155 FERC ¶ 61,276
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 35

[Docket No. RM15-24-000; Order No. 825]

Settlement Intervals and Shortage Pricing in Markets Operated by Regional Transmission Organizations and Independent System Operators

(Issued June 16, 2016)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Final Rule

SUMMARY: The Federal Energy Regulatory Commission (Commission) is revising its regulations to address certain practices that fail to compensate resources at prices that reflect the value of the service resources provide to the system, thereby distorting price signals, and in certain instances, creating a disincentive for resources to respond to dispatch signals. We require that each regional transmission organization and independent system operator align settlement and dispatch intervals by: (1) settling energy transactions in its real-time markets at the same time interval it dispatches energy; (2) settling operating reserves transactions in its real-time markets at the same time interval it prices operating reserves; and (3) settling intertie transactions in the same time interval it schedules intertie transactions. We also require that each regional transmission organization and independent system operator trigger shortage pricing for any interval in which a shortage of energy or operating reserves is indicated during the pricing of resources for that interval. Adopting these reforms will align prices with resource

dispatch instructions and operating needs, providing appropriate incentives for resource performance.

EFFECTIVE DATE: This rule will become effective **75 days after publication in the FEDERAL REGISTER.**

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SUPPLEMENTARY INFORMATION:

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FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Norman C. Bay, Chairman;
Cheryl A. LaFleur, Tony Clark,
and Colette D. Honorable.

Settlement Intervals and Shortage Pricing in Markets Operated by Regional Transmission Organizations and Independent System Operators — Docket No. RM15-24-000

ORDER NO. 825

FINAL RULE

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I. Introduction

1. In this Final Rule, we address certain practices that fail to compensate resources at prices that reflect the value of the service resources provide to the system, thereby distorting price signals, and in certain instances, creating a disincentive for resources to respond to dispatch signals. We require, pursuant to section 206 of the Federal Power Act (FPA),[1] that each regional transmission organization (RTO) and independent system operator (ISO) align settlement and dispatch[2] intervals by: (1) settling energy transactions in its real-time markets at the same time interval it dispatches energy; (2) settling operating reserves transactions in its real-time markets at the same time interval it prices operating reserves;[3] and (3) settling intertie transactions[4] in the same

[1] 16 U.S.C. 824e (2012).

[2] As mentioned in the Notice of Proposed Rulemaking, the Commission sometimes uses the term "dispatch" as shorthand when describing how RTOs/ISOs acquire and price energy and operating reserves. With respect to operating reserves, the Commission uses dispatch to describe the intervals at which they are acquired and priced. *See Settlement Intervals and Shortage Pricing in Markets Operated by Regional Transmission Organizations and Independent System Operators*, 80 Fed. Reg. 58,393 (Sept. 29, 2015), FERC Stats. & Regs. ¶ 32,710, at P 1 (2015) (NOPR).

[3] Operating reserves refer to certain ancillary services procured in the wholesale market, although they are often defined differently in each RTO/ISO. Operating reserves typically include: (a) Regulating Reserve, used to account for very short-term deviations between supply and demand (e.g., 4 to 6 seconds); (b) Spinning, or Synchronous Reserve,

(continued...)

time interval it schedules intertie transactions (settlement interval requirements). We also require, pursuant to section 206 of the FPA, that each RTO/ISO establish a mechanism to trigger shortage pricing for any interval in which a shortage of energy or operating reserves is indicated during the pricing of resources for that interval (shortage pricing requirement).

2. Some current RTO/ISO settlement practices fail to reflect the value of providing a given service, thereby distorting price signals and failing to provide appropriate signals for resources to respond to the actual operating needs of the market. One such practice occurs when RTOs/ISOs dispatch resources every five minutes but perform settlements based on an hourly integrated price, or when RTOs/ISOs schedule intertie transactions every fifteen minutes, but perform settlements on an hourly integrated price. This misalignment between dispatch and settlement intervals distorts the price signals sent to resources and fails to reflect the actual value of resources responding to operating needs

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which is capacity held in reserve and synchronized to the grid and able to respond within a relatively short amount of time (e.g., within 10 minutes), to be used in case of a contingency, such as the loss of a generator; and (c) Non-Spinning Reserve, capacity that is not synchronized to the grid and which can take longer to respond (e.g., within 10-30 minutes) in case of a contingency. Federal Energy Regulatory Commission, *Price Formation in Organized Wholesale Electricity Markets: Staff Analysis of Shortage Pricing*, Docket No. AD14-14-000, at 3 n.7 (Oct. 2014), http://www.ferc.gov/legal/staff-reports/2014/AD14-14-pricing-rto-iso-markets.pdf (Shortage Pricing Paper).

[4] Intertie transactions are transactions across RTO/ISO borders, including imports, exports and wheel-through transactions.

because compensation will be based on average output and average prices across an hour, rather than output and prices during the periods of greatest need within a particular hour.

3. We also find that a second problem occurs if there is a mismatch between the time when a system experiences a shortage of energy and operating reserves and the time when prices reflect the shortage condition. This can be particularly problematic when, for example, an RTO's/ISO's market rules require a shortage to last a minimum time period before triggering shortage pricing. In this instance, short-term prices fail to reflect system conditions and potential reliability costs, as well as the value of both internal and external market resources responding to a dispatch signal. In addition, inaccurate price signals are provided to market participants if shortage pricing is still in effect after the shortage has been resolved.

4. To address these problems associated with differing dispatch intervals and settlement intervals, as well as with shortage pricing triggers, we are setting forth the settlement interval requirements and the shortage pricing requirement in this Final Rule.[5] These settlement interval and shortage pricing requirements will help ensure that resources have price signals that provide incentives to conform their output to dispatch instructions, and that prices reflect operating needs at each dispatch interval.

5. As set forth in the NOPR, we reiterate the goals of price formation are to: (1) maximize market surplus for consumer and suppliers; (2) provide correct incentives

[5] We are not at this time proposing to change the price paid by any RTO/ISO when shortage pricing is triggered.

for market participants to follow commitment and dispatch instructions, make efficient investments in facilities and equipment, and maintain reliability; (3) provide transparency so that market participants understand how prices reflect the actual marginal cost of serving load and the operational constraints of reliably operating the system; and, (4) ensure that all suppliers have an opportunity to recover their costs.[6]

6. As noted in the NOPR, the reforms adopted in this Final Rule advance at least two of the Commission's goals with respect to price formation. First, the proposed reforms will help provide correct incentives for market participants to follow commitment and dispatch instructions,[7] to make efficient investments in facilities and equipment, and to maintain reliability. Specifically, requiring RTOs/ISOs to align the settlement and dispatch intervals will more accurately reward resources that are providing energy and ancillary services in periods of the greatest need and will discourage provision of energy and ancillary services immediately following periods of system stress. Doing so will enhance the incentive to follow an RTO's/ISO's dispatch signal and thus help maintain system reliability. This reform will also reward resources that can

[6] *See* Notice Inviting Post-Technical Workshop Comments, Docket No. AD14-14-000, at 1 (Jan. 16, 2015); Notice, Docket No. AD14-14-000 (June 19, 2014).

[7] The Commission notes that the reforms proposed herein would further augment existing mechanisms in each RTO/ISO market that provide incentives to follow dispatch instructions, such as penalties for excessive or deficient energy and the allocation of commitment and dispatch costs to deviations from energy dispatch targets. *See, e.g.*, MISO, FERC Electric Tariff, §§ 40.3.3(a) (36.0.0) (allocating Revenue Sufficiency Guarantee costs to, inter alia, resources providing excessive or deficient energy), 40.3.4 (33.0.0) (charges for excessive or deficient energy deployment).

flexibly respond to system needs, thus creating an incentive for resources to make efficient investments in facilities and equipment. Similarly, implementing shortage pricing for any dispatch interval during which a shortage of energy or operating reserves occurs will provide an incentive for resources to ensure that they are available to respond to high prices, which should help alleviate shortages and avoid shortage pricing during subsequent dispatch intervals. This reform would also ensure that resources operating during a shortage are compensated for the value of the service that they provide, regardless of whether the shortage is short-lived.

7. Second, the proposed reforms will also help provide transparency and certainty so that market participants understand how compensation and prices reflect the actual marginal cost of serving load and the operational constraints of reliably operating the system. Requiring settlement intervals to match dispatch intervals will make resource compensation more transparent by, among other things, increasing the proportion of resource payment provided through payments of energy and operating reserves rather than uplift. Further, requiring RTOs/ISOs to trigger shortage pricing for an interval in which a shortage of energy or operating reserves is indicated during the pricing of resources for that interval will ensure that prices transparently reflect the operational constraints of reliably operating the system. This increased transparency, in turn, better informs decisions to build or maintain resources and enhances consumers' ability to hedge. The benefits summarized above and discussed in detail below would ultimately help to ensure just and reasonable rates.

8. As discussed below, we require each RTO/ISO to submit a compliance filing with the tariff changes needed to implement this Final Rule within 120 days of the Final Rule's effective date. We will allow a further 12 months from the compliance filing date for the tariff changes implementing reforms to settlement intervals to be effective, and 120 days from that same compliance filing date for the tariff changes implementing shortage pricing reforms to be effective.[8]

II. Background

9. The Commission has addressed price formation in organized markets on prior occasions. For example, in Order No. 719, the Commission addressed shortage pricing[9] and required RTOs/ISOs to develop and implement shortage pricing rules that would apply during operating reserve shortages to "ensure that the market price for energy reflects the value of energy during an operating reserve shortage."[10] The Commission required such rules out of concern that inappropriate price signals during an operating

[8] The Commission has followed a similar approach with the timelines for compliance and implementation in the past. *See, e.g.*, *Frequency Regulation Compensation in the Organized Wholesale Power Markets*, Order No. 755, FERC Stats. & Regs. ¶ 31,324, at P 201 (2011), *reh'g denied*, Order No. 755-A, 138 FERC ¶ 61,123 (2012).

[9] *Wholesale Competition in Regions with Organized Electric Markets*, Order No. 719, FERC Stats. & Regs. ¶ 31,281, at PP 192-194 (2008), *order on reh'g*, Order No. 719-A, FERC Stats. & Regs. ¶ 31,292, *order on reh'g*, Order No. 719-B, 129 FERC ¶ 61,252 (2009).

[10] Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 194.

reserve shortage would provide an insufficient incentive for market participants to take appropriate actions.

10. In June 2014, the Commission initiated a proceeding, in Docket No. AD14-14-000, to evaluate issues regarding price formation in the energy and ancillary services markets operated by RTOs/ISOs (price formation proceeding). In the notice initiating that proceeding, the Commission stated that there may be opportunities for the RTOs/ISOs to improve the energy and ancillary services price formation process. As set forth in the notice, locational marginal prices (LMP) and market-clearing prices used in energy and ancillary services markets ideally "would reflect the true marginal cost of production, taking into account all physical system constraints, and these prices would fully compensate all resources for the variable cost of providing service."[11] Pursuant to the notice, staff conducted outreach and convened technical workshops on the following four general issues: (1) use of uplift payments; (2) offer price mitigation and offer price caps; (3) scarcity and shortage pricing; and (4) operator actions that affect prices.[12] The Commission also released staff reports on these topics. In one of those reports, issued in October 2014, staff analyzed shortage pricing issues.[13]

[11] Notice, Docket No. AD14-14-000, at 2 (June 19, 2014).

[12] *Id*. at 1, 3-4.

[13] *See* Shortage Pricing Paper.

11. In its January 2015 Notice Inviting Comments, the Commission requested comments on questions that arose from the price formation technical workshops.[14] In response, among other price formation issues, commenters addressed settlement intervals and shortage pricing.

12. On September 17, 2015, the Commission issued a NOPR proposing to require that each RTO/ISO: (1) settle energy transactions in its real-time markets at the same time interval it dispatches and prices energy, and settle operating reserves transactions in its real-time markets at the same time interval it prices operating reserves; and (2) trigger shortage pricing for any dispatch interval during which a shortage of energy or operating reserves occurs.[15] The Commission sought comments on these proposals, and sought comment on: (1) whether settlement interval reforms are appropriate for intertie transactions that are scheduled on intervals different from the intervals on which RTOs/ISOs dispatch internal real-time energy; and (2) whether it is appropriate to align the settlement interval for intertie transactions with external scheduling intervals, e.g., fifteen minutes.[16] Additionally, the Commission sought comment on whether to require that RTOs/ISOs settle real-time operating reserves transactions at the same interval as real-time energy dispatch and settlement intervals or whether a settlement interval that

[14] Notice Inviting Post-Technical Workshop Comments, Docket No. AD14-14-000 (Jan. 16, 2015).

[15] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 14.

[16] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 39.

differs from an RTO's/ISO's real-time energy dispatch interval would be appropriate for some operating reserves transactions.[17] Finally, the Commission sought comment on the implementation schedule and the costs of implementation.[18] A list of commenters and the abbreviated names used for them in this Final Rule appears in the Appendix.

III. Discussion

A. Settlement Interval Reform

1. Need for Reform

13. In the NOPR,[19] the Commission preliminarily found that the current RTO/ISO settlement practice of using hourly integrated prices for real-time settlement and five-minute dispatch instructions may fail to reflect the value of providing a given service, and may contribute to lack of a response to the actual operating needs of those markets. In addition, the Commission stated that the use of hourly integrated prices for real-time settlement may discourage resources from following five-minute dispatch instructions, and may increase the need for uplift payments. Therefore, the Commission preliminarily found that the use of hourly integrated prices for real-time settlement may result in rates that are unjust and unreasonable.

14. Commenters generally agree with the Commission's preliminary finding regarding the settlement interval proposal. For example, EPSA states that "[w]hen real-time

[17] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 40.

[18] NOPR, FERC Stats. & Regs. ¶ 32,710 at PP 56, 60.

[19] NOPR, FERC Stats. & Regs. ¶ 32,710 at PP 26-33.

settlements for generation or dispatchable demand are calculated based on hourly prices that are the simple average of sub-hourly prices resulting from the actual dispatch, there is a distortion to the real-time price signal impacting both reliability and efficiency."[20] Similarly, Potomac Economics states that the inconsistency between five-minute dispatch instructions and hourly-average price settlement intervals "creates incentives for generators to not follow the dispatch signal or to simply be inflexible by a) restricting dispatch range (the difference between a generator's minimum dispatch level and maximum dispatch level) or b) offering a slower dispatch ramp rate."[21] Potomac Economics notes that while MISO makes uplift payments to generators to alleviate these incentive issues, such payments are "an inferior substitute for a true alignment where each generator, importer or exporter would settle based on the actual value of energy corresponding with its production or transactions in each five-minute interval."[22] ELCON asserts that hourly prices do not "reflect system needs and costs, and may result in over or under recovery of costs depending on how the shortage plays out during the hour. When SPP moved to sub-hourly settlements, overall system costs were lower."[23]

[20] EPSA Comments, Pope Aff. at 2-3.

[21] Potomac Economics Comments at 4.

[22] Potomac Economics Comments at 4-5.

[23] ELCON Comments at 2.

15. In some instances, commenters assert that the Commission should not affirm its preliminary finding on the settlement interval proposal. APPA and NRECA assert that Commission approval of any five-minute settlement implementation process should require vetting and approval by the RTOs'/ISOs' stakeholders.[24] Direct Energy asserts that the Commission should solicit further information from the RTOs/ISOs before determining whether or not to direct settlement interval reforms.[25]

16. Based on analysis of the record, we adopt our preliminary findings, and, as described in detail below, conclude that certain RTO/ISO settlement practices are not just and reasonable and are unduly discriminatory and preferential. Accordingly, we direct each RTO/ISO to align its settlement and dispatch intervals by settling energy transactions in its real-time markets at the same time interval it dispatches energy, settling operating reserves transactions in its real-time markets at the same time interval it prices operating reserves, and settling intertie transactions in the same time interval it schedules intertie transactions, as discussed further herein.

[24] APPA and NRECA Comments at 4.

[25] Direct Energy Comments at 6.

2. Settlement Interval Reform for Energy Transactions and Operating Reserves

a. Proposal

i. Energy Transactions

17. In the NOPR, the Commission proposed to require that each RTO/ISO settle energy transactions in its real-time markets at the same time interval it dispatches energy. The Commission preliminarily found the use of hourly integrated prices for real-time settlement may have the unintended effect of distorting price signals, and, in certain instances, contributing to market participants' failing to respond appropriately to operating needs.[26] Specifically, the Commission stated that hourly integrated prices for real-time settlement may: (1) not accurately reflect the value a resource provides to the system; (2) discourage resources from following dispatch instructions; and (3) cause increased uplift payments. Therefore, the Commission preliminarily found that the use of hourly integrated prices for real-time settlement may result in rates that are unjust and unreasonable.

18. To remedy any potentially unjust and unreasonable rates caused by the use of hourly integrated prices for real-time settlement, the Commission proposed in the NOPR to require that each RTO/ISO settle energy transactions in its real-time markets at the same time interval it dispatches energy.[27]

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[26] NOPR, FERC Stats. & Regs. ¶ 32,710 at PP 26-33.

[27] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 34.

19. The Commission explained that in the short-term, the settlement interval proposal should improve incentives for resources to respond quickly to dispatch instructions, which should in turn lead to operators taking fewer out-of-market actions to ensure that supply meets demand. The Commission noted that by improving resources' response to dispatch instructions, the settlement interval proposal would result in a more efficient use of generation resources to the benefit of all consumers. In the long-term, the Commission maintained that these reforms should provide more accurate price signals, which should provide, together with other market price signals, the appropriate incentives to build or maintain resources that can respond to energy or operating reserve deficiencies.[28]

20. In addition, the Commission noted, where settlement and dispatch intervals are aligned, resources dispatched economically during high-priced periods would receive those higher prices rather than an hourly average of the dispatch interval LMPs, thereby reducing the need to make uplift payments.

ii. Operating Reserves

21. The Commission proposed requiring that each RTO/ISO "settle operating reserves transactions in its real-time markets at the same time interval it prices operating reserves."[29] Although the Commission noted that dispatch and pricing of energy and operating reserves are closely linked through co-optimization in the real-time market, it

[28] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 35.

[29] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 34.

also noted that certain RTOs/ISOs acquire operating reserves on a different time interval than they dispatch energy.[30] The Commission sought comment on whether the Commission should require RTOs/ISOs to settle all real-time operating reserves transactions at the same time interval as real-time energy dispatch and settlement intervals, or whether a settlement interval that differs from an RTO's/ISO's real-time energy dispatch interval would be appropriate for some operating reserves transactions.[31]

b. Current Practices in the RTOs/ISOs

i. Energy Transactions

22. The following table describes how each RTO/ISO currently dispatches and settles real-time energy transactions:

[30] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 40.

[31] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 40.

Table 1: RTO/ISO Dispatch and Settlement Intervals for Energy

	Real-Time Dispatch[32]	Real-Time Settlement[33]
CAISO	5 minute	5 minute
ISO-NE	5 minute	hourly average
MISO	5 minute	hourly average
NYISO	5 minute	5 minute
PJM	5 minute	hourly average
SPP	5 minute	5 minute

ii. Operating Reserves

23. The RTOs/ISOs vary in how they settle and treat operating reserves. For example, CAISO represents that it settles its operating reserve transactions on fifteen-minute

[32] *See* CAISO, eTariff, § 34.5 (17.0.0); ISO-NE, Transmission, Markets and Services Tariff, Market Rule 1, § III.2.3 (15.0.0); MISO, FERC Electric Tariff, § 40.2 (34.0.0); NYISO Markets and Services Tariff, § 4.4.2.1 (17.0.0); PJM OATT, Attachment K, Appendix, § 2.3 (2.0.0); SPP, OATT, Sixth Revised Volume No. 1, Attachment AE, § 6.2.2 (1.0.0).

[33] *See* CAISO, eTariff, § 11.5 (2.0.0), Appendix A, Settlement Interval (2.0.0); ISO-NE, Transmission, Markets and Services Tariff, Market Rule 1, § III.2.2(b) (15.0.0); MISO, FERC Electric Tariff, §§ 40.3 (32.0.0), 40.3.1 (32.0.0), 40.3.3 (36.0.0); NYISO, NYISO Tariffs, NYISO Markets and Services Tariff, §§ 4.4.2.1, 4.4.2.8 (17.0.0); PJM, Intra-PJM Tariffs, OATT, Attachment K, Appendix, §§ 2.5(e), (4.0.0), 3.2.1(e), (f) (28.0.0); SPP, OATT, Sixth Revised Volume No. 1, Attachment AE, §§ 8.6, 8.6.1 (2.1.0). The above tariff citations refer to internal transactions. CAISO settles its intertie interchange transactions on fifteen-minute intervals. *See* CAISO, eTariff, HASP Block Intertie Schedule (0.0.0).

intervals and dispatches energy on five-minute intervals.[34] MISO states that it currently calculates settlements for real-time operating reserves transactions at the same interval that they are dispatched, i.e., five minutes, but that actual settlements are on an hourly basis due to the specific calculations MISO makes.

24. The PJM Market Monitor explains that the synchronized and regulation reserves markets in PJM clear hourly but already incorporate five-minute LMP data for calculating opportunity costs. The PJM Market Monitor states that the offer price in PJM's synchronized reserve market includes both the direct short-run marginal cost of providing synchronized reserves, which does not vary every five minutes, and the opportunity cost of providing synchronized reserves, which does vary with five-minute LMPs. The PJM Market Monitor explains that PJM currently updates the opportunity cost every five minutes using five-minute LMP data for the Tier 2 synchronized reserve market and recalculates the market clearing price every five minutes, with settlement based on the average of the five-minute clearing price.[35]

25. The PJM Market Monitor explains that, in PJM's regulation market, the offer price includes both the direct short-run marginal cost of providing regulation, which does not vary every five minutes, and the opportunity cost of providing regulation, which varies with five-minute LMPs. The PJM Market Monitor adds that PJM currently updates the

[34] CAISO Comments at 8.

[35] PJM Market Monitor Comments at 8.

opportunity cost every five minutes using five-minute LMP data for the regulation market and recalculates the clearing price every five minutes, with settlement based on the average of five-minute clearing prices. The PJM Market Monitor also notes that PJM purchases other forms of operating reserves on a cost basis, including Tier 1 synchronized reserves, non-synchronized reserves, and day-ahead scheduling reserves.[36]

26. NYISO explains that it uses five-minute intervals to settle its real-time markets for energy, regulation service, and operating reserves.[37] ISO-NE currently has hourly integrated settlement for its real-time energy transactions and its real-time operating reserves. However, ISO-NE states it intends to implement five-minute settlement of real-time operating reserves in connection with implementing five-minute settlement of real-time energy transactions, which is a current discussion among ISO-NE stakeholders.[38] SPP prices and settles operating reserve products in its real-time market on a dispatch interval, or five minute, basis.[39]

[36] PJM Market Monitor Comments at 8.

[37] NYISO Comments at 2-3.

[38] ISO-NE Comments at 2-3.

[39] SPP Market Protocols, Sections 4.5.4 and 4.5.9.

c. Comments on the Proposed Settlement Interval Reform

27. Twenty-seven of the thirty commenters providing input on this issue generally support the NOPR's proposed settlement interval reform.[40] As described below, many assert that the proposed reform will align the price signals with system conditions and provide accurate incentives for generation units to follow dispatch instructions.[41] Others point to additional benefits.

i. Comments from the RTOs/ISOs

28. The ISO/RTO Council supports the Commission's goals of aligning prices with resource dispatch instructions and operating needs and specifically supports the settlement interval proposal for energy transactions. The ISO/RTO Council states that the proposed settlement interval reform will make resource compensation more

[40] Ameren Comments at 1, 3-4; ANGA Comments at 2-5; CAISO Comments at 2; CEA Comments at 3-6; Dominion Comments at 1-2; DTE Comments at 3-4; EDP Renewables Comments at 2; EEI Comments at 2; ESA Comments at 2-4; Entergy Nuclear Power Marketing Comments at 2; EPSA Comments at 1-5; Exelon Comments at 4; Financial Marketers Coalition Comments at 1; Golden Spread Initial Comments at 1-3; Inertia Power and DC Energy Comments at 2; ISO-NE Comments at 1; MISO Comments at 2, 9; NEI Comments at 1; NGSA Comments at 2-5; ODEC Comments at 3; PJM Power Providers Comments at 2-5; Potomac Economics Comments at 2; Powerex Comments at 6; PSEG Comments at 3; Public Interest Organizations Comments at 5; SPP Market Monitor Comments at 2; Westar Comments at 1.

[41] Inertia Power and DC Energy Comments at 2; Potomac Economics Comments at 1; Westar Comments at 1; PSEG Comments at 3.

transparent by increasing the proportion of payments to resources through the price paid for energy as opposed to uplift.[42]

29. In separate comments, NYISO, ISO-NE, MISO, and PJM support the settlement interval proposal for both energy and operating reserve transactions. Likewise, in separate comments, CAISO supports the settlement interval proposal for energy transactions, but does not support requiring RTOs/ISOs to settle all real-time operating reserves transactions at the same interval as real-time energy dispatch and settlement intervals.

30. CAISO states that the settlement interval proposal would improve market efficiency, and that accurate price signals provide market participants with incentives to develop needed capabilities and to offer those capabilities into the market.[43] CAISO states that where settlement and dispatch intervals are aligned, resources dispatched economically during high-priced periods should receive high prices, thus reducing the need to pay uplift caused by non-alignment of settlement and dispatch intervals.[44]

31. However, CAISO does not support requiring RTOs/ISOs to settle all real-time operating reserves transactions at the same interval as real-time energy dispatch and settlement intervals. Instead, CAISO asserts that it is appropriate to maintain its current

[42] ISO/RTO Council Comments at 2.

[43] CAISO Comments at 7.

[44] CAISO Comments at 7.

fifteen-minute procurement and settlement interval for operating reserves transactions, which differs from the five-minute real-time energy dispatch interval. CAISO explains that its current settlement methodology aligns ancillary services commitment with internal generation commitment and intertie transactions scheduling so that the market accurately reflects the overall amount of supply resources available to provide energy and ancillary services.[45]

32. NYISO supports the settlement interval proposal and asserts that its use of five-minute intervals to settle its real-time markets for energy, regulation service, and operating reserves, has provided significant incentives for resources to follow dispatch instructions and opportunities for supply resources to obtain full payment for their performance based on actual system conditions.[46]

33. ISO-NE contends that settling on sub-hourly or five-minute intervals would help to improve price signals and resource compensation.[47] ISO-NE states that five-minute settlements will help improve price formation by ensuring that compensation for real-time performance sends more accurate market signals of power system conditions when energy is provided.[48] ISO-NE supports the settlement interval proposal for operating reserve transactions. It asserts that settling all real-time operating reserves transactions at

[45] CAISO Comments at 17-18.

[46] NYISO Comments at 2-3.

[47] ISO-NE Comments at 2.

[48] ISO-NE Comments at 2.

the same interval as real-time energy dispatch and settlement intervals would assist in aligning dispatch following incentives in markets that simultaneously co-optimize energy and reserve dispatch in real-time. ISO-NE states it intends to implement five-minute settlement of real-time operating reserves in connection with implementing five-minute settlement of real-time energy transactions, which is a current discussion among ISO-NE stakeholders.[49]

34. MISO asserts that the inconsistency between dispatch and settlements may produce financial outcomes that do not align with the guiding principles of co-optimized (energy and ancillary services) security constrained economic dispatch.[50] If the Commission requires five-minute settlements of operating reserves, MISO states that it would modify its operating reserves settlements from its current hourly method of settling operating reserves to align with real-time energy transactions.[51]

35. PJM states that ancillary services, including operating reserves, should settle on the same interval as energy because they are co-optimized. PJM argues that not doing so could yield discrepancies between the prices used to settle each product and could therefore undo enhancements made since implementation of Order No. 719, reduce

[49] ISO-NE Comments at 2-3.

[50] MISO Comments at 2.

[51] MISO Comments at 7-8.

market efficiencies, disrupt operations, and hinder proper price formation.[52] PJM states that it intends to change its market rules to settle energy and ancillary services transactions in its real-time energy market at the same interval on which it dispatches resources.[53]

ii. Comments by Market Monitors

36. The PJM Market Monitor agrees that it would be appropriate to implement five-minute pricing for the reasons stated in the NOPR, and that implementing five-minute settlements will contribute significantly to reducing uplift payments in PJM, an ongoing goal in the PJM region.[54] The PJM Market Monitor states that, while it is appropriate to include the impact of five-minute LMP changes on the cost of operating reserves in the form of synchronized reserves and regulation, the PJM design for these markets currently incorporates those impacts. The PJM Market Monitor asserts that no additional changes to PJM market and non-market mechanisms for acquiring operating reserves are currently necessary to incorporate changes in five-minute LMPs.[55]

37. Potomac Economics, which serves as the market monitor for ISO-NE, MISO, and NYISO, argues that hourly settlements encourage resources not to follow dispatch instructions or to decrease their flexibility by restricting dispatch ranges and offering

[52] PJM Comments at 9.

[53] PJM Comments at 2.

[54] PJM Market Monitor Comments at 2, 4.

[55] PJM Market Monitor Comments at 8-9.

slower ramp rates, and states that MISO pays uplift to alleviate these issues. Potomac Economics cites its 2014 MISO State of the Market Report to show how five-minute settlements would change total payments to resources compared to current hourly settlements. This analysis showed that fossil-fueled resources in 2014 received settlements that were $35 million less than they would have received if the settlement were based on five-minute prices and output, and that only one-fifth of this lost value was paid via uplift. In contrast, Potomac Economics represents that non-fossil resources were paid on net in hourly revenues slightly above what they would have received with five-minute settlements. Potomac Economics asserts that five-minute settlement provides greater compensation to fossil resources, more accurately representing the flexibility fossil resources provide to the system. In contrast, Potomac Economics argues that hourly settlement overvalues wind resources because such resources cannot ramp up in response to higher prices, are negatively correlated with load and contribute to higher congestion at higher output levels.[56] Potomac Economics states that the settlement interval proposal will provide incentives for better resource performance, will improve price signals, and will improve markets' short-run commitment and dispatch of existing resources.[57]

[56] Potomac Economics Comments at 6.

[57] Potomac Economics Comments at 1.

38. The SPP Market Monitor agrees with the Commission's preliminary finding that aligning settlement and dispatch intervals would make resource compensation more transparent by increasing the proportion of resource payments made through energy and operating reserve payments instead of uplift.[58] The SPP Market Monitor states that aligning dispatch and settlement intervals in neighboring markets would enhance price signals at seams and enhance market efficiency.[59]

iii. Comments Supporting the Proposed Settlement Interval Reform

39. Many commenters expressly support the NOPR's settlement interval proposal, citing many of the benefits that were outlined in the NOPR.[60] They generally argue that the settlement interval proposal will provide incentives for generators to follow dispatch more precisely, thus leading to better resource performance, and improved reliability.[61]

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[58] SPP Market Monitor Comments at 2.

[59] SPP Market Monitor Comments at 2-3.

[60] Ameren Comments at 1, 3-4; ANGA Comments at 2-5; CAISO Comments at 2; CEA Comments at 3-6; Dominion Comments at 1-2; DTE Comments at 3-4; EDP Renewables Comments at 2; EEI Comments at 2; ESA Comments at 2-4; Entergy Nuclear Power Marketing Comments at 2; EPSA Comments at 1-5; Exelon Comments at 4; Financial Marketers Coalition Comments at 1; Golden Spread Initial Comments at 1-3; Inertia Power and DC Energy Comments at 2; ISO-NE Comments at 1; MISO Comments at 2, 9; NEI Comments at 1; NGSA Comments at 2-5; PJM Power Providers Comments at 2-5; Potomac Economics Comments at 2; Powerex Comments at 6; PSEG Comments at 3; Public Interest Organizations Comments at 5; SPP Market Monitor Comments at 2; Westar Comments at 1; AEMA Comments at 2; XO Energy Comments at 1; PJM Market Monitor at 2; ODEC at 3.

[61] Inertia Power and DC Energy Comments at 2; Westar Comments at 1, 3; EEI Comments at 6-7; Exelon Comments at 4-5.

They also assert that the settlement interval proposal will properly compensate resources for the service they provide and will more fully recognize the value of flexible or fast-ramping resources.[62] In addition, they generally state that the settlement interval proposal will lead to fewer out-of-market payments, will increase transparency, and will support more efficient market outcomes.[63]

40. More specifically, Exelon asserts that the settlement interval proposal will support ongoing market improvements, such as ISO-NE's performance incentive mechanism, effective in June 2018, that will pay resources bonuses or impose penalties based on performance during operating reserve shortages that last five minutes or longer. Exelon argues that ISO-NE's market must settle at five-minute intervals to implement this mechanism completely.[64]

41. According to EDP Renewables, greater participation of fast ramping renewable resources will also enhance resource adequacy, produce cost savings for consumers, and improve grid resilience.[65]

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[62] Public Interest Organizations Comments at 2-3; ELCON Comments at 2-3; EDP Renewables Comments at 2-3; ESA Comments at 3; NEI Comments at 14.

[63] *See* supra note 60; ELCON Comments at 3; Exelon Comments at 4-5.

[64] Exelon Comments at 5.

[65] EDP Renewables Comments at 3.

42. Some commenters also argue that the settlement interval proposal will reduce market inefficiencies and lead to greater investment. PSEG asserts that the proposed reforms correct market flaws that have caused inefficiencies in both price signals and resource dispatch decisions.[66] ELCON states that the proposed settlement reform addresses an embedded inconsistency in market operation that promotes gaming and other forms of ill behavior or inefficiencies.[67] EDP Renewables argues that the proposed reforms will also yield savings, remove opportunities for market manipulation, and encourage investment in new services and new technologies, all of which will result in a more robust and resilient grid and help both consumers and suppliers through more efficient market operation.[68]

43. EPSA argues that implementing sub-hourly settlement intervals is needed to obtain the full benefits of other price formation reforms to improve the accuracy with which real-time prices communicate the time-dependent and location-dependent value of incremental energy and ancillary services.[69]

44. TAPS does not oppose the settlement interval proposal, as long as it does not impose an undue burden on load serving entities.[70]

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[66] PSEG Comments at 3.

[67] Public Interest Organizations Comments at 2-3; ELCON Comments at 2-3.

[68] EDP Renewables Comments at 2.

[69] EPSA Comments at 6-7, Pope Aff. at 4-5.

[70] TAPS Comments at 4.

45. EPSA supports the settlement interval proposal for operating reserves. It argues that real-time operating reserves should be co-optimized in the dispatch and settled with energy for every hourly sub-interval (generally five minutes) to ensure that resources are compensated for following RTO/ISO instructions and are indifferent to providing either energy or operating reserves during periods of high energy or operating reserves prices.[71] EPSA emphasizes the importance of sending sub-hourly price signals to ensure that operating reserves are available in sub-hourly intervals due to their contribution to maintaining reliability, further stating that sub-hourly settlements for operating reserves send information to the market relating to the potential profitability of incremental investments to enhance the sub-hourly availability of such reserves.[72] EPSA argues that to ensure accurate prices for both energy and operating reserves, RTOs/ISOs should be required to co-optimize these products in real-time because suppliers should be indifferent to providing incremental energy and operating reserves in each sub-hourly interval to allow the RTO/ISO to perform a reliable least-cost dispatch.[73]

46. Dominion supports the settlement interval proposal for operating reserves. However, Dominion argues that only specific reserve products should settle at the same interval that they are priced and that other types of settlement provisions, such as make-

[71] EPSA Comments, Pope Aff. at 11.

[72] EPSA Comments, Pope Aff. at 11.

[73] EPSA Comments, Pope Aff. at 12-13.

whole payments, should not.[74] Dominion explains that, in PJM, for example, "balancing Operating Reserves" includes the costs to dispatch resources out-of-merit for reliability or to cover deficiencies in the day-ahead market solution.[75] According to Dominion, these resources do not provide a specific reserve product; rather, these resources are made whole when they are dispatched to address a mismatch between day-ahead commitment and real-time requirements. Dominion therefore requests that the Commission not require the settlement intervals for these types of operating reserve to change.[76]

47. PSEG supports applying the proposed settlement intervals to both real-time energy transactions and real-time operating reserves. PSEG explains that given the linkage between energy transactions and reserve services, settling those products on different intervals would introduce dislocations, and incent resource actions that could disrupt these co-optimization objectives, essentially undermining the Commission's objectives in the NOPR.[77]

48. The New Jersey Board concurs with the PJM Market Monitor that no changes should be made in PJM's synchronized reserve and regulation markets given that the opportunity cost component in these ancillary services markets, which is the only cost component subject to five-minute changes in LMP, already accounts for the five-minute

[74] Dominion Comments at 3.

[75] Dominion Comments at 3.

[76] Dominion Comments at 3.

[77] PSEG Comments at 4-5.

interval changes.[78] Duke acknowledges potential benefits from aligning operating reserve transactions with their respective settlement intervals but argues that stakeholders should consider whether operating reserves transactions should be aligned with settlement intervals for energy given the costs of doing so.[79] Although it takes no position on the operating reserves proposal, EEI states that additional clarity from the Commission on the definition of operating reserve transactions would be helpful, given the varied definitions of reserve products among regions. EEI states that such regional variation warrants further consideration.[80]

iv. Comments Opposed to the Proposed Settlement Interval Reform

49. Several commenters oppose the settlement interval proposal. Direct Energy states that the Commission should solicit information from RTOs/ISOs to determine whether existing generation resources are able to respond effectively to five-minute price signals before determining whether any settlement interval reform is warranted.[81] Direct Energy doubts the ability of longer lead-time resources to respond to five-minute price signals during periods of extreme price volatility, and surmises that look-ahead unit commitment and dispatch software results could exacerbate swings in generation and load balance.

[78] New Jersey Board Comments at 4.

[79] Duke Comments at 5.

[80] EEI Comments at 9-10 & n.16.

[81] Direct Energy Comments at 6.

Direct Energy states that a high-priced dispatch interval could encourage dispatch of peaking generation, which would take several minutes with longer ramp times and cause other resources to ramp up more quickly. Direct Energy argues that this could lead to an oversupply and to depressed prices, thus making the longer-ramping resources responding to the original signal uneconomic by running below their costs and incurring uplift—the opposite of the goal of the settlement interval proposal.[82]

50. Duke, APPA and NRECA, and Concerned Cooperatives argue that the Commission should refrain from requiring a one-size-fits-all approach.[83] Duke, APPA and NRECA, and Concerned Cooperatives contend that RTO/ISO stakeholder processes should vet this issue and consider issues such as the costs, benefits, types of changes needed to implement this reform, price formation issues more generally, and unintended consequences.[84] Duke states that this approach would notify the Commission with regard to possible solutions, cost of implementation, and the timeframe in which the RTO/ISO could reasonably address each issue.[85] Additionally, Concerned Cooperatives disagree with the Commission's conclusion that reforming the settlement intervals will result in more efficient use of generating resources.

[82] Direct Energy Comments at 3-5.

[83] Duke Comments at 2-3; APPA and NRECA Comments at 4-5; Concerned Cooperatives Comments at 4-5.

[84] Duke Comments at 4; APPA and NRECA Comments at 3; Concerned Cooperatives Comments at 1.

[85] Duke Comments at 4-5.

51. Concerned Cooperatives argue that the benefits of moving to five-minute settlements will not offset the cost. They state that the Potomac Economics report cited in the NOPR shows that switching to matching intervals would force MISO market participants to expend millions of dollars on upgrades and operation and maintenance (O&M) costs, without realizing lower rates. Instead, those participants would face an annual increase of approximately $28 million, after netting the estimated $6.6 million system benefit from the increased payments to generators of about $35 million dollars.[86]

52. Concerned Cooperatives further argue that the Commission relies solely upon a letter filed in Docket No. AD14-14-000[87] to support its finding with no analysis as to whether the observed increase in capacity factors for internal combustion engines in SPP was the result of SPP's adoption of five-minute settlement intervals or other factors.[88] Concerned Cooperatives argue that, even if there was some marginal benefit to the settlement interval proposal, many market participants would not benefit from the reform even though they would be responsible for funding it.[89] Concerned Cooperatives represent that 90 to 95 percent of their transactions take place in the day-ahead market, which settles on an hourly basis, and that adopting five-minute settlement intervals in the

[86] Concerned Cooperatives Comments at 10 (citing Potomac Economics, 2014 State of the Market Report for the MISO Electricity Markets, at 43-44, Figure 19 (2015)).

[87] Concerned Cooperatives Comments at 11 (citing Comments of Wärtsilä North America, Inc., Docket No. AD14-14-000, at 1-2 (Mar. 6, 2015)).

[88] Concerned Cooperatives Comments at 11.

[89] Concerned Cooperatives Comments at 11.

real-time market does not help Concerned Cooperatives hedge prices.[90] Concerned Cooperatives also state that the National Renewable Energy Laboratory study cited in the NOPR in support of adopting five-minute settlement intervals also recognizes that limiting market complexity may be a reason to maintain hourly settlements, and that RTOs/ISOs already have tools to encourage resources to follow efficient schedules, such as uninstructed deviation penalties and *ex post* pricing rules. Concerned Cooperatives recommend that the Commission instead identify objectives and allow RTOs/ISOs to pursue options for achieving those objectives.[91]

d. Commission Determination

i. Energy Transactions

53. We adopt the NOPR proposal to require that each RTO/ISO settle energy transactions in its real-time markets at the same time interval it dispatches energy, as discussed below.[92] We find that the settlement interval requirement for energy transactions will meet the Commission's price formation goals by more accurately reflecting the value of the service a resource provides to the system, which, in so doing, helps to ensure that rates are just and reasonable and not unduly discriminatory or preferential.

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[90] Concerned Cooperatives Comments at 11.

[91] Concerned Cooperatives Comments at 12.

[92] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 34.

54. As discussed below, providing the correct incentives for market participants to follow commitment and dispatch instructions, make efficient investments in facilities and equipment, maintain reliability, and increase transparency is fundamental to proper formation of energy prices, helping to ensure just and reasonable rates, terms and conditions of service.

55. One important element of ensuring reliable grid operations is resources following dispatch instructions. The requirement that each RTO/ISO settle energy transactions at the same interval it dispatches energy sends accurate market signals of power system conditions, thus encouraging resources to follow commitment and dispatch instructions, a point noted by ISO-NE.[93]

56. The settlement interval requirement for energy transactions also provides an incentive to make efficient investments in facilities and equipment.[94] In the long-term, we expect that appropriate compensation would help to encourage efficient investments in facilities and equipment, enabling reliable service. We also find that the settlement interval requirement will provide incentives to more flexible resources, thus leading to more efficient markets, as noted by several commenters.[95] More flexible resources will help system operators address transient system conditions. We find that greater

[93] ISO-NE Comments at 2.

[94] EPSA Comments, Pope Aff. at 4.

[95] Public Interest Organizations Comments at 2-3; ELCON Comments at 2-3; EDP Renewables Comments at 2-3; ESA Comments at 3; NEI Comments at 14.

participation of these more flexible resources should generally enhance resource adequacy because it allows the participation of diverse resources and improves reliability, as noted by EDP Renewables.[96]

57. The settlement interval requirement for energy transactions should help in maintaining reliability because resources will have a greater incentive to follow dispatch instructions, as noted by Exelon.[97] In addition, these reforms will provide resource owners with a greater incentive to adequately maintain their equipment, conduct maintenance during non-peak periods, and invest in new and upgraded equipment. As noted by CAISO, linking prices with compensation will pay resources for providing needed flexibility to the market operator and would motivate these resources to improve their operational performance.[98]

58. The settlement interval requirement for energy transactions also results in more accurate market prices, reducing the need for out-of-market operator actions. Under an hourly settlement system, resources do not have the same incentive to follow five-minute prices since compensation is based on an hourly average. Therefore, system operators are more likely to take out-of-market actions in real-time, such as increasing the use of regulating reserves or committing additional resources, to ensure that adequate resources

[96] EDP Renewables Comments at 2-3.

[97] Exelon Comments at 4-5.

[98] CAISO Comments at 7.

are available to meet system needs. Such actions may result in uplift. By providing incentives to follow dispatch instructions, the settlement interval requirement should reduce such operator actions and, thereby, reduce uplift.[99] When this occurs, energy prices are based on more observable market fundamentals – such as the marginal cost of serving load and the operational constraints of reliably operating the system – and not on less observable operator action.[100] As a result of a reduction in out-of-market uplift payments, resources will perceive stronger financial incentives to perform, especially during stressed system conditions, when the performance of all resources is paramount. Further, we note, this increased transparency, in turn, better informs decisions to build or maintain resources.

59. Taken together, the benefits we expect as a result of this settlement reform will ensure that rates are just and reasonable and not unduly discriminatory or preferential.

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[99] Reducing out-of-market uplift payments can be beneficial to RTOs'/ISOs' market participants because, among other reasons, charges to market participants for uplift are often volatile. As a result, market participants may build risk premiums into their resource bids in the real-time energy market to shield them from the uncertainty associated with unexpected uplift charges. *See* Staff Analysis of Uplift in RTO and ISO Markets, Docket No. AD14-14-000, at 18 (Aug. 2014), http://www.ferc.gov/legal/staff-reports/2014/08-13-14-uplift.pdf. In addition, making system conditions and compensation more transparent through market prices will make that price apparent to all available resources and thus encourage them to fully participate in the market, which is likely to reduce generation costs incurred by load.

[100] In addition to greater transparency, reducing uplift is a goal generally. For example, "[t]he implementation of five minute settlements would contribute significantly to the reduction of uplift payments, which is an ongoing goal of PJM, of the Market Monitor and of PJM members." PJM Market Monitor Comments at 4.

60. We are not persuaded by the arguments opposing the settlement interval proposal. Underlying much of the opposition is the assumption that many resources cannot take advantage of five-minute settlement intervals because they are not flexible enough to respond to five-minute dispatch. For example, Direct Energy argues that RTOs/ISOs should report the types of resources able to effectively modify their output to respond to five-minute price signals.[101] The concern Direct Energy identifies is, in fact, one of the objectives of this reform. Specifically, resources that are not able to respond quickly enough to address acute system needs should not receive the same level of compensation as those resources that are able to flexibly respond.[102] Further, we note that all RTOs/ISOs have a combination of resources, some of which can respond within five minutes and some that cannot, and that knowing the exact percentages of resources available to respond to prices is not determinative of whether the reforms adopted here will prove beneficial. Instead, we believe it is important to ensure settlement practices do not distort existing five-minute pricing signals.

61. We are not persuaded by Concerned Cooperatives' argument that the settlement interval proposal should be rejected because market participants, such as Concerned Cooperatives, funding the reform do not have a large fraction of their positions in the

[101] Direct Energy Comments at 6.

[102] This rule does not require resources to be dispatched more quickly than they are now, but it does increase the incentive for those resources that can and do respond quickly.

real-time market and therefore will not benefit significantly from it.[103] We find that aligning prices and settlement intervals will enhance the operation of markets by ensuring resources respond to actual system condition regardless of the percentage of resources that clear in the day-ahead market.

62. We also disagree with Concerned Cooperatives' statement that the Commission relied upon a single document to support its finding without additional analysis.[104] Commenters supporting the reform have provided sound economic analysis and examples demonstrating the value of the proposed settlement reform.[105] Though Concerned Cooperatives state that many market participants would not benefit from the reform even though they would be responsible for funding it,[106] we believe that many market participants are likely to benefit from the reform through improved economic incentives to respond to system needs. Potomac Economics' analysis of fossil-fueled and non-fossil-fueled resources[107] demonstrates that settlement reform will incentivize generator flexibility, improve generators' dispatch performance, and increase investments in more flexible resources.

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[103] Concerned Cooperatives Comments at 11.

[104] Concerned Cooperatives Comments at 11.

[105] EPSA Comments, Pope Aff. at 2-14; Potomac Economics Comments at 3-7; *See also supra* note 60.

[106] Concerned Cooperatives Comments at 11.

[107] Potomac Economics Comments at 5-6.

63. Concerned Cooperatives express concern that adopting five-minute settlement intervals could result in errors and disputes that could lead to resettlement and uncertainty for the market.[108] All RTOs/ISOs currently compute five-minute LMPs. Therefore, there is no new data being generated or calculated that would lead to additional need for resettlement or increased uncertainty. Concerned Cooperatives have cited neither examples of more errors and disputes on RTO/ISO systems currently using five-minute settlement intervals, nor examples of additional resettlement and uncertainty for the market. Also, we find that, while administratively-determined uninstructed deviation penalties (which Concerned Cooperatives suggest could be used in lieu of settlement reform) are appropriate in certain contexts, settlements based on the actual value of energy corresponding with its production or transaction in each five-minute interval provide more accurate incentives for resources to respond to price signals.

64. Concerned Cooperatives also assert that the objective of incenting market participants to follow dispatch instructions or invest in upgrades must be considered in the context of existing market rules that already may provide incentives for investment in faster ramping capability.[109] To the extent an RTO/ISO has a functional mechanism to encourage the installation of fast-ramping resources, this Final Rule will augment the existing RTO/ISO mechanisms.

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[108] Concerned Cooperatives Comments at 12.

[109] Concerned Cooperatives Comments at 6.

65. Contrary to Concerned Cooperatives' argument, we are not persuaded to abandon the settlement interval proposal because a Potomac Economics report indicates that it would have resulted in an additional $28 million in increased energy costs on the MISO system in 2014.[110] First, we recognize that that there could be higher revenues to generators, but we believe that this is the correct reflection of value provided in these circumstances and would send an improved signal for long-term investment and short-term performance, to the overall benefit of the market. Second, it is important to note that the Potomac Economics report indicates that for many settlement intervals during 2014, MISO resources were paid an hourly settlement rate lower than what five-minute settlements would justify. Thus, the Potomac Economics report should be viewed as indicating a need to correct settlement practices, rather than indicating a windfall to resources. Third, it is not clear that the proposal will result in generally increased energy payments to generators. For example, an ISO-NE study for the year 2013 found that the net increase in real-time energy credits on its system (once the decrease in real-time reserve credits was considered) would have been only $600,000.[111] Finally, due to the increased efficiencies resulting from improving incentives to respond to market price signals, total costs to electric wholesale customers over time are likely to decrease.

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[110] Concerned Cooperatives Comments at 10.

[111] ISO-NE, *Subhourly Real-Time Market Settlements*, A11 ISO Presentation 05-07-14 Revision 1, Matt Brewster, at 11 (May 8, 2014), http://www.iso-ne.com/committees/key-projects/subhourly-real-time-settlement.

66. Additionally, some commenters argue that other types of settlement provisions, such as make-whole payments, should not be subject to settlement interval reform. We would like to clarify that the Final Rule does not apply to make-whole payments for units dispatched out-of-merit.

67. We disagree with the recommendation of some commenters that the decision to modify settlement intervals should be subject to a stakeholder process.[112] RTOs/ISOs implementing this Final Rule are free to use a stakeholder process within the implementation timelines specified herein, but we see no need to further delay this reform. This does not limit stakeholders' input as RTOs/ISOs form their compliance filings in response to this aspect of the Final Rule.

68. We conclude that the settlement interval requirement for energy transactions should ensure that hourly settlement practices do not distort five-minute price signals in RTOs/ISOs. Instead, the compensation provided to resources must reflect the value of a resource providing given services to ensure appropriate economic incentives to meet system needs.

ii. Operating Reserves

69. We adopt the proposal in the NOPR that RTOs/ISOs settle real-time operating reserves transactions at the same time interval that they price operating reserves. This requirement for operating reserves will accomplish the Commission's price formation

[112] APPA and NRECA Comments at 4.

goals and thereby ensure just and reasonable rates, and will further preserve the co-optimization of operating reserves with energy. Under the settlement interval requirement for operating reserves, to the extent that an RTO/ISO prices operating reserves transactions at a different time interval than it prices internal real-time energy transactions, that RTO/ISO need only settle operating reserves transactions at the same time interval that they are priced. Thus, we will not require an RTO/ISO to settle operating reserves transactions on the same time interval as it settles energy transactions. This will preserve the existing energy and operating reserves co-optimization methodologies of the various RTOs/ISOs.

70. The settlement interval requirement increases transparency and provides the correct incentives to maintain reliability. It also meets the Commission's other price formation goals of encouraging resources to follow the RTO's/ISO's commitment and dispatch instructions and to make efficient investments. The reform to the settlement interval for operating reserves will increase reliability because resource owners will have a greater incentive to adequately maintain their equipment, conduct maintenance during non-peak periods, and invest in new and upgraded equipment. Similar to energy settlement intervals, requiring settlement intervals of operating reserves transactions to match the intervals upon which those reserves are priced will reduce the need for payments made through uplift, make resource compensation more transparent and help ensure that there are adequate operating reserves to maintain reliability. Finally, co-optimized energy and reserve prices are designed so that a resource is indifferent between providing energy or operating reserves. Ensuring that energy and operating

reserve settlements are done on the same basis will preserve this indifference and create an incentive for a resource to provide the service the RTO/ISO has instructed it to provide. The reform to operating reserve settlements will, by achieving the Commission's price formation goals and preserving the co-optimization of energy and operating reserves, ensure that rates are just and reasonable.

71. While, as discussed above, some commenters also support RTOs/ISOs settling all real-time operating reserves transactions at the same time interval that they dispatch real-time energy,[113] we are not requiring that these settlement intervals align. CAISO, in defending its current practices, states that it procures operating reserves and settles them on a fifteen-minute basis and distinguishes this type of ancillary service from five-minute real-time energy dispatch.[114] However, CAISO, along with all of the other RTOs/ISOs, supports the requirement that they settle operating reserves transactions at the same time interval that they price these transactions, which accommodates both RTOs/ISOs that currently settle co-optimized reserve transactions on a five-minute basis and those that currently settle these transactions on a fifteen-minute basis. Accordingly, we clarify that CAISO's understanding in this regard is consistent with how operating reserves and energy on its system are "priced," as contemplated by the wording of the settlement interval regulations adopted by this Final Rule.

[113] PSEG Comments at 4-5; EPSA Comments, Pope Aff. at 11-13.

[114] CAISO Comments at 17-18.

72. NYISO states that, although it uses sub-hourly settlements in its real-time market, in certain cases, the Commission has approved NYISO performing settlements on an hourly basis, and NYISO argues it should not be required to bring those settlements into alignment with its normal dispatch intervals.[115] NYISO cites limited energy storage resources as an example of services that currently settle hourly and yet follow dispatch instructions and provide resource response in real-time. To the extent NYISO or other RTOs/ISOs seek to argue on compliance that their existing market rules are consistent with or superior to the Final Rule reforms adopted herein, the Commission will entertain those at that time.[116]

73. Although generally supporting the settlement interval requirement for operating reserves, some commenters question whether such a requirement should apply to all reserve products or assert that regional variations should be considered.[117] We appreciate that regional variations may exist among the many different reserve products in the RTOs/ISOs and we clarify that all operating reserve products that have a market-based price are subject to the settlement interval reform.

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[115] NYISO Comments at 3-4.

[116] *See, e.g.*, *Demand Response Compensation in Organized Wholesale Energy Markets*, Order No. 745, FERC Stats. & Regs. ¶ 31,322, at P 4 & n.7, *order on reh'g and clarification*, Order No. 745-A, 137 FERC ¶ 61,215 (2011), *reh'g denied*, Order No. 745-B, 138 FERC ¶ 61,148 (2012), *vacated sub nom. Elec. Power Supply Ass'n v. FERC*, 753 F.3d 216 (D.C. Cir. 2014), *rev'd & remanded sub nom. FERC v. Elec. Power Supply Ass'n*, 136 S. Ct. 760 (2016).

[117] *See, e.g.*, Dominion Comments at 3; EEI Comments at 10.

3. Interties

a. Commission Request for Comments

74. The Commission sought comment on whether the proposed reforms are appropriate for intertie transactions scheduled on intervals different from the intervals on which RTOs/ISOs dispatch internal real-time energy.[118]

i. Comments by RTOs/ISOs

75. The ISO/RTO Council asserts that aligning dispatch and pricing should also apply to intertie transactions, adding that this would prevent price discrepancies and may reduce uplift.[119]

76. PJM asserts that intertie transactions should be included in the scope of the Final Rule, noting that it plans to settle intertie transactions on a five-minute basis, consistent with its proposal for its real-time energy market. PJM suggests that, where a transaction is curtailed or the MW quantity is reduced during a fifteen-minute interval due to a reliability directive, each five-minute interval in the transaction should settle on the integrated transaction MW quantity that flowed during the five-minute interval.[120]

77. ISO-NE argues that external interties should settle no less often than the intervals for which they are scheduled. ISO-NE represents that its proposals to implement sub-hourly settlements would fully meet this objective at all its external

[118] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 39.

[119] ISO/RTO Council Comments at 2.

[120] PJM Comments at 8.

interfaces.[121] NYISO argues that intertie and internal transactions should have the same settlement interval because this alignment will promote competition, identify the most economic supply option, provide equal incentives to respond to the same operating conditions, and improve the efficiency of interregional transactions.[122]

78. CAISO notes that it already schedules and settles intertie transactions and internal resources on a fifteen-minute basis.[123] However, CAISO also provides three options for scheduling imports and exports on an hourly basis: (1) economic-bid hourly block; (2) economic-bid hourly block with a single intra-hour schedule change that will be dispatched to zero within the hour if a fifteen-minute price is less than an import's bid price or greater than an export's bid price; and (3) self-scheduled hourly.[124] CAISO requests that the Commission state that CAISO's current market design with granular dispatch and settlement of its real-time energy market is consistent with the settlement interval proposal.[125]

79. CAISO asserts that a blanket requirement that hourly intertie schedules revert to hourly pricing, as was previously the case under its prior market design, would result in the same adverse market outcomes it resolved through its fifteen-minute market

[121] ISO-NE Comments at 2.

[122] NYISO Comments at 5.

[123] CAISO Comments at 12.

[124] CAISO Comments at 9.

[125] CAISO Comments at 10.

enhancement.[126] CAISO requests that the Commission clarify that the availability of hourly block intertie bidding options would not violate the settlement interval proposal because its current market design ensures all internal and external transactions are cleared and settled based on fifteen-minute market intervals that optimize all transactions in its markets.[127]

ii. Comments by Market Monitors

80. The PJM Market Monitor asserts that intertie transactions in PJM cannot be measured accurately enough to support five-minute settlements, noting that accurate measurement is difficult because of differences between actual and scheduled flows. The PJM Market Monitor thus recommends that settlements be based on the same fifteen-minute interval used for external scheduling intervals. The PJM Market Monitor asserts that this approach would more accurately reflect LMP during the actual time period of the transaction and would make the period and settlement of the transaction consistent.[128]

[126] CAISO Comments at 14.

[127] CAISO Comments at 15.

[128] PJM Market Monitor Comments at 7.

81. The PJM Market Monitor states that alternative settlement approaches include using the integrated price over the same fifteen-minute interval used in scheduling and using five-minute interval settlements.[129]

iii. Comments in Support of Applying Settlement Reform to Interties

82. The New Jersey Board, EEI, EPSA, Dominion, and EDP Renewables concur with the PJM Market Monitor that intertie settlements should be at fifteen-minute intervals, the same interval as external scheduling.[130]

83. Golden Spread states that alignment between dispatch and settlement intervals is generally desirable for the reasons listed in the NOPR, and notes that it believes SPP already aligns dispatch and settlement intervals for intertie transactions on a five-minute basis.[131]

84. ANGA, PSEG, and the Financial Marketers Coalition assert that the logic underlying the proposed settlement reform as applied to internal transactions should apply equally to intertie transactions, and ANGA recommends that the Commission

[129] The PJM Market Monitor in its comments provides examples of these alternatives. PJM Market Monitor Comments at 5-7.

[130] New Jersey Board Comments at 3-4; EEI Comments at 9; EPSA Comments, Pope Aff. at 9; Dominion Comments at 4; EDP Renewables Comments at 5.

[131] Golden Spread Initial Comments at 2.

consider evolving these interfaces to five-minute dispatch and settlement, perhaps over the next three to five years.[132]

85. Although it generally agrees that the settlement interval proposal should apply equally to internal and intertie transactions, Financial Marketers Coalition states that, in CAISO, clearing some transactions (such as load and generation) on a five-minute price and others (such as internal and intertie convergence bids) on a fifteen-minute price has yielded price divergence instead of convergence.

iv. Comments Opposed to Applying Settlement Reform to Interties

86. Inertia Power and DC Energy argue that intertie economic dispatch intervals cannot easily be aligned with internal real-time energy dispatch but emphasize the importance of maintaining the highest possible consistency across the seams to ensure a more efficient, resilient, and reliable electrical system.[133]

87. Duke states that the issue of whether to apply the settlement interval proposal to intertie transactions should be discussed in the RTO/ISO stakeholder processes and that they should be treated comparably to reforms to internal transactions.[134]

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[132] ANGA Comments at 3-4; Financial Marketers Coalition Comments at 3-4; PSEG Comments at 5.

[133] Inertia Power and DC Energy Comments at 4-5.

[134] Duke Comments at 5.

b. Commission Determination

88. Based upon the comments received on this issue, we modify the regulatory text proposed in the NOPR to require each RTO/ISO to settle intertie transactions in the same time interval that it schedules intertie transactions. The settlement interval requirement for intertie transactions will facilitate the coordination of the scheduling and settlement of intertie transactions, and will discourage inefficient practices such as the chasing of inaccurate intertie prices. For example, if there are very high prices in the first fifteen minutes of an hour, resources will know that for that entire operating hour, there will be a high integrated hourly price. This provides an incentive for resources to increase the volume of intertie transactions for the remainder of the hour, even if the price for the subsequent fifteen-minute interval is much lower reflecting that it may no longer be efficient to schedule such intertie transactions. Most commenters, as described above, agree that such a requirement will aid in the achievement of these goals.

89. However, a difference of opinion exists between PJM and the PJM Market Monitor. PJM supports moving to a five-minute settlement interval for intertie transactions while the PJM Market Monitor supports aligning the settlement interval for intertie transactions with the fifteen-minute scheduling interval for these transactions.

90. If an RTO/ISO settles or proposes to settle intertie transactions using a shorter time interval than by which it schedules such transactions, the RTO/ISO may propose to do so in its compliance filing and demonstrate that such a proposal is consistent with or superior to the Commission's intertie reforms. The compliance filing proceeding will provide a forum in which to consider alternative practices and resolve disputes that may

arise within regions, as well as provide for the development of a more complete record on these issues.

91. We decline to clarify for CAISO that the availability of hourly block intertie bidding options would not violate the settlement interval requirement for interties. Such a determination is more appropriately made upon reviewing CAISO's compliance filing and CAISO should justify its proposed treatment for intertie transactions there.

4. Demand Response Resources

a. Comments

92. Several commenters discuss the application of the settlement interval proposal to demand response resources even though the Commission did not specifically solicit those comments and did not make a separate proposal concerning demand response resources apart from other resources considered in the NOPR.

93. The PJM Market Monitor, with the New Jersey Board concurring, recommends that five-minute pricing in energy markets explicitly cover all resources providing energy, including demand side and storage resources.[135] PJM Market Monitor recommends that the Commission require any associated, necessary metering associated with applying the requirement to demand resources.[136]

94. Public Interest Organizations also urge the Commission to make clear that its proposed reforms apply to all resources able to participate in wholesale energy

[135] PJM Market Monitor Comments at 2; New Jersey Board Comments at 2.

[136] PJM Market Monitor Comments at 2; New Jersey Board Comments at 2.

markets.[137] PSEG similarly supports the application of the settlement interval proposal to demand response resources. PSEG states that real-time settlements for demand response resources, or any other load-side resources that are price responsive in wholesale markets, should be based on five-minute intervals, in the same manner as the supply resources with which it competes.[138] PSEG acknowledges that some demand resources will lack necessary meters and/or communication, and states that it would be reasonable to allow these resources a transition period to install them without delaying overall implementation.[139]

95. AEMA states that it recommends that demand response resources have the option to continue to settle on the basis of one-hour meter readings. AEMA asserts that demand resources use hourly intervals because only hourly interval metering may be available and even new advanced metering infrastructure is only capable of fifteen minute interval data, whereas settling on five-minute intervals could entail adding an expense that is an economic barrier to entry for some resources.[140]

96. AEMA also states that few demand response resources have the operational communications to modify their demand at frequent intervals and that frequent demand

[137] Public Interest Organizations at 5.

[138] PSEG Comments at 5.

[139] PSEG Comments at 5.

[140] AEMA Comments at 4.

changes would require more robust communications than may be economic.[141] AEMA further states that the Net Benefits Price Threshold that many RTOs/ISOs established in response to FERC Order No. 745 is applied on an hourly basis and that the industry has universally adopted hourly baseline methodologies for demand response resources.[142]

97. AEMA explains that much of the current energy-related demand response participation relies on the commitment to dispatch for one or more hours and if the bid-offer is accepted for demand response resources, those resources are eligible for uplift payments if the energy prices fall below their bid-offer during their committed dispatch time. AEMA requests that these bid offer guarantees continue to be incorporated in the Final Rule.[143]

b. Commission Determination

98. In using the term "resource" in the NOPR, the Commission intended for the settlement interval proposal to apply to all supply resources, including demand response resources. We find that, as with other resources, aligning the price signal and dispatch signal provides demand response resources capable of following a given dispatch signal the incentive to do so, resulting in a more efficient use of demand response resources in the real-time energy and operating reserve markets. As stated above, all RTOs/ISOs have

[141] AEMA Comments at 4.

[142] AEMA Comments at 3-5 (citing Order No. 745, FERC Stats. & Regs. ¶ 31,322).

[143] AEMA Comments at 5.

a combination of resources, some of which can respond within five minutes and some that cannot, and that includes demand response resources. It is important to provide a price signal to all resources, regardless of type or capability, as this will provide proper compensation to those resources capable of responding to five-minute dispatch signals, and will incentivize such capability to those resources that do not currently have it.

99. In response to concerns about the need to upgrade metering technology for demand response resources, we note that this Final Rule does not contemplate requiring any new metering capability, such as five-minute revenue quality metering, and that such metering is not necessary for implementation given RTOs'/ISOs' ability to create five-minute load and generation profiles using telemetry and hourly revenue quality data. We also do not require any changes to baseline methodologies. Although a more granular baseline may provide additional value, RTOs/ISOs need not change their baseline methodology to comply with this Final Rule. Finally, we find that AEMA's arguments regarding the Net Benefits Price Threshold[144] and "make whole" rules are beyond the scope of this Final Rule because it does not require any changes to the Net Benefits Price Threshold or make-whole payments. Even if modest changes to these provisions were required for RTOs/ISOs to comply with this Final Rule, the benefits of this rule would justify such modifications.

[144] AEMA Comments at 3.

5. Load

a. Comments

100. A number of commenters state the proposed rule did not specify whether the settlement interval proposal would apply to load,[145] or, in other words, whether it would change how load is settled and measured.

101. EEI, PSEG, SCE, AEMA, EPSA and CAISO recommend that the Commission not apply the settlement reform to load.[146] The primary arguments these commenters cite against applying the settlement interval proposal to load include: (1) the benefit of settling load on an interval basis is not likely to outweigh the cost, which may include the need for new expensive metering;[147] (2) settlement reform alone will not encourage price responsive load without corresponding changes to state-jurisdictional retail rate design;[148] and (3) because load is not dispatchable, there is no dispatch interval that aligns with load.[149] Direct Energy recommends either not applying the settlement reform to load or delaying implementation until the majority of load has the ability, incentive and

[145] For purposes of this Final Rule, the term "load" generally refers to consumption of electricity in the wholesale markets, but not to demand response acting as a supply resource in the wholesale markets.

[146] EEI Comments at 8-9; PSEG Comments at 5-6; SCE Comments at 2; AEMA Comments at 4-5; EPSA Comments, Pope Aff. at 6-7; CAISO Comments at 16-17.

[147] SCE Comments at 2.

[148] SCE Comments at 2.

[149] CAISO Comments at 16-17.

information necessary to respond to five-minute settlements.[150] EEI specifically requests that the Commission clarify that it is not proposing to change how load is metered.[151]

102. PJM, however, states that it is advantageous to apply the proposed rule to load, and proposes to settle load on the same interval as dispatch intervals by using a combination of state-estimator and telemetry data for each settlement interval.[152] PJM states that it thus does not foresee changes being required for market participants' metering.[153]

103. Mr. Centolella states that advancing load settlements to reflect the actual interval demand of each load serving entity's customers could remove an important barrier to developing the next generation of responsive demand. Mr. Centolella also encourages the Commission to work with states to optimize collecting customer data, and to evaluate how to support efficient price formation related to the load data used in wholesale settlements.[154]

[150] Direct Energy Comments at 7. *See also* Supplemental Comments of Direct Energy (filed Mar. 4, 2016).

[151] EEI Comments at 8-9.

[152] PJM Comments at 5.

[153] PJM Comments at 5.

[154] Mr. Centolella Comments at 4-6.

b. Commission Determination

104. We clarify that the Commission did not propose to apply the settlement interval proposal to load. We also clarify that adoption of the settlement interval requirements are not intended to change how load is metered. The Commission's basis for requiring changes to the settlement interval focused exclusively on supply resources rather than load. As a result, we have no record to require any changes to the settlement interval for load. However, we are not prohibiting settling load on a five-minute basis, and will evaluate any such proposals on a case-by-case basis in separate proceedings submitted pursuant to section 205 of the FPA.

B. Shortage Pricing Reform

1. Need for Reform

105. In the NOPR, the Commission stated that shortage prices send a short-term price signal to provide an incentive for the performance of existing resources and help to maintain reliability. The Commission noted that some RTOs/ISOs currently restrict the use of shortage pricing to certain causes of shortages, or some RTOs/ISOs require a shortage to exist for a minimum amount of time before triggering shortage pricing.[155] The Commission further noted that not invoking shortage pricing when there is a shortage (regardless of the duration or cause of that shortage) distorts price signals that are designed to elicit increased supply and to compensate resources for the value of the

[155] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 46.

services they provide when the system needs energy or operating reserves. Because these price signals fail to reflect adequately the value that a resource provides to the system, the Commission preliminarily found in the NOPR that the resulting price is not just and reasonable.[156]

106. The Commission also noted that its rationale regarding shortage pricing was similar to the rationale the Commission relied on in Order No. 719, in which the Commission determined that "rules that do not allow for prices to rise sufficiently during an operating reserve shortage to allow supply to meet demand are unjust, unreasonable, and may be unduly discriminatory" and that such rules "may not produce prices that accurately reflect the value of energy."[157]

107. Commenters generally support the rationale provided by the Commission in support of the need for reform. For example, as discussed below, MISO, NYISO and ISO-NE all support the need for reform, and CAISO supports the conceptual need, but requests further clarifications. EEI and EPSA also support the Commission's shortage pricing proposal. Conversely, SPP and PJM, in joint comments, oppose implementing shortage pricing in all dispatch intervals, and request revisions if the Commission adopts its proposed reforms.

[156] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 47.

[157] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 48 (citing Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 192).

108. Based on analysis of the record, we adopt our preliminary findings and conclude that existing shortage pricing triggers that do not invoke shortage pricing when there is a shortage (regardless of duration or cause) are unjust and unreasonable and are unduly discriminatory and preferential. Thus, there is a need to reform the use of shortage pricing in RTO/ISO markets, as discussed further herein.

2. NOPR Proposal

109. In order to remedy the potentially unjust and unreasonable rates caused by restrictions on shortage pricing, the Commission proposed to require that RTOs/ISOs institute mechanisms that trigger shortage pricing for any dispatch interval during which a shortage of energy or operating reserves occurs.

3. Comments on the Proposed Shortage Pricing Reform

a. Comments by RTOs/ISOs

110. MISO states that it supports shortage pricing reform and maintains that MISO's current practices are already consistent with the Commission's proposal. Specifically, MISO states its operating reserve demand curve is used in the five-minute dispatch interval and triggers shortage pricing in any five-minute interval in which operating reserve requirements cannot be fully satisfied, regardless of duration or causation.[158] MISO also states that its recent implementation of extended locational marginal pricing (ELMP) considers offline fast-start resources in its price setting algorithm to more

[158] MISO Comments at 10.

accurately reflect the cost of the next MW to meet demand during scarcity conditions.[159] MISO notes that if no economic offline fast-start resources are eligible, it will rely upon the operating reserve demand curve values for shortage pricing. MISO states that it is already compliant with the proposed rule on shortage pricing.[160]

111. ISO-NE supports the shortage pricing proposal and asserts that its current market rules and real-time pricing systems already comply with the proposed requirement.[161]

112. NYISO supports the shortage pricing proposal, and states that it uses demand curves to price all reserve shortages, regardless of their duration. NYISO adds that it currently implements shortage pricing in its day-ahead and real-time markets using various demand curves for operating reserves, regulating reserves, and transmission security, where the demand curves represent the escalating value of each product as the level of any shortage increases.[162] NYISO also states that it does not interpret the NOPR to be addressing the use of offline resources in real-time pricing or to be implying that

[159] *See* MISO, Extended Locational Marginal Pricing, Docket No. ER12-668-000 (filed Dec. 22, 2011).

[160] MISO Comments at 11-12.

[161] ISO-NE Comments at 3.

[162] NYISO Comments at 6.

practices, such as the NYISO's "Hybrid Pricing" rules,[163] are inconsistent with the NOPR.[164]

113. CAISO agrees with the concept behind the shortage pricing reform and supports its implementation, subject to certain clarifications. CAISO expects that its existing tariff provisions implementing scarcity pricing for energy and ancillary services already comply with the NOPR's proposal. CAISO explains that, in any fifteen-minute interval of the fifteen-minute market, it will co-optimize the procurement of energy and ancillary services based on submitted supply bids and the forecast of demand and its ancillary services requirements. CAISO further explains that, in any given fifteen-minute interval, if effective supply bids are insufficient to clear forecasted demand, scarcity pricing will trigger and thereby indicate a shortage of supply for that applicable fifteen-minute interval. CAISO states that, similarly, if ancillary services bids are not sufficient to meet the ancillary services procurement target, ancillary services scarcity pricing will trigger for that interval.[165]

[163] NYISO's Hybrid Pricing rules were adopted in 2001. *See New York Indep. Sys. Operator, Inc.*, 95 FERC ¶ 61,121 (2001). The Hybrid Pricing rules apply to Real-Time Market pricing and relax the minimum operating limits of certain fast-start, block-loaded resources in order to permit them to be eligible to set price based on the incremental need that required their commitment.

[164] NYISO Comments at 7.

[165] CAISO Comments at 20.

114. CAISO notes that within a fifteen-minute operating interval it may need to deploy operating reserves to address a contingency in the case of operating reserves, or in the case of regulation to continuously balance supply and demand. CAISO states that it is important that the Final Rule clarify that the deployment of operating reserves or regulation does not necessarily mean a shortage exists. CAISO notes that in some cases the deployment of reserves is made through alternative deployment mechanisms and not in the co-optimization function of the market.[166] CAISO also explains that in any given fifteen-minute market interval, if a shortage is observed, shortage pricing will trigger within that interval and CAISO will not wait for the shortage to materialize beyond that interval before triggering shortage pricing. However, CAISO states that not all price signals triggered by "transient shortages" provide incentives to resources that have the capability to respond to brief-duration shortages.[167]

115. PJM and SPP filed joint comments opposing triggering shortage pricing in any dispatch interval in which a shortage of energy or operating reserves occurs. First, PJM and SPP state that they support shortage pricing only when "a shortage of a particular

[166] CAISO explains that during each fifteen-minute interval in which the resources are deployed, the system is not actually short of supply bids when the operating reserves for that interval are procured. Also, CAISO states that once the reserves are deployed, to the extent that the market allows for full recovery of the required reserves, the contingency event itself does not trigger scarcity pricing for ancillary services. According to CAISO, this is because no actual shortage of operating reserves exists unless there are insufficient resources to meet operational needs for operating reserves in the next applicable fifteen-minute market interval. CAISO Comments at 21-22.

[167] CAISO Comments at 23.

product exists that presents reliability concerns."[168] PJM and SPP argue that applying shortage prices to shortage events that do not cause reliability concerns allows price increases even when such events are transitory, do not pose reliability concerns, and cannot be addressed due to limitations on resource response. PJM and SPP maintain that applying shortage pricing to some transient shortages will give inaccurate prices and could potentially degrade system reliability, and may also result in market pricing and operations that are contrary to the Commission's stated goals.[169]

116. PJM and SPP further state that they have in place rules related to this issue consistent with the principles and goals of shortage pricing. PJM and SPP urge the Commission to provide flexibility by allowing RTOs/ISOs to implement shortage pricing in the context of their regional rules. This, PJM and SPP assert, will ensure that inefficient pricing does not result.[170]

117. PJM and SPP argue that allowing transient periods of shortage to trigger shortage pricing could overstate the severity of the operating condition and result in prices that do not accurately reflect operating conditions on the system, or last long enough to allow market participants responding to them to take meaningful action. In fact, PJM and SPP assert that responses may occur after the relevant interval has passed, which could be

[168] PJM and SPP Comments at 1.

[169] PJM and SPP Comments at 1-2.

[170] PJM and SPP Comments at 2-3.

counterproductive operationally and economically. PJM and SPP pose two examples to illustrate this point. As the first example, they posit: PJM carrying the required amount of reserves when a market seller of a generation resource lowers the resource's economic maximum capability, for a brief time (ten minutes or less), causing PJM to have less reserves than its requirement. Currently, PJM can recover these reserves by re-executing its dispatch engine and re-dispatching its system; but under the shortage pricing reform, this could invoke shortage pricing, which would then attract more suppliers than needed and create disincentives for resources to back down once the event was over. In another example, they posit: PJM has scheduled a resource with a ten-minute start-up time to come online to provide energy so that another resource may be reduced to provide reserves; but if the resource scheduled to come online actually takes twenty minutes instead of ten, shortage pricing would be triggered under the shortage pricing proposal, and the second resource, instead of having its output reduced to provide reserves would now need to continue to provide energy, thus potentially leaving PJM short on reserves for a brief period.[171]

118. PJM and SPP introduce another hypothetical scenario from the SPP region. PJM and SPP state that SPP can temporarily use operating reserves to meet energy requirements during transient periods when system conditions do not present reliability concerns. PJM and SPP argue that while this may technically compromise the operating

[171] PJM and SPP Comments at 4.

reserve requirement, the condition is transient and is recovered in less than ten minutes. According to PJM and SPP, this is not an operating reserve shortage, but rather a transient reallocation of capacity to manage temporary energy needs caused by the operational characteristics of resources. PJM and SPP further state that the examples described above do not present emergency conditions or reliability concerns that would justify shortage pricing.[172]

119. In order to "recognize and respect the fact that not all instances of shortages justify shortage pricing," PJM and SPP propose alternative language for any Final Rule on shortage pricing:

> Each RTO/ISO must establish tariff provisions that implement shortage pricing for pre-defined operating conditions related to a shortage of energy or operating reserves. The Commission will allow each RTO/ISO to develop those provisions based on their regional circumstances, provided that the rules are consistent with shortage pricing principles and are designed to facilitate the goals of this [Final Rule]. The Commission expects that each RTO/ISO will explain why their provisions, or why their current rules, comply with this rule.[173]

120. PJM and SPP further assert that a universal shortage pricing rule requiring shortage pricing even for transient circumstances would require the implementation of operating reserve demand curves that distinguish prices relative to varying degrees of shortage. PJM and SPP explain further that in PJM's case, the current operating reserve

[172] PJM and SPP Comments at 5-6.

[173] PJM and SPP Comments at 7.

demand curves are a step function, which would need to be changed, and in SPP's case it would likely consider the implementation of a pricing gradient demand curve based on different degrees of shortages and their impact on reliability, rather than steep step curves.[174]

b. Comments by Market Monitors

121. Potomac Economics explains that all the markets that it monitors (ISO-NE, NYISO, and MISO) are designed to price all shortages, regardless of duration.[175] Potomac Economics states that it strongly supports the shortage pricing reform and argues that pricing all shortages, regardless of duration, provides efficient incentives for resources to be flexible and to perform well, which ultimately lowers costs to consumers and improves reliability.[176] Potomac Economics states that, together with the alignment of dispatch and settlement intervals, a requirement for RTOs/ISOs to price "transitory shortages" rewards units that can respond quickly to help the RTO/ISO remedy the shortage and, in doing so, addresses the diminished reliability caused by the shortage.[177]

122. Potomac Economics states that transitory shortages typically occur when the system is ramp-constrained, and that these are true shortages, because if a large contingency occurs during this period (e.g., a generator tripping off-line), the RTO/ISO

[174] PJM and SPP Comments at 8.

[175] Potomac Economics Comments at 9.

[176] Potomac Economics Comments at 7.

[177] Potomac Economics Comments at 7.

will not have the ability to replace the capacity because its other generators are already ramping as quickly as possible. Potomac Economics states that the Commission's proposal will lead to resources offering faster ramp rates, offering wider dispatch ranges and not self-scheduling resources, and offering shorter start times for natural gas turbines. Potomac Economics states that the proposal also has important long-term implications as it provides efficient incentives for participants to build more flexible, fast-ramping generating resources, and to make maintenance decisions on existing resources to increase their flexibility.[178]

123. Potomac Economics also states that allowing offline resources to set real-time energy and ancillary services prices can be efficient, but there are also conditions under which the use of these resources can artificially lower energy prices and obscure shortages.[179] Potomac Economics explains that if an RTO's/ISO's pricing model allows infeasible or uneconomic units to set prices, the offline units represent an artificial increase in real-time supply that will depress real-time prices. Further, Potomac Economics explains that the artificial increase in real-time supply can have a large effect when the system is experiencing an operating reserve or transmission shortage, which is ultimately not priced as a shortage because an offline unit has set the price.[180]

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[178] Potomac Economics Comments at 8.

[179] Potomac Economics Comments at 9.

[180] Potomac Economics Comments at 10.

124. Potomac Economics recommends that the Commission require RTOs/ISOs to demonstrate that their real-time pricing models do not allow offline units to set prices in a manner that undermines its real-time shortage pricing. Potomac Economics believes that this can be demonstrated by the RTO/ISO describing how and when offline units set real-time prices and showing that when offline units have set price historically that they are generally committed and dispatched as well. Potomac Economics further asserts that if the RTOs/ISOs cannot demonstrate this in their compliance filing, then they may need to make changes to their pricing models to ensure that they satisfy the Commission's price formation goals.[181]

125. The PJM Market Monitor states that five-minute shortage pricing would correctly reflect actual shortage conditions and should be implemented if PJM can accurately measure the level of reserves on a five-minute basis, which the PJM Market Monitor understands that PJM currently cannot do. The PJM Market Monitor asserts that, without accurate measurement of reserves at minute-by-minute granularity, system operators cannot know with certainty that a shortage condition exists, thus masking the trigger for five-minute shortage pricing. The PJM Market Monitor recommends that if PJM cannot measure operating reserves on a five-minute basis, the Commission should direct PJM to develop methods to do so. The PJM Market Monitor asserts that if RTOs/ISOs cannot

[181] Potomac Economics Comments at 9-11.

demonstrate that they can accurately measure reserves at minute-by-minute granularity, they should not implement five-minute shortage pricing until they have that capability.[182]

126. The SPP Market Monitor supports the Commission's proposal to require RTOs/ISOs to trigger shortage pricing for any dispatch interval during which a shortage of energy and operating reserves occurs. The SPP Market Monitor states that SPP's Integrated Marketplace uses administratively-determined scarcity pricing demand curves to set prices during capacity shortages. The SPP Market Monitor explains that, during shortages, quick-start and fast-ramping resources – which generally have higher costs and low capacity factors – earn a significant portion of their annual revenue. The SPP Market Monitor asserts that scarcity pricing serves as an important mechanism for sending correct price signals to these resources; however, the SPP Market Monitor states that SPP is not sending this price signal during ramp-constrained operating reserve shortages since the SPP market rules do not allow insufficient ramping capability to trigger scarcity pricing of operating reserves.[183] The SPP Market Monitor requests that the Commission address the ramp-constrained operating reserve shortage pricing issue in the Final Rule.[184]

[182] PJM Market Monitor Comments at 9.

[183] SPP Market Monitor Comments at 4 (citing SPP Tariff, Attachment AE §§ 5.1.2.1 and 8.3.4.2).

[184] SPP Market Monitor Comments at 4-6.

c. Comments Supporting the Shortage Pricing Reform

127. Several other commenters express support for shortage pricing reform. These commenters agree that the proposed shortage pricing reform will increase transparency, create incentives to trigger quick response from supply, promote investment in resources that can respond to short duration shortages, and provide revenues to resources that reflect the value of the service provided.[185] In addition, several commenters, including EPSA and Westar, support the shortage pricing proposal and state that it should apply to all shortages, regardless of duration.[186]

[185] Ameren Comments at 1, 3-4; ANGA Comments at 2-5; CAISO Comments at 2; CEA Comments at 3-6; Dominion Comments at 1-2; DTE Comments at 3-4; EDP Renewables Comments at 2; EEI Comments at 2; ESA Comments at 2-4; Entergy Nuclear Power Marketing Comments at 2; EPSA Comments at 1-5; Exelon Comments at 4; Financial Marketers Coalition Comments at 1; Golden Spread Initial Comments at 1-3; Inertia Power and DC Energy Comments at 2; ISO-NE Comments at 1; MISO Comments at 2, 9; NEI Comments at 1; NGSA Comments at 2-5; PJM Power Providers Comments at 2-5; Potomac Economics Comments at 2; Powerex Comments at 6; PSEG Comments at 3; Public Interest Organizations Comments at 5; SPP Market Monitor Comments at 2; Westar Comments at 1; Duke Comments at 7.

[186] EPSA Comments at 9; EPSA Comments, Pope Aff. at 15; Golden Spread Initial Comments at 6; PJM Power Providers Comments at 4; Powerex Comments at 6; EDP Renewables Comments at 5-6; Entergy Nuclear Power Marketing Comments at 2; Exelon Comments at 6; PSEG Comments at 13; Westar Comments at 5; NEI Comments at 14; CEA Comments at 4; NGSA Comments at 5.

128. Several commenters support the Commission's shortage pricing proposal, arguing that market clearing prices should reflect shortage or emergency situations so that generators are provided transparent price signals that reflect the market conditions.[187] EPSA and Westar note that reflecting a shortage price signal during transient shortage events will result in a price signal that incents resources to respond to real-time system constraints based on a price that reflects the value of loss of load even if the event is less than ten minutes in duration.[188] Further, Westar states that if the "steepness" of regulation and operating reserve demand scarcity pricing curves is a concern then an RTO/ISO should create separate operating reserve scarcity demand curves for transitory periods versus periods lasting longer than ten minutes.[189]

129. Some commenters state that the shortage pricing proposal will provide an incentive for existing resources to offer their supply and to be available if shortages occur and will provide an incentive for incremental investments to enable existing or new generation or dispatchable demand to respond to shortages, regardless of duration.[190] Further, CEA states that without appropriate compensation prices invariably become distorted insofar as they do not reflect the increased value of that resource with utmost

[187] EEI Comments at 10; EPSA Comments at 9; PJM Power Providers Comments at 4; Westar Comments at 5; NEI Comments at 14.

[188] EPSA Comments at 9; Westar Comments at 5.

[189] Westar Comments at 5.

[190] EPSA Comments, Pope Aff. at 15; NEI Comments at 14; CEA Comments at 4; NGSA Comments at 5.

accuracy and granularity.[191] In addition, NGSA comments that the proposal will encourage investments by generators that allow them to more reliably perform, leading to greater regional fuel assurance.[192]

130. ANGA states that while a shortage may be transient and last only a single five-minute interval, some resources are able to move quickly enough to meet these shifts in demand and, hence, reduce overall system instability. Further, ANGA maintains, allowing prices to respond to these small shortages also sends a long-term price signal to the market, highlighting where and what types of resources are needed on the system, which improves overall system reliability. ANGA also agrees with EPSA's position, recorded in the NOPR, that all markets should prioritize establishing shortage pricing based on operating reserve demand curves and co-optimized with the energy market. ANGA states that this is a least-cost solution and recommends that the Commission direct the RTOs/ISOs to include in their compliance filing a plan for modifying their rules, to the extent necessary, to include these features in both the day-ahead and real-time markets.[193]

131. Powerex supports the Commission's proposal to require RTOs/ISOs to apply shortage pricing for any dispatch interval during which a shortage of energy or operating

[191] CEA Comments at 4.

[192] NGSA Comments at 5.

[193] ANGA Comments at 5.

reserves occurs.[194] Powerex contends that shortage pricing mechanisms tied to real-time conditions provide revenues to generators and demand side resources that provide energy and reserves when needed, which is an advantage over the capacity markets long-term focus on load growth and reliability.[195]

132. EDP Renewables states that the Commission's shortage pricing proposal would result in more accurate price signals than under existing market rules, and therefore would encourage greater investment in new production and storage technologies with the ability to respond quickly to shortages.[196] Similarly, ESA asserts that the shortage pricing reform will improve the ability for a resource to be compensated based on the value of the service the resource provides.[197] ESA maintains that, for energy storage resources to help ensure grid reliability, an economic incentive must exist to incorporate those resources onto the grid.[198]

133. Exelon and Inertia Power assert that implementing shortage pricing for any interval during which a shortage could occur will provide the right incentives for generating resources and will promote adequate incentives for resource adequacy. Exelon and Inertia Power state that it is economically more efficient for prices to reflect

[194] Powerex Comments at 6.

[195] Powerex Comments at 8.

[196] EDP Renewables Comments at 5-6.

[197] ESA Comments at 4.

[198] ESA Comments at 4.

the value of the marginal resource during shortage periods, and that this is particularly true in instances where generation resources must compete with alternatives, such as exporting power to a neighboring market or not consuming a scarce fuel.[199]

134. PSEG states that it supports the shortage pricing proposal, that the proposal would address concerns about transparency, and that it would accomplish Order No. 719's objective of enhancing market efficiency by establishing a price that reflects the value of the loss of load and encourage resources to respond to shortage events.[200] PSEG further states that the absence of shortage pricing in the appropriate intervals is inefficient within individual RTOs/ISOs as well as between them, and it can frustrate the objectives of Coordinated Transaction Scheduling, which is currently being deployed by several RTOs/ISOs.[201]

135. Golden Spread supports the Commission's proposed shortage pricing reform and argues that even the smallest amount of operating reserve and energy shortage should be reflected in scarcity pricing.[202] Golden Spread states that it has invested hundreds of millions of dollars in a fleet of new quick-start, fast-ramping generation resources in anticipation of the proper working of efficient marginal cost-based energy markets. Golden Spread states that to the extent these resources are not fully compensated because

[199] Inertia Power and DC Energy Comments at 5; Exelon Comments at 6.

[200] PSEG Comments at 13.

[201] PSEG Comments at 14.

[202] Golden Spread Reply Comments at 4.

shortage pricing is masked, the value of these assets to Golden Spread's members and their consumers is diminished.[203]

136. DTE states that, as a member of MISO, it has largely supported the changes MISO has made through ELMP to ensure that generators are provided accurate price signals, akin to the shortage pricing proposal.[204]

d. Comments Recommending Changes to the Shortage Pricing Reform

137. Several commenters propose changes to the shortage pricing reform, or identify implementation issues in specific RTOs/ISOs.

138. Golden Spread, for example, states that the current SPP rules allow the temporary use of operating reserves to meet energy requirements during transient periods without invoking shortage pricing; in other words, SPP's rules encourage "price manipulation" undermining the transparency needed to incentivize longer term economic and reliable solutions.[205]

139. Golden Spread identifies examples of issues with certain SPP processes that it argues need to be addressed to comply with this reform and provides the following recommendations to resolve them: (1) relax constraints to allow economic dispatch to solve when there is a resource capacity constraint, global power balance constraint,

[203] Golden Spread Reply Comments at 7.

[204] DTE Comments at 5.

[205] Golden Spread Reply Comments at 5.

resource ramp constraint or operating constraint;[206] (2) prevent insufficient ramping capability to be subject to scarcity pricing;[207] (3) include fast-start technologies in a Reliability Unit Commitment action to avoid scarcity events, which then eliminates scarcity prices;[208] and (4) use of the concept of "head-room" to not factor much-needed ramping capacity in the LMP, which is reducing transparency and creating large uplifts.[209]

140. ELCON states that the shortage pricing proposal should be adopted only if the Commission promotes the development of technology-neutral fast-ramp products paid to provide the specific shortage service, and for which compensation would not inflate real-time LMPs.[210] ELCON asserts that it conditionally supports the provision on shortage price triggers when applied to technology-neutral fast-ramping products – products it states could be provided by demand response, energy storage technologies, or generation – but not to real-time shortage pricing in which every resource dispatched or called by the system operator during a dispatch interval is paid the same price.[211]

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[206] Golden Spread Comments at 8.

[207] Golden Spread Comments at 7-8.

[208] Golden Spread Comments at 9-10.

[209] Golden Spread Comments at 10.

[210] ELCON Comments at 2.

[211] ELCON Comments at 3-6.

e. Comments Opposed to the Proposed Shortage Pricing Reform

141. Several commenters oppose the shortage pricing proposal. Several commenters argue that while the NOPR does not address the price level of the shortage pricing, to the extent that RTOs/ISOs do change shortage pricing triggers, the RTOs/ISOs should also evaluate whether shortage pricing levels remain just and reasonable.[212] For example, Concerned Cooperatives and APPA and NRECA argue that the NOPR will raise prices for consumers, but the Commission fails to quantify the cost impact of the shortage pricing proposal on consumers or the potential benefits to the market and consumers.[213] Concerned Cooperatives add that any changes to the shortage pricing triggers in the RTO/ISO markets must be cost-justified on the basis of quantifiable improvements in market efficiencies and cost reductions. Furthermore, Concerned Cooperatives argue that the Commission's shortage pricing will raise prices for consumers and increase revenues to incumbent generators.[214]

142. APPA and NRECA assert that it is important to understand how various resource types would respond to price signals created by the shortage pricing proposal. Specifically, they assert that the NOPR did not discuss whether a five-minute shortage

[212] APPA and NRECA Comments at 12; TAPS Comments at 14-15; Concerned Cooperatives Comments at 13.

[213] Concerned Cooperatives Comments at 13-14; APPA and NRECA Comments at 6.

[214] Concerned Cooperatives Comments at 13.

pricing event would produce a sufficient response or only reflect a transient shortage resolvable without resorting to shortage pricing.[215] APPA and NRECA reference PJM representative Adam Keech's comment at the October 28, 2014 workshop on scarcity and shortage pricing, justifying PJM's current minimum duration of 30 minutes prior to triggering shortage pricing, and assert that the shortage pricing proposal runs the risk of rewarding generators that are already online just because another generator has not fully ramped up yet.[216] APPA and NRECA state that the NOPR neither discussed the degree to which the RTOs/ISOs are already in compliance with the proposal, the extent to which implementation would impact the frequency of shortage pricing events or impact prices, nor did it require RTOs/ISOs to undertake this analysis.[217] APPA and NRECA state that shortage pricing was triggered relatively infrequently in PJM and MISO, but more frequently in NYISO.[218]

143. APPA and NRECA question the extent to which shortage pricing would improve short-term system efficiency. They comment that existing variations among RTOs/ISOs in shortage pricing approaches create an opportunity to analyze the efficacy of more frequent shortage events. They request that the Commission direct the RTOs/ISOs to

[215] APPA and NRECA Comments at 6-7.

[216] APPA and NRECA Comments at 7.

[217] APPA and NRECA Comments at 9.

[218] APPA and NRECA Comments at 9-10.

provide evidence or examine whether the theoretical benefits of the shortage pricing proposal can be validated with actual resource decisions. APPA and NRECA caution that, without such analysis, entities, such as generators already online that cannot easily ramp up or down or financial marketers, could benefit financially without contributing to system efficiency.[219] Concerned Cooperatives also note that the Commission's rationale that prices must rise to reflect the true value of generation offered during operational shortages for the market to function properly fails to consider that only half of the market, i.e., generators, may be able to respond to the price signal in real-time.[220]

144. On the topic of long-term incentives, several commenters assert that no evidence exists that price signals as volatile and transient as shortage prices would be the basis for capital investments, whether to improve flexibility, whether to delay or avoid retirements, and especially not for the construction of new resources. APPA and NRECA assert that, even with a slight uptick in merchant plant construction compared to prior years, 95 percent of new construction was built under contract in 2014, and 98 percent of new construction was built under contract in 2013.[221] Further, Concerned Cooperatives argue that the evidence presented at the technical conferences preceding the NOPR demonstrate

[219] APPA and NRECA Comments at 10-11.

[220] Concerned Cooperatives Comments at 14.

[221] APPA and NRECA Comments at 11-12; TAPS Comments at 7-13; Concerned Cooperatives Comments at 15-16.

that short-term price signals from shortage pricing do not result in the long-term resource investment contemplated in the NOPR.[222]

145. Concerned Cooperatives contend that the RTOs/ISOs could develop better products, such as a fast-ramping product, that could encourage investment in more flexible resources without having to pay every resource a high price during shortage intervals of short duration.[223] Moreover, APPA and NRECA encourage the Commission to examine alternative methods of achieving its stated goal of incentivizing the availability of resources during periods of shortage, such as separately priced ramping products. APPA and NRECA urge the Commission to also examine whether such methods might achieve this goal at a lower cost to consumers.[224] Concerned Cooperatives further argue that the Commission's proposal is simply a transfer of wealth from consumers to generators without value to consumers, because, as the Commission admitted in the NOPR, some shortage events are so short that suppliers cannot react to the price signal.[225]

146. ODEC states that, in the example provided by PJM, if a unit is slow in coming online for a five-minute interval, it is not clear that shortage pricing would not over-compensate a resource, or if supply can even respond to such a short-term event in

[222] Concerned Cooperatives Comments at 15-16.

[223] Concerned Cooperatives Comments at 22-24.

[224] APPA and NRECA Comments at 12.

[225] Concerned Cooperatives Comments at 15-16.

sufficient time for the price signal to create an incentive to change behavior. ODEC states that it therefore believes that shortage pricing during transient shortages may be unjust and unreasonable because it will increase prices paid by load without corresponding benefits.[226]

147. APPA and NRECA also express concern that more frequent shortage pricing creates incentives to exercise market power and game market rules due to the potential for higher energy and operating reserve prices. They assert that if the proposal moves forward, each RTO/ISO should be required to reevaluate its market power mitigation rules and propose new or additional mitigation measures if necessary.[227] In addition, Concerned Cooperatives also argue that revising RTO/ISO tariffs to invoke shortage pricing more frequently is likely to increase opportunities for exploitation of consumers, but that the NOPR does not propose to require RTOs/ISOs to include in their compliance filings an analysis of needed reforms to ensure that consumers remain protected against the exercise of market power.[228]

148. Concerned Cooperatives also argue that if the Commission issues a final rule in this proceeding, RTOs/ISOs must be required to demonstrate that their shortage pricing mechanisms comply with four overarching principles, by providing for (1) prices that

[226] ODEC Comments at 6.

[227] APPA and NRECA Comments at 15-16.

[228] Concerned Cooperatives Comments at 15.

reflect the marginal costs of meeting the shortage; (2) a cap that is designed to mitigate adverse financial impacts on parties who are short; (3) prices that escalate with greater levels of shortage, because marginal costs will vary by shortage; and (4) a mechanism to ensure that revenues earned through shortage pricing are not duplicated by capacity market revenues.[229]

149. The New Jersey Board urges the Commission to allow PJM to retain its current shortage pricing mechanism—a thirty-minute look-ahead dispatch algorithm that identifies reserve shortages as only those lasting a minimum of thirty minutes. The New Jersey Board agrees with PJM that five-minute shortfalls are not necessarily symptomatic of system stress, but are merely transient shortfalls that can be quickly addressed through system re-dispatch.

150. More broadly, TAPS argues that any price signal during transient scarcity events is meaningless because resources cannot respond in time to the higher prices.[230] In addition, Direct Energy says that targeting transient shortages will create control issues and increase uplift, and the application of RTO/ISO shortage penalty factors to these transient situations will likely lead to higher prices than would otherwise be produced, creating unjust and unreasonable rates for generation compensation.[231]

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[229] Concerned Cooperatives Comments at 24-25.

[230] TAPS Comments at 7-13.

[231] Direct Energy Comments at 10-11.

151. Regarding definitions, Direct Energy asserts that a true shortage implies that insufficient capacity exists on an RTO's/ISO's system to meet energy and reserve requirements. In contrast, Direct Energy argues, transient shortage conditions are not true shortages because they simply reflect the operating characteristics of the generators being used to meet energy and reserve targets. Direct Energy argues that in a transient shortage condition, the RTO/ISO has the capacity to meet energy and reserve requirements and the transient shortage period represents the period of time it takes to deploy generation resources to meet those targets.[232]

152. Direct Energy claims the response an RTO/ISO receives based on the shortage pricing signals sent during transient shortage conditions is likely to cause a control issue when generation already being ramped through RTO/ISO dispatch to resolve the shortage condition hits its dispatch targets. Further, Direct Energy argues unjust and unreasonably higher prices would result from targeting "transient" shortages because of the impact of shortage pricing penalty factors in transient shortage circumstances, because the shortage pricing reserve penalty factors would be applied to a marginal unit providing energy that is not the highest opportunity cost reserve unit. Thus, Direct Energy argues the Commission should either revise its proposal to reflect issues with transient shortages of

[232] Direct Energy Comments at 10-11.

operating reserves, or permit individual RTOs/ISOs to evaluate this proposal and consider tariff revisions to address true shortages and to send appropriate price signals.[233]

153. Concerned Cooperatives and APPA and NRECA argue that the NOPR does not account for differences among the RTOs/ISOs, maintaining that shortage pricing issues should be resolved through individual stakeholder processes.[234] Alternatively, Concerned Cooperatives request that the Commission not implement shortage pricing reform until an RTO/ISO demonstrates that it has eliminated the conditions that cause "artificial" shortages (those arising from mathematical modeling when no actual operational shortage exists), adopts rules preventing shortage pricing from being applied during artificial shortages, and adopts rules ensuring that shortage price levels are reduced during artificial shortages to reflect that these are not real shortages.[235]

154. Concerned Cooperatives also note that the NOPR fails to provide a comparison of the market design in RTO/ISO-administered markets that trigger shortage pricing for a shortage event of any duration and those that use longer duration events as the trigger.[236] Concerned Cooperatives argue that, before imposing a uniform rule, the Commission should determine whether these different shortage pricing rules have resulted in incremental resource development, improved generator response to shortage conditions,

[233] Direct Energy Comments at 11-13.

[234] APPA and NRECA Comments at 5; Concerned Cooperatives Comments at 18.

[235] Concerned Cooperatives Comments at 18.

[236] Concerned Cooperatives Comments at 26.

and/or reduced the need for uplift charges. Concerned Cooperatives state that in some cases, uplift payments may be the most cost-effective solution for consumers.[237]

155. Several commenters point to various efforts in RTOs/ISOs that may impact shortage pricing. Concerned Cooperatives argue that the Commission should not address price formation issues in a piecemeal fashion, as changes to one element will impact the need for other reforms. Concerned Cooperatives note that several RTOs/ISOs already have rules providing adequate incentives for resource performance and investment, such as PJM's Reliability Pricing Model, ISO-NE's Forward Capacity Market, or MISO's ELMP.[238] Concerned Cooperatives assert that the Commission provides no evidence that more frequent triggering of shortage pricing is necessary to ensure resource adequacy or improve resource performance and flexibility when RTOs/ISOs use other market tools to achieve the same objectives set forth in the NOPR.

156. The New Jersey Board, APPA and NRECA and ODEC all acknowledge PJM's Capacity Performance Program[239] and argue to varying degrees that shortage pricing need not be considered here given this PJM reform or that the Commission should consider whether there would be overlap between this PJM reform and the shortage pricing

[237] Concerned Cooperatives Comments at 26.

[238] Concerned Cooperatives Comments at 18-21.

[239] *See PJM Interconnection, L.L.C.*, 151 FERC ¶ 61,208 (2015).

proposal.[240] Furthermore, APPA and NRECA state that another factor in determining whether the shortage pricing proposal would improve market efficiency and benefit consumers is the extent to which there is an overlap between this proposal and other RTO/ISO market rules.[241] APPA and NRECA also point out that, in some RTOs/ISOs such as NYISO, scarcity pricing is an additional and separate revenue stream that can balance reliance on capacity market revenues.[242] Further, ODEC suggests that, instead of requiring an expansion of scarcity pricing to transient time periods, the Commission require PJM to consider the need to reduce, if not eliminate, scarcity pricing in light of the new Capacity Performance construct.[243]

157. Concerned Cooperatives note that the NOPR fails to identify the number of additional shortages that would be triggered in RTO/ISO markets that do not invoke shortage pricing for a single settlement interval. They argue that the NOPR also fails to quantify what that cost might potentially be for consumers, particularly in PJM, which recently sought to increase its energy offer caps to $2,000 per MWh which could produce LMPs of $3,700 per MWh during shortage events. Concerned Cooperatives state that the NOPR provides no evidence that prices at this level are just and reasonable for a

[240] New Jersey Board Comments 4-6; APPA and NRECA Comments at 14.

[241] APPA and NRECA Comments at 13.

[242] APPA and NRECA Comments at 14-15.

[243] ODEC Comments at 8.

five-minute shortage where a resource cannot respond and/or the event is triggered by an artificial shortage.[244]

158. PG&E urges the Commission to examine transient shortages and their attendant price spikes, and resolve modeling issues that are causing these shortages. PG&E understands that shortage pricing might be appropriate to the extent that such pricing provides a meaningful price signal to resources. However, PG&E argues that most price spikes in the CAISO over the past five years have been so short that they have not provided a meaningful opportunity for resources to respond.[245] For example, PG&E states that from 2012 through 2014, the CAISO five-minute market saw positive price spikes (>$250/ MWh) in approximately 0.75 percent of the intervals. PG&E argues that transitory price spikes do not contribute to market efficiency, but result in increased market costs, and they give false signals to virtual participants, which can distort day-ahead awards and prices. PG&E also asserts that these transitory price spikes have contributed to price divergence between day-ahead and real-time and have resulted in significant uplift costs.[246]

159. PG&E notes that CAISO is already taking significant steps to address modeling issues that create transient shortages and attendant transient price spikes. For example,

[244] Concerned Cooperatives Comments at 25.

[245] PG&E Comments at 1-2.

[246] PG&E Comments at 1-2.

PG&E states that CAISO is working to augment the real-time dispatch function with a Flexible Ramping Product which will help avoid ramp-induced shortages that cause scarcity conditions in real-time. PG&E also explains that CAISO is considering applying different penalty prices for infeasibilities depending on the level of constraint relaxation, which will more appropriately reflect the cost of constraint violations. PG&E asserts that a small violation of the power balance constraint may be covered by deploying regulation reserves at a smaller cost per megawatt-hour than a larger violation, which may require more costly load shedding.[247]

160. Dominion states that it is concerned that some shortages are merely transient in nature due to slight differences in modeling and the ramping of generation, and may not warrant sending a shortage price signal to the market. Dominion argues that issues regarding transient shortages should be addressed prior to implementation of the proposed reforms.[248] Dominion states that the Commission should require RTOs/ISOs to specifically explain how the RTOs/ISOs will address this issue as part of their compliance filings. Further, Dominion asserts that the modification of shortage pricing triggers to better correlate to dispatch intervals should coincide with implementation of the Commission's proposal to align settlement intervals with dispatch intervals.

[247] PG&E Comments at 2.

[248] Dominion Comments at 4-5.

Dominion argues that this will align a resource's timely response to shortage pricing with payment for its response.[249]

4. Commission Determination

161. For the reasons discussed below, we adopt the NOPR shortage pricing proposal and modify the regulatory text to clarify that shortage pricing is required only when a shortage of energy or operating reserves is indicated by the RTO's/ISO's software.

162. Specifically, we require each RTO/ISO to trigger shortage pricing for any interval in which a shortage of energy or operating reserves is indicated during the pricing of resources for that interval. As stated in the NOPR, the shortage pricing requirement should "ensure that a resource is compensated based on a price that reflects the value of the service the resource provides."[250] This rationale applies to any shortage "regardless of the duration or cause of [the] shortage."[251] It thus would apply to "transient shortages." Several commenters specifically agreed with this analysis.[252] Under this requirement, whenever a shortage of energy or operating reserves is indicated in an

[249] Dominion Comments at 5.

[250] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 52.

[251] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 47; *see also id.* P 9 ("This reform would also ensure that resources operating during a shortage are compensated for the value of the service that they provide, regardless of whether the shortage is short-lived.").

[252] *See, e.g.*, Inertia Power and DC Energy Comments at 6 (citing NYISO Comments, Docket No. AD14-14-000, at 28-29 (Mar. 6, 2015), Potomac Economics Comments, Docket No. AD14-14-000, at 25-26 (Mar. 6, 2015), and Calpine Comments, Docket No. AD14-14-000, at 20 (Mar. 6, 2015)); SPP Market Monitor Comments at 3; Golden Spread Comments at 3-4.

RTO's/ISO's pricing run software for a particular pricing interval, shortage pricing should be invoked even if during that period resources are ramping up to a particular level they are likely to reach in a few minutes.

163. We find that the shortage pricing requirement will help ensure that prices rise sufficiently and appropriately to allow supply to meet demand during an operating reserve shortage, and thus will more accurately reflect the value a resource provides.[253] Better formed prices help ensure just and reasonable rates by providing appropriate incentives for market participants to follow commitment and dispatch instructions, maintain reliability, provide transparency of the underlying value of the service so that operational and investment decisions are based on prices that reflect the actual marginal cost of serving load and the operational constraints of reliable system operation, and encourage efficient investments in facilities and equipment.

164. As for incentives to follow dispatch, as noted in the NOPR, if a resource is compensated based on a price that reflects the value of the service the resource provides, the resource will have appropriate incentives to address energy or reserve shortages. As explained by Potomac Economics, the higher prices (relative to non-shortage price intervals) resulting from the shortage pricing proposal will enhance resource flexibility by leading to: (1) faster resource ramp rates; (2) wider dispatch ranges and not self-scheduling resources; (3) shorter start times for natural gas turbines; and (4) an incentive

[253] *See* NOPR, FERC Stats. & Regs. ¶ 32,710 at P 48 (citing Order No. 719, FERC Stats. & Regs. ¶ 31,281).

to build more flexible, fast-ramping generating resources and to perform maintenance on existing resources that increases their flexibility.[254] In addition, shortage pricing during all reserve deficiencies also sends the correct price signal to already operating resources to take any actions necessary to remain operational during the shortage event. For instance, a resource that is already operating but realizes it will need to take a forced outage in the near-term will receive a clear signal to delay that forced outage, to the extent possible, until the reserve shortage has been resolved.

165. A number of commenters cite the role of appropriate shortage pricing in creating an incentive for market participants to make investments that will alleviate shortages in the future.[255] EDP Renewables and ESA note that the shortage pricing proposal will encourage greater investment in new production and storage technologies.[256] In response to commenters that assert that short duration shortage prices will not create a sufficient incentive for new entry, we agree with EPSA that appropriate shortage pricing will encourage more modest investments that can improve availability and response-time, such as weatherization of fuel supplies, heat tracing to reduce instrument failure during freezing temperatures, and completion of deferred maintenance such as burner

[254] Potomac Economics Comments at 8.

[255] NEI Comments at 14; NGSA Comments at 5; EPSA Comments, Pope Aff. at 15; Potomac Economics Comments at 8.

[256] EDP Renewables Comments at 5-6; ESA Comments at 4. ESA states that the shortage pricing reform will improve the ability for a resource to be compensated based on the value of the service the resource provides.

upgrades.[257] Investments of the nature identified by commenters should enhance reliability in the long-run as system resources are more able to perform during critical system conditions.

166. With regard to transparency, an RTO's/ISO's action to establish prices at the times of shortage, including transient shortages, makes the shortage apparent to all market participants. This maximizes the opportunities and incentives for all system resources to take actions to address the shortage.

167. In response to commenters like CAISO, we clarify that we did not intend to impose shortage pricing if a shortage occurs during an interval for which the prices and dispatch decisions have already been set. We did not intend that, for example, *ex post* pricing should, after binding prices have been determined by the RTO/ISO software, invoke shortage pricing based upon a subsequent recognition that a shortage existed in a particular prior interval. Similarly, the shortage pricing proposal also did not intend to require any changes to the frequency of existing dispatch and pricing runs for energy or operating reserves. To the extent that operating reserves are priced at a different interval than energy resources are dispatched, as is the case in CAISO, this Final Rule applies to the interval that prices and co-optimizes both energy and operating reserves. Thus, an RTO/ISO need not trigger shortage pricing during a fifteen-minute operating reserve period if it becomes aware of a shortage within that interval, because reserve prices have

[257] EPSA Comments, Pope Aff. at 19.

already been set for that entire fifteen-minute period. Only if that shortage is projected to continue into the next reserve period and there is time to factor that shortage into the dispatch and pricing run for the next interval does the RTO/ISO need to trigger shortage pricing for that next interval.

168. Also, the shortage pricing proposal did not intend to require any changes to existing pricing methods, such as ELMP in MISO that allows offline resources to set energy prices, and we agree that the use of offline resources can result in efficient pricing.[258] However, we agree with Potomac Economics that if an RTO's/ISO's pricing model allows infeasible or uneconomic units to set prices, the offline units represent an artificial increase in real-time supply that will depress real-time prices. Therefore, for the purpose of this Final Rule, RTOs/ISOs choosing to use offline resources to count towards energy and operating reserve requirements may not allow infeasible or uneconomic offline units to set prices through the real-time pricing model or to be counted as providing reserves.

169. In opposing the proposal, PJM and SPP argue that an energy or operating reserve shortage that the RTO/ISO expects to be resolved quickly (e.g., within ten minutes),

[258] *See Midcontinent Indep. Sys. Operator, Inc.*, 150 FERC ¶ 61,143, at P 36 (2015) ("For the reasons discussed below, we conditionally accept MISO's Revised ELMP Filing, effective March 1, 2015, subject to a further compliance filing…."); *Midcontinent Indep. Sys. Operator, Inc.*, Docket No. ER15-685-001 (Feb. 4, 2016) (delegated letter order accepting compliance filing).

should not trigger shortage pricing. They note that, in PJM, for example, shortage pricing is not triggered until a shortage is projected to last at least thirty minutes.[259]

170. We disagree that an energy or operating reserve shortage that the RTO/ISO expects to be resolved quickly should not trigger shortage pricing. Such a shortage presents exactly the type of mismatch between system conditions and pricing that the reform was meant to remedy. Thus, by adopting the proposed shortage pricing reform, we require PJM and SPP to modify their existing shortage pricing mechanisms.

171. As summarized above, PJM and SPP provide three hypothetical situations in their joint comments to describe situations where they argue shortage pricing should not apply.[260] In all of these scenarios, RTOs/ISOs are "technically compromising the operating reserve requirement," as PJM and SPP concede,[261] although such transient shortages may not violate NERC's reliability standards.[262] However, we find that RTOs/ISOs should reflect these system conditions in the price. Using shortage pricing for a transient shortage situation reflects in the price of operating reserves the current

[259] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 46 & n.70; PJM and SPP Comments at 5.

[260] PJM and SPP Comments at 3-5.

[261] PJM and SPP Comments at 4.

[262] Requirement R6.2 of North American Electric Reliability Corporation's Reliability Standard BAL-002-1 requires restoration of contingency reserves within 90 minutes: "The default Contingency Reserve Restoration Period is 90 minutes." In the Western Electric Coordinating Council (WECC), the reliability standards require restoration of contingency reserves within 60 minutes. WECC BAL-002-WECC-2, R1.

system conditions, which include the possibility of a contingency occurring —for which operating reserves were procured and designed to address. This is designed to appropriately value those resources that provide value to the system by their ability to respond quickly to changing prices. As Potomac Economics states,[263] transient shortages, which typically occur when the system is ramp-constrained, are true shortages because, if a large contingency occurs during such a shortage (e.g., a generator trips off-line), the RTO/ISO will not have the ability to replace the capacity because other generators are already ramping as quickly as possible. It is possible, as PJM and SPP state, that when a transient shortage is recognized, RTOs/ISOs can re-dispatch their system to eliminate the shortage quickly.[264] However, until the shortage is resolved, prices should reflect the system conditions and the actions taken to resolve the shortage as much as possible.

172. PJM, SPP, and Direct Energy have also not shown that applying shortage pricing to transient shortages will create control issues and increase uplift.[265] In fact, there is evidence in this record that it will not. The RTOs/ISOs which currently invoke shortage pricing during relatively brief periods, i.e., MISO, NYISO and ISO-NE, do not appear to have these types of control issues. Further, we note that reflecting system conditions in prices should decrease uplift over time, as the costs of units committed, dispatched, or

[263] Potomac Economics Comments at 8.

[264] PJM and SPP Comments at 4.

[265] *See* PJM and SPP Comments at 3-5 (making this argument in the context of the hypotheticals discussed above); Direct Energy Comments at 10-11.

designated as reserves would be reflected in prices and those units would no longer need to be made whole through uplift payments.

173. PJM and SPP state that application of the shortage pricing reform to transient shortages would likely require the implementation of operating reserve demand curves that distinguish prices relative to varying degrees of shortage.[266] In the NOPR, the Commission acknowledged that, as a result of the shortage pricing reform, "an RTO/ISO may need to calibrate administrative shortage prices to better reflect the value of the service."[267] Thus, if PJM or SPP believes that a modification of the applicable operating reserve demand curves is appropriate in light of the shortage pricing reform, the appropriate forum to make such is a change is through an FPA section 205 filing.

174. We disagree with TAPS, Concerned Cooperatives, APPA, and NRECA that the only effect of requiring RTOs/ISOs to trigger shortage prices in transient events is to provide extra revenue to generators already in the market.[268] While extra revenue may result from prices accurately reflecting shortage conditions, we believe that is appropriate. The purpose for requiring the shortage pricing is to create transparent market prices that reflect system conditions. The benefit of triggering shortage prices for all shortages is that it gives all suppliers an incentive to do as much as they can, including

[266] PJM and SPP Comments at 7-8.

[267] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 49.

[268] TAPS Comments at 9; APPA and NRECA Comments at 7; Concerned Cooperatives Comments at 16.

investments and operational alterations, to be available the next time it appears that shortages may occur and shortage pricing may be invoked, even if such shortages last briefly. Further, as discussed above, shortage pricing during all reserve deficiencies also sends the correct price signal to already operating resources to take any actions necessary to remain operational during the shortage event.

175. We disagree with the views of those commenters[269] who assert that the proposed rule is not justified because no evidence exists that price signals as volatile and transient as shortage prices would be the basis for capital investments. While shortage pricing revenues may not, by themselves, be enough to financially justify entirely new generation projects, commenters who are generation owners and project developers have indicated that triggering shortage prices during short duration shortages as proposed in the NOPR "will provide an incentive for incremental investments to enable existing or new generation or dispatchable demand to respond to short-duration shortages."[270] As to the amount of construction done recently by merchants as opposed to that done under long-term contracts, we note that RTOs/ISOs such as PJM have been able to maintain

[269] APPA and NRECA Comments at 11-12; TAPS Comments at 7-13; Concerned Cooperatives Comments at 15-16.

[270] EPSA Comments, Pope Aff. at 15.

reliability with reliance primarily upon their capacity market and not long-term contracts for new generation.[271]

176. TAPS recommends that the Commission direct each RTO/ISO to propose new shortage prices for transient shortages that do not exceed the value of the incremental benefit (if any) provided by an additional megawatt in those circumstances, or to demonstrate that the RTO's/ISO's existing shortage prices applicable in such circumstances already meet that standard.[272] We decline to require this in the Final Rule both because this was not originally proposed and because the record in this proceeding has not persuaded us that any RTO's/ISO's administrative shortage prices need to be modified. However, as discussed above, any RTO/ISO may file, pursuant to section 205 of the FPA, to propose a modification of any of the administrative shortage prices as a result of this Final Rule, as PJM and SPP indicate they might.

177. The PJM Market Monitor identifies an implementation issue, which may be unique to PJM. The PJM Market Monitor asserts that PJM cannot accurately measure the actual level of operating reserves on a five-minute basis. To address this, the PJM Market Monitor and the New Jersey Board recommend that the Commission direct PJM

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[271] *See generally* Monitoring Analytics, *New Generation in the PJM Capacity Market: MW and Funding Sources for Delivery Years 2007/2008 through 2018/2019* (May 4, 2016), http://www.monitoringanalytics.com/reports/Reports/2016/New_Generation_in_the_PJM_Capacity_Market_20160504.pdf.

[272] TAPS Comments at 13. PJM and SPP indicate that they may need to file to modify their shortage prices. *See* PJM and SPP Comments at 8.

to develop this measurement capability before it implements the shortage pricing proposal.[273] To the extent that PJM or any other RTO/ISO believes it needs to enhance its measurement capabilities to implement the shortage pricing requirement, it should propose to do so in its compliance filing.

178. Concerned Cooperatives maintains that the shortage pricing proposal may not achieve the price formation objective of increased transparency because generators may not be capable of responding fast enough to shortage pricing triggered during transient events.[274] However, we find that the shortage pricing requirement will increase transparency because shortage prices provide a clear and public market signal, while compensation to resources provided through uplift provides a signal only to individual resources and after-the-fact. In addition, consistently sending a clear price signal during reserve deficiencies in real-time should encourage market participant behavior in the day-ahead market that translates into day-ahead prices that better reflect expected system conditions.

179. Concerned Cooperatives, ODEC, ELCON, and PG&E suggest that the Commission should not adopt the shortage pricing proposal because other initiatives, such as PJM's Reliability Pricing Model modifications and fast ramping products, already provide adequate incentives for resource performance and send the signals

[273] PJM Market Monitor Comments at 9.

[274] Concerned Cooperatives Comments at 6.

needed for generation investment.[275] We are not persuaded by these arguments. While other initiatives, such as PJM's Reliability Pricing Model modifications and additional fast-ramping products, could decrease the occurrence of shortages and shortage pricing, an effective shortage pricing trigger is still required to ensure appropriate pricing when shortages occur. This is particularly important for incenting behavior by load in the day-ahead market that is consistent with expected system conditions in real-time. For instance, the Reliability Pricing Model modifications will send real-time price signals to encourage resource performance, but will not necessarily encourage accurate day-ahead load forecast for load.

180. Concerned Cooperatives express concern that the Commission does not require the RTOs/ISOs to include, in their compliance filings, an analysis to ensure that consumers remain protected against the exercise of market power when the proposed reforms are implemented.[276] However, Concerned Cooperatives do not explain why the RTOs'/ISOs' existing market power mitigation methodologies would not prevent the exercise of market power during times of shortage pricing, under the proposed reforms or otherwise. Therefore, we do not require the RTOs/ISOs to provide a market power review and mitigation reforms in their compliance filings.

[275] Concerned Cooperatives Comments at 18-25; ELCON Comments at 2; PG&E Comments at 2.

[276] Concerned Cooperatives Comments at 15.

C. Compliance and Implementation

1. Commission Proposal

181. In the NOPR, the Commission proposed that RTOs/ISOs submit compliance filings on both the proposed settlement reform and the proposed shortage pricing reform four months from the effective date of the Final Rule; that the proposed settlement reform become effective twelve months from the date of the compliance filings for implementation of reforms to settlement systems; and that the shortage pricing proposal become effective four months from the date of the compliance filings for implementation of reforms to shortage pricing triggers.[277]

2. Comments

182. As described below, some commenters sought more time to submit compliance filings and questioned (1) whether the Commission provided enough time to implement the settlement proposal; and (2) whether the Commission should extend implementation of the shortage pricing proposal to allow for simultaneous implementation of shortage pricing proposal with the settlement proposal.

a. Comments from RTOs/ISOs

183. The ISO/RTO Council argues that the Commission should not force the RTOs/ISOs to substantially reform their existing market structure to comply with the

[277] NOPR, FERC Stats. & Regs. ¶ 32,710 at PP 38, 54-55.

shortage pricing proposal.[278] PJM, MISO, and ISO-NE either support the compliance deadline or believe that they can meet the compliance deadline once a Final Rule is published in the Federal Register.[279]

184. ISO-NE supports the implementation timeline for the shortage pricing proposal because it believes that its market already meets the NOPR proposal.[280] Similarly, ISO-NE states that it has already engaged its participants to discuss tariff changes to settle the real-time markets in five-minute intervals, and is therefore not concerned with the implementation timeline because it anticipates tariff changes will be filed with the Commission in mid-2016, to be effective in 2017.[281]

185. MISO states that it already has a project in progress to replace the current software systems that perform market and transmission settlements processing,[282] and it estimates that an additional eight months would be required to mitigate any issues related to the new software and complete development of the revised settlement system, allowing implementation by the fourth quarter of 2017.[283] MISO states that the Commission

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[278] ISO/RTO Council Comments at 3.

[279] PJM Comments at 7; MISO Comments at 13; ISO-NE Comments at 1.

[280] ISO-NE Comments at 3.

[281] ISO-NE Comments at 2. "ISO-NE plans to implement five-minute settlement of real-time reserves as part of the implementation of five-minute settlement of real-time energy transactions, which is currently being discussed with stakeholders." *Id.* at 3.

[282] MISO Comments at 3.

[283] MISO Comments at 6.

should allow each RTO/ISO to propose, in its compliance filing, what it believes is a reasonable implementation schedule.[284]

186. PJM asserts that it can make a compliance filing four months after the date of the Final Rule, but is concerned that insufficient time was suggested for implementation.[285] PJM hopes to complete an evaluation of what changes are needed in its settlement system around April 2016, but, depending upon on the outcome of that analysis, it estimates that revising the settlement process will require between fifteen to thirty-eight months.[286] PJM also states that, though it opposes the shortage pricing proposal, if the Commission orders some version of shortage pricing reform, the Commission should consider simultaneous implementation of shortage pricing with the settlement interval proposal.[287]

187. CAISO also states that, depending upon the specifics of the Final Rule, extra time may be necessary for a complete compliance filing.[288]

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[284] MISO Comments at 12.

[285] PJM Comments at 7.

[286] PJM Comments at 3-4.

[287] PJM addresses its objections to the shortage pricing proposals in the PJM and SPP Comments.

[288] CAISO Comments at 25. CAISO has asked for certain clarifications as part of its comments, and states that if the Commission does not make the necessary clarifications, CAISO will need extra time to consider what changes would need to be made to its systems, and to develop implementing tariff language along with the supporting filing. *Id*.

b. Comments Urging Flexibility in Implementation

188. Several commenters urge flexibility in the implementation timelines.[289] The New Jersey Board concurs with PJM that, given the technical uncertainties involved, the Commission, in the Final Rule, should provide flexibility in the implementation timeline.[290] Duke states that the RTOs/ISOs should determine the implementation timeline after first exploring system design options, cost impacts to market participants, and approaches to reduce cost impacts.[291] EEI and APPA and NRECA contend that not only is a flexible implementation timeline necessary, but RTOs/ISOs should also be encouraged to work with market participants to ensure they have the necessary systems and metering in place in advance.[292]

189. NEPOOL, Golden Spread, and TAPS echo the statements of EEI, contending that implementation should account for specific differences between the RTOs/ISOs instead of imposing a rigid standard.[293]

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[289] ISO/RTO Council Comments at 3; New Jersey Board Comments at 3; PJM Comments at 4; EEI Comments at 8; NEPOOL Comments at 1; Golden Spread Comments at 7-8.

[290] New Jersey Board Comments at 3 (citing PJM Comments at 4).

[291] Duke Comments at 6.

[292] EEI Comments at 8; APPA and NRECA Comments at 4-5.

[293] NEPOOL Comments at 5; Golden Spread Comments at 7-8; TAPS Comments at 14-15.

190. Although TAPS argues against the proposed shortage pricing rule, it states that if the rule is adopted, then needed administrative shortage pricing level modifications should become effective when other shortage pricing modifications become effective.[294] Golden Spread also identifies issues it believes need to be addressed before the proposed shortage pricing requirement can be properly implemented in SPP.[295]

c. Compliance Filing Deadline

191. Some commenters commented on the amount of time allowed to submit a compliance filing. With regard to the settlement interval proposal, Concerned Cooperatives state that because it could take over a year to determine what market rules may need modification and to subsequently implement those changes, the Commission should require a compliance filing after one year so that RTOs/ISOs can discuss implementation issues with stakeholders.[296] TAPS states that the four-month compliance deadline proposed in the NOPR is too short because a rule adjusting shortage pricing triggers needs to be accompanied by an adjustment to shortage pricing levels.[297]

[294] TAPS Comments at 13.

[295] Golden Spread Comments at 8-10.

[296] Concerned Cooperatives Comments at 12.

[297] TAPS Comments at 14.

d. Implementation Deadline

192. PSEG states that, in markets where the current equipment can be utilized, the twelve-month implementation timeline proposed by the NOPR would be reasonable.[298] However, PSEG notes that the Commission must take into account the time it will take the individual RTOs/ISOs to implement computer system changes.[299] Several commenters assert that the timelines for implementation mentioned in the NOPR may be too short.

193. ODEC asserts that, instead of requiring implementation within twelve months of the compliance filings, if the Commission determines PJM must settle resources at the same interval those resources are dispatched, then the Commission should require each RTO/ISO to submit a proposed plan for compliance and implementation of the Final Rule.[300]

194. Exelon maintains that the implementation period for the five-minute settlement interval proposal should be 18 months because of the equipment changes that will be necessary for generators in the RTOs/ISOs that do not currently use five-minute pricing.[301]

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[298] PSEG Comments at 8.

[299] PSEG Comments at 15; Inertia Power Comments at 9.

[300] ODEC Comments at 5.

[301] Exelon Comments at 5.

195. Ameren argues the timeline proposed in the NOPR is too short and could potentially increase both costs and risks to the detriment of their customers.[302] As for the settlement interval proposal, Ameren states that the implementation timeline developed from its internal assessment is at least 24 months to 29 months, with a possible implementation date of June 1, 2018 if a Final Rule is issued in early 2016.[303]

196. Dominion and IPL point out that implementation timing and specifics for market participants will depend upon when the RTOs/ISOs finalize their own implementation details, and it argues that the proposed twelve-month implementation period for settlement interval reforms does not appropriately take this factor into account.[304]

197. DTE states that it would need a minimum of eighteen months and "several million dollars" to implement necessary changes to its settlement system,[305] and Duke is concerned that twelve months will not be enough time.[306] DTE and Duke emphasize that it is essential for the Commission to encourage RTOs/ISOs to work with stakeholders and

[302] Ameren Comments at 6.

[303] Ameren Comments at 6-7. Ameren also suggests "aligning the implementation of a final rule with the beginning of the MISO Planning Year, i.e. June 1, in order to facilitate a more seamless transition." *Id.*

[304] Dominion Comments at 2; IPL Comments at 2-3.

[305] DTE Comments at 4-5. DTE explains that these changes would include, among other things, evaluating its meters and computer systems, as well as re-evaluating many of its current contracts. *Id.*

[306] Duke Comments at 6-7; DTE Comments at 4-5. DTE explains that these changes would include, among other things, evaluating its meters and computer systems, as well as re-evaluating many of its current contracts. *Id.*

market participants in order to facilitate the most cost-effective and timely implementation.[307] Commenting on the shortage pricing proposal, Concerned Cooperatives, who also contend stakeholders need to work cooperatively with RTOs/ISOs, assert that the implementation timeline is not long enough, and that the Commission should allow at least a year for the RTOs/ISOs to vet the shortage pricing implementation details with their stakeholders.[308]

198. APPA and NRECA request that RTOs/ISOs ensure all market participants either have the necessary metering and billing systems in place or have sufficient time to add required systems.[309]

199. Only one entity, Direct Energy, requested an indefinite delay of implementation: specifically, for the five-minute settlement proposal, arguing that the underlying technology of many supply resources is not advanced enough to ensure the efficiency the Commission states it seeks in the NOPR.[310]

[307] DTE Comments at 5; Duke Comments at 6-7.

[308] Concerned Cooperatives Comments at 26-27.

[309] APPA and NRECA Comments at 4-5.

[310] Direct Energy Comments at 6.

e. Simultaneous Implementation

200. Some commenters argue that the Commission should synchronize implementation of the shortage pricing reform with the settlement interval proposal due to their interrelated nature.[311]

f. Costs

201. In the NOPR, the Commission noted that while adopting the proposed reforms might provide significant benefits, implementing and modifying settlement systems can be complex and costly.[312] Various commenters provided settlement implementation cost estimates: PJM ($3 to $5.6 million),[313] Ameren ($3 million, plus an additional $13 to $20 million if the settlement interval proposal is applied to load),[314] Duke ($1 to $3.25 million, plus an additional $4 million if the settlement interval proposal is applied to load),[315] and Concerned Cooperatives ($1.5 to $2 million capital costs and $300,000 to $600,000 annual costs).[316]

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[311] PJM Comments at 10; EEI Comments at 10-11; DTE Comments at 6; EPSA Comments at 8; PSEG Comments at 15-16; Inertia Power and DC Energy Comments at 8-9.

[312] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 60.

[313] PJM Comments at 3-4.

[314] Ameren Comments at 5-6.

[315] Duke Comments at 6.

[316] Concerned Cooperatives Comments at 9.

202. While the NOPR did not propose that a cost-benefit analysis must be performed in conjunction with the proposed reforms, some commenters discuss whether a formal cost-benefit analysis is necessary prior to implementation of the proposals. APPA and NRECA, Concerned Cooperatives, Ameren, and IPL claim that a cost-benefit analysis is necessary before implementation.[317] IPL asserts this analysis will prove that market benefits will be small in comparison to the costs of implementation.[318] Conversely, EPSA and the PJM Market Monitor state that they should not be required to do a cost-benefit analysis (specifically in reference to sub-hourly pricing) because it would be too difficult to accurately measure or approximate the potential long-term benefits.[319]

203. Some commenters opine on how they perceive the costs relate to the benefits of the proposed reforms. Duke expresses concerns that the costs of aligning dispatch and settlement intervals will exceed the benefits. Duke acknowledges that the potential impact of these reforms is not currently knowable, given that MISO and PJM have not proposed new market rules and system changes.[320] However, Duke states that if RTOs/ISOs determine that costs associated with the proposed reform will not exceed the benefits, stakeholder discussions could involve software system changes and relevant

[317] APPA and NRECA Comments at 4-5; Concerned Cooperatives Comments at 12; Ameren Comments at 4; IPL Comments at 2.

[318] IPL Comments at 2.

[319] EPSA Comments, Pope Aff. at 13-14; PJM Market Monitor Comments at 2-3.

[320] Duke Comments at 6.

costs and impacts on market participants.[321] In contrast, Inertia Power states that, although the long-term benefits are not quantifiable, the direct savings to consumers and market participants will warrant the costs. Inertia Power suggests that the Commission should consider the "immeasurable cost of muted price signals" when comparing costs to benefits.[322]

3. Commission Determination

204. Because the reforms required in this Final Rule are targeted and specific, we believe RTOs/ISOs will have sufficient time to develop and file tariff changes to adopt these limited reforms, contrary to the concerns of commenters such as Concerned Cooperatives and TAPS. In the NOPR, the Commission recognized that implementation of the settlement reform could take up to a year after the compliance filings were submitted.[323] With regard to shortage pricing, any revisions an RTO/ISO may propose to shortage pricing levels (which are not required by this Final Rule) must be filed under section 205 and could be submitted prior to the actual implementation of the shortage pricing provisions of this Final Rule, thereby permitting stakeholders and the RTO/ISO additional time to work through the implementation details.

205. Of the entities required to submit a compliance filing, PJM, MISO, and ISO-NE either support the compliance deadline or believe that they can meet the compliance

[321] Duke Comments at 5.

[322] Inertia Power Comments at 7.

[323] NOPR, FERC Stats. & Regs. ¶ 32,710 at P 55.

deadline once a Final Rule is published in the Federal Register. Further, neither SPP nor NYISO submitted comments opposing the compliance deadline. CAISO expressed concern about its ability to submit a compliance filing within 120 days of the effective date of this Final Rule. We believe that, with the various clarifications provided in this Final Rule, CAISO should be able to submit a compliance filing within four months of the effective date of the Final Rule. Accordingly, we adopt the proposal in the NOPR and require each RTO/ISO to submit, within 120 days of the effective date of this Final Rule, a compliance filing that includes tariff changes that adopt the requirements in this Final Rule, or demonstrates how the RTO/ISO already complies. We will allow a further 12 months from the compliance filing date for the tariff changes implementing reforms to settlement intervals to be effective, and 120 days from that same compliance filing date for the tariff changes implementing shortage pricing reforms to be effective.[324]

206. As previously noted, comments on the implementation schedule focused on two areas: (1) whether the Commission provided enough time to implement the settlement reform proposal; and (2) whether the Commission should extend implementation of the shortage pricing reform proposal to allow for simultaneous implementation of shortage pricing with settlement reform. Based upon the comments received, we retain the current implementation schedule, but will consider requests for

[324] The Commission has followed a similar approach with the timelines for compliance and implementation in the past. *See, e.g.*, Order No. 755, FERC Stats. & Regs. ¶ 31,324 at P 201, *reh'g denied*, Order No. 755-A, 138 FERC ¶ 61,123.

extensions of time to extend the implementation dates when the RTOs/ISOs submit their compliance filings. The RTOs/ISOs will have had 120 days as they prepare their compliance filings to assess the feasibility of implementing the reforms set forth in this Final Rule. It is premature at this time to extend the implementation timelines when affected parties are only just starting to analyze what actions they must take in order to implement the requirements of the Final Rule.

207. Moreover, when the RTOs/ISOs submit their respective compliance filings, we will consider whether it is appropriate to permit the RTO/ISO to synchronize implementation of shortage pricing with the settlement interval based upon the facts presented at that time. We expect that any RTO/ISO seeking to synchronize shortage pricing with the settlement interval will set forth compelling reasons as to why it is necessary based upon the unique nature of the RTO/ISO.

208. We will not dictate how RTOs/ISOs must implement the reforms set forth in the Final Rule from a technical perspective. Nevertheless, we recommend that wherever possible, the RTO/ISO should consider using existing metering equipment and current data collection processes, such as the process currently being explored by PJM.[325]

209. With regard to the comments concerning the costs of implementing the NOPR proposals, we find that some of these costs appear to be overstated, taken as a whole. For example, PJM's use of its state estimator and telemetry may reduce, if not eliminate, the

[325] PJM Comments at 3.

need for new five-minute revenue quality meters; and it is unclear, in the case of the Concerned Cooperatives, why costs equal to several more full-time employees would need to be incurred on an annual basis as a result of the NOPR reform. In any event, we find that the value of the benefits of more accurate pricing under the proposed rule described in the NOPR, as recognized by the vast majority of commenters in this proceeding, and the net present value of the future increases in market surplus, although difficult to quantify with precision, are likely to outweigh any one-time implementation costs.

210. We reject the proposal to require RTOs/ISOs to conduct a cost-benefit analysis before implementing the settlement reform.[326] The Commission has not previously conducted such analyses when it has considered whether to require various market reforms.[327] Also, since many of the expected benefits will occur in the long-run due to changes in marginal investments and enhancements resulting from other price formation reforms, there is limited ability to quantify the short-run benefits before adopting these reforms.[328] We agree with the PJM Market Monitor's assertion that, while the costs of

[326] APPA and NRECA Comments at 4.

[327] *Cf.* Order No. 719-A, FERC Stats. & Regs. ¶ 31,292 at P 179 ("For instance, although we believe that cost-benefit analyses can be useful in analyzing new projects, we are unconvinced that the Commission should mandate cost-benefit analyses in all circumstances where an RTO or ISO engages in a major initiative").

[328] EPSA Comments, Pope Aff. at 13-14.

implementation may be approximated, calculating the efficiency benefits of implementing five-minute settlements is effectively impossible.[329]

D. Requests Beyond the Scope of this Proceeding

1. Comments

211. Commenters raised issues that are not discussed above and that are outside of the scope of this rulemaking. EPSA states that the Commission and RTOs/ISOs must move expeditiously on the reforms proposed in the NOPR as well as others identified in the price formation proceeding that encourage economically efficient decisions about resource entry and exit.[330]

212. PJM Power Providers and Exelon urge the Commission to focus on reducing uplift and remedying its causes as well as market power mitigation, operator actions, and other issues.[331] PJM Power Providers, Exelon, EPSA, and NGSA also encourage Commission action on reforming the energy offer cap.[332]

213. ELCON, Westar, TAPS, and Inertia Power and DC Energy recognize the interconnected nature of the issues in the price formation proceeding. ELCON urges the Commission to consolidate any additional price formation proposals into a single

[329] PJM Market Monitor Comments at 2-3.

[330] EPSA Comments at 11.

[331] PJM Power Providers Comments at 7; Exelon Comments at 8.

[332] PJM Power Providers Comments at 6; EPSA Comments at 13-15; Exelon Comments at 8-9; NGSA Comments at 6 (citing NGSA Comments, Docket No. ER15-623-000 (filed Jan. 20, 2015)).

NOPR.[333] Westar states that the Commission should consider the NOPR in conjunction with other items identified in the price formation proceedings.[334] TAPS states that RTOs/ISOs should have the flexibility to comply with all price formation rulemakings in a way that coordinates implementation and reduces the possibility of overlapping modifications of software and hardware.[335] Inertia Power and DC Energy asks the Commission to be mindful of other system benefits that may result from the required software and hardware upgrades in the RTO/ISOs.[336]

214. EEI and EPSA reiterate their prior comments regarding common principles that should guide the discussion of price formation: (1) dispatch-based pricing; (2) efficient commitment that will provide accurate day-ahead and real-time price signals; and (3) transparency with regard to out-of-market actions and payments.[337] EEI further states that the Commission should consider issues related to improving the transparency of LMPs by addressing the treatment of start-up and no-load costs, and operator actions that result in out-of-market payments.[338]

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[333] ELCON Comments at 7.

[334] Westar Comments at 2-3.

[335] TAPS Comments at 6.

[336] Inertia Power and DC Energy Comments at 8.

[337] EEI Comments at 4-5 (citing EEI Comments, Docket No. AD14-14-000, at 2 (filed Mar. 6, 2015)); EPSA Comments at 12 and Att. B.

[338] EEI Comments at 6.

215. Westar requests that the Commission encourage RTOs/ISOs to clarify what costs may constitute marginal costs.[339] Additionally, XO Energy lists many benefits of a day-ahead transmission product, and recommends the implementation of such a product across all RTOs/ISOs.[340]

216. Financial Marketers Coalition and XO Energy assert that while the NOPR addresses settlement intervals for generation (supply), similar reforms are needed for the intervals in which load is forecasted, bid and settled in order to eliminate the mismatch between generation and load.[341]

217. Entergy Nuclear Power Marketing and NEI state that although the reforms proposed in the NOPR will improve price formation for resources operating in real-time, they will not improve the outlook for baseload resources such as nuclear plants typically fully committed in the day-ahead market.[342]

218. NEI recommends various changes to price formation to better ensure that the market clearing price reflects all of the costs associated with reliably providing service to the market.[343]

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[339] Westar Comments at 3.

[340] XO Energy Comments at 2-3 (citing MISO, Virtual Spread Bid Proposal Stakeholder Workshop, at 10 (Nov. 18, 2013)).

[341] Financial Marketers Coalition Comments at 4-6; XO Energy Comments at 3-4.

[342] Entergy Nuclear Power Marketing Comments at 2-3; NEI Comments at 15.

[343] NEI Comments at 15-16.

219. With respect to other issues, DTE requests clarification from the Commission that market participants will not have to change the manner in which they currently net purchases and sales for purposes of FERC Form No. 1.[344] The SPP Market Monitor raises look-ahead modeling concerns.[345] Powerex has concerns regarding steps CAISO takes to minimize the occurrence of shortages (as opposed to when shortage pricing occurs)[346] and Public Interest Organizations have a concern regarding possible barriers to the participation of demand response in RTO/ISO markets.[347]

220. Referencing the NOPR's discussion of the role that look-ahead tools can play in mitigating seemingly artificial shortages, the SPP Market Monitor also requests the Commission clarify that look-ahead models incorporate administrative pricing in their least cost evaluation before choosing unit commitments to relieve shortages.[348]

221. Powerex argues that further Commission action is necessary to ensure that RTOs/ISOs refrain from using more general tariff provisions and non-tariff protocols, including out-of-market procurement and other operator interventions, to prevent

[344] DTE Comments at 6.

[345] PSEG Comments at 14; SPP Market Monitor at 4-7; Westar Comments at 3.

[346] Powerex Comments at 9-13.

[347] Public Interest Organizations Comments at 4-5.

[348] SPP Market Monitor Comments at 7.

shortage pricing from being triggered or otherwise prevent scarcity from being reflected in market prices.[349]

222. Dominion questions if the proposed settlement reforms require further consideration of the interactions between the day-ahead and real-time markets. Specifically, Dominion suggests that changes may be necessary to how the RTOs/ISOs calculate generator deviations in the real-time market from their day-ahead schedules.[350]

223. ESA requests that the Commission consider five-minute scheduling once it implements five-minute intervals to better access the greater operational flexibility of fast-ramping resources like energy storage.[351]

224. Powerex requests that the Commission require each RTO/ISO to: (1) identify all out-of-market actions or procurement tools that it uses, or is authorized to use, to manage its system; and (2) propose tariff amendments to ensure that these actions are appropriately reflected in prices or, alternatively, demonstrate that its existing tariff provisions already achieve such a result.[352]

225. Appian Way states that the instant proposals encompassed by this NOPR are insufficient to ensure proper shortage pricing. Appian Way adds that some RTOs/ISOs will continue to have defective pricing unless and until the Commission requires them to

[349] Powerex Comments at 9.

[350] Dominion Comments at 3-4.

[351] ESA Comments at 4-5.

[352] Powerex Comments at 12-13.

establish pricing rules that ensure prices rise to scarcity levels when shortage conditions occur that require the RTO/ISO to call demand response in order to serve load.[353]

226. Inertia Power and DC Energy state that when operating reserves and other ancillary services are priced "out of market," it prevents the triggering of shortage pricing and circumvents the intent of the NOPR.[354]

227. Potomac Economics states that the Commission's focus on shortage pricing should extend to transmission shortages.[355]

228. Public Interest Organizations state that if the Commission carries out the shortage pricing proposal as set forth in the NOPR, it should simultaneously ensure that demand-side resources can respond to those prices to reduce the potential for unjust and unreasonable rates.[356]

229. Mr. Lively maintains that shortages should be viewed as a continuum, not as a shortage versus non-shortage issue. Mr. Lively cites a paper he wrote that discusses using Area Control Error (ACE) in a pricing mechanism to adjust the nominal price of electricity to determine a settlement price.[357]

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[353] Appian Way Comments at 2.

[354] Inertia Power Comments at 5-6.

[355] Potomac Economics Comments at 11.

[356] Public Interest Organizations Comments at 3-5.

[357] Mr. Lively Comments at 3-4 (filed Nov. 23, 2015).

2. Commission Determination

230. We appreciate the concerns raised by numerous commenters requesting that the Commission undertake various initiatives, as set forth above. However, we find that the requested initiatives go beyond the scope of this rulemaking. Many of the issues raised by commenters may be relevant in other price formation proceedings,[358] but they go beyond the limited issues in this proceeding, which deals only with the settlement interval proposal and the trigger for shortage pricing. Accordingly, we will not address those issues here.

IV. Information Collection Statement

231. The Paperwork Reduction Act (PRA)[359] requires each federal agency to seek and obtain Office of Management and Budget (OMB) approval before undertaking a collection of information directed to ten or more persons or contained in a rule of general applicability. OMB's regulations,[360] in turn, require approval of certain information collection requirements imposed by agency rules. Upon approval of a collection(s) of information, OMB will assign an OMB control number and an expiration date.

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[358] *See, e.g.*, *Offer Caps in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Notice of Proposed Rulemaking, 81 Fed. Reg. 5591 (Feb. 4, 2016), FERC Stats. & Regs. ¶ 32,714 (2016), *Price Formation in Energy and Ancillary Services Markets Operated by Regional Transmission Organizations and Independent System Operators*, 153 FERC ¶ 61,221 (2015).

[359] 44 U.S.C. §§ 3501-3520 (2012).

[360] 5 C.F.R. § 1320 (2015).

Respondents subject to the filing requirements of a rule will not be penalized for failing to respond to these collection(s) of information unless the collection(s) of information display a valid OMB control number.

232. In this Final Rule, we are amending the Commission's regulations to improve the operation of organized wholesale electric power markets operated by RTOs and ISOs. We require that each RTO/ISO align settlement and dispatch intervals by: (1) settling energy transactions in its real-time markets at the same time interval it dispatches energy; (2) settling operating reserves transactions in its real-time markets at the same time interval it prices operating reserves; and (3) settling intertie transactions in the same time interval it schedules intertie transactions. We also require that each RTO/ISO trigger shortage pricing for any interval that prices both energy and operating reserves in which a shortage of energy or operating reserves is indicated during the pricing of resources for that interval. The reforms required in this Final Rule require a one-time tariff filing due 120 days after the effective date of this Final Rule. With regard to those RTOs/ISOs that believe that they already comply with the reforms required here, they can demonstrate their compliance in their compliance filing. The Commission will submit the proposed reporting requirements to OMB for its review and approval under section 3507(d) of the Paperwork Reduction Act.[361]

[361] 44 U.S.C. § 3507(d).

233. Although the Commission stated in the NOPR that it expects the adoption of the reforms proposed to provide significant benefits,[362] the Commission solicited comments on the accuracy of provided burden and cost estimates set forth in the NOPR and any suggested methods for minimizing the respondents' burdens, including the use of automated information techniques. Specifically, the Commission sought detailed comments on the potential cost and time necessary to implement aspects of the reforms proposed in the NOPR, including (1) hardware, software, and business processes changes; (2) increased data storage and validation; (3) changes to market participant metering or other equipment; and (4) processes for RTOs/ISOs to vet proposed changes amongst their stakeholders. The Commission also sought comment on whether changes in settlement systems would disrupt existing contractual relationships and, if so, what burdens this might impose and how the Commission should address any potential issues resulting from such disruption.

234. The Commission received responses regarding the costs of implementing the reforms described in the NOPR;[363] however we find that those costs do not fall under the definition of "burden" as defined by OMB's regulations.[364] Therefore, an analysis of those costs is not relevant to our analysis under the PRA.

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[363] *See supra* PP 201-203.

[364] "Burden" is defined as "the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal Agency, including… (ii) Developing, acquiring, installing, and utilizing

(continued...)

Burden Estimate and Information Collection Costs: We believe that the burden estimates below are representative of the average burden on respondents. The estimated burden and cost[365] for the requirements contained in this Final Rule follow.[366]

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technology and systems for the purpose of collecting, validating, and verifying information; (iii) Developing, acquiring, installing, and utilizing technology and systems for the purpose of processing and maintaining information; (iv) Developing, acquiring, installing, and utilizing technology and systems for the purpose of disclosing and providing information…." 5 C.F.R. § 1320.3(b)(1) (2015). We respond to comments regarding other costs not related to "burden" (such as hardware and software) in PP 209-210 above.

[365] The estimated hourly cost (salary plus benefits) provided in this section are based on the salary figures for May 2015 posted by the Bureau of Labor Statistics for the Utilities sector (available at http://www.bls.gov/oes/current/naics2_22.htm#00-0000) and scaled to reflect benefits using the relative importance of employer costs in employee compensation from December 2015 (released March 10, 2016 and available at http://www.bls.gov/news.release/ecec.nr0.htm). The hourly estimates for salary plus benefits are:

- Legal (code 23-0000), $128.94
- Computer and Mathematical (code 15-0000), $60.54
- Information Security Analyst (code 15-1122), $57.99
- Accountant and Auditor (code 13-2011), $53.78
- Information and Record Clerk (code 43-4199), $37.69
- Electrical Engineer (code 17-2071), $64.20
- Economist (code 19-3011), $74.43
- Computer and Information Systems Manager (code 11-3021), $91.63
- Management (code 11-0000), $88.94

The average hourly cost (salary plus benefits), weighting all of these skill sets evenly, is $73.13. For the calculations here, the Commission rounds it to $73 per hour.

[366] The RTOs/ISOs (CAISO, ISO-NE, MISO, NYISO, PJM, and SPP) are required to comply with the reforms in this Final Rule. Three RTOs/ISOs (ISO-NE, MISO, and PJM) currently do not align real-time settlement with dispatch intervals and thus likely would be burdened more by that aspect of the reforms in this Final Rule.

FERC 516D,[367] as implemented in Final Rule in RM15-24-000	Number of Respondents	Annual Number of Responses per Respondent	Total Number of Responses	Average Burden Hours & Cost per Response	Annual Burden Hours & Total Annual Cost
	(1)	(2)	(1)×(2)=(3)	(4)	(3)×(4)=(5)
Tariff filings one-time in Year 1, for RTOs/ISOs that currently align real-time settlement with dispatch intervals	3 RTOs or ISOs	1	3	80 hrs; $5,840	240 hrs; $17,520
Tariff filings one-time in Year 1, for RTOs/ISOs that *do not* currently align real-time settlement with dispatch intervals	3 RTOs or ISOs	1	3	160 hrs; $11,680	480 hrs; $35,040
TOTAL (one-time in Year 1)[368]	6		6		720 hrs.; $52,560

[367] The information collection requirements and related burden for the NOPR in Docket No. RM15-24 were submitted to OMB under FERC-516 (Electric Rate Schedules and Tariff Filings, OMB Control No. 1902-0096). Currently, there is an unrelated package (in Docket No. PL15-3) pending OMB review under FERC-516. Because only one item per OMB Control No. can be pending OMB review at a time, the reporting requirements in the Final Rule in RM15-24 are being submitted to OMB for review under FERC-516D (a temporary 'placeholder' collection number, OMB Control No. to be determined). Long-term, the staff expects to transfer administratively the requirements and burden of this final rule to FERC-516 (OMB Control No. 1902-0096) from FERC-516D.

[368] The burden costs (one-time in Year 1) consist of filing proposed tariff changes to the Commission within four months of the effective date of the Final Rule.

Title: FERC-516D, Electric Rate Schedules and Tariff Filings in Docket RM15-24.

Action: A new information collection.

OMB Control No. To Be Determined.

Respondents for this Rulemaking: RTOs and ISOs.

Frequency of Information: One-time during Year one.

Necessity of Information: The Federal Energy Regulatory Commission implements this rule to improve competitive wholesale electric markets in the RTO and ISO regions.

Internal Review: The Commission has reviewed the changes and has determined that such changes are necessary. These requirements conform to the Commission's need for efficient information collection, communication, and management within the energy industry. The Commission has specific, objective support for the burden estimates associated with the information collection requirements.

235. Interested persons may obtain information on the reporting requirements by contacting the following: Federal Energy Regulatory Commission, 888 First Street, NE, Washington, DC 20426 [Attention: Ellen Brown, Office of the Executive Director], e-mail: DataClearance@ferc.gov, Phone: (202) 502-8663, fax: (202) 273-0873. Comments concerning the collection of information and the associated burden estimate(s) may also be sent to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503 [Attention: Desk Officer for the Federal Energy Regulatory Commission]. Due to

security concerns, comments should be sent electronically to the following e-mail address: oira_submission@omb.eop.gov. Comments submitted to OMB should refer to FERC-516D and OMB Control No. To Be Determined.

V. Environmental Analysis

236. The Commission is required to prepare an Environmental Assessment or an Environmental Impact Statement for any action that may have a significant adverse effect on the human environment.[369] We conclude that neither an Environmental Assessment nor an Environmental Impact Statement is required for this Final Rule under section 380.4(a)(15) of the Commission's regulations, which provides a categorical exemption for approval of actions under sections 205 and 206 of the FPA relating to the filing of schedules containing all rates and charges for the transmission or sale of electric energy subject to the Commission's jurisdiction, plus the classification, practices, contracts and regulations that affect rates, charges, classifications, and services.[370]

VI. Regulatory Flexibility Act

237. The Regulatory Flexibility Act of 1980 (RFA)[371] generally requires a description and analysis of rules that will have significant economic impact on a substantial number

[369] *Regulations Implementing the National Environmental Policy Act of 1969*, Order No. 486, 52 Fed. Reg. 47,897 (Dec. 17, 1987), FERC Stats. & Regs., Regulations Preambles 1986-1990 ¶ 30,783 (1987).

[370] 18 C.F.R. § 380.4(a)(15) (2015).

[371] 5 U.S.C. §§ 601-612 (2012).

of small entities. The RFA does not mandate any particular outcome in a rulemaking. It only requires consideration of alternatives that are less burdensome to small entities and an agency explanation of why alternatives were rejected.

238. This rule applies to six RTOs/ISOs (all of which are transmission organizations). The three RTOs/ISOs that do not currently align real-time settlement with dispatch intervals will have to incur a one-time cost to upgrade their hardware and software. These enhancements will be needed to allow the RTOs/ISOs to process settlement data on a more granular level. That one-time cost (spread over Years 1 and 2) for hardware and software for each of those three RTOs/ISOs is estimated to be an average of $3 million (a total of $9 million for those three RTOs/ISOs). The average estimated burden cost (one-time in Year 1) to each of the RTOs/ISOs is $8,760 (total of $52,560 for all six RTOs/ISOs). Therefore the estimated total cost (burden, hardware, and software) over Years 1 and 2 for all six RTOs/ISOs is $9,052,560.

239. The RTOs/ISOs, however, are not small entities, as defined by the RFA.[372] This is because the relevant threshold between small and large entities is 500 employees and the Commission understands that each RTO/ISO has more than 500 employees.

[372] The RFA definition of "small entity" refers to the definition provided in the Small Business Act, which defines a "small business concern" as a business that is independently owned and operated and that is not dominant in its field of operation. The Small Business Administration's regulations at 13 C.F.R. § 121.201 (2015) define the threshold for a small Electric Bulk Power Transmission and Control entity (NAICS code 221121) to be 500 employees. *See* 5 U.S.C. § 601(3) (2012) (citing to section 3 of the Small Business Act, 15 U.S.C. § 632 (2012)).

Furthermore, because of their pivotal roles in wholesale electric power markets in their regions, none of the RTOs/ISOs meet the last criterion of the two-part RFA definition of a small entity: "not dominant in its field of operation." As a result, we certify that the reforms required by this Final Rule would not have a significant economic impact on a substantial number of small entities**.**

VII. Document Availability

240. In addition to publishing the full text of this document in the Federal Register, the Commission provides all interested persons an opportunity to view and/or print the contents of this document via the Internet through FERC's Home Page (http://www.ferc.gov) and in FERC's Public Reference Room during normal business hours (8:30 a.m. to 5:00 p.m. Eastern time) at 888 First Street, NE, Room 2A, Washington DC 20426.

241. From FERC's Home Page on the Internet, this information is available on eLibrary. The full text of this document is available on eLibrary in PDF and Microsoft Word format for viewing, printing, and/or downloading. To access this document in eLibrary, type the docket number excluding the last three digits of this document in the docket number field.

242. User assistance is available for eLibrary and the FERC's website during normal business hours from FERC Online Support at (202) 502-6652 (toll free at 1-866-208-3676) or email at ferconlinesupport@ferc.gov, or the Public Reference Room at (202) 502-8371, TTY (202) 502-8659. E-mail the Public Reference Room at public.referenceroom@ferc.gov.

VIII. Effective Date and Congressional Notification

243. These regulations are effective 75 days from the date the rule is published in the Federal Register. The Commission has determined, with the concurrence of the Administrator of the Office of Information and Regulatory Affairs of OMB, that this rule is not a "major rule" as defined in section 351 of the Small Business Regulatory Enforcement Fairness Act of 1996.

List of subjects in 18 C.F.R. Part 35
Electric power rates; Electric utilities; Reporting and record-keeping requirements

By the Commission.

(S E A L)

Kimberly D. Bose,
Secretary.

In consideration of the foregoing, the Commission proposes to amend Part 35, Chapter I, Title 18, *Code of Federal Regulations*, as follows:

PART 35 – FILING OF RATE SCHEDULES AND TARIFFS

1. The authority citation for part 35 continues to read as follows:

Authority: 16 U.S.C. 791a-825r, 2601-2645; 31 U.S.C. 9701; 42 U.S.C. 7101-7352.

2. Amend § 35.28 as follows:

(a) Paragraph (g)(1)(iv)(A) is revised.

(b) Add a new paragraph (g)(1)(vi).

§ 35.28 Non-discriminatory open access transmission tariff

***** ***** ***** ***** *****

(g) *Tariffs and operations of Commission-approved independent system operators and regional transmission organizations.* * * *

(1) *Demand response and pricing.** * * *

(iv) *Price Formation during periods of operating reserve shortage*. (A) Each Commission-approved independent system operator and regional transmission organization must modify its market rules to allow the market-clearing price during periods of operating reserve shortage to reach a level that rebalances supply and demand so as to maintain reliability while providing sufficient provisions for mitigating market power. Each Commission-approved independent system operator and regional transmission organization must trigger shortage pricing for any interval in which a shortage of energy or operating reserves is indicated during the pricing of resources for that interval. * * * *

(vi) *Settlement intervals*. Each Commission-approved independent system operator and regional transmission organization must settle energy transactions in its real-time markets at the same time interval it dispatches energy, must settle operating reserves transactions in its real-time markets at the same time interval it prices operating reserves, and must settle intertie transactions at the same time interval it schedules intertie transactions.

Note: The following appendix will not be published in the *Federal Register*.

APPENDIX: List of Commenters

The following is a list of the entities that filed comments in this proceeding, along with the short name/acronym used in this Final Rule. Unless otherwise noted, all comments were submitted on November 30, 2015.

Comments

Short Name/Acronym	Commenter
AEMA	Advanced Energy Management Alliance
Ameren	Ameren Services Company (on behalf of Ameren Illinois Company and Union Electric Company)
ANGA	America's Natural Gas Alliance
APPA and NRECA	American Public Power Association and National Rural Electric Cooperative Association
Appian Way	Appian Way Energy Partners
CAISO	California Independent System Operator Corporation
CEA	Canadian Electricity Association
Concerned Cooperatives	Hoosier Energy Rural Electric Cooperative, Inc., Kansas Electric Power Cooperative, Inc., and North Carolina Electric Membership Corporation
Delaware Commission	Delaware Public Service Commission
Direct Energy	Direct Energy Business, LLC and Direct Energy Business Marketing, LLC

Dominion	Dominion Resources Services, Inc.
DTE	DTE Electric Company
Duke	Duke Energy Corporation, Duke Energy Progress, LLC, Duke Energy Carolinas, LLC, Duke Energy Kentucky, Inc., Duke Energy Indiana, Inc., and Duke Energy Ohio, Inc.
EDP Renewables	EDP Renewables North America LLC
EEI	Edison Electric Institute
ELCON	Electricity Consumers Resource Council
ESA	Energy Storage Association
EPSA	Electric Power Supply Association
Entergy Nuclear Power Marketing	Entergy Nuclear Power Marketing, LLC
Exelon	Exelon Corporation
Financial Marketers Coalition	Financial Marketers Coalition
Golden Spread	Golden Spread Electric Cooperative, Inc.
Inertia Power and DC Energy	Inertia Power, LP and DC Energy, LLC
IPL	Indianapolis Power & Light Company
ISO/RTO Council	ISO/RTO Council
ISO-NE	ISO New England Inc.
Mr. Lively	Mark B. Lively, Utility Economic Engineers
MISO	Midcontinent Independent System Operator, Inc.

NEPOOL	New England Power Pool Participants Committee
NEI	Nuclear Energy Institute
New Jersey Board	New Jersey Board of Public Utilities
NGSA	Natural Gas Supply Association
NYISO	New York Independent System Operator, Inc.
ODEC	Old Dominion Electric Cooperative
Mr. Centolella	Paul Centolella and Associates, L.L.C.
PG&E	Pacific Gas & Electric Company
PJM	PJM Interconnection, L.L.C.
PJM Market Monitor	Monitoring Analytics, LLC, Independent Market Monitor for PJM
PJM Power Providers	PJM Power Providers Group
Potomac Economics	Potomac Economics, Ltd.
Powerex	Powerex Corp.
PSEG	PSEG Companies (Public Service Electric and Gas Company, PSEG Power LLC, and PSEG Energy Resources & Trade LLC)
Public Interest Organizations	Acadia Center, Americans for a Clean Energy Grid, Climate + Energy Project, Great Plains Institute, Natural Resources Defense Council, Sierra Club, Sustainable FERC Project, Union of Concerned Scientists, and Wind on the Wires
SCE	Southern California Edison Company

SPP	Southwest Power Pool, Inc.
SPP Market Monitor	Southwest Power Pool, Inc. Independent Market Monitoring Unit
TAPS	Transmission Access Policy Study Group
Westar	Westar Energy, Inc.
XO Energy	XO Energy, LLC

Reply or Supplemental Comments

Short Name/Acronym	Commenter	Date Submitted
Golden Spread	Golden Spread Electric Cooperative, Inc.	December 14, 2015
Direct Energy	Direct Energy Business, LLC and Direct Energy Business Marketing, LLC	March 4, 2016

Late Comments

Short Name/Acronym	Commenter	Date Submitted
New Jersey Board	New Jersey Board of Public Utilities	December 3, 2015