

139 FERC ¶ 61,057
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Jon Wellinghoff, Chairman;
Philip D. Moeller, John R. Norris,
and Cheryl A. LaFleur.

PJM Interconnection, L.L.C.

Docket No. ER09-1063-004

ORDER ON COMPLIANCE FILING

(Issued April 19, 2012)

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I. Introduction

1. On June 18, 2010, PJM Interconnection, L.L.C. (PJM) submitted a compliance filing and proposed tariff changes addressing the shortage pricing requirements established by the Commission in Order No. 719.¹ For the reasons discussed below, we accept PJM's filing, subject to conditions, to become effective as of the date of this order.² We also direct PJM to make an additional compliance filing, within 90 days of the date of this order.

2. In Order No. 719, the Commission required regional transmission organizations (RTO) and independent system operators (ISO) to reform their existing market rules or otherwise demonstrate their ability to ensure that energy prices, during an operating reserve shortage, will appropriately reflect the value of energy. PJM, in response, proposes numerous tariff changes based on its analysis that its existing shortage pricing provisions fail to satisfy the shortage pricing requirements of Order No. 719. PJM notes, among other things, that its existing shortage pricing rules apply only in maximum generation emergencies, not in the case of a reserve shortage.

3. PJM's existing shortage pricing provisions are triggered when PJM: (i) dispatches generation that is offered for use under a maximum generation emergency; (ii) initiates a voltage reduction action (iii) makes emergency energy purchases or (iv) directs a manual load dump.³ When such conditions arise in a given scarcity pricing region, the Locational Marginal Prices (LMP) established at all nodes in that region will be based on the highest market-based offer price, as submitted by those generators in the region operating at PJM's direction to supply energy or reserves. When scarcity is triggered, offer caps that would otherwise apply to resources that have been dispatched out of

¹ *Wholesale Competition in Regions with Organized Electric Markets*, Order No. 719, 73 Fed. Reg. 64,100 (Oct. 28, 2008), FERC Stats. & Regs. ¶ 31,281, at P 165, *et seq.* (2008), *order on reh'g*, Order No. 719-A, FERC Stats. & Reg. ¶ 31,292 (2009), FERC Stats. & Regs. ¶ 31,292 (2009), *order on reh'g*, Order No. 719-B, 129 FERC ¶ 61,252 (2009).

² With respect to implementation, PJM states, and we acknowledge, that the software necessary to implement PJM's shortage pricing revisions will require start-up testing and related training prior to its full implementation – a process, it is estimated, that may require six months to complete. Accordingly, we direct PJM to notify the Commission, on an informational basis, within 14 days prior to implementation of the authorizations issued in this order. Upon receipt, the Commission does not intend to act on, or notice, this informational filing.

³ *See infra* note 13.

economic merit order, and that have failed the three-pivotal supplier test, are lifted. PJM's scarcity pricing rules are also subject to an overall price cap of \$1000/MWh.

4. PJM's currently effective scarcity pricing rules do not result in price impacts during reserve shortages; instead, these existing rules result in price impacts only after emergency procedures are implemented in anticipation of the need to deploy emergency measures to resolve an energy shortage, or a significant reserve shortage. Under this existing framework, then, energy prices will not necessarily rise when an operating reserve shortage is either imminent or encountered. In fact, PJM's current market mechanisms may cause reserve prices to fall when shortage conditions occur as reserves are continually converted into energy to serve load.

5. To address these deficiencies, PJM proposes to: (i) establish a non-synchronized reserves market; (ii) require simultaneous dispatch of energy and reserves; (iii) establish an \$850 per MWh reserve price cap phased-in over four years; (iv) establish a single \$2,700 aggregated price cap for the energy and reserve markets phased-in over four years; (v) set the price for regulation service at five-minute intervals; (vi) allow emergency demand response, emergency purchases, and generation from emergency segments of generators already on-line and operating to set price; and (vii) permit the prices of synchronized and non-synchronized reserve to continue to reflect synchronized and primary reserve shortage in the event of voltage reduction or manual load dump action.

6. For the reasons discussed below, we find that PJM's pricing mechanism, subject to the revisions PJM proposes and the additional modifications we require, satisfies the six criteria enumerated in Order No. 719.⁴ Specifically, we find that PJM's proposal, as modified herein, will: (i) enhance reliability by reducing demand and increasing generation during periods of operating reserve shortage; (ii) encourage investment in demand response technologies; (iii) encourage reliance on existing generation and demand resources; (iv) encourage new generation and demand resource entry; (v) ensure comparable treatment of resources during periods of operating reserve shortage; and (vi) ensure that market power is mitigated and that gaming behavior is deterred during periods of operating reserve shortages including, but not limited to, showing how demand resources discipline bidding behavior to competitive levels.

7. PJM's proposed pricing reforms will encourage existing demand response and generation resources to continue to provide supplies during shortage conditions, given that these resources will be eligible to receive the prevailing energy and reserve market clearing price. PJM's pricing reforms will also increase the availability of supply from resources that might otherwise remain off-line due to a forced outage. In addition,

⁴ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 247.

PJM's proposal will increase the accuracy of market clearing prices during shortage conditions, minimize the need for out-of-market payments, and provide clearer price signals to both demand response and generation resources. PJM's proposal will also appropriately maintain existing mitigation measures.

8. For the reasons discussed below, however, we also require PJM to submit an additional compliance filing to modify its proposal, in part. Specifically, we direct PJM to modify its shortage pricing proposal to:

- clarify, in its tariff, the operation of its shortage pricing rules during emergency actions;⁵
- incorporate, in its tariff, the methods by which PJM will monitor non-synchronized reserves and the notification processes that will apply to alert the market that a primary reserve shortage is expected;
- explain, in its tariff, how non-synchronized reserve credits will be awarded to demand response resources;
- identify, in its tariff, the system conditions that will justify, or support, the creation of additional sub-zones applicable to the synchronized reserve market;
- remove its \$1,000 day-ahead energy market offer cap on demand resources that have cleared a previous capacity auction;
- incorporate, in its tariff, its business rules allowing emergency demand response, emergency purchases, and generation from emergency segments of on-line generators to set the market clearing price during emergencies;
- include, in its tariff, a must-offer requirement applicable to PJM's synchronized and non-synchronized reserves market;⁶

⁵ With respect to PJM's proposed phase-in of its reserve penalty factors, we also require PJM, for the reasons discussed below, to specify revised delivery years applicable to its proposed four-year transition period.

⁶ As discussed below, synchronized reserves are resources already synchronized to the grid that can produce additional energy within 10 minutes, or demand response that can reduce consumption within 10 minutes. PJM's rules recognize both Tier 1 and Tier 2 synchronized reserves. Tier 1 synchronized reserves are on-line resources that are not fully loaded and which are already counted toward meeting the synchronized reserve and primary reserve requirements. Tier 2 resources are on-line resources that are dispatched
(continued...)

- include, in its tariff, language addressing the recallability of capacity resources during an emergency; and
- include, in its tariff, language addressing the monitoring of system conditions, as required to avoid transient conditions that may otherwise cause false positives of reserve shortages.⁷

II. Background

A. Order No. 719

9. In Order No. 719, the Commission amended its regulations, under the Federal Power Act (FPA), to improve the operation of organized wholesale electric power markets. With respect to shortage pricing, the Commission held that existing market rules that do not produce prices that accurately reflect the value of energy during an operating reserve shortage may harm reliability, inhibit demand response, deter entry of demand response and generation resources, and thwart innovation.⁸ To remove these barriers to competition, the Commission required RTOs and ISOs to reform their existing market rules or otherwise demonstrate their ability to ensure that energy prices in their markets, during an operating reserve shortage, will appropriately reflect the value of energy.

10. To implement these reforms, the Commission identified four authorized approaches. Specifically, the Commission held that as operating reserves grow short, or an emergency condition arises, market rules should operate to: (i) increase demand bid

to an operating point that deviates from economic dispatch, demand response, and combustion turbines that can be placed into condensing mode and may be assigned to provide synchronized reserves when there are insufficient Tier 1 resources to meet the must-offer requirement. *See generally* PJM's Amended and Restated Operating Agreement (Operating Agreement) at Schedule 1, sections 3.2.3A(b)(i) and (j) (Synchronized Reserves).

⁷ In addition, we direct PJM to provide an annual report to its stakeholders analyzing market participants' responses to prices exceeding \$1,000/MWh to determine whether any changes to the synchronized and primary reserve penalty factors are warranted for subsequent delivery years. We also direct PJM's Independent Market Monitor (IMM) to include a review of false positives or actual operating reserve shortage events and to address the operation of PJM's shortage pricing mechanism as part of its quarterly reporting requirement and in its annual state of the market report.

⁸ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 192.

caps above the current level; (ii) increase both demand bid caps and supply prices above the current level; (iii) establish a demand curve for operating reserves for the purpose of raising prices in a previously agreed-upon way; or (iv) set the market-clearing price for supply and demand response resources equal to the payment made to participants in an emergency demand response program.⁹ Finally, the Commission required the IMM for each RTO and ISO to inform the Commission of the IMM's views regarding its respective RTO's/ISO's compliance proposal.¹⁰

B. PJM's Currently Effective Shortage Pricing Provisions

11. PJM's market rules currently provide for shortage pricing in certain circumstances.¹¹ Shortage pricing applies when emergency procedures are implemented in anticipation of the need to deploy emergency measures to resolve an energy shortage, or a significant reserve shortage. Specifically, shortage pricing is triggered when PJM: (i) dispatches generation that has been offered for use under a maximum emergency condition; (ii) initiates a voltage reduction action; (iii) makes emergency energy purchases; or (iv) directs a manual load dump.¹² These conditions are monitored, and responded to by PJM within the context of defined shortage pricing regions.¹³ When these conditions arise, the LMP at all nodes in the region will be based on the highest market-based offer price of all generators in the region operating at PJM's direction to supply energy or reserves. When a shortage condition arises, offer caps are lifted for the resources to which they would otherwise apply, i.e., for resources dispatched out of economic merit order that fail the three-pivotal supplier test (PJM's market power mitigation screen).¹⁴

⁹ *Id.* P 208. In addition to these four authorized approaches, the Commission permitted RTOs and ISOs to propose their own alternative approaches, provided that any such alternative satisfies the Commission's shortage pricing objectives. *Id.*

¹⁰ *Id.* P 234. As discussed at section III.A of this order, below, the IMM submitted its views on PJM's filing on July 19, 2010.

¹¹ PJM's filing and certain intervenor comments and protests refer to the term "shortage pricing," a term used by the Commission in Order No. 719, as "scarcity pricing." In this order, we use the former term exclusively.

¹² *See* PJM OATT, Attachment K - Appendix at section 6A.1.1.

¹³ The PJM Open Access Transmission Tariff (OATT) currently identifies six such regions. *See id.* at section 6A.2.

¹⁴ *PJM Interconnection, L.L.C.*, 114 FERC ¶ 61,076 (2006) and *PJM*

12. PJM's existing shortage pricing rules have been triggered on only one occasion, on August 8, 2007. Since 2005, PJM has experienced seven instances (a total of 28 hours) in which part or all of its transmission system has been in a reserve shortage. These reserve shortage events occurred on July 27, 2005, August 4, 2005, July 18, 2006, August 2, 2006, August 3, 2006, August 8, 2007, and June 10, 2008.

C. PJM's Initial Compliance Filing

13. In its initial Order No. 719 compliance filing, submitted April 29, 2009, PJM requested a 10 month extension of time, until April 1, 2010, to submit its shortage pricing proposal, given the ongoing deliberations of its stakeholders. The Commission granted PJM's request, subject to the requirement that PJM submit a 30-day status report addressing its ability to meet its revised filing deadline and implement its proposal by June 1, 2010.¹⁵ In its status report, submitted January 15, 2010, PJM sought an additional extension, through June 18, 2010, based, in part, on the timeline applicable to its development of its new dispatch software for its Advanced Control Center.¹⁶

D. PJM's Shortage Pricing Proposal

14. PJM states that five shortage pricing proposals were vetted through PJM's stakeholder process, including PJM's proposal and a proposal made by the IMM.¹⁷ PJM states that, of these proposals, none received the two-thirds majority sector vote required under PJM's stakeholder voting rules. PJM states that its proposal received the support of a sector-weighted simple majority.

15. PJM proposes to implement one of the four shortage pricing approaches authorized by the Commission in Order No. 719, namely, PJM proposes to establish a demand curve for operating reserves and implement related pricing and monitoring mechanisms.¹⁸

Interconnection, L.L.C., 110 FERC ¶ 61,053 (2005).

¹⁵ *PJM Interconnection, L.L.C.*, 129 FERC ¶ 61,250, at P 64 (2009) (December 2009 Order).

¹⁶ In a notice issued January 27, 2010, the Commission granted PJM's request for extension.

¹⁷ The IMM's proposal is summarized at section III.A of this order, below.

¹⁸ In this order, the term operating reserves refers to the primary reserve total 10-minute market as comprised of synchronized and non-synchronized reserves. Under PJM's proposed provisions, primary reserves refer to the total reserve capability of

(continued...)

16. PJM states that its shortage pricing proposal should be adopted because its existing shortage pricing rules, as summarized above, fail to comply with Order No. 719. Specifically, PJM asserts that, under its existing rules, reserve shortage event data shows a recurring pattern of relatively low, or even zero value, clearing prices for synchronized reserves in the face of reserve shortages that are otherwise marked by high energy prices, high out-of-market opportunity cost payments for synchronized reserves, and a call for emergency demand response. PJM cites, as an example of this deficiency, the reserve shortage events of August 2, 2006, a day when the synchronized reserve market clearing price remained at zero despite the presence of high energy prices, a primary reserve shortage, and a call for emergency load management. PJM notes that it had no mechanism in place that day (and has none now, absent the implementation of its pricing proposal) to price non-synchronized reserves or to avoid out-of-market payments to demand response resources.

17. PJM states that its existing shortage pricing rules apply only in maximum generation emergencies, not reserve shortages. PJM adds that its existing rules, as the events of August 2, 2006 demonstrate, can operate in a counter-intuitive manner by actually reducing prices at times of high demand.¹⁹ PJM states that these skewed price signals do not encourage other resources to increase generation or reduce demand to the levels needed to alleviate a shortage, nor do they accurately signal the value the system places on avoiding shortages to those planning investments in either generation or demand response.

18. PJM also states that there is a need to reform the rules regarding dispatch of regulation services, as this service is closely linked to the markets for energy and operating reserves. PJM explains that the need for reform stems from the fact that, under the current rules, energy, regulation and synchronized reserves are jointly optimized an hour before the operating hour based on forecasted conditions; however, since the resource commitments and market clearing prices are based on forecasts, those

generation resources that can be converted fully into energy or demand resources whose demand can be reduced within 10 minutes of a request from the PJM dispatcher. Primary reserves comprise both synchronized reserves and non-synchronized reserves.

¹⁹ PJM explains that under its existing rules before it declares a maximum generation emergency, it typically calls for load reductions by emergency demand response providers. PJM also explains that while providers typically offer emergency demand response only at a high price, PJM's rules expressly provide that emergency demand response offer prices will not set the clearing price, unless the resource is metered directly by PJM. PJM asserts that demand response, when implemented (while emergency demand response is compensated at its offer price outside the market), simply reduces load in the affected area, which tends to reduce the market price.

commitments and prices may prove sub-optimal in light of the actual conditions in the operating hour. This can result in PJM operators re-allocating some ancillary service commitments to resources that previously were not economic during the hour-ahead market clearing, but are subsequently required in real-time. Additionally, clearing prices in such case may not reflect the true value of the service because they were calculated based on forecasted conditions that were not commensurate with real-time operations.

19. To address these deficiencies, PJM proposes the following pricing reforms:

- Establish a Non-Synchronized Reserves Market.²⁰ PJM explains that it currently operates a synchronized reserves market (a 10-minute reserve), but does not operate a market for its remaining 10-minute reserves, i.e., for non-synchronized reserves. PJM states that, to meet its 10-minute reserves requirement, both synchronized and non-synchronized reserves must be used. PJM states that its proposed non-synchronized reserves market will provide a cost-based service but that, in practice, there is likely to be little, or no, marginal costs incurred for standing ready on a non-synchronized basis to provide energy. PJM states that, when system conditions warrant shortage pricing, opportunity costs will be determined automatically by PJM's dispatch algorithms based on LMPs and suppliers' marginal costs of providing energy.
- Require Energy and Reserve Prices In the Event of a Voltage Reduction or Manual Load Dump Action.²¹ PJM proposes to apply reserve penalty factors when voltage reduction or manual load dump actions have been taken. PJM explains that if energy and reserve prices were allowed to fall in the wake of these emergency actions, the wrong signal would be sent to market participants regarding both the severity of system conditions and the need for additional resources. PJM explains that, in the event of a voltage reduction or manual load dump action, the prices of synchronized and non-synchronized reserves will continue to affect the energy price until such time as the voltage reduction or manual load dump action has been terminated and reserve requirements can be maintained. PJM asserts that, in this way, if additional resources do become available after the initiation of voltage reduction or manual load dump actions, resources have an incentive to help alleviate these reserve conditions.

²⁰ See proposed PJM OATT at Attachment K – Appendix, section 3.2.3A.001.

²¹ See, e.g., *id.* at sections 3.2.3A(d) and 3.2.3A.001(c).

- Require Simultaneous Dispatch of Energy and Reserves.²² PJM proposes to clear its markets for energy and reserves, i.e., for all 10-minute reserves, simultaneously every five minutes, given the close relationship between these two products.²³ PJM asserts that, under its proposal, energy prices will more readily adjust in response to reserve needs while reserve prices will better reflect energy needs. PJM adds that, under its proposal, the market clearing price of reserves in real-time operation will reflect any opportunity costs associated with foregone profits in the energy market of resources that may be held back to provide reserves.²⁴ In addition, PJM states that its proposal should reduce the need for out-of-market, unit-specific opportunity cost payments, given that these costs will be better reflected in the clearing prices. PJM further states that its proposal will enable energy prices to signal approaching reserve shortages.²⁵
- Establish an \$850 per MWh Reserve Price Cap.²⁶ PJM proposes to apply price caps (Reserve Penalty Factors) for its two reserve products, i.e., for synchronized and non-synchronized reserves, similar to those approved for the New York Independent System Operator, Inc. (NYISO) and ISO New England, Inc. (ISO-NE).²⁷ PJM proposes that this price cap be made effective at the conclusion of a

²² *Id.* at proposed section 2.5(a).

²³ Currently, PJM dispatches reserves and energy sequentially. Reserves are committed and priced on an hour-ahead basis. Energy is then committed and priced every five minutes. PJM asserts that, as a consequence, reserve market clearing prices cannot respond to conditions arising later than one hour ahead. PJM adds that resources not committed as reserves in the hour-ahead clearing market may still provide reserves, but their compensation may then derive from unit-specific opportunity costs, rather than from transparent market-clearing prices. PJM asserts that this limitation can inhibit reserve price signals, especially in the case of reserve shortages.

²⁴ Currently, synchronized resources are committed and priced one hour in advance. Under PJM's proposal, a subset of Tier 2 synchronized resources will be assigned by PJM prior to the operational hour, utilizing PJM's joint optimization software.

²⁵ In section IV.C of this order, below, we require PJM to incorporate in its tariff the warnings and actions indicating a shortage that will trigger implementation of the penalty factors.

²⁶ *See, e.g.*, proposed PJM OATT at Attachment K - Appendix, section 3.2.3A. PJM's existing \$1,000 per MWh energy offer cap would continue to apply.

²⁷ *See New York Independent System Operator, Inc.*, 129 FERC ¶ 61,164, at P 45

(continued...)

four-year transition period.²⁸ Specifically, PJM proposes a cap of \$250 per MWh in the first year, \$400 per MWh in the second year, \$550 per MWh in the third year, and \$850 per MWh in the fourth year and thereafter. The price caps would be additive for progressively greater reserve shortages. Thus, if there is a shortage of primary reserves, which are comprised of both non-synchronized and synchronized reserves, the reserve price would rise to \$850 (after the third year). If there is a shortage of synchronized reserves, the price for reserves would rise by an additional \$850, i.e., to \$1700. PJM states that the reserve penalty factor must be set high enough so that if the price of reserves reaches that level, PJM will have exhausted all other physically available resources, signaling that PJM has entered a reserve shortage condition. PJM states that, while a \$1,000 per MWh cap would be the theoretical maximum that could be set, PJM's proposed cap is reasonable given the opportunity costs actually paid on peak days from January 1, 2006 to November 1, 2009.²⁹ PJM's proposed shortage pricing mechanism will enable the market clearing price to gradually increase as the severity of a reserve shortage increases. When energy demand exceeds the capacity that is available to provide energy and the required amount of operating reserves, and no emergency resources are marginal, PJM will be required to convert reserves to energy from the least-cost energy resource providing reserves, in order to meet demand. During such conditions, PJM's proposed mechanism will operate to increase the LMP up to a price cap.

- Establish a Single, Aggregated Price Cap for the Energy and Reserve Markets. PJM states that without an overall cap on the combined price of energy and reserves, an \$850 per MWh reserve cap and a \$1,000 per MWh energy offer price cap could yield an unwarranted total price of \$4,400 per MWh under the most extreme shortage conditions.³⁰ PJM therefore proposes to set a maximum energy

(2009) (NYISO/Order No. 719 Compliance Order) and *ISO New England, Inc.*, 130 FERC ¶ 61,054, at P 74 (2010) (ISO-NE/Order No. 719 Compliance Order).

²⁸ See *supra* note 2.

²⁹ PJM states that opportunity cost payments made to reserve providers on these peak days exceeded \$500 per MWh for eight hours (cumulative); and exceeded \$700 per MWh for four hours (cumulative). Opportunity cost payments exceeded \$850 per MWh on three hours on August 8, 2007, the day PJM's current shortage pricing provisions were implemented, resulting in prices ranging from \$850 per MWh to \$923.92 per MWh.

³⁰ Such a price could be achieved if both of PJM's reserve requirements were violated in both PJM reserve zones. PJM, however, proposes to limit the maximum energy price in the most severe shortage condition to \$2,700 per MWh, given its concerns regarding the political sustainability of prices that could rise to \$4,400 per MWh and that

(continued...)

price of approximately \$2,700 per MWh, the price that would result from energy and two reserve products reaching their caps, to be transitioned in over a four-year period.

- Set the Price for Regulation Service at Five-Minute Intervals.³¹ PJM proposes to conform the pricing intervals for regulation service with those applicable to its energy and reserve markets.³² PJM states that this revision is necessary to ensure a consistent set of prices capable of minimizing the need to make resource-specific uplift payments for regulation when the regulation price is less than the LMP.
- Allow Emergency Resources to Set Price. PJM states that, currently, emergency resources are generally not permitted to set price. PJM states that, as a result, energy and reserve prices are misaligned such that a manual dispatch of resources and out-of-market payments are required to maintain reliable system operations. PJM states that permitting emergency resources to set price in the real-time energy market will properly align energy and reserve market prices with system conditions and dispatch instructions, thereby enhancing operational reliability during periods of operating reserve shortage. PJM adds that, if an emergency resource is allowed to set the price of energy at its marginal cost or, in the case of a demand response resource, based on its willingness to pay, the appropriate market signals are sent to both resources providing energy to serve load and those providing reserves. PJM further notes that permitting an emergency demand response resource to set price in the real-time energy market when it is the marginal unit allows for comparable treatment of resources, as required by Order No. 719.³³
- Require Curtailment Service Providers to Provide Real-Time Data.³⁴ PJM states that, given the quantity of emergency demand response operating as capacity in PJM, it is necessary for the efficient and reliable operation of its system to require curtailment service providers to submit real-time operational data to PJM. PJM

PJM has not experienced more than two simultaneous reserve shortages during any event.

³¹ See proposed PJM OATT at Attachment K – Appendix, section 3.2.2(c).

³² Currently, energy, regulation and synchronized reserves are priced (i.e., jointly optimized) an hour prior to their operation based on forecasted conditions, a price, PJM claims, that may not reflect actual conditions as of the operating hour.

³³ PJM Filing at 29 (citing Order No. 719, FERC Stats. and Reg. ¶ 31,281 at P 47).

³⁴ See, e.g., proposed PJM OATT at Attachment K - Appendix, section 2.2(b).

proposes that these data elements be defined in a PJM Manual and be provided to PJM at least daily during the summer months, hourly during emergency conditions, and otherwise monthly. PJM further proposes to develop a web-based user interface for the submission of this information so as not to impose the cost burden of real-time metering on discrete demand response resources. PJM also proposes to permit curtailment service providers that operate a fleet of distributed emergency demand response resources to aggregate the operational data for these resources up to a control zonal and sub-zonal level.

- Raise the Day-Ahead Caps of Demand and Virtual Supply Bids. PJM proposes to raise the caps on demand bids and on bids from virtual supply and demand to the level of the potential maximum energy price in the real-time energy market to allow demand to more fully express its willingness to pay for energy.³⁵

20. In addition to the changes described above, PJM also proposes to revise the meaning of “least-cost security-constrained dispatch” to include the cost to meet reserve requirements.³⁶ Finally, PJM proposes to clarify which power flow solution will be used to calculate LMPs.³⁷

21. PJM states that, collectively, its pricing proposal satisfies the six shortage pricing criterion set forth by the Commission in Order No. 719.³⁸ PJM requests that its filing be made effective May 1, 2011.

III. Notice of Filing and Responsive Pleadings

22. Notice of PJM’s filing was published in the *Federal Register*, 75 Fed. Reg. 37,423 (2010), with interventions and protests due on or before July 30, 2010.³⁹ Notices of intervention and timely filed motions to intervene were filed by the entities listed in the

³⁵ See *id.* at section 1.10.1A(viii) (Day-Ahead Energy Market Scheduling).

³⁶ See *id.* at proposed Attachment K – Appendix, section 2.2 (Calculation of Locational Marginal Prices).

³⁷ See *id.* at section 2.3 (Determination of System Conditions Using the State Estimator).

³⁸ Order No. 719, FERC Stats. & Reg. ¶ 31,281 at P 247. These criterion are addressed in section IV.A of this order, below.

³⁹ See June 29, 2010 notice extending comment date.

appendix to this order.⁴⁰ Motions to intervene out-of-time were submitted by AB Energy NE (AB Energy), on August 11, 2010, and by Enbala Power Networks (USA), Inc. (Enbala), on August 12, 2011.

A. IMM Proposal

23. On July 18, 2010, the IMM submitted its report addressing PJM's filing.⁴¹ In addition to the arguments summarized and addressed in section IV of this order, below, we provide a brief summary here of the IMM's position.

24. The IMM states that PJM's shortage pricing proposal is predicated on the false assumptions that prices are too low in PJM and the level of reserves available to PJM threatens system reliability. The IMM argues that PJM's response to these claimed concerns will raise the overall price of wholesale electric service in PJM while providing no corresponding benefit for PJM's customers. Specifically, the IMM argues that PJM's proposal will unnecessarily add fixed reserve penalty factors to the price of energy, thereby causing real-time energy prices to artificially exceed real-time energy offer caps and price caps.

25. The IMM further argues that PJM's proposal will create double recovery of shortage rents by capacity resources in a given delivery year by failing to include a shortage pricing revenue true-up mechanism in the Energy & Ancillary Services offset and give rise to market power concerns. The IMM also argues that PJM's proposal fails to address the issue of false positive shortage events, eliminates full Tier 2 hour-ahead assignment of reserves,⁴² and adds an unnecessary primary reserve requirement and unnecessary market for non-synchronized primary reserves. In addition, the IMM objects to allowing some emergency resources to set price because, among other things, the IMM contends that only economic demand response resources with discrete and measurable dispatchability in the form of telemetry, metering and a specific bus location should be eligible to set price. The IMM also argues that PJM's proposal fails to address the recallability of capacity resources during an emergency, or imperfections in the regulation market.

⁴⁰ The abbreviated names used for these entities are noted both in the body of this order and in the appendix.

⁴¹ As noted above, Order No. 719 required the IMM to address PJM's proposal. *See* Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 235.

⁴² *See supra* note 6 (summarizing PJM's rules regarding Tier 1 and Tier 2 synchronized reserves).

26. To address these concerns, the IMM recommends that PJM be required to: (i) maintain and enforce the penalty factor associated with reserve shortages, while limiting the price effect of reserve shortages to a level that is consistent with the physical resource price caps that exist in the day-ahead and real-time energy markets; (ii) utilize a shortage pricing revenue true-up that explicitly eliminates double recovery of shortage rent by capacity resources in a given delivery year; (iii) address market power concerns in the synchronized reserve market; (iv) utilize a duration component in the determination of a reserve shortage; (v) assign Tier 2 reserves prior to the operational hour; (vi) model only synchronized reserve requirements as a constraint in the security constrained optimization approach to shortage pricing; (vii) not allow emergency demand-side resources and emergency purchases to set prices; (viii) develop clear rules governing the emergency recall of capacity procured in PJM's reliability pricing model (RPM) capacity auctions, to ensure that such capacity meets its obligations to provide system resources during an emergency; and (ix) resolve existing design flaws in the regulation market by using the actual dispatch schedule as the reference for opportunity cost calculations and netting regulation revenues from make-whole balancing operating reserve payments.

B. Additional Responsive Pleadings

27. In addition to the protests and comments noted above, answers to protests or answers to answers were submitted on August 16, 2010, by the PJM Power Providers Group (P3), on August 23, 2010, PJM, on August 26, 2010 and September 7, 2010, the IMM, on September 1, 2010, Rockland Electric Company (Rockland), on September 7, 2010, the Pennsylvania Public Utility Commission (Pennsylvania Commission), on September 10, 2010, Allegheny Electric Cooperative, Inc, *et al.* (PJM Consumers), and on September 17, 2010, by DTE Energy Trading, Inc. (DTE Energy).

C. Procedural Matters

28. Pursuant to Rule 214 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.214 (2009), the notices of intervention and timely, unopposed motions to intervene serve to make the entities that filed them parties to this proceeding. We also accept the unopposed motions to intervene out-of-time submitted by AB Energy and Enbala, given their interests in this proceeding.

29. Rule 213(a)(2) of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.213(a)(2) (2009), prohibits an answer to a protest or an answer to an answer, unless otherwise ordered by the decisional authority. We will accept the answers submitted by PJM, the IMM, Rockland, the Pennsylvania Commission, PJM Consumers and DTE. Energy, because they provided information that assisted us in our decision-making process.

IV. Discussion

30. For the reasons discussed below, PJM's shortage pricing proposal is hereby accepted for filing, subject to conditions and except as otherwise noted below, to become effective, as of the date of this order. PJM is required to make an additional compliance filing within 90 days of the date of this order.

A. Whether PJM's Shortage Pricing Proposal Satisfies the Commission's Six Shortage Pricing Criterion

31. For the reasons discussed below, we find that PJM's shortage pricing proposal satisfies the six shortage pricing criterion, as set forth by the Commission in Order No. 719.⁴³ We also find that PJM's shortage pricing proposal ensures that the market price for energy reflects the value of energy during an operating reserve shortage. Such prices should encourage market participants to make available and maintain existing generation or demand resources, or bring new generation or demand resources to the PJM markets to enhance short-term reliability during operating reserve shortage conditions.

32. *Criteria One: Improve Reliability by Reducing Demand and Increasing Generation During Periods of Operating Reserve Shortage.* We find that PJM's shortage pricing proposal will improve reliability by reducing demand and increasing generation during periods of operating reserve shortage. PJM's proposal appropriately relies, in this regard, on an operating reserve demand curve to raise prices in the event of an energy and reserve markets shortage in an agreed upon manner.⁴⁴ This will send price signals confirming that a shortage has occurred and will incent physically available generation and demand response resources to enter the market, thus restoring reserves to levels required to maintain reliability. PJM's proposal also relies on the implementation of joint optimization, i.e., the simultaneous dispatch of energy and reserves and the clearing of these markets at five-minute intervals. We agree that joint optimization will appropriately reflect opportunity costs in PJM's market clearing price. Specifically, as energy prices rise to reflect the operating costs of the higher marginal cost provider, reserve prices will also rise to reflect the higher opportunity costs component, based on the difference between LMP and the energy cost of the unit that is marginal for reserves. Additionally, PJM's proposal will permit emergency resources to

⁴³ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 247.

⁴⁴ As PJM's system moves into a reserve shortage, prices in the reserve markets will rise to their penalty factor levels. The price of energy will rise beyond the reserve penalty factor levels. *See supra* PP 65-66.

set the market price in the energy market.⁴⁵ Permitting emergency resources to set price in the real-time energy market will properly align energy and reserve market prices with system conditions and dispatch instructions, thereby enhancing operational reliability during periods of operating reserve shortage. For all these reasons, we find that PJM's shortage pricing proposal satisfies criteria one.

33. *Criteria Two: Make it More Worthwhile for Customers to Invest in Demand Response Technologies.* We find that PJM's proposal will make it more worthwhile for customers to invest in demand response technologies. PJM's proposed operating reserve demand curve will provide more stable and predictable price signals for energy and reserves and thus allow PJM's customers to better observe when shortage conditions are approaching and make decisions to offer demand response.⁴⁶ We find that PJM's proposal will provide a more efficient price signal to demand response and generation resources as well as to those entities considering investment in new technologies. PJM's proposal will thus provide a more transparent and predictable price signal for, and returns on, investment in demand response technologies.

34. PJM's joint optimization proposal, moreover, will factor in the actual opportunity costs in reserve prices and provide a more efficient market signal to compensate investment in demand response technologies.⁴⁷ In addition, permitting an emergency resource to set price in the real-time market, when it is the marginal resource, provides comparable treatment of resources and ensures that the market price or energy reflects the value of energy during an operating reserve shortage. In addition, the five-minute pricing of regulation, for the reasons discussed in section IV.F of this order, below, will provide a more efficient price signal that will enhance market opportunities. For all these reasons, we find that PJM's shortage pricing proposal satisfies criteria two.

⁴⁵ See sections IV.B and IV.D of this order, below. Under PJM's existing market rules, such resources are generally not permitted to set energy market prices, thus limiting the reflection of system conditions and dispatch instructions in energy and reserve prices, thus requiring manual dispatch of resources, and necessitating out-of-market payments to maintain reliable operations.

⁴⁶ By contrast, under PJM's existing market design, reserve prices have historically remained low, even as the system was entering into a reserve shortage condition.

⁴⁷ Under PJM's existing market design, by contrast, sequential market clearing and pricing of reserves prior to the clearing of the energy market triggers the need for out-of-market, unit specific, opportunity cost payments on an after-the-fact basis.

35. *Criteria Three: Encourage Existing Generation and Demand Resources to Continue to be Relied Upon During an Operating Reserve Shortage.* We find that PJM's pricing proposal will encourage continued reliance on existing demand and generation resources during reserve shortage conditions by allowing all resources, including RPM capacity resources, to receive the prevailing energy and reserve price during shortage conditions. PJM's proposal will also encourage continued reliance on existing demand and generation resources by pricing energy and resources at a level that will incentivize internal and external resources to engage in transactions in the PJM region. Allowing emergency and non-emergency resources to earn the prevailing market price will maintain incentives for existing supply and demand resources to participate in PJM's markets based on prices that are consistent with system conditions. For all these reasons, we find that PJM's shortage pricing proposal satisfies criteria three.

36. *Criteria Four: Encourage Entry of New Generation and Demand Resources.* We find that PJM's pricing proposal will encourage entry of new generation and demand resources. For example, we find that the improved transparency and price predictability that will result from the implementation of PJM's proposal will increase investor confidence in market outcomes. These market enhancements, in turn, will better facilitate investment decisions.⁴⁸ For these reasons, we find that PJM's shortage pricing proposal satisfies criteria four.

37. *Criteria Five: Ensure that the Principle of Comparability in Treatment of, and Compensation to, all Resources is Not Discarded During Periods of Operating Reserve Shortage.* We find that PJM's pricing proposal will ensure that the principle of comparability in treatment of, and compensation to, all resources is not discarded during periods of operating reserve shortage. Specifically, we find that PJM's joint optimization proposal will ensure comparable compensation to resources providing reserves in PJM. PJM's proposal will ensure that all resources, regardless of whether they are RPM resources or non-RPM resources, will receive the real-time energy market price and associated revenues during reserve shortage conditions, ensuring comparable treatment. Demand response resources and supply resources will be compensated on a comparable basis. For all these reasons, we find that PJM's shortage pricing proposal satisfies criteria five.

38. *Criteria Six: Ensure that Market Power is Mitigated and Gaming Behavior is Deterred During Periods of Operating Reserve Shortages and Demonstrate How Demand Resources Discipline Bidding Behavior to Competitive Levels.* We find that PJM's pricing proposal will ensure that market power is mitigated, gaming behavior is deterred, and demand resources will operate to discipline bidding behavior to

⁴⁸ See section IV.B of this order, below.

competitive levels.⁴⁹ In contrast to PJM's current emergency procedures, PJM's proposal will maintain the application of market power mitigation in the form of the three pivotal supplier test during reserve shortage conditions (a test that will serve as a screen for market power). PJM's proposal will allow existing demand resources to convey their willingness to respond during shortage conditions, whether through their commitment in RPM or through their participation in PJM's economic load response program in the real-time energy market. We find that this approach will maximize and leverage investments already made to increase actual demand response during reserve shortage conditions.⁵⁰ PJM's proposal will also price energy and reserves in a manner consistent with system conditions to attract resources of all types, both internal and external to PJM, regardless of their RPM commitment. PJM's proposal will allow these resources to earn the prevailing market prices for energy and reserves during shortage conditions and incent these resources to follow dispatch instructions.

39. With respect to demand resources disciplining bidding behavior to competitive levels, we note that PJM's market rules already allow demand resources to participate in the energy market through PJM's economic load response program.⁵¹ As such, demand

⁴⁹ We note that PJM proposes to retain its existing market power screen, as applicable to the real-time energy market, and the application of cost-based offer mitigation at all times, including during periods of operating reserve shortage. PJM also proposes to retain its must-offer rules for generation capacity resources in the PJM day-ahead energy market, allow resources to receive the prevailing energy and reserve prices during shortage conditions, and allow emergency resources to compete to set the marginal energy price in a least-cost manner.

⁵⁰ The total quantity of demand resources offered into the 2014-15 base residual auction was 15,546 MW (unforced capacity), an increase of 2,593 MW (or 20 percent) over the demand resources offered into the 2013-14 base residual auction. Approximately 91 percent (14,119 MW) of these demand resources cleared in the auction.

⁵¹ In an order issued December 15, 2011, in Docket No. ER11-4106-000 (*see PJM Interconnection, L.L.C.*, 137 FERC ¶ 61,216 (2011), *reh'g pending*), the Commission accepted, subject to conditions, PJM's compliance filing made in response to Order No. 745. *See Demand Response Compensation in Organized Wholesale Energy Markets*, Order 745, FERC Stats & Regs. ¶ 31,322 (2011), *reh'g pending*. Specifically, the Commission accepted PJM's proposal that only demand reduction offers submitted in the day-ahead, or real-time, energy markets that satisfy the net benefits test and that follow PJM's dispatch signals be compensated at full LMP. As further authorized by the Commission, economic demand response resources became eligible to receive full LMP payment, effective April 1, 2012.

resources can take actions that reduce demand when prices rise. During periods of shortage, PJM's proposal allows for emergency resources, including emergency demand response, to set price when these resources constitute the marginal unit and are needed to meet demand.⁵² PJM's proposal also enables competition between emergency demand response, other emergency resources, and generation resources that are also providing reserves, thereby providing for greater competition during shortage conditions.

40. Finally, we agree with PJM that the more demand response participates in the energy markets over time, the greater the price responsiveness of demand will become in the aggregate, thus reducing the financial gains from any potential exercise of market power. We note that PJM's market rules provide a variety of opportunities for demand response participation. For example, there are three options for emergency load response participation: (i) energy only;⁵³ (ii) capacity only; and (iii) capacity plus energy (the full emergency option).⁵⁴ Additionally, three new demand response products are now available in the capacity market: annual demand response, extended summer demand response and limited demand response. In the energy market, demand response has the opportunity to participate using the economic load response program. With regard to ancillary services, demand response participants have the option of participating in the regulation market and the synchronized and non-synchronized reserve market.

B. Reserve Penalty Factors and Combined Energy and Reserves Price Cap

1. PJM's Proposal

41. PJM proposes to establish price caps (reserve penalty factors) for its two reserve products, synchronized and non-synchronized reserves, on a phased-in basis,

⁵² See PJM's 2014-15 Base Residual Auction Report at 4: <http://www.pjm.com/markets-and-operations/rpm/~media/markets-ops/rpm/rpm-auction-info/20110513-2014-15-base-residual-auction-report.ashx>.

⁵³ This option is similar to the economic load response program in that it provides only energy payments and participation is voluntary.

⁵⁴ As of March 8, 2012, 11,821 MW of emergency load response had been identified as available through PJM's load response program for use in emergency events. See PJM's Load Response Activity Report dated March 16, 2012 at 2-3: <http://www.pjm.com/markets-and-operations/demand-response/~media/markets-ops/dsr/2012-dsr-activity-report-20120316.ashx>.

specifically, an \$850 per MWh reserve price cap transitioned in over a four-year period. PJM also proposes to implement a single, aggregated price cap, over a phased-in four-year period, for the energy and reserves market. PJM's proposal is summarized above at section II.D of this order.

42. In support of its proposal, PJM states that the reserve penalty factor must be set high enough so that if the price of reserves reaches that level, PJM will have exhausted all other physically available resources, signaling that PJM has entered a reserve shortage condition. PJM states that the proposed cap is reasonable given the opportunity costs actually paid on peak days from January 1, 2006 to November 1, 2009. PJM states that without an overall cap on the combined price of energy and reserves, an \$850 reserve cap and a \$1,000 energy offer price cap could yield an unwarranted total - a price of \$4,400 under the most extreme shortage conditions. PJM therefore proposes to set a maximum energy price of approximately \$2,700 per MWh, the price that would result from energy and the two reserve products reaching their caps.⁵⁵

2. Protests and Comments

44. The IMM argues that shortage pricing is not required in PJM for the purpose of achieving revenue adequacy. Specifically, the IMM states that the PJM RPM capacity market is explicitly designed to provide revenue adequacy and the resultant reliability. The IMM argues that there is no reason to increase the maximum price in PJM's markets in order to implement shortage pricing. First, the IMM asserts that PJM has provided no evidence that, given an RPM construct that procures capacity well in excess of what is needed to meet system reliability requirements, prices in excess of the \$1,000 per MWh offer cap are needed to make PJM's system reliable. The IMM adds that PJM has not made the case that its system is currently, or will become, unreliable under the current price caps, or that prices in excess of \$1,000 are needed to incent economic demand response.

45. The IMM states that a simpler solution is to limit the price effect of going short reserves to a level that is consistent with the physical resource price caps that exist in the

⁵⁵ PJM notes that this proposed combined cap is less than that approved by the Commission for the Midwest Independent Transmission System Operator, Inc. (MISO), *see Midwest Independent Transmission System Operator, Inc.*, 122 FERC ¶ 61,172, at PP 191, 215 (2008) (approving \$3,500 per MWh), and equal to that approved for NYISO, *see NYISO/Order No. 719 Compliance Order*, 129 FERC ¶ 61,164 at P 45 (approving \$2,750/MWh for Long Island). The overall cap would be \$1,500 per MWh in the first year, \$1,800 per MWh in the second year, \$2,100 per MWh in the third year, and \$2,700 per MWh in the fourth year and thereafter.

day-ahead and real-time energy markets. The IMM asserts that this goal can be achieved by relaxing the reserve constraint to prevent the constraint from binding and setting the marginal unit bus prices to predefined price targets when the constraint is relaxed. The IMM recommends a predefined energy price target that is consistent with PJM's current \$1,000 per MWh offer cap in both the day-ahead and real-time energy markets.

46. The IMM also argues that under PJM's pricing proposal, prices can be expected to rise, in the event of a shortage, in excess of \$1,700 per MWh in addition to the unadjusted energy price, the latter of which would reasonably be expected to be \$1,000 under these system conditions. The IMM also argues that unnecessarily forcing fixed reserve constraint penalty factors into energy prices, introducing administrative margins of \$850 to \$1,700 to marginal offers, and causing real-time energy prices to artificially exceed real-time energy offer caps and price caps causes the shortage pricing mechanism to work at cross purposes with the PJM day-ahead and real-time market designs. Finally, the IMM argues that PJM's proposed \$2700 per MWh cap for emergency purchases will undermine the three pivotal supplier test as a means of mitigation.

47. The IMM also argues that, in relying on the value of lost load analysis, PJM incorrectly assumes that the price required to incent partial reductions in demand is equivalent to the consumer surplus associated with consuming electricity. The IMM states that the price level that will maintain this equilibrium should be determined at the point of intersection of the marginal valuation of power for both generators and customers, not the price at which customers are indifferent between consuming electricity and suffering a blackout.

48. The IMM states that PJM has not clearly defined how it intends to recognize the use of emergency actions in applying its reserve penalty factor curve methodology. Further, the IMM argues that PJM does not define the level of reserve shortage that would trigger voltage reductions or manual load dumps, or how it will determine when they are no longer needed. The IMM contends that a reserve MW offset mechanism should be used to maintain consistent pricing only for non-market emergency actions, such as voltage reductions and manual load dumps. The IMM argues that the reserve penalty factor curve methodology, regardless of the price target, also needs an explicit mechanism to offset the effect of non-market administrative measures used during scarcity situations. The offset would increase the reserve requirement by the amount of effective energy provided by the emergency step so as to maintain a market signal consistent with the actual level of scarcity. The IMM explains that its reserve MW offset mechanism should not be applied to maximum emergency generation and emergency load resources that have cleared RPM. The IMM states that these resources need to be counted towards energy when deployed, not against the reserve requirements, as these resources have recognized value in the capacity market and provide their energy, or reduction in demand, at a specified price under emergency conditions.

49. The National Rural Electric Cooperative Association (NRECA) and PJM Consumers argue that PJM's proposal lacks the factual data necessary to justify the overall maximum energy-reserves cap of \$2,700/MWh. NRECA also challenges the relevance of the historical data relied upon by PJM in support of PJM's proposed price caps. NRECA asserts that this historical data shows that PJM experienced operating reserve shortages on only seven prior occasions. NRECA further argues that PJM's proposal to pay generators \$2,700 per MWh will not encourage additional investment in new generation in PJM, but rather will encourage generators to manufacture the appearance of a shortage, either by inaction (failing to invest in new generation), or by overt actions (withholding supply).

50. PJM Consumers argue that PJM's proposal also fails to demonstrate any connection between low synchronized reserve prices and reduced or inadequate demand response. PJM Consumers argue, to the contrary, that economic demand response is correlated to transparent energy prices regardless of the synchronized reserve price. PJM Consumers add that no other ISO or RTO has a centralized capacity procurement protocol comparable to PJM's RPM protocols – a mechanism to provide long-term price signals for generation and demand response investment.⁵⁶ PJM Consumers and the Public Service Commission of Maryland (Maryland Commission) argue that PJM's pricing proposal will transfer additional, needless payments to resources that are already receiving compensation through RPM. The Maryland Commission argues that, at most, PJM's pricing revisions should be limited to the extent necessary to address short-term shortage pricing needs.

51. The Pennsylvania Commission argues that PJM's proposed demand curve and penalty factors will unnecessarily inflate costs.⁵⁷ The Pennsylvania Commission asserts that while a high price may be justified when the system experiences a shortage and a loss of load is likely, PJM's proposed mechanism will trigger the maximum price when a reserve shortage is low, moderate or high. The Pennsylvania Commission adds that under PJM's shortage pricing proposal, the last increment of reserve needed to satisfy the full requirement will be priced several hundred times its value.⁵⁸ The Pennsylvania Commission supports a graduated operating reserve demand curve. The Pennsylvania

⁵⁶ See also NRECA Protest at 10.

⁵⁷ See also Maryland Commission Protest at 2-3; New Jersey Board of Public Utilities (New Jersey Board) Comments at 4-5; and American Public Power Association (APPA) Protest at 6.

⁵⁸ The Pennsylvania Commission notes that the conditional loss of load expectation is a measure of expected frequency of load loss in an hour, given a quantity of operating reserves.

Commission argues that such an approach would better represent the real value of operating reserves and would reduce the vulnerability of shortage pricing to gaming and market power attempts. The Pennsylvania Commission proposes that three steps be utilized based on shortage thresholds of 10, 20, and 70 percent of the reserve requirement. The Pennsylvania Commission states that reserves would be priced at \$250 per MWh at step one, \$400 per MWh at step two, and \$850 per MWh at step three.

53. Intervenors also challenge PJM's assertion that PJM's proposed price caps are comparable to those implemented by NYISO, ISO-NE, or MISO. PJM Consumers argue that significant differences exist between these regions' market designs. Rockland adds that PJM's reliance on NYISO's maximum energy price of \$2,750 per MWh is misplaced because this price ceiling is only calculated when all reserve types are short on Long Island, a constrained location. Rockland argues that PJM has not explained why operating reserve and energy market price caps that are higher than New York's caps are needed.

54. The Pennsylvania Commission requests that PJM be required to provide additional details (i.e., tariff language) addressing the procedures pursuant to which PJM would be authorized, or required, to take emergency actions such as voltage reduction or manual load dump. In particular, the Pennsylvania Commission requests tariff language addressing the full range of system conditions triggering such actions. The Pennsylvania Commission further requests that the PJM tariff address the issues of how pricing would work for the duration of the emergency actions imposed by PJM, and how pricing based on supply and demand would be restored.

3. PJM's Answer

55. PJM argues that the IMM's alternative proposal to retain PJM's existing \$1,000 per MWh price cap is inconsistent with the Commission's finding in Order No. 719 that energy prices, during an operating reserve shortage, may not be high enough to allow the balancing of supply and demand and maintain reliable operations. PJM argues that, as such, the IMM's proposal is, in effect, a collateral attack on Order No. 719.

56. PJM further asserts that the IMM's proposal rests on the erroneous assumption that energy consumers are not willing to pay (or would not value energy) in excess of \$1,000 per MWh during an operating reserve shortage. PJM responds that empirical evidence suggests otherwise and that, regardless, even if all demand did express a willingness to pay no more than \$1,000 per MWh, PJM's proposal would allow that demand level to set the energy price.

57. PJM adds that the IMM overlooks the limited nature of PJM's proposal, specifically the extreme reserve shortage conditions that would have to prevail to result in the maximum \$2,700 per MWh price being reached, and why it is relevant to compare the potential maximum price during reserve shortage conditions to the

willingness to pay to avoid a complete service interruption. PJM states that, under its proposal, if energy prices reach the maximum \$2,700 per MWh under reserve shortage conditions, PJM will have been required to convert all primary reserves and possibly all synchronized reserves to energy to maintain energy balance. PJM notes that the last resource to provide energy will have an energy offer of \$1,000 per MWh.

58. PJM also disputes intervenors' allegation that shortage pricing revenue duplicates capacity market revenue. PJM responds that these two revenue streams operate in a complementary manner, not as substitutes. PJM states that its RPM protocols operate to secure capacity and thus to ensure a loss of load expectation of one day in 10 years, but are not designed to prevent reserve shortages or reduce their probability to the same expectation as a loss of load.

59. Finally, PJM states that the only means available to maintain energy balance, under such severe shortage conditions, would be to involuntarily shed load, given that all possible reserves will have been converted to energy to maintain energy balance, should a contingency occur such as a loss of a generator. PJM asserts that load shedding means that some demand would be subject to a complete service interruption.

60. The IMM renews its argument that there is no reason to increase the maximum price in PJM's markets in order to implement shortage pricing. The IMM contends that PJM has provided no evidence that increasing the maximum price is required for either the resource adequacy or operational aspects of reliability. The IMM further asserts that PJM has not provided evidence that, given an RPM construct that purchases a surplus of capacity well in excess of what is needed to meet system planning requirements, prices in excess of the \$1,000 offer cap are needed to make PJM's system reliable. The IMM also argues that PJM has not provided evidence that its current market design is preventing it from meeting North American Electric Reliability Corporation (NERC) reliability requirements.

61. The IMM also disputes PJM's argument that the IMM proposal represents a collateral attack of Order No. 719. The IMM responds that Order No. 719 does not require the elimination of offer caps or price caps, and that the Commission required each organized market to preserve an effective mitigation program. The IMM asserts that its proposal is responsive to the Commission's concern.

4. Commission Determination

62. We accept PJM's proposed \$850 per MWh reserve price cap and the \$2,700 per MWh combined energy and reserves price cap, subject to conditions. With respect to PJM's phase-in proposal, PJM explains that its proposed transition period will ease the initial short-term economic impact of expanding the price cap to include reserves. PJM further explains that it will allow market participants a period of time to gain experience with the new mechanism and to become more comfortable with hedging against the

higher prices that are associated with reserve shortage conditions. Order No. 719 allows an RTO or ISO to phase in new pricing rules, provided that the transition is limited to a few years.⁵⁹ Accordingly, we accept PJM's phase-in proposal. For the reasons discussed below, however, we direct PJM to submit additional clarifying tariff language addressing the operation of its shortage pricing rules during emergency actions, as requested by the Pennsylvania Commission and generally the IMM. We also require the IMM to provide a review in its quarterly and annual reports regarding the operation of PJM's shortage pricing mechanisms.

63. As a threshold matter, we agree with PJM that PJM's existing reserve shortage provisions fail to comply with Order No. 719. PJM has identified seven events occurring during 28 hours over the previous five years when reserve shortage conditions have been experienced within the PJM region. During these shortage events, synchronized reserve market clearing prices were consistently low, sometimes as low as \$0 per MWh, while energy prices ranged between \$300 per MWh to just over \$1,000 per MWh. However, during most of these shortage events, there were sizable out-of-market, resource-specific opportunity cost payments made to resources that were held back from energy production to provide reserves, including payments as high as \$923 per MWh during the August 8, 2007 event. This evidence demonstrates that market prices for reserves have not reflected the cost and value of providing reserves during these periods. We also agree with PJM that the costs of resources procured to alleviate shortages should be reflected in transparent market prices whenever possible. Payments made only to individual resources and recovered in uplift fail to send clear market signals.

64. PJM's proposed shortage pricing mechanism will enable the market clearing price to gradually increase as the severity of a reserve shortage increases. When energy demand exceeds the capacity that is available to provide energy and the required amount of operating reserves, and no emergency resources are marginal, PJM will be required to convert reserves to energy from the least-cost energy resource providing reserves, in order to meet demand. During such conditions, PJM's proposed mechanism will operate to increase the LMP.

65. If the least-cost energy resource that is also providing reserves has an energy offer price of \$250 per MWh, for example, this resource will be directed by PJM's joint optimization software to convert reserves to energy in order to maintain energy balance. Because such a conversion will cause PJM's reserve levels to fall below PJM's requirement, a reserve penalty factor (\$850 per MWh) would be incorporated into the LMP.

⁵⁹ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 258.

66. We disagree with the Pennsylvania Commission's argument that PJM's proposed demand curve and penalty factors will unnecessarily inflate costs. If this penalty factor were added to the \$250 per MWh energy offer discussed above, the resulting total energy price would be \$1,100 per MWh. If the reserve shortage persists, PJM's proposed mechanism will enable the LMP to gradually rise as higher priced energy resources convert their reserves into energy and as PJM accepts offers from marginal emergency resources, such as emergency demand response. When both the primary and synchronized reserve requirements cannot be met, the price of reserves will rise to twice the reserve penalty factor (equal to \$1,700 per MWh by the 2015-16 delivery year), a price that would be added to the lowest priced energy resource that is also providing reserves when that resource is directed to convert its reserves to energy. The theoretical maximum energy price during a single reserve zone shortage would be \$2,700 per MWh.

67. We find that this maximum energy-reserves cap is appropriate. For example, the maximum energy-reserves cap will be implemented in conjunction with jointly optimized energy and ancillary service markets, with operating reserve demand curves set at levels that allow the market-clearing price during periods of operating reserve shortage to more accurately reflect the cost of providing reserves, thereby enhancing reliability. We also find that PJM's proposal will stimulate investment in demand response resources and generation. PJM's proposal will also encourage demand response resources, generation and transmission to operate in a manner that will alleviate, or minimize, system emergencies.

68. PJM's proposal also appropriately relies on its retention of its existing market power mitigation screen, the three pivotal supplier test, and its existing overall \$1,000 per MWh energy offer cap for generators.⁶⁰ We note, in this regard, that in addressing shortage pricing in Order No. 719, the Commission did not require RTOs and ISOs to revise their existing market mitigation rules, and PJM does not propose to do so here.

69. PJM's proposal also ensures that the market price for energy will allow the market-clearing price during periods of operating reserve shortage to more accurately reflect the true value of energy, thereby enhancing reliability. We also agree with PJM that the establishment of an \$850 per MWh reserve penalty factor is appropriate given

⁶⁰ See PJM OATT at Attachment K - Appendix, section 6.4.1(a) (Offer Price Caps). A generation resource that is dispatched out of merit order to maintain system reliability or local reliability may be offer-capped at specified levels. Offer price caps will apply on a generation supplier basis (not on a generating unit-by-generating unit basis) and only the generation suppliers that fail the three pivotal supplier test will have their units that are dispatched with respect to the transmission constraint offer-capped. *Id.* at section 6.4.1(f)(iii).

the opportunity costs actually paid by PJM on peak days in recent years. We agree that this price is generally consistent with the caps now in place in NYISO and ISO-NE.⁶¹ We also find that PJM's four-year, phased implementation of its reserve penalty factors and combined price cap is permitted by Order No. 719 and has not otherwise been shown to be unjust, unreasonable or unduly discriminatory.⁶²

70. We reject the IMM's argument that PJM has failed to demonstrate that increasing the maximum prices above \$1,000 is required for either resource adequacy or for operational considerations related to reliability. PJM's proposal to allow bid caps to rise during shortage periods at prices above \$1,000 per MWh is consistent Order No. 719's finding that existing 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.⁶³ By contrast, the IMM's proposal would set the maximum energy price at \$1,000 per MWh in any reserve shortage condition regardless of the severity of the shortage – a policy that would result in decreased prices at the time of shortage.⁶⁴

71. We find that such conditions may not produce prices that accurately reflect the value of energy and, by failing to do so, may harm reliability, inhibit demand response, deter entry of demand response and generation resources, and thwart innovation. We find convincing PJM's analysis of reserve shortage events showing relatively low, or even zero value, clearing prices for synchronized reserves in the face of a reserve shortage. For example, on August 2, 2006, PJM recorded its all-time peak load of 145,000 MW and the entire RTO was in a shortage of total 10-minute reserves. However, the synchronized reserve market clearing price was zero throughout this reserve shortage event. The zero price for reserves occurred in the presence of high energy prices and a deployment of emergency demand response resources. For the above reasons, we find that this price formation during a primary reserve shortage is not consistent with system or dispatch needs.

72. PJM's 10-minute reserve requirement is established to ensure that PJM is able to recover from a contingency event within the 15-minute interval mandated by NERC. PJM, moreover, will assign reserves if they are physically available, regardless of cost.

⁶¹ See NYISO/Order No. 719 Compliance Order, 129 FERC ¶ 61,164 at P 50 and ISO-NE/Order No. 719 Compliance Order, 130 FERC ¶ 61,054 at P 74.

⁶² Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 258.

⁶³ *Id.* P 192.

⁶⁴ See IMM Protest at Appendix A (Table 1).

If reserve penalty factors are set too low, however, the system will go short for economic reasons. In this instance, market prices may create the appearance of a reserve shortage, even where the actual operating conditions would reflect the availability of sufficient reserves to meet the reserve requirement. Resources, under these circumstances, would be compensated through out-of-market payments, contrary to the requirements of Order No. 719.

73. In Order No. 719, the Commission stated it would rely on the factual record, as submitted in individual Order No. 719 compliance proceedings, to determine whether, or to what extent, an RTO's or ISO's compliance proposal will improve reliability by reducing demand and increasing generation during periods of operating reserve shortage.⁶⁵ Here, we find that PJM's shortage pricing proposal will enhance the reliability of PJM's system by providing incentives for resources offering emergency energy to produce additional energy and demand response resources that can respond when called upon to reduce consumption.

74. We reject intervenors' arguments that PJM's capacity auctions procure capacity in excess of what is needed to meet system reliability requirements, and that, as such, energy prices in excess of the \$1,000 per MWh offer cap are not needed to make PJM's system reliable. Shortages of operating reserves can and do occur for a limited number of hours even when PJM has procured capacity in excess of its reliability requirement. In addition, we agree with PJM that reserve shortage conditions may be experienced due to severe weather conditions, economic conditions more robust than expected, and/or due to the unexpected under-performance of a supply resource. Allowing prices to rise above the current \$1,000 per MWh cap during such shortages, as PJM proposes, will encourage responsive actions by market participants that will lessen the extent of the shortage and signal investment in both demand response technology and generation, thus minimizing the economic harm of future shortages. Specifically, higher clearing prices will encourage customers to reduce their consumption, or encourage the owners of resources that may be shut down due to forced outages to bring their resources back online faster.

75. We also reject intervenors' arguments that PJM's proposed caps will unnecessarily inflate costs. In Order No. 719, the Commission found that market rules should produce prices that accurately reflect the value of energy during an operating reserve shortage.⁶⁶ PJM's shortage pricing methodology achieves this goal. PJM is not proposing to add its reserve penalty factors to the highest energy offer price during a shortage. Instead, PJM will reset the LMP, when its system goes short on reserves, by adding a reserve penalty

⁶⁵ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 239.

⁶⁶ *Id.* P 192.

factor to the price offer of the least-cost energy resource that is also providing reserves. When this occurs, PJM's joint optimization mechanism will reflect in the energy price the additional cost of going short one MW of reserves in order to produce a sufficient amount of energy necessary to maintain energy balance (the additional cost being a reserve penalty factor of \$850 per MWh as of the 2015-16 delivery year). We note that the \$850 per MWh reserve penalty factor is supported by historical evidence, i.e., by the maximum opportunity cost that has been paid to a generator providing reserves (an amount just over \$850/MWh).

76. The Pennsylvania Commission argues that, absent a graduated operating reserve demand curve, PJM's proposal will not produce prices that accurately reflect the value of energy. We disagree. Under PJM's proposal, energy prices prevailing when the system goes short on reserves will be determined by the operating reserve demand curve and the offer price of the least-cost energy resource that is also providing reserves at the time of a given shortage. While the shape of this demand curve will be based on only a two-step calculation, the resulting energy and reserve price transactions will be consistent and gradual.⁶⁷ As noted above, PJM's proposed mechanism will enable the LMP to gradually rise as higher priced energy resources convert their reserves into energy and as PJM accepts offers from marginal emergency resources. PJM's shortage pricing mechanism is also complemented by joint optimization of the energy and ancillary service markets, which will allow the market-clearing price to more accurately reflect the cost of providing reserves. As such, incorporating both energy and reserve requirements will ensure that the trade-off between energy and reserves will be accurately captured through both energy and reserve clearing prices. We find that setting the penalty factors too low would be inconsistent with system conditions and reliable operations.

77. We reject intervenors' arguments that PJM's pricing proposal is distinguishable from the pricing authorizations approved for NYISO and ISO-NE.⁶⁸ PJM argues, and we agree, that these pricing provisions are comparable.⁶⁹ Order No. 719 does not prescribe the specific market rules or mechanism that an RTO or ISO must adopt.⁷⁰ Instead, Order No. 719 provides latitude to each RTO and ISO to work with their respective stakeholders to determine the appropriate rules and/or mechanisms for their regions and then explain how these rules and/or mechanisms meet the revised criteria

⁶⁷ See *supra* PP 65-66.

⁶⁸ ISO-NE/Order No. 719 Compliance Order, 130 FERC ¶ 61,054 at P 74 and NYISO/Order No. 719 Compliance Order, 129 FERC ¶ 61,164 at P 50.

⁶⁹ See *supra* note 55.

⁷⁰ See Order No. 719, FERC Stats & Regs ¶ 31,281 at P 248

set out in Order No. 719. In addition, we note that developing a method that allows prices to be set at the marginal cost of emergency resources to improve pricing and market efficiencies was encouraged by the Commission in Order No. 719.⁷¹

78. PJM Consumers and NRECA argue that PJM lacks sufficient factual data to support its proposed maximum energy-reserves cap. PJM's data and assumptions, however, are reasonable. We note, however, that PJM, uses statistical data identifying seven discrete events occurring during 28 hours over the previous five years when reserve shortage conditions occurred within the PJM region. PJM states in its filing, moreover, that it has paid prices ranging from \$1,500 per MW to \$4,500 per MWh for emergency power from neighboring systems.⁷² PJM adds that, on August 8, 2007, the day PJM's current shortage pricing provisions were triggered, prices for emergency power ranged from \$850 per MWh to \$932.92 per MWh. These price points, we conclude, provide a reasonable proxy for the cost of providing reserves to maintain reliability.

79. We also reject the IMM's argument that PJM's proposed maximum energy-reserve cap for emergency purchases will undermine market mitigation measures. Under PJM's current scarcity pricing mechanism, offer caps for generators that fail PJM's three pivotal supplier test are lifted while shortage pricing is in effect.⁷³ In contrast, PJM's proposal here will maintain offer caps for generators during shortage pricing events. In addition, the IMM is, and will remain, authorized to monitor the market and identify any indications of physical withholding of generation in periods leading up to a reserve shortage. PJM's current market rules, moreover, do not produce prices that reflect these shortage conditions. The establishment of an operating reserve demand curve will set administratively-determined caps on reserve prices during periods

⁷¹ *Id.* at PP 193-194.

⁷² *See* PJM filing, Attachment C (affidavit of Mr. Sotkiewicz) at 27. These prices have not set the market price, but rather, have been paid out-of-market and recovered in uplift charges. We agree with PJM that the costs of resources procured to alleviate shortages should be reflected in transparent market prices whenever possible. Payments made only to individual resources and recovered in uplift fail to send clear market signals.

⁷³ The three pivotal supplier test is applied to a generator dispatched out of economic merit order when there are three or fewer generation suppliers available that are jointly pivotal with respect to transmission limits and pivotal when combined with the two largest other generation suppliers. *See* PJM OATT at Attachment K - Appendix, section 6.4.1(e).

of operating reserve shortages.⁷⁴ PJM's joint optimization mechanism will ensure that the least-cost resource will be marginal during emergencies and periods of shortage. Further, joint optimization will allow for competition between reserve-to-energy conversions and emergency energy resources, including emergency purchases, during periods of shortage.

80. In Order No. 719-A, the Commission rejected arguments that Order No. 719's shortage pricing requirements will result in the exercise of market power. Indeed, the transparent price signals that will be achieved through compliance with Order No. 719 will likely attract participation by more resources and competitive bids will discourage the exercise of market power. While shortage pricing may result in increased price volatility by increasing prices during shortage conditions, such volatility is not undesirable, given that the associated higher prices reflect the higher marginal value of energy and reserves during shortage conditions. As the Commission has found, Order No. 719 does not require the elimination of bid caps or existing market power mitigation provisions in regional markets. Rather, Order No. 719 simply requires each RTO and ISO to demonstrate that its market rules accurately reflect the value of energy during reserve shortage periods or requires these entities to propose changes in their rules to achieve this objective.⁷⁵ Here, PJM's proposal satisfies these requirements.

81. We also find unpersuasive NRECA's concerns that energy prices that rise above the existing \$1,000 per MWh during an operating reserve shortage will, or may, reflect the exercise of market power. NRECA argues that while PJM's pricing proposal purports not to eliminate PJM's existing \$1,000 per MWh offer cap on energy offers submitted by generators in PJM's market, the proposal does allow up to \$1,700 per MWh in adders during shortage events. NRECA concludes that energy prices above this offer cap may well reflect the potential to exercise market power.

82. We disagree. PJM's pricing proposal will allow prices to rise sufficiently to allow supply to meet demand and more accurately reflect the value of energy during a shortage period. As the Commission affirmed in Order No. 719-A, each of the four shortage pricing proposals permitted by Order No. 719 maintains bid and price caps, but would allow price caps to rise during shortage periods provided that the RTO or ISO

⁷⁴ In the ISO-NE Order No. 719 Compliance Order, the Commission agreed with ISO-NE's independent market monitor's analysis that the operating reserve demand curve avoids reliance on market power to set prices during periods of operating reserve shortages and that the use of the demand curve is an effective way to reflect the economic value of reserve shortages in energy and reserve prices in a co-optimized energy and ancillary services market. *Id.* P 88.

⁷⁵ Order No. 719-A, FERC Stats. & Regs. ¶ 31,281 at P 95.

demonstrates that adequate market power mitigation provisions are in place.⁷⁶ Here, PJM's proposal satisfies these requirements. Specifically, PJM's proposal contemplates the continued use of the three pivotal supplier test, the market power screen used during operating reserve shortage conditions. In addition, PJM's proposal retains PJM's existing must-offer rules for generation capacity resources in the day-ahead market. Further, we expect the IMM to continue to closely monitor market behavior during periods of shortage. Consistent with this obligation, we direct the IMM to provide a review in its quarterly and annual reports regarding reserve penalty levels, the operating reserve demand curve and energy prices during the occurrence of shortage conditions.

83. Finally, the Pennsylvania Commission requests that PJM be required to provide additional details in the form of tariff language addressing how emergency actions such as voltage reduction or manual load dump will be treated under PJM's shortage pricing rules. Under PJM's proposal, PJM will initiate reserve penalty factors when reserve requirements cannot be met.⁷⁷ However, we agree that additional OATT and Operating Agreement language is required. PJM's proposed tariff provisions provide that if it has initiated in a reserve zone either a voltage reduction action or a manual load dump action, LMPs will be calculated including penalty factors.⁷⁸ PJM's intent, as we construe it, is to incorporate a reserve penalty factor in LMP when PJM initiates a primary reserve or voltage reduction *warning*, a measure that would occur before a voltage reduction or manual load dump *action*, as provided by Manual 13.⁷⁹ In addition, PJM's shortage pricing mechanism appears to impose synchronized and primary reserve penalty factors concurrently upon the initiation of emergency actions.⁸⁰

⁷⁶ *Id.* P 95.

⁷⁷ *See* proposed PJM OATT at Attachment K – Appendix, section 3.2.2A.

⁷⁸ *See id.* at Attachment K, section 2.5 (c) (Calculation of Real-Time Prices).

⁷⁹ *See* PJM Manual 13 at sections 2.3.2 (Real-Time Emergency Procedures - Warnings and Actions) and 5.2 (Transmission Security Emergency Procedures). Under these guidelines, a primary reserve warning is implemented when available primary reserve capacity is less than the primary reserve requirement, but is greater than the synchronized reserve requirement. A voltage reduction warning is provided to participants when available synchronized reserves decrease below the synchronized reserve requirement.

⁸⁰ *See* proposed PJM OATT at Attachment K – Appendix, section 3.2.3A(d) (Synchronized Reserves).

84. Accordingly, we direct PJM to include in its compliance filing, clarifying OATT and Operating Agreement language addressing exactly how its emergency actions will correspond to the institution of the reserve penalty factors. Additionally, as we find in section II.D above, while PJM's Manual 12 and 13 provide the standards for when a system operator is out of compliance with the reliability standard and therefore when it has an operating reserve shortage, we direct PJM to incorporate, in its tariff, the warnings and actions indicating a shortage that will trigger implementation of the penalty factors.

B. Reserve Levels

1. PJM's Proposal

85. In addition to its existing markets for synchronized reserves, PJM proposes to establish a new market for non-synchronized reserves to ensure that pricing will support the short-term reliability needs of PJM's system and meet PJM's 10-minute reserves requirement (synchronized reserves and non-synchronized reserves are collectively referred to as primary reserves).⁸¹ PJM states that, under its proposal, shortage pricing will be triggered when PJM's system dips below a threshold level of primary reserves. PJM states that it will continue to rely on the primary reserve requirements as established by the ReliabilityFirst Corporation (RFC), as applicable to a portion of the PJM footprint, and notes that these requirements are currently set at 150 percent of the largest contingency, equal to the capacity of its largest generator.⁸² In addition, PJM states that there is a separate primary reserve requirement for the Mid-Atlantic control zone, which is based on a primary reserve requirement of 1,700 MW.⁸³

⁸¹ Primary reserves will be defined as the total reserve capability of generation resources that can be converted fully into energy or demand resources whose demand can be reduced within 10 minutes of a request from the PJM dispatcher. *See id.* at proposed section 1.3.29A.

⁸² PJM is required to schedule sufficient contingency reserves to satisfy both the RFC and Southeastern Electric Reliability Council (SERC) requirements. RFC primary reserves must be made up of at least 50 percent synchronized reserves, with no more than 25 percent of primary reserves made up of interruptible load.

⁸³ PJM proposes to define reserve zone in its OATT as a geographic area consisting of a combination of one or more control zone(s), as designated by PJM in its Manuals, as relevant to provision of, and requirements for, reserve service. *See* PJM OATT, proposed section 1.38 D (Reserve Zone). As specified under PJM's business rules, there will be a single RTO synchronized and non-synchronized reserve market with a single subzone (the Mid-Atlantic + Dominion subzone).

86. PJM has also revised its compensation rule for reserves by assigning a market clearing price for both synchronized and non-synchronized reserves for each hour of the operating day based on the average of all five-minute clearing prices calculated during the operating hour. Under PJM's current market rules, the synchronized reserve market clearing price is determined prior to the operating hour. PJM asserts that the pricing of reserves committed in advance of real-time dispatch may not reflect actual system conditions, and results in out-of-market uplift payments to resources later assigned to provide reserves (as assignment made to ensure that these resources will have incentives to follow dispatch instructions by making these resources whole relative to the actual opportunity costs incurred).

2. Protests and Comments

87. The IMM and PJM Consumers object to PJM's proposal to the extent it fails to address measurement issues. Specifically, the IMM argues that PJM's proposal fails to explain how it will either measure its primary reserves or the level of such reserves that will trigger shortage pricing. The IMM further argues that the Commission cannot evaluate, or accept, PJM's proposal absent a review of this critical component.

88. The IMM asserts that the impacts of adding a non-synchronized reserve market are unknown and unwarranted and will only increase the incidence of shortage pricing. The Pennsylvania Commission and PJM Consumers agree that PJM's proposed primary reserves market will exceed PJM's reliability needs. The Pennsylvania Commission argues that the NERC standard for contingency reserves (a term PJM refers to as primary reserves),⁸⁴ requires a minimum level of reserves equal to 100 percent of the most severe single loss of generation, not 150 percent, as proposed by PJM. PJM Consumers add that the NERC requirement used by other control areas, such as those overseen by the Western Electricity Coordinating Council (WECC), is only set to 100 percent of the single largest contingency in the overall control area, not on a sub-regional basis as proposed by PJM.

89. PJM Consumers argue that if the Commission accepts PJM's proposed non-synchronized reserve requirement, PJM should be directed to: (i) lower its primary reserve and total 10-minute reserve levels to take into account the additional reserves that PJM expects through its new market and in order to prevent load from paying for PJM over-procuring reserves; (ii) require all reserves, flexible or inflexible,⁸⁵ to bid in

⁸⁴ See PJM answer (affidavit of Mr. Bryson at P 6) (noting that a primary reserve is a NERC contingency reserve that is deliverable within 15 minutes).

⁸⁵ Under PJM's business rules, flexible resources are resources with a valid synchronized reserve offer that have an economic maximum greater than their economic minimum and not committed solely for the purpose of providing synchronized reserves.

(continued...)

the hour-ahead market; and (iii) schedule both flexible and inflexible reserves hour ahead subject to five minute intra-hour redispatch. PJM Consumers argues that PJM's proposal conflicts with material elements of PJM's existing market design, most notably RPM rules.

90. Intervenors also assert that PJM's pricing proposal raises market power concerns.⁸⁶ PJM Consumers argue that assigning inflexible synchronized reserves on an hour-ahead basis will impair the ability of the IMM to detect gaming during operating reserves shortages and likely reduce the level of reserves available. PJM Consumers assert that if a resource is not assigned to provide reserves in the hour-ahead assignment process, then the resource can and should be expected to follow LMPs in order to provide energy.

91. The IMM explains that PJM's proposal partially replaces the synchronized reserve market with a hybrid structure that assigns only a subset of Tier 2 synchronized resources deemed inflexible prior to the operational hour, with the remainder of any Tier 2 assignments made on a five minute basis through use of optimization software. The IMM argues that this mixed assignment structure converts the current hour-ahead market construct into a mechanism to estimate the level of Tier 2 reserve requirements and assigns unpriced obligations to these inflexible resources. The IMM argues that these residual resources would then become price takers in the residual five minute market for Tier 2 reserves.

92. The IMM further explains that, under its alternative approach, more resources would be committed prior to the operational hour when there is more time to arrange generation set points to provide for Tier 2 reserves and regulation. Based on these factors, the IMM recommends, among other things, that a full hour-ahead commitment process, rather than a partial commitment process, be put in place, in combination with a within-hour five minute optimization, to maximize the transparency and potential participation in the Tier 2 synchronized reserves market. The IMM also recommends that a must-offer requirement be established for the Tier 2 synchronized reserve market.

Inflexible resources are those resources with a valid synchronized reserve offer that are committed solely for the purpose of providing synchronized reserves and therefore cannot be dispatched simultaneously for energy. Inflexible reserves include but are not limited to generation resources operating in a synchronous condensing mode and demand response.

⁸⁶ See IMM Protest at 32-33; NRECA Protest at 7-13; PJM Consumers Protest at 14-20; APPA Protest at 6; and Maryland Commission Protest at 1-4.

3. PJM's Answer

93. PJM urges that its shortage pricing proposal be viewed as a package that, collectively, results in enhanced reliability, smooth and transparent price formation approaching and during reserve shortage conditions, greater market efficiency, and prices that appropriately reflect the value of energy. PJM adds that it can measure all reserve types, as evident from recent NERC and RFC audits.⁸⁷

94. PJM argues that its method of compensating Tier 2 synchronized reserves is appropriate because these offers are cost-based. PJM explains that, currently, resources used to provide reserves, but which are not committed as reserves in the hour-ahead clearing, are subject to compensation based on unit-specific opportunity costs. PJM states that this compensation requirement can inhibit reserve price signals, especially when reserves are scarce.

4. Additional Answers

95. The IMM renews its challenge regarding PJM's ability to accurately measure primary reserves. The IMM points out that, currently, PJM utilizes an instantaneous reserve check to request member dispatchers to submit estimates of their available reserves at a given point in time. The IMM argues that between checks, as the system changes, the estimates are rendered unreliable. The IMM argues that without accurate measurement of available reserves, any mechanism designed to dispatch the system to maintain reserves will be compromised in both efficiency and effectiveness.

5. Commission Determination

96. We accept PJM's proposed implementation of a non-synchronized reserves market and proposed reserve levels, subject to conditions. PJM monitors and maintains two reserve requirements in real-time operations: primary reserves and synchronized reserves. In addition, PJM initiates a synchronized reserve event through both an electronic message to PJM member systems, and a burst phone message to all other

⁸⁷ PJM states that its primary reserve and synchronized reserve requirements meet the applicable NERC (BAL-002-2), RFC (BAL-002-RFC-02), and VACAR (SERC Reliability Corporation Contingency Reserve Policy, December 8, 2008), reserve requirements. In an audit conducted by NERC, RFC and SERC, PJM was found compliant in the areas of reserve requirements and reserve monitoring. See 2011 PJM Reserve Requirement Study dated September 29, 2011: <http://www.pjm.com/~media/committees-groups/subcommittees/raas/20110929/20110929-2011-pjm-reserve-requirement-study.ashx>

member companies. PJM monitors primary reserves and takes action as needed to maintain or restore these reserves in real-time and has several methods of doing so.

97. PJM explains that operating reserves, including primary reserves, enable PJM to respond to system emergencies such as loss of generation, or interchange or steep load increases. According to PJM, it deploys operating reserves to return Area Control Error to pre-disturbance values within pre-defined time frames based on NERC's Disturbance Control Standards. PJM has not had a Disturbance Control Standard violation in over five years. Consistent with the Commission's intent in Order No. 719 to minimize uplift charges by developing new reserve products, we find that PJM's proposal permits PJM to operate a market for all 10-minute reserves needed to help meet its reserve requirements that will enhance reliability and minimize uplift charges.

98. PJM is obligated under its market rules to comply with NERC and applicable regional reliability council operation and planning standards, principles and guidelines.⁸⁸ As such, PJM is required to schedule sufficient contingency reserves to satisfy RFC requirements. It is appropriate that PJM be able to reflect the costs of these reserves in a transparent market clearing price.

99. Accordingly, it is also appropriate that PJM have the resources available to mitigate the reliability issues that may arise in delivering needed power to loads, including distant loads in a sub-region, to enhance reliability and avoid involuntary firm load shedding. It is further appropriate that PJM have in place a broad pool of market participants available to respond to price signals to prevent or mitigate emergency operating situations and involuntary firm load shedding in the event PJM experiences differences in forecasted loads and forced generator outages, or the loss of larger elements.

100. However, given that primary reserves will be incorporated as part of the co-optimized dispatch for energy and reserves, we require PJM, in its compliance filing, to incorporate in its OATT and Operating Agreement the methods by which PJM will monitor these reserves. We also require PJM to include, in its OATT and Operating Agreement, the notification process that will be followed to alert the market that the system is approaching a primary reserve shortage. In addition, we find that the incorporation of a non-synchronized reserve product into the five minute co-optimized dispatch for energy and reserves as a penalty factor affects the rates, terms and conditions of jurisdictional transactions. Accordingly, we require PJM, in its compliance filing, to incorporate in its OATT and Operating Agreement provisions pertaining to non-synchronized reserves, including provisions addressing: (i) resource eligibility; (ii) offer information; (iii) transactions; and (iv) non-performance penalties.

⁸⁸ See Operating Agreement at section 10.4 (Duties and Responsibilities).

101. In addition, we require PJM to explain how it will credit demand resources that reduce load in response to a non-synchronized event. We note that under the PJM OATT existing provisions for synchronized reserves at section 3.2.3(b), credits for generation and demand resources are provided. Therefore, we require PJM to explain, in its compliance filing, how credits are provided to demand resources that reduce load in response to a non-synchronized event initiated by PJM.

102. In addition, we share the concerns raised by intervenors regarding the specificity of PJM's proposed dispatch procedures, and will therefore require PJM to identify, in its OATT and Operating Agreement, the system conditions allowing PJM to redefine or include additional sub-zones in its synchronized reserves market. In addition, PJM commits in its business rules to notify stakeholders in the event any additional sub-zone needs to be created. However, we require that this notification also be provided by PJM to the public, including the Commission, by PJM posting a notification on its website within 10 days after redefining or including an additional subzone.

103. We reject intervenors' argument that PJM's proposed reserve requirements are deficient to the extent PJM's proposal does not also include rules or mechanisms allowing PJM to accurately measure its reserves. We disagree that PJM will be unable to accurately or meaningfully measure primary reserves in such a way as to justify utilizing a reserve penalty factor as part of the five-minute co-optimized dispatch for energy and reserves. PJM explains that it monitors and maintains both primary and synchronized reserve requirements in real-time operations.⁸⁹ PJM further explains that it consistently monitors primary reserves and takes action as needed to maintain or restore these reserves in real-time and has several methods of doing so. PJM adds that it monitors these reserves through the use of real-time calculations and periodic instantaneous reserve calculations that are updated every 10 seconds as actual generation loading and availability changes throughout the day.

104. These calculations determine the number of megawatts that can be achieved in 10 minutes given a generator's physical and operating limitations. PJM asserts that these real-time calculations provide the specific amount of each reserve category by area for that moment in time. As evident from NERC and RFC audits, PJM has the ability to measure all reserve types (e.g., synchronized and non-synchronized reserves and regulation service).

⁸⁹ See PJM Answer (affidavit of Mr. Bryson at P 6). As PJM explains, PJM has issued primary reserve warnings over the past four years on three occasions. A primary reserve warning is issued to warn members that the available primary reserve is less than the required amount and that present operations are becoming critical. The current approved value for this reserve, in the RFC region of PJM, is 1,700 MW.

105. However, as stated above, we accept PJM's proposal to incorporate non-synchronized reserves into the five-minute dispatch, subject to PJM codifying in its OATT and Operating Agreement its ability to monitor all primary reserves and notify market participants that the system is approaching a primary reserve shortage. Additionally, while PJM's business rules, at Manuals 12 and 13, identify the circumstances giving rise to an operating reserve shortage (including the warnings and actions indicating the existence of a shortage that will trigger PJM's implementation of its penalty factors), we direct PJM to submit tariff revisions, in its compliance filing, incorporating these provisions into its OATT and Operating Agreement.

106. We also reject PJM Consumers' argument that assigning synchronized reserves one-hour ahead will increase the ability of market participants to engage in anti-competitive behavior. We find that PJM's OATT and Operating Agreement provide sufficient safeguards to detect and mitigate such a risk and the PJM OATT includes sanctions to deter such anti-competitive behavior. PJM's establishment of joint optimized dispatch, i.e., its proposed requirement that energy and reserves be simultaneously dispatched, will require the evaluation of trade-offs as between scheduling a resource as energy or as an ancillary service. As such, we agree that joint optimization mitigates market power. For example, a resource owner that submits a high offer price for reserves can be dispatched for energy, based on mitigated pricing in the energy market, if it has the potential to exercise market power. This allows the market to redispatch to meet reserve requirements without the use of the reserve unit with the elevated offer price. Further, the must-offer provisions that we direct PJM to file, discussed in further detail in section IV.H, below, will minimize the potential exercise of market power in the synchronized reserves market.

107. Finally, the IMM objects to PJM's pricing proposal as it relates to within-hour five minute Tier 2 assignment pricing and recommends that within-hour committed units be paid the higher of the hourly integrated five minute market-clearing prices or their effective offer. The IMM defines an effective offer as the unit specific hourly integrated opportunity cost; whereas, PJM's proposal would define effective offer to equal the unit's synchronized reserve offer, plus the unit specific opportunity cost. The IMM asserts that PJM's proposal will result in an inefficient allocation of the unit's capability, as between reserves and energy, because it will artificially create inconsistent parameters sets, one for energy and one for reserves. The IMM argues that this will distort the direct substitutability of unit capacity deployed as either reserves or energy within the hour.

108. We reject the IMM's argument as beyond the scope of Order No. 719. PJM, in this proceeding, is not proposing to revise the payment structure for Tier 2 synchronized reserves, which according to the current tariff provides the higher of (i) the synchronized reserve market clearing price or (ii) the sum of (A) the synchronized

reserve offer and (B) the specific opportunity cost of the generation resource.⁹⁰ Nor is PJM required to do so under Order No. 719.

C. Demand and Virtual Supply Bid Caps in the Day-Ahead Market

1. PJM's Proposal

109. PJM's existing \$1,000/MWh energy offer cap applies to both the day-ahead and real-time energy markets. Absent congestion and marginal losses, the maximum energy price is therefore the same in both the day-ahead and real-time markets. PJM, however, proposes to raise the day-ahead energy market caps on physical demand bids and on virtual supply and demand bids to \$2,700 per MWh, equal to the level of the potential maximum energy price in the real-time energy market.⁹¹

110. Under PJM's proposed tariff language, PJM will maintain the \$1,000 per MWh bid cap in the day-ahead energy market for all generation and demand resources that have cleared an RPM capacity auction.⁹² As background, PJM's current tariff requires that market sellers shall submit offers in the day-ahead energy market for the output of a generation capacity resource that cleared in a RPM capacity auction, was either committed in an Fixed Resource Requirement (FRR) Capacity Plan, self-supplied, or designated as replacement capacity, and that has not been rendered unavailable by an outage for the available capacity.⁹³ In contrast, while demand response resources that

⁹⁰ See PJM OATT at Attachment K - Appendix, section 3.2.3A (b) (ii) (Synchronized Reserve).

⁹¹ PJM proposes that when it has implemented emergency procedures, resources offering emergency energy be eligible to set real-time LMPs, capped at the energy offer cap plus the sum of the applicable reserve penalty factors, i.e., at \$2,700 per MWh at the end of PJM's proposed four-year phase-in period. See proposed OATT at Attachment K - Appendix, section 3.2.6(a) (Emergency Energy).

⁹² See *id.* at proposed section 1.10.1A(d)(viii).

⁹³ See *id.*

have cleared in PJM's capacity market⁹⁴ can bid into the day-ahead market, they are not specifically required to do so under PJM's tariff.⁹⁵

111. PJM states that allowing energy prices in the day-ahead and real-time markets to converge during shortage conditions will eliminate the gaming opportunity to over-bid demand in the day-ahead energy market at a lower maximum price and sell back that position in the real-time energy market at prices that are permitted to exceed the maximum day-ahead price. In addition, PJM states that its proposal is consistent with the Commission's statement that energy prices should be allowed to rise to the value of energy and that energy should be allocated to those who value it most. PJM also states that its proposal is consistent with the Commission's Order No. 719 criterion regarding comparable treatment and compensation for all resources. PJM adds that permitting these caps to rise, as proposed, will allow market participants to fully hedge the risks attributable to real-time energy prices and/or performance in the day-ahead energy market.

2. Protests and Comments

112. Comments generally supportive of PJM's proposal were filed by SESCO Enterprises LLC, *et al.* (SESCO, *et al.*), PPL Parties (PPL), and DC Energy, LLC (DC Energy).

113. Other intervenors oppose PJM's proposal, noting that the potential \$1,700 difference in prices between the day-ahead and real-time energy markets will provide capacity owners an incentive to withhold from the day-ahead energy market. PJM Consumers argue that withholding could occur *via* a virtual bidding strategy. PJM Consumers assert that this strategy will inflate day-ahead energy market clearing prices for the owner's remaining resource portfolio. PJM Consumers further state that raising these caps will allow resource owners to eviscerate the application of the three pivotal supplier test and the use of cost based offers, thus circumventing PJM's market power mitigation rules.

⁹⁴ Demand resources that are committed in an RPM auction as capacity resources must be registered to participate in the full program option of PJM's emergency load response program and thus are available for dispatch during PJM-declared emergency events. *See id.* at Attachment DD, section A.6.

⁹⁵ PJM's tariff provides that market sellers owning or controlling the output of a capacity demand c resource *may* submit demand reduction bids in the day-ahead energy market for the available load reduction capability. *See id.* at Attachment K - Appendix, section 1.10.1A(l).

114. The IMM argues that increasing the caps for demand and virtual supply bids will create market power concerns and increase incentives, *via* virtual bids and offers, to force up prices during conditions of potential shortage. The IMM argues that the incentives are pronounced among participants with portfolios of generation in highly concentrated transmission constrained markets. In addition, the IMM maintains that these price differences will eliminate mitigation in the form of the \$1,000 bid cap that currently exists in PJM's day-ahead energy market. The IMM concludes that PJM's proposal is inconsistent with PJM's market design fundamentals and, if implemented, would require that PJM's bid cap be raised for all resources in both the day-ahead and real-time energy markets.

115. The IMM also argues that maintaining a price difference between demand and virtual supply versus energy resources is discriminatory. The IMM asserts that the supply of capacity resources within PJM are available for prices approaching \$1,000 per MWh in real-time. The IMM argues that, as such, prices over \$1,000 per MWh in the day-ahead energy market will only increase the prices paid for energy. The IMM adds that under PJM's existing market design, arbitrage incentives between the day-ahead and real-time markets are designed to promote price convergence such that day-ahead scheduling will be consistent with the system's real-time requirements.

116. The Public Utilities Commission of Ohio (Ohio Commission) echoes the IMM's concerns about the potential for market power to be exercised through the use of virtual bids and offers in the day-ahead market. The Ohio Commission requests that PJM be directed to propose and track metrics to identify whether market power could be exercised using virtual bids and offers in the day-ahead market and indicate what additional steps should be taken to mitigate such market power in the event it were to be found.

117. The Maryland Commission also opposes PJM's proposal, arguing that demand response resources are often owned and controlled by owners of traditional generation resources, who will be able to manipulate market transactions – particularly through virtual bids in the day-ahead markets – that could dramatically increase the earning potential of both their demand response and generation assets. The Maryland Commission argues that prices in excess of \$1,000 per MWh in the day-ahead energy market will not serve to improve the dispatch efficiency of physical resources.

PJM Consumers argue that the \$1,700 per MWh shortage adder will not elicit any additional generation in the day-ahead market. With the majority of PJM's load's requirements filled in the day-ahead market (96.8 percent), PJM Consumers argue that exposing load to shortage pricing levels, where no additional resources with a strike price above \$1,000 per MWh could possibly participate, is unjust and unreasonable. Moreover, according to PJM's Consumers, lifting bid caps for virtual bidders and demand will introduce a new opportunity for economic withholding and market gaming that will allow an end-run around current mitigation measures. PJM Consumers presents

an example intended to illustrate how resource owners could submit virtual bids to purchase in the day-ahead market in order to raise day-ahead prices above \$1,000 per MWh when shortages and prices above \$1,000 per MWh are expected in real time. PJM Consumers argues that such virtual bids would raise day-ahead prices above \$1,000 per MWh and closer to the levels expected in real-time, thereby benefitting the portion of the bidder's resource portfolio remaining in the day-ahead market.

118. American Electric Power Service Corporation (AEP) argues against the retention of the \$1,000 per MWh price cap on generators when other resources will have the option of bidding higher. AEP points out that a generator who sells into the day-ahead market at \$1,000 per MWh and later suffers a forced outage, may be required to buy power in the real-time market for \$2,700 per MWh. P3 states that this factor greatly increases the outage risk for generators committed in the day-ahead market. P3 notes that PJM partially addresses this issue by allowing the caps on virtual bids to increase, which would effectively move the generation into the real-time market. AEP and P3 argue that such a move is not costless, as the generator would have to incur imbalance charges in the form of operating reserve charges assessable for deviations on both the generator and the virtual transaction. AEP adds that the generator may be forced to pay twice for operating reserves in an effort to hedge its position. P3 also states that it is not necessarily appropriate to create an incentive that biases all settlements towards real-time for purposes of managing this risk.

119. To remedy this alleged inefficiency, AEP proposes that generators be allowed to offer into the day-ahead market at a capped rate equivalent to that of demand response resources. AEP argues that such a policy would provide an adequate hedge while not forcing additional operating reserve costs upon the generation owner. P3 proposes that the Commission condition its acceptance of the increase of the virtual bid cap by giving the supplier the option of: (i) bidding in such a fashion so as to move the delivery into real-time and incur the imbalance charges, or (ii) modifying its day ahead bid (when otherwise constrained, e.g., when it is subject to offer caps) to reflect such a risk. P3 suggests that this premium would be difficult to estimate, so it proposes that suppliers be permitted to demonstrate that they purchased such a day-ahead option or insurance in an arms' length transaction from one or more third parties.

3. PJM's Answer

120. PJM argues that allowing demand or virtual bids to rise, as permitted under its proposal, will not automatically imply an exercise of market power. PJM argues that if demand resources bid up to the maximum market price, it will be willing to pay up to that price to consume energy. PJM asserts that the existing incentives under which demand and virtual bidders operate will not change under its proposal. PJM states that allowing demand to bid up to the maximum price in the day-ahead energy market reduces the ability of market participants to game institutionalized price differences that

would occur if prices were not allowed to rise to the same level in the day-ahead energy market as in the real-time energy market.

4. Additional Answers

121. P3 argues that because shortage events are rare and difficult to predict, it is unlikely that day-ahead prices will reflect real-time shortage revenues. P3 further argues that if PJM or market participants could predict reserve shortage events in advance, PJM would be able to commit sufficient units in the day-ahead market to ensure that reserve shortage events do not occur.

122. PJM Consumers point out that neither NYISO nor ISO-NE allows virtual offers above their \$1,000 offer cap.

5. Commission Determination

123. For the reasons discussed below, we accept PJM's proposal to increase bid caps in the day-ahead energy market for physical demand and virtual supply and demand up to a level of \$2,700 per MWh, subject to conditions.

124. PJM's existing shortage pricing mechanism, in its currently-effective tariff, applies only to the real-time market, not to the day-ahead market. Therefore, if virtual traders and demand cannot submit higher bids in the day-ahead market, that market may not converge with prices in the real-time market during times when PJM experiences shortage conditions in the real-time market. As we have explained regarding convergence bidding in the market operated by the California Independent System Operator Corporation (CAISO), without convergence bidding, participants with market power may have the ability to price discriminate between the day-ahead and real-time markets, resulting in a forward price that is systematically different than the expected real-time price.⁹⁶ Additionally, we found that convergence bidding reduces the price differences between the real-time and the day-ahead markets, thus reducing the incentive for buyers or sellers to forego bidding physical schedules in day-ahead markets in expectation of better prices in the real-time markets.⁹⁷

125. We find that there are benefits attributable to PJM's proposal and the associated price convergence it will promote, in anticipation of a reserve shortage. First PJM's proposal will mitigate the opportunity to "over-bid" demand in the day-ahead energy market and sell back that position in the real-time energy market at prices above the

⁹⁶ *California Independent System Operator Corporation*, 116 FERC ¶ 61,274 (2006).

⁹⁷ *Id.* PP 449-450.

maximum day-ahead prices. That is, if physical demand and virtual bidders were not allowed to bid above \$1,000 per MWh, bids in the day-ahead market may not be able to be satisfied when real-time shortages and prices above \$1,000 per MWh are expected. That is because, in these circumstances, a large profit could be earned by purchasing in the day-ahead market for \$1,000 per MWh and reselling in the real-time market for up to \$2,700 per MWh. As a result, virtual demand bidders and physical demand bidders would want to procure as much energy in the day-ahead market as possible. Day-ahead demand would likely exceed supply – possibly by a large amount – and PJM would need to pro-rate demand according to administrative provisions in its tariff to equate supply and demand. Thus, as PJM explains, because of the magnitude of the arbitrage opportunity and the prospect of having to pro-rate demand to clear the market, the ability to completely hedge, or lock in prices for demand scheduled, in the day-ahead market is lost. Physical demand would be more exposed to real-time price risk that it may have desired. Allowing physical demand and virtual bidders to bid up to \$2,700 per MWh can avoid this problem, because higher bids will allow buyers to see the value of reducing consumption in advance.⁹⁸

126. In addition, price convergence helps ensure that market participants in the day-ahead market see accurate price signals that encourage efficient decisions. Of course, one of the benefits of a day-ahead market is that it provides some advance notice to market participants of likely real-time market conditions. This advance notice provides time for market participants to adjust their economic decisions in a way that may not be possible on short notice. For example, suppose a shortage condition is likely to develop in real-time, it would be desirable to encourage buyers with lower-valued uses to reduce their consumption.⁹⁹ But some buyers may require advance notice in order reduce their

⁹⁸ We note that, as a practical matter, no buyer would be willing to pay more than \$2,700 per MWh in the day-ahead market, because it can purchase energy for \$2,700 per MWh (the price cap in the real-time market) or less in the real-time market.

⁹⁹ For example, in Manual 13 (Emergency Operations), PJM states that alerts are issued in advance of a scheduled load period to allow sufficient time for members to prepare for anticipated initial capacity shortage. In the day-ahead market, alerts may be issued for Maximum Emergency Generation, Primary Reserve, and Voltage Reduction. PJM explains that the purpose of the Maximum Emergency Generation alert is to provide an early alert that system conditions may require the use of PJM's emergency procedures. Such an emergency will be implemented when a Maximum Emergency Generation is called into the operating capacity. PJM further explains that the purpose of the Primary Reserve alert is to alert members of the anticipated shortage of operating reserve capacity for a future critical period. It is implemented when estimated operating reserve capacity is less than the forecast primary reserve requirement. PJM states that the purpose of the

(continued...)

consumption. Price convergence helps these buyers to see the value of reducing consumption in advance – in the day-ahead market – and allows them the time to take action. With price convergence, the day-ahead market would reflect this anticipated shortage with prices up to the potential maximum energy price in the real-time energy market, i.e., \$2,700 per MWh. The higher day-ahead price would encourage buyers who require advance notice to reduce their consumption.

127. By contrast, if day-ahead prices were maintained at a comparatively low level by a \$1,000 per MWh price cap, while real-time prices were actually above \$1000 per MWh, these buyers might be unable to reduce their consumption in real-time on short notice. By facilitating consumption reductions in uses that have comparatively lower value, supplies can be made available to other buyers with more urgent uses. In addition, by reducing consumption, additional resources may be made available to provide operating reserves, thereby reducing the reserve shortage and improving reliability. Higher day-ahead prices during anticipated shortage conditions may also encourage additional supplies, such as from outside the PJM footprint, to enter the market to help alleviate the shortage. Accordingly, we direct PJM to include in its compliance filing, OATT and Operating Agreement language that incorporates the day-ahead emergency procedures discussed in Manual 13 that may cause expectations of shortage conditions in real-time.

128. PJM explains, in its transmittal letter, that its proposal raises the caps on demand bids and on bids from virtual supply and demand to the level of the potential maximum energy price in the real-time energy market.¹⁰⁰ However, PJM's proposed tariff revisions do not limit this rise to physical demand and virtual bidders. Rather, the proposed tariff only provides an offer cap for capacity resources.¹⁰¹ By exclusion, all other resources that can bid into the day-ahead energy market can seemingly bid up to \$2,700 per MWh. Thus, PJM's tariff provisions would seemingly allow not only demand and virtual supply and demand offer prices to rise above \$1,000 per MWh, but would also allow such increases for other resources, such as: (i) energy offers from generation resources that have not cleared in an RPM capacity auction; and (ii) offers to reduce demand submitted by an economic load response participant.

Voltage Reduction alert is to alert members that a voltage reduction may be required during a future critical period. It is implemented when the estimated operating reserve capacity is less than the forecasted synchronized reserve requirement.

¹⁰⁰ See PJM Filing, transmittal sheet at 40.

¹⁰¹ PJM proposes that offers “[s]hall not exceed an energy offer price of \$1,000/megawatt-hour for all generation resources and Demand Resources that have cleared a Base Residual Auction or an Incremental Auction.” See proposed PJM OATT at Attachment K - Appendix, section 1.10.1A(d)(viii).

129. We find that during a shortage period, allowing not only virtual supply, but also non-capacity resources to offer above \$1,000 per MWh in the day-ahead market may result in lower day-ahead and real-time prices than otherwise because physical supply without must-offer requirements will have greater incentives to offer their resources ahead of time. This is so because a non-capacity resource can elect not to offer its energy into the day-ahead energy market – and as a result, PJM’s shortage would become more severe than otherwise, and its energy price (as established by the demand curve for operating reserves) would increase. By allowing a non-capacity resource to offer a price above \$1,000, that resource will have a greater incentive to offer energy into the day-ahead market. We note that capacity generators are obligated to bid into the day-ahead market. Thus, higher bid caps will not attract more of this group of resources into the day-ahead market.

130. We find that the key distinction between capacity demand resources and capacity generation resources is the must-offer requirement in the day-ahead market. PJM offers no explanation as to why given this distinction, the \$1,000 bid cap should apply to capacity demand resources.

131. We find that PJM’s proposed \$1,000 per MWh cap on capacity demand resources reduces incentives to offer these resources in the day-ahead market. For users that derive more than \$1,000 per MWh of value from consuming energy, their cost of providing demand response exceeds \$1,000 per MWh, since they give up in excess of \$1,000 per MWh of value by reducing energy usage. Such users would generally be unwilling to reduce their energy usage at compensation levels below \$1,000 per MWh. As with non-capacity resources, emergency demand response capacity resources do not have a day-ahead must-offer requirement.¹⁰² Thus, these resources can also elect not to offer into the day-ahead market. However, offers from these resources would be a benefit to the day-ahead market because resources will only act to increase competition in that market. If capacity demand response offer prices are greater than demand is willing to pay, then the capacity demand response bids will not clear in the day-ahead market. Also, given PJM’s proposal to allow these resources to set real-time price up to \$2,700 per MWh in the real-time market and given the prior finding by the Commission regarding the lack of market power for demand resources,¹⁰³ allowing these resources to submit offers above \$1,000 per MWh in the day-ahead market is helpful to promote convergence between the day-ahead and real-time markets and to signal these resource’s desire to reduce energy purchases at prices between \$1,000 per MWh and \$2,700 per MWh. PJM is proposing in its filing an explicit offer cap for capacity demand response

¹⁰² See *id.* at section 1.10.1A(1) (Day-Ahead Energy Market Scheduling); see also *id.* section (PJM Emergency Load Response Program, Emergency Operations).

¹⁰³ *PJM Interconnection, L.L.C.*, 129 FERC ¶ 61,081, at PP 31 (2009) (RPM Enhancements Order).

and does not explain a basis for this proposal. For all these reasons, we require PJM to revise its proposed tariff to remove the \$1,000 offer cap for capacity demand resources.

132. AEP requests that the Commission raise the \$1,000 per MWh offer cap on generators. AEP and P3 state that generators with forced outages may be required to buy power in the real-time market for \$2,700 per MWh. These intervenors add that hedging this risk, by making a virtual purchase¹⁰⁴ in the day-ahead energy market, is not costless, given the operating reserve charges assessable for deviations on both the generator and the virtual transaction. To account for the cost of insuring against this risk, P3 requests that PJM be required to increase the applicable seller-specific offer caps.

133. We deny AEP's request. The \$1,000 offer cap for generators has been found necessary to protect against physical withholding by generators, and we find no basis for removing that protection, even though the offer cap for other market participants would be raised. First, the \$1,000 per MWh offer cap provides a protection against any residual seller market power. Second, while generators that are capacity resources would face a lower offer cap than other market participants, generators that are capacity resources would receive the same market clearing price as other market participants that clear in the day-ahead market. Thus, there would be no discrimination among market participants with respect to actual compensation.

134. Moreover, PJM's proposal should serve to reduce the risk to a generator from a forced outage. Because virtual demand bids (by all market participants, including generators) would be allowed to exceed \$1,000 per MWh, PJM's proposal allows prices to go above \$1,000 per MWh in the day-ahead energy market when real-time prices are expected to exceed \$1,000 per MWh. Under PJM's proposal, therefore, there is less likely to be a significant divergence between the day-ahead and real-time prices so that the cost of buying back energy in the event of a forced outage will be less than if the bid cap is retained. For example, if day-ahead bids are limited to \$1,000 per MWh, and a shortage occurred in real-time, generators could be exposed to a cost of up to \$1,700 per MWh to buy back energy.¹⁰⁵ But if the day-ahead price could anticipate the shortage, the generator's exposure would be less.

¹⁰⁴ A generator, for example, that is paid \$1,000 per MWh in the day-ahead market and experiences an outage during the delivery hour may be forced to buy energy at \$2,700 per MWh in the real-time market. Through the use of a virtual demand bid, the generator can mitigate at least some of the losses it would experience meeting its day-ahead commitment.

¹⁰⁵ The \$1,700 per MWh net cost arises from the difference between the real-time power purchase of \$2,700 per MWh and the day-ahead price cap of \$1,000 per MWh.

135. Also, if the \$1,000 offer cap in the day-ahead market were retained for all resources, then generators would be unable to hedge against the risk of a shortage in real-time. However, under PJM's proposal, a generator whose virtual demand bids clear would be permitted to hedge its risk by making a virtual purchase in the day-ahead energy market to offset the price risk in the real-time market. While the hedge in some cases might result in operating reserve charges, that cost is far less than not being able to hedge against the risk at all. In fact, if a shortage event does occur in real-time, the generator would not be assessed operating reserve charges.¹⁰⁶

136. The IMM opposes PJM's proposal, noting that the potential \$1,700 difference in prices between the day-ahead and real-time energy markets will, together with PJM's offset mechanism, provide capacity owners an incentive to withhold from the day-ahead energy market, so they can receive shortage prices in the real-time market. The IMM argues that its alternative, primarily limiting capacity to existing offer cap levels,¹⁰⁷ would resolve a number of other issues created by PJM's proposal.

137. However, contrary to the IMM's statement, PJM's proposal does not innately provide for a \$1,700 difference in prices, but instead for a price convergence between the day-ahead and real-time energy markets by allowing prices to reach \$2,700 in the day-ahead market when shortage prices are anticipated in the real-time market. These higher prices will incentivize generation and demand response to participate in the day-ahead market. As the Commission affirmed in Order No. 719-A, existing RTO and ISO market 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.¹⁰⁸ PJM's pricing reforms address this concern while providing protection against the exercise of market power. The issue here, then, is whether PJM's proposal is just and reasonable, not whether another party has fashioned a comparably reasonable alternative.¹⁰⁹

138. With respect to the IMM's alternative proposal, we note that the Commission, in Order No. 719, acknowledged the IMM's recommendation that shortage pricing be

¹⁰⁶ See PJM OATT at Attachment K – Appendix, section 3.2.3(h)(ii).

¹⁰⁷ The IMM states its amended proposal limits shortage prices to offer cap levels and incorporates a shortage pricing true up mechanism.

¹⁰⁸ Order No. 719-A, FERC Stats. & Regs. ¶ 31,292 at P 93.

¹⁰⁹ While the IMM's proposal reflects a different perception of the need for shortage pricing, it does not render PJM's proposal unjust or unreasonable.

defined in stages.¹¹⁰ The Commission determined, however, that it would not mandate any specific approach that RTOs and ISOs must follow. As provided above, we find that PJM's proposal to incorporate real-time shortage prices that exceed the \$1,000 energy offer caps by as much as \$1,700 is just and reasonable and PJM is not required to establish a shortage pricing mechanism that retains a \$1,000 energy offer cap with various stages of shortage pricing. As we found previously, if higher shortage prices result from amending market rules, those prices could be expected to attract investment in both demand response technology and generation by providing opportunities for a higher return on investment, and the entry of demand response over time may lead to lower prices in the long run. We are concerned that such investments may not occur under existing rules, given that existing market rules may not accurately reflect the value of energy during periods of shortage and, therefore may deter new entry of demand response and generation resources.

139. Additionally, PJM's proposal retains all of the current market power mitigation protocols, including application of the market power screen in the real-time energy market, the three pivotal supplier test, and the application of cost-based offer mitigation, and PJM further proposes to implement an operating reserve demand curve. PJM also proposes to retain its existing must-offer rules for generation capacity resources in the day-ahead market, a requirement that obligates generation capacity resources to be available. Also, generation capacity resources must be available during emergency and non-emergency conditions unless they are designated as a maximum emergency offer due to environmental limits, fuel limits, temporary emergency conditions rendering the unit physically unavailable, or other temporary conditions.¹¹¹ Furthermore, PJM's OATT and Operating Agreement already provide for demand resources to participate in the energy market through PJM's economic load response program.¹¹² We find that the retention of these rules is consistent with the Commission's Order No. 719 requirement that market power mitigation remain in place.¹¹³

140. PJM Consumers argue that by raising the bid cap for virtual bidders, withholding and gaming could occur via a virtual bidding strategy when a shortage is expected in real time. Specifically, PJM Consumers are concerned that generators seeking to increase the day-ahead price closer to the expected real-time price for their generation fleet will submit a virtual bid to purchase energy, in the day-ahead market and

¹¹⁰ Order No. 719, FERC Stats. & Regs. ¶ 31,282 at P 229.

¹¹¹ See proposed PJM OATT at Attachment K - Appendix, section 1.10.1A(d).

¹¹² See *id.* at section 1.5A.

¹¹³ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at PP 246-247.

subsequently sell the energy in the real-time market. However, as long as there is no market manipulation, we think that virtual bidding that moves day-ahead prices closer to real-time prices is desirable, because it brings the benefits of price convergence discussed above. Of course, to the extent a market participant places such virtual bids as part of a manipulative scheme to benefit other products or positions, we have the authority to investigate and to penalize such conduct. In addition, RTO market monitors and our own staff monitor the markets regularly for potentially manipulative conduct. Regardless, we expect that the IMM will include a review of increases or decreases in price divergence between day-ahead and real-time prices as part of its required quarterly and annual state of the market reports.

141. The IMM argues that maintaining a price difference between demand and virtual supply versus energy resources is discriminatory. The IMM believes that keeping consistency with PJM's current design fundamentals would require the bid cap to be raised for all resources in both the day-ahead and real-time energy markets. We disagree. PJM's proposal does not distort pricing in the day-ahead market. While PJM's proposal may not allow for resources that have cleared in an RPM auction to bid above \$1,000 per MWh, it does not prevent these resources from receiving a day-ahead market price higher than \$1,000 per MWh if prices reach these levels. As explained above, moreover, PJM's proposal does not prevent these same resources from submitting virtual demand bids higher than \$1,000 per MWh if prices are expected to rise to shortage levels in the real-time market.

142. The Ohio Commission requests that PJM be directed to propose and track metrics to identify whether market power could be exercised using virtual bids and offers in the day-ahead market. Intervenors are also concerned that lifting the caps for demand and virtual bids in the day-ahead market will reduce or render useless a key market power mitigation method. However, we are not persuaded that these market power concerns warrant the formulation and utilization of a new monitoring standard. In fact, the IMM mandate already includes monitoring, evaluating, and reporting on changes and flaws in all of PJM's markets. Additionally, Order No. 719 allows for prices to rise sufficiently during an operating reserve shortage to allow supply to meet demand.¹¹⁴

143. Finally, intervenors argue that PJM's proposal to lift bid caps in the day-ahead energy markets for virtual and demand bids, only, is inconsistent with PJM's design fundamentals and will deter generation and demand response resources from participating in PJM's day-ahead market. We disagree. Given the ability of demand and virtual bidders to bid up to \$2700 per MWh, day-ahead, prices may reach these higher levels when shortages are expected in real-time. Higher prices will encourage generation and demand response to participate in the day-ahead market by providing a

¹¹⁴ *Id.* PP 192, 207.

greater financial reward relative to PJM's current market. In addition, PJM's proposal will provide price convergence between the day-ahead and real-time markets. Finally, as we found above, higher day-ahead prices during anticipated shortage conditions may also encourage additional supplies, including supplies from outside the PJM footprint, to enter the market to help alleviate any such shortage.

D. Emergency Resources

1. PJM's Proposal

144. PJM proposes to revise its tariff to permit resources offering emergency energy to be eligible to set the market clearing price, capped at the energy offer cap plus the sum of the applicable reserve penalty factors, provided that the emergency energy is needed to meet demand when PJM has implemented emergency procedures. Specifically, PJM proposes to allow emergency load response resources, emergency purchases, and generation from emergency segments of on-line generators to set the market-clearing price during emergencies.¹¹⁵ PJM proposes in its business rules to dispatch emergency demand response resources by transmission zone by lead time based on system conditions.¹¹⁶

145. PJM's existing market rules allow emergency demand response resources to set the market clearing price in certain situations.¹¹⁷ However, emergency demand

¹¹⁵ PJM proposes that emergency load response resources participating in the Full Program Option, or the Energy Only Option, be permitted to set real-time LMPs under certain conditions. Under the Full Program Option, participants would be eligible to receive: (i) an energy payment for load reductions during an emergency event; and (ii) a capacity payment for load reductions during an emergency event. Under the Energy Only Option, participants would receive only an energy payment for load reductions during an emergency event. *See* PJM OATT, Attachment K – Appendix (Emergency Load Response Program).

¹¹⁶ Lead times are addressed in the existing provisions of the PJM OATT at Attachment DD-1, section H and in the Attachment K – Appendix. In the case of a short lead time, a demand resource or interruptible load for reliability (ILR) must be implemented in one hour or less from the time that the PJM dispatcher notifies the market operations center of a curtailment event. In the case of a long lead time, a demand resource or ILR must be implemented no more than two hours from the time that the PJM dispatcher notifies the market operations center of a curtailment event.

¹¹⁷ *See* PJM OATT at Attachment K – Appendix (Emergency Load Response Program, Emergency Operations) (providing that the “Minimum Dispatch Price of a Full Program Option participant that reduces load may set the real-time [LMP] provided that
(continued...)

response resources are deployed in bulk independent of the price offered by an individual resource. PJM states that other resources offering emergency energy are not sufficiently integrated with the market. PJM adds that, as such, when these resources are used under emergency conditions, they cause market outcomes that do not reflect shortage conditions.¹¹⁸

146. PJM proposes to require a curtailment service provider to submit real-time operational data to PJM. PJM proposes that these data elements be defined in PJM's Manuals and be required at least daily during the summer months, hourly during emergency conditions, and otherwise monthly. PJM further proposes to develop a web-based user interface for the submission of this information. PJM also proposes, for administrative ease, to permit curtailment service providers who may operate a fleet of distributed emergency demand response resources to aggregate the operational data for these resources up to a control zonal level, by notification time.

147. PJM states that allowing emergency resources to set prices will help improve reliability by reducing demand and increasing generation during periods of shortage. PJM states that under its existing shortage pricing rules, the market fails to send accurate and transparent price signals for energy and reserves, which results in uplift costs, because its market does not permit emergency purchases and generation from emergency segments of generators to set the market clearing price. When shortage conditions exist, under the current market rules, PJM lifts its offer caps for generation resources dispatched for local reliability and dispatched out of economic merit order to maintain system reliability and allows the market clearing price to be set by the highest market-based offer of all the generators in the PJM region operating at its direction to supply energy or reserves.¹¹⁹

148. PJM notes that its current market design results in inaccurate pricing during periods of reserve shortage. PJM explains that during reserve shortage events, PJM currently permits prices to be set by these unmitigated offers and such offers may not

the participant's load reductions are needed to meet demand in the PJM Region.”).

¹¹⁸ See PJM filing, Attachment C (affidavit of Mr. Sotkiewicz) at 11-16. See also “Shortage Pricing: Energy and Ancillary Service Market Business Rules,” March 4, 2010 at: <http://www.pjm.com/~media/committees-groups/working-groups/spwg/20100304/20100304-item-03-shortage-pricing-draft-business-rules.ashx> and <http://www.pjm.com/~media/committees-groups/working-groups/spwg/20091204/20091204-item-03-dr-dispatch.ashx>.

¹¹⁹ See PJM Operating Agreement at Schedule 1, section 6A.3 (Shortage Pricing); See also *id.* at section 6.4 (Offer Price Caps).

reflect the costs of resources being dispatched to address the emergency. PJM further explains that, currently, in spite of shortage conditions, PJM's markets appear to be experiencing reduced system demand, and consequently, prices are artificially suppressed. PJM adds that, in addition, under the current market rules, the market clearing price set by unmitigated offers applies across the entire PJM region. PJM states that, as a result, its existing market design permits substantial uplift payments because resources offering emergency energy are essentially compensated for the difference between their actual costs and the market clearing price. PJM states that its proposal to permit emergency resources to set price properly aligns energy and reserve market prices with system conditions and dispatch instructions, thereby enhancing reliability during shortages.

149. PJM argues that its proposal to allow resources offering emergency energy to set LMP during operating reserve shortage events is a logical extension of PJM's current rules, which allow emergency demand response resources to set LMP during emergency events.¹²⁰ Currently, following PJM's request to reduce load, participants in the full emergency load response program are required to reduce load and PJM will dispatch the resources of all emergency load response program participants (not already dispatched under the economic load response program) based on the minimum dispatch prices specified in the participants' emergency registration forms.¹²¹ The minimum dispatch price of a full program option participant that reduces load may set the real-time LMP provided that the participant's load reductions are needed to meet demand in the PJM region.¹²² Emergency load response resources are currently eligible to set the LMP according to their minimum dispatch price, but are later made whole if the sum of the

¹²⁰ See *PJM Interconnection, L.L.C.*, 114 FERC ¶ 61,201 (2006).

¹²¹ PJM provides two options for participation in the emergency load response program: (i) a full program option, permitting participants to receive an energy payment for load reductions during an emergency event and capacity payments through PJM's RPM auction; and (ii) an energy only option, permitting participants to receive only an energy payment for load reductions during an emergency event. See PJM OATT at Attachment DD-1, section A6. We also note that effective with the 2014-15 delivery year a load management resource (i.e., load response) may be one of three capacity product types namely: (i) limited demand resource; (ii) extended summer demand resource; or (iii) annual demand resource. See, e.g., *id.* at section 5.8 (c) (Submission of Sell Offers and Buy Bids).

¹²² *Id.* at Attachment K - Appendix (PJM Emergency Load Response Program, Emergency Operations).

hourly energy payments is not greater than or equal to the offer value (i.e. minimum dispatch price, minimum down time and shut down costs).¹²³

150. PJM explains that its proposal to allow all emergency resources to set price will encourage existing generation and emergency load resources to continue to be relied upon during an operating reserve shortage.

2. Protests and Comments

151. The IMM argues that emergency demand response resources are not comparable to resources eligible to set price in a least-cost security constrained dispatch model. PJM Consumers argue that PJM's proposal would require additional rule changes in order to ensure that demand resources are treated comparably to generation resources. The Pennsylvania Commission adds that PJM should defer its implementation of PJM's proposal until telemetry and metering concerns are addressed. NRECA concurs, noting that these resources should not be treated as comparable to synchronized reserves. PJM Consumers argue that, because emergency demand response resources have no function in keeping the system from entering an emergency condition, such resources should not be allowed to set price. PJM Consumers add that generation, by contrast, has an obligation to be made available under normal operations.

152. The IMM argues that emergency demand response represents non-firm load that does not have a right to the capacity that it has not paid for and is, in the case of an emergency, required to be curtailed by the participant. As a result, the IMM recommends that the option to specify a minimum dispatch price under the emergency program full option be eliminated and that participating resources receive the hourly real-time LMP less any generation component of their retail rate. The IMM also recommends that the emergency energy only option be eliminated because the opportunity to receive the appropriate energy market incentive is already provided in the economic program.

153. The IMM argues that PJM has failed to show that allowing emergency purchases to set price during an operating reserve shortage will improve security constrained system dispatch. The IMM further asserts that PJM's proposal raises market power concerns involving sellers of emergency power during a reserve shortage event. The IMM notes that PJM's existing rules prevent emergency purchases from setting price and thereby prevent a seller of emergency power from abusing market power during a system emergency. The IMM asserts that removing this provision will create

¹²³ The minimum dispatch price is the LMP specified by an emergency program participant at which it will reduce load when PJM requests load reductions in an emergency.

opportunities for PJM market participants, through third parties or affiliates outside the PJM footprint, to influence price through emergency power sales. Additionally, the IMM argues that since PJM is proposing a cap of \$2,700 per MWh as applicable to these purchases, PJM's \$1,000 per MWh offer cap and three pivotal supplier test will effectively be undermined as a means of mitigating PJM's markets.

154. AEP argues that emergency demand resources permitted to set price should be subject to the same market power review as generation resources. AEP adds that PJM should also subject emergency demand response resources to the three pivotal supplier test, even during shortage conditions, given PJM's proposal to subject generation resources to this test.

155. Intervenors also express concern that emergency demand resources will not be subject to mitigation and may be owned by entities that own other generation resources in the bid stack. Intervenors argue that these circumstances may give rise to market manipulation. PJM Consumers and the Pennsylvania Commission note that several demand resources are controlled and offered into the markets by entities other than load, such as generation owners and aggregators of retail load. PJM Consumers argue that because demand resources are not mitigated, these owners may submit high bids to raise the clearing price and increase the amounts paid to the generation owner's generation resources. The Maryland Commission adds that third-party intermediaries, or aggregators of retail customers, may also have similar incentives. PJM Consumers further argue that emergency purchases not subject to an offer cap should not set the clearing price.

156. EnerNOC, Inc. (EnerNOC) argues that PJM's proposal would require emergency demand response resources to submit bids in energy markets. EnerNOC argues that such a new requirement is untested and undefined. EnerNOC adds that it would not object to a proposal that would permit demand response resources to set the LMP on an optional basis.

157. EnerNOC contends that PJM operators do not actually know how much operational performance can be expected to respond to an event because PJM's emergency demand response program allows compliance to be demonstrated through use of a firm service level (FSL) baseline.¹²⁴ EnerNOC states that the FSL baseline is static and that it does not bear a relationship to the actual dynamic demand response from the customer at the time of a given event. EnerNOC contends that if a customer has substantially reduced consumption, perhaps due to economic conditions, the FSL

¹²⁴ The PJM OATT, at Attachment DD-1, defines firm service level as load management achieved by a customer reducing its load to a pre-determined level upon notification from the provider's market operations center or its agent.

baseline for capacity performance would exceed the amount of actual dynamic demand response that occurs during an emergency demand response event. EnerNOC asserts that no telemetry is currently required, and that data regarding compliance need not be submitted until well after the event. EnerNOC argues that, as such, PJM currently has no operational visibility into how much of dynamic demand response to expect from a dispatch of emergency demand response. EnerNOC argues that PJM should first obtain operational visibility into the operational performance of demand response before requiring these emergency resources to set price during an emergency.

158. Although EnerNOC does not concede to all of the IMM's points, EnerNOC acknowledges the arguments of the IMM that requiring emergency demand response to set price can raise market power concerns and suggests that market power mitigation, based upon marginal costs, may be necessary if demand response is required to set the price in PJM's energy markets. EnerNOC notes that it is exceedingly difficult, perhaps impossible, to determine the true marginal cost of demand response. EnerNOC contends that one of the most significant cost elements to demand response resources is the opportunity cost to the customer deciding to consume less energy and that the opportunity cost to the customers can change from day to day, or hour to hour.

159. PPL argues that PJM's proposal fails to specify the conditions pursuant to which resources, such as emergency demand response resources, will be eligible to set price. PPL, P3, and PSEG Companies (PSEG) seek clarification that emergency demand response resources will be eligible to set price if they are the marginal units called upon to meet demand. Constellation Energy Commodities Group, Inc., *et al.* (Constellation) also seeks clarification about how emergency demand response resources will be permitted to set the market-clearing price during emergencies. Mirant also seeks clarification regarding the ability of emergency resources that set LMPs to provide sufficiently granular locational price signals.

160. Exelon seeks clarification regarding how and when emergency demand response will be permitted to set the LMP in sub-regional transmission-limited regions or in the reserve shortage regions and what data will be relied upon by PJM when emergency demand response does so. P3 seeks clarification regarding the specific operational data needed if these resources are to set price. The Ohio Commission seeks clarification as to how PJM will dispatch emergency demand response when the location within a load zone is important for determining when it will alleviate a transmission constraint.

161. The New Jersey Board and NRECA argue that allowing emergency demand response to set price is not required by Order No. 719. PJM Consumers argue that PJM's proposal fails to demonstrate that a departure from the current rules is necessary or that the proposal is narrowly tailored to meet the needs of the region.

3. PJM's Answer

162. PJM argues that its proposal is consistent with the Commission's policy of allowing emergency demand response to set price during operating reserve shortages. PJM adds that if the LMP is not permitted to reflect the value of the emergency demand response needed to clear the market, the result will be an inefficient price signal.

163. PJM also responds to intervenors' concerns regarding telemetry, metering and communications for demand response resources and how PJM dispatches such resources. PJM argues that its proposal requires curtailment service providers to supply PJM with certain operational information for use by PJM during emergencies. PJM clarifies that, in each zone, the price of emergency demand response will be the capacity-weighted average minimum dispatch price offers of the full-program option emergency demand response resources in the zone. PJM further clarifies that this demand response will be considered to be dispatched at a zonal or sub-zonal aggregate bus, as appropriate for the purpose of setting the price.¹²⁵

164. PJM states that its proposal treats demand response, in a given zone, similarly to a combustion turbine for purposes of dispatch and price setting, i.e., if the emergency demand response resource submits a minimum quantity block offer, it will be considered marginal if any of the MWs are needed to maintain power balance or to resolve a transmission constraint when it is needed for reliability. PJM notes that this proposed approach is similar to the mechanism approved for NYISO, which allows emergency demand response to set price at the reference bus when called upon, even though there is no telemetry equipment in place to measure the demand response action. PJM proposes that these details will be addressed in its business rules.

165. PJM also responds to intervenors' concerns regarding market power. PJM argues that if demand were to exercise market power, the effect would be a price reduction, not a price spike. PJM explains that emergency demand response offers only increase the resources available to PJM to maintain reliability during these periods.

166. On the issue of how or whether to mitigate emergency demand response resources, PJM notes that demand response resources do not have a cost basis to provide the necessary reference point by which offers could be mitigated. PJM states that, instead, these resources can express only a willingness to pay, an intent that will depend, largely, on individual valuations. PJM further notes that some forms of economic demand

¹²⁵ PJM's business rules provide that an emergency action will be issued for specific transmission zone(s), or a subset of a transmission zone, if transmission limitations exist. The specific transmission zone(s) for which such action is initiated first are those where the impact of the load reductions will have the greatest benefit on any binding transmission constraints.

response are already allowed to set price even though they are not subject to offer caps. PJM argues that if an emergency purchase is made that costs more than converting reserves to energy would cost, such a purchase would not be marginal and would not set price. PJM explains that if emergency purchases set price in a particular instance, it will be because they are marginal and more cost effective than converting reserves to energy.

4. Additional Answers

167. The IMM argues that PJM provides no evidence that demand response only occurs at prices above \$1,000 per MWh, and no support as to why demand would be unresponsive at prices below this amount. The IMM notes that most load clears in the day-ahead market and therefore does not pay real-time prices. The IMM further notes that there is a significant amount of actual, as well as potential, demand response at prices of \$1,000 per MWh or less. The IMM argues that the greatest barriers to the development of demand response are not insufficient prices but regulatory barriers that prevent retail customers from being able to see prices. The IMM argues that given the role of RPM in the PJM market, PJM's proposal ignores the fact that the all-in price of electricity during peak demand hours is already well in excess of \$1,000 per MWh.

168. The IMM argues that the PJM criteria used to determine whether a resource can be marginal preclude emergency demand response from setting price. The IMM asserts that PJM cannot measure emergency demand response and that because emergency demand response is not metered, it is not directly dispatchable and specific locations of the response are not known. The IMM concludes that, consequently, emergency demand response should not set price.

169. Rockland and PJM Consumers argue that emergency demand response resources will have the same economic incentives to engage in economic withholding as any supplier. Rockland asserts that an emergency demand response resource could submit a bid above its true cost in order to increase revenues for other supply controlled by the same entity. PJM Consumers state that emergency demand resources and emergency energy purchases are not similarly situated to generation resources under PJM's existing or proposed market design, and therefore should not be allowed to set price in PJM's energy market, due to market power concerns.

170. Rockland argues that PJM has failed to quantify the costs of emergency demand response resources. Rockland further notes that, while NYISO does allow emergency demand response resources to set price, PJM fails to note that NYISO limits dispatch bids for such resources to \$500 per MWh. Rockland proposes a class-wide cap similar to NYISO's if PJM cannot apply unit-specific offer caps.

5. Commission Determination

171. We accept, subject to conditions, PJM's proposal to expand the circumstances in which emergency resources will be eligible to set the market-clearing price during

emergencies. We agree that PJM's proposal appropriately extends PJM's existing rules governing offers of emergency energy.¹²⁶ PJM's proposal is also consistent with the Commission's treatment of demand response resources in NYISO's market.¹²⁷ In addition, PJM's proposal is consistent with Commission precedent supporting the use of marginal pricing models.¹²⁸ When PJM is forced to dispatch resources offering emergency energy, these resources are the least expensive method of resolving the reserve shortage. In that case, it is reasonable to set the market clearing price at the marginal cost of resolving the shortage. We agree with PJM that if emergency purchases cost more than converting reserves to energy, such resources will not be marginal and should not set price.¹²⁹

172. While emergency resources, including emergency purchases will not be subject to a resource-specific offer cap under PJM's proposal, the opportunity for emergency resources to set the market price will only occur if these resources are marginal for maintaining energy balance and reserves and more cost effective than converting reserves to energy.¹³⁰

173. Additionally, by permitting emergency resources to set the market clearing price, PJM's proposal addresses a shortcoming in PJM's existing market design. Not allowing emergency resources to set prices has resulted in increases in uplift and inconsistencies in dispatch and pricing. As PJM explains, reserve prices at \$0 per MWh in the presence of high energy prices, a primary reserve shortage, and a call for emergency load management are not consistent with system conditions or dispatch needs.¹³¹ As the Commission has found, previously, allowing emergency load response resources to set

¹²⁶ As previously explained, PJM's tariff currently permits emergency demand response to set the market clearing price in certain situations. PJM's proposal, by allowing emergency resources to set price up to the energy offer cap, plus the sum of the applicable reserve penalty factors (i.e. a maximum of \$2,700 per MWh by the 2015-16 delivery year), would expand these existing allowances.

¹²⁷ See NYISO/Order No. 719 Compliance Order, 129 FERC ¶ 61,164 at P 50.

¹²⁸ See, e.g., *Pennsylvania-New Jersey-Maryland Interconnection, et al.*, 81 FERC ¶ 61,257 (1997).

¹²⁹ See PJM Answer at 22.

¹³⁰ See ISO-NE/Order No. 719 Compliance Order, 130 FERC ¶ 61,054 at P 88 (recognizing the improved pricing and market efficiencies in permitting emergency purchases to set the market clearing price).

¹³¹ PJM filing, Attachment C (affidavit of Mr. Sotkiewicz) at 11-12.

energy prices provides a valuable complement to operating reserve demand curves and ensures that prices are set efficiently when the ISO or RTO must take emergency actions for reliability purposes.¹³² Accordingly, we find persuasive PJM's argument that not permitting emergency resources to set the market clearing price has the effect of misaligning energy and reserve prices with system conditions and dispatch instructions, thus requiring manual dispatch of resources and out of market payments to maintain reliable system operations. As a result, we find reasonable, with the modifications discussed herein, PJM's proposal to permit emergency resources to set the market clearing price.

174. While PJM's OATT requires PJM to determine that an emergency exists in all or part of the PJM region before these resources are dispatched,¹³³ we agree with intervenors that further details presented in PJM's business rules pertaining to emergency resources must also be in the OATT and Operating Agreement.¹³⁴ Accordingly, we direct PJM to incorporate in its Operating Agreement and OATT its business rules and clarifications addressing the dispatch of emergency load response resources.¹³⁵ While sub-zonal dispatch of resources has occurred only in rare circumstances, the deployment of emergency resources may be more common if supply margins fall.¹³⁶ As a result, efficient-price setting when emergency demand resources are needed to satisfy regional, or sub-regional reliability-needs, will be important.

¹³² NYISO/Order No. 719 Compliance Order, 129 FERC ¶ 61,164 at P 50.

¹³³ See PJM OATT at Attachment K – Appendix, section 1.6.2.

¹³⁴ See “Shortage Pricing: Energy and Ancillary Service Market Business Rules,” March 4, 2010 at: <http://www.pjm.com/~media/committees-groups/working-groups/spwg/20100304/20100304-item-03-shortage-pricing-draft-business-rules.ashx>; and “Proposed DR Dispatch and Operational Reporting Business Rules,” July 5, 2011 at: <http://www.pjm.com/~media/committees-groups/working-groups/spwg/20100304/20100304-item-02-dr-dispatch-business-rules.ashx>.

¹³⁵ See PJM Answer at 18-19.

¹³⁶ On May 26, 2010, PJM declared a load management event in the DC portion of Pepco. This event marked the first time in the history of PJM load response programs that PJM deployed emergency demand resources sub-zonally. See the IMM 2010 State of the Market Report at 131. See also Summary of PJM Initiated Load Management Events at: <http://www.pjm.com/planning/resource-adequacy-planning/~media/planning/res-adeq/load-forecast/alm-history.ashx>.

175. We also find that additional information regarding emergency demand response zonal and sub-zonal dispatch, beyond that provided in the business rules and PJM's answer, must be included in PJM's tariff.¹³⁷ In its answer, PJM states that emergency load response resources will be considered as marginal if any of the MWs are needed to maintain power balance or resolve transmission constraints. PJM states that its approach will allow PJM to deploy emergency load response in zones where it is needed and will ensure that prices are accurately set to reflect the actual system operating conditions. However, it appears that PJM has not changed its tariff to reflect this approach. PJM's tariff currently provides that emergency load response resources will be requested to reduce load *via* web postings, e-mail notification, and a separate all-call telephone message that is sent to all emergency demand response resources.¹³⁸ PJM, however, has not proposed changes to these provisions in its filing. In addition, PJM's shortage pricing business rules provide that PJM will dispatch emergency load response *via* use of an all call telephone message. Accordingly, we require PJM to revise its tariff to detail how PJM will dispatch emergency load response resources by offer price to ensure that LMP is accurate and that only marginal demand response resources set price.

176. Intervenors claim that PJM's proposal lacks specificity regarding which emergency resources will be eligible to set the market-clearing price, and under what circumstances. PJM attempts to clarify this matter in its answer. Specifically, PJM states that it will allow emergency demand response, emergency purchases, and generation from emergency segments of generators already operating in PJM's real-time energy market to set the market clearing price if those resources are the marginal resources needed to clear the market when PJM has implemented emergency procedures. With regard to sub-regional transmission-limited regions, PJM notes that its existing OATT provides that implementation of the emergency load response program can be used for regional emergencies.

177. However, the specific circumstances regarding when emergency demand response can set price are unclear. PJM's proposed business rules on emergency demand response dispatch require curtailment service providers to provide real-time information to PJM during emergencies.¹³⁹ Under these proposed business rules, a curtailment

¹³⁷ We note that PJM has submitted, in a pending proceeding filed in Docket No. ER12-1372-000, proposed revisions to its dispatch procedures for emergency load response resources. In that filing, PJM proposes to remove its currently-effective minimum dispatch price provision.

¹³⁸ See PJM OATT at Attachment K – Appendix (Emergency Load Response Program, Emergency Operations).

¹³⁹ See “Proposed DR Dispatch and Operational Reporting Business Rules,” July 5, 2011, at: <http://www.pjm.com/~media/committees-groups/working->

service provider must provide PJM with data regarding: (i) total load reduction capability; (ii) load reductions that are already in progress or planned for the relevant day; and (iii) the difference between (i) and (ii), in order to indicate the load reductions that are actually available during an emergency. PJM's proposed business rules are unclear, however, on the issue of whether a load reductions that is already in progress can set price or whether, instead, only those load reductions that are still available and able to respond to a PJM notification can set price. We require PJM to identify, in its tariff, which emergency demand response resources can set price and under what circumstances.

178. We next address intervenors' concerns that emergency demand response resources will be able to set the market clearing price while not being subject to offer caps, thus giving rise to potential market power abuses. To this asserted concern, AEP recommends that PJM subject these resources to the three pivotal supplier test. EnerNOC agrees that permitting emergency demand response resources to set the price in energy markets is inappropriate. We reject these arguments as outside the scope of this proceeding, as PJM's currently effective tariff already allows these resources to set the market clearing price.

179. EnerNOC argues that the PJM proposal would require that demand response resources submit bids in energy markets that would set the clearing price for the market if the demand response resource is marginal. Under PJM's existing market rules, curtailment service providers specify a strike price (i.e., minimum dispatch price) for full emergency program participants and any shutdown costs during the registration process. Registrations must be submitted one day prior to 10 business days before the start of the delivery year, i.e., by June 1st of each year.¹⁴⁰ We reject EnerNOC's argument that PJM's proposal would require emergency load response to submit bids.¹⁴¹ As discussed above, CSPs already must specify a strike price for full program option participants during the registration process, not on an hourly or daily basis. However, we encourage PJM to investigate the possibility of revising its tariff to allow for emergency load response participants to voluntarily update their resources' strike prices during the delivery year. We believe that these updates would ensure that the most up-

groups/spwg/20100304/20100304-item-02-dr-dispatch-business-rules.ashx.

¹⁴⁰ See PJM's Demand Side Response Overview, PJM State and Member Training Presentation dated February 2012 at 72-74 and 163: <http://www.pjm.com/training/~media/training/core-curriculum/ip-dsr/demand-side-response-training-materials.ashx>.

¹⁴¹ We note that capacity only resources do not submit a strike price for energy, because they do not receive an energy payment.

to-date dispatch prices are provided to PJM, therefore increasing the accuracy of prices during emergency and shortage conditions. Such updates would also provide greater flexibility to participants whose strike price is susceptible to change depending on the time of year and demand for energy.

180. With regard to EnerNOC's statement that it would not oppose a ruling directing PJM to modify its tariff to permit demand response resources to set price in energy markets on an optional basis, we find that full program option resources are capacity resources that are required to reduce load when called upon. As stated above, full emergency program participants specify a strike price during the registration process and we encourage PJM, using its stakeholder process, to provide flexibility for participants that elect to modify their strike price.

181. We disagree that emergency demand response must be subjected to market power mitigation screens. PJM's proposal allows for adequate competition that will result in accurate and efficient pricing, as based on the offer prices of marginal resources. PJM's proposal allows for an emergency resource to set price when it is the marginal unit. PJM's joint optimization mechanism will also provide for market price signals to be sent in a least-cost manner. In addition, several categories of resources will be able to set price at LMPs above \$1,000 per MWh (including emergency purchases, emergency demand response, emergency generation, and reserve-to-energy conversions from generation). Thus, PJM's proposal enhances competition during emergencies and creates incentives for emergency resources to provide competitive offers. PJM's proposal will also yield prices that reflect the value of least-cost marginal energy during shortage conditions. In addition, intervenors provide no evidence as to any limitation on participation in the emergency demand response program that could lead to any demand response or curtailment service provider possessing market power. Finally, PJM's proposal is consistent with PJM's existing market design under which energy efficiency, emergency demand response resources, and economic load response resources are exempt from PJM's offer mitigation rules and are not barred from setting the market clearing price.¹⁴²

182. With respect to the market power concerns raised by the IMM, we expect the IMM to continue to monitor this activity and report to the Commission, as necessary. Should the IMM identify evidence of gaming, or other market violations, we expect the IMM to make a referral of the matter to the Commission's Office of Enforcement, pursuant to the IMM's duties under Attachment M of the OATT.¹⁴³ We also note that

¹⁴² RPM Enhancements Order, 129 FERC ¶ 61,081 at PP 30-31.

¹⁴³ See PJM OATT at Attachment M, sections I(1) (Required Notice and Referral to Commission of Suspected Market Violations) and I(2) (Required Referral to Commission of Perceived Market Design Flaws).

PJM periodically posts on its website a report of demand response activity.¹⁴⁴ We expect that PJM's stakeholders will be provided all relevant data allowing for the ongoing discussion and assessment of this issue.

183. We reject, as beyond the scope of this proceeding, the IMM's argument that emergency demand response resources that clear in a PJM capacity auction should not be permitted to sell capacity for which these resources have not paid.¹⁴⁵ PJM's currently effective tariff allows these resources to set the market clearing price, a policy that allows PJM to avoid using a more expensive resource or converting reserves into energy and instituting a shortage penalty factor. In addition, emergency demand response resources that offer to curtail at a minimum dispatch price (i.e., strike price) are being responsive to actions taken to maintain short-term reliability during system emergencies, thereby improving reliability by reducing demand and increasing generation during periods of operating reserve shortage.

184. Intervenors also express concern regarding the lack of telemetry and metering for emergency demand response resources within PJM. However, PJM's proposal to require curtailment service providers to supply certain operational information for use by PJM during emergencies alleviates concerns regarding the telemetry and metering capabilities of resources offering emergency energy. We find that the operational reporting data requirement will allow PJM to determine the amount of load management required to be dispatched during emergency conditions.

185. Mirant and PJM Consumers contend that the lack of telemetry and a specific bus location for emergency resources that will be permitted to set price needs further clarification. Mirant requests clarification regarding the ability of emergency resources that set the market clearing price to provide sufficiently granular locational price signals. As stated above, emergency demand response can already set price in PJM if it is needed to meet demand. Further, we find that using a single load bus in each transmission zone and allowing resources to offer emergency load response will promote efficiency relative to the current market, which can result in inaccurate pricing when emergency resources' prices are not used to set the LMP, even though they are needed to meet system demand.

186. PJM Consumers argue that PJM has failed to support its proposal to continue dispatching emergency demand resources by zone – rather than by discrete resource provider within each zone – and allowing these resources to set price. However,

¹⁴⁴ See PJM's Demand Response webpage at: <http://www.pjm.com/markets-and-operations/demand-response/dr-reference-materials.aspx>.

¹⁴⁵ See *PJM Interconnection, L.L.C.*, 137 FERC ¶ 61,108 (2011).

emergency demand response resources can already set the market clearing price in PJM. As discussed above, however, we require PJM to revise its tariff to explain how its emergency demand response dispatch will result in accurate, least-cost pricing.

187. Finally, we reject intervenors' argument that PJM's emergency demand response resource proposal is beyond the scope of Order No. 719. Allowing emergency demand response resources to set the market clearing price was both discussed and sanctioned by the Commission in Order No. 719 and is already provided for in PJM's currently effective tariff.¹⁴⁶

E. Regulation Service

1. PJM's Proposal

188. PJM proposes to conform the pricing intervals for regulation service with those applicable to its energy and reserves markets. PJM's proposal is summarized above at section II.D of this order. In addition, on March 5, 2012, PJM submitted a compliance filing, in Docket No. ER12-1204-000, in response to the Commission's rules addressing frequency regulation service.¹⁴⁷ This docket is pending.

2. Protests and Comments

189. Comments generally supportive of PJM's proposal were filed by P3, Beacon Power Corporation (Beacon Power) Metropolitan Energy LLC (Met Energy) ENBALA Power Networks (USA), Inc., and the Electric Energy Storage Association.

190. The IMM agrees with PJM that an after the fact, rather than prior to the hour, determination of regulation pricing would provide a more accurate and transparent proposal. However, the IMM argues that PJM's proposal, if implemented, would continue the faulty calculation of opportunity costs based on the lower-of either cost, or price-based offers, rather than the actual dispatch schedule as the reference. The IMM asserts that PJM's proposal also continues to fail to properly account for regulation revenues when providing for make whole balancing operating reserve payments. The IMM also proposes that opportunity costs for regulation resources be calculated by PJM based on LMPs and a resource's actual current dispatch schedule as the reference. The IMM further proposes that all units cleared in the regulation markets be paid the higher of the hourly integrated five minute regulation market-clearing prices or the unit's regulation offer plus \$12 plus the unit-specific opportunity cost and the cost of energy

¹⁴⁶ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 193.

¹⁴⁷ See *Frequency Regulation Compensation in the Organized Wholesale Power Markets*, Order No. 755 FERC Stats. & Regs. ¶ 31,324 (2011).

use incurred. The IMM also proposes to net regulation revenues from make whole balancing operating reserve payments. The IMM argues that its proposal would result in a competitive market outcome, consistent treatment of the opportunity costs across all markets, and consistent treatment of offsets to operating reserves across all markets.

3. PJM's Answer

191. PJM states that intervenors who participate in PJM's regulation market with innovative technologies supported this aspect of the PJM proposal, specifically stating that the revisions to the regulation market provisions were improvements to PJM's current shortage pricing mechanism because they: (i) provide operational flexibility to respond to price signals through a consistent approach with transparent incentives; (ii) correct the aspect of the current mechanism that it believes causes regulation to be undervalued and inefficient; (iii) correct what it perceives as a flaw in the way that regulation is currently priced which results in alternative technologies being paid substantially less than the market value of regulation, thereby eliminating a barrier to the entry of such technologies into the regulation market; and (iv) minimizes uplift payments and sends the correct market signal needed to maintain system reliability. PJM asserts that one intervenor also states there is widespread support for calculating the regulation market clearing price using real-time hourly integrated five minute prices, even among the alternative proposals presented to the stakeholders.

192. PJM points out that the IMM agrees with PJM that an after the fact, rather than prior to the hour, determination of regulation pricing would provide a more accurate and transparent price signal for the regulation market. PJM also argues that the IMM's concerns regarding the design of the regulation market are outside of the scope of Order No. 719 and PJM's filing, because the calculation of opportunity costs on the basis of the lower of cost-based or price-based offers rather than the actual dispatch schedule are not addressed here.¹⁴⁸ PJM requests the Commission direct the IMM to raise its concerns in a PJM stakeholder process.

¹⁴⁸ We note that on March 5, 2012, PJM submitted its filing to comply with Order No. 755's frequency regulation requirements. PJM's proposal retains certain of its calculation provisions for opportunity costs. We also note that at the September 13, 2011, Market Implementation Committee (MIC) meeting, the IMM presented a proposal to modify the calculation of opportunity costs in the regulation market. See PJM's website at: <http://www.pjm.com/~media/committees-groups/committees/mic/20110913/20110914-item-14-definition-of-opportunity-cost.ashx> In the 2011 State of the Market Report, the IMM states that on January 11, 2012, PJM presented to the MIC a recommendation that energy related opportunity cost calculations be standardized across all markets, tariffs, and manuals. The IMM states that if implemented as recommended this would resolve the opportunity cost issue in the

(continued...)

4. Commission Determination

193. We accept PJM's proposal to establish a regulation market clearing price for each regulating hour equal to the average of all five-minute clearing prices calculated during that hour. We agree that, by calculating prices on a five-minute basis, PJM will be able to reduce its system's reliance on hour-ahead forecasts and resource-specific uplift payments. As such, regulation service will be more appropriately valued, which will be especially critical for new technologies that exclusively provide regulation services and may not be eligible for opportunity cost credits paid to traditional generation resources. Also, consistent with Order No. 719, PJM's proposal will help to encourage investment in new technologies and new entry in the regulation market by reflecting the full value of alternative regulation resources such as demand response, battery storage and flywheel technology.¹⁴⁹ Further, a five-minute clearing price for regulation resources is consistent with price setting for PJM's real-time energy and reserves operations, which we approve here, and thus enhances comparability across these markets.

194. We will not address, here, the IMM's argument that PJM's proposal, if implemented, will continue what the IMM argues is a faulty opportunity cost calculation and an improper accounting for regulation revenues when providing for make whole balancing operating reserve payments. We agree with PJM that these issues are beyond the scope of Order No. 719. We find that the appropriate forum to consider this issue is the on-going discussion in the PJM stakeholder process. We note that PJM and the IMM, using stakeholder mechanisms, are jointly reviewing potential modifications for the calculation of energy-related opportunity costs across the markets.

F. Whether PJM's Proposal Should Be Required to Address the Occurrence of False Positive Shortage Pricing Events

1. PJM's Proposal

195. PJM's proposed tariff provisions do not address the occurrence of false positive shortage events, i.e., the short-term perception of a shortage that can and will be met by generation and demand response resources as ramp rates increase to meet a sudden

regulation market. On February 17, 2012, a problem statement was approved by the MIC and PJM expects to complete a final report in September 2012 that will include tariff provisions, if any, regarding, among other things, the calculation of opportunity costs in the regulation market. See PJM's website at: <http://www.pjm.com/~media/committees-groups/committees/mic/20120411/20120411-item-05a-opportunity-cost-calculation-examples-presentation.ashx>

¹⁴⁹ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 203.

increase in demand. However, PJM's business rules do address this issue. Specifically, PJM's business rules provide that PJM will utilize a software application to avoid transient conditions that may otherwise cause false positives of reserve shortages and to accurately detect actual shortages.¹⁵⁰ In addition, PJM will signal an operating reserve shortage when an additional software application, known as Intermediate Security Constrained Economic Dispatch (Economic Dispatch Application), indicates a forecasted reserve shortage in three of consecutive 15-minute look-ahead intervals.¹⁵¹

2. Protests and Comments

196. Intervenors argue that PJM's tariff should be revised to address the issue of false positive shortage events.¹⁵² The IMM proposes that PJM be required to relax the reserve constraint for an appropriate interval, i.e., for a pre-set time limit, to prevent the application of its proposed penalty factors in the case of a transient dip in reserves. The Maryland Commission echoes the IMM's concern that there is no clear mechanism that would identify and prevent false positives from being incorporated in PJM's shortage pricing algorithm. The Pennsylvania Commission argues that PJM's pricing proposal also exposes market participants to risks attributable to false positive shortage events and gaming opportunities. The Pennsylvania Commission and the Ohio Commission add that PJM should be required to address this deficiency in its tariff.

3. Answers

198. PJM Consumers support intervenors' arguments and propose that a trigger interval of 90 minutes or more be included in PJM's tariff. P3 proposes that a graduated demand curve be considered allowing low deviations to be ignored if the penalty price falls below a specified level.

¹⁵⁰ PJM's business rules specify that PJM will use this software application, the Generation Control Application, to dispatch energy and ensure adequate primary and synchronized reserves in real-time. This application jointly optimizes these products on a five-minute basis to ensure that all system requirements are met using the least-cost resource.

¹⁵¹ With this application, dispatch and pricing will not occur during a reserve shortage condition unless, subject to certain override contingencies, a reserve shortage has been forecasted to last for at least 45 minutes.

¹⁵² See IMM Protest at 46-47; Maryland Commission Protest at 4-5; Ohio Commission Comments at 27; and Pennsylvania Commission Protest at 29-30.

4. Commission Determination

199. We agree with intervenors that PJM's business rules addressing the occurrence of false positive shortage events should be included in PJM's tariff, given their rate implications.¹⁵³ We therefore direct PJM to include these provisions in its compliance filing. We also direct the IMM to include a review of false positives or actual operating reserve shortage events as part of its quarterly reporting requirement and its annual state of the market report.

G. Whether PJM's Proposal Should Be Required to Include A Must-Offer Requirement

1. PJM's Proposal

200. PJM's pricing proposal does not include a must-offer requirement applicable to synchronized reserves.¹⁵⁴

2. Protests and Comments

201. Intervenors object to PJM's failure to include a must-offer requirement in its pricing proposal.¹⁵⁵ The IMM argues that if prices rise when reserves are short, absent a must-offer obligation, generators may try to trigger shortage pricing by declining to submit offers. The IMM proposes that PJM be required to apply a must-offer requirement for units operating at PJM's discretion, in real-time, and not otherwise assigned *via* the hour-ahead Tier 2 assignment.¹⁵⁶ The IMM asserts that while PJM's synchronized reserves market has functioned up to now without such a requirement, the risk of withholding will be exacerbated under PJM's pricing proposal, given the impact that a reserve shortage will have on energy prices.

¹⁵³ See *Southwest Power Pool, Inc.* 119 FERC ¶ 61,342, at PP 16-17 (2008); *Midwest Independent Transmission System Operator, Inc.*, 125 FERC ¶ 61,318, at PP 90-95 (2008).

¹⁵⁴ The term, synchronized reserves, is explained above. See *supra* note 6.

¹⁵⁵ See IMM Protest at 52-53; Ohio Commission Comments at 25; PJM Consumers Protest at 30-32.

¹⁵⁶ As explained above, Tier 2 resources are synchronized to the grid, but at PJM's direction are operating at a point that deviates from PJM's energy dispatch signals and instructions. Tier 1 resources are offering reserves, but are subject to energy dispatch signals and instructions from PJM. See PJM Operating Agreement at Schedule 1, sections 3.2.3A(b)(i) and (j) (Synchronized Reserves).

3. PJM's Answer

202. PJM explains that effectively, there is a *de facto* must-offer requirement for Tier 1 resources, that is, for on-line resources following economic dispatch that are not fully loaded, and that these resources are already counted toward meeting the synchronized and primary reserve requirements. PJM further explains that Tier 2 resources consist of resources that are: (i) on-line, but are dispatched to an operating point that deviates from economic dispatch; (ii) demand response; and (iii) combustion turbines that can be placed into condensing mode and may be assigned to provide synchronized reserves when there are insufficient Tier 1 resources to meet the synchronized reserves requirement.¹⁵⁷ PJM asserts that Tier 2 resources do not have an implicit or explicit must-offer requirement. PJM argues, however, that the IMM, to date, has expressed no concern regarding the volume of available Tier 2 offers from these or other resources to maintain the synchronized reserve requirement. Moreover, PJM contends that the IMM's 2009 State of the Market Report shows there is sufficient excess supply of Tier 2 offers to meet the synchronized reserves requirements absent any available Tier 1 synchronized reserve.

203. Finally, PJM acknowledges that there is sufficient excess supply of Tier 2 offers to meet the synchronized reserve requirements, as noted in the IMM's 2009 State of the Market Report. PJM states that, nevertheless, it is not opposed to treating all on-line supply resources providing energy as available to provide Tier 1 or Tier 2 synchronized reserves, consistent with PJM's proposed treatment of all off-line resources available to respond within 10 minutes to provide non-synchronized reserves. In PJM's business rules, it requires non-emergency generation resources that are available to provide energy and can start in 10 minutes or less will be considered available for non-synchronized reserves.¹⁵⁸

4. Commission Determination

204. Joint optimization will minimize the opportunity for a supplier to exercise market power. For example, a resource owner that submits high offer prices for reserves can be dispatched for energy, allowing the market to re-dispatch to meet reserve requirements with lower offer resources. Nevertheless, we acknowledge that suppliers could become

¹⁵⁷ We note that, in the event of a reduction in available Tier 1 synchronized reserves, PJM will assign additional Tier 2 synchronized reserves (e.g., hydro-units and/or condensing combustion turbines).

¹⁵⁸ We interpret this to mean that PJM will apply a must-offer requirement for the Tier 2 synchronized reserve market.

pivotal suppliers of contingency reserves and may, in this instance, possess market power.¹⁵⁹

205. Accordingly, given the market concentration identified in the synchronized reserve market, as early as 2002,¹⁶⁰ and PJM's offer to revise its tariff with respect to this issue, we direct PJM to submit, in its compliance filing, provisions requiring that all on-line non-emergency generation resources providing energy are to be considered available to provide Tier 1 or Tier 2 synchronized reserves. We also direct PJM to submit provisions requiring all other non-emergency generation capacity resources to submit offers for either Tier 2 synchronized reserves or non-synchronized reserves, as applicable to the capacity resource's eligibility in these markets, following the issuance of warnings that indicate upcoming shortage conditions. These requirements are consistent with the existing obligation for capacity resources to offer energy from all of their capacity to the PJM day-ahead energy market. We note that a must-offer requirement, when implemented, should not impede resources from exporting energy on a non-firm or recallable basis, i.e., that the must-offer requirement will not operate in manner that requires the resource to sit idle.

H. Whether PJM's Capacity Pricing Rules Properly Account for Shortage Pricing Revenues

1. PJM's Proposal

206. PJM purchases capacity, in its capacity auctions, on a multi-year forward basis. Capacity prices are determined through these forward auctions. To date, PJM has conducted six base residual auctions, which have determined the level of capacity and prices for delivery years 2007-15. PJM's most recent base residual auction was conducted in May 2011 to procure capacity for the 2014-15 delivery year. PJM's capacity auctions rely on the variable resource requirement demand curve to establish the reliability requirement and Net Cost of New Entry for capacity resources in a given delivery year. Under PJM's existing capacity market rules, PJM determines the Net Cost of New Entry by subtracting the Energy & Ancillary Services offset (revenues received by a reference combustion turbine generating station for the previous three calendar years) from the Cost of New Entry (the nominal levelized cost of new entry for a combustion turbine generating station). Currently, the Energy & Ancillary Services

¹⁵⁹ In the 2009 State of the Market Report, the IMM confirms that there are a limited number of suppliers in the synchronized reserves market. *See* IMM 2009 State of the Market Report at 386-387. *See* IMM 2010 State of the Market Report at 454-55.

¹⁶⁰ *PJM Interconnection, L.L.C.*, 101 FERC ¶ 61,115, at PP 8, 15 (2002).

offset is adjusted upward in accordance to any shortage pricing revenues received during the delivery year preceding the base residual auction.

207. In place of adjusting the Energy & Ancillary Services offset by the shortage revenues received only in the prior delivery year, PJM proposes to include shortage revenues received during all previous three years in its Energy & Ancillary Services offset, which is consistent with the way in which PJM accounts for other revenues received by the reference combustion turbine. Thus, the proposed mechanism does not differentiate between shortage revenues and other energy and ancillary service revenues when calculating the Net Cost of New Entry.¹⁶¹

2. Protests and Comments

208. Intervenors raise no objections to PJM's proposed change from a one-year to a three-year averaging of shortage pricing revenues. However, a number of intervenors argue against retaining PJM's existing overall approach to offsetting the Cost of New Entry.

209. The IMM states that under PJM's proposal while the over-collection and over-payment of shortage pricing revenues will occur for individual participants, any offset will occur through adjustments to capacity clearing prices in the specific locational deliverability areas, not participant specific adjustments.¹⁶² The IMM also argues that there is a mismatch between the timing of the shortage event and the impact on the RPM clearing prices. The IMM and DTE Energy state that PJM's approach will cause the energy market shortage mechanism to distort the longer-term price signal provided by the RPM market. The IMM argues that PJM ignores the fact that capacity resources have already been compensated for availability during shortage (and non-shortage) periods while non-RPM resources have not. In addition, the IMM states that the RPM demand curves will not account for shortage revenues that may accrue during an interim period (from the proposed effective date of PJM's filing through May 31, 2015) and that, as such, shortage revenues will not offset capacity.

210. The IMM proposes that PJM's proposed shortage offset mechanism be replaced by an alternative mechanism that would net shortage revenues from RPM payments in the same year.

211. The Pennsylvania Commission proposes that the existing historically-based Energy and Ancillary Services Revenues offset be replaced with a forward-looking

¹⁶¹ See proposed PJM OATT at Attachment DD, section 5.10(B) (vi).

¹⁶² See also EnerNOC Protest at 2; Ohio Commission Comments at 20.

offset. As a transitional measure for the delivery years for which RPM auctions have already been run, the Pennsylvania Commission proposes that capacity sellers be allowed to retain the greater of RPM revenues or shortage revenues for each delivery year, with shortage revenues based on the performance of a reference unit.

212. P3 notes that PJM's proposed Energy and Ancillary Services Revenue offset does not account for day-ahead commitments, a circumstance that would prevent most suppliers from earning shortage revenues. As a solution, P3 proposes that PJM calculate the offset for the reference resource in the same way that avoidable cost rates are calculated for individual units for the purposes of market mitigation. P3 adds that the computation would first consider if the reference resource would have been committed in the day-ahead market. If so, for that day, the relevant prices are from the day ahead market. If the unit is not committed in the day-ahead market, it is evaluated again based on real-time prices.

213. While the Ohio Commission agrees with the IMM that an offset mechanism in the delivery year is needed,¹⁶³ the Ohio Commission believes that an offset should provide incentives to promote behavior that enhances system reliability and efficiency by: (i) rebating shortage revenues to load serving entities based on a fixed ratio, in proportion to their capacity obligations; (ii) incenting non-committed capacity resources and non-capacity resources to perform in real-time and be eligible for shortage pricing; and (iii) discouraging capacity resources from making non-competitive offers in the day-ahead market by not allowing them to retain shortage revenues.

214. PJM Consumers note that PJM's proposal will require that charges to customers not be adjusted to reflect the double payment until, indirectly, they pay relatively lower RPM clearing prices (a payment that does not carry interest and thus does not compensate customers for the time value of their payment).¹⁶⁴ PJM Consumers add that PJM's class of customers does not remain static, thus giving rise to an inter-generational equity concern. DTE Energy adds that shortage pricing charges will not even out over the long run for load serving entities that serve load under contracts with one to three-year terms. The Ohio Commission also notes that there may be no offset for shortage prices for consumers served by Fixed Resource Requirement utilities.

¹⁶³ The Ohio Commission argues that the IMM's proposal to return revenues based on balancing loads could dilute the incentive for consumers to respond to shortage prices.

¹⁶⁴ See also DTE Energy Comments at 13; Ohio Commission Comments at 19-20.

215. Rockland argues that steps should be taken to ensure that capacity resources that have cleared in the RPM Base Residual Auctions for the 2011-12, 2012-13, and 2013-14 delivery years will not receive excessive compensation.¹⁶⁵

216. The New Jersey Board argues that PJM's offset mechanism may deter new entry investments to the extent it reduces capacity revenues for new entrants that did not benefit from the initial shortage payment.

217. PPL argues that basing the Energy and Ancillary Services Revenue offset on real-time prices will reduce capacity payments of suppliers that did not receive any shortage revenues because they were committed on a day-ahead basis.¹⁶⁶ P3 explains that, because RPM capacity is required to offer in the day-ahead market and because, in periods of high demand, most supply would be committed in the day-ahead market, most suppliers will not have the opportunity to earn the revenues from PJM's pricing proposal. PJM Consumers assert that PJM's pricing proposal overshoots the "1 in 10" reliability target of RPM because the RPM-calculated procurement target is not adjusted to reflect the operational reality of shortage pricing. PJM Consumers propose that the RPM target MWs be reduced for expected energy brought to bear through shortage pricing through a MW reconciliation mechanism and that the existing one percent adder to the Installed Reserve Margin be removed due to the addition of a new shortage market design.

3. PJM's Answer

218. In its answer, PJM states that its proposed methodology is consistent with the determination of projected energy market revenues for the purposes of determining market seller offer caps in PJM's RPM markets.¹⁶⁷ PJM adds that its proposed methodology is empirically correct, in that data from high peak load days indicates that the reference resource would have been committed in the day-ahead energy market.

219. PJM also disputes intervenors' allegation that shortage pricing revenue duplicates capacity market revenue. PJM responds that these two revenue streams operate in a

¹⁶⁵ Rockland states that, to preserve the incentive for suppliers to provide operating reserves, any adjustment should be the same for all suppliers and should be based on PJM's estimate of the revenues that would be earned by a reference unit, i.e., a generic new entrant.

¹⁶⁶ See also Constellation Comments at 4; PSEG Comments at 11-12.

¹⁶⁷ PJM Answer at 39, (citing PJM OATT at Attachment DD, sections 6.4(a) and 6.8(d)).

complementary manner, not as substitutes. PJM states that its RPM protocols operate to secure capacity and thus to ensure a loss of load expectation of one day in 10 years, but is not designed to prevent reserve shortages or reduce their probability to the same expectation as a loss of load.

220. PJM also responds to the proposal made by DTE Energy and the Pennsylvania Commission, i.e., to eliminate capacity resource's shortage revenues based on revenues from the hypothetical reference resource. PJM argues that this proposal fails to consider that the reference resource's revenue estimate may not equal each resource's actual shortage revenues. PJM adds that, as such, this proposal would force some capacity resources to relinquish shortage revenues that will never have been received.

221. PJM agrees with P3's suggested revision to calculate the Energy and Ancillary Services Revenue offset for the reference resource in the same way avoidable cost rates are calculated for individual units for the purposes of market mitigation. P3 explains that the computation would screen the reference unit for commitment first in the day ahead market, and then in the real-time market if not taken. P3 explains that calculating the adjustment in this manner would not significantly increase the burden on the IMM, and it would ensure that the adjustment operates as intended and not as a penalty on suppliers whose offers clear in the day-ahead market (typically more efficient generators).¹⁶⁸

222. With regards to treating the shortage revenues differently than Energy and Ancillary Services revenue, PJM explains that the Commission has rejected a discrete change to a single component of a utility's cost of service, because Commission policy does not favor this type of spot adjustment.¹⁶⁹ According to PJM, federal appellate precedent recognizes that wholesale rates should ordinarily be adjusted only upon a comprehensive review of cost-of-service data, on the assumption that overstated estimates of a utility's expenses are almost always accompanied by offsetting understatements.¹⁷⁰ PJM also states that returning shortage payments made by real-time load back to the very same load, as proposed by the IMM, significantly reduces the incentives to engage in demand response because load is held financially harmless, which is antithetical to the encouragement of demand response.

¹⁶⁸ P3 Protest at 24-26.

¹⁶⁹ *Id.* at 46 (citing *Am. Elec. Power Serv. Corp.*, 80 FERC ¶ 63,006 (1997), *aff'd in relevant part*, Opinion No. 440, 88 FERC ¶ 61,141 (1999)).

¹⁷⁰ *Id.* (citing *Carolina Power & Light Co. v. FERC*, 860 F.2d 1097, 1102 (D.C. Cir 1988)); *see also Villages of Chatham v. FERC*, 662 F.2d 23, 34-35 (D.C. Cir. 1981); *Ariz. Pub. Serv. Co.*, 21 FERC at p. 65,084.

4. Additional Answers

223. P3 argues that PJM Consumers' allegation that PJM's proposal will deprive consumers of the time value of money ignores the fact that shortage pricing revenues will constitute only a small fraction of suppliers' total Energy and Ancillary Services Revenue offset.

224. The IMM argues that if shortage revenues represented complements, then PJM's true up mechanism would not be required. The IMM believes that the purpose of a true up mechanism is to prevent double recovery of shortage revenues. The IMM asserts that PJM needs to clarify whether it believes that shortage pricing should increase the total revenues received by capacity resources.

225. The IMM states that RPM does account for unexpected conditions because the reserve margin calculations are probabilistic in nature. The IMM states that if reducing the probability of reserve shortages were the goal, then the reserve margin and RPM could be modified accordingly. The IMM adds that any capacity needed in addition to the 20.2 percent reserves is by definition not a capacity resource. According to the IMM, non-RPM resources should get shortage revenues from the energy market mechanism, not the RPM capacity resources that are already paid for.

5. Commission Determination

226. In Order No. 719, the Commission held that “[u]nder all existing capacity market rules, the revenues earned from the sale of energy and ancillary services are accounted for in the calculation of capacity payments so that customers will not be double charged.”¹⁷¹ Thus, the Commission has already found that a mechanism such as the Energy & Ancillary Services offset appropriately accounts for capacity resource shortage revenues.¹⁷² Therefore, consistent with our findings in Order No. 719, this compliance proceeding is not designed to address capacity market issues, and thus the

¹⁷¹ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 201.

¹⁷² On January 30, 2012, the Commission accepted PJM's Energy & Ancillary Services offset proposal to become effective January 31, 2012. In that proceeding, PJM proposed to revise the definition of peak-hour dispatch, in its OATT, to provide that day-ahead revenues will be considered in determining the Energy & Ancillary Services offset. The revised definition provides that, to the extent not committed in the day-ahead energy market, the reference resource will be dispatched in the real-time energy market if economic on a peak-hour basis. In the January 30, 2012 Order, the Commission agreed that PJM's proposal better reflects a capacity resource's actual commitment and will therefore lead to a more accurate calculation of the Net Cost of New Entry.

energy and ancillary service revenue issues raised above are beyond the scope of this proceeding.¹⁷³

I. Additional Issues

1. Force Majeure

227. The Pennsylvania Commission asserts that should circumstances occur that result in the shortage pricing mechanism setting excessively high reserve and energy prices on multiple hours over multiple days, the result may be a significant transfer of wealth from consumers to producers, resulting in a windfall for suppliers. The Pennsylvania Commission therefore proposes a “circuit breaker” provision that would be triggered if the cumulative hours of shortage pricing exceed a given threshold (such as 30 hours over a 10-day period). Alternatively, the Pennsylvania Commission proposes that should PJM prospectively determine that hours of shortage pricing may exceed a certain threshold (for instance, due to an event resulting in the loss of facilities), PJM be required to promptly file with the Commission a description of the recent and/or anticipated circumstances, including an estimate of the potential impact on prices and consumers.

228. The Pennsylvania Commission and PJM Consumers note that PJM’s OATT and Operating Agreement contain provisions to protect generation owners and transmission owners, but not load, from a shortage event. PJM Consumers request that a stakeholder forum be convened to consider the circumstances in which it would be appropriate to limit load’s exposure beyond the current offer cap at the marginal bus and whether it would be appropriate to limit load’s exposure to the generator’s cost-based schedule until the event is resolved. The Pennsylvania Commission states that tariff protections are required that would compensate energy and ancillary services above \$1,000 per MWh cap, based on cost plus an adder instead of setting higher market clearing prices.

229. PJM and P3 defend PJM’s existing provision, which gives PJM the ability to seek Commission approval under FPA section 205 to address emergency circumstances when there is imminent harm to system reliability or imminent severe economic harm to consumers.¹⁷⁴

230. We disagree with the Pennsylvania Commission’s argument that tariff protections are necessary to protect load from lengthy occurrences of shortage pricing. We find that PJM’s proposal permits price caps to rise to accurately reflect the value of energy during reserve shortage periods. As the Commission found in Order No. 719-A, moreover,

¹⁷³ Order No. 719, FERC Stats. & Regs. ¶ 31,292 at P 201.

¹⁷⁴ See PJM OATT at section 9.2(b).

Order No. 719's shortage pricing requirements will not lead to increased price volatility, will not leave consumers unprotected from high prices, and does not remove bid and price caps that are in place to mitigate market power.¹⁷⁵ If shortage conditions continue over multiple hours, that may merely reflect market conditions that require shortage pricing.

231. The Commission further found, in Order No. 719-A, that if higher shortage prices result, in conjunction with the Commission's rule, those prices can be expected to attract investment in both demand response technology and generation by providing opportunities for a higher return on investment – and the entry of over time may lead to lower prices in the long run. Under PJM's proposal, prices reflect the accurate cost of marginal resources needed to provide power and avoid manual load dumps in the PJM region.

232. Additionally, under PJM's proposal, shortage pricing will only be effective when the system is short, with respect to reserves, and the operating reserve demand curve will act to decrease prices once the reserve shortage is mitigated. As a result, we agree with PJM and P3 that section 9.2(b) of the PJM OATT gives PJM the discretion to consult with owners of the transmission grid, the ability to respond to emergency circumstances, and will not require PJM to implement, or rely on, circuit breaker provisions. However, we direct PJM to provide a report to stakeholders starting in April 2013, that analyzes market participants' response to prices exceeding \$1,000/MWh on an annual basis and to review this analysis to determine whether any changes to the synchronized and primary reserve penalty factors are warranted for subsequent delivery years. We direct PJM to include in its compliance filing revisions to its OATT and Operating Agreement to reflect this reporting requirement.

2. Allocating Operating Reserve Shortage Costs

233. Long Island argues that real-time deviations resulting from reductions in load reduce operating reserve shortages and potentially lower locational prices. Long Island asserts that under these circumstances it would be inappropriate to allocate operating reserve shortage costs to such deviations. Long Island notes, however, that PJM's filing fails to address this issue and that the PJM OATT, at Attachment K – Appendix, section 3.2.3(h) is similarly ambiguous.¹⁷⁶ Accordingly Long Island seeks clarification that PJM will not allocate operating reserve shortage costs to entities whose deviations

¹⁷⁵ Order 719-A, FERC Stats. & Regs. ¶ 31,292 at P 95.

¹⁷⁶ The PJM OATT at Attachment K - Appendix, section 3.2.3(h) addresses the cost of operating reserves for the real-time energy market for each operating day and its allocation.

reduce the need for operating reserves. Long Island also seeks clarification that similar netting provisions will be applied to energy sales to load outside the region.¹⁷⁷

234. We disagree with Long Island that PJM's OATT fails to address the allocation of operating reserve shortage costs to entities whose deviations reduce the need for operating reserves. In Order No. 719, the Commission required all RTOs and ISOs to modify their tariffs to eliminate a deviation charge to a buyer in the energy market for taking less electric energy in the real-time market than was scheduled in the day-ahead market during a real-time market period for which the RTO or ISO declares an operating reserve shortage or makes a generic request to reduce load in order to avoid an operating reserve shortage. Subsequently, in the December 18, 2009 Order, the Commission accepted PJM's proposal to eliminate certain deviation charges¹⁷⁸ attributable to an existing or possible operating reserve shortage, subject to our acceptance of PJM's shortage pricing proposal. PJM's tariff provides:

Demand deviations will be assessed by comparing all day-ahead demand transactions at a single transmission zone, hub, or interface against the real-time demand transactions at that same transmission zone, hub, or interface; except that the positive values of demand deviations, as set forth in the PJM Manuals, will not be assessed Operating Reserve charges in the event of an Operating Reserve shortage in real-time or where PJM initiates the request for load reductions in real-time in order to avoid an Operating Reserve shortage as described in this Schedule, section 6A, Scarcity Pricing.[¹⁷⁹]

¹⁷⁷ Long Island proposes that section 3.2.3(h) be amended to include the following additional sub-section:

Deviations in energy sales from the Day-Ahead Energy Market from within the PJM Region to load outside the region will be assessed by comparing all Day-Ahead Energy sales to load outside the region against the real-time energy sales to load outside the region at the same transmission zone, hub or interface except that the deviations resulting from a reduction of MWs for such outside energy sales will not be assessed Operating Reserve charges in the event of an Operating Reserve shortage in real-time or where PJM initiates the request for load reductions in real-time in order to avoid an Operating Reserve shortage.

¹⁷⁸ December 2009 Order, 129 FERC ¶ 61,250 at P 53.

¹⁷⁹ See PJM OATT at Attachment K – Appendix, section 3.2.3(h)(ii).

235. We find that these provisions clearly provide that a demand deviation that results in a day-ahead quantity that is greater than a real-time quantity will not be assessed operating reserve charges during an operating reserve shortage. Further, we reject, as beyond the scope of this filing, Long Island's request for clarification regarding netting provisions applied to energy sales to load outside the region.

3. Filing Rights

236. The IMM argues that the failure of PJM's shortage pricing proposal to secure a two-thirds supermajority approval from PJM's stakeholders barred PJM from submitting, for Commission review, those portions of its filing that were not required by Order No. 719. The IMM alleges, in this regard, that portions of PJM's filing are beyond the scope of Order No. 719.

In Order No. 719, the Commission required RTOs and ISOs to reform their existing market rules, or demonstrate the ability of their existing market rules, to ensure that the market price for energy reflects the value of energy during an operating reserve shortage. Therefore, this filing was not a section 205 filing subject to the supermajority provisions of PJM's tariff, but was made in compliance to the Commission's order. While Order No. 719 also required RTOs and ISOs to consult with their stakeholders in the preparation of their compliance filings, it did not require that such filings receive stakeholder approval. For the reasons outlined elsewhere in this order, we have determined that PJM's compliance filing has, or will, satisfy these requirements, subject to conditions.

4. Price Responsive Demand

237. The Ohio Commission requests that the Commission address, in this proceeding, issues relating to price responsive demand, an initiative that PJM's stakeholders have considered that would require dynamic retail rates and supervisory controls to cut demand to agreed upon firm service levels in the event of a system emergency.¹⁸⁰ Given the Commission's pending consideration of these issues in Docket No. ER11-4628-000, we will not address these issues here.

¹⁸⁰ PJM submitted its proposals addressing these issues on September 23, 2011, in Docket No. ER11-4628-000. See *PJM Interconnection, L.L.C.*, 137 FERC ¶ 61,204, at P 3 (2011) (order accepting and suspending proposed tariff changes, subject to refund and the outcome of a staff technical conference). On February 14, 2012, Staff held a technical conference with comments due on February 29, 2012. This docket is pending.

5. Seams Issues

238. The Indiana Commission asserts that seams issues should be considered and resolved prior to implementing PJM's pricing proposal. The Indiana Commission argues that the PJM proposal greatly increases the differences between it and other RTOs and may encourage utilities with generation resources to transfer to PJM in order to benefit from the much higher prices during times of shortages, having an increasingly destabilizing effect on multiple RTOs. The Indiana Commission contends that, as recent cases seeking withdrawal from MISO to PJM demonstrate, this matter has broad regional implications that extend well beyond PJM. Moreover, the Indiana Commission argues that the issues of short and long-term shortage pricing (i.e., capacity markets) are integral to all other aspects of planning and resource adequacy. The Indiana Commission adds that if there are persistent and significant differences in short or long-term capacity prices among RTOs, this must be the result of a market flaw or a seams issue.

239. We find that PJM's proposed pricing reforms are necessary to comply with our finding in Order No. 719 that existing 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.¹⁸¹ As to the potential that utilities may want to switch to PJM because of the incentives provided by PJM's shortage pricing proposal, we note that all RTOs are required to implement shortage pricing proposals that are just and reasonable, a shared obligation which we expect will mitigate any such incentive. Whenever utilities seek to join or leave an RTO, for whatever reason, the Commission evaluates the justness and reasonableness of such proposals.¹⁸² We are not persuaded that shortage pricing, considered alone, will give rise to such a proposal, or that we should further modify PJM scarcity pricing proposal to address such a contingency.

6. Recallability

240. The IMM argues that PJM's proposal fails to address the recallability of capacity resources during an emergency, thereby failing to ensure that a key obligation of capacity resources is enforced when it is most critical to the operation of the market. PJM notes in its answer that when it calls for Maximum Emergency Generation, the PJM dispatcher recalls off-system capacity sales that are recallable (network resources).¹⁸³ As the IMM acknowledges in a December 2011 memorandum, PJM rules

¹⁸¹ Order No. 719, FERC Stats. & Regs. ¶ 31,281 at P 192.

¹⁸² See *American Transmission Systems, Inc.*, 129 FERC ¶ 61,249, at P 7 (2009).

¹⁸³ See PJM OATT at Attachment DD, section 5.3. See also PJM Manual 13 at 22.

specify that when a generation owner sells capacity resources from a unit, the seller is contractually obligated to allow PJM to recall the energy generated by that unit if the energy is sold outside of PJM.¹⁸⁴ Further, the IMM acknowledges that this right enables PJM to recall energy exports from capacity resources when it invokes emergency procedures; and the ability to recall establishes a link between capacity and actual delivery of energy when it is needed. For the above reasons, we will not require tariff provisions for recallability.

The Commission orders:

(A) PJM's compliance filing is hereby accepted, subject to conditions, to become effective as of the date of this order, as discussed in the body to this order.

(B) PJM is hereby required to make a compliance filing, within 90 days of the date of this order, as discussed in the body of this order.

(C) PJM is hereby directed to submit, for informational purposes, a status report within 60 days of the occurrence of a false positive or actual operating reserve shortage, as discussed in the body to this order.

(D) The IMM is hereby directed to include a review in its quarterly reporting requirement and its annual state of the market report regarding the operation of PJM's shortage pricing mechanism, as discussed in the body of this order.

(E) The IMM is hereby directed to include a review of false positive or actual operating reserve shortage events as part of its quarterly reporting requirement and its annual state of the market report, as discussed in the body of this order.

(F) PJM is hereby directed to provide an annual report to stakeholders that analyzes market participants' responses to prices exceeding \$1,000/MWh and to review this analysis to determine whether any changes to the synchronized and primary reserve penalty factors are warranted for subsequent delivery years.

¹⁸⁴ See IMM Memorandum, "Obligations of Generation Capacity Resources," dated December 12, 2011 at: http://www.monitoringanalytics.com/reports/Presentations/2011/IMM_MIC_Obligations_of_Generation_Capacity_Resources_20111212.pdf.

By the Commission.

(S E A L)

Nathaniel J. Davis, Sr.,
Deputy Secretary.

Appendix
List of Intervenors
ER09-1063-004

AB Energy NE, Pty. Ltd. (AB Energy) *
American Electric Power Service Corporation (AEP) *
American Public Power Association (APPA) *
Beacon Power Corporation (Beacon Power) *
Calpine Corporation
Commonwealth Chesapeake Company LLC
Consolidated Edison Energy, Inc.
Constellation Energy Commodities Group, Inc.,
Constellation NewEnergy, Inc., and Constellation
Power Source Generation, Inc. (Constellation)
DC Energy, LLC (DC Energy) *
Delaware Public Service Commission
DTE Energy Trading, Inc. (DTE Energy) *
Duquesne Light Company
Edison Mission Energy, *et al.*
EnerNOC, Inc. (EnerNOC) *
Electric Power Supply Association (EPSA) *

Enbala Power Networks (USA), Inc. (Enbala) *
Exelon Corporation (Exelon) *
FirstEnergy Companies (FirstEnergy) *
Illinois Commerce Commission *
Indiana Office of Utility Consumer Counselor
Indiana Utility Regulatory Commission
Long Island Power Authority and LIPA (Long Island) *
Macquarie Energy LLC
Metropolitan Energy LLC (Met Energy)
Mirant Companies (Mirant) *
Monitoring Analytics, LLC, acting in its capacity as the
Independent Market Monitor for PJM (IMM) *
National Rural Electric Cooperative Association (NRECA) *
New Jersey Board of Public Utilities (New Jersey Board) *
Northern Virginia Electric Cooperative, Inc.
EC, et al.
PJM Consumers (Allegheny Elec. Coop., Inc.; American Mun.
Power, Inc.; ArcelorMittal USA, Inc; Blue Ridge Power
Agency; Borough of Chambersburg, PA; Delaware Division
of the Pub. Advocate; Duquesne Light Co.; MD Office of

the People's Counsel; NJ Division of Rate Counsel; NC Elec. Membership Corp.; Office of the People's Counsel for the Dist. Of Columbia; Old Dominion Elec. Coop; PA Office of Consumer Advocate; PJM Industrial Customer Coalition; Portland Cement Ass'n; Pub. Power Ass'n of NJ; and So. MD Elec. Coop., Inc.)*

PJM Power Providers Group (P3) *

Public Service Commission of Maryland

Pennsylvania Public Utility Commission (Pennsylvania Commission) *

PSEG Companies (PSEG) *

PPL Parties (PPL) *

Public Utilities Commission of Ohio (Ohio Commission) *

Rockland Electric Company (Rockland) *

SESCO Enterprises LLC, Black Oak Energy, LLC, Coaltrain Energy LP, CAM Energy, LLC, JPTC, LLC, West Oaks Energy, LLC, Red WolfEnergy Trading Co., Twin Cities Power, LLC, City Power Marketing, LLC, and Dyon, LLC (SESCO, *et al.*) *

* Intervenors submitting comments and/or protests