

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

Energy Storage Association)	
)	
v.)	Docket No. EL17-64-000
)	
PJM Interconnection, L.L.C.)	
)	

**ANSWER TO MOTION TO CONSOLIDATE AND
MOTION FOR LEAVE TO ANSWER AND ANSWER OF
ENERGY STORAGE ASSOCIATION**

Pursuant to Rules 212 and 213 of the Federal Energy Regulatory Commission’s (“FERC” or “Commission”) Rules of Practice and Procedure,¹ the Energy Storage Association (“ESA”)² hereby submits this Answer to Motion to Consolidate and Motion for Leave to Answer and Answer, in response to: (i) the Motion to Consolidate filed by PJM Interconnection L.L.C. (“PJM”) on May 15, 2017 (“Motion to Consolidate”); (ii) the Answer filed by PJM on May 15, 2017 (“PJM Answer”); and (iii) the Comments filed by the Independent Market Monitor (“IMM”) on May 25, 2017 (“IMM Comments”). Each of the foregoing pleadings was filed in Docket No. EL17-64-000 and Docket No. EL17-65-000.

I. MOTION FOR LEAVE TO ANSWER

Although the Commission’s Rules do not permit answers to answers or protests as a matter of right, the Commission routinely allows such answers where they will aid the

¹ 18 C.F.R. §§ 385.212 and 385.213.

² This filing represents the opinions of the ESA rather than those of individual association members.

Commission's decision-making process, clarify the issues before the Commission, or assure a complete record in the proceeding.³ Accepting this answer will aid the Commission's decision-making process by addressing and correcting errors and omissions in the PJM Answer and IMM Comments. Moreover, accepting the answer will promote administrative efficiency by allowing ESA to address the Motion to Consolidate filed by PJM in a single pleading.⁴ ESA thus respectfully requests the Commission grant this motion for leave to answer.

II. ANSWER

Through its Complaint, ESA requests that the Commission direct PJM to comply with the filing requirements of the Federal Power Act by submitting revisions to the Tariff or Operating Agreement⁵ setting forth the methodology by which PJM calculates the benefits factor used in clearing resources in the Regulation market and the parameters governing the design of the dynamic Regulation ("RegD") signal. The concerns underlying this request were stated clearly: the various changes to the Regulation market implemented by PJM without Commission review are resulting in limited-energy RegD resources being called upon to operate at full raise or full lower position for extended periods of time. These changes have fundamentally altered the Regulation product for RegD resources, significantly affecting the rates, terms, and conditions of Regulation service. In response, PJM freely admits that Regulation resources are frequently

³ See, e.g., *E.ON U.S. LLC*, 134 FERC ¶ 61,167, at P 7 (2011); *EnerNOC, Inc.*, 134 FERC ¶ 61,158, at P 15 (2011); *Cal. Indep. Sys. Operator, Corp.*, 134 FERC ¶ 61,140, at P 4 (2011); *Transcon. Gas Pipe Line Co.*, 130 FERC ¶ 61,019, at P 9 (2010); *Pac. Interstate Transmission Co.*, 85 FERC ¶ 61,378, at 62,443 (1998), *order on reh'g*, 89 FERC ¶ 61,246 (1999).

⁴ Under Rule 213, answers to motions must be filed within 15 days unless otherwise ordered. See 18 C.F.R. § 385.213(a)(3). ESA is responding to PJM's Motion to Consolidate as part of this answer given the overlap in issues raised in the Motion to Consolidate and the PJM Answer. Moreover, the issues raised in the PJM Answer also overlap with issues raised in the IMM Comments, which were filed after the comment period closed. To address these overlapping issues in a single pleading, ESA is responding slightly beyond the customary 15-day answer period as applied to the PJM filing, and requests leave of the Commission to accept this answer under Rule 213.

⁵ Capitalized terms not otherwise defined herein have the meaning given in the Complaint.

pegged under the new Regulation signal, but argues that the pegging activity is not as severe as ESA claims. Putting this quibbling over how to define the duration of a pegging event aside, PJM never answers the fundamental question posed in the Complaint: why is there a clear pattern of PJM dispatching Regulation resources to absorb or provide energy for long periods of time, however defined, on an almost daily basis?

Instead, PJM dedicates most of its answer to presenting an incomplete or inaccurate picture of the facts and circumstances giving rise to the December 2015 Benefits Factor Change, December 2015 Cap, and January 2017 Signal Change challenged in the ESA Complaint. PJM mischaracterizes the proper use of Regulation resources in order to conclude that its dispatching of RegD resources is appropriate. PJM misrepresents ESA's position in the stakeholder process in order to present its changes to the Regulation market as unopposed. PJM incorrectly describes the contents of the Tariff and Operating Agreement in order to conclude that the performance requirements for Regulation resources are sufficiently documented. PJM warns of immediate reliability impacts that are contradicted by historical performance and its leisurely pace in the stakeholder process. PJM overstates the nature of the analysis performed in support of its market rule changes. And PJM misrepresents the harm to ESA members from implementation of those changes.

In the end, however, many of the arguments made by PJM, as well as in the IMM Comments, are simply premature. The question for the Commission is whether the various changes implemented by PJM in the Regulation market need to be reflected in the Tariff or Operating Agreement. Answering this question in the affirmative does not stop PJM from seeking to implement those changes – it merely makes them subject to Commission review. While ESA questions whether PJM will be able to adequately justify the changes upon

Commission review, as discussed below, that only supports granting the Complaint to ensure that the rates, terms and conditions of jurisdictional services are just and reasonable and not unduly discriminatory. With this framework in mind, ESA addresses the various arguments raised in the PJM Answer and IMM Comments.

A. PJM’S “FACTUAL BACKGROUND” IS INCOMPLETE

i. PJM Mischaracterizes the Regulation Product and the Proper Use of Regulation Resources

PJM begins its answer by purporting to provide “a complete factual record” regarding the purposes of its Regulation market and the circumstances that gave rise to the December 2015 Benefits Factor Change, December 2015 Cap, and January 2017 Signal Change.⁶ In opening its discussion, PJM quotes a study prepared for the Department of Energy (“DOE”) indicating that “[r]egulation is the variable amount of energy ‘under automatic generation control [(‘AGC’)] [sic] that can respond rapidly to system-operator requests for up and down movements.’”⁷ PJM fails to acknowledge, however, the actual details provided in the DOE study regarding the features of regulation service that are essential to understanding the concerns leading ESA to file the Complaint. The DOE report defines regulation service as the use of power sources “to track the minute-to-minute fluctuations in system load and to correct for unintended fluctuations in generator output to comply with [reliability standards].”⁸ That is, regulation service is not designed or intended to provide bulk energy over long periods of time, which instead is properly

⁶ PJM Answer at pg. 4. While the IMM Comments also discuss the procedural history of the various changes implemented by PJM in the Regulation market, the IMM does not address the nature of Regulation service or the proper use of Regulation resources within an operating hour.

⁷ PJM Answer at pg. 5 (quoting BRENDAN J. KIRBY, FREQUENCY REGULATION BASICS AND TRENDS, at pg. 3 (Dec. 2004) (prepared for the U.S. Department of Energy) (available at http://www.consultkirby.com/files/TM2004-291_Frequency_Regulation_Basics_and_Trends.pdf) (“Kirby Report”).

⁸ Kirby Report at p. 3.

the function of the energy market.⁹ Regulation, the report makes clear, is a “zero-energy service”¹⁰ whose patterns are “[r]andom and uncorrelated.”¹¹ The following figures from the DOE report visually illustrate that regulation is not a long-duration balancing service:

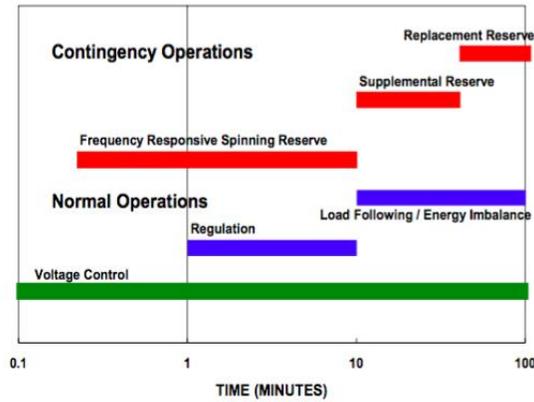


Fig. 3. The response time frame distinguishes ancillary services.

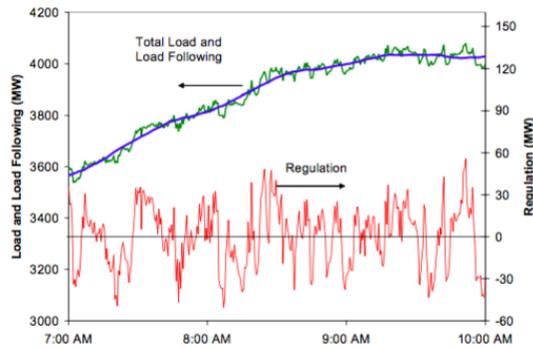


Fig. 4. Regulation is a zero-energy service that compensates for minute-to-minute fluctuations in total system load and uncontrolled generation.

The ESA Complaint extensively documents how PJM’s use of Regulation resources violates the foregoing principles by routinely leaning on Regulation resources to address long-duration imbalances in the energy market, referred to as “pegging.”¹² In response, PJM states that it operates Regulation resources “based on the megawatt capability they offer into the market, and the new RegD signal now fully utilizes the RegD resource’s offered capability. This can, at times, require RegD resources to operate at a full raise or full lower position (i.e., pegging) when needed for [Area Control Error (“ACE”)] control or RegD signal energy management.”¹³ PJM fails to address, however, the fundamental question of why its management of the energy market causes it to frequently call upon Regulation resources to

⁹ *Id.* at p. 5.

¹⁰ *Id.* at p. 5 and 19.

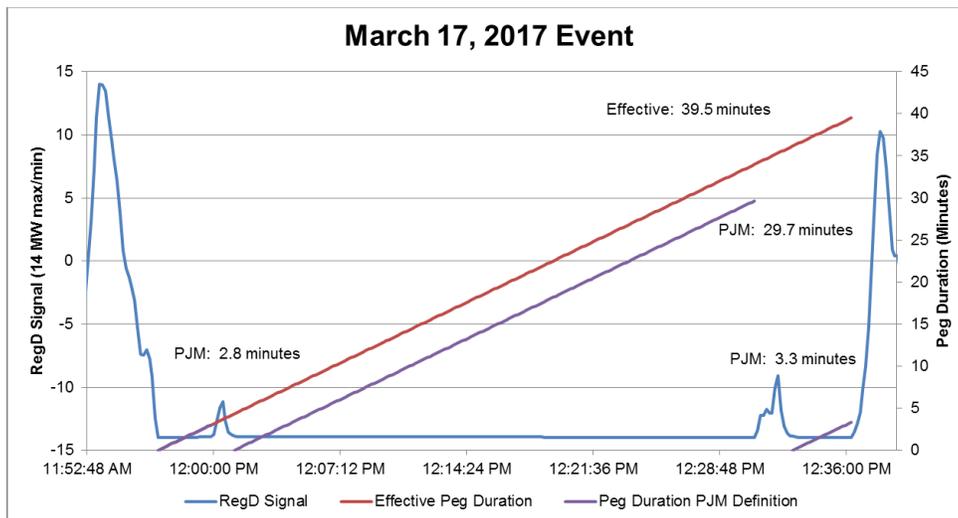
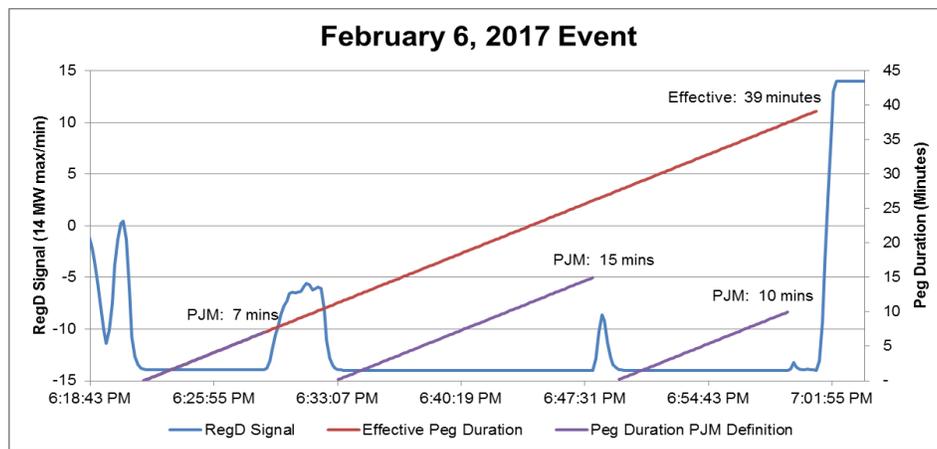
¹¹ *Id.* at p. 6.

¹² *See, e.g.*, ESA Complaint at p. 15-18; *id.* at Attachment 1, Affidavit of Alan Smith, CFA, P.E., at P 10-16 (“Smith Affidavit”).

¹³ PJM Answer at p. 27 (footnote omitted).

absorb or provide energy for up to an hour at a time.

Instead, PJM takes issue with “the expansive definition of pegging advocated by ESA.”¹⁴ Under PJM’s view of pegging, RegD resources must be dispatched at a full raise or full lower position for a continuous uninterrupted period. This means that events such as those that occurred on February 6 and March 17, 2017, as shown in the figures below provided in the ESA Complaint, are counted as less than 30 minutes by PJM, implying that longer-duration pegging is less pervasive:¹⁵



¹⁴ *Id.* at pg. 27, n.80.

¹⁵ Smith Affidavit at P 11.

As these two events show, PJM is managing long-duration imbalances in the energy market by leaning on Regulation resources for long periods of time. By defining pegging events to ignore short-term releases of the RegD signal such as those on February 6 and March 17, PJM obscures the true nature of its operations and minimizes the impact of the market rule changes challenged in the Complaint. ESA emphasizes this point at the outset because it is the core of our disagreement with PJM as to how RegD resources are being impacted by its market rule changes, and the reason why those changes significantly affect the rates, terms and conditions of Regulation service, as discussed below.

ii. PJM Misstates ESA's Position in the Stakeholder Process

PJM fails to fully describe ESA's objections to the December 2015 Benefits Factor Change and December 2015 Cap during the stakeholder process. PJM states that "ESA members, including RESI, did not oppose the changes PJM made to the benefits factor, as evidenced by the fact that the associated changes that were documented in the PJM Manuals were endorsed by PJM's members at the October 22, 2015 Markets and Reliability Committee by acclamation with no objections or abstentions."¹⁶ This is misleading, as ESA had repeatedly raised concerns regarding these changes to the benefits factor and imposition of a cap on RegD clearing during the stakeholder process. ESA representatives participated in PJM Operating Committee meetings regarding the Regulation market beginning in the spring of 2015 and, by August 14, 2015, ESA had become concerned enough to send a letter to PJM management¹⁷ arguing that PJM's changes were "an arbitrary limitation on RegD resources," expressing disappointment with the "unexpected and sudden departure from the regular stakeholder

¹⁶ PJM Answer at p. 11-12; *see also* Hsia Affidavit at P 8-12.

¹⁷ Attached hereto as Exhibit A.

process,” and noting that “PJM staff have not provided the data and analysis used to specify the limitation on RegD resources.” Following this, ESA made a formal presentation at the August 17, 2015 Operating Committee meeting noting that PJM’s proposed solution “appears arbitrary and is not a least-cost solution” and highlighting the need to concurrently address the excessive energy demands made on the Regulation market.¹⁸

The changes implemented by PJM in December 2015 were characterized by PJM as a “provisional solution”¹⁹ and were approved at the same meeting in which the new Regulation Market Issues Senior Task Force (“RMISTF”) was charged with, among other things, evaluating the causes for prolonged Regulation pegging and recommending a replacement for the provisional solution within 6 to 8 months.²⁰ ESA took these assurances at face value. In a good faith attempt to support a solution through the stakeholder process, ESA did not recommend to its members that they formally oppose the December 2015 changes.²¹ It strains reason, however, for PJM to claim “ESA members, including RESI, did not oppose the changes PJM made to the benefits factor.”²²

In any event, after ESA, PJM, and other stakeholders worked for over a year to attempt to develop a consensus solution, PJM announced in November 2016 that it would unilaterally move

¹⁸ *Fast Regulation Performance*, Presentation by ESA to PJM Operating Committee, Aug. 17, 2015, at pg. 2, 4, 6 (August 17, 2015) (available at <http://www.pjm.com/~media/committees-groups/committees/oc/20150817-rpi/20150817-item-04-fast-regulation-performance-stakeholder-proposal.ashx>). This presentation was not recorded in the minutes of the stakeholder meeting. See Regulation Performance Impacts Minutes, Aug. 17, 2015 (available at <http://www.pjm.com/~media/committees-groups/committees/oc/20150908/20150908-rpi-minutes-20150817.ashx>).

¹⁹ *Regulation Performance Impacts*, Presentation of Eric Hsia to PJM Markets & Reliability Committee, Oct. 22, 2015, at pg. 9 (available at <http://www.pjm.com/~media/committees-groups/committees/mrc/20151022/20151022-item-05-regulation-performance-impacts-presentation.ashx>).

²⁰ Charter: Regulation Market Issues Senior Task Force, Oct. 2, 2015 (available at <http://www.pjm.com/~media/committees-groups/task-forces/rmistf/postings/20151102-rmistf-charter.ashx>).

²¹ The ESA is not a PJM member and, therefore, does not vote at PJM meetings.

²² PJM Answer at p. 11.

forward with changes to the Regulation signals and benefits factor.²³ In response to that announcement, ESA again objected that “[t]his allows PJM to materially change the regulation products without FERC review. We believe that this violates the plain language of the Federal Power Act.”²⁴ This did not alter PJM’s plan and, in a final effort to “avoid immediate litigation,”²⁵ ESA offered to temporarily accept the new signal and a loosened cap, provided that PJM commit to including these items in a future Section 205 filing so that they could be addressed by the Commission.²⁶ PJM declined this offer, moving forward with the January 2017 Signal Change without a Section 205 filing and without addressing the underlying causes for prolonged pegging of Regulation resources. Left with no other options, ESA filed the Complaint.

B. PJM’S ACTIONS ARE SUBJECT TO THE FILING REQUIREMENTS OF THE FEDERAL POWER ACT

Through its Complaint, ESA seeks to compel PJM to comply with the filing requirements of the Federal Power Act by submitting for Commission review the methodology by which PJM calculates the benefits factor used in clearing resources in the Regulation market and the parameters governing the design of its RegD signal.²⁷ In response, PJM argues that no rates,

²³ See November Meeting Minutes, RMISTF, Nov. 16, 2016, at Item 4 (available at <http://www.pjm.com/~media/committees-groups/task-forces/rmistf/20161116/20161116-minutes.ashx>); Regulation Market Issues Package/Proposal Matrix, Nov. 16, 2016 (items related to regulation signals and benefits factor “greyed out” to indicate PJM no longer considered them part of stakeholder discussions) (available at <http://www.pjm.com/~media/committees-groups/task-forces/rmistf/20161116/20161116-rmistf-options-packages-matrix-post-meeting.ashx>).

²⁴ ESA Comments on Regulation Market Issues Senior Task Force Proposal, Dec. 8, 2016, at p. 2. (available at <http://www.pjm.com/~media/committees-groups/task-forces/rmistf/20161208/20161208-esa-proposal-executive-summary-draft.ashx>).

²⁵ Comments on PJM Transition Proposal, Presentation by ESA to PJM RMISTF, Dec. 8, 2016, at p. at 4 (available at <http://www.pjm.com/~media/committees-groups/task-forces/rmistf/20161208/20161208-item-02b-esa-transition-plan.ashx>).

²⁶ *Id.*

²⁷ Complaint at 3.

terms or conditions of service have been implicated by any of the changes it has made to the Regulation market and, therefore, PJM's actions are consistent with those filing requirements.²⁸ Specifically, PJM claims that "[a]ll relevant information that significantly impact [sic] the rates, terms and conditions for resources providing Regulation service are enumerated in the Tariff and Operating Agreement,"²⁹ and that the "'performance requirements' for Regulation resources are properly documented in the Tariff and Operating Agreement, with supplemental operational details appropriately contained in the Manuals."³⁰

This is not true. Section 3.2.2 of Schedule 1 to the Operating Agreement (and corresponding section 3.2.2 of Attachment K-Appendix of the Tariff) – the only place in either document addressing the rates, terms and conditions of Regulation service – merely states that "[i]n accordance with the PJM Manuals, the total Regulation market-clearing price shall be calculated by optimizing the dispatch profile to obtain the lowest cost combination set of resources that satisfies the Regulation requirement."³¹ There is no reference to any performance requirements for Regulation resources. Similarly, the performance clearing price tariff provision³² refers to resource dispatch "based on the ratio of control signals calculated by the Office of the Interconnection," with no mention of the requirements actually reflected in those control signals. And while the capability clearing price tariff provision does refer to the benefits factor, it merely states that PJM "shall calculate" the benefits factor in accordance with the

²⁸ PJM Answer at 16.

²⁹ *Id.* at 21.

³⁰ *Id.* at 23 (citing Operating Agreement, Schedule 1, section 3.2.2).

³¹ Operating Agreement, Schedule 1, section 3.2.2(c).

³² *Id.* at section 3.2.2(g).

Manuals.³³ Continuing omission of the actual performance requirements imposed on Regulation resources from the Tariff or Operating Agreement allows PJM to substantially change those requirements, and thus the Regulation product itself, without Commission review – as it did through the changes challenged in the Complaint. This lack of information is striking compared to the detail provided for other services, such as operating reserves.³⁴

PJM nonetheless argues that the benefits factor and Regulation signals are only implementation details of the Regulation market that do not need to be in the Tariff or Operating Agreement and are appropriately left to its Manuals.³⁵ PJM contends that the benefits factor curve reflects the operational relationship between RegA and RegD resources and the Regulation signal reflects the operational needs of the PJM system, and that such operational “detail” and “data” supplements, and need not be set forth in, the Tariff and Operating Agreement.³⁶ The difficulty with this argument is that, as demonstrated above, neither the Tariff nor Operating agreement actually say anything about the requirements imposed on Regulation resources. The Manuals do not merely supplement the Tariff and Operating Agreement in this regard – they entirely replace them. In any event, PJM misunderstands the relief requested in the Complaint, which is for the benefits factor *methodology* and RegD signal *parameters* to be in the tariff. This allows for details regarding the implementation of those methodology and parameters to be in Manuals, as PJM indicates is appropriate.

³³ *Id.* at section 3.2.2(h).

³⁴ *Id.* at 3.2.3(o).

³⁵ PJM Answer at 15 (citing *Midwest Indep. Sys. Operator, Inc.* 124 FERC ¶ 61,183, P 145 (2008) (“MISO”); *California Indep. Sys. Operator*, 122 FERC ¶ 61,271, P 16 (2008) (“CAISO”).

³⁶ PJM Answer at 22.

Indeed, the *CAISO* precedent cited by PJM compels this outcome.³⁷ In that case, the Commission did state a general principle that, as PJM notes, implementation details regarding how an independent system operator (“ISO”) or regional transmission organization (“RTO”) conducts its operations can be left to business manuals.³⁸ But in applying that general principle, the Commission explained that implementation details can be left to business manuals only when the “key provisions of [a] policy are spelled out in the tariff.”³⁹ For this reason, the Commission rejected several of the ISO’s requests to maintain certain requirements in its business manuals instead of the tariff. One particular instance involved a formula used to calculate heat rates used for default energy bids, which the Commission found significantly affects the rates, terms and conditions of service.⁴⁰ Just as a generating unit’s heat rate is central to its energy bid, the benefits factor applied by PJM to RegD resources is central to its Regulation offer. Finally, PJM argues that the January 2017 Signal Change was a dispatch decision that, under Commission precedent, does not require review or approval by either stakeholders or the Commission.⁴¹ PJM first points to *Dominion Resources Services, Inc.*, in which the Commission affirmed PJM’s ability to change its dispatch practice for operating reserves without a tariff filing.⁴² As noted above, however, PJM’s Tariff and Operating Agreement contain specific performance requirements for operating reserves,⁴³ and so the flexibility given to PJM with

³⁷ The *MISO* case cited by PJM involved MISO’s administration of cluster queues within its interconnection process and sheds no light on application of the “rule of reason” in the context of market rule changes affecting the clearing of and compensation for resources in the energy or ancillary services markets.

³⁸ *CAISO* at P 16.

³⁹ *Id.* at P 83.

⁴⁰ *Id.* at P 23.

⁴¹ PJM Answer at 18.

⁴² *Dominion Resources Services, Inc. v. PJM Interconnection, L.L.C.*, 142 FERC ¶ 61,068 (2013).

⁴³ Operating Agreement, Schedule 1, section 3.2.3(o).

respect to dispatch practices was subject to clear limitations set forth in the tariff, again consistent with the *CAISO* precedent. The Tariff and Operating Agreement contain no such limitations (or any substantive requirements) for Regulation service. Similarly, the second case cited by PJM, *Big Sandy Peaker Plant, LLC*,⁴⁴ involved the discretion given to PJM in its tariff “to decide whether a generating resource is capable to reliably provide Tier 1 Synchronized Reserve.”⁴⁵ This case involved PJM’s discretion to determine the threshold eligibility of a resource to provide a service. In the instant case, PJM does not challenge the ability of limited-energy resources to provide Regulation service; instead, it has redefined the Regulation performance requirements in a way that fundamentally altered the Regulation product for RegD resources. In any event, PJM again misses the point in arguing that ESA is challenging its dispatch decisions. ESA understands that PJM has discretion to make dispatch decisions. This is why ESA asked that PJM be required to submit for Commission review the *parameters* governing the RegD signal. PJM describes these parameters in the January White Paper attached to its answer,⁴⁶ and it clearly could submit the parameters as tariff language – it simply does not want to, notwithstanding the IMM’s support for “including as much of the rules in the tariff as possible.”⁴⁷

C. PJM’S JUSTIFICATIONS FOR ITS ACTIONS ARE INADEQUATE AND, IN ANY EVENT, PREMATURE

PJM defends its decision to implement the December 2015 Benefits Factor Change, December 2015 Cap, and January 2017 Signal change on a desire to enhance operational control

⁴⁴ *Big Sandy Peaker Plant, LLC, et al. v. PJM Interconnection, L.L.C.*, 154 FERC ¶ 61,216 (2016).

⁴⁵ *Id.* at P 46.

⁴⁶ Exhibit A, attached to PJM Answer.

⁴⁷ IMM Comments at 9.

in order to maintain reliability.⁴⁸ Even taking this laudable goal at face value, PJM should not be allowed to violate the filing requirements of the Federal Power Act for convenience and then, after the fact, argue the reasonableness of its actions in response to a 206 protest. PJM must place within the Tariff or Operating Agreement the methodology and parameters pursuant to which it procures and dispatches Regulation resources, providing the Commission with its justification for such methodology and parameters. One potential reason for PJM’s failure to do so is that the justifications for its actions do not withstand scrutiny, as discussed below.

i. PJM’s Claim of Reliability Need is not Adequately Supported

PJM contends that the December 2015 Benefits Factor Change, December 2015 Cap, and January 2017 Signal Change “were necessary to properly control ACE and maintain the reliability of the bulk power system.”⁴⁹ Joined by the IMM,⁵⁰ PJM presents a narrative in which a substantial increase in RegD resources exposed flaws in the Regulation signal design, eventually reaching a point where “PJM needed to take more immediate action to protect the reliability of the bulk power system.”⁵¹ PJM warns that the need to implement similar changes in the future may arise so rapidly that it would be “unreasonable”⁵² to apply the filing requirements of the Federal Power Act because doing so would “hamstring”⁵³ PJM’s ability to ensure reliability, potentially leading to damage to generators’ equipment and even blackouts.⁵⁴ The IMM appears to agree, arguing that the changes implemented by PJM were needed to

⁴⁸ PJM Answer at 3 and 14.

⁴⁹ *Id.* at 14.

⁵⁰ IMM Comments at 4-7.

⁵¹ PJM Answer at 10-11.

⁵² *Id.* at 15.

⁵³ *Id.* at 2.

⁵⁴ *Id.* at 15.

maintain system reliability and address operational problems in the Regulation market.⁵⁵

PJM is correct to note that the Commission grants independent system operators (“ISO”) and regional transmission organizations (“RTO”) discretion on certain reliability-related matters.⁵⁶ However, the Commission has made clear that PJM does not deserve deference on every decision once it waives the reliability flag.⁵⁷ In order for PJM to implement disruptive change to existing market structures, it must provide sufficient evidence that its concerns merit the disruption.⁵⁸ PJM’s Answer fails this test: PJM presents no evidence of an actual decline in compliance with reliability metrics associated with the increased penetration of RegD resources.

As PJM explains, Regulation resources are dispatched to control ACE (to supplement redispatch in the energy market, not mentioned by PJM).⁵⁹ The degree to which ACE is controlled is measured by NERC performance metrics, CPS1 and BAAL. Thus, any decline in the quality of Regulation service should have manifested as a decrease in those metrics. As shown in the charts below, however, no decrease in reliability has been observed. The first chart below, from the IMM’s State of the Market Report,⁶⁰ shows PJM’s CPS1 and BAAL scores from 2011 through December 2015, when PJM implemented the cap on RegD. (The downward spike in early 2014 was due to the extreme winter weather during the Polar Vortex that year.) The

⁵⁵ IMM Comments at 9-10.

⁵⁶ *See, e.g.*, PJM Answer, 18, n.58.

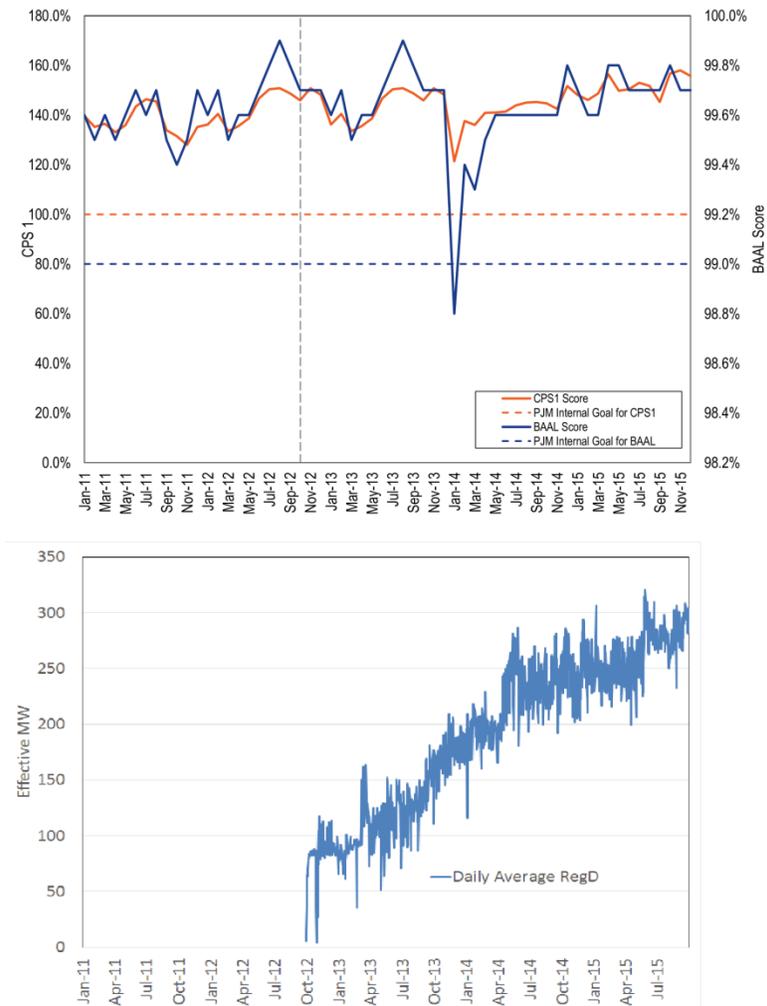
⁵⁷ *See, e.g., PJM Interconnection, L.L.C.*, 147 FERC ¶ 61,108 (2014) (finding that PJM identified a reliability issue regarding speculative capacity market offers that merits consideration while rejecting PJM’s proposed remedy for failing to promote long-term reliability).

⁵⁸ *Id.* at P 73 (“we find that PJM has not provided sufficient evidence that the concerns giving rise to its filing merit this disruptive a proposal”).

⁵⁹ PJM Answer at 2, 7, 11.

⁶⁰ *2015 State of the Market Report for PJM*, Monitoring Analytics, Mar. 10, 2016, at Figure 10-31 (available at http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2015/2015-som-pjm-volume2-sec10.pdf).

second chart, reflecting PJM’s Regulation market data,⁶¹ shows the average amount of RegD clearing daily from the start of the current market design in October 2012 through the imposition of the RegD cap.



Over the entire period PJM claims RegD resources were harming reliability, RegD increased nearly fourfold while BAAL and CPS1 remain unchanged or improved slightly. At all times, the reliability metrics remained well above both PJM’s internal targets and NERC requirements.

⁶¹ Market-Based Regulation: Historical Market Data (available at <http://www.pjm.com/markets-and-operations/ancillary-services.aspx>).

PJM's claims that their actions taken "were necessary to properly control ACE"⁶² are demonstrably false: the only instance in which PJM has been unable to control ACE involved poor generator performance during the Polar Vortex.

Perhaps in tacit acknowledgement of this, PJM presents no data on ACE or the Commission-approved reliability metrics and, instead, offers counts of "manual moves."⁶³ These manual moves are occasions when operators manually adjust the Regulation signals.⁶⁴ PJM states that manual interventions to correct ACE imbalances "had been caused largely by RegD resources inhibiting ACE control"⁶⁵ in instances "when the RegD signal moved in the opposite direction of ACE control."⁶⁶ As ESA demonstrated in its Complaint, and PJM ignores in its answer,⁶⁷ the underlying reason for the RegD signal moving in the opposition direction of ACE control is because PJM has been consistently leaning on Regulation resources to address long-term imbalances not addressed in (or created by) PJM's management of the its energy market.⁶⁸ PJM should be achieving load and generation balance over the operating hour primarily through its energy market, supplemented by Regulation resources moving frequently within the hour.

⁶² PJM Answer at 14.

⁶³ See Hsia Affidavit at P10.

⁶⁴ PJM Answer at 11.

⁶⁵ *Id.* at 27.

⁶⁶ Hsia Affidavit at P 8.

⁶⁷ Instead of addressing how management of the energy market causes it to lean on Regulation resources, PJM argues that energy neutrality was not mandated by the Commission in Order No. 755. See PJM Answer at 20-21. While this is true, PJM made neutrality an integral part of its Order No. 755 compliance proposal as accepted by the Commission. Moreover, objecting to neutrality over long periods is just another way of PJM saying that it wants the ability to frequently peg Regulation resources for sustained periods of time, which ESA believes is inconsistent with the proper use of those resources.

⁶⁸ These longer term imbalances could be caused by a host of reasons, including those cited by PJM (load forecast error, high system frequency, large schedule changes, or resources running off of their base) as well as other reasons not cited by PJM (such as ramp limitations of RegA resources). Irrespective of the reason for these imbalances, the frequent and sustained pegging of Regulation resources indicates that PJM is not using its energy market to manage longer-term imbalances.

PJM's failure to operate its markets in this way and corresponding use of manual interventions is a matter of resource management, not reliability.

In any event, even had PJM demonstrated a reliability need to implement the changes challenged in the Complaint, it has failed to show how placing the benefits factor methodology and RegD signal parameters in the Tariff or Operating Agreement would impair its ability to address that need. PJM's claims that the filing Section 205 requirements would impede its ability to reliably manage its system assume that some situation might suddenly arise demanding immediate changes to the Regulation market. This is belied by the leisurely pace with which PJM implemented its changes to the Regulation market. PJM first began reexamining the Regulation market design in May 2015.⁶⁹ PJM's characterization of the December 2015 Signal Change and December 2015 Cap, implemented after seven months of consideration, as "immediate action to protect the reliability of the bulk power system"⁷⁰ is somewhat curious. Stakeholders then discussed Regulation market issues for thirteen months before PJM implemented the January 2017 Signal Change. Nothing about this schedule suggests that the 60-day statutory review period of the Federal Power Act would have limited PJM's ability to address any legitimate reliability needs. Moreover, PJM fails to explain how having the benefits factor methodology and RegD signal parameters in the Tariff or Operating Agreement would in fact tie its hands. The ESA's requested relief would not alter the ability of PJM operators to make real-time dispatch decisions or override Regulation signals as necessary and appropriate to ensure reliability.

⁶⁹ PJM Answer at 10.

⁷⁰ *Id.* at 11.

ii. *PJM's Empirical Support for the December 2015 Benefits Factor Change is Inadequate*

ESA acknowledged in the Complaint that the Commission's orders in the Order No. 755 compliance proceedings accepted PJM's proposal to calculate the benefits factor used in clearing RegD resources "in accordance with the PJM Manuals."⁷¹ ESA argued, however, that the December 2015 Benefits Factor Change demonstrates how PJM has abused its authority to update the benefits factor without Commission review, noting the only analysis provided by PJM to support this change was a simulation of a single hour on June 2, 2015 that was unusual in that it had a large ACE excursion.⁷² In response, PJM declares that the December 2015 Benefits Factor Change was based on an uncited "careful analysis."⁷³ The only explanation of this "analysis" is that "PJM performed off-line simulation studies using historical ACE, Regulation performance, and control metric data" that "aided PJM in determining the optimal mix of RegA and RegD resources for a given control standard."⁷⁴ PJM has not directly responded to ESA's evidence that only one hour of performance data was presented, leaving us to conclude that the "off-line simulation studies" referred to are for that single hour on June 2, 2015. PJM's failure to address ESA's concern directly is precisely why PJM should be required to submit the methodology by which it calculates the benefits factor for Commission review.

Attempting to duck the issue, PJM refers to a separate graph of Regulation and ACE data to identify correlations between RegD penetration, manual dispatcher interventions, and RegA

⁷¹ Complaint at 22 (quoting PJM compliance filings in response to Order No. 755).

⁷² *Id.* at 22-23.

⁷³ PJM Answer at 16.

⁷⁴ Hsia Affidavit at P 9. The IMM similarly states that "PJM did exactly the analysis complainants ask for," but cites no materials produced by PJM. IMM Comments at 9.

signal pegging.⁷⁵ PJM states that observed correlations “indicated that the increased RegD megawatts were posing continuing challenges to the system,”⁷⁶ but does not explain how it reached that conclusion from the observed correlations. As discussed above, those “challenges” did not affect PJM’s reliability metrics and have more to do with PJM’s management of the energy market than the performance of Regulation resources. In any event, even assuming a correlation between RegD penetration and RegA signal pegging or manual dispatcher interventions revealed a general need to adjust the benefits factor, it provides no information as to what the specific ratio of exchange between RegD and RegA resources should be. An empirical analysis of RegA and RegD resource performance over a reasonable period of time would be needed – an analysis that has not been provided or even referred to by PJM.⁷⁷

Doubling down on its position, PJM further argues that it has not implemented a cap on RegD resources as claimed by ESA and, instead, used its authority to adjust the benefits factor curve to reflect “that after more than 40% (rather than 62%) of the Effective Regulation Requirement is comprised of RegD resources, PJM would experience a decrease in its ability to control ACE.”⁷⁸ For the subset of “excursion hours” during the morning and afternoon ramps, however, “the Benefits Factor curve was defined at a Benefits Factor of 1 at 26.2%, where PJM would not procure additional RegD resources beyond that point given the observed heightened operational challenges.”⁷⁹ In other words, after the specified number of RegD megawatts are

⁷⁵ Hsia Affidavit at P 10.

⁷⁶ *Id.*

⁷⁷ The PJM Answer also fails to acknowledge that the benefits factor has not been updated to reflect the January 2017 Signal Change. Even if PJM had performed a complete empirical analysis of RegD and RegA performance under the prior Regulation signals, those results would need to be updated to analyze the impact of the January 2017 Signal Change. *See* Complaint at 23.

⁷⁸ PJM Answer at 17.

⁷⁹ *Id.* at 17-18.

cleared during ramp hours, all remaining Regulation megawatts must be acquired from RegA resources. Notwithstanding PJM's objection in this proceeding to calling this a "cap" on RegD procurement, that is how PJM refers to the practice in its Manuals⁸⁰ and how the IMM understands the practice.⁸¹ PJM has therefore not only failed to provide adequate empirical support for its adjustment to the benefits factor curve, but it is then using those adjustments to implement a cap on RegD procurement that violates its Tariff and Operating Agreement.⁸²

The IMM Comments demonstrate a similar lack of empirical analysis supporting an alternative change to the benefits factor. The IMM argues that during the ramp hours in which PJM has capped RegD procurement, the "correct value" of the benefits factor at 26.2% RegD is zero.⁸³ The IMM then "corrects" the benefits factor curve by moving it to the left to connect the upper end and lower ends of the benefits factor range with a straight line, without any reference to engineering analysis, mention of NERC standards, or reliance on actual data. As with PJM's December 2015 Benefits Factor Change, the IMM's proposed benefits factor change must be supported by actual data in order to be justified.

In the end, all of the foregoing arguments offered by PJM and the IMM justifying the changes implemented in the Regulation market put the cart before the horse. The question for the Commission to address is whether those changes significantly affected the rates, terms and conditions of Regulation service. If so, then PJM must seek Commission authorization through revisions to the Tariff or Operating Agreement to implement those changes. PJM and the IMM

⁸⁰ PJM Manual 11, Revision 86, at pg. 77 ("A cap will be implemented at BF = 1 during these [excursion] hours.").

⁸¹ IMM Comments at 12.

⁸² Complaint at pg. 25 (noting that the Tariff and Operating Agreement require PJM to clear a resource with a benefits factor of less than 1 if, after taking into account the resource's benefits factor and historical performance, it is still a lower cost resource).

⁸³ IMM Comments at 12-13.

can present their support for PJM's actions in that proceeding, giving affected parties an opportunity to respond. This proceeding will provide the Commission with the record it needs to determine whether the methodology used to calculate the benefits factor and the parameters of the RegD signal are just and reasonable and not unduly discriminatory.

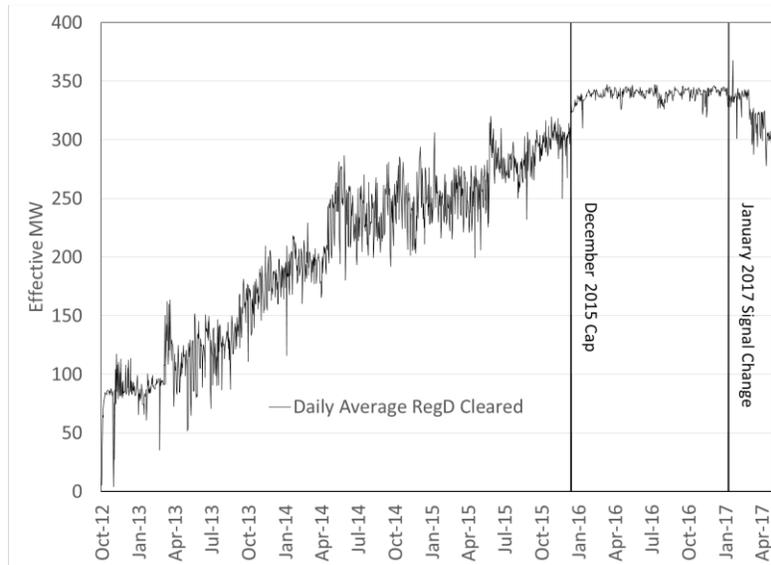
D. PJM MISREPRESENTS THE HARM TO ESA MEMBERS FROM ITS CHANGES TO THE REGULATION MARKET

Seeking to further justify the December 2015 Benefits Factor Change, December 2015 Cap, and January 2017 Signal Change, PJM asserts that the impact of these changes on RegD resources has been minimal, implying that the ESA's objections and requests for relief are unfounded. Again, PJM presents an incomplete and misleading picture of the effect its changes have had on the Regulation market. As documented in the ESA Complaint and below, PJM's actions have materially altered the Regulation market and, therefore, must be reflected in the Tariff or Operating Agreement subject to Commission review and approval.

PJM first misrepresents the total amount of RegD resources historically participating in the Regulation market and thus downplays the impact of the December 2015 Benefits Factor Change and December 2015 Cap. PJM states that, "[a]fter the updates were implemented, PJM did not see a large shift in resources participating in RegD Regulation service"⁸⁴ and that average megawatts of RegD cleared in the market actually increased. The data presented by PJM compares average RegD participation over roughly a year before and after the December 2015 Cap. Because RegD participation grew significantly over the course of 2015, this creates an artificially low baseline for comparison. The graph below, reflecting PJM Regulation market

⁸⁴ Hsia affidavit at P 13 (Table 1).

data,⁸⁵ shows the daily average effective megawatts of RegD cleared over the last several years. Growth in the volume of RegD resources clearing in the market abruptly stopped after the December 2015 Cap⁸⁶ and the effective megawatts of RegD resources cleared has been consistently limited by the cap since its implementation.



While it is technically true that PJM did not see any “large shift” in resources RegD participation after the December 15 Cap was implemented, that is only because the cap was specifically designed to inhibit continued growth.

PJM similarly misconstrues the impact of the January 2017 Signal Change. PJM states that it “has not observed any significant decrease in the amount of RegD resources participating

⁸⁵ PJM Market-Based Regulation: Historical Market Data (available at <http://www.pjm.com/markets-and-operations/ancillary-services.aspx>).

⁸⁶ The increase in the weeks after the December Cap reflects that at least 38MW of storage was already under construction when the cap was put in place and entered service in December 2015. See *Meyersdale Energy Storage*, DOE Global Storage Database (available at <https://www.energystorageexchange.org/AESDB/projects/2018>); *RES Completes Construction of the McHenry Storage Project*, Press Release (available at <http://www.prnewswire.com/news-releases/res-completes-construction-of-the-mchenry-storage-project-300239169.html>).

in the Regulation market since the January 2017 Signal change.”⁸⁷ PJM provides data indicating that RegD performance scores decreased only slightly and that the “Raw” megawatts of cleared RegD resources remained relatively steady, although shifting around somewhat among peak/off-peak hours.⁸⁸ As the graph above clearly shows, however, the megawatts of effective (i.e., performance-adjusted) RegD resources fell after the January 2017 Signal Change was implemented. The “Raw” megawatts figures provided by PJM are prior to adjustment to reflect performance scores and the benefits factor, which both drive actual compensation for RegD resources. The fact that “Raw” megawatts remained relatively unchanged is likely the result of PJM raising the cap on RegD procurement at the same time it implemented the January 2017 Signal Change.⁸⁹ But that higher cap did not offset the negative impacts of the signal change.

PJM nonetheless argues that any RegD resources impacted by the January 2017 Signal Change can simply offer less capability into the market.⁹⁰ This is, in fact, what sellers have been forced to do in response to the signal change.⁹¹ But the fact that sellers have had to derate their facilities in order to continue participating effectively in the Regulation market proves that the changes implemented by PJM have significantly altered the performance requirements of the Regulation product. This supports, rather than undermines, the conclusion that the parameters governing the RegD signal must be set forth in the Tariff or Operating Agreement.

⁸⁷ PJM Answer at 28 (citing Hsia Affidavit at P 28).

⁸⁸ Hsia Affidavit at P 28.

⁸⁹ *Regulation Signal and Requirement Update*, Presentation of Eric Endress to PJM RMISTF, at pg. 3 (January 24, 2017) (available at <http://pjm.com/~media/committees-groups/task-forces/rmistf/20170124/20170124-item-04-signal-implementation-review.ashx>).

⁹⁰ PJM Answer at 27-28.

⁹¹ Smith Affidavit at P 15; ESA Complaint at Attachment 2, Affidavit of Damien Buie at P 10. Similar information was provided in support of a complaint filed by Renewable Energy Systems Americas and Invenegy Storage Development, LLC in Docket No. EL17-65-000 (“RESI Complaint”). See RESI Complaint at Attachment 1, Affidavit of Andrew Oliver, Ph.D at P 7.

Finally, in a related argument PJM objects to ESA's reliance on the Commission's decision in ISO New England's Order No. 755 compliance proceeding with respect to regulations signals allowing limited energy resources to participate effectively in the regulation market.⁹² In that proceeding, the Commission rejected ISO New England's proposal to eliminate a regulation signal that reflected the operational characteristics of limited energy resources, finding that only limited energy resources "would be required to limit the amount of capacity they offer" to avoid penalties for potential non-performance if called on to perform for long periods of time.⁹³ PJM argues that the Commission's decision in that proceeding is irrelevant here because the changes to its Regulation market improved the coordination between the RegA and RegD signals and did not attempt to move to a single Regulation signal.⁹⁴ This again misses the point. Of course PJM was attempting to coordinate its Regulation signals and of course it maintained a separate RegD signal. But the changes implemented by PJM have the same result as the changes rejected in New England: only limited energy RegD resources are required to derate their facilities in order to participate effectively in the Regulation market. PJM has failed to justify why this discriminatory treatment should be accepted in its region when it already has been rejected in another.

E. ESA'S REQUESTED RELIEF IS REASONABLE

PJM is thus left standing on its claim that the requested relief in the Complaint is simply unreasonable. PJM variously claims that ESA demands that PJM "file hundreds of lines of software code,"⁹⁵ that ESA wishes to "lock in" the current Regulation market design,⁹⁶ and that

⁹² PJM Answer at 25 (discussing *ISO New England, Inc.*, 147 FERC ¶ 61,135 (2014) ("*ISO New England*").

⁹³ *ISO New England* at P 26.

⁹⁴ PJM Answer at 25.

⁹⁵ *Id.* at 19.

granting ESA's requested relief would result in needlessly higher rates for consumers.⁹⁷ Each of these claims are unsupported and appear to misunderstand the relief actually requested in the Complaint.

PJM states that, if the Commission were to require PJM to place the parameters governing the design of its RegD signal in the Tariff or Operating Agreement, it would be required to file "hundreds of lines of software code" that would likely require PJM to "violat[e] commercial agreements with outside vendors" that developed the algorithms used by PJM.⁹⁸ PJM does not explain, however, why it would be unable to document the parameters governing the design of the RegD signal without publishing the algorithmic computer code used to implement those parameters. Indeed, as discussed above, PJM already has described these parameters in the January White Paper attached to its answer, so it clearly could provide tariff language setting forth those parameters without violating commercial arrangements.⁹⁹

PJM also argues that ESA is attempting to "'lock in' operational practices that were beneficial to one set of resources."¹⁰⁰ While it is certainly true that ESA has substantive concerns with the changes made by PJM to the Regulation market, as discussed at length in the Complaint and this answer, the actual relief requested by ESA is that PJM be required to submit the benefits factor methodology and RegD signal parameters for Commission review. All this requires PJM to do is justify the changes that are significantly affecting the rates, terms and

⁹⁶ *Id.* at 25.

⁹⁷ *Id.* at 31.

⁹⁸ *Id.* at 19.

⁹⁹ The January White Paper also describes the procedure used to calculate the benefits factor curve, resolving any concerns that the methodology by which the benefits factor curve is defined is reasonably capable of specification. *See* PJM Answer, Attachment at pg. 20-25. Note that PJM has proposed replacing the benefits factor curve with the closely related Rate of Technical Substitution. *See* IMM Comments at 3.

¹⁰⁰ PJM Answer at 27.

conditions of Regulation service, nothing more.

Finally, PJM claims that granting the Complaint would raise costs to consumers, with PJM taking longer to correct for ACE and potentially dispatching additional RegA megawatts.¹⁰¹ PJM provides no indication of how material that cost impact might be, nor acknowledges that its reliance on Regulation resources to absorb or provide energy for up to an hour at a time to manage ACE has its own impact on consumer costs. By leaning on Regulation resources to perform a longer-term balancing function more appropriate for the energy market, PJM is effectively moving money in the form of resource payments between its markets. Whether this is good or bad for consumers is not known, but the effect is undeniable. To the extent the Commission is concerned about the nature or scope of cost impacts associated with PJM's changes to its Regulation market, the Commission should grant rather than deny the Complaint to ensure that those concerns are addressed by PJM in a tariff filing demonstrating the justness and reasonableness of its rates.

III. ANSWER TO MOTION TO CONSOLIDATE

ESA opposes PJM's Motion to Consolidate this proceeding with the RESI Complaint. Although each of the complaints involve overlapping facts, the scope of each complaint is distinct, with the RESI Complaint focusing solely on the January 2017 Signal Change. Moreover, the remedies requested in each complaint are fundamentally distinct. The ESA Complaint seeks to ensure that PJM comply with the filing requirements of the Federal Power Act with respect to changes it has implemented (and may implement in the future) with respect to the Regulation market. The RESI Complaint seeks immediate redress and compensation for

¹⁰¹ *Id.* at 30-31.

discriminatory harm to RegD resources. In light of the distinct remedies sought in each complaint, ESA respectfully requests that the Commission maintain separate proceedings for each complaint, even if the Commission ultimately addresses both complaints in a single order.

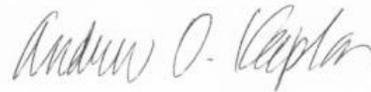
IV. CONCLUSION

For the foregoing reasons, ESA requests that the Commission grant its Complaint and deny PJM's request to consolidate the proceedings.

Respectfully submitted,

ENERGY STORAGE ASSOCIATION

By its attorney,



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Telephone: 617.488.8104

Dated: June 2, 2017

Exhibit A:

August 2015 ESA Letter Objecting to PJM's Proposed RegD Cap



Energy
Storage
Association

1155 15th Street NW | Suite 500 | Washington, DC 20005

August 14, 2015

Mike Bryson
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David Anders
Director, Stakeholder Affairs
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Dear Mr. Bryson and Mr. Anders—

The Energy Storage Association ("ESA") submits this letter to strongly encourage the PJM Operating Committee to offer stakeholders a reasonable opportunity to provide input on its proposal to temporarily limit Fast Response Regulation resources. We support PJM staff's efforts to ensure grid reliability. Given that the impact of this proposal most adversely affects the energy storage industry, which is providing PJM one of the most cost-effective grid technologies, we urge PJM to take the time to work with ESA and its members to improve its proposal.

ESA's over 200 members represent a diverse group of entities, including electric utilities, energy service companies, independent power producers, technology developers -- of advanced batteries, flywheels, thermal and compressed air energy storage, pumped hydro, and supercapacitors -- and component suppliers. ESA's members also include researchers who are committed to advancing the state-of-the-art in energy storage solutions and advanced grid operations.

ESA and its members recognize PJM staff's concern for effective system control and reliability in the Regulation market. ESA agrees that the recent outcomes in the Regulation market are undesirable and do not reflect the intent of the market design. For this reason, ESA is prepared to work closely and diligently with PJM's Operating Committee to modify Fast Response Regulation ("RegD") operations and ameliorate its undesirable consequences with a competitive, transparent, market-based solution.

ESA and its members learned recently that PJM's Operating Committee is expected to propose an arbitrary limitation on RegD resources at its August 17 Regulation

Performance Impacts meeting. We understand that the proposal is offered as a result of the significant narrowing of the scope of the Operating Committee's review of RegD operations. We also understand that the proposal is intended as a temporary adjustment to ensure reliability while the Regulation market design review takes place in the Markets & Reliability Committee. Based on our understanding of PJM staff's proposal--which has not been communicated in writing--the adjustments will effectively cap RegD resources at approximately 130-140 MW. If adopted, PJM staff's proposal would result in significant and lasting suppression of a new, innovative cost-effective resource, contrary to the previous efforts of PJM leadership.

ESA respectfully requests that PJM staff give stakeholders sufficient opportunity to provide input to inform the ultimate proposal, given PJM's changes to the stakeholder process. The narrowing of the Operating Committee's previously established agenda and the quick issuance of this proposal is an unexpected and sudden departure from the regular stakeholder process. PJM staff have not provided the data and analysis used to specify the limitation on RegD resources. Moreover, the decision of PJM staff to present the proposal on very short notice impairs informed decision-making. ESA is preparing helpful input to improve the proposal, and we ask that PJM staff delay issuing its proposal to allow that input.

“As the largest grid operator in North America, PJM considers energy storage vital to the reliable operation of the electric system of the future.”

--PJM President and CEO Terry Boston

Approximately 130 MW of energy storage participates in the RegD market, and an additional 140 MW of energy storage is under construction and expected to come online in 2015 with the aim of participating in the RegD market. In addition to potentially excluding some existing energy storage resources, PJM staff's proposal would effectively deprive projects under construction from market entry. Besides the losses that market participants will suffer, the uncertainty generated by this proposal will stifle future energy storage investment and delay the maturation of a cost-effective resource for grid reliability. Additionally, the nature of the intervention may send a negative message to other ISOs and jurisdictions that are looking to PJM's leadership in energy storage. We strongly suggest that, rather than imposing an arbitrary cap, PJM make economic market adjustments to reduce the amount of RegD products offered into the PJM market.

Ultimately, ESA and its members ask PJM staff to engage the broader set of stakeholders for a longer-term fix. We look forward to working with stakeholders and staff to identify optimal solutions that ensure reliability cost-effectively and maintain PJM's leadership on these important market innovations.

We thank you for your attention to this urgent matter. I encourage you to get in touch.

Sincerely,

A handwritten signature in black ink, appearing to read 'JB', with a long horizontal flourish extending to the right.

Jason Burwen
Policy & Advocacy Director
Energy Storage Association

CERTIFICATE OF SERVICE

I, Anne O'Hanlon, hereby certify that the foregoing Comments were served via electronic mail to the service list.

Dated in Boston, MA this 2nd day of June 2017.

A handwritten signature in blue ink that reads "Anne O'Hanlon". The signature is written in a cursive style and is positioned above a horizontal line.

Anne O'Hanlon, Legal Executive
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