UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	**Docket No.**	**ER18-87-000** **ER18-87-001**

PROTEST OF THE ENERGY STORAGE ASSOCIATION

Pursuant to Sections 211 and 214 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission ("FERC" or the "Commission"), 18 C.F.R. §§ 385.211 and 385.214 and the Commission's Notice of Complaints, the Energy Storage Association ("ESA") hereby protests the Proposed Tariff Revisions to Implement Regulation Market Enhancements ("Proposed Changes") filed in the above-captioned docket by PJM Interconnection, L.L.C. ("PJM") to its Open Access Transmission Tariff ("Tariff") and Amended and Restated Operating Agreement of PJM Interconnection, L.L.C (Operating Agreement). For the reasons set forth below, FERC should reject the proposed revisions to the Tariff and Operating Agreement[1] as deficient in satisfying the filing requirements of the Federal Power Act ("FPA"), unduly discriminatory in its Proposed Changes to settlement, leading to unjust and unreasonable rates, and inconsistent with prior Commission directives to PJM on compliance with Order No. 755.[2]

[1] Given that the revisions to the Tariff and Operating Agreement proposed by PJM are identical, for simplicity ESA refers only to the Tariff changes for the remainder of this pleading. However, objections to revisions in the Tariff apply equally to corresponding revisions in the Operating Agreement.

[2] *Frequency Regulation Compensation in the Organized Wholesale Power Markets*, Order No. 755, FERC Stats. & Regs. ¶ 31,324 (2011), *reh'g denied*, Order No. 755-A, 138 FERC ¶ 61.123 (2012).

I. COMMUNICATIONS

Andrew O. Kaplan
Pierce Atwood LLP
100 Summer Street, Suite 2250
Boston, MA 021.
Phone: 617-488-8104
akaplan@pierceatwood.com

Jason Burwen
Policy and Advocacy Director
Energy Storage Association
1800 M Street, NW
Suite 400S
Washington, DC 20036
Phone: 202-580-6285
j.burwen@energystorage.org

II. MOTION TO INTERVENE

ESA's mission is to promote the development and commercialization of competitive and reliable energy storage delivery systems for use by electricity suppliers and their customers. ESA's membership comprises a diverse group of electric sector stakeholders, including utilities, independent power producers, and manufacturers of advanced technologies -- such as batteries, flywheels, thermal energy storage, compressed air energy storage and supercapacitors. Several ESA member companies develop or operate energy storage facilities in PJM's Regulation[3] market. The instant proceeding is focused on PJM's tariff changes to its Regulation market. Accordingly, ESA will be directly and substantially affected by FERC's decision in this proceeding and its interests cannot be represented adequately by any other entity or party.

[3] Capitalized terms not otherwise defined herein have the meaning specified in the Tariff or Operating Agreement.

III. PROTEST

A. PJM'S FILING FAILS TO SPECIFY MATTERS THAT SIGNIFICANTLY AFFECT RATES AND SERVICES AND IS THEREFORE, DEFICIENT.

In at least two areas, the Proposed Changes fail to adequately specify matters that significantly affect rates and service. These omissions leave the Commission with an insufficient record to determine if the Proposed Changes are just and reasonable pursuant to Section 205[4]. If approved, the omissions in the Proposed Changes will leave Regulation suppliers subject to arbitrary modifications of the terms under which they provide and are compensated for Regulation service at any time, with no guarantee such changes will be subject to Commission or even stakeholder review. For these reasons, the Commission should find the Proposed Changes deficient, and direct PJM to make an updated filing that:

- includes in the Tariff the methodology by which PJM calculates the RRTS Curve[5] and justify the reasonableness of its calculations; and
- includes in the Tariff definitions of the RegA[6] and RegD[7] products, including the obligations of providers, physical requirements of the products, and the parameters governing the RegA and RegD signals; and
- justifies the reasonableness of the January 2017 Changes[8] to the RegA and RegD signals.

Section 205 requires every public utility to file "all rates and charges" and "the classifications, practices, and regulations affecting such rates and charges" for all sales subject to the jurisdiction of the Commission[9]. It further requires that no changes be made to "any such rate, charge, classification, or service, or in any rule, regulation, or contract relating thereto"

[4] 16 U.S.C. § 824 ("Section 205").
[5] Regulation Rate of Technical Substitution, Proposed Changes at 11
[6] Regulation provided according to the traditional regulation signal. *See* Proposed Changes at 4.
[7] Regulation provided according to the dynamic regulation signal. *See* Proposed Changes at 4.
[8] Changes made to the Regulation signals in January 2017. *See* Proposed Changes at 9.
[9] Section 205(c).

without sixty days' notice.[10] As PJM's Regulation service is obviously subject to FERC's jurisdiction, the only open question pertains to what aspects of Regulation service "affect" or "relate to" the rate.

FERC has followed, and the courts upheld, a "rule of reason" approach to this question.[11] The rule of reason allows for Commission discretion[12], but the courts have provided guidance that practices that could significantly affect rates and service[13] are required to be filed, so long as they (1) are reasonably susceptible of specification,[14] and (2) provide enough information for market participants to determine the charges that apply to the market.[15] Details and similar matters may be included in Business Practice Manuals rather than a filed rate, so long as the information contained in Business Practice Manuals "provide[s] further explanation" but does "not significantly affect" any rates required to be filed with the Commission.[16]

1. The RRTS Curve Proposed By PJM Meets FERC's Criteria For A Required Filing.

A key feature of the Proposed Changes is the introduction of a "Regulation Rate of Technical Substitution" curve[17]. In its submittal letter, PJM devotes approximately a dozen pages describing this curve, but the tariff merely states that it "is calculated in accordance with the PJM Manuals."[18] The RRTS curve fails to meet the Commission's criteria for matters that may be regulated to RTO Manuals.

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[10] Section 205(d).
[11] *See* Prior Notice and Filing Requirements Under Part II of the Federal Power Act (1993), Final Order in Docket No. PL93-2-002. ("Filing Requirements Order"), *especially* Appendix at 8*ff.*
[12] *Id.* Appendix at 8.
[13] *Midwest Independent Transmission System Operator, Inc.*, 98 FERC 61,137 at P61,401.
[14] *See Cal. Indep. Sys. Operator Corp.*, 122 FERC ¶ 61,271, at P 16 (2008), citing *City of Cleveland v. FERC*, 773 F.2d 1368, 1376 (D.C. Cir 1985) at 1376
[15] *Southwest Power Pool, Inc*., 112 FERC ¶ 61,303 at P 25 (2005) ("SPP")
[16] *Cal. Indep. Sys. Operator Corp.*, 116 FERC ¶ 61,274 at P 1358 and 1369.
[17] *Proposed Changes* at 11-19.
[18] Proposed Changes, Operating Agreement Section 1. *See also* proposed Changes at 29.

The RRTS curve significantly affects rates. First, the Proposed Changes present the RRTS curve as rescuing the Regulation market from fatal flaws,[19] which is hardly insignificant. Second, the RRTS curve is used to modify the submitted offers of Regulation resources, thus determining which units clear the market.[20] Third, the RRTS curve determines the Regulation Marginal Rate of Technical Substitution ("RMRTS"), which is a direct settlement determinant: payments made to dynamic regulation resources are multiplied by the RMRTS.[21] Thus, the RRTS curve affects nearly every aspect of the regulation market.

The RRTS Curve is also reasonably susceptible to specification. According to PJM, the RRTS curve measures the "operational relationship" between RegA and RegD resources.[22] As the purpose of regulation is to maintain well-defined NERC reliability metrics, such an operational relationship can be precisely specified. While PJM explains how they will derive the RRTS curve,[23] PJM has reported to stakeholders that this derivation is based on an engineering model.[24] Thus, PJM has a well-defined method of determining the RRTS curve, proving it to be susceptible to specification, yet they have left the information out of the tariff.

Finally, the omission of the RRTS curve leaves market participants with insufficient detail to determine the rates that apply to them. The Tariff says nothing regarding the engineering model behind the RRTS curve, and PJM's submittal letter and manuals fail to provide information, instead simply stating that "PJM will perform simulation studies."[25] This leaves market participants entirely in the dark as to how charges for the Regulation market are

[19] *Id.* at 27-29.
[20] *Id. at 14-15 and 33-34*.
[21] *Id. at 22-28*.
[22] *Id.* at 11.
[23] *Id.* at 15-19. *See also* PJM Interconnection, L.L.C., Implementation and Rationale for PJM's Conditional Neutrality Regulation Signals, (Jan. 2017), http://www.pjm.com/~/media/committees-groups/task-forces/rmistf/postings/regulation-market-whitepaper.ashx) ("PJM Regulation Whitepaper")
[24] *Id.* at 15-18.
[25] *Proposed Changes* at 15.

determined. The Proposed Changes do not meet the standard for market transparency set forth in SPP.[26]

Omitting the RRTS curve from the tariff also invites violations of the prior notice requirements of Section 205(c). There is also no assurance that the RRTS curve will not be changed for arbitrary reasons, as previously cited in ESA's complaint in Docket No. EL17-64-000 ("ESA Complaint").[27] Since the RRTS curve determines both which resources clear the Regulation market and how much RegD resources are paid, it amounts to a black box that may spit out nearly *any* market result. If the RRTS curve is specified in PJM Manuals, it may be changed unilaterally at any time, giving the RTO essentially unlimited ability to dictate market outcomes.

2. The Regulation Signals Enacted By PJM Meet FERC's Criteria For A Required Filing and Therefore, Should Be Included in the Proposed Changes.

PJM's Regulation market is based on the distinction between dynamic and traditional regulation resources.[28] However, the Tariff is completely silent on what these two products are. Even the names of the regulation products are undefined in the tariff. Most importantly, nothing on file with the Commission states the obligations or performance requirements of the different types of regulation service.

The physical obligations of a supplier are in themselves a substantial condition of service. The undefined dynamic and traditional regulation signals set the ramping and energy requirements of regulation providers, directly determining if a resource is even capable of

[26] "the tariff must provide enough information for market participants to determine the steps of all the processes….as well as the charges that apply…" *SPP* at 25.
[27] *See* ESA Complaint at 20-27
[28] *See, e.g.,* Proposed Changes at 4-5 and note 12.

providing service. The Tariff describes at length how physical obligations are defined in other markets.[29]

Because the obligations of regulation providers are not on file with the Commission, regulation providers are subject to material changes in their terms of service in violation of FPA 205(d). For example, in January 2017, the RegD product changed from one that generally guaranteed 15-minute energy neutrality to one that made best-effort attempts to achieve 30-minute energy neutrality.[30] These changes had a material impact on ESA members' ability to provide regulation service.[31]

The regulation signals also affect rates through the RRTS curve. The RRTS curve is defined as the engineering relationship between RegA and RegD resources. Changes to the regulation signals thus directly change this curve, potentially dramatically altering the competitive relationship and payments made to different regulation resources.

The regulation signals are reasonably susceptible to specification, and in fact, have already been specified. PJM explains the signals in some detail in their submittal and PJM Regulation whitepaper. These product definitions should be removed from supplementary documents and placed on file with the Commission.

B. PJM'S PROPOSED CHANGES TO REGULATION MARKET SETTLEMENTS LEADS TO UNJUST AND UNREASONABLE RATES AND REMAINS UNDULY DISCRIMINATORY.

As FERC has determined in prior dockets,[32] the Proposed Changes to PJM Tariff and Operating Agreement that insert the Regulation Marginal Rate of Technical Substitution

[29] *See, e.g.*, Tariff Attachment K at Section 1.10.1A(d), Section 3.2(o), Section 6.6
[30] Proposed Changes at 4 and 9-10.
[31] *See* ESA Complaint Attachment 1, *Affidavit of Alan Smith, CFA, P.E.*. *See also* ESA Complaint Attachment 2, *Affidavit of Damien Buie*.
[32] Dockets No. ER12-1204 and ER12-2391.

("RMRTS") into settlement calculations for Regulation resources are unjust, unreasonable, and unduly discriminatory against RegD providers, the majority of which are energy storage resources and ESA Members, as well as a violation of Order No. 755.[33]

PJM proposes changes in two sections of the Tariff to insert the RMRTS into the settlement calculations for Regulation resources (copied and highlighted in red font below). First, PJM proposes to modify subsection (g) of section 3.2.2 of its Tariff and Operating Agreement to replace mileage with the RMRTS in the settlement of Regulation performance.

> The owner of each Regulation resource that actively follows the Office of the Interconnection's Regulation signals and instructions, will be credited for Regulation performance by multiplying the assigned MW(s) by the ~~**performance**~~ Regulation market **performance** clearing price, by the **Regulation Marginal Rate of Technical Substitution** ~~**ratio between the requested mileage for the Regulation dispatch signal assigned to the Regulation resource and the Regulation dispatch signal assigned to traditional resources**~~, and by the Regulation resource's **performance** ~~**accuracy**~~ score calculated in accordance with subsection (**l**~~**k**~~) of this section.

Second, PJM proposes to modify subsection (h) of section 3.2.2 of its Tariff and Operating Agreement to include RMRTS in the settlement of Regulation capability.

> The owner of each Regulation resource that actively follows the Office of the Interconnection's Regulation signals and instructions will be credited for Regulation capability based on the assigned MW and the ~~**capability**~~ Regulation market **capability** clearing price multiplied by the **Regulation Marginal Rate of Technical Substitution, and** the Regulation resource's **performance** ~~**accuracy**~~ score calculated in accordance with subsection (**l**~~**k**~~)

These Proposed Changes still lead to unjust and unreasonable rates, are unduly discriminatory against RegD providers, and are a violation of Order No. 755. PJM proposed similar changes (using the Marginal Benefits Factor instead of the Marginal Rate of Technical

[33] Frequency Regulation Compensation in the Organized Wholesale Power Markets, Order No. 755, 137 FERC 61,064 (2011)

Substitution) in a companion filing to its Order No. 755 compliance filing in 2012,[34] which FERC rejected: "We reject PJM's proposal to include a "marginal benefits factor" in settlement as unjust and unreasonable, unduly discriminatory and a violation of Order No. 755." [35]

1. The Use of RMRTS for Settlement Would Establish Unjust and Unreasonable Rates by Creating Inconsistency Between Clearing, Unit Operations, and Settlement.

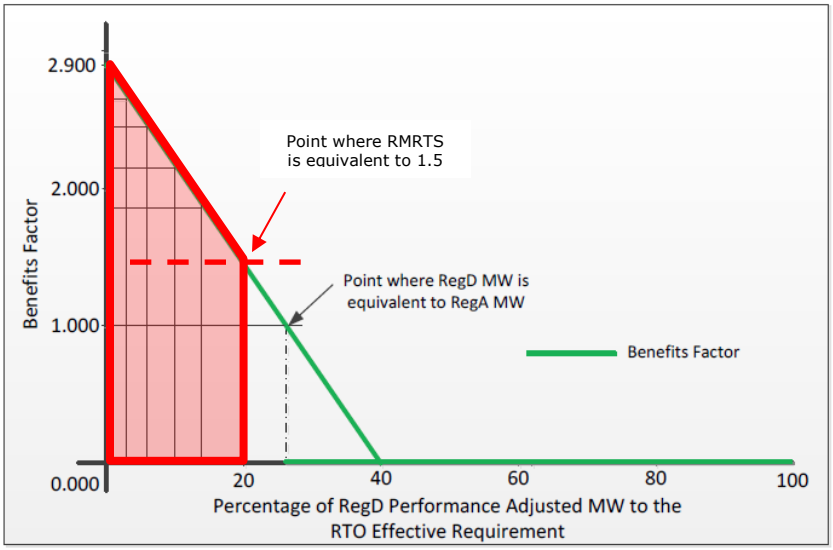
The Proposed Changes fail to appropriately compensate Regulation resources since they do not settle resources consistent with their clearing or operation, despite PJM's claims to the contrary. Doing so systematically understates the amount of RegA resources displaced by RegD, which in turn systematically undervalues RegD relative to RegA and creates unjust and unreasonable rates. PJM's examples obscure this fact.

The inconsistency occurs between how RegD effective MW is calculated to clear the market and how compensation for RegD resources is calculated. PJM's proposal for clearing the Regulation market uses the area under the RRTS Curve to determine the effective MW of each RegD resource and their substitution value for RegA resources; doing so creates a total value of RegA resources displaced by RegD. However, PJM proposes to compensate RegD resources based on the *marginal* value of that RRTS curve (calling it the Regulation Marginal Rate of Technical Substitution, or "RMRTS"), which PJM defines as "the Regulation Rate of Technical Substitution assigned to the last dynamic Regulation resource committed to provide Regulation service in a given hour."[36] As such, the RMRTS value used in settlement is always lower than the RegD effective MW used in market clearing. These aspects of clearing and compensation are therefore inconsistent, and their effect is to produce unjust and unreasonable rates.

[34] PJM Interconnection, L.L.C. filing submitted August 2, 2012 in ER12-2391.
[35] PJM Interconnection, L.L.C., 141 FERC § 61,134, at P 85 (2012). (Order on Compliance issued November 16, 2012, Docket Nos. ER12-1204 and ER12-2391)
[36] Transmittal letter at 29.

ESA presents an illustration of this inconsistency using the current Benefits Factor curve, which is renamed the RRTS curve in PJM's filing and used here for simplicity.[37] According to the Proposed Changes, RegD resources would get cleared and would displace RegA resources according to the large area under the curve bounded on the right by the RMRTS, such as that shaded in red below, while being compensated at the value of the RMRTS, which is the lowest point along the shaded part of the curve. Effectively, PJM clears the market using the entire red-shaded area and is paying resources as though it had only cleared the red-shaded area below the MRTS value (dashed line).

In this example, 160MW of RegD provides equivalent service to 352MW of RegA (the shaded area)—that is, each MW of RegD displaces 2.2MW of RegA. However, the marginal RTS is 1.5, so RegD is compensated at 150% the rate of RegA. The result is RegD being paid only 68% what RegA earns for equivalent service. This is not consistent.



Therefore, all of PJM's examples in its Transmittal letter at 24-27 are misleading. PJM's first example uses a RMRTS of 1.5. Referring to the Benefits Factor curve copied above, a 1

[37] PJM Manual 11: Energy & Ancillary Services Market Operations, 3.2.7 Regulation Market Clearing.

MW RegD resource from a RegD fleet with a RMRTS of 1.5 would equate to ~2.2 effective MW under PJM's proposed rules for clearing (taking the area under the curve highlighted in red above),[38] and would thus displace ~2.2 MW of RegA resources. However, PJM proposes to compensate that 1 MW RegD resource at a value of 1.5 (based on the RMRTS), which is not consistent. PJM's second example uses a RMRTS of 0.5. Referring to the Benefits Factor curve copied above, a 1 MW RegD resource from a RegD fleet with a RMRTS of 1.5 would equate to ~1.7 effective MW.[39] However, PJM proposes to compensate that 1 MW RegD resource at a value of 0.5, which is not consistent.

This inconsistency in the clearing then propagates into the settlement. While PJM claims the new settlement formula results in all resources being paid the same per effective MW,[40] that is false. The $/EffectiveMW values for RegD resources in PJM's examples in its Transmittal letter are overstated, as they use the (lower) RMRTS values in the denominator to calculate the $ earned per effective MW, while they should be using the (higher) effective MW values in the denominator, thus producing a lower $/EffectiveMW.

Referring back to PJM's first example that uses a RMRTS of 1.5, there is a 1 MW RegD resource that would be counted as ~2.2 effective MW. Its compensation under PJM's proposal would be $24.00, which would translate to $24.00/2.2 = $10.91/EffectiveMW, which is lower than PJM's reported value of $16.00. Referring back to PJM's second example that uses a RMRTS of 0.5, there is a 1 MW RegD resource that would be counted as ~1.7 effective MW. Its compensation under PJM's proposal would be $8.00, which would translate to $8.00/1.7 =

[38] Taking the x-axis under the curve to represent one unit of capacity, the rectangle under the curve represents 1 MW x 1.5 = 1.5 MW, while the triangle under the curve represents ½ x 1 MW x (2.9-1.5) = 0.7 MW, for a total area under the curve of 2.2 MW of effective capacity.
[39] The area under the curve is made up of the rectangle, which represents 1 MW x 0.5 = 0.5 MW, and the triangle, which represents ½ x 1 MW x (2.9-0.5) = 1.2 MW, for a total of 1.7 MW of effective capacity.
[40] Transmittal letter at 26.

$4.71/EffectiveMW, which is much lower than PJM's reported value of $16.00. The inconsistency lies within PJM's proposal to calculate effective MW and clear the market based on the area under the RRTS Curve while compensating resources based on the RMRTS.

Thus, despite PJM's assertion, RegD resources are always undercompensated on an effective MW basis under PJM's proposal. Further, as discussed below, under PJM's proposal, RegD resources are always compensated less on a dollar per effective MW basis compared to RegA resources, which is unduly discriminatory.

PJM assures us that its proposed settlement scheme, which includes the RMRTS, will always make RegD resources whole.[41] While this is necessary for just and reasonable rates, it is not sufficient. Simply ensuring that resources' costs are covered is not enough to guarantee resources will always have the ability to earn fair rates. As illustrated above, PJM's proposal would leave RegD resources always undercompensated on an effective MW basis and never compensated in a manner consistent with the service they provide in their operations. Being guaranteed that their bid costs will be covered is not a sufficient remedy.

Moreover, as discussed further in Section C, the RRTS on which the RMRTS is based is deeply flawed. While an RRTS, derived appropriately, maybe useful in market clearing to provide a guide to the relative contributions of RegA resources and RegD resources, it is not appropriate in settling individual resources with individual operations.

Regulation dispatch and supplier compensation is based on the system operator providing useful dispatch signals and suppliers following those signals. It is up to PJM to design useful signals and it is up to resource owners to decide which signal to follow. Resource-specific Performance Scores track how well each resource followed the dispatch signal and are correctly

[41] Transmittal letter at 27-28.

part of the determination of how much it should be paid. The RMRTS has no place in the settlement of Regulation.

2. The Mileage Ratio Is Necessary For Settlement To Reflect Regulation Resource Performance, And The Use Of The RMRTS For Settlement Is A Violation Of Order No. 755.

The Proposed Changes eliminate use of the mileage ratio in the Regulation performance settlement. The mileage ratio signifies the volume of Regulation service actually provided in an interval and is measured in the amount of up and down movement following the dispatch signal, in units of miles. The mileage ratio is distinct from the Regulation capacity set aside ready to respond and is necessary to capture the performance value of resources providing Regulation service, which is a foundational part of the market signal for PJM Regulation resources.

The mileage ratio multiplier communicates the value of providing Regulation under each dispatch signal. It allows resources that might qualify for both RegA and RegD signals to make an informed decision as to whether it is in their economic interest to provide RegD service and be dispatched to move up and down more quickly and more often, thus incurring more wear and tear/variable O&M and lower efficiency/more losses. The mileage ratio is the main parameter to enable these resource owners to assess the potential costs and benefits of providing Regulation service on a particular dispatch signal. While PJM claims, "the mileage ratio multiplier distorts the market signal for RegD resources,"[42] this is not true—it informs market participants of the tradeoffs to RegD versus RegA provision.

However, the Proposed Changes specify formulas for RegD clearing and settlement that do not include a value for volume of actual mileage provided by resources, even though the

[42] Transmittal letter at 23.

performance offer portion of PJM's Regulation cost calculation[43] captures a resource's offered cost to provide Regulation movement. By ignoring actual performance of Regulation resources in settlement, PJM's proposal is analogous to having generators offer a volume of Energy on a $/MWh basis and then settling them based on cleared MW without any reference to the duration over which the necessary volume of Energy is delivered. In this analogy of Energy offers, it is critical to specify the duration over which the volume of Energy is offered to ensure desired performance and provide an appropriate settlement result; similarly, for Regulation offers, it is the volume of actual mileage provided, and only this value, that, when multiplied by the performance clearing price, would provide the appropriate settlement result – a value in dollars per MW of resource capacity *following a particular control signal* (namely RegA or RegD). This volume of actual mileage provided is captured by the mileage ratio in PJM's market design.[44] For these reasons, PJM's elimination of the use of mileage ratio in settlement would produce the wrong payments for actual work done and thus misinform market participants of the economics associated with RegD provision, leading to unjust and unreasonable rates.

Moreover, the Proposed Changes are also a violation of Order No. 755. As discussed above, PJM's proposal does not compensate all Regulation providers (i.e., RegD) based on the quantity of Regulation service, as measured by the amount of up and down movement the resource provides while following the dispatch signal, which is a requirement of Order No. 755.[45] This noncompliant market design was actually proposed by PJM and rejected by FERC in PJM's Order No. 755 compliance process in 2012.[46] By basing performance payments on

[43] See Transmittal letter at 28.
[44] While PJM is the only ISO to use a mileage *ratio* in Regulation settlement, all other jurisdictional ISOs use a representation of a resource's actual mileage volume in Regulation settlement.
[45] Order No. 755 P 133.
[46] PJM Interconnection, L.L.C., 141 FERC § 61,134, at P 85 (2012). (Order on Compliance issued November 16, 2012, Docket Nos. ER12-1204 and ER12-2391

expectations regarding resource movement internalized within the market optimization at the time of clearing, instead of the actual movement provided during the operating hour, the Proposed Changes violate the requirement in Order No. 755 that performance payments reflect the quantity of Regulation service *actually* provided by a resource. The mileage ratio in the current settlements formula reflects precisely this difference between actual movement within an hour and the assumed movement embedded in the RRTS.

PJM does not overcome the burden to re-litigate FERC's orders in its Order No. 755 compliance case. As presented above, PJM has not proven that the Proposed Changes produce just and reasonable rates and are not unduly discriminatory. PJM has argued that because Regulation clearing already recognizes mileage, the settlement does not remove the consideration of movement. But, as discussed above, these arguments do not address the core issue of resources' actual movement being compensated. In response to "potential misconceptions" that its proposed Tariff revision would result in mileage no longer being recognized in the settlement construct, PJM states, "removing mileage ratio from the settlements equation does not remove recognition of the requested movement for each resource type. The movement requested of Regulation resources (i.e., mileage) is already recognized in Regulation clearing."[47] As discussed above, nowhere in PJM's offer formula or settlement formula is there a value for volume of *actual* mileage provided by the resource, only a historical expectation of it embedded in the RRTS. As such, keeping the mileage ratio in the Regulation performance settlement formula is necessary for continued compliance with Order No. 755. FERC should therefore reject the Proposed Changes to Regulation settlement.

[47] Transmittal letter at 27.

C. THE PROPOSED REGULATION RATE OF TECHNICAL SUBSTITUTION CURVE IS UNREASONABLE AND UNDULY DISCRIMINATORY.

The proposed RRTS curves differ in a subtle but significant way from the existing Benefits Factor ("BF") curves. BF curves were calculated based on the characteristics of the RegD signal. Because the RegD signal at the time incorporated 15-minute energy neutrality, increasing amounts of dynamic regulation had diminishing value.[48] The BF curves correctly capture the value of a RegD resource that perfectly follows the RegD signal; resource deviations from that signal are captured in resource-specific performance scores.

In contrast, the new conditionally-neutral signal only accommodates energy neutrality when it can do so without compromising system control.[49] This means that the dynamic regulation product is *never* less valuable than traditional regulation: dynamic regulation is always faster, and will be asked to provide as much energy as needed for system control.[50] Based on the obligations of RegD resources, the RTS value should never be less than 1. So what is the source of the diminishing value of RegD expressed in PJM's published RRTS curves?

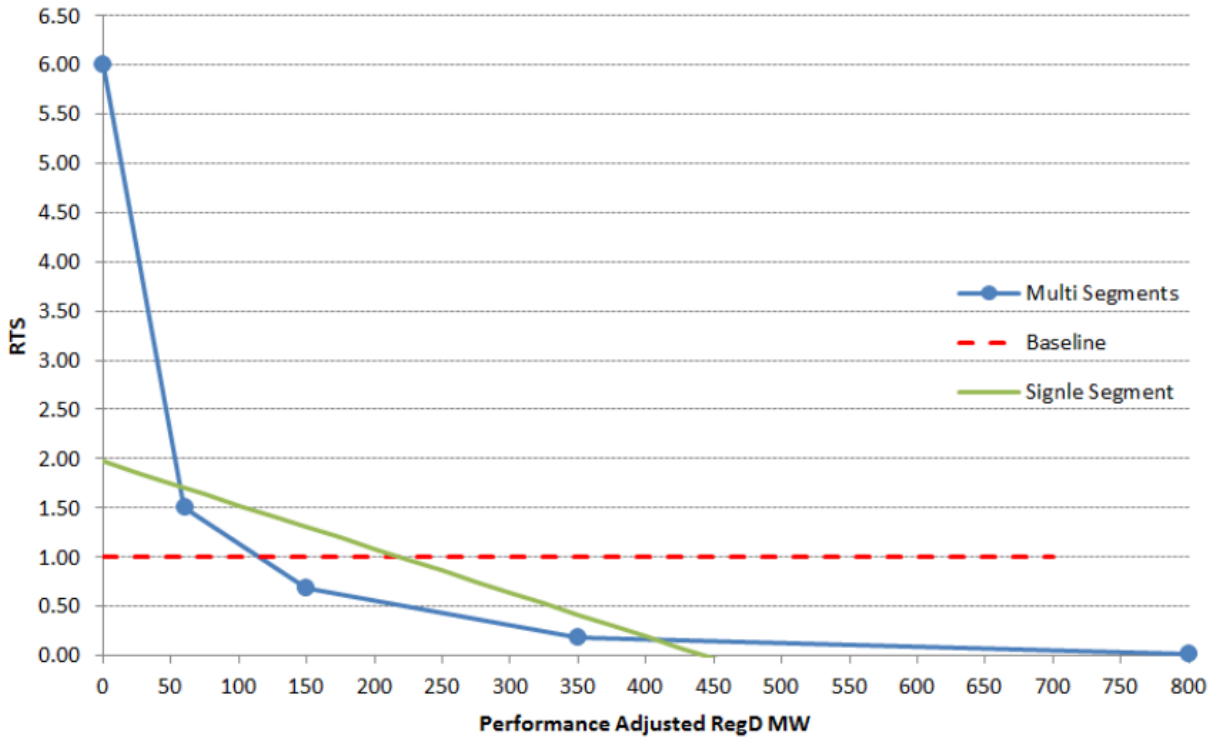
The answer lies in the "simulation studies"[51] used to define the RRTS curve. In conducting those studies, PJM assumes a particular fleet of RegD resources, models their performance, and then bases the RRTS curve on that modeling. The diminishing returns in the RRTS curve arise from the simulation's prediction that some RegD resources will not be able to follow the RegD signal. Where the BF models the value of the service RegD resources are asked

[48] See PJM Interconnection, L.L.C., Order No. 755 Compliance Filing, Docket No. ER12-1204-000 (Mar. 5, 2012) at 9.
[49] Proposed Changes at 9.
[50] A clarifying example is if PJM were to clear 100% RegD resources. Under the conditionally neutral signal, those resources would be directed to provide all of the energy that would otherwise have come from RegA resources, and do so faster.
[51] Proposed Changes at 15.

to provide, the RRTS curve models a presumed level of failure to provide the service. This results in several unreasonable outcomes.

1. Resources Providing Equivalent Service are Compensated Differently.

Although the Proposed Changes do not specify RRTS curves in sufficient detail to determine if they are reasonable, PJM has published RRTS curves in stakeholder meetings. One such curve is reproduced below:[52]



The blue line in this curve shows the RRTS as a function of the amount of RegD clearing the market. We note three points: (1) Once there is more than about 120MW of RegD, the RRTS falls below 1.0, indicating that RegD is less valuable than RegA; (2) At about 230MW of RegD,

[52] Eric J. Endress, *PJM Regulation Study Update* (November 16, 2016) at 14. Available at http://www.pjm.com/-/media/committees-groups/task-forces/rmistf/20161116/20161116-item-02-regulation-study-update-new-mrts-curves.ashx. The curve reproduced applies during non-ramping hours in the spring; curves for other periods are similar.

the RRTS falls below 0.5; (3) The RRTS can go as low as 0.01. These values result in RegD resources providing service equivalent or superior to RegA resources receiving lower payments.

PJM's regulation market is an hourly market. Regulation resources offer and are committed in one-hour blocks. Resources are under no obligation to offer regulation service in any particular hour or for multiple consecutive hours. Thus, any resource that can accurately follow regulation signals for an hour must be considered as providing the full value of regulation service. The RRTS curves are inconsistent with that.

Consider a one-hour battery[53], or an unlimited energy RegD resource such as a combustion turbine or hydro unit. Such a resource is capable of following any RegD signal perfectly for its entire commitment period. Because of the characteristics of the conditionally neutral RegD signal, that resource is providing equivalent or superior service to a RegA resource. However, even though this resource can meet all possible obligations over its commitment period, it may be compensated at a substantial discount to RegA because of a presumed failure. A market construct that results in lower payments for equivalent service is discriminatory, and should be rejected.

PJM states that they simulated a regulation fleet consisting primarily of 30-minute storage resources in constructing the RRTS curve. [54] However, the published curves are inconsistent with this claim. As a simple example, that PJM could be assured that 30-minute resources would have sufficient energy to follow the RegD signal simply by treating each as providing 50% of its nameplate capability. That would result in a RTS never lower than 0.5 regardless of how much RegD cleared the market. Under PJM's proposed 30-minute neutrality,

[53] A battery that can maintain its full nameplate output or charge rate for one hour.
[54] PJM Regulation Whitepaper at 17.

any RTS value less than 0.5 can only mean the combination of regulation signal and RRTS curve unreasonably squanders the value of RegD resources.

Lower RRTS values also discriminate against individual storage resources. The potential very low RRTS value of 0.01 means that 100MW of RegD is required to provide equivalent service to 1MW of RegA. Under PJM's assumption of 30-minute storage, this means that the Proposed Changes will require storage be able to maintain its full output for up to 50 hours to be considered as providing equivalent service as an energy-unlimited resource for 1 hour. Since only 1 hour of storage is required for a RegD resource to provide equivalent or superior service to RegA, this is discriminatory to the point of irrationality.

2. Resources Are Penalized Twice For Failure To Follow PJM Signals.

RegD resources that are unable to fully follow the RegD signal are also unjustly harmed by the proposed RRTS methodology. As explained above, the RRTS curve models the value of a resource that to some degree fails to follow the RegD signal. A RegD resource that performed exactly as anticipated in PJM's simulations would thus be providing the full value they are being compensated for. But, under the Proposed Changes, this resource would receive a performance score lower than 100% because it did not follow the signal perfectly, and have its payment reduced a second time. RegD resources are devalued up-front by an expectation of imperfect performance, then penalized a second time for performing to the standard they are being compensated for.[55]

[55] This is analogous to the treatment of ICAP (Installed Capacity) and UCAP (Unforced Capacity, equal to ICAP derated by expected outage rates) in capacity markets. Capacity resources are valued at their UCAP, but only penalized if they fail to deliver less than their UCAP. PJM's proposed RRTS and penalty structure is equivalent to paying capacity resources based on UCAP but penalizing them for delivering less than their ICAP.

3. The RRTS Curve Rewards Lower Capability Resources And Discourages Investment In Higher Performance.

The RRTS curve essentially compensates all RegD resources based on fleet-average performance expectations resulting in perverse incentives. Low and high capability unit will both receive the RRTS values ascribed to a fleet of 30-minute batteries. This will further muddle the investment signals the Proposed Changes are designed to correct: developers who invest in longer-duration storage will still only be valued as if they were 30-minute resources.

The deficiencies in the Proposed Changes prevent any evaluation of the proposed methodology for determining the RRTS curves. However, published results of those methods show the outcome of that methodology to be unjust, discriminatory, and unreasonable. Even if the Proposed Changes were not deficient, the Commission should reject them based on these results.

IV. CONCLUSION

As explained herein, PJM's filing does not include changes to the Regulation market that require Commission review under the FPA and is therefore deficient. Fundamentally, PJM has sought to redefine its Regulation market product in a unilateral manner; should the Commission allow PJM to do so, then there is not surety against PJM doing so again anytime in the future. ESA urges the Commission to direct PJM to fulfill its duties under the FPA to file changes significantly affecting rates for Commission review so that regulatory uncertainty is not unbounded. Moreover, the Proposed Changes to settlement in PJM's filing would lead to unjust and unreasonable rates, are unduly discriminatory, and are inconsistent with prior Commission directives to PJM on compliance with Order No. 755. ESA respectfully requests that the Commission reject PJM's filing for these reasons.

Respectfully submitted,

Energy Storage Association
By its attorney,

Andrew O. Kaplan
PIERCE ATWOOD LLP
100 Summer Street
Boston, MA 02110
Telephone: 617.488.8104
Email: akaplan@pierceatwood.com

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

Dated in Boston, MA this 15th day of November 2017.

Anne O'Hanlon, Legal Executive Assistant
PIERCE ATWOOD LLP
100 Summer Street
Boston, MA 02110
Phone: 617.488.8123
aohanlon@pierceatwood.com