

**BEFORE  
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of Duke	)	
Energy Ohio, Inc. for Approval of McMann	)	Case No. 19-2223-EL-UNC
Battery Storage Project.	)	

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**COMMENTS OF INTERSTATE GAS SUPPLY, INC.  
\*Public Version\***

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Interstate Gas Supply, Inc. (“IGS Energy” or “IGS”) submits these comments in opposition to the application of Duke Energy Ohio, Inc. (“Duke”). In its application, Duke proposes to collect the cost of a battery storage system (“battery”) through Rider DCI — a rider that recovers costs associated with non-competitive services — and to use the battery to participate in the PJM Frequency Regulation (“FR”) market.<sup>1</sup> IGS does not oppose the deployment of battery resources to defer distribution circuit upgrades. But IGS does oppose Duke’s request to use a distribution customer-funded battery to compete in the PJM wholesale frequency regulation market.

Duke’s proposal to participate in PJM’s FR market not only exceeds the scope of the Opinion and Order<sup>2</sup> that gave rise to its application in this case, but also contradicts Duke’s claim that its battery should be classified as a distribution resource under Federal

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<sup>1</sup> *In the Matter of the Application of Duke Energy Ohio, Inc. for Approval of McMann Battery Storage Project* at 3 (hereinafter “Application”).

<sup>2</sup> *In the Matter of the Application of Duke Energy Ohio, Inc., for an Increase of its Electric Distribution Rates*, Case No. 17-0032-EL-AIR, *et al.*, Opinion and Order at 41 (Dec. 19, 2018) (hereinafter “Order”).

Energy Regulatory Commission (“FERC”) Account 363.<sup>3</sup> As written, Duke’s FR market proposal violates Ohio law and policy.

Even if the Commission were to turn a blind eye to the law and good policy, Duke’s proposal is a raw deal for customers. While Duke suggests that it makes sense to construct a battery in lieu of a substation upgrade, Duke’s financial projections tell a different story. On its face, Duke’s annual revenue requirement for the battery is several multiples higher than the revenue requirement for the substation. Indeed, Duke’s financial projections confirm that its proposal is nothing more than an attempt to gold plate the ratebase under the veil of innovation and information gathering.

The proposal becomes even more problematic for customers when Duke’s overblown projections are subjected to scrutiny. Duke intends to use the battery in the Regulation D (“RegD”)<sup>4</sup> FR market, which raises concerns that PJM’s RegD dispatch signal will derate the battery and reduce its projected 15 year<sup>5</sup> useful life. As the life span of the battery decreases, Duke must recover additional depreciation expenses over a shorter period (increasing the rate).<sup>6</sup> The reduced life span results in less total frequency regulation revenue to offset the cost of the battery. The combined result is a double

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<sup>3</sup> Direct Testimony of Linda Miller at 4 (Dec. 12, 2019) (hereinafter “Miller Testimony”).

<sup>4</sup> Direct Testimony of Matthew Schultz at 8 (Dec. 20, 2019) (hereinafter “Schultz Testimony”).

<sup>5</sup> Miller Testimony at 4.

<sup>6</sup> See Duke Response to IGS’ INT 1-001(E). Duke confirms its intention to seek recovery of any outstanding underappreciated net plant balance if the battery reaches the end of its useful life in advance of Duke’s 15-year projection.

whammy to the annual revenue requirement of the battery (increased cost and decreased revenue to offset costs), further tilting the cost benefit analysis<sup>7</sup> in favor of a substation.

As explained in more detail below, the Commission should reject Duke's request to utilize a battery storage system to participate in the PJM FR market.

## **I. BACKGROUND**

### **A. Duke's Application for Approval of its Battery Storage Project**

On December 19, 2018, the Commission issued an Opinion and Order<sup>8</sup> ("Order") approving and adopting a stipulation that addressed several pending matters related to Duke's application for approval of its electric security plan. As part of its Order, the Commission authorized Duke to invest in battery storage assets for the limited purpose "of deferring circuit investments or addressing distribution reliability issues[,] and to seek recovery of the costs associated with those investments through its nonbypassable Rider DCI."<sup>9</sup> The Order<sup>10</sup> also required Duke to file an application detailing its proposed battery storage project in a separate proceeding. Duke's application would be subject to the terms and conditions of the Stipulation<sup>11</sup> adopted and approved in the Commission's Order.

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<sup>7</sup> Duke Response to OCC-POD-01-009 (CONFIDENTIAL).

<sup>8</sup> Order at 113.

<sup>9</sup> *Id.* at 41. Per the Order, Duke shall invest no more than \$20 million in battery storage projects.

<sup>10</sup> *Id.* at 73.

<sup>11</sup> See *In the Matter of the Application of Duke Energy Ohio, Inc., for an Increase of its Electric Distribution Rates*, Case No. 17-0032-EL-AIR, *et al.*, Stipulation and Recommendation (Apr. 13, 2018) (hereinafter "Stipulation").

Under the terms of the Order, Duke is authorized to recover the costs associated with its proposed battery storage project(s), so long as those projects qualify as *distribution equipment* under the FERC uniform system of accounts authorized for collection via the Rider DCI and subject to the Rider DCI caps.<sup>12</sup> The Order provides that “[c]apital costs included in Rider DCI shall be those recorded in FERC Accounts 360 through 374, provided such costs are not recovered elsewhere.”<sup>13</sup> Accordingly, Duke cannot recover the costs associated with its proposed battery storage project(s) unless those projects are classified as distribution assets under FERC accounts 360-374. This makes perfect sense, given that Rider DCI recovers costs relates to the provision of distribution service.

On December 20, 2019, Duke filed an application (“Application”) in this case and requested Commission approval to install a lithium ion battery adjacent to its existing McMann substation in Union Township, Ohio.<sup>14</sup> Duke’s application provides that the primary purpose of the project is to reduce peak load on the circuit, and thereby defer the need for additional distribution upgrades at its McMann substation.<sup>15</sup> Duke contends that it filed its Application “under the terms approved by the Commission in the Order[,]” yet the Application also seeks Commission approval to use the battery to “participate in the PJM regulation market when it is not otherwise needed to reduce peak load on the

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<sup>12</sup> Order at 41.

<sup>13</sup> *Id.* at 39.

<sup>14</sup> Application at 2.

<sup>15</sup> *Id.*

circuit.”<sup>16</sup> In support, Duke claims that distribution reliability is just one of the purposes specifically permitted by the Commission in the Order that triggered its Application in this case.<sup>17</sup>

Duke’s application also maintains that it should be entitled to recover the \$11.7 million needed to develop the battery project through Rider DCI, because the “facts and circumstances related to this project support the classification of the battery as a distribution function.”<sup>18</sup> Indeed, Duke claims that because the battery’s primary application will be to reduce load on the McMann distribution circuit during peak hours, and its “participation in the PJM market will not interfere with [its] distribution purpose[,]” the battery should be classified as a distribution function under FERC account 363.<sup>19</sup>

#### **B. Battery Accounting and Classification Under the FERC Uniform System of Accounts**

The FERC uniform system of accounts provides explicit standards of accounting applicable to battery resources. As discussed in the Affidavit of Joseph Haugen, those standards are intended to ensure that energy storage operations are reported by utilities in a uniform, transparent, and consistent manner.<sup>20</sup> In order to provide for enhanced “monitoring for cross-subsidization” of utility energy storage resources, the FERC issued Order 784 and adopted certain accounting and reporting revisions specific to those

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<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

<sup>18</sup> *Id.* at 3.

<sup>19</sup> Miller Testimony at 3-4.

<sup>20</sup> Affidavit of Joseph Haugen.

resources.<sup>21</sup> There, the FERC concluded that “[i]n instances where an energy storage asset performs multiple functions, it is imperative that costs associated with each function be transparent and allocable to the function performed so that cross-subsidization of costs can be prevented.”<sup>22</sup> Indeed, FERC was specifically trying to “prevent and discourage cross-subsidization between cost-based and market-based activities.”<sup>23</sup>

To that end, the FERC required energy storage to be classified as either distribution (Account 363), transmission (Account 351), or production (Account 348) depending on the service the battery provides.<sup>24</sup> Batteries that provide wholesale market generation services via the FR market – such as the battery at issue here – cannot be recorded in FERC Account 363. The FR market is a PJM wholesale market competitive service that is completely unrelated to distribution service. Therefore, Duke’s accounting treatment of its battery asset must be properly allocated and reflect the changes adopted under FERC Order 784.

### **C. The PJM Frequency Regulation Market and Its Impact on Battery Storage Resources**

The PJM FR market is a competitive wholesale service that is designed to correct for short-term changes in electricity use.<sup>25</sup> Frequency Regulation helps match generation and demand and provides market-based compensation to resources that can adjust

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<sup>21</sup> FERC Order 784, Third-Party Provision of Ancillary Services; Accounting and Financial Reporting for New Electric Storage Technologies at Para. 136, 144 FERC ¶ 61,056 (Jul. 18, 2013) (hereinafter “FERC Order 784”).

<sup>22</sup> *Id.*

<sup>23</sup> *Id.* at Para. 125.

<sup>24</sup> *Id.* at Para. 126.

<sup>25</sup> Affidavit of Joseph Haugen.



output or consumption in response to an automated signal.<sup>26</sup> Market participants submit their offer price the day before the operating day and adjust the MW capability hourly throughout the operating day.<sup>27</sup> PJM runs an hourly auction for the service, which sets the hourly market price and determines which units will provide FR services based on the lowest price offers and historical performance.<sup>28</sup>

PJM deploys a variety of resources to meet regulation needs, and those resources differ in both their ramping ability (i.e. ability to increase or decrease output when providing Regulation service) and the accuracy with which those resources can respond to either the PJM system operator's RegA or RegD signals.<sup>29</sup> RegD is a more rapid signal and is used to dispatch faster, dynamic resources, such as battery storage.<sup>30</sup> PJM's RegD signal was originally designed to be unconditionally energy neutral over a 15-minute period, but has since been modified in favor of a conditionally neutral 30-minute signal.<sup>31</sup> PJM implemented its redesigned RegD signal on January 9, 2017, and its impact thus far on battery storage resources participating in the FR market cannot be overstated.

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<sup>26</sup> FERC Order 755, Frequency Regulation Compensation in the Organized Wholesale Power Markets at Para 4, n.5 137 FERC ¶ 61,064 (Oct. 20, 2011) (hereinafter "FERC Order 755").

<sup>27</sup> *Id.* at Para. 128.

<sup>28</sup> Affidavit of Joseph Haugen.

<sup>29</sup> FERC Order on Contested Settlement at Para. 3, 170 FERC ¶ 61,258 (Mar. 26, 2020).

<sup>30</sup> *Id.*

<sup>31</sup> See *PJM Interconnection, L.L.C.*, 139 FERC ¶ 61, 130 at Para. 12, n. 11 (May 2012 Order); *Implementation and Rationale for PJM's Conditional Neutrality Regulation Signals*, PJM Staff, January 2017 at 5 (available at <https://www.pjm.com/~media/committees-groups/task-forces/rmistf/postings/regulation-market-whitepaper.ashx>)).

The application of a battery resource directly impacts its useful life. The more a battery is cycled – whether through participation in the FR market or otherwise – the more rapidly it reaches the end of its useful life.<sup>32</sup> Frequency regulation requires frequent cycling, and therefore, has a destructive impact on the useful life of a battery storage resource relative to other applications.

Indeed, it is well-documented that the redesigned RegD signal, which requires batteries to operate with greater intensities and duration of signal holds, has caused derating and/or physical damage to battery assets participating in the FR market.<sup>33</sup> As the more aggressive RegD signal accelerates degradation, the system life of the battery asset is similarly shortened.<sup>34</sup> Predictably, the redesigned signal has prompted several battery owners to argue that their participation in the RegD market has led to a dramatic reduction in revenue that otherwise would not have occurred but for the signal change.<sup>35</sup> Duke should be familiar with these challenges, given that both its parent company and affiliate have raised these concerns to FERC.

## **II. ARGUMENT**

### **A. Duke's FR Market Proposal Exceeds the Scope of the Stipulation and the Commission's Order.**

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<sup>32</sup> *Energy Storage Assoc. v. PJM Interconnection, L.L.C.*, Docket No. EL17-64-000 et al., Reply Comments of the AES Corporation and Duke Energy Corporation In Support of Settlement at 5-6 (May 23, 2019) (hereinafter "Duke Energy Corp. Comments").

<sup>33</sup> *Id.*

<sup>34</sup> *Id.* at 11.

<sup>35</sup> See Duke Energy Corp. Comments at 6-7. In which AES Corporation alleges that the redesigned signal derated its battery and led to drops in revenue that exceeded 50% year-to-year.

IGS does not oppose deployment of battery resources to defer distribution upgrades; however, Duke's battery application in this case exceeds the scope of the Stipulation approved under the Commission's Order and should be denied. The Stipulation expressly limits the application of Duke's battery storage project(s) to "deferring circuit investments or addressing *distribution* reliability issues."<sup>36</sup> (emphasis added). Nevertheless, Duke's Application seeks the authority to use battery storage resource(s) to participate in the PJM FR market, claiming that distribution reliability is just "one of the purposes specifically permitted by the Commission in the Order."<sup>37</sup> Duke's claim not only mischaracterizes the plain language of that Order, but also seeks to unreasonably expand its scope.

The Commission's Order mirrors the terms of the Stipulation, which authorizes Duke to install a battery storage project so long as that resource is used exclusively for circuit deferral and/or distribution purposes.<sup>38</sup> Despite Duke's claim to the contrary, the Commission's Order does not authorize, contemplate, or discuss any additional purposes for Duke's battery storage project(s). The FR market is also unrelated to deferring circuit investments and/or addressing distribution reliability issues. Indeed, frequency regulation is a competitive service used to match up generation and demand to help the grid maintain its desired electrical frequency and operate normally. It follows then that Duke's request to provide FR market services unreasonably expands the scope of its authority under the Commission's Order and, therefore, should be denied.

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<sup>36</sup> Stipulation at 13.

<sup>37</sup> Application at 2.

<sup>38</sup> Order at 41.

Moreover, Duke's request to recover the costs associated with its provision of FR market services not only contradicts its claim that its battery should be classified as a distribution resource under FERC Account 363, but also fails to satisfy the standard for cost recovery set forth in the Stipulation and the Commission's Order.

The Order provides that to recover the costs of its battery storage project(s) under Rider DCI, Duke's battery assets must qualify as distribution equipment under FERC Accounts 360-374.<sup>39</sup> In order for Duke's battery to qualify as distribution equipment under FERC Account 363 as it recommends, the resource must be entirely distribution related. Otherwise, FERC requires Duke to allocate the costs associated with its battery asset according to the function performed (e.g. production; transmission; distribution).<sup>40</sup> FERC established this accounting methodology to ensure transparency and prevent cross-subsidization of utility costs.<sup>41</sup>

Duke maintains that because the battery's "intended services provide peak shaving/management to regulated customers" of its service territory, the battery should be classified as a distribution asset under FERC Account 363.<sup>42</sup> The \$11.7 million question, however, is not whether Duke intends to use the battery to provide distribution services, but whether Duke also intends to use that battery to perform other functions. In this case, the scope of services Duke's battery application seeks to provide is clear: the

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<sup>39</sup> Stipulation at 12-13, n.10.

<sup>40</sup> FERC Order 784 at ¶136.

<sup>41</sup> *Id.*

<sup>42</sup> Miller Testimony at 3.

battery will provide distribution *and* wholesale FR market services.<sup>43</sup> Indeed, Duke claims that the battery will provide FR services [REDACTED]<sup>44</sup> In other words, [REDACTED]

[REDACTED] of Duke's battery is to provide FR services; [REDACTED]  
[REDACTED]

Duke's battery does not qualify as an energy storage distribution resource under FERC Account 363, because Duke also plans to use that resource to provide FR services and receive revenue from the PJM wholesale markets for the services provided. The accounting treatment of Duke's battery asset must reflect the fact that FR market services are either production-related or a competitive wholesale ancillary transmission service, which means the battery's FR function must be recorded in a FERC account other than distribution Accounts 360-374. Accordingly, Duke's proposal cannot satisfy the standard necessary for distribution cost recovery under the Stipulation, and its request to subsidize a competitive battery function through Rider DCI should be dismissed.

#### **B. Duke's FR Market Proposal Also Violates Ohio Law.**

Duke's request also violates Ohio law, which requires unbundled rates and prohibits subsidies from flowing between noncompetitive (i.e. distribution) and competitive (i.e. generation) services. Specifically, Duke's application violates R.C. 4928.02(B) because it requests to bundle the costs associated with the provision of competitive FR market services into non-competitive distribution rates.<sup>45</sup> The result of Duke's proposal, if approved, is an anticompetitive subsidy that allows the utility to

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<sup>43</sup> Application at 2.

<sup>44</sup> Duke Response to IGS' INT 01-004(B)(CONFIDENTIAL).

<sup>45</sup> Application at 3.

artificially fund competitive generation and transmission, and thereby discourage other resources from participating in the competitive market.

Duke's proposal also violates R.C. 4928.02(H), because it seeks to insulate its battery from market risk by unlawfully subsidizing that resource through distribution rates. The FR market is competitive and prices in that market are established based upon supply and demand.<sup>46</sup> The result is a FR market that rewards efficient sellers and drives inefficient sellers out of business.

Duke's proposal, however, distorts market forces by allowing it to receive a different level of compensation in addition to the PJM uniform clearing price.<sup>47</sup> The proposal provides Duke with a competitive subsidy that unfairly discriminates against other, unsubsidized resources that must bid into hourly FR market auctions. The subsidy acts as a financial parachute that alleviates the need for Duke to make decisions like a rational market participant and, in doing so, promotes FR market instability and unpredictability. Thus, Duke's proposal not only harms existing FR market participants, but also sends price signals that act as a barrier to entry for other, unsubsidized resources interested in competing for FR services.

Nevertheless, Duke attempts to sweeten its proposal by promising to return any net benefit received from FR market participation to customers through Rider DCI.<sup>48</sup> Duke's offer, however, cannot conceal the bare truth that its request to utilize a ratepayer-funded resource to provide competitive wholesale services is unlawful. Based on the

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<sup>46</sup> Affidavit of Joseph Haugen.

<sup>47</sup> *Id.*

<sup>48</sup> Schultz Testimony at 3.

foregoing, the Commission should find that Duke's FR market participation proposal violates Ohio law, and its Application request should be denied.

**C. Duke's Distribution Reliability Needs Are Better Addressed Through Traditional Wired Upgrades.**

**i. The Battery Fails a Cost Benefit Analysis Under Duke's Own Projections.**

Based upon a cursory review of the cost of a battery (\$11+ million) and a substation upgrade (\$3.9 million), it is immediately apparent that Duke's proposal doesn't add up. Duke's own cost benefit analysis confirms IGS's point.

In discovery, Duke provided a cost benefit analysis that compared the cost of the battery against a substation upgrade. To that end, Duke calculated the total cost of constructing the battery, then applied the cost of a substation as well as projected frequency regulation revenue as a reduction to the cost to show a cost benefit ratio. The structure is flawed and makes no sense.

Even if the Commission accepted Duke's 15-year depreciation rate as accurate, it simply doesn't make sense to compare the drastically shorter lifespan of a battery to the projected [REDACTED] lifespan of a transformer substation.<sup>49</sup> Under a best-case scenario, Duke will need to make an additional capital investment to install a new battery at the end of 15 years.<sup>50</sup> The capital investment Duke needs to install its battery today is approximately \$11.7 million vs. \$3.9 million for a substation.<sup>51</sup>

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<sup>49</sup> Duke Response to IGS' INT 1-002(B) (CONFIDENTIAL).

<sup>50</sup> Affidavit of Amy Sheppard.

<sup>51</sup> Duke Response to IGS' INT 1-002(A)(CONFIDENTIAL).



Moreover, the battery also fails a proper cost benefit analysis under Duke's own financial projections. A proper cost benefit analysis would compare the annual cost of a substation upgrade versus the net cost of the battery (assuming one turns a blind eye to subsidizing competitive market participation). In comparing the annual revenue requirement of a substation upgrade versus the net cost of the battery (with frequency regulation revenue as an offset), it is patently clear that the cost of the battery is significantly greater. These facts are laid bare in the Affidavit of Amy Sheppard, IGS' Director of Accounting.

As Ms. Sheppard's affidavit shows, the discounted cost of the battery is more than twice as expensive as the substation.

<b>Figure 1</b>	
<b>Substation Scenario- \$3,994,281 initial cost</b>	
Total revenue requirements - 12 years	\$ 6,305,841
Discounted revenue requirements - 12 years	\$ 4,277,950
<b>Battery Scenario- 15 year life \$11,694,616 initial cost</b>	
Total revenue requirements - 12 years*	\$ 13,461,312
Discounted revenue requirements - 12 years*	\$ 9,539,264

The numbers provided in Figure 1 above are based off Duke's own assumptions. Notably, the math [REDACTED] when more reasonable assumptions are used.

**D. RegD Market Participation Will Accelerate the Depreciation of Duke's Battery Storage Project(s), Which Further Tilts the Cost Benefit Analysis Against Building a Battery.**

Since PJM implemented its RegD signal change on January 9, 2017, FR market participants have complained that the new signal has directed resources to operate



outside of their design parameters, and therefore, has resulted in performance and efficiency issues, reduced compensation, and adverse impacts on their energy storage equipment.<sup>52</sup> RegD market participants argue that PJM's conversion from an unconditionally energy neutral 15-minute signal to a conditionally neutral 30-minute signal results in market requirements that exceed the physical limitations of energy storage resources.<sup>53</sup> Specifically, market participants argue that the increased 30-minute signal, which requires storage resources to run through more extended charge/discharge periods, dramatically reduces the life of battery storage projects.<sup>54</sup> Indeed, IGS' own battery has experienced these issues.

Duke's parent, Duke Energy Corporation, also relied on its own experience in the redesigned RegD market to share its belief that "[t]hese changes in market rules have also caused operational issues and *shortened the lives of the batteries due to the intense thermal cycling imposed by following the new increased signal intensity.*"<sup>55</sup> (emphasis added). Though several market participants filed complaints at FERC alleging that the redesigned signal increased wear and tear on energy storage resources, FERC recently approved a settlement in those matters whereby the makeup of the redesigned RegD signal will remain unchanged for new market entrants.<sup>56</sup>

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<sup>52</sup> *Energy Storage Assoc. v. PJM Interconnection, L.L.C.*, Docket No. 17-64-000 at 15-16 (Apr. 13, 2017) (hereinafter "ESA Complaint").

<sup>53</sup> *Renewable Energy Systems Americas and Invenergy Storage Development LLC v. PJM Interconnection L.L.C.*, Docket No. EL17-65-000 at 11 (Apr. 14, 2017) (hereinafter "RESA Complaint").

<sup>54</sup> *Id.* at 10.

<sup>55</sup> Duke Energy Corp. Comments at 10.

<sup>56</sup> See generally FERC Order on Contested Settlement 170 FERC ¶ 61,258 (Mar. 26, 2020).

Duke acknowledges that a battery's useful life depends on several factors, including how frequently a battery is charged/discharged.<sup>57</sup> While Duke promises not to operate the McMann battery storage project in a way that reduces its expected useful life,<sup>58</sup> it nevertheless seeks approval to use that battery to participate in the RegD FR market. Duke, however, seems to overlook the fact that any use of that battery in the RegD FR market will be subject to the redesigned signal, and is therefore likely to accelerate the depreciation of its battery asset. Equally troubling is Duke's stated intention to seek recovery of any outstanding underappreciated net plant balance (e.g. stranded costs) if the battery were to reach the end of its useful life prior to the end of its projected 15-year timeline.<sup>59</sup>

Duke's FR market proposal, if approved, will not only accelerate the depreciation of its battery asset, but also is likely to lead to stranded distribution costs. Here, Duke's cost benefit analysis assumes that use of the battery in the RegD FR market will have no adverse impact on its projected 15-year book depreciation life.<sup>60</sup> Duke's cost benefit analysis also relies upon approximately [REDACTED]

[REDACTED]<sup>62</sup> Both assumptions are out of

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<sup>57</sup> Duke Response to IGS' INT 1-001(D).

<sup>58</sup> Duke Response to IGS' INT 1-003(B).

<sup>59</sup> Duke Response to IGS' INT 1-001(E).

<sup>60</sup> Direct Testimony of Jay Brown at Attachment JPB-1, 2-3 (Dec. 20, 2019) (hereinafter "Brown Testimony").

<sup>61</sup> Duke Response to IGS' INT 1-004(B)(CONFIDENTIAL).

<sup>62</sup> Duke Response to OCC INT 1-009(d)(CONFIDENTIAL).

line for a battery storage resource that is likely to depreciate more quickly through RegD FR market participation.

Indeed, as RegD FR market participation accelerates the depreciation of the battery asset, Duke's battery depreciation expense must either quicken or be recovered as a stranded cost at the end of that battery's useful life. The accelerated depreciation expense will also increase Duke's annual revenue requirement over a shorter timeframe. Clearly, any reduction in the useful life of the battery asset eliminates any projected frequency regulation revenues that Duke factored into its cost benefit analysis in this case. Despite Duke's claims to the contrary, FR market participation harms its financial projections by increasing overall annual expense and decreasing associated FR revenues over the life of the battery asset.

The Affidavit of Amy Sheppard further demonstrates the impact of a shorter useful life on the cost benefit analysis.

**Figure 2**

<b>Substation Scenario- \$3,994,281 initial cost</b>	
Total revenue requirements - 12 years	\$ 6,305,841
Discounted revenue requirements - 12 years	\$ 4,277,950
<b>Battery Scenario- 7 year life \$11,694,616 initial cost</b>	
Total revenue requirements - 7 years*	\$ 13,114,613
Discounted revenue requirements - 7 years*	\$ 10,258,616
* includes estimated Frequency regulation revenue benefit	

These numbers do not even account for all the overblown assumptions included as part of Duke's analysis. For example, the revenue benefit from Duke's frequency regulation estimate does not include [REDACTED]

This is not a realistic scenario, nevertheless IGS left these assumptions as is in the model for the time being. Moreover, Duke estimates that frequency market prices [REDACTED] [REDACTED] even though market prices simply [REDACTED]

Given that Duke's own load projections estimate that the McMann battery storage project will not provide benefits for Peak Load Shaving until 2024,<sup>63</sup> it is reasonable to conclude that Duke's distribution reliability needs are better addressed through other, more traditional wired upgrades. Nevertheless, if the Commission does approve Duke's application to install a battery storage resource at the McMann substation, IGS respectfully requests that the Commission limit the application of that resource to address distribution reliability issues only. Duke's request to use that battery to provide RegD FR market services, therefore, should be dismissed

### **III. CONCLUSION**

Duke's proposal to expand its battery service(s) into PJM's FR market exceeds the scope of the Stipulation and violates Ohio law. Duke should not be permitted to use customer funds to provide a competitive service that will accelerate the depreciation of its battery asset and promote stranded costs. Based on the foregoing, IGS respectfully requests that the Commission deny Duke's request to use its proposed battery storage project in PJM's frequency regulation market.

Respectfully submitted,

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<sup>63</sup> Direct Testimony of William Lowder at 10 (Dec. 20, 2019).

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## **CERTIFICATE OF SERVICE**

I certify that this *Comments of Interstate Gas Supply, Inc.* was filed electronically with the Docketing Division of the Public Utilities Commission of Ohio on this 20<sup>th</sup> day of May 2020.

/s/ Michael Nugent  
Michael Nugent

## **SERVICE LIST**

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**Duke Energy Ohio**  
**Case No. 19-2223-EL-UNC**  
**IGS First Set of Interrogatories**  
**Date Received: February 6, 2020**  
**IGS-INT-01-001**

**REQUEST:**

The testimony of Linda Miller claims at p. 4 that "The battery storage project has two major components: cells and monitoring equipment and other battery related equipment (balance of plant). The overall expected useful life of these components is 15 years. There are no battery storage assets in the Company's most recently approved depreciation study; therefore, the Company is requesting the Commission's specific approval of the new depreciation rate based on the assets' expected useful life of 15 years." Regarding this testimony:

- A. Identify all studies and analyses used to support your proposal to depreciate the battery asset over 15 years as well as all associated documents.
- B. Identify the "recently approved depreciation study[.]"
- C. What efforts or analyses has Duke undertaken to identify the useful life of battery storage assets.
- D. Does Duke agree that the useful life of a battery storage asset is dependent on the rate of charge/discharge? In other words, does Duke agree that the more frequently a battery is charged and discharged, the quicker it will degrade its useful life? Explain your answer and identify all scientific or engineering studies relied upon to support your response.
- E. To the extent that the battery reaches the end of its useful life after 5 years, identify whether Duke will seek recovery of any outstanding undepreciated net plant balance.

**RESPONSE:**

- A. Duke relies upon the studies and analysis developed by Gannett Fleming as part of Depreciation Studies filed in various electric jurisdictions. In other jurisdictions, a 15-year survivor curve is used, consistent with industry practice.
- B. Please see attached IGS-INT-01-001(B) Attachment, which did not include Energy Storage accounts.
- C. Duke has utilized the Depreciation Studies filed in other jurisdictions to identify the useful life of battery storage assets. The battery projects are designed to comply with this life.
- D. No. Duke Energy designs its battery storage projects to meet the expected useful life of the project, given a specific use case for that project. So, the useful life does not necessarily depend on the rate of charge/discharge. The rate of charge/discharge

for a specific use case will impact the design of the project. Battery cell life and degradation depend on a number of factors, including but not limited to how frequently it is charged or discharged.

E. Yes.

**PERSON RESPONSIBLE: Linda Miller as to parts A - C.**  
**Matt G. Schultz as to part D.**  
**Jay P. Brown as to part E.**



**Duke Energy Ohio**  
**Case No. 19-2223-EL-UNC**  
**OCC's First Set Production of Documents**  
**Date Received: March 9, 2020**

**OCC-POD-01-009 CONFIDENTIAL as to Attachment**

**REQUEST:**

Please provide a copy of the cost benefit studies or analysis that were performed by Duke Energy Ohio supporting the application for the proposed McMann Battery Storage Project.

**RESPONSE:**

**CONFIDENTIAL PROPRIETARY TRADE SECRET as to Attachment**

[REDACTED]

[REDACTED]







**BEFORE  
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of Duke Energy Ohio, Inc., for an Increase in Electric Distribution Rates.	)	Case No. 17-32-EL-AIR
	)	
In the Matter of the Application of Duke Energy Ohio, Inc., for Tariff Approval.	)	Case No. 17-33-EL-ATA
	)	
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Change Accounting Methods.	)	Case No. 17-34-EL-AAM
	)	
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Modify Rider PSR.	)	Case No. 17-872-EL-RDR
	)	
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Amend Rider PSR.	)	Case No. 17-873-EL-ATA
	)	
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Change Accounting Methods.	)	Case No. 17-874-EL-AAM
	)	
In the Matter of the Application of Duke Energy Ohio, Inc., for Authority to Establish a Standard Service Offer Pursuant to Section 4928.143, Revised Code, in the Form of an Electric Security Plan, Accounting Modifications and Tariffs for Generation Service.	)	Case No. 17-1263-EL-SSO
	)	
In the Matter of the Application of Duke Energy Ohio, Inc., for Authority to Amend its Certified Supplier Tariff, P.U.C.O. No. 20.	)	Case No. 17-1264-EL-ATA
	)	
In the Matter of the Application of Duke Energy Ohio, Inc., for Authority to Defer Vegetation Management Costs.	)	Case No. 17-1265-EL-AAM
	)	
In the Matter of the Application of Duke Energy Ohio, Inc., to Establish Minimum Reliability Performance Standards Pursuant to Chapter 4901:1-10, Ohio Administrative Code.	)	Case No. 16-1602-EL-ESS
	)	

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## STIPULATION AND RECOMMENDATION

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### I. INTRODUCTION

Rule 4901-1-30, Ohio Administrative Code provides that any two or more parties to a proceeding may enter into a written stipulation covering the issues presented in such a proceeding. The purpose of this document is to set forth the understanding and agreement of the parties that have signed below (Signatory Parties) and to recommend that the Public Utilities Commission of Ohio (Commission) approve and adopt this Stipulation and Recommendation (Stipulation), which resolves all of the issues raised in these proceedings through the Applications filed by Duke Energy Ohio, Inc., (Duke Energy Ohio or Company) on March 2, 2017 (Case No. 17-32-EL-AIR, *et al.*), March 31, 2017 (Case No. 17-872-EL-RDR, *et al.*), June 1, 2017 (Case No. 17-1263-EL-SSO, *et al.*), and July 22, 2016 (Case No. 16-1602-EL-ESS).

The Stipulation represents a just and reasonable resolution of the issues raised in these proceedings, violates no regulatory principle or precedent, and is the product of lengthy, serious bargaining among knowledgeable and capable parties representing a wide range of interests, including the Staff of the Commission (Staff), to resolve the aforementioned issues. The Stipulation is supported by adequate data and information and, as a package, benefits customers and the public interest. Although this Stipulation is not binding on the Commission, it is entitled to careful consideration by the Commission. For purposes of resolving all issues raised by these proceedings, the Signatory Parties stipulate, agree, and recommend as set forth below.

### II. RECITALS

WHEREAS, on March 2, 2017, Duke Energy Ohio filed an Application to adjust its base distribution rates (Rate Case Application); and

- For the period of January 1 through May 31, **2025**, the DCI Revenue Cap will be between the range of \$62.4 million and \$66.3 million, depending on the Company's reliability performance in prior years.<sup>9</sup>

Capital costs included in Rider DCI shall be those recorded in FERC Accounts 360 through 374, provided such costs are not recovered elsewhere. Rider DCI shall be computed by comparing the current rate base associated exclusively with plant accounts recorded in the FERC accounts noted above to the rate base related to the same accounts as included in the overall rate base approved in the most recent base electric distribution rate case. The Rider DCI revenue requirement shall be limited to (i) a return on distribution rate base using the weighted average cost of capital approved in the most recent base electric distribution rate case, grossed up for prevailing tax rates; (ii) depreciation expense; and (iii) property taxes on the incremental rate base (*i.e.*, net plant less Accumulated Deferred Income Taxes (ADIT)) accumulated since the date certain in the Rate Case, grossed up for Commercial Activity Taxes (CAT) taxes. The pre-tax return of 8.94 percent on rate base is based on the after-tax weighted-average cost of capital, as shown on Schedule A-1 of Stipulation Attachment D, grossed up for the current 21 percent federal income tax rate.

The collection of the revenue requirement shall be based on a percentage of the customer's base distribution charge.

As provided for in Part III.D.3., the Company shall file at least one base electric distribution rate case application on or before May 31, 2024. If the Company files a base electric distribution rate case earlier than May 31, 2024, the revenue caps for Rider DCI will be adjusted to reflect the updated rate case and Rider DCI will continue until May 31, 2025, unless otherwise

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<sup>9</sup> In the absence of an order authorizing a standard service offer to commence June 1, 2025, Duke Energy Ohio may petition the Commission for permission to extend Rider DCI beyond May 31, 2025, and adjust the revenue cap applicable to said extension. In order to make such petition, Duke Energy Ohio must file an SSO application before May 31, 2024.

extended by the Commission. If the Company does not file a base electric distribution rate case application by May 31, 2024, the DCI rate and associated revenue caps will be set to zero on June 1, 2024. Rider DCI shall be updated quarterly and subject to annual audit at the Commission's discretion.

**b. Reliability Standards**

Duke Energy Ohio's Customer Average Interruption Duration Index (CAIDI) and System Average Interruption Frequency Index (SAIFI) performance for 2016 and 2017, will not be used to determine any penalty for non-compliance with Ohio Adm.Code 4901:1-10-10(E). The Signatory Parties agree that all matters related to Case No. 16-1602-EL-ESS are resolved via the terms of this Stipulation as set forth here and below.

The CAIDI and SAIFI standards for 2018 through 2025 shall be as follows:

YEAR	CAIDI	SAIFI
2018	134.34	1.12
2019	134.34	1.00
2020	134.34	0.91
2021	135.52	0.83
2022 through 2025	137.00	0.75

The Signatory Parties agree that Duke Energy Ohio may install a battery storage project(s) for the purpose of deferring circuit investments or addressing distribution reliability issues. During the term of the ESP, Duke Energy Ohio shall invest no more than \$20 million in such beneficial battery storage project(s) in its service territory, with such costs being eligible<sup>10</sup> and recovered through Rider DCI.

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<sup>10</sup> Must qualify as distribution equipment under the FERC uniform system of accounts authorized for collection via the Rider DCI and subject to the Rider DCI caps.



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

Energy Storage Association,	)	
Complainant	)	
	)	
v.	)	Docket No. EL17-64-000
	)	
PJM Interconnection, L.L.C.	)	
Respondent	)	
Renewable Energy Systems Americas and	)	
Invenergy Storage Development LLC	)	
Complainants	)	
	)	
v.	)	Docket No. EL17-65-000
	)	
PJM Interconnection, L.L.C.	)	
Respondent	)	(unconsolidated)

**REPLY COMMENTS OF  
THE AES CORPORATION AND  
DUKE ENERGY CORPORATION  
IN SUPPORT OF SETTLEMENT**

The AES Corporation (“AES”) on behalf of itself and its subsidiaries that own and operate battery-based energy storage facilities<sup>1</sup> and Duke Energy Corporation on behalf of itself and Duke Energy Beckjord Storage, LLC (collectively, “Duke Energy”)<sup>2</sup>, pursuant to Rule 213

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<sup>1</sup> The AES subsidiaries supporting this filing either own and operate battery-based energy storage facilities or finance and construct such facilities for third parties and include: AES Energy Storage, LLC, AES ES Tait, LLC, and Laurel Mountain, LLC. Together these entities invested over \$50 million that brought 52 MW of battery energy storage to PJM markets, prior to deratings caused by the market rule changes that prompted the Complaints in these dockets.

<sup>2</sup> Duke Energy Beckjord Storage, LLC owns two 2 MW batteries in PJM.

of the Federal Energy Regulatory Commission's ("FERC" or "Commission") Rules of Practice and Procedure,<sup>3</sup> hereby file reply comments in support of the Settlement filed in these proceedings and responding to the comments in opposition filed by the Independent Market Monitor ("IMM" and "IMM Comments") and Dominion Energy Services, Inc. ("Dominion" and "Dominion Comments").

I. The Settlement Provides a Just and Reasonable Settlement of Issues Presented.

A. Settlements, Almost by Definition, Are Compromises.

The Settlement reflects a negotiated compromise among litigants in these proceedings. The Complaints were initiated in response to certain unilateral changes that were made by PJM Interconnection, L.L.C. ("PJM") to PJM's frequency regulation market Reg D signal.<sup>4</sup> These changes had the effect of dramatically impairing the economic viability of millions of dollars of investment that had been made in battery storage facilities designed to meet what was then PJM's Reg D standard for a 15-minute energy neutral signal and associated performance metrics.

Complainants, and similarly situated battery owners including AES who filed in support of Complainants, sought relief and recommended a range of options including: 1) a roll-back to the Reg D signal that was in effect prior to the changes made in January 2017<sup>5</sup>; 2) grandfathering

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<sup>3</sup> 18 C.F.R. § 385.213 (2017)

<sup>4</sup> *Energy Storage Assoc. v. PJM Interconnection, L.L.C.*, Docket No. EL17-64-000 (filed Apr. 13, 2017) ("ESA Complaint"); *Renewable Energy Systems Americas and Invenergy Storage Development LLC v. PJM Interconnection, L.L.C.*, Docket No. EL17-65-000 (filed Apr. 14, 2017) ("RESA Complaint") (together the "Complaints").

<sup>5</sup> ESA Complaint at 34; RESA Complaint at 15

for existing battery facilities to that prior Reg D signal<sup>6</sup>; 3) some form of transition rule to mitigate the harm done to existing battery facilities<sup>7</sup>; 4) the elimination of a cap imposed in changes made by PJM to Manual 11<sup>8</sup>; 5) an order directing PJM to file for review the methodology for calculate the Benefit Factor<sup>9</sup>; 6) an order finding that PJM's elimination of energy neutrality precluded energy storage participation in violation of FERC precedent<sup>10</sup>; and 7) requiring a full Section 205 proceeding to be initiated by PJM to allow all interested parties to make recommendations for a proper set of market rules.<sup>11</sup> PJM, defending its new rules, had a litigation position that basically took the view that its modifications and the way in which it implemented them was flawless.

The IMM's litigation position was that all interim relief requests should be denied and, if anything, PJM market rules were still flawed and potentially overly generous to battery owners participating in the Reg D market.<sup>12</sup> The IMM also opposed going to a settlement process in these cases, arguing that everything should be deferred pending the future issuance of an order

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<sup>6</sup> The AES Corporation Comments in Support of Complaints, Docket Nos. EL17-64-000 and EL17-65-000 (filed May 15, 2017) at 12-13 ("AES May 2017 Comments").

<sup>7</sup> AES May 2017 Comments at 6, 12-13.

<sup>8</sup> ESA Complaint at 34.

<sup>9</sup> ESA Complaint at 34.

<sup>10</sup> RESA Complaint at 15.

<sup>11</sup> AES May 2017 Comments at 14.

<sup>12</sup> IMM Comments at 3-4, 9-10, 12.

on rehearing in another case.<sup>13</sup> Dominion has been totally silent throughout until this late stage of the case; filing only document-less motions to intervene but no other pleadings

The lengthy Settlement process successfully concluded with compromises made by all the Settling Parties. The Complainants, AES and Duke Energy did not “win” a roll-back for all Reg D assets to pre-2017 price signals; we did not “win” a grandfathering provision that would have applied the pre-2017 price signals to then-existing assets. We did succeed in getting a compromise that provides a form of transitional period partial relief for existing affected battery storage assets in the form of a “scoring” mechanism that permits the existing assets to remain active in the Reg D market so long as they continue to be available for service and meet certain performance requirements.

Oddly enough, the IMM comments appear to start from the premise that a settlement goes beyond the issues presented in a case unless one achieves total victory and arrives at a result that is exactly what the Complainants sought in their initial complaint. The IMM asserts (at 14) that the Settlement is beyond the scope of what legitimate for settlement because the Complaints asked for a return to the status quo ante and did not achieve that. That is a true statement so far as it goes, and almost certainly the affected battery owners would have agreed to that if it had been offered by PJM. But the Settlement reflected a compromise approach resulting from complex negotiations where the current 30-minute Reg D signal remains in place, the affected battery facilities continue to provide valuable regulation services, but performance under that the 30-minute Reg D signal will be measured generally in accord with the pre-2017 historic

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<sup>13</sup> IMM Answering Comments, Docket Nos. EL17-64-000 and EL17-65-000 at 2-3 (filed May 24, 2018).

performance scoring.

It is asserted as a criticism that the Settlement does not eliminate a Regulation procurement cap or revise the PJM tariff to address the method for calculating the benefit factor or parameters of the Reg D signal. IMM comments at 7. But the Settlement implicitly addresses those issue by compromise: PJM “wins in part” because the cap, the benefit factor and parameters of the Reg D signal remain in place for all Reg D assets, but Complainants “win in part” because of the modifications made in the Settlement for a transitional period to the scoring mechanism for performance.

B. The Complaint Cases Presented Sufficient Evidence to Demonstrate the Economic and Physical Harm that PJM’s Regulation D (“Reg D”) Changes Imposed on Existing Battery Installations that Were Designed to Operate Against a 15-Minute Energy Neutral Signal.

Under PJM’s market rules in effect prior to a series of changes first in 2015 and then in 2017, the Reg D signal created incentives for companies to invest and bring to market battery facilities that could provide a frequency regulation service against a 15 minute energy neutral signal. Operating in this 15-minute mode meant that a battery storage installation needed to be able to discharge for no more than 7½ minutes and then go into recharge mode for 7½ minutes. In reality, the batteries were not expected to operate even on this 7 ½ minutes discharge/charge cycle. They were designed to provide a frequency regulation service – swinging quickly from discharge to charge many times in any given 15 minute period.

When PJM changed its dispatch signal to require batteries to operate more like a load-balancing resource requiring operations for up to 30-minute in discharge mode along with greater intensities and duration of signal direction holds (also known as “pegging”) without providing any meaningful compensatory transitional period, the new dispatch signal immediately

created the following dilemma for every battery owner: 1) derate to as low as one-quarter of the batteries' prior capability, while attempting to operate the batteries within design parameters to minimize physical damage to the cells and greatly shortened useful lives; or 2) cease participation in the PJM Reg D market and lose any chance of future recovery of the millions of dollars invested in the PJM market.<sup>14</sup>

The Complaints filed by the battery owners who initiated these cases included affidavits describing the problems of massive derating and/or physical damage that the change market rules caused. The ESA Complaint included an 18-page affidavit of Alan Smith from NextEra. It provided compelling evidence that the market design rule changed had dramatically decreased the value of NextEra's Reg D resources (p. 3); created almost immediate performance problems for one asset (p.5); vastly increased the "pegging" events where the dispatch signal is calling for discharge for periods far in excess of the 7½ minutes that these battery facilities were designed to discharge (pp. 6-14); and caused a derate of a size that was included in the confidential version of the Affidavit but not available to AES (p. 15).

During the settlement process, credible data was provided to PJM and made available to the IMM, including investment details, assumptions, expenses and drops in experienced revenues that showed the damaging effects of the market rule changes, which threatened the present and future viability and participation in PJM markets of the battery facilities. For AES, those derates and drops in revenue exceeded 50% year-to-year. AES has publicly shared one telling statistic regarding AES ES Tait, LLC. In a public filing with the SEC, AES ES Tait took a write-down of

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<sup>14</sup> AES entities invested approximately \$50 million between 2010 and 2015 in battery-based storage facilities located in PJM.

\$8 million in the first quarter of 2017.<sup>15</sup> AES ES Tait's sole asset within PJM was its 15-minute battery storage facility and the impairment was directly a result of changes to PJM regulation market rules.<sup>16</sup>

For an existing battery owner who invested in batteries that were designed to meet the pre-existing Reg D signal, the choices were stark: shut-down, relocate the equipment out of PJM if feasible; derate the units and earn a fraction of their prior earning, or operate their equipment to the edge of its design parameters which would dramatically shorten the assets' useful lives.

It is with this background in mind that AES and Duke Energy request the Commission to view skeptically the claims made by IMM and Dominion that nothing in these new rules discriminated against existing battery owners who continued to participate in the Reg D market and nothing in these rules required battery owners to operate their equipment in a way that shortened their lives or damaged their equipment.<sup>17</sup>

In reality, that is exactly what the new rules did – in order to recoup any investment, the battery operator had to comply with PJM's new rules and in order to do that, the batteries had to be derated and pushed to their absolute design limits. To use an automobile analogy: it is as if PJM had sponsored in 2012 a multi-million dollar road rally that was open to any car that could quickly and repeatedly accelerate and decelerate from 0 to 70 miles per hour; then, after millions was invested in constructing such cars, new rules were put in place in 2017 that required the cars

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<sup>15</sup> The AES Corporation, 2017 10-Q, 1<sup>st</sup> Quarter, at 31 n.3.

<sup>16</sup> See also, Public Version of Protest and Comments of The AES Corporation, FERC Docket No. ER18-87-000, Appendix 1 at 2 (Letter of Kenneth Zagzebski, President, U.S. Strategic Business Unit, to PJM Board, dated July 20, 2017).

<sup>17</sup> IMM Comments at 10-12; Dominion Comments at 5.

to go back and forth between 0 to 160 miles an hour and, on top of that, further requiring the 160 mile per hour speed to be held for 30 minutes or more. By “red-lining” their existing cars, the car owners could barely meet the standard, but only for a short-time before damaging the engine.

C. The Settlement Provides an Appropriate 3½ Year Transition Rule that Should Have Been Part of PJM’s Original Proposal.

The IMM Comments at 17 and Dominion Comments at 4 oppose the 3½ year term of the Settlement as unsupported by record evidence and not really a benefit. Neither party, however, appears to recognize that this provision is, in effect, a bargained-for and acceptable form of transition rule for the affected units. The Commission’s initial order responding to the Complaints recognized that parties had raised the issue that the new market rules were imposed with no transition period to mitigate the impact on existing battery facilities.<sup>18</sup>

The Commission described AES’s comments on transitional rules in some detail:<sup>19</sup>

AES argues, at a minimum, PJM should have established a transitional rule. AES states that PJM did not provide a transition to battery-based storage providers to minimize the financial impact of the market changes, as PJM has previously done for other market rules where correct results were not produced. AES asserts that either grandfathering of 15-minute resources or a compensatory transition mechanism should have been provided to enable affected facilities to be made whole, and that the costs of such mechanisms should be borne proportionally by all market users. AES asserts further that the Commission should establish guidelines for compensation or initiate settlement proceedings to accomplish an equitable outcome.

The battery owners would have preferred a grandfathering rule or some long-term indefinite

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<sup>18</sup> *Energy Storage Ass’n v. PJM Interconnection, L.L.C., et al*, Docket Nos. EL17-64-000 and EL17-65-000, 162 FERC ¶ 61,296 at P 51 (March 30, 2018), (also noting at P 24 relief requested in the RESA Complaint and at P 44 AES comments urging alternative approaches including a different set of rules with a transition period for existing facilities.”).

<sup>19</sup> *Id.* at P 51.



period under which they would have been compensated based on pre-2017 rules for the life of their facilities. Some of the other parties in the case might have preferred a result that provides zero compensation to the existing battery owners. The 3 1/2 year term for the settlement payments reflects a reasonable compromise between those extremes and reflects an appropriate transition rule that provides an opportunity for battery owners to recoup some, but not all of their investments.

D. Cynical and Untrue: Claims that Nothing in the Market Rule Changes  
Created Disproportionate Damages to Existing 15-Minute Battery Owners.

The IMM's comments start from the implicit, but invalid premise that the market rule changes adopted by January 2017 are appropriately designed and that economic and physical harms caused to the existing 15-minute battery owners are:

- 1) Fictitious – “nothing prevented these regulation resources from recovering their costs of service” (p.8); “no evidence to support the assertion regarding a loss of revenue” (p.8); “affected resources continued to participate in the market throughout the negotiation period” (p. 14); *see also* Dominion Comments at 5 (“energy storage resources can and do participate [under the new rules]”).
- 2) The Owners’ Fault – “PJM did not force Complainants to offer resources or to offer their resources at a loss into the market” (p. 9); “nothing in the new signal requires batteries to exceed physical limitation (p. 9), PJM dispatch rules cannot damage a resource – that’s the owner’s fault (p. 11).
- 3) A Normal Risk of Being in the Market – risks of market rule changes are on suppliers (pp. 8-9); IMM positions taken in 2012 should have signaled that rules were subject to change (pp. 12-13).
- 4) Justified – If owners “cannot profit under these conditions, [the facilities] by definition are uneconomic relative to their competitors. (p.9); these are “old, inefficient energy storage” facilities (p.19).

These arguments are misleading, internally inconsistent and wrong.

The precipitous drop in revenues and the massive derates necessary to meet the changed market rules are real and the IMM claims to the contrary are themselves asserted with zero evidentiary support even in the form of an affidavit. The drop in revenues reported confidentially within the Affidavit of Alan Smith attached to the ESA Complaint is real.<sup>20</sup> The \$8 million write-off by AES ES Tait, LLC in the first quarter of 2017 is real. And the detailed confidential data provided in the settlement process by battery owners showing decreases in revenues and massive derating of units is real.

And those massive derates are exactly in line with what any engineer would predict immediately if given the information that batteries designed to discharge for no more than 7½ minutes were going to be required to discharge for up to 30 minutes. A 75% derate and running each quarter of the facility in sequence instead of as a single unit would allow a 28 MW battery unit with 7½ minutes of discharge capability to provide 7 MW of power for 30 minutes. These changes in market rules have also caused operational issues and shortened the lives of the batteries due to the intense thermal cycling imposed by following the new increased signal intensity. It was estimated by one Affiant that compliance with the new market rules would cause a 50% reduction in useful life of the assets.<sup>21</sup> Another Affiant did not try to quantify the physical damage being done, but quantified the almost immediate drop in performance, noted the necessity to derate the system to prevent over-heating as the result of aggressive signal

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<sup>20</sup> ESA Complaint, Affidavit of Alan Smith P 15.

<sup>21</sup> RESA Complaint, Affidavit of Alex Ma at P 8.b.

movement periods, and concluded that: “The more aggressing signal will also accelerate the degradation of the equipment (the capacity of the batteries) resulting in a shorter system life.”<sup>22</sup>

In short, the IMM Comments present inconsistent arguments that nothing prevents continued participation, but it is the Owner’s fault if continued participation comes a cost of massive derates and/or physical damage to the batteries.

It is also misleading to assert that it is a normal risk of the market for new rules to be imposed make existing assets uneconomic at the stroke of a pen. As noted in prior filings by AES, it has often been the case that significant market design changes are accompanied by a transition rule to ameliorate adverse consequences. In this regard, AES and Duke Energy also submit that there is no knowledge and assumption of risk of drastic rule changes established by the IMM Comments that point to certain positions the IMM advocated in 2012 that were rejected or never considered. IMM Comments at 12-14. Rejected past proposals are hardly reliable indicators of what is likely to be approved in the future.

Back in 2012, the FERC approved PJM’s market rules designed to encourage the installation of Reg D regulation service assets that could provide that service under a 15-minute energy neutral signal. And millions of dollars were spent to meet that need. The destruction of value created by the new market rules in 2017 prompted the existing battery owners to file their Complaints and begin the litigation that will end with the approval of the Settlement.

E. The Settlement Meets the Goal of a Quicker Resolution of the Issues Presented.

The Commission has already rejected a prior pleading by the IMM in opposition to a Settlement process. When settlement procedures were first proposed by Complainants, the IMM

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<sup>22</sup> RESA Complaint, Affidavit of Andrew Oliver, Ph.D at P 7.

filed an answer opposing such a process and urging instead that the Complaint case be held in abeyance until an order on rehearing was issued in a separate proceeding and a Technical Conference in this case was held.<sup>23</sup>

The Commission rejected that approach:

We grant the Joint Request. We find that the involvement of a settlement judge may assist the parties in reaching a satisfactory resolution of the issues raised in these proceedings. We disagree with the IMM that the settlement procedures should be delayed due to the pendency of rehearing requests in Docket No. ER18-87-000. We note that Commission policy favors settlement.<sup>10</sup>

<sup>10</sup> See, e.g., *San Diego Gas & Elec. Co. v. Sellers of Energy and Ancillary Servs.*, 122 FERC ¶ 61,009, at P 13 (2008) (“[T]he Commission strongly favors settlements, particularly in cases that are highly contested and complex.”); *Montana Power Co.*, 77 FERC ¶ 61,110, at 61,434 (1996) (“[T]he Commission strongly favors settlements, which provide the opportunity to eliminate the need for more lengthy proceedings if the parties reach an agreement on the issues that is compatible with the public interest”)

This is a complex case with a large number of parties and a larger number of issues. The Commission was correct to establish a settlement process and it would be correct as well to approve the resulting Settlement.

F. Most of the Claims Made in Opposition to the Settlement Are Unsubstantiated.

While complaining that the Settling Parties have not presented sufficient evidence to support the Settlement, the IMM and Dominion fail utterly to present any evidence, even in the form of an affidavit, that support the claims they make to minimize the benefits or to support hypothetical harms allegedly caused by the Settlement. Dominion postulates with no record evidence that maybe other regulation service providers will be pushed out of the market, or that costs overall will rise (pp. 2-4). AES and Duke Energy would note in response that the

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<sup>23</sup> Answer of the Independent Market Monitor for PJM, May 24, 2018.

Settlement is intended to preserve the value that existing battery installation provide to PJM markets. The entities that were being pushed out of the market were the existing battery owners. As noted in the Affidavit of Alex Ma, “As a direct result of the changes unilaterally made by PJM, the regulation market is no longer an attractive market for Invenergy. Invenergy does not have any current plans to develop further advanced energy storage devices in PJM.”<sup>24</sup>

AES and Duke Energy respectfully submit that having more participants in the market, rather than fewer, is generally going to result in positive outcomes for competition.

The IMM Comments (p. 8) and Dominion Comments (p.7) also assert that there is no support for the proposition that existing battery owners have been financially damaged. This ignores the affidavits that have been submitted by Complainants, demonstrates a studious disregard of the comprehensive and detailed financial records provided during the settlement negotiations, and further highlights that, in the absence of a settlement, this complex case would have ended up in full administrative litigation to establish the level of harm that the new market rules did to existing battery owners.<sup>25</sup>

And on the benefit side, the IMM and Dominion take the view that litigation costs avoided are low because there is no basis for litigation (IMM Comments at 21) or because costs would be limited to those incurred in the context of a Technical Conference (Dominion pp. 4-5). This fails to recognize the very real probability for continued litigation after the technical conference, as Complainants and other battery owners may have sought full evidentiary hearings.

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<sup>24</sup> RESA Complaint, Affidavit of Alex Ma at P 6.c.

<sup>25</sup> Dominion, even if it had been an active participant in the settlement discussions would not have had access to competitively sensitive confidential data. The IMM, however, did have access to these confidential submissions made by the battery owners.

For its part, the IMM Comments make a host of unsubstantiated claims. Most of those are variants of the four inconsistent set of IMM allegations addressed above in section I.D. In addition, however, the IMM Comments claim (p. 10) that the Settlement will promote investment system upgrades, system replacements and increased capacity during the settlement period. But for each Settling Party, the Settlement limits the payments under the Settlement to the existing size of the installations. Section 2.1.1, Table 2.2 and 5.2. Section 5.2 is explicit that offers in excess of the Affected Battery's original capacity is not subject to the scoring and compensation mechanisms of the Settlement but are instead subject to the PJM tariff rules and payment mechanisms. Thus, to the extent there are upgrades and increased capacity, those would not qualify under the Settlement – and the IMM should applauding as a benefit of the Settlement, not decrying, the possibility that existing battery owners would reconsider investing to upgrade existing units and new investments in new installations instead of exiting the PJM market.

The IMM Comments assert that Complainants are seeking guaranteed returns (p. 8-10). But that is patently untrue. The Settlement does not guarantee any particular level of return. Each participating battery owner must continue to meet certain operational performance standards to obtain any revenue under the Settlement while providing continued regulation services. Settlement Section 5.4.

The IMM Comments also claim (pp. 17-18) that the Settlement actually provides more generous benefits than the pre-existing market rules due to the combination of the scoring mechanism within the Settlement and the inclusion of a mileage factor. The IMM Comments recognize at p. 10 that the existing installations had to derate in order to participate at any level under the new rules (“RegD resources have either adapted to the changes in the market by

modifying their offer parameters (reduction in bid in capability to support longer duration injections and withdrawals).” But the IMM Comments continue to fail to recognize that the massive nature of the derates (50% - 75%) were so economically devastating to the 15-minute battery owners that the inclusion of a mileage factor was a mere band-aid. As attested to by Alan Smith from NextEra, “The significant decrease in capability revenues were only partially offset by the additional revenues related to the increase in the mileage ratio.”<sup>26</sup> The Settlement payment structure, even with a mileage factor, is not going to equal, but less exceed, the revenues that were being earned prior to the market changes.

The IMM Comments (pp. 19) claim that the Settlement does not provide a benefit of retaining the existing 15-minute battery facilities in the Reg D market because: 1) they continue to participate; and 2) to the extent they do not or cannot, the Settlement result is to “subsidize old, inefficient energy storage.” As noted above, the continued participation is at a much lower level due to massive derates or is being done by pushing the batteries to their limits for extended periods which greater reduces their useful live.

And it is simply not true that these are “old, inefficient” systems.” Most of them were built within the last 8 years and they are very efficient performers when dispatched under a 15-minute energy neutral signal.

## II. The Trailblazer Standards Are Met and Justify an Approval of the Settlement.

AES and Duke Energy has reviewed the draft reply comments of PJM and Invenergy Storage Development, LLC in this proceeding and we largely adopt their positions with respect

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<sup>26</sup> ESA Complaint, Affidavit of Alan Smith at P 15 (Total revenues paragraph).

to the how this Settlement meets the standards set forth in the Trailblazer case.<sup>27</sup>

AES and Duke Energy note in particular that both the IMM and Dominion dramatically under-value the benefits of not taking these Complaints through a complete administrative litigation process. The IMM Comments, for example, take the position that the new market rules were improvements over the prior rules to maintain reliable operation (p. 8) and further recognizes that the Complainants sought a return to the pre-existing market rules (p. 17). If this case were to go through a complete administrative litigation process, the end-result could well be a return to the prior market rules. Or a return to those pre-existing market rules for these assets. In either event, the IMM would “lose” whatever value the IMM believes exists from the new market rules relative to the pre-existing rules. The Settlement, in contrast, preserves PJM’s current 30-minute market rules, provides a temporary transition rule of 3½ years for the affected battery owners, and allows PJM to proceed with the development of additional market changes that it may ultimately propose.

Allowing PJM the option to make additional rule changes will be valuable for the entire market. Settlement Section 5.6 requires the settling battery owners to forego any rights they may have to protest future changes made to the regulation signal on grounds that it uses a single regulation signal or employs a signal that is not designed to be energy-neutral. The signatory battery owners represent a substantial sub-set of approximately 82% of the battery storage

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<sup>27</sup> *Trailblazer Pipeline Co.*, 85 FERC ¶ 61,082 (1998) (“*Trailblazer I*”); *Trailblazer Pipeline Co.*, 85 FERC ¶ 61,345 at 62,341 (“*Trailblazer II*”), *order on reh’g*, 87 FERC ¶ 61,110 (“*Trailblazer III*”), *aff’d*, 88 FERC ¶ 61,168; *see also Pub. Utils. Comm’n of Cal. v. El Paso Natural Gas Co.*, 105 FERC ¶ 61,201 at P 44 (2003), *reh’g denied*, 106 FERC ¶ 61,315 (2004).



operators within PJM.<sup>28</sup> To the extent that load interests, the IMM, or other market participants would benefit from some future changes proposed by PJM to the Regulation market design, such a proposal will be far easier to implement with a large group of stakeholders limited in the issues that they could raise.

As a final observation, AES and Duke Energy respectfully submit that the customers of PJM as well as PJM system operations have greatly benefited from the large investments that battery storage owners have made to provide improved regulation service and lower regulation costs. These customer benefits were largely created by the market rules approved by FERC and implemented in 2011. Keeping the existing facilities available and operating enhances competition by increasing the number of market participants. And, not least, the adoption of the Settlement sends a reassuring message to potential future entrants looking at today's market rules that "bait-and-switch" is not a favored result: if there are future significant market rule changes, there will be some consideration of a transitional mechanism. The likely cost of the settlement is small compared to the overall value of retaining existing and attracting future Reg D market participants to the PJM regulation markets.

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<sup>28</sup> Settlement Table 2.2 Affected Batteries of 247.9 MW. <https://www.pjm.com/-/media/committees-groups/committees/oc/20190514/20190514-item-21-regulation-update.ashx> at p.7 shows 301.5 MW of Regulation D from Energy Storage facilities.

III. Conclusion

For the foregoing reasons, The AES Corporation on behalf of itself and its battery-based energy storage-owning subsidiaries and Duke Energy, respectfully requests that the Commission issue an order approving the Settlement.

on behalf of Respectfully submitted,  
The AES Corporation  
and its battery-owning subsidiaries  
operating within PJM

/ss/ *Randall V. Griffin*

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/ss/ *Sheri Hylton May*

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Dated: May 23, 2019

# CERTIFICATE OF SERVICE

I hereby certify that I have this day, May 23, 2019 served via e-mail or by first-class mail, a copy of the foregoing on each party on the official service list compiled by the Secretary in this proceeding.

On behalf of                      The AES Corporation  
and Duke Energy Corporation

*Iss: Randall V. Griffin*  
Randall V. Griffin  
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AES Duke Reply Comments in Support of Settlement-rev.DOCX.....1-19

Duke Energy Ohio  
Case No. 19-2223-EL-UNC  
IGS First Set of Interrogatories  
Date Received: February 6, 2020

IGS-INT-01-004 CONFIDENTIAL as to Attachment

**REQUEST:**

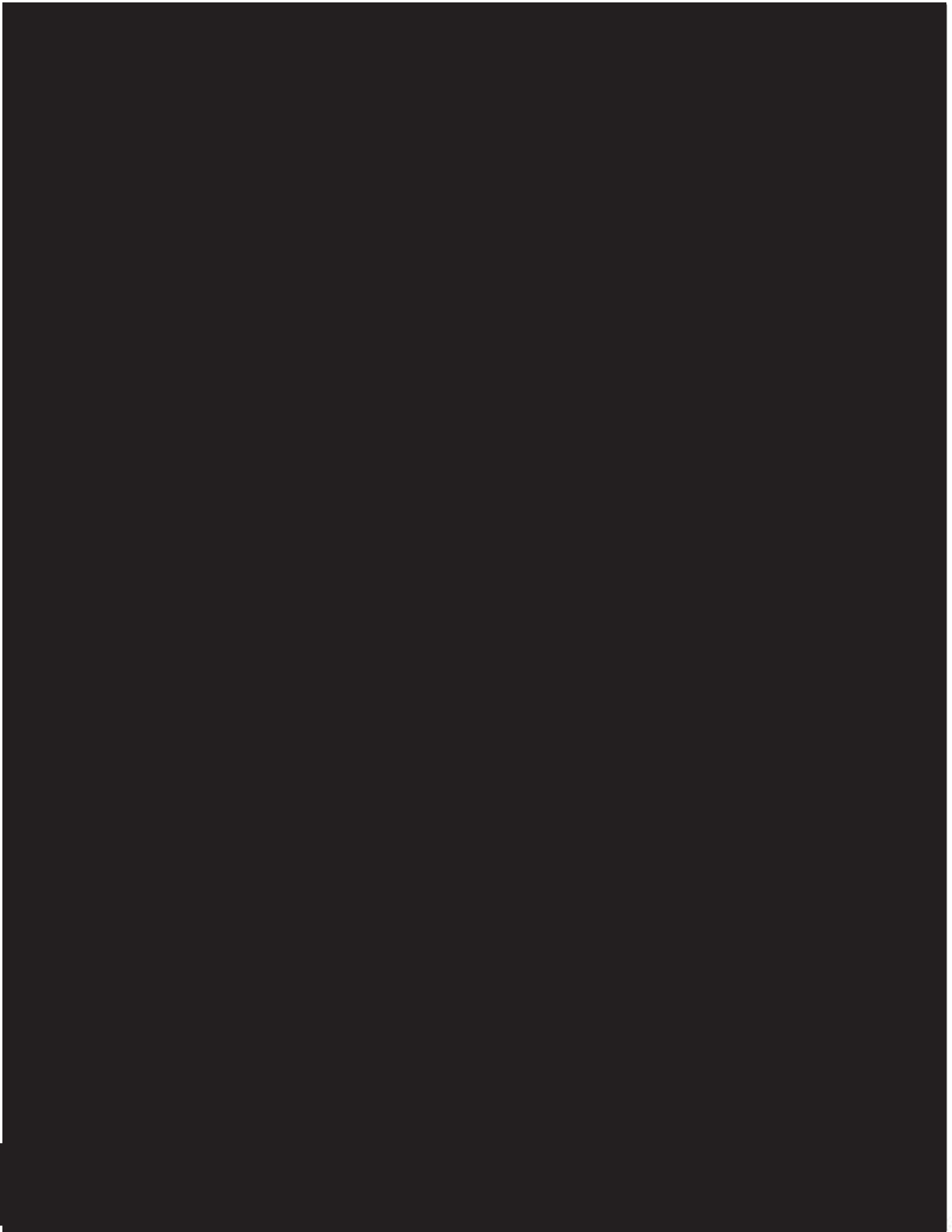
The testimony of witness Schultz states that Duke proposes to use the proposed battery storage assets to participate in the frequency regulation market. Regarding this testimony,

- A. Does Duke propose to participate in the PJM regulation A market, PJM regulation D market, or both markets.
- B. For the next five years, identify all forecasted revenues that Duke anticipates the battery storage asset will earn in the frequency regulation market (either A or D).
- C. Describe the operation of the PJM regulation A market.
- D. Describe the operation of the PJM regulation D market.
- E. Does Duke agree that the PJM regulation A market is a competitive market that requires participants to bid every day?
- F. Does Duke agree that only certain bidders into the PJM regulation A market are selected to provide regulation service?
- G. Does Duke agree that the PJM regulation D market is a competitive market that requires participants to bid every day?
- H. Does Duke agree that only certain bidders into the PJM regulation D market are selected to provide regulation service?

**RESPONSE:**

CONFIDENTIAL PROPRIETARY TRADE SECRET as to Attachment





[REDACTED]

[REDACTED]



**Duke Energy Ohio**  
**Case No. 19-2223-EL-UNC**  
**IGS First Set of Interrogatories**  
**Date Received: February 6, 2020**

**IGS-INT-01-002 CONFIDENTIAL as to Attachments**

**REQUEST:**

The testimony of witness Miller states at p. 3 that the battery storage project will “defer the need to install an additional transformer and additional distribution upgrades at this location.” Regarding this testimony:

- A. Identify the capital investment and annual operating and maintenance cost associated with the transformer and distribution upgrades.
- B. Identify the total annual revenue requirement related to the transformer and distribution upgrades, including a specific breakout of the costs included in the annual revenue requirement.
- C. The useful life of the transformer and associated upgrades.
- D. Identify all documents to support Duke’s response to INT 1.2 (A), (B), and (C).









[REDACTED]

[REDACTED]

[REDACTED]

**\* COMPLAINT \***

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

Energy Storage Association )  
Complainant. )

v. )

Docket No. EL17-\_\_\_\_-000

PJM Interconnection, L.L.C. )  
Respondent. )

**COMPLAINT BY  
ENERGY STORAGE ASSOCIATION**

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*Counsel for Energy Storage Ass'n*

April 13, 2017

But PJM did not stop there. PJM also made adjustments to the RegA signal “in order to more closely follow the capabilities” of RegA resources.<sup>42</sup> PJM noted that its control systems were accelerating the RegA signal when there are large changes in ACE, which was a leftover design feature from before the implementation of the RegD signal.<sup>43</sup> PJM concluded that elimination of this acceleration function, effectively slowing down the RegA signal, was necessary to “better align [the signal] with resource capabilities.”<sup>44</sup> That is, at the same time PJM removed aspects of the RegD signal that respected the operational characteristics of limited-energy resources, it revised the RegA signal to respect the operational characteristics of traditional generation resources. Because the rules governing the RegA and RegD signals are not found in the PJM Manuals, much less the Tariff, PJM was able to unilaterally implement both of these changes in January 2017, which it did over the objections of ESA and its members.

Immediately upon implementation of the January 2017 Signal Change, the elimination of energy neutrality in the RegD signal subjected RegD resources to almost daily pegging, mostly in the RegDown position, meaning that participating energy storage resources are being directed to accept power at their full Regulation commitment for the duration of the pegging event.<sup>45</sup> Over the first two days the new signal was in effect, RegD resources were directed to charge at full power for 20 or more minutes on six separate occasions.<sup>46</sup> Between January 9 and January 31, the PJM RegD signal pegged resources at the maximum or minimum output in every hour of

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<sup>42</sup> March Regulation Study at 8.

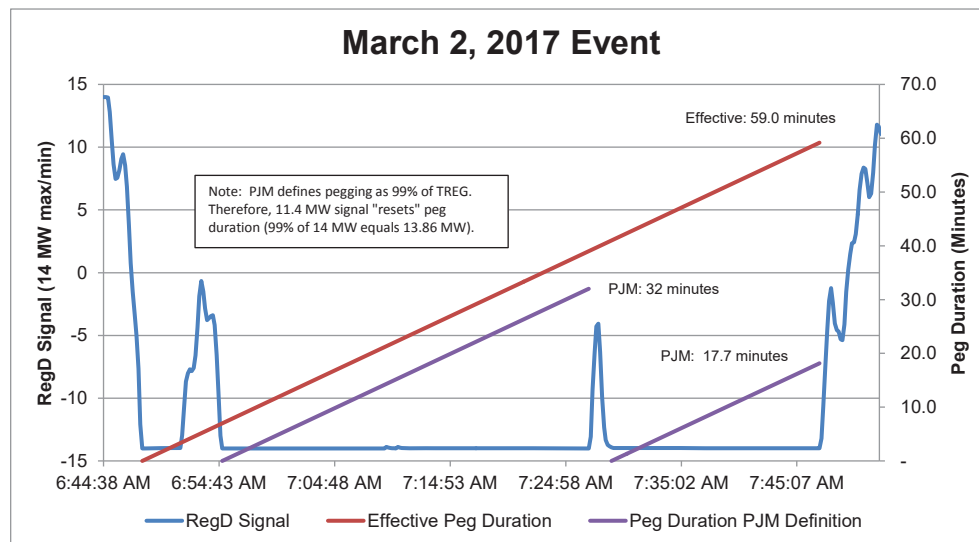
<sup>43</sup> *Id.* at 4.

<sup>44</sup> June Regulation Study Update at 5.

<sup>45</sup> Smith Affidavit at 6-14. Additionally, the new signal demands significantly more energy throughput from RegD resources and causes energy storage devices providing RegD to run through more charge/discharge cycles, reducing market opportunities and decreasing the service life of the devices. *See* Buie Affidavit at 3-4; Smith Affidavit at 9.

<sup>46</sup> *Regulation Signal and Requirement Update*, Presentation of Eric J. Endress to RMISTF, at 9 (January 23, 2016) (available at <http://www.pjm.com/~media/committees-groups/task-forces/rmistf/20170124/20170124-item-04-signal-implementation-review.ashx>).

operation, and in 40 percent of those hours the RegD signal was pegged on a non-contiguous basis for 15 minutes or more.<sup>47</sup> To illustrate these pegging events visually, the following graph shows the pegging event that occurred on March 2, 2017<sup>48</sup>:



As noted in the text box within the graph, PJM's definition of pegging resets the clock when there are short releases in the Regulation signal, illustrated by the difference between the purple and red lines. As shown in this example, RegD resources are clearly being directed to operate outside of their design parameters. There are numerous occurrences in which pegging events have durations up to or approaching an hour.<sup>49</sup>

This almost daily pegging of the RegD signal has revealed that PJM is seeking to use RegD resources in a way that is fundamentally inconsistent with the purpose of Regulation reserves. As discussed above, Regulation service entails the balancing of generation and load on

<sup>47</sup> Smith Affidavit at 7-10.

<sup>48</sup> Smith Affidavit at 11.

<sup>49</sup> Smith Affidavit at 11.

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

Renewable Energy Systems Americas and	)	
Invenergy Storage Development LLC	)	
Complainants.	)	
	)	Docket No. EL17-____-000
v.	)	
	)	
PJM Interconnection, L.L.C	)	
Respondent.	)	
	)	

**COMPLAINT OF  
RENEWABLE ENERGY SYSTEMS AMERICAS  
AND  
INVENERGY STORAGE DEVELOPMENT LLC**

Pursuant to Sections 205 and 206 of the Federal Power Act (“FPA”), 16 U.S.C. §§ 824d, 824e, and Rules 206 and 212 of the Federal Energy Regulatory Commission’s (“FERC” or “Commission”) Rules of Practice and Procedure, 18 C.F.R. §§ 385.206 and 385.212, Renewable Energy Systems Americas (“RES) and Invenergy Storage Development LLC (“Invenergy” and together with RES, the “Complainants”)<sup>1</sup> hereby file this Complaint against PJM Interconnection, L.L.C. (“PJM”) to challenge PJM’s January 9, 2017, unilateral, unreasonable and unduly discriminatory change to its long-established Reg-D frequency regulation<sup>2</sup> signal. As a result of such change, Complainants’ storage facilities, which participate in the PJM-administered regulation markets were adversely affected.

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<sup>1</sup> In support of the Complainants’ position, attached please find affidavits submitted by Andrew Oliver, Ph.D., RES’ Chief Technology Officer and Global Head of Energy Storage (attached as Attachment 1) and Alexander Ma Invenergy’s Senior Manager for Regulatory Affairs (attached as Attachment 2).

<sup>2</sup> Frequency regulation is an ancillary service required under the Commission’s *pro forma* open access transmission tariff (“OATT”). As described *infra*, PJM has established two categories of regulation service; RegA and RegD. RegD procures fast response regulation service specifically designed to take advantage of storage technologies. *PJM Interconnection, L.L.C.*, 139 FERC ¶ 61,130 (2012).

and 7.5 minutes of output being unable to maintain those levels of performance they were previously capable of providing. As is documented in the affidavits of Dr. Oliver and Mr. Ma, the first day the new signal was in effect, the Complainants each experienced a signal that was more difficult to respond to, resulting in reduced market performance, adverse impacts on the equipment, and increased costs.<sup>18</sup>

The new signal requires storage projects to run through more extended charge/discharge periods which, as explained in the affidavits, will reduce the service lives of these projects.<sup>19</sup> And, because it mutes the efficiencies of the storage technologies, it affects the performance of these resources and reduces their compensation. This performance impact enforces the stark deviation from the original operating parameters when the original RegD signal, which was designed to accommodate energy storage resources capable of responding optimally to a 15-minute energy neutral signal. As noted in Dr. Oliver's affidavit, RES has experienced a performance loss of approximately 11 percent.<sup>20</sup> And, Mr. Ma explains that, prior to the signal change, 75% of the time its projects were within 10% of net neutral over fifteen minutes, whereas after the signal change, that has occurred only 10% of the time.<sup>21</sup>

#### IV. COMPLAINT

PJM's action not only violates FERC precedent that precludes ISOs from changing frequency regulation signals if the change negates the need to consider operational characteristics of specific resources, but also ignored FERC's need to ensure regulatory certainty in all markets.

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<sup>18</sup> Ma affidavit at 3; Oliver affidavit at 3.

<sup>19</sup> *Id.*

<sup>20</sup> Oliver affidavit at 2-3.

<sup>21</sup> Ma affidavit at 3.



***1. PJM's unilateral change to the frequency regulation signal results in market requirements that exceeds the physical limitation of energy storage resources.***

As explained in the affidavits of Dr. Oliver and Mr. Ma, the RegD signal was designed to be energy neutral over each 15 minute settlement period 95 percent of the time. This means that in any given 15-minute settlement period, PJM would require injection into the grid the same amount of energy that would it would require to be withdrawn. For batteries, this means that no more than 7.5 minutes at full rated power output and 7.5 minutes of full rated power input would be necessary under the RegD signal.

Ignoring those parameters and requiring limited-energy storage facilities to shift from a 15-minute energy neutral signal to a 30-minute conditionally energy neutral signal means that batteries are less able to provide Regulation at the level of performance previously achieved. As is documented in the affidavits of Dr. Oliver and Mr. Ma, the first day the new signal was in effect, the Complainants each experienced a signal that was more difficult to respond to, resulting in reduced market performance, increased costs to run the system and wear and tear on the equipment.

PJM's actions are clearly discriminatory insofar as PJM would not require a RegA generator, or any thermal generation unit to operate outside its design parameters, *e.g.*, by operating below its minimum load or outside of its ramp rates. Thus, we have been disproportionately affected by the change in the RegD signal as compared with other technologies that follow the same signal. If PJM continues to make the RegD signal harder for energy-neutral storage resources to operate, the Complainants will need to either modify their technology at significant and very likely prohibitive cost, or no longer participate in the regulation market – the market for which they were specifically designed.

**Duke Energy Ohio**  
**Case No. 19-2223-EL-UNC**  
**IGS First Set of Interrogatories**  
**Date Received: February 6, 2020**  
**IGS-INT-01-003**

**REQUEST:**

The testimony of witness Miller at p.4 states that "the facts and circumstances support the classification of the battery as a distribution function because participation in the PJM market will not interfere with the distribution purpose of the battery." Regarding this statement:

- A. Identify Duke's definition of the word "interfere"
- B. If participation in the PJM market degrades the battery to a useful life of less than 15 years, would that degradation interfere with the distribution purpose of the battery?

**RESPONSE:**

- A. The Company accepts the Merriam-Webster definition of the word "interfere."
- B. Duke Energy Ohio will not operate the battery in way that reduces the expected useful life of the battery. If authorized to participate in the PJM market Duke Energy Ohio will design the battery project with this use in mind to ensure that the distribution purpose of the battery is not interfered with.

**PERSON RESPONSIBLE: Jay P. Brown as to part A,  
Matthew G. Schultz as to part B.**

**BEFORE  
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of Duke	)	
Energy Ohio, Inc. for Approval of McMann	)	Case No. 19-2223-EL-UNC
Battery Storage Project.	)	
	)	
	)	<b><u>Affidavit of Joseph Haugen</u></b>

Joseph Haugen, upon oath, deposes and states:

1. I am the Power Supply Director for Interstate Gas Supply, Inc. ("IGS"), and my duties include representing IGS in the PJM Interconnection, Inc. ("PJM") stakeholder process, supervising IGS' demand response programs, and overseeing the daily operation and bidding of distributed energy resources into the PJM Frequency Regulation Market.
2. I have reviewed the stipulation and recommendation ("Stipulation") that was filed by Duke Energy Ohio, Inc. ("Duke") in Case Nos. 17-32-EL-AIR et al. and adopted and approved by the Public Utilities Commission of Ohio ("PUCO" or "Commission") on December 19, 2018.
3. I have also reviewed Duke's application for approval of its McMann Battery Storage Project ("Application"), which was filed in the above-captioned proceeding.
4. I have also reviewed FERC Order 784. The purpose of that order was to provide accounting guidance for energy storage resources. In proposing these rules, the FERC noted that the lack of transparency affects interested parties', including FERC's, ability to monitor these utilities' operations to prevent and discourage cross-subsidization between cost-based and market-based activities. Therefore, in instances where an energy storage asset performs multiple functions, it is imperative that costs associated with each function be transparent and allocable to the function performed so that cross-subsidization of costs can be prevented. Consequently, FERC requires energy storage to be accounted for as either production (Account 348), transmission (Account 351), or distribution (Account 363). Additional rules apply to storage-related costs, such as labor and materials used for power production and transmission (Account 548.1/Account 553.1/Account 562.1/Account 570.1).
5. My understanding is that Duke's Application seeks to collect the cost of a battery storage system through its nonbypassable Rider DCI, and to use that battery to participate in the PJM Frequency Regulation ("FR") market.
6. It is also my understanding that Duke's Application is subject to the terms and conditions of the Stipulation, which authorizes Duke to install a battery storage project for the limited purpose of deferring circuit investments or addressing distribution reliability issues.



7. The Stipulation further provides that to be eligible for cost recovery under Rider DCI, Duke's battery storage investments must qualify as distribution equipment under FERC Accounts 360 through 374.
8. Based upon my review of the Stipulation and Duke's Application in this case, I conclude that Duke's proposal to participate in the FR market is not distribution-related, and therefore, would not qualify for cost recovery under FERC Accounts 360 through 374.
9. The FERC regulated wholesale markets are not distribution related. Rather, the FR market is a competitive wholesale service that corrects for short-term changes in electricity by matching up generation and demand. PJM runs an hourly auction for the service, which sets the hourly market price and determines which units will provide FR services based on the lowest price offers and historical performance.
10. It is my belief that a battery storage resource participating in the FR market does not qualify as a distribution resource under FERC Accounts 360 through 374, because that resource is providing a wholesale competitive service and receiving revenue from the PJM wholesale markets. For that reason, I believe that the more appropriate account to record Duke's proposed use of its battery asset is FERC Account 348 Production or 351 Transmission.
11. I also believe that Duke's proposal violates Ohio law and policy. Specifically, Duke's request to obtain cost recovery under Rider DCI would provide it with a subsidy to support the provision of a wholesale competitive service in violation of R.C. 4928(B) and (H), which requires unbundled rates and expressly prohibits subsidies from flowing between utility distribution and competitive services.
12. If approved, Duke's proposal will distort FR market forces by insulating the battery from risk, and thereby discouraging other, unsubsidized resources from competing for FR market services.
13. For the reasons set forth above, I believe that Duke's Application is inconsistent with the terms of the Stipulation, violates Ohio law and policy, and if approved, will distort wholesale market prices to the detriment of other distributed energy resources, such as those owned by IGS.

Dated: 5-19-2020

  
Joseph Haugen

**PUCO Case No. 19-2223-EL-UNC**

**IGS' Attachment C**

**Page 1 of 15**

**BEFORE  
THE PUBLIC UTILITIES COMMISSION OF OHIO**

In the Matter of the Application of Duke	)	
Energy Ohio, Inc. for Approval of McMann	)	Case No. 19-2223-EL-UNC
Battery Storage Project.	)	
	)	
	)	

**Affidavit of Amy Sheppard**

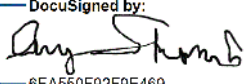
Amy Sheppard, upon oath, deposes and states:

1. I am the Director of Accounting of Interstate Gas Supply, Inc. ("IGS"), and my duties include overseeing the company's general accounting function including developing and maintaining accounting policies and reviewing and analyzing IGS monthly, quarterly and annual financial statements. In addition, I am responsible for adherence to accounting reporting requirements and documentation and compliance with annual audit requirements for all of the IGS and related affiliate companies. I received a BS in Accounting from Miami University in 1994. I am a Certified Public Accountant (CPA) in the State of Ohio. Following graduation I was employed by PricewaterhouseCoopers (Cincinnati OH) in varying roles varying from Staff Associate to Senior Manager. I was then hired by Cinergy Corporation, where I was the Manager of Accounting Research and Policy. In 2013, I joined IGS Energy as a Lead Account. I was later promoted to Manager of Accounting and later Director of Accounting.
2. I have reviewed Duke Energy Ohio's proposal to construct the McMann battery storage project in lieu of completing a substation upgrade, as well as the cost benefit analysis that Duke presented regarding these options.
3. My understanding is that Duke's Application seeks to collect the cost of a battery storage system through its nonbypassable Rider DCI, and to use that battery to participate in the PJM Frequency Regulation ("FR") market.
4. I have concluded that Duke improperly framed its cost benefit analysis. Duke's analysis first calculates the total annual revenue requirement of the battery. It then calculates the benefit as the cost of the deferred substation and the available frequency regulation revenue. Duke then divides the present value of these benefits by the present value of the future annual revenue requirements. Duke's analysis is improper and disconnected from the type of analysis a business would undertake to determine whether a battery is a more sensible solution than a traditional substation upgrade.

**PUCO Case No. 19-2223-EL-UNC****IGS' Attachment C****Page 2 of 15**

5. A business without captive customers would compare the present value revenue requirement of a battery to the present value revenue requirement of a substation. Under such an analysis, even accepting Duke's projections and including frequency regulation revenues, but excluding the cost of the deferred substation as a benefit, it is clear that the battery is more than twice the cost of a substation.
6. After reviewing Duke's cost benefit analysis, it is clear that Duke included several flawed assumptions. When these assumptions are replaced with more reasonable figures, the economics get even worse for customers. Specifically, Duke used the incorrect useful life assumption for a battery storage project that participates in the frequency regulation market.
7. Duke's cost benefit analysis uses a 15 year useful life. Based upon IGS' experience with battery resources, something confirmed by Duke Corporation's public filings at FERC, Duke has overstated the useful life of its proposed battery. IGS, for example, depreciated its battery resource over a 5-year period, given the stress caused by the frequency regulation market. Although that is likely the correct useful life, I performed a cost benefit analysis using a 7-year useful life.
8. When the analysis reduces the useful life of the battery asset, the impact is to increase the annual depreciation expense (or include a stranded cost payment at the end of the useful life) while simultaneously reducing the total amount of frequency regulation revenue available to reduce costs (less years in use equals less revenues available). The end result is an increase to the present value of the revenue requirement for the battery.
9. Duke's analysis included other unreasonable assumptions as well. [REDACTED]  
[REDACTED] This is not a realistic scenario although IGS left these assumptions in the model as is for the time being.
10. Duke estimates that frequency market prices [REDACTED] when market prices do [REDACTED]
11. Finally, it should be noted that even if Duke's proposed assumptions are accepted at the end of 15 years (projected useful life per Duke), Duke would need to buy another battery to replace this one. Over the expected life of the substation [REDACTED] with the current estimate of useful lives. If the useful life of the battery is in fact 7 years, Duke would need to [REDACTED] when Duke could build one \$4 million substation.
12. My cost benefit analysis of Duke's proposed battery relative to a substation upgrade is attached to this affidavit.

Dated: 5/19/2020

DocuSigned by:  
  
 6EA550F92F9E469...  
 Arty Sheppard

12 Year Comparison Analysis as provided by Duke

<b>Substation Scenario- \$3,994,281 initial cost</b>	
Total revenue requirements - 12 years	\$ 6,305,841
Discounted revenue requirements - 12 years	\$ 4,277,950

<b>Battery Scenario- 15 year life \$11,694,616 initial cost</b>	
Total revenue requirements - 12 years*	\$ 13,461,312
Discounted revenue requirements - 12 years*	\$ 9,539,264

\* includes estimated Frequency regulation revenue benefit



2025	2026	2027	2028	2029	2030	2031	2032
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12 Year Comparison Analysis

<b>Battery Scenario- 7 year life \$11,694,616 initial cost</b>	
Total revenue requirements - 7 years*	\$ 13,114,613
Discounted revenue requirements - 7 years*	\$ 10,258,616
* includes estimated Frequency regulation revenue benefit	

<b>Battery Scenario- 15 year life \$11,694,616 initial cost</b>	
Total revenue requirements - 12 years*	\$ 13,461,312
Discounted revenue requirements - 12 years*	\$ 9,539,264
* includes estimated Frequency regulation revenue benefit	

[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]		
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]	[REDACTED]	
[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

2022	2023	2024	2025	2026	2027	2028
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2029	2030	2031	2032
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Add some

Assumptions		
Book life	Tax Life	Capital Cost

2021

2022

2023





2024	2025	2026	2027	2028	2029	2030	2031	2032
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2033





	</							

Category	Percentage
Overall	100%
Male	100%
Female	100%
White	100%
Black	100%
Hispanic	100%

Duke Energy Ohio  
Case No. 19-2223-EL-UNC  
IGS First Set of Interrogatories  
Date Received: February 6, 2020  
IGS-INT-01-002(B) Attachment

The chart displays the following components over the timeline:

- Project:** A series of black bars representing cash flow, starting in 2019 and continuing through 2028.
- Property, Plant and Equipment (Capital):** A series of grey bars representing capital expenditures, starting in 2019 and continuing through 2028.
- Tax Depreciation on:** A series of green bars representing depreciation, starting in 2019 and continuing through 2028.
- Cash:** A series of black bars representing cash flow, starting in 2019 and continuing through 2028.
- Cash Paid:** A series of black bars representing cash paid, starting in 2019 and continuing through 2028.
- Cash Received:** A series of black bars representing cash received, starting in 2019 and continuing through 2028.

The chart shows a significant initial outflow in 2019, followed by a period of relative stability, and then a large inflow starting in 2023, peaking in 2024 and 2025, before declining towards 2028.

\_\_\_\_\_

[illegible][illegible]

Category	Percentage
U.S. should take action to address climate change	70%
U.S. should not take action to address climate change	30%

[illegible]

**This foregoing document was electronically filed with the Public Utilities**

**Commission of Ohio Docketing Information System on**

**5/20/2020 8:40:42 AM**

**in**

**Case No(s). 19-2223-EL-UNC**

Summary: Comments (Public Version) of Interstate Gas Supply, Inc. electronically filed by Mr. Michael A Nugent on behalf of Interstate Gas Supply, Inc.