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September 1, 2023

The Honorable Kimberly D. Bose  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E. Room 1A  
Washington, D.C. 20426

**Re: *PJM Interconnection L.L.C., Docket No. ER22-962-00\_*  
*Order No. 2222 Compliance Filing of PJM Interconnection, L.L.C.***

Dear Secretary Bose,

In compliance with the Federal Energy Regulatory Commission’s (“FERC” or the “Commission”) March 1, 2023 Order<sup>1</sup> in the above-captioned Order No. 2222<sup>2</sup> compliance proceeding, PJM Interconnection, L.L.C. (“PJM”) hereby submits proposed revisions to the PJM Open Access Transmission Tariff (“Tariff”) and the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. (“Operating Agreement”).<sup>3</sup>

As discussed below, PJM respectfully requests that the Commission grant an effective date of February 2, 2026 for the Tariff and Operating Agreement revisions proposed herein.

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<sup>1</sup> *PJM Interconnection, L.L.C.*, 182 FERC ¶ 61,143 (2023) (the “March 1, 2023 Order”). *See also PJM Interconnection, L.L.C.*, Docket No. ER22-962-001, Notice of Extension of Time (Apr. 11, 2023) (“Upon consideration, notice is hereby given that PJM’s motion for a 120-day extension of time to and including September 1, 2023, to submit its compliance filing as directed by the March 1 Order is granted.”).

<sup>2</sup> *Participation of Distributed Energy Resource Aggregations in Markets Operated by Regional Transmission Organizations and Independent System Operators*, 172 FERC ¶ 61,247 (2020) (“Order No. 2222”); 174 FERC ¶ 61,197 (2021) (“Order No. 2222-A”); 175 FERC ¶ 61,227 (2021) (“Order No. 2222-B”).

<sup>3</sup> The Tariff and Operating Agreement are currently located under PJM’s “Intra-PJM Tariffs” eTariff title, available here: <https://etariff.ferc.gov/TariffBrowser.aspx?tid=1731>. Terms not otherwise defined herein shall have the same meaning as set forth in the Tariff, Operating Agreement, and the Reliability Assurance Agreement among Load-Service Entities in the PJM Region (“RAA”).

**I. DESCRIPTION OF PROPOSED TARIFF AND OPERATING AGREEMENT REVISIONS.**

For ease of reference, PJM has compiled into the following **Table 1** the individual compliance directives identified by the Commission in the March 1, 2023 Order, the specific Paragraph of the March 1, 2023 Order in which a given compliance directive is located, and the corresponding sections of the PJM Tariff and Operating Agreement that have been amended in response to each compliance directive. If no Tariff or Operating Agreement changes were made, PJM identifies the applicable portion of this transmittal letter where further explanation is provided.

**Table 1.** Compliance Directives

Compliance Directive	Para.	Amended Tariff Sections or Applicable Transmittal Letter Sections
Regarding the small utility opt-in, clarify the entities that may present evidence of a RERRA’s opt-in determination to PJM and the manner in which such evidence may be presented to PJM.	32	Transmittal Letter at I.A
Regarding the demand response opt-out, clarify that the demand response opt-out rules set forth in Tariff, Attachment K-Appendix, section 1.5A.3 (1)(a)(i) and Operating Agreement, Schedule 1, section 1.5A.3 (1)(a)(i) will be used to demonstrate that a RERRA has prohibited the participation of demand response in the DER Aggregator Participation Model.	38	Tariff, Attachment K-Appendix, section 1.4B(g); Operating Agreement, Schedule 1, section 1.4B(g)
Specify market rules in the PJM Tariff regarding compensation and settlement of DER Aggregation Resources with both injecting and curtailment capability, including those that can reflect both attributes at a single Component DER site.	106	Tariff, Attachment K-Appendix, section 1.4B(m); Operating Agreement, Schedule 1, section 1.4B(m)
Revise Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h) to specify that the double-counting restrictions apply to the same “service” being provided by a Component DER.	136	Tariff, Attachment K-Appendix, section 1.4B(h); Operating Agreement, Schedule 1, section 1.4B(h)

<b>Compliance Directive</b>	<b>Para.</b>	<b>Amended Tariff Sections or Applicable Transmittal Letter Sections</b>
<p>Explain whether, pursuant to Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h), Component DER can be precluded by either PJM or an electric distribution company from providing ancillary services in PJM markets due to double counting concerns, clarify whether, pursuant to Tariff, Attachment K-Appendix, section 1.4B(b)(iv) and Operating Agreement, Schedule 1, section 1.4B(b)(iv), an electric distribution company during its review may raise concerns about whether Component DER should be precluded from providing ancillary services in PJM markets to avoid double counting.</p>	138	Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b)
<p>Explain how PJM’s proposed general exclusion from the energy and capacity market of Component DER that are not participating in net energy metering retail programs but are located at sites where at least one resource is participating in a net energy metering retail program is narrowly designed, and if necessary, revise this restriction.</p>	141	Transmittal Letter at I.F
<p>Provide a detailed technical explanation as required by Order No. 2222 to demonstrate that it is not technically feasible for any Component DER to aggregate more broadly than a single-node, as proposed, for energy market participation, or propose alternative locational requirements for energy market participation that are as geographically broad as technically feasible, as well as a detailed technical explanation for the geographical scope of these alternative locational requirements.</p>	186	Attachment K-Appendix, section 1.4B(c); Operating Agreement, Schedule 1, section 1.4B(c)
<p>To the extent that PJM proposes alternative locational requirements for energy market participation that necessitate the use of distribution factors, revise the PJM tariff as needed to require that distributed energy resource aggregators give to the RTO/ISO the total distributed energy resource aggregation response that would be provided from each pricing node, where applicable, when they initially register their</p>	197	Transmittal Letter at I.H

<b>Compliance Directive</b>	<b>Para.</b>	<b>Amended Tariff Sections or Applicable Transmittal Letter Sections</b>
aggregation, and to update these distribution factors if they change.		
Identify and explain the proposed information requirements for the individual distributed energy resources with respect to: (1) evidence of approval to interconnect, and (2) associated physical and transmission system electrical location information of the applicable Component DER, including compliance with applicable PJM and electric distribution company metering and telemetry requirements.	224	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b)
Revise the PJM Tariff to include the meter data submission deadline for settlement.	249	Tariff, Attachment K-Appendix, section 1.4B(e); Operating Agreement, Schedule 1, section 1.4B(e)
Revise the PJM Tariff to clarify, consistent with PJM’s representations, that a DER Aggregation Resource under 10 MW that is only participating in the energy market is exempted from telemetry requirements.	251	Attachment K-Appendix, section 1.4B(e); Operating Agreement, Schedule 1, section 1.4B(e)
Revise PJM’s distribution utility review process such that the 60-day distribution utility review period for incremental changes occurs upon PJM transmitting the necessary information to review such incremental changes to the electric distribution company.	298	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b)
Revise the PJM Tariff to clarify that only the distribution utility hosting a Component DER has the opportunity to review the addition of that resource to a DER Aggregation Resource.	299	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b)
Revise the distribution utility review process to comply with the requirement to provide adequate and reasonable time for distribution utility review that does not exceed 60 days, and that incorporates any distribution utility verification into the 60-day process.	300	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b)
Revise the PJM Tariff to designate the DER Aggregator as responsible for dispatching the Component DER in its aggregation or explain how	302	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b); Tariff, Attachment K-

<b>Compliance Directive</b>	<b>Para.</b>	<b>Amended Tariff Sections or Applicable Transmittal Letter Sections</b>
its proposed tariff language is consistent with this requirement.		Appendix, section 1.4B(e); Operating Agreement, Schedule 1, section 1.4B(e).
Revise the PJM Tariff to require PJM to share with the DER Aggregator any information regarding a Component DER that is provided by a distribution utility to PJM as part of the distribution utility review process.	303	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b).
Regarding the criteria in the distribution utility review process, either remove the criterion regarding whether “participation” in PJM’s markets complies with rules of any applicable RERRA, or revise it to address “ <i>whether the aggregation complies</i> ” with rules of any applicable RERRA.	306	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b).
Regarding the criteria in the distribution utility review process, revise the PJM Tariff to include specific, transparent criteria by which an electric distribution company will determine during its review whether each proposed Component DER is capable of participating in a DER Aggregation Resource and explain why these criteria are appropriate for the PJM region.	307	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b).
Revises the PJM tariff to clarify that the scope of the distribution utility review of distribution system reliability impacts is limited to any incremental impacts from a resource’s participation in a distributed energy resource aggregation that were not previously considered by the distribution utility during the interconnection study process for that resource.	314	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b)
Addresses how PJM will resolve disputes that it determines are within its authority and subject to its Tariff.	323	Tariff, Attachment K-Appendix, section 1.4B(b); Operating Agreement, Schedule 1, section 1.4B(b)
Revise the PJM Tariff to include a definition of electric distribution company.	333	Tariff, Definitions E-F
Revise the PJM Tariff to include the coordination protocols and processes for the operating day that	354	Tariff, Attachment K-Appendix, sections 1.4B(f) and Operating Agreement, Schedule 1, sections 1.4B(f)

Compliance Directive	Para.	Amended Tariff Sections or Applicable Transmittal Letter Sections
allow distribution utilities to override PJM’s dispatch.		
Revises the PJM tariff to specify the existing non-performance penalties that will apply to a DER Aggregation Resource when the DER Aggregation Resource does not perform because an electric distribution utility overrides PJM’s dispatch.	357	Tariff, Attachment K-Appendix, sections 1.4B(f) and Operating Agreement, Schedule 1, sections 1.4B(f)
Revise the PJM Tariff to establish a process for ongoing coordination, including operational coordination, that addresses data flows and communication between: (1) the distribution utility and the DER Aggregator, with respect to overrides during the Operating Day; and (2) PJM and the distribution utility in both day-ahead and real-time markets.	359	Tariff, Attachment K-Appendix, sections 1.4B(f) and Operating Agreement, Schedule 1, sections 1.4B(f)

Descriptions of, and justification for, the proposed Tariff and Operating Agreement revisions addressing each compliance directive are provided in seriatim in the following subsections A-X.

***A. Regarding the small utility opt-in, clarify the entities that may present evidence of a RERRA’s opt-in determination to PJM and the manner in which such evidence may be presented to PJM.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission noted that while PJM’s proposed revisions permit only the electric distribution company to present evidence of a RERRA’s opt-in determination to PJM, PJM had also stated in its Data Request Response<sup>4</sup> that a DER Aggregator or RERRA *may also* provide to PJM evidence of a RERRA’s opt-in determination by coordinating with the electric distribution company.<sup>5</sup> The Commission stated that “PJM does not explain the

<sup>4</sup> *PJM Interconnection, L.L.C.*, Response to the May 18, 2022 Request for Additional Information of PJM Interconnection, L.L.C., Docket No. ER22-962-001 (Jul. 7, 2022) (the “Data Request Response”).

<sup>5</sup> March 1, 2023 Order at P 32.

process by which an electric distribution company, DER Aggregator, or RERRA may coordinate to present such evidence to PJM,<sup>6</sup> and accordingly directed PJM to clarify the entities that may present evidence of a RERRA's opt-in determination to PJM and the manner in which such evidence may be presented to PJM.<sup>7</sup>

ii. PJM Compliance

In compliance with this directive, PJM clarifies that the Electric Distribution Company is the entity responsible for presenting applicable evidence of a RERRA's opt-in determination to PJM under PJM's proposed Tariff, Attachment K-Appendix, section 1.4B(g) and Operating Agreement, Schedule 1, section 1.4B(g). Specifically, the Electric Distribution Company may email a copy of the evidence, or provide a public link to the evidence, to PJM. PJM will maintain a public list of the RERRAs that have opted into PJM's DER Aggregator Participation Model on [pjm.com](http://pjm.com), which will provide additional transparency. PJM posts a similar list today for demand response.<sup>8</sup> PJM will also share the opt-in evidence with the applicable RERRA for informational purposes.

If the DER Aggregator or RERRA do not see the RERRA's opt-in determination posted on [pjm.com](http://pjm.com), they may contact PJM directly and provide a copy of the communication containing the applicable evidence that was sent to the Electric Distribution Company. PJM will coordinate with the Electric Distribution Company, the DER Aggregator, and/or the RERRA, as necessary, to timely resolve the issue.

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<sup>6</sup> *Id.*

<sup>7</sup> *Id.*

<sup>8</sup> PJM, RERRAs that Prohibit, Permit or Condition Retail Participation in PJM Demand Response Programs, <https://www.pjm.com/-/media/etools/dr-hub/opt-in-opt-out-rerra-evidence-for-dsr.ashx>.

***B. Regarding the demand response opt-out, clarify that the demand response opt-out rules set forth in Tariff, Attachment K-Appendix, section 1.5A.3 (1)(a)(i) and Operating Agreement, Schedule 1, section 1.5A.3 (1)(a)(i) will be used to demonstrate that a RERRA has prohibited the participation of demand response in the DER Aggregator Participation Model.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that PJM's proposal did not clearly articulate the relationship between the demand response opt-out rules and their application to PJM's DER Aggregator Participation Model.<sup>9</sup> Accordingly, the Commission directed PJM to clarify that the demand response opt-out rules set forth in Tariff, Attachment K-Appendix, section 1.5A.3 (1)(a)(i) and Operating Agreement, Schedule 1, section 1.5A.3 (1)(a)(i) will be used to demonstrate that a RERRA has prohibited the participation of demand response in the DER Aggregator Participation Model.<sup>10</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify as follows its proposed language related to the demand response opt-out rules in Tariff, Attachment K-Appendix, section 1.4B(g) and Operating Agreement, Schedule 1, section 1.4B(g). The revised language provides a direct reference to the existing demand response opt-out rules in PJM's Tariff that will be used to demonstrate that a RERRA has prohibited the participation of demand response in the DER Aggregator Participation Model.

PJM proposes to modify Tariff, Attachment K-Appendix, section 1.4B(g) and Operating Agreement, Schedule 1, section 1.4B(g) in the following manner.

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<sup>9</sup> March 1, 2023 Order at P 38.

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



The Office of the Interconnection shall permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model if the applicable DER Aggregation Resource includes Component DER that are end-use customers of an ~~electric distribution company~~ Electric Distribution Company that distributed more than 4 million MWh in the previous fiscal year, as identified by the ~~electric distribution company~~ Electric Distribution Company, unless the DER Aggregation Resource includes one or more Component DER that are demand response and the Relevant Electric Retail Regulatory Authority has prohibited the participation of demand response in the DER Aggregator Participation Model, pursuant to the rules set forth in Tariff, Attachment K-Appendix, section 1.5A.3 (1)(a)(i) and Operating Agreement, Schedule 1, section 1.5A.3 (1)(a)(i).

**C. *Specify market rules in the PJM Tariff regarding compensation and settlement of DER Aggregation Resources with both injecting and curtailment capability, including those that can reflect both attributes at a single Component DER site.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that while PJM had demonstrated that its DER Aggregator Participation Model will permit curtailing and injecting Component DER to participate in a heterogeneous aggregation and will compensate them for load reduction and provision of energy in both the energy and capacity markets, “PJM’s proposal does not include these market rules in the tariff.”<sup>11</sup> The Commission noted that “[p]roposed section 1.4B(n), which discusses how PJM will account for and settle heterogeneous DER Aggregation Resources, includes only a reference to the section of the tariff that governs the compensation and settlement of economic load participants, i.e., demand response” and that “this reference is insufficient to comply with the requirement of Order No. 2222 that each RTO/ISO *revise its tariff* to allow heterogeneous aggregations.”<sup>12</sup> Accordingly, the Commission directed PJM to specify market

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<sup>11</sup> *Id.* at P 106.

<sup>12</sup> *Id.* (emphasis in original).

rules in the PJM Tariff regarding compensation and settlement of DER Aggregation Resources with both injecting and curtailment capability, including those that can reflect both attributes at a single Component DER site.<sup>13</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify Tariff, Attachment K-Appendix, section 1.4B(m) and Operating Agreement, Schedule 1, section 1.4B(m) to clearly articulate the settlement rules for *both* the injecting and curtailment capabilities of heterogeneous resources. The amended language clarifies that the DER Aggregator will submit the data to determine the load reduction and energy injection MWh for each Component DER that has both capabilities. Specifically, load reductions will be calculated using existing demand response methodologies, as outlined in Tariff, Attachment K-Appendix, section 3.3A and Operating Agreement, Schedule 1, section 3.3A. All injections, which are determined by a negative load metered value at the point of interconnection to the distribution system, will be measured in accordance with the Day-ahead Energy Market and Real-time Energy Market rules. The MWh energy contribution of a single Component DER will equal the sum of the demand response and injection calculated values. The DER Aggregation Resource will be settled by summing the MWh energy contributions of all underlying Component DER within the DER Aggregation Resource.

PJM proposes to modify Tariff, Attachment K-Appendix, section 1.4B(m) and Operating Agreement, Schedule 1, section 1.4B(m) in the following manner.

(m) ~~A DER Aggregator's DER Aggregation Resource that contains Component DER that are also load reduction resources shall be accounted for and settled in accordance with Tariff, Attachment K-Appendix, section 3.3A and Operating Agreement, Schedule 1, section 3.3A. The Office of the Interconnection shall~~

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

account for and settle a DER Aggregator's DER Aggregation Resource, in the Day-ahead Energy Market and Real-time Energy Market, by summing all load reduction and injection MWh for the underlying Component DER within the Aggregation. The Office of the Interconnection shall calculate the performance of Component DER that have both load reduction and injection capability as follows:

(i) load reduction to 0 MWh shall be calculated in accordance with Tariff, Attachment K-Appendix, sections 1.5A and 3.3A and Operating Agreement, Schedule 1, sections 1.5A and 3.3A;

(ii) injection shall be determined in accordance with the Day-ahead Energy Market and Real-time Energy Market rules as specified in Tariff, Attachment K- Appendix, section 3.1A, and Operating Agreement, Schedule 1, section 3.1A.

***D. Revise Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h) to specify that the double-counting restrictions apply to the same “service” being provided by a Component DER.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that PJM’s proposed tariff revisions related to double counting required an assessment of whether the same “product is not also credited,” rather than “whether, as the Commission discussed in Order No. 2222, the *same service is being provided* by the Component DER.”<sup>14</sup> The Commission explained that “being credited for a product may not be the same as providing a service,” and accordingly directed PJM to revise this language to be consistent with Order No. 2222.

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify as follows its proposed language related to double counting in Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h). PJM proposes to amend its Tariff and Operating

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<sup>14</sup> *Id.* at P 136.

Agreement to indicate that the Electric Distribution Company will assess, for each Component DER and the associated PJM market(s) in which the Component DER seeks to participate, whether the same service is being *provided* by that Component DER, rather than *credited* to the owner of that Component DER through an existing retail program. In its March 1, 2023 Order, the Commission specifically highlighted the distinction between “credited” and “provided” by noting that a Component DER participating in a net energy metering retail program may be credited for a product or service that it does not actually provide. The Commission further indicated that Order No. 2222 requires PJM to establish rules by which double counting is assessed based on whether a service is being “provided” by a resource, and not simply “credited” to the owner of that resource. Accordingly, PJM proposes to revise Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h) as follows.

(h) A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources containing one or more Component DER that also participate in one or more retail programs. The Office of the Interconnection shall only credit a DER Aggregator for the sale of ~~a product in the PJM~~ energy, capacity, and/or ancillary services in the PJM markets if one or more of those ~~at same product-services are~~ is not also ~~credited provided~~ as part of a retail program, including but not limited to a Component DER participating in a retail net energy metering program.

A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources that provide multiple services in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model. A Component DER shall not be registered with multiple DER Aggregation Resources, or participate as part of another Market Participant outside of the DER Aggregator Participation Model. The Office of the Interconnection shall only credit a DER Aggregator for the sale of ~~a product in the PJM~~ energy, capacity, and/or ancillary services in the PJM markets if one or more of those ~~at same product-services are~~ is not also ~~credited provided~~ as part of another wholesale sale.

***E. Explain whether, pursuant to Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h), Component DER can be precluded by either PJM or an electric distribution company from providing ancillary services in PJM markets due to double counting concerns, and clarify whether, pursuant to Tariff, Attachment K-Appendix, section 1.4B(b)(iv) and Operating Agreement, Schedule 1, section 1.4B(b)(iv), an electric distribution company during its review may raise concerns about whether Component DER should be precluded from providing ancillary services in PJM markets to avoid double counting.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that PJM’s double counting proposal is unclear with respect to Component DER that wish to provide ancillary services in PJM’s markets.<sup>15</sup> The Commission noted PJM’s stated rationale that ancillary services would not be provided by Component DER participating in a net energy metering retail program, and that such Component DER could accordingly provide ancillary services in PJM without constituting a double counting concern.<sup>16</sup> The Commission found however that “certain state net metering tariffs currently include compensation for ancillary services,” and therefore PJM needed to provide “a clear opportunity for an electric distribution company to raise concerns about double counting.”<sup>17</sup> Accordingly, the Commission directed PJM to explain whether, pursuant to Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h), Component DER can be precluded by either PJM or an Electric Distribution Company from providing ancillary services in PJM markets due to double counting concerns, and clarify whether, pursuant to Tariff, Attachment K-Appendix, section 1.4B(b)(iv) and Operating Agreement, Schedule 1, section 1.4B(b)(iv), an Electric Distribution Company during its review may raise concerns about whether

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<sup>15</sup> *Id.* at P 138

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

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

Component DER should be precluded from providing ancillary services in PJM markets to avoid double counting.<sup>18</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM broadly clarifies that an Electric Distribution Company may raise concerns regarding double counting, including with regard to participation in net energy metering or another retail program, during the first fifteen day review period of the Electric Distribution Company review process that occurs during registration, as further described in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b). During this fifteen-day review period, an Electric Distribution Company may recommend that PJM deny the participation of a Component DER in PJM's energy, capacity, and/or ancillary services markets on the grounds that the Component DER's participation in an Electric Distribution Company's retail program at the time of registration would result in double counting.

With regard to ancillary services specifically, the Electric Distribution Company may recommend that PJM deny participation of a Component DER in PJM's regulation or reserve markets if that Component DER is also "providing" that service to a retail program. PJM notes that the revisions described above resolve any inconsistency between PJM's original proposal that Component DER that participate in a net energy metering retail program may also participate with grid injections in PJM's ancillary services markets, and the fact that certain state net metering tariffs include "credit" for ancillary services. Under PJM's original proposal, the participation of a Component DER in PJM's ancillary services markets while also being credited for ancillary services through a retail program would result in double counting. However, pursuant to the

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

proposed revisions in Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h), described above, the Electric Distribution Company will assess double counting based on whether the same service is being “provided” by the Component DER.

While PJM recognizes that certain net energy metering rates may credit customers for the cost of wholesale ancillary services, PJM is not aware of any retail program in its territory that permits Component DER to *provide* ancillary services at this time. If a retail program is developed where a Component DER provides ancillary services, the Electric Distribution Company may raise to PJM that this Component DER would result in double counting by participating in PJM’s ancillary service markets. Neither PJM nor the Electric Distribution Company may preclude a Component DER from providing ancillary services based on the resource being compensated or “credited for” ancillary services at the retail level. If an Electric Distribution Company permits Component DER to *provide* ancillary services, either through the net energy metering retail rate or another program, the Electric Distribution Company may, within the first fifteen day review period, identify that the Component DER participation in PJM’s ancillary services markets results in double counting and recommend to PJM that the participation of this Component DER in PJM’s ancillary services markets be prohibited.<sup>19</sup>

Finally, PJM expects that information regarding the participation of the Component DER in a retail net energy metering program will be provided by either the DER Aggregator or the Electric Distribution Company during the registration process. PJM clarifies that Component DER that participate in a net energy metering retail program that also participate with grid injections in the PJM ancillary services markets will be excluded from PJM energy market settlements, to

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<sup>19</sup> See, *infra* Section N(ii).

prevent any double compensation for energy. As such, PJM proposes to revise Tariff, Attachment K-Appendix, section 1.4B(b)(ii) and Operating Agreement, Schedule 1, section 1.4B(b)(ii) as follows.

b. Component DER that participate in a net energy metering retail program that also participate with grid injections in the PJM ancillary services markets shall, based on the information provided by the DER Aggregator or the Electric Distribution Company, be excluded from PJM energy market settlements.

***F. Explain how PJM’s proposed general exclusion from the energy and capacity market of Component DER that are not participating in net energy metering retail programs but are located at sites where at least one resource is participating in a net energy metering retail program is narrowly designed, and if necessary, revise this restriction.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that PJM’s proposed double-counting restriction on Component DER that are not participating in a net energy metering retail program and are co-located at a site where at least one resource is participating in a net energy metering retail program, may not be narrowly designed.<sup>20</sup> The Commission concluded that “PJM’s proposed restriction may unnecessarily limit participation of Component DER in the PJM energy and capacity markets solely based on their location and not based on a double counting concern.”<sup>21</sup> Accordingly, the Commission directed PJM to explain how this proposed general exclusion from the energy and capacity market of Component DER that are not participating in net energy metering retail programs but are located at sites where at least one resource is participating in a net energy metering retail program is narrowly designed, and if necessary, revise this restriction.<sup>22</sup>

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<sup>20</sup> March 1, 2023 Order at P 141.

<sup>21</sup> *Id.*

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



ii. PJM Compliance

In compliance with this directive, PJM further explains the manner in which the general exclusion from PJM’s energy and capacity markets of Component DER that are not participating in net energy metering retail programs but are co-located at sites where at least one Component DER is participating in a net energy metering retail program is narrowly designed.

As a threshold matter, PJM highlights that the proposed DER Aggregation Participation Model, as approved by the Commission’s March 1, 2023 Order, relies on data from a single point of interconnection to the distribution system, as reflected in a unique Electric Distribution Company account number. Although the use of device-level metering was proposed and discussed by participants in this proceeding, the Commission declined to direct PJM to permit the use of device-level metering, noting that “PJM has demonstrated that its proposed metering requirements do not pose an unnecessary and undue barrier to distributed energy resources, as Order No. 2222 requires....”<sup>23</sup> As such, the approved design necessitates that each location, or Component DER, registered with PJM be associated with a unique Electric Distribution Company account number.

Given that an individual location, or Component DER, will be associated with one unique Electric Distribution Company account number, PJM addresses the Commission’s directive “with respect to Component DER that are not participating in a net energy metering retail program and are co-located at a site where at least one resource is participating in a net energy metering retail program.”<sup>24</sup> First, PJM clarifies that within its proposed model “Component DER” refers to *all* technologies, not an individual technology, associated with one unique Electric Distribution Company account number. As such, if a Component DER was not participating in a net energy

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<sup>23</sup> *Id.* at P 250.

<sup>24</sup> *Id.* at P 141.

metering program, but was co-located with another Component DER that *was* participating in such a program, PJM’s definition of a “Component DER” would necessitate that this resource be separately metered and associated with a separate Electric Distribution Company account number. PJM clarifies that, as a separately metered resource that is *not* participating in a net energy metering retail program, the Component DER would be able to participate in PJM’s energy and capacity markets, even if this resource was located at a premise where one or more resources *are* participating in a net energy metering program.

Second, PJM addresses the scenario that it believes is the primary focus of this directive—a case where one Component DER comprises several behind-the-meter resources with injecting capabilities, and only *some* of these resources are participating in a net energy metering retail program. PJM notes its understanding that, by and large, enrollment in net energy metering programs is established at the level of the Electric Distribution Company account number—*i.e.*, *all* technologies associated with a single account number are either enrolled or not enrolled in net energy metering. As such, PJM cannot identify a scenario where a unique resource behind the meter is simultaneously “co-located at a site where at least one resource is participating in net energy metering” and is not “participating in a net energy metering retail program” itself.

PJM’s proposal to prohibit, with the limited exceptions described in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b), Component DER that participate in a net energy metering retail program from also participating with injections in PJM energy or capacity markets is designed as narrowly as practical, because both participation in a net energy metering program and double counting is assessed and established at the level of a single point of interconnection to the distribution system, and is associated with a unique Electric Distribution Company account number, as discussed above. The only scenario in which a resource

behind a retail meter would be *co-located* with another resource that is participating in a net energy metering program but *would not* be participating in net energy metering itself is if that resource were separately metered, with a separate Electric Distribution Company account number. PJM clarifies above that this scenario is already permitted under the current DER Aggregator Participation Model design.

**G. *Provide a detailed technical explanation as required by Order No. 2222 to demonstrate that it is not technically feasible for any Component DER to aggregate more broadly than a single-node, as proposed, for energy market participation;<sup>25</sup> or propose alternative locational requirements for energy market participation that are as geographically broad as technically feasible, as well as a detailed technical explanation for the geographical scope of these alternative locational requirements.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission acknowledged that it may not be feasible for Component DER to aggregate across certain nodes where such nodes have different and opposing impacts on transmission constraints, and stated “[w]e understand PJM’s concern that allowing Component DER to aggregate across such nodes could raise operational challenges.”<sup>26</sup> However, the Commission found that “while PJM has provided its assessment that allowing Component DER to aggregate across multiple nodes could raise operational or reliability challenges or concerns, PJM has not demonstrated that it is not technically feasible for Component DER to aggregate across a broader geographic area than a single node, at least for some nodes or groupings of electrical facilities, for energy market participation.”<sup>27</sup> Accordingly, the Commission directed PJM to provide a detailed technical explanation as required by Order No. 2222 to demonstrate that

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<sup>25</sup> Order No. 2222, 172 FERC ¶ 61,247 at P 204.

<sup>26</sup> March 1, 2023 Order at P 186.

<sup>27</sup> *Id.*

it is not technically feasible for any Component DER to aggregate more broadly than a single-node, as proposed, for energy market participation; or propose alternative locational requirements for energy market participation that are as geographically broad as technically feasible, as well as a detailed technical explanation for the geographical scope of these alternative locational requirements.<sup>28</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM clarifies that the nodal energy market participation framework is the only “technically feasible” option for DER Aggregation Resources containing large Component DER at any point in PJM’s implementation of the DER Aggregation Participation model. It is also the only technically feasible option for all Component DER integrated into PJM markets *at scale*—*i.e.*, at future operationally-significant penetration, as explained below. This is because constraint control is a foundational component of PJM operations, and essential to maintaining the integrity of the LMP-based model that has operated in PJM for more than twenty years, as explained in detail in PJM’s prior affidavits in this proceeding.<sup>29</sup>

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<sup>28</sup> *Id.*

<sup>29</sup> *See, e.g., PJM Interconnection, L.L.C., Order No. 2222 Compliance Filing, Bielak Affidavit at P 20, Docket No. ER22-962-000 (Feb. 1, 2022) (“With all of these factors being accounted for, PJM has determined that the current level of distribution aggregation provided by the existing transmission-level Pnode methodology is as broad as technically feasible to continue using market pricing as a means of operational control. Permitting any broader level of aggregation for DER would lead to a fundamental breakdown of determining net effects of generation resources on constraints (DFAX) and therefore congestion pricing. As such, it would deprive PJM Operators of off-cost operations, which has already been established as the primary means of constraint control on the PJM system. Without off-cost operations as a reliable means of constraint control, there are significant concerns within PJM Operations regarding the ability to exercise PJM’s Operating Plan to acceptably maintain SOLs and IROLs per NERC Standards TOP001, R1, R12, and R14, as well as IRO-009, R1, R2, R3, and R4, respectively. As described above, this determination is based on PJM’s unique system topology, congestion patterns, and operating practices.”).*

In response to the Commission’s question, a multi-nodal energy market participation model for smaller Component DER could arguably be “technically feasible” so long as the following four criteria are met:

1. The multi-nodal DER Aggregation Resource may be comprised of one or more Component DER with capability smaller than 0.1 MW;
2. Component DER at a single primary node with capability greater than 0.1 MW will be excluded from participation in the multi-nodal DER Aggregation Resource *unless* the total capability of all other Component DER in an aggregation is below the 0.1 MW participation threshold, as further described in the PJM Manuals;
3. The multi-nodal aggregation must self-schedule into PJM’s energy market and must not be dispatchable; and
4. The total capability of all multi-nodal aggregations across PJM’s footprint does not exceed 167 MW.<sup>30</sup>

While PJM believes that a nodal framework for energy market participation is the correct solution in the long term, for large-scale deployment of DER Aggregation Resources, this proposed multi-nodal option may help facilitate the deployment of DER Aggregation Resources with smaller Component DER at the early implementation stages of the DER Aggregator Participation Model.

In this section, PJM first provides additional analysis to support its conclusion that a nodal energy market participation framework is the only “technically feasible” option for DER Aggregation Resources containing *larger* Component DER, as well as for all DER Aggregation Resources integrated into PJM markets *at scale*. PJM then provides analysis in support of its

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<sup>30</sup> This will be subject to review, as indicated in PJM proposes to modify Attachment K-Appendix, section 1.4B(c) and Operating Agreement, Schedule 1, section 1.4B(c).

proposed multi-nodal option for DER Aggregation Resources containing smaller Component DER.

- a. A nodal energy market participation framework is the only “technically feasible” option for larger Component DER, as well as for all Component DER integrated into PJM markets at operationally-significant penetration.*

In light of the Commission’s directive in the March 1, 2023 Order, PJM conducted further analysis to examine the operational challenges that would arise if Component DER were aggregated more broadly, and therefore eliminated as dispatchable resources for constraint control. PJM performed several thorough analyses of its system topology and operational dynamics in order to assess the feasibility of accommodating DER Aggregation Resources at the levels of the: (i) transmission zone, (ii) substation, and (iii) specifically-defined groupings of pricing nodes.

The first analysis compared the LMP at all individual PJM pricing nodes to the larger zonal aggregate LMP for the zones in which the pricing nodes are located. The intent of this analysis was to help determine the viability of DER Aggregation Resources with a zonal locational requirement, similar to the PJM Demand Response aggregation model. PJM analyzed five years of data, from June 2018 to May 2023, which included over 11,000 pricing nodes and 446 million hours of real-time LMP data. The results demonstrate that *virtually all pricing nodes* within the PJM footprint have significant price separation when the nodal LMP is compared to the zonal LMP. Because LMP (which is based on a nodal—“locational”—framework) is the primary tool that PJM utilizes in dispatching resources to relieve constraints on the Transmission System, price separation under a multi-nodal energy market framework represents a kind of operational “dissonance”—in essence, PJM is unable to send an accurate dispatch instruction (which is nodally based) to a given DER Aggregation Resource (which, in this scenario, is multi-nodal). This

produces an operational situation in which the multi-nodal DER Aggregation Resource is instructed to move in a direction that is unlikely to relieve the constraint, and in some circumstances may actually *exacerbate* the constraint. Accordingly, in order for a multi-nodal energy market participation framework to be “technically feasible” in PJM, an analysis would have to show little to no price separation.

**Table 2**, below, summarizes the number of nodes with a maximum price separation of less than \$1, \$2, and \$5, by year—values that PJM considers to represent a minimal price separation. PJM chose to focus on the “maximum” price separation because these intervals represent the periods of time when PJM operations requires the greatest flexibility in terms of dispatching resources for constraint control. The largest number of pricing nodes with a maximum price separation of less than \$5 compared to the zonal average was seen in 2019 with 112 nodes, or approximately 1% of all nodes in the PJM system. Importantly, even a \$5 price separation can be meaningful to dispatching a resource for a desired output for constraint control.

**Table 2.** Number of Nodes that have a Price Separation of less than \$1, \$2, \$5

Delivery Year	Max Absolute Price Separation		
	Less Than \$1	Less Than \$2	Less Than \$5
2018	2	10	42
2019	23	49	112
2020	1	5	22
2021	1	4	18
2022	1	3	8

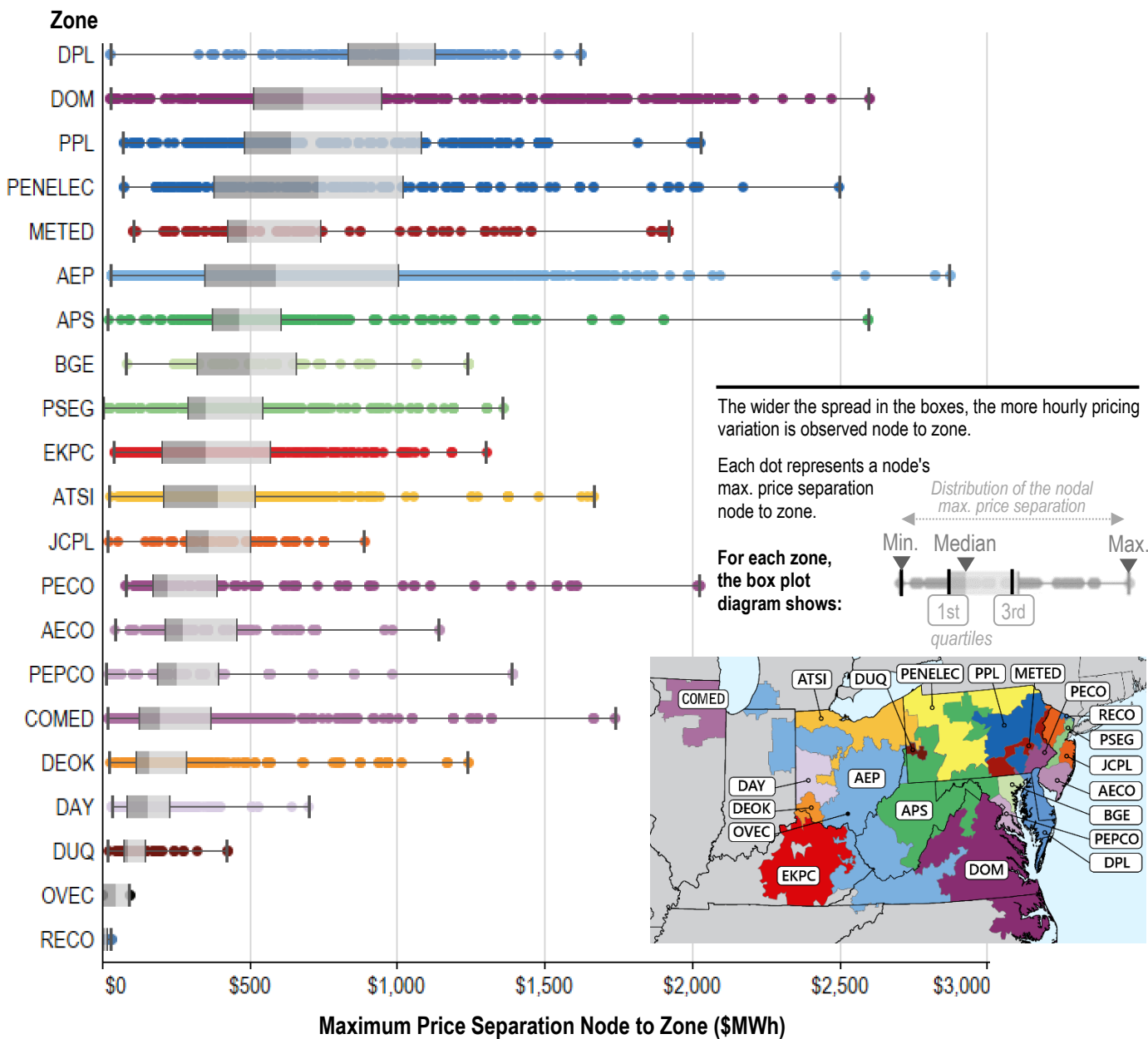
There are two key observations from this data. First, the remaining nodes within the system had a maximum observed price separation *greater than* \$5, which PJM considers to represent an unacceptable misalignment between pricing and dispatch to ensure reliable operations. Second,

even for the nodes where price separation was *less than* \$5, the number of nodes meeting this criteria varied significantly from year to year, between 2018 and 2022, indicating that the long-term (greater than one-year) viability of a defined multi-nodal DER Aggregation Resource is extremely uncertain.

To better visualize the above dataset, PJM plotted the distribution of all the maximum price separations between the LMP of nodes within a zone and the zonal aggregate price (x-axis). **Figure 1** below shows this distribution for each zone (y-axis). Each dot within the distribution represents the maximum price separation between the LMP at an individual pricing node within the zone, and the zonal aggregate price. As can be observed, the price separation across the nodes in a zone can be extreme, demonstrating that two nodes can have a measurable, electrical difference even if they are geographically similar (*i.e.*, in the same zone).



**Figure 1.** Distribution of Maximum Price Separation by Zone



The second analysis PJM performed was a more granular look at the possibility of aggregations within a geographic area that is wider than a single node, but more limited than a zone. Taking one step to a broader geographical aggregation from nodal, this analysis compared the LMP of individual nodes to other available nodes *at a single substation*. This analysis used the same data set as the “nodal to zonal” LMP comparison described above—meaning it

considered over 11,000 pricing nodes, 446 million hours of real-time LMP data, and examined a five-year period from 2018 to 2022.

First, the results demonstrated that 23% of load nodes did not qualify for substation aggregation, with only one node at the given substation. Further, 54% of PJM load nodes were located at substations with a maximum of two nodes; 70% were located at stations with a maximum of 3 nodes; and 83% were located at stations with a maximum of 4 nodes. This shows that only a small set of PJM load nodes could materially benefit from a substation-type aggregation model.

Further, PJM performed a similar price separation evaluation as in the first analysis, looking at the percentage of nodes with maximum price separation of less than \$1 and \$5 between the LMP at the given node and its substation. The results are detailed in **Table 3**.

**Table 3.** Percent of Nodes with Max Absolute Price Separation of Less than \$5 and \$1

Nodes Per Station	Percent of Nodes with Max Absolute Price Separation	
	Less than \$1	Less than \$5
1	23%	23%
2	20%	23%
3	9%	10%
4+	5%	7%
5	2%	2%
6	2%	2%
7	1%	1%
8	0%	1%
9	0%	0%
10	0%	0%
11	0%	0%
12	0%	0%
14	0%	0%
15	0%	0%
16	0%	0%
17	0%	0%

The data shows that, as the number of nodes at a substation increases, the observed maximum price separation increases as well. At substations that would meaningfully broaden the geographic potential of an aggregation (i.e., substations with many individual nodes), the observed price separation is too large for this solution to be technically feasible for PJM operations. While the data does show the ability to aggregate more broadly at *some* substations with 4 or more nodes, implementing this type of an aggregation approach would be challenging. Specifically, this approach would require continual review and potential adjustment to the groups of nodes that can be aggregated. Future congestion will undoubtedly be different from previously observed congestion. The transmission grid is constantly evolving and new connections lead to new congestion patterns. Component DER participation in the wholesale market will also create new participation on the supply side, which will in turn influence nodal pricing in ways not previously seen. Wholesale market participation of resources on the distribution system may result in two nearby nodes seeing pricing differences where, previously, their LMPs were nearly identical. As congestion patterns change, the ability to aggregate more broadly in areas where this was previously possible may become infeasible. Moreover, at large levels, it could jeopardize the performance and timeliness of the PJM market solve times.

PJM performed yet a third analysis to more closely examine multi-nodal aggregations using a more customized pricing node “pairing” strategy. This analysis was performed on the DPL zone<sup>31</sup> and identified groupings of “similar nodes,” or nodes with a maximum difference in LMP of between \$1 and \$5. PJM selected DPL for this analysis based on its geographic isolation from system transfers, which make it the best possible case among PJM zones for an electrically broader

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<sup>31</sup> See PJM, Transmission Zones MAP, <https://www.pjm.com/library/~media/about-pjm/pjm-zones.ashx>.

DER Aggregation Resource and the possible pairings found would be optimistic compared to other, more interconnected, transmission zones. The reason why DPL was selected as a good representative sample area for this analysis was the ability to minimize the nodal pricing impact, and observed price separation between nodes, from constraints that were geographically and electrically distant. As PJM has previously discussed in this proceeding,<sup>32</sup> a generator in Illinois for example can have an impact on a constraint in Virginia. However, with the DPL area being relatively isolated from system transfers, PJM was able to examine primarily *localized* constraints and remove that additional variable impacting LMP.

Under this third analysis, of the 286 demand side pricing nodes in DPL, 111 contained completely unique LMPs (defined as having the lowest deviation of at least \$1 from all other points in at least one hour) over the 5-year look back. Of the remaining 175 nodes, only 14 shared a consistent LMP pattern beyond the substation throughout the five-year time window. The largest multi-nodal aggregation PJM identified was only six nodes, all of which shared the same substation. If PJM were required to create sub-zones inside DPL, without including nodes with dissimilar historical LMPs, PJM would require 172 distinct sub-zones in DPL alone.

Attempting to define custom sub-zones when these would be subject to changes based on observed congestion and price separation would introduce a large administrative burden for PJM, Electric Distribution Companies, and DER Aggregators. It would also introduce regulatory uncertainty in terms of whether the Component DER within the multi-nodal aggregation would be able to participate from one year to the next.

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<sup>32</sup> *PJM Interconnection, L.L.C.*, Motion for Leave to Answer and Answer of PJM at 14-16, Docket No. ER22-962-000 (Apr. 26, 2022).

- b. In response to the Commission’s question, a multi-nodal energy market participation framework for smaller Component DER could arguably be “technically feasible,” so long as the participation of these DER Aggregation Resources do not raise the same operational and price signal concerns.*

In response to the Commission’s question, a multi-nodal energy market participation model for smaller Component DER could arguably be “technically feasible” so long as the participation of these multi-nodal DER Aggregation Resources do not raise the same operational and price signal concerns described above. PJM believes that this can be accomplished so long as the following four criteria are met:

1. The multi-nodal DER Aggregation Resource may be comprised of one or more Component DER with capability smaller than 0.1 MW;
2. Component DER at a single primary node with capability greater than 0.1 MW will be excluded from participation in the multi-nodal DER Aggregation Resource *unless* the total capability of all other Component DER in an aggregation is below the 0.1 MW participation threshold, as further described in the PJM Manuals;
3. The multi-nodal aggregation must self-schedule into PJM’s energy market and must not be dispatchable; and
4. The total capability of all multi-nodal aggregations across PJM’s footprint does not exceed 167 MW.

As further explained in the Affidavit of Donald Bielak, based on PJM’s internal operational assessment, Conditions (1) and (2) broadly ensure that Component DER and/or aggregations of Component DER that can participate in PJM’s energy market at a single pricing node are required to participate nodally. PJM’s proposal to permit *one* Component DER within the multi-nodal aggregation or *one group* of Component DER within a single pricing node within the multi-nodal aggregation is intended to provide an “anchor” for smaller resources that, even under a multi-nodal approach, cannot alone meet the 100 kW minimum resource size requirement. Condition (3) limits

the ability of multi-nodal aggregations to set market price. A multi-nodal DER Aggregation Resource cannot be nodally dispatched. As such, the LMP cannot correctly reflect its impact on a constraint. Finally, condition (4) limits the multi-nodal aggregation option to a size that is not expected to impact PJM's ability to effectively exercise constraint control. PJM derived the cap by taking 0.1 percent of the estimated summer peak load across the RTO in 2026<sup>33</sup> multiplied by the Forecast Pool Requirement.<sup>34</sup> Importantly, PJM proposes to assess the multi-nodal aggregation option and, if appropriate, propose any changes to the total MW cap described above, once the penetration of DER Aggregation Resources participating in the multi-nodal aggregation option exceeds ninety percent of the total cap value. PJM would seek Commission approval of any changes to the multi-nodal aggregation option in a future filing.

PJM believes that the approach described herein responds to the Commission's question regarding the technical feasibility of permitting Component DER to aggregate across broader geographical areas. For informational purposes, if the Commission finds this approach technically feasible, PJM presents the following revisions to Attachment K-Appendix, section 1.4B(c) and Operating Agreement, Schedule 1, section 1.4B(c).

(c) All Component DER in a DER Aggregation Resource shall interface with the same primary pricing node, except: (i) in the case of a DER Aggregation Resource that only provides ancillary services and is less than or equal to 5 MW, the Component DER within the DER Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are in the same state ~~and~~, service territory of a single ~~electric distribution company~~ Electric Distribution Company and Transmission Zone; and (ii) in the case of a DER Aggregation Resource utilizing the limited multi-nodal aggregation participation option described

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<sup>33</sup> The estimated summer peak load for the PJM RTO in 2026 is 152,736. PJM Load Forecast Report, Table B-1, at 35 (January 2023), <https://www.pjm.com/-/media/library/reports-notice/load-forecast/2023-load-report.ashx>.

<sup>34</sup> The Forecast Pool Requirement for the 2026/2027 Delivery Year is 1.0918. PJM Reserve Requirement Study, at 8 (Oct. 4, 2022), <https://www.pjm.com/-/media/planning/res-adeq/2022-pjm-reserve-requirement-study.ashx>.

below, so long as those primary pricing nodes are in the same state, service territory of a single Electric Distribution Company and Transmission Zone, and meet the criteria defined below and in the PJM Manuals; and (iii) in the case of a DER Capacity Aggregation Resource, the Component DER within a DER Aggregation Resource(s) linked to the DER Capacity Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are located within a defined zone or sub-zonal Locational Deliverability Area.

The purpose of participating under the limited multi-nodal aggregation option is to allow the participation of Component DER in the energy market that cannot form aggregations at a single primary pricing node at the minimum capability criteria of 0.1 MW. To participate, the multi-nodal DER Aggregation Resource may be comprised of one or more Component DER with capability smaller than 0.1 MW. Component DER at a single primary node with capability greater than 0.1 MW shall be excluded from participation in the multi-nodal DER Aggregation Resource unless the total capability of all other Component DER in an aggregation is below the 0.1 MW participation threshold, as further described in the PJM Manuals. The multi-nodal DER Aggregation Resource shall also be self-scheduled into the PJM energy markets. The megawatt participation cap on the multi-nodal aggregation participation option will be set to 167 MW within the PJM Region. The Office of the Interconnection shall conduct an assessment of the 167 MW cap upon penetration of DER Aggregation Resources participating in the limited multi-nodal aggregation option exceeding ninety percent of the 167 MW cap value. The Office of the Interconnection will shall establish a periodic review, in coordination with the ~~electric distribution company~~ Electric Distribution Company and DER Aggregator, no less than annually, or more frequently as needed, to identify any permanent electrical location change that would modify the pricing node associated with a DER Aggregation Resource or its underlying Component DER. During this review, the Office of the Interconnection shall: (i) confirm that applicable data reviewed and verified in the registration process is still complete and accurate, and (ii) request any updates to such data as a condition of continued participation in the DER Aggregator Participation Model.

**H. To the extent that PJM proposes alternative locational requirements for energy market participation that necessitate the use of distribution factors, revise the PJM Tariff as needed to require that distributed energy resource aggregators give to the RTO/ISO the total distributed energy resource aggregation response that would be provided from each pricing node, where applicable, when they initially register their aggregation, and to update these distribution factors if they change.**

*i. Commission Directive*

In the March 1, 2023 Order, the Commission stated that, to the extent that PJM proposes alternative locational requirements for energy market participation that necessitate the use of distribution factors, PJM must revise the PJM tariff as needed to require that distributed energy resource aggregators give to PJM the total distributed energy resource aggregation response that would be provided from each pricing node, where applicable, when they initially register their aggregation, and to update these distribution factors if they change.<sup>35</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM clarifies that the alternative described above, if ordered by the Commission, does not require the use of distribution factors.

**I. Identify and explain the proposed information requirements for the individual distributed energy resources with respect to: (1) evidence of approval to interconnect, and (2) associated physical and transmission system electrical location information of the applicable Component DER, including compliance with applicable PJM and electric distribution company metering and telemetry requirements.**

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that PJM had not sufficiently identified and explained the specific information that it proposed to require the DER Aggregator to provide about the individual distributed resources within an aggregation.<sup>36</sup> Accordingly, the Commission

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<sup>35</sup> *Id.* at P 197.

<sup>36</sup> March 1, 2023 Order at P 220.



directed PJM to identify and explain the proposed information requirements for the individual distributed energy resources with respect to: (1) evidence of approval to interconnect, and (2) associated physical and transmission system electrical location information of the applicable Component DER, including compliance with applicable PJM and electric distribution company metering and telemetry requirements.<sup>37</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b) to fully remove references to the above-cited informational requirements. PJM clarifies that the DER Aggregator will be required to obtain, verify, and provide during registration a variety of information about each Component DER. PJM further notes that the Tariff language as originally proposed was meant to demonstrate the *type* of information and data components that would be required, not provide an exhaustive list of such requirements. Because the original language was not exhaustive and created ambiguity, PJM proposes to remove the illustrative examples from the Tariff.

PJM notes that in Order No. 2222, the Commission specifically *declined* to adopt the original Notice of Proposed Rulemaking proposal that each RTO/ISO revise its tariff to require distributed energy resource aggregators to provide the RTO/ISO with specific information about each of the distributed energy resources.<sup>38</sup> Instead, the Commission simply required that each RTO/ISO revise its tariff to require distributed energy resource aggregators to provide a list of the

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<sup>37</sup> *Id.* at P 224.

<sup>38</sup> Order No. 2222 at P 238.

individual distributed energy resources participating in their aggregations to the RTO/ISO.<sup>39</sup> Importantly, the Commission clarified that “[i]f an RTO/ISO needs additional information beyond this list, the RTO/ISO should identify and explain in its compliance filing what additional specific information about the individual distributed energy resources within an aggregation that the RTO/ISO needs.”<sup>40</sup> In light of the fact that the Commission did not mandate that each RTO/ISO revise its tariff to require distributed energy resource aggregators to provide the RTO/ISO with specific information about each of the distributed energy resources, PJM believes that its proposal to fully remove references to the above-cited informational requirements is appropriate under the compliance requirements contemplated by Order No. 2222.

As is currently the case for demand response participating in PJM’s energy, capacity and ancillary services markets, the specific information and data required of each Component DER during registration will be fully enumerated and described in the relevant PJM Manuals.

PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b) in the following manner.

~~i. With the express written consent of the applicable Component DER, the electric distribution company customer account number and associated physical and transmission system electrical location information of the applicable Component DER, including compliance with applicable PJM and electric distribution company metering and telemetry requirements;~~

~~ii. Evidence of approval to interconnect, including but not limited to a finalized interconnection agreement, with the applicable Component DER, in accordance with any applicable tariffs, agreements, and operating procedures of the electric distribution company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, to the distribution system for identified megawatts, and identification of participation in an electric~~

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

<sup>40</sup> *Id.*

~~distribution company program that recognizes grid withdrawals and/or injections, including but not limited to a net energy metering program.~~

***J. Revise the PJM Tariff to include the meter data submission deadline for settlement.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that PJM’s basic description of its metering practices for DER Aggregation Resources in its tariff is incomplete “because it lacks the deadline for meter data submission for settlements.”<sup>41</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to include the meter data submission deadline for settlement.<sup>42</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(e) and Operating Agreement, Schedule 1, section 1.4B(e) to include the meter data submission deadline for settlement. Specifically, as discussed with PJM stakeholders in the DER and Inverter Based Resource Subcommittee on December 21, 2021, in order to settle the DER Aggregation Resource, PJM clarifies that all meter data must be submitted to PJM within one business day. This requirement mirrors the deadline currently in place for generation resources in PJM’s territory, as detailed in the Power Meter and InSchedule submission deadlines.<sup>43</sup>

PJM proposes to amended the proposed language in Tariff, Attachment K-Appendix, section 1.4B(e) and Operating Agreement, Schedule 1, section 1.4B(e) in the following manner.

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<sup>41</sup> March 1, 2023 Order at P 249.

<sup>42</sup> *Id.*

<sup>43</sup> See PJM, Current Power Meter and InSchedule Submission Deadlines (June 1, 2015), <https://www.pjm.com/-/media/etools/power-meter/power-meter-and-inschedule-submission-deadlines.ashx>.

A DER Aggregator shall provide to the Office of the Interconnection all individual Component DER meter data necessary to facilitate the settlement of the DER Aggregator's DER Aggregation Resource, in accordance with Operating Agreement, section 14 and the PJM Manuals. A DER Aggregator shall retain performance data for individual Component DER in a DER Aggregation Resource for auditing purposes, in accordance with the PJM Manuals. A DER Aggregator is responsible for ensuring that Component DER within a DER Aggregation Resource have metering equipment that provides integrated hourly kWh values on an ~~electric distribution company~~ Electric Distribution Company account basis. For non-interval metered residential DER Aggregation Resources, the DER Aggregator must ensure that a representative sample of Component DER have metering equipment that provides integrated hourly kWh values on an ~~electric distribution company~~ Electric Distribution Company account basis, as set forth in the PJM Manuals. For DER Aggregation Resources containing Component DER that are mass market customers, DER Aggregators shall provide aggregated meter data to the Office of the Interconnection for the settlement of the DER Aggregator's DER Aggregation Resource. Meter data shall be submitted to the Office of Interconnection within one business day. The measurement systems shall comply with the applicable ~~electric distribution company~~ Electric Distribution Company accuracy requirements for meters, and/or as described in the PJM Manual 01. Additional details for the configuration of such measurement systems under various specific configurations are specified in PJM Manual 14D.

***K. Revise the PJM Tariff to clarify, consistent with PJM's representations, that a DER Aggregation Resource under 10 MW that is only participating in the energy market is exempted from telemetry requirements.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that the basic description of PJM's telemetry practices in its Tariff is incomplete because, "unlike PJM's Transmittal and Data Request Response, it does not indicate that a DER Aggregation Resource under 10 MW that is only participating in the energy market is exempted from telemetry requirements."<sup>44</sup> Accordingly,

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<sup>44</sup> March 1, 2023 Order at P 251.

the Commission directed PJM to revise the PJM Tariff to clarify, consistent with PJM's representations, that a DER Aggregation Resource under 10 MW that is only participating in the energy market is exempted from telemetry requirements.<sup>45</sup>

ii. PJM Compliance

In compliance with this directive, PJM proposes to modify the proposed language Tariff, Attachment K-Appendix, section 1.4B(e) and Operating Agreement, Schedule 1, section 1.4B(e) to state that a DER Aggregation Resource that is less than 10 MW and that solely participates in PJM's energy market is exempt from PJM's telemetry requirements, unless otherwise specified in the PJM Manuals.

As PJM stated in its Data Request Response:

The specific details associated with the telemetry scan rates and metering accuracy are contained in the PJM manuals, and are not contained in the Tariff. This is a long-standing practice that applies for all resources in PJM, not just resources under the proposed DER Aggregator Participation Model. PJM details the telemetry scan rates applicable to resources, by market participation in PJM Manual 01.21 PJM Manual 14D provides additional details on metering and telemetry points and PJM Manual 03A describes sufficient telemetry for observability of the BES.<sup>46</sup>

PJM outlines in detail the real-time telemetry requirements pertaining to generators in Manual 14D. While DER Aggregation Resources less than 10 MW that solely participate in PJM's energy market are indeed exempt from PJM's telemetry requirements, *individual generators*, or Component DER in the DER Aggregation Participation Model, may be required to provide real-time telemetry under a specific and limited set of circumstances. These circumstances are detailed

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<sup>45</sup> *Id.*

<sup>46</sup> Data Request Response at P 34.

in PJM Manual 14D, section 4.2.2 and 4.2.3.<sup>47</sup> Accordingly, PJM proposes revisions to Tariff, Attachment K-Appendix, section 1.4B(e) and Operating Agreement, Schedule 1, section 1.4B(e) to appropriately memorialize this exemption.

**This telemetry requirement shall not apply to a DER Aggregation Resource exclusively participating in the energy market that is less than 10 MW, notwithstanding the technical specifications described in the PJM Manuals.**

***L. Revises PJM’s distribution utility review process such that the 60-day distribution utility review period for incremental changes occurs upon PJM transmitting the necessary information to review such incremental changes to the electric distribution company.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that under PJM’s proposal, the distribution utility review period commences for incremental changes to a DER Aggregation Resource “upon a DER Aggregator’s notice to PJM of a proposed update.”<sup>48</sup> The Commission found that “this could result in the 60-day review period commencing before the electric distribution company has received the data necessary to perform its assessment, given that the triggering event could occur before PJM transmits the necessary information to the electric distribution company.”<sup>49</sup> Accordingly, the Commission directed PJM to revise its distribution utility review process such that the 60-day distribution utility review period for incremental changes occurs upon PJM transmitting the necessary information to review such incremental changes to the electric distribution company.<sup>50</sup>

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<sup>47</sup> PJM, *Manual 14D: Generator Operational Requirements*, § 4.2.2 (rev. 62, Dec. 21, 2022), <https://www.pjm.com/~media/documents/manuals/m14d.ashx>.

<sup>48</sup> March 1, 2023 Order at P 298.

<sup>49</sup> *Id.*

<sup>50</sup> *Id.*

ii. PJM Compliance

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b) to specify that the distribution utility review period commences *upon the Electric Distribution Company's* receipt of notification of any proposed update, including all applicable information and data.

Upon the Electric Distribution Company's receipt of notification of any proposed update, including all applicable information or data, the ~~host electric distribution company~~ Electric Distribution Company shall have an opportunity to conduct a review, for ~~a period of up to 60 calendar days~~ the first fifteen calendar day and/or second forty-five calendar day review period, in accordance with the provisions of this section related to initial registration, and make a recommendation to the Office of the Interconnection, prior to the Office of the Interconnection approving or denying the proposed update to the DER Aggregation Resource.

**M. *Revise the PJM Tariff to clarify that only the distribution utility hosting a Component DER has the opportunity to review the addition of that resource to a DER Aggregation Resource.***

i. Commission Directive

In the March 1, 2023 Order, the Commission found that while PJM's proposed Tariff revisions specify that a DER Aggregator must coordinate with "the *applicable* electric distribution company" during pre-registration, it refers only to "the electric distribution company" in the context of the review process related to incremental changes.<sup>51</sup> The Commission found this inconsistent with the requirement in Order No. 2222 that only the distribution utility hosting a distributed energy resource has the opportunity to review the addition of that resource to a

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<sup>51</sup> March 1, 2023 Order at P 299 (emphasis in original).

distributed energy resource aggregation.<sup>52</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to clarify that only the distribution utility hosting a Component DER has the opportunity to review the addition of that resource to a DER Aggregation Resource.

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b) to specify that the Electric Distribution Company *hosting* a Component DER is the entity responsible for reviewing the addition of that resource to a DER Aggregation.

Upon the Electric Distribution Company's receipt of notification of any proposed update, including all applicable information or data, the ~~host electric distribution company~~ Electric Distribution Company shall have an opportunity to conduct a review, for ~~a period of up to 60 calendar days~~ the first fifteen calendar day and/or second forty-five calendar day review period, in accordance with the provisions of this section related to initial registration, and make a recommendation to the Office of the Interconnection, prior to the Office of the Interconnection approving or denying the proposed update to the DER Aggregation Resource.

*N. **Revise the distribution utility review process to comply with the requirement to provide adequate and reasonable time for distribution utility review that does not exceed 60 days, and that incorporates any distribution utility verification into the 60-day process.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that “[b]ecause PJM’s proposed pre-registration process is mandatory but contains no deadline or obligation for timely coordination and review by the electric distribution company,” an electric distribution company could “unduly delay or erect barriers to distributed energy resource aggregation participation in the wholesale

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<sup>52</sup> *Id.*



markets by failing to verify the necessary information in a timely manner or simply through inaction.”<sup>53</sup> The Commission clarified that “any distribution utility review, to include verification of information provided by the DER Aggregator, should be completed as part of the 60-day process as set forth in Order No. 2222 through which the distribution utility determines whether the proposed distributed energy resource is capable of participation in the DER aggregation.”<sup>54</sup> Accordingly, the Commission directed PJM to revise its distribution utility review process to comply with the requirement to provide adequate and reasonable time for distribution utility review that does not exceed 60 days, and that incorporates any distribution utility verification into the 60-day process.<sup>55</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify as follows the proposed language in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b). Specifically, PJM has separated the distribution utility review period into two distinct review periods. The first review period, to last no more than fifteen calendar days, will be triggered once the Electric Distribution Company is notified that a DER Aggregator has successfully registered a location, or Component DER, in the applicable PJM system. At the time of notification, the Electric Distribution Company will also be able to access all relevant information and data necessary to determine whether the Component DER meets the criteria for participation in PJM’s markets, as outlined in PJM’s Tariff. Additionally, during this fifteen-day period, the Electric Distribution Company will need to provide the primary electrical node

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<sup>53</sup> *Id.* at P 300.

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

<sup>55</sup> *Id.*

associated with the Component DER on PJM's Transmission System. PJM will use this information to assign a pricing node to that Component DER. At the conclusion of the first review period, or earlier if practical, the Electric Distribution Company may recommend that PJM approve the Component DER.

Following Electric Distribution Company review of a Component DER's data and information, the DER Aggregator will be able to designate DER Aggregation Resources comprising of one or more of the approved Component DER. The second review period, which is to last no more than forty-five calendar days, will be triggered by this designation. During the second review period, the Electric Distribution Company may perform any reliability assessments necessary to determine that the participation of the DER Aggregation Resource in the PJM energy, capacity, and/or ancillary service markets do not pose a threat to the reliable and safe operation of the distribution system, the public, or distribution utility personnel. At the conclusion of the second review period, or earlier if practical, the Electric Distribution Company may recommend that PJM approve or deny the participation of the DER Aggregation Resource in the PJM market(s) indicated by the DER Aggregator.

PJM believes that proposed bifurcation of the distribution utility review period into two distinct periods effectively balances DER Aggregators' need for a reasonably quick review of the basic data and information components pertaining to an individual Component DER such that simple errors may be quickly remedied, with the desire of Electric Distribution Companies to have sufficient time to conduct a thorough reliability assessment of any potential incremental impacts caused by the DER Aggregation Resource that were not considered during the interconnection of the Component DER. Moreover, the proposed time limits of fifteen and forty-five calendar days<sup>56</sup>

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<sup>56</sup> If the fifteen or forty-five day review period ends on a non-business day, the obligation will fall to the next business

for the completion of the first and second review periods, respectively, ensure that, in total, distribution utility review does not exceed 60 days, in compliance with the Commission's requirements in Order No. 2222.

PJM proposes to amend Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b) in the following manner.

The Electric Distribution Company review process shall consist of two periods, in sum not to exceed sixty calendar days. The first shall be a single period, not to exceed fifteen calendar days, during which time the Electric Distribution Company and the Office of the Interconnection shall review and verify each Component DER for which a location was created. The second shall be a single period, not to exceed forty-five calendar days, during which the Electric Distribution Company shall perform a reliability review of the DER Aggregation Resource. In the event that the last day of either fifteen or forty-five calendar day review period falls on a weekend or holiday, the review period shall conclude on the next business day.

The first fifteen calendar day review period shall commence upon receipt by the Electric Distribution Company of notification by from the Office of the Interconnection. Following notification, the electric distribution company Electric Distribution Company may, within 60 calendar days, may review and verify, as applicable, the registration Component DER for which a location was created and the following information associated therewith:

[...]

Within the first fifteen calendar day review period, and in coordination with the Office of Interconnection, the Electric Distribution Company shall also assign the electrical node on the PJM Transmission System to each Component DER. The Office of the Interconnection shall ensure that any information regarding Component DER that the Office of the Interconnection receives from an Electric Distribution Company or a DER Aggregator is accessible to both the Electric Distribution Company and the DER Aggregator.

Following approval of the Component DER by the Electric Distribution Company and the Office of the Interconnection, the DER Aggregator shall designate DER Aggregation Resources comprising of one or more of the approved Component DER. The second forty-five calendar day review period shall commence upon such designation by the DER Aggregator, whereby the Electric Distribution Company shall review the DER Aggregation Resource and verify that vii. —The participation of the Component DER/DER Aggregation Resource in the PJM energy, capacity, and/or ancillary service markets does not pose a threat to the reliable and safe operation of the distribution system, the public, or electric distribution company Electric Distribution Company personnel. The scope of the Electric Distribution Company review of distribution system reliability impacts shall be limited to any incremental impacts arising from a Component DER participation in a DER Aggregation Resource that were not previously considered by the Electric Distribution Company during the interconnection study process for that Component DER.

***O. Revise the PJM Tariff to designate the DER Aggregator as responsible for dispatching the Component DER in its aggregation or explain how its proposed tariff language is consistent with this requirement.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that PJM’s tariff language “does not account for the Commission’s requirement that a distributed energy resource aggregator is responsible for dispatching the distributed energy resources in its aggregation in response to RTO/ISO direction.”<sup>57</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to designate the DER Aggregator as responsible for dispatching the Component DER in its aggregation or to explain how its proposed tariff language is consistent with this requirement.<sup>58</sup>

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<sup>57</sup> March 1, 2023 Order at P 302.

<sup>58</sup> *Id.*

ii. PJM Compliance

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b) to remove the language that assigns the responsibility for physically operating the Component DER during the registration process to the Electric Distribution Company, the DER Aggregator, or another entity, as applicable. PJM clarifies that the DER Aggregator is responsible for dispatching the Component DER in its aggregation in response to dispatch instructions of PJM for the DER Aggregation Resource. As is the case for all resources in PJM, a DER Aggregator retains the ability to elect to designate another entity to dispatch the DER Aggregation Resource in the PJM Market. PJM allows a Market Participant, in this case the DER Aggregator, to assign a different party to interface with PJM operations, and receive and respond to PJM dispatch instructions.<sup>59</sup> This role of interfacing with PJM operations does not change or remove the DER Aggregator's responsibility to dispatch the Component DER in response to the DER Aggregation Resource's dispatch signal(s).

With the removal of the proposed tariff language, PJM clarifies that: (1) a DER Aggregator is responsible for dispatching the Component DER within their DER Aggregation Resource, (2) the physical operation of the Component DER would be determined by the DER Aggregator in accordance with any applicable tariffs, agreements, and operating procedures of the Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory

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<sup>59</sup> More information regarding this existing business practice in PJM is available here: <https://www.pjm.com/about-pjm/member-services>

Authority and (3) the DER Aggregator can assign a different party to interface with PJM operations on their behalf.

PJM proposes to modify Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b) in the following manner, and add a new requirement to Tariff, Attachment K-Appendix, section 1.4B(e) and Operating Agreement, Schedule 1, section 1.4B(e).

~~During the registration process, the responsibility for physically operating the Component DER within a DER Aggregation Resource and/or dispatching the DER Aggregation Resource will be assigned to the electric distribution company, the DER Aggregator, or another entity, in accordance with any applicable tariffs, agreements, and operating procedures of the electric distribution company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority.~~

~~(e) A DER Aggregator shall be responsible for dispatching the underlying Component DER within a DER Aggregation Resource in accordance with the Office of the Interconnection's dispatch instructions for the DER Aggregation Resource, unless the DER Aggregator elects to designate another entity to dispatch the Component DER.~~

***P. Revise the PJM Tariff to require PJM to share with the DER Aggregator any information regarding a Component DER that is provided by a distribution utility to PJM as part of the distribution utility review process.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission acknowledged PJM's proposal to construct a software program to facilitate coordination and communication between PJM, the DER Aggregator, and the electric distribution company, and PJM's statements that the DER Aggregator will be required to provide information and data from each Component DER during the registration process, which will be available to all parties.<sup>60</sup> However, the Commission found that Order No.

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<sup>60</sup> March 1, 2023 Order at P 303.

2222-A “also requires that specific information regarding a Component DER that is provided by an electric distribution company to PJM also be shared with the DER Aggregator.”<sup>61</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to require PJM to share with the DER Aggregator any information regarding a Component DER that is provided by a distribution utility to PJM as part of the distribution utility review process.<sup>62</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b) to specify that the DER Aggregator will be able to access any information pertaining to a Component DER that has been provided by the Electric Distribution Company to PJM. As an example, once the Electric Distribution Company assigns an electrical node to a Component DER, that information will be visible to both PJM and the DER Aggregator within the registration platform.

PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b) in the following manner.

The Office of the Interconnection shall ensure that any information regarding Component DER that the Office of the Interconnection receives from an Electric Distribution Company or a DER Aggregator is accessible to both the Electric Distribution Company and the DER Aggregator.

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<sup>61</sup> *Id.*

<sup>62</sup> *Id.*

***Q. Regarding the criteria in the distribution utility review process, either remove the criterion regarding whether “participation” in PJM’s markets complies with rules of any applicable RERRA, or revise it to address “whether the aggregation complies” with rules of any applicable RERRA.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that PJM’s proposed criterion in the distribution utility review process that assessed whether “participation” in PJM’s markets complies with the rules of any applicable RERRA was improper because “the Commission has exclusive jurisdiction over the wholesale markets and the criteria for participation in those markets.”<sup>63</sup> Recognizing the important role that state and local authorities play with respect to distributed energy resources and their potential aggregation, the Commission explained that “this criterion could be compliant if it were revised to address *whether the aggregation complies* with rules of any applicable RERRA.<sup>64</sup> Accordingly, the Commission directed PJM to either remove the criterion regarding whether “participation” in PJM’s markets complies with rules of any applicable RERRA, or revise it to address “whether the aggregation complies” with rules of any applicable RERRA.

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(b)(iii) and Operating Agreement, Schedule 1, section 1.4B(b)(iii) to remove reference to the DER Aggregator’s “participation” in PJM’s energy, capacity, and/or ancillary services markets in the manner suggested by the Commission.

~~iii.v. The Component DER Aggregator’s participation in the PJM energy, capacity, and/or ancillary service markets complies with the~~

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<sup>63</sup> *Id.* at P 306.

<sup>64</sup> *Id.* (emphasis in original).



rules and regulations of any applicable Relevant Electric Retail Regulatory Authority;

- R. Regarding the criteria in the distribution utility review process, revise the PJM Tariff to include specific, transparent criteria by which an electric distribution company will determine during its review whether each proposed Component DER is capable of participating in a DER Aggregation Resource and explain why these criteria are appropriate for the PJM region.***

*i. Compliance Directive*

In the March 1, 2023 Order, the Commission found that three of PJM’s proposed distribution utility review criteria<sup>65</sup> “do not constitute capability *criteria* because they do not include a principle or standard by which an electric distribution company would determine whether each proposed Component DER is capable of participation in a DER aggregation.”<sup>66</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to include specific, transparent criteria by which an electric distribution company will determine during its review whether each proposed Component DER is capable of participating in a DER Aggregation Resource and explain why these criteria are appropriate for the PJM region.<sup>67</sup>

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<sup>65</sup> These three criteria, as proposed in full, are:

- i. Operational and physical characteristics, including an inventory of the individual Component DER location-specific capability to reduce load and/or produce electricity;
- ii. The specific PJM markets in which the DER Aggregation Resource plans to participate and, if applicable, the effective and termination dates for participation; and
- iii. The electric distribution company customer account number(s) which represent Component DER location(s) and related information, as defined in the PJM Manuals.

<sup>66</sup> March 1, 2023 Order at P 307 (emphasis in original).

<sup>67</sup> *Id.*

ii. PJM Compliance

In compliance with this directive, PJM proposes to modify as follows the proposed language in Tariff, Attachment K-Appendix, sections 1.4B(b)(i-iii) and Operating Agreement, Schedule 1, sections 1.4B(b)(i-iii). Specifically, PJM proposes to eliminate the three criteria referenced by the Commission in this directive and replace them with one criterion that allows the Electric Distribution Company to review the information provided by the DER Aggregator for accuracy. PJM agrees that the original language—operational characteristics, the PJM market in which the Component DER will participate, and the customer account number—describes information that the Electric Distribution Company would review and verify and is not sufficiently clear regarding the principle or standard by which participation eligibility may be assessed. However, PJM maintains that verifying the accuracy of certain information provided by the DER Aggregator for each Component DER, including the Electric Distribution Company account number and physical address, *is* an important part of the first fifteen calendar day review period described above. As such, PJM proposes to replace the first three participation criteria with language that instructs the Electric Distribution Company to verify that the location and data components associated with each Component DER have been accurately represented by the DER Aggregator.

- i. The location and data components that represents each Component DER, as further defined in the relevant PJM Manuals, are accurate; Operational and physical characteristics, including an inventory of the individual Component DER location specific capability to reduce load and/or produce electricity;
- ii. ~~The specific PJM markets in which the DER Aggregation Resource plans to participate and, if applicable, the effective and termination dates for participation;~~
- iii. ~~The electric distribution company customer account number(s) which represent Component DER location(s) and related information, as defined in the PJM Manuals;~~

- S. Revise the PJM Tariff to clarify that the scope of the distribution utility review of distribution system reliability impacts is limited to any incremental impacts from a resource's participation in a distributed energy resource aggregation that were not previously considered by the distribution utility during the interconnection study process for that resource.***

*i. Compliance Directive*

In the March 1, 2023 Order, the Commission found that while PJM's proposed Tariff revisions properly allowed the electric distribution company to review and verify whether the participation of Component DER in the PJM energy, capacity, and/or ancillary services markets would pose a threat to the reliable and safe operation of the distribution system, the public, or electric distribution company personnel, PJM had not properly addressed the *scope* of such electric distribution company review.<sup>68</sup> Specifically, the Commission noted that in Order No. 2222-A, the Commission clarified that the potential impacts on distribution system reliability specifically refer to any incremental impacts from a resource's participation in a distributed energy resource aggregation that were not previously considered by the distribution utility during the interconnection study process for that resource.<sup>69</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to clarify that the scope of the distribution utility review of distribution system reliability impacts is limited to any incremental impacts from a resource's participation in a distributed energy resource aggregation that were not previously considered by the distribution utility during the interconnection study process for that resource.<sup>70</sup>

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<sup>68</sup> *Id.* at PP 313-314.

<sup>69</sup> *Id.* at P 314.

<sup>70</sup> *Id.*

ii. PJM Compliance

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, sections 1.4B(b) and Operating Agreement, Schedule 1, sections 1.4B(b) to clearly indicate that the scope of the Electric Distribution Company’s reliability review should be limited to any *incremental* impacts associated with a Component DER’s participation in PJM’s energy, capacity, and/or ancillary services markets that were not already considered during the interconnection study process.

The scope of the Electric Distribution Company review of distribution system reliability impacts shall be limited to any incremental impacts arising from a Component DER participation in a DER Aggregation Resource that were not previously considered by the Electric Distribution Company during the interconnection study process for that Component DER.

***T. Addresses how PJM will resolve disputes that it determines are within its authority and subject to its Tariff.***

i. Compliance Directive

In the March 1, 2023 Order, the Commission noted that PJM’s proposal would properly allow a DER Aggregator or electric distribution company to initiate the dispute resolution process described in Operating Agreement, Schedule 5.<sup>71</sup> However, the Commission also noted that, under PJM’s proposal, any disputes arising under “any applicable tariffs, agreements, and operating procedures of the [electric distribution company], and/or the rules and regulations of any [RERRA]” shall be resolved in accordance with applicable state or local law, and not by PJM.<sup>72</sup> The Commission found that the use of the phrase “*arising under*” any applicable tariffs,

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<sup>71</sup> *Id.* at P 322.

<sup>72</sup> *Id.*

agreements, and operating procedures of the electric distribution company, and/or the rules and regulations of any RERRA was “so broad that it may allow for disputes to be inappropriately brought to a state or local regulator when PJM should resolve them.”<sup>73</sup> Accordingly, the Commission directed PJM to address how PJM will resolve disputes that it determines are within its authority and subject to its Tariff.<sup>74</sup>

ii. PJM Compliance

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, sections 1.4B(b) and Operating Agreement, Schedule 1, sections 1.4B(b) as follows. First, PJM clarifies that the intent of the original language was to leave to the jurisdiction of the distribution utility and/or the RERRA the resolution of issues within disputes that deal *exclusively* with the rules and regulations of these entities. That said, PJM acknowledges that the phrase “arising under” may be inappropriately broad. In order to both preserve the original intent of the Tariff provision, as well as more precisely describe the situations which would be subject to this provision, PJM proposes to replace disputes “arising under...” with *issues within* disputes “that solely concern the application of...” any tariffs, agreements, and operating procedures of the Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority.

At the same time, PJM recognizes that some issues within disputes may fall within its own purview. Accordingly, PJM proposes to add language to Tariff, Attachment K-Appendix, sections 1.4B(b) and Operating Agreement, Schedule 1, sections 1.4B(b) that specifies that issues within

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<sup>73</sup> *Id.* at P 323.

<sup>74</sup> *Id.*

disputes that concern the provisions of the PJM Governing Agreements may be arbitrated under the dispute resolution processes described in Operating Agreement, Schedule 5.

Issues within disputes ~~Disputes arising under that the Office of the Interconnection determines solely concern the application of~~ any applicable tariffs, agreements, and operating procedures of the ~~electric distribution company~~ Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, shall be ~~addressed~~ ~~resolved~~ in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5. Issues within disputes that the Office of the Interconnection determines concern the provisions of the PJM Governing Agreements may be arbitrated under the dispute resolution processes under Operating Agreement, Schedule 5.

*U. Revise the PJM Tariff to include a definition of electric distribution company.*

*i. Compliance Directive*

In the March 1, 2023 Order, the Commission found PJM’s proposal to use the undefined term “electric distribution company” improper.<sup>75</sup> The Commission found that the lack of a definition “creates uncertainty as to the precise entity responsible for the significant roles ascribed to the electric distribution company in PJM’s proposed coordination-related tariff revisions, including the electric distribution company review process.”<sup>76</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to include a definition of electric distribution company.<sup>77</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to add a definition of an Electric Distribution Company to Tariff, Definitions E-F, as follows:

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<sup>75</sup> *Id.* at P 333.

<sup>76</sup> *Id.*

<sup>77</sup> *Id.*

### **Electric Distribution Company**

"Electric Distribution Company" shall mean, exclusively for purposes of the Tariff, Attachment K-Appendix, section 1.4B and Operating Agreement, Schedule 1, section 1.4B, a PJM Member, or an entity that mutually agrees with a PJM Member that the PJM Member shall represent the entity and act on their behalf, that owns or leases with rights equivalent to ownership, electric distribution facilities that are used to provide electric distribution service to electric load within the PJM Region under rates and tariffs approved or authorized by the applicable Relevant Electric Retail Regulatory Authority.

This definition is, among other things, designed to ensure that an applicable distribution utility participating in the DER Aggregator Participation Model is either a PJM Member, or represented by a PJM Member, as is the case for some entities within the PJM Region. Given that all PJM Members sign the PJM Operating Agreement and are subject to the rights and obligations therein, PJM views this requirement as important for the protection of customers and other market participants.

***V. Revise the PJM Tariff to include the coordination protocols and processes for the operating day that allow distribution utilities to override PJM's dispatch.***

*i. Compliance Directive*

In the March 1, 2023 Order, the Commission observed that PJM proposed to incorporate by reference in its proposed Tariff language the means through which a distribution utility may initiate override as provided in the applicable tariffs, agreements, and operating procedures of the electric distribution company and/or the rules and regulations of any RERRA.<sup>78</sup> However, the Commission also observed that Order No. 2222 required that each RTO/ISO tariff include any such protocols and processes.<sup>79</sup> The Commission noted that these protocols and processes need

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<sup>78</sup> *Id.* at P 354.

<sup>79</sup> *Id.*

not specify the scenarios under which a distribution utility may override PJM’s dispatch, which may be contained in applicable tariffs, agreements, and operating procedures of the electric distribution company, and/or the rules and regulations of any RERRA, yet “PJM’s tariff should include further details on PJM’s approach to ongoing operational coordination with respect to overrides to ensure the protocols and processes are non-discriminatory and transparent, similar to how PJM describes other operational coordination protocols and processes in Tariff, Attachment K-Appendix, section 1.4B(f); Operating Agreement, Schedule 1, section 1.4B(f).”<sup>80</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to include the coordination protocols and processes for the operating day that allow distribution utilities to override PJM’s dispatch.<sup>81</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify the proposed language of Tariff, Attachment K-Appendix, sections 1.4B(f) and Operating Agreement, Schedule 1, sections 1.4B(f) to more clearly outline the proposed approach to ongoing operational coordination with respect to Electric Distribution Company overrides of PJM dispatch instructions. Specifically, the decision to override PJM dispatch should be communicated by the Electric Distribution Company directly to the DER Aggregator as soon as practicable. PJM will not interrupt or interfere with this decision in any way. Once notified, the DER Aggregator is instructed to revise the bidding parameters of the affected DER Aggregation Resource in PJM’s system to reflect the override. PJM will subsequently re-dispatch the aggregation in a manner consistent with the updated bidding parameters.

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<sup>80</sup> *Id.*

<sup>81</sup> *Id.*



During the Operating Day, the Office of the Interconnection shall dispatch DER Aggregation Resources, by communicating with the entity responsible for physically operating the Component DER within a DER Aggregation Resource and/or dispatching a DER Aggregation Resource, in accordance with the DER Aggregator's submitted bidding parameters. During the Operating Day, an ~~electric distribution company~~ Electric Distribution Company may exercise its ability to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource, for purposes of maintaining safe and reliable operation of distribution facilities, pursuant to any applicable tariffs, agreements, and operating procedures of the ~~electric distribution company~~ Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority. The Electric Distribution Company may communicate the decision to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource directly to the DER Aggregator. Following the exercise of the ~~electric distribution company~~ Electric Distribution Company's override, the DER Aggregator shall reflect the override by updating the applicable bidding parameters of its DER Aggregation Resource. The Office of the Interconnection shall not take any actions to interrupt or interfere with the Electric Distribution Company's decision to override and will re-dispatch the DER Aggregation Resource to reflect its updated bidding parameters.

- W. Revise the PJM Tariff to specify the existing non-performance penalties that will apply to a DER Aggregation Resource when the DER Aggregation Resource does not perform because an electric distribution utility overrides PJM's dispatch.***
- i. Compliance Directive*

In the March 1, 2023 Order, the Commission found that PJM's proposal lacked specificity regarding the existing resource non-performance penalties that would apply to a DER Aggregation Resource when an electric distribution company overrides PJM's dispatch.<sup>82</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to specify the existing non-performance

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<sup>82</sup> *Id.* at P 357.

penalties that will apply to a DER Aggregation Resource when the DER Aggregation Resource does not perform because an electric distribution utility overrides PJM's dispatch.<sup>83</sup>

ii. PJM Compliance

In compliance with this directive, PJM proposes to modify the proposed language in Tariff, Attachment K-Appendix, section 1.4B(f) and Operating Agreement, Schedule 1, section 1.4B(f) to specify that an Electric Distribution Company's override does not excuse the DER Aggregator from any *financial obligations* under the PJM Governing Agreements that may arise due to a DER Aggregation Resource's failure to perform in response to PJM dispatch instructions. PJM believes the term "financial obligation" appropriately covers the diversity of consequences for non-performance that exist under the PJM Governing Agreements, but may not specifically be described in the Governing Agreements as a "penalty." For example, in the PJM regulation market, if an Electric Distribution Company were to override the dispatch of a DER Aggregation Resource, that resource would earn a decreased "accuracy" or "performance" score.<sup>84</sup>

PJM believes that this approach will directly address the Commission's directive in Order No. 2222, in which the Commission required PJM "to revise its tariff to apply *any* existing resource non-performance penalties to a distributed energy resource aggregation when the aggregation does not perform because a distribution utility overrides the RTO's/ISO's dispatch."<sup>85</sup>

An ~~electric distribution company~~ Electric Distribution Company's override shall not excuse a DER Aggregator's ~~from any financial obligations under the PJM Governing Agreements~~ for failure to perform any of the obligations established under the PJM ~~Tariff, Operating Agreement, RAA, or PJM Manuals~~ Governing Agreements for the relevant PJM capacity, energy, and/or ancillary services markets.

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<sup>83</sup> *Id.*

<sup>84</sup> *See, e.g.*, Tariff, Attachment K-Appendix, section 3.2(k).

<sup>85</sup> Order No. 2222 at P 312 (emphasis added).

**X. *Revise the PJM Tariff to establish a process for ongoing coordination, including operational coordination, that addresses data flows and communication between: (1) the distribution utility and the DER Aggregator, with respect to overrides during the Operating Day; and (2) PJM and the distribution utility in both day-ahead and real-time markets.***

*i. Commission Directive*

In the March 1, 2023 Order, the Commission found that while PJM’s proposal addresses ongoing coordination between: (1) PJM and the DER Aggregator; and (2) the distribution utility and the DER Aggregator, as discussed above, “PJM does not sufficiently address ongoing coordination, including operational coordination, such as data flows and communication between PJM and the distribution utility.”<sup>86</sup> The Commission also noted that, while PJM discusses data flows and communication between the distribution utility and the DER Aggregator with respect to overriding DER Aggregation Resources or underlying Component DER under PJM dispatch in its filing, “PJM does not include this process in its tariff, as required by Order No. 2222.”<sup>87</sup> Accordingly, the Commission directed PJM to revise the PJM Tariff to establish a process for ongoing coordination, including operational coordination that addresses data flows and communication between: (1) the distribution utility and the DER Aggregator, with respect to overrides during the Operating Day; and (2) PJM and the distribution utility in both day-ahead and real-time markets.<sup>88</sup>

*ii. PJM Compliance*

In compliance with this directive, PJM proposes to modify the proposed language related to operational coordination during overrides in Tariff, Attachment K-Appendix, sections 1.4B(f)

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<sup>86</sup> March 1, 2023 Order at P 359.

<sup>87</sup> *Id.*

<sup>88</sup> *Id.*

and Operating Agreement, Schedule 1, sections 1.4B(f), in the manner described above. With respect to the operational coordination between PJM and the Electric Distribution Company, in both the day-ahead and real-time markets, PJM anticipates all communications to flow to and through the DER Aggregator. For example, PJM will make available directly to the DER Aggregator all day-ahead schedules and real-time dispatch instructions. The DER Aggregator is responsible for following all PJM instructions and/or updating its bidding parameters in PJM's system as appropriate. Similarly, all decisions to override PJM dispatch will also be communicated directly to the DER Aggregator and the DER Aggregator will be responsible for reflecting overrides by updating the relevant bidding parameters in PJM's system. Although PJM and the Electric Distribution Company will maintain informal communications as necessary, at this time, PJM is not establishing a formal role in the Tariff related to operational coordination between itself and the Electric Distribution Company.

## **II. EFFECTIVE DATE**

As referenced above, PJM respectfully requests that the Commission grant an effective date of February 2, 2026 for the Tariff and Operating Agreement revisions proposed herein, to align with the effective date already established by the Commission in this proceeding.

## **III. CORRESPONDENCE AND COMMUNICATIONS**

Please direct any communications regarding this filing to the following individuals:

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#### **IV. DOCUMENTS INCLUDED WITH THIS FILING**

In accordance with the requirements of Order No. 714<sup>89</sup> and the Commission's eTariff regulations, PJM hereby submits an eTariff XML filing package consisting of the following materials:

1. This transmittal letter;
3. Attachment A – Revisions to the Tariff and Operating Agreement, effective February 2, 2026, in redlined format;
3. Attachment B – Revisions to the Tariff and Operating Agreement, effective February 2, 2026, in clean format; and
4. Attachment C – Affidavit of Donald Bielak on behalf of PJM Interconnection, L.L.C.

#### **V. SERVICE**

PJM has served a copy of this filing on all PJM Members and on all state utility regulatory commissions in the PJM Region by posting this filing electronically. In accordance with the Commission's regulations,<sup>90</sup> PJM will post a copy of this filing to the FERC filings section of its internet site, located at the following link: <https://www.pjm.com/library/filing-order> with a specific link to the newly-filed document, and will send an e-mail on the same date as this filing to all PJM Members and all state utility regulatory commissions in the PJM Region<sup>91</sup> alerting them that this filing has been made by PJM today and is available by following such link. If the document is not immediately available by using the referenced link, the document will be available through the referenced link within 24 hours of the filing. Also, a copy of this filing will be

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<sup>89</sup> *Electronic Tariff Filings*, Order No. 714, 124 FERC ¶ 61,270 (2008), *final rule*, Order No. 714-A, 147 FERC ¶ 61,115 (2014).

<sup>90</sup> See 18 C.F.R. §§ 35.2(e) and 385.2010(f)(3).

<sup>91</sup> PJM already maintains, updates, and regularly uses e-mail lists for all PJM members and affected commissions.

available on the FERC's eLibrary website located at the following link: <http://www.ferc.gov/docs-filing/elibrary.asp> in accordance with the Commission's regulations and Order No. 714. PJM also served this filing on each person designated on the official service list maintained by the Commission for this proceeding.

## VI. CONCLUSION

In accordance with the foregoing, PJM respectfully requests that the Commission accept this submission and associated tariff records, as discussed herein.

Respectfully submitted,

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*On behalf of*  
*PJM Interconnection, L.L.C.*

September 1, 2023

**CERTIFICATE OF SERVICE**

I hereby certify that I have this day caused the foregoing document to be served upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Audubon, PA this 1<sup>st</sup> day of September, 2023.

/s/ Thomas DeVita

Thomas S. DeVita

Associate General Counsel

PJM Interconnection, L.L.C.

# Attachment A

## Revisions to the PJM Open Access Transmission Tariff and Operating Agreement

(Identified by Additional Cover Pages)

(Marked/Redline Format)



PJM Open Access Transmission Tariff  
Definitions – E – F  
Attachment K-Appendix, section 1.4B

## **Definitions – E - F**

### **Economic-based Enhancement or Expansion:**

“Economic-based Enhancement or Expansion” shall have the same meaning provided in the Operating Agreement.

### **Economic Load Response Participant:**

“Economic Load Response Participant” shall mean a Member or Special Member that qualifies under Operating Agreement, Schedule 1, section 1.5A, and the parallel provisions of Tariff, Attachment K-Appendix, section 1.5A, to participate in the PJM Interchange Energy Market and/or Ancillary Services markets through reductions in demand.

### **Economic Maximum:**

“Economic Maximum” shall mean the highest incremental MW output level, submitted to PJM market systems by a Market Participant, that a unit can achieve while following economic dispatch.

### **Economic Minimum:**

“Economic Minimum” shall mean the lowest incremental MW output level, submitted to PJM market systems by a Market Participant, that a unit can achieve while following economic dispatch.

### **Effective FTR Holder:**

“Effective FTR Holder” shall mean:

- (i) For an FTR Holder that is either a (a) privately held company, or (b) a municipality or electric cooperative, as defined in the Federal Power Act, such FTR Holder, together with any Affiliate, subsidiary or parent of the FTR Holder, any other entity that is under common ownership, wholly or partly, directly or indirectly, or has the ability to influence, directly or indirectly, the management or policies of the FTR Holder; or
- (ii) For an FTR Holder that is a publicly traded company including a wholly owned subsidiary of a publicly traded company, such FTR Holder, together with any Affiliate, subsidiary or parent of the FTR Holder, any other PJM Member has over 10% common ownership with the FTR Holder, wholly or partly, directly or indirectly, or has the ability to influence, directly or indirectly, the management or policies of the FTR Holder; or
- (iii) an FTR Holder together with any other PJM Member, including also any Affiliate, subsidiary or parent of such other PJM Member, with which it shares common ownership, wholly or partly, directly or indirectly, in any third entity which is a PJM Member (e.g., a joint venture).

**EFORd:**

“EFORd” shall have the meaning specified in the PJM Reliability Assurance Agreement.

**Electric Distribution Company**

"Electric Distribution Company" shall mean, exclusively for purposes of the Tariff, Attachment K-Appendix, section 1.4B and Operating Agreement, Schedule 1, section 1.4B, a PJM Member, or an entity that mutually agrees with a PJM Member that the PJM Member shall represent the entity and act on their behalf, that owns or leases with rights equivalent to ownership, electric distribution facilities that are used to provide electric distribution service to electric load within the PJM Region under rates and tariffs approved or authorized by the applicable Relevant Electric Retail Regulatory Authority.

**Electrical Distance:**

“Electrical Distance” shall mean, for a Generation Capacity Resource geographically located outside the metered boundaries of the PJM Region, the measure of distance, based on impedance and in accordance with the PJM Manuals, from the Generation Capacity Resource to the PJM Region.

**Eligible Customer:**

“Eligible Customer” shall mean:

- (i) Any electric utility (including any Transmission Owner and any power marketer), Federal power marketing agency, or any person generating electric energy for sale for resale is an Eligible Customer under the Tariff. Electric energy sold or produced by such entity may be electric energy produced in the United States, Canada or Mexico. However, with respect to transmission service that the Commission is prohibited from ordering by Section 212(h) of the Federal Power Act, such entity is eligible only if the service is provided pursuant to a state requirement that the Transmission Provider or Transmission Owner offer the unbundled transmission service, or pursuant to a voluntary offer of such service by a Transmission Owner.
- (ii) Any retail customer taking unbundled transmission service pursuant to a state requirement that the Transmission Provider or a Transmission Owner offer the transmission service, or pursuant to a voluntary offer of such service by a Transmission Owner, is an Eligible Customer under the Tariff. As used in Tariff, Part VI, Eligible Customer shall mean only those Eligible Customers that have submitted a Completed Application.

**Eligible Fast-Start Resource:**

“Eligible Fast-Start Resource” shall mean a Fast-Start Resource that is eligible for the application of Integer Relaxation during the calculation of Locational Marginal Prices as set forth in Tariff, Attachment K-Appendix, section 2.2.

**Emergency Action:**

“Emergency Action” shall mean (1) any megawatt shortage of the Primary Reserve requirement (as specified in the PJM Manuals) in a Reserve Zone or Sub-zone, inclusive of any adjustments to such requirement to account for system conditions, as determined by the dispatch run from the security constrained economic dispatch and where there is also a Voltage Reduction Warning and reduction of critical plant load, Manual Load Dump Warning, Maximum Emergency Generation Action, or the curtailment of non-essential building loads and voltage reduction that encompasses such Reserve Zone or Reserve Sub-zone or (2) anytime the Office of Interconnection identifies an emergency and issues a load shed directive, Manual Load Dump Action, Voltage Reduction Action, or deploy all resources action for an entire Reserve Zone or Reserve Sub-zone.

**Emergency Condition:**

“Emergency Condition” shall mean a condition or situation (i) that in the judgment of any Interconnection Party is imminently likely to endanger life or property; or (ii) that in the judgment of the Interconnected Transmission Owner or Transmission Provider is imminently likely (as determined in a non-discriminatory manner) to cause a material adverse effect on the security of, or damage to, the Transmission System, the Interconnection Facilities, or the transmission systems or distribution systems to which the Transmission System is directly or indirectly connected; or (iii) that in the judgment of Interconnection Customer is imminently likely (as determined in a non-discriminatory manner) to cause damage to the Customer Facility or to the Customer Interconnection Facilities. System restoration and black start shall be considered Emergency Conditions, provided that a Generation Interconnection Customer is not obligated by an Interconnection Service Agreement to possess black start capability. Any condition or situation that results from lack of sufficient generating capacity to meet load requirements or that results solely from economic conditions shall not constitute an Emergency Condition, unless one or more of the enumerated conditions or situations identified in this definition also exists.

**Emergency Load Response Program:**

“Emergency Load Response Program” shall mean the program by which Curtailment Service Providers may be compensated by PJM for Demand Resources that will reduce load when dispatched by PJM during emergency conditions, and is described in Operating Agreement, Schedule 1, section 8 and the parallel provisions of Tariff, Attachment K-Appendix, section 8.

**Energy Efficiency Resource:**

“Energy Efficiency Resource” shall have the meaning specified in the PJM Reliability Assurance Agreement.

**Energy Market Opportunity Cost:**

“Energy Market Opportunity Cost” shall mean the difference between (a) the forecasted cost to operate a specific generating unit when the unit only has a limited number of available run hours due to limitations imposed on the unit by Applicable Laws and Regulations, and (b) the forecasted future Locational Marginal Price at which the generating unit could run while not violating such limitations. Energy Market Opportunity Cost therefore is the value associated with a specific generating unit’s lost opportunity to produce energy during a higher valued period of time occurring within the same compliance period, which compliance period is determined by the applicable regulatory authority and is reflected in the rules set forth in PJM Manual 15. Energy Market Opportunity Costs shall be limited to those resources which are specifically delineated in Operating Agreement, Schedule 2.

**Energy Resource:**

“Energy Resource” shall mean a Generating Facility that is not a Capacity Resource.

**Energy Settlement Area:**

“Energy Settlement Area” shall mean the bus or distribution of busses that represents the physical location of Network Load and by which the obligations of the Network Customer to PJM are settled.

**Energy Storage Resource:**

“Energy Storage Resource” shall mean a resource capable of receiving electric energy from the grid and storing it for later injection to the grid that participates in the PJM Energy, Capacity and/or Ancillary Services markets as a Market Participant. Open-Loop Hybrid Resources are not Energy Storage Resources.

**Energy Storage Resource Model Participant:**

“Energy Storage Resource Model Participant” shall mean an Energy Storage Resource utilizing the Energy Storage Resource Participation Model.

**Energy Storage Resource Participation Model:**

“Energy Storage Resource Participation Model” shall mean the participation model accepted by the Commission in Docket No. ER19-469-000.

**Energy Transmission Injection Rights:**

“Energy Transmission Injection Rights” shall mean the rights to schedule energy deliveries at a specified point on the Transmission System. Energy Transmission Injection Rights may be awarded only to a Merchant D.C. Transmission Facility that connects the Transmission System

to another control area. Deliveries scheduled using Energy Transmission Injection Rights have rights similar to those under Non-Firm Point-to-Point Transmission Service.

**Entity Providing Supply Services to Default Retail Service Provider:**

“Entity Providing Supply Services to Default Retail Service Provider” shall mean any entity, including but not limited to a load aggregator or power marketer, providing supply services to an electric distribution company when that electric distribution company is serving as the default retail service provider, and that enters into a contract or similar obligation with such electric distribution company to serve retail customers who have not selected a competitive retail service provider.

**Environmental Laws:**

“Environmental Laws” shall mean applicable Laws or Regulations relating to pollution or protection of the environment, natural resources or human health and safety.

**Environmentally-Limited Resource:**

“Environmentally-Limited Resource” shall mean a resource which has a limit on its run hours imposed by a federal, state, or other governmental agency that will significantly limit its availability, on either a temporary or long-term basis. This includes a resource that is limited by a governmental authority to operating only during declared PJM capacity emergencies.

**Equivalent Load:**

“Equivalent Load” shall mean the sum of a Market Participant’s net system requirements to serve its customer load in the PJM Region, if any, plus its net bilateral transactions.

**Event of Default:**

“Event of Default,” as that term is used in Tariff, Attachment Q, shall mean a Financial Default, Credit Breach, or Credit Support Default.

**Exercise of Buyer-Side Market Power:**

“Exercise of Buyer-Side Market Power” shall mean anti-competitive behavior of a Capacity Market Seller with a Load Interest, or directed by an entity with a Load Interest, to uneconomically lower RPM Auction Sell Offer(s) in order to suppress RPM Auction clearing prices for the overall benefit of the Capacity Market Seller’s (and/or affiliates of Capacity Market Seller) portfolio of generation and load or that of the directing entity with a Load Interest as determined pursuant to Tariff, Attachment DD, section 5.14(h-2)(2)(B). A bilateral contract between the Capacity Market Seller and an entity with a Load Interest with the express purpose of lowering capacity market clearing prices shall be evidence of the Exercise of Buyer-Side Market Power.

**Existing Generation Capacity Resource:**

“Existing Generation Capacity Resource” shall have the meaning specified in the Reliability Assurance Agreement.

**Export Credit Exposure:**

“Export Credit Exposure” is determined for each Market Participant for a given Operating Day, and shall mean the sum of credit exposures for the Market Participant’s Export Transactions for that Operating Day and for the preceding Operating Day.

**Export Nodal Reference Price:**

“Export Nodal Reference Price” at each location is the 97th percentile, shall be, the real-time hourly integrated price experienced over the corresponding two-month period in the preceding calendar year, calculated separately for peak and off-peak time periods. The two-month time periods used in this calculation shall be January and February, March and April, May and June, July and August, September and October, and November and December.

**Export Transaction:**

“Export Transaction” shall be a transaction by a Market Participant that results in the transfer of energy from within the PJM Control Area to outside the PJM Control Area. Coordinated External Transactions that result in the transfer of energy from the PJM Control Area to an adjacent Control Area are one form of Export Transaction.

**Export Transaction Price Factor:**

“Export Transaction Price Factor” for a prospective time interval shall be the greater of (i) PJM’s forecast price for the time interval, if available, or (ii) the Export Nodal Reference Price, but shall not exceed the Export Transaction’s dispatch ceiling price cap, if any, for that time interval. The Export Transaction Price Factor for a past time interval shall be calculated in the same manner as for a prospective time interval, except that the Export Transaction Price Factor may use a tentative or final settlement price, as available. If an Export Nodal Reference Price is not available for a particular time interval, PJM may use an Export Transaction Price Factor for that time interval based on an appropriate alternate reference price.

**Export Transaction Screening:**

“Export Transaction Screening” shall be the process PJM uses to review the Export Credit Exposure of Export Transactions against the Credit Available for Export Transactions, and deny or curtail all or a portion of an Export Transaction, if the credit required for such transactions is greater than the credit available for the transactions.

**Export Transactions Net Activity:**

“Export Transactions Net Activity” shall mean the aggregate net total, resulting from Export Transactions, of (i) Spot Market Energy charges, (ii) Transmission Congestion Charges, and (iii) Transmission Loss Charges, calculated as set forth in Operating Agreement, Schedule 1 and the parallel provisions of Tariff, Attachment K-Appendix. Export Transactions Net Activity may be positive or negative.

**Extended Primary Reserve Requirement:**

“Extended Primary Reserve Requirement” shall equal the Primary Reserve Requirement in a Reserve Zone or Reserve Sub-zone, plus 190 MW, plus any additional reserves scheduled under emergency conditions necessary to address operational uncertainty. The Extended Primary Reserve Requirement is calculated in accordance with the PJM Manuals.

**Extended Summer Demand Resource:**

“Extended Summer Demand Resource” shall have the meaning specified in the Reliability Assurance Agreement.

**Extended Summer Resource Price Adder:**

“Extended Summer Resource Price Adder” shall mean, for Delivery Years through May 31, 2018, an addition to the marginal value of Unforced Capacity as necessary to reflect the price of Annual Resources and Extended Summer Demand Resources required to meet the applicable Minimum Extended Summer Resource Requirement.

**Extended Synchronized Reserve Requirement:**

“Extended Synchronized Reserve Requirement” shall equal the Synchronized Reserve Requirement in a Reserve Zone or Reserve Sub-zone, plus 190 MW, plus any additional reserves scheduled under emergency conditions necessary to address operational uncertainty. The Extended Synchronized Reserve Requirement is calculated in accordance with the PJM Manuals.

**Extended 30-minute Reserve Requirement:**

“Extended 30-minute Reserve Requirement” shall equal the 30-minute Reserve Requirement in a Reserve Zone or Reserve Sub-zone, plus 190 MW, plus any additional reserves scheduled under emergency conditions necessary to address operational uncertainty. The Extended 30-minute Reserve Requirement is calculated in accordance with the PJM Manuals.

**External Market Buyer:**

“External Market Buyer” shall mean a Market Buyer making purchases of energy from the PJM Interchange Energy Market for consumption by end-users outside the PJM Region, or for load in the PJM Region that is not served by Network Transmission Service.

**External Resource:**



“External Resource” shall mean a generation resource located outside the metered boundaries of the PJM Region.

**Facilities Study:**

“Facilities Study” shall be an engineering study conducted by the Transmission Provider (in coordination with the affected Transmission Owner(s)) to: (1) determine the required modifications to the Transmission Provider’s Transmission System necessary to implement the conclusions of the System Impact Study; and (2) complete any additional studies or analyses documented in the System Impact Study or required by PJM Manuals, and determine the required modifications to the Transmission Provider’s Transmission System based on the conclusions of such additional studies. The Facilities Study shall include the cost and scheduled completion date for such modifications, that will be required to provide the requested transmission service or to accommodate a New Service Request. As used in the Interconnection Service Agreement or Construction Service Agreement, Facilities Study shall mean that certain Facilities Study conducted by Transmission Provider (or at its direction) to determine the design and specification of the Customer Funded Upgrades necessary to accommodate the New Service Customer’s New Service Request in accordance with Tariff, Part VI, section 207.

**Fast-Start Resource:**

“Fast-Start Resource” shall have the meaning set forth in Tariff, Attachment K-Appendix, section 2.2A

**Federal Power Act:**

“Federal Power Act” shall mean the Federal Power Act, as amended, 16 U.S.C. §§ 791a, et seq.

**FERC or Commission:**

“FERC” or “Commission” shall mean the Federal Energy Regulatory Commission or any successor federal agency, commission or department exercising jurisdiction over the Tariff, Operating Agreement and Reliability Assurance Agreement.

**FERC Market Rules:**

“FERC Market Rules” mean the market behavior rules and the prohibition against electric energy market manipulation codified by the Commission in its Rules and Regulations at 18 CFR §§ 1c.2 and 35.37, respectively; the Commission-approved PJM Market Rules and any related proscriptions or any successor rules that the Commission from time to time may issue, approve or otherwise establish.

**Final Offer:**

“Final Offer” shall mean the offer on which a resource was dispatched by the Office of the Interconnection for a particular clock hour for the Operating Day.

**Final RTO Unforced Capacity Obligation:**

“Final RTO Unforced Capacity Obligation” shall mean the capacity obligation for the PJM Region, determined in accordance with RAA, Schedule 8.

**Financial Close:**

“Financial Close” shall mean the Capacity Market Seller has demonstrated that the Capacity Market Seller or its agent has completed the act of executing the material contracts and/or other documents necessary to (1) authorize construction of the project and (2) establish the necessary funding for the project under the control of an independent third-party entity. A sworn, notarized certification of an independent engineer certifying to such facts, and that the engineer has personal knowledge of, or has engaged in a diligent inquiry to determine, such facts, shall be sufficient to make such demonstration. For resources that do not have external financing, Financial Close shall mean the project has full funding available, and that the project has been duly authorized to proceed with full construction of the material portions of the project by the appropriate governing body of the company funding such project. A sworn, notarized certification by an officer of such company certifying to such facts, and that the officer has personal knowledge of, or has engaged in a diligent inquiry to determine, such facts, shall be sufficient to make such demonstration.

**Financial Default:**

“Financial Default” shall mean (a) the failure of a Member or Transmission Customer to make any payment for obligations under the Agreements when due, including but not limited to an invoice payment that has not been cured or remedied after notice has been given and any cure period has elapsed, (b) a bankruptcy proceeding filed by a Member, Transmission Customer or its Guarantor, or filed against a Member, Transmission Customer or its Guarantor and to which the Member, Transmission Customer or Guarantor, as applicable, acquiesces or that is not dismissed within 60 days, (c) a Member, Transmission Customer or its Guarantor, if any, is unable to meet its financial obligations as they become due, or (d) a Merger Without Assumption occurs in respect of the Member, Transmission Customer or any Guarantor of such Member or Transmission Customer.

**Financial Transmission Right:**

“Financial Transmission Right” or “FTR” shall mean a right to receive Transmission Congestion Credits as specified in Operating Agreement, Schedule 1, section 5.2.2 and the parallel provisions of Tariff, Attachment K-Appendix, section 5.2.2.

**Financial Transmission Right Obligation:**

“Financial Transmission Right Obligation” shall mean a right to receive Transmission Congestion Credits as specified in Operating Agreement, Schedule 1, section 5.2.2(b), and the parallel provisions of Tariff, Attachment K-Appendix, section 5.2.2(b).

**Financial Transmission Right Option:**

“Financial Transmission Right Option” shall mean a right to receive Transmission Congestion Credits as specified in Operating Agreement, Schedule 1, section 5.2.2(c), and the parallel provisions of Tariff, Attachment K-Appendix, section 5.2.2(c).

**Firm Point-To-Point Transmission Service:**

“Firm Point-To-Point Transmission Service” shall mean Transmission Service under the Tariff that is reserved and/or scheduled between specified Points of Receipt and Delivery pursuant to Tariff, Part II.

**Firm Transmission Feasibility Study:**

“Firm Transmission Feasibility Study” shall mean a study conducted by the Transmission Provider in accordance with Tariff, Part II, section 19.3 and Tariff, Part III, section 32.3.

**Firm Transmission Withdrawal Rights:**

“Firm Transmission Withdrawal Rights” shall mean the rights to schedule energy and capacity withdrawals from a Point of Interconnection of a Merchant Transmission Facility with the Transmission System. Firm Transmission Withdrawal Rights may be awarded only to a Merchant D.C. Transmission Facility that connects the Transmission System with another control area. Withdrawals scheduled using Firm Transmission Withdrawal Rights have rights similar to those under Firm Point-to-Point Transmission Service.

**First Incremental Auction:**

“First Incremental Auction” shall mean an Incremental Auction conducted 20 months prior to the start of the Delivery Year to which it relates.

**Flexible Resource:**

“Flexible Resource” shall mean a generating resource that must have a combined Start-up Time and Notification Time of less than or equal to two hours; and a Minimum Run Time of less than or equal to two hours.

**Forecast Pool Requirement:**

“Forecast Pool Requirement” shall have the meaning specified in the Reliability Assurance Agreement.

**Foreign Guaranty:**

“Foreign Guaranty” shall mean a Corporate Guaranty provided by an Affiliate of a Participant that is domiciled in a foreign country, and meets all of the provisions of Tariff, Attachment Q.

**Form 715 Planning Criteria:**

“Form 715 Planning Criteria” shall have the same meaning provided in the Operating Agreement.

**Forward Daily Natural Gas Prices:**

“Forward Daily Natural Gas Prices” shall have the meaning provided in Tariff, Attachment DD, section 5.10(a)(v-1)(E).

**Forward Hourly Ancillary Services Prices:**

“Forward Hourly Ancillary Services Prices” shall have the meaning provided in Tariff, Attachment DD, section 5.10(a)(v-1)(D).

**Forward Hourly LMPs:**

“Forward Hourly LMPs” shall have the meaning provided in Tariff, Attachment DD, section 5.10(a)(v-1)(C).

**FTR Credit Limit:**

“FTR Credit Limit” shall mean the amount of credit established with PJMSettlement that an FTR Participant has specifically designated to be used for FTR activity in a specific customer account. Any such credit so set aside shall not be considered available to satisfy any other credit requirement the FTR Participant may have with PJMSettlement.

**FTR Credit Requirement:**

“FTR Credit Requirement” shall mean the amount of credit that a Participant must provide in order to support the FTR positions that it holds and/or for which it is bidding. The FTR Credit Requirement shall not include months for which the invoicing has already been completed, provided that PJMSettlement shall have up to two Business Days following the date of the invoice completion to make such adjustments in its credit systems. FTR Credit Requirements are calculated and applied separately for each separate customer account.

**FTR Flow Undiversified:**

“FTR Flow Undiversified” shall have the meaning established in Tariff, Attachment Q, section VI.C.6.

**FTR Historical Value:**

For each FTR for each month, “FTR Historical Value” shall mean the weighted average of historical values over three years for the FTR path using the following weightings: 50% - most recent year; 30% - second year; 20% - third year.

**FTR Holder:**

“FTR Holder” shall mean the PJM Member that has acquired and possesses an FTR.

**FTR Monthly Credit Requirement Contribution:**

For each FTR, for each month, “FTR Monthly Credit Requirement Contribution” shall mean the total FTR cost for the month, prorated on a daily basis, less the FTR Historical Value for the month. For cleared FTRs, this contribution may be negative; prior to clearing, FTRs with negative contribution shall be deemed to have zero contribution.

**FTR Net Activity:**

“FTR Net Activity” shall mean the aggregate net value of the billing line items for auction revenue rights credits, FTR auction charges, FTR auction credits, and FTR congestion credits, and shall also include day-ahead and balancing/real-time congestion charges up to a maximum net value of the sum of the foregoing auction revenue rights credits, FTR auction charges, FTR auction credits and FTR congestion credits.

**FTR Participant:**

“FTR Participant” shall mean any Market Participant that provides or is required to provide Collateral in order to participate in PJM’s FTR market.

**FTR Portfolio Auction Value:**

“FTR Portfolio Auction Value” shall mean for each customer account of a Market Participant, the sum, calculated on a monthly basis, across all FTRs, of the FTR price times the FTR volume in MW.

**Fuel Cost Policy:**

“Fuel Cost Policy” shall mean the document provided by a Market Seller to PJM and the Market Monitoring Unit in accordance with PJM Manual 15 and Operating Agreement, Schedule 2, which documents the Market Seller’s method used to price fuel for calculation of the Market Seller’s cost-based offers for a generation resource.

**Full Notice to Proceed:**

“Full Notice to Proceed” shall mean that all material third party contractors have been given the notice to proceed with construction by the Capacity Market Seller or its agent, with a guaranteed completion date backed by liquidated damages.

## 1.4B DER Aggregator Participation Model

(a) The rules and procedures for the participation of DER Aggregators are established pursuant to this section 1.4B and the PJM Manuals.

(b) In order to participate in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model, a DER Aggregator shall register each DER Aggregation Resource and DER Capacity Aggregation Resource with the Office of the Interconnection, in accordance with the procedures established under the PJM Manuals.

~~Prior to the initiation of the registration review process by the Office of the Interconnection, a DER Aggregator shall obtain and verify, through good faith efforts and in coordination with the applicable electric distribution company, and, if necessary, any relevant Transmission Owner, the following location and data components needed for the DER Aggregator's registration with the Office of the Interconnection:~~

~~i. With the express written consent of the applicable Component DER, the electric distribution company customer account number and associated physical and transmission system electrical location information of the applicable Component DER, including compliance with applicable PJM and electric distribution company metering and telemetry requirements;~~

~~ii. Evidence of approval to interconnect, including but not limited to a finalized interconnection agreement, with the applicable Component DER, in accordance with any applicable tariffs, agreements, and operating procedures of the electric distribution company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, to the distribution system for identified megawatts, and identification of participation in an electric distribution company program that recognizes grid withdrawals and/or injections, including but not limited to a net energy metering program.~~

~~Disputes between the DER Aggregator and the electric distribution company regarding the location and data components needed for the DER Aggregator's registration with the Office of the Interconnection described above shall be resolved in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5.~~

The Electric Distribution Company registration review portion of the registration process shall commence after: (1) the Office of the Interconnection has an executed DER Aggregator Participation Service Agreement on file, to be used for all DER Aggregation Resources associated with the DER Aggregator; and (2) the Office of the Interconnection receives a complete registration from the DER Aggregator, in a form specified in the PJM Manuals; ~~and (3) pre-registration activities have been completed, consisting of the DER Aggregator obtaining and verifying the location and data components described above needed for its registration.~~

Upon receipt of a DER Aggregator's completed registration, tThe Office of the Interconnection shall review the registration and data submitted therein for completeness, and verify that the DER Aggregator meets the eligibility criteria for participation in the DER Aggregator Participation Model, as defined under the PJM Tariff and Operating Agreement and Manuals. The DER Aggregator shall only submit a registration for Component DER that are under contract for the term of the registration, and only one DER Aggregator may operate Component DER at a specific location. The Office of the Interconnection shall notify the appropriate ~~electric distribution company~~Electric Distribution Company of the DER Aggregator's registration through the appropriate PJM system. A single registration shall only be comprised of individual Component DER in the same state, ~~electric distribution company~~Electric Distribution Company, Transmission Zone, and pricing point unless otherwise noted below.

The Electric Distribution Company review process shall consist of two periods, in sum not to exceed sixty calendar days. The first shall be a single period, not to exceed fifteen calendar days, during which time the Electric Distribution Company and the Office of the Interconnection shall review and verify each Component DER for which a location was created. The second shall be a single period, not to exceed forty-five calendar days, during which the Electric Distribution Company shall perform a reliability review of the DER Aggregation Resource. In the event that the last day of either the fifteen or forty-five calendar day review period falls on a weekend or holiday, the review period shall conclude on the next business day.

The first fifteen calendar day review period shall commence uUpon receipt by the Electric Distribution Company of notification by from the Office of the Interconnection.; Following notification, the ~~electric distribution company~~Electric Distribution Company may, within 60 calendar days, review and verify, as applicable, the Component DER for which a location was created registration and the following information associated therewith~~contained therein~~:

- i. The location and data components that represents each Component DER, as further defined in the relevant PJM Manuals, are accurate~~Operational and physical characteristics, including an inventory of the individual Component DER location-specific capability to reduce load and/or produce electricity;~~
- ii. ~~The specific PJM markets in which the DER Aggregation Resource plans to participate and, if applicable, the effective and termination dates for participation;~~
- iii. ~~The electric distribution company customer account number(s) which represent Component DER location(s) and related information, as defined in the PJM Manuals;~~
- iv. Participation of the Component DER in an ~~electric distribution company~~Electric Distribution Company's retail program at the time of registration does not, and whether such participation precludes participation of the Component DER in the energy, capacity, and/or ancillary services markets of PJM, and as defined in the PJM Manuals;



a. Component DER that participate in a net energy metering retail program may only participate with grid injections in the PJM ancillary services markets, and may not participate in PJM energy or capacity markets, unless:

1. the ~~electric distribution company~~Electric Distribution Company confirms to the Office of the Interconnection that participation of the Component DER in a net energy metering retail program or tariff approved by the Relevant Electric Retail Regulatory Authority will not violate the restrictions on duplicative compensation, as described in Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h); and

2. the Office of the Interconnection determines that the participation of the Component DER otherwise meets the applicable requirements for energy market or capacity market participation.

b. Component DER that participate in a net energy metering retail program that also participate with grid injections in the PJM ancillary services markets shall, based on the information provided by the DER Aggregator or the Electric Distribution Company, be excluded from PJM energy market settlements.

~~viii. The Component DER Aggregator's participation in the PJM energy, capacity, and/or ancillary service markets~~ complies with the rules and regulations of any applicable Relevant Electric Retail Regulatory Authority;

~~iv. The Relevant Electric Retail Regulatory Authority allows the participation of any applicable Component DER that are also end-use customers of an electric distribution company~~Electric Distribution Company, in accordance with the provisions of Tariff, Attachment K-Appendix, section 1.4B(g), and Operating Agreement, Schedule 1, section 1.4B(g).

Within the first fifteen calendar day review period, and in coordination with the Office of Interconnection, the Electric Distribution Company shall also assign the electrical node on the PJM Transmission System to each Component DER. The Office of the Interconnection shall ensure that any information regarding Component DER that the Office of the Interconnection receives from an Electric Distribution Company or a DER Aggregator is accessible to both the Electric Distribution Company and the DER Aggregator.

Following approval of the Component DER by the Electric Distribution Company and the Office of the Interconnection, the DER Aggregator shall designate DER Aggregation Resources comprising of one or more of the approved Component DER. The second forty-five calendar

day review period shall commence upon such designation by the DER Aggregator, whereby the Electric Distribution Company shall review the DER Aggregation Resource and verify that ~~vii.~~ ————The participation of the ~~DER Aggregation Resource Component DER~~ in the PJM energy, capacity, and/or ancillary service markets does not pose a threat to the reliable and safe operation of the distribution system, the public, or ~~electric distribution company~~Electric Distribution Company personnel. The scope of the Electric Distribution Company review of distribution system reliability impacts shall be limited to any incremental impacts arising from a Component DER participation in a DER Aggregation Resource that were not previously considered by the Electric Distribution Company during the interconnection study process for that Component DER.

If the ~~electric distribution company~~Electric Distribution Company identifies concerns during the Electric Distribution Company review portion of the registration process~~based on factors (i) through (vii) within the 60 calendar day review period~~, the ~~electric distribution company~~Electric Distribution Company may notify the Office of the Interconnection and the DER Aggregator, and the ~~electric distribution company~~Electric Distribution Company and the DER Aggregator may first attempt to resolve those concerns bilaterally, or in accordance with applicable state or local law, prior to seeking initiation of the dispute resolution process described in Operating Agreement, Schedule 5. Issues within disputes that the Office of the Interconnection determines solely concern the application of ~~Disputes arising under~~ any applicable tariffs, agreements, and operating procedures of the ~~electric distribution company~~Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, shall be ~~resolved~~ addressed in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5. Issues within disputes that the Office of the Interconnection determines concern the provisions of the PJM Governing Agreements may be arbitrated under the dispute resolution processes under Operating Agreement, Schedule 5.

In the event that the ~~electric distribution company~~Electric Distribution Company's concerns are resolved within the Electric Distribution Company 60 calendar day review portion of the registration process~~period~~, the ~~electric distribution company~~Electric Distribution Company may recommend that the Office of the Interconnection approve the location and/or registration, as applicable. In the event that the concerns identified by the ~~electric distribution company~~Electric Distribution Company are not resolved, the ~~electric distribution company~~Electric Distribution Company may, within the Electric Distribution Company review portion of the registration process~~60 calendar day review period~~, recommend that the Office of the Interconnection: (i) reject the location and/or registration, (ii) approve the registration with certain operational limitations on the DER Aggregation Resource identified in the registration, or (iii) approve the registration with the removal of one or more specific Component DER from the DER Aggregation Resource identified in the registration.

Following the Electric Distribution Company's review of the DER Aggregation Resource registration, wWithin fifteen calendar days, the Office of the Interconnection shall apply the applicable pricing points to the DER Aggregation Resource~~Component DER~~, and shall either approve or deny the DER Aggregator's registration based on the Office of the Interconnection's review of the registration and receipt and review of the ~~electric distribution company~~Electric

~~Distribution Company~~'s comments and recommendation, with deference given to the ~~electric distribution company~~Electric Distribution Company's assessment of the impact of the DER Aggregator's registration on the safety and reliability of distribution facilities. To the extent that no comments or recommendations are provided by the ~~electric distribution company~~Electric Distribution Company, including after the Office of the Interconnection provides final notice to the ~~electric distribution company~~Electric Distribution Company prior to the expiration of the Electric Distribution Company 60 calendar day review portion of the registration process period, the Office of the Interconnection shall approve the DER Aggregator's registration.

~~During the registration process, the responsibility for physically operating the Component DER within a DER Aggregation Resource and/or dispatching the DER Aggregation Resource will be assigned to the electric distribution company, the DER Aggregator, or another entity, in accordance with any applicable tariffs, agreements, and operating procedures of the electric distribution company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority.~~

All DER Aggregators shall remain in full compliance with the tariffs, agreements, and operating procedures of the applicable ~~electric distribution company~~Electric Distribution Company, and the rules and regulations of any Relevant Electric Retail Regulatory Authority, in accordance with their executed DER Aggregator Participation Service Agreement, at all times while participating in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model.

Transmission Owners shall, in coordination with the Office of the Interconnection, provide all data to the Office of the Interconnection reasonably required to accurately represent the DER Aggregation Resource in the Regional Transmission Expansion Plan, in accordance with Operating Agreement, section 1.5.4 and the PJM Manuals.

A DER Aggregator shall report to the Office of the Interconnection any proposed update to the inventory of the individual Component DER within the DER Aggregation Resource, or proposed additional market services provided by the DER Aggregation Resource, identified in the DER Aggregator's registration to reflect any proposed addition or subtraction of a Component DER or market service, and any applicable information or data associated with the Component DER or market service, in accordance with the specifications described in the PJM Manuals. Any proposed update shall not require a new registration of the existing Component DER within the approved DER Aggregation Resource. Upon the Electric Distribution Company's receipt of notification of any proposed update, including all applicable information or data, the ~~electric distribution company~~Electric Distribution Company shall have an opportunity to conduct a review, for the first fifteen calendar day and/or second forty-five calendar day review period~~a period of up to 60 calendar days~~, in accordance with the provisions of this section related to initial registration, and make a recommendation to the Office of the Interconnection, prior to the Office of the Interconnection approving or denying the proposed update to the DER Aggregation Resource. The DER Aggregator may continue to participate in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model using its existing approved DER Aggregation Resource during the course of any such review conducted by the ~~electric distribution company~~Electric Distribution Company. An inventory of the

individual Component DER within a DER Aggregation Resource registration that is linked to a DER Capacity Aggregation Resource may not be modified during the course of an applicable Delivery Year.

(c) All Component DER in a DER Aggregation Resource shall interface with the same primary pricing node, except: (i) in the case of a DER Aggregation Resource that only provides ancillary services and is less than or equal to 5 MW, the Component DER within the DER Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are in the same state, ~~and~~ service territory of a single ~~electric distribution company~~ Electric Distribution Company and Transmission Zone; and (ii) in the case of a DER Aggregation Resource utilizing the limited multi-nodal aggregation participation option described below, so long as those primary pricing nodes are in the same state, service territory of a single Electric Distribution Company and Transmission Zone, and meet the criteria defined below and in the PJM Manuals; and (iii) in the case of a DER Capacity Aggregation Resource, the Component DER within a DER Aggregation Resource(s) linked to the DER Capacity Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are located within a defined zone or sub-zonal Locational Deliverability Area.

The purpose of participating under the limited multi-nodal aggregation option is to allow the participation of Component DER in the energy market that cannot form aggregations at a single primary pricing node at the minimum capability criteria of 0.1 MW. To participate, the multi-nodal DER Aggregation Resource may be comprised of one or more Component DER with capability smaller than 0.1 MW. Component DER at a single primary node with capability greater than 0.1 MW shall be excluded from participation in the multi-nodal DER Aggregation Resource unless the total capability of all other Component DER in a DER Aggregation Resource is below the 0.1 MW participation threshold, as further described in the PJM Manuals. The multi-nodal DER Aggregation Resource shall also be self-scheduled into the PJM energy markets. The megawatt participation cap on the multi-nodal aggregation participation option shall be set to 167 MW within the PJM Region. The Office of the Interconnection shall conduct an assessment of the 167 MW cap upon penetration of DER Aggregation Resources participating in the limited multi-nodal aggregation option exceeding ninety percent of the 167 MW cap value. The Office of the Interconnection ~~will~~ shall establish a periodic review, in coordination with the ~~electric distribution company~~ Electric Distribution Company and DER Aggregator, no less than annually, or more frequently as needed, to identify any permanent electrical location change that would modify the pricing node associated with a DER Aggregation Resource or its underlying Component DER. During this review, the Office of the Interconnection shall: (i) confirm that applicable data reviewed and verified in the registration process is still complete and accurate, and (ii) request any updates to such data as a condition of continued participation in the DER Aggregator Participation Model.

(d) A DER Aggregator shall self-schedule their DER Aggregation Resource into the PJM Day-ahead Energy Market and Real-time Energy Market based on bidding parameters for the applicable technology-type, as described in the PJM Manuals. A DER Aggregator shall be eligible, at their election, to offer a dispatchable range in submitting bidding parameters into the Day-ahead Energy Market and Real-time Energy Market.

(e) A DER Aggregator shall be responsible for dispatching the underlying Component DER within a DER Aggregation Resource in accordance with the Office of the Interconnection's dispatch instructions for the DER Aggregation Resource, unless the DER Aggregator elects to designate another entity to dispatch the Component DER. A DER Aggregator ~~or the entity responsible for physically operating the Component DER within a DER Aggregation Resource and/or dispatching a DER Aggregation Resource~~ shall provide telemetry for each DER Aggregation Resource participating in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model, in accordance with the technical specifications described in the PJM Manuals. A DER Aggregator ~~or the entity responsible for physically operating the Component DER within a DER Aggregation Resource and/or dispatching a DER Aggregation Resource~~ may provide telemetry for the individual Component DER within a DER Aggregation Resource. This telemetry shall represent one or more values indicative of the total electrical output of the DER Aggregation Resource and inclusive of all underlying Component DER. This telemetry requirement shall not apply to a DER Aggregation Resource exclusively participating in the energy market that is less than 10 MW, notwithstanding the technical specifications described in the PJM Manuals.

A DER Aggregator shall provide to the Office of the Interconnection all individual Component DER meter data necessary to facilitate the settlement of the DER Aggregator's DER Aggregation Resource, in accordance with Operating Agreement, section 14 and the PJM Manuals. A DER Aggregator shall retain performance data for individual Component DER in a DER Aggregation Resource for auditing purposes, in accordance with the PJM Manuals. A DER Aggregator is responsible for ensuring that Component DER within a DER Aggregation Resource have metering equipment that provides integrated hourly kWh values on an ~~electric distribution company~~Electric Distribution Company account basis. For non-interval metered residential DER Aggregation Resources, the DER Aggregator must ensure that a representative sample of Component DER have metering equipment that provides integrated hourly kWh values on an ~~electric distribution company~~Electric Distribution Company account basis, as set forth in the PJM Manuals. For DER Aggregation Resources containing Component DER that are mass market customers, DER Aggregators shall provide aggregated meter data to the Office of the Interconnection for the settlement of the DER Aggregator's DER Aggregation Resource. Meter data shall be submitted to the Office of Interconnection within one business day. The measurement systems shall comply with the applicable ~~electric distribution company~~Electric Distribution Company accuracy requirements for meters, and/or as described in the PJM Manual 01. Additional details for the configuration of such measurement systems under various specific configurations are specified in PJM Manual 14D.

The metering equipment shall meet the ~~electric distribution company~~Electric Distribution Company requirements for accuracy, or otherwise have a maximum error of two percent over the full range of the metering equipment (including potential transformers and current transformers) and the metering equipment and associated data shall meet the requirements set forth herein and in the PJM Manuals.

(f) The ~~electric distribution company~~Electric Distribution Company should, prior to the deadline for submission of offers into the Day-ahead Energy Market, as described in Tariff,



Attachment K-Appendix, section 1.10.1A and Operating Agreement, Schedule 1, section 1.10.1A, notify the DER Aggregator of any operational limitations for the Operating Day that may impact the bidding parameters of an applicable DER Aggregation Resource. In the event that the ~~electric distribution company~~Electric Distribution Company identifies additional operational concerns after the deadline described in Tariff, Attachment K-Appendix, section 1.10.1A and Operating Agreement, Schedule 1, section 1.10.1A, the DER Aggregator may utilize the generation rebidding period identified in Tariff, Attachment K-Appendix, section 1.10.9, and Operating Agreement, Schedule 1, section 1.10.9, to update its bidding parameters.

During the Operating Day, the Office of the Interconnection shall dispatch the DER Aggregation Resources, ~~by communicating with the entity responsible for physically operating the Component DER within a DER Aggregation Resource and/or dispatching a DER Aggregation Resource,~~ in accordance with the DER Aggregator's submitted bidding parameters. During the Operating Day, an ~~electric distribution company~~Electric Distribution Company may exercise its ability to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource, for purposes of maintaining safe and reliable operation of distribution facilities, pursuant to any applicable tariffs, agreements, and operating procedures of the ~~electric distribution company~~Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority. The Electric Distribution Company may communicate the decision to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource directly to the DER Aggregator. Following the exercise of the ~~electric distribution company~~Electric Distribution Company's override, the DER Aggregator shall reflect the override by updating the applicable bidding parameters of its DER Aggregation Resource. The Office of the Interconnection shall not take any actions to interrupt or interfere with the Electric Distribution Company's decision to override and will re-dispatch the DER Aggregation Resource to reflect its updated bidding parameters.

An ~~electric distribution company~~Electric Distribution Company's override shall not excuse a DER Aggregator's ~~from any financial obligations under the PJM Governing Agreements for~~ failure to perform any of the obligations established under the PJM Governing Agreements~~Tariff, Operating Agreement, RAA,~~ or PJM Manuals for the relevant PJM capacity, energy, and/or ancillary services markets.

Any disputes regarding an ~~electric distribution company~~Electric Distribution Company's exercise of its ability to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource, for purposes of maintaining safe and reliable operation of distribution facilities, pursuant to any applicable tariffs, agreements, and operating procedures of the ~~electric distribution company~~Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, shall be addressed in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5.

(g) The Office of the Interconnection shall not permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER

Aggregator Participation Model if the applicable DER Aggregation Resource includes Component DER that are end-use customers of an ~~electric distribution company~~Electric Distribution Company that distributed 4 million MWh or less in the previous fiscal year, as identified by the ~~electric distribution company~~Electric Distribution Company, unless the ~~electric distribution company~~Electric Distribution Company determines that the Relevant Electric Retail Regulatory Authority permits such end-use customers to participate. The Office of the Interconnection shall permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model with a DER Aggregation Resource including Component DER that are end-use customers of an ~~electric distribution company~~Electric Distribution Company that distributed 4 million MWh or less in the previous fiscal year, as identified by the ~~electric distribution company~~Electric Distribution Company, if, during the course of the registration process described above in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b), the ~~electric distribution company~~Electric Distribution Company presents any of the following evidence to PJM:

- i. an order, resolution or ordinance of the Relevant Electric Retail Regulatory Authority permitting or conditionally permitting the end-use customer's participation;
- ii. an opinion of the Relevant Electric Retail Regulatory Authority's legal counsel attesting to the existence of a regulation or law permitting or conditionally permitting the end-use customer's participation; or
- iii. an opinion of the state Attorney General, on behalf of the Relevant Electric Retail Regulatory Authority, attesting to the existence of a regulation or law permitting or conditionally permitting the end-use customer's participation.

The Office of the Interconnection shall permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model if the applicable DER Aggregation Resource includes Component DER that are end-use customers of an ~~electric distribution company~~Electric Distribution Company that distributed more than 4 million MWh in the previous fiscal year, as identified by the ~~electric distribution company~~Electric Distribution Company, unless the DER Aggregation Resource includes one or more Component DER that are demand response and the Relevant Electric Retail Regulatory Authority has prohibited the participation of demand response in the DER Aggregator Participation Model, pursuant to the rules set forth in Tariff, Attachment K-Appendix, section 1.5A.3 (1)(a)(i) and Operating Agreement, Schedule 1, section 1.5A.3 (1)(a)(i).

(h) A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources containing one or more Component DER that also participate in one or more retail programs. The Office of the Interconnection shall only credit a DER Aggregator for the sale of ~~a product in the PJM~~ energy, capacity, and/or ancillary services in PJM markets if one or more of those~~that~~ same ~~product is services are~~ not also credited provided as part of a retail program,

including but not limited to a Component DER participating in a retail net energy metering program.

A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources that provide multiple services in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model. A Component DER shall not be registered with multiple DER Aggregation Resources, or participate as part of another Market Participant outside of the DER Aggregator Participation Model. The Office of the Interconnection shall only credit a DER Aggregator for the sale of ~~a product in the PJM~~ energy, capacity, and/or ancillary services in PJM markets if ~~that one or more of those same product is services are~~ not also credited-provided as part of another wholesale sale.

(i) DER Aggregators providing capacity using a DER Capacity Aggregation Resource shall be subject to the Day-ahead Energy Market must-offer requirement described in Tariff, Attachment K-Appendix, section 1.10.1A(d) and Operating Agreement, Schedule 1, section 1.10.1A(d), based on the technology of the Component DER within the DER Aggregation Resource linked to the DER Capacity Aggregation Resource, in accordance with the PJM Manuals.

(j) DER Aggregation Resources are subject to offer price cap and associated three pivotal supplier test provisions of Operating Agreement, Schedule 1, section 6.4.

(k) A DER Capacity Aggregation Resource shall be subject to a MOPR Floor Offer Price in accordance with the provisions applicable to MOPR Floor Offer Price for Generation Capacity Resources, as described in Tariff, Attachment DD, section 5.14(h-2), and Market Seller Offer Cap for Generation Capacity Resources in a manner consistent with the provisions applicable to Market Seller Offer Cap for Generation Capacity Resources, as described in Tariff, Attachment DD, section 6.4 and Tariff, Attachment M-Appendix, section II.E, based on the underlying technology of the Component DER.

A DER Capacity Aggregation Resource may segment offers for the Component DER subject to mitigation, based on the underlying technology of the Component DER in the DER Capacity Aggregation Resource, and further described in the PJM Manuals.

If a DER Capacity Aggregation Resource is subject to the Minimum Floor Offer Price pursuant to Tariff, Attachment DD, sections 5.14(h-2), the Capacity Market Seller that owns or controls such resources may submit a Sell Offer with a Minimum Floor Offer Price of no lower than the MW-weighted average of the applicable MOPR Floor Offer Prices (zero if not applicable) of the aggregated resources in such Sell Offer.

(l) Projected PJM Market Revenues for DER Capacity Aggregation Resources subject to the Minimum Floor Offer Price or Market Seller Offer Cap shall be determined in accordance with Tariff, Attachment DD, section 6.8(d-1). The determination of PJM Market Revenues by the Market Monitoring Unit or the Office of the Interconnection shall utilize either the hourly output profiles, or the Projected EAS Dispatch, as appropriate



(m) The Office of the Interconnection shall account for and settle a DER Aggregator's DER Aggregation Resource, in the Day-ahead Energy Market and Real-time Energy Market, by summing all load reduction and injection MWh for the underlying Component DER within the Aggregation. The Office of the Interconnection shall calculate the performance of Component DER that have both load reduction and injection capability as follows:

(i) load reduction to 0 MWh shall be calculated in accordance with Tariff, Attachment K-Appendix, sections 1.5A and 3.3A and Operating Agreement, Schedule 1, sections 1.5A and 3.3A;

(ii) injection shall be determined in accordance with the Day-ahead Energy Market and Real-time Energy Market rules as specified in Tariff, Attachment K-Appendix, section 3.1A, and Operating Agreement, Schedule 1, section 3.1A. ~~A DER Aggregator's DER Aggregation Resource that contains Component DER that are also load reduction resources shall be accounted for and settled in accordance with Tariff, Attachment K-Appendix, section 3.3A and Operating Agreement, Schedule 1, section 3.3A.~~

(n) Component DER interconnecting to distribution facilities for purposes of participating in the energy, capacity, and/or ancillary services markets of PJM exclusively through the DER Aggregator Participation Model shall not be subject to the Part IV of the Tariff relating to interconnections with the Transmission System, and shall exclusively interconnect to distribution facilities pursuant to applicable state or local law.

PJM Operating Agreement  
Schedule 1, section 1.4B

## 1.4B DER Aggregator Participation Model

(a) The rules and procedures for the participation of DER Aggregators are established pursuant to this section 1.4B and the PJM Manuals.

(b) In order to participate in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model, a DER Aggregator shall register each DER Aggregation Resource and DER Capacity Aggregation Resource with the Office of the Interconnection, in accordance with the procedures established under the PJM Manuals.

~~Prior to the initiation of the registration review process by the Office of the Interconnection, a DER Aggregator shall obtain and verify, through good faith efforts and in coordination with the applicable electric distribution company, and, if necessary, any relevant Transmission Owner, the following location and data components needed for the DER Aggregator's registration with the Office of the Interconnection:~~

~~i. With the express written consent of the applicable Component DER, the electric distribution company customer account number and associated physical and transmission system electrical location information of the applicable Component DER, including compliance with applicable PJM and electric distribution company metering and telemetry requirements;~~

~~ii. Evidence of approval to interconnect, including but not limited to a finalized interconnection agreement, with the applicable Component DER, in accordance with any applicable tariffs, agreements, and operating procedures of the electric distribution company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, to the distribution system for identified megawatts, and identification of participation in an electric distribution company program that recognizes grid withdrawals and/or injections, including but not limited to a net energy metering program.~~

~~Disputes between the DER Aggregator and the electric distribution company regarding the location and data components needed for the DER Aggregator's registration with the Office of the Interconnection described above shall be resolved in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5.~~

The Electric Distribution Company registration review portion of the registration process shall commence after: (1) the Office of the Interconnection has an executed DER Aggregator Participation Service Agreement on file, to be used for all DER Aggregation Resources associated with the DER Aggregator; and (2) the Office of the Interconnection receives a complete registration from the DER Aggregator, in a form specified in the PJM Manuals; ~~and (3) pre-registration activities have been completed, consisting of the DER Aggregator obtaining and verifying the location and data components described above needed for its registration.~~

Upon receipt of a DER Aggregator's completed registration, tThe Office of the Interconnection shall review the registration and data submitted therein for completeness, and verify that the DER Aggregator meets the eligibility criteria for participation in the DER Aggregator Participation Model, as defined under the PJM Tariff and Operating Agreement and Manuals. The DER Aggregator shall only submit a registration for Component DER that are under contract for the term of the registration, and only one DER Aggregator may operate Component DER at a specific location. The Office of the Interconnection shall notify the appropriate ~~electric distribution company~~Electric Distribution Company of the DER Aggregator's registration through the appropriate PJM system. A single registration shall only be comprised of individual Component DER in the same state, ~~electric distribution company~~Electric Distribution Company, Transmission Zone, and pricing point unless otherwise noted below.

The Electric Distribution Company review process shall consist of two periods, in sum not to exceed sixty calendar days. The first shall be a single period, not to exceed fifteen calendar days, during which time the Electric Distribution Company and the Office of the Interconnection shall review and verify each Component DER for which a location was created. The second shall be a single period, not to exceed forty-five calendar days, during which the Electric Distribution Company shall perform a reliability review of the DER Aggregation Resource. In the event that the last day of either the fifteen or forty-five calendar day review period falls on a weekend or holiday, the review period shall conclude on the next business day.

The first fifteen calendar day review period shall commence uUpon receipt by the Electric Distribution Company of notification by from the Office of the Interconnection.; Following notification, the ~~electric distribution company~~Electric Distribution Company ~~may, within 60 calendar days,~~ review and verify, as applicable, the Component DER for which a location was created registration and the following information associated therewith~~contained therein~~:

- i. The location and data components that represents each Component DER, as further defined in the relevant PJM Manuals, are accurate~~Operational and physical characteristics, including an inventory of the individual Component DER location-specific capability to reduce load and/or produce electricity;~~
- ii. ~~The specific PJM markets in which the DER Aggregation Resource plans to participate and, if applicable, the effective and termination dates for participation;~~
- iii. ~~The electric distribution company customer account number(s) which represent Component DER location(s) and related information, as defined in the PJM Manuals;~~
- iiiv. Participation of the Component DER in an ~~electric distribution company~~Electric Distribution Company's retail program at the time of registration does not, and whether such participation precludes participation of the Component DER in the energy, capacity, and/or ancillary services markets of PJM, and as defined in the PJM Manuals;

a. Component DER that participate in a net energy metering retail program may only participate with grid injections in the PJM ancillary services markets, and may not participate in PJM energy or capacity markets, unless:

1. the ~~electric distribution company~~Electric Distribution Company confirms to the Office of the Interconnection that participation of the Component DER in a net energy metering retail program or tariff approved by the Relevant Electric Retail Regulatory Authority will not violate the restrictions on duplicative compensation, as described in Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h); and

2. the Office of the Interconnection determines that the participation of the Component DER otherwise meets the applicable requirements for energy market or capacity market participation.

b. Component DER that participate in a net energy metering retail program that also participate with grid injections in the PJM ancillary services markets shall, based on the information provided by the DER Aggregator or the Electric Distribution Company, be excluded from PJM energy market settlements.

~~viii. The Component DER Aggregator's participation in the PJM energy, capacity, and/or ancillary service markets~~ complies with the rules and regulations of any applicable Relevant Electric Retail Regulatory Authority;

~~iv. The Relevant Electric Retail Regulatory Authority allows the participation of any applicable Component DER that are also end-use customers of an electric distribution company~~Electric Distribution Company, in accordance with the provisions of Tariff, Attachment K-Appendix, section 1.4B(g), and Operating Agreement, Schedule 1, section 1.4B(g).

Within the first fifteen calendar day review period, and in coordination with the Office of Interconnection, the Electric Distribution Company shall also assign the electrical node on the PJM Transmission System to each Component DER. The Office of the Interconnection shall ensure that any information regarding Component DER that the Office of the Interconnection receives from an Electric Distribution Company or a DER Aggregator is accessible to both the Electric Distribution Company and the DER Aggregator.

Following approval of the Component DER by the Electric Distribution Company and the Office of the Interconnection, the DER Aggregator shall designate DER Aggregation Resources comprising of one or more of the approved Component DER. The second forty-five calendar

day review period shall commence upon such designation by the DER Aggregator, whereby the Electric Distribution Company shall review the DER Aggregation Resource and verify that ~~vii.~~ ————The participation of the ~~DER Aggregation Resource Component DER~~ in the PJM energy, capacity, and/or ancillary service markets does not pose a threat to the reliable and safe operation of the distribution system, the public, or ~~electric distribution company~~Electric Distribution Company personnel. The scope of the Electric Distribution Company review of distribution system reliability impacts shall be limited to any incremental impacts arising from a Component DER participation in a DER Aggregation Resource that were not previously considered by the Electric Distribution Company during the interconnection study process for that Component DER.

If the ~~electric distribution company~~Electric Distribution Company identifies concerns during the Electric Distribution Company review portion of the registration process~~based on factors (i) through (vii) within the 60 calendar day review period~~, the ~~electric distribution company~~Electric Distribution Company may notify the Office of the Interconnection and the DER Aggregator, and the ~~electric distribution company~~Electric Distribution Company and the DER Aggregator may first attempt to resolve those concerns bilaterally, or in accordance with applicable state or local law, prior to seeking initiation of the dispute resolution process described in Operating Agreement, Schedule 5. Issues within disputes that the Office of the Interconnection determines solely concern the application of ~~Disputes arising under~~ any applicable tariffs, agreements, and operating procedures of the ~~electric distribution company~~Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, shall be ~~resolved~~ addressed in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5. Issues within disputes that the Office of the Interconnection determines concern the provisions of the PJM Governing Agreements may be arbitrated under the dispute resolution processes under Operating Agreement, Schedule 5.

In the event that the ~~electric distribution company~~Electric Distribution Company's concerns are resolved within the Electric Distribution Company 60 calendar day review portion of the registration process~~period~~, the ~~electric distribution company~~Electric Distribution Company may recommend that the Office of the Interconnection approve the location and/or registration, as applicable. In the event that the concerns identified by the ~~electric distribution company~~Electric Distribution Company are not resolved, the ~~electric distribution company~~Electric Distribution Company may, within the Electric Distribution Company review portion of the registration process~~60 calendar day review period~~, recommend that the Office of the Interconnection: (i) reject the location and/or registration, (ii) approve the registration with certain operational limitations on the DER Aggregation Resource identified in the registration, or (iii) approve the registration with the removal of one or more specific Component DER from the DER Aggregation Resource identified in the registration.

Following the Electric Distribution Company's review of the DER Aggregation Resource registration, wWithin fifteen calendar days, the Office of the Interconnection shall apply the applicable pricing points to the DER Aggregation Resource~~Component DER~~, and shall either approve or deny the DER Aggregator's registration based on the Office of the Interconnection's review of the registration and receipt and review of the ~~electric distribution company~~Electric

~~Distribution Company~~'s comments and recommendation, with deference given to the ~~electric distribution company~~Electric Distribution Company's assessment of the impact of the DER Aggregator's registration on the safety and reliability of distribution facilities. To the extent that no comments or recommendations are provided by the ~~electric distribution company~~Electric Distribution Company, including after the Office of the Interconnection provides final notice to the ~~electric distribution company~~Electric Distribution Company prior to the expiration of the Electric Distribution Company 60 calendar day review portion of the registration process period, the Office of the Interconnection shall approve the DER Aggregator's registration.

~~During the registration process, the responsibility for physically operating the Component DER within a DER Aggregation Resource and/or dispatching the DER Aggregation Resource will be assigned to the electric distribution company, the DER Aggregator, or another entity, in accordance with any applicable tariffs, agreements, and operating procedures of the electric distribution company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority.~~

All DER Aggregators shall remain in full compliance with the tariffs, agreements, and operating procedures of the applicable ~~electric distribution company~~Electric Distribution Company, and the rules and regulations of any Relevant Electric Retail Regulatory Authority, in accordance with their executed DER Aggregator Participation Service Agreement, at all times while participating in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model.

Transmission Owners shall, in coordination with the Office of the Interconnection, provide all data to the Office of the Interconnection reasonably required to accurately represent the DER Aggregation Resource in the Regional Transmission Expansion Plan, in accordance with Operating Agreement, section 1.5.4 and the PJM Manuals.

A DER Aggregator shall report to the Office of the Interconnection any proposed update to the inventory of the individual Component DER within the DER Aggregation Resource, or proposed additional market services provided by the DER Aggregation Resource, identified in the DER Aggregator's registration to reflect any proposed addition or subtraction of a Component DER or market service, and any applicable information or data associated with the Component DER or market service, in accordance with the specifications described in the PJM Manuals. Any proposed update shall not require a new registration of the existing Component DER within the approved DER Aggregation Resource. Upon the Electric Distribution Company's receipt of notification of any proposed update, including all applicable information or data, the ~~electric distribution company~~host Electric Distribution Company shall have an opportunity to conduct a review, for the first fifteen calendar day and/or second forty-five calendar day review perioda period of up to 60 calendar days, in accordance with the provisions of this section related to initial registration, and make a recommendation to the Office of the Interconnection, prior to the Office of the Interconnection approving or denying the proposed update to the DER Aggregation Resource. The DER Aggregator may continue to participate in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model using its existing approved DER Aggregation Resource during the course of any such review conducted by the ~~electric distribution company~~Electric Distribution Company. An inventory of the



individual Component DER within a DER Aggregation Resource registration that is linked to a DER Capacity Aggregation Resource may not be modified during the course of an applicable Delivery Year.

(c) All Component DER in a DER Aggregation Resource shall interface with the same primary pricing node, except: (i) in the case of a DER Aggregation Resource that only provides ancillary services and is less than or equal to 5 MW, the Component DER within the DER Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are in the same state, ~~and~~ service territory of a single ~~electric distribution company~~ Electric Distribution Company and Transmission Zone; and (ii) in the case of a DER Aggregation Resource utilizing the limited multi-nodal aggregation participation option described below, so long as those primary pricing nodes are in the same state, service territory of a single Electric Distribution Company and Transmission Zone, and meet the criteria defined below and in the PJM Manuals; and (iii) in the case of a DER Capacity Aggregation Resource, the Component DER within a DER Aggregation Resource(s) linked to the DER Capacity Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are located within a defined zone or sub-zonal Locational Deliverability Area.

The purpose of participating under the limited multi-nodal aggregation option is to allow the participation of Component DER in the energy market that cannot form aggregations at a single primary pricing node at the minimum capability criteria of 0.1 MW. To participate, the multi-nodal DER Aggregation Resource may be comprised of one or more Component DER with capability smaller than 0.1 MW. Component DER at a single primary node with capability greater than 0.1 MW shall be excluded from participation in the multi-nodal DER Aggregation Resource unless the total capability of all other Component DER in a DER Aggregation Resource is below the 0.1 MW participation threshold, as further described in the PJM Manuals. The multi-nodal DER Aggregation Resource shall also be self-scheduled into the PJM energy markets. The megawatt participation cap on the multi-nodal aggregation participation option shall be set to 167 MW within the PJM Region. The Office of the Interconnection shall conduct an assessment of the 167 MW cap upon penetration of DER Aggregation Resources participating in the limited multi-nodal aggregation option exceeding ninety percent of the 167 MW cap value. The Office of the Interconnection ~~will~~ shall establish a periodic review, in coordination with the ~~electric distribution company~~ Electric Distribution Company and DER Aggregator, no less than annually, or more frequently as needed, to identify any permanent electrical location change that would modify the pricing node associated with a DER Aggregation Resource or its underlying Component DER. During this review, the Office of the Interconnection shall: (i) confirm that applicable data reviewed and verified in the registration process is still complete and accurate, and (ii) request any updates to such data as a condition of continued participation in the DER Aggregator Participation Model.

(d) A DER Aggregator shall self-schedule their DER Aggregation Resource into the PJM Day-ahead Energy Market and Real-time Energy Market based on bidding parameters for the applicable technology-type, as described in the PJM Manuals. A DER Aggregator shall be eligible, at their election, to offer a dispatchable range in submitting bidding parameters into the Day-ahead Energy Market and Real-time Energy Market.



(e) A DER Aggregator shall be responsible for dispatching the underlying Component DER within a DER Aggregation Resource in accordance with the Office of the Interconnection's dispatch instructions for the DER Aggregation Resource, unless the DER Aggregator elects to designate another entity to dispatch the Component DER. A DER Aggregator ~~or the entity responsible for physically operating the Component DER within a DER Aggregation Resource and/or dispatching a DER Aggregation Resource~~ shall provide telemetry for each DER Aggregation Resource participating in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model, in accordance with the technical specifications described in the PJM Manuals. A DER Aggregator ~~or the entity responsible for physically operating the Component DER within a DER Aggregation Resource and/or dispatching a DER Aggregation Resource~~ may provide telemetry for the individual Component DER within a DER Aggregation Resource. This telemetry shall represent one or more values indicative of the total electrical output of the DER Aggregation Resource and inclusive of all underlying Component DER. This telemetry requirement shall not apply to a DER Aggregation Resource exclusively participating in the energy market that is less than 10 MW, notwithstanding the technical specifications described in the PJM Manuals.

A DER Aggregator shall provide to the Office of the Interconnection all individual Component DER meter data necessary to facilitate the settlement of the DER Aggregator's DER Aggregation Resource, in accordance with Operating Agreement, section 14 and the PJM Manuals. A DER Aggregator shall retain performance data for individual Component DER in a DER Aggregation Resource for auditing purposes, in accordance with the PJM Manuals. A DER Aggregator is responsible for ensuring that Component DER within a DER Aggregation Resource have metering equipment that provides integrated hourly kWh values on an ~~electric distribution company~~Electric Distribution Company account basis. For non-interval metered residential DER Aggregation Resources, the DER Aggregator must ensure that a representative sample of Component DER have metering equipment that provides integrated hourly kWh values on an ~~electric distribution company~~Electric Distribution Company account basis, as set forth in the PJM Manuals. For DER Aggregation Resources containing Component DER that are mass market customers, DER Aggregators shall provide aggregated meter data to the Office of the Interconnection for the settlement of the DER Aggregator's DER Aggregation Resource. Meter data shall be submitted to the Office of Interconnection within one business day. The measurement systems shall comply with the applicable ~~electric distribution company~~Electric Distribution Company accuracy requirements for meters, and/or as described in the PJM Manual 01. Additional details for the configuration of such measurement systems under various specific configurations are specified in PJM Manual 14D.

The metering equipment shall meet the ~~electric distribution company~~Electric Distribution Company requirements for accuracy, or otherwise have a maximum error of two percent over the full range of the metering equipment (including potential transformers and current transformers) and the metering equipment and associated data shall meet the requirements set forth herein and in the PJM Manuals.

(f) The ~~electric distribution company~~Electric Distribution Company should, prior to the deadline for submission of offers into the Day-ahead Energy Market, as described in Tariff,

Attachment K-Appendix, section 1.10.1A and Operating Agreement, Schedule 1, section 1.10.1A, notify the DER Aggregator of any operational limitations for the Operating Day that may impact the bidding parameters of an applicable DER Aggregation Resource. In the event that the ~~electric distribution company~~Electric Distribution Company identifies additional operational concerns after the deadline described in Tariff, Attachment K-Appendix, section 1.10.1A and Operating Agreement, Schedule 1, section 1.10.1A, the DER Aggregator may utilize the generation rebidding period identified in Tariff, Attachment K-Appendix, section 1.10.9, and Operating Agreement, Schedule 1, section 1.10.9, to update its bidding parameters.

During the Operating Day, the Office of the Interconnection shall dispatch the DER Aggregation Resources, ~~by communicating with the entity responsible for physically operating the Component DER within a DER Aggregation Resource and/or dispatching a DER Aggregation Resource,~~ in accordance with the DER Aggregator's submitted bidding parameters. During the Operating Day, an ~~electric distribution company~~Electric Distribution Company may exercise its ability to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource, for purposes of maintaining safe and reliable operation of distribution facilities, pursuant to any applicable tariffs, agreements, and operating procedures of the ~~electric distribution company~~Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority. The Electric Distribution Company may communicate the decision to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource directly to the DER Aggregator. Following the exercise of the ~~electric distribution company~~Electric Distribution Company's override, the DER Aggregator shall reflect the override by updating the applicable bidding parameters of its DER Aggregation Resource. The Office of the Interconnection shall not take any actions to interrupt or interfere with the Electric Distribution Company's decision to override and will re-dispatch the DER Aggregation Resource to reflect its updated bidding parameters.

An ~~electric distribution company~~Electric Distribution Company's override shall not excuse a DER Aggregator's ~~from any financial obligations under the PJM Governing Agreements for failure to perform any of the obligations established under the PJM Governing Agreements~~Tariff, Operating Agreement, RAA, or PJM Manuals for the relevant PJM capacity, energy, and/or ancillary services markets.

Any disputes regarding an ~~electric distribution company~~Electric Distribution Company's exercise of its ability to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource, for purposes of maintaining safe and reliable operation of distribution facilities, pursuant to any applicable tariffs, agreements, and operating procedures of the ~~electric distribution company~~Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, shall be addressed in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5.

(g) The Office of the Interconnection shall not permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER

Aggregator Participation Model if the applicable DER Aggregation Resource includes Component DER that are end-use customers of an ~~electric distribution company~~Electric Distribution Company that distributed 4 million MWh or less in the previous fiscal year, as identified by the ~~electric distribution company~~Electric Distribution Company, unless the ~~electric distribution company~~Electric Distribution Company determines that the Relevant Electric Retail Regulatory Authority permits such end-use customers to participate. The Office of the Interconnection shall permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model with a DER Aggregation Resource including Component DER that are end-use customers of an ~~electric distribution company~~Electric Distribution Company that distributed 4 million MWh or less in the previous fiscal year, as identified by the ~~electric distribution company~~Electric Distribution Company, if, during the course of the registration process described above in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b), the ~~electric distribution company~~Electric Distribution Company presents any of the following evidence to PJM:

- i. an order, resolution or ordinance of the Relevant Electric Retail Regulatory Authority permitting or conditionally permitting the end-use customer's participation;
- ii. an opinion of the Relevant Electric Retail Regulatory Authority's legal counsel attesting to the existence of a regulation or law permitting or conditionally permitting the end-use customer's participation; or
- iii. an opinion of the state Attorney General, on behalf of the Relevant Electric Retail Regulatory Authority, attesting to the existence of a regulation or law permitting or conditionally permitting the end-use customer's participation.

The Office of the Interconnection shall permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model if the applicable DER Aggregation Resource includes Component DER that are end-use customers of an ~~electric distribution company~~Electric Distribution Company that distributed more than 4 million MWh in the previous fiscal year, as identified by the ~~electric distribution company~~Electric Distribution Company, unless the DER Aggregation Resource includes one or more Component DER that are demand response and the Relevant Electric Retail Regulatory Authority has prohibited the participation of demand response in the DER Aggregator Participation Model, pursuant to the rules set forth in Tariff, Attachment K-Appendix, section 1.5A.3 (1)(a)(i) and Operating Agreement, Schedule 1, section 1.5A.3 (1)(a)(i).

(h) A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources containing one or more Component DER that also participate in one or more retail programs. The Office of the Interconnection shall only credit a DER Aggregator for the sale of ~~a product in the PJM~~ energy, capacity, and/or ancillary services in PJM markets if one or more of those~~that~~ same ~~product is services are~~ not also ~~credited provided~~ as part of a retail program,

including but not limited to a Component DER participating in a retail net energy metering program.

A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources that provide multiple services in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model. A Component DER shall not be registered with multiple DER Aggregation Resources, or participate as part of another Market Participant outside of the DER Aggregator Participation Model. The Office of the Interconnection shall only credit a DER Aggregator for the sale of ~~a product in the PJM~~ energy, capacity, and/or ancillary services in PJM markets if ~~that one or more of those same product is services are~~ not also credited provided as part of another wholesale sale.

(i) DER Aggregators providing capacity using a DER Capacity Aggregation Resource shall be subject to the Day-ahead Energy Market must-offer requirement described in Tariff, Attachment K-Appendix, section 1.10.1A(d) and Operating Agreement, Schedule 1, section 1.10.1A(d), based on the technology of the Component DER within the DER Aggregation Resource linked to the DER Capacity Aggregation Resource, in accordance with the PJM Manuals.

(j) DER Aggregation Resources are subject to offer price cap and associated three pivotal supplier test provisions of Operating Agreement, Schedule 1, section 6.4.

(k) A DER Capacity Aggregation Resource shall be subject to a MOPR Floor Offer Price in accordance with the provisions applicable to MOPR Floor Offer Price for Generation Capacity Resources, as described in Tariff, Attachment DD, section 5.14(h-2), and Market Seller Offer Cap for Generation Capacity Resources in a manner consistent with the provisions applicable to Market Seller Offer Cap for Generation Capacity Resources, as described in Tariff, Attachment DD, section 6.4 and Tariff, Attachment M-Appendix, section II.E, based on the underlying technology of the Component DER.

A DER Capacity Aggregation Resource may segment offers for the Component DER subject to mitigation, based on the underlying technology of the Component DER in the DER Capacity Aggregation Resource, and further described in the PJM Manuals.

If a DER Capacity Aggregation Resource is subject to the Minimum Floor Offer Price pursuant to Tariff, Attachment DD, sections 5.14(h-2), the Capacity Market Seller that owns or controls such resources may submit a Sell Offer with a Minimum Floor Offer Price of no lower than the MW-weighted average of the applicable MOPR Floor Offer Prices (zero if not applicable) of the aggregated resources in such Sell Offer.

(l) Projected PJM Market Revenues for DER Capacity Aggregation Resources subject to the Minimum Floor Offer Price or Market Seller Offer Cap shall be determined in accordance with Tariff, Attachment DD, section 6.8(d-1). The determination of PJM Market Revenues by the Market Monitoring Unit or the Office of the Interconnection shall utilize either the hourly output profiles, or the Projected EAS Dispatch, as appropriate

(m) The Office of the Interconnection shall account for and settle a DER Aggregator's DER Aggregation Resource, in the Day-ahead Energy Market and Real-time Energy Market, by summing all load reduction and injection MWh for the underlying Component DER within the Aggregation. The Office of the Interconnection shall calculate the performance of Component DER that have both load reduction and injection capability as follows:

(i) load reduction to 0 MWh shall be calculated in accordance with Tariff, Attachment K-Appendix, sections 1.5A and 3.3A and Operating Agreement, Schedule 1, sections 1.5A and 3.3A;

(ii) injection shall be determined in accordance with the Day-ahead Energy Market and Real-time Energy Market rules as specified in Tariff, Attachment K-Appendix, section 3.1A, and Operating Agreement, Schedule 1, section 3.1A. A DER Aggregator's DER Aggregation Resource that contains Component DER that are also load reduction resources shall be accounted for and settled in accordance with Tariff, Attachment K-Appendix, section 3.3A and Operating Agreement, Schedule 1, section 3.3A.

(n) Component DER interconnecting to distribution facilities for purposes of participating in the energy, capacity, and/or ancillary services markets of PJM exclusively through the DER Aggregator Participation Model shall not be subject to the Part IV of the Tariff relating to interconnections with the Transmission System, and shall exclusively interconnect to distribution facilities pursuant to applicable state or local law.

# Attachment B

## Revisions to the PJM Open Access Transmission Tariff and Operating Agreement

(Identified by Additional Cover Pages)

(Clean Format)

PJM Open Access Transmission Tariff  
Definitions – E – F  
Attachment K-Appendix, section 1.4B

## **Definitions – E - F**

### **Economic-based Enhancement or Expansion:**

“Economic-based Enhancement or Expansion” shall have the same meaning provided in the Operating Agreement.

### **Economic Load Response Participant:**

“Economic Load Response Participant” shall mean a Member or Special Member that qualifies under Operating Agreement, Schedule 1, section 1.5A, and the parallel provisions of Tariff, Attachment K-Appendix, section 1.5A, to participate in the PJM Interchange Energy Market and/or Ancillary Services markets through reductions in demand.

### **Economic Maximum:**

“Economic Maximum” shall mean the highest incremental MW output level, submitted to PJM market systems by a Market Participant, that a unit can achieve while following economic dispatch.

### **Economic Minimum:**

“Economic Minimum” shall mean the lowest incremental MW output level, submitted to PJM market systems by a Market Participant, that a unit can achieve while following economic dispatch.

### **Effective FTR Holder:**

“Effective FTR Holder” shall mean:

- (i) For an FTR Holder that is either a (a) privately held company, or (b) a municipality or electric cooperative, as defined in the Federal Power Act, such FTR Holder, together with any Affiliate, subsidiary or parent of the FTR Holder, any other entity that is under common ownership, wholly or partly, directly or indirectly, or has the ability to influence, directly or indirectly, the management or policies of the FTR Holder; or
- (ii) For an FTR Holder that is a publicly traded company including a wholly owned subsidiary of a publicly traded company, such FTR Holder, together with any Affiliate, subsidiary or parent of the FTR Holder, any other PJM Member has over 10% common ownership with the FTR Holder, wholly or partly, directly or indirectly, or has the ability to influence, directly or indirectly, the management or policies of the FTR Holder; or
- (iii) an FTR Holder together with any other PJM Member, including also any Affiliate, subsidiary or parent of such other PJM Member, with which it shares common ownership, wholly or partly, directly or indirectly, in any third entity which is a PJM Member (e.g., a joint venture).



**EFORd:**

“EFORd” shall have the meaning specified in the PJM Reliability Assurance Agreement.

**Electric Distribution Company**

"Electric Distribution Company" shall mean, exclusively for purposes of the Tariff, Attachment K-Appendix, section 1.4B and Operating Agreement, Schedule 1, section 1.4B, a PJM Member, or an entity that mutually agrees with a PJM Member that the PJM Member shall represent the entity and act on their behalf, that owns or leases with rights equivalent to ownership, electric distribution facilities that are used to provide electric distribution service to electric load within the PJM Region under rates and tariffs approved or authorized by the applicable Relevant Electric Retail Regulatory Authority.

**Electrical Distance:**

“Electrical Distance” shall mean, for a Generation Capacity Resource geographically located outside the metered boundaries of the PJM Region, the measure of distance, based on impedance and in accordance with the PJM Manuals, from the Generation Capacity Resource to the PJM Region.

**Eligible Customer:**

“Eligible Customer” shall mean:

- (i) Any electric utility (including any Transmission Owner and any power marketer), Federal power marketing agency, or any person generating electric energy for sale for resale is an Eligible Customer under the Tariff. Electric energy sold or produced by such entity may be electric energy produced in the United States, Canada or Mexico. However, with respect to transmission service that the Commission is prohibited from ordering by Section 212(h) of the Federal Power Act, such entity is eligible only if the service is provided pursuant to a state requirement that the Transmission Provider or Transmission Owner offer the unbundled transmission service, or pursuant to a voluntary offer of such service by a Transmission Owner.
- (ii) Any retail customer taking unbundled transmission service pursuant to a state requirement that the Transmission Provider or a Transmission Owner offer the transmission service, or pursuant to a voluntary offer of such service by a Transmission Owner, is an Eligible Customer under the Tariff. As used in Tariff, Part VI, Eligible Customer shall mean only those Eligible Customers that have submitted a Completed Application.

**Eligible Fast-Start Resource:**

“Eligible Fast-Start Resource” shall mean a Fast-Start Resource that is eligible for the application of Integer Relaxation during the calculation of Locational Marginal Prices as set forth in Tariff, Attachment K-Appendix, section 2.2.

**Emergency Action:**

“Emergency Action” shall mean (1) any megawatt shortage of the Primary Reserve requirement (as specified in the PJM Manuals) in a Reserve Zone or Sub-zone, inclusive of any adjustments to such requirement to account for system conditions, as determined by the dispatch run from the security constrained economic dispatch and where there is also a Voltage Reduction Warning and reduction of critical plant load, Manual Load Dump Warning, Maximum Emergency Generation Action, or the curtailment of non-essential building loads and voltage reduction that encompasses such Reserve Zone or Reserve Sub-zone or (2) anytime the Office of Interconnection identifies an emergency and issues a load shed directive, Manual Load Dump Action, Voltage Reduction Action, or deploy all resources action for an entire Reserve Zone or Reserve Sub-zone.

**Emergency Condition:**

“Emergency Condition” shall mean a condition or situation (i) that in the judgment of any Interconnection Party is imminently likely to endanger life or property; or (ii) that in the judgment of the Interconnected Transmission Owner or Transmission Provider is imminently likely (as determined in a non-discriminatory manner) to cause a material adverse effect on the security of, or damage to, the Transmission System, the Interconnection Facilities, or the transmission systems or distribution systems to which the Transmission System is directly or indirectly connected; or (iii) that in the judgment of Interconnection Customer is imminently likely (as determined in a non-discriminatory manner) to cause damage to the Customer Facility or to the Customer Interconnection Facilities. System restoration and black start shall be considered Emergency Conditions, provided that a Generation Interconnection Customer is not obligated by an Interconnection Service Agreement to possess black start capability. Any condition or situation that results from lack of sufficient generating capacity to meet load requirements or that results solely from economic conditions shall not constitute an Emergency Condition, unless one or more of the enumerated conditions or situations identified in this definition also exists.

**Emergency Load Response Program:**

“Emergency Load Response Program” shall mean the program by which Curtailment Service Providers may be compensated by PJM for Demand Resources that will reduce load when dispatched by PJM during emergency conditions, and is described in Operating Agreement, Schedule 1, section 8 and the parallel provisions of Tariff, Attachment K-Appendix, section 8.

**Energy Efficiency Resource:**

“Energy Efficiency Resource” shall have the meaning specified in the PJM Reliability Assurance Agreement.

**Energy Market Opportunity Cost:**

“Energy Market Opportunity Cost” shall mean the difference between (a) the forecasted cost to operate a specific generating unit when the unit only has a limited number of available run hours due to limitations imposed on the unit by Applicable Laws and Regulations, and (b) the forecasted future Locational Marginal Price at which the generating unit could run while not violating such limitations. Energy Market Opportunity Cost therefore is the value associated with a specific generating unit’s lost opportunity to produce energy during a higher valued period of time occurring within the same compliance period, which compliance period is determined by the applicable regulatory authority and is reflected in the rules set forth in PJM Manual 15. Energy Market Opportunity Costs shall be limited to those resources which are specifically delineated in Operating Agreement, Schedule 2.

**Energy Resource:**

“Energy Resource” shall mean a Generating Facility that is not a Capacity Resource.

**Energy Settlement Area:**

“Energy Settlement Area” shall mean the bus or distribution of busses that represents the physical location of Network Load and by which the obligations of the Network Customer to PJM are settled.

**Energy Storage Resource:**

“Energy Storage Resource” shall mean a resource capable of receiving electric energy from the grid and storing it for later injection to the grid that participates in the PJM Energy, Capacity and/or Ancillary Services markets as a Market Participant. Open-Loop Hybrid Resources are not Energy Storage Resources.

**Energy Storage Resource Model Participant:**

“Energy Storage Resource Model Participant” shall mean an Energy Storage Resource utilizing the Energy Storage Resource Participation Model.

**Energy Storage Resource Participation Model:**

“Energy Storage Resource Participation Model” shall mean the participation model accepted by the Commission in Docket No. ER19-469-000.

**Energy Transmission Injection Rights:**

“Energy Transmission Injection Rights” shall mean the rights to schedule energy deliveries at a specified point on the Transmission System. Energy Transmission Injection Rights may be awarded only to a Merchant D.C. Transmission Facility that connects the Transmission System

to another control area. Deliveries scheduled using Energy Transmission Injection Rights have rights similar to those under Non-Firm Point-to-Point Transmission Service.

**Entity Providing Supply Services to Default Retail Service Provider:**

“Entity Providing Supply Services to Default Retail Service Provider” shall mean any entity, including but not limited to a load aggregator or power marketer, providing supply services to an electric distribution company when that electric distribution company is serving as the default retail service provider, and that enters into a contract or similar obligation with such electric distribution company to serve retail customers who have not selected a competitive retail service provider.

**Environmental Laws:**

“Environmental Laws” shall mean applicable Laws or Regulations relating to pollution or protection of the environment, natural resources or human health and safety.

**Environmentally-Limited Resource:**

“Environmentally-Limited Resource” shall mean a resource which has a limit on its run hours imposed by a federal, state, or other governmental agency that will significantly limit its availability, on either a temporary or long-term basis. This includes a resource that is limited by a governmental authority to operating only during declared PJM capacity emergencies.

**Equivalent Load:**

“Equivalent Load” shall mean the sum of a Market Participant’s net system requirements to serve its customer load in the PJM Region, if any, plus its net bilateral transactions.

**Event of Default:**

“Event of Default,” as that term is used in Tariff, Attachment Q, shall mean a Financial Default, Credit Breach, or Credit Support Default.

**Exercise of Buyer-Side Market Power:**

“Exercise of Buyer-Side Market Power” shall mean anti-competitive behavior of a Capacity Market Seller with a Load Interest, or directed by an entity with a Load Interest, to uneconomically lower RPM Auction Sell Offer(s) in order to suppress RPM Auction clearing prices for the overall benefit of the Capacity Market Seller’s (and/or affiliates of Capacity Market Seller) portfolio of generation and load or that of the directing entity with a Load Interest as determined pursuant to Tariff, Attachment DD, section 5.14(h-2)(2)(B). A bilateral contract between the Capacity Market Seller and an entity with a Load Interest with the express purpose of lowering capacity market clearing prices shall be evidence of the Exercise of Buyer-Side Market Power.

**Existing Generation Capacity Resource:**

“Existing Generation Capacity Resource” shall have the meaning specified in the Reliability Assurance Agreement.

**Export Credit Exposure:**

“Export Credit Exposure” is determined for each Market Participant for a given Operating Day, and shall mean the sum of credit exposures for the Market Participant’s Export Transactions for that Operating Day and for the preceding Operating Day.

**Export Nodal Reference Price:**

“Export Nodal Reference Price” at each location is the 97th percentile, shall be, the real-time hourly integrated price experienced over the corresponding two-month period in the preceding calendar year, calculated separately for peak and off-peak time periods. The two-month time periods used in this calculation shall be January and February, March and April, May and June, July and August, September and October, and November and December.

**Export Transaction:**

“Export Transaction” shall be a transaction by a Market Participant that results in the transfer of energy from within the PJM Control Area to outside the PJM Control Area. Coordinated External Transactions that result in the transfer of energy from the PJM Control Area to an adjacent Control Area are one form of Export Transaction.

**Export Transaction Price Factor:**

“Export Transaction Price Factor” for a prospective time interval shall be the greater of (i) PJM’s forecast price for the time interval, if available, or (ii) the Export Nodal Reference Price, but shall not exceed the Export Transaction’s dispatch ceiling price cap, if any, for that time interval. The Export Transaction Price Factor for a past time interval shall be calculated in the same manner as for a prospective time interval, except that the Export Transaction Price Factor may use a tentative or final settlement price, as available. If an Export Nodal Reference Price is not available for a particular time interval, PJM may use an Export Transaction Price Factor for that time interval based on an appropriate alternate reference price.

**Export Transaction Screening:**

“Export Transaction Screening” shall be the process PJM uses to review the Export Credit Exposure of Export Transactions against the Credit Available for Export Transactions, and deny or curtail all or a portion of an Export Transaction, if the credit required for such transactions is greater than the credit available for the transactions.

**Export Transactions Net Activity:**

“Export Transactions Net Activity” shall mean the aggregate net total, resulting from Export Transactions, of (i) Spot Market Energy charges, (ii) Transmission Congestion Charges, and (iii) Transmission Loss Charges, calculated as set forth in Operating Agreement, Schedule 1 and the parallel provisions of Tariff, Attachment K-Appendix. Export Transactions Net Activity may be positive or negative.

**Extended Primary Reserve Requirement:**

“Extended Primary Reserve Requirement” shall equal the Primary Reserve Requirement in a Reserve Zone or Reserve Sub-zone, plus 190 MW, plus any additional reserves scheduled under emergency conditions necessary to address operational uncertainty. The Extended Primary Reserve Requirement is calculated in accordance with the PJM Manuals.

**Extended Summer Demand Resource:**

“Extended Summer Demand Resource” shall have the meaning specified in the Reliability Assurance Agreement.

**Extended Summer Resource Price Adder:**

“Extended Summer Resource Price Adder” shall mean, for Delivery Years through May 31, 2018, an addition to the marginal value of Unforced Capacity as necessary to reflect the price of Annual Resources and Extended Summer Demand Resources required to meet the applicable Minimum Extended Summer Resource Requirement.

**Extended Synchronized Reserve Requirement:**

“Extended Synchronized Reserve Requirement” shall equal the Synchronized Reserve Requirement in a Reserve Zone or Reserve Sub-zone, plus 190 MW, plus any additional reserves scheduled under emergency conditions necessary to address operational uncertainty. The Extended Synchronized Reserve Requirement is calculated in accordance with the PJM Manuals.

**Extended 30-minute Reserve Requirement:**

“Extended 30-minute Reserve Requirement” shall equal the 30-minute Reserve Requirement in a Reserve Zone or Reserve Sub-zone, plus 190 MW, plus any additional reserves scheduled under emergency conditions necessary to address operational uncertainty. The Extended 30-minute Reserve Requirement is calculated in accordance with the PJM Manuals.

**External Market Buyer:**

“External Market Buyer” shall mean a Market Buyer making purchases of energy from the PJM Interchange Energy Market for consumption by end-users outside the PJM Region, or for load in the PJM Region that is not served by Network Transmission Service.

**External Resource:**

“External Resource” shall mean a generation resource located outside the metered boundaries of the PJM Region.

**Facilities Study:**

“Facilities Study” shall be an engineering study conducted by the Transmission Provider (in coordination with the affected Transmission Owner(s)) to: (1) determine the required modifications to the Transmission Provider’s Transmission System necessary to implement the conclusions of the System Impact Study; and (2) complete any additional studies or analyses documented in the System Impact Study or required by PJM Manuals, and determine the required modifications to the Transmission Provider’s Transmission System based on the conclusions of such additional studies. The Facilities Study shall include the cost and scheduled completion date for such modifications, that will be required to provide the requested transmission service or to accommodate a New Service Request. As used in the Interconnection Service Agreement or Construction Service Agreement, Facilities Study shall mean that certain Facilities Study conducted by Transmission Provider (or at its direction) to determine the design and specification of the Customer Funded Upgrades necessary to accommodate the New Service Customer’s New Service Request in accordance with Tariff, Part VI, section 207.

**Fast-Start Resource:**

“Fast-Start Resource” shall have the meaning set forth in Tariff, Attachment K-Appendix, section 2.2A

**Federal Power Act:**

“Federal Power Act” shall mean the Federal Power Act, as amended, 16 U.S.C. §§ 791a, et seq.

**FERC or Commission:**

“FERC” or “Commission” shall mean the Federal Energy Regulatory Commission or any successor federal agency, commission or department exercising jurisdiction over the Tariff, Operating Agreement and Reliability Assurance Agreement.

**FERC Market Rules:**

“FERC Market Rules” mean the market behavior rules and the prohibition against electric energy market manipulation codified by the Commission in its Rules and Regulations at 18 CFR §§ 1c.2 and 35.37, respectively; the Commission-approved PJM Market Rules and any related proscriptions or any successor rules that the Commission from time to time may issue, approve or otherwise establish.

**Final Offer:**

“Final Offer” shall mean the offer on which a resource was dispatched by the Office of the Interconnection for a particular clock hour for the Operating Day.

**Final RTO Unforced Capacity Obligation:**

“Final RTO Unforced Capacity Obligation” shall mean the capacity obligation for the PJM Region, determined in accordance with RAA, Schedule 8.

**Financial Close:**

“Financial Close” shall mean the Capacity Market Seller has demonstrated that the Capacity Market Seller or its agent has completed the act of executing the material contracts and/or other documents necessary to (1) authorize construction of the project and (2) establish the necessary funding for the project under the control of an independent third-party entity. A sworn, notarized certification of an independent engineer certifying to such facts, and that the engineer has personal knowledge of, or has engaged in a diligent inquiry to determine, such facts, shall be sufficient to make such demonstration. For resources that do not have external financing, Financial Close shall mean the project has full funding available, and that the project has been duly authorized to proceed with full construction of the material portions of the project by the appropriate governing body of the company funding such project. A sworn, notarized certification by an officer of such company certifying to such facts, and that the officer has personal knowledge of, or has engaged in a diligent inquiry to determine, such facts, shall be sufficient to make such demonstration.

**Financial Default:**

“Financial Default” shall mean (a) the failure of a Member or Transmission Customer to make any payment for obligations under the Agreements when due, including but not limited to an invoice payment that has not been cured or remedied after notice has been given and any cure period has elapsed, (b) a bankruptcy proceeding filed by a Member, Transmission Customer or its Guarantor, or filed against a Member, Transmission Customer or its Guarantor and to which the Member, Transmission Customer or Guarantor, as applicable, acquiesces or that is not dismissed within 60 days, (c) a Member, Transmission Customer or its Guarantor, if any, is unable to meet its financial obligations as they become due, or (d) a Merger Without Assumption occurs in respect of the Member, Transmission Customer or any Guarantor of such Member or Transmission Customer.

**Financial Transmission Right:**

“Financial Transmission Right” or “FTR” shall mean a right to receive Transmission Congestion Credits as specified in Operating Agreement, Schedule 1, section 5.2.2 and the parallel provisions of Tariff, Attachment K-Appendix, section 5.2.2.

**Financial Transmission Right Obligation:**



“Financial Transmission Right Obligation” shall mean a right to receive Transmission Congestion Credits as specified in Operating Agreement, Schedule 1, section 5.2.2(b), and the parallel provisions of Tariff, Attachment K-Appendix, section 5.2.2(b).

**Financial Transmission Right Option:**

“Financial Transmission Right Option” shall mean a right to receive Transmission Congestion Credits as specified in Operating Agreement, Schedule 1, section 5.2.2(c), and the parallel provisions of Tariff, Attachment K-Appendix, section 5.2.2(c).

**Firm Point-To-Point Transmission Service:**

“Firm Point-To-Point Transmission Service” shall mean Transmission Service under the Tariff that is reserved and/or scheduled between specified Points of Receipt and Delivery pursuant to Tariff, Part II.

**Firm Transmission Feasibility Study:**

“Firm Transmission Feasibility Study” shall mean a study conducted by the Transmission Provider in accordance with Tariff, Part II, section 19.3 and Tariff, Part III, section 32.3.

**Firm Transmission Withdrawal Rights:**

“Firm Transmission Withdrawal Rights” shall mean the rights to schedule energy and capacity withdrawals from a Point of Interconnection of a Merchant Transmission Facility with the Transmission System. Firm Transmission Withdrawal Rights may be awarded only to a Merchant D.C. Transmission Facility that connects the Transmission System with another control area. Withdrawals scheduled using Firm Transmission Withdrawal Rights have rights similar to those under Firm Point-to-Point Transmission Service.

**First Incremental Auction:**

“First Incremental Auction” shall mean an Incremental Auction conducted 20 months prior to the start of the Delivery Year to which it relates.

**Flexible Resource:**

“Flexible Resource” shall mean a generating resource that must have a combined Start-up Time and Notification Time of less than or equal to two hours; and a Minimum Run Time of less than or equal to two hours.

**Forecast Pool Requirement:**

“Forecast Pool Requirement” shall have the meaning specified in the Reliability Assurance Agreement.

**Foreign Guaranty:**

“Foreign Guaranty” shall mean a Corporate Guaranty provided by an Affiliate of a Participant that is domiciled in a foreign country, and meets all of the provisions of Tariff, Attachment Q.

**Form 715 Planning Criteria:**

“Form 715 Planning Criteria” shall have the same meaning provided in the Operating Agreement.

**Forward Daily Natural Gas Prices:**

“Forward Daily Natural Gas Prices” shall have the meaning provided in Tariff, Attachment DD, section 5.10(a)(v-1)(E).

**Forward Hourly Ancillary Services Prices:**

“Forward Hourly Ancillary Services Prices” shall have the meaning provided in Tariff, Attachment DD, section 5.10(a)(v-1)(D).

**Forward Hourly LMPs:**

“Forward Hourly LMPs” shall have the meaning provided in Tariff, Attachment DD, section 5.10(a)(v-1)(C).

**FTR Credit Limit:**

“FTR Credit Limit” shall mean the amount of credit established with PJMSettlement that an FTR Participant has specifically designated to be used for FTR activity in a specific customer account. Any such credit so set aside shall not be considered available to satisfy any other credit requirement the FTR Participant may have with PJMSettlement.

**FTR Credit Requirement:**

“FTR Credit Requirement” shall mean the amount of credit that a Participant must provide in order to support the FTR positions that it holds and/or for which it is bidding. The FTR Credit Requirement shall not include months for which the invoicing has already been completed, provided that PJMSettlement shall have up to two Business Days following the date of the invoice completion to make such adjustments in its credit systems. FTR Credit Requirements are calculated and applied separately for each separate customer account.

**FTR Flow Undiversified:**

“FTR Flow Undiversified” shall have the meaning established in Tariff, Attachment Q, section VI.C.6.

**FTR Historical Value:**

For each FTR for each month, “FTR Historical Value” shall mean the weighted average of historical values over three years for the FTR path using the following weightings: 50% - most recent year; 30% - second year; 20% - third year.

**FTR Holder:**

“FTR Holder” shall mean the PJM Member that has acquired and possesses an FTR.

**FTR Monthly Credit Requirement Contribution:**

For each FTR, for each month, “FTR Monthly Credit Requirement Contribution” shall mean the total FTR cost for the month, prorated on a daily basis, less the FTR Historical Value for the month. For cleared FTRs, this contribution may be negative; prior to clearing, FTRs with negative contribution shall be deemed to have zero contribution.

**FTR Net Activity:**

“FTR Net Activity” shall mean the aggregate net value of the billing line items for auction revenue rights credits, FTR auction charges, FTR auction credits, and FTR congestion credits, and shall also include day-ahead and balancing/real-time congestion charges up to a maximum net value of the sum of the foregoing auction revenue rights credits, FTR auction charges, FTR auction credits and FTR congestion credits.

**FTR Participant:**

“FTR Participant” shall mean any Market Participant that provides or is required to provide Collateral in order to participate in PJM’s FTR market.

**FTR Portfolio Auction Value:**

“FTR Portfolio Auction Value” shall mean for each customer account of a Market Participant, the sum, calculated on a monthly basis, across all FTRs, of the FTR price times the FTR volume in MW.

**Fuel Cost Policy:**

“Fuel Cost Policy” shall mean the document provided by a Market Seller to PJM and the Market Monitoring Unit in accordance with PJM Manual 15 and Operating Agreement, Schedule 2, which documents the Market Seller’s method used to price fuel for calculation of the Market Seller’s cost-based offers for a generation resource.

**Full Notice to Proceed:**

“Full Notice to Proceed” shall mean that all material third party contractors have been given the notice to proceed with construction by the Capacity Market Seller or its agent, with a guaranteed completion date backed by liquidated damages.

## **1.4B DER Aggregator Participation Model**

(a) The rules and procedures for the participation of DER Aggregators are established pursuant to this section 1.4B and the PJM Manuals.

(b) In order to participate in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model, a DER Aggregator shall register each DER Aggregation Resource and DER Capacity Aggregation Resource with the Office of the Interconnection, in accordance with the procedures established under the PJM Manuals.

The Electric Distribution Company review portion of the registration process shall commence after: (1) the Office of the Interconnection has an executed DER Aggregator Participation Service Agreement on file, to be used for all DER Aggregation Resources associated with the DER Aggregator; and (2) the Office of the Interconnection receives a complete registration from the DER Aggregator, in a form specified in the PJM Manuals.

Upon receipt of a DER Aggregator's completed registration, the Office of the Interconnection shall review the registration and data submitted therein for completeness, and verify that the DER Aggregator meets the eligibility criteria for participation in the DER Aggregator Participation Model, as defined under the PJM Tariff and Operating Agreement and Manuals. The DER Aggregator shall only submit a registration for Component DER that are under contract for the term of the registration, and only one DER Aggregator may operate Component DER at a specific location. The Office of the Interconnection shall notify the appropriate Electric Distribution Company of the DER Aggregator's registration through the appropriate PJM system. A single registration shall only be comprised of individual Component DER in the same state, Electric Distribution Company, Transmission Zone, and pricing point unless otherwise noted below.

The Electric Distribution Company review process shall consist of two periods, in sum not to exceed sixty calendar days. The first shall be a single period, not to exceed fifteen calendar days, during which time the Electric Distribution Company and the Office of the Interconnection shall review and verify each Component DER for which a location was created. The second shall be a single period, not to exceed forty-five calendar days, during which the Electric Distribution Company shall perform a reliability review of the DER Aggregation Resource. In the event that the last day of either the fifteen or forty-five calendar day review period falls on a weekend or holiday, the review period shall conclude on the next business day.

The first fifteen calendar day review period shall commence upon receipt by the Electric Distribution Company of notification from the Office of the Interconnection. Following notification, the Electric Distribution Company may review and verify, as applicable, the Component DER for which a location was created and the following information associated therewith:

- i. The location and data components that represents each Component DER, as further defined in the relevant PJM Manuals, are accurate;

ii. Participation of the Component DER in an Electric Distribution Company's retail program at the time of registration does not preclude participation of the Component DER in the energy, capacity, and/or ancillary services markets of PJM, and as defined in the PJM Manuals;

a. Component DER that participate in a net energy metering retail program may only participate with grid injections in the PJM ancillary services markets, and may not participate in PJM energy or capacity markets, unless:

1. the Electric Distribution Company confirms to the Office of the Interconnection that participation of the Component DER in a net energy metering retail program or tariff approved by the Relevant Electric Retail Regulatory Authority will not violate the restrictions on duplicative compensation, as described in Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h); and

2. the Office of the Interconnection determines that the participation of the Component DER otherwise meets the applicable requirements for energy market or capacity market participation.

b. Component DER that participate in a net energy metering retail program that also participate with grid injections in the PJM ancillary services markets shall, based on the information provided by the DER Aggregator or the Electric Distribution Company, be excluded from PJM energy market settlements.

iii. The Component DER complies with the rules and regulations of any applicable Relevant Electric Retail Regulatory Authority;

iv. The Relevant Electric Retail Regulatory Authority allows the participation of any applicable Component DER that are also end-use customers of an Electric Distribution Company, in accordance with the provisions of Tariff, Attachment K-Appendix, section 1.4B(g), and Operating Agreement, Schedule 1, section 1.4B(g).

Within the first fifteen calendar day review period, and in coordination with the Office of Interconnection, the Electric Distribution Company shall also assign the electrical node on the PJM Transmission System to each Component DER. The Office of the Interconnection shall ensure that any information regarding Component DER that the Office of the Interconnection receives from an Electric Distribution Company or a DER Aggregator is accessible to both the Electric Distribution Company and the DER Aggregator.

Following approval of the Component DER by the Electric Distribution Company and the Office of the Interconnection, the DER Aggregator shall designate DER Aggregation Resources comprising of one or more of the approved Component DER. The second forty-five calendar day review period shall commence upon such designation by the DER Aggregator, whereby the Electric Distribution Company shall review the DER Aggregation Resource and verify that the participation of the DER Aggregation Resource in the PJM energy, capacity, and/or ancillary service markets does not pose a threat to the reliable and safe operation of the distribution system, the public, or Electric Distribution Company personnel. The scope of the Electric Distribution Company review of distribution system reliability impacts shall be limited to any incremental impacts arising from a Component DER participation in a DER Aggregation Resource that were not previously considered by the Electric Distribution Company during the interconnection study process for that Component DER.

If the Electric Distribution Company identifies concerns during the Electric Distribution Company review portion of the registration process, the Electric Distribution Company may notify the Office of the Interconnection and the DER Aggregator, and the Electric Distribution Company and the DER Aggregator may first attempt to resolve those concerns bilaterally, or in accordance with applicable state or local law, prior to seeking initiation of the dispute resolution process described in Operating Agreement, Schedule 5. Issues within disputes that the Office of the Interconnection determines solely concern the application of any applicable tariffs, agreements, and operating procedures of the Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, shall be addressed in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5. Issues within disputes that the Office of the Interconnection determines concern the provisions of the PJM Governing Agreements may be arbitrated under the dispute resolution processes under Operating Agreement, Schedule 5.

In the event that the Electric Distribution Company's concerns are resolved within the Electric Distribution Company review portion of the registration process, the Electric Distribution Company may recommend that the Office of the Interconnection approve the location and/or registration, as applicable. In the event that the concerns identified by the Electric Distribution Company are not resolved, the Electric Distribution Company may, within the Electric Distribution Company review portion of the registration process, recommend that the Office of the Interconnection: (i) reject the location and/or registration, (ii) approve the registration with certain operational limitations on the DER Aggregation Resource identified in the registration, or (iii) approve the registration with the removal of one or more specific Component DER from the DER Aggregation Resource identified in the registration.

Following the Electric Distribution Company's review of the DER Aggregation Resource registration, within fifteen calendar days, the Office of the Interconnection shall apply the applicable pricing points to the DER Aggregation Resource, and shall either approve or deny the DER Aggregator's registration based on the Office of the Interconnection's review of the registration and receipt and review of the Electric Distribution Company's comments and recommendation, with deference given to the Electric Distribution Company's assessment of the impact of the DER Aggregator's registration on the safety and reliability of distribution facilities.

To the extent that no comments or recommendations are provided by the Electric Distribution Company, including after the Office of the Interconnection provides final notice to the Electric Distribution Company prior to the expiration of the Electric Distribution Company review portion of the registration process, the Office of the Interconnection shall approve the DER Aggregator's registration.

All DER Aggregators shall remain in full compliance with the tariffs, agreements, and operating procedures of the applicable Electric Distribution Company, and the rules and regulations of any Relevant Electric Retail Regulatory Authority, in accordance with their executed DER Aggregator Participation Service Agreement, at all times while participating in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model.

Transmission Owners shall, in coordination with the Office of the Interconnection, provide all data to the Office of the Interconnection reasonably required to accurately represent the DER Aggregation Resource in the Regional Transmission Expansion Plan, in accordance with Operating Agreement, section 1.5.4 and the PJM Manuals.

A DER Aggregator shall report to the Office of the Interconnection any proposed update to the inventory of the individual Component DER within the DER Aggregation Resource, or proposed additional market services provided by the DER Aggregation Resource, identified in the DER Aggregator's registration to reflect any proposed addition or subtraction of a Component DER or market service, and any applicable information or data associated with the Component DER or market service, in accordance with the specifications described in the PJM Manuals. Any proposed update shall not require a new registration of the existing Component DER within the approved DER Aggregation Resource. Upon the Electric Distribution Company's receipt of notification of any proposed update, including all applicable information or data, the host Electric Distribution Company shall have an opportunity to conduct a review, for the first fifteen calendar day and/or second forty-five calendar day review period, in accordance with the provisions of this section related to initial registration, and make a recommendation to the Office of the Interconnection, prior to the Office of the Interconnection approving or denying the proposed update to the DER Aggregation Resource. The DER Aggregator may continue to participate in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model using its existing approved DER Aggregation Resource during the course of any such review conducted by the Electric Distribution Company. An inventory of the individual Component DER within a DER Aggregation Resource registration that is linked to a DER Capacity Aggregation Resource may not be modified during the course of an applicable Delivery Year.

(c) All Component DER in a DER Aggregation Resource shall interface with the same primary pricing node, except: (i) in the case of a DER Aggregation Resource that only provides ancillary services and is less than or equal to 5 MW, the Component DER within the DER Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are in the same state, service territory of a single Electric Distribution Company and Transmission Zone; and (ii) in the case of a DER Aggregation Resource utilizing the limited multi-nodal aggregation participation option described below, so long as those primary pricing nodes are in the same state, service territory of a single Electric Distribution



Company and Transmission Zone, and meet the criteria defined below and in the PJM Manuals; and (iii) in the case of a DER Capacity Aggregation Resource, the Component DER within a DER Aggregation Resource(s) linked to the DER Capacity Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are located within a defined zone or sub-zonal Locational Deliverability Area.

The purpose of participating under the limited multi-nodal aggregation option is to allow the participation of Component DER in the energy market that cannot form aggregations at a single primary pricing node at the minimum capability criteria of 0.1 MW. To participate, the multi-nodal DER Aggregation Resource may be comprised of one or more Component DER with capability smaller than 0.1 MW. Component DER at a single primary node with capability greater than 0.1 MW shall be excluded from participation in the multi-nodal DER Aggregation Resource unless the total capability of all other Component DER in a DER Aggregation Resource is below the 0.1 MW participation threshold, as further described in the PJM Manuals. The multi-nodal DER Aggregation Resource shall also be self-scheduled into the PJM energy markets. The megawatt participation cap on the multi-nodal aggregation participation option shall be set to 167 MW within the PJM Region. The Office of the Interconnection shall conduct an assessment of the 167 MW cap upon penetration of DER Aggregation Resources participating in the limited multi-nodal aggregation option exceeding ninety percent of the 167 MW cap value. The Office of the Interconnection shall establish a periodic review, in coordination with the Electric Distribution Company and DER Aggregator, no less than annually, or more frequently as needed, to identify any permanent electrical location change that would modify the pricing node associated with a DER Aggregation Resource or its underlying Component DER. During this review, the Office of the Interconnection shall: (i) confirm that applicable data reviewed and verified in the registration process is still complete and accurate, and (ii) request any updates to such data as a condition of continued participation in the DER Aggregator Participation Model.

(d) A DER Aggregator shall self-schedule their DER Aggregation Resource into the PJM Day-ahead Energy Market and Real-time Energy Market based on bidding parameters for the applicable technology-type, as described in the PJM Manuals. A DER Aggregator shall be eligible, at their election, to offer a dispatchable range in submitting bidding parameters into the Day-ahead Energy Market and Real-time Energy Market.

(e) A DER Aggregator shall be responsible for dispatching the underlying Component DER within a DER Aggregation Resource in accordance with the Office of the Interconnection's dispatch instructions for the DER Aggregation Resource, unless the DER Aggregator elects to designate another entity to dispatch the Component DER. A DER Aggregator shall provide telemetry for each DER Aggregation Resource participating in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model, in accordance with the technical specifications described in the PJM Manuals. A DER Aggregator may provide telemetry for the individual Component DER within a DER Aggregation Resource. This telemetry shall represent one or more values indicative of the total electrical output of the DER Aggregation Resource and inclusive of all underlying Component DER. This telemetry requirement shall not apply to a DER Aggregation Resource exclusively participating in the energy market that is less than 10 MW, notwithstanding the technical specifications described in the PJM Manuals.

A DER Aggregator shall provide to the Office of the Interconnection all individual Component DER meter data necessary to facilitate the settlement of the DER Aggregator's DER Aggregation Resource, in accordance with Operating Agreement, section 14 and the PJM Manuals. A DER Aggregator shall retain performance data for individual Component DER in a DER Aggregation Resource for auditing purposes, in accordance with the PJM Manuals. A DER Aggregator is responsible for ensuring that Component DER within a DER Aggregation Resource have metering equipment that provides integrated hourly kWh values on an Electric Distribution Company account basis. For non-interval metered residential DER Aggregation Resources, the DER Aggregator must ensure that a representative sample of Component DER have metering equipment that provides integrated hourly kWh values on an Electric Distribution Company account basis, as set forth in the PJM Manuals. For DER Aggregation Resources containing Component DER that are mass market customers, DER Aggregators shall provide aggregated meter data to the Office of the Interconnection for the settlement of the DER Aggregator's DER Aggregation Resource. Meter data shall be submitted to the Office of Interconnection within one business day. The measurement systems shall comply with the applicable Electric Distribution Company accuracy requirements for meters, and/or as described in the PJM Manual 01. Additional details for the configuration of such measurement systems under various specific configurations are specified in PJM Manual 14D.

The metering equipment shall meet the Electric Distribution Company requirements for accuracy, or otherwise have a maximum error of two percent over the full range of the metering equipment (including potential transformers and current transformers) and the metering equipment and associated data shall meet the requirements set forth herein and in the PJM Manuals.

(f) The Electric Distribution Company should, prior to the deadline for submission of offers into the Day-ahead Energy Market, as described in Tariff, Attachment K-Appendix, section 1.10.1A and Operating Agreement, Schedule 1, section 1.10.1A, notify the DER Aggregator of any operational limitations for the Operating Day that may impact the bidding parameters of an applicable DER Aggregation Resource. In the event that the Electric Distribution Company identifies additional operational concerns after the deadline described in Tariff, Attachment K-Appendix, section 1.10.1A and Operating Agreement, Schedule 1, section 1.10.1A, the DER Aggregator may utilize the generation rebidding period identified in Tariff, Attachment K-Appendix, section 1.10.9, and Operating Agreement, Schedule 1, section 1.10.9, to update its bidding parameters.

During the Operating Day, the Office of the Interconnection shall dispatch the DER Aggregation Resource, in accordance with the DER Aggregator's submitted bidding parameters. During the Operating Day, an Electric Distribution Company may exercise its ability to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource, for purposes of maintaining safe and reliable operation of distribution facilities, pursuant to any applicable tariffs, agreements, and operating procedures of the Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority. The Electric Distribution Company may communicate the decision to override the physical operation of a DER Aggregation Resource or individual Component DER

within a DER Aggregation Resource directly to the DER Aggregator. Following the exercise of the Electric Distribution Company's override, the DER Aggregator shall reflect the override by updating the applicable bidding parameters of its DER Aggregation Resource. The Office of the Interconnection shall not take any actions to interrupt or interfere with the Electric Distribution Company's decision to override and will re-dispatch the DER Aggregation Resource to reflect its updated bidding parameters.

An Electric Distribution Company's override shall not excuse a DER Aggregator from any financial obligations under the PJM Governing Agreements for failure to perform any of the obligations established under the PJM Governing Agreements or PJM Manuals for the relevant PJM capacity, energy, and/or ancillary services markets.

Any disputes regarding an Electric Distribution Company's exercise of its ability to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource, for purposes of maintaining safe and reliable operation of distribution facilities, pursuant to any applicable tariffs, agreements, and operating procedures of the Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, shall be addressed in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5.

(g) The Office of the Interconnection shall not permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model if the applicable DER Aggregation Resource includes Component DER that are end-use customers of an Electric Distribution Company that distributed 4 million MWh or less in the previous fiscal year, as identified by the Electric Distribution Company, unless the Electric Distribution Company determines that the Relevant Electric Retail Regulatory Authority permits such end-use customers to participate. The Office of the Interconnection shall permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model with a DER Aggregation Resource including Component DER that are end-use customers of an Electric Distribution Company that distributed 4 million MWh or less in the previous fiscal year, as identified by the Electric Distribution Company, if, during the course of the registration process described above in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b), the Electric Distribution Company presents any of the following evidence to PJM:

- i. an order, resolution or ordinance of the Relevant Electric Retail Regulatory Authority permitting or conditionally permitting the end-use customer's participation;
- ii. an opinion of the Relevant Electric Retail Regulatory Authority's legal counsel attesting to the existence of a regulation or law permitting or conditionally permitting the end-use customer's participation; or

- iii. an opinion of the state Attorney General, on behalf of the Relevant Electric Retail Regulatory Authority, attesting to the existence of a regulation or law permitting or conditionally permitting the end-use customer's participation.

The Office of the Interconnection shall permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model if the applicable DER Aggregation Resource includes Component DER that are end-use customers of an Electric Distribution Company that distributed more than 4 million MWh in the previous fiscal year, as identified by the Electric Distribution Company, unless the DER Aggregation Resource includes one or more Component DER that are demand response and the Relevant Electric Retail Regulatory Authority has prohibited the participation of demand response in the DER Aggregator Participation Model, pursuant to the rules set forth in Tariff, Attachment K-Appendix, section 1.5A.3 (1)(a)(i) and Operating Agreement, Schedule 1, section 1.5A.3 (1)(a)(i).

(h) A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources containing one or more Component DER that also participate in one or more retail programs. The Office of the Interconnection shall only credit a DER Aggregator for the sale of energy, capacity, and/or ancillary services in PJM markets if one or more of those same services are not also provided as part of a retail program, including but not limited to a Component DER participating in a retail net energy metering program.

A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources that provide multiple services in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model. A Component DER shall not be registered with multiple DER Aggregation Resources, or participate as part of another Market Participant outside of the DER Aggregator Participation Model. The Office of the Interconnection shall only credit a DER Aggregator for the sale of energy, capacity, and/or ancillary services in PJM markets if one or more of those same services are not also provided as part of another wholesale sale.

(i) DER Aggregators providing capacity using a DER Capacity Aggregation Resource shall be subject to the Day-ahead Energy Market must-offer requirement described in Tariff, Attachment K-Appendix, section 1.10.1A(d) and Operating Agreement, Schedule 1, section 1.10.1A(d), based on the technology of the Component DER within the DER Aggregation Resource linked to the DER Capacity Aggregation Resource, in accordance with the PJM Manuals.

(j) DER Aggregation Resources are subject to offer price cap and associated three pivotal supplier test provisions of Operating Agreement, Schedule 1, section 6.4.

(k) A DER Capacity Aggregation Resource shall be subject to a MOPR Floor Offer Price in accordance with the provisions applicable to MOPR Floor Offer Price for Generation Capacity Resources, as described in Tariff, Attachment DD, section 5.14(h-2), and Market Seller

Offer Cap for Generation Capacity Resources in a manner consistent with the provisions applicable to Market Seller Offer Cap for Generation Capacity Resources, as described in Tariff, Attachment DD, section 6.4 and Tariff, Attachment M-Appendix, section II.E, based on the underlying technology of the Component DER.

A DER Capacity Aggregation Resource may segment offers for the Component DER subject to mitigation, based on the underlying technology of the Component DER in the DER Capacity Aggregation Resource, and further described in the PJM Manuals.

If a DER Capacity Aggregation Resource is subject to the Minimum Floor Offer Price pursuant to Tariff, Attachment DD, sections 5.14(h-2), the Capacity Market Seller that owns or controls such resources may submit a Sell Offer with a Minimum Floor Offer Price of no lower than the MW-weighted average of the applicable MOPR Floor Offer Prices (zero if not applicable) of the aggregated resources in such Sell Offer.

(l) Projected PJM Market Revenues for DER Capacity Aggregation Resources subject to the Minimum Floor Offer Price or Market Seller Offer Cap shall be determined in accordance with Tariff, Attachment DD, section 6.8(d-1). The determination of PJM Market Revenues by the Market Monitoring Unit or the Office of the Interconnection shall utilize either the hourly output profiles, or the Projected EAS Dispatch, as appropriate

(m) The Office of the Interconnection shall account for and settle a DER Aggregator's DER Aggregation Resource, in the Day-ahead Energy Market and Real-time Energy Market, by summing all load reduction and injection MWh for the underlying Component DER within the Aggregation. The Office of the Interconnection shall calculate the performance of Component DER that have both load reduction and injection capability as follows:

(i) load reduction to 0 MWh shall be calculated in accordance with Tariff, Attachment K-Appendix, sections 1.5A and 3.3A and Operating Agreement, Schedule 1, sections 1.5A and 3.3A;

(ii) injection shall be determined in accordance with the Day-ahead Energy Market and Real-time Energy Market rules as specified in Tariff, Attachment K-Appendix, section 3.1A, and Operating Agreement, Schedule 1, section 3.1A.

(n) Component DER interconnecting to distribution facilities for purposes of participating in the energy, capacity, and/or ancillary services markets of PJM exclusively through the DER Aggregator Participation Model shall not be subject to the Part IV of the Tariff relating to interconnections with the Transmission System, and shall exclusively interconnect to distribution facilities pursuant to applicable state or local law.

PJM Operating Agreement  
Schedule 1, section 1.4B

## **1.4B DER Aggregator Participation Model**

(a) The rules and procedures for the participation of DER Aggregators are established pursuant to this section 1.4B and the PJM Manuals.

(b) In order to participate in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model, a DER Aggregator shall register each DER Aggregation Resource and DER Capacity Aggregation Resource with the Office of the Interconnection, in accordance with the procedures established under the PJM Manuals.

The Electric Distribution Company review portion of the registration process shall commence after: (1) the Office of the Interconnection has an executed DER Aggregator Participation Service Agreement on file, to be used for all DER Aggregation Resources associated with the DER Aggregator; and (2) the Office of the Interconnection receives a complete registration from the DER Aggregator, in a form specified in the PJM Manuals.

Upon receipt of a DER Aggregator's completed registration, the Office of the Interconnection shall review the registration and data submitted therein for completeness, and verify that the DER Aggregator meets the eligibility criteria for participation in the DER Aggregator Participation Model, as defined under the PJM Tariff and Operating Agreement and Manuals. The DER Aggregator shall only submit a registration for Component DER that are under contract for the term of the registration, and only one DER Aggregator may operate Component DER at a specific location. The Office of the Interconnection shall notify the appropriate Electric Distribution Company of the DER Aggregator's registration through the appropriate PJM system. A single registration shall only be comprised of individual Component DER in the same state, Electric Distribution Company, Transmission Zone, and pricing point unless otherwise noted below.

The Electric Distribution Company review process shall consist of two periods, in sum not to exceed sixty calendar days. The first shall be a single period, not to exceed fifteen calendar days, during which time the Electric Distribution Company and the Office of the Interconnection shall review and verify each Component DER for which a location was created. The second shall be a single period, not to exceed forty-five calendar days, during which the Electric Distribution Company shall perform a reliability review of the DER Aggregation Resource. In the event that the last day of either the fifteen or forty-five calendar day review period falls on a weekend or holiday, the review period shall conclude on the next business day.

The first fifteen calendar day review period shall commence upon receipt by the Electric Distribution Company of notification from the Office of the Interconnection. Following notification, the Electric Distribution Company may review and verify, as applicable, the Component DER for which a location was created and the following information associated therewith:

- i. The location and data components that represents each Component DER, as further defined in the relevant PJM Manuals, are accurate;

ii. Participation of the Component DER in an Electric Distribution Company's retail program at the time of registration does not preclude participation of the Component DER in the energy, capacity, and/or ancillary services markets of PJM, and as defined in the PJM Manuals;

a. Component DER that participate in a net energy metering retail program may only participate with grid injections in the PJM ancillary services markets, and may not participate in PJM energy or capacity markets, unless:

1. the Electric Distribution Company confirms to the Office of the Interconnection that participation of the Component DER in a net energy metering retail program or tariff approved by the Relevant Electric Retail Regulatory Authority will not violate the restrictions on duplicative compensation, as described in Tariff, Attachment K-Appendix, section 1.4B(h) and Operating Agreement, Schedule 1, section 1.4B(h); and

2. the Office of the Interconnection determines that the participation of the Component DER otherwise meets the applicable requirements for energy market or capacity market participation.

b. Component DER that participate in a net energy metering retail program that also participate with grid injections in the PJM ancillary services markets shall, based on the information provided by the DER Aggregator or the Electric Distribution Company, be excluded from PJM energy market settlements.

iii. The Component DER complies with the rules and regulations of any applicable Relevant Electric Retail Regulatory Authority;

iv. The Relevant Electric Retail Regulatory Authority allows the participation of any applicable Component DER that are also end-use customers of an Electric Distribution Company, in accordance with the provisions of Tariff, Attachment K-Appendix, section 1.4B(g), and Operating Agreement, Schedule 1, section 1.4B(g).

Within the first fifteen calendar day review period, and in coordination with the Office of Interconnection, the Electric Distribution Company shall also assign the electrical node on the PJM Transmission System to each Component DER. The Office of the Interconnection shall ensure that any information regarding Component DER that the Office of the Interconnection receives from an Electric Distribution Company or a DER Aggregator is accessible to both the Electric Distribution Company and the DER Aggregator.



Following approval of the Component DER by the Electric Distribution Company and the Office of the Interconnection, the DER Aggregator shall designate DER Aggregation Resources comprising of one or more of the approved Component DER. The second forty-five calendar day review period shall commence upon such designation by the DER Aggregator, whereby the Electric Distribution Company shall review the DER Aggregation Resource and verify that the participation of the DER Aggregation Resource in the PJM energy, capacity, and/or ancillary service markets does not pose a threat to the reliable and safe operation of the distribution system, the public, or Electric Distribution Company personnel. The scope of the Electric Distribution Company review of distribution system reliability impacts shall be limited to any incremental impacts arising from a Component DER participation in a DER Aggregation Resource that were not previously considered by the Electric Distribution Company during the interconnection study process for that Component DER.

If the Electric Distribution Company identifies concerns during the Electric Distribution Company review portion of the registration process, the Electric Distribution Company may notify the Office of the Interconnection and the DER Aggregator, and the Electric Distribution Company and the DER Aggregator may first attempt to resolve those concerns bilaterally, or in accordance with applicable state or local law, prior to seeking initiation of the dispute resolution process described in Operating Agreement, Schedule 5. Issues within disputes that the Office of the Interconnection determines solely concern the application of any applicable tariffs, agreements, and operating procedures of the Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, shall be addressed in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5. Issues within disputes that the Office of the Interconnection determines concern the provisions of the PJM Governing Agreements may be arbitrated under the dispute resolution processes under Operating Agreement, Schedule 5.

In the event that the Electric Distribution Company's concerns are resolved within the Electric Distribution Company review portion of the registration process, the Electric Distribution Company may recommend that the Office of the Interconnection approve the location and/or registration, as applicable. In the event that the concerns identified by the Electric Distribution Company are not resolved, the Electric Distribution Company may, within the Electric Distribution Company review portion of the registration process, recommend that the Office of the Interconnection: (i) reject the location and/or registration, (ii) approve the registration with certain operational limitations on the DER Aggregation Resource identified in the registration, or (iii) approve the registration with the removal of one or more specific Component DER from the DER Aggregation Resource identified in the registration.

Following the Electric Distribution Company's review of the DER Aggregation Resource registration, within fifteen calendar days, the Office of the Interconnection shall apply the applicable pricing points to the DER Aggregation Resource, and shall either approve or deny the DER Aggregator's registration based on the Office of the Interconnection's review of the registration and receipt and review of the Electric Distribution Company's comments and recommendation, with deference given to the Electric Distribution Company's assessment of the impact of the DER Aggregator's registration on the safety and reliability of distribution facilities.

To the extent that no comments or recommendations are provided by the Electric Distribution Company, including after the Office of the Interconnection provides final notice to the Electric Distribution Company prior to the expiration of the Electric Distribution Company review portion of the registration process, the Office of the Interconnection shall approve the DER Aggregator's registration.

All DER Aggregators shall remain in full compliance with the tariffs, agreements, and operating procedures of the applicable Electric Distribution Company, and the rules and regulations of any Relevant Electric Retail Regulatory Authority, in accordance with their executed DER Aggregator Participation Service Agreement, at all times while participating in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model.

Transmission Owners shall, in coordination with the Office of the Interconnection, provide all data to the Office of the Interconnection reasonably required to accurately represent the DER Aggregation Resource in the Regional Transmission Expansion Plan, in accordance with Operating Agreement, section 1.5.4 and the PJM Manuals.

A DER Aggregator shall report to the Office of the Interconnection any proposed update to the inventory of the individual Component DER within the DER Aggregation Resource, or proposed additional market services provided by the DER Aggregation Resource, identified in the DER Aggregator's registration to reflect any proposed addition or subtraction of a Component DER or market service, and any applicable information or data associated with the Component DER or market service, in accordance with the specifications described in the PJM Manuals. Any proposed update shall not require a new registration of the existing Component DER within the approved DER Aggregation Resource. Upon the Electric Distribution Company's receipt of notification of any proposed update, including all applicable information or data, the host Electric Distribution Company shall have an opportunity to conduct a review, for the first fifteen calendar day and/or second forty-five calendar day review period, in accordance with the provisions of this section related to initial registration, and make a recommendation to the Office of the Interconnection, prior to the Office of the Interconnection approving or denying the proposed update to the DER Aggregation Resource. The DER Aggregator may continue to participate in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model using its existing approved DER Aggregation Resource during the course of any such review conducted by the Electric Distribution Company. An inventory of the individual Component DER within a DER Aggregation Resource registration that is linked to a DER Capacity Aggregation Resource may not be modified during the course of an applicable Delivery Year.

(c) All Component DER in a DER Aggregation Resource shall interface with the same primary pricing node, except: (i) in the case of a DER Aggregation Resource that only provides ancillary services and is less than or equal to 5 MW, the Component DER within the DER Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are in the same state, service territory of a single Electric Distribution Company and Transmission Zone; and (ii) in the case of a DER Aggregation Resource utilizing the limited multi-nodal aggregation participation option described below, so long as those primary pricing nodes are in the same state, service territory of a single Electric Distribution

Company and Transmission Zone, and meet the criteria defined below and in the PJM Manuals; and (iii) in the case of a DER Capacity Aggregation Resource, the Component DER within a DER Aggregation Resource(s) linked to the DER Capacity Aggregation Resource may interface with multiple primary pricing nodes, so long as those primary pricing nodes are located within a defined zone or sub-zonal Locational Deliverability Area.

The purpose of participating under the limited multi-nodal aggregation option is to allow the participation of Component DER in the energy market that cannot form aggregations at a single primary pricing node at the minimum capability criteria of 0.1 MW. To participate, the multi-nodal DER Aggregation Resource may be comprised of one or more Component DER with capability smaller than 0.1 MW. Component DER at a single primary node with capability greater than 0.1 MW shall be excluded from participation in the multi-nodal DER Aggregation Resource unless the total capability of all other Component DER in a DER Aggregation Resource is below the 0.1 MW participation threshold, as further described in the PJM Manuals. The multi-nodal DER Aggregation Resource shall also be self-scheduled into the PJM energy markets. The megawatt participation cap on the multi-nodal aggregation participation option shall be set to 167 MW within the PJM Region. The Office of the Interconnection shall conduct an assessment of the 167 MW cap upon penetration of DER Aggregation Resources participating in the limited multi-nodal aggregation option exceeding ninety percent of the 167 MW cap value. The Office of the Interconnection shall establish a periodic review, in coordination with the Electric Distribution Company and DER Aggregator, no less than annually, or more frequently as needed, to identify any permanent electrical location change that would modify the pricing node associated with a DER Aggregation Resource or its underlying Component DER. During this review, the Office of the Interconnection shall: (i) confirm that applicable data reviewed and verified in the registration process is still complete and accurate, and (ii) request any updates to such data as a condition of continued participation in the DER Aggregator Participation Model.

(d) A DER Aggregator shall self-schedule their DER Aggregation Resource into the PJM Day-ahead Energy Market and Real-time Energy Market based on bidding parameters for the applicable technology-type, as described in the PJM Manuals. A DER Aggregator shall be eligible, at their election, to offer a dispatchable range in submitting bidding parameters into the Day-ahead Energy Market and Real-time Energy Market.

(e) A DER Aggregator shall be responsible for dispatching the underlying Component DER within a DER Aggregation Resource in accordance with the Office of the Interconnection's dispatch instructions for the DER Aggregation Resource, unless the DER Aggregator elects to designate another entity to dispatch the Component DER. A DER Aggregator shall provide telemetry for each DER Aggregation Resource participating in the energy, capacity, and/or ancillary services markets of PJM through the DER Aggregator Participation Model, in accordance with the technical specifications described in the PJM Manuals. A DER Aggregator may provide telemetry for the individual Component DER within a DER Aggregation Resource. This telemetry shall represent one or more values indicative of the total electrical output of the DER Aggregation Resource and inclusive of all underlying Component DER. This telemetry requirement shall not apply to a DER Aggregation Resource exclusively participating in the energy market that is less than 10 MW, notwithstanding the technical specifications described in the PJM Manuals.

A DER Aggregator shall provide to the Office of the Interconnection all individual Component DER meter data necessary to facilitate the settlement of the DER Aggregator's DER Aggregation Resource, in accordance with Operating Agreement, section 14 and the PJM Manuals. A DER Aggregator shall retain performance data for individual Component DER in a DER Aggregation Resource for auditing purposes, in accordance with the PJM Manuals. A DER Aggregator is responsible for ensuring that Component DER within a DER Aggregation Resource have metering equipment that provides integrated hourly kWh values on an Electric Distribution Company account basis. For non-interval metered residential DER Aggregation Resources, the DER Aggregator must ensure that a representative sample of Component DER have metering equipment that provides integrated hourly kWh values on an Electric Distribution Company account basis, as set forth in the PJM Manuals. For DER Aggregation Resources containing Component DER that are mass market customers, DER Aggregators shall provide aggregated meter data to the Office of the Interconnection for the settlement of the DER Aggregator's DER Aggregation Resource. Meter data shall be submitted to the Office of Interconnection within one business day. The measurement systems shall comply with the applicable Electric Distribution Company accuracy requirements for meters, and/or as described in the PJM Manual 01. Additional details for the configuration of such measurement systems under various specific configurations are specified in PJM Manual 14D.

The metering equipment shall meet the Electric Distribution Company requirements for accuracy, or otherwise have a maximum error of two percent over the full range of the metering equipment (including potential transformers and current transformers) and the metering equipment and associated data shall meet the requirements set forth herein and in the PJM Manuals.

(f) The Electric Distribution Company should, prior to the deadline for submission of offers into the Day-ahead Energy Market, as described in Tariff, Attachment K-Appendix, section 1.10.1A and Operating Agreement, Schedule 1, section 1.10.1A, notify the DER Aggregator of any operational limitations for the Operating Day that may impact the bidding parameters of an applicable DER Aggregation Resource. In the event that the Electric Distribution Company identifies additional operational concerns after the deadline described in Tariff, Attachment K-Appendix, section 1.10.1A and Operating Agreement, Schedule 1, section 1.10.1A, the DER Aggregator may utilize the generation rebidding period identified in Tariff, Attachment K-Appendix, section 1.10.9, and Operating Agreement, Schedule 1, section 1.10.9, to update its bidding parameters.

During the Operating Day, the Office of the Interconnection shall dispatch the DER Aggregation Resource, in accordance with the DER Aggregator's submitted bidding parameters. During the Operating Day, an Electric Distribution Company may exercise its ability to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource, for purposes of maintaining safe and reliable operation of distribution facilities, pursuant to any applicable tariffs, agreements, and operating procedures of the Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority. The Electric Distribution Company may communicate the decision to override the physical operation of a DER Aggregation Resource or individual Component DER

within a DER Aggregation Resource directly to the DER Aggregator. Following the exercise of the Electric Distribution Company's override, the DER Aggregator shall reflect the override by updating the applicable bidding parameters of its DER Aggregation Resource. The Office of the Interconnection shall not take any actions to interrupt or interfere with the Electric Distribution Company's decision to override and will re-dispatch the DER Aggregation Resource to reflect its updated bidding parameters.

An Electric Distribution Company's override shall not excuse a DER Aggregator from any financial obligations under the PJM Governing Agreements for failure to perform any of the obligations established under the PJM Governing Agreements or PJM Manuals for the relevant PJM capacity, energy, and/or ancillary services markets.

Any disputes regarding an Electric Distribution Company's exercise of its ability to override the physical operation of a DER Aggregation Resource or individual Component DER within a DER Aggregation Resource, for purposes of maintaining safe and reliable operation of distribution facilities, pursuant to any applicable tariffs, agreements, and operating procedures of the Electric Distribution Company, and/or the rules and regulations of any Relevant Electric Retail Regulatory Authority, shall be addressed in accordance with applicable state or local law, and shall not be arbitrated or in any way resolved by the Office of the Interconnection or through the dispute resolution processes under Operating Agreement, Schedule 5.

(g) The Office of the Interconnection shall not permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model if the applicable DER Aggregation Resource includes Component DER that are end-use customers of an Electric Distribution Company that distributed 4 million MWh or less in the previous fiscal year, as identified by the Electric Distribution Company, unless the Electric Distribution Company determines that the Relevant Electric Retail Regulatory Authority permits such end-use customers to participate. The Office of the Interconnection shall permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model with a DER Aggregation Resource including Component DER that are end-use customers of an Electric Distribution Company that distributed 4 million MWh or less in the previous fiscal year, as identified by the Electric Distribution Company, if, during the course of the registration process described above in Tariff, Attachment K-Appendix, section 1.4B(b) and Operating Agreement, Schedule 1, section 1.4B(b), the Electric Distribution Company presents any of the following evidence to PJM:

- i. an order, resolution or ordinance of the Relevant Electric Retail Regulatory Authority permitting or conditionally permitting the end-use customer's participation;
- ii. an opinion of the Relevant Electric Retail Regulatory Authority's legal counsel attesting to the existence of a regulation or law permitting or conditionally permitting the end-use customer's participation; or

- iii. an opinion of the state Attorney General, on behalf of the Relevant Electric Retail Regulatory Authority, attesting to the existence of a regulation or law permitting or conditionally permitting the end-use customer's participation.

The Office of the Interconnection shall permit a DER Aggregator to participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model if the applicable DER Aggregation Resource includes Component DER that are end-use customers of an Electric Distribution Company that distributed more than 4 million MWh in the previous fiscal year, as identified by the Electric Distribution Company, unless the DER Aggregation Resource includes one or more Component DER that are demand response and the Relevant Electric Retail Regulatory Authority has prohibited the participation of demand response in the DER Aggregator Participation Model, pursuant to the rules set forth in Tariff, Attachment K-Appendix, section 1.5A.3 (1)(a)(i) and Operating Agreement, Schedule 1, section 1.5A.3 (1)(a)(i).

(h) A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources containing one or more Component DER that also participate in one or more retail programs. The Office of the Interconnection shall only credit a DER Aggregator for the sale of energy, capacity, and/or ancillary services in PJM markets if one or more of those same services are not also provided as part of a retail program, including but not limited to a Component DER participating in a retail net energy metering program.

A DER Aggregator may participate in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model using DER Aggregation Resources that provide multiple services in the PJM energy, capacity, and/or ancillary services markets through the DER Aggregator Participation Model. A Component DER shall not be registered with multiple DER Aggregation Resources, or participate as part of another Market Participant outside of the DER Aggregator Participation Model. The Office of the Interconnection shall only credit a DER Aggregator for the sale of energy, capacity, and/or ancillary services in PJM markets if one or more of those same services are not also provided as part of another wholesale sale.

(i) DER Aggregators providing capacity using a DER Capacity Aggregation Resource shall be subject to the Day-ahead Energy Market must-offer requirement described in Tariff, Attachment K-Appendix, section 1.10.1A(d) and Operating Agreement, Schedule 1, section 1.10.1A(d), based on the technology of the Component DER within the DER Aggregation Resource linked to the DER Capacity Aggregation Resource, in accordance with the PJM Manuals.

(j) DER Aggregation Resources are subject to offer price cap and associated three pivotal supplier test provisions of Operating Agreement, Schedule 1, section 6.4.

(k) A DER Capacity Aggregation Resource shall be subject to a MOPR Floor Offer Price in accordance with the provisions applicable to MOPR Floor Offer Price for Generation Capacity Resources, as described in Tariff, Attachment DD, section 5.14(h-2), and Market Seller

Offer Cap for Generation Capacity Resources in a manner consistent with the provisions applicable to Market Seller Offer Cap for Generation Capacity Resources, as described in Tariff, Attachment DD, section 6.4 and Tariff, Attachment M-Appendix, section II.E, based on the underlying technology of the Component DER.

A DER Capacity Aggregation Resource may segment offers for the Component DER subject to mitigation, based on the underlying technology of the Component DER in the DER Capacity Aggregation Resource, and further described in the PJM Manuals.

If a DER Capacity Aggregation Resource is subject to the Minimum Floor Offer Price pursuant to Tariff, Attachment DD, sections 5.14(h-2), the Capacity Market Seller that owns or controls such resources may submit a Sell Offer with a Minimum Floor Offer Price of no lower than the MW-weighted average of the applicable MOPR Floor Offer Prices (zero if not applicable) of the aggregated resources in such Sell Offer.

(l) Projected PJM Market Revenues for DER Capacity Aggregation Resources subject to the Minimum Floor Offer Price or Market Seller Offer Cap shall be determined in accordance with Tariff, Attachment DD, section 6.8(d-1). The determination of PJM Market Revenues by the Market Monitoring Unit or the Office of the Interconnection shall utilize either the hourly output profiles, or the Projected EAS Dispatch, as appropriate

(m) The Office of the Interconnection shall account for and settle a DER Aggregator's DER Aggregation Resource, in the Day-ahead Energy Market and Real-time Energy Market, by summing all load reduction and injection MWh for the underlying Component DER within the Aggregation. The Office of the Interconnection shall calculate the performance of Component DER that have both load reduction and injection capability as follows:

(i) load reduction to 0 MWh shall be calculated in accordance with Tariff, Attachment K-Appendix, sections 1.5A and 3.3A and Operating Agreement, Schedule 1, sections 1.5A and 3.3A;

(ii) injection shall be determined in accordance with the Day-ahead Energy Market and Real-time Energy Market rules as specified in Tariff, Attachment K-Appendix, section 3.1A, and Operating Agreement, Schedule 1, section 3.1A.

(n) Component DER interconnecting to distribution facilities for purposes of participating in the energy, capacity, and/or ancillary services markets of PJM exclusively through the DER Aggregator Participation Model shall not be subject to the Part IV of the Tariff relating to interconnections with the Transmission System, and shall exclusively interconnect to distribution facilities pursuant to applicable state or local law.

# Attachment C

Affidavit of Donald Bielak  
on behalf of PJM Interconnection, L.L.C.



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

**PJM Interconnection, L.L.C.**

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**Docket No. ER22-962-000**

**AFFIDAVIT OF DONALD BIELAK  
ON BEHALF OF PJM INTERCONNECTION, L.L.C**

1. My name is Donald Bielak, and my business address is 2750 Monroe Blvd., Audubon, Pennsylvania, 19403. My current title is Sr. Manager – Dispatch at PJM Interconnection, L.L.C. (“PJM”). I am submitting this affidavit on behalf of PJM, in support of its proposed September 1, 2023 Order No. 2222 compliance filing.
  
2. Specifically, in this affidavit, I provide support and additional analysis for PJM’s proposal to utilize a nodal model for energy market participation in its DER Aggregator Participation Model. I also provide support for defining a multi-nodal solution that is geographically broad as technically feasible, and allows PJM to maintain reliability. This determination is based on PJM’s unique system topology, congestion patterns, and operating practices.

## **I. QUALIFICATIONS**

3. I joined PJM in September of 2004 and have been under continuous full-time employment since January of 2007. As Sr. Manager – Dispatch, I am responsible for the oversight and operation of the Valley Forge and Milford Control Centers. This function includes ensuring the reliable operation of the power grid, in accordance with all PJM and NERC reliability standards pertaining to the functions of Reliability Coordinator, Balancing Authority, and Transmission Operator. In addition, I am responsible for ensuring the efficient economic dispatch of the system under the existing PJM market rules and neighboring Joint Operating Agreements.
4. Prior to this position, I served as an Engineer in the Engineering Support department, as a Sr. Engineer in the Markets Coordination department, as a Reliability Engineer, and then as Manager – Reliability Engineering. As the Manager for the Reliability Engineering group, I managed the group responsible for coordinating day-ahead and real-time operating plans between PJM, its member Transmission Owners and Generation Owners, and our neighboring entities. As a Reliability Engineer prior to this, I performed these functions directly. In my previous engineering positions, I supported the Energy Management System (“EMS”) and the Security Constrained Economic Dispatch (“SCED”) application.
5. I hold a Bachelor of Science degree in Electrical Engineering, a Master of Science degree in Electrical Engineering, and a Master of Science degree in Engineering Management, all from Drexel University.

## **II. NODAL AGGREGATION MAINTAINS RELIABILITY**

6. Requiring DER Aggregation Resources to operate as nodal aggregations will be essential for maintaining reliability and proper price formation with the integration of DER Aggregation Resources into PJM’s energy markets. This approach will allow accurate locational pricing and appropriate dispatch response—two key components to effective constraint control—and enable PJM to effectively carry out its responsibility to maintain system reliability and compliance with North American Electric Reliability Corporation (“NERC”) standards.
7. As detailed in my February 1, 2022 and May 30, 2022 affidavits in this proceeding, PJM has an obligation as a Reliability Coordinator, Balancing Authority, and Transmission Operator to maintain compliance with all applicable NERC and regional standards. An essential operational practice PJM performs to maintain reliability under these standards is generation re-dispatch for constraint control. As previously discussed, resources are only effective for constraint control when PJM has visibility and dispatchability of these resources through setting appropriate congestion cost which is reflected in a nodal Locational Marginal Price (“LMP”). As such, PJM has proposed the nodal aggregation model for DER Aggregation Resources as the most geographically broad as technically feasible approach, to allow DER to integrate at scale on to the PJM system. This remains true; a nodal aggregation approach is the broadest area of aggregation that is technically

feasible for PJM operations to support DER Aggregation Resources containing large Component DER at any point in PJM's implementation of the DER Aggregator Participation model. It is also the only technically feasible option for all Component DER integrated into PJM markets *at scale*—*i.e.*, at future operationally-significant penetration.

### **III. A TECHNICALLY FEASIBLE SOLUTION IN PARALLEL WITH OPERATING DER AT SCALE**

8. In addition to the nodal model, PJM has identified another technically feasible solution that would allow DER Aggregation Resources containing small Component DER to aggregate multi-nodally, at a contained penetration. I emphasize that this is *not* a technically feasible option for DER Aggregation Resources at higher levels of Component DER penetration for reasons described in my February 1, 2022 and May 30, 2022 affidavits and reiterated above. However, the multi-nodal approach *is* technically feasible at low levels of Component DER penetration, so long as the multi-nodal DER Aggregation Resources comply with the criteria further outlined below.
9. PJM operations can permit multi-nodal aggregations within the same transmission zone, Electric Distribution Company territory, and state, under the following four conditions. Together, these conditions preserve the technical feasibility of the option by ensuring that the total amount of capability tied to multi-nodal DER Aggregation Resources remains relatively small, limiting any adverse impacts to PJM operations.
10. First, the multi-nodal DER Aggregation Resource must be comprised of one or more Component DER with capability smaller than 0.1 MW. This requirement facilitates the market entry of small resources that, on their own, may be unable to aggregate to meet the 0.1 MW energy market participation threshold within a single node. At the same time, restricting the multi-nodal participation model to small resources ensures that larger Component DER (*i.e.*, those with capability greater than 0.1 MW) utilize the robust nodal model. Restricting the size of the Component DER that are able to participate in a multi-nodal aggregation is a core component of the technical feasibility of this approach. Specifically, it ensures that PJM operations have complete dispatchability of Component DER that are most likely to impact a constraint and can therefore rely on them to respond to nodal LMP.
11. Second, the multi-nodal DER Aggregation Resource must *not* comprise, at a single node, aggregations of Component DER at a single primary node with capability equal to or greater than 0.1 MW. These Component DER can and should utilize the nodal aggregation model. This criteria is needed *in addition to* the first criteria, described above, because, in its absence, a multi-nodal DER Aggregation Resource could be comprised entirely of Component DER with capability well-below 0.1 MW but, in aggregate, the capability of Component DER at a *single* primary node could be significant enough to impact a constraint. In that scenario, the Component DER should be participating in a DER Aggregation Resource at the nodal level, to facilitate those Component DER participating as a robust PJM resource. This nodal DER Aggregation

Resource would be dispatchable by PJM, and can effectively be used for operational constraint control. In order to prevent “orphaned” DERs, a multi-nodal aggregation can include 0.1 MW total Component DER at a single primary node if and only if the remaining Component DER totals less than 0.1 MW. This ensures participation for every resource while maximizing the amount of DER that would be nodally dispatchable. The intent of this requirement is to maintain a “nodal where possible” approach, and guard against the proliferation of non-dispatchable DER Aggregation Resources that can impact system control.

12. Third, the multi-nodal DER Aggregation Resource must self-schedule into PJM’s energy market as *non-dispatchable*. These resources cannot be effectively dispatched given their dynamic nature and unknown impacts to congestion (*i.e.*, by definition, they are unable to respond to nodal LMP, which is the most relevant pricing signal used for constraint control). As such, they should not offer a dispatchable range, which would prevent against this resource being dispatched in PJM’s Security Constraint Economic Dispatch system based on an inaccurate price with respect to where the underlying Component DER are located (*i.e.*, the nodal location of the Component DER). This is an essential tenet of the multi-nodal model to safeguard against DER Aggregation Resource responding to a dispatch signal that can aggravate a given constraint.
13. Fourth, the total capability of all multi-nodal DER Aggregation Resources across PJM’s footprint must not exceed 167 MW. This is necessary to protect against the operational impacts of a large number of multi-nodal aggregations participating in PJM’s energy markets, bringing this limited multi-nodal option closer to a fully zonal multi-nodal approach. This restriction is necessary *in addition* to the first restriction against Component DER with capability equal to or greater than 0.1 MW and the second restriction against aggregations of small Component DER at a single node with capability equal to or great than 0.1 MW because both of these limitations would be levied at the level of a DER Aggregator. Absent an overall cap, DER Aggregators could, in sum, have substantial capability at a single primary node tied to multi-nodal aggregations. This scenario would result in a measureable amount of resources with limited dispatchability and observability *replacing* resources that are dispatchable and observable by PJM dispatch, and relied on for reliable operations and compliance with NERC standards. The 167 MW is calculated as 0.1% of expected peak load for the 2026/2027 delivery year, the expected operational date of the DER Aggregator Participation Model. While PJM continues to believe that the nodal approach is the only scalable option for DER Aggregation Resources, PJM operations has the flexibility to permit broader aggregations for the purposes of testing new models of market participation at a size that would not significantly impact LMP formation or PJM’s ability to control constraints. PJM has determined that 0.1% of peak load effectively represents this threshold and that permitting multi-nodal aggregations up to this quantity would pose no challenges to grid operations and constraint control. In short, keeping the multi-nodal participation within a 0.1% penetration level can provide confidence that PJM will be able to rely on other PJM generation to maintain compliance with NERC standards.

14. PJM recognizes that DER Aggregation Resource participation in PJM markets represents a new concept and resource type, with the potential to grow into a large portion of overall PJM generating capacity. As such, PJM maintains that the nodal aggregation approach for energy market participation is the only technically feasible construct to ensure reliable operations. However, PJM also recognizes that there will be a growth period from the model's inception until its final realized penetration level. The proposed multi-nodal DER Aggregation Resource option aims to allow both DER Aggregators and customers to pilot participation in wholesale energy markets in a manner that does not limit the flexibility of PJM operations or threaten the reliability of the system, eventually graduating to a nodal resource once it is able to fulfill its operational obligations as a wholesale resource.
15. As multi-nodal DER Aggregation Resources are established and their Component DER are nodally mapped to the transmission grid, Component DER will shift into nodal DER Aggregation Resources due to the "nodal when possible" philosophy and in turn create additional space under the cap for new Component DER entry to the market. While PJM identified many concerns with multi-nodal participation models, nodal DER Aggregation Resources are positioned to be valuable resources in support of grid reliability through clear nodal response to nodal pricing signals.
16. This concludes my affidavit.

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

**PJM Interconnection, L.L.C.**

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**Docket No. ER22-962-000**

**VERIFICATION OF DONALD BIELAK**

Donald Bielak, being first duly sworn, deposes and states on this date of September 1, 2023, that he is the Donald Bielak referred to in the foregoing document entitled "Affidavit of Donald Bielak on Behalf of PJM Interconnection, L.L.C.," that he has read the same and is familiar with the contents thereof, and that the testimony set forth therein is true and correct to the best of his knowledge, information, and belief.



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Donald Bielak  
Sr. Manager – Dispatch  
PJM Interconnection, L.L.C.

Subscribed and sworn to before me, the undersigned notary public, on September 1, 2023.



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Notary Public

My                      Commission                      expires:

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**Commonwealth of Pennsylvania - Notary Seal  
JACQUELINE COBB - Notary Public  
Montgomery County  
My Commission Expires December 20, 2023  
Commission Number 1291751**