



Continuous Model and Participation Criteria

PJM Staff

DISRS

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Continuous or Heterogeneous DER (Reduction + Injection) Payments

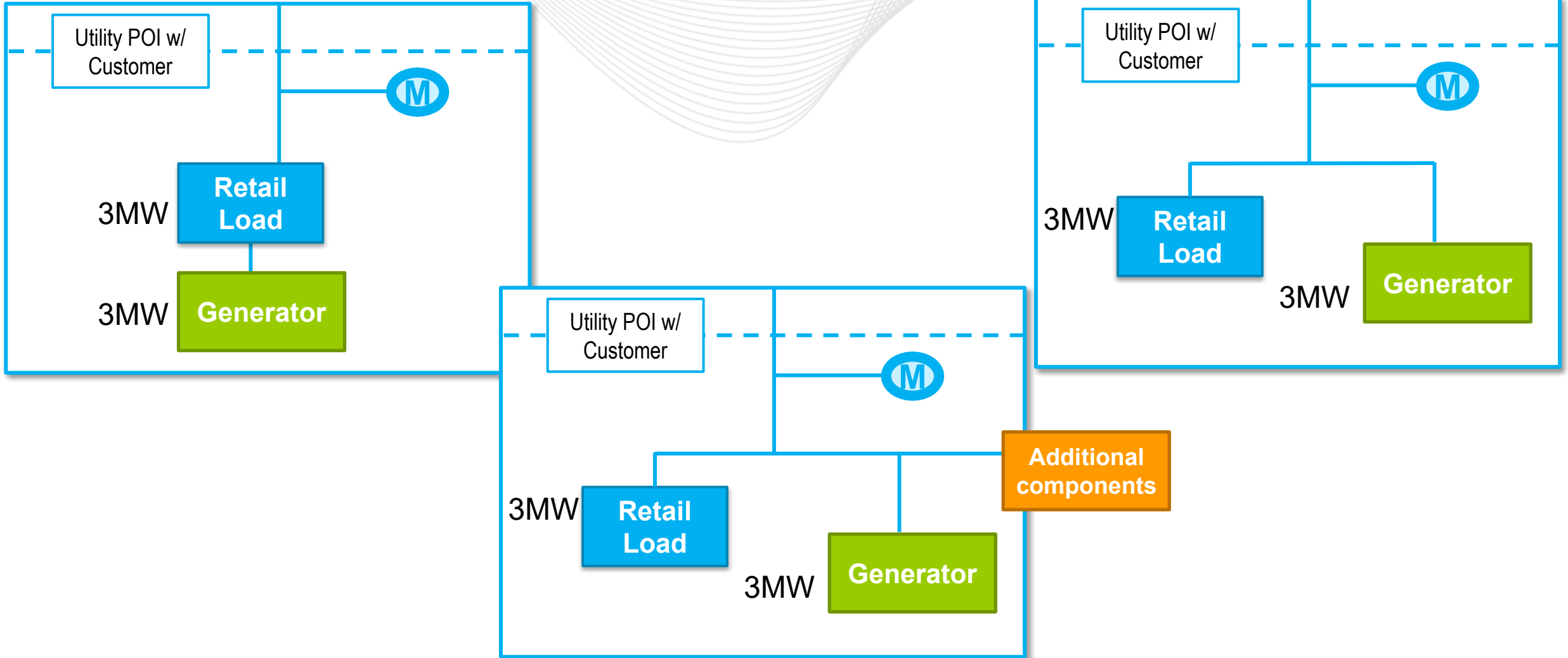
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Market Design

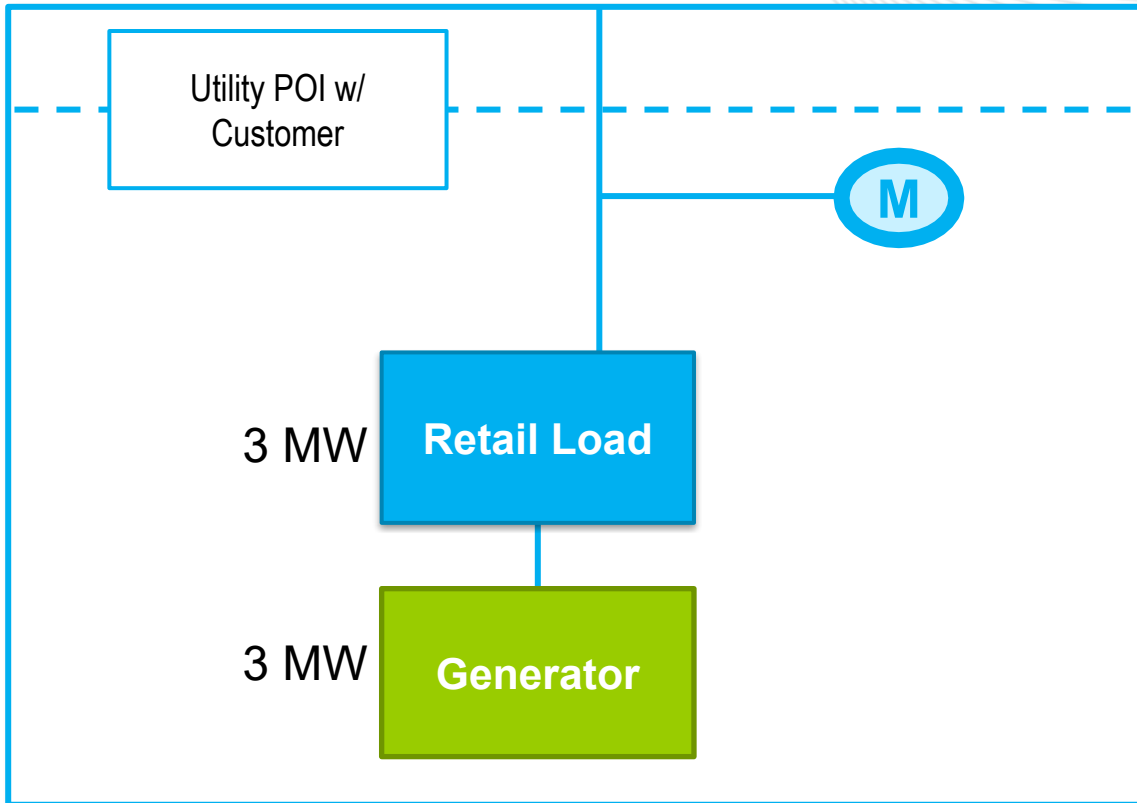
- **Paragraph 106** – However, we agree with parties that PJM’s proposal lacks the necessary detail regarding the participation of heterogeneous DER Aggregation Resources. While PJM has demonstrated that its DER Aggregator Participation Model will permit curtailing and injecting Component DER to participate 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. Proposed 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.** We find 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. **The provisions referenced do not specify how PJM will account for and settle the energy injecting portion of a heterogeneous DER Aggregation Resource, or how PJM would distinguish the injection and curtailment capability in a heterogeneous DER Aggregation Resource for the purpose of energy market participation.** Accordingly, we direct PJM to file, within 60 days of the date of this order, a further compliance filing that specifies market rules in its 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.

(n) 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.

- FERC requires PJM to “specif[y] market rules in its 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.”

Single meter setups – result in the same outcome

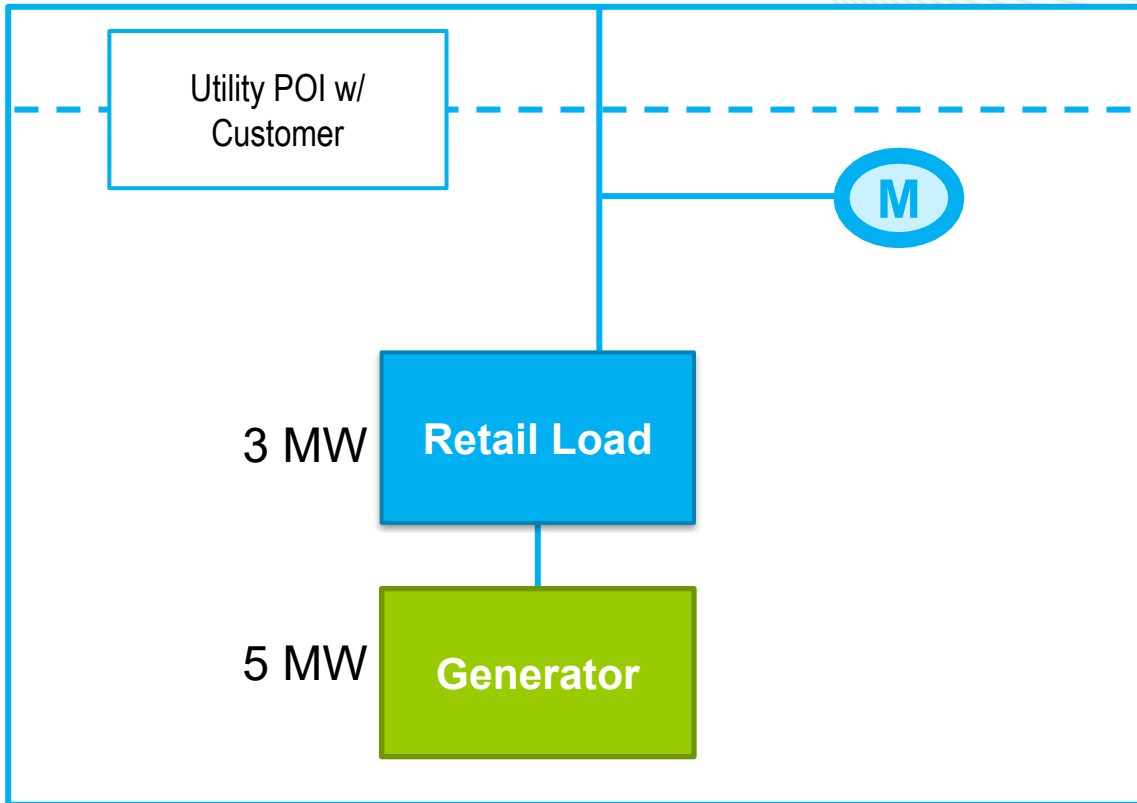




- With single meter arrangement
 - [CBL,0] Settle as Economic DR
 - [0,Injection] Settle as generation

Example	CBL	Generator Output	Meter reading	DR Revenue	Generator Revenue
Full Load	3 MWh	3 MWh	0 MWh	3 MWh	0 MWh
Partial Load	2 MWh	3 MWh	-1 MWh	2 MWh	1 MWh
No Load	0 MWh	3 MWh	-3 MWh	0 MWh	3 MWh

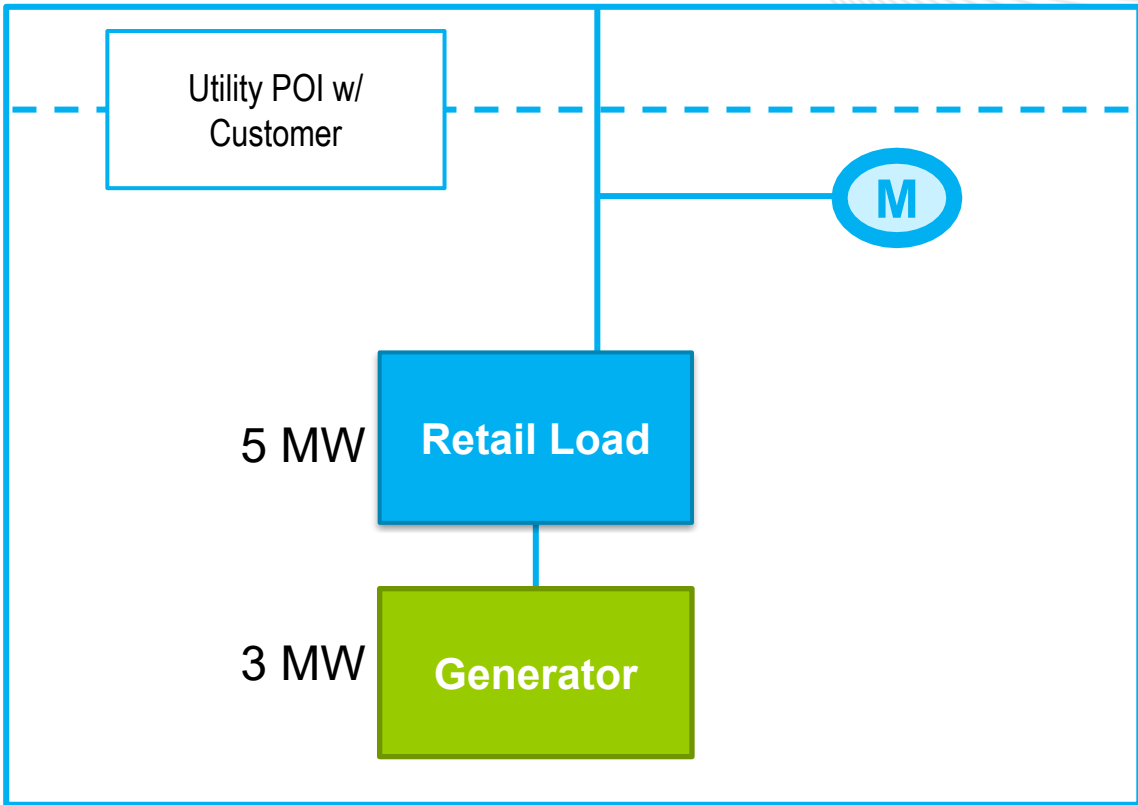
Single Meter Example – Gen Heavy



- With single meter arrangement
 - [CBL,0] Settle as Economic DR
 - [0,Injection] Settle as generation

Example	CBL	Generator Output	Meter reading	DR Revenue	Generator Revenue
Full Load	3 MWh	5 MWh	-2 MWh	3 MWh	2 MWh
Partial Load	2 MWh	5 MWh	-3 MWh	2 MWh	3 MWh
No Load	0 MWh	5 MWh	-5 MWh	0 MWh	5 MWh

Single Meter Example – Load Heavy



- With single meter arrangement
 - [CBL,0] Settle as Economic DR
 - [0,Injection] Settle as generation

Example	CBL	Generator Output	Meter reading	DR Revenue	Generator Revenue
Full Load	5 MWh	3 MWh	2 MWh	3 MWh	0 MWh
Partial Load	2 MWh	3 MWh	-1 MWh	2 MWh	1 MWh
No Load	0 MWh	3 MWh	-3 MWh	0 MWh	3 MWh

- DA Offers are put into Markets Gateway.
- Do not differentiate between Demand Response or injection MWh in Markets Gateway offer.
- Settlement process will use both DR Hub and Power Meter to capture load reduction and injections separately.

Example	DA Demand Response	DA Injection	DA Offer
Full Load	3 MWh	0 MWh	3 MWh
Partial Load	2 MWh	1 MWh	3 MWh
No Load	0 MWh	3 MWh	3 MWh



Day Ahead to Real Time Settlement: No deviations

- Resources able to perfectly forecast their CBL that follow their DA commitment.
- No deviation between DA and RT

Example	DA Commitment	RT Demand Response	RT Injection	Total RT Output	DA Revenue	RT DR Revenue	RT Injection Revenue
Full Load	3 MWh	3 MWh	0 MWh	3 MWh	$3 \text{ MWh} \times LMP_{DA}$	$0 \text{ MWh} \times LMP_{RT}$	$0 \text{ MWh} \times LMP_{RT}$
Partial Load	3 MWh	2 MWh	1 MWh	3 MWh	$3 \text{ MWh} \times LMP_{DA}$	$0 \text{ MWh} \times LMP_{RT}$	$0 \text{ MWh} \times LMP_{RT}$
No Load	3 MWh	0 MWh	3 MWh	3 MWh	$3 \text{ MWh} \times LMP_{DA}$	$0 \text{ MWh} \times LMP_{RT}$	$0 \text{ MWh} \times LMP_{RT}$

- Revenue is entirely DA
- LMP_{DA} and LMP_{RT} are the same value for DR or injection



Day Ahead to Real Time Settlement: Deviations

- Resources are not able to perfectly forecast their CBL that follow their DA commitment.
- Deviation between DA and RT

Example	DA Commitment	RT Demand Response	RT Injection	Total RT Output	DA Revenue	RT DR Revenue	RT Injection Revenue
Full Load	3 MWh	2 MWh	0 MWh	2 MWh	$3 \text{ MWh} \times LMP_{DA}$	$-1 \text{ MWh} \times LMP_{RT}$	$0 \text{ MWh} \times LMP_{RT}$
Partial Load	3 MWh	2 MWh	0 MWh	2 MWh	$3 \text{ MWh} \times LMP_{DA}$	$0 \text{ MWh} \times LMP_{RT}$	$-1 \text{ MWh} \times LMP_{RT}$
No Load	3 MWh	1 MWh	1 MWh	2 MWh	$3 \text{ MWh} \times LMP_{DA}$	$0 \text{ MWh} \times LMP_{RT}$	$-1 \text{ MWh} \times LMP_{RT}$
Extra Output	2 MWh	1 MWh	3 MWh	4 MWh	$2 \text{ MWh} \times LMP_{DA}$	$1 \text{ MWh} \times LMP_{RT}$	$1 \text{ MWh} \times LMP_{RT}$

- Revenue is DA and RT
- LMP_{DA} and LMP_{RT} are the same value for DR or injection

- Add explanation that reductions from CBL to 0 MWh are paid under economic load response rules.
- Add explanation that injections are paid under normal settlement rules.
- Load reductions will be submitted through DR Hub, while injections will be submit through Power Meter.
- Currently exploring the feasibility of one submission through DR Hub.

- (n) A DER Aggregator's DER Aggregation Resource that contains Component DER that are also load reduction resources shall ~~be accounted for and settled~~ **load reductions to 0 MWh** in accordance with Tariff, Attachment K-Appendix, section 3.3A and Operating Agreement, Schedule 1, section 3.3A. **Injections shall be accounted for and settled in accordance with the Day-ahead Energy Market and Real-time Energy Market rules.**



Participation Criteria

- **Paragraphs 306/307:** ...we find that the first three factors as well as the fifth factor identified in PJM’s tariff do not comply with the requirements of Order No. 2222.
 -the first three factors ... 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.** These factors implicate operational characteristics (the first factor), the PJM market where the DER Aggregator will participate (the second factor), and customer account numbers (the third factor), and arguably this is just information that an electric distribution company could review and verify. It is unclear how the electric distribution company will use this information in its review, and we therefore find that inclusion of these factors is inconsistent with the requirement of Order No. 2222 that the review process be transparent with specific criteria for the electric distribution companies to use when reviewing Component DER.
 - More specifically, we find that **the “operational and physical characteristics”** that an electric distribution company should be reviewing, and **what should comprise the referenced “inventory of the individual Component DER location-specific capability to reduce load and/or produce electricity,”** are **inappropriately vague.** It is likewise unclear what **“related information”** the electric distribution company should be reviewing with respect to **customer account numbers and Component DER locations.** As a result, these provisions are inconsistent with the requirement of Order No. 2222 that the distribution utility review process be transparent and provide specific review criteria.
 - Accordingly, we direct PJM to file, within 60 days of the date of issuance of this order, a further compliance filing that revises its 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 to explain why these criteria are appropriate for the PJM region, as required by Order No. 2222.

Upon receipt of notification by the Office of the Interconnection, the electric distribution company may, within 60 calendar days, review and verify, as applicable, the registration and the following information contained therein:

- 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;
- 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. ...
- v. The 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;
- vi. ...
- vii. ...

- The Tariff currently lists: a) items that the Aggregator will need to input when creating locations (for operations and transparency) and b) checks that the EDC will perform to determine whether each proposed Component DER *is capable of participating in a DER aggregation*.
 - FERC directed PJM to focus on the latter
- PJM proposes to remove from the tariff reference to specific data/other information that the Aggregator will need to input when creating locations (criteria 1-3) & replace these with one criterion that will direct the EDC to review and verify, as applicable, whether the information provided by the DER Aggregator is accurate.
 - PJM cannot enumerate in the tariff all data and information that the Aggregator will be required to input during registration
 - The current language, which was intentionally broad and not exhaustive, was deemed “inappropriately vague” by FERC
 - Replacing criteria 1-3 with one criterion that instructs EDCs to check for accuracy also responds to FERC’s concern that “it is unclear how the [EDC] will use this information in its review”
 - All specific informational and data requirements will be detailed in relevant PJM manuals

Upon receipt of notification by the Office of the Interconnection, the electric distribution company may, within 60 calendar days, review and verify, as applicable, the registration and the following information contained therein:

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

- **Paragraphs 306/307:** ...we find that the first three factors as well as the fifth factor identified in PJM's tariff do not comply with the requirements of Order No. 2222.
 - With respect to the fifth factor, the proposal addresses **whether “participation” in PJM’s markets complies with rules of any applicable RERRA. However, the Commission has exclusive jurisdiction over the wholesale markets and the criteria for participation in those markets.** Nonetheless, we continue to recognize the important role that state and local authorities play with respect to distributed energy resources and their potential aggregation. Therefore, this criterion could be compliant if it were revised to address **whether the aggregation complies with rules of any applicable RERRA.** PJM may propose such a criterion on further compliance. Accordingly, we direct PJM to file, within 60 days of the date of issuance of this order, a further compliance filing that either removes or revises this criterion in its tariff consistent with the discussion above.

Upon receipt of notification by the Office of the Interconnection, the electric distribution company may, within 60 calendar days, review and verify, as applicable, the registration and the following information contained therein:

- 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;
- 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. ...
- v. The 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;
- vi. ...

- Change language in OATT Att K-Appx Sec 1.4B as follows to comply with FERC's directive:
 - iv. ...
 - v. The DER ~~Aggregator's participation in the PJM energy, capacity, and/or ancillary service markets~~ **Aggregation** complies with the rules and regulations of any applicable Relevant Electric Retail Regulatory Authority;
 - vi. ...

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