



*Working to Perfect the Flow of Energy*

PJM Manual 11:

**Energy & Ancillary Services  
Market Operations**

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Prepared by

Forward Market Operations

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## Section 4: Overview of the PJM Synchronized Reserve Market

### 4.2.8 Demand Resources

- Demand resources providing Synchronized Reserve are required to provide metering information at no less than a one minute scan surrounding a synchronized reserve event. [Residential customers without one-minute metering may participate using the statistical sampling method detailed in Manual 19 Attachment D and subject to PJM approval.](#)
- Metering information for demand resources is not required to be sent to PJM in real time. Load data for all Synchronized Reserve events must be submitted two business days following the event day.
- Members that offer into the Synchronized Reserve market and do not provide complete, accurate and timely load data for all Synchronized Reserve events may be suspended from participating in the Synchronized Reserve Market until corrective measures are implemented and may be referred to the PJM Market Monitor and/or the FERC Office of Enforcement for further investigation as necessary.
- Demand resources are limited to providing 33% of the Synchronized Reserve requirement.
- Demand resources that are considered to be “batch load” resources are limited to providing 20% of the Synchronized Reserve requirement. If PJM determines that satisfying 20 percent of the Synchronized Reserve requirement from Batch Load demand resources is causing or may cause a reliability degradation, PJM may reduce the percentage of the requirement that may be satisfied by Batch Load demand resources in any hour to as low as 10 percent.
- Demand resources must complete initial and continuing training on Regulation and Synchronized Reserve Markets as documented in Manual 40: Certification and Training Requirements, Section 2.6: Training Requirements for demand response Resources Supplying Regulation and Synchronized Reserve.



## Section 10: Overview of the Demand Resource Participation

Welcome to the Overview of the Demand Resource Participation section of the PJM Manual Energy & Ancillary Services Market Operations. In this section you will find the following information:

- An overview description of the Demand Resource Participation in the PJM Energy Market (see “Demand Resource Participation”).
- A list of the Demand Resource Registration Requirements (see “*Demand Resource Registration Requirements*”).
- A list of the Demand Resource Energy Market Participation (see “*Demand Resource Energy Market Participation*”).
- A list of the Demand Resource Metering and Settlement Data Requirements (“*Demand Resource Metering and Settlement Data Requirements*”).

### 10.1 Overview of Demand Resource Participation

The integration of Demand Response into the PJM Markets recognizes the importance of load response to a fully functioning market as well as the affect of load response on the reliability of the grid. The purpose of these rules is to enable Demand Resources under the direction and control of Curtailment Service Providers to participate in the various PJM markets. Curtailment Service Providers (CSPs) are Members or Special Members of PJM that participate in the PJM Markets by causing Demand Resources to reduce demand.

PJM Emergency or Pre-Emergency Load Response enables Demand Resources that reduce load during emergency or pre-emergency conditions to receive payment for those reductions.

- Demand Resources in the Energy Only Option of Emergency Load Response are defined as Demand Resources that receive only an energy payment for reductions.
- Demand Resources in Full Emergency or Pre-Emergency Load Response are defined as Demand Resources that receive both an energy payment for reductions and a capacity payment.
- Demand Resources in Capacity Only Option of Emergency or Pre-Emergency Load Response are defined as Demand Resources that receive only a capacity payment for reduction.

PJM Economic Load Response enables Demand Resources to respond to PJM energy, synchronized reserve, and/or day-ahead scheduling reserve prices by reducing consumption and receiving a payment for the reduction or following PJM signal to reduce or increase load if providing regulation services.



- The **Day-ahead Option** will provide a mechanism by which any qualified market participant may offer Demand Resources the opportunity to reduce the load they draw from the PJM system in advance of real-time operations and receive payments based on day-ahead LMP for the reductions
- The **Real-time Option** will provide a mechanism by which any qualified market participant may offer Demand Resources the opportunity to commit to a reduction and receive payments based on real-time LMP for the reductions.

Energy Settlements shall be limited to demand reductions that are executed in response to the real-time and/or day-ahead LMP or as dispatched by PJM and that are not implemented as part of normal operations. Reductions that do not meet these requirements will not be eligible for settlement. Examples of ineligible settlements include, but are not limited to the following:

- Settlements based on variable demand where the timing of the demand reduction supporting the settlement did not change in direct response to the real-time and/or day-ahead LMP
- Consecutive daily settlements that are the result of a change in normal demand patterns that are submitted to maintain a CBL that no longer reflects the relevant end-use customer's demand.
- Settlements based on On-Site Generator data if the On-Site Generation is not supporting demand reductions executed in response to the real-time and/or day-ahead LMP
- Settlements based on demand reductions that are the result of operational changes between multiple end-use customer sites in the PJM footprint except that settlements based on such demand reduction shall be allowed if the demand reduction alleviates congestion.
- Settlements based on load reductions from normal operations that would have occurred without PJM dispatch, or that would have occurred absent PJM energy market compensation as approved under Order 745.

PJM shall disallow settlements for demand reductions that do not meet the requirements set forth above. If the CSP continues to submit settlements for demand reductions that do not meet the requirements set forth above then PJM shall suspend the CSP's Energy Market activity and refer the matter to the FERC Office of Enforcement.

## 10.2 Demand Resource Registration Requirements

Curtailed Service Providers shall register Demand Resources that choose to participate in the PJM Energy, Capacity, Synchronized Reserve, Day-Ahead Scheduling Reserve or Regulation Market according to the rules and requirements set forth below. A CSP is required to have effective agreement with a customer to register a location.

### 10.2.2 Curtailment Service Providers



The following business rules apply to Curtailment Service Providers:

- Prior to participating in the PJM Markets, Curtailment Service Providers must complete a registration in the appropriate PJM eSuite application which identifies the specific location(s) based on the unique EDC account number that will participate and their associated load reduction capability. Curtailment Service Providers shall maintain the accuracy of the registration information provided to PJM for each demand resource and each time the CSP registers the location or extends the registration, the CSP will review all information to ensure it is reasonably accurate and update as necessary. On a periodic basis, PJM may request supporting information from the CSP to verify that the information provided by the CSP is reasonably accurate.
- In order to register demand resources all specific information as defined in the eLRS User Guide shall be provided including the following:
  - Business Segment - CSPs shall classify locations according to the location's primary purpose or business use. CSP should first determine if the location's business use falls under one of the following primary categories: Hospitals, Industrial / Manufacturing, Office Building, Residential, Retail Service, Correctional Facilities or Schools. In cases where the location does not fit into one of the primary categories the CSP shall select from one of the following categories: "Agriculture, Forestry and Fishing", "Mining", "Transportation, Communications, Electric, Gas and Sanitary Services" or "Services". A description of each category will be included in the appropriate PJM system user guide.
  - Load Reduction Method and associated Capability - The CSPs shall provide for each location the load reduction method and the associated load reduction kilowatts capability. Load reduction methods indicate the type of electrical equipment that will be controlled to provide the demand response activity and include: Heating, Ventilation and Air Conditioning (HVAC), Lighting, Refrigeration, Manufacturing, Water Heaters, Batteries, Plug Load and Generation. In cases, where multiple on-site generators are behind the meter, CSPs should report aggregate load reduction capabilities for all generation units.

A Plug Load represents an electronic device that's plugged into a socket, which is not already represented by the methods described above. Examples of Plug Load include IT Peripherals, such as large computers, monitors, printers, routers, copiers and scanners or appliances such as washers, dryers or dishwashers.

The CSP shall provide the load reduction kilowatt capability for each method which represents a reasonable estimate of the location's expected hourly energy load reduction (at the retail meter) that will be performed during a system emergency when wholesale energy prices are high and the resource participates in the wholesale market. The load reduction kilowatts capability may be significantly different than the capacity commitment or the economic energy offered into wholesale market on a daily basis. The load reduction



capability should not reflect the entire load for the location unless the location expects to reduce all loads during a PJM emergency when participating in the wholesale capacity and/or energy market. If Generation will be used to reduce all of the load at the location and the location will reduce load with other load reduction methods then the Generation load reduction capability should reflect the expected load after the other load reduction methods have been deployed (this will allow the sum of each load reduction method capability to reflect the total load reduction capability for the location).

The CSP shall report the following generation attributes for each generation unit at the location. Only locations with on-site generation that will be used to provide the load reduction and have environmental restrictions as defined and required by applicable local, state or federal law, ordinances and regulations, that require emergency conditions to operate may qualify as an Emergency Demand Resource. :

**On-Site Generator Type** - CSPs shall provide PJM with the type of on-site generation used for load reduction. On-Site Generator types are: Internal Combustion Engine, Combustion Turbines, Steam Engines and Cogeneration units (this also include Central Heat and Power units).

**Generator Fuel Type** - Locations that use generators, in whole or in part as a load reduction method shall provide PJM with the primary fuel type used for each generator which includes: Coal, Diesel, Natural Gas, Oil, Gasoline, Kerosene, Propane, Wood, Landfill Gases and Waste products. In cases where the on-site generator has a mixed fuel type, CSPs should report on the primary fuel source as the on-site generator fuel type.

**Generator Vintage** - The year the generator was built (included on nameplate). If you do not know the exact year the CSP should use reasonable estimate.

**Generator Retrofit Year** - If the generator was retrofit for pollution control equipment please include the year of the retrofit or a reasonable estimate of year if specific year is not available

**Nameplate Capacity** - MW rated capacity for the generator

**Permit Status** - The current status of environmental permits for the generator where:

- "Available" - indicates that the CSP represents to PJM that the end-use customer generator has all the Local, State and Federal permits required to operate in the PJM Market as a demand response resource. Unless notified otherwise, the Office of the Interconnection shall deem such representation applies to each time the On-Site Generator is used to reduce demand to participate in the PJM markets and that the On-Site Generator is being operated consistent with all applicable permits.
- "Not Available" - indicates that the CSP represents to PJM that the end-use customer generator does not have the required Local, State and Federal permits



- required to operate in the PJM Market as a demand response resource. The CSP shall enter a load reduction value of zero, until all required permits become available.
- "Permit Application in Progress" - indicates that the CSP represents to PJM that one or more of the required Local, State and/or Federal permits for the end-use customer generator are pending and are expected to be received prior to the effective date of registration. CSP will terminate the registration, if the on-site generator is the only source for the demand response activity, and update the status if necessary permits are not received prior to such end-use customer generator's registration effective date.
  - "Not Applicable" – indicates that the CSP represents to PJM that one or more of the Local, State and/or Federal permits for the end-use customer generator are not required for generator to participate as a demand resource and all other necessary permission from appropriate Local, State and Federal environmental agencies has been received.
  - Permit Type – The permit type indicates whether on-site generators can run during emergency or non-emergency conditions.
    - "Emergency Only" – An "Emergency Only" permit type indicates that the on-site Generator has the Local, State and Federal permits required to operate in the PJM Market as a demand response resource during grid emergency conditions. This also indicates that such location may qualify as Emergency resource instead of being a Pre-Emergency resource.
    - "Non-Emergency" – A "Non-Emergency" permit type indicates that the on-site Generator has the Local, State and Federal permits required to operate in the PJM Market as a demand response resource during emergency and non-emergency grid conditions.
  - -Economic registration must have the same EDC, LSE, Transmission zone and Pricing point where each location is defined as a unique EDC account number and may be included on the registration subject to aggregation rules in this manual. Emergency registrations, ~~and~~ Economic Regulation Only registrations, and Economic registrations for Residential customers that do not participate in the Day Ahead market must have the same EDC and Transmission zone.
  - If CSP has Economic Regulation Only registration then Economic registration will only allow same location(s) to participate in energy market ("Economic (Energy Only)" in chart above) and they will not be permitted to participate in the SR or DASR market.
  - If CSP has Economic registration with any certified ancillary service (SR, DASR or Reg) then Economic Regulation Only registration may not be submitted.
  - Econ Regulation Only CSP must be able to manage regulation for location whether or not the location has been called to provide capacity during an emergency or pre-



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emergency situation or is providing a load reduction as an economic resource in the energy market.

- Economic demand resource registration may be associated with a dispatch group. The dispatch group will allow the Curtailment Service Provider to have one real time or Day-Ahead energy market bid for the entire dispatch group.
- The dispatch group must have the registrations with the same Transmission Zone and energy market pricing point.
- Registrations that participate in ancillary service markets will not be permitted to use a dispatch group unless approved by PJM.
- Registration cannot be in a dispatch group and as a standalone registration. This will ensure that each registration is only available to bid once in the market and avoid duplications.
- Registrations must be confirmed before they may be added to a dispatch group.
- Registration that clears in Day-Ahead market is not allowed to be assigned to dispatch group on same day it cleared in Day-Ahead market. If CSP does try to assign to dispatch group on such day then PJM will remove (because this may create conflict between single registration that cleared in Day-Ahead market and dispatch group that may be dispatched in real time market for same Operating Day).
- The CSP is responsible for ensuring that at least 1 registration is in a dispatch group when bid in the Day-Ahead or Real Time energy market through the appropriate PJM system.
- Demand resources may be registered simultaneously as Economic Load Response Resources and Emergency or Pre-Emergency Load Response Resources.
- Demand resources may switch CSPs. The CSP registering the switching Demand resource shall provide PJM with the registration information of the resource. Registrations may only be submitted when there is an effective contract with the customer for the term and product on the registration. CSP will check their records to ensure they have an effective contract to support the registration and contact customer as appropriate before they submit the registration. PJM will treat the switching as a new registration. If the current registration is a full emergency or full Pre-Emergency registration and the Delivery Year has begun, the new registration will be denied. Both new and current CSPs will be notified by PJM of the switch and will be given 5 business days to affirm they have a valid contract with the end-use customer for the term and product as included on their registration and notify PJM through the appropriate system that the customer has affirmed the contract. After 5 business days, if only one CSP has affirmed their registration in the appropriate PJM system, that CSP's registration will continue and the other registration will be terminated as soon as possible. If both CSPs have affirmed their registration, both registrations will be terminated as soon as possible. In order to accommodate day-ahead load response the switch or termination will become effective at 12:01 a.m. of the third business day after the previous registration is terminated or deemed terminated by PJM. The previous registration will remain active for the sole purpose of settlement of load reductions that occurred before the switch became effective.





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- Demand Resource intending to run an On-Site Generator in support of local load represents to PJM that it holds all applicable environmental and use permits for running those generators by submitting a registration. Continuing participation will be deemed as a continuing representation by the owner that each time its On-Site Generator is run it complies with all applicable permits, including any emissions, run-time limit or other constraint on plant operations that may be imposed by such permits.
  - To assist CSPs in obtaining the electric usage information of the end-use customer the following Customer Usage Information Authorization form has been developed.
  - A Curtailment Service Provider shall not submit a request to be an Emergency resource (instead of Pre-Emergency) unless it has done its due diligence to confirm that the Demand Resource meets the requirements and has obtained from the end-use customer documentation supporting the exception request. The Curtailment Service Provider shall provide the Office of the Interconnection with a copy of such supporting documentation within three (3) business days of a request therefor. Failure to provide such supporting documentation by the deadline shall result in the Demand Resource being classified as a Pre-Emergency resource.



## 10.4 Demand Resource Metering and Settlement Data Requirements

The settlements submitted to PJM by Curtailment Service Providers must conform to the following requirements for data, including metered data, and Customer Baseline Load (CBL) calculations. All settlement related calculations for economic and emergency demand resources are provided in Manual 28.

### 10.4.1 Metered Data

- Demand Resources must be equipped with interval meters recording electrical usage at the EDC account level. The interval of data collection must be sufficient to provide PJM with hourly, one minute or real time load data as applicable for wholesale market. Residential Direct Load Control aggregates may have interval meters installed on a statistical sample of EDC accounts per Manual 19 Attachment D and subject to PJM approval.
- For load reduction that is not metered directly by PJM, Curtailment Service Providers are responsible for forwarding the appropriate meter data (as defined in this Manual) to PJM within 60 days of the reduction. Participants submitting a settlement for an energy payment when load reduction complies with a synchronized reserve event or regulation assignment must use data provided by the load meter. This data shall be forwarded through the appropriate PJM system.
- If the meter data files are not received within 60 days, no payment for participation is provided.
- Load data must be provided for all hours of the day and for all days necessary for PJM to calculate the CBL for settlements or to measure compliance as necessary.
- When on-site generation is used solely to enable the Participant to provide demand reductions then the CSP may provide qualified meter generation output data, upon approval by PJM, from the on-site generation for each hour of the event day instead of actual load metered data. Provision of hourly meter data from the on-site generation will be deemed a certification by the CSP that the on-site generation was not used for any purpose other than to support the load reduction during the event day. If the On-Site Generator is used on a regular basis for normal operations then the CSP may provide qualified meter data from the On-Site Generator for each hour of the event provided the amount of generation run to provide Economic Load Response can be quantified in a manner that is acceptable to PJM. For example, if a 5 MW On-Site Generator that normally provides 3 MW boosts its output to 5 MW in response to LMPs the CSP will be eligible to receive a demand response energy settlement for the additional 2 MW of output.
- Meter data will be forwarded to the EDC ~~and LSE~~ upon receipt, and these parties will then have ten (10) business days to review accuracy and provide feedback to PJM.

Comment [A1]: Cleanup from a previous change



- Objection by the EDC ~~or the LSE~~ to the Meter Data shall be clearly set forth in the Comments related to the Settlement Data. The CSP shall correct and re-submit the Settlement Data within 2 business days. The objecting EDC ~~and/or LSE~~ shall have 5 business days to review the re-submitted Settlement Data or PJM will assume acceptance.
- All load reduction data are subject to PJM Market Monitoring Unit audit.

**Comment [A2]:** Cleanup from a previous change



## 10.5 Aggregation for Economic and Emergency Demand Resources

The purpose for aggregation is to allow the participation of end-use customers in the energy market that can provide less than 100 kW of demand response when they currently have no alternative opportunity to participate on an individual basis or can provide less than 100 kW of demand response in the day-ahead scheduling reserve (DASR), synchronized reserve (SR) or regulation (REG) markets when they currently have no alternative opportunity to participate on an individual basis. An aggregation shall meet the following requirements:

- If the aggregation will only provide energy to the market then only 1 end use customer within the aggregation shall have the ability to reduce more than 99kw of load unless the CSP, LSE and PJM approve. If the aggregation will provide a DASR or SR to the market then only 1 end use customer within the aggregation shall have the ability to reduce more than 99kw of load unless the CSP, LSE and PJM approve. If the aggregation will provide Regulation Only through and Economic Regulation Only registration to the market then only 1 end use customer within the aggregation shall have the ability to reduce more than 99kw of load unless the CSP and PJM approve.
- All end-use customers in an ~~economic aggregation, except for an Emergency and Pre-Emergency registration and Economic Regulation Only registration~~ shall be served by the same electric distribution company and Load Serving Entity (LSE) and have the same energy pricing point. All end use customers in an Emergency and Pre-Emergency registration, ~~Economic registration of residential customers not participating in the Day Ahead market~~, and Economic Regulation Only registration shall be served by the same electric distribution company and located in the same transmission zone. If the aggregation will provide synchronized reserves, all customers in the aggregation must also be part of the same synchronized reserve sub-zone.
- All end-use customers in an aggregation that settle at Transmission Zone, existing load Aggregate, or node prices shall be located in the same Transmission Zone, existing load Aggregate, or at the same node except for an Economic Regulation Only registration.
- Each end-use customer site must meet the requirements for market participation by a demand resource except for the 100 kW minimum load reduction requirement for energy and ancillary services.
- An end use customer's participation in the energy and ancillary service markets shall be administered either under one economic registration or if only providing Regulation service then with and Economic Regulation Only registration and an Economic (Energy Only registration) as outlined in this manual.

### 10.5.1 Calculations for the weighted average line loss factor



- When all end-use customers in a Registration are not subject to the same line loss factor, the factor for the Registration shall be the registration load reduction weighted average of the factors for end-use customers in an aggregation.
- PJM shall calculate the Ratio Share for each end-use customer as the percentage share of the summation of the individual anticipated load reduction capabilities (Total kW).
- PJM shall calculate the Weighted Average line loss factor (WA LF) by multiplying the Ratio Share times the loss factor (LF) for each end-use customer and totalizing the results. The WA LF shall represent the loss factor of the Registration.
- PJM shall provide the calculation of all load weighted values and their supporting data to the LSE and CSP at the time of registration.

Customer	1	2	3	Total
kW	32.02	22.46	50.91	105.38
Ratio Share	30.38%	21.31%	48.31%	100.00%
G&T \$	0.0500	0.0660	0.0890	
LF	1.0680	1.0790	1.0900	
WA G&T \$	0.0152	0.0141	0.0430	0.0722
WA LF	0.32448	0.22995	0.52654	1.08097

### 10.5.2 Settlement for Aggregation

All end-use customers in the Registration are considered to have individually participated in each curtailment event if cleared in Day-Ahead market -or dispatched by PJM in Real Time market for the Registration. All supporting details as outlined below will be available to the LSE after the settlement is submitted by the CSP, except where the end-use customers in the registration are not required to have the same LSE.

- Registration Customer Baseline (CBL) based on the sum of the each end use customer's meter data where each end use customer is defined as a unique EDC account number.
- Meter data for each end use customer in the aggregation, except for non-interval metered residential Direct Load Control registrations, where a statistical sample of end use customers may be used for meter data, in accordance with PJM Manual 19 Attachment D.
- Metered Load - Each individual end-use customer in the aggregation will have its own metered load and the summation of the individual metered loads will represent the Registration metered load. Non-interval metered residential Direct Load Control registrations may use a statistical sample of end-use customers' meter data to



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[represent the Registration metered load in accordance with PJM Manual 19 Attachment D.](#)

- Weighted Average Loss Factor - The load reduction weighted average loss factor shall be the value calculated for registration.