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PJM Manual 28:

Operating Agreement Accounting

Revision: ~~724~~

Effective Date: ~~June 1, 2015~~

Prepared by:

Market Settlements Development
Department

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PJM Manual 28: Operating Agreement Accounting

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-
- Ray Fernandez, Manager
- Market Settlements Development

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- ~~Effective 6/1/2015, changes to section 5 to include the impact of load reconciliation MWh in the settlement of balancing operating reserve deviation charges and section 12 to include the extension for submitting monthly meter error corrections.~~

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Introduction

- Welcome to the ***PJM Manual for Operating Agreement Accounting***. In this Introduction, you will find information about PJM Manuals in general, an overview of this PJM Manual in particular, and information on how to use this manual.

About PJM Manuals

- The PJM Manuals are the instructions, rules, procedures, and guidelines established by the PJM for the operation, planning, and accounting requirements of PJM and the PJM Energy Market. The manuals are grouped under the following categories:
 - Transmission
 - PJM Energy Market
 - Generation and transmission interconnection
 - Reserve
 - Accounting and Billing
 - PJM administrative services
- For a complete list of all PJM Manuals, go to www.pjm.com and select “Manuals” under the “Documents” pull-down menu.

About This Manual

- The ***PJM Manual for Operating Agreement Accounting*** is one of a series of manuals within the Accounting and Billing set of manuals. This manual focuses on the accounting for energy with the PJM Energy Market. It establishes the basis for the charges and credits for the purchase and sale of energy and related services.
- The ***PJM Manual for Operating Agreement Accounting*** consists of 21 sections. The sections are listed in the table of contents beginning on page ii.

Intended Audience

- The intended audiences for this PJM Manual for Operating Agreement Accounting are:
 - PJM Members and Transmission Customers
 - Other Control Areas
 - External auditors, lawyers, and regulators
 - PJM settlements staff and audit staff
 - PJM customer relations and training staff

References

- The references to other documents that provide background or additional detail directly related to the ***PJM Manual for Operating Agreement Accounting*** are:
 - PJM Manual for [**Open Access Transmission Tariff Accounting \(M-27\)**](#)
 - PJM Manual for [**Balancing Operations \(M-12\)**](#)
 - PJM Manual for [**Billing \(M-29\)**](#)
 - PJM Manual for [**Energy & Ancillary Services Market Operations \(M-11\)**](#)
 - PJM Manual for [**Administrative Services for the PJM Interconnection Agreement \(M-33\)**](#)
 - Operating Agreement of PJM Interconnection, L.L.C.
 - PJM Open Access Transmission Tariff

Using This Manual

- We believe that explaining concepts is just as important as presenting the procedures. This philosophy is reflected in the way we organize the material in this manual. We start each section with an overview. Then, we present details, procedures or references to procedures found in other PJM manuals.

What You Will Find In This Manual

- A table of contents that lists two levels of subheadings within each of the sections
- An approval page that lists the required approvals and a brief outline of the current revision
- Sections containing the specific guidelines, requirements, or procedures including PJM actions and PJM Member actions
- A section at the end detailing all previous revisions of this PJM manual

Section 1: Market Overview

- Welcome to the *Market Overview* section of the ***PJM Manual for Operating Agreement Accounting***. In this section, you will find the following information:
 - A description of the PJM Energy Market accounting services (see “Market Accounting Overview”).
 - A description of PJM Market Settlements Accounting Input Data (see “Accounting Input Data”).

1.1 Market Accounting Overview

- There are several services within the PJM Energy Market for which PJM calculates charges and credits that are allocated among the PJM Members. PJM provides accounting for the following services that are described in detail in the other sections of this manual.
 - Spot Market Energy — Energy bought or sold by PJM Members through the PJM Energy Market.
 - Transmission Congestion — The increased cost of energy delivered when the Transmission System is operating under constrained conditions.
 - Transmission Losses — Energy requirements in excess of load requirements due to the energy consumed by the electrical impedance characteristics of the Transmission System.
 - Regulation — The capability of a specific resource with appropriate telecommunications, control, and response capability to increase or decrease its output in response to a regulating control signal (see the PJM Manual for Balancing Operations).
 - Synchronized Reserve – The capability of a specific resource with appropriate telecommunications, control, and response capability to increase output (or reduce consumption) in response to a synchronized reserve event and/or operate at a point that deviates from economic dispatch (including condensing mode) to provide 10-minute reserve (see the PJM Manual for Balancing Operations).
 - Non-Synchronized Reserve – The capability of a specific non-emergency generation resource with appropriate telecommunications, control, and response capability to increase output from an offline state in response to a non-synchronized reserve event to provide 10-minute reserve (see the PJM Manual for Balancing Operations).
 - Operating Reserve — The amounts of generating Capacity scheduled to be available for specified periods of an Operating Day to ensure the reliable operation of PJM.
 - Reactive Services — The amounts of generation altered by PJM to maintain reactive reliability.

- Synchronous Condensing — The instructions to generators to operate in synchronous condensing mode for reasons other than reactive support or synchronized reserve to ensure the reliable operation of PJM.
- Emergency Energy — Energy bought from other Control Areas or sold to other Control Areas by PJM due to Emergencies either within PJM or within the other Control Areas.
- PJM Emergency Load Response — The Emergency Load Response Program is designed to provide a method by which end-use customers may be compensated by PJM for voluntarily reducing load during an emergency event.
- PJM Economic Load Response — The Economic Load Response Program is designed to provide incentive to end-use customers or Curtailment Service Providers (“CSP”) to enhance the ability and opportunity for reduction of consumption when PJM Locational Marginal Prices (“LMP”) are high.
- Metering Reconciliation — Metering errors and corrections that are reconciled at the end of each month by a meter error correction charge adjustment.
- Inadvertent Interchange — Differences between hourly net actual energy flows and net scheduled energy flow into or out of the PJM control area.
- Unscheduled Transmission Service — Service that PJM Members can provide to or receive from the New York ISO and are credited or charged according to the Operating Agreement.
- Ramapo PAR Facilities — Carrying charges collected from PJM Mid-Atlantic Control Zone transmission owners paid to the New York ISO for the Phase Angle Regulators (PARs) at Ramapo and charged according to the Operating Agreement.
- Financial Transmission Rights Auction — market participants may purchase/sell FTRs by participating in the Annual and Monthly auctions.
- Auction Revenue Rights — ARRAs are the mechanism by which the proceeds from the FTR auctions are allocated.

- These services are applicable to the different types of market participation, as shown in Exhibit 1. Each service is further broken down in the billing statement (see the *PJM Manual for Billing*).

	MARKET BUYERS	MARKET SELLERS	TRANSMISSION CUSTOMERS
Spot Market Energy	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Regulation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Operating Reserves	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Transmission Congestion	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Transmission Losses	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Emergency Energy	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Meter Reconciliation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Unscheduled Transmission Service	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Capacity Credit Market	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Financial Transmission Rights	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Auction Revenue Rights	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Exhibit 1: Types of PJM Services

- The PJM Energy Market accounting is designed to operate on a balanced basis. That is, the total amount of the charges equals the total amount of the credits; there are no residual funds. With certain exceptions, each of the services also operates on a balanced basis. That is, the charges and credits for a particular service, such as regulation, offset each other exactly. In certain cases, charges in excess of credits, or vice versa, in one service are used to offset the costs of providing another service.

1.2 Accounting Input Data

- At the end of each operating hour, PJM collects information regarding actual operations during the hour. This information is recorded either by the PJM dispatchers or by automated systems. The market accounting processes use this information as input data. Other accounting input data is provided from various systems and databases. This information includes data describing PJM Members' installed generating resources, scheduling information for PJM Members' transactions, and Transmission System parameters, such as loss factors determined annually by PJM system planning staff. The market accounting processes use this information as described in the following sections of this manual

Section 2: Interface Pricing

- Welcome to the *Interface Pricing* section of the ***PJM Manual for Operating Agreement Accounting***. In this section, you will find the following information:
 - An overview of the interface pricing settlements business rules (see “Business Rules for Interface Pricing”).

2.1 Business Rules for Interface Pricing

- Market Participants have the ability to transact energy in-to, out-of or through the PJM RTO (see OASIS – Regional Transmission and Energy Scheduling Practices for details on the PJM processes for facilitating the transaction and scheduling process). The source and sink pricing assignments for these external transactions are determined using mappings that use a combination of the ExSchedule system source and sink selection, the NERC Tag, and the OASIS reservation.
 - For Day-ahead export (out-of PJM RTO) transactions where the source and sink on the OASIS are the same, the source and sink price is assigned based on the Export Pricing Point selected by the customer in the ExSchedule system. Where the source and sink are not the same, the source price is assigned based on the source of the OASIS reservation being used, while the sink price is the Export Pricing Point selected by the customer in the ExSchedule system.
 - For Real-time export (out-of PJM RTO) transactions where the source and sink on the OASIS are the same, the source and sink price is assigned based on the sink of the NERC Tag and the applicable interface pricing mapping*. Where the source and sink on the OASIS are not the same, the source price is assigned based on the source of the OASIS reservation being used, while the sink price is based on the sink of the NERC Tag and the applicable interface pricing mapping*.
 - For Day-ahead import (in-to PJM RTO) transactions using a Spot-In OASIS reservation, both the source and sink prices are based on the Import Pricing Point selected by the customer in the ExSchedule system.
 - For Day-ahead import (in-to PJM RTO) transactions using an OASIS reservation (other than a Spot-In OASIS reservation) where the source and sink on the OASIS are the same, the source and sink price is assigned based on the Import Pricing Point selected by the customer in the ExSchedule system. Where the source and sink are not the same, the source price is based on the Import Pricing Point selected by the customer in the ExSchedule system, while the sink price is based on the sink of the OASIS reservation being used.
 - For Real-time import (in-to PJM RTO) transactions using a Spot-In OASIS reservation, both the source and sink prices are based on the source of the NERC Tag and the applicable interface pricing mapping*.
 - For Real-time import (in-to PJM RTO) transactions using an OASIS reservation (other than a Spot-In OASIS reservation) where the source and sink on the OASIS are the same, the source and sink price is assigned based on the source

Section 6: Synchronized Reserve Accounting

- Welcome to the *Synchronized Reserve Accounting* section of the **PJM Manual for Operating Agreement Accounting**. In this section, you will find the following information:
 - A description of how Synchronized Reserve are provided and accounted for in the PJM Energy Markets (see “*Synchronized Reserve Accounting Overview*”).
 - How credits are calculated for providers of Synchronized Reserve (see “*Credits for Synchronized Reserve*”).
 - How the total cost of Synchronized Reserve is allocated (see “*Charges for Synchronized Reserve*”).
 - How Synchronized Reserve charge reconciliations are calculated (see “*Reconciliation for Synchronized Reserve Charges*”).

6.1 Synchronized Reserve Accounting Overview

- Accounting for Synchronized Reserve is performed on an hourly basis. Synchronized Reserve shall be supplied from resources located within the metered boundaries of PJM. Resources participating in the reserve market are divided into two tiers. Tier 1 is comprised of all those resources on-line following economic dispatch and [capable to-of reliably ramping up from their current output in response to a synchronized reserve event, or Demand Resources capable of reducing load within 10 minutes](#). Tier 2 consists of the additional resources that are synchronized to the grid and operating at a point that deviates from economic dispatch (including condensing mode) to provide additional synchronized reserve not available from Tier 1 resources. Synchronized Reserve resources include generators and demand side response resources.
 - The total PJM Synchronized Reserve Requirement is defined as the amount of 10-minute reserve that must be synchronized to the grid in accordance with the applicable NERC Council standards.
- ~~— Tier 1 synchronized reserve credits are awarded to all resource owners whose resources increased output or decreased consumption in response to a synchronized reserve event (with the exception of those resources that were assigned Tier 2 synchronized reserve). Effective 10/1/2012, Tier 1 synchronized reserve resources are also compensated [the Synchronized Reserve Market Clear Price when the Non-Synchronized Reserve Market Clear Price is non-zero and if the resource opts into a Tier 1 Obligation](#). Tier 2 synchronized reserve credits are awarded to all resource owners that have assigned self-scheduled or pool-scheduled synchronized reserve.~~
- [Tier 1 Actual Estimate MW is defined as the lesser of the Synchronized Reserve Ramp Rate adjusted by the Degree of Generator Performance, multiplied by 10 minutes or Synchronized Reserve maximum MW minus the -MW output reported in](#)

Power Meter. The Synchronized Reserve Ramp Rate and the Synchronized Reserve maximum MW are obtained from eMKT.

- Tier 1 Estimate MW is defined as the 10 minute ramping estimated for the resource by the RT SCED application, as detailed in Manual 11.
 - Tier 1 Response MW is defined as the difference between the lowest telemetered generator output 1 minute before and 1 minute after the start of the event and the greatest telemetered generator output between 9 and 11 minutes after the start of the event.
 - The synchronized reserve energy premium price is defined as the average of the 5-minute LMPs calculated during the synchronized reserve event plus \$50/MWh.
- ~~— A refund will be owed when an obligation is not met by a resource with a Tier 1 Performance Obligation during a synchronized reserve event. Individual units have the option to opt out of having a Tier 1 Performance Obligation on an hourly basis in real-time. Units that opt out of a Tier 1 Performance Obligation will not be paid the Synchronized Reserve Market Clearing Price when the Non-Synchronized Reserve Market Clearing Price is non-zero and no event occurs, but may be compensated for responding during an event.~~
- ~~— Prior to 10/1/2012, Tier 1 synchronized reserve credits are equal to the integrated increase in MWh output or decrease in MWh of consumption from each resource over the length of a synchronized reserve event times the synchronized energy premium less the hourly integrated LMP. The synchronized energy premium is defined as the average of the 5-minute LMPs calculated during the synchronized reserve event plus \$50/MWh.~~
- ~~— Effective 10/1/2012, when the Non-Synchronized Reserve Clearing Price is zero Tier 1 synchronized reserve credits are equal to the integrated increase in MWh output or decrease in MWh of consumption from each resource over the length of a synchronized reserve event times the synchronized energy premium less the hourly integrated LMP. The synchronized energy premium is defined as the average of the 5-minute LMPs calculated during the synchronized reserve event plus \$50/MWh.~~
- ~~— Effective 10/1/2012, when the Non-Synchronized Reserve Clearing Price is non-zero Tier 1 synchronized reserve credits are equal to the lesser of the integrated increase in MWh output or decrease in MWh of consumption from each resource over the length of a synchronized reserve event or the Tier 1 estimate attributed to the resource multiplied by the Synchronized Reserve Market Clearing Price. During hours where no synchronized reserve event occurs, the Tier 1 resource will be compensated for the Tier 1 estimated amount for only those resources that can reliably provide Synchronized Reserve service per the rules in Manual 11, Section 4.2.1 Synchronized Reserve Eligibility.~~
- The synchronized reserve offer price for Tier 2 resources will be capped at a maximum value of the unit's Operating and Maintenance cost (as determined by the Cost Development Task Force) plus \$7.50/MWh.
 - Generator resources on-line and providing Tier 2 are made eligible for make-whole payments to recover applicable start-up, no-load and minimum energy costs in the Balancing Operating Reserve billing line item. Demand response resources which

respond to a synchronized reserve event, and are eligible for make-whole payments to recover shutdown cost will be made-whole in the Operating Reserve for Load Response billing line item.

- Resources that are assigned regulation when a synchronized reserve event is initiated will be compensated based on the amount of response provided beyond their regulation commitment, as well as for any response in excess of their regulation high limit or economic maximum (whichever is lower). Additional details can be found in PJM Manual 11, Section 4.2.11.
- Each PJM Member LSE that is not part of an agreement to share reserves with external entities subject to the requirements in NERC Reliability Standard BAL-002 incurs a synchronized reserve obligation based on their hourly real-time load ratio share and applicable reserve zone's requirements during that hour. During hours when the Synchronized Reserve Clearing Price is the same throughout the reserve zone, an LSE's synchronized reserve obligation is equal to its real-time load ratio share times the amount of synchronized reserve assigned for the entire reserve zone. During hours when congestion causes the Synchronized Reserve Clearing Price to separate, each LSE's synchronized reserve obligation is equal to its real-time load ratio share within its reserve zone or sub-zone and the amount of synchronized reserve assigned in that reserve zone or sub-zone.
- Participants may fulfill their synchronized reserve obligations by: owning Tier 1 resources from which PJM obtains synchronized reserve, entering bilateral arrangements with other PJM market participants or purchasing synchronized reserve from the PJM synchronized reserve market.

6.2 Credits for Synchronized Reserve

—At the end of each hour, PJM calculates the credits due each PJM Member for Synchronized Reserve.

PJM Actions:

- PJM retrieves the following information:
 - Synchronized Reserve Ramp rate for Tier 1 resources
 - Synchronized Reserve maximum for Tier 1 resources
 - [Synchronized Reserve availability for Tier 1 resources](#)
 - Synchronized Reserve availability for Tier 2 resources
 - Synchronized Reserve assigned quantity for Tier 2 resources (MW)
 - Synchronized Reserve offer price for Tier 2 resources (\$/MWh)
 - Energy use for condensing Tier 2 resources
 - Condense-to-generate startup cost

- Synchronized Reserve bilateral transactions
- 5-minute interval LMP data
- Total PJM synchronized reserve requirement as determined in whole MWh for each hour of the operating day
- Synchronized Reserve Clearing Price (\$/MWh)
- Non-Synchronized Reserve Clearing Price (\$/MWh)
- PJM calculates the hourly Synchronized Reserve credits for each Tier 1 resource as follows:
 - ~~During hours when the Non-Synchronized Reserve Market Clearing Price is non-zero and no synchronized event occurs, Tier 1 synchronized reserve resources are compensated the Synchronized Reserve Market Clearing Price multiplied by the Tier 1 estimated MW amount for those resources that can reliably provide Synchronized Reserve service accept a Tier 1 Performance Obligation per the rules in Manual 11, Section 4.2.6+ Synchronized Reserve Eligibility Commitment.~~
 - ~~Prior to 10/1/2012, Tier 1 synchronized reserve credits are equal to the integrated increase in MWh output or decrease in MWh of consumption from each resource over the length of a synchronized reserve event multiplied by the difference between the synchronized energy premium and the hourly integrated LMP. The synchronized energy premium is defined as the average of the 5-minute LMPs calculated during the synchronized reserve event plus \$50/MWh. If the hourly integrated LMP is greater than the synchronized energy premium, the Tier 1 credit is zero.~~
 - ~~Effective 10/1/2012, during~~ During hours when ~~re a synchronized reserve event occurs and~~ the Non-Synchronized Reserve Market Clearing Price is zero for the ~~same applicable~~ reserve zone or sub-zone that a Tier 1 resource is located, ~~Tier 1 synchronized reserve credits are equal to the~~ Tier 1 synchronized reserve credits are equal to the higher of the following: (1) the integrated increase in MWh output or decrease in MWh of consumption from each resource over the length of a synchronized reserve event multiplied by the synchronized reserve energy premium price less the hourly integrated LMP multiplied by the lesser of Tier 1 actual estimated MWs and Tier 1 response (up to 110% of Tier 1 estimated MWs) or (2) the cost to respond to the event, if the unit is scheduled for energy by PJM or self-scheduled for energy and dispatched above minimum.
 - ~~to the integrated increase in MW generator output (or decrease in MW consumption for demand side response resources) from each resource over the length of a synchronized reserve event multiplied by the difference between the synchronized energy premium and the hourly integrated LMP. The synchronized energy premium is defined as the average of the 5-minute LMPs calculated during the synchronized reserve event plus \$50/MWh. If the hourly integrated LMP is greater than the synchronized energy premium, the Tier 1 credit is zero.~~

- ~~Effective 10/1/2012, when During hours wWhen a synchronized reserve event occurs and the Non-Synchronized Reserve Clearing Price is non-zero for the applicable reserve zone or sub-zone that a Tier 1 resource is located, Tier 1 synchronized reserve credits are equal to the higher of the following; (1) the lesser of the integrated increase in MWh output or decrease in MWh of consumption from each resource over the length of a synchronized reserve event or the Tier 1 estimate attributed to the resource multiplied by the Synchronized Reserve Market Clearing Price multiplied by (a) the Tier 1 estimated MWs (obligation MWs) less any shortfall due to failure to provide the obligation MWs for a Tier 1 resource with a Tier 1 Performance Obligation or (b) the lesser of Tier 1 actual estimated MWs and Tier 1 response (up to 110% of Tier 1 estimated MWs) for a Tier 1 resource that opts out of an obligation but responds to an event or (2) the cost to respond to the event, if the unit is scheduled for energy by PJM or self-scheduled for energy and dispatched above economic minimum. to the applicable reserve zone or sub-zone Synchronized Reserve Market Clearing Price multiplied by the lesser of the integrated increase in MWh output or decrease in MWh of consumption from each resource over the length of a synchronized reserve event and the estimated Tier 1 the resource could have provided. During hours when no synchronized reserve event occurs in the applicable reserve zone or sub-zone, the Tier 1 resource will be compensated using the estimated Tier 1 amount for only those resources that can reliably provide Synchronized Reserve service per the rules in Manual 11, Section 4.2.1 Synchronized Reserve Eligibility.~~
 - In cases where a synchronized reserve event spans two or more hours, the response from each resource will be integrated according to the length of the response in each hour for the purpose of calculating the Tier 1 credit. Details on the amount of increase in output (or decrease in MW consumption for demand side response resources) can be found in Manual 11: Energy & Ancillary Services Market Operations, Section 4.
- PJM calculates the hourly Synchronized Reserve credits for each Tier 2 resource as follows:
 - These credits are awarded to resource owners that have either assigned self-scheduled or pool-scheduled synchronized reserve.
 - Synchronized reserve credits for resources assigned self-scheduled synchronized reserve equal the Tier 2 clearing price times the resource's self-scheduled synchronized reserve capability less any shortfall due to failure to provide assigned capability during a synchronized reserve event.
 - Synchronized reserve credits for resources that are assigned pool-scheduled synchronized reserve are the higher of: the Tier 2 clearing price times the resource's assigned synchronized reserve capability less any shortfall due to failure to provide assigned capability during a synchronized reserve event or the resource's synchronized reserve offer times its assigned synchronized reserve capability less any shortfall due to failure to provide assigned capability during a synchronized reserve event (plus

opportunity cost, energy use costs, and startup costs incurred, for generators), as applicable.

- Tier 1 resources with a Performance Obligation that fail to provide their Tier 1 Estimate MW and Tier 2 resources that fail to provide their assigned Tier 2 capability during a synchronized reserve event in duration of 10 minutes or more incur a retroactive obligation to refund at SRMCP the amount of the shortfall measured in MW for all of the hours the resource was obligated to perform over the immediate past interval, the duration of which is equal to the lesser of the average number of days between events as determined by the annual review of the last 2 years, or the number of days since the resource last failed to respond with its assigned or self-scheduled Synchronized Reserve amount in response to a synchronized reserve event. A refund applies to any hours where a resource has a Tier 1 or Tier 2 obligation. A Tier 1 resource over response to an event offsets any Tier 1 or Tier 2 compensation refund within the corresponding customer account.
 - Market Participants that own multiple resources with a Tier 1 Performance Obligation or are assigned or self-scheduled to provide Tier 2 Synchronized Reserve are permitted to demonstrate aggregate response, such that any resources that have responded greater than their Tier 1 Performance Obligation or their Tier 2 assignment or self-schedule MW value can be used to offset any resource that has responded less than their Tier 1 Performance Obligation or their assignment or self-schedule of Tier 2 Synchronized Reserve during a Synchronized Reserve Event.
 - The Market Participant's aggregate response shall not affect how an individual resource is credited for Tier 2 Synchronized Reserve it provides as described above, but shall be used to determine what the Market Participant owes in refund charges for each resource that was assigned or self-scheduled to provide Tier 2 Synchronized Reserve and responded less than their assignment or self-schedule of Tier 2 Synchronized Reserve.
- Resource Retroactive Shortfall MWh = Resource Shortfall MWh – ((Resource Shortfall MWh / Participant's Total Shortfall MWh) * Participant's Total Over Response MWh)
- If the Retroactive Shortfall MWh value per the above equation is less than 0 MWh, the Retroactive Shortfall MWh is equal to 0 MWh.
- Note: If there are multiple Synchronized Reserve Events during a day, the maximum Resource Retroactive Shortfall MWh for the day is used to determine what the participant owes in refund charges
- The retroactive penalty charges calculated above are allocated based on a participant's ratio share of the synchronized reserve obligation MW less any Tier 1 synchronized reserve applied to obligation on the hour(s) of the synchronized reserve event for the sub-zone or Reserve Zone for which the synchronized reserve event occurred. If the event spans multiple hours, the penalty charges will be prorated hourly based on the duration of the event within each hour. Participants that incur a penalty charge and also have an

[applicable synchronized reserve obligation during the hours\(s\) of the synchronized reserve event shall not be included in the allocation of such penalties. Additional details on verification and non-performance can be found in Manual 11: Energy & Ancillary Services Market Operations, Section 4: Overview of the PJM Synchronized Reserve Market.](#)

6.3 Charges for Synchronized Reserve

The total cost of providing Synchronized Reserve for each hour is the sum of the credits provided to PJM Members for supplying Synchronized Reserve in that hour. The hourly cost of Tier 1 and Tier 2 Synchronized Reserve is allocated separately and charged to PJM Members.

PJM Actions:

- PJM calculates for each hour the Total Cost of Synchronized Reserve by summing the following credits for all PJM Members:
 - Total Tier 1 credits for Synchronized Reserve (\$)
 - Total Tier 2 credits for Synchronized Reserve (\$)
- PJM calculates for each hour each participants synchronized reserve obligation as determined by applying the real-time load ratio share (adjusted for load responsibility) in the applicable reserve zone or sub-zone to the total synchronized reserve assigned for that hour and then adding bilateral sales and subtracting bilateral purchases. Note that LSEs whose reserve obligations are satisfied through an agreement to share reserves with external entities subject to the requirements in NERC Reliability Standard BAL-002 will not have a synchronized reserve obligation. Synchronized reserve charges are then determined for both the amount of Tier 1 applied to each participant's obligation and the amount of Tier 2 each participant purchased from the market.
- PJM calculates for each hour the Tier 1 charges by allocating the total cost of Tier 1 credits to each PJM Member based on their ratio share of Tier 1 synchronized reserve allocated to obligation. The amount of Tier 1 applied to each participant's obligation is equal to the amount of Tier 1 estimated prior to the operating hour as part of the market clearing process on that participant's own resources up to the amount of obligation, plus the remaining obligation ratio share of any excess Tier 1 estimated on the resources of generation owners in excess of their individual obligations.
- PJM calculates for each hour the [Tier 1 and](#) Tier 2 charges as follows:
 - The appropriate hourly Tier 2 clearing price times the participant's synchronized reserve obligation MW less any Tier 1 synchronized reserve applied to obligation.
 - The appropriate hourly Tier 2 clearing price for each LSE is the clearing price for the sub-zone or Reserve Zone for which the LSE's load is located. Loads located in a sub-zone will pay that sub-zone's clearing price. Loads

not located in a sub-zone will pay the corresponding Reserve Zone clearing price.

- The participant's share of any unrecovered costs incurred by assigned Tier 2 pool-schedule resources, including those Tier 2 resources assigned in addition to that which was estimated prior to a given hour, over and above the Tier 2 clearing price
- The amount of unrecovered costs allocated to each participant is determined based on each participant's ratio share of Tier 2 synchronized reserve purchased from the market. A participant's purchases from the market equals their synchronized reserve obligation MW less any Tier 1 synchronized reserve applied to obligation, less any self-scheduled Tier 2 MW.
- The cost of Tier 2 resources assigned by PJM during the operating hour in addition to that which resulted from the Tier 2 clearing process due to reduced availability of Tier 1 Synchronized Reserve are allocated to those entities for which less Tier 1 was available during the hour that was estimated prior to the hour, in proportion to the reduction in Tier 1 availability. If there are no entities with a reduction in Tier 1 availability, the cost of these resources assigned during the hour is allocated based on a participant's purchases from the market as described in the preceding bullet.
- ~~○ Tier 2 resources that fail to provide assigned Tier 2 capability during a synchronized reserve event incur a retroactive obligation to refund at SRMCP the amount of the shortfall measured in MW for all of the hours the resource was assigned over the immediate past interval, the duration of which is equal to the lesser of the average number of days between events as determined by the annual review of the last 2 years, or the number of days since the resource last failed to respond with its assigned or self-scheduled Synchronized Reserve amount in response to a synchronized reserve event.~~
- ~~➤ Market Participants that own multiple resources assigned or self-scheduled to provide Tier 2 Synchronized Reserve are permitted to demonstrate aggregate response, such that any resource that has responded greater than their assignment or self-schedule can be used to offset any resource that has responded less than their assignment or self-schedule of Tier 2 Synchronized Reserve during a Synchronized Reserve Event.~~
- ~~➤ The Market Participant's aggregate response shall not affect how an individual resource is credited for Tier 2 Synchronized Reserve it provides as described above, but shall be used to determine what the Market Participant owes in refund charges for each resource that was assigned or self-scheduled to provide Tier 2 Synchronized Reserve and responded less than their assignment or self-schedule of Tier 2 Synchronized Reserve.~~

~~Resource Retroactive Shortfall MWh = Resource Shortfall MWh – ((Resource Shortfall MWh / Participant’s Total Shortfall MWh) * Participant’s Total Over Response MWh)~~

~~If the Retroactive Shortfall MWh value per the above equation is less than 0 MWh, the Retroactive Shortfall MWh is equal to 0 MWh.~~

~~Note: If there are multiple Synchronized Reserve Events during a day, the maximum Resource Retroactive Shortfall MWh for the day is used to determine what the participant owes in refund charges~~

- ~~o The retroactive penalty charges calculated above are allocated based on a participant’s ratio share of the synchronized reserve obligation MW less any Tier 1 synchronized reserve applied to obligation on the hour(s) of the synchronized reserve event for the sub-zone or Reserve Zone for which the synchronized reserve event occurred. If the event spans multiple hours, the penalty charges will be prorated hourly based on the duration of the event within each hour. Participants that incur a penalty charge and also have an applicable synchronized reserve obligation during the hours(s) of the synchronized reserve event shall not be included in the allocation of such penalties. Additional details on verification and non-performance can be found in Manual 11: Energy & Ancillary Services Market Operations, Section 4: Overview of the PJM Synchronized Reserve Market.~~

6.4 Reconciliation for Synchronized Reserve Charges

- PJM will calculate reconciled Synchronized Reserve charges for EDCs and Retail Load Aggregators (a.k.a. Electric Generation Suppliers) for past months’ billings that were based on load ratio shares. The reconciliation kWh data must be supplied to PJM by the EDCs, and represents the difference between the scheduled Retail Load Responsibility InSchedule (in MWh) and the “actual” usage based on metered data. This hourly kWh data must be reported separately for each applicable InSchedule contract.
- PJM calculates the Synchronized Reserve charge reconciliations by multiplying the kWh data (de-rated for transmission losses) by the Synchronized Reserve billing determinants for that hour. The hourly Synchronized Reserve charge billing determinants (in \$/MWh) for each reserve zone and sub-zone is calculated by dividing the total hourly Synchronized Reserve charges in that reserve zone or sub-zone by the total PJM real-time load (de-rated for transmission losses) in that reserve zone or sub-zone for that hour. These charge reconciliations are then totaled for the month for each EDC or Retail Load Aggregator. Note that the reconciliation for Synchronized Reserve charges for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.