



# Reserve Market

## PJM Initial Training Program

### *Student Guide*

Prepared by:  
State & Member Training  
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# Table of Contents

<b>Course Overview .....</b>	<b>4</b>
Objectives .....	5
<b>Reserve Markets .....</b>	<b>5</b>
Reserve Markets .....	6
Synchronized and Non-Synchronized Reserve Markets .....	7
Identical Clearing Mechanism in DA and RT Markets .....	8
Reserve MW Calculation Example from an Online Unit .....	9
Reserve MW Calculation Example from an Offline Unit .....	10
Day Ahead Reserve Assignments Carried to Real-Time .....	11
<b>Reserve Market Requirements and Obligations.....</b>	<b>11</b>
Reserve Market Resource Eligibility .....	12
Must Offer Requirement .....	13
Resource Obligations .....	14
LSE Obligation.....	15
<b>Reserve Offers and Data .....</b>	<b>15</b>
Reserve Offers .....	16
Synchronized Reserve Offers.....	17
Non-Synchronized and Secondary Reserve Offers .....	18
Reserve Parameters.....	19
Managing Synchronized and Secondary Reserve Data .....	20
Segmented Ramp Rates .....	21
<b>Reserve Market Timeline .....</b>	<b>21</b>
Reserve Market Timeline.....	22
Synchronized Reserve Timing.....	23


Reserve Results Posting .....	24
Day Ahead Reserve Results - Markets Gateway.....	25
RT Reserve Results - Markets Gateway Dispatch Lambda.....	26
Public Reserve Results - Markets Gateway .....	27
Public Reserve Results - Data Miner .....	28
Public Reserve Results - Data Miner .....	29
<b>Reserve Zone .....</b>	<b>29</b>
Reserve Zone Structure .....	30
Mid-Atlantic Dominion (MAD) Reserve Subzone .....	31
Reserve Subzone Composition .....	32
Flexible Reserve Subzones .....	33
<b>Loading Synchronized Reserves.....</b>	<b>33</b>
Loading Synchronized Reserves .....	34
Call for Synchronized Reserve .....	35
Electronic (ICCP) Signal for Reserves.....	36
<b>Response Calculation .....</b>	<b>36</b>
Response Calculation / Verification .....	37
Resource Response Measurement .....	38
<b>Shortage Pricing .....</b>	<b>38</b>
Shortage Conditions .....	39
Shortage Pricing .....	40
<b>Knowledge Check .....</b>	<b>40</b>
<b>Summary.....</b>	<b>41</b>
Summary .....	42
Questions .....	43



# Objectives

- Describe the types of reserves
- Identify PJM reserve requirements
- Explain the PJM Reserve Markets
- Describe the Reserve participation response verification process

# Reserve Markets

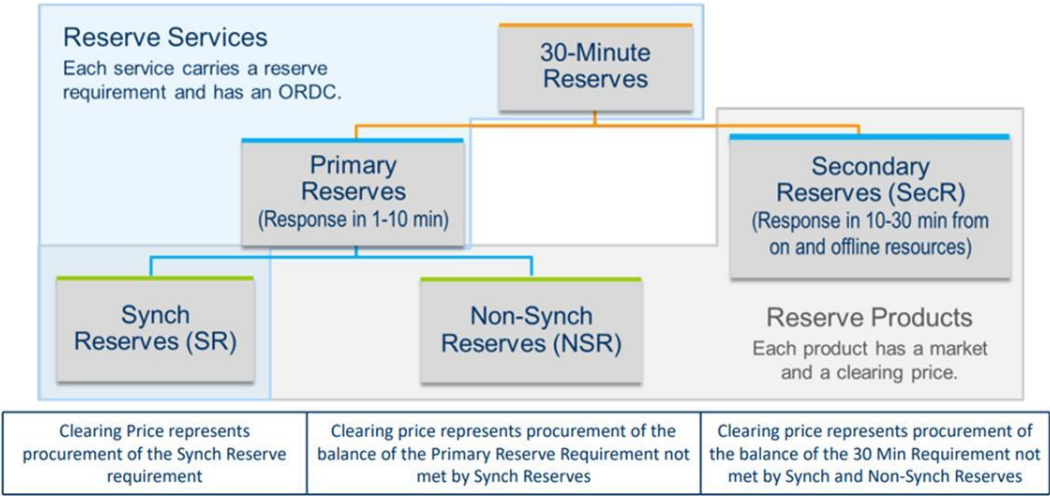


## Reserve Markets

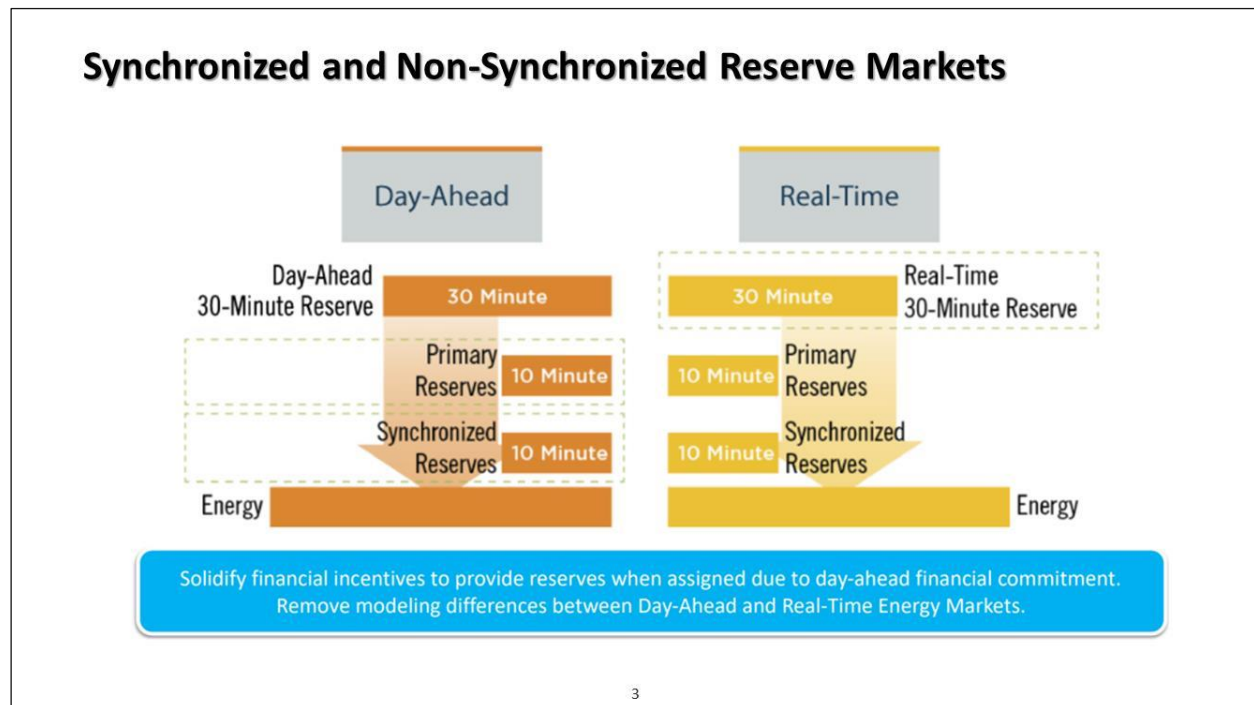
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## Reserve Markets



# Synchronized and Non-Synchronized Reserve Markets



# Identical Clearing Mechanism in DA and RT Markets

## Identical Clearing Mechanism in DA and RT Markets

Reserves and energy are co-optimized the same way in Day Ahead and Real-time

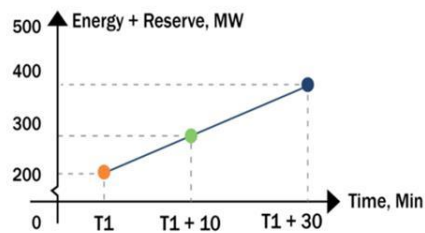
- Two-stepped ORDC is implemented in DA and RT. Penalty factors will be the same in DA and RT
- Same reserve zone/subzone in DA and RT. Operational emergency may require a change in RT

Like the energy market, cleared MW and prices will typically differ between DA and RT reserve markets



# Reserve MW Calculation Example from an Online Unit

## Reserve MW Calculation Example from an Online Unit



Unit A		
STATUS: <b>Online</b> <b>200 MW</b>		STARTUP TIME: <b>5 Min</b> NOTIFICATION TIME: <b>0 Min</b>
ECOMIN: <b>100 MW</b>	ECOMAX: <b>600 MW</b>	RAMP RATE (RR): <b>5 MW/Min</b>

**SR** = min[EcoMax – MW, RR\*10]

= min[600 – 200, 5\*10]

= min[400,50]

= **50 MW**

**SecR** = min[EcoMax – MW, RR\*30]-SR

= min[600 – 200, 5\*30]-50

= min[400,150]-50

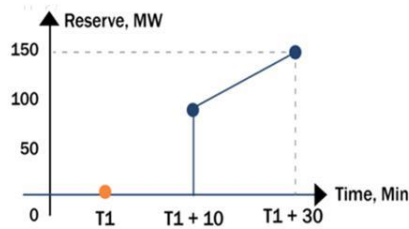
= 150-50

= **100 MW**

**\*Note:** For Day Ahead, EcoMin is used instead of the current MW output (e.g. min[EcoMax - EcoMin, RR\*10])

# Reserve MW Calculation Example from an Offline Unit

## Reserve MW Calculation Example from an Offline Unit



Unit A

STATUS: <b>Offline</b> <b>0 MW</b>		STARTUP TIME: <b>5 Min</b>	NOTIFICATION TIME: <b>2 Min</b>
ECOMIN: <b>50 MW</b>	ECOMAX: <b>150 MW</b>	RAMP RATE (RR): <b>10 MW/Min</b>	

$$\begin{aligned}
 \text{NSR} &= \min[\text{EcoMax}, \text{EcoMin} + (10 - \text{StartTime} - \text{NotifTime}) * \text{RR}] \\
 &= \min[150, 50 + (10 - 5 - 2) * 10] \\
 &= \min[150, 50 + 3 * 10] \\
 &= \min[150, 80] \\
 &= \mathbf{80 \text{ MW}}
 \end{aligned}$$

$$\begin{aligned}
 \text{SecR} &= \min[\text{EcoMax}, \text{EcoMin} + (30 - \text{StartTime} - \text{NotifTime}) * \text{RR}] - \text{NSR} \\
 &= \min[150, 50 + (30 - 5 - 2) * 10] - 80 \\
 &= \min[150, 280] - 80 \\
 &= 150 - 80 \\
 &= \mathbf{70 \text{ MW}}
 \end{aligned}$$

# Day Ahead Reserve Assignments Carried to Real-Time

## Day Ahead Reserve Assignments Carried to Real-Time

**Condensers and Inflexible Economic Load Response resources that are cleared day-ahead will have their commitments carried to real-time**

Need to have a min run time no greater than one hour and notification time between ten and thirty minutes

Commitment is carried over unless in real-time the resource is committed to provide energy or another reserve product

# Reserve Market Resource Eligibility



## Reserve Market Resource Eligibility

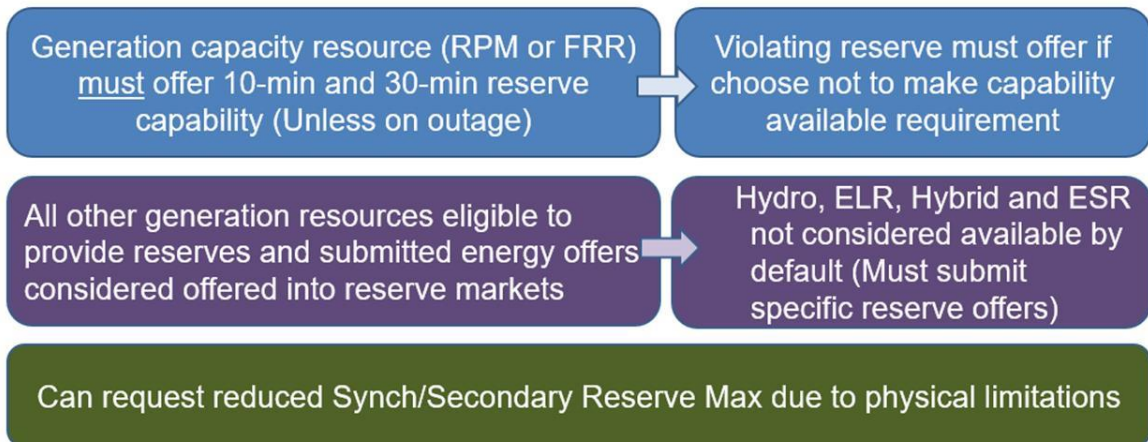


### Not Eligible for Non-Synchronized Reserves:

- Economic Load Response
- Energy Storage Resources enrolled participation model

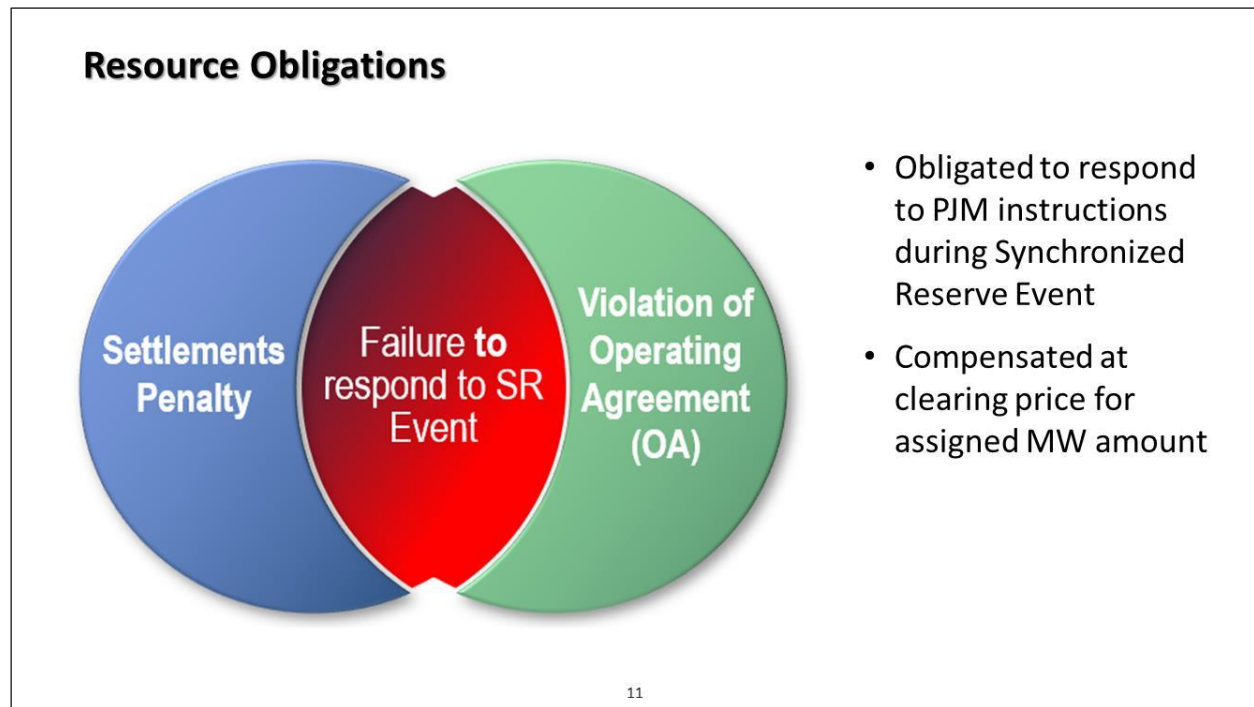
# Must Offer Requirement

## Must Offer Requirement

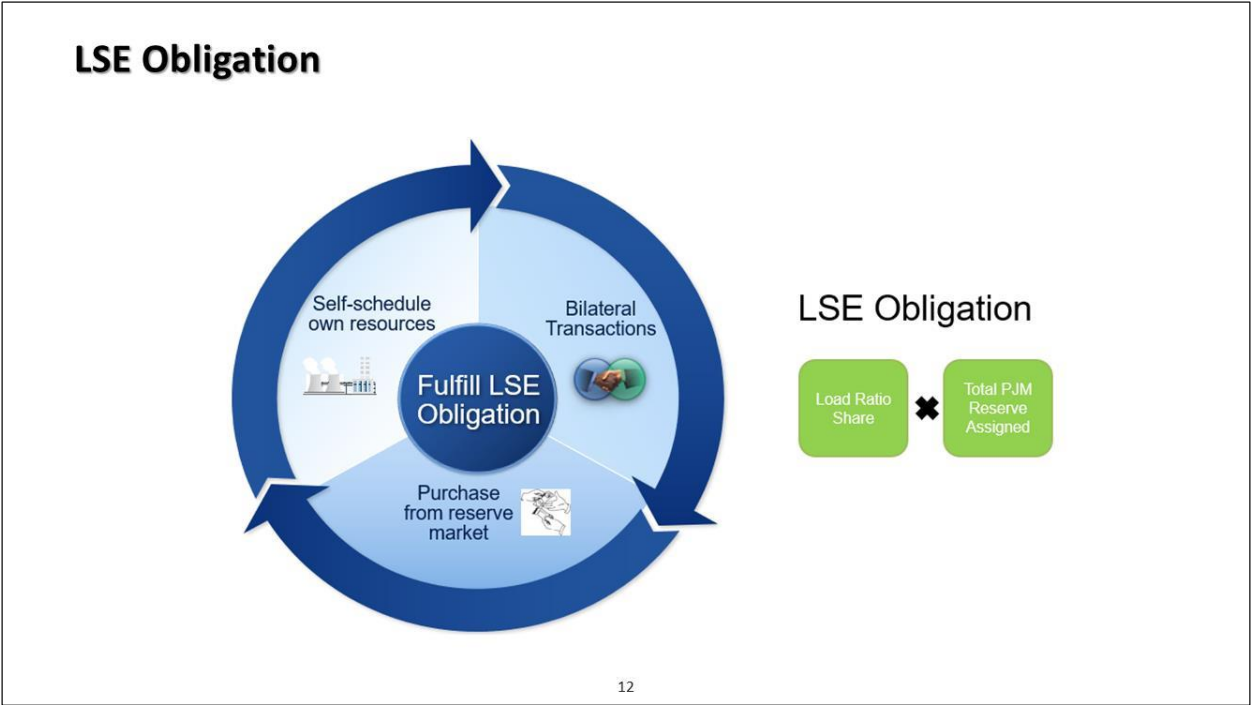


10


# Resource Obligations



# LSE Obligation



# Reserve Offers



## Reserve Offers and Data

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### Reserve Offers

- Consist of three elements:
    - Availability
    - Offer MW
    - Offer price
- If Hydro, ESR, Hybrid and ELR unable to participate in any given hour during Operating Day:
    - Set Offer MW = 0
    - Set to “Not Available”
    - Done in Markets Gateway sixty-five (65) minutes prior to the operating hour

Reserve Market	Resource Type				
	Condensers	Other Gen	Wind/Solar/ Nuclear	ESR/Hydro/Hybrid Resource	Load Response
SR	Set through energy offer			Specify availability separately	
NSR				N/A for ESR and Hybrid Resource; Specify availability separately for hydro	N/A for NSR
SecR				Specify availability separately	



# Synchronized Reserve Offers

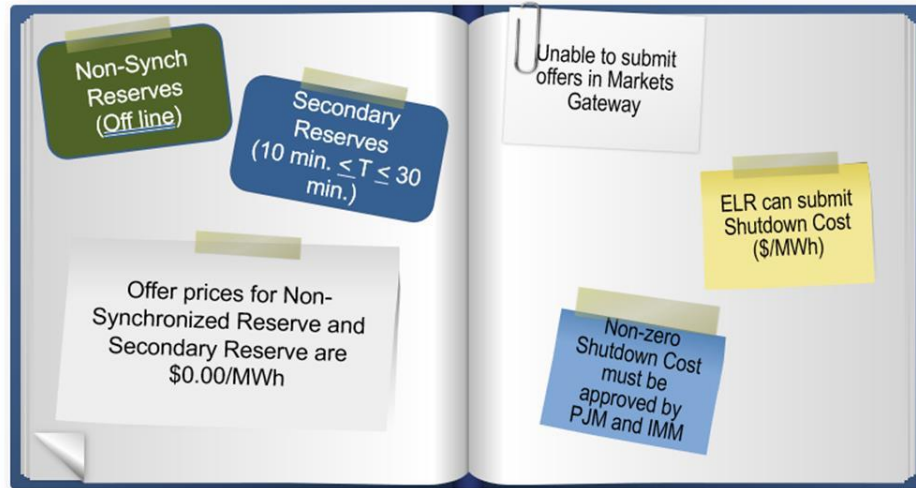
## Synchronized Reserve Offers



15

# Non-Synchronized and Secondary Reserve Offers

## Non-Synchronized and Secondary Reserve Offers



16

# Reserve Parameters

## Reserve Parameters

Parameter	Update Available	Markets Gateway Update Location
<b>EcoMax &amp; EcoMin</b>	Must be entered prior to 11 a.m. the day before the operating day Can be updated anytime to reflect real-time changes	<ul style="list-style-type: none"> <li>Generator &gt; Unit &gt; Detail</li> <li>Demand Response &gt; Hourly Updates</li> <li>Generator &gt; Hourly Updates</li> </ul>
<b>Initial Energy Output</b>	No updates available. Based on actual resource output	N/A
<b>Ramp Rates</b>	Default and Daily Ramp Rates must be entered prior to 11 a.m. the day before the operating day. Ramp Rate updates can be made during the operating day 65-minutes prior to the operating hour.	<ul style="list-style-type: none"> <li>Default: Generator &gt; Unit &gt; Detail</li> <li>Daily Ramp Rate: Generator &gt; Unit &gt; Ramp Rates</li> <li>Updates: Generator &gt; Unit &gt; Ramp Rates Updates</li> </ul>
<b>Startup Time</b>	Must be entered prior to 11 a.m. the day before the operating day	Generator > Unit > Detail
<b>Notification Time</b>	Must be entered prior to 11 a.m. the day before the operating day Notification Time updates can be made during the operating day 65-minutes prior to the operating hour.	<ul style="list-style-type: none"> <li>Demand Response &gt; Parameters</li> <li>Generator &gt; Unit &gt; Detail</li> <li>Updates: Generator &gt; Schedules &gt; Detail Updates</li> </ul>
<b>Condense to Generation Time</b>	Must be entered prior to 11 a.m. the day before the operating day	Generator > Unit > Detail

# Managing Synchronized and Secondary Reserve Data

## Managing Synchronized and Secondary Reserve Data

- Condense to Gen Cost
- Condense Startup Cost
- Condense Hourly Cost
- Heat Rate
- Condense To Notification Time
- Condense To Generate Time

Hourly Updates

Detail

Ramp Rates

Ramp Rates Updates

Wind Forecast

Solar Forecast

IntraDay Opt Out

Storage Updates

Cost

Use Cost Based Startup 1 ☒

Use Cost Based Startup 2 ☒

Condense

Available ☐

Energy Usage

Notification Time

To Generate Time

Reserve as Condenser ☐

Startup Cost

To Generation Cost

Hourly Cost

SR MW Capability = max {0, min [min (EcoMax, SynchMax), EcoMin + RampRate\* (10 minutes - condense to gen time)]}

# Segmented Ramp Rates

## Segmented Ramp Rates

Demand Response  
 Generator  
 Unit  
 Schedules  
 Dispatch Lambda  
 Market Results  
 Regulation Market  
 Synchronized Reserve Mz  
 Non-Synchronized Reserv  
 Secondary Reserve Mark  
 Unit Limitations  
 Interface Pricing  
 Opportunity Cost Calculator  
 Parameter Limits  
 Order Response Period

Portfolio  Location

Hourly Updates  
 Detail  
 Ramp Rates  
 Ramp Rates Updates

MW	Up Ramp Rate	Down Ramp Rate
450.0	15.0	15.0
451.0	0.1	5.0
530.0	5.0	5.0

- Ensure ramp rates are accurate
- Utilize Ramp Rates in Markets Gateway
  - Allows use of segmented ramp rates
  - Model situations where ramp rates can change
    - Mill Points
    - Transition Points
- Can be updated hourly
  - Ramp Rates Updates tab

# Reserve Market Timeline



## Reserve Market Timeline



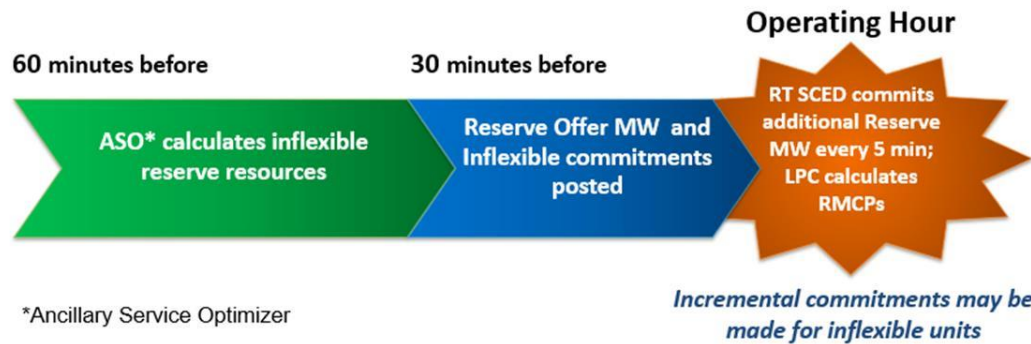
\*Times are in Eastern Prevailing Time (EPT)

21

# Synchronized Reserve Timing

## Synchronized Reserve Timing

- Forward commitment for reserve resources and all regulation resources will be posted 30 minutes prior to the operating hour
  - Synchronous Condensers and Economic Load Response resources will be considered “inflexible” units and committed on a forward basis



# Reserve Results Posting

## Reserve Results Posting

	What	Frequency	Location	When
Day Ahead	Synch Reserve	Hourly	Market Results in Markets Gateway	A day ahead of the operating day
	Non-synch Reserve	Hourly	Market Results in Markets Gateway	A day ahead of the operating day
	Secondary Reserve	Hourly	Market Results in Markets Gateway	A day ahead of the operating day
Real-Time	Inflexible Synch Reserve	Hourly	Market Results in Markets Gateway	30 min prior to top of hour
	Inflexible Secondary Reserve	Hourly	Market Results in Markets Gateway	30 min prior to top of hour
	Flexible Reserves	Every 5 minutes	ICCP link and Dispatch Lambda in MG	Every 5 min
	Clearing Price	Every 5 minutes	Data Miner and PJM Now	Every 5 min



# Day Ahead Reserve Results - Markets Gateway

## Day Ahead Reserve Results - Markets Gateway

Bilaterals

Demand

Demand Response

Generator

Unit

Schedules

Dispatch Lambda

Market Results

Regulation Market

Synchronized Reserve M

Non-Synchronized Reser

Secondary Reserve Mark

Unit Limitations

Interface Pricing

Opportunity Cost Calculator

Parameter Limits

Price Responsive Demand

Pseudo Tie Transaction

Public

System Utilities

Up-To-Transaction

Virtual

Weather Forecast

Portfolio: BOLLIC

Refresh

DA Energy Award

Regulation Award

DA Synchronized Reserve Award

RT Synchronized Reserve Award

DA Non-Synchronized Reserve Award

DA Secondary Reserve Award

RT Secondary Reserve Award

BOLLIC >> 2024-02-13 >> BOLLIC

Hour	Location	Area	Offer MW	Self-Scheduled MW	Awarded MW
Show all	Show All	Show all	Show all	Show all	Show all
1	BOLLIC ANHIERBAC 10 Steam	RTO			0.0
1	BOLLIC ANHIERBAC 20 Steam	RTO			0.0
1	BOLLIC ANHIERBAC 30 Diesel	RTO			0.0
1	BOLLIC Caprice 31 Hydro	PJM_RTO	10.0		0.0
1	BOLLIC Haida 1 Steam	PJM_RTO	30.0		0.0
1	BOLLIC Hydra 34 Hydro	RTO			0.0
1	BOLLIC Lock 1 Steam	RTO			0.0
1	BOLLIC Lock 2 Steam	RTO			0.0
1	BOLLIC Russet 1 Steam	RTO			0.0
1	BOLLIC Yacree 10 Steam	RTO			0.0
1	BOLLIC Yacree 20 Steam	PJM_RTO	60.0		0.0
1	BOLLIC Yacree 30 Steam	RTO			0.0
2	BOLLIC ANHIERBAC 10 Steam	RTO			0.0
2	BOLLIC ANHIERBAC 20 Steam	RTO			0.0

# RT Reserve Results - Markets Gateway Dispatch Lambda

## RT Reserve Results - Markets Gateway Dispatch Lambda

Location *	Schedule	Schedule Type	Lambda	Gen. MW	Non-Ramp MW	Reg. MW	Deviation MW	Econ. Min.	Econ. Max.	Capacity Max.	SR Assignment	NGR Assignment	SecR Assignment	On Time	Off Time	Status
	Cost DR	Cost	0	0.0	0.0	0.0	0.0	16.0	18.0	18.0	18.0	0.0	0.0			Condensing for Tier 2 spinning reserve
	Price	Price	20.5	465.0	465.0	0.0	-0.9	374.0	568.0	568.0	13.1	0.0	0.0			Running continuously for PJM from one day to the next
	Price	Price	11.9	828.0	828.0	0.0	2.6	365.0	836.0	836.0	8.0	0.0	0.0			Running continuously for PJM from one day to the next
	Price	Price	19.7	484.0	484.0	0.0	8.4	377.0	567.0	567.0	17.3	0.0	0.0			Running continuously for PJM from one day to the next
	Price	Price	19.5	480.0	480.0	0.0	0.7	376.0	567.0	567.0	13.1	0.0	0.0			Running continuously for PJM from one day to the next

- Flexible resource assignments viewed in Dispatch Lambda
- Non-flexible resource assignments viewed:
  - Generator > Market Results
  - Dispatch Lambda

# Public Reserve Results - Markets Gateway

## Public Reserve Results - Markets Gateway

Bilaterals

Demand

Demand Response

Generator

Interface Pricing

Opportunity Cost Calculator

Parameter Limits

Price Responsive Demand

Pseudo Tie Transaction

Public

Messages

Reports

Pricing Nodes

Market Results Energy

Market Results Ancillary

System Utilities

Up-To-Transaction

Virtual

Weather Forecast

Area

ACTIVE SUBZONE

Regulation Results

DA Synchronized Reserve Results

RT Synchronized Reserve Results

DA Primary Reserve Results

RT Primary Reserve Results

DA 30 Minute Reserve Results

RT 30 Minute Reserve Results

Active Subzone

PJM >> 2024-01-16 >> ACTIVE SUBZONE

Data provided on this page is based on an hour ahead projection. Actual values may vary in real time depending on changes in system conditions.


Hour	Area	Requirement	Avail. Transfer Preliminary	Self Scheduled	Assigned Preliminary	Total Preliminary	Deficiency Preliminary
Show all	Show all	Show all	Show all	Show all	Show all	Show all	Show all
1	HAD	1,851.0	641.0	0.0	1,697.0	1,697.0	0.0
2	HAD	1,855.0	595.0	0.0	1,749.0	1,749.0	0.0
3	HAD	1,855.0	655.0	0.0	1,689.0	1,689.0	0.0
4	HAD	1,855.0	367.0	0.0	1,820.0	1,820.0	0.0
5	HAD	1,855.0	350.0	0.0	1,604.0	1,604.0	0.0
6	HAD	1,874.0	156.0	0.0	1,826.0	1,826.0	0.0
7	HAD	1,878.0	0.0	0.0	2,430.0	2,430.0	0.0
8	HAD	1,878.0	58.0	0.0	2,249.0	2,249.0	0.0
9	HAD	1,870.0	342.0	94.0	1,879.0	1,977.0	0.0
10	HAD	1,867.0	131.0	200.0	1,980.0	2,180.0	0.0
11	HAD	1,840.0	297.0	0.0	1,973.0	1,973.0	0.0
12	HAD	1,809.0	19.0	0.0	2,294.0	2,294.0	0.0
13	HAD	1,809.0	775.0	0.0	1,539.0	1,539.0	0.0
14	HAD	1,870.0	242.0	0.0	2,073.0	2,073.0	0.0
15	HAD	1,850.0	330.0	0.0	1,955.0	1,955.0	0.0
16	HAD	1,830.0	0.0	0.0	2,293.0	2,293.0	0.0
17	HAD	1,830.0	36.0	0.0	2,219.0	2,219.0	0.0
18	HAD	1,830.0	150.0	0.0	2,105.0	2,105.0	0.0
19	HAD	1,870.0	0.0	0.0	2,381.0	2,381.0	0.0
20	HAD	1,867.0	485.0	134.0	1,714.0	1,845.0	0.0





[illegible]

# Public Reserve Results - Data Miner

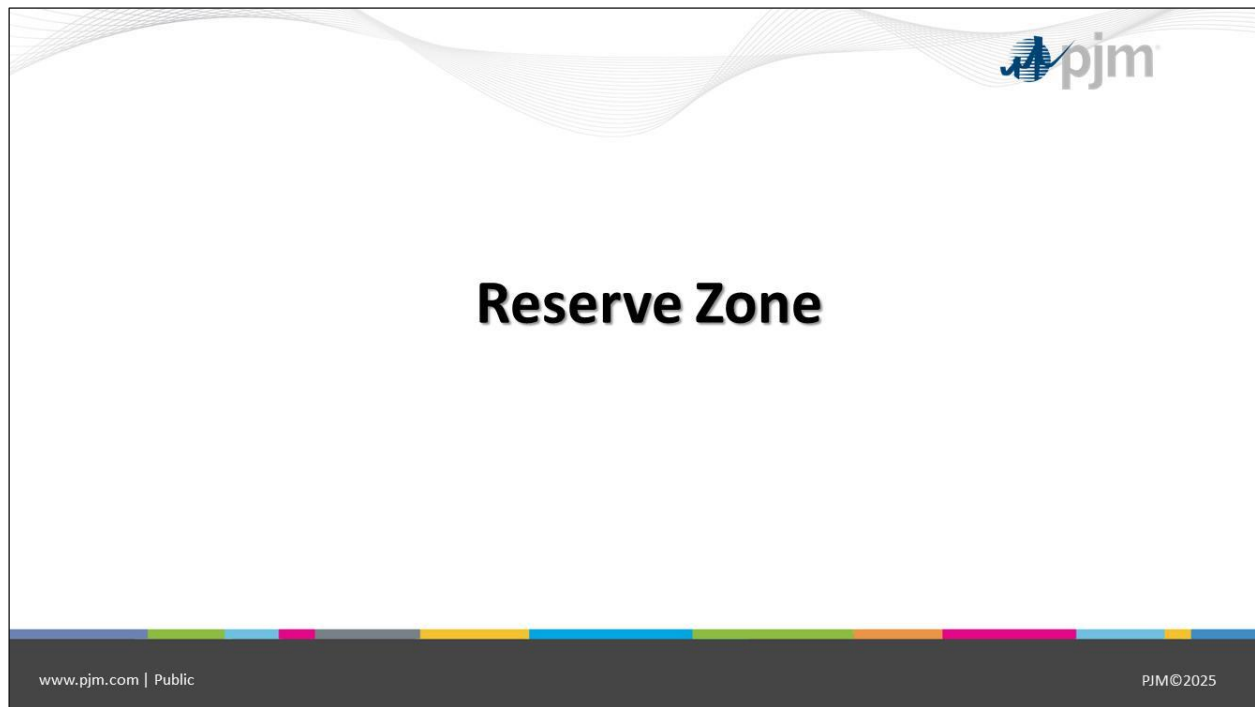
## Public Reserve Results - Data Miner

Deadline Beginning EPT: Start Date: 1/1/2024 00:00 End Date: 1/31/2024 23:59 Submit Reset

Export: 

Locate 	Service 	Market Clearing Price	Market Clearing Price Capped	Regulation Capability Clearing Price	Regulation Performance Clearing Price	Ancillary Service Required	Total MW	Assigned MW	Self-scheduled MW	Tier 1 MW	Interface Reserve Capability MW	Demand Response MW Assigned	Non-Synchronized Reserve MW
All 	All 												
PJM_OTO	REG	10.72	10.72	9.97	4.76	925	925	925	371.8	0	0	54.4	
PJM_OTO	SR	0.04	0.04			2,359.7	2,559.6	2,559.6	49	0	0	371.9	
HA0	SR	0.04	0.04			1,859	1,859	715.6	30	0	1,143.4	34	
PJM_OTO	PR	0.04	0.04			3,444.6	3,444.6	3,444.6	49	0	0	0	
HA0	PR	0.04	0.04			2,692.5	2,692.5	1,158.6	30	0	1,534.9	0	
PJM_OTO	30MW	0	0			3,444.6	25,770.7	25,770.7	49	0	0	0	
PJM_OTO	REG	8.12	8.12	3.74	4.39	925	925	925	371.8	0	0	54.4	
PJM_OTO	SR	0.04	0.04			2,359.7	2,559.6	2,559.6	49	0	0	371.9	
HA0	SR	0.04	0.04			1,859	1,859	655.5	30	0	1,203.5	34	
PJM_OTO	PR	0.04	0.04			3,444.6	3,444.6	3,444.6	49	0	0	0	
HA0	PR	0.04	0.04			2,692.5	2,692.5	1,098.5	30	0	1,595	0	
PJM_OTO	30MW	0	0			3,444.6	25,770.7	25,770.7	49	0	0	0	

# Reserve Zone Structure



## Reserve Zone Structure

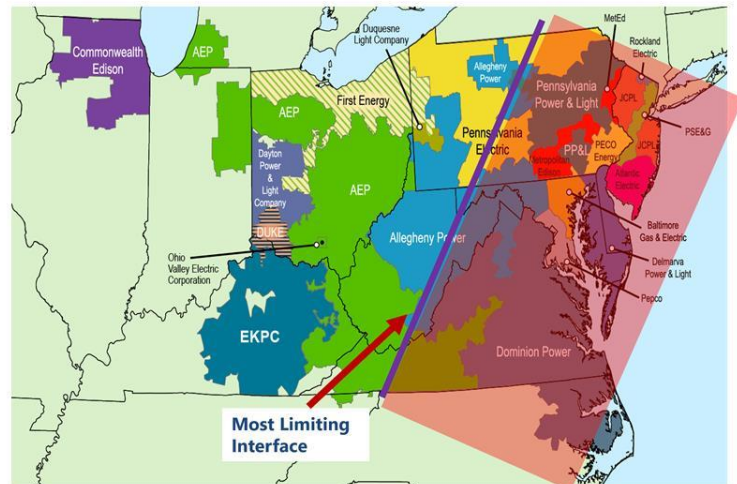
- One Reserve Zone: RTO Reserve Zone**
  - Currently, one subzone due to potential deliverability issues
    - Mid-Atlantic Dominion (MAD)
- Creation of New Reserve Subzones**
  - New reserve subzones defined as far in advance as possible
  - Cannot be created on a same-day basis
  - Defined for constraints in these three categories:
    - Reactive transfer interfaces (AP South, BEDBLA, etc.)
    - $\geq 230$  KV actual overload constraint (i.e. Conastone-Peach Bottom 500kV actual overload)
    - Contingency overload exceeding load dump limit on 230kV or above facility

30

# Mid-Atlantic Dominion (MAD) Reserve Subzone

## Mid-Atlantic Dominion (MAD) Reserve Subzone

- Default subzone
- Defined by the most-limiting reactive transfer interface
  - Procure reserves that will not overload critical constraints when reserves are deployed



31

# Reserve Subzone Composition

## Reserve Subzone Composition

- Reserve subzones defined as all buses with 3% or greater (raise-help) distribution factor on associated transmission constraint
- Definitions typically published every business day
- Definitions posted on Data Miner

Ancillary Services

Bid and Offer Data

Constraints

Credit

Financial Transmission Rights

Generation

Imports and Exports

LMP Model

Load

Load Forecast

Locational Marginal Prices

Losses

Reference Data

Pricing Nodes

Reserve Subzone Buses

Reserve Subzone Resources

Retired

Settlements

System Information

Uplift

Data Miner 2 > Reserve Subzone Resources

Reserve Subzone Resources

Reserve Subzone resource mapping for Synchronized, Primary, and 30-Minute Reserve

Posting Frequency: Daily on Business Days

Update Availability: Daily at 01:00 p.m.

Retention Time: Indefinitely

Last Updated: 1/31/2024 13:33

First Available: 10/1/2022 00:00

Download API

In order to create a system-to-system connection to this dataset, you can download and implement download and use the API.

Data Fields

Field name	Data type	Description
Subzone	String	Subzone
Resource ID	Number	Resource ID
Resource Name	String	Resource Name
Resource Type	String	Resource Type
Zone	String	Transmission Zone
Effective Date	Date	Reserve Subzone Mapping Effective Date
Terminate Date	Date	Reserve Subzone Mapping Termination Date



# Flexible Reserve Subzones

## Flexible Reserve Subzones

- Dynamically adjust reserve subzone to reflect system conditions
- Better enable reliable operations and result in market results more consistent with system operations
- Only one subzone active at any given time
  - Communicated in Markets Gateway

Note: Changes to the active reserve subzone can be made in real-time intraday on an exception basis

The screenshot shows the PJM Markets Gateway interface. The left sidebar contains a navigation menu with the following items: Home, Con Edison, Demand, Demand Response, Generation, Interface Pricing, Opportunity Cost Calculator, Reserve Market, Price Regulation Demand, Power To Transition, Public, Reserves, Reports, Pricing Models, Market Results History (highlighted with a red box), Up To Transition, Virtual, and Weather Forecast. The main content area displays the Reserve Market subzone selection. The 'Active Subzone' dropdown is highlighted with a red box, and the 'Market Results History' link in the left sidebar is also highlighted with a red box. The table below shows the Reserve Market subzone selection results.

Hour	Active Subzone	Subzone	Subzone	Subzone	Subzone
1	RES	RES	RES	RES	RES
2	RES	RES	RES	RES	RES
3	RES	RES	RES	RES	RES
4	RES	RES	RES	RES	RES
5	RES	RES	RES	RES	RES
6	RES	RES	RES	RES	RES
7	RES	RES	RES	RES	RES
8	RES	RES	RES	RES	RES
9	RES	RES	RES	RES	RES
10	RES	RES	RES	RES	RES
11	RES	RES	RES	RES	RES
12	RES	RES	RES	RES	RES
13	RES	RES	RES	RES	RES
14	RES	RES	RES	RES	RES
15	RES	RES	RES	RES	RES
16	RES	RES	RES	RES	RES
17	RES	RES	RES	RES	RES
18	RES	RES	RES	RES	RES
19	RES	RES	RES	RES	RES
20	RES	RES	RES	RES	RES
21	RES	RES	RES	RES	RES
22	RES	RES	RES	RES	RES
23	RES	RES	RES	RES	RES
24	RES	RES	RES	RES	RES

# Loading Synchronized Reserves

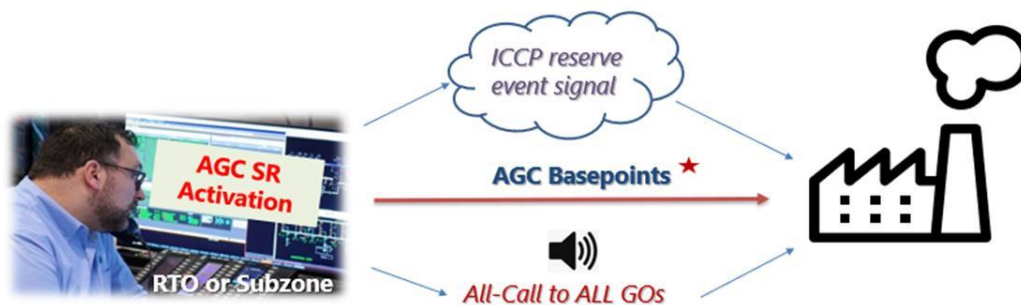


## Loading Synchronized Reserves

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### Loading Synchronized Reserves



- After SR initiation, Economic Basepoints raised for resources with assignments
- ELR follow instructions in DR Hub
- Self-scheduled, not following dispatch generation and Synchronous Condensers take manual action to respond
- ★ During SR event, AGC will only change basepoint for units with SR assignment if SCED call for increase in output

35

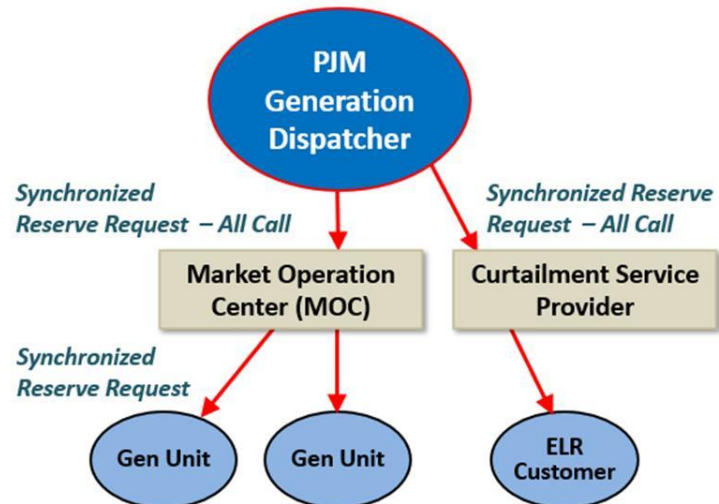
# Call for Synchronized Reserve

## Call for Synchronized Reserve

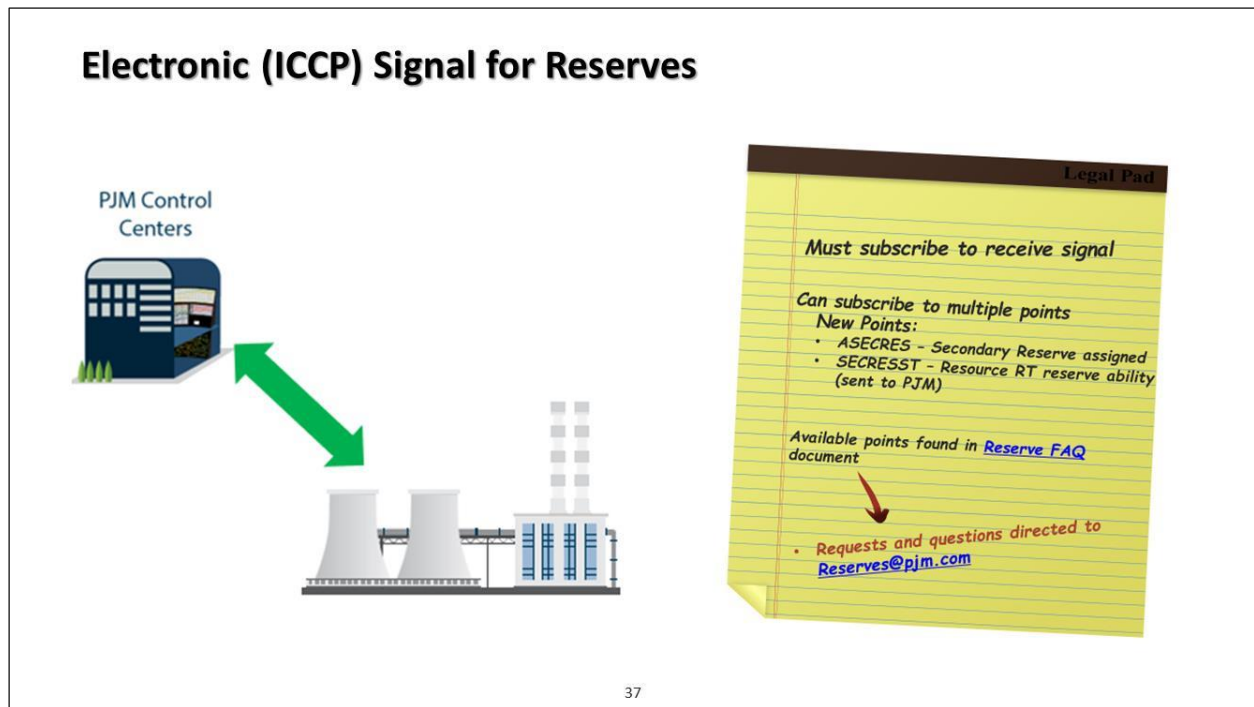
**Loading of Synchronized Reserve is a Reliability Service!**

- ELR resources implement requested percentage of Synchronized Reserve as quickly as possible without regard to price
- Continue to implement Synchronized Reserve until directed by PJM to discontinue

**At most, one level of operator intervention between PJM and entity taking action**



# Electronic (ICCP) Signal for Reserves



<https://www.pjm.com/-/media/DotCom/etools/markets-gateway/synchronized-reserve-deployment-and-reserve-price-formation-faq.pdf>

# Response Calculation / Verification



## Response Calculation

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### Response Calculation / Verification

- Resource responses verified by PJM Performance Compliance Dept. following each event
- Actual responses compared to assignments used to determine penalties



39

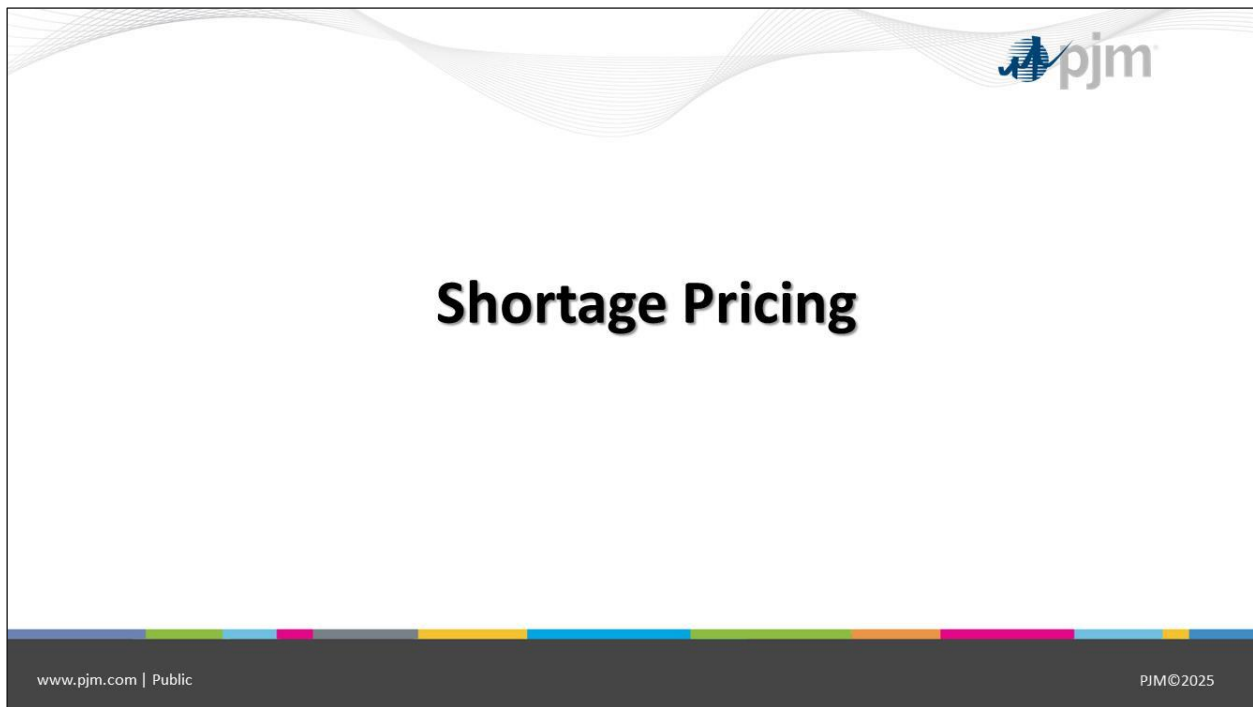
# Resource Response Measurement

## Resource Response Measurement

- Resource response to a synchronized reserve event is
  - Difference between resource's output at start of event, **and**
  - Output ten minutes after start of event, allowing for small fluctuations and possible telemetry delays
- Resource output at start of event
  - Lowest telemetered output between 1 minute prior to and 1 minute following start of event
- Resource output ten minutes after event
  - Greatest output achieved between 9 and 11 minutes after start of event



# Shortage Conditions



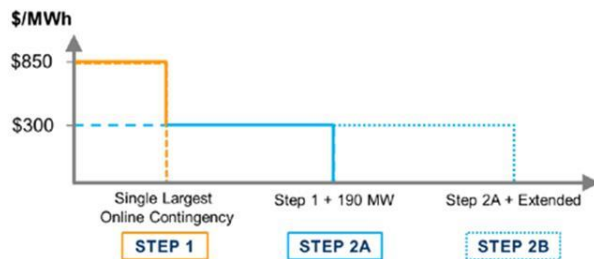
## Shortage Conditions

- Reserve Requirements (RTO & Sub Zone) exist for:
  - 30-minute Reserves
  - Primary Reserves
  - Synchronized Reserves
- Reserve shortage when not enough non-emergency resources available to maintain requirements in event of unforeseen incident including, but not limited to:
  - Extreme Weather
  - Higher peak load growth
  - Higher than average generator outages
  - Unexpected transmission outage

# Shortage Pricing

## Shortage Pricing

- Max Energy LMP Component = Energy Offer Cap + 2 \* Reserve Penalty Factor



- Max Energy Offer
  - \$2000/MWh
- Max Penalty Factor
  - \$850/MWh
- Max Energy Component
  - \$3700/MWh\*\*

43

## Knowledge Check

Let's Review



44

### 1. Which service has an Operating Reserve Demand Curve (ORDC)?

- Synchronized Reserves*
- Non-Synchronized Reserves*



- c. *Secondary Reserves*
- d. *Regulation Reserves*

**2. What is the PJM Primary Reserve Reliability Requirement?**

- a. *Largest single contingency*
- b. *Largest single contingency + 190 MW*
- c. *150% of the Synchronized Reserve requirement*
- d. *150% of the Synchronized Reserve requirement + 190 MW*

# Summary

# Questions

## Questions

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