



# Resource Performance Expectations

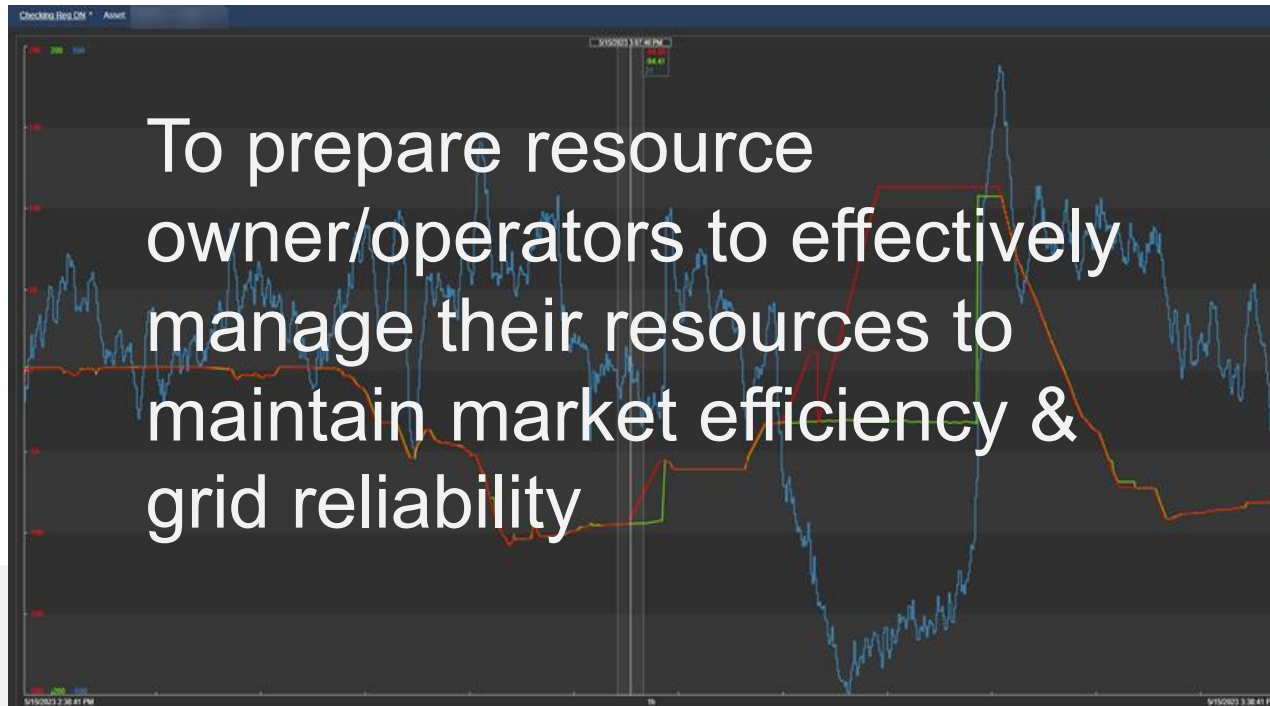
## Welcome

Our presentation will begin shortly.

*Today's Trainer:*

*Heidi Holmberg Carder, Lead Customer Education Trainer*

## Why are we here?



It requires a partnership to ensure the safety and reliability of the grid!

# Housekeeping



Keep yourself muted to minimize background noise

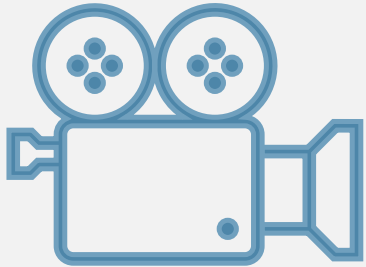


Unmute to ask verbal questions or write questions in the chat pod



Raise your hand using WebEx interactivity tools

# Sharing



Training is being recorded



Presentation & recording to be posted to the CAISO Training Center

Q & A

Questions & answers will be captured & shared

The information contained in these materials is provided for general information only and does not constitute legal or regulatory advice. The ultimate responsibility for complying with the ISO FERC Tariff and other applicable laws, rules or regulations lies with you. In no event shall the ISO or its employees be liable to you or anyone else for any decision made or action taken in reliance on the information in these materials.

# What Will I Be Learning?



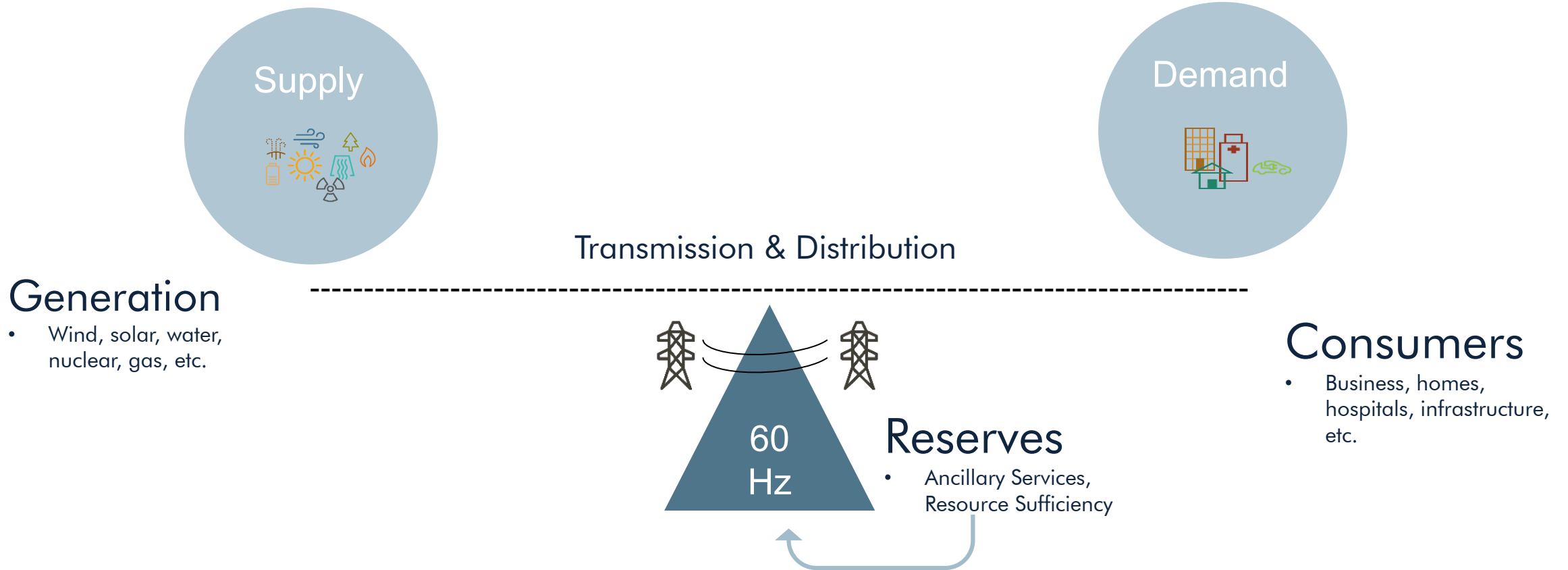
- Where do I fit within the CAISO footprint?
- What are the differences between a Dispatch Instruction and an Operating Instruction?
- What are my resource performance expectations?
- What are my communication responsibilities?
- What are the consequences of not following my instructions?



# Foundational Information

**Foundational insights into CAISO footprint, system reliability, and summer outlook**

# System reliability requires a constant and instantaneous match between supply and demand



# California Independent System Operator

- Maintains reliability on the grid
- Manages the flow of energy
- Oversees the transmission planning process
- Operates the wholesale electric market
- Registered NERC entity



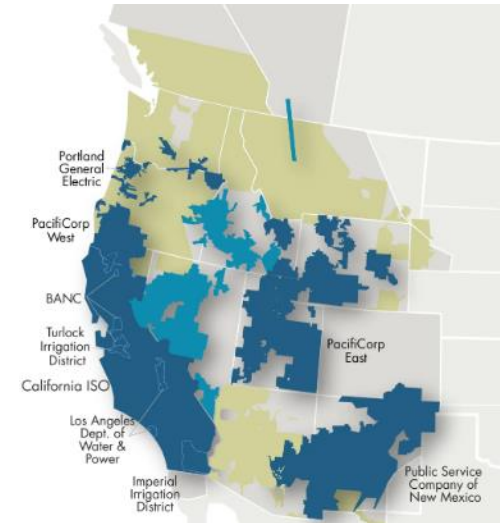
# ISO Market and Reliability Footprints



CAISO BAA



RC West



WEIM/EDAM

# CAISO Performance and Market Indicators

32

million consumers served

26,000

circuit miles of transmission lines

239.2

million MWh of load served by CAISO (2025)

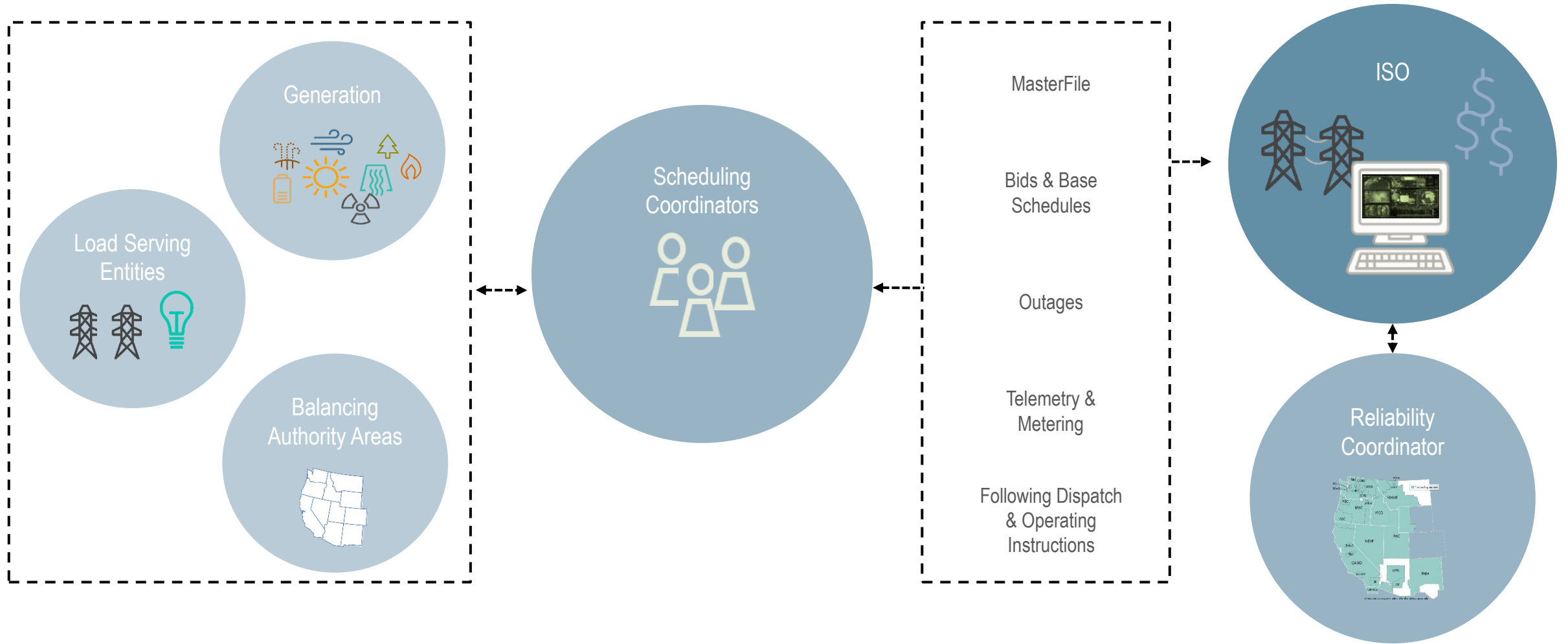
41,886

market transactions per day (2025)

\$14.9

billion annual market (2025)

# Communication + Coordination = Reliability



# 2026 Summer Loads and Resources Assessment Interactive

**Link:** <https://www.caiso.com/generation-transmission/resource-adequacy/2026-summer-loads-and-resources-assessment>



# 2026 Summer Loads and Resources Assessment Article

[Summer Loads and Resources Assessment](#) shows sufficient energy to meet a wide range of conditions throughout the upcoming summer driven by continued procurement and onboarding of significant amounts of new resources.



## Pause for thought



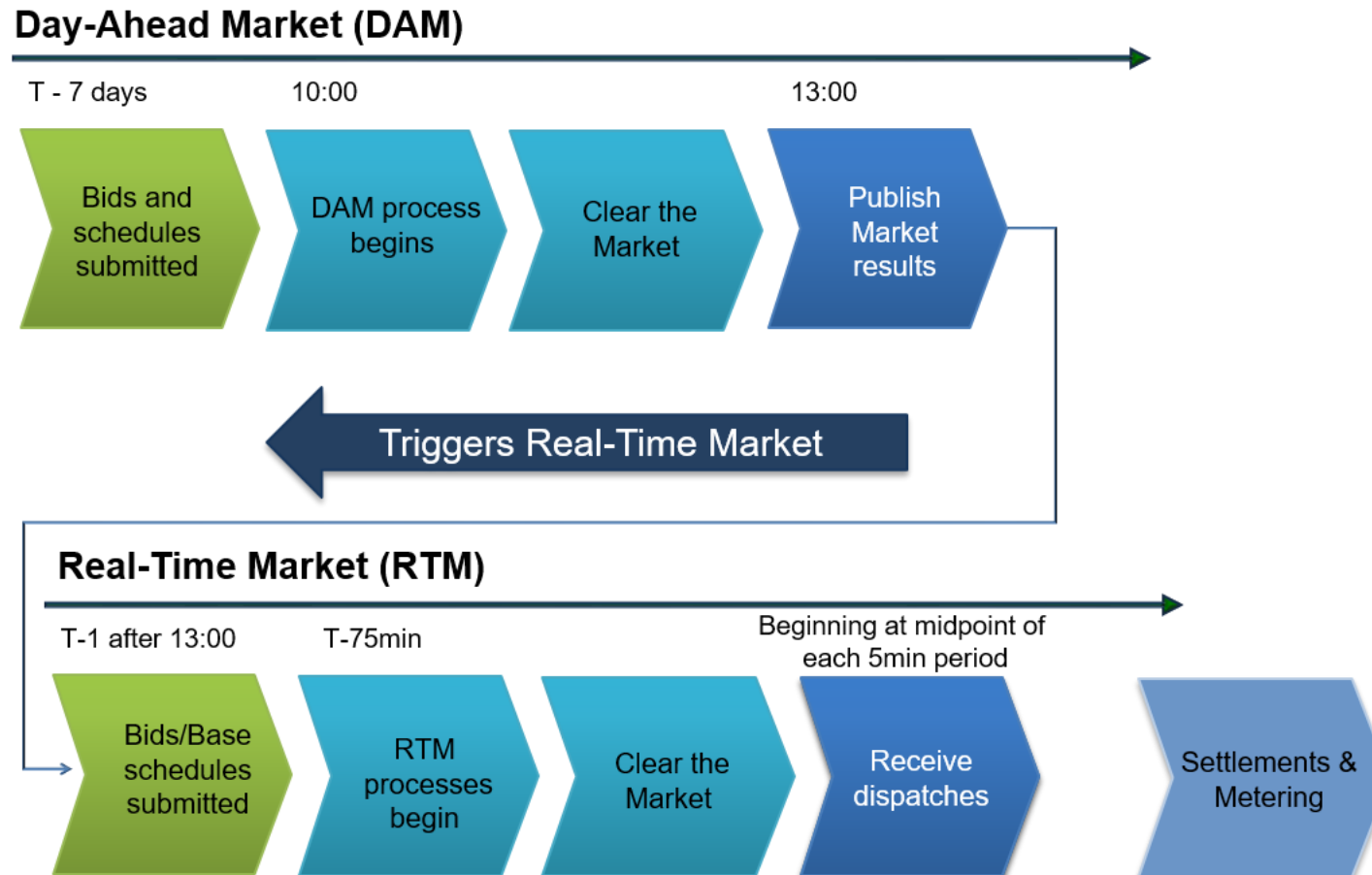
What impact does your work have on maintaining system reliability across the ISO footprint?



## Management of Resources

# Expected Response to Dispatch and Operating Instructions

# Market process timelines



# Each transaction within the market is associated with a specific Scheduling Coordinator type, market activity, timeframe and charge code



Annual

Month Ahead

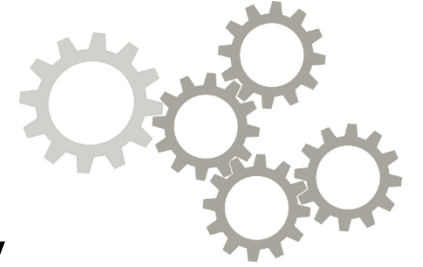
Day-Ahead

Hour-Ahead

Fifteen Minute

Five-Minute

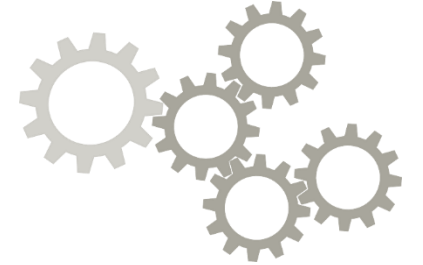
# The CAISO uses security constrained unit commitment (SCUC) to run the processes associated with the commitment of resources



- SCUC objective:
  - to minimize start-up and minimum load costs, bid in energy costs, and ancillary services costs, subject to network and resource-related constraints over the entire time horizon
- SCUC methodology:
  - maximizes economic efficiency, relieves network congestion, and considers physical constraints to achieve least-cost resource commitment and scheduling

Day-Ahead  
Process

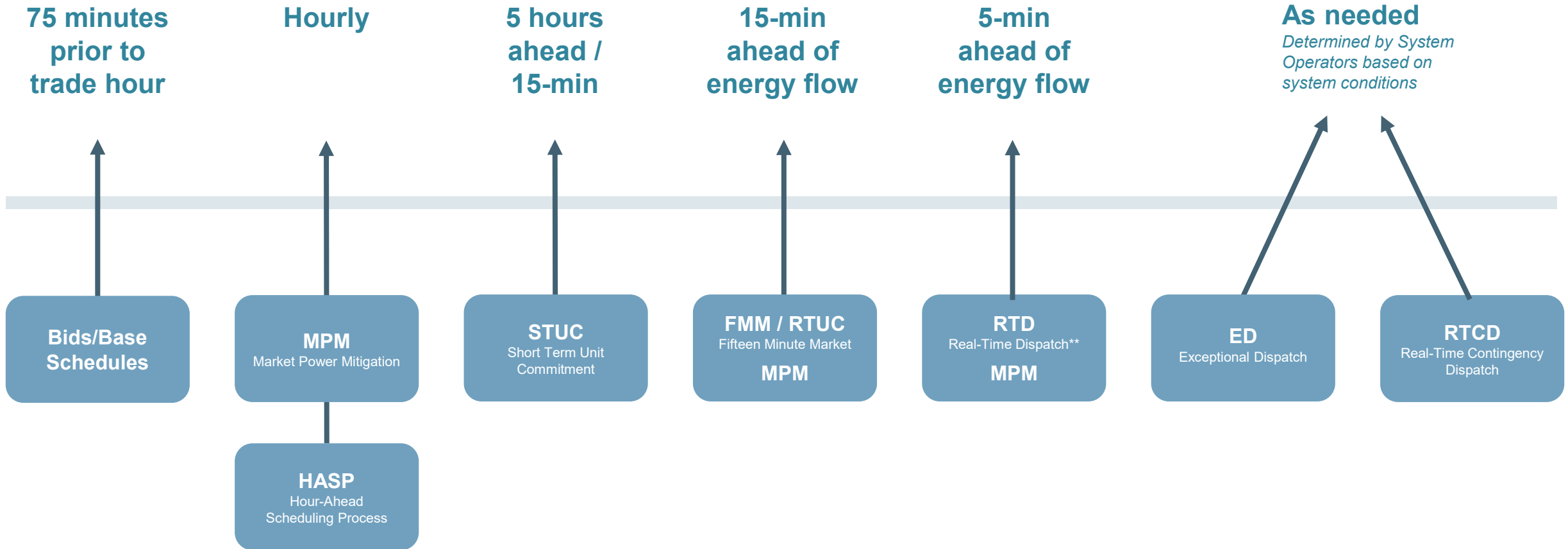
# The CAISO uses security constrained economic dispatch (SCED) as a centralized economic dispatch that optimizes the use of all resources



## Real-Time Process

- SCED objective:
  - Reduces cost of serving demand
  - Resolves transmission constraints economically
  - Provides transparency on constraints and costs
- SCED methodology:
  - Re-dispatches system every five minutes to meet current system conditions

# Real-time milestones



# Resource instructions are sent via Automated Dispatch System (ADS)

RTM  
Outputs

- For each **fifteen-minute interval** the market is:
  - Starting-up or shutting down resources
  - Transitioning multi-stage generators
- For each **five-minute interval** the market is:
  - Issuing real-time dispatch instructions



Real-time contingency dispatch dispatches energy to respond to a grid disturbance or a system emergency such that waiting until the next normal economic run is not adequate

## RTCD

- May occur at any time
- Produces a 10-minute dispatch
- Dispatch instructions override previously issued instructions Real-Time Economic Dispatch (RTED)
- Ancillary service awards for spinning or non-spinning reserves designated as contingency only are made available to the market
- Energy produced as a result of RTCD settles at real-time Locational Marginal Price (LMP)

*Real-Time Market Process*

Exceptional dispatch (ED) is used to prevent a situation that impacts system reliability, or an imminent system emergency, that cannot be addressed through normal market operations

ED

- Entered manually by ISO operator into the real-time market optimization software
- May be used to meet reliability requirements for voltage and contingencies
- Responded to immediately
- Cannot set the Locational Marginal Price (LMP)
- Called “Manual Dispatch” when performed by WEIM Entity Operator

*Real-Time Market Process*

# Automated Dispatch System (ADS)

The screenshot displays the California ISO Automated Dispatch System (ADS) interface. It features several key components:

- Batch Status and Interval Grid:** A table at the top left showing current and dispatch intervals, their statuses (Active, Fixed Max Min, Idle), and commitment times.
- System Messages and Operator Grid:** A table at the top right displaying system messages and operator actions, such as receiving new batch instructions.
- Resource Data Grid:** A large table in the center showing detailed data for various resources, including Resource ID, Config ID, DOT Type, and various performance metrics like RT, DOT, and Commitment.
- Trajectory Plot for Specified Resource:** A line graph at the bottom left showing the trajectory for resource 7STDRD\_1\_SOLAR1, plotting DOT (Dispatch Order Time) and DOP (Dispatch Order Price) over time.
- Instruction Details Grid for a Specified Resource:** A table at the bottom right providing detailed information for individual instructions, including Instruction Type, Accept Status, Award MW, and Start/End Times.

## Resource Management Priorities

- **Follow Dispatch Operating Targets accurately**
- Notify the ISO immediately if your resource is incapable of following your Dispatch Operating Target
- Ramp linearly to follow Dispatch Operating Points mid interval to mid interval
- Immediately follow Operating Instructions when issued by the ISO

**SCs and Resource Owner/Operators must work together**

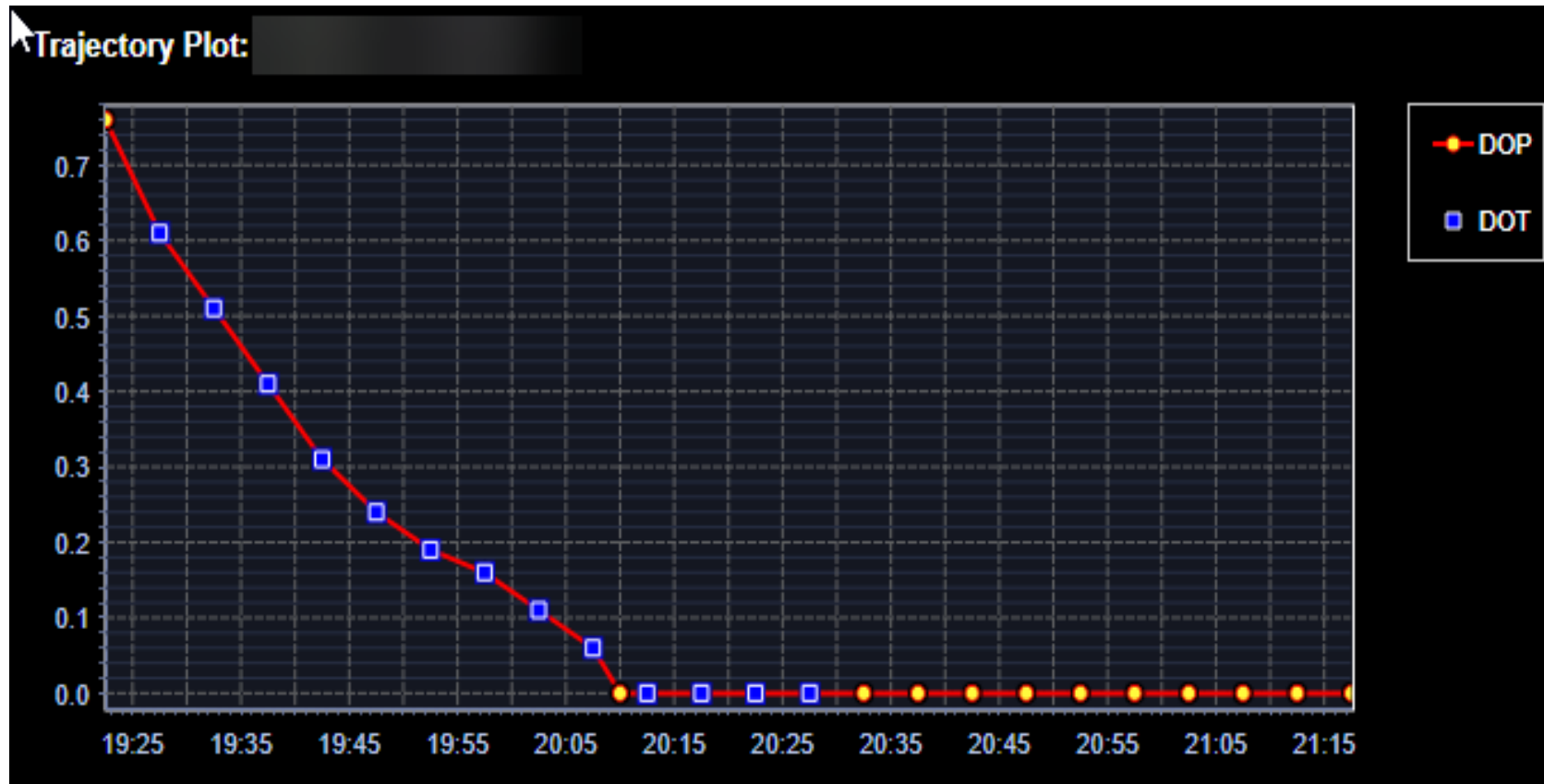
Market optimization results in dispatch instructions sent via ADS

Dispatch  
Operating  
Target

## Daily Instructions

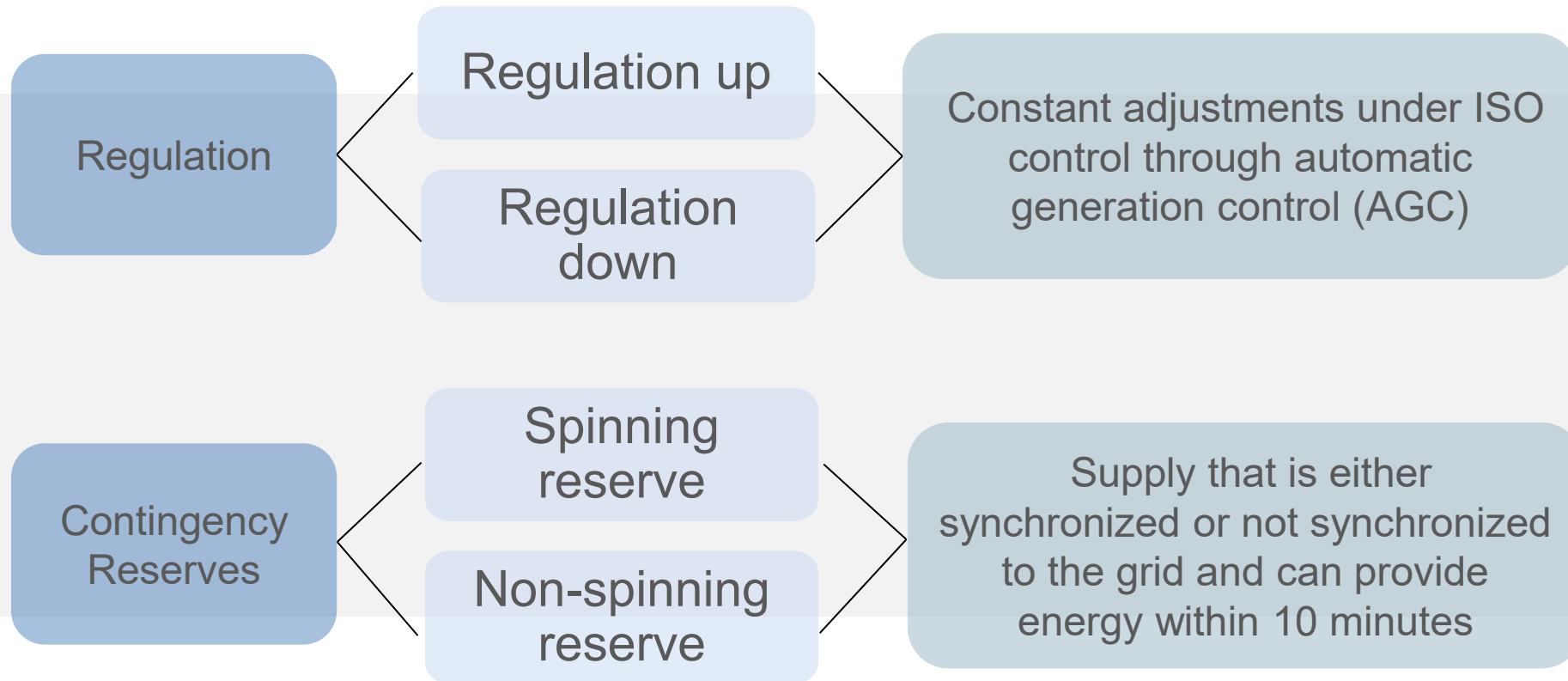
- Resources expected to perform as instructed
- Variable Energy Resources are allowed to “produce as capable” with some conditions

# Optimal dispatch representing a single point on the Dispatch Operating Point trajectory

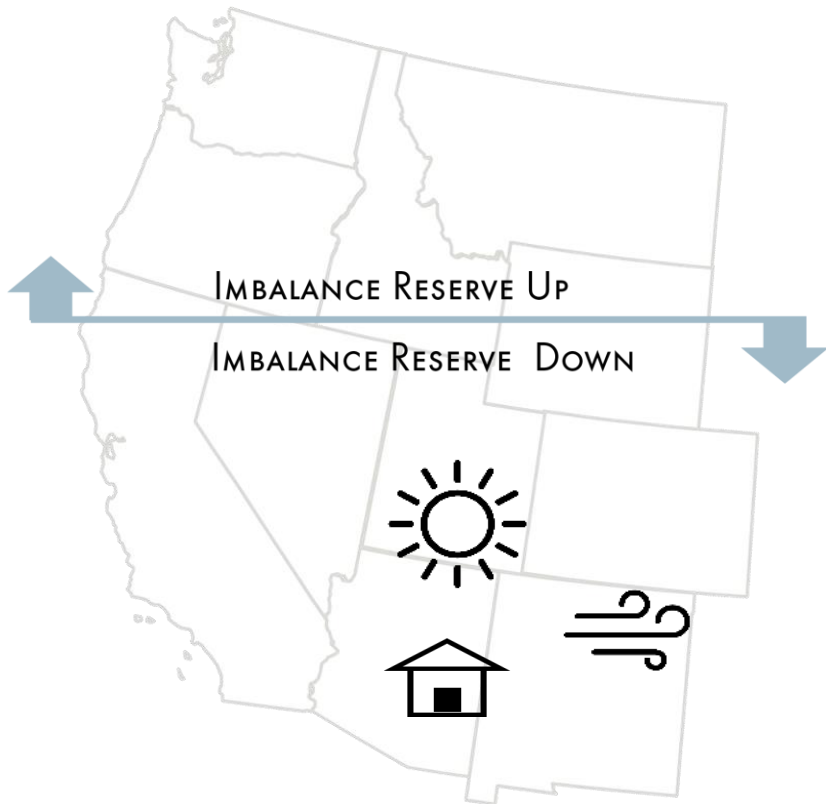




# Ancillary services ensure reliability as electricity is moved from generating sources to customers

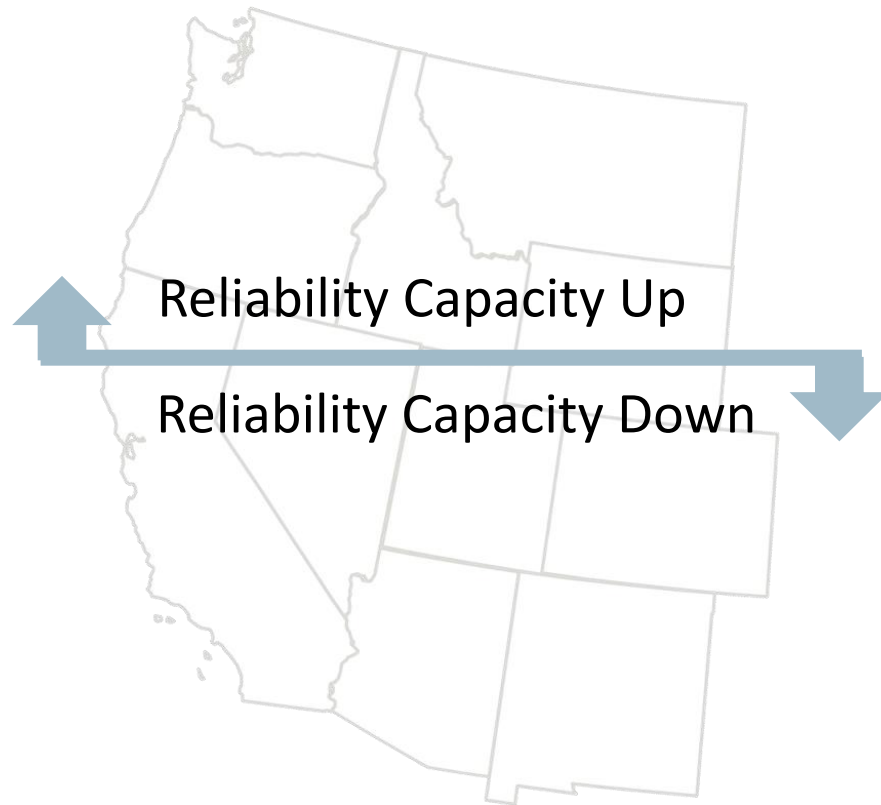


# Day-Ahead Market Imbalance Reserves provide consistent method for evaluating & addressing uncertainty needs in each BA



- Procured on an hourly basis for each area
- Requirements based on tomorrow's forecast and the historical uncertainty in the day-ahead load, solar, and wind forecasts
- Bids for imbalance reserves are submitted by participants across the EDAM footprint which maximizes diversity benefit
- SCs submit bids for **Imbalance Reserves UP** and **DOWN**
- May receive hourly awards for **one or both** products.

# Day-Ahead Market Reliability Capacity ensures sufficient physical supply is scheduled in the DA



With EDAM, reliability capacity provides BAs with upward **or** downward dispatch capability, ensuring sufficient physical supply scheduled in day-ahead.

Procurement of Reliability Capacity is done on an hourly basis for each BA from the bids that are submitted by SCs across the EDAM footprint.

SCs submit bids for **Reliability Capacity UP (RCU)** and **Reliability Capacity DOWN (RCD)** and may receive hourly awards for **only one** of the products.

# Ancillary Service (AS) awards in Real-Time

Applicable to  
ISO Balancing  
Authority Area  
Only

- Used to account for change in system conditions
  - Replacement for day-ahead awards that are not available in real-time
  - Changes to load forecast
  - Replacement of converted capacity (DA AS awards used)
  - Additional requirements in regional areas
- AS awards:
  - are designated as contingency only capacity
  - may be converted from capacity into energy in the event of a system disturbance

# Ancillary Services Requirements

- Resources with awards for A/S must submit real-time energy bids for those awards
- Nuances for Regulation:
  - **Regulation Down** must submit a self-schedule in real-time (we need to ensure that they are at the top of the Regulation range to bring them down)
    - does not apply to storage resources
  - **Regulation Up** can submit a self-schedule or an economic bid

Section 7.1.6 of the BPM for Market Operations, Real-Time Energy Bids

## AGC Terminology

- **Set Points**

- A megawatt output target for a participating generator. The ISO's Automatic Generation Control (AGC) is normally set to send a direct MW set point signal to all participating units every four seconds
- The difference between the **set point** and **base point** is the MW quantity of regulation service that a unit is providing at a given moment in time
  - The total regulation for the whole system is allocated among all participating regulating units
  - Base points that are set by non-economic dispatches are called **manual base points** (MBPs)

# Expectations for Ancillary Services (A/S) Certified Resources

## Performance for Reliability

In order to provide Regulation, be able to:

- ramp on and off Automatic Generation Control (AGC) to DOP in linear fashion
- stay on AGC for entire duration of A/S award and have manual controls to place on AGC
  - The ADS AGC flag is a courtesy feature for AGC notification; however, the resource must have the capability to have manual control to place on AGC
    - *Note: Do not program your controllers to rely on the ADS AGC feature alone*
- follow 4 second set points accurately
- show that regulation range reflects accurate capability
- ensure Outage Management System (OMS) reflects true capability and availability of resource
  - Resource cannot be on AGC providing Regulation with failed Telemetry
    - OMS Metering Telemetry card required with A/S fields set to 0 availability

# Automatic Generation Control (AGC) Flag & Transitioning Between AGCs and DOTs

## Summary of current issues

- Some resources do not have the capability to put themselves on control by any other means, causing issues to the grid's reliability.
- Timing discrepancies are occurring between AGC and DOT instructions, particularly around the top of the hour.
  - Instructions are sent slightly early, causing generators to go on and off control prematurely, leading to reliability issues and frequency excursions.
  - This early response can cause rapid ramps and potential grid instability.

# Automatic Generation Control (AGC) Flag & Transitioning Between AGCs and DOTs

## Addressing the issue

- Resources need to have the ability to control their AGC resources manually
  - Example: Adding a delay or putting a key off physical interval
- In case information is not available in ADS, Resources need to have the ability to fall back and review CMRI report to determine if there is a regulation award and identify if they are on AGC or not
- Informational guides:
  - [Operations Procedure 2710 Section 3.5 and 3.6](#)
  - [Knowledge Article: Required Criteria for the AGC Flag in the Automated Dispatch System \(ADS\) to be Set to “Y” When Awarded Regulation](#)

# Resource Management Priorities

- Follow Dispatch Operating Targets accurately
- Notify the ISO immediately if your resource is incapable of following your Dispatch Operating Target
- Ramp linearly to follow Dispatch Operating Points mid interval to mid interval
- Immediately follow Operating Instructions when issued by the ISO

**SCs and Resource Owner/Operators must work together**

# Example – Energy Resource Not Following Dispatch Instruction



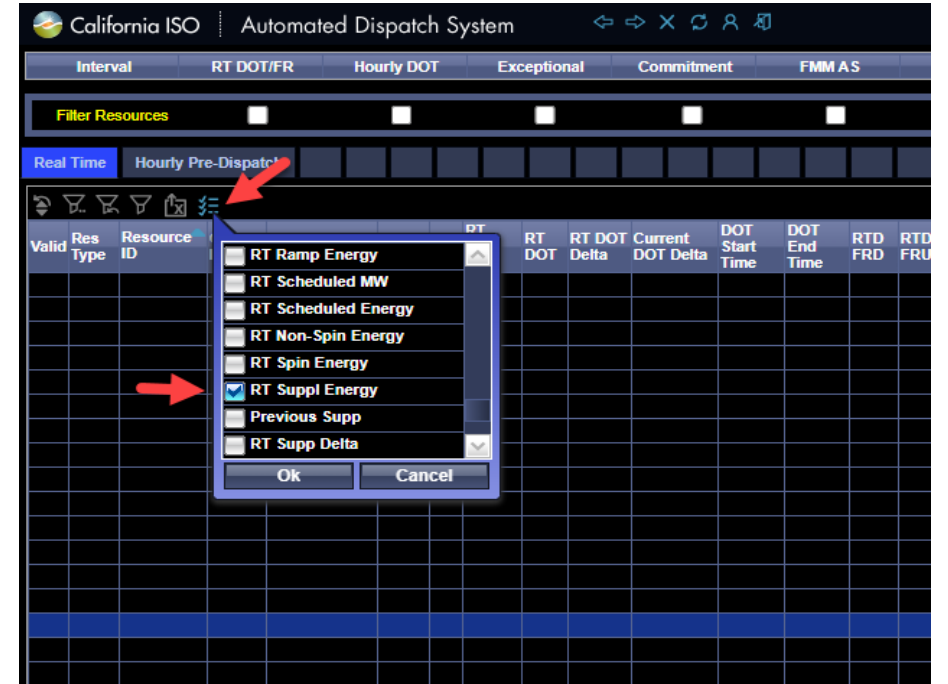
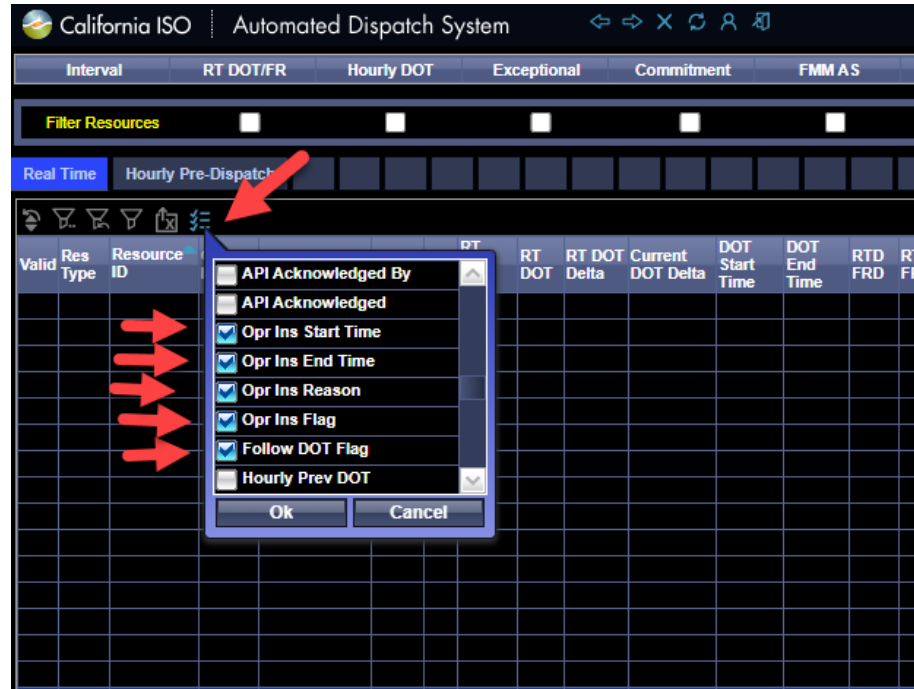
# Example – Resource Not Following AGC Set Point Instruction



Green Plant MW Output  
Red AGC Setpoint  
Light Blue SOC as % of Max  
Dark Blue DOT

# What Are Some Steps You Can Take To Improve Visibility?

**Make These 6 Columns Visible To See Flags When Resources Are Not Following DOTs**



This may significantly reduce the length of time resources fail to follow their DOTs

# Make sure AGC Flag is visible for Reg Up/Reg Down Awards

California ISO | Automated Dispatch System

| Interval          | RT DOT/FR   | Hourly DOT  | Exceptional | Commitment  | FMM AS      | Hourly AS   | Opr Instruction | AS Test |
|-------------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------------|---------|
| Current Interval  | 09:30-09:35 | 09:00-10:00 |             | 09:30-09:45 | 09:30-09:45 | 09:00-10:00 |                 |         |
| Dispatch Interval | 09:35-09:40 | 10:00-11:00 |             | 10:00-10:15 | 10:00-10:15 | 10:00-11:00 |                 |         |
| Received/Status   | 09:31:23    | 09:01:10    | Idle        | 09:30:06    | 09:30:06    | 09:01:14    | Idle            | Idle    |

| System Messages     | Query Tool | Configurations   | Operator |
|---------------------|------------|--|----------|
| 05/06/2026 09:34:19 |            | ADS System Ready   |          |
| 05/06/2026 09:31:23 |            | Received new 5 Minute DOT batch DISP-F21DCFB0-2B96-403F-FFB6-AC15E0B84F99    |          |
| 05/06/2026 09:30:06 |            | Received new Unit Commitment batch DISP-C535FDB0-2B96-403F-FFB3-AC15E0B8DBFE |          |
| 05/06/2026 09:30:06 |            | Received new FMM AS batch DISP-C511D3E0-2B96-403F-FFB9-AC15E0BA02B8          |          |
| 05/06/2026 09:30:06 |            | Received new FMM Energy batch DISP-C51444E0-2B96-403F-FFB9-AC15E0BA02B8      |          |

| Valid | Resource ID           | Config ID | Contingency Type | DOT Type | SC ID | RT Interval | RT Prev DOT | RT DOT  | RT DOT Delta | Current DOT Delta | DOT Start Time | DOT End Time | RTD FRD | RTD ED | ED Max | ED Min | ED Unit | Commitment Start Time | Commitment End Time | Commitment To Config | FMM Dispatch Energy | Current Dispatch AS Total | Current Dispatch Spin | Dispatch AS Total | Dispatch Dispatch Spin | Dispatch Non Spin | Dispatch Regl Up | Dispatch Regl Down | AS Test Constraint MW | Follow RT Flag | RT Suppl Energy | Opr Ins Flag | Opr Ins Start Time | Opr Ins End Time | Opr Ins Reason | Priority | Base Schedule |
|-------|-----------------------|-----------|------------------|----------|-------|-------------|-------------|---------|--------------|-------------------|----------------|--------------|---------|--------|--------|--------|---------|-----------------------|---------------------|----------------------|---------------------|---------------------------|-----------------------|-------------------|------------------------|-------------------|------------------|--------------------|-----------------------|----------------|-----------------|--------------|--------------------|------------------|----------------|----------|---------------|
|       | GEN CRMSN_2_CRMDBT1   |           |                  | DOT      | SCE1  | 8           | -200.00     | -200.00 | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      | 200.00              | 200.00                    | 0.00                  | 0.00              | 0.00                   | 0.00              | 0.00             |                    | -200.00               |                |                 |              |                    | 3                | 0.00           |          |               |
|       | GEN TRMGLT_2_RETBT1   |           |                  | DOT      | SCE1  | 8           | -36.00      | -36.00  | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      | 72.00               | 72.00                     | 0.00                  | 0.00              | 0.00                   | 0.00              | 0.00             |                    | -36.00                |                |                 |              |                    | 3                | 0.00           |          |               |
|       | GEN BLACK_7_UNIT 1    |           |                  | DOT      | PCG2  | 8           | 0.00        | 0.00    | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      | 50.60               | 50.60                     | 0.00                  | 0.00              | 0.00                   | 0.00              | 0.00             |                    | 0.00                  |                |                 |              |                    | 3                | 0.00           |          |               |
|       | GEN AGRICO_7_UNIT     |           |                  | DOT      | WPX1  | 8           | 0.00        | 0.00    | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         | Shutdown              | 10:00               | 10:00                |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    | 3                | 0.00           |          |               |
|       | GEN STANTN_2_STAGT2   |           |                  | DOT      | WPX1  | 8           | 0.00        | 0.00    | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      | 49.65               | 49.65                     | 0.00                  | 0.00              | 0.00                   | 0.00              | 0.00             |                    | 0.00                  |                |                 |              |                    |                  | 3              | 0.00     |               |
|       | GEN BLACK_7_UNIT 2    |           |                  | DOT      | PCG2  | 8           | 0.00        | 0.00    | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      | 70.10               | 47.91                     | 0.00                  | 0.00              | 0.00                   | 0.00              | 0.00             |                    | 0.00                  |                |                 |              |                    |                  | 3              | 0.00     |               |
|       | GEN CENTER_6_PEAKE    |           |                  | DOT      | SCE1  | 8           | 0.00        | 0.00    | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    |                  |                |          |               |
|       | GEN JOANEC_2_ST3BT3   |           |                  | DOT      | JEC1  | 8           | -40.00      | -40.00  | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    |                  |                |          |               |
|       | GEN PROXSR_2_PS1BT1   |           |                  | DOT      | SCE1  | 8           | -1.19       | -15.54  | -14.25       | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    |                  |                |          |               |
|       | TO SUNPND_5_SPSBT1    |           |                  | DOT      | LBCE  | 8           | -17.05      | -15.91  | 1.14         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    |                  |                |          |               |
|       | GEN VERNON_6_MALBRG   |           |                  | DOT      | VLRN  | 8           | 34.00       | 34.00   | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    |                  |                |          |               |
|       | GEN JOANEC_2_STABT1   |           |                  | DOT      | JEC1  | 8           | -10.00      | -10.00  | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    |                  |                |          |               |
|       | GEN STANIS_7_UNIT 1   |           |                  | DOT      | PCG2  | 8           | 3.25        | 3.25    | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    |                  |                |          |               |
|       | GEN MIRLOM_2_MLBDBT6  |           |                  | DOT      | SCE1  | 8           | -5.77       | -5.77   | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    |                  |                |          |               |
|       | GEN MIRLOM_2_MLBDBT7A |           |                  | DOT      | SCE1  | 8           | -1.36       | -1.36   | 0.00         | 0.00              | 09:37          |              |         |        |        |        |         |                       |                     |                      |                     |                           |                       |                   |                        |                   |                  |                    |                       |                |                 |              |                    |                  |                |          |               |

Trajectory Plot: MIRLOM\_2\_MLBDBT7A

| Valid | Instruction Type | AGC | Accept DOT | Accept Status | Award MW | ED Energy Code | Instd MW | Min Accept | Self Sched MW | Start Time | End Time | Prev Goto | Responder | From Config Id | To Config Id |
|-------|------------------|-----|------------|---------------|----------|----------------|----------|------------|---------------|------------|----------|-----------|-----------|----------------|--------------|
|       | RU               |     |            |               | 0.00     |                | 9.61     |            |               | 9:51       | 10:00    |           |           |                |              |
|       | RD               |     |            |               | 4.33     |                | 6.56     |            |               | 2:23       | 09:45    | 10:00     |           |                |              |
|       | SR               |     |            |               | 0.00     |                | 2.72     |            |               | 2:72       | 09:45    | 10:00     |           |                |              |
|       | DOT              | Y   | -1.36      |               |          |                | -1.36    |            |               |            | 09:37    |           |           |                | -1.36        |
|       | DOT              | Y   | -1.36      |               |          |                | -1.36    |            |               |            | 09:32    |           |           |                | -1.36        |
|       | RD               |     |            |               | 4.33     |                | 6.56     |            |               | 2:23       | 09:30    | 09:45     |           |                |              |
|       | SR               |     |            |               | 0.00     |                | 2.72     |            |               | 2:72       | 09:30    | 09:45     |           |                |              |
|       | DOT              | Y   | -1.36      |               |          |                | -1.36    |            |               |            | 09:27    |           |           |                | -1.36        |
|       | DOT              | Y   | -1.36      |               |          |                | -1.36    |            |               |            | 09:22    |           |           |                | -1.36        |
|       | DOT              | Y   | -1.36      |               |          |                | -1.36    |            |               |            | 09:17    |           |           |                | -1.36        |
|       | RD               |     |            |               | 0.00     |                | 2.23     |            |               | 2:23       | 09:15    | 09:30     |           |                |              |
|       | SR               |     |            |               | 0.00     |                | 2.72     |            |               | 2:72       | 09:15    | 09:30     |           |                |              |

# Managing State of Charge (SOC) for storage resources

## Reserves

Spinning and Non-Spinning awards ensure that 30 minutes of SOC is reserved in the Fifteen Minute Market (FMM) and Real-time Dispatch (RTD)

## Regulation

Regulation Up and Regulation Down awards ensure that 30 minutes of SOC is reserved in the Fifteen Minute Market (FMM) and Real-time Dispatch (RTD) and 20 minutes of SOC for RTCD\*

*\* For the 1<sup>st</sup> RTCD the market reserves 20 minutes and releases 10 minutes*

*\* For the 2<sup>nd</sup> and beyond it releases all*

## Self Schedules

Self-Schedules are respected by reserving SOC for Self-schedules outside of the RTD horizon and then RTD ensures that SOC is reserved to meet the Self-Schedule for the hour

# Managing State of Charge (SOC) for resources

## Day-Ahead Market

Resources submit SOC for HE01 into Scheduling Infrastructure and Business Rules (SIBR)



### Regulation Energy Management (REM)

The REM SOC is 50% so they have equal upward/downward mobility

### Non-Regulation Energy Management (NREM)

The market tracks a resource's SOC and uses it to determine when to charge/discharge in order to optimize it across the 24-hour period

## Real-Time Market

Monitors resources SOC using telemetry -- the measurement of flow on the lines -- and ensures that sufficient SOC is reserved to support market awards

# Storage Key Terms

## **Primary Frequency Response (PFR)**

First stage of frequency control and is the response of generator governors and loads to arrest locally detected changes in frequency

## **Droop (FERC Order 842)**

Variation in real power (MW) output due to variations in system frequency and is typically expressed as a percentage -- e.g. 5% droop -- and reflects the amount of frequency change from nominal e.g. 5% of 60 Hz is 3 Hz necessary to cause the main prime mover control mechanism of a generating facility to move from fully closed to fully open

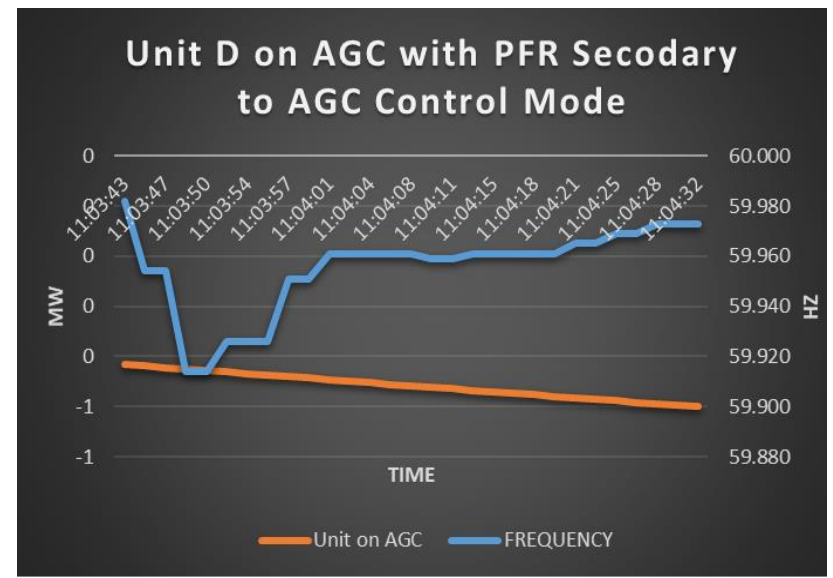
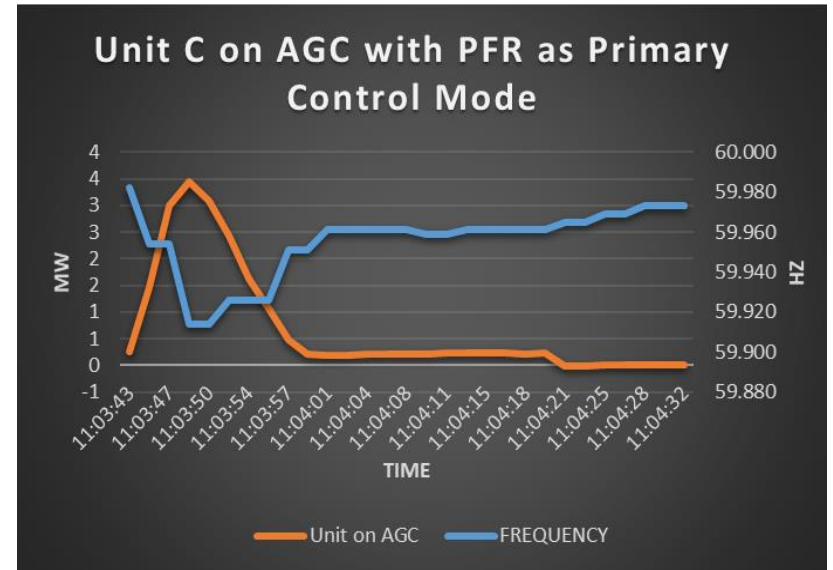
## **Deadband (FERC Order 842)**

Represents a minimum frequency deviation e.g.  $\pm 0.036$  Hz from nominal system frequency -- 60 Hz in North America -- that must be exceeded in order for the generating facility to provide primary frequency response

# Primary Frequency Response (PFR)

PFR needs to be the Primary Control Mode and be additive to other control modes

Most battery storage facilities have Automatic Generation Control (AGC) as the primary control mode and need to be able to take control



# Managing oscillation issues is key

## Reminder

- As your resource is attached to a much larger grid, actions should be taken with caution.

## Example

- A 250 MW battery oscillating 60 times per second due to an online software update. Such updates can cause erratic behavior, including rapid power swings that impact grid stability.

## Important Note

- Software updates should **only** be done offline to avoid grid disturbances.



# Communicating unavailability of resources may be done using outages

When **should** an outage be submitted?

When a **physical** restriction limits a unit's output  
Must be submitted regardless of whether it is expected to be a long or serious outage

When should an outage **NOT** be submitted?

For economic reasons

What happens when the outage is ended or cancelled?

Update outage tool as soon as resource is available  
The bidding tool does not check a resource's availability

# Outages are treated differently in Day-Ahead vs. Real-Time

## Day-Ahead

- After any outage, the Cold Startup time is enforced

In Real Time, a Commitment Override may also be utilized should the actual operations of the resource differ than the market

## Real-Time

- After any outage, the startup time is determined by comparison to the registered Masterfile startup profiles
- For example, if the outage was less than 4 hours and they have a startup curve under 4 hours is X minutes, we will use that

# Resource availability provided via outage data

Resource outages may be **forced** or **planned**

## Generation

- Master File provides the market with information on generating resources
- Resource availability values are sent to market systems - setting the limits for forward schedules and real-time dispatches

## Transmission

- The market runs a power flow calculation which takes into account the status of the bulk electrical system

# What tool is used to communicate your outage?

**Use OMS to  
Reflect  
Physical Limits  
of Resources**

- The Outage Management System (OMS) is the primary method of communicating Outage related information. OMS provides an automated mechanism for parties to communicate all aspects of Outage information.
- OMS should be used for all physical limitations at the plant.
  - Early submission is highly encouraged.
  - Non-urgent outages should be scheduled based on the practices established in the Outage Management BPM.
    - Reference § 8.2 Outage Management BPM for Real-Time Outage Submissions.

Coordination & communication  
ensure the safety of the grid!

# What Information Is Required For Outages?

## Solar Example

NEW GENERATION OUTAGE

Participant Name:

Outage Class:

Resource:

Start Date/Time: 07/18/2023 09:36

End Date/Time: 07/18/2023 10:00

Outage Duration: 0 day(s) 0 hour(s) 24 minute(s)

Discovery Date/Time: 07/18/2023 09:36

Emerg. Return Time/Types:

Nature of Work:

BA/TOP Confirmed:

Emergency:  Operational:

RAS/SPS Out of Service:  Y  N  N/A

RAS/SPS Reduced Redundancy:  Y  N  N/A

Protection Zone:  Y  N  N/A

EHS/ICCP Outage:  Y  N  N/A

Opportunity:

Participant Outage ID:

GADS Cause Codes:

Time To Start Up:

Short Description: \*

Test Outage

Be as detailed as possible in describing the issue with your resource

your SCID

Market Resource ID

Refer to Procedure 3220 Section 3.3.1 Nature of Work (NOW) Categories

Availability(Pmax) = VER Capability

| Availability | Notes                  | A/S Availability             | PMIN Re-Rate                 | Ramp Re-Rate | Max Energy      | Min Energy         | Load Max          | Load Min            | Use Limited | RIMS |
|--------------|------------------------|------------------------------|------------------------------|--------------|-----------------|--------------------|-------------------|---------------------|-------------|------|
| Resource:    |                        |                              |                              |              |                 |                    |                   |                     |             |      |
|              | Availability Date/Time | OOS <input type="checkbox"/> | NDC <input type="checkbox"/> | MAX          | Availability MW | Outage Curtailment | Total Curtailment | Overlapping Outages |             |      |
| +            | 07/18/2023 09:36       | <input type="checkbox"/>     | <input type="checkbox"/>     | 0            | 20.00           | 0.00               | 0.00              |                     |             |      |
|              | 07/18/2023 10:00       |                              |                              | 20           | 20.00           | 0.00               | 0.00              |                     |             |      |

Regulation Up  
Regulation Down  
Spin/Non-Spin

Can your resource provide their awards?  
If not, Enter 0 for the appropriate product.

If your resource minimum output needs to be adjusted up

# What Information Is Required For Outages?

## Battery Example – Additional Info Required

your SCID

Market Resource ID

Refer to Procedure 3220 Section 3.3.1 Nature of Work (NOW) Categories

Be as detailed as possible in describing the issue with your resource

Min Energy = Minimum SOC (MWh)

Load Max(Pmin) = Charging Capability

Availability(Pmax) = Discharge Capability

Regulation Up  
Regulation Down  
Spin/Non-Spin  
Can your resource provide their awards?  
If not, Enter 0 for the appropriate product.

Max Energy = Maximum SOC (MWh)

Participant Name: [dropdown]  
 Outage Class: Generation  
 Resource: [dropdown]  
 Start Date/Time: 06/29/2023 11:45  
 End Date/Time: 06/29/2023 20:00  
 Outage Duration: 0 day(s) 8 hour(s) 15 minute(s)  
 Discovery Date/Time: 06/29/2023 11:45  
 Emerg. Return Time/Type: Duration  
 Nature of Work: PLANT\_TROUBLE  
 BA/TOP Confirmed:   
 Emergency:  Operational:   
 RAS/SPS Out of Service:  Y  N  N/A  
 RAS/SPS Reduced Redundancy:  Y  N  N/A  
 Protection Zone:  Y  N  N/A  
 EMS/ICCP Outage:  Y  N  N/A  
 Opportunity: [dropdown]  
 Participant Outage ID: [text]  
 GADS Cause Codes: [text]  
 Time To Start Up: [dropdown]

Short Description: \*  
Test Outage

Availability Notes A/S Availability PMIN Re-Rate Ramp Re-Rate Max Energy Min Energy Load Max Load Min Use Limited RIMS

| Resource: | Availability Date/Time | OOS <input type="checkbox"/> | NDC <input type="checkbox"/> | PMAX   | Availability MW | Outage Curtailment | Total Curtailment | Overlapping Outages |
|-----------|------------------------|------------------------------|------------------------------|--------|-----------------|--------------------|-------------------|---------------------|
| +         | 06/29/2023 11:45       | <input type="checkbox"/>     | <input type="checkbox"/>     | 100.45 | 85.00           | 0.00               | 15.45             |                     |
|           | 06/29/2023 20:00       |                              |                              | 100.45 | 85.00           | 0.00               | 15.45             |                     |

# Nature of Work

The screenshot shows a web form for submitting an outage request. The form includes the following fields and options:

- Participant Name: [Dropdown]
- Outage Class: Generation [Dropdown]
- Resource: [Dropdown]
- Start Date/Time: 06/29/2023 11:45 [Calendar icon]
- End Date/Time: 06/29/2023 20:00 [Calendar icon]
- Outage Duration: 0 day(s) 8 hour(s) 15 minute(s)
- Discovery Date/Time: 06/29/2023 11:45 [Calendar icon]
- Emergency Return time/type: [Dropdown]
- Nature of Work: PLANT\_TROUBLE [Dropdown, highlighted with a blue box]
- Emergency:  Operational:
- RAS/SPS Out of Service:  Y  N  N/A
- RAS/SPS Reduced Redundancy:  Y  N  N/A
- Protection Zone:  Y  N  N/A
- EHS/ICCP Outage:  Y  N  N/A
- Opportunity: [Dropdown]

Callouts on the left side of the form:

- your SCID (points to Participant Name)
- Market Resource ID (points to Resource)
- Refer to Procedure 3220 Section 3.3.1 Nature of Work (NOW) Categories (points to Nature of Work)

- All Outage requests submitted to the CAISO OMS must have an associated NoW category assigned to it
- Captures relevant data for outage coordination, and increase consistency in the level of information reported
- Use of certain NoW categories will determine whether an Outage de-rate for an RA resource will be subject to Resource Adequacy Availability Incentive Mechanism (RAAIM) provisions

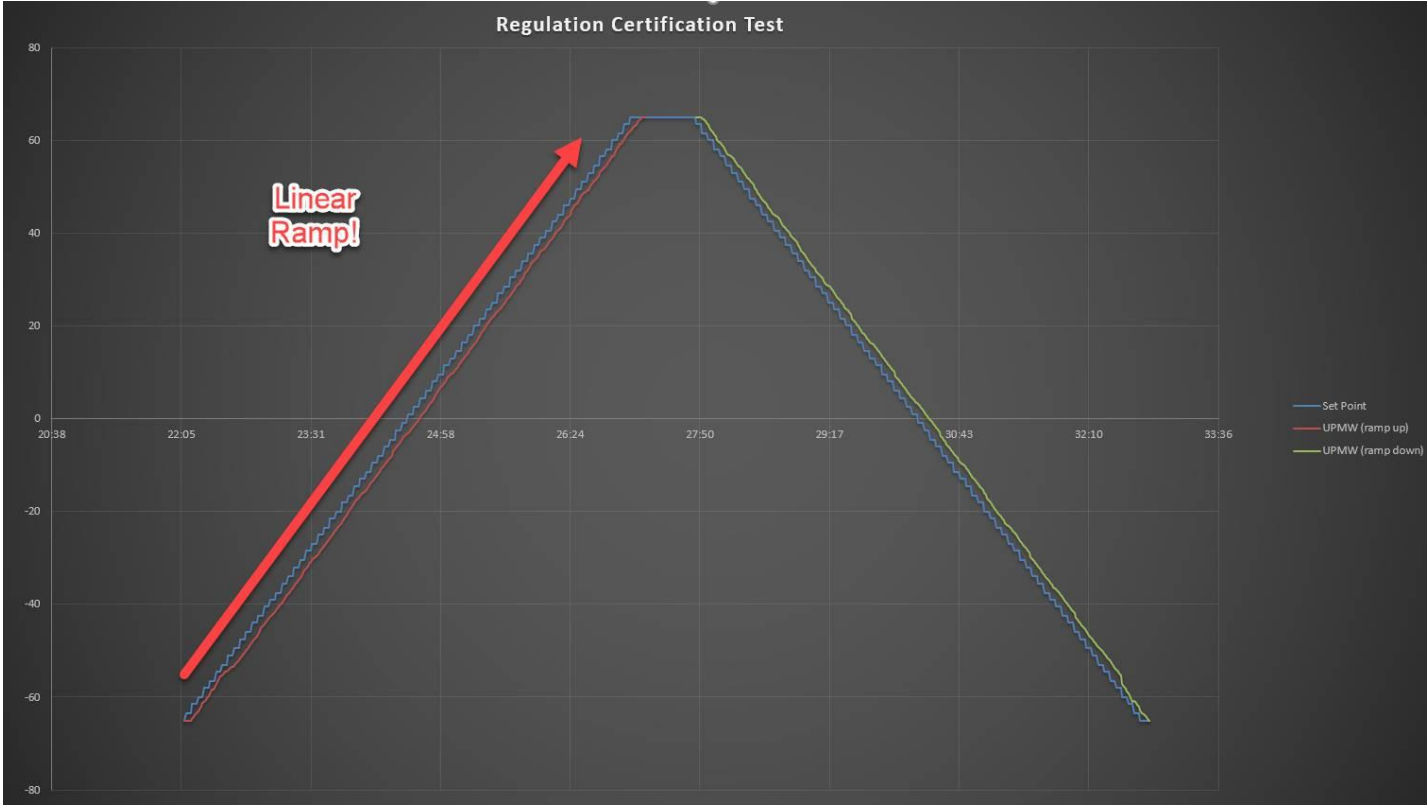
Refer to the Outage Management Business Practice Manual

# Resource Management Priorities

- Follow Dispatch Operating Targets accurately
- Notify the ISO immediately if your resource is incapable of following your Dispatch Operating Target
- Ramp linearly to follow Dispatch Operating Points mid interval to mid interval
- Immediately follow Operating Instructions when issued by the ISO

**SCs and Resource Owner/Operators must work together**

# Example of a Successful Test with a Linear Ramp



# Ramping in Accordance with Operator Instructions

## Linear Ramp Rate

- The set point will increment linearly from starting point to target at an agreed upon ramp rate.
- Set points will increment every 4 seconds from start to finish.
  - Resource expected to respond linearly as instructions are received.
- Resource response must never “Step” above its expected ramp rate during testing or normal operations.
- Default ramp rate should be a controlled value.

# Resource Management Priorities

- Follow Dispatch Operating Targets accurately
- Notify the ISO immediately if your resource is incapable of following your Dispatch Operating Target
- Ramp linearly to follow Dispatch Operating Points mid interval to mid interval
- Immediately follow Operating Instructions when issued by the ISO

**SCs and Resource Owner/Operators must work together**

Command by Operators to preserve the state, status, output or input of a Bulk Electric System resource

Operating  
Instructions

## Emergency Instructions

- May be received via EMS and/or verbal communication
- May be received via ADS as a result of Operator intervention
- Required to be followed within given timelines and ramp requirements unless physically impossible

# Complying with Operating Instructions

## **Tariff Requires Compliance with Dispatch and Operating Instructions**

### **4.2.1 Comply with Dispatch Instructions and Operating Instructions**

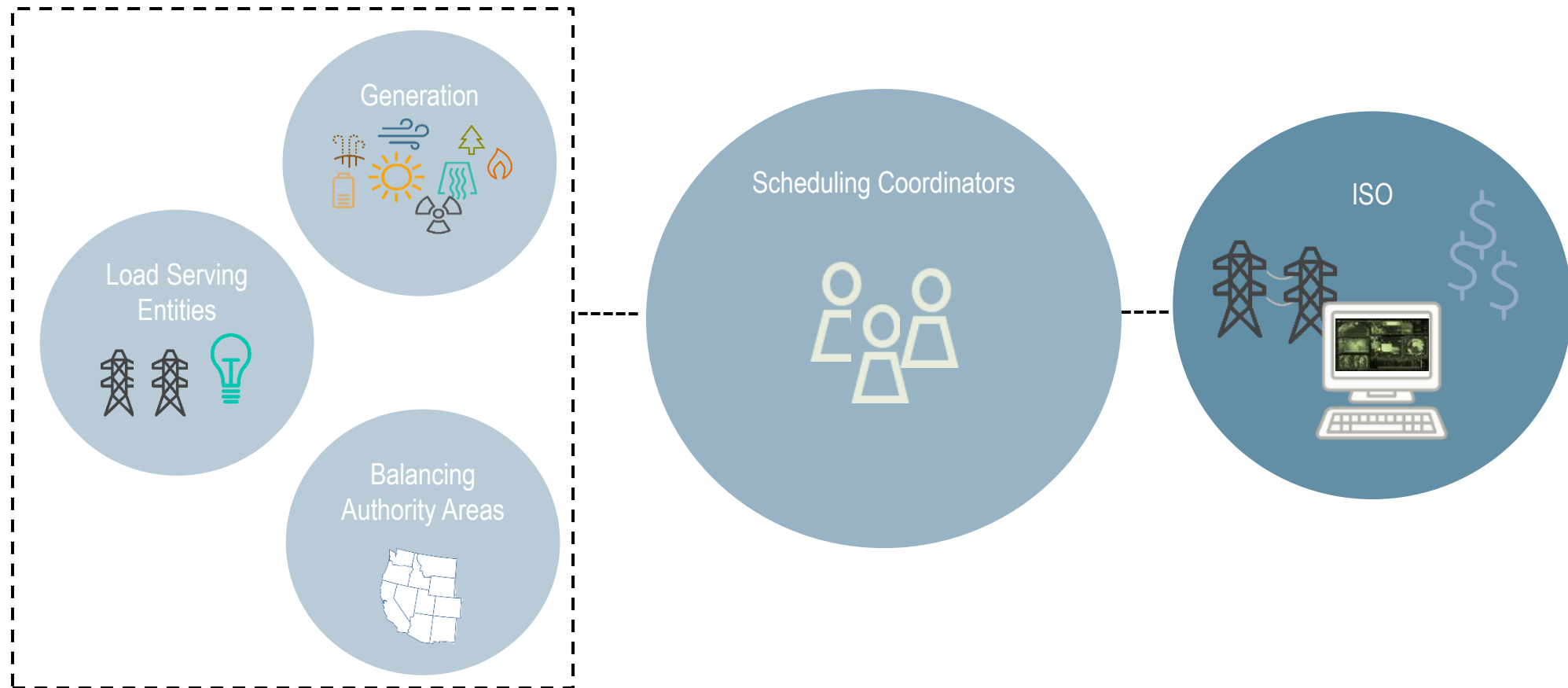
- With respect to this Section 4.2, all Market Participants, including Scheduling Coordinators, Utility Distribution Companies, Participating Transmission Owners, Participating Generators, Participating Loads, Demand Response Providers, Distributed Energy Resource Providers, Balancing Authorities (to the extent the agreement between the Balancing Authority and the CAISO so provides), and MSS Operators within the CAISO Balancing Authority Area and all System Resources shall comply fully and promptly with the Dispatch Instructions and Operating Instructions, unless such compliance (1) would impair public health or safety; (2) is otherwise exempted pursuant to Section 34.13.1; or (3) it is physically impossible for the Market Participant to perform in compliance with the Dispatch Instruction or Operating Instruction. Shedding Load for a System Emergency does not constitute impairment to public health or safety. The Market Participant shall immediately notify the CAISO of its inability to perform in compliance with the Operating Instruction.

# Example of Operating Instruction in ADS



- Note Field will indicate “Do not exceed DOT due to <Reason>”
- Resource obligated to comply with Operating Instruction within 10 minutes, ramping linearly with DOT.
  - The acknowledgement should be visible when the first user from the SC organization acknowledges the pop up.
- The message shall only pop up once per user per time horizon of the instruction, and will remain until acknowledged by the user.

# Communications with the ISO Generator Operator should be coordinated through the Scheduling Coordinator



# Role of the CAISO Generation Dispatcher

Mitigation



Communication

Balancing

## Manage and mitigate within System Limits

~26,000 circuit miles of transmission

- ISO Transmission ↔ Utilities Participating Transmission Owners
- Scheduling Coordinators ↔ Resources

## Manage Supply to meet Real-Time Demand

Serve ~80% of California demand

- Scheduling Coordinators ↔ Resources
- Reliability Coordinator ↔ Gen Dispatcher



## Three-part conversation pursuant to [NERC COM-002](#)

This is the ISO Generation Dispatcher and I need for you to take Unit ABC\_123 offline within the next 10 minutes.

This is the Resource Operator, and I understand you are instructing me to take Unit ABC\_123 offline within the next 10 minutes.

That is correct.  
Thank you.

# Initial set up and testing procedures

- Create a test plan that has detailed actions in the description field
- Ensure proper set up and communication for resource testing and performance
- Communicate to ensure adequate control of resources
  - **Operating Instructions**
    - Respond to Operating Instructions (OI) within required time parameters
    - Must have control of resource(s) at all times
- Ensure proper updates for resource testing and availability
- Actively monitor your resource
  - *Who is running the resource? Who has control? Can you manually place your resource on AGC? If needed, can you take the site offline within 10 minutes?*
- Proactively communicate and coordinate ANY deviations from the test plan with the associated ISO Generation Dispatcher

# Resource Testing

## **Important Reminder**

- Operators must call the gen desk at least 30 minutes prior to testing for approval

## **Common Misconception**


- An approved test card does not grant automatic permission to start testing.

## **Disciplinary Actions**

- Misunderstandings about test approvals can lead to forced test shutdowns and financial penalties, especially for pre-commercial resources.

# What Happens in Case of ADS/Market Disruption?

## Review Operating Procedures 2710 or 2720


|   |                            |  |
|---|----------------------------|--|
|  <b>California ISO</b> | <b>Operating Procedure</b> | <b>Procedure No.</b> 2710                |
|   |                            | <b>Version No.</b> 5.4                   |
|   |                            | <b>Effective Date</b> 8/15/24            |
| <b>Market Disruption - RTM Failure and Suspension</b>   |                            | <b>Distribution Restriction:</b><br>None |

### Table of Contents

|   |           |
|---|-----------|
| <b>Purpose</b> .....  | <b>1</b>  |
| 1. Responsibilities.....  | 2         |
| 2. Scope/Applicability.....   | 2         |
| 2.1. Background.....  | 2         |
| 2.2. Scope / Applicability.....   | 3         |
| 3. Procedure Detail.....  | 3         |
| 3.1. HASP Processing and Failure.....   | 3         |
| 3.1.1. RTPD/STUC Processing.....  | 4         |
| 3.1.2. HASP Processing and Failure Details and Actions.....                       | 4         |
| 3.2. RTD Dependencies.....  | 6         |
| 3.3. RTD Failure.....   | 6         |
| 3.4. RTCD Failure.....  | 8         |
| 3.5. RTPD Failure.....  | 9         |
| 3.6. HASP/RTPD/RTUC/RTD Disruptions: Hold Last DOT or Revert to DA Schedules..... | 10        |
| 3.7. Suspension of the Real-Time Market.....                                      | 11        |
| 3.8. Resumption of the Real-Time Market.....                                      | 12        |
| 3.9. MNS Notice Templates.....  | 12        |
| 4. Supporting Information.....  | 13        |
| Operationally Affected Parties.....   | 13        |
| References.....   | 13        |
| Definitions.....  | 13        |
| Version History.....  | 14        |
| 5. Periodic Review Procedure.....   | 15        |
| Review Criteria & Incorporation of Changes.....                                   | 15        |
| Frequency.....  | 15        |
| <b>Appendix</b> .....   | <b>15</b> |

### Purpose

Provides guidelines for mitigating an Hour-Ahead Scheduling Process (HASP) failure, a Real-Time Dispatch (RTD) failure, a Real-Time Contingency Dispatch (RTCD) failure, a Real-Time Pre-Dispatch (RTPD) failure, or a suspension of the Real-Time Market.

|   |                            |  |
|---|----------------------------|--|
|  <b>California ISO</b> | <b>Operating Procedure</b> | <b>Procedure No.</b> 2720                |
|   |                            | <b>Version No.</b> 4.8                   |
|   |                            | <b>Effective Date</b> 8/15/24            |
| <b>Market Disruption – Western Energy Imbalance Market (WEIM)</b>   |                            | <b>Distribution Restriction:</b><br>None |

### Table of Contents

|   |           |
|---|-----------|
| <b>Purpose</b> .....  | <b>1</b>  |
| 1. <b>Responsibilities</b> .....  | <b>2</b>  |
| 2. <b>Scope/Applicability</b> .....                                     | <b>2</b>  |
| 2.1. Background.....  | 2         |
| 2.2. Scope / Applicability.....   | 2         |
| 3. <b>Procedure Detail</b> .....  | <b>3</b>  |
| 3.1. Tier 1.....  | 3         |
| 3.1.1. Scenario 1-A: Market Failures – Advisory Results Sent.....       | 3         |
| 3.1.2. Scenario 1-B: Market Failures – No Results Sent.....             | 8         |
| 3.1.3. Scenario 1-C: Software System Maintenance.....                   | 13        |
| 3.1.4. Scenario 1-D: High Impact Scheduled Maintenance/Enhancement..... | 17        |
| 3.2. Tier 2.....  | 20        |
| 3.2.1. Scenario 2-A: Exhausted Advisory Runs - No Results Sent.....     | 20        |
| 3.3. Tier 3.....  | 22        |
| 3.3.1. Scenario 3-A: Planned Market Separation Event.....               | 24        |
| 3.3.2. Scenario 3-B: Unplanned Market Separation Event.....             | 29        |
| 4. <b>Supporting Information</b> .....                                  | <b>35</b> |
| Operationally Affected Parties.....                                     | 35        |
| References.....   | 35        |
| Definitions.....  | 35        |
| Version History.....  | 35        |
| 5. <b>Periodic Review Procedure</b> .....                               | <b>37</b> |
| Review Criteria & Incorporation of Changes.....                         | 37        |
| Frequency.....  | 37        |
| <b>Appendix</b> .....   | <b>37</b> |

### Purpose

In the event that data exchange and/or communication between the California ISO (CAISO) and a WEIM Entity Balancing Authority Area (BA) are disrupted, this document provides guidelines for mitigating Western Energy Imbalance Market (WEIM) disruptions test.

The ISO will inform you using applicable communication tools

# Considerations

- Review CAISO Operating Procedures:
  - OP 5320 – Resource Trial Operations and Test Energy Process
  - OP 5320A – Test Energy for NGR Resources
  - OP 5330 – Resource Testing Guidelines
  - OP 5330A – Resource Test Request Form
- Who will be maintaining control over the resource after testing has completed?
  - Make sure you have a handoff process to ensure continuity on how the resource will respond to DOTs, AGC and Operating Instructions

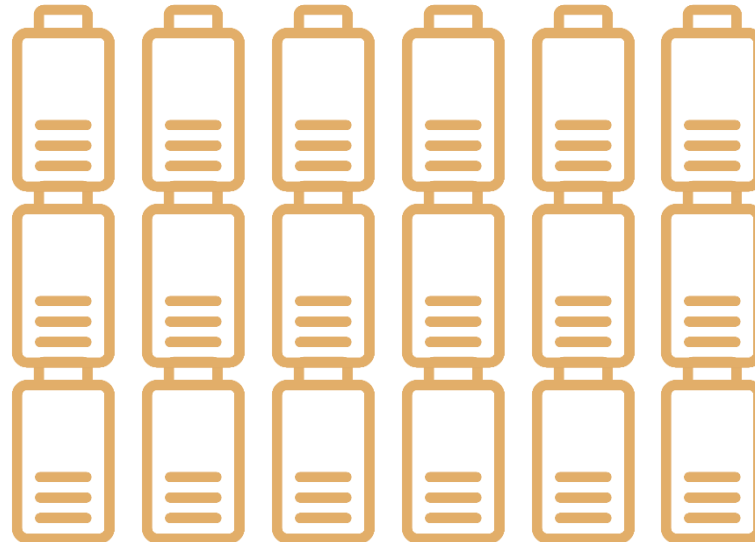
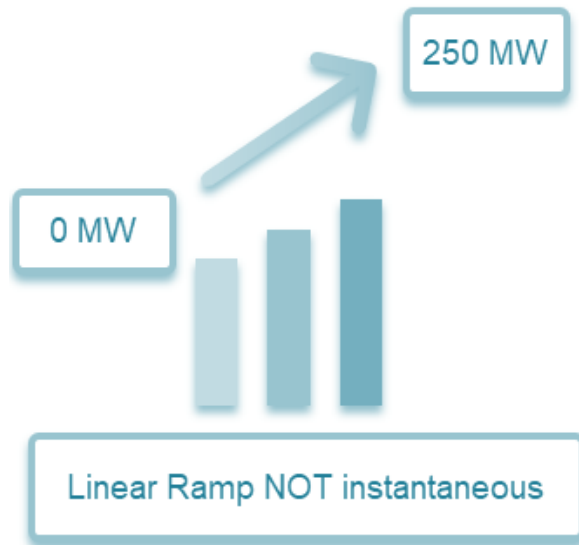
# Self Scheduling Test for Batteries

## Summary

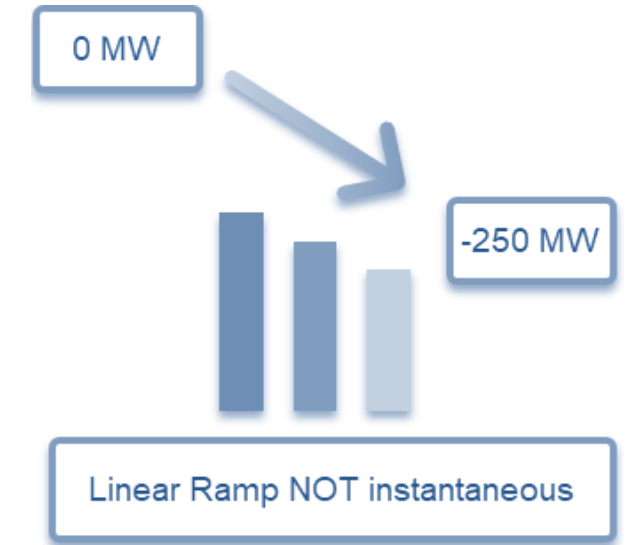
- Operators must average output over hourly blocks, which can be confusing when charging and discharging occur within the same hour.
- Clear communication and detailed test cards are necessary to coordinate with market and operations personnel.

# Battery Linear Ramping

## Discharge (+)



## Charge (-)



# What steps does the CAISO take if you cannot perform and have not communicated your resource limitations?

## Performance for Reliability

- CAISO Generation Dispatcher will create internal tickets flagging a resources inability to perform:
  - CAISO will issue the following:
    - an official letter stating importance of reliability and adhering to regulatory standards, requesting;
      - completion of training
      - detailed root cause analysis that led to inability to perform and what has been done to rectify the situation
    - potential Ancillary Service (AS) block preventing AS awards
    - potential removal from market
    - for repeat offenders; potential referral to Department of Market Monitoring (DMM)

***Resolution requires submission of proof through CIDI and approval from ISO Operations Management***

## Pause for thought



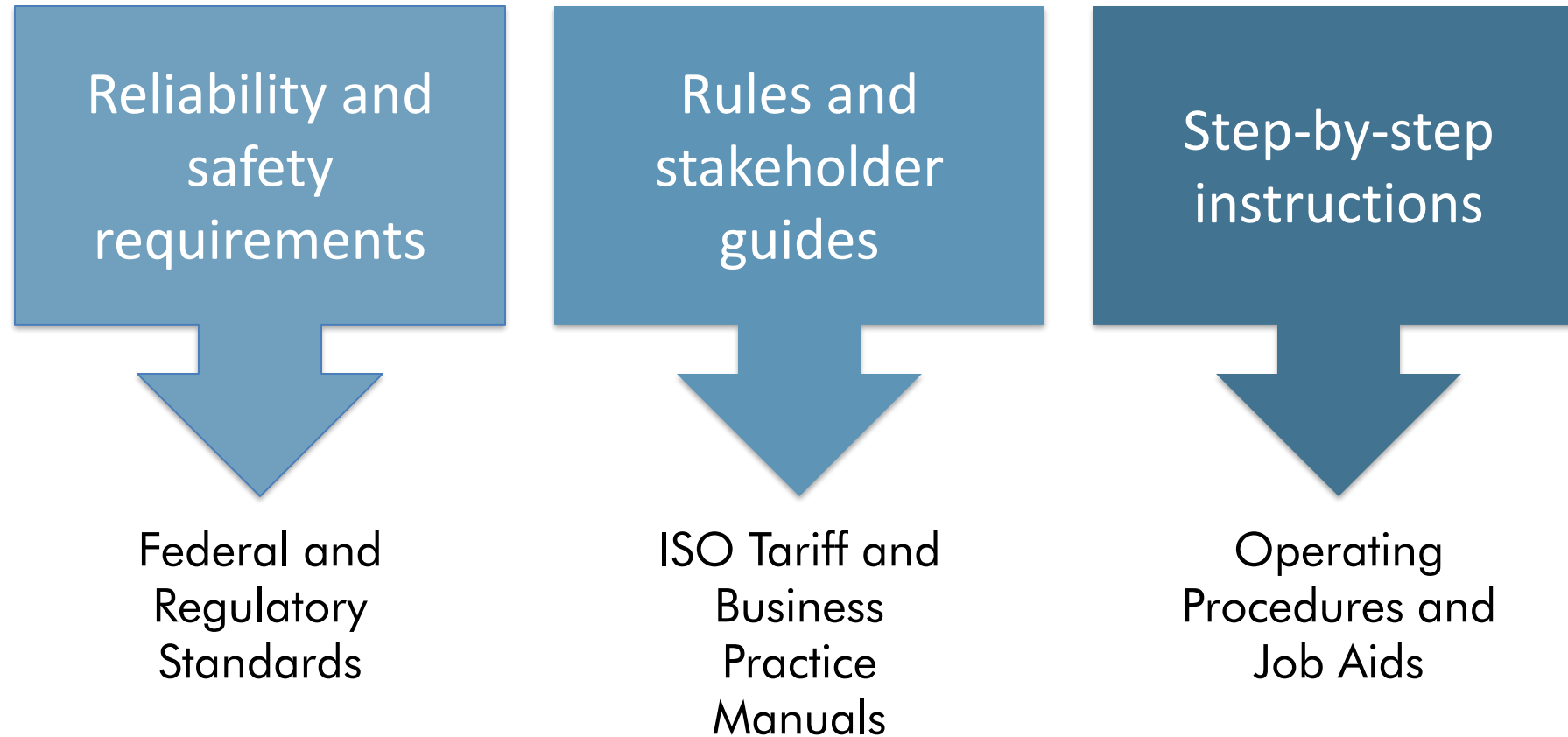
- What would you do if your resource can't meet its Dispatch Operating Target—how quickly would you act, and who would you notify?
- How does your response time to ISO instructions impact overall grid reliability?
- What are the risks to the system if a resource does not follow its Dispatch Operating Target accurately?
- How can you ensure your resource is ramping correctly between dispatch intervals?”
- Think about a real scenario—what could prevent your resource from following instructions, and how would you handle it?



# Failure to Comply with Operator Instructions

## Settlements, Regulatory, and Enforcement Implications

# Rules, guidelines and instructions define market and reliability processes



## Possible Implications of Non-Response

Settlements

Economic  
Consequences

Regulatory

Contractual  
Consequences

Enforcement

Report or referral to  
FERC,  
NERC/WECC  
CAISO DMM

# Resource Performance Issue for resources within the ISO BAA

- Process increases the awareness of resource performance issues by notifying SCs via email when resources fail to perform as expected and in accordance with the ISO Tariff.
- SCs are responsible for coordinating with resource owners and scheduling desks to ensure understanding and corrective actions are being taken.
- Categories to be monitored:

Failed to follow DOT

Failed to ramp in linear manner

Failed to transition correctly between AGC to DOT

Failed to be on and/or follow AGC

# Resource Performance Issues will be tracked in CIDI

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- Primary, Compliance, and Regulatory contacts will be notified of the new CIDI Case
- Important to monitor and respond to performance issues in a timely manner
- New CIDI list found under the reports titled CAISO BAA Resource Performance Issues

Your cooperation in maintaining system reliability is critical & appreciated!

## Pause for thought



- What are the consequences of not following your instructions?



# Wrap Up

Summary, Q&A

## To Recap: It Takes All Of Us To Maintain Safety and Reliability of the Grid!

- Ensure proper set up for resource testing and performance
- Communicate between SC and Resource Operator to ensure adequate control of resources
- Register accurate information in Master File
- Submit detailed outage cards reflecting physical limitations
- Actively monitor flags and control your resources
- Respond to Operating Instructions within required time parameters, consistent with Tariff requirements
- Be ready to respond to emergency notifications
- Report suspicious activity

**Share information with your colleagues!**

# Additional Resources: New reference guide to help Resource Owner/Operators find important information

## Resource Owners / Operators Desk Reference Guide

START



Welcome to the Resource Owners/Operators interactive desk reference! This dynamic training module is crafted to help you locate the suitable resources that streamline your tasks and simplify your role as they relate to your interactions with the California ISO.

Includes helpful links such as:

- Training Resources
- Knowledge Articles
- Policies & Procedures
- New Resource Implementation Documents

[ISO Training Center > Market and Operations](#)

# Additional Resources: New Resource Implementation (NRI) Webpage provides guidance and resources to help connect your project to the grid



[Generation and transmission](#) / [Generation](#) / [New resource implementation](#)

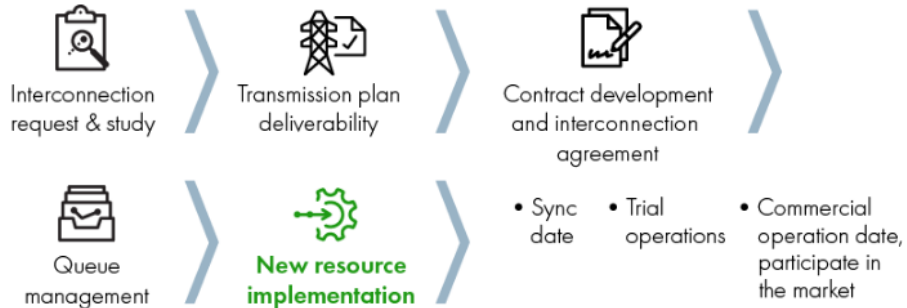
## New resource implementation

The following applies to CAISO BA participants. WEIM and EDAM participants should refer to the [resources page](#) on the Western Energy Markets website.

### On this page

[Bucket system](#)

[Related ISO Tariff and BPMs](#)



Find the guidelines, deliverables and activities needed during the final days of interconnection projects to successfully connect to the ISO grid.

[California ISO - New Resource Implementation \(caiso.com\)](https://www.caiso.com)

# Additional Resources – Summer Readiness

## 2026 Summer Readiness Refresher Training for Scheduling Coordinators

- [Presentation](#) | [Video](#)

## 2026 Summer Loads and Resources Assessment

- [Article](#) | [Interactive Site](#)

## ISO Communication Methods

- [Article](#)

## Emergency Notification Fact Sheet

- [Article](#)

# Additional Resources – Operational Procedures

## NERC Standards

- [COM-002-4 - Operating Personnel Communications Protocol](#)
- [EOP-011-1 – Emergency Operations](#)

## RC West Procedures

(<https://www.caiso.com/rules/Pages/OperatingProcedures/Default.aspx>)

- [RC0410 – System Emergencies](#)

## CAISO BA Procedures

(<https://www.caiso.com/rules/Pages/OperatingProcedures/Default.aspx>)

- [4420 – System Emergency](#)
- [4410 – Emergency Assistance](#)
- [4510 – Load Management](#)
- [4510A](#)

# Additional Resources – Training

## ISO Training Center Self Paced Training Resources

- <https://www.caiso.com/stakeholder/training>
- [Resource Owners/Operators Desk Reference Guide](#)
- [Resource Performance Expectations of Dispatch and Operating Instructions CBT](#)

## [Market Participant Portal](#)

- Requires certificate provisioning to access ADS and other helpful Scheduling Coordinator training materials

**REGISTRATION IS OPEN**

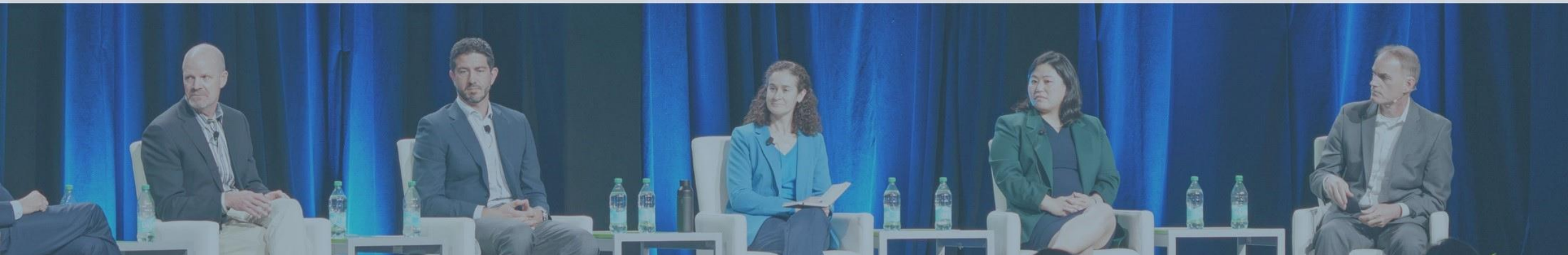
# 2026 STAKEHOLDER SYMPOSIUM

**Welcome reception - Oct. 5**  
at Kimpton Sawyer Hotel, Sacramento, CA

**Symposium program - Oct. 6**  
SAFE Credit Union Convention Center  
Sacramento, CA

Visit: <https://www.caiso.com/meetings-events/events/stakeholder-symposium>

**SPONSORSHIP OPPORTUNITIES AVAILABLE**





# Thank you for your participation!

For more detailed information on anything presented, please visit our website at: [www.caiso.com](http://www.caiso.com) or send an email to: [CustomerReadiness@caiso.com](mailto:CustomerReadiness@caiso.com).

For resource specific questions or concerns, please submit a CIDI ticket.