



Grid Operations Role with NRI

May 2024

Welcome

Our presentation will begin shortly.

Today's Presenter: Drew Thompson, Lead Generation Dispatcher

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

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Objectives

Discuss the role of Operations as a Balancing Authority (BA)

Identify the role and process after Sync Approval in NRI with Operations

Discuss Unit Testing and expectations prior and post COD

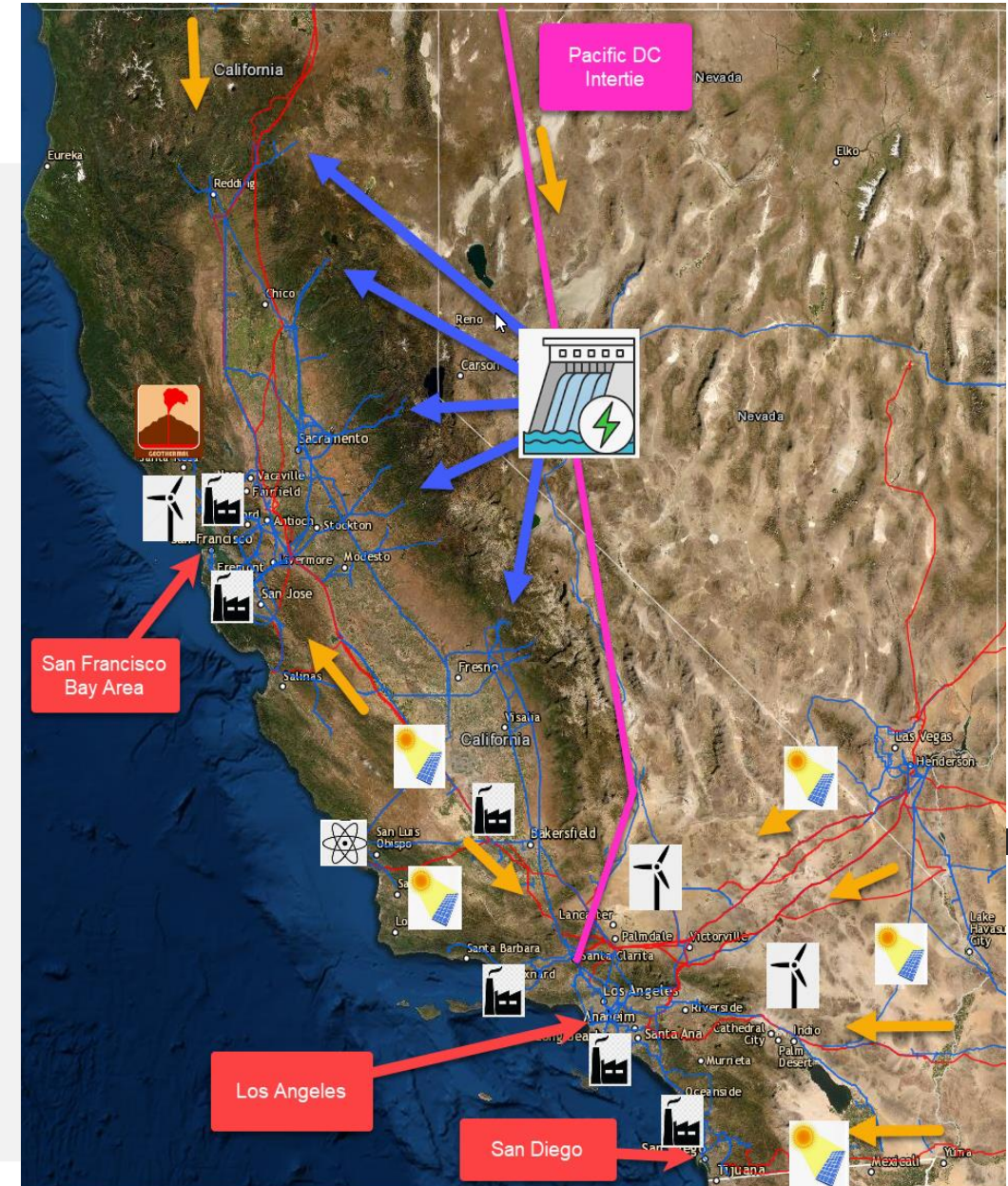
CAISO (California Independent System Operator)

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

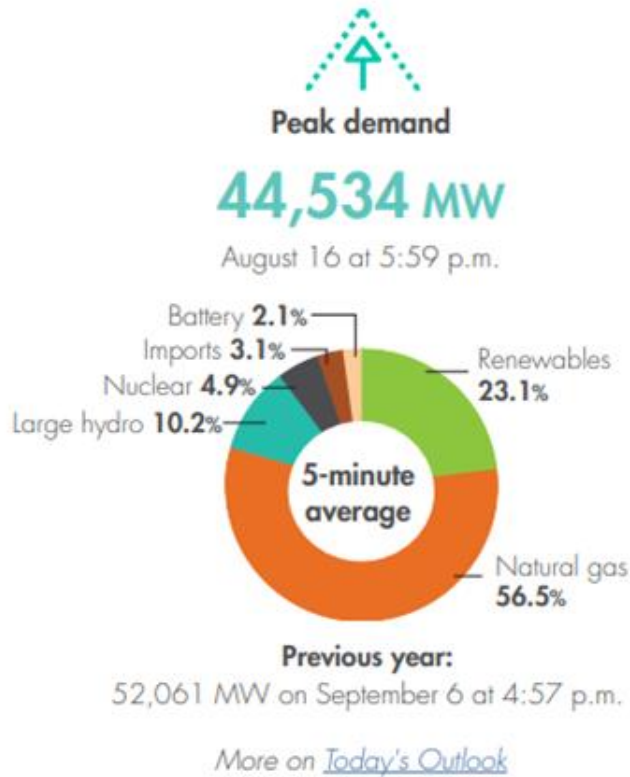


Overview of CAISO's Grid

- 3 Major Load Centers and Investor Owned Utilities (IOU's)
 - Pacific Gas & Electric (PG&E), Southern California Edison (SCE), San Diego Gas & Electric (SDG&E)
- Hydro power from the eastern mountain range (Sierra Nevada)
- 1 nuclear power plant (current retirement in 2030)
- DC Intertie (PDCI) from the Pacific Northwest's hydro power (3,100 MW)
- World's largest geothermal system ("The Geysers") 835 MW
- Natural gas fleet largely near the coastlines of the load centers
- Solar and Wind in less populated inland areas



2023 Statistics



Solar peak
NEW RECORD

16,056 MW

Sept 26 at 11:32 a.m.

Previous year:

14,352 MW on June 7
 at 12:16 p.m.



Added installed storage capacity
NEW RECORD

2,684 MW

Previous year:

1,984 MW

Total installed storage capacity:

7,188 MW



Wind peak

6,317 MW

May 28 at 5:39 p.m.

Previous year:

6,465 MW on May 28
 at 5:39 p.m.



Peak net imports

10,480 MW

May 20 at 11:36 p.m.

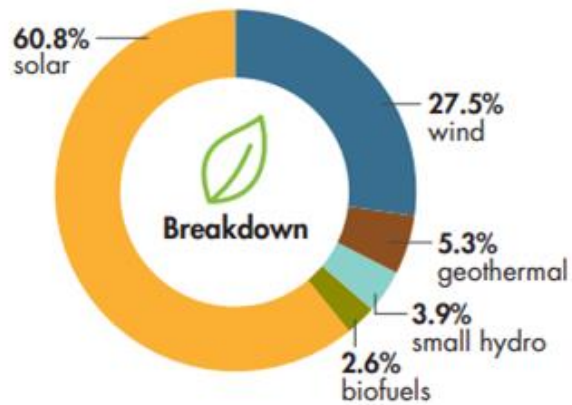
Previous year:






11,465 MW on Feb 10
 at 5:29 p.m.

2023 Statistics

KEY STATISTICS

Installed renewable resources *(as of 02/01/2024)*



	Megawatts
 Solar	18,517
 Wind	8,358
 Geothermal	1,610
 Small hydro	1,180
 Biofuels	778
TOTAL	30,443

[See Today's Outlook](#)



Installed battery capacity⁴
7,261 MW

As of 02/07/24; subject to change.



Role of the CAISO Generation Dispatcher

Mitigation

Manage and mitigate within System Limits

~26,000 circuit miles of transmission

- CAISO Transmission (TOP) to Utilities [Participating Transmission Owners (PTOs)]
- Scheduling Coordinators to Resources (GO/GOPs)

Balancing

Manage Supply to meet Real-Time Demand

Serve ~80% of California demand

- Scheduling Coordinators to Resources (GO/GOPs)
- Reliability Coordinator (RC)

Communication



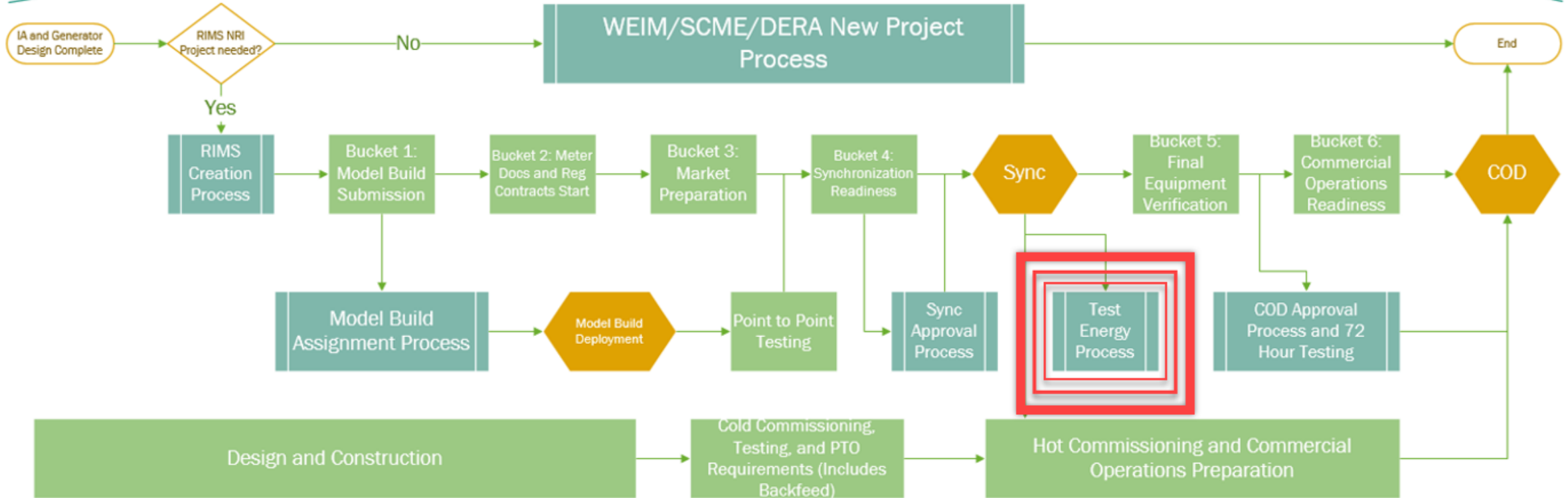
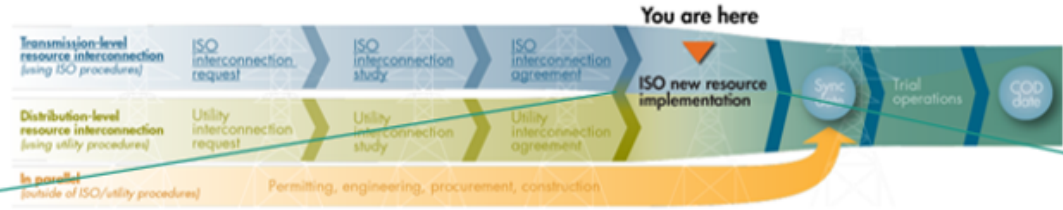
High Level Interconnection Process Map



Grid Operations –
Trial Operations

NRI Process Flow

May 1, 2024



Steps of Test Energy Process with Grid Operations




Submit Test Schedule

Pre-COD


Unit Testing

Pre-COD

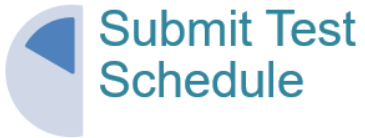

Unit Commercial

COD

COD (Commercial Operation Date)

Grid Operations role with New Resource Implementation (NRI)

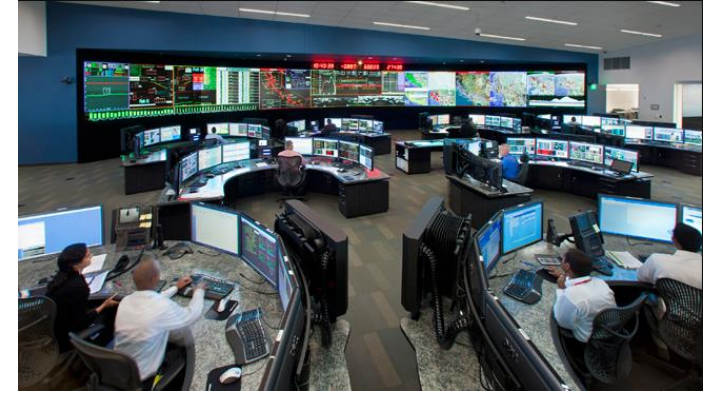
- **After Sync Prerequisites** are met:
 - Approval must be given prior to Resource Testing
 - Scheduling Coordinator (SC) actions:
 - CAISO Operating Procedure 5320
 - Submit an outage type NEW_GENERATOR_TEST_ENERGY
 - » Resource availability to 0 MW, from the time of the initial sync until the assumed COD
 - » Provide information from NRI Test Energy Template
 - » Provide a test schedule for the resource
 - » Communicate any changes to the test schedule prior to test date



Submit Test
Schedule

Pre-COD

Test Schedule Review in Real-Time Horizon



- D+2 and D+1 Generation Work Review Process
 - Generation Dispatcher will review the submitted work in addition to the NEW_GENERATOR_TEST_ENERGY type for test schedule plans
 - Listed in either the Short Description or External Notes section of the outage card
 - If its not present, then CAISO will contact Scheduling Coordinator (SC) to discuss updating outage information
 - If such test plans are not present, then testing will not proceed or be approved until provided

Submit Test Schedule

Pre-COD

Outage Example

Submit Test Schedule

Pre-COD

Outage View
Outage ID: 15107557 FAR

Resource Name: [REDACTED] **Resource Type:** NGRL **PMAX:** 230.00 **Start:** 02/02/2024 08:00 **End:** 04/01/2024 00:00 **Emergency Return:** [REDACTED] **Linked Outages:** [REDACTED] Modify

Participant: [REDACTED] **Participant Outage ID:** [REDACTED] **Nature of Work:** NEW_GENERATOR_TEST_EN

Short Description:
 Power Plant Address - [REDACTED]
 Power Plant Control Room Phone Number - [REDACTED]
 Scheduling Coordinator ID - [REDACTED]
 Scheduling Coordinator Contact Phone Number - [REDACTED]
 Resource ID - [REDACTED]
 Resource Name - [REDACTED]
 PTO/Transmission Operator - SCE
 POD Description? [REDACTED]
 Type Of Generator - BESS
 Resource Capacity - PMax: 230 MW

External Notes:
 Date Day HE Peak Output MW Avg Output MW STATE
 3/10/2024 Sunday 1 0 0 IDLE
 3/10/2024 Sunday 2 0 0 IDLE
 3/10/2024 Sunday 3 0 0 IDLE
 3/10/2024 Sunday 4 0 0 IDLE
 3/10/2024 Sunday 5 0 0 IDLE
 3/10/2024 Sunday 6 -175 -175 CHARGE
 3/10/2024 Sunday 7 -175 -175 CHARGE
 3/10/2024 Sunday 8 -175 -175 CHARGE
 3/10/2024 Sunday 9 -175 -175 CHARGE
 3/10/2024 Sunday 10 -175 -175 CHARGE
 3/10/2024 Sunday 11 -175 -175 CHARGE
 3/10/2024 Sunday 12 -175 -175 CHARGE
 3/10/2024 Sunday 13 -175 -175 CHARGE
 3/10/2024 Sunday 14 0 0 IDLE
 3/11/2024 Monday 1 0 0 IDLE
 3/11/2024 Monday 2 0 0 IDLE
 3/11/2024 Monday 3 0 0 IDLE
 3/11/2024 Monday 4 0 0 IDLE
 3/11/2024 Monday 5 0 0 IDLE
 3/11/2024 Monday 6 -175 -175 CHARGE
 3/11/2024 Monday 7 -175 -175 CHARGE
 3/11/2024 Monday 8 -175 -175 CHARGE
 3/11/2024 Monday 9 -175 -175 CHARGE
 3/11/2024 Monday 10 -175 -175 CHARGE
 3/11/2024 Monday 11 -175 -175 CHARGE
 3/11/2024 Monday 12 -175 -175 CHARGE
 3/11/2024 Monday 13 -175 -175 CHARGE
 3/11/2024 Monday 14 -175 -175 CHARGE
 3/11/2024 Monday 15 -175 -175 CHARGE

Availability Date/Time	OOS	NDC	PMAX	Availability MW	Curtailment MW
02/02/2024 08:00	<input type="checkbox"/>	<input type="checkbox"/>	230.00	0.00	230.00
04/01/2024 00:00	<input type="checkbox"/>	<input type="checkbox"/>	230.00	230.00	0.00

Availability at OMW which shows market not available for dispatch

Short Description: includes all NRI Energy Template information in addition to a complete test schedule.

External Notes: includes complete test schedule for desired testing days

Outage Card Example (CAISO View)

Planned Start Date/Time: 02/02/2024 08:00
Planned End Date/Time: 04/01/2024 00:00
Outage Duration: 58 day(s) 15 hour(s) 0 minute(s)
Actual Start Date/Time: 02/02/2024 08:00
Actual End Date/Time: [REDACTED]
Discovery Date/Time: 01/23/2024 11:00

BA/TOP Confirmed:
Emergency:
Operational:
Black Start:
RC Priority Date/Time: [REDACTED]
Priority Date/Time: 01/23/2024 11:03
SCP Exempt:
Outage State Reason: OTHER
Opportunity: [REDACTED]
GADS Cause Codes: [REDACTED]
Version: 48

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

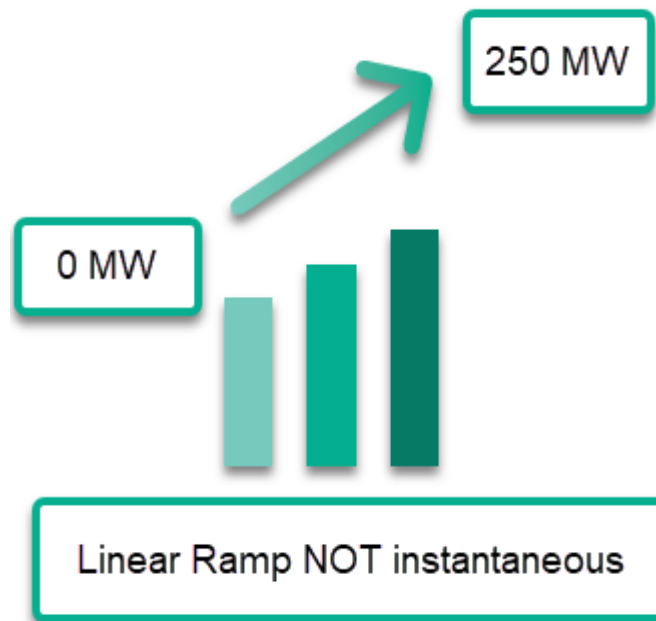
Pre-Commercial (Pre-COD) Batteries (NGR) Resource Testing



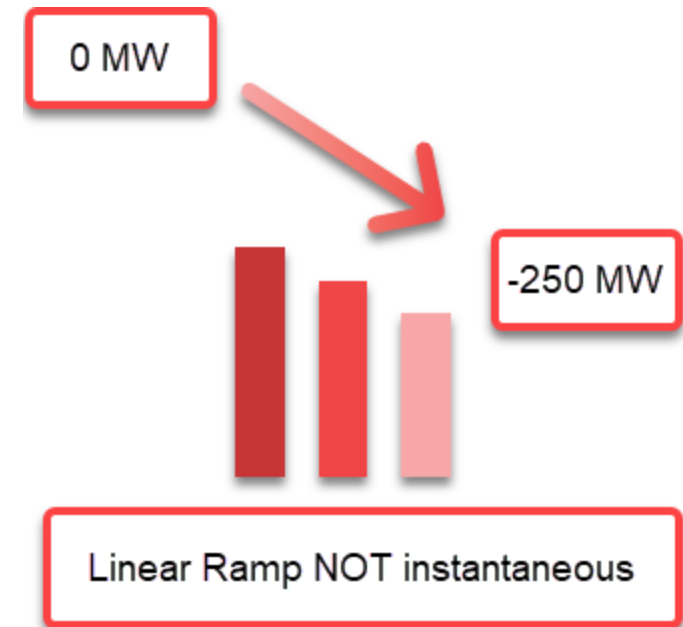
Terms used during testing:

(Example: 250 MW Battery [Pmax: 250 MW and Pmin: -250 MW])

Discharge (+)



Charge (-)



Pre-Commercial (Pre-COD) Resource Testing



- **Communications**

- Scheduling Coordinator (SC) must have good communications with CAISO and the resource (GOP) during testing
- Coordinate any changes to the approved test plan with CAISO

- **Telemetry**

- CAISO must have good quality data from the resource during testing or testing will be denied, rescheduled, or terminated

- **Control of Resource (*Must have control of resource(s) at all times*)**

Ramping (ability to ramp to a 5 minute dispatch instruction)



- Batteries (NGRs) have distinct ramp rates for operating in a consuming mode (charging) or in a generating mode (discharging)



- Solar testing to develop forecasting models



Pre-Commercial (Pre-COD) Resource Testing

- **Communications**

We understand on the Construction Project side that multiple parties are involved in the process from commissioning, operator groups, engineers, etc. but CAISO Generation Dispatchers should not be communicating with these parties

These parties should be coordinating and relaying all information to their associated Scheduling Coordinator (SC)

CAISO Generation Dispatcher communicates with the Scheduling Coordinator (SC)



Overall Expectations for Communications and Performance



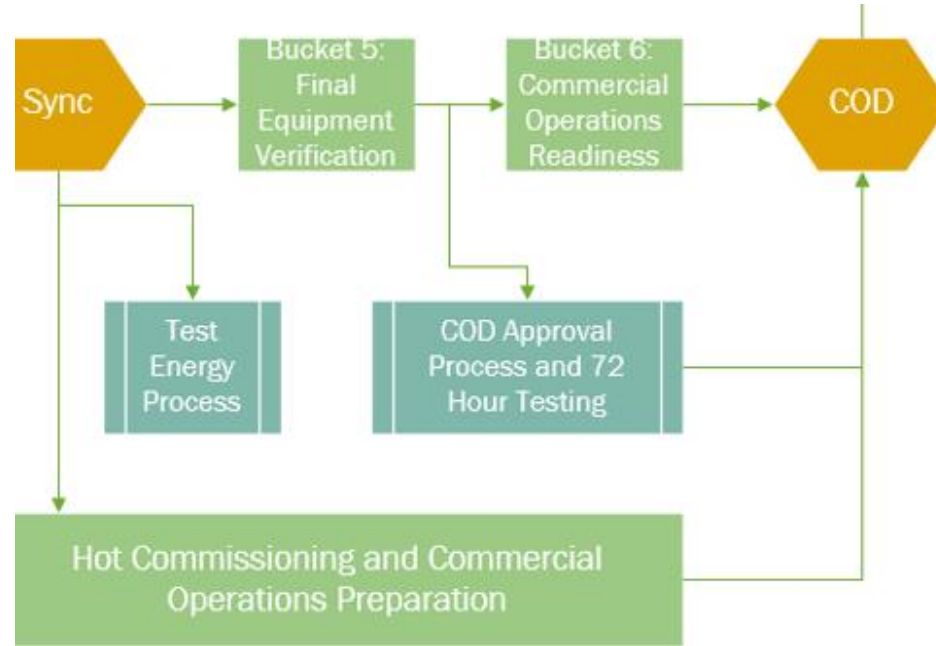
- **Communications for Reliability**
 - The CAISO will not approve testing unless sufficient transmission capacity is available to support test schedule
 - Studies will be performed and testing may need to be rescheduled
- **Performance for Reliability**
 - If resource is causing a reliability situation on the Grid, then an Operating Instruction will be issued from CAISO to come offline within 10 minutes until further notice
 - » *Note: If resource is not able to come offline, CAISO can coordinate with the transmission utility to open circuit breakers to trip resource offline to mitigate the reliability situation*

(Must have control of resource(s) at all times)



NRI Process

Once you have completed all necessary steps in the final stages...



Grid Operations – COD



Expectations for Commercial (COD) Resources



- **Performance for Reliability**
 - Ability to follow DOTs [5 (five) minute Dispatch Operating Targets] accurately
 - Linear ramping to follow DOPs [Dispatch Operating Points] mid interval to mid interval
 - Not exceed DOT when Follow DOT and Operating Instruction (OI) flag's are "Y" in ADS (Automated Dispatch Instruction) for Variable Energy Resources
 - Immediately follow Operating Instructions (OI) when issued by CAISO
 - Starting up and Shutting down timely
 - Resource Testing should be self-scheduled in the market.
 - *Note: Unit Testing type OMS should be submitted and test plan should match the self-schedules*
 - Ensure Outage Management System (OMS) reflects true capability and availability of resource
 - *Note: OMS fields for managing Batteries (NGRs)*
 - Load Max = Pmin(charging) derates
 - Max Energy = SOC derates (SOC = State of Charge)
 - Availability = Pmax (output/discharging) derates

Expectations for Ancillary Services (A/S) Certified Resources



- **Performance for Reliability**
 - In order to provide Regulation:
 - Ability 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*
 - Following 4 second set points accurately
 - 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

Expectations for Commercial (COD) Resources

- **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)



To Recap:

- 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 I manually place my resource on AGC?
If needed, can I take the site offline within 10 minutes
- 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

Share information with your Resource Operators!

The grid is more transformative than ever, and we as an industry will need to stay agile, evolve our practices, and work together to discover creative solutions to whatever the future holds





Thank you for your participation!

For more detailed information on anything presented, please visit our website at:

www.caiso.com

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