September Heatwave Analysis
Summer Readiness

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Introduction

Despite the sustained heat wave and unprecedented load levels, the California Independent System Operator (ISO) did not order rotating outages and maintained reliable system operations at all times during the September heatwave.

• This presentation discusses
  – the heatwave and its impacts,
  – performance of different market areas,
  – opportunities for improvements.
CAISO was able to keep the lights on due to action steps and multiple external factors

1. Increased capacity through resource adequacy procurement,
2. Enhanced coordination, awareness, and communications,
3. Market enhancements developed and implemented over the past two years,
4. The use of new state programs to provide non-market resources to address extreme events,
5. Deployment of demand response and calls for conservation efforts,
6. Geographic diversity of extreme heat across the West.
Areas for improvements

- Addressing miscalculation of the capacity used in the WEIM capacity test
- Enhancing the market logic to clear exports based on intended scheduling priorities and their consideration in the capacity test
- Fixing logic to properly schedule storage resources in the real-time market and properly account for their ancillary services awards in the capacity test
CAISO set a record load of 52,061 MW on Sept. 6
A 10-day shattering heatwave drove record demands

- Multiple cities in California broken 100-year old records for maximum and minimum temperatures

- Using 28 years’ worth of weather data, the ISO weighted 3-day temperature through September 6 was a 1-25 year event
Enhancements in place for summer 2022

- WEIM resource sufficiency test
- Import market incentives during tight supply conditions
- Enhanced real-time pricing signals during tight supply conditions
- Management of storage resources during tight system conditions
- Reliability demand response dispatch and real-time price impacts
- Load, export and wheeling priorities
- Enhancements to supporting resources for exports and added visibility to scheduling coordinators
- Increased bid caps under FERC Order 831
Many factors helped prevent the CAISO from ordering rotating outages

Demand Response and conservation efforts may have reduced demand by up to 1,500MW
The loads levels during the heatwave were above the show resource adequacy capacity.

To meet the demand, CAISO also relied on:

- Above RA supply
- Non-RA supply
- Non-market capacity
- Conservation efforts
RA fleet performed at different rates depending on the time assessed and resource type.
With the adjusted bid cap in place, market prices reached $2,000 MWh"
Load adjustments in the day-ahead and real-time markets drove higher prices, reduction of export schedules and infeasibilities.
Load adjustments in day-ahead and real-time markets drove higher prices, reduction of export schedules, additional WEIM transfers.
Based on bilateral prices, CAISO triggered FERC831 logic to increase the bid cap to $2,000
CAISO failed the capacity test in two 15-minute market intervals on Sept. 6.

The consequence of the failures were *di minimus* given current levels of transfers.

These occurred during the EEA timeframe.

All energy conservation effort decreased the load obligation.
Multiple issues impacted the accurate assessment of the capacity used in the test

- Issues with MSG calculation
- Consideration of AS capacity
- Counting of imports/export reductions
- Counting of DC losses
- Counting of emergency energy
- Not counting armed load

On September 6, CAISO would have failed four additional intervals if these issues were not present
CAISO observed robust level of net interchange during the heatwave, with over 6,000MW during the most critical times.
WEIM transfers helped CAISO with 1,000MW of imports during the most critical time
WEIM transfers came from many different balancing areas and were very dynamic.
The net interchange volume depends on the level of both imports and exports.
With insufficient supply to meet the load obligation, the day-ahead market reduced over 1,500MW of exports.
HASP process reduced exports to balance the load under tight supply conditions

HASP also projected to reduce high priority exports, but they are not depicted here because they were blocked before the solution went out.
Export schedules in the market cleared at different volumes, maxing out prior to peak hours when there is sufficient supply.

Low priority exports cleared during critical hours due to unintended interplay of market functionalities.
All high-priority wheels bid in the market were honored

About 55% of all the high priority wheels registered in September were scheduled in the market.
Over 99% of RA imports bid in at or below $0/MWh in September

Assessment is based on only

- CPUC-jurisdictional Imports
- Non-resource specific Imports
- Weekdays and peak hours
Storage resources provided critical supply during peak hours

On Sept. 6 they were depleted too early in the day based on higher clearing prices

Minimum state of charge triggered to preserve storage level

Operators manually dispatched resources on Sept 6-8

A software issue prevented some resources to charge early in the day
Storage provided both energy and ancillary services capacity
Average daily wholesale cost in September was about $110 million, with the highest at $375 million on Sept. 6.