Resource Sufficiency Evaluation

Capacity test performance during the summer heatwave

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May 21, 2021

Bid Range Capacity Tests

- Three tests are performed: (T-75, T-55 and T-40)

- Tests are performed for both Under and Over direction for each 15-minute interval

- The first two tests (T-75 and T-55) are advisory and enable a BAA to adjust their schedules in order to make necessary adjustments to pass the test (T-40)

- For CAISO, there is no action between T-75/T-55 and T-40 to cure any failures

- A BAA fails the bid-range capacity test if they fail the test at (T-40)

- If a BAA fails the bid-range capacity Under test, it automatically fails the flexible ramp sufficiency up test.

- If a BAA fails the bid-range capacity Over test, it automatically fails the flexible ramp sufficiency down test.

Inputs to the Bid Range Capacity Test

- Fifteen-Minute Demand Forecast
  - FMM CAISO's forecast

- Imports and Exports
  - For CAISO's test at T-40, only Fifteen-minute Imports and Exports bids can provide incremental capacity
  - Hourly net schedule interchange schedules
  - EIM transfers are not included

- Resource Bids
  - Bids for all internal supply resources
  - FMM schedules for upward Ancillary Services

- Resources' derates and rerates

- EIM transfers -either Imports or Exports- are **<u>NOT</u>** an input to the Bid Range Test for either CAISO or EIM area calculation

- Historical Intertie deviation
  Histogram data given in percentiles

The objective of the Bid Range Capacity Test is simply to assess whether there is sufficient Bid-Range Capacity in the BAA to meet its capacity requirements
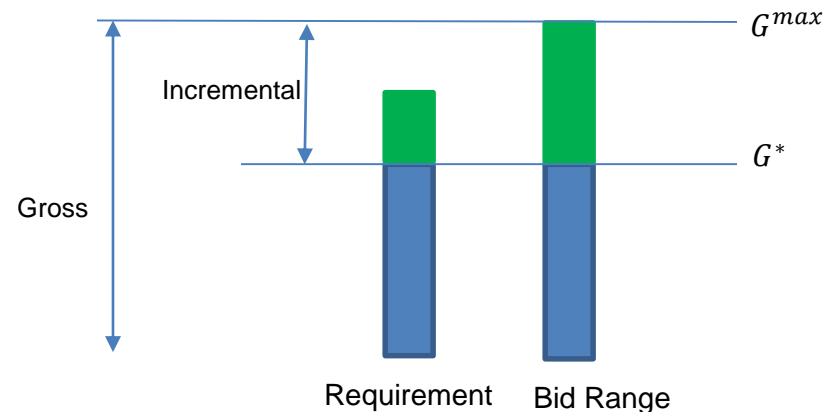
If

Bid range capacity   > Capacity requirement
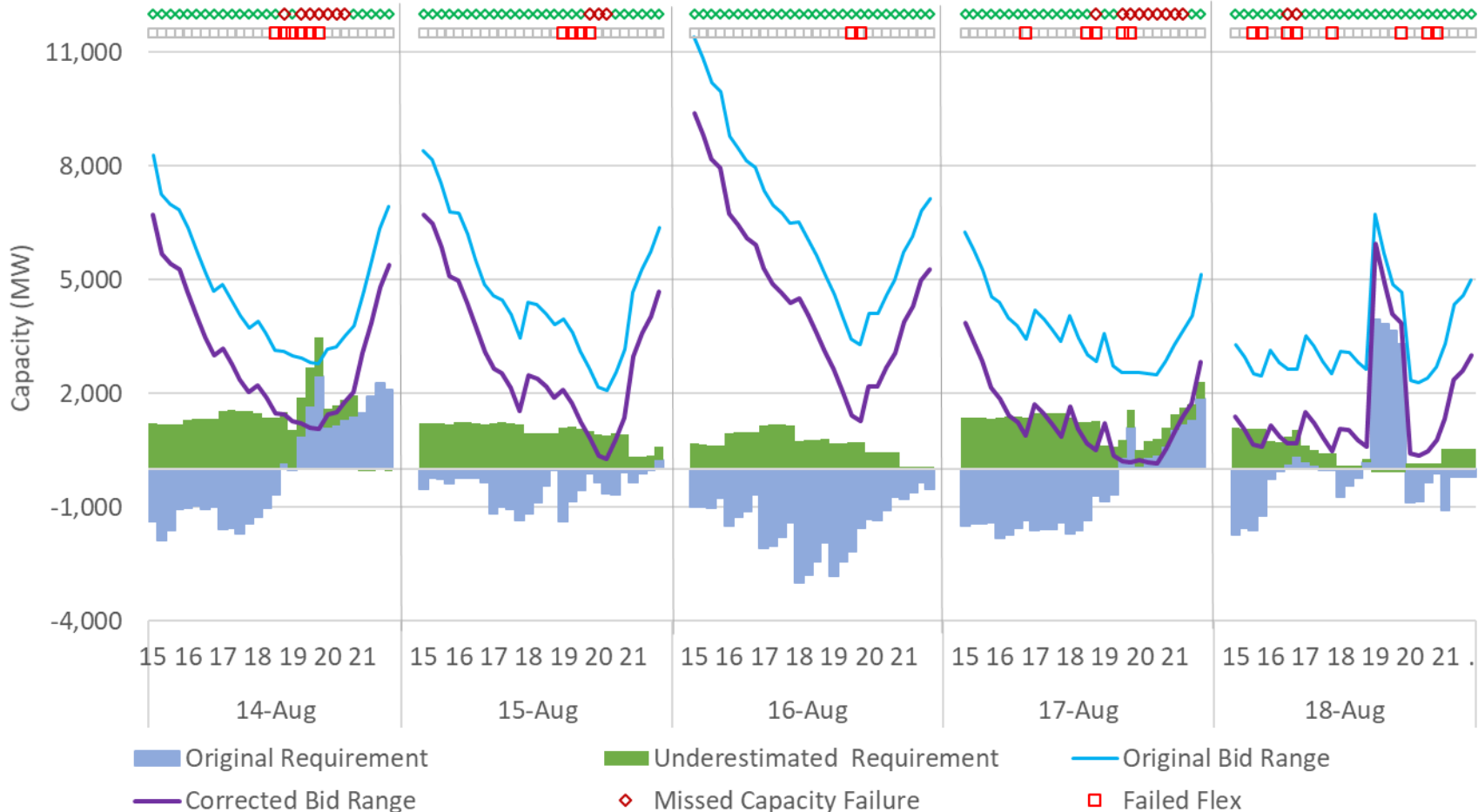(Generation Bid range + NSI bid range)

Then

BAA passes the test

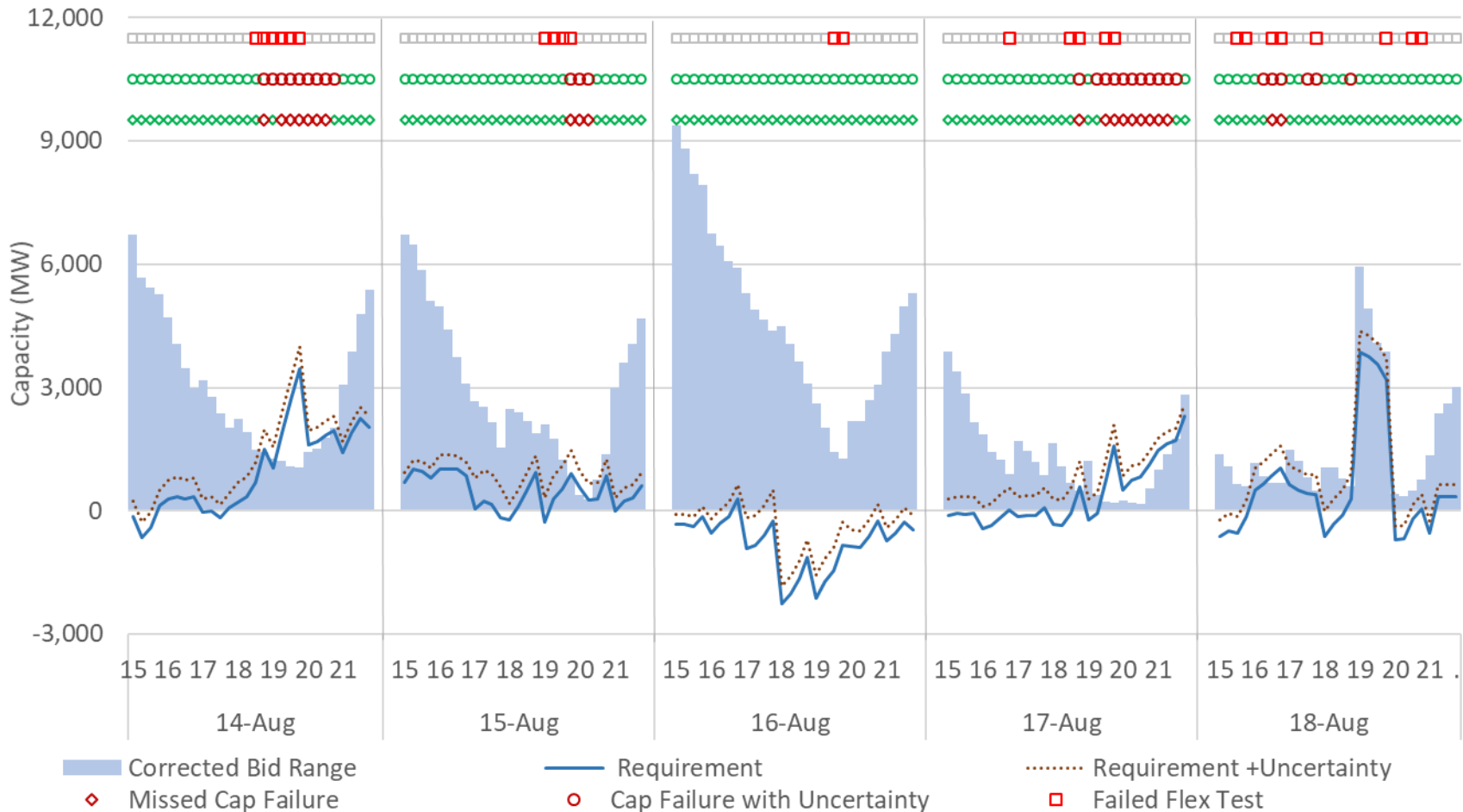Bid range is the summation
of the bid range of all resources

Requirements for Bid Range Capacity
Test includes an incremental requirement
to account for historical intertie deviations

The over-calculation of capacity range resulted in CISO area passing the capacity test during 21 intervals of critical peak hours, with 10 of those already covered by the flex test failures
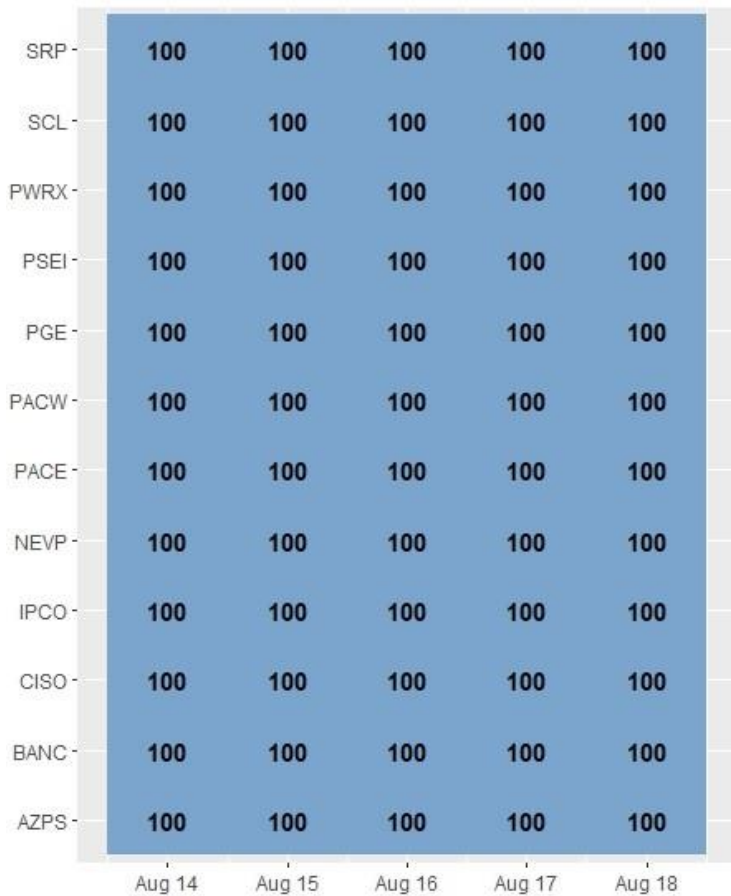

Legend:
- Original Requirement
- Underestimated Requirement
- Original Bid Range
- Corrected Bid Range
- ◇ Missed Capacity Failure
- □ Failed Flex

CAISO Public

California ISO

With uncertainty added to the capacity requirement, CISO would have seen eight additional capacity test failures during critical peak intervals

Corrected Bid Range   Requirement   Requirement +Uncertainty
◇ Missed Cap Failure   ○ Cap Failure with Uncertainty   □ Failed Flex Test
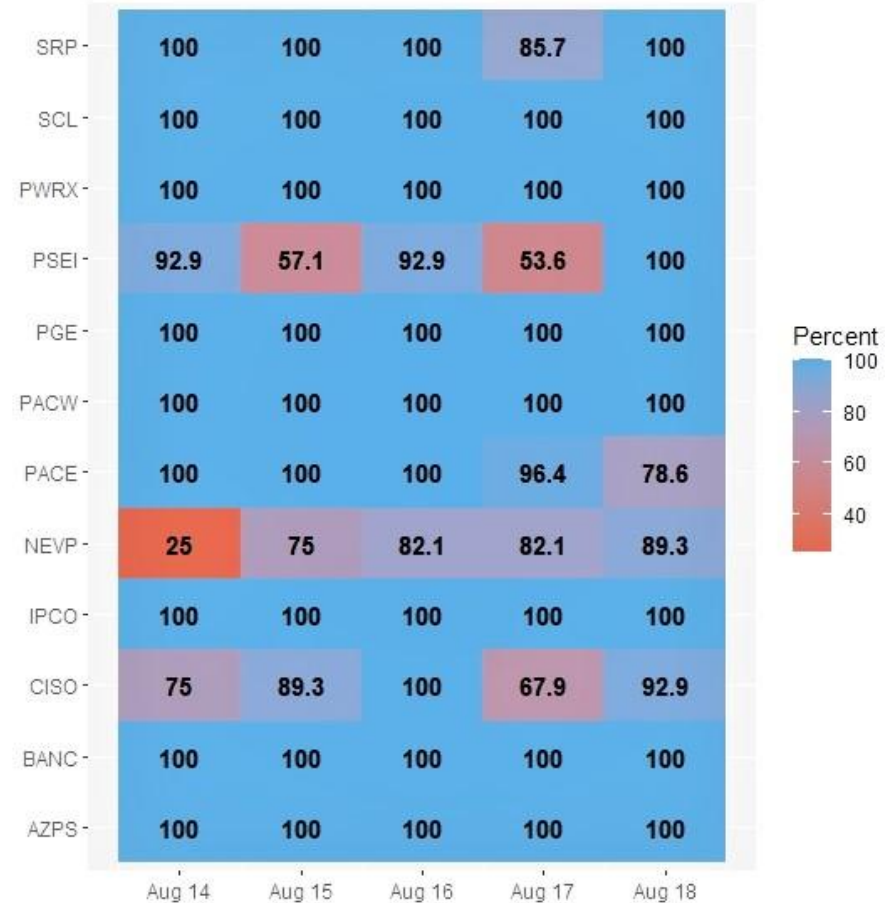
CAISO Public

The lack of accounting for derates resulted in multiple EIM entities, including the ISO, passing incorrectly the Capacity test
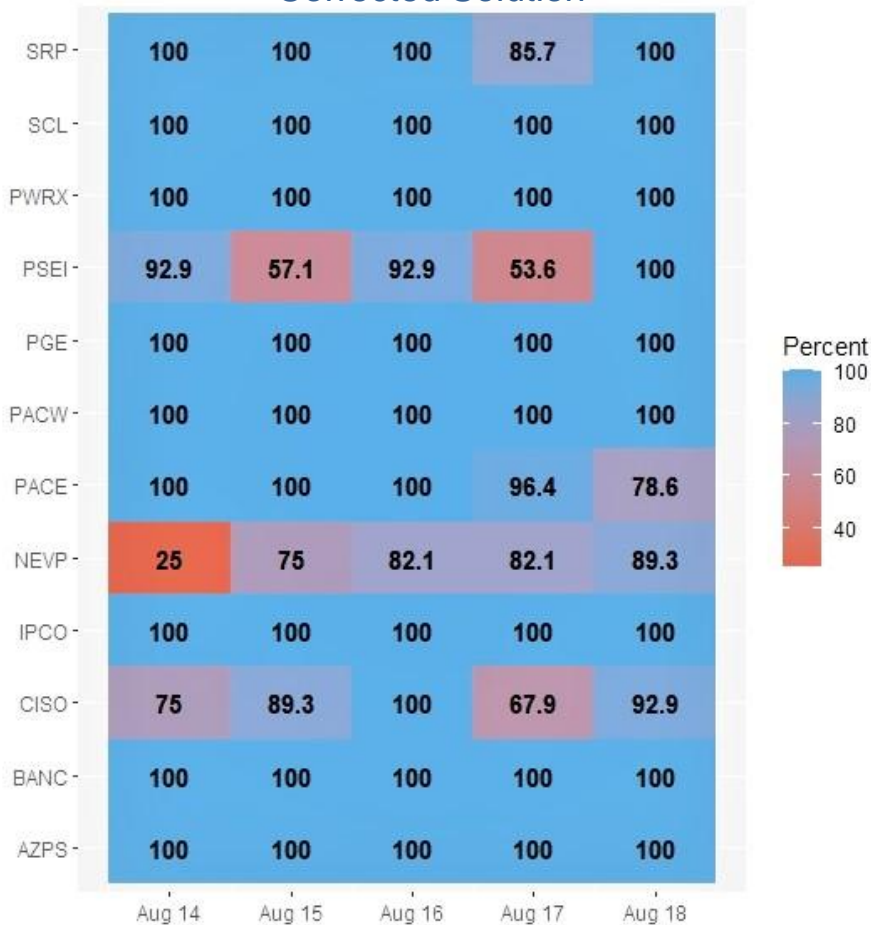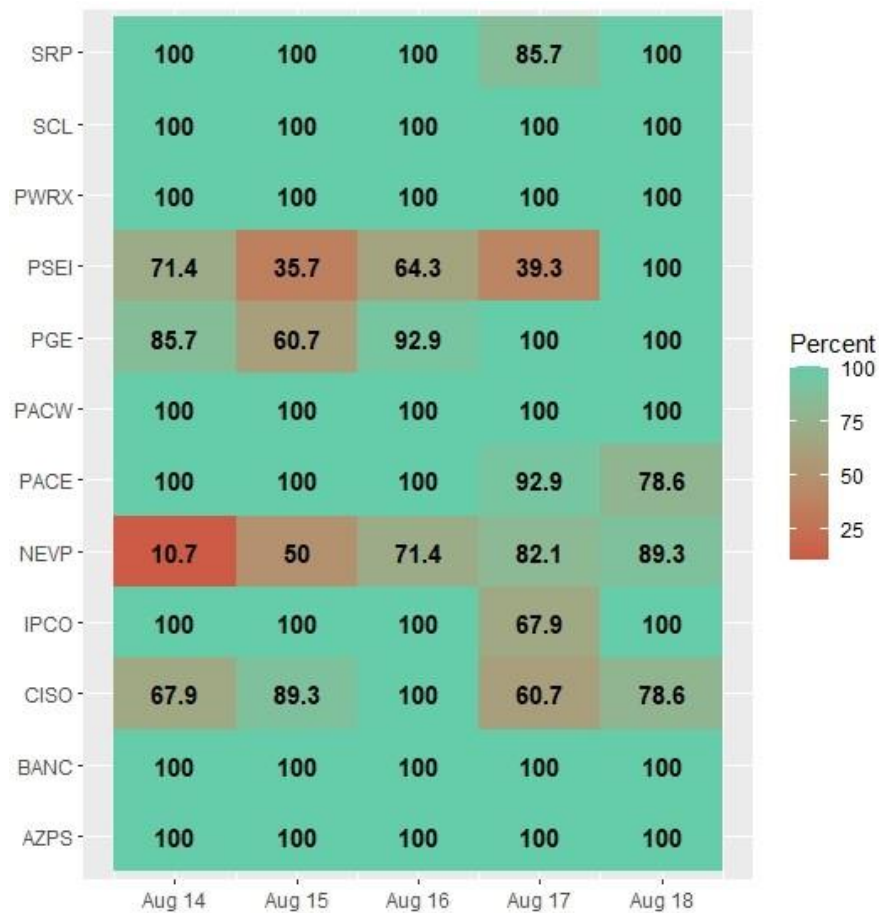

Original solution

Corrected solution

*The values in the matrices represent the percent of peak intervals analyzed in each day in which each EIM passed the capacity test

California ISO

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The addition of the uncertainty to the capacity requirement would have fairly impacted multiple EIM entities to be able to pass the capacity test
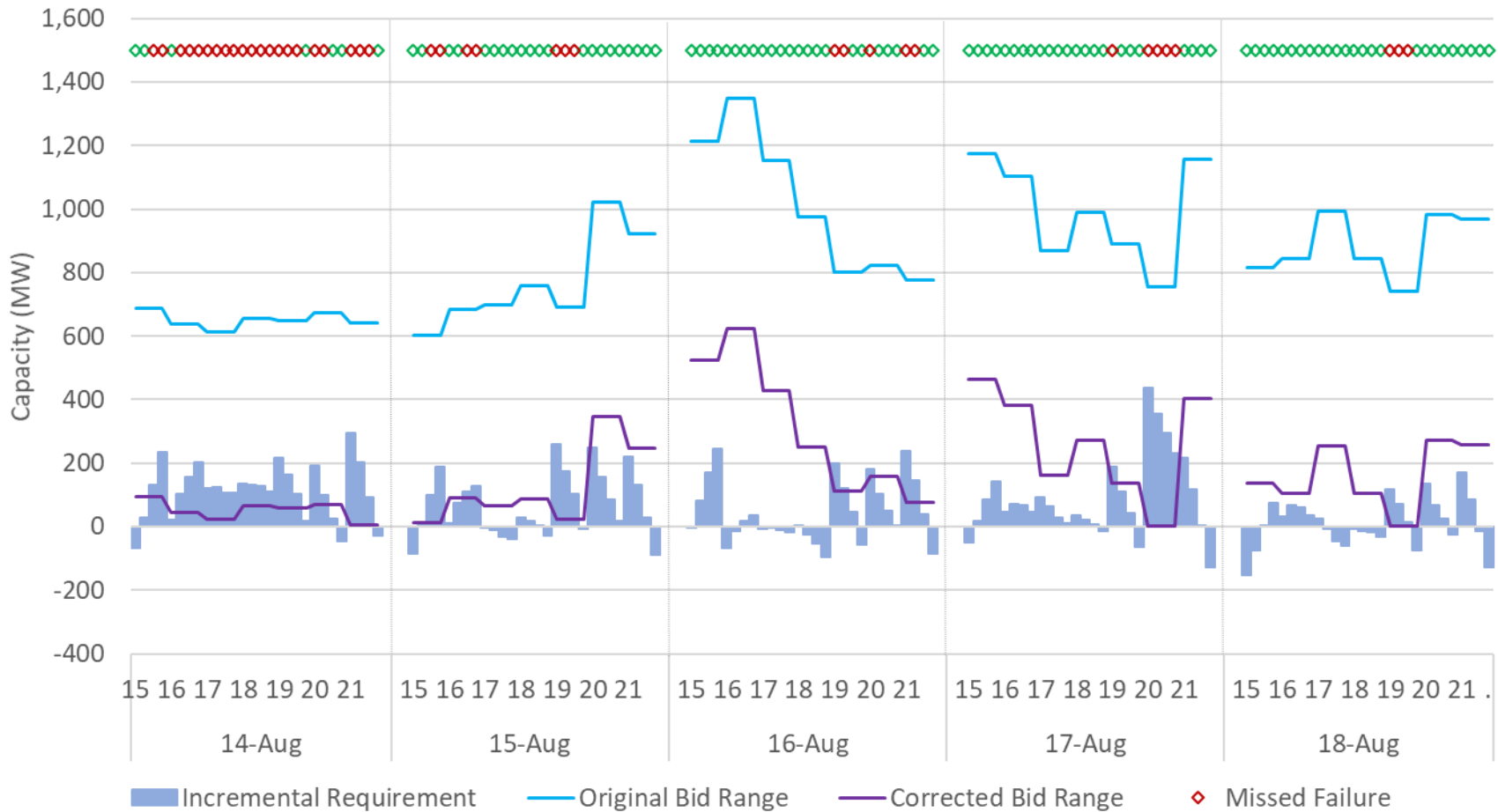
Corrected Solution

Summer Enhancement

*The values in the matrices represent the percent of peak intervals analyzed in each day in which each EIM passed the capacity test
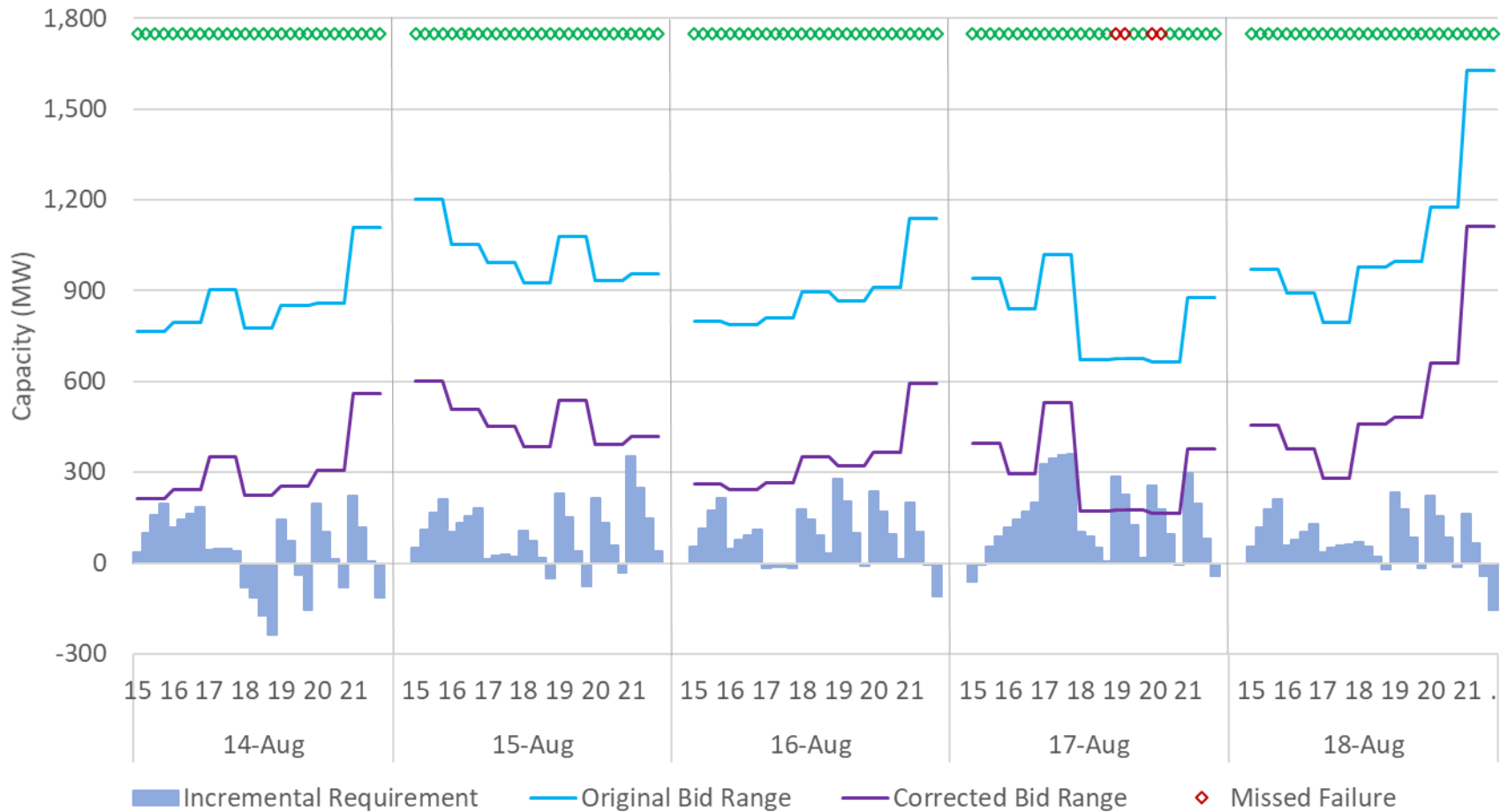
California ISO

CAISO Public

The over-calculation of capacity range resulted in Nevada passing the capacity test in 41 intervals during critical peak intervals

The over-calculation of capacity range resulted in PSEI passing the capacity test in 29 intervals during critical peak intervals
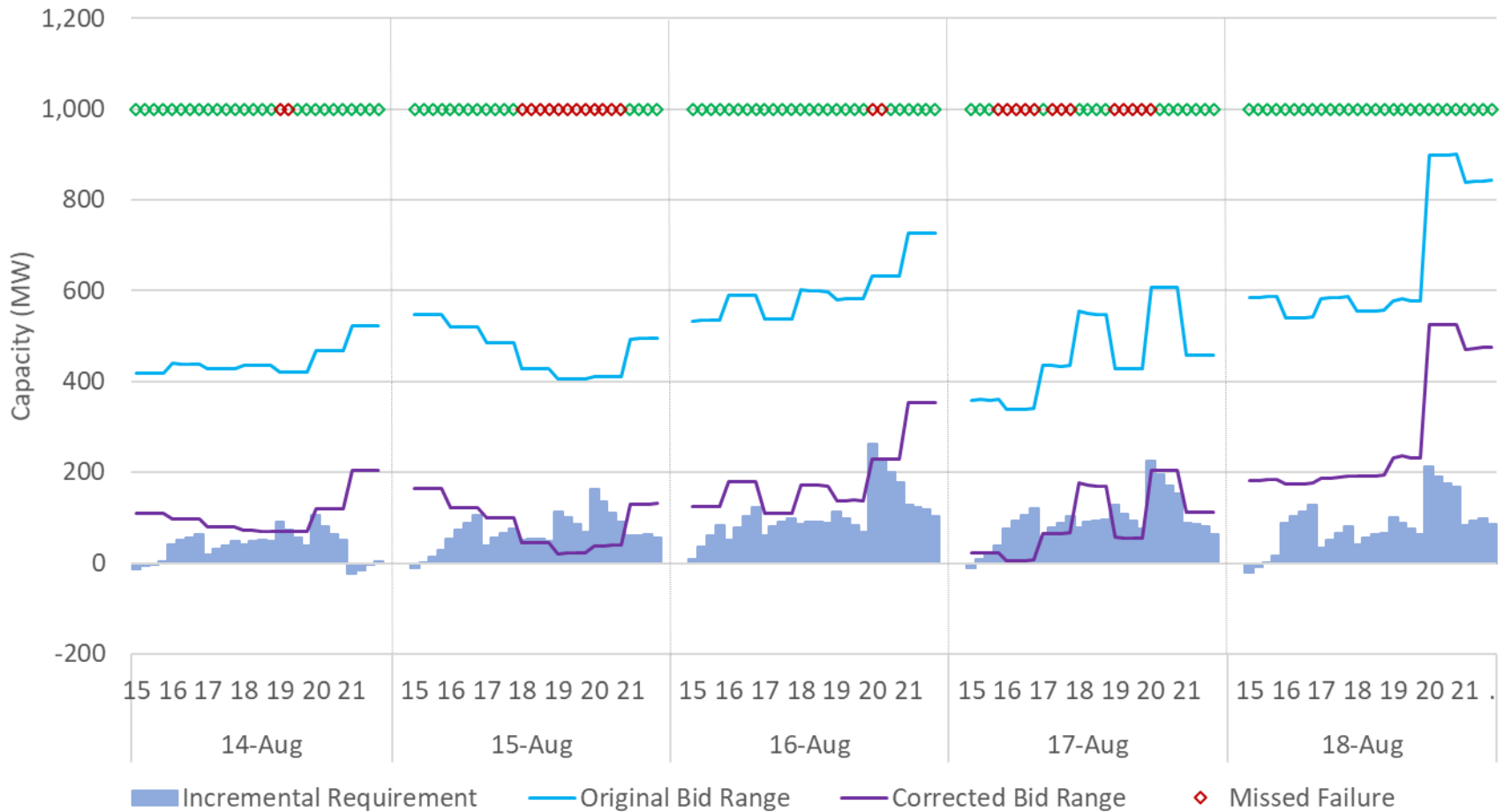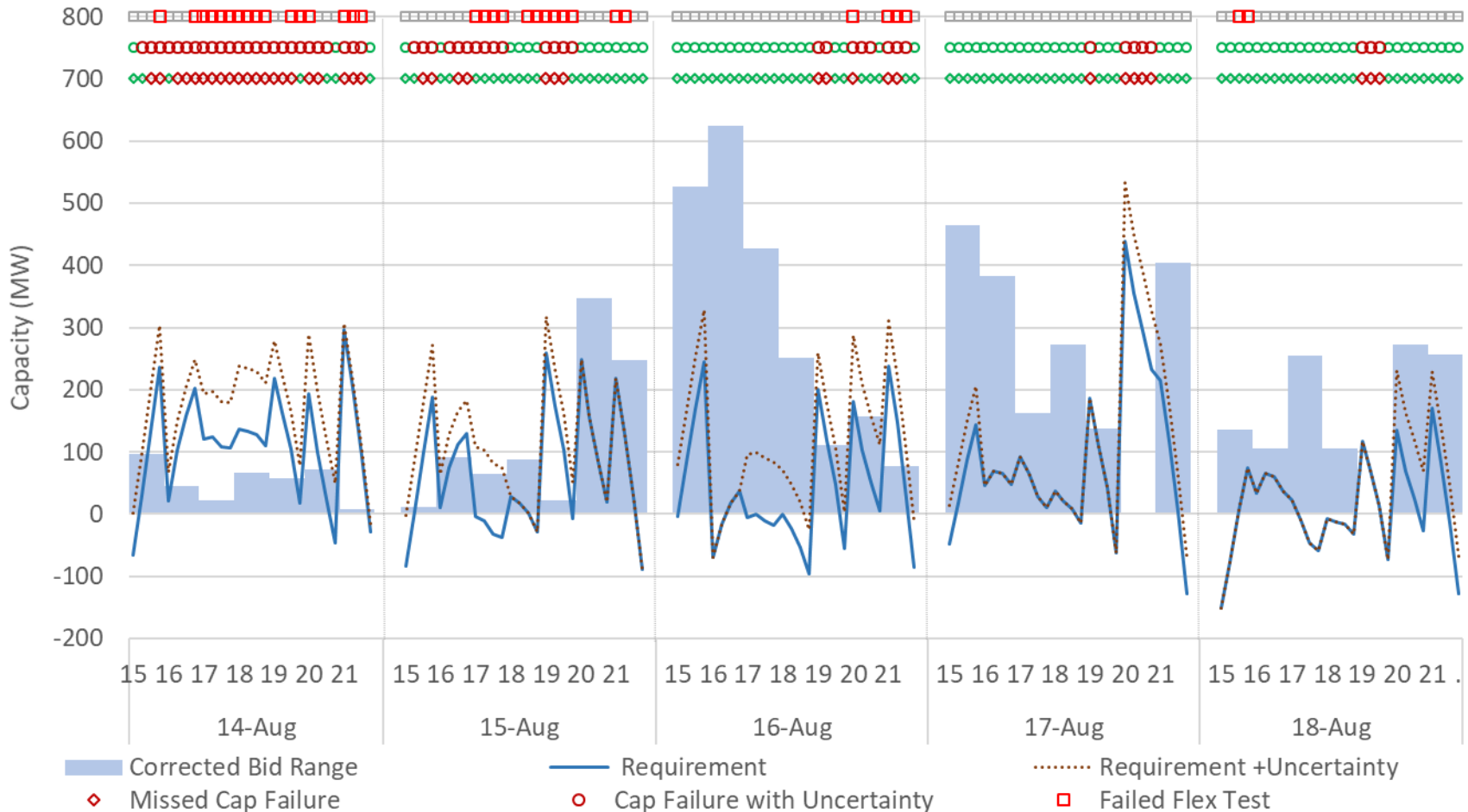
The over-calculation of capacity range resulted in SRP passing the capacity test in four intervals during critical peak intervals
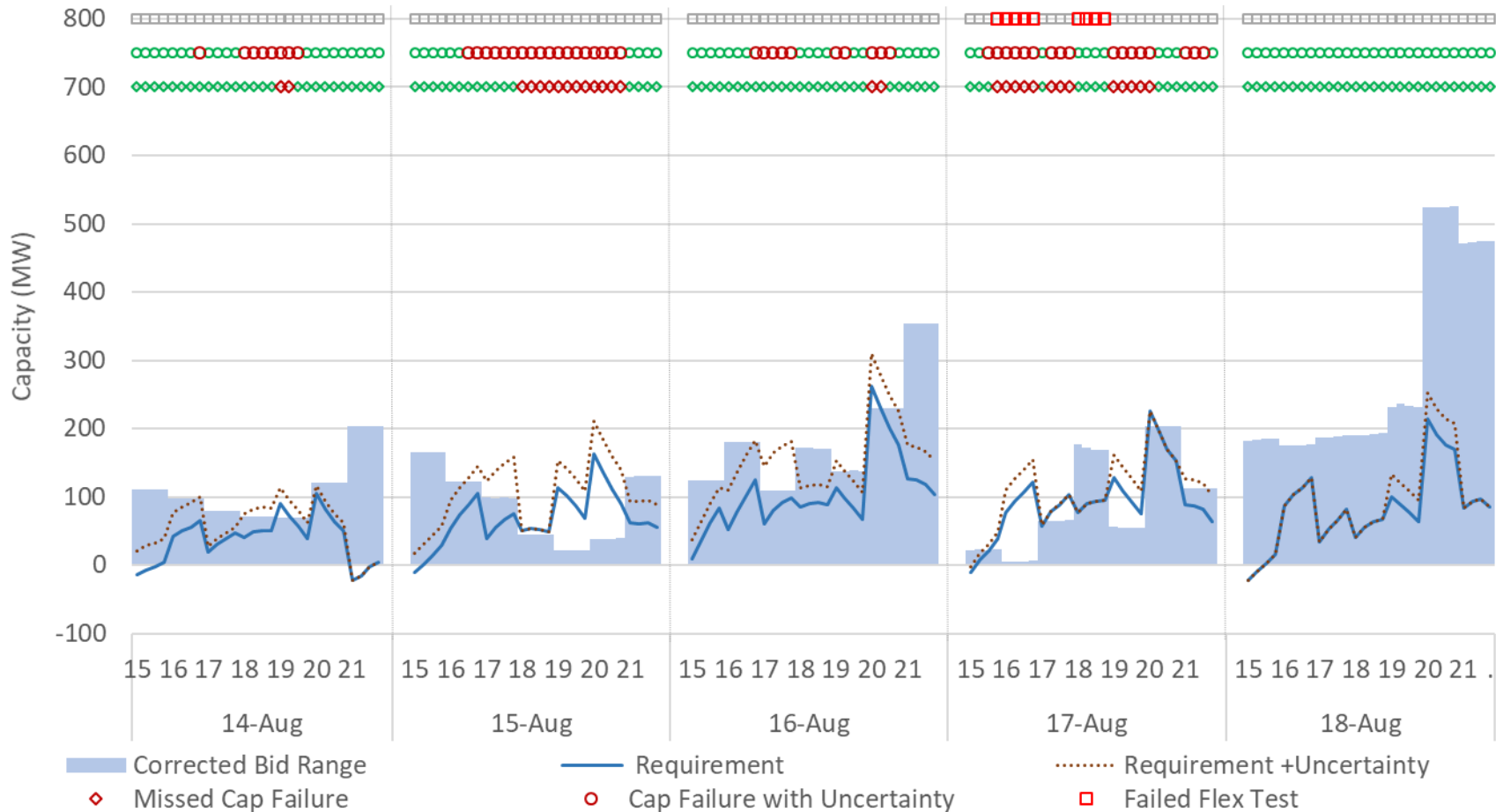
The over-calculation of capacity range resulted in PACE passing the capacity test in seven intervals during critical peak intervals
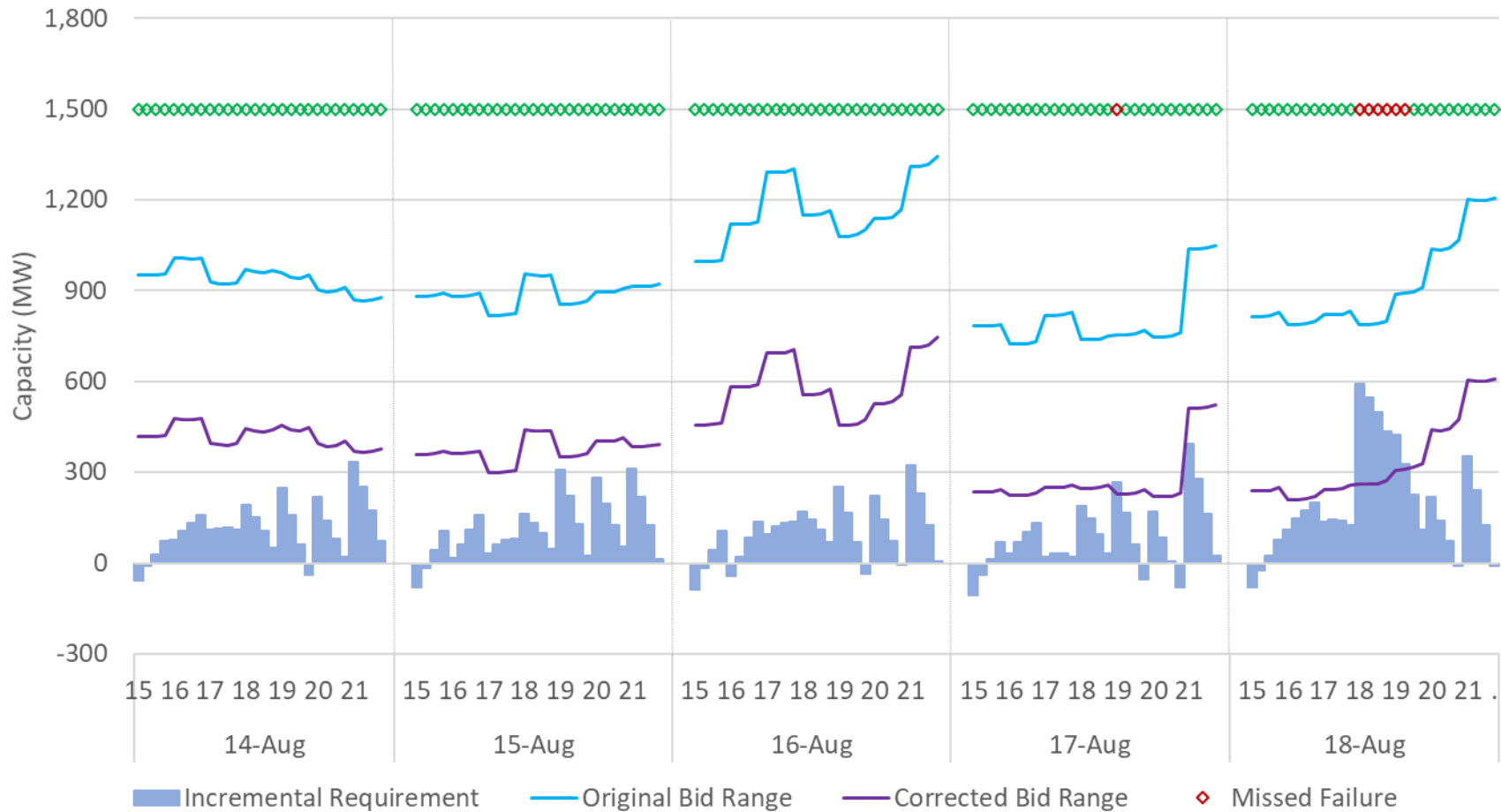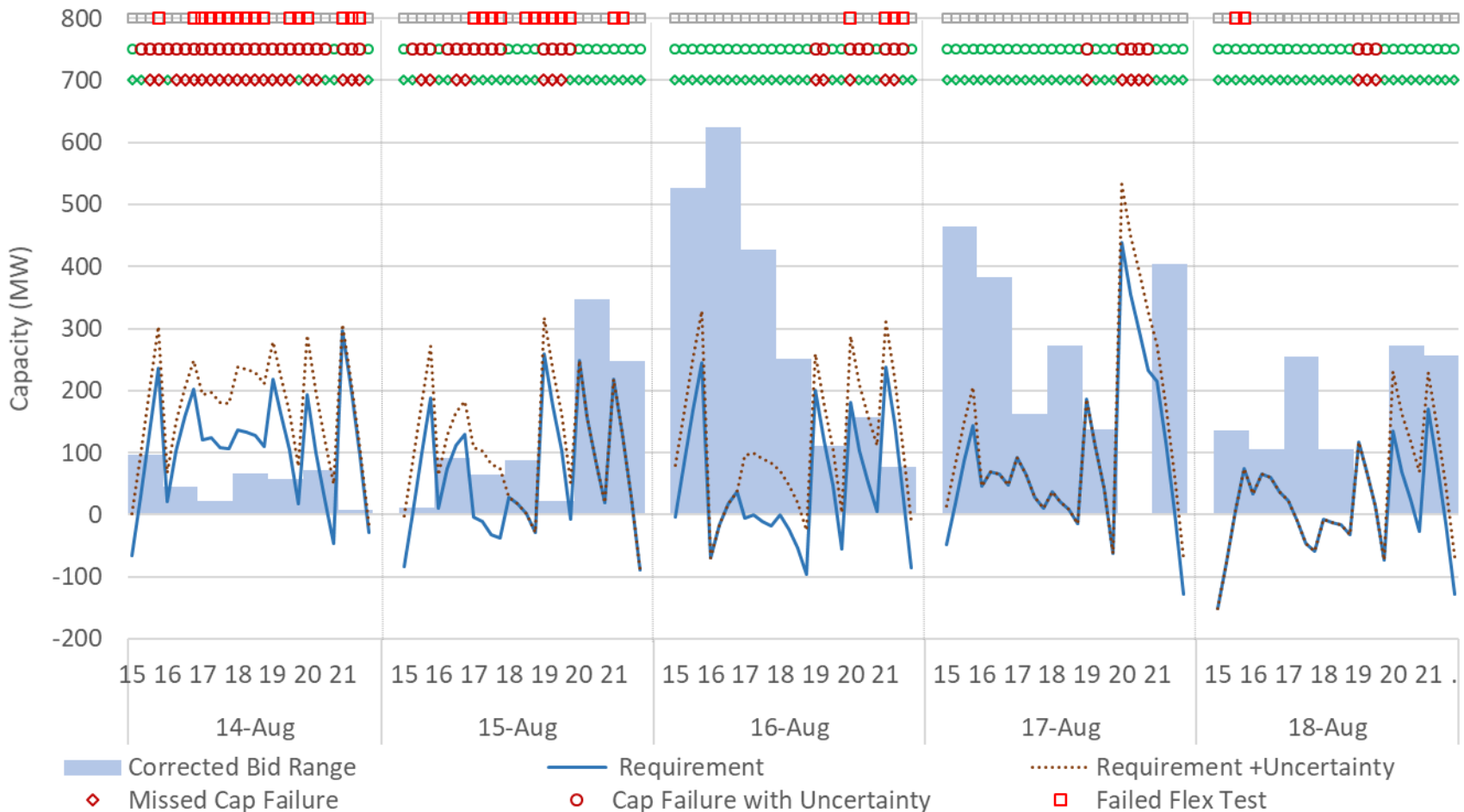
With uncertainty added to the capacity requirement, Nevada would have seen capacity test failures in 14 additional intervals during critical peak hours

Corrected Bid Range —— Requirement ········ Requirement +Uncertainty
◇ Missed Cap Failure   ○ Cap Failure with Uncertainty   □ Failed Flex Test

CAISO Public

With uncertainty added to the capacity requirement, PSEI would have seen 24 additional capacity test failures during critical peak hours

Corrected Bid Range | Requirement | Requirement +Uncertainty
◇ Missed Cap Failure | ○ Cap Failure with Uncertainty | □ Failed Flex Test

California ISO

With uncertainty added to the capacity requirement, PGE would have seen 17 capacity test failures during critical peak intervals

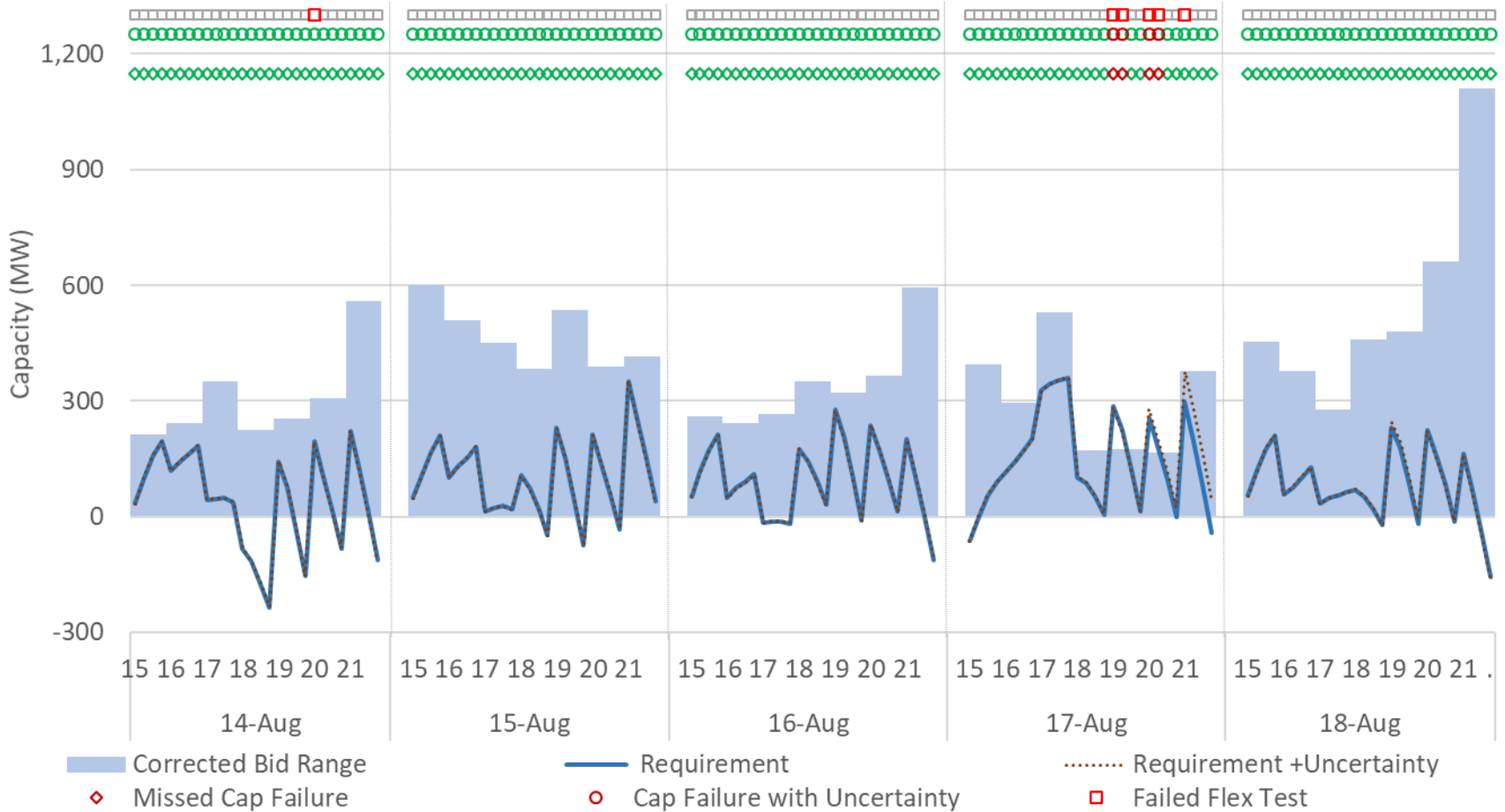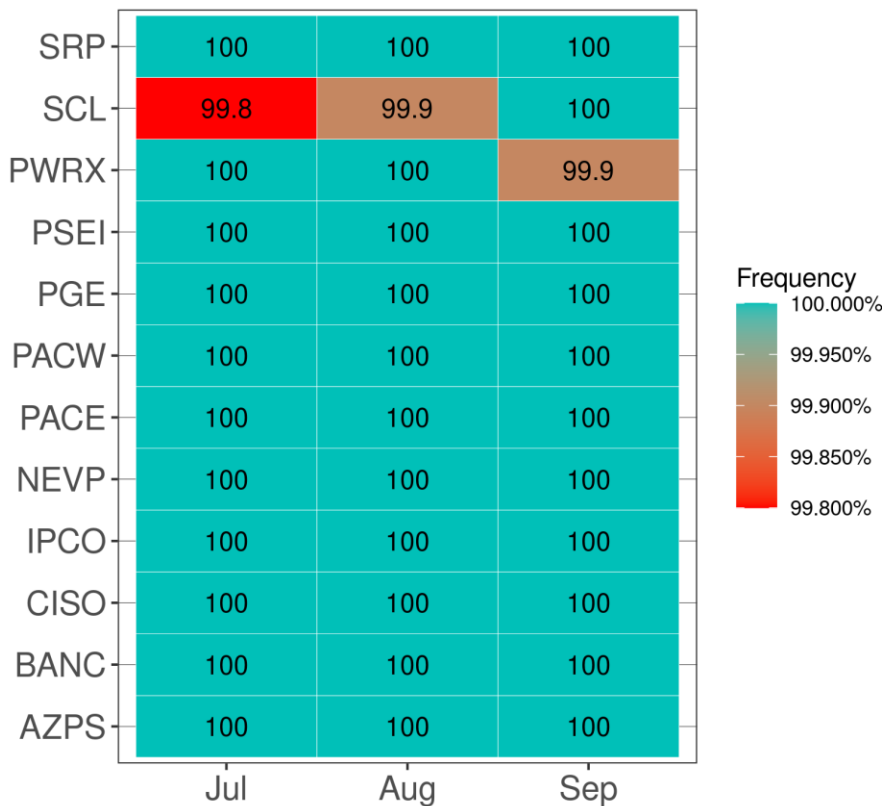# With uncertainty added to the capacity requirement, SRP would have seen no additional capacity test failures during critical peak hours
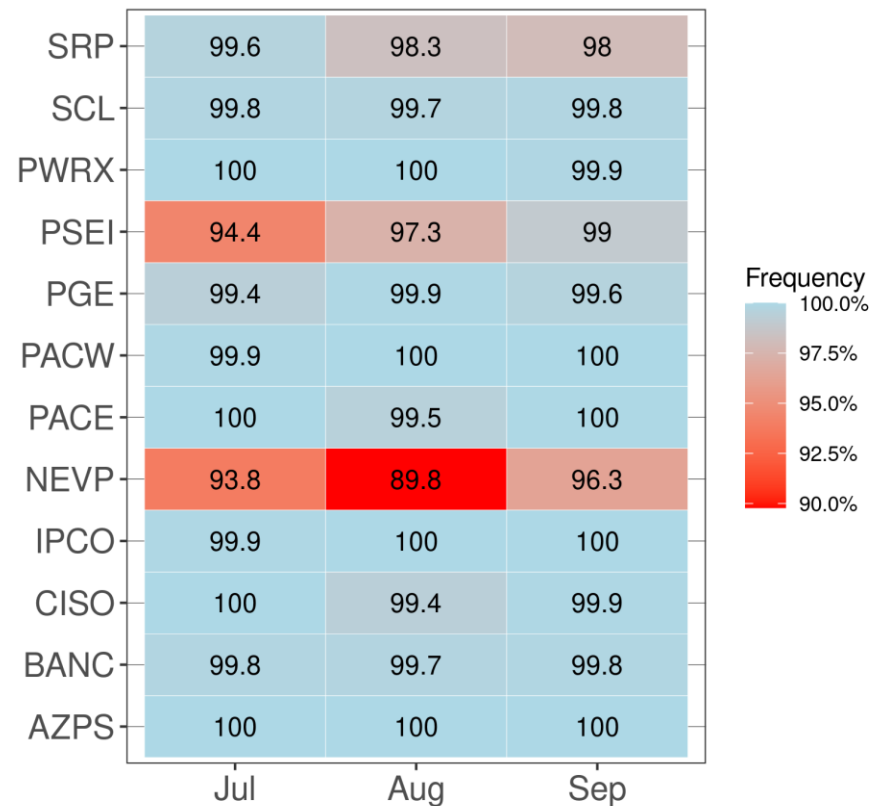
During the summer season, missing to account for derates in the bid range calculation resulted in multiple EIM entities to incorrectly pass the capacity test
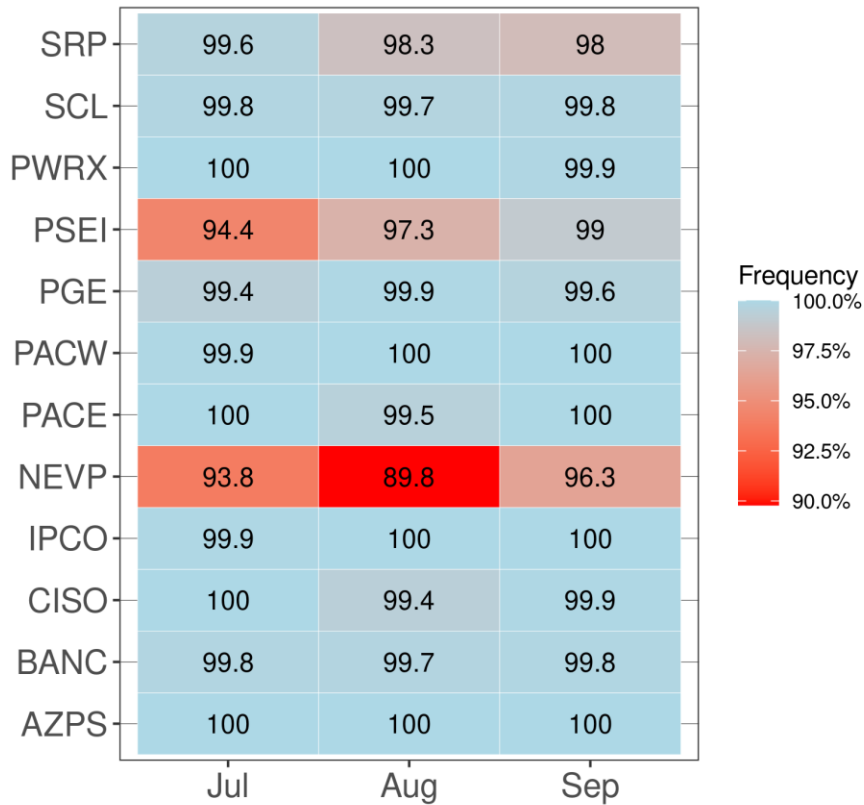

Original solution
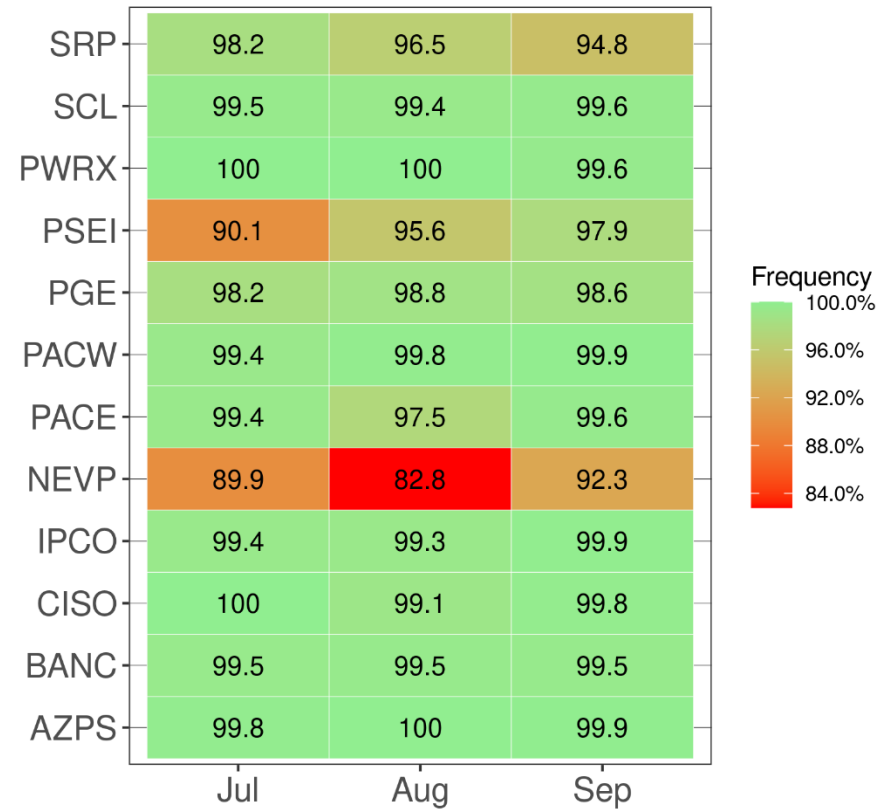
Corrected solution

California ISO

The addition of uncertainty to the Capacity Test requirement will increase the frequency of all EIM entities failing the capacity test


Corrected solution

	Jul	Aug	Sep
SRP	99.6	98.3	98
SCL	99.8	99.7	99.8
PWRX	100	100	99.9
PSEI	94.4	97.3	99
PGE	99.4	99.9	99.6
PACW	99.9	100	100
PACE	100	99.5	100
NEVP	93.8	89.8	96.3
IPCO	99.9	100	100
CISO	100	99.4	99.9
BANC	99.8	99.7	99.8
AZPS	100	100	100

Frequency
100.0%
97.5%
95.0%
92.5%
90.0%

Requirement+ Uncertainty

	Jul	Aug	Sep
SRP	98.2	96.5	94.8
SCL	99.5	99.4	99.6
PWRX	100	100	99.6
PSEI	90.1	95.6	97.9
PGE	98.2	98.8	98.6
PACW	99.4	99.8	99.9
PACE	99.4	97.5	99.6
NEVP	89.9	82.8	92.3
IPCO	99.4	99.3	99.9
CISO	100	99.1	99.8
BANC	99.5	99.5	99.5
AZPS	99.8	100	99.9

Frequency
100.0%
96.0%
92.0%
88.0%
84.0%

California ISO

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The gross capacity approach instead of the incremental approach eases the overall view of the system capacity while holding the same test outcomes

CAISO BAA

Gross Capacity (MW)

Generation   NSI   Incremental Bid Range   Total Requirement

California ISO
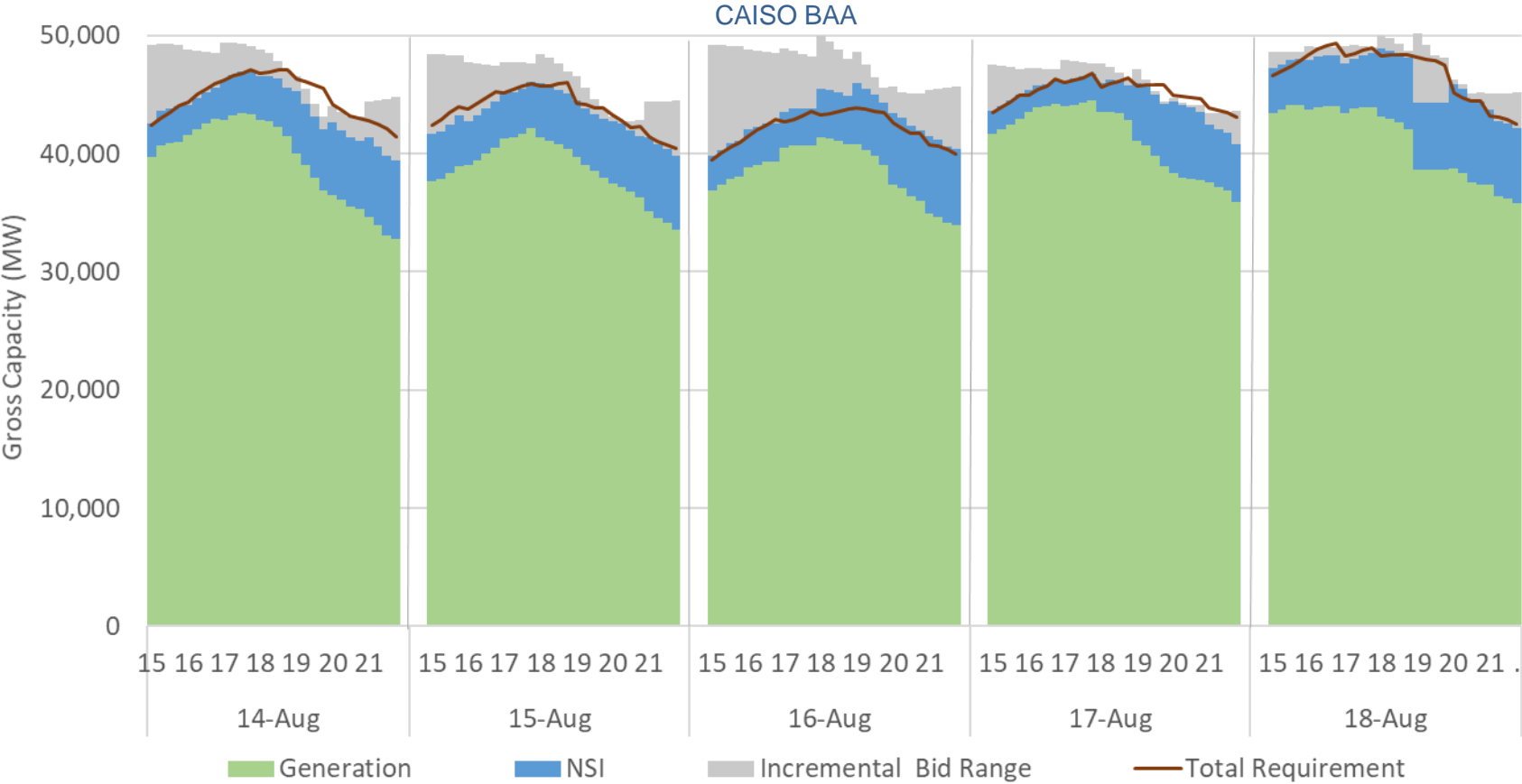
The real-time dispatch requirement tracked generally close to the Capacity test requirement while HASP and FMM requirements were higher
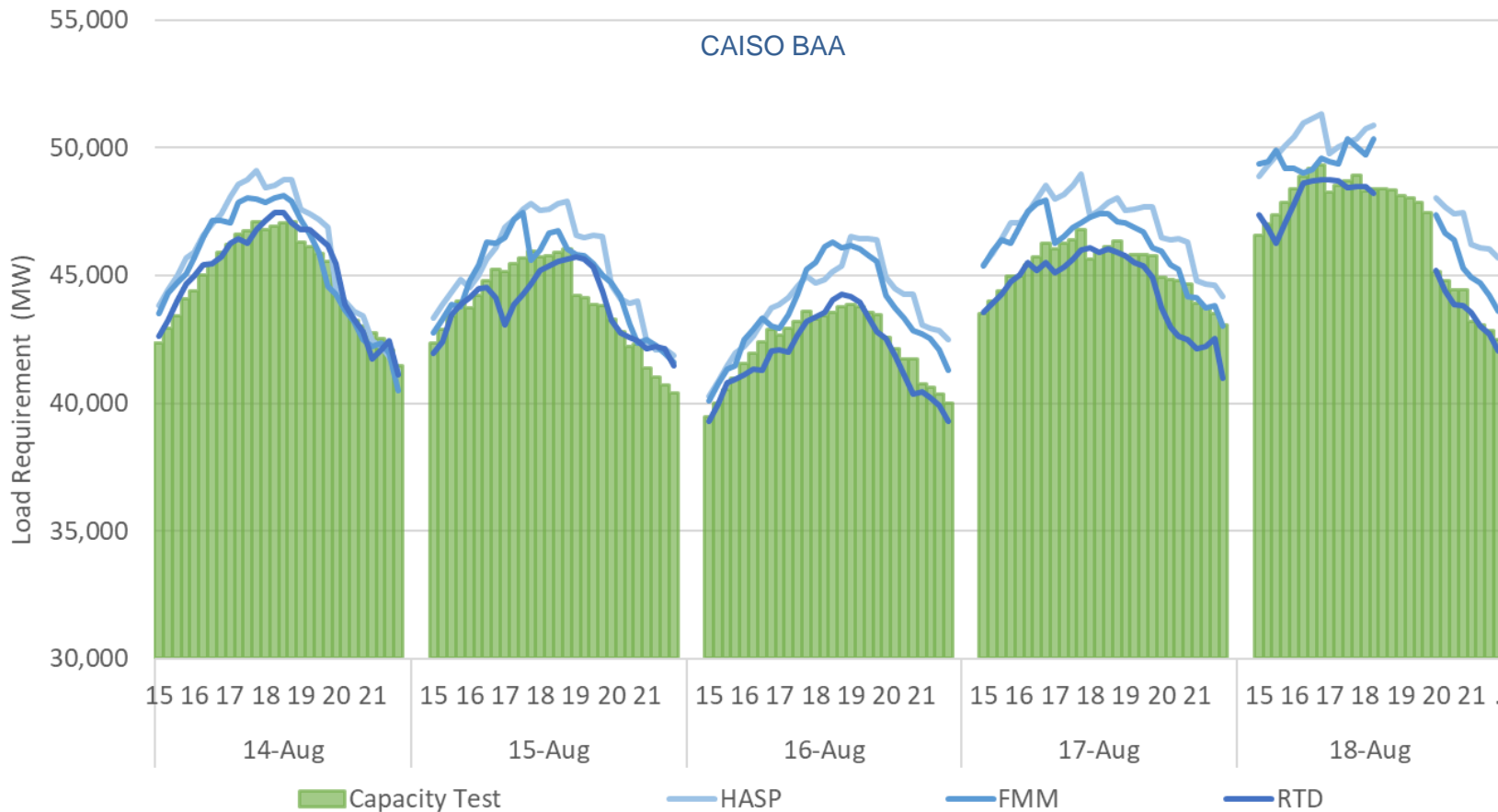
The HASP, FMM and RTD requirements includes any load conformance used in real-time

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How do we reconcile the capacity between the test and the "actual" capacity available?

- Was the capacity test properly projecting the capacity eventually available in real time?

- "Actual" capacity is an elusive target
  - How quickly should it be readily available?
  - How to measure it?

- The time gap between running the test and the utilization of it in real-time will naturally lead to some divergence

- The original principle of the capacity test is simply an assessment of "capacity". The flex test complements it.

California ISO

ISO's approximation of "actual" capacity relies on what is made available to the last run of the market

- Using the bid-range available in the real-time dispatch is a crude approximation subject to further tuning

- It accounts only for the capacity already online and available for energy

- It does not consider capacity accessible by starting or transitioning units

- For non-peaking conditions it will simply reflect the condition of partial loading of units even when more capacity is actually available

- For peaking conditions the exercise is to see trends of divergence between the test and actual conditions

Capacity test and Real-time market capacity tracked relatively close one to another for Dynamic resources
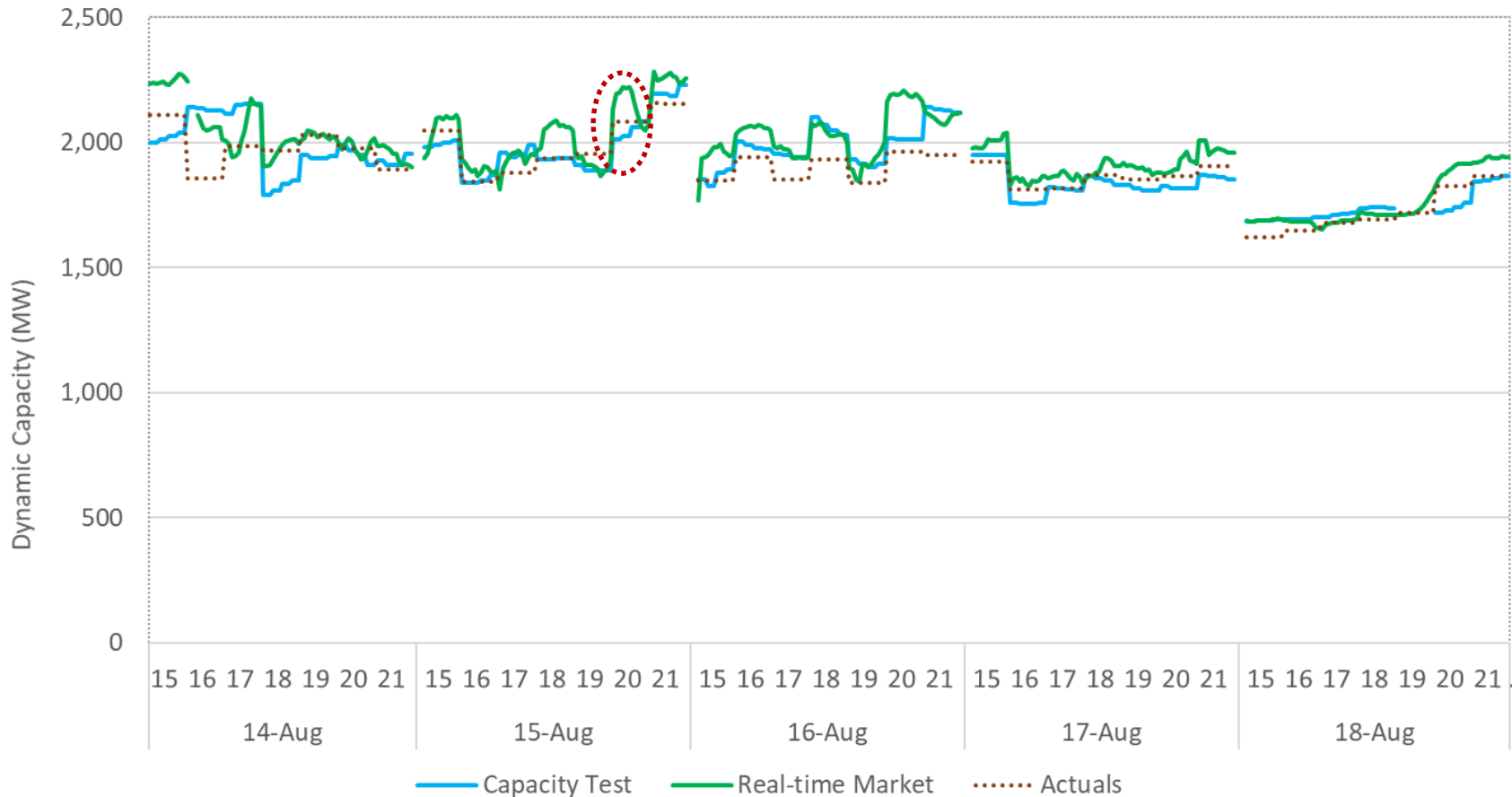

There are some marked divergences, like those of August 15, due to forecast changes for some wind dynamic resources

# Capacity test and real-time market tracked closely for static import for most of the times
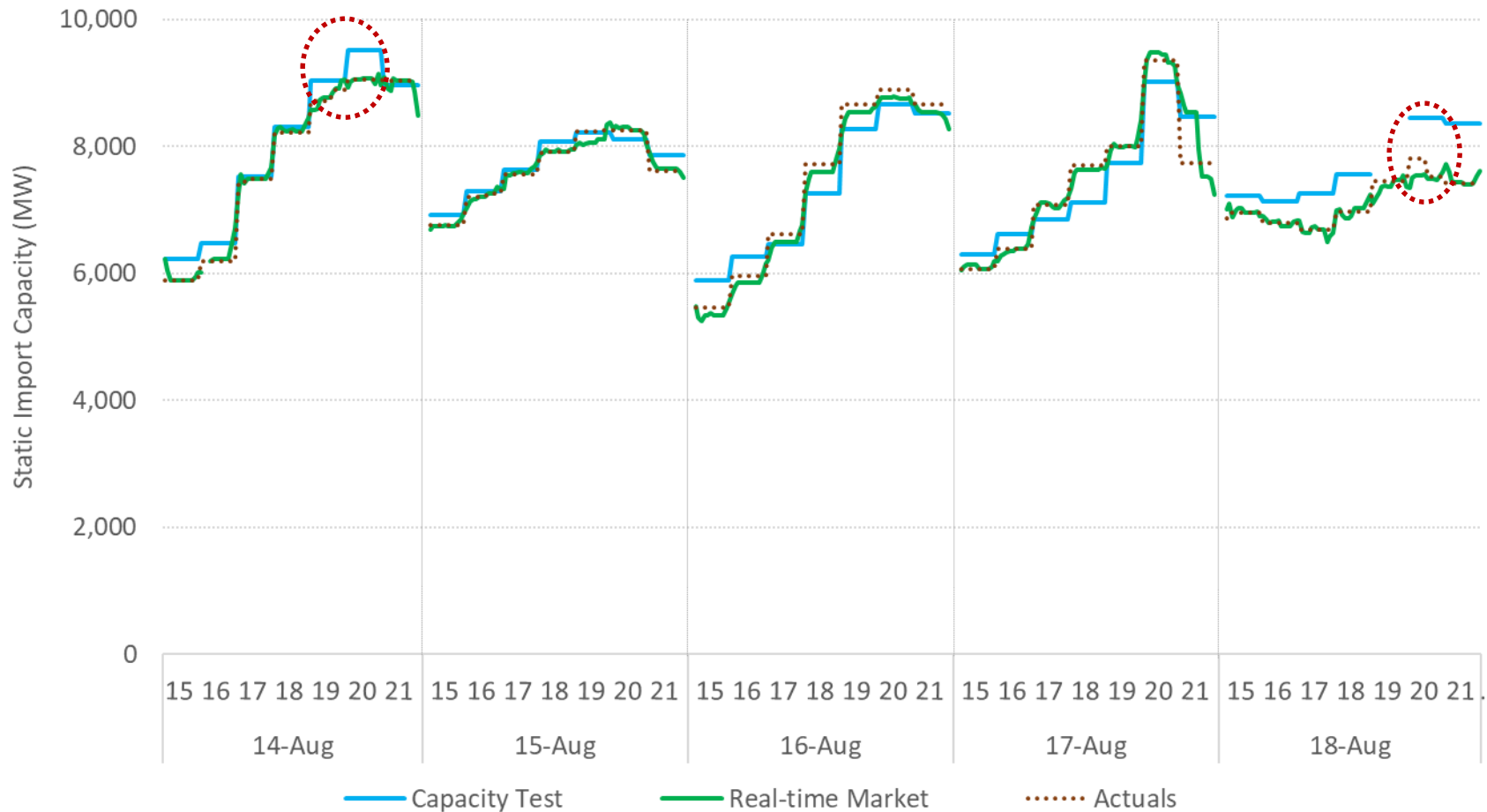
Partial deliveries from imports cleared in HASP resulted in some deltas between the capacity test and the real-time capacity

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Wind resources experienced variability during the heat wave days which resulted in fair divergences between the test and the real-time market
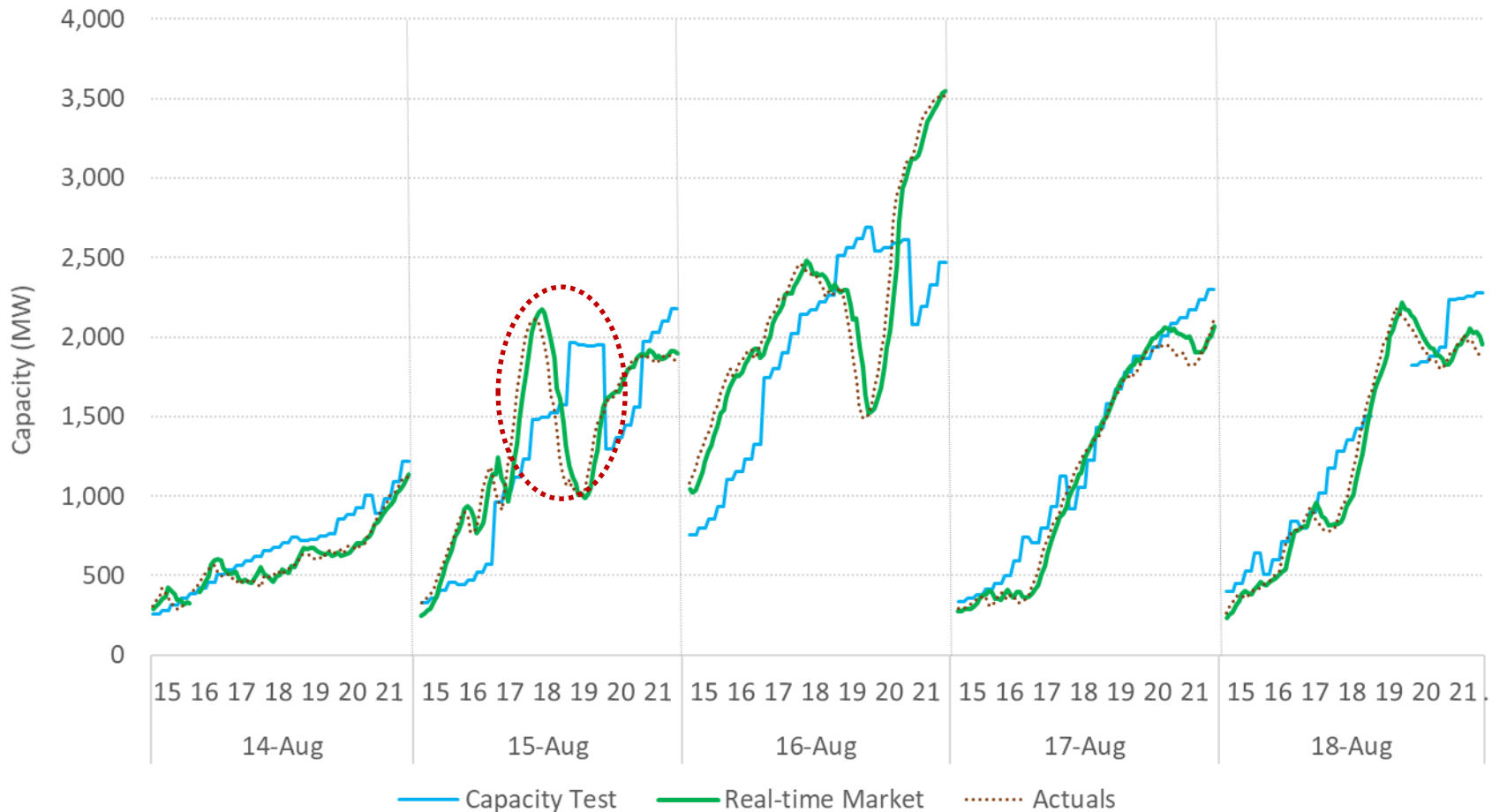
Solar capacity in the test was generally higher than in real-time market during the downward evening ramp

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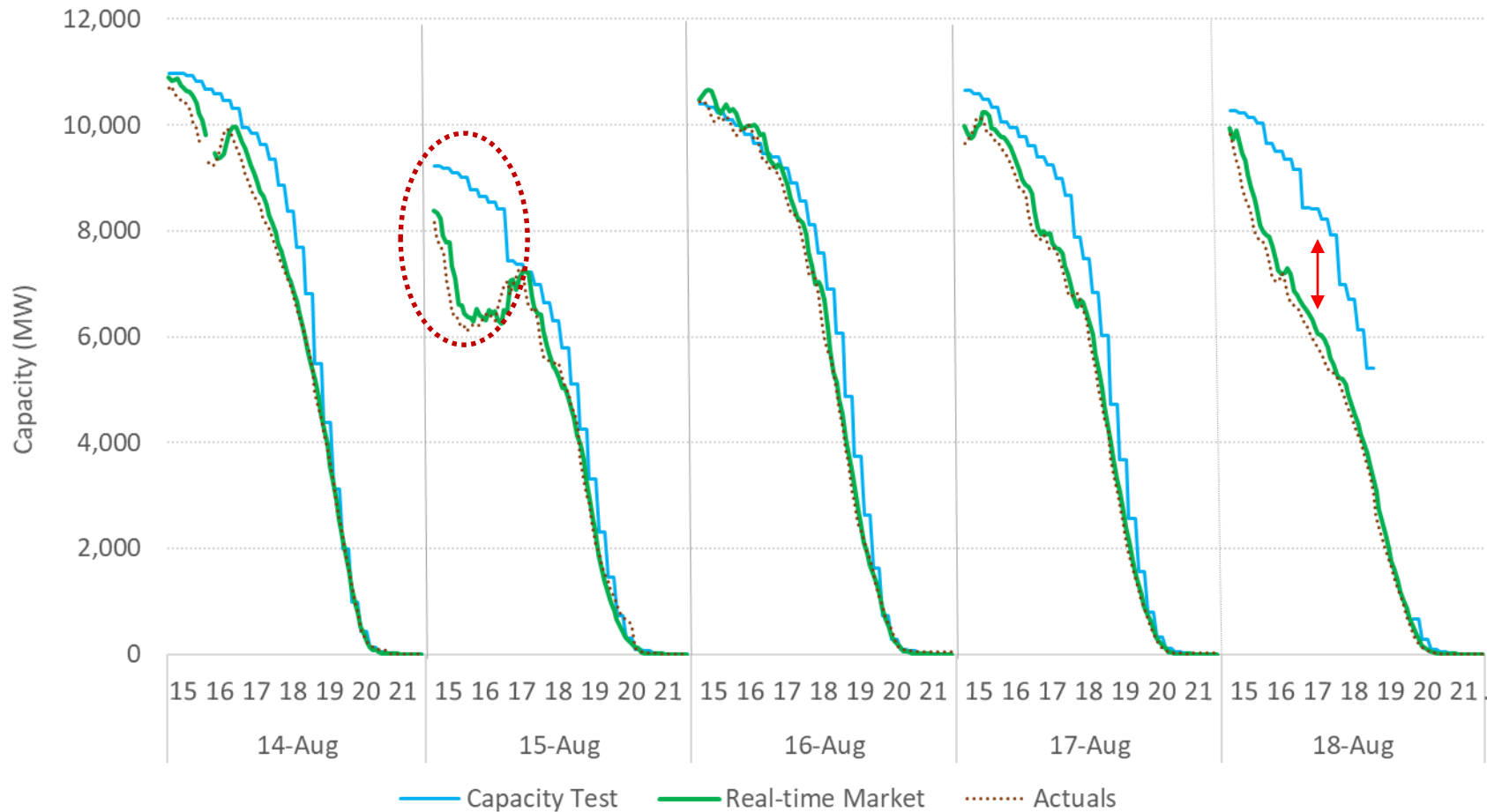
Proxy Demand Response resources were consistently accounted for higher capacity in the bid-range test in comparison to the real-time market
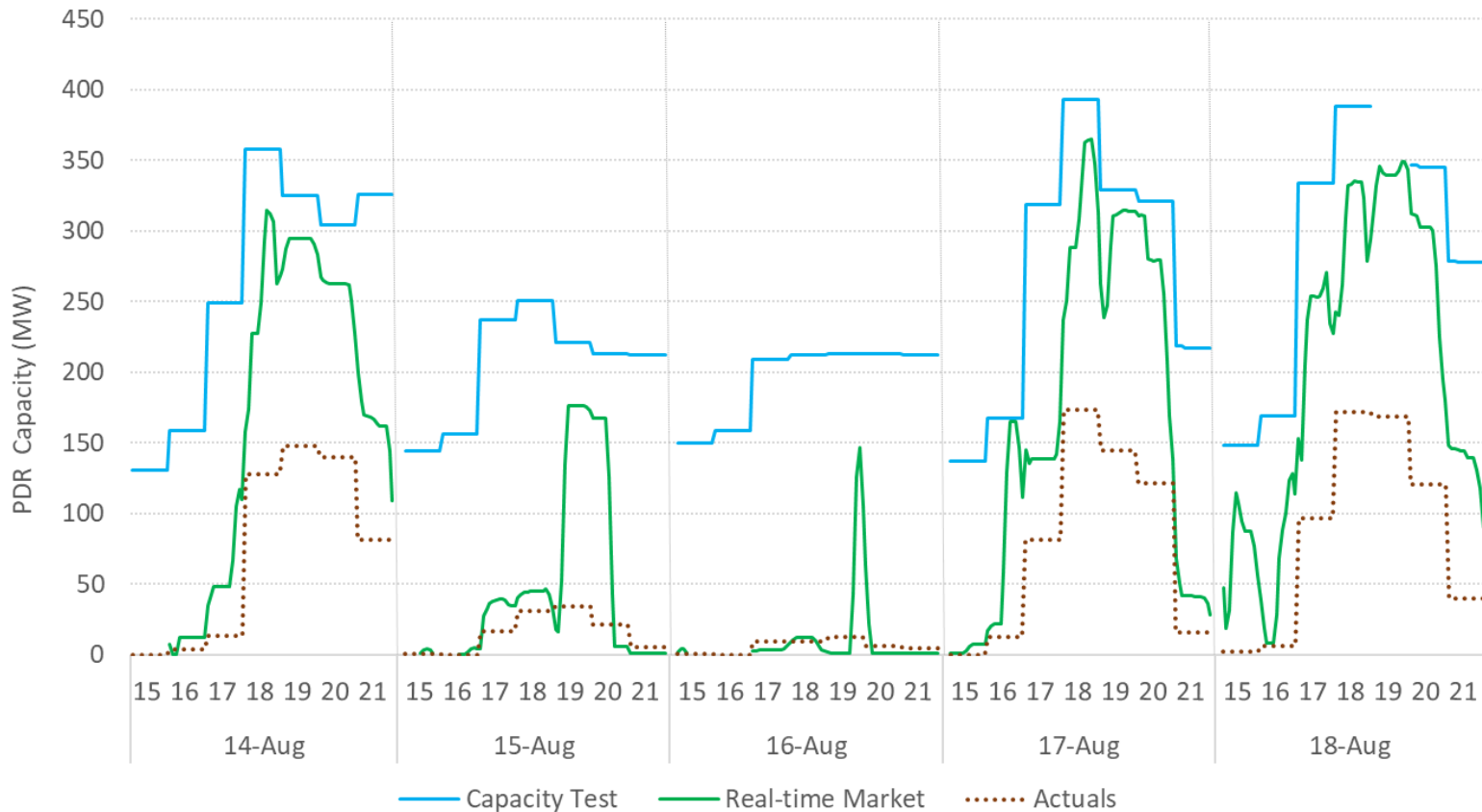

Slow ramp rates, high-price bids and hourly- and fifteen-minute type of resources contributed to real-time to not have access to more PDR capacity

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Reliability Demand Response utilized in the real-time market was generally not accounted for in the capacity test
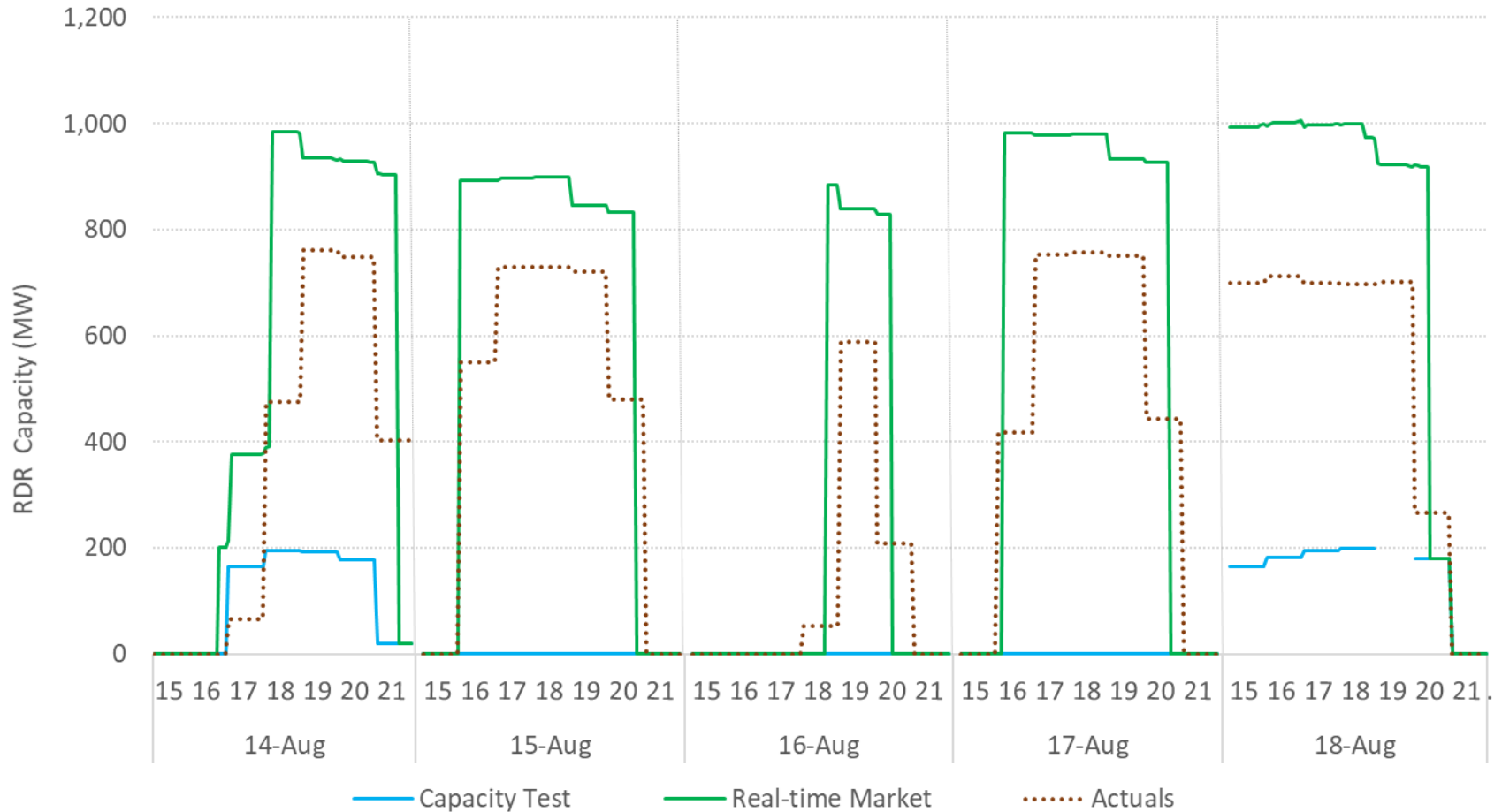
Only RDR bid-in and cleared in the day-ahead market was accounted for in the capacity test

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Capacity from hydro resources tracked closely between the test and the real-time market
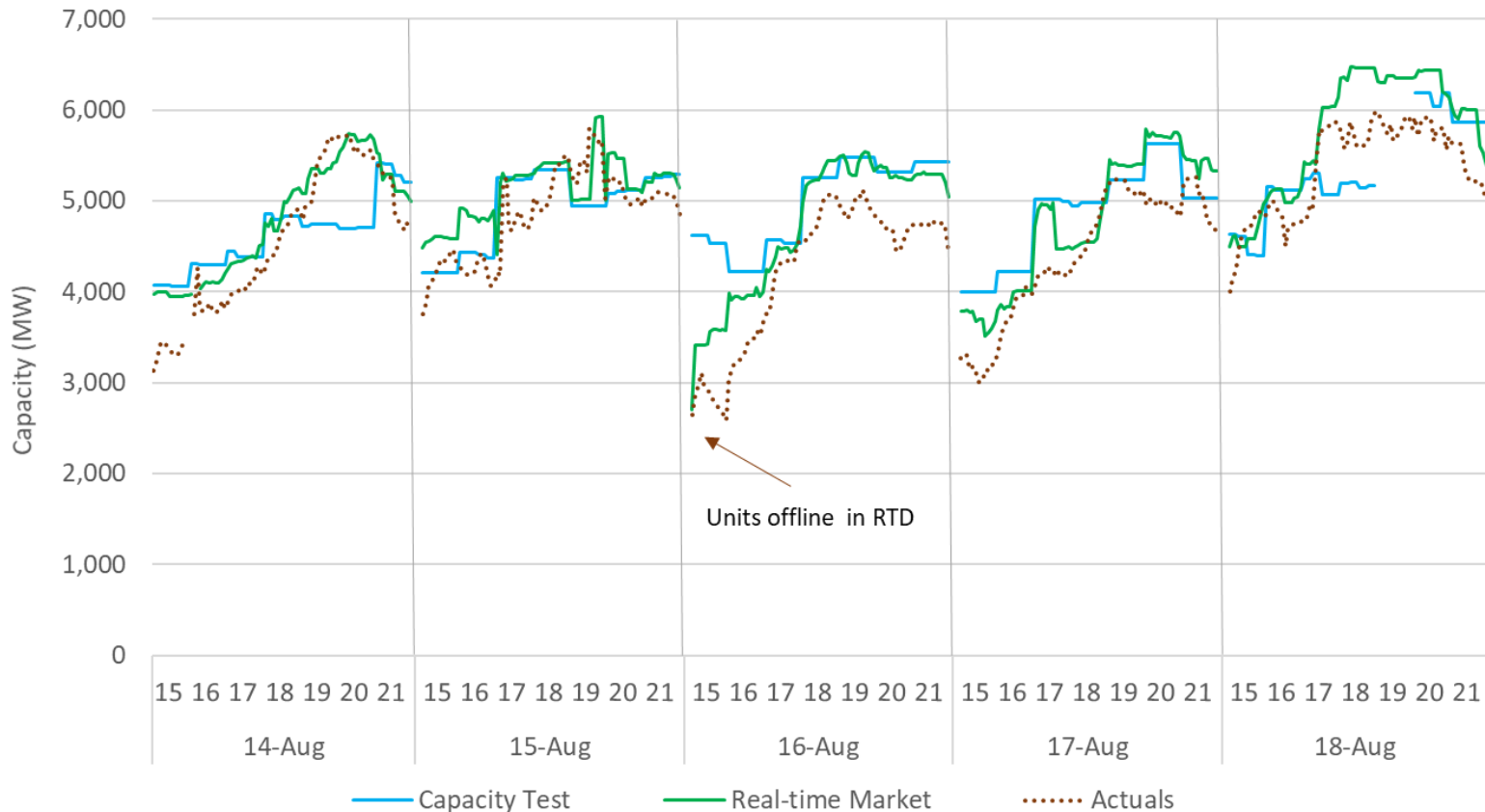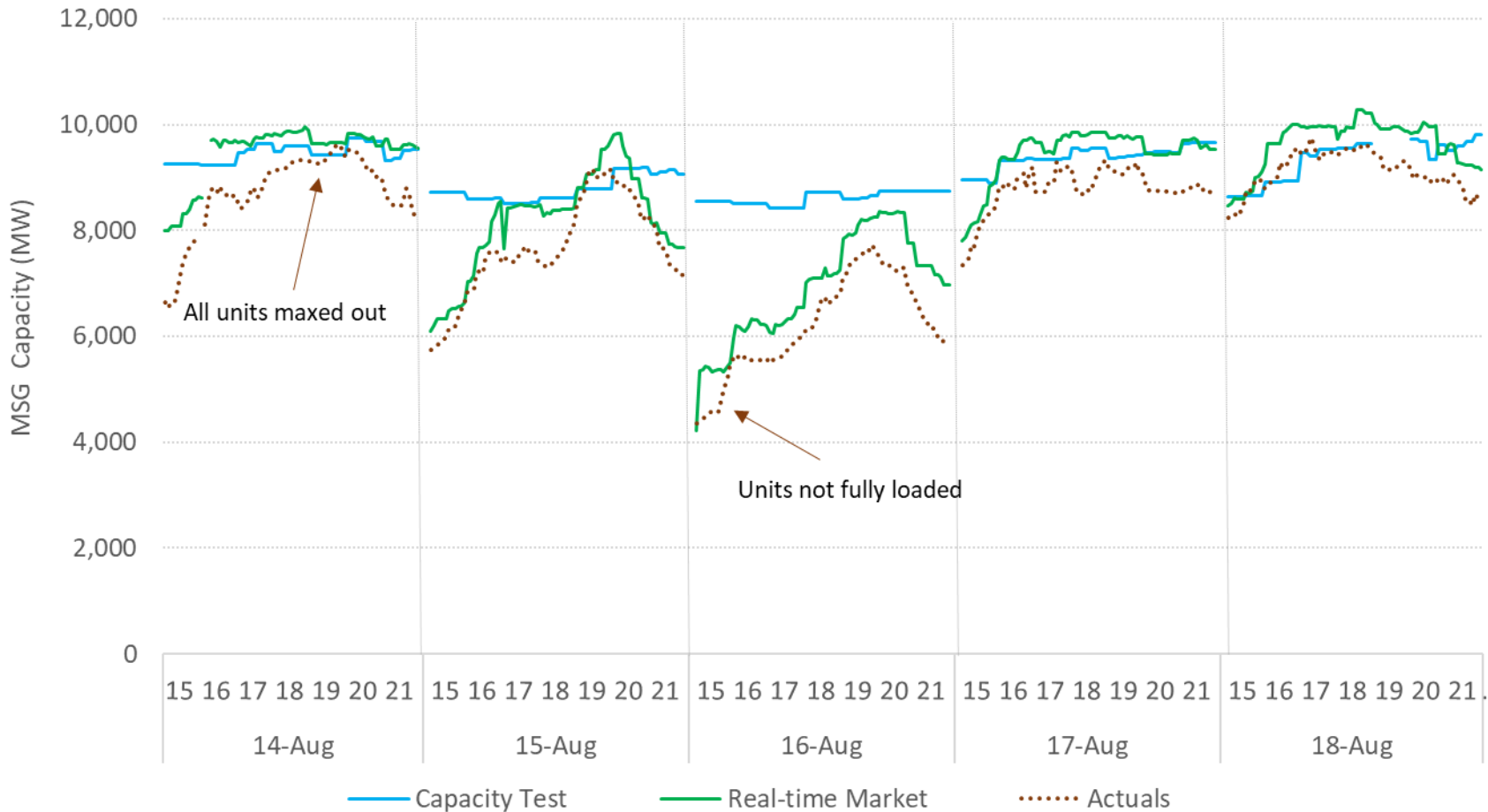

In some cases divergences show when operating reserves were converted to energy

# MSG capacity generally converged to capacity test during peaking conditions
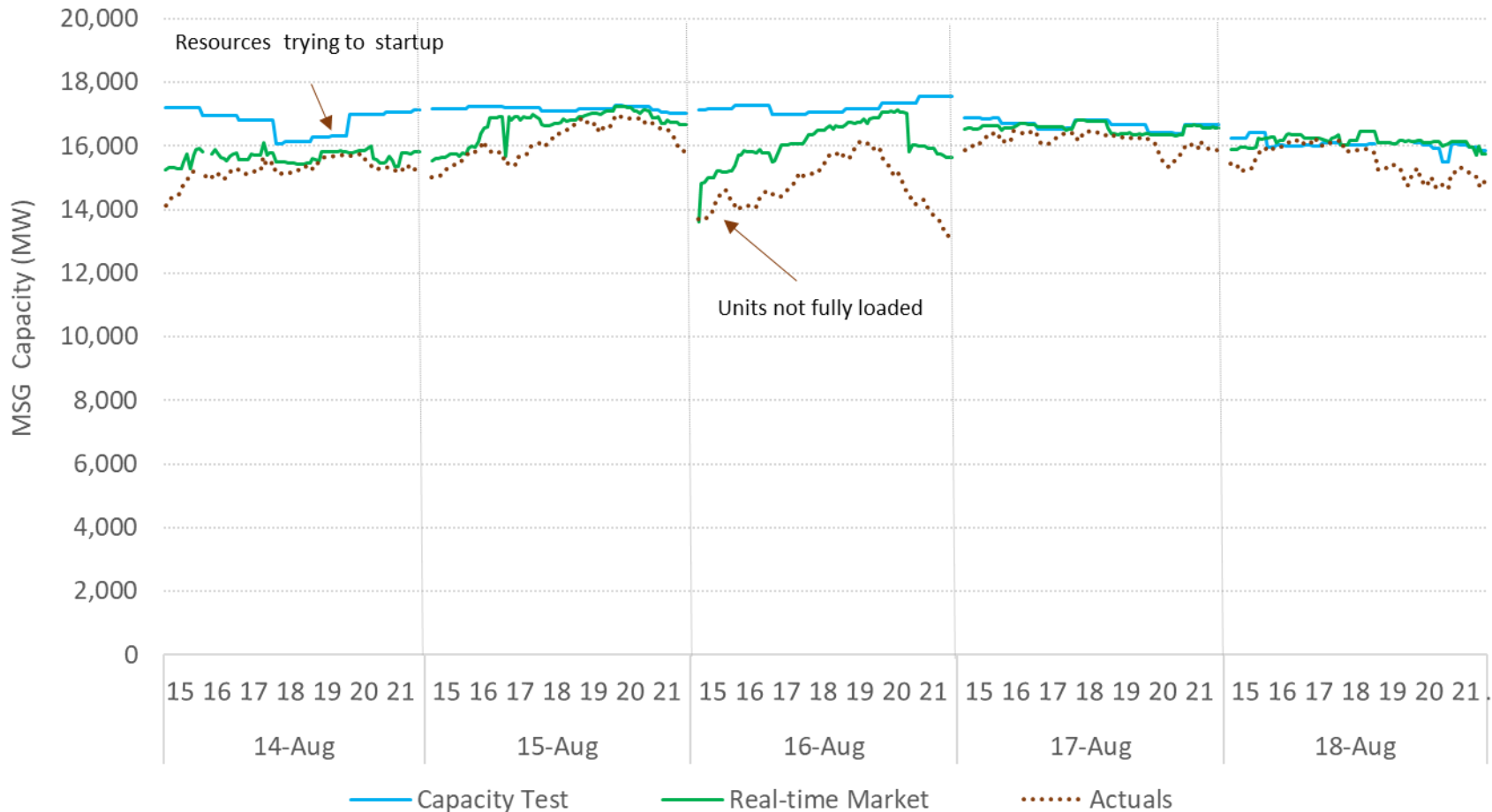
For non peak hours Real-time market capacity will simply show the need of partial loading for resources

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Capacity in real-time for gas units tracked with test capacity during peak hours

During non peak hours, gas units may not be on-line since loading conditions do not require them

CAISO Public

During the heatwave, the majority of offline units accounted for in the capacity test had startup times shorter than 2 hours, which could be started up in real timecal
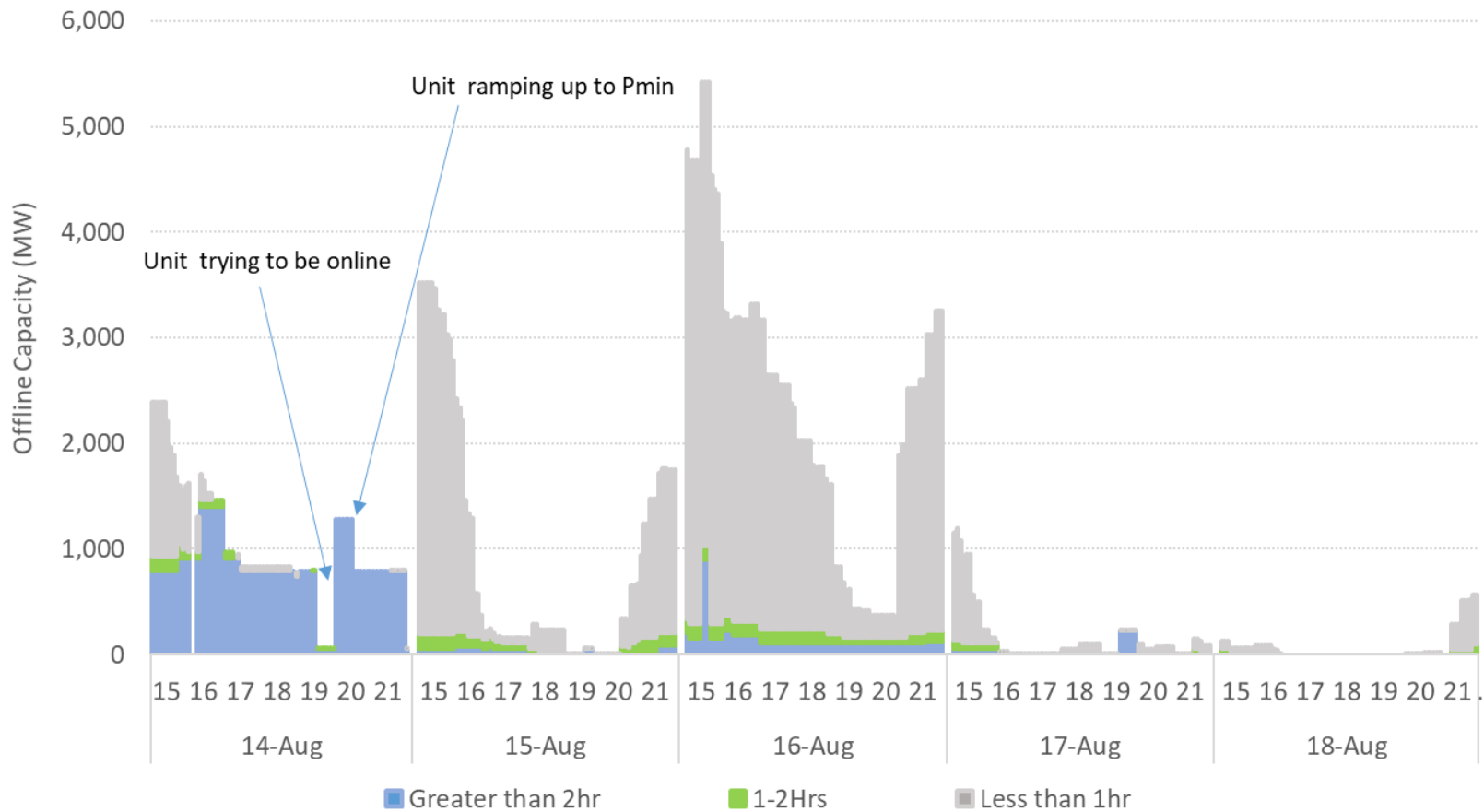
As discussed in previous analysis, the blue area on August 14 represents a unit coming back from an outage that could not get synchronize to the system

CAISO Public