PERFORMANCE DURING SYSTEM EMERGENCIES: WHAT LESSONS CAN WE LEARN?

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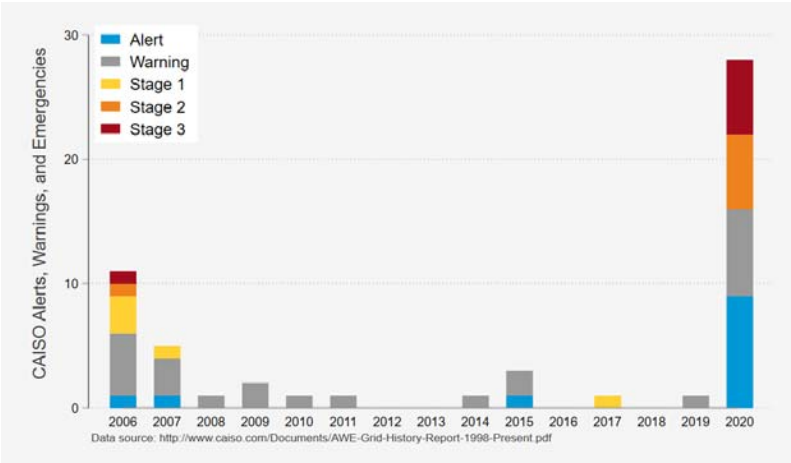
DATA DRIVEN RESEARCH AND INSIGHTS

WLRA 2021 SPRING CONFERENCE, APRIL 16, 2021

1

THE CALIFORNIA ISO EXPERIENCED A LARGE NUMBER OF EMERGENCY CONDITIONS IN THE SUMMER OF 2020



Stage 1 Emergency
Contingency Reserve shortfalls exist or forecast to occur.
Strong need for conservation.

Stage 2 Emergency
The ISO has taken all mitigating actions and is no longer able to provide its expected energy requirements.
Requires ISO intervention in the market, such as ordering power plants online.

Stage 3 Emergency
The ISO is unable to meet minimum contigency reserve requirements, and load interruption is imminent or in progress.
Notice issued to utilities of potential electricity interruptions.

SOURCE:
http://www.caiso.com/Documents/SystemAlertsWarningsandEmergenciesFactSheet.pdf

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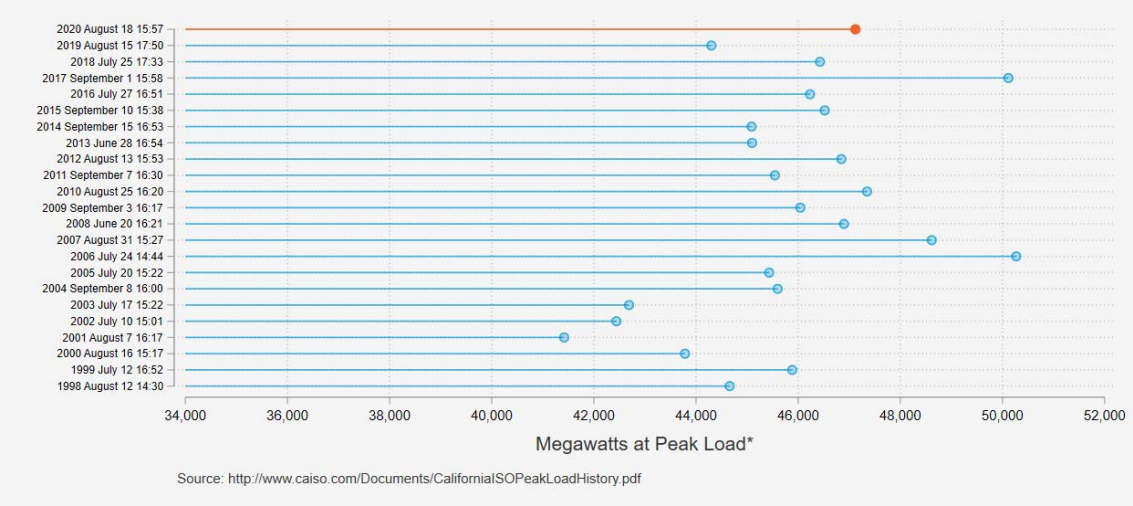
2

CAISO PEAKS WERE HIGH, BUT NOT OUTSIDE OF HISTORICAL PEAKS



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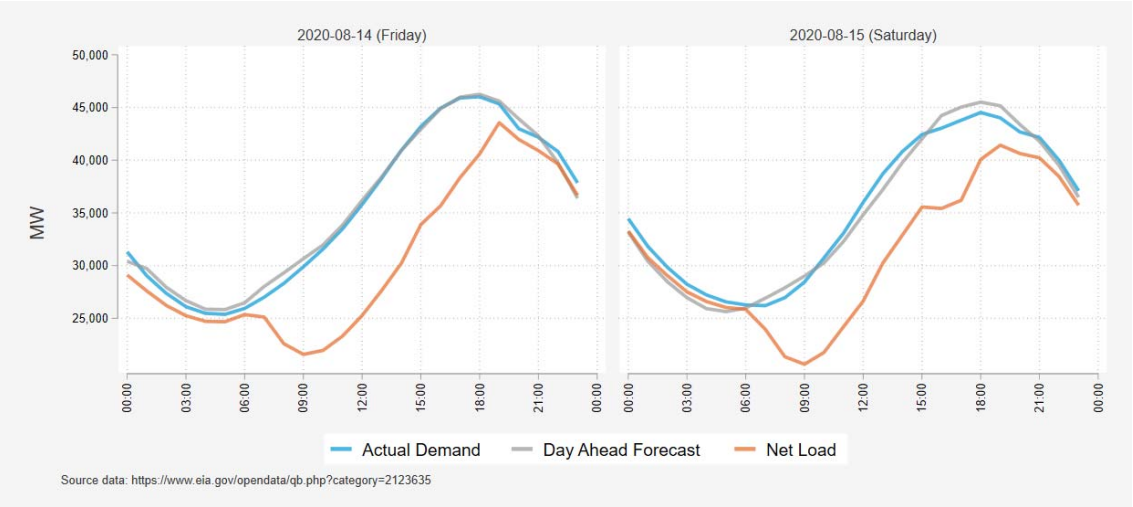
3

ON AUGUST 14TH AND AUGUST 15TH, CAISO CALLED FOR ROLLING BLACKOUTS



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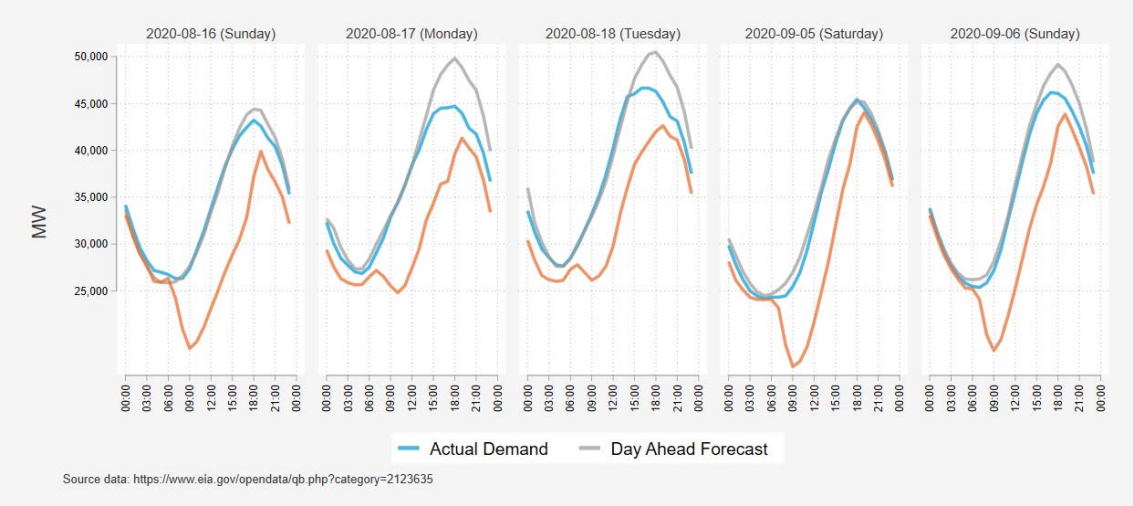
4

THEY ALSO DECLARED FIVE STAGE 2 EMERGENCIES



Source data: https://www.eia.gov/opendata/qb.php?category=2123635

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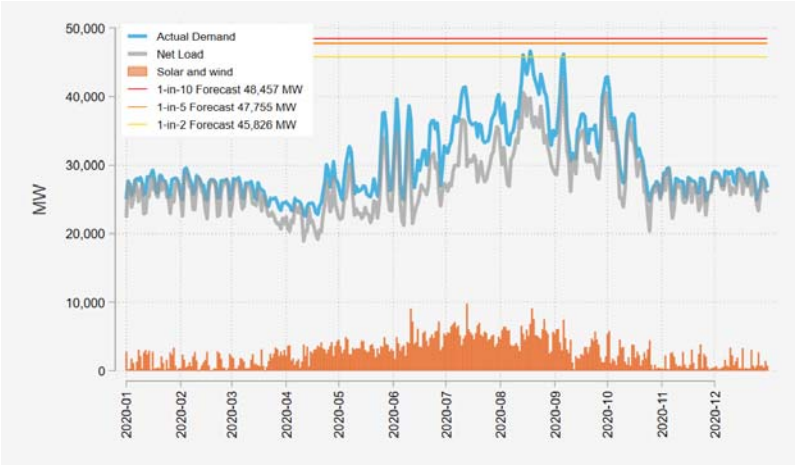
5

5

BEFORE THE SUMMER, THE SYSTEM OPERATOR PLANNED FOR MORE EXTREME DEMAND



Summer Outlook

- The ISO anticipates adequate resources to meet demand this summer
- Forecasted peak demand of 45,907 megawatts (MW) is relatively unchanged from 2019
- 1,952 MW of generation will retire and 1,990 MW generation will be added
- Hydroelectric conditions are below normal
- Under more extreme scenarios, low hydropower supplies combined with late summer high heat and reduced imports could cause energy shortfalls
- Risk of energy shortages in late summer increase in the evening hours

Source: CAISO 2020 Readiness Fact Sheet

Base case probability of system capacity shortfall

Base Case	Shortfall Probability	Number of Shortfall Scenarios
Stage 2	3.7%	74
Stage 3	1.1%	21
Unserved energy	0.2%	3

Source: CAISO 2020 Readiness Fact Sheet

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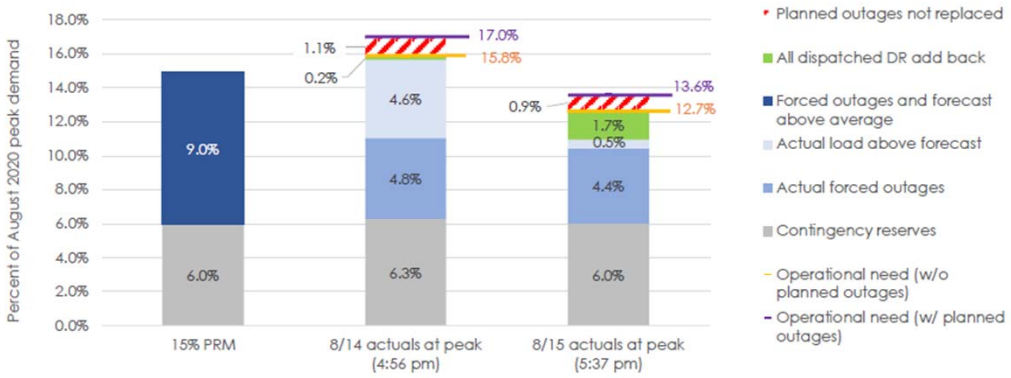
6

6

RESERVE MARGINS WERE SUFFICIENT ON THE PEAK HOUR: WHAT HAPPENED?



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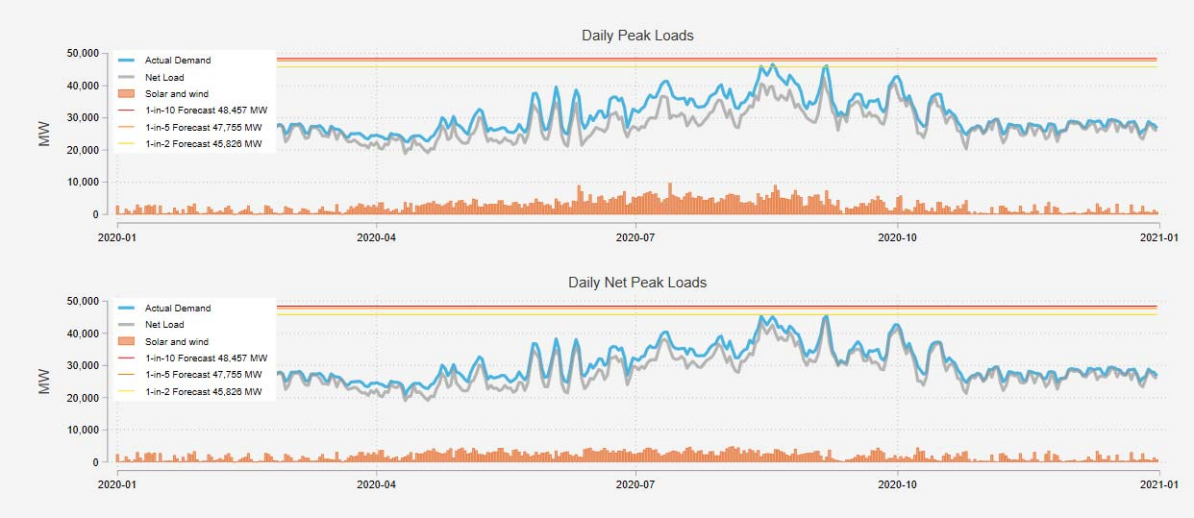
7

WHAT IS DIFFERENT IN THE TWO PICTURES?



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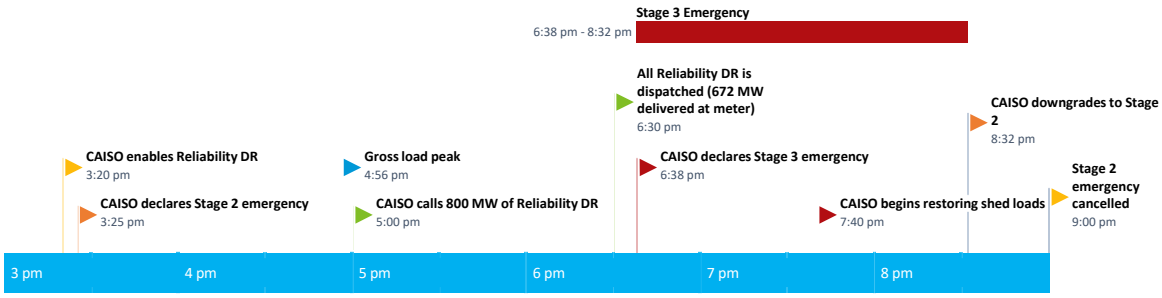
8

AUGUST 14TH EVENTS



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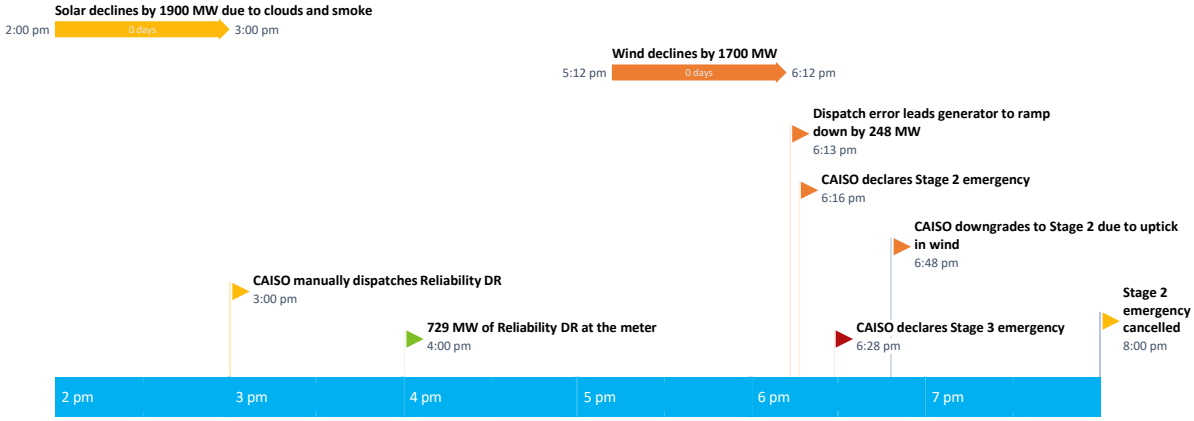
AUGUST 15TH EVENTS



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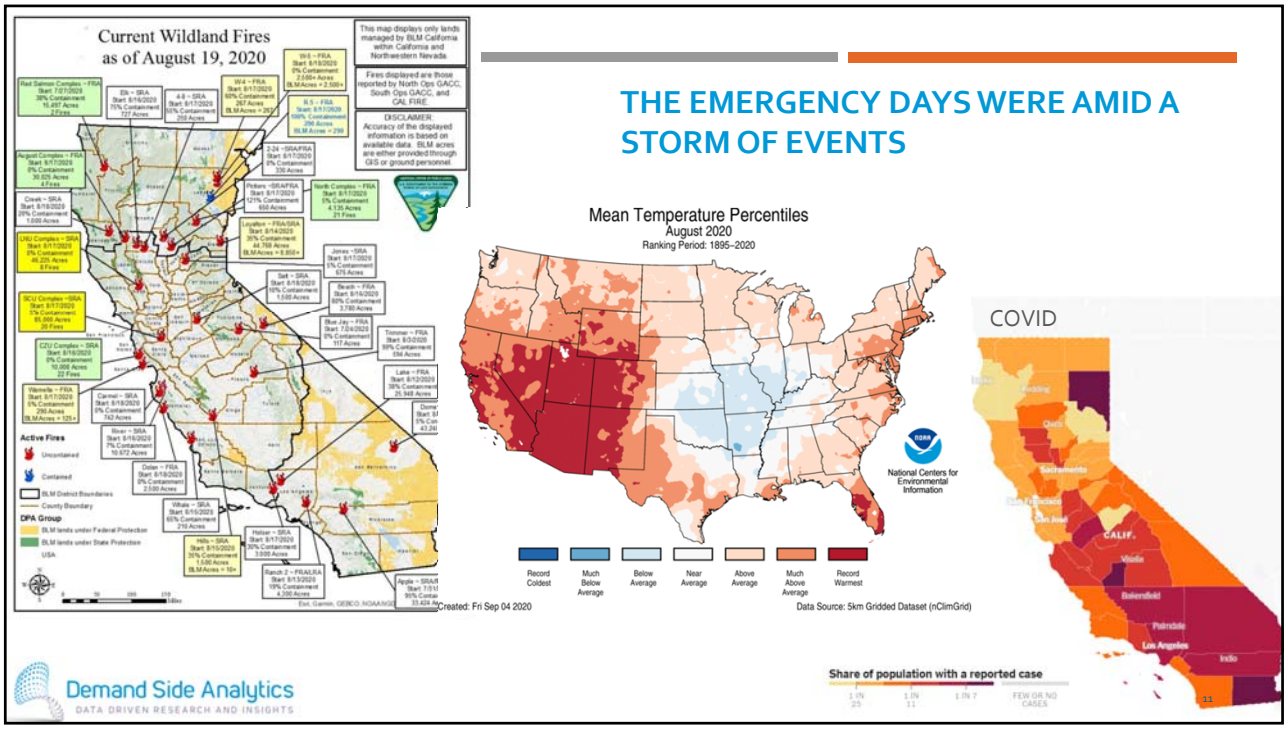
10



11

CAISO IDENTIFIED THREE MAIN FACTORS

1. Extreme heat wave across the western United States – a 1-in-30 year event
2. Planning for gross peak instead of net peak – the rotating outages both occurred during the "net demand peak"
3. Under-scheduling of demand in day-ahead market: 3,386 MW on August 14th and 3,434 MW on August 15th

BUT I'D LIKE TO ADD A FEW MORE

4. Not all installed resources were scheduled, in the day-ahead market, leaving CAISO scrambling for resources
5. The world changed, but the resource adequacy reserve margin has stayed the same (15%) for over 30 years
6. Contingency reserves need to account for both for large contingencies and for large, unforeseen fluctuations in wind and solar

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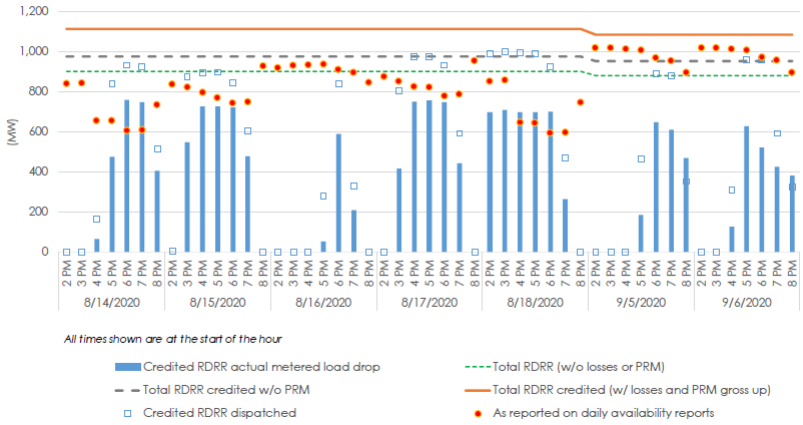
12

ALL RESOURCES, INCLUDING DEMAND RESPONSE WERE NEEDED TO AVOID MORE BROADER ROLLING BLACKOUTS

Figure 4.5: Credited IOU Reliability Demand Response Resource Real-Time Availability, Dispatch, and Performance



- Based on the CAISO root cause analysis, DR underperformed compared to resource adequacy
- All of their estimates are based 10-in-10 day matching baselines, which are not the most accurate approach for weather sensitive sites
- Not all of the resources were dispatched

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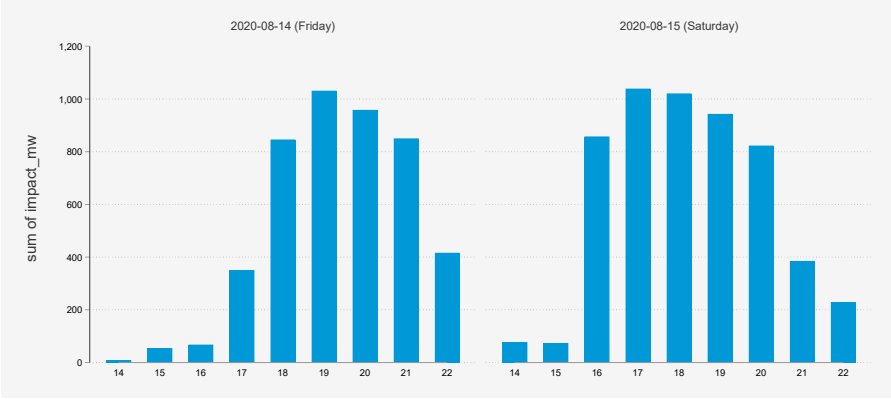
13

THE DR PROGRAMS ARE ALSO EVALUATED AND INDICATE OVER PERFORMANCE ON STAGE 3 EMERGENCY DAYS



- Over 200 MW gap from CAISO
- Most analysis done with extensive out of sample validation
- Use of matched control groups is common
- More detailed assessment of impacts

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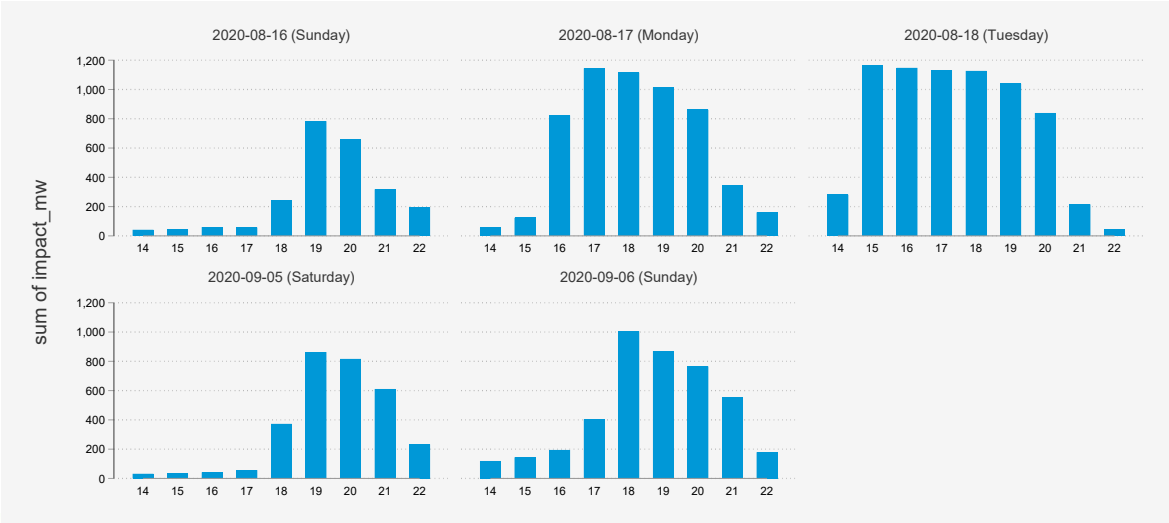
14

WE SEE A SIMILAR GAP ON STAGE 2 EMERGENCY DAYS



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15

KEY QUESTIONS

- Do we need to align evaluation and settlement? Move away from 10-in-10 baselines when they do not make sense?
- Do we need better information for CAISO – a time temperature matrix?
- Do we need to start reporting capability of resources for weekends?

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16

16

QUESTIONS?

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17