



# Report on system and market conditions, issues and performance: August and September 2020

December 18, 2020

Department of Market Monitoring, California ISO

<http://www.caiso.com/Documents/ReportonMarketConditionsIssuesandPerformanceAugustandSeptember2020-Nov242020.pdf>

# Background

- Prepared by CAISO's Department of Market Monitoring (DMM), the independent market monitor for CAISO and Western Energy Imbalance markets.
- A prior report prepared by the CAISO, CPUC and CEC focuses on the root causes of the load shedding events occurring on August 14-15.
- This report:
  - provides additional analysis
  - offers recommendations based on DMM's own independent analysis
  - covers high load periods from mid-August through September 7
    - CAISO energy demand forecast to be higher than August 14 and 15,
    - further load curtailments were avoided due to a combination of different market conditions and steps taken by the CAISO and other entities.

# Key findings are consistent with CAISO/CPUC/CEC report

## Load curtailments due to a series of contributing factors:

- **Extreme temperatures and energy demand** across the West, electricity demand well in excess of current resource planning targets.
- **California state resource adequacy requirements** based on 1-in-2 year loads plus a 15 percent planning reserve margin, insufficient to reflect actual system conditions.
- **Counting rules for resource adequacy capacity** which overestimate the actual capacity that is available from many resources during the early evening hours.
- **Transmission capacity from Pacific Northwest de-rated by about 650 MW** as a result of a weather-related forced outage which prevented additional available supply from being imported into the CAISO.
- **The sudden loss of several large gas fired units** contributed to curtailment events, although the overall level of gas capacity on outage was not unusually high.
- **Self-scheduling of relatively large volumes of exports** in the day-ahead market, which reduced net imports into CAISO.
- **Residual unit commitment (RUC) process and related real-time bid processing design.** Detailed discussion of this to follow.

# Overall resource adequacy availability was not unusually low during hours of load curtailments

Resource type	Date	Hour ending	Total resource adequacy capacity (MW)	Day-ahead market				Real-time market		
				Adjusted for outages		Bids and self-schedules		Bids and self-schedules		Bids and self-schedules below cap
				MW	% of total RA Cap.	MW	% of total RA Cap.	MW	% of total RA Cap.	MW
Total	8/14/2020	19	51,373	49,313	96%	45,889	89%	45,003	88%	6,370
		20	51,373	49,373	96%	44,090	86%	43,128	84%	8,245
	8/15/2020	19	51,333	48,894	95%	45,044	88%	45,221	88%	6,112
		20	51,333	48,955	95%	43,365	84%	43,879	85%	7,454

Availability = Total MW self-scheduled and/or bid into CASO day-ahead and real-time market.

Source: DMM Report, Table 3-1, p. 27

# Solar and wind account for a significant portion of unavailable resource adequacy capacity in hours 19 and 20

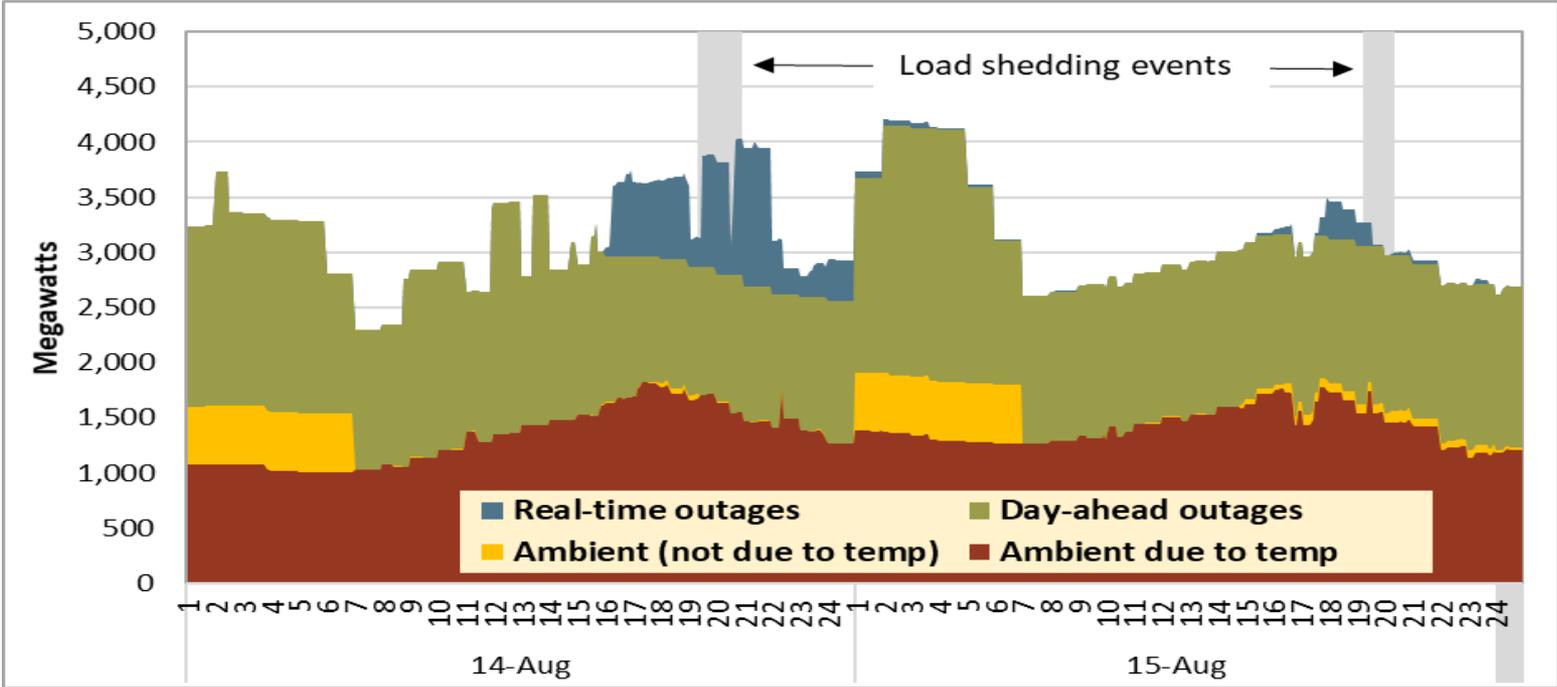
Resource type	Date	Hour ending	Total resource adequacy capacity (MW)	Day-ahead market				Real-time market		
				Adjusted for outages		Bids and self-schedules		Bids and self-schedules		Bids and self-schedules below cap
				MW	% of total RA Cap.	MW	% of total RA Cap.	MW	% of total RA Cap.	MW
Solar	8/14/2020	19	3,077	3,071	100%	2,202	72%	2,197	71%	880
		20	3,077	3,071	100%	330	11%	427	14%	2,650
	8/15/2020	19	3,079	3,073	100%	2,072	67%	1,729	56%	1,350
		20	3,079	3,073	100%	268	9%	202	7%	2,877
Wind	8/14/2020	19	1,253	1,253	100%	824	66%	483	39%	770
		20	1,253	1,253	100%	886	71%	538	43%	715
	8/15/2020	19	1,253	1,253	100%	895	71%	864	69%	389
		20	1,253	1,253	100%	959	77%	935	75%	318
Total	8/14/2020	19	51,373	49,313	96%	45,889	89%	45,003	88%	6,370
		20	51,373	49,373	96%	44,090	86%	43,128	84%	8,245
	8/15/2020	19	51,333	48,894	95%	45,044	88%	45,221	88%	6,112
		20	51,333	48,955	95%	43,365	84%	43,879	85%	7,454

*Output from solar and wind averaged about 2,490 MW (57 percent) below 4,300 MW resource adequacy rating of solar/wind units.*

Some gas-fired capacity also unavailable due to outages, but 92-95% of gas capacity available.

Resource type	Date	Hour ending	Total resource adequacy capacity (MW)	Day-ahead market				Real-time market		
				Adjusted for outages		Bids and self-schedules		Bids and self-schedules		Bids and self-schedules below cap
				MW	% of total RA Cap.	MW	% of total RA Cap.	MW	% of total RA Cap.	MW
Gas	8/14/2020	19	27,743	26,668	96%	26,629	96%	25,710	93%	2,033
		20	27,743	26,727	96%	26,687	96%	25,441	92%	2,302
	8/15/2020	19	27,716	26,197	95%	26,159	94%	26,062	94%	1,654
		20	27,716	26,258	95%	26,220	95%	26,234	95%	1,482
Total	8/14/2020	19	51,373	49,313	96%	45,889	89%	45,003	88%	6,370
		20	51,373	49,373	96%	44,090	86%	43,128	84%	8,245
	8/15/2020	19	51,333	48,894	95%	45,044	88%	45,221	88%	6,112
		20	51,333	48,955	95%	43,365	84%	43,879	85%	7,454

# Gas unit outages and load shedding events (August 14-15)



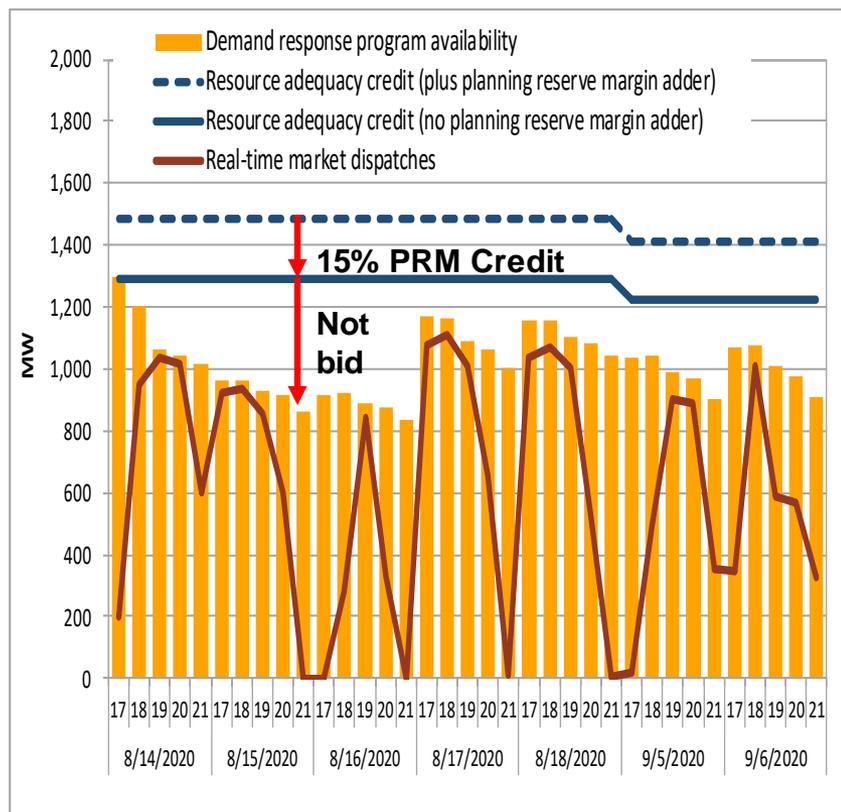
Almost half of unavailable gas-fired capacity (or about 3 percent of total RA capacity from gas units) was due to ambient de-rates which occur in very hot weather – when the total output from gas units falls below their normal rated capacity due to ambient temperature.

More than one-third of the 1,847 MW of demand response resource adequacy capacity requirement was unavailable.

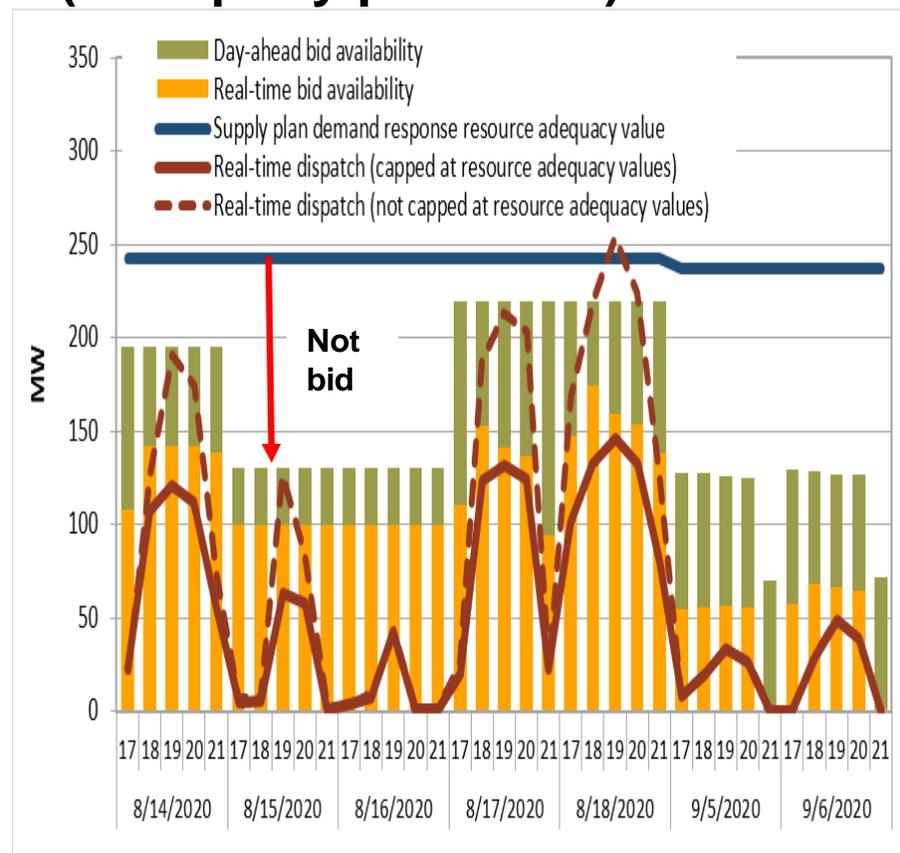
Resource type	Date	Hour ending	Total resource adequacy capacity (MW)	Day-ahead market				Real-time market		
				Adjusted for outages		Bids and self-schedules		Bids and self-schedules		Bids and self-schedules below cap
				MW	% of total RA Cap.	MW	% of total RA Cap.	MW	% of total RA Cap.	MW
Utility demand response	8/14/2020	19	1,604	1,604	100%	315	20%	1,040	65%	564
		20	1,604	1,604	100%	288	18%	1,022	64%	582
	8/15/2020	19	1,604	1,604	100%	8	1%	931	58%	673
		20	1,604	1,604	100%	0	0%	917	57%	687
Supply plan demand response	8/14/2020	19	243	243	100%	195	80%	142	58%	101
		20	243	243	100%	195	80%	142	58%	101
	8/15/2020	19	243	243	100%	130	53%	100	41%	143
		20	243	243	100%	130	53%	100	41%	143
Total	8/14/2020	19	51,373	49,313	96%	45,889	89%	45,003	88%	6,370
		20	51,373	49,373	96%	44,090	86%	43,128	84%	8,245
	8/15/2020	19	51,333	48,894	95%	45,044	88%	45,221	88%	6,112
		20	51,333	48,955	95%	43,365	84%	43,879	85%	7,454

Performance of demand response resources has yet to be evaluated, but is likely to be less than market dispatch

## CPUC-jurisdictional DR availability and credits



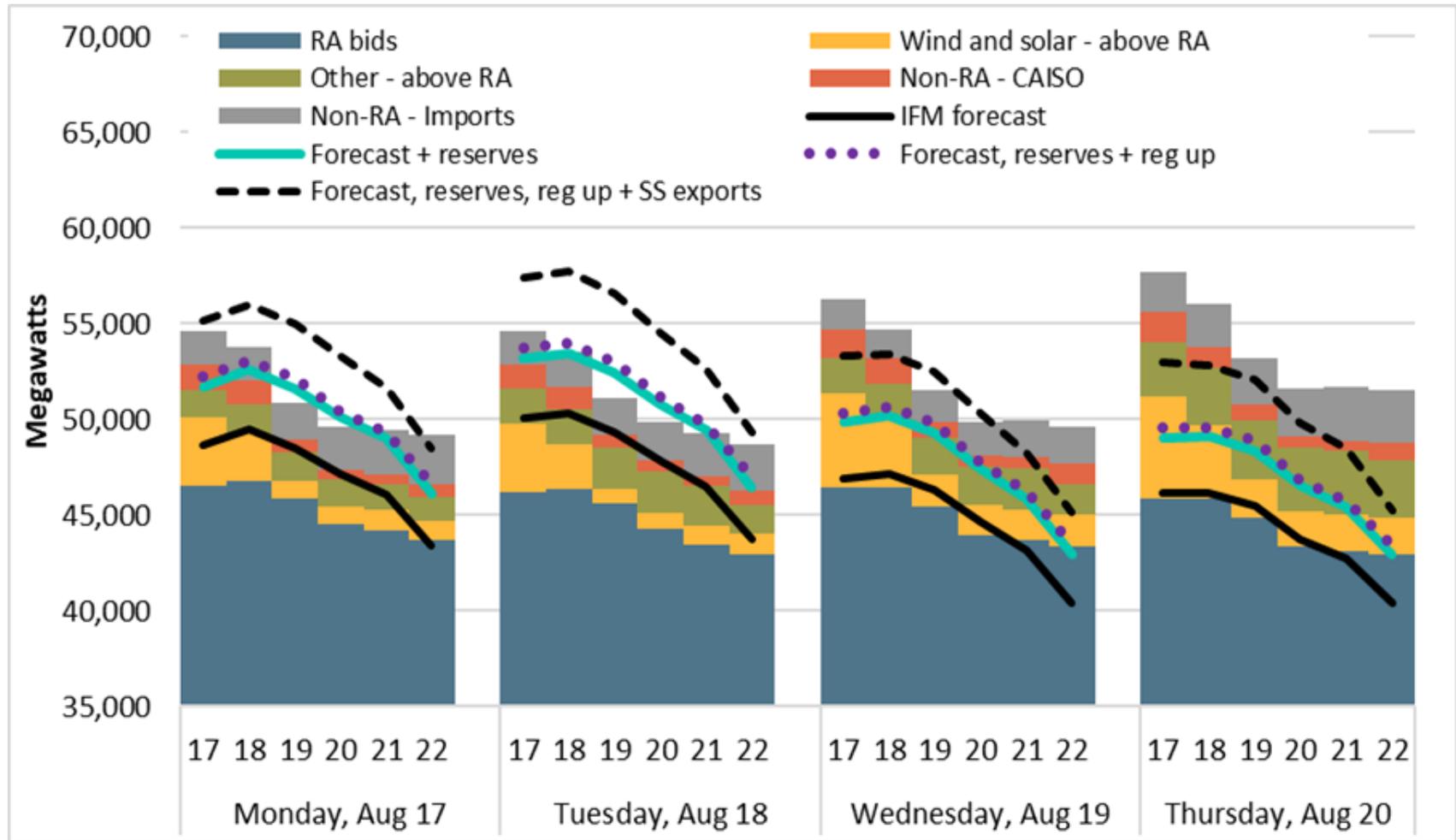
## Supply plan demand response (third party providers)



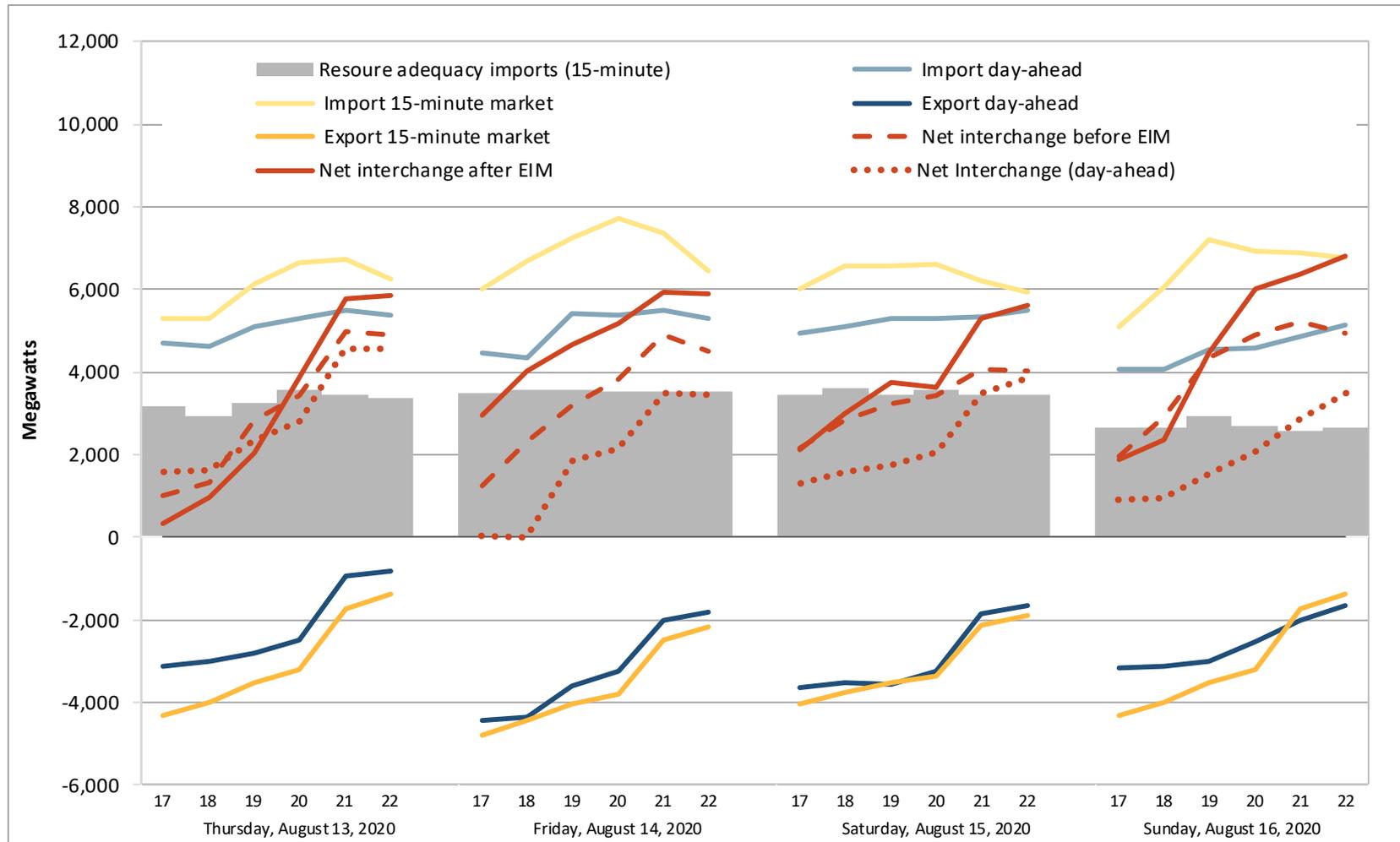
# About 9% of import and hydro unit RA capacity was unavailable in real-time.

Resource type	Date	Hour ending	Total resource adequacy capacity (MW)	Day-ahead market				Real-time market		
				Adjusted for outages		Bids and self-schedules		Bids and self-schedules		Bids and self-schedules below cap
				MW	% of total RA Cap.	MW	% of total RA Cap.	MW	% of total RA Cap.	MW
Hydro	8/14/2020	19	6,663	6,250	94%	6,074	91%	5,955	89%	708
		20	6,663	6,250	94%	6,075	91%	6,090	91%	573
	8/15/2020	19	6,661	6,253	94%	6,144	92%	6,155	92%	506
		20	6,661	6,253	94%	6,144	92%	6,160	92%	501
Imports	8/14/2020	19	4,171	4,100	98%	4,100	98%	3,834	92%	337
		20	4,171	4,100	98%	4,100	98%	3,833	92%	338
	8/15/2020	19	4,131	4,126	100%	4,098	99%	3,739	91%	392
		20	4,131	4,126	100%	4,098	99%	3,743	91%	388
Metered subsystem imports	8/14/2020	19	327	327	100%	26	8%	26	8%	301
		20	327	327	100%	27	8%	27	8%	300
	8/15/2020	19	327	327	100%	27	8%	27	8%	300
		20	327	327	100%	27	8%	27	8%	300
Total	8/14/2020	19	51,373	49,313	96%	45,889	89%	45,003	88%	6,370
		20	51,373	49,373	96%	44,090	86%	43,128	84%	8,245
	8/15/2020	19	51,333	48,894	95%	45,044	88%	45,221	88%	6,112
		20	51,333	48,955	95%	43,365	84%	43,879	85%	7,454

# Available capacity from resource adequacy units insufficient to meet demand in peak net load hours.

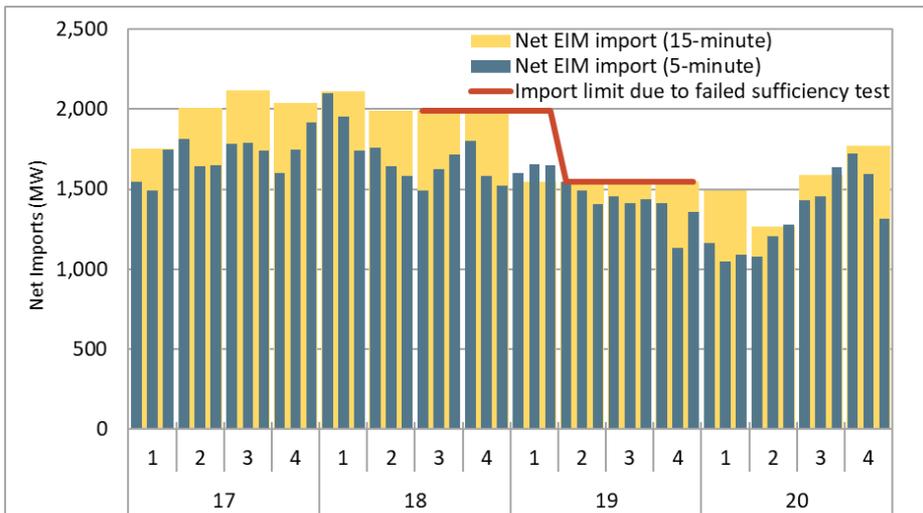


# Non-RA imports and EIM transfers increase CAISO net interchange in key hours, offsetting exports

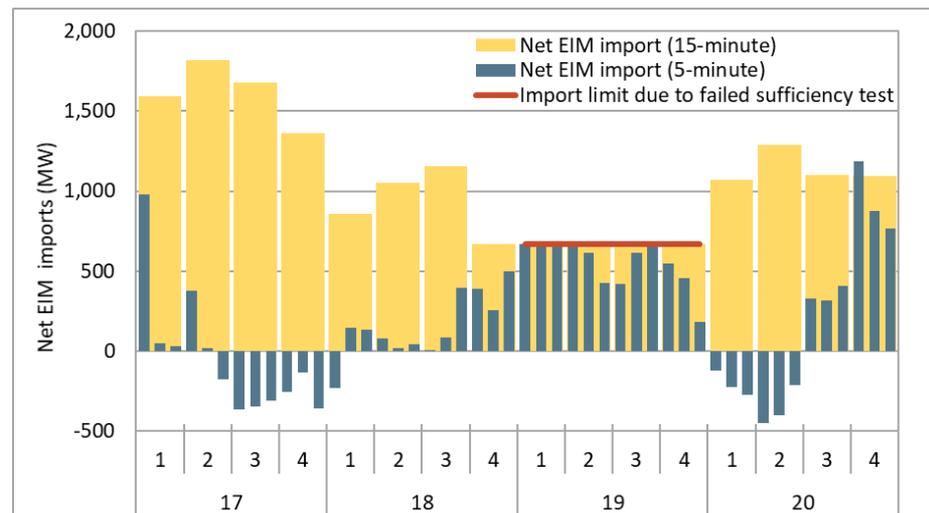


# Limit on EIM imports triggered by resource sufficiency test failures in CAISO

## August 14



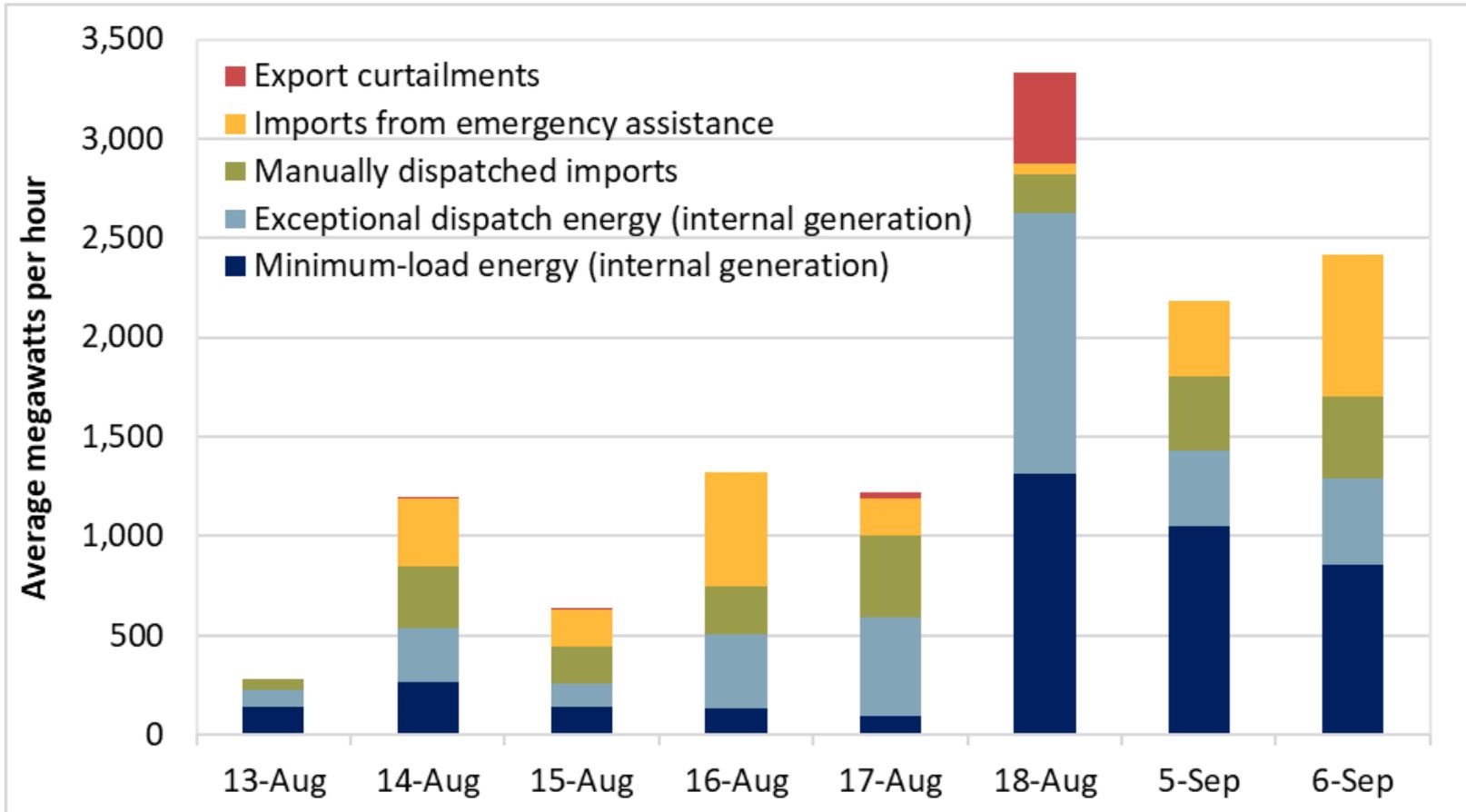
## August 15



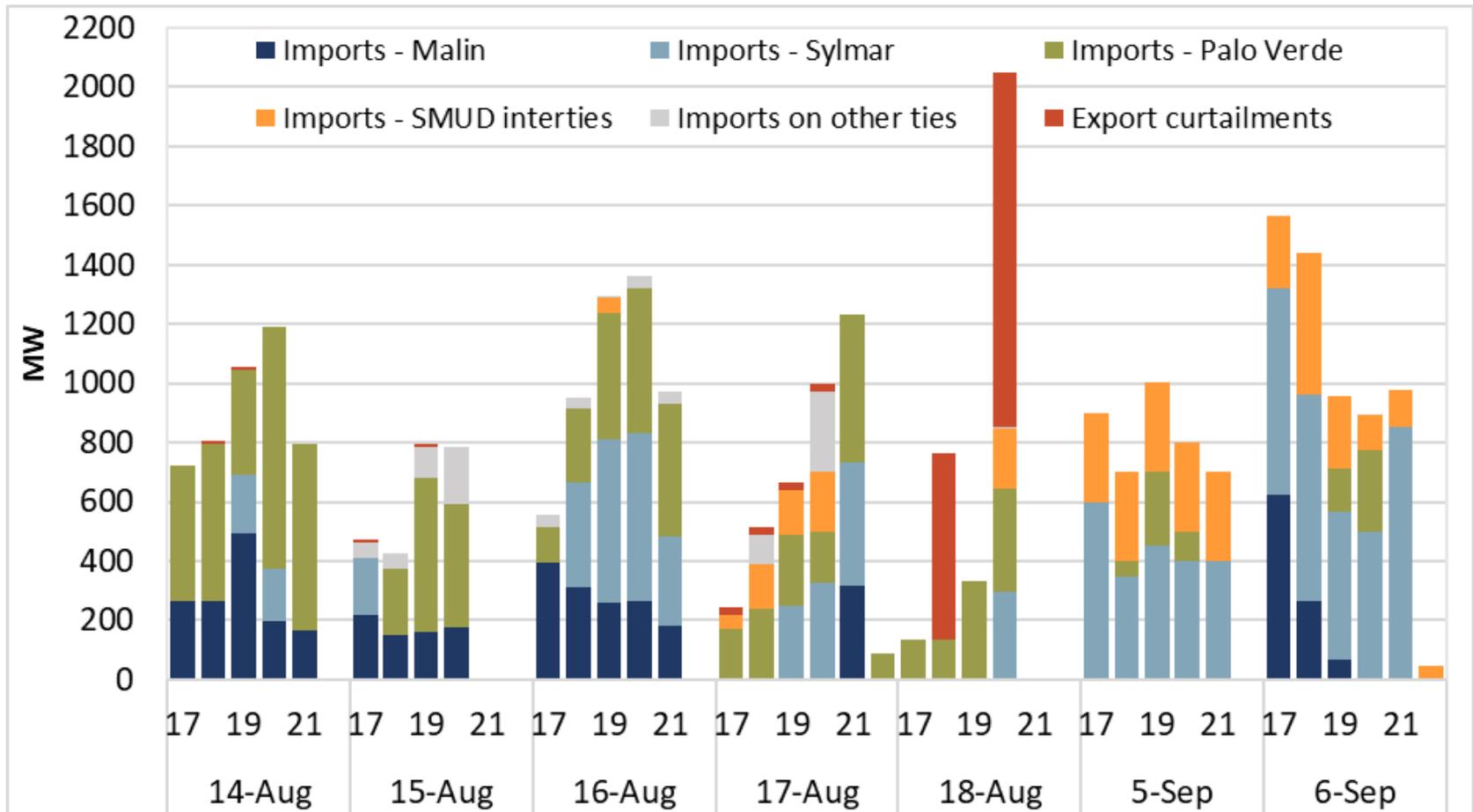
- This limitation had little or no impact on net transfers from the energy imbalance market into the ISO during these intervals.
- EIM transfers were, however, limited by the total available greenhouse gas import supply in some intervals on both of these days.

# Out of market actions increase supply, potentially lowering prices in the real-time

Average hourly out-of-market energy and market export curtailments (hours 17-22)

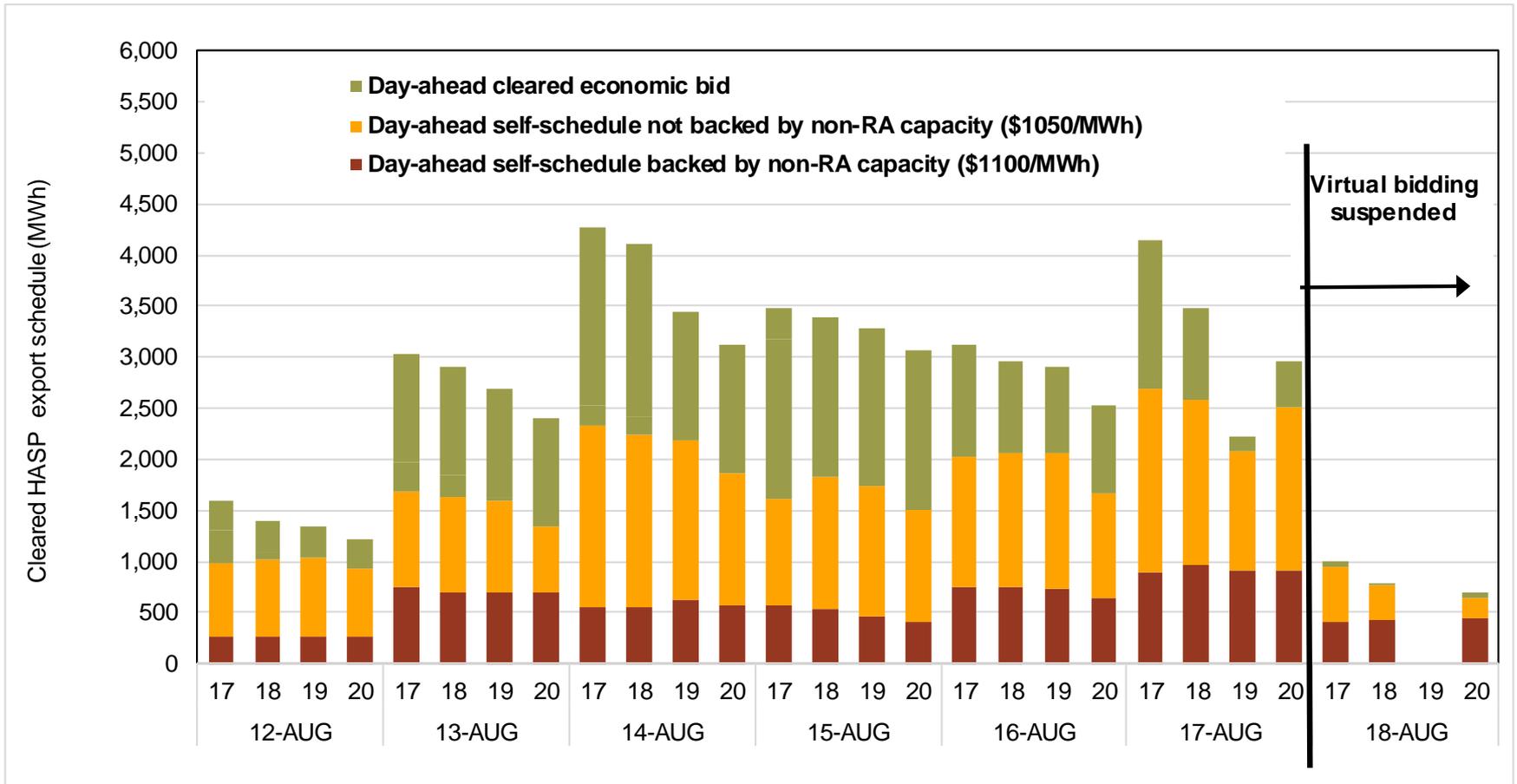


# Hourly out-of-market imports, emergency assistance and market export curtailments (hours 17-22)



# Exports increased demand above levels that could be supported by physical generation.

*Day-ahead export schedules clearing in HASP have real-time scheduling priority above real-time load curtailment (by HASP scheduling priority penalty price)*



## CAISO took steps to ensure exports were limited to physically feasible levels.

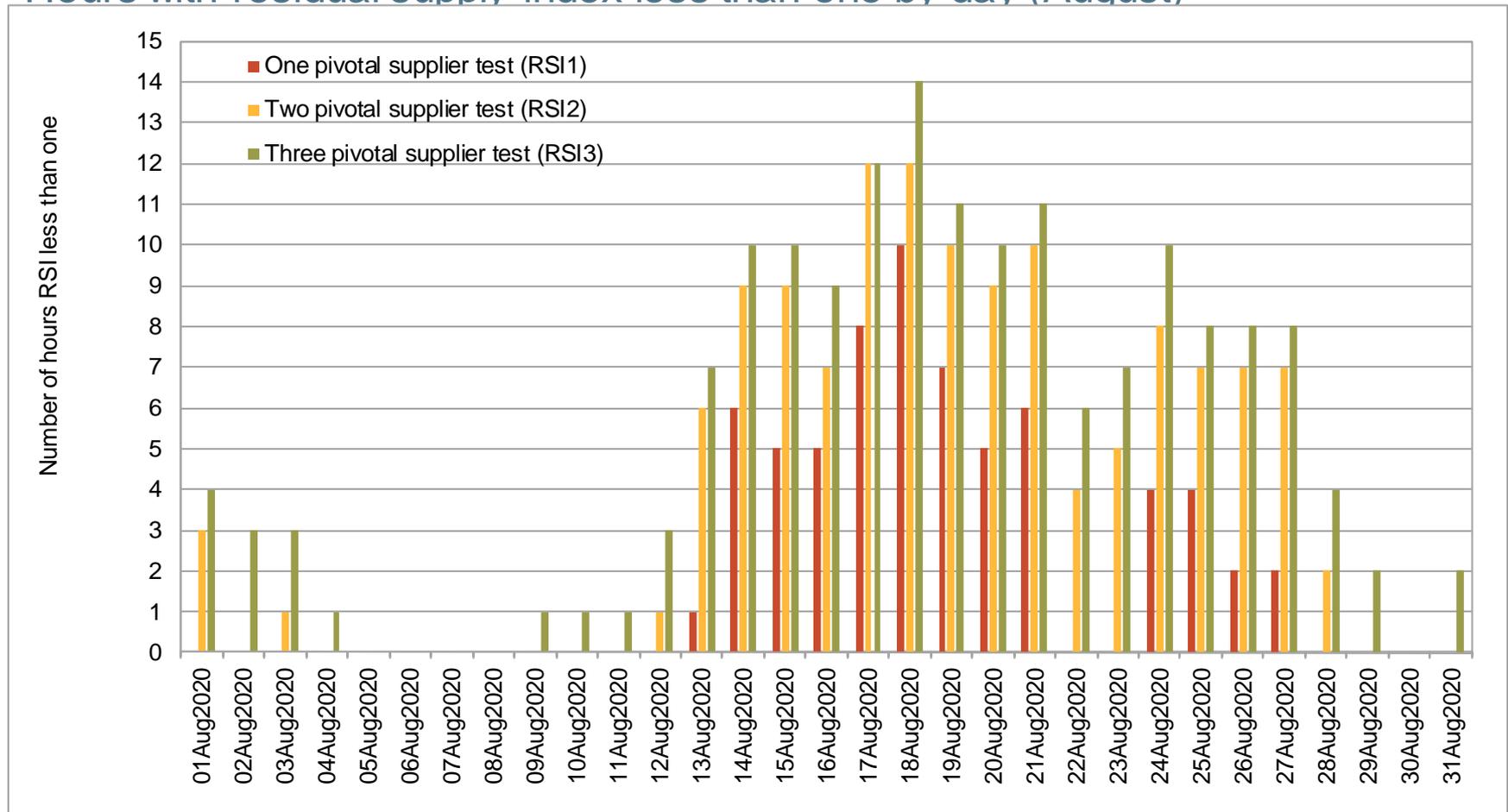
- Virtual bidding suspended effective August 18.
- Effective September 5, CAISO made important enhancements to RUC and the real-time scheduling priority of day-ahead energy market export schedules that do not receive RUC awards.
- CAISO's current policy is still to prioritize exports that receive day-ahead RUC awards over native CAISO balancing area load in real-time.
- The rules and processes for limiting/curtailing exports used by the CAISO and other balancing areas should be reviewed, clarified, and potentially modified -- with a goal of establishing equal treatment and expectations of exports by all balancing areas.

## Additional findings

- The Western energy imbalance market functioned well and helped facilitate transfers of available capacity in real-time across the west.
- DMM has carefully reviewed major outages which occurred on August 14-15 – and found no indication of false outages/manipulation.
- Contrary to some suggestions in the media, DMM has found no evidence that market results on these days were the result of market manipulation.

# CAISO day-ahead market was structurally uncompetitive during the high load days in August

Hours with residual supply index less than one by day (August)



# System wide mitigation of imports and gas-fired resources during this period would not have lowered prices significantly

## Price-cost markup by scenario (Aug 14 – Aug 19)

Scenario	Load-wtd avg day-ahead prices	Load-wtd avg base case prices	Load-wtd avg scenario prices	Price-cost markup (\$/MWh)	Price-cost markup (%)
Gas resources at min(bid,DEB)	\$217	\$216	\$214	\$2.32	1%
Commitment costs for gas resources at min(bid,110% proxy)	\$217	\$216	\$218	-\$1.17	-1%
Import bids at min(bid,hydro DEB)	\$217	\$216	\$217	-\$0.58	0%
Energy and commitment cost bids capped for gas resources, imports capped	\$217	\$216	\$211	\$5.67	3%

# DMM Recommendations

- **Resource adequacy:** Place high priority on key recommendations in CAISO/CPUC/CEC report:
  - Increase resource adequacy requirements to more accurately reflect risk of extreme weather events.
  - Continue to work with stakeholders to clarify and revise the counting rules for resource adequacy capacity.
- **Exports/imports:** Further changes and clarifications in the rules and processes for limiting/curtailing exports should be discussed and pursued by CAISO in conjunction with other balancing areas.
- **Demand Response:** Ensure a higher portion of demand response used to meet resource adequacy requirements is available during critical net load hours.