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

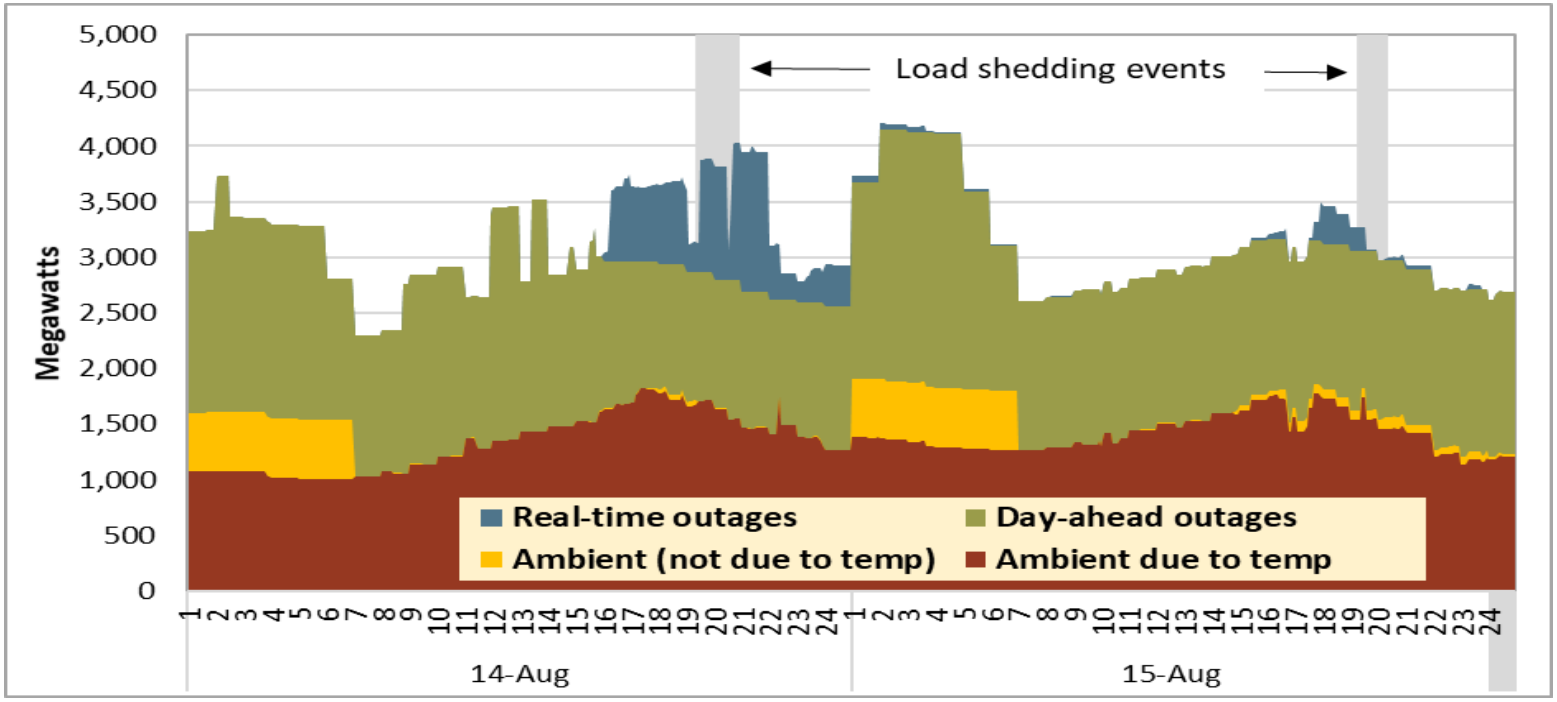
Resource type	Date	Hour ending	Total resource adequacy capacity (MW)	Day-ahead market				Real-time market		
				Adjusted for outages		Bids and self-schedules		Bids and self-schedules		Bids and self-schedules below cap
				MW	% of total RA Cap.	MW	% of total RA Cap.	MW	% of total RA Cap.	MW
Solar	8/14/2020	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**
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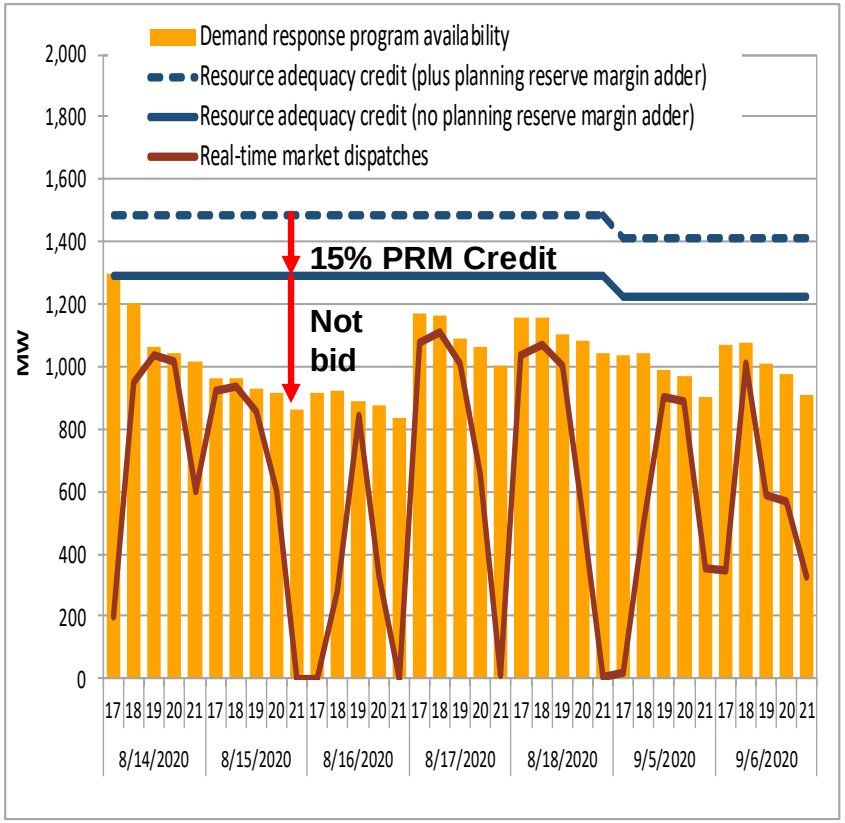
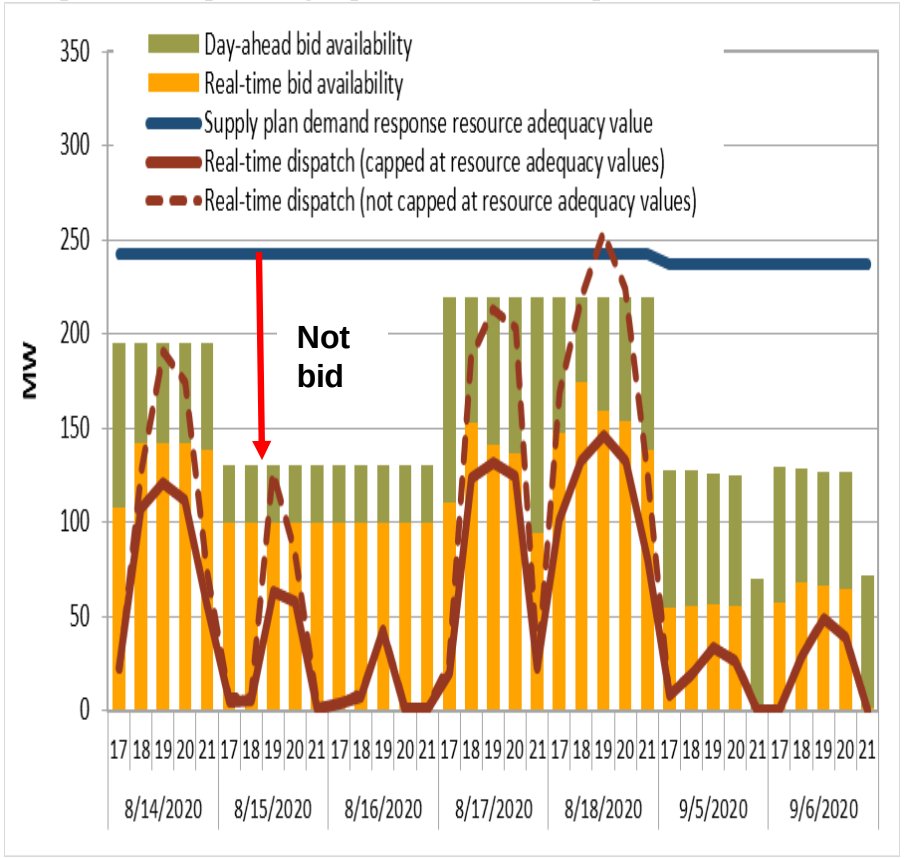
		20	**51,333**	**48,955**	**95%**	**43,365**	**84%**	**43,879**	**85%**	**7,454**

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**
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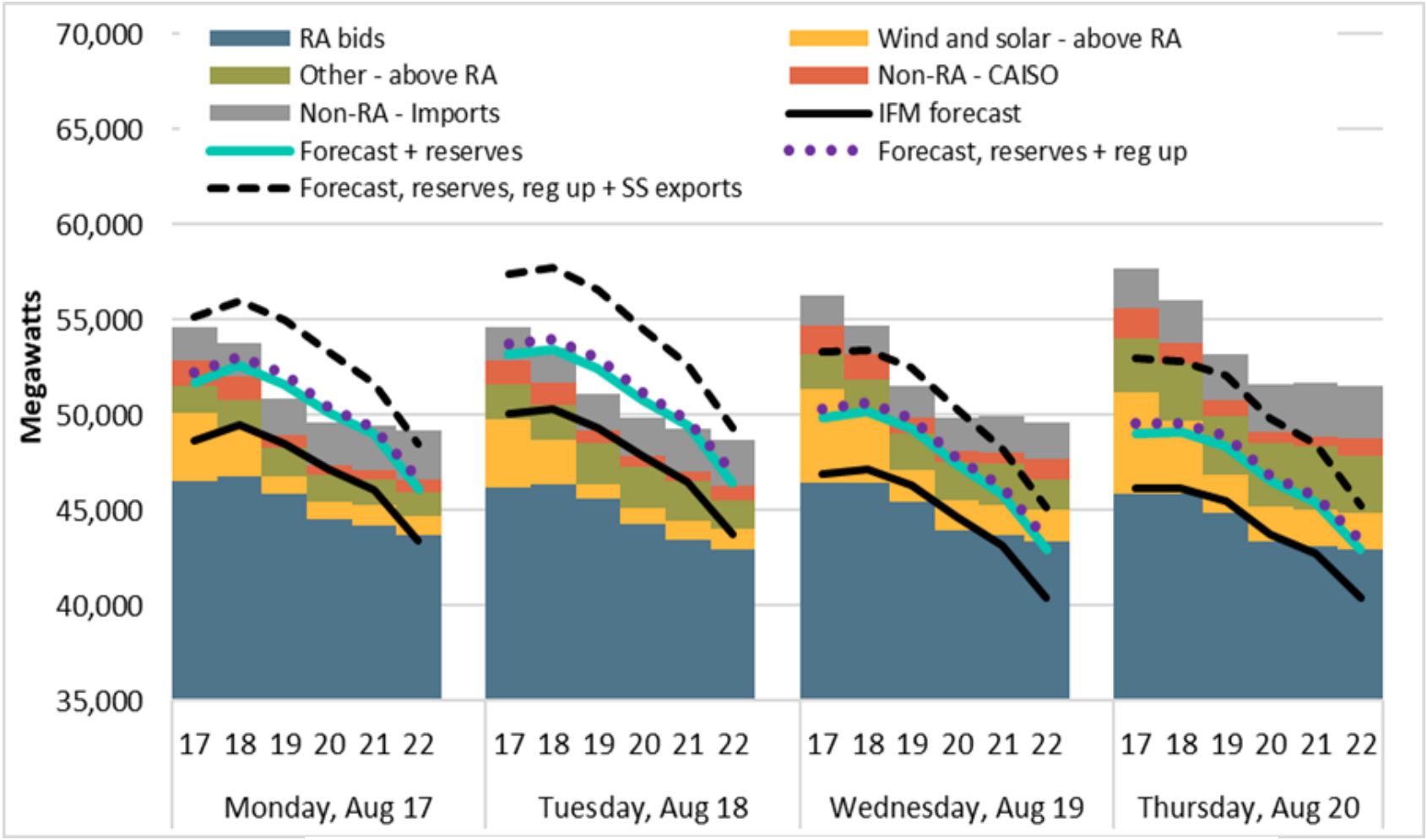
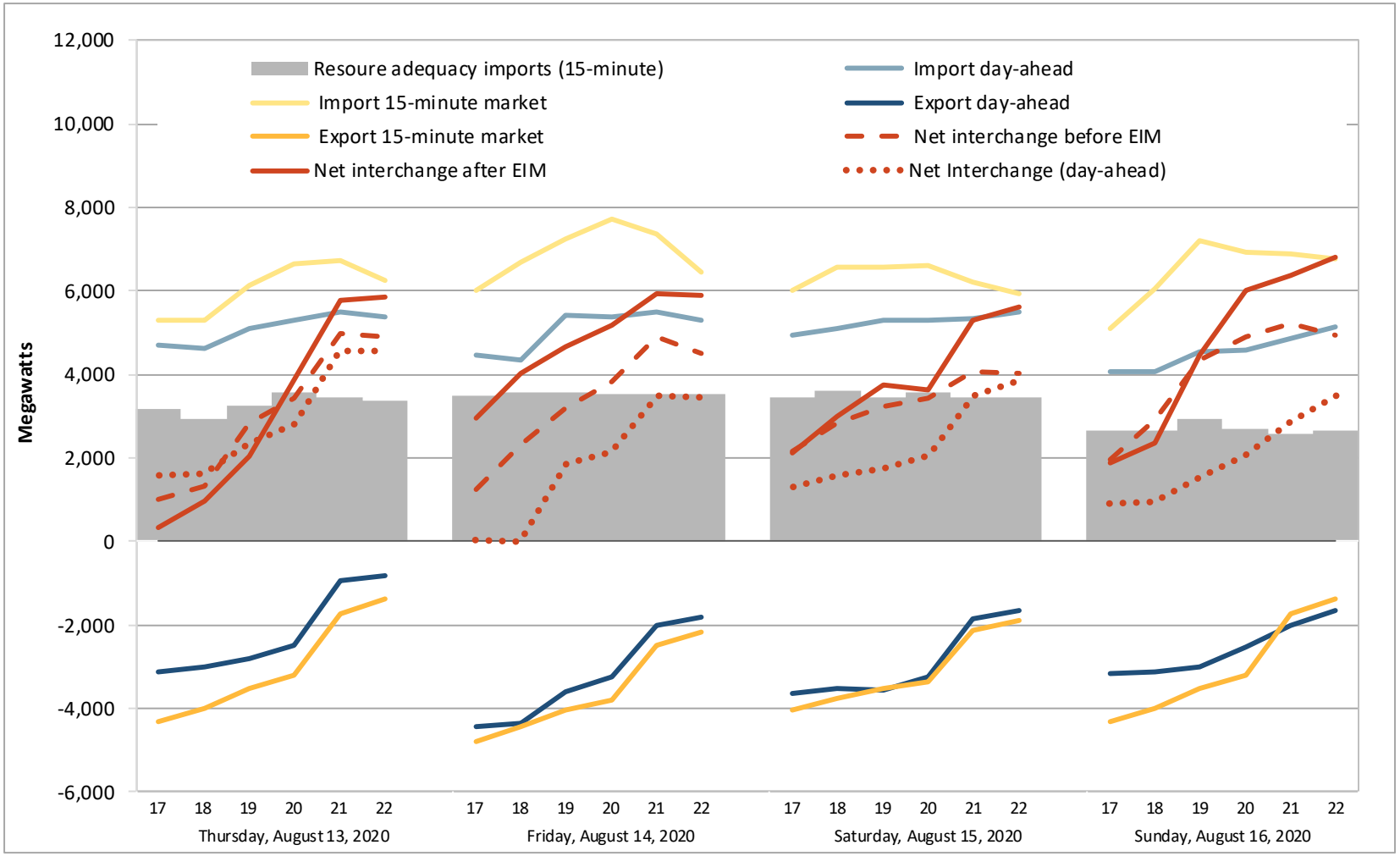
		20	**51,333**	**48,955**	**95%**	**43,365**	**84%**	**43,879**	**85%**	**7,454**

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



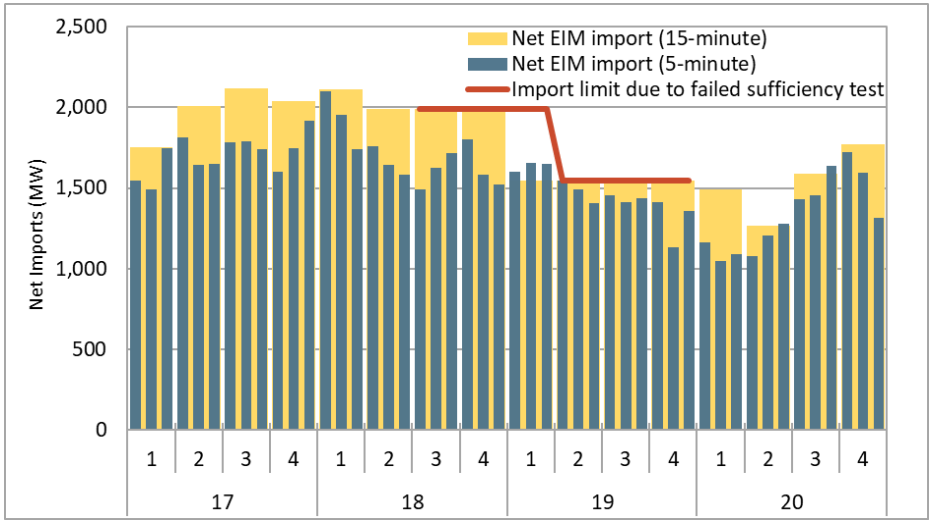
Source: DMM Report, Figure 3.20, p. 30

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

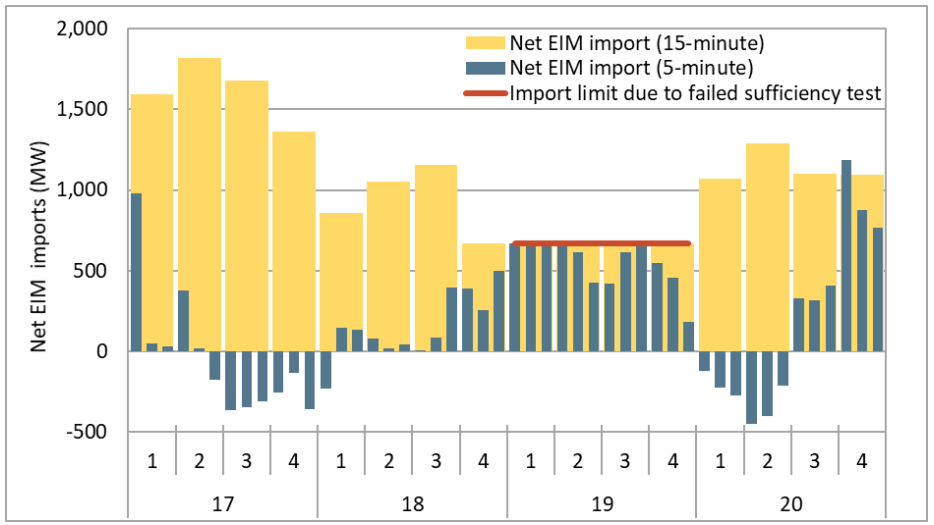


Limit on EIM imports triggered by resource sufficiency test failures in CAISO

August 14



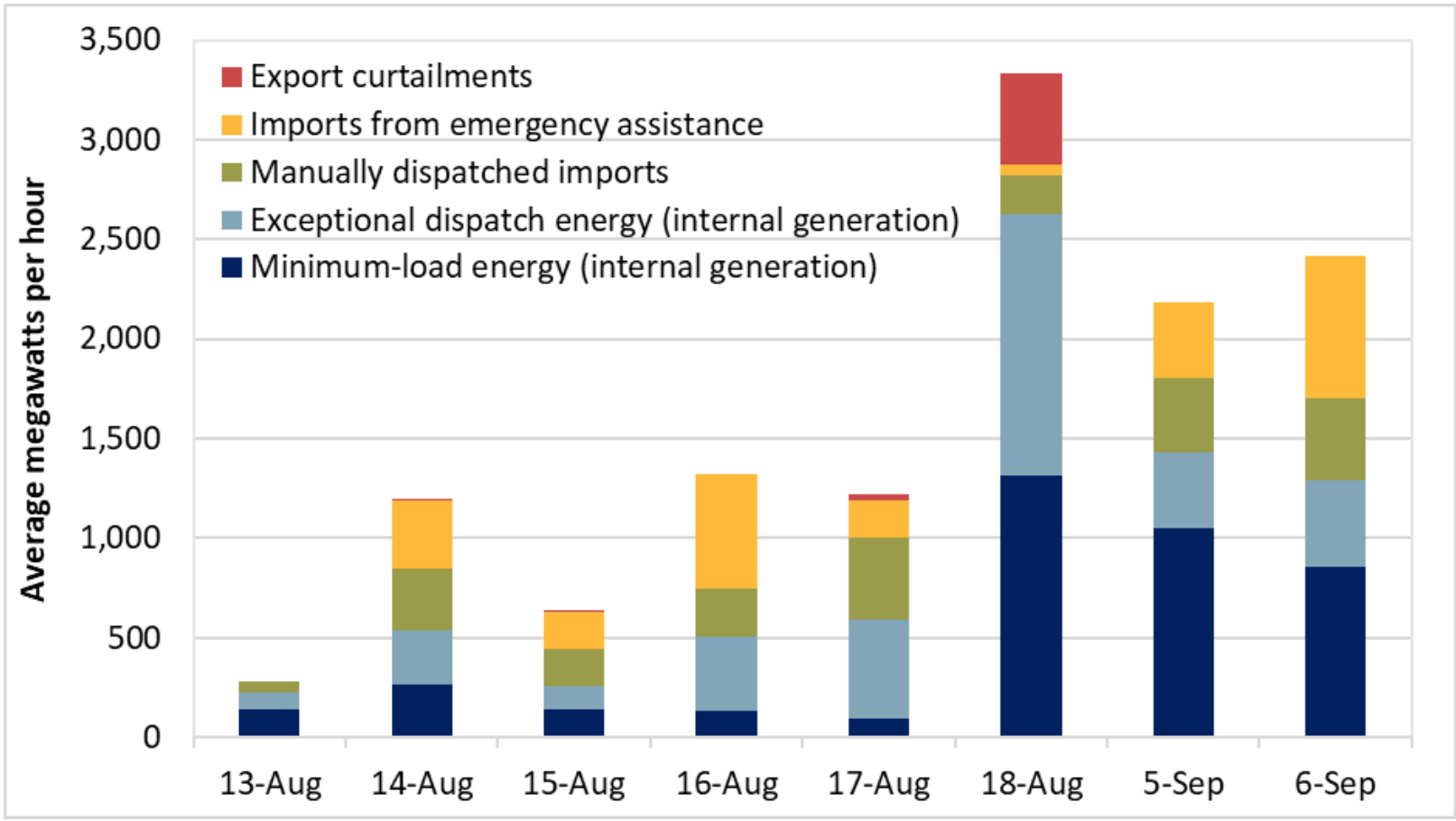
August 15



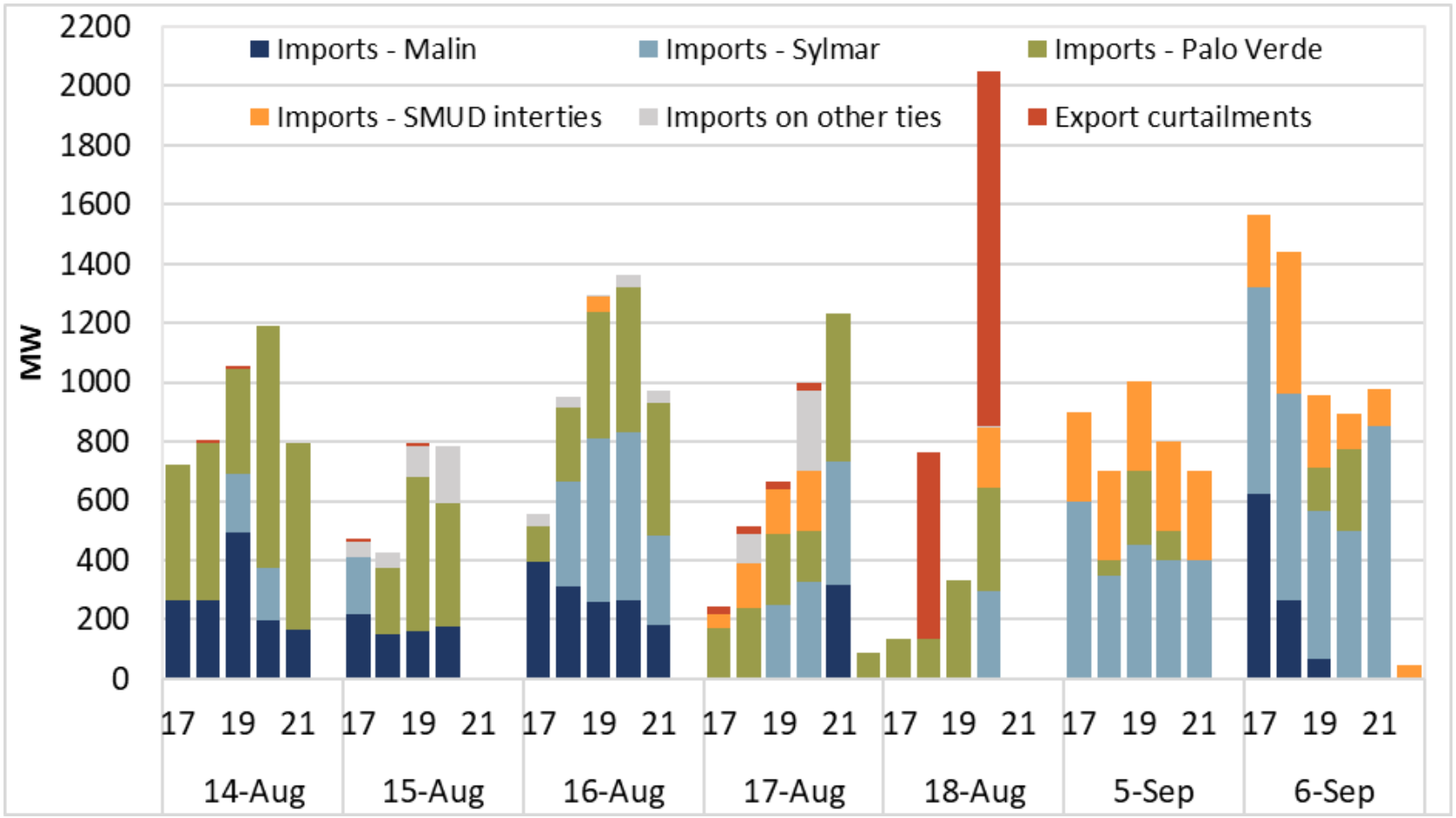
- This limitation had little or no impact on net transfers from the energy imbalance market into the ISO during these intervals.
- EIM transfers were, however, limited by the total available greenhouse gas import supply in some intervals on both of these days.

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)

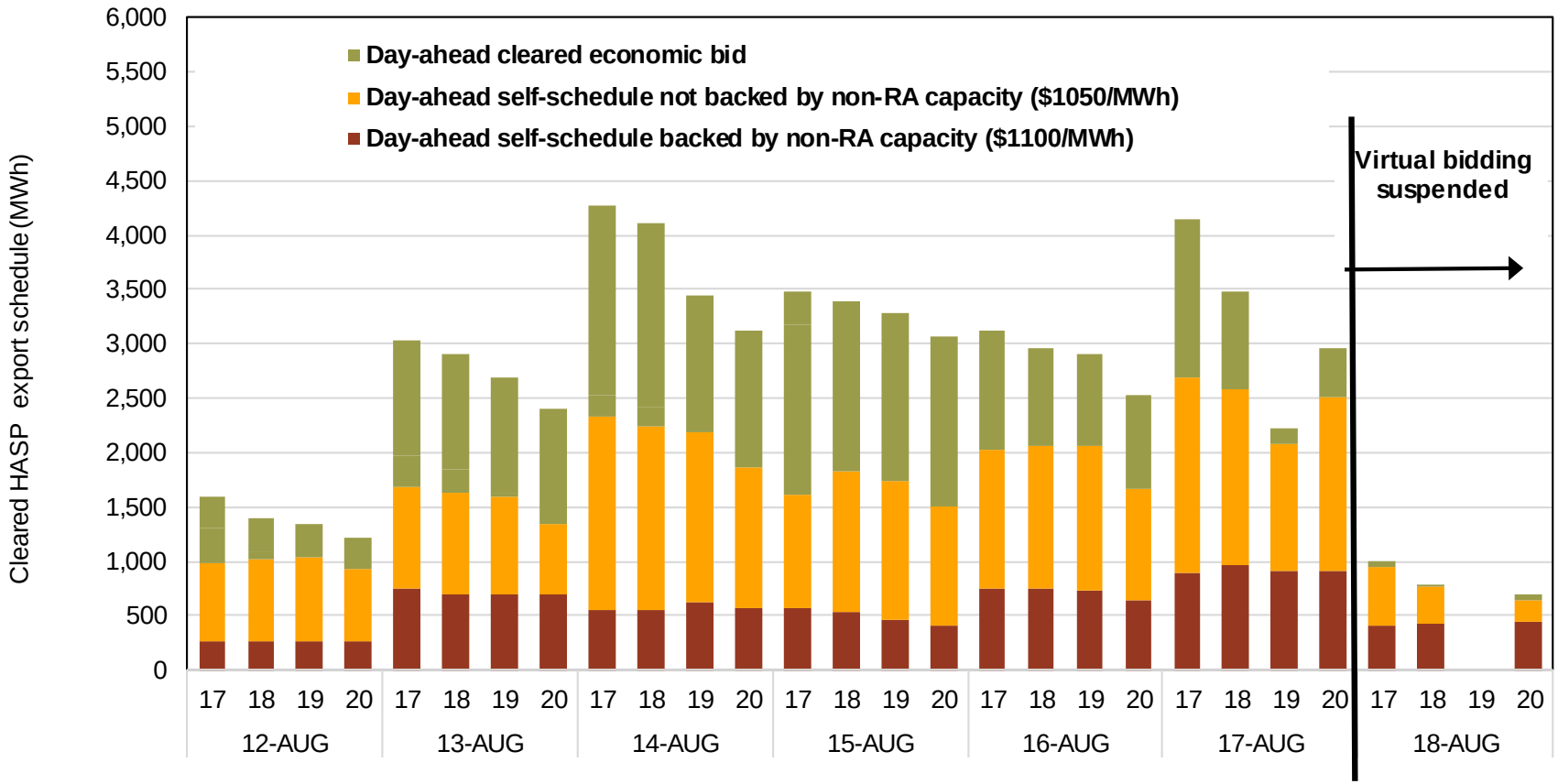


Hourly out-of-market imports, emergency assistance and market export curtailments (hours 17-22)



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.

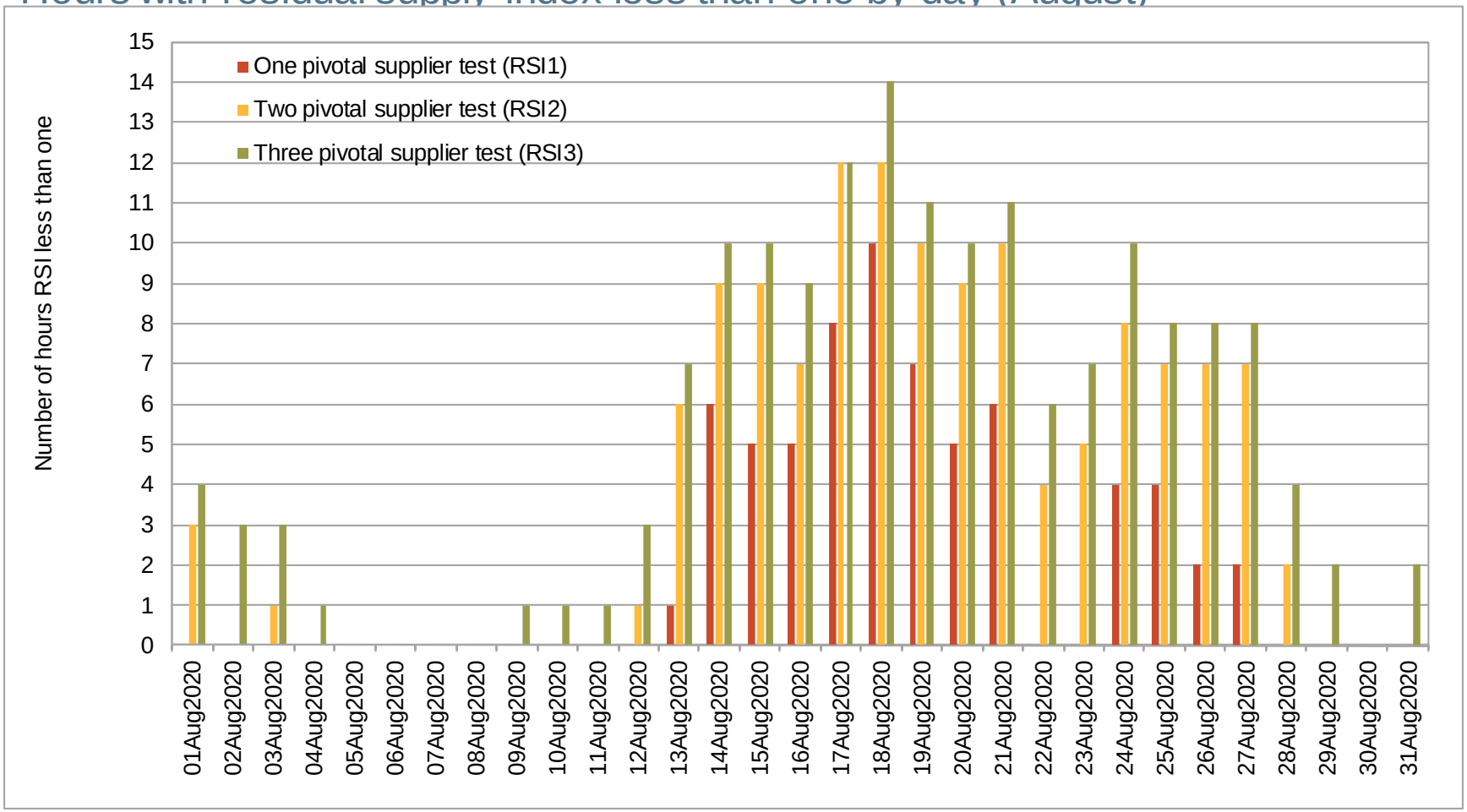
- Virtual bidding suspended effective August 18.
- Effective September 5, CAISO made important enhancements to RUC and the real-time scheduling priority of day-ahead energy market export schedules that do not receive RUC awards.
- CAISO's current policy is still to prioritize exports that receive day-ahead 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.