2021 Q2 Report on Market Issues and Performance

October 8, 2021

Department of Market Monitoring, California ISO
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http://www.caiso.com/Documents/2021-Second-Quarter-Report-on-Market-Issues-and-Performance-Oct-5-2021.pdf

Highlights of Q2 2021 market performance

- **Higher prices compared to Q2 2020**
  - lower hydro
  - high gas prices
  - higher outage rates
- **Settlement timeline changes delay reporting on some areas**
  - Congestion revenue rights
  - Real-time offset costs

Western Energy Imbalance Market highlights

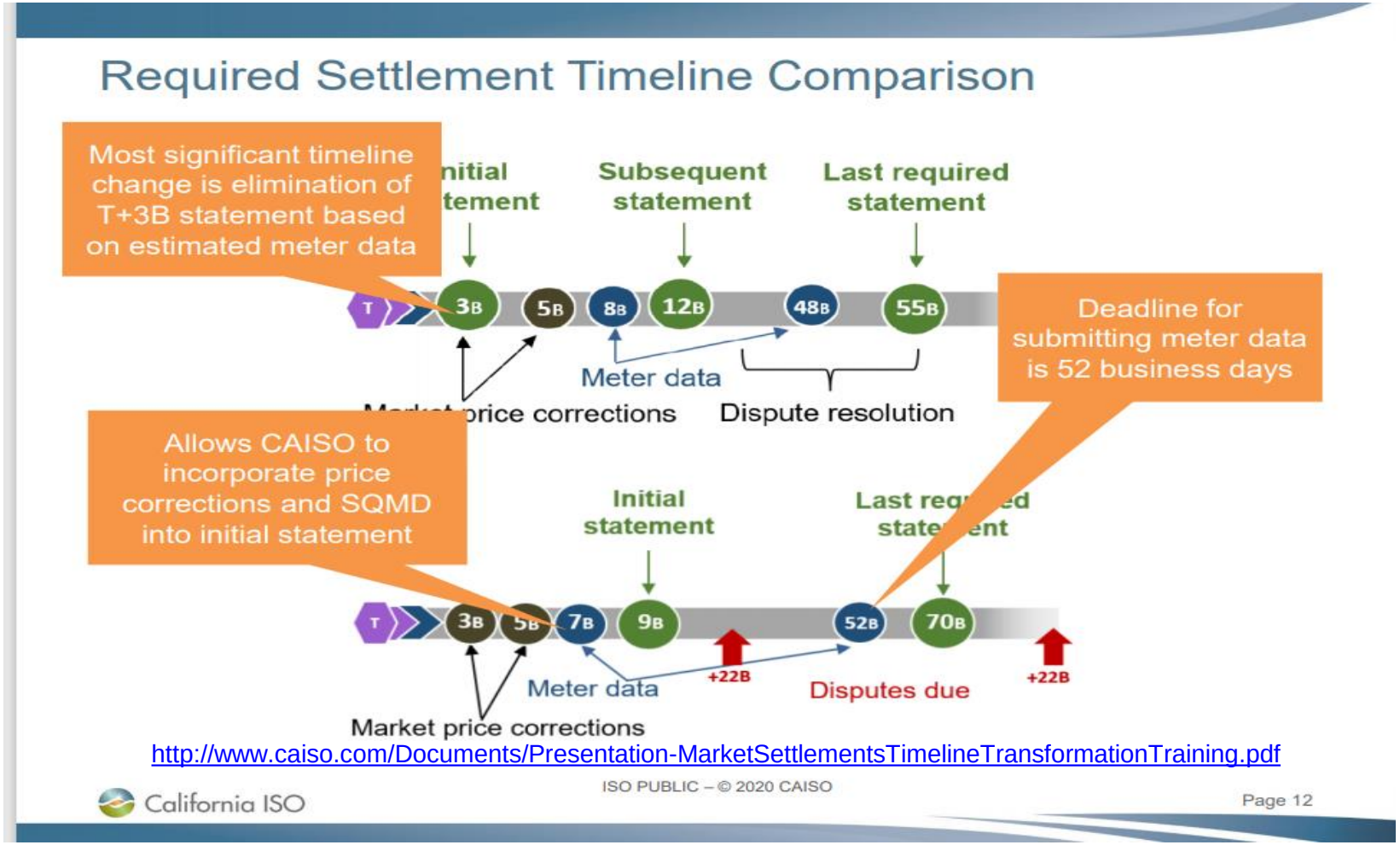
- **Los Angeles Department of Water and Power, the Public Service Company of New Mexico, and NorthWestern Energy** joined the EIM in Q2
  - added 14 GW of generation and 20 GW of transfers
- **Resource sufficiency tests**
  - failures and subsequent under-supply power balance constraint relaxations drove average real-time prices higher for some areas
  - expanded DMM role in monitoring and reporting on EIM resource sufficiency test performance and issues

Special issues covered in Q2 market report

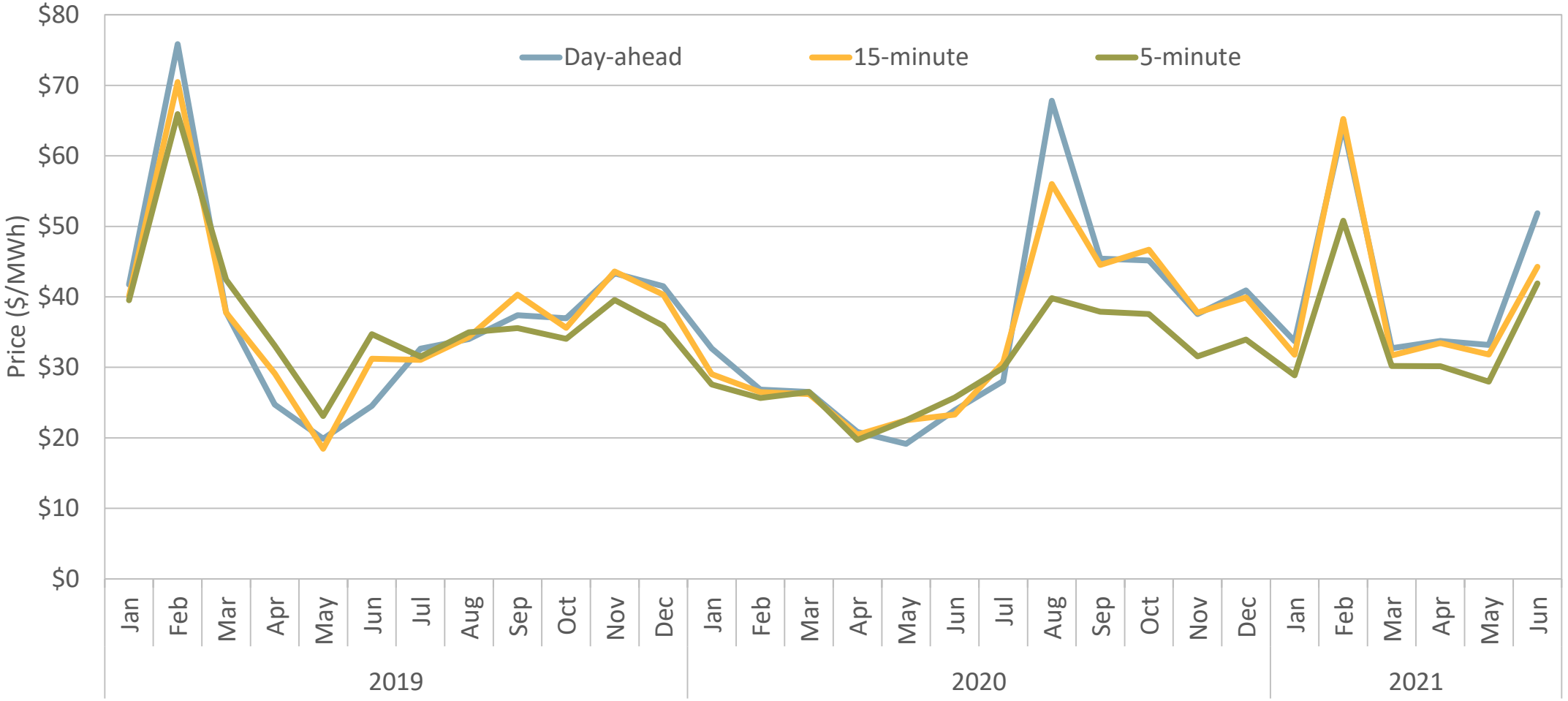
- **FERC Order 831 Compliance – phase 2**
  - Imports and virtual bidders are only able to bid over soft bid cap under certain market conditions
  - Resource adequacy import bids are capped at a maximum import bid cap
  - Power balance constraint penalty price only set over $1,000/MWh soft bid cap in certain conditions

- **Intertie deviation settlement**

Settlement timeline changes prevent timely reporting on market settlements – but DMM will monitor

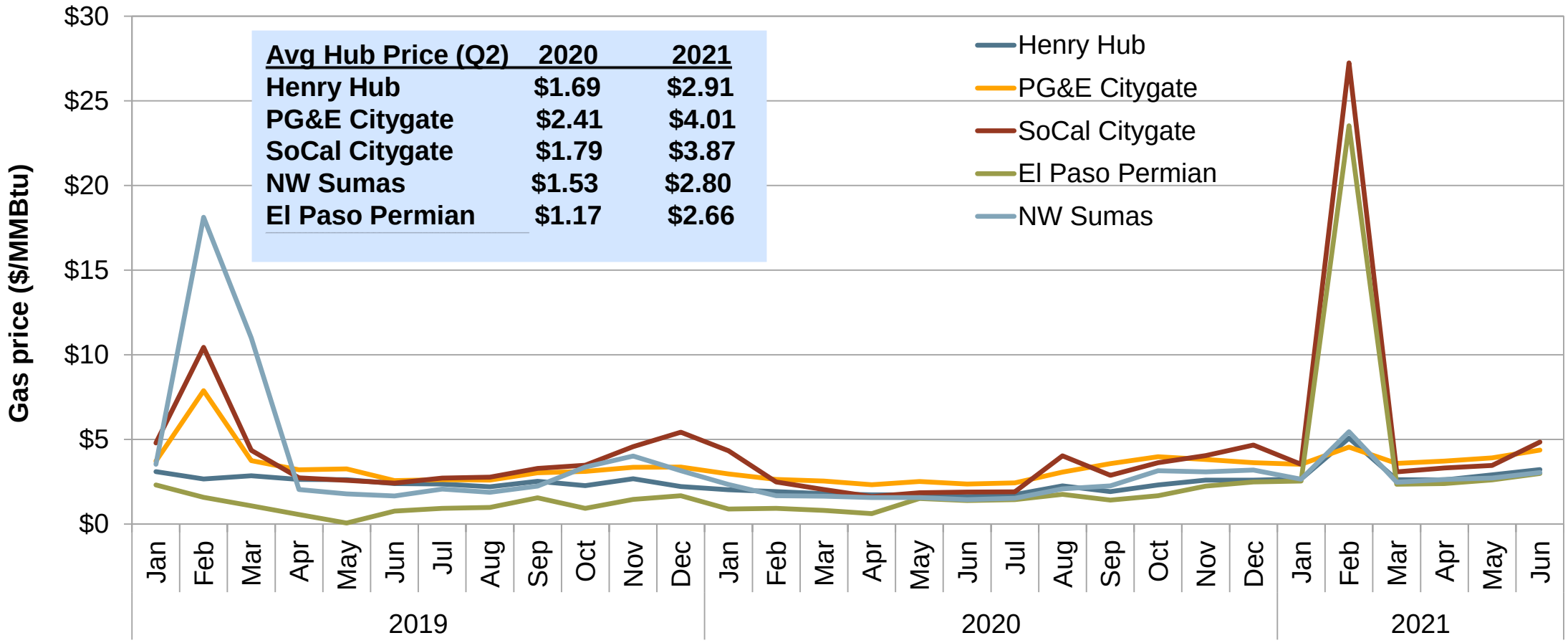


Prices were significantly higher than the same quarter of 2020

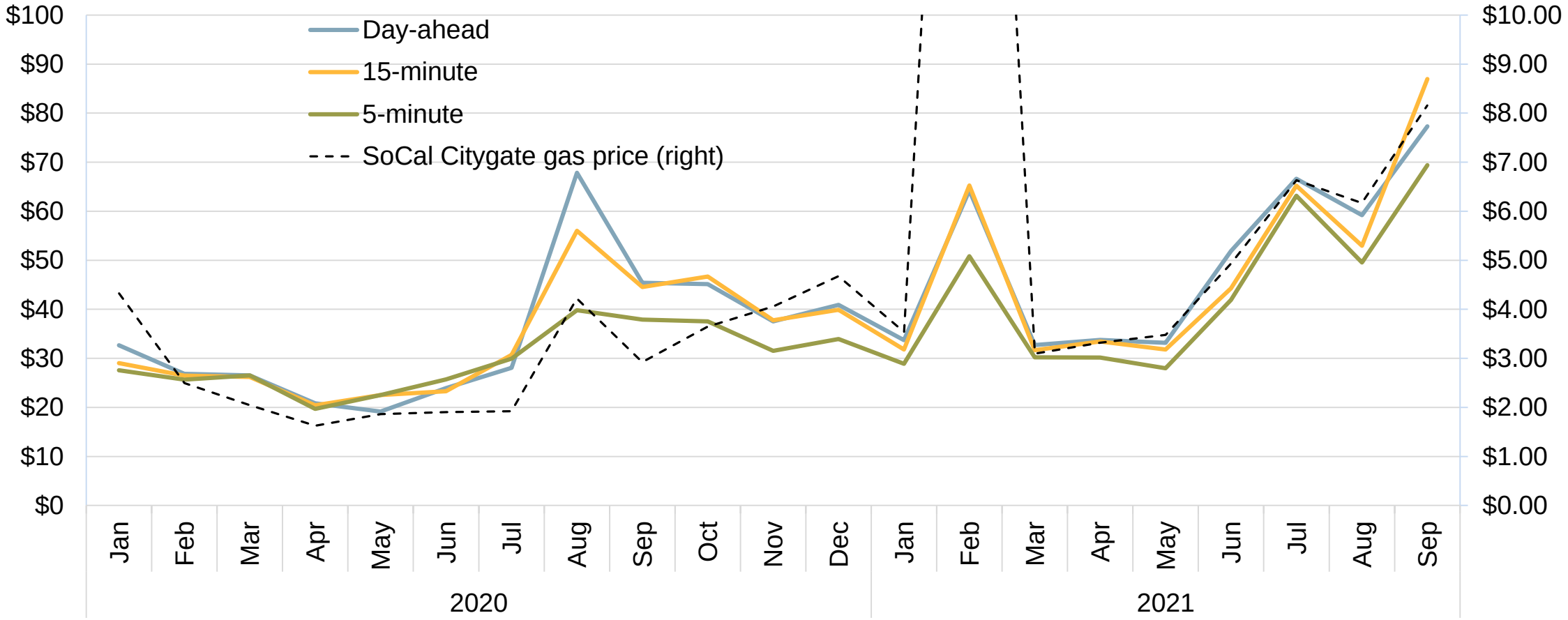


Gas prices increase in all major gas trading hubs in the west compared to Q2 2020

Avg Hub Price (Q2)	2020	2021
Henry Hub	$1.69	$2.91
PG&E Citygate	$2.41	$4.01
SoCal Citygate	$1.79	$3.87
NW Sumas	$1.53	$2.80
El Paso Permian	$1.17	$2.66



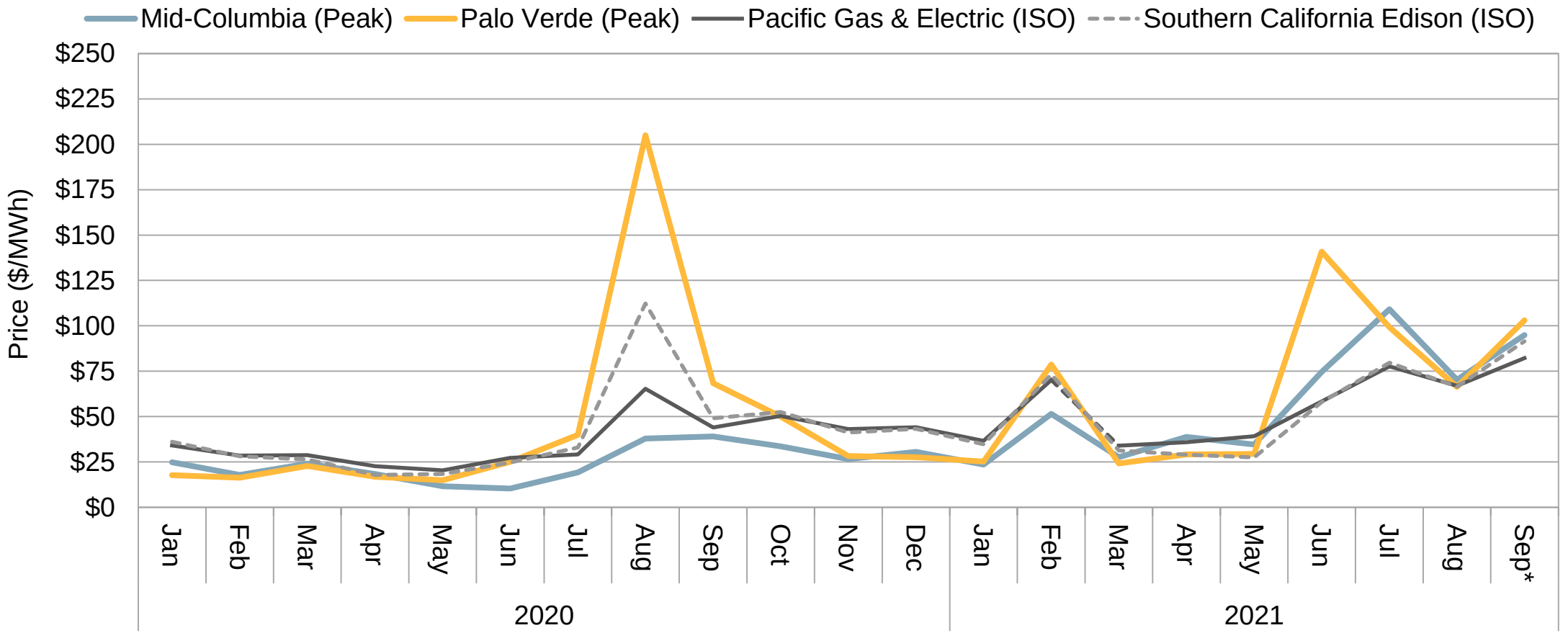
Higher gas prices in one region often result in higher electricity prices across the ISO footprint



http://www.caiso.com/Documents/Department-Market-Monitoring-Update-Sep-2021.pdf

September 2021 data reflects September 1 through September 13 only

Average peak hour bilateral and ISO prices



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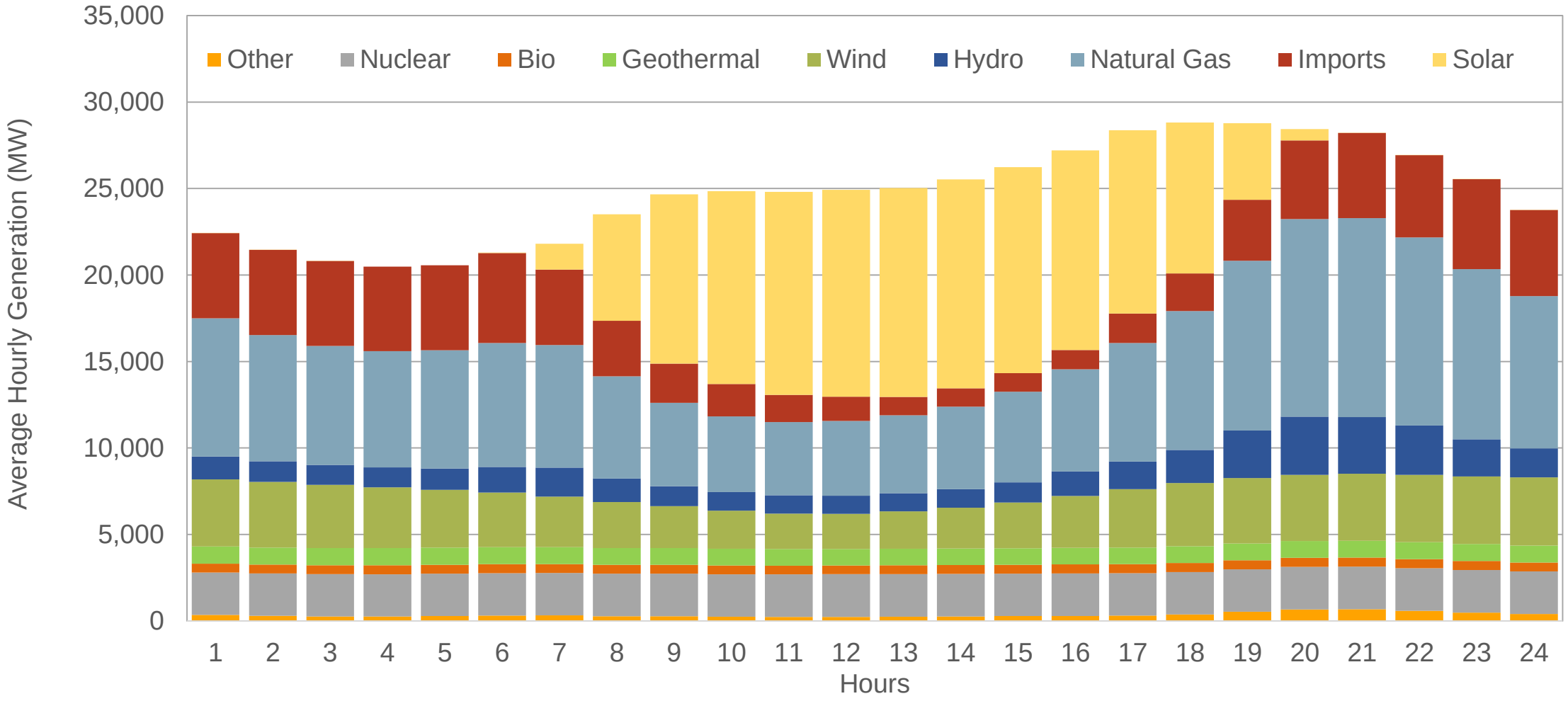
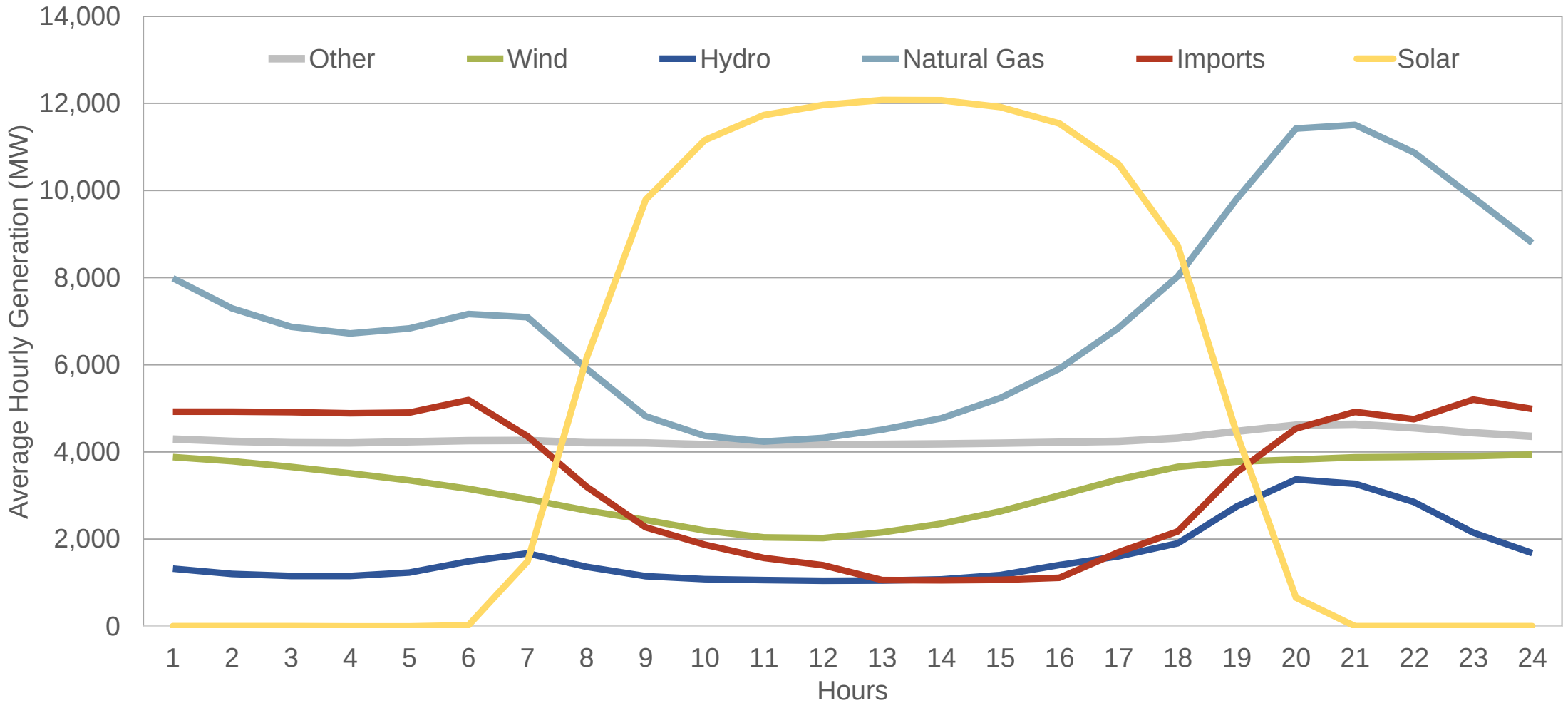
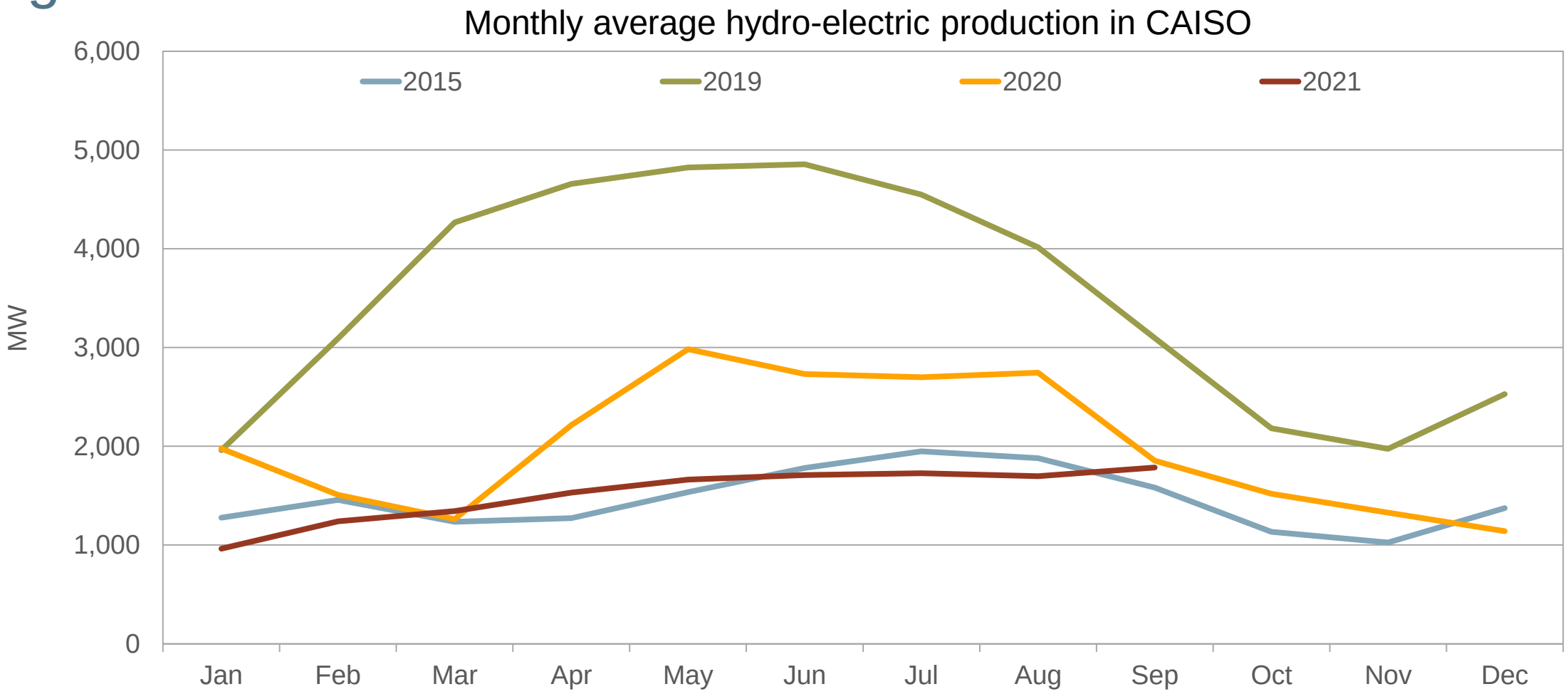
Average hourly generation by fuel type (Q2 2021)



Hourly variation in generation by fuel type (Q2 2021)

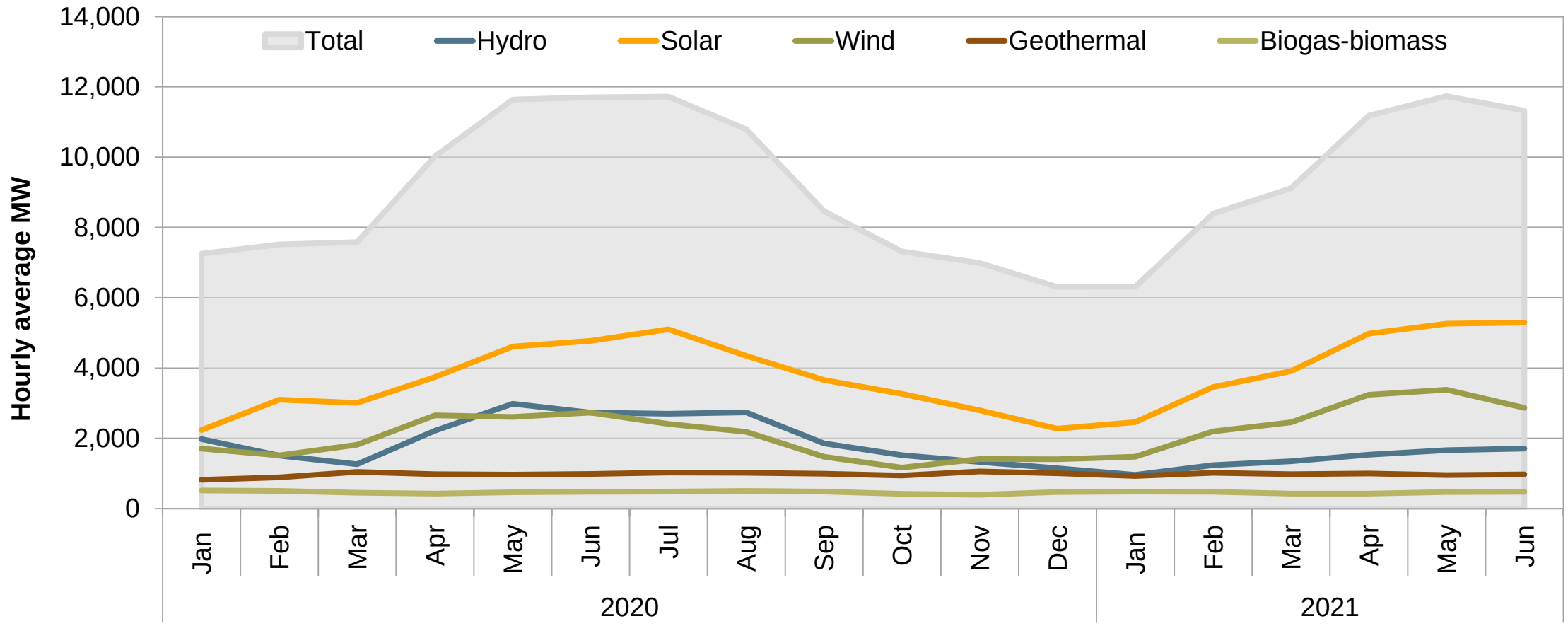


Lower hydro-electric production in California contributes to higher costs

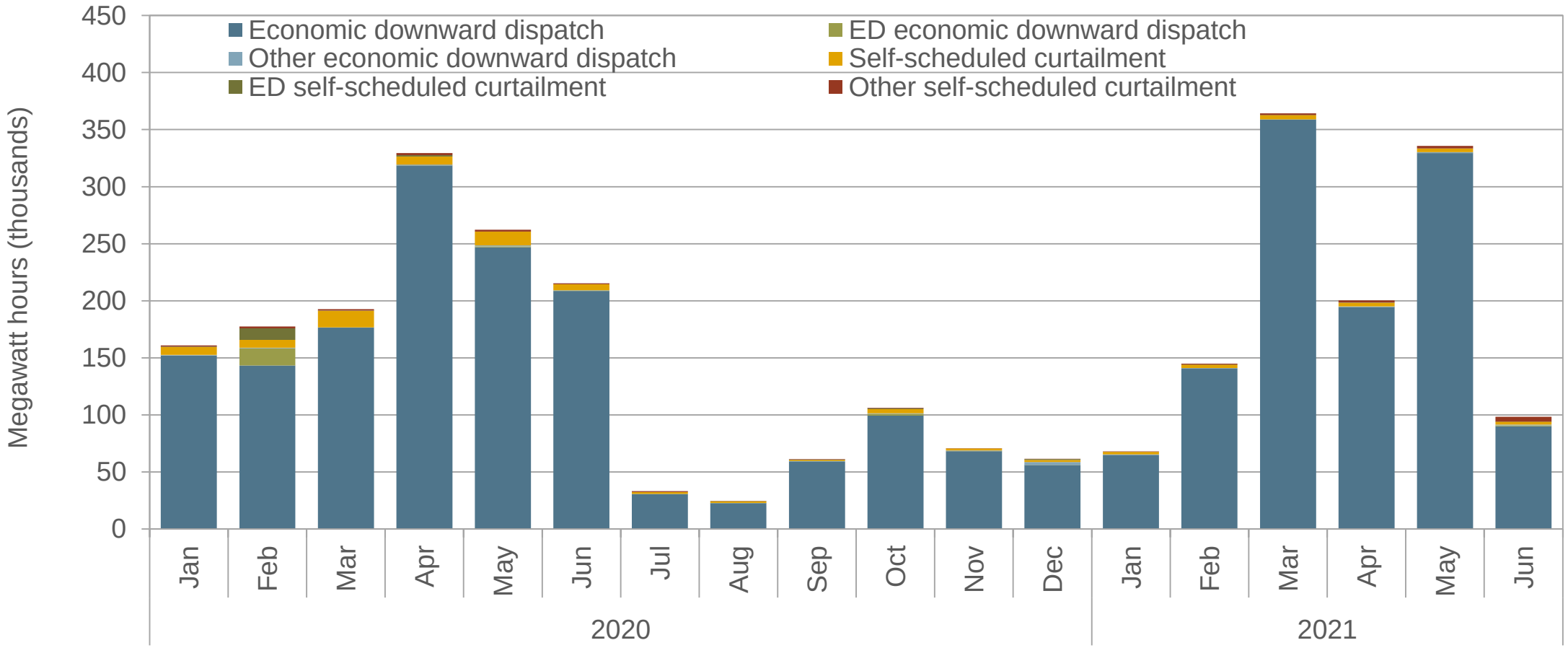


California ISO

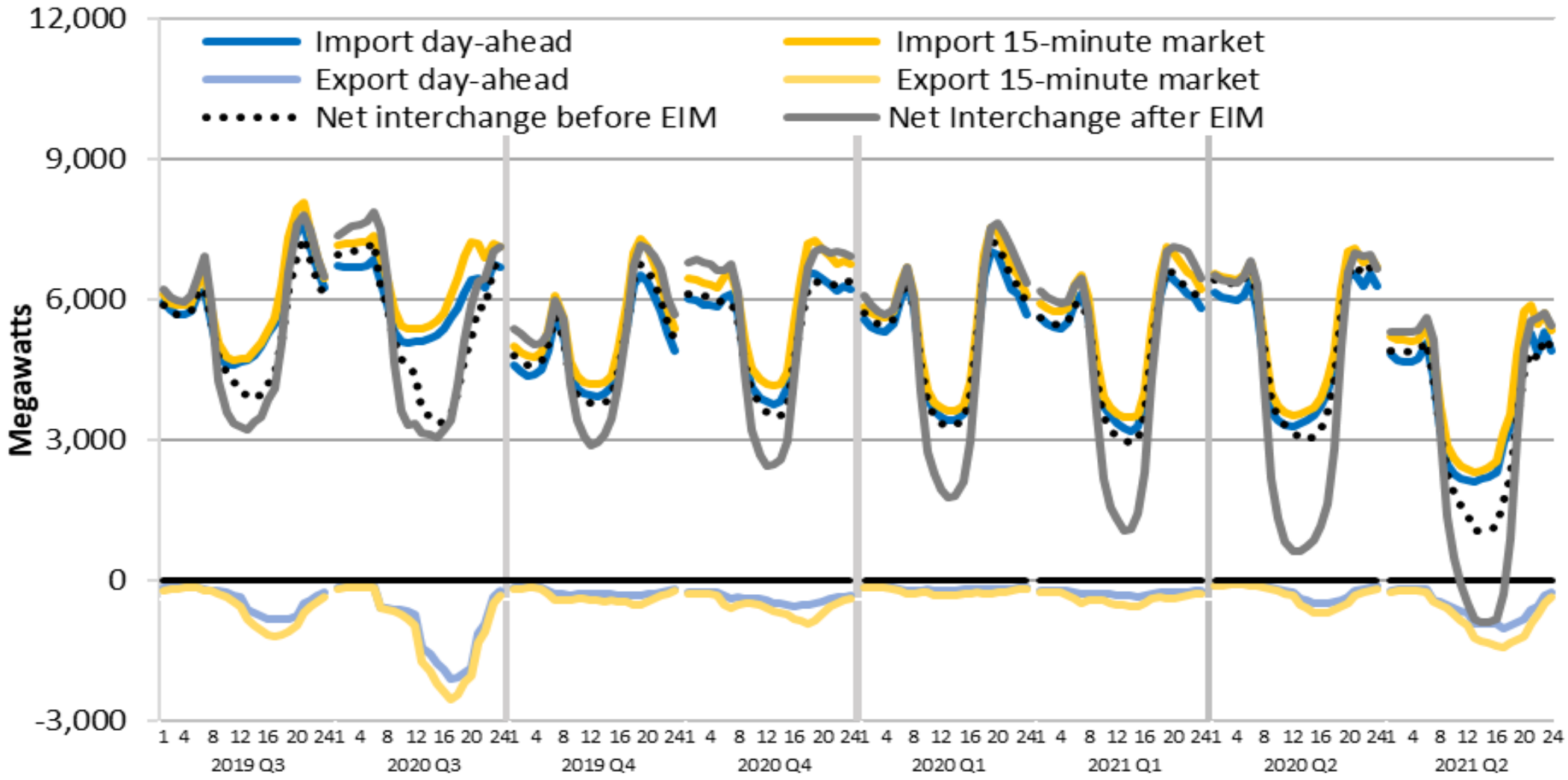
Renewable production up 3 percent compared to the same quarter in 2020, despite a decrease of 38 percent for hydroelectric production



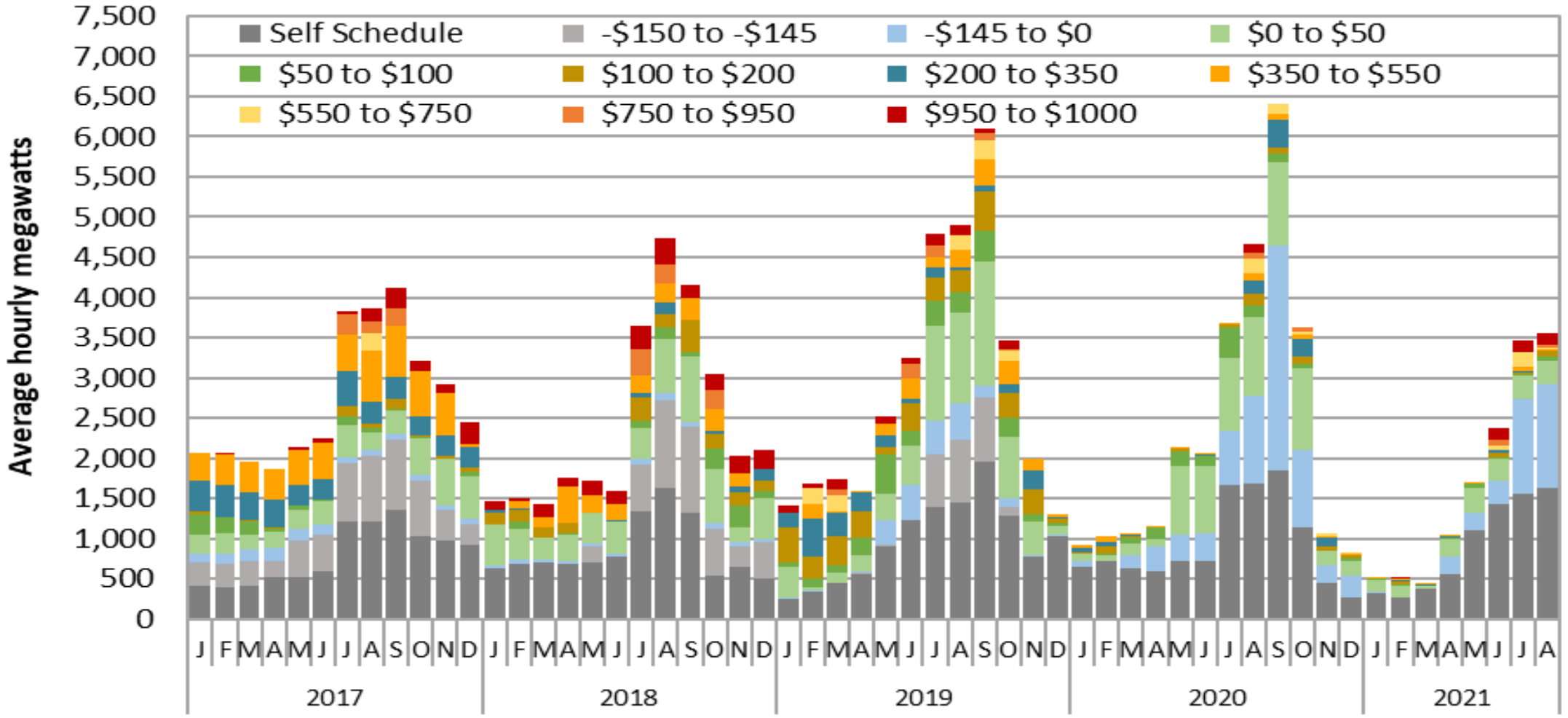
Reduction of wind and solar generation high within the ISO, almost all economic



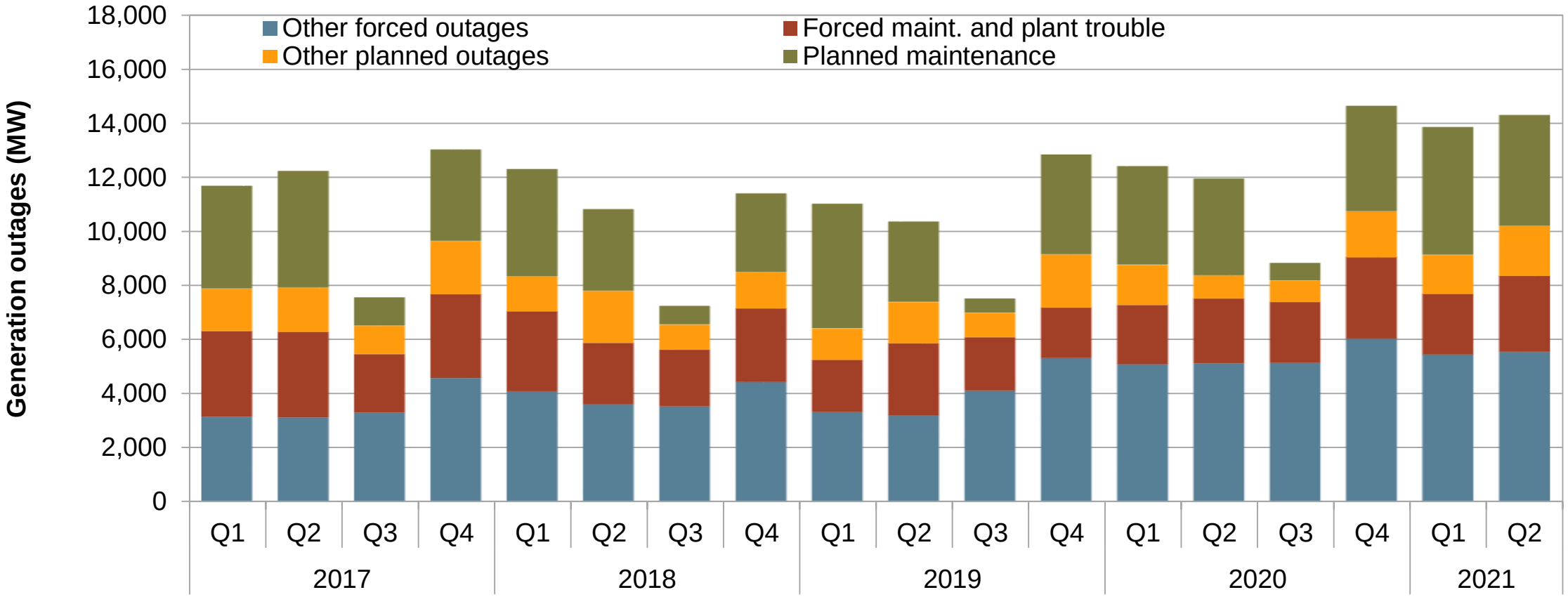
Average hourly net interchange decreases in all hours



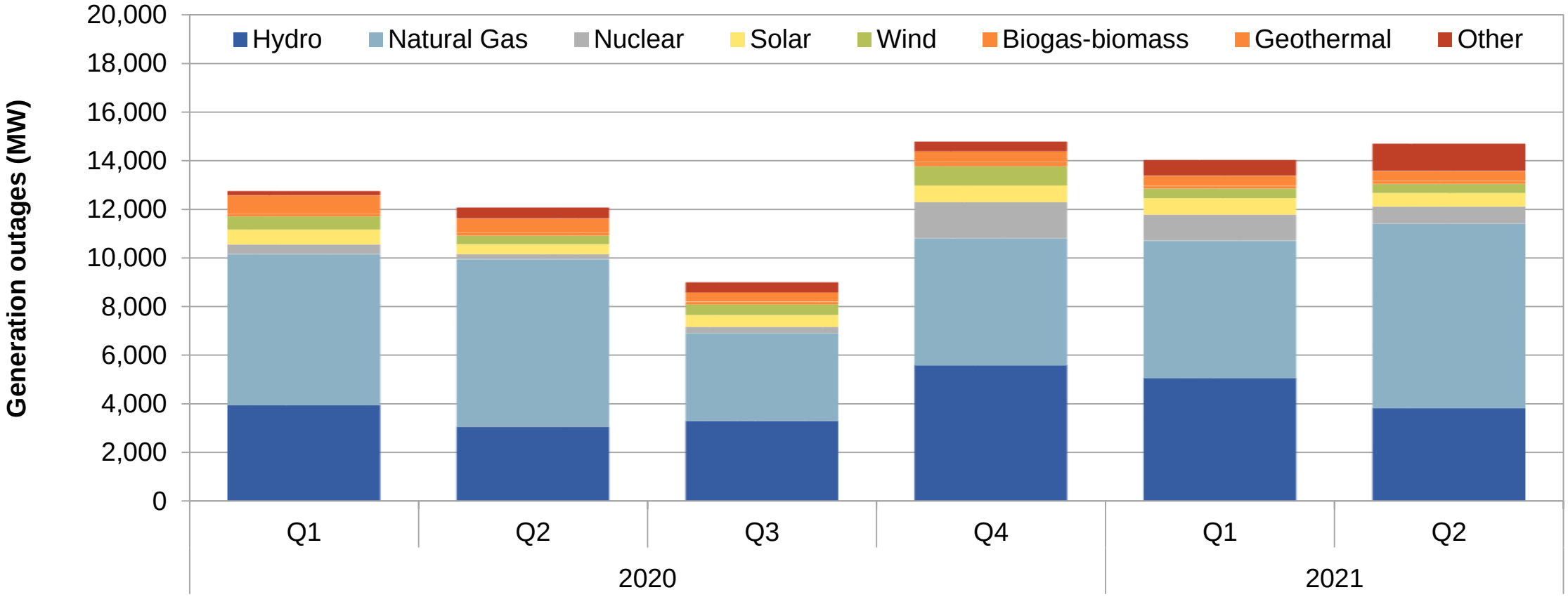
Resource adequacy import bids decrease in price and volume



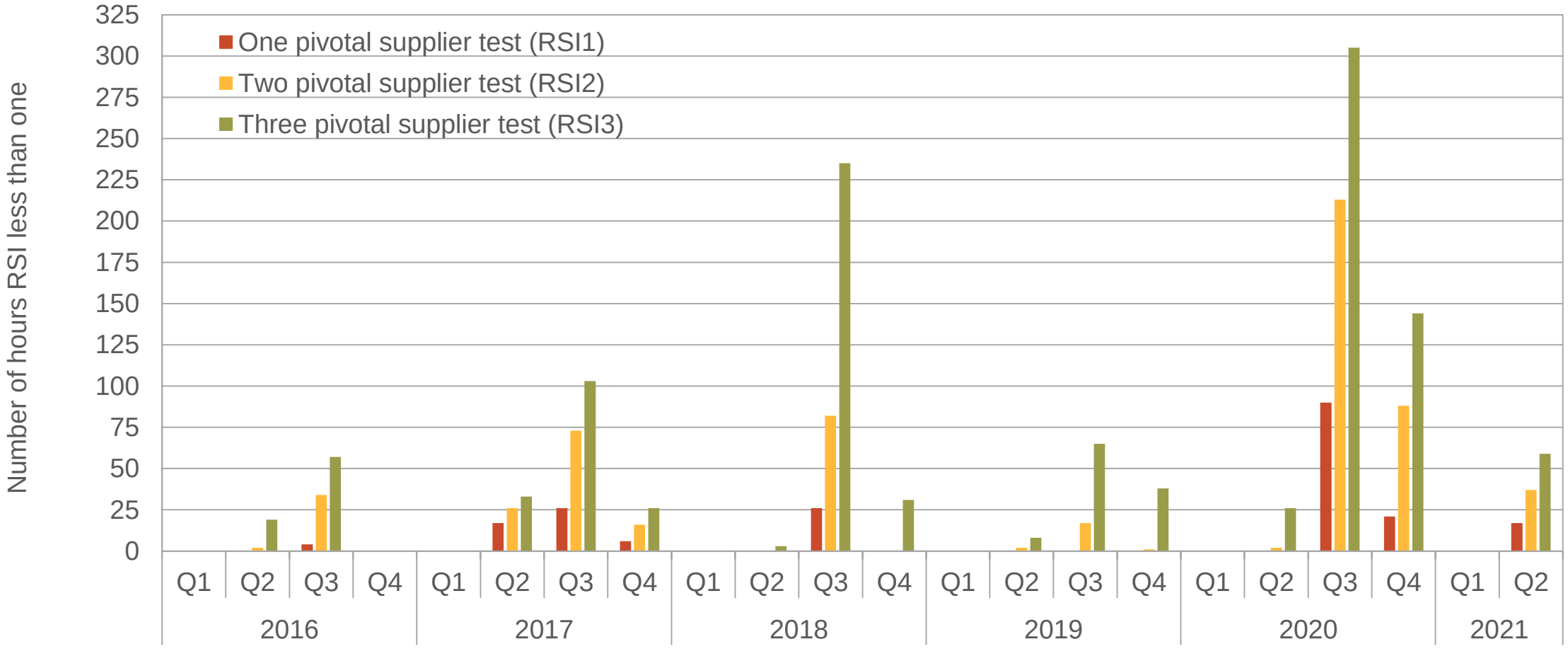
Generation outages increase relative to Q2 in prior years



Generation outages increase relative to Q2 in prior years, by fuel

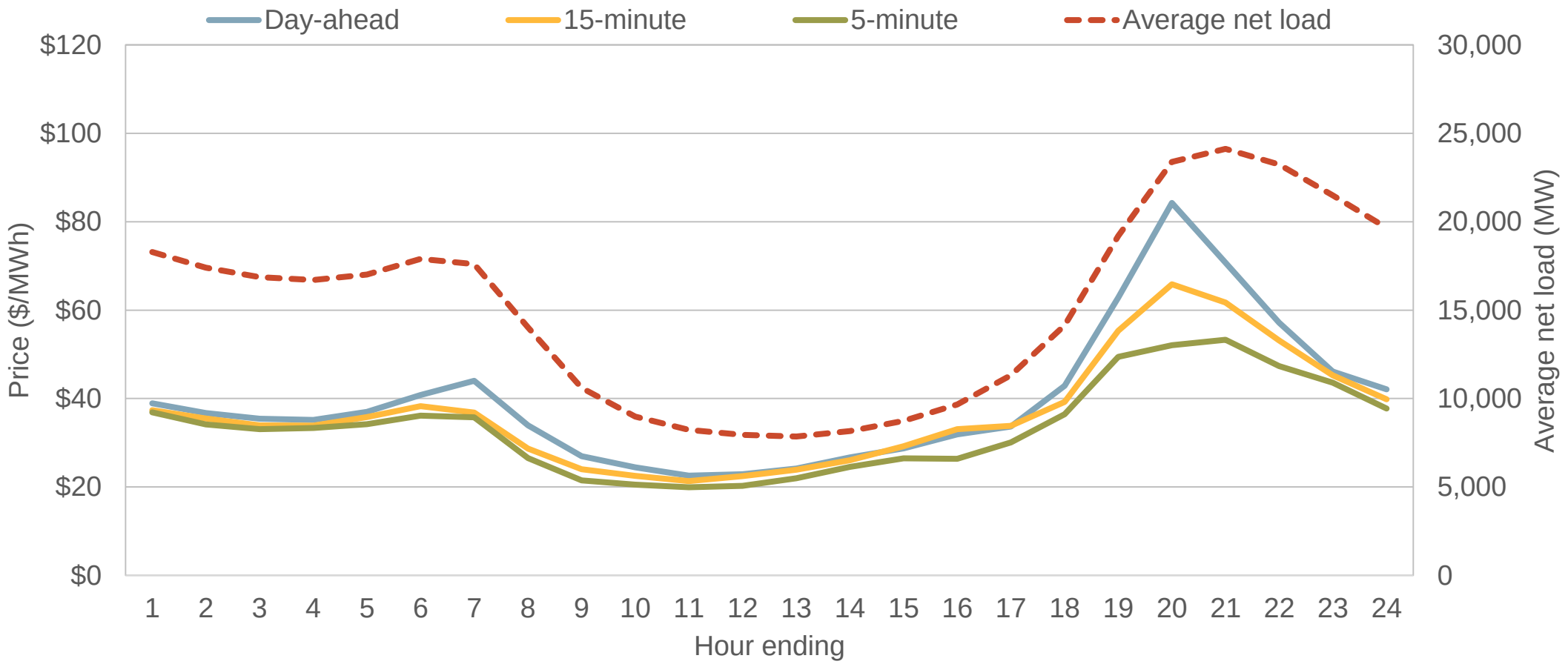


The CAISO market was less structurally competitive than prior Q2s

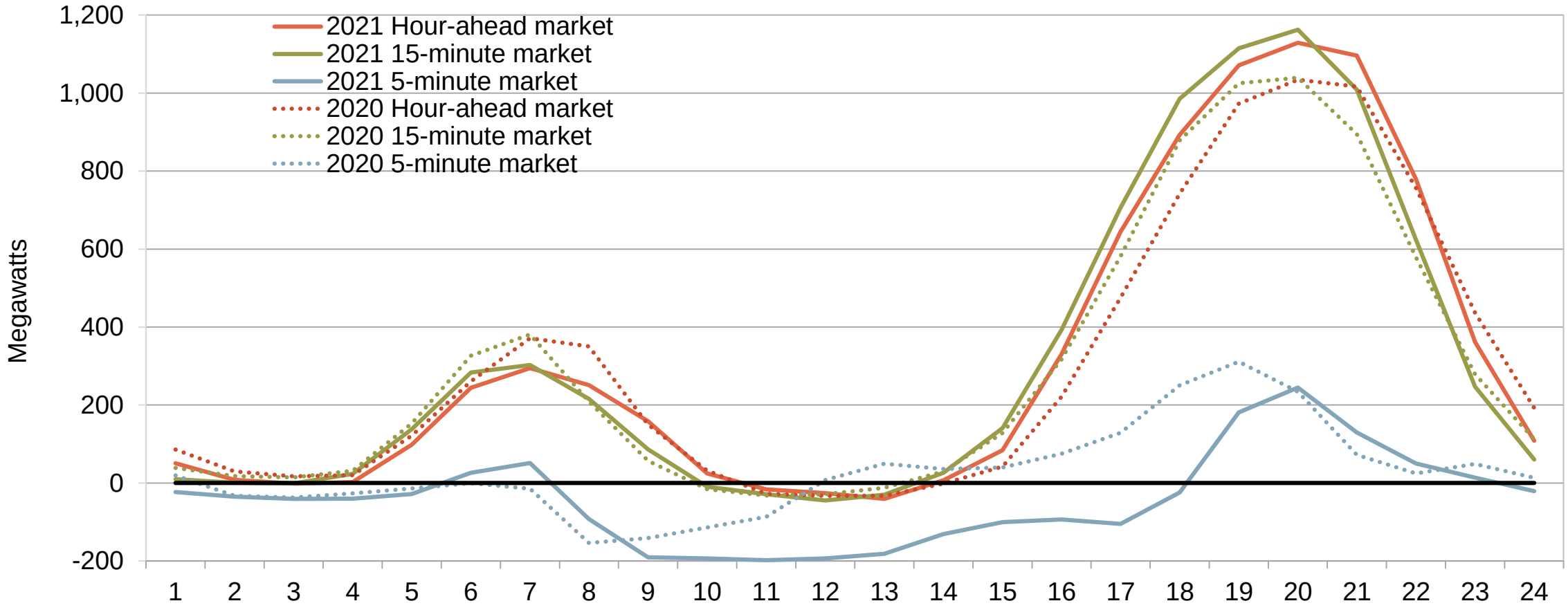


Lowest 500 residual supply index with largest one, two, or three suppliers excluded

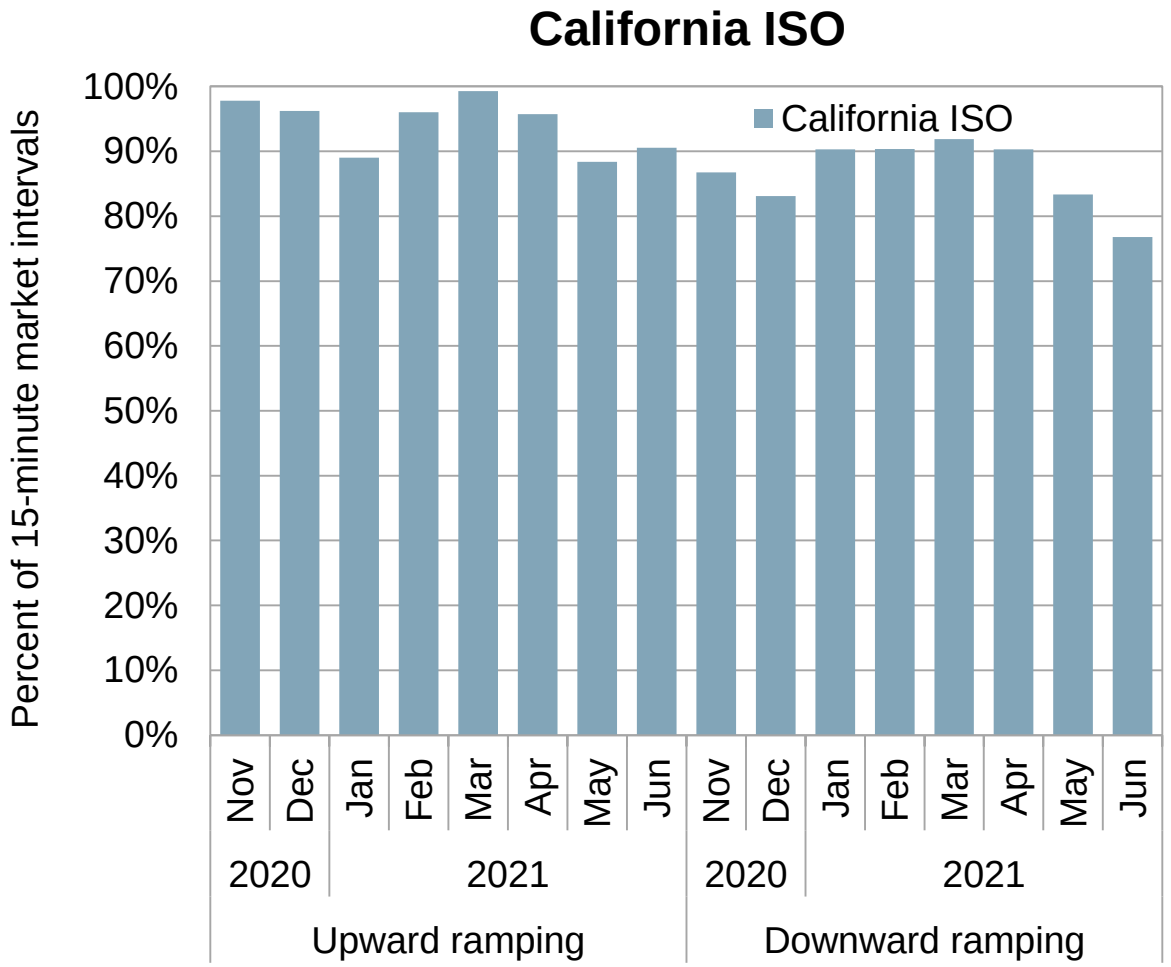
Average prices up – with highest average prices in net load peak hours, particularly day-ahead

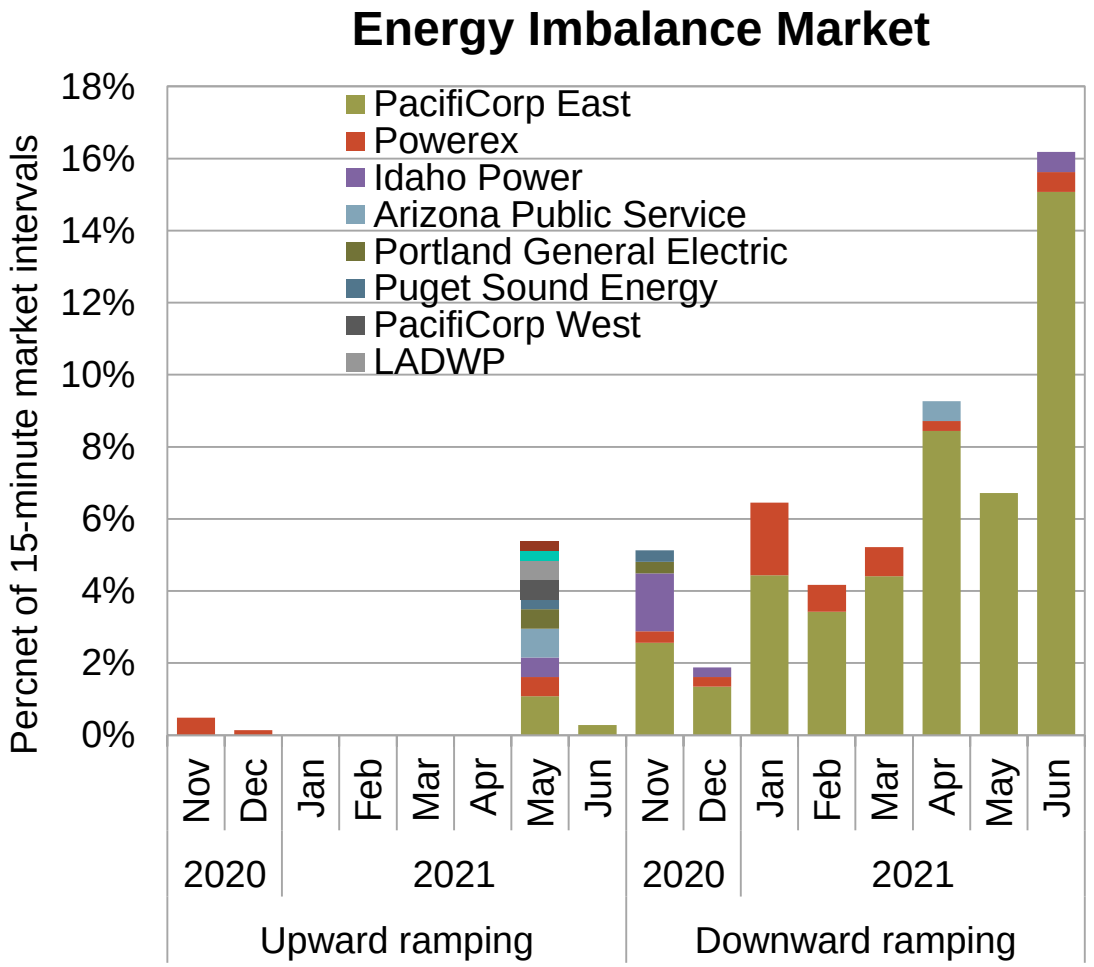


Imbalance conformance adjustments continue to increase

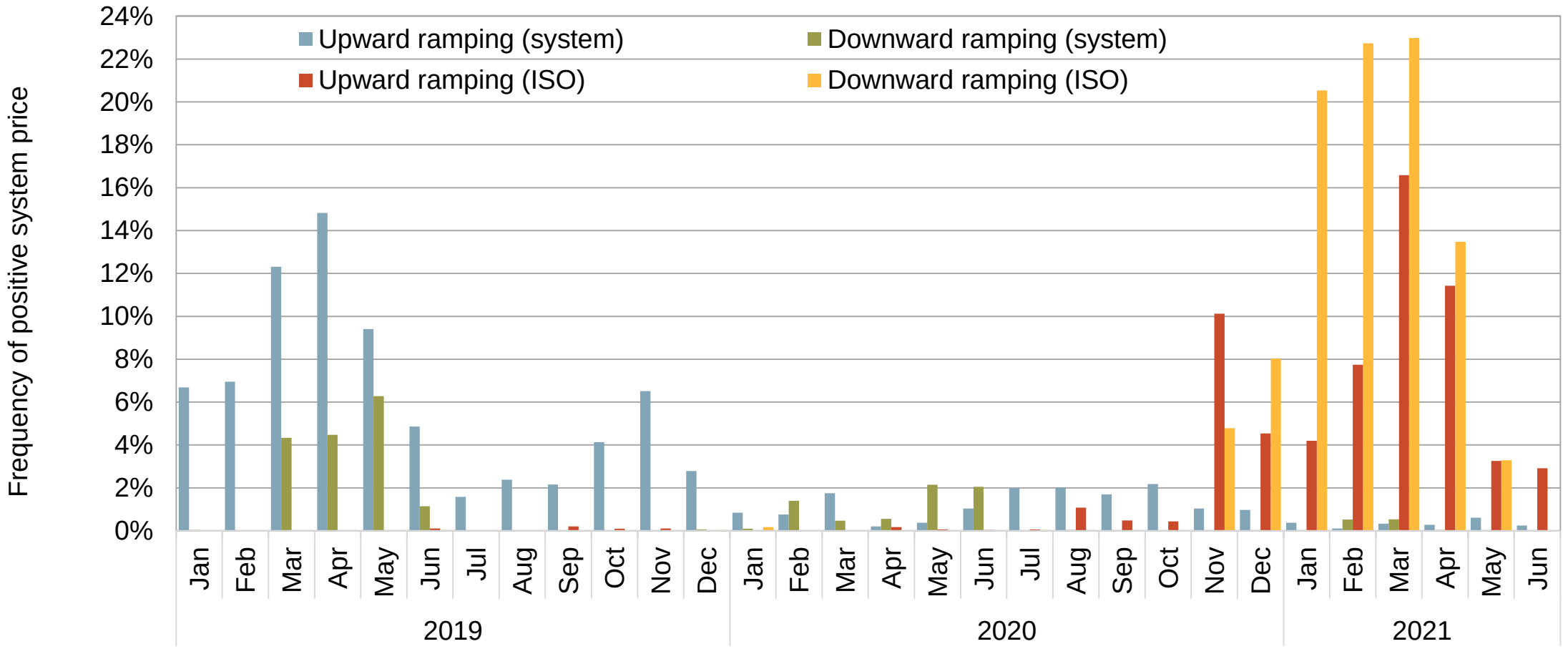


Flexible ramping product minimum area requirement introduced November 2020
Frequency minimum area requirement enforced



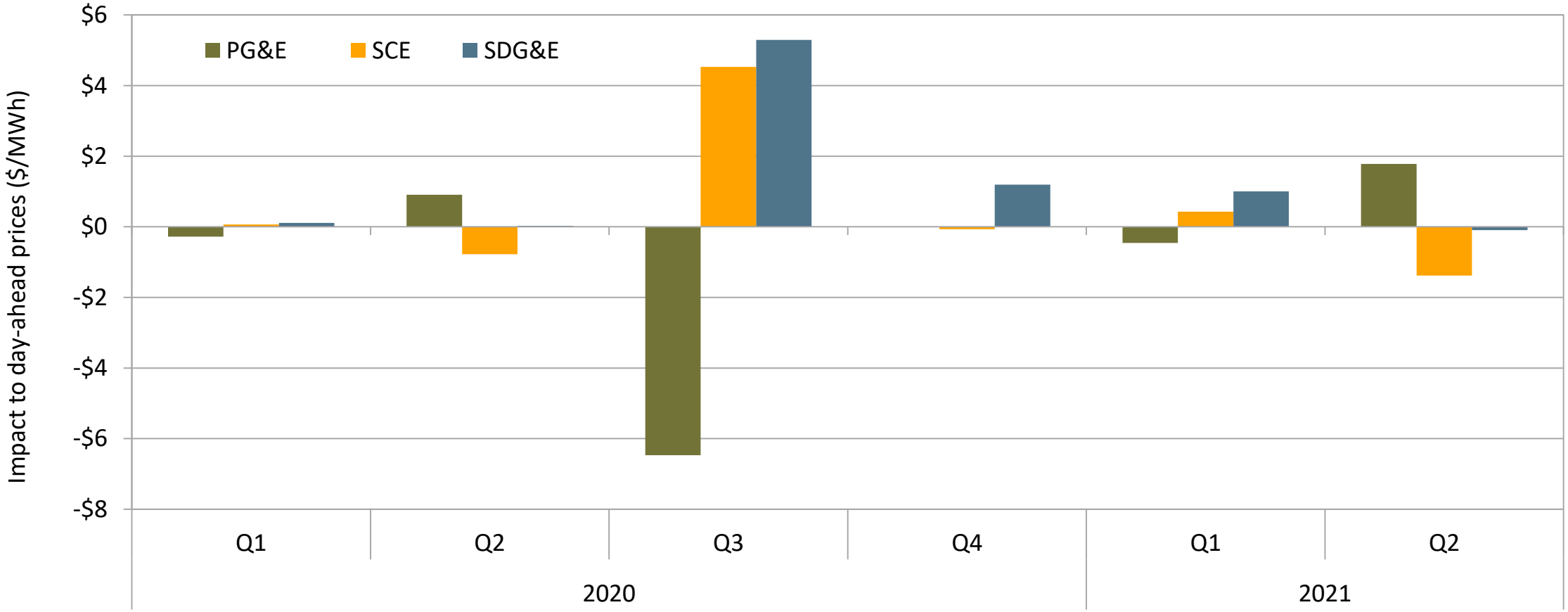


Monthly frequency of positive system or ISO flexible ramping shadow price (15-minute market)

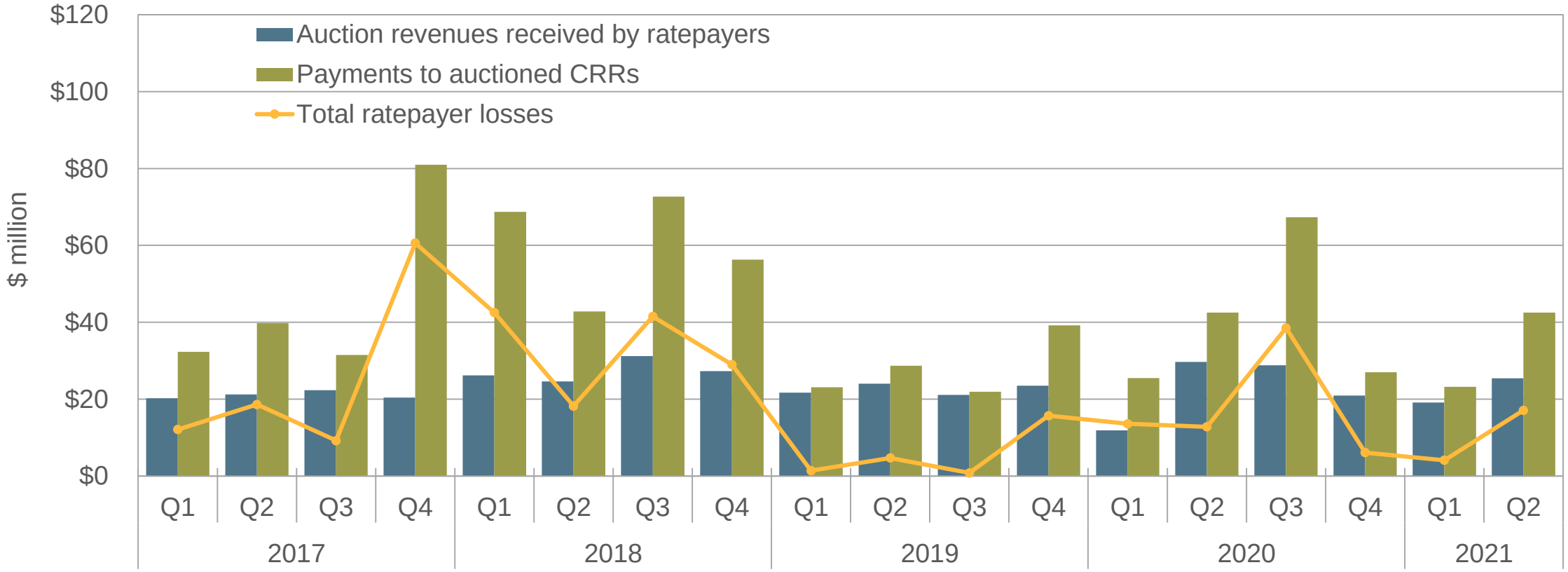


Congestion increased in the second quarter

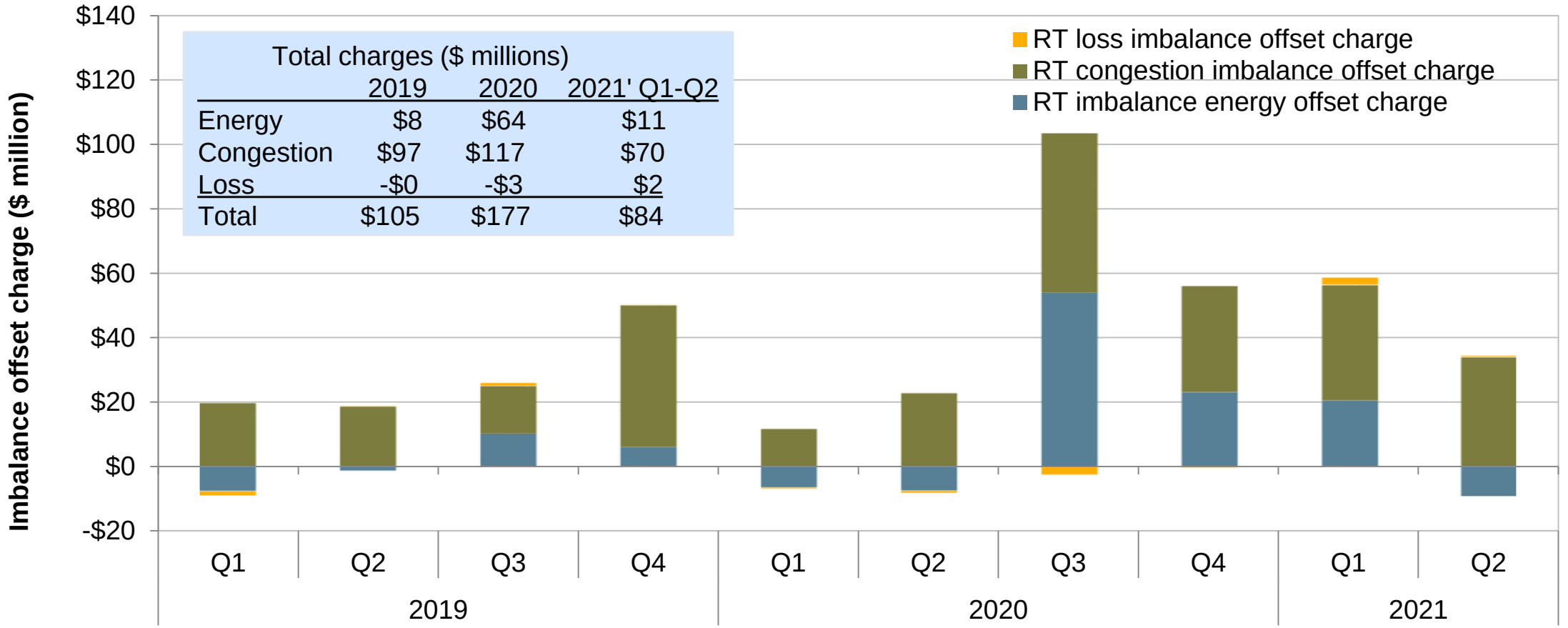
$98 million day-ahead congestion rent greater than Q2 2020 ($90 million)



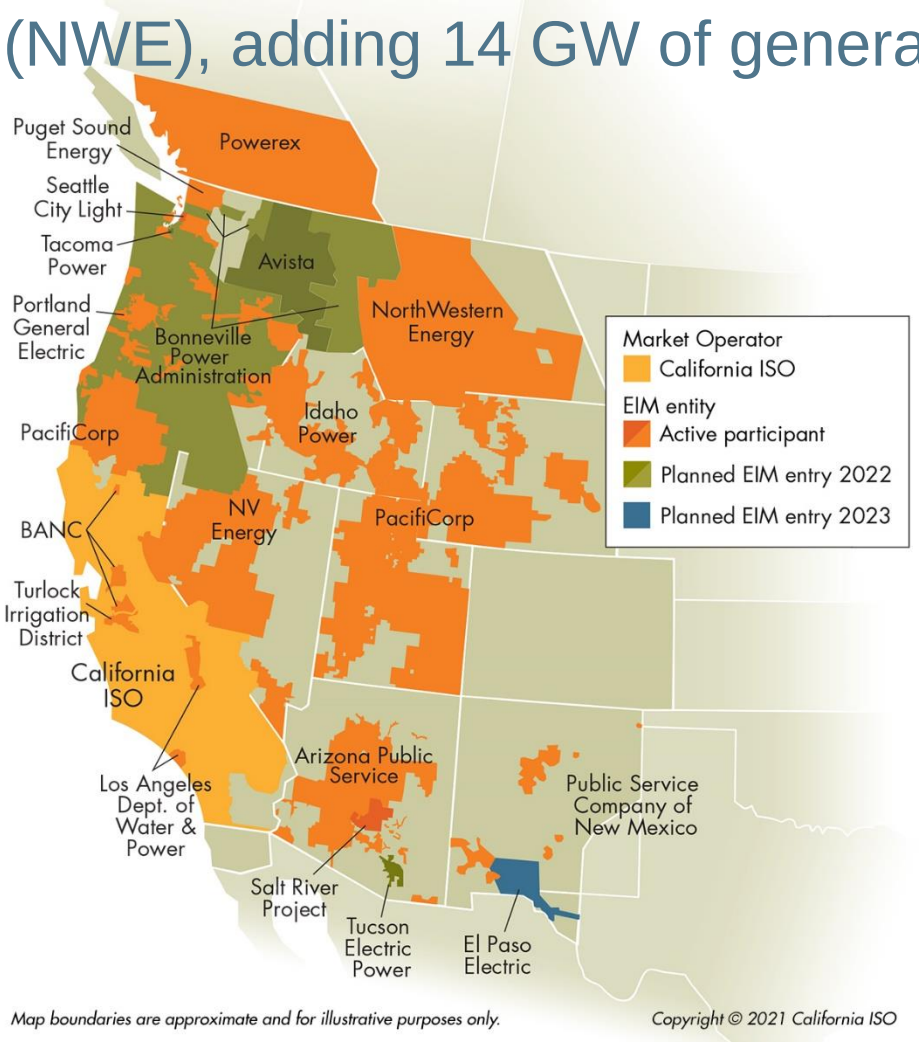
Congestion revenue rights auction revenues are estimated to be $17 million less than payments made to non-load-serving entities, about 12 percent of day-ahead congestion rent
Q1: losses $4.1 million, 2% of day-ahead congestion rent



Real-time offset costs increased to $84 million in the first half of 2021, highest cost for Q1+Q2 since 2014



Los Angeles Department of Water and Power, the Public Service Company of New Mexico, and NorthWestern Energy joined the EIM on April 1 and June 15 (NWE), adding 14 GW of generation and 20 GW of transfers

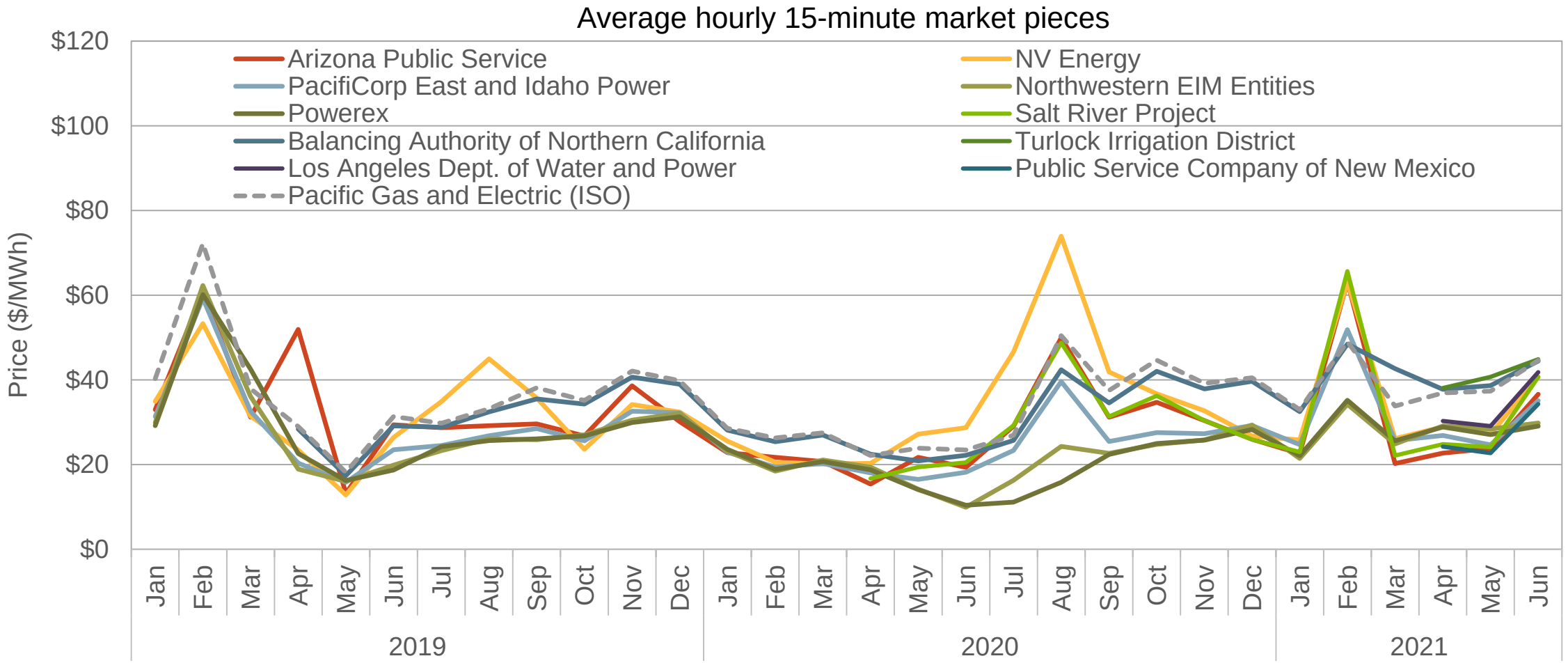


The ability to transfer energy between areas is one of the key benefits of the EIM

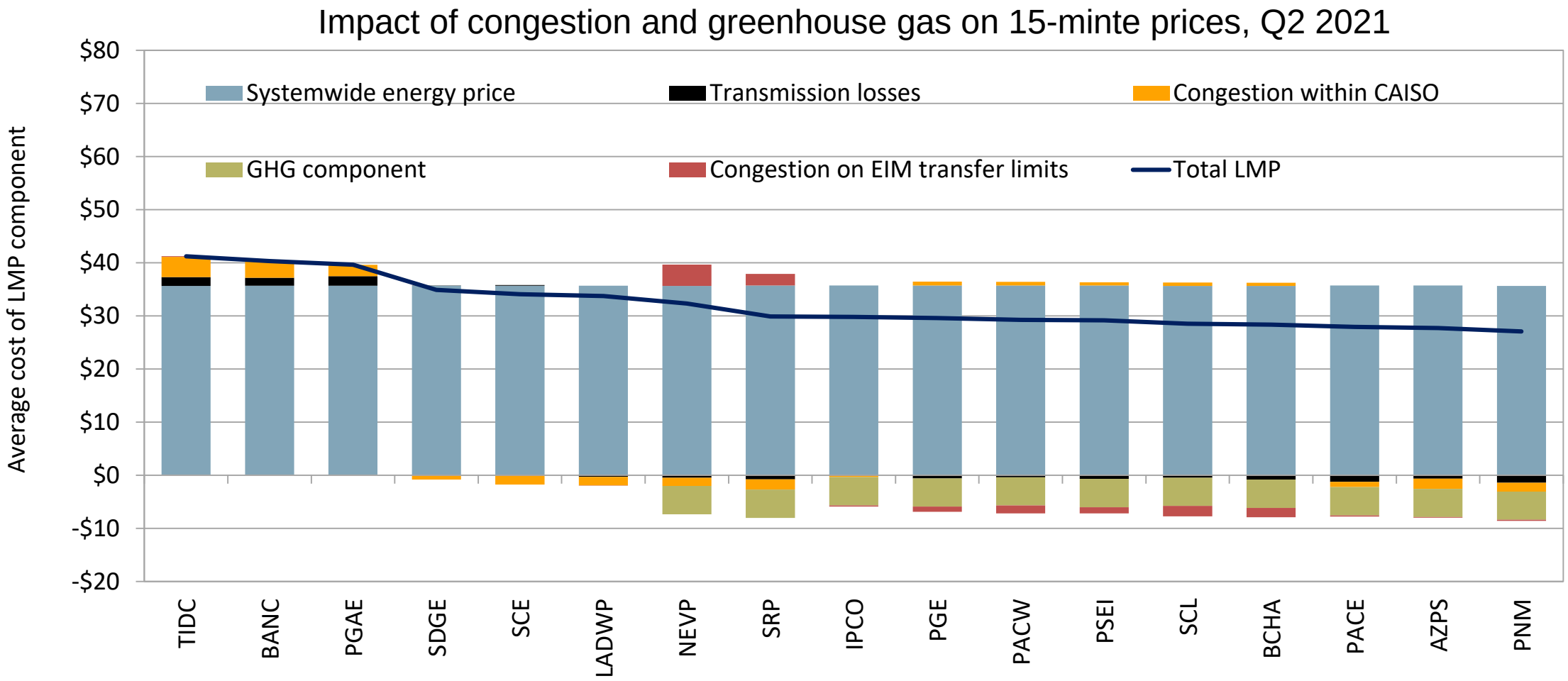
Average 15-minute transfer limits

From Balancing Authority Area	To Balancing Authority Area																*Total*
	CISO	BANC	TIDC	LADWP	NEVP	AZPS	SRP	PNM	PACE	IPCO	NWMT*	PACW	PGE	PSEI	SCL	PWRX	*export limit*
California ISO		3,200	1,130	4,990	3,320	1,070	1,450					0	90	0		260	15,510
BANC	3,240		650														3,890
Turlock Irrig. District	1,220	790															2,010
LADWP	8,590				1,500	400			180								10,670
NV Energy	3,990			1,240		240			860	470							6,800
Arizona Public Service	2,680			490	330		6,900	900	810								12,110
Salt River Project	2,230					4,920		110	0								7,260
PSC New Mexico						850	180										1,030
PacifiCorp East				170	670	670	0			1,020	410	280					3,220
Idaho Power					530				1,760		280	320		50	30		2,970
NorthWestern Energy*									390	100		0	0	0			490
PacifiCorp West	90								380	350	40		330	150	0		1,340
Portland GE	110										30	330		130	10		610
Puget Sound Energy	0									0	20	180	130		350	90	770
Seattle City Light										30		30	20	350			430
Powerex	0													210			210
Total import limit	22,150	3,990	1,780	6,890	6,350	8,150	8,530	1,010	4,380	1,970	780	1,140	570	890	390	350	

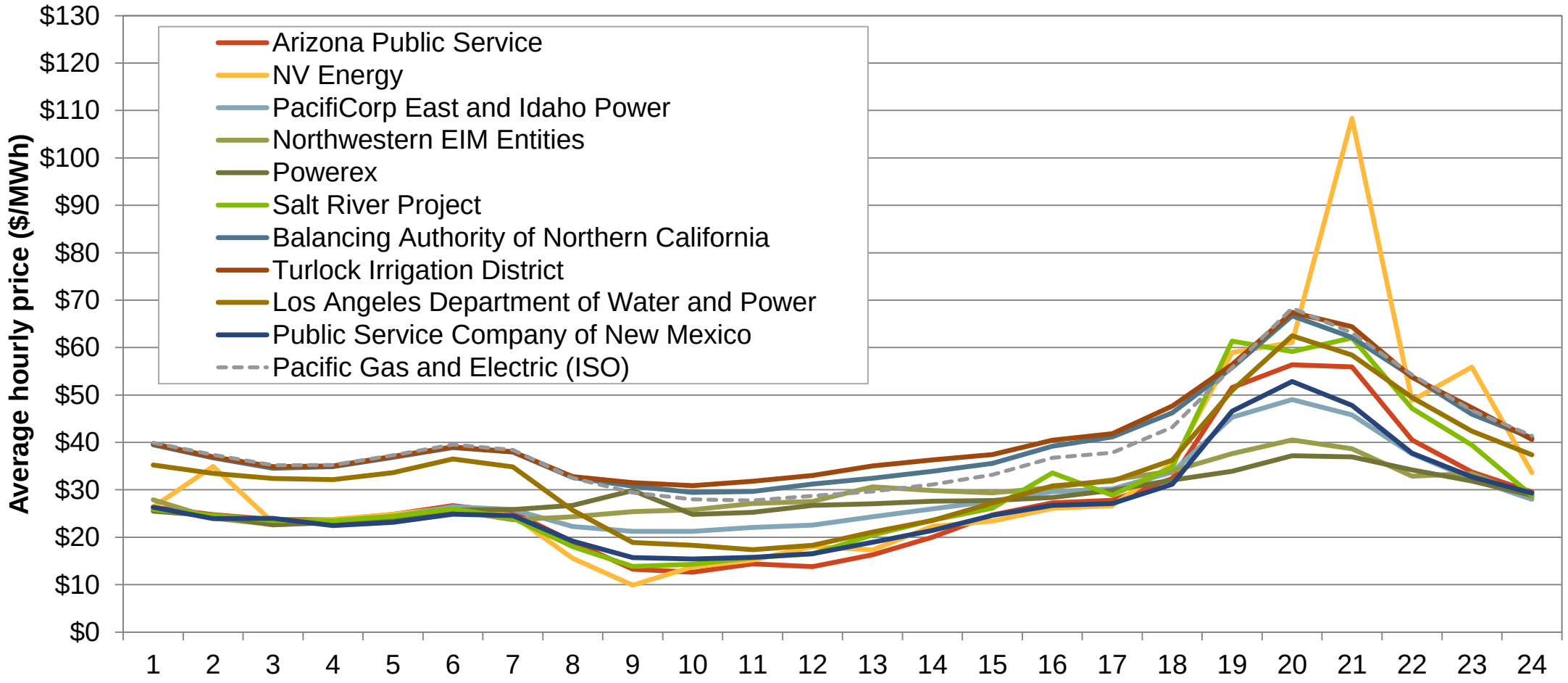
Peak prices in Northern CA exceeded the rest of the system



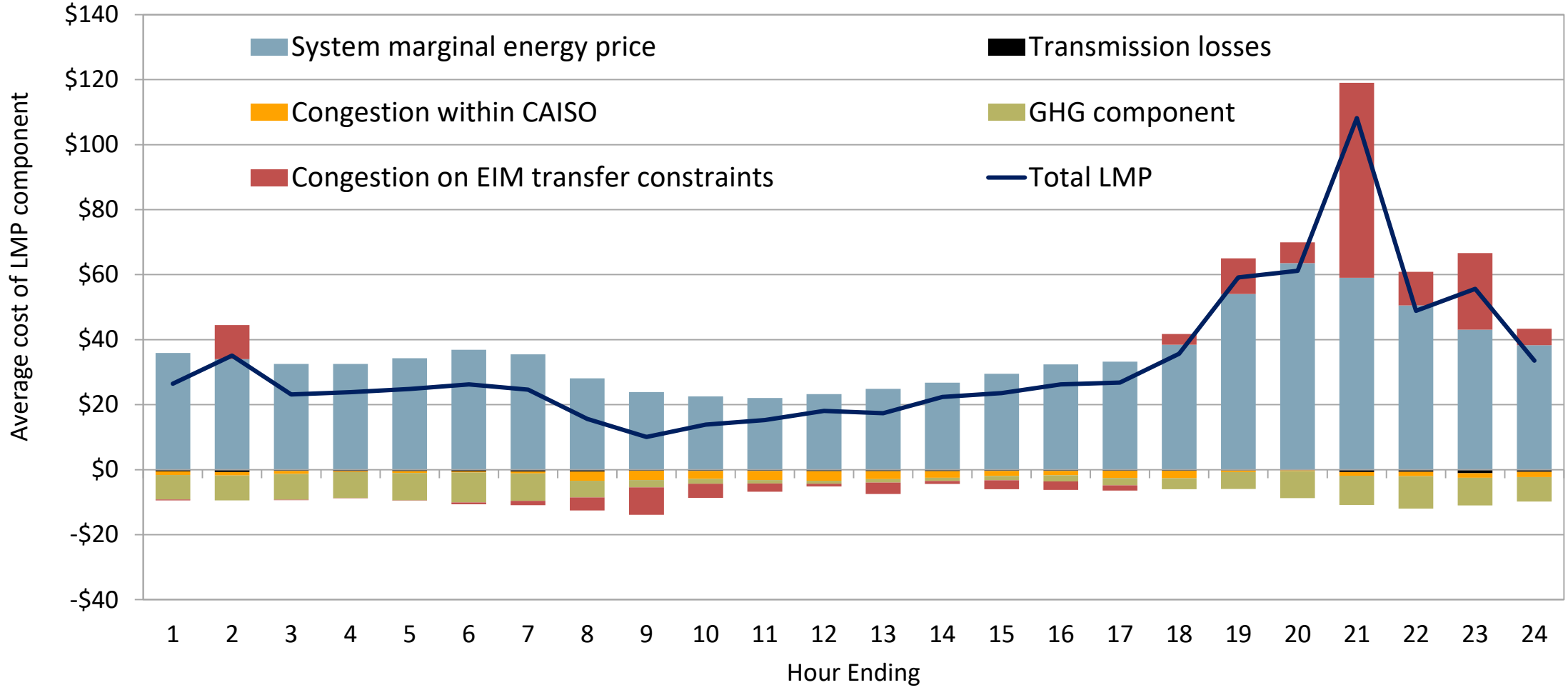
Prices and transfers reflect differences in regional supply conditions and transfer limitations



Hourly 15-minute market prices (April – June)



NV Energy average 15-minute price by component (Q2 2021)



EIM Sufficiency Tests

- **Two types of tests performed as part of resource sufficiency evaluation each hour for each 15-minute interval:**
  - Bid range capacity test (a.k.a. “capacity test”)
  - Flexible ramping sufficiency test (a.k.a. “sufficiency test”)
- **If an EIM balancing area fails one of these upward tests, net EIM imports into the area are capped based on advisory interval imports**
- **Purpose of tests:**
  - Ensure sufficient resources are scheduled/offered in EIM to cover load forecast and ramping needs (plus some uncertainty)
  - Deter excessive or intentional “leaning” by individual EIM areas for capacity needed to meet loads and uncertainty
  - Also viewed by FERC as a mechanism to help deter exercise of market power through physical withholding of resources

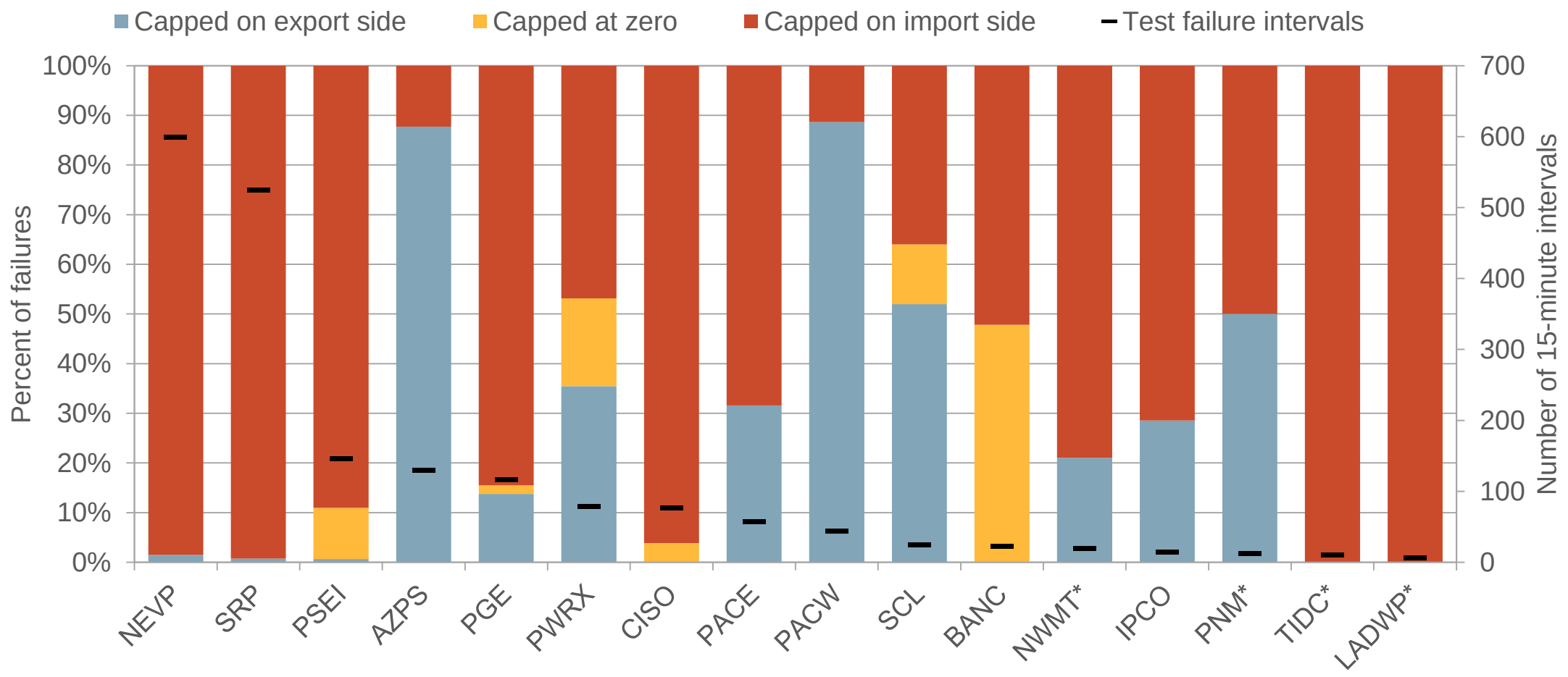
Expanded DMM role in monitoring and reporting on EIM resource sufficiency test performance and issues

- **Special monthly reporting beginning in September**
  - Aimed at providing quicker feedback on performance
  - Additional information in quarterly reports: http://www.caiso.com/market/Pages/MarketMonitoring/MarketMonitoringReportsPresentations/Default.aspx#special
- **DMM will work with stakeholders and CAISO on development of reporting metrics and analysis**
  - Standardized metrics for all BAAs and CAISO
  - Provision of detailed underling data to participants
  - Analysis of potential changes in how requirement and available supply which are being discussed in stakeholder process
- **Enhanced informational reporting to Governing Body**

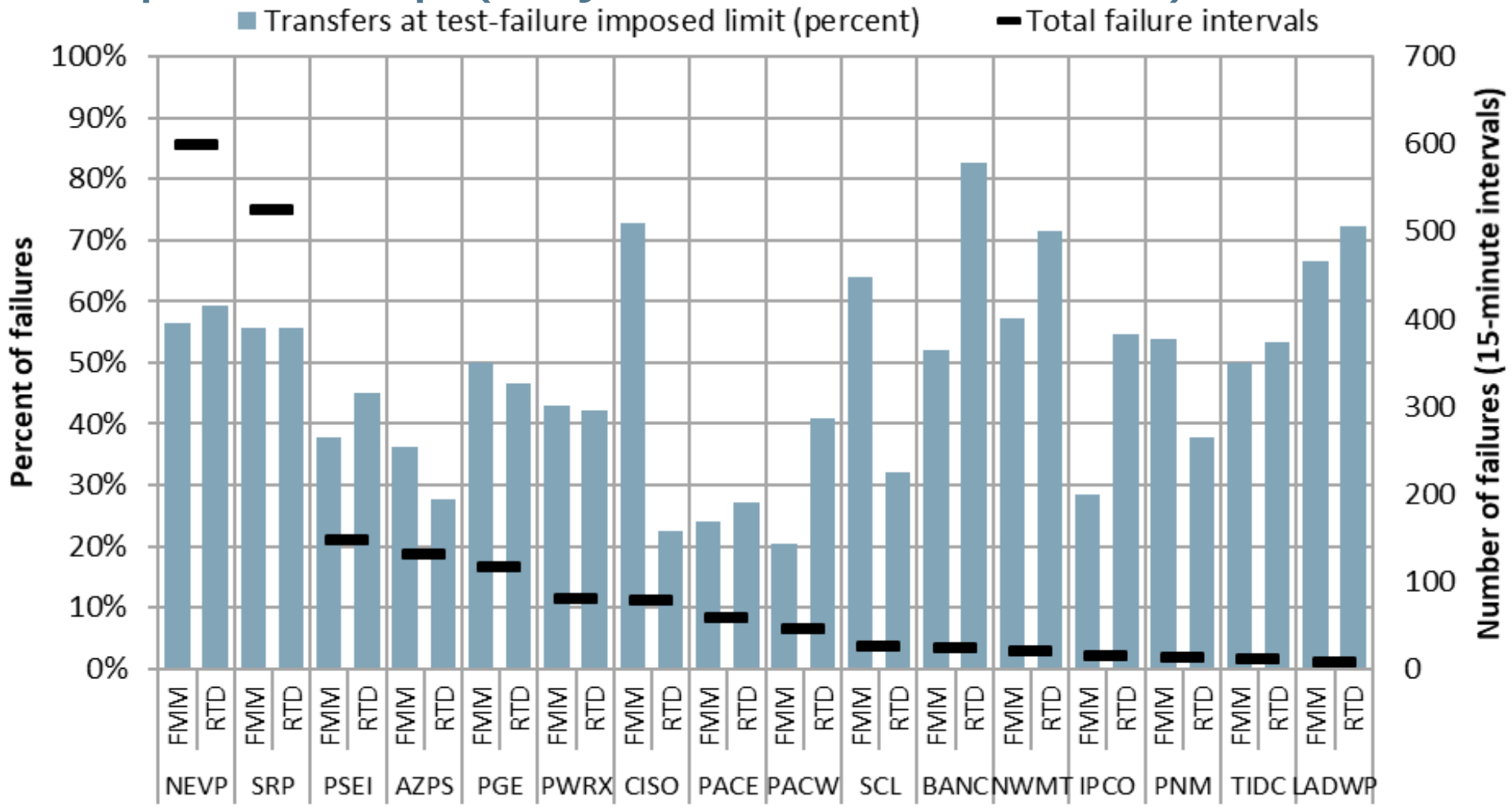
Bid range capacity test

- **ISO identified two issues, corrected February 4, 2021**
  - Resource de-rates and outages were not accounted for resulting in higher resource capacity relative to actual availability
  - Mirror resources were incorrectly included for the ISO, impacting net scheduled interchange and the capacity test requirement
- **ISO added net load uncertainty to the bid range capacity test on June 16**
  - From June 16 to June 30, most capacity test failures were caused by the additional uncertainty component (83% of 65 failures)
- **The ISO has proposed a series of additional enhancements as part of the resource sufficiency evaluation stakeholder initiative**
  - http://www.caiso.com/InitiativeDocuments/StrawProposal-ResourceSufficiencyEvaluationEnhancements.pdf

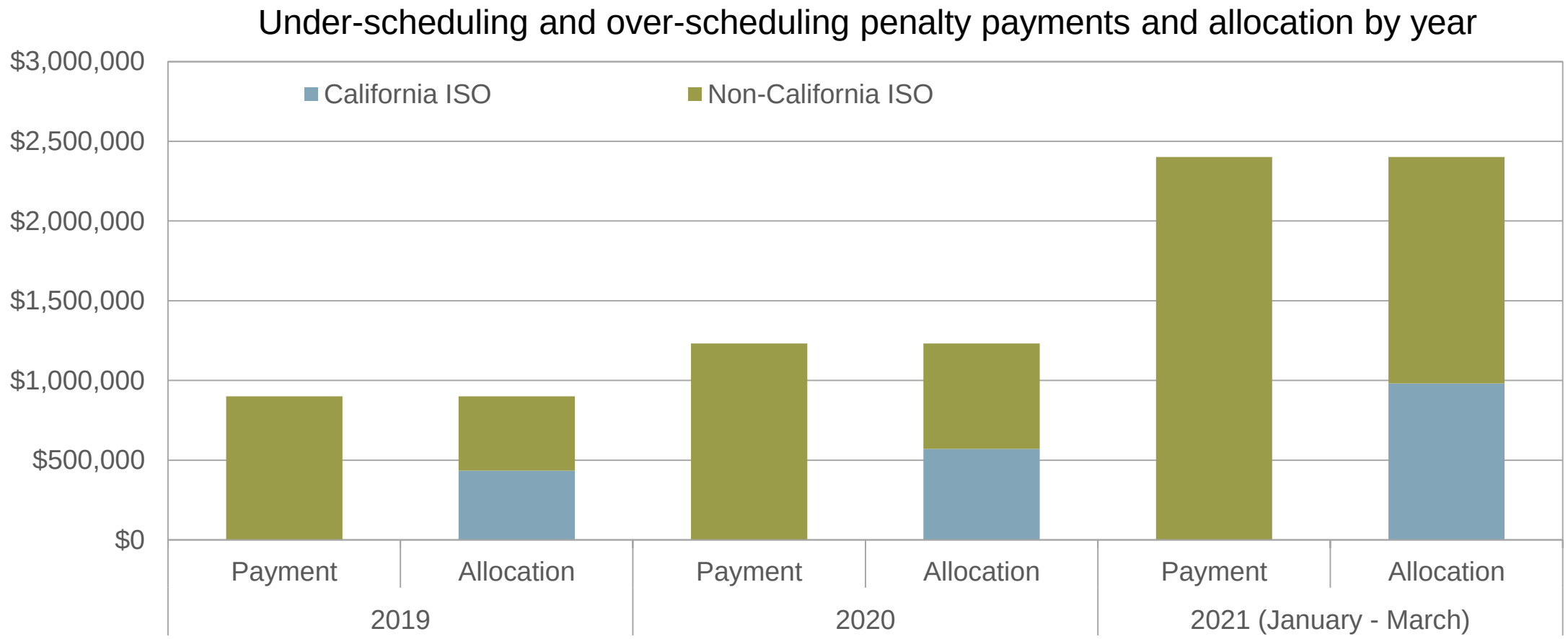
Upward capacity/sufficiency test failure intervals by import limit position (July 2020 – June 2021)



Percent of upward test failure intervals with market transfers at the imposed cap (July 2020 – June 2021)



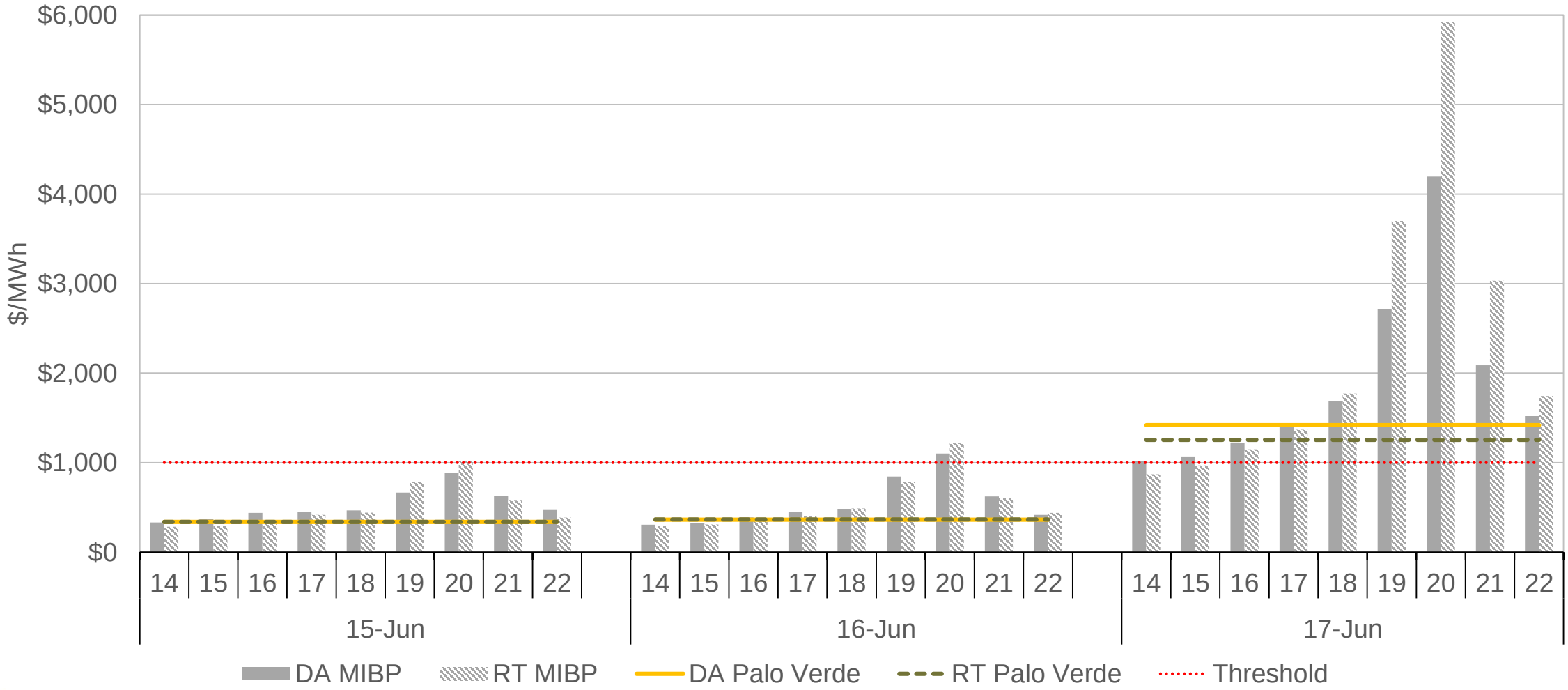
The ISO and stakeholders should reassess the need for applying the balancing test to any EIM balancing area



FERC Order 831 compliance

- **Phase 1 implemented March 20**
  - Resource-specific resources can bid over the soft bid cap through the reference level request process
  - Imports and virtual bidders able to bid over soft bid cap at any time
  - Power balance constraint penalty price set at $2,000/MWh hard bid cap
- **Phase 2 implemented June 13**
  - Imports and virtual bidders are only able to bid over soft bid cap under certain market conditions
  - Resource adequacy import bids are capped at a maximum import bid cap
  - Power balance constraint penalty price only set over $1,000/MWh soft bid cap in certain conditions

Maximum import bid price on days with high bilateral market prices



Intertie deviation settlement

- Implemented on February 8
- Increases settlement penalties applied to over- and under-delivered intertie transactions
- The ISO published a paper to address issues and to align tariff and implementation
- Intertie deviation penalties charged between February and June are estimated to total about $5.5 million