2021 Q3 Report on Market Issues and Performance

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http://www.caiso.com/Documents/2021-Third-Quarter-Report-on-Market-Issues-and-Performance-Dec-9-2021.pdf

http://www.caiso.com/Documents/Department-Market-Monitoring-Report-Dec-2021.pdf

Highlights of Q3 2021 market performance

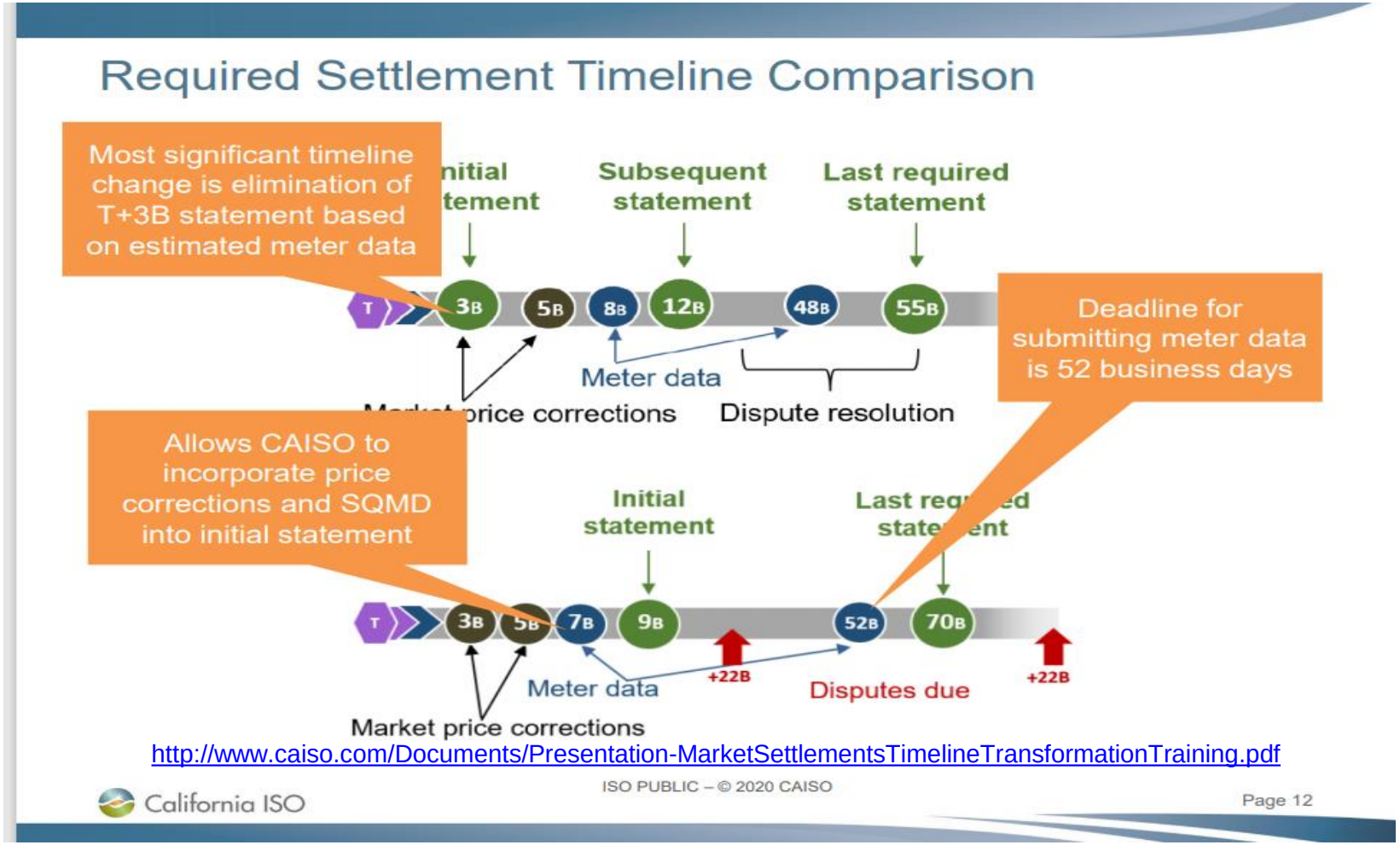
- **Higher prices in ISO and EIM compared to Q3 2020**
  - lower ISO hydro
  - higher gas prices
  - higher ISO outage rates
- **Special issues**
  - new market rules implemented in Q3
  - wheels and ISO exports
  - ISO resource adequacy performance and backstop capacity procurement

Western Energy Imbalance Market highlights

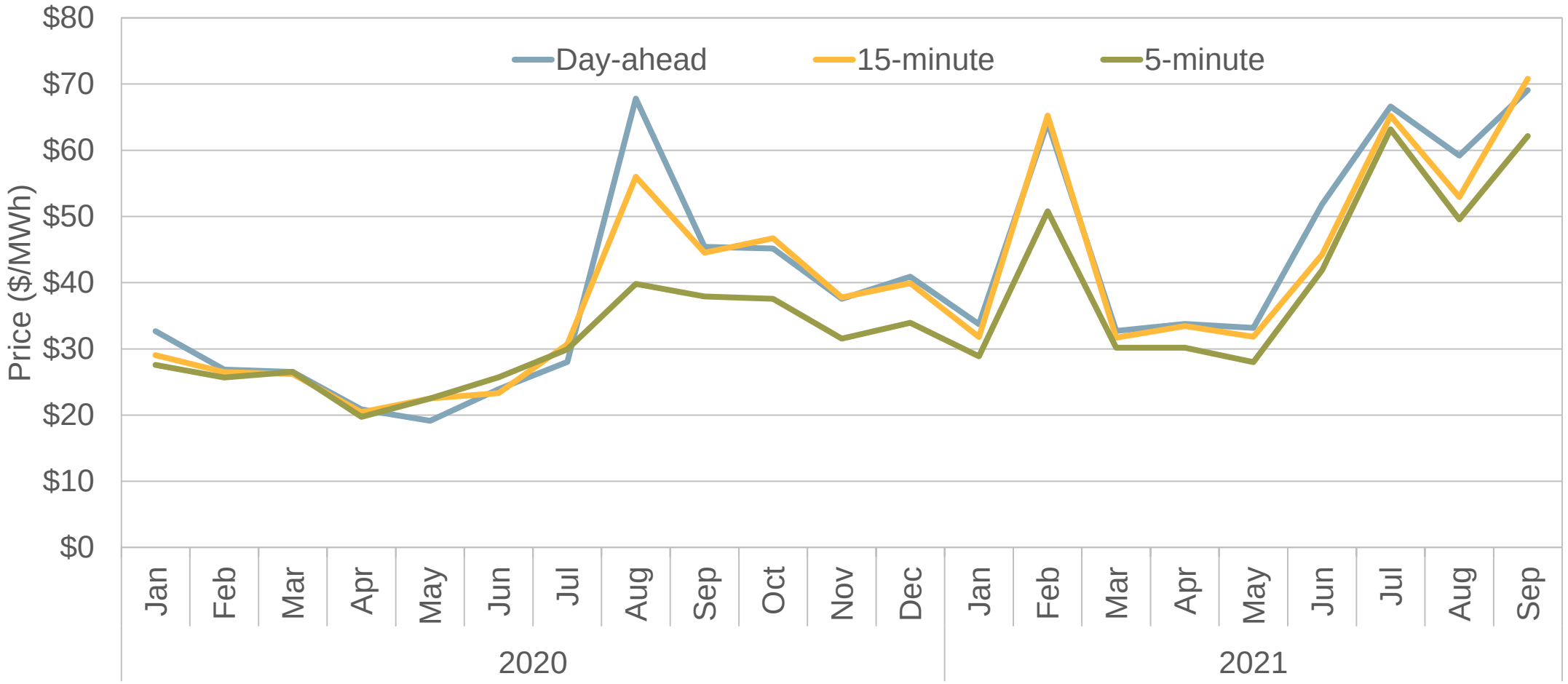
- **EIM Resource sufficiency tests**
  - expanded DMM role in monitoring and reporting on performance and issues
  - Reports and data for July – October available on DMM's website:

    http://www.caiso.com/market/Pages/MarketMonitoring/Default.aspx
  - Test failure can have a significant impact on prices
  - Mid-day transfer changes

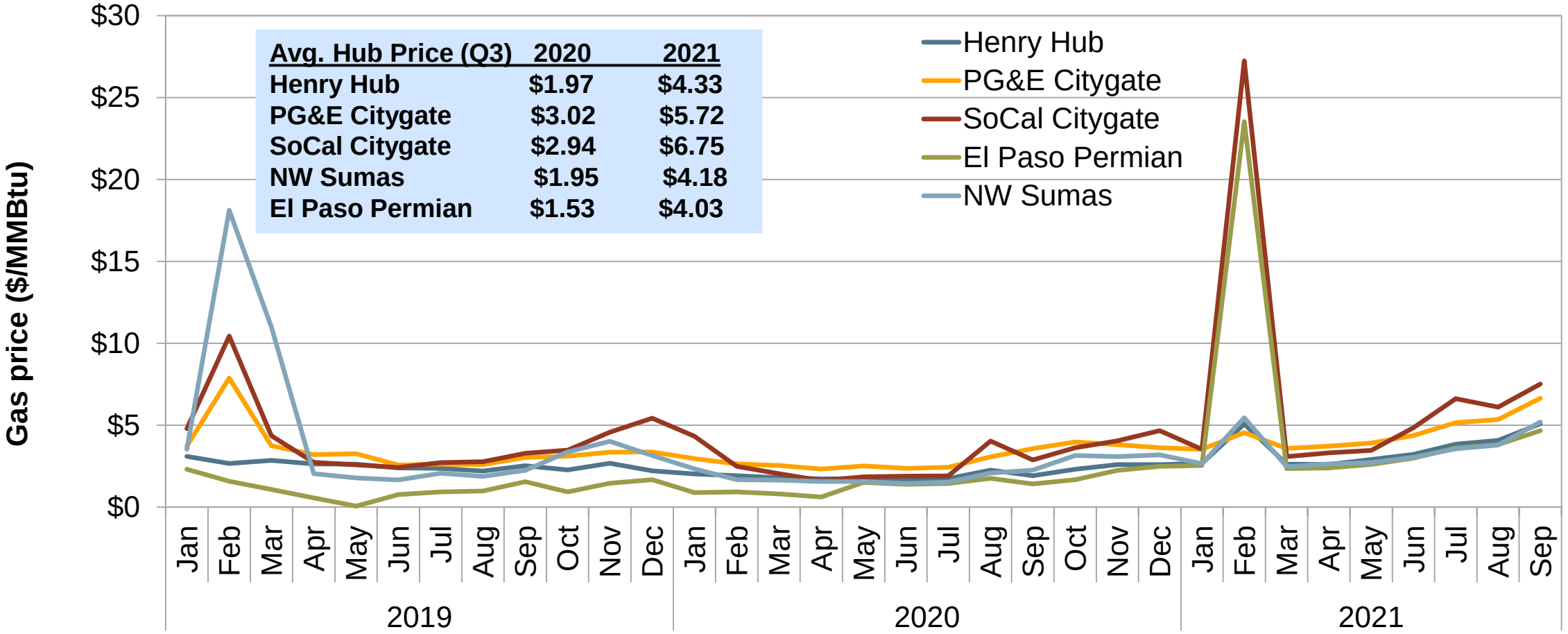
Settlement timeline changes prevent timely reporting on market settlements – but DMM will monitor



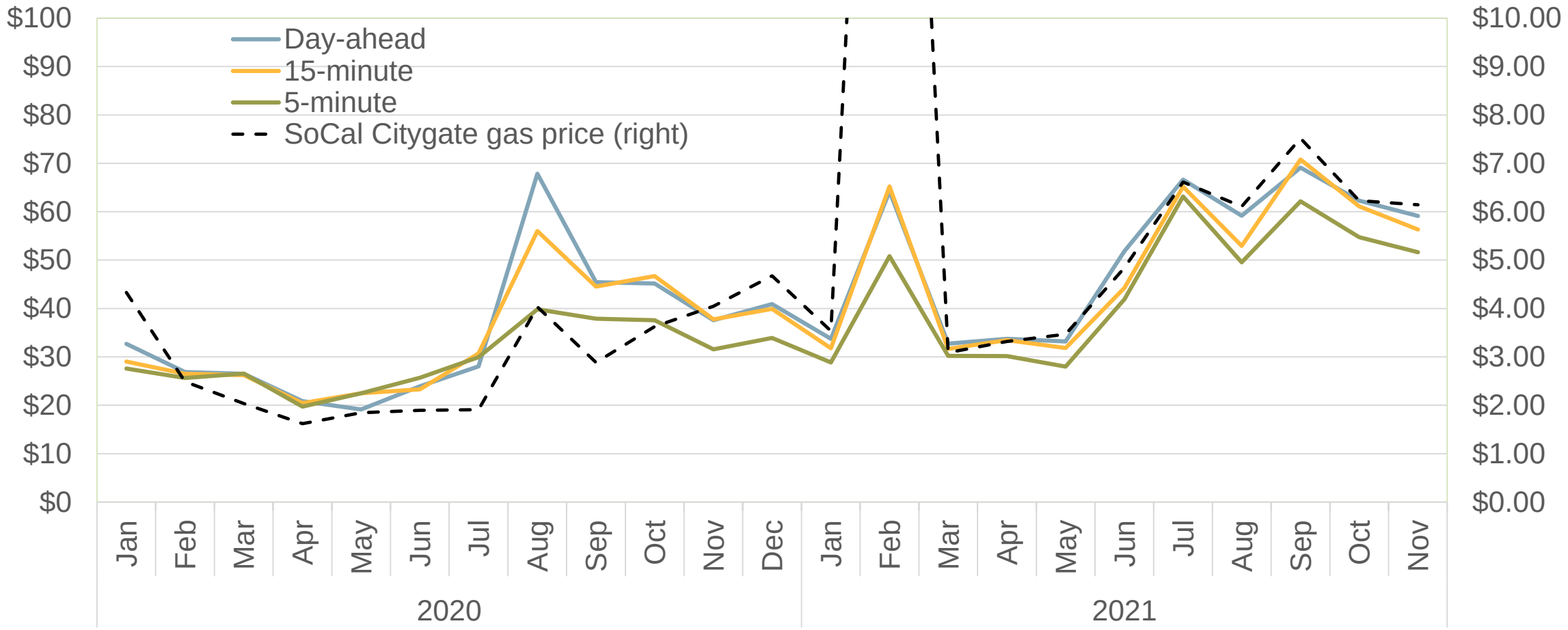
Prices were significantly higher than the same quarter of 2020



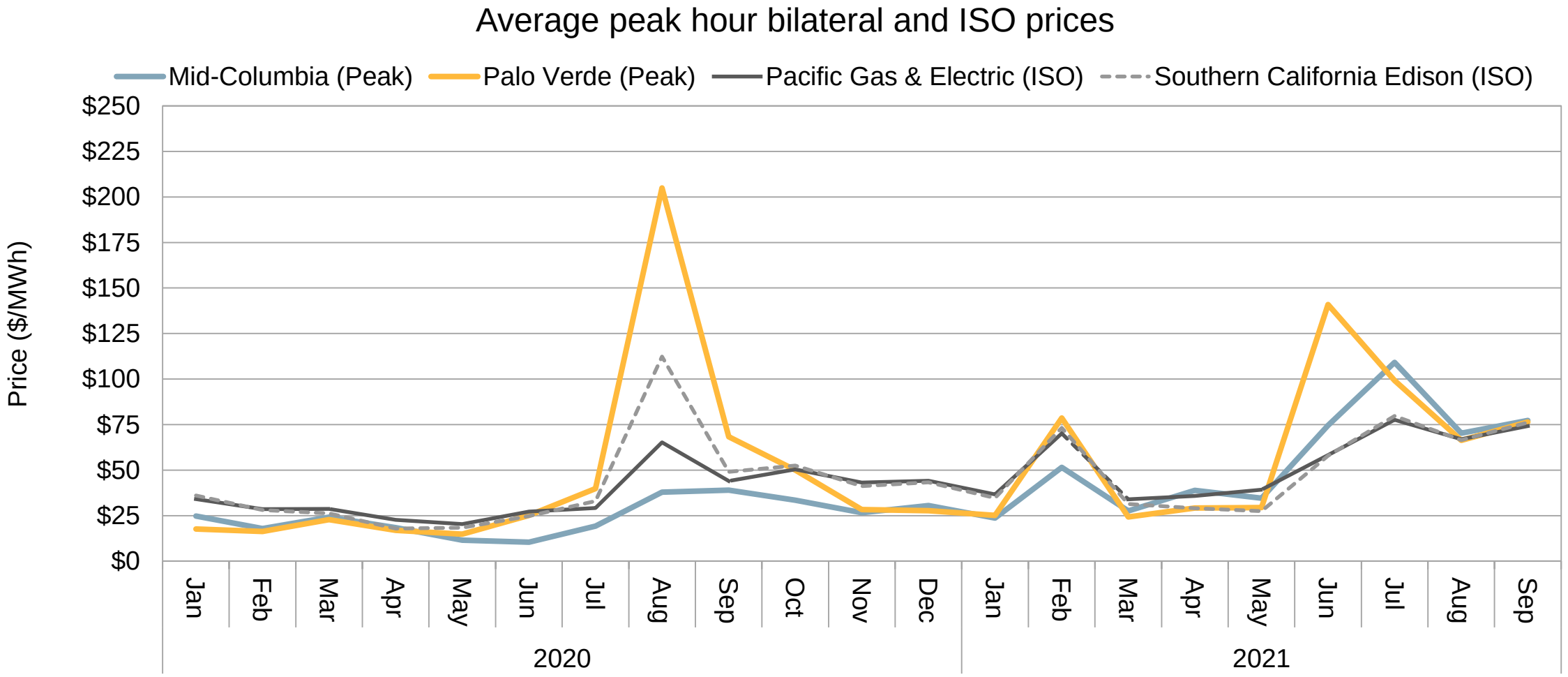
Gas prices increase in all major gas trading hubs in the west compared to Q3 2020



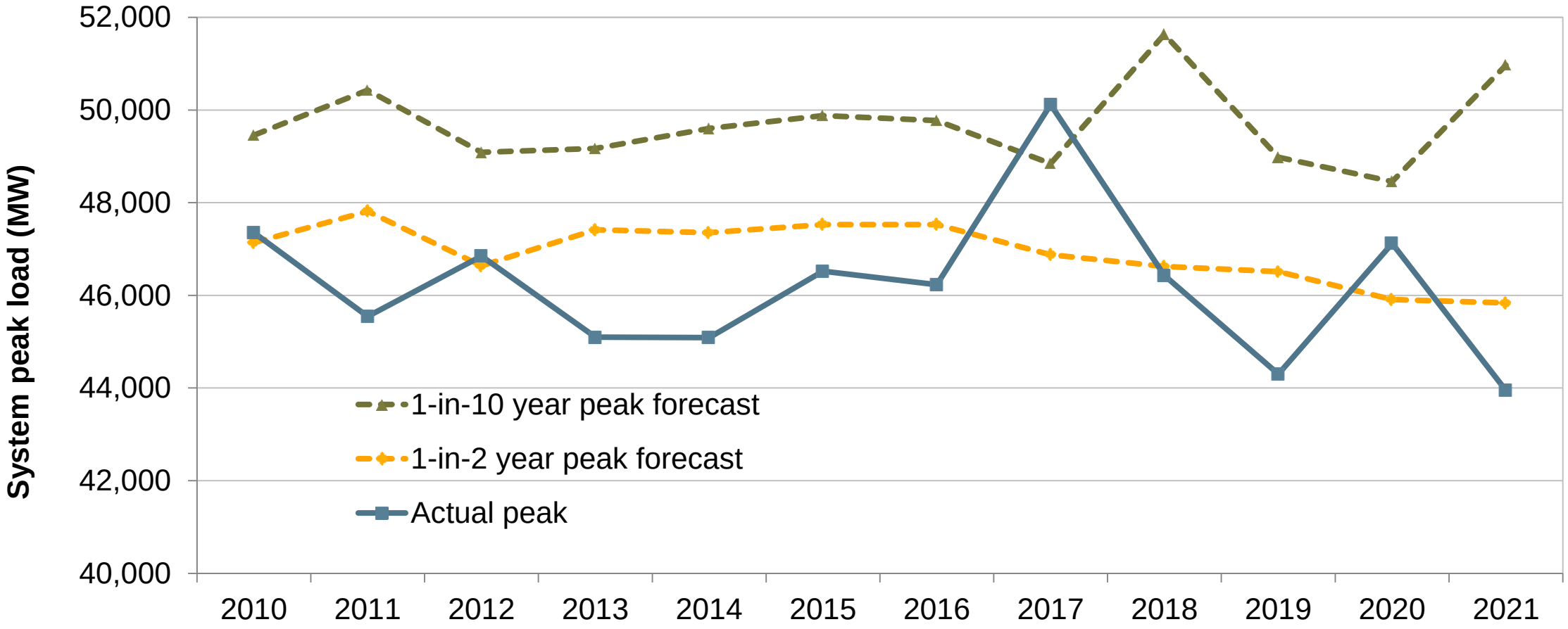
Higher gas prices in one region often result in higher electricity prices across the ISO footprint



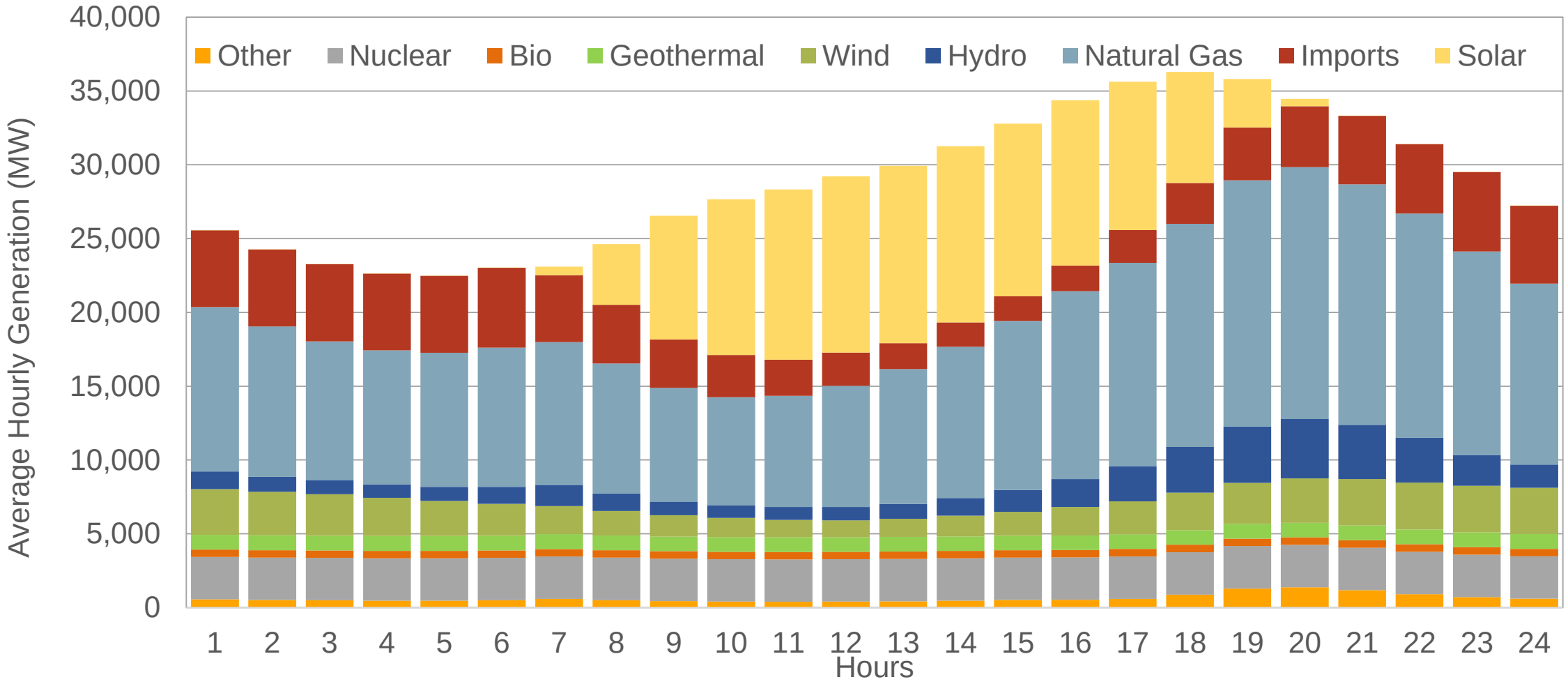
During high load periods, bilateral market prices in some other balancing areas were often significantly higher than ISO market prices



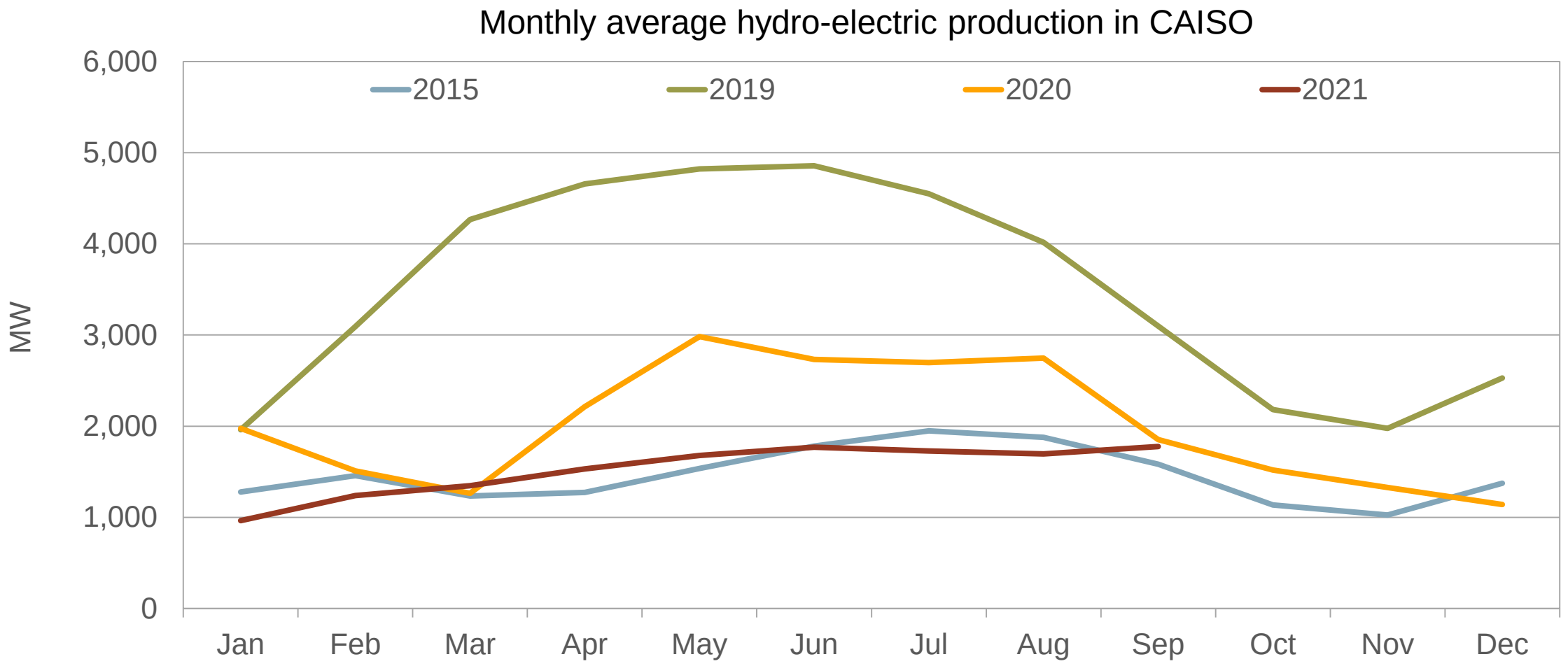
ISO load peaked at about 43,947 MW on September 8, well below any peak load reported in the last decade



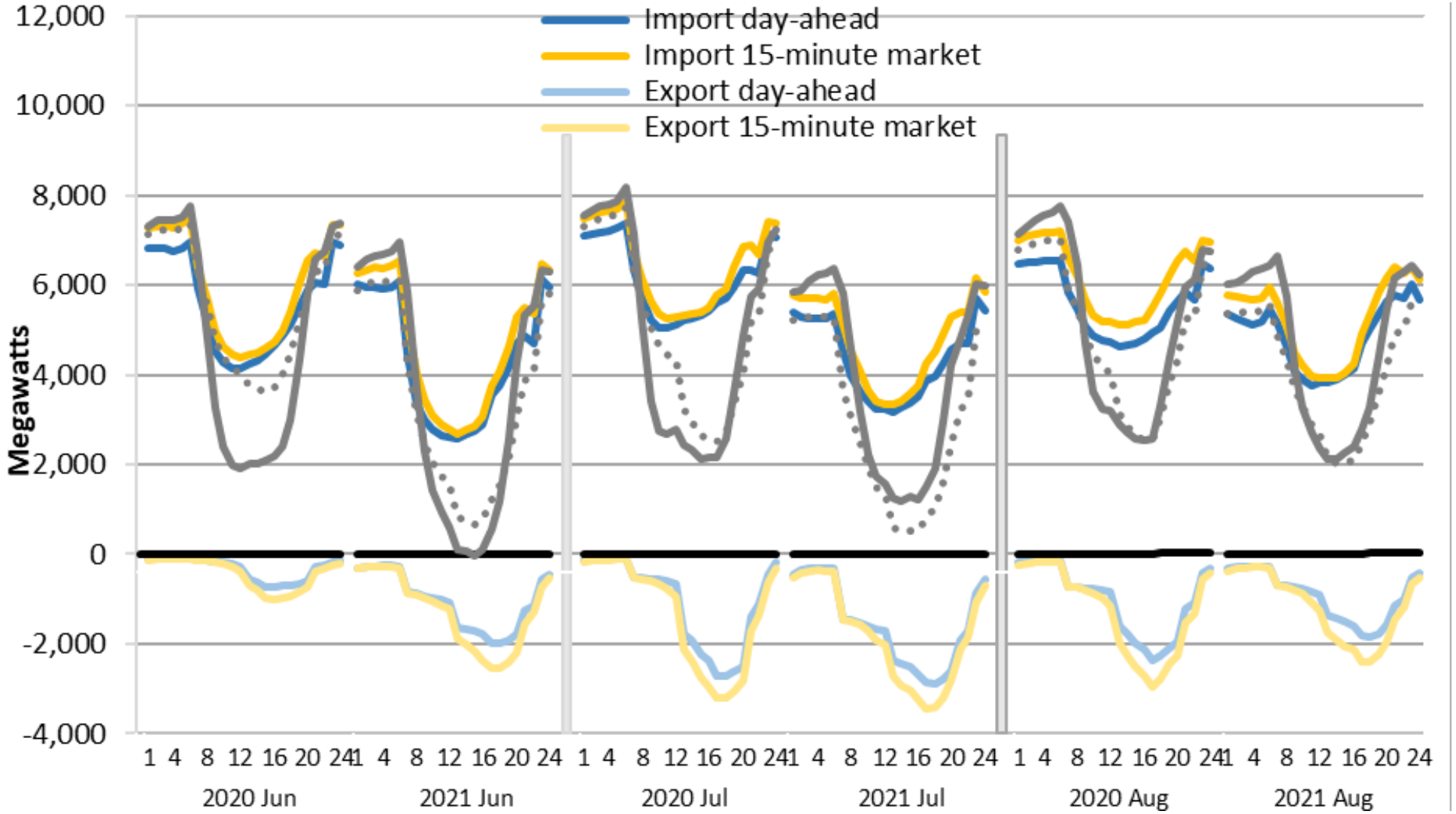
Average hourly generation by fuel type (Q3 2021)



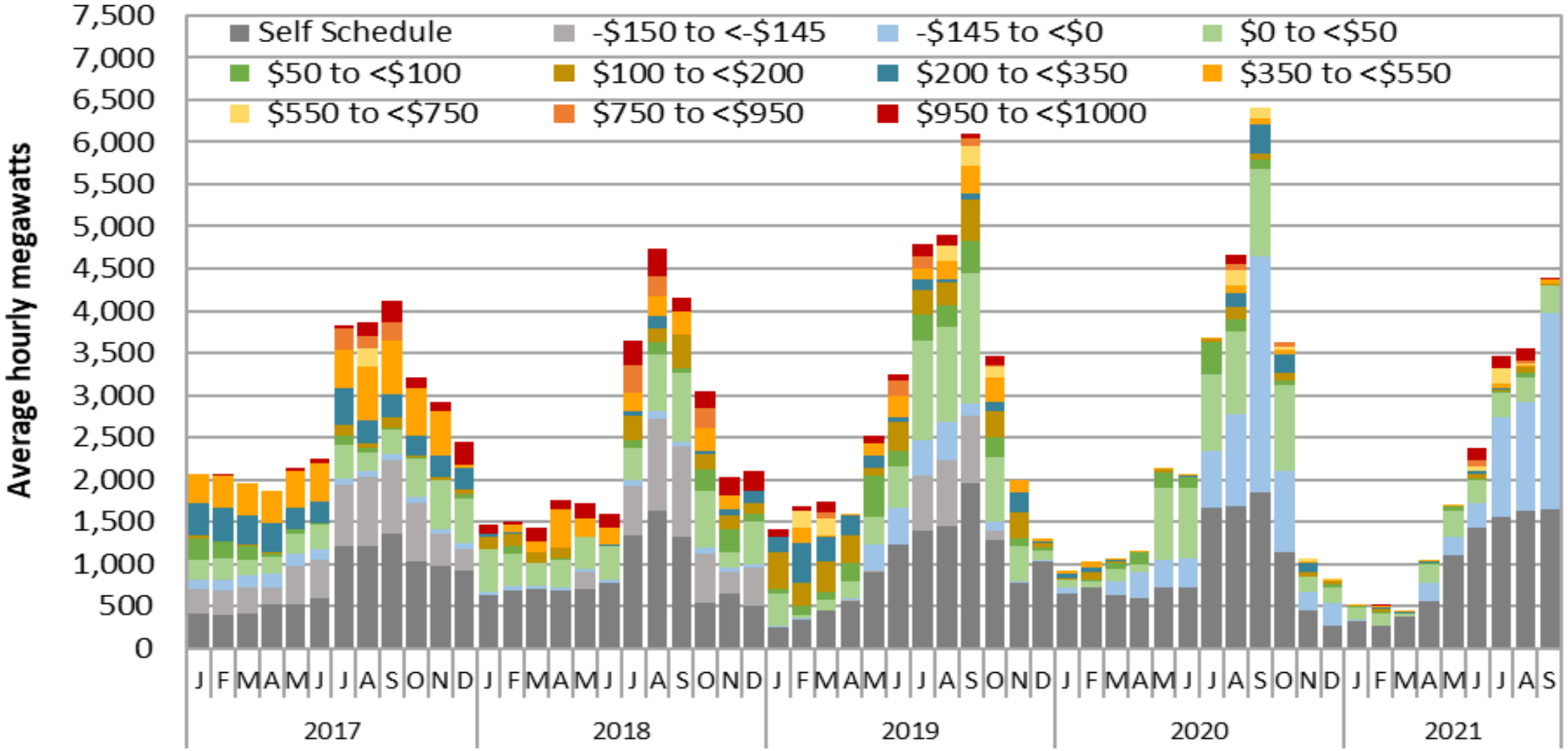
Lower hydro-electric production in California contributes to higher costs



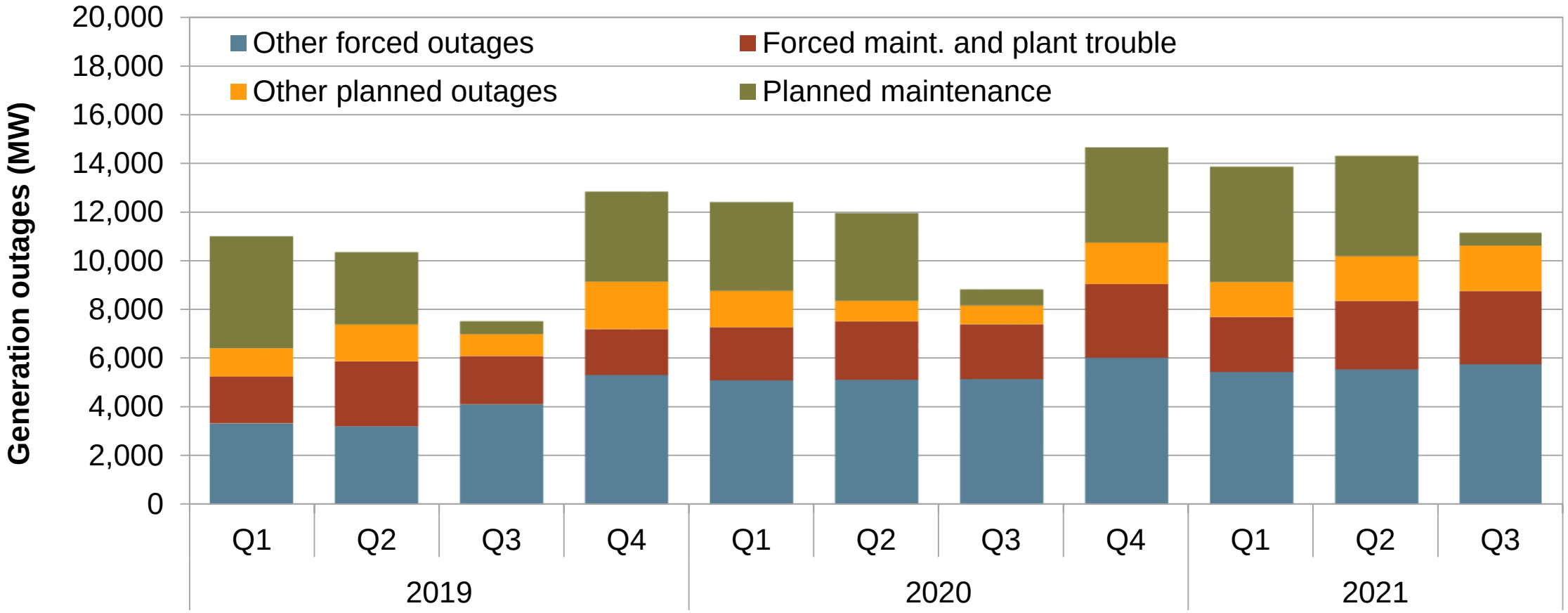
Average hourly net interchange decreases in all hours



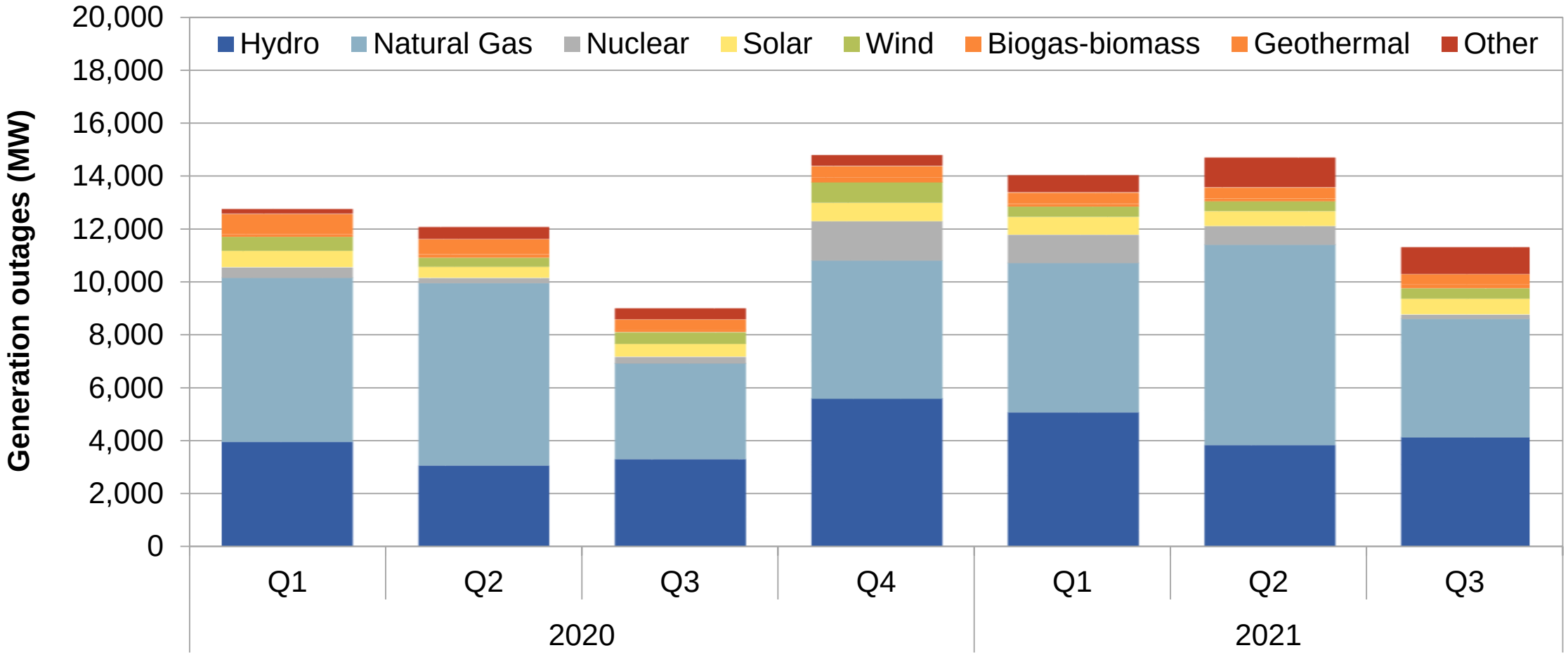
Resource adequacy import bids decrease in price and volume



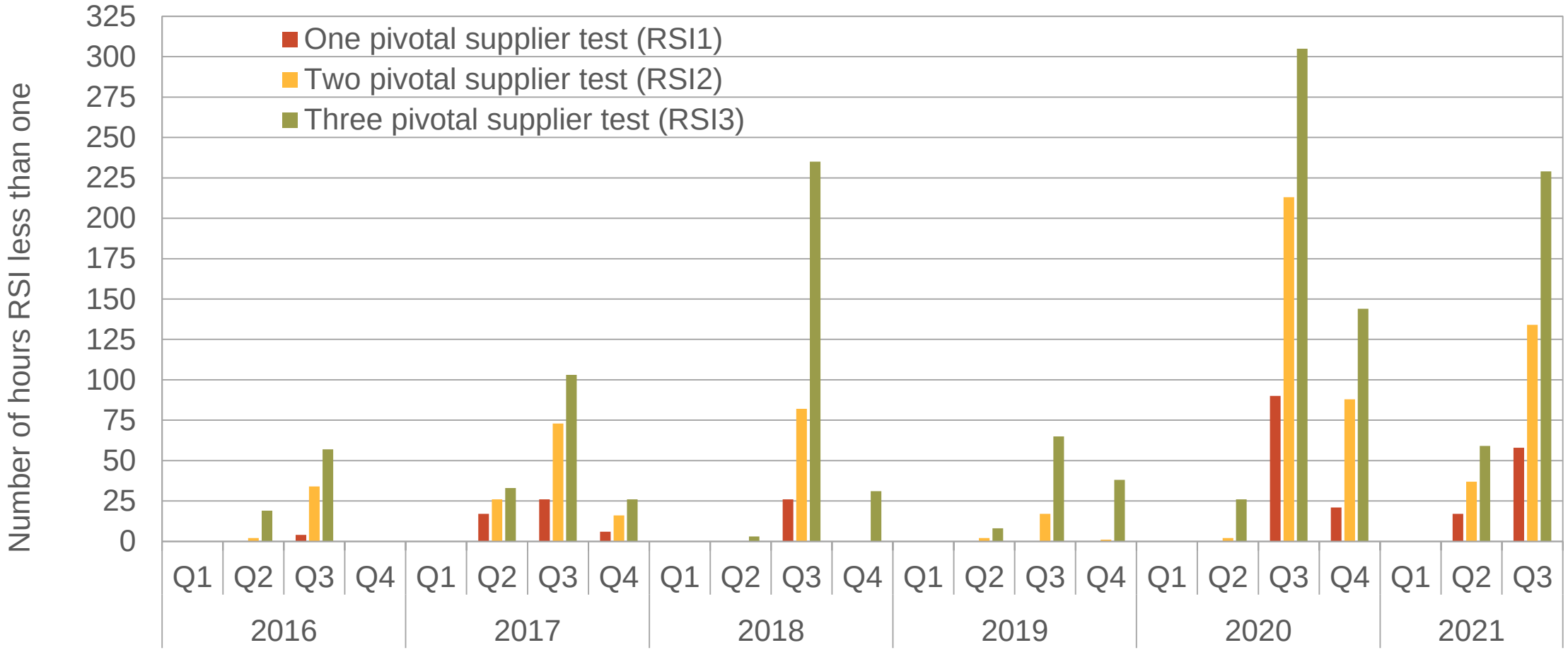
Generation outages increase relative to Q3 in prior years



Generation outages increase relative to Q3 in prior years, by fuel

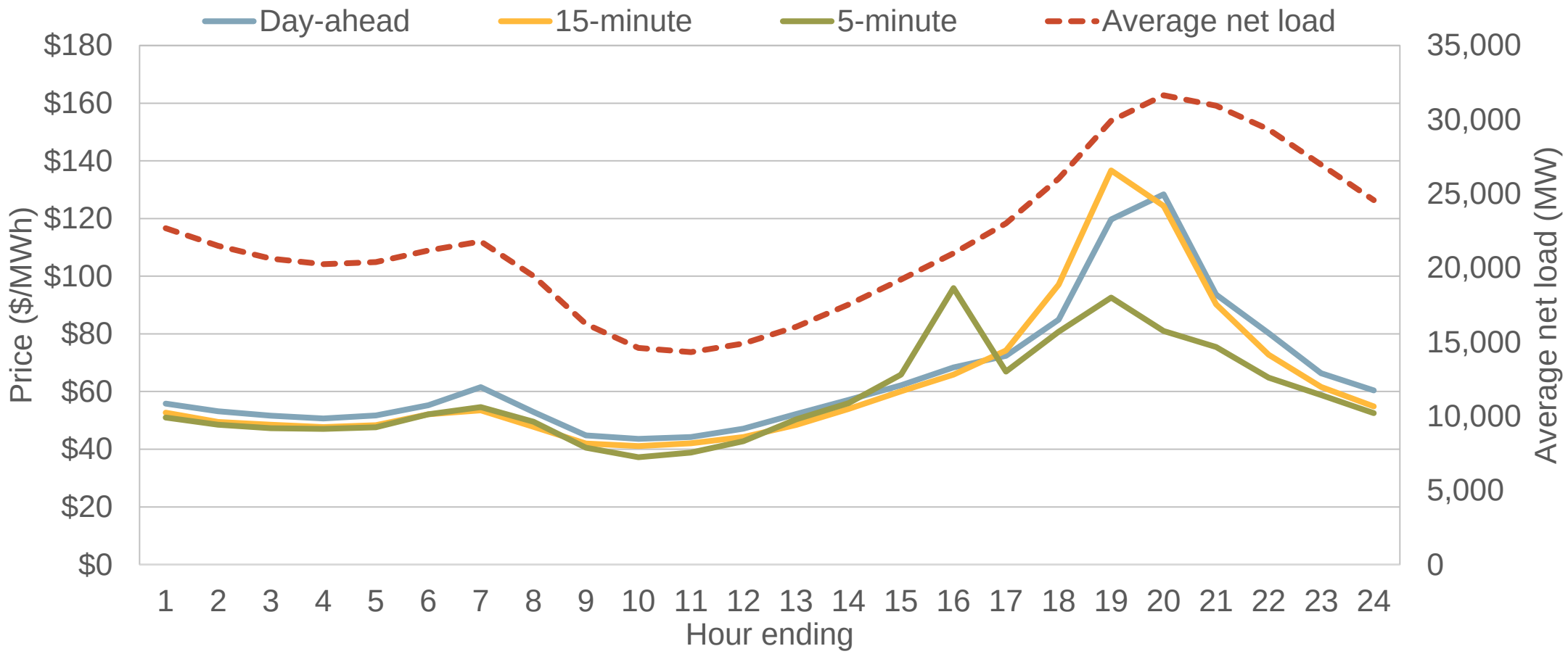


CAISO market was more structurally competitive than Q3 2020

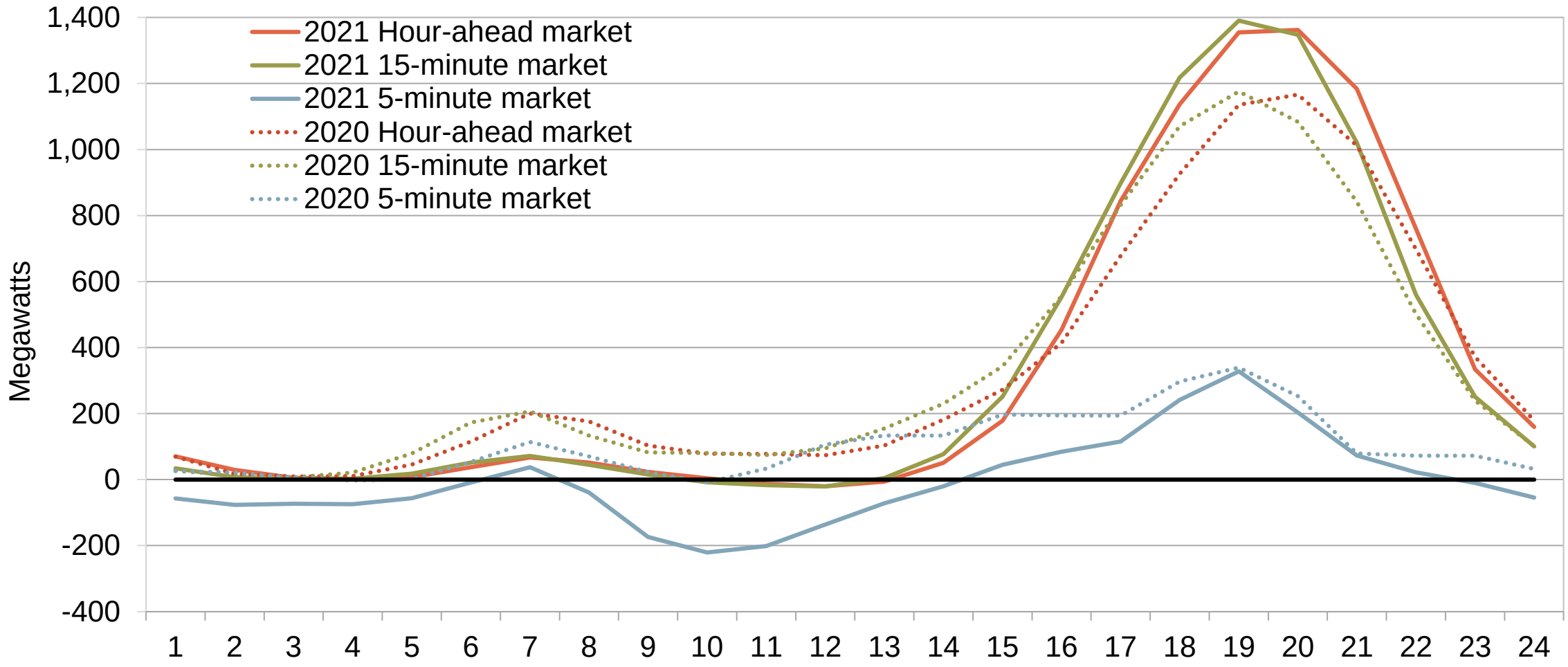


Lowest 500 residual supply index with largest one, two, or three suppliers excluded

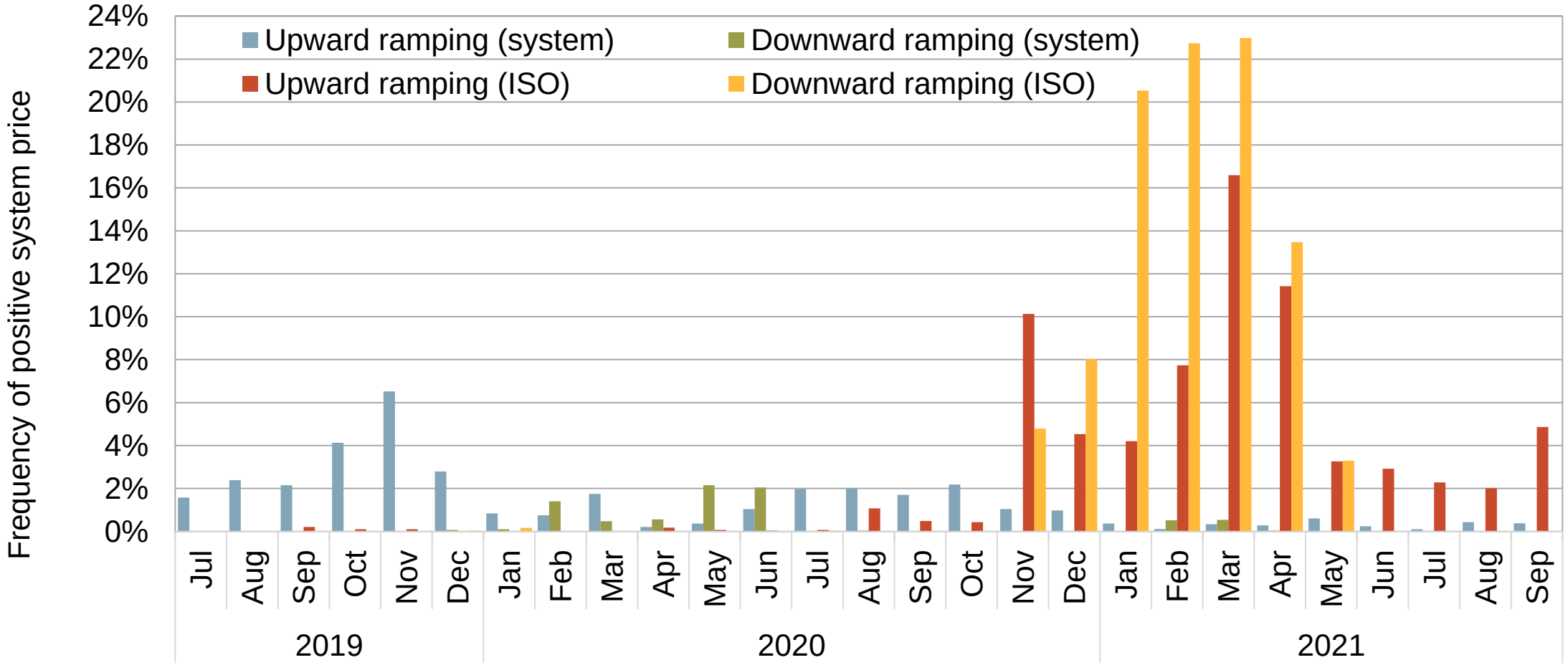
Average prices up – with highest average prices in net load peak hours, particularly day-ahead



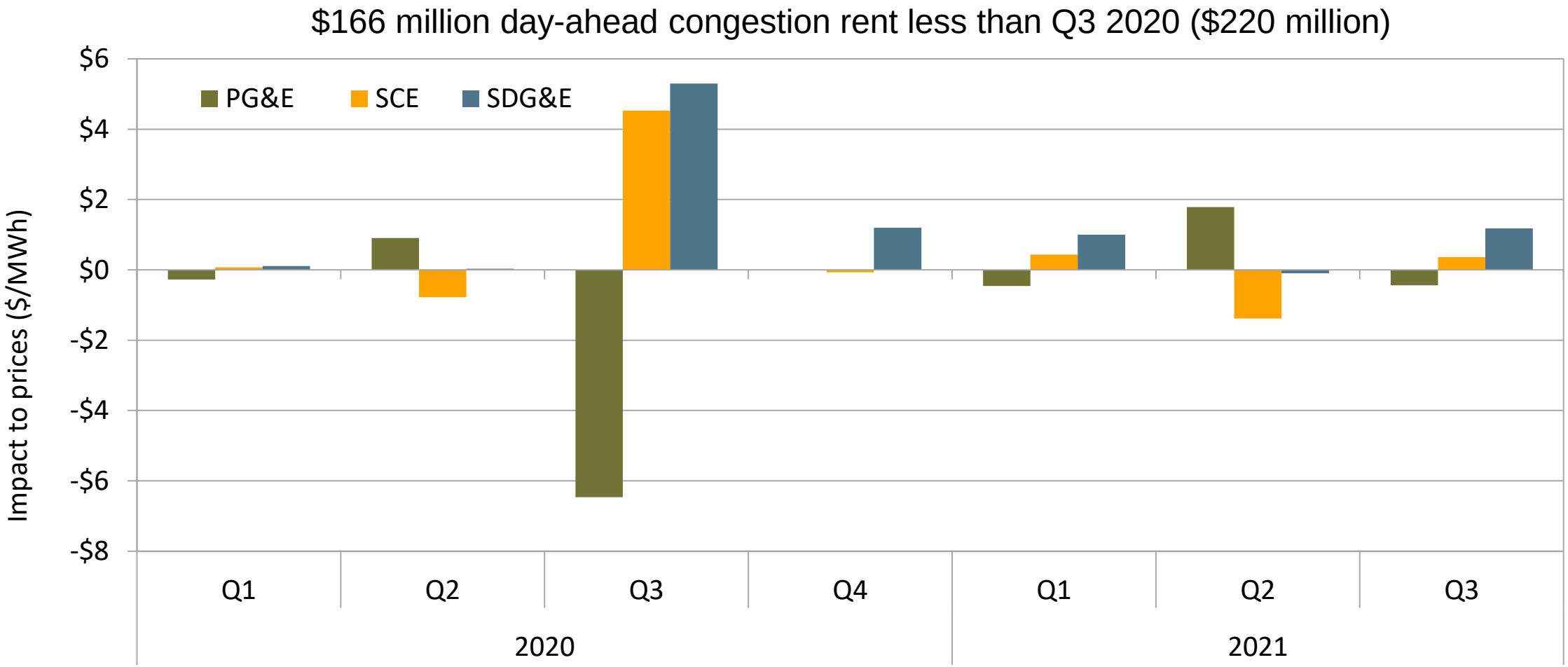
Imbalance conformance adjustments continue to increase



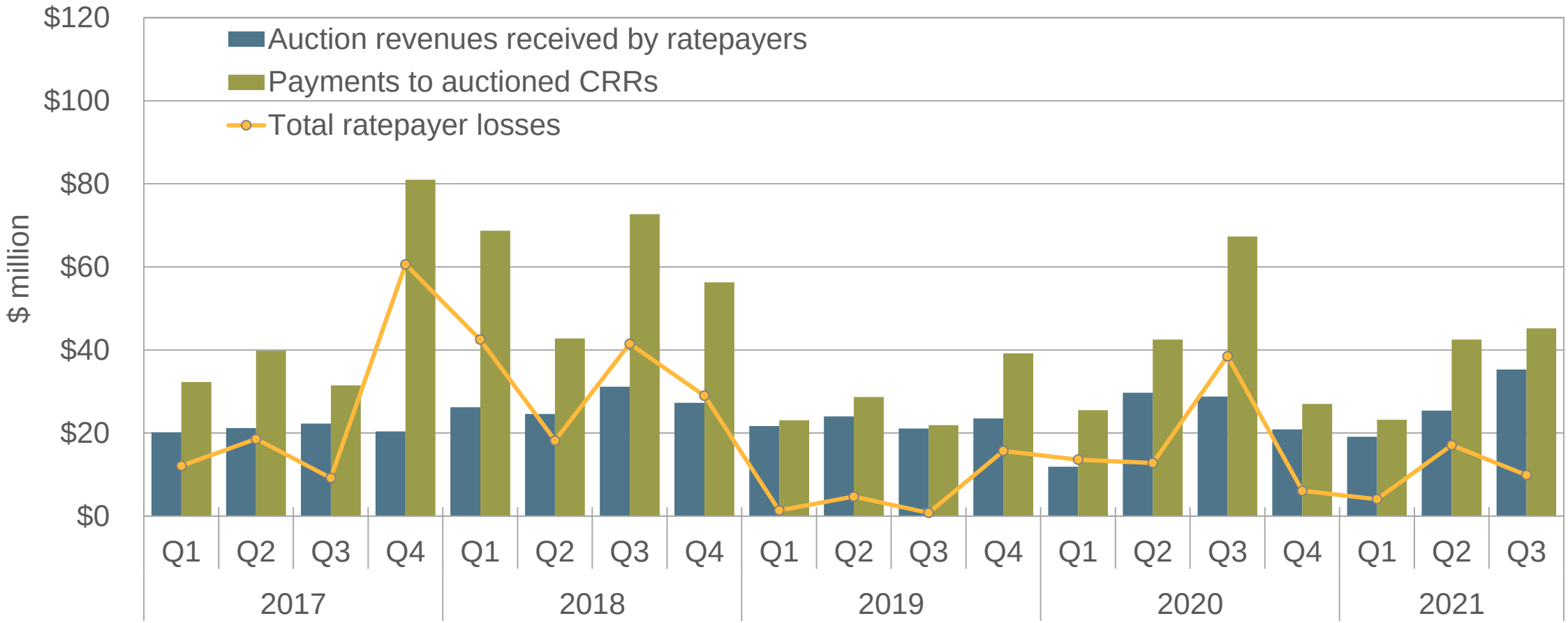
Monthly frequency of positive system or ISO flexible ramping shadow price (15-minute market)



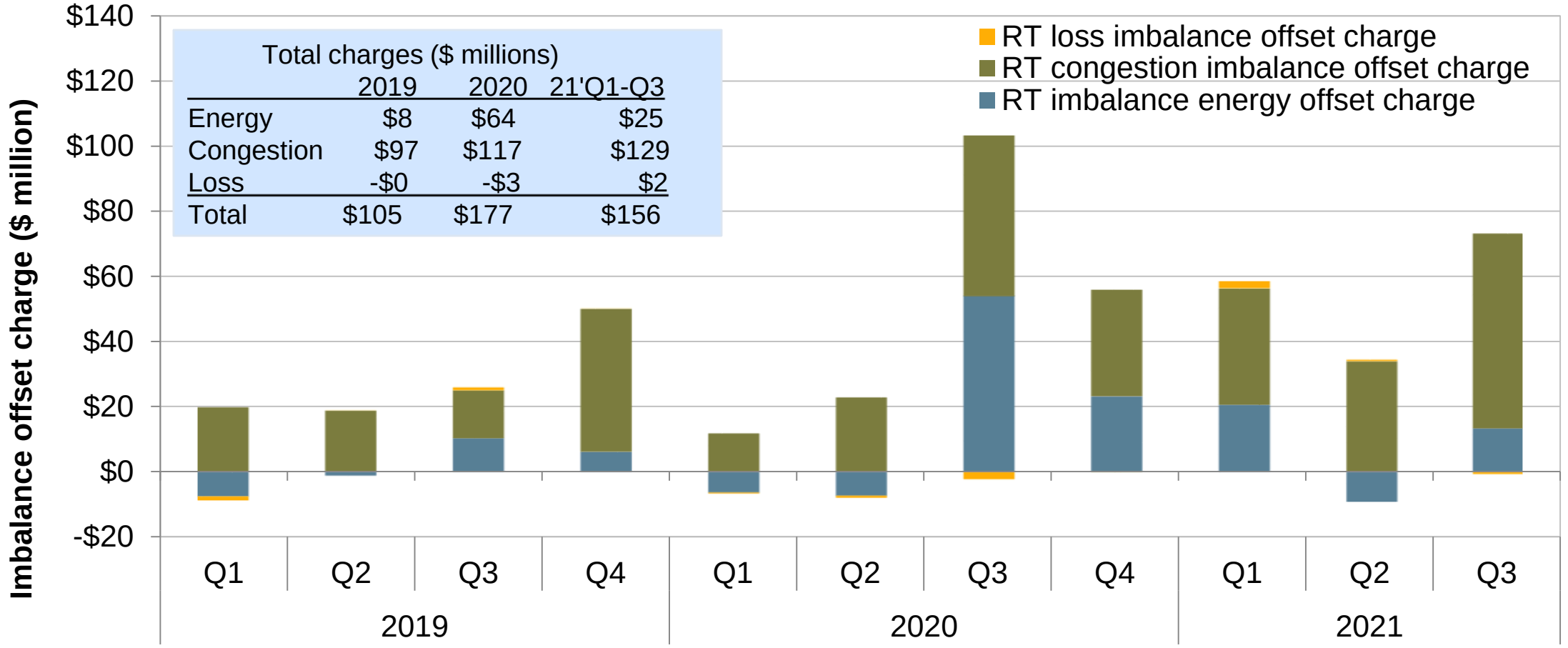
Congestion decreased relative to Q3 2020



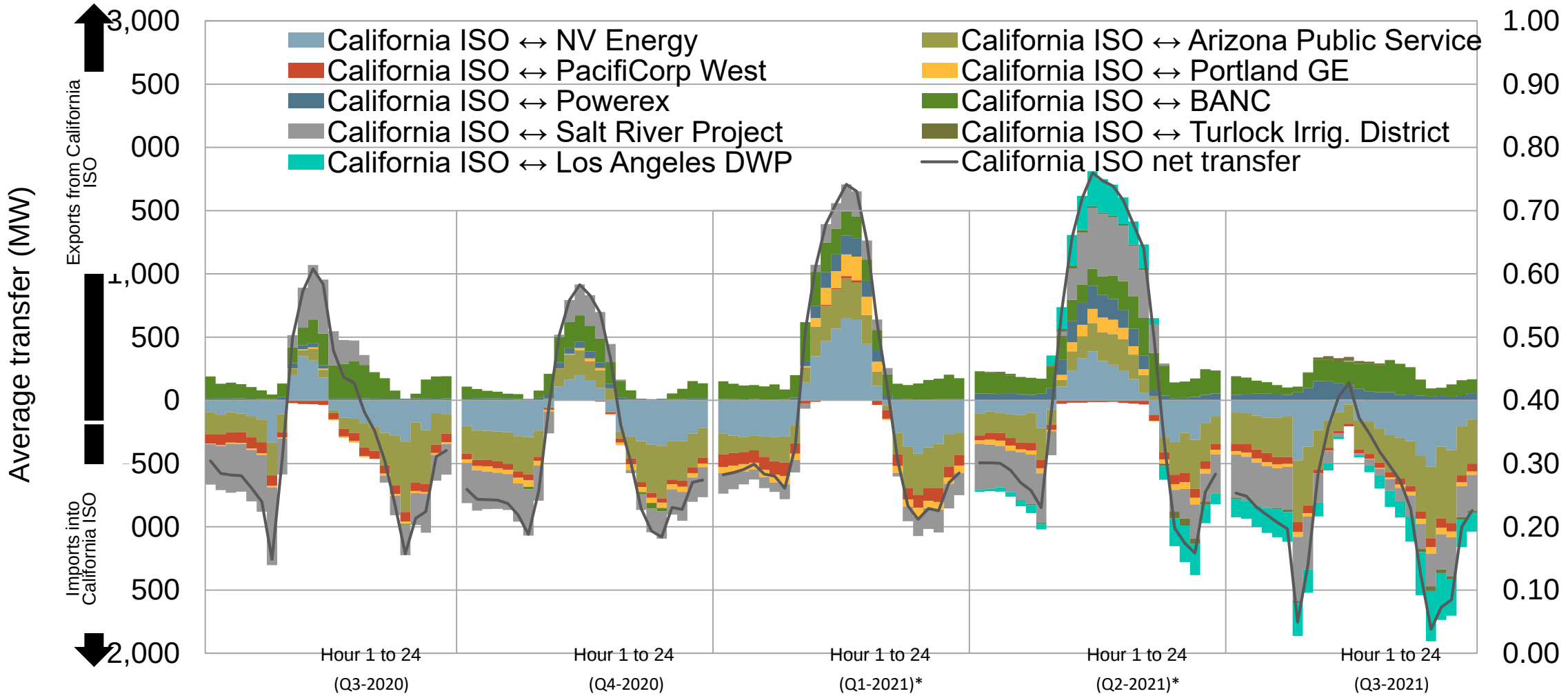
Congestion revenue rights auction revenues are estimated to be $10 million less than payments made to non-load-serving entities, about 6% of day-ahead congestion rent, well below average of 28% (2016-2018)



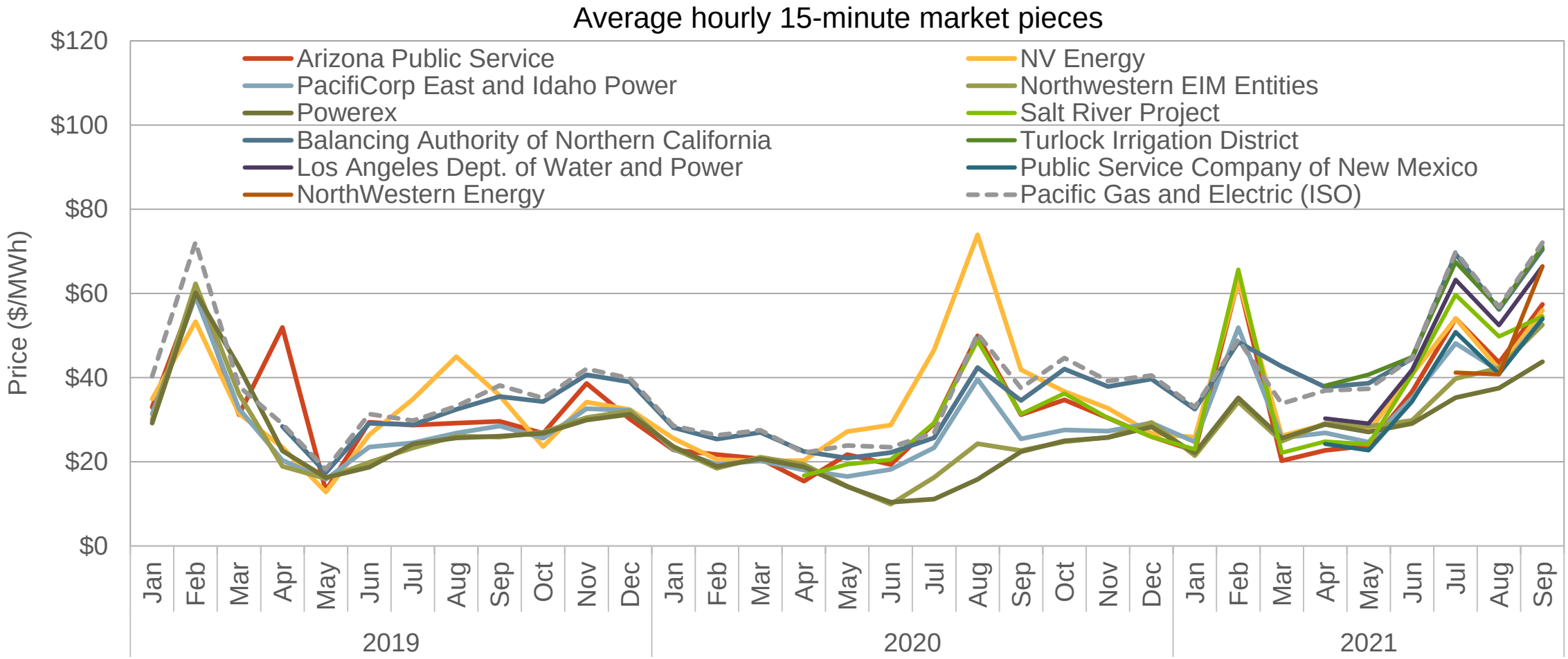
Real-time offset costs increased to $72 million in Q3, more than total ancillary services ($51 million) and bid cost recovery ($26 million)



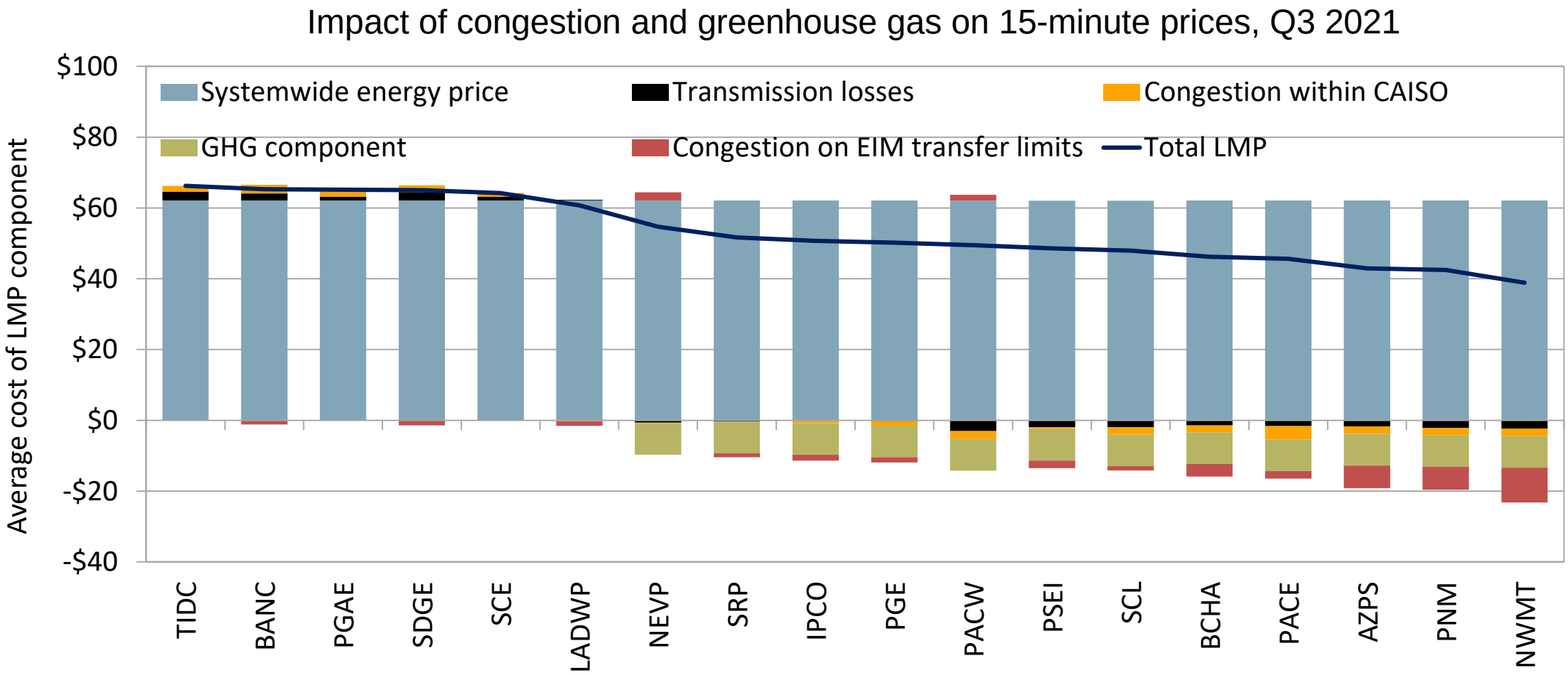
California ISO – EIM average hourly 15-minute market transfer



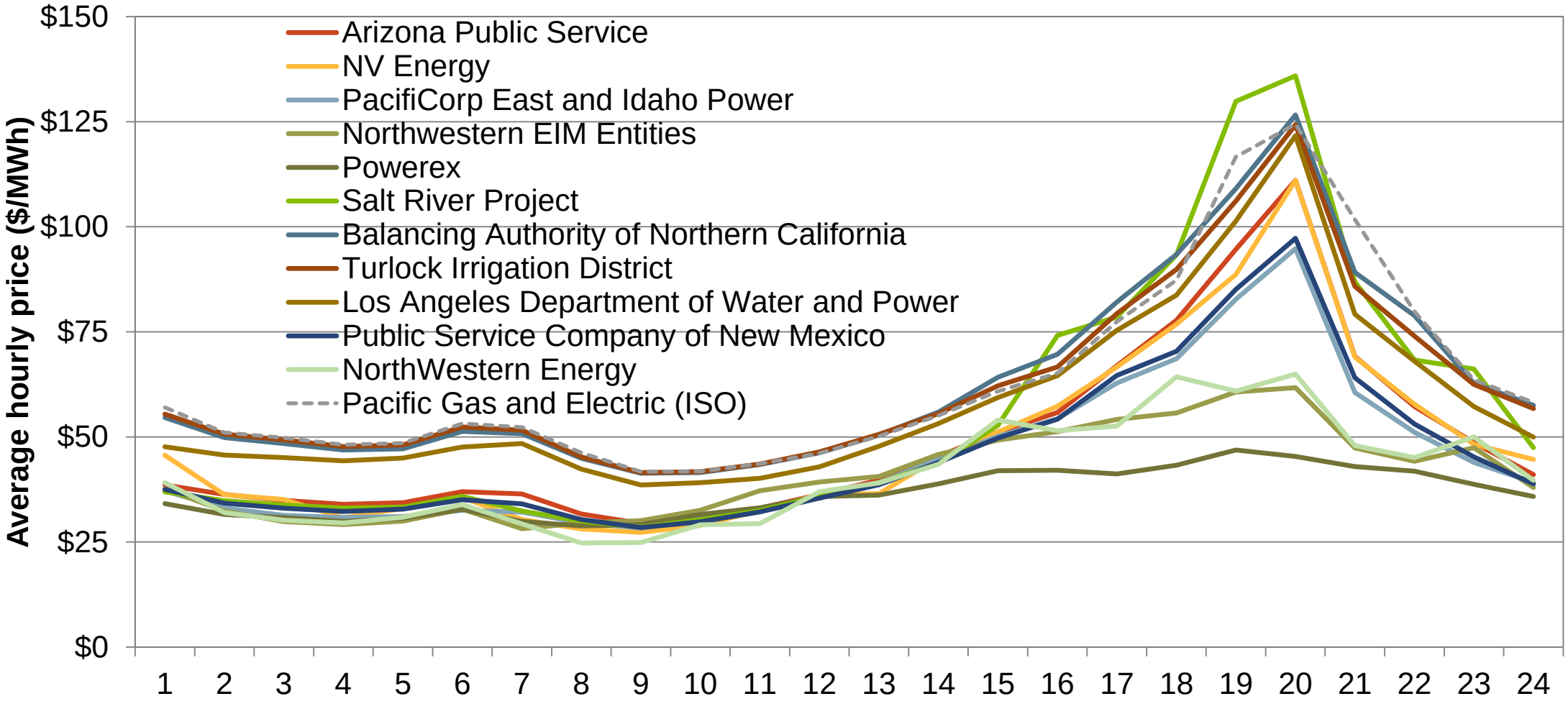
Peak prices in Northern CA exceeded the rest of the system



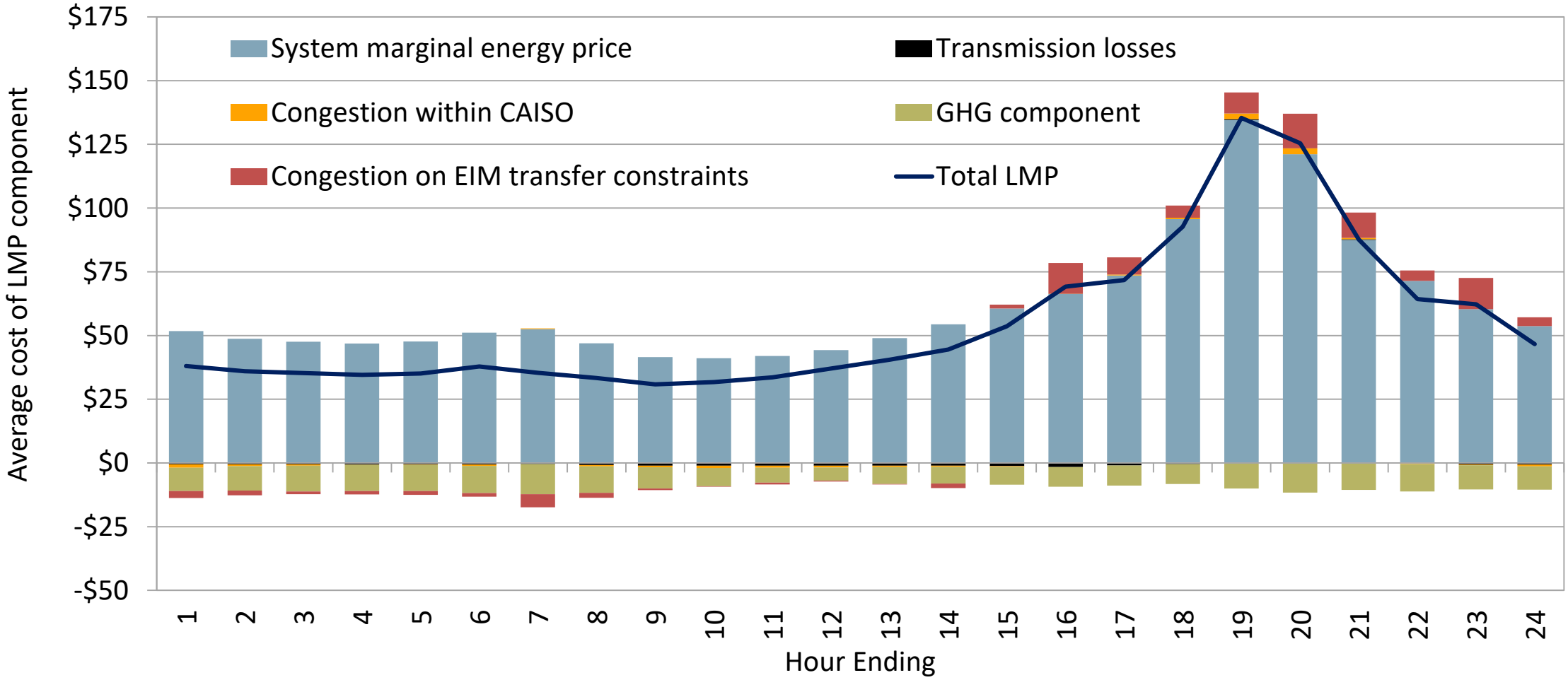
Prices and transfers reflect differences in regional supply conditions and transfer limitations



Hourly 15-minute market prices Q3



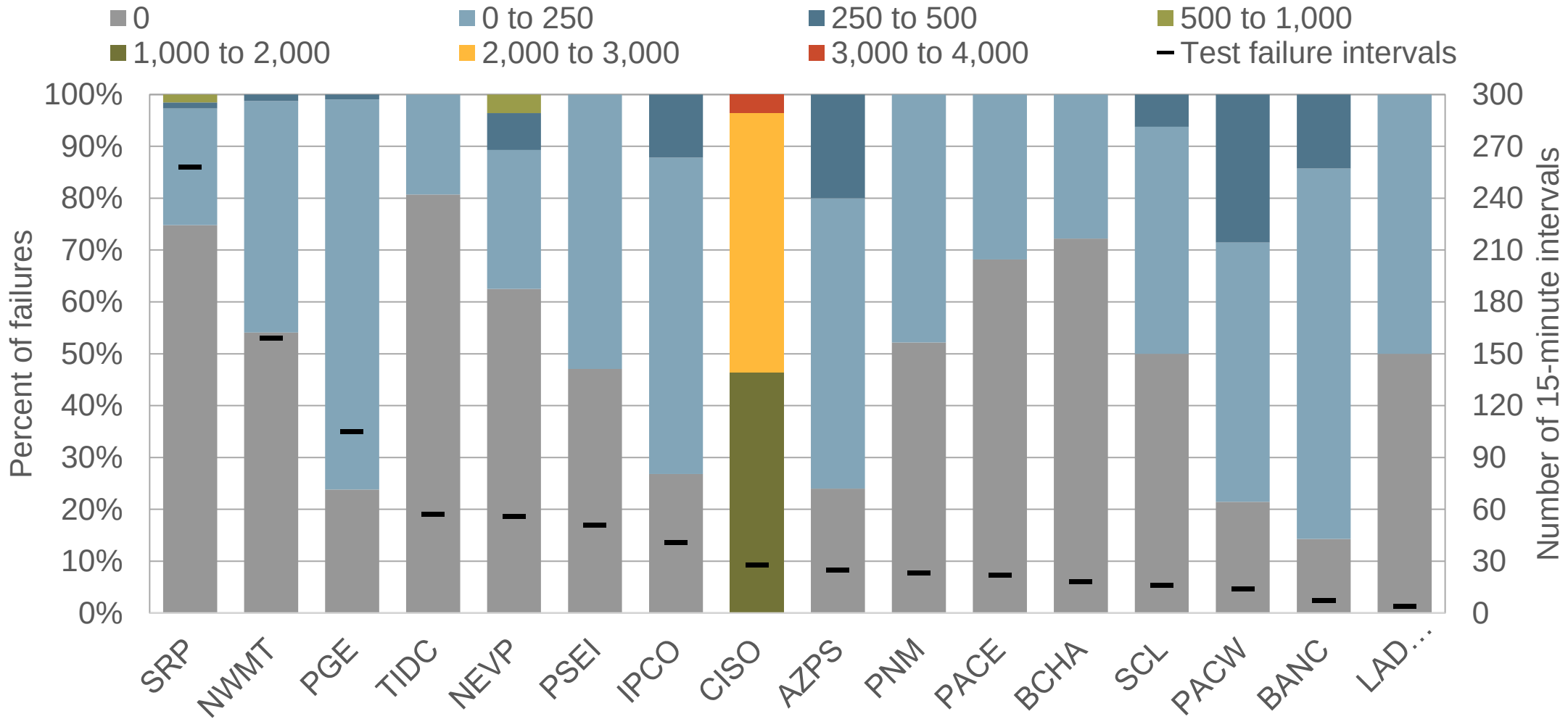
Salt River Project average 15-minute price by component



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 is working 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**

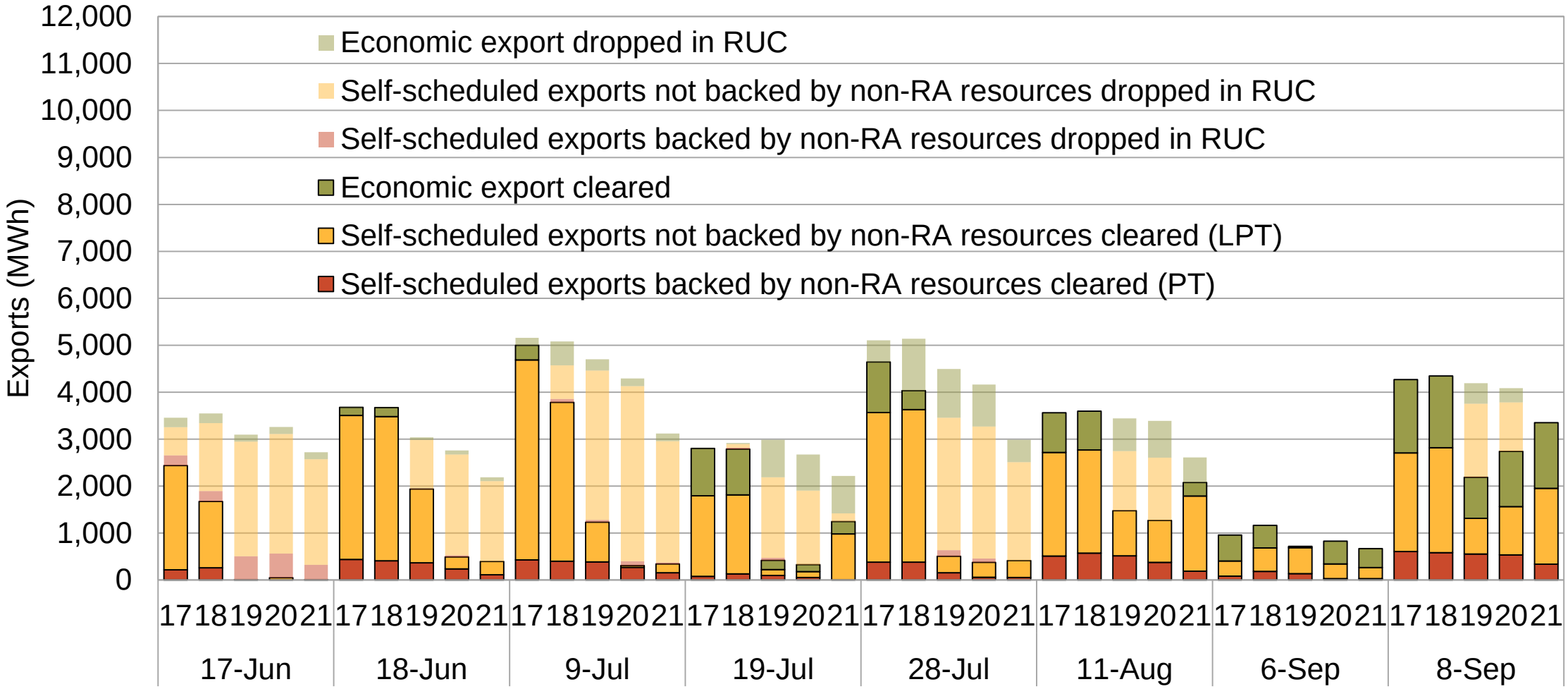
Upward capacity/sufficiency test failure intervals by *incremental* import limit amount



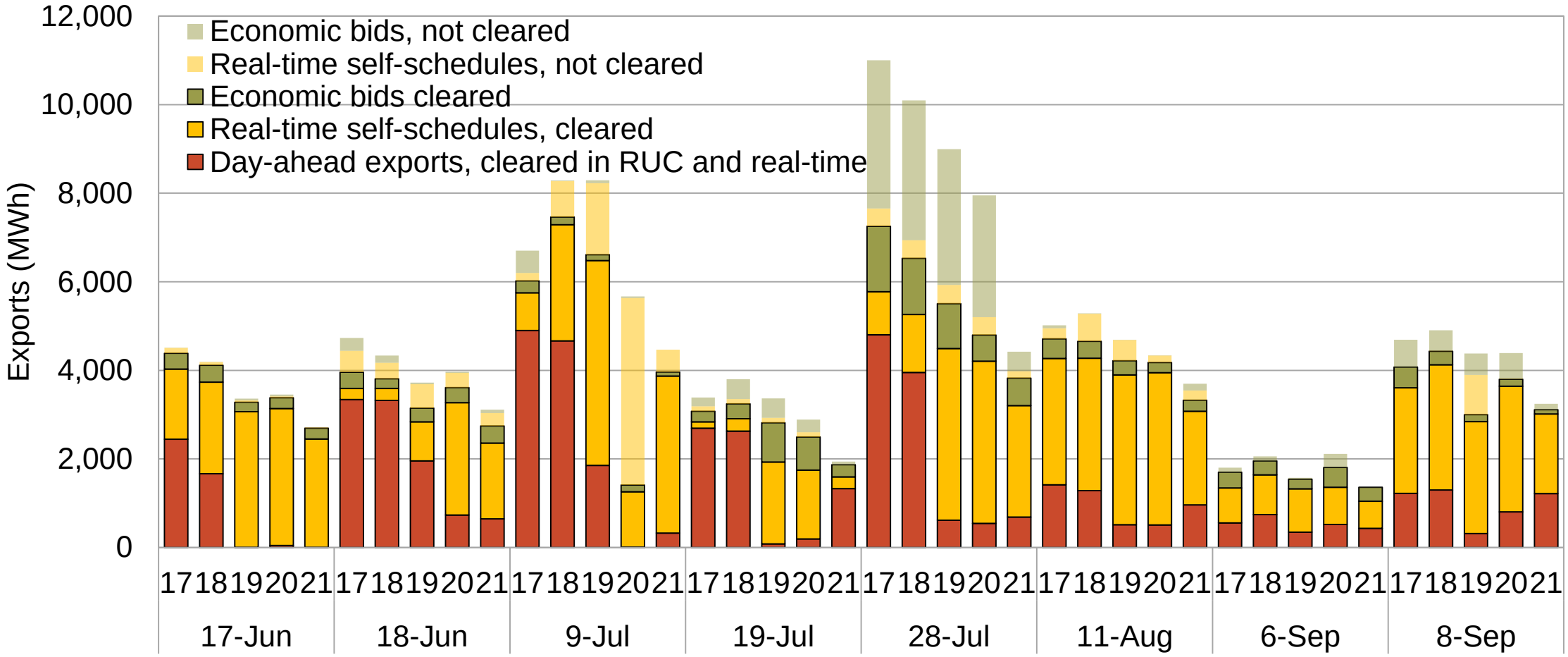
The ISO implemented several market enhancements designed to address concerns raised following load curtailment event of August 2020

Enhancement	Implementation date	Summary	Standing or triggered feature
Interconnection process enhancements	May 25, 2021	Remove cap on behind-the-meter expansions and award interim deliverability on temporary basis	Standing feature
Import market incentives during tight system conditions	June 15, 2021	Provide make-whole payments for hourly intertie block schedules issued through HASP[66]	Triggered during tight system conditions[67]
Real-time scarcity pricing enhancements	June 15, 2021	Price all operating reserves at energy bid cap when dispatched to provide energy in a system emergency[68]	Triggered during stage 2 emergencies
Add uncertainty to EIM resource capacity test	June 15, 2021	Add uncertainty requirement to EIM resource sufficiency evaluation	Standing feature
Management of storage resources during tight system conditions	June 30, 2021	Minimum state of charge (MSOC) requirement[69]	Triggered when RUC identifies shortfalls
Substitution for capacity on planned outage	June 30, 2021	Requires scheduling coordinators for all resource adequacy resource to provide substitute capacity to be approved for planned outages	Standing feature
Publication of intertie schedules information on OASIS	July 26, 2021	Provide additional information on OASIS	Standing feature
Load, export, and wheeling priorities	August 4, 2021	Defines high-priority and low-priority self-schedule wheels and establishes new priority ranking for load, exports, and wheels	Standing feature (but sunsets after May 31, 2022)
Reliability demand response dispatch and real-time price impacts	August 4, 2021	Expands functionality to dispatch RDRR resources in FMM, adds expected RDRR load drop back into real-time load forecasts	Triggered by activation of RDRR
New displays in Today's outlook for projected conditions	August 17, 2021	Daily resource adequacy capacity trends for current day and upcoming 7 days	Standing feature

Significant volumes of exports clearing the day-ahead market were curtailed through residual unit commitment process on high load days



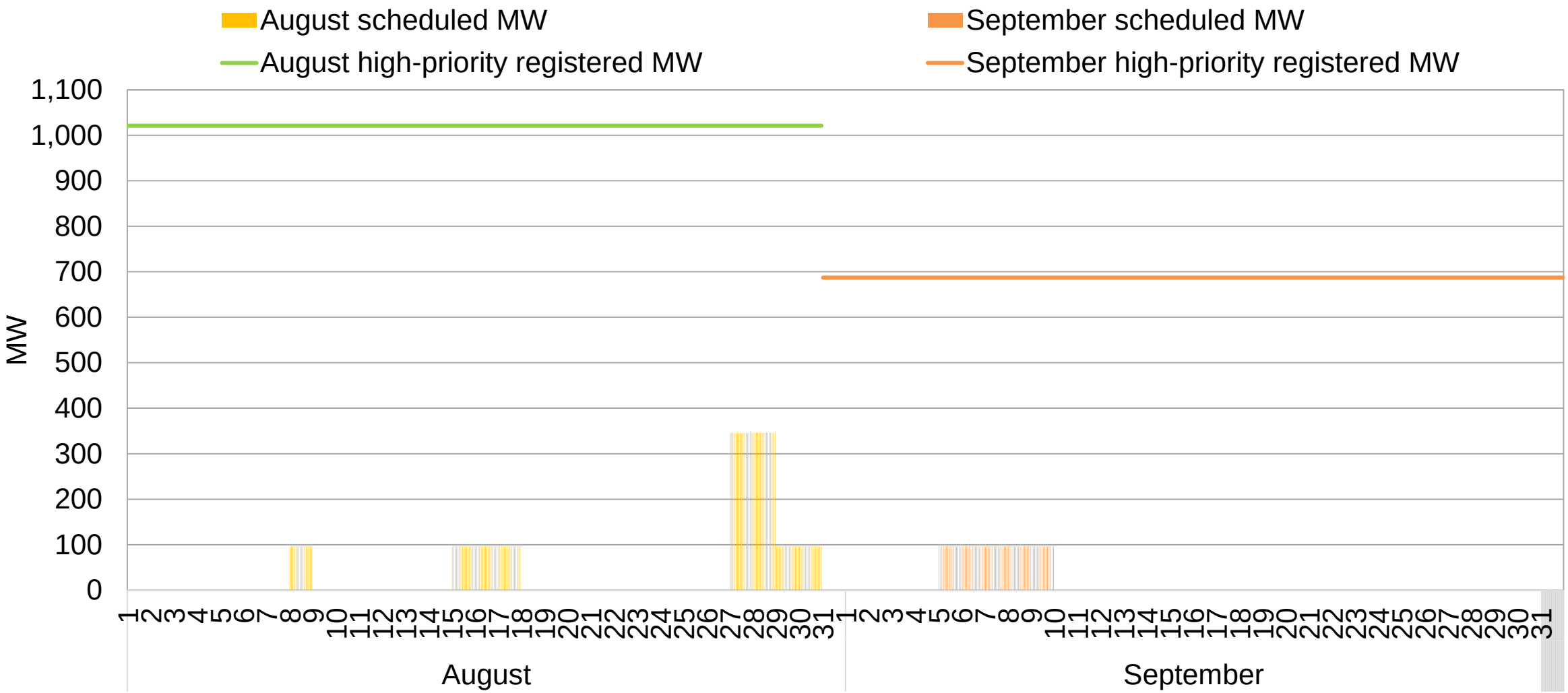
On these days, some exports rebid into the real-time market cleared, ultimately meeting high demand in other regions



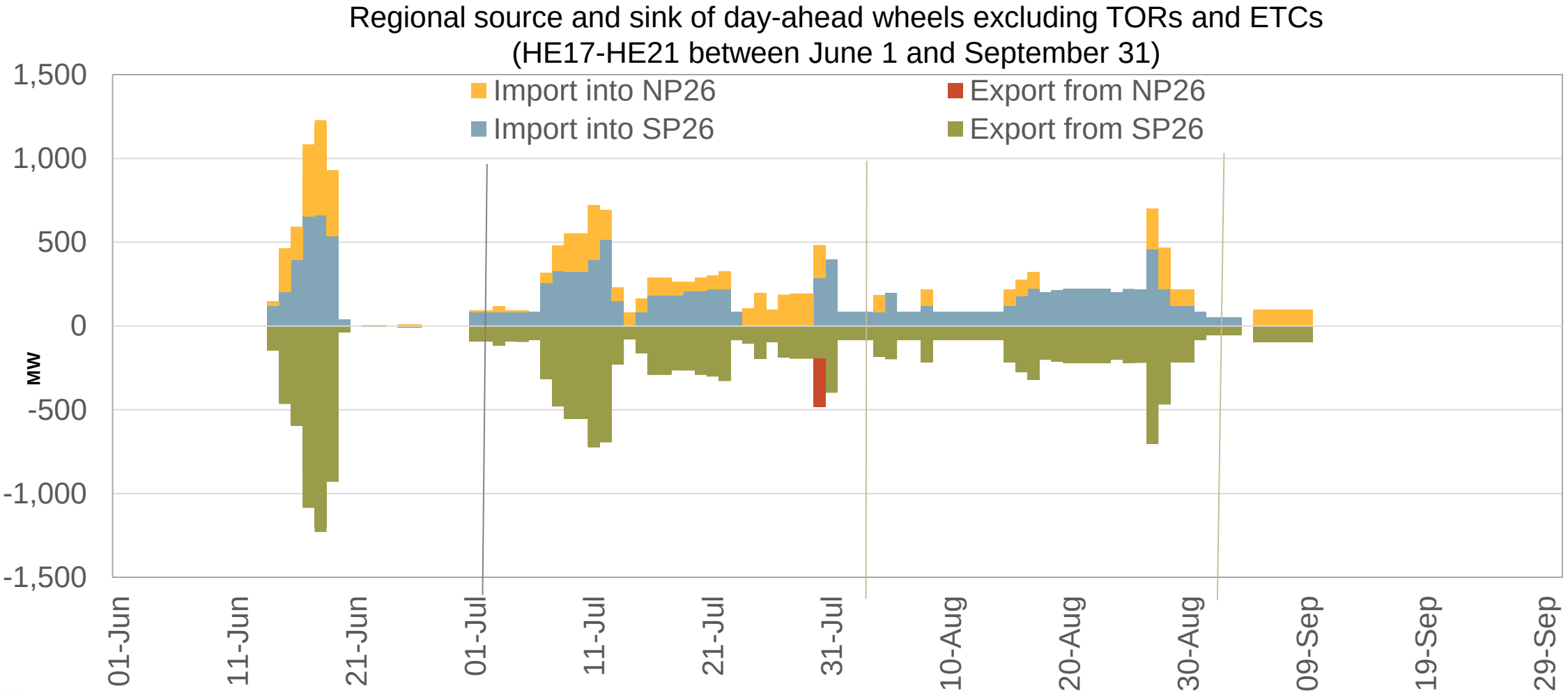
High priority exports and wheels

- Under August 4 tariff changes, exports clearing both the day-ahead market and residual unit commitment process can be curtailed before internal load in the real-time market.
- Exports are now required to demonstrate support from non-resource adequacy capacity to have equal priority with native load if curtailment is necessary. Thus far, no curtailment has been necessary.
- Under August 4 tariff changes, wheeling transactions are required to register 45 days in advance of the month and must demonstrate both a firm power supply contract to serve the load of an external load serving entity and monthly firm transmission to the CAISO border to qualify for prioritization equal to or above native load. Thus far, no curtailment has been necessary.

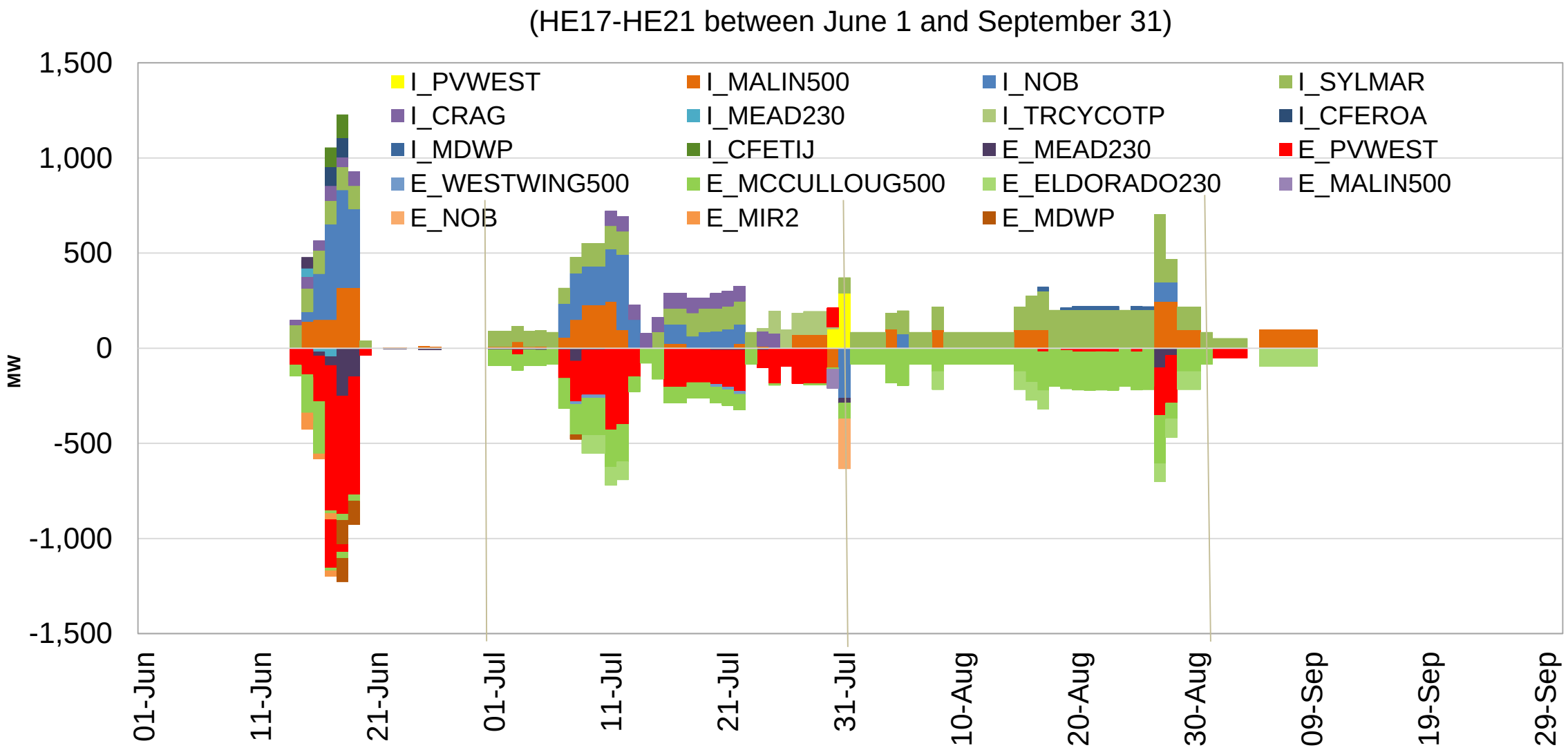
High priority wheels were not scheduled in the market on most days



The volume of wheeled energy increased significantly, compared to the summer of 2020



Source and sink of day-ahead wheels excluding TORs and ETCs



In the real-time market, less than 90% of system resource adequacy capacity was bid or self-scheduled during high load hours

Resource type	Total resource adequacy capacity (MW)	Day-ahead market				Real-time market			
		Adjusted for outages		Bids and self-schedules		Adjusted for outages/availability		Bids and self-schedules	
		MW	% of total RA Cap.	MW	% of total RA Cap.	MW	% of total RA Cap.	MW	% of total RA Cap.
Must-Offer:									
Gas-fired generators	19,388	17,751	92%	17,750	92%	17,417	90%	17,386	90%
Other generators	1,415	1,324	94%	1,324	94%	1,312	93%	1,311	93%
Subtotal	**20,803**	**19,075**	**92%**	**19,074**	**92%**	**18,729**	**90%**	**18,697**	**90%**
Other:									
Imports	3,185	3,091	97%	3,041	95%	3,159	99%	2,886	91%
Imports - MSS	293	293	100%	236	81%	293	100%	240	82%
Use-limited gas units	8,581	8,264	96%	8,212	96%	8,249	96%	8,189	95%
Hydro generators	5,889	5,244	89%	4,901	83%	5,201	88%	4,870	83%
Nuclear generators	2,893	2,887	100%	2,868	99%	2,874	99%	2,856	99%
Solar generators	3,786	3,767	99%	2,702	71%	3,724	98%	2,697	71%
Wind generators	1,310	1,306	100%	964	74%	1,304	100%	1,013	77%
Qualifying facilities	881	859	98%	822	93%	846	96%	804	91%
Demand response	261	261	100%	188	72%	259	99%	109	42%
Storage	1,166	1,071	92%	1,048	90%	1,057	91%	998	86%
Other non-dispatchable	362	344	95%	330	91%	333	92%	331	91%
Subtotal	**28,607**	**27,387**	**96%**	**25,312**	**88%**	**27,299**	**95%**	**24,993**	**87%**
Total	**49,410**	**46,462**	**94%**	**44,386**	**90%**	**46,028**	**93%**	**43,690**	**88%**