



2018 Q1 Report

July 11, 2018

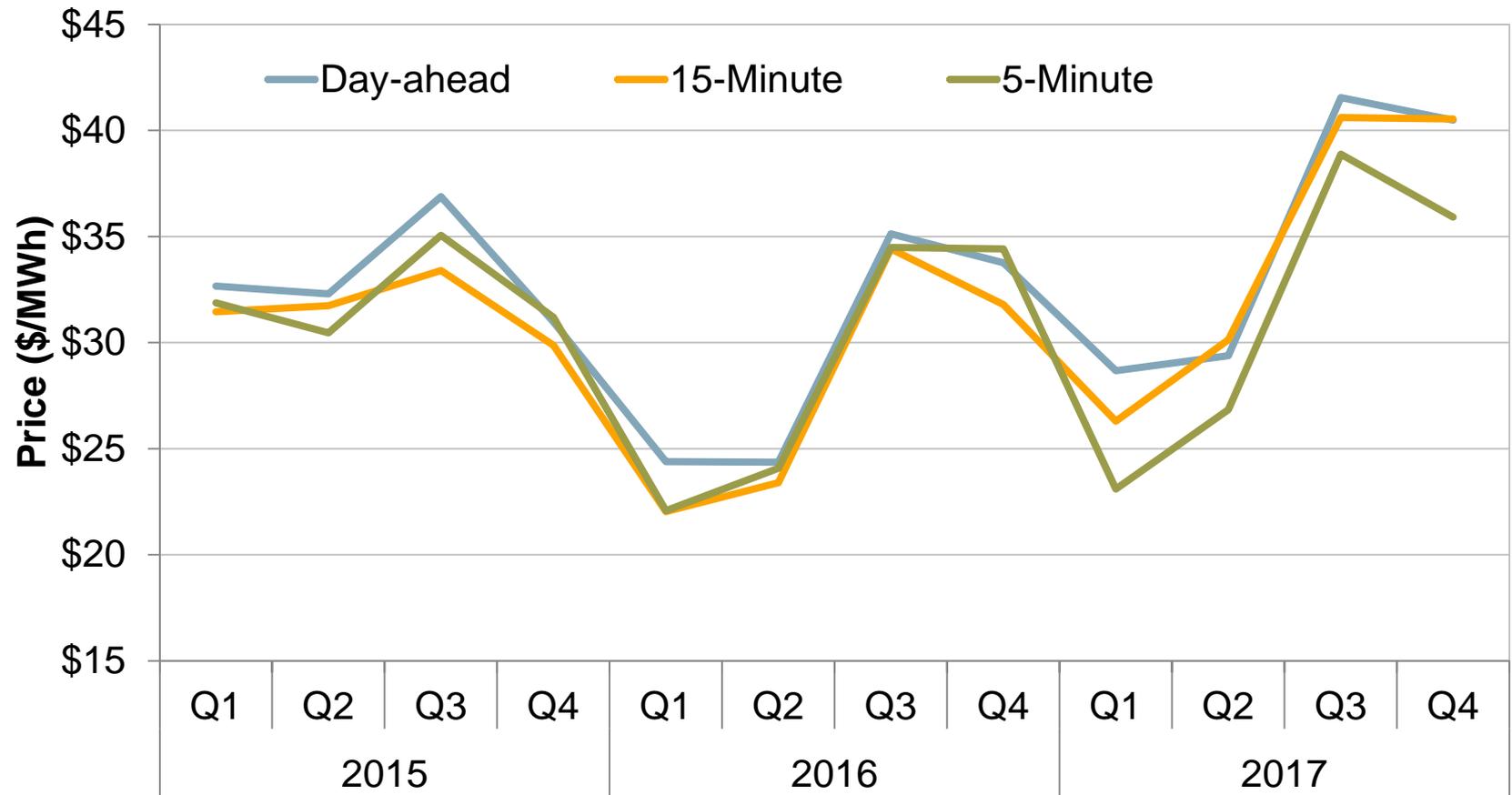
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Department of Market Monitoring, California ISO

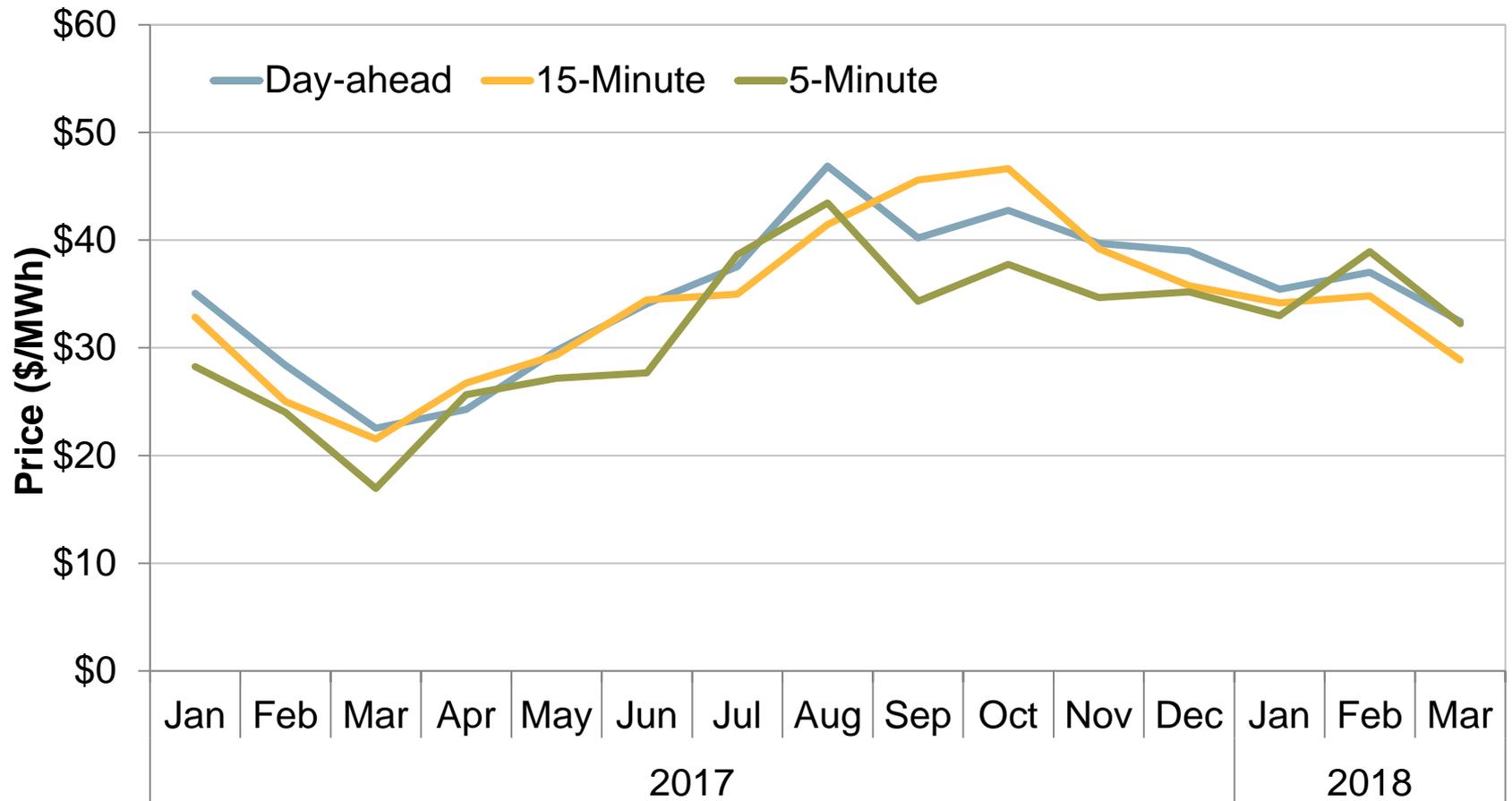
<http://www.caiso.com/Documents/2018FirstQuarterReportonMarketIssuesandPerformance.pdf>

<http://www.caiso.com/market/Pages/MarketMonitoring/AnnualQuarterlyIssuesPerformanceReports/Default.aspx>

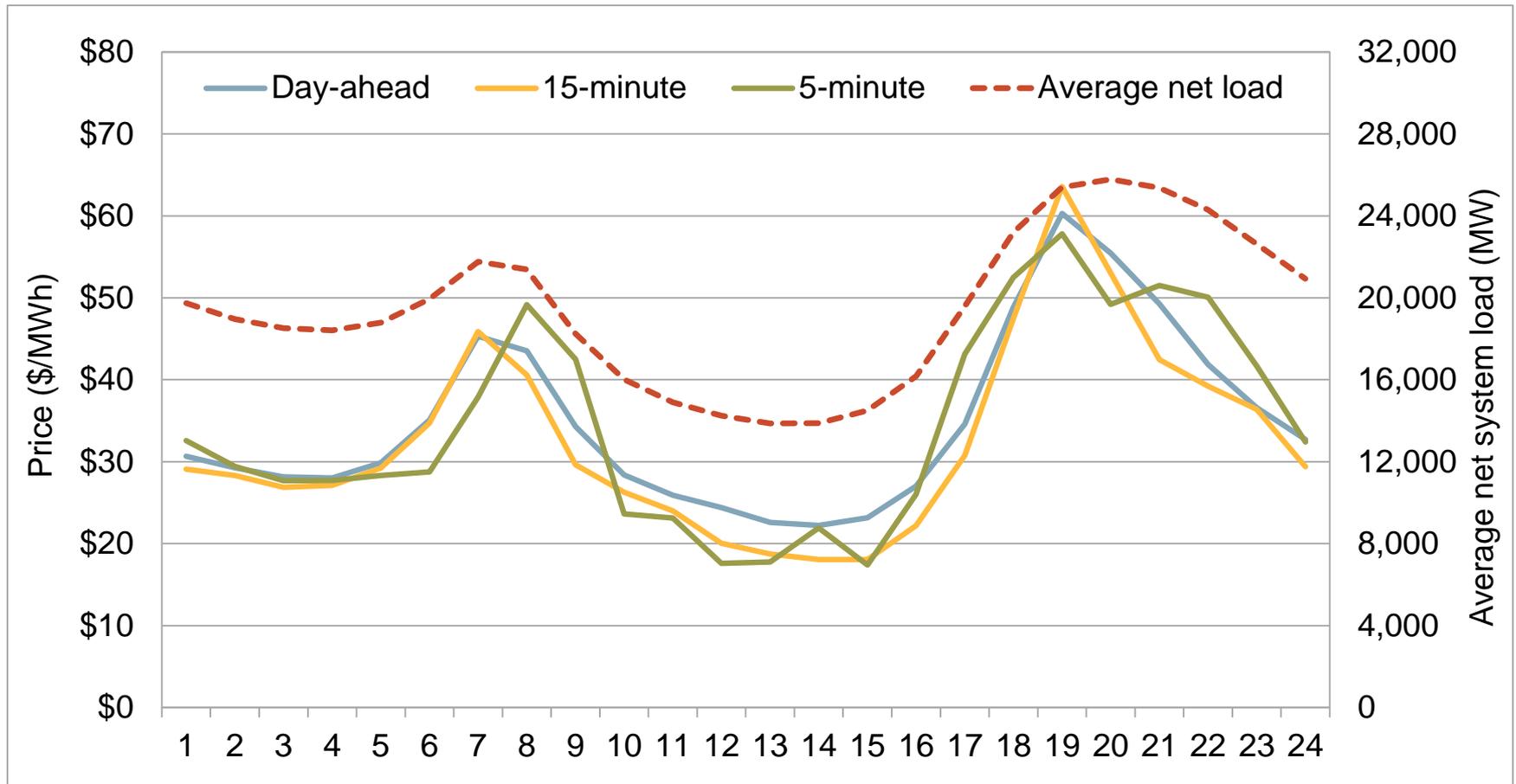
Average quarterly prices, 2015 - 2017



Q1 prices up \$6/MWh in 15 minute and day-ahead over Q1 2017;
 5 minute prices up \$12/MWh
 Average monthly prices (all hours) – system marginal energy price

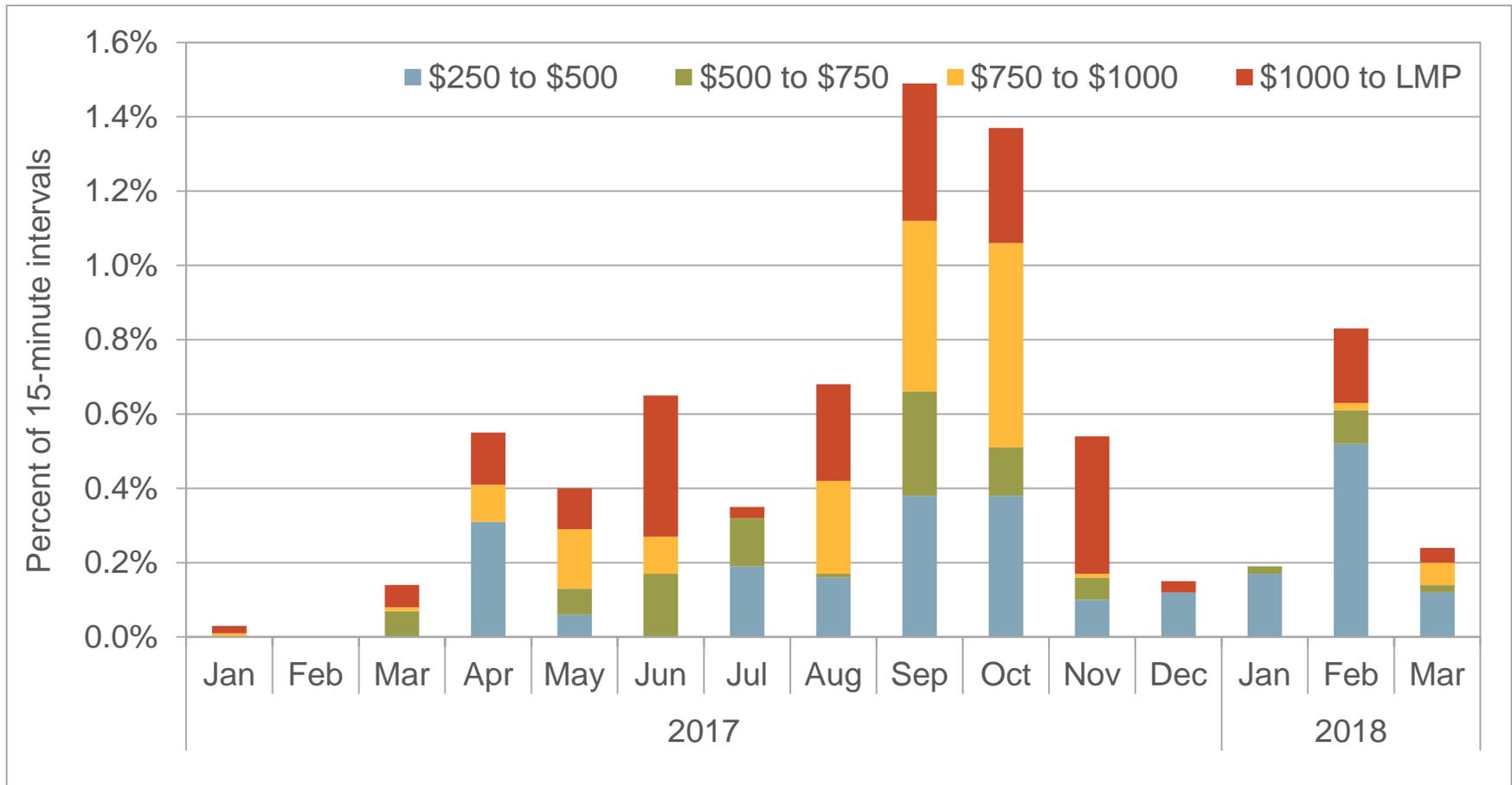


Hourly system marginal energy prices

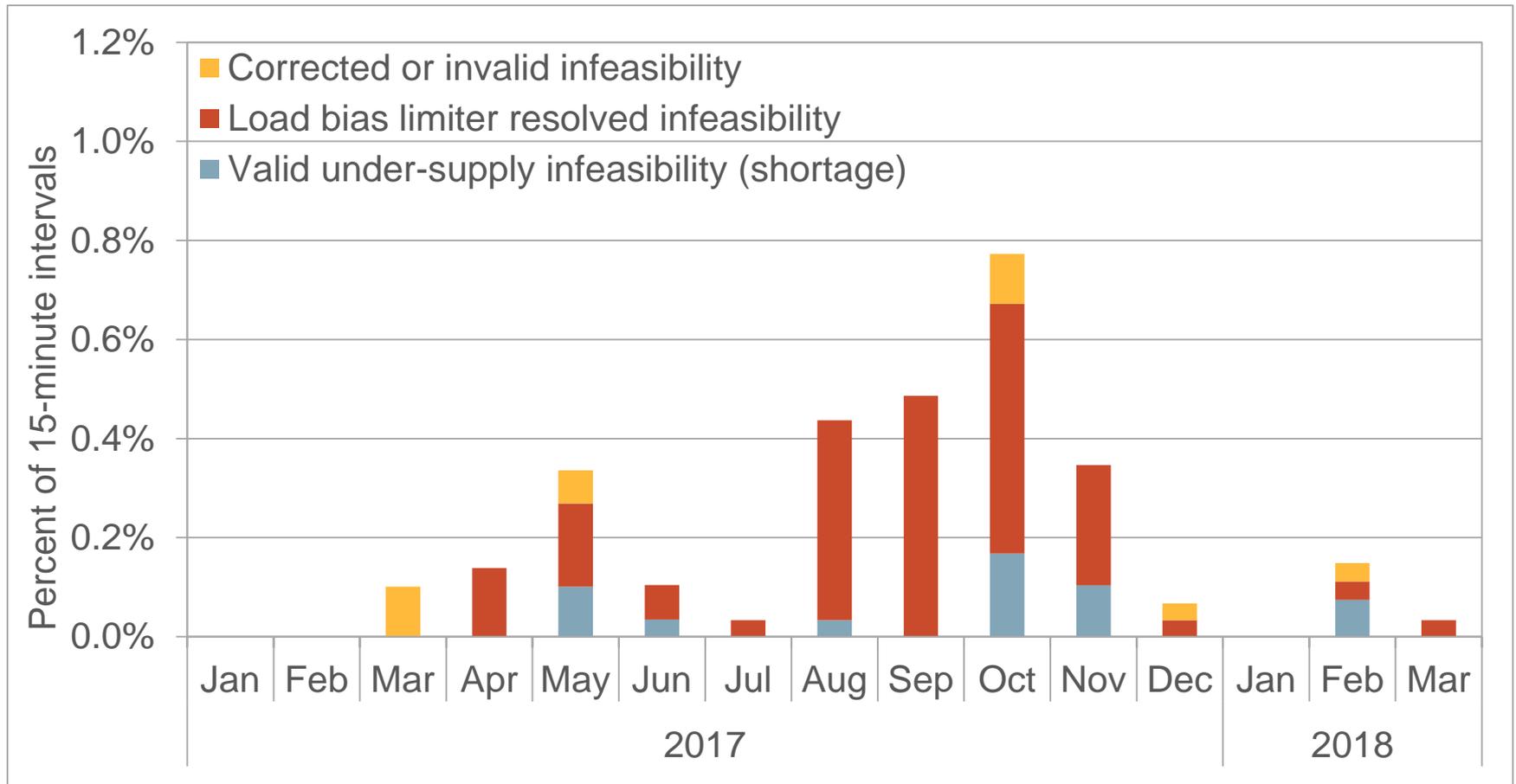


Frequency of high 15-minute prices by month

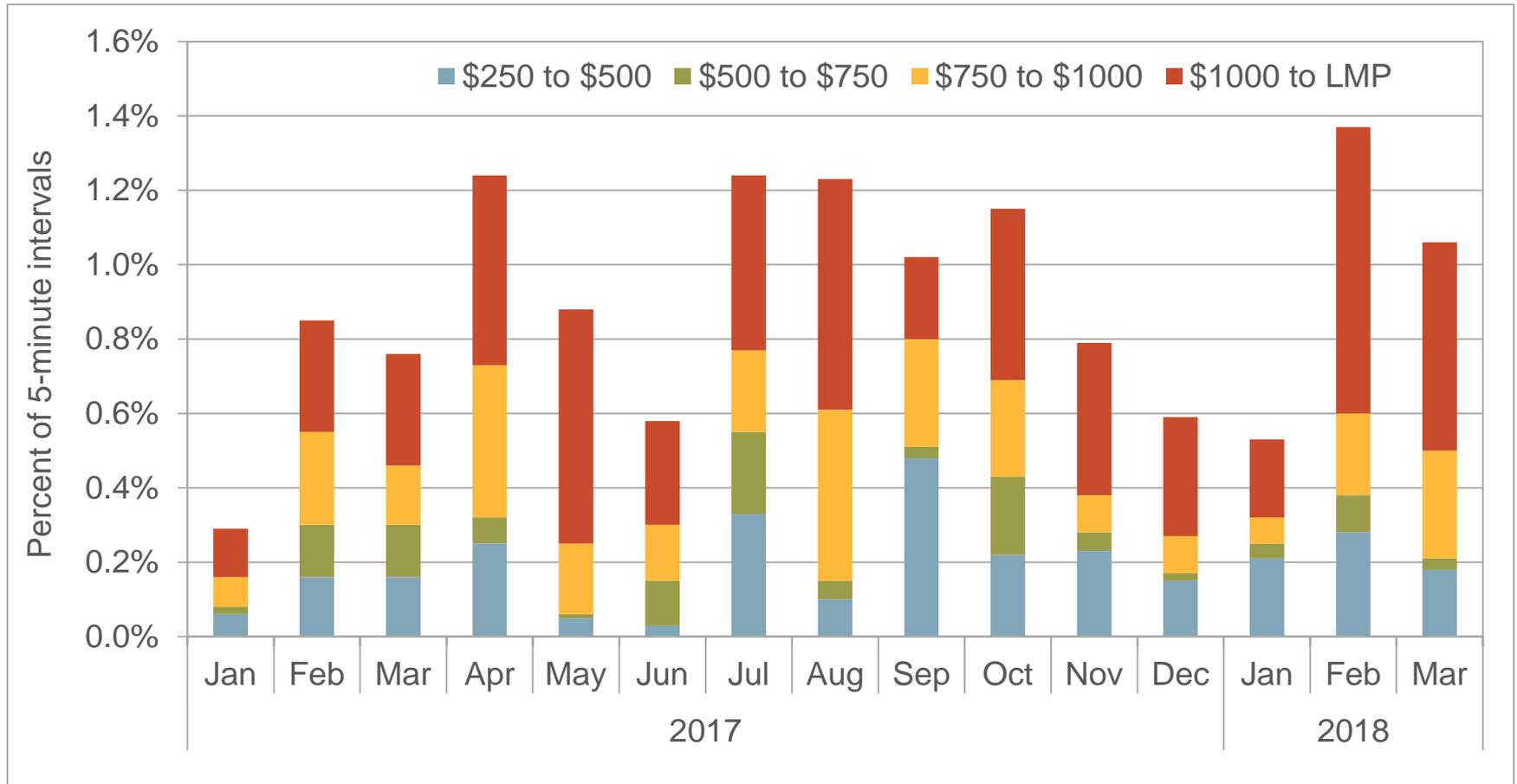
Most high prices set by unmitigated high bids



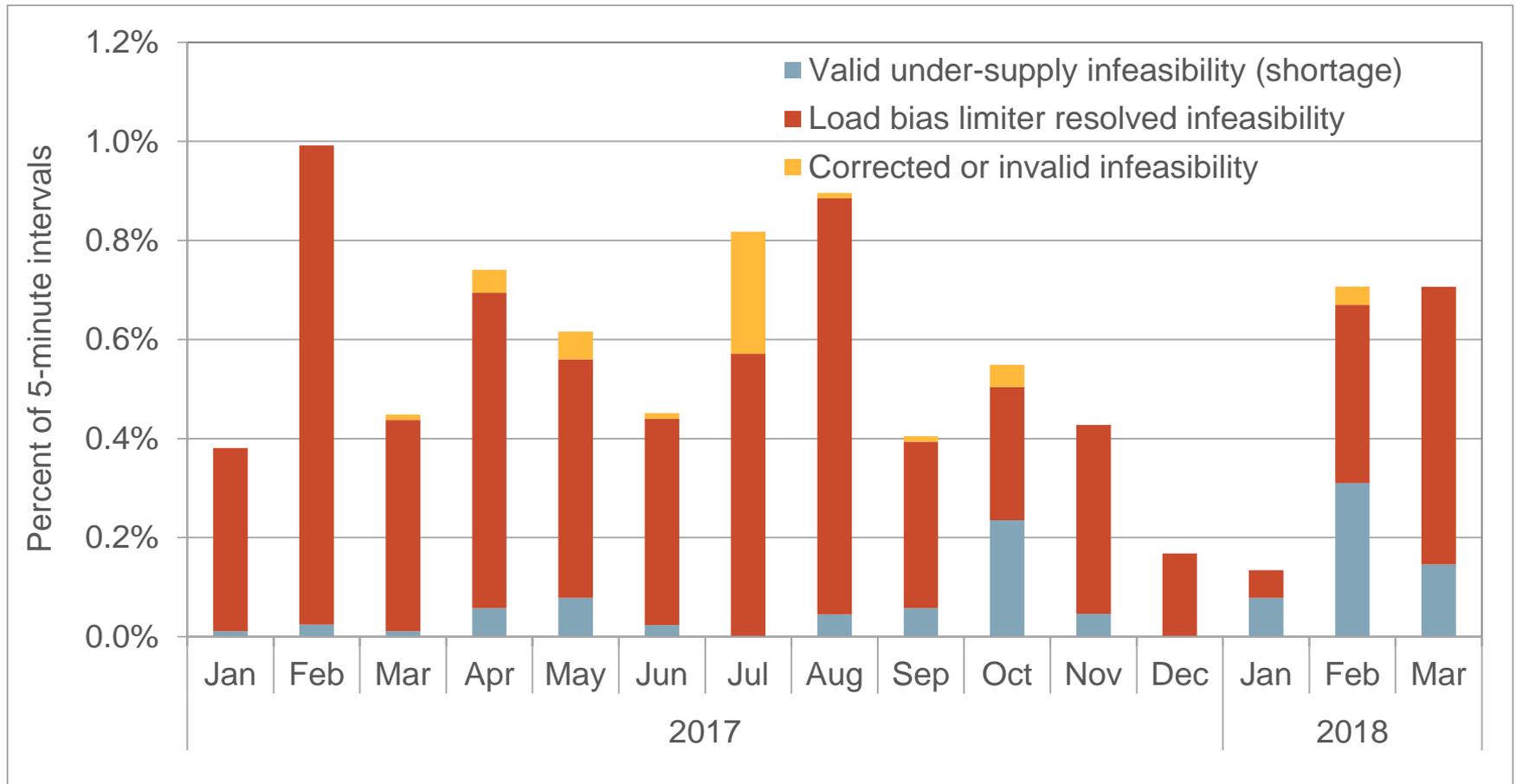
Frequency of under-supply power balance constraint infeasibilities (15-minute market)



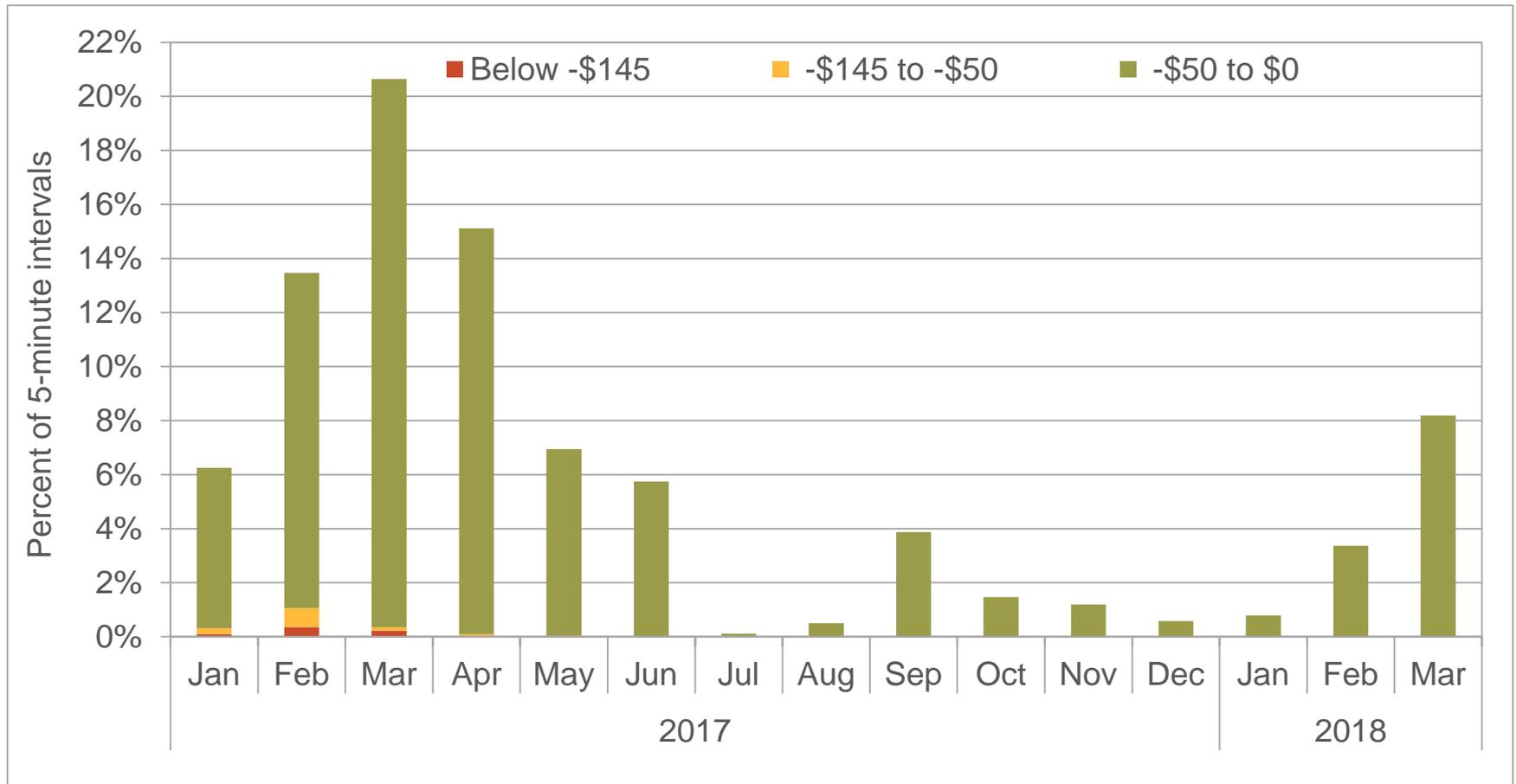
Frequency of high 5-minute prices by month



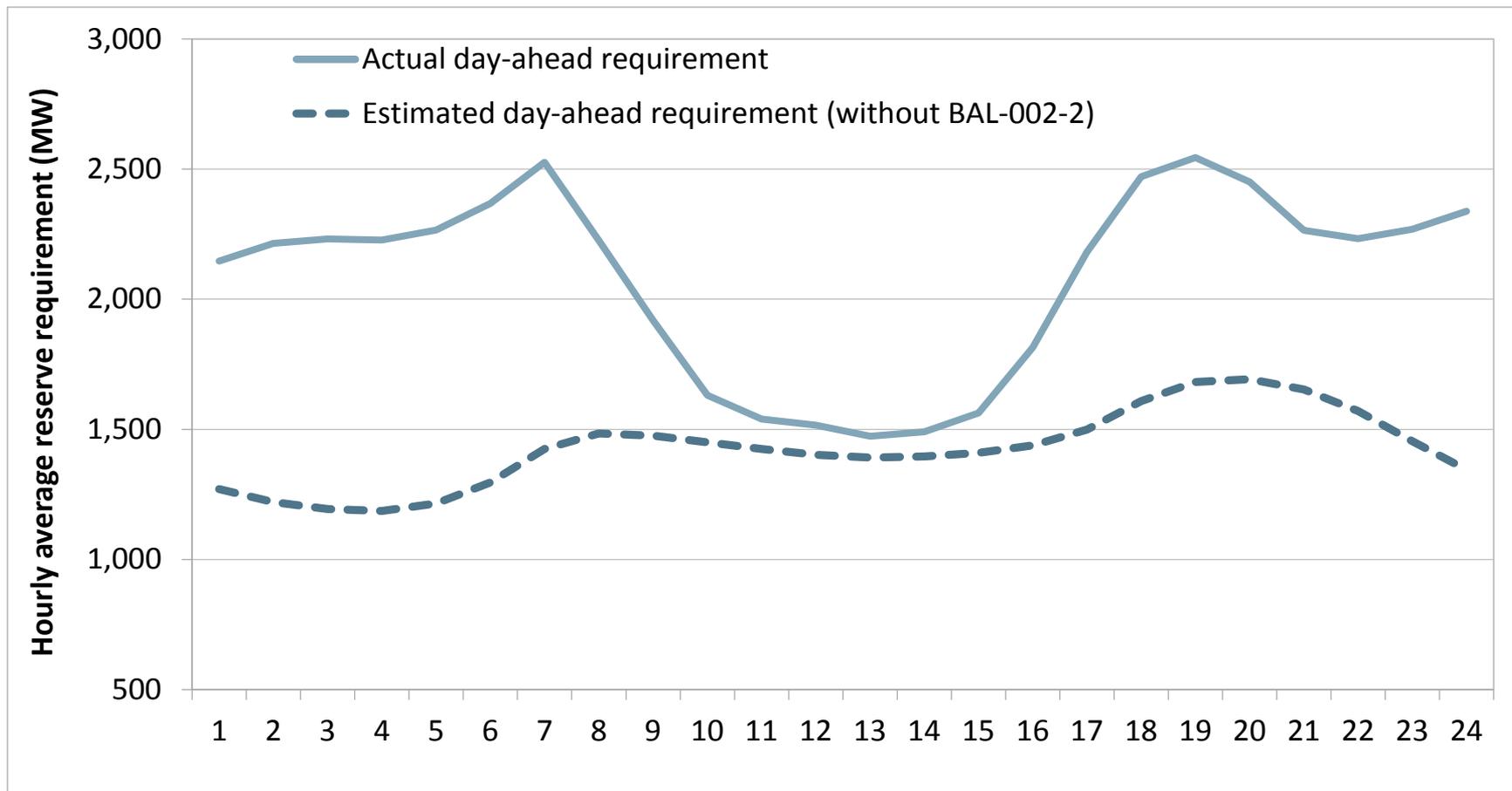
Frequency of under-supply power balance constraint infeasibilities (5-minute market)



Frequency of negative 5-minute prices by month

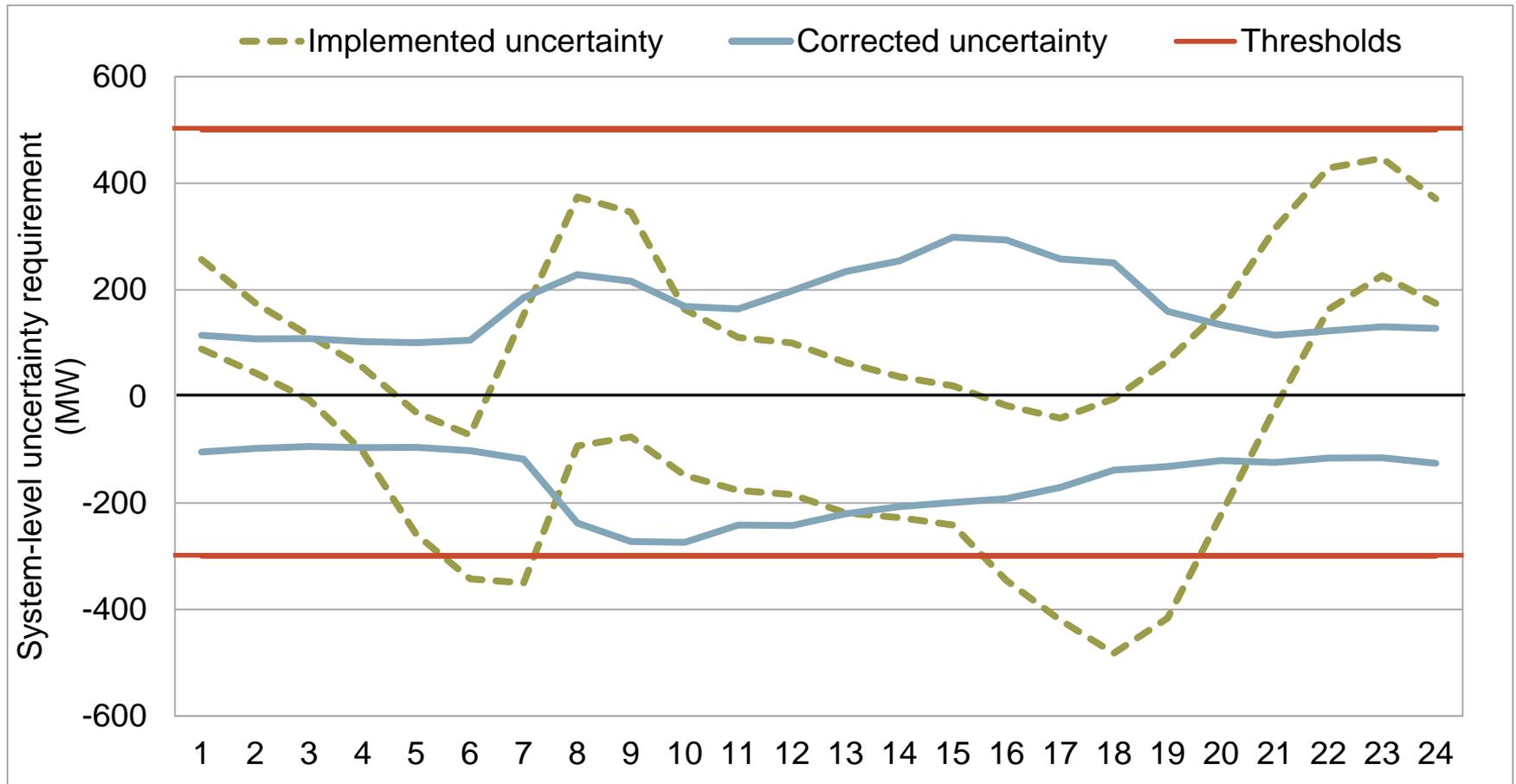


Hourly average operating reserve requirement (January – March)

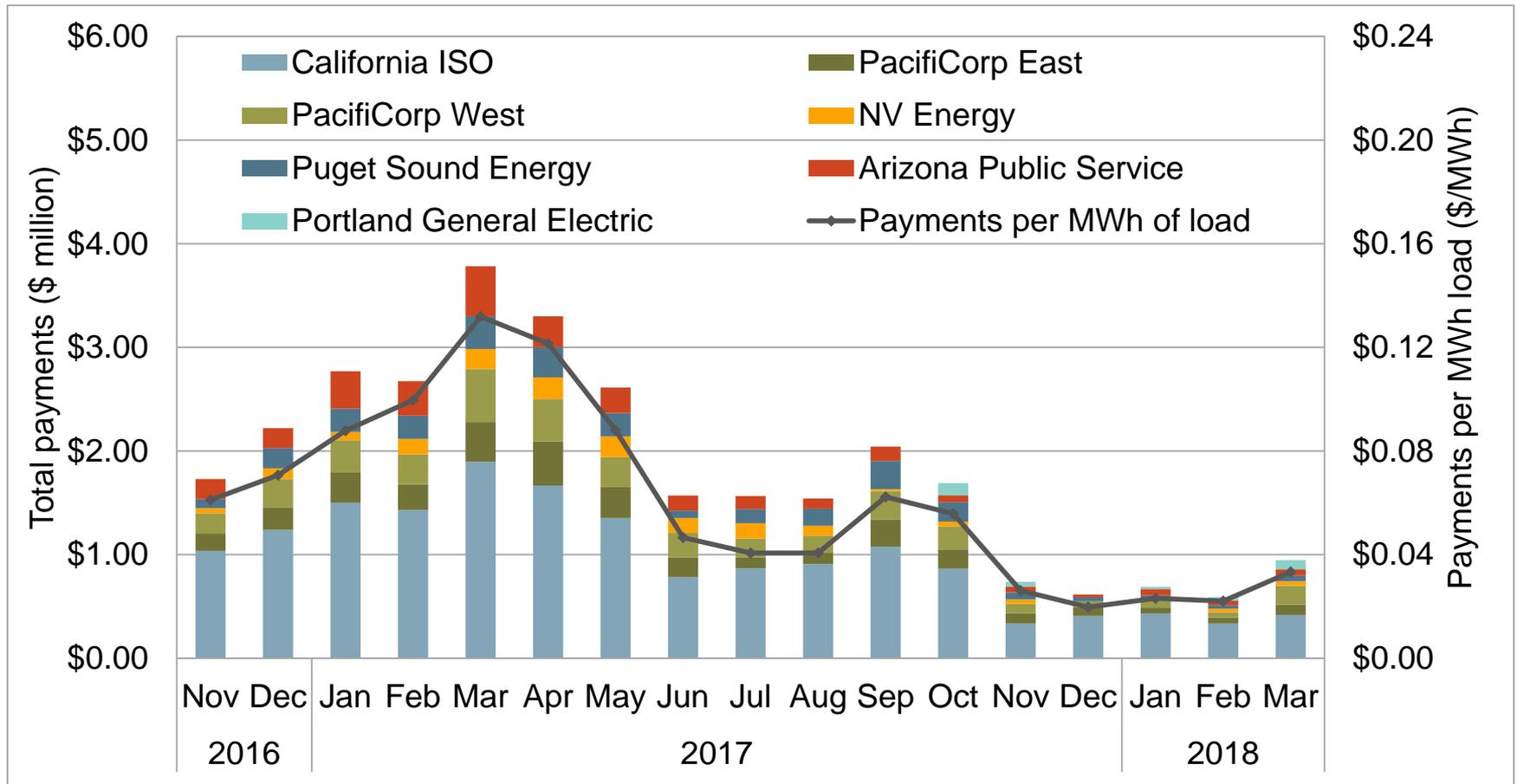


Average hourly 5-minute market system-level uncertainty requirements (March – December, 2017)

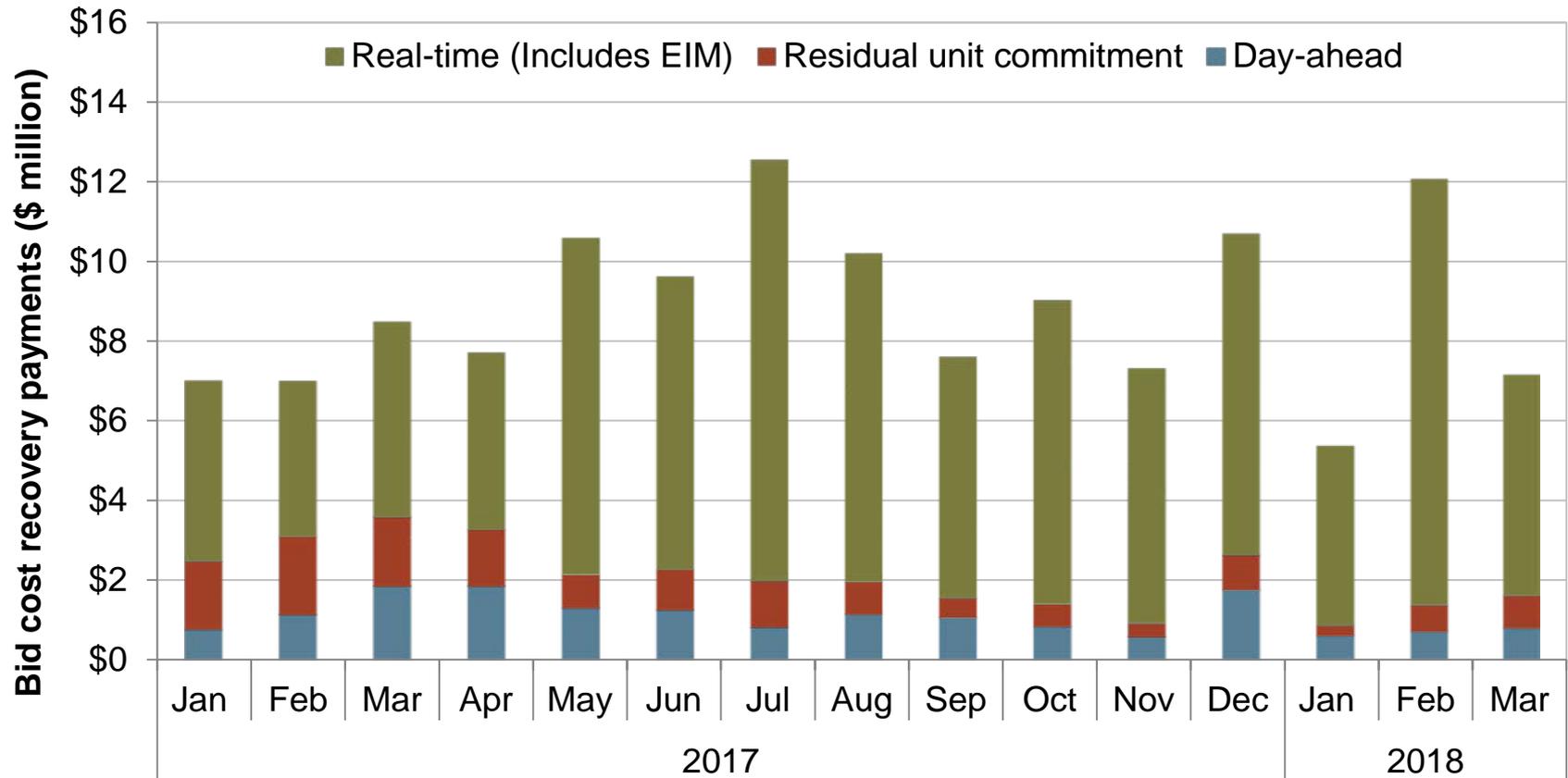
ISO resolved primary issue effective February 22, 2018



Monthly flexible ramping payments by balancing area



Monthly bid cost recovery payments, Q1 = \$25 million.
 Real-time BCR in February totaled \$11 million, the
 highest amount in any month since 2011.



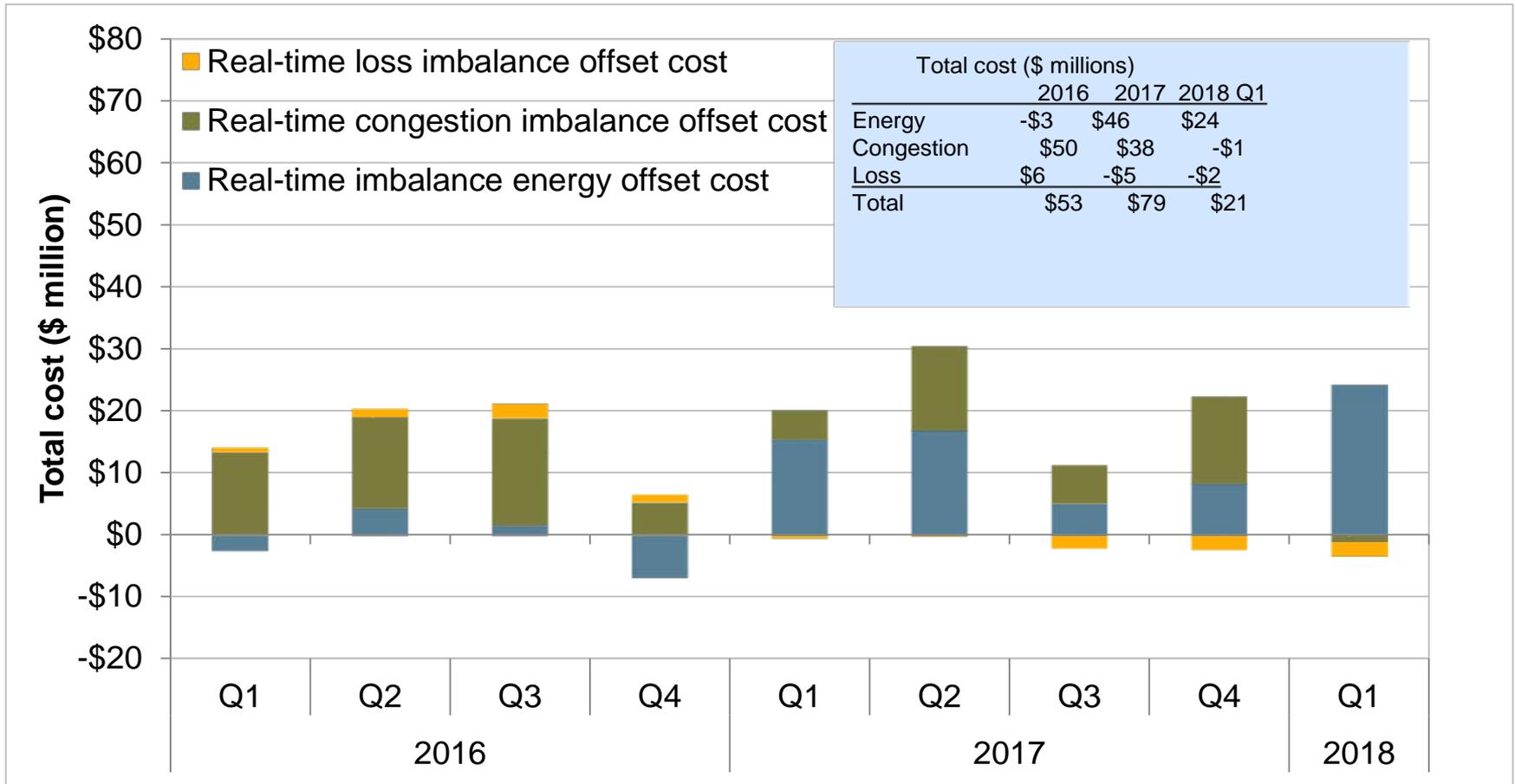
Convergence bidding volumes and revenues by participant type

Convergence bidders received about \$0.6 million after subtracting bid cost recovery charges of about \$1.1 million for the quarter.

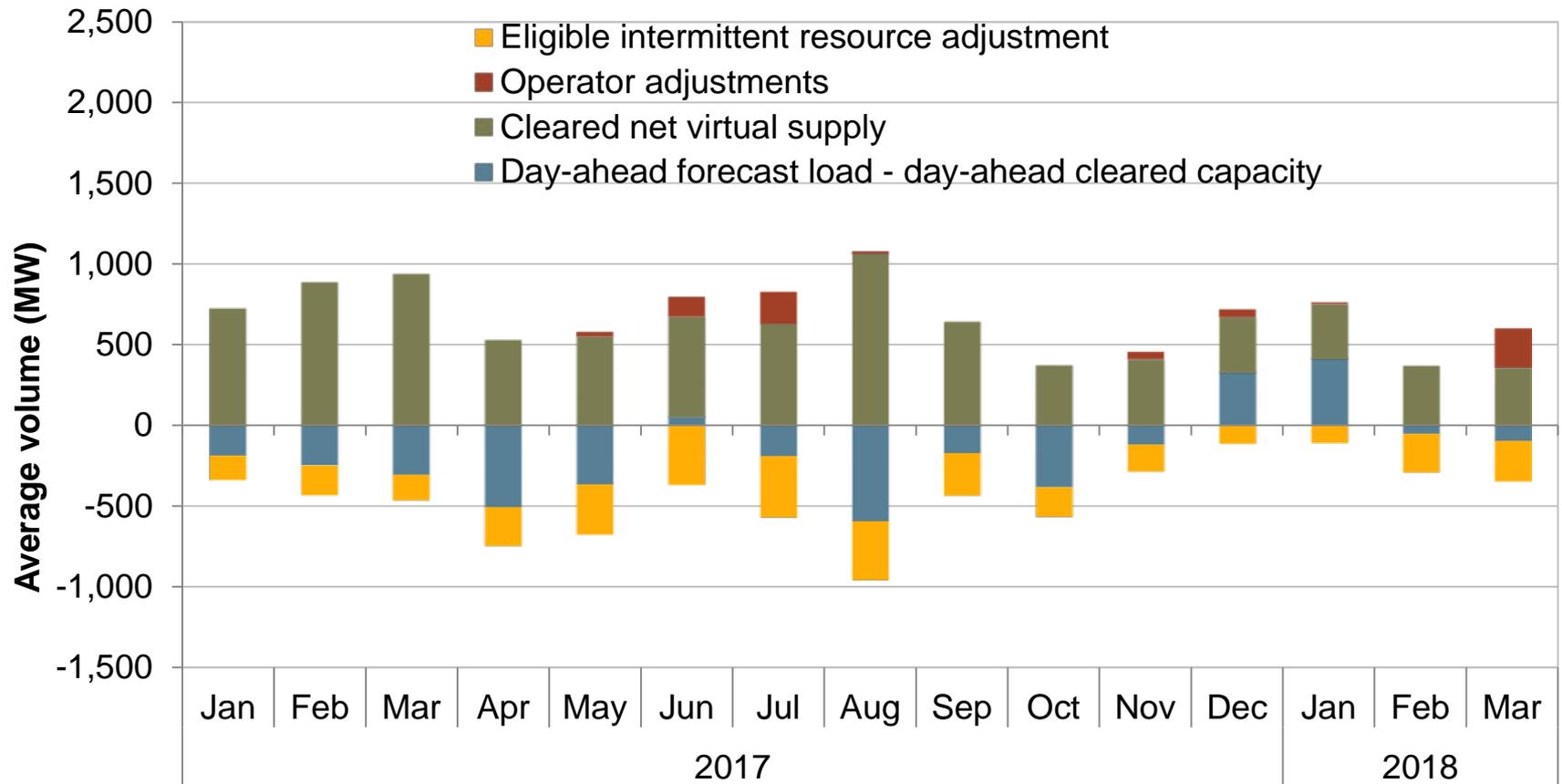
Trading entities	Average hourly megawatts			Revenues\Losses (\$ million)		
	Virtual demand	Virtual supply	Total	Virtual demand	Virtual supply	Total
Financial	500	638	1,138	-\$0.15	\$1.21	\$1.07
Marketer	326	419	745	-\$0.22	\$1.06	\$0.84
Physical load	0	135	135	\$0.00	-\$0.07	-\$0.07
Physical generation	10	0	11	-\$0.13	\$0.00	-\$0.13
Total	836	1,192	2,029	-\$0.5	\$2.2	\$1.7

Real-time imbalance offset costs

\$19 million RTIEO incurred on 4 days when real-time gas nomogram constraints were binding



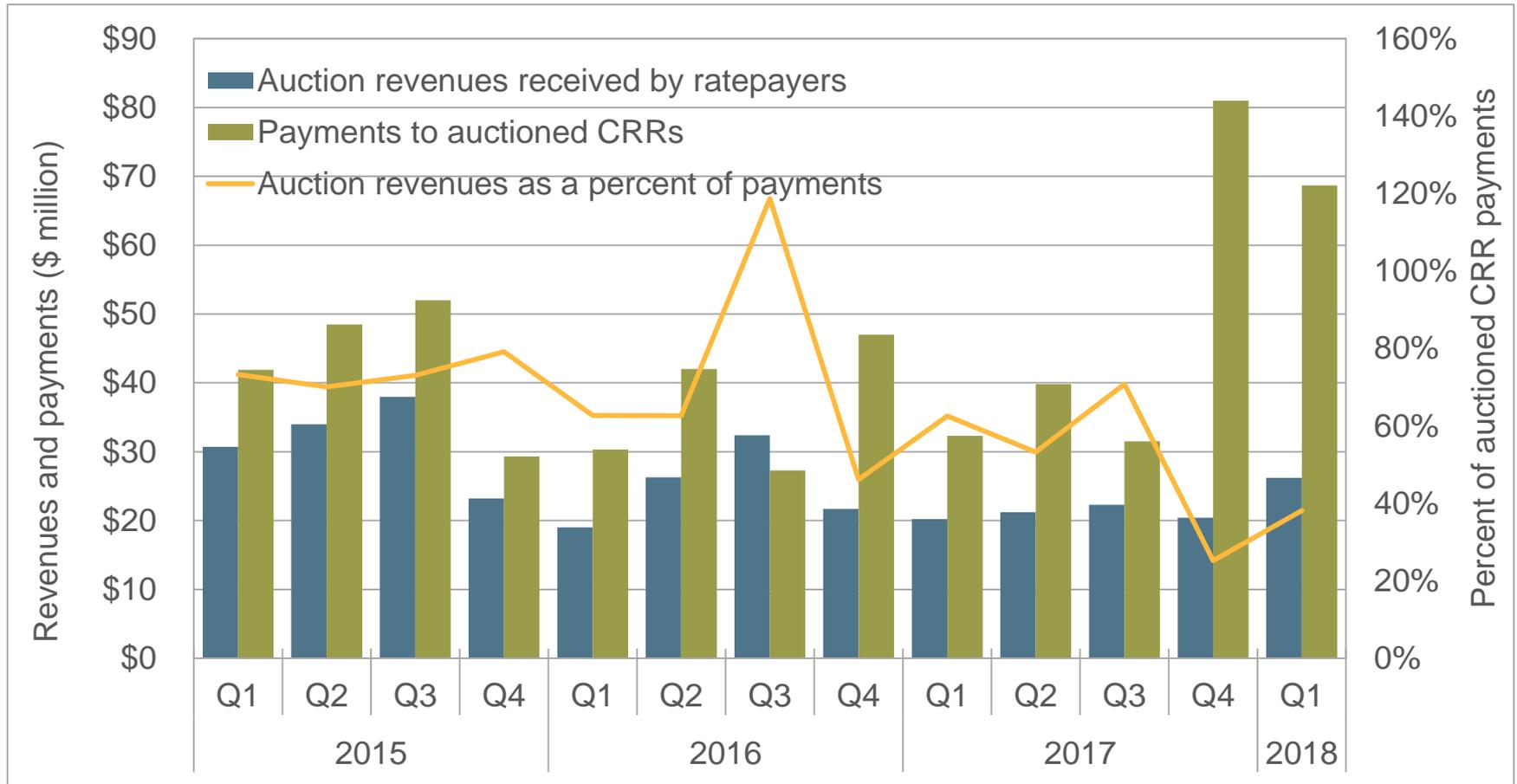
Determinants of residual unit commitment procurement



Auction revenues and payments to non-load-serving entities

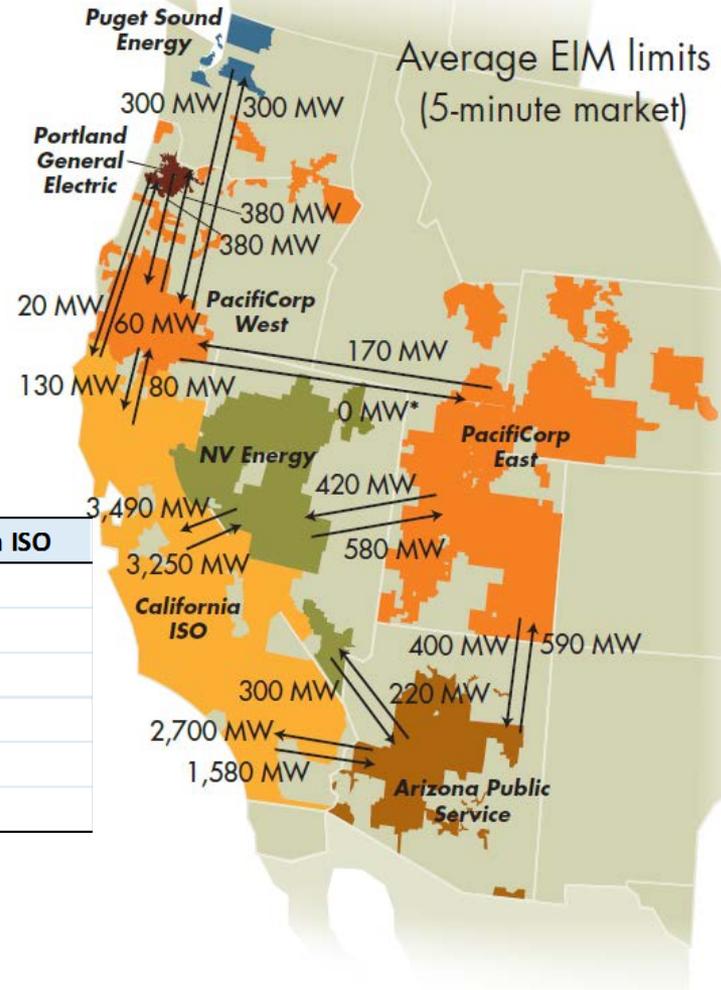
Q1 payments \$43 million over cost in auction

CRR auction reform measures passed by Board



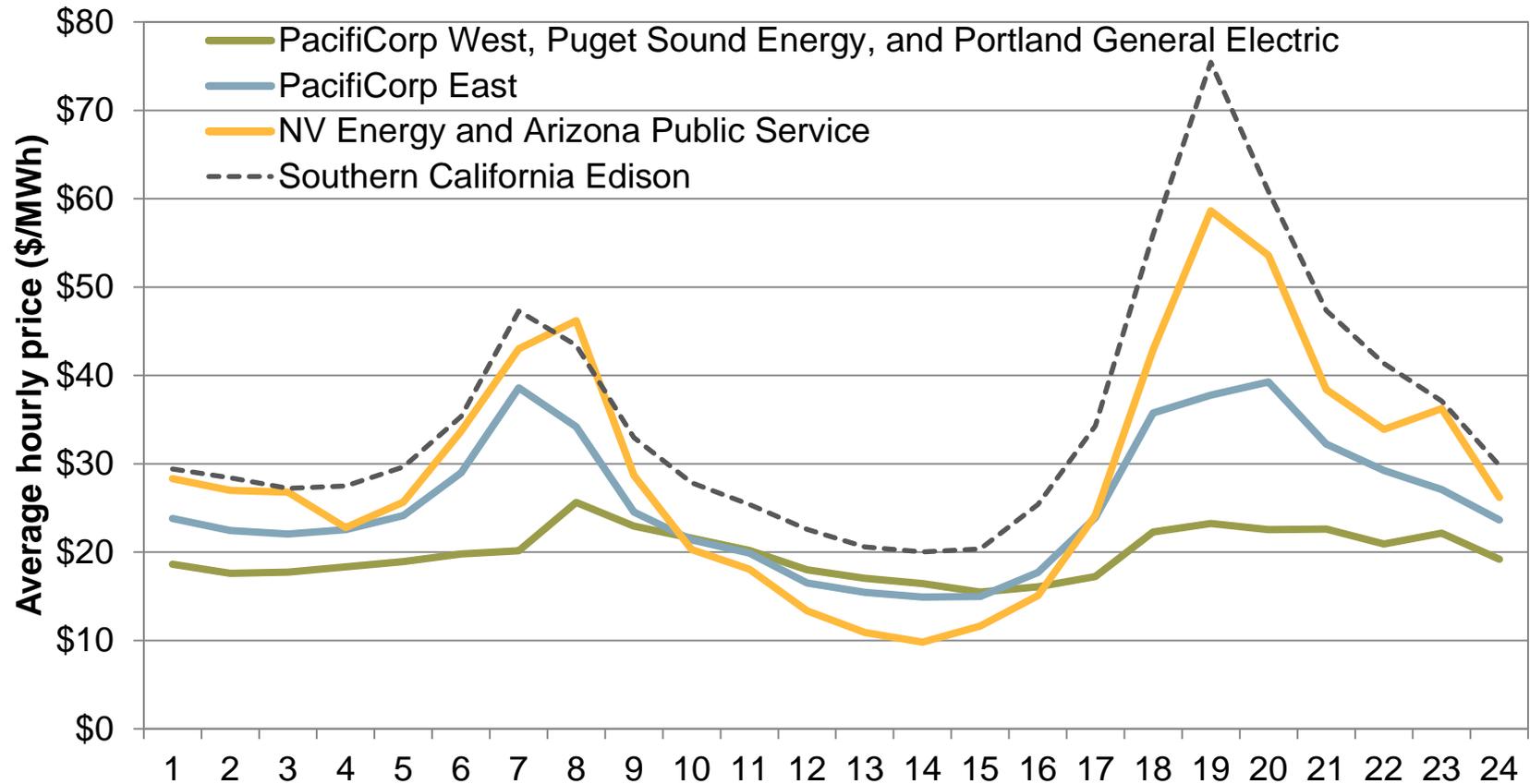
2017

Estimated congestion status and flows in EIM (January – March)



	Congested toward ISO	Congested from ISO
Arizona Public Service	2%	1%
NV Energy	5%	2%
PacifiCorp East	17%	2%
PacifiCorp West	62%	10%
Portland General Electric	62%	11%
Puget Sound Energy	63%	11%

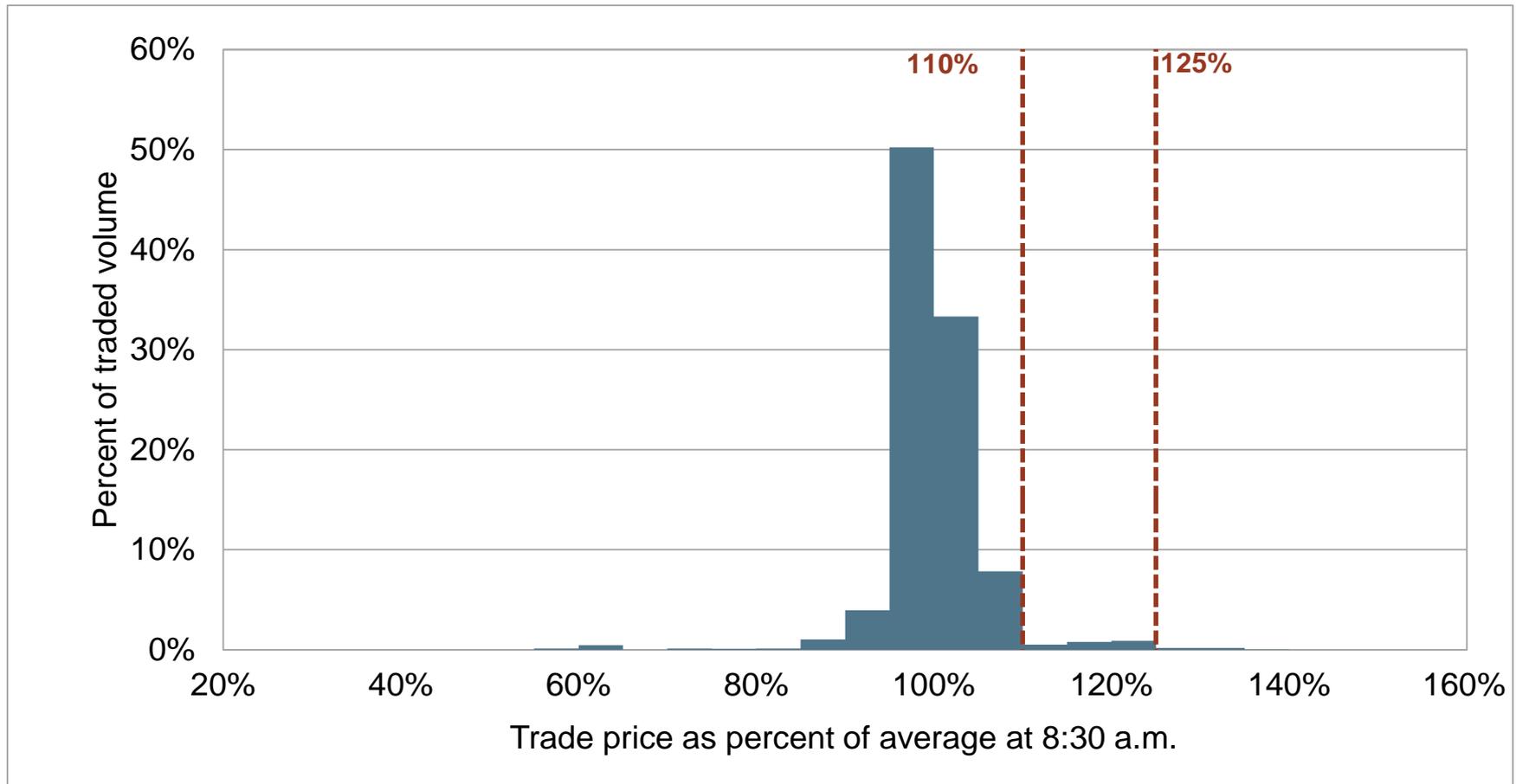
Hourly 15-minute market prices (January – March)



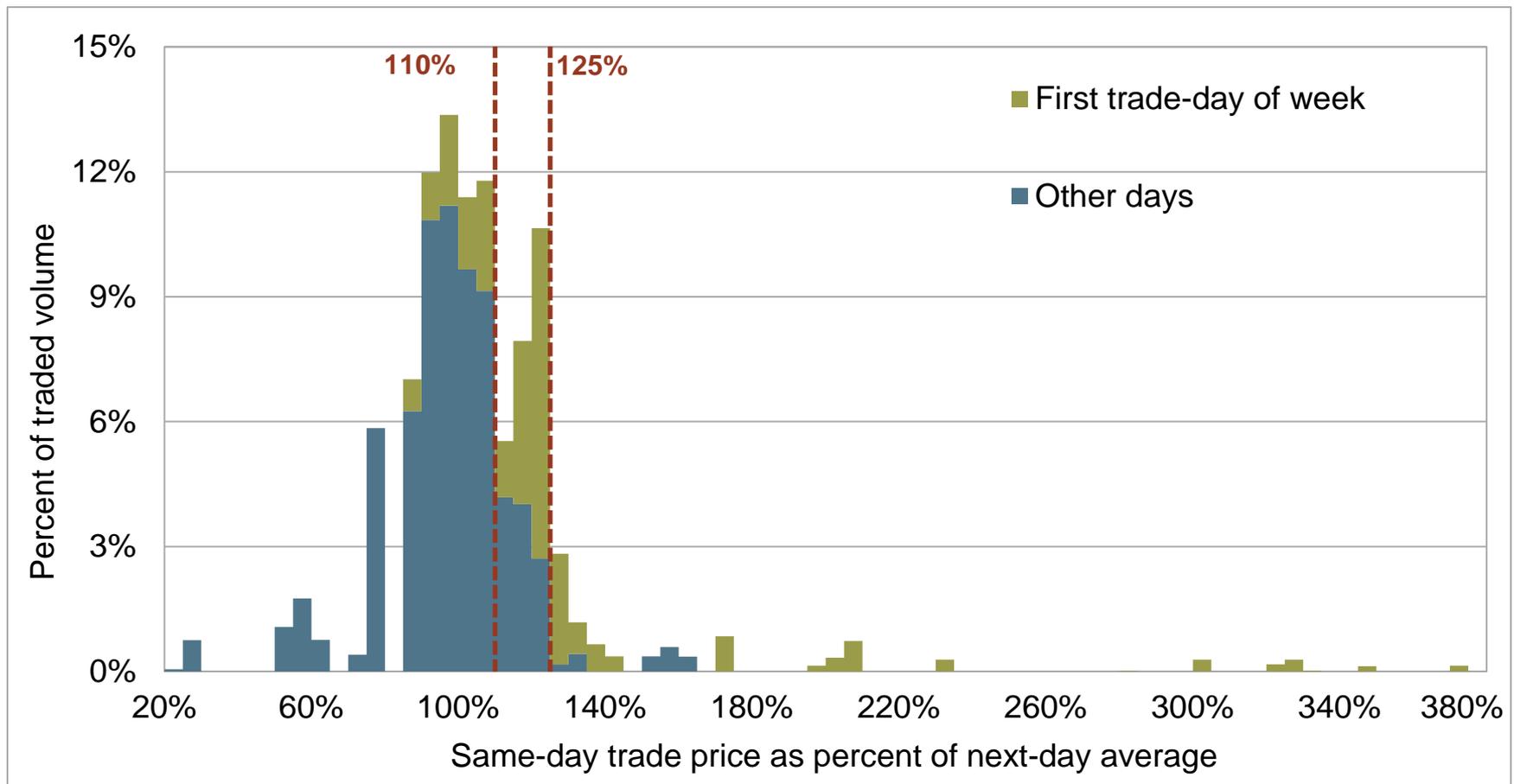
Aliso total gas burn constraints enforced February 20 – March 5

- Day-ahead: all days except February 20 and 23
- Real-time: all days except February 24 and 25, selected intervals
- Aliso total:
 - Day-ahead: February 28 – March 5, 19% binding
 - Real-time: February 23 and 27 only, 11 % binding
- San Diego: February 24 – March 5
 - binding 4% day-ahead, 3% real-time when enforced
- LA Basin and Inland: February 20-27, selected intervals
 - LA Basin: binding 23% day-ahead, 70% real-time when enforced
 - Inland: binding 11% day-ahead, 78% real-time when enforced
- Real-time binding enforcement correlated with high energy offset and other costs

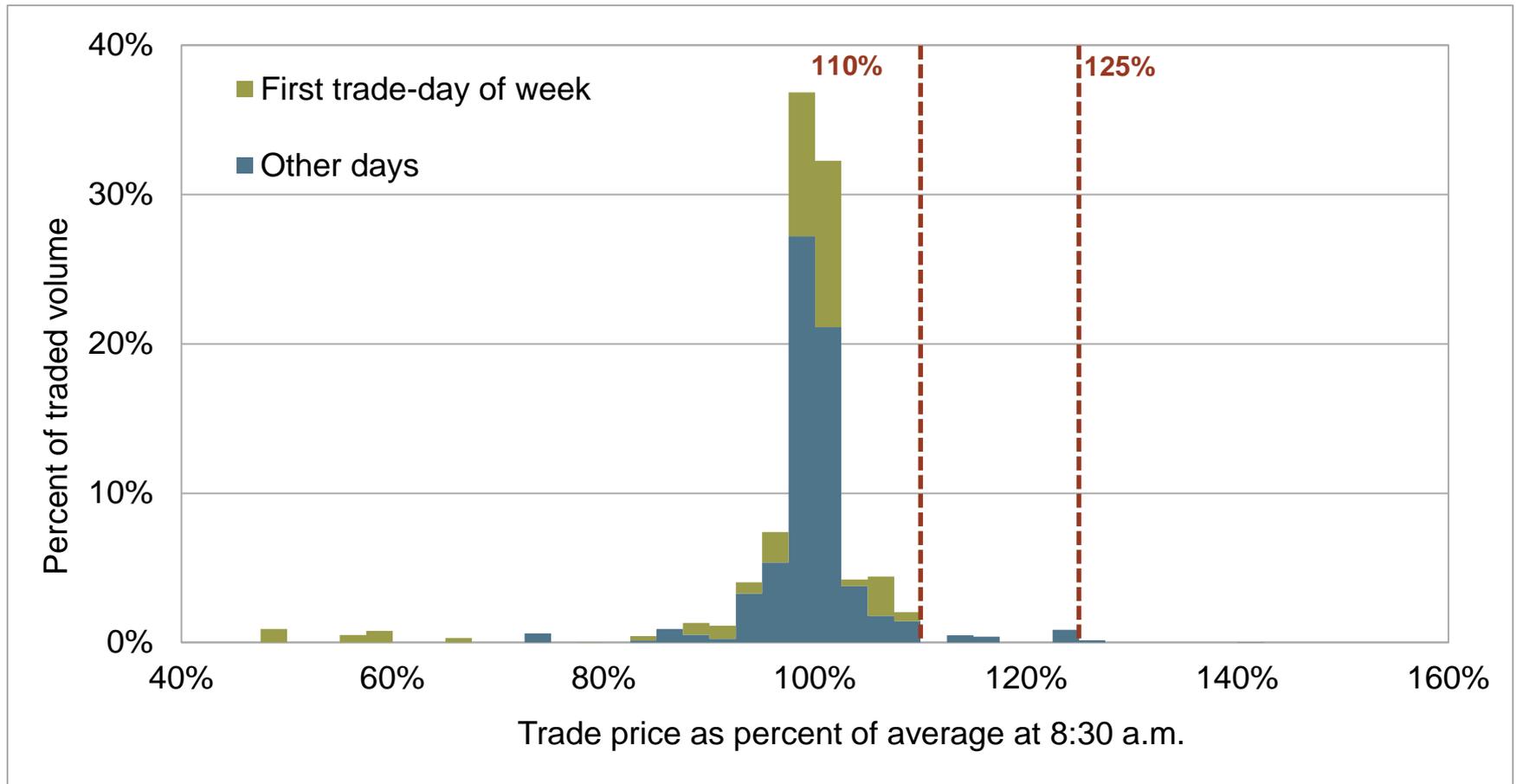
Next-day trade prices compared to updated next-day average price (Jan - Mar)



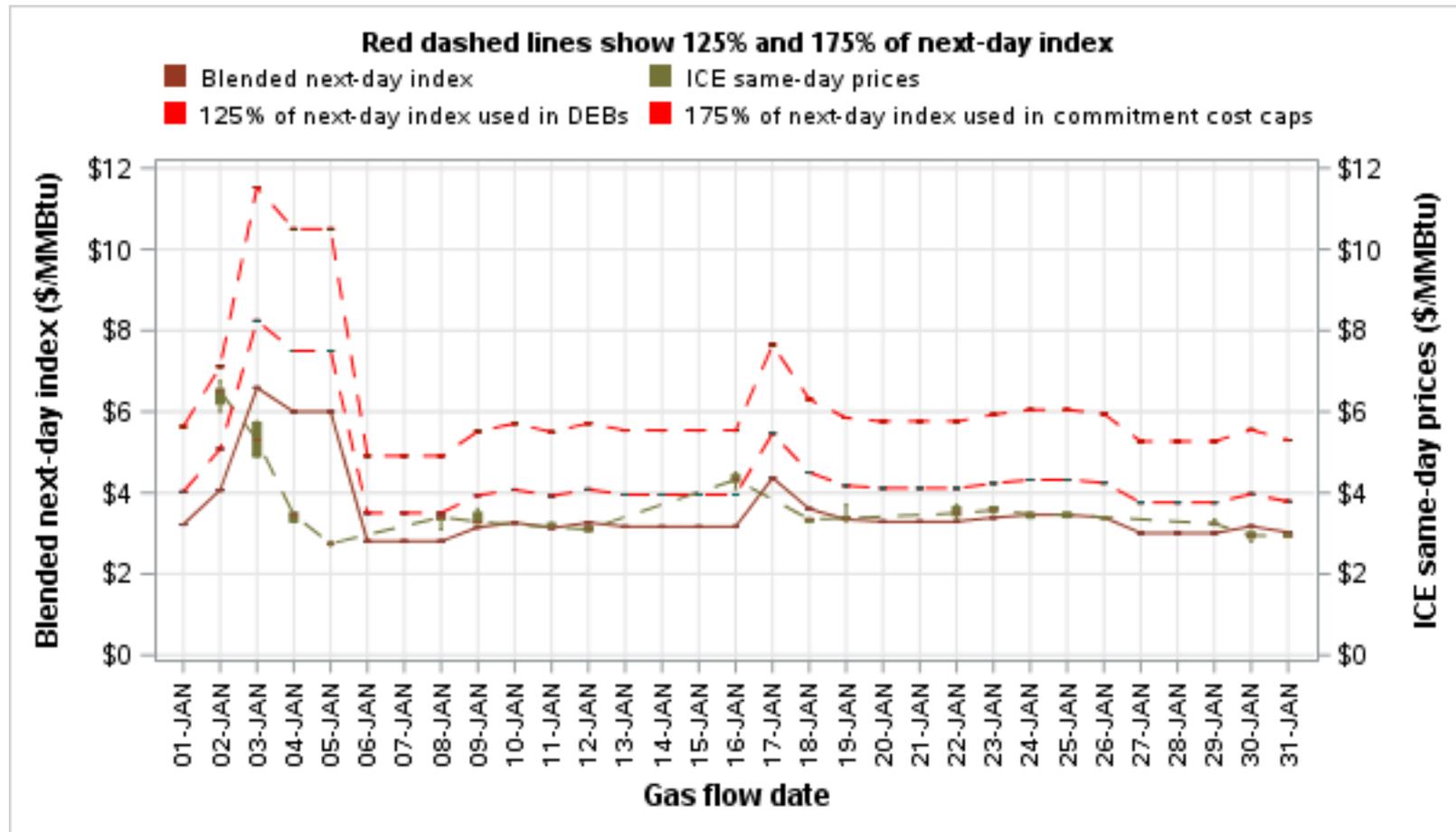
Same-day trade prices compared to next-day index (January – March)



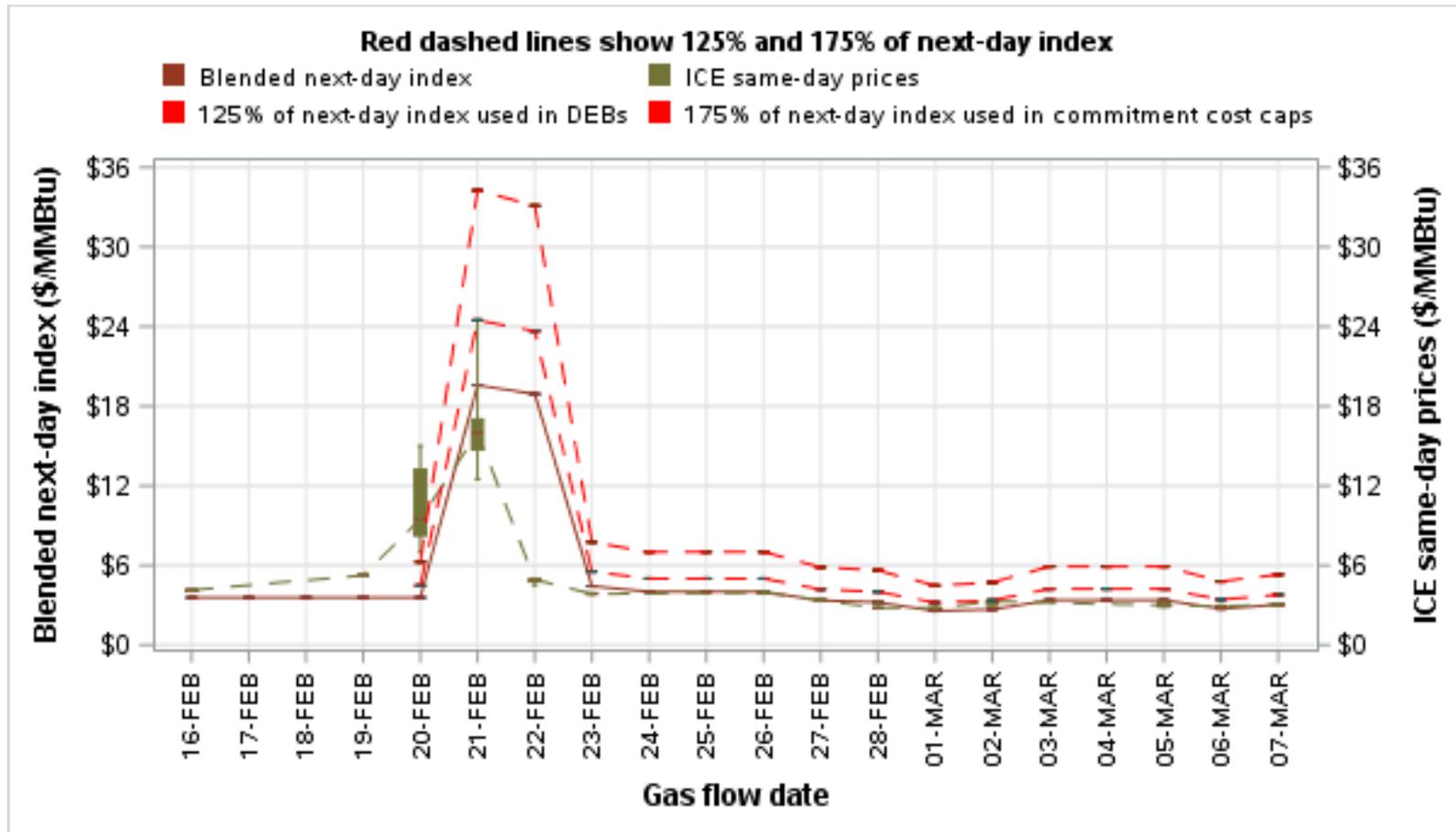
Same-day prices as a percent of updated same-day averages (January – March)



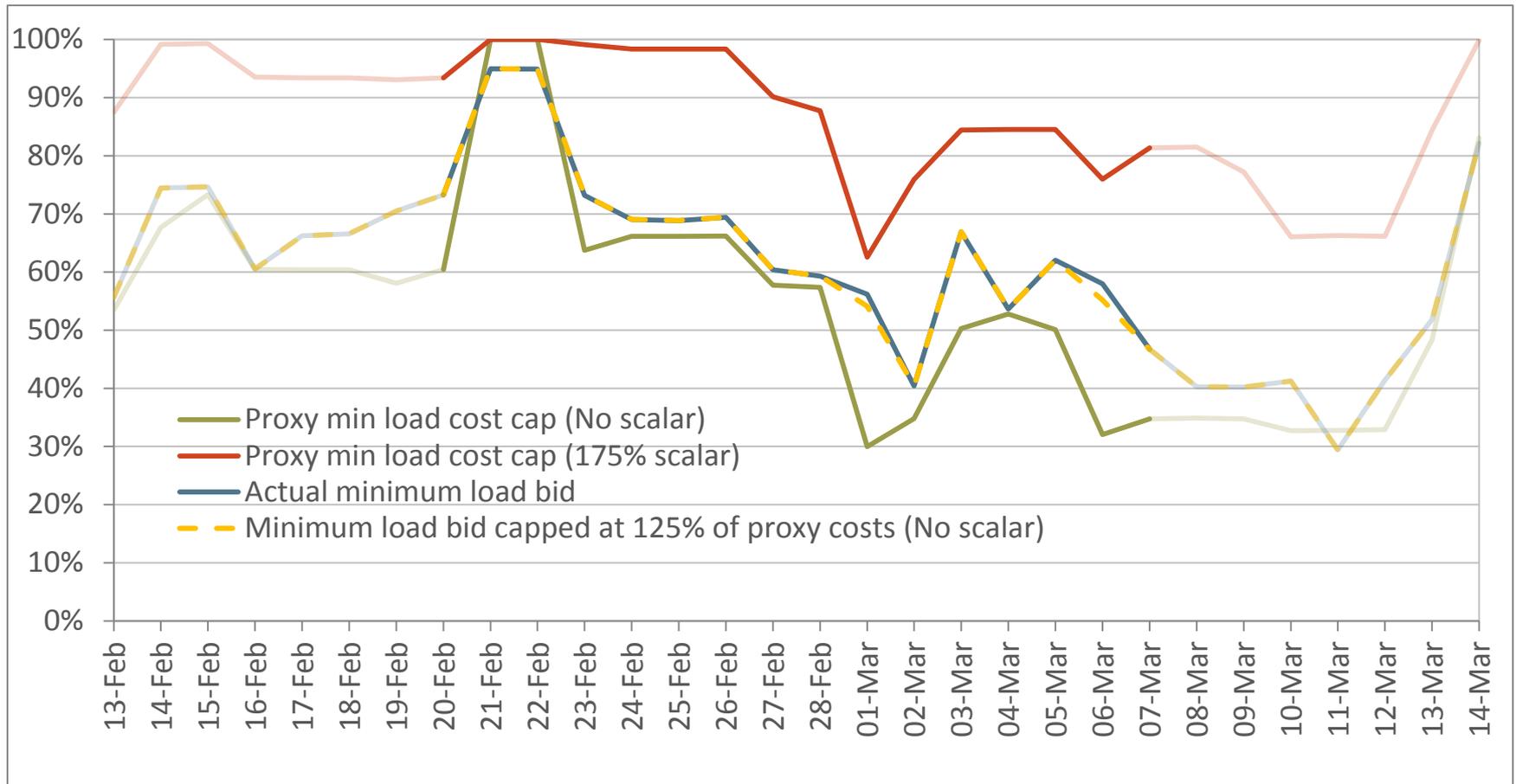
SoCal Citygate next-day index versus ICE same-day price distribution (January 1 – 31)



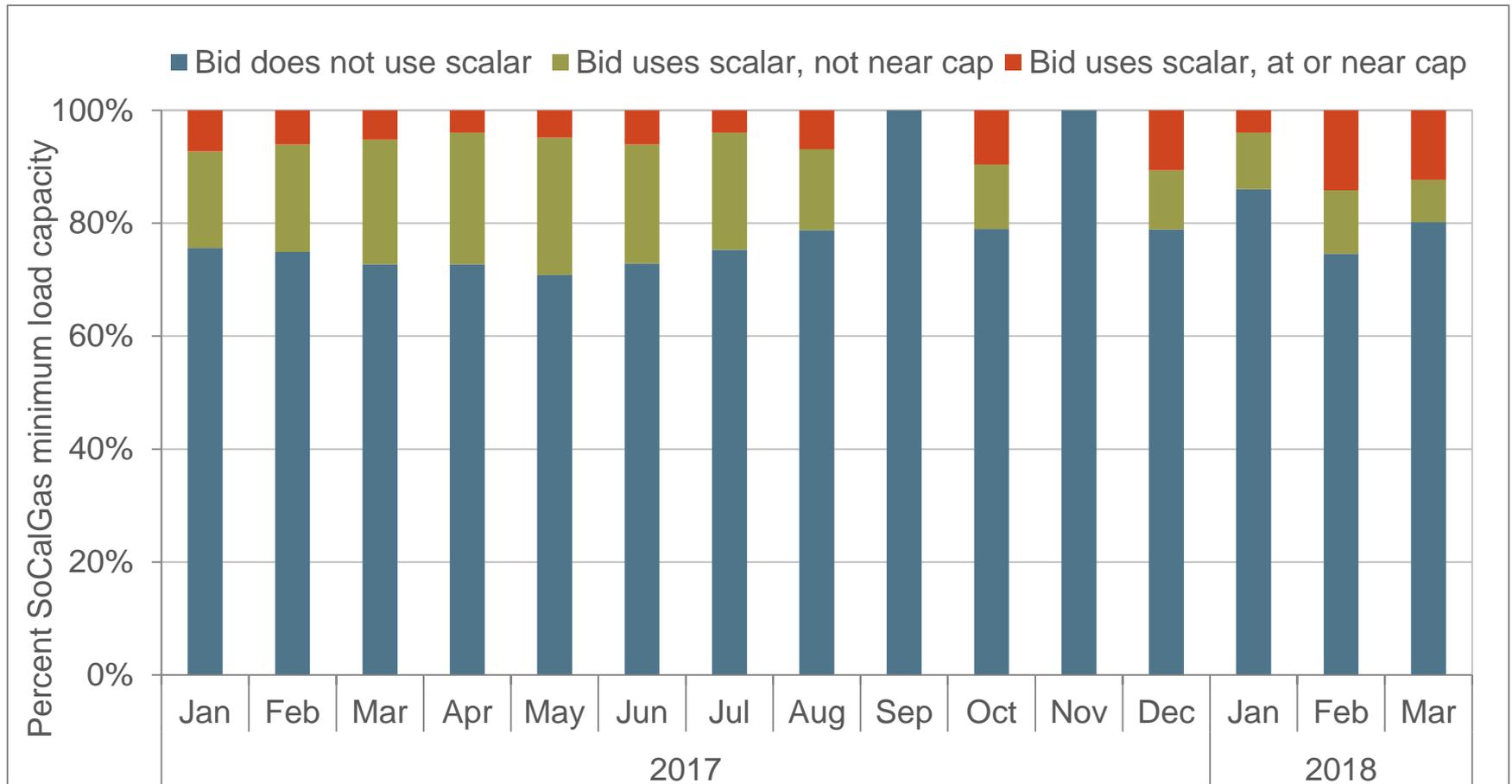
SoCal Citygate next-day index versus ICE same-day price distribution (Feb 16 – Mar 7)



Percent of SoCalGas resources minimum load capacity at high end of merit order



SoCalGas system resources minimum load capacity bid level



Aliso Canyon gas measures

DMM recommendations

- More improvements needed in gas use nomograms
 - Inconsistency between day ahead and real-time
 - Adjustment of use limits in real-time
 - Can create high uplift
- Gas cost scalars
 - Do not appear effective at reflecting actual gas prices and modifying merit order of units.
 - Should be replaced by ability to update gas prices during operating day based on actual gas market conditions.