



2018 Q3 Report

November 6, 2018

Amelia Blanke, Ph.D., Manager of Monitoring and Reporting

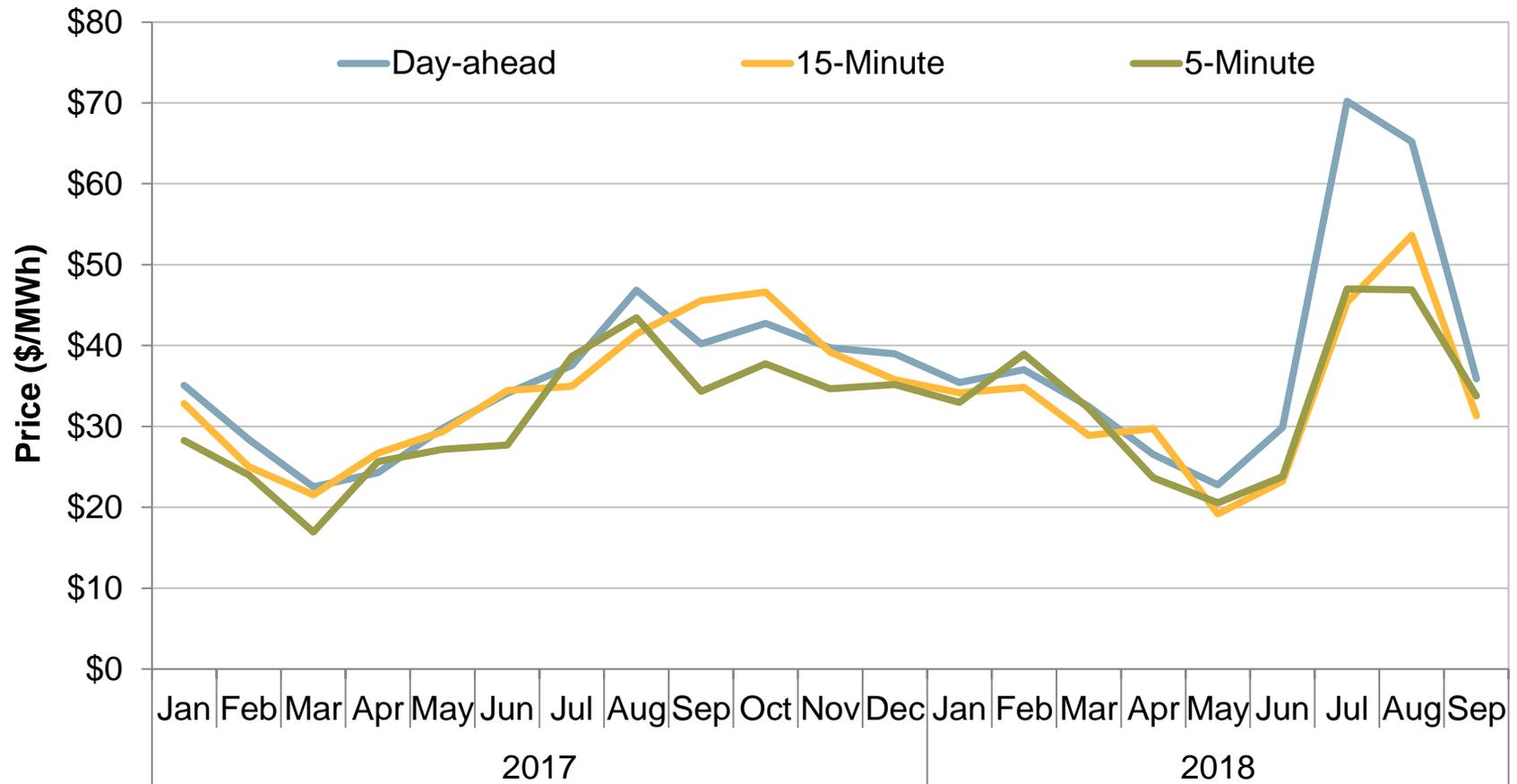
Department of Market Monitoring, California ISO

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

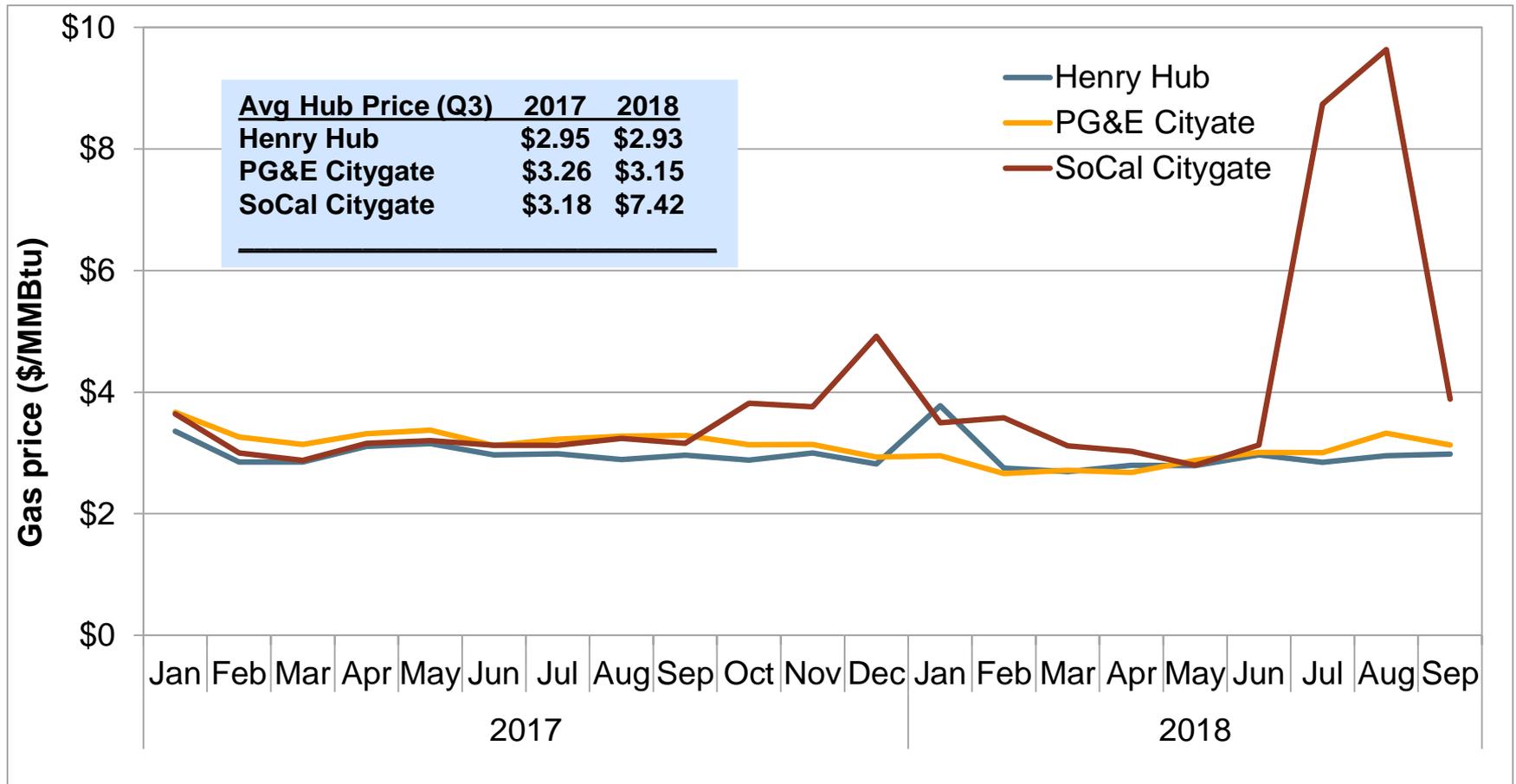
<http://www.caiso.com/market/Pages/MarketMonitoring/AnnualQuarterlyIssuesPerformanceReports/Default.aspx>

Q3 prices increase dramatically, particularly in July and August in the day-ahead market, driven by higher gas prices

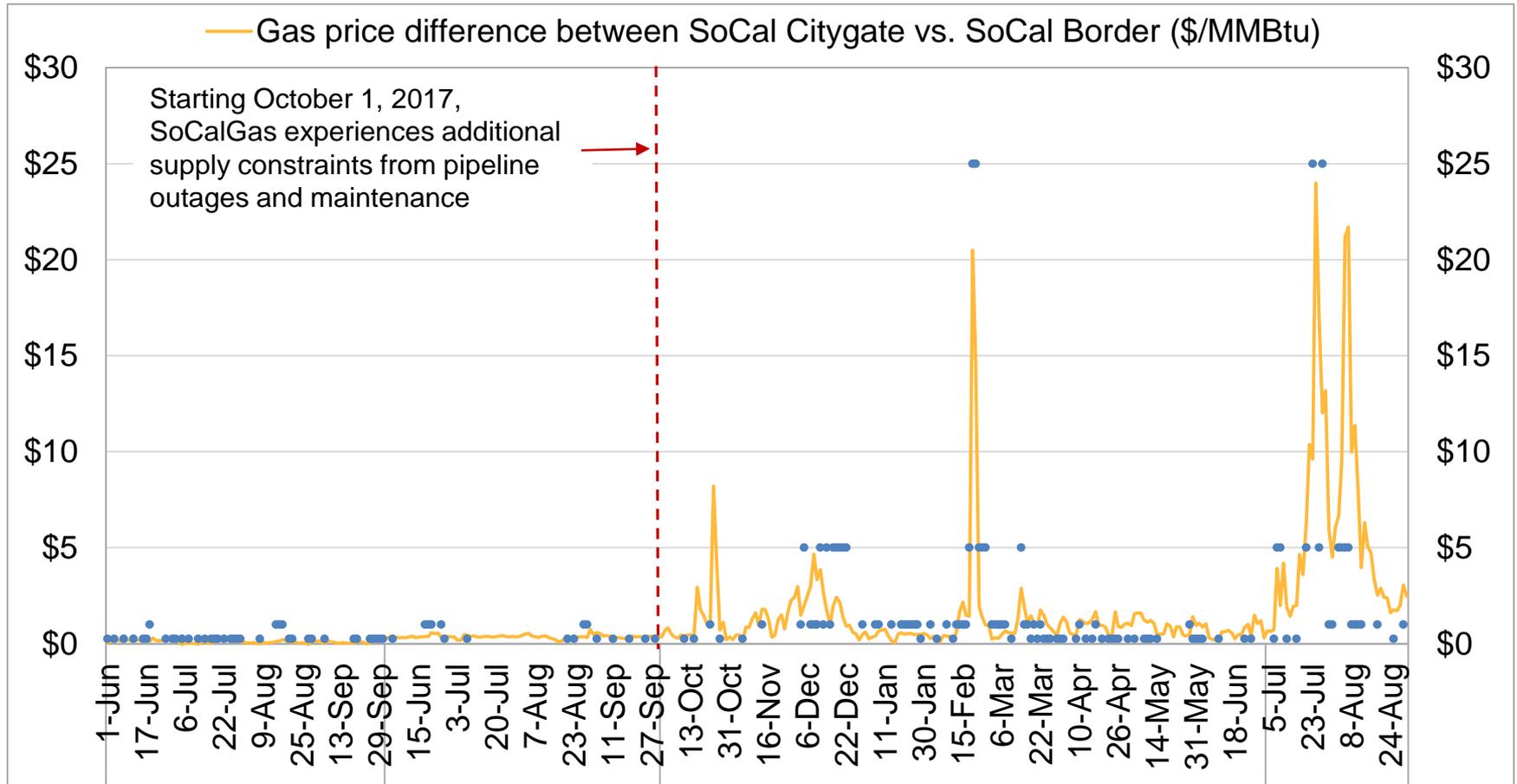
Average monthly prices (all hours) – system marginal energy price



Gas prices are up in July and August in the south, frequent location of marginal resource

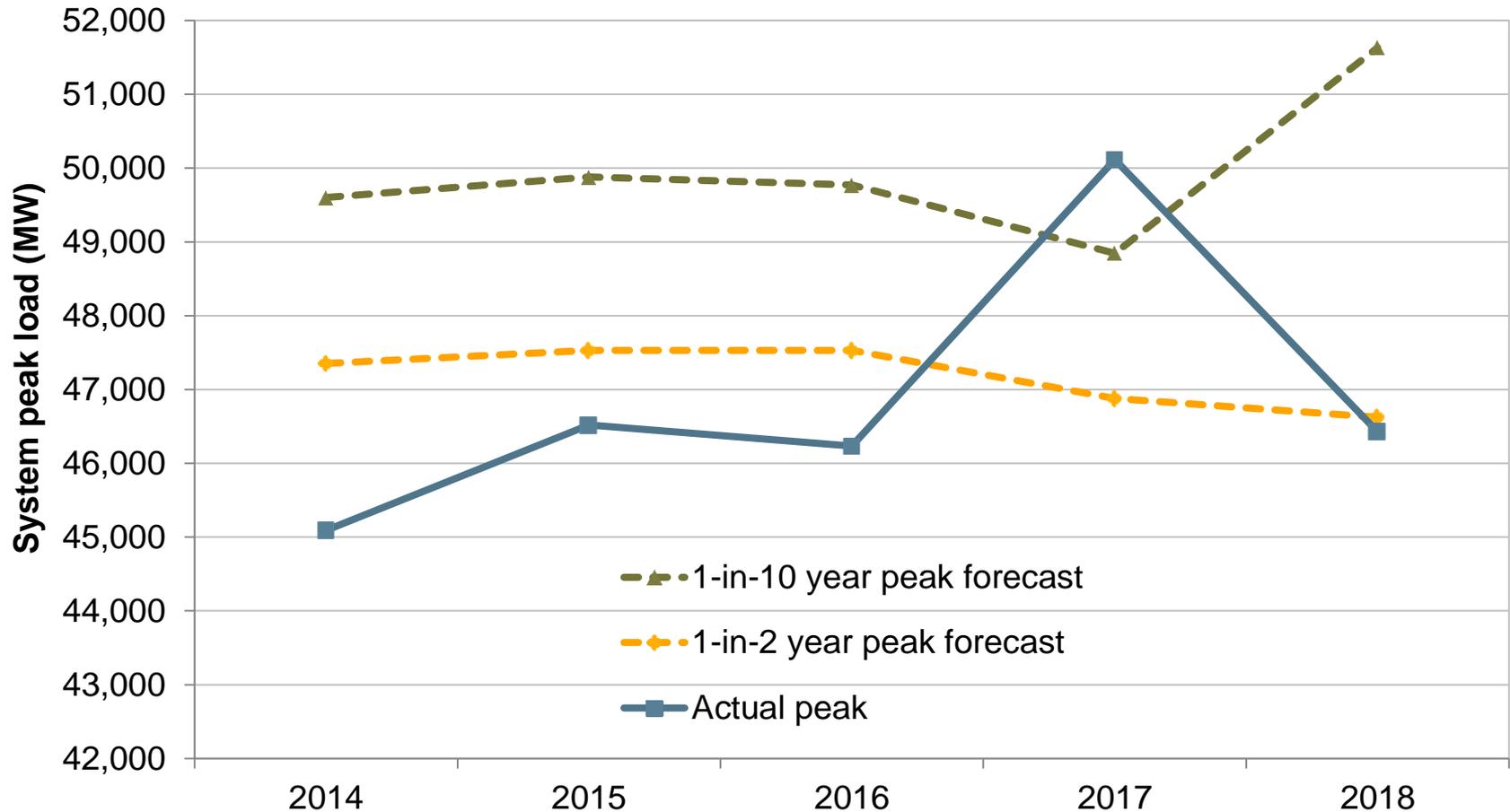


Impact of potential low OFO noncompliance charges on next-day SoCal Citygate prices



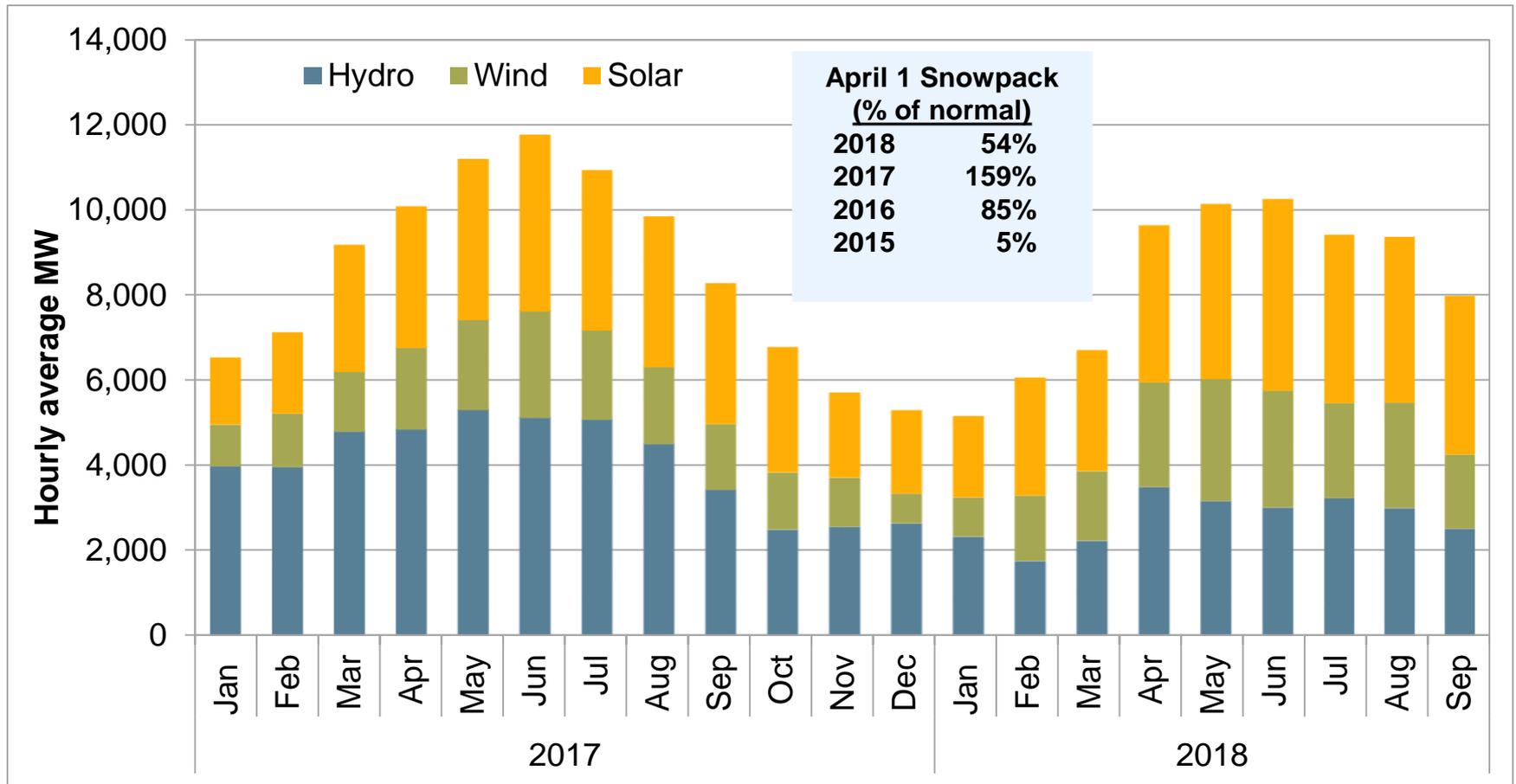
Actual load compared to planning forecasts

instantaneous peak load 46,625 MW on July 25

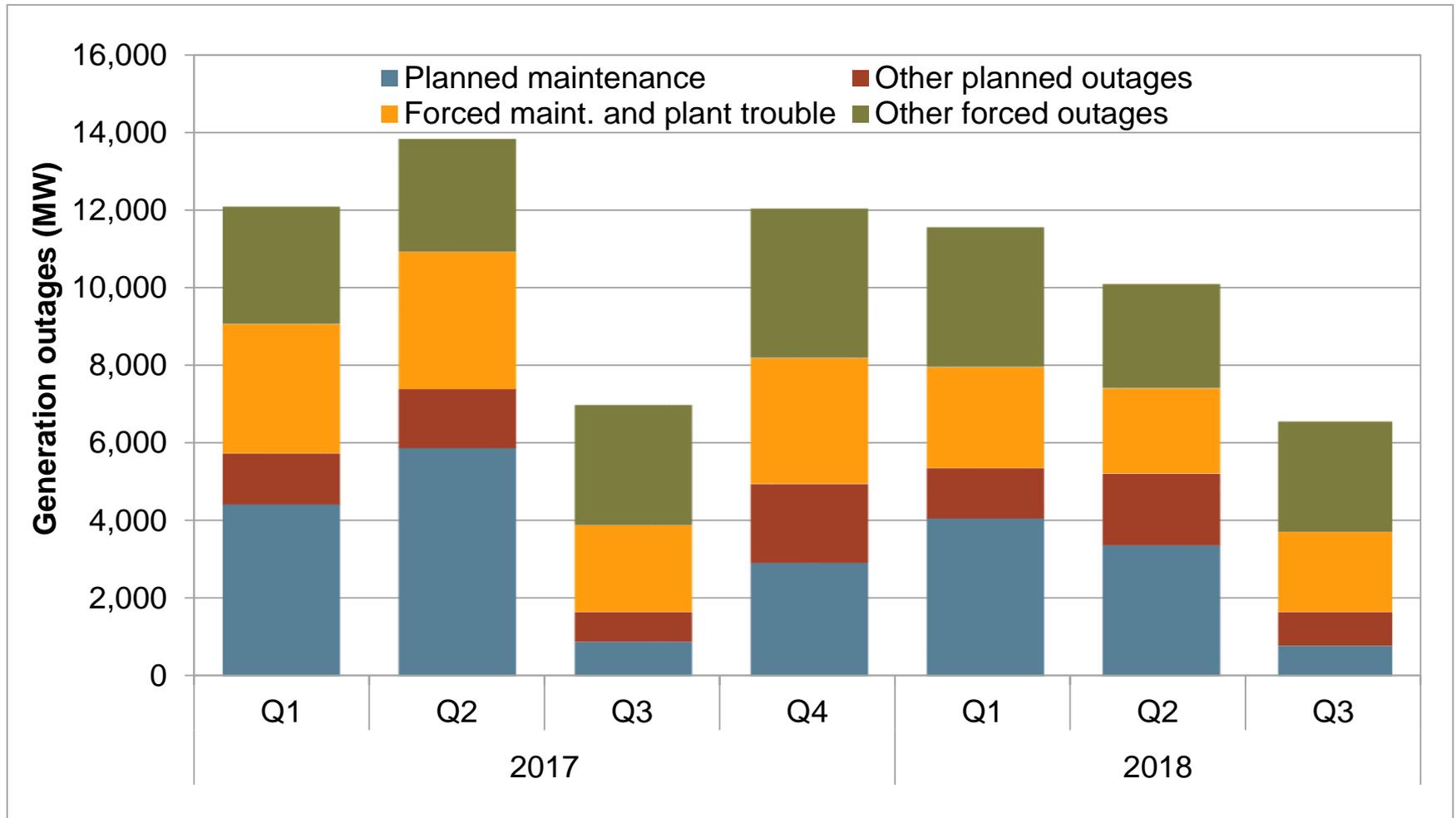


Total renewable production decreases in Q3, relative to Q3 2017, with hydro down 33%, solar up 20%, and wind up 10%

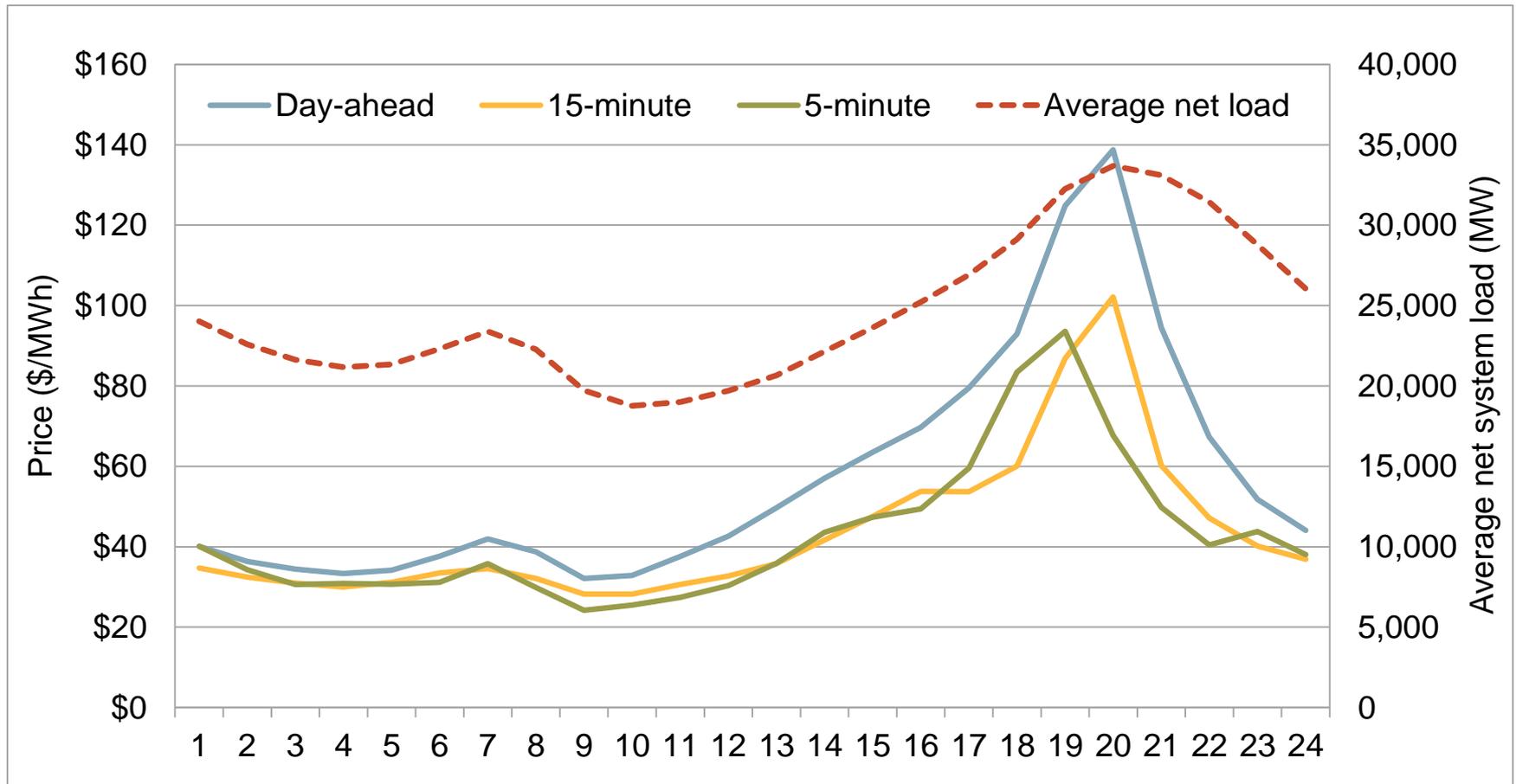
Average hourly hydroelectric, wind, and solar generation by month



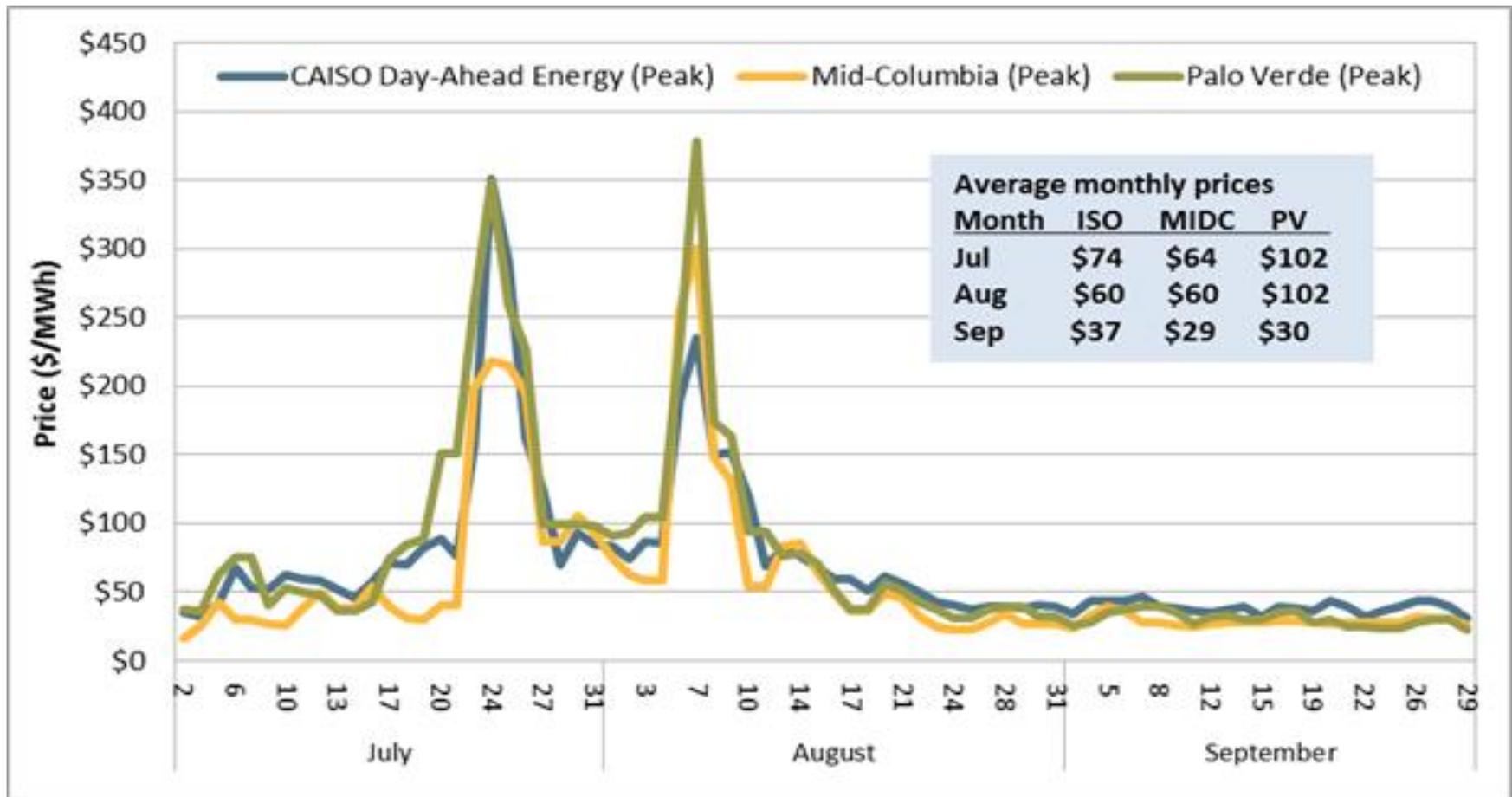
Average of peak hour maximum daily generation outages totals 6,500 MW, down from 7,000 MW in Q3 2017



Average prices up in Q3 2018, day-ahead by \$16/MWh, 15-minute by \$3/MWh, and 5-minute by \$4/MWh, relative to Q3 2017

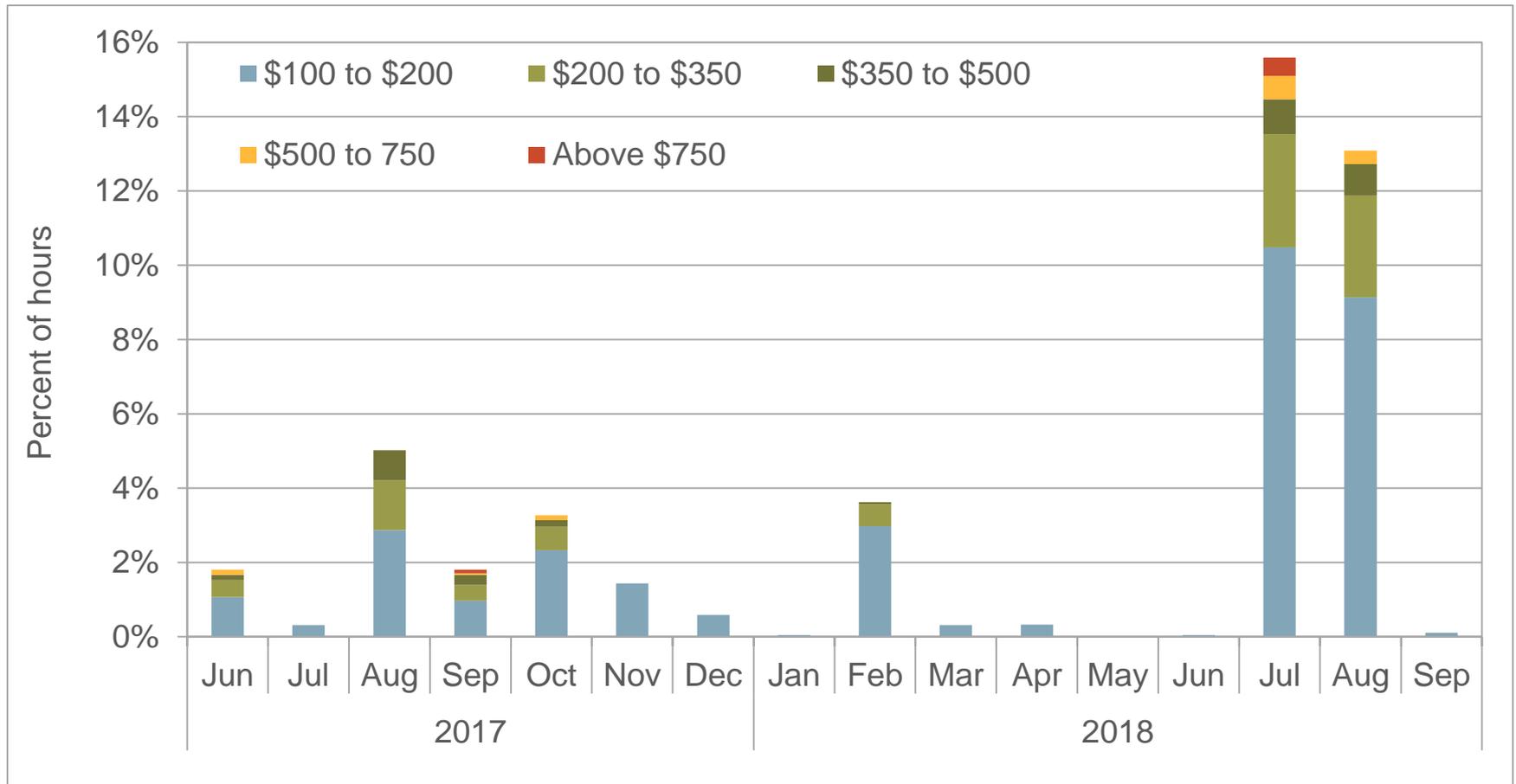


Day-ahead ISO and bilateral market prices for peak hours (7-22)

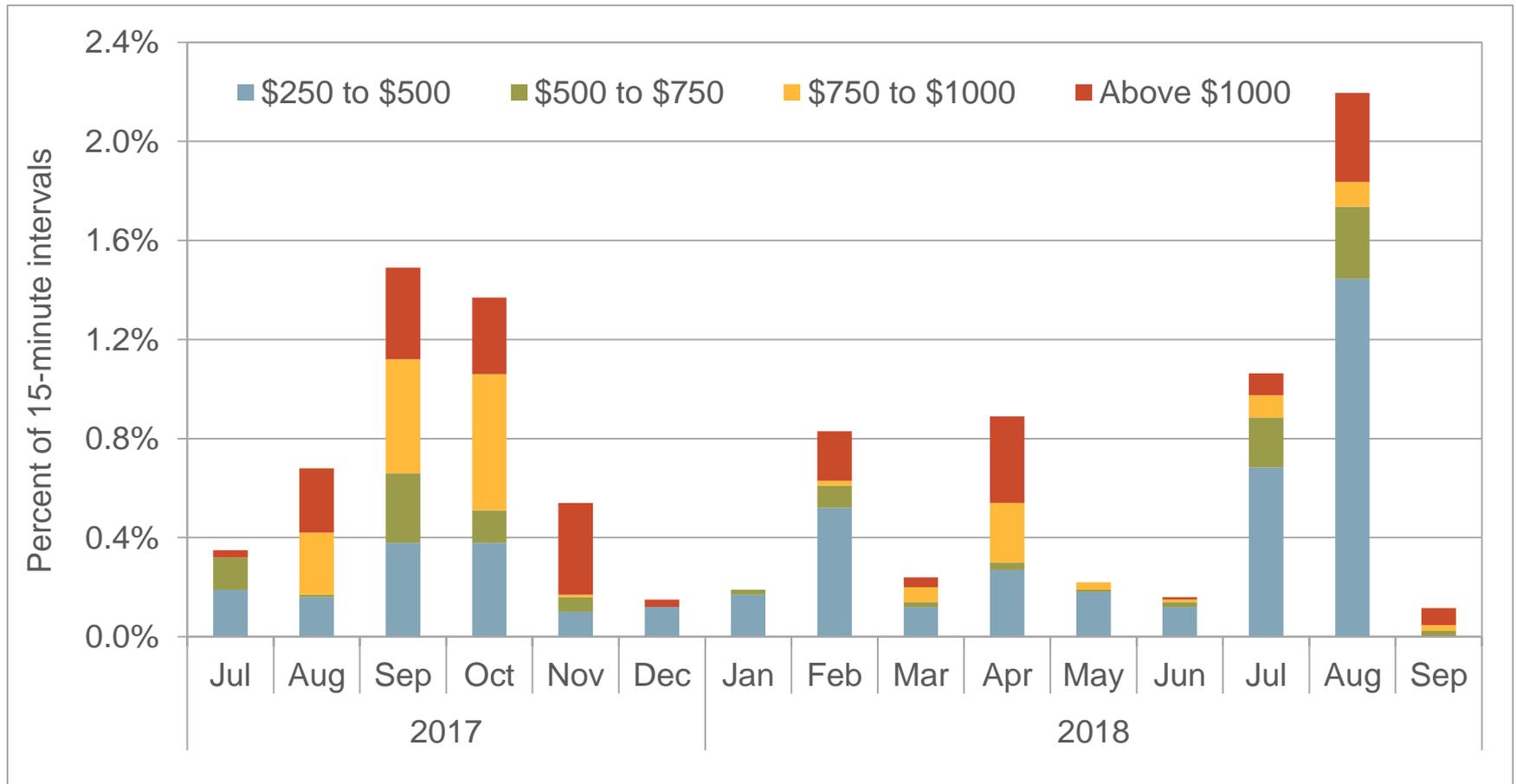


Frequency of high day-ahead prices by month

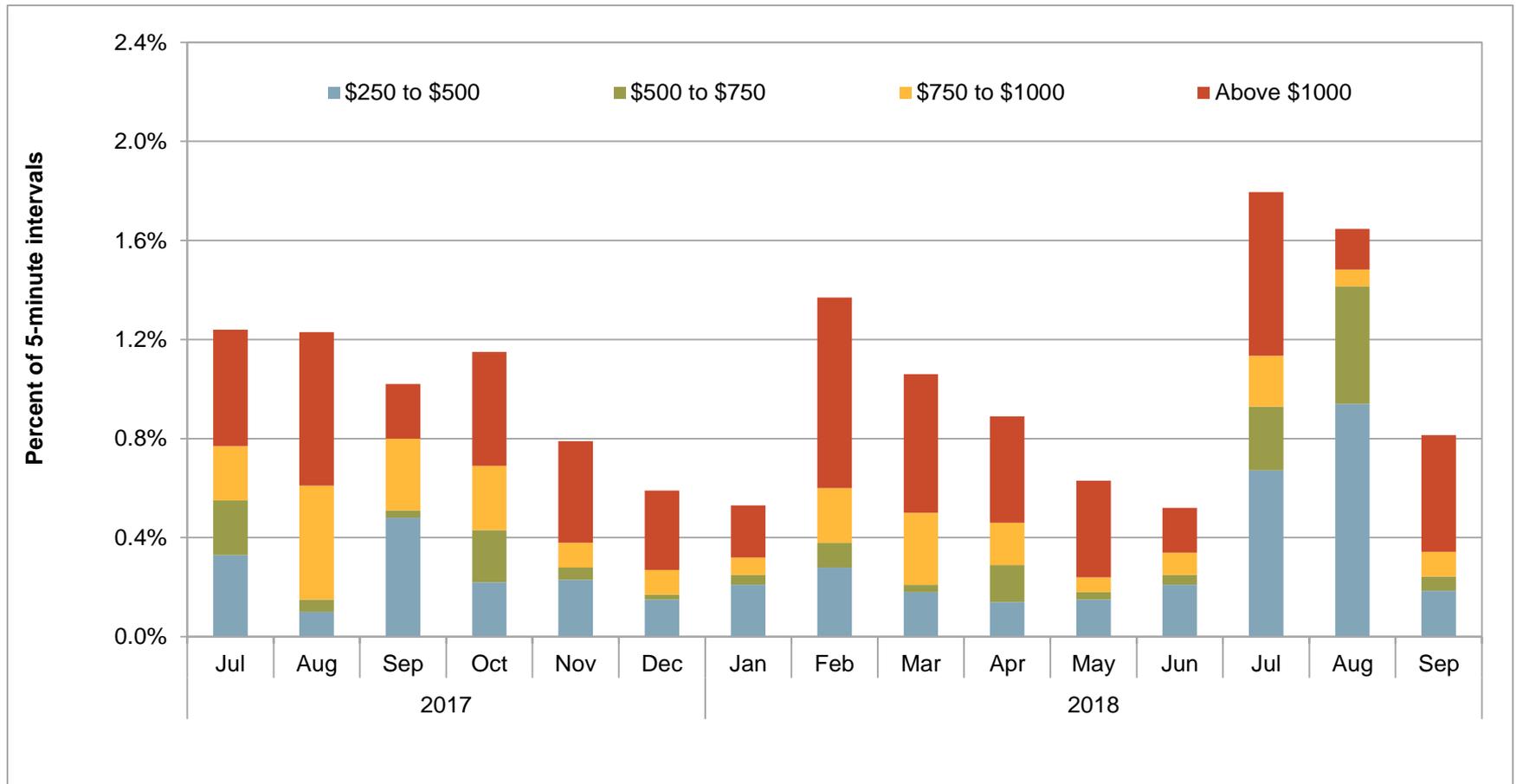
Most high prices set by unmitigated high bids



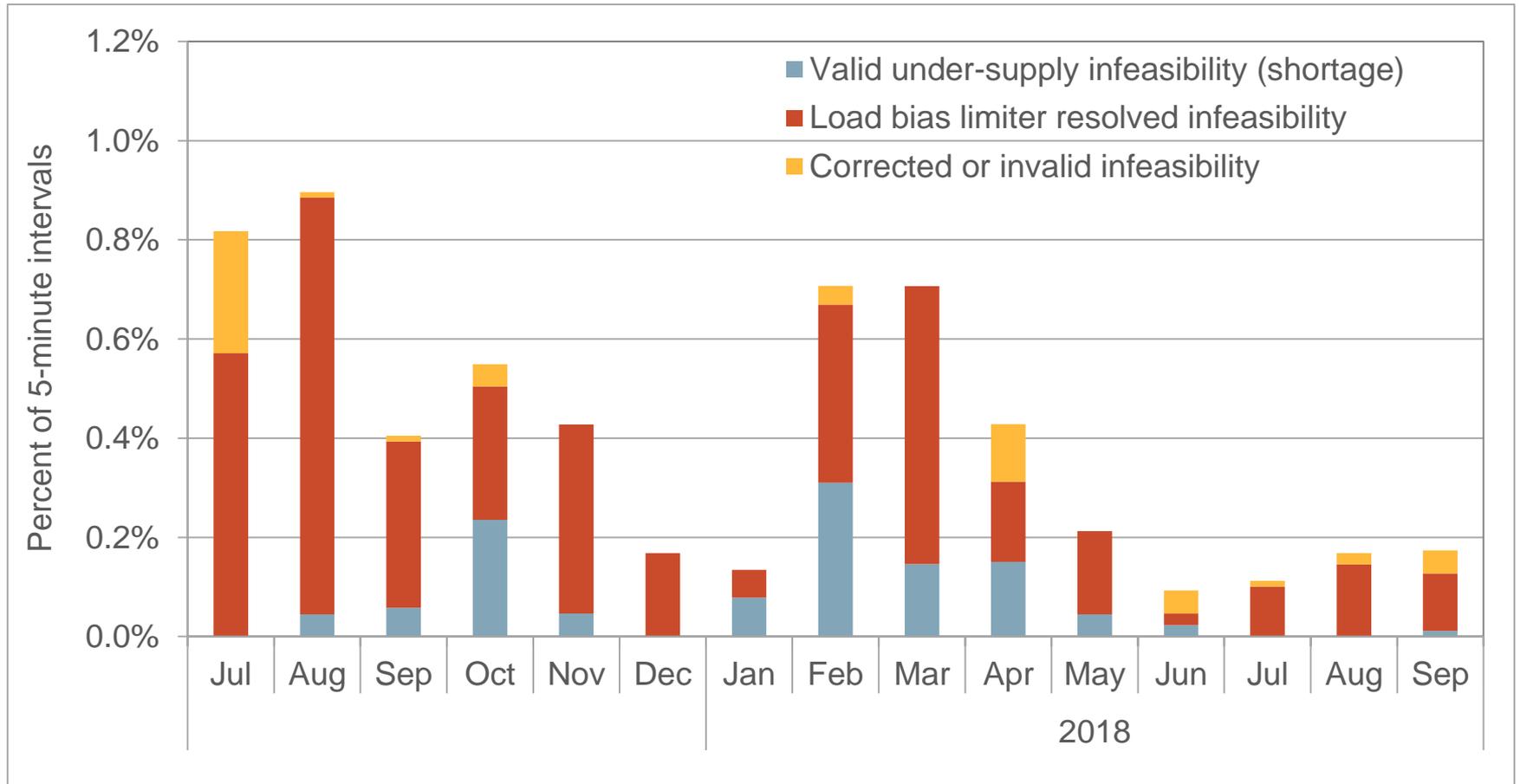
Frequency of high 15-minute prices by month



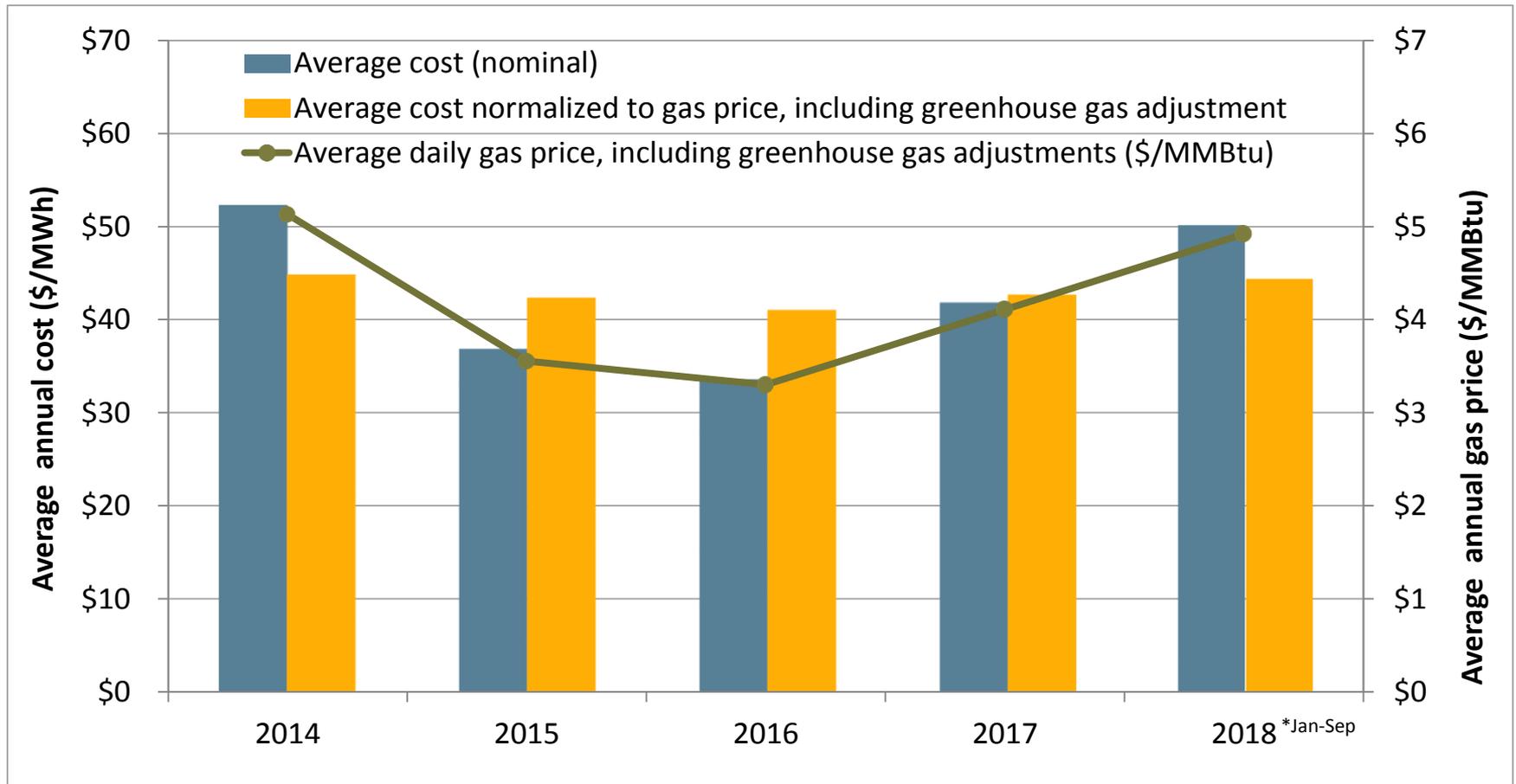
Frequency of high 5-minute prices by month



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



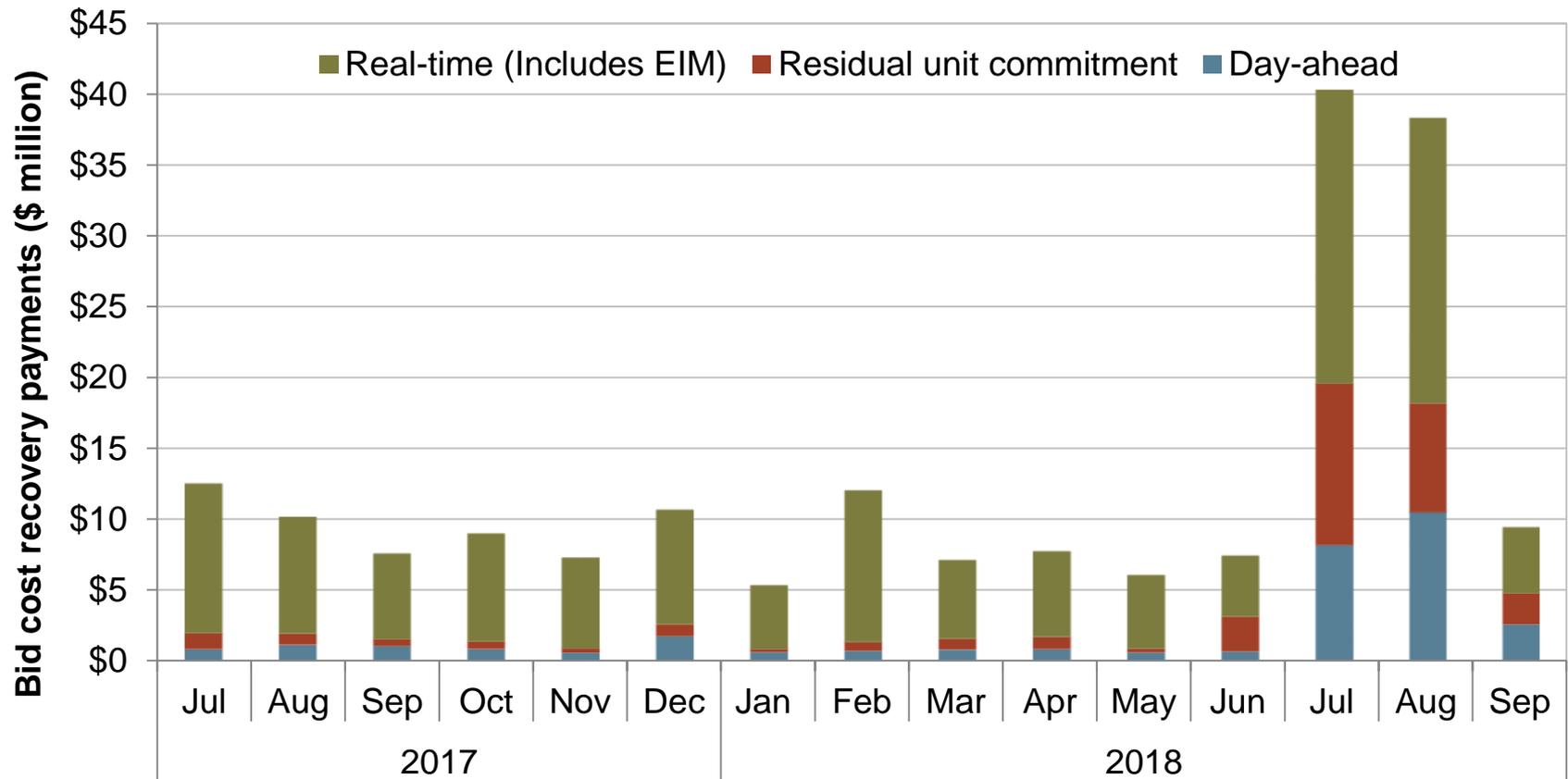
Total wholesale costs increased 20% -- or 4% after accounting for increase in gas cost (2014-2018 *Jan-Sep)



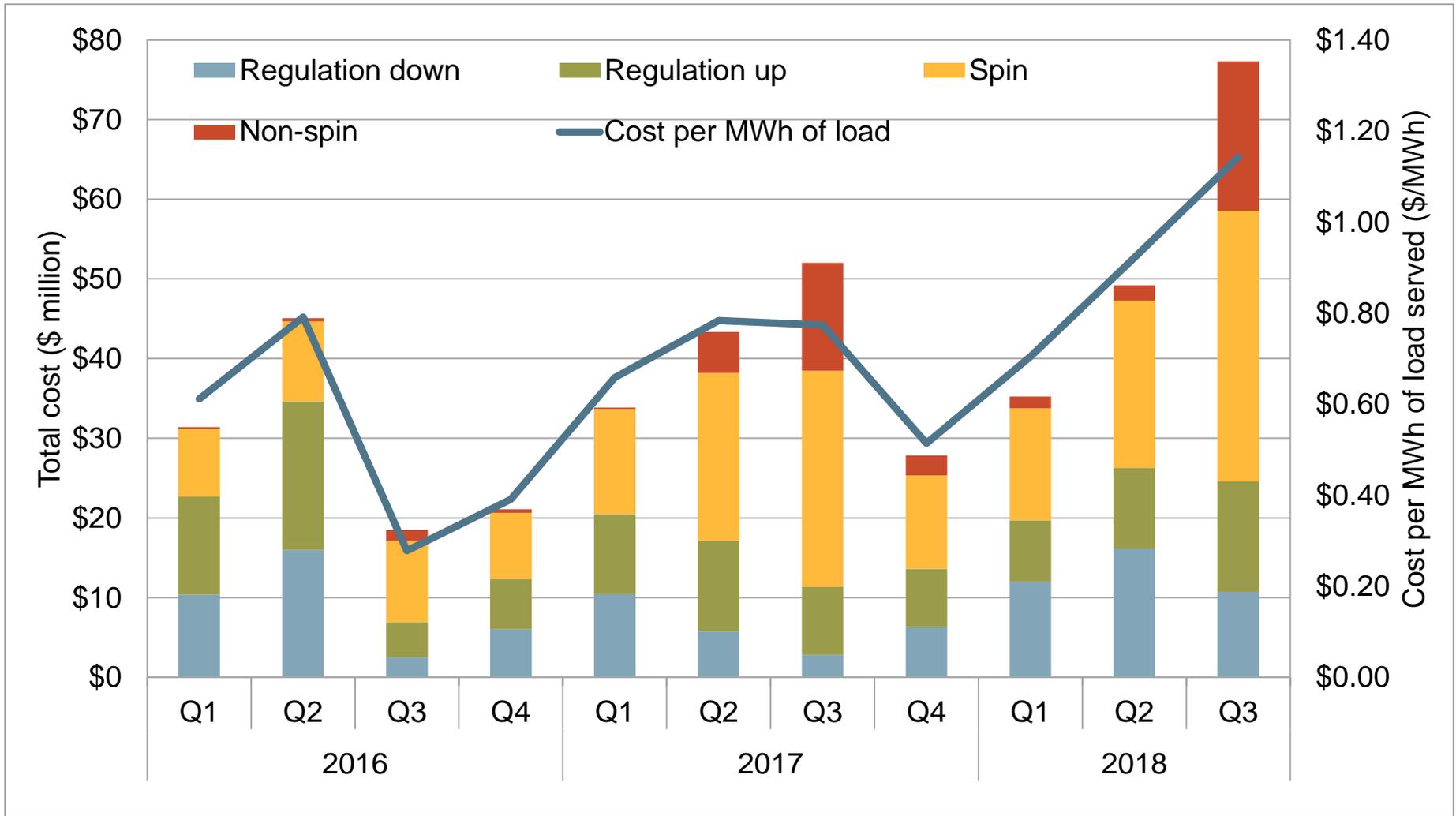
Total wholesale costs by category – excludes costs of meeting resource adequacy requirements.

	2014	2015	2016	2017	2018	Change '17-'18
Day-ahead energy costs	\$ 48.57	\$ 34.54	\$ 30.70	\$ 37.59	\$ 44.36	\$ 6.77
Real-time energy costs (incl. flex ramp)	\$ 1.98	\$ 0.69	\$ 1.03	\$ 2.01	\$ 2.49	\$ 0.48
Grid management charge	\$ 0.80	\$ 0.80	\$ 0.81	\$ 0.81	\$ 0.82	\$ 0.01
Bid cost recovery costs	\$ 0.40	\$ 0.39	\$ 0.33	\$ 0.47	\$ 0.78	\$ 0.31
Reliability costs (RMR and CPM)	\$ 0.14	\$ 0.12	\$ 0.11	\$ 0.10	\$ 0.64	\$ 0.53
Average total energy costs	\$ 51.89	\$ 36.54	\$ 32.98	\$ 40.99	\$ 49.09	\$ 8.10
Reserve costs (AS and RUC)	\$ 0.30	\$ 0.27	\$ 0.54	\$ 0.77	\$ 0.96	\$ 0.18
Average total costs of energy and reserve	\$ 52.19	\$ 36.81	\$ 33.52	\$ 41.77	\$ 50.05	\$ 8.28

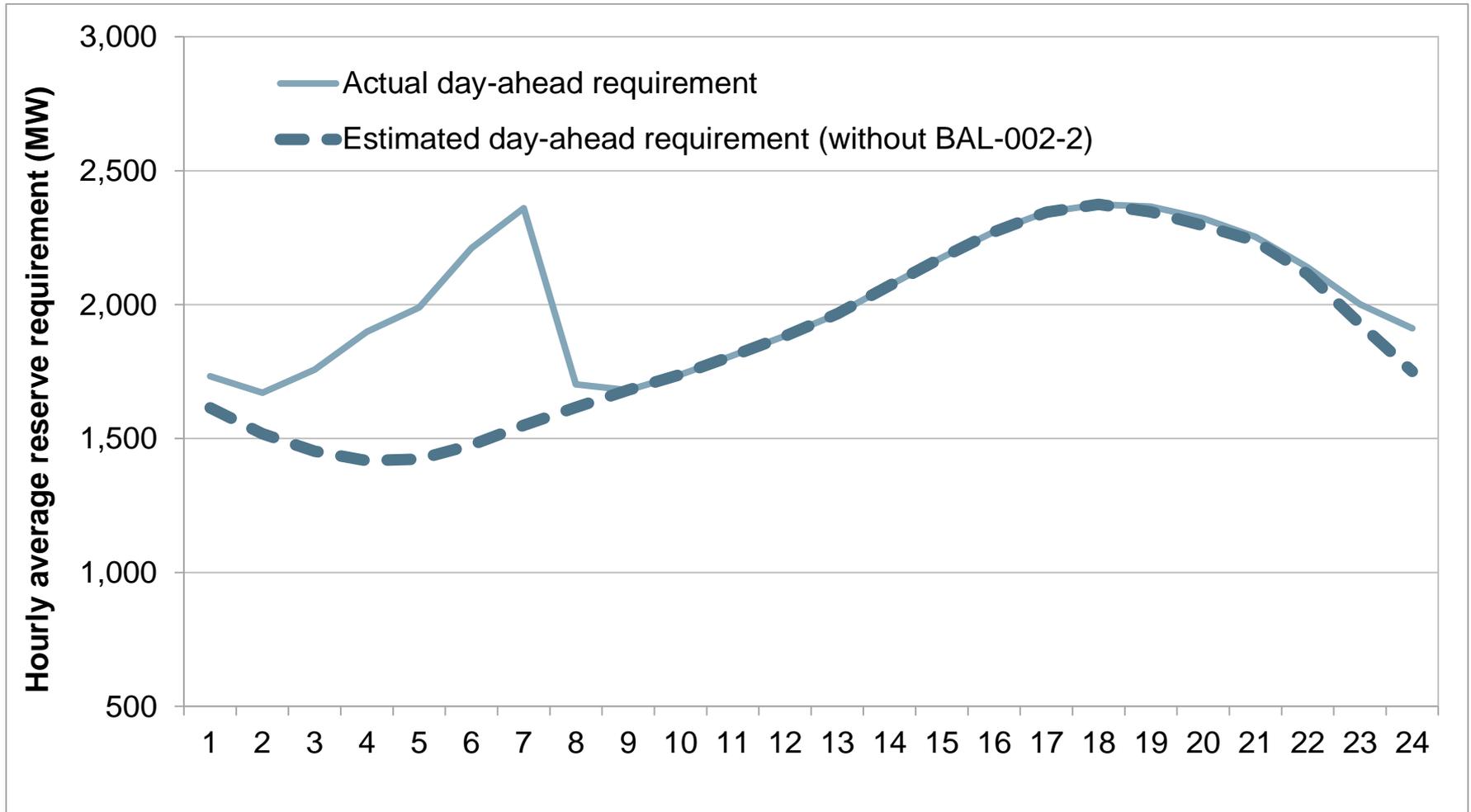
Bid cost recovery payments \$88 million, the highest cost of any quarter since 2011



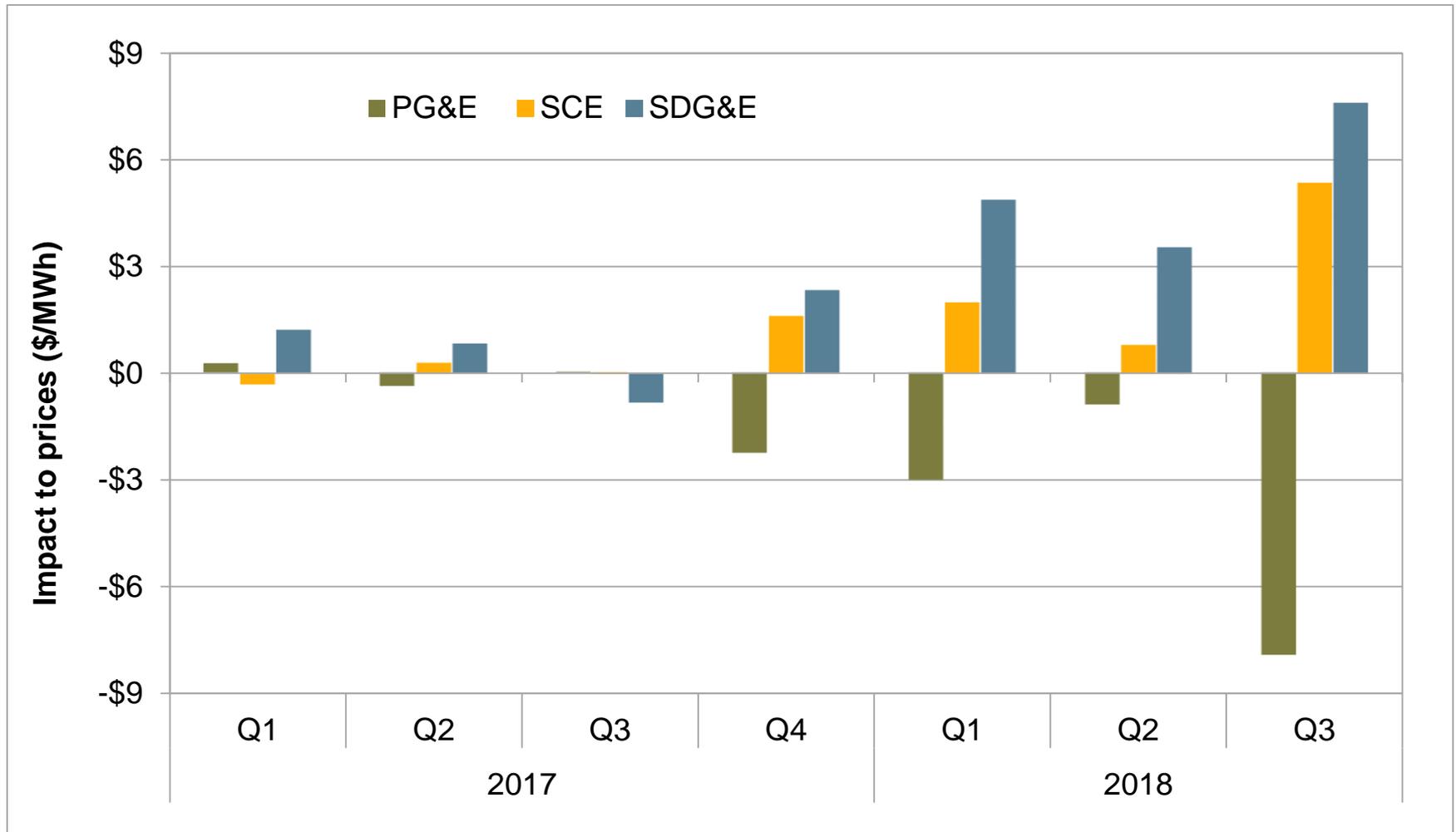
Ancillary service cost by product



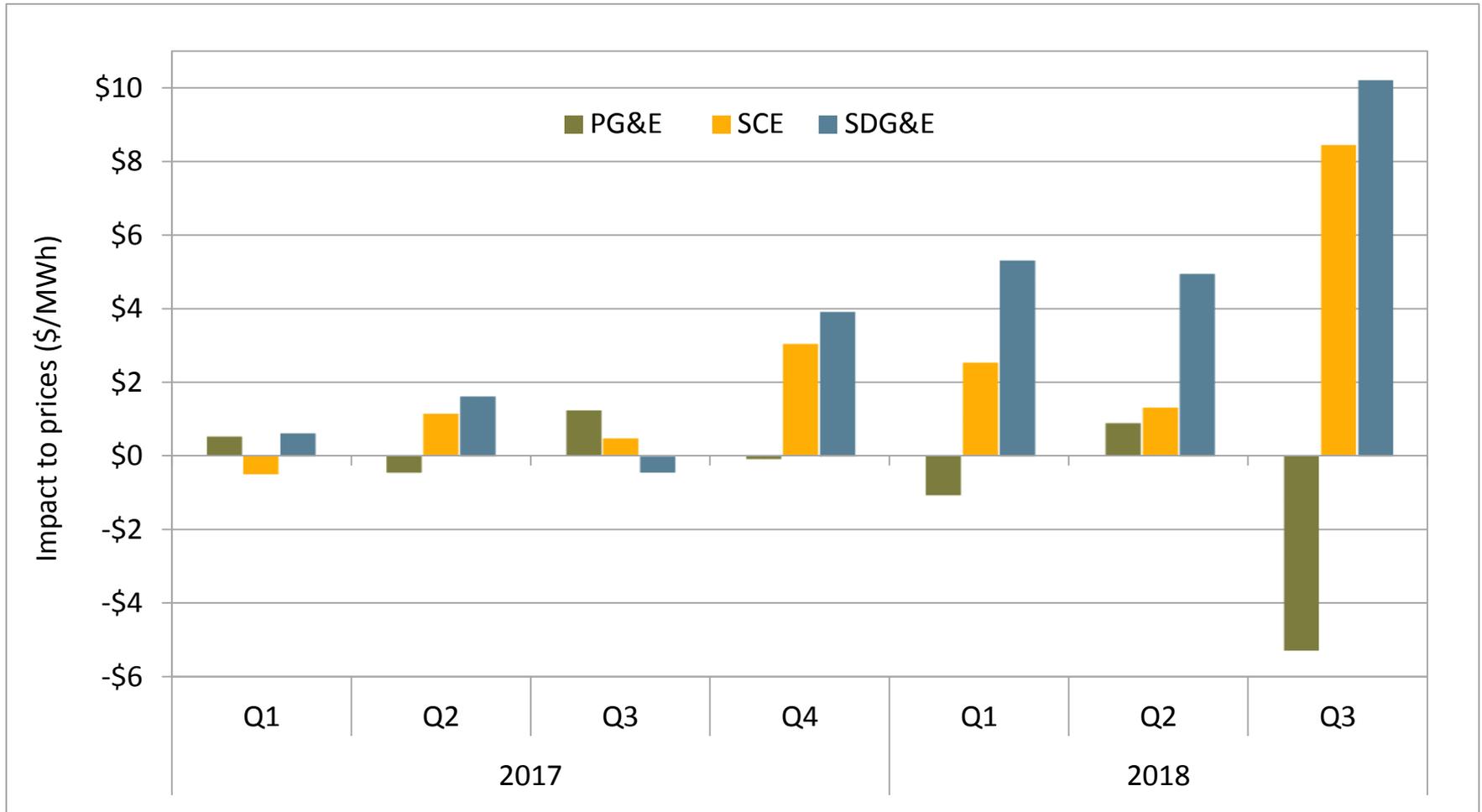
Hourly average operating reserve requirement (Q3)



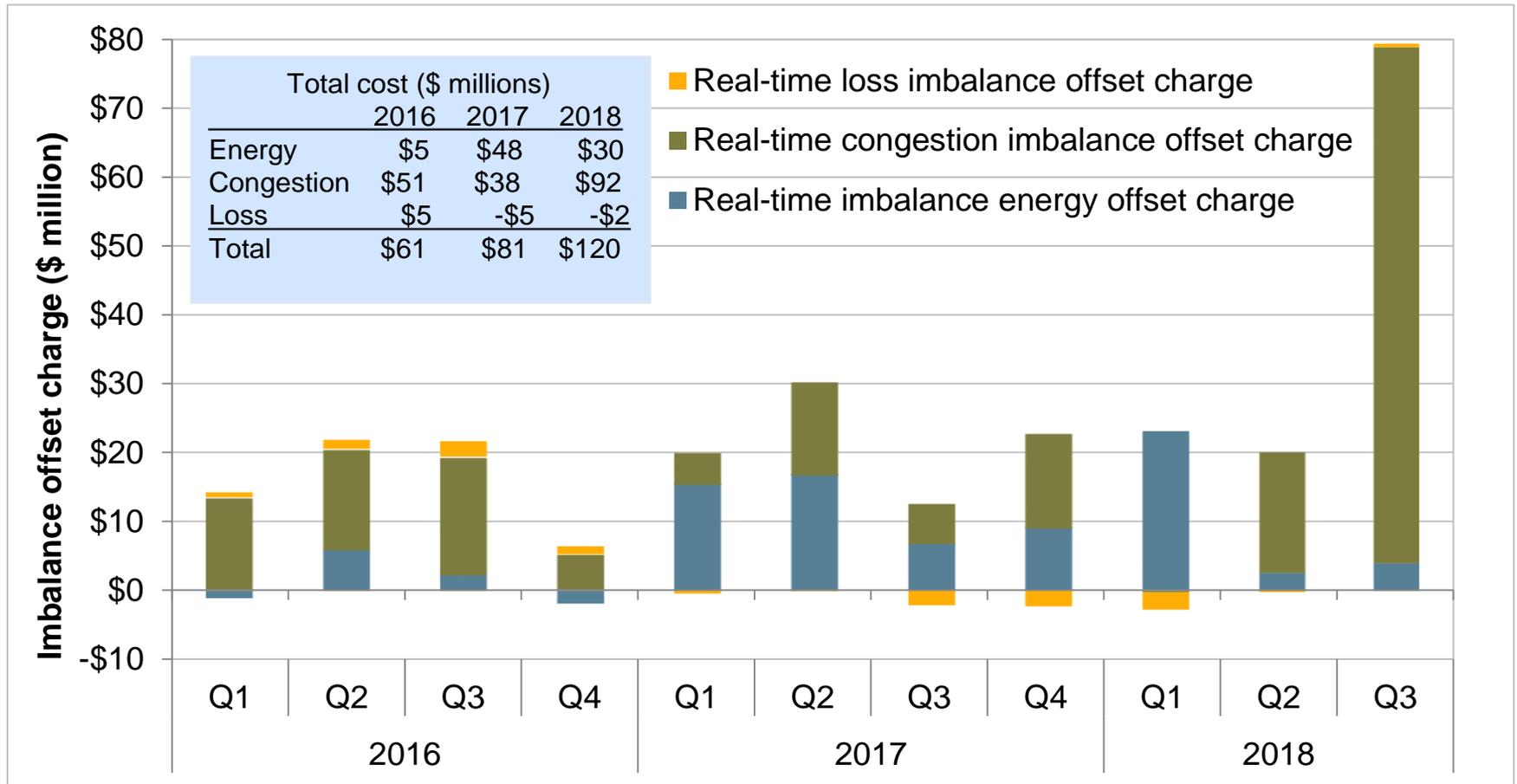
Impact of congestion on day-ahead prices



Impact of congestion on 15-minute prices



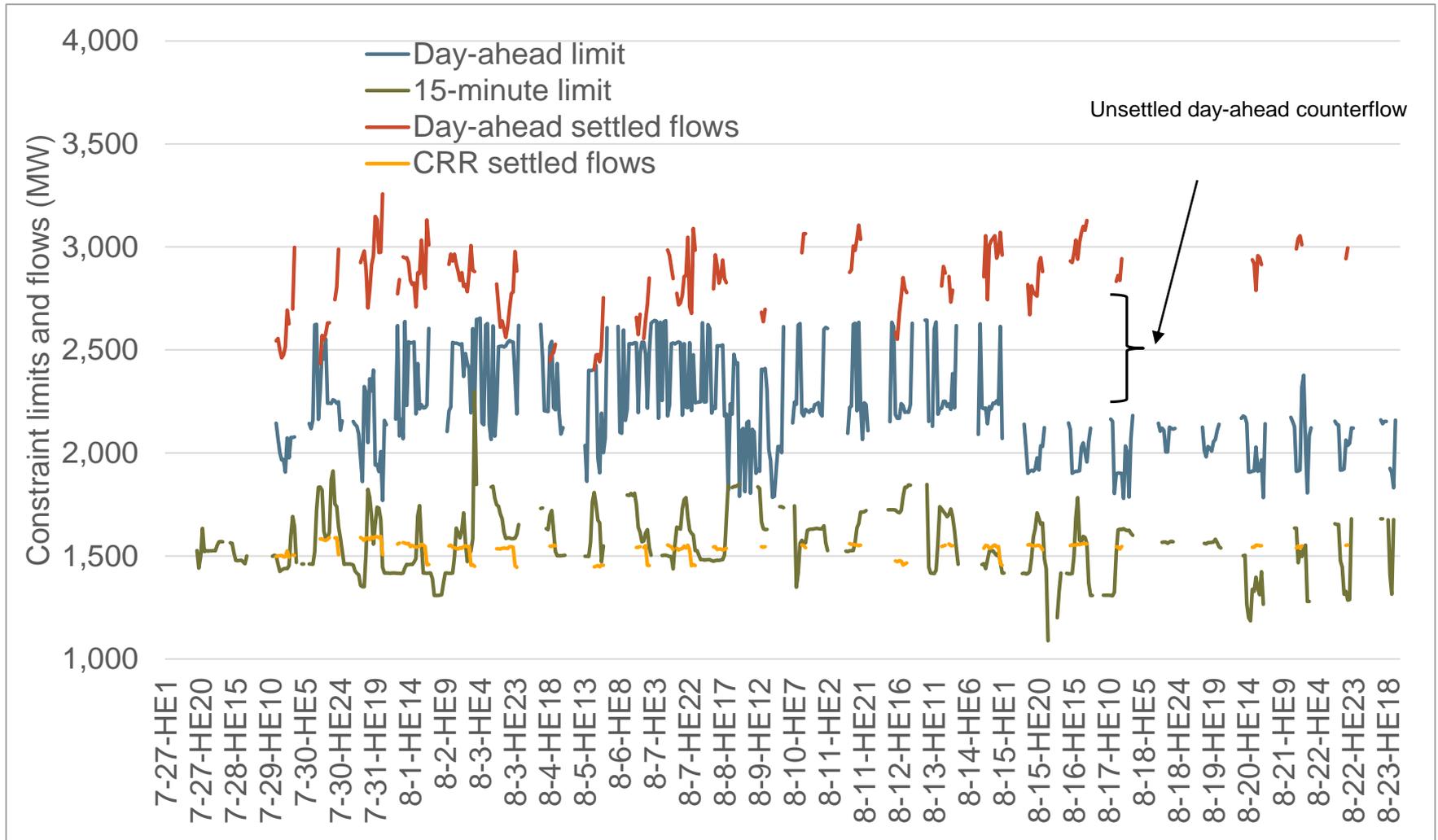
Real-time imbalance offset charges increase to about \$79 million from about \$20 million



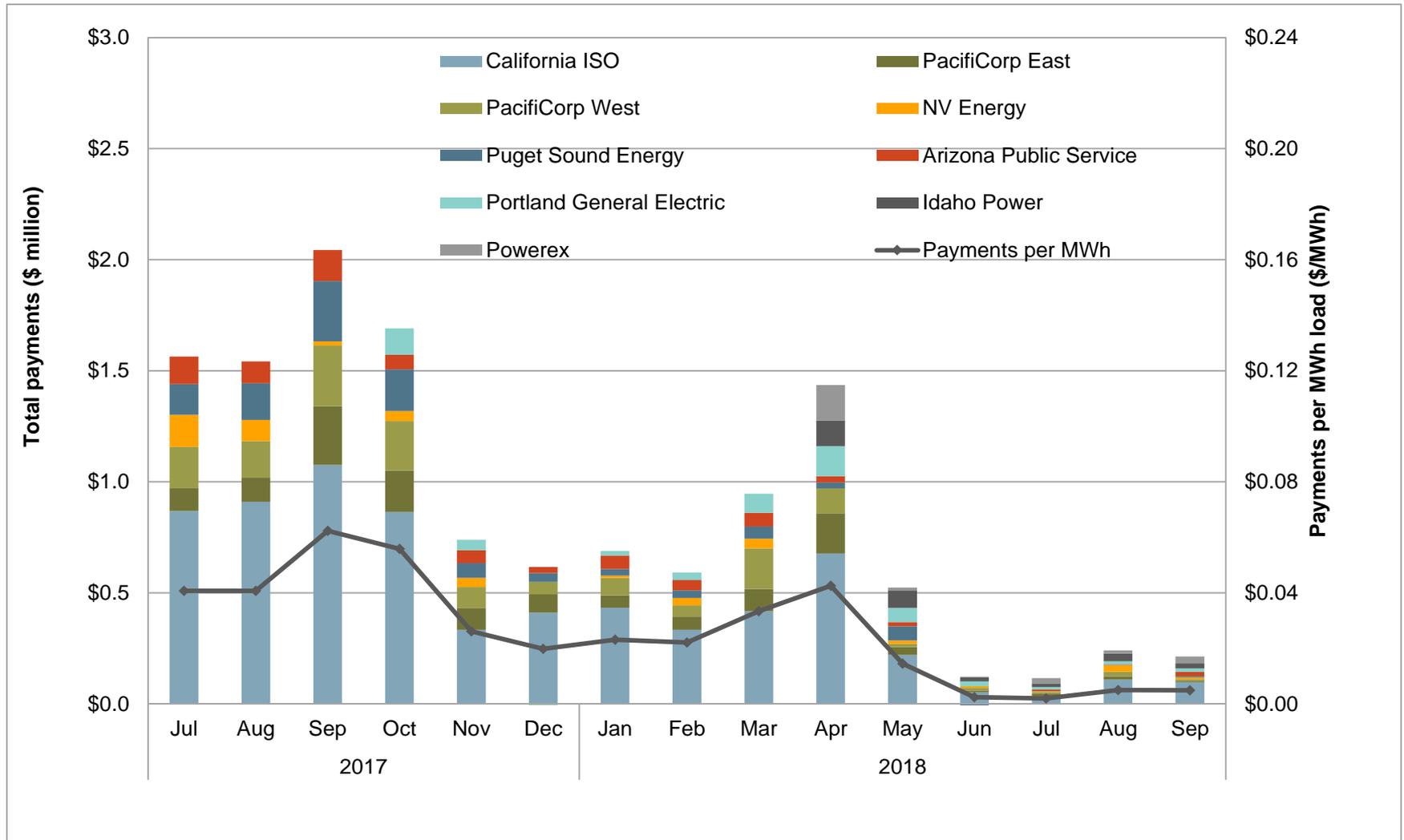
Estimated Q3 15-minute market congestion imbalances – top 10 constraints

Constraint	Estimated imbalances (million \$)	Binding in FMM	Total hours in quarter			Avg DA limit (MW)	Avg limit change (MW)	Estimated CRR surpluses (million \$)
			w/ lower FMM limit	w/o lower FMM limit	w/o DA limit			
30060_MIDWAY_500_24156_VINCENT_500_BR_1_1	(\$14.6)	288	251	2	35	2,094	(506)	\$36.6
24016_BARRE_230_24154_VILLAPK_230_BR_1_1	(\$13.7)	221	206	7	8	1,373	(256)	\$2.2
6410_CP5_NG	(\$8.3)	158	113	15	30	1,288	(681)	\$3.3
6510_CP1_NG	(\$8.0)	60	0	0	60	.	.	\$0.0
30055_GATES1_500_30900_GATES_230_XF_11_S	(\$5.1)	213	132	2	79	1,110	(204)	(\$1.5)
6410_CP1_NG	(\$4.5)	67	60	2	5	3,133	(1,309)	\$10.4
30060_MIDWAY_500_24156_VINCENT_500_BR_2_3	(\$2.7)	88	6	49	33	2,172	240	\$0.0
MALIN500	(\$2.3)	89	58	31	0	2,715	(325)	(\$1.2)
24016_BARRE_230_25201_LEWIS_230_BR_1_1	(\$1.1)	29	23	4	2	1,528	(291)	\$1.7
22192_DOUBLTTP_138_22300_FRIARS_138_BR_1_1	(\$1.0)	259	214	36	9	162	(15)	(\$8.6)

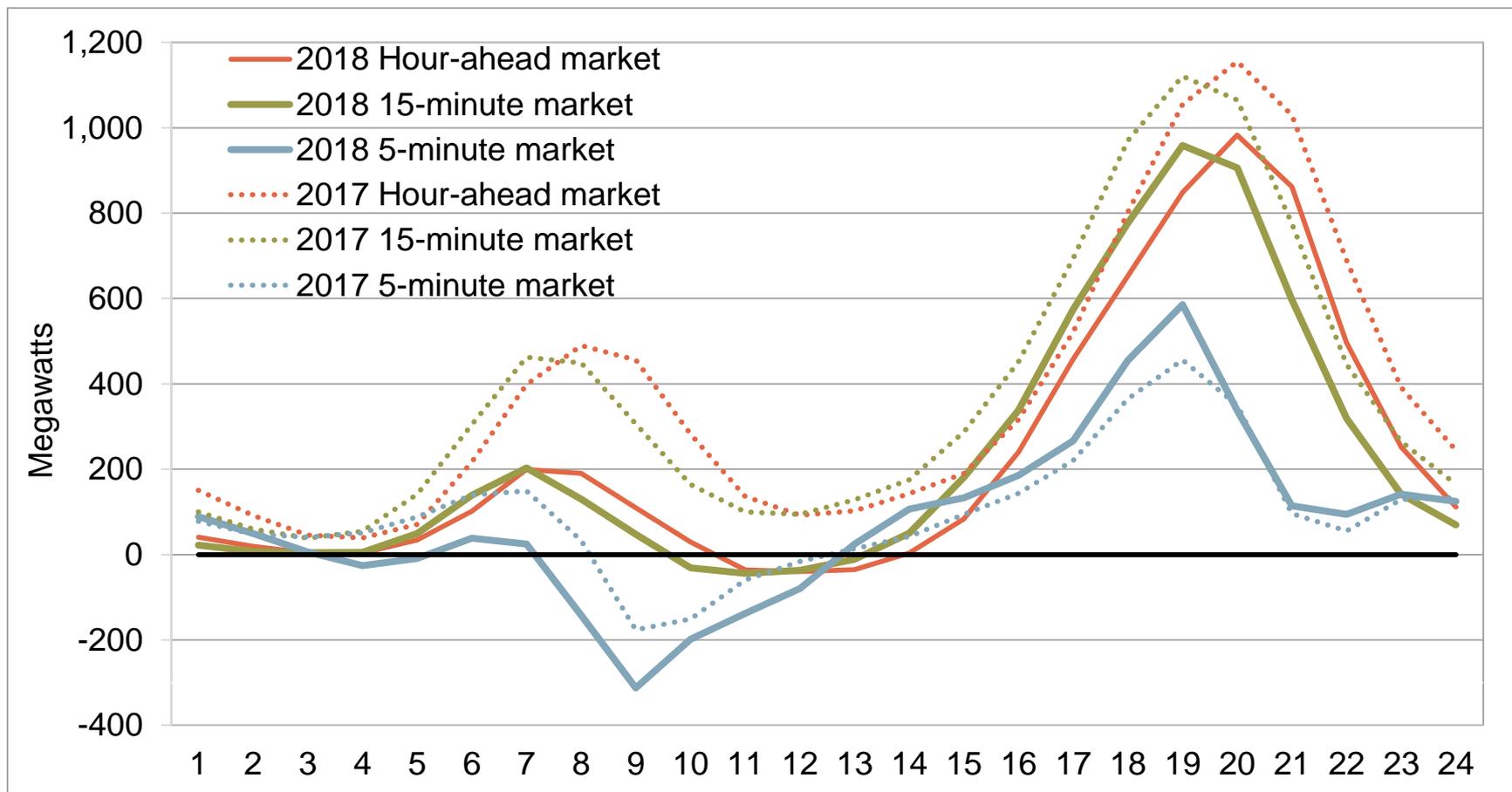
Midway-Vincent 1 limits and settled flows



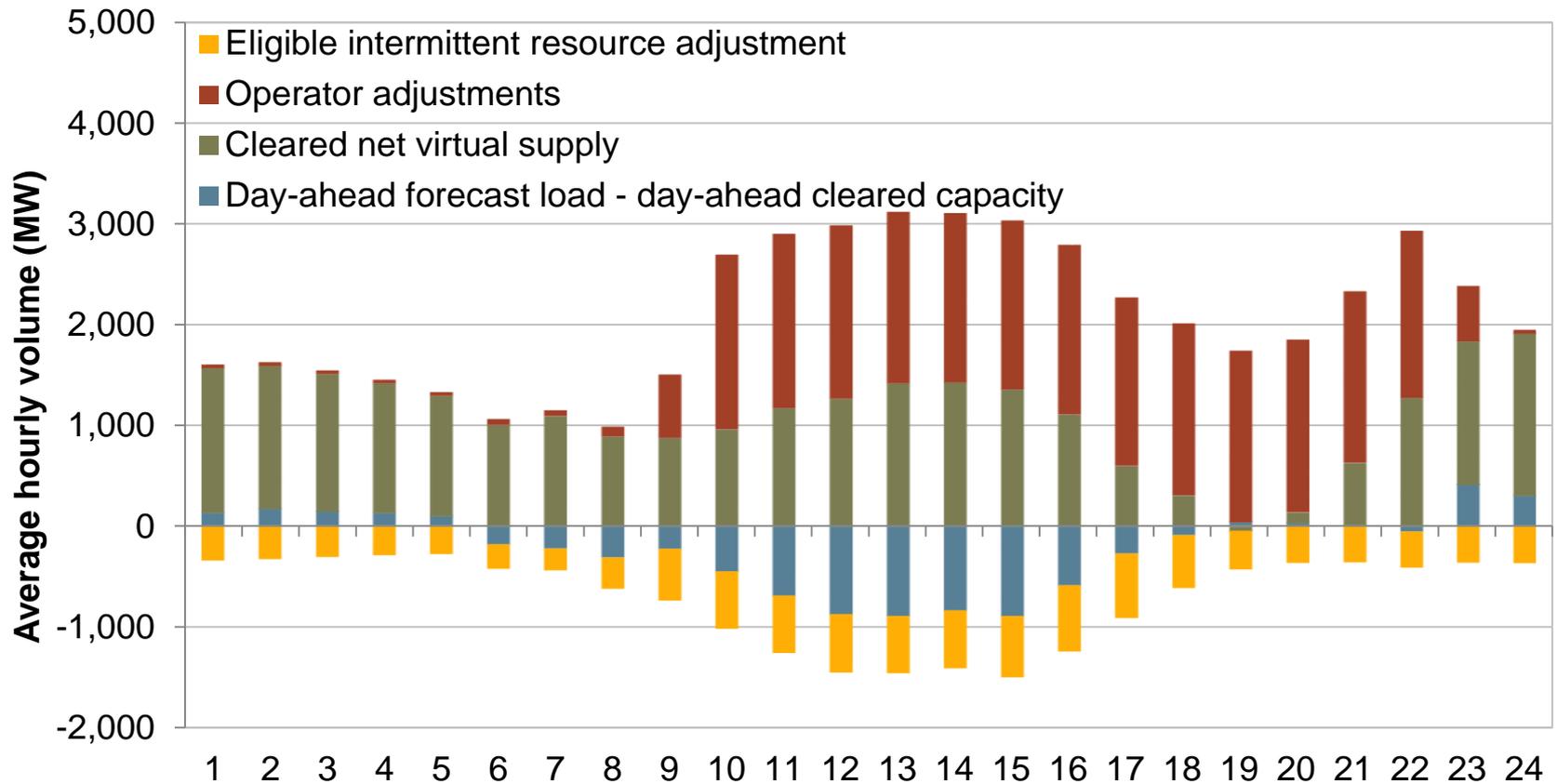
Monthly flexible ramping payments by balancing area



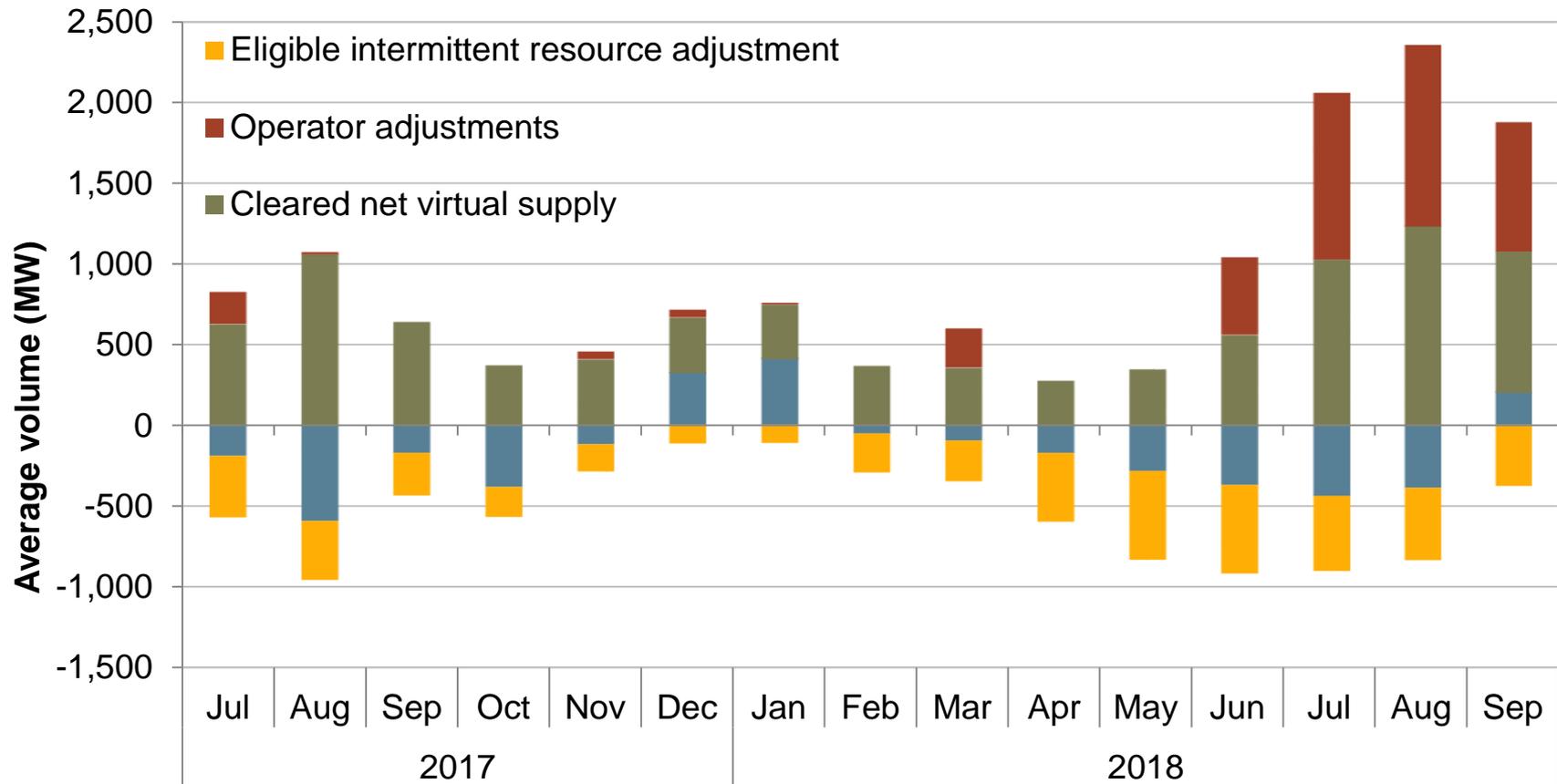
Average hourly load adjustment (Q3 2018 – Q3 2017)



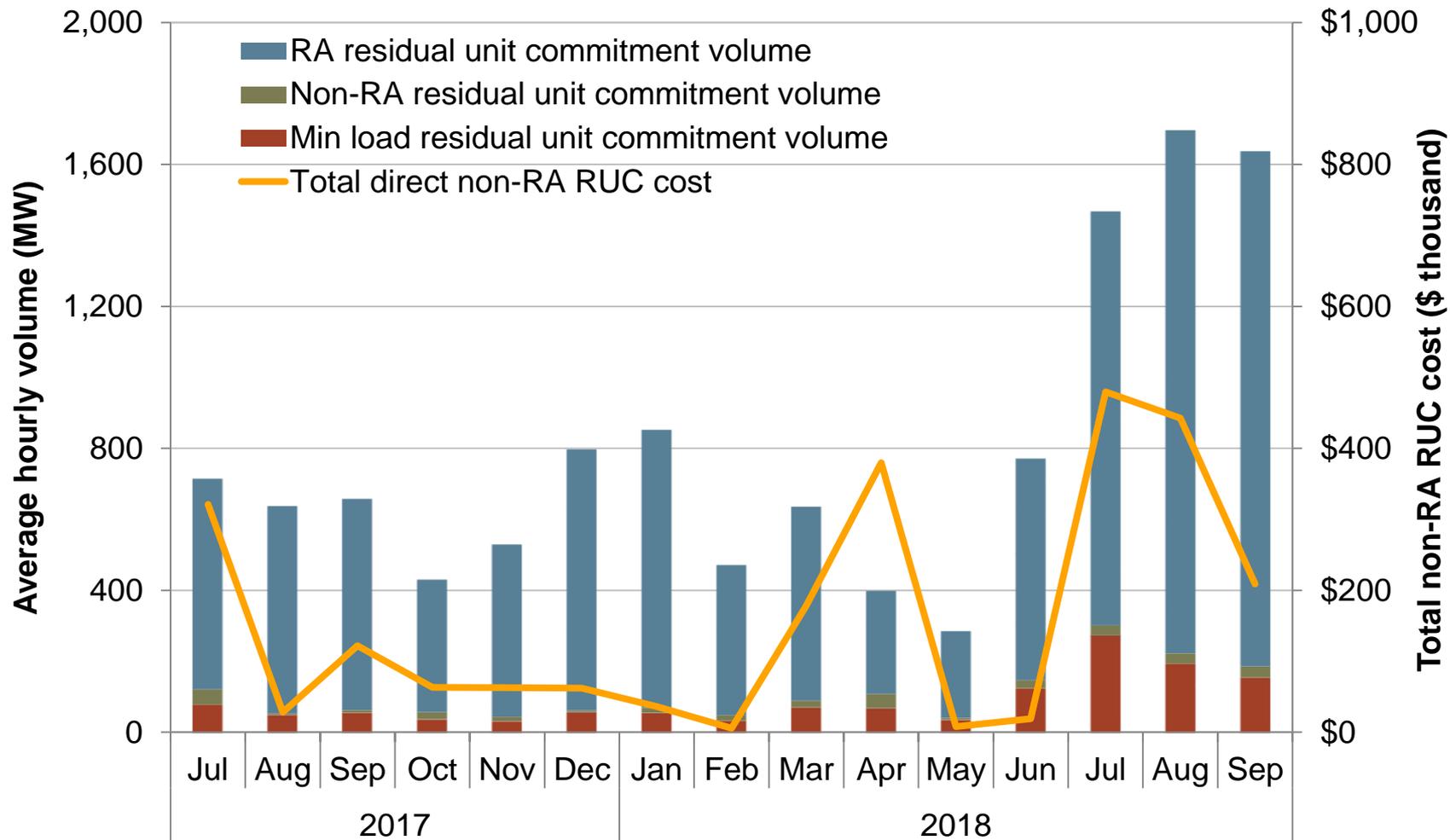
Average hourly determinants of residual unit commitment procurement (July - September)



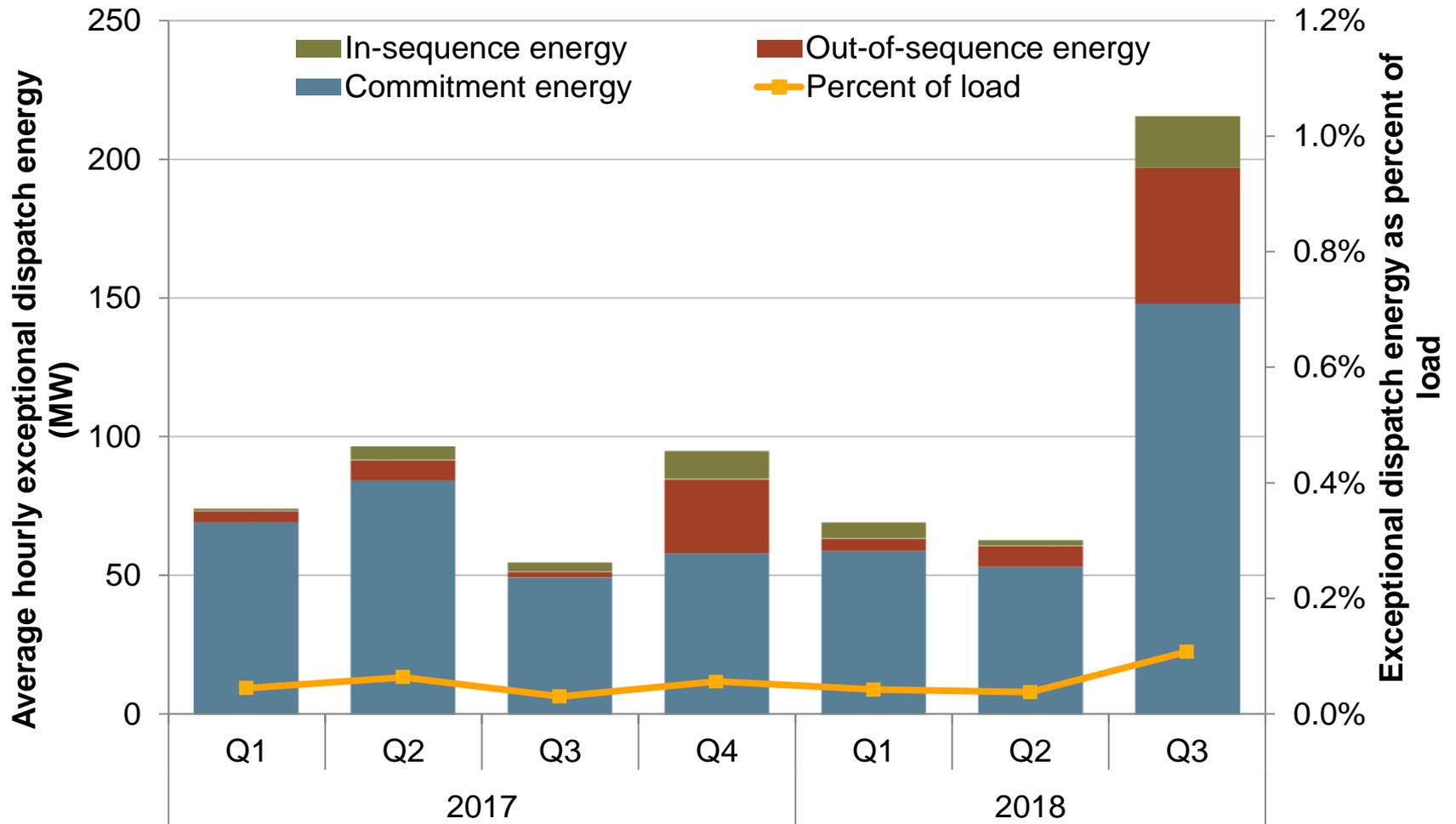
Determinants of residual unit commitment procurement



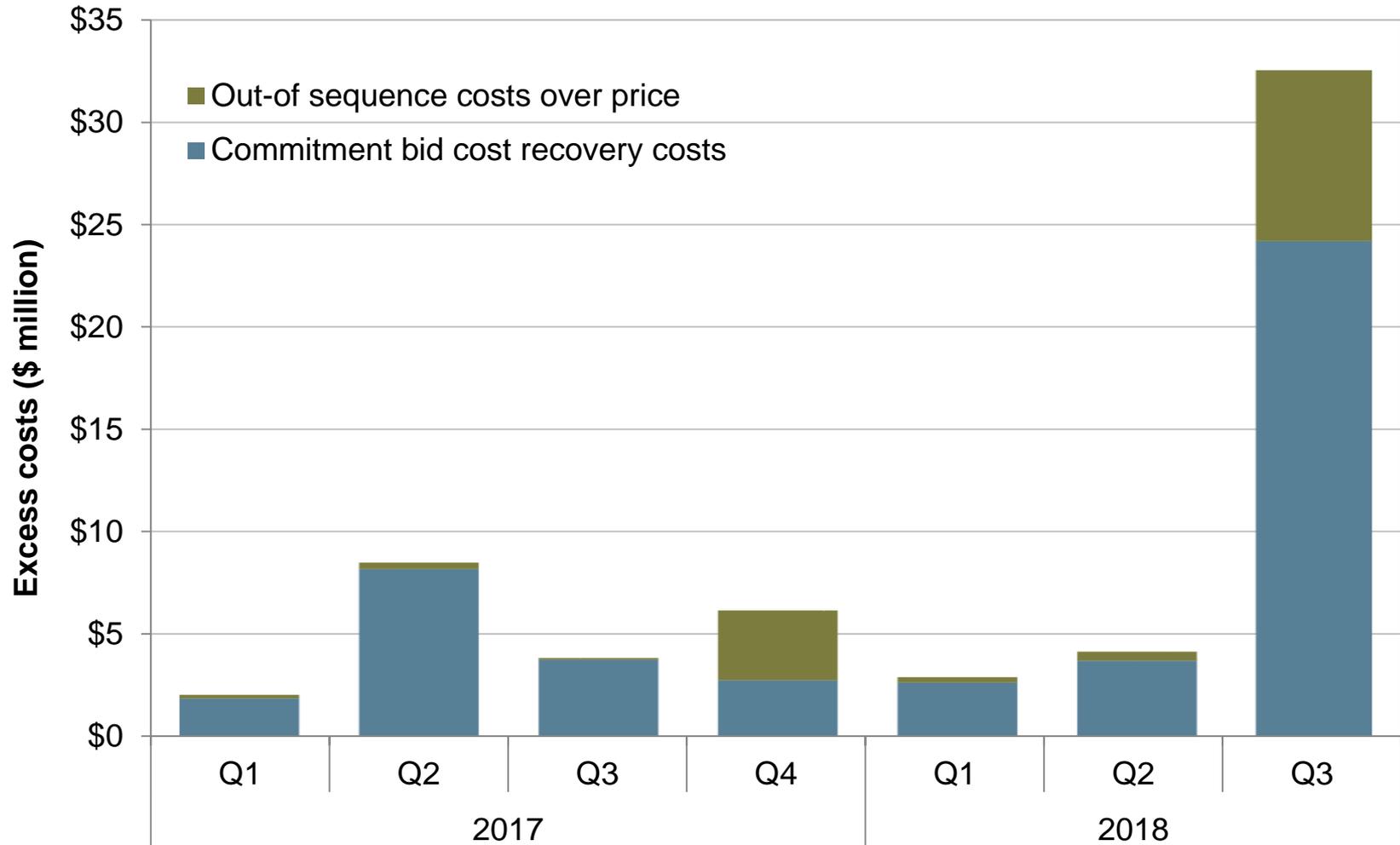
Residual unit commitment costs and volume



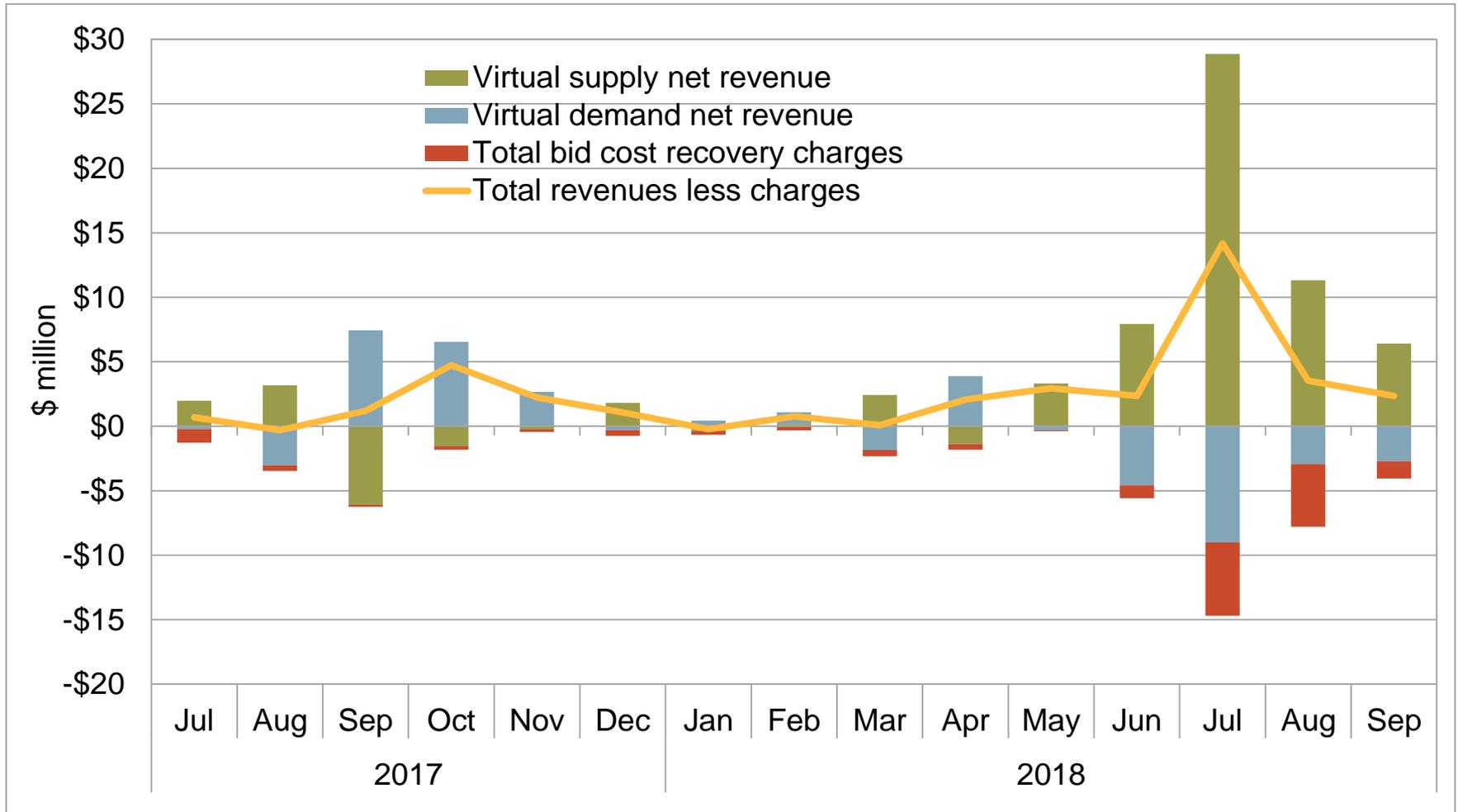
Average hourly energy from exceptional dispatch



Excess exceptional dispatch cost by type

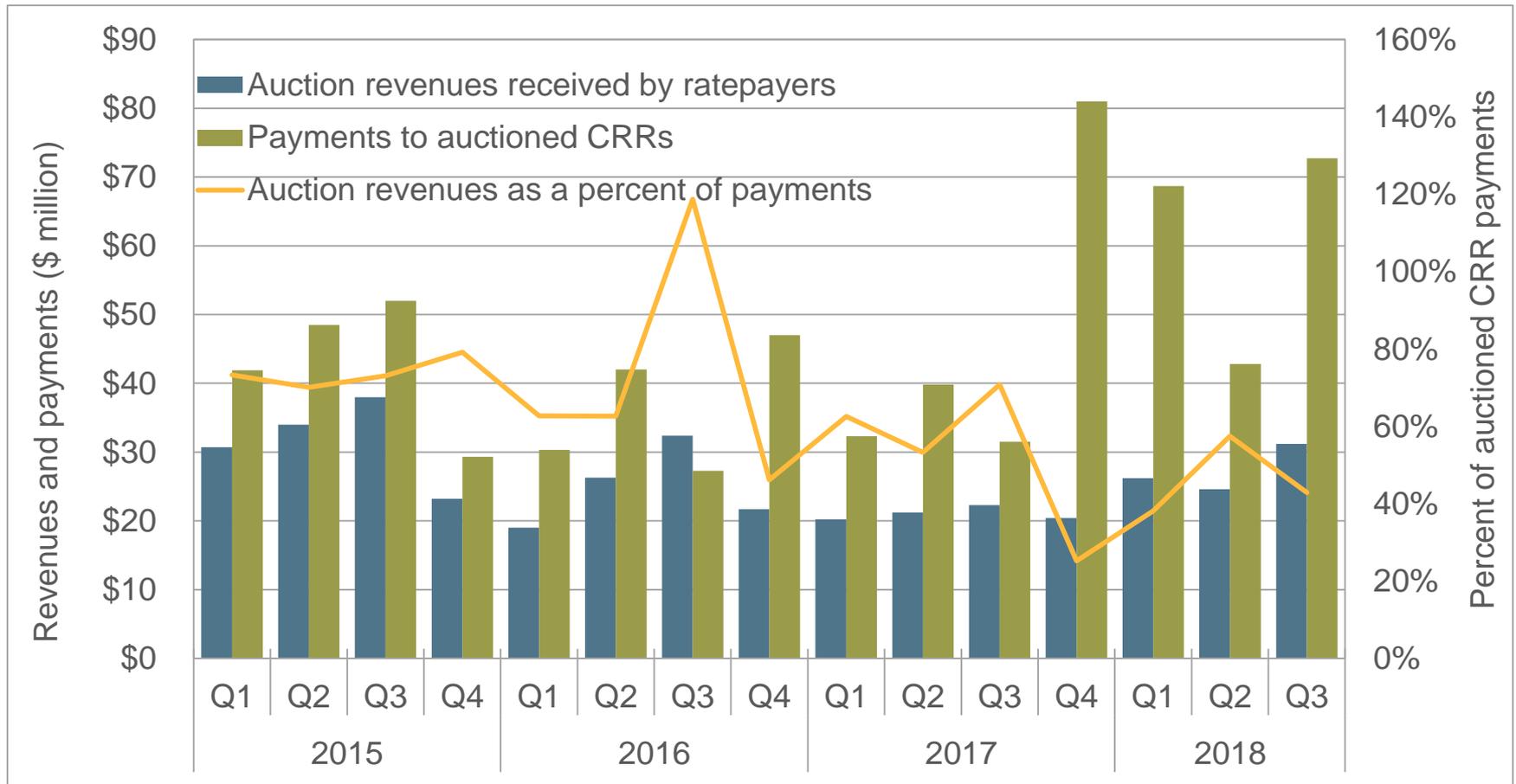


Convergence bidding revenues and bid cost recovery charges increases to \$20 million

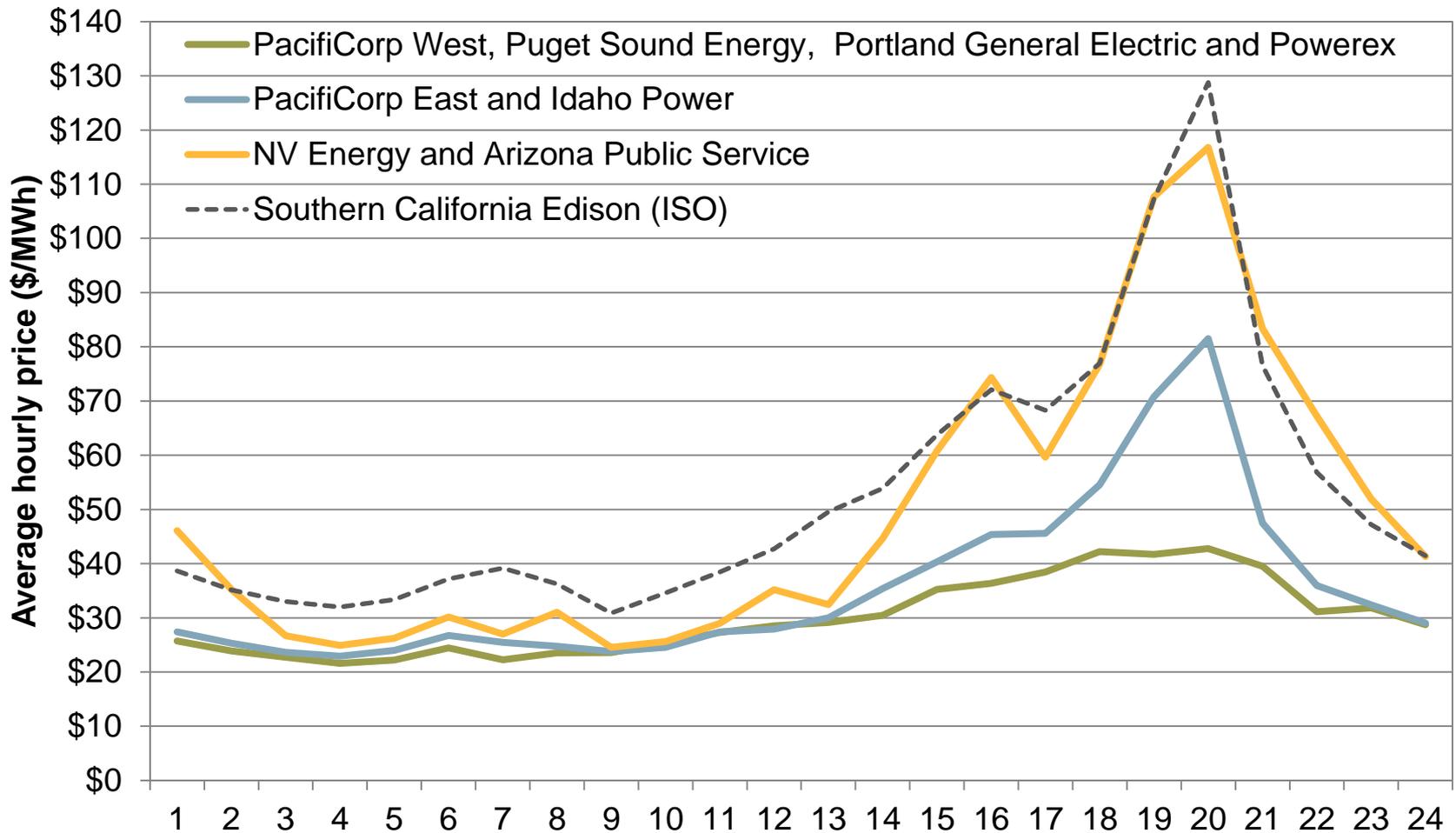


Auction revenues and payments to non-load-serving entities

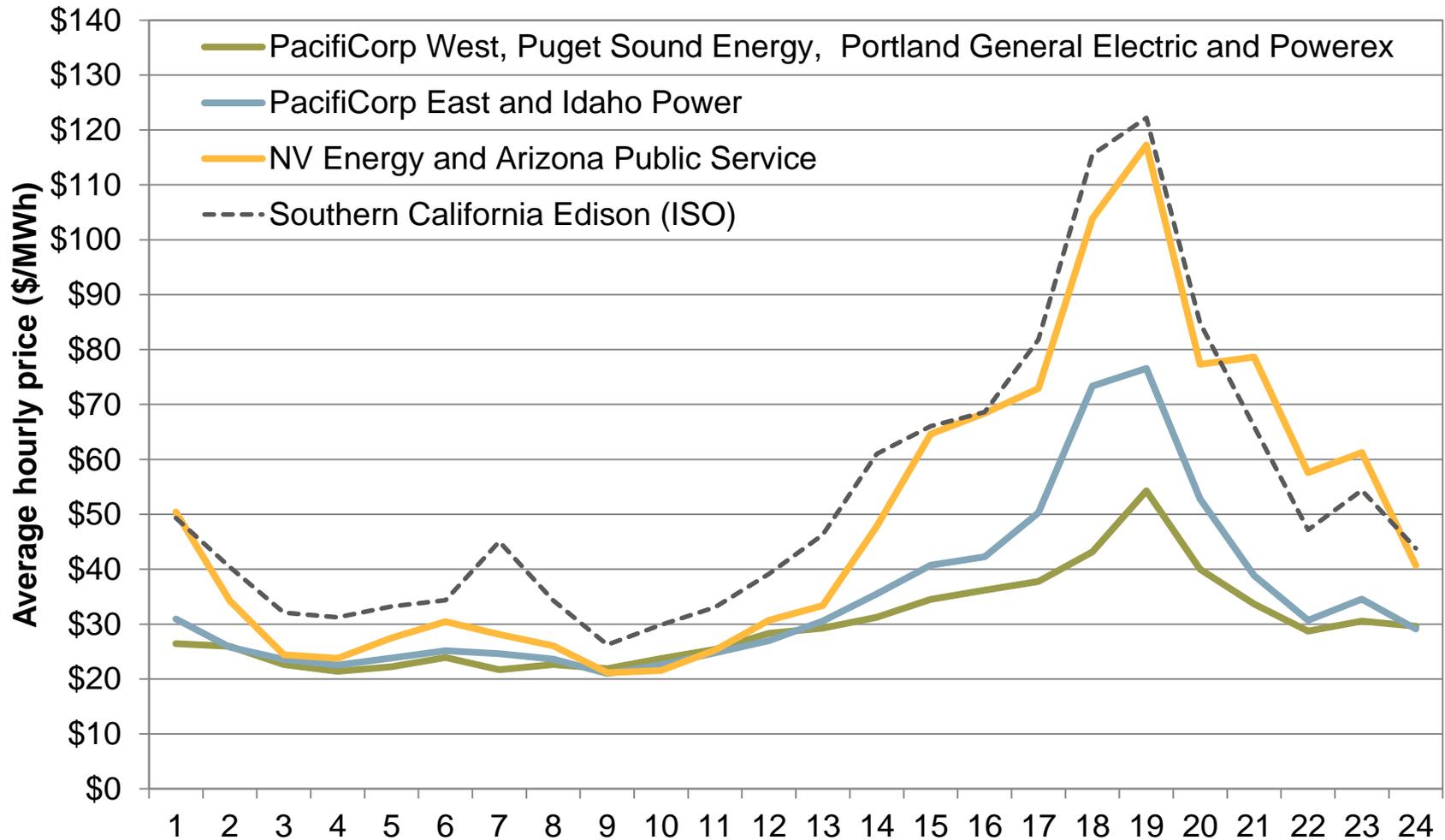
Q3 payments \$41.5 million over cost in auction, for \$102 million YTD



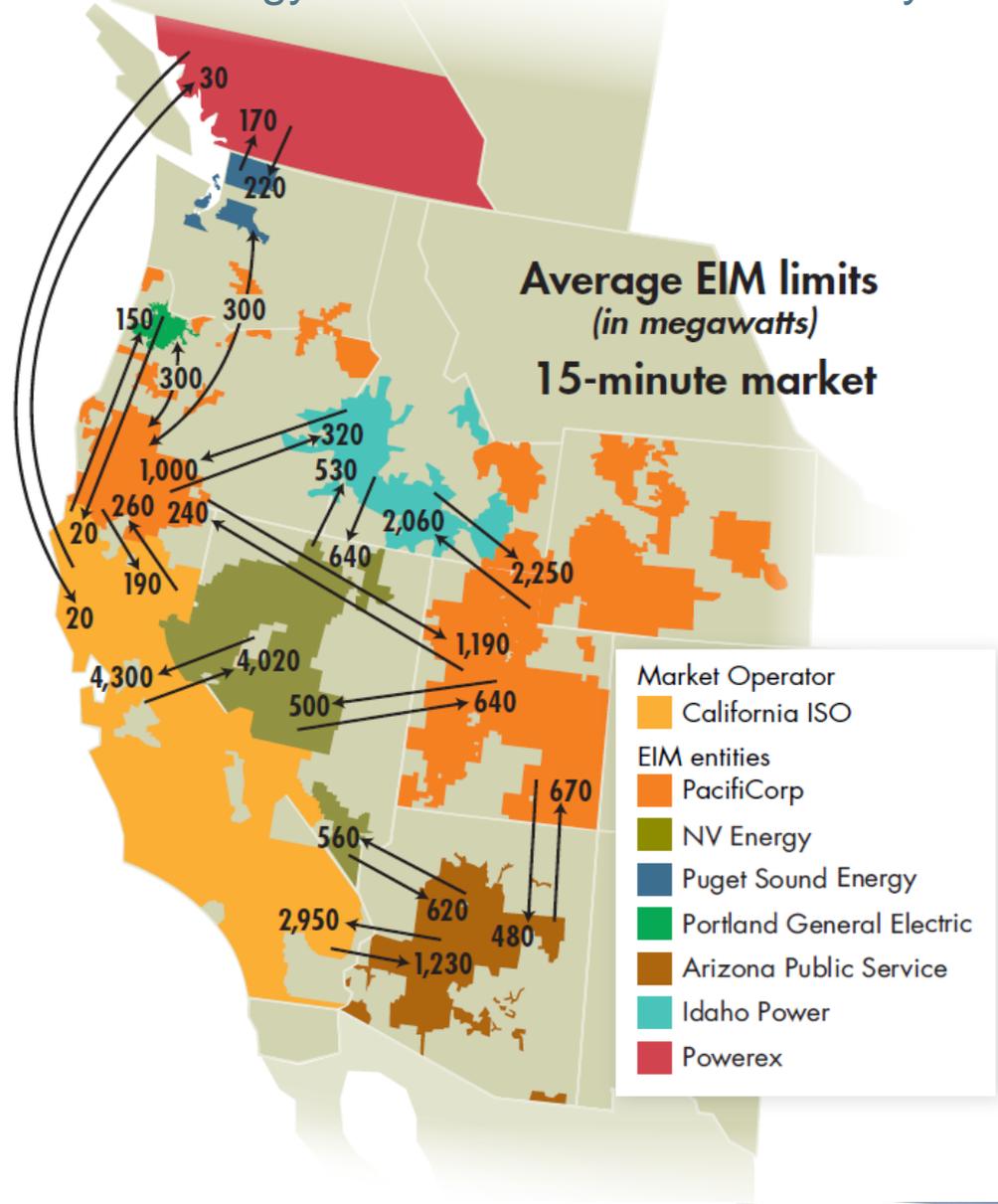
Hourly 15-minute market prices (July – September)



Hourly 5-minute market prices (July – September)



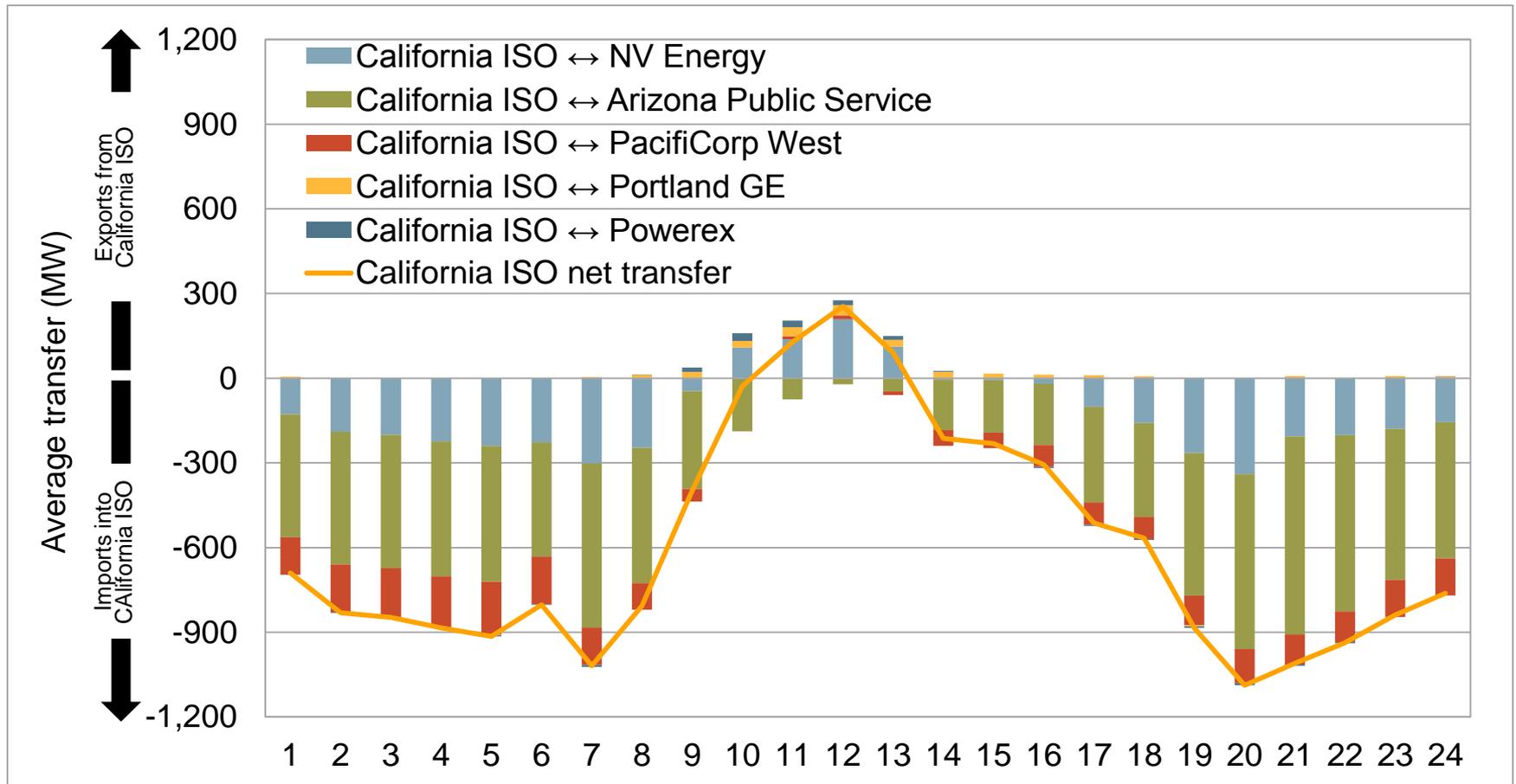
Average 15-minute market energy imbalance market limits July - September



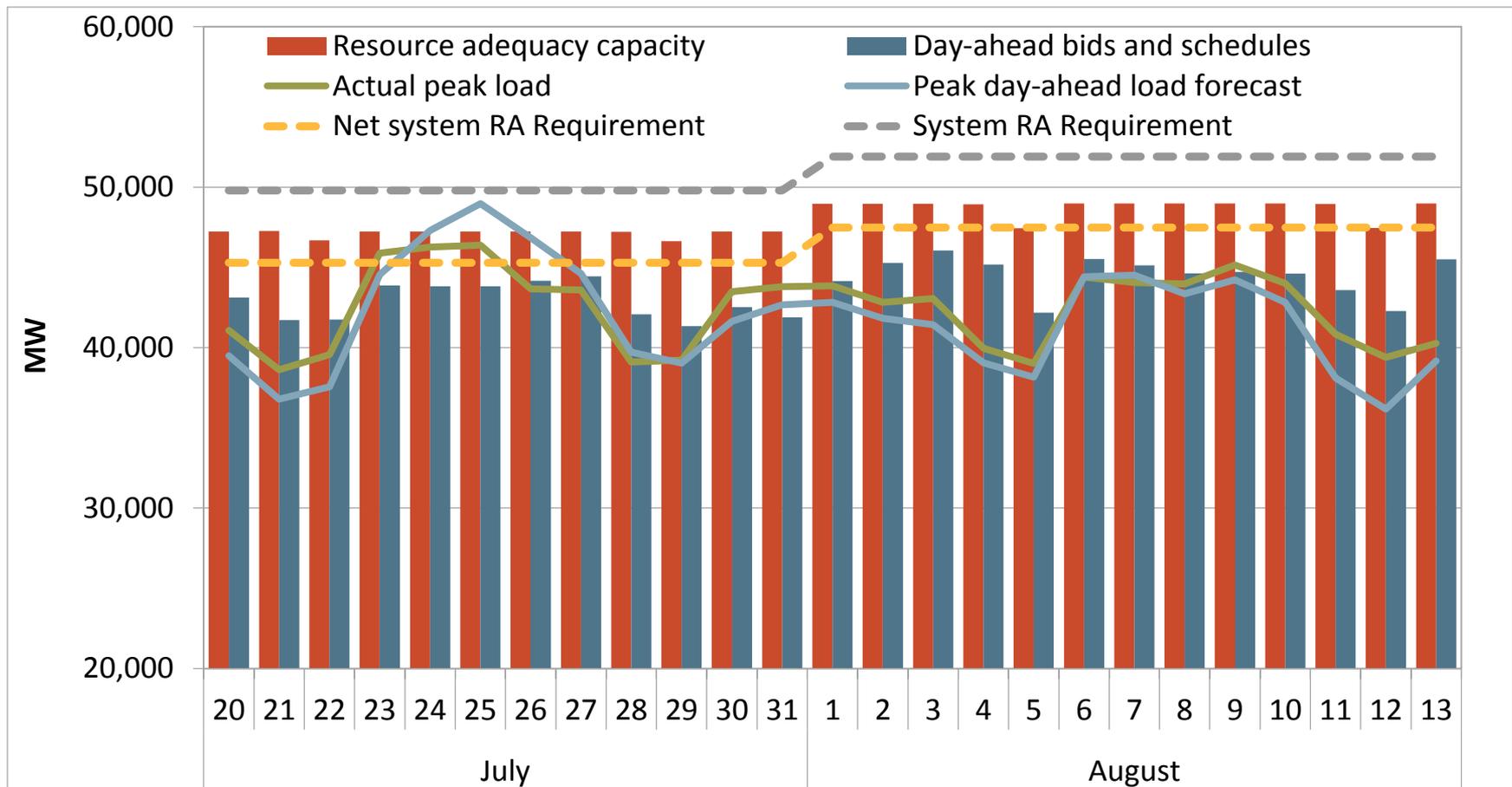
Frequency of congestion in the energy imbalance market July - September

	15-minute market		5-minute market	
	Congested toward ISO	Congested from ISO	Congested toward ISO	Congested from ISO
NV Energy	3%	5%	3%	3%
Arizona Public Service	1%	4%	0%	2%
PacifiCorp East	7%	2%	4%	1%
Idaho Power	6%	0%	4%	1%
PacifiCorp West	34%	1%	21%	1%
Portland General Electric	33%	4%	21%	5%
Puget Sound Energy	33%	8%	21%	4%
Powerex	31%	21%	14%	11%

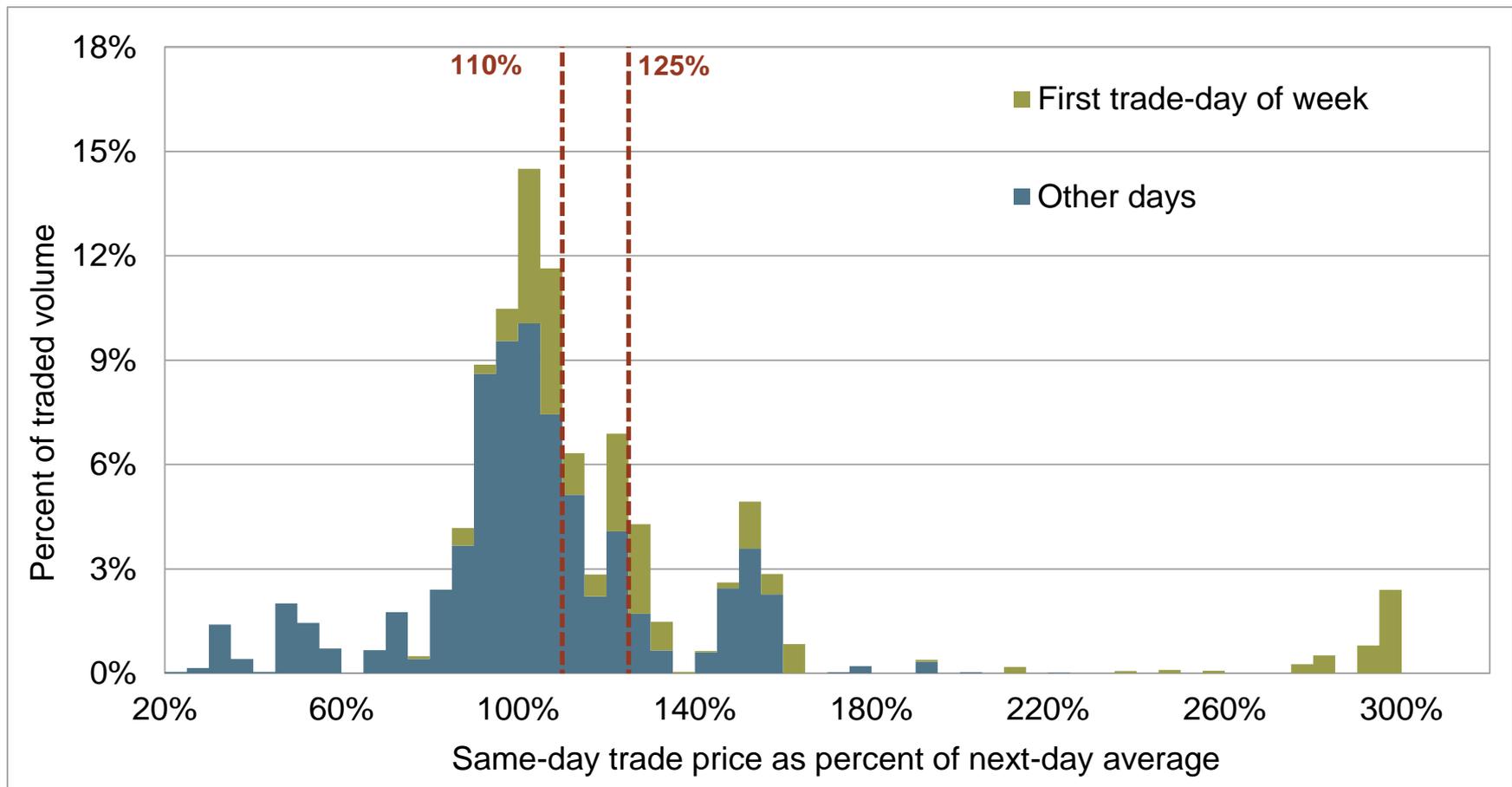
California ISO – average hourly 15-minute market transfer (July - September)



Daily peak load, resource adequacy capacity, and planning forecast



Same-day trade prices compared to next-day index (July - September)



Same-day prices as a percent of updated same-day averages (July - September)

