



Q1 and Q2 Reports on Market Issues and Performance

October 19, 2022

Amelia Blanke
Manager, Monitoring & Reporting
Department of Market Monitoring

<http://www.caiso.com/Documents/2022-Second-Quarter-Report-on-Market-Issues-and-Performance-2022-10-14.pdf>

<http://www.caiso.com/Documents/2022-First-Quarter-Report-on-Market-Issues-and-Performance-Sep-6-2022.pdf>

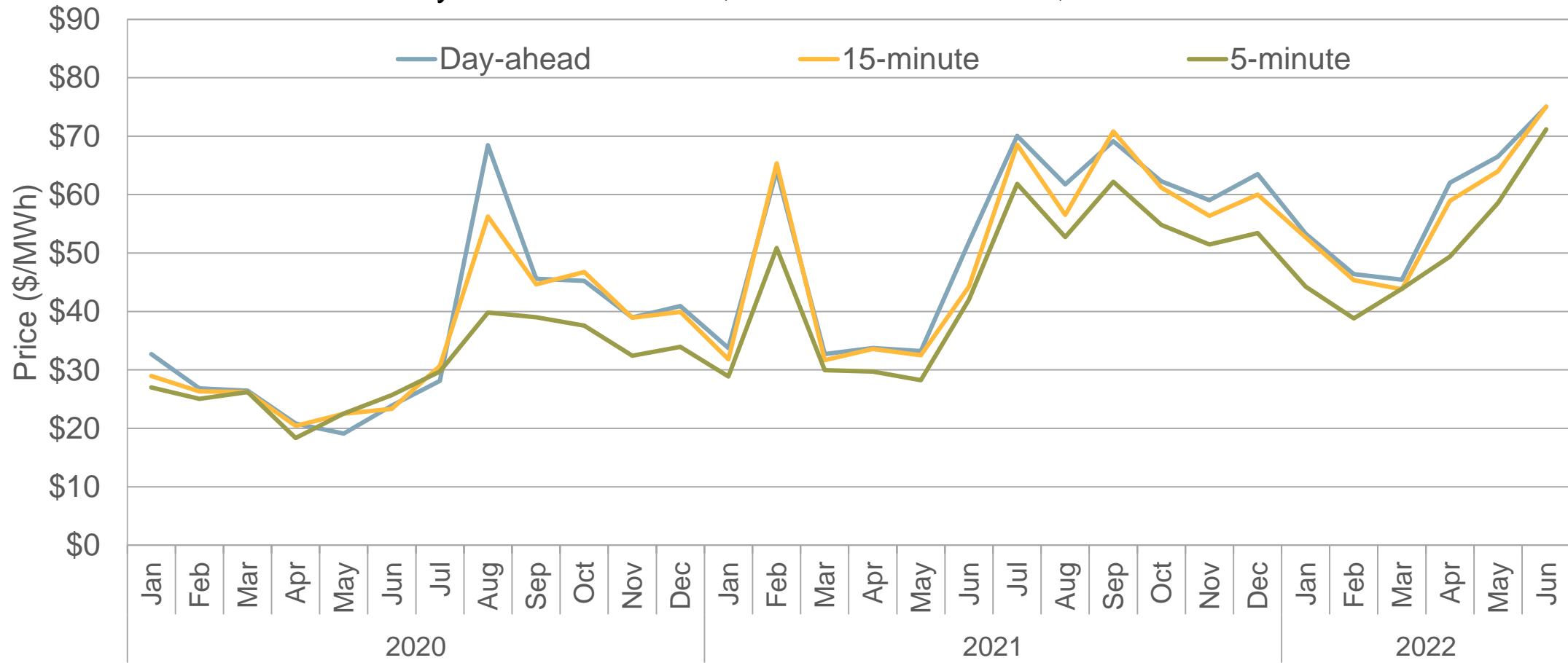
<http://www.caiso.com/market/Pages/MarketMonitoring/Default.aspx>

Highlights of Q1-Q2 2022 market performance

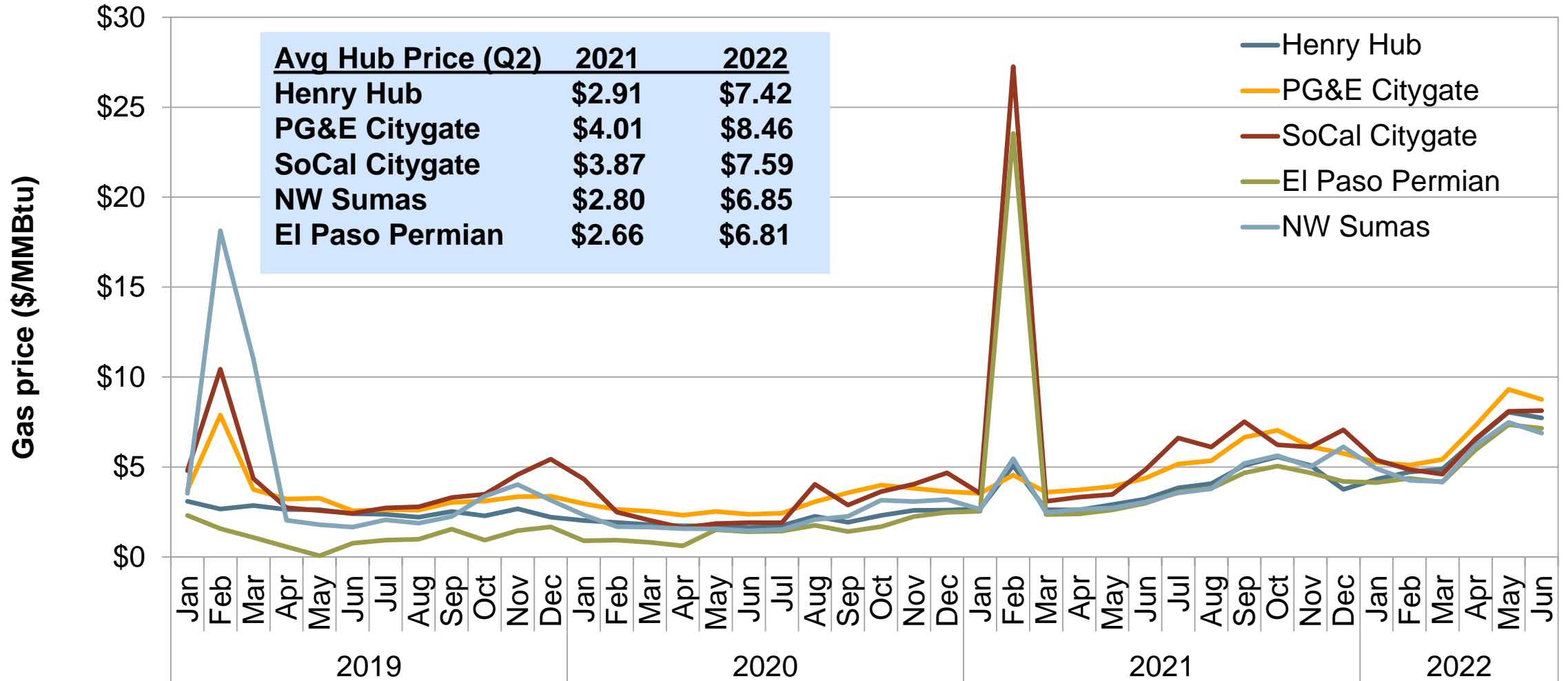
- **Higher prices in ISO and WEIM compared to 2021**
 - Higher natural gas prices
- **WEIM membership increases to 18**
- **Special issues**
 - Congestion increases
 - High real-time imbalance offset costs
 - Higher losses congestion revenue rights
 - Higher virtual revenues

CAISO prices increase with gas prices

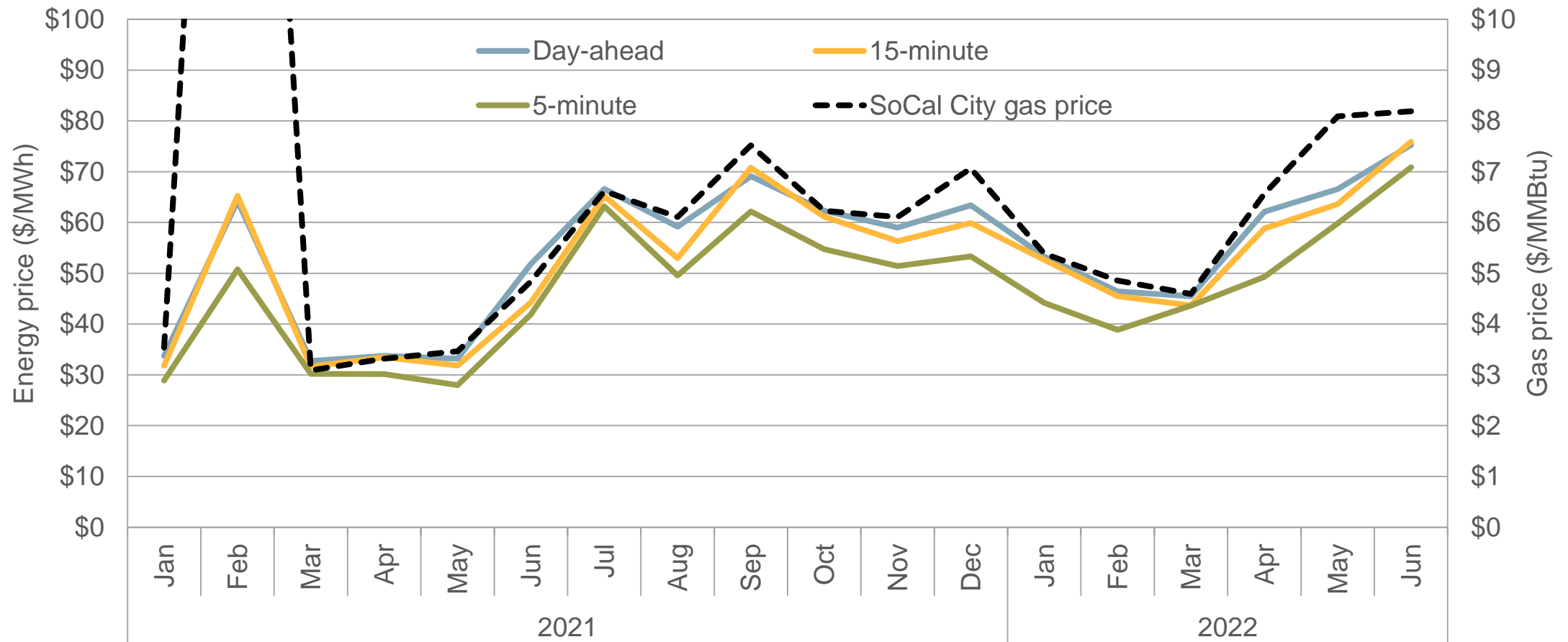
Q1 CAISO Day-ahead \$48/MWh, 15-minute \$47/MWh, 5-minute \$42/MWh
Q2 CAISO Day-ahead \$68/MWh, 15-minute \$66/MWh, 5-minute \$60/MWh



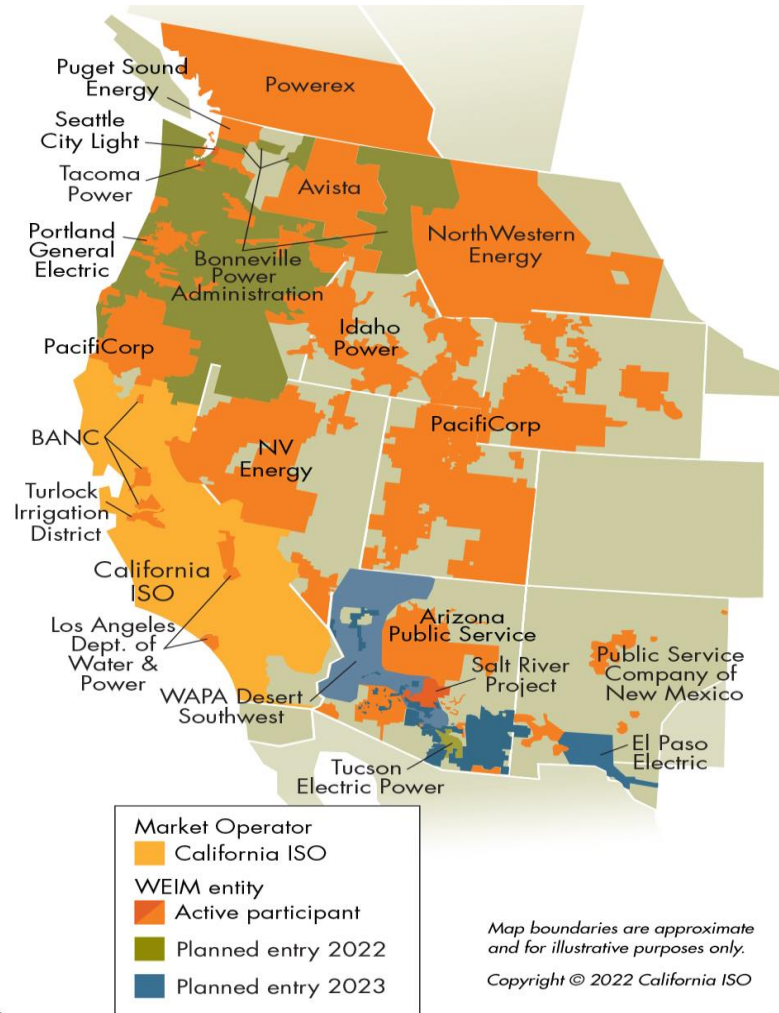
Higher natural gas prices support higher electricity prices



As gas prices have continued to rise in 2022, so have electricity prices



Expansion of the Western Energy Imbalance Market (WEIM) helped improve the overall structure and performance of the real-time market



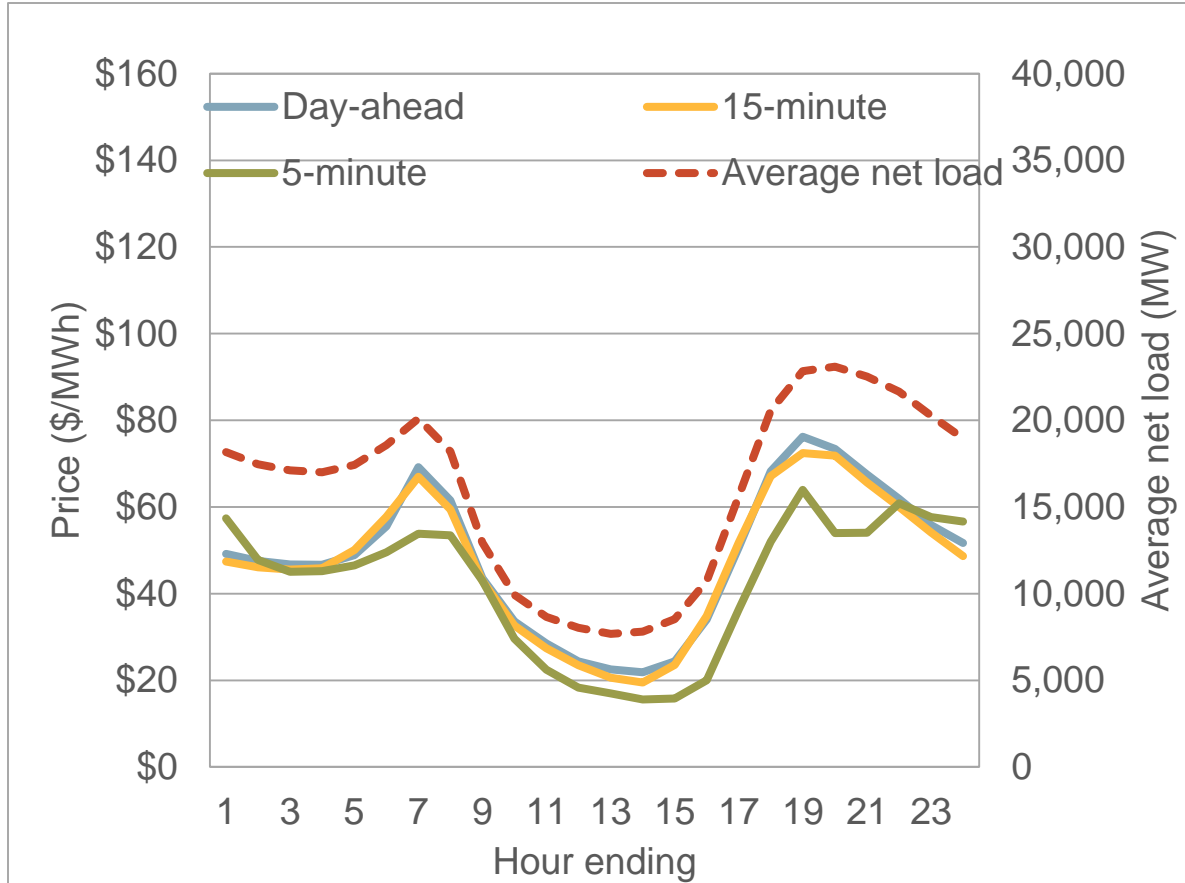
- Two new members of the WEIM in 2020
- Five new members of the WEIM in 2021
- Four new members in 2022:
 - Avista Utilities,
 - Bonneville Power Administration,
 - Tacoma Power, and
 - Tucson Electric Power joined WEIM
- Northwest prices regularly lower than the rest of the system due to limited transfer capability
- Peak California area prices exceed other areas due to GHG and congestion

Impact of congestion and greenhouse gas on 5 minute prices (Q2 2022)

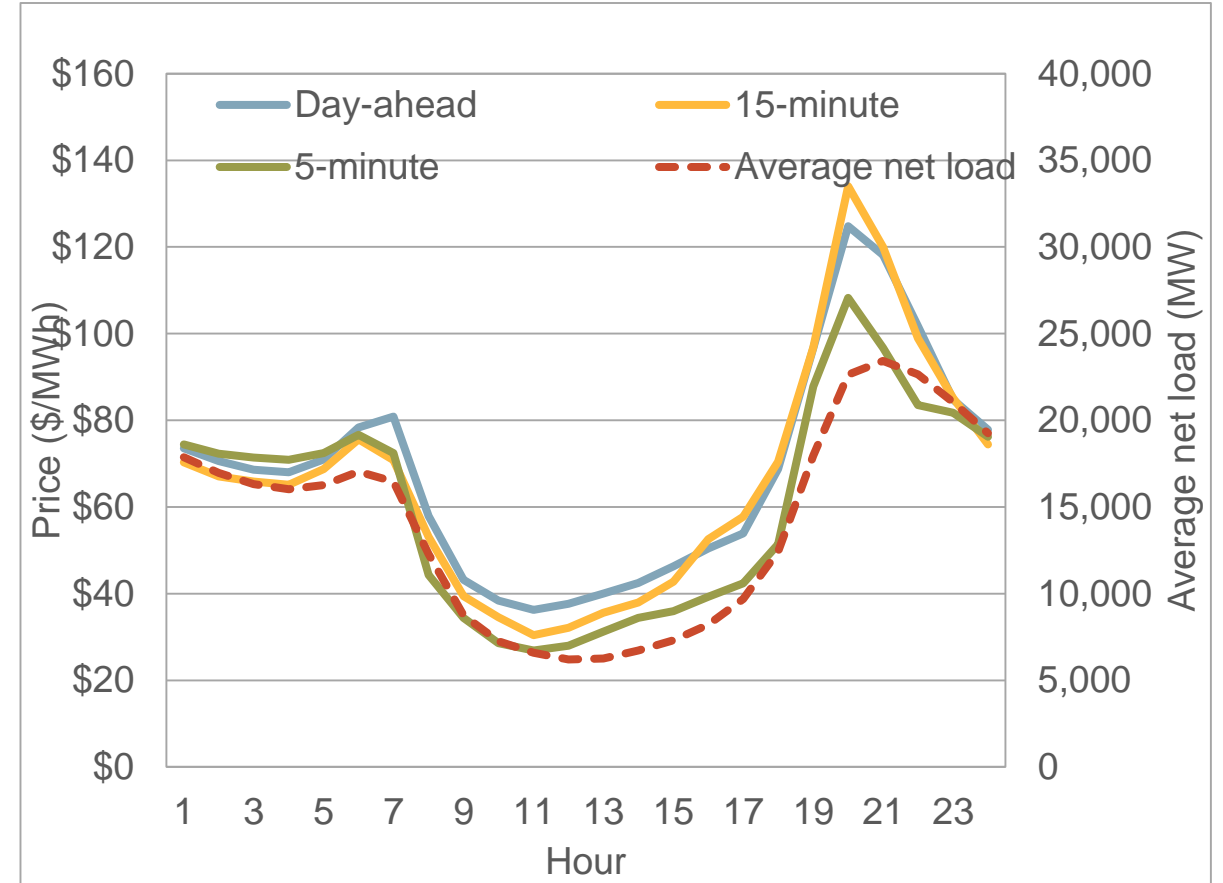
SMEC	\$59	\$55	\$54	\$53	\$55	\$59	\$58	\$38	\$32	\$28	\$27	\$29	\$32	\$33	\$33	\$36	\$37	\$43	\$66	\$81	\$76	\$69	\$68	\$62
PG&E (CAISO)	\$79	\$75	\$77	\$74	\$78	\$83	\$77	\$50	\$41	\$36	\$33	\$35	\$39	\$41	\$42	\$50	\$54	\$60	\$87	\$111	\$105	\$87	\$85	\$80
SCE (CAISO)	\$69	\$67	\$65	\$65	\$67	\$71	\$67	\$39	\$25	\$20	\$19	\$21	\$24	\$26	\$29	\$33	\$36	\$47	\$80	\$101	\$94	\$81	\$79	\$72
BANC	\$75	\$73	\$75	\$71	\$75	\$80	\$75	\$49	\$44	\$39	\$38	\$43	\$44	\$45	\$45	\$51	\$53	\$56	\$82	\$97	\$96	\$83	\$82	\$78
Turlock ID	\$77	\$73	\$75	\$72	\$76	\$80	\$75	\$51	\$51	\$48	\$47	\$50	\$55	\$55	\$54	\$61	\$60	\$59	\$83	\$106	\$98	\$83	\$82	\$78
LADWP	\$64	\$61	\$59	\$58	\$61	\$64	\$62	\$36	\$25	\$20	\$20	\$22	\$25	\$28	\$28	\$32	\$34	\$44	\$74	\$93	\$87	\$75	\$74	\$67
NV Energy	\$56	\$53	\$51	\$53	\$53	\$57	\$49	\$35	\$31	\$18	\$24	\$23	\$25	\$32	\$28	\$37	\$29	\$37	\$74	\$91	\$77	\$64	\$67	\$57
Arizona PS	\$59	\$57	\$55	\$55	\$57	\$61	\$54	\$28	\$19	\$14	\$18	\$24	\$26	\$26	\$28	\$32	\$36	\$43	\$74	\$91	\$84	\$70	\$75	\$62
Tucson Electric*	\$59	\$59	\$58	\$57	\$59	\$62	\$53	\$27	\$21	\$21	\$26	\$33	\$40	\$42	\$45	\$52	\$55	\$58	\$76	\$103	\$95	\$73	\$71	\$62
Salt River Project	\$62	\$56	\$55	\$55	\$57	\$60	\$49	\$28	\$19	\$18	\$23	\$38	\$46	\$54	\$48	\$54	\$46	\$60	\$92	\$96	\$88	\$72	\$72	\$59
PSC New Mexico	\$47	\$47	\$45	\$47	\$48	\$52	\$48	\$27	\$15	\$15	\$14	\$19	\$20	\$23	\$27	\$30	\$33	\$42	\$66	\$80	\$67	\$53	\$56	\$51
PacifiCorp East	\$40	\$37	\$35	\$36	\$39	\$43	\$41	\$27	\$24	\$22	\$21	\$23	\$26	\$29	\$26	\$27	\$27	\$31	\$49	\$61	\$53	\$47	\$50	\$44
Idaho Power	\$37	\$33	\$31	\$32	\$35	\$39	\$42	\$35	\$36	\$36	\$35	\$34	\$36	\$36	\$34	\$33	\$33	\$35	\$44	\$51	\$48	\$47	\$49	\$42
NorthWestern	\$26	\$26	\$23	\$23	\$27	\$31	\$35	\$32	\$41	\$33	\$32	\$33	\$34	\$32	\$30	\$28	\$27	\$29	\$32	\$37	\$35	\$38	\$40	\$35
Avista Utilities	\$27	\$24	\$21	\$22	\$24	\$27	\$32	\$31	\$35	\$35	\$33	\$34	\$34	\$32	\$30	\$28	\$29	\$26	\$30	\$29	\$30	\$35	\$38	\$32
BPA*	\$15	\$13	\$11	\$10	\$8	\$15	\$18	\$12	\$13	\$21	\$21	\$22	\$25	\$24	\$22	\$18	\$23	\$17	\$24	\$26	\$28	\$29	\$26	\$19
Tacoma Power	\$33	\$28	\$26	\$25	\$26	\$31	\$34	\$34	\$38	\$37	\$38	\$34	\$36	\$34	\$32	\$31	\$33	\$35	\$42	\$43	\$42	\$40	\$44	\$38
PacifiCorp West	\$29	\$25	\$22	\$23	\$25	\$29	\$30	\$32	\$35	\$35	\$36	\$36	\$40	\$33	\$30	\$28	\$29	\$29	\$31	\$35	\$34	\$40	\$41	\$33
Portland GE	\$27	\$24	\$22	\$23	\$24	\$29	\$30	\$33	\$36	\$35	\$37	\$35	\$37	\$34	\$31	\$29	\$28	\$30	\$33	\$36	\$38	\$37	\$41	\$32
Puget Sound Energy	\$32	\$28	\$26	\$26	\$26	\$32	\$34	\$34	\$37	\$37	\$37	\$35	\$36	\$34	\$36	\$31	\$33	\$35	\$43	\$43	\$41	\$41	\$46	\$38
Powerex	\$33	\$30	\$29	\$29	\$31	\$33	\$37	\$34	\$35	\$32	\$33	\$33	\$32	\$32	\$34	\$33	\$35	\$38	\$40	\$43	\$41	\$42	\$42	\$35
Seattle City Light	\$33	\$28	\$26	\$26	\$27	\$32	\$34	\$35	\$38	\$37	\$37	\$34	\$35	\$33	\$32	\$31	\$33	\$35	\$43	\$43	\$42	\$40	\$44	\$35
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Average hourly CAISO prices mirror net load, with day-ahead prices higher than 5-minute real-time in peak hours

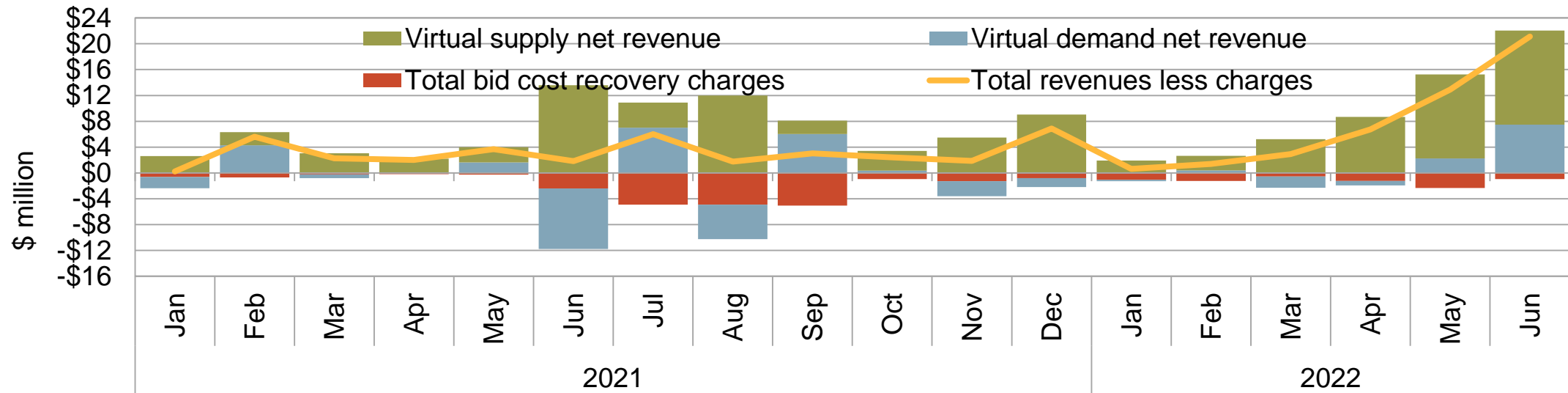
Q1 2022



Q2 2022

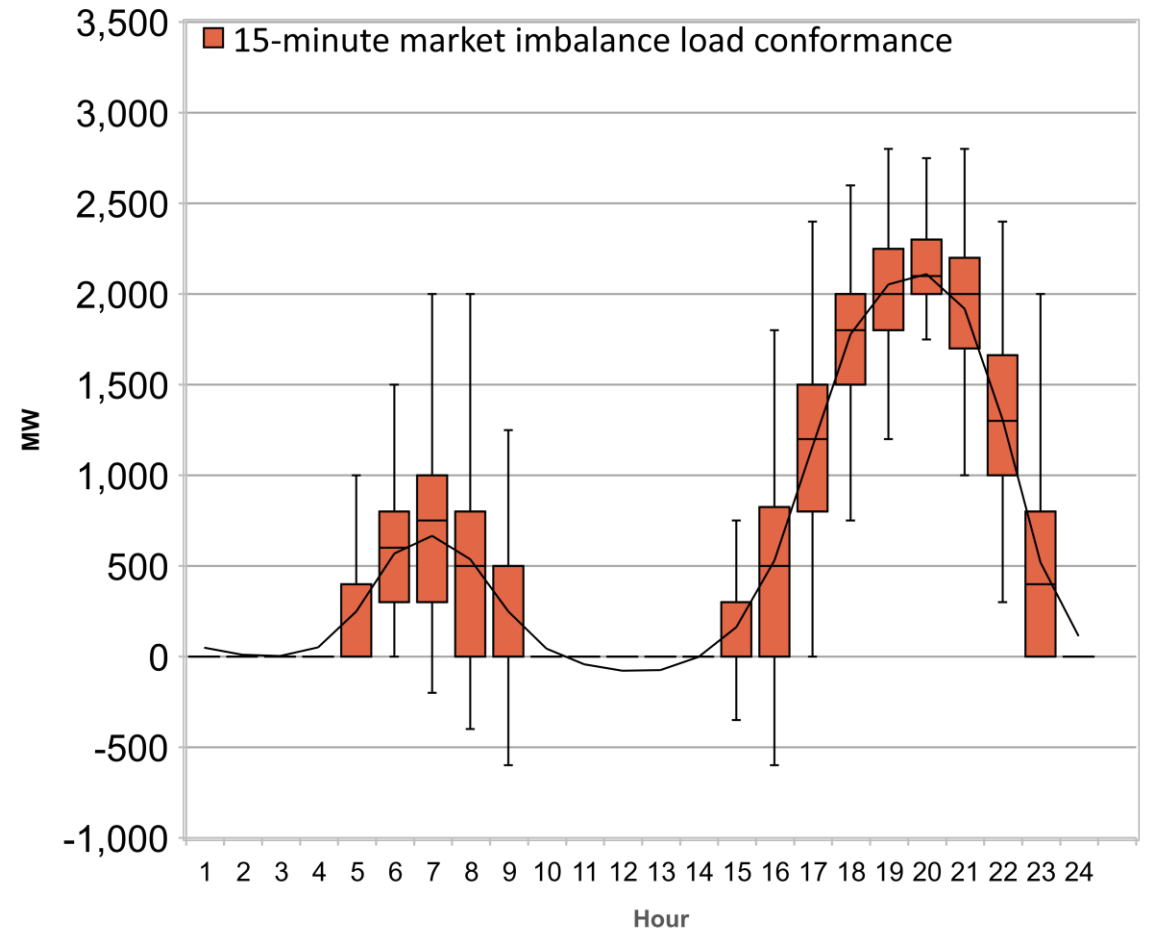
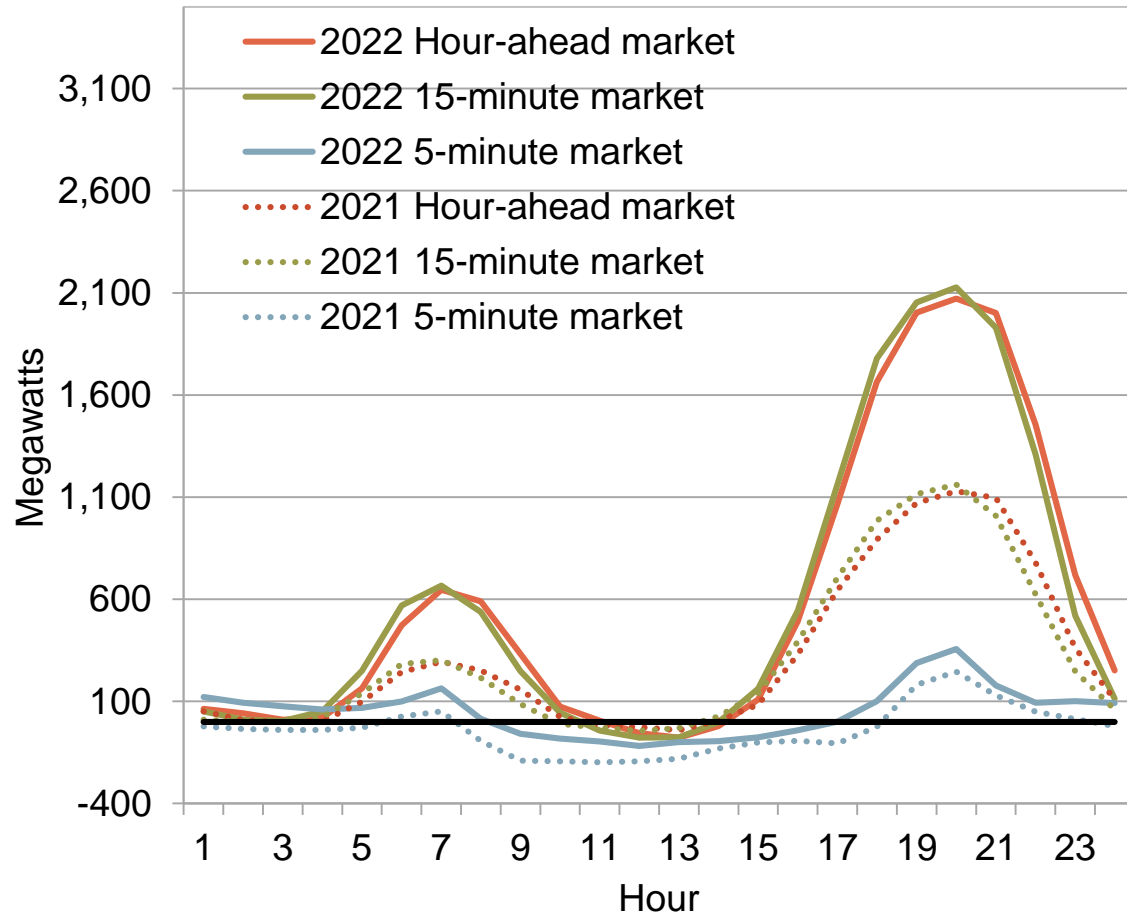


Convergence bidding net profits increase to \$41 million in Q2 alone, up from \$38 million in the entire year of 2021 (\$45 million in 2020)

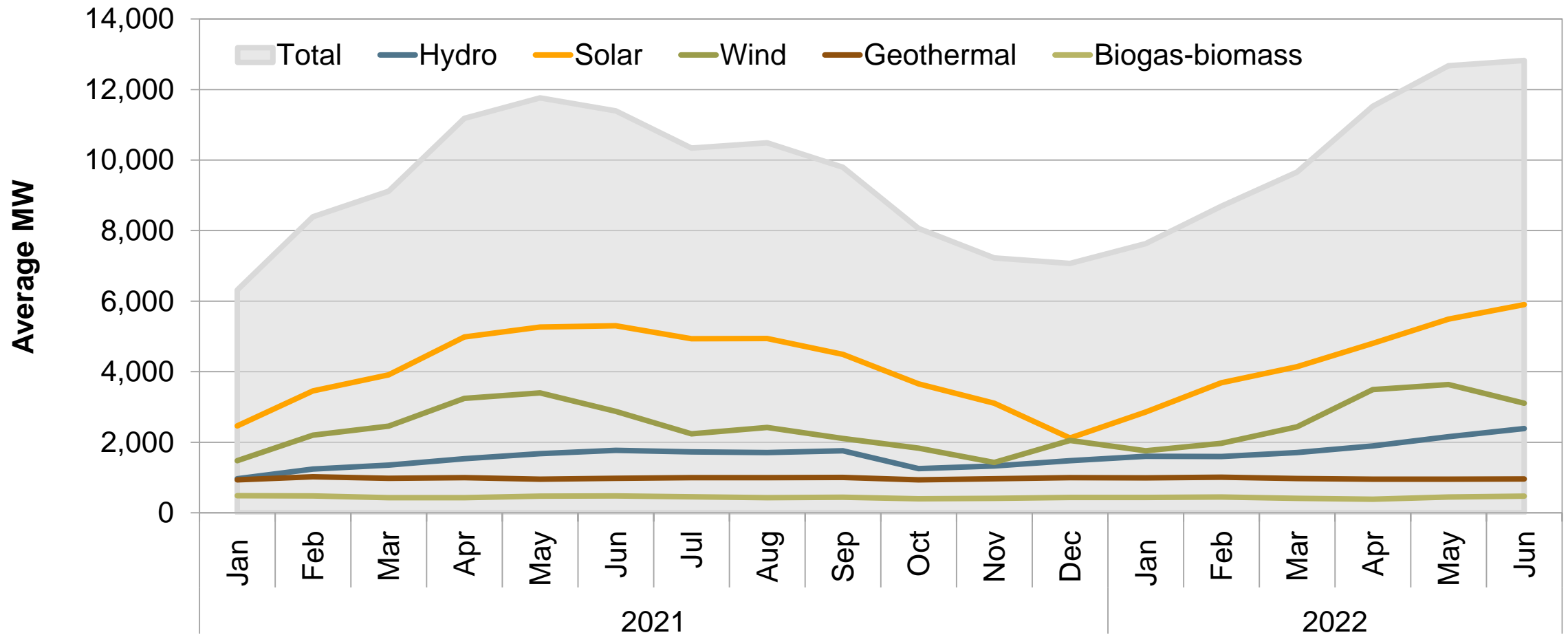


Trading entities	Average hourly megawatts			Revenues\Losses (\$ million)				Total Revenue after BCR
	Virtual demand	Virtual supply	Total	Virtual demand	Virtual supply before BCR	Virtual bid cost recovery	Virtual supply after BCR	
2022 Q2								
Financial	1,653	2,150	3,803	\$6.05	\$28.83	-\$3.26	\$25.57	\$31.62
Marketer	474	706	1,180	\$2.95	\$7.02	-\$0.98	\$6.04	\$8.99
Physical load	0	43	43	\$0.00	\$0.25	-\$0.21	\$0.04	\$0.04
Physical generation	15	18	32	\$0.04	\$0.13	-\$0.07	\$0.06	\$0.10
Total	2,142	2,916	5,058	\$9.04	\$36.23	-\$4.53	\$31.70	\$40.74

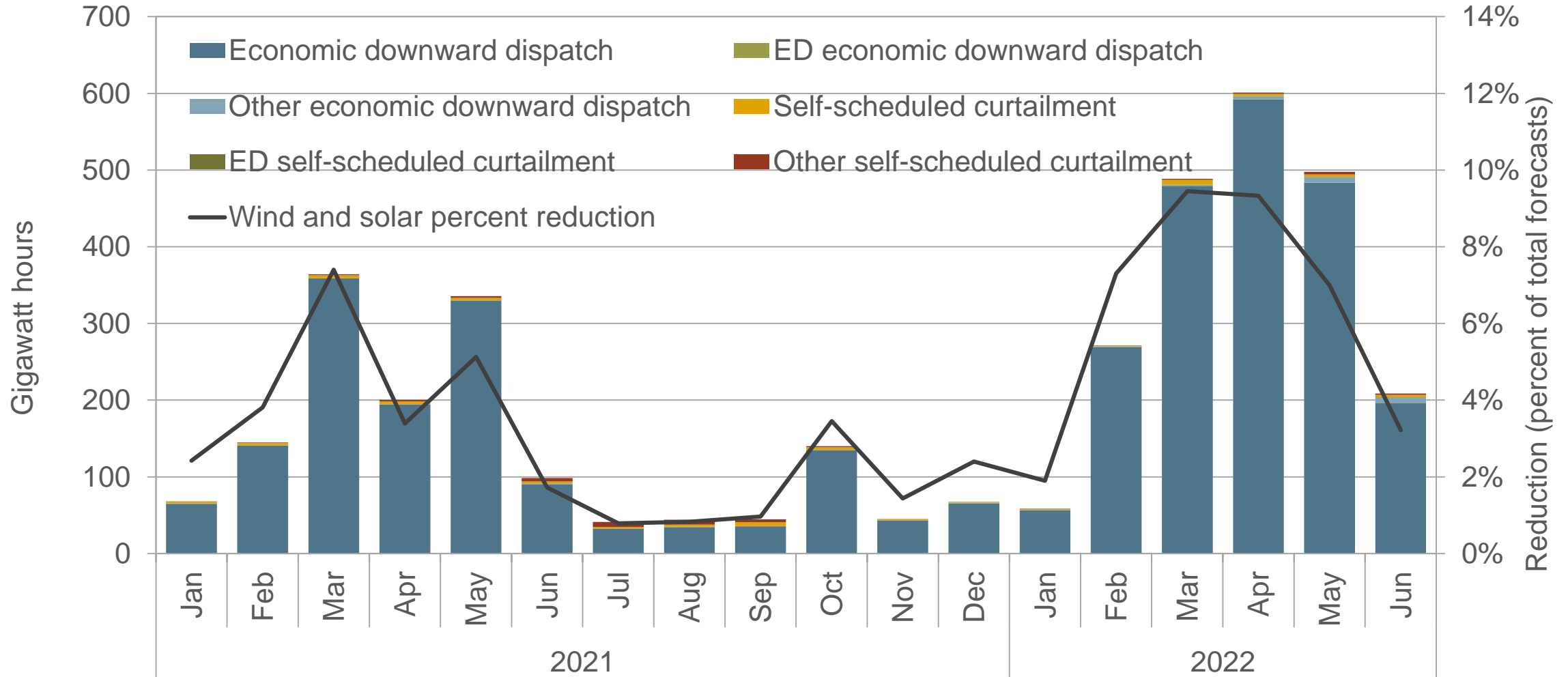
Load adjustment by grid operators remained high, particularly in ramping hours (Q2)



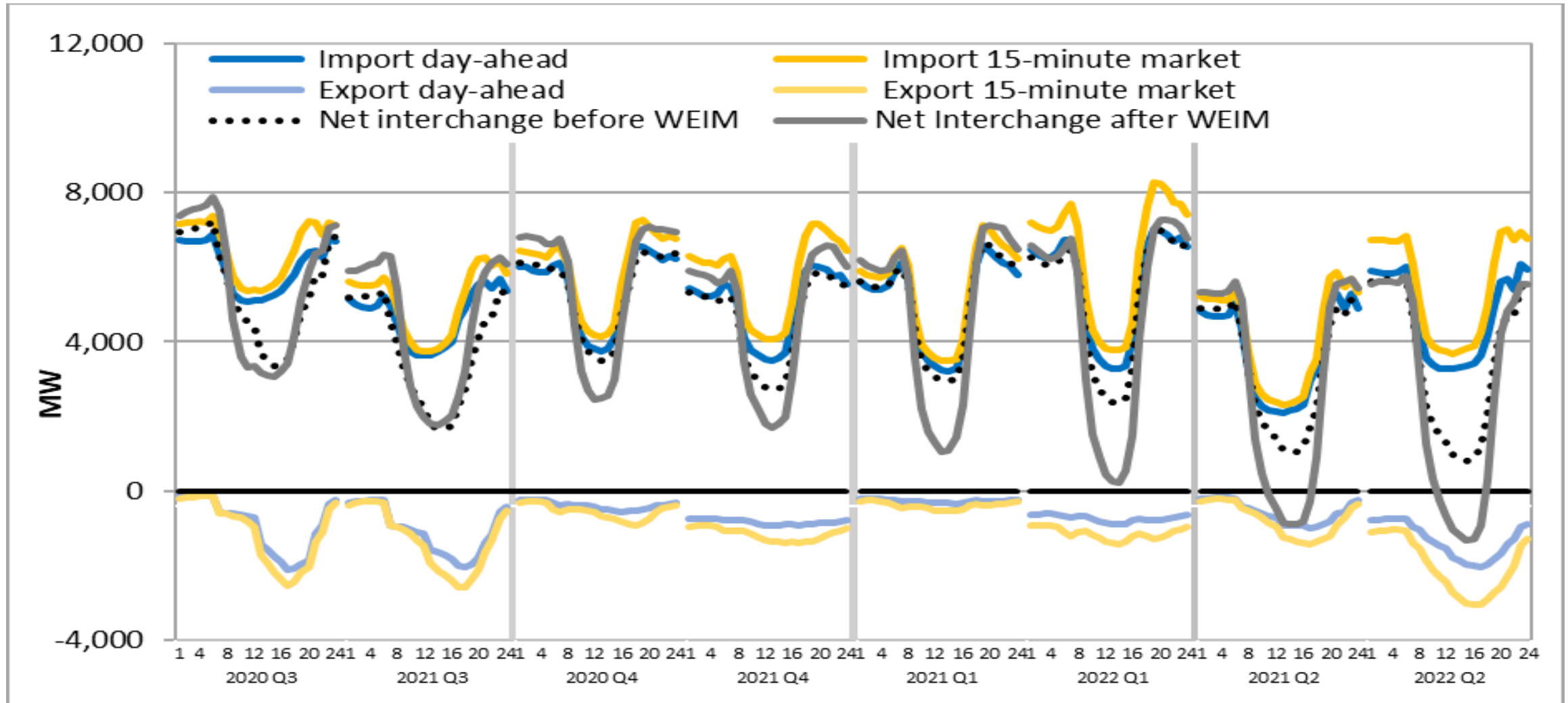
Hydroelectric generation remained low in CAISO, with continued drought across the West, but CAISO renewable generation increased



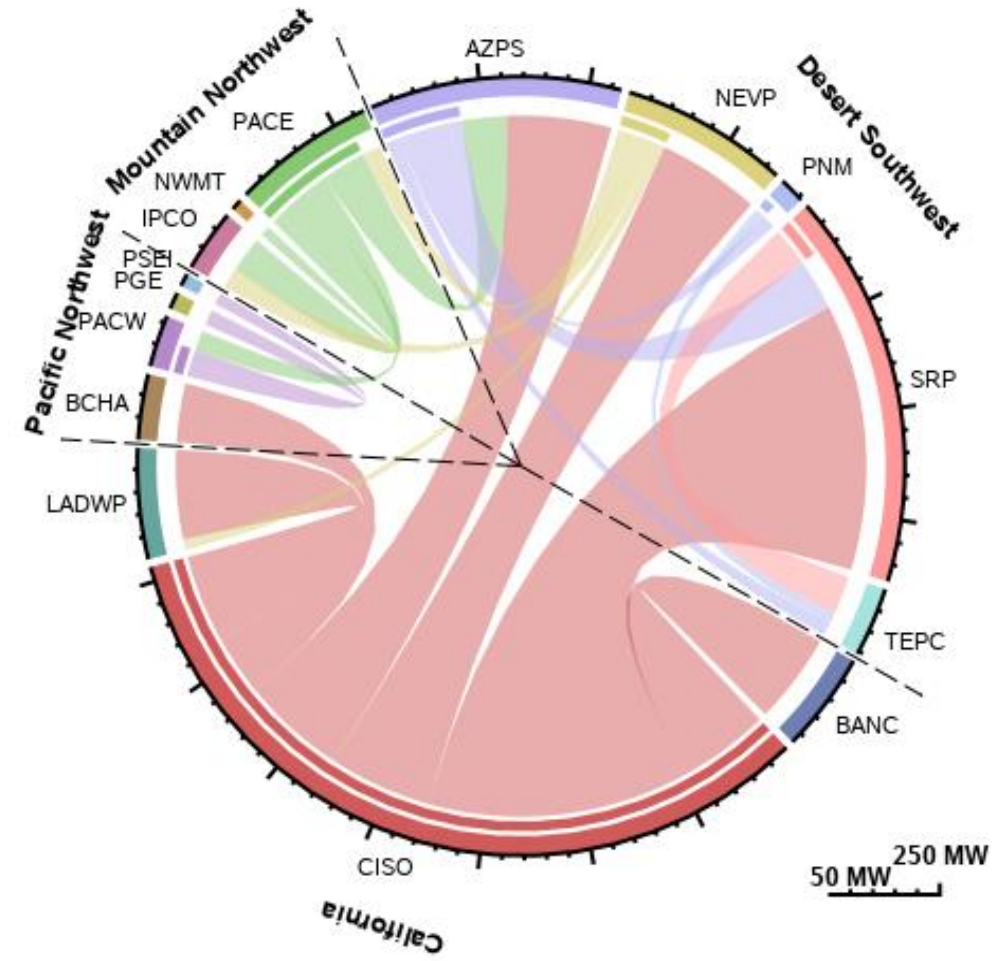
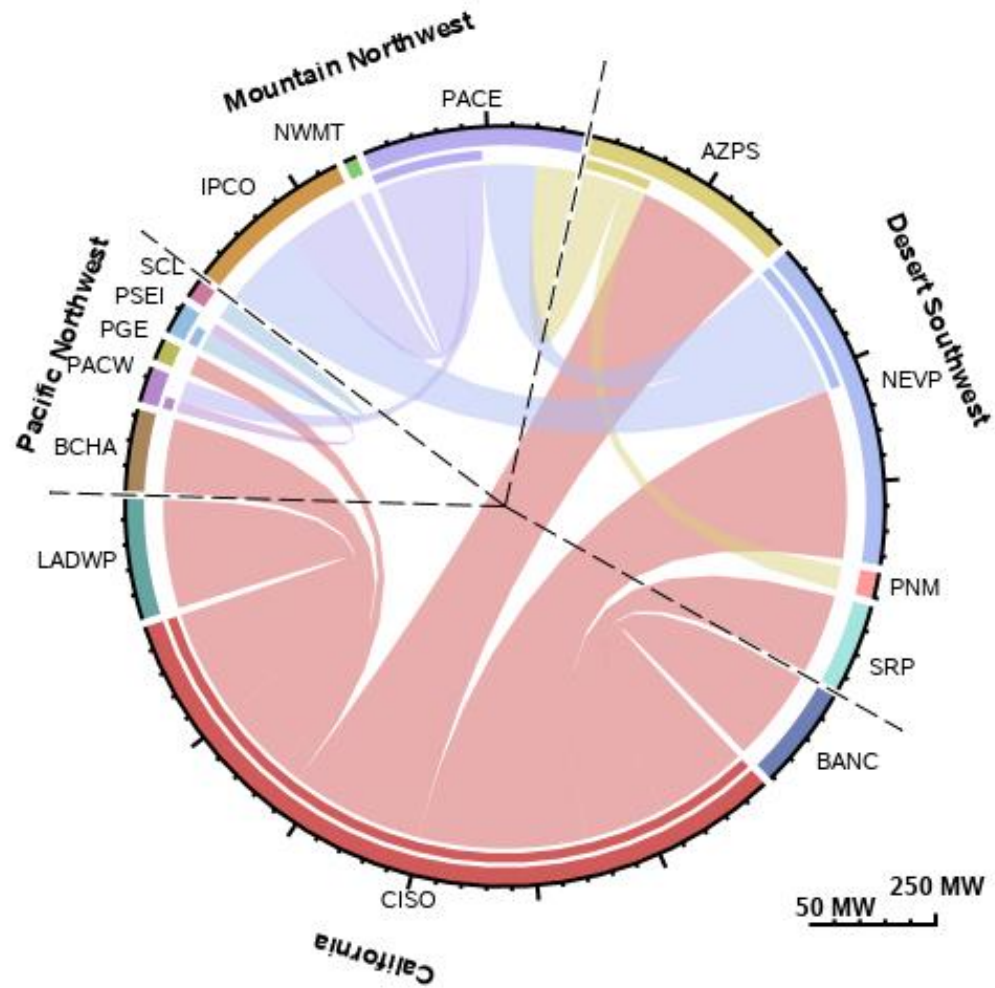
Reduction of wind and solar generation by month (California ISO)



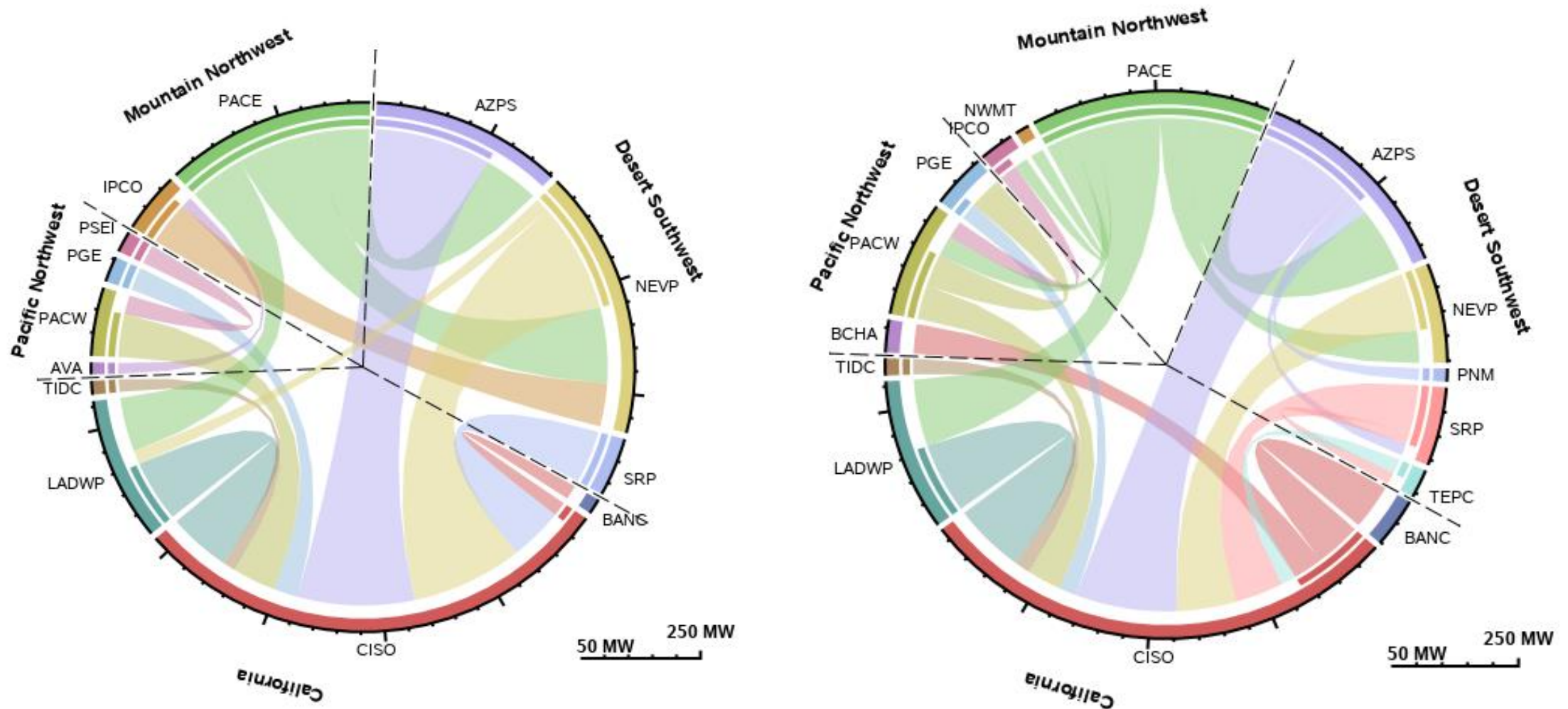
Average imports and exports both increase



Average 15-minute WEIM exports mid-day hours, Q1 and Q2, 2022



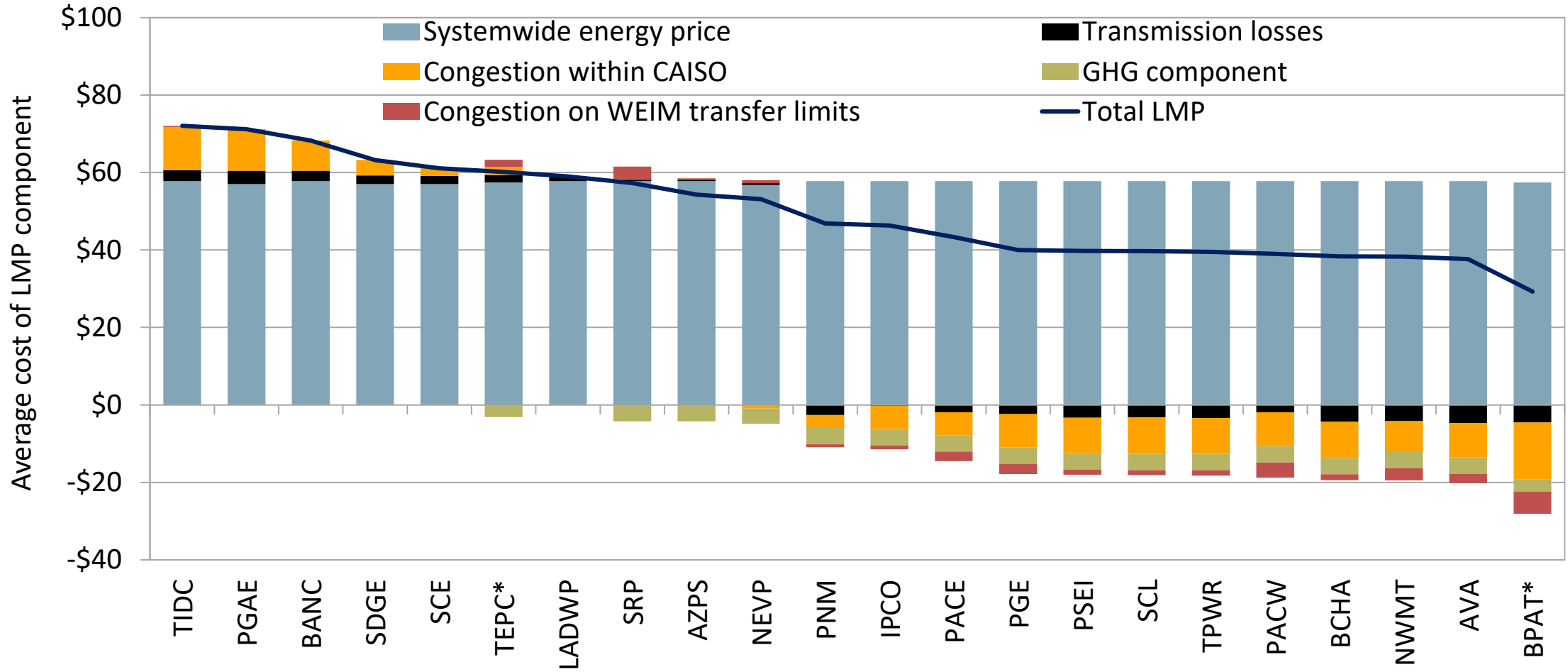
Average 15-minute WEIM exports peak hours, Q1 and Q2, 2022



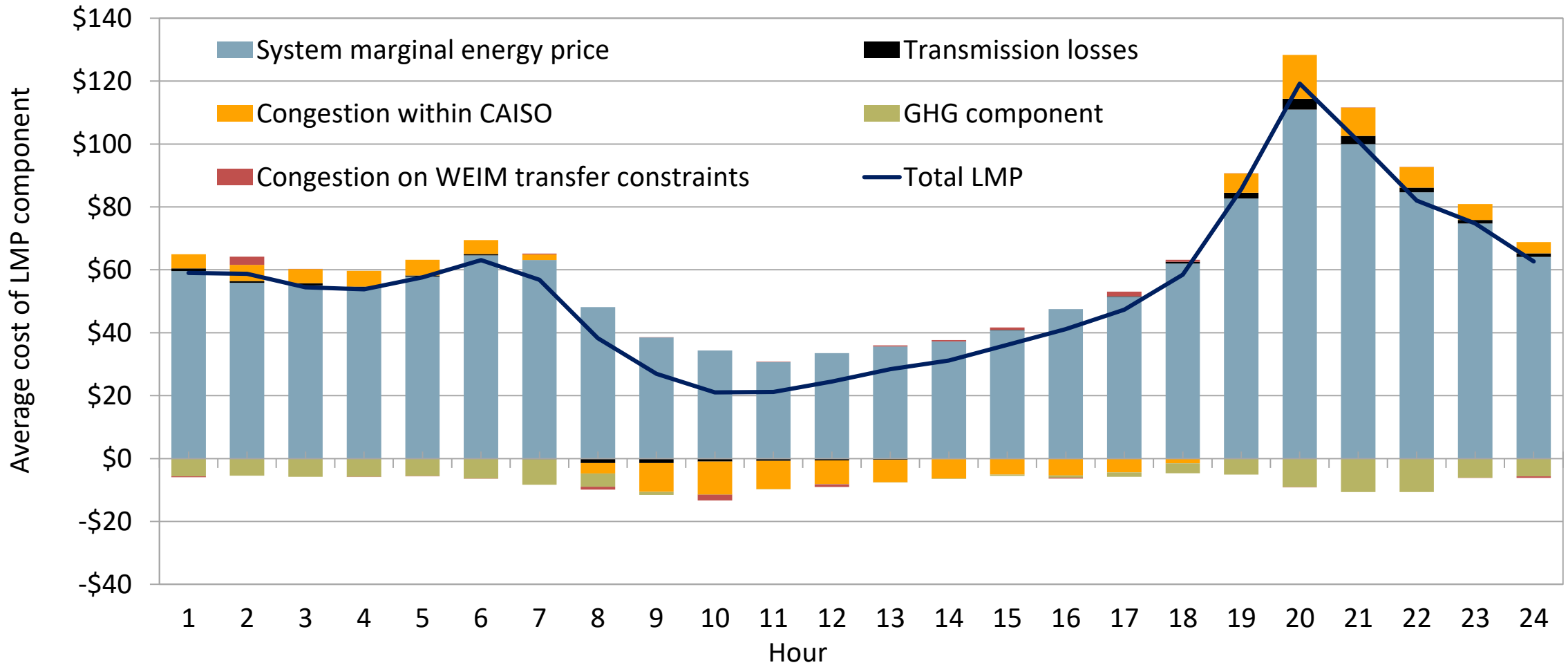
WEIM transfer constraint congestion had greater impact on prices than internal constraint congestion in all areas outside of CAISO, lowering prices in Northwest (Q2)

	15-minute market		5-minute market	
	Congested from area	Congested into area	Congested from area	Congested into area
BANC	0%	0%	0%	0%
L.A. Dept. of Water and Power	0%	0%	0%	0%
Turlock Irrigation District	0%	1%	0%	1%
Arizona Public Service	0%	1%	0%	1%
NV Energy	2%	1%	2%	1%
Public Service Company of NM	2%	1%	2%	1%
Tucson Electric Power*	2%	8%	1%	9%
PacifiCorp East	11%	1%	9%	2%
Salt River Project	3%	8%	3%	9%
Idaho Power	12%	9%	8%	12%
Avista	17%	11%	10%	14%
NorthWestern Energy	17%	11%	11%	14%
PacifiCorp West	24%	15%	14%	17%
Portland General Electric	24%	17%	14%	18%
Puget Sound Energy	27%	25%	18%	34%
Tacoma Power	27%	25%	18%	34%
Seattle City Light	27%	26%	18%	34%
Powerex	29%	19%	29%	40%
Bonneville Power Admin.*	38%	24%	28%	27%

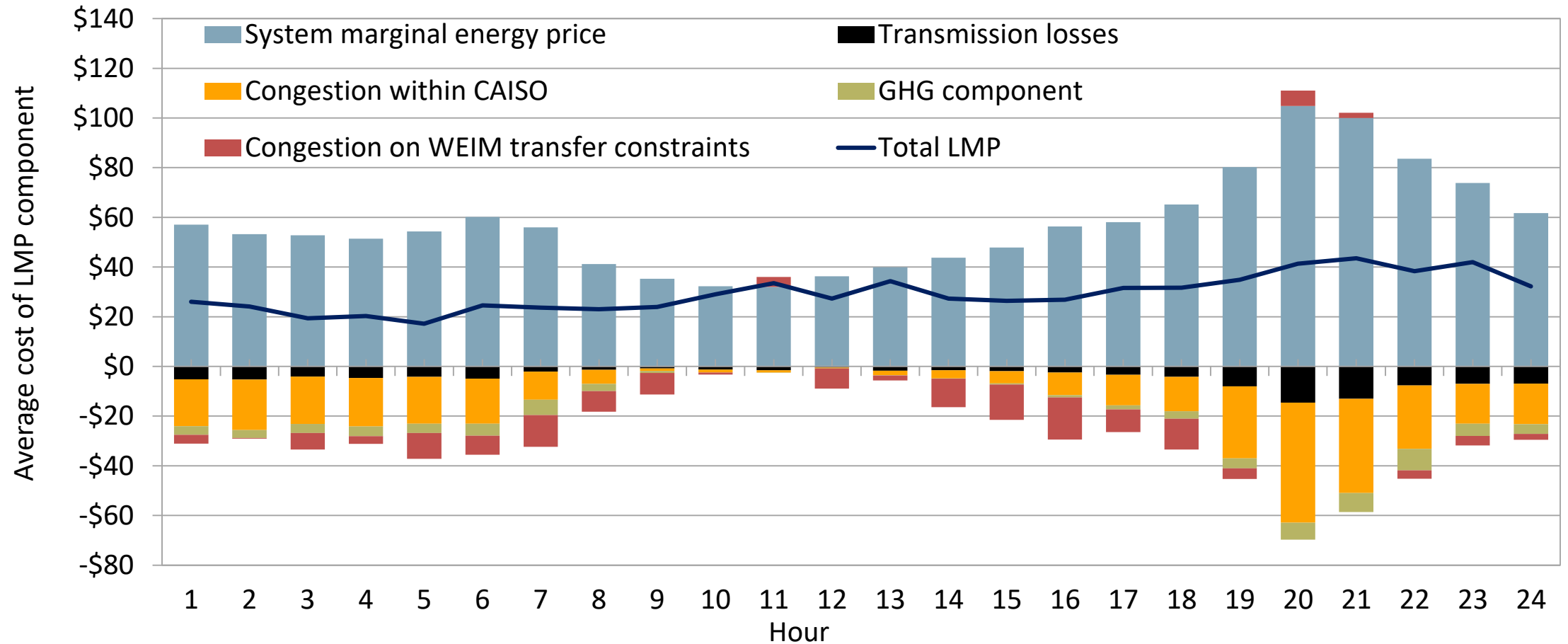
Impact of congestion and greenhouse gas on 15-minute prices (Q2)



Arizona Public Service, average 15-minute price by component (Q2)



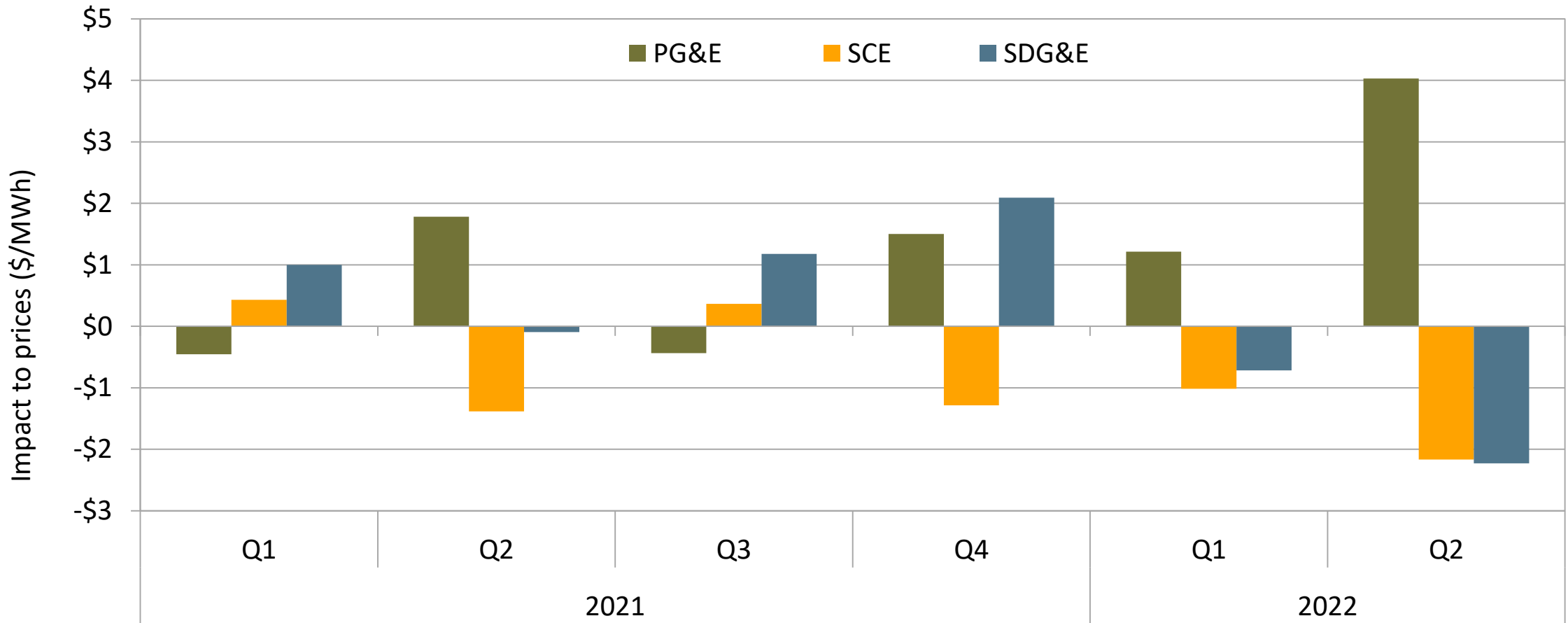
Bonneville Power Administration average 15-minute price by component (May 3, 2022 – June 30, 2022)



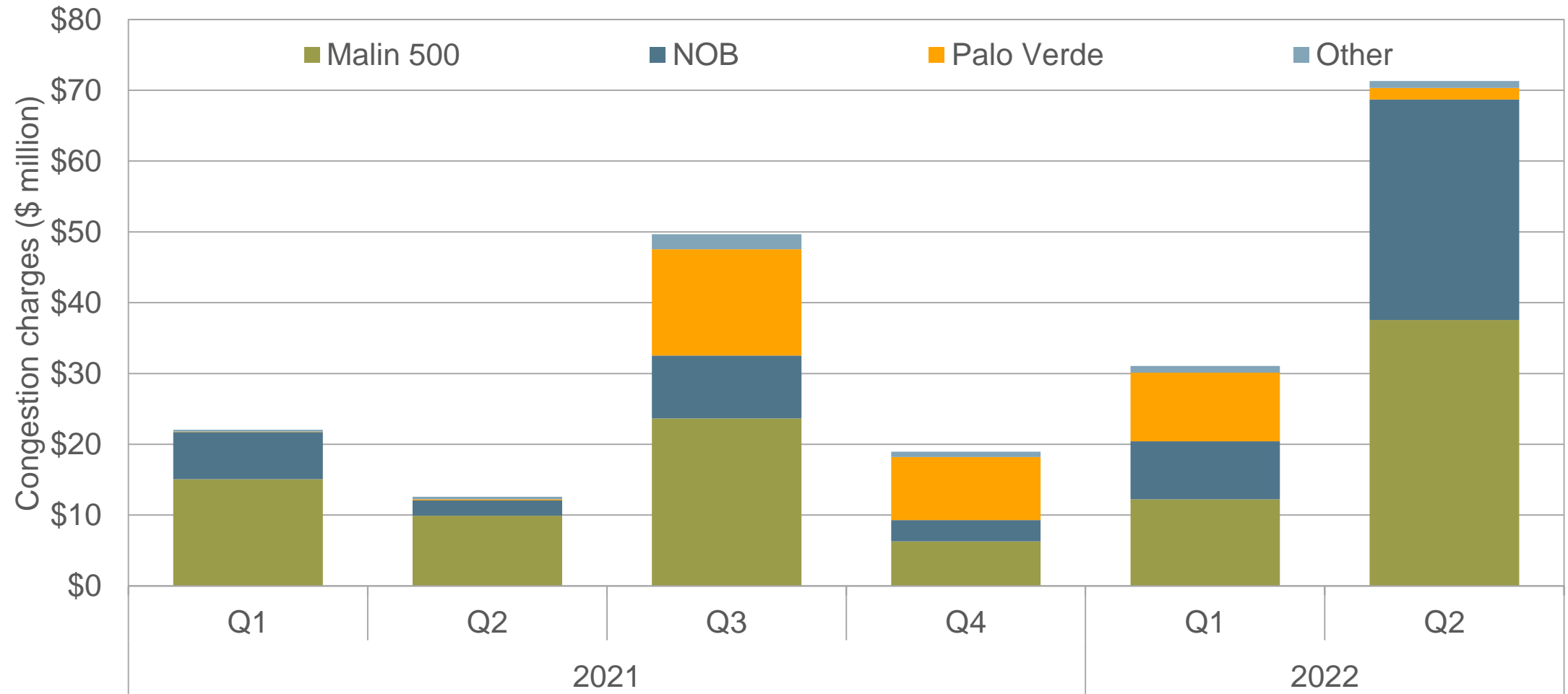
Congestion increased in both the day-ahead and real-time markets

- Low CAISO demand, high renewable, mid-day hours:
 - South-to-north congestion within CAISO
 - California WEIM areas transferring to WEIM system
 - WEIM congestion into Northwestern portion of WEIM
- High CAISO demand, low renewable, peak hours:
 - North-to-south congestion within CAISO
 - Intertie congestion into CAISO
 - WEIM system transferring to CAISO and other California WEIM areas
 - WEIM congestion from Northwestern portion of the WEIM

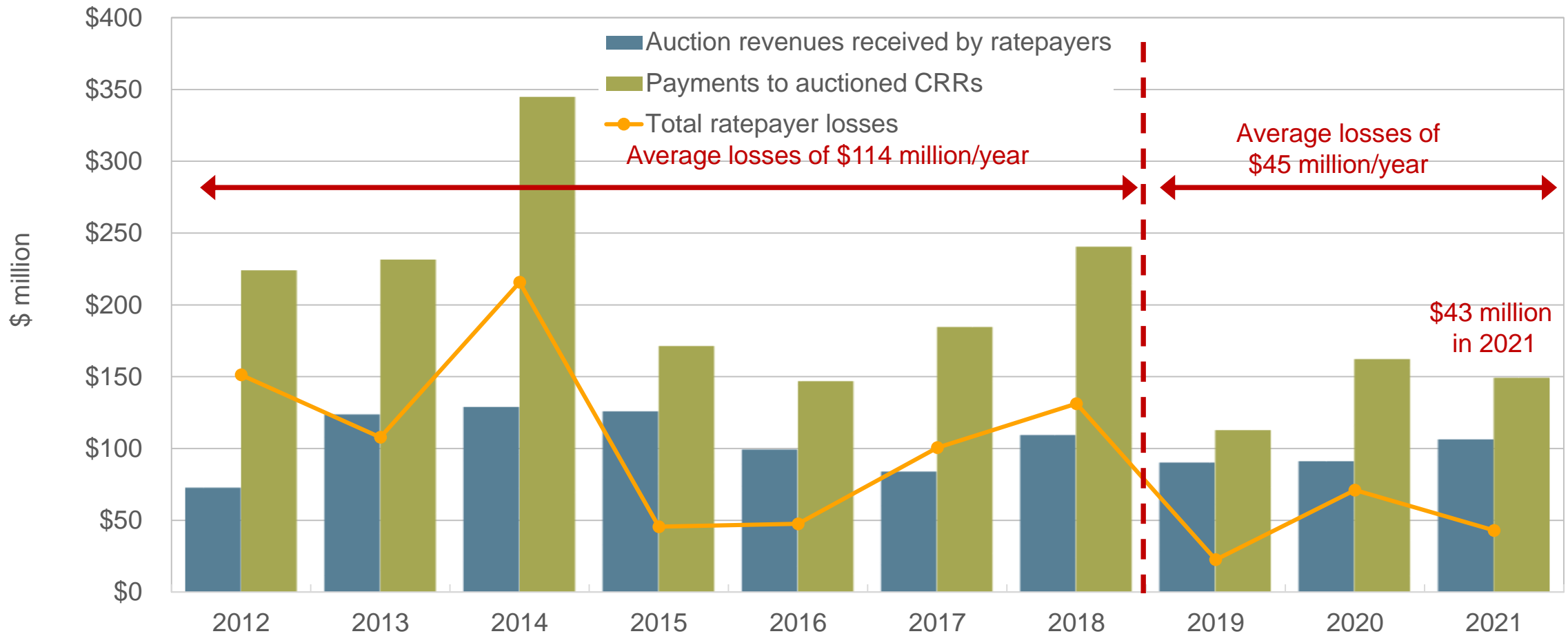
Day-ahead congestion rent rose to \$391 million in the first half of 2022, from \$292 million in 2021, driven by increases in Q2



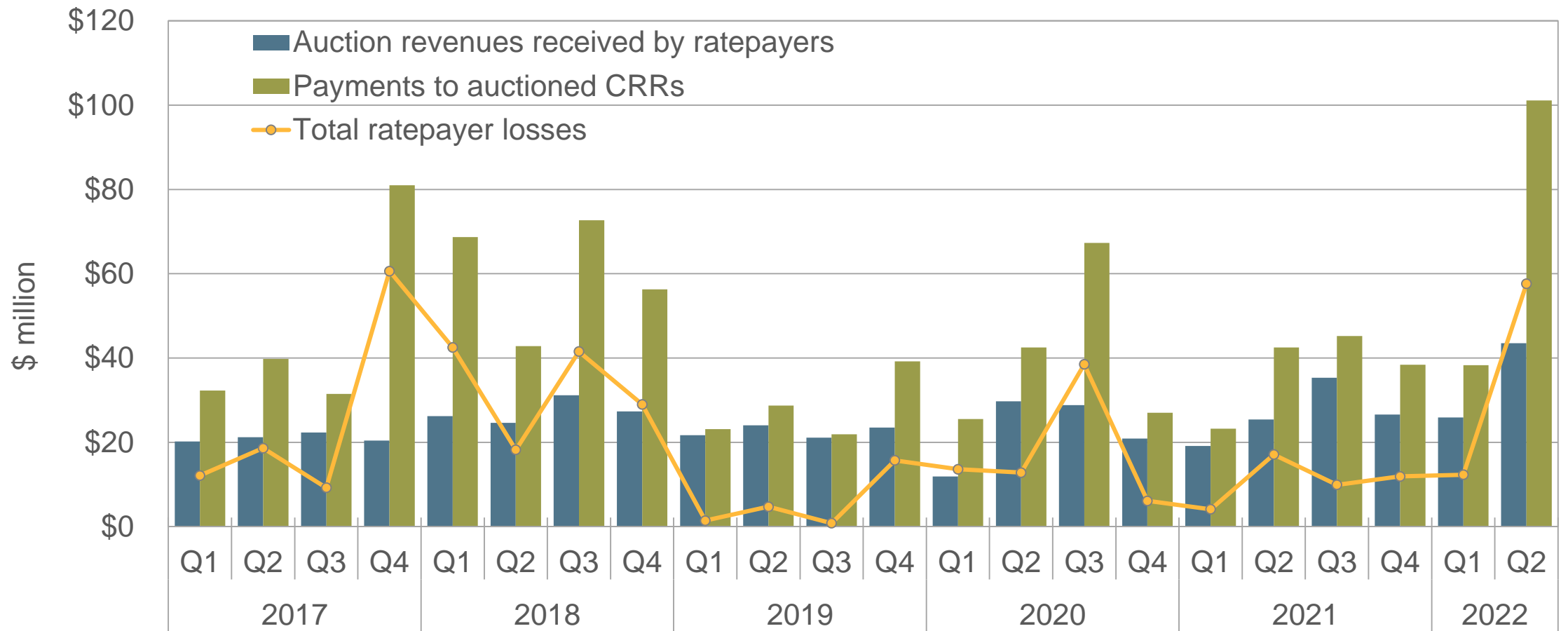
Day-ahead import congestion charges on major interties increases



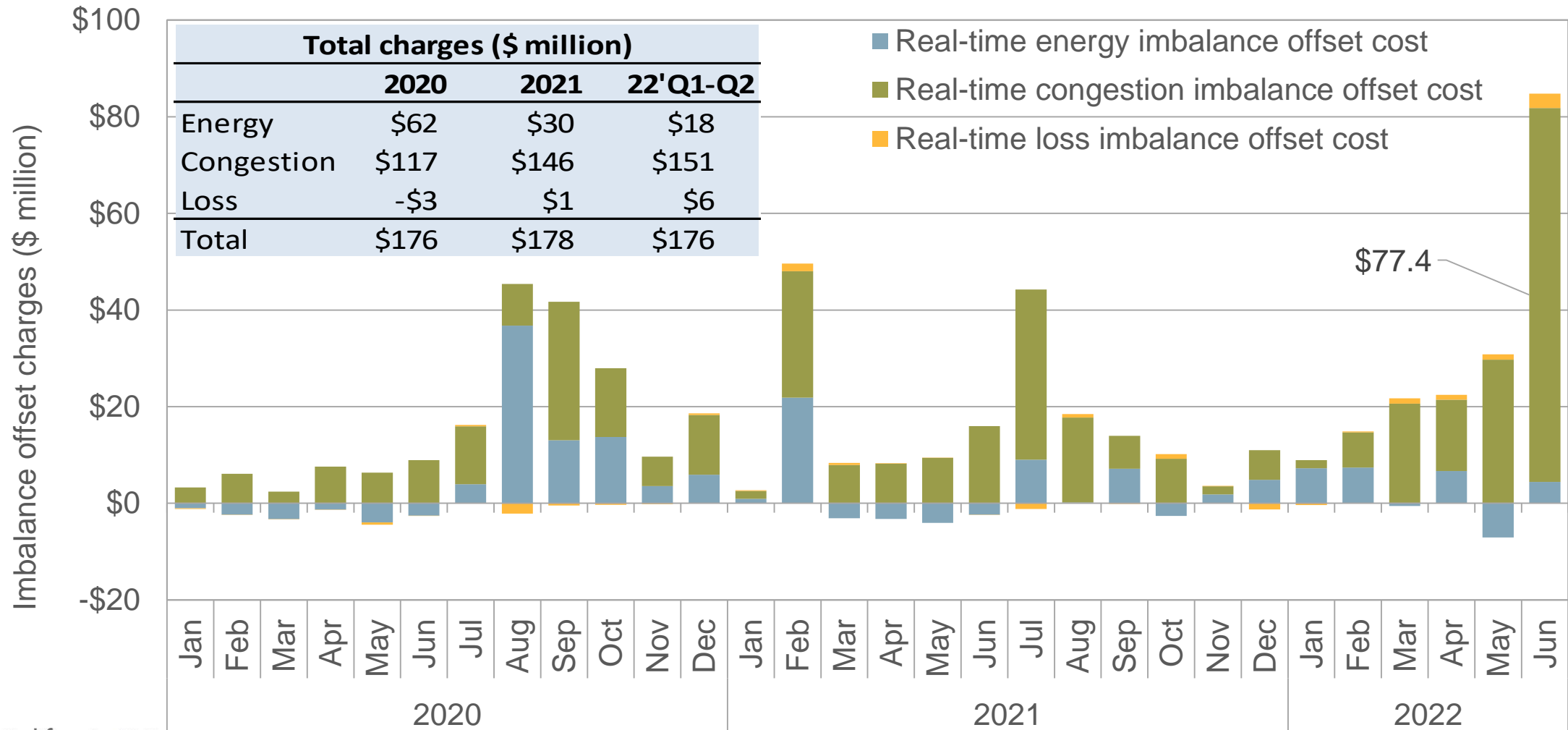
Transmission ratepayers losses from auctioned CRRs have been reduced by changes made in 2019, but still averaging \$45 million per year through 2021



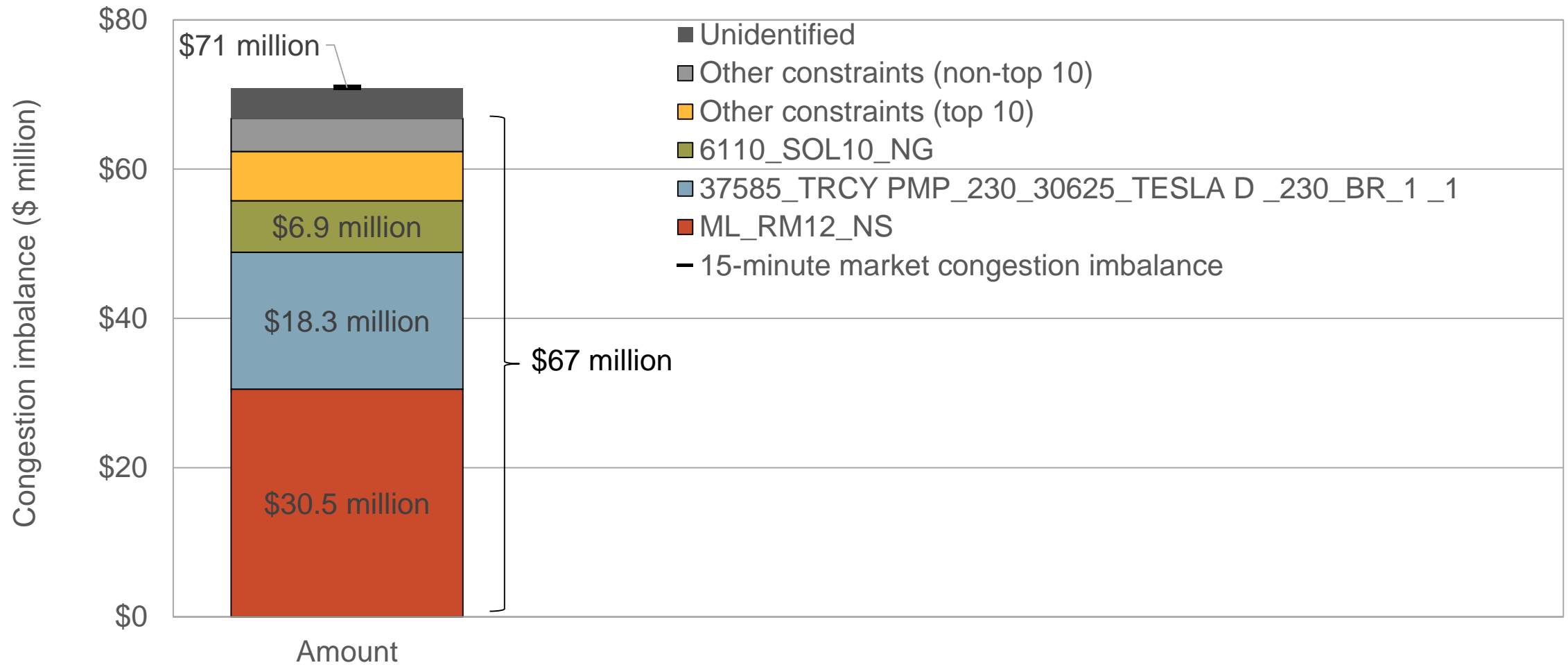
Payouts to congestion revenue rights sold in the California ISO auction exceeded auction revenues by \$70 million in Q1 and Q2



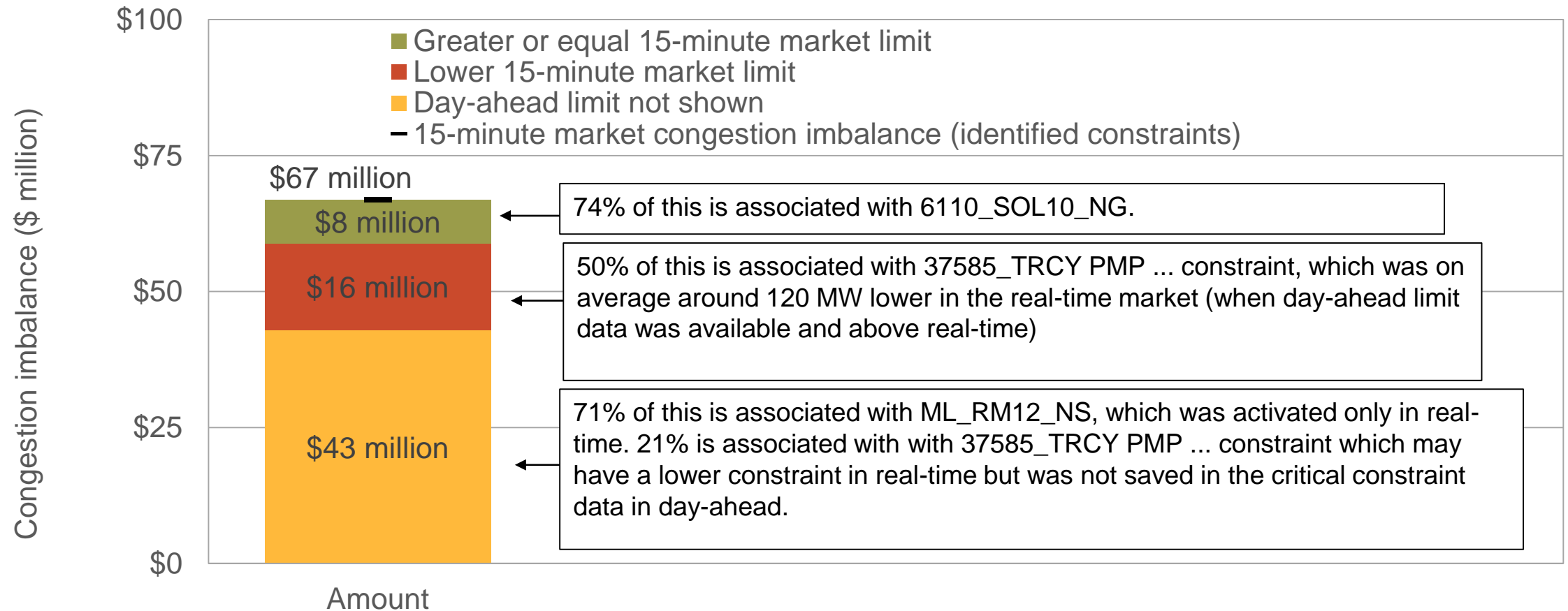
Real-time imbalance offset costs increased to \$176 million, record high offsets in June



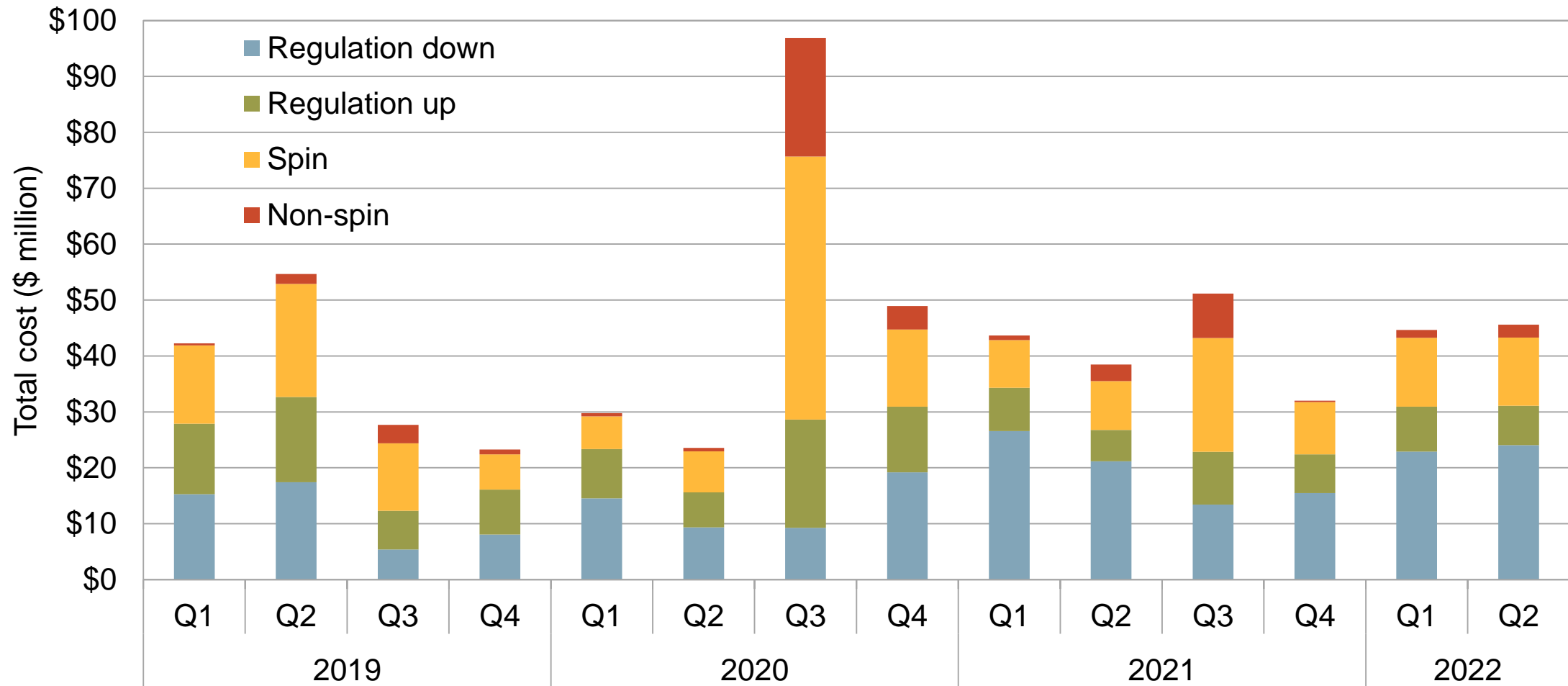
15-minute market congestion imbalance by constraint (June 2022)



15-minute market congestion imbalance by status, 15-minute market limit relative to day-ahead market limit



Ancillary service costs increased to \$93 million in Q1 and Q2



Flexible ramping capacity

- Designed to enhance reliability and market performance by procuring real-time ramping capacity to help manage variability and uncertainty
- Flexible ramping prices were frequently zero
- Minimum area constraint implemented in November 2020, only in the 15-minute market
 - added to the 5-minute market on February 16, 2022
 - Frequently binding in CAISO, but not other areas
- DMM supports the ISO's planned Dec 2022 implementation of (nodal procurement):
 - Procurement of capacity from resources not able to meet system uncertainty because of resource characteristics or congestion
 - This can reduce the effectiveness of the product to manage net load volatility and prevent power balance violations
- Uncertainty over load and the future availability of resources to meet that load contributes to operators needing to enter systematic and large imbalance conformance adjustments

WEIM RSE phase 1 enhancements implementation in June

- Intertie uncertainty removed from the capacity test on June 1.
 - Net load uncertainty removed from the capacity test on February 15, 2022.
- Exclude long start units that are off-line and short start units that fail to start from capacity test.
- Account for the state-of-charge of batteries from the market run immediately prior to the test hour.*
- Reduce CAISO import/exports awards counted in test based on transmission profile e-Tags submitted at T-40.*
- Flexibility test requirement now accounts for any power balance constraint shortage during the interval immediately prior to the test hour.
- Demand response actions taken which aren't accounted for in real-time market can be submitted as an adjustment to load forecast used in test.
- CAISO excluded from distribution of potential revenues from failures of the balancing test.

*** DMM analysis indicates these changes were not implemented correctly.**