

WESTERN ENERGY MARKETS

2025 Annual Report on Market Issues and Performance

Ryan Kurlinski

Senior Manager, Monitoring and Reporting
Department of Market Monitoring

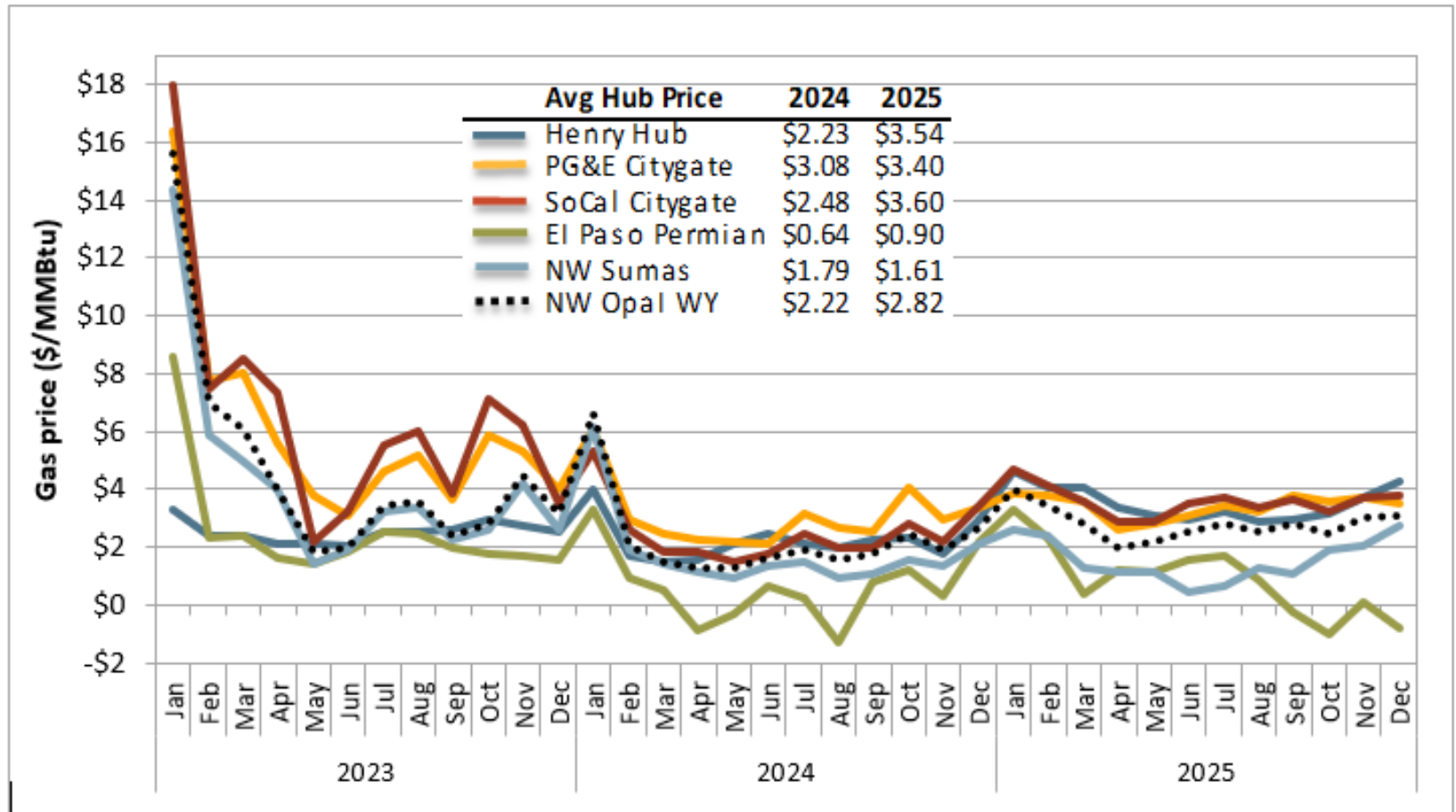
June 30, 2026

<https://www.caiso.com/documents/2025-annual-report-on-market-issues-and-performance.pdf>



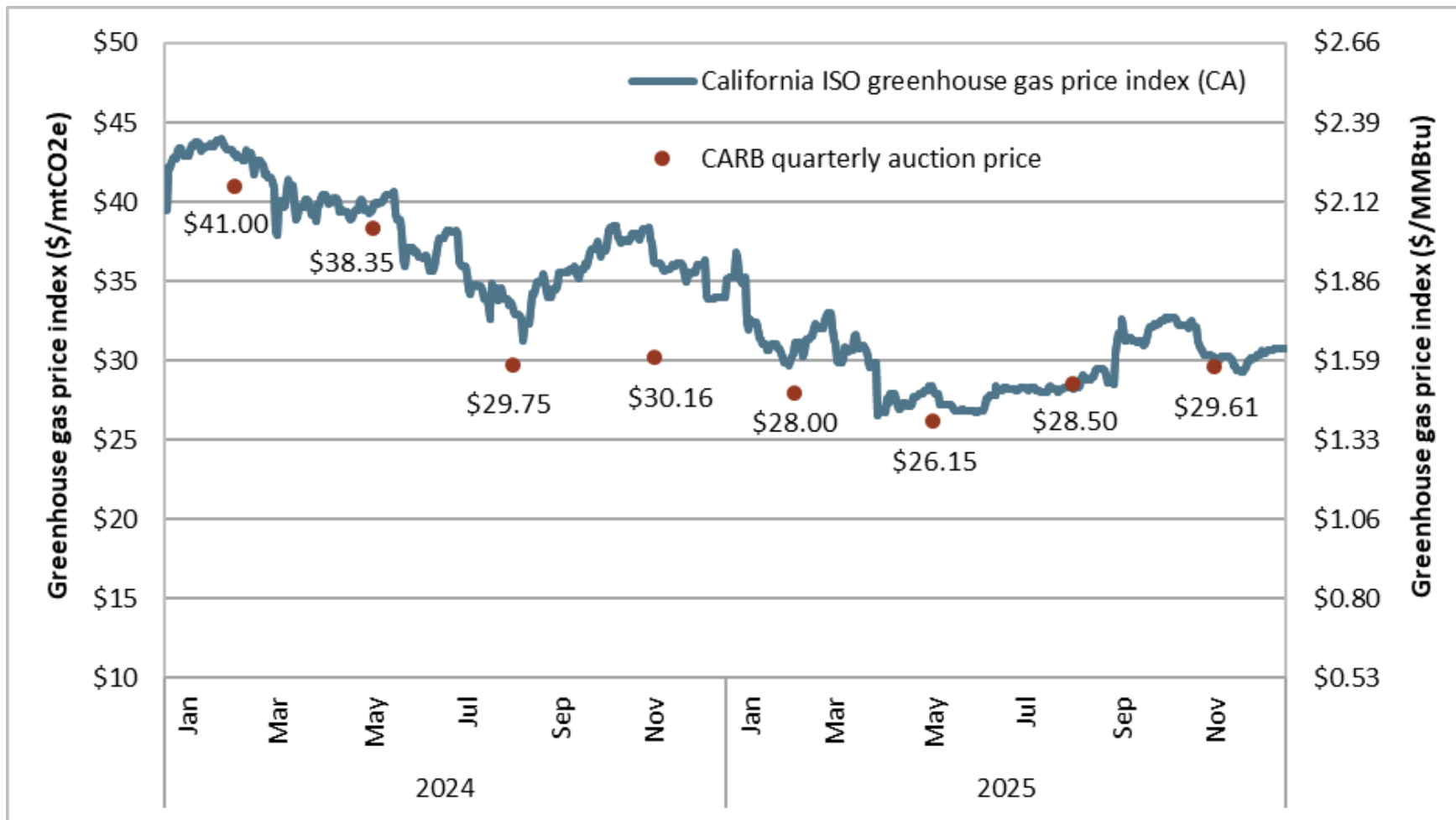
Natural gas prices at major Western hubs up between 11 and 45%

Monthly average natural gas prices (2023–2025)



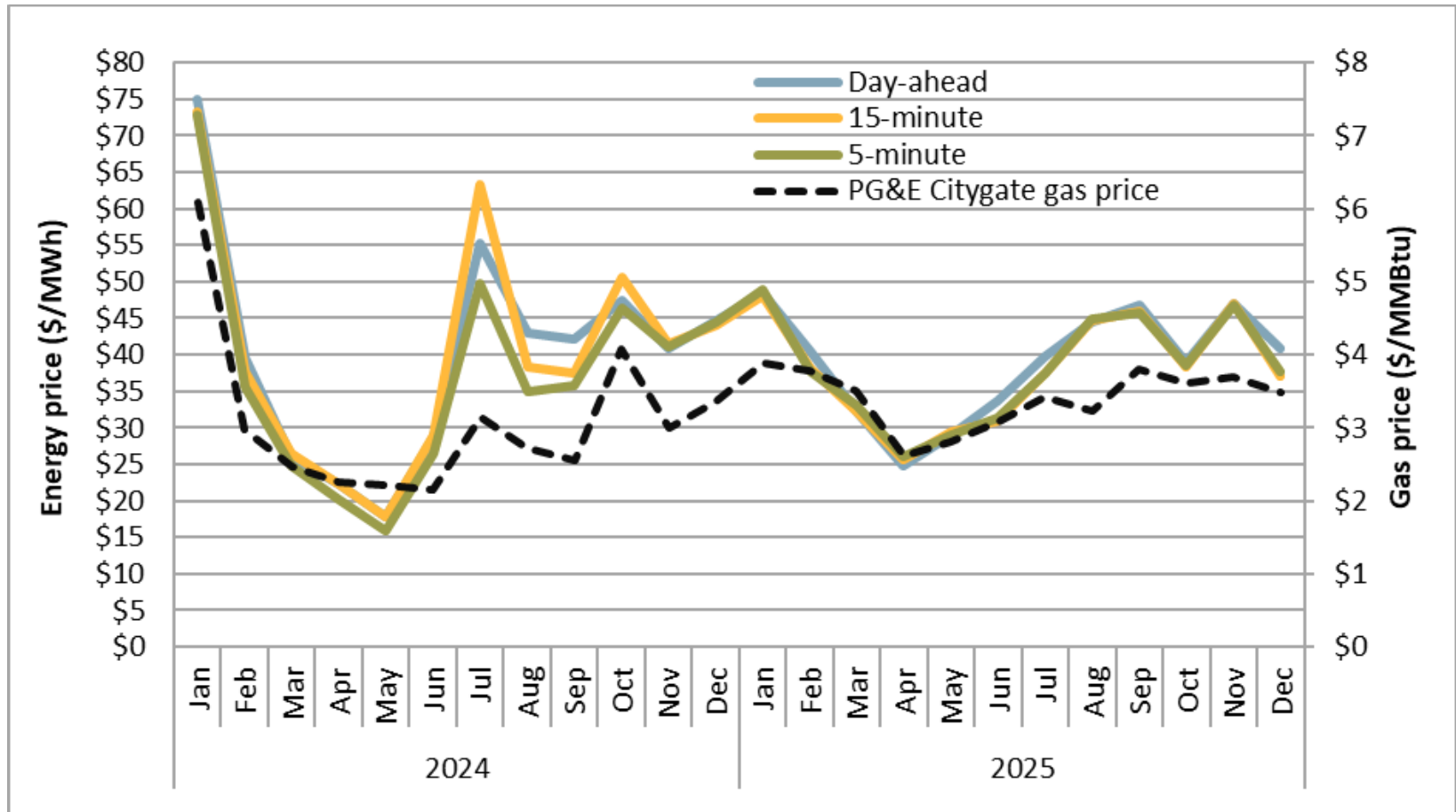
Greenhouse gas prices down in CA, up in WA

California ISO greenhouse gas allowance price index for California and CARB auction prices



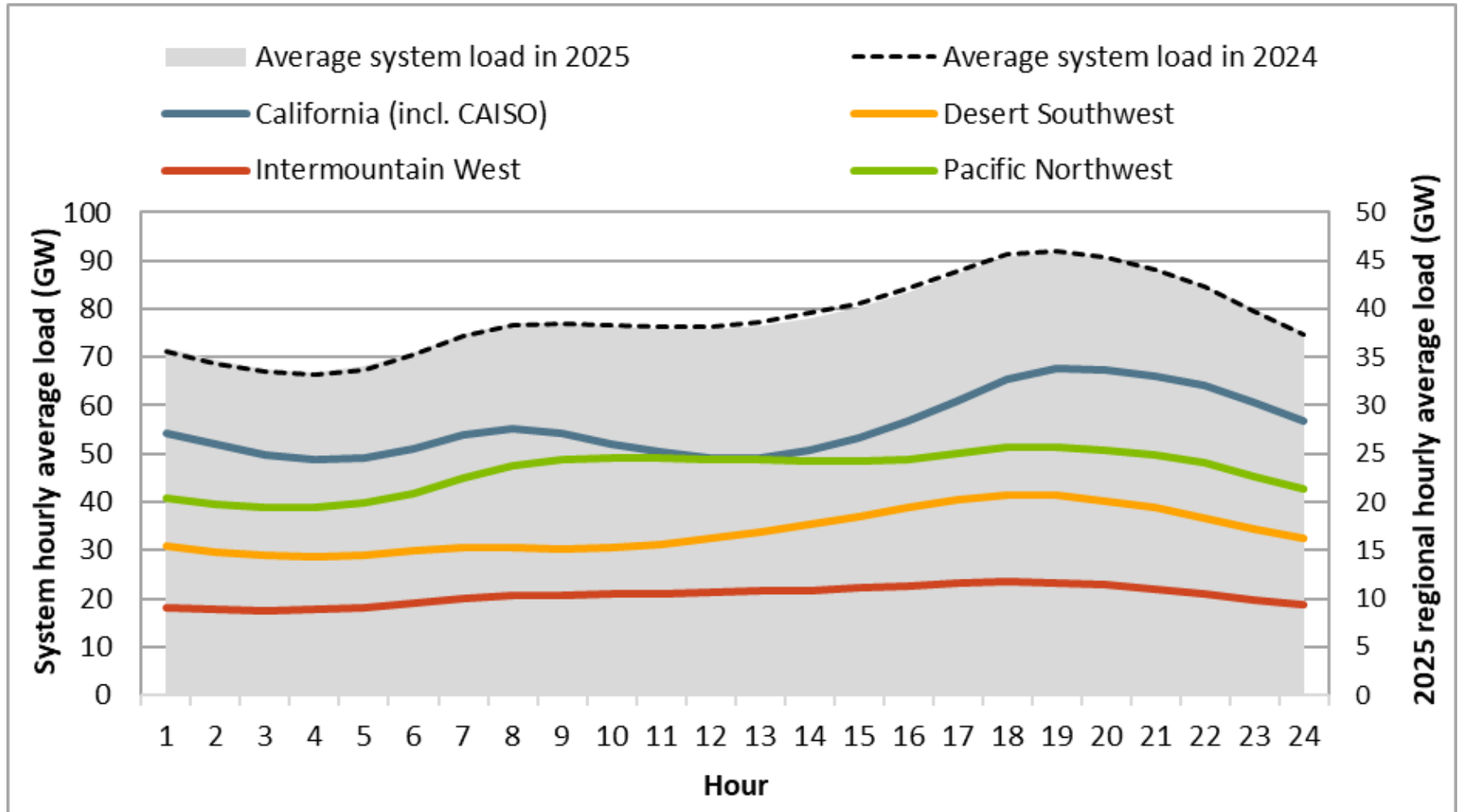
Electricity prices still correlated with natural gas prices, but less so

Monthly average PG&E Citygate gas price and load-weighted average electricity prices for balancing areas in day-ahead market (CAISO)



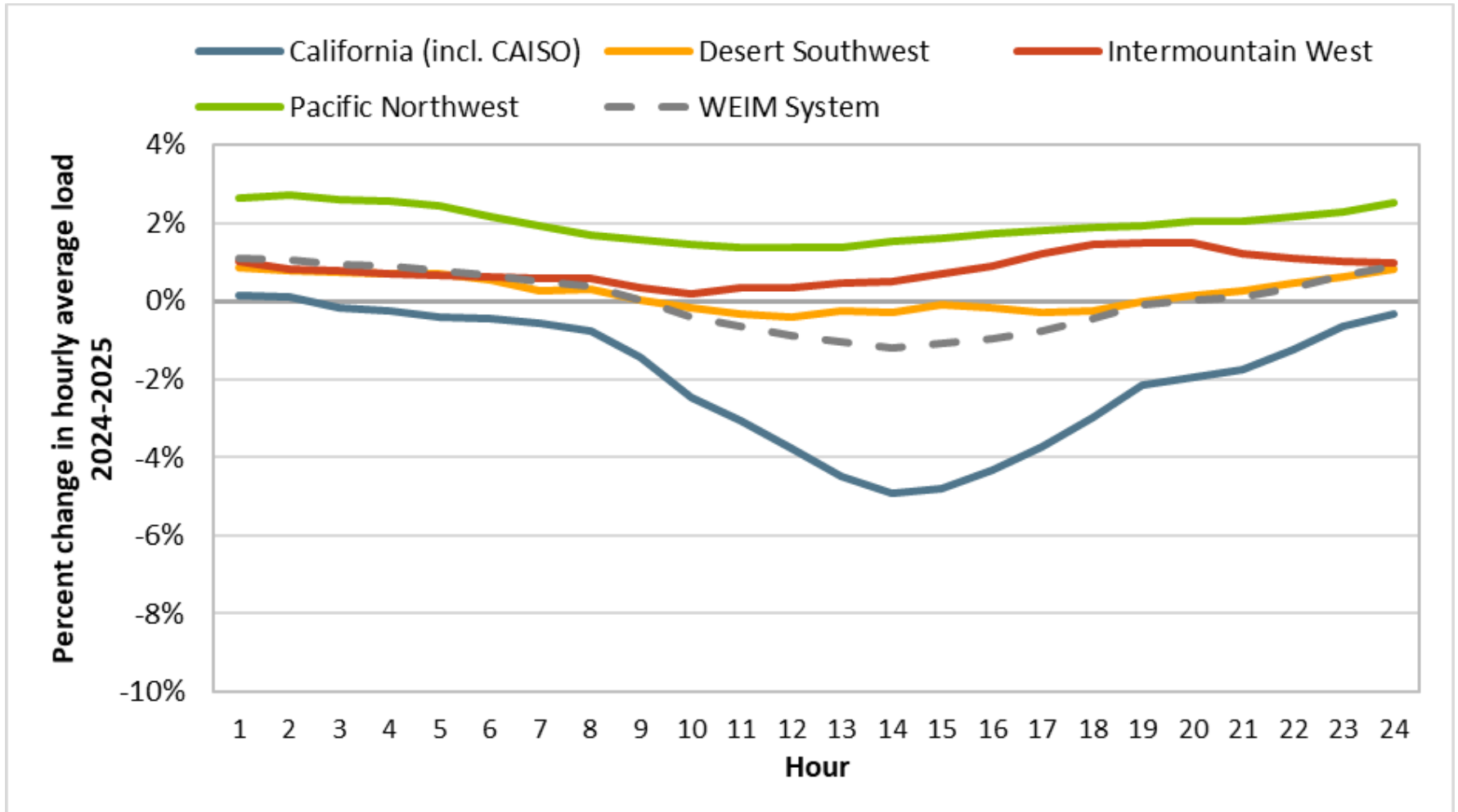
Load stayed same overall, down 2% in CA

Hourly average 5-minute market load by region (GW)



CA load down, including during peak evening hours

Percent change in hourly average 5-minute market load by region (2024–2025)



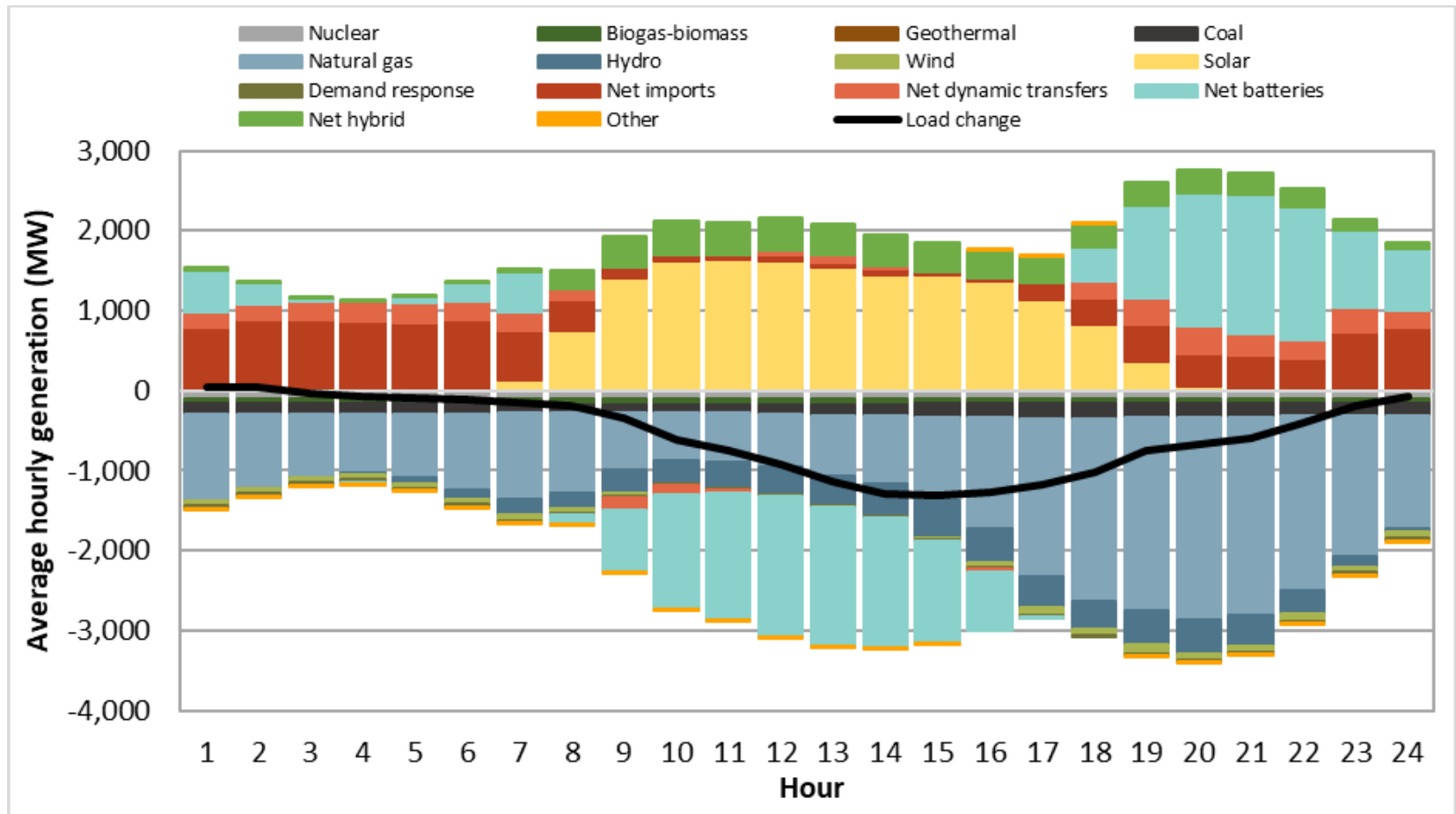
PNW loads peak in winter; system loads in summer

Peak WEIM load (January–December 2025)

Region/balancing area	Peak load (2025)		Load during WEIM system peak (22-Aug-2025)	
	Date	Load (MW)	Load (MW)	Percent
WEIM system	22-Aug-25	130,122	130,122	
California	21-Aug-25	52,190	51,740	40%
California ISO	21-Aug-25	42,549	42,121	32%
BANC	11-Jul-25	4,115	3,944	3%
LADWP	22-Aug-25	5,186	5,054	4%
Turlock Irrig. District	2-Sep-25	660	621	.5%
Desert Southwest	7-Aug-25	35,224	32,250	25%
Arizona Public Service	9-Jul-25	8,764	8,077	6%
El Paso Electric	6-Aug-25	2,313	1,838	1.4%
NV Energy	14-Jul-25	9,305	7,971	6%
PSC New Mexico	6-Aug-25	2,690	2,437	2%
Salt River Project	7-Aug-25	8,699	7,713	6%
Tucson Electric	6-Aug-25	3,119	2,762	2%
WAPA - Desert SW	6-Aug-25	1,671	1,452	1.1%
Intermountain West	8-Jul-25	17,537	15,848	12%
Avista Utilities	12-Feb-25	2,222	1,762	1%
Idaho Power	8-Jul-25	4,028	3,542	3%
NorthWestern Energy	12-Feb-25	1,994	1,495	1%
PacifiCorp East	14-Jul-25	9,775	9,048	7%
Pacific Northwest	12-Feb-25	38,283	30,285	23%
BPA	12-Feb-25	11,421	8,551	7%
PacifiCorp West	12-Feb-25	4,202	3,640	3%
Portland General Electric	12-Aug-25	4,481	4,122	3%
Powerex	4-Feb-25	11,504	8,597	7%
Puget Sound Energy	12-Feb-25	4,986	3,549	3%
Seattle City Light	12-Feb-25	1,800	1,252	1%
Tacoma Power	27-Jan-25	923	574	.4%

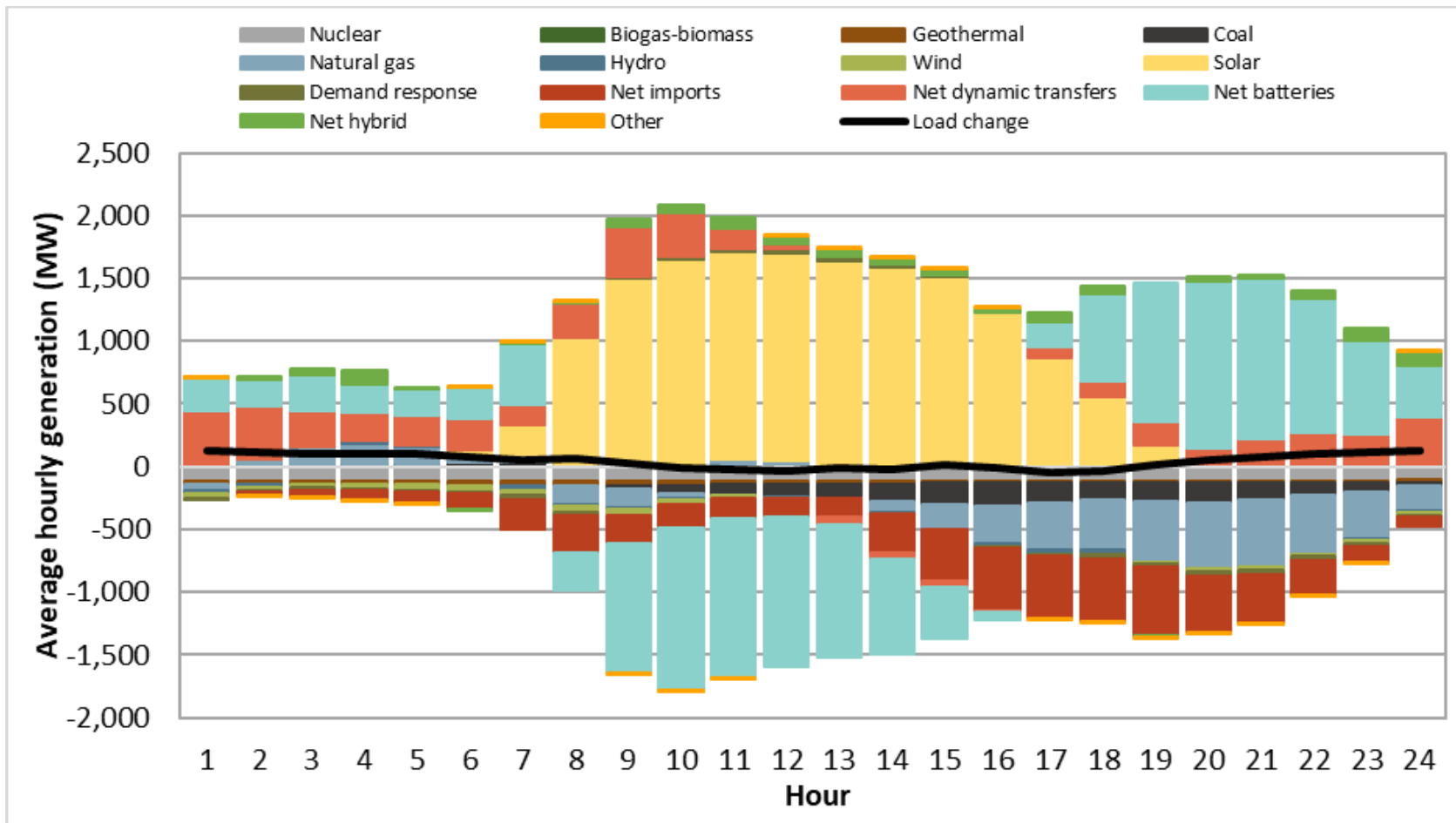
Solar, imports, and battery charge and discharge increased in California; natural gas generation down

Change in average hourly generation by fuel type in the California region (2025 compared to 2024)



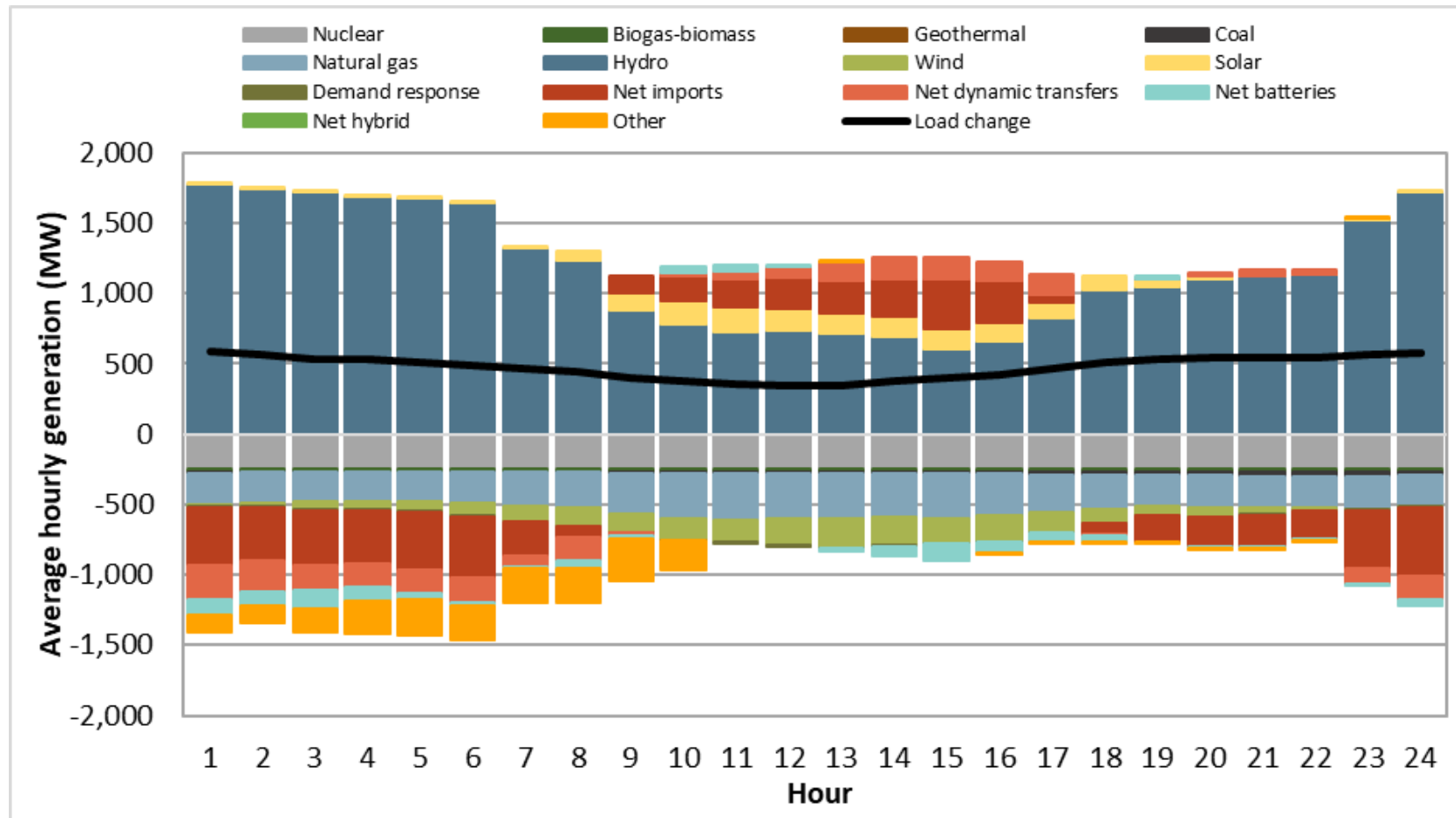
Desert Southwest: Solar and batteries up; imports and gas down

Change in average hourly generation by fuel type in the Desert Southwest region (2025 compared to 2024)



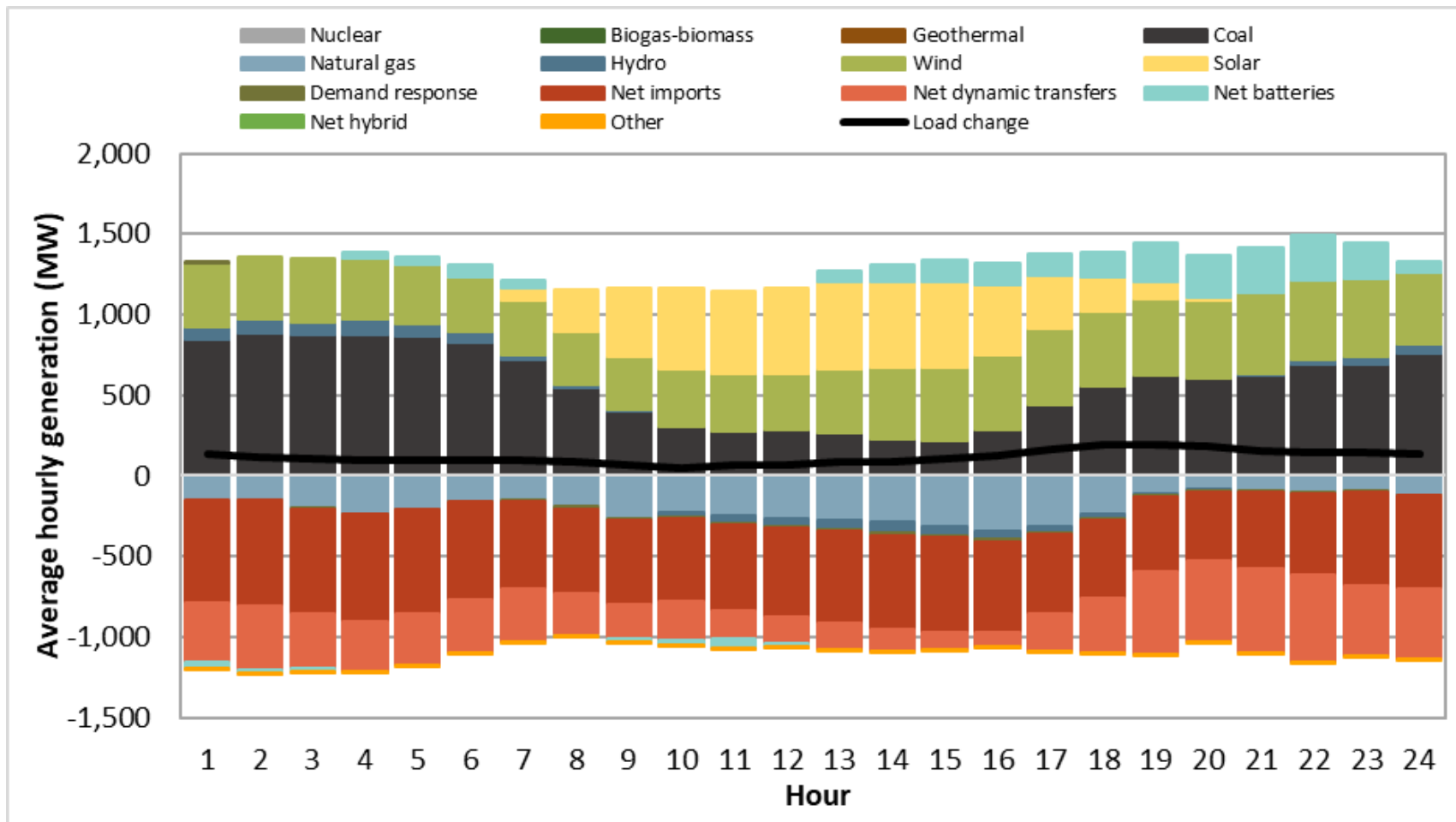
Pacific Northwest: hydro and solar increased; wind, natural gas, and nuclear decreased

Change in average hourly generation by fuel type in the Pacific Northwest region (2025 compared to 2024)



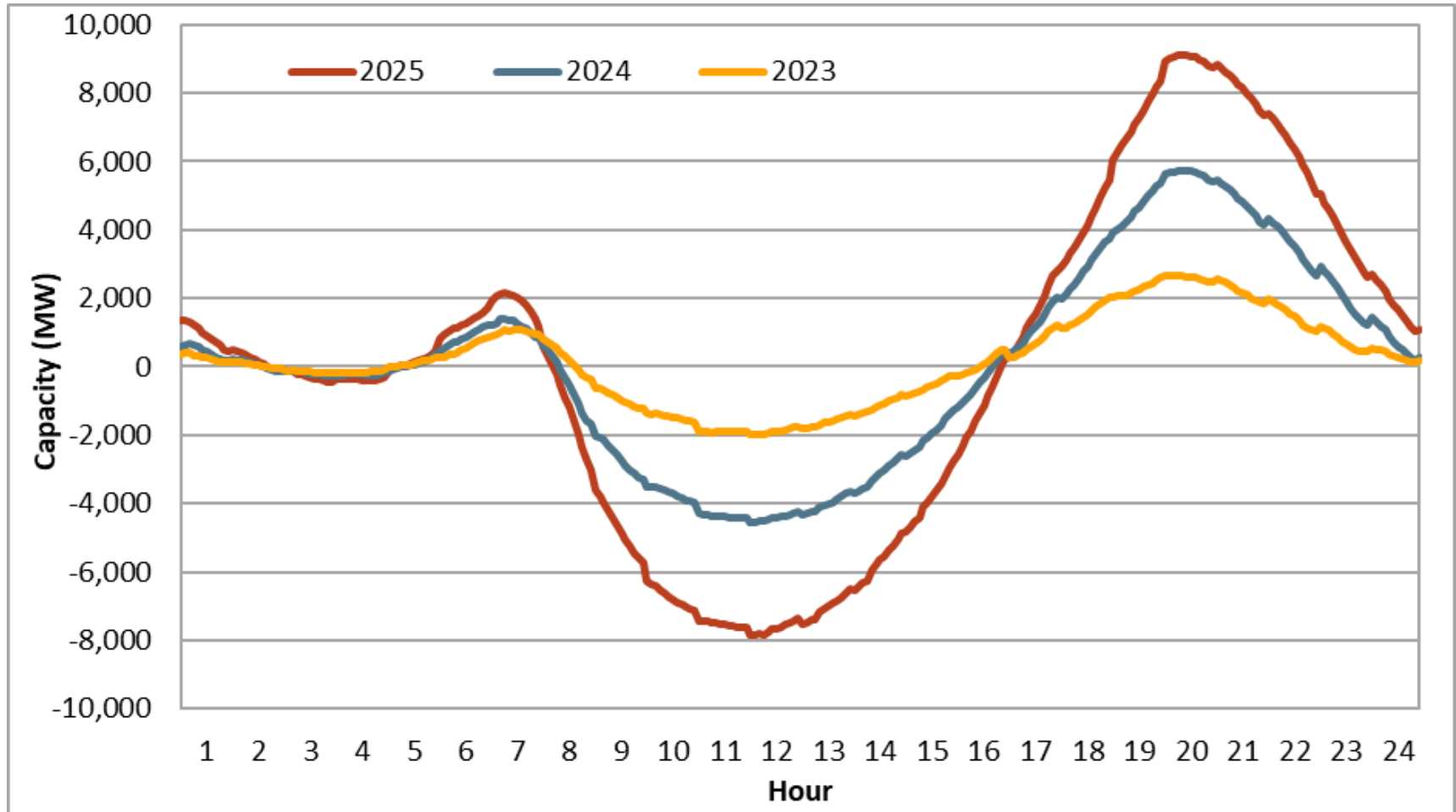
Intermountain West: Coal, wind, solar, and batteries up; natural gas, imports, and WEIM transfers in down

Change in average hourly generation by fuel type in the Intermountain West region (2025 compared to 2024)



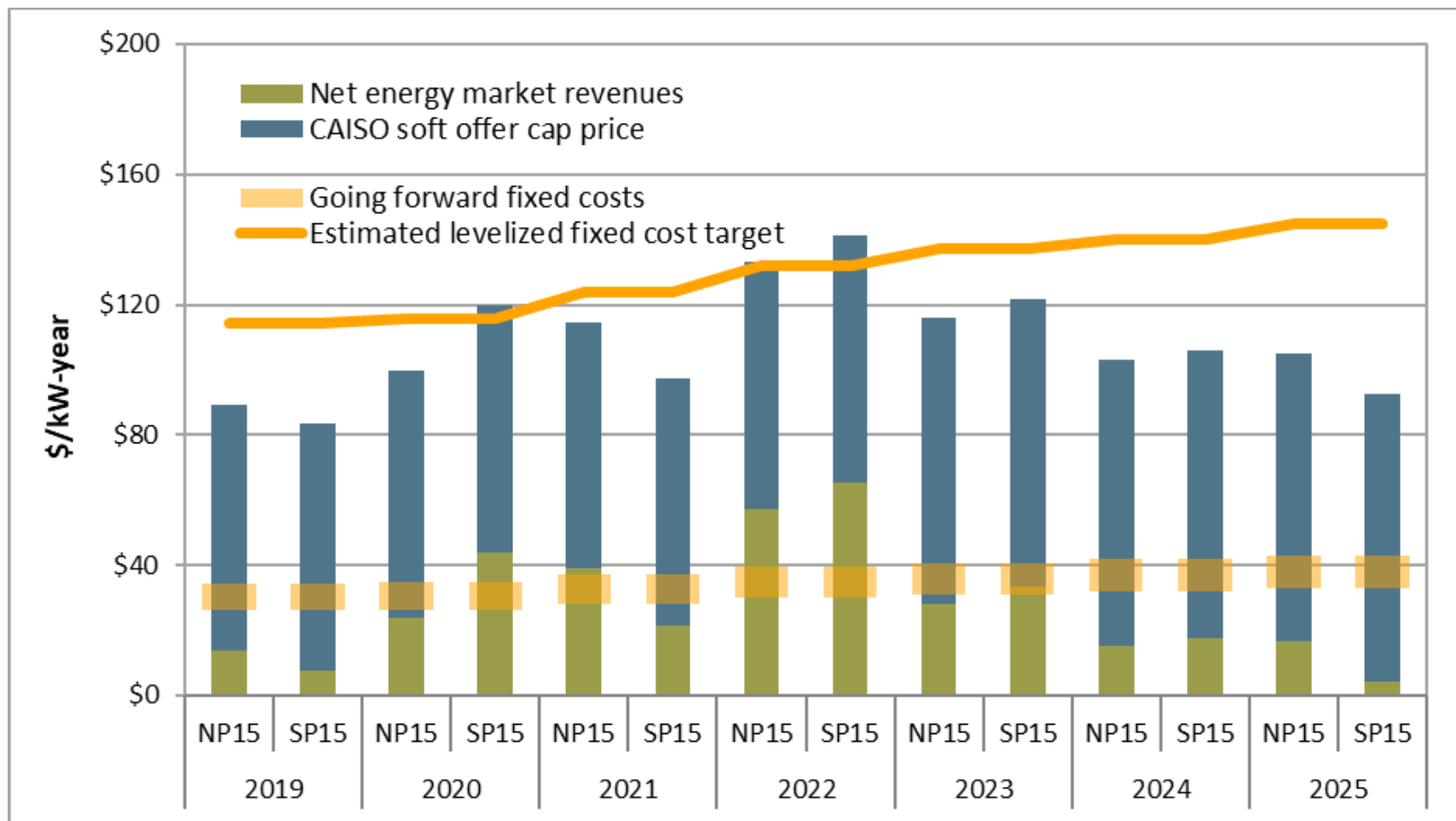
Battery charge and discharge increased significantly

Average 5-minute market battery energy schedules



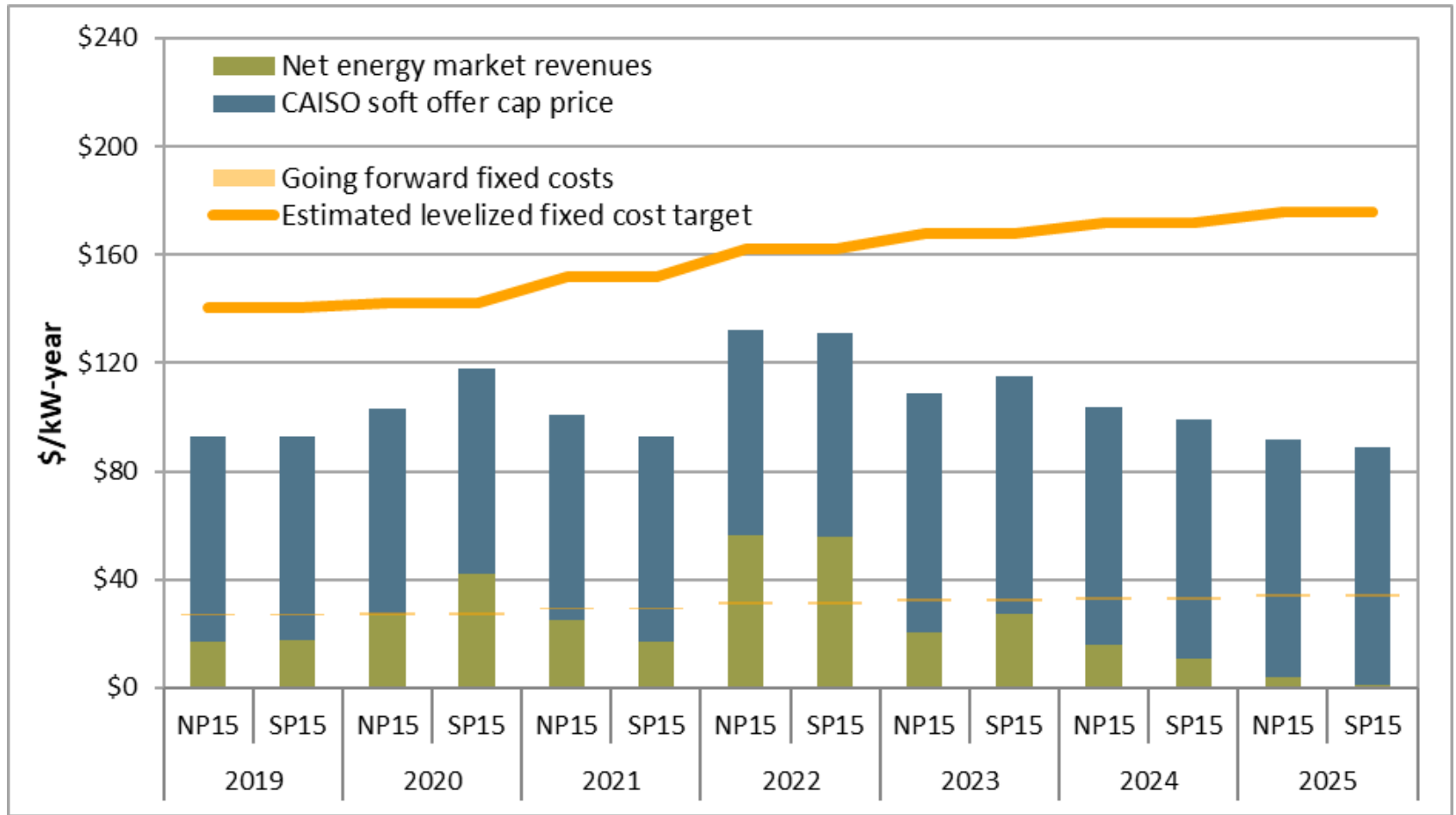
Estimated net energy market revenues for new combined cycle below levelized and going forward fixed costs

Estimated net revenue of hypothetical combined cycle unit



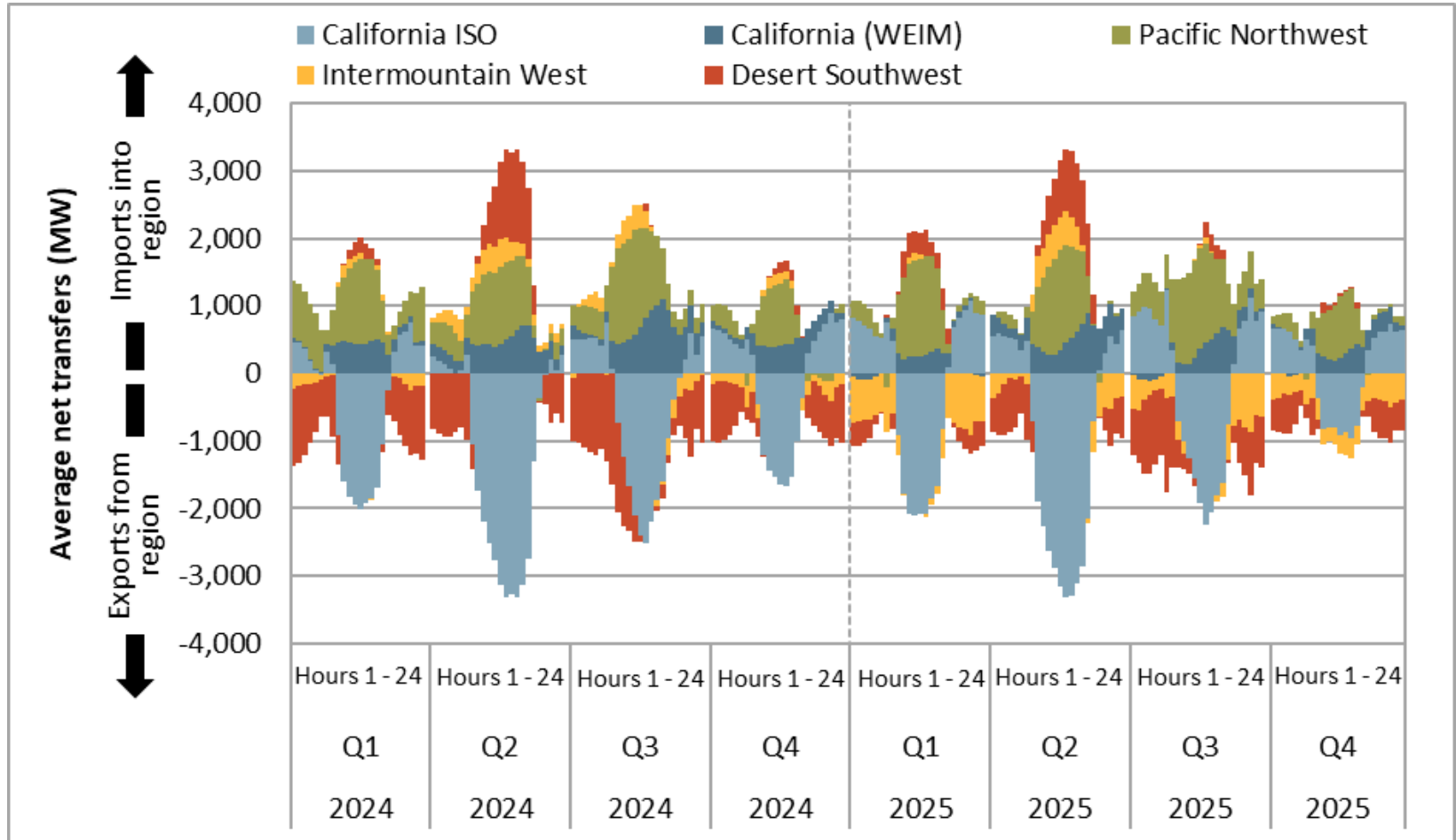
Estimated net energy market revenues for new combustion turbine below levelized and going forward fixed costs

Estimated net revenue of hypothetical combustion turbine unit



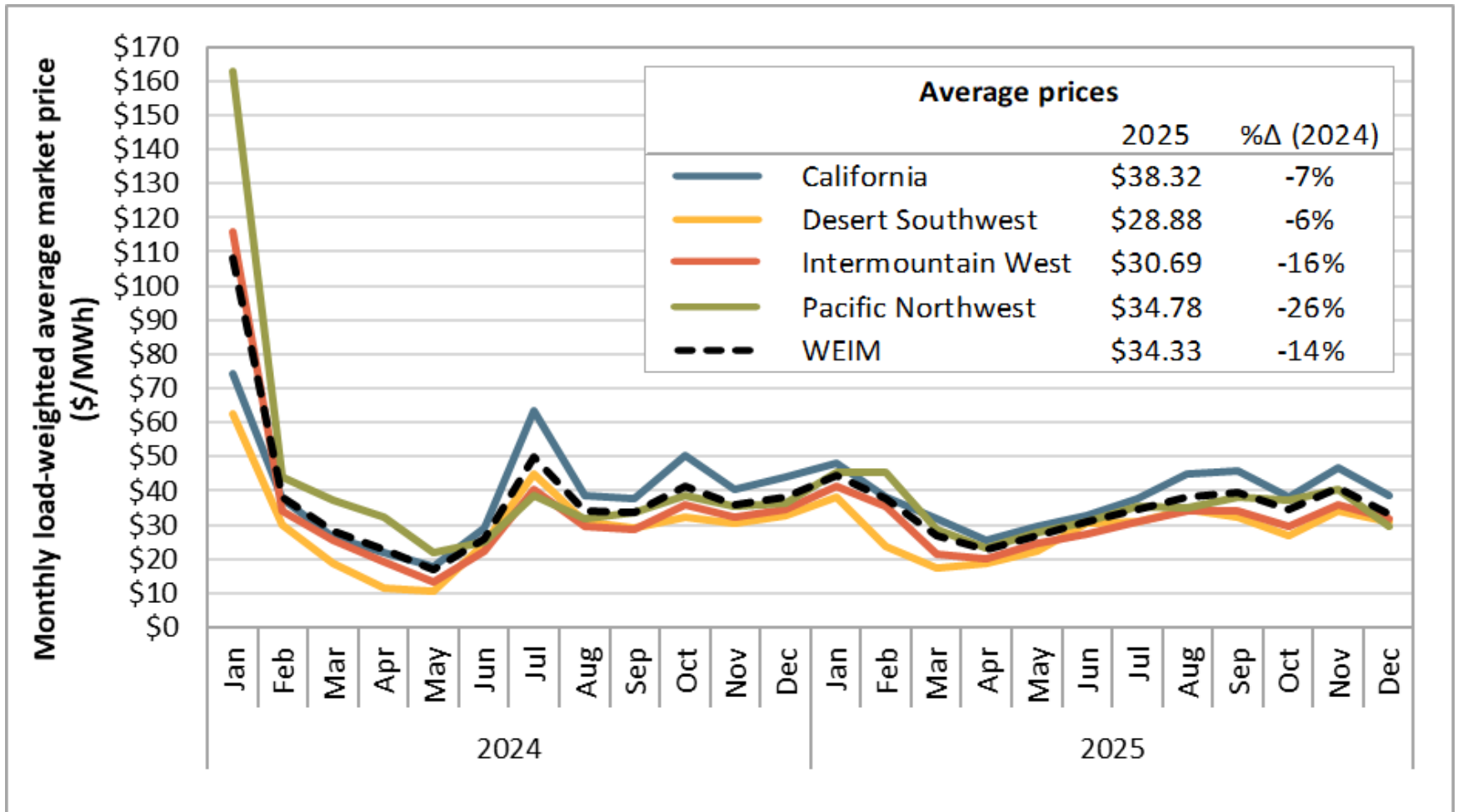
Main exporters of WEIM transfers: CAISO in solar hours; DSW and IMW in non-solar hours

Average dynamic inter-regional WEIM transfers by hour
(5-minute market)



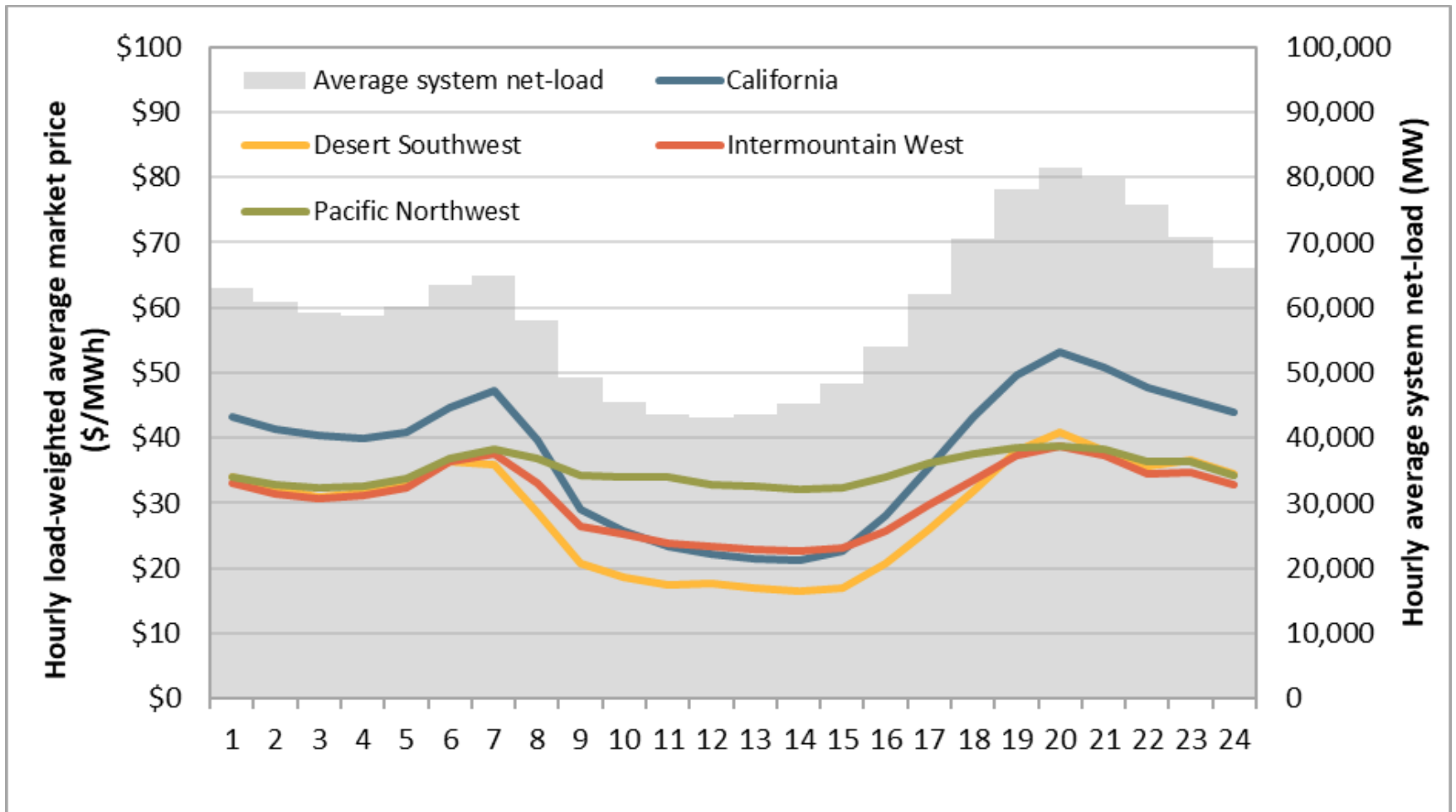
Across WEIM, 15-minute prices averaged \$34/MWh, down 14% despite higher natural gas prices

Weighted average monthly 15-minute market prices by region



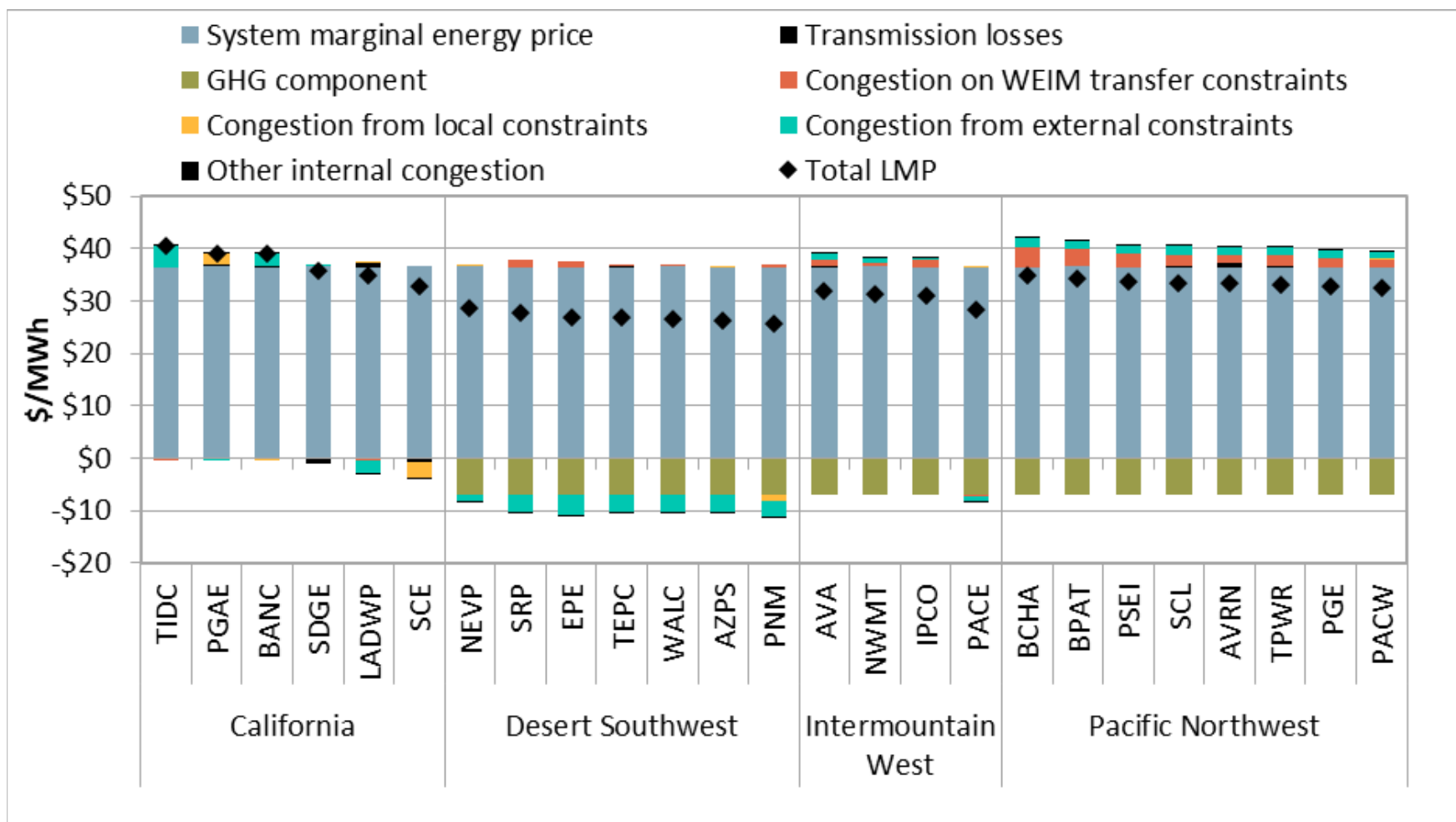
Pacific NW prices higher during mid-day solar hours; Other regions' prices follow net load pattern

Weighted average hourly 15-minute market prices by region (2025)



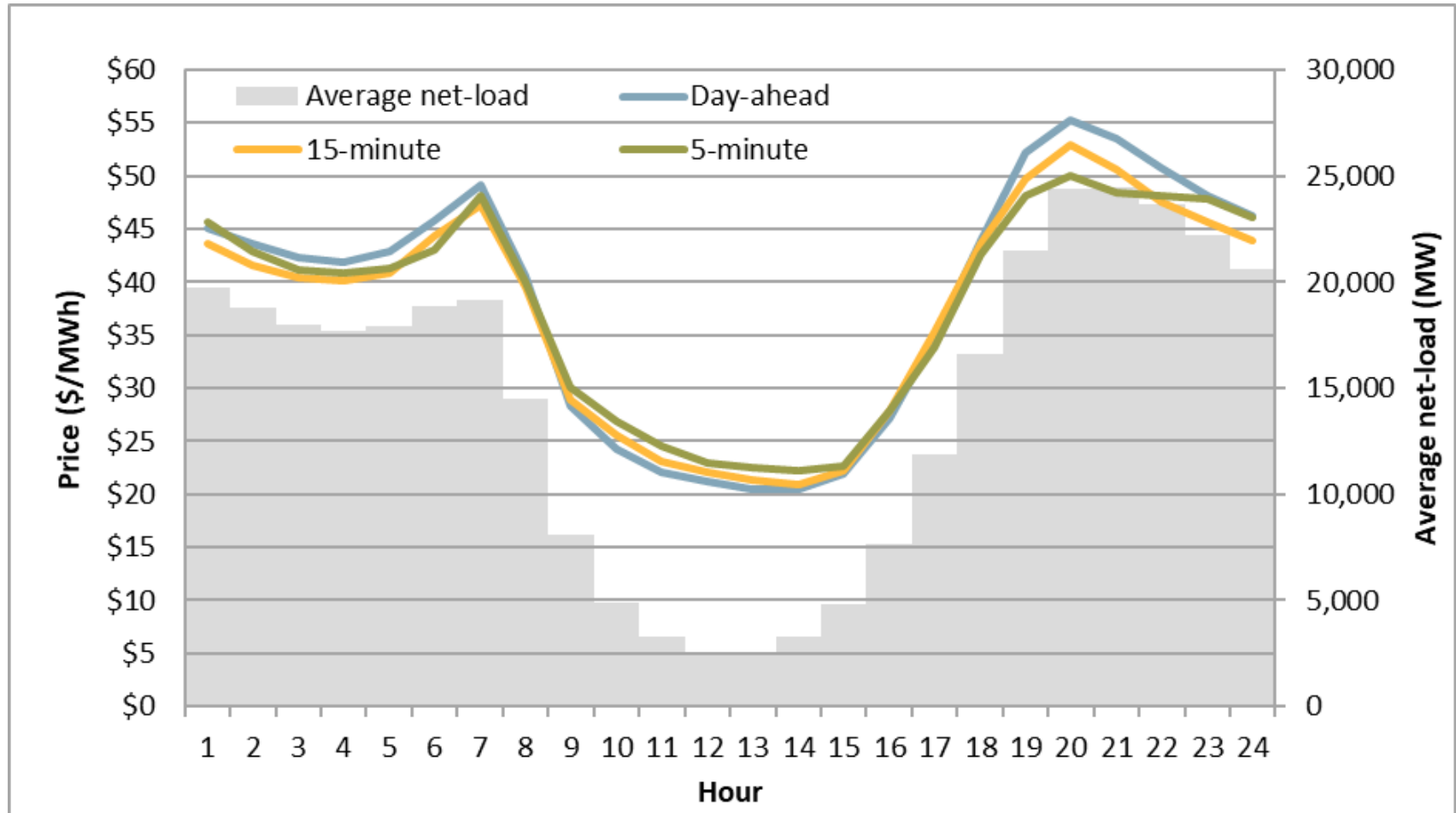
GHG costs increase prices in California, transfer congestion elevates prices in Northwest

Average 15-minute market prices by balancing area (2025)



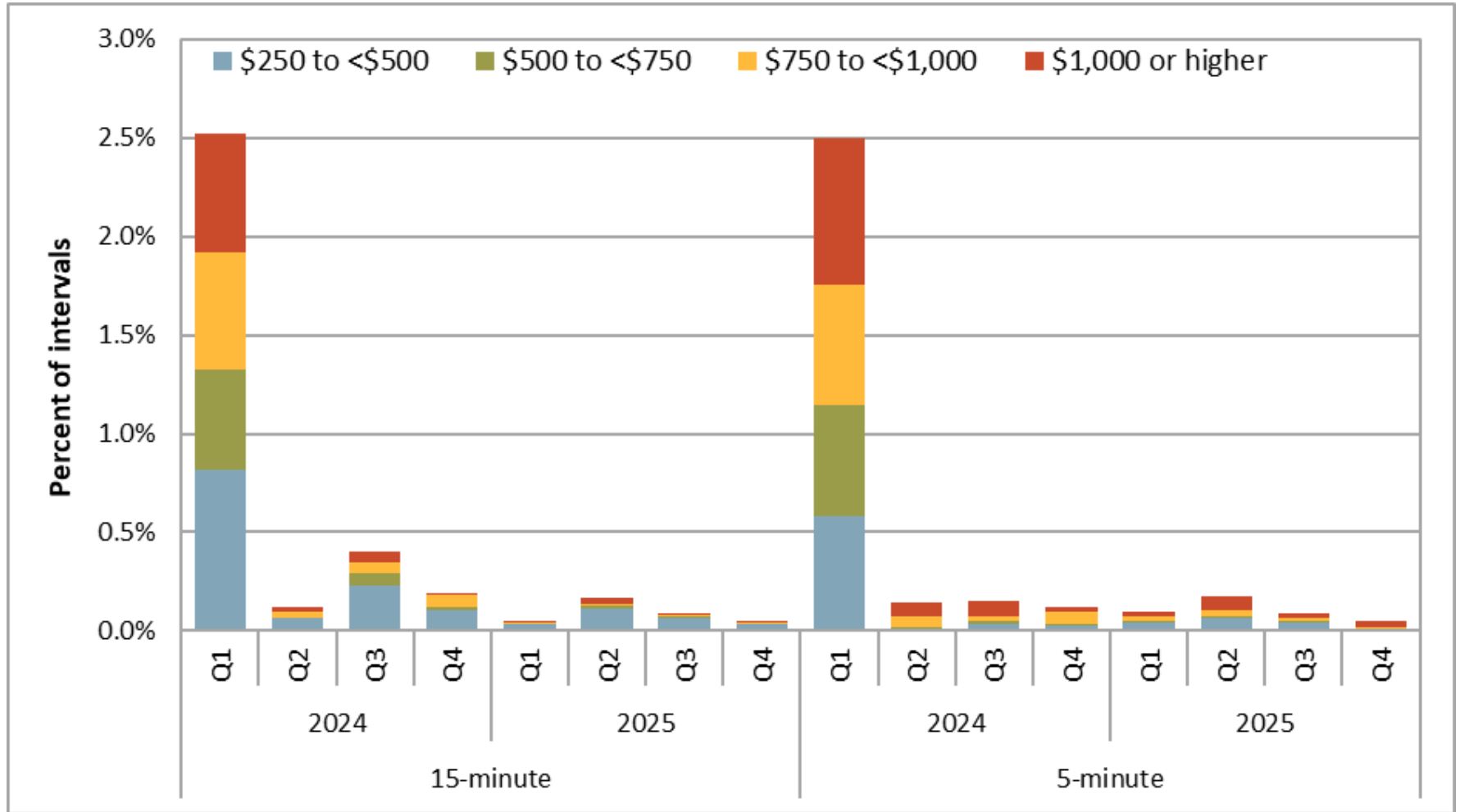
CAISO 15-minute only slightly higher than 5-minute prices over peak net load hours due to load bias

Hourly load-weighted average energy prices for balancing areas in day-ahead market (CAISO 2025)



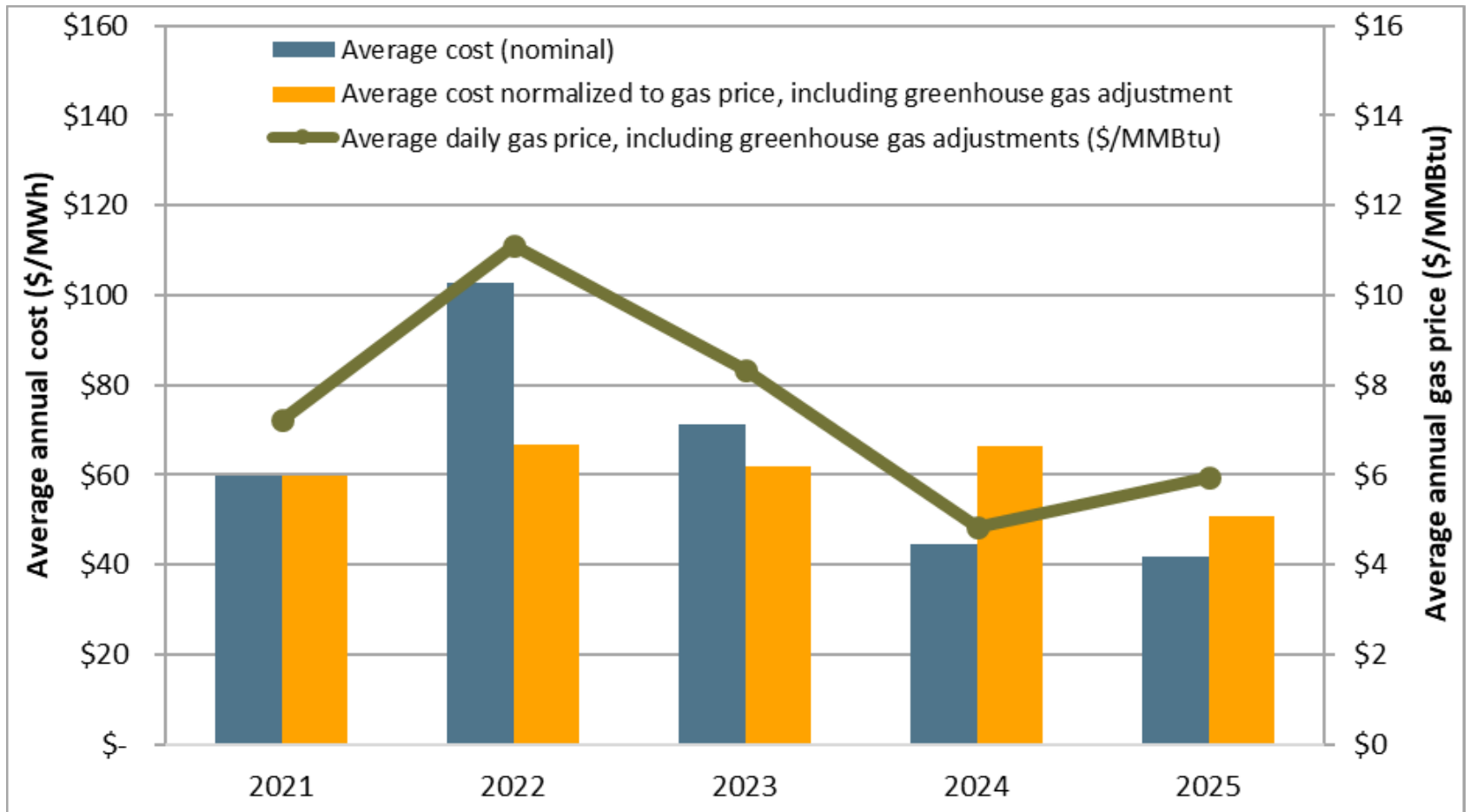
Frequency of high price intervals down significantly

Frequency of high prices in BAAs participating only in the real-time markets



Total CAISO wholesale costs down 6%, down 24% after normalizing for higher gas costs

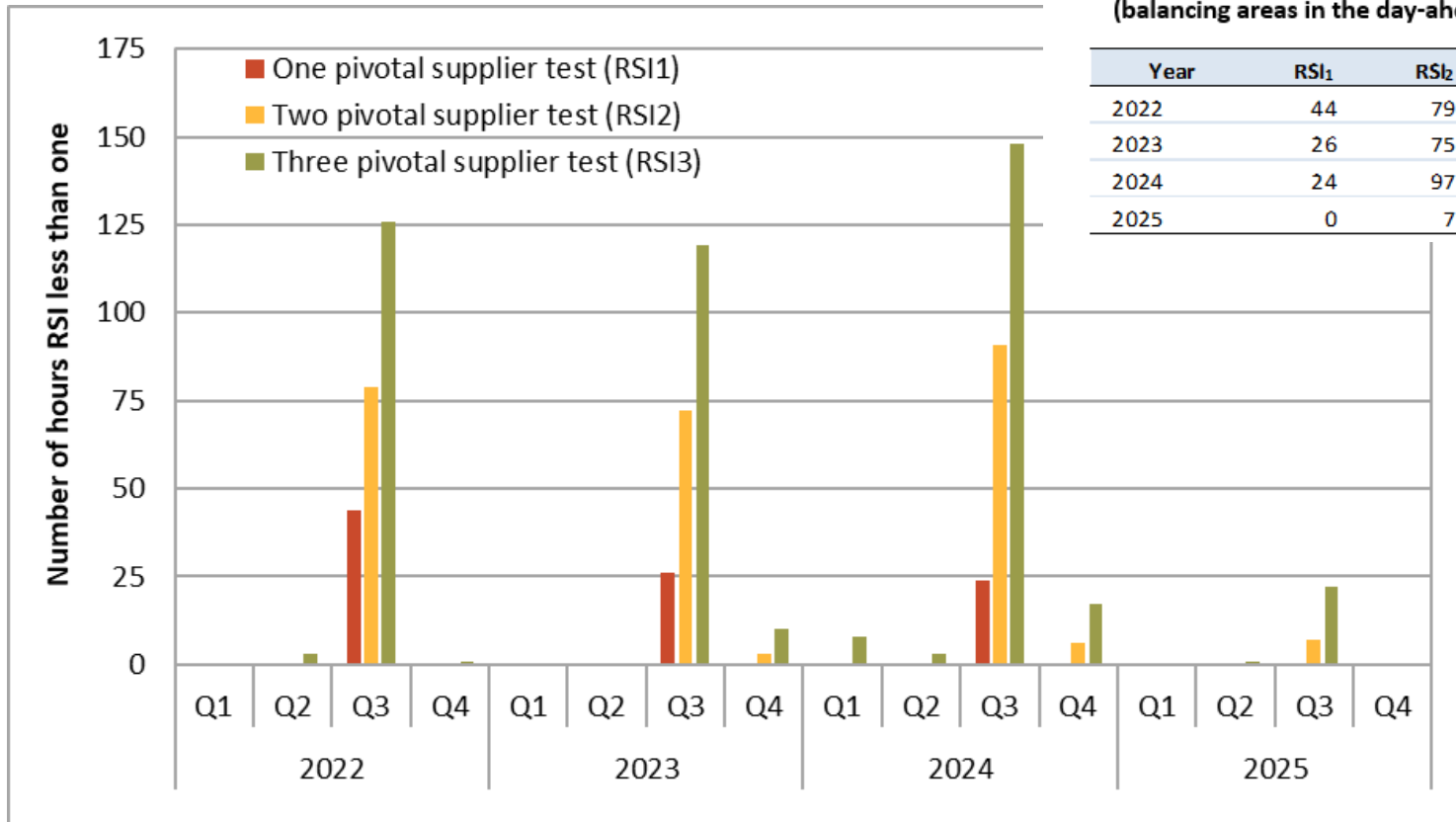
Total annual wholesale costs per MWh of load (2021–2025)



Structural competitiveness of day-ahead market highest of last 4 years

Hours with day-ahead residual supply index less than one by quarter (balancing areas in the day-ahead market)

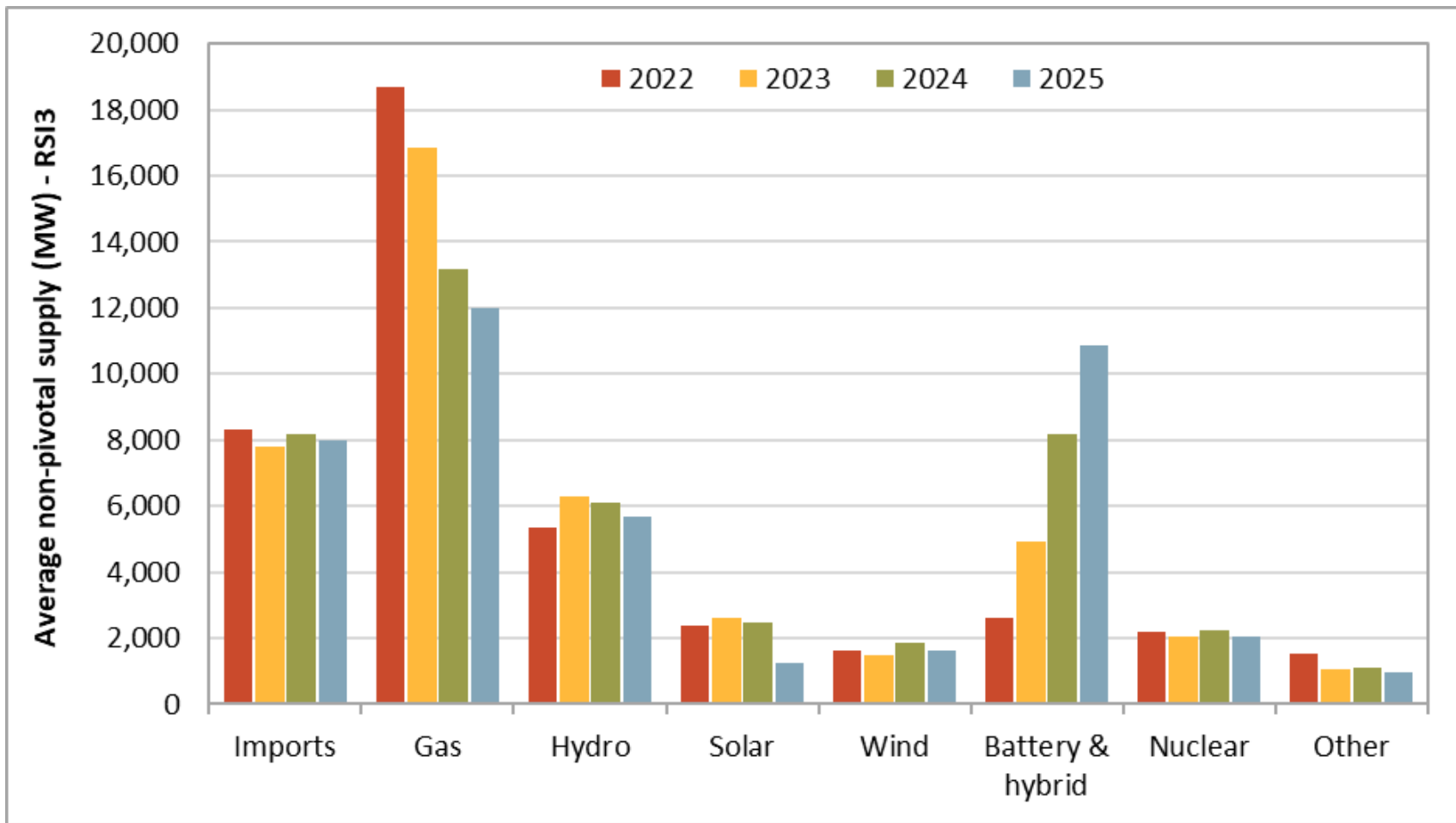
Hours with day-ahead residual supply index less than one by year (balancing areas in the day-ahead market)



Year	RSI ₁	RSI ₂	RSI ₃
2022	44	79	130
2023	26	75	129
2024	24	97	176
2025	0	7	23

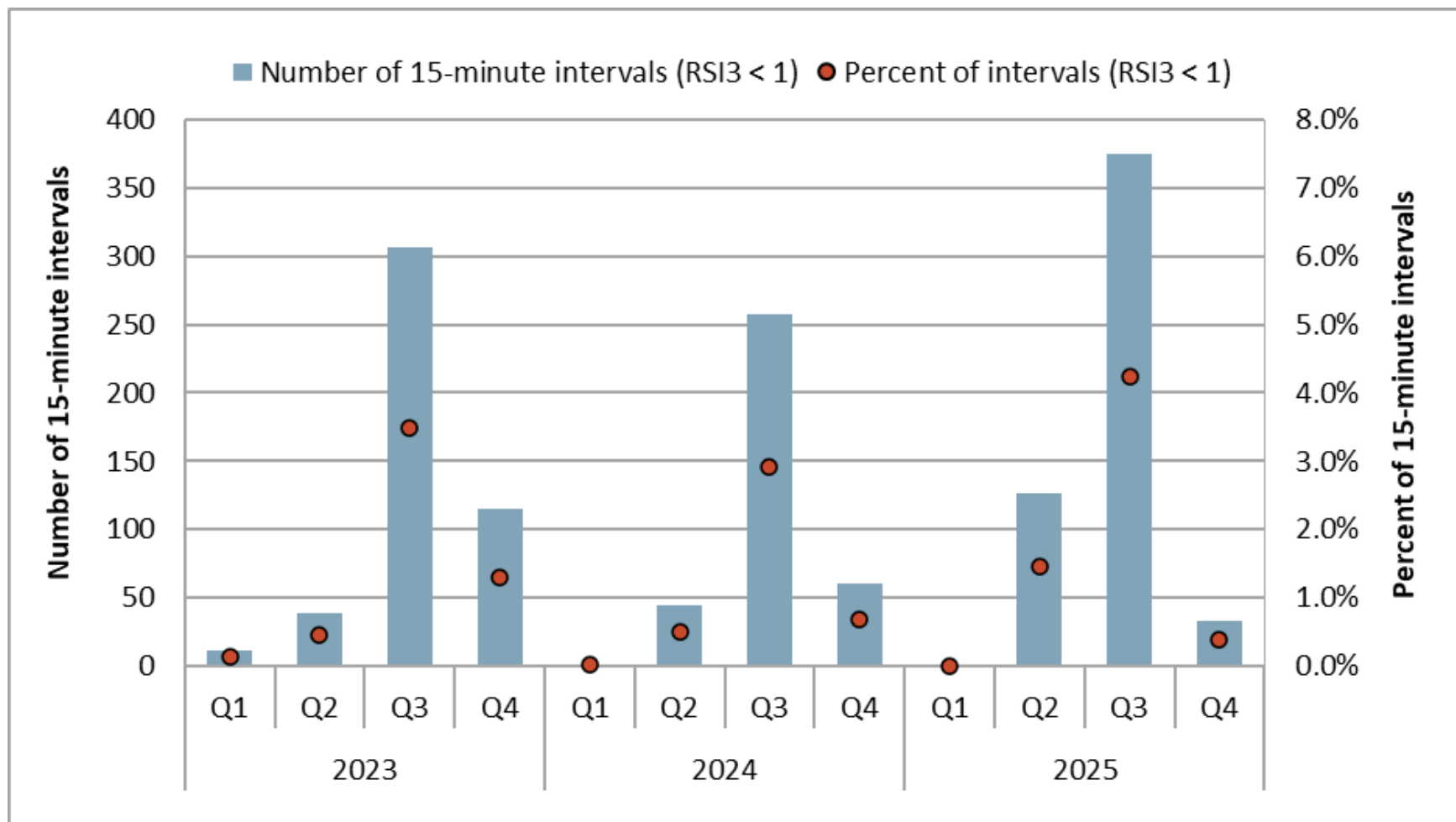
Growing battery capacity contributing to market competitiveness

Non-pivotal supply with the largest three suppliers excluded
(balancing areas in the day-ahead market, lowest 500 hours)



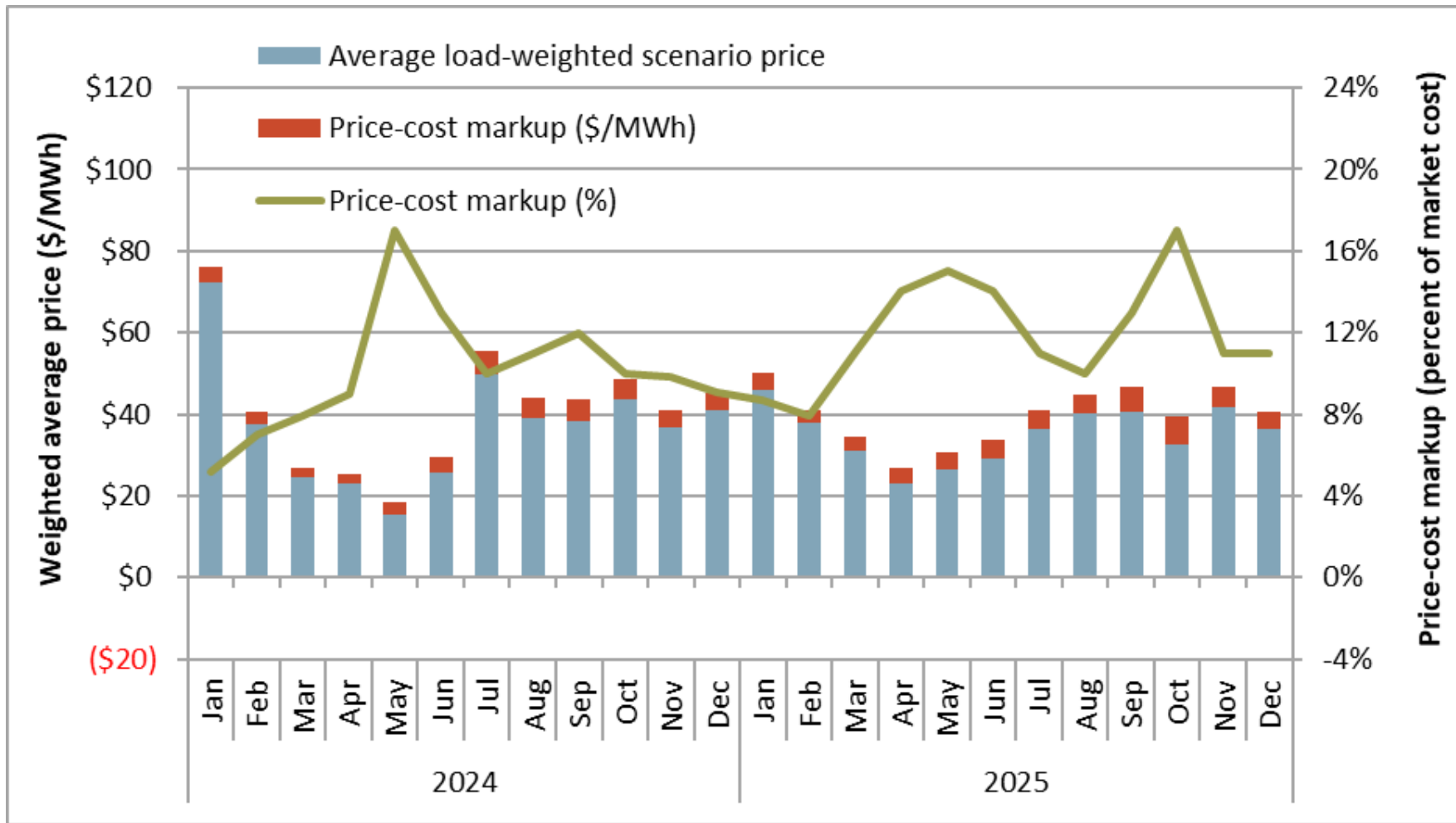
Structurally uncompetitive hours in real-time market up in 2025

Intervals with failed three pivotal supplier test (greater WEIM system)



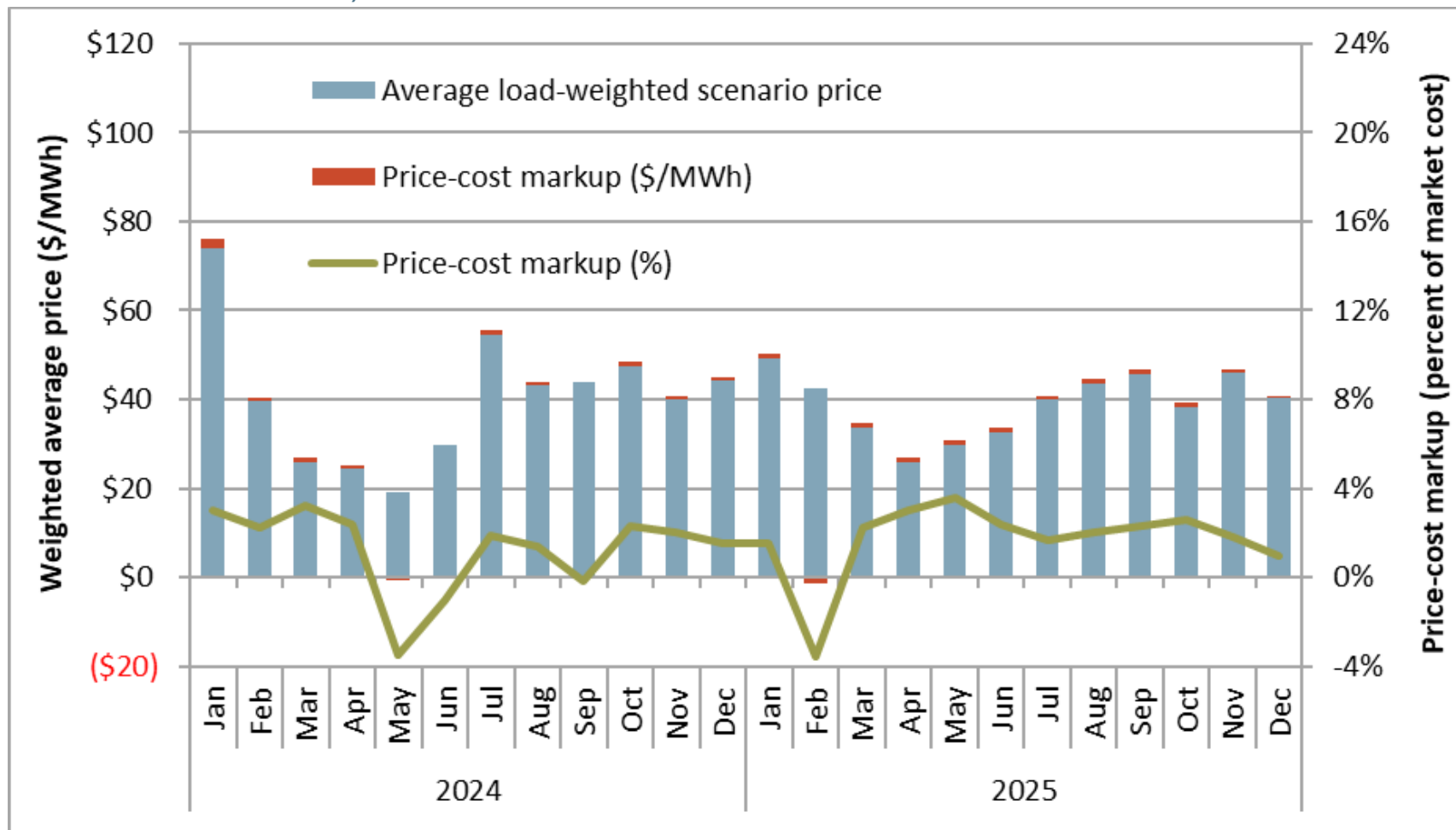
Day-ahead price-cost markup increases to \$4.66/MWh

Day-ahead market price-cost markup (comprehensive scenario)



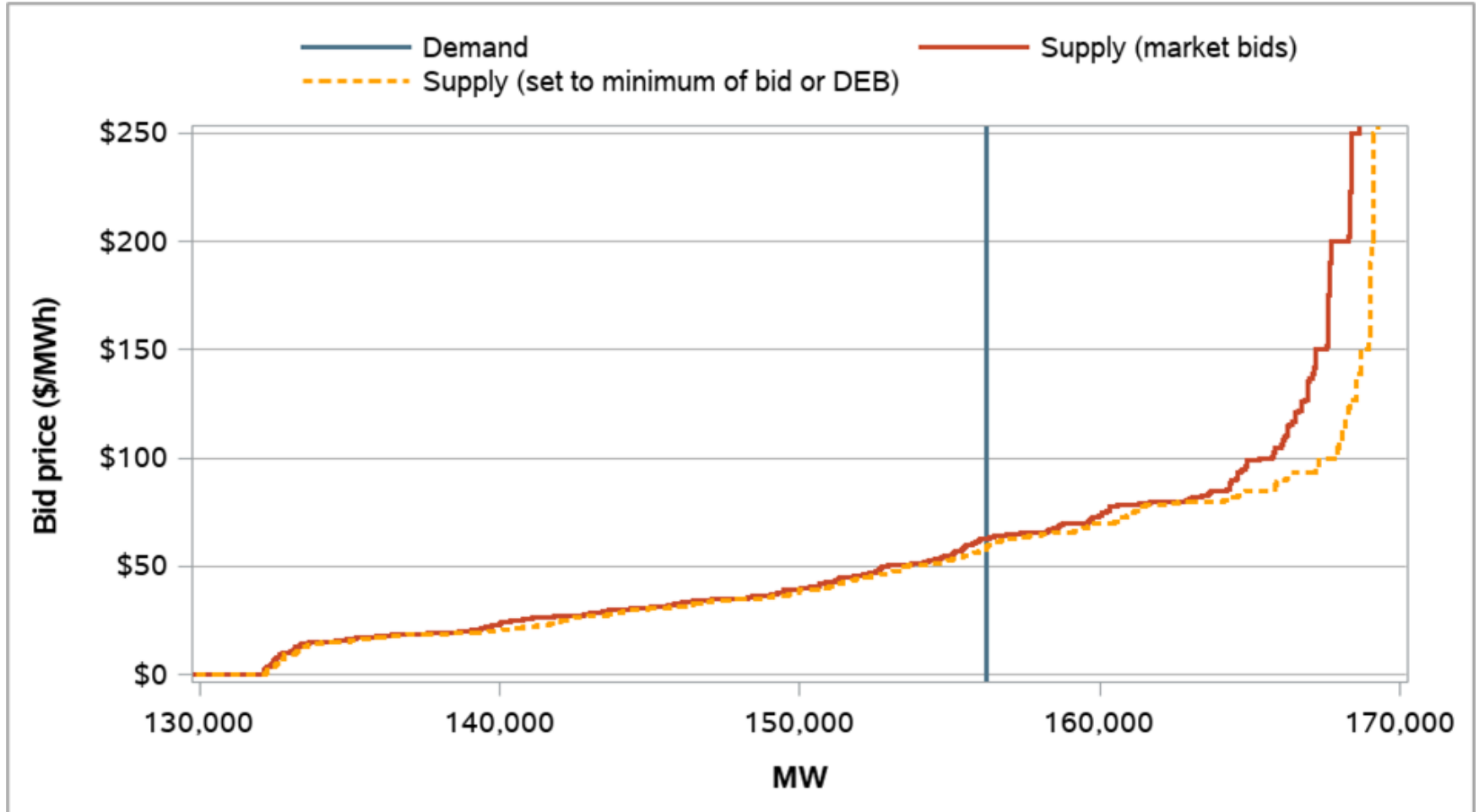
Increased price-cost markup due to less commitment of gas resources

Day-ahead market price-cost markup (gas cost-based scenario—no substitution of commitment cost bids)



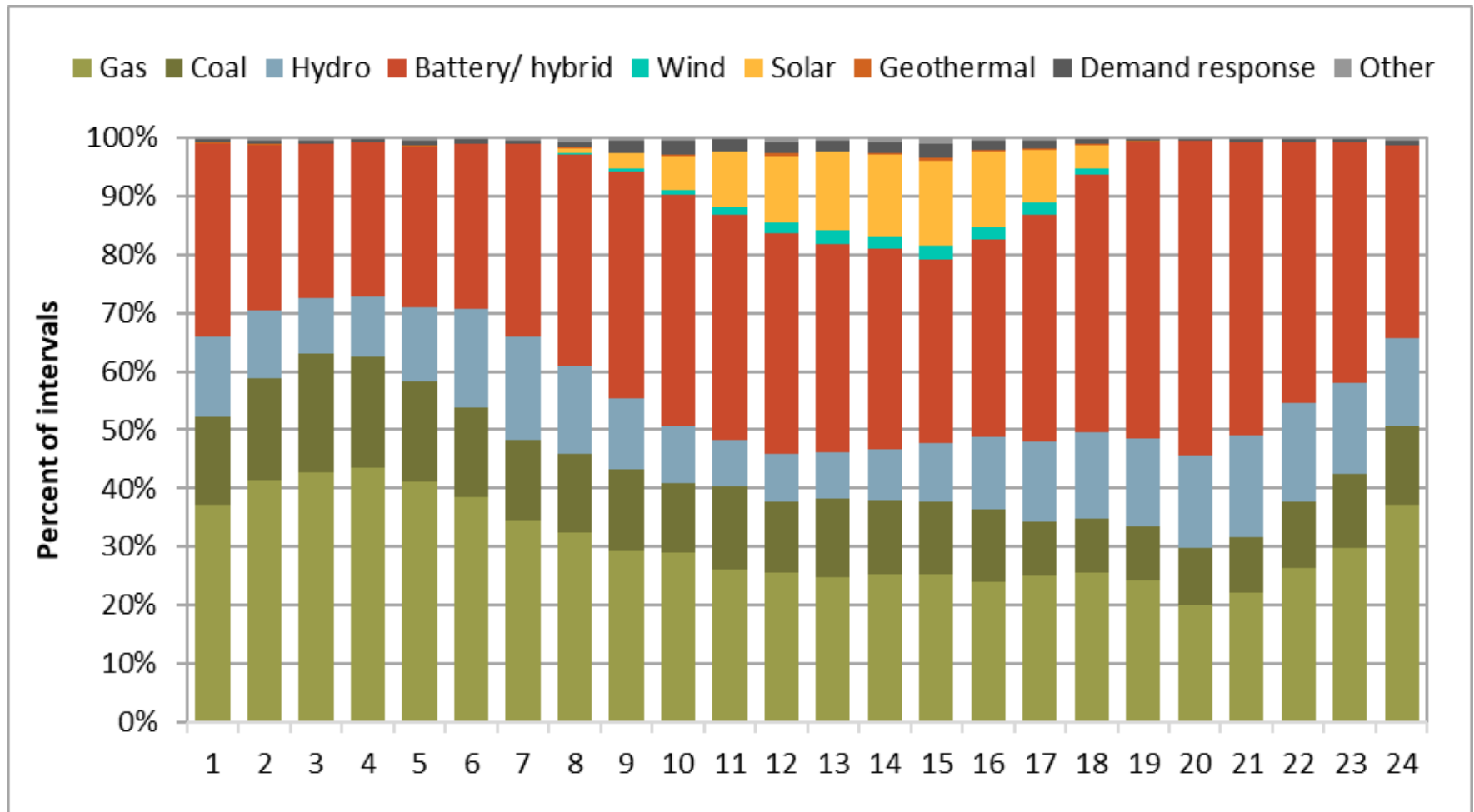
Real-time price-cost markup and marginal resource sample interval

Average 15-minute market supply and demand with generation at competitive reference levels (September 1, 2025, 16:45)



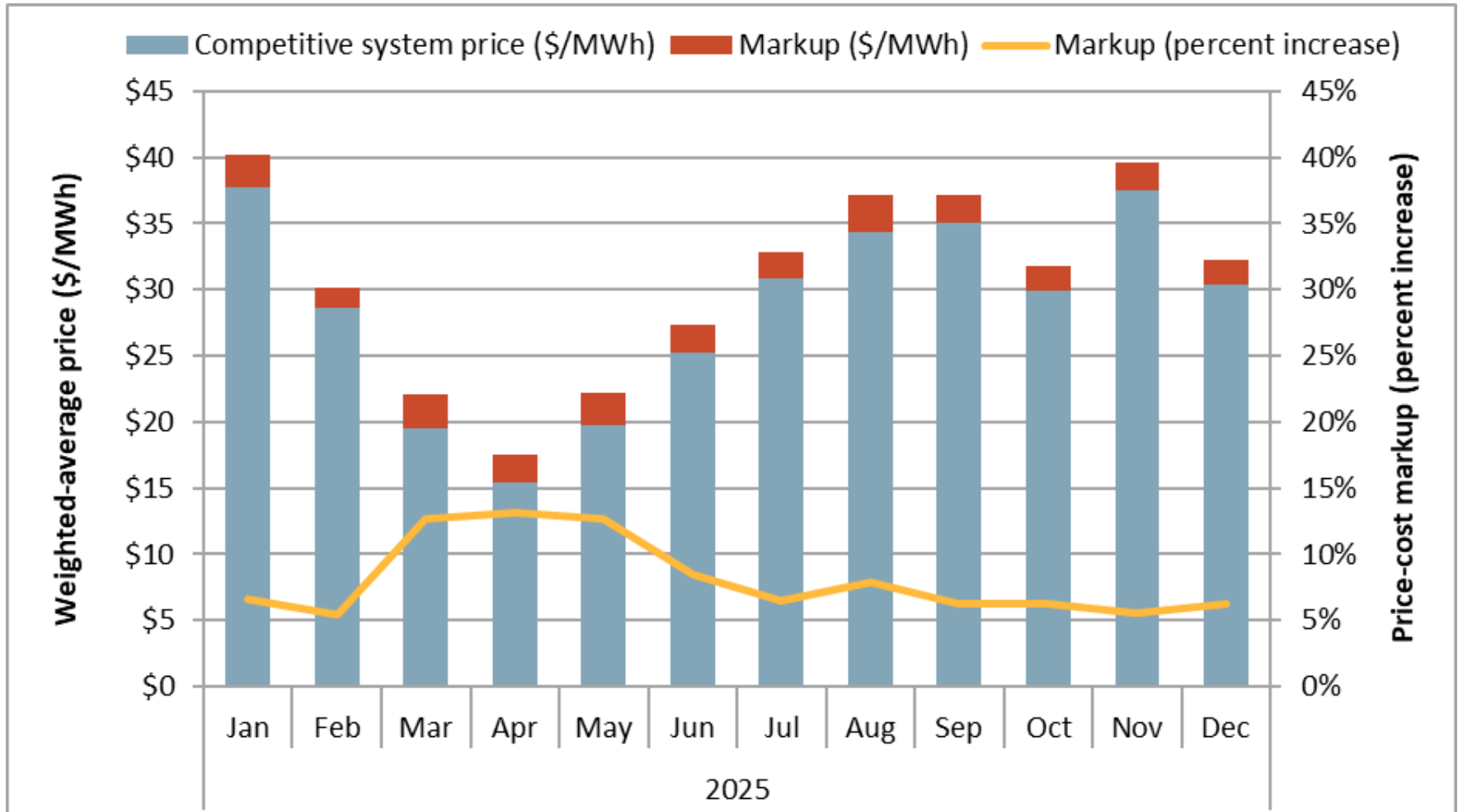
Batteries frequently marginal system resource, especially in evening peak hours

Percent of intervals each fuel type is marginal by hour (2025)



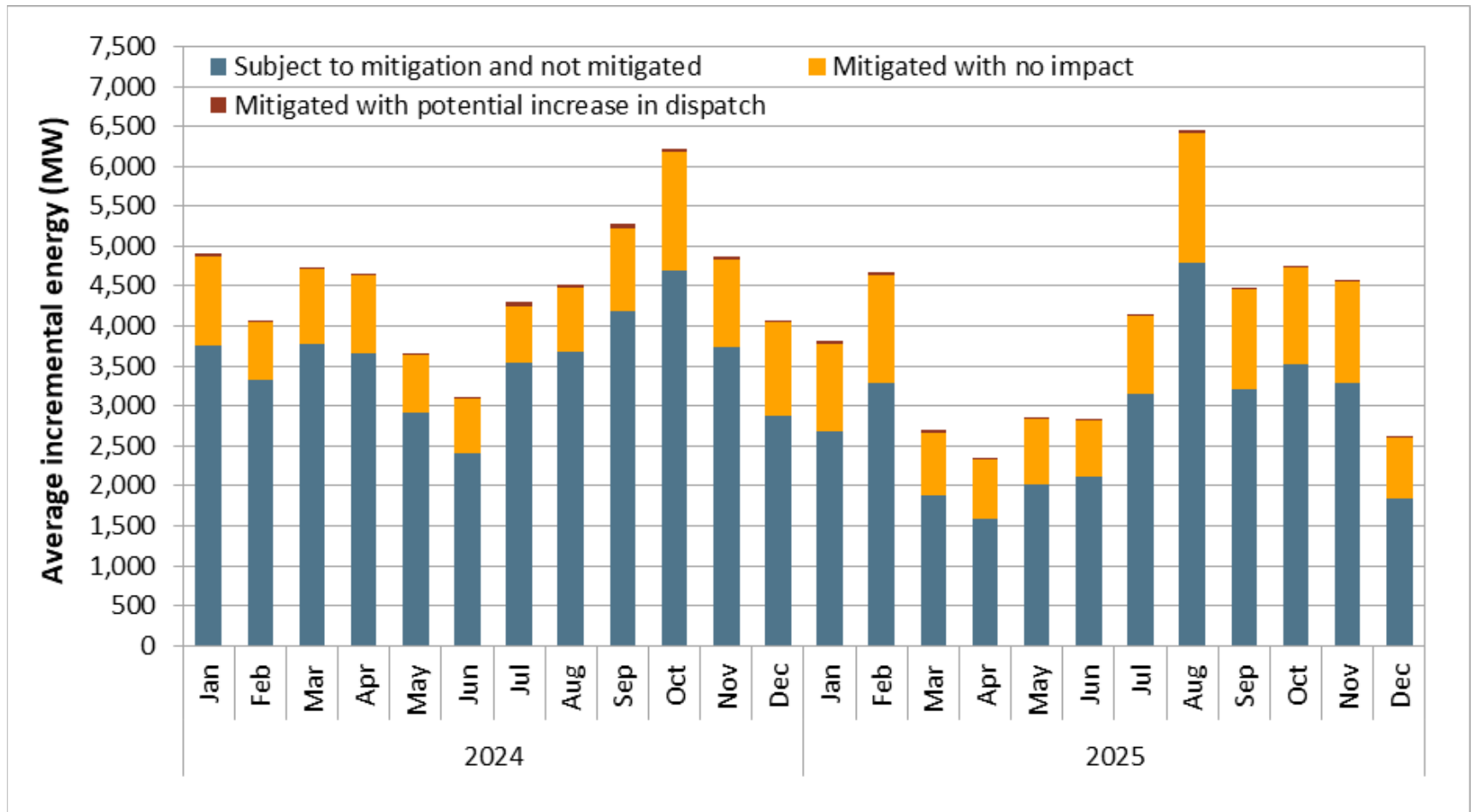
Real-time price-cost markup < \$3/MWh each month

Real-time market price-cost markup



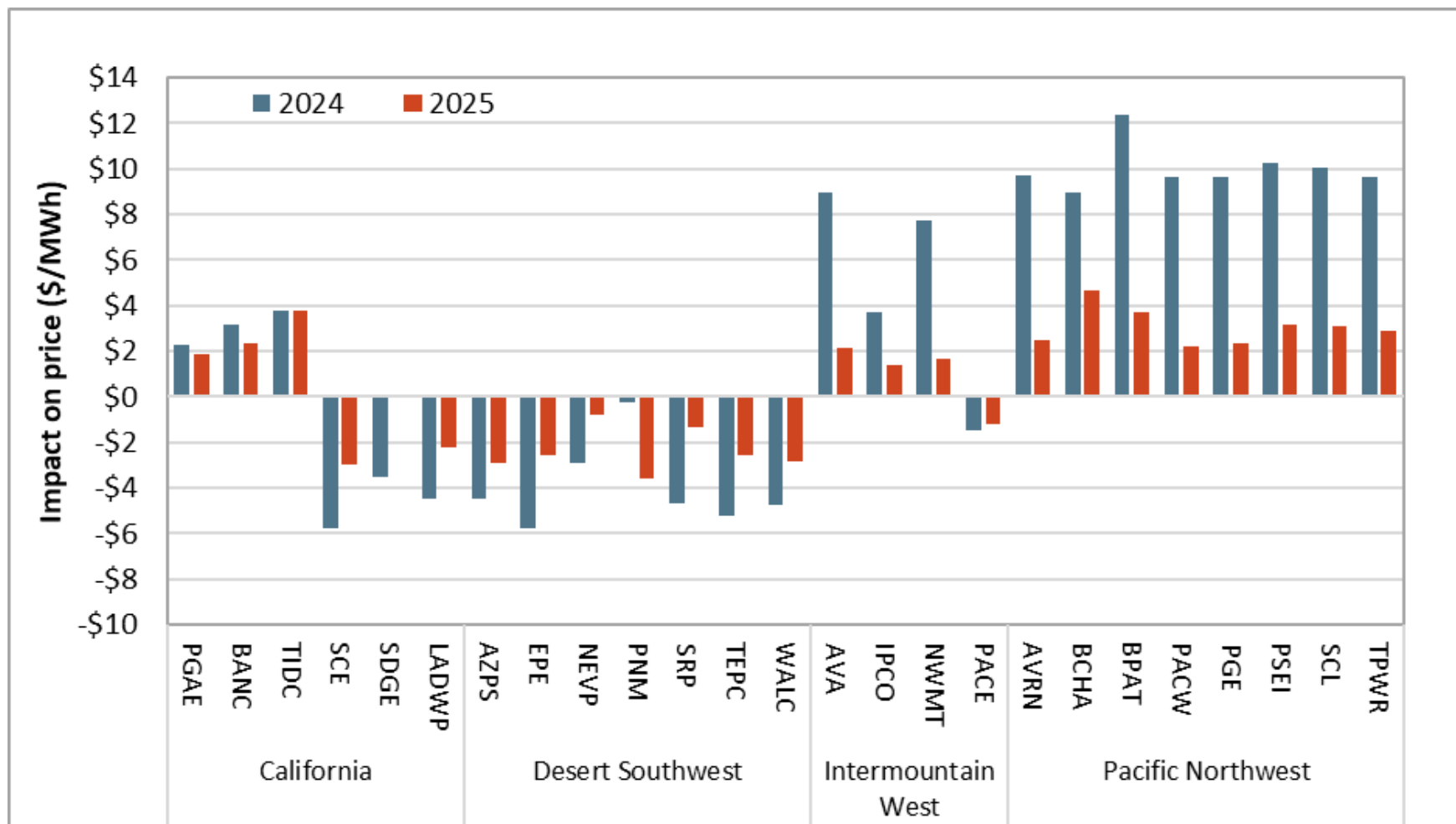
Bids in DAM subject to mitigation down 15%. Bids changed by mitigation and increase in dispatch remained very low

Average incremental energy mitigated in day-ahead market



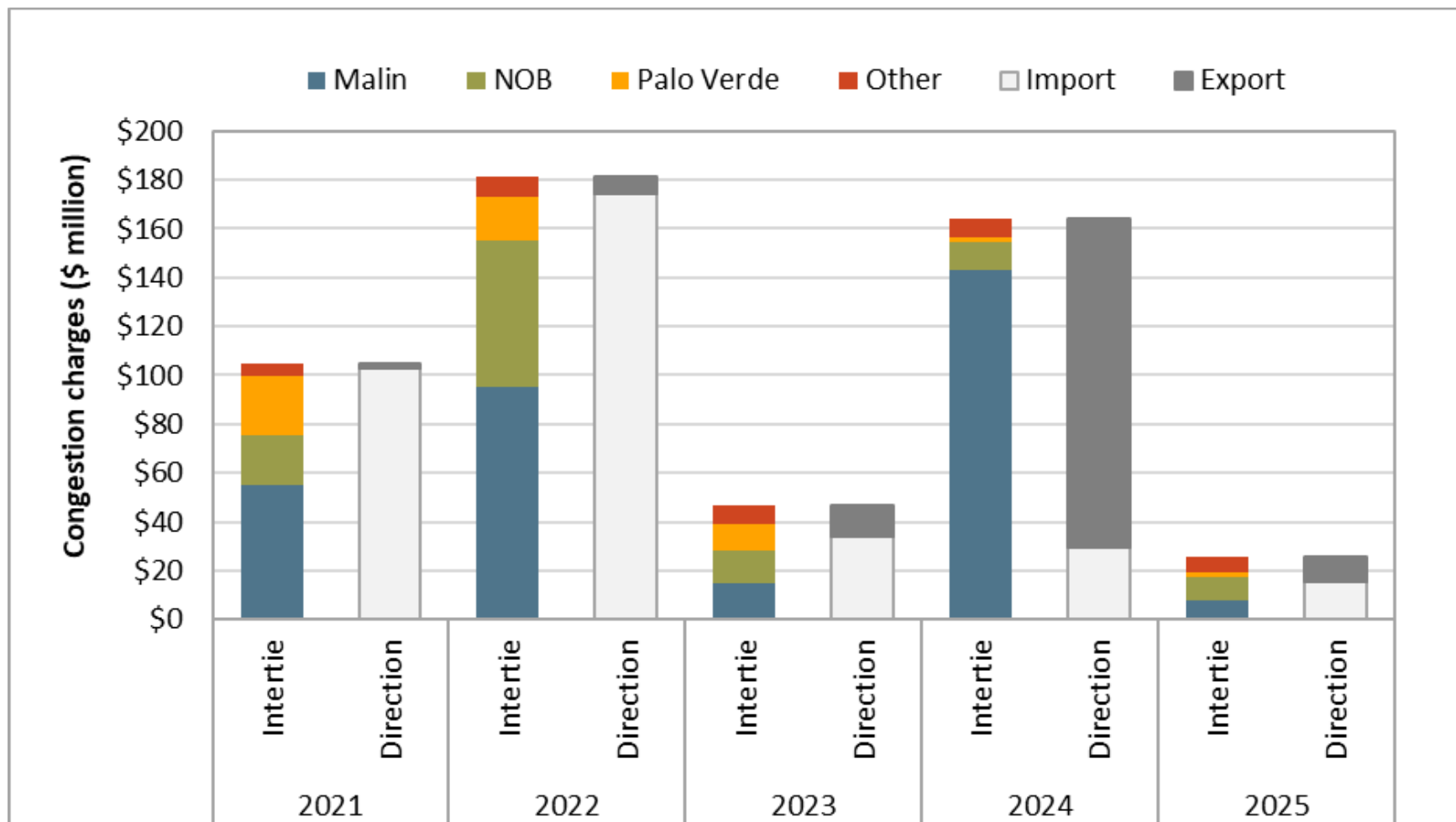
Impact of congestion on RT price separation down in 2025

Average impact of total congestion on real-time market price (2024–2025)



Day-ahead congestion rent down due to decreased intertie congestion rent

Day-ahead congestion charges on major interties



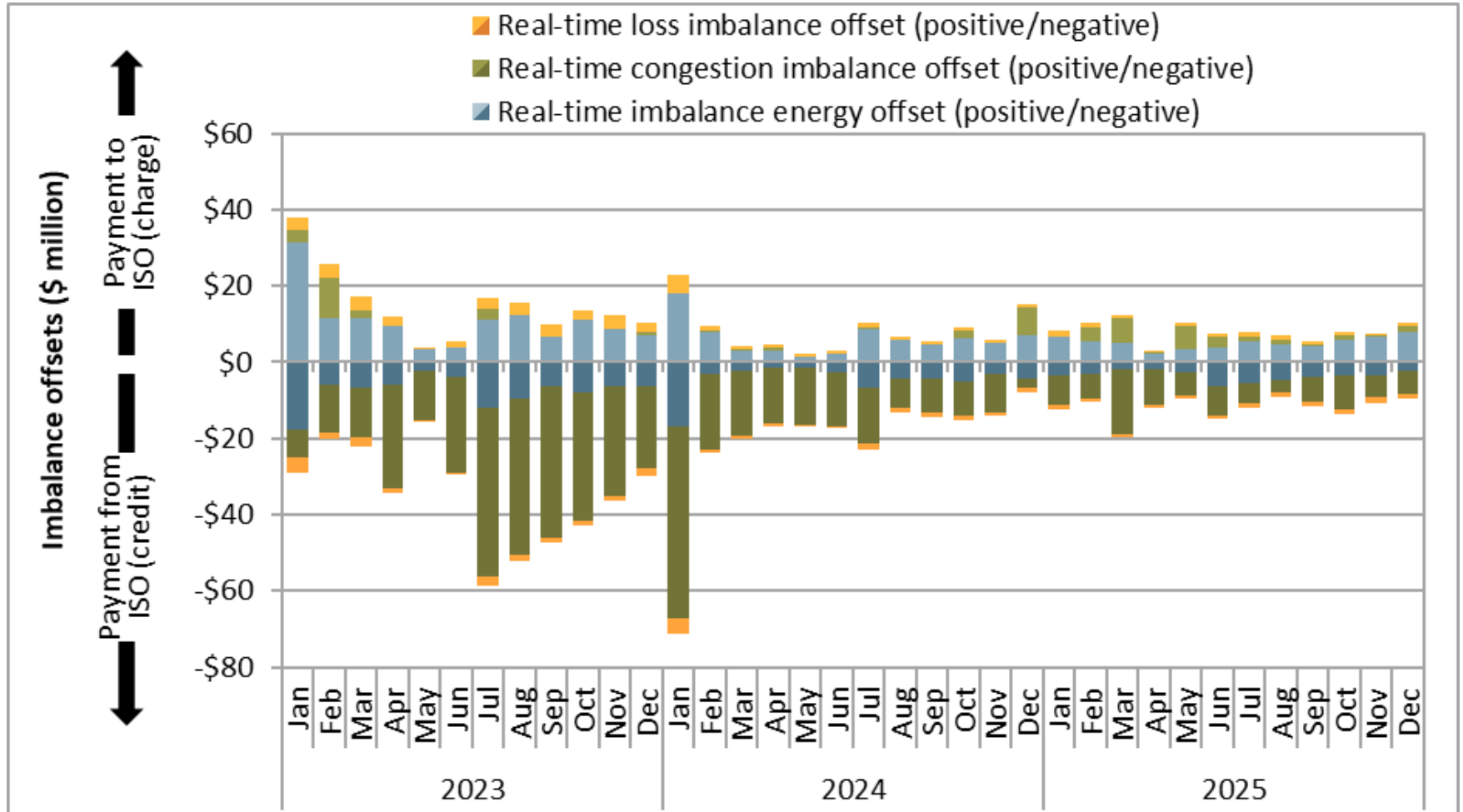
10 balancing areas received additional transfers during RSE failures due to assistance energy transfers

Resource sufficiency evaluation failures during assistance energy transfer opt-in (2025)

Balancing area	Days opted in to AET	RSE failures under AET (15-min. intervals)	Percent of failure intervals with additional WEIM imports due to AET	Average WEIM imports added (MW)	Max WEIM imports added (MW)	Total WEIM imports added (MWh)
Avangrid	365	40	33%	15	115	151
BANC	108	0	N/A	N/A	N/A	N/A
California ISO	92	0	N/A	N/A	N/A	N/A
Idaho Power	265	19	39%	46	292	220
NorthWestern Energy	360	51	46%	20	140	252
NV Energy	243	11	52%	92	532	253
PacifiCorp East	344	40	53%	112	594	1,118
PacifiCorp West	344	143	32%	18	196	631
PSC of New Mexico	130	16	65%	144	634	575
WAPA Desert Southwest	139	41	14%	10	164	99

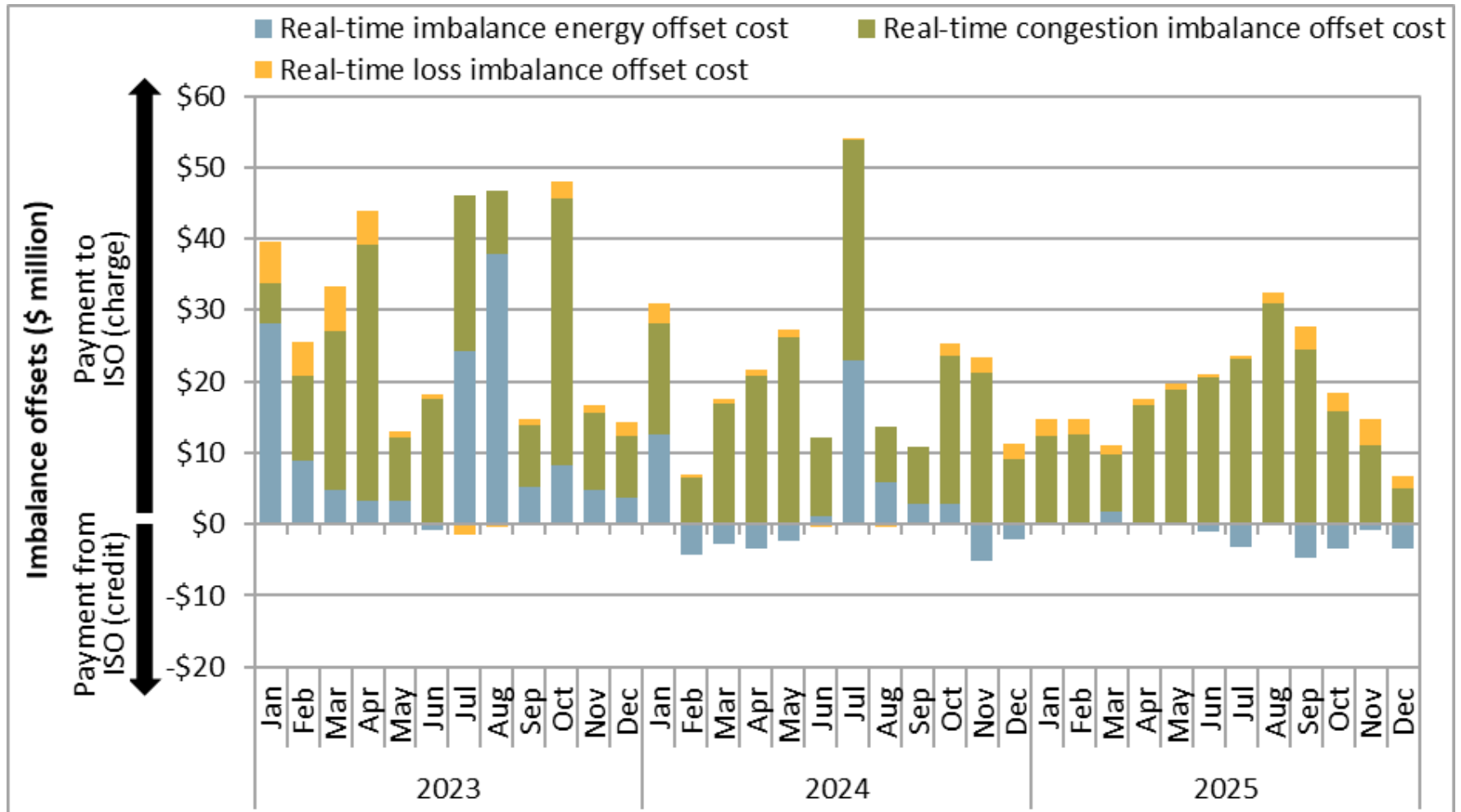
WEIM BAs' RTIO credit down significantly to \$48 million

Monthly real-time imbalance offset costs (balancing areas participating only in WEIM)



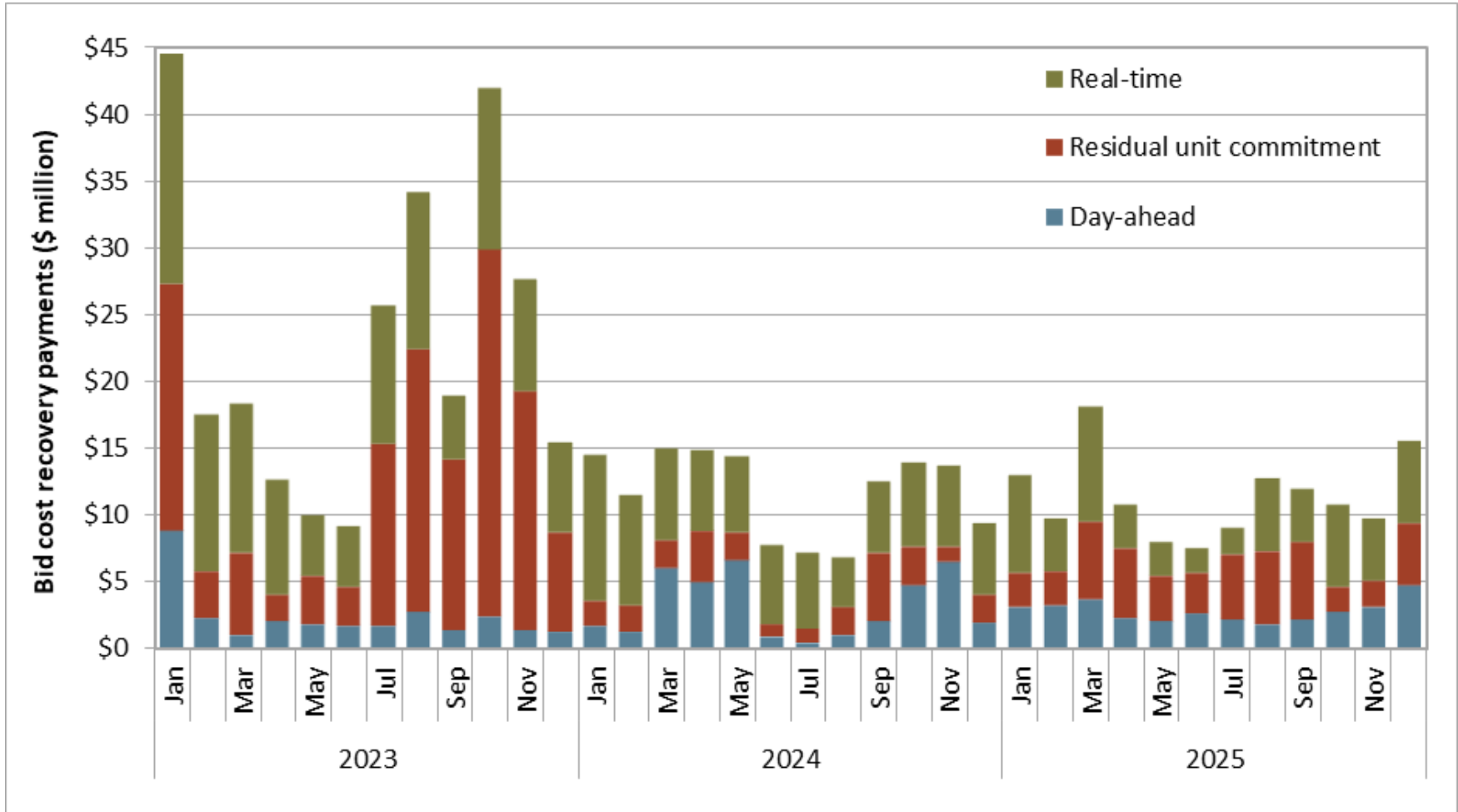
CAISO RTIO uplift costs were \$205 million

Monthly real-time imbalance offset costs (balancing areas in day-ahead market)



BCR over all BAs down 4% to \$151 million

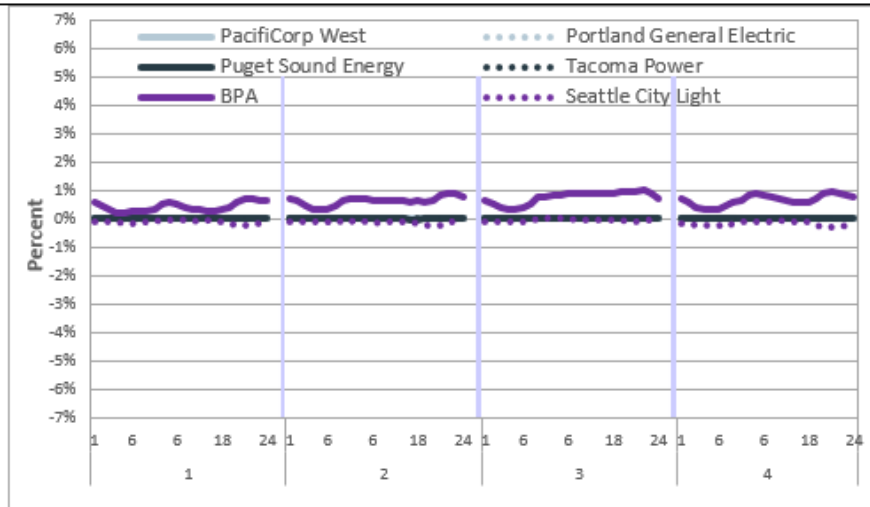
Monthly bid cost recovery payments for day-ahead market area (CAISO)



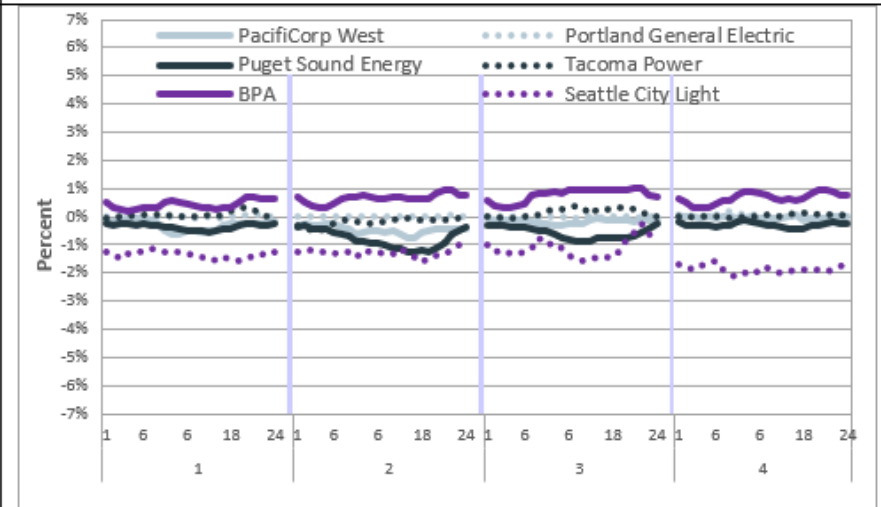
RTD load bias >> FMM in most BAs besides BPA and CAISO

Pacific Northwest: Average hourly imbalance conformance as a percent of average load in the 15-minute and 5-minute markets by balancing area (Q1–Q4 2025)

15-minute market

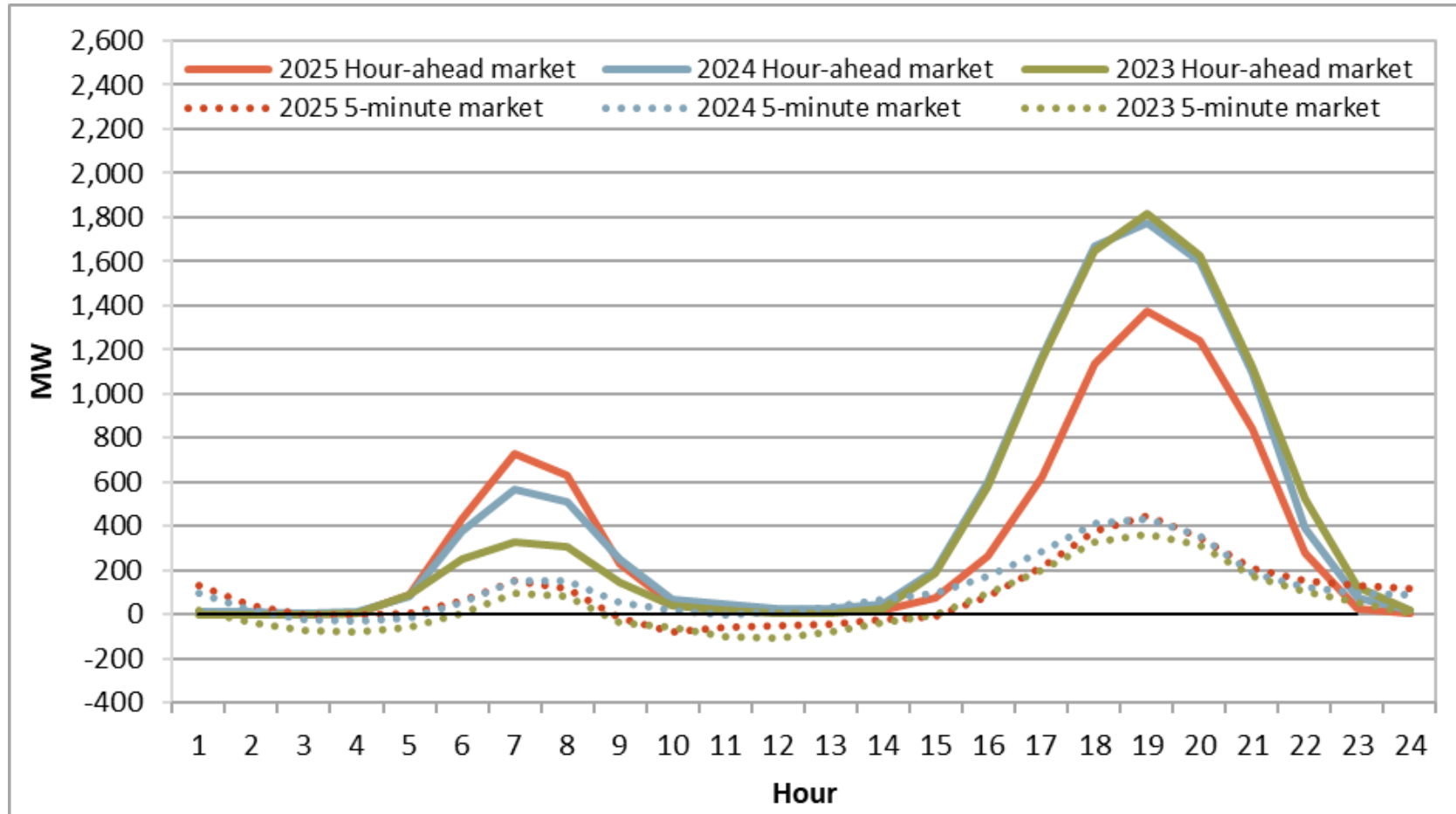


5-minute market



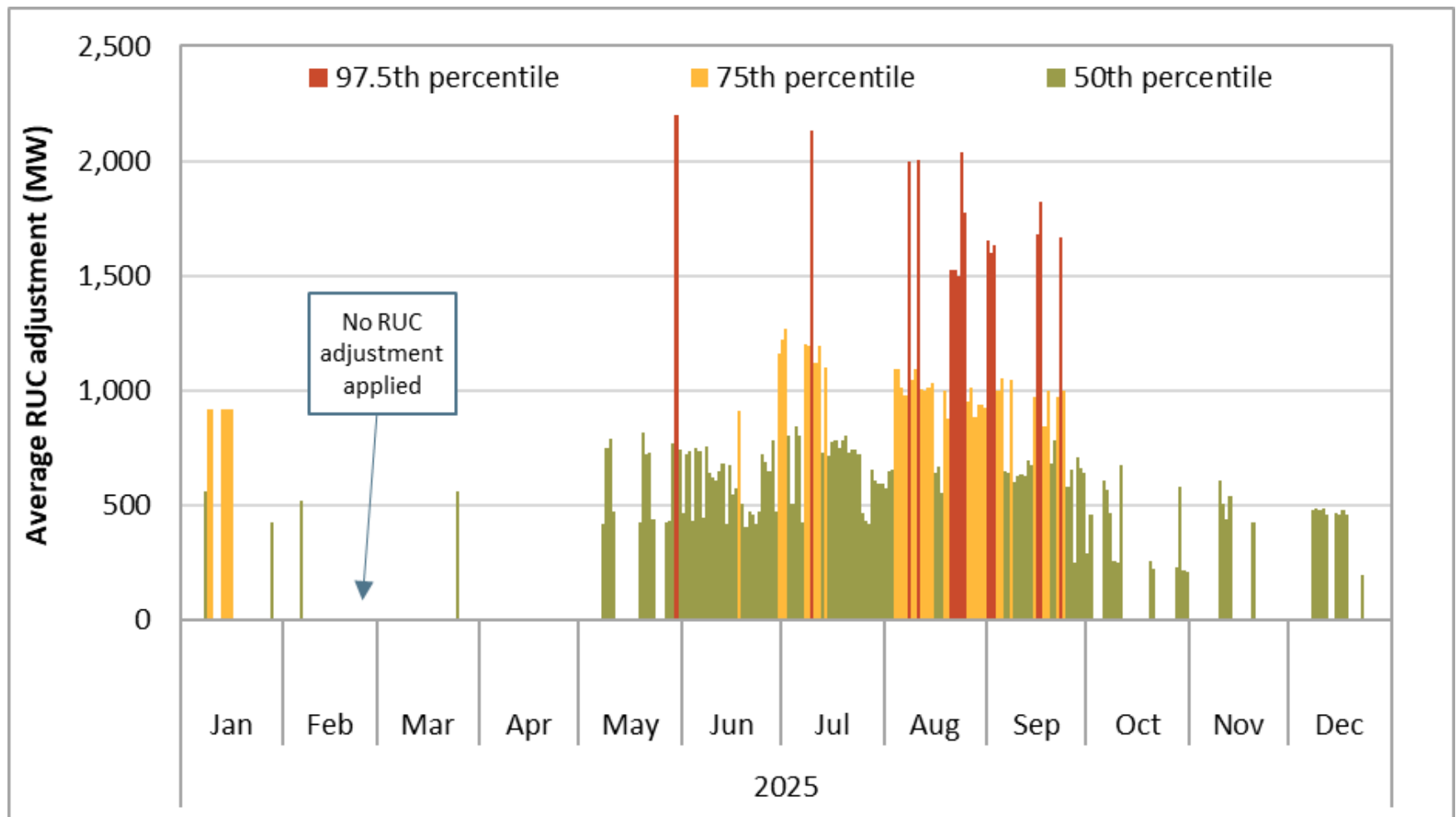
CAISO hour-ahead and 15-minute market load bias > 5-minute market load bias over peak net load hours

Average CAISO balancing area hourly imbalance conformance adjustment (2023–2025)



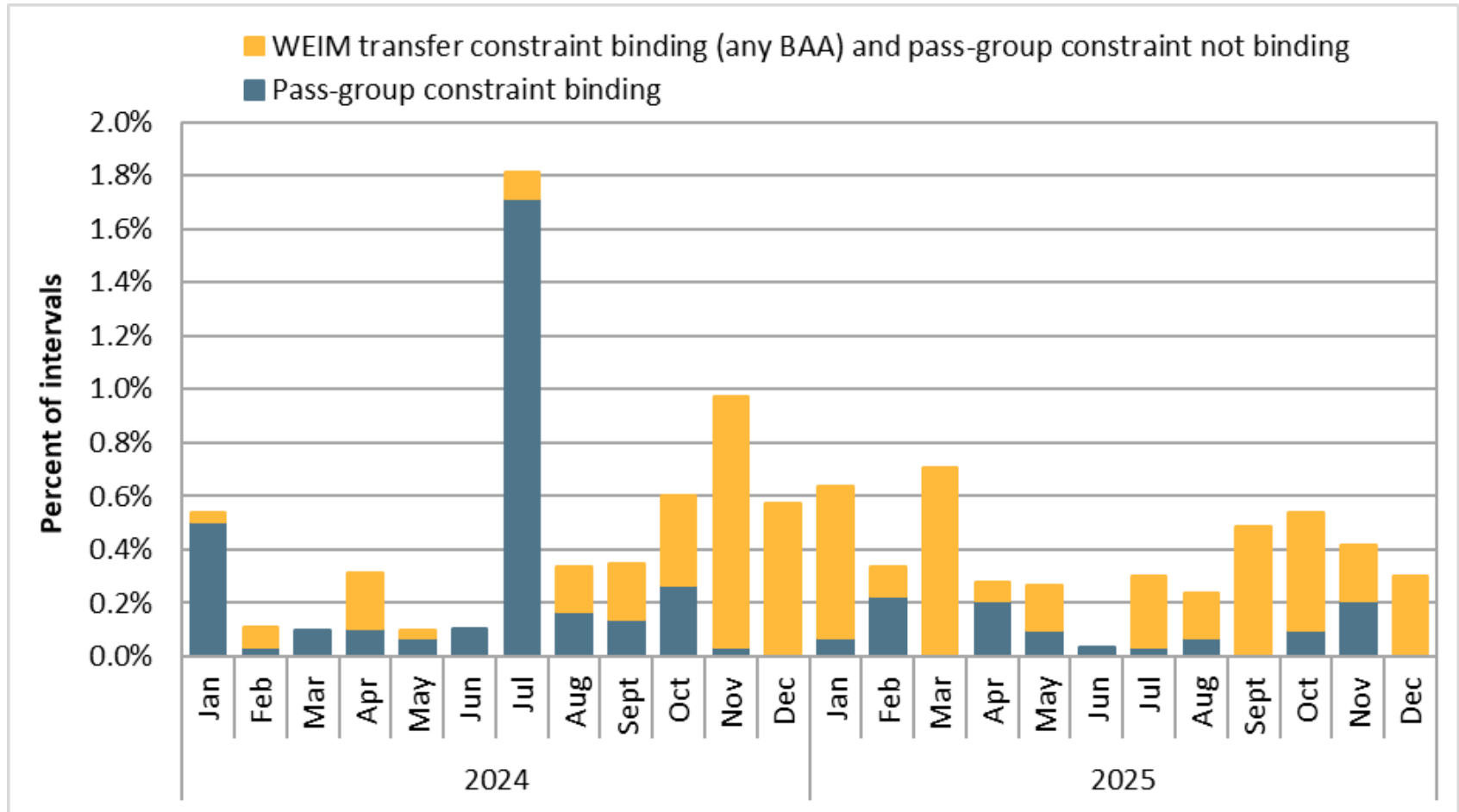
RUC adjustments targeted 97.5th percentile of net load uncertainty on only 4% of days

Average residual unit commitment adjustment by day



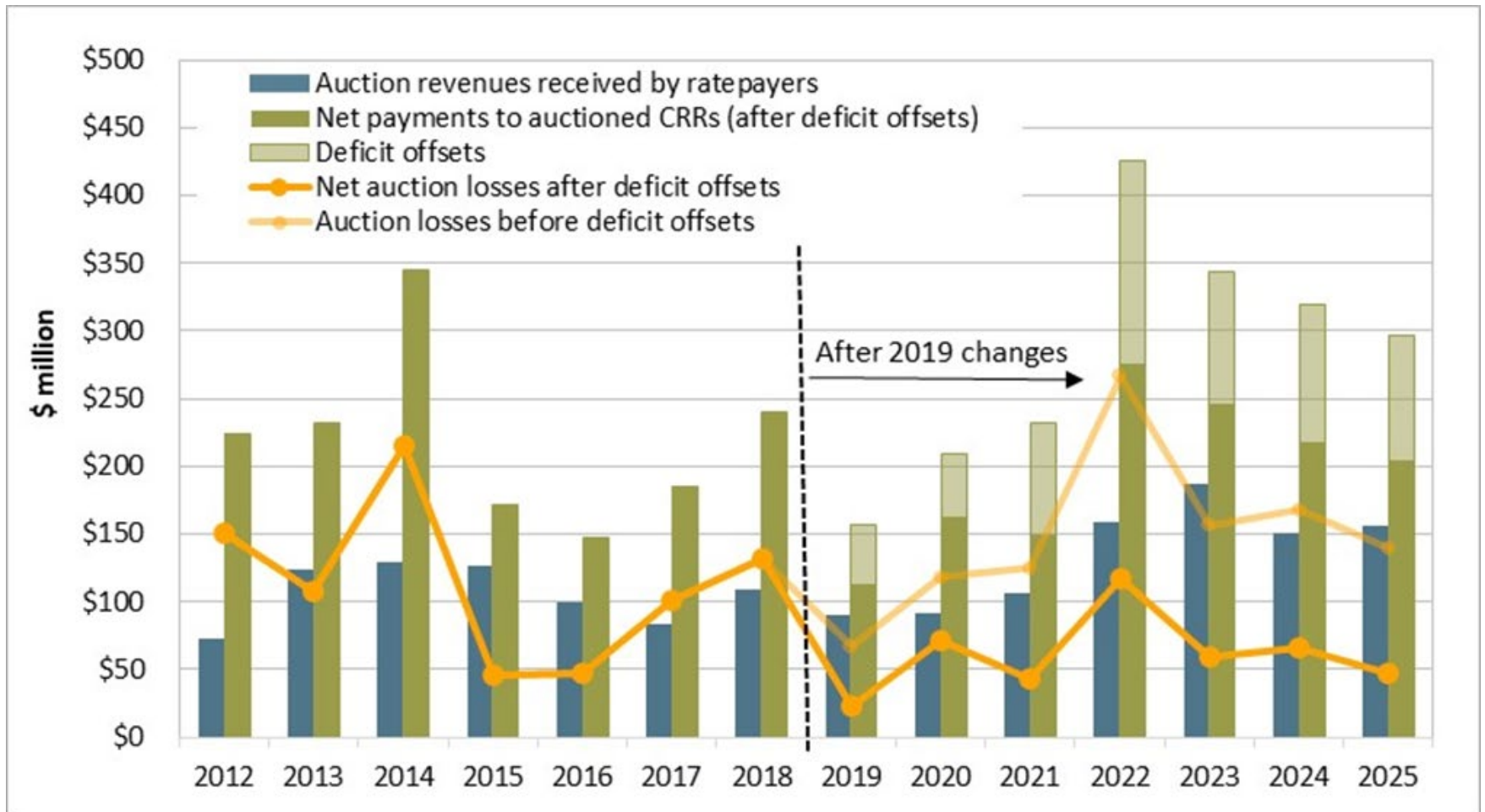
Infrequent flexible ramping product prices at system/BA level for BAs that pass RSE test

Frequency of upward flexible ramping product prices from pass-group or WEIM transfer constraints (15-minute market)



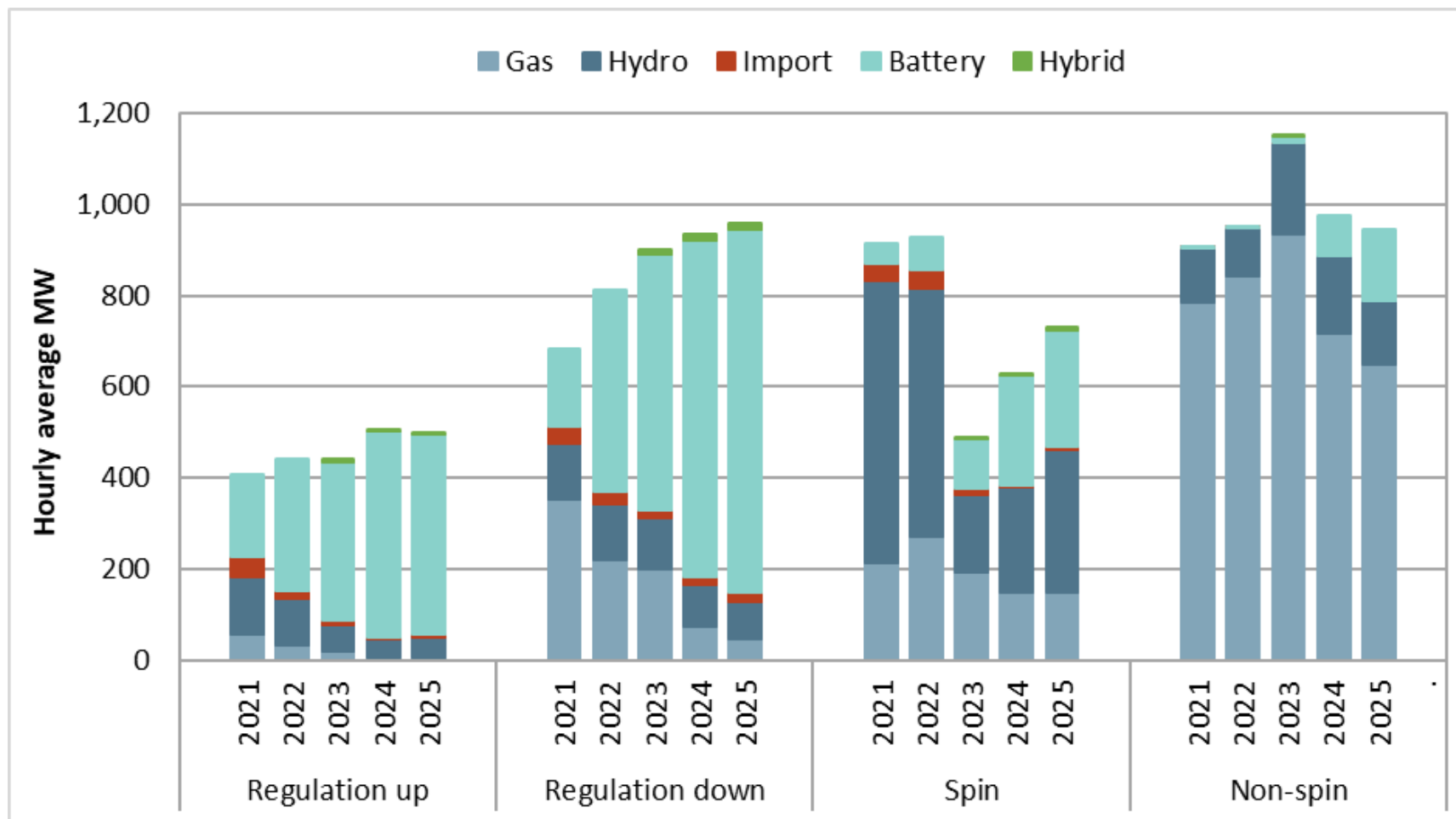
Ratepayer losses from CRR auction were \$48 million

Auction revenues and payments to non-load serving entities



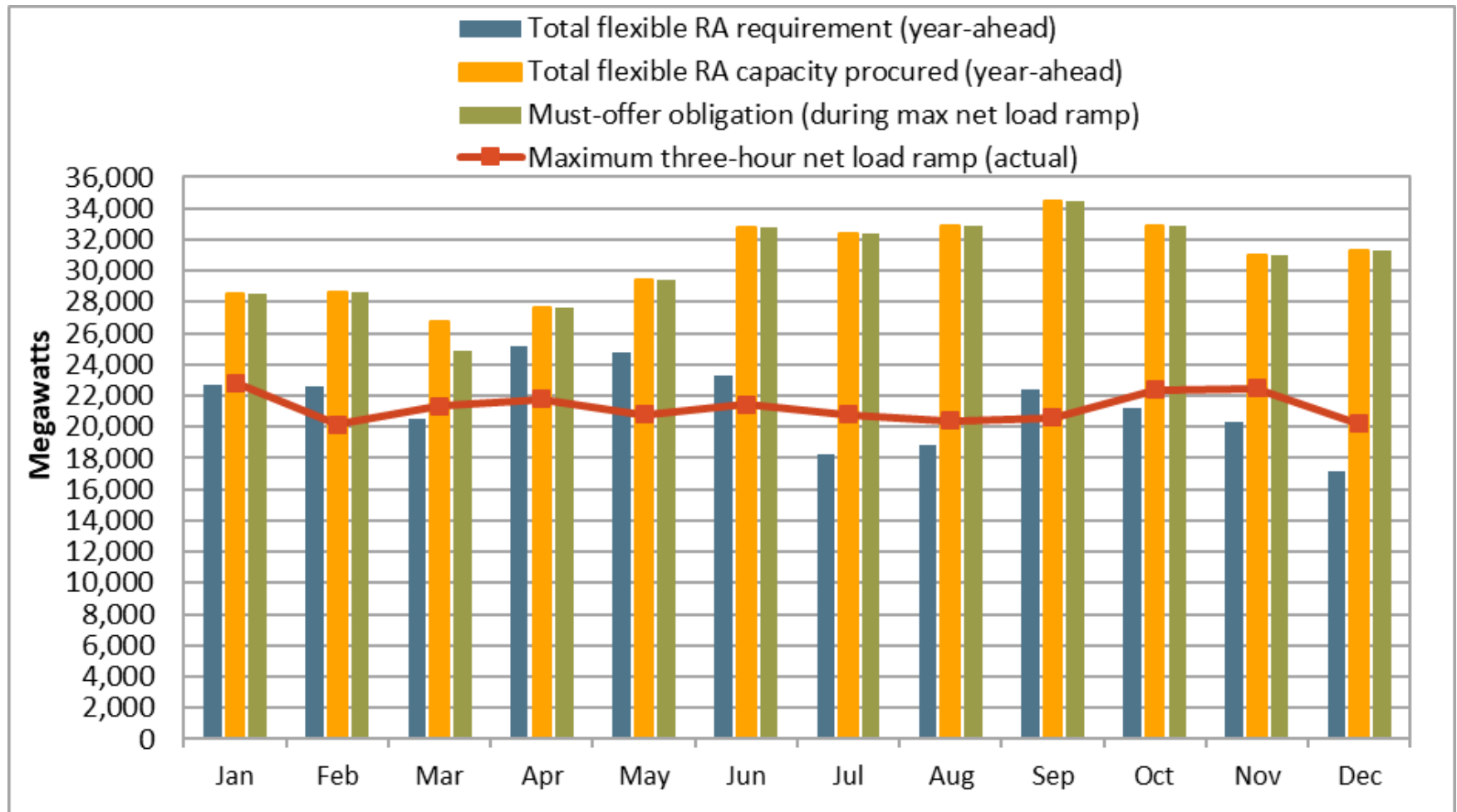
Batteries providing increasing share of ancillary services

Ancillary service procurement by fuel type



System RA meets instantaneous peak load; Flex RA requirements below actual max 3-hour net load ramps

Flexible resource adequacy procurement during the maximum net load ramp (2025)



Recommendations

- Extended day-ahead market
 - Congestion rent allocation – inefficient scheduling incentives with current interim approach
 - Decrease imbalance reserve product demand curve and decouple its uncertainty requirement from EDAM RSE uncertainty requirement
 - Develop real-time product covering uncertainty several hours out to retain imbalance reserves procured in EDAM
- Congestion revenue rights
 - Modify auction based on transmission capacity that forces transmission ratepayers to offer to sell CRRs at a \$0 reservation price
 - Replace with auction in which every seller sets their reservation price

Recommendations

- Batteries
 - Further revise bid cost recovery rules
 - Eliminate BCR when batteries are constrained by operational parameters set by unit operators
 - Incentivize batteries to reflect real-time intraday opportunity costs in energy bids during the hours preceding the highest net load hours of the day.
 - Enhance default energy bids to allow variation throughout day based on current opportunity costs
 - Create standardized default energy bid for batteries in WEIM
 - Extend local market power mitigation to include hybrid resources

Recommendations

- Price formation enhancements
 - Extend flexible ramping product time horizon or develop simpler product to ensure ramping capacity to cover uncertainty several hours in future
- Resource adequacy
 - Redesign mechanism for incentivizing availability to evaluate performance and to have much larger financial penalties
 - Enhance outage reporting requirements so CAISO operators can decline discretionary maintenance outage requests made within the “forced outage” timeframe

For more information

- 2025 annual report on market issues and performance
 - <https://www.caiso.com/documents/2025-annual-report-on-market-issues-and-performance.pdf>
- Department of Market Monitoring webpage
 - <https://www.caiso.com/market-operations/market-monitoring>
- CAISO Tariff, Appendix P
 - <https://www.caiso.com/documents/appendix-p-california-iso-department-of-market-monitoring-as-of-jan-6-2025.pdf>
- Email questions to:
 - Ryan Kurlinski, rkurlinski@caiso.com
 - DMM, DMM@caiso.com