Memorandum

To: ISO Board of Governors and Western Energy Markets Governing Body

From: Eric Hildebrandt, Executive Director, Market Monitoring

Date: September 20, 2024

Re: **Department of Market Monitoring report**

This memorandum does not require ISO Board of Governors or WEM Governing Body action.

EXECUTIVE SUMMARY

This memo provides a short summary of market conditions and performance of balancing areas in the Western Energy Imbalance Market (WEIM) during the summer months of June through August 2024.

- Despite some periods of high loads and prices, overall prices across the WEIM remained competitive over the summer. From June to August, system-wide prices in the WEIM averaged about $37/MWh in the 15-minute market, down 31 percent from the summer of 2023.
- Natural gas prices in the West were down significantly in the summer of 2024 compared to summer 2023, driving electricity prices lower despite higher loads.
- Average load across the WEIM was about 5 percent higher in the summer of 2024 compared to 2023. The peak WEIM system wide load was about 134,000 MW, or about 2 percent higher than last summer.
- Net interchange into the ISO balancing area from the rest of the WEIM increased in the summer of 2024, compared to the previous summer, particularly in June and July.
- Ten balancing areas opted into assistance energy transfers this summer. Nine areas failed the resource sufficiency evaluation during at least one interval while opted in to the program, gaining access to additional WEIM supply that would not have been available otherwise.
- For much of the second half of 2023, the ISO restricted WEIM import transfers into its balancing area in the hour-ahead and 15-minute markets during peak net load hours. The ISO has not implemented these limitations for any hour in 2024 through mid-September.

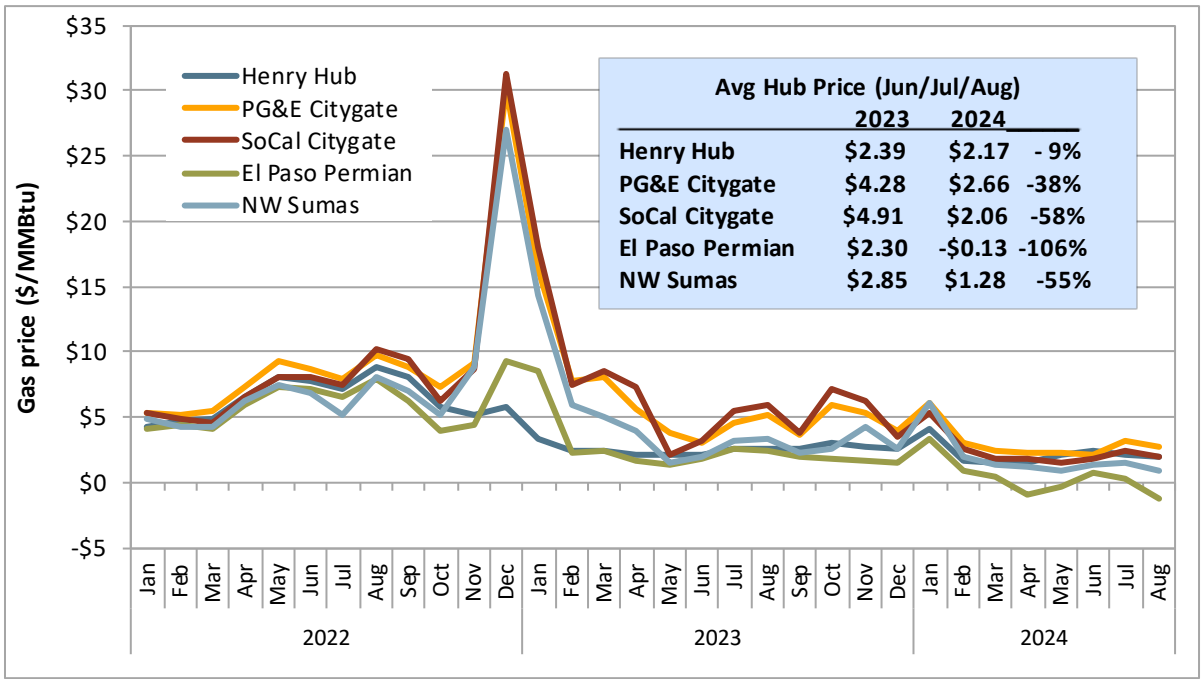
- Upward adjustments to the residual unit commitment load requirements to account for uncertainty made by ISO system operators are down significantly in the summer of 2024 compared to 2023. In 2023, high upward adjustments to these requirements contributed to higher bid cost recovery payments.

MARKET TRENDS

Gas prices

Lower gas prices were a major driver of lower electricity prices over the summer. Figure 1 shows monthly average natural gas prices at key delivery points across the West, as well as the Henry Hub trading point, which acts as a point of reference for the national market for natural gas. Natural gas prices in the West were down significantly in the summer of 2024 compared to 2023.

Figure 1. Monthly average natural gas



Real time market prices by region

Despite the higher loads in the West, prices across the WEIM were lower in the summer of 2024 due to significantly lower natural gas prices. Figure 2 shows regional load-weighted monthly average prices in the 15-minute market for January 2023 through August 2024.[1]

[1] The California region includes CAISO, BANC, TIDC, and LADWP. The Desert Southwest region includes NEVP, AZPS, TEPC, SRP, PNM, WALC, and EPE. The Intermountain West includes PACE, IPCO, NWMT, and AVA. The Pacific Northwest includes AVRN, BPA, TWPR, PGE, PSEI, and SCL. Powerex is categorized separately due to transmission limitations that frequently isolate it from the rest of the WEIM system.

Figure 2. Weighted average monthly 15-minute market prices by region

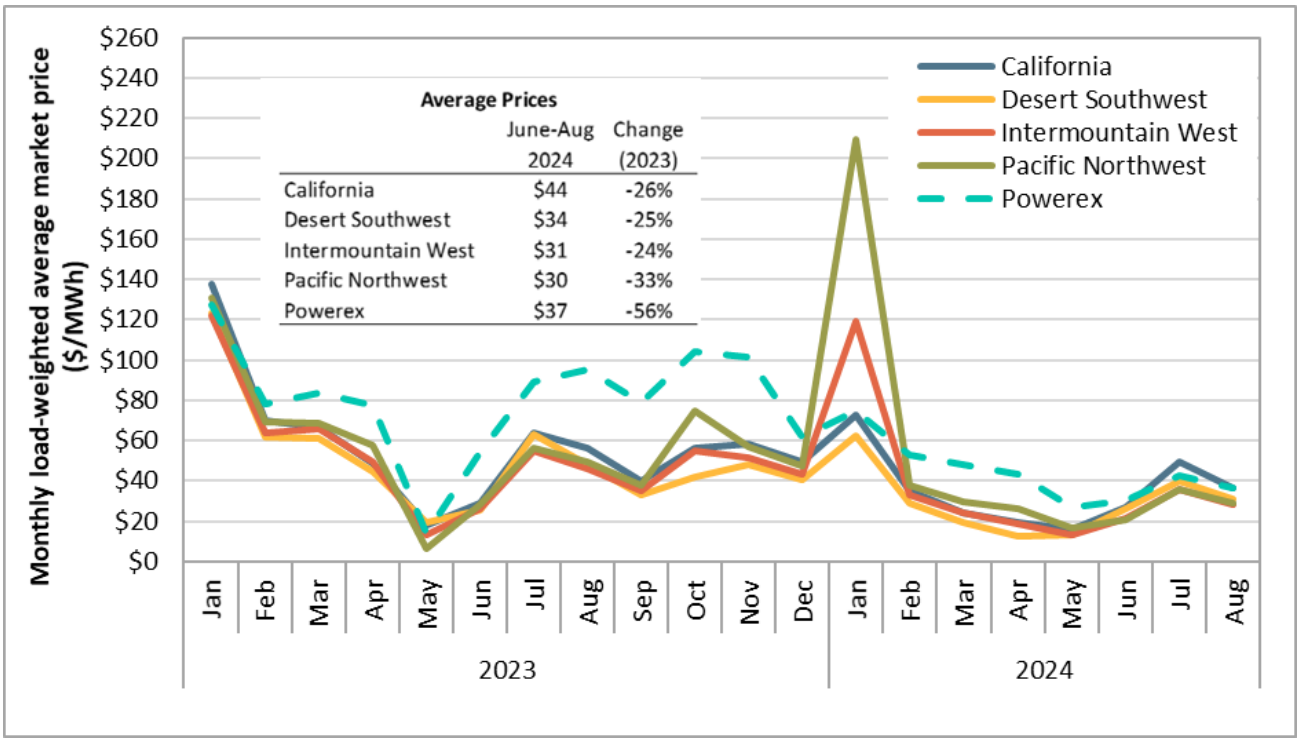


Figure 3. Average monthly 15-minute market prices by balancing area (June–August)

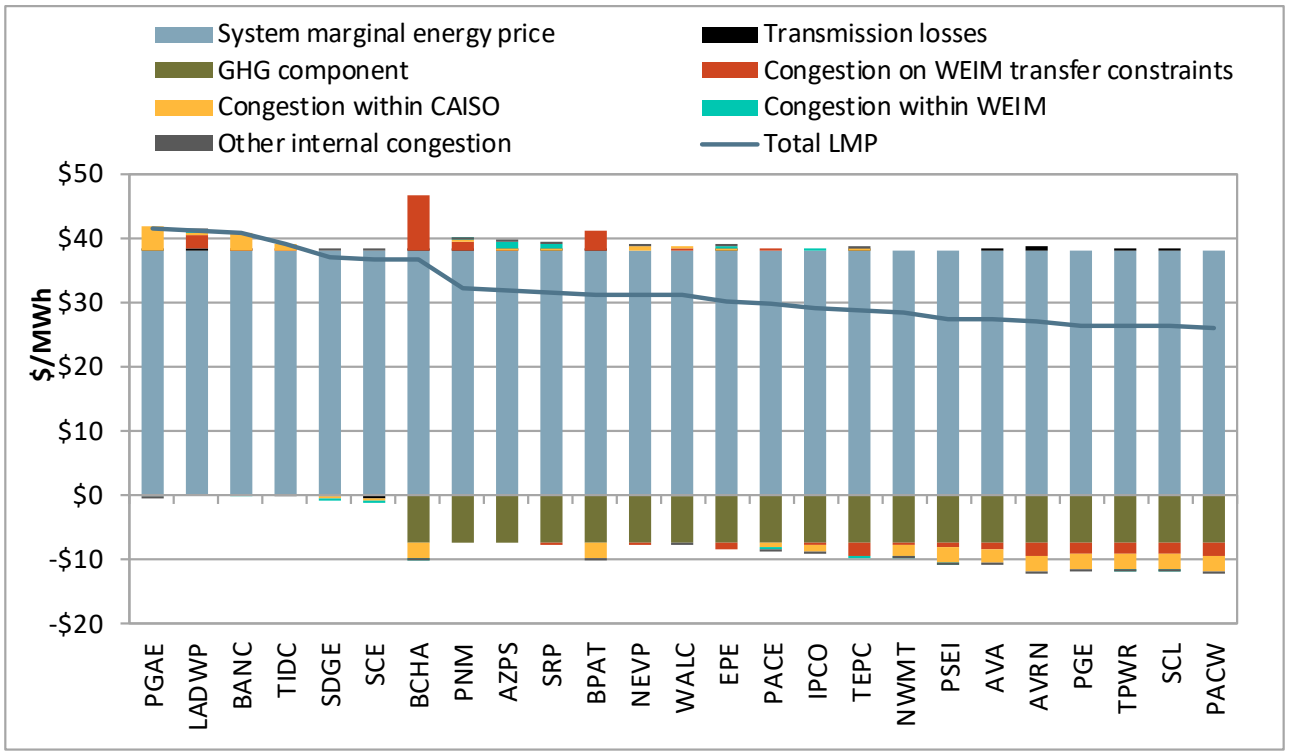


Figure 3 shows 15-minute prices by balancing area averaged over the three summer months from June to August. This figure highlights how price differences between regions are determined by differences in transmission losses, greenhouse gas compliance costs, congestion, and power balance constraint violations.

As shown in Figure 3, greenhouse gas compliance costs were the major driver of the higher average prices in balancing areas within California, making prices in these areas about $7/MWh higher (about 16 percent) than prices in the rest of the WEIM. These compliance costs are embedded within system marginal energy costs, but are reflected as negative costs (or payments) that are received by other WEIM areas making transfers into California areas through the WEIM.

Figures 4 and 5 compare 15-minute prices in different parts of the WEIM during peak hours (hours-ending 7-22) to day-ahead prices for comparable markets. As shown in these figures:

- Average peak hour prices in the 15-minute market for WEIM areas in the Pacific Northwest and Desert Southwest were significantly lower than day-ahead prices in the Intercontinental Commodity Exchange for the Mid-Columbia and Palo Verde trading hubs, respectively,
- Prices in the 15-minute market for the two main areas in the California ISO area (Pacific Gas and Electric, and Southern California Edison) tracked much more closely with day-ahead prices in the ISO's integrated forward market (IFM). For both these areas, 15-minute prices tracked closely with day-ahead prices in June. In July, real-time prices in these areas rose above day-ahead prices, and then dropped below day-ahead prices in August.

Loads

Average load across the system was about 5 percent higher in the summer of 2024 compared to 2023. Load growth was highest in the Desert Southwest (7 percent) and lowest in the Pacific Northwest (2 percent). Figure 6 compares the average monthly 5-minute market load forecast for each WEIM region from June to August 2024 (bars), along with the total WEIM load during these same months in 2023 (black lines).

Total WEIM system wide load peaked during hour 18 on July 10, at about 134,000 MW, or about 2 percent higher than last summer. As shown in Figure 7, there was significant peak load diversity across different balancing areas on this day, with different areas hitting their peak loads in different hours.

Table 1 further highlights the level of peak load diversity across the WEIM by showing the peak load of each individual area between June and August 2024, and the day on which this occurred. As shown in Table 1, many different balancing areas in the WEIM hit their peak loads on different days. The sum of the peak loads for each area in the WEIM totals 140,700 MW, or about 5 percent higher than the co-incident peak for all areas of 134,120 MW on July 10, 2024. This highlights the potential load diversity benefits for all areas within the WEIM.

Figure 4. Day-ahead versus real-time prices (peak hours)

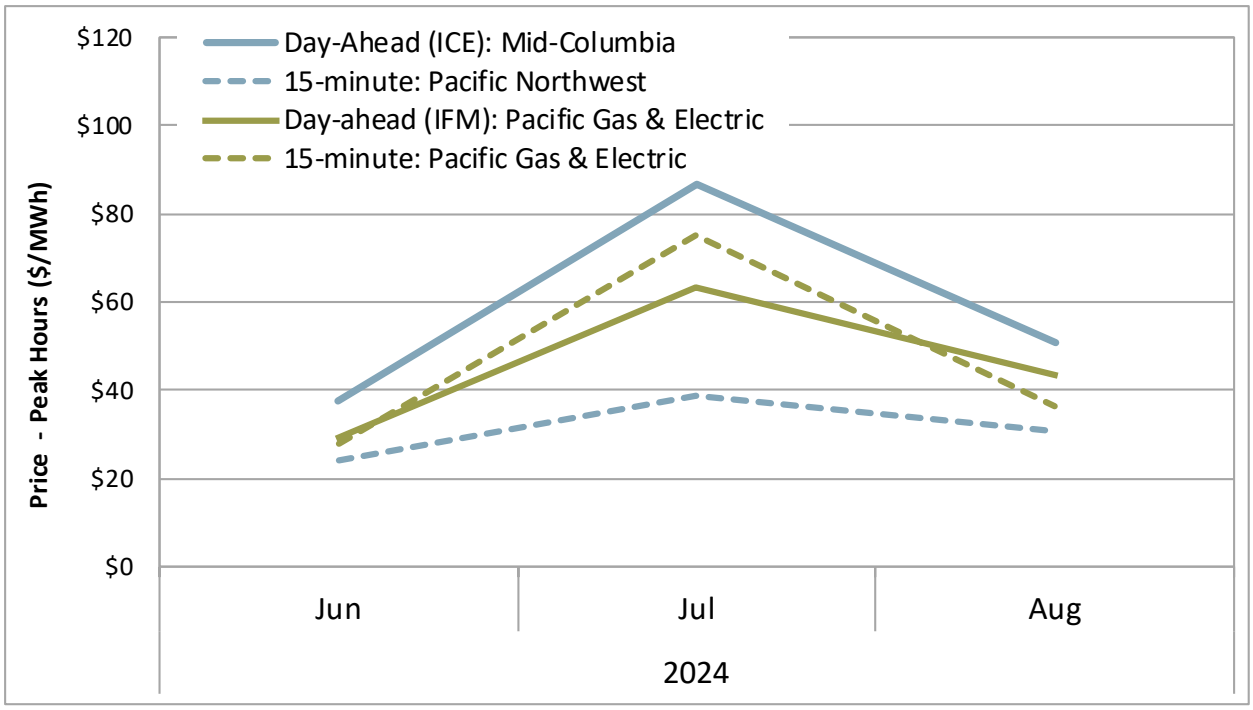


Figure 5. Day-ahead versus real-time prices (peak hours)

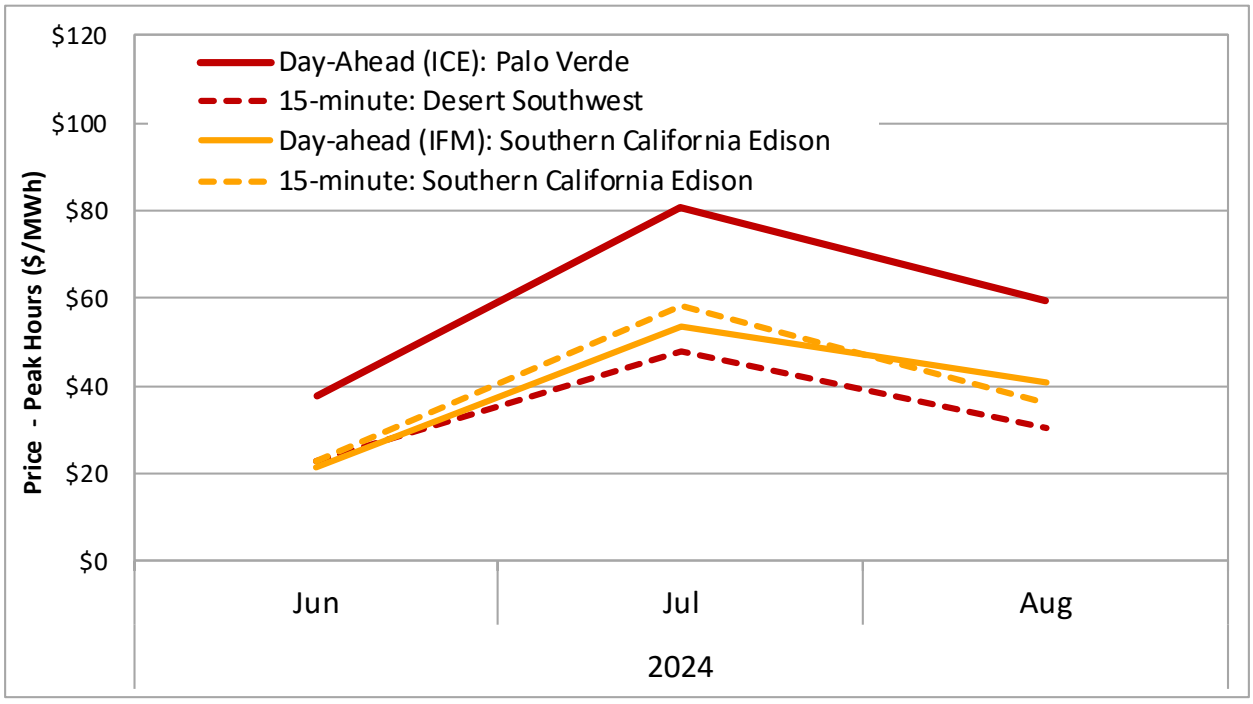


Figure 6. Average Monthly WEIM 5-minute market load by region

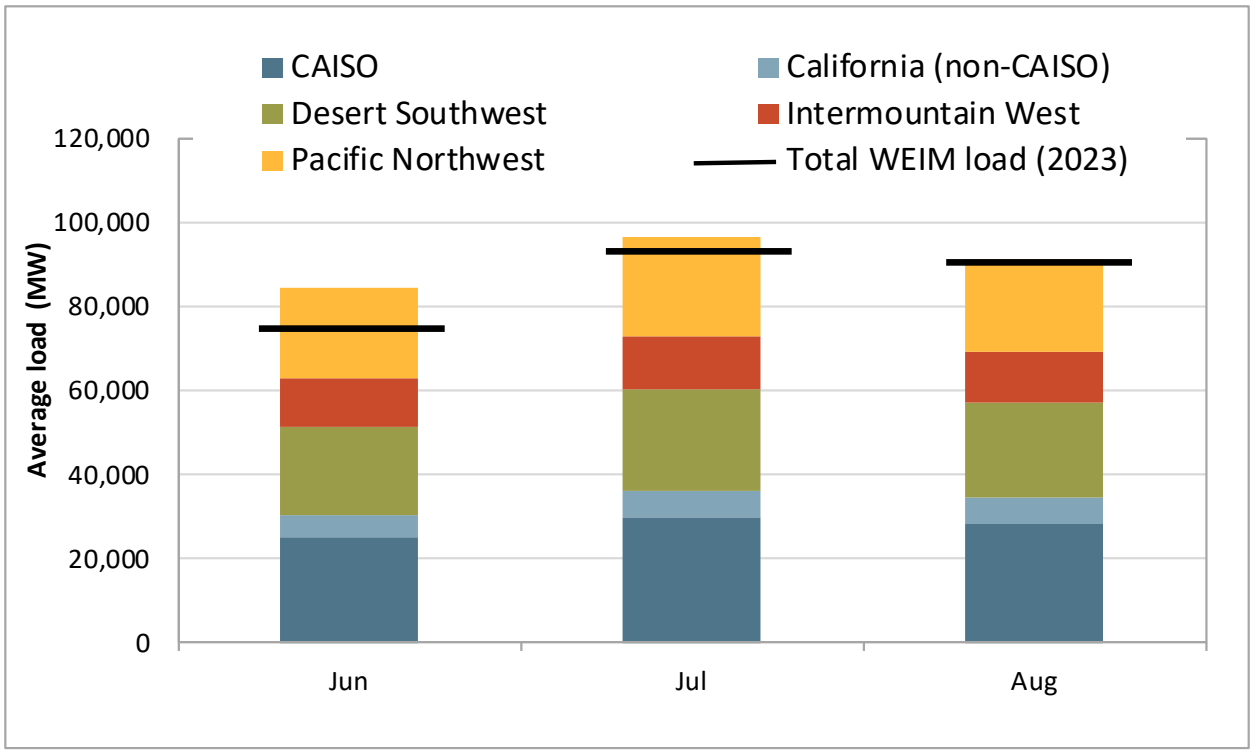


Figure 7. Hourly load (GW) by balancing area during system peak day (July 10, 2024)

	12	13	14	15	16	17	18	19	20	21	22	23	24
SYSTEM	106.3	112.4	118.5	124.5	128.7	131.8	133.7	133.1	131.4	126.2	119.8	111.7	101.4
CAISO	29.8	32.0	34.4	37.2	39.8	41.5	42.8	43.7	43.6	42.2	40.3	37.6	34.0
BANC	2.77	3.09	3.48	3.80	4.07	4.19	4.24	4.17	4.11	3.89	3.66	3.31	2.90
Turlock ID	0.49	0.54	0.57	0.61	0.63	0.65	0.66	0.66	0.65	0.63	0.61	0.57	0.52
LADWP	3.64	3.89	4.13	4.37	4.57	4.64	4.66	4.61	4.45	4.16	4.01	3.72	3.35
NV Energy	7.51	8.09	8.52	8.92	9.13	9.56	9.66	9.72	9.28	8.83	8.43	7.79	7.21
Arizona PS	6.17	6.55	7.04	7.45	7.66	7.75	7.88	7.92	7.78	7.46	7.04	6.43	5.86
Tucson Electric	2.16	2.34	2.53	2.66	2.78	2.87	2.92	2.91	2.78	2.62	2.35	2.19	1.93
Salt River Project	6.70	7.09	7.42	7.61	7.73	7.76	7.84	7.78	7.62	7.28	6.80	6.23	5.77
PSC New Mexico	1.85	1.96	2.13	2.22	2.31	2.33	2.36	2.35	2.23	1.99	1.83	1.56	1.36
WAPA - Desert SW	1.25	1.35	1.42	1.49	1.51	1.55	1.53	1.50	1.44	1.36	1.25	1.18	1.08
El Paso Electric	1.61	1.73	1.82	1.93	1.97	1.97	1.87	1.70	1.59	1.49	1.35	1.24	1.15
PacifiCorp East	8.05	8.51	8.90	9.31	9.35	9.36	9.41	9.33	9.07	8.61	8.15	7.51	6.93
Idaho Power	3.57	3.65	3.89	4.04	4.09	4.08	3.99	3.96	3.95	3.85	3.57	3.34	3.10
NorthWestern	1.80	1.73	1.78	1.84	1.87	1.86	1.97	1.83	1.79	1.76	1.65	1.52	1.37
Avista Utilities	1.80	1.93	1.96	2.00	2.04	2.07	2.08	2.04	1.99	1.89	1.78	1.63	1.46
BPA	7.58	7.65	7.86	7.96	8.02	8.13	8.36	8.04	7.89	7.68	7.37	7.04	6.44
Tacoma Power	0.55	0.56	0.58	0.60	0.61	0.62	0.63	0.63	0.62	0.60	0.58	0.55	0.50
PacifiCorp West	3.29	3.45	3.58	3.67	3.72	3.77	3.83	3.80	3.71	3.56	3.34	3.14	2.83
Portland GE	3.28	3.45	3.60	3.73	3.81	3.93	3.93	3.90	3.85	3.70	3.48	3.24	2.95
Puget Sound Energy	3.20	3.34	3.43	3.55	3.64	3.70	3.75	3.73	3.65	3.47	3.33	3.14	2.85
Seattle City Light	1.20	1.23	1.27	1.29	1.30	1.29	1.29	1.27	1.22	1.18	1.15	1.11	1.03
Powerex	8.05	8.22	8.26	8.31	8.39	8.51	8.58	8.41	8.29	8.09	7.84	7.57	6.97

Table 1. Peak WEIM 5-minute market load by balancing area (June–August, 2024)

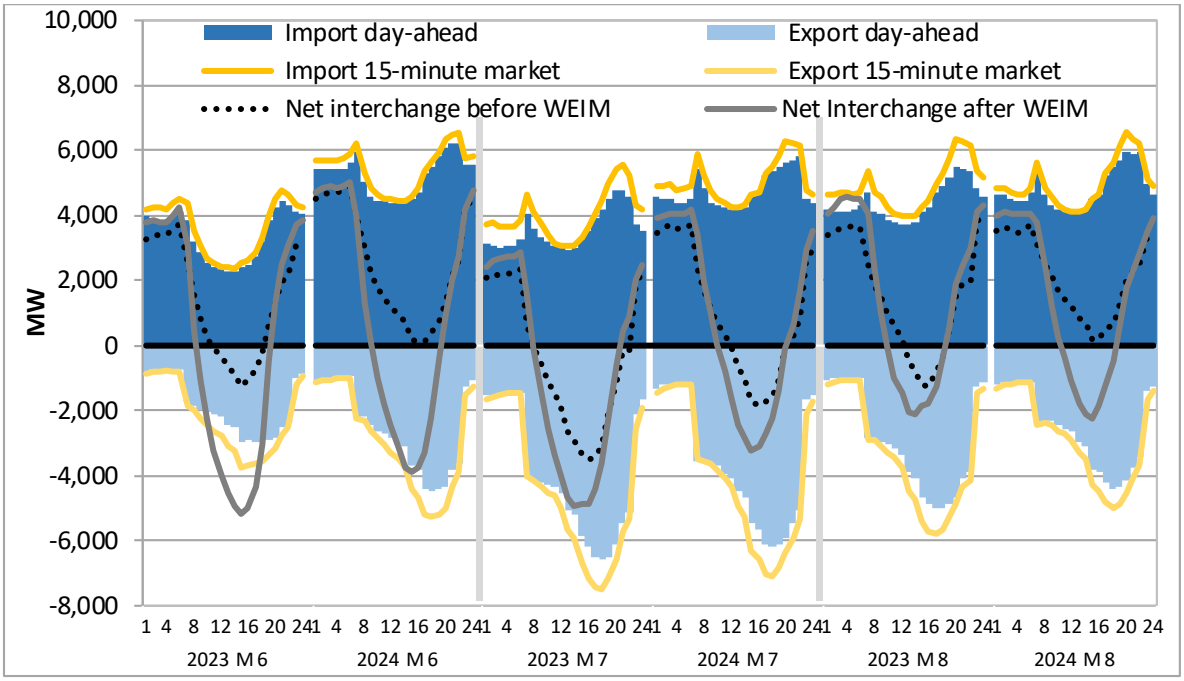
Region/ balancing area	Peak load (June - August, 2024) Date	Peak load (June - August, 2024) Load (MW)	Load during WEIM system peak (10-Jul-24) Load (MW)
WEIM system	**10-Jul-24**	**134,120**	**134,120**
California	**23-Jul-24**	**53,443**	**52,109**
California ISO	25-Jul-24	43,776	42,428
BANC	11-Jul-24	4,582	4,317
LADWP	5-Aug-24	5,127	4,694
Turlock Irrig. District	11-Jul-24	715	670
Desert Southwest	**9-Jul-24**	**33,187**	**33,058**
Arizona Public Service	4-Aug-24	8,309	8,052
El Paso Electric	25-Jun-24	2,336	1,758
NV Energy	11-Jul-24	9,702	9,670
PSC New Mexico	20-Aug-24	2,645	2,288
Salt River Project	4-Aug-24	8,314	7,914
Tucson Electric	8-Jul-24	3,015	3,002
WAPA - Desert SW	5-Aug-24	444	374
Intermountain West	**11-Jul-24**	**17,867**	**17,672**
Avista Utilities	10-Jul-24	2,120	2,108
Idaho Power	10-Jul-24	4,229	4,058
NorthWestern Energy	23-Jul-24	2,029	1,914
PacifiCorp East	11-Jul-24	9,932	9,593
Pacific Northwest	**9-Jul-24**	**33,317**	**31,281**
BPA	9-Jul-24	9,204	8,688
PacifiCorp West	9-Jul-24	4,030	3,863
Portland General Electric	9-Jul-24	4,405	3,985
Powerex	9-Jul-24	9,490	9,031
Puget Sound Energy	9-Jul-24	4,183	3,778
Seattle City Light	9-Jul-24	1,417	1,300
Tacoma Power	9-Jul-24	694	636

WEIM transfers with California ISO area

The net transfers into the California ISO area from other areas in the WEIM increased in the summer of 2024, compared to the previous summer, particularly in June and July.

Figure 8 shows average hourly imports and exports for the ISO balancing area for each summer month in 2023 and 2024. The dotted grey line in Figure 8 shows the ISO area's average net interchange by hour before the WEIM, while the solid gray line shows net interchange after transfers made through the WEIM. The difference in these lines represent the average net transfers made through the WEIM between the ISO and the rest of the WEIM areas.

Figure 8. Average hourly imports and exports for California ISO area (June–August 2023 and 2024)



During very tight system conditions, the hour-ahead market may not give schedules to all exports that have tried to uneconomically self-schedule out of the ISO balancing area. Over the summer of 2024, such export limitations primarily occurred on July 23 and 24.

- On July 23, the hour-ahead market did not give awards to about 500 MWh of low priority self-scheduled exports.
- On July 24, during hour-ending 20, the hour-ahead market did not give awards to about 900 MW of self-scheduled exports. About 200 MW of these curtailed exports were high priority exports backed by capacity contracts. The ISO has explained that software issues related to bid validation caused the curtailment of the high priority exports.

The ISO balancing area declared an Energy Emergency Alert Watch for the peak net load hours on July 24.

Assistance energy transfers

Assistance energy transfers provide balancing areas access to excess WEIM supply that may not have been available otherwise following an upward resource sufficiency evaluation failure. Without assistance energy transfers, a balancing area failing an upward resource sufficiency evaluation test would have net WEIM imports limited to the greater of either the base transfer or the optimal transfer from the last 15-minute market interval. Balancing areas can voluntarily opt in to the assistance energy transfers program to prevent their WEIM transfers from being limited during an upward resource sufficiency evaluation failure. WEIM transfers during such failure periods are subject to an ex-post surcharge. Balancing areas must opt in or opt out of the program in advance of the trade date.

Opting in to the assistance energy transfer program does not guarantee that the balancing area will achieve additional WEIM supply following a resource sufficiency evaluation failure (compared to transfers that would occur if the area did not opt in to the program). Opting in to the program only removes the import limit that would have been in place following a test failure, allowing the market to freely and optimally schedule WEIM transfers based on supply and demand conditions in the system. If the import limit following a test failure is high enough to not restrict the optimal solution, then opting in or opting out of the program will have no effect on WEIM import supply in that interval.

Table 2 summarizes all balancing areas that opted in to assistance energy transfers on at least one day over the summer of 2023, and the subsequent impact following a resource sufficiency evaluation failure.

The left most columns in Table 2 show the days in which each area opted in to the assistance energy transfer program, and the number of 15-minute intervals on these days in which a balancing area failed the resource sufficiency evaluation. These are the intervals in which the WEIM import limit following the test failure was removed—giving the WEIM entity access to WEIM supply that may not have been available otherwise.

Table 2 also shows the percent of failure intervals in the 5-minute market in which the balancing area achieved additional WEIM imports due to assistance energy transfers—along with various measures of the volume of these additional transfers. The additional WEIM imports shown in Table 2 is a measurement of the WEIM transfers in the 5-minute market above what the import limit would have been if the balancing area had not been opted in to the program when it failed the resource sufficiency evaluation test. The table also shows the average, maximum, and total WEIM imports added in the 5-minute market due to the balancing area having opted in to the assistance energy transfer program.

Table 2. Assistance energy transfers, June–August 2024

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	92	19	30%	26	198	125
Idaho Power	92	6	56%	69	278	104
NorthWestern Energy	92	16	31%	8	84	32
NV Energy	92	4	42%	78	336	78
PacifiCorp East	92	3	33%	61	203	45
PacifiCorp West	92	2	50%	40	99	20
PNM	55	62	35%	36	314	563
WAPA Desert Southwes	55	9	56%	99	277	223
California ISO	11	1	0%	0	0	0
Portland General Elect	10	0	N/A	N/A	N/A	N/A

Limitations on WEIM transfers into California ISO balancing area

On July 26, 2023, ISO operators began limiting WEIM import transfers into the California ISO balancing area each day during the peak net load hours. This limitation was put in place for the hour-ahead and 15-minute markets, to mitigate the risk during the critical hours that internal generation and hourly-block intertie schedules might be displaced by WEIM imports that may not materialize in real-time. This limitation typically lasted five hours each day and continued through November 15, 2023.[2]

DMM has recommended that the ISO provide greater transparency on when and why it may implement these transfer limitations in the future. DMM has also recommended that the ISO work with stakeholders to consider other methods of achieving the intended reliability outcomes without creating the large and systematic modeling differences between the 15-minute and 5-minute markets.

Through several public presentations, the ISO has increased transparency into the limited situations in which it may implement these transfer limitations going forward. Despite tight system conditions in January, July, and September of this year, the ISO has not implemented these import transfer limitations for any hour this year through mid-September.

Residual unit commitment load adjustments

The residual unit commitment process runs immediately after the day-ahead market and procures capacity sufficient to bridge the gap between the amount of supply cleared in the day-ahead market and the amount needed to meet export schedules and real-time load. In the absence of any load adjustment, the residual unit commitment capacity requirement would be based only on the difference between the day-ahead load forecast and physical supply clearing the day-ahead market.

[2] See *2023 Annual Report on Market Issues and Performance*, Department of Market Monitoring, July 29, 2023, pp 145-154: https://www.caiso.com/documents/2023-annual-report-on-market-issues-and-performance.pdf

However, numerous factors are likely to affect the actual amount of supply needed in real-time. The day-ahead forecast for renewable resources may be higher than the actual renewable production. Similarly, the day-ahead load forecast may be significantly lower than the actual real-time load. Therefore, to ensure sufficient capacity in real-time to address the supply and demand uncertainty that may materialize, operators need to adjust hourly residual unit commitment capacity requirements to levels above the day-ahead load forecast.

Figure 9 shows daily average residual unit commitment load adjustments during 2023 and 2024. At the end of June 2023, the adjustments rose to very high levels when the ISO began using the mosaic quantile regression method to attempt to procure capacity to cover uncertainty that may materialize between the day-ahead and real-time, based on a 97.5 percent confidence level. In 2023, high upward adjustments to these requirement contributed to higher bid cost recovery payments

As highlighted in Figure 9, residual unit commitment adjustments were down significantly in the summer of 2024 compared to 2023. On December 21, 2023, the ISO began using an assessment of system conditions to determine the percentile of uncertainty to attempt to cover the load adjustment, rather than always attempting to cover the uncertainty 97.5 percent of the time. This significantly reduced the load adjustments.

On May 7, 2024, the ISO further adjusted its methodology to mainly use load adjustments only during peak hours, and to have more options for using lower load adjustments based on the ISO's assessments of system conditions.

Figure 9. Daily average residual unit commitment requirement adjustments