



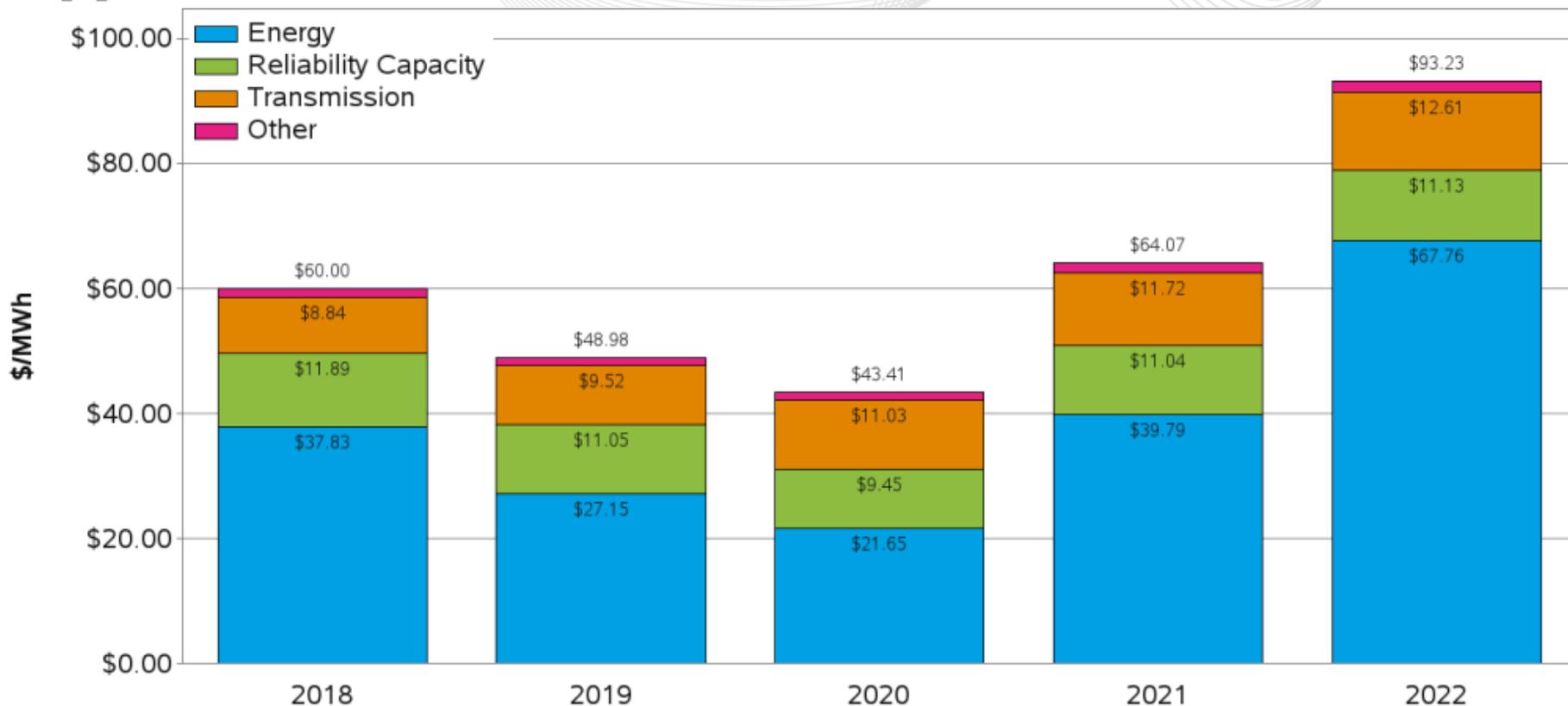
Markets Report

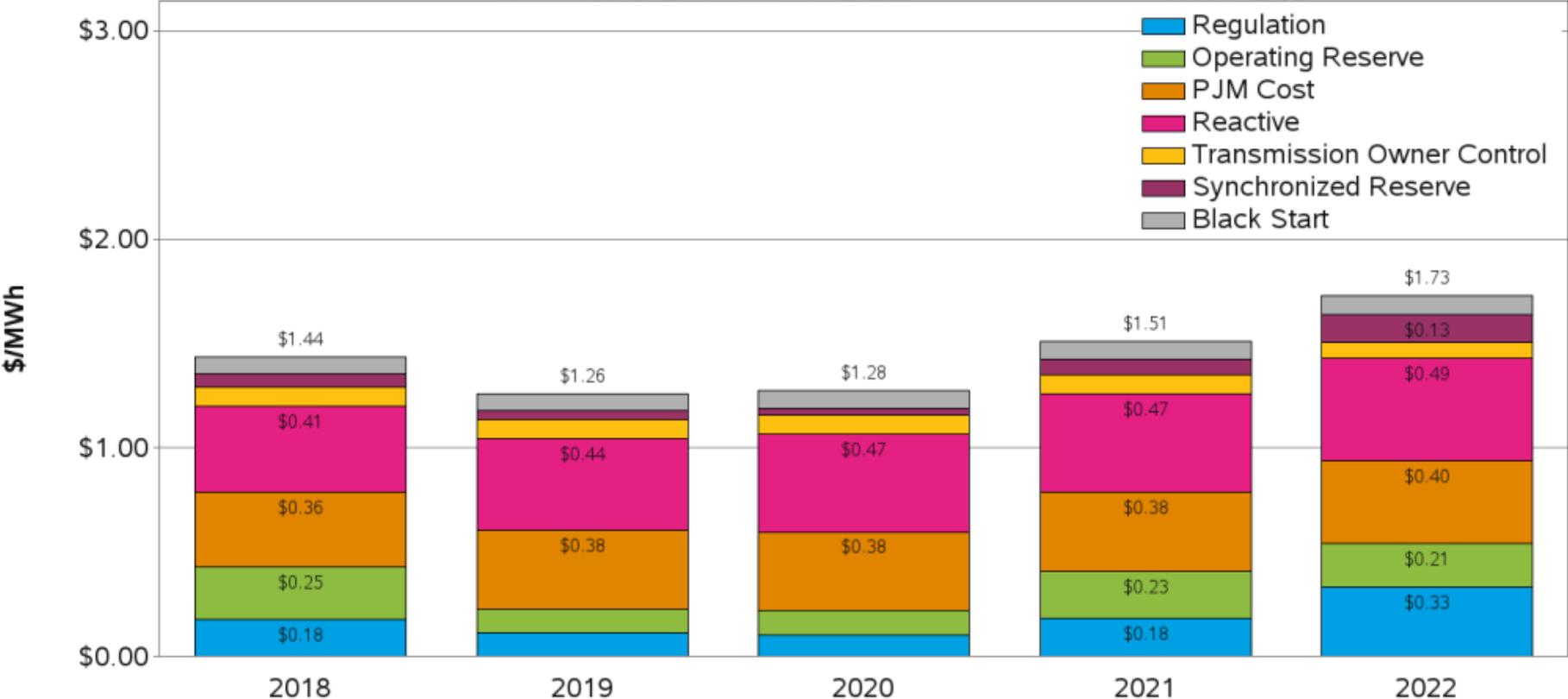
MC Webinar
July 26, 2022

- PJM Wholesale Cost 2022 is \$93.23/MWh, up from full-year 2021 costs of \$64.07/MWh. (Slides 5 & 6)
- Slides pertaining to weather conditions, in addition to slides showing average fuel prices, generation on-line fuel mixes, and System Marginal Prices have been combined into a **Market Conditions** section. (Slides 8- 22)
- In June, temperatures were above average for most of the month. Thus, the sum of Heating and Cooling Degree Days was also above its historic average. (Slides 8-10)
- Energy use was also above its historic average for June. (Slides 8-10)
- In June, uplift exceeded \$800,000 on nine days. (Slides 27 & 28)

- Load-weighted average LMP for 2021 is \$67.76/MWh: (Slides 39-41)
 - June 2022 was \$97.90/MWh, which is higher than June 2021 (\$34.10/MWh) and June 2020 (\$20.50/MWh).
- There were 35 5-minute intervals that experienced shortage pricing in June. (Slides 34-38)
- FTR revenue adequacy for the month of June is 95% and the 2022-2023 Planning Year is currently funded at 95%. (Slides 56-59)
- Congestion values have been trending upwards. June's value is much more in line with recent history than May's. (Slide 57)
- Regulation and Synchronized Reserve market costs have generally tracked with energy prices over time. (Slides 72-74)

Markets Report

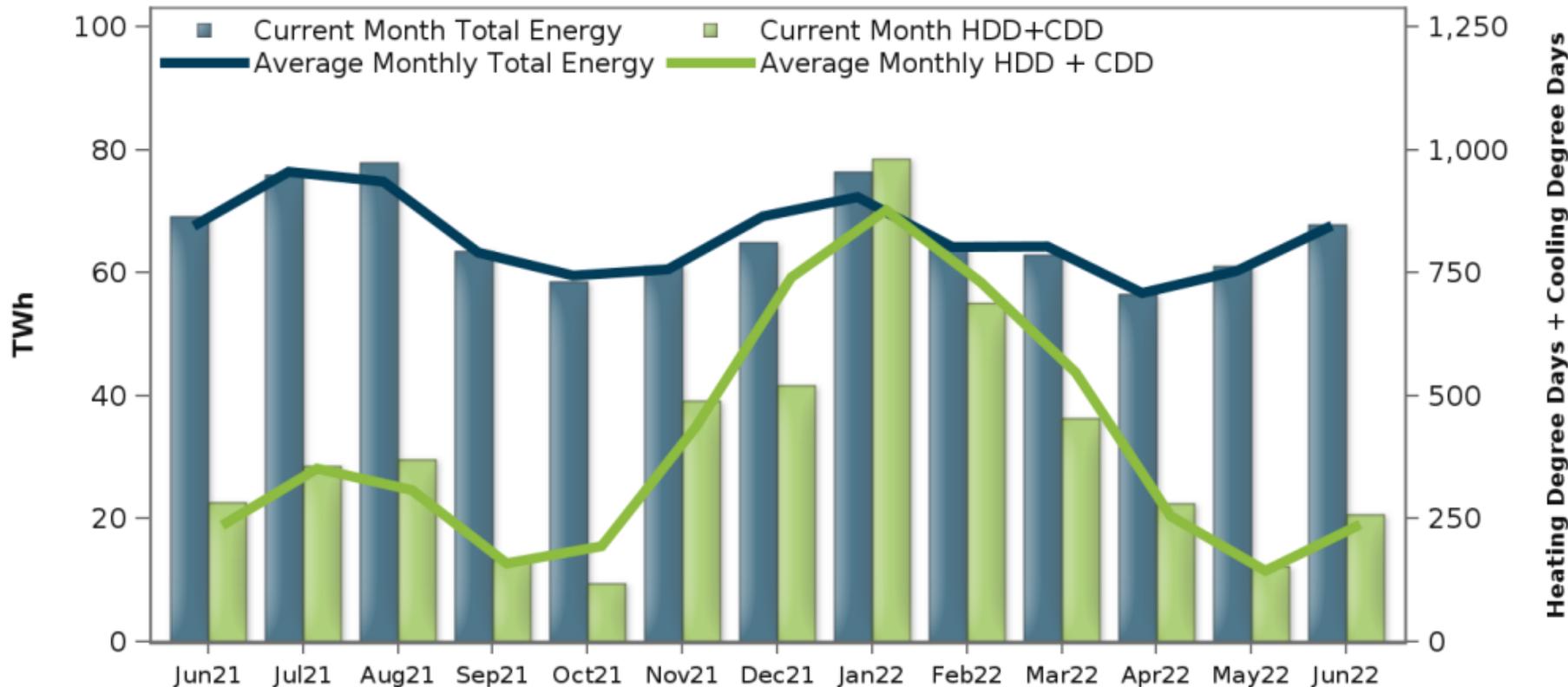




Market Conditions

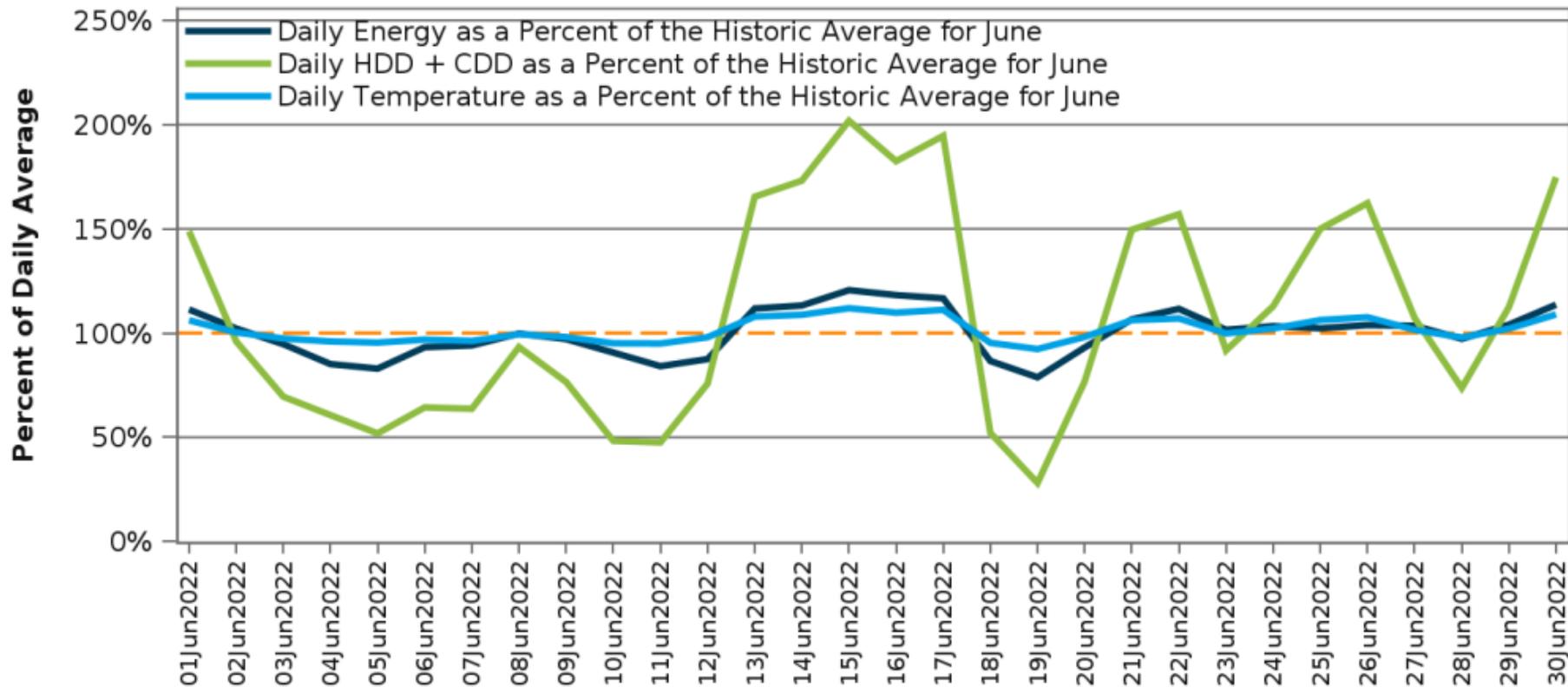
- The weather parameter shown in the following slide is a monthly sum of daily Heating Degree Days (HDD) and Cooling Degree Days (CDD).
- Degree days represent a deviation from a baseline temperature, in this case 60 degrees for HDD and 65 degrees for CDD. As temperatures get more extreme, colder or hotter, either HDDs or CDDs, respectively, will increase.
- Typically, winter months will only record HDDs, while summer months will only record CDDs. Shoulder months may have both HDDs and CDDs.
- Degree Days are calculated using a daily load weighting that weights values from stations in each TO zone according to the zonal contribution to the RTO peak on that day.
- Average values use data from 1998 to the most recent complete year, in this case, 2021. Averages include load data for all of TO zones in the current RTO footprint.

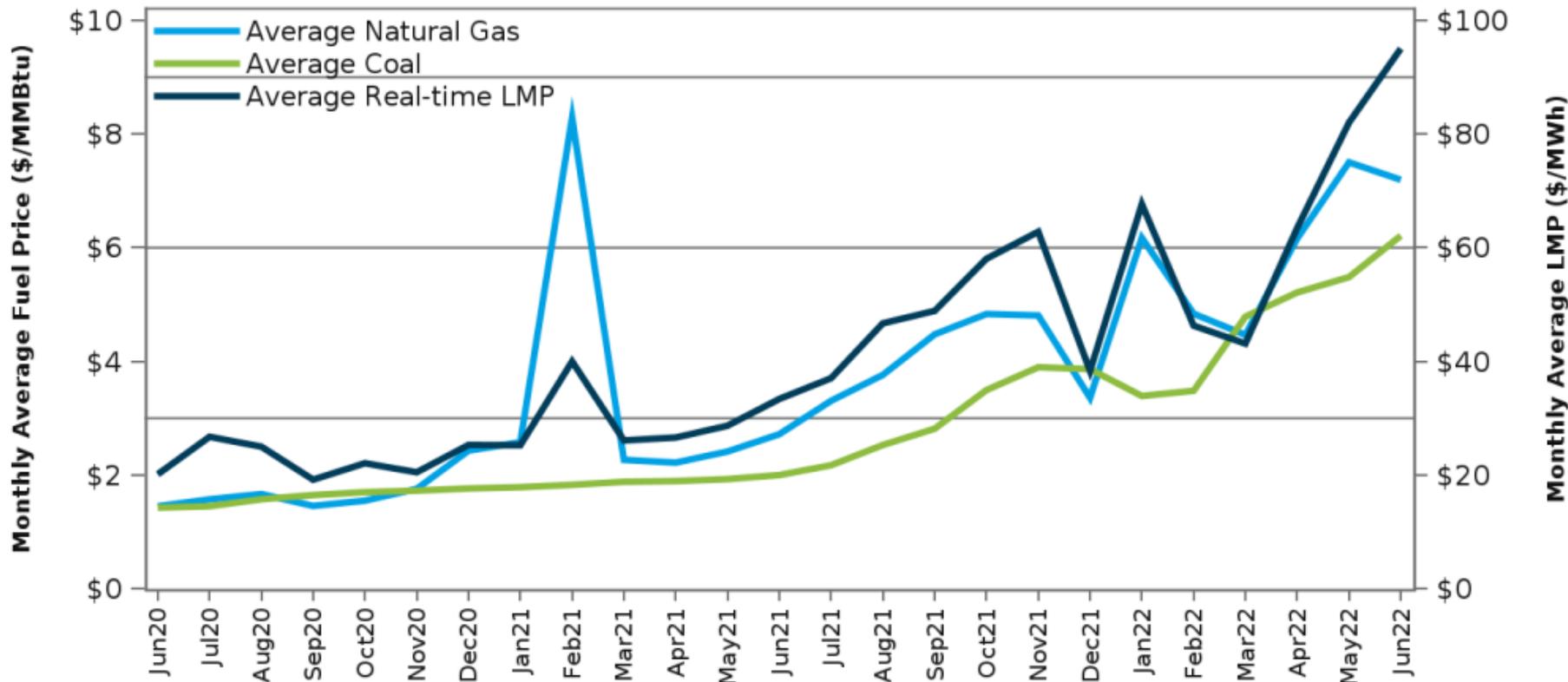
Historic Average Weather and Energy versus Current Month



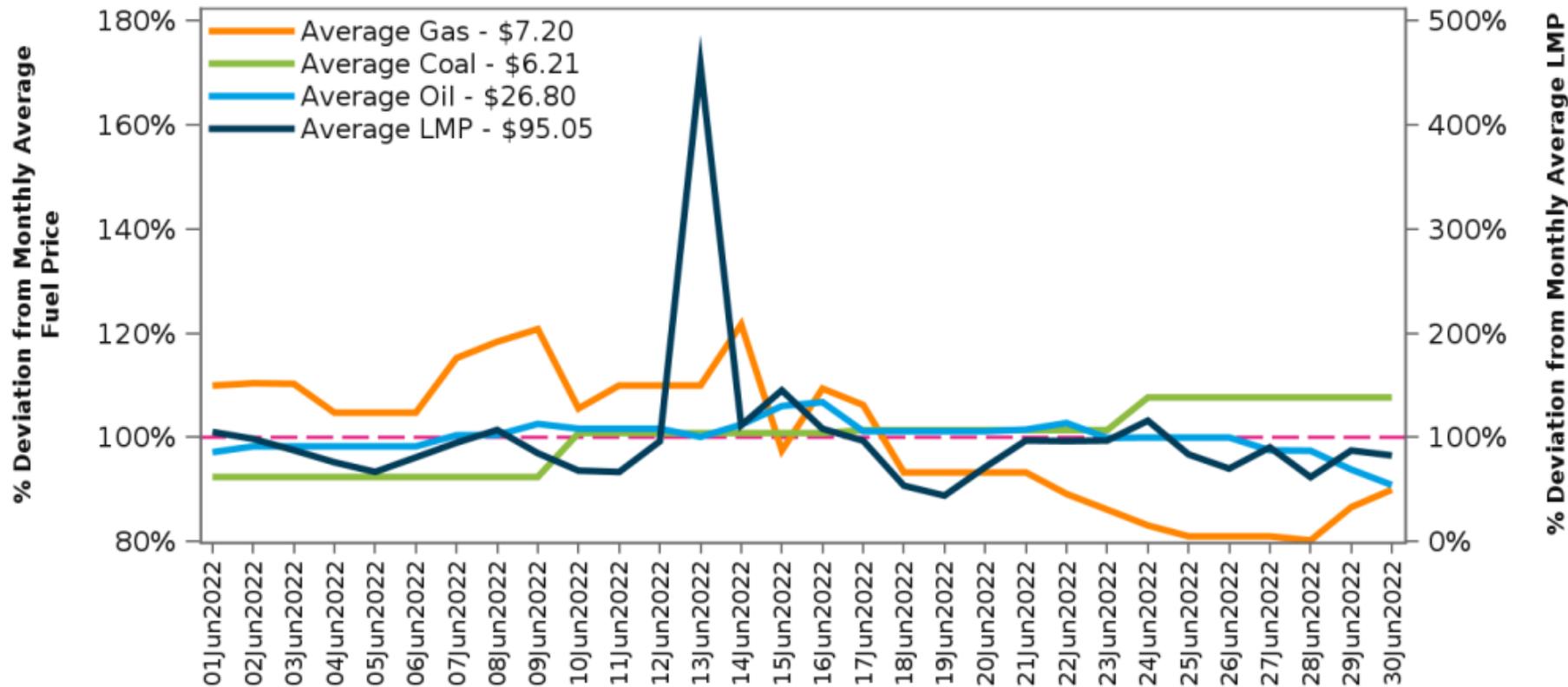


Historic Average Weather and Energy versus Current Month - Daily





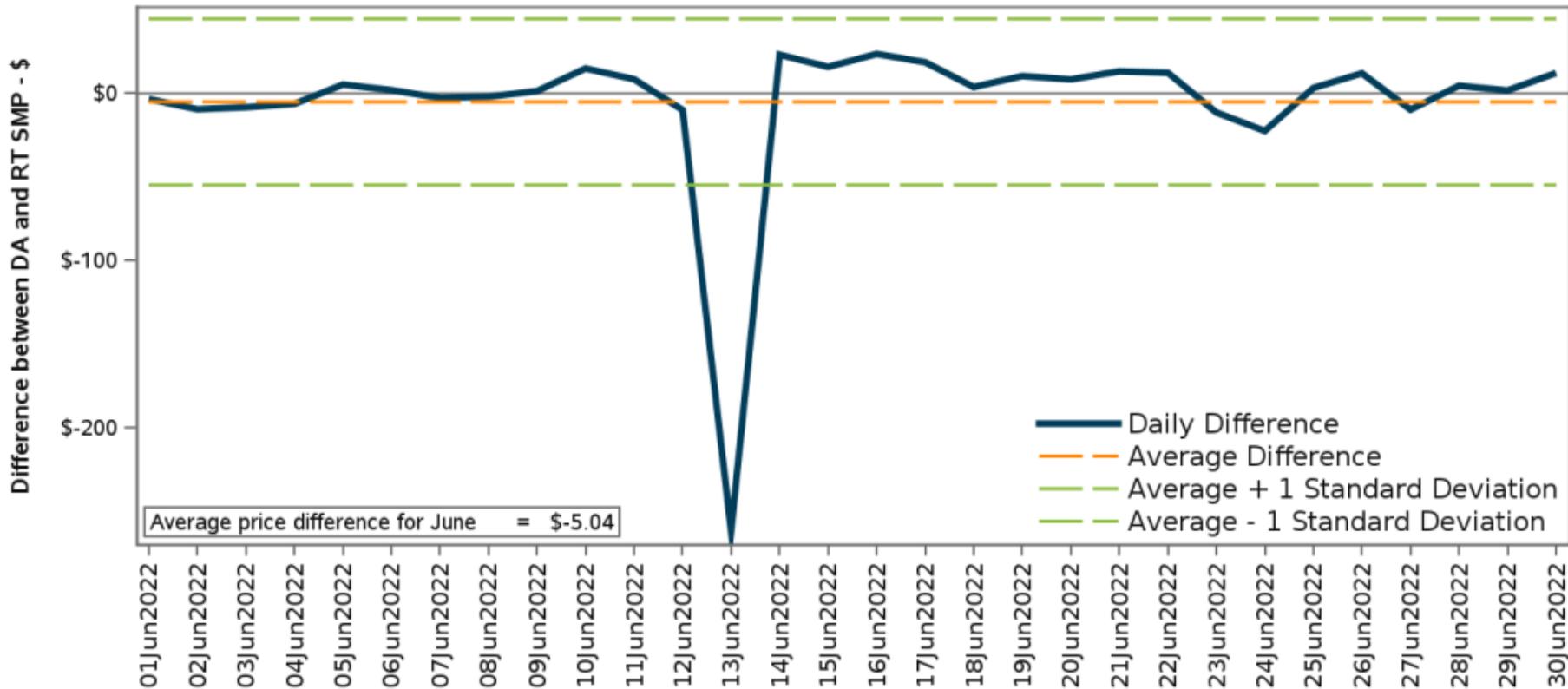
Fuel Price Source: S&P Global Platts



Fuel Price Source: S&P Global Platts

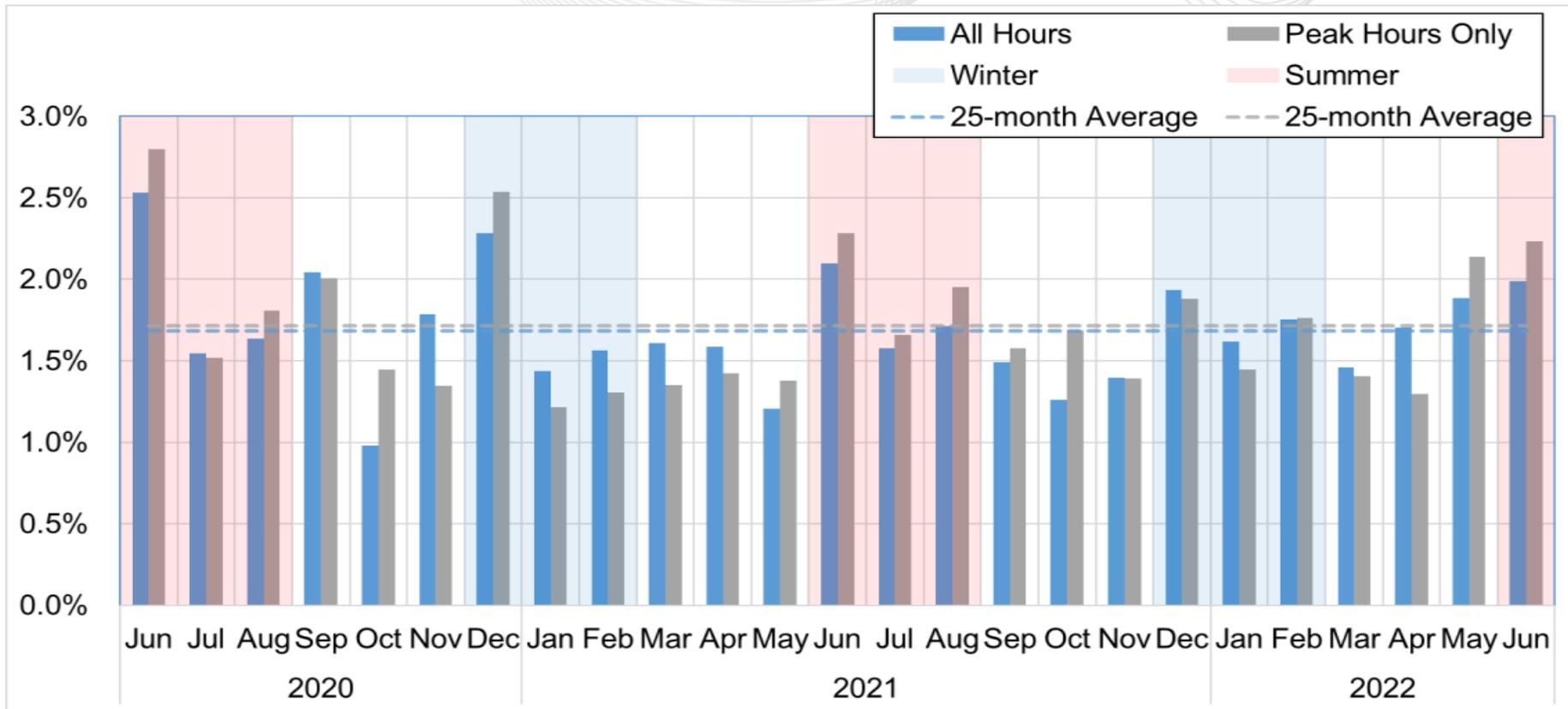


Daily Difference Between Day-Ahead and Real-Time System Marginal Prices

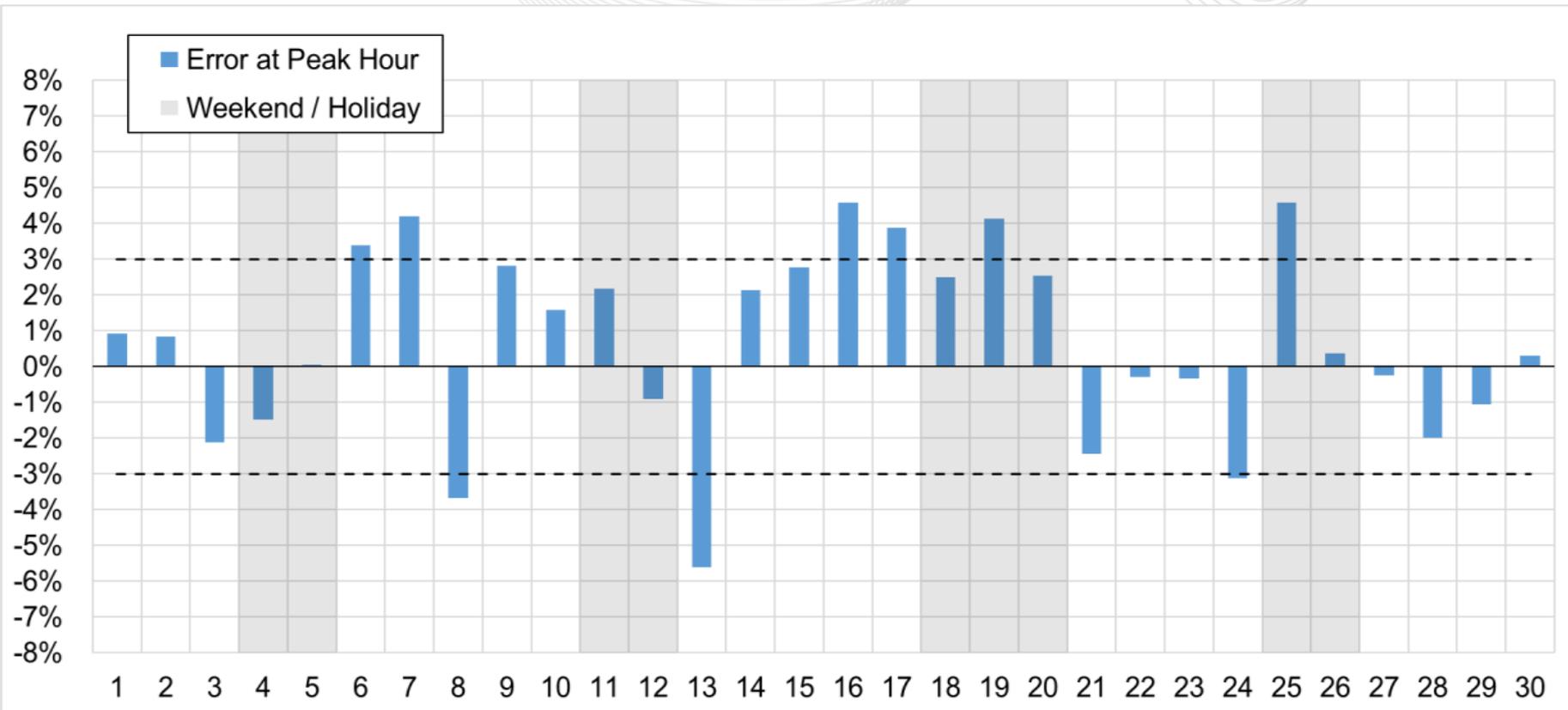


Positive values represent days when the DA daily average price was higher than RT. Negative values represent days when the DA price was lower.

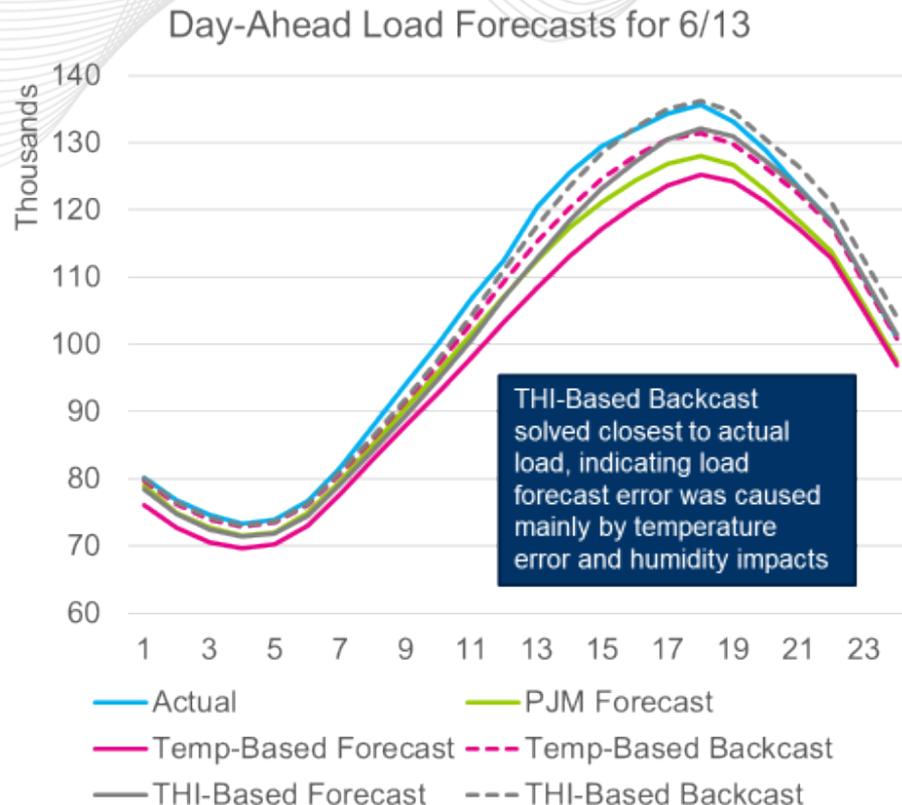
Load Forecast Error - Monthly Absolute Error, 10:00 Forecast



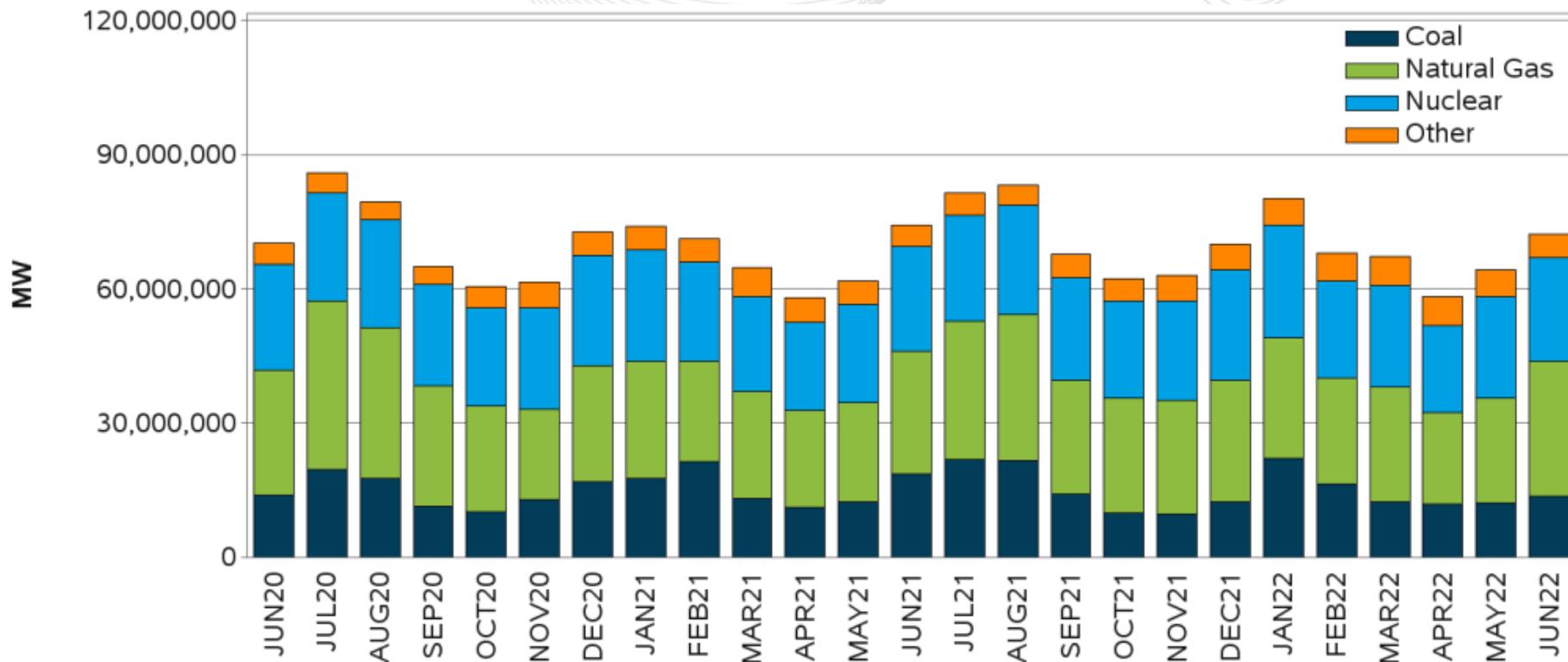
Load Forecast Error - June Daily Peaks, 10:00 Forecast



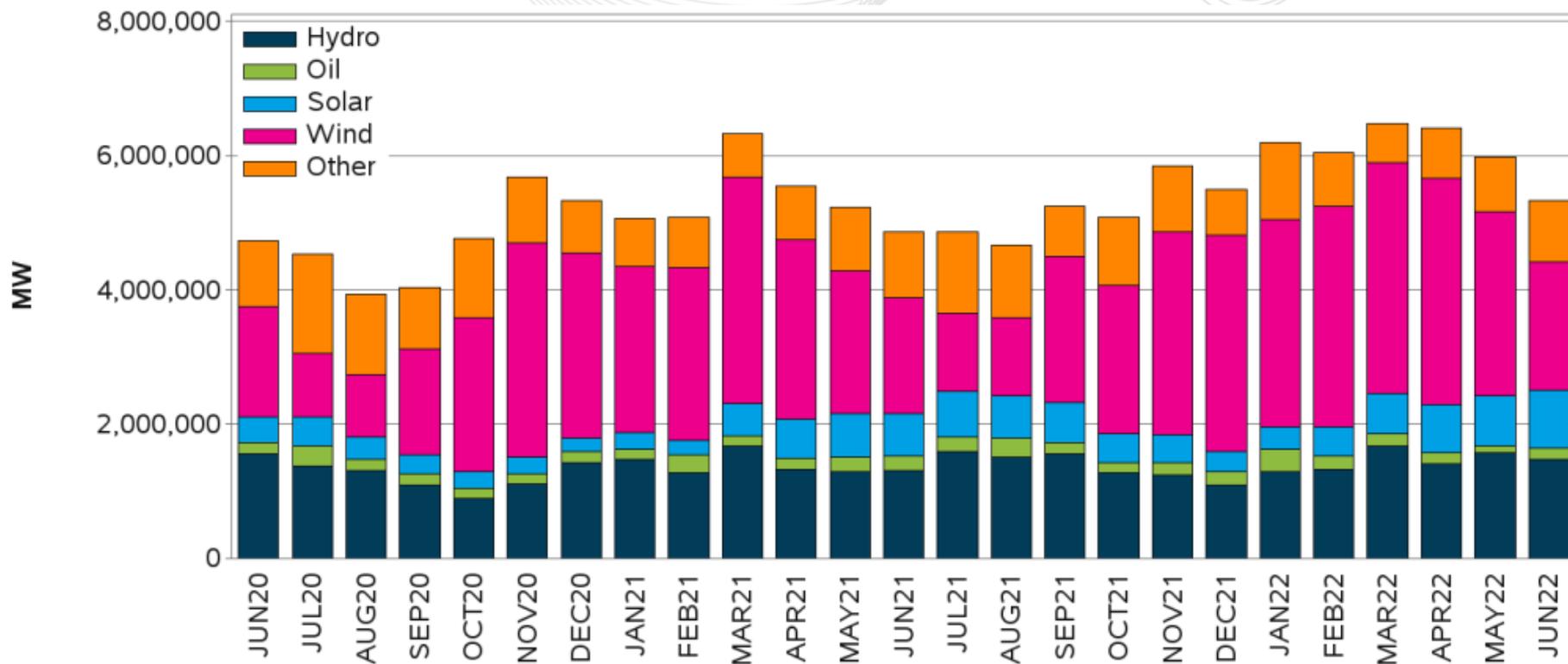
- Significant, widespread under-forecasting of temperatures throughout entire RTO
- First occurrence of extremely high heat indices this year
- Drastic increase in temperature and load from previous day (Sunday)
- Storms, which would have lowered load, did not materialize until after the load peak



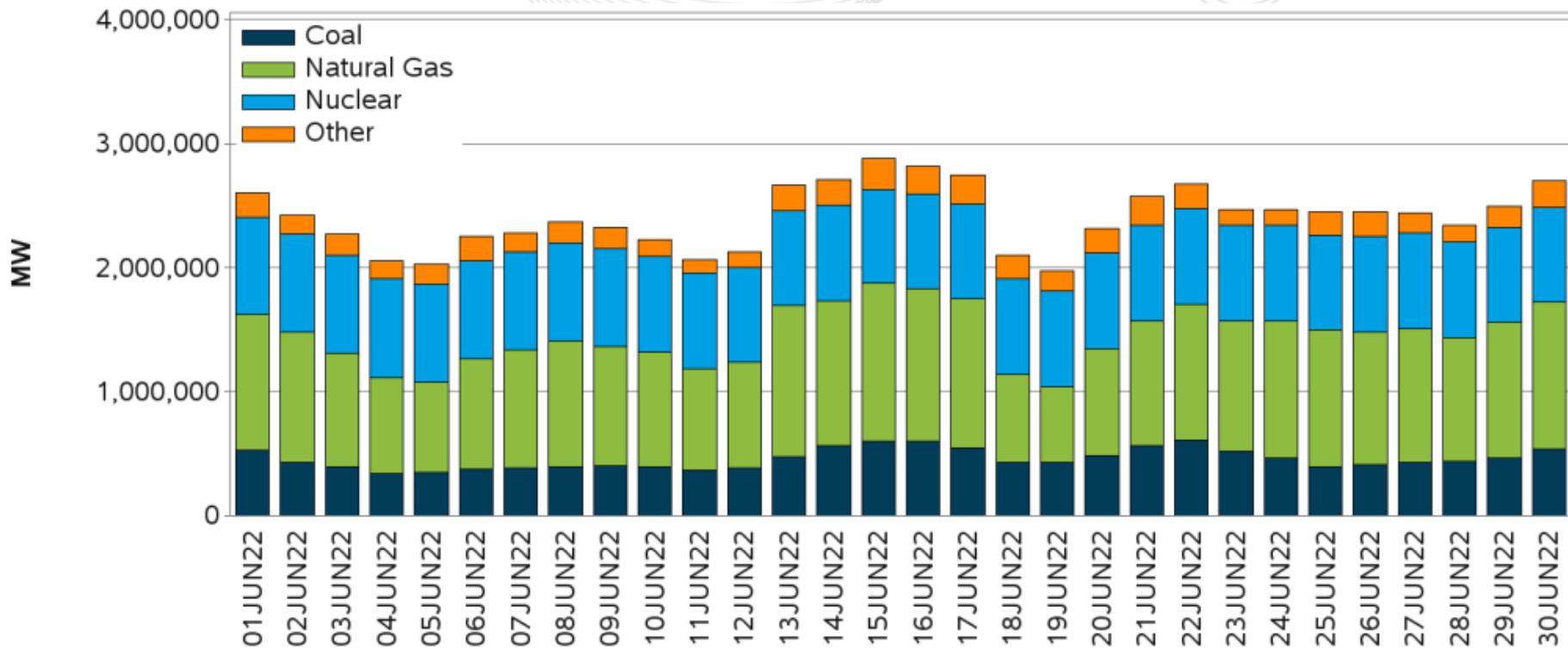
- PJM prepares a day-ahead load forecast at 10:00 am for use by our members.
- This forecast is not used to clear the day-ahead market and is not utilized for the reliability tools that run subsequent to the day-ahead market.
- *The especially challenging combination of anticipated hot weather and risk of storms continued to plague our forecasting efforts in June. This led, in large part, to a string of difficult-to-forecast days during the week of June 13. On Monday the 13th, the day with the highest error at the peak, storms didn't materialize until later in the evening. Daytime temperatures were under-forecasted, and we experienced extreme heat indices, upwards of 100° in many places, for the first time this season. Storm activity during the remainder of the week led, in many cases, to significant over-forecasting of temperatures. Paired with ongoing customer outages due to the severe weather early in the week, peak loads were generally over-forecasted.*



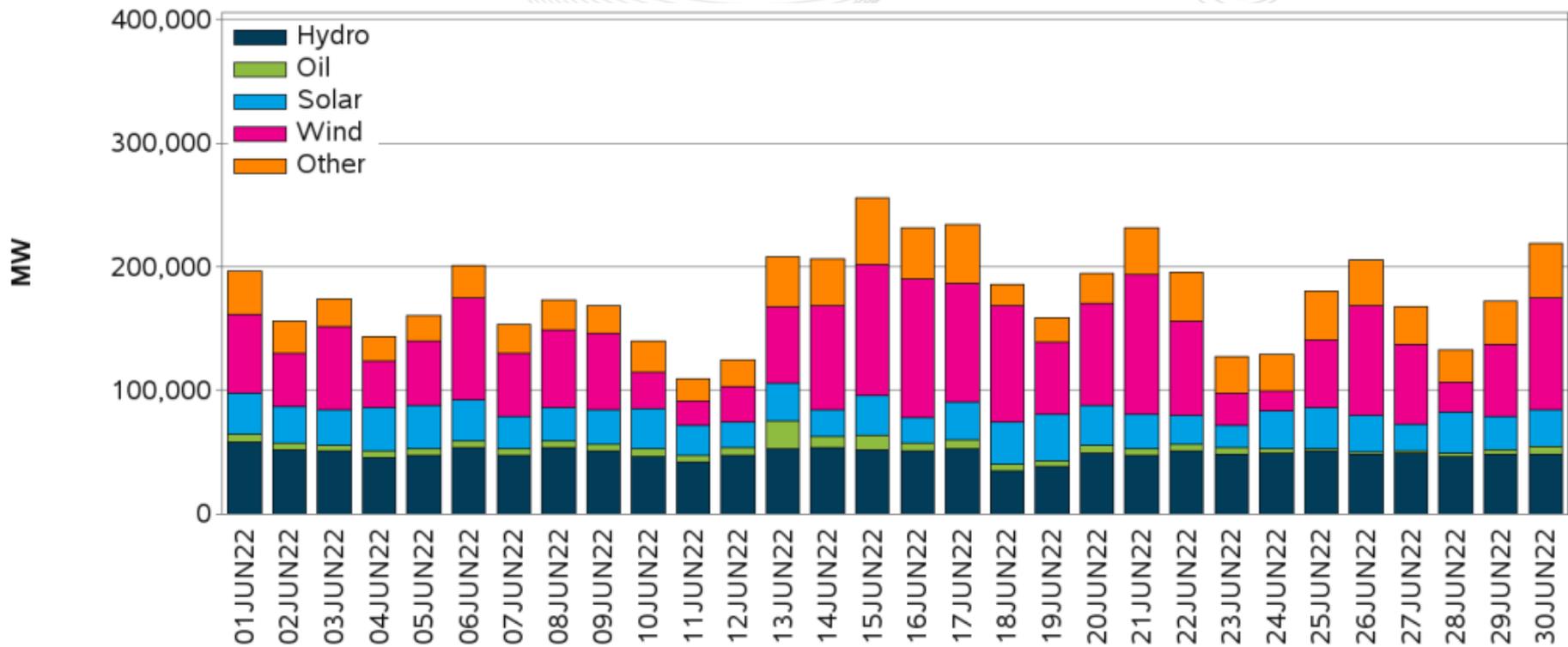
Other includes Hydro, Oil, Solar, Wind, and Other



'Other' includes Flywheels, Multiple Fuels, Storage, and Other Renewables

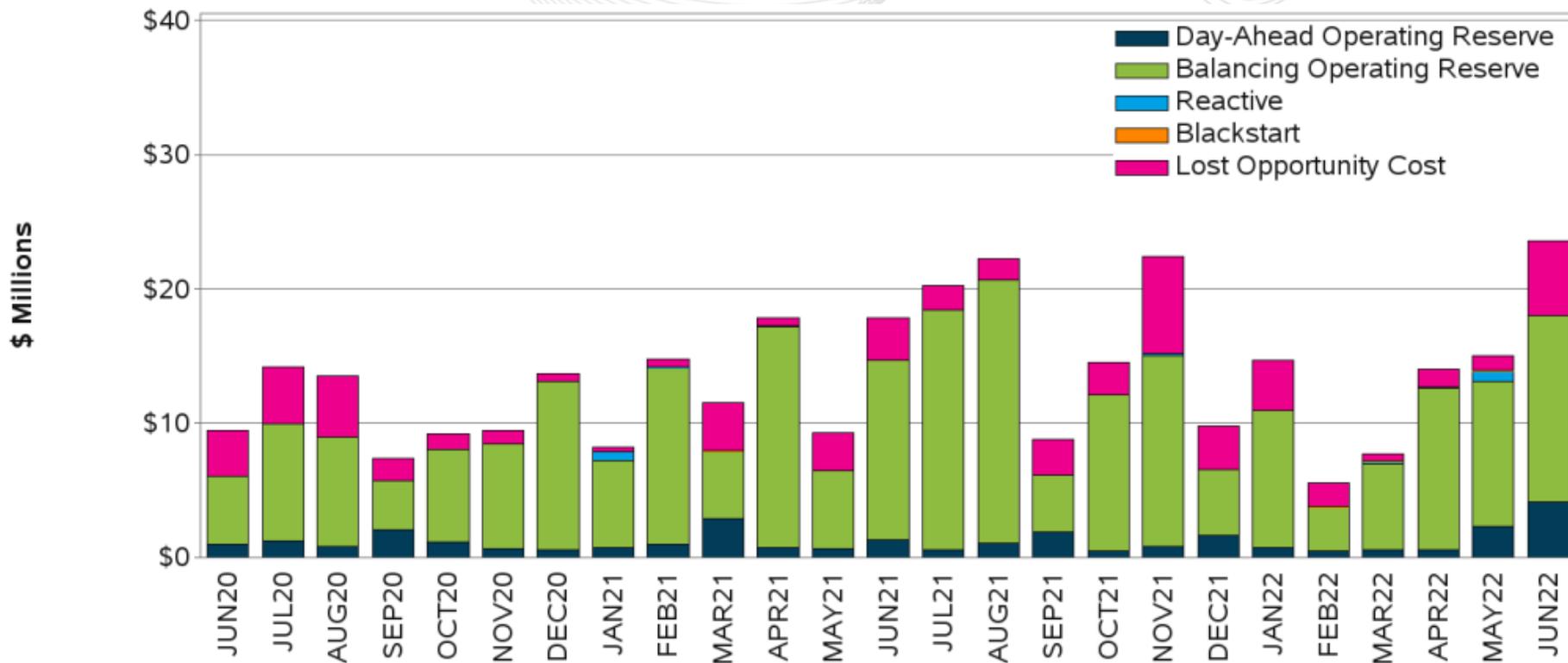


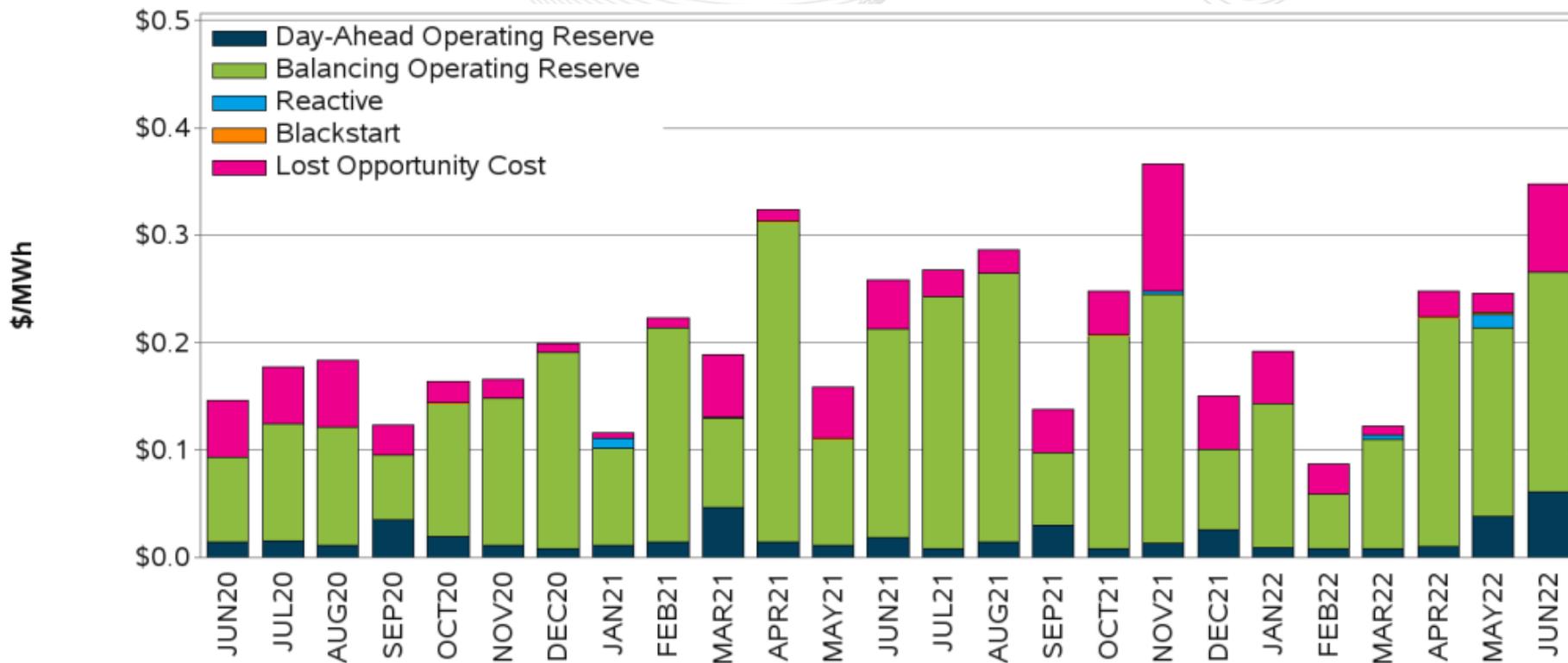
Other includes Hydro, Oil, Solar, Wind, and Other

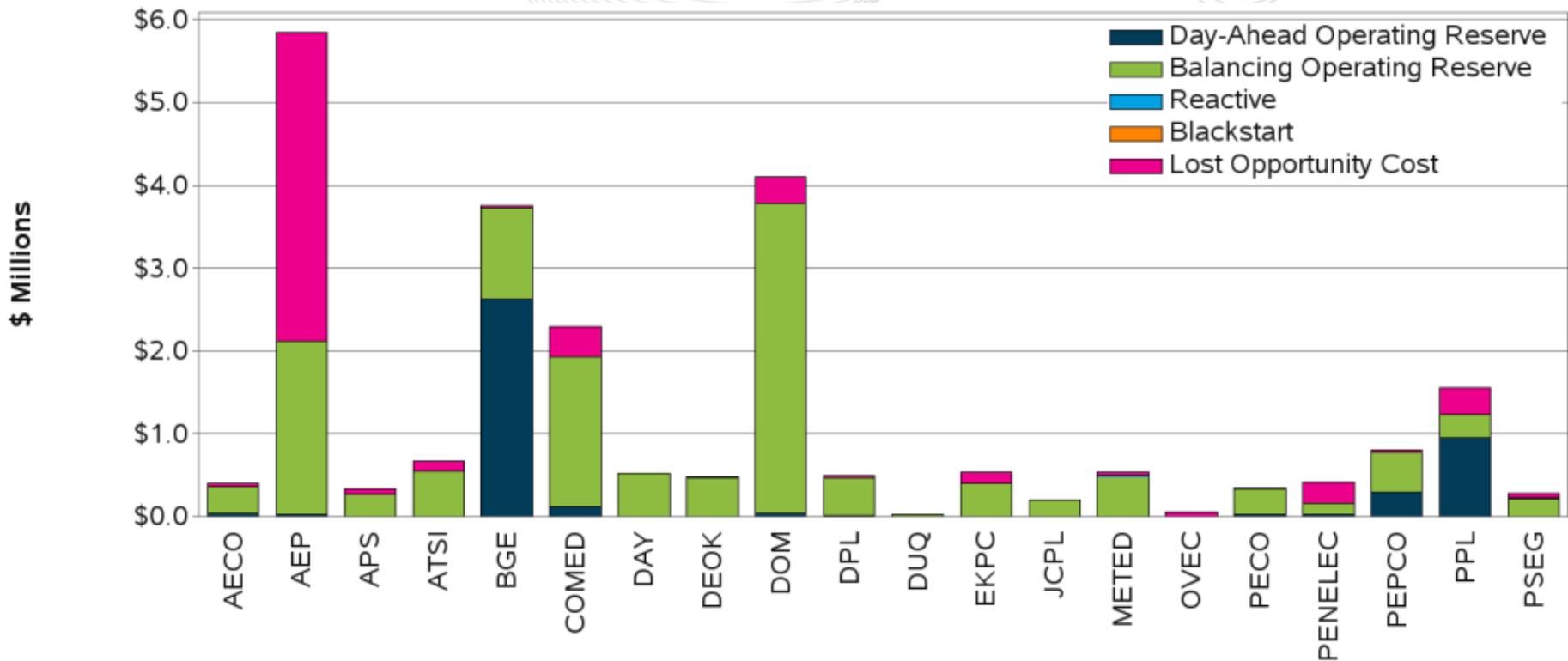


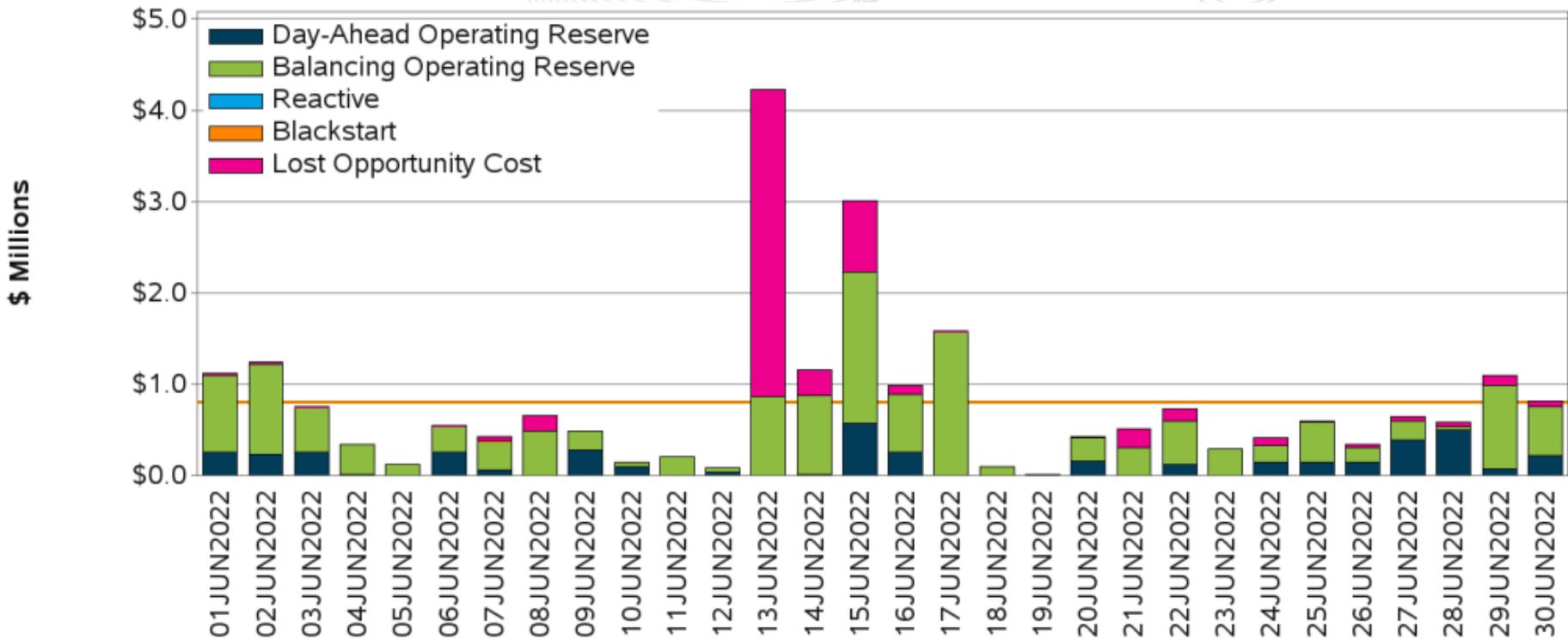
'Other' includes Flywheels, Multiple Fuels, Storage, and Other Renewables

Operating Reserve (Uplift)



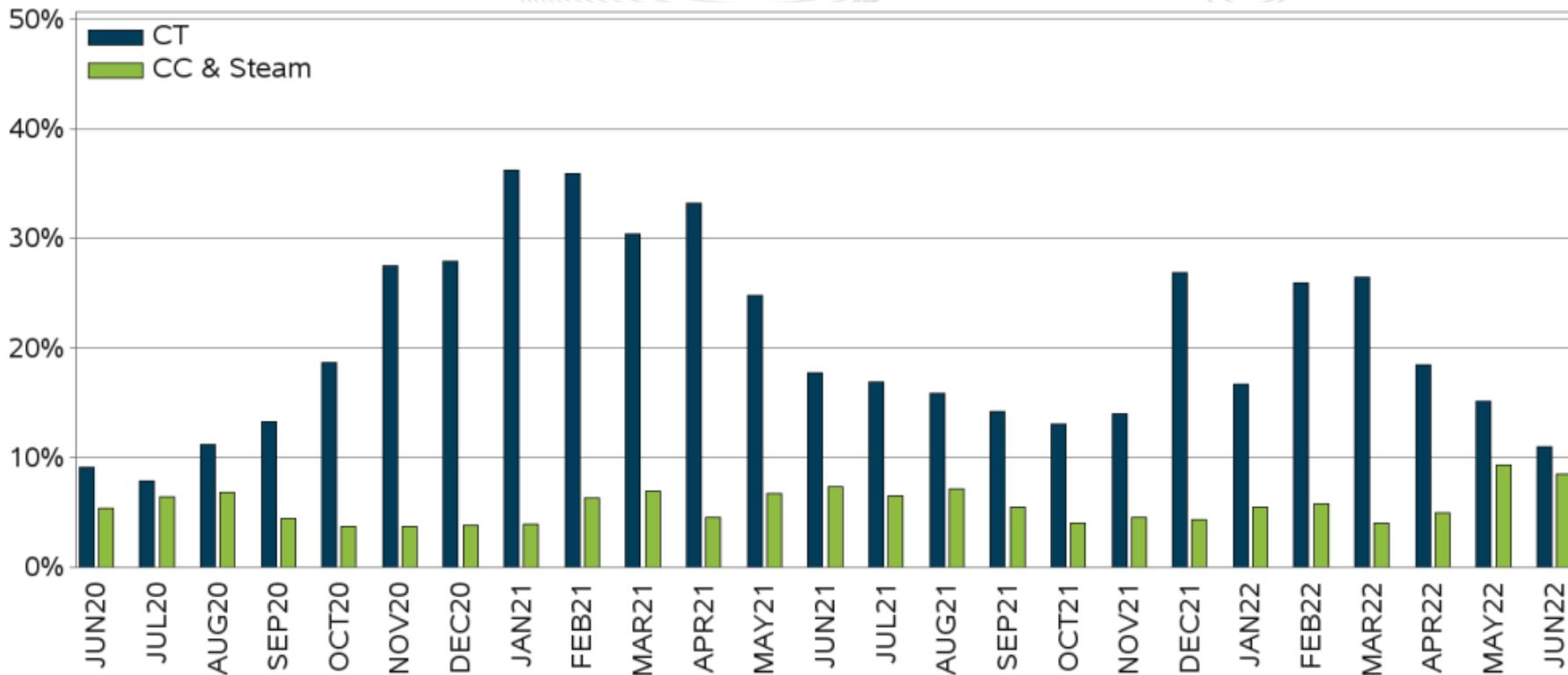




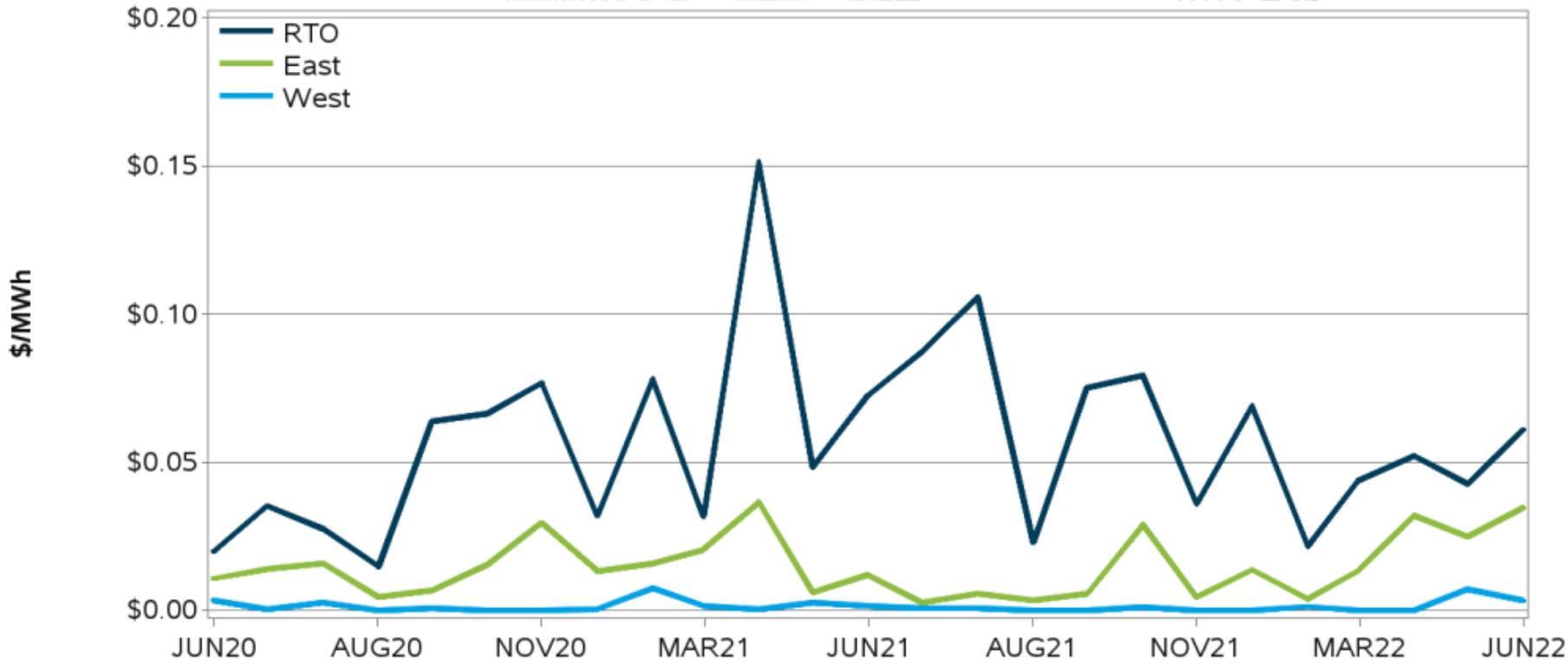


- In June, uplift exceeded \$800,000 on nine days -
- Contributing factors to uplift were:
- *Our reliability needs, compounded by the hot weather and forecast error as we transitioned to higher load days, were the primary drivers of uplift for June. For BOR, the volatility of localized congestion caused us to run CTs longer through the evening peaks. Additionally, we had quite a few high load days, some with unit trips that caused us to need to run more uneconomic CTs. For DA OR, the localized congestion limiting our north to south flows on smaller scale have been a big factor similar to the impact on the higher numbers we see on BOR. As for LOC, the majority of the LOC was from CTs which we could not run for constraints that materialized in Real Time.*
- More information on Uplift can be found on the PJM website at [Drivers of Uplift](#)

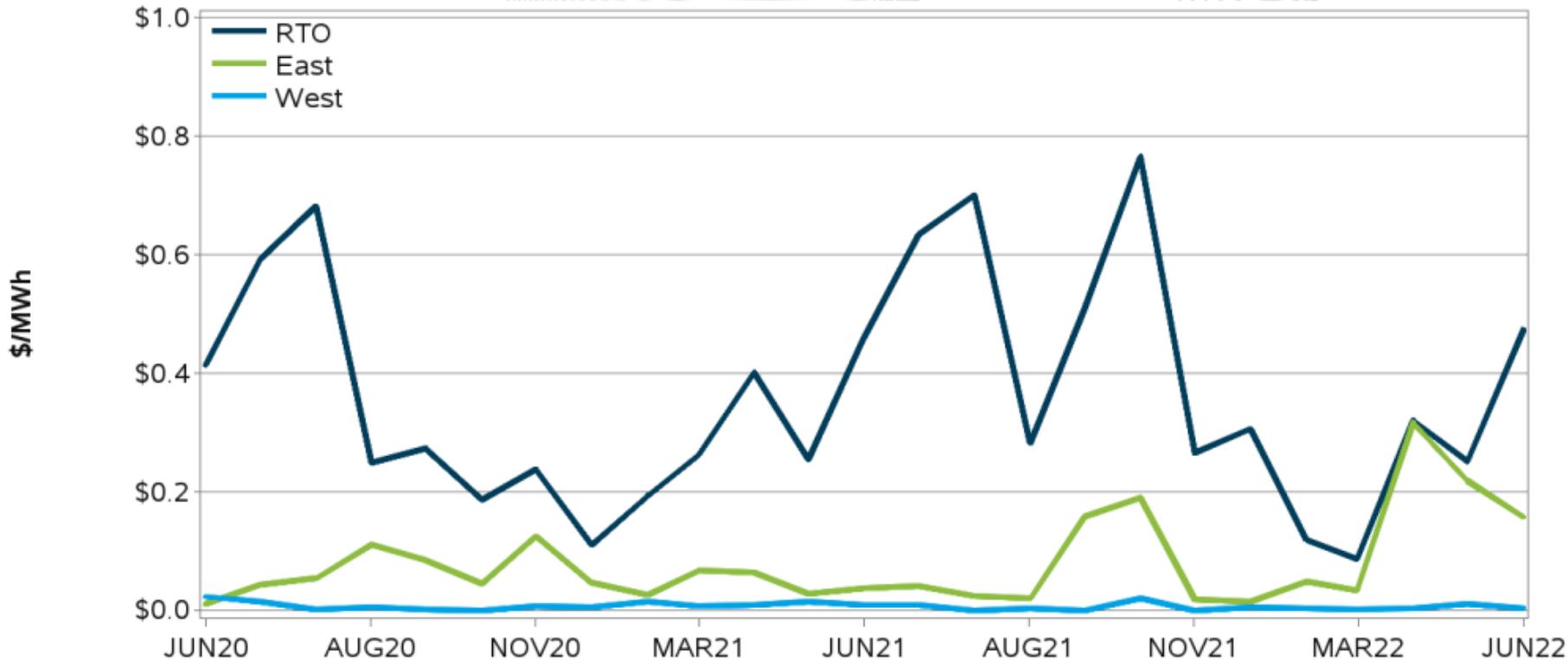
Percent of Total CT, CC and Steam Hours with LMP < Offer



- Beginning in December 2008, the daily Balancing Operating Reserves (BOR) rate was replaced with six different BOR rates: RTO BOR for Reliability Rate, RTO BOR for Deviations Rate, East BOR for Reliability Rate, East BOR for Deviations Rate, West BOR for Reliability Rate, West BOR for Deviations Rate.
- Reliability rates are charged to all real-time load and exports, whereas deviation rates, as before, are charged only to real-time deviations. RTO rates are charged to the whole footprint, whereas East and West rate adders are charged based on location.

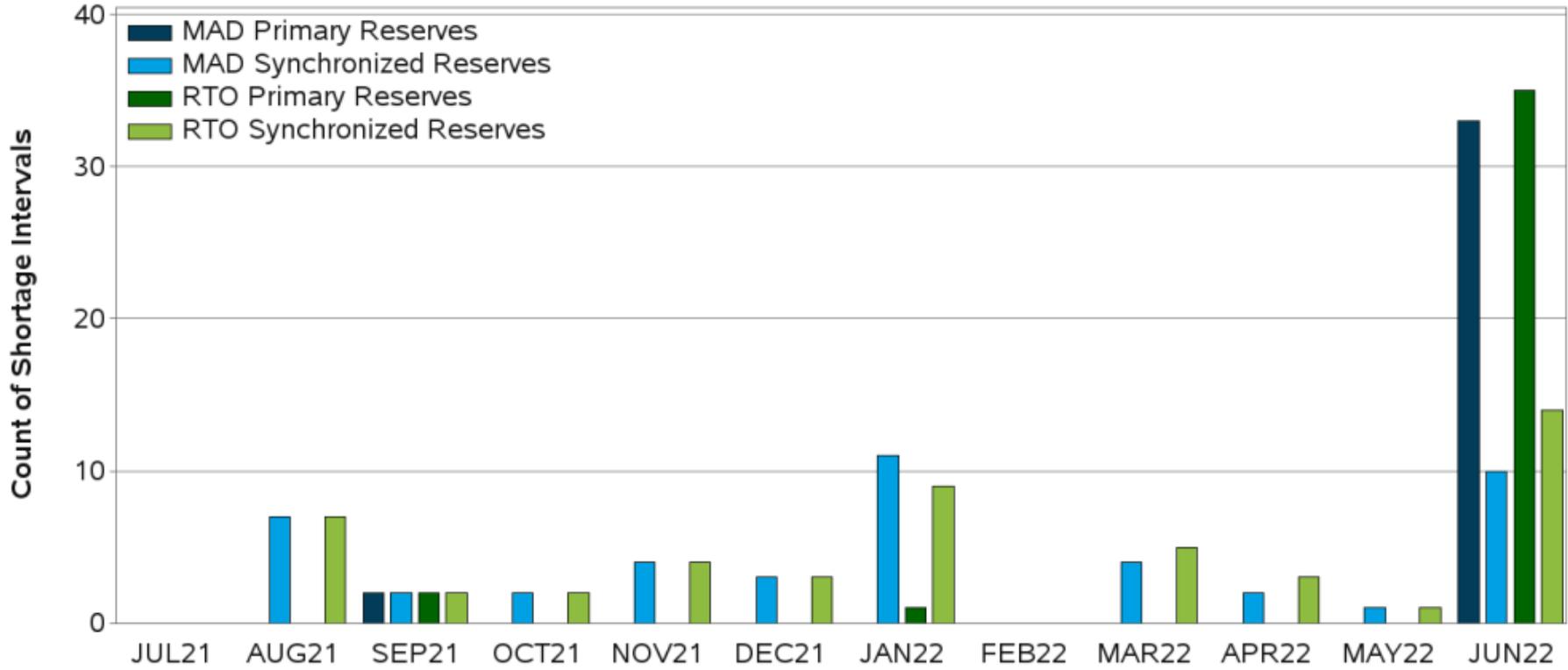


Deviations Balancing Operating Reserve Rates



Energy Market

LMP Summary



Date	5-Minute Interval	Reserve Penalty Factors	5-Minute Interval SMP	Hourly Integrated SMP
Monday, June 13, 2022	14:55 - 15:00	RTO Primary Reserves; MAD Primary Reserves	\$1,009.91	\$296.97
Monday, June 13, 2022	15:00 - 15:05	RTO Synchronized Reserves; RTO Primary Reserves; MAD Synchronized Reserves; MAD Primary Reserves	\$2,747.42	\$1,317.72
Monday, June 13, 2022	15:05 - 15:10	RTO Synchronized Reserves; RTO Primary Reserves; MAD Synchronized Reserves; MAD Primary Reserves	\$1,488.34	\$1,317.72
Monday, June 13, 2022	15:25 - 15:30	RTO Primary Reserves	\$701.87	\$1,317.72
Monday, June 13, 2022	15:30 - 15:35	RTO Primary Reserves	\$774.42	\$1,317.72
Monday, June 13, 2022	15:35 - 15:40	RTO Primary Reserves; MAD Primary Reserves	\$913.41	\$1,317.72
Monday, June 13, 2022	15:40 - 15:45	RTO Primary Reserves; MAD Primary Reserves	\$1,384.32	\$1,317.72
Monday, June 13, 2022	15:45 - 15:50	RTO Primary Reserves; MAD Primary Reserves	\$2,206.95	\$1,317.72
Monday, June 13, 2022	15:50 - 15:55	RTO Primary Reserves; MAD Primary Reserves	\$2,135.27	\$1,317.72
Monday, June 13, 2022	15:55 - 16:00	RTO Primary Reserves; MAD Primary Reserves	\$2,180.67	\$1,317.72
Monday, June 13, 2022	16:00 - 16:05	RTO Synchronized Reserves; RTO Primary Reserves; MAD Synchronized Reserves; MAD Primary Reserves	\$2,994.09	\$2,639.71
Monday, June 13, 2022	16:05 - 16:10	RTO Synchronized Reserves; RTO Primary Reserves; MAD Synchronized Reserves; MAD Primary Reserves	\$2,983.26	\$2,639.71

Date	5-Minute Interval	Reserve Penalty Factors	5-Minute Interval SMP	Hourly Integrated SMP
Monday, June 13, 2022	16:10 - 16:15	RTO Primary Reserves; MAD Primary Reserves	\$2,330.65	\$2,639.71
Monday, June 13, 2022	16:15 - 16:20	RTO Synchronized Reserves; RTO Primary Reserves; MAD Primary Reserves	\$2,644.56	\$2,639.71
Monday, June 13, 2022	16:20 - 16:25	RTO Primary Reserves; MAD Primary Reserves	\$2,325.88	\$2,639.71
Monday, June 13, 2022	16:25 - 16:30	RTO Synchronized Reserves; RTO Primary Reserves; MAD Synchronized Reserves; MAD Primary Reserves	\$3,079.63	\$2,639.71
Monday, June 13, 2022	16:30 - 16:35	RTO Synchronized Reserves; RTO Primary Reserves; MAD Synchronized Reserves; MAD Primary Reserves	\$3,124.70	\$2,639.71
Monday, June 13, 2022	16:35 - 16:40	RTO Synchronized Reserves; RTO Primary Reserves; MAD Primary Reserves	\$2,598.24	\$2,639.71
Monday, June 13, 2022	16:40 - 16:45	RTO Primary Reserves; MAD Primary Reserves	\$2,076.97	\$2,639.71
Monday, June 13, 2022	16:45 - 16:50	RTO Synchronized Reserves; RTO Primary Reserves; MAD Synchronized Reserves; MAD Primary Reserves	\$3,045.75	\$2,639.71
Monday, June 13, 2022	16:50 - 16:55	RTO Synchronized Reserves; RTO Primary Reserves; MAD Primary Reserves	\$2,605.72	\$2,639.71
Monday, June 13, 2022	16:55 - 17:00	RTO Primary Reserves; MAD Primary Reserves	\$1,912.79	\$2,639.71
Monday, June 13, 2022	17:00 - 17:05	RTO Primary Reserves; MAD Primary Reserves	\$1,609.78	\$1,586.15

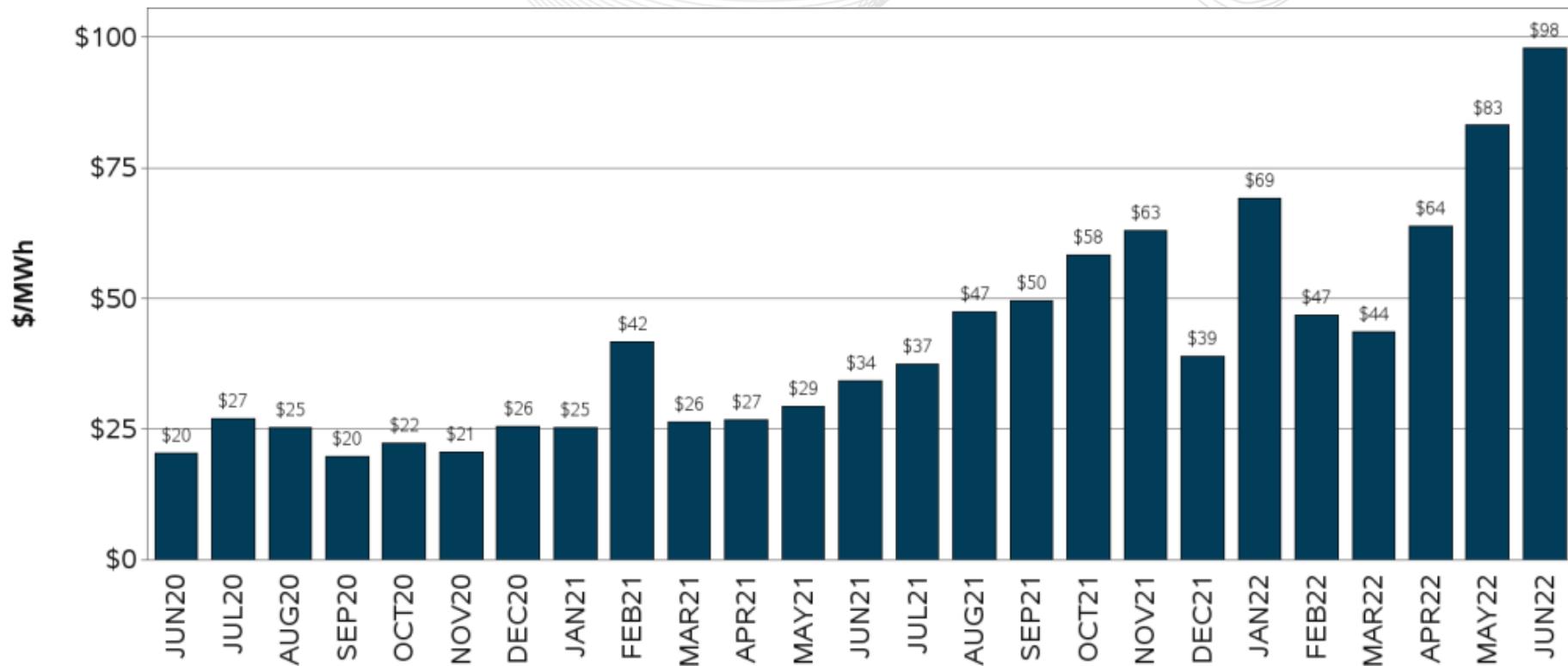
Date	5-Minute Interval	Reserve Penalty Factors	5-Minute Interval SMP	Hourly Integrated SMP
Monday, June 13, 2022	17:05 - 17:10	RTO Primary Reserves; MAD Primary Reserves	\$2,064.39	\$1,586.15
Monday, June 13, 2022	17:10 - 17:15	RTO Primary Reserves; MAD Primary Reserves	\$726.66	\$1,586.15
Monday, June 13, 2022	17:15 - 17:20	RTO Primary Reserves; MAD Primary Reserves	\$1,301.03	\$1,586.15
Monday, June 13, 2022	17:20 - 17:25	RTO Primary Reserves; MAD Primary Reserves	\$1,301.03	\$1,586.15
Monday, June 13, 2022	17:25 - 17:30	RTO Primary Reserves; MAD Primary Reserves	\$1,255.02	\$1,586.15
Monday, June 13, 2022	17:30 - 17:35	RTO Primary Reserves; MAD Primary Reserves	\$1,872.07	\$1,586.15
Monday, June 13, 2022	17:35 - 17:40	RTO Primary Reserves; MAD Primary Reserves	\$1,875.51	\$1,586.15
Monday, June 13, 2022	17:40 - 17:45	RTO Primary Reserves; MAD Primary Reserves	\$1,880.32	\$1,586.15
Monday, June 13, 2022	17:45 - 17:50	RTO Synchronized Reserves; RTO Primary Reserves; MAD Synchronized Reserves; MAD Primary Reserves	\$2,556.89	\$1,586.15
Monday, June 13, 2022	17:50 - 17:55	RTO Primary Reserves; MAD Primary Reserves	\$1,920.32	\$1,586.15
Monday, June 13, 2022	17:55 - 18:00	RTO Primary Reserves; MAD Primary Reserves	\$697.83	\$1,586.15
Monday, June 13, 2022	18:00 - 18:05	RTO Primary Reserves; MAD Primary Reserves	\$1,839.79	\$398.59
Monday, June 27, 2022	17:05 - 17:10	RTO Synchronized Reserves; MAD Synchronized Reserves	\$1,650.84	\$338.15

Date	5-Minute Interval	Reserve Penalty Factors	5-Minute Interval SMP	Hourly Integrated SMP
Monday, June 27, 2022	17:10 - 17:15	RTO Synchronized Reserves	\$695.34	\$338.15
Wednesday, June 29, 2022	16:30 - 16:35	RTO Synchronized Reserves; MAD Synchronized Reserves	\$1,099.05	\$203.08

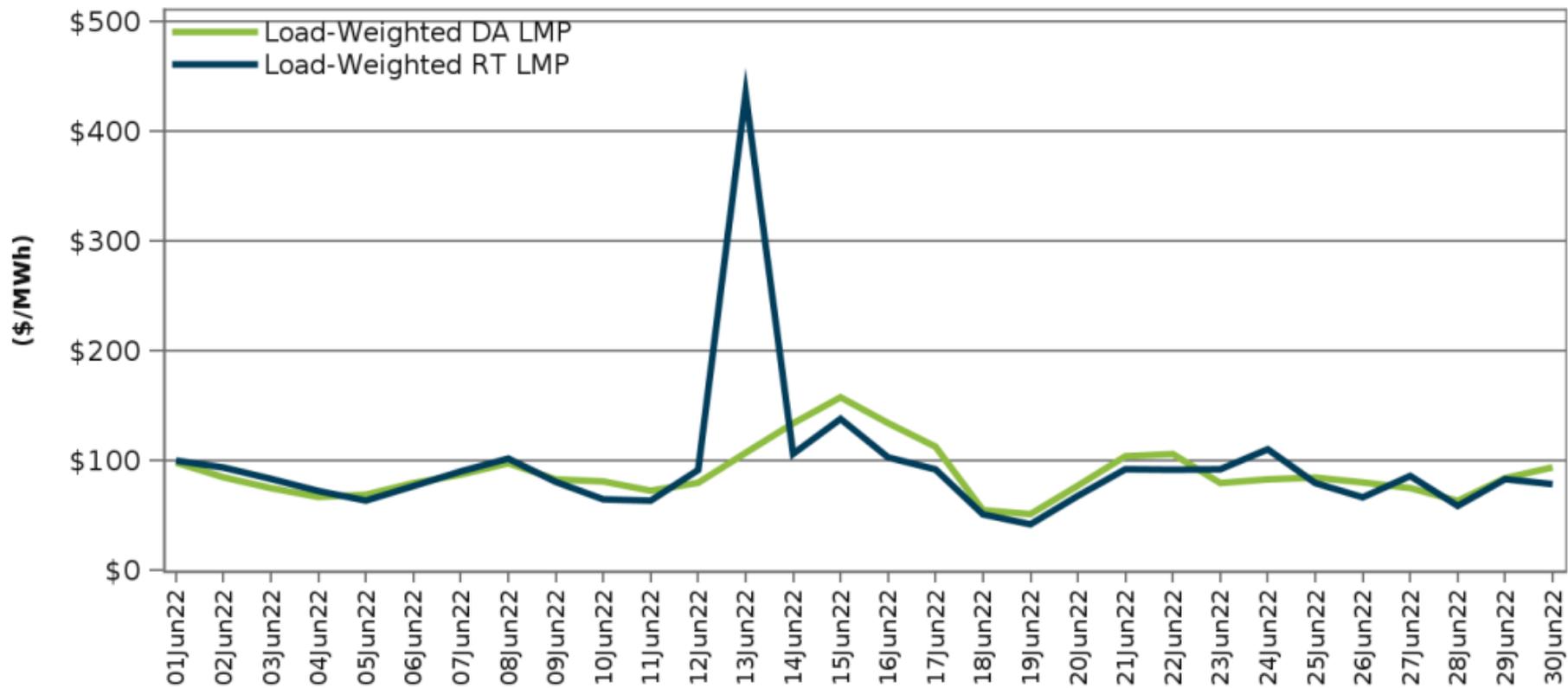
Information on constraints and shadow prices can be found here:

http://dataminer2.pjm.com/feed/rt_marginal_value

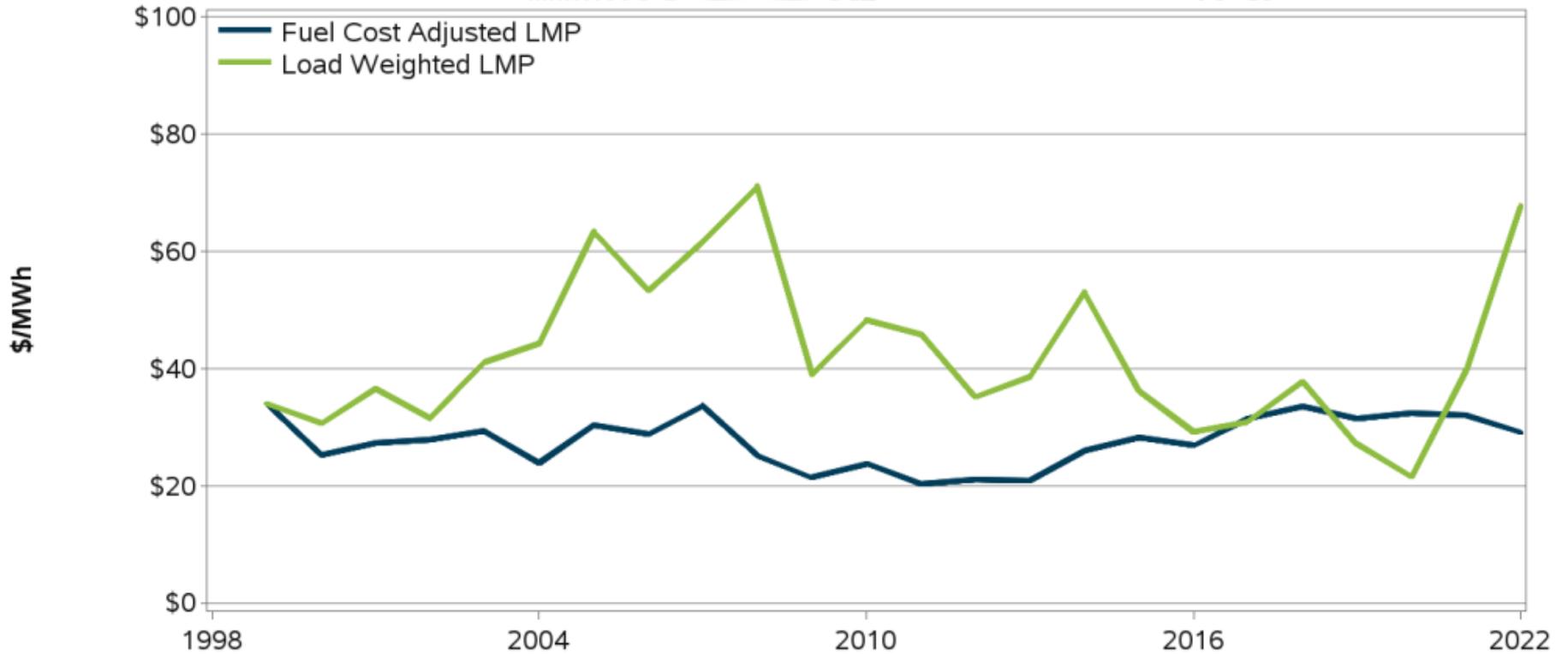
Monthly Load-Weighted Average Real-time LMP

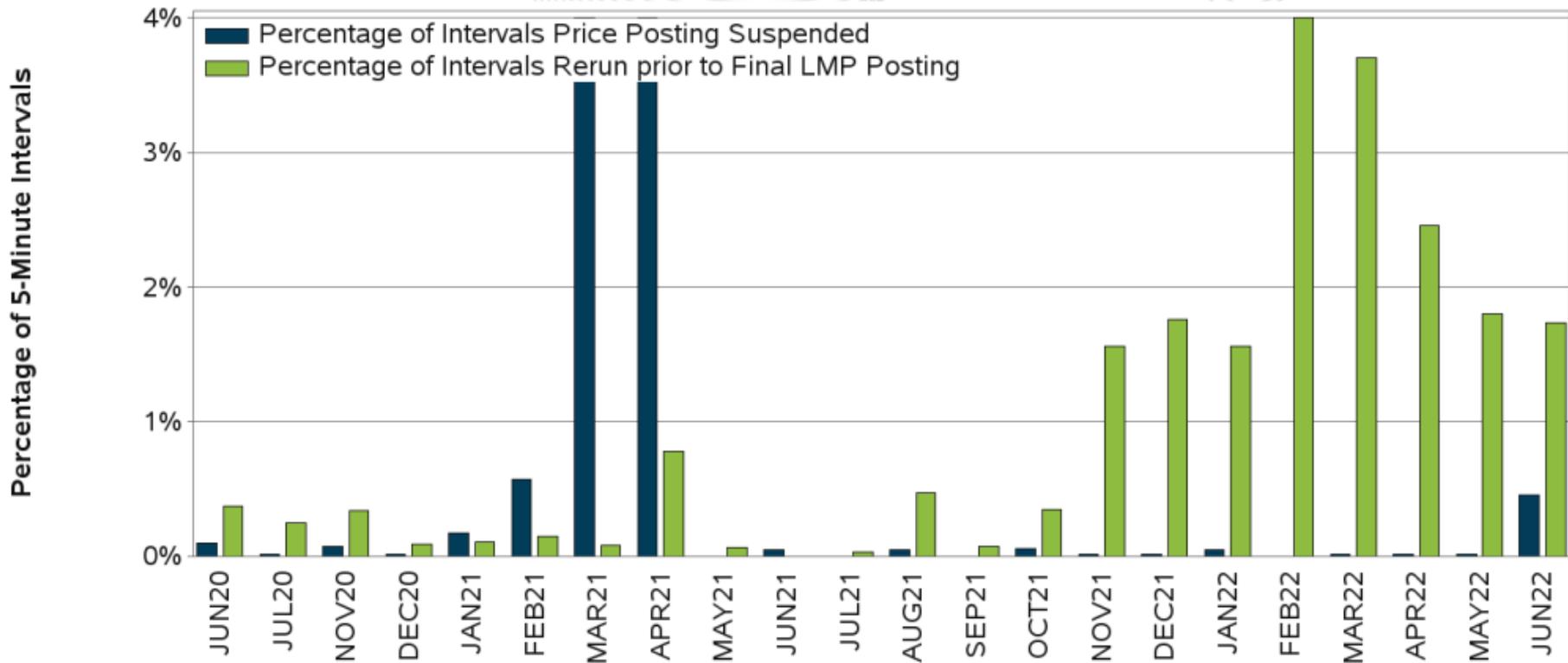


Daily Load-Weighted Average DA & RT LMP



Fuel Cost Adjusted LMP (Referenced to 1999 Fuel Prices)

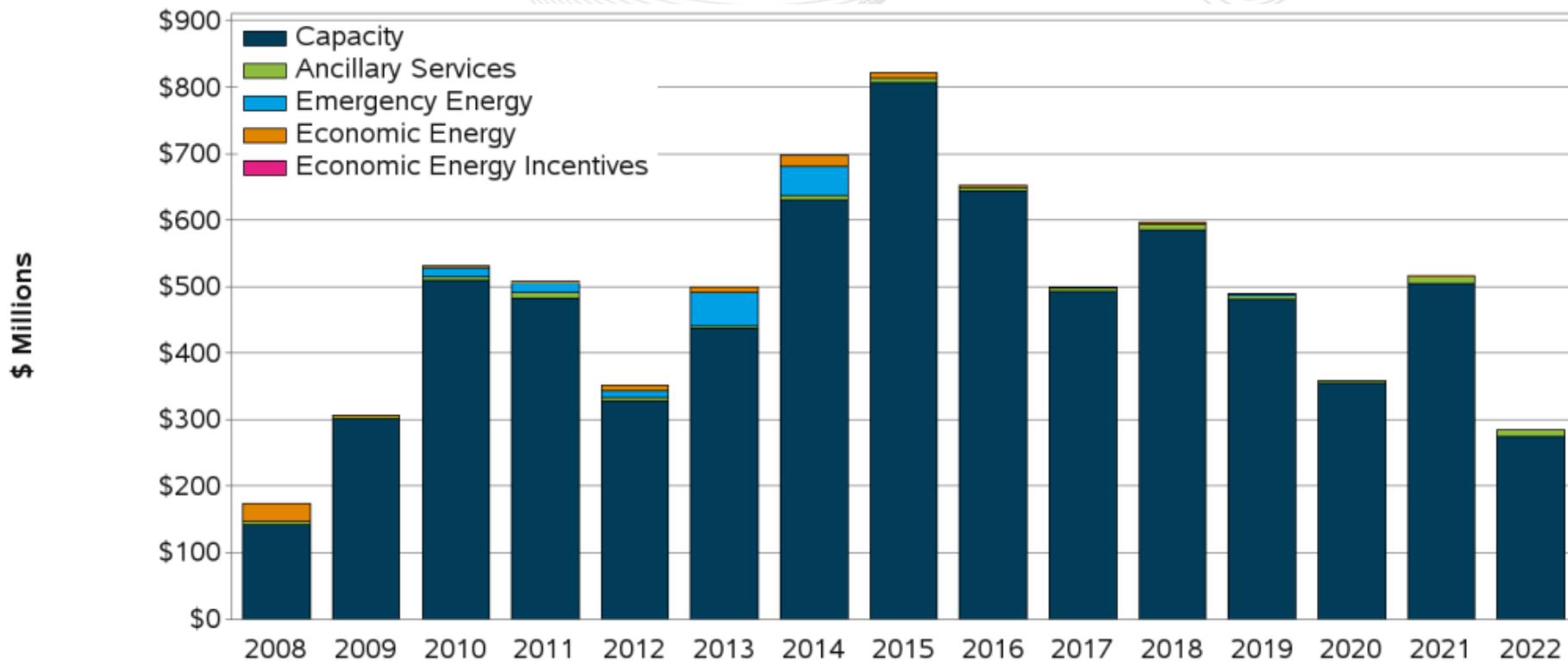


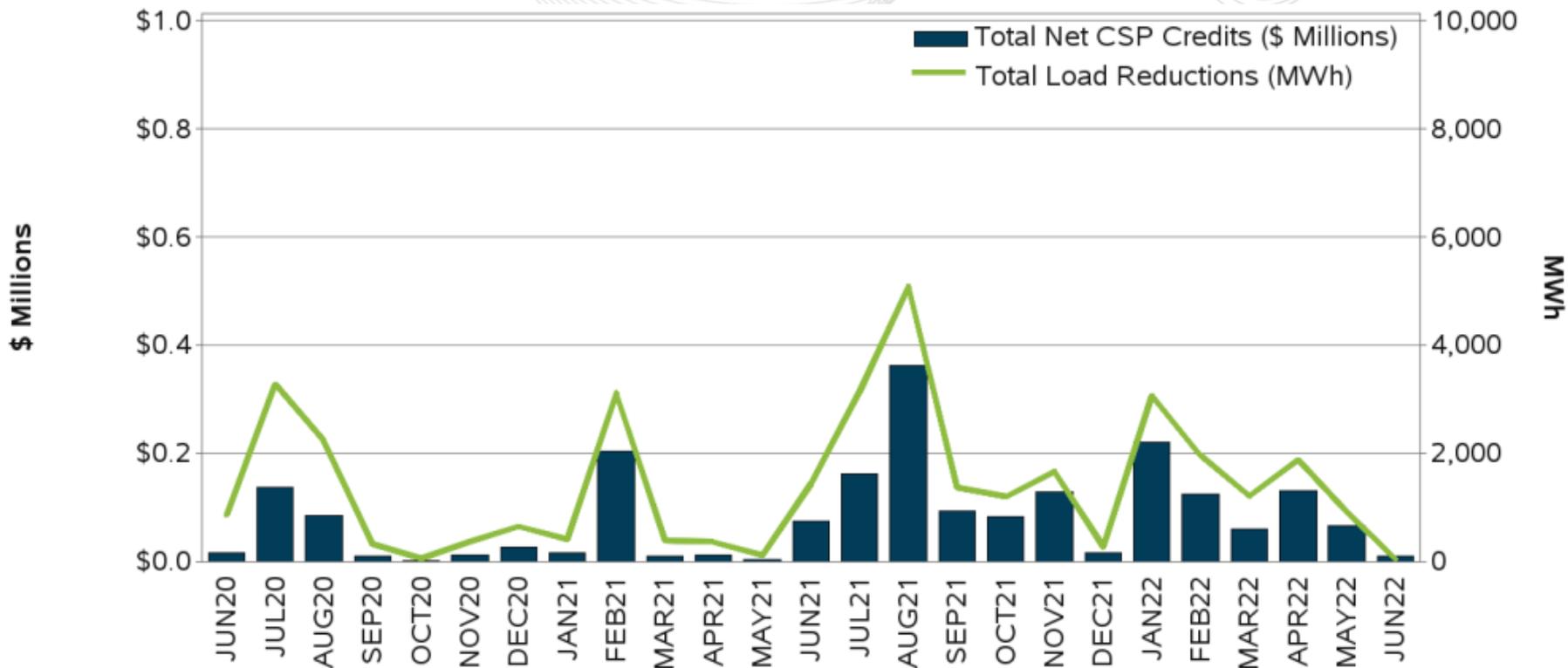


Spikes seen in March and April 2021 are incorrect and due to a software bug which has since been fixed.

Energy Market

Demand Response Summary





*Data for the last few months are subject to significant change due to the settlement window.



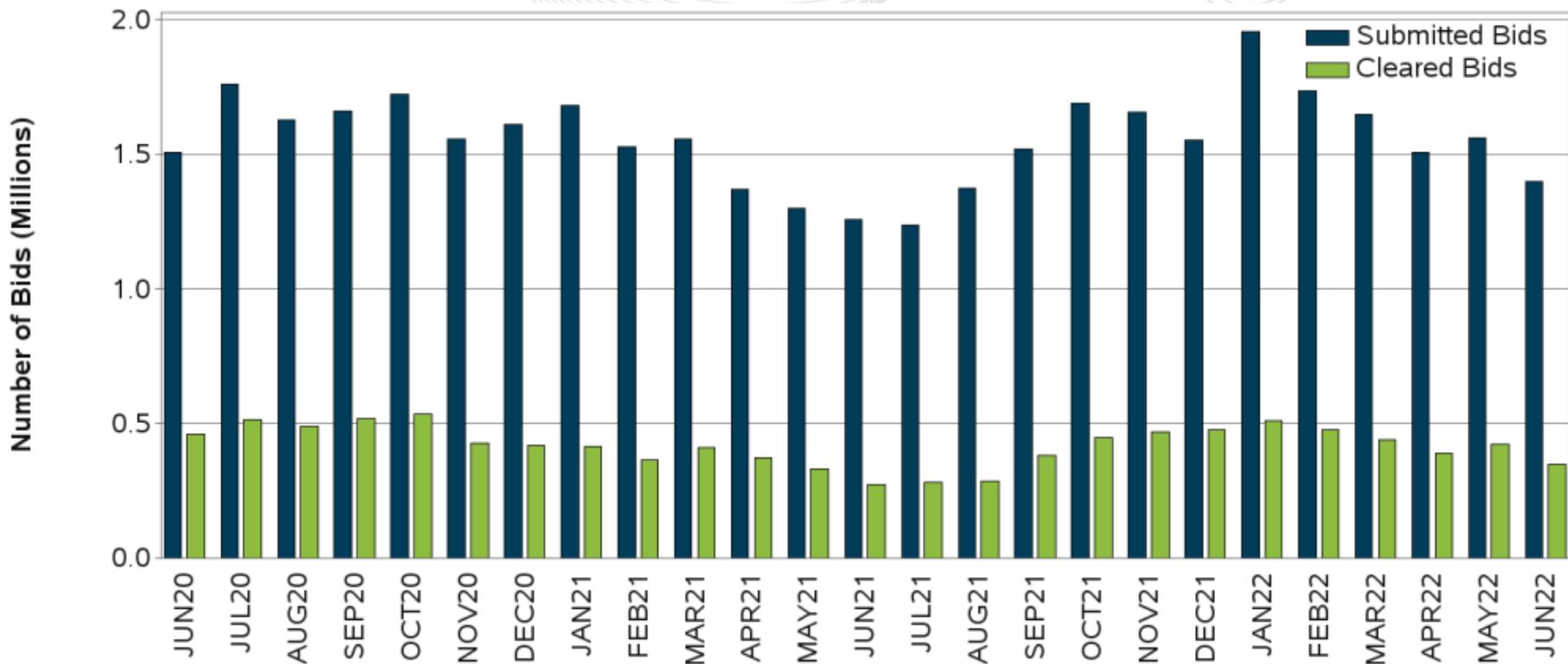
Total Registered MW in PJM's Economic Demand Response

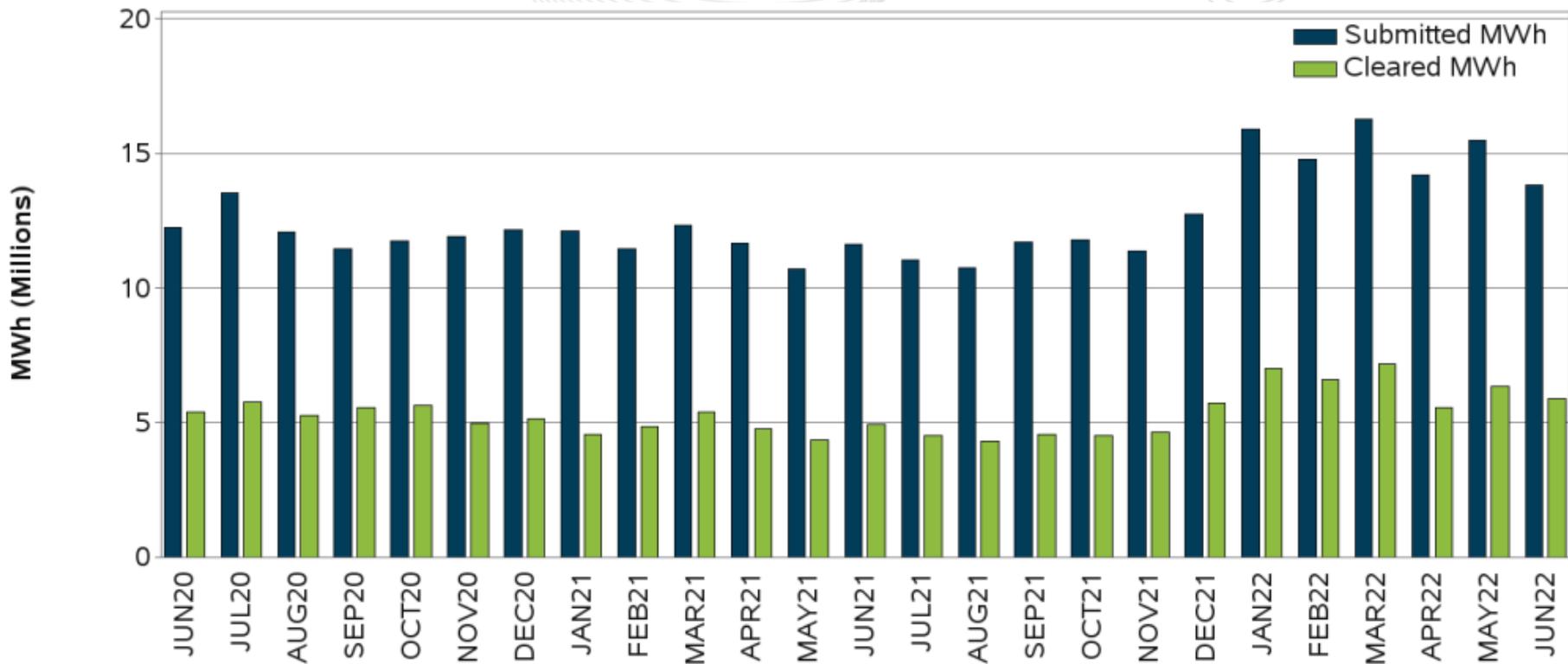


Energy Market

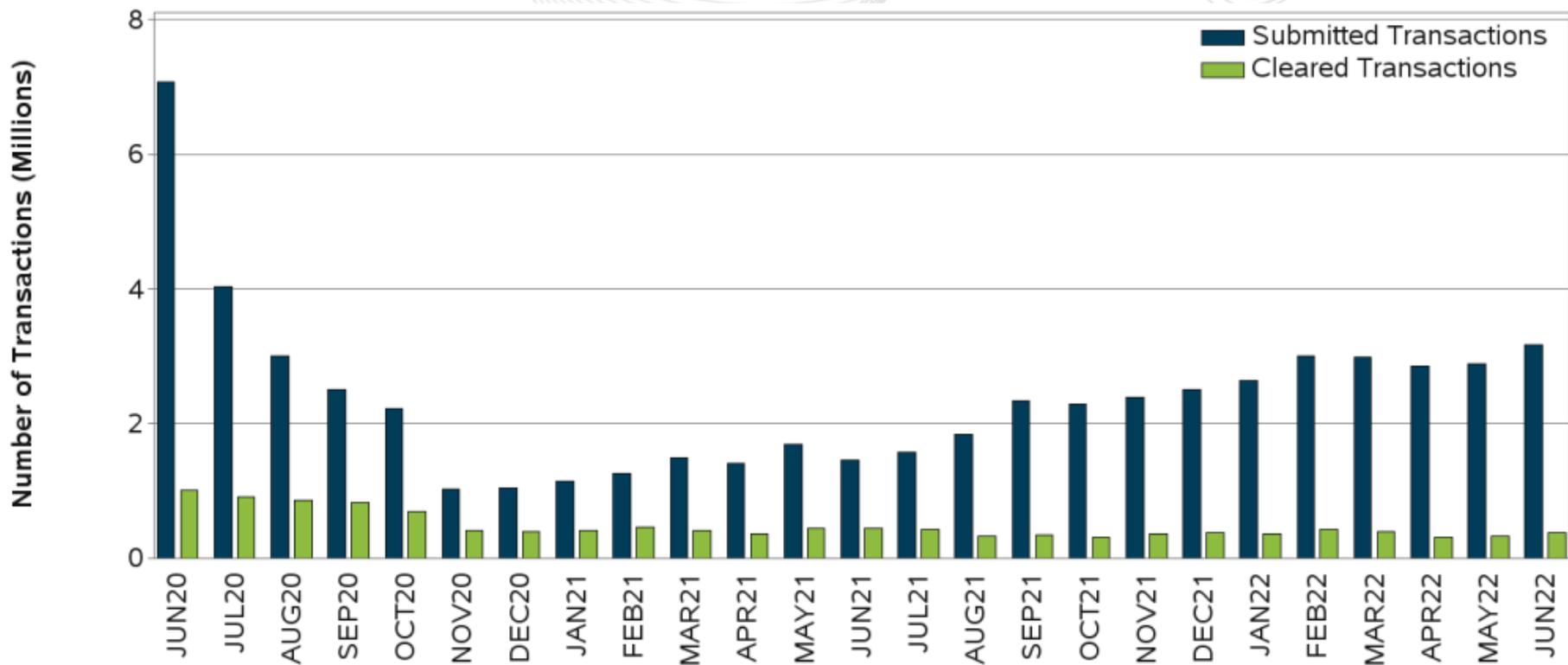
Virtual Activity Summary

- The following six charts depict trends in submitted and cleared virtual and up-to-congestion transactions, in terms of number and volume, into the PJM Energy Market. The first two of these charts show the submitted and cleared increment and decrement bids (virtual transactions or virtuals) and they are the same as what was previously being presented in this report. The two charts after them display the trends in submitted and cleared up-to-congestion transactions into the PJM Energy Market. The last two of these six charts combine the virtual and up-to-congestion transactions and show the sum of these two categories.
- To clarify what a bid or transaction is, please consider the following example: An offer (increment, decrement or up-to-congestion) of 10 MW, valid for eight hours for a given day, is captured in the charts as eight submitted bids/transactions and 80 submitted MWh. If this offer fully clears for three of the hours it was submitted for, it shows in the charts as three cleared bids/transactions and 30 cleared MWh.

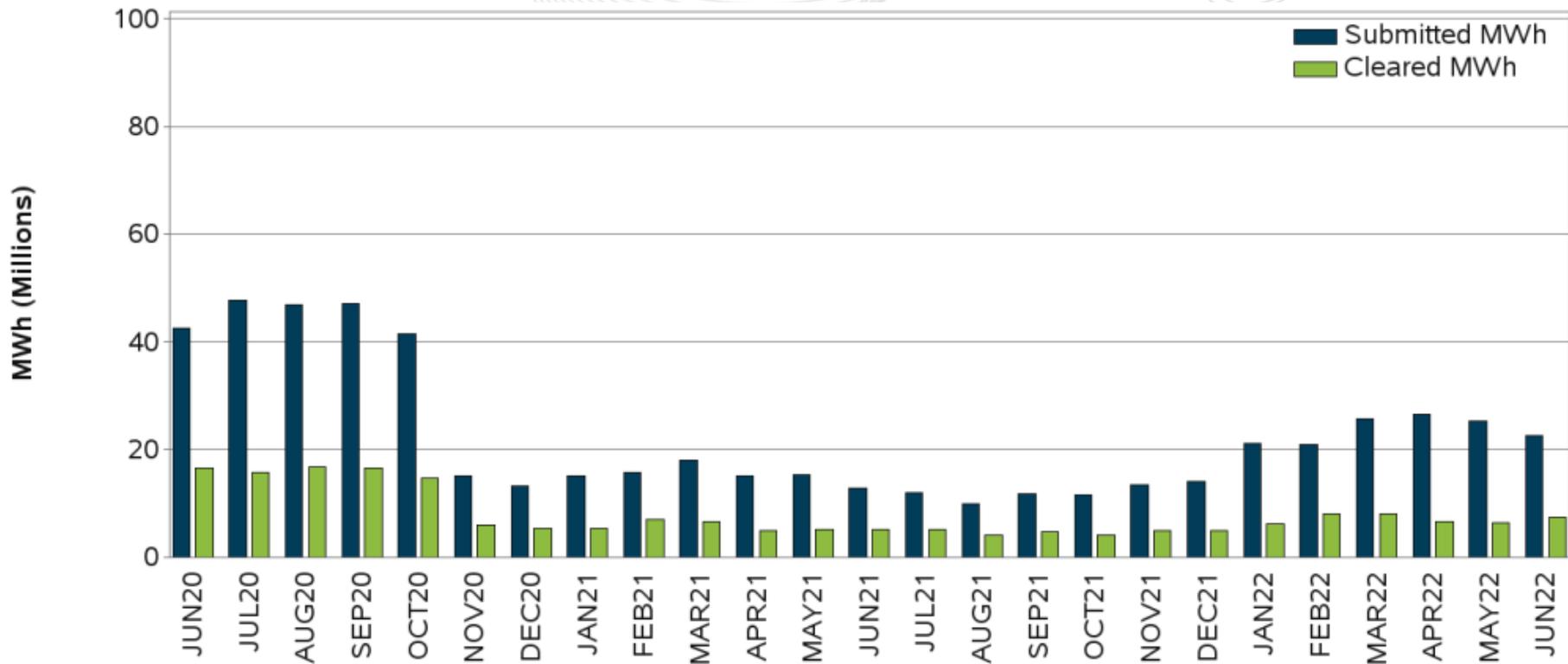




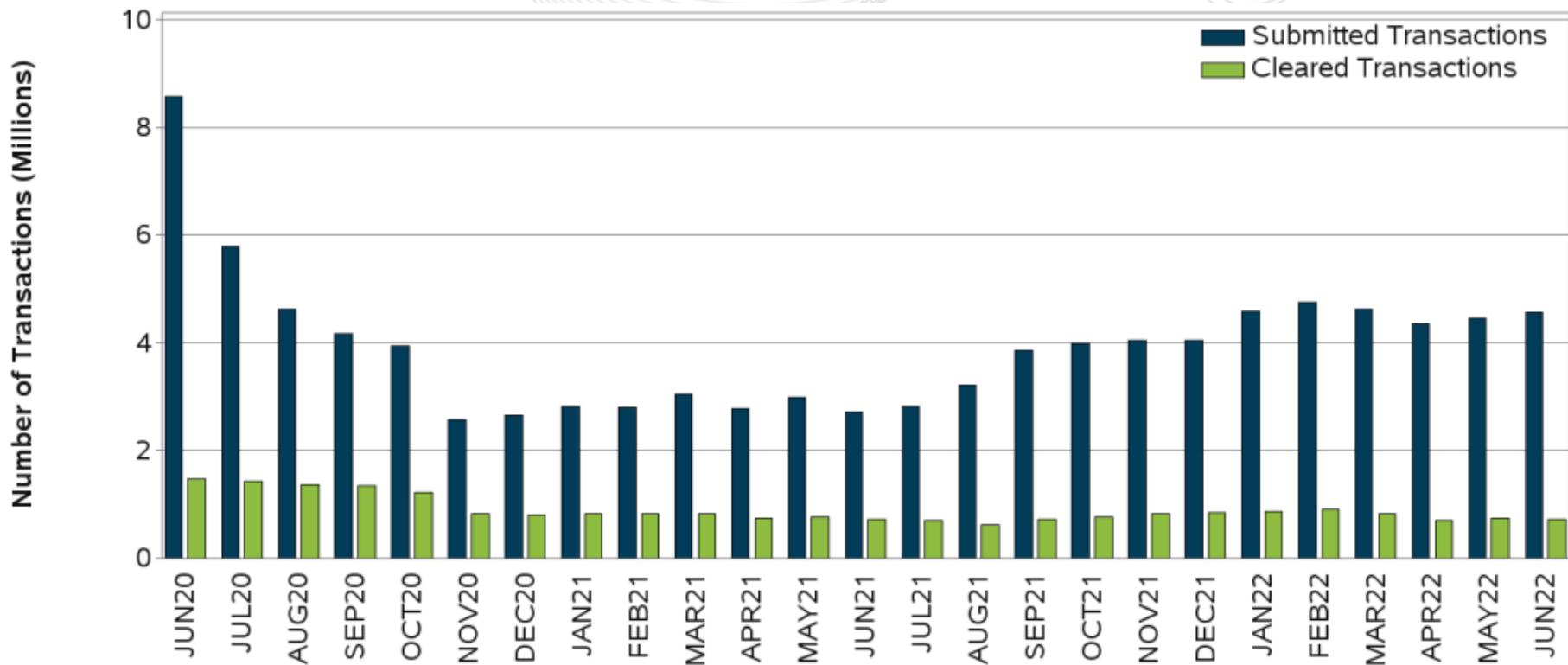
Up-To-Congestion Transactions - Total Number



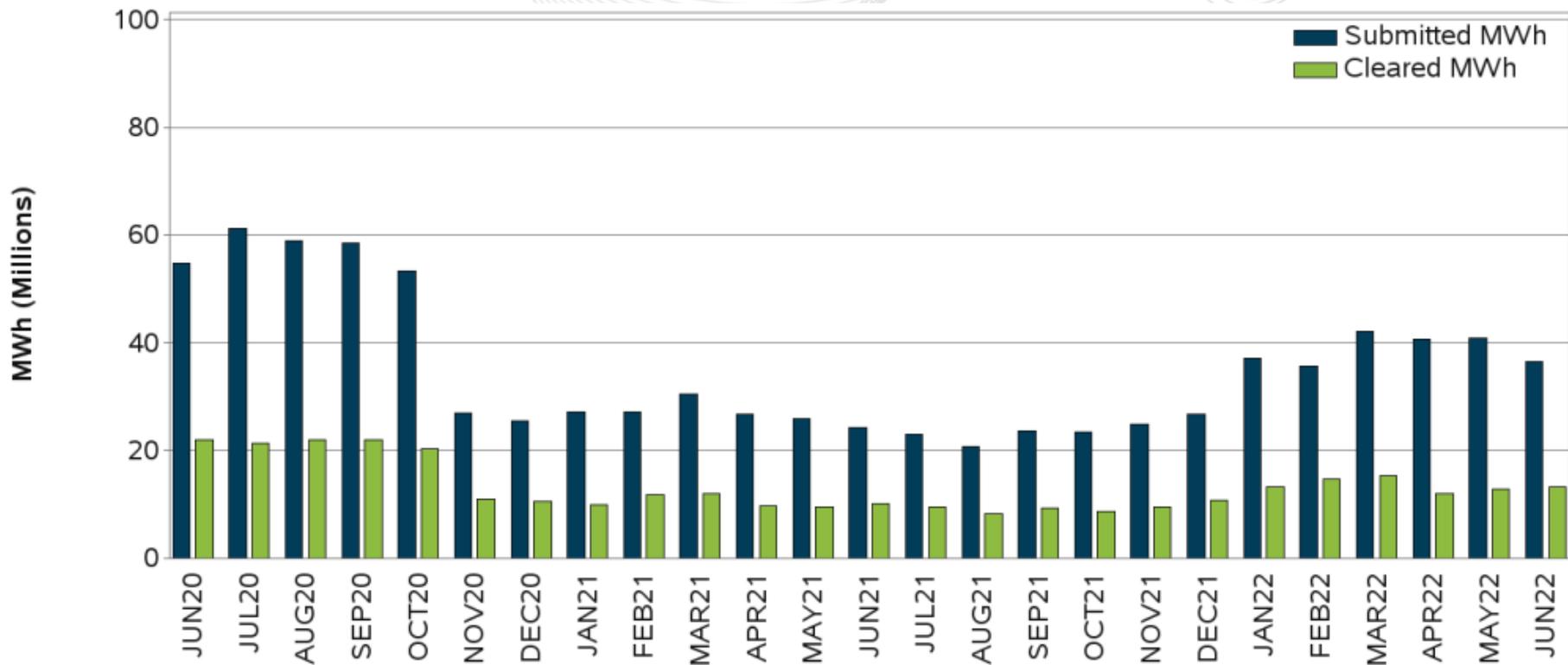
Up-To-Congestion Transactions - Total Volume



INCs, DECIs and Up-To-Congestion Transactions - Total Number



INCs, DEC and Up-To-Congestion Transactions - Total Volume

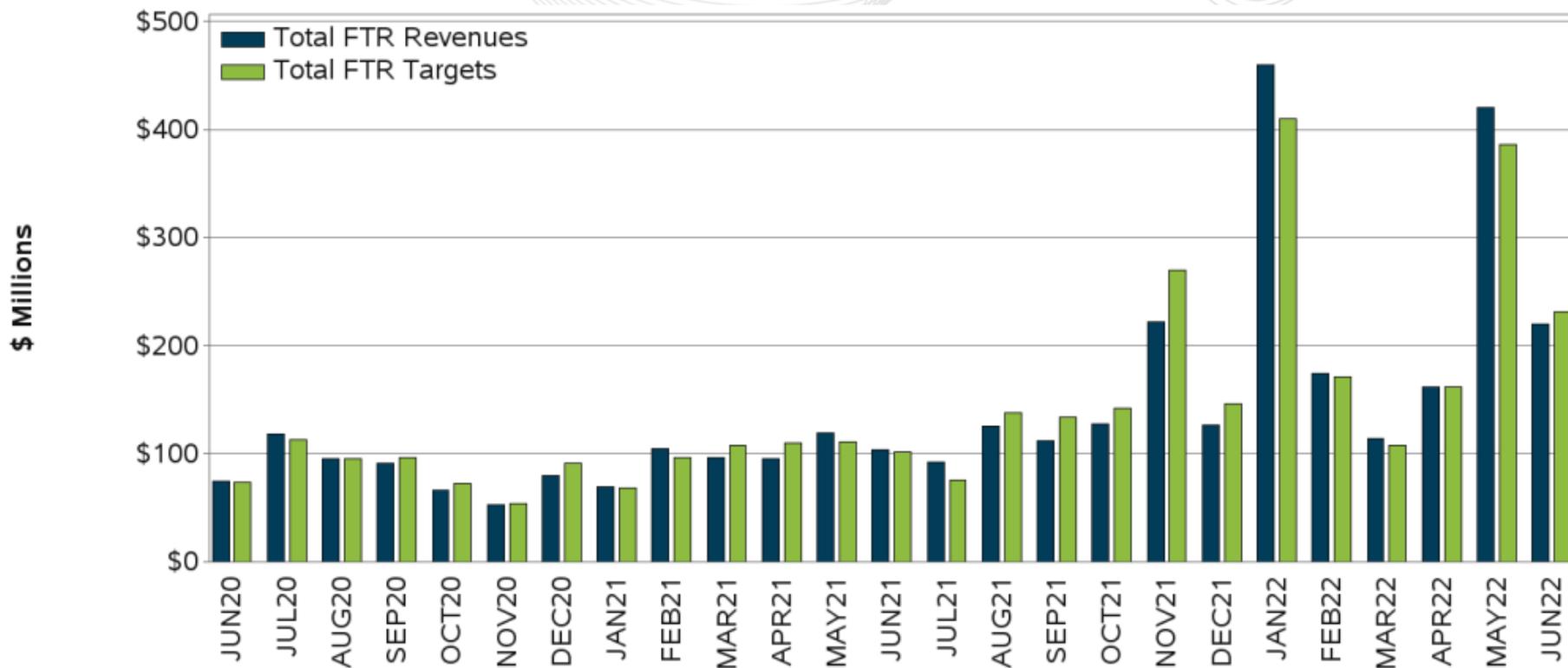


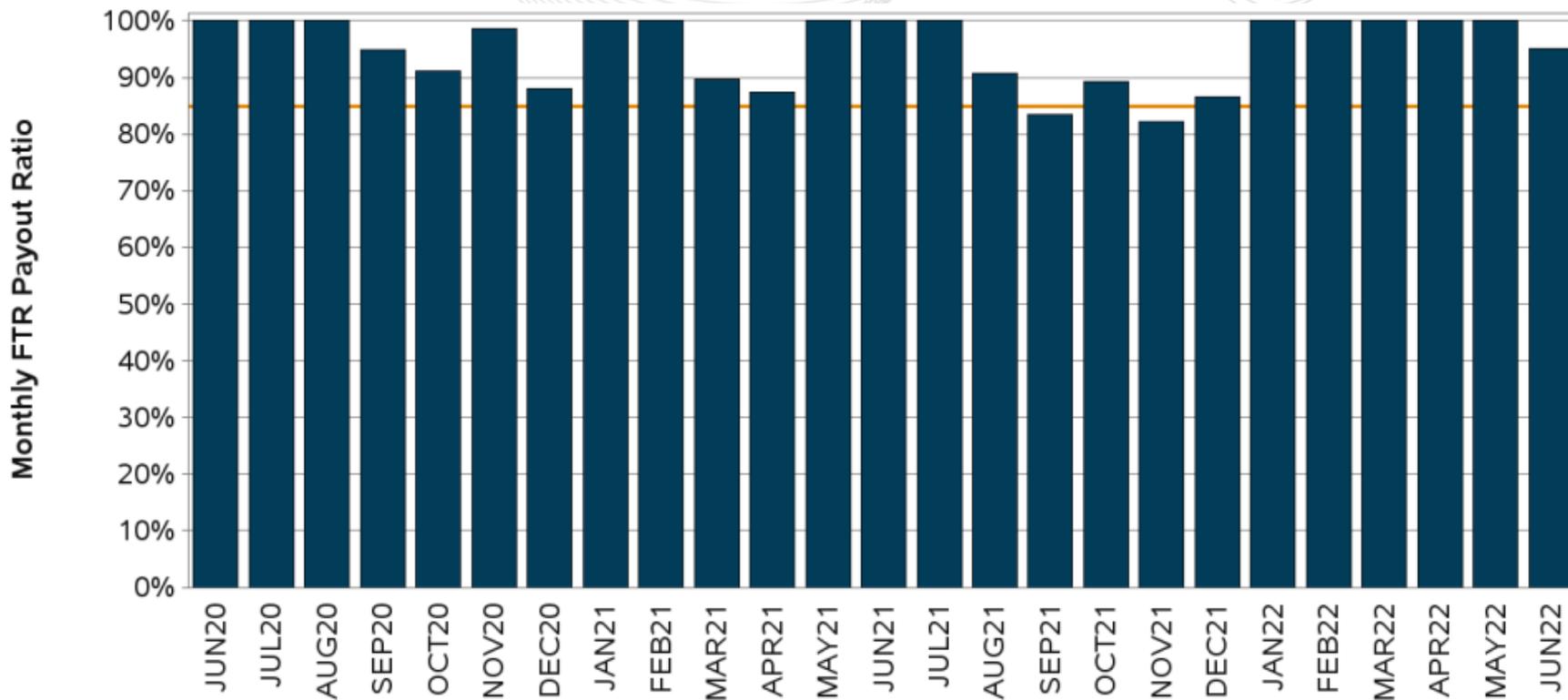
Energy Market

Congestion and FTR Summary

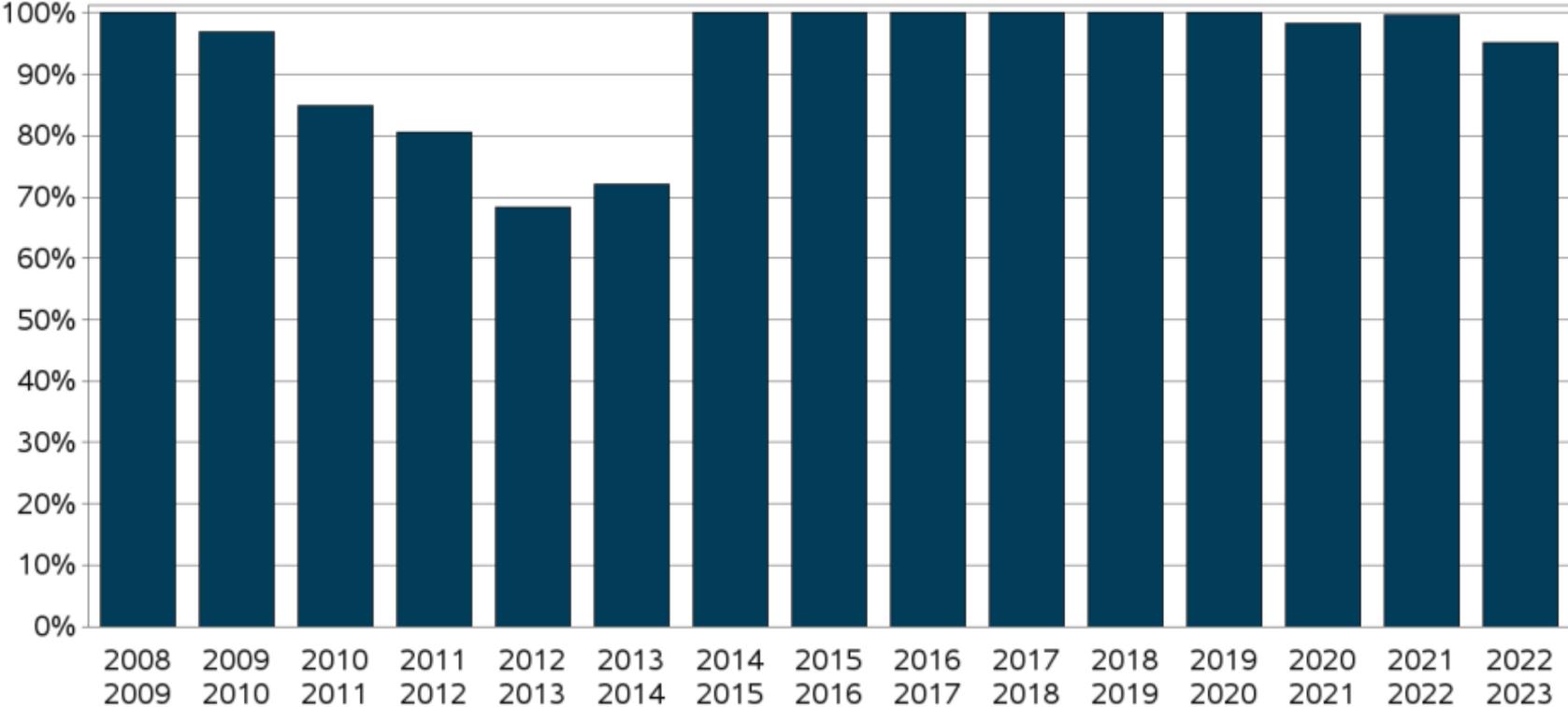
Period	Surplus / Underfunding	Payout Ratio
June 2022	\$-11,318,859	95%
2022	\$82,787,162	100%
2022/2023	\$-11,318,859	95%

FTR Revenue vs. FTR Target Allocation

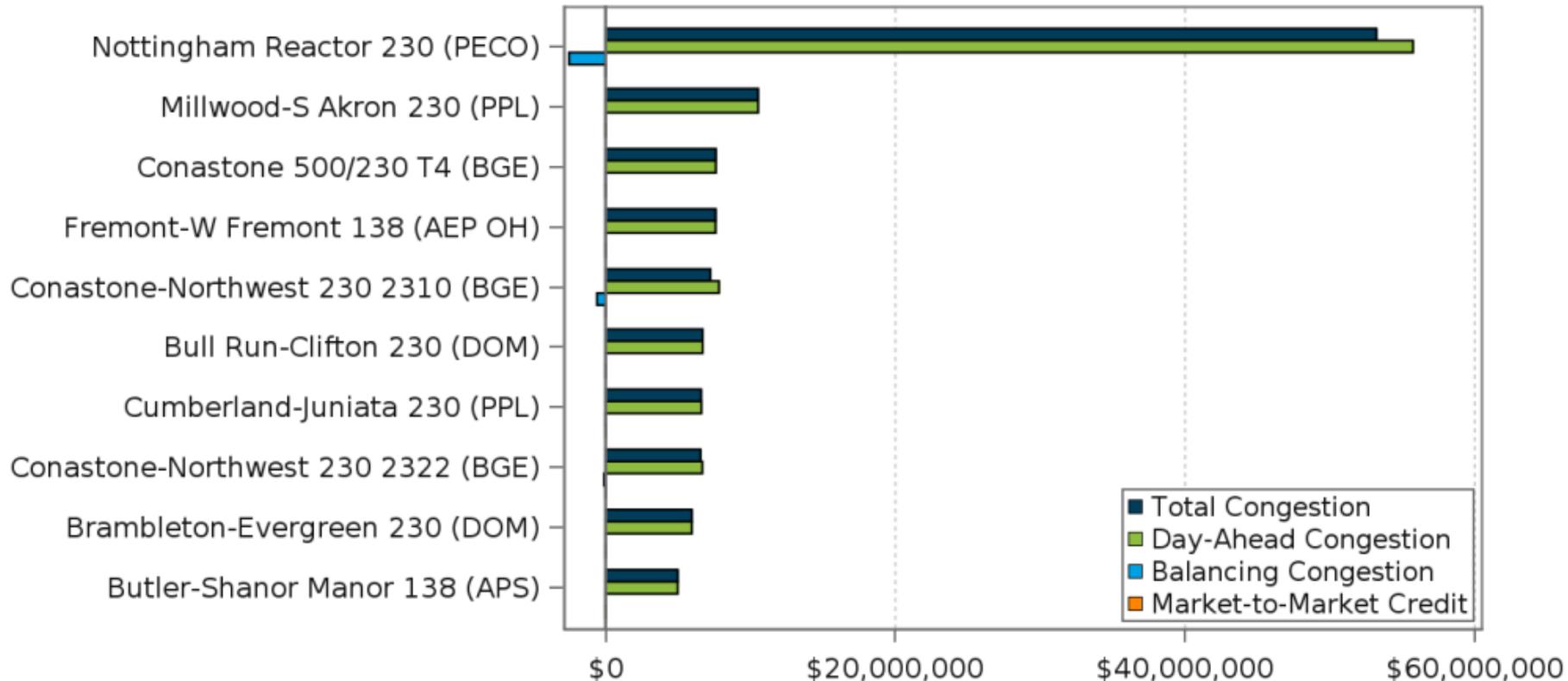




Planning Period FTR Payout Ratio

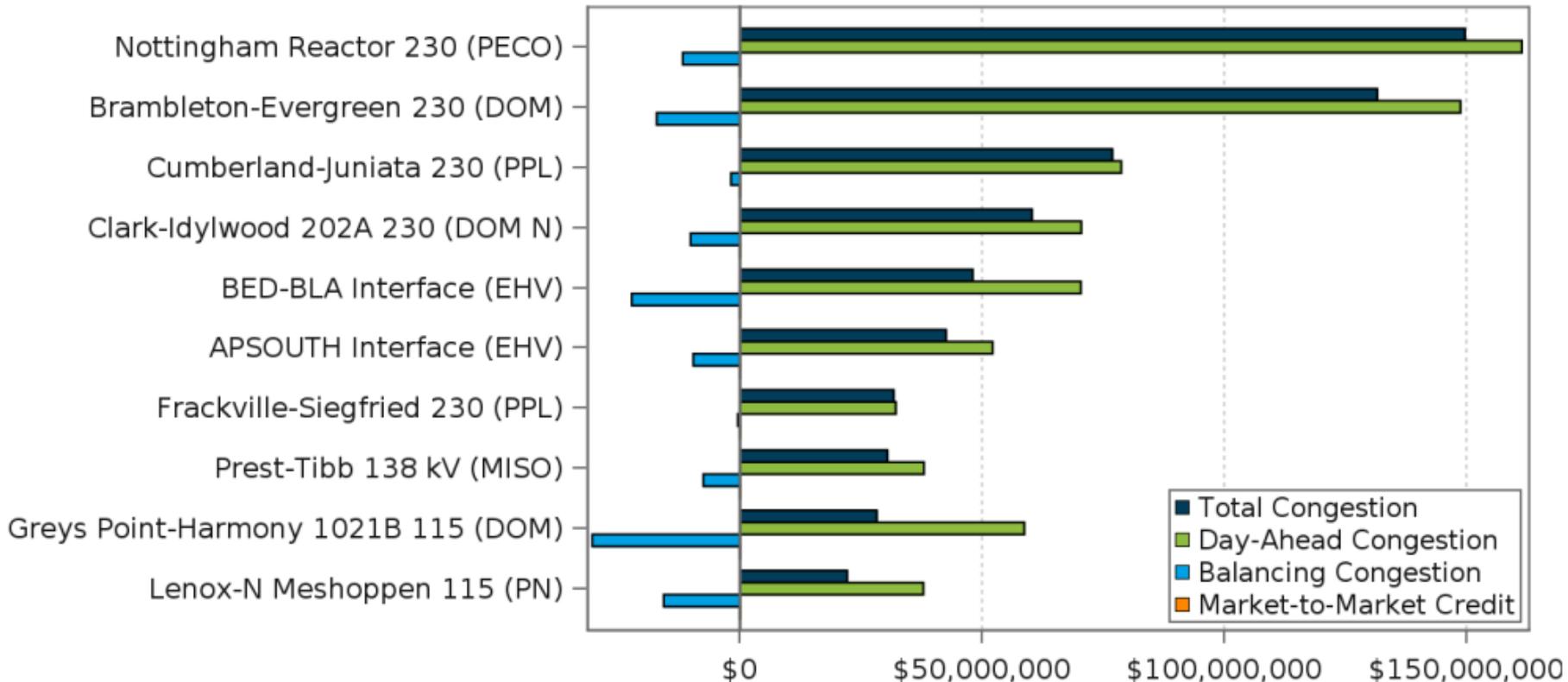


Ten Most Heavily Congested Transmission Facilities - Overall, June



The ten most heavily congested facilities account for 67% of total congestion for June.

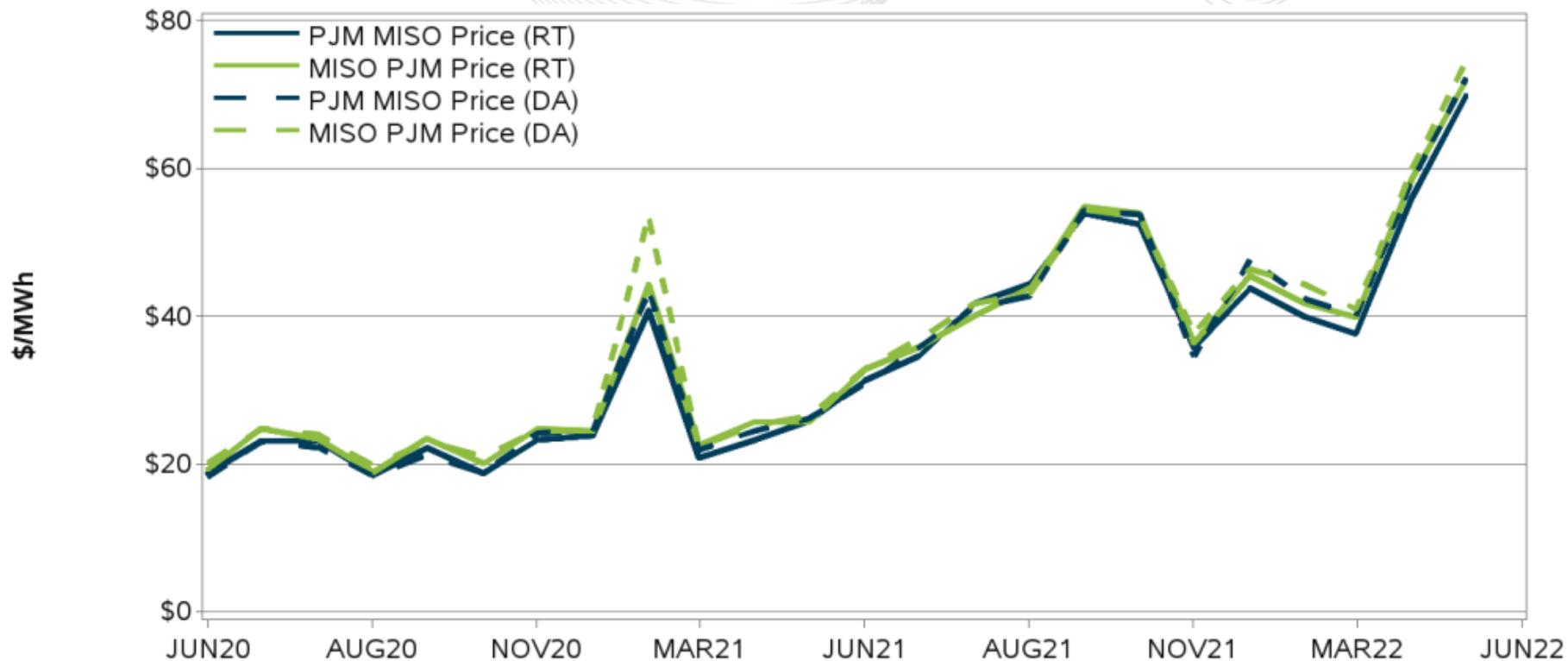
Ten Most Heavily Congested Transmission Facilities - Overall, 2022

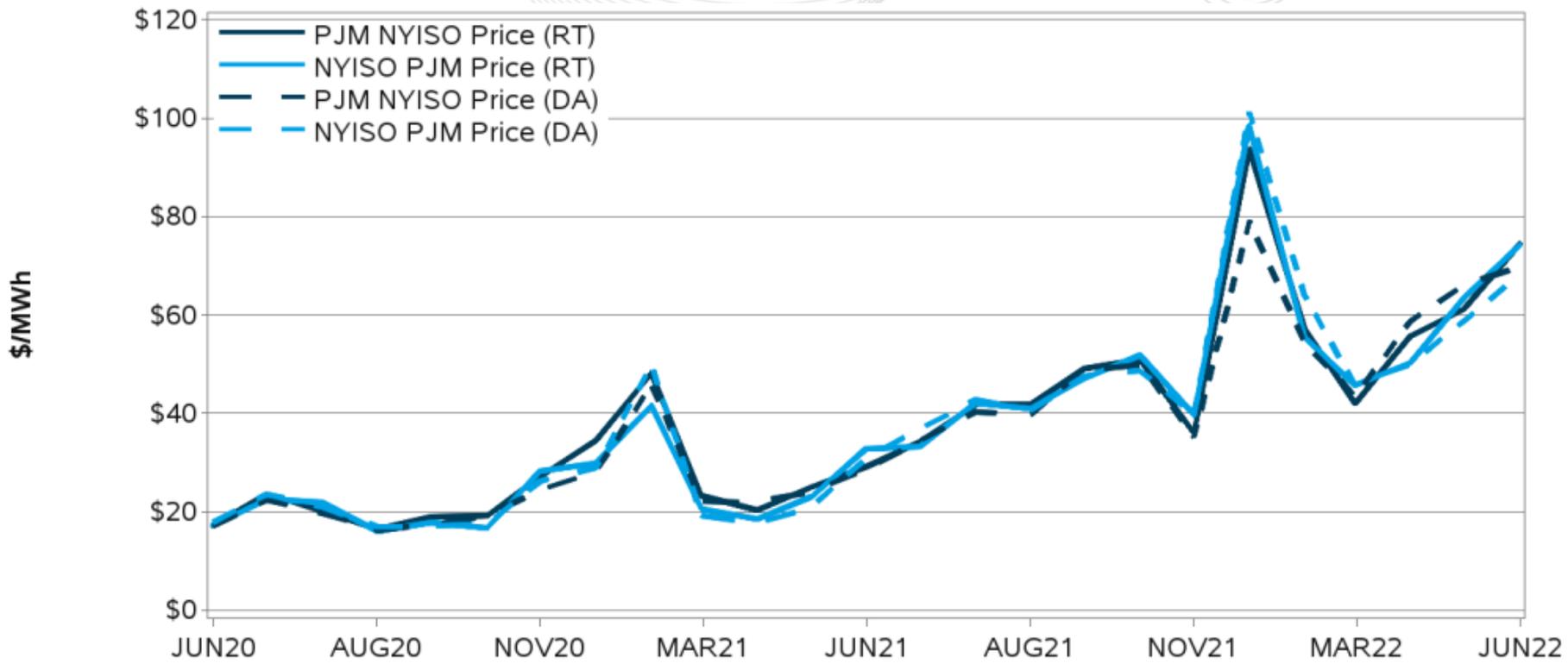


The ten most heavily congested facilities account for 57% of total congestion for 2022.

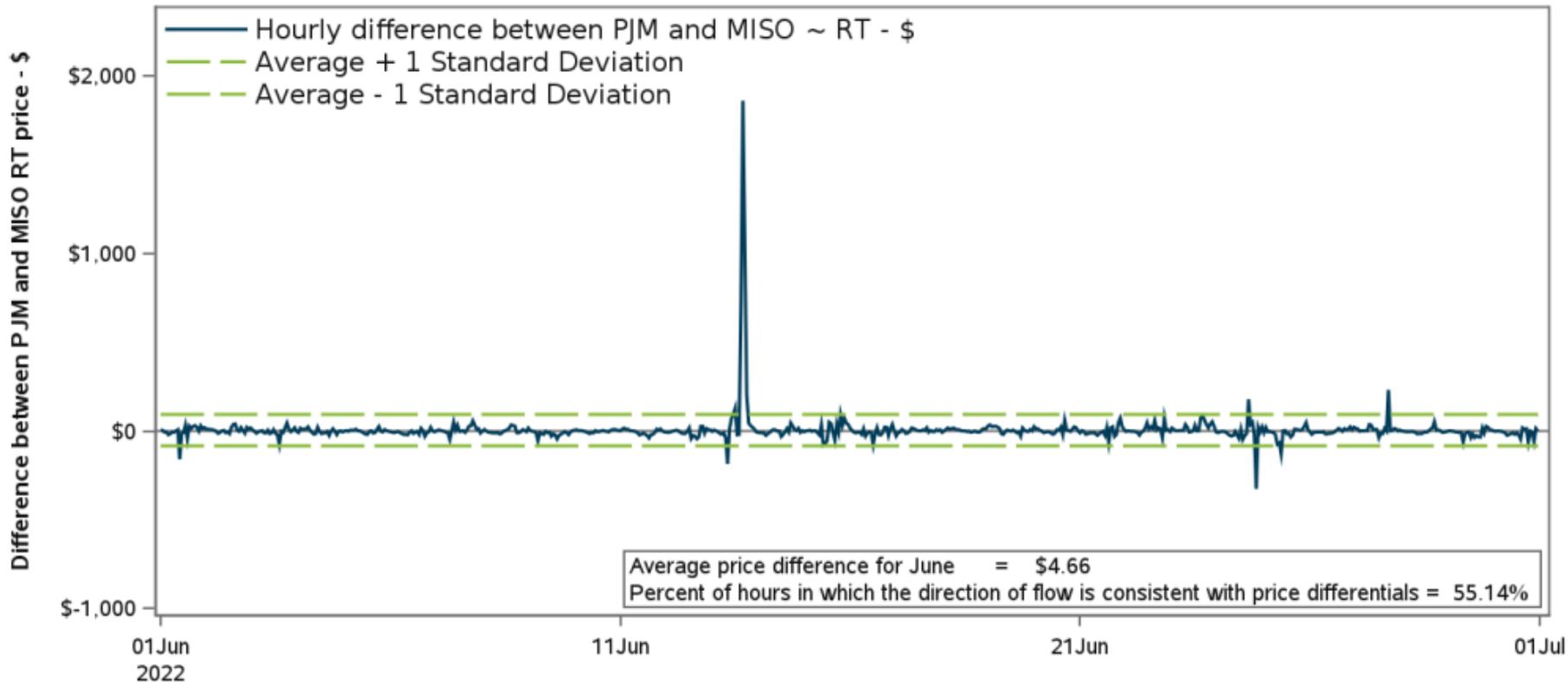
Energy Market

Interchange/Seams Summary



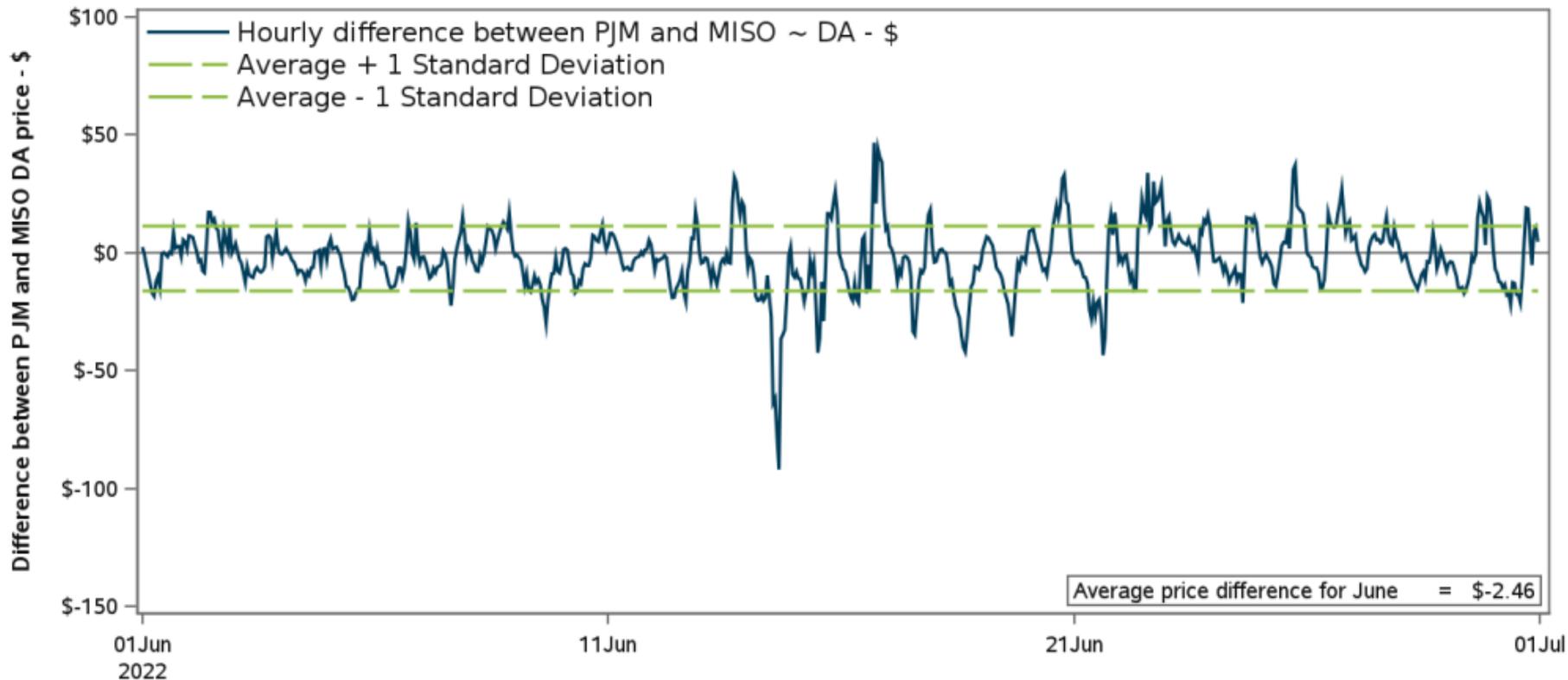


Hourly Difference Between PJM and MISO Real-Time Prices



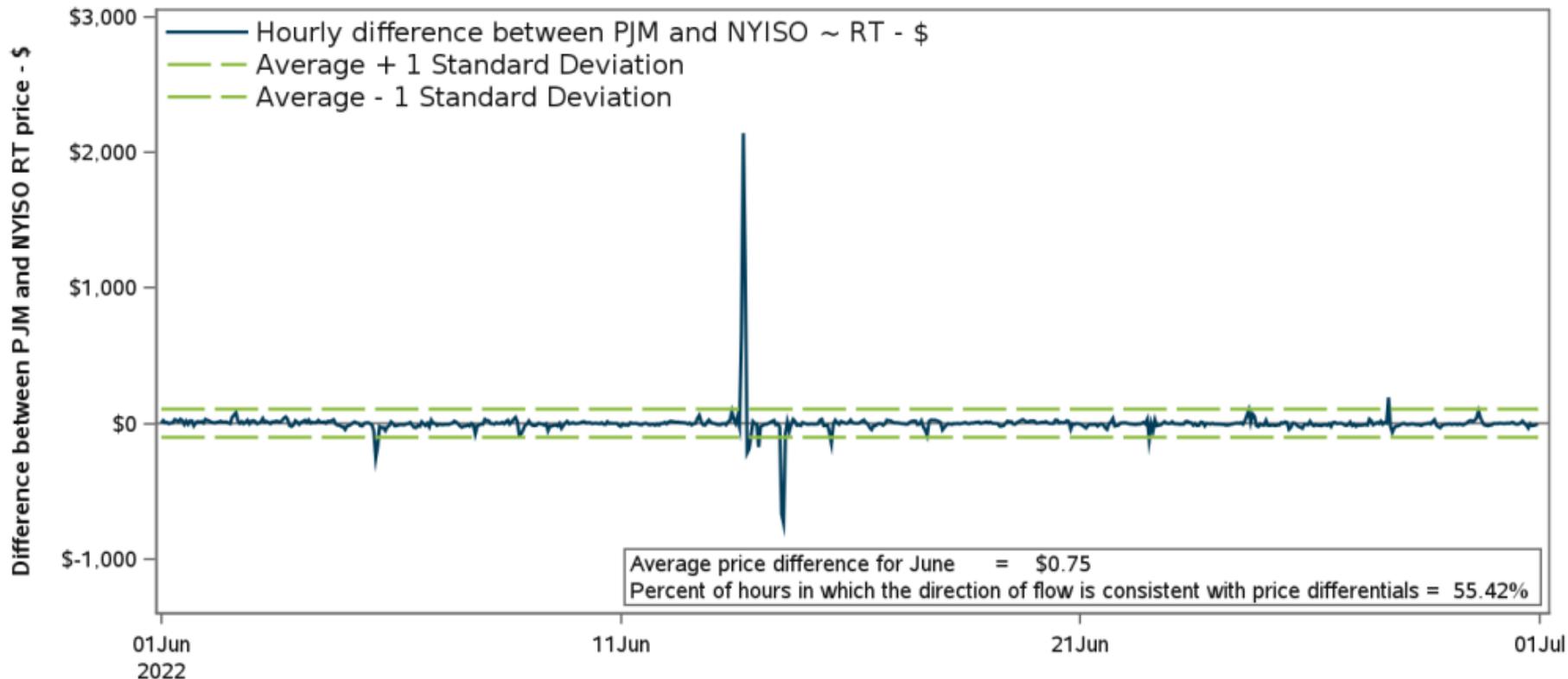
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and MISO Day-Ahead Prices



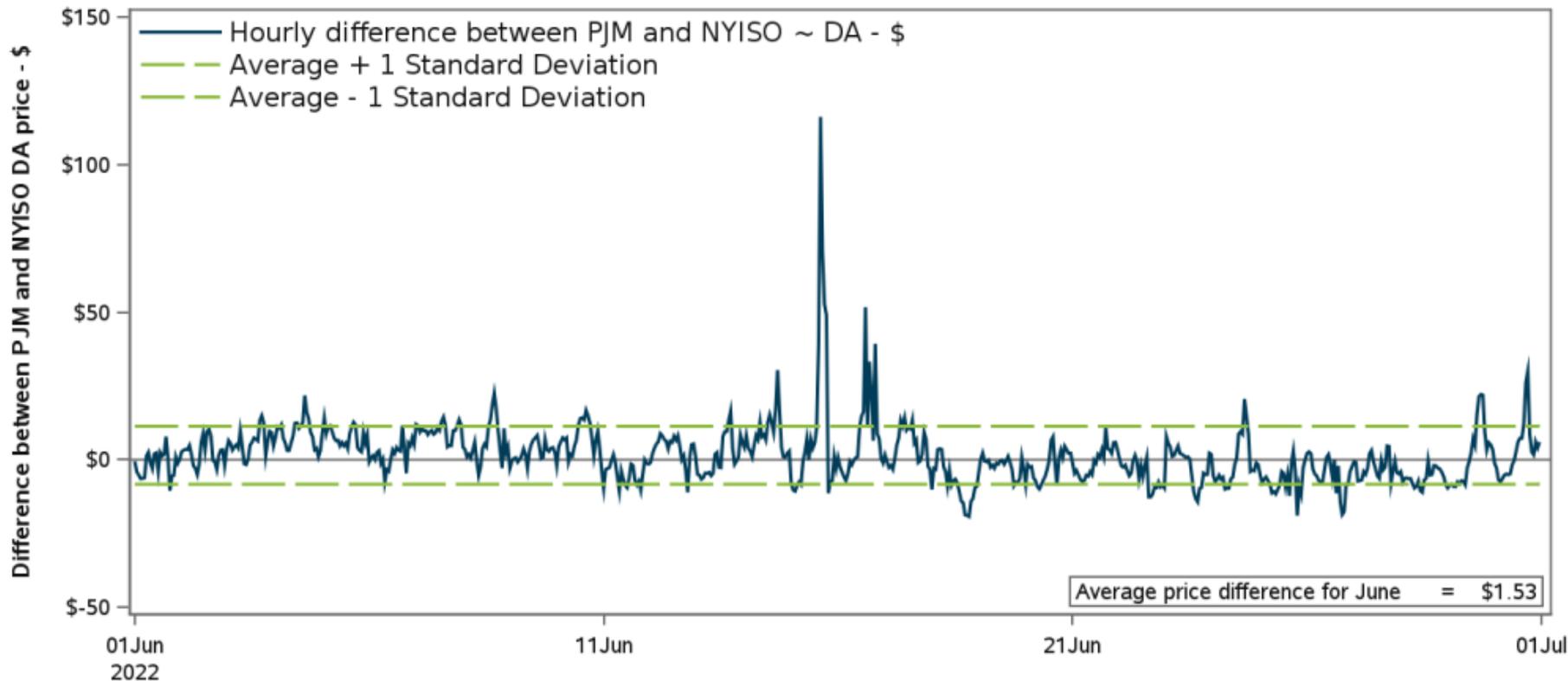
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and NYISO Real-Time Prices

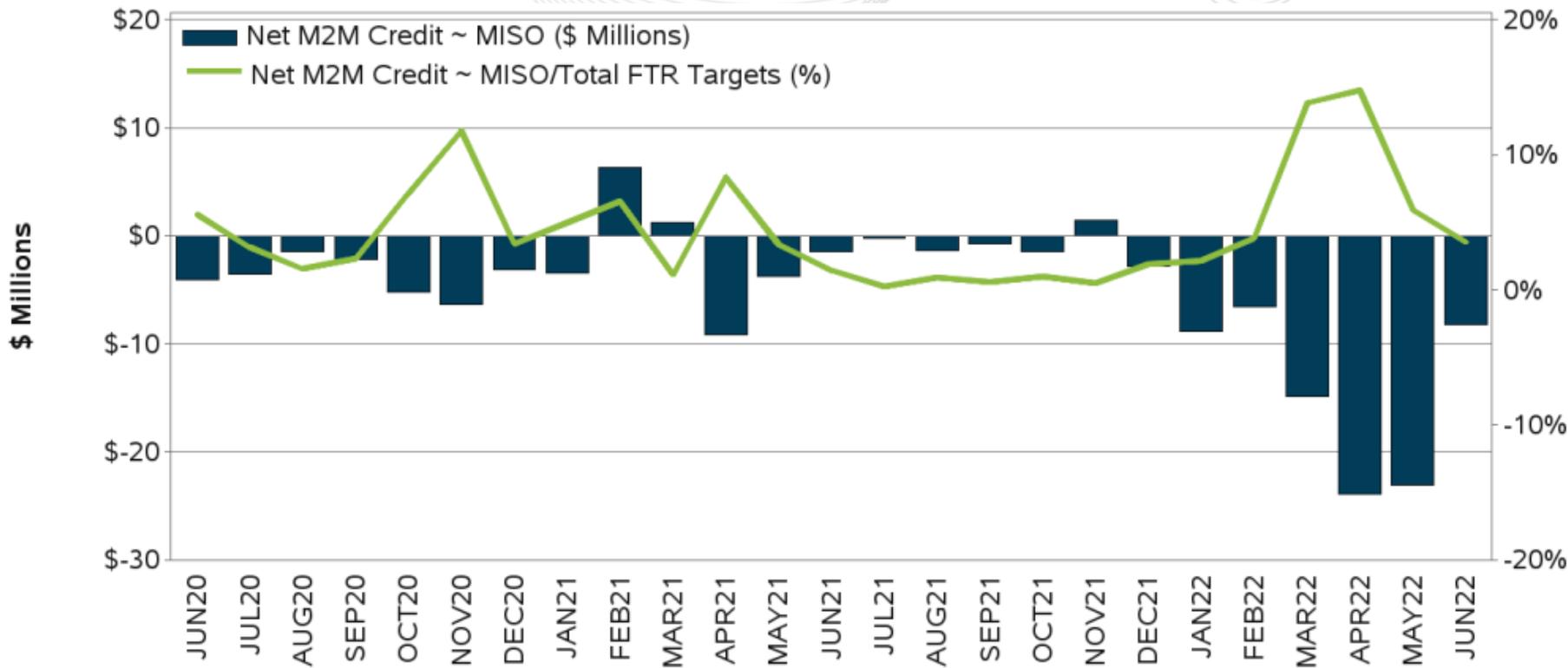


Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and NYISO Day-Ahead Prices



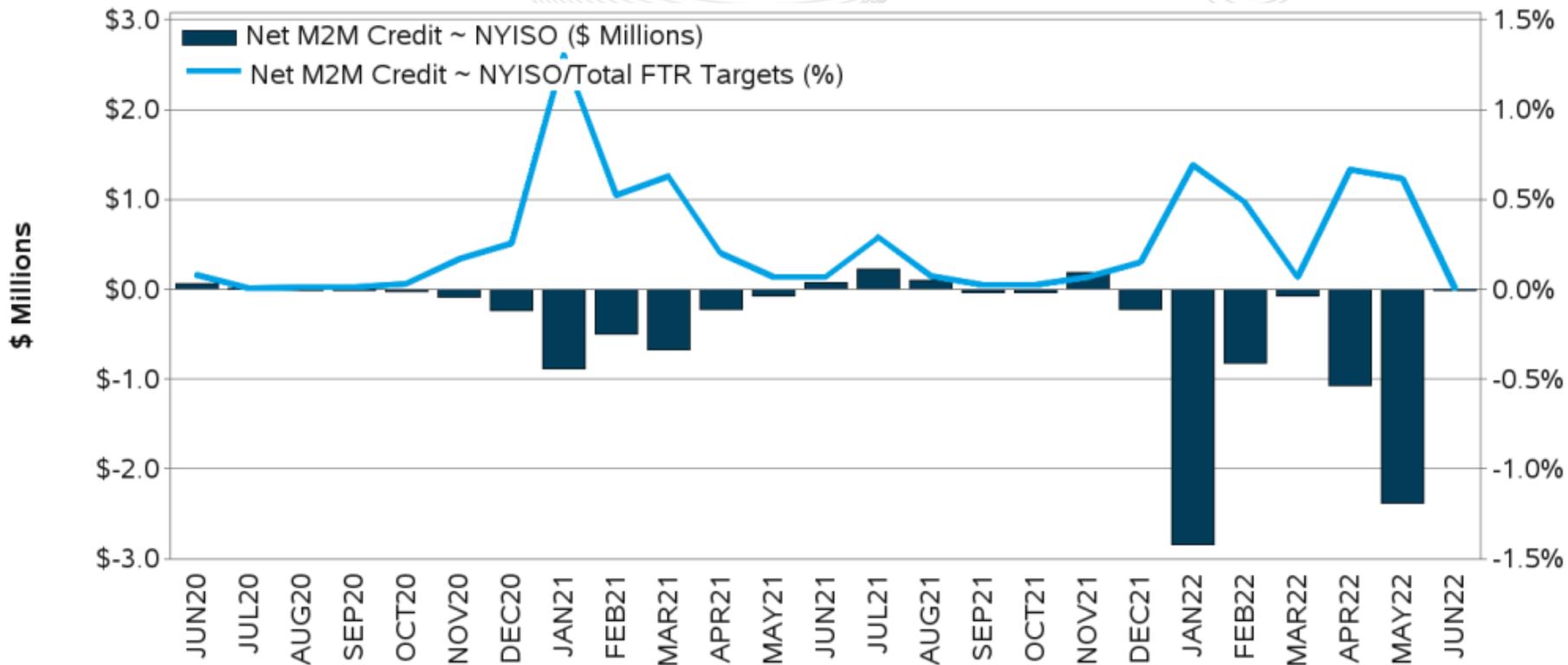
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.



Negative M2M Credit represents PJM payment to MISO

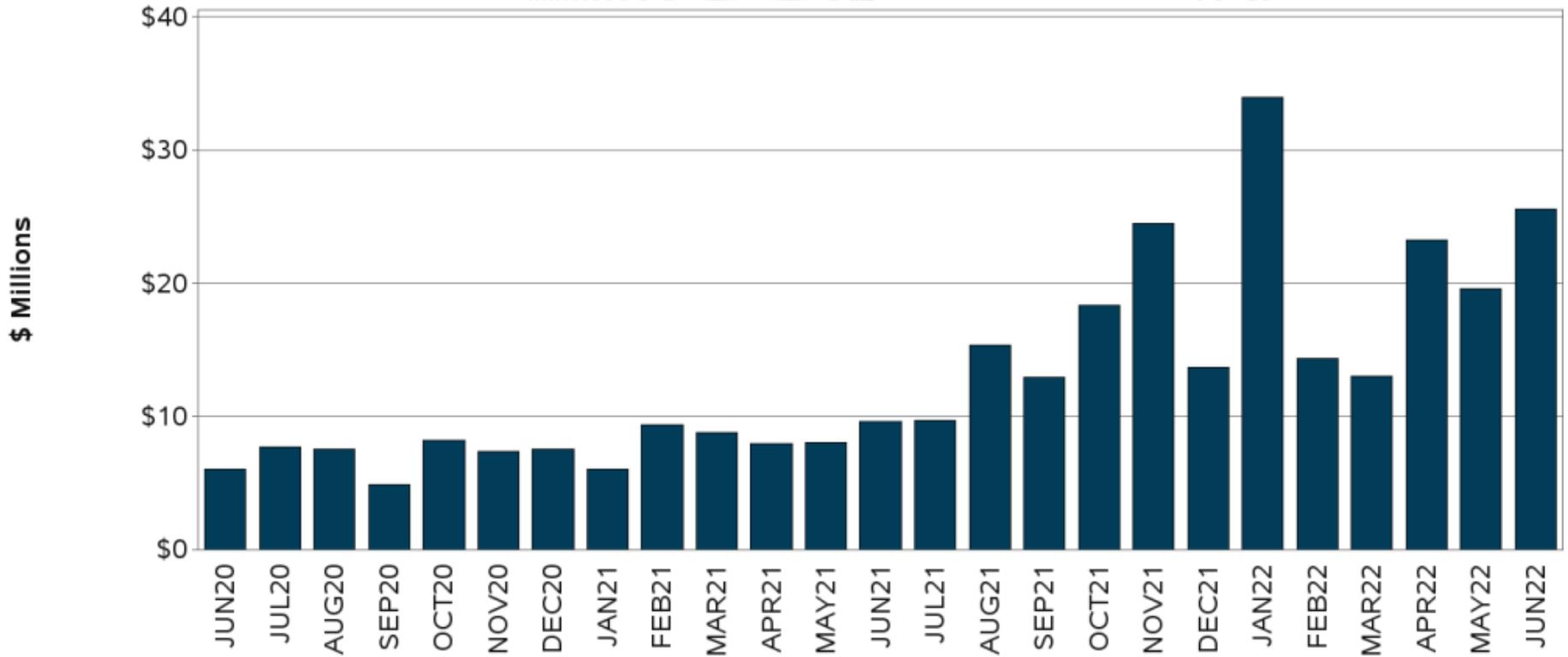


PJM-NYISO Market-to-Market Coordination Settlement

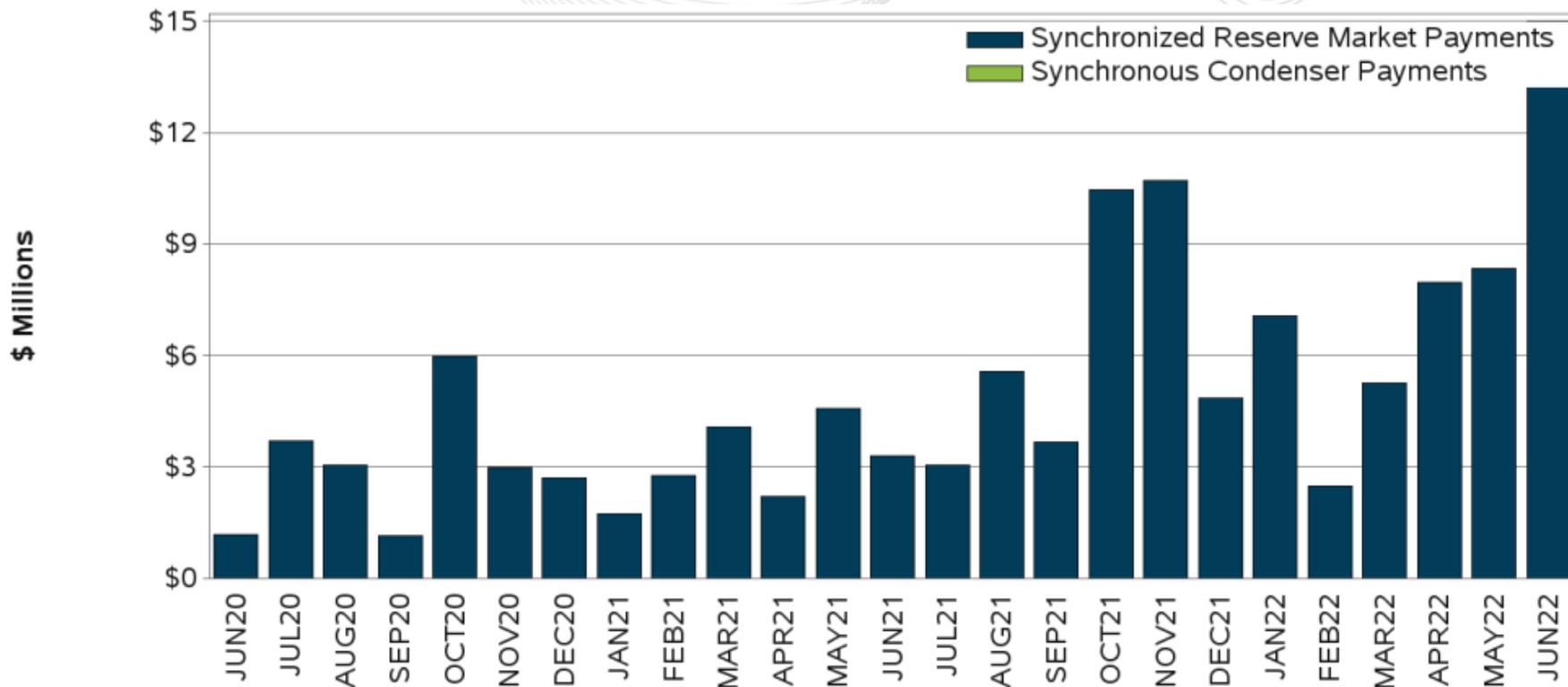


Negative M2M Credit represents PJM payment to NYISO

Ancillary Service Market Summary

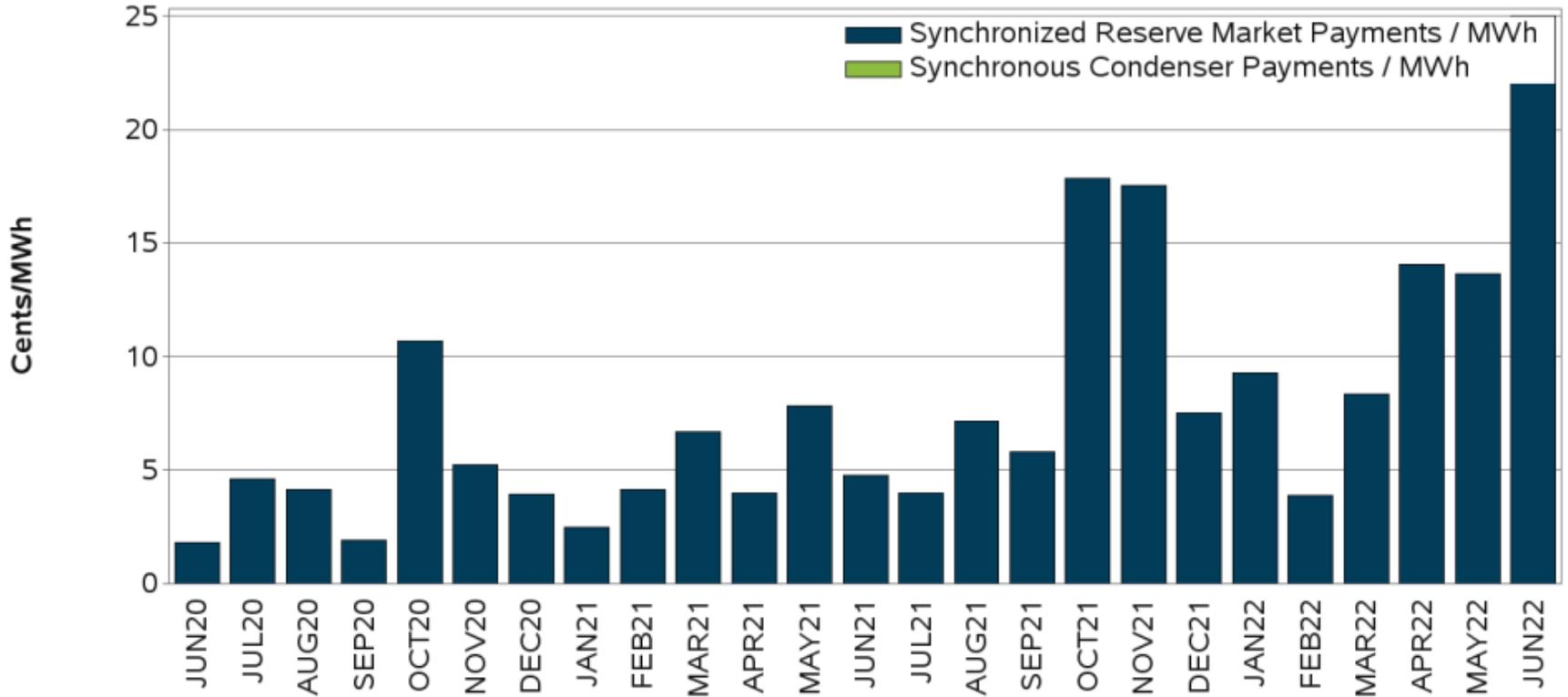


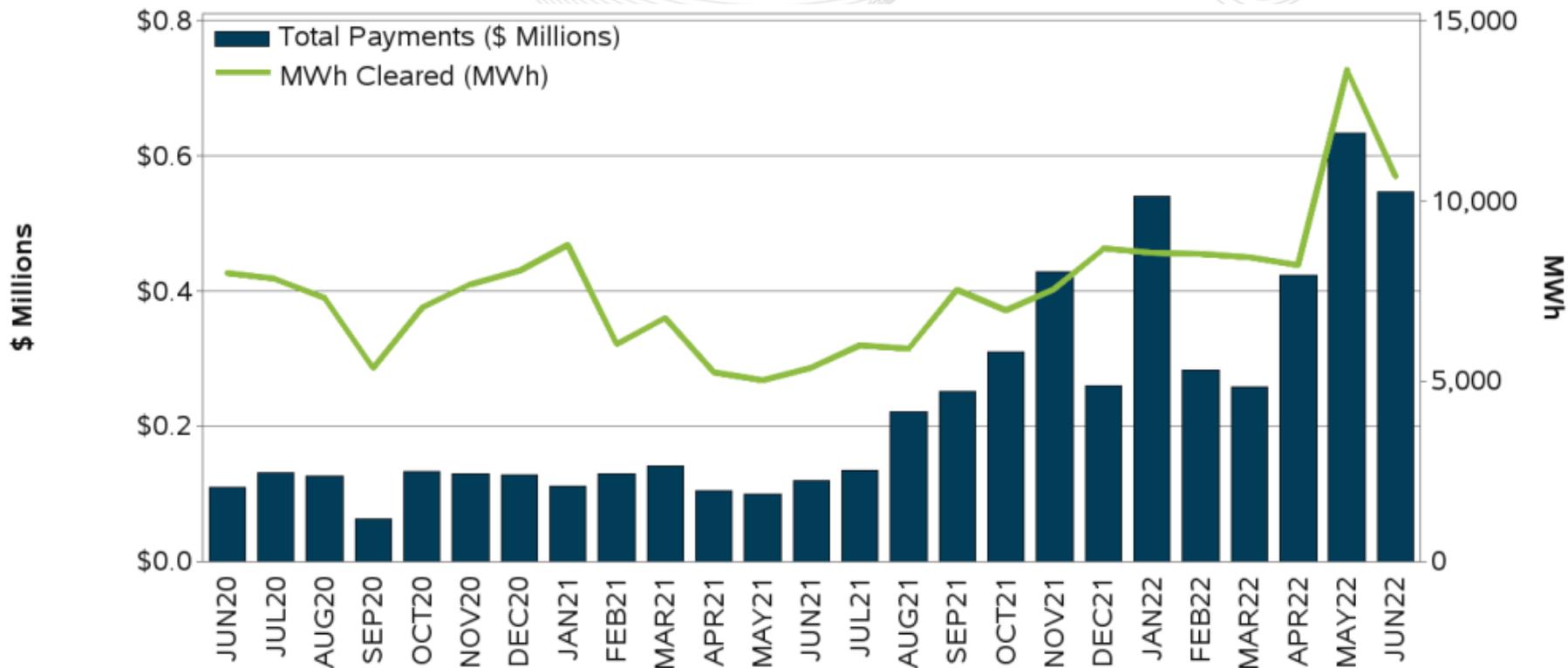
Synchronized Reserve and Synchronous Condenser Costs



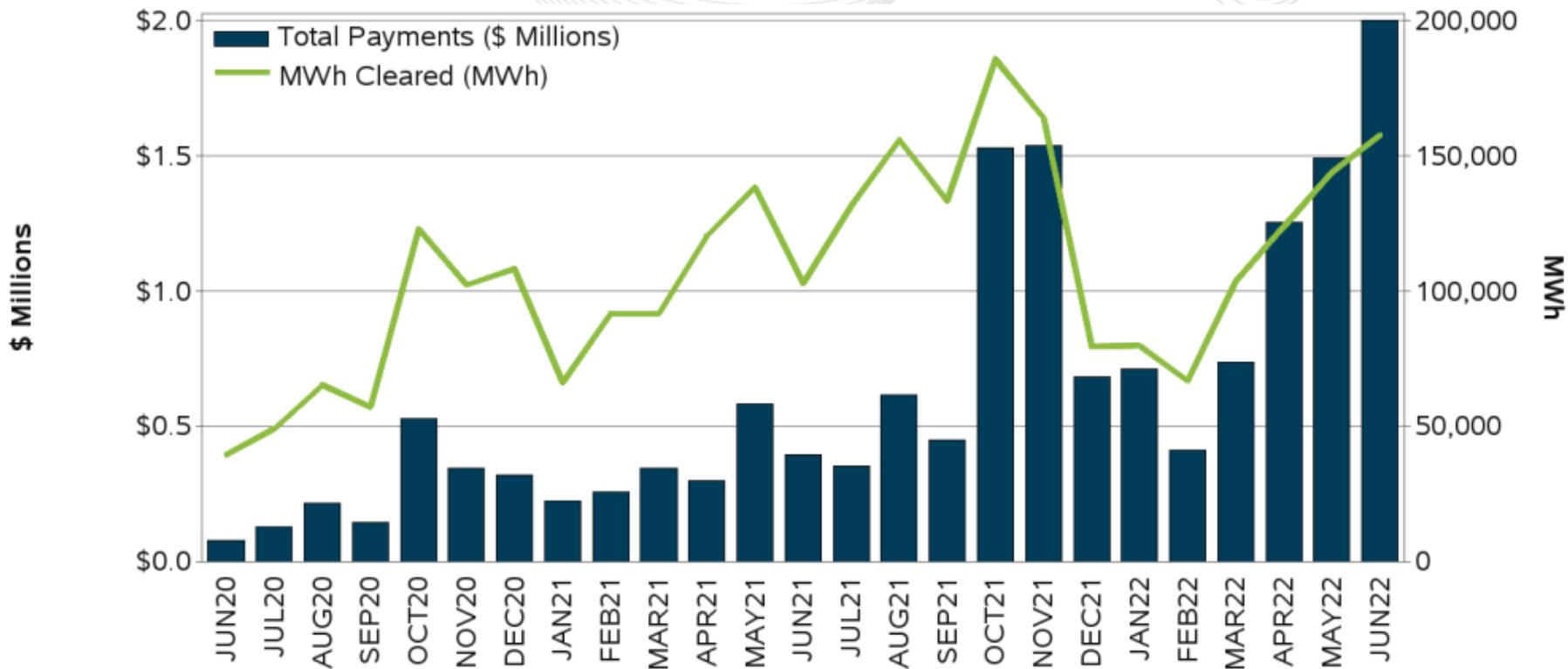


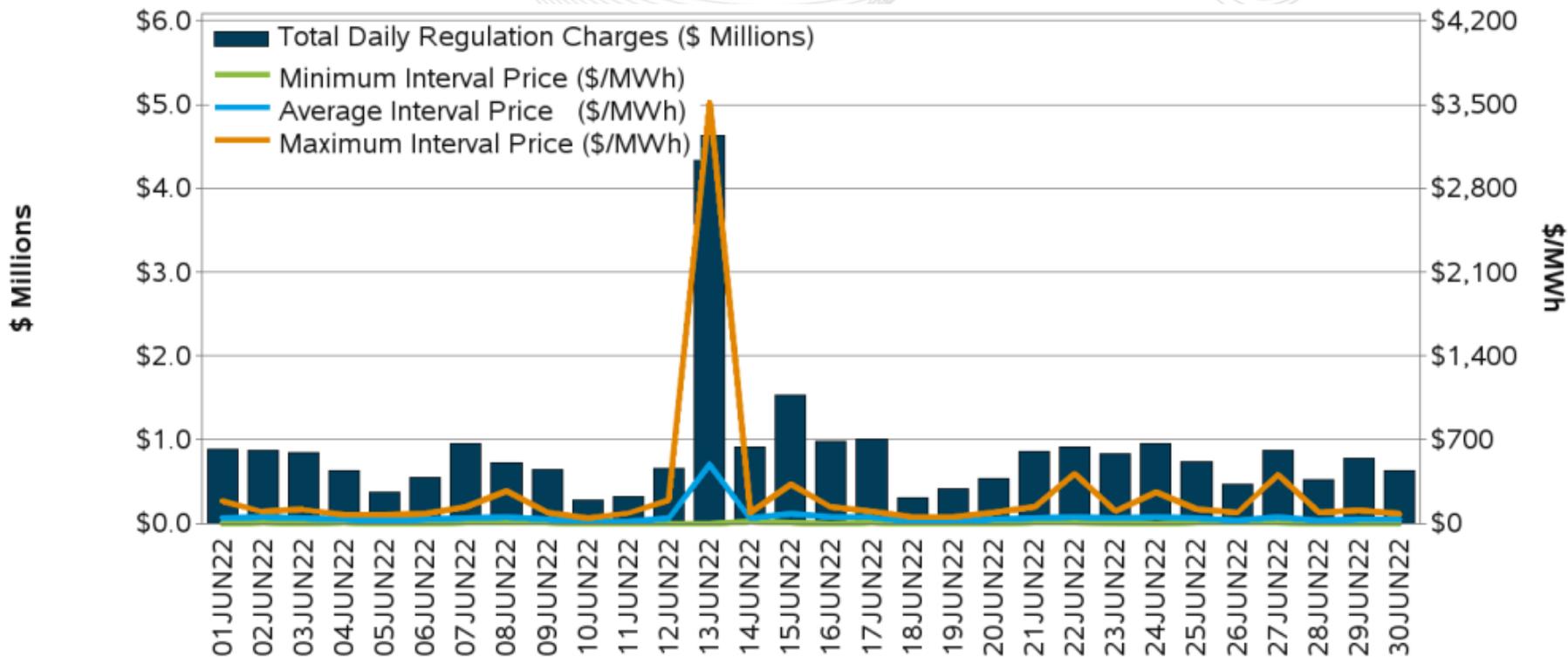
Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs



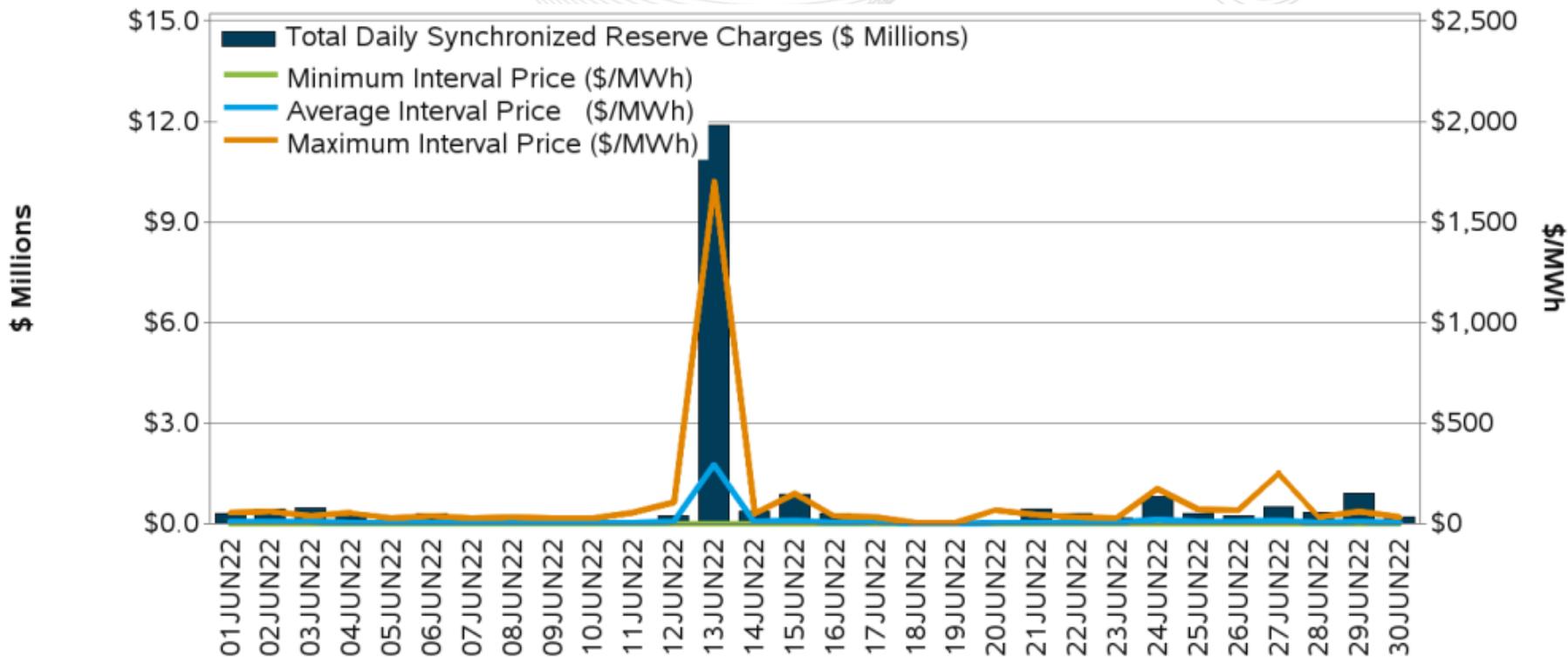


DR Participation in PJM Synchronized Reserve Markets





Synchronized Reserve Market Daily Prices and Charges



Jennifer Warner-Freeman
Jennifer.Freeman@pjm.com



Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com