Markets Report

MC Webinar
June 27, 2022

Executive Summary

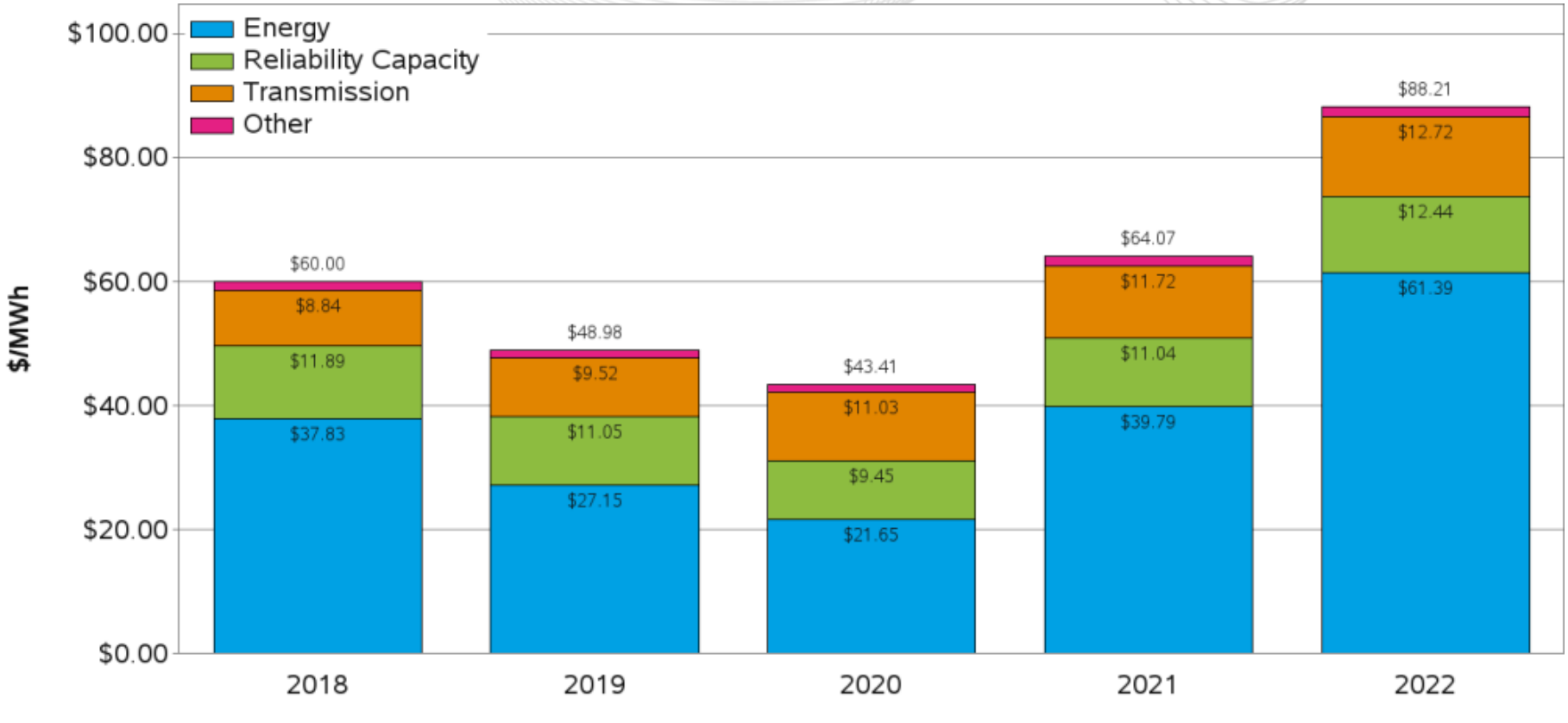
- PJM Wholesale Cost for 2022 YTD is $88.21/MWh, up from full-year 2021 costs of $64.07/MWh . (Slides 5 & 6)
- Slides pertaining to weather conditions, in addition to slides showing average fuel prices, generation on-line fuel mixes, and System Marginal Prices have been combined into a **Market Conditions** section. (Slides 8-19)
- In May, temperatures were slightly above average for most of the month. Thus , the sum of Heating and Cooling Degree Days was also just above its historic average. (Slides 8-10)
- Energy use was also above its historic average for May. (Slides 8-10)
- In May, uplift exceeded $800,000 on four days. (Slides 24 & 25)

Executive Summary

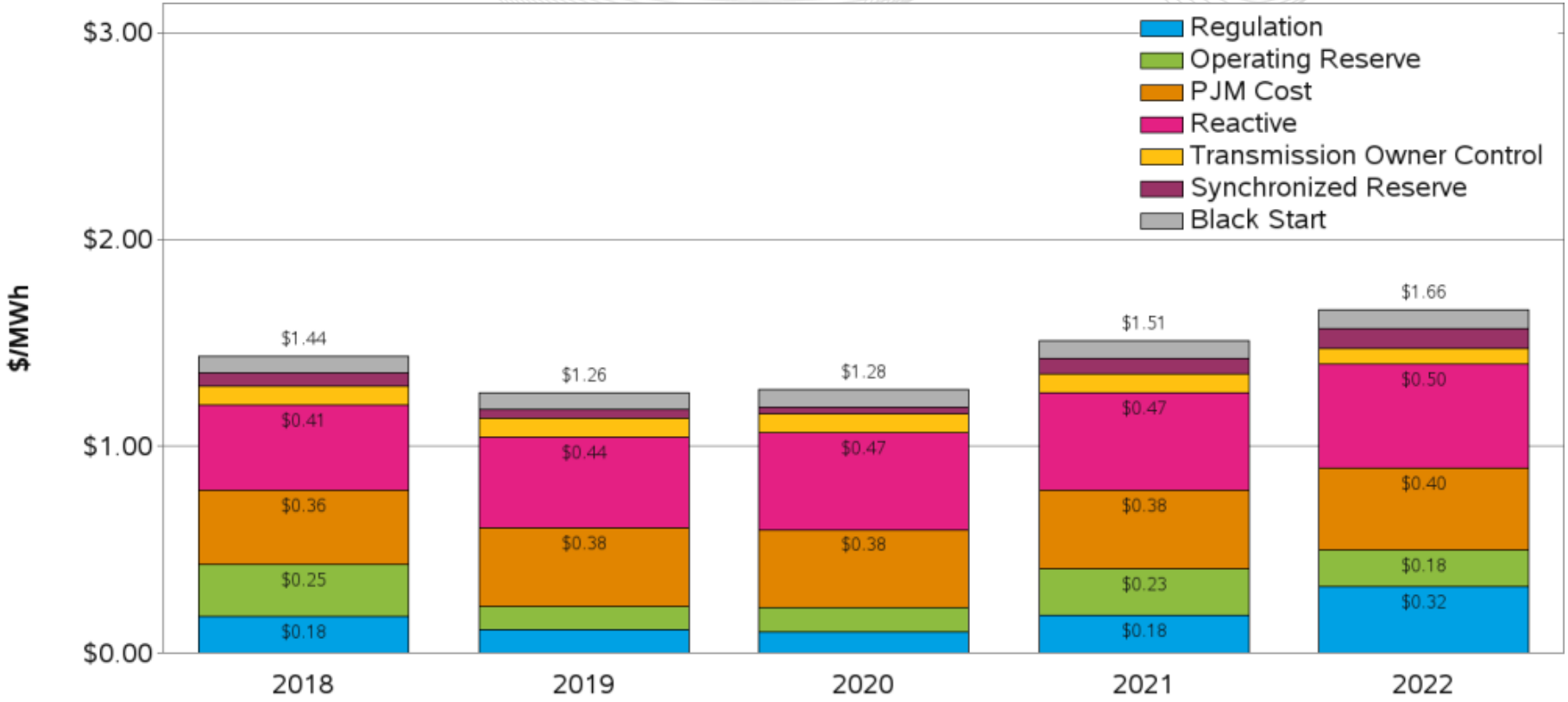
- Load-weighted average LMP for 2022 YTD is $61.39/MWh: (Slides 33 & 34)
  - May 2022 was $83.20/MWh, which is higher than May 2021 ($29.40/MWh) and May 2020 ($18.30/MWh).
- There was one 5-minute interval that experienced shortage pricing in May. (Slides 31 & 32)
- FTR revenue adequacy for the month of May is 100% and the 2021-2022 Planning Year is currently funded at 99.8%. (Slides 49-52)
- May's congestion values are in-line with January's, however, both months are higher than others in recent history. (Slide 50)
- Regulation and Synchronized Reserve market costs have generally tracked with energy prices over time. (Slides 65-67)

Markets Report

PJM Wholesale Cost



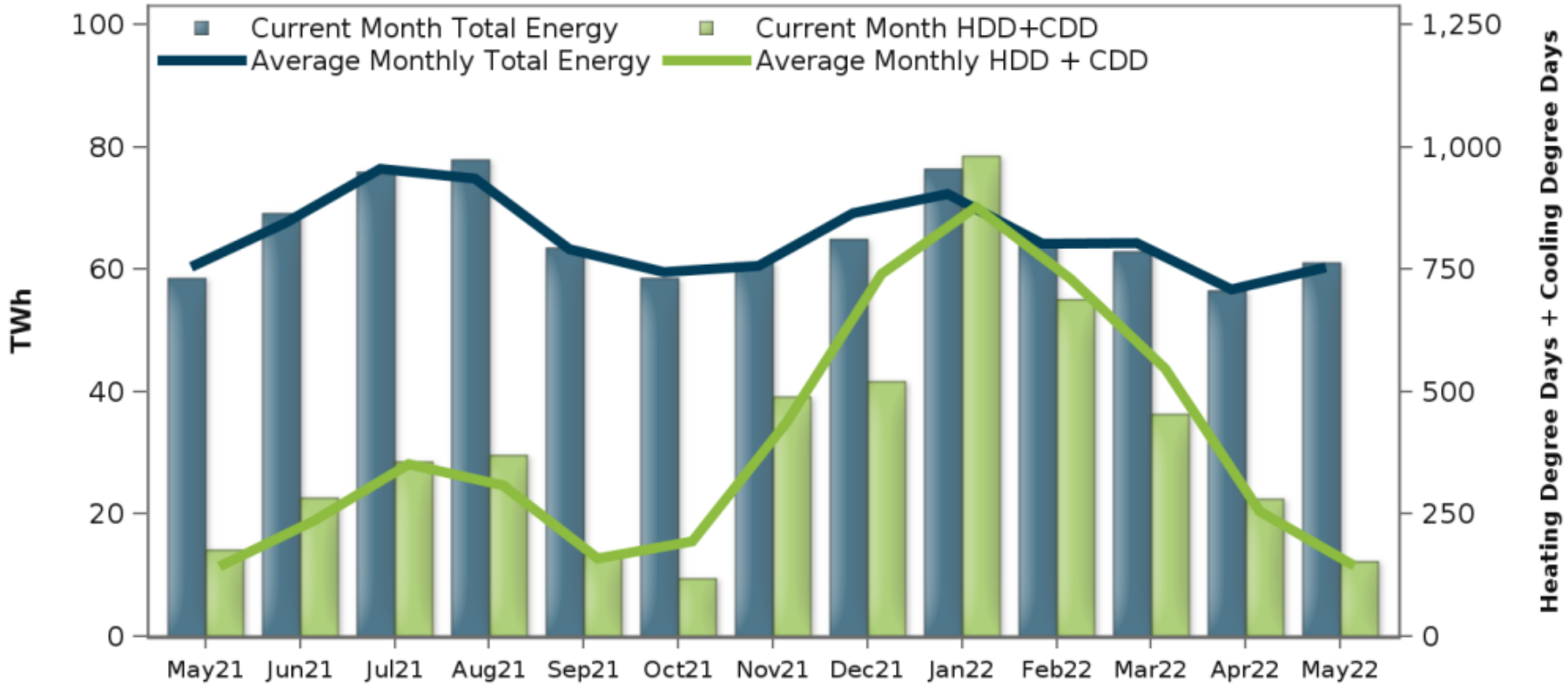
PJM Wholesale Cost - Other



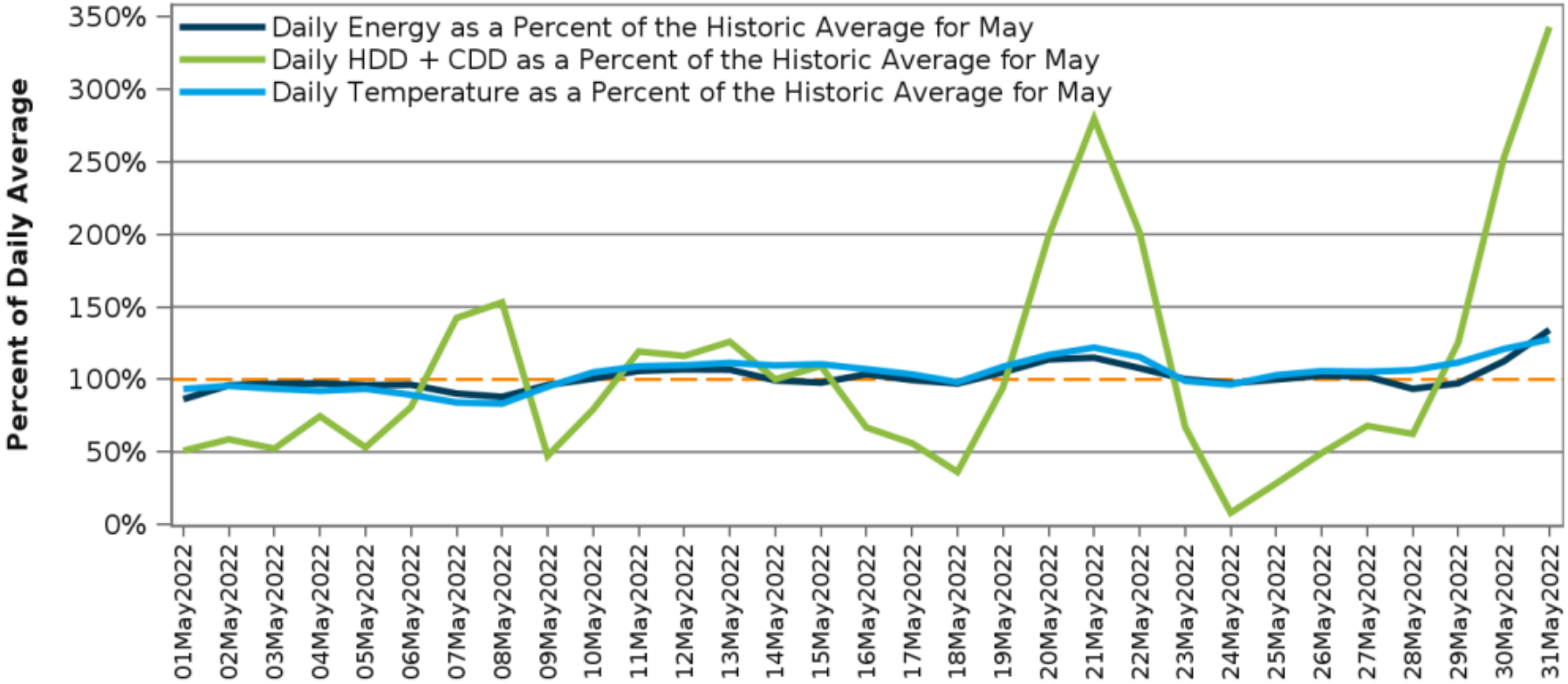
Market Conditions

- 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.

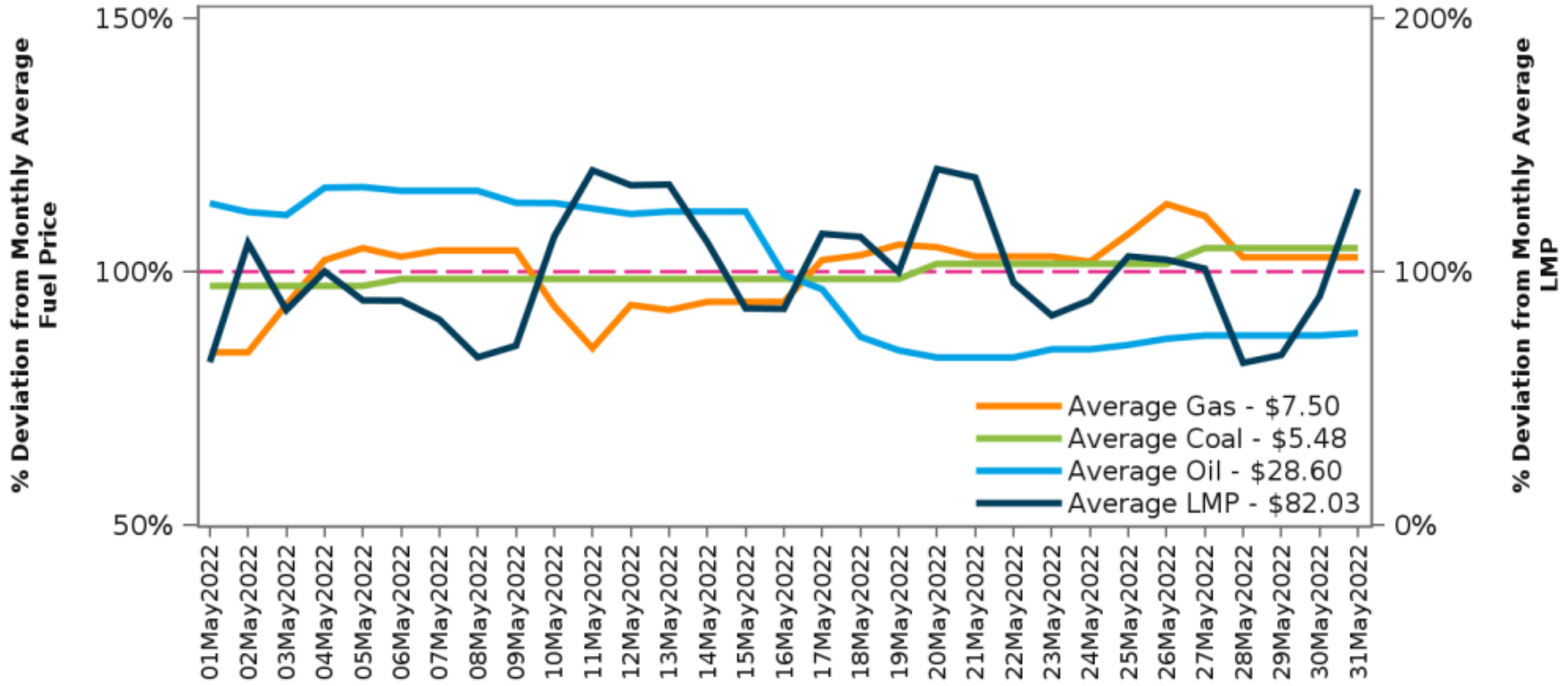
Historic Average Weather and Energy versus Current Month



Historic Average Weather and Energy versus Current Month - Daily

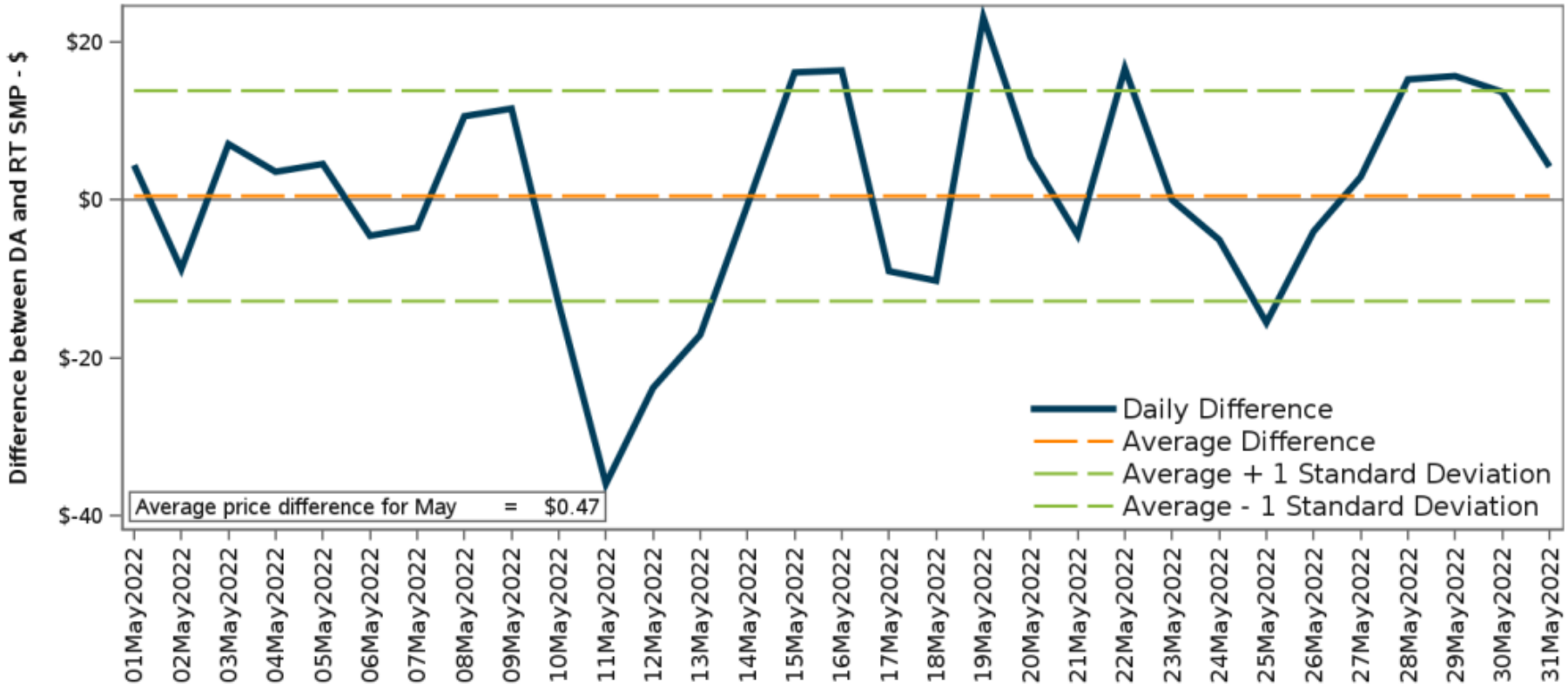


Average Fuel Prices - Daily



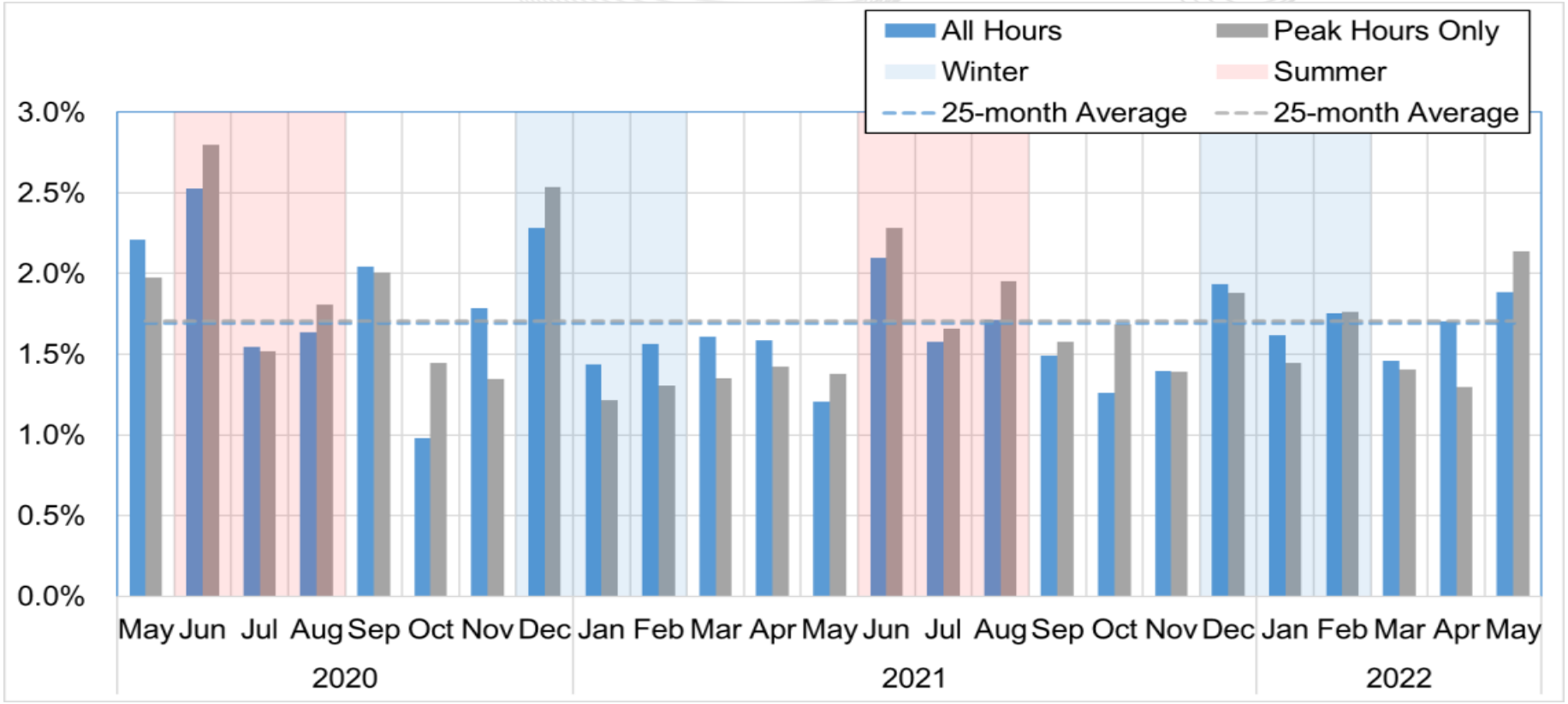
Fuel Price Source: S&P Global Platts

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

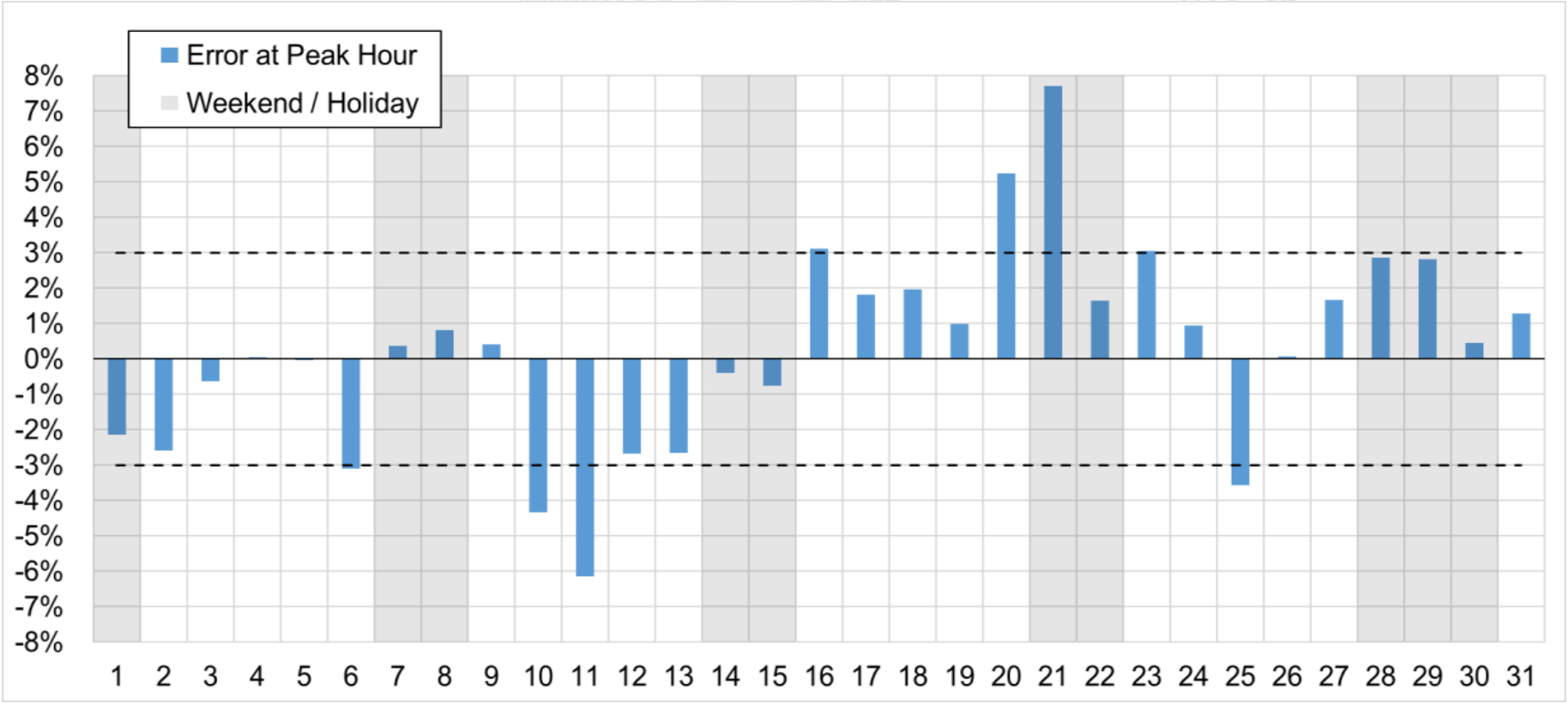


Positive values represent days when the DA daily average price was higher than RT. Negative values represent days when the DA price was lower.

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



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



Load Forecast Error

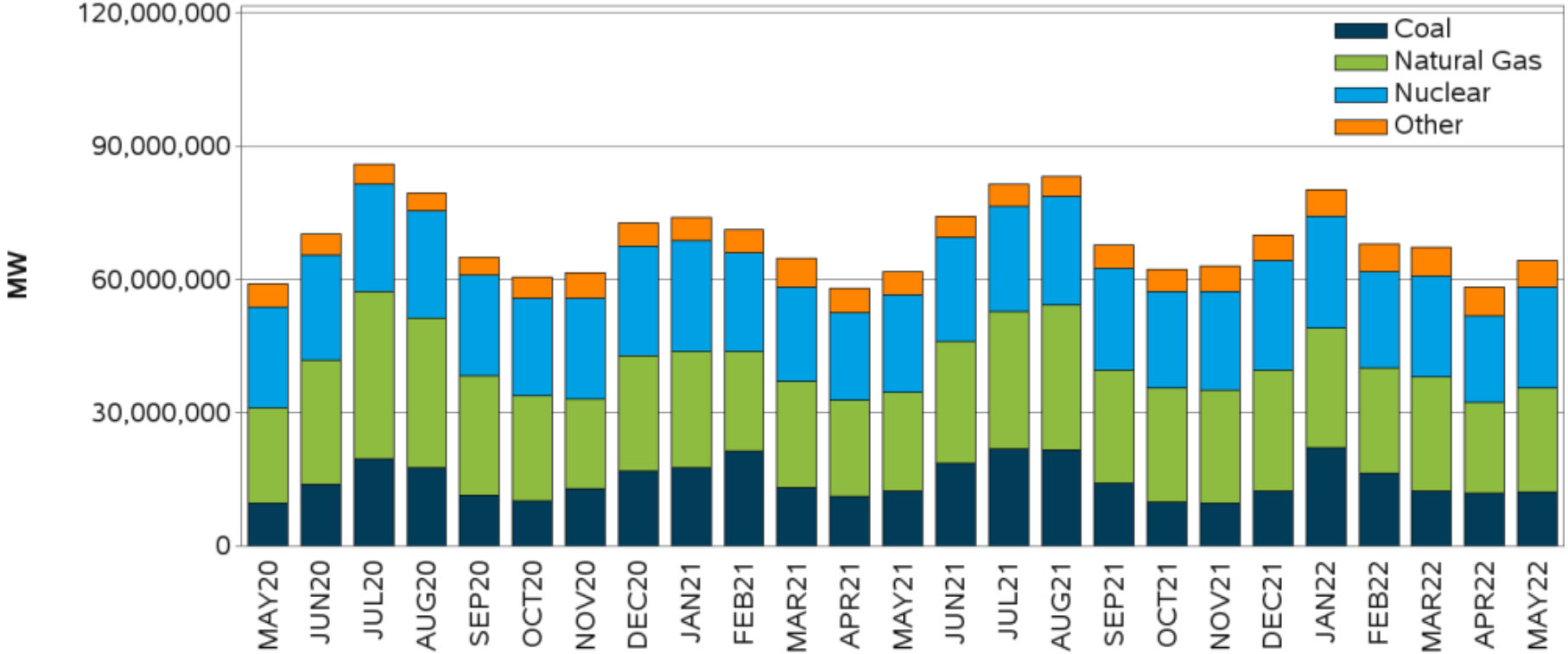
- PJM prepares a day-ahead load forecast at 10:00 am for use by our members.
- This forecast is not used to clear the day-ahead market and is not utilized for the reliability tools that run subsequent to the day-ahead market.

- *May is often a challenging month as we transition between seasons, moving from a double peak to a traditional summer curve, and this month was especially challenging due to a number of periods of unseasonable heat. This hot weather, paired with storm activity and temperature forecast error, made the task of load forecasting particularly difficult.*

- *On May 10 and 11, hot weather impacted the western zones of PJM including temperatures above 90 in ComEd. The heat was not well forecasted, especially on the 11th, resulting in load that came in quite a bit higher than expected.*

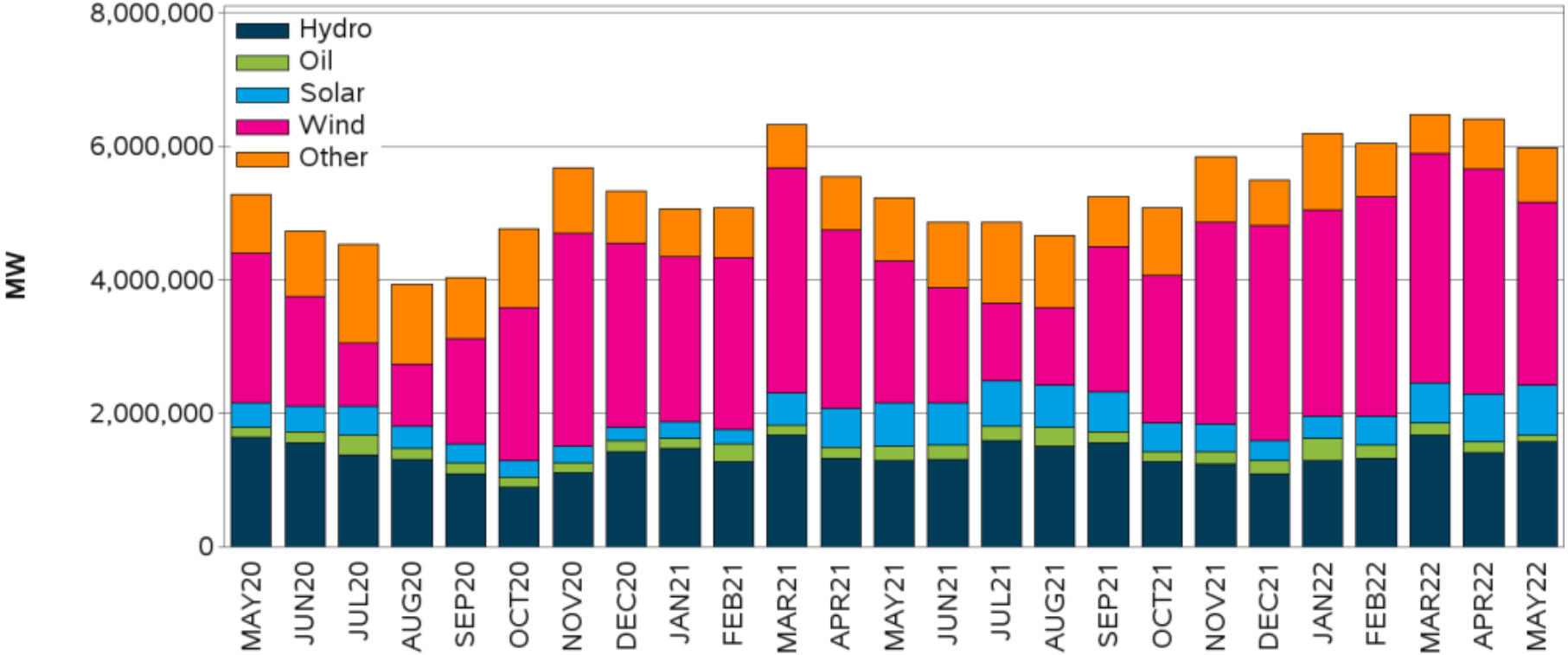
- *On May 20 and 21 we saw another period of hot weather, with temperatures above 90 in the East this time. Unlike earlier in the month, temperatures were over-forecasted. This was exacerbated in some zones by stormy weather, the timing of which can be tricky to predict with 100% accuracy.*

Monthly Generation by Fuel



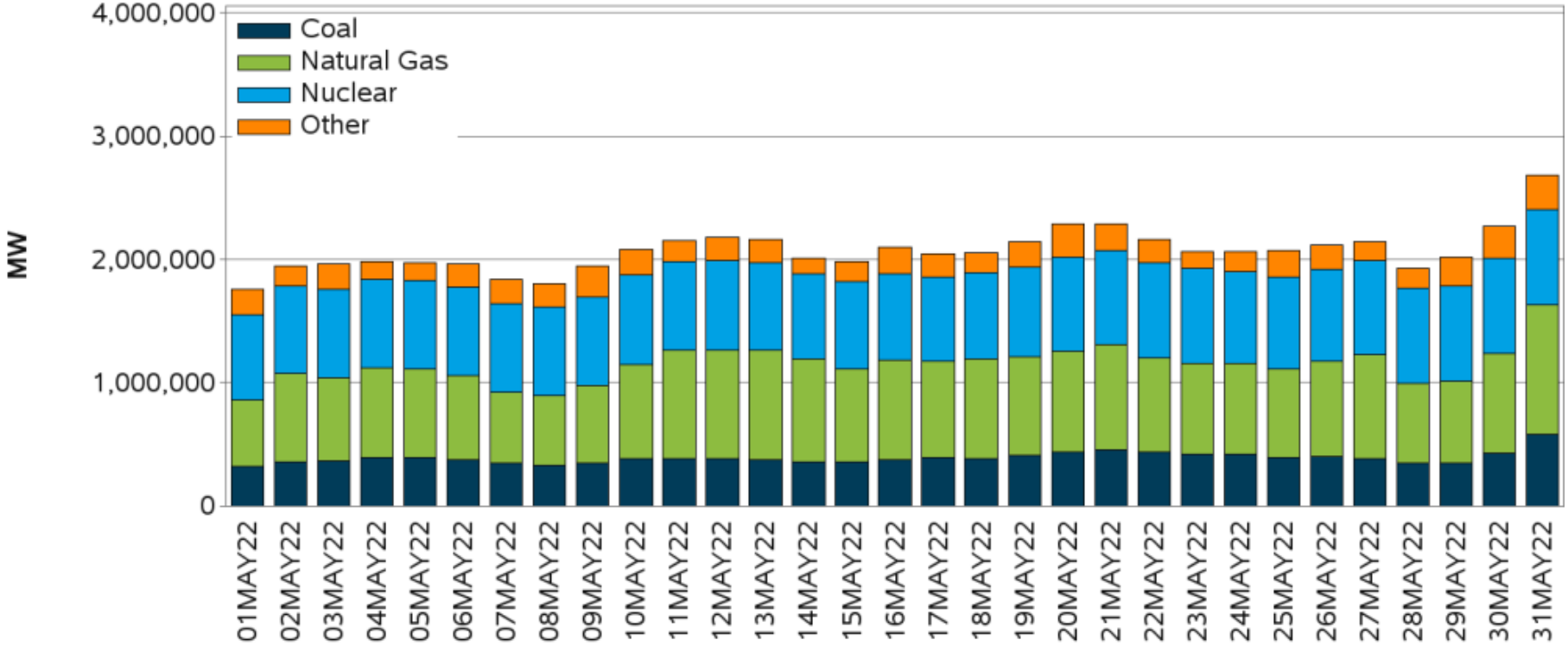
'Other' includes Hydro, Oil, Solar, Wind, and Other

Monthly Generation by Fuel, Other



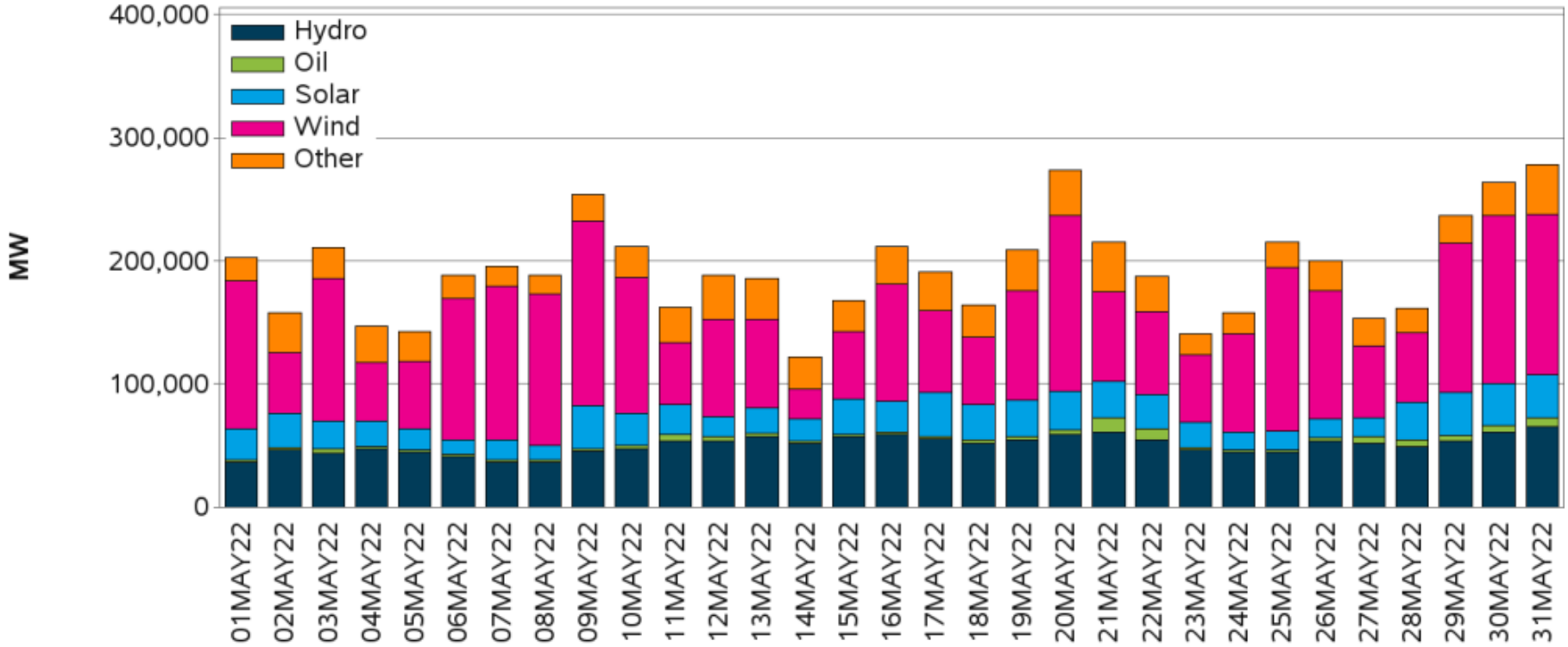
'Other' includes Flywheels, Multiple Fuels, Storage, and Other Renewables

Daily Generation by Fuel - May



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

Daily Generation by Fuel, Other - May

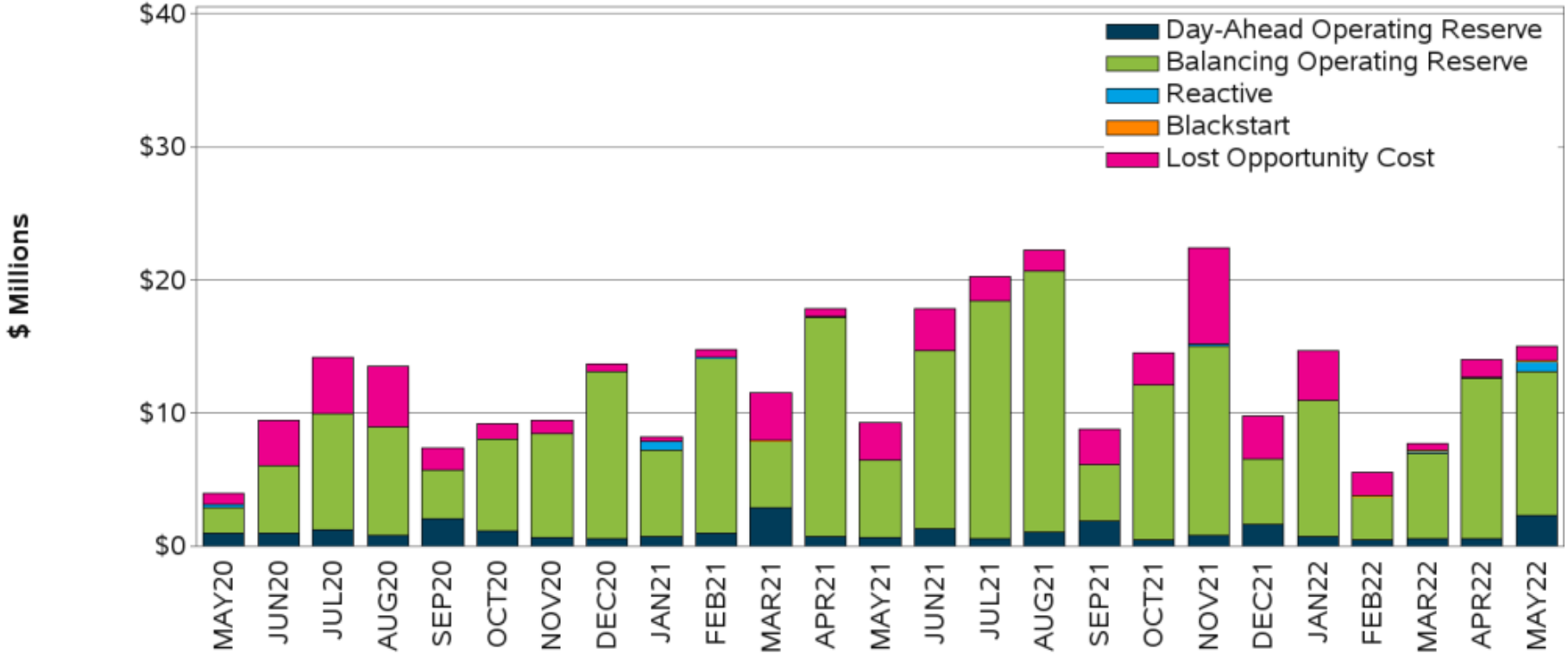


'Other' includes Flywheels, Multiple Fuels, Storage, and Other Renewables

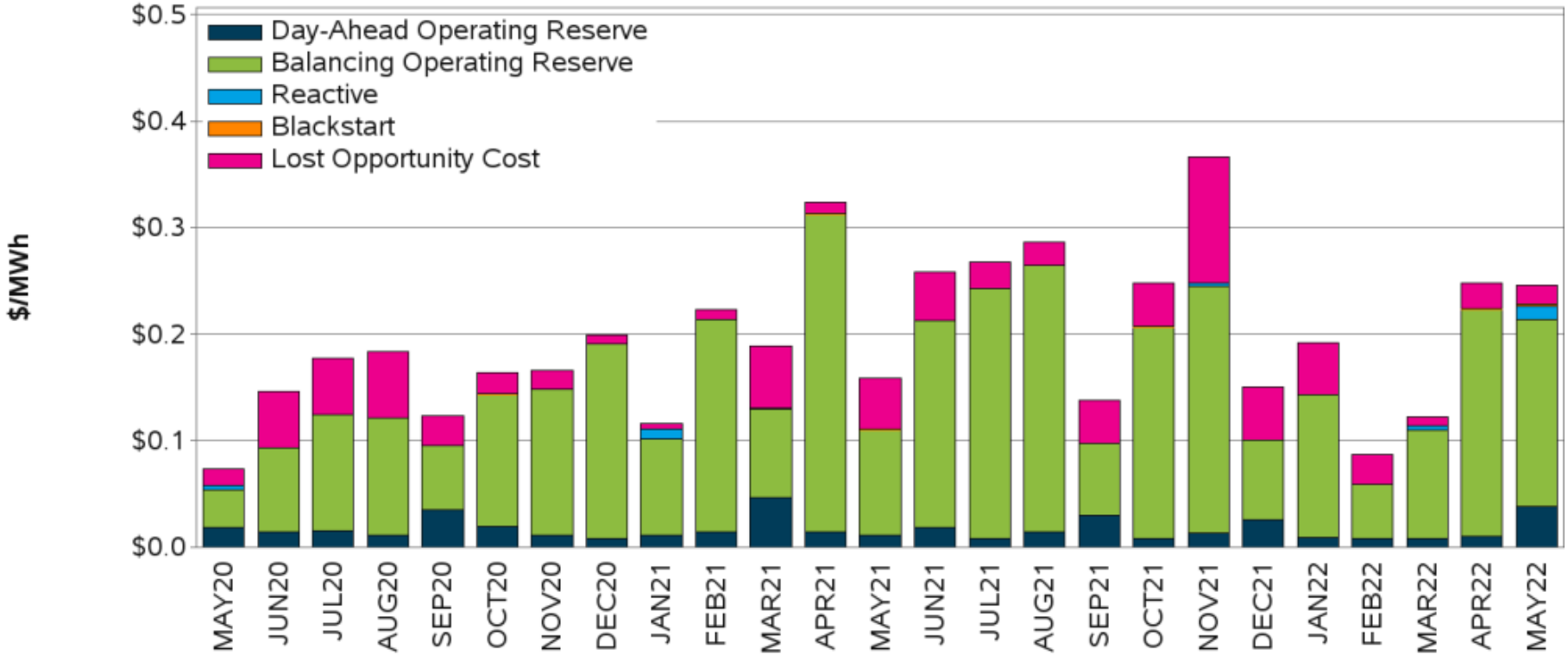
Operating Reserve

(Uplift)

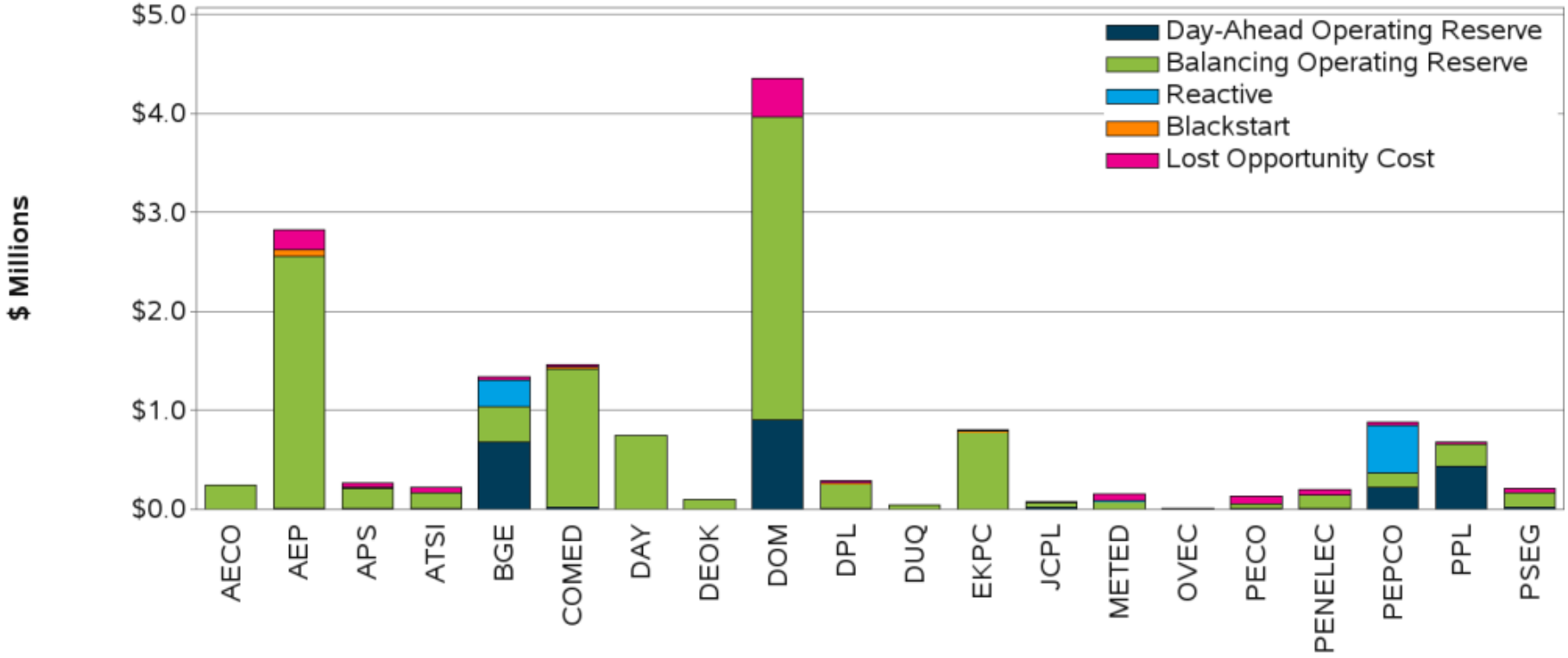
Monthly Uplift



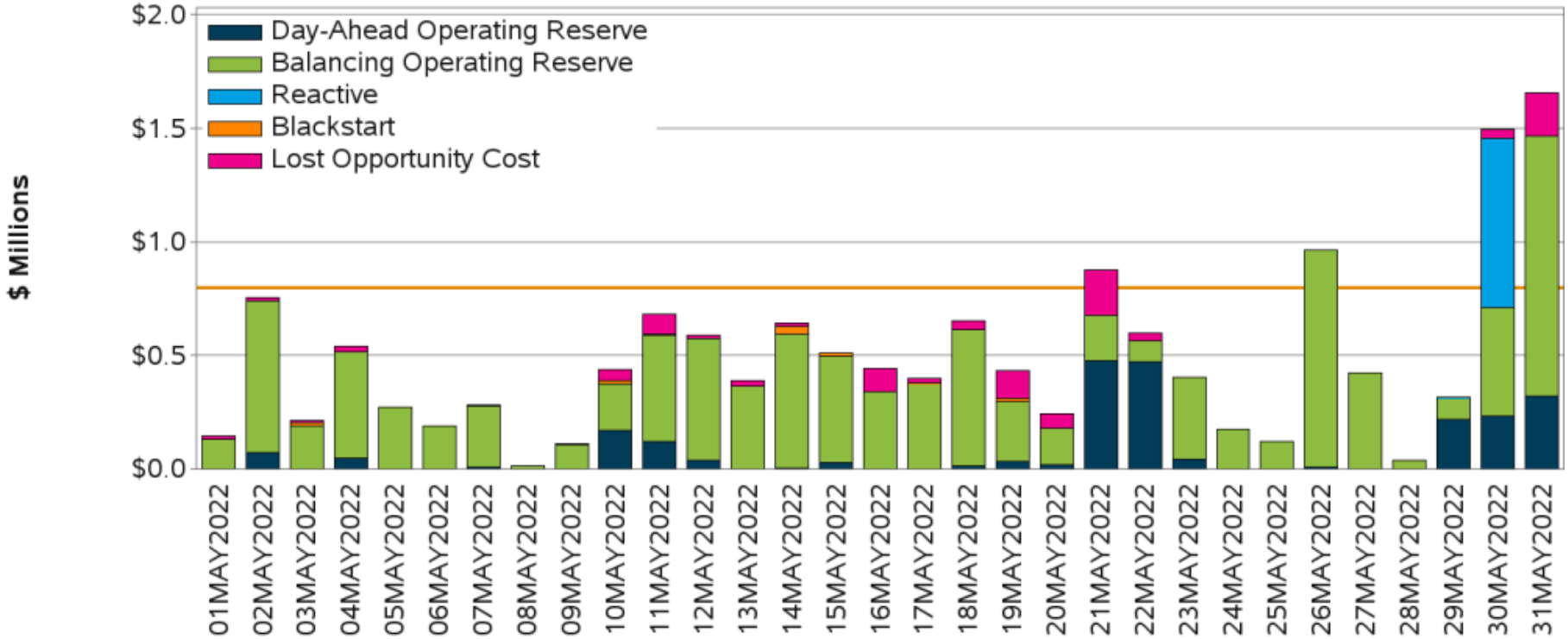
Monthly Uplift - $/MWh Load



Zonal Uplift - May



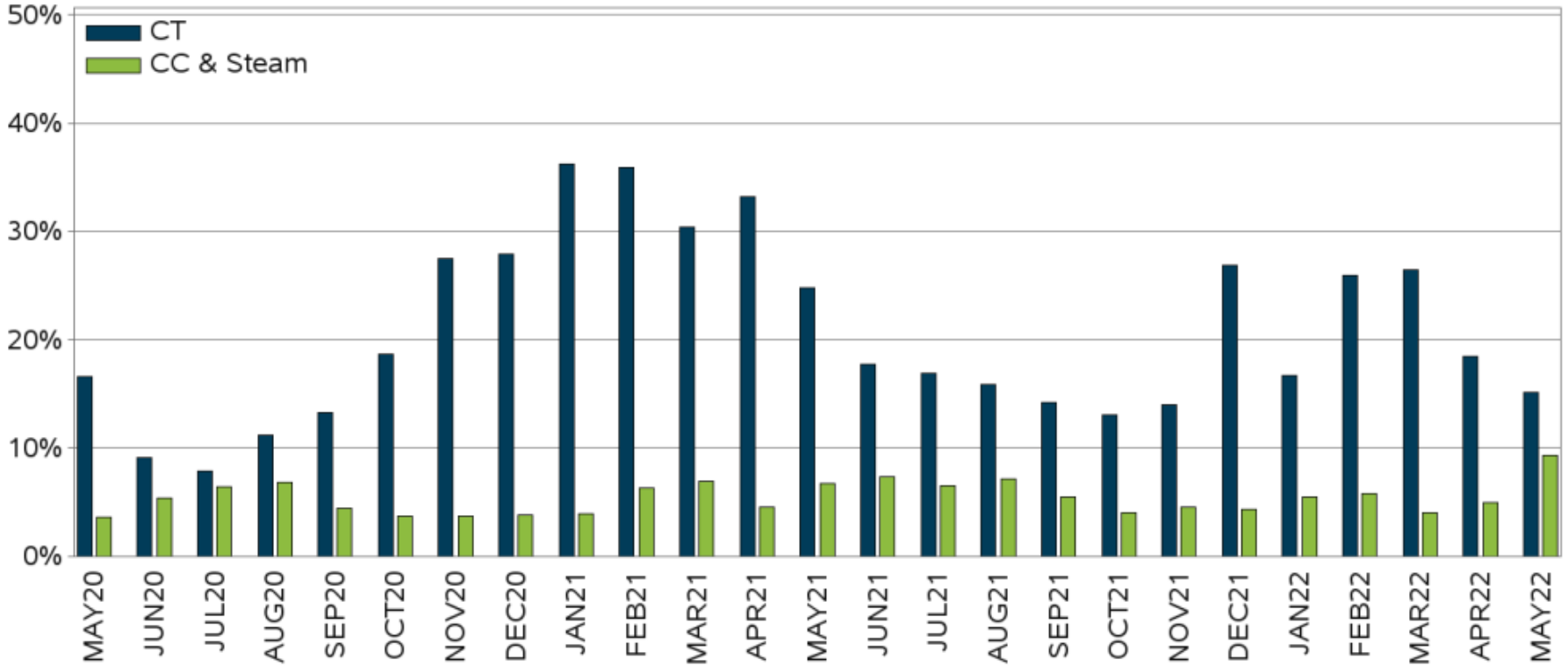
Daily Uplift - May



- In May, uplift exceeded $800,000 on four days – May 21, 26, 30 & 31
- Contributing factors to uplift were:
  - Hot Weather Alerts
  - Localized congestion

More information on Uplift can be found on the PJM website at Drivers of Uplift

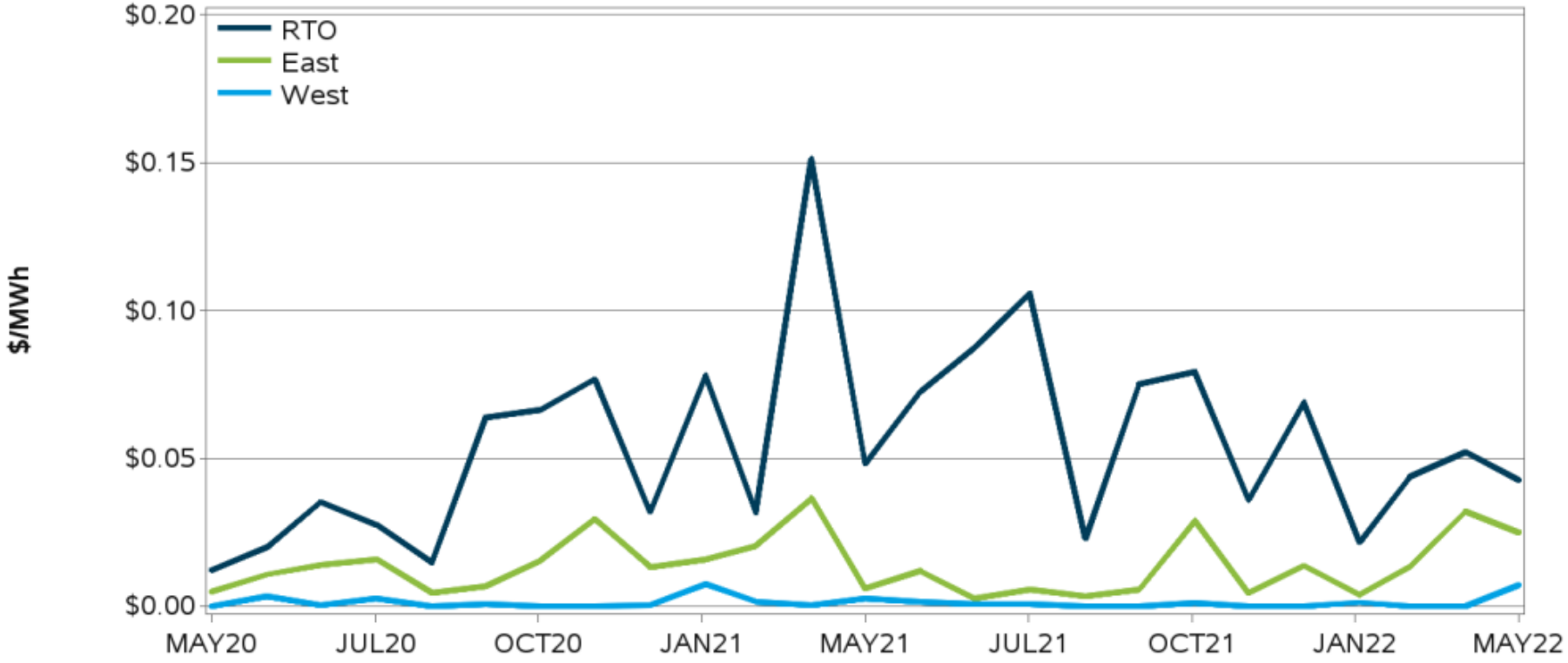
Percent of Total CT, CC and Steam Hours with LMP < Offer



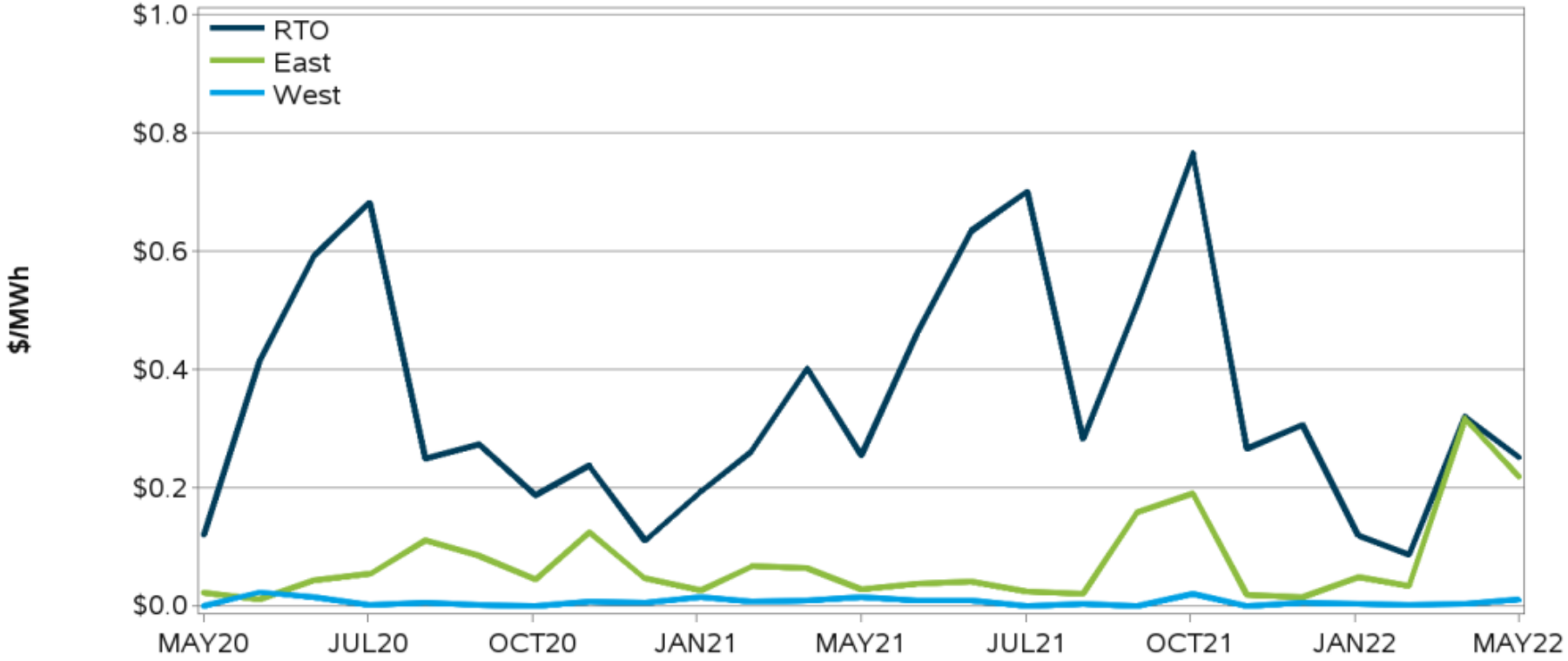
- Beginning in December 2008, the daily Balancing Operating Reserves (BOR) rate was replaced with six different BOR rates: RTO BOR for Reliability Rate, RTO BOR for Deviations Rate, East BOR for Reliability Rate, East BOR for Deviations Rate, West BOR for Reliability Rate, West BOR for Deviations Rate.

- 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.

Reliability Balancing Operating Reserve Rates



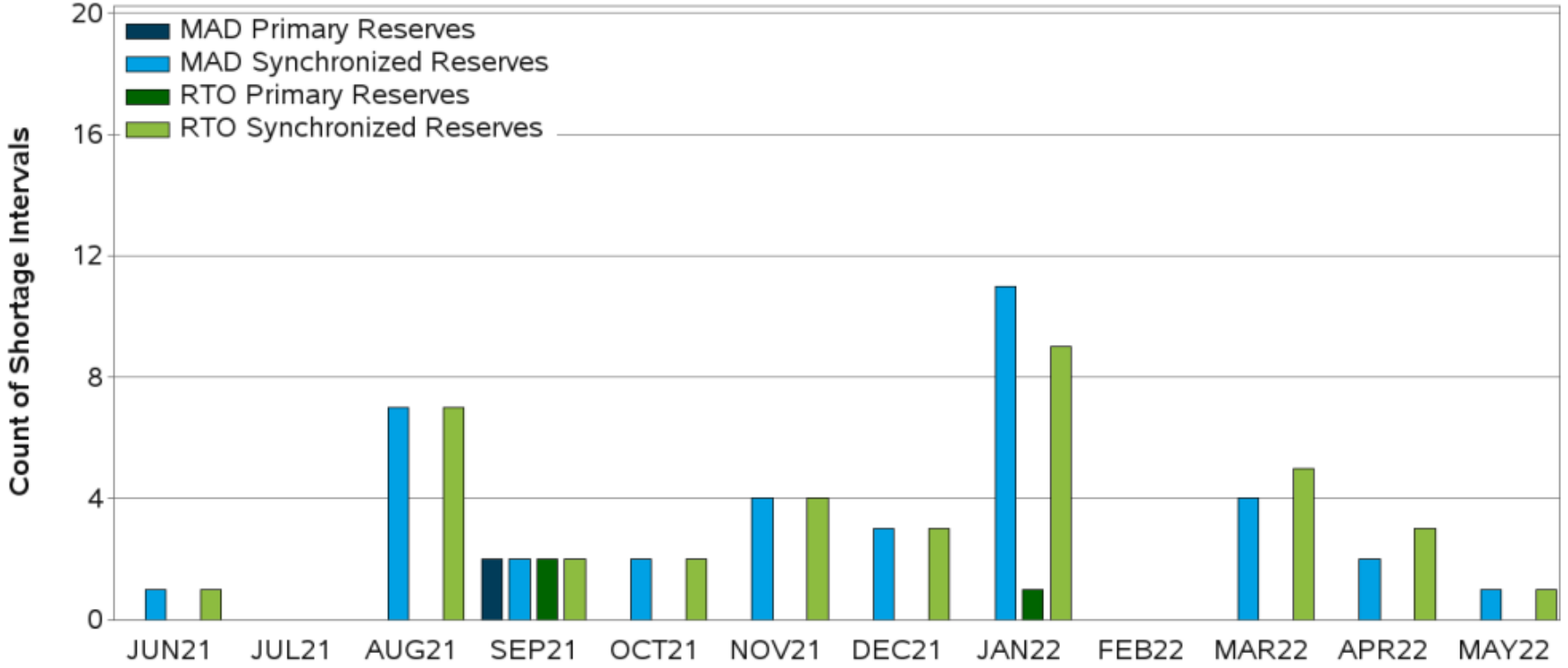
Deviations Balancing Operating Reserve Rates



Energy Market

LMP Summary

Shortage Pricing Intervals

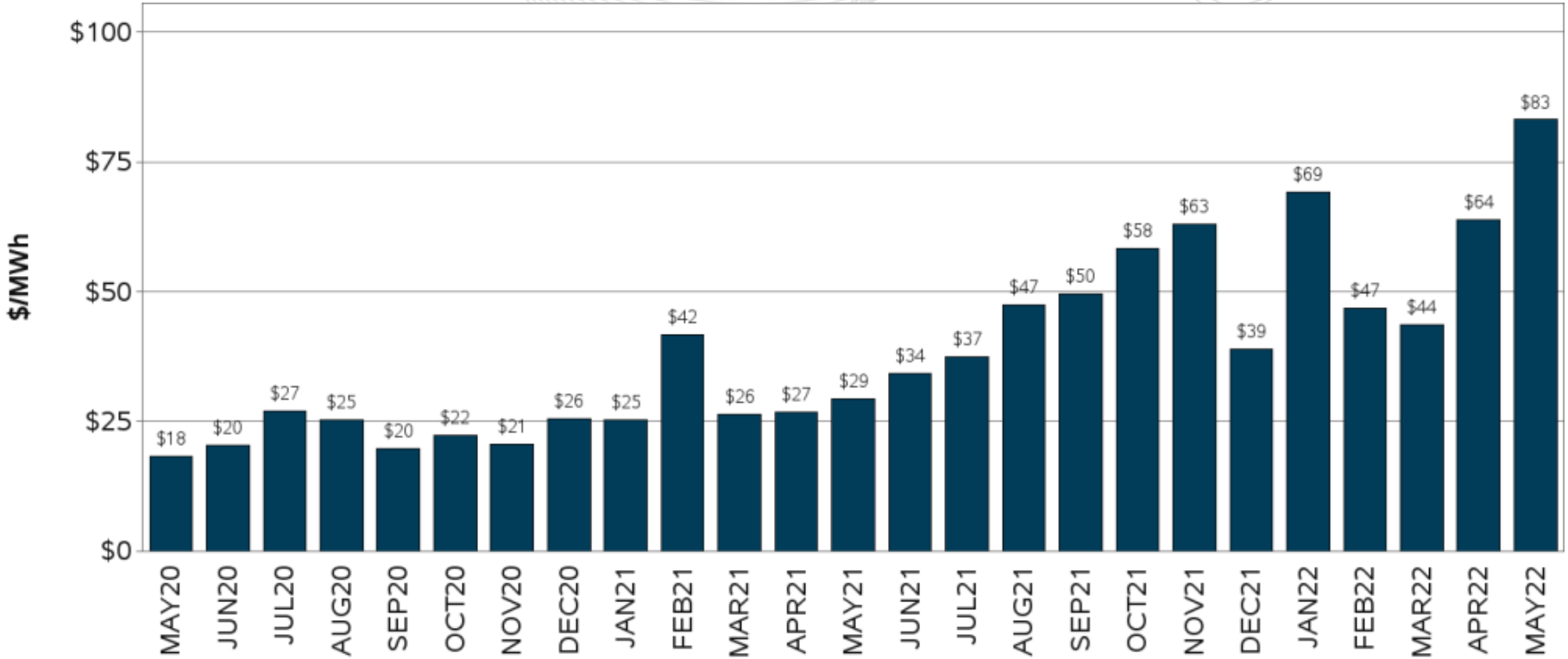


Date	5-Minute Interval	Reserve Penalty Factors	5-Minute Interval SMP	Hourly Integrated SMP
Monday, May 16, 2022	15:55 - 16:00	RTO Synchronized Reserves; MAD Synchronized Reserves	$700.24	$148.45

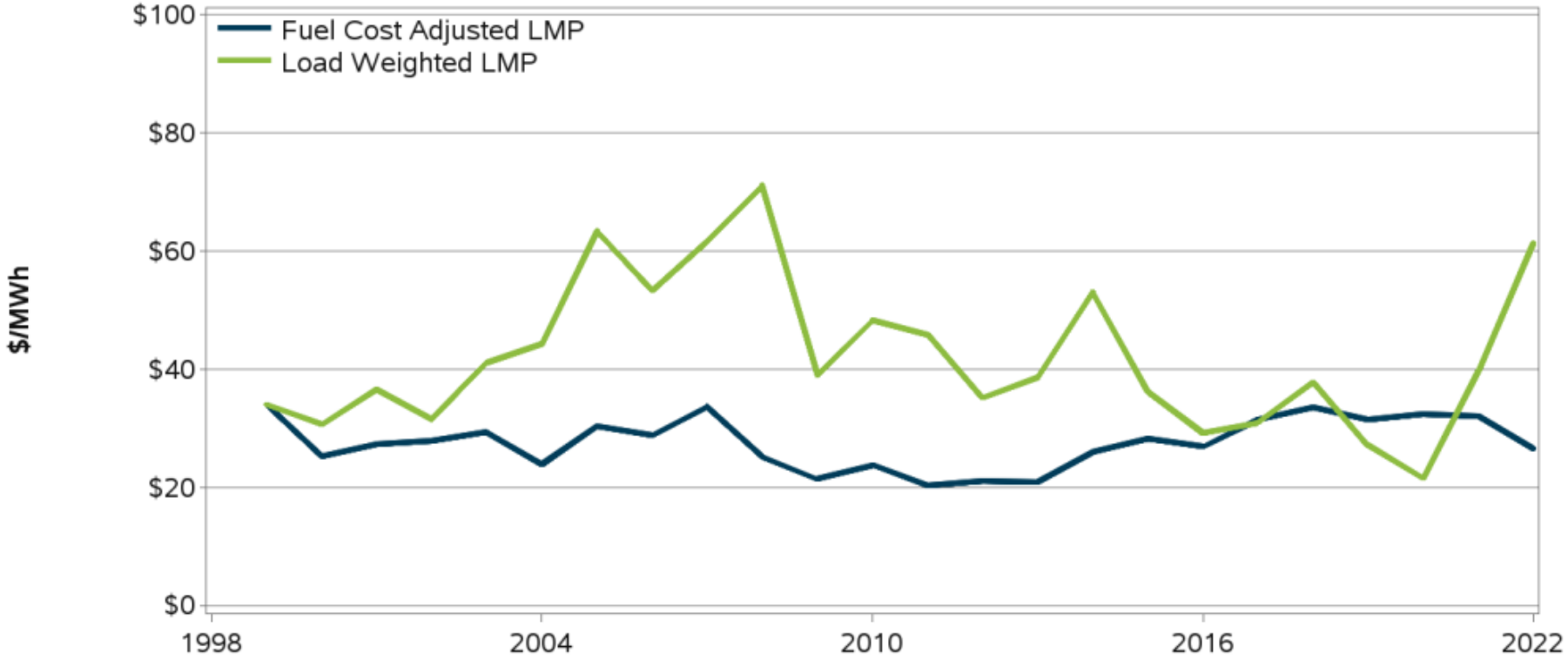
Information on constraints and shadow prices can be found here:

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

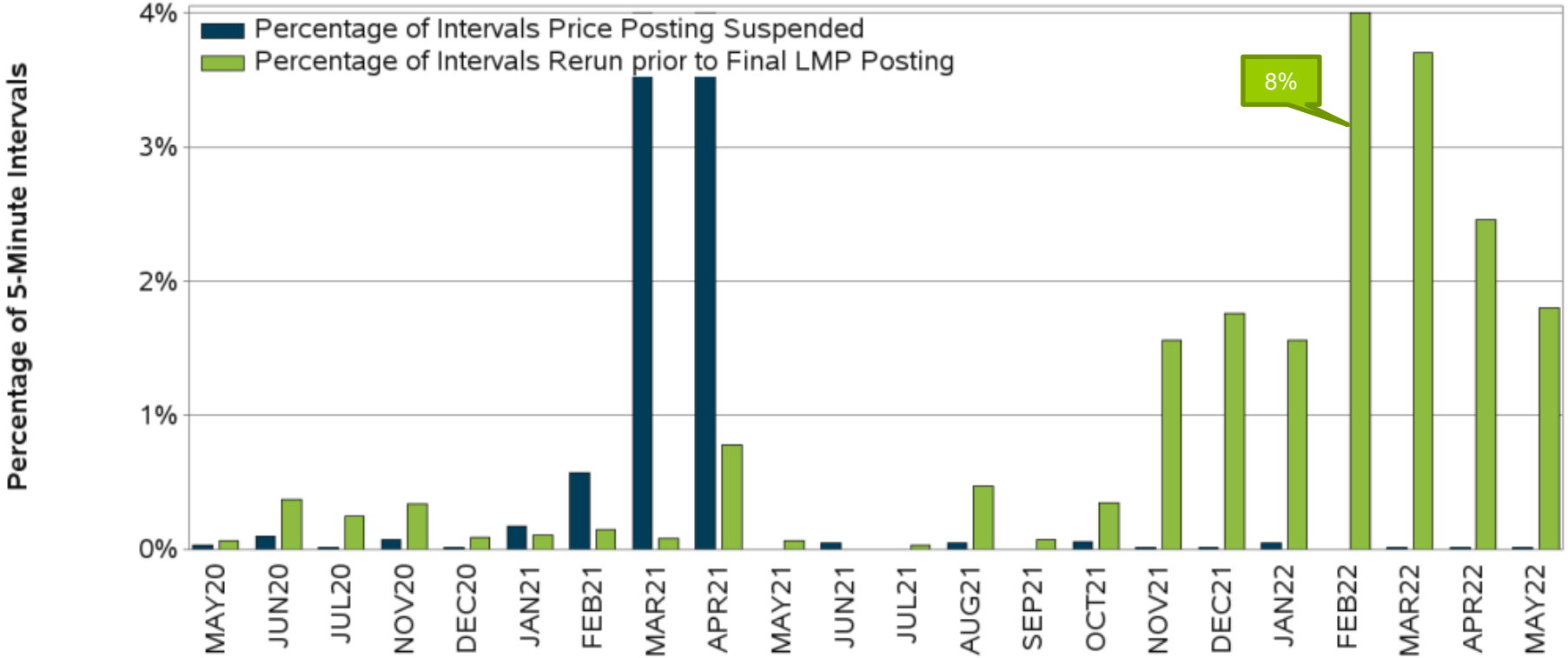
Load-Weighted Average LMP



Fuel Cost Adjusted LMP (Referenced to 1999 Fuel Prices)



LMP Price Posting Suspensions and Reruns

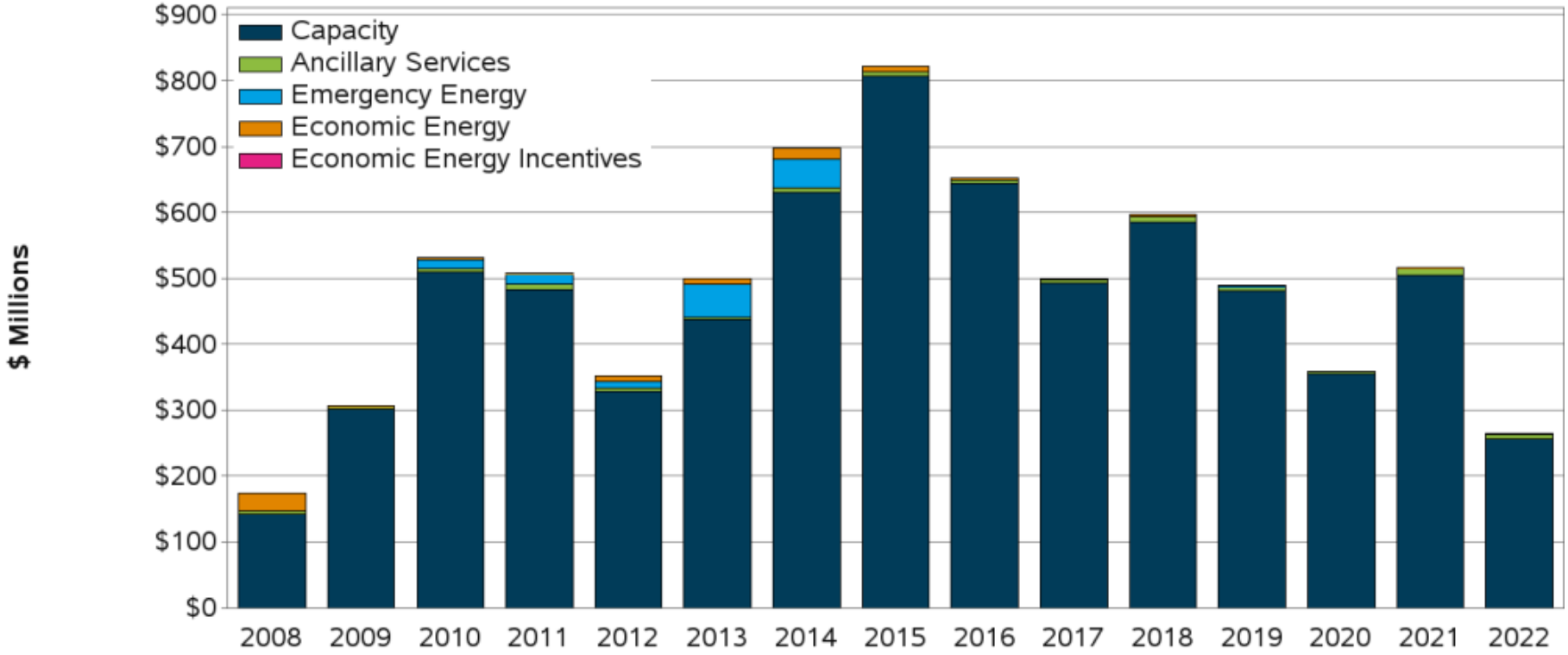


Spikes seen in March and April 2021 are incorrect and due to a software bug which has since been fixed. The February 2022 rate is due to reruns for the Lanexa-Dunsville outage.

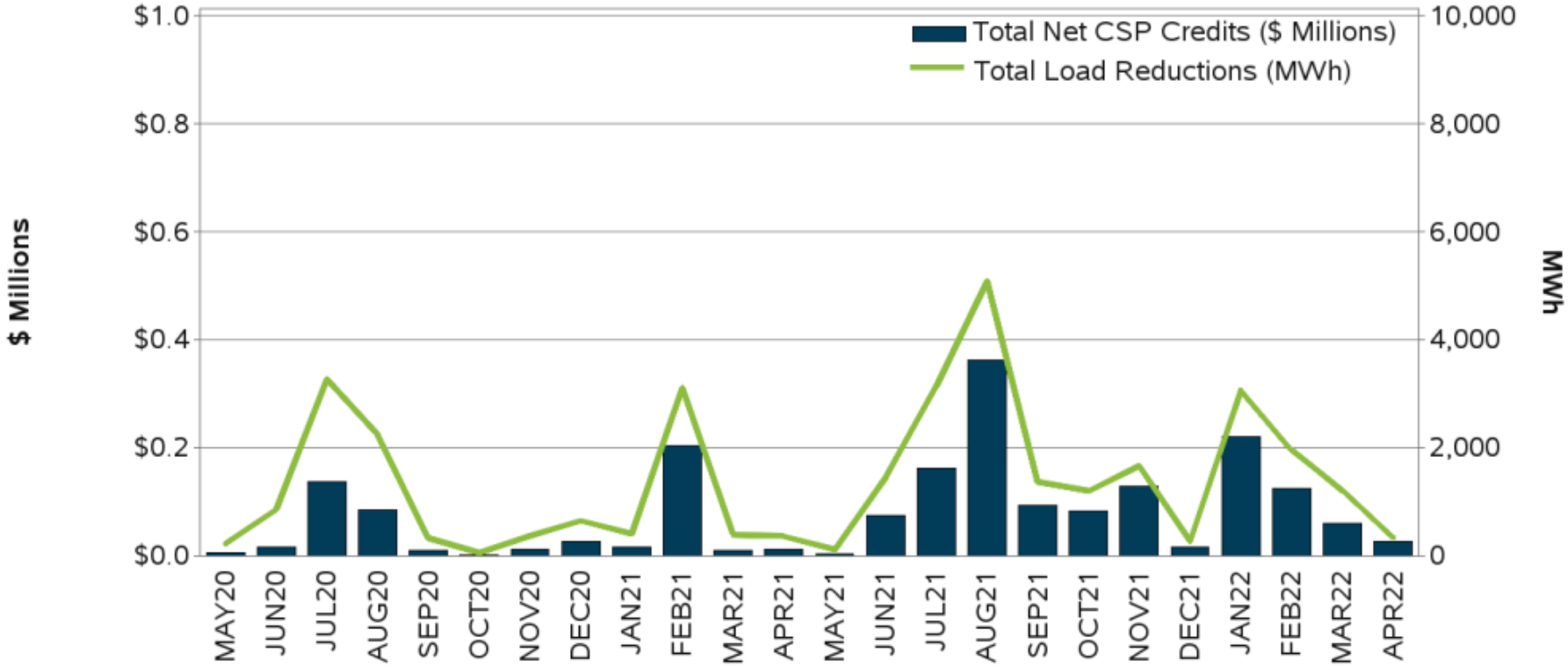
Energy Market

Demand Response Summary

Demand Side Response Estimated Revenue

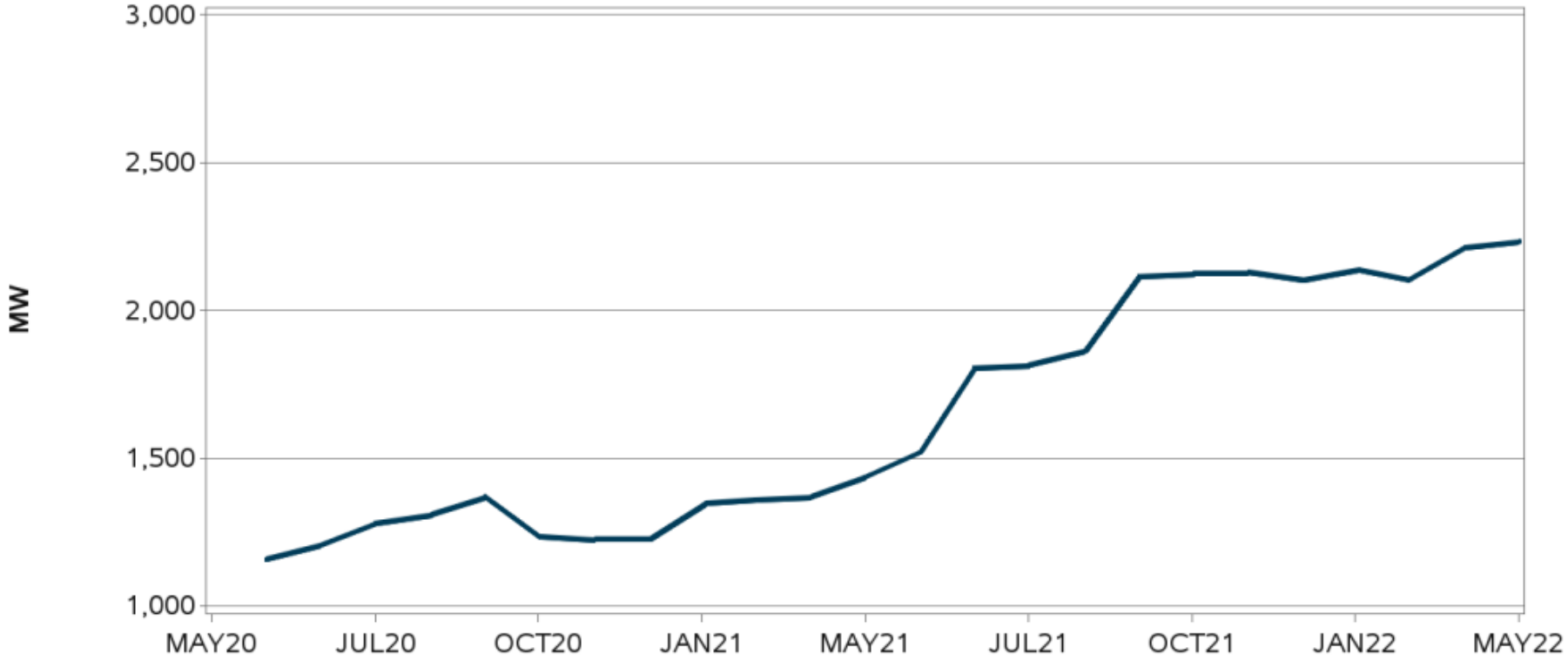


Economic Demand Response Activity



*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



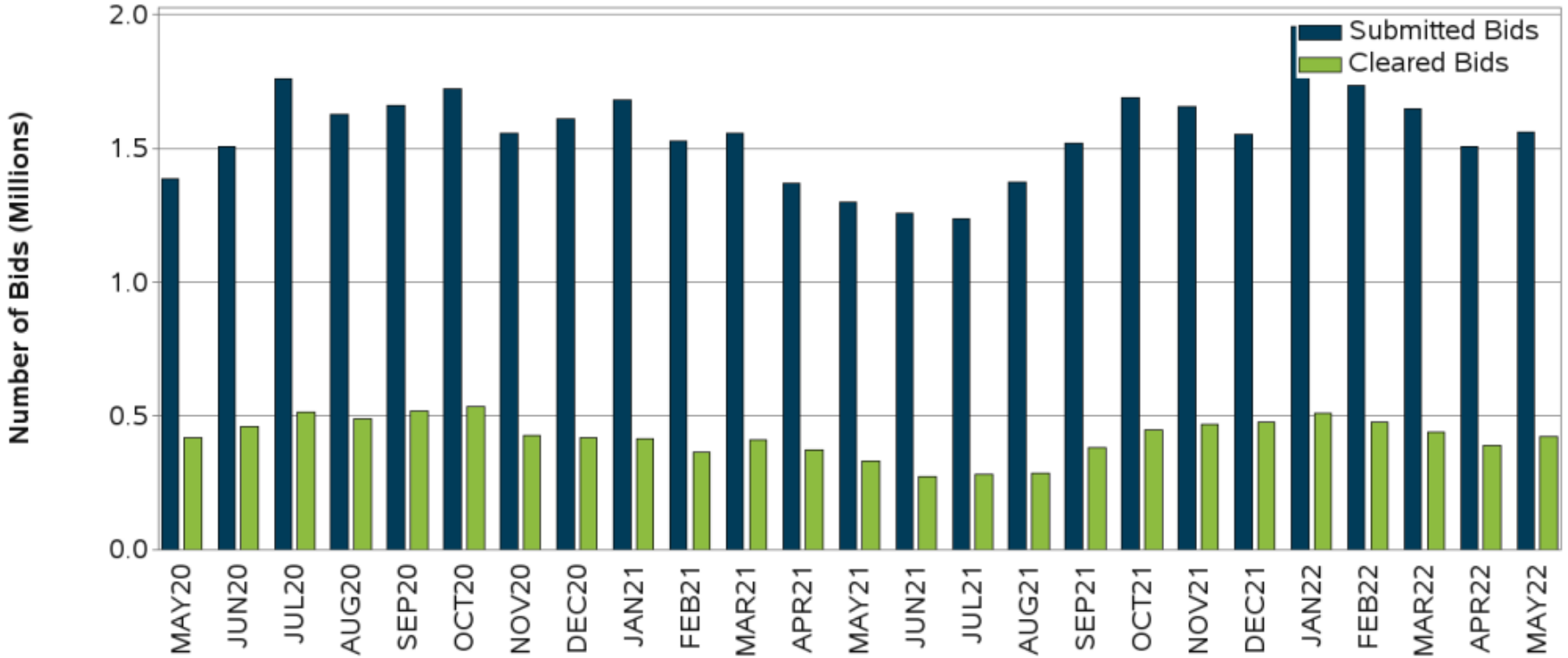
Energy Market

Virtual Activity Summary

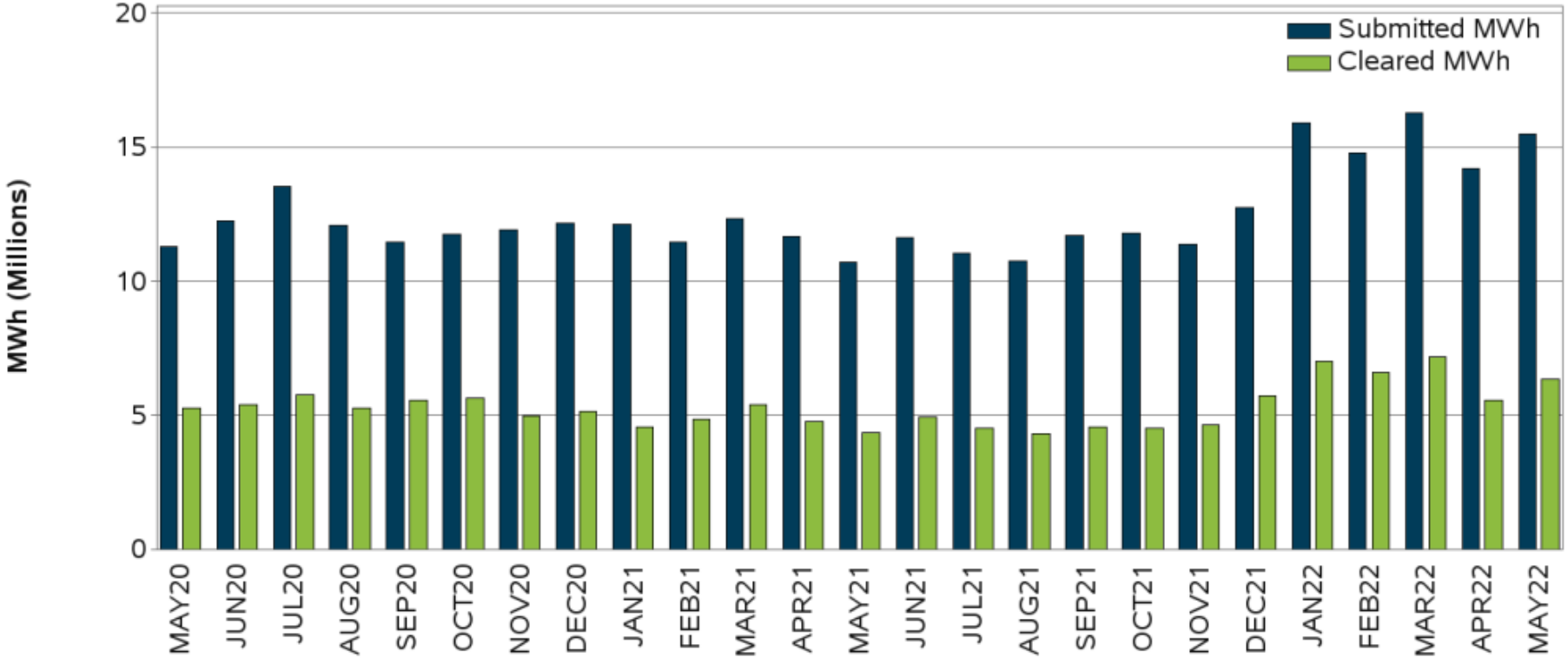
- The following six charts depict trends in submitted and cleared virtual and up-to-congestion transactions, in terms of number and volume, into the PJM Energy Market. The first two of these charts show the submitted and cleared increment and decrement bids (virtual transactions or virtuals) and they 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.

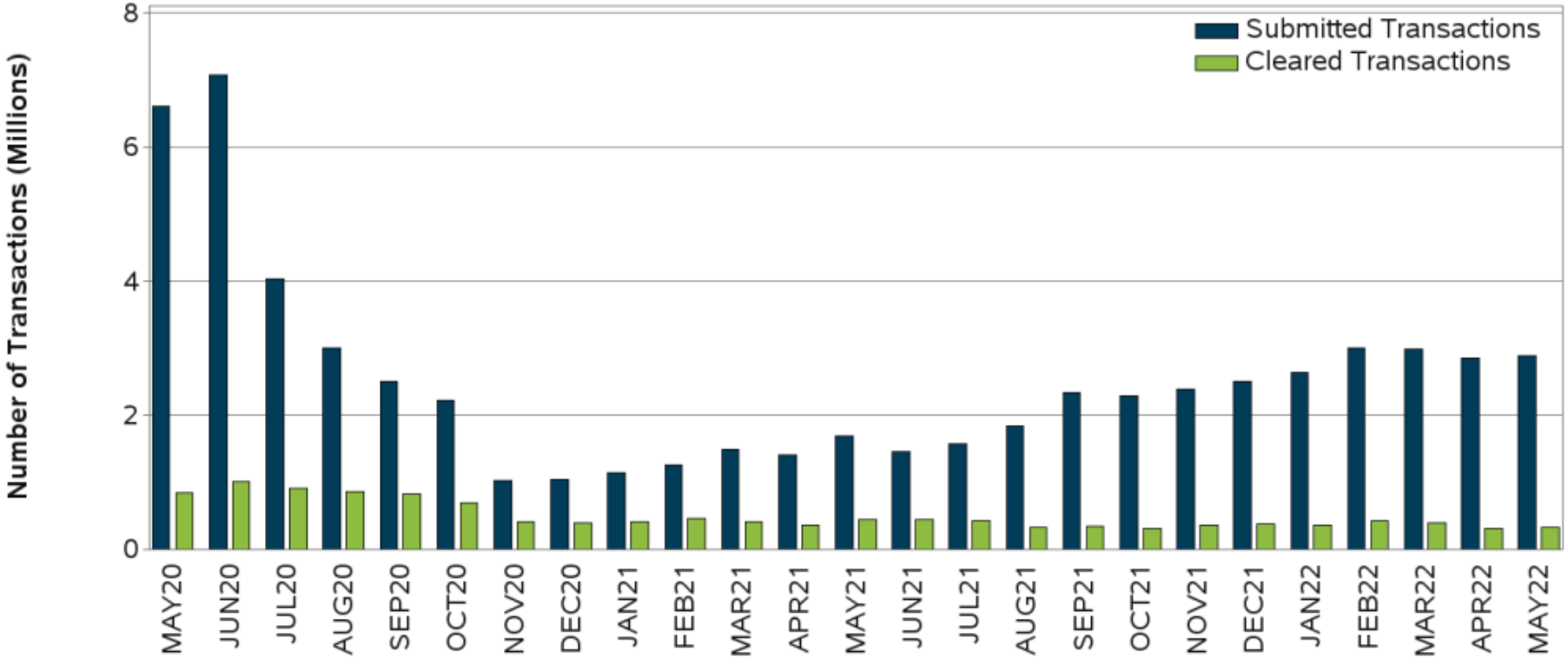
Virtual Bids (INCs & DECs) - Total Number



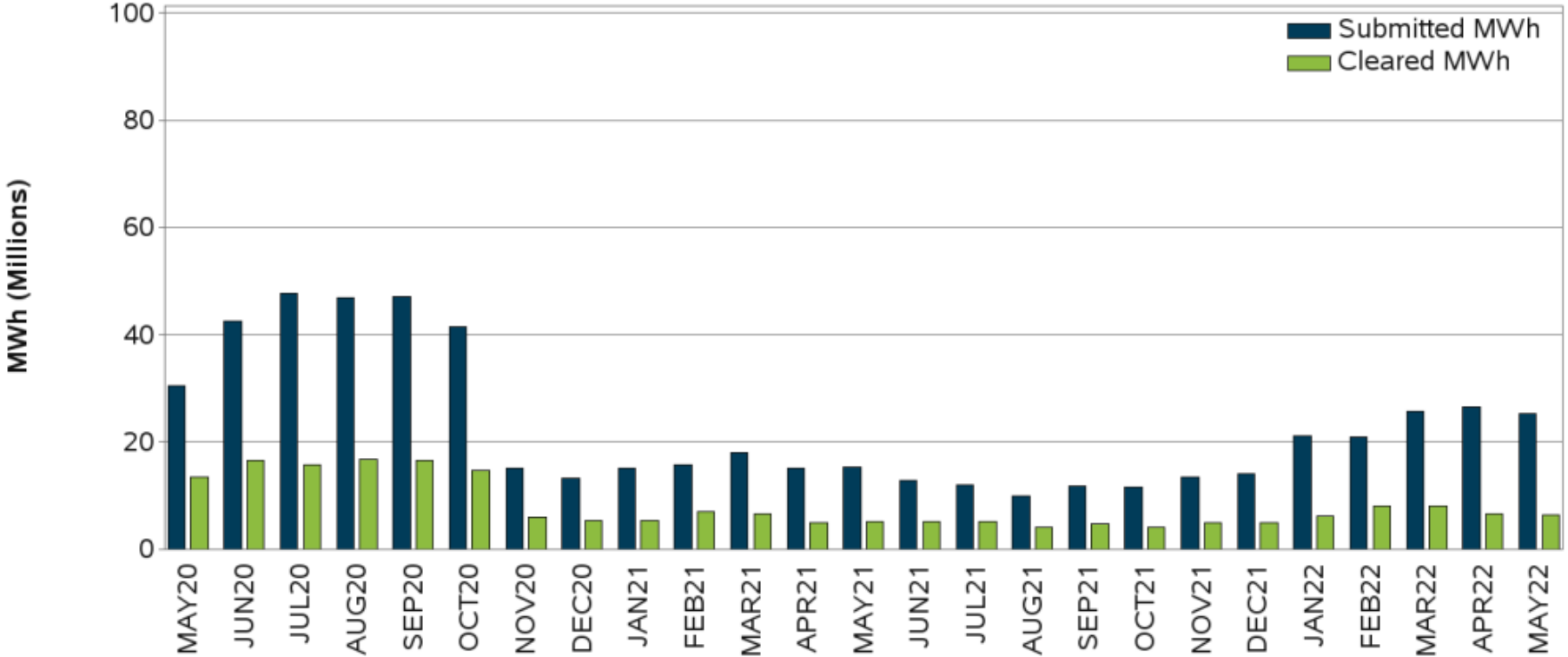
Virtual Bids (INCs & DECs) - Total Volume



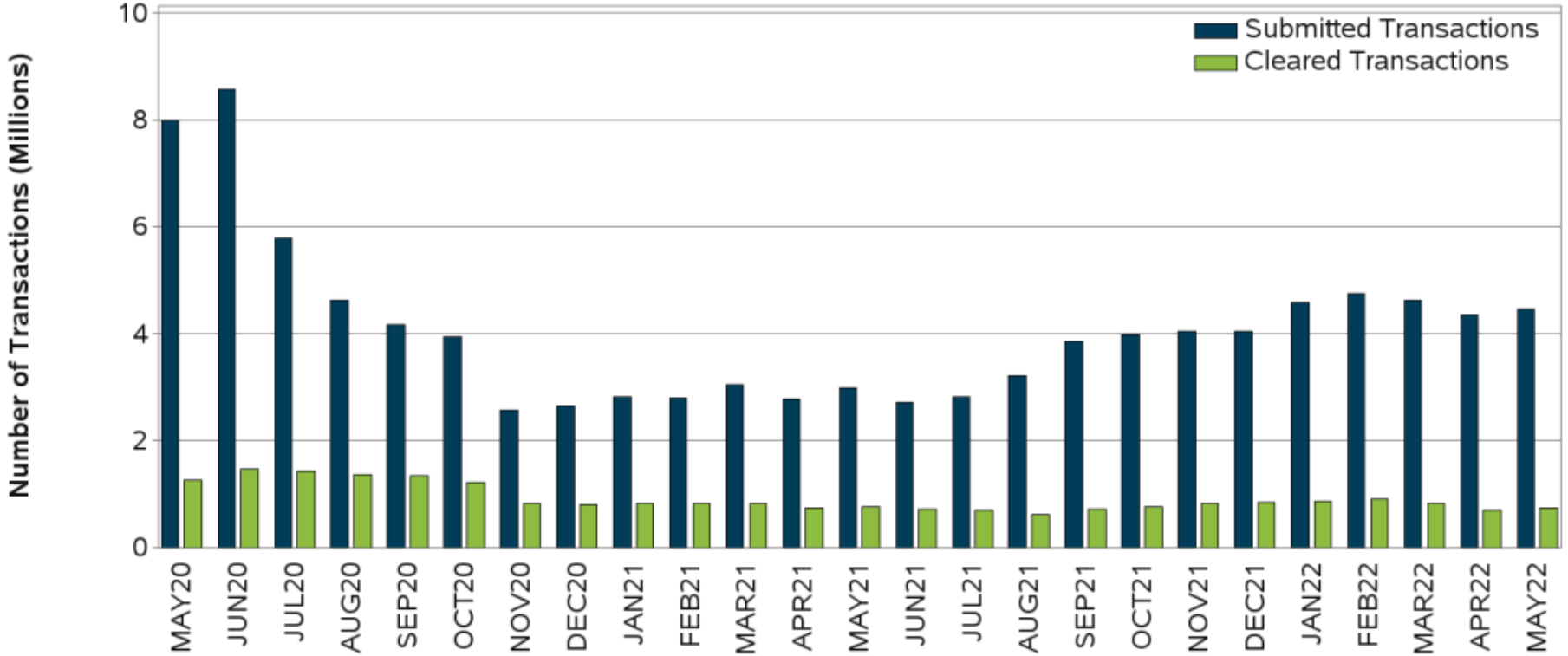
Up-To-Congestion Transactions - Total Number



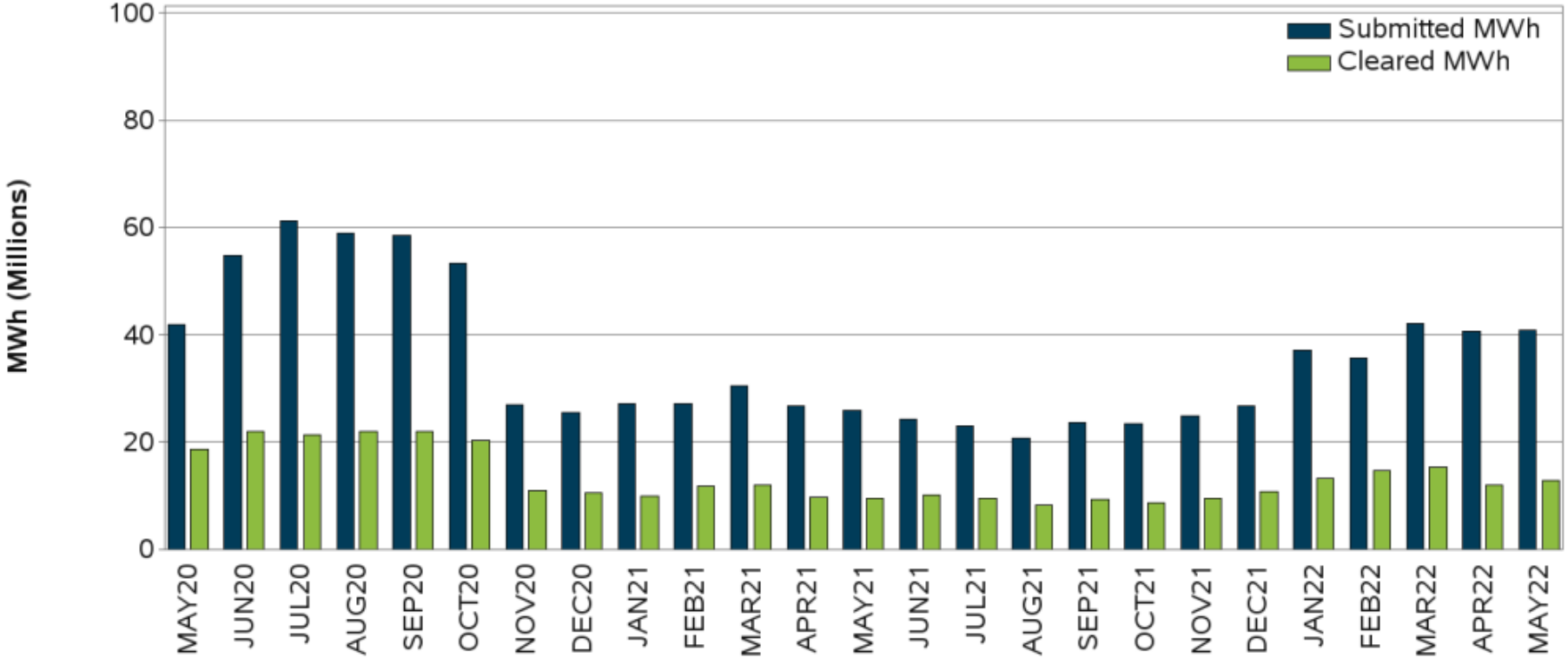
Up-To-Congestion Transactions - Total Volume



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



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

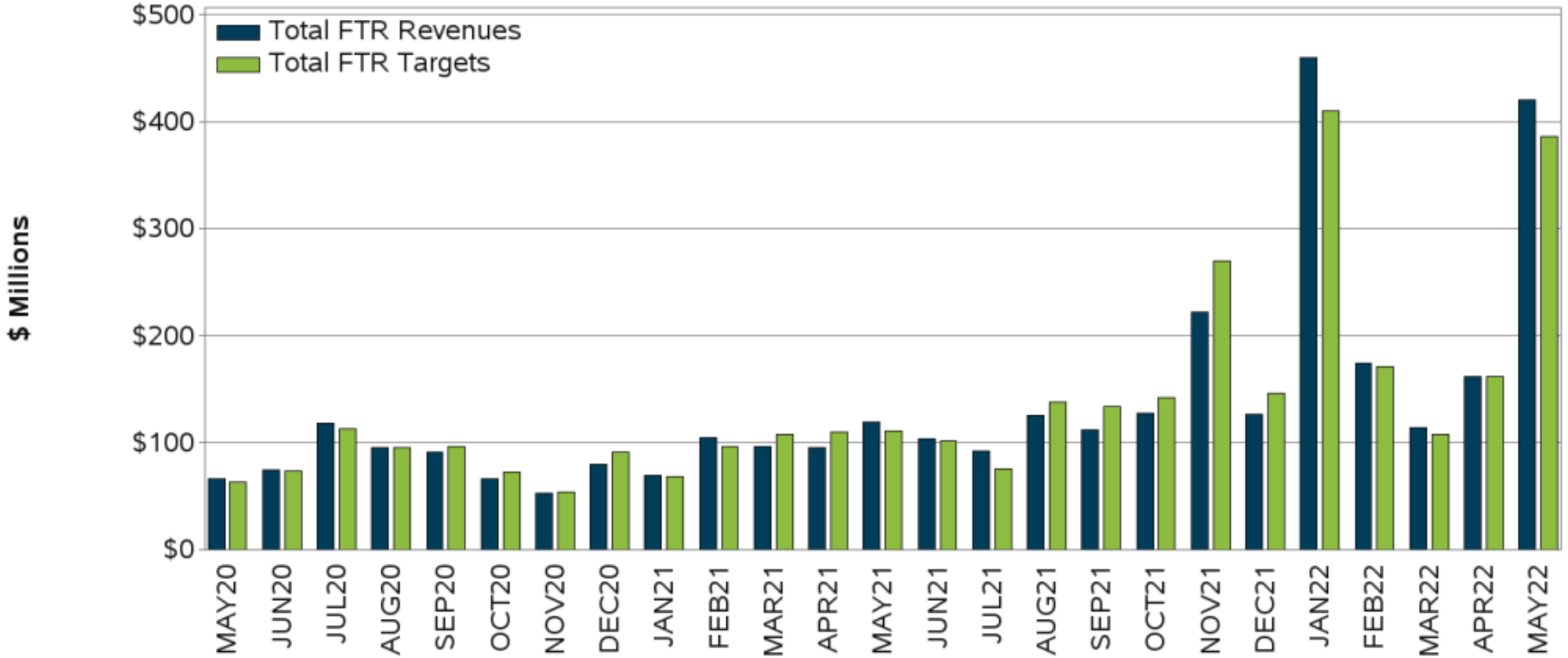


Energy Market

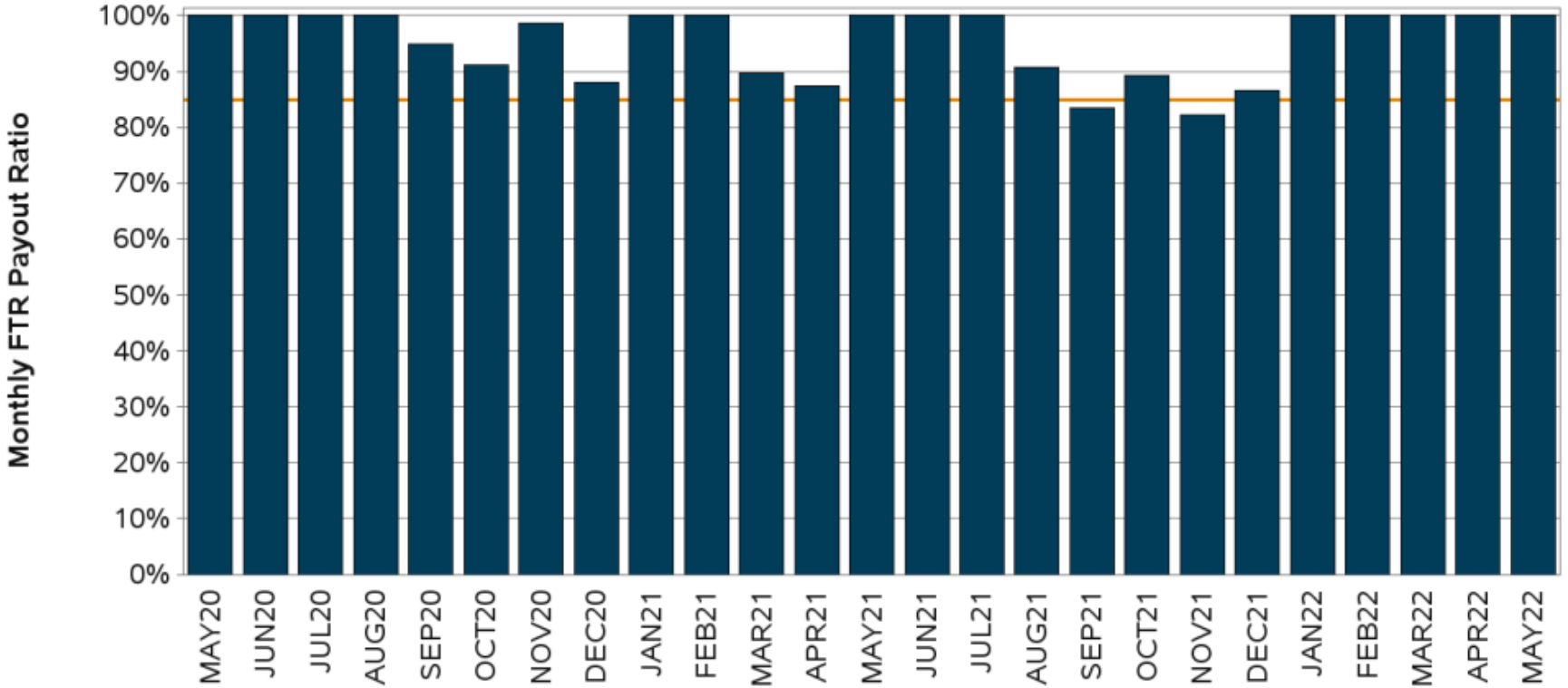
Congestion and FTR Summary

Period	Surplus / Underfunding	Payout Ratio
May, 2022	$34,545,897	100%
2022	$94,106,021	100%
2021/2022	$-5,379,381	100%

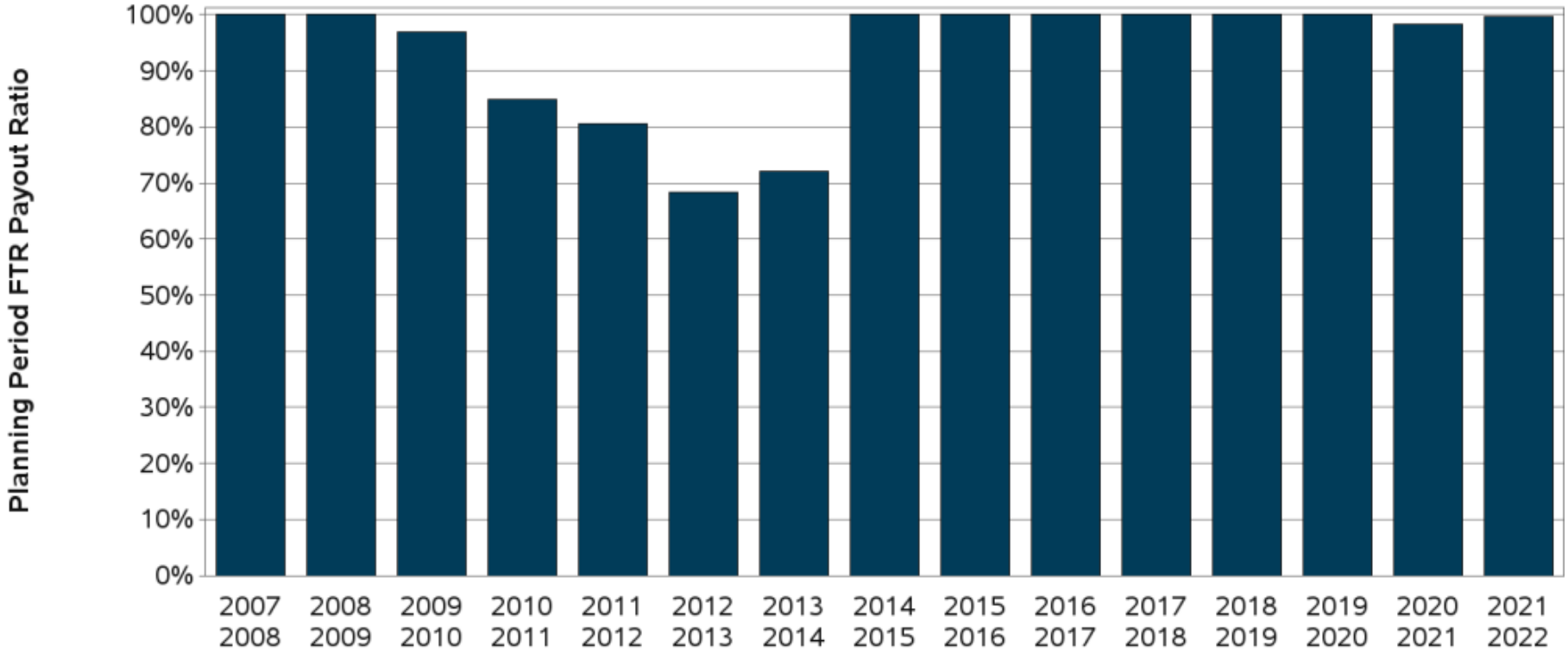
FTR Revenue vs. FTR Target Allocation



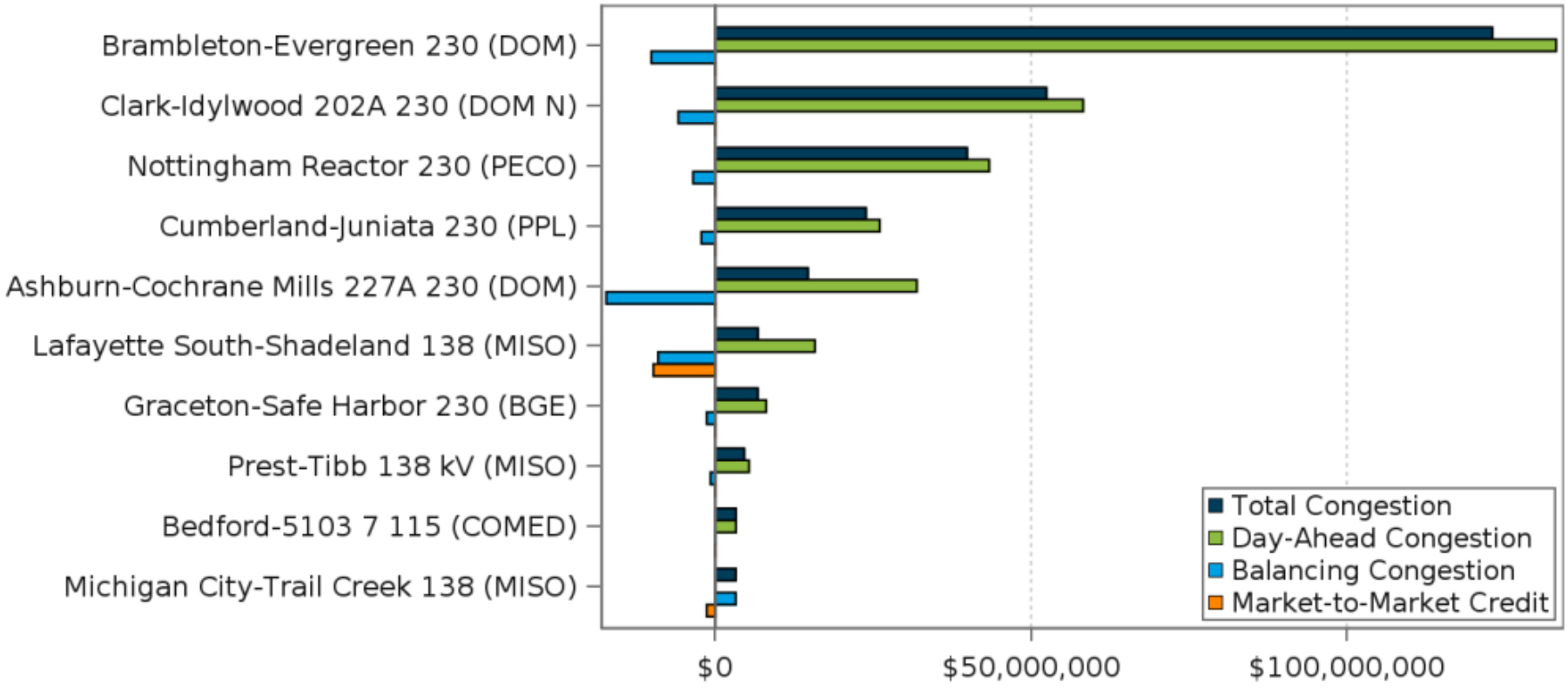
Monthly FTR Payout



Planning Period FTR Payout

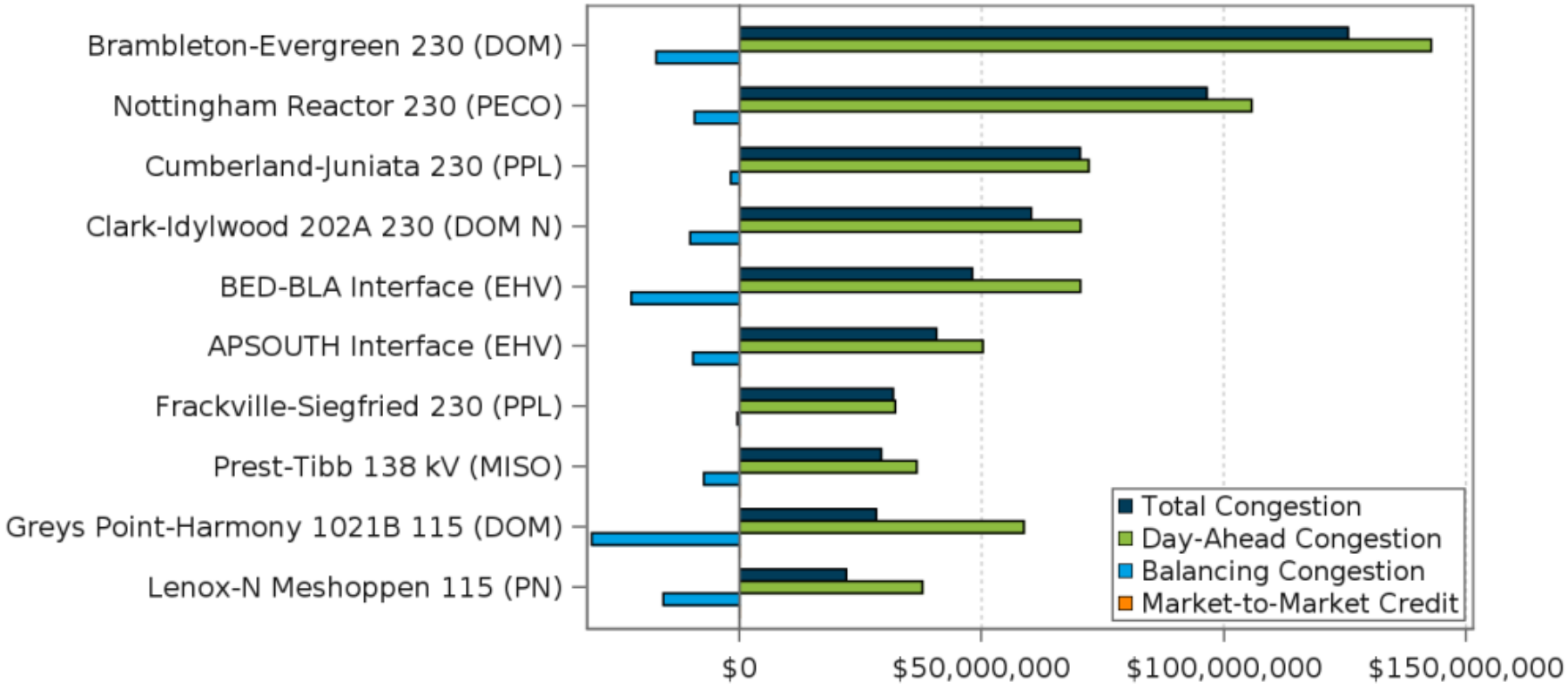


Ten Most Heavily Congested Transmission Facilities - Overall, May



The ten most heavily congested facilities account for 91% of total congestion for May.

Ten Most Heavily Congested Transmission Facilities - Overall, 2022

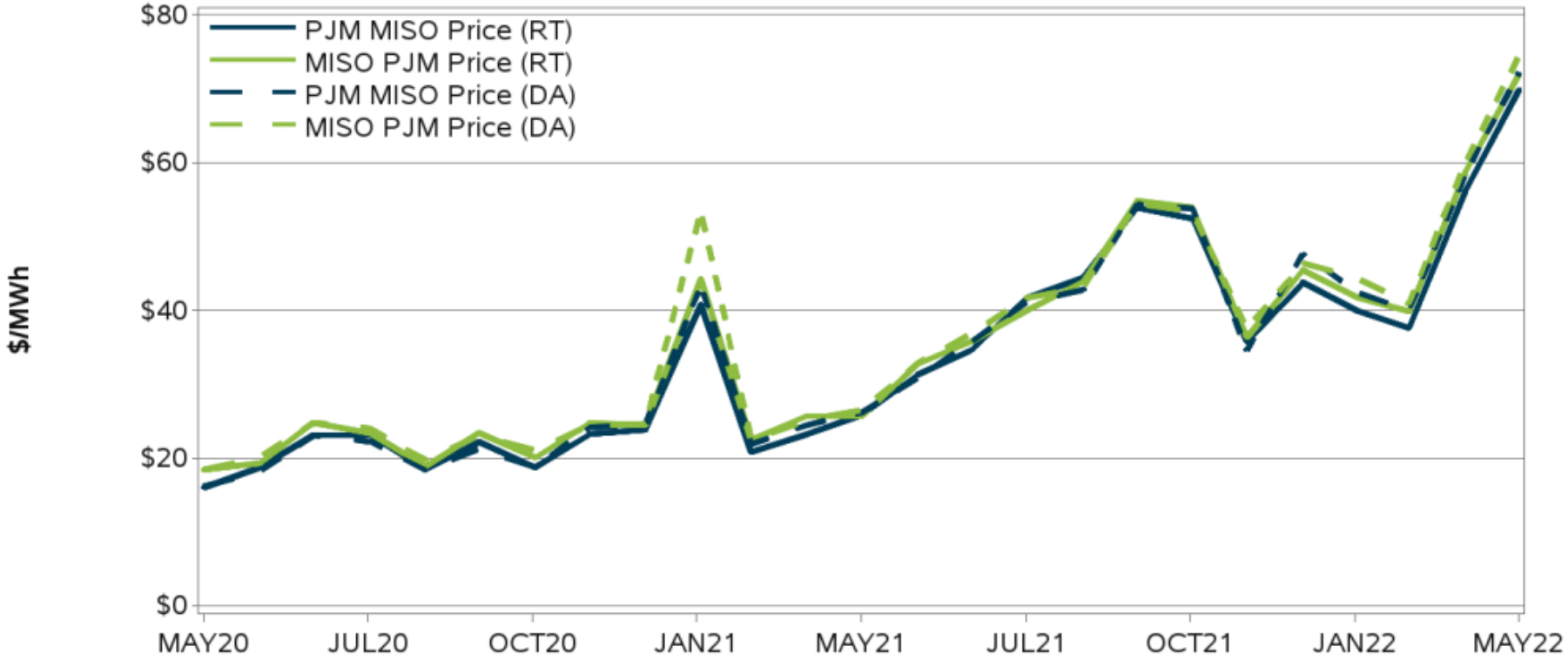


The ten most heavily congested facilities account for 60% of total congestion for 2022.

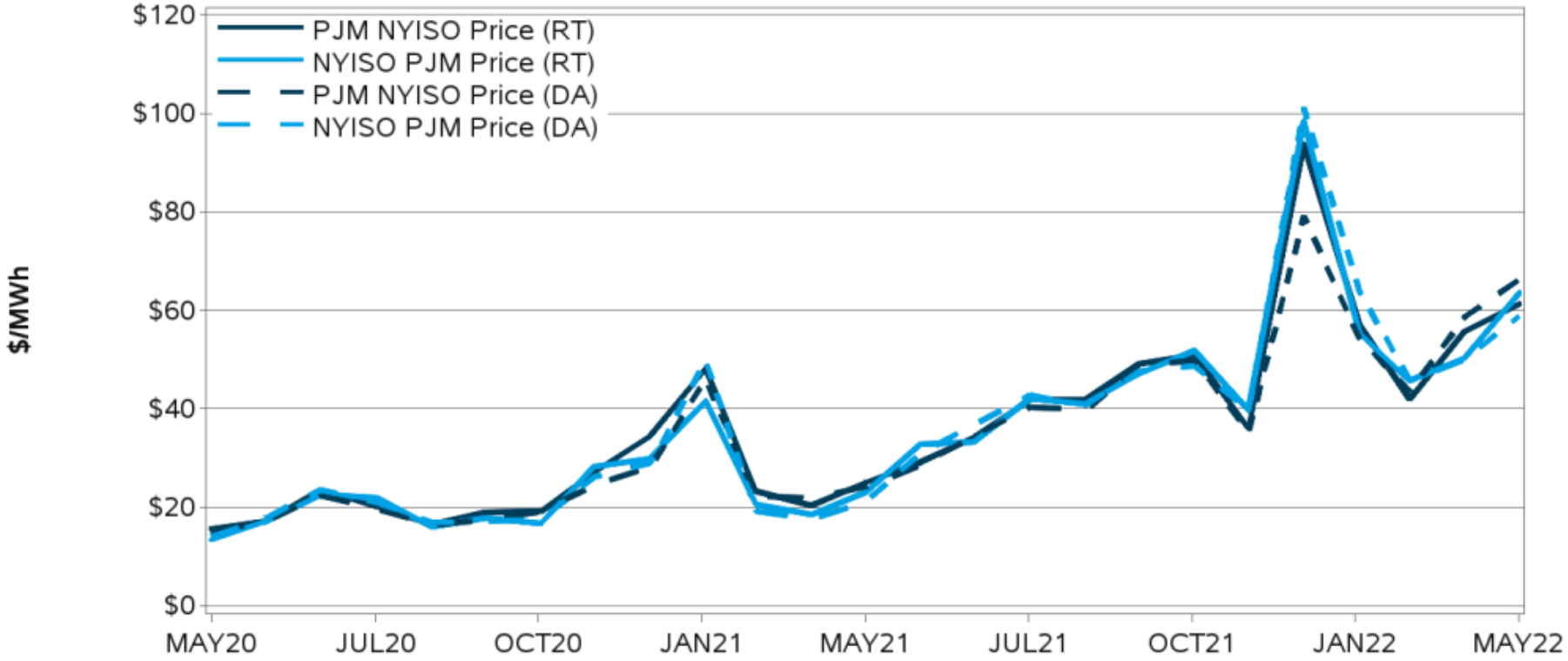
Energy Market

Interchange/Seams Summary

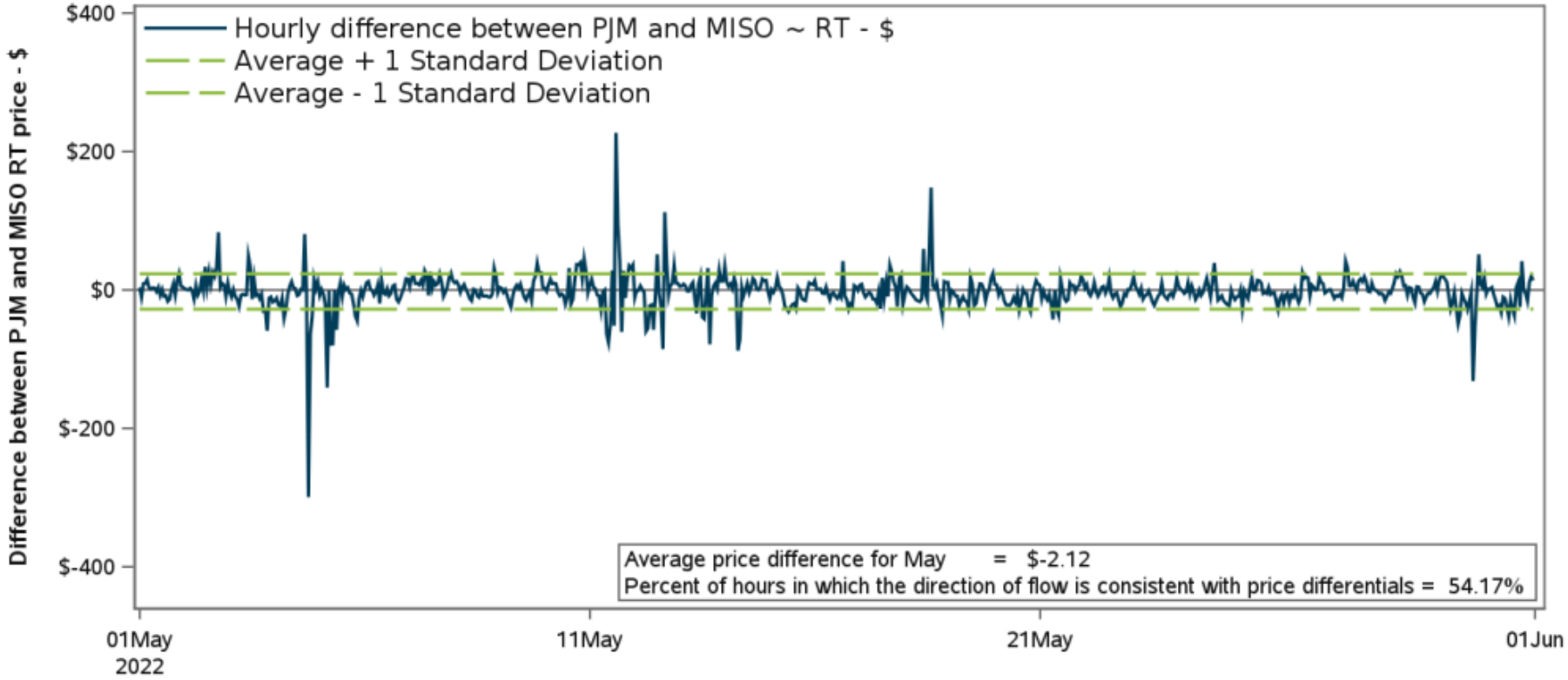
Monthly Average MISO Interface Pricing



Monthly Average NYISO Interface Pricing

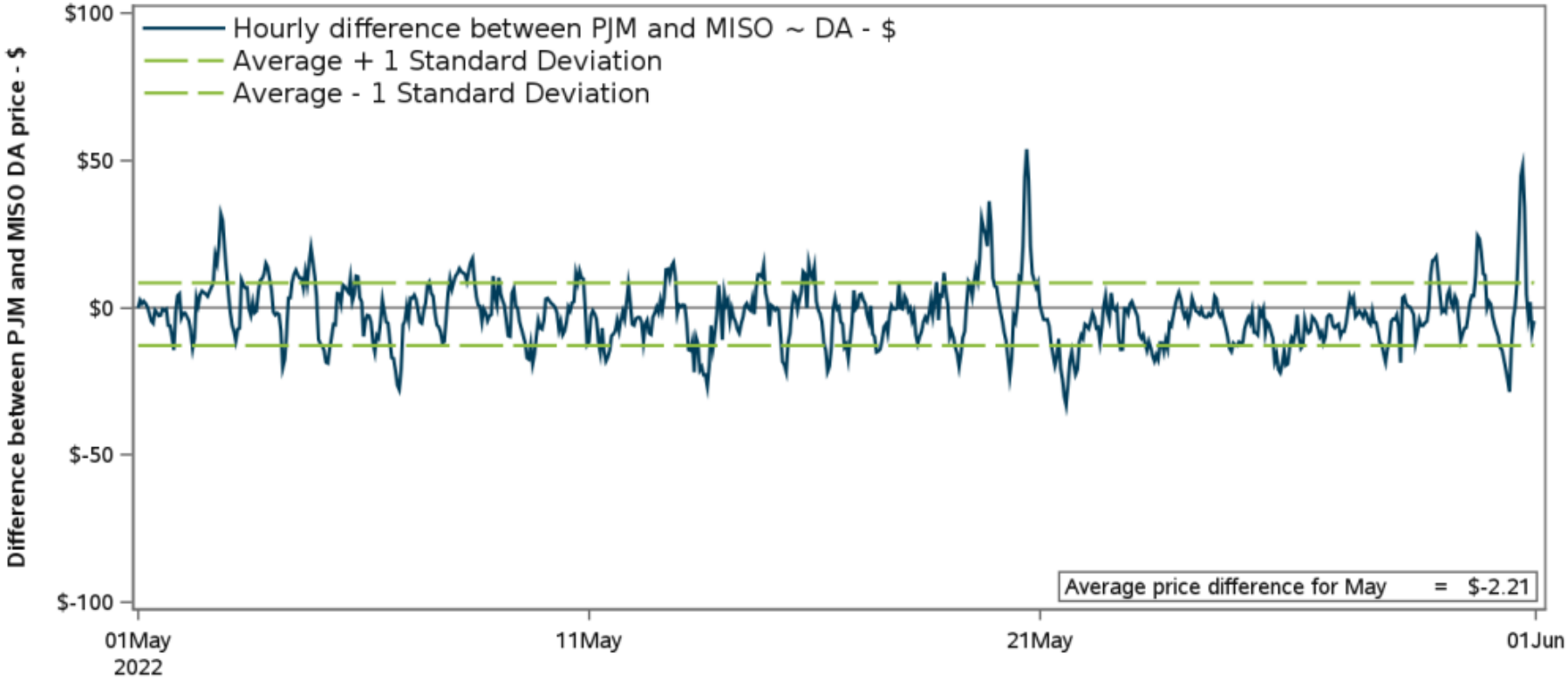


Hourly Difference Between PJM and MISO Real-Time Prices



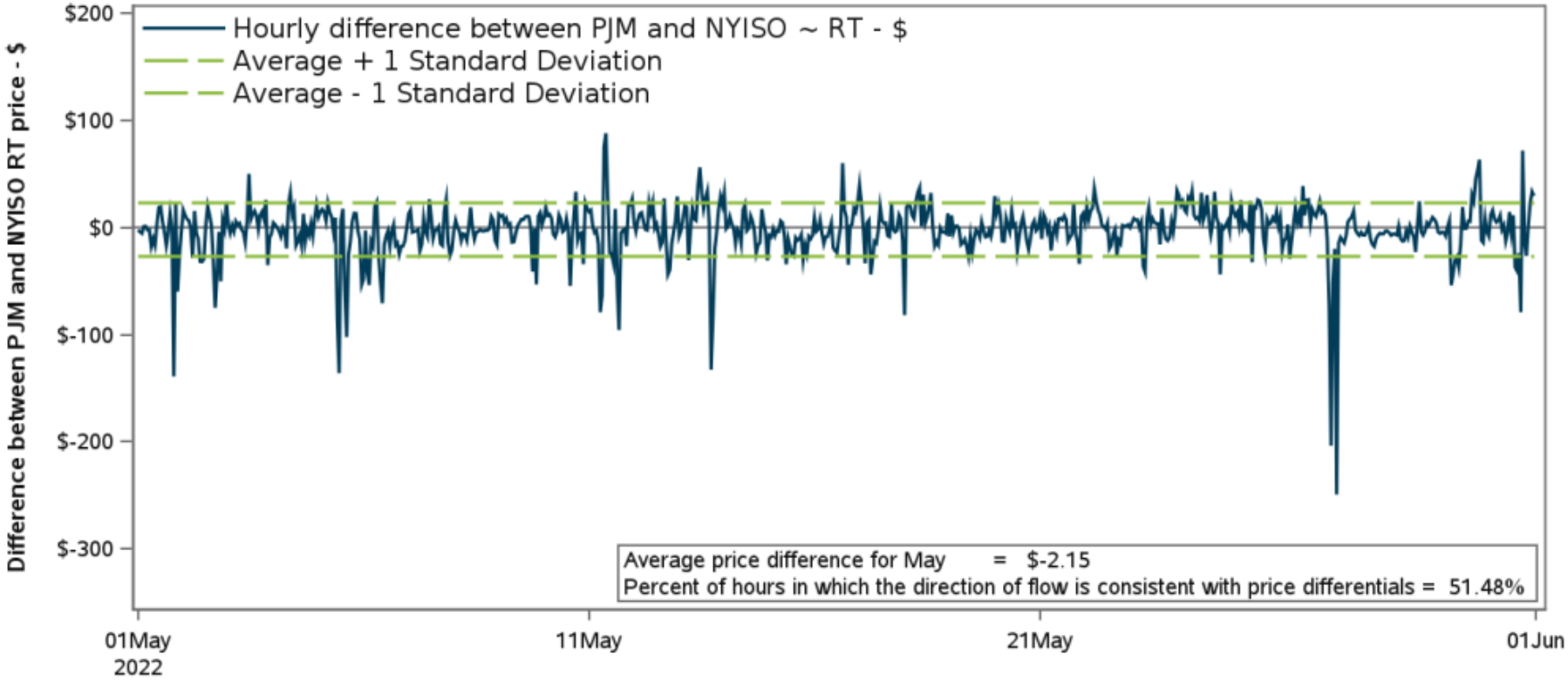
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and MISO Day-Ahead Prices



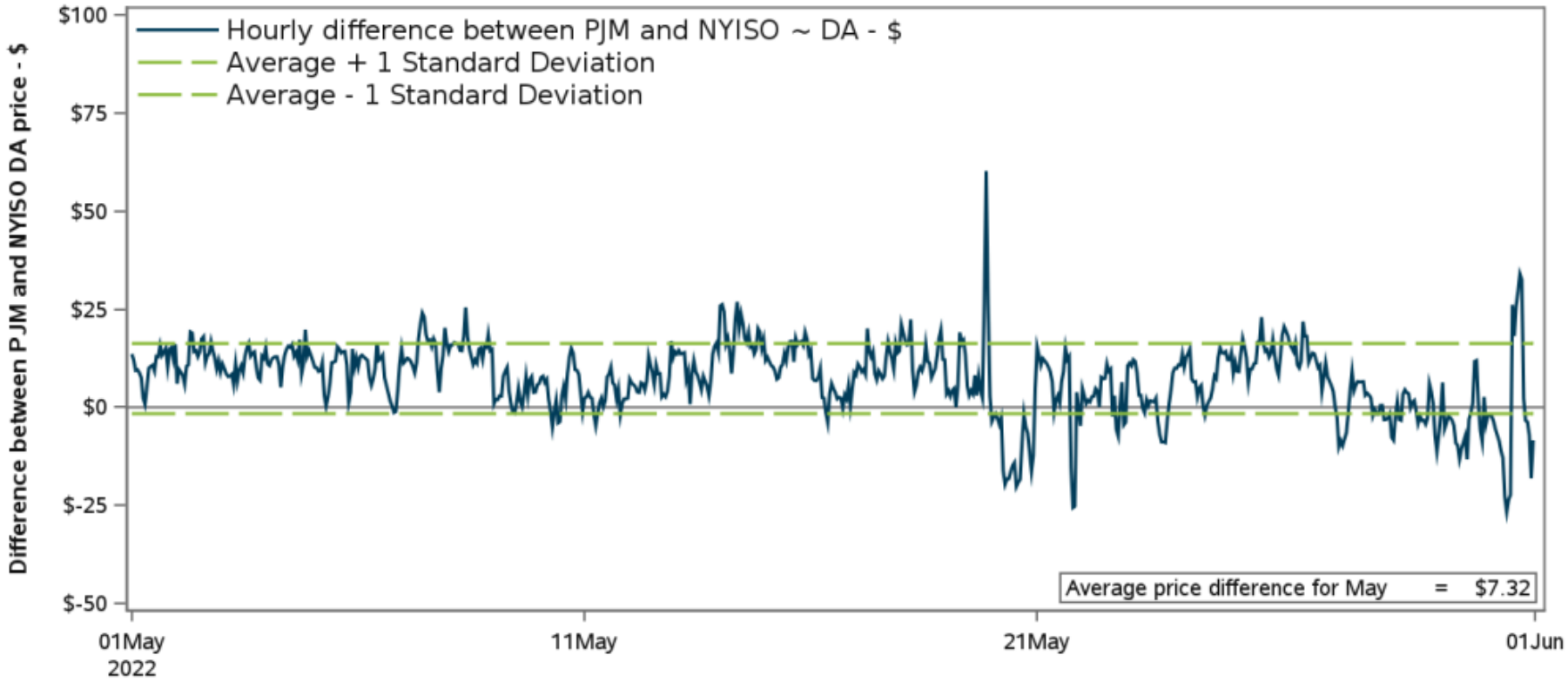
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and NYISO Real-Time Prices



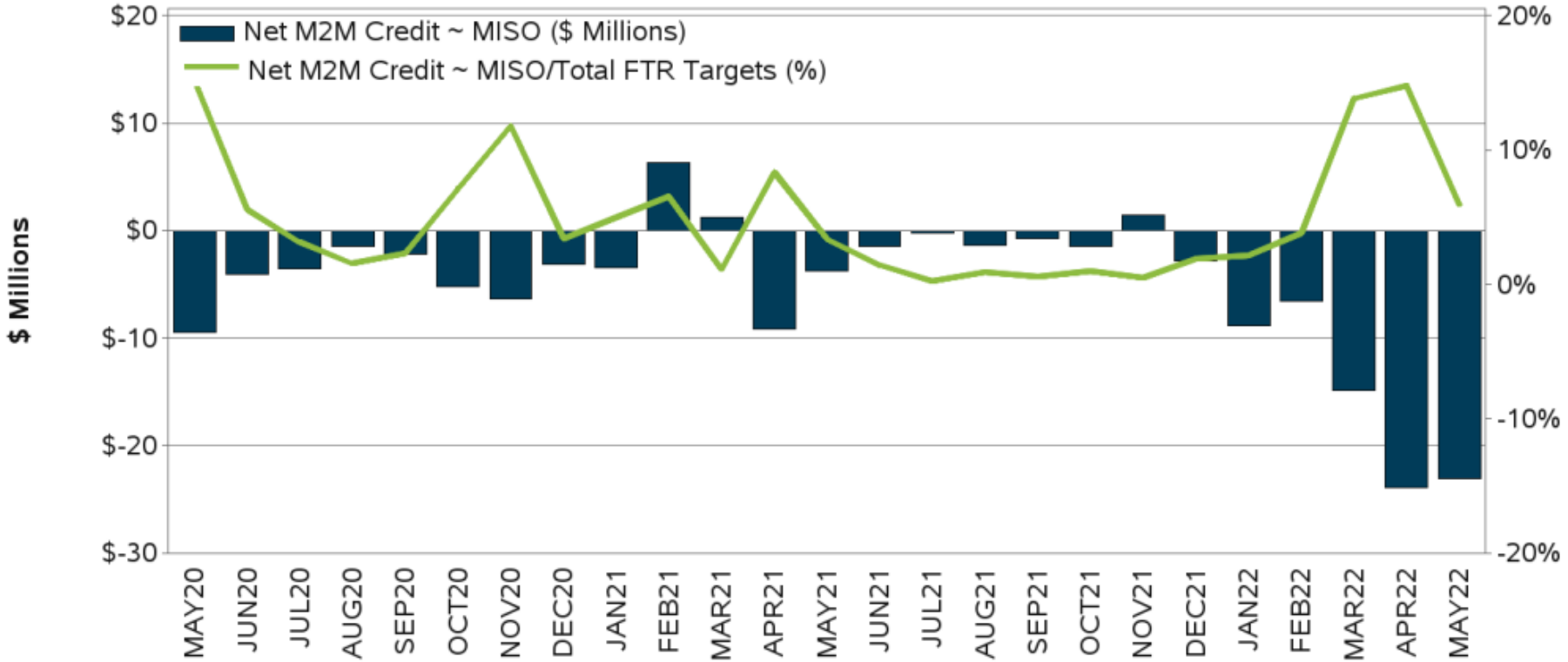
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and NYISO Day-Ahead Prices



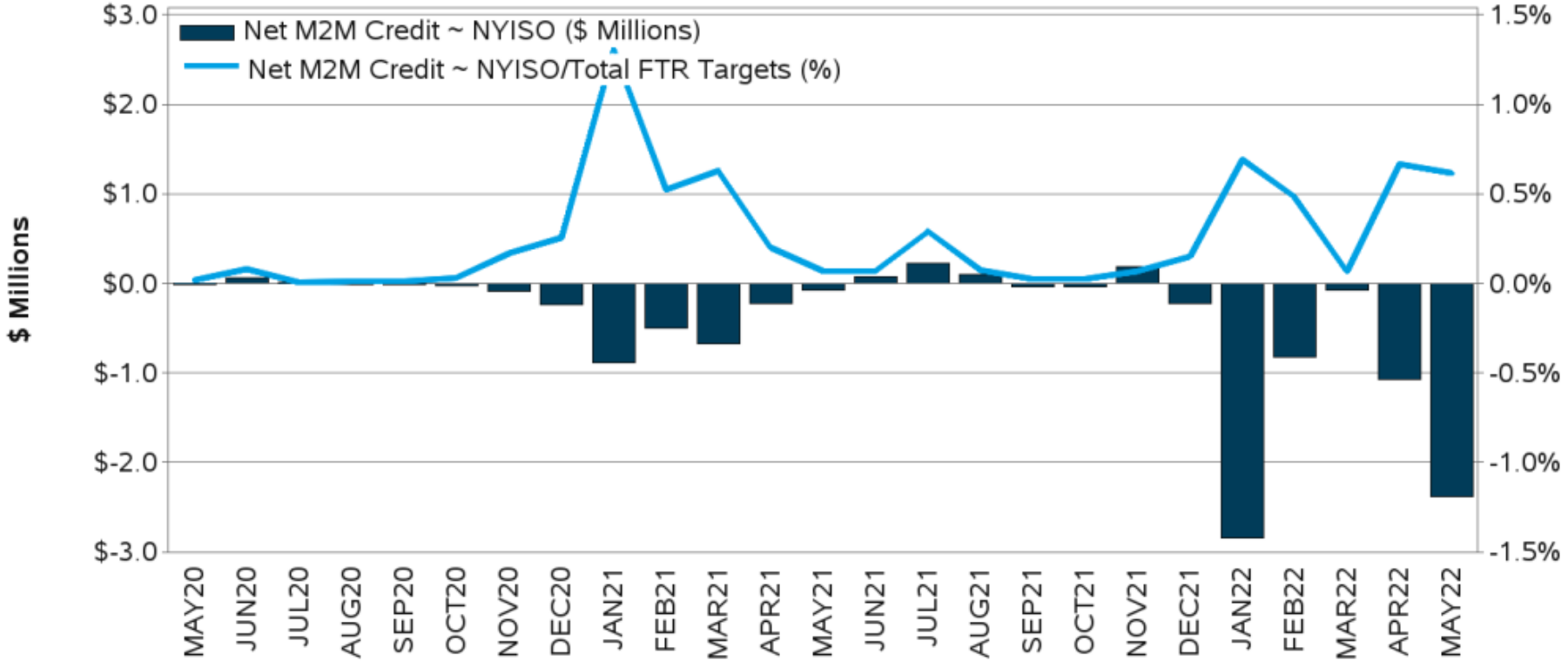
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

PJM-MISO Market-to-Market Coordination Settlement



Negative M2M Credit represents PJM payment to MISO

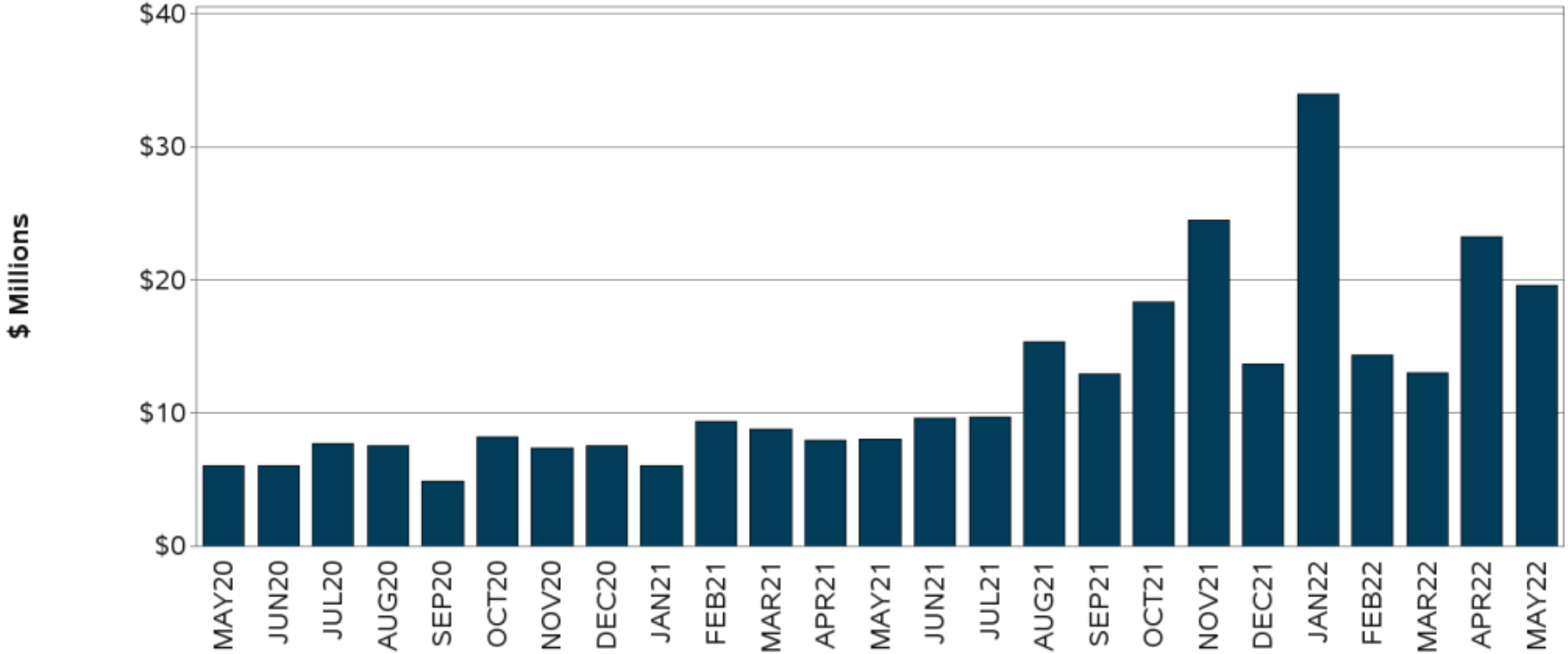
PJM-NYISO Market-to-Market Coordination Settlement



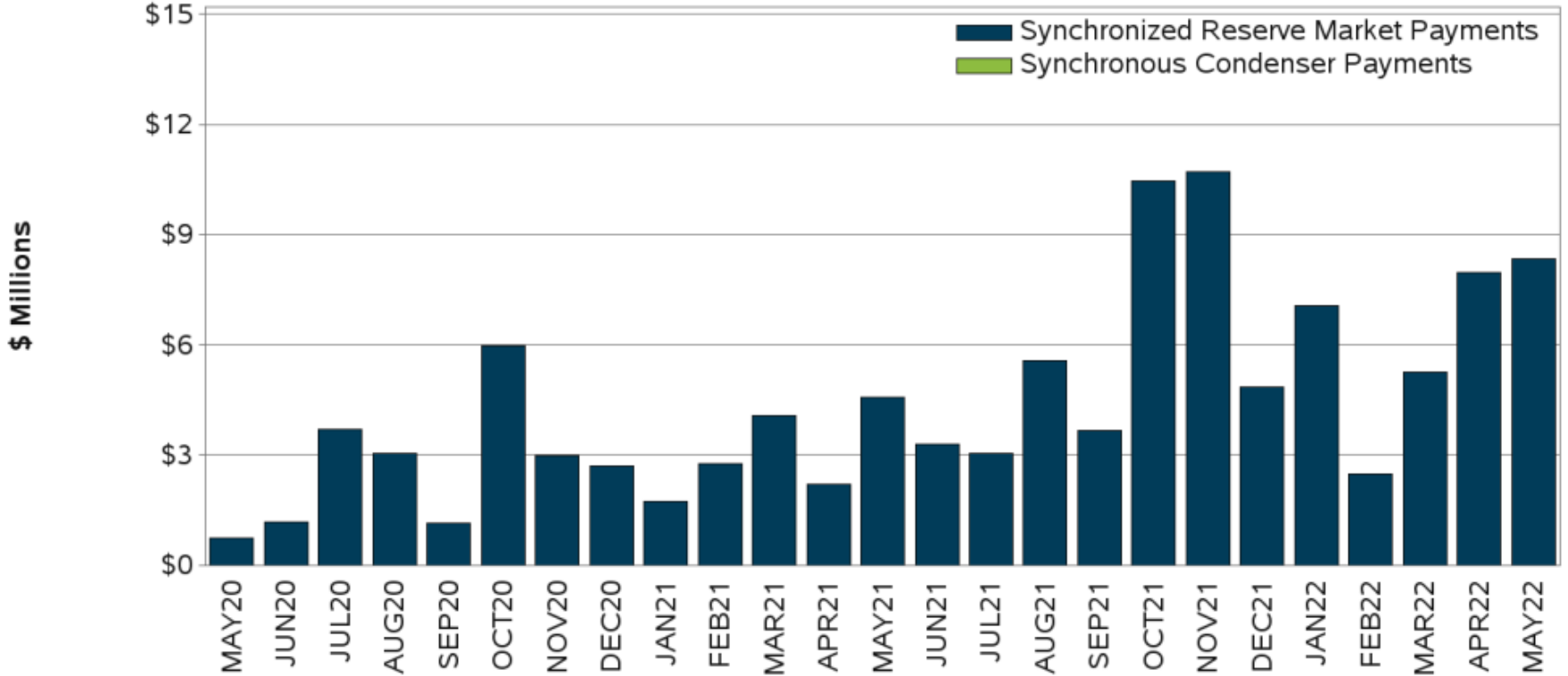
Negative M2M Credit represents PJM payment to NYISO

Ancillary Service Market Summary

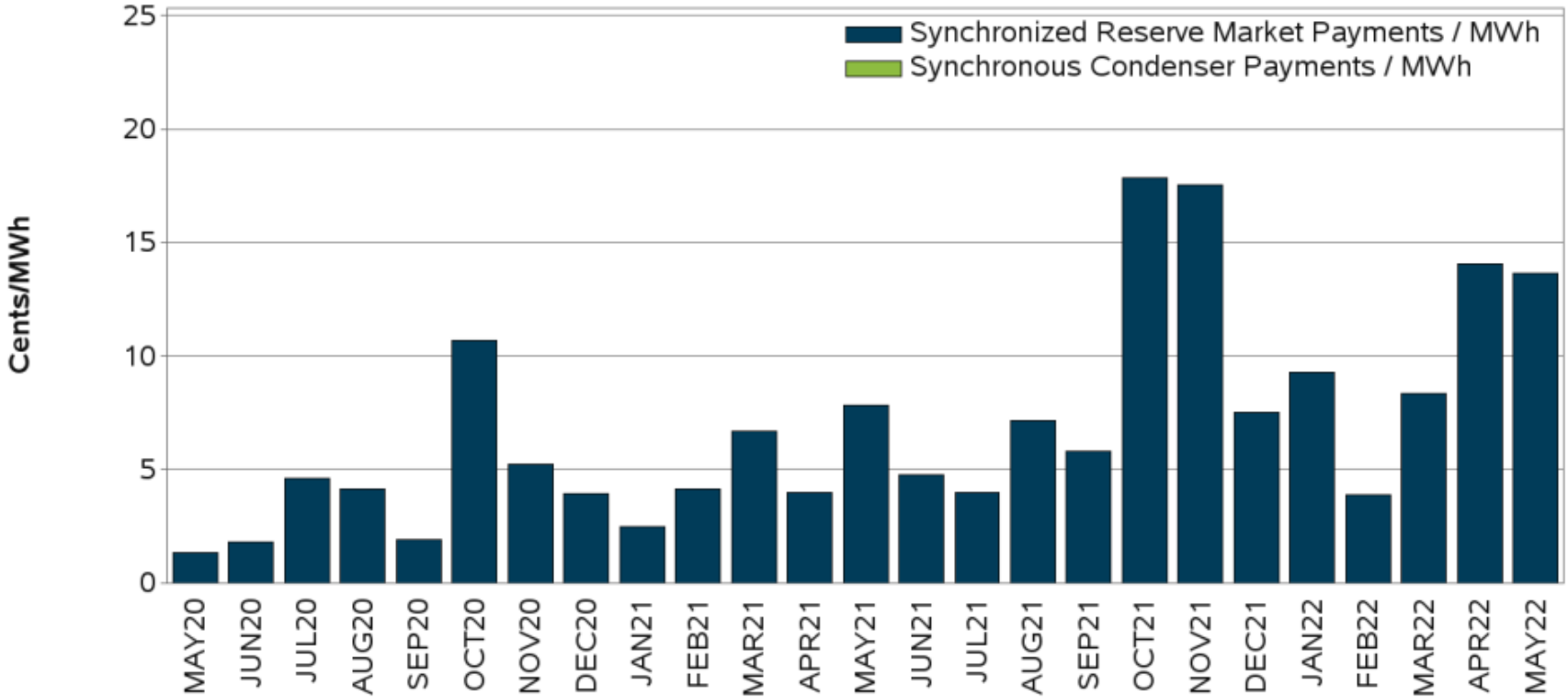
Regulation Costs



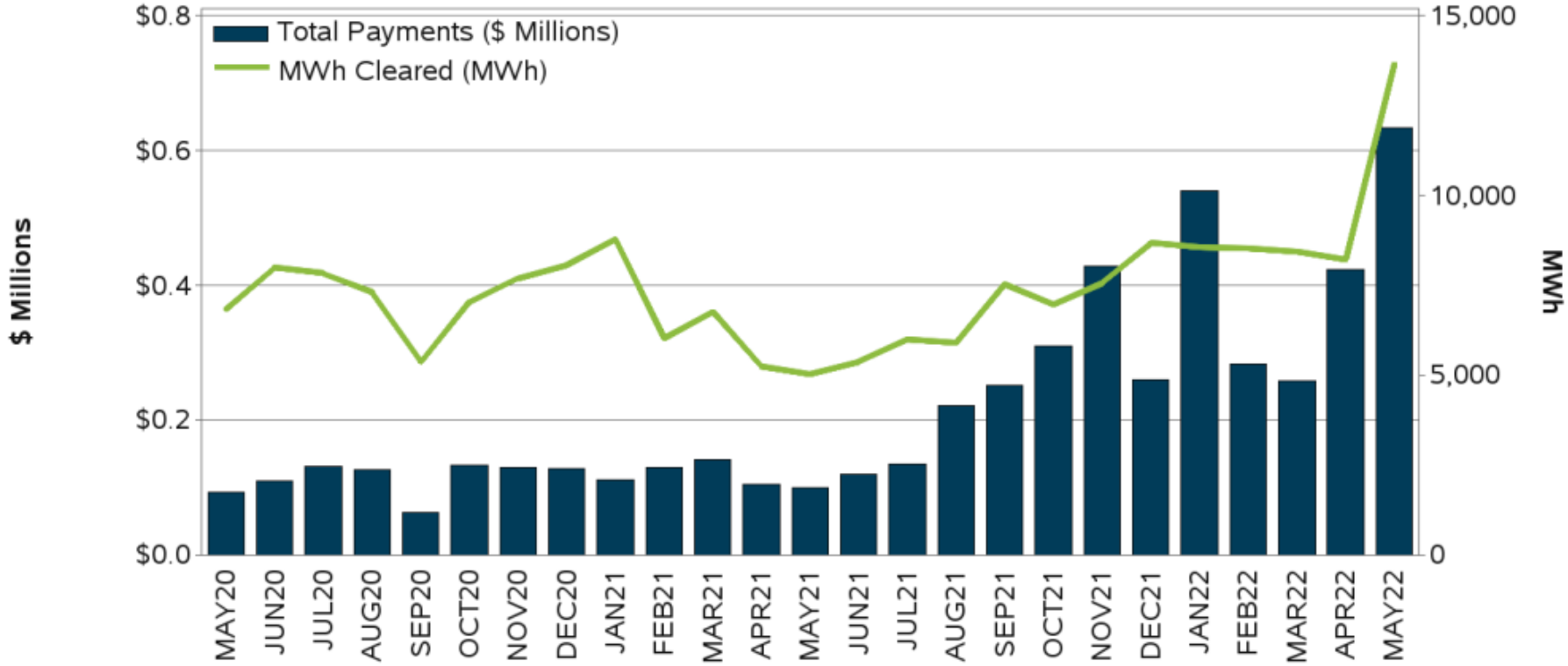
Synchronized Reserve and Synchronous Condenser Costs



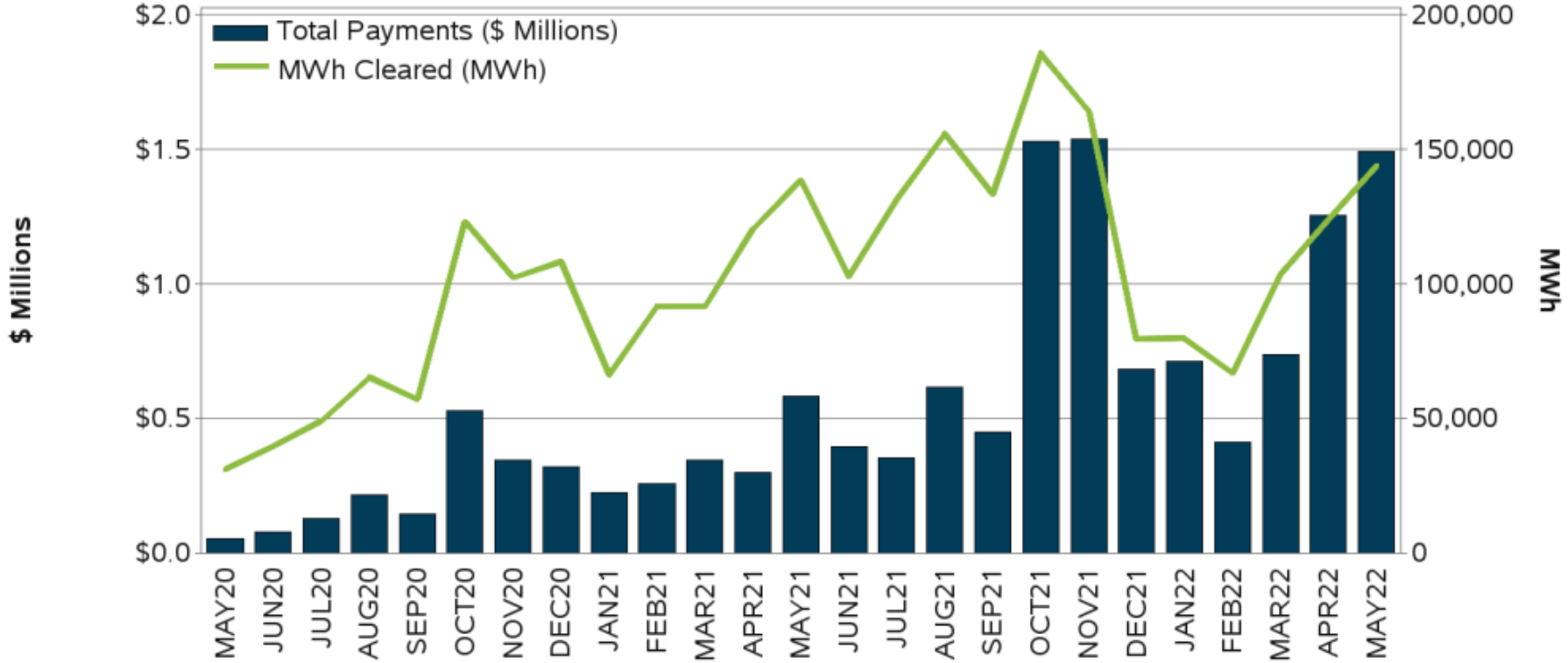
Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs



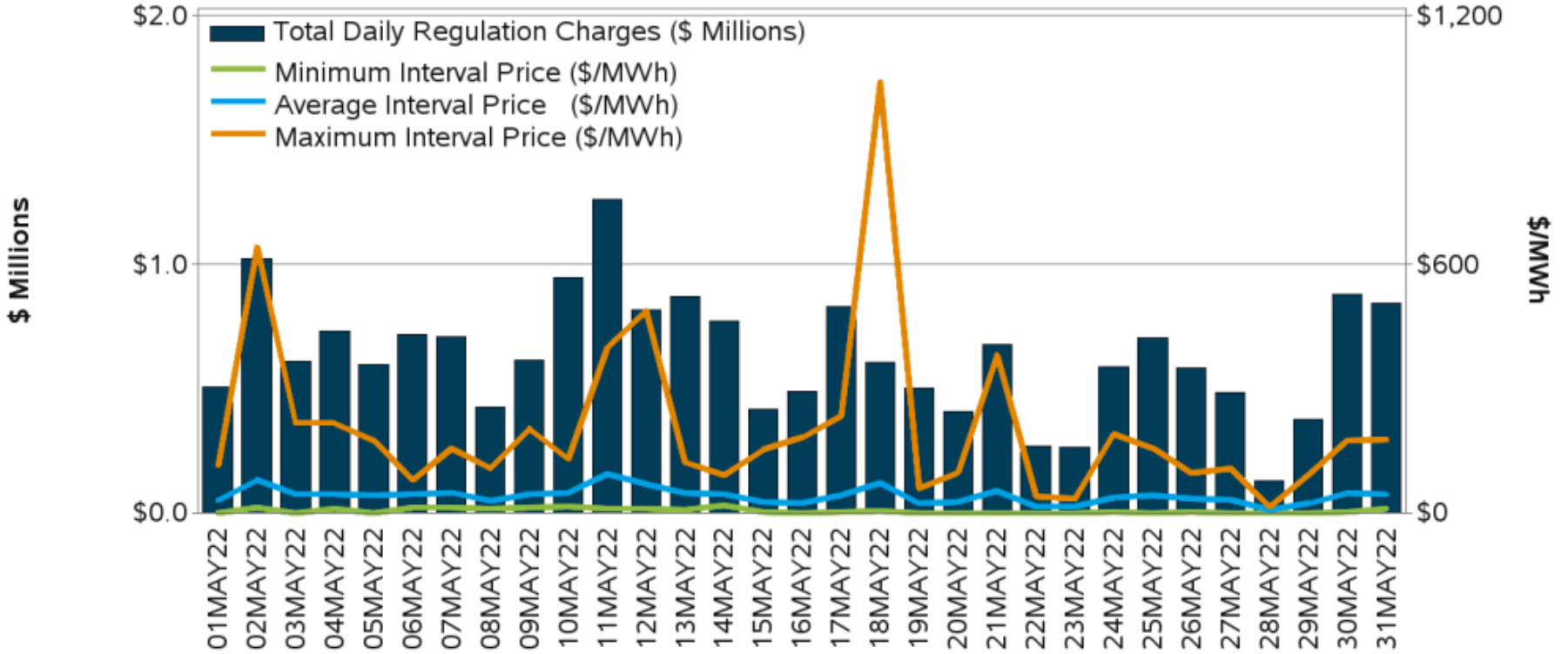
DR Participation in PJM Regulation Markets



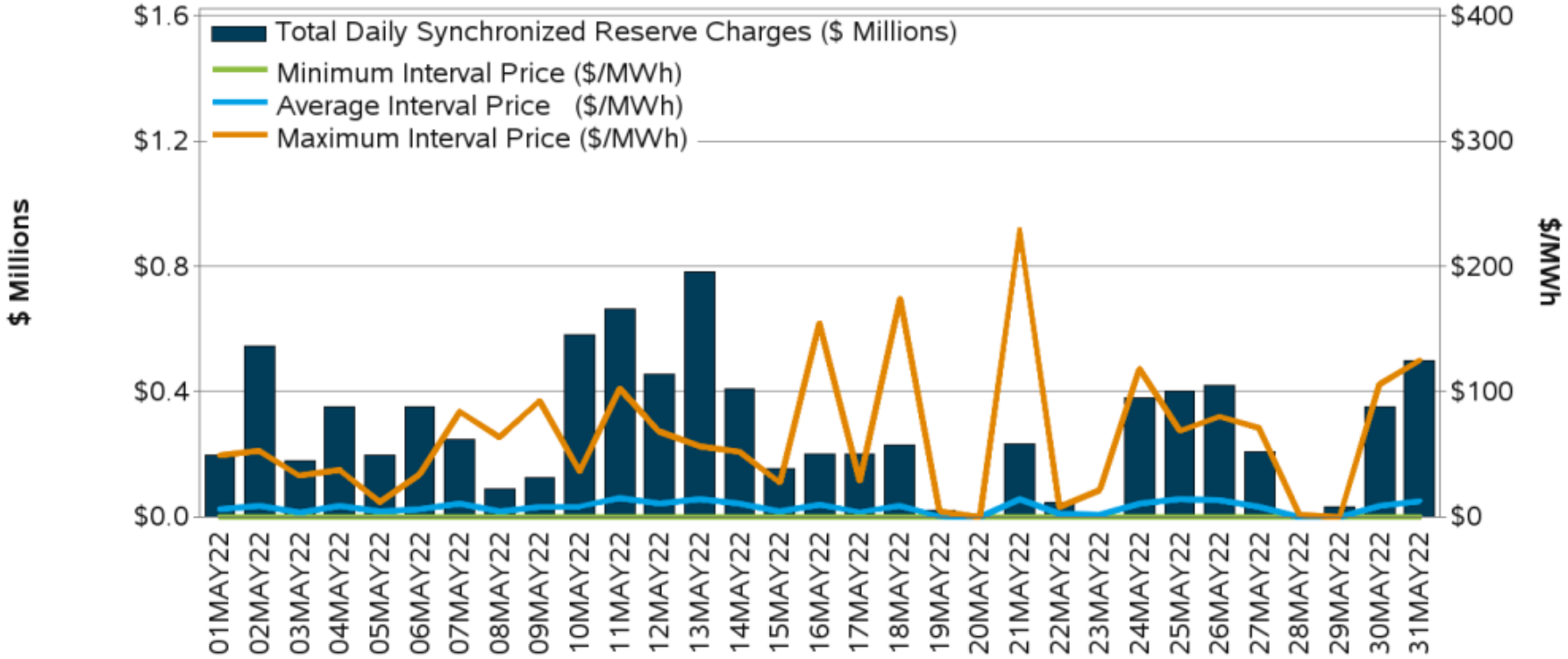
DR Participation in PJM Synchronized Reserve Markets



Regulation Market Daily Prices and Charges



Synchronized Reserve Market Daily Prices and Charges



Contact

Jennifer Warner-Freeman

Jennifer.Freeman@pjm.com

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com