



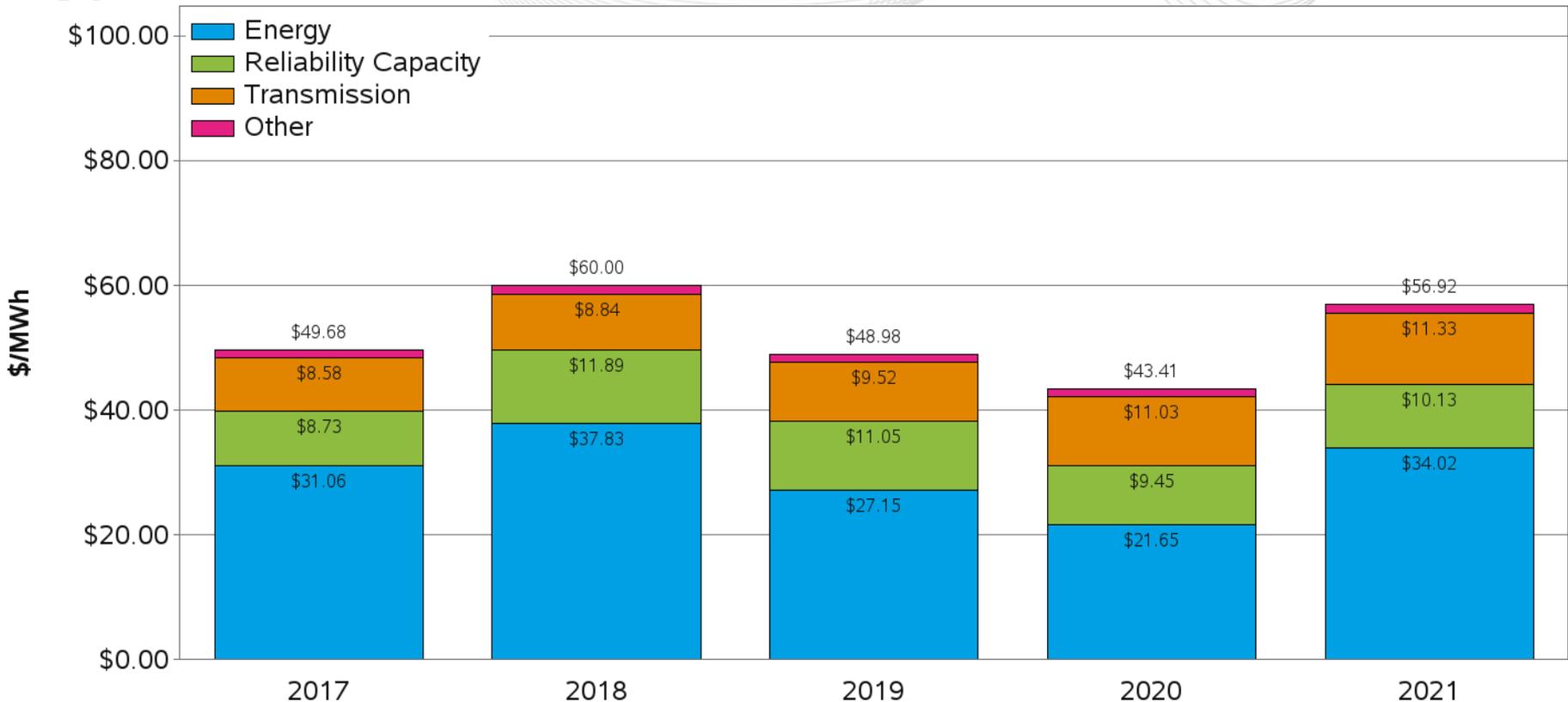
# Markets Report

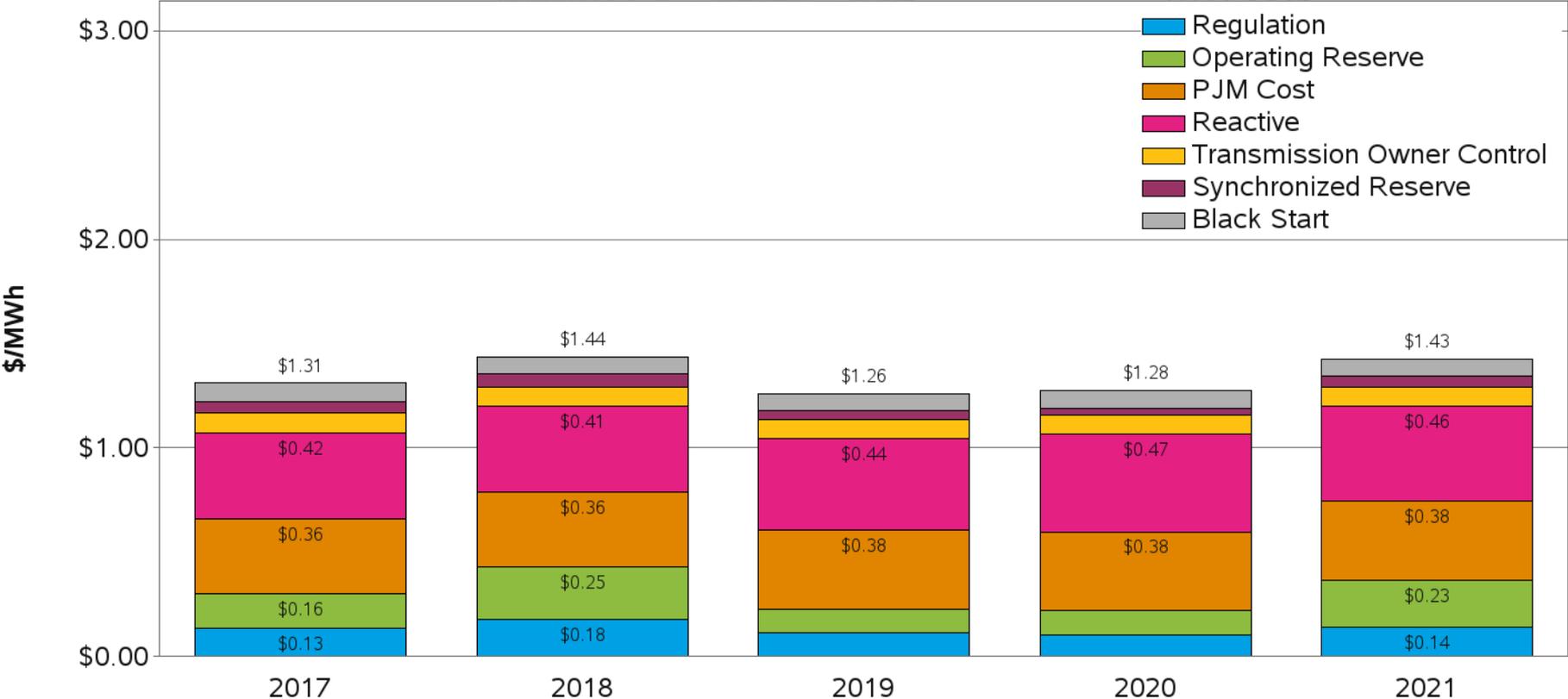
MC Webinar  
September 27, 2021

- PJM Wholesale Cost for 2021 is \$56.92/MWh, up from full-year 2020 costs of \$43.41/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 August, temperatures were above average throughout the month. Thus, Cooling Degree Days were above their historic average. (Slides 8-10)
- Energy use was also above its historic average for August. (Slides 8-10)

- In August, uplift exceeded \$800,000 on ten days. (Slides 24 & 25)
- Load-weighted average LMP for 2021 is \$34.02/MWh: (Slides 33 & 34)
  - August 2021 was \$47.40/MWh, which is higher than August 2020 (\$25.20/MWh) and also higher than August 2019 (\$24.20/MWh).
- There were seven 5-minute intervals that experienced shortage pricing in August. (Slide 31)
- FTR revenue adequacy for the month of August is 99% and the 2021-2022 Planning Year is currently funded at 100%. (Slides 49-52)
- Congestion values have been trending upwards with August seeing the highest level in the last several years. (Slide 50)
- Regulation and Synchronized Reserve market costs have generally tracked with energy prices over time. (Slides 65-67)

# Markets Report

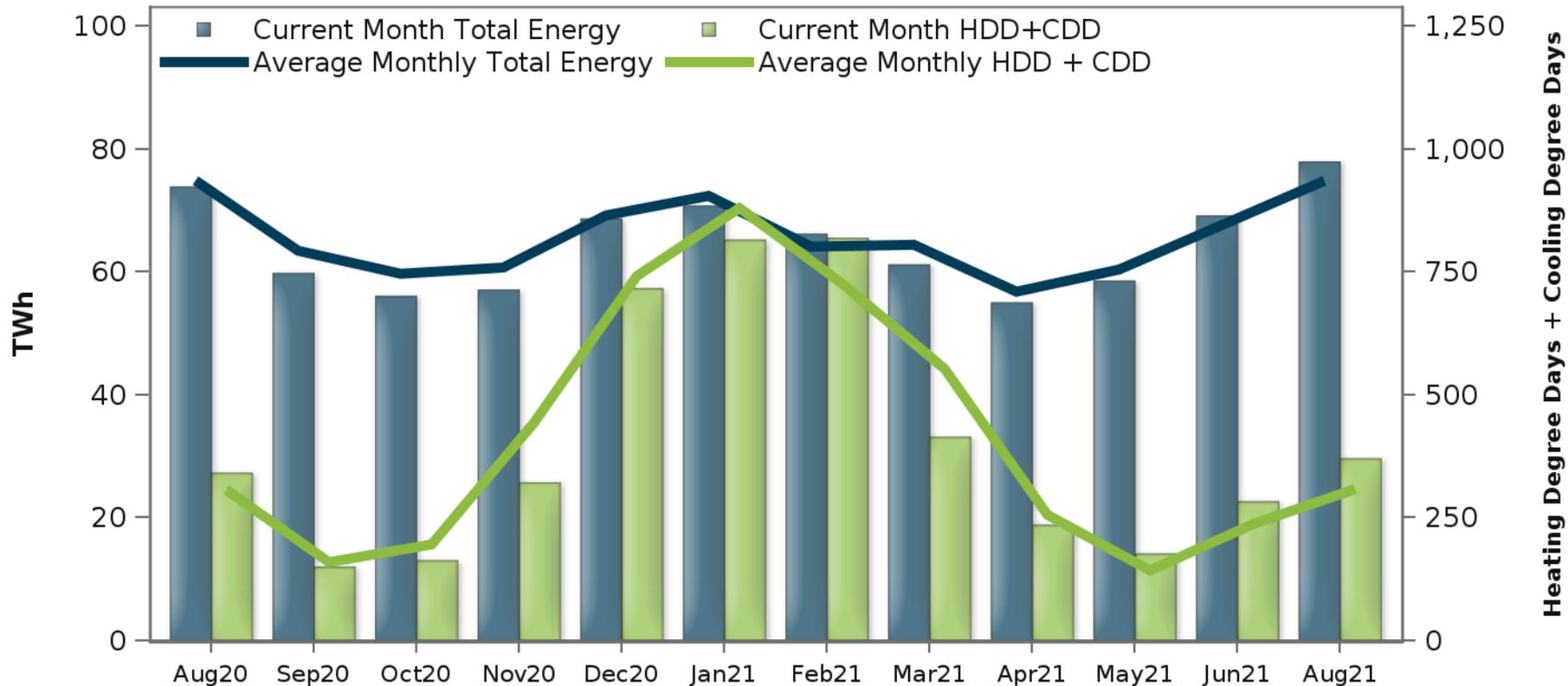




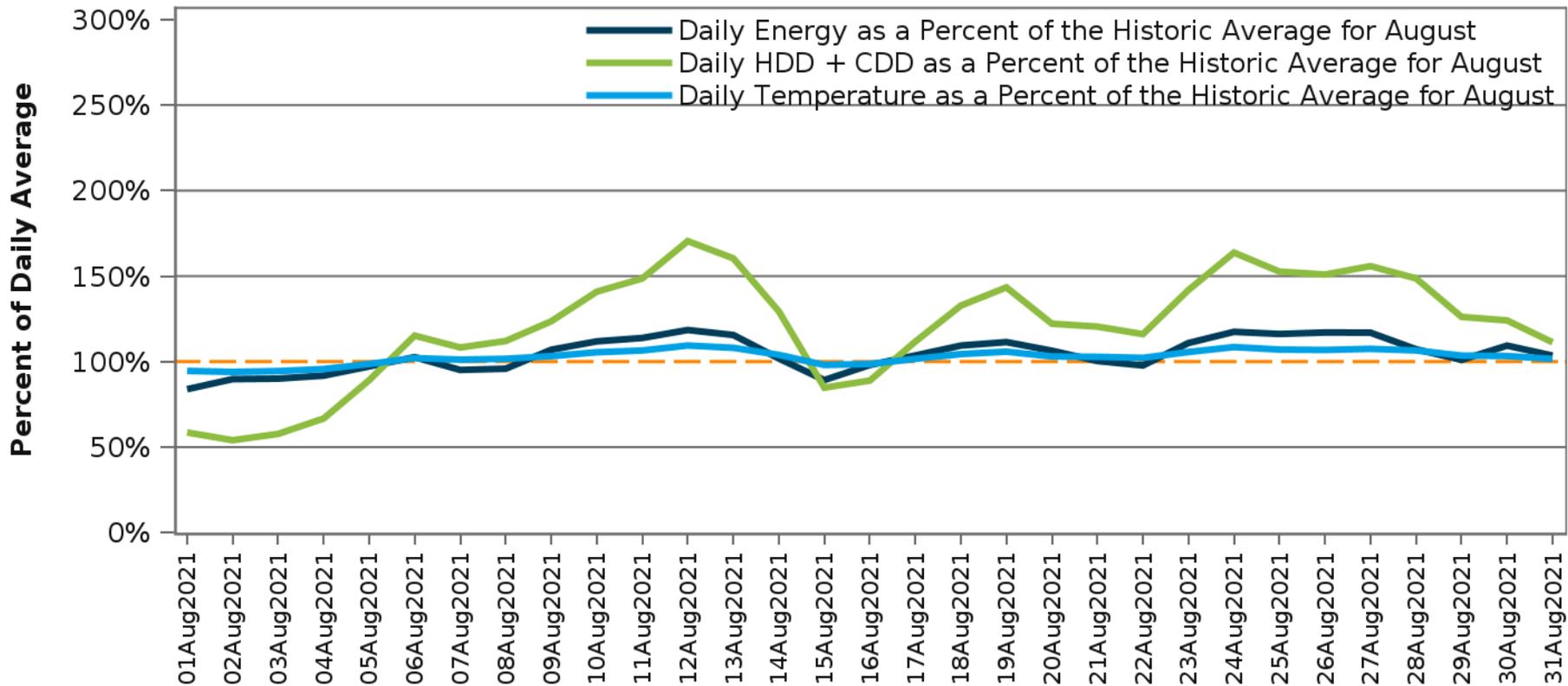
# Market Conditions

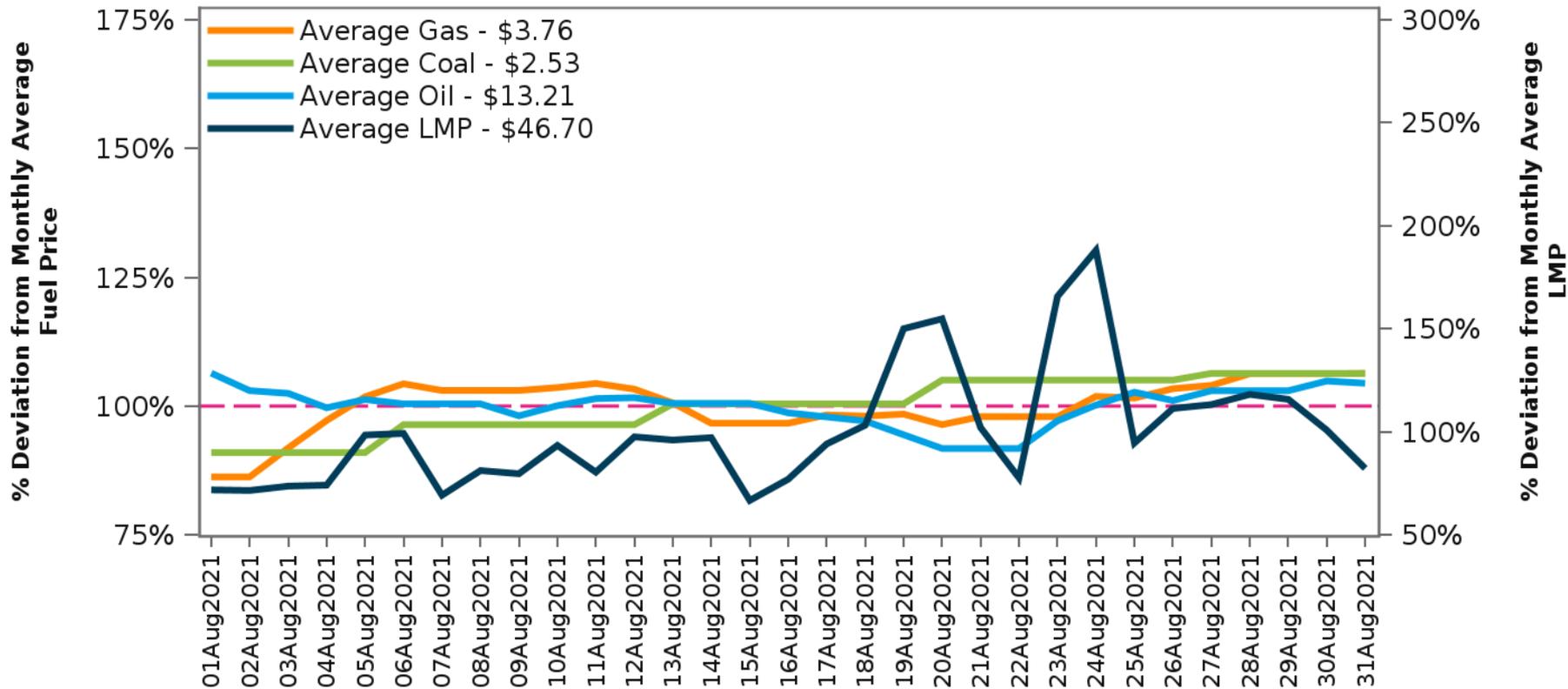
- The weather parameter shown in the following slide is a monthly sum of daily Heating Degree Days (HDD) and Cooling Degree Days (CDD).
- Degree days represent a deviation from a baseline temperature, in this case 60 degrees for HDD and 65 degrees for CDD. As temperatures get more extreme, colder or 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, 2020. 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

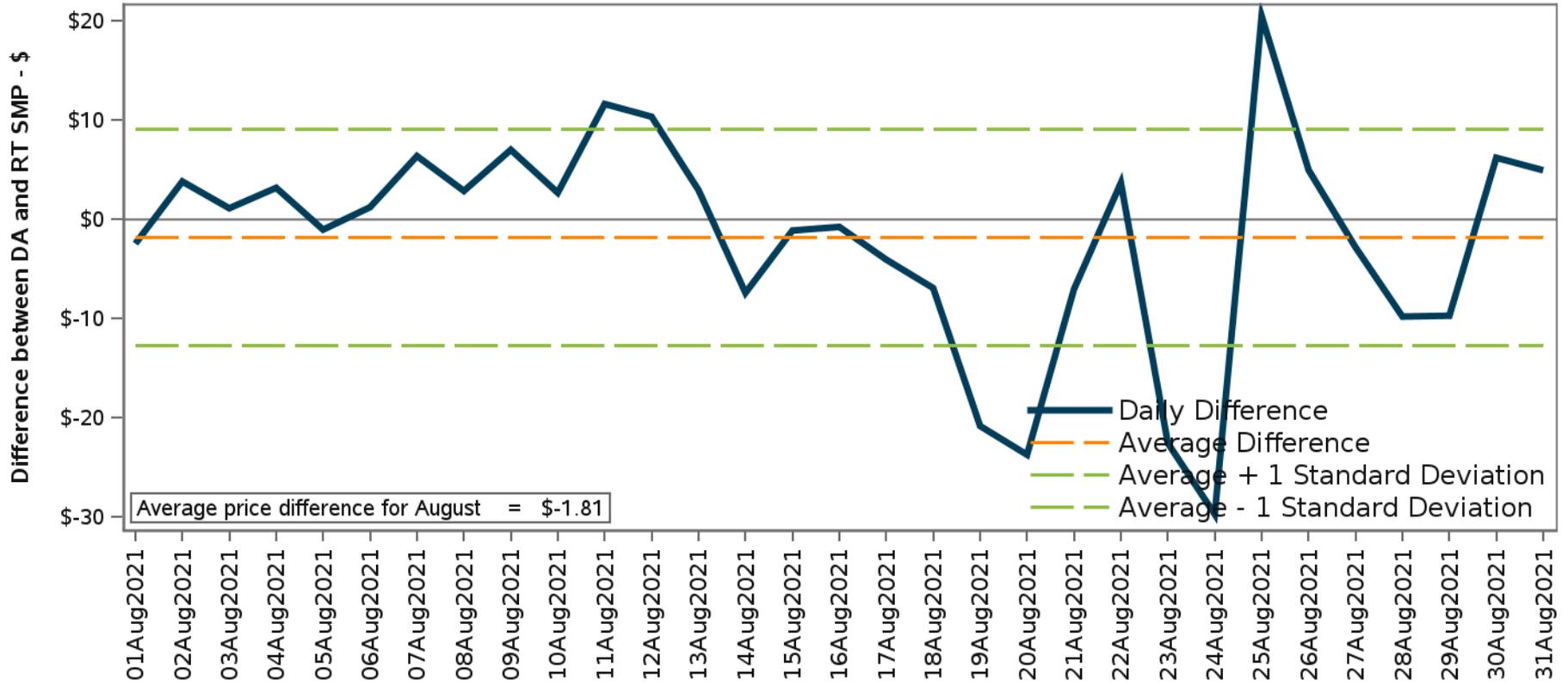




Fuel Price Source: S&P Global Platts



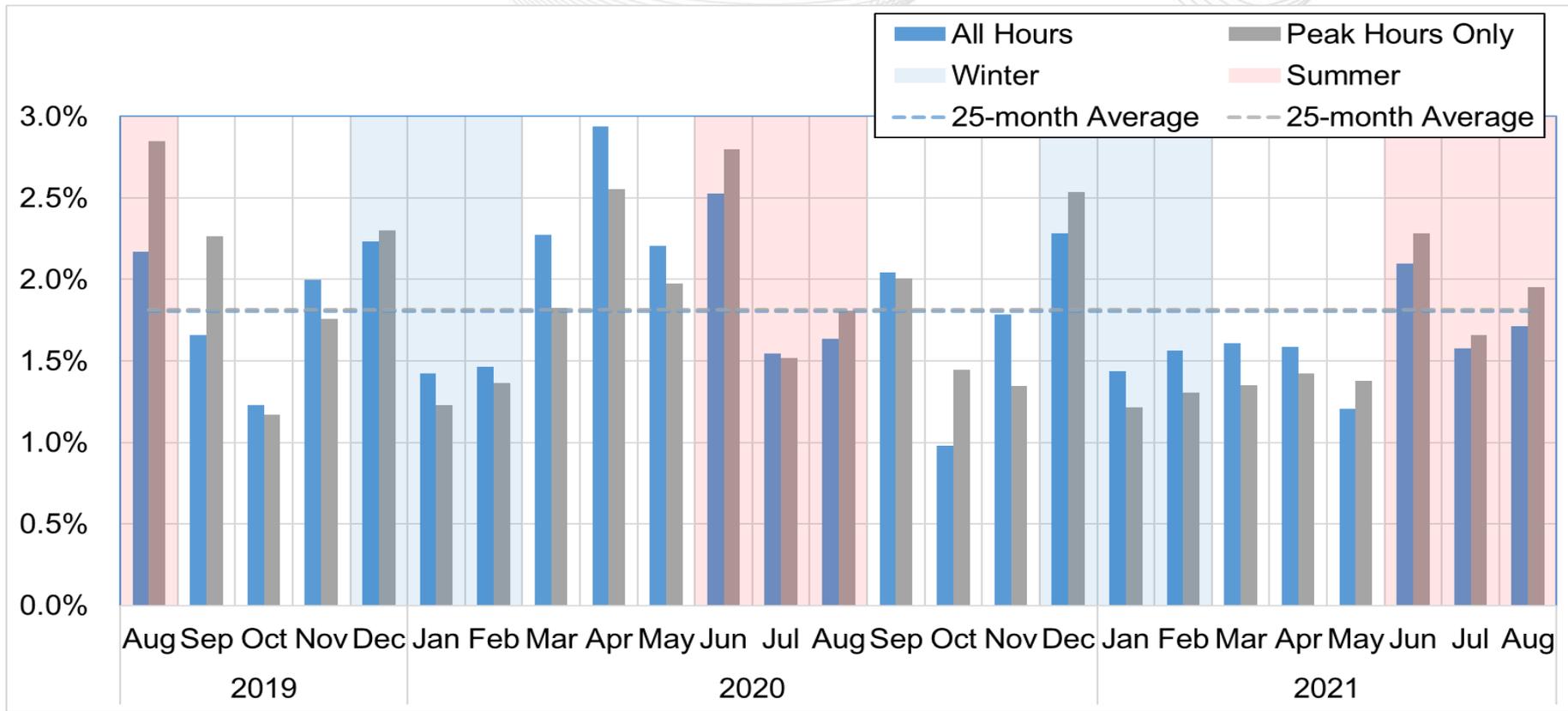
# Daily Difference Between Day-Ahead and Real-Time System Marginal Prices



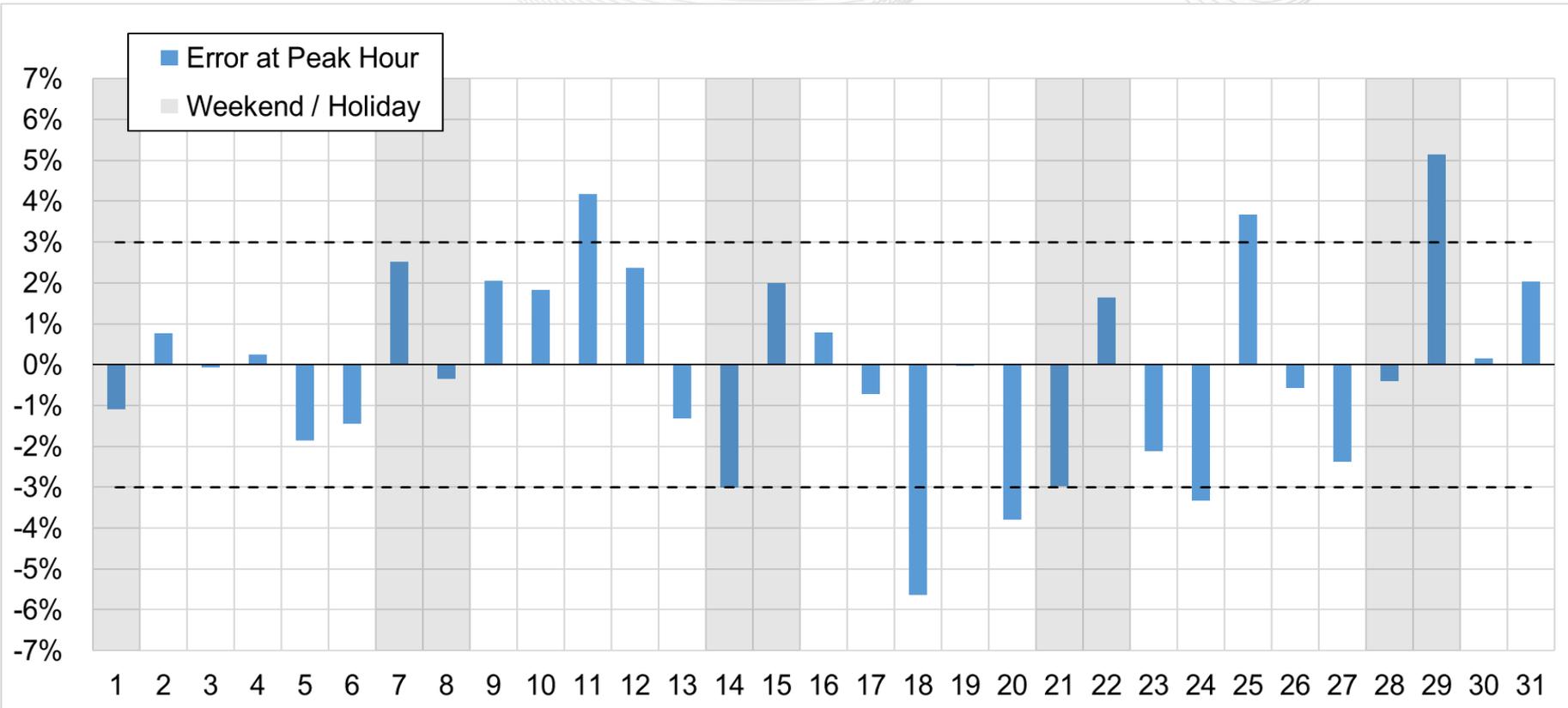
Positive values represent days when the DA daily average price was higher than RT. Negative values represent days when the DA price was lower.



# Load Forecast Error – Monthly Absolute Error, 10:00 Forecast



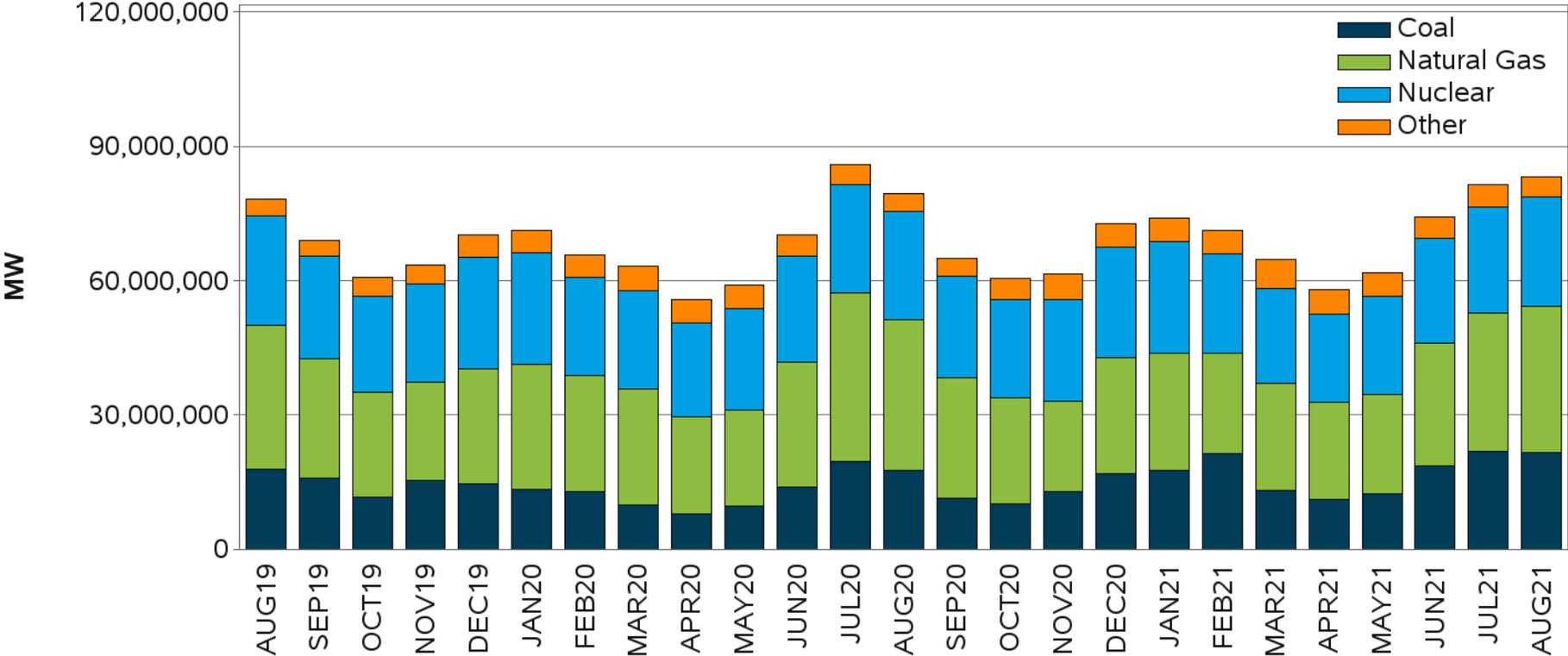
# Load Forecast Error – June Daily Peaks, 10:00 Forecast



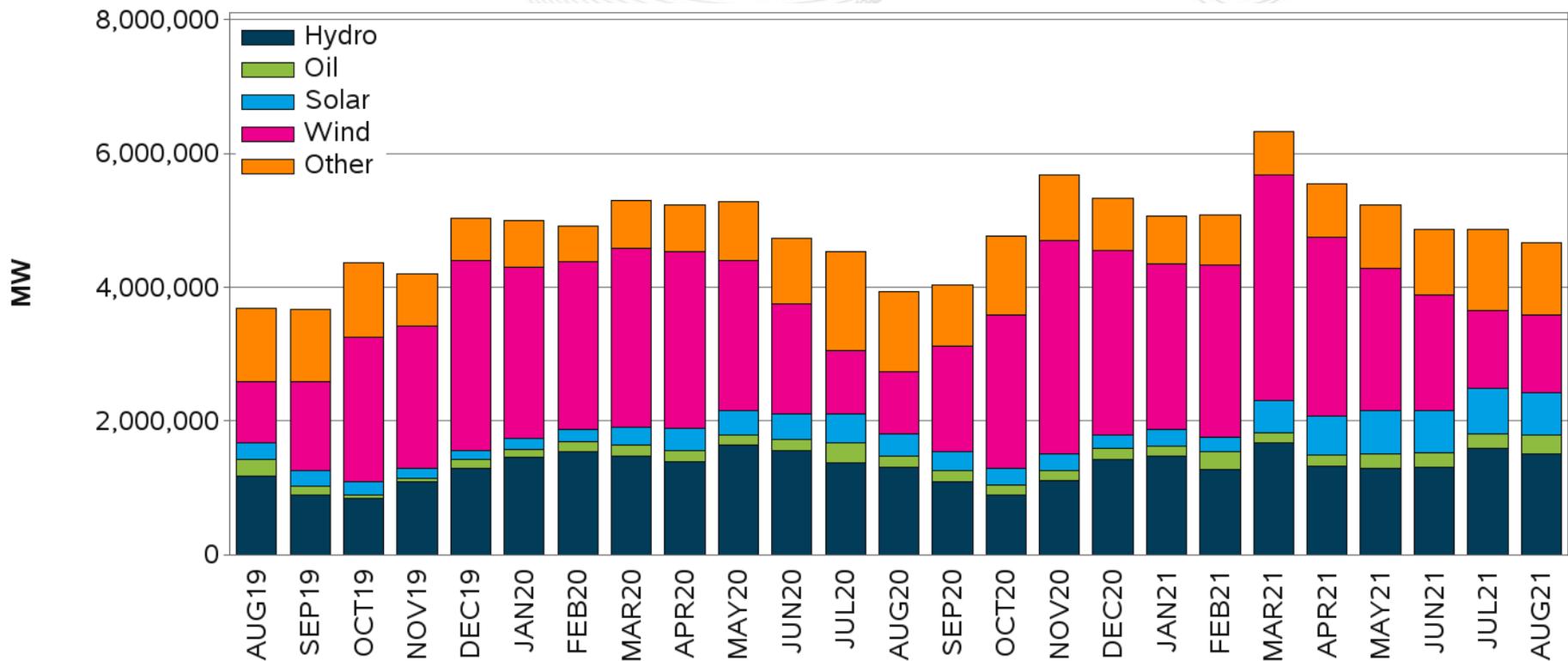
PJM prepares a day-ahead load forecast at 10:00 am for use by our members.

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.

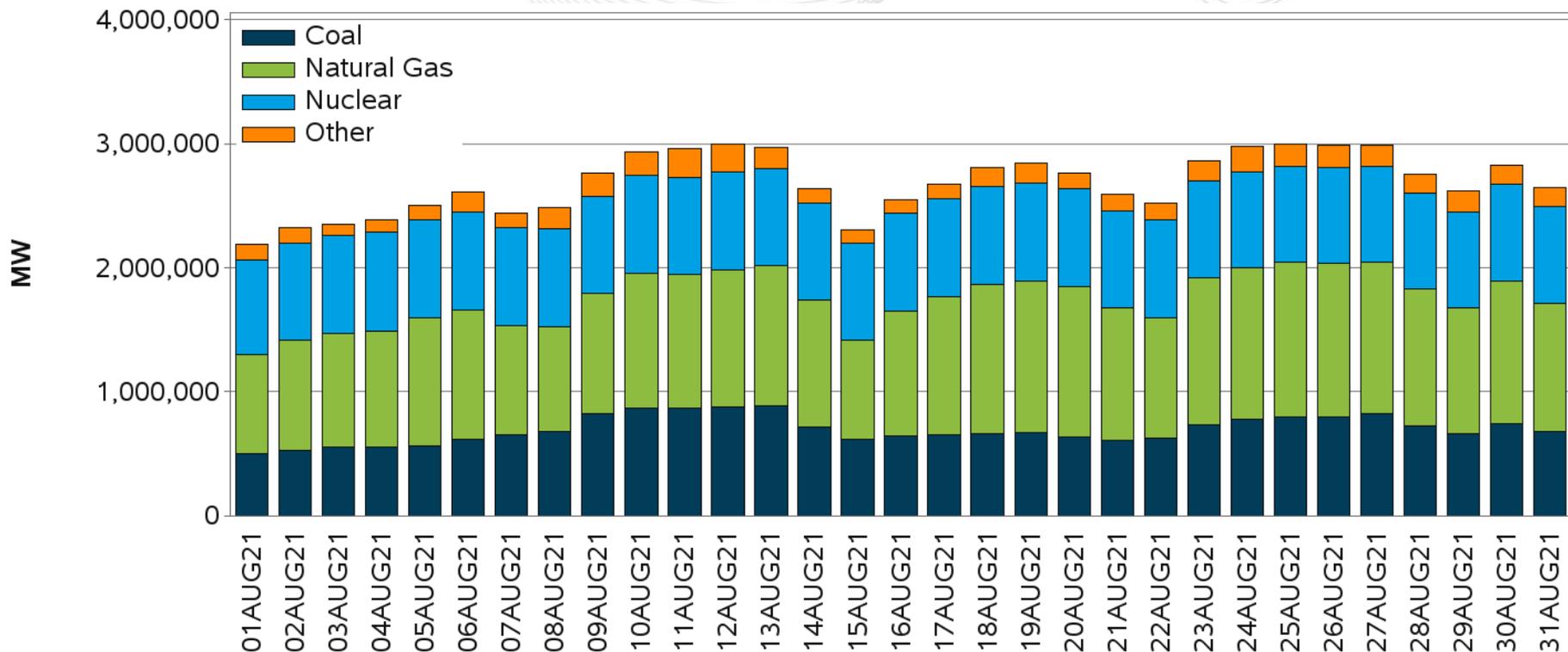
- The month of August experienced a range of weather conditions, including stretches of exceptionally hot days, periods of moderate temperatures with very high humidity, and thunderstorms with heavy rainfall. The thunderstorms throughout the month presented the most significant challenges to load forecast accuracy, leading to over-forecasting of load on August 11, 22, and 25. On August 14 and 18, temperatures came in much warmer than expected, leading to the load being under-forecasted. The opposite pattern occurred on August 29, when temperatures were over-forecasted, causing load to be over-forecasted as well.



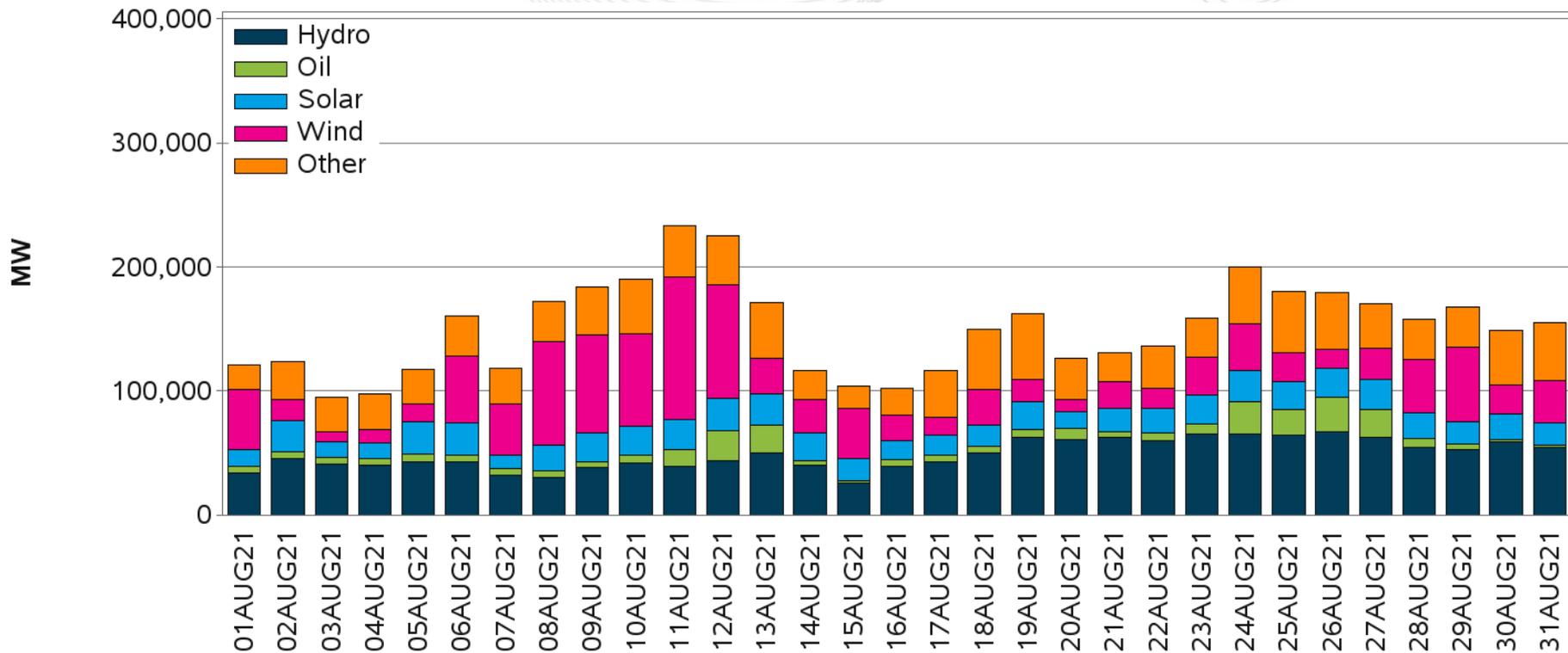
\*Other\* includes Hydro, Oil, Solar, Wind, and Other



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

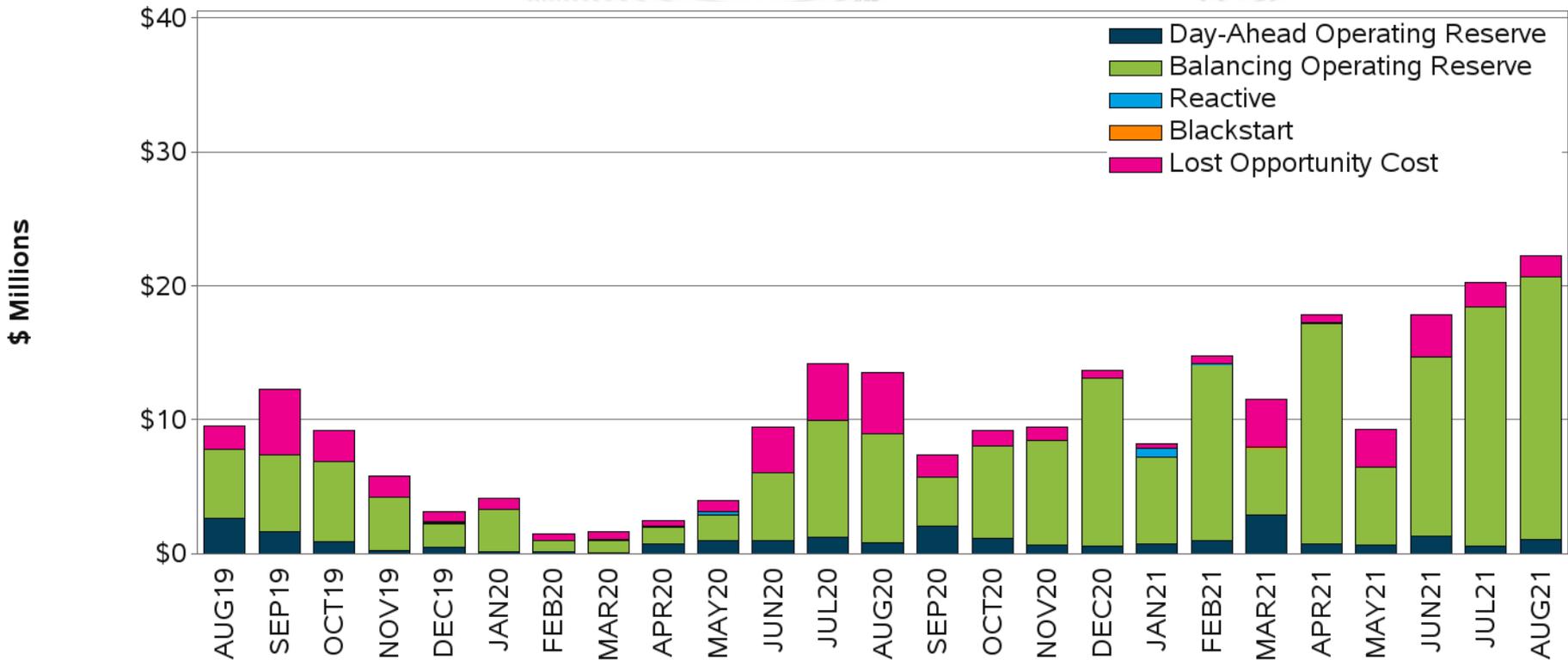


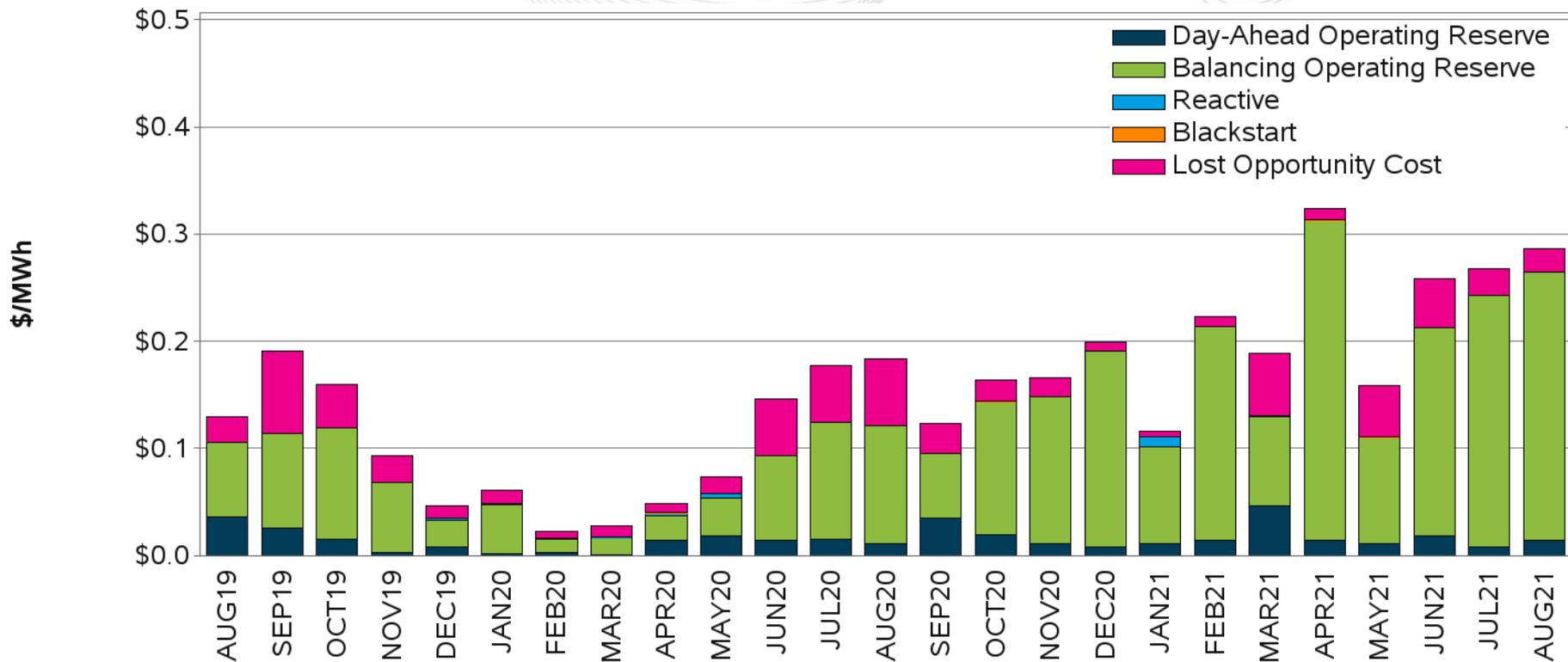
\*Other\* includes Hydro, Oil, Solar, Wind, and Other

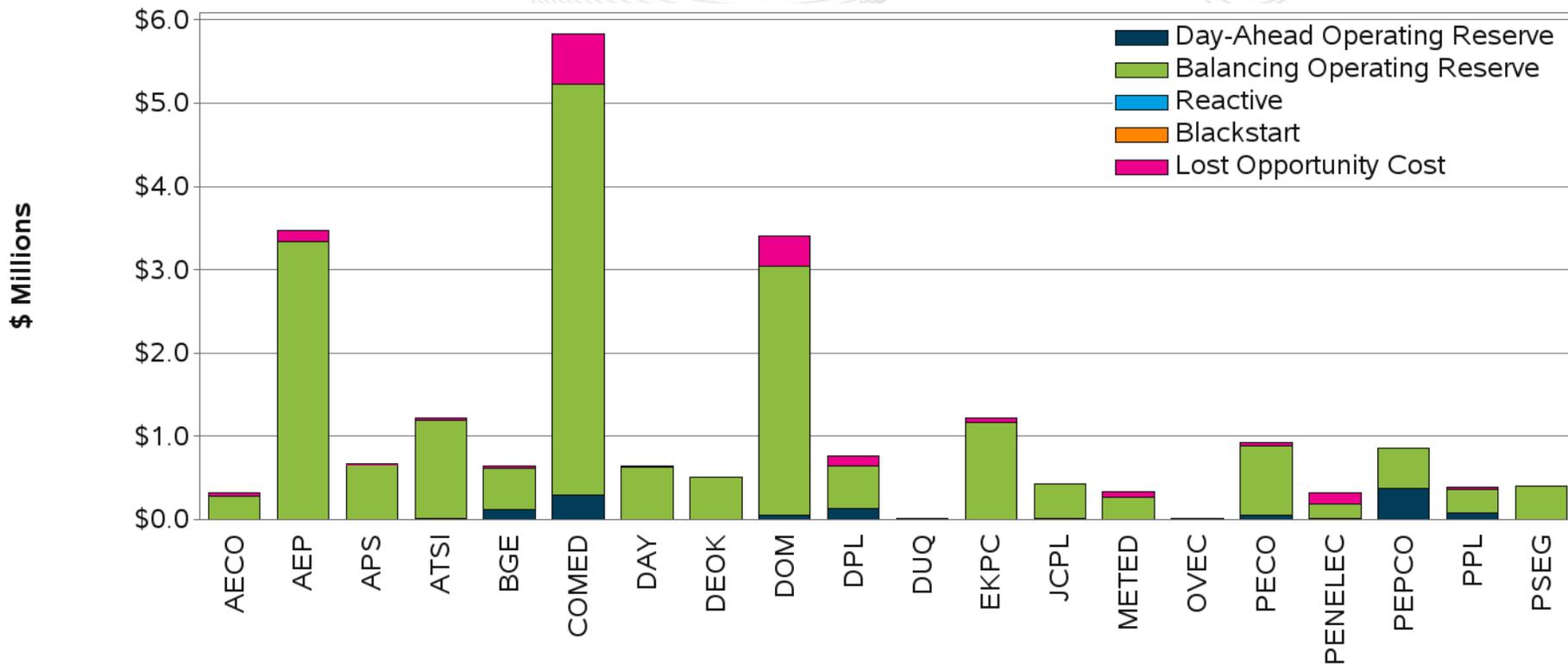


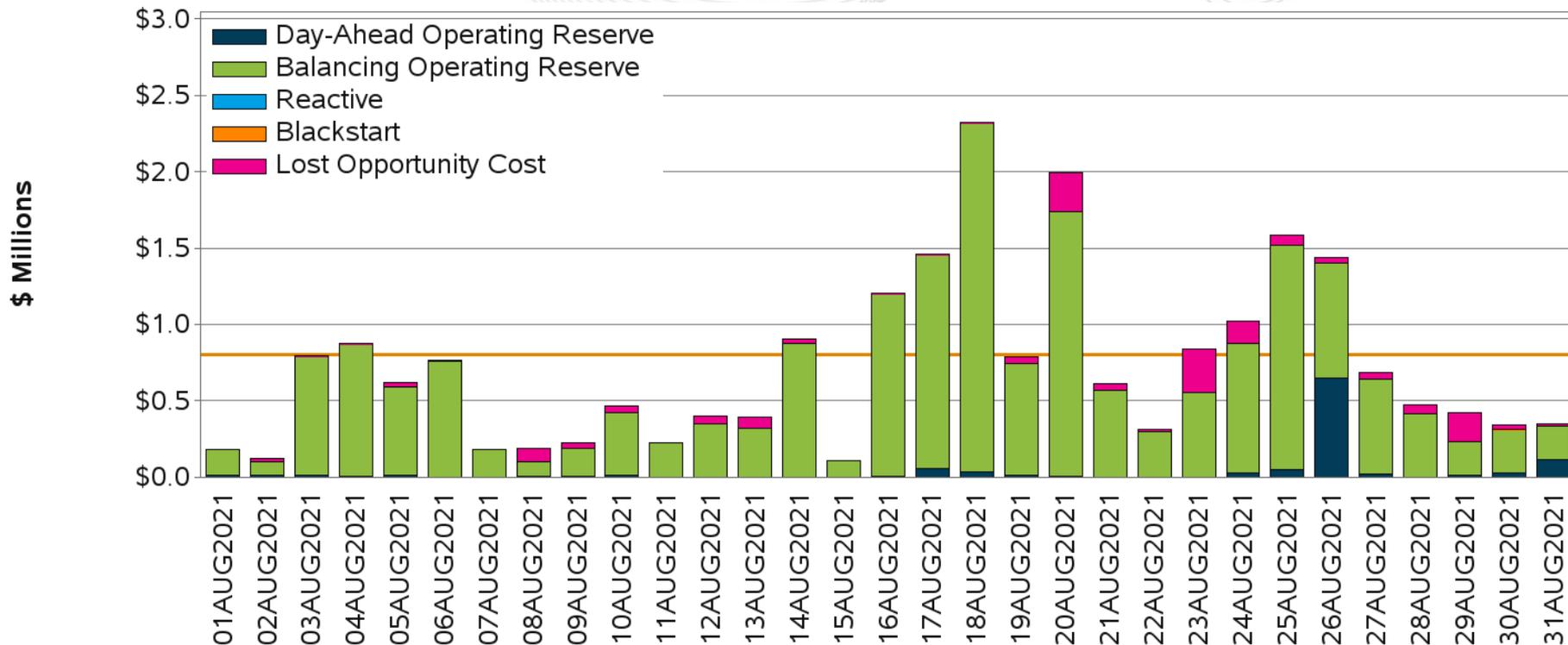
'Other' includes Flywheels, Multiple Fuels, Storage, and Other Renewables

# Operating Reserve (Uplift)









In August, uplift exceeded \$800,000 on ten days – August 4, 14, 16-18, 20, 23-26.

### Contributing factors to uplift were:

August 4:

- Zonal congestion/constraint control

August 14, 16, 17, 18 & 20:

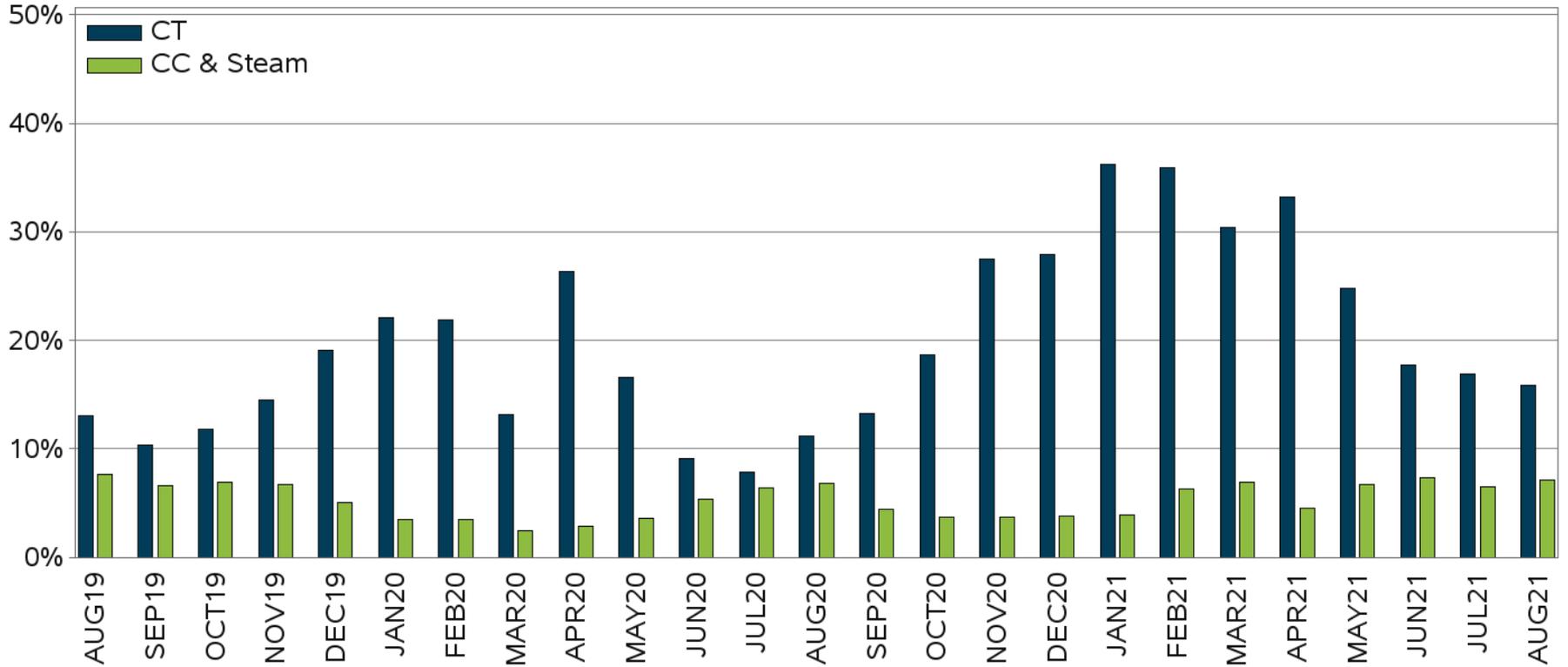
- Load materializing at different times (earlier or later) and at different levels (higher or lower) than forecasted
- Localized congestion/constraint control

August 23, 24, 25, 26:

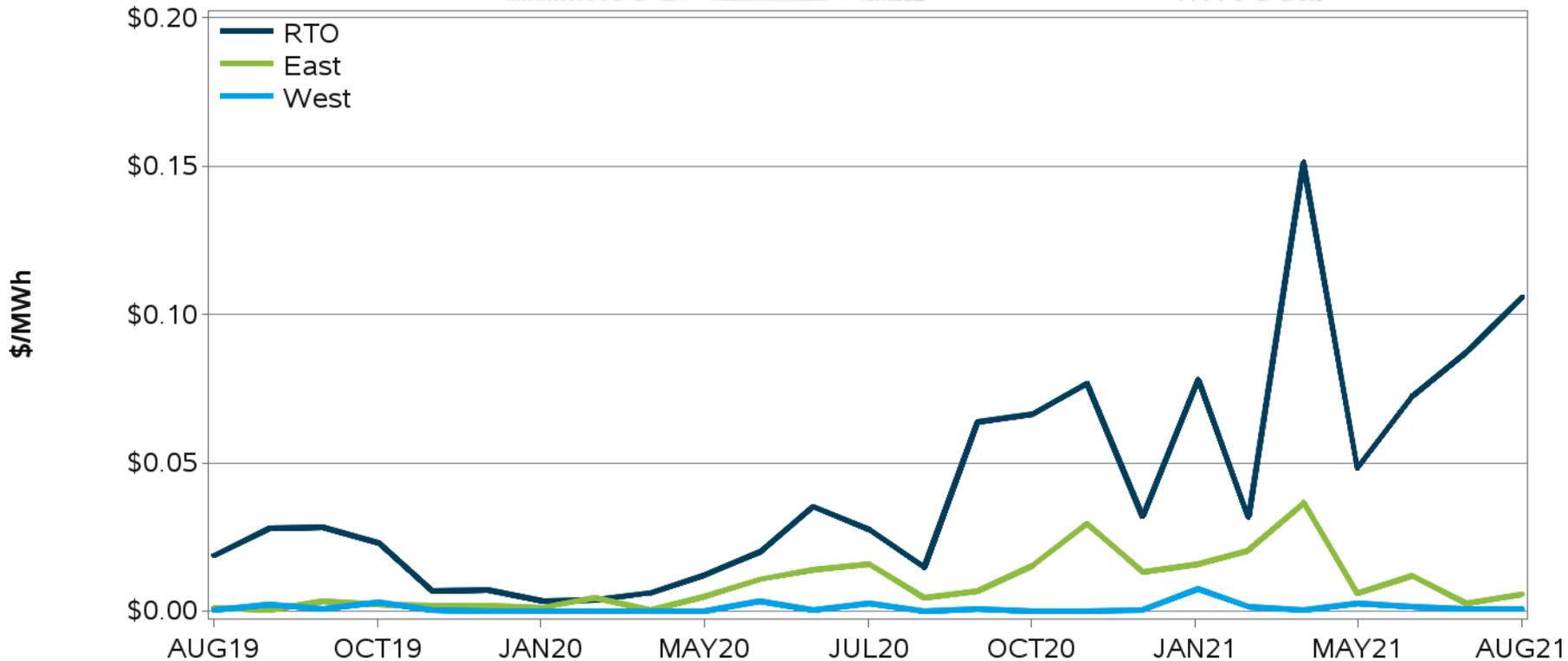
- Hot Weather Alert for part or all of the RTO
- High load days
- Congestion/constraint control on a high load day

More information on Uplift can be found on PJM's website at [Drivers of Uplift](#)

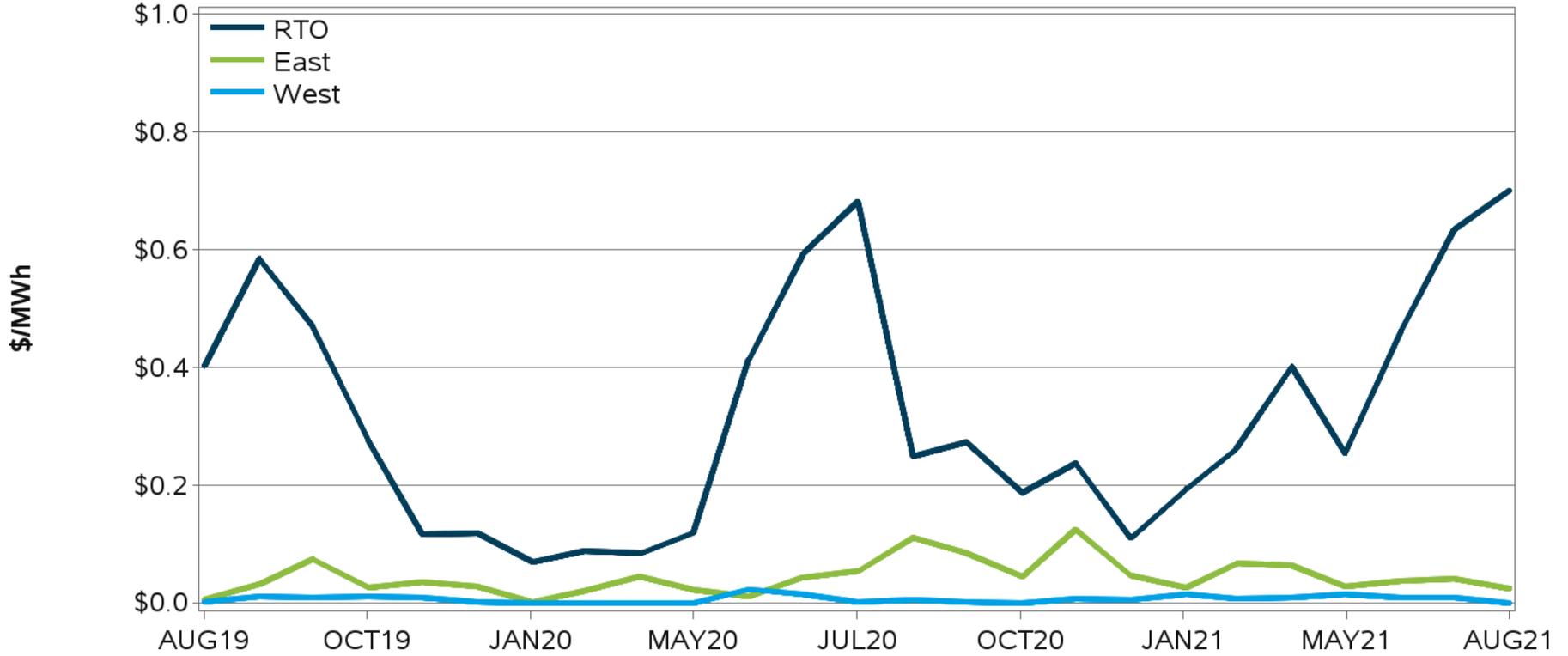
# Percent of Total CT, CC and Steam Hours with LMP < Offer



- 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

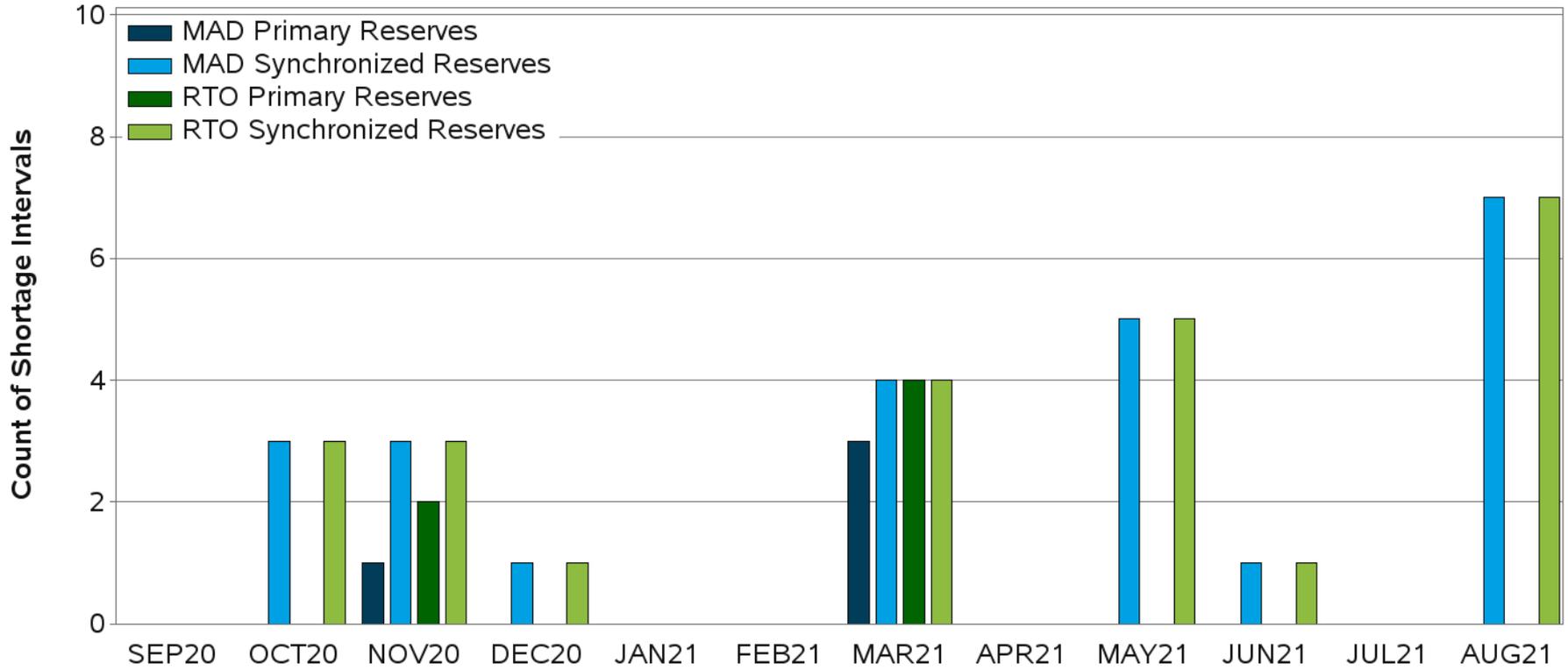


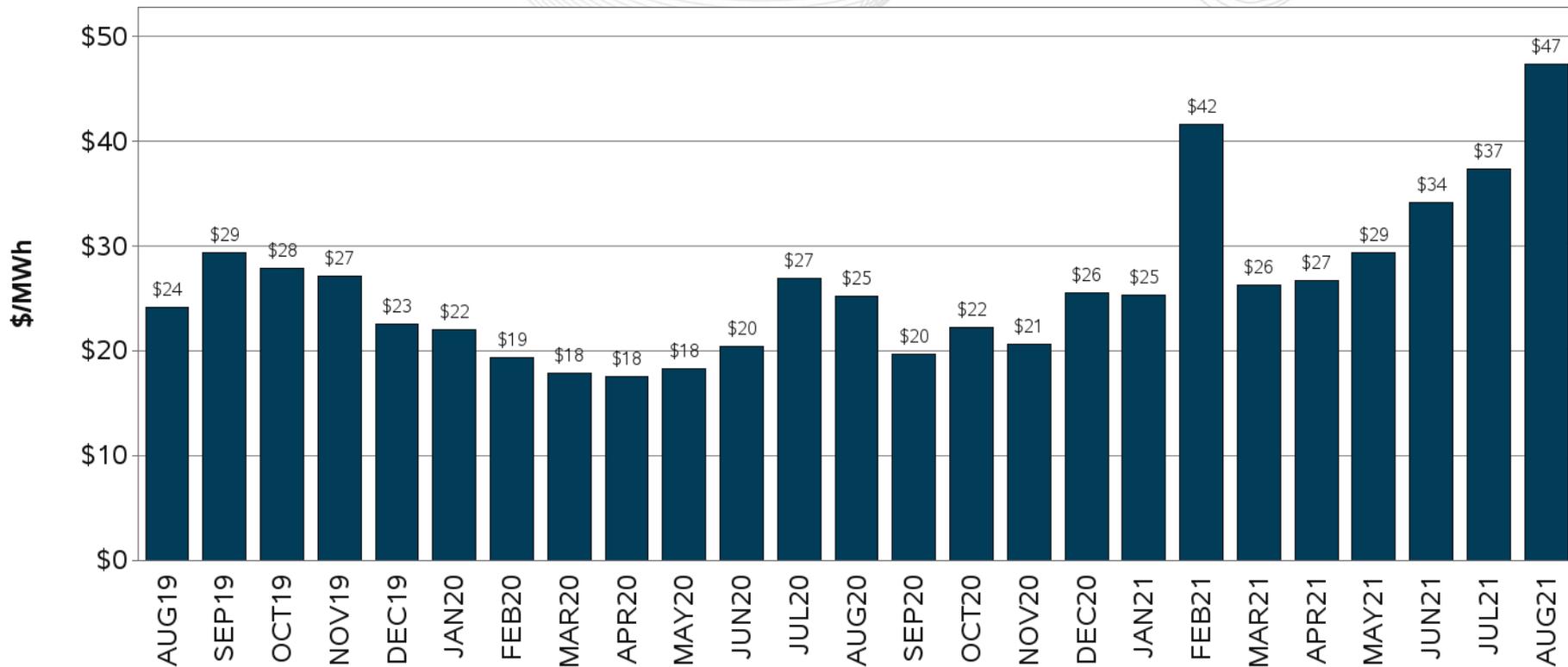
# Energy Market LMP Summary

Date	5-minute Interval	Reserve Penalty Factors	5-minute Interval SMP	Hourly Integrated SMP
Friday, August 20, 2021	16:15 - 16:20	1st step penalty for Synchronized Reserve deficiencies in RTO; 2nd step penalty for Synchronized Reserve deficiencies in MAD	\$1,791.22	\$441.14
Friday, August 20, 2021	16:20 - 16:25	1st step penalty for Synchronized Reserve deficiencies in RTO; 2nd step penalty for Synchronized Reserve deficiencies in MAD	\$1,759.22	\$441.14
Friday, August 20, 2021	18:00 - 18:05	2nd step penalty for Synchronized Reserve deficiencies in RTO and MAD	\$904.56	\$119.77
Monday, August 23, 2021	16:50 - 16:55	2nd step penalty for Synchronized Reserve deficiencies in RTO and MAD	\$808.25	\$213.21
Monday, August 23, 2021	16:55 - 17:00	2nd step penalty for Synchronized Reserve deficiencies in RTO and MAD	\$808.76	\$213.21
Monday, August 23, 2021	17:00 - 17:05	2nd step penalty for Synchronized Reserve deficiencies in RTO and MAD	\$691.18	\$259.35
Monday, August 23, 2021	17:05 - 17:10	2nd step penalty for Synchronized Reserve deficiencies in RTO and MAD	\$691.18	\$259.35

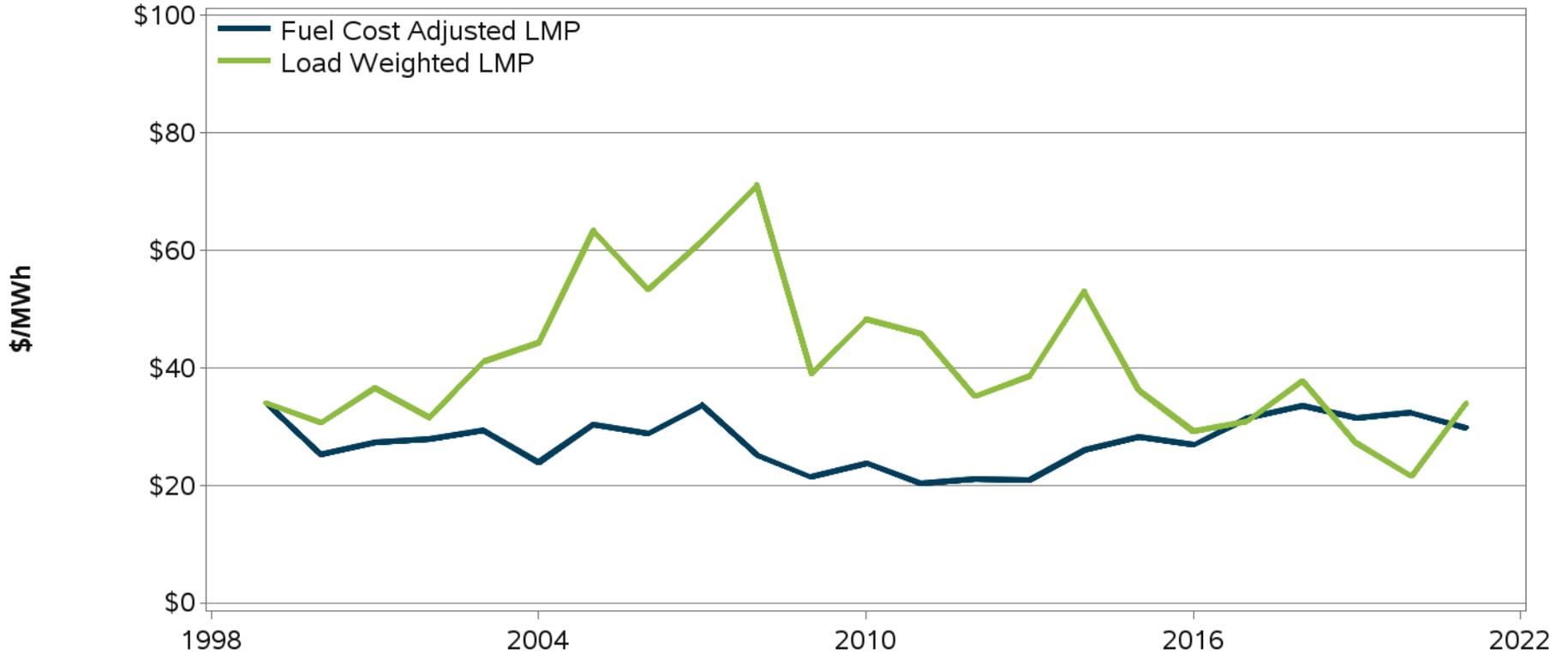
Information on constraints and shadow prices can be found here:

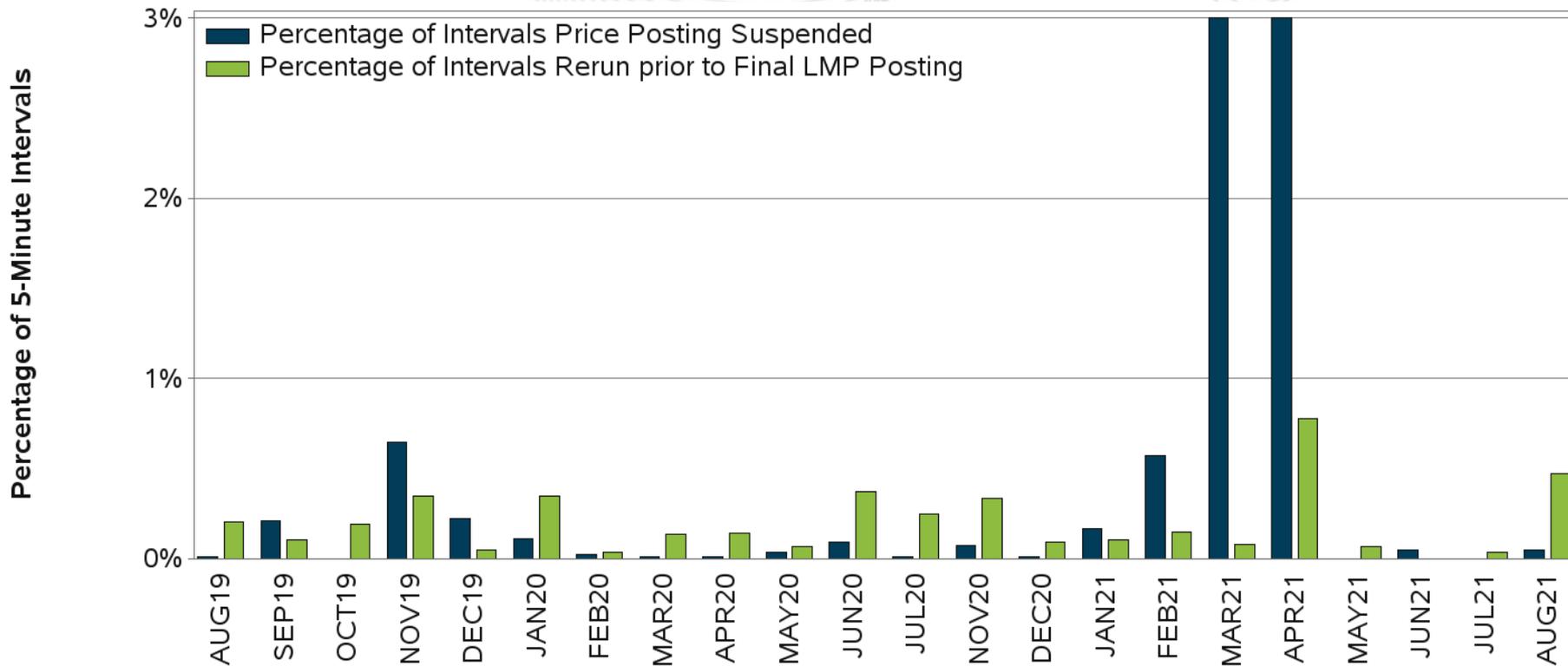
[http://dataminer2.pjm.com/feed/rt\\_marginal\\_value](http://dataminer2.pjm.com/feed/rt_marginal_value)





# Fuel Cost Adjusted LMP (Referenced to 1999 Fuel Prices)



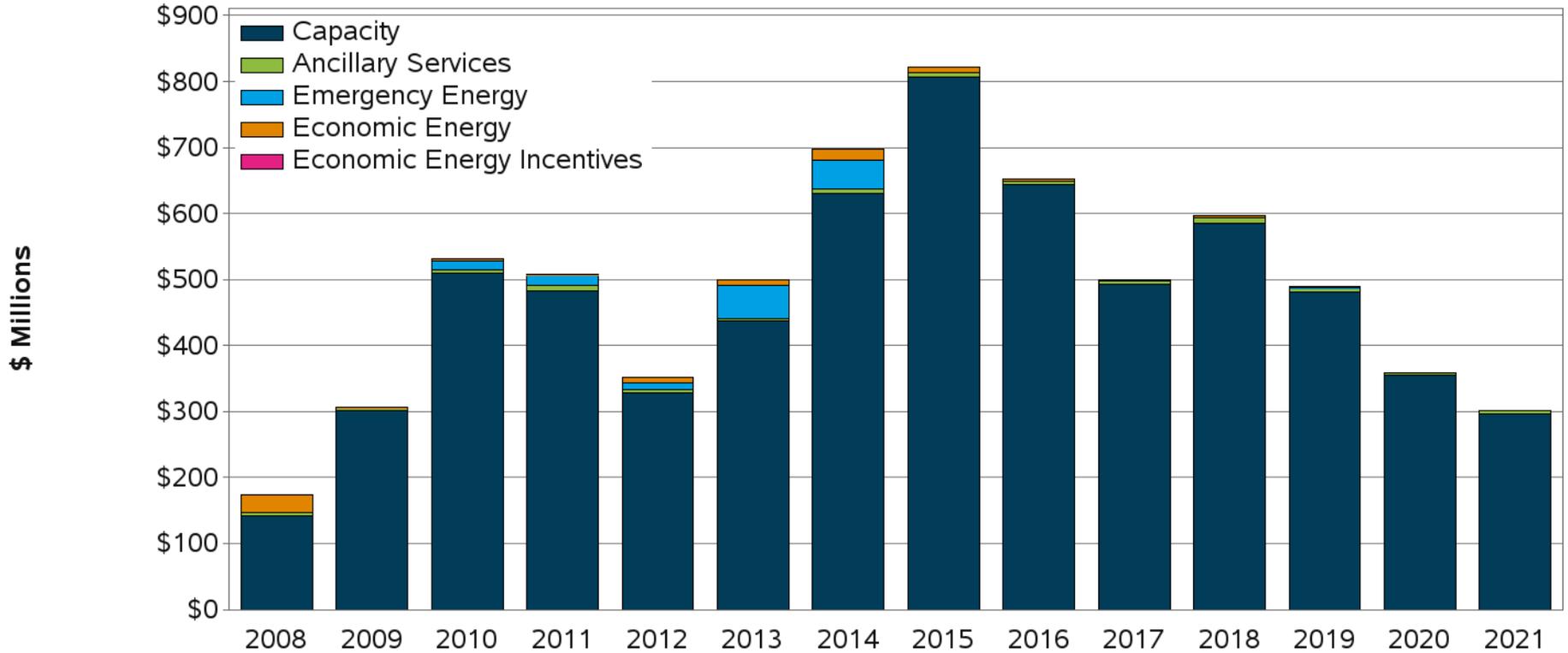


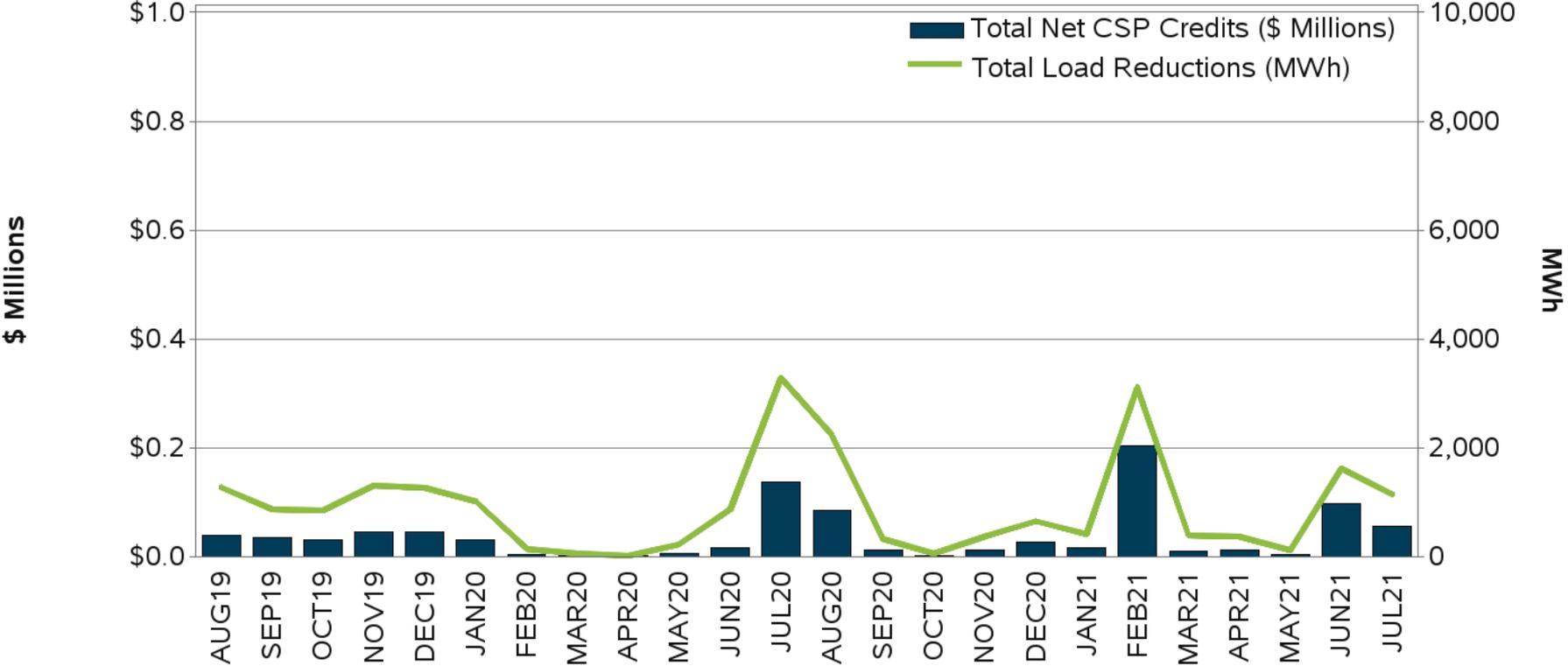
Spikes seen in March and April 2021 are incorrect and due to a software bug which has since been fixed.

# Energy Market

# Demand Response Summary

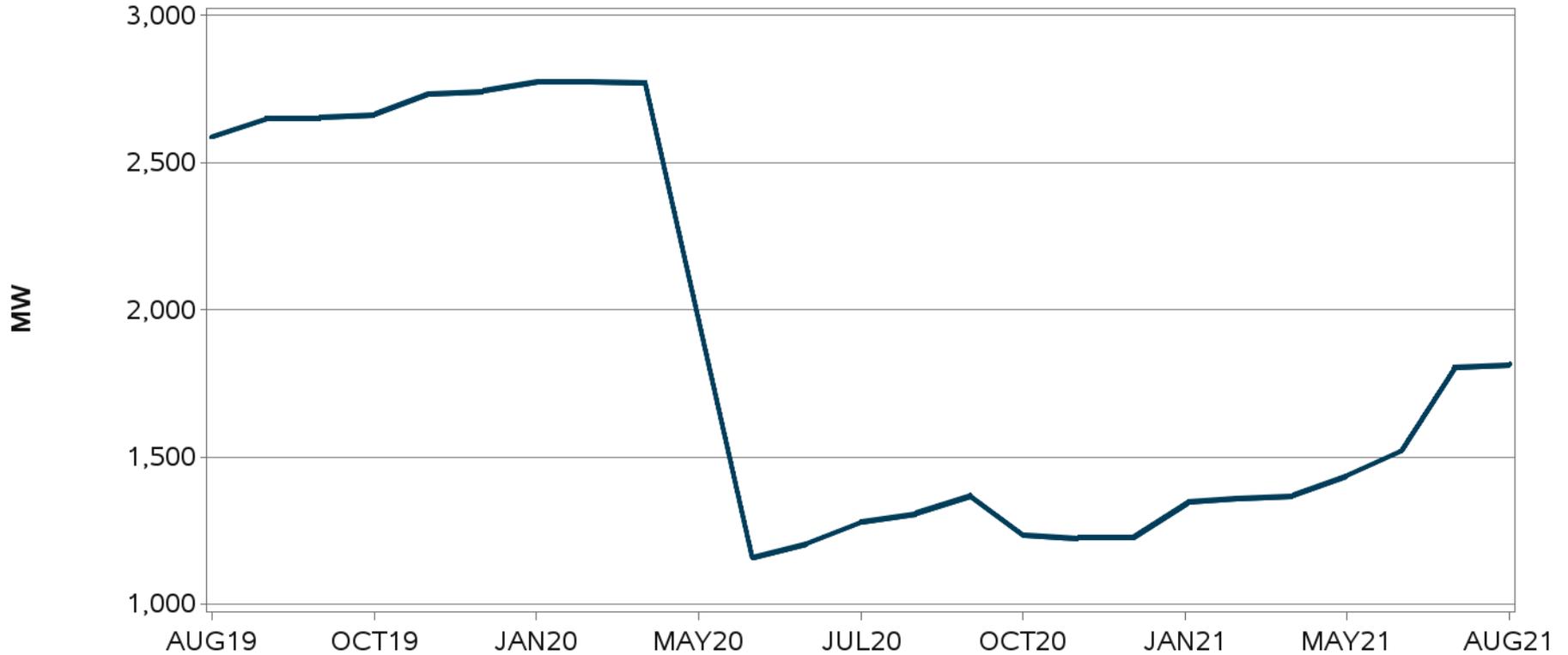
Spikes seen in March and April 2021 are incorrect and due to a software bug which has since been fixed.





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

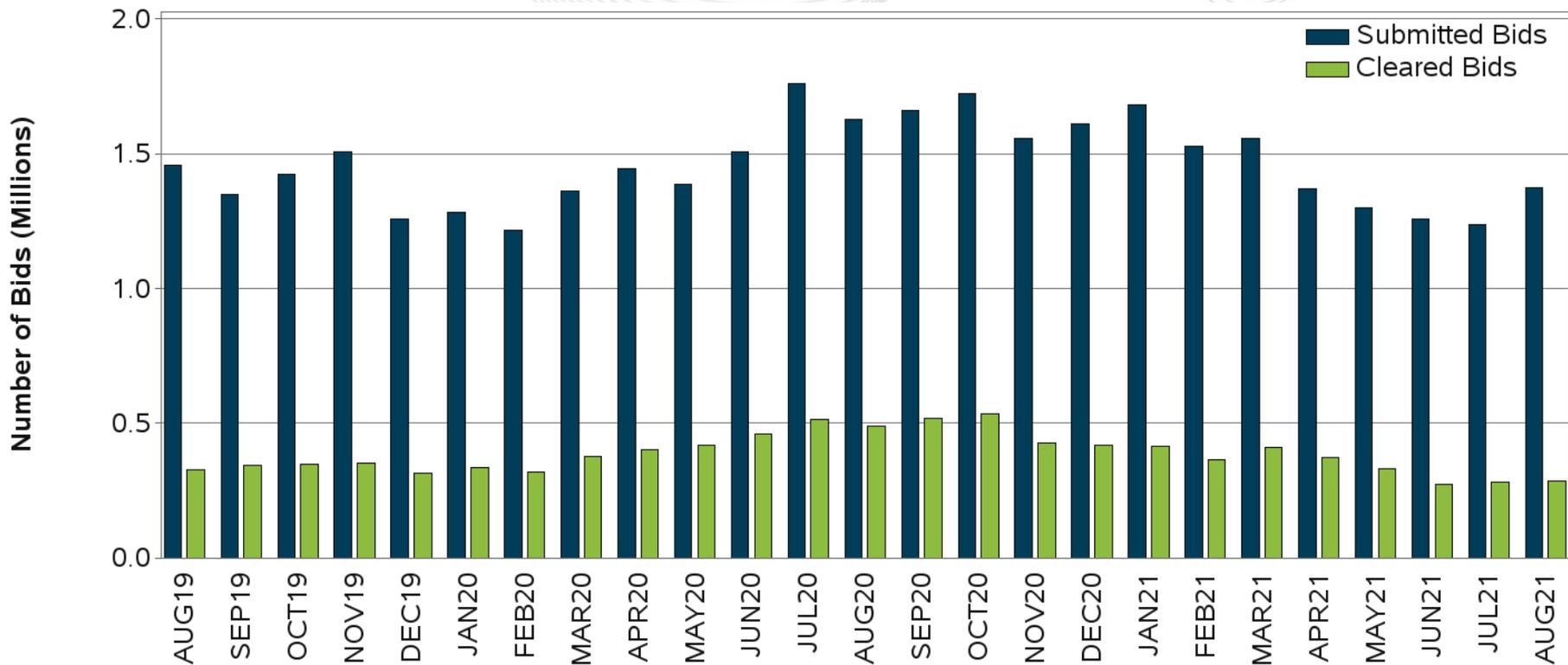
# Total Registered MW in PJM's Economic Demand Response

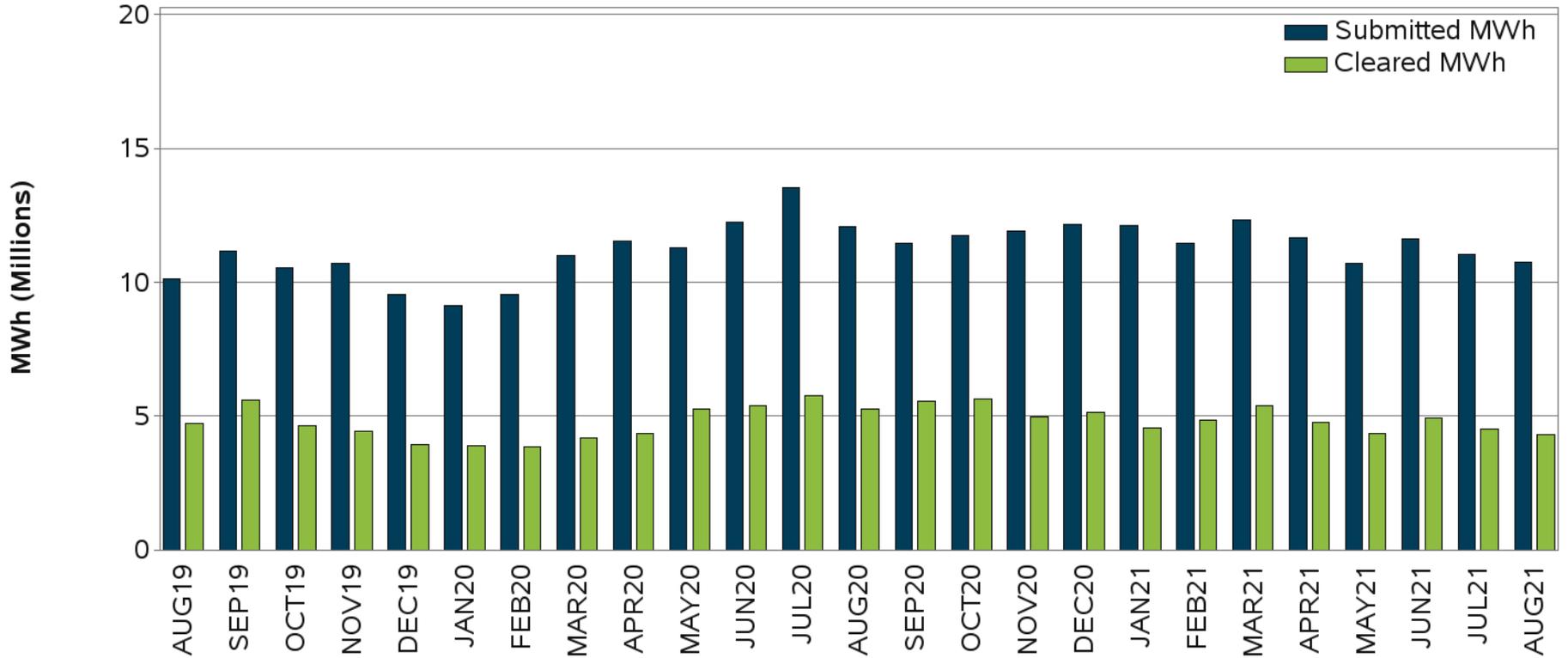


# Energy Market

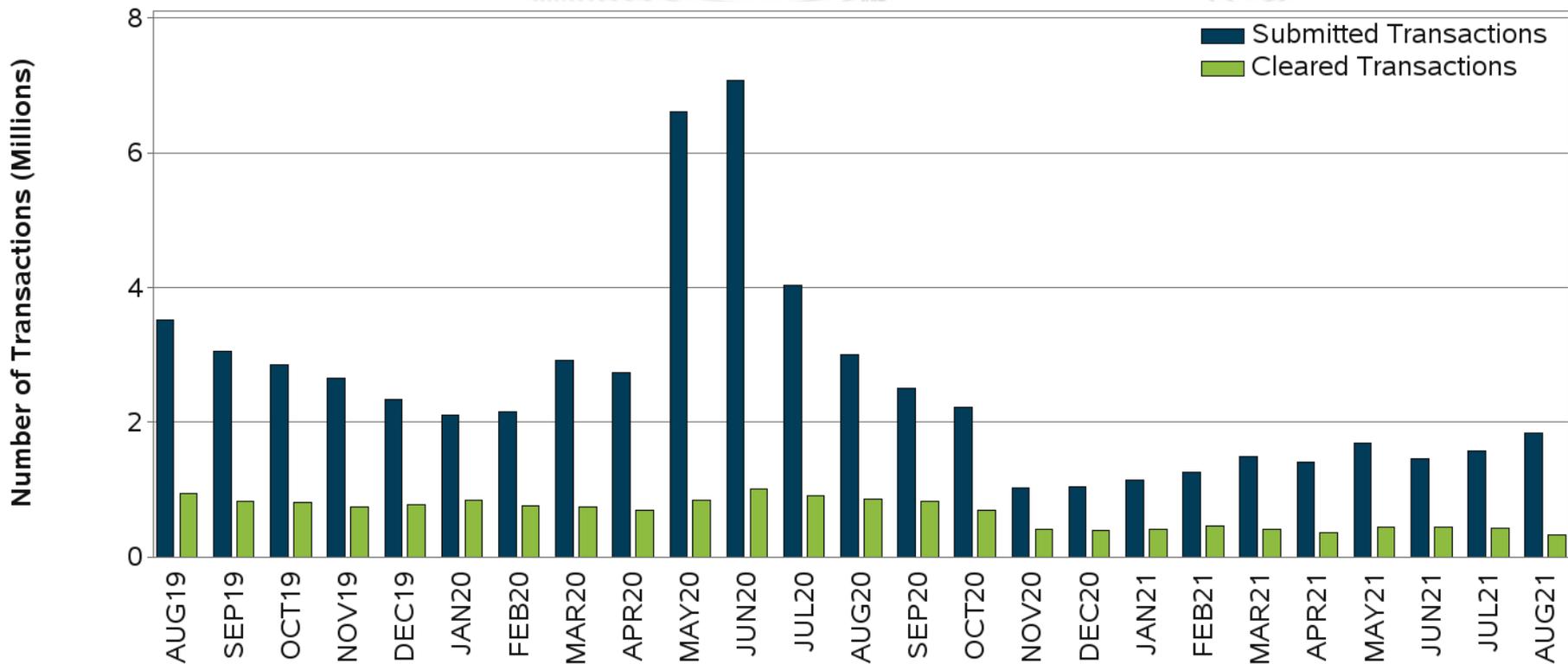
# Virtual Activity Summary

- 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.

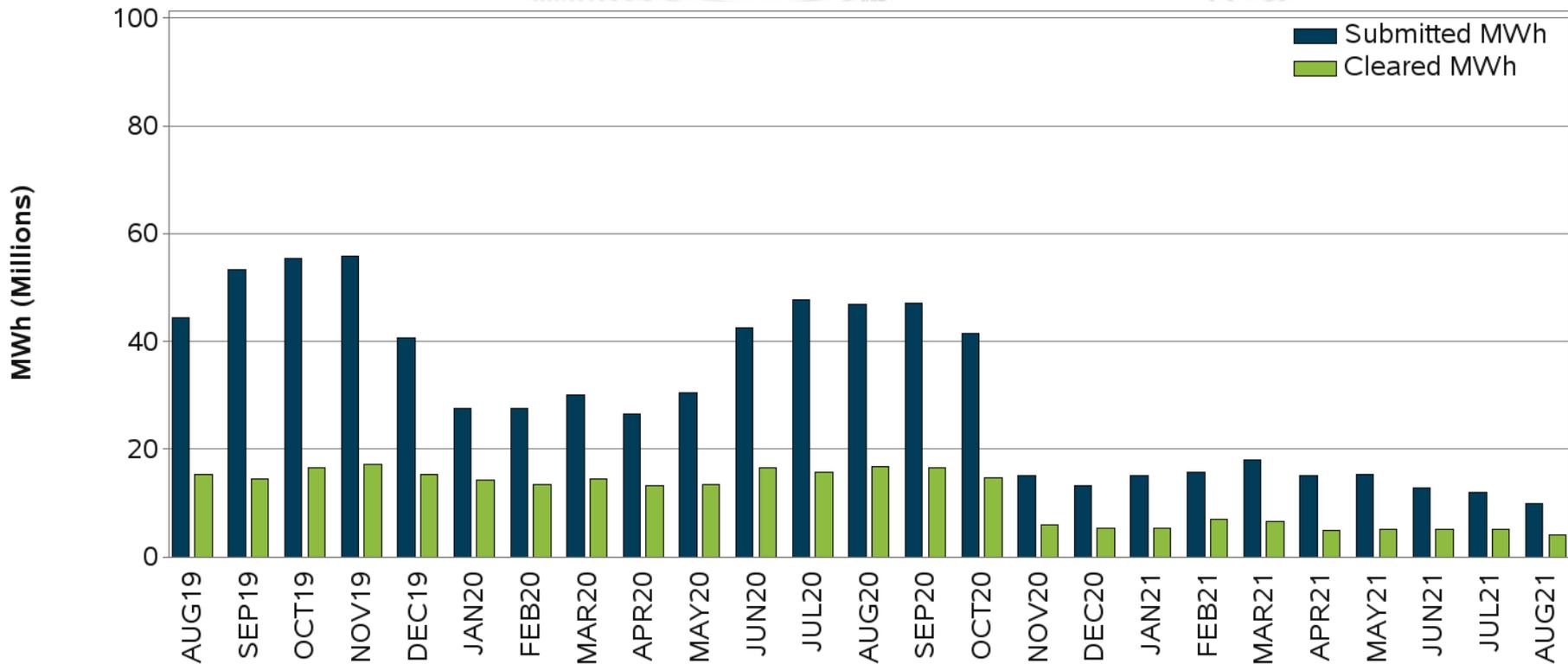




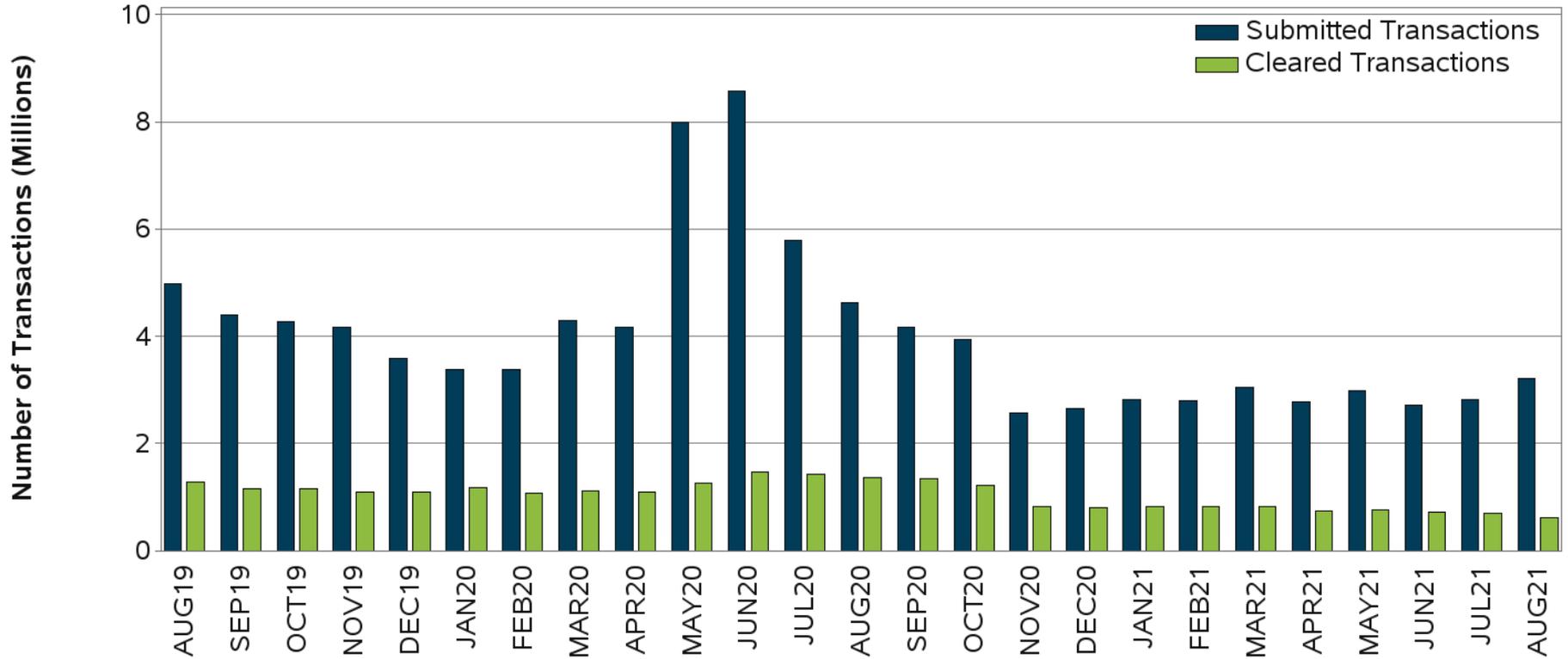
# Up-To-Congestion Transactions - Total Number



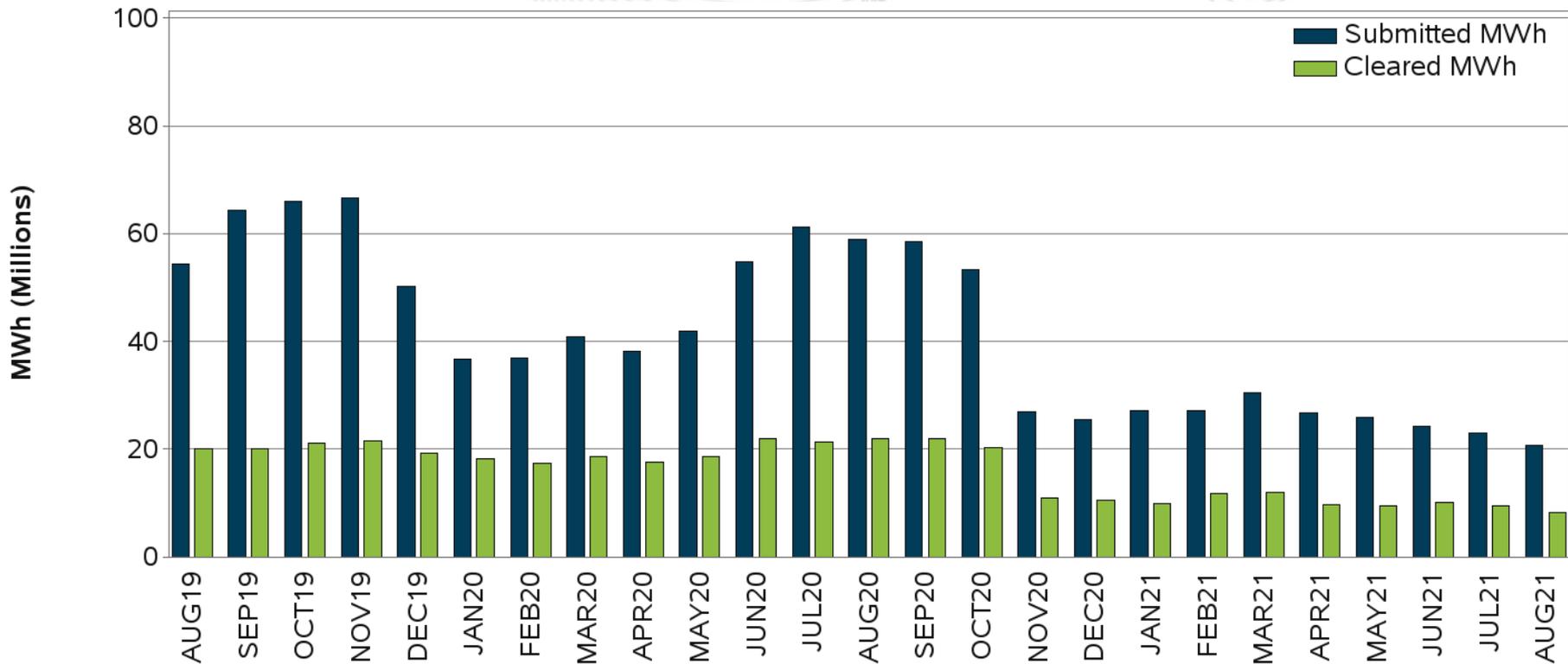
# Up-To-Congestion Transactions - Total Volume



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



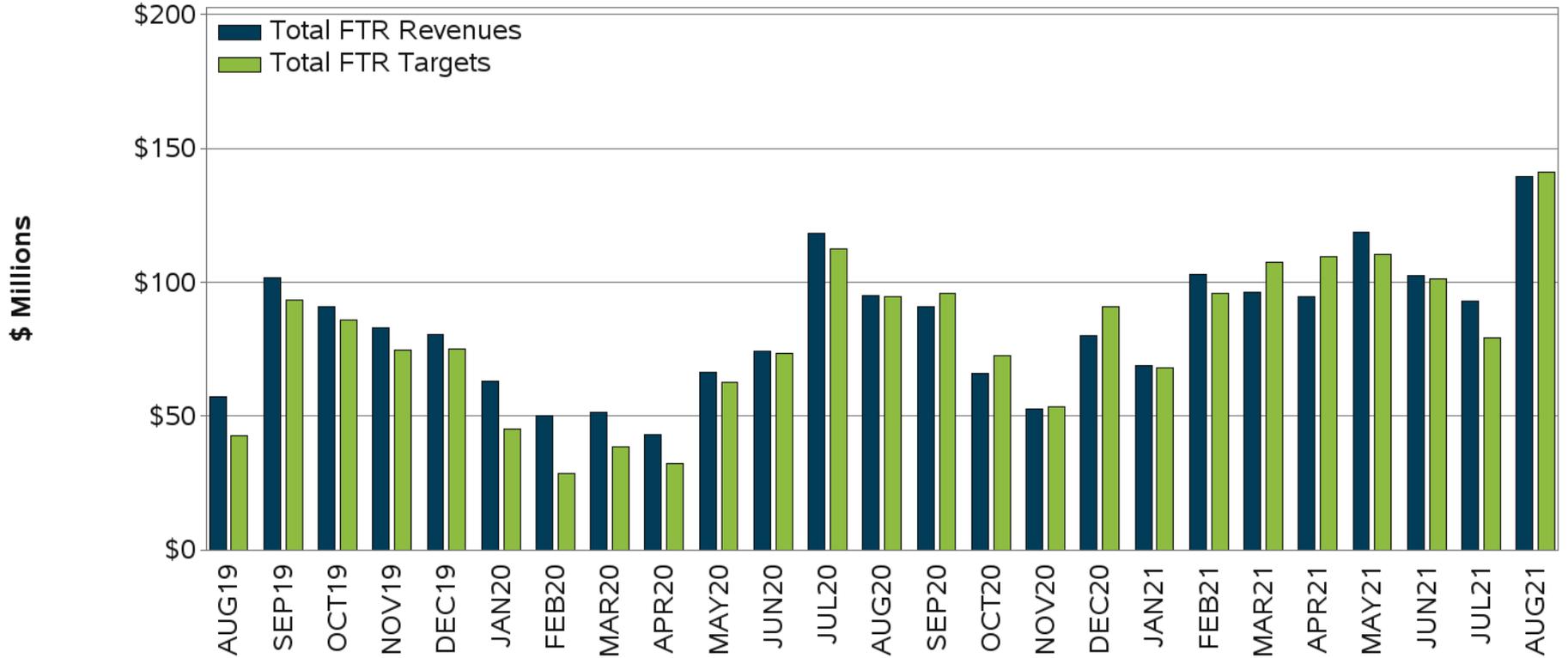
# INCs, DECs and Up-To-Congestion Transactions - Total Volume

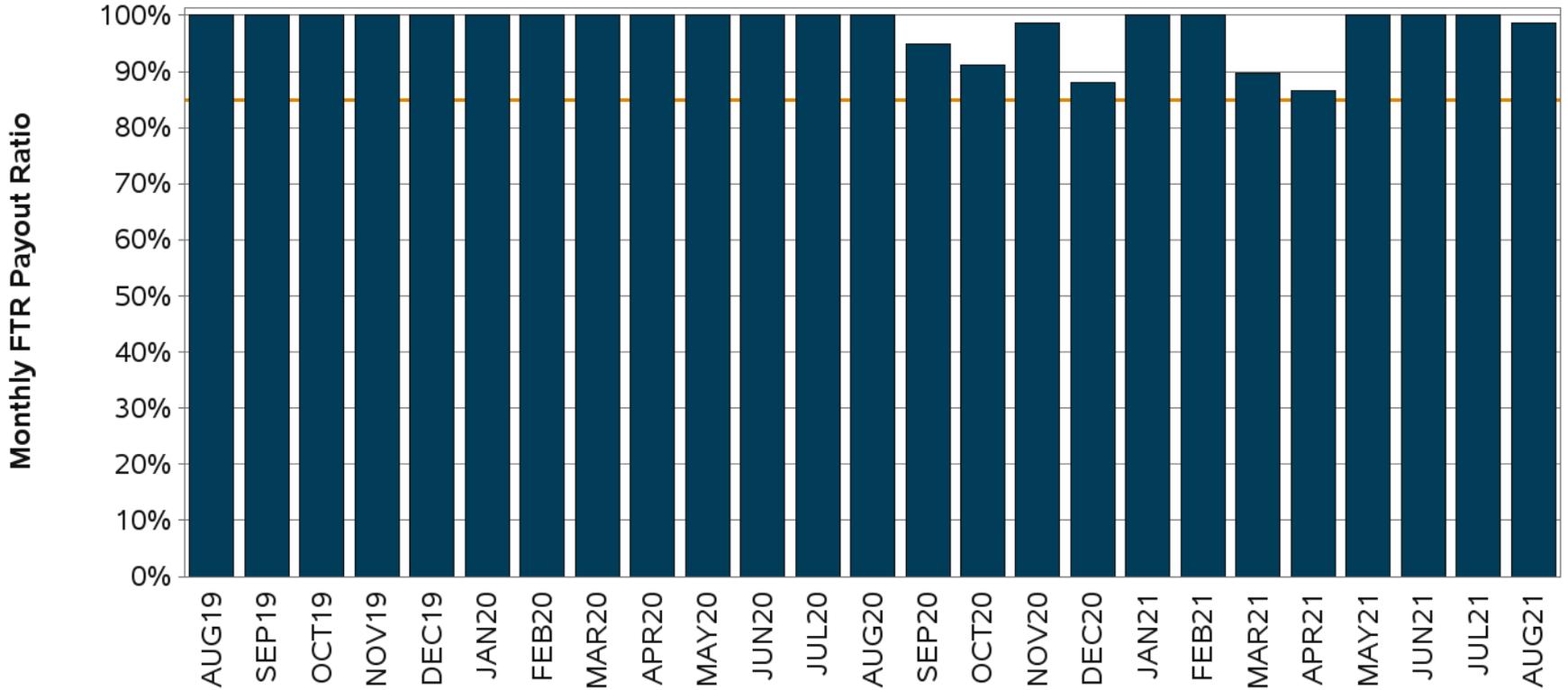


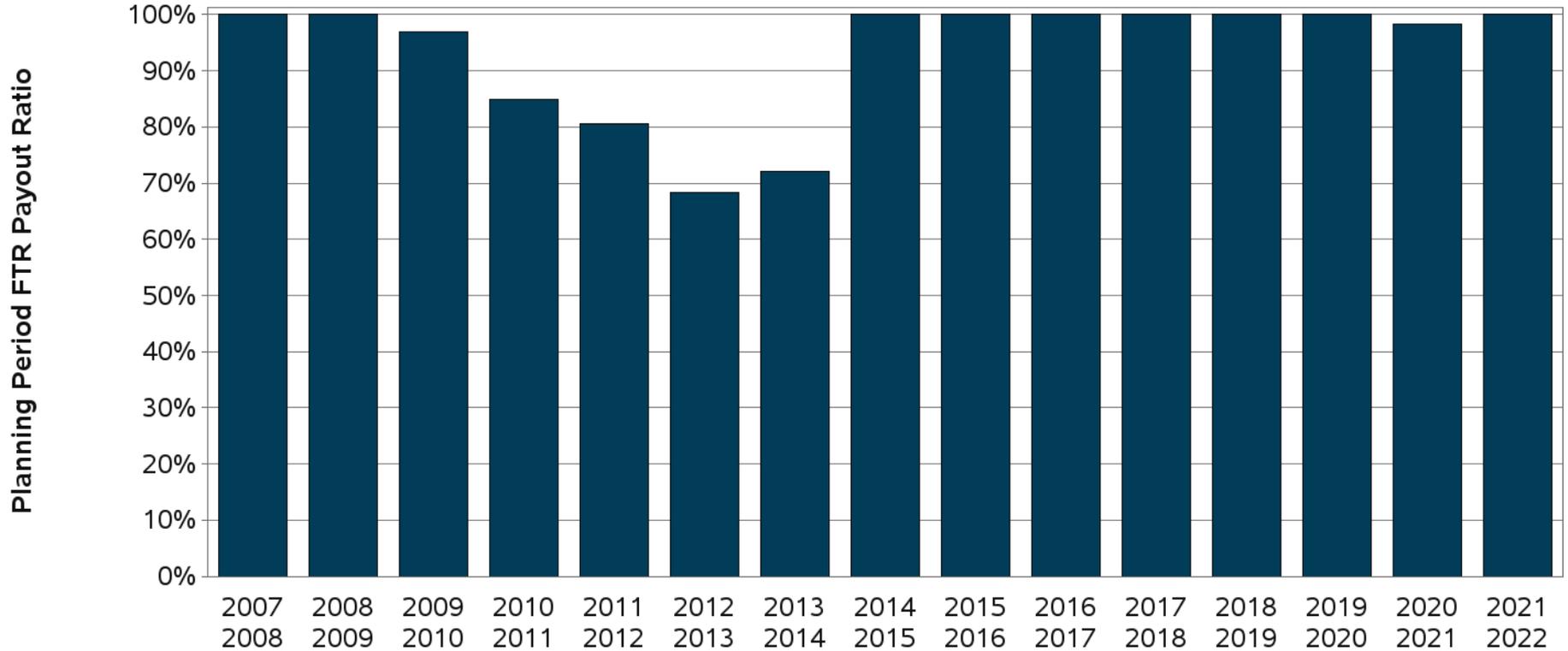
# Energy Market

## Congestion and FTR Summary

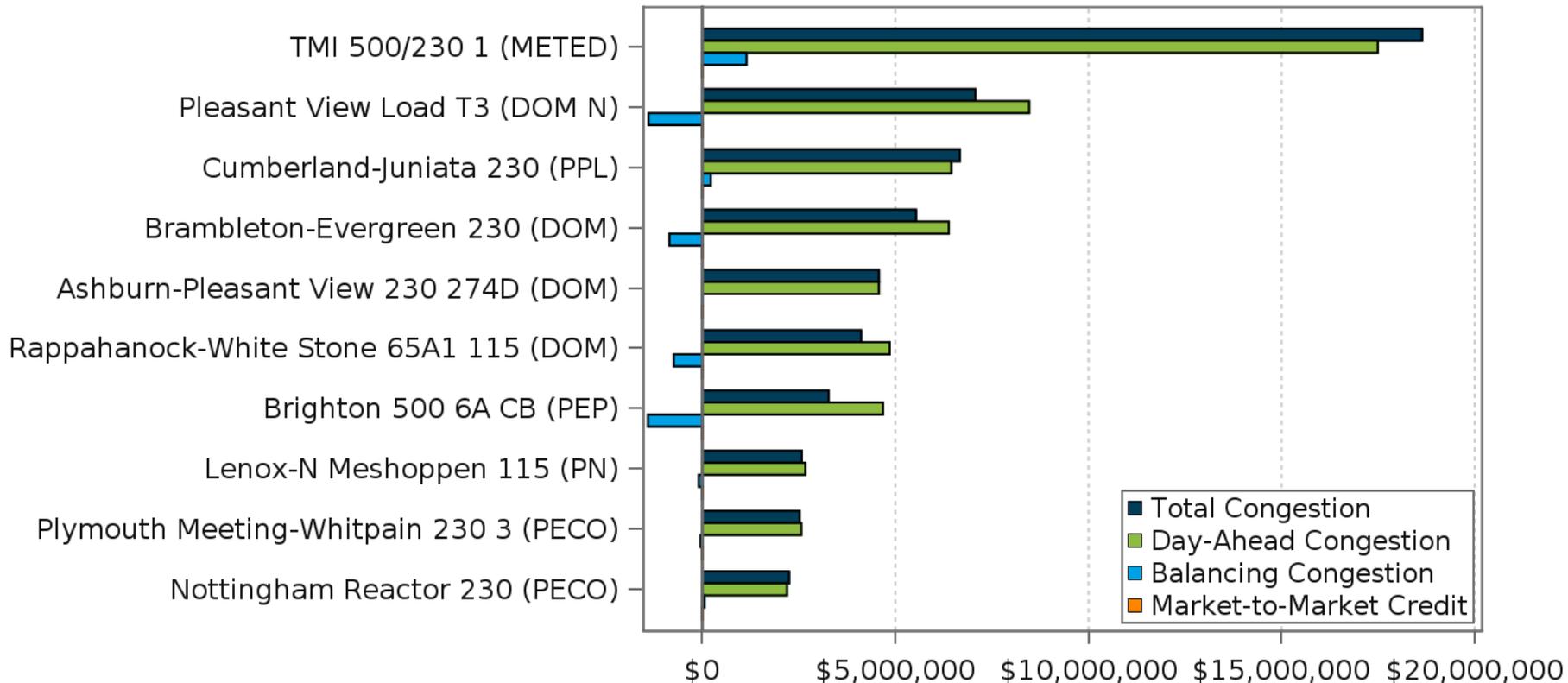
Period	Surplus / Underfunding	Payout Ratio
August, 2021	\$-1,789,746	99%
2021	\$3,697,784	100%
2021/2022	\$13,105,206	100%





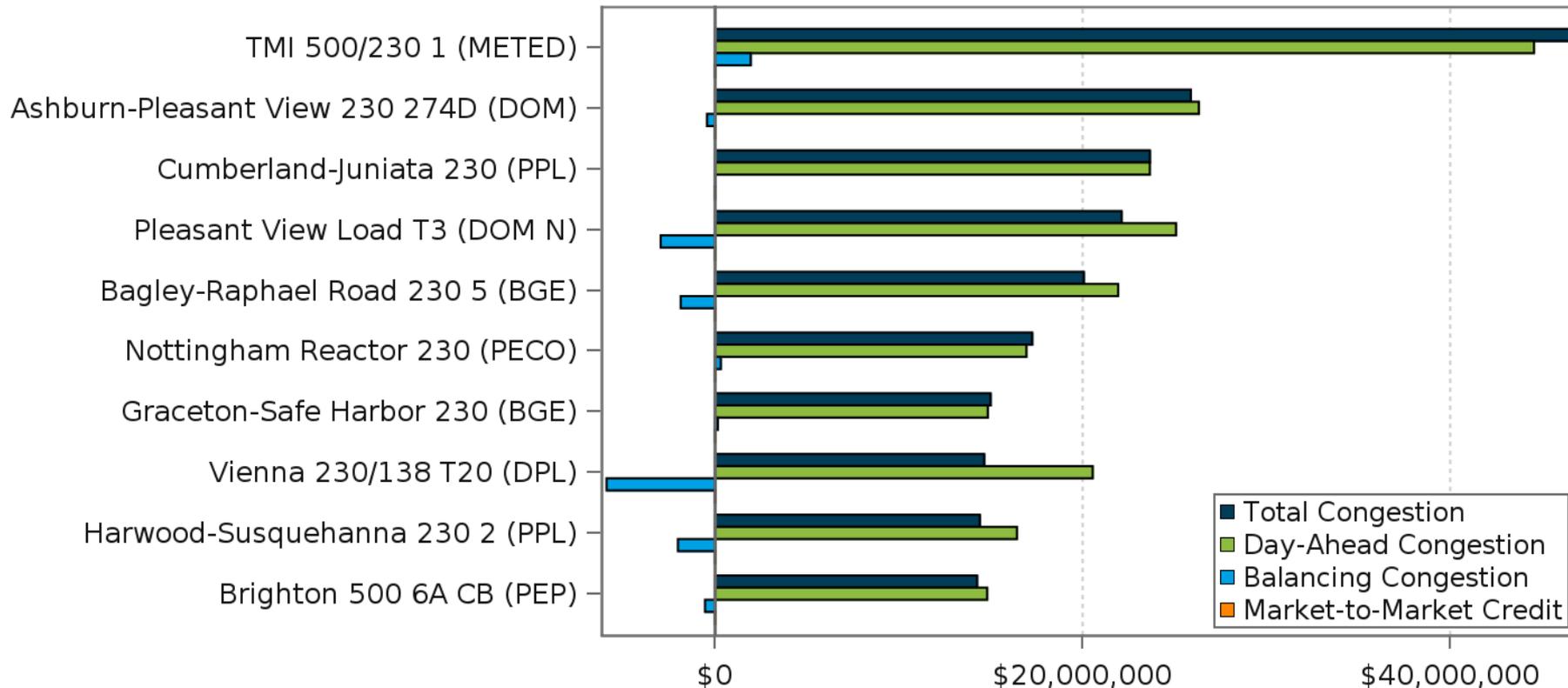


# Ten Most Heavily Congested Transmission Facilities - Overall, August



The ten most heavily congested facilities account for 71% of total congestion for August.

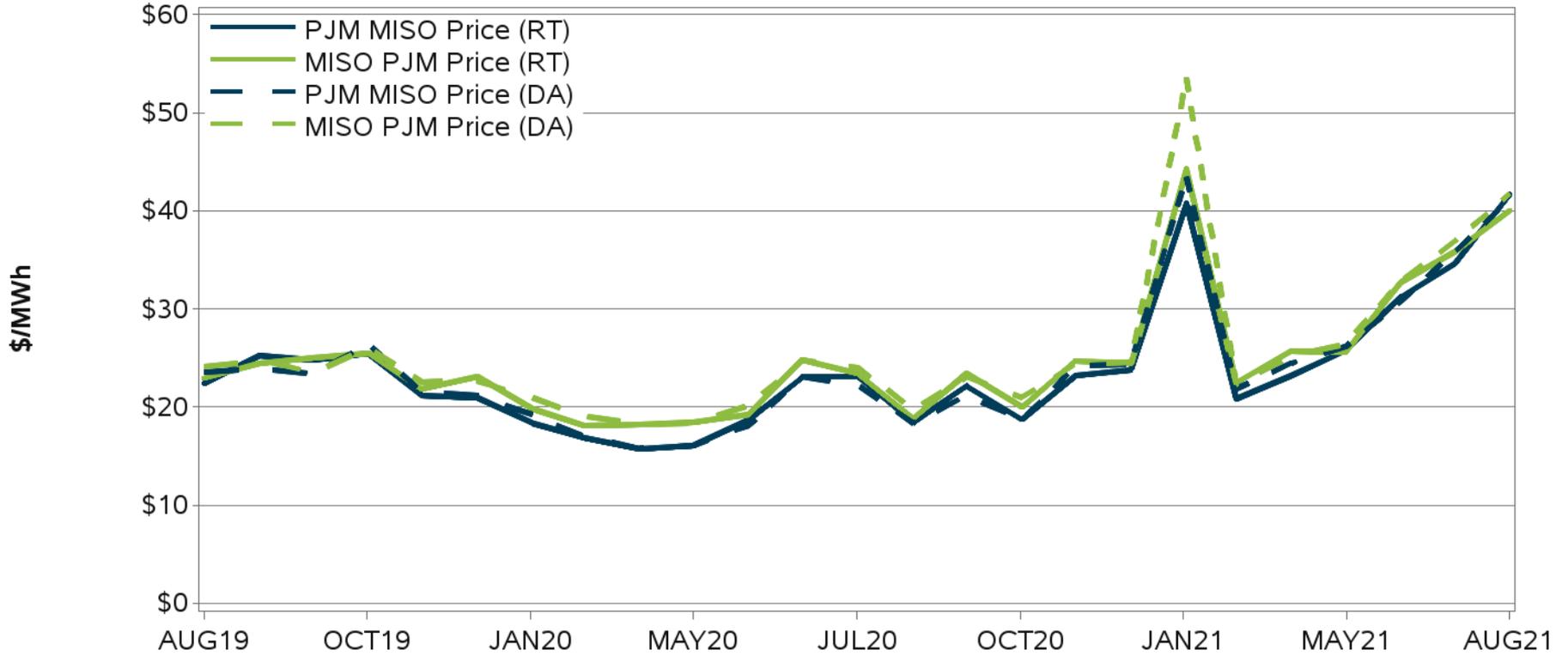
# Ten Most Heavily Congested Transmission Facilities - Overall, 2021

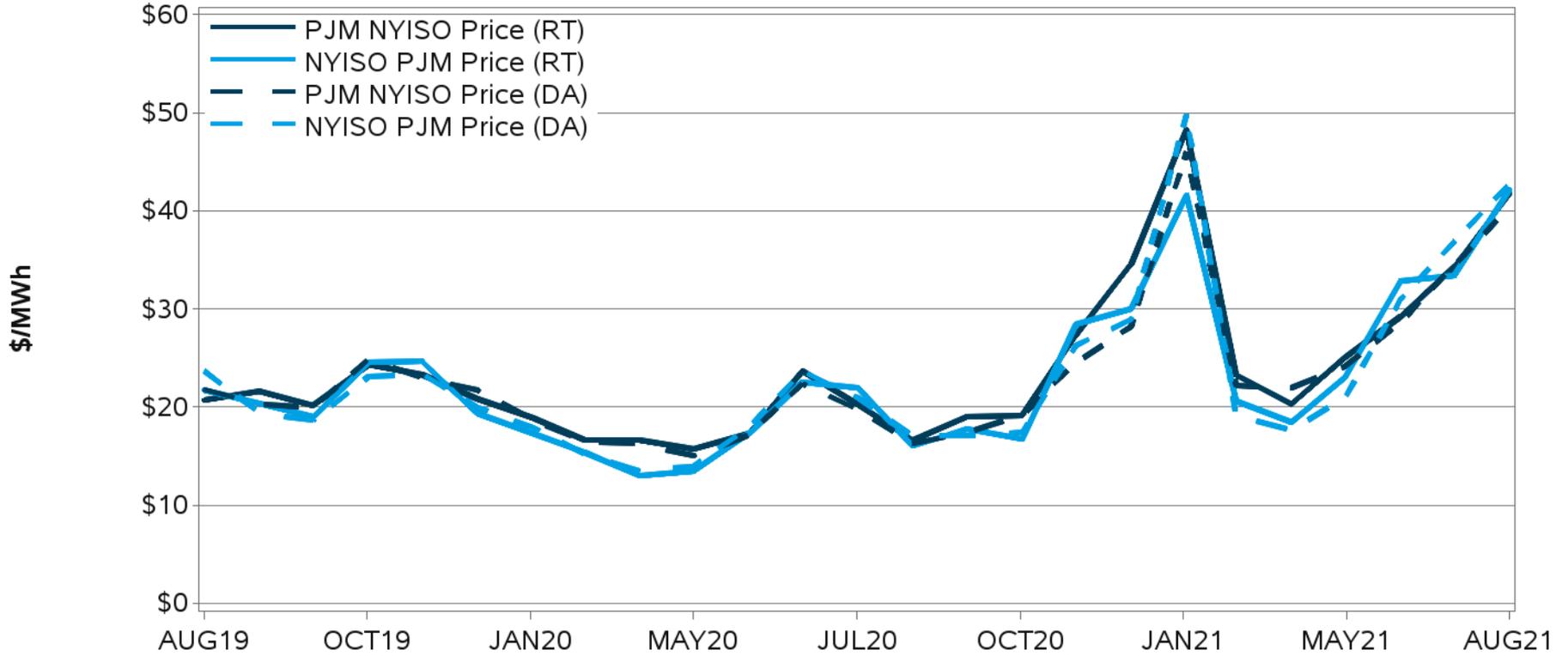


The ten most heavily congested facilities account for 41% of total congestion for 2021.

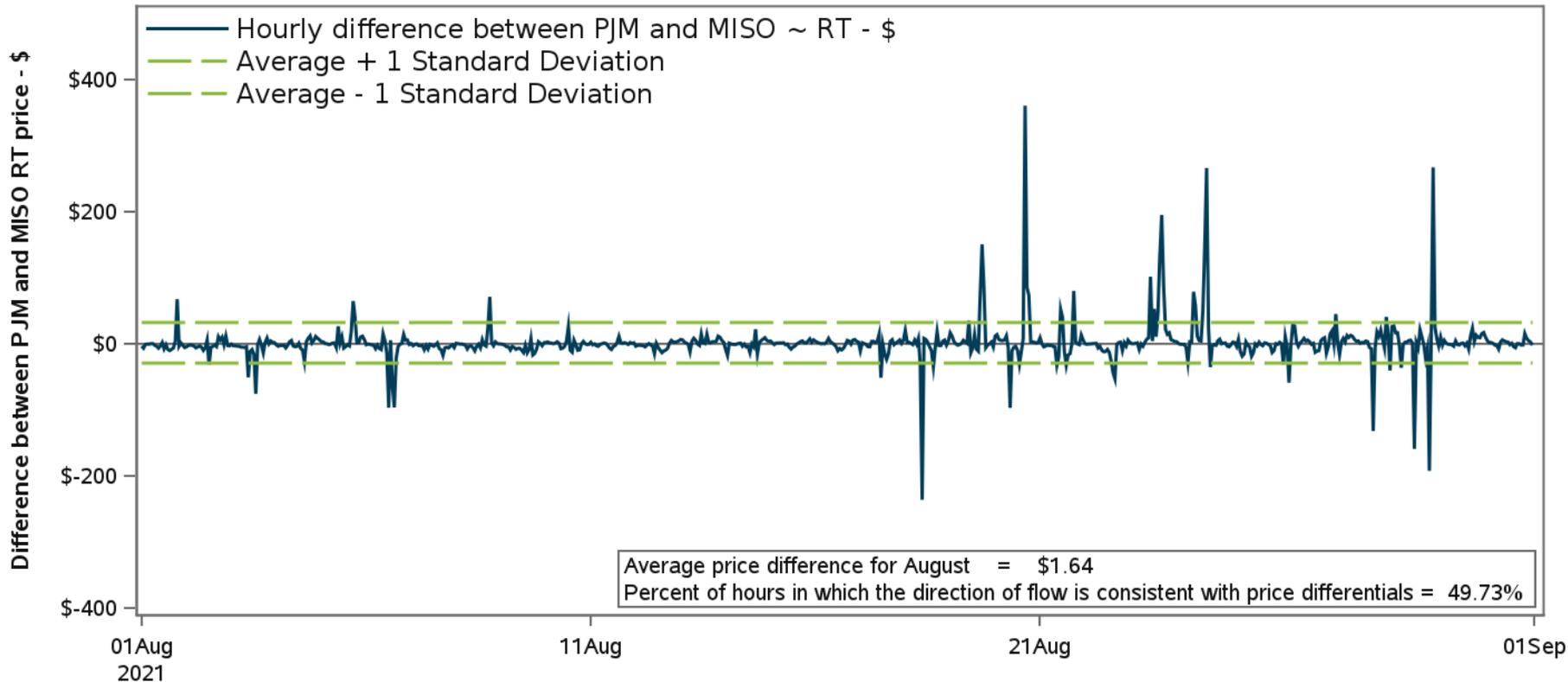
# Energy Market

# Interchange/Seams Summary



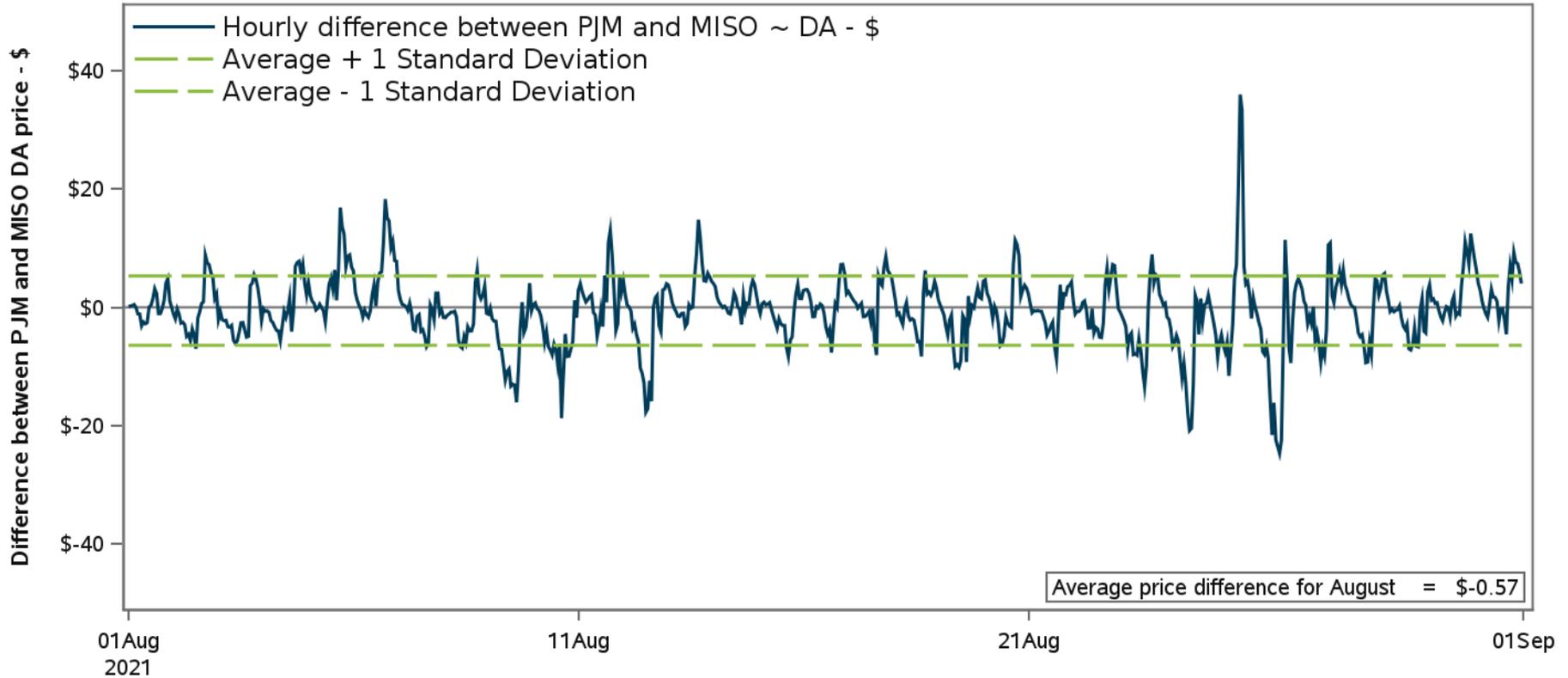


# Hourly Difference Between PJM and MISO Real-Time Prices



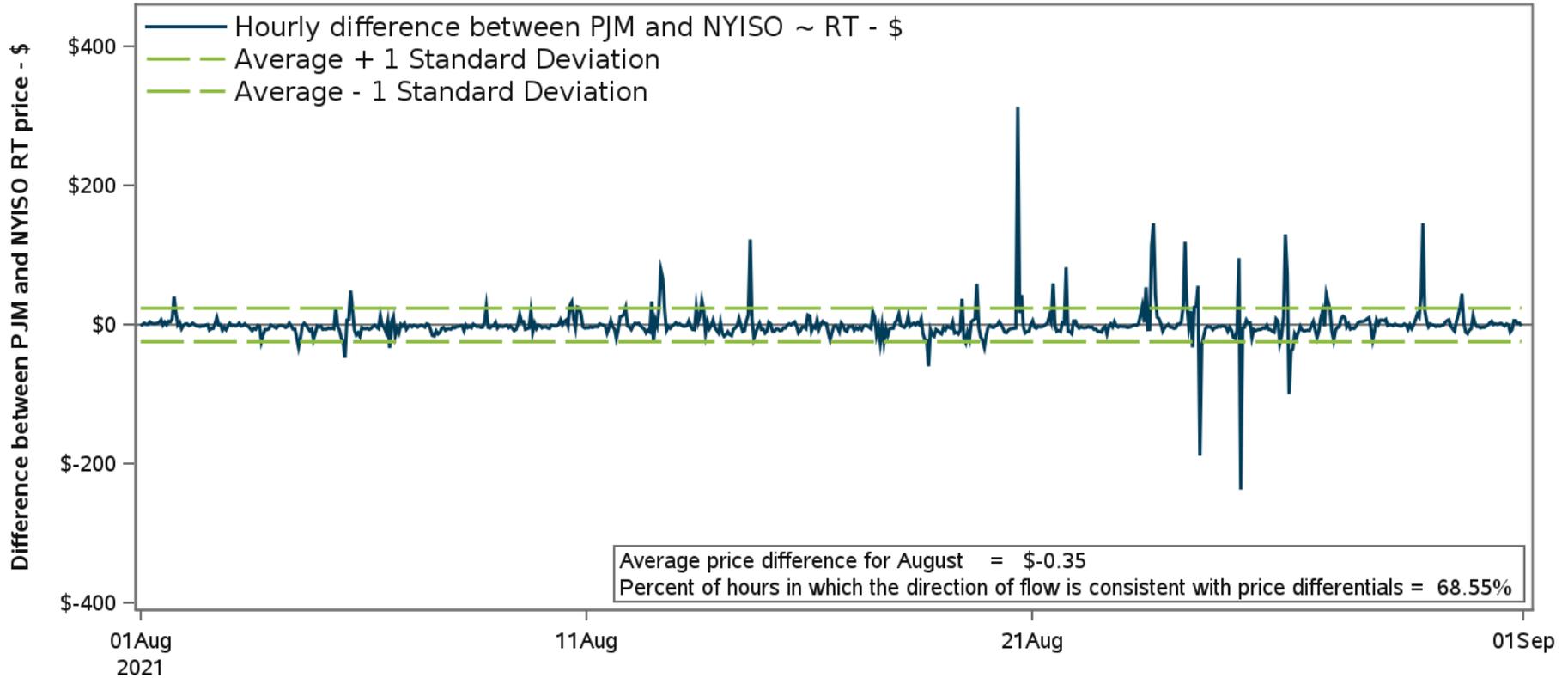
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

# Hourly Difference Between PJM and MISO Day-Ahead Prices



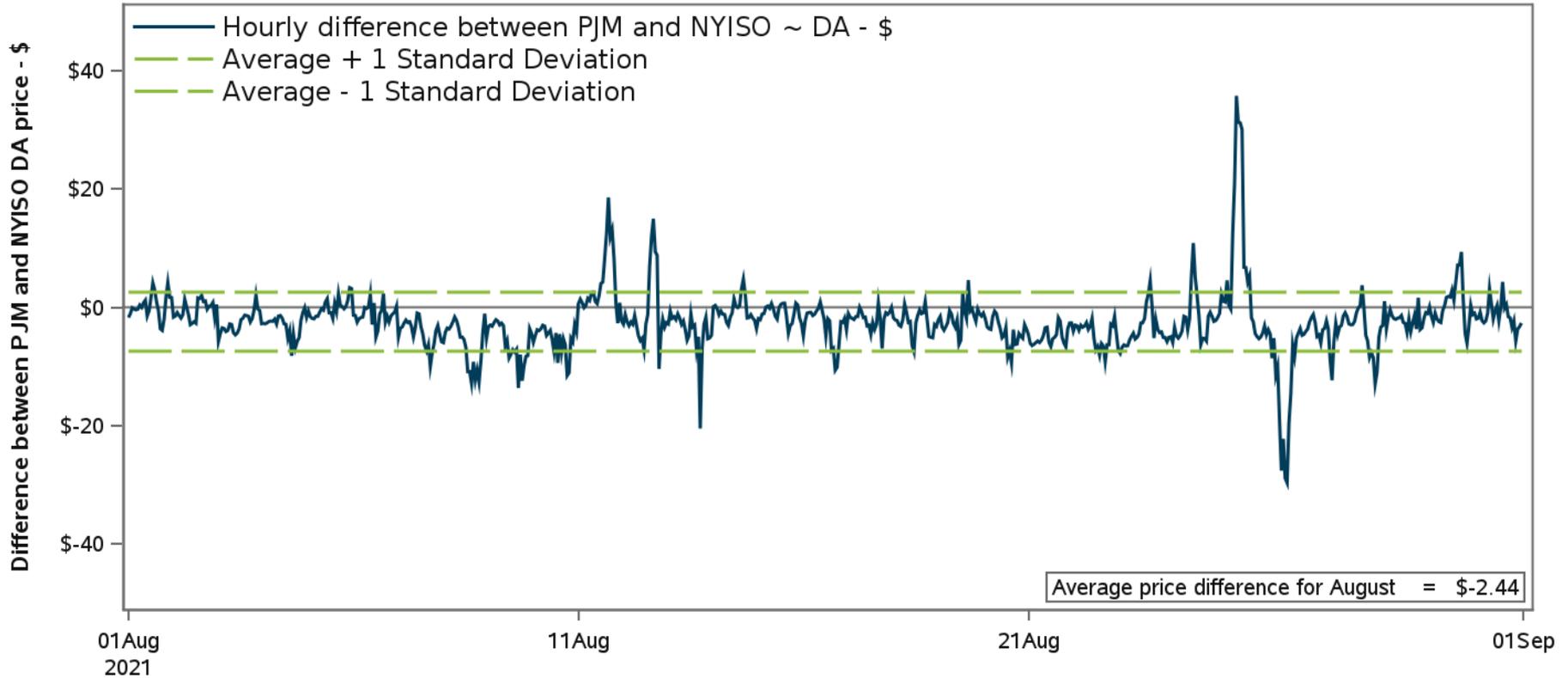
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

# Hourly Difference Between PJM and NYISO Real-Time Prices

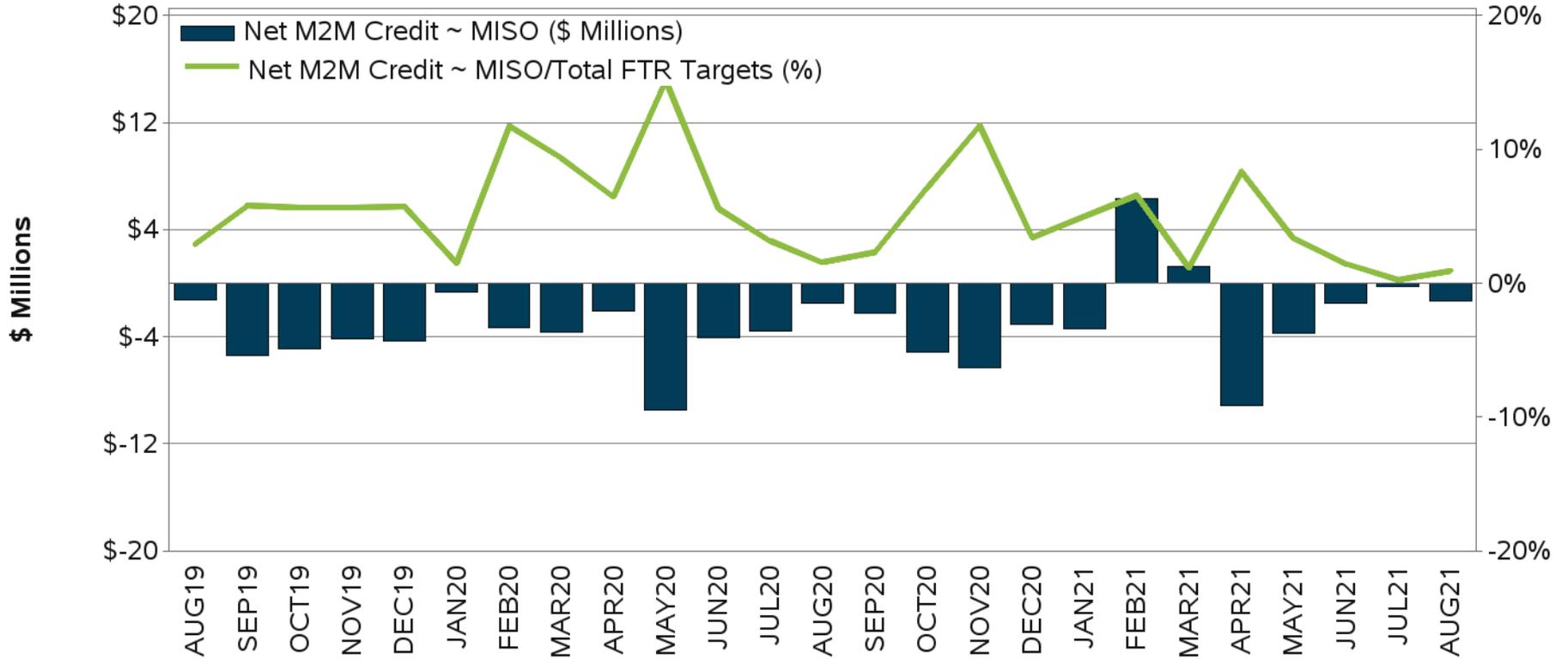


Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

# Hourly Difference Between PJM and NYISO Day-Ahead Prices



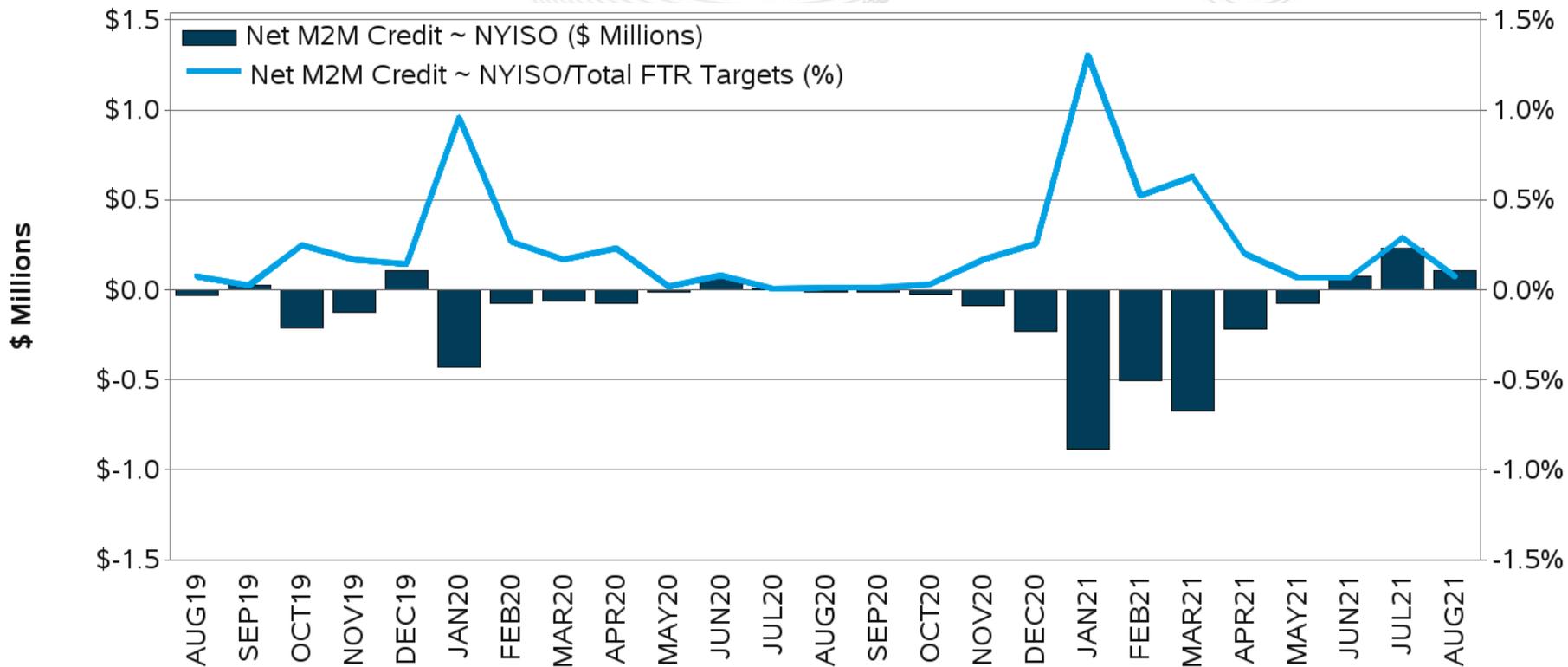
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.



Negative M2M Credit represents PJM payment to MISO

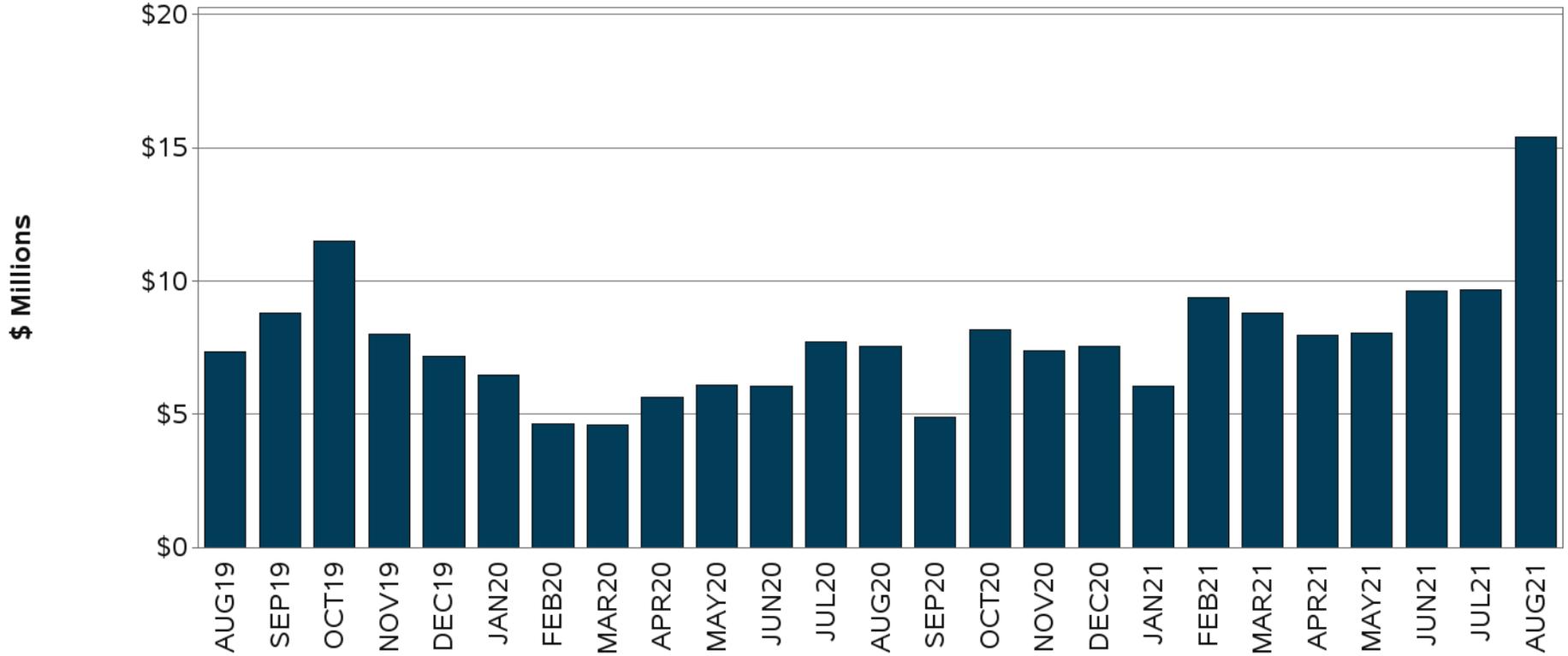


# PJM-NYISO Market-to-Market Coordination Settlement

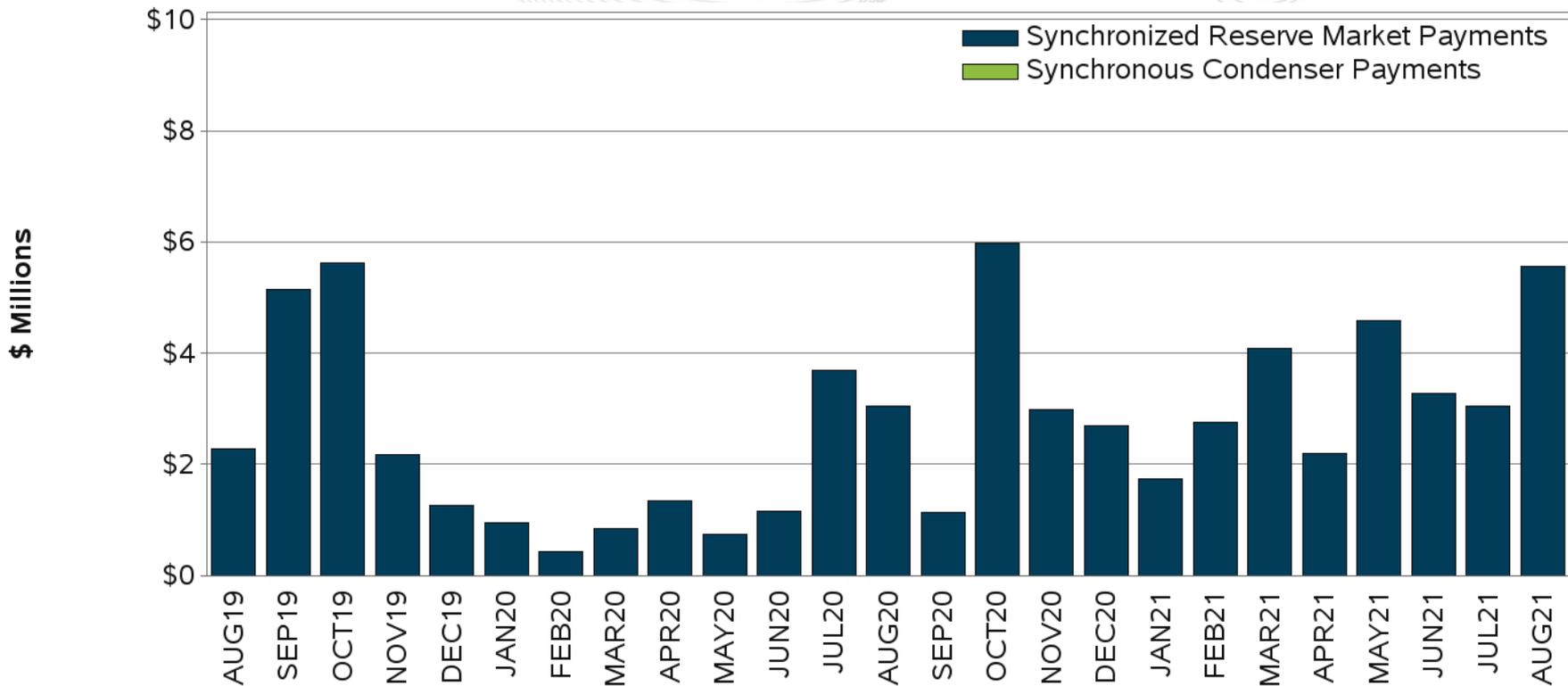


Negative M2M Credit represents PJM payment to NYISO

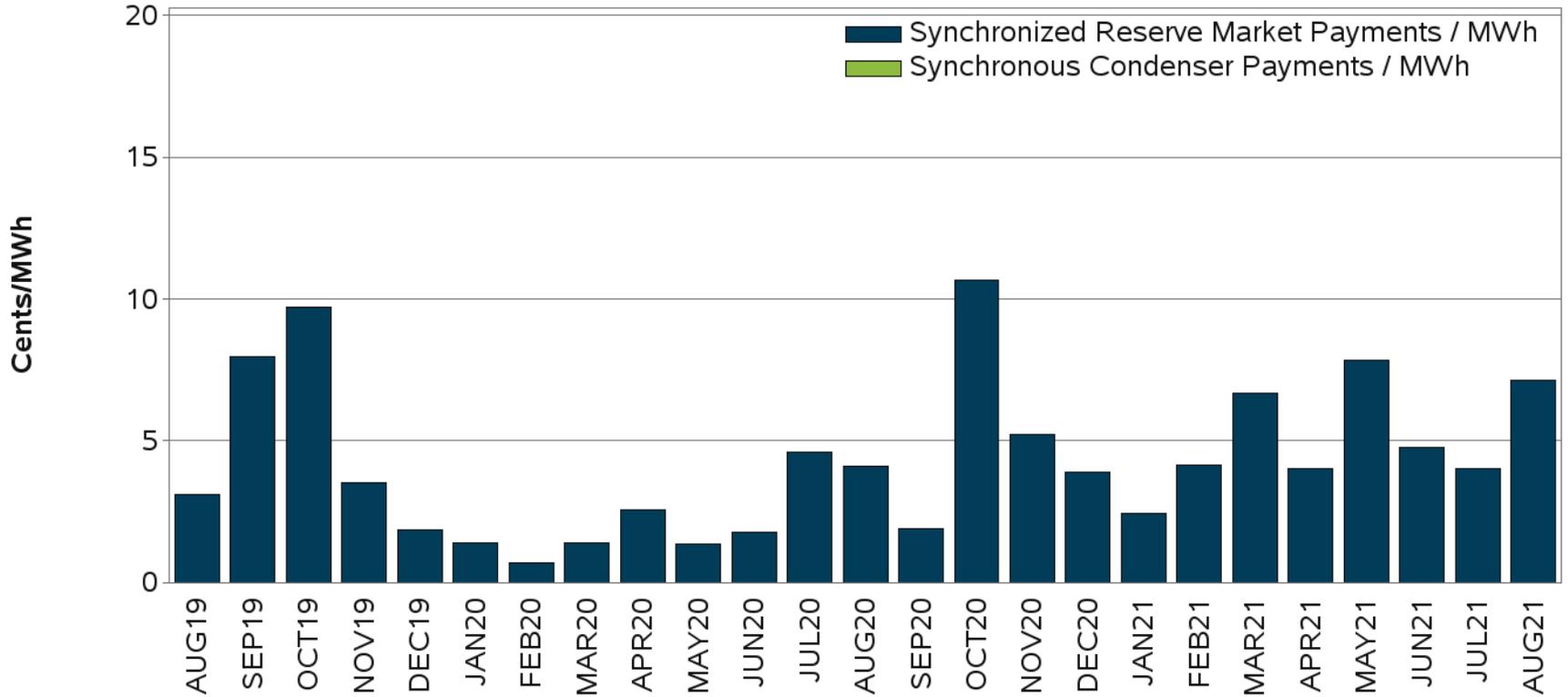
# Ancillary Service Market Summary

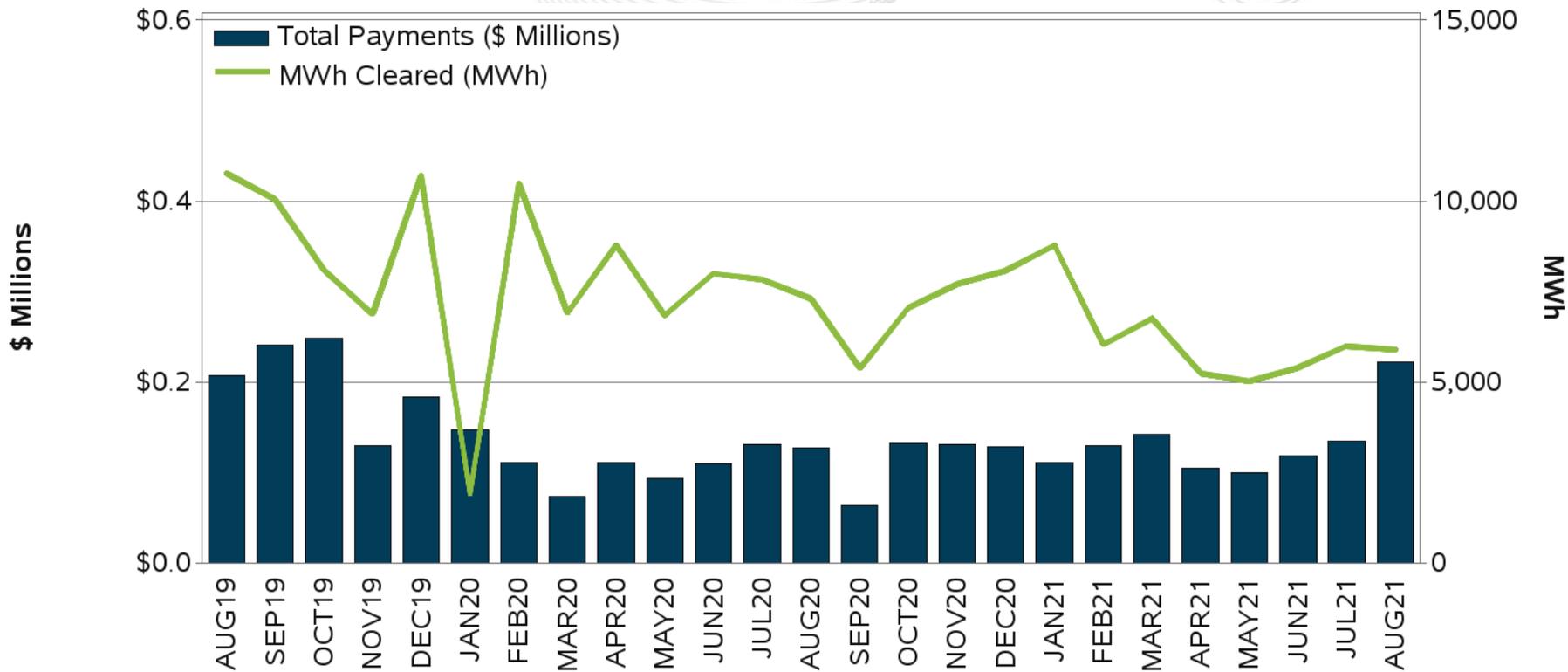


# Synchronized Reserve and Synchronous Condenser Costs

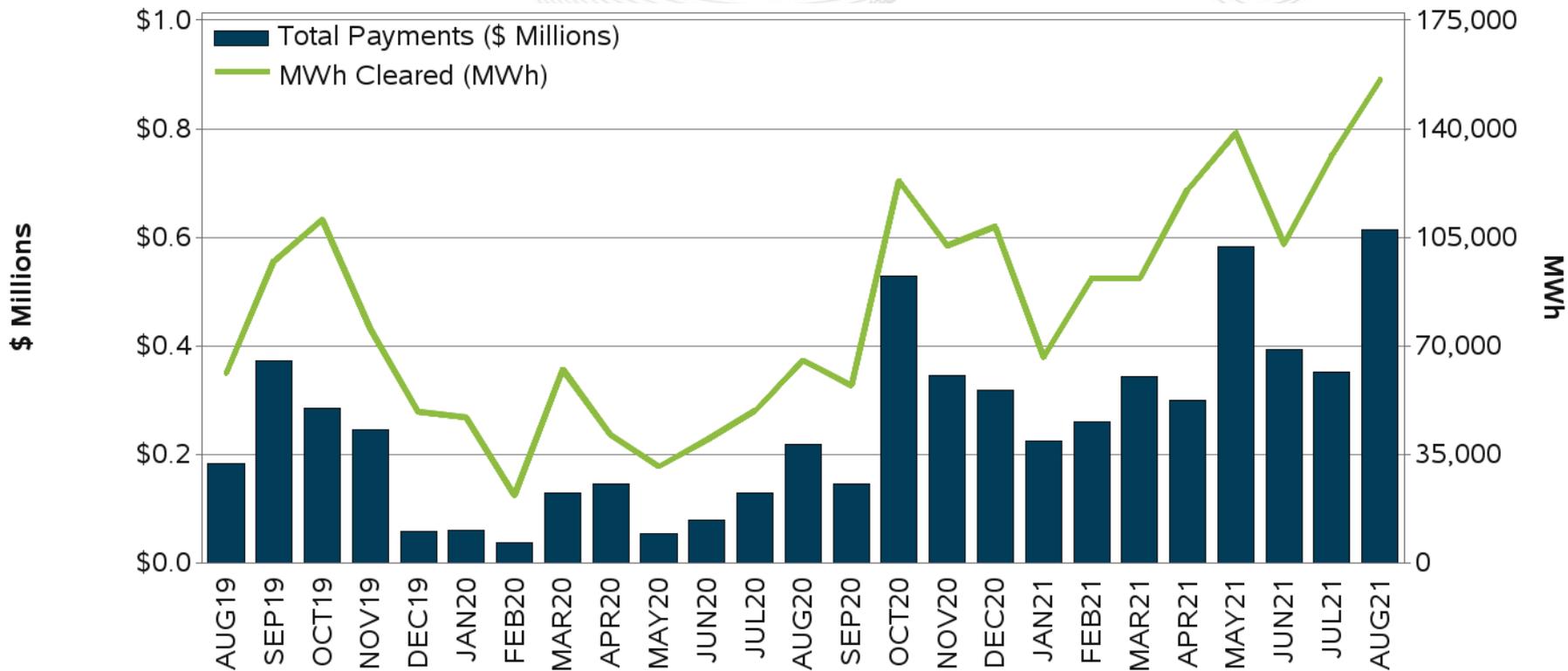


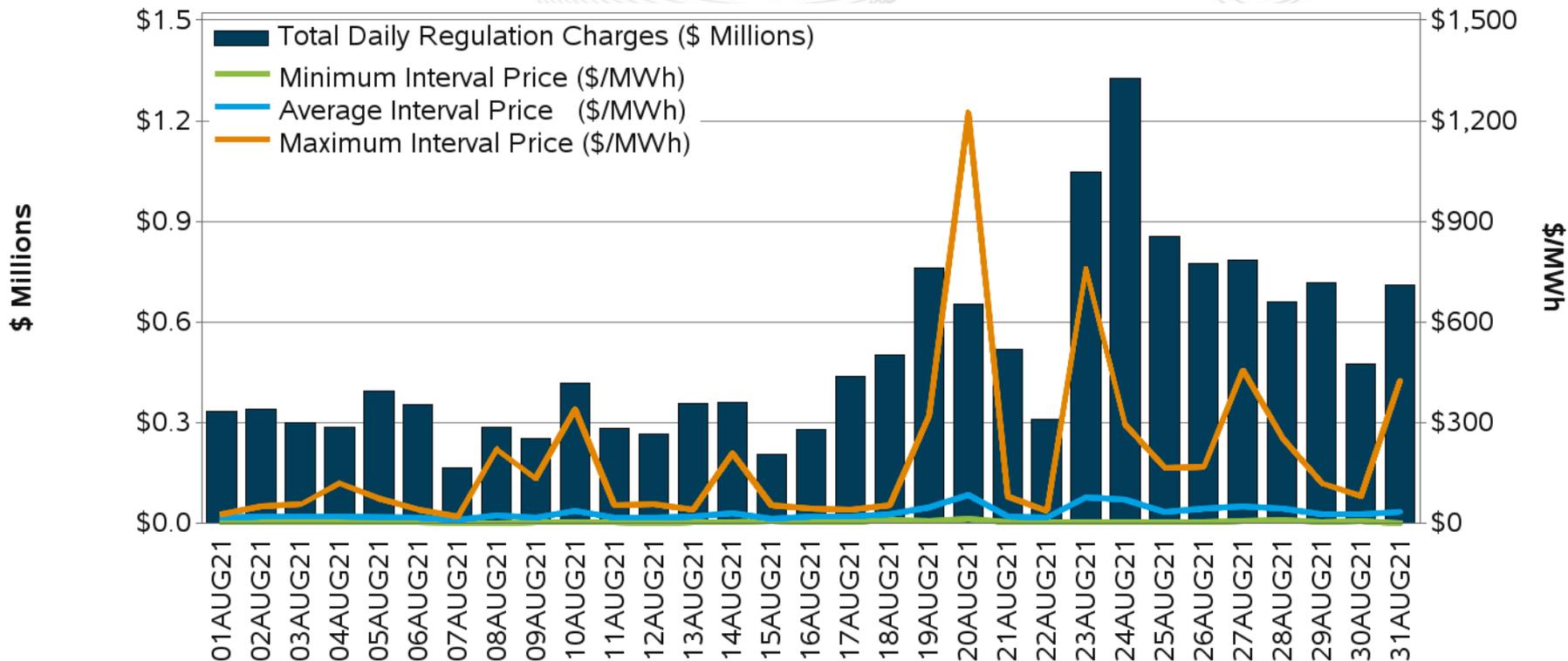
**pjm** Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs



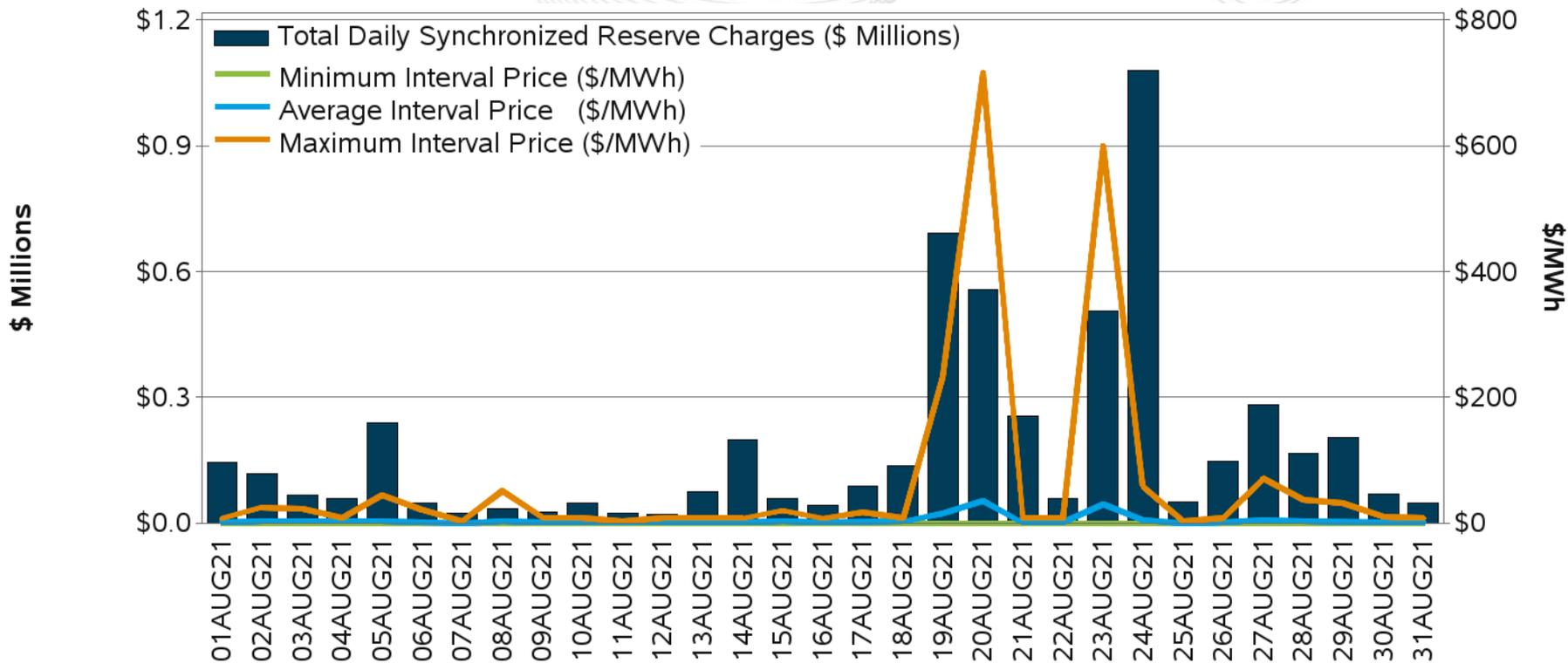


# DR Participation in PJM Synchronized Reserve Markets





# Synchronized Reserve Market Daily Prices and Charges



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