



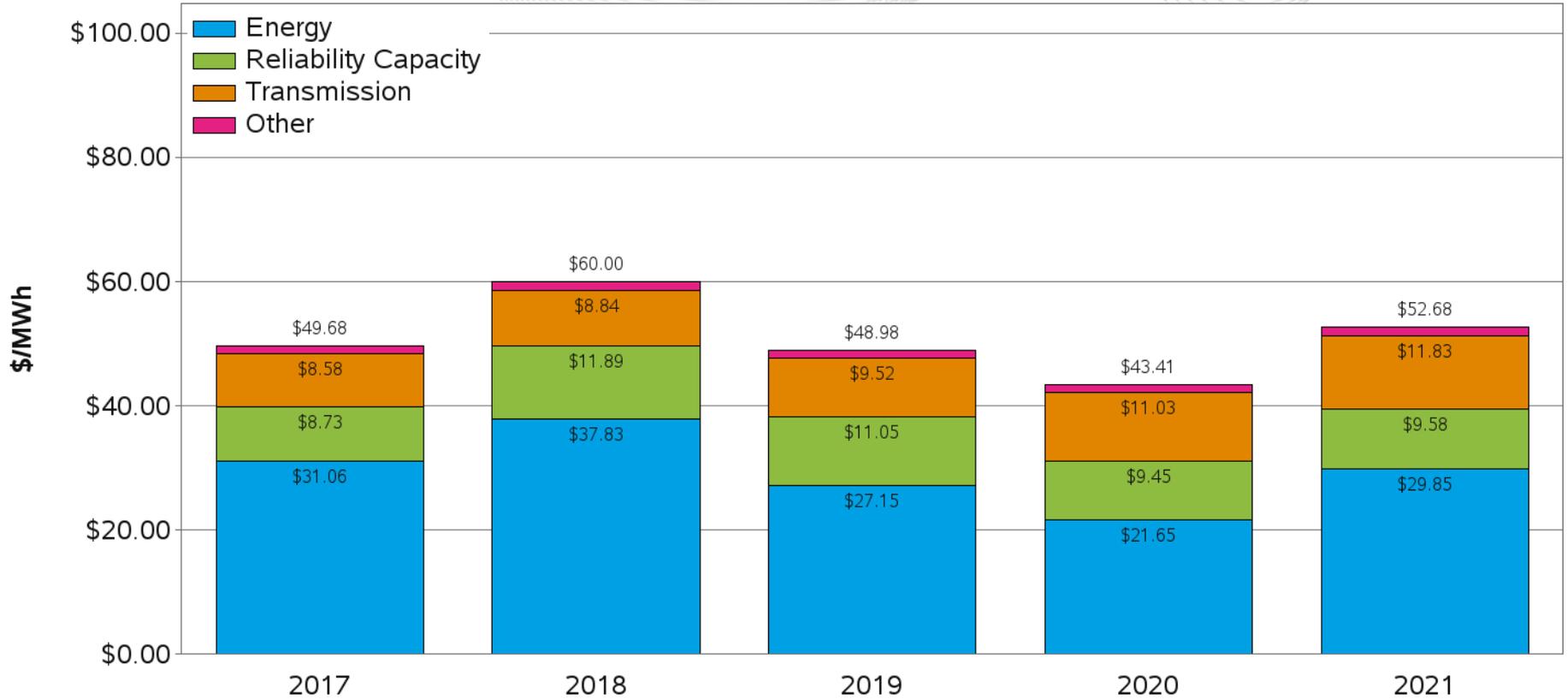
Markets Report

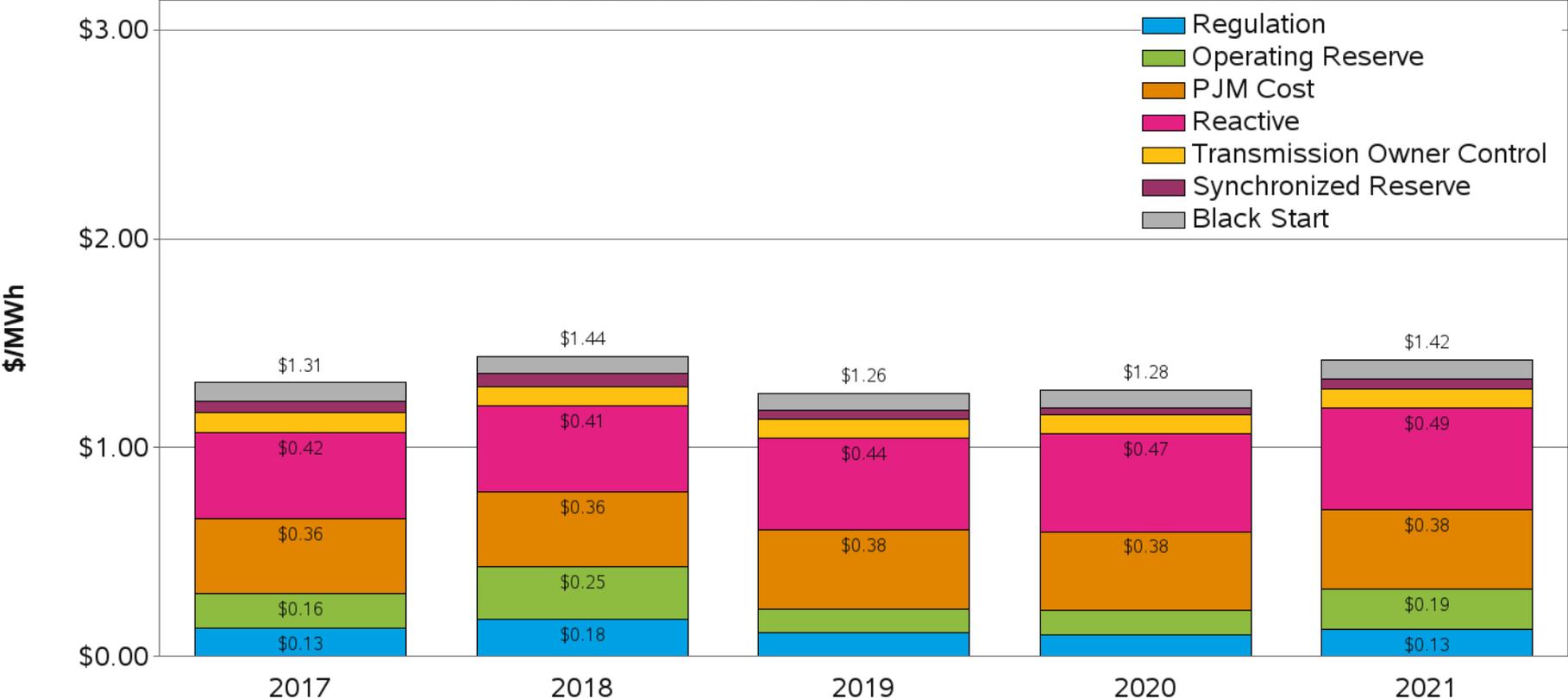
MC Webinar
June 21, 2021

- PJM Wholesale Cost for 2021 is \$52.68/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 May, temperatures were below average at the beginning of the month leading to an increase in Heating Degree Days and above average at the end of the month leading to an increase in Cooling Degree Days. Thus, the sum of Heating and Cooling Degree Days was above its historic average. (Slides 8-10)
- Energy use was below its historic average for May. (Slides 8-10)

- In May, uplift exceeded \$800,000 on three days – March 3rd, 4th and 26th. (Slides 24 & 25)
- Load-weighted average LMP for 2021 is \$29.85/MWh: (Slides 34 & 35)
 - May 2021 was \$29.40/MWh, which is higher than May 2020 (\$18.30/MWh) and also higher than May 2019 (\$24.20/MWh).
- There were five 5-minute intervals that experienced shortage pricing in May. (Slide 31 - 33)
- FTR revenue adequacy for the month of May is 100% and the 2020-2021 Planning Year is currently funded at 98%. (Slides 50-53)
- Congestion remains low, however, higher than values observed last May. (Slide 51)
- Regulation and Synchronized Reserve market costs have generally tracked with energy prices over time. (Slides 66-68)

Markets Report

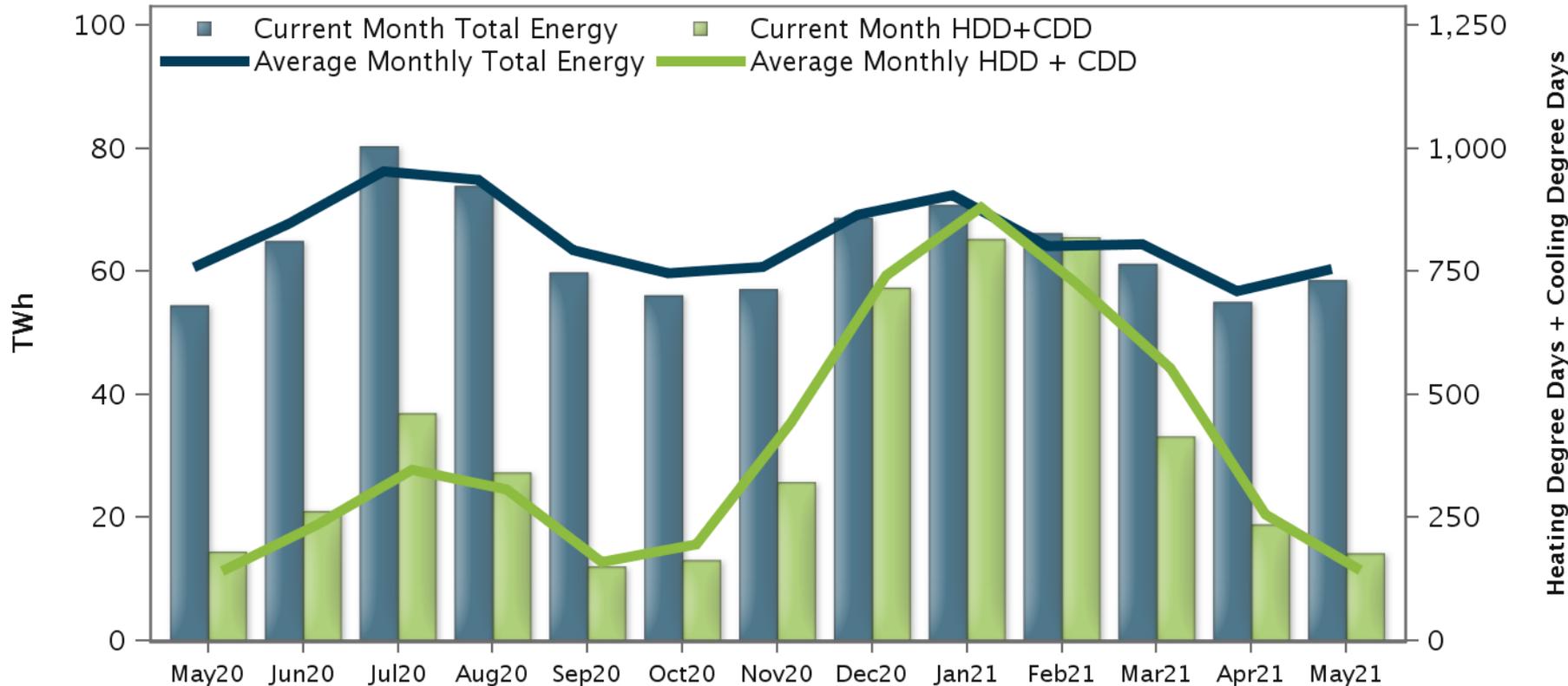




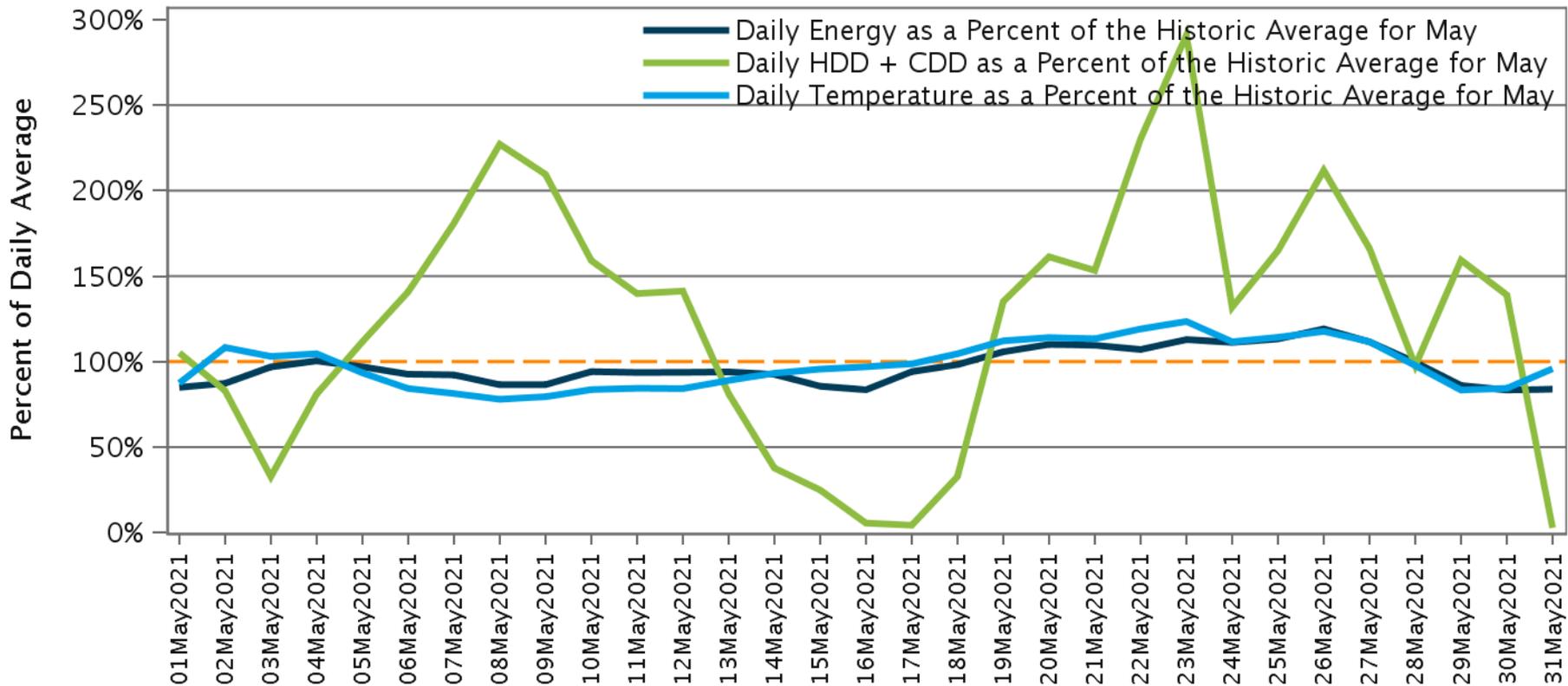
Market Conditions

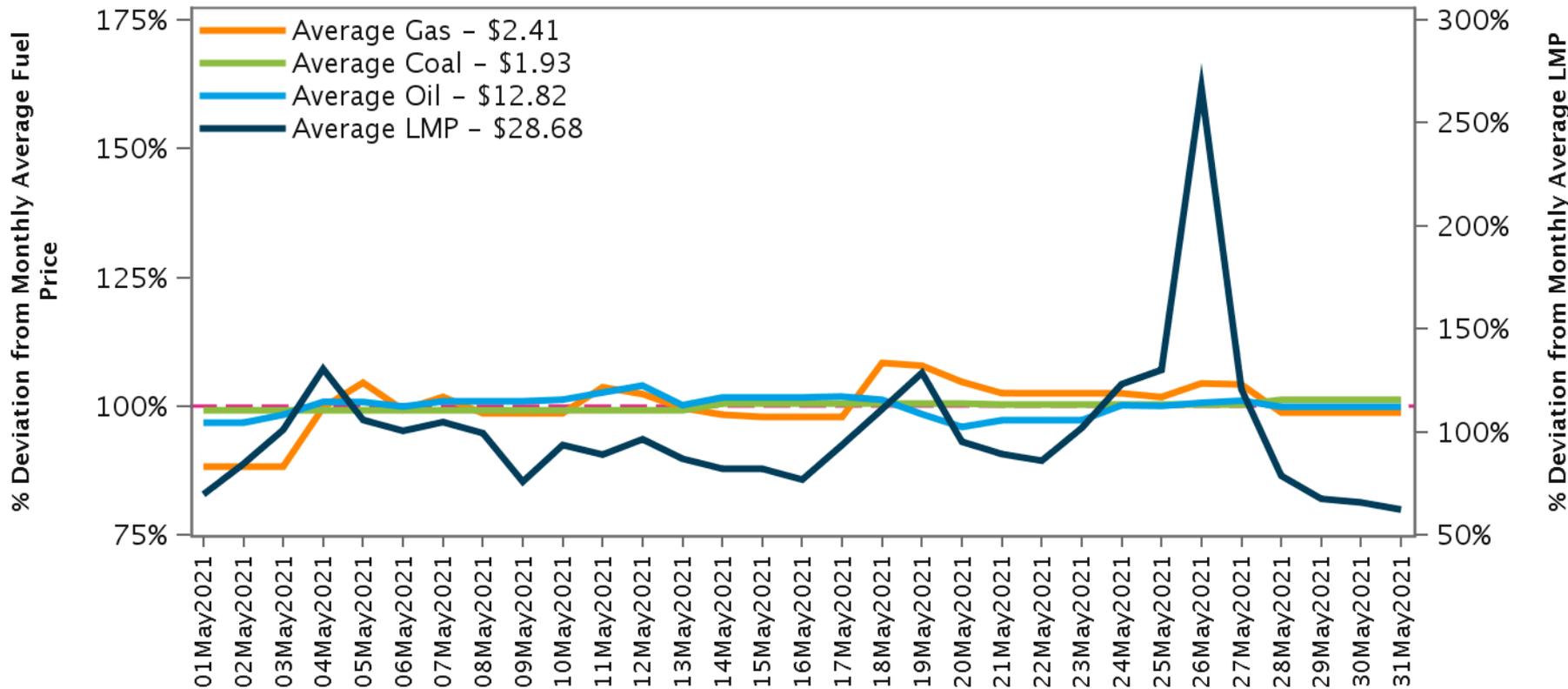
- The weather parameter shown in the following slide is a monthly sum of daily Heating Degree Days (HDD) and Cooling Degree Days (CDD).
- Degree days represent a deviation from a baseline temperature, in this case 60 degrees for HDD and 65 degrees for CDD. As temperatures get more extreme, colder or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

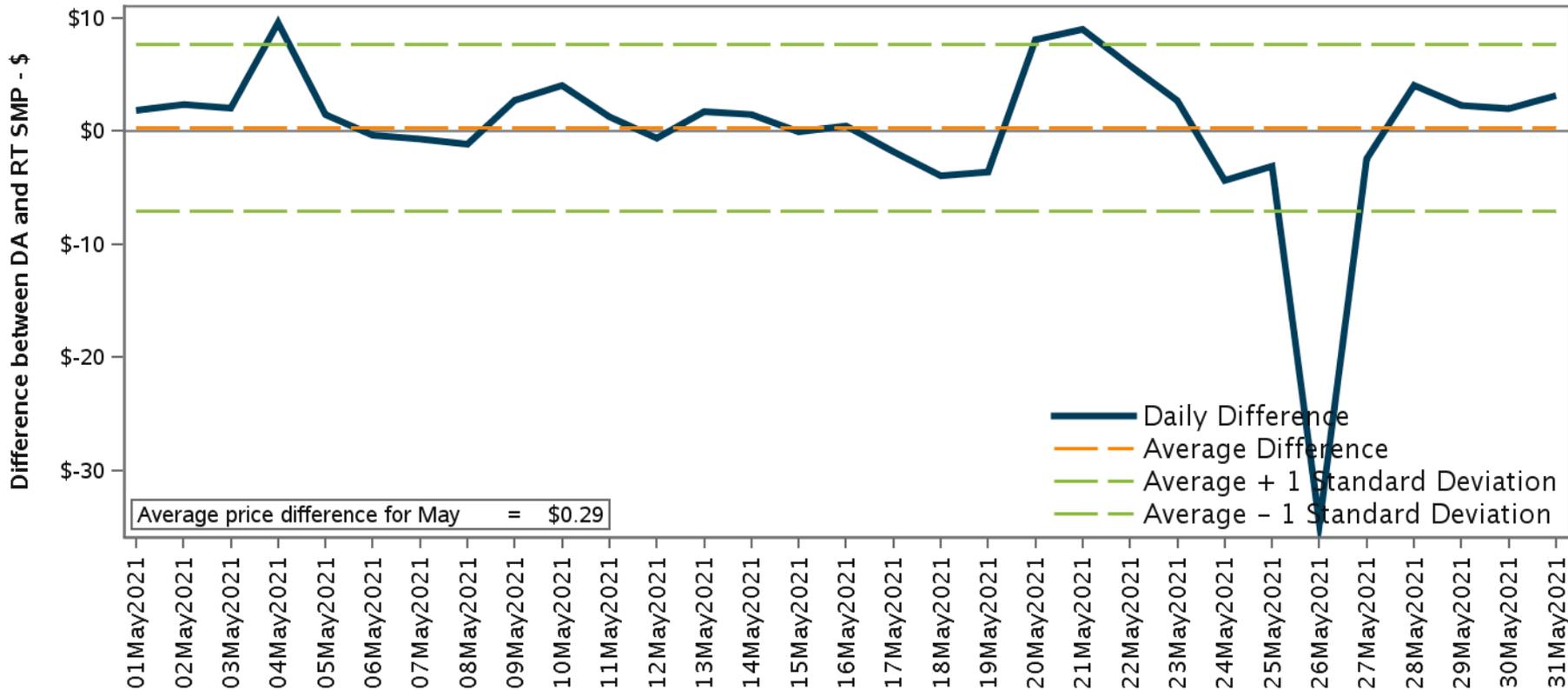




Fuel Price Source: S&P Global Platts



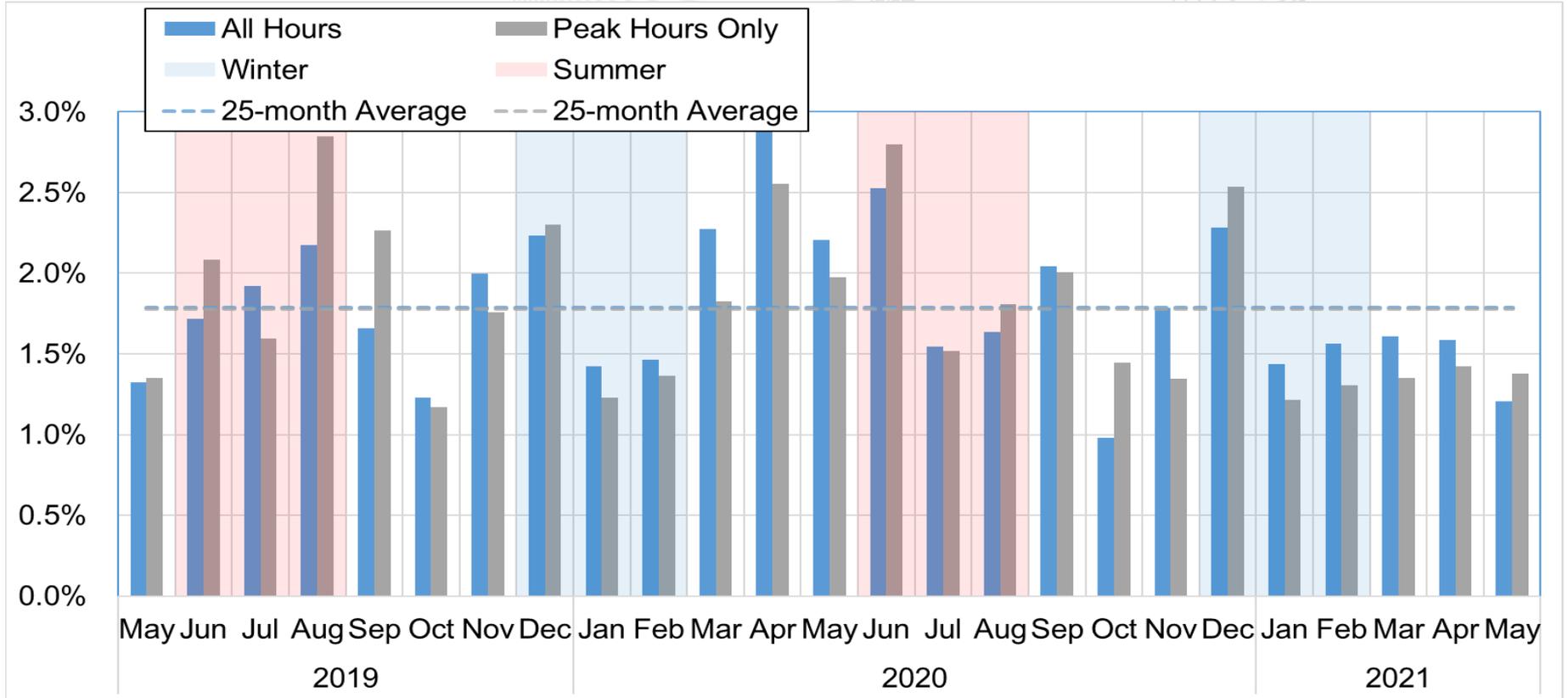
Daily Difference Between Day-Ahead and Real-Time System Marginal Prices



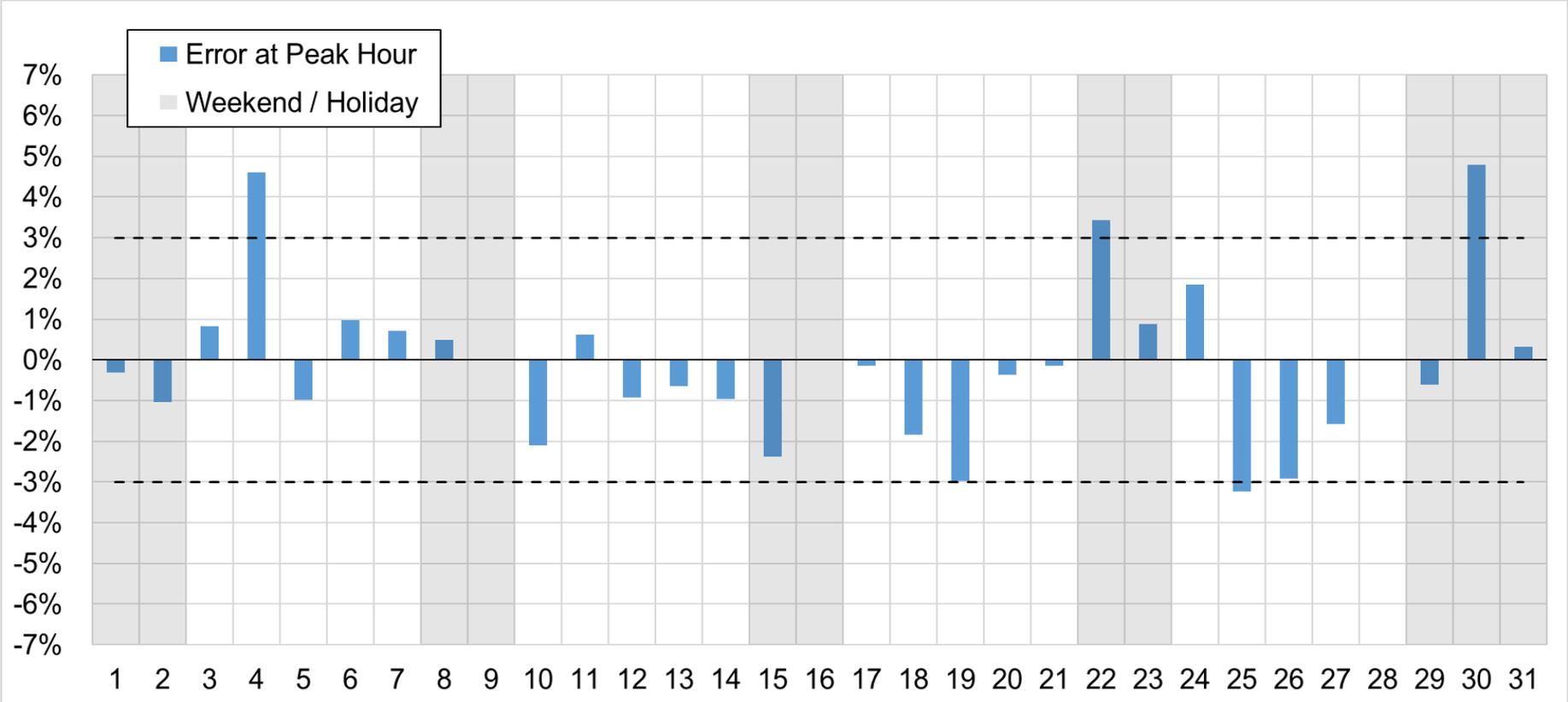
Positive values represent days when the DA daily average price was higher than RT. Negative values represent days when the DA price was lower.



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



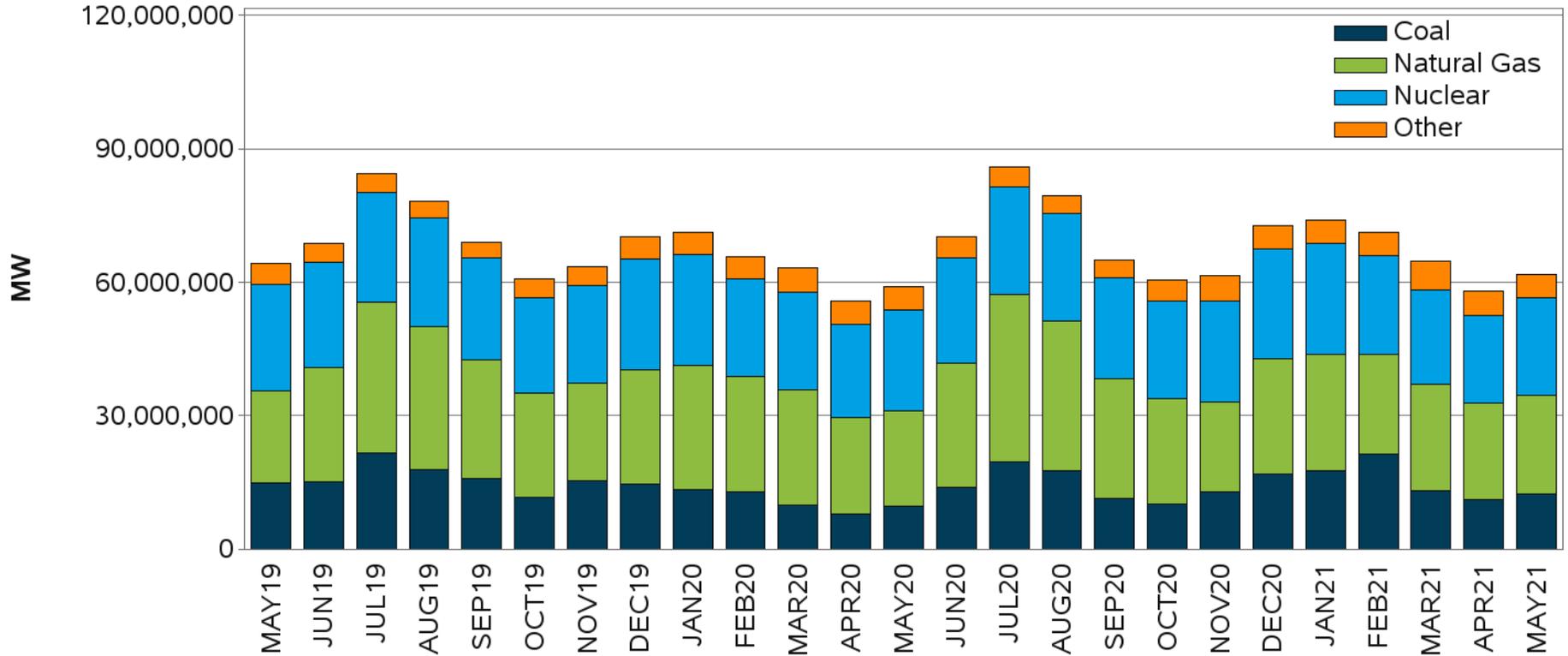
Load Forecast Error – May Daily Peaks, 10:00 Forecast



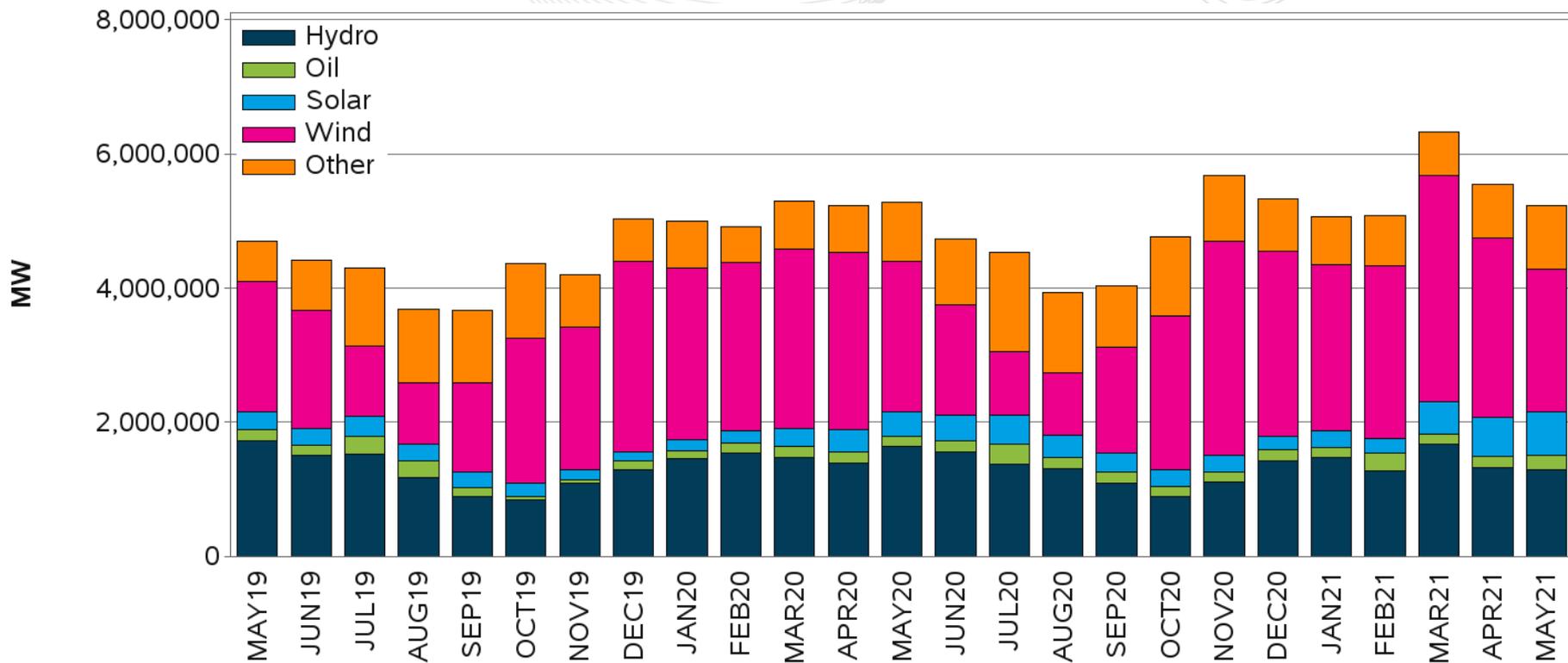
PJM prepares a day-ahead load forecast at 10:00 am for use by our members.

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.

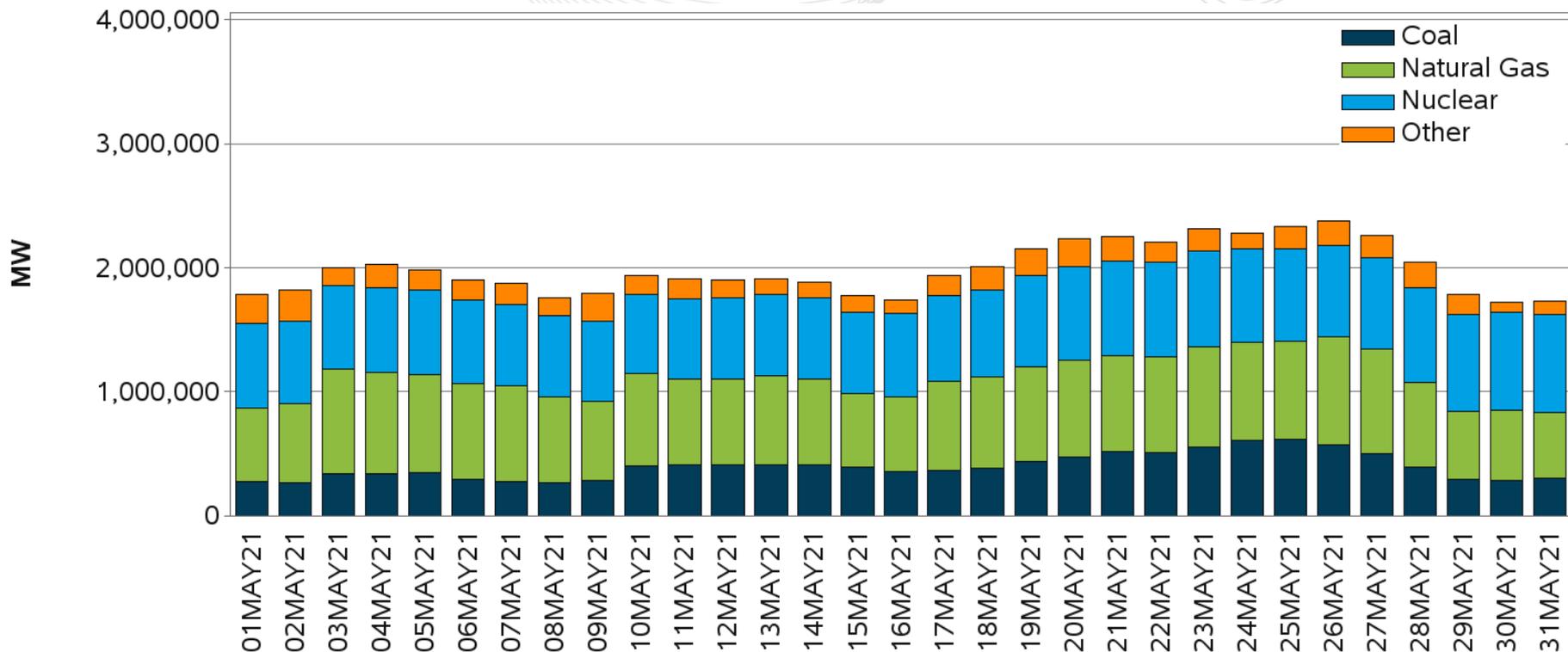
- Several days in May were challenging to forecast, especially during the afternoon peaks, as we experienced some unseasonable weather and the rapid changes in temperature that are more typical of shoulder seasons. These types of weather conditions increase forecast uncertainty because they are not consistent with the vast majority of historical data used by the models. On May 4th, rapidly changing weather and temperature forecast error caused significant over-forecasting. Later in May, unseasonably hot temperatures followed by a drastic decrease in the eastern part of the RTO drove the model error observed on May 22nd and 25th. Load forecast model error also led to over-forecasting on May 30th – the Sunday before Memorial Day, which did not experience the increased load typical of most Sunday evenings – though the models did perform well on Memorial Day itself.



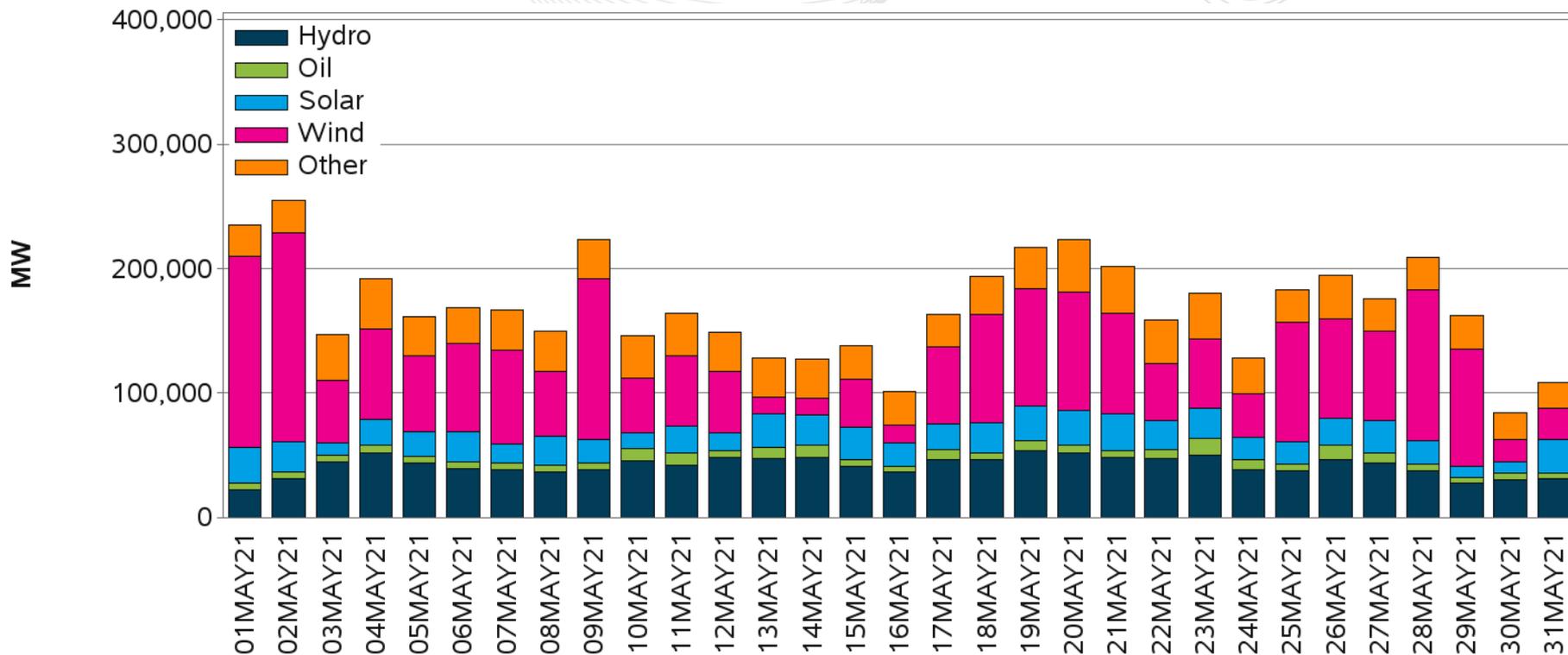
'Other' includes Hydro, Oil, Solar, Wind, and Other



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

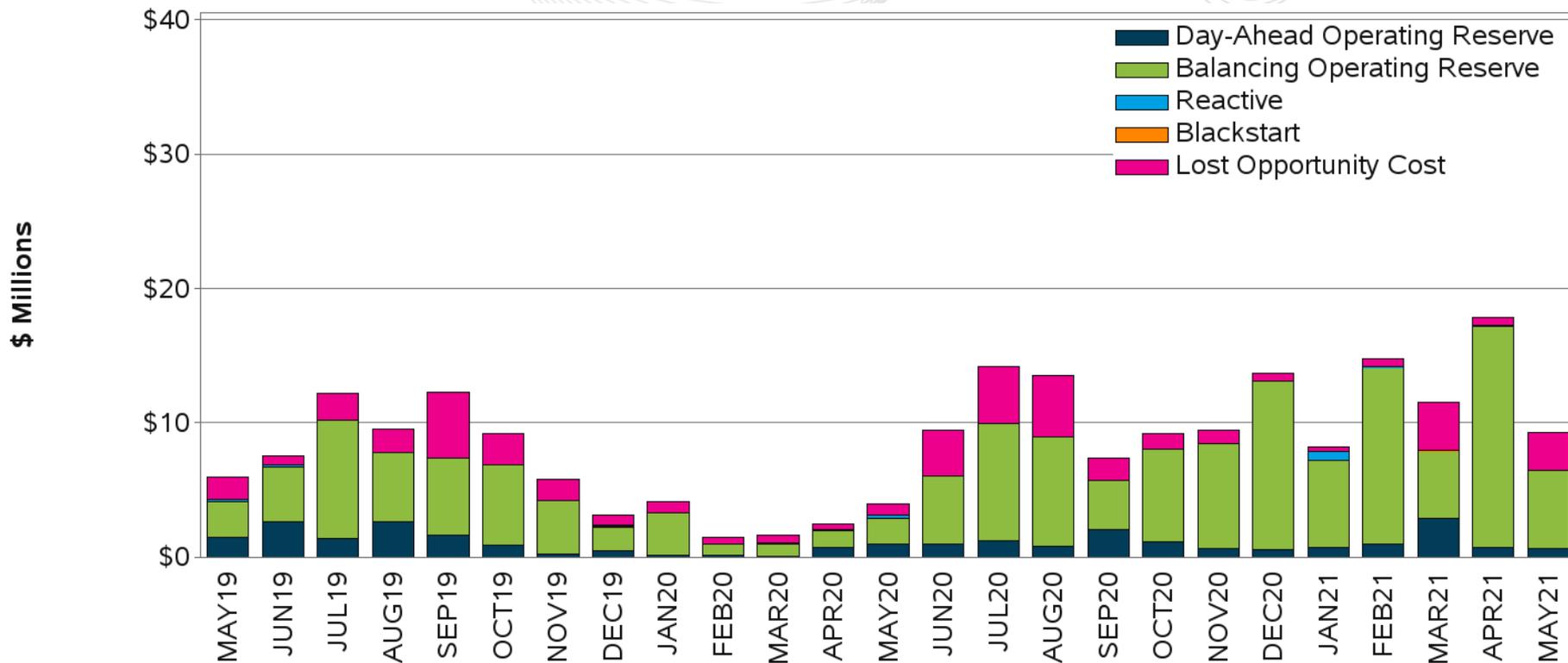


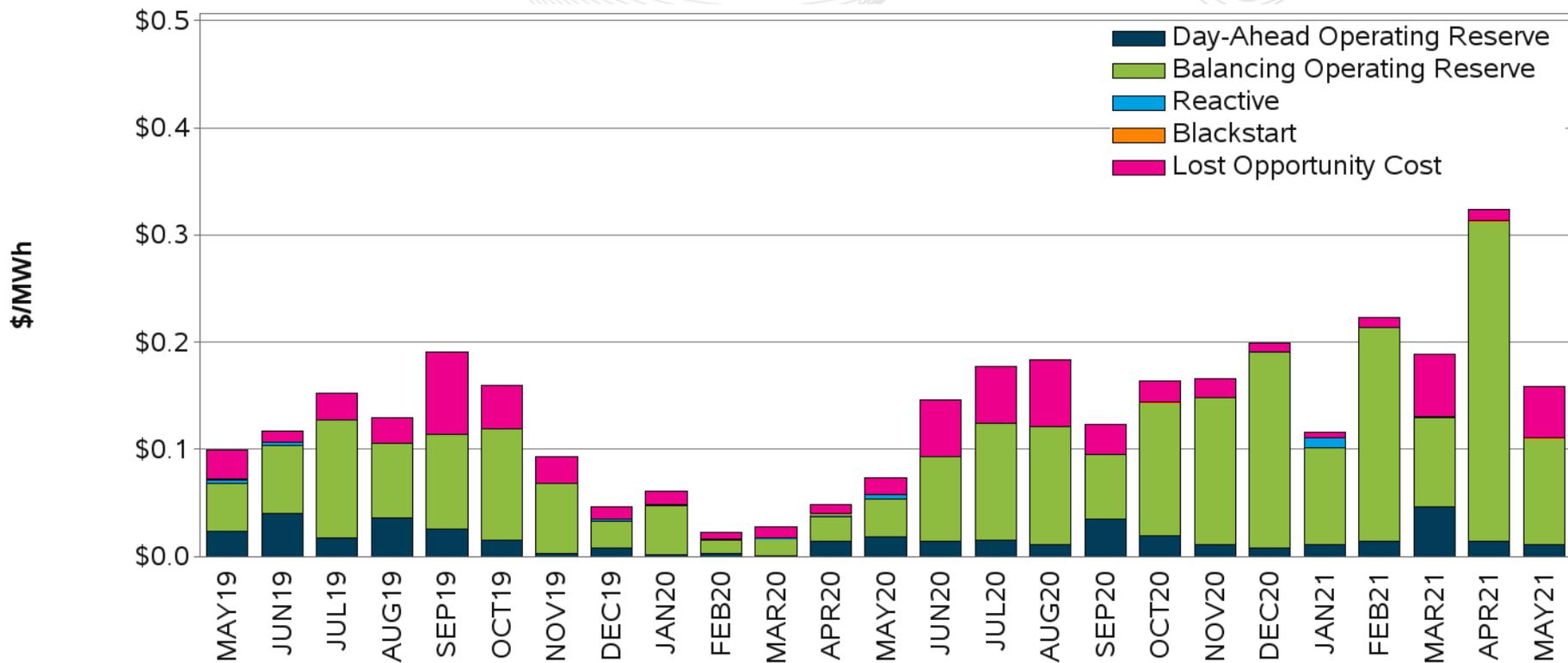
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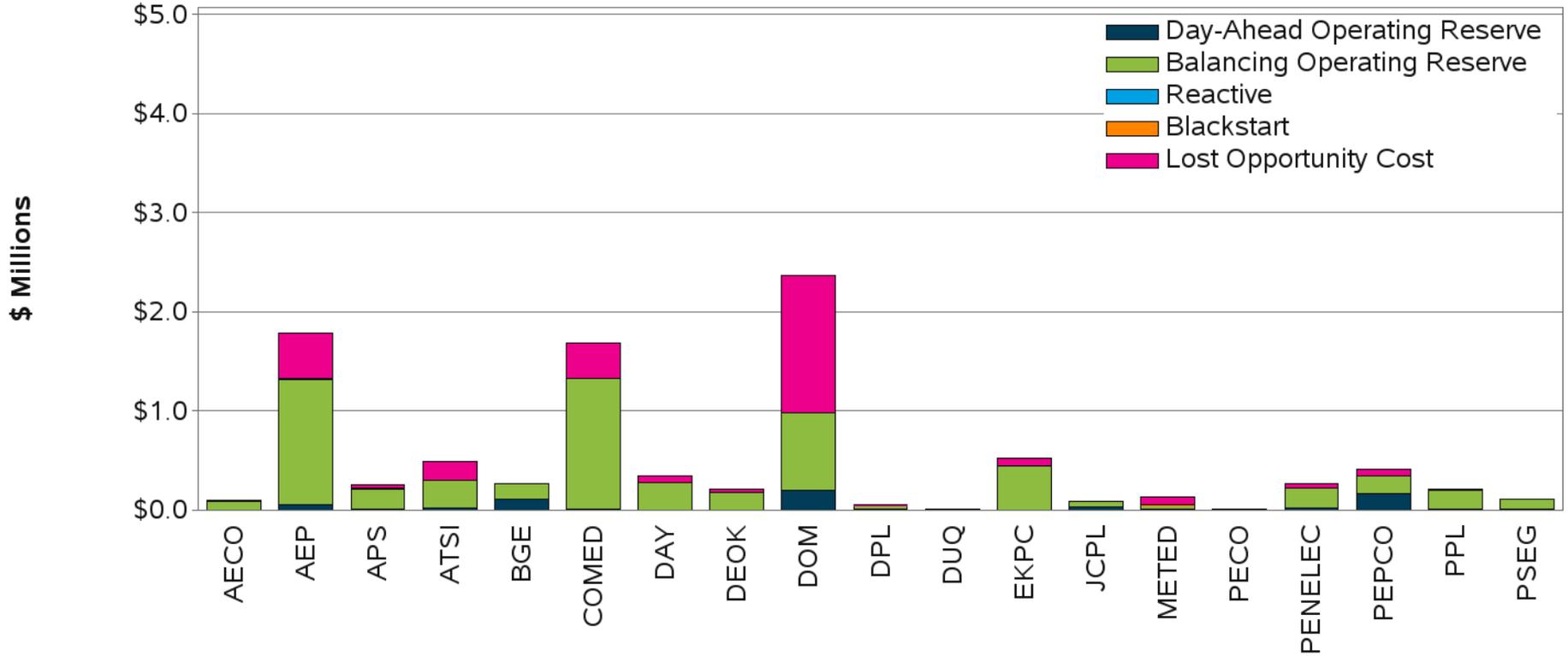


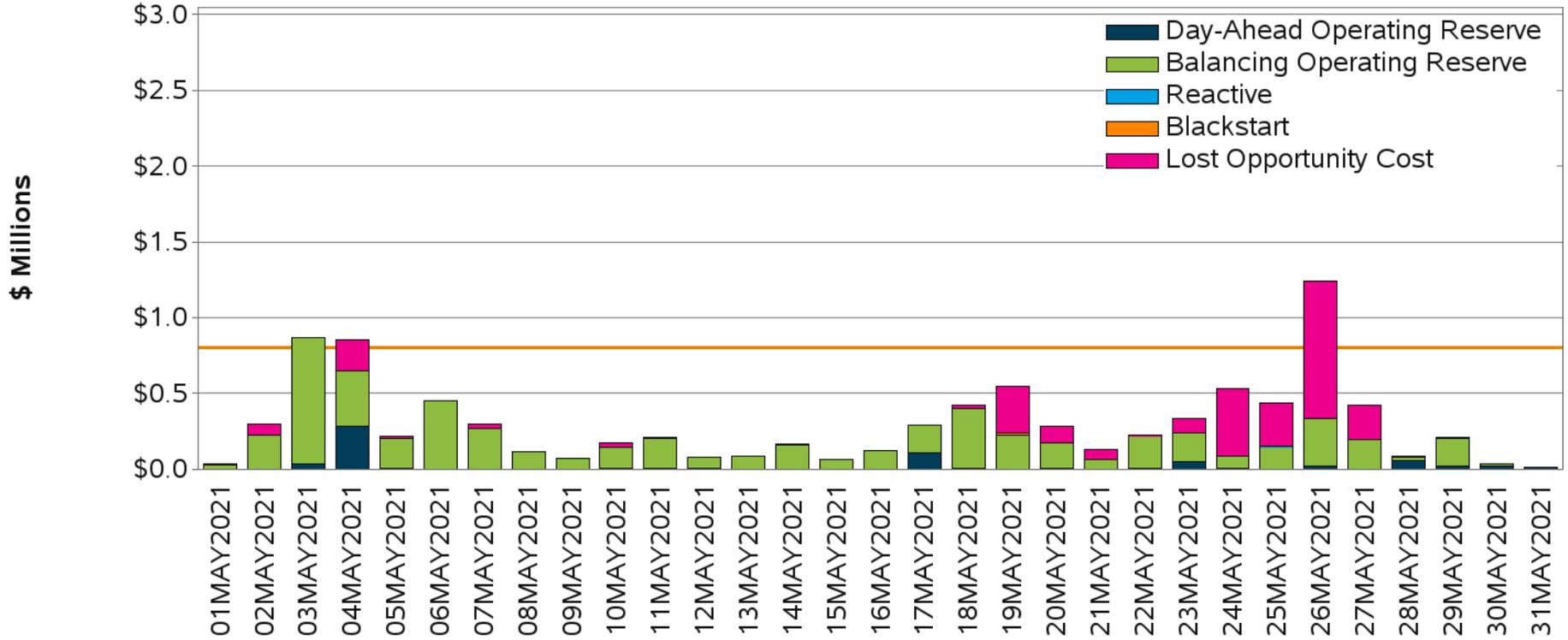
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Operating Reserve (Uplift)









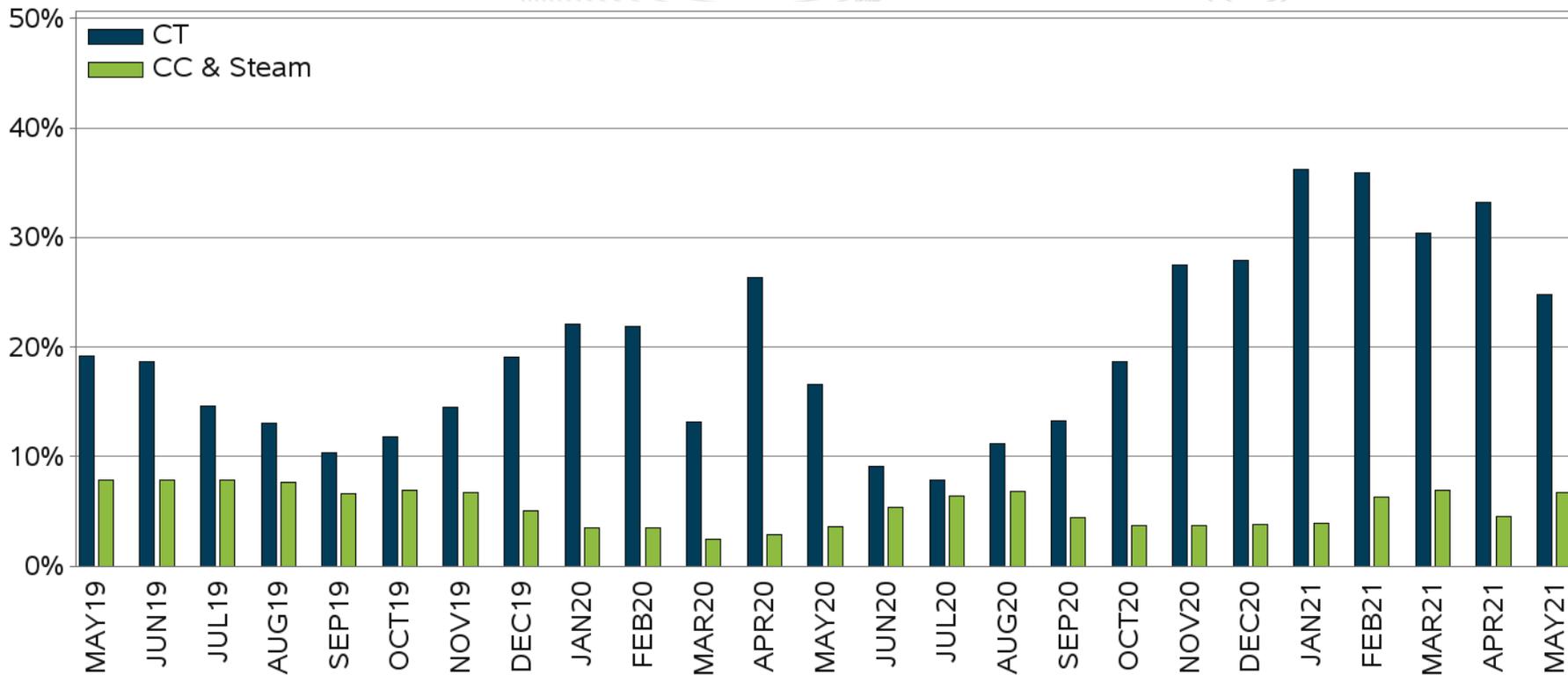
In May, uplift exceeded \$800,000 on three days – May 3rd, 4th and 26th.

Contributing factors to uplift were:

- May 3
 - Load Forecast error
- May 4
 - Localized congestion/constraint control
- May 26
 - Congestion/constraint control and high system load

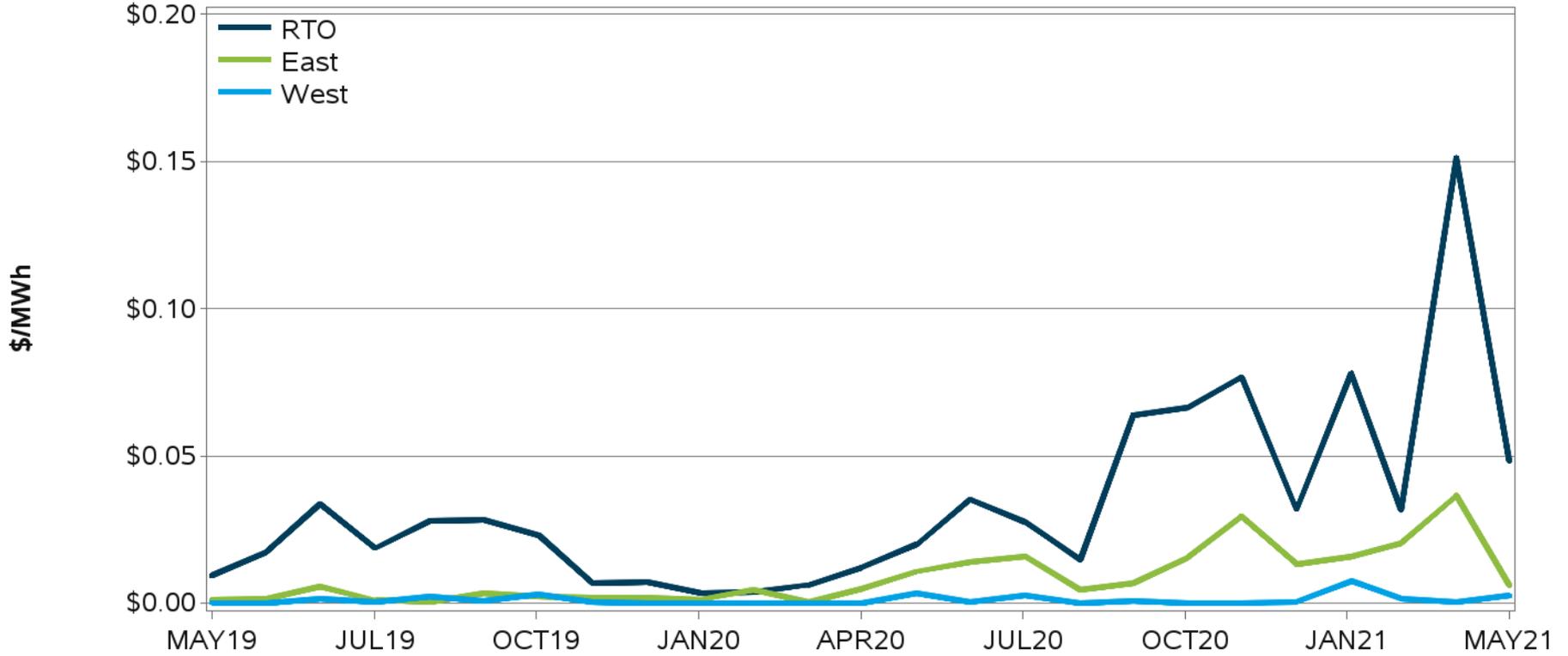
More information on Uplift can be found on PJM's website at [Drivers of Uplift](#)

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

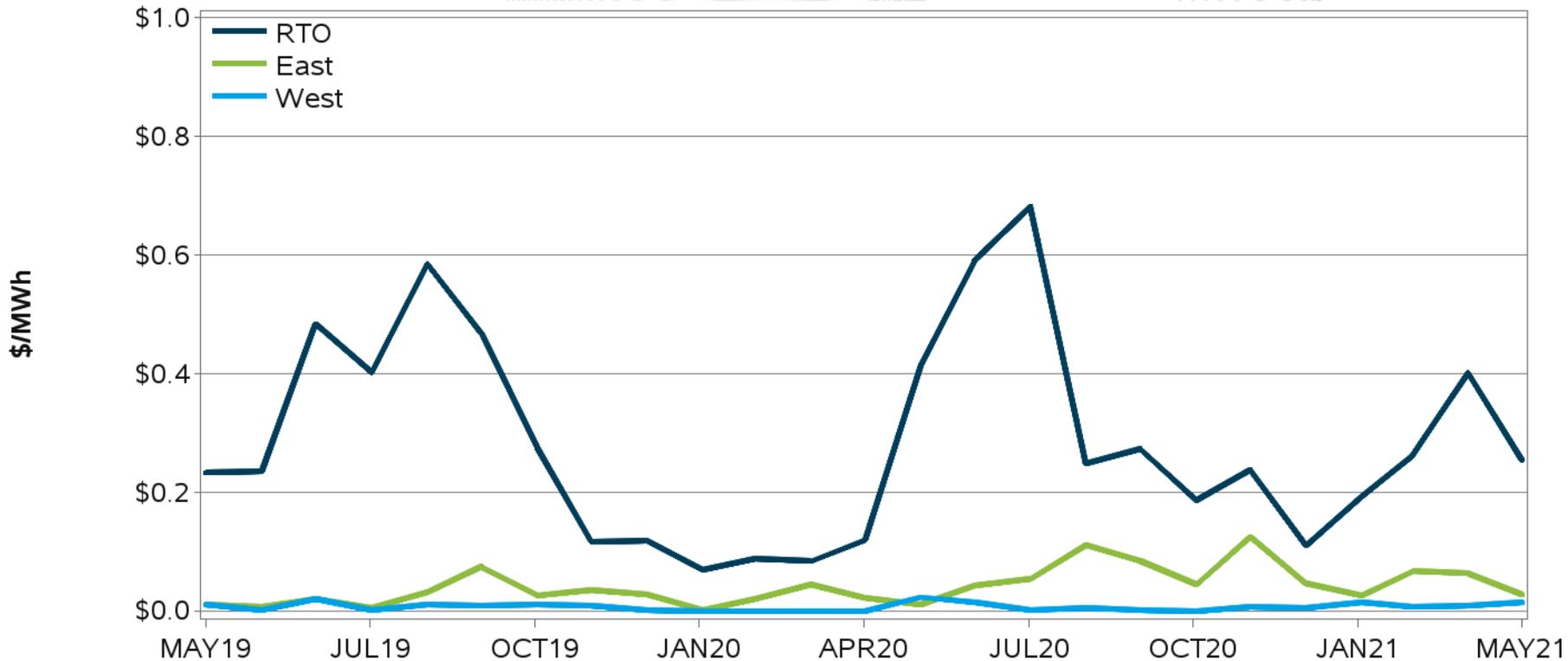


- Beginning in December 2008, the daily Balancing Operating Reserves (BOR) rate was replaced with six different BOR rates: RTO BOR for Reliability Rate, RTO BOR for Deviations Rate, East BOR for Reliability Rate, East BOR for Deviations Rate, West BOR for Reliability Rate, West BOR for Deviations Rate.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

Reliability Balancing Operating Reserve Rates



Deviations Balancing Operating Reserve Rates



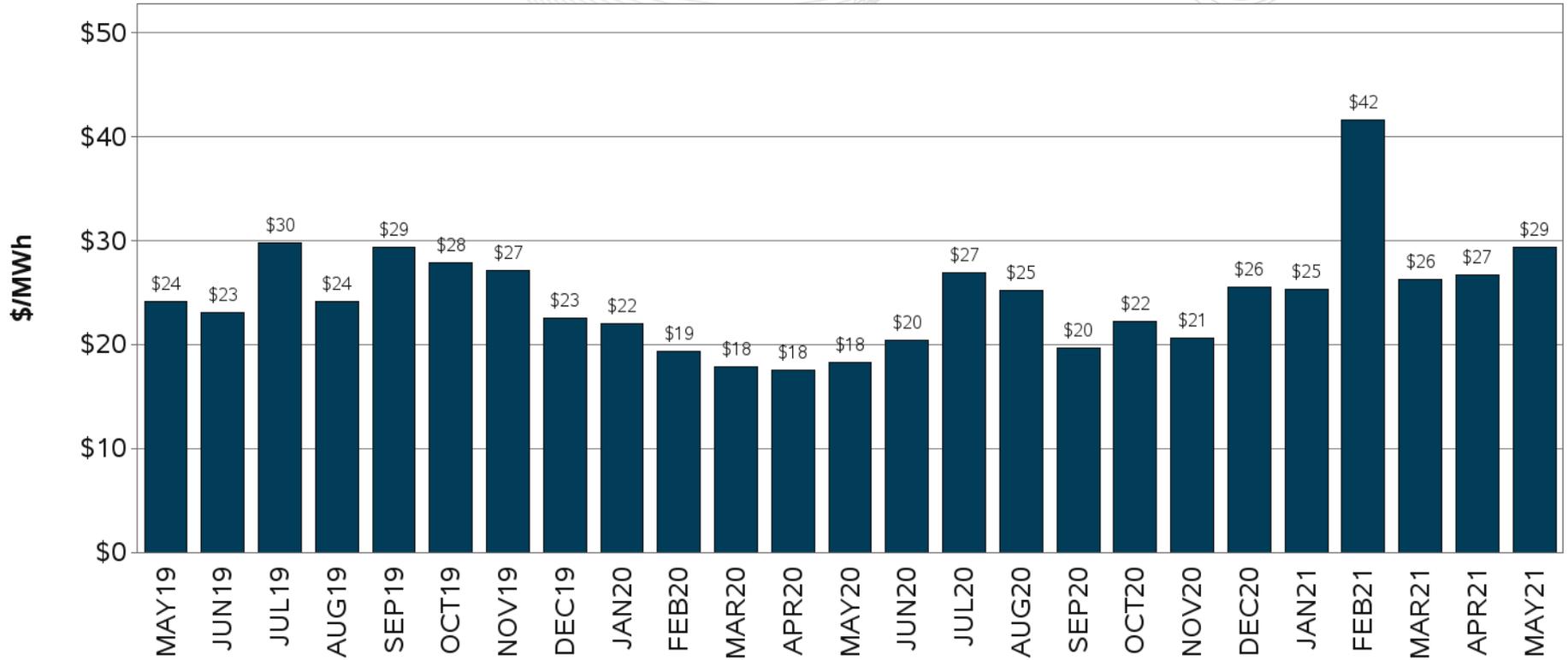
Energy Market

LMP Summary

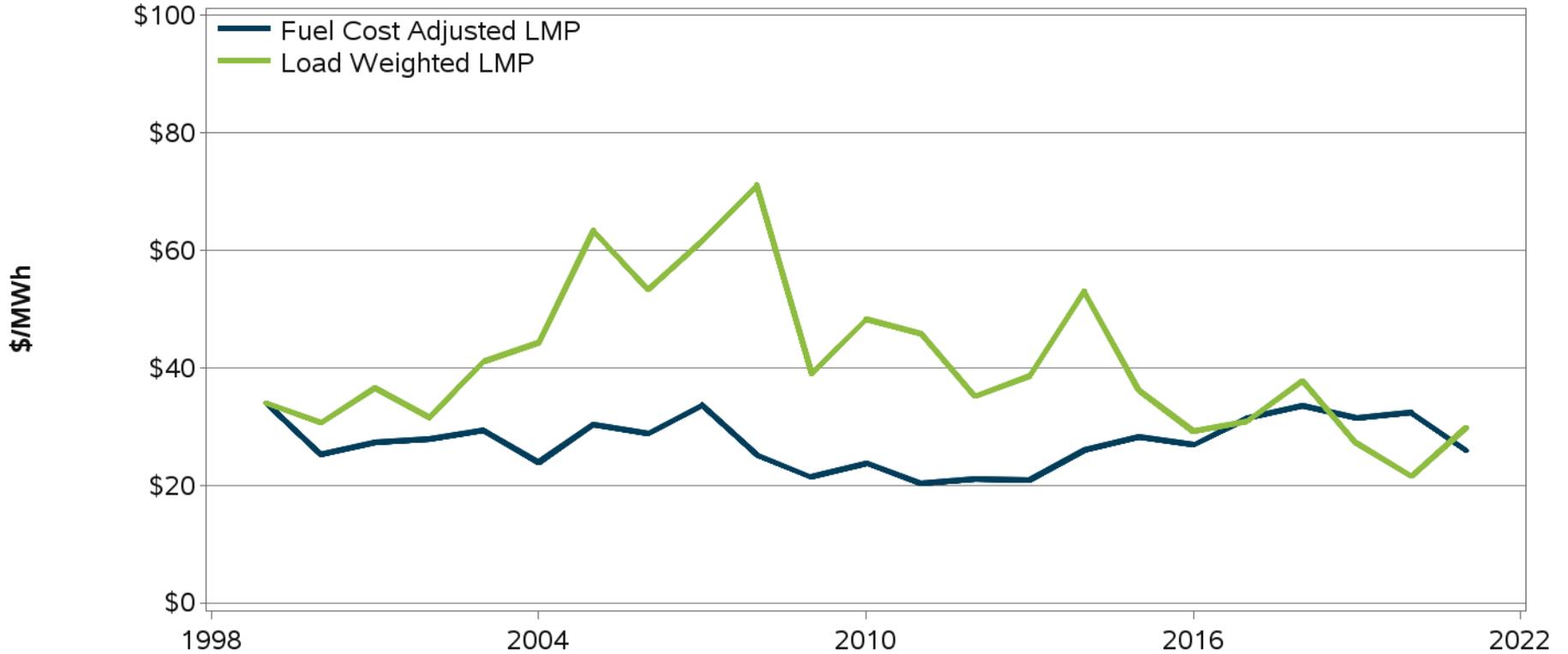
- One 5-minute shortage pricing interval occurred on May 7th between 06:30 and 06:35.
- PJM experienced the following reserve penalty factors:
 - 1st step penalty for Synchronized Reserve deficiencies in the RTO and MAD
- System Marginal Price (SMP) for the 5-minute interval was \$733.54, and the hourly integrated SMP was \$121.06.

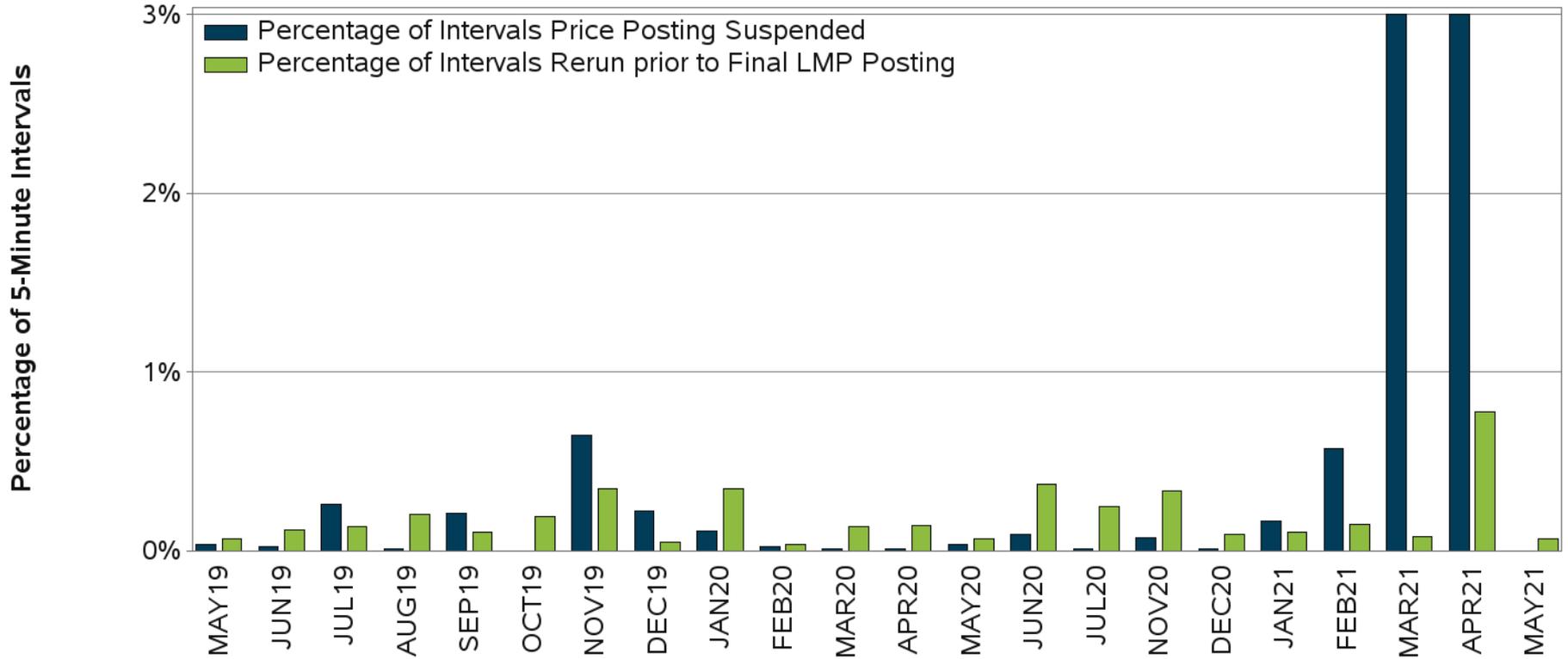
- Two 5-minute shortage pricing intervals occurred on May 19th between 17:10 and 17:20.
- PJM experienced the following reserve penalty factors:
 - 17:10-17:15 interval
 - 1st step penalty for Synchronized Reserve deficiencies in the RTO and MAD
 - 17:15-17:20 interval
 - 1st step penalty for Synchronized Reserve deficiencies in the RTO and MAD
- SMPs for the 5-minute intervals were \$738.86 and \$792.20, respectively and the hourly integrated SMP was \$211.43.

- Two 5-minute shortage pricing intervals occurred on May 26th between 10:25 and 10:35.
- PJM experienced the following reserve penalty factors:
 - 10:25-10:30 interval
 - 1st step penalty for Synchronized Reserve deficiencies in the RTO and MAD
 - 10:30-10:35 interval
 - 1st step penalty for Synchronized Reserve deficiencies in the RTO and MAD
- SMPs for the 5-minute intervals were \$1054.08, and the hourly integrated SMP was \$410.17.



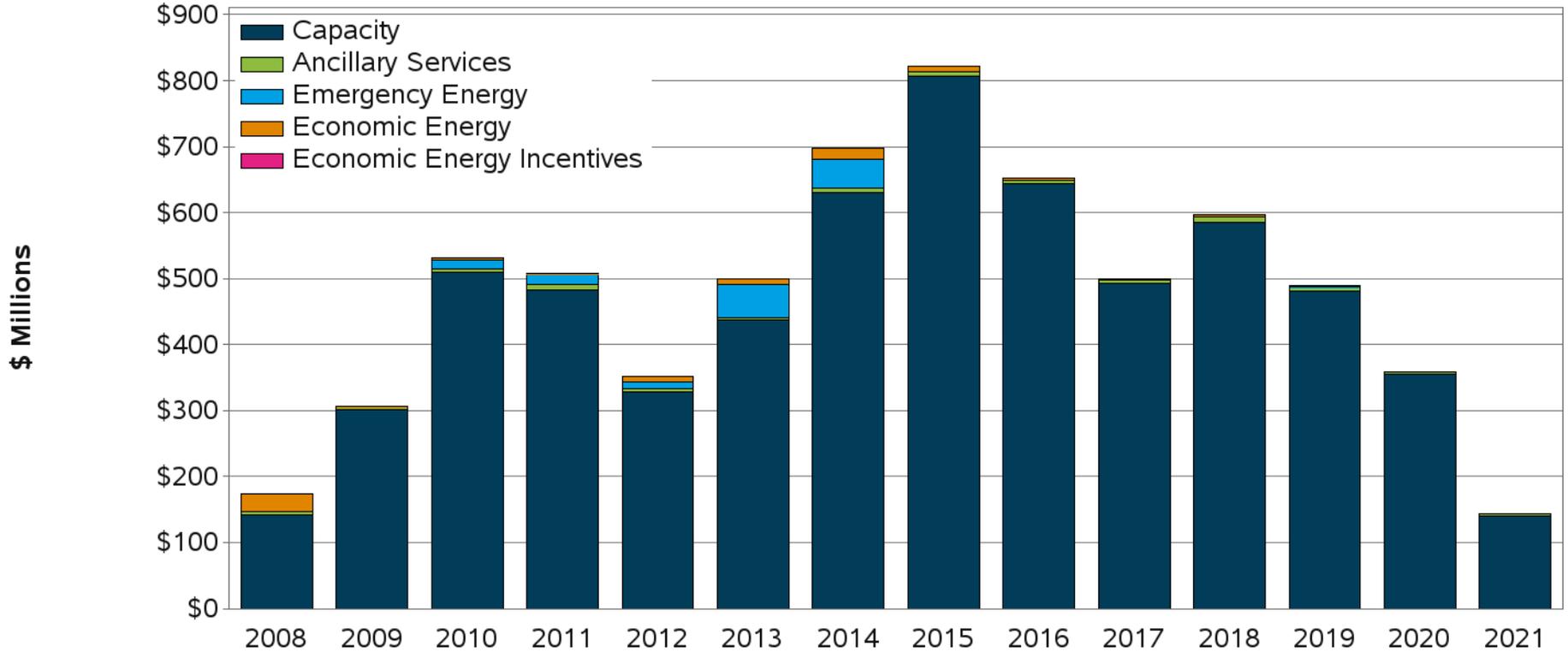
Fuel Cost Adjusted LMP (Referenced to 1999 Fuel Prices)

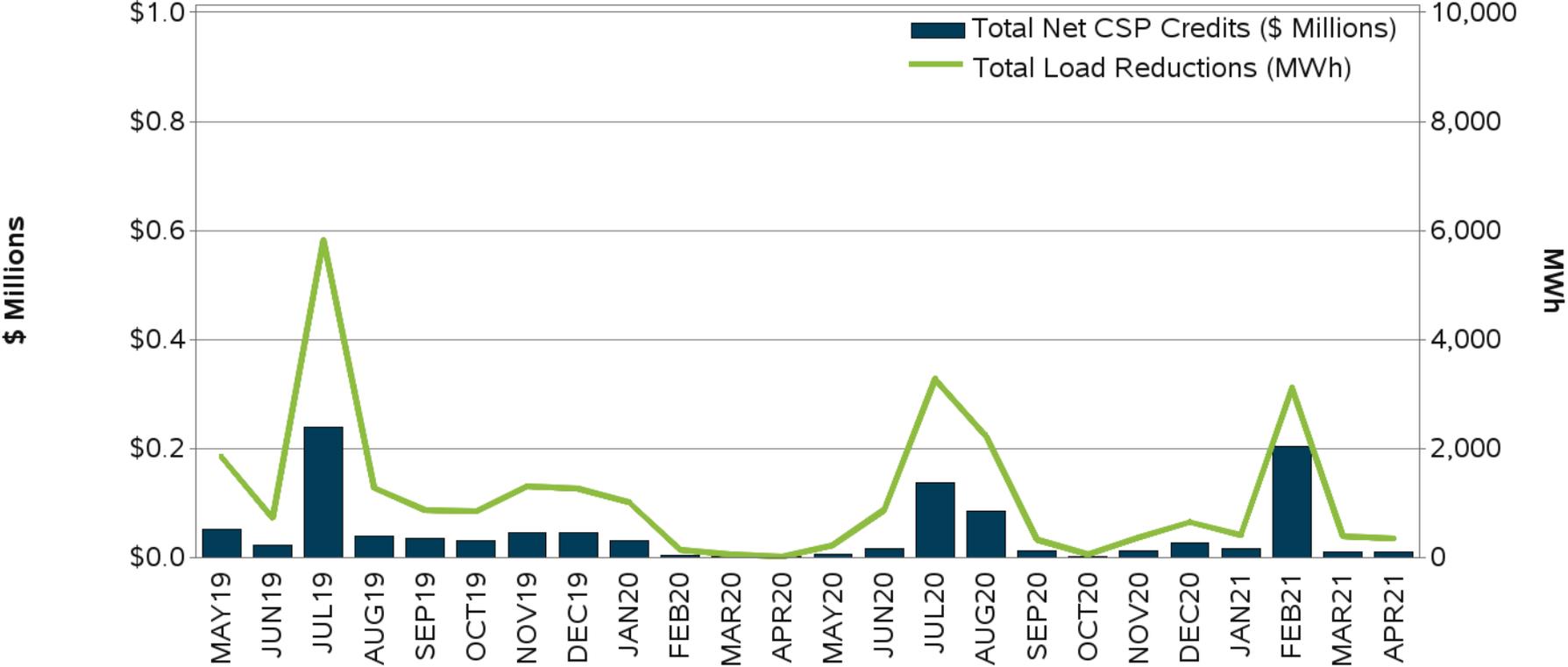




Energy Market

Demand Response Summary

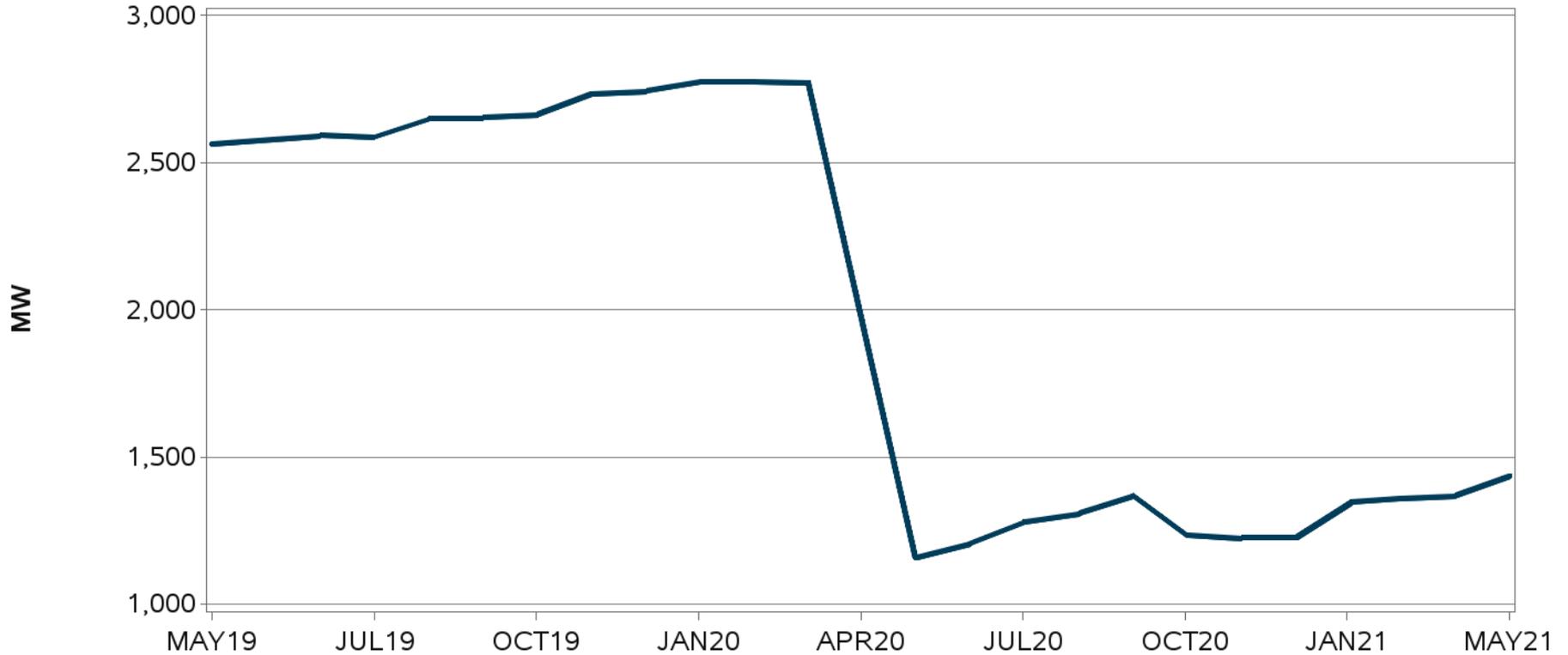




*Data for the last few months are subject to significant change due to the settlement window.



Total Registered MW in PJM's Economic Demand Response

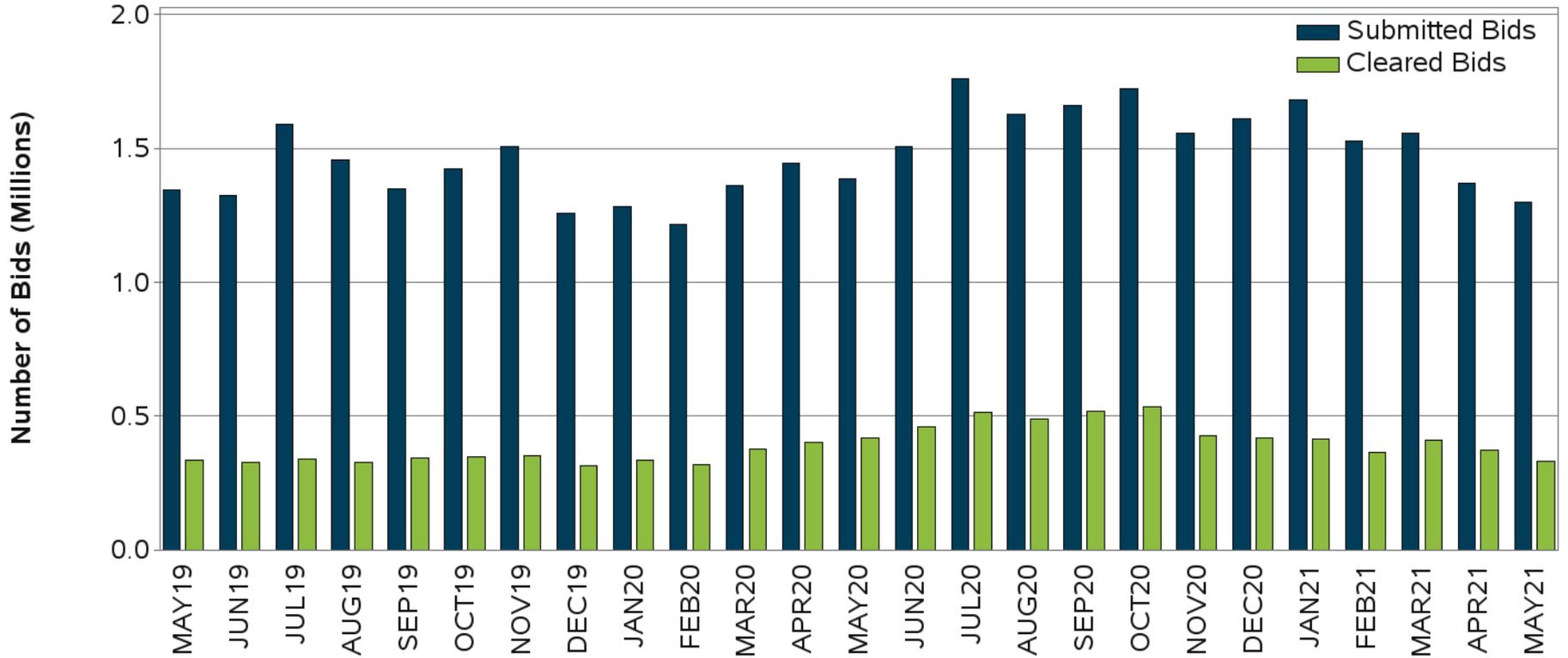


Energy Market

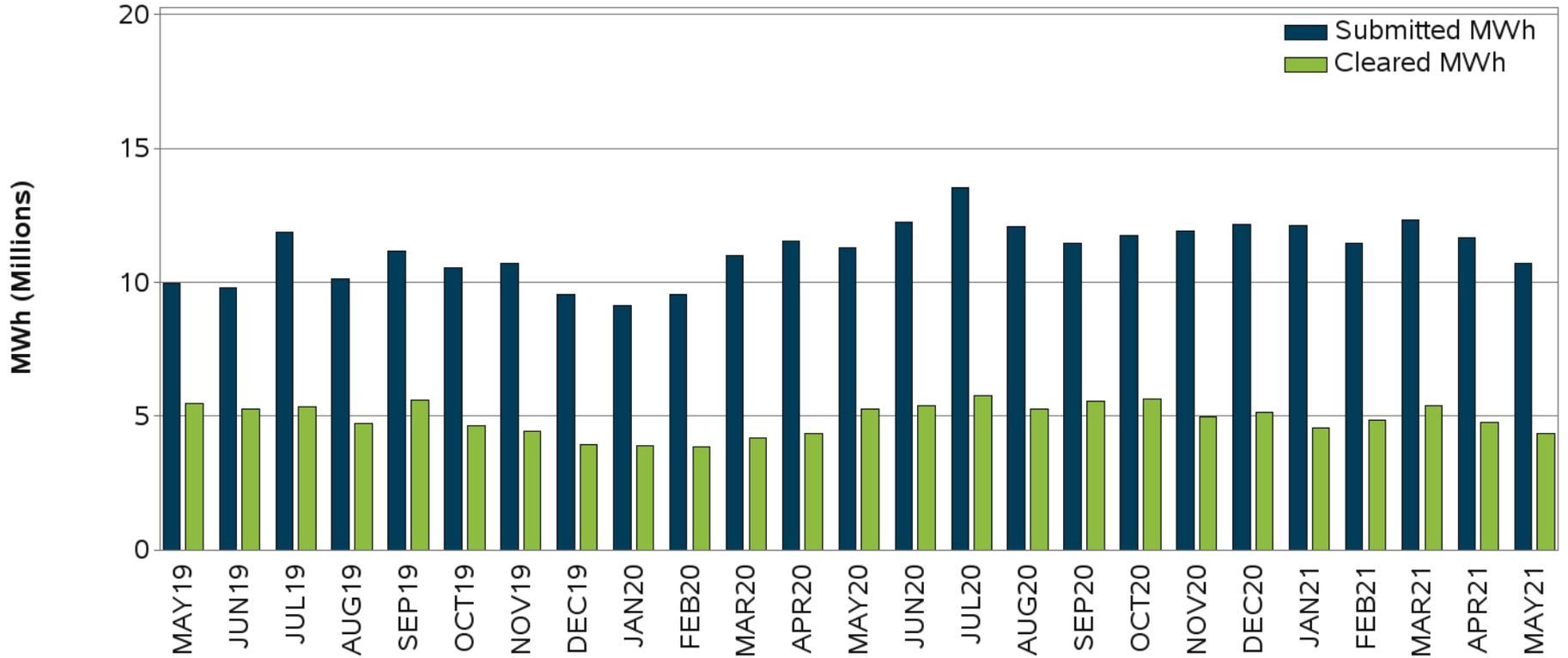
Virtual Activity Summary

- 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.

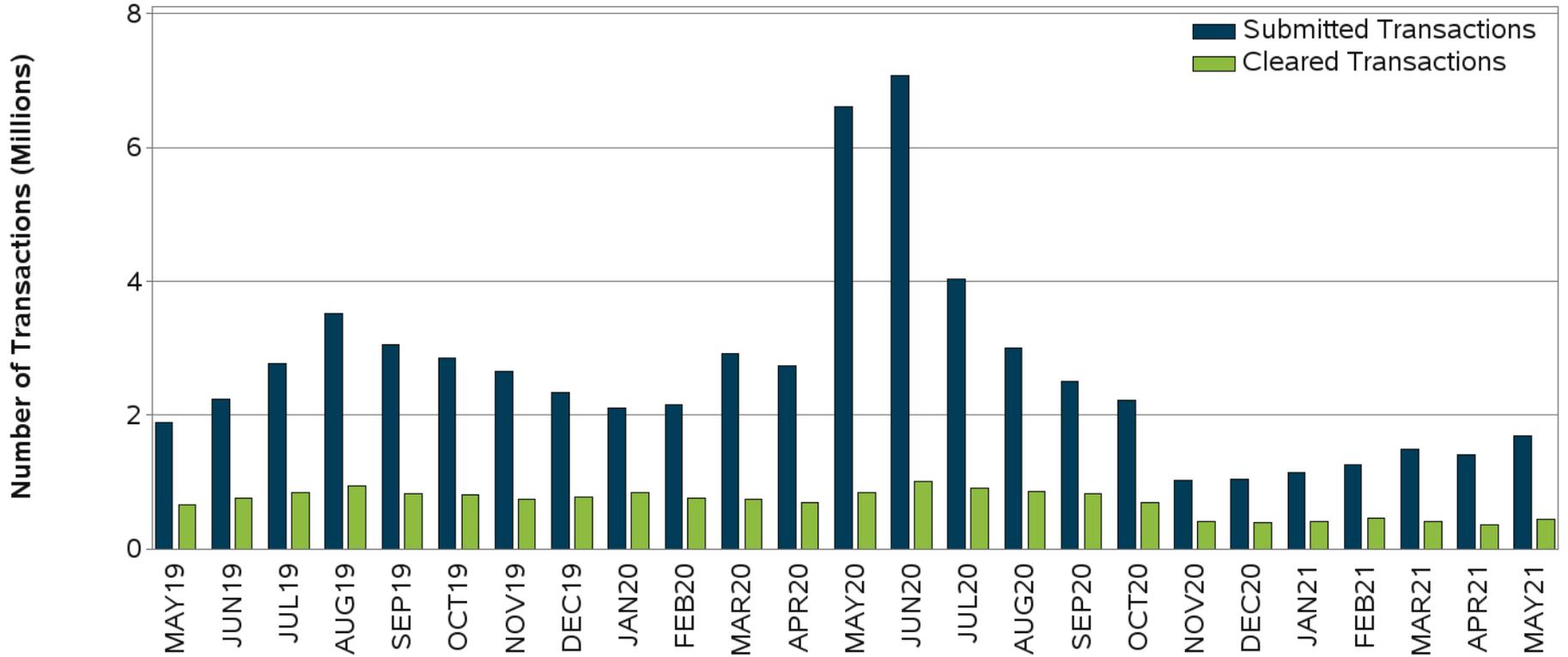
Virtual Bids (INCs & DEC)s - Total Number



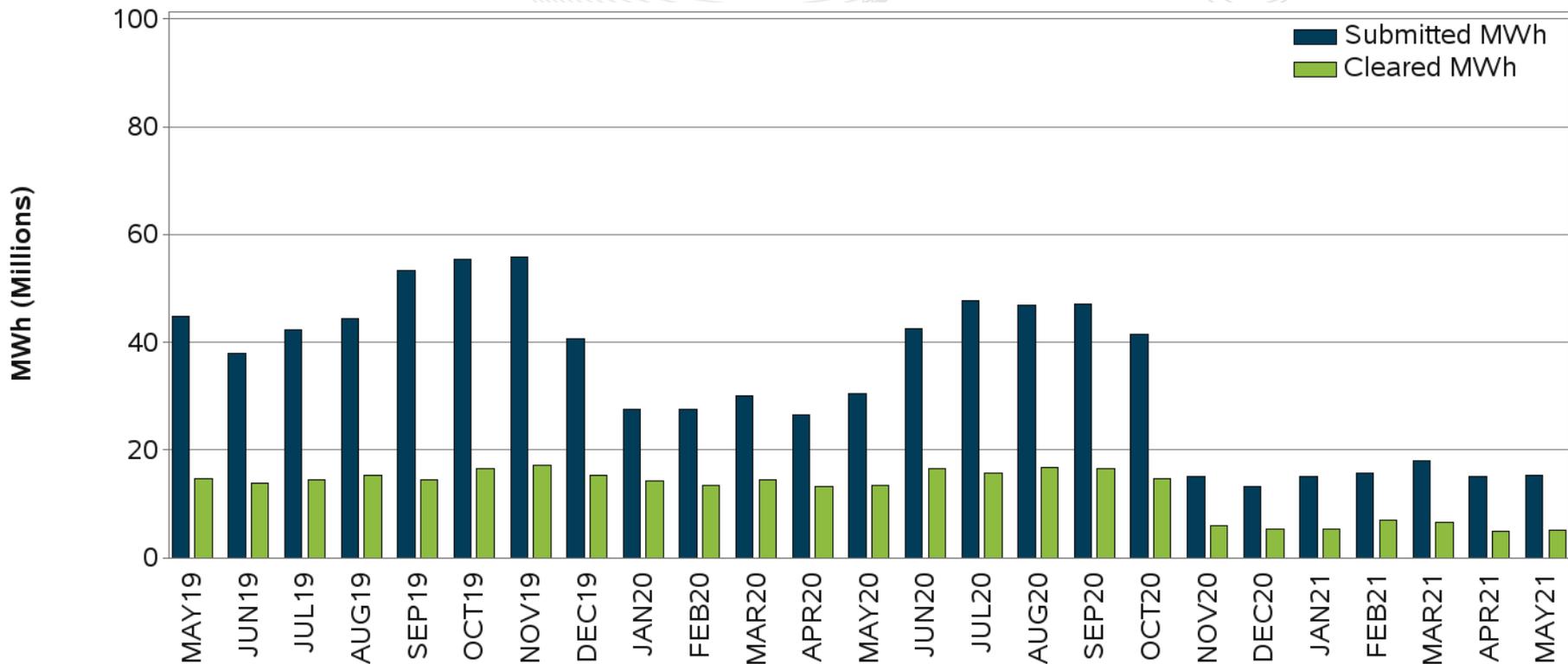
Virtual Bids (INCs & DECs) - Total Volume



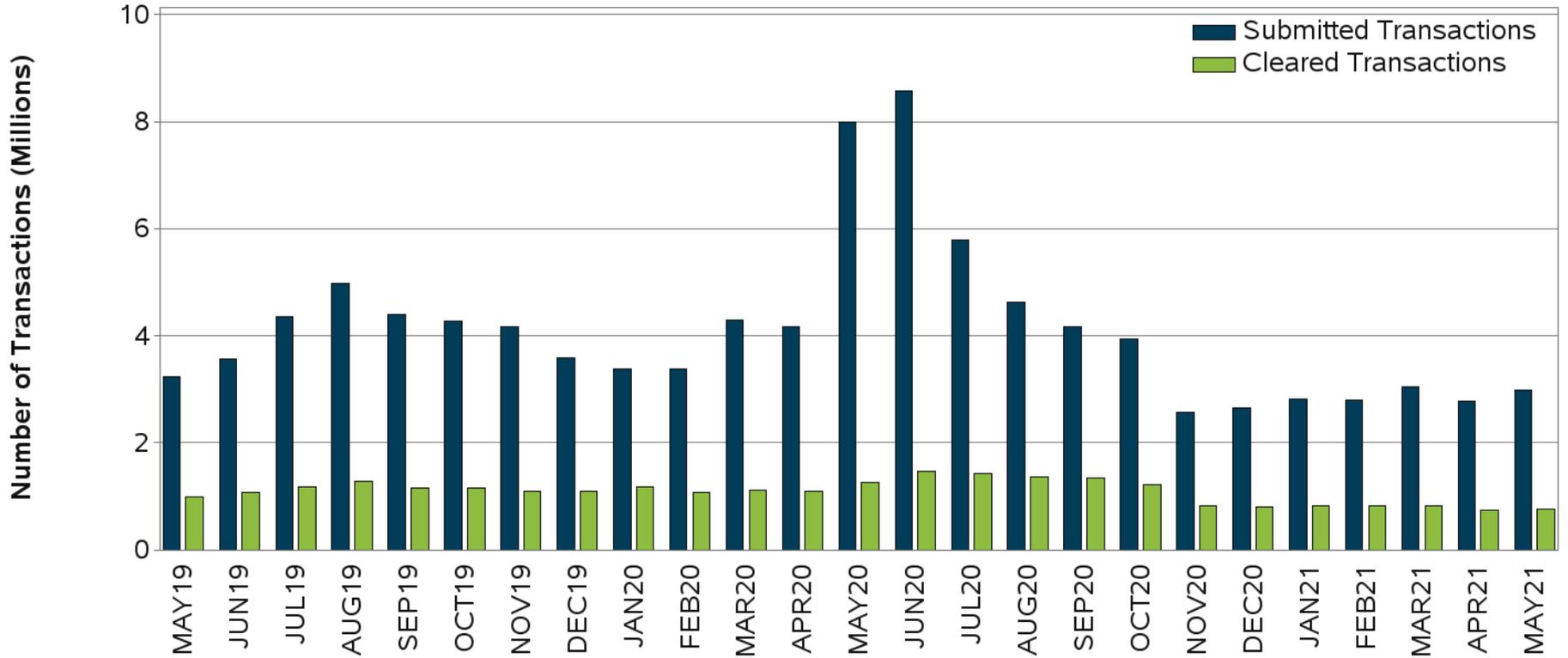
Up-To-Congestion Transactions - Total Number



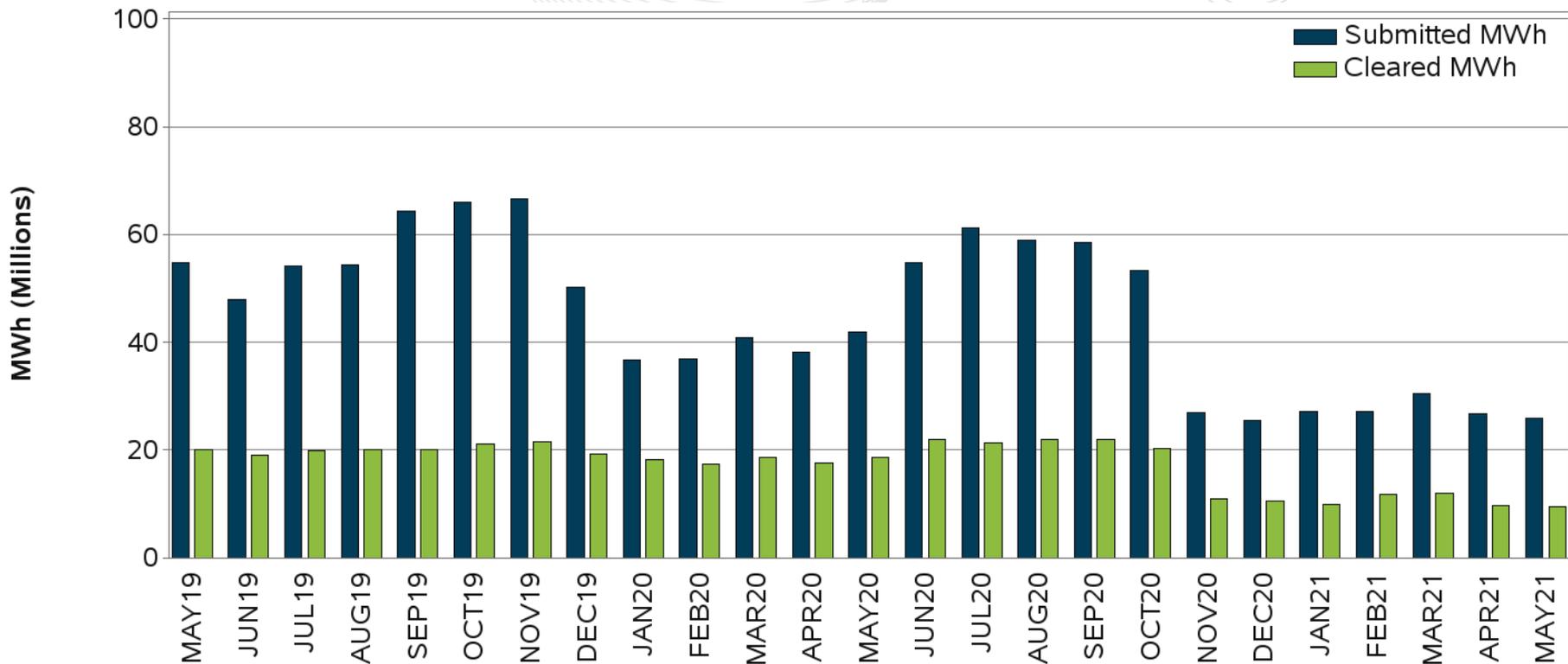
Up-To-Congestion Transactions - Total Volume



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



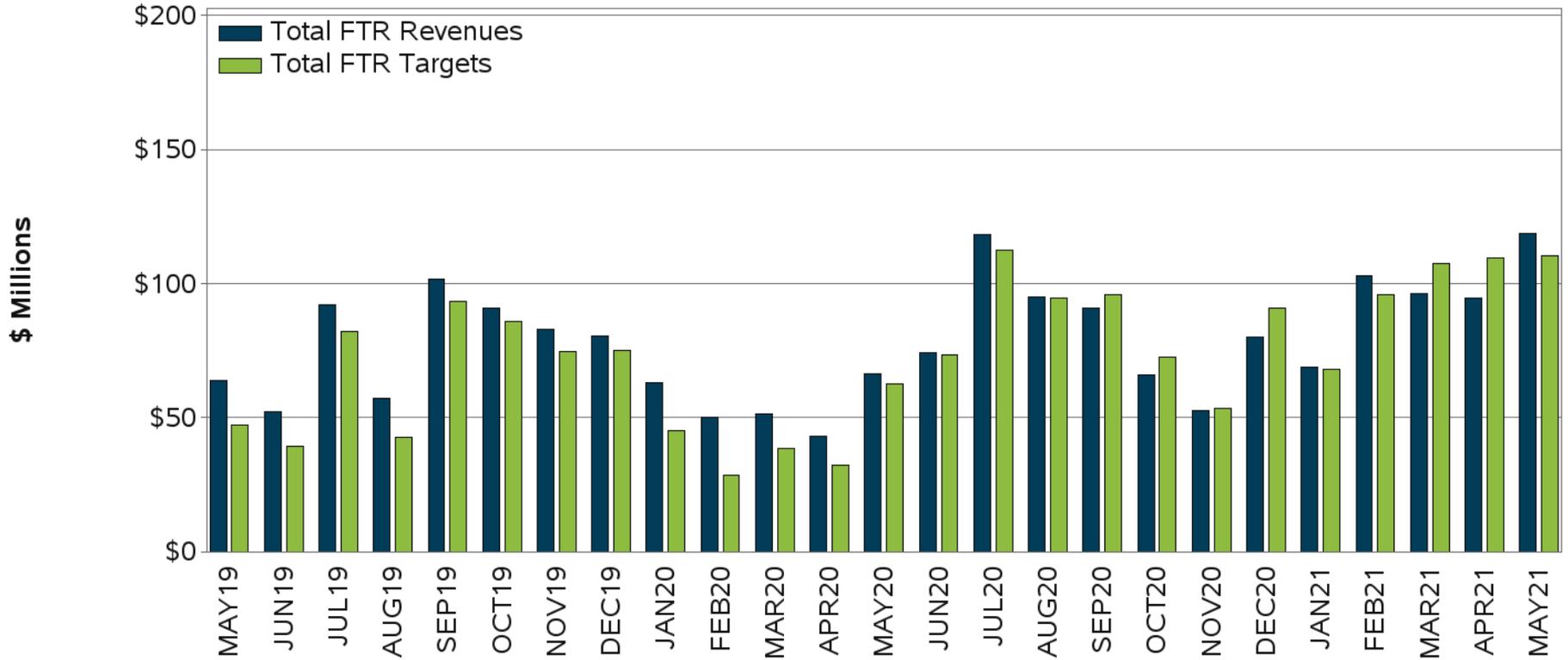
INCs, DECs and Up-To-Congestion Transactions - Total Volume

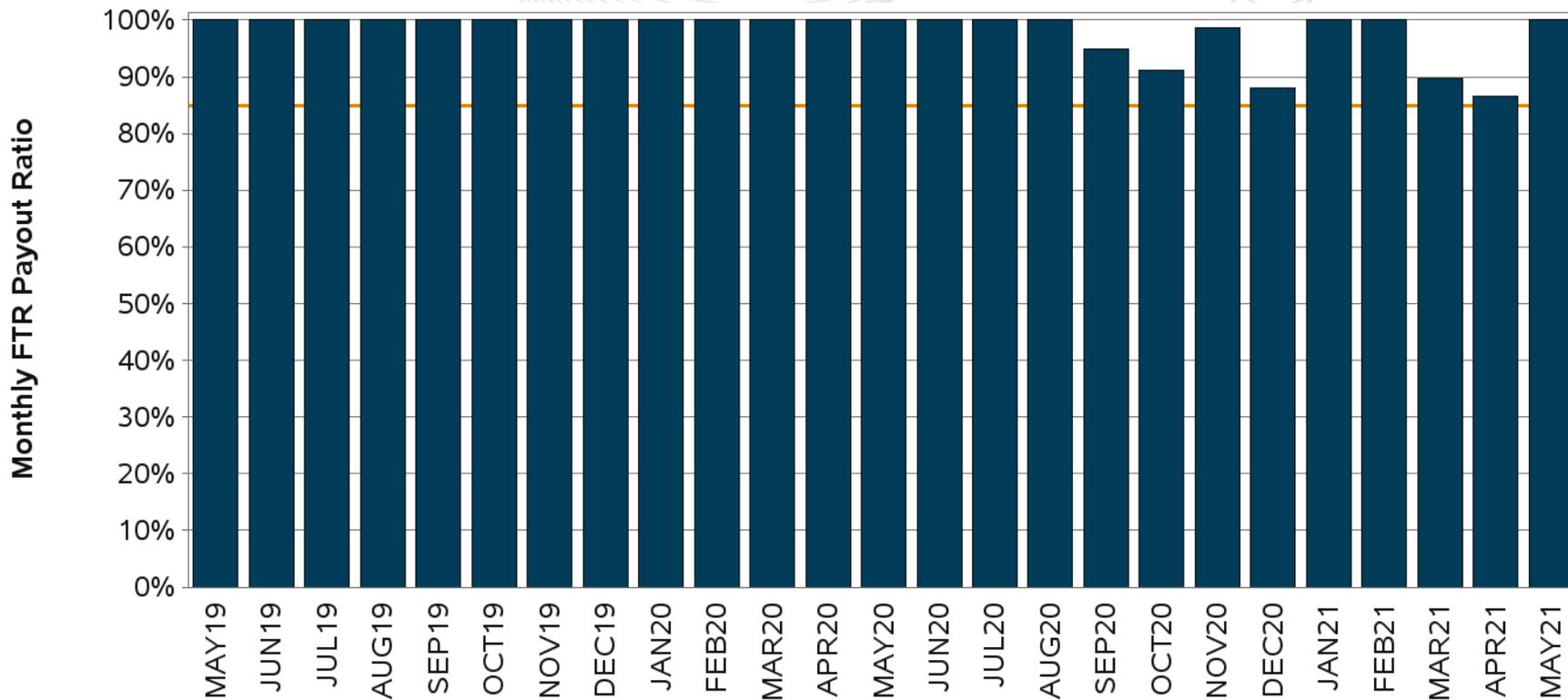


Energy Market

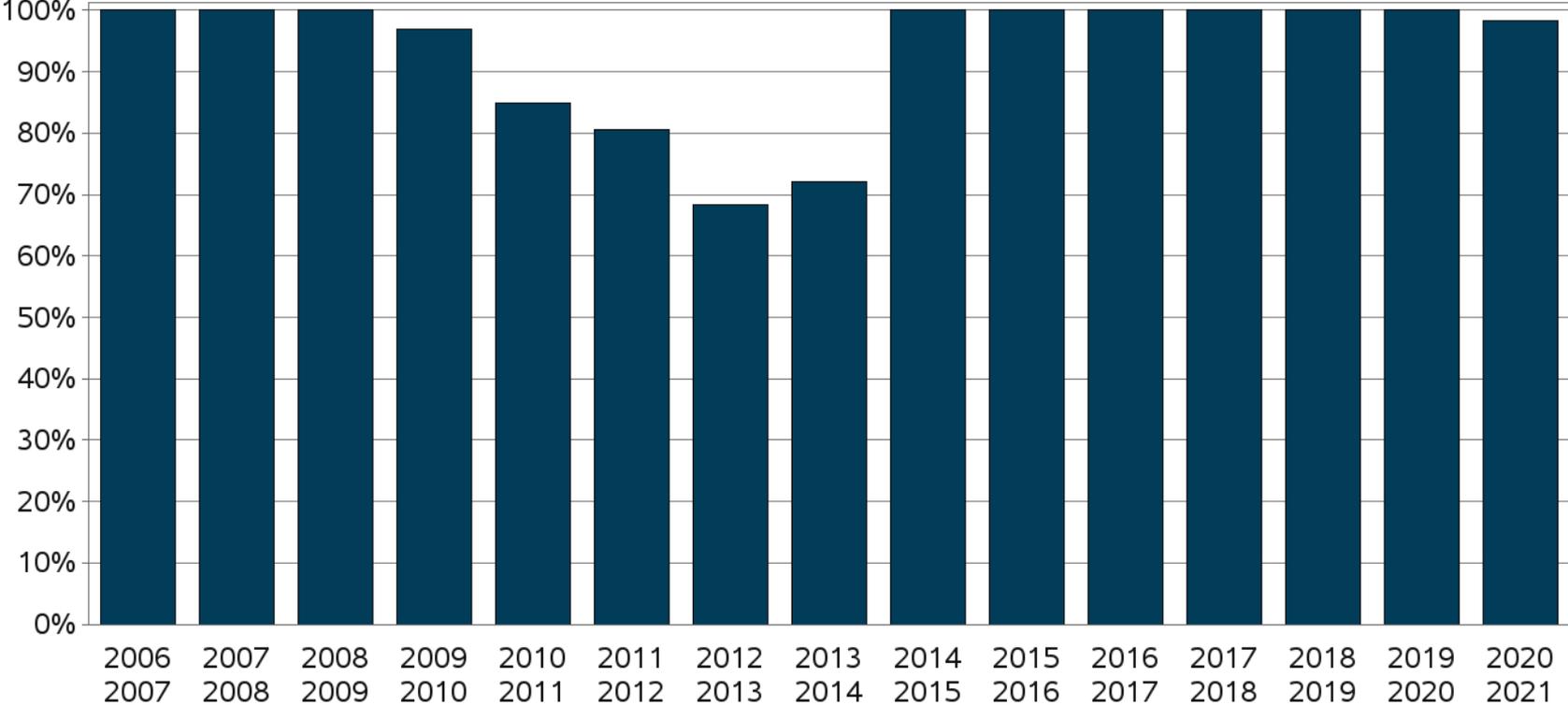
Congestion and FTR Summary

Period	Surplus / Underfunding	Payout Ratio
May, 2021	\$8,610,482	100%
2021	\$-6,397,570	99%
2020/2021	\$-18,569,729	98%

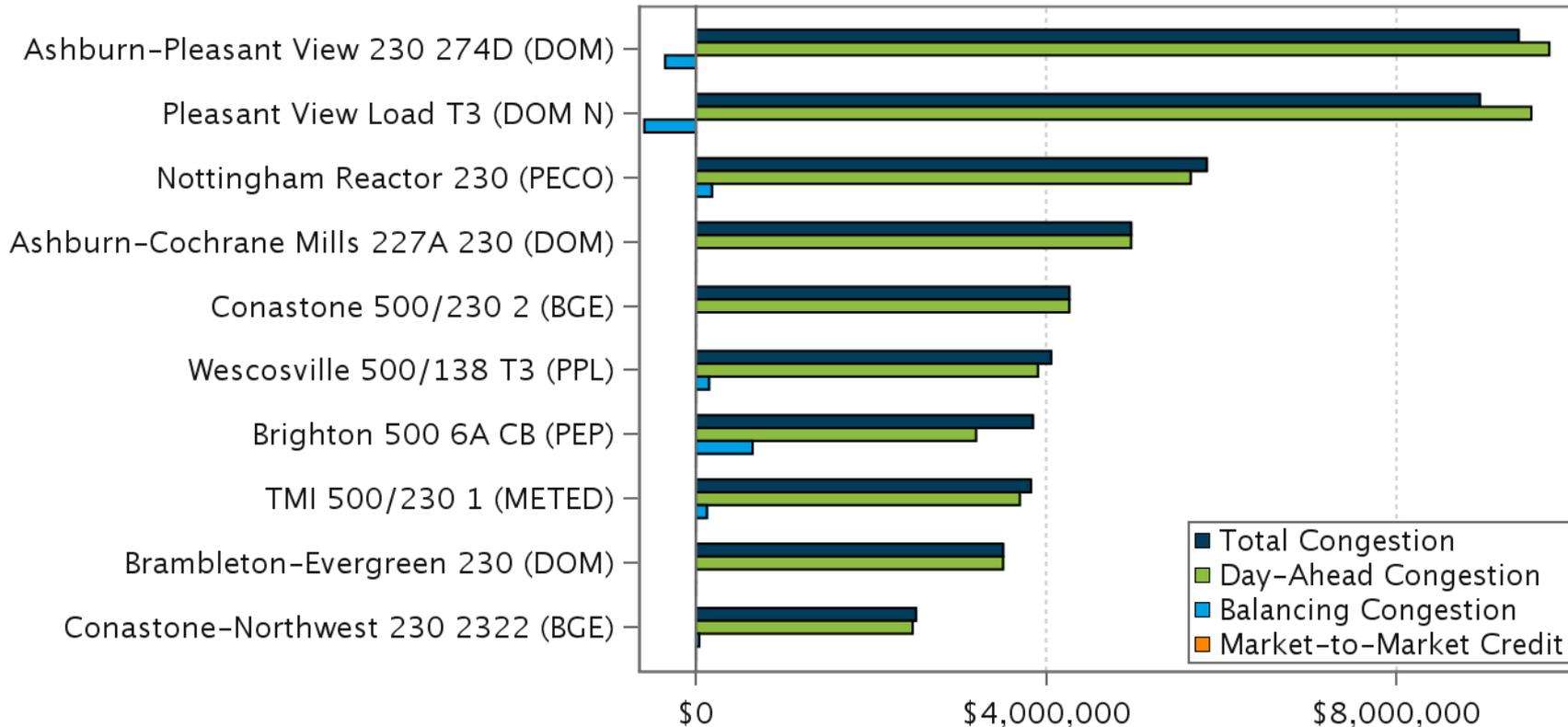




Planning Period FTR Payout Ratio

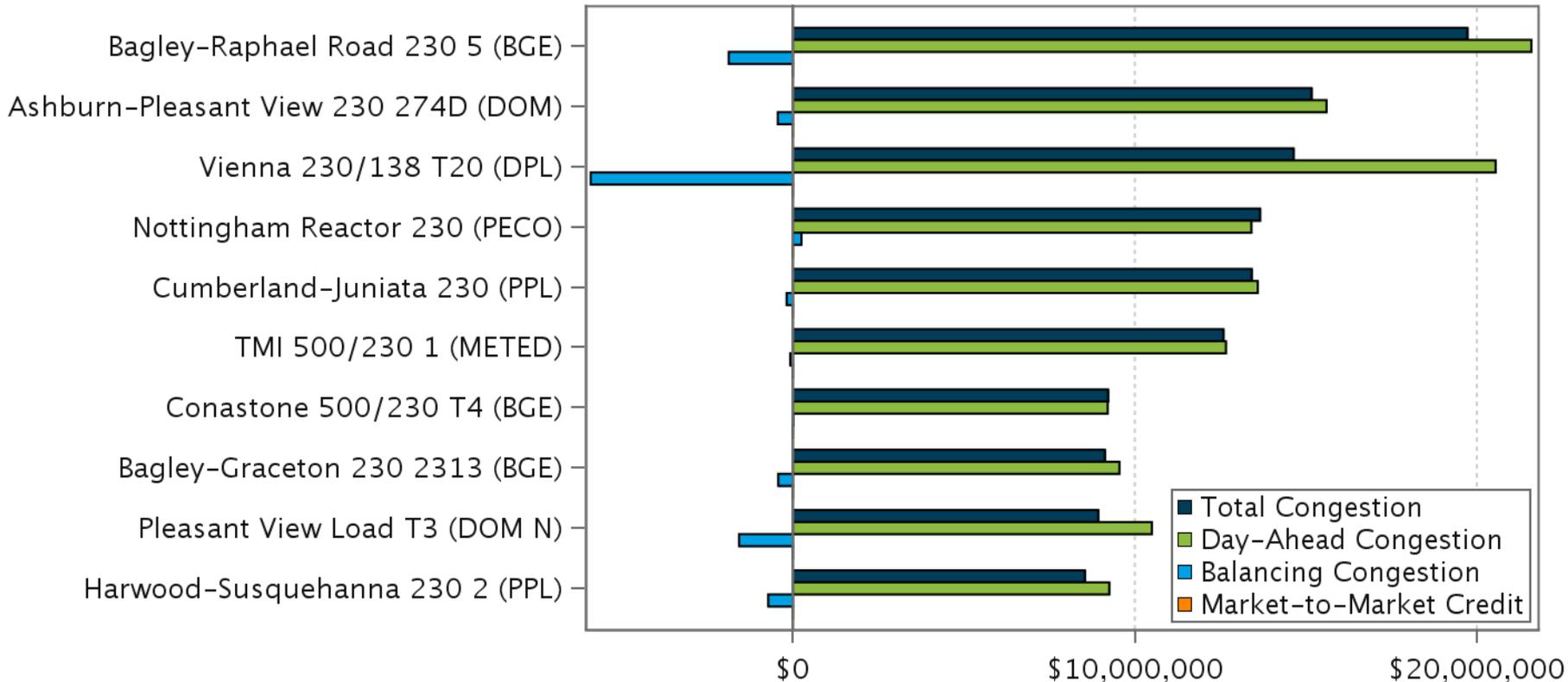


Ten Most Heavily Congested Transmission Facilities - Overall, May



The ten most heavily congested facilities account for 55% of total congestion for May.

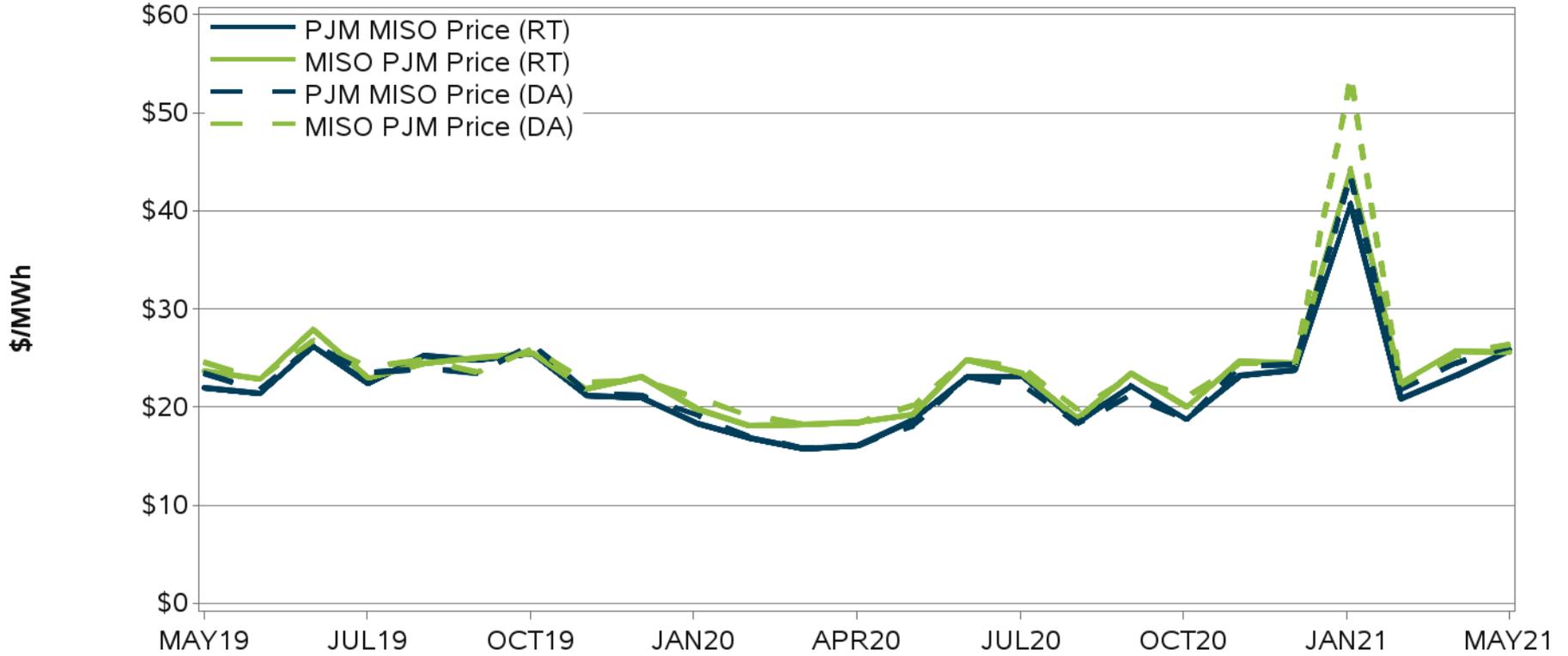
Ten Most Heavily Congested Transmission Facilities - Overall, 2021

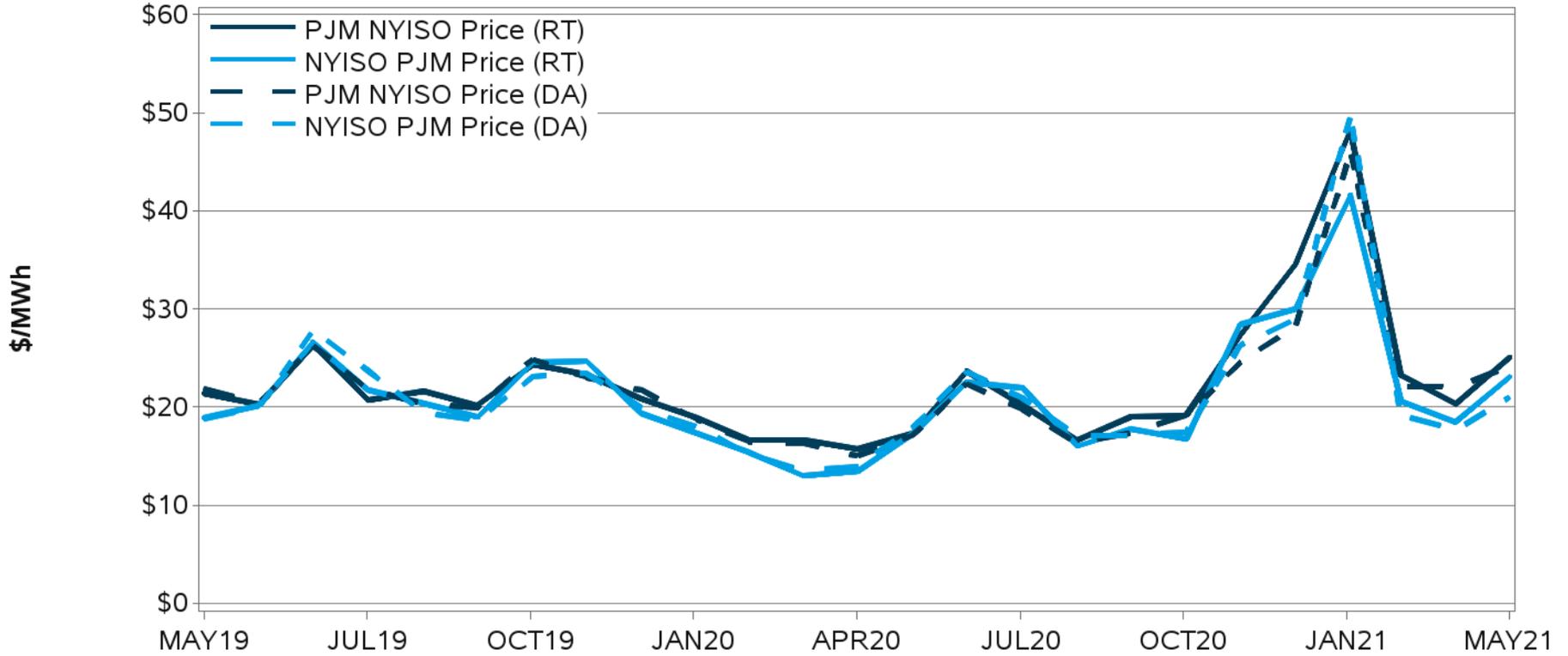


The ten most heavily congested facilities account for 43% of total congestion for 2021.

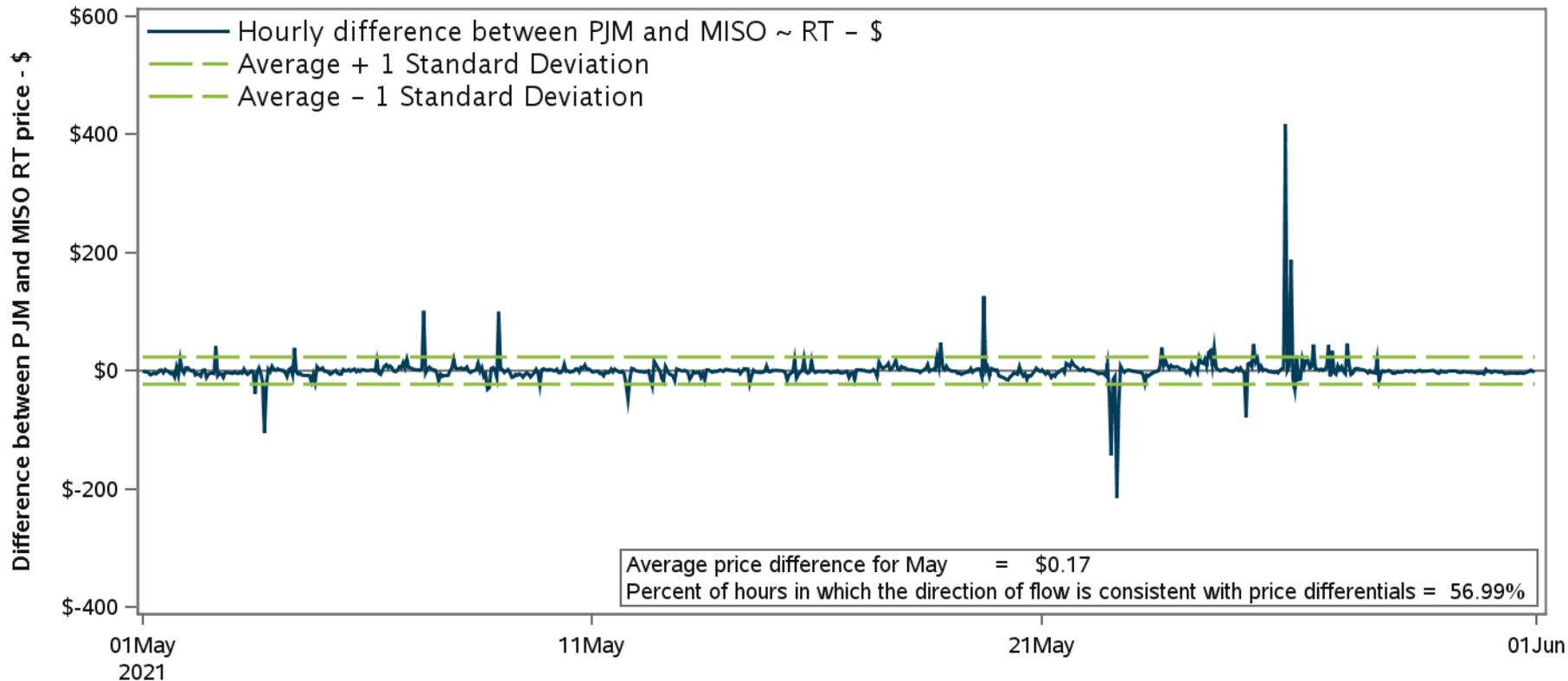
Energy Market

Interchange/Seams Summary



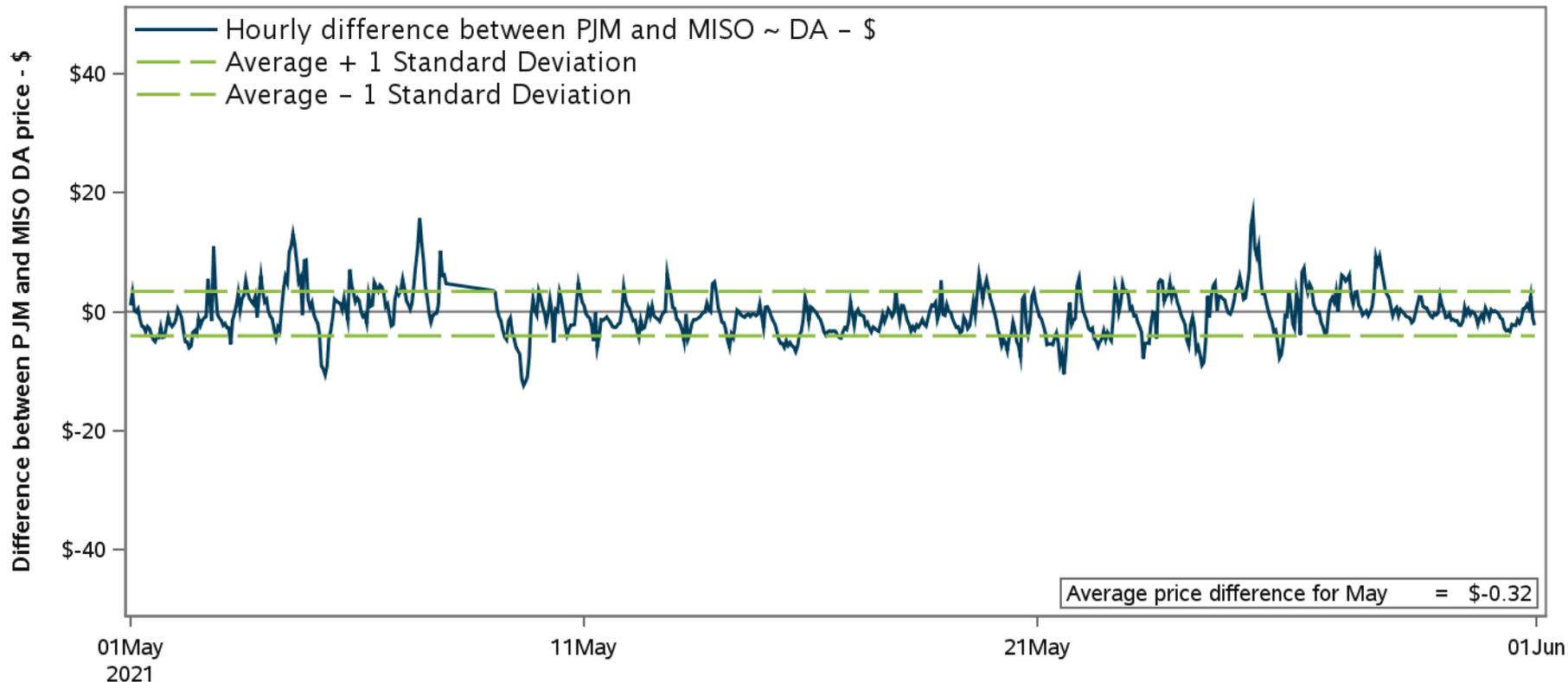


Hourly Difference Between PJM and MISO Real-Time Prices



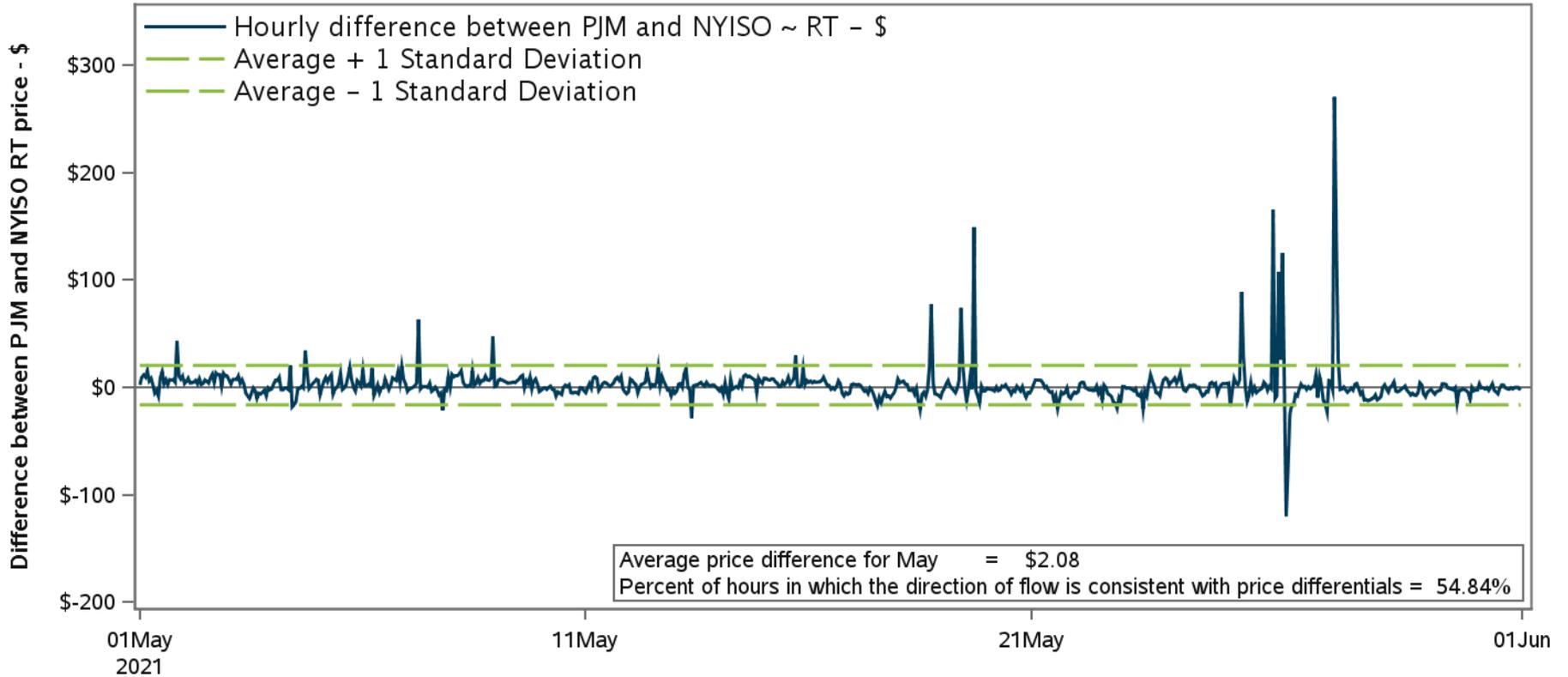
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and MISO Day-Ahead Prices



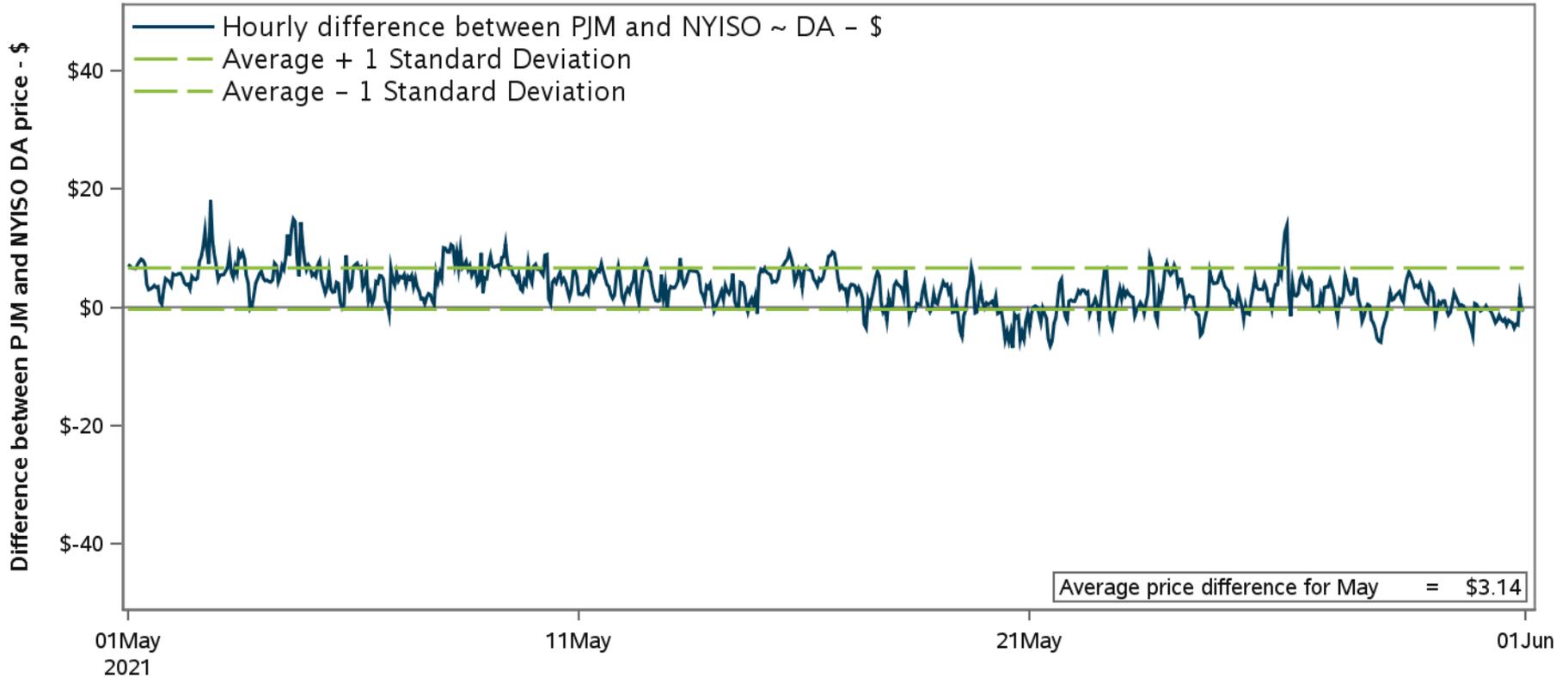
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and NYISO Real-Time Prices

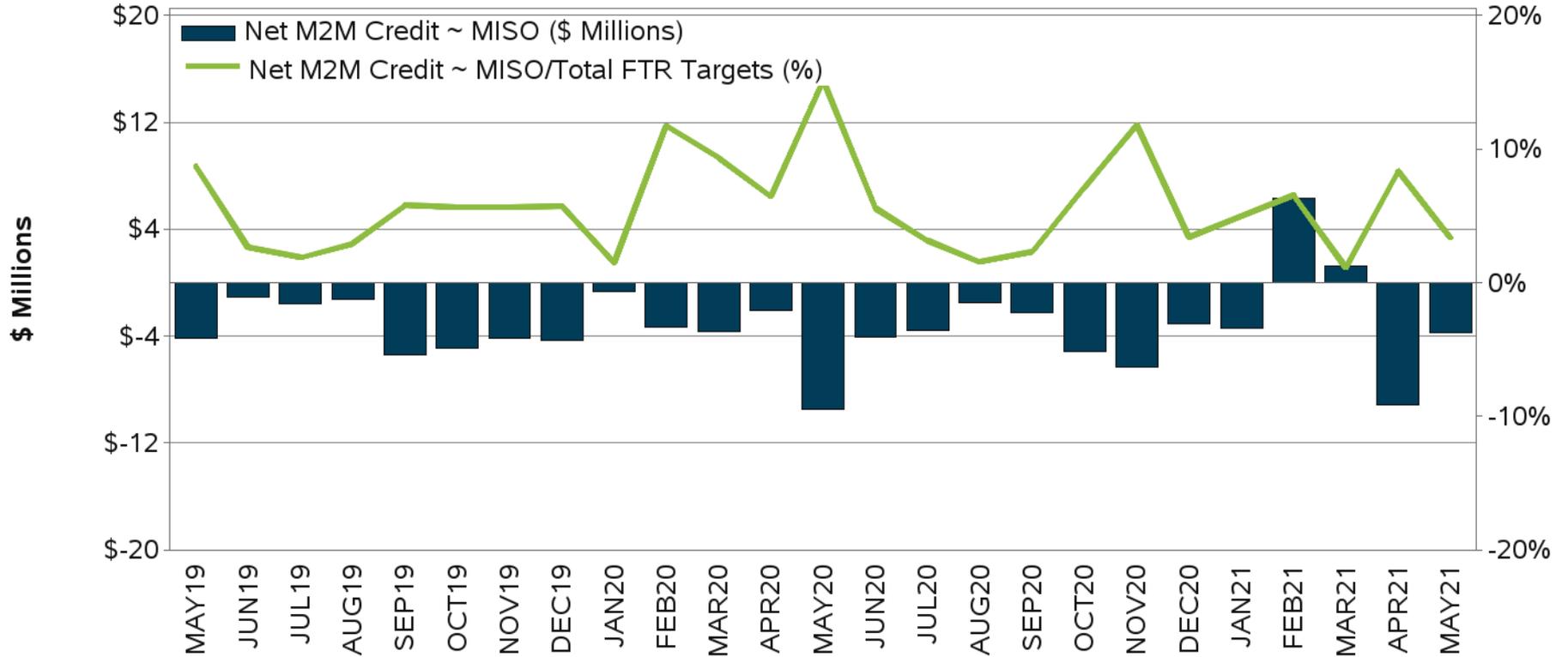


Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and NYISO Day-Ahead Prices

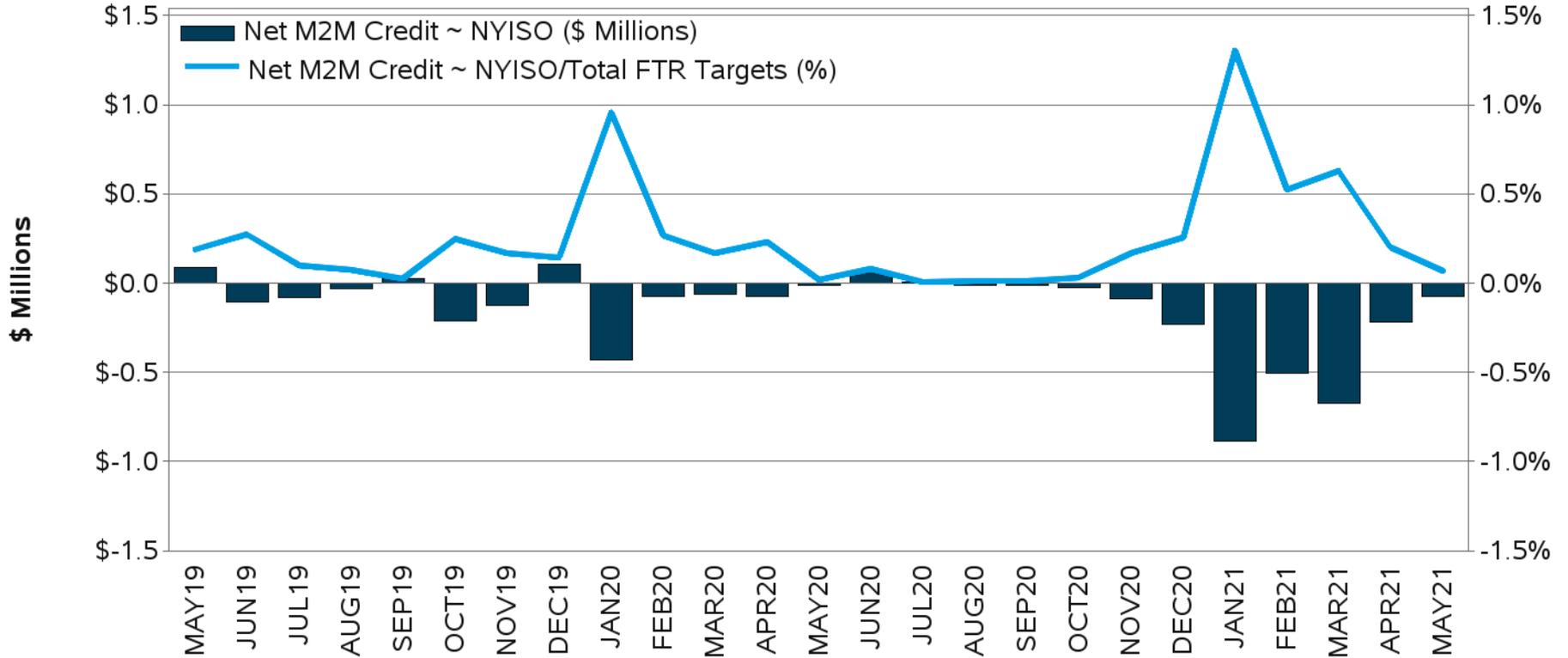


Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.



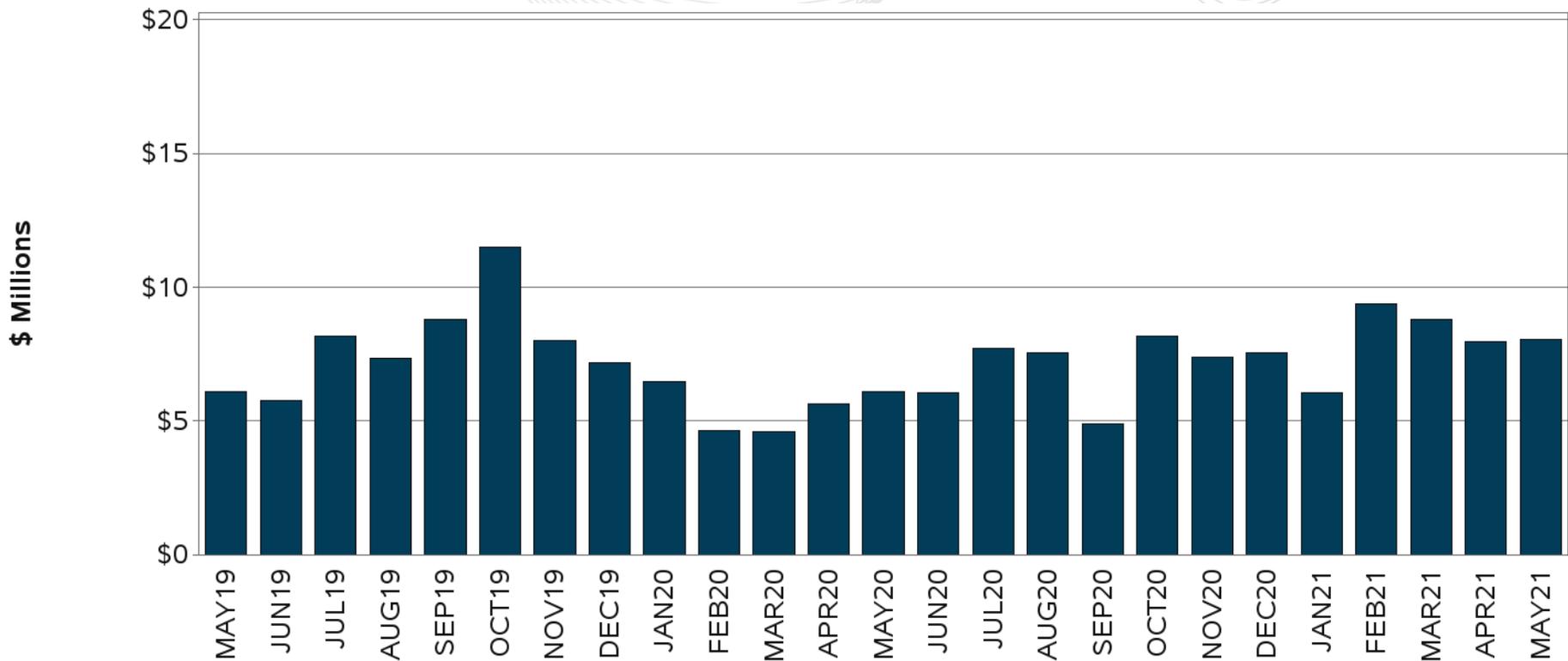
Negative M2M Credit represents PJM payment to MISO

PJM-NYISO Market-to-Market Coordination Settlement

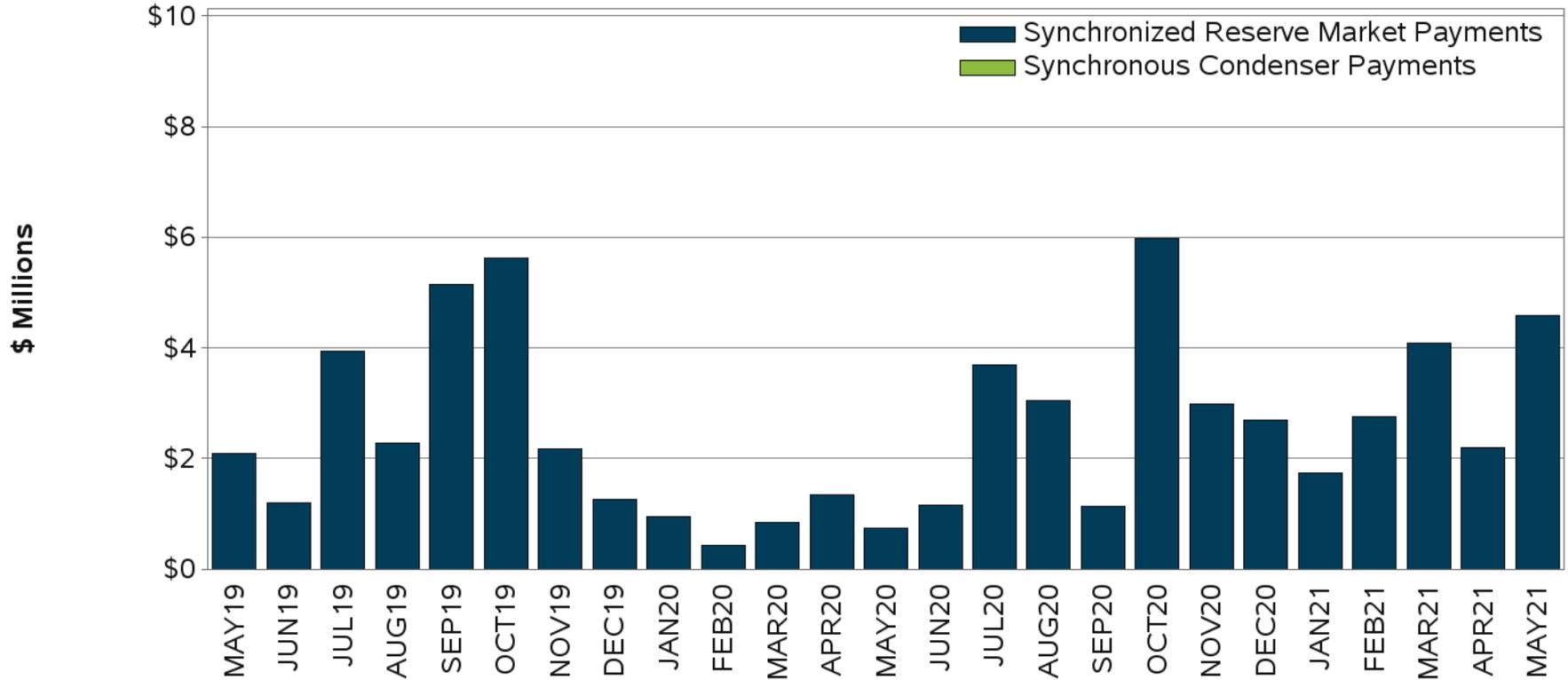


Negative M2M Credit represents PJM payment to NYISO

Ancillary Service Market Summary

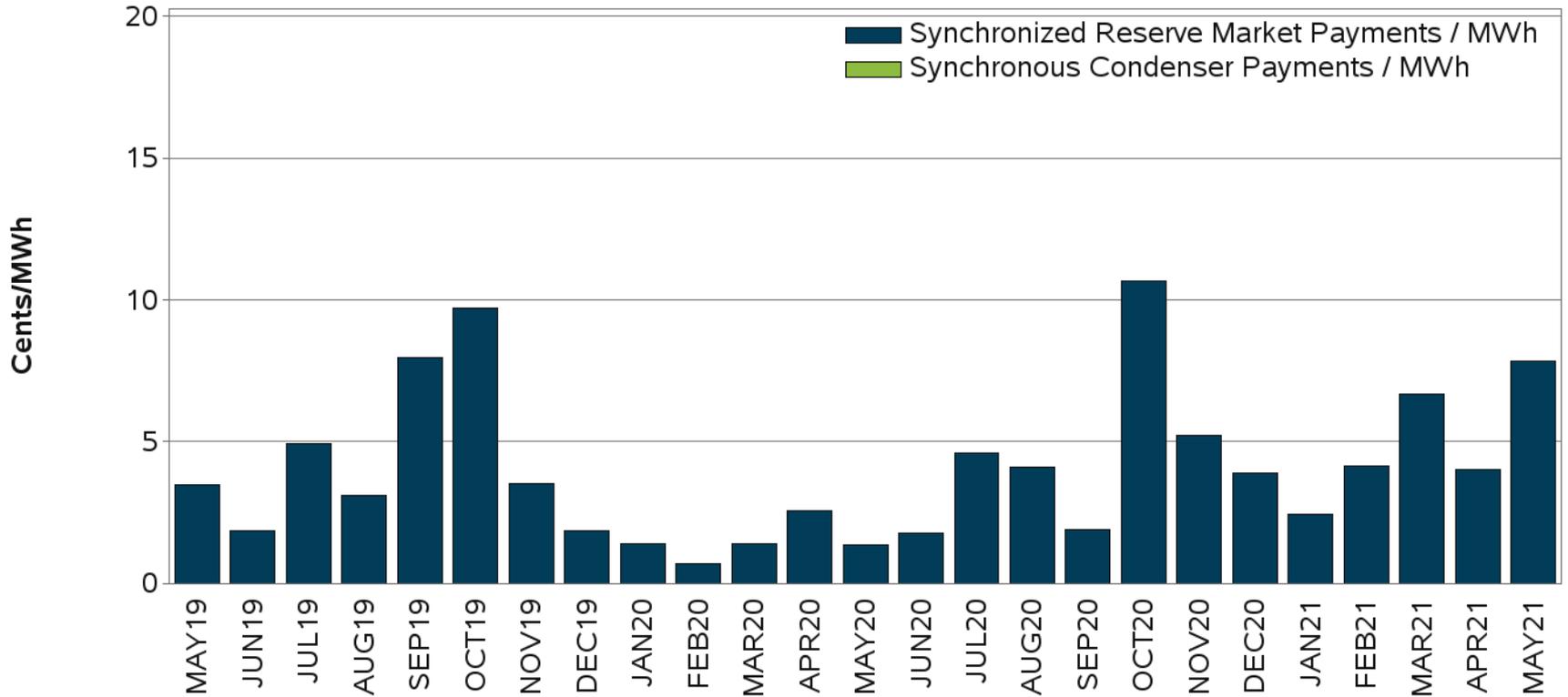


Synchronized Reserve and Synchronous Condenser Costs

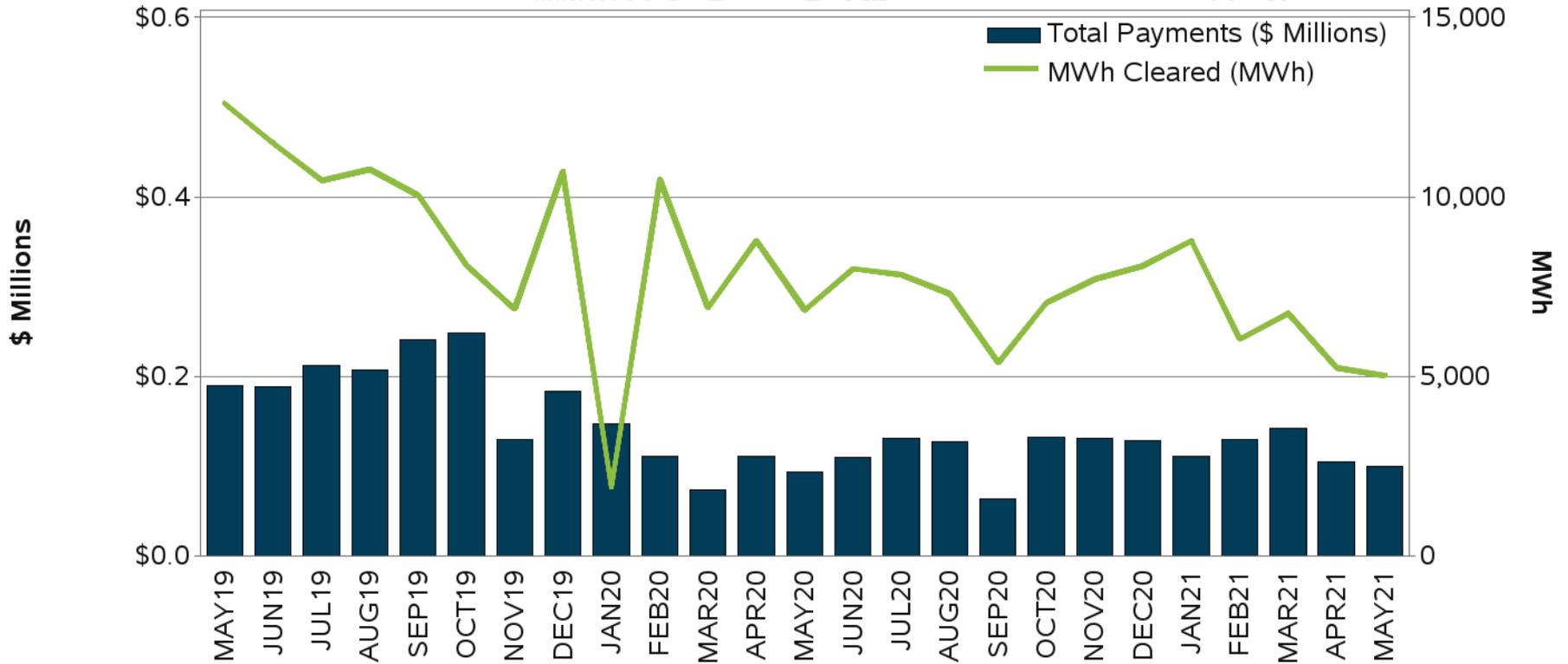




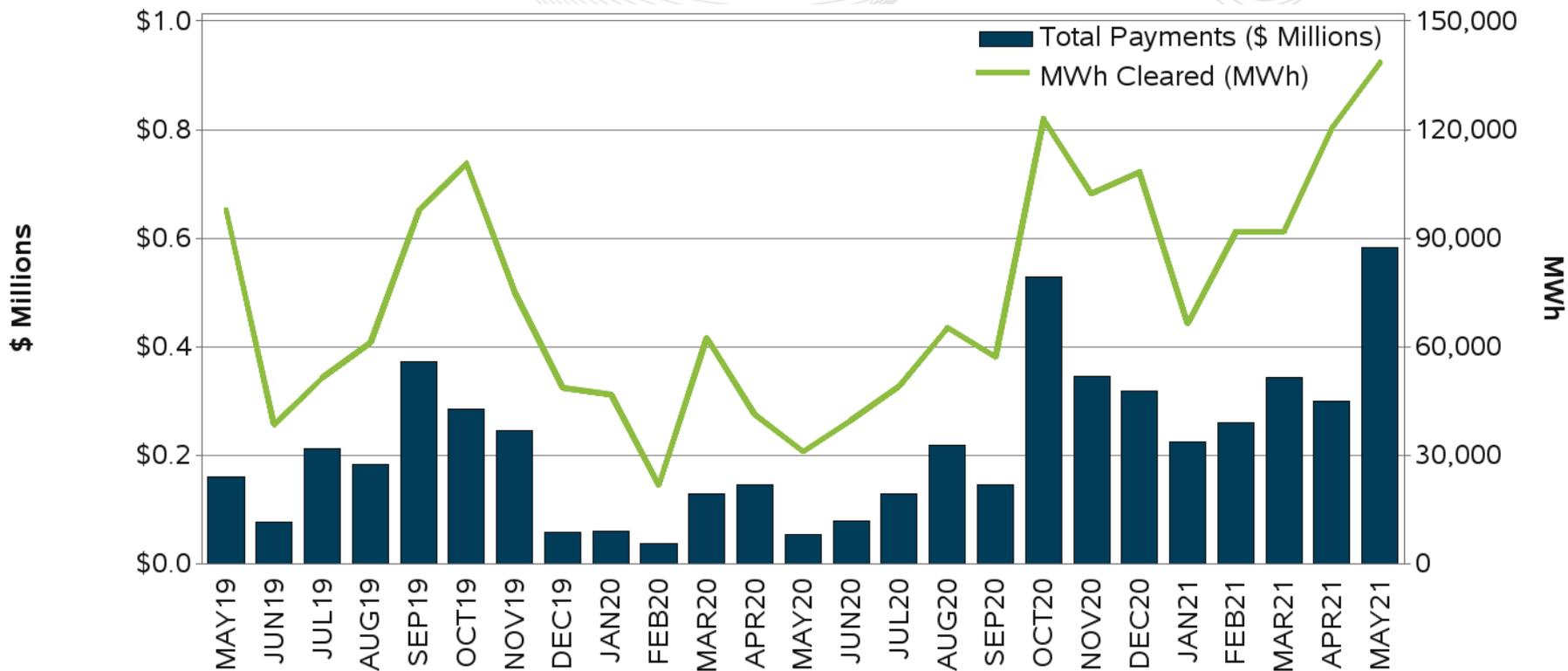
Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs

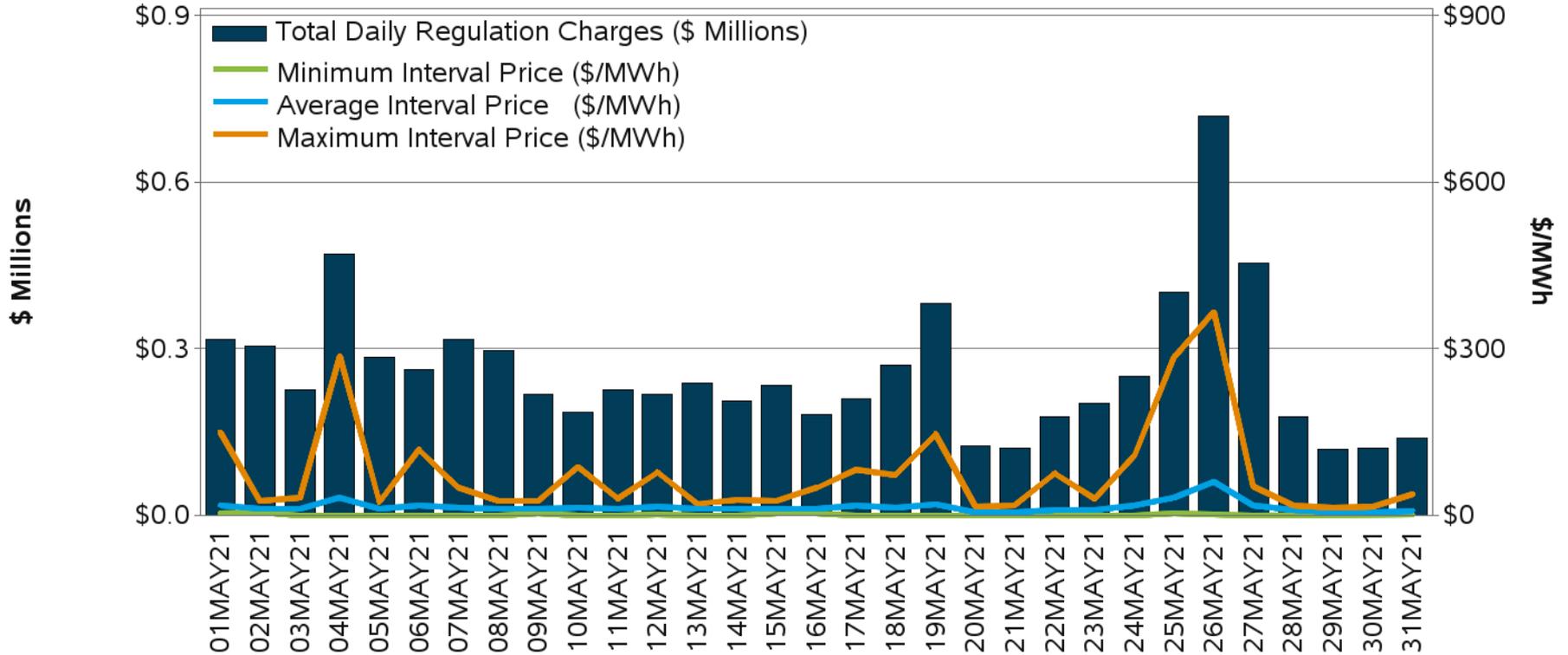


DR Participation in PJM Regulation Markets

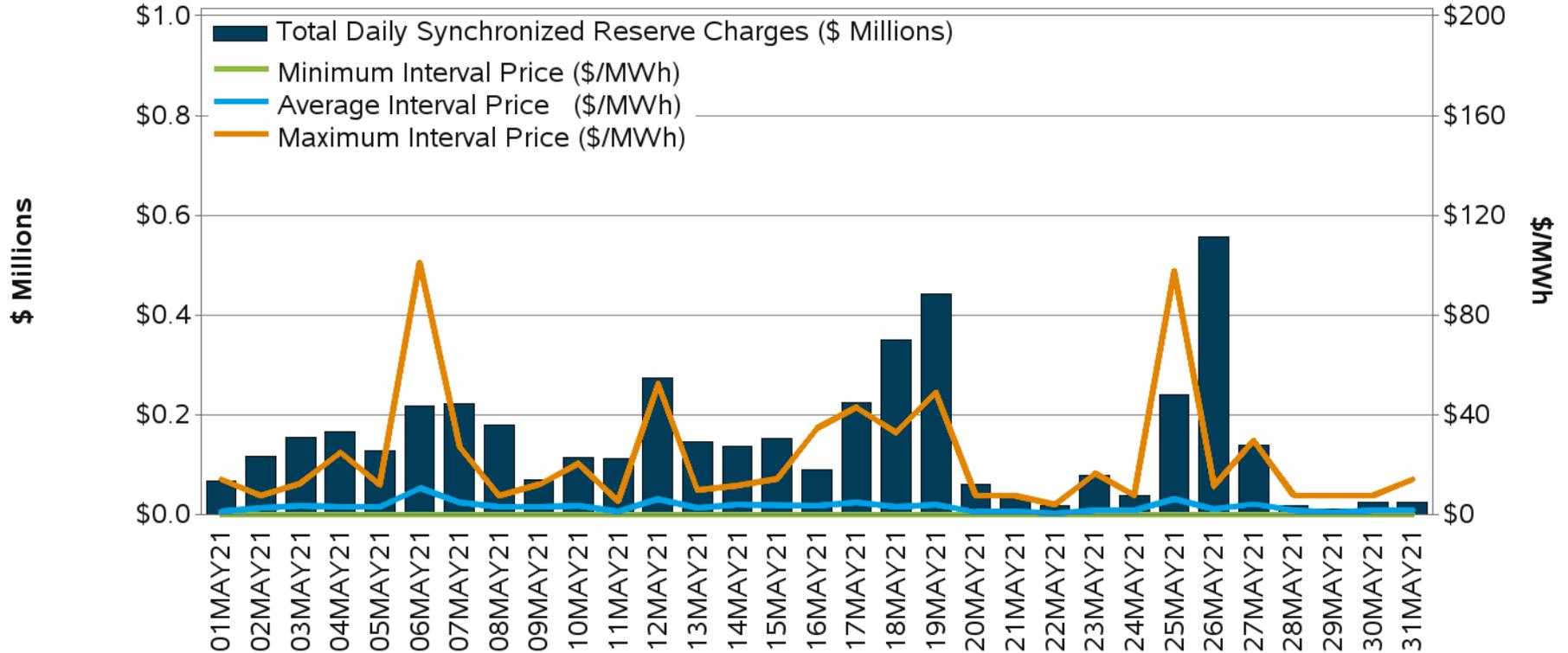


DR Participation in PJM Synchronized Reserve Markets





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