



Markets Report

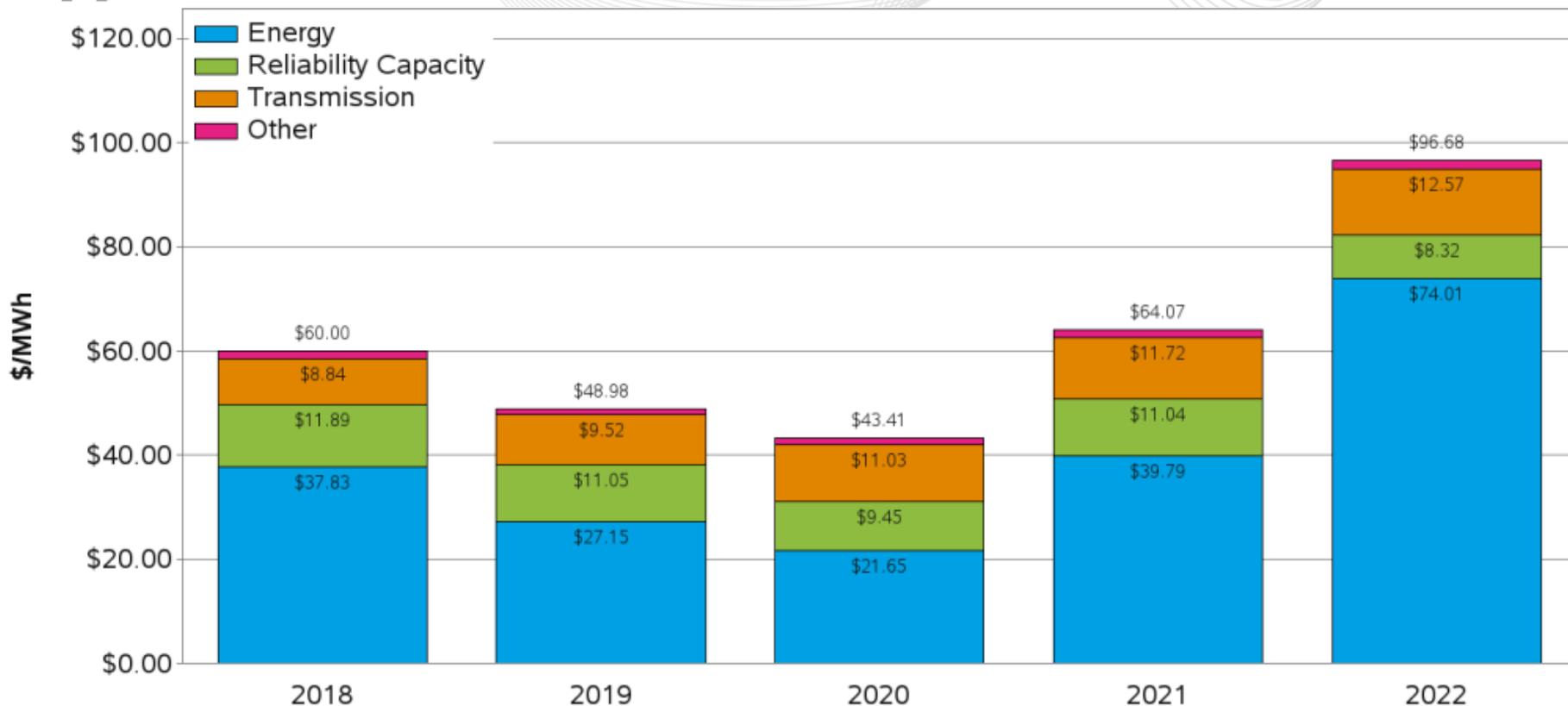
MC Webinar

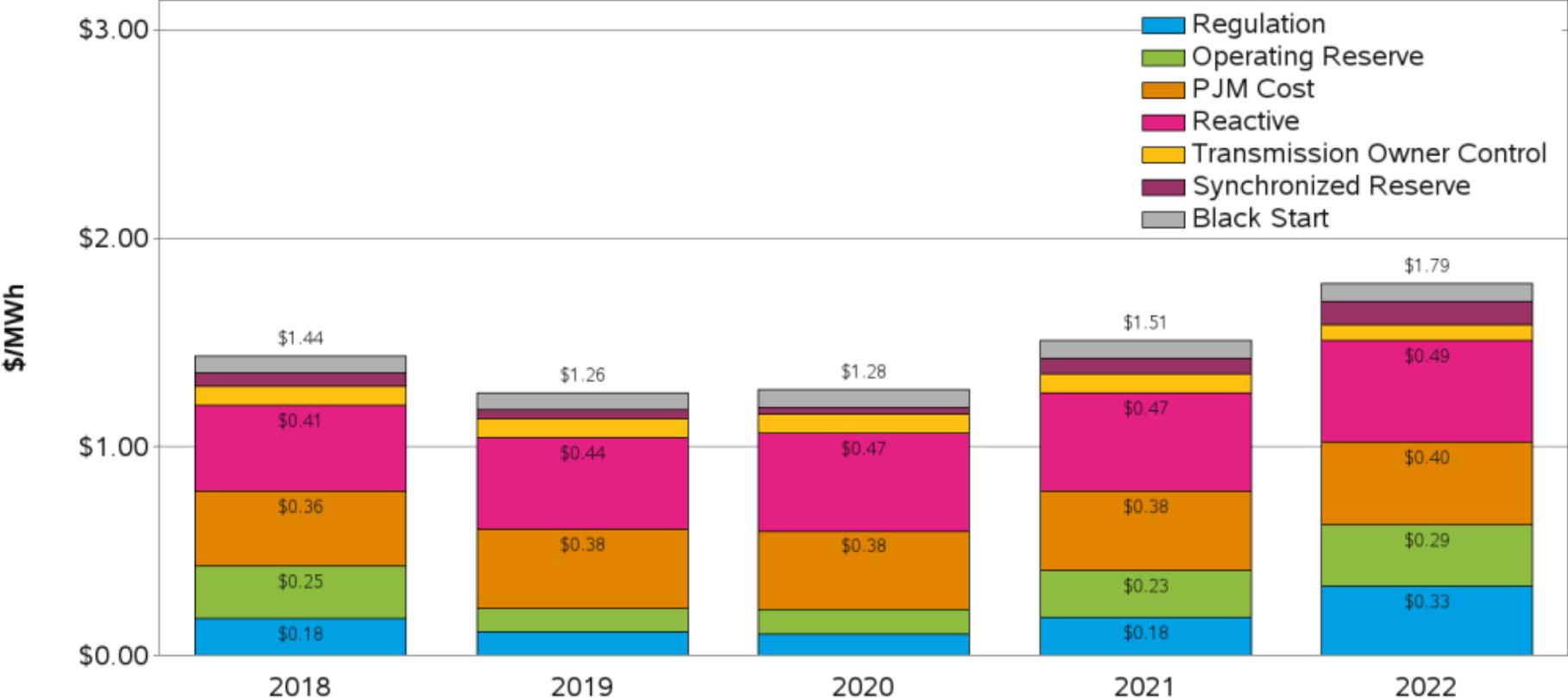
December 19, 2022

- PJM Wholesale Cost 2022 is \$96.68/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 November, temperatures overall were above average for most of the month. Thus, the sum of Heating and Cooling Degree Days was just below its historic average. (Slides 8-10)
- Energy use was also slightly below its historic average for November. (Slides 8-10)
- In November, uplift exceeded \$800,000 on five days. (Slides 25 & 26)

- Load-weighted average LMP for 2022 is \$74.01/MWh: (Slides 35-37)
 - November 2022 was \$52.90/MWh, which is lower than November 2021 (\$63.00/MWh) but higher than November 2020 (\$20.70/MWh). (Appendix)
- There were no 5-minute intervals that experienced shortage pricing in November. (Slides 33-34)
- FTR revenue adequacy for the month of November is 99% and the 2022-2023 Planning Year is currently funded at 95%. (Slides 52-55)
- Congestion values have been trending upwards. November's value is in-line with recent history. (Slide 53)
- Regulation and Synchronized Reserve market costs have generally tracked with energy prices over time. (Slides 69-71)

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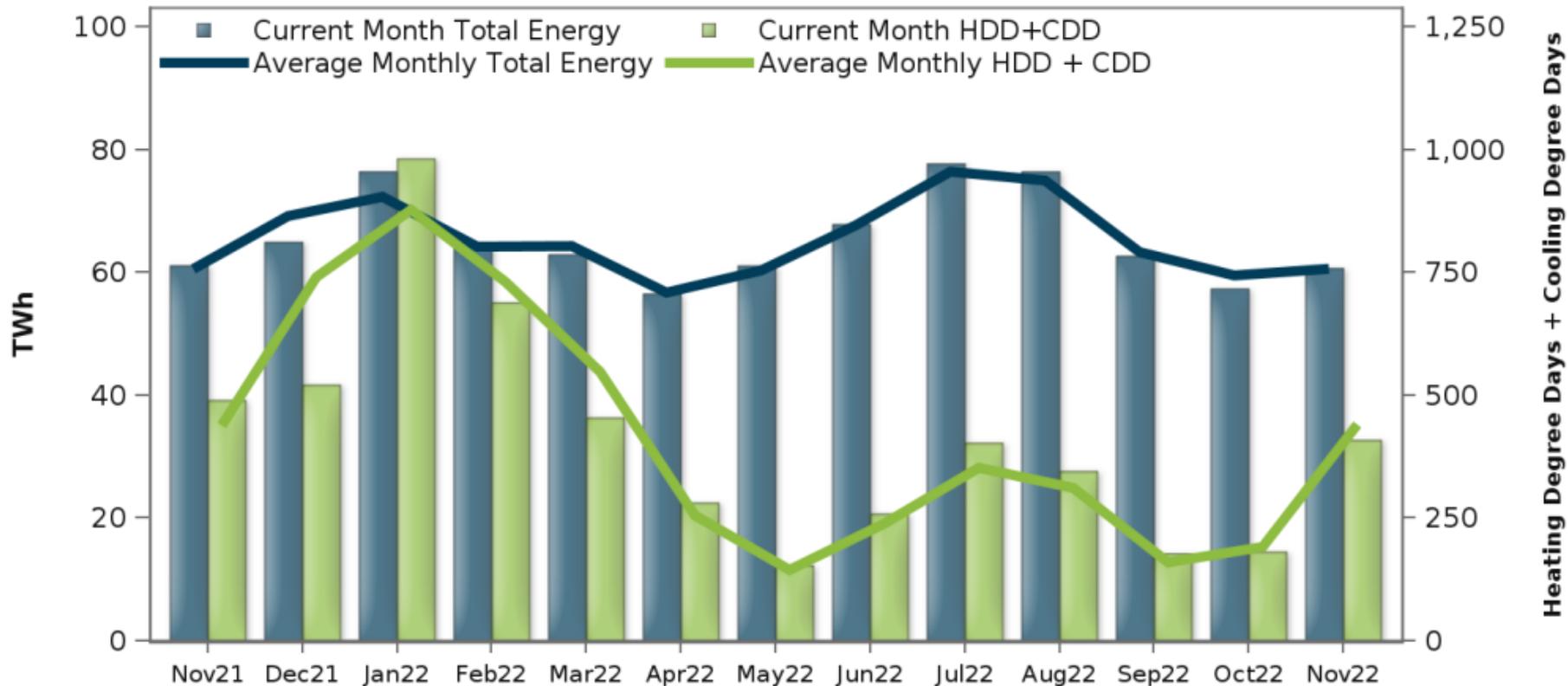




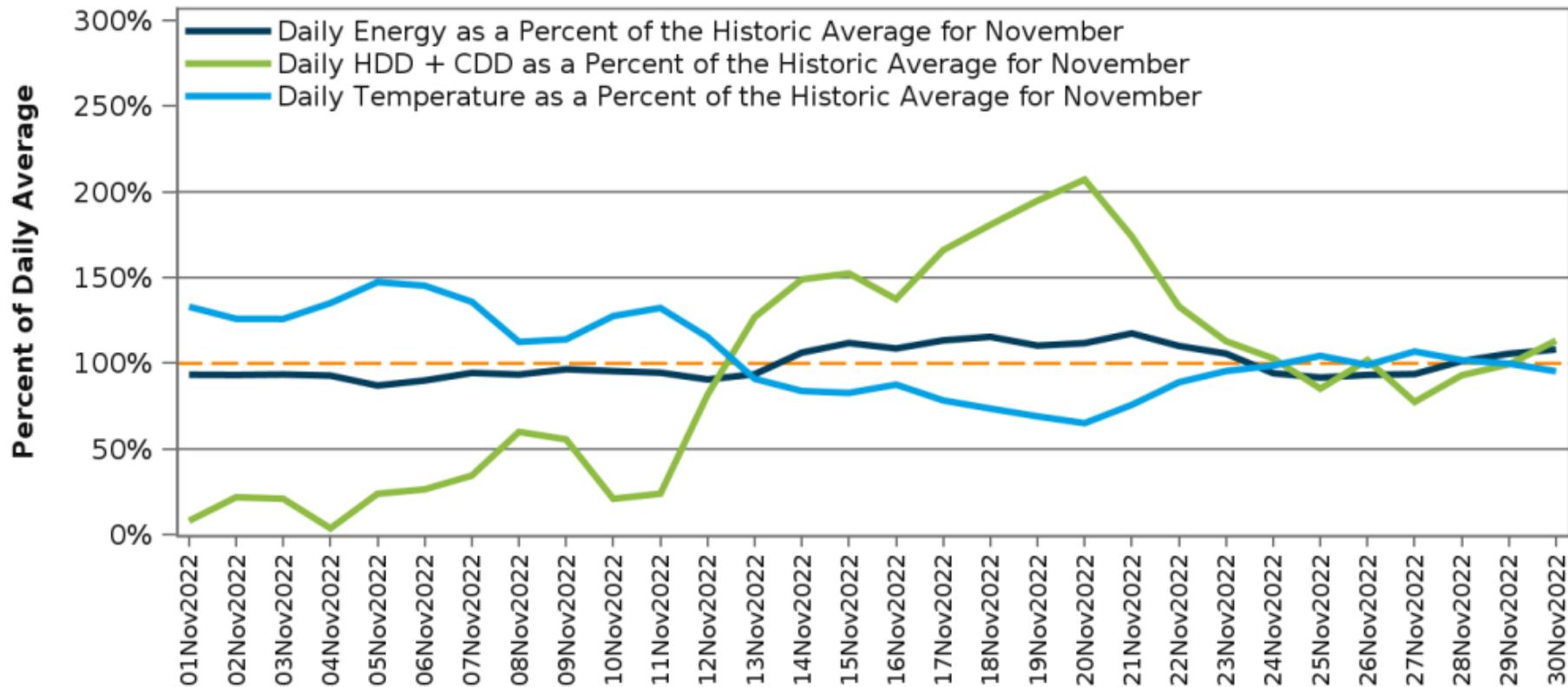
Market Conditions

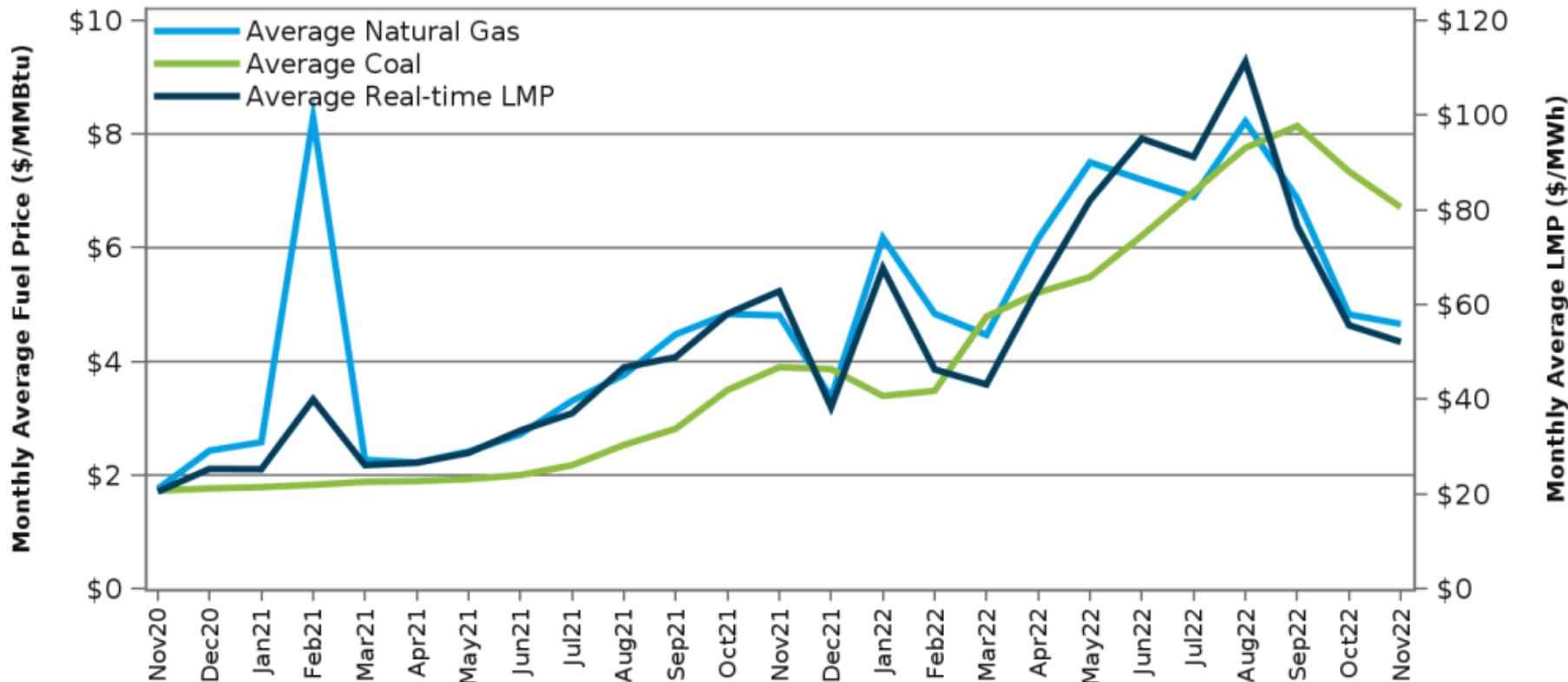
- The weather parameter shown in the following slide is a monthly sum of daily Heating Degree Days (HDD) and Cooling Degree Days (CDD).
- Degree days represent a deviation from a baseline temperature, in this case 60 degrees for HDD and 65 degrees for CDD. As temperatures get more extreme, colder or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

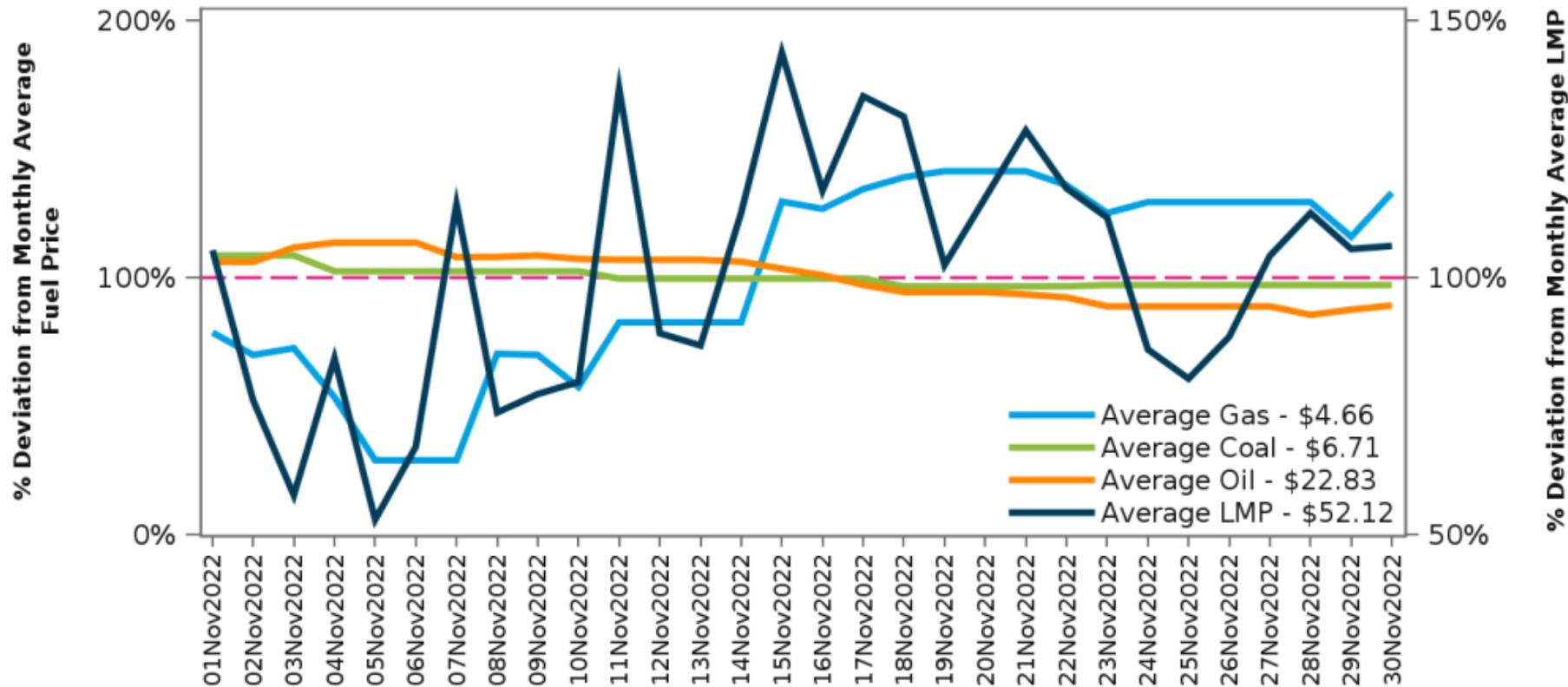


Historic Average Weather and Energy versus Current Month - Daily





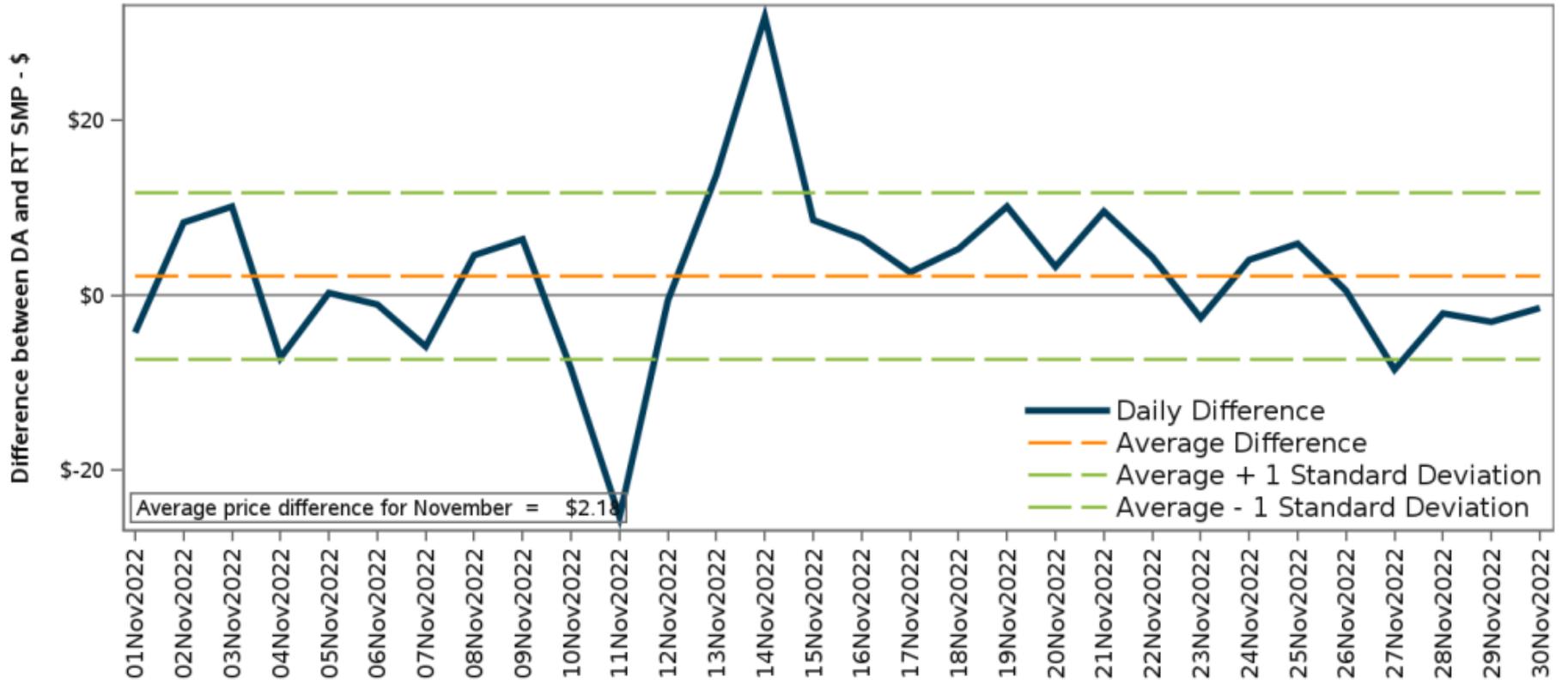
Fuel Price Source: S&P Global Platts



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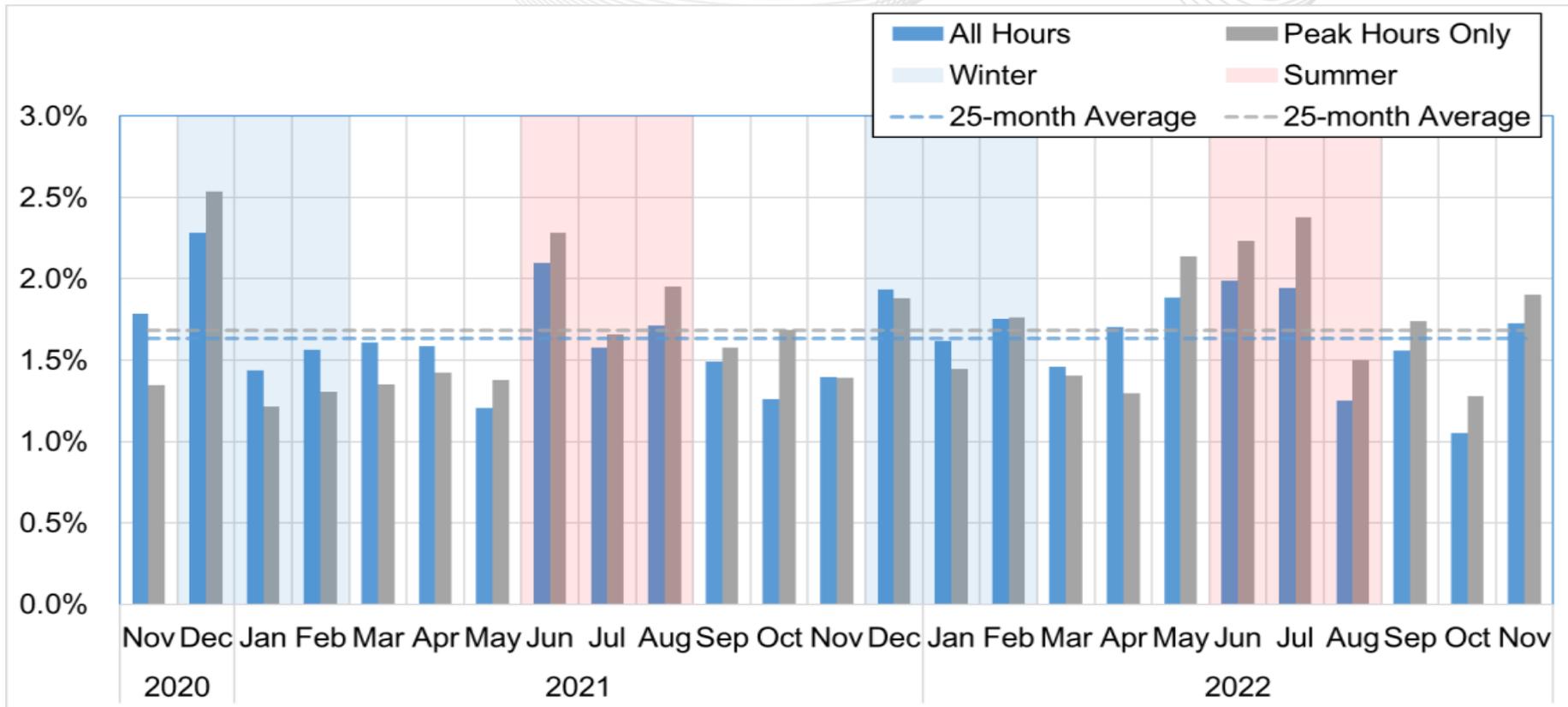


Daily Difference Between Day-Ahead and Real-Time System Marginal Prices

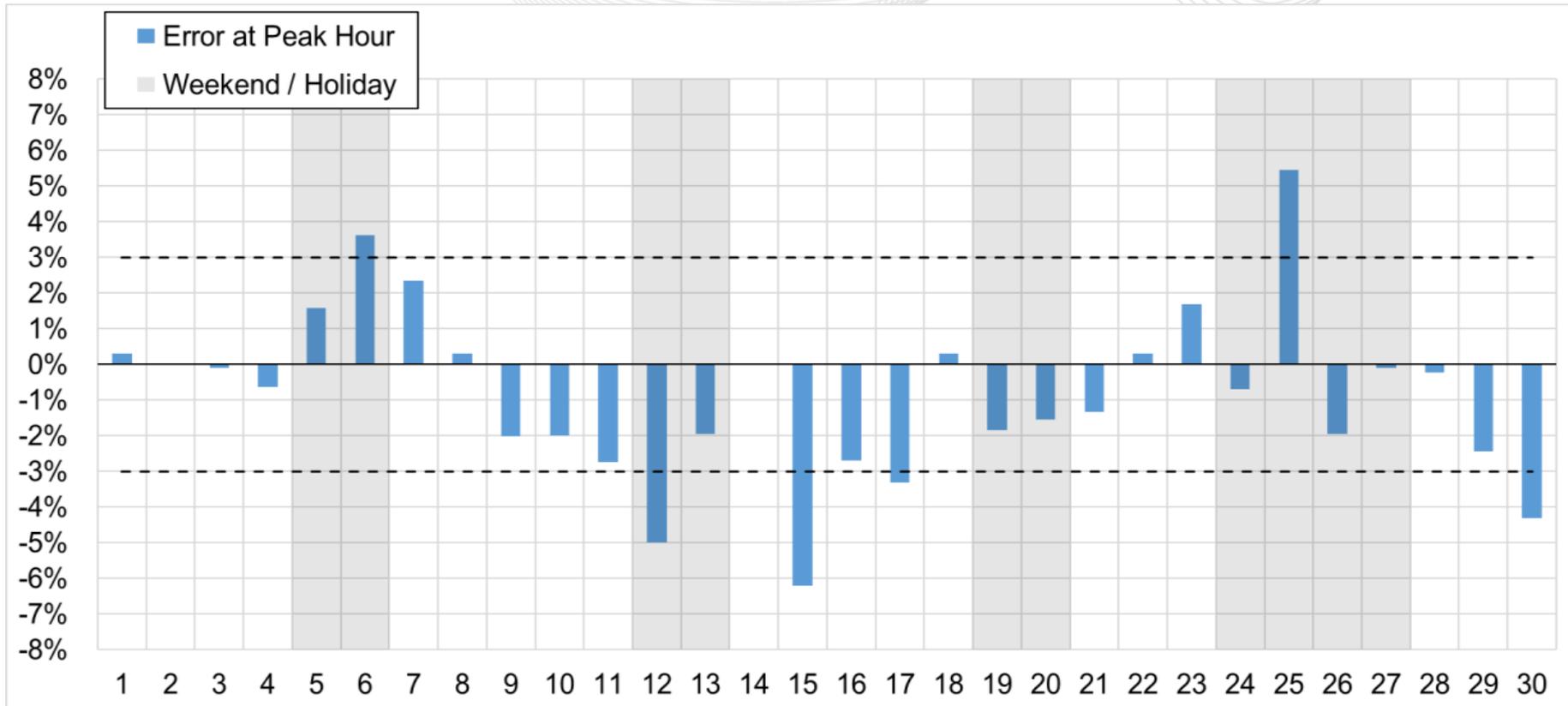


Positive values represent days when the DA daily average price was higher than RT. Negative values represent days when the DA price was lower.

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



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

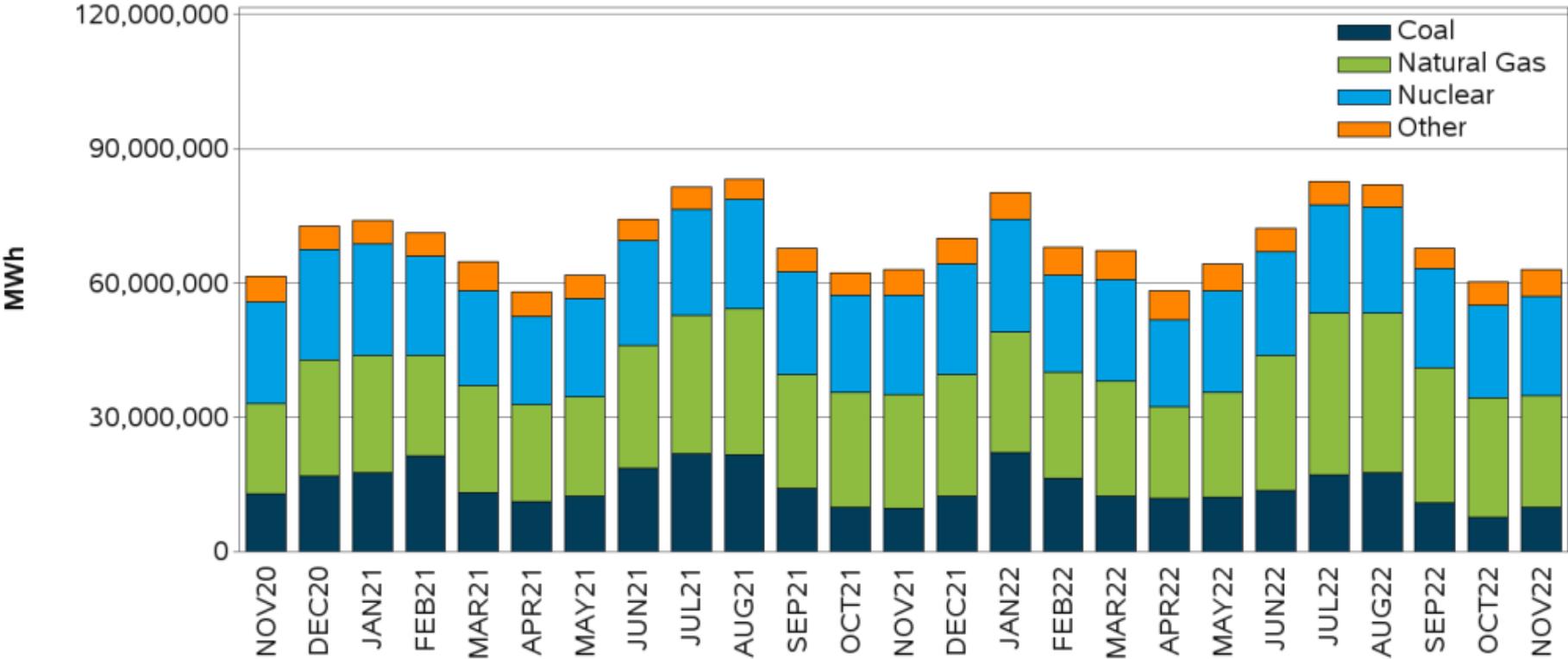


- PJM prepares a day-ahead load forecast at 10:00 am for use by our members.
- This forecast is not used to clear the day-ahead market and is not utilized for the reliability tools that run subsequent to the day-ahead market.

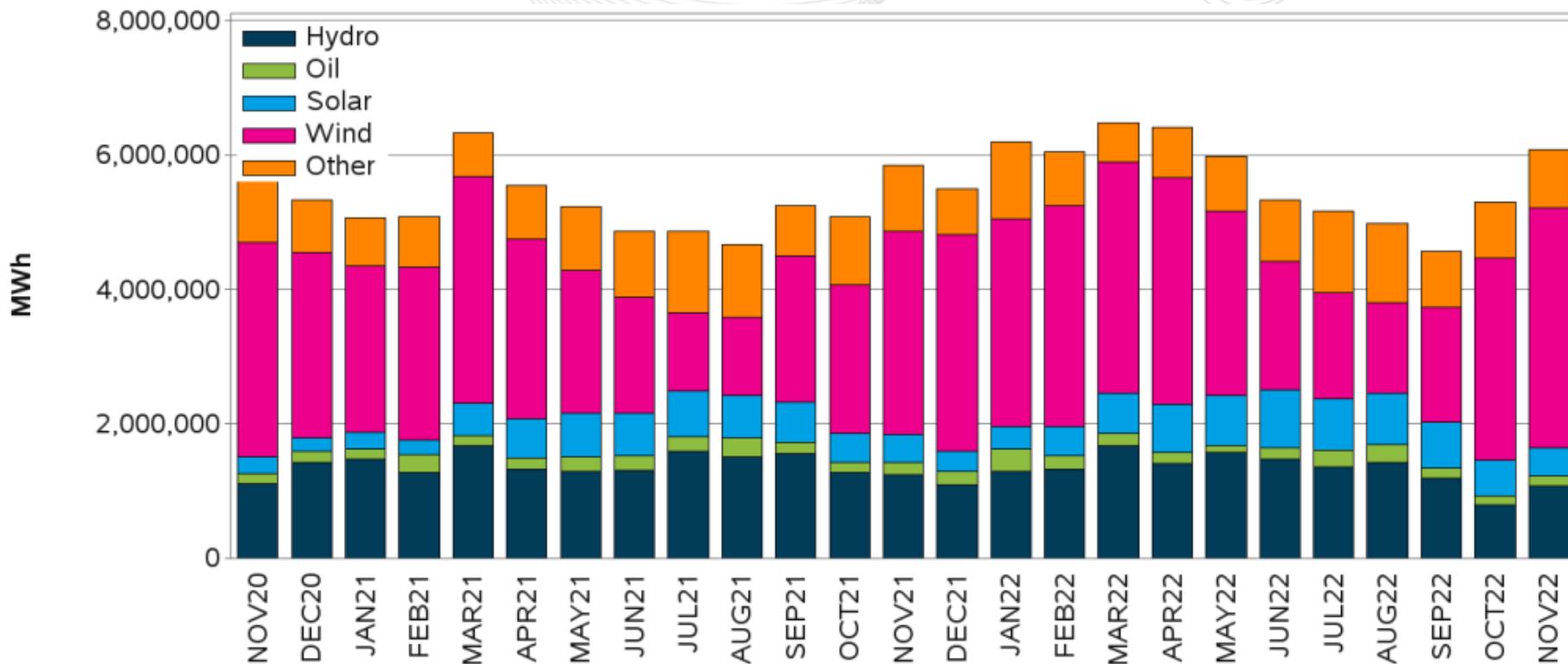
Load forecast error experienced in November was primarily driven by unusual weather. Temperatures were unseasonably warm at times, and that caused the peaks of November 6th and 25th to be over-forecasted. Error on the 25th, the Friday after Thanksgiving, may have been also been caused in part by the holiday.

Under-forecasting on November 12th and 30th happened at the end of stretches of warm weather. On these days, temperatures dropped drastically throughout the day, and the models struggled with this unusual temperature profile.

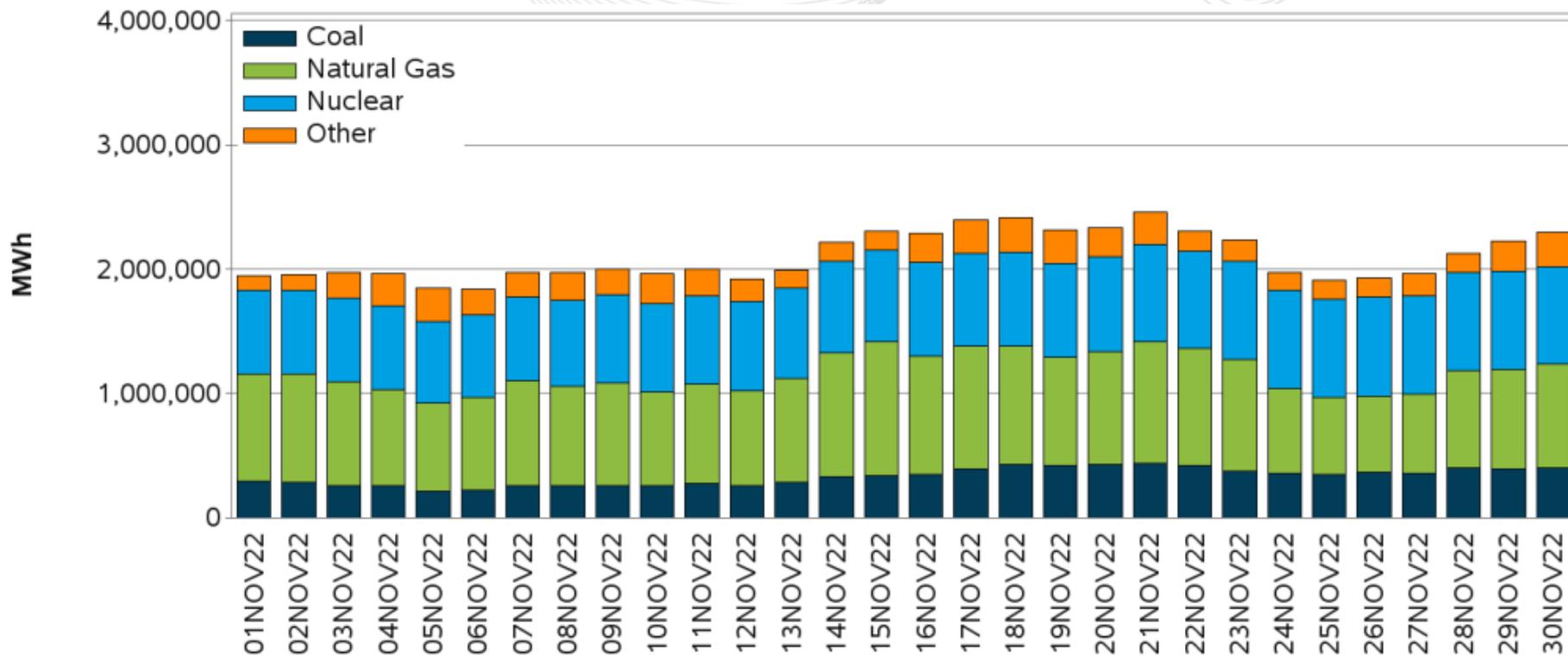
On November 15th and 17th, under-forecasting was driven by temperatures coming in cooler than expected in the afternoons and evenings.



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

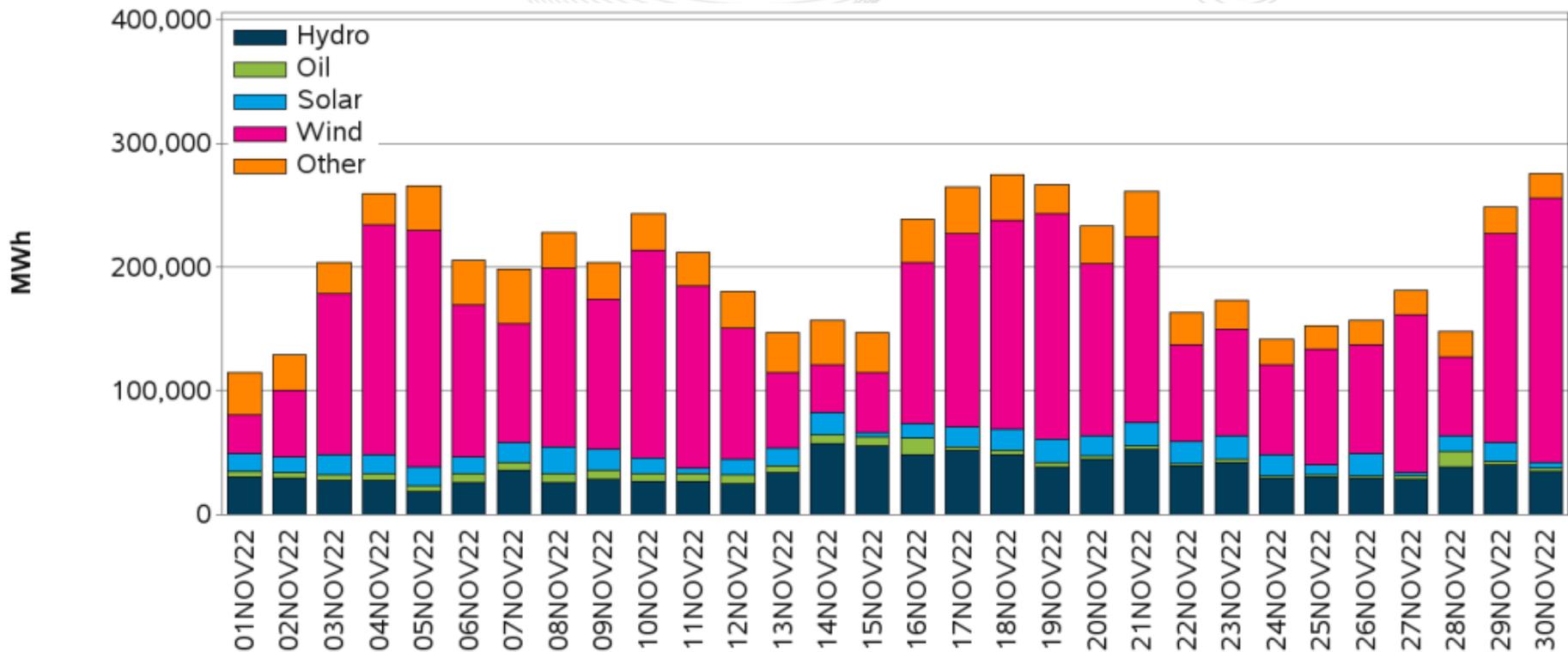


'Other' includes Flywheels, Multiple Fuels, Storage, and Other Renewables



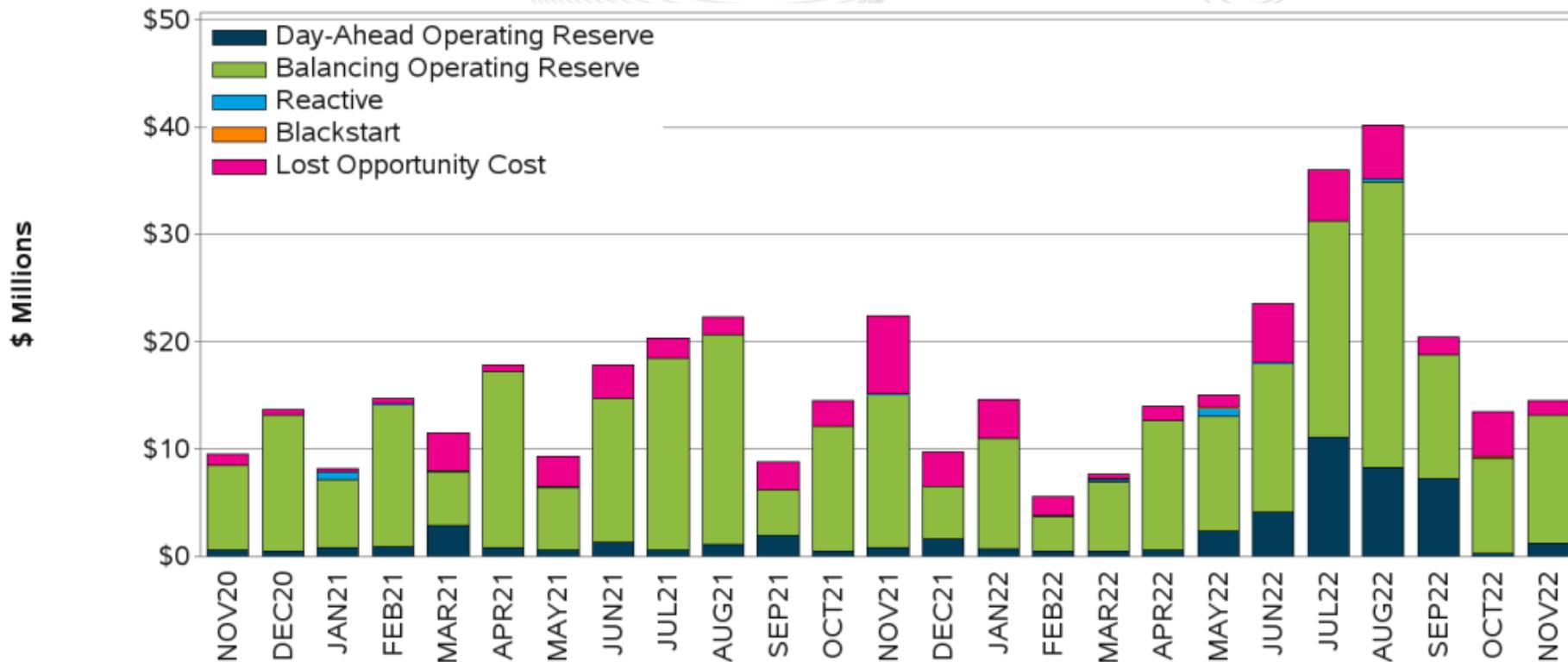
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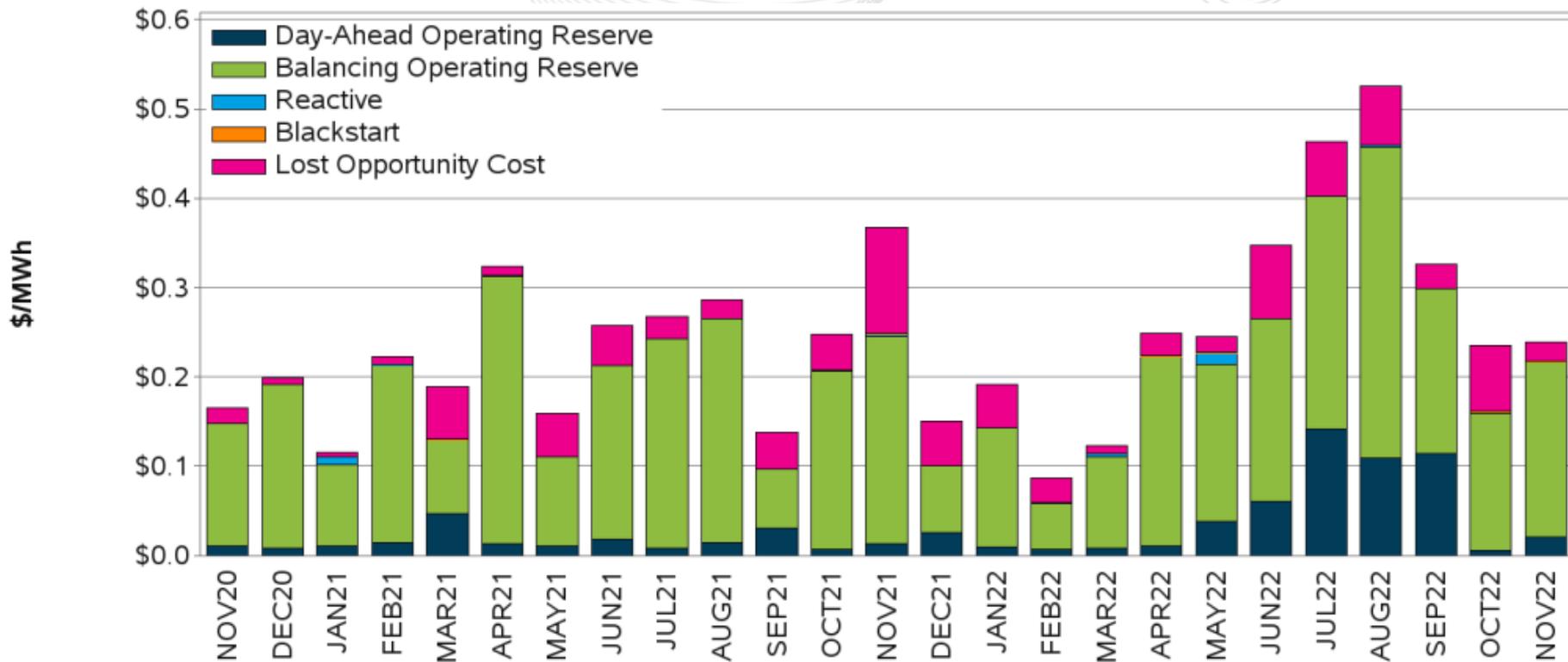
Daily Generation by Fuel, Other - November

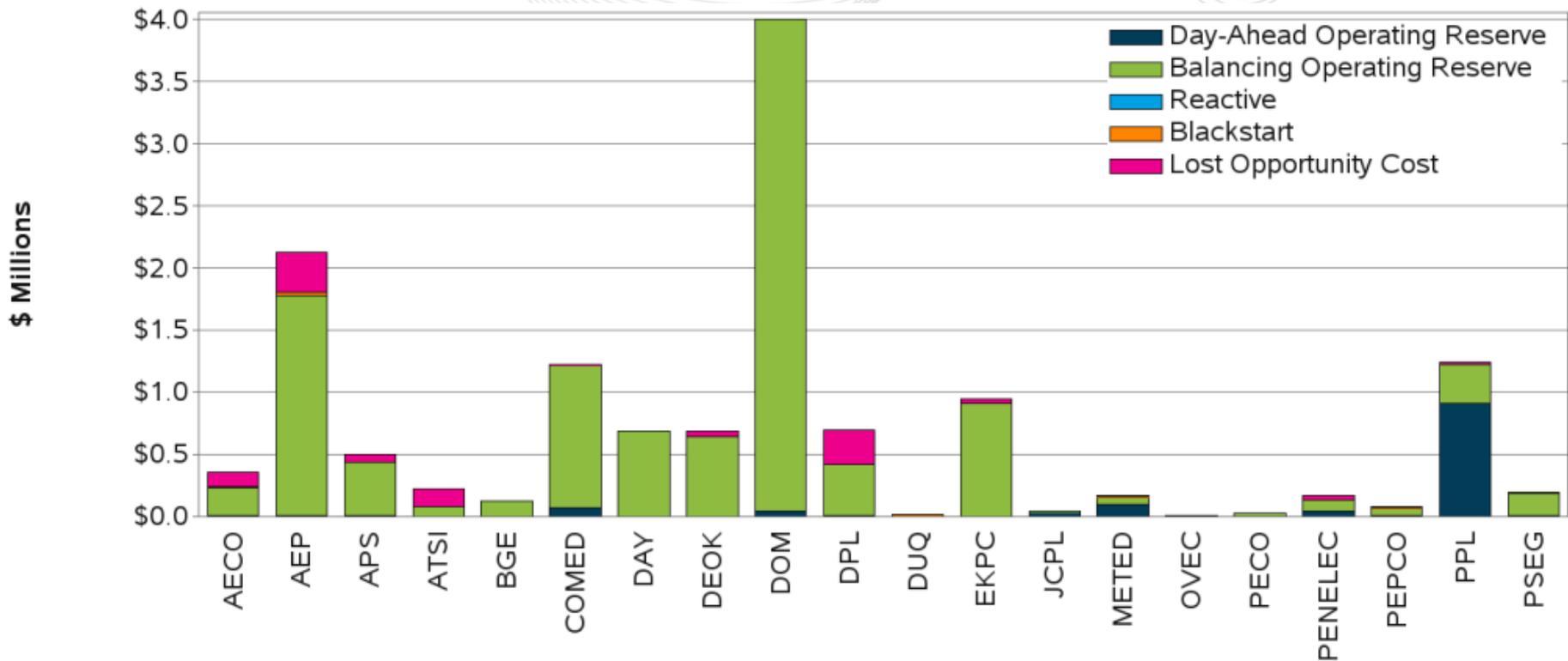


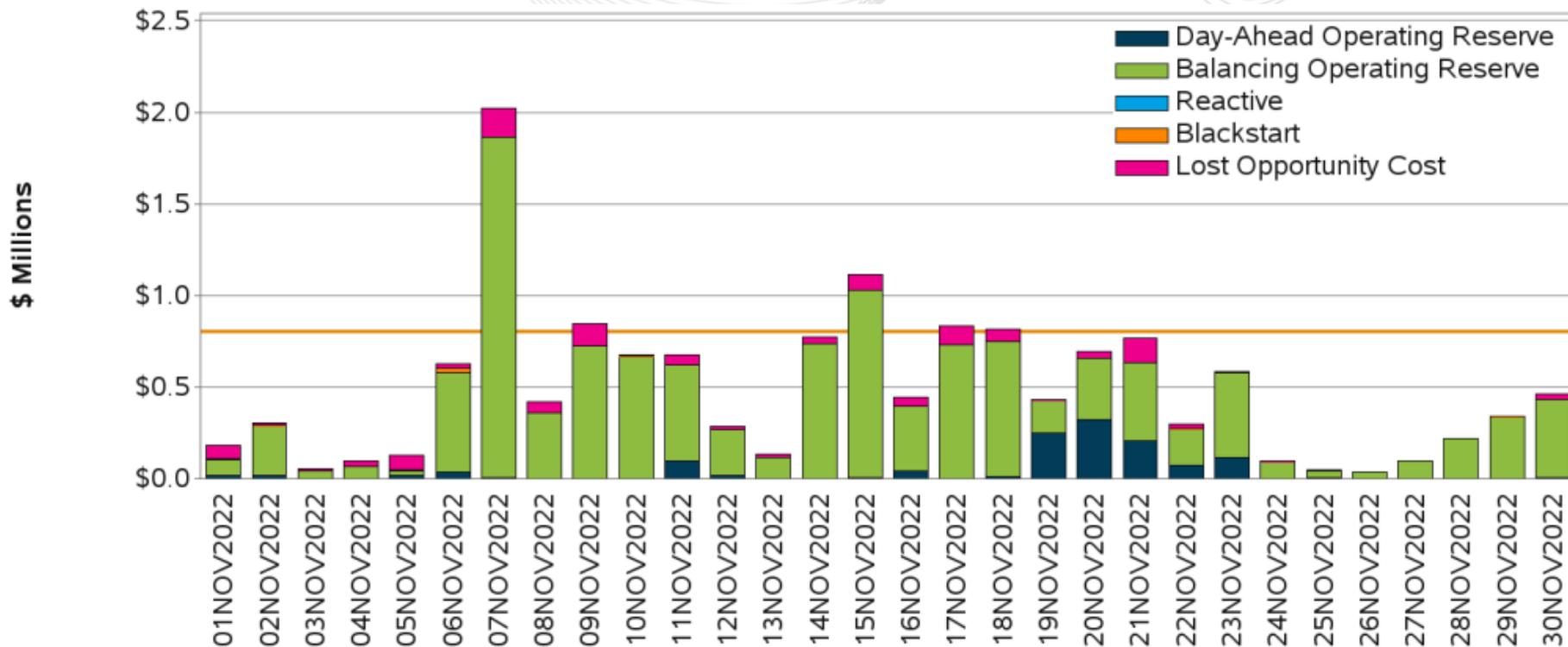
'Other' includes Flywheels, Multiple Fuels, Storage, and Other Renewables

Operating Reserve (Uplift)





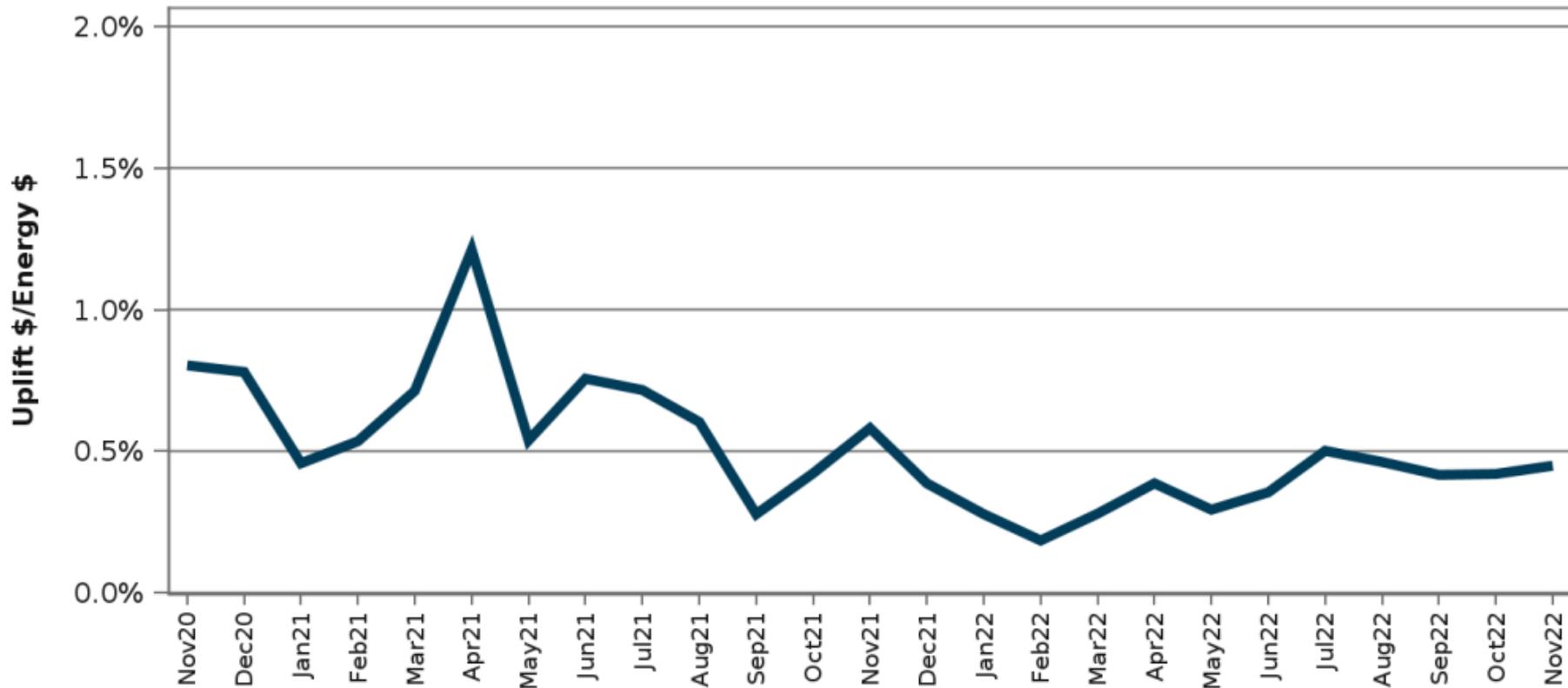




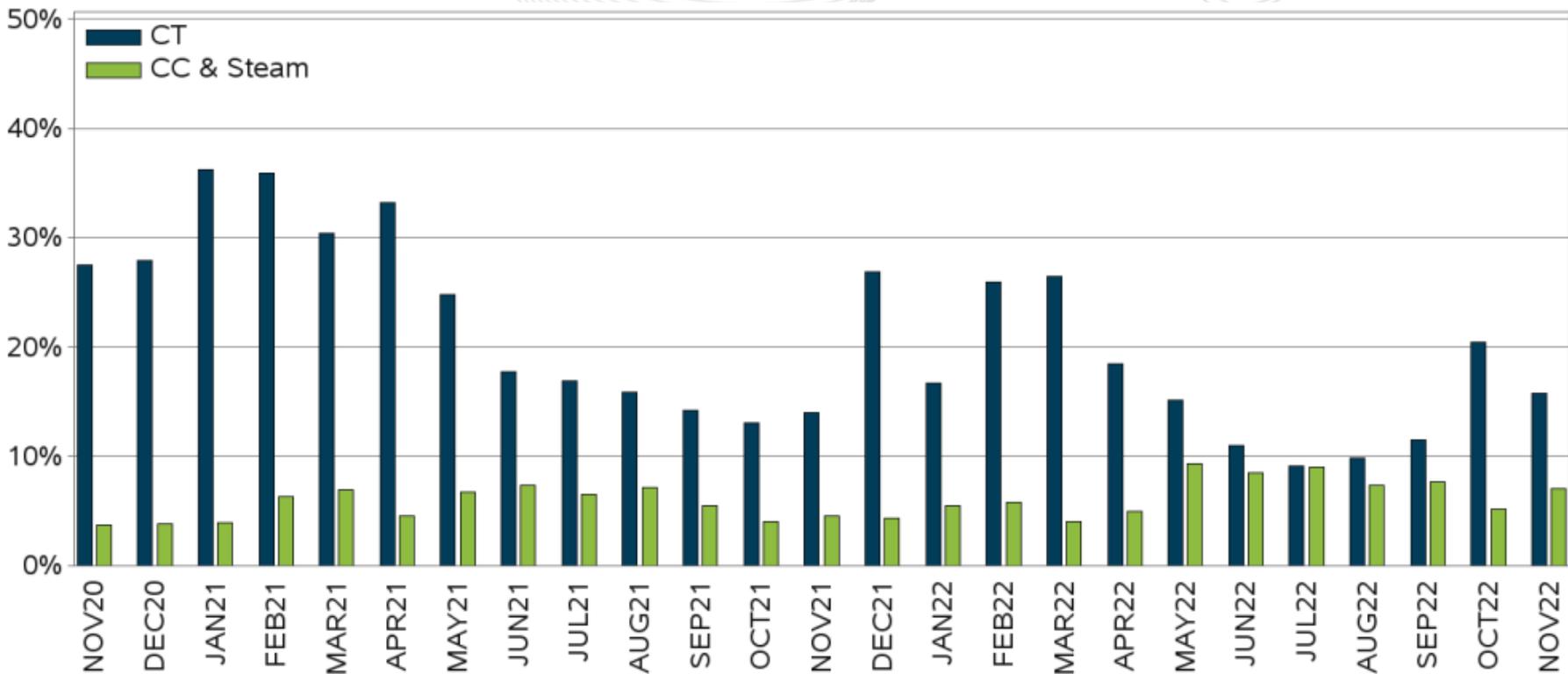
- In November, uplift exceeded \$800,000 on five days -
- Contributing factors to uplift were:

The high uplift days are a result of CTs and steam units running for localized congestion.

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

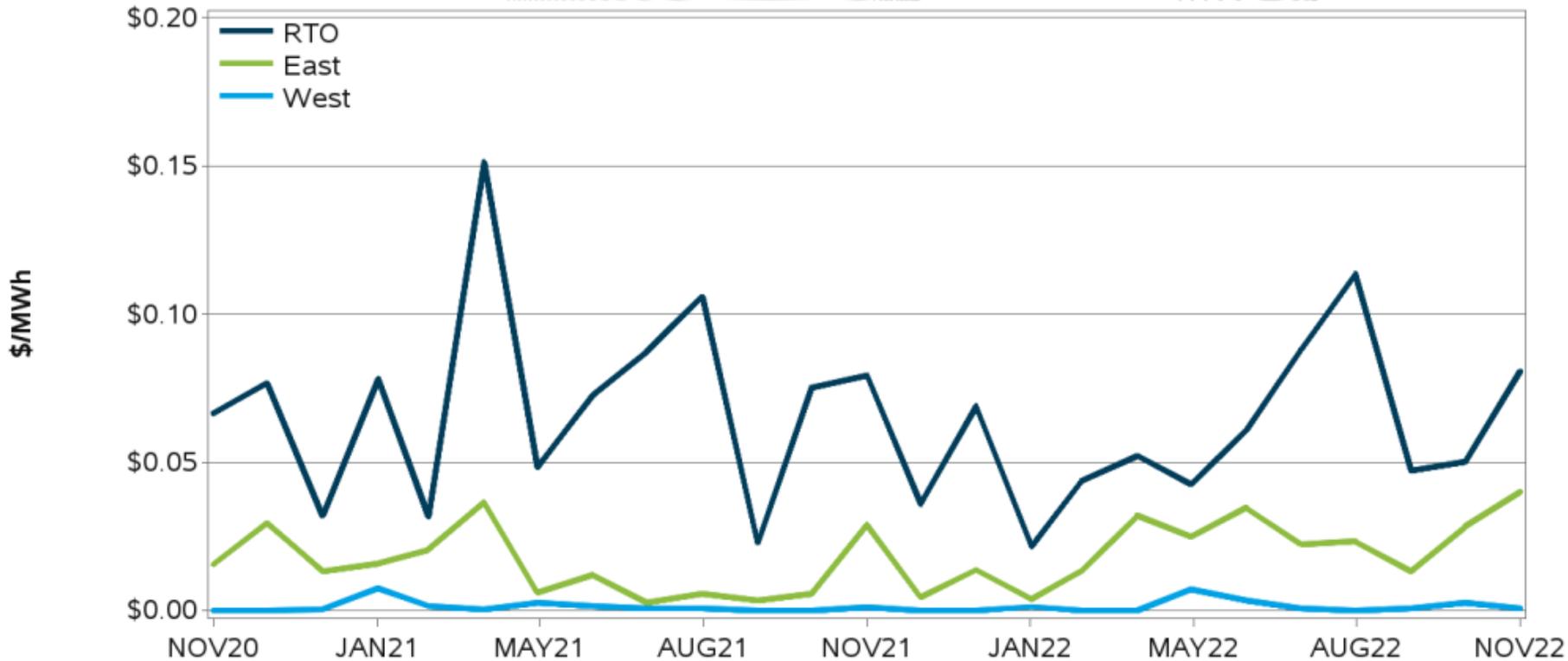


Percent of Total CT, CC and Steam Hours with LMP < Offer

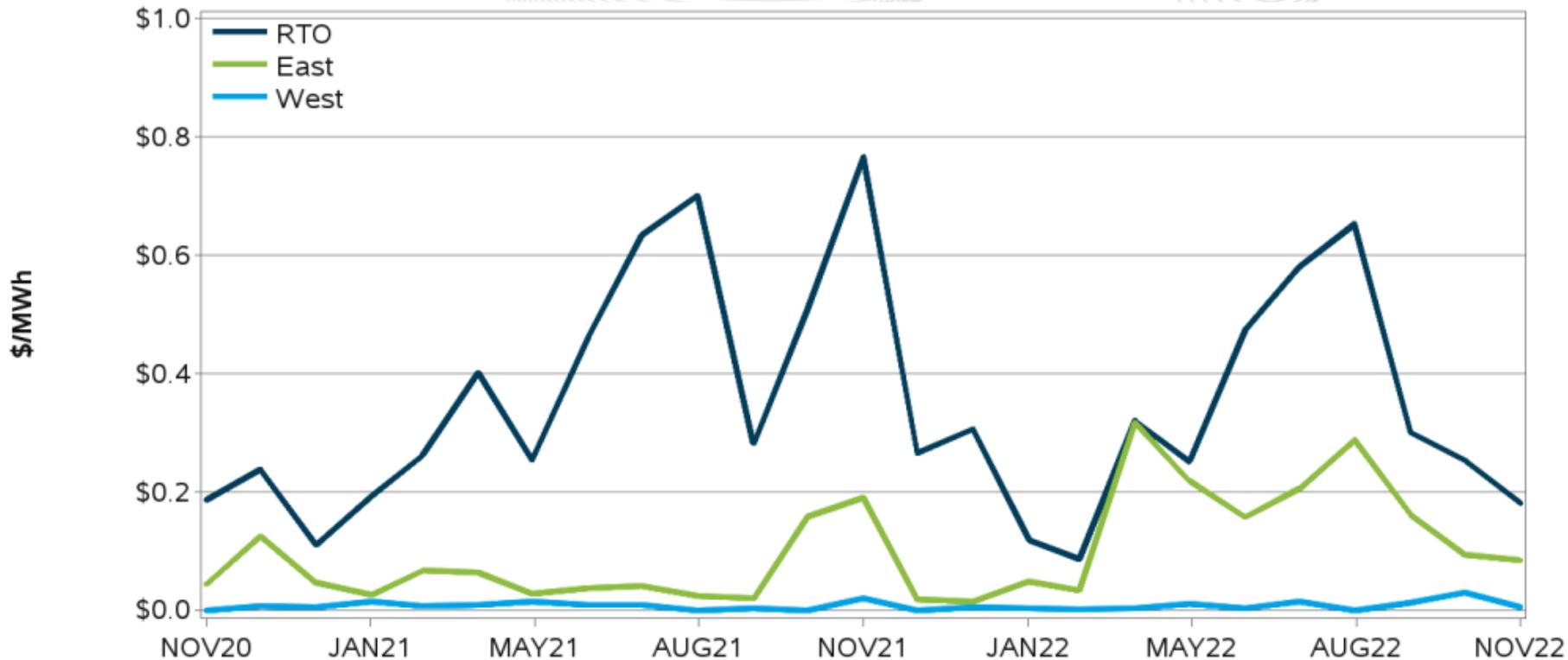


- Beginning in December 2008, the daily Balancing Operating Reserves (BOR) rate was replaced with six different BOR rates: RTO BOR for Reliability Rate, RTO BOR for Deviations Rate, East BOR for Reliability Rate, East BOR for Deviations Rate, West BOR for Reliability Rate, West BOR for Deviations Rate.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

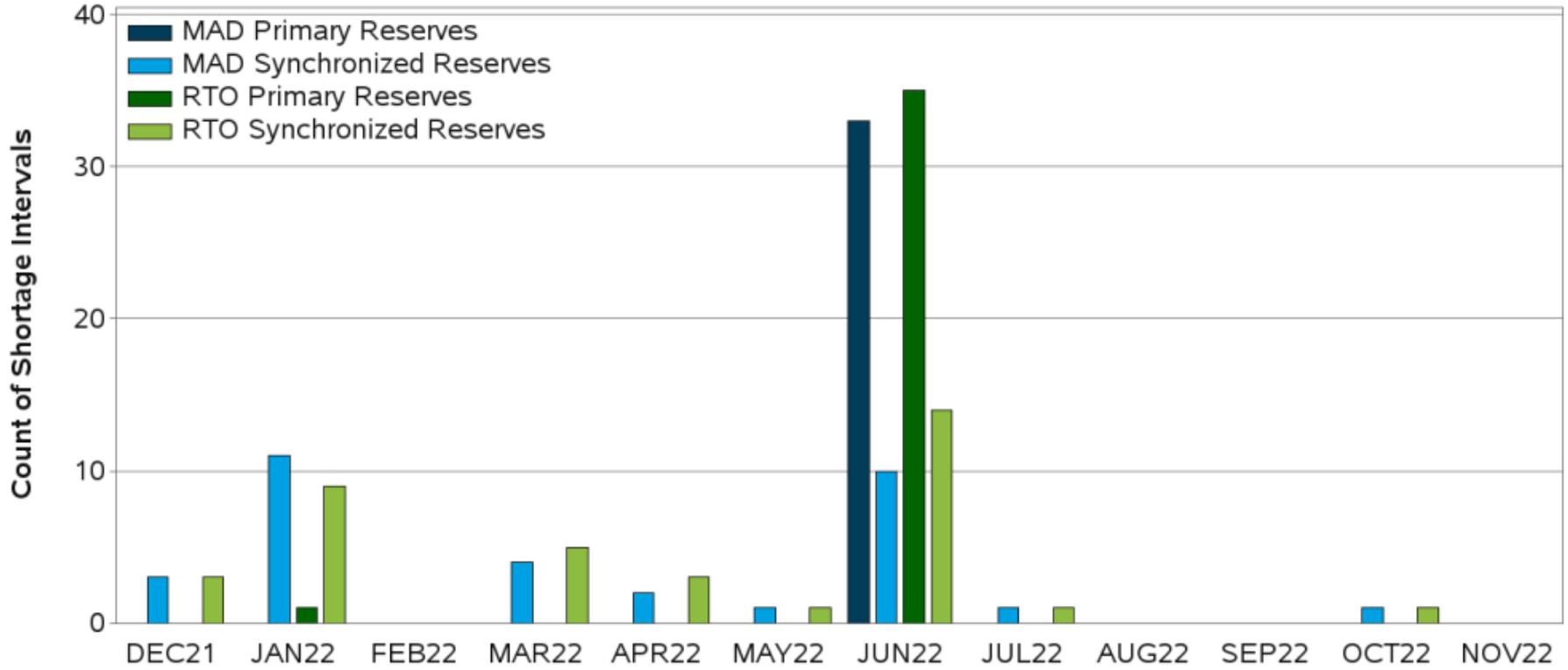
Reliability Balancing Operating Reserve Rates



Deviations Balancing Operating Reserve Rates



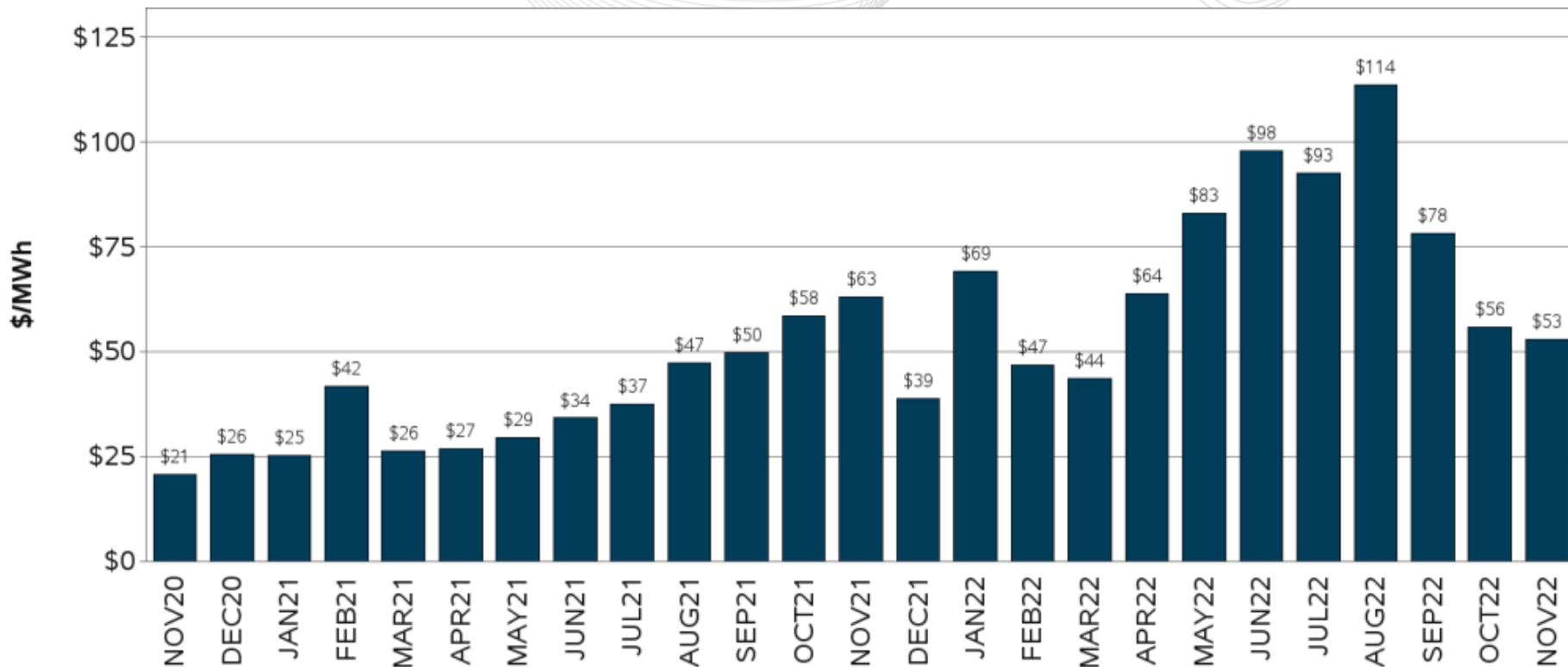
Energy Market LMP Summary



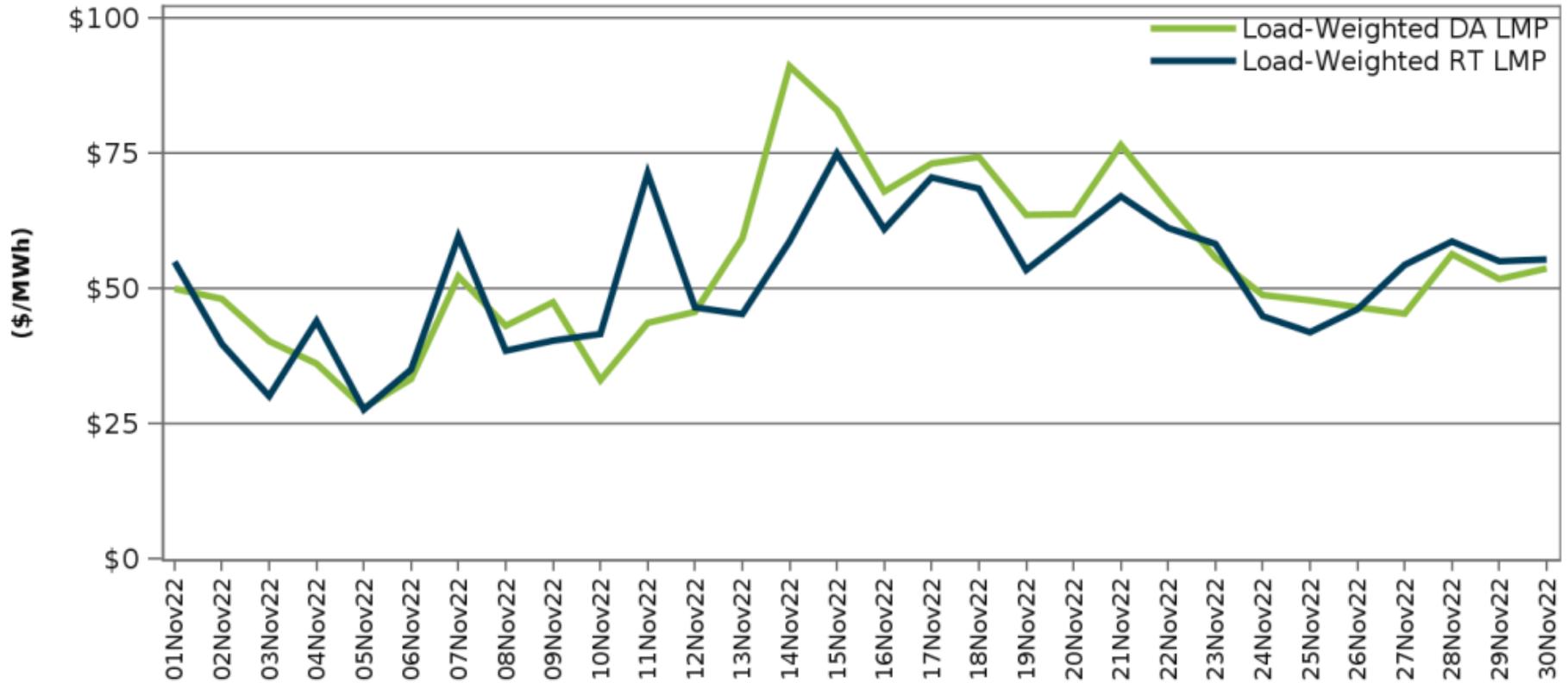
Information on constraints and shadow prices can be found here:

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

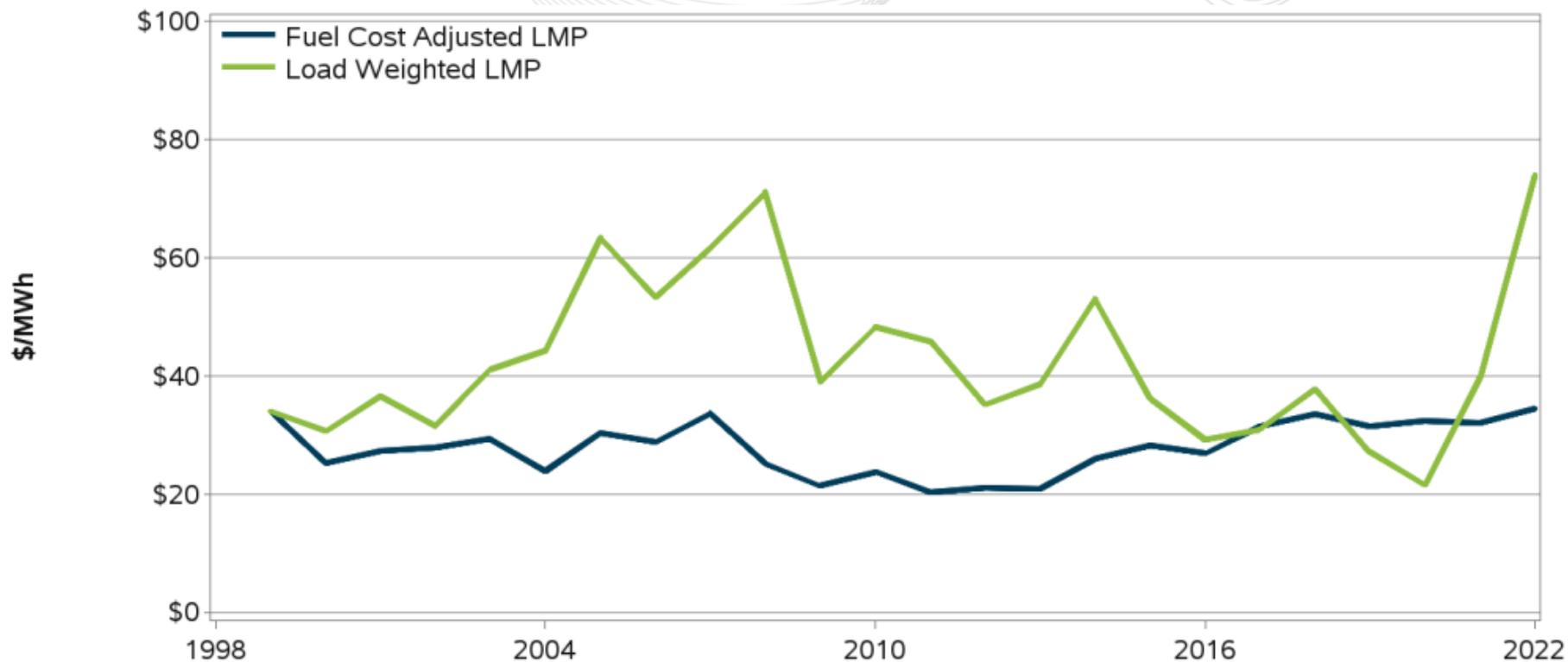
Monthly Load-Weighted Average Real-time LMP

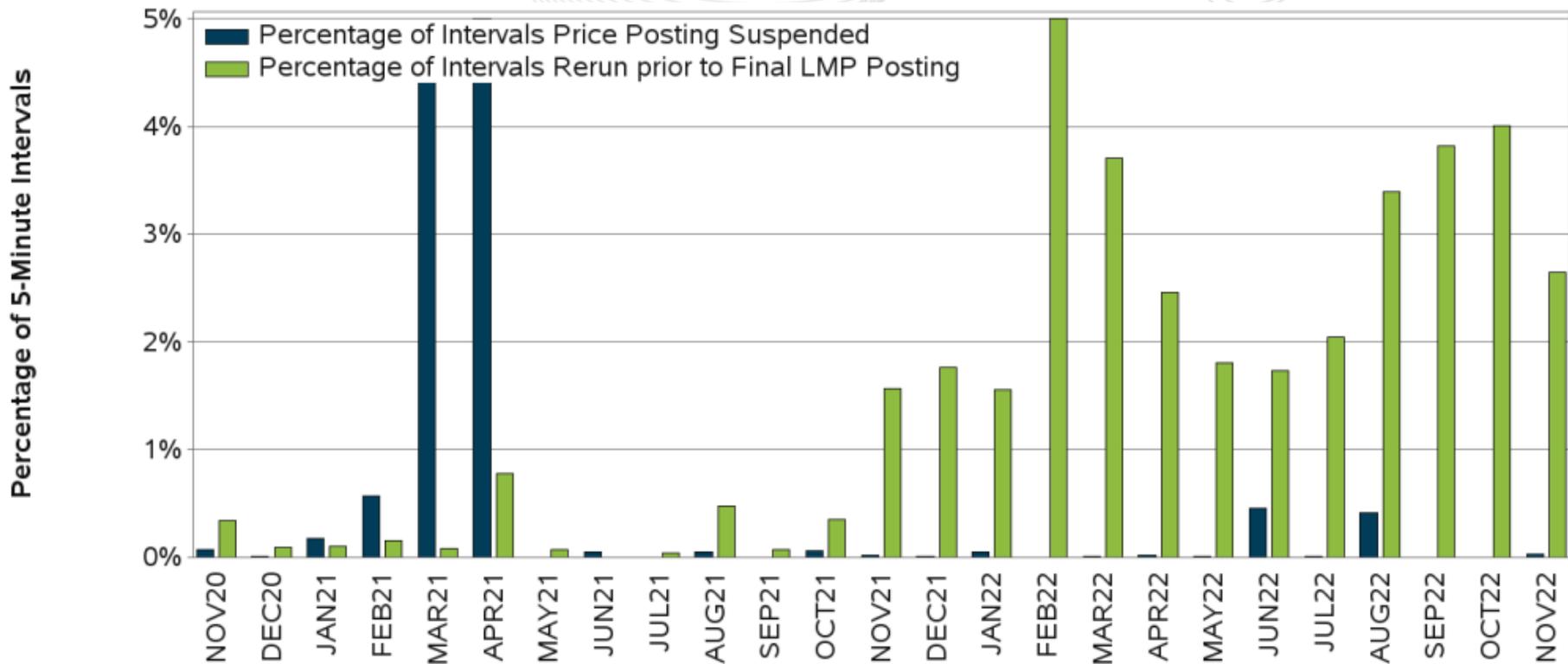


Daily Load-Weighted Average DA & RT LMP



Fuel Cost Adjusted LMP (Referenced to 1999 Fuel Prices)



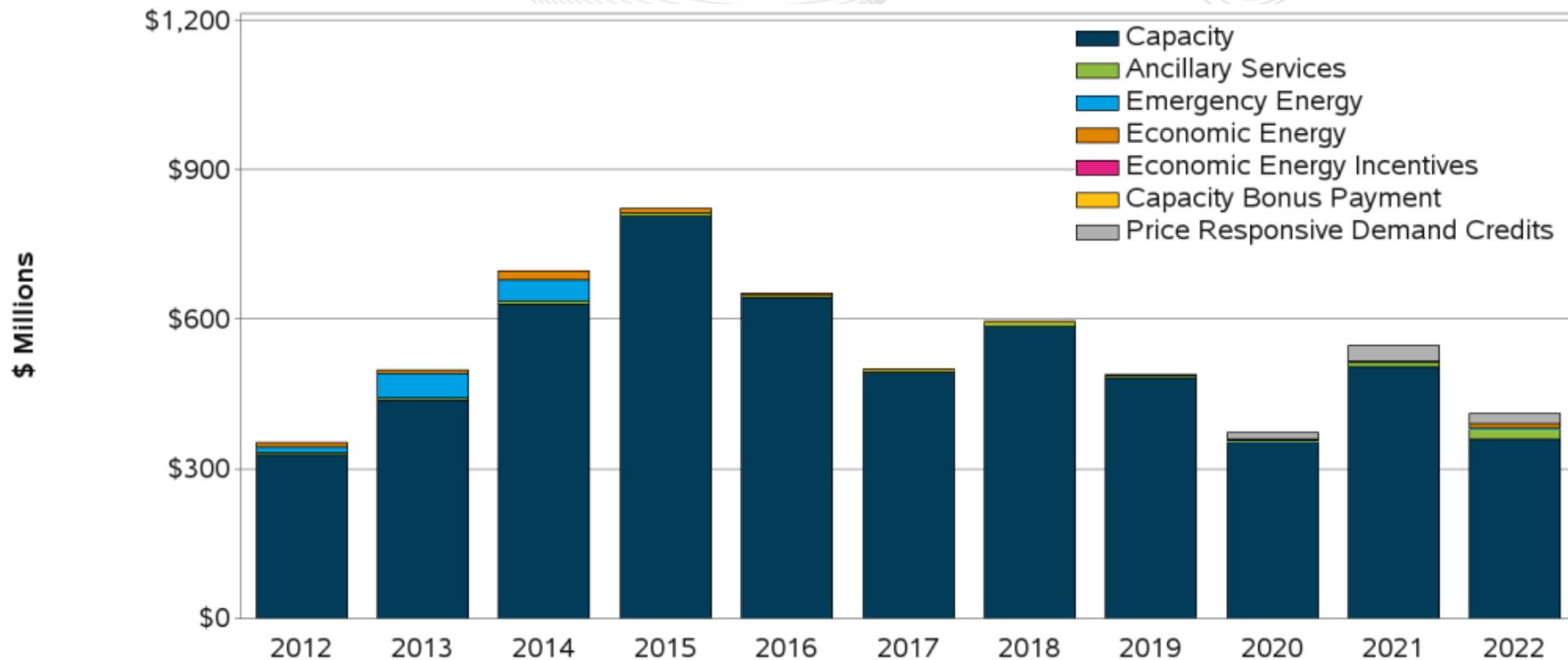


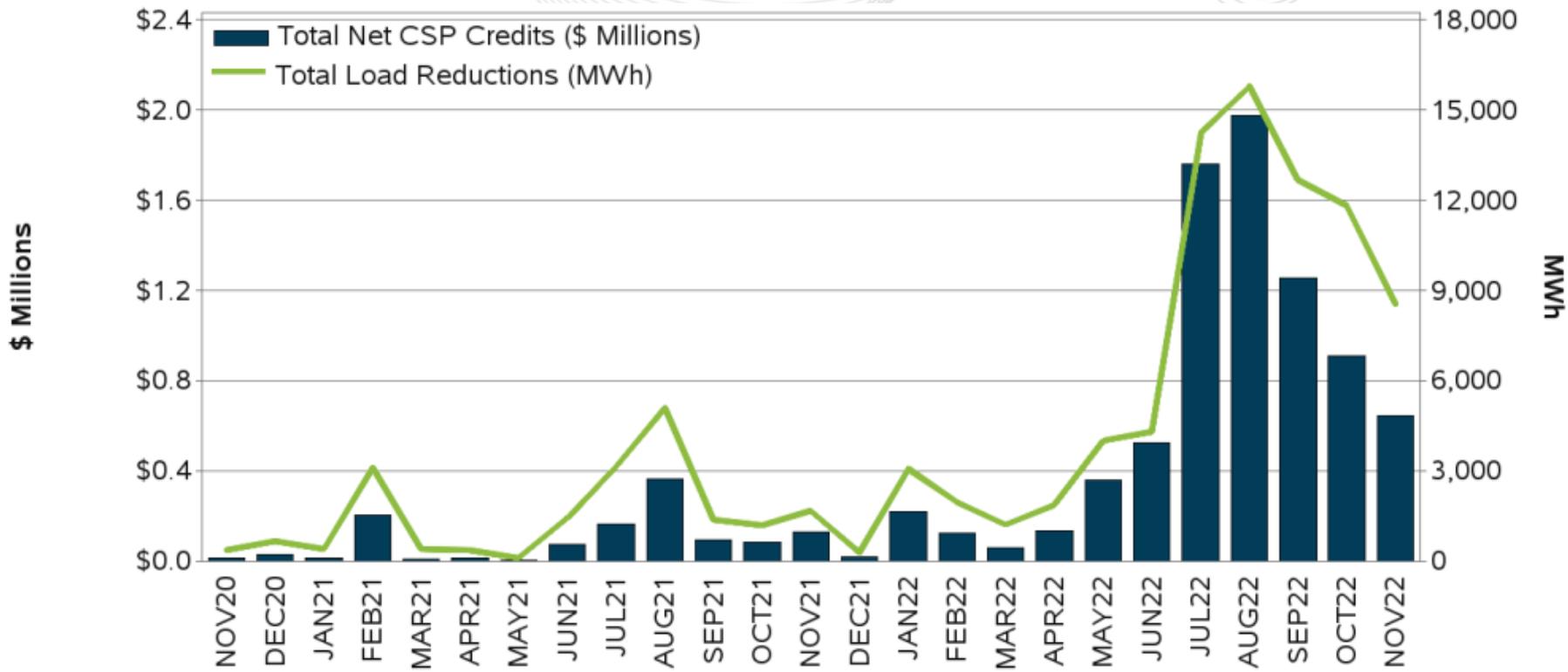
Spikes seen in March and April 2021 are incorrect and due to a software bug which has since been fixed.

Energy Market

Demand Response Summary

Demand Side Response Estimated Revenue

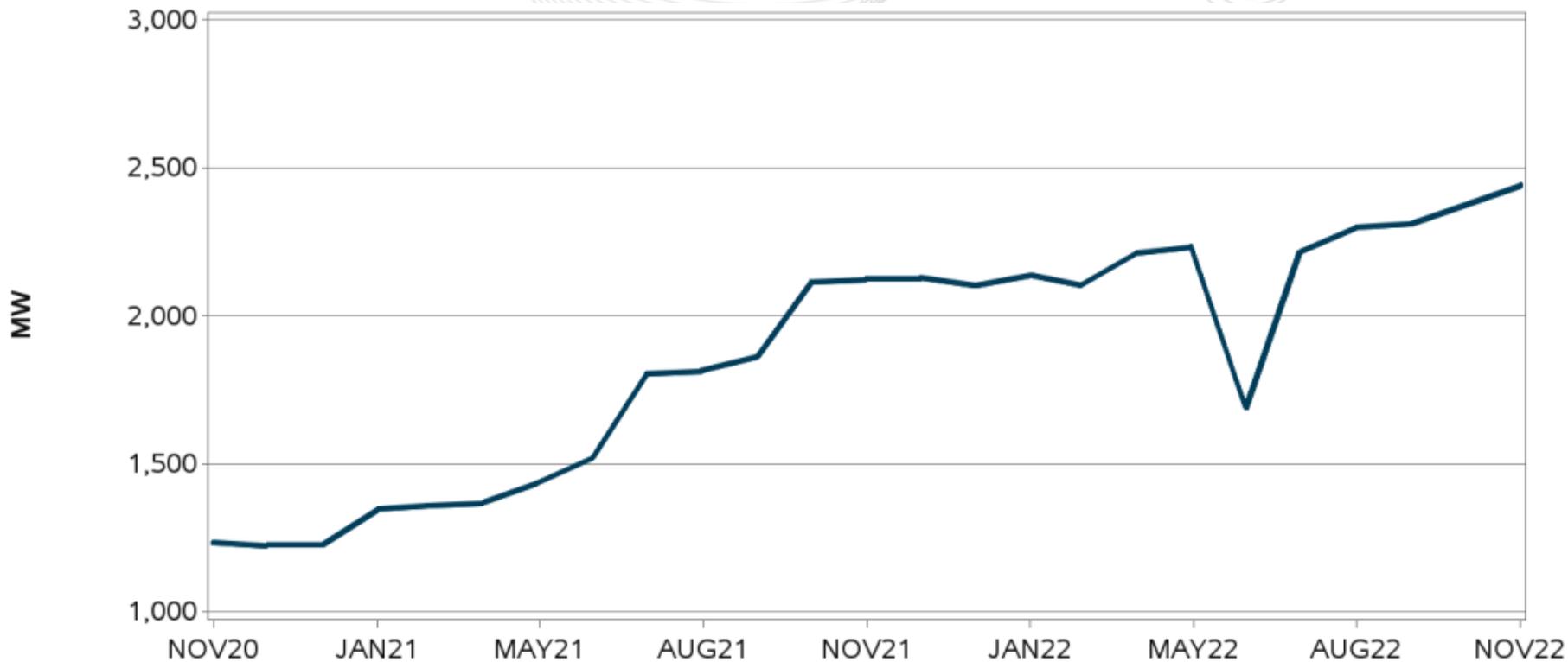




*Data for the last few months are subject to significant change due to the settlement window.



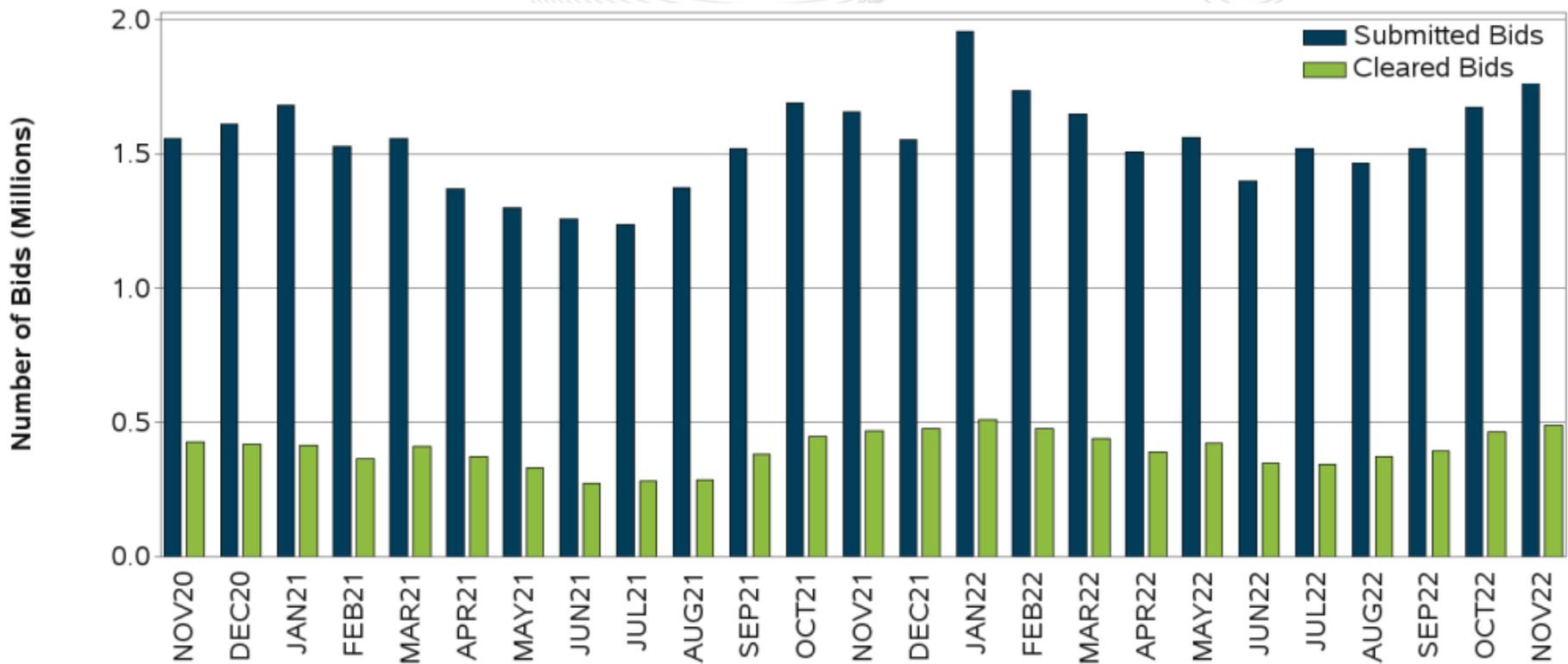
Total Registered MW in PJM's Economic Demand Response



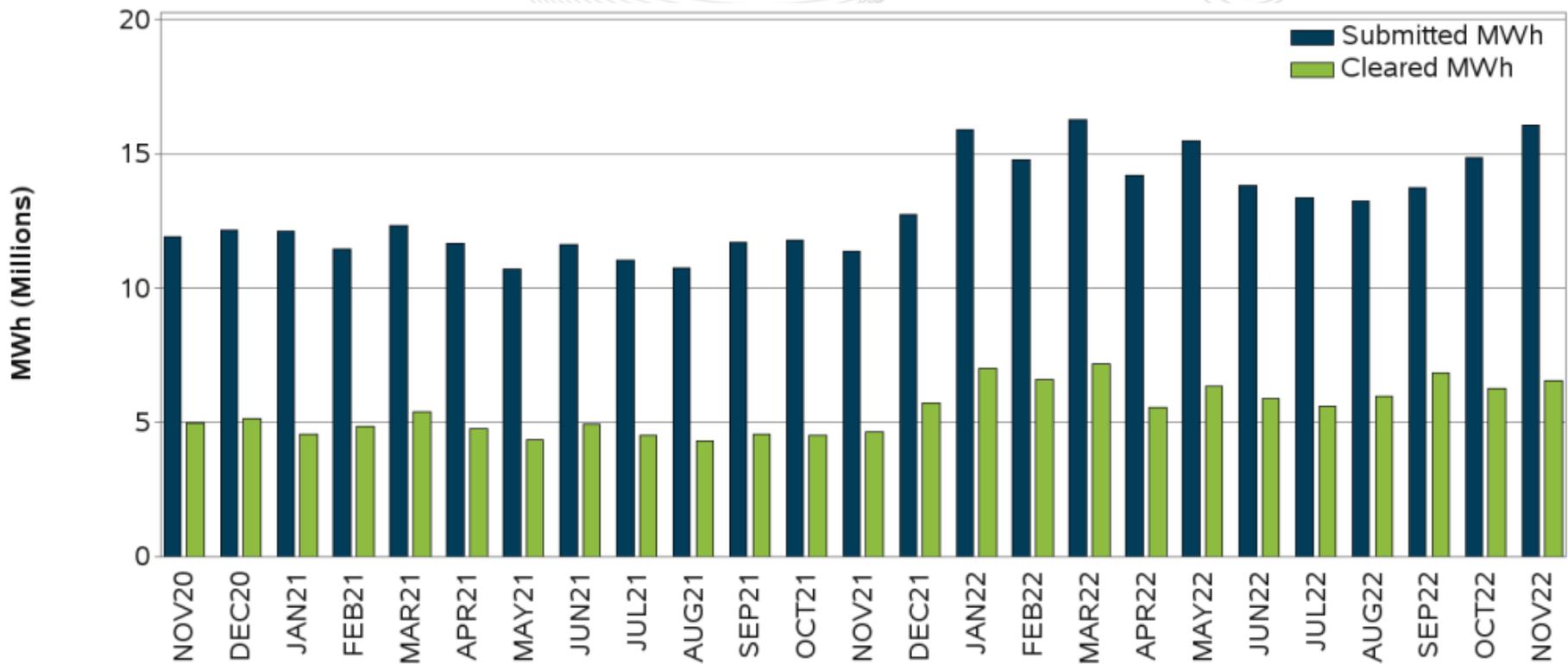
Energy Market

Virtual Activity Summary

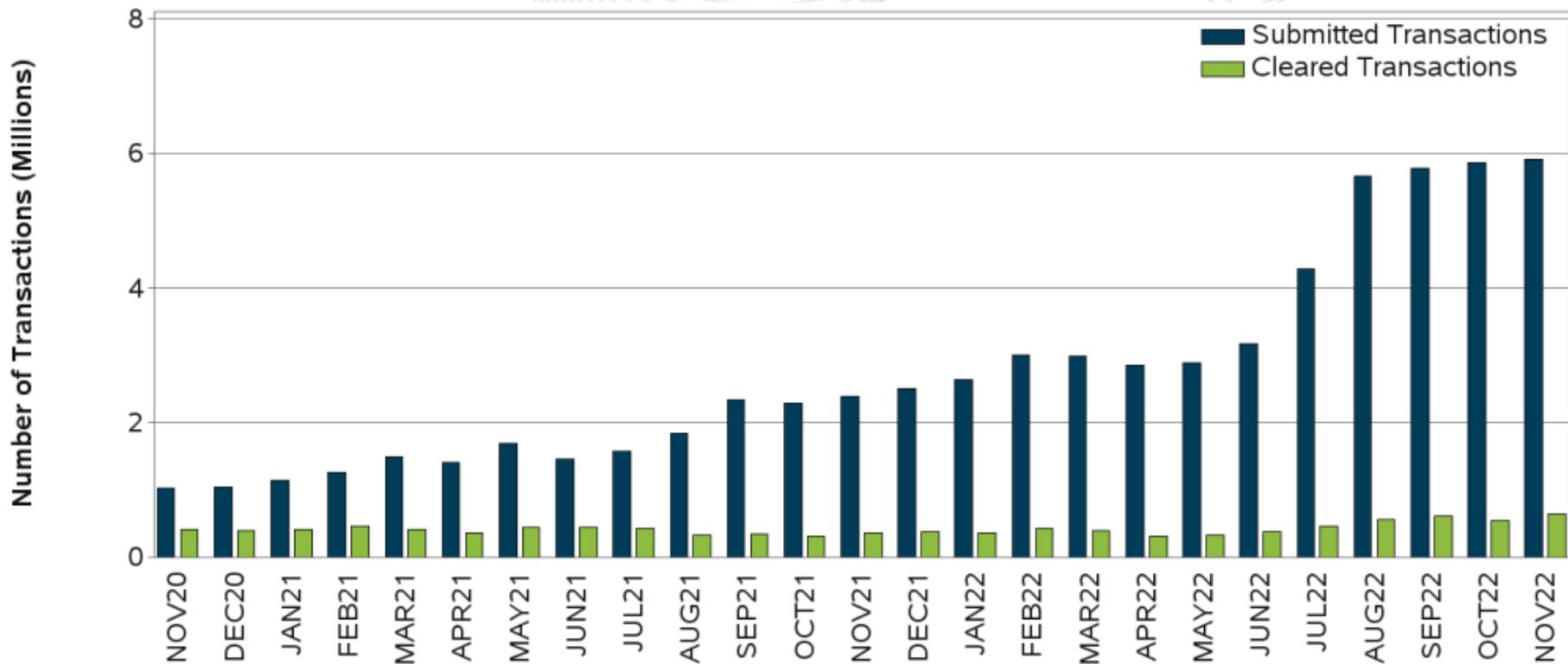
- The following six charts depict trends in submitted and cleared virtual and up-to-congestion transactions, in terms of number and volume, into the PJM Energy Market. The first two of these charts show the submitted and cleared increment and decrement bids (virtual transactions or virtuals) and they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



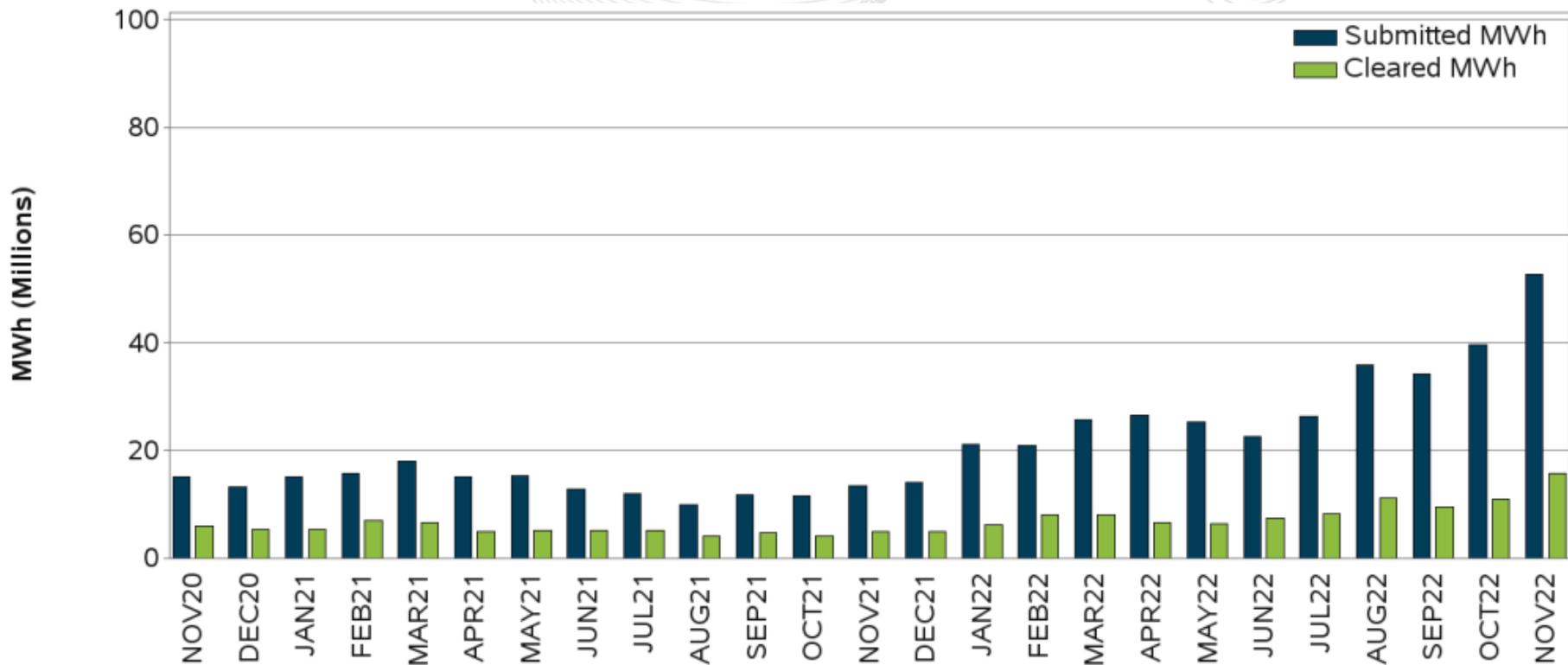
Virtual Bids (INCs & DECs) - Total Volume



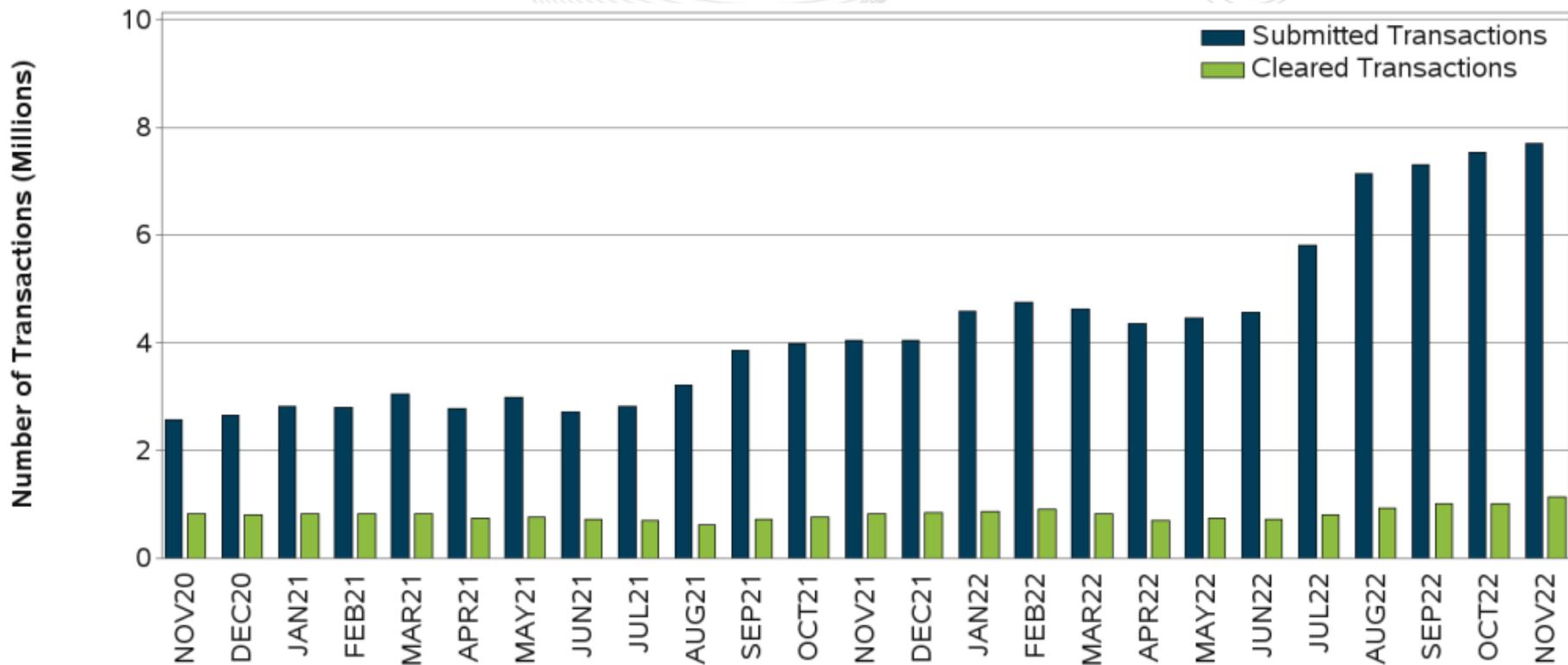
Up-To-Congestion Transactions - Total Number



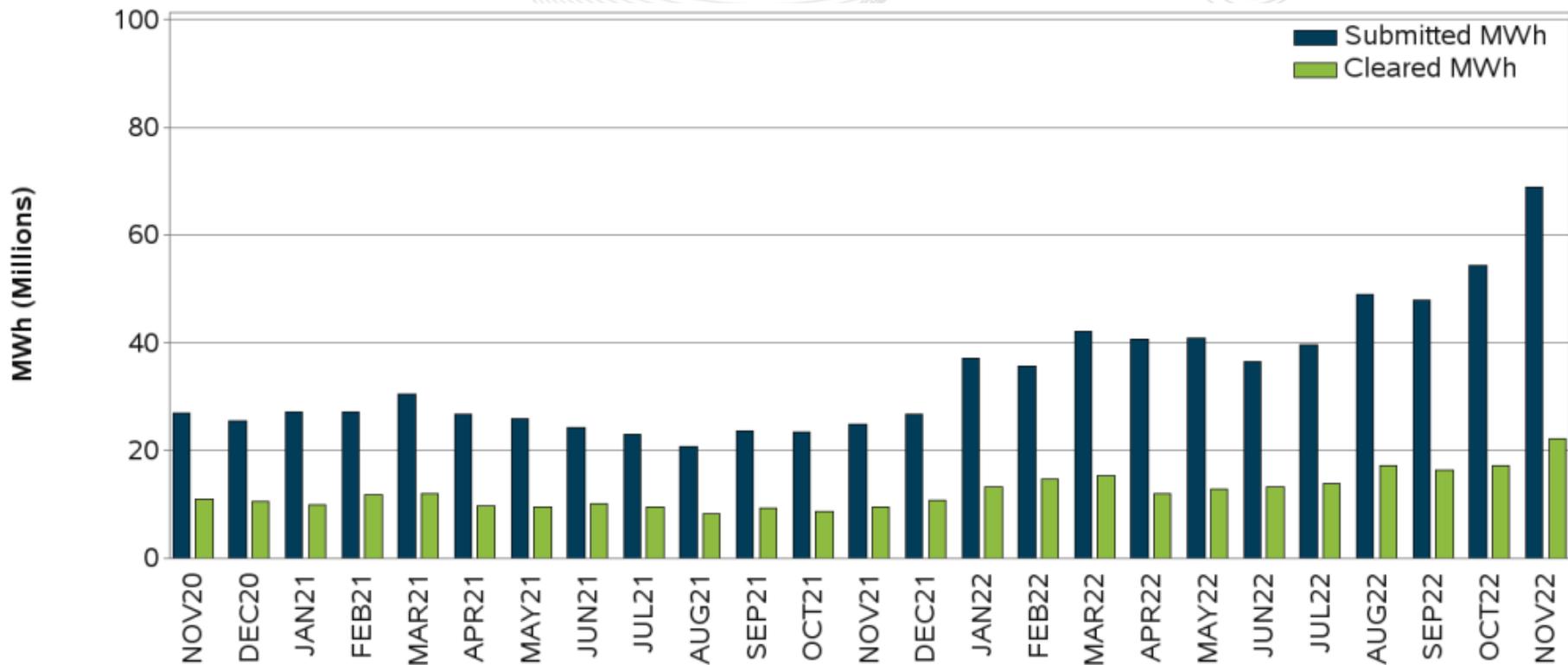
Up-To-Congestion Transactions - Total Volume



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



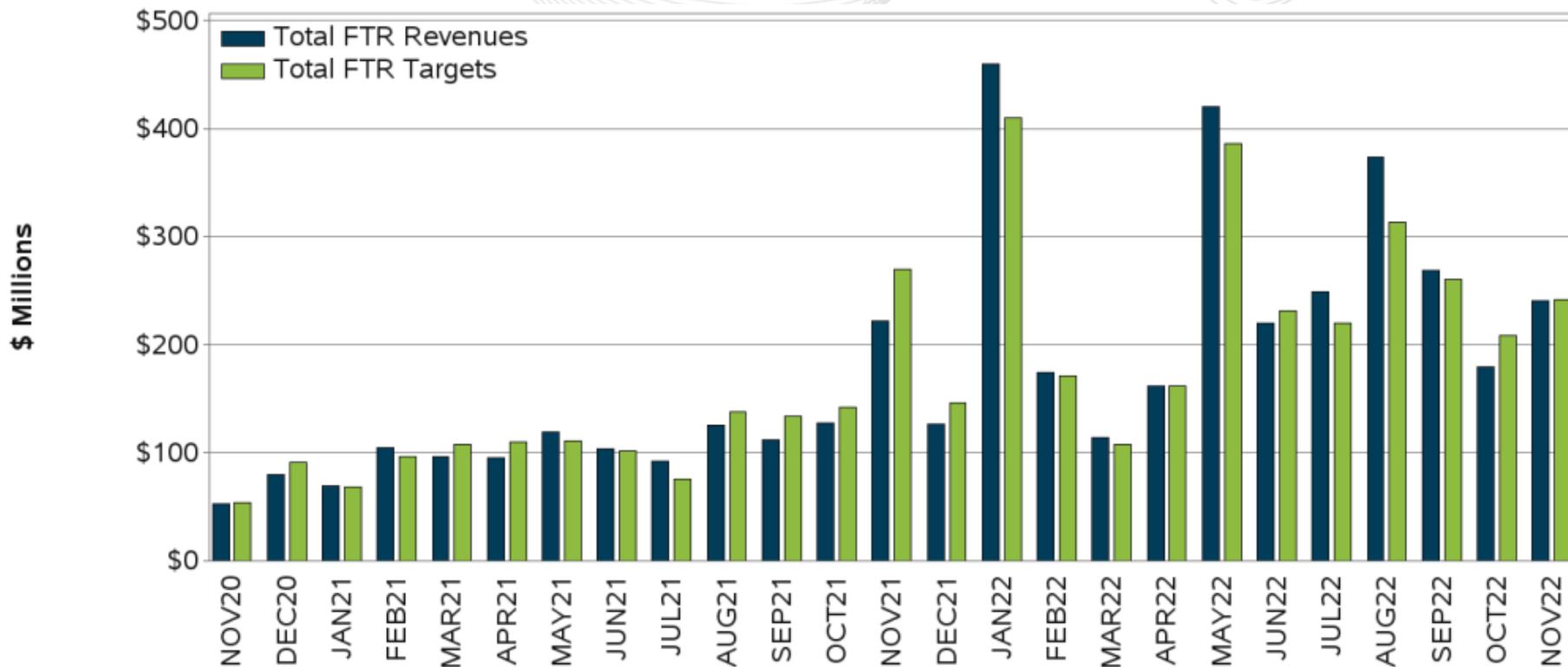
INCs, DEC and Up-To-Congestion Transactions - Total Volume

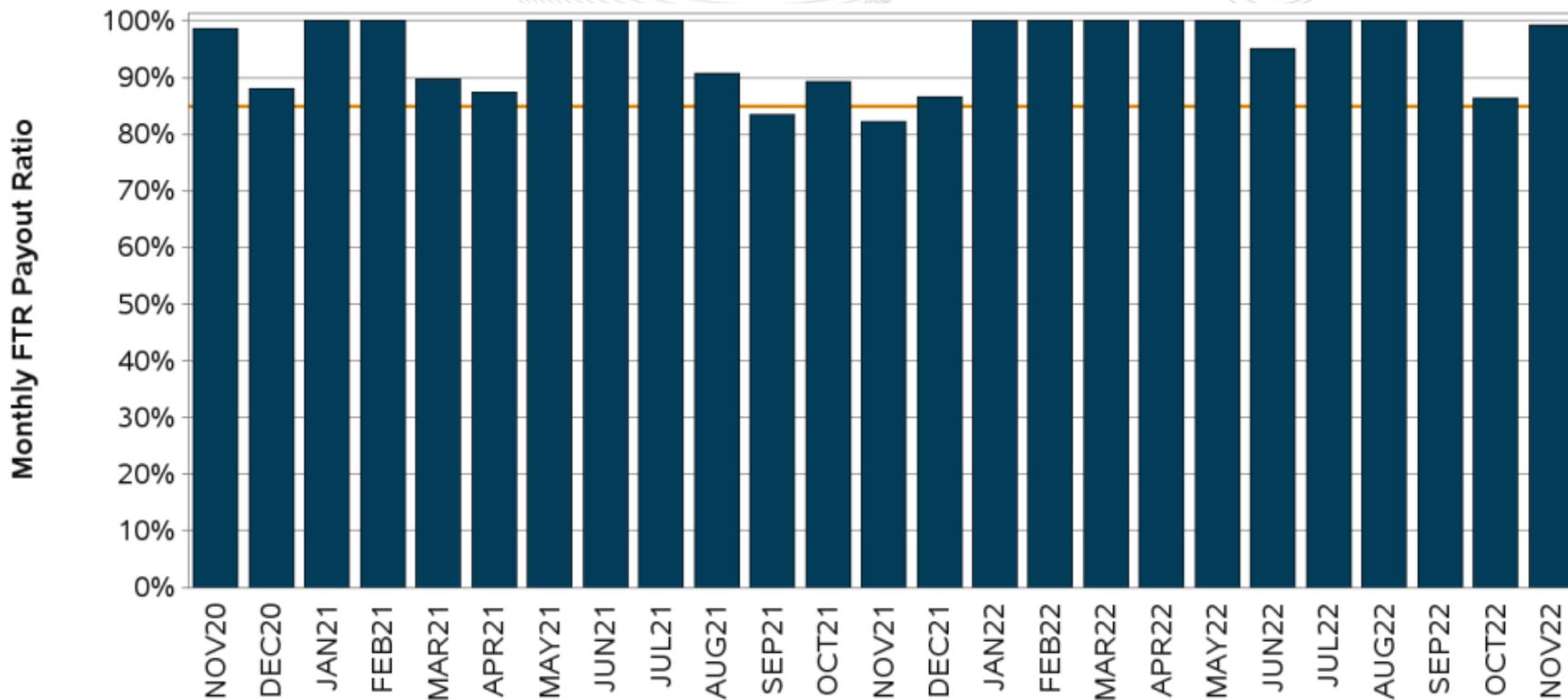


Energy Market

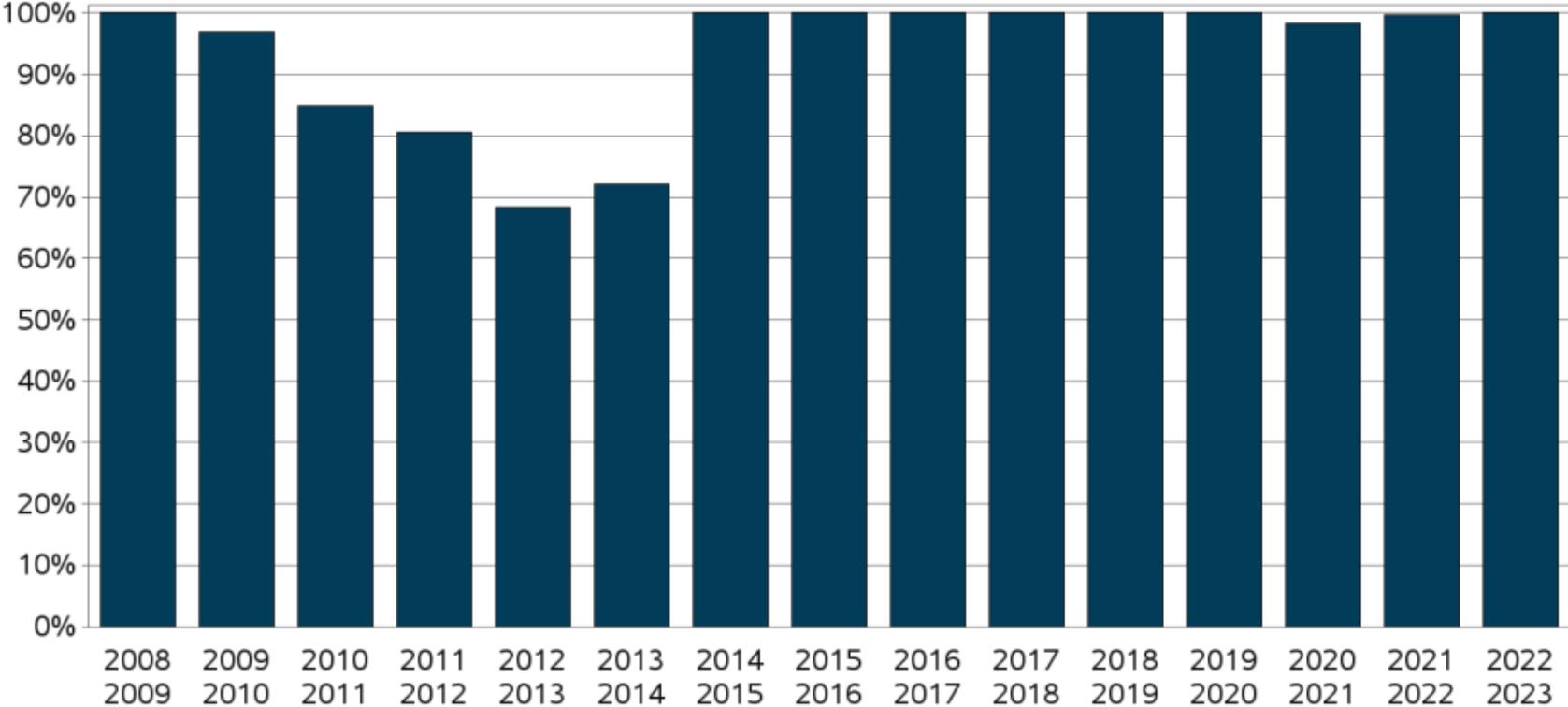
Congestion and FTR Summary

Period	Surplus / Underfunding	Payout Ratio
November 2022	\$-1,700,837	99%
2022	\$157,983,460	100%
2022/2023	\$63,877,440	100%



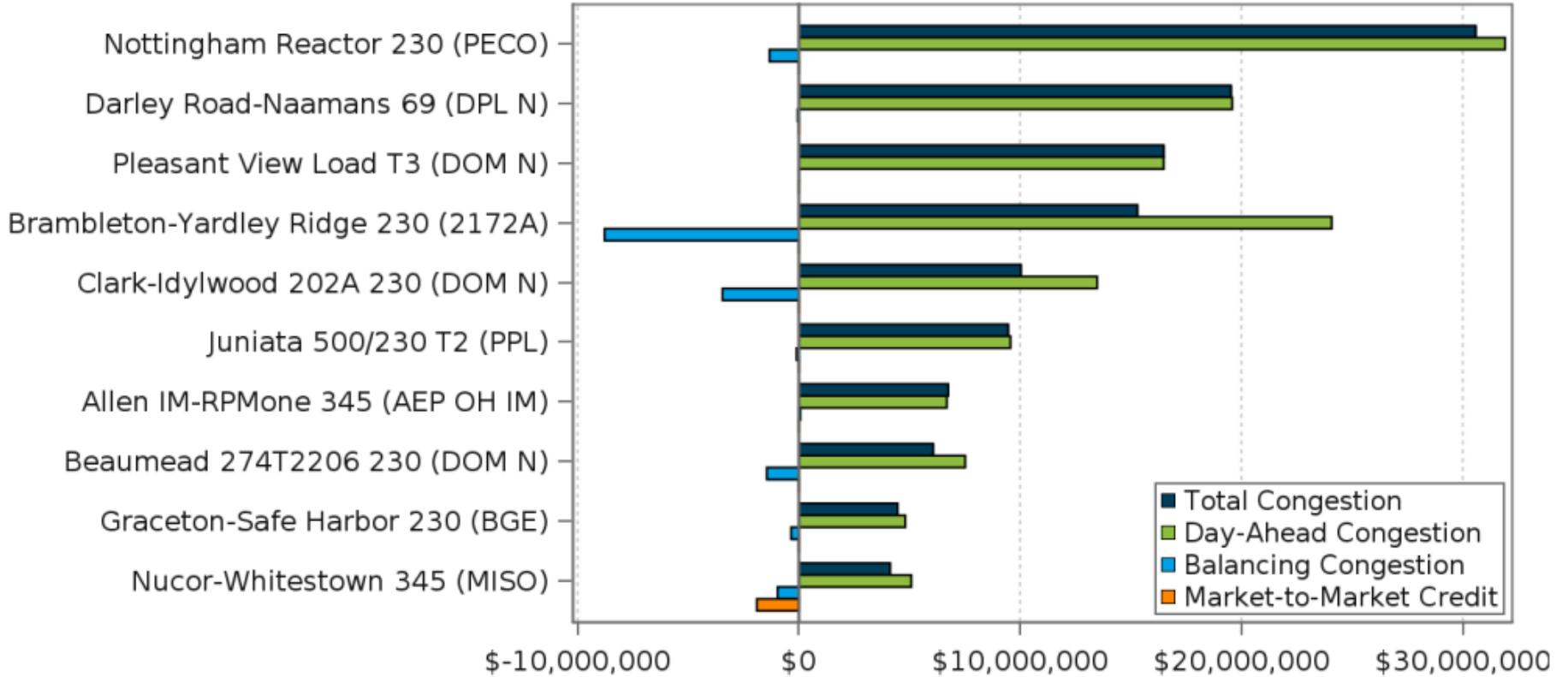


Planning Period FTR Payout Ratio



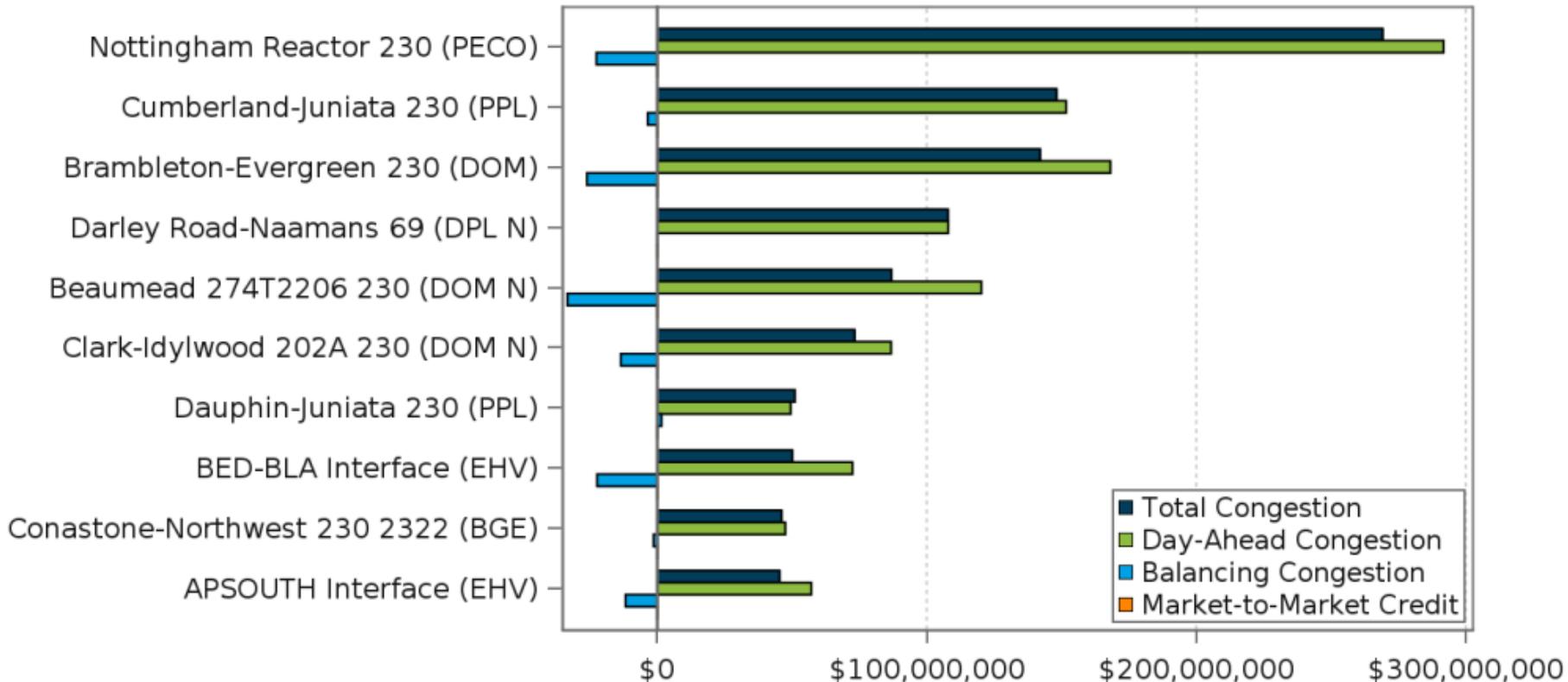


Ten Most Heavily Congested Transmission Facilities - Overall, November



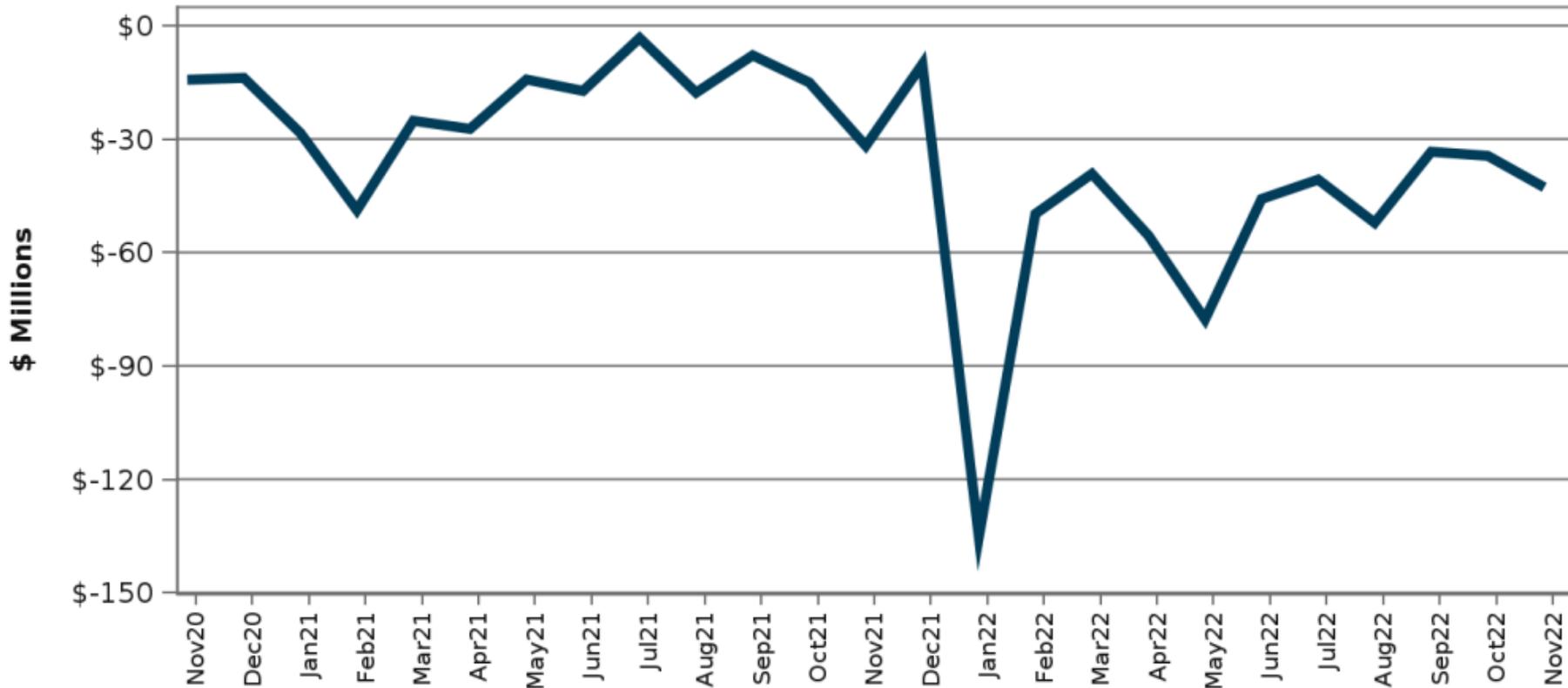
The ten most heavily congested facilities account for 65% of total congestion for November.

Ten Most Heavily Congested Transmission Facilities - Overall, 2022



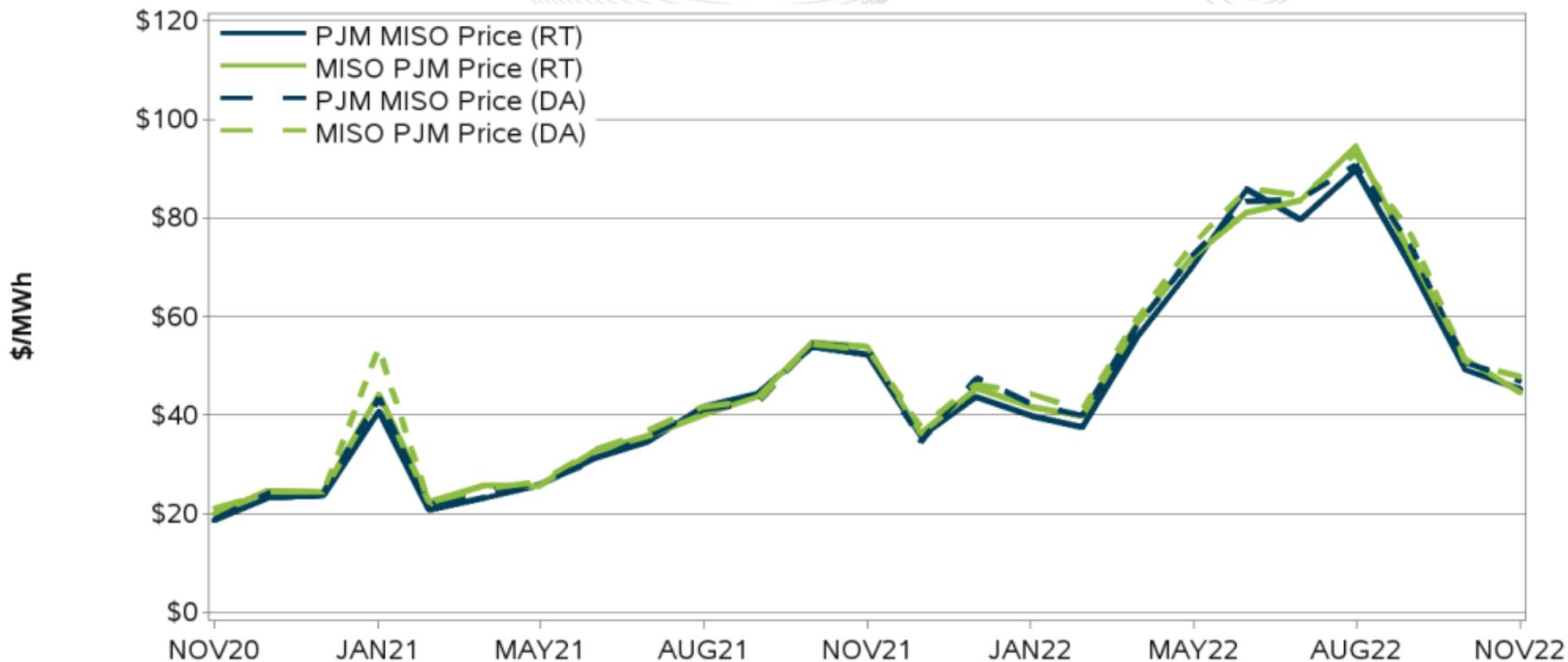
The ten most heavily congested facilities account for 47% of total congestion for 2022.

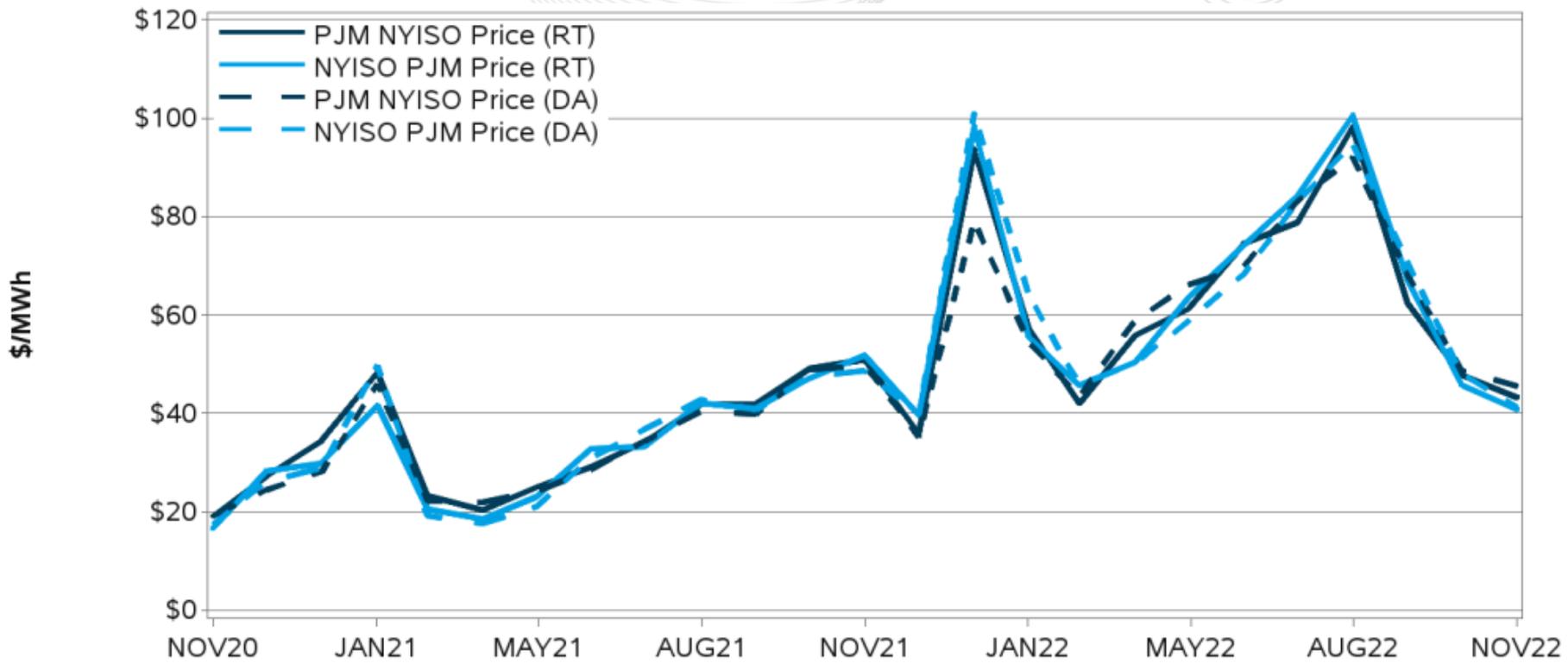
Balancing Congestion Charge Revenues (BLI 2215)



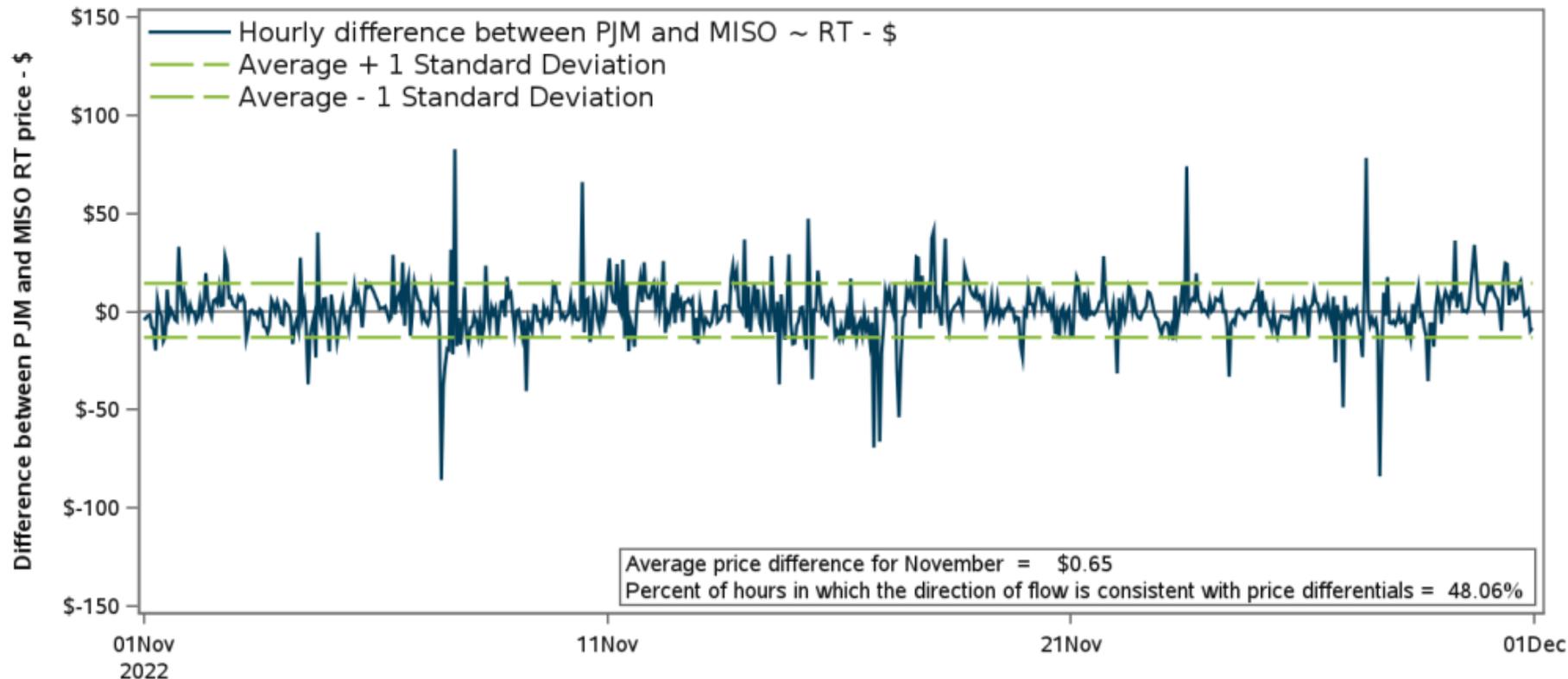
Energy Market

Interchange/Seams Summary



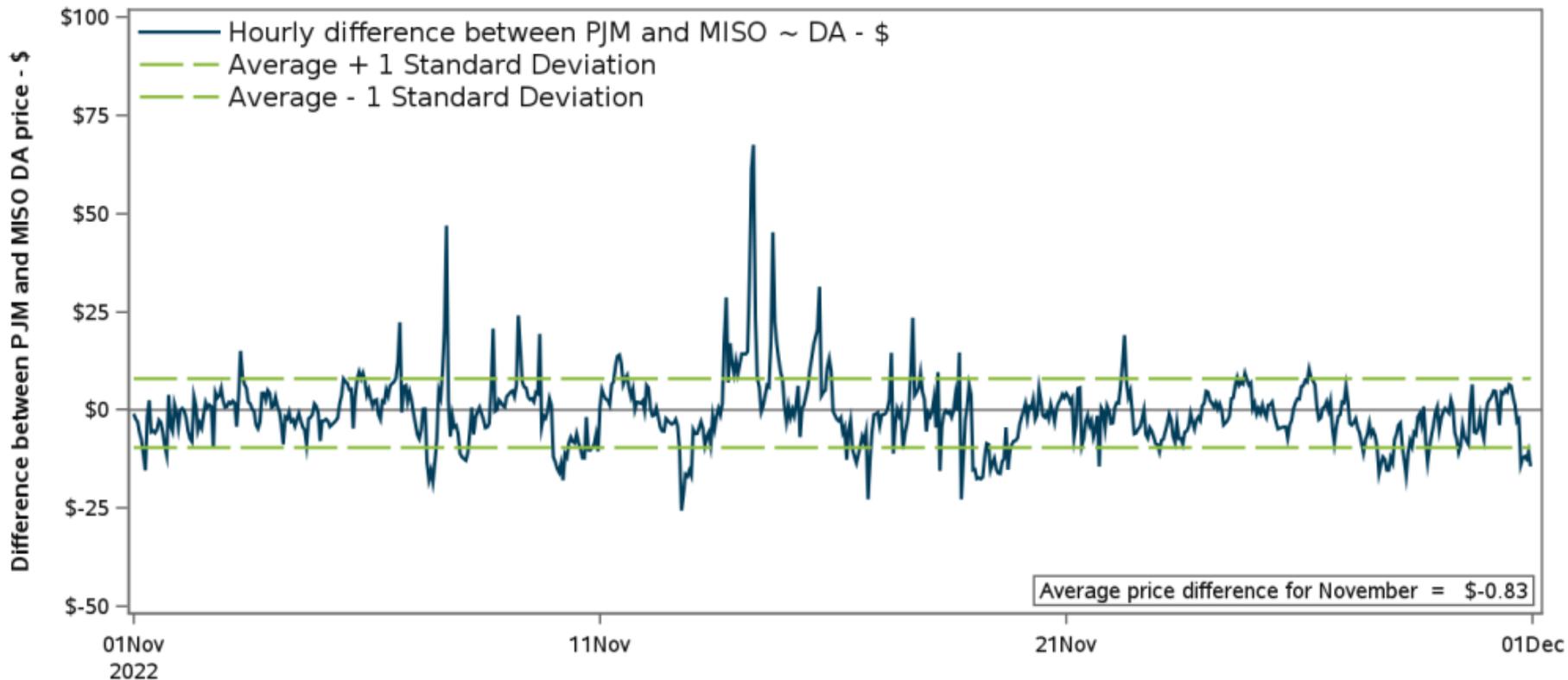


Hourly Difference Between PJM and MISO Real-Time Prices



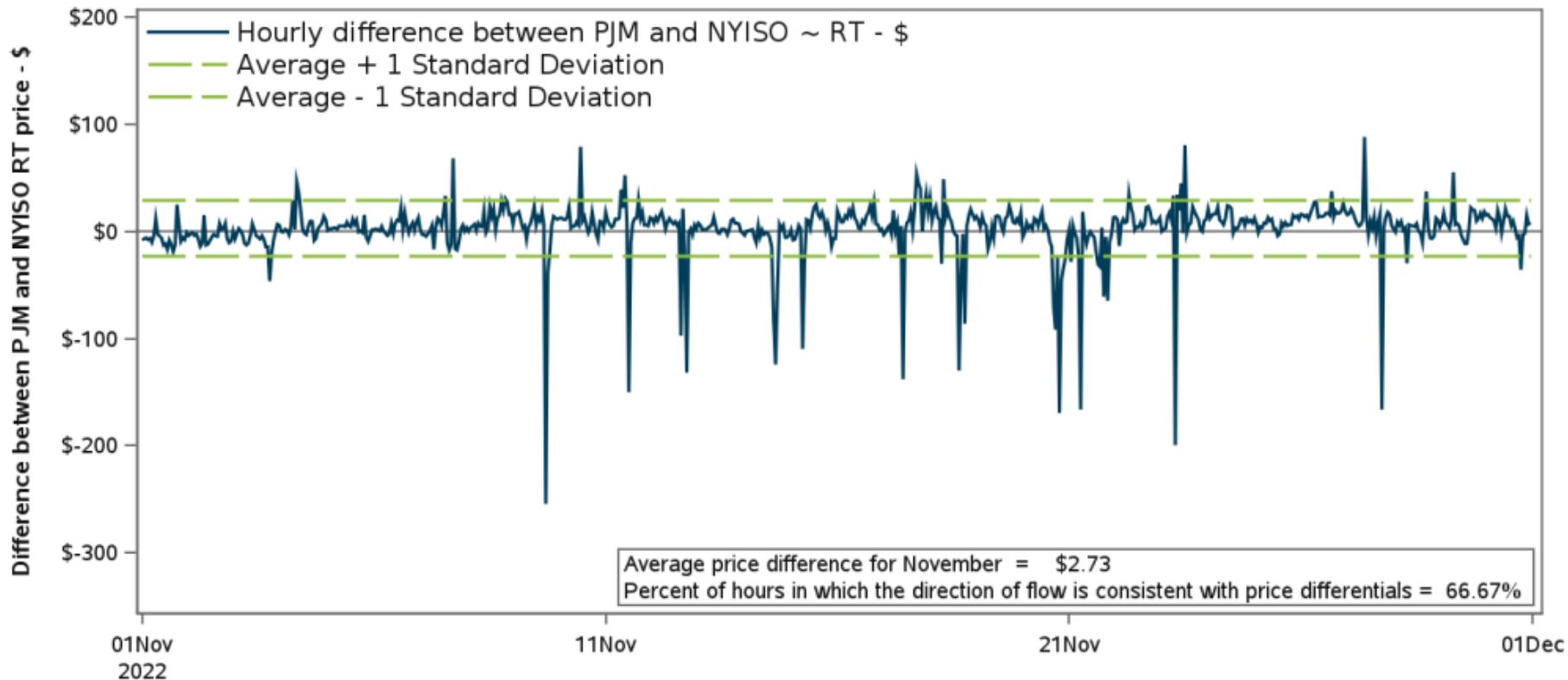
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and MISO Day-Ahead Prices



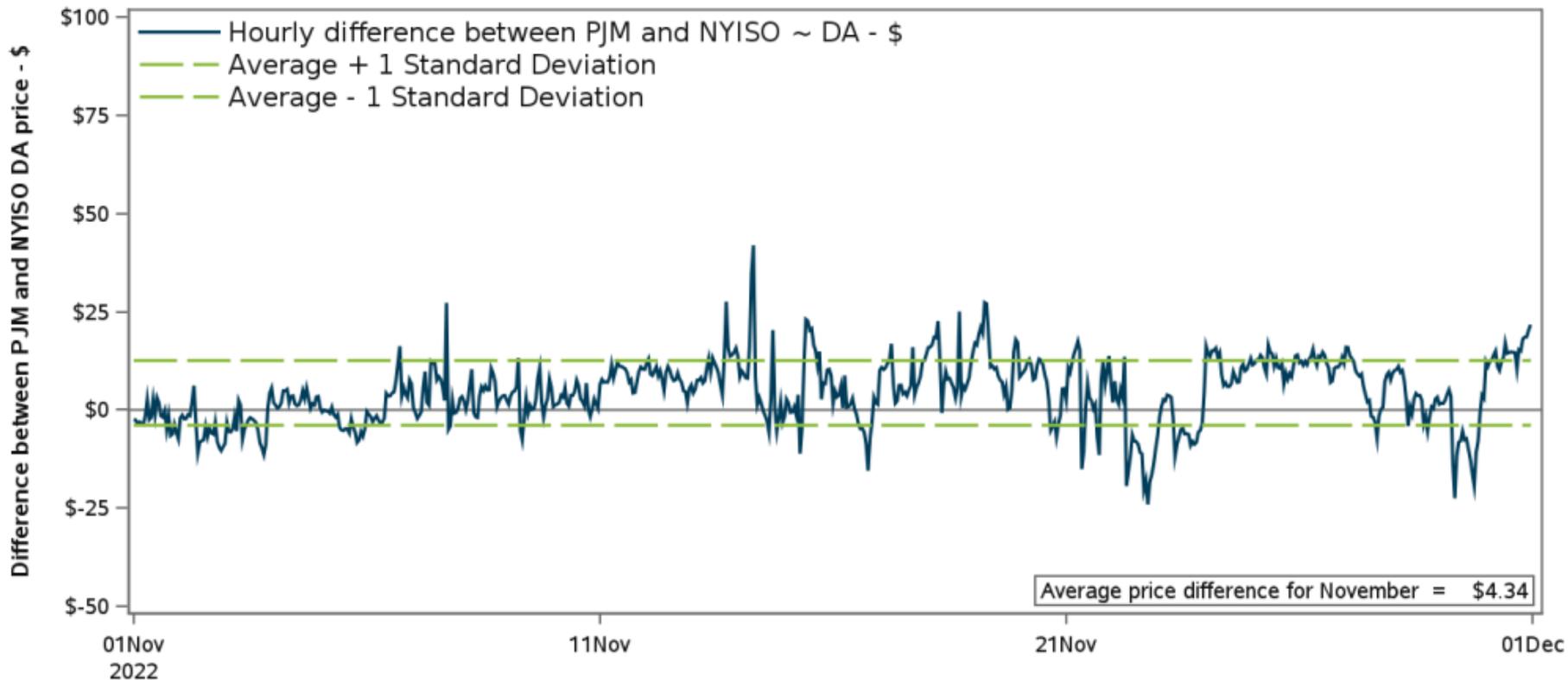
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Hourly Difference Between PJM and NYISO Real-Time Prices

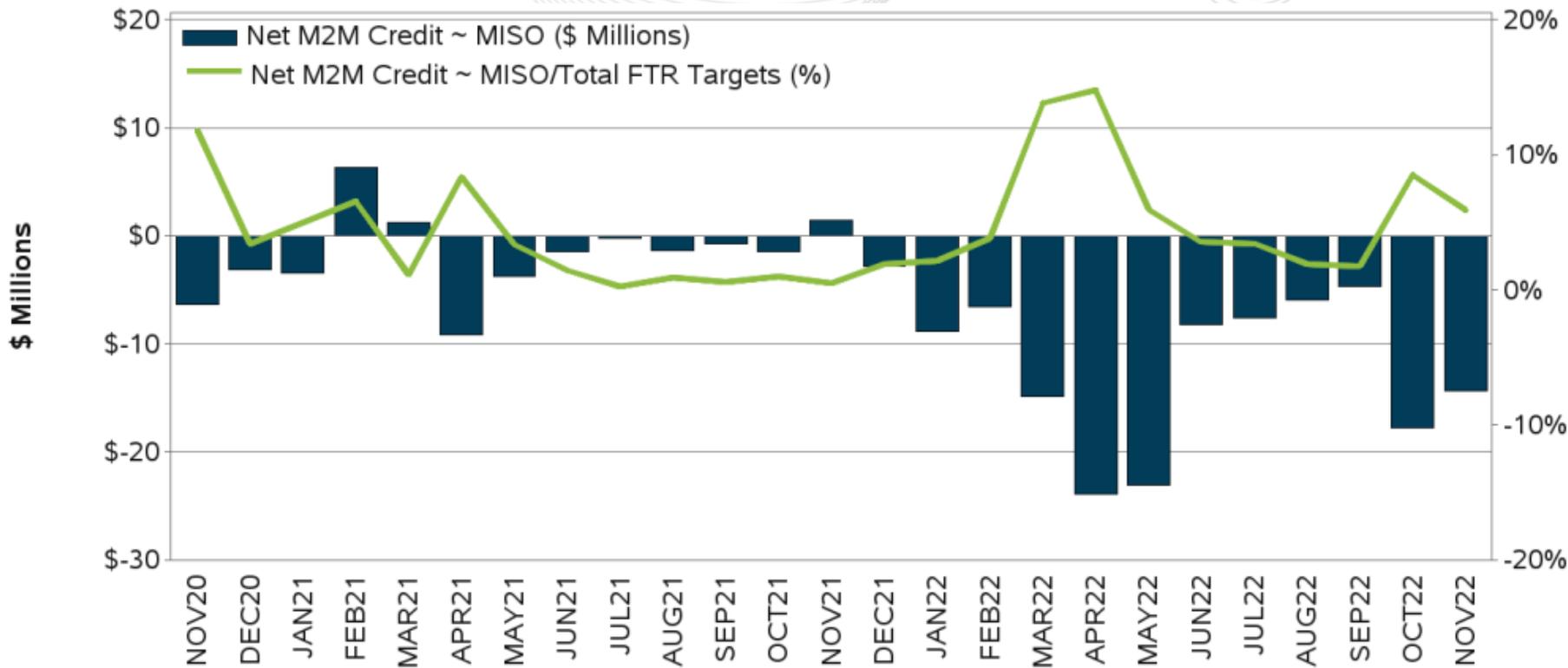


Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

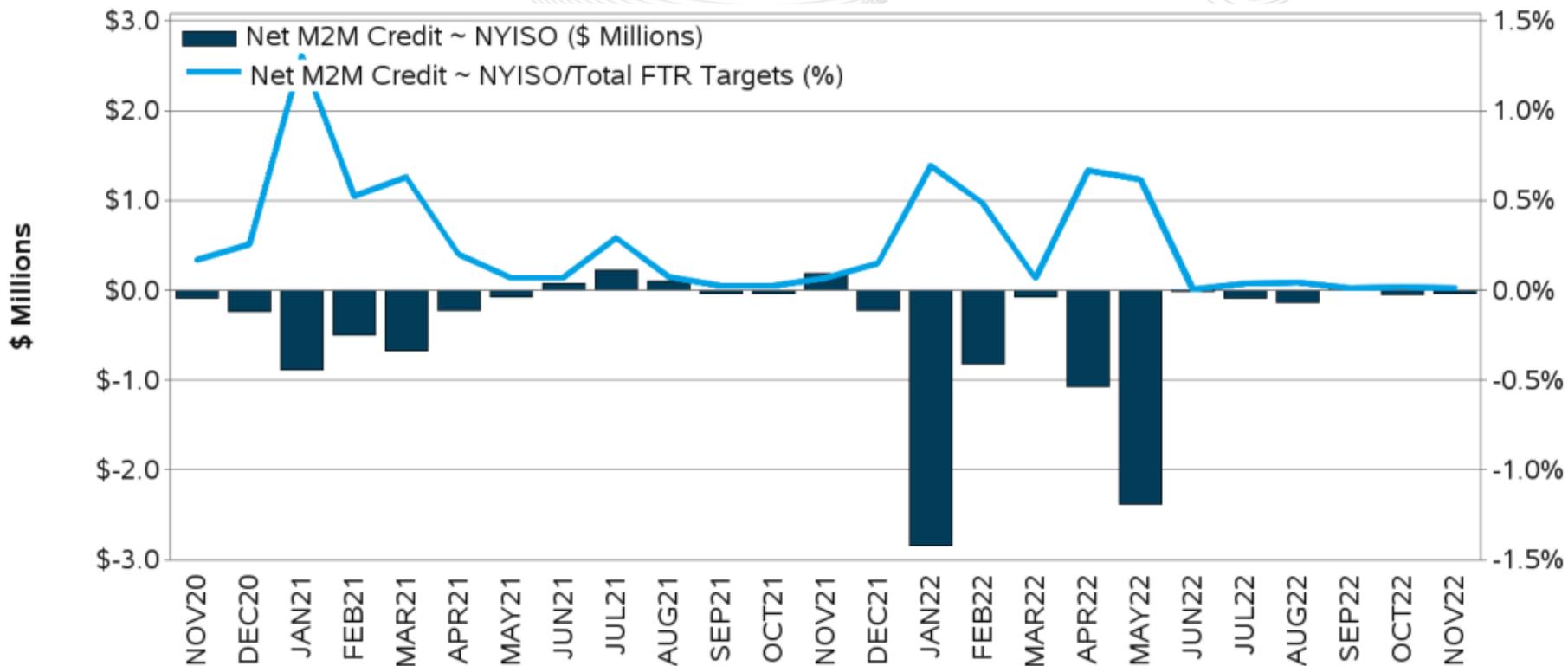
Hourly Difference Between PJM and NYISO Day-Ahead Prices



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

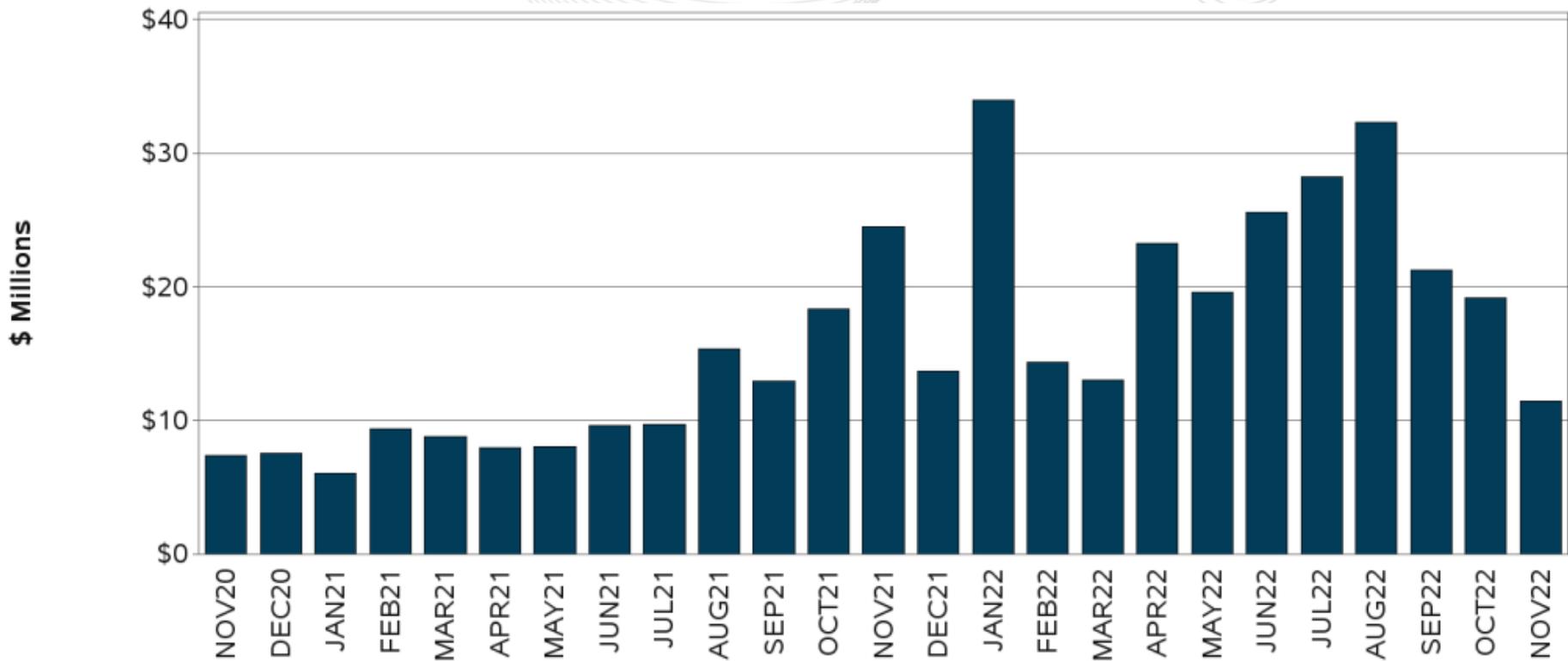


Negative M2M Credit represents PJM payment to MISO

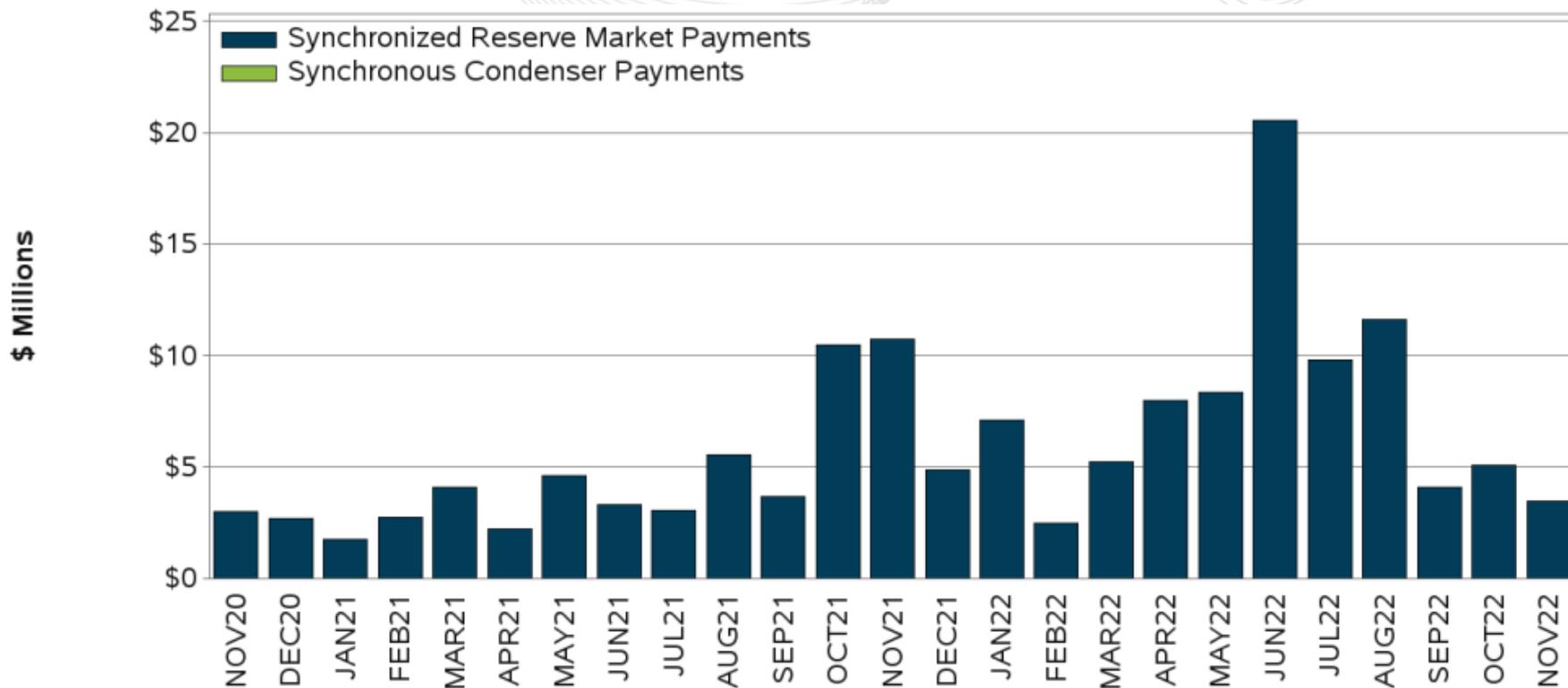


Negative M2M Credit represents PJM payment to NYISO

Ancillary Service Market Summary

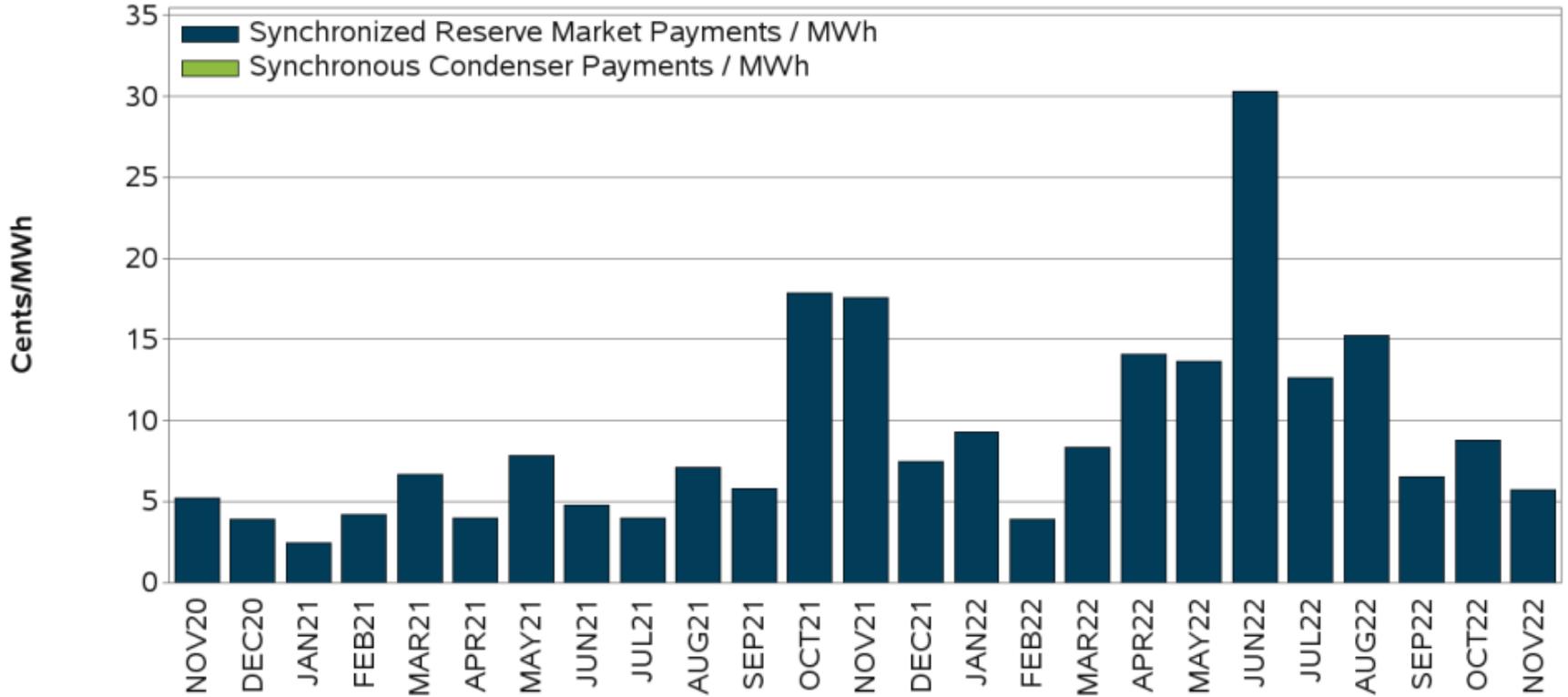


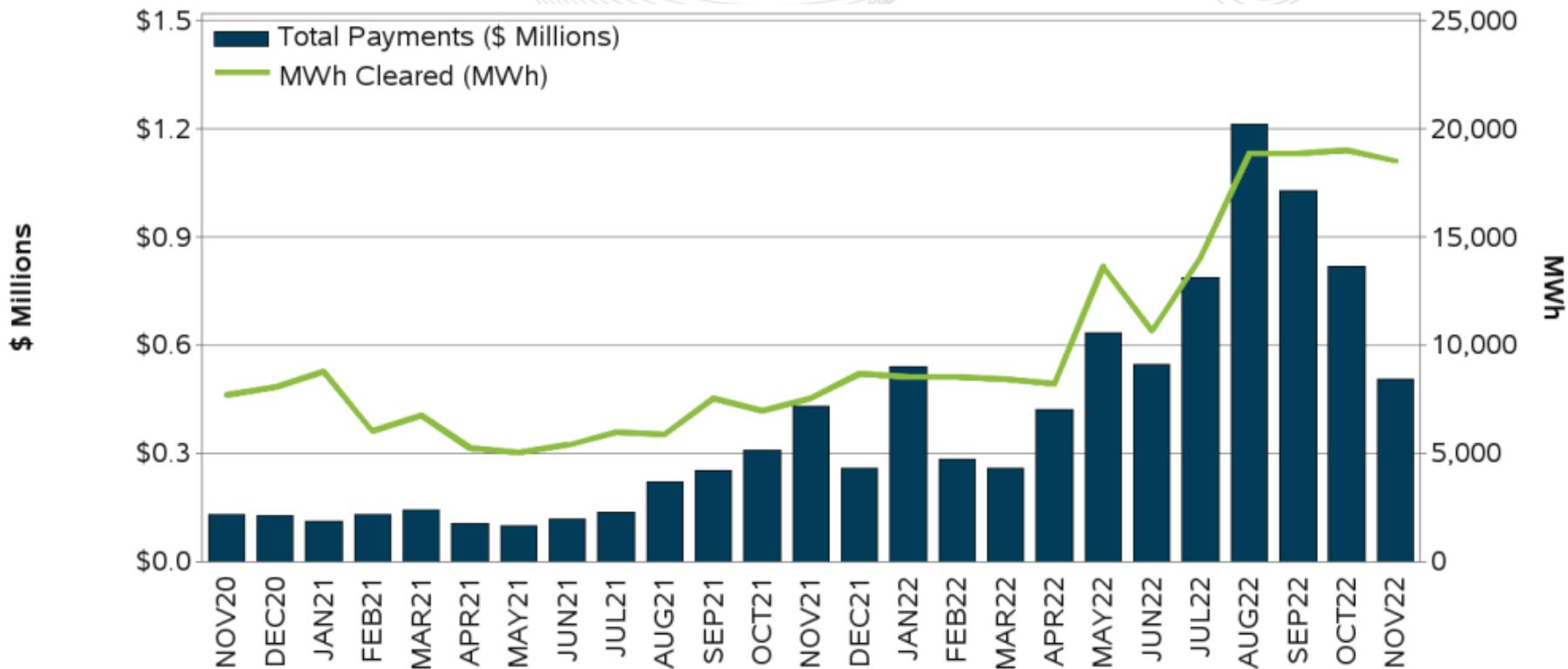
Synchronized Reserve and Synchronous Condenser Costs



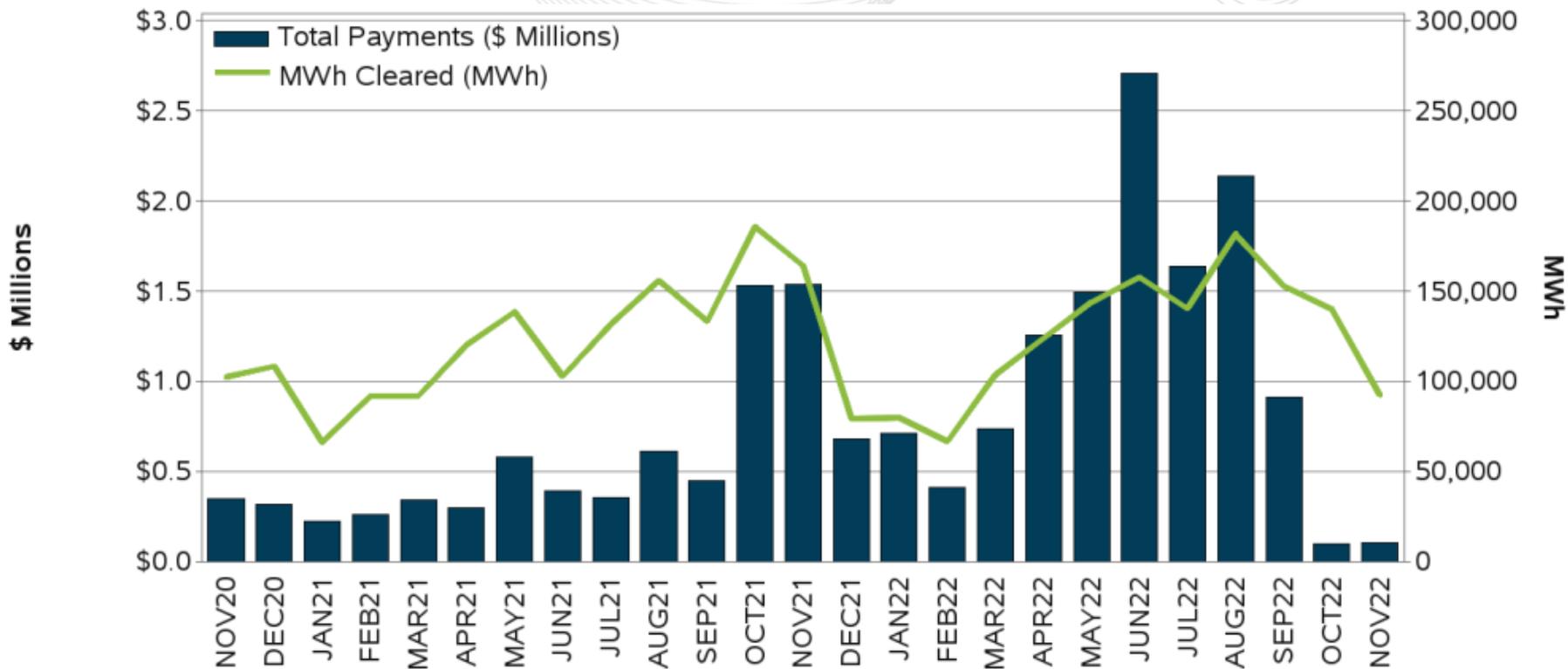


Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs

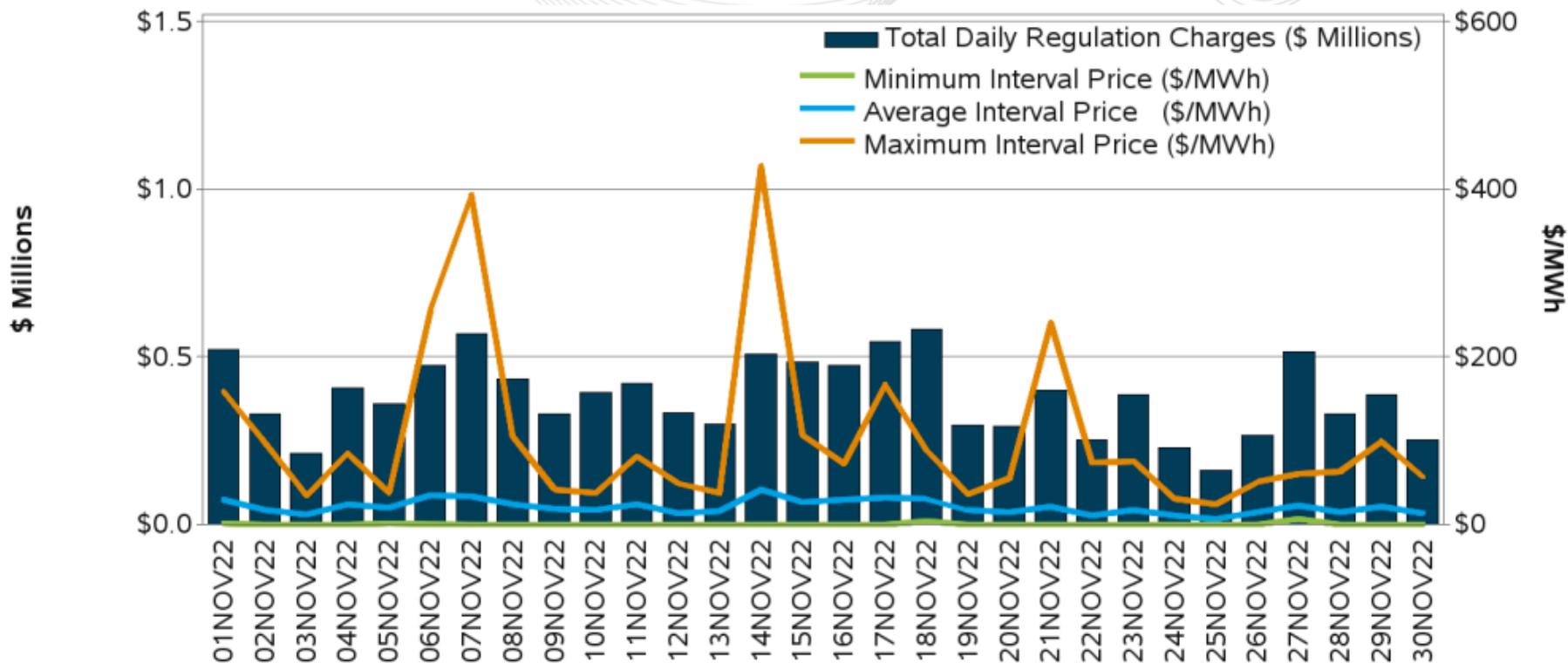




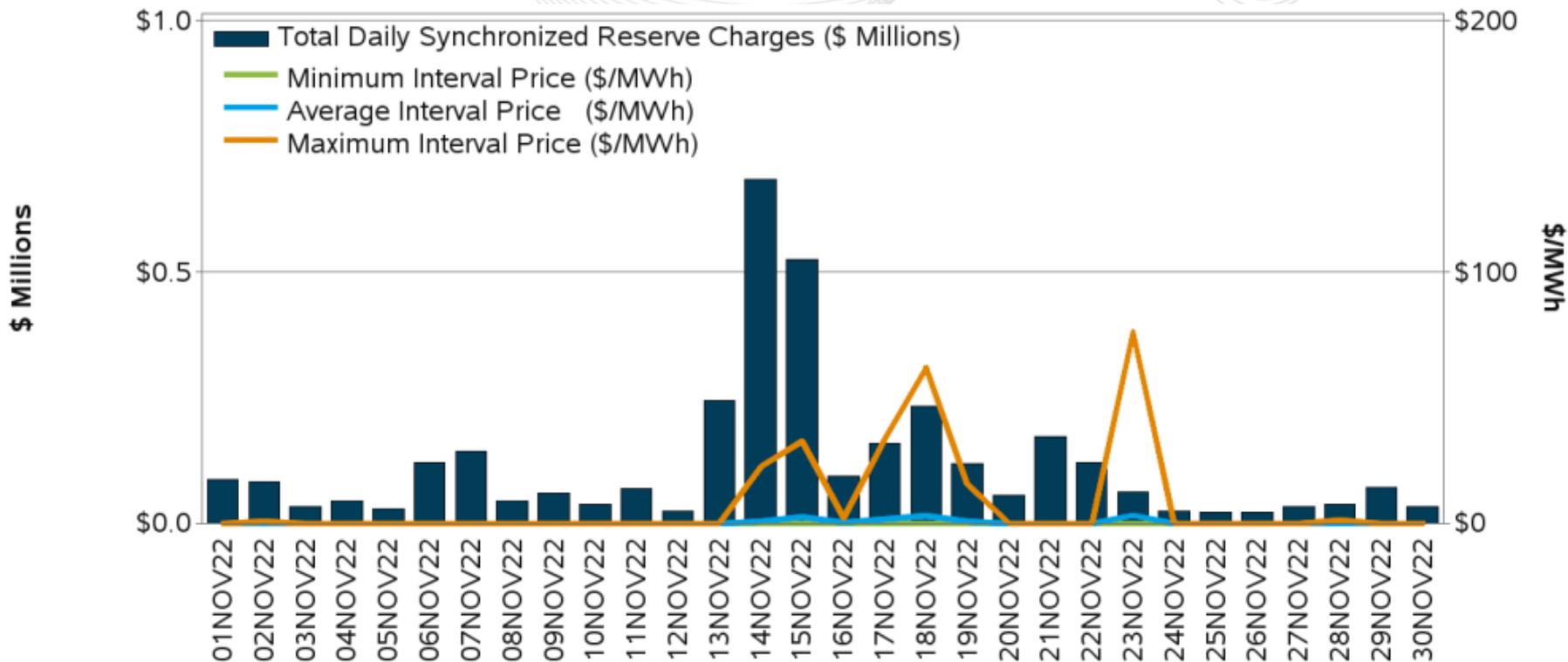
DR Participation in PJM Synchronized Reserve Markets



Regulation Market Daily Prices and Charges



Synchronized Reserve Market Daily Prices and Charges



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