Markets Report

MC Webinar
March 18, 2024
Executive Summary

• PJM Wholesale Cost in 2024 is $52.83/MWh, up from full-year 2023 costs of $50.18/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 February, temperatures fluctuated above and below average for most of the month. The sum of Heating and Cooling Degree Days was well below its historic average. (Slides 8-10)

• Energy use was slightly below its historic average for February. (Slides 8-10)

• In February, uplift exceeded $800,000 on no days. (Slides 26 & 27)
Executive Summary

- Load-weighted average LMP for 2024 is $34.54/MWh: (Slides 35-37)
  - February 2024 was $24.90/MWh, which is lower than February 2023 ($26.00/MWh) and February 2022 ($46.80/MWh).

- There were no 5-minute intervals that experienced shortage pricing in February. (Slides 34, Report Appendix)

- FTR revenue adequacy for the month of February is 100% and the 2023-2024 Planning Year is currently funded at 100%. (Slides 52-55)

- Congestion values have been trending lower in 2024 as compared to 2022. (Slide 53)

- Regulation and Synchronized Reserve market costs have generally tracked with energy prices over time. (Slides 69-71)
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

- Daily Energy as a Percent of the Historic Average for February
- Daily HDD + CDD as a Percent of the Historic Average for February
- Daily Temperature as a Percent of the Historic Average for February
Average Fuel Prices - Monthly

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.

Average price difference for February = $-1.08
Load Forecast Error - February Daily Peaks, 10:00 Forecast

- Error at Peak Hour
- Weekend / Holiday
• 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.

  • On Friday, 2/2/2024, temperatures in many regions, especially in the western territories, came in a few degrees warmer than forecast. This led to lower loads and over-forecasting.
Monthly Generation by Fuel, Other

'Mother' includes Flywheels, Multiple Fuels, Storage, and Other Renewables
Daily Generation by Fuel - February

'Mother' includes Hydro, Oil, Solar, Wind, and Other
Daily Generation by Fuel, Other - February

'Mother' includes Flywheels, Multiple Fuels, Storage, and Other Renewables
Percent of Renewable and Clean Generation

'Renewable' includes Wind, Solar, Hydro, and Other Renewables. 'Clean' includes Renewable and Nuclear.
Operating Reserve
(Uplift)
Monthly Uplift - $/MWh Load

- Day-Ahead Operating Reserve
- Balancing Operating Reserve
- Reactive
- Blackstart
- Lost Opportunity Cost

$/MWh

FEB22 | MAR22 | APR22 | MAY22 | JUN22 | JUL22 | AUG22 | SEP22 | OCT22 | NOV22 | DEC22 | JAN23 | FEB23 | MAR23 | APR23 | MAY23 | JUN23 | JUL23 | AUG23 | SEP23 | OCT23 | NOV23 | DEC23 | JAN24 | FEB24
Zonal Uplift - February

- Day-Ahead Operating Reserve
- Balancing Operating Reserve
- Reactive
- Blackstart
- Lost Opportunity Cost

$ Millions

- AECO
- AEP
- APS
- ATSI
- BGE
- COMED
- DAY
- DEOK
- DOM
- DPL
- EKPC
- JCPL
- METED
- PECO
- PENELEC
- PEPCO
- PPL
- PSEG
• In February, uplift exceeded $800,000 on no days -
• Contributing factors to uplift were:
• 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

$/MWh

RTO
East
West

FEB22  MAY22  AUG22  NOV22  FEB23  MAY23  AUG23  NOV23  FEB24
Energy Market

LMP Summary
Information on constraints and shadow prices can be found here
Monthly Load-Weighted Average Real-time LMP

![Bar Chart]

- **FEB22**: $47
- **MAR22**: $44
- **APR22**: $64
- **MAY22**: $83
- **JUN22**: $99
- **JUL22**: $99
- **AUG22**: $114
- **SEP22**: $78
- **OCT22**: $56
- **NOV22**: $53
- **DEC22**: $142
- **JAN23**: $36
- **FEB23**: $26
- **MAR23**: $28
- **APR23**: $29
- **MAY23**: $28
- **JUN23**: $27
- **JUL23**: $37
- **AUG23**: $31
- **SEP23**: $32
- **OCT23**: $35
- **NOV23**: $33
- **DEC23**: $28
- **JAN24**: $43
- **FEB24**: $25

**Notes:**
- The chart shows the monthly load-weighted average real-time LMP prices from February 2022 to February 2024.
- Prices are denoted in $/MWh.
- The highest price recorded is in December 2022 at $142/ MWh.
Fuel Cost Adjusted LMP (Referenced to 1999 Fuel Prices)
LMP Price Posting Suspensions and Reruns

Percentage of Intervals Price Posting Suspended
Percentage of Intervals Rerun prior to Final LMP Posting
Energy Market

Demand Response Summary
Demand Side Response Estimated Revenue

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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 (INC & DEC) - Total Number

Number of Bids (Millions)

Submitted Bids
Cleared Bids

| Month | FEB22 | MAR22 | APR22 | MAY22 | JUN22 | JUL22 | AUG22 | SEP22 | OCT22 | NOV22 | DEC22 | JAN23 | FEB23 | MAR23 | APR23 | MAY23 | JUN23 | JUL23 | AUG23 | SEP23 | OCT23 | NOV23 | DEC23 | JAN24 | FEB24 |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Bids  | 0.80  | 1.50  | 1.20  | 1.00  | 0.80  | 0.60  | 0.40  | 0.20  | 0.40  | 0.60  | 0.80  | 1.00  | 1.20  | 1.40  | 1.60  | 1.80  | 2.00  | 1.80  | 1.60  | 1.40  | 1.20  | 1.00  | 0.80  | 0.60  | 0.40  |
Virtual Bids (INC & DECs) - Total Volume
Up-To-Congestion Transactions - Total Number

Number of Transactions (Millions)

- Submitted Transactions
- Cleared Transactions
INCs, DECs and Up-To-Congestion Transactions - Total Number
INCs, DECs and Up-To-Congestion Transactions - Total Volume
Energy Market

Congestion and FTR Summary
<table>
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<th>Surplus / Underfunding</th>
<th>Payout Ratio</th>
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<td>February 2024</td>
<td>$18,422,794</td>
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<td>2024</td>
<td>$81,317,879</td>
<td>100%</td>
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<td>2023/2024</td>
<td>$107,674,077</td>
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FTR Revenue vs. FTR Target Allocation

Chart showing the comparison of Total FTR Revenues and Total FTR Targets from February 2022 to February 2024.
Planning Period FTR Payout Ratio

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The ten most heavily congested facilities account for 80% of total congestion for February.
Ten Most Heavily Congested Transmission Facilities - Overall, 2024

The ten most heavily congested facilities account for 78% of total congestion for 2024.
Energy Market

Interchange/Seams Summary
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Average price difference for February = $-1.81
Percent of hours in which the direction of flow is consistent with price differentials = 52.73%
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.

Average price difference for February = $0.02
Percent of hours in which the direction of flow is consistent with price differentials = 59.05%
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.

Average price difference for February = $-0.78
Negative M2M Credit represents PJM payment to MISO
Negative M2M Credit represents PJM payment to NYISO
Ancillary Service Market Summary
Regulation Costs

$ Millions

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<th>$ Millions</th>
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Synchronized Reserve and Synchronous Condenser Costs

- Synchronized Reserve Market Payments
- Synchronous Condenser Payments

$ Millions

- FEB22
- MAR22
- APR22
- MAY22
- JUN22
- JUL22
- AUG22
- SEP22
- OCT22
- NOV22
- DEC22
- JAN23
- FEB23
- MAR23
- APR23
- MAY23
- JUN23
- JUL23
- AUG23
- SEP23
- OCT23
- NOV23
- DEC23
- JAN24
- FEB24
Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs
DR Participation in PJM Regulation Markets

- Total Payments ($ Millions)
- MWh Cleared (MWh)

Graph showing the trend of Total Payments and MWh Cleared over months from February 2022 to February 2024.
DR Participation in PJM Synchronized Reserve Markets

- Total Payments ($ Millions)
- MWh Cleared (MWh)

$ Millions

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Regulation Market Daily Prices and Charges

- Total Daily Regulation Charges ($ Millions)
- Minimum Interval Price ($/MWh)
- Average Interval Price ($/MWh)
- Maximum Interval Price ($/MWh)

$ Millions

$0.0
$0.4
$0.8
$1.2
$1.6
$2.0
$2.4
$600
$500
$400
$300
$200
$100
$0

$/MWh

Synchronized Reserve Market Daily Prices and Charges

- Total Daily Synchronized Reserve Charges ($ Millions)
- Minimum Interval Price ($/MWh)
- Average Interval Price ($/MWh)
- Maximum Interval Price ($/MWh)

$ Millions

$0.0 $0.3 $0.6 $0.9 $1.2 $1.5 $2.0 $2.5 $3.0 $3.5 $4.0 $4.5 $5.0

$/MWh

$0 $100 $200 $300 $400 $500

Jennifer Warner-Freeman
Jennifer.Freeman@pjm.com

Member Hotline
(610) 666 – 8980
(866) 400 – 8980
custsvc@pjm.com
PROTECT THE POWER GRID
THINK BEFORE YOU CLICK!

Be alert to malicious phishing emails.

Report suspicious email activity to PJM.
(610) 666-2244 / it_ops_ctr_shift@pjm.com