• PJM Wholesale Cost 2022 is $82.96/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 February, temperatures were above average for most of the month. Thus, the sum of Heating and Cooling Degree Days was below its historic average. (Slides 8-10)

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

• In February, uplift did not exceed $800,000 on any days. (Slides 24 & 25)
Executive Summary

- Load-weighted average LMP for 2021 is $58.90/MWh: (Slides 33 & 34)
  - February 2022 was $46.80/MWh, which is higher than February 2021 ($41.60/MWh) and February 2020 ($19.40/MWh).

- There were no 5-minute intervals that experienced shortage pricing in February. (Slides 31 & 32)

- FTR revenue adequacy for the month of February is 100% and the 2021-2022 Planning Year is currently funded at 97%. (Slides 49-52)

- Congestion values have been trending upwards. February’s value is much more in line with recent history than January’s. (Slide 50)

- Regulation and Synchronized Reserve market costs have generally tracked with energy prices over time. (Slides 65-67)
Markets Report
PJM Wholesale Cost - Other

- Regulation
- Operating Reserve
- PJM Cost
- Reactive
- Transmission Owner Control
- Synchronized Reserve
- Black Start

$MWh

2018: $1.44
2019: $1.26
2020: $1.28
2021: $1.51
2022: $1.55
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

- Current Month Total Energy
- Current Month HDD+CDD
- Average Monthly Total Energy
- Average Monthly HDD + CDD

TWh vs Heating Degree Days + Cooling Degree Days

February 21 - February 22
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

Percent of Daily Average

0% 50% 100% 150% 200%

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 = $2.75
Load Forecast Error - Monthly Absolute Error, 10:00 Forecast

[Bar chart showing monthly absolute error for All Hours and Peak Hours Only, with separate data for Winter and Summer. The chart includes data for February to December for 2020, 2021, and 2022.]
Load Forecast Error - February Daily Peaks, 10:00 Forecast

- Error at Peak Hour
- Weekend / Holiday

1% 2% 3% 4% 5% 6% 7%

-7% -6% -5% -4% -3% -2% -1% 0% 1% 2% 3% 4% 5% 6% 7%
• 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 February 14, cold temperatures - much colder than the day before, colder than normal, and colder than forecasted – contributed to under-forecasting during the morning peak. On February 25, cloudy skies, cooler-than-expected temperatures, and the remnants of an impactful winter storm led to under-forecasting of the morning peak, which occurred an hour later than anticipated.**
Monthly Generation by Fuel

'Mother' 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 - February

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

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Daily Generation by Fuel, Other - February

'Mother' includes Flywheels, Multiple Fuels, Storage, and Other Renewables
Operating Reserve

(Uplift)
Monthly Uplift - $/MWh Load

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

$/MWh

$0.5

$0.4

$0.3

$0.2

$0.1

$0.0

FEB20  MAR20  APR20  MAY20  JUN20  JUL20  AUG20  SEP20  OCT20  NOV20  DEC20  JAN21  FEB21  MAR21  APR21  MAY21  JUN21  JUL21  AUG21  SEP21  OCT21  NOV21  DEC21  JAN22  FEB22
• In February, uplift exceeded $800,000 on no days.

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

FEB20 MAY20 AUG20 NOV20 JAN21 MAY21 AUG21 NOV21 FEB22
Energy Market

LMP Summary
Shortage Pricing Intervals

Count of Shortage Intervals

- MAD Primary Reserves
- MAD Synchronized Reserves
- RTO Primary Reserves
- RTO Synchronized Reserves

MAR21 | APR21 | MAY21 | JUN21 | JUL21 | AUG21 | SEP21 | OCT21 | NOV21 | DEC21 | JAN22 | FEB22

0 | 0 | 3 | 1 | 0 | 8 | 2 | 1 | 1 | 1 | 11 | 4
Information on constraints and shadow prices can be found here:

http://dataminer2.pjm.com/feed/rt marginal value
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.
Energy Market

Demand Response Summary
Demand Side Response Estimated Revenue

$ Millions

- Capacity
- Ancillary Services
- Emergency Energy
- Economic Energy
- Economic Energy Incentives


$ Millions: $900, $800, $700, $600, $500, $400, $300, $200, $100, $0

Note: The data represents estimated revenue for demand side response activities from 2008 to 2022, categorized by different services and incentives.
Economic Demand Response Activity

*Data for the last few months are subject to significant change due to the settlement window.
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 & DECs) - Total Volume

MWh (Millions)

- Submitted MWh
- Cleared MWh
Up-To-Congestion Transactions - Total Number

Number of Transactions (Millions)

- Submitted Transactions
- Cleared Transactions

FEB20 | MAR20 | APR20 | MAY20 | JUN20 | JUL20 | AUG20 | SEP20 | OCT20 | NOV20 | DEC20 | JAN21 | FEB21 |MAR21 | APR21 | MAY21 | JUN21 | JUL21 | AUG21 | SEP21 | OCT21 | NOV21 | DEC21 | JAN22 | FEB22
Up-To-Congestion Transactions - Total Volume

MWh (Millions)

- Submitted MWh
- Cleared MWh

FEB20 | MAR20 | APR20 | MAY20 | JUN20 | JUL20 | AUG20 | SEP20 | OCT20 | NOV20 | DEC20 | JAN21 | FEB21 | MAR21 | APR21 | MAY21 | JUN21 | JUL21 | AUG21 | SEP21 | OCT21 | NOV21 | DEC21 | JAN22 | FEB22
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>
<thead>
<tr>
<th>Period</th>
<th>Surplus / Underfunding</th>
<th>Payout Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>February, 2022</td>
<td>$3,231,537</td>
<td>100%</td>
</tr>
<tr>
<td>2022</td>
<td>$52,793,571</td>
<td>100%</td>
</tr>
<tr>
<td>2021/2022</td>
<td>-$46,691,830</td>
<td>97%</td>
</tr>
</tbody>
</table>
Planning Period FTR Payout Ratio

- 2007: 100%
- 2008: 100%
- 2009: 90%
- 2010: 80%
- 2011: 70%
- 2012: 60%
- 2013: 50%
- 2014: 40%
- 2015: 30%
- 2016: 20%
- 2017: 10%
- 2018: 0%
- 2019: 0%
- 2020: 0%
- 2021: 0%
- 2022: 0%

Data source: www.pjm.com | Public
Ten Most Heavily Congested Transmission Facilities - Overall, February

The ten most heavily congested facilities account for 56% of total congestion for February.
Ten Most Heavily Congested Transmission Facilities - Overall, 2022

The ten most heavily congested facilities account for 62% of total congestion for 2022.
Energy Market

Interchange/Seams Summary
Monthly Average MISO Interface Pricing

- PJM MISO Price (RT)
- MISO PJM Price (RT)
- PJM MISO Price (DA)
- MISO PJM Price (DA)

$/MWh

FEB20  MAY20  AUG20  NOV20  JAN21  MAY21  AUG21  NOV21  FEB22
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.

Average price difference for February = -$1.94
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.
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 = $-9.54
Negative M2M Credit represents PJM payment to MISO
Negative M2M Credit represents PJM payment to NYISO
Ancillary Service Market Summary
Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs

Cents/MWh

- Synchronized Reserve Market Payments / MWh
- Synchronous Condenser Payments / MWh

FEB20 | MAR20 | APR20 | MAY20 | JUN20 | JUL20 | AUG20 | SEP20 | OCT20 | NOV20 | DEC20 | JAN21 | FEB21 | MAR21 | APR21 | MAY21 | JUN21 | JUL21 | AUG21 | SEP21 | OCT21 | NOV21 | DEC21 | JAN22 | FEB22
DR Participation in PJM Regulation Markets

- Total Payments ($ Millions)
- MWh Cleared (MWh)
DR Participation in PJM Synchronized Reserve Markets

MWh Cleared (MWh) vs. Total Payments ($ Millions)

- $0.0 to $2.0 on the Y-axis
- 150,000 to 200,000 on the Y-axis

- April 2020 to February 2022 on the X-axis

Graph showing the trend of MWh cleared and total payments from April 2020 to February 2022.
Regulation Market Daily Prices and Charges

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