Markets Report

MC Webinar
July 26, 2021
• PJM Wholesale Cost for 2021 is $53.67/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 June, temperatures were above average throughout the month. Thus, Cooling Degree Days were above its historic average. (Slides 8-10)
• Energy use was above its historic average for June. (Slides 8-10)
Executive Summary

• In June, uplift exceeded $800,000 on nine days. (Slides 24 & 25)

• Load-weighted average LMP for 2021 is $30.62/MWh: (Slides 33 & 34)
  – June 2021 was $34.10/MWh, which is higher than June 2020 ($20.50/MWh) and also higher than June 2019 ($23.10/MWh).

• There was one 5-minute interval that experienced shortage pricing in June. (Slide 31)

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

• Congestion remains low, however, higher than values observed last June. (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

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

TWh

Heating Degree Days + Cooling Degree Days
Average Fuel Prices - Daily

Fuel Price Source: S&P Global Platts

- Average Gas - $2.72
- Average Coal - $2.00
- Average Oil - $13.44
- Average LMP - $33.39
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 June = $-0.75
Load Forecast Error – Monthly Absolute Error, 10:00 Forecast

- All Hours
- Peak Hours Only
- Winter
- Summer
- 25-month Average
- 25-month Average

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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.

• As we transitioned into true summer weather in June, including the highest temperatures so far this year and periods of very high humidity and THI, load and weather models had a tendency to under-forecast, especially in the first half of the month. A few instances of unseasonably cool weather mixed in with the hotter conditions also caused suboptimal performance of the load forecast models, as they are challenged by these transitionary periods. Peak forecasts were within the 3% threshold during our first two stretches of 90+ degree days in the Mid-Atlantic – June 5-7 and 28-30 – despite continued under-forecasting of temperatures, as operators identified the trend and helped mitigate the impact on the load forecast.
Monthly Generation by Fuel

'Mother' includes Hydro, Oil, Solar, Wind, and Other
'Other' includes Flywheels, Multiple Fuels, Storage, and Other Renewables
Daily Generation by Fuel - June

'Mother' includes Hydro, Oil, Solar, Wind, and Other
'Other' includes Flywheels, Multiple Fuels, Storage, and Other Renewables.
Operating Reserve

(Uplift)
In June, uplift exceeded $800,000 on nine days – June 5, 7, 8, 10, 18, 21, 28, 29 and 30.

Contributing factors to uplift were:

- In June PJM experienced high temperatures, periods of very high humidity (and THIs), as well as instances of unseasonably cool weather. Resulting load levels, constraint control, and load forecast error directly impacted Balancing Operating Reserve throughout the month. In addition, larger units needed for reliability resulted in increased BOR and Day-Ahead Operating Reserve.

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

JUN19 AUG19 NOV19 MAR20 MAY20 AUG20 NOV20 MAR21 JUN21
Deviations Balancing Operating Reserve Rates

$/MWh

RTO
East
West

JUN19  AUG19  NOV19  MAR20  MAY20  AUG20  NOV20  MAR21  JUN21
Energy Market

LMP Summary
### Shortage Pricing – 6/2

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)

<table>
<thead>
<tr>
<th>Date</th>
<th>5-minute Interval</th>
<th>Reserve Penalty Factors</th>
<th>5-minute Interval SMP</th>
<th>Hourly Integrated SMP</th>
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<tbody>
<tr>
<td>Wednesday, June 02, 2021</td>
<td>17:00 - 17:05</td>
<td>2nd step penalty for Synchronized Reserve deficiencies in RTO and MAD</td>
<td>$704.38</td>
<td>$88.21</td>
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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

Percentage of 5-Minute Intervals
Energy Market

Demand Response Summary
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.
Up-To-Congestion Transactions - Total Number

Number of Transactions (Millions)

- Submitted Transactions
- Cleared Transactions
Up-To-Congestion Transactions - Total Volume

MWh (Millions)

Submitted MWh
Cleared MWh

JUN19 JUL19 AUG19 SEP19 OCT19 NOV19 DEC19 JAN20 FEB20 MAR20 APR20 MAY20 JUN20 JUL20 AUG20 SEP20 OCT20 NOV20 DEC20 JAN21 FEB21 MAR21 APR21 MAY21 JUN21
INCs, DECs and Up-To-Congestion Transactions - Total Number

Number of Transactions (Millions)

Submitted Transactions
Cleared Transactions

Month:
JUN19, JUL19, AUG19, SEP19, OCT19, NOV19, DEC19, JAN20, FEB20, MAR20, APR20, MAY20, JUN20, JUL20, AUG20, SEP20, OCT20, NOV20, DEC20, JAN21, FEB21, MAR21, APR21, MAY21, JUN21

Values:
- JUN19: 0.5
- JUL19: 4.5
- AUG19: 4.5
- SEP19: 1.5
- OCT19: 1.5
- NOV19: 1.5
- DEC19: 2.5
- JAN20: 2.5
- FEB20: 2.5
- MAR20: 2.5
- APR20: 2.5
- MAY20: 2.5
- JUN20: 8.5
- JUL20: 6.5
- AUG20: 6.5
- SEP20: 6.5
- OCT20: 6.5
- NOV20: 6.5
- DEC20: 6.5
- JAN21: 6.5
- FEB21: 6.5
- MAR21: 6.5
- APR21: 6.5
- MAY21: 6.5
- JUN21: 6.5
INCs, DECs and Up-To-Congestion Transactions - Total Volume
Energy Market
Congestion and FTR Summary
## FTR Funding

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<th>Period</th>
<th>Surplus / Underfunding</th>
<th>Payout Ratio</th>
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<tr>
<td>June, 2021</td>
<td>$981,647</td>
<td>100%</td>
</tr>
<tr>
<td>2021</td>
<td>-$5,415,923</td>
<td>99%</td>
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<tr>
<td>2021/2022</td>
<td>$981,647</td>
<td>100%</td>
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FTR Revenue vs. FTR Target Allocation

- Total FTR Revenues
- Total FTR Targets

$ Millions

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<thead>
<tr>
<th>JUN19</th>
<th>JUL19</th>
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The ten most heavily congested facilities account for 46% of total congestion for June.
The ten most heavily congested facilities account for 39% of total congestion for 2021.
Energy Market

Interchange/Seams Summary
Monthly Average NYISO Interface Pricing

- PJM NYISO Price (RT)
- NYISO PJM Price (RT)
- PJM NYISO Price (DA)
- NYISO PJM Price (DA)

$/MWh

JUN19 AUG19 NOV19 MAR20 MAY20 AUG20 NOV20 MAR21 JUN21
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 June = $-2.11
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.

Average price difference for June = $-2.35
PJM-MISO Market-to-Market Coordination Settlement

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

$ Millions

- Synchronized Reserve Market Payments
- Synchronous Condenser Payments

JUN19 | JUL19 | AUG19 | SEP19 | OCT19 | NOV19 | DEC19 | JAN20 | FEB20 | MAR20 | APR20 | MAY20 | JUN20 | JUL20 | AUG20 | SEP20 | OCT20 | NOV20 | DEC20 | JAN21 | FEB21 | MAR21 | APR21 | MAY21 | JUN21

($ Millions)
Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs
DR Participation in PJM Synchronized Reserve Markets

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

$ Millions

MWh

JUN19 | JUL19 | AUG19 | SEP19 | OCT19 | NOV19 | DEC19 | JAN20 | FEB20 | MAR20 | APR20 | MAY20 | JUN20 | JUL20 | AUG20 | SEP20 | OCT20 | NOV20 | DEC20 | JAN21 | FEB21 | MAR21 | APR21 | MAY21 | JUN21

150,000 | 120,000 | 90,000 | 60,000 | 30,000 | 0
Regulation Market Daily Prices and Charges

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

$ Millions

01 JUN 21 | 02 JUN 21 | 03 JUN 21 | 04 JUN 21 | 05 JUN 21 | 06 JUN 21 | 07 JUN 21 | 08 JUN 21 | 09 JUN 21 | 10 JUN 21 | 11 JUN 21 | 12 JUN 21 | 13 JUN 21 | 14 JUN 21 | 15 JUN 21 | 16 JUN 21 | 17 JUN 21 | 18 JUN 21 | 19 JUN 21 | 20 JUN 21 | 21 JUN 21 | 22 JUN 21 | 23 JUN 21 | 24 JUN 21 | 25 JUN 21 | 26 JUN 21 | 27 JUN 21 | 28 JUN 21 | 29 JUN 21 | 30 JUN 21

$0.0 to $0.9

$0.0 to $900

$0.0 to $600

$0.0 to $300

$0.0
Synchronized Reserve Market Daily Prices and Charges

![Graph showing daily synchronized reserve charges and interval prices over a specified period.](image_url)
Jennifer Warner-Freeman
Jennifer.Freeman@pjm.com

Member Hotline
(610) 666 – 8980
(866) 400 – 8980
custsvc@pjm.com