Markets Report

MC Webinar
November 16, 2020
PJM Wholesale Cost through October 2020 is $43.03/MWh, down from full-year 2019 costs of $48.98/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 October, temperatures were milder than average for most of the month. Thus, the sum of Heating and Cooling Degree Days was below its historic average. (Slides 8-10)

Because of mild weather and continued Corona Virus impacts, Energy use remained below the historic average. (Slides 8-10)
• In October, uplift exceeded $800,000 on one day – October 13th. (Slides 24 & 25)
• Load-weighted average LMP through October 2020 is $21.31/MWh: (Slides 31 & 32)
  – October 2020 was $22.20/MWh, which is lower than October 2019 ($27.90/MWh) and October 2018 ($33.90/MWh).
• FTR revenue adequacy for the month of October is 91% and the 2020-2021 Planning Year is currently funded at 99%. (Slides 47-50)
• Congestion remains low and lower than the values observed last October. (Slide 48)
• Regulation and Synchronized Reserve market costs have generally tracked with energy prices over time. (Slides 63-65)
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, 2019. 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** (blue bars)
- **Current Month HDD+CDD** (green bars)
- **Average Monthly Total Energy** (light blue line)
- **Average Monthly HDD + CDD** (light green line)

The graph shows the comparison between the current month's energy usage and historical averages for both heating degree days (HDD) and cooling degree days (CDD) for each month from October 2019 to October 2020.
Historic Average Weather and Energy versus Current Month - Daily

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

Fuel Price Source: S&P Global Platts

- Average Gas - $1.55
- Average Coal - $1.70
- Average Oil - $7.74
- Average LMP - $22.08
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

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

Oct Nov Dec 2018
Jan Feb Mar Apr May Jun 2019
Jul Aug Sep Oct Nov Dec 2019
Jan Feb Mar Apr May Jun 2020
Jul Aug Sep Oct 2020
Load Forecast Error – October 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.

The following days had load forecast error exceeding 3%:

- 10/29/2020 - The primary cause was model error likely due in part to a big drop in temperature in the Mid-Atlantic zone.
Monthly Generation by Fuel

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

'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
Zonal Uplift - October

$ Millions

- AECO
- AEP
- APS
- ATSI
- BGE
- COMED
- DAY
- DEOK
- DOM
- DPL
- DUQ
- EKPC
- JCPL
- METED
- PECO
- PENLEC
- PEPCO
- PPL
- PSEG

Legend:
- Day-Ahead Operating Reserve
- Balancing Operating Reserve
- Reactive
- Blackstart
- Lost Opportunity Cost
In October, uplift exceeded $800,000 on one day – October 13th.

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.
Deviations Balancing Operating Reserve Rates

$/MWh

- RTO
- East
- West

奸1.0
0.8
0.6
0.4
0.2
0.0

OCT18 DEC18 APR19 JUL19 OCT19 DEC19 APR20 JUL20 OCT20
Energy Market
LMP Summary
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

OCT18  NOV18  DEC18  JAN19  FEB19  MAR19  APR19  MAY19  JUN19  JUL19  AUG19  SEP19  OCT19  NOV19  DEC19  JAN20  FEB20  MAR20  APR20  MAY20  JUN20  JUL20
Energy Market

Demand Response Summary
Demand Side Response Estimated Revenue

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

<table>
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<th>Year</th>
<th>Capacity</th>
<th>Ancillary Services</th>
<th>Emergency Energy</th>
<th>Economic Energy</th>
<th>Economic Energy Incentives</th>
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<td>$900</td>
<td>$140</td>
<td>$290</td>
<td>$150</td>
<td>$130</td>
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*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: OCT18, NOV18, DEC18, JAN19, FEB19, MAR19, APR19, MAY19, JUN19, JUL19, AUG19, SEP19, OCT19, NOV19, DEC19, JAN20, FEB20, MAR20, APR20, MAY20, JUN20, JUL20, AUG20, SEP20, OCT20

Y-axis: Number of Bids (Millions)
INCs, DECs and Up-To-Congestion Transactions - Total Number

Number of Transactions (Millions)
INCs, DECs and Up-To-Congestion Transactions - Total Volume

- MWh (Millions)


- Submitted MWh
- Cleared MWh
Energy Market

Congestion and FTR Summary
<table>
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<tr>
<th>Period</th>
<th>Surplus / Underfunding</th>
<th>Payout Ratio</th>
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<tr>
<td>October, 2020</td>
<td>$-6,465,410</td>
<td>91%</td>
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<tr>
<td>2020</td>
<td>$62,660,841</td>
<td>100%</td>
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<tr>
<td>2020/2021</td>
<td>$-4,246,648</td>
<td>99%</td>
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FTR Revenue vs. FTR Target Allocation

$ Millions

- Total FTR Revenues
- Total FTR Targets

- OCT18
- NOV18
- DEC18
- JAN19
- FEB19
- MAR19
- APR19
- MAY19
- JUN19
- JUL19
- AUG19
- SEP19
- OCT19
- NOV19
- DEC19
- JAN20
- FEB20
- MAR20
- APR20
- MAY20
- JUN20
- JUL20
- AUG20
- SEP20
- OCT20
Ten Most Heavily Congested Transmission Facilities - Overall, October

The ten most heavily congested facilities account for 82% of total congestion for October.
Ten Most Heavily Congested Transmission Facilities - Overall, 2020

The ten most heavily congested facilities account for 48% of total congestion for 2020.
Energy Market

Interchange/Seams Summary
Monthly Average MISO Interface Pricing
Monthly Average NYISO Interface Pricing

$/MWh

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

OCT18  DEC18  APR19  JUL19  OCT19  DEC19  APR20  JUL20  OCT20
Positive values represent hours when the PJM price was higher. Negative values represent hours when the PJM price was lower.

Average price difference for October = $-1.28
Percent of hours in which the direction of flow is consistent with price differentials = 68.82%
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 October = $-1.87
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 October = $1.29
Percent of hours in which the direction of flow is consistent with price differentials = 49.60%
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

- Net M2M Credit ~ NYISO ($ Millions)
- Net M2M Credit ~ NYISO/Total FTR Targets (%)
Ancillary Service Market

Summary
Synchronized Reserve and Synchronous Condenser Costs

$ Millions

- Synchronized Reserve Market Payments
- Synchronous Condenser Payments

Data for months OCT18 to OCT20.
Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs

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

Chart showing costs per month from October 2018 to October 2020.
DR Participation in PJM Synchronized Reserve Markets

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

The chart shows the trend of total payments and MWh cleared over time from October 2018 to October 2020. The payments are measured in millions of dollars, and the MWh cleared is measured in millions of MWh.
Synchronized Reserve Market Daily Prices and Charges