PJM Wholesale Cost through October 2019 is $49.81/MWh, down from full-year 2018 costs of $59.96/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 7-16)

In October, 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)

Because temperatures were mild, Energy use was below the historic average. (Slides 8-10)

In October, uplift exceeded $800,000 on two days – the 1\textsuperscript{st} and the 2\textsuperscript{nd}. (Slides 21 & 22)
• Load-weighted average LMP through October 2019 is $27.63/MWh: (Slides 28-29)
  – October 2019 was $27.90/MWh, which is lower than both October 2018 ($33.90/MWh) and October 2017 ($28.30/MWh).

• FTR revenue adequacy for the month of October is 100% and the 2019-2020 Planning Year is currently fully funded. (Slides 44-47)

• Congestion remains low and is more in-line with values seen earlier in 2019 than with last October. (Slide 45)

• Regulation and Synchronized Reserve market costs have generally tracked with energy prices over time. (Slides 60-62)
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, 2018. 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**

The chart compares the total energy and heating degree days (HDD + CDD) for each month from October 2018 to October 2019. The energy is measured in TWh (terawatt-hours), and the heating degree days are measured in Heating Degree Days. The chart shows a fluctuation in both energy usage and HDD+CDD values throughout the year.
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 - $1.67
Average Coal - $1.77
Average Oil - $12.99
Average LMP - $26.60
Positive values represent days when the DA daily average price was higher than RT. Negative values represent days when the DA price was lower.
Monthly Generation by Fuel, Other

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

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

'Mother' includes Flywheels, Multiple Fuels, Storage, and Other Renewables
Operating Reserve
(Uplift)
Zonal Uplift - October

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

$ Millions

AECO  AEP  APS  ATSI  BGE  COMED  DAY  DEOK  DOM  DPL  DUQ  EKPC  JCPL  METED  PECO  PENLECO  PEPCO  PPL  PSEG
In October, uplift exceeded $800,000 on two days – the 1st and the 2nd.

Contributing factors to uplift were:
- Unseasonably warm weather
- Load forecast error
- Constraint control

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

OCT17  DEC17  APR18  JUL18  OCT18  DEC18  APR19  JUL19  OCT19
Deviations Balancing Operating Reserve Rates

$/MWh

- RTO
- East
- West

OCT17  DEC17  APR18  JUL18  OCT18  DEC18  APR19  JUL19  OCT19
Energy Market

LMP Summary
Fuel Cost Adjusted LMP (Referenced to 1999 Fuel Prices)

- Fuel Cost Adjusted LMP
- Load Weighted LMP

$/MWh

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

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

$ Millions

- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
Economic Demand Response Activity

- Total Net CSP Credits ($ Millions)
- Total Load Reductions (MWh)

*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)

- Returned Bids
- Cleared Bids

Data for OCT17 to OCT19.
Virtual Bids (INC$s & DECs) - Total Volume

MWh (Millions)

- Submitted MWh
- Cleared MWh

OCT17 | NOV17 | DEC17 | JAN18 | FEB18 | MAR18 | APR18 | MAY18 | JUN18 | JUL18 | AUG18 | SEP18 | OCT18 | NOV18 | DEC18 | JAN19 | FEB19 | MAR19 | APR19 | MAY19 | JUN19 | JUL19 | AUG19 | SEP19 | OCT19
Up-To-Congestion Transactions - Total Number

Number of Transactions (Millions)

- Submitted Transactions
- Cleared Transactions

OCT17 | NOV17 | DEC17 | JAN18 | FEB18 | MAR18 | APR18 | MAY18 | JUN18 | JUL18 | AUG18 | SEP18 | OCT18 | NOV18 | DEC18 | JAN19 | FEB19 | MAR19 | APR19 | MAY19 | JUN19 | JUL19 | AUG19 | SEP19 | OCT19
INCs, DECs and Up-To-Congestion Transactions - Total Number

Number of Transactions (Millions)

- **Submitted Transactions**
- **Cleared Transactions**

<table>
<thead>
<tr>
<th>Month</th>
<th>OCT17</th>
<th>NOV17</th>
<th>DEC17</th>
<th>JAN18</th>
<th>FEB18</th>
<th>MAR18</th>
<th>APR18</th>
<th>MAY18</th>
<th>JUN18</th>
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<th>MAR19</th>
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<th>MAY19</th>
<th>JUN19</th>
<th>JUL19</th>
<th>AUG19</th>
<th>SEP19</th>
<th>OCT19</th>
</tr>
</thead>
</table>
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>October, 2019</td>
<td>$5,281,420</td>
<td>100%</td>
</tr>
<tr>
<td>2019</td>
<td>$130,644,961</td>
<td>100%</td>
</tr>
<tr>
<td>2019/2020</td>
<td>$50,845,124</td>
<td>100%</td>
</tr>
</tbody>
</table>
Monthly FTR Payout Ratio

- OCT17
- NOV17
- DEC17
- JAN18
- FEB18
- MAR18
- APR18
- MAY18
- JUN18
- JUL18
- AUG18
- SEP18
- OCT18
- NOV18
- DEC18
- JAN19
- FEB19
- MAR19
- APR19
- MAY19
- JUN19
- JUL19
- AUG19
- SEP19
- OCT19
Planning Period FTR Payout Ratio

Ten Most Heavily Congested Transmission Facilities - Overall, October

The ten most heavily congested facilities account for 72% of total congestion for October.
Ten Most Heavily Congested Transmission Facilities - Overall, 2019

The ten most heavily congested facilities account for 47% of total congestion for 2019.
Energy Market

Interchange/Seams Summary
Monthly Average NYISO Interface Pricing

$/MWh

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

Dates:
- OCT17
- DEC17
- APR18
- JUL18
- OCT18
- DEC18
- APR19
- JUL19
- OCT19
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 = $-0.16
Percent of hours in which the direction of flow is consistent with price differentials = 55.91%
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 October = $1.32

Percent of hours in which the direction of flow is consistent with price differentials = 50.00%
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 October = $1.26
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

OCT17 | NOV17 | DEC17 | JAN18 | FEB18 | MAR18 | APR18 | MAY18 | JUN18 | JUL18 | AUG18 | SEP18 | OCT18 | NOV18 | DEC18 | JAN19 | FEB19 | MAR19 | APR19 | MAY19 | JUN19 | JUL19 | AUG19 | SEP19 | OCT19

$ Millions
Load-Adjusted Synchronized Reserve and Synchronous Condenser Costs

Cents/MWh

Synchronized Reserve Market Payments / MWh
Synchronous Condenser Payments / MWh
DR Participation in PJM Synchronized Reserve Markets

[Bar and line graph showing total payments and MWh cleared over time from October 2017 to October 2019.]
Regulation Market Daily Prices and Charges

- Total Daily Regulation Charges ($ Millions)
- Minimum Hourly Price ($/MWh)
- Average Hourly Price ($/MWh)
- Maximum Hourly Price ($/MWh)
Synchronized Reserve Market Daily Prices and Charges

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

Data from 01 Oct 19 to 31 Oct 19.