# Introduction to Markets

NATIONAL COUNCIL ON ELECTRICITY POLICY

**October 25, 2020**

Virtual Meeting

Moderator Hon. Upendra Chivukula, New Jersey BPU

Panelist Joe Bowring, Monitoring Analytics

# Welcome

## During the webinar:

- This webinar is being recorded.
- Type in Questions anytime in the GoToWebinar application.
- "Raise Hand" to be unmuted (the moderator will call on you).

## After the webinar:

- Presentation and recording posted on www.electricitypolicy.org.
- Unanswered questions will be sent to panelist for follow up.
- Point of contact:

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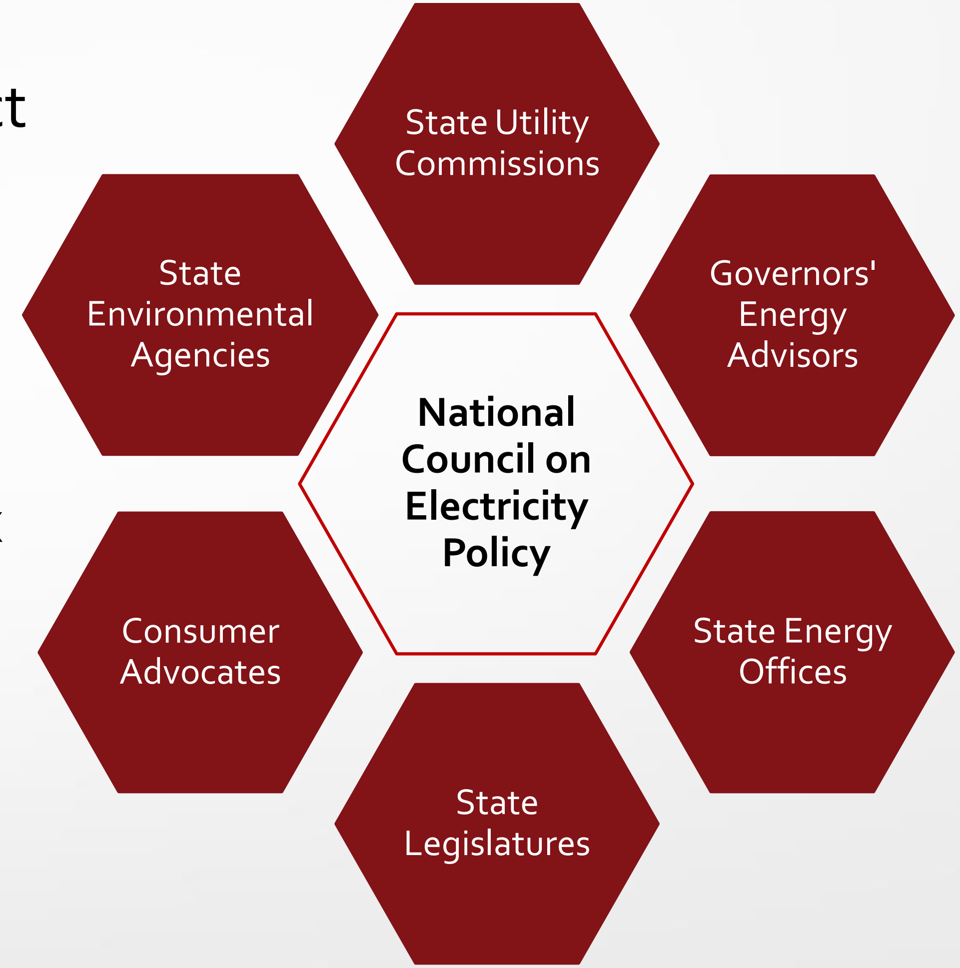
  kworthington@naruc.org

# The National Council on Electricity Policy (NCEP)

- NCEP is a peer-learning platform to examine the ways new technologies, policies, regulations, and markets impact state resources and the bulk power system.
- NCEP is currently exploring the evolving interface between the transmission and distribution systems as the resource mix on the grid changes (planning, operations, and markets).
- **All NCEP resources are available at [www.electricitypolicy.org](http://www.electricitypolicy.org).**
- NCEP thanks the U.S. Department of Energy for its ongoing support. NCEP is an affiliate project of NARUC.



# NCEP Annual Meeting and Workshop 2020
## December 7, 8, and 9, 2020 (afternoons Eastern Time)
## Evolving Compensation and Market Mechanisms

Registration Open

In 2020, NCEP will continue it’s multi-year T&D coordination theme and explore the age-old utility question of “who pays?” with a new twist from grid modernization: “how?” Session Concepts include:

- Operational Considerations for Distribution-Level Markets
- Introduction to Compensation and Market Mechanisms
- Exploring Optimization through Benefit-Cost Analysis
- A Future with Customer-Level Markets

# *US DOE Notice of Opportunity for Technical Assistance (NOTA):*

- NOTA to Support Hydropower Decision Making
  - An informational webinar will take place on November 4 at 2PM (ET).

- NOTA for Connected Communities
  - Purpose is to demonstrate how buildings plus DERs serve the grid

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# Introduction to Wholesale Power Markets

NCEP

October 26, 2020

Joe Bowring

Independent Market Monitor for PJM

Monitoring Analytics

# PJM Market Monitor

- **MMU role is included in PJM tariff per FERC order.**
- **Since 1999, the PJM Market Monitoring Unit has been responsible for promoting a robust, competitive and nondiscriminatory electric power market in PJM by implementing the PJM Market Monitoring Plan.**
- **The MMU was internal to PJM until 2008. A dispute over independence led to the creation of a fully independent external MMU for PJM.**
- **Monitoring Analytics is the Independent Market Monitor for PJM.**

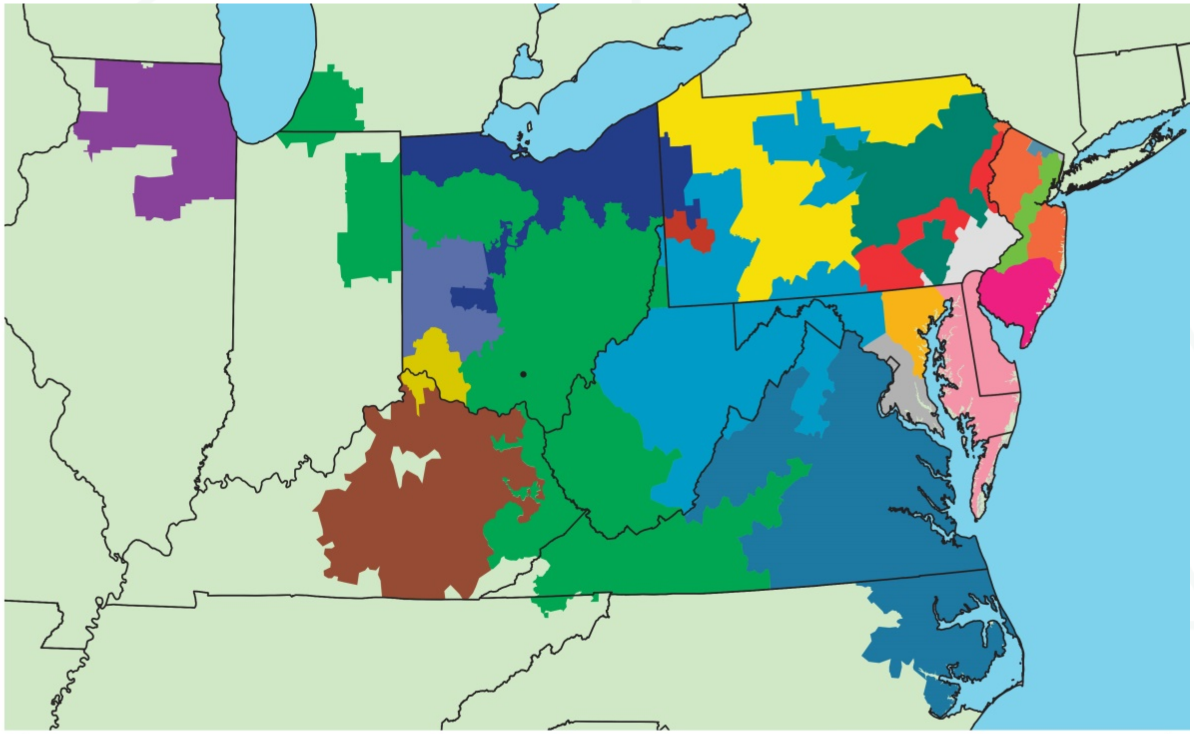
# MMU functions

- Monitoring
  - Compliance with market rules
  - Noncompetitive behavior
  - Retrospective mitigation
  - Inputs to prospective mitigation
- Reporting
  - State of the market reports
  - Reports on specific issues
- Market Design
  - Recommendations for improved market design

# Role of markets

- Role of competition under the FPA
  - Mechanism to regulate prices
  - Competitive outcome = just and reasonable
- Relevant model of competition is not laissez faire
- Competitive outcomes are not automatic
- Detailed rules required
  - Like other markets/exchanges
- Comprehensive market monitoring required
  - Of participants
  - Of RTO
  - Of rules
- Detailed market power mitigation rules required

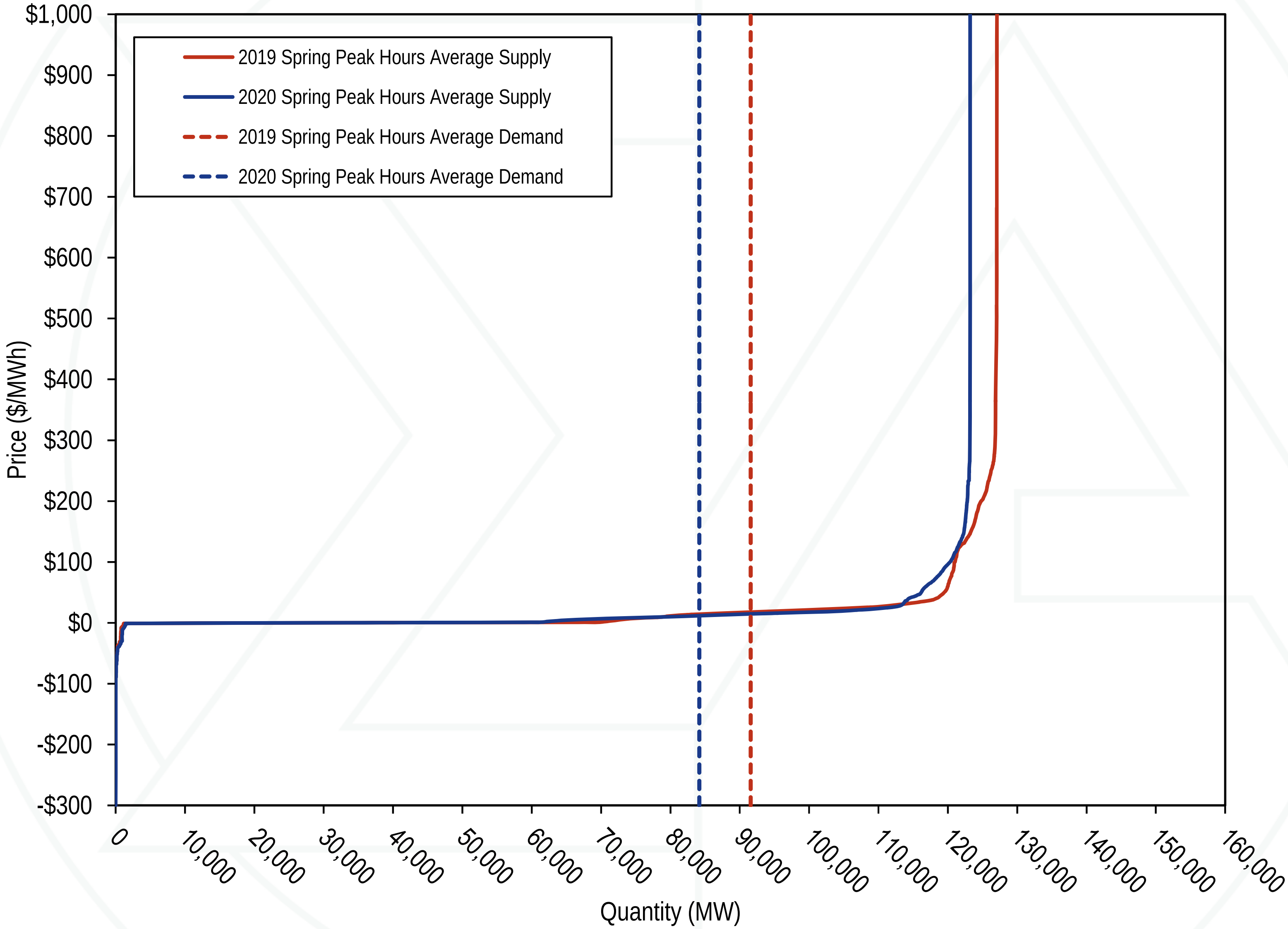
# PJM: 21 control zones



## Legend

- Allegheny Power Company (APS)
- American Electric Power Co., Inc (AEP)
- American Transmission Systems, Inc. (ATSI)
- Atlantic Electric Company (AECO)
- Baltimore Gas and Electric Company (BGE)
- ComEd
- Dayton Power and Light Company (DAY)
- Delmarva Power and Light (DPL)
- Dominion
- Duke Energy Ohio/Kentucky (DEOK)
- Duquesne Light (DLCO)
- Eastern Kentucky Power Cooperative (EKPC)
- Jersey Central Power and Light Company (JCPL)
- Metropolitan Edison Company (Met-Ed)
- Ohio Valley Electric Corporation (OVEC)
- PECO Energy (PECO)
- Pennsylvania Electric Company (PENELEC)
- Pepco
- PPL Electric Utilities (PPL)
- Public Service Electric and Gas Company (PSEG)
- Rockland Electric Company (RECO)

# Real-time supply curves



# Real-time load

| | PJM Real-Time Demand (MWh) | | | | Year-to-Year Change | | | |
|---|---|---|---|---|---|---|---|---|
| | Load | | Load Plus Exports | | Load | | Load Plus Exports | |
| Jan-Jun | Load | Standard Deviation | Demand | Standard Deviation | Load | Standard Deviation | Demand | Standard Deviation |
| 2001 | 30,180 | 5,274 | 32,041 | 5,103 | NA | NA | NA | NA |
| 2002 | 32,678 | 6,457 | 33,969 | 6,557 | 8.3% | 22.4% | 6.0% | 28.5% |
| 2003 | 36,727 | 6,428 | 38,775 | 6,554 | 12.4% | (0.4%) | 14.1% | (0.0%) |
| 2004 | 41,787 | 8,999 | 44,808 | 10,033 | 13.8% | 40.0% | 15.6% | 53.1% |
| 2005 | 71,939 | 13,603 | 78,745 | 13,798 | 72.2% | 51.2% | 75.7% | 37.5% |
| 2006 | 77,232 | 12,003 | 83,606 | 12,377 | 7.4% | (11.8%) | 6.2% | (10.3%) |
| 2007 | 81,110 | 13,499 | 86,557 | 13,819 | 5.0% | 12.5% | 3.5% | 11.6% |
| 2008 | 78,685 | 12,819 | 85,819 | 13,242 | (3.0%) | (5.0%) | (0.9%) | (4.2%) |
| 2009 | 75,991 | 12,899 | 81,062 | 13,253 | (3.4%) | 0.6% | (5.5%) | 0.1% |
| 2010 | 78,106 | 13,643 | 83,758 | 14,227 | 2.8% | 5.8% | 3.3% | 7.3% |
| 2011 | 78,823 | 13,931 | 84,288 | 14,046 | 0.9% | 2.1% | 0.6% | (1.3%) |
| 2012 | 84,946 | 13,941 | 89,638 | 13,848 | 7.8% | 0.1% | 6.3% | (1.4%) |
| 2013 | 86,897 | 13,871 | 91,199 | 13,848 | 2.3% | (0.5%) | 1.7% | 0.0% |
| 2014 | 90,529 | 16,266 | 96,189 | 16,147 | 4.2% | 17.3% | 5.5% | 16.6% |
| 2015 | 90,586 | 16,192 | 94,782 | 16,589 | 0.1% | (0.5%) | (1.5%) | 2.7% |
| 2016 | 85,800 | 14,517 | 89,746 | 14,798 | (5.3%) | (10.3%) | (5.3%) | (10.8%) |
| 2017 | 84,569 | 13,670 | 89,477 | 13,638 | (1.4%) | (5.8%) | (0.3%) | (7.8%) |
| 2018 | 88,847 | 14,683 | 92,352 | 14,818 | 5.1% | 7.4% | 3.2% | 8.7% |
| 2019 | 86,297 | 14,038 | 91,262 | 14,303 | (2.9%) | (4.4%) | (1.2%) | (3.5%) |
| 2020 | 81,255 | 13,191 | 86,344 | 13,133 | (5.8%) | (6.0%) | (5.4%) | (8.2%) |

# Real-time LMP

| | Real-Time, Load-Weighted, Average LMP | | | Year-to-Year Change | | |
|---|---|---|---|---|---|---|
| (Jan-Jun) | Average | Median | Standard Deviation | Average | Median | Standard Deviation |
| 1998 | $21.66 | $16.80 | $18.39 | NA | NA | NA |
| 1999 | $25.34 | $18.59 | $52.06 | 17.0% | 10.7% | 183.1% |
| 2000 | $27.76 | $18.91 | $29.69 | 9.5% | 1.7% | (43.0%) |
| 2001 | $35.27 | $27.88 | $22.12 | 27.0% | 47.4% | (25.5%) |
| 2002 | $25.93 | $20.67 | $14.62 | (26.5%) | (25.9%) | (33.9%) |
| 2003 | $44.43 | $37.98 | $28.55 | 71.4% | 83.8% | 95.2% |
| 2004 | $47.62 | $43.96 | $23.30 | 7.2% | 15.8% | (18.4%) |
| 2005 | $48.67 | $42.30 | $24.81 | 2.2% | (3.8%) | 6.5% |
| 2006 | $51.83 | $45.79 | $26.54 | 6.5% | 8.3% | 7.0% |
| 2007 | $58.32 | $52.52 | $32.39 | 12.5% | 14.7% | 22.1% |
| 2008 | $74.77 | $64.26 | $44.25 | 28.2% | 22.4% | 36.6% |
| 2009 | $42.48 | $36.95 | $20.61 | (43.2%) | (42.5%) | (53.4%) |
| 2010 | $45.75 | $38.78 | $23.60 | 7.7% | 5.0% | 14.5% |
| 2011 | $48.47 | $38.63 | $37.59 | 5.9% | (0.4%) | 59.3% |
| 2012 | $31.21 | $28.98 | $17.69 | (35.6%) | (25.0%) | (52.9%) |
| 2013 | $37.96 | $33.58 | $18.54 | 21.6% | 15.9% | 4.8% |
| 2014 | $69.92 | $42.61 | $103.35 | 84.2% | 26.9% | 457.6% |
| 2015 | $42.30 | $30.34 | $37.85 | (39.5%) | (28.8%) | (63.4%) |
| 2016 | $27.09 | $23.82 | $14.49 | (36.0%) | (21.5%) | (61.7%) |
| 2017 | $29.81 | $26.47 | $12.88 | 10.1% | 11.1% | (11.1%) |
| 2018 | $42.44 | $28.36 | $43.68 | 42.4% | 7.1% | 239.1% |
| 2019 | $27.49 | $24.40 | $16.38 | (35.2%) | (14.0%) | (62.5%) |
| 2020 | $19.40 | $18.13 | $8.93 | (29.4%) | (25.7%) | (45.5%) |

# Components of real-time LMP

| Element | 2019 (Jan - Jun) Contribution to LMP | 2019 (Jan - Jun) Percent | 2020 (Jan - Jun) Contribution to LMP | 2020 (Jan - Jun) Percent | Change Percent |
|---|---|---|---|---|---|
| Gas | $12.45 | 45.3% | $8.39 | 43.3% | (2.0%) |
| Coal | $7.30 | 26.6% | $5.66 | 29.1% | 2.6% |
| Ten Percent Adder | $2.15 | 7.8% | $1.58 | 8.2% | 0.3% |
| VOM | $1.54 | 5.6% | $1.41 | 7.3% | 1.6% |
| Constraint Violation Adder | $1.19 | 4.3% | $0.77 | 4.0% | (0.4%) |
| NA | $0.10 | 0.4% | $0.53 | 2.7% | 2.3% |
| $CO_2$ Cost | $0.21 | 0.8% | $0.36 | 1.8% | 1.1% |
| Markup | $1.71 | 6.2% | $0.34 | 1.8% | (4.4%) |
| LPA Rounding Difference | $0.19 | 0.7% | $0.22 | 1.1% | 0.4% |
| Increase Generation Adder | $0.10 | 0.4% | $0.06 | 0.3% | (0.0%) |
| Scarcity Adder | $0.25 | 0.9% | $0.03 | 0.2% | (0.7%) |
| Oil | $0.02 | 0.1% | $0.03 | 0.1% | 0.1% |
| Ancillary Service Redispatch Cost | $0.24 | 0.9% | $0.03 | 0.1% | (0.7%) |
| Opportunity Cost Adder | $0.04 | 0.1% | $0.02 | 0.1% | (0.0%) |
| LPA-SCED Differential | $0.00 | 0.0% | $0.01 | 0.1% | 0.0% |
| $NO_x$ Cost | $0.01 | 0.0% | $0.00 | 0.0% | (0.0%) |
| Market-to-Market Adder | $0.00 | 0.0% | $0.00 | 0.0% | 0.0% |
| Other | $0.00 | 0.0% | $0.00 | 0.0% | (0.0%) |
| $SO_2$ Cost | $0.00 | 0.0% | $0.00 | 0.0% | (0.0%) |
| Uranium | $0.00 | 0.0% | $0.00 | 0.0% | 0.0% |
| Renewable Energy Credits | ($0.02) | (0.1%) | ($0.01) | (0.0%) | 0.0% |
| Landfill Gas | $0.00 | 0.0% | ($0.01) | (0.1%) | (0.1%) |
| Decrease Generation Adder | ($0.02) | (0.1%) | ($0.02) | (0.1%) | (0.1%) |
| Total | $27.49 | 100.0% | $19.40 | 100.0% | 0.0% |

# Total congestion offset for ARR holders

| Revenue | | | | | | | Pre 2017/2018 (Without Balancing) | | 2017/2018 (With Balancing) | | Post 2017/2018 (With Surplus) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Planning Period | ARR Credits | FTR Credits | Day Ahead Congestion | Balancing + M2M Congestion | Total Congestion | Surplus Revenue | Total ARR/FTR Offset | Percent Offset | Current Revenue Received | Percent Offset | New Revenue Received | New Offset |
| 2011/2012 | $512.2 | $249.8 | $1,025.4 | ($275.7) | $749.7 | ($192.5) | $762.0 | 101.6% | $598.6 | 79.8% | $563.0 | 79.8% |
| 2012/2013 | $349.5 | $181.9 | $904.7 | ($379.9) | $524.8 | ($292.3) | $531.4 | 101.3% | $275.9 | 52.6% | $257.5 | 52.6% |
| 2013/2014 | $337.7 | $456.4 | $2,231.3 | ($360.6) | $1,870.6 | ($678.7) | $794.0 | 42.4% | $574.1 | 30.7% | $623.1 | 30.7% |
| 2014/2015 | $482.4 | $404.4 | $1,625.9 | ($268.3) | $1,357.6 | $139.6 | $886.8 | 65.3% | $686.6 | 50.6% | $715.0 | 52.7% |
| 2015/2016 | $635.3 | $223.4 | $1,098.7 | ($147.6) | $951.1 | $42.5 | $858.8 | 90.3% | $744.8 | 78.3% | $745.2 | 78.4% |
| 2016/2017 | $640.0 | $169.1 | $885.7 | ($104.8) | $780.8 | $72.6 | $809.1 | 103.6% | $727.7 | 93.2% | $763.8 | 97.8% |
| 2017/2018 | $427.3 | $294.2 | $1,322.1 | ($129.5) | $1,192.6 | $371.2 | $721.5 | 60.5% | $595.7 | 50.0% | $886.5 | 74.3% |
| 2018/2019 | $529.1 | $130.1 | $832.7 | ($152.6) | $680.0 | $112.3 | $675.93 | 99.4% | $530.8 | 78.1% | $626.3 | 92.1% |
| 2019/2020 | $542.0 | $91.9 | $612.1 | ($160.4) | $442.7 | $140.7 | $652.54 | 147.4% | $492.1 | 111.2% | $614.2 | 138.8% |
| Total | $4,455.5 | $2,201.1 | $10,538.4 | ($1,979.5) | $8,550.0 | ($284.6) | $6,692.0 | 78.3% | $5,226.5 | 61.1% | $5,794.8 | 67.8% |



Monitoring Analytics

# Generation by fuel source

| | | 2019 (Jan - Jun) GWh | Percent | 2020 (Jan - Jun) GWh | Percent | Change in Output |
|---|---|---|---|---|---|---|
| Coal | | 99,864.3 | 24.8% | 67,845.1 | 17.6% | (32.1%) |
| | Bituminous | 84,501.8 | 21.0% | 62,576.2 | 16.2% | (25.9%) |
| | Sub Bituminous | 11,708.4 | 2.9% | 2,840.9 | 0.7% | (75.7%) |
| | Other Coal | 3,654.1 | 0.9% | 2,428.0 | 0.6% | (33.6%) |
| Nuclear | | 138,609.7 | 34.4% | 136,376.4 | 35.4% | (1.6%) |
| Gas | | 136,016.0 | 33.8% | 151,835.3 | 39.4% | 11.6% |
| | Natural Gas CC | 129,375.4 | 32.1% | 143,212.5 | 37.2% | 10.7% |
| | Natural Gas CT | 4,187.1 | 1.0% | 5,573.6 | 1.4% | 33.1% |
| | Natural Gas Other Units | 1,381.2 | 0.3% | 1,996.8 | 0.5% | 44.6% |
| | Other Gas | 1,072.4 | 0.3% | 1,052.5 | 0.3% | (1.9%) |
| Hydroelectric | | 9,817.5 | 2.4% | 9,155.7 | 2.4% | (6.7%) |
| | Pumped Storage | 2,188.8 | 0.5% | 2,221.4 | 0.6% | 1.5% |
| | Run of River | 7,002.2 | 1.7% | 6,296.9 | 1.6% | (10.1%) |
| | Other Hydro | 626.6 | 0.2% | 637.4 | 0.2% | 1.7% |
| Wind | | 13,644.9 | 3.4% | 14,497.6 | 3.8% | 6.2% |
| Waste | | 2,125.6 | 0.5% | 2,145.3 | 0.6% | 0.9% |
| Oil | | 907.5 | 0.2% | 931.5 | 0.2% | 2.6% |
| | Heavy Oil | 6.5 | 0.0% | 0.0 | 0.0% | (100.0%) |
| | Light Oil | 88.1 | 0.0% | 55.2 | 0.0% | (37.3%) |
| | Diesel | 65.1 | 0.0% | 9.5 | 0.0% | (85.4%) |
| | Other Oil | 747.9 | 0.2% | 866.8 | 0.2% | 15.9% |
| Solar, Net Energy Metering | | 1,349.6 | 0.3% | 1,872.7 | 0.5% | 38.8% |
| Battery | | 10.9 | 0.0% | 17.1 | 0.0% | 55.9% |
| Biofuel | | 592.1 | 0.1% | 438.4 | 0.1% | (26.0%) |
| Total | | 402,938.1 | 100.0% | 385,115.0 | 100.0% | (4.4%) |

# RPM reserve margin

| | Generation and DR RPM Committed Less Deficiency UCAP (MW) | Forecast Peak Load | FRR Peak Load | PRD | RPM Peak Load | IRM | Pool Wide Average EFORd | Generation and DR RPM Committed Less Deficiency ICAP (MW) | Reserve Margin | Reserve Margin in Excess of IRM Percent | Reserve Margin in Excess of IRM ICAP (MW) | Projected Replacement Capacity using Cleared Buy Bids UCAP (MW) | Projected Reserve Margin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01-Jun-16 | 160,883.3 | 152,356.6 | 12,511.6 | 0.0 | 139,845.0 | 16.4% | 5.91% | 170,988.7 | 22.3% | 5.9% | 8,209.2 | 0.0 | 22.3% |
| 01-Jun-17 | 163,872.0 | 153,230.1 | 12,837.5 | 0.0 | 140,392.6 | 16.6% | 5.94% | 174,220.7 | 24.1% | 7.5% | 10,522.9 | 0.0 | 24.1% |
| 01-Jun-18 | 161,242.6 | 152,407.9 | 12,732.9 | 0.0 | 139,675.0 | 16.1% | 6.07% | 171,662.5 | 22.9% | 6.8% | 9,499.8 | 0.0 | 22.9% |
| 01-Jun-19 | 162,276.1 | 151,643.5 | 12,284.2 | 0.0 | 139,359.3 | 16.0% | 6.08% | 172,781.2 | 24.0% | 8.0% | 11,124.4 | 0.0 | 24.0% |
| 01-Jun-20 | 159,560.4 | 148,355.3 | 11,488.3 | 558.0 | 136,309.0 | 15.5% | 5.78% | 169,348.8 | 24.2% | 8.7% | 11,911.9 | 0.0 | 24.2% |
| 01-Jun-21 | 161,959.4 | 147,501.6 | 11,394.3 | 510.0 | 135,597.3 | 15.1% | 5.56% | 171,494.5 | 26.5% | 11.4% | 15,422.0 | 1,232.8 | 25.5% |

- **PJM excess reserves at 06.01.2020: 11,911.9 MW**
- **PJM excess reserves at 06.01.2021: 14,189.2 MW**
  - **Expected, net of projected replacement**

# Total price: January through June, 2019 and 2020

| Category | Jan-Jun 2019 $/MWh | Jan-Jun 2019 ($ Millions) | Jan-Jun 2019 Percent of Total | Jan-Jun 2020 $/MWh | Jan-Jun 2020 ($ Millions) | Jan-Jun 2020 Percent of Total | Percent Change |
|---|---|---|---|---|---|---|---|
| Load Weighted Energy | $27.49 | $10,302 | 51.7% | $19.40 | $6,884 | 45.1% | (29.4%) |
| Capacity | $13.81 | $5,175 | 26.0% | $9.83 | $3,487 | 22.8% | (28.8%) |
| Capacity | $13.78 | $5,164 | 25.9% | $9.83 | $3,487 | 22.8% | (28.7%) |
| Capacity (FRR) | $0.00 | $0 | 0.0% | $0.00 | $0 | 0.0% | 0.0% |
| Capacity (RMR) | $0.03 | $12 | 0.1% | $0.00 | $0 | 0.0% | (100.0%) |
| Transmission | $10.55 | $3,954 | 19.8% | $12.48 | $4,428 | 29.0% | 18.3% |
| Transmission Service Charges | $9.92 | $3,717 | 18.7% | $11.78 | $4,182 | 27.4% | 18.8% |
| Transmission Enhancement Cost Recovery | $0.54 | $204 | 1.0% | $0.60 | $214 | 1.4% | 11.2% |
| Transmission Owner (Schedule 1A) | $0.09 | $33 | 0.2% | $0.09 | $32 | 0.2% | 2.7% |
| Transmission Seams Elimination Cost Assignment (SECA) | $0.00 | $0 | 0.0% | $0.00 | $0 | 0.0% | 0.0% |
| Transmission Facility Charges | $0.00 | $0 | 0.0% | $0.00 | $0 | 0.0% | 0.0% |
| Ancillary | $0.69 | $259 | 1.3% | $0.72 | $254 | 1.7% | 3.6% |
| Reactive | $0.44 | $166 | 0.8% | $0.50 | $178 | 1.2% | 12.9% |
| Regulation | $0.11 | $40 | 0.2% | $0.09 | $34 | 0.2% | (10.4%) |
| Black Start | $0.09 | $32 | 0.2% | $0.09 | $33 | 0.2% | 9.8% |
| Synchronized Reserves | $0.04 | $14 | 0.1% | $0.02 | $5 | 0.0% | (59.0%) |
| Non-Synchronized Reserves | $0.01 | $5 | 0.0% | $0.01 | $2 | 0.0% | (48.5%) |
| Day Ahead Scheduling Reserve (DASR) | $0.00 | $2 | 0.0% | $0.00 | $1 | 0.0% | (22.4%) |
| Administration | $0.51 | $192 | 1.0% | $0.54 | $192 | 1.3% | 6.0% |
| PJM Administrative Fees | $0.48 | $179 | 0.9% | $0.50 | $179 | 1.2% | 6.0% |
| NERC/RFC | $0.03 | $12 | 0.1% | $0.03 | $12 | 0.1% | 7.5% |
| RTO Startup and Expansion | $0.00 | $1 | 0.0% | $0.00 | $1 | 0.0% | (9.7%) |
| Energy Uplift (Operating Reserves) | $0.10 | $36 | 0.2% | $0.06 | $23 | 0.1% | (34.0%) |
| Demand Response | $0.00 | $1 | 0.0% | $0.00 | $1 | 0.0% | (11.5%) |
| Load Response | $0.00 | $1 | 0.0% | $0.00 | $1 | 0.0% | (11.5%) |
| Emergency Load Response | $0.00 | $0 | 0.0% | $0.00 | $0 | 0.0% | 0.0% |
| Emergency Energy | $0.00 | $0 | 0.0% | $0.00 | $0 | 0.0% | 0.0% |
| Total Price | $53.14 | $19,918 | 100.0% | $43.03 | $15,268 | 100.0% | (19.0%) |
| Total Load (GWh) | 374,789 | | | 354,842 | | | (5.3%) |
| Total Billing ($ Billions) | $19.92 | | | $15.27 | | | (23.3%) |

# PJM Markets

- Competitive wholesale power markets work.
  - The goal is power at lowest possible cost.
- PJM energy market needs more effective market power mitigation.
- PJM capacity market needs to be improved.
  - Market power in the last base auction.
- Markets are good for all unit types.
- Markets are good for renewables.
- Markets create incentives for creative responses.
- Markets preferred to planning.
- Market alternative to subsidies to address carbon:
  - Carbon price
  - RGGI
- Markets only work with clear rules

# MOPR Order

- Order defines boundary between federal and state jurisdiction for PJM wholesale power market.
- States have authority over generation.
- MOPR is not about market power.
- MOPR is about defining competitive markets.
- Definition of competitive offers in the capacity market
  - Net CONE
  - Net ACR
- MOPR Order versus Sustainable Market Rule (SMR)
  - Net ACR
- History of MOPR
  - NJ
  - MD
  - Hughes vs Talen Energy Marketing decision (2016)

# MOPR Order

- State subsidies are distinguishing element.
- Significant exemptions for existing resource categories:
  - Renewables
  - Resources under RPS (PA Tier II Resources)
  - Demand side
  - Self supply
- Offer floors
  - Existing resources subject to MOPR
  - New resources subject to MOPR
- Double payment issue
  - Subsidized resources that do not clear capacity market

# Impacts of MOPR Order

- Detailed analysis/modeling shows no impact on capacity prices in upcoming capacity auction
- Capacity  market auctions for 2022/2023; 2023/2024; 2024/2025
- Existing nuclear units with subsidies are expected to clear
- Existing renewable resources are exempt
- Existing resources with RPS qualifications are exempt
- Existing self supply resources are exempt
- Existing demand resources are exempt
- Estimates of price increase are incorrect:
  - Commissioner Glick’s estimate
  - Grid Strategies’ estimate

# Long term impacts of MOPR Order

- Will renewable supply be competitive?
- Renewables contribution to capacity/reliability.
    - Derates
    - ELCC
- Will states implement carbon pricing?
- Least cost approach to low carbon
    - Option: Markets with MOPR
    - Option: Markets with SMR
    - Option: Markets with carbon price
    - Option: Markets plus targeted RECs/subsidies
    - Option: FRR instead of markets

# CONE offer floors

- **Default net CONE values are relatively low for combined cycle plants and high for coal and nuclear plants.**
- **Default net CONE values for onshore and offshore wind, and for solar, are high enough that offers based on these values would be unlikely to clear in a capacity auction, based on the clearing prices in recent capacity auctions.**
- **Unit specific values may vary significantly from these values.**
- **Unit specific values for renewables lower than default.**

# ACR offer floors

- **Default net ACR values, excluding major maintenance, for all existing technologies are close to zero, with the exception of coal and diesel and single unit nuclear.**
- **Based on the net ACR values and the clearing prices in recent capacity auctions, all existing technologies except single unit nuclear plants would be expected to clear if subject to a net ACR MOPR price floor.**
- **Unit specific values may vary significantly from these values.**

# FRR option

- In order to create a new FRR service area, a utility must elect the FRR option consistent with the PJM Market Rules. The utility can be required to make the FRR election by the state in which the FRR exists.
- Regardless of the existence of retail choice, the FRR entity must include all load in the FRR service area for all LSEs and must provide adequate capacity to meet that load.
- LSEs are required to pay the FRR entity based on a state mandated compensation mechanism or based on the rest of RTO capacity price in the absence of such a mechanism.

# FRR option

- Generators in the FRR area are not required to participate.
- The creation of an FRR is likely to increase payments for capacity by customers.
- The increase in payments by customers would be larger with additional subsidies.
- Market power is an issue in an FRR.
- The actual price for capacity and any actual subsidies would be the result of a negotiation between generation owners and the state.
- FRR option replaces competitive markets with an undefined weak form of cost of service regulation.
- No market power mitigation rules.
- No rules about competition or relative costs or goals.
- Details would be defined by each state.

# IMM Analysis of FRR Options

- ComEd
- Maryland
- New Jersey
- Ohio
- Virginia (forthcoming)
- Washington, DC (forthcoming)
- Additional LDAs (forthcoming)

# IMM recommendations: Transmission

- **Increase the role of competition in transmission consistent with Order 1000**
  - **Eliminate the exemption of supplemental projects**
  - **Eliminate the exemption of end of life projects**
  - **Implement robust evaluation of competing cost containment project and cost of service project proposals**
- **The rules governing cost/benefit analysis for evaluation of transmission projects should be modified to include all costs in all zones.**

# Market power issues

- Energy
  - Application of market power mitigation rules flawed
  - MMU filings on MBR
  - Mark up; inflexible parameters
  - ARR/FTR design flaws
- Capacity
  - Market power through inflated offer cap
  - Over procurement
  - Definition of PAIs
  - MOPR
  - ELCC
- Ancillary Services
  - Regulation market design flawed
- Transmission
  - Inadequate competition

# All in costs of wholesale power: Issues

- Energy
  - ORDC; Fast start pricing
  - Uplift; inflexible parameters
  - Carbon price; RPS
  - ARR/FTR
- Capacity
  - Market power
  - Over procurement
  - Subsidies
  - MOPR
  - FRR
  - ELCC
- Ancillary Services
  - Regulation
- Transmission

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