

**Ohio Energy**

23RD ANNUAL OHIO

**Energy  
Management  
CONFERENCE**

# Workshop N

**PJM Advanced ... A Deeper  
Dive Into the Emerging Issues in  
PJM's Electricity Markets**

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**Tuesday, February 19, 2019  
3:15 p.m. to 4:30 p.m.**

## Biographical Information

**Adam J. Keech, Executive Director – Market Operations,  
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Adam has worked at PJM for over 16 years in both Market Operations and System Operations. He is currently responsible for the efficient design and operation of PJM's electricity markets including the Day-ahead and Real-time Energy and Ancillary Service Markets, Financial Transmission Rights auctions and the capacity market. During his time in System Operations, he was the director of Dispatch Operations and was responsible for oversight of the PJM control room. Adam graduated from Rutgers University in 2002 with a bachelor's degree in Electrical Engineering. He earned a master's degree in Applied Statistics from West Chester University in 2013.

*PJM Interconnection, founded in 1927, ensures the reliability of the high-voltage electric power system serving 61 million people in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM coordinates and directs the operation of the region's transmission grid, which includes 62,556 miles of transmission lines; administers a competitive wholesale electricity market; and plans regional transmission expansion improvements to maintain grid reliability and relieve congestion.*

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**Kevin Murray, Executive Director, Industrial Energy Users-Ohio  
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Kevin Murray is the Executive Director of the Industrial Energy Users-Ohio and a Technical Specialist in the Columbus, Ohio office of McNees Wallace & Nurick LLC. He has worked with customers addressing matters that affect the pricing, availability and reliability of natural gas, electricity and other utility services. His experience includes evaluating regulatory proceedings at the Federal Energy Regulatory Commission and various state agencies; providing analysis of proposed tariff or rate offerings; assisting in the development of regulatory and commercial strategies; and providing clients assistance in utility contract negotiations, utility and site selections for new facilities, and performing competitor analysis and analysis of customer usage patterns. He has assisted customers on committing energy efficiency projects towards electric distribution company portfolio obligations to comply with recent legislative requirements. He has been extensively involved in activities related to the creation and startup of regional transmission organizations and energy markets in the Midwest. He is a sector representative for end use customers on the Midcontinent ISO Advisory Committee and previously served as committee chairman.

Prior to joining McNees Wallace & Nurick LLC, Mr. Murray spent twelve years with a large industrial corporation where his duties including managing a 20,000 DTH per day natural gas portfolio for the company's Midwest facilities and participating in natural gas, pipeline and electric utility contract negotiation. He also was a company representative at the Electricity Consumers Resource Council (ELCON) and Process Gas Consumers (PGC), where he participated in the development of regulatory advocacy positions and worked with outside counsel representing the company in regulatory proceedings. Mr. Murray also spent several years in supervisory positions in manufacturing operations.

Mr. Murray received a Bachelor of Science degree in Metallurgical Engineering from the University of Cincinnati.



# PJM Proposal: Reserve Market Enhancements

23<sup>rd</sup> Annual Ohio Energy Management Conference  
February 2019

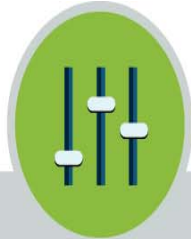
Adam Keech  
Executive Director, Market Operations  
PJM Interconnection

The PJM Board has determined that a comprehensive package inclusive of the components outlined below, is needed to meaningfully address the reserve procurement and pricing issues.

- 1.Consolidation of Tier 1 and Tier 2 Synchronized Reserve products
- 2.Improved utilization of existing capability for locational reserve needs
- 3.Alignment of market-based reserve products in day-ahead and real-time energy markets
- 4.Operating Reserve Demand Curves (ORDC) for all reserve products
- 5.Increased penalty factors to ORDCs to ensure utilization of all supply prior to a reserve shortage
- 6.Transitional mechanism to the RPM Energy and Ancillary Services (E&AS) Revenue Offset to reflect expected changes in revenues in the determination of the Net Cost of New Entry

- PJM determines minimum reserve requirements based on the largest contingency on the system
- PJM schedules to these requirements based on forecast information. When forecasts are inaccurate, more reserves may be needed
- PJM often has more reserves on its system available, but does not value the ability for these reserves to respond to uncertainty
- When not explicitly valued, reserves beyond the minimum requirement suppress prices despite the fact that they have value
- PJM seeks to appropriately value all available reserves

# Component #1: Consolidation of Tier 1 and Tier 2 and Offer Changes



## Tier 1 Market Product

Remaining ramping capability on flexible dispatchable generation resources after economic dispatch



## Tier 2 Market Product

- Generation resources reduced from their economic set point
- Synchronous condensing resources and DR

vs.

10-minute response time

Obligation to respond

Non-compliance penalty

Paid for response to an event

10-minute response time

Obligation to respond

Non-compliance penalty

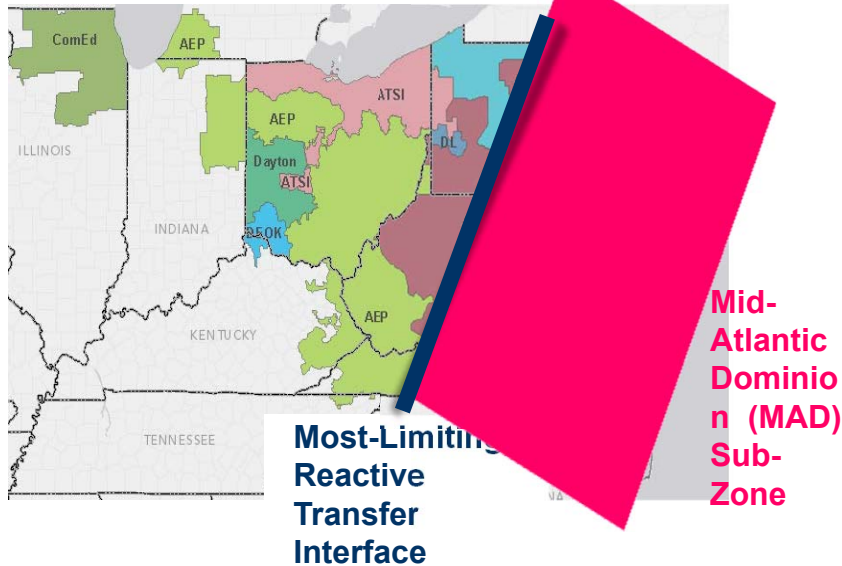
Paid market clearing price regardless of deployment



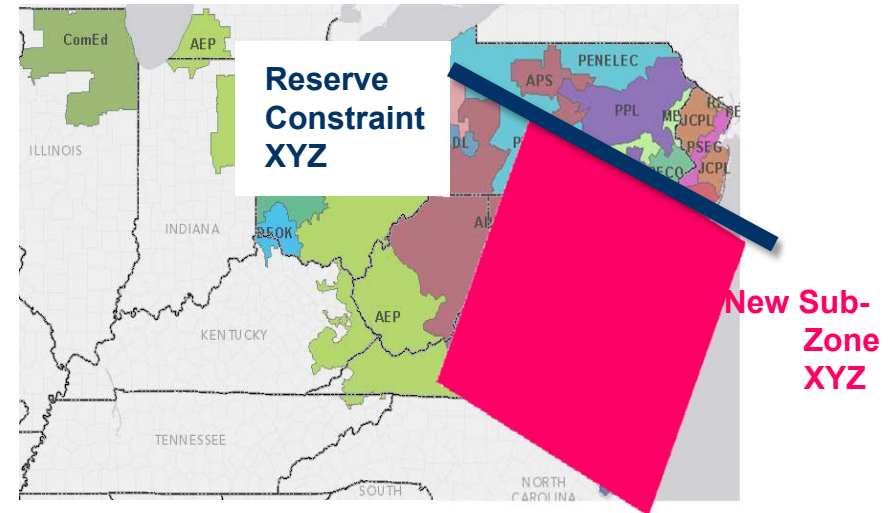
## Component #1: Consolidation of Tier 1 and Tier 2 and Offer Changes

- PJM will strengthen the synchronized reserve must-offer requirement
- PJM will calculate a resource's availability and reserve offer MW using the availability and unit parameters offered in for energy, with some exceptions
  - Participants will be provided additional flexibility to update energy ramp rates intra-day and to update the Synch Reserve Maximum MW intra-hour to enable more accurate representation of their reserve capability
- The proposal reduces the maximum level of synchronized reserve offers
  - The Variable Operations & Maintenance component will be removed from SR offers (it is already included in energy offers)
  - The \$7.50/MWh offer margin will be reduced to the expected value of the penalty (\$0.02 for 2018)

- More Flexible Reserve Sub-Zone Modeling
  - Keep existing RTO reserve zone with closed loop sub-zone structure, but allow flexibility to change the location of the sub-zone on a day-ahead basis, as needed
    - Allow changes intra-day on an exception basis
  - Define several reserve sub-zones, of which only one will be used at a time



OR





# Component #3: Reserve Market Alignment



**ORDCs and Offer Price Caps will be consistent between DA & RT for each product**

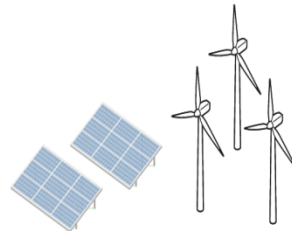
- PJM resource commitment and dispatch tools use forecast information to schedule resources and calculate prices
  - Load forecast
  - Interchange forecast
  - Resource performance
    - Renewable resource forecasts
    - Bid-in resource operating parameters
    - Resource availability
- These forecasts are not 100% accurate and therefore result in uncertainty on the system that PJM system operators must manage
- PJM existing scheduling and dispatch processes do not account for this uncertainty

- Market clearing engines commit and dispatch based on forecast information with the assumption that forecasts are 100% accurate
- When forecast error manifests in real-time, operators must take additional actions to maintain supply-demand balance
- When these actions are taken outside of the market tools, they may not be performed on a least-cost basis, can be done inconsistently by operators, and can suppress prices resulting in uplift
- If there is limited or no ability to respond to forecast errors quickly, it can result in transient or sustained reserve shortages - neither is desirable

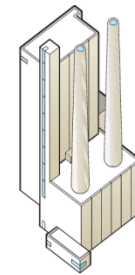
- Basis for value is the maximum cost of actions taken to maintain reserves and the uncertainty on the system that could result in falling below the reserve requirement despite procuring sufficient reserves in advance
  - Cost of a reserve shortage is based on the penalty factor
  - Uncertainty is measured from historical data:



Real-time load forecast



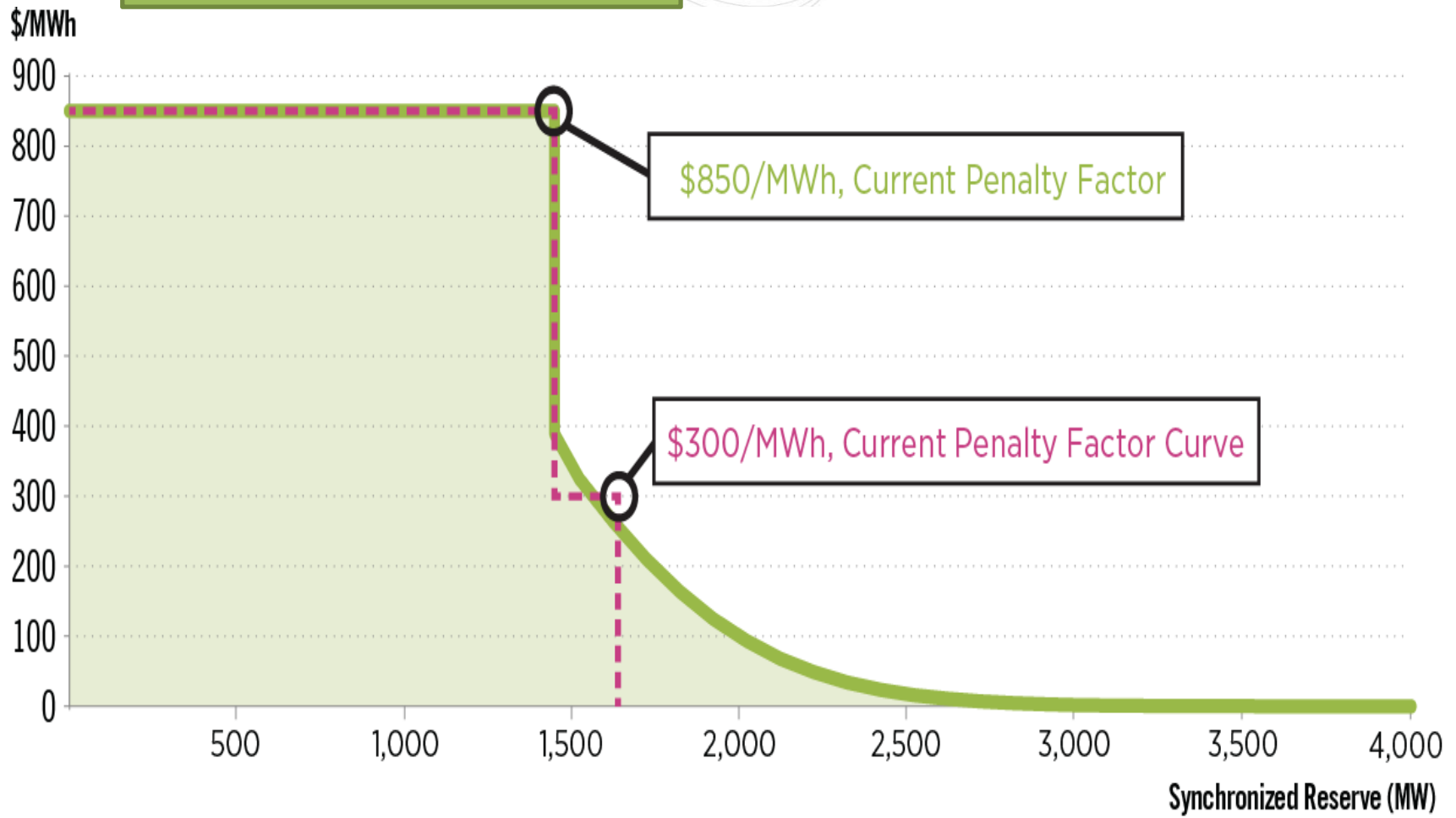
Real-time solar and wind forecast



Expectation of conventional generator failure

# Component #4: Implement Downward-Sloping Demand Curves

## Synchronized Reserves





## Component #5: Implement \$2,000/MWh Penalty Factors for All Products

PJM dispatchers will commit high-cost generation and deploy pre-emergency and emergency load management reductions, which have a cost in excess of the existing \$850 penalty factor, in order to maintain Synchronized and Primary Reserves.

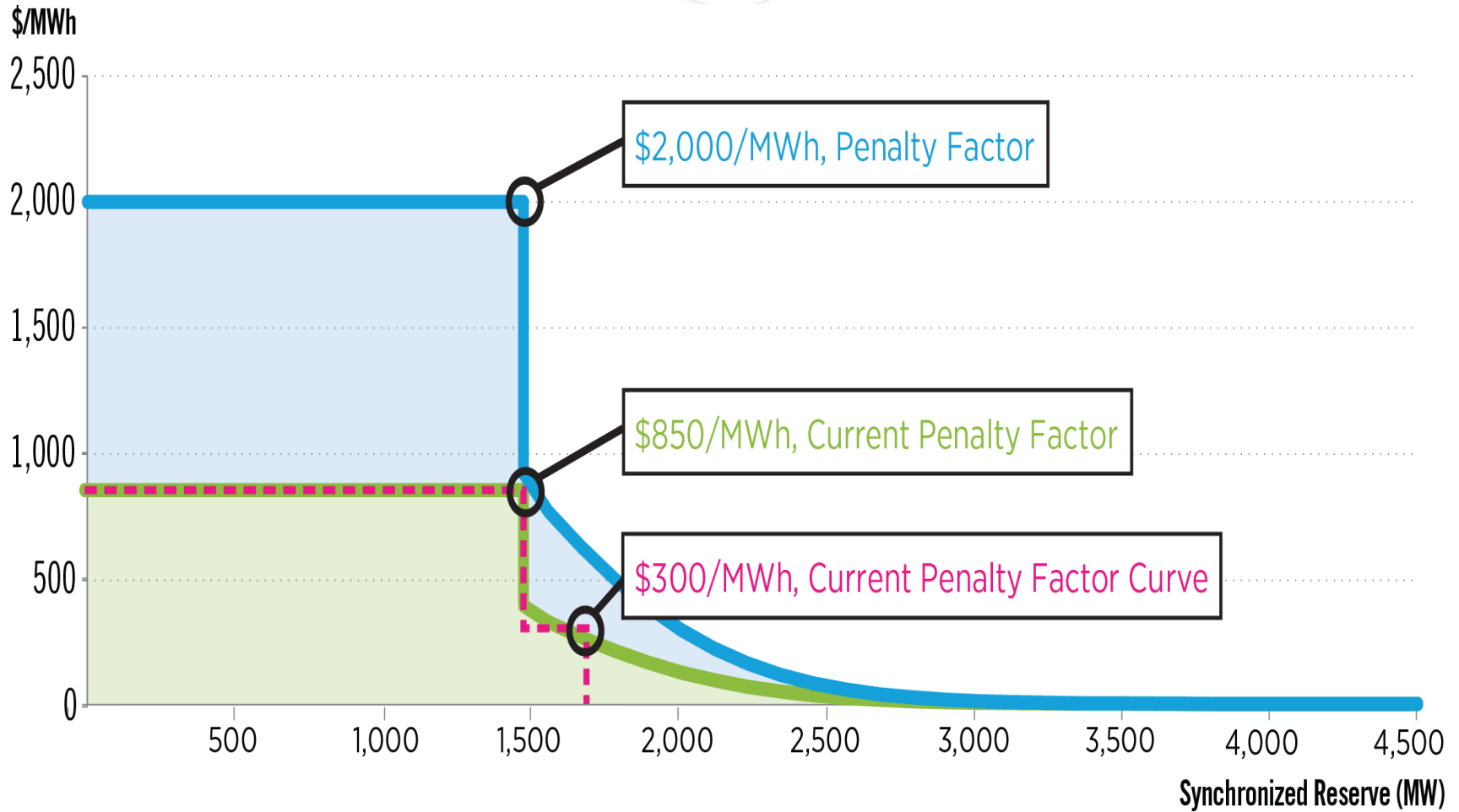
- Generation offer cap (for price-setting): \$2,000/MWh
- Offer cap for Pre-Emergency and Emergency Load Management Reduction Actions:

Lead Time	Offer Cap Formula	Offer Cap
2 hours	\$1,000 plus the Primary Reserve Penalty Factor	\$1,100/MWh
1 hour	\$1,000 plus (the Primary Reserve Penalty Factor * ½)	\$1,425/MWh
30 minutes	\$1,000 plus (the Primary Reserve Penalty Factor -\$1)	\$1,849/MWh

The Penalty Factor should be revised to \$2,000/MWh at all times to allow these operator actions to be reflected in prices should they be taken to maintain reserves.

# Component #5: Implement \$2,000/MWh Penalty Factors for All Products

## Synchronized Reserves



- PJM's original proposal an adjustment to the E&AS offset
- The adjustment was intended to more quickly reflect the expected increase in energy and reserve market revenues in the capacity market
- Compelling arguments have been made to not make this adjustment
  1. An adjustment of this type has never been proposed despite other energy market rule changes (Fast-Start Pricing, Shortage Pricing, etc.)
  2. The proposal would result in suppliers trading a predictable amount of capacity revenues based on an as-yet unrealized expectation of increased energy and reserve market revenues
  3. The E&AS offset is intended to net energy revenues over the long-term, not perfectly offset them in any specific year.
- PJM can support a proposal without this component



- If it is desirable to keep a transition mechanism, PJM believes it is more defensible to more significantly weight more recent years in the E&AS offset rather than rely on simulation data as originally proposed
- For example, if Year 1 is the calendar year immediately preceding the BRA:
  - $E\&AS\ Offset = 50\% * Year\ 1\ Net\ Revenues +$   
 $34\% * Year\ 2\ Net\ Revenues +$   
 $16\% * Year\ 3\ Net\ Revenues$
- This method would allow for a quicker transition of the E&AS offset without introducing a simulation into the calculation

- **Stakeholder Process Began:** January 2018
- **Stakeholder Process Concluded:** January 2019
- As of early February 2019, stakeholders negotiating towards consensus.
- Absent consensus, PJM will discuss a path forward with its Board in mid-February 2019.

# PJM Advanced

## What is Next on the Horizon for PJM's Electricity Markets?

*23<sup>rd</sup> Annual Ohio  
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# Agenda

- A little history (a.k.a. the great stakeholder debate).
- PJM has a jump ball (you pick one).
- Bring me another rock.
- Whose on FERC.
- Off to the races (or at least to an appeals court).



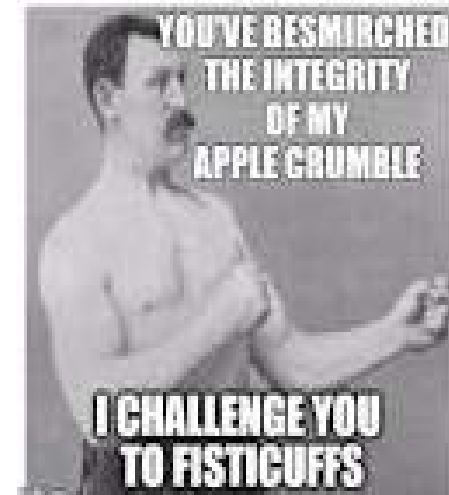
## A Little History

- For the better part of the last two years, PJM stakeholders have debated changes to PJM's market rules to address state actions to support continued operation of specific generation resources.
  - Triggered by Illinois ZEC legislation.
  - Other states have taken similar actions.
  - Debate within PJM Energy Price Formation Senior Task Force.
- Stakeholders' views on the wisdom of taking actions and what those actions should be run the gamut.



# PJM and its IMM Find Themselves at Odds

- After months of debate at the end of 2017, PJM and its Independent Market Monitor (IMM) found themselves at odds over the best way to proceed.
  - PJM – Capacity Repricing
  - IMM – MOPR-Ex.
- PJM management decided to let the PJM Board of Managers pick the winner.



# Capacity Repricing

- Two stage auction to address resources receiving state support.
- State supported resources allowed to participate in stage one of the auction.
- Assume price taker bid from state supported resources.
- State supported resources clear auction stage one.



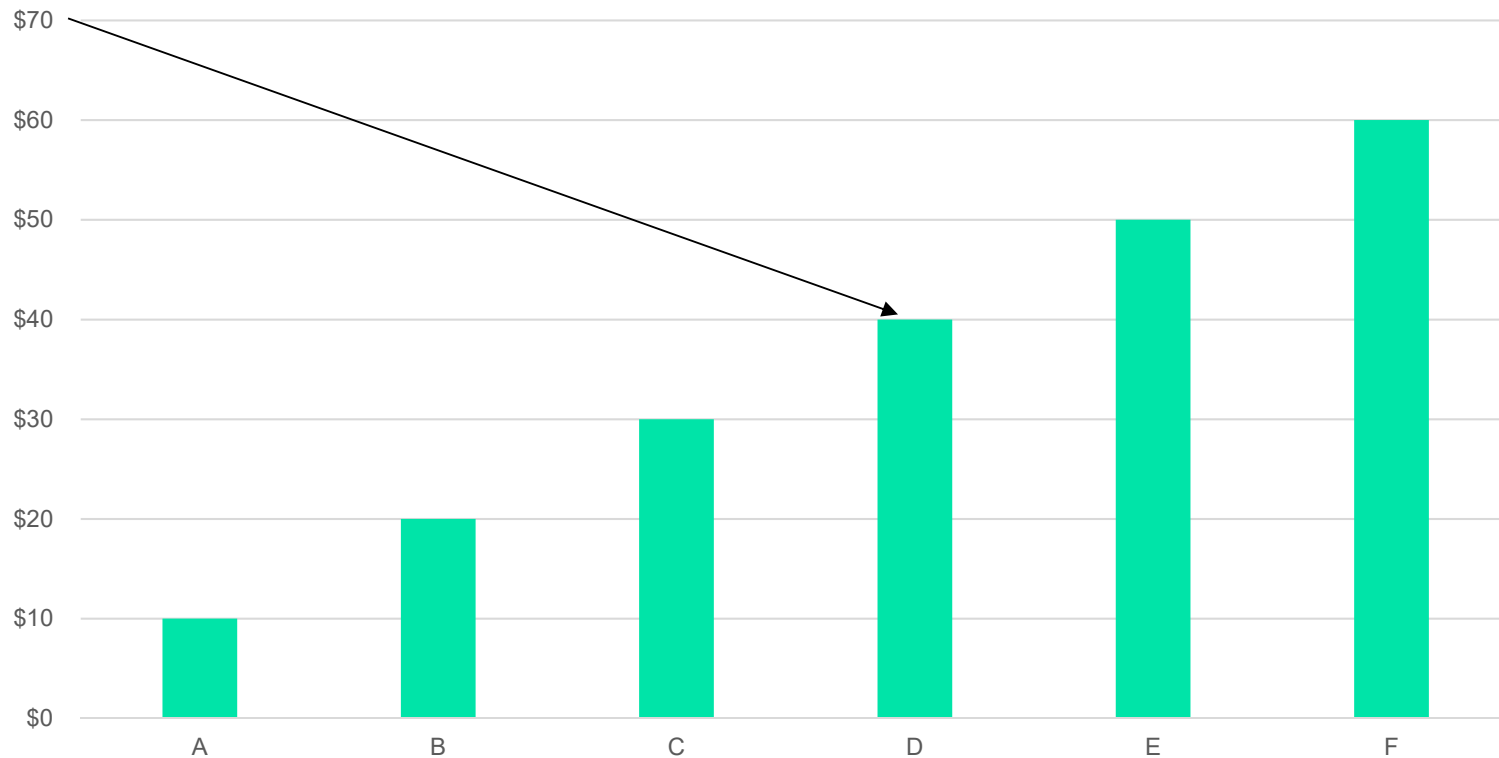
# Capacity Repricing

- In stage two of the auction, bids from state supported resources are removed from the supply stack.
- Incremental higher priced capacity resources that did not clear stage one set the auction clearing price.
- Higher clearing price paid to resources that clear stage one.





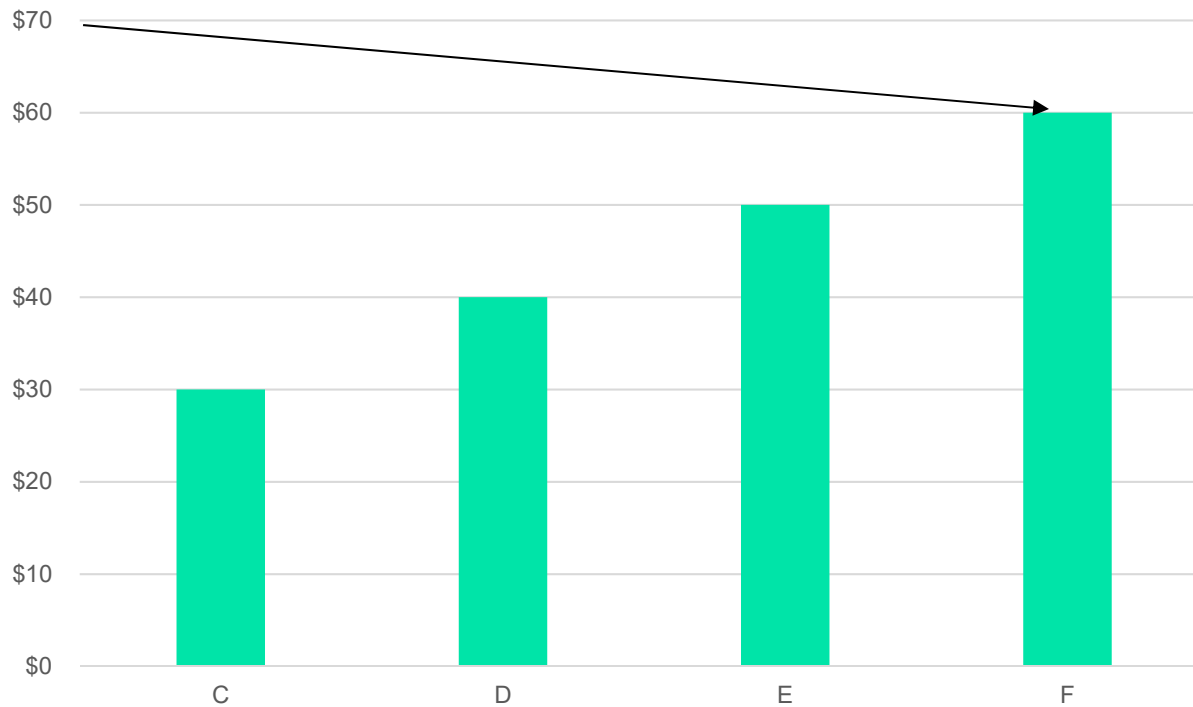
# RPM First Stage Auction



Each generator is 100 MW, demand is 400 MW.



# RPM Second Stage Auction



Each generator is 100 MW, demand is 400 MW.



## MOPR-Ex

- PJM currently has a minimum offer price rule (MOPR) that applies to a subset of generation resources.
- Expand MOPR to apply to any resource receiving a material subsidy, unless exempted.
- MOPR-Ex floor price set equal to Market Seller Offer Cap or Net Cone \* B.
- Self supply exemption.



## PJM has a Jump Ball

- After confronting the stark list of choices presented to it, the PJM Board of Managers decided its best decision was to let someone else decide.
- PJM management directed to submit both capacity repricing and MOPR-Ex to the Federal Energy Regulatory Commission (FERC).
- In regulatory speak this is known as a jump ball.



## FERC Makes a Decision (Sort of)

- After confronting the stark list of choices presented to it, FERC decided to reject capacity repricing and MOPR-Ex.
- Capacity repricing is not just and reasonable.
- PJM has not justified the disparity among the treatment of generators under the MOPR-Ex.



## On to Better Things (Sort of)

- While it rejected both capacity repricing and MOPR-Ex, FERC's June 29, 2018 order found PJM's existing tariff was unjust and unreasonable for its failure to appropriately address resources receiving state support.
- PJM directed to bring FERC another rock by October 4, 2018.
  - Other parties file testimony and comments.
  - Reply briefs filed on November 6, 2018.
- In its June 29, 2018 order, FERC said it would endeavor to issue an order by January 4, 2019.



# PJM's Proposal

- Expanded MOPR that applies to all new and existing resources with limited exemptions.
- Resource carve out option for states to provide material subsidies to specific resources.
  - States would need to define load associated with resource carve out.
  - Material subsidies exclude generic economic development grants, subsidies less than 1% of total revenues, voluntary REC sales and federal programs in place prior to March 21, 2016.



# PJM's Proposal

- New proposal includes extended resource auction proposal.
- Similar to prior two stage auction proposal.
- State resources receiving out of market support are carved out of auction and receive no capacity payments.
- Crowded out resources will receive the difference between their offer and the second stage clearing price.





## Whose on FERC?

- FERC makeup January 1, 2018:
  - Chairman McIntyre, Commissioners Chatterjee, Glick, LaFleur and Powelson.
- Commissioner Powelson resigns August 2018.
- Chairman McIntyre steps aside October 2018; Chatterjee named chair.
- Bernard McNamee confirmed December 2018.
- Current makeup: two Democrats and two Republicans.



## Off to the Races

- At the time these slides were prepared (January 21, 2019), FERC had not issued a substantive decision on the merits of PJM's proposal.
- Any FERC decision is likely to be challenged on appeal through a federal appellate court.
- Regulatory churn regarding PJM's market rules has become the new normal.
- EPSA et al. have requested U.S. Supreme Court review of appellate court decisions upholding New York and Illinois ZEC programs.

