Investigation of Resource Adequacy Alternatives

Technical Conference

September 18, 2020

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Opening Remarks:

Joseph Fiordaliso,

President, New Jersey BPU

Education:

Kathleen Spees

The Brattle Group

Education Session

Fundamentals of Resource Adequacy

September 18, 2020

PREPARED FOR

New Jersey Board of Public Utilities

Technical Conference: Investigation of Resource Adequacy Alternatives

PREPARED BY

Kathleen Spees

Walter Graf

Brattle

Fundamentals of Resource Adequacy

- What is resource adequacy?
- How do we achieve resource adequacy?
- How does the PJM capacity market work?
- How are other regions approaching resource adequacy for the 100% clean grid?

What is resource adequacy?

Resource adequacy = Enough resources to reliably serve customers

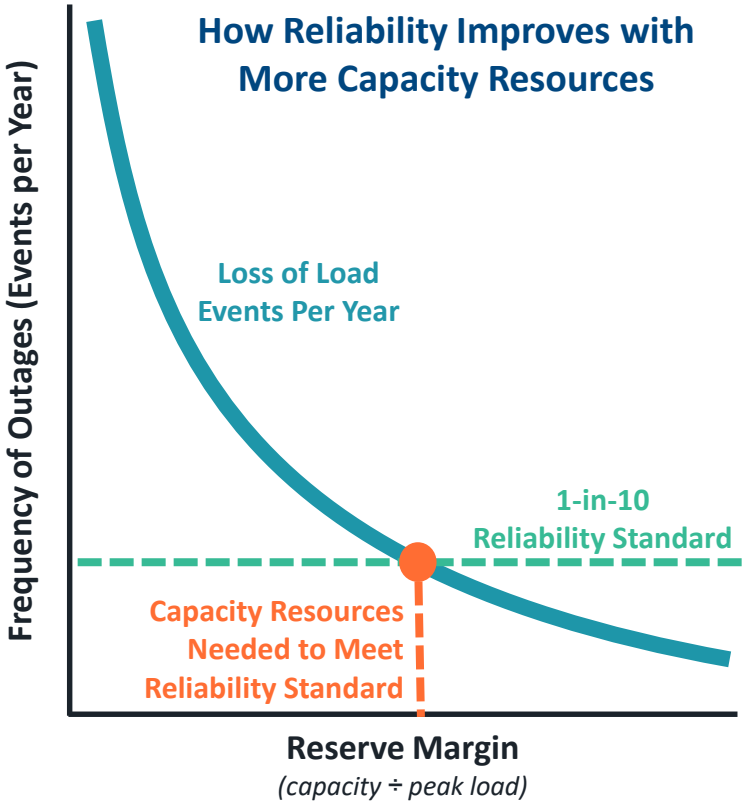
The electricity grid must have enough generation, storage & demand response resources to meet peak demand in both "normal" and "extreme weather" years

PJM Resource Adequacy Standards

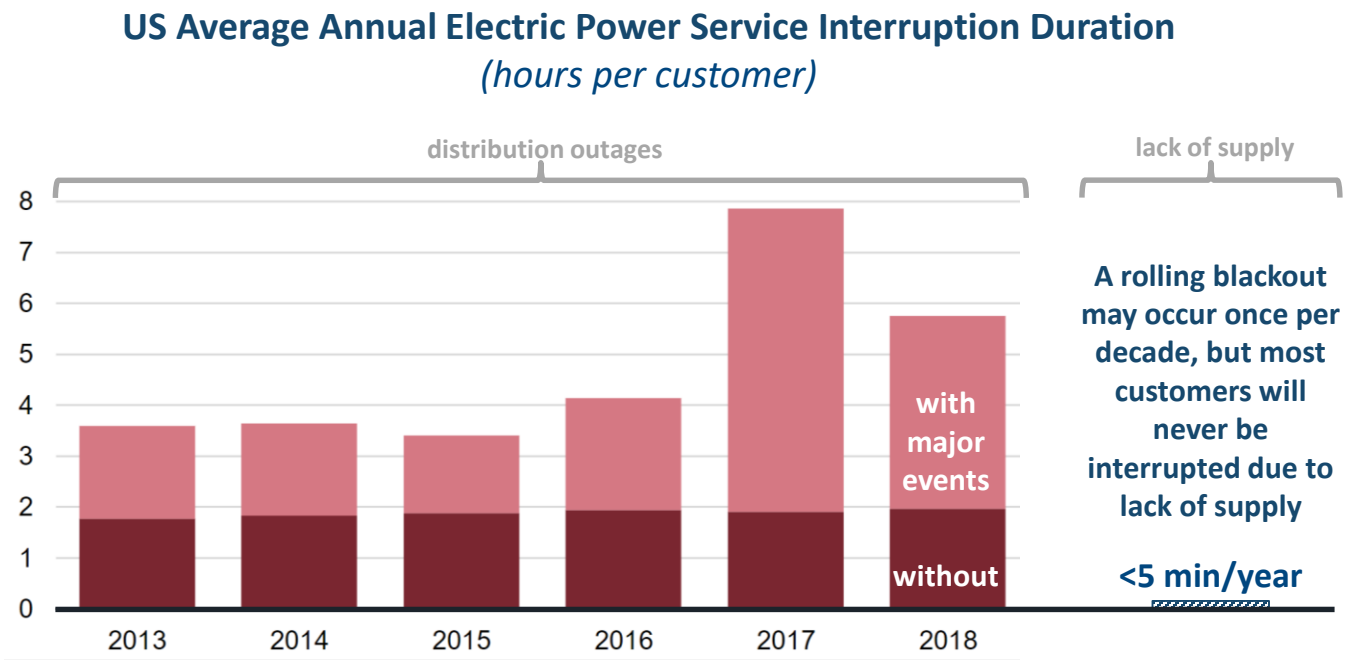
System-Wide: No more than 1 supply shortfall event in 10 years, or **"1-in-10" reliability standard**

+

Locational: Transmission import-constrained regions such as New Jersey require enough transmission capability and local supply to achieve no more than 1 shortfall event in 25 years, or **1-in-25 reliability standard**



Resource adequacy is only one part of reliability



"Resource adequacy" refers to having **sufficient supply & demand response** to avoid shortfalls.

Traditionally, excludes:

- *Operational reasons* for outages
- *Transmission* outages
- *Distribution* outages

SOURCE: EIA, "U.S. CUSTOMERS EXPERIENCED AN AVERAGE OF NEARLY SIX HOURS OF POWER INTERRUPTIONS IN 2018," JUNE 1, 2020.

How do we achieve resource adequacy?

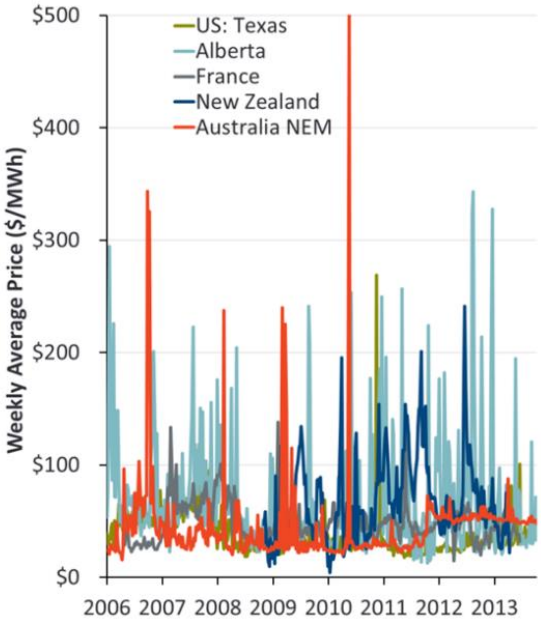
There are several ways to achieve resource adequacy:

Market-Based Options

Vertically Integrated/ Planned	Energy-Only Market	Capacity Market
Vertically integrated utilities or a government entity does resource planning to build or contract new resources	Energy prices (plus “scarcity price” during tight hours) is primary mechanism to attract new investments	Organized market for “capacity” product is primary mechanism to attract new investments
MISO, California, SPP, Ontario	ERCOT, Alberta, Australia	PJM, ISO-NE, NYISO, UK, Ireland

Energy-only and capacity markets both use competitive prices to attract new supply investments

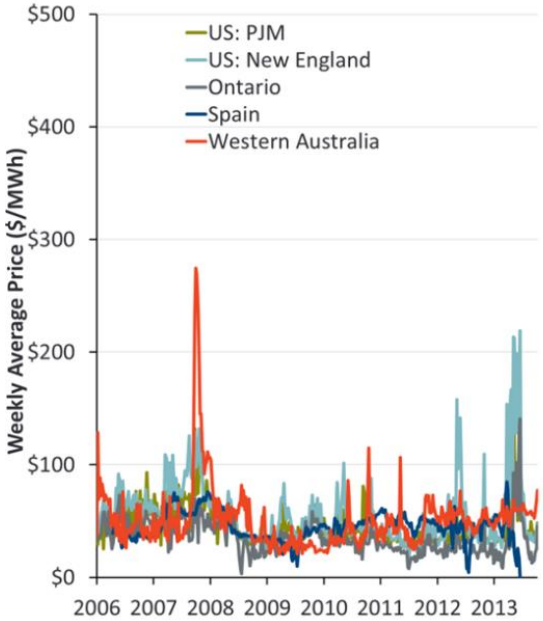
Energy-Only Markets



Investments attracted through occasional high price spikes if reserve margins fall

No capacity payments

Capacity Markets



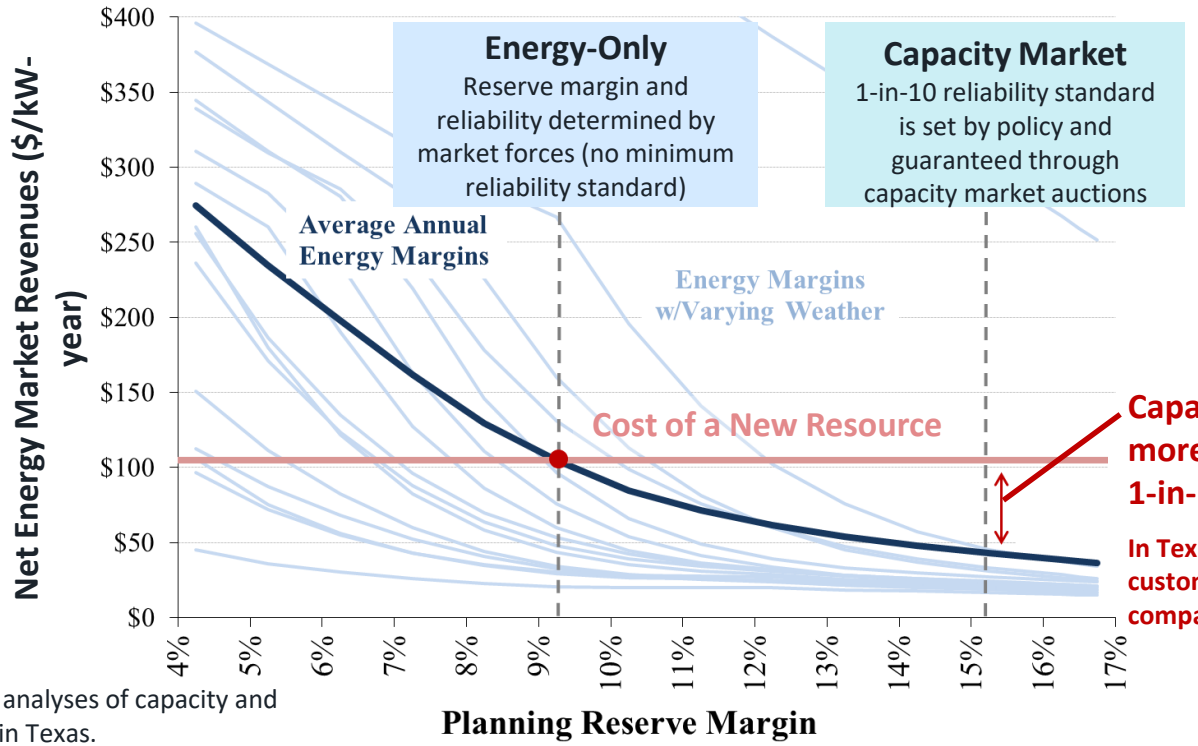
Energy prices are more stable and lower on average

Investments attracted through capacity market payments

See Spees & Newell discussion of alternative resource adequacy constructs.

A capacity market can be used to achieve higher reliability than market forces alone would support

Texas Example: Power Plant Energy Market Net Revenues



Capacity payments to attract more investments & achieve 1-in-10 reliability standard

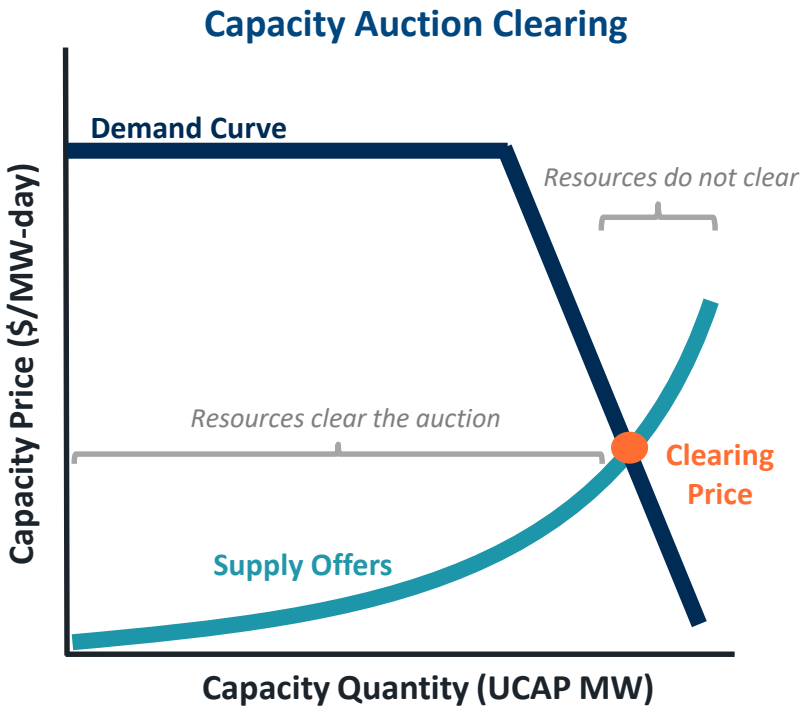
In Texas we estimated 1% greater customer costs in the long run compared to energy-only

See Brattle's 2012 and 2014 analyses of capacity and energy-only market options in Texas.

How does the PJM capacity market work?

Capacity is procured via technology-neutral competitive auctions

- **Product:** The obligation to be online and available to produce energy during shortage conditions, denominated as unforced capacity (UCAP) MW
- **Supply:** All generation, storage, and demand response resources can offer their UCAP rating. Typical UCAP ratings as a percentage of installed capacity: 13% wind, 38% solar, 95% gas plant
- **Downward-Sloping Demand Curve**: Determined administratively to reflect system and local resource adequacy objectives
- **Three-Year Forward Auctions:** Supply and demand are brought together in auctions to clear the **lowest-cost set of resources** to serve resource adequacy



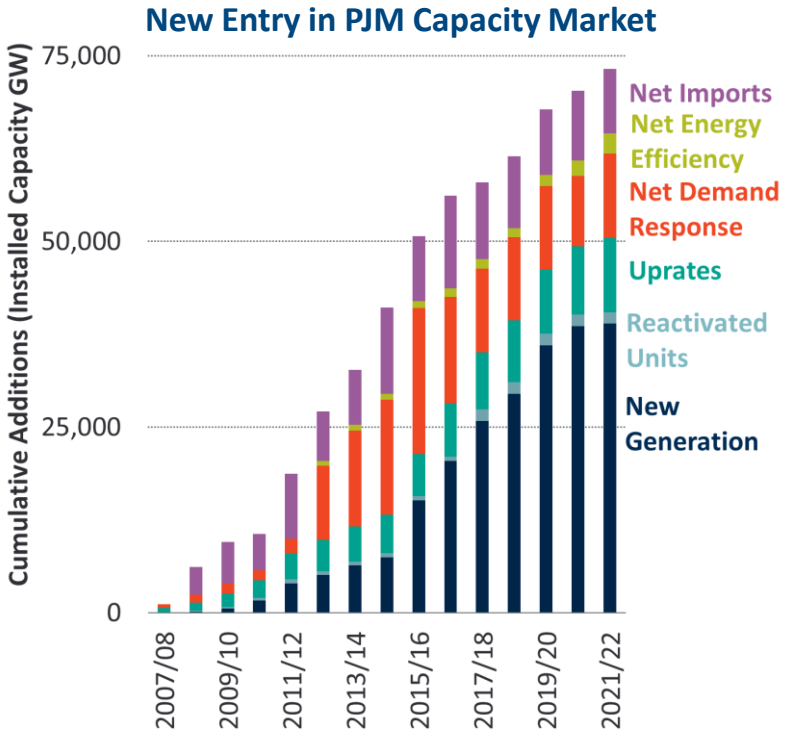
Successes and challenges with PJM's capacity market

Successes to date:

- Consistently met system & local resource adequacy, even as 41 GW of capacity (primarily fossil) has retired since its inception
- Attracted large quantities of new entry at low prices (far below the prices available from contract solicitations)
- Proved ability to attract merchant generation entry, placing almost all risks on developers (not customers)
- Technology-neutral approach unlocked large quantities of non-traditional supply, including launching a thriving merchant demand response industry

Challenges going forward:

- Many challenges already addressed through rule refinements over time to better meet reliability needs
- Procurement in excess of reliability needs
- Need improved supply & demand accounting for the clean grid
- **Minimum offer price rule (MOPR) will exclude many state-supported policy resources from clearing**

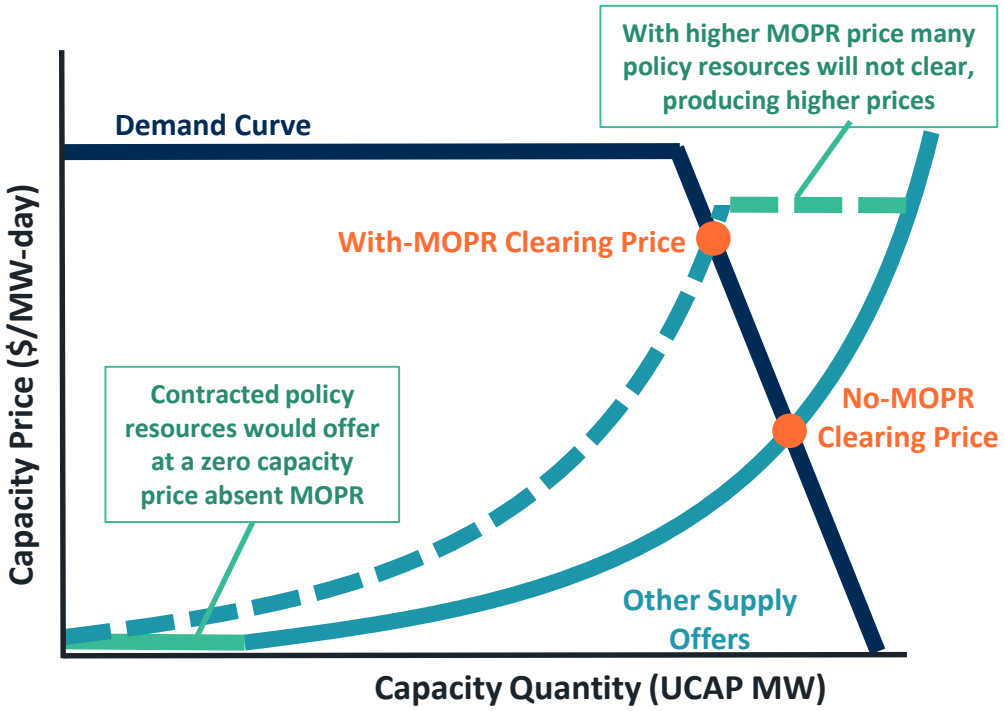


Source: Brattle analysis of PJM 2021/2022 RPM Base Residual Auction Results.

Recent FERC expansion of MOPR could exclude many state policy resources from clearing the capacity market

- MOPR originally intended to address manipulative price suppression from large buyers
- Expanded MOPR applies to existing and new state-supported policy resources (existing renewable resources are grandfathered in)
- Affected resource offers are restated to higher levels in the capacity auction; many will not clear
- Likely impacts: higher capacity clearing prices, retention of fossil fuel resources beyond what is needed for capacity, and customers "paying twice" for capacity
- States and delegated entities can choose fixed resource requirement (FRR) to secure capacity for resource adequacy and avoid MOPR

MOPR Requires Policy Resources to Offer at Higher Prices



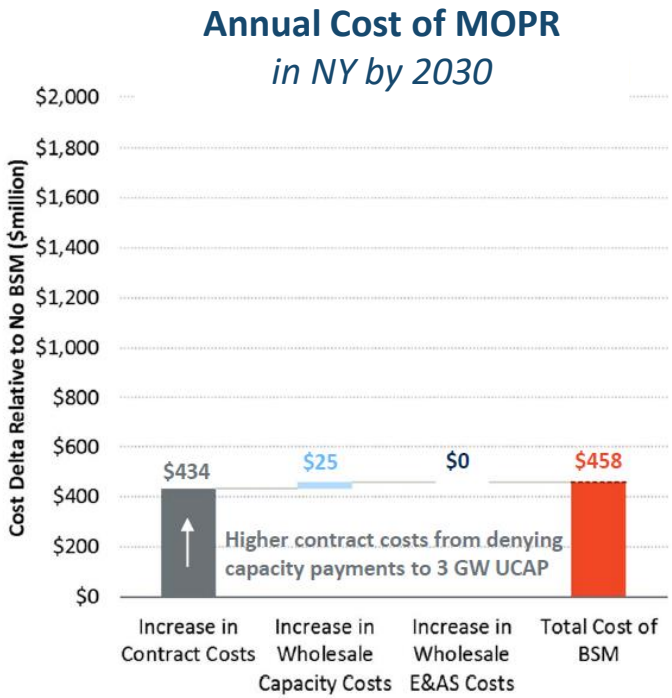
How are other regions approaching resource adequacy for the 100% clean grid?

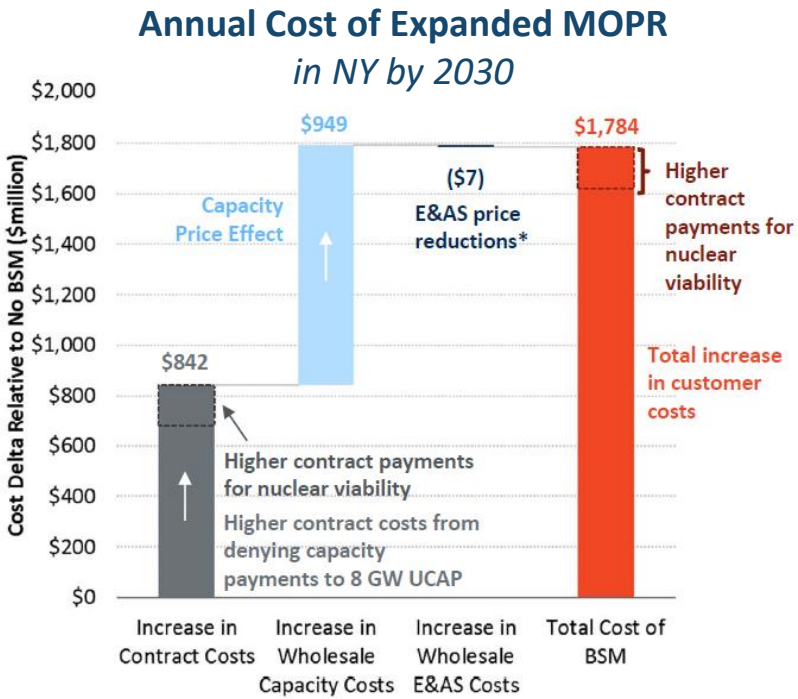
New York: Policymakers are evaluating capacity market alternatives to eliminate MOPR

Structure		Description
1	**Current Market with Status Quo MOPR**	Current capacity market with current rules (including MOPR)
2	**Current Market with Expanded MOPR**	Same as above but with potential expansion to MOPR rules corresponding to FERC's December 2019 order for PJM
3	**Current Capacity Market without MOPR**	Similar to current capacity market, but with rule-setting by State No MOPR, except as applied by state commission to prevent the intentional introduction of uneconomic capacity to profitably suppress capacity prices
4	**Competitive Retailers Contract Bilaterally for Capacity**	Same as #3, but with no centralized market Retail providers must procure sufficient capacity bilaterally
5	**Co-optimized Capacity and Clean Energy Procurement**	Same as #3, but a State entity would procure capacity and RECs for retail providers in a joint, co-optimized auction

See our Qualitative and Quantitative (original and updated) assessments of resource adequacy structures conducted on behalf of NYSERDA and NY DPS.

New York: MOPR will impose significant excess costs on customers

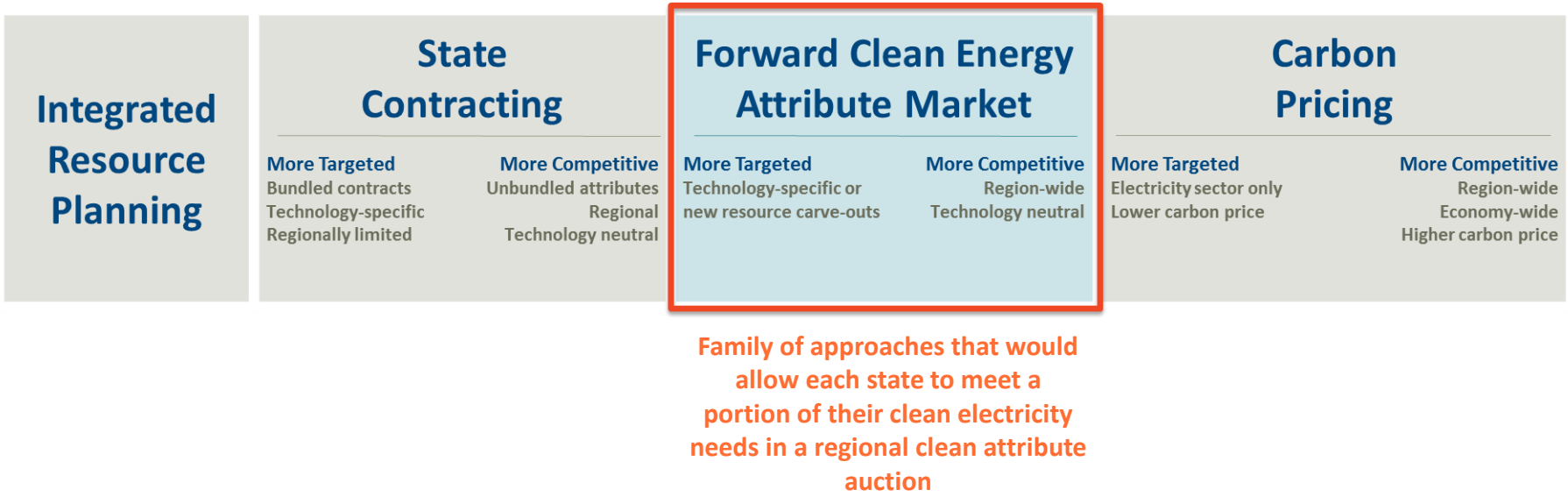


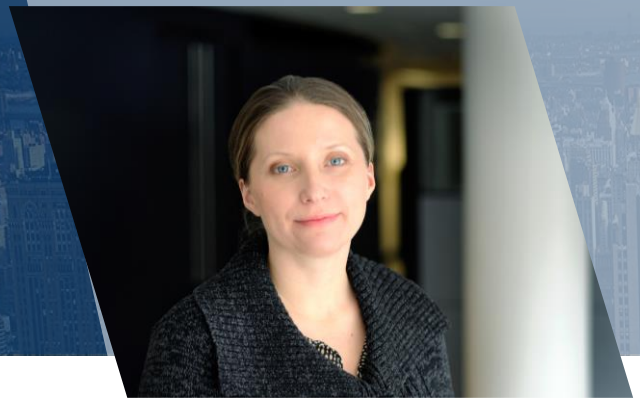


* Energy and AS prices decrease in some cases because excess capacity depresses prices in tight hours; and because higher contract payments (due to lack of capacity payments) cause energy prices to be more negative in over-generation hours.

ISO New England: Considering market-based approaches to align RTO market with state policies

Broad state-driven "Future Grid" and "Pathways" stakeholder efforts are underway to identify how wholesale power markets should change to support the states' economy-wide 80x50 goals. Pathways track is evaluating options for states to attract clean resources in a regional competitive market:





Kathleen Spees

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Experience

- Dr. Spees is an expert in wholesale electricity and environmental policy design and analysis
- Her work for market operators, policymakers, utilities, and market participants focuses on:
  - Energy, capacity, and ancillary service market design
  - Carbon and environmental policy design
  - Valuation of traditional and emerging technology assets

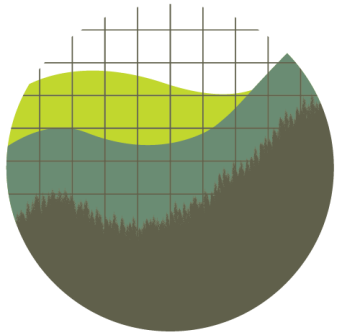
Education

- Ph.D., Engineering and Public Policy, Carnegie Mellon University, 2008
- M.S., Electrical and Computer Engineering, Carnegie Mellon University, 2007
- B.S., Physics and Mechanical Engineering, Iowa State University, 2005

Panel 1:

- **Paul Flanagan, Executive Director, New Jersey Board of Public Utilities**

  - Sylwia Bialek, NYU Policy Integrity
  - Joseph Bowring, Monitoring Analytics
  - Lathrop Craig, PSEG Power Ventures
  - Rob Gramlich, Grid Strategies LLC
  - Brian Lipman, New Jersey Division of Rate Counsel
  - Glen Thomas, PJM Power Providers Group
  - Kevin Warvell, FirstEnergy



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FRR options for New Jersey

Sylwia Bialek
09/18/2020
BPU Technical Conference

Institute *for* Policy Integrity
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FRR design choice - main dimensions

Sylwia Bialek
09/18/2020

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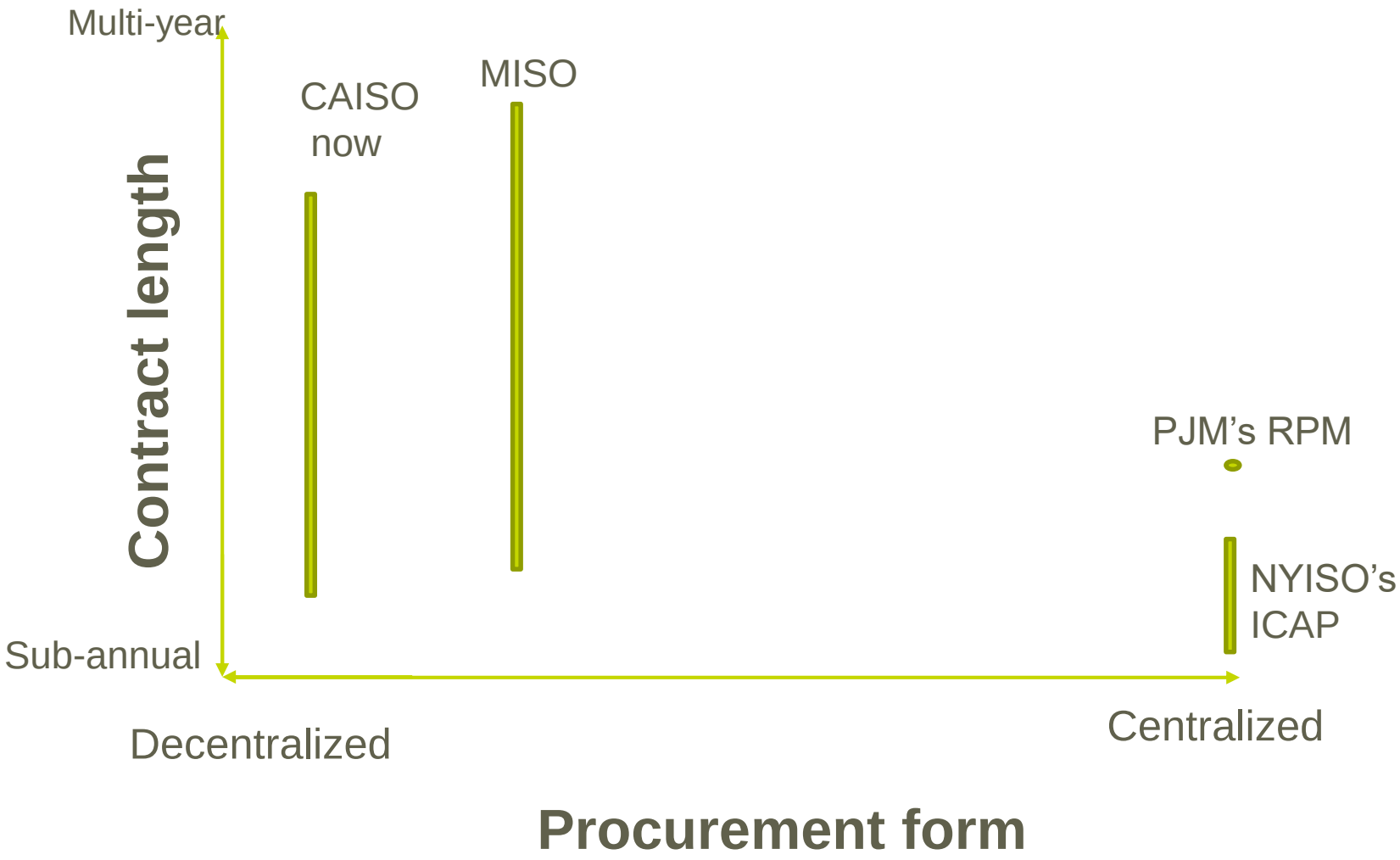

Sylwia Bialek
09/18/2020

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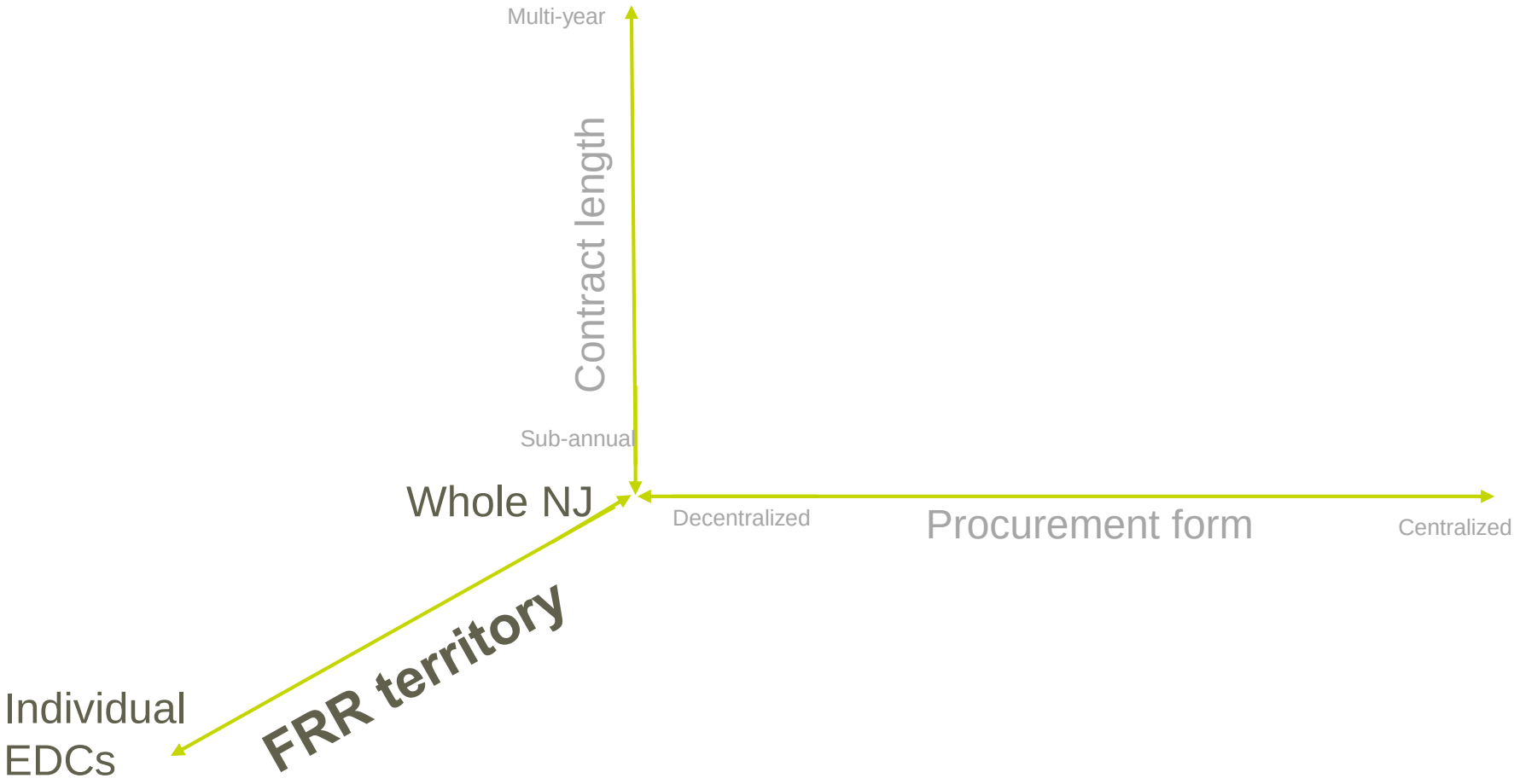

Sylwia Bialek
09/18/2020

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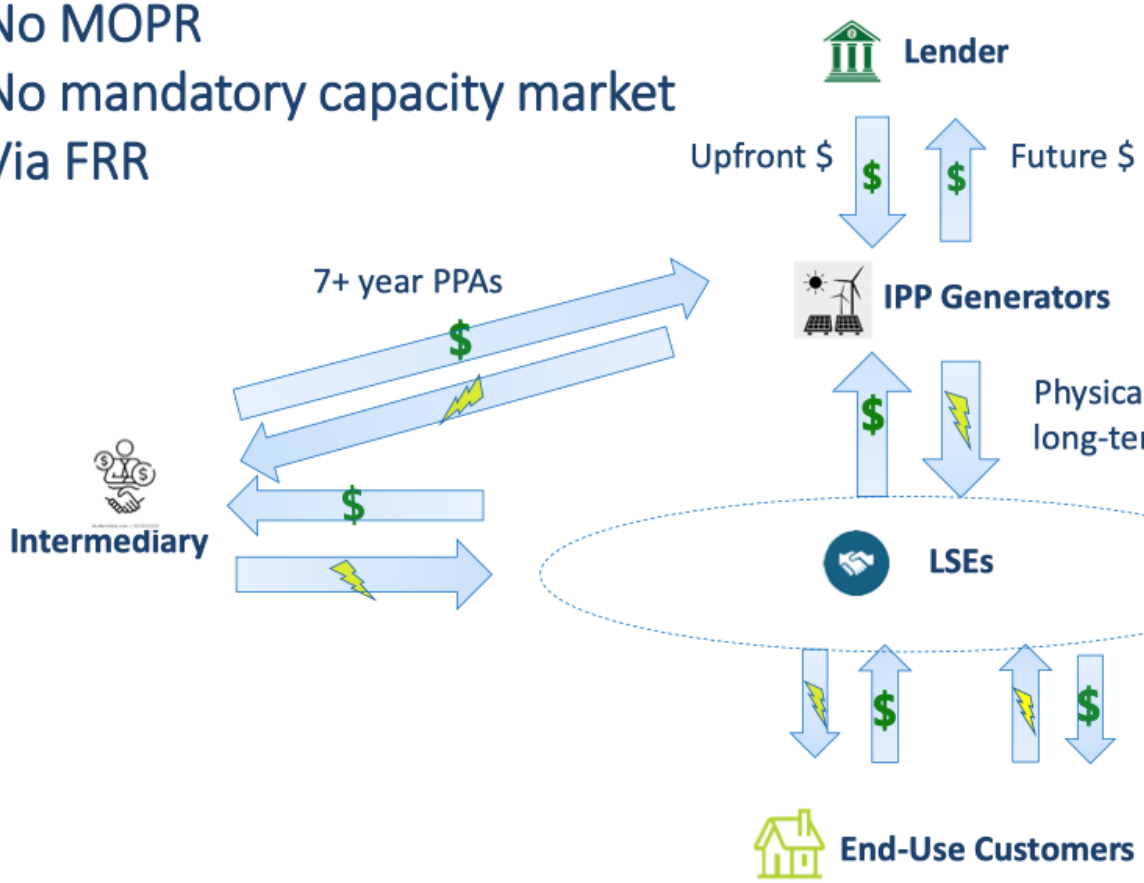
How Actual Power Markets Attract Investment

No MOPR
No mandatory capacity market
Via FRR



State Resource Adequacy Oversight

Texas style: voluntary contracting, no reserve margin or mandatory obligation

California style: State Commission capacity requirement

Australia style: Flexible oversight to ensure annual load-generation balance

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  - Jeff Dennis, Advanced Energy Economy
  - Travis Kavula, NRG Energy, Inc.
  - Katie Guerry, Enel North America

Panel 2: Resource Adequacy in New Jersey and Distributed Energy Resources

Katherine Hamilton
AEMA Executive Director
September 18, 2020

advanced energy management alliance

AEMA mission and members

Advanced Energy Management Alliance (AEMA) advocates for policies that empower and compensate customers appropriately--to contribute energy or energy-related services or to manage their energy usage--in a manner which contributes to a more efficient, cost-effective, resilient, reliable, and environmentally sustainable grid.

Our members are providers and supporters of distributed energy resources (DERs), including demand response (DR) and advanced energy management, united to overcome barriers to nationwide use of demand-side resources.

Demand response and distributed energy in New Jersey

AEMA members-–including providers and customers—are active throughout NJ, bringing clean, efficient, resilient, and reliable resources to the state.

Current and future demand response and distributed energy resources are cost-effective, clean, resilient, and reliable resources that should be key components to New Jersey's resource adequacy mix.

AEMA strongly urges NJ to remain in PJM in order to maximize the benefits of the regional market to customers based on cost savings, environmental benefits, and resource efficiency.

Demand Response in NJ

PJM DR By the Numbers

Category	Number
C&I customer locations in PJM DR	1,444
MW in PJM DR	400+
Estimated $ saved for all NJ consumers from PJM DR	$148 M, or $50/house in 20/21
Estimated $ paid to C&I customers in NJ	$20 M in 20/21

Enablers for C&I DR

- 95+% of revenues for C&I DR comes from PJM capacity market
- Capacity payments provide C&I customers with the predictability they need to participate in DR
- If NJ leaves PJM, DR throughout PJM would be reduced

To meet resource adequacy and climate goals, NJ should

- meet goals cost-effectively and reliably, using wholesale markets to do so;
- benefit from regional competition and ability to leverage other states' resources;
- take steps to align capacity resource mix with state clean energy goals;
- encourage less energy intensive resources that avoid new generation procurement such as behind-the-meter customer-sited DERs.

AEMA Recommendation #1

The state should continue to support in-state energy efficiency, demand response, and distributed energy resources that contribute to NJ's resource adequacy and offset the need to build new generation.

AEMA Recommendation #2

The state should consider key principles as it evaluates potential Resource Adequacy alternatives.

- Minimized cost and risks to ratepayers;
- Procurement mechanisms that allow free entry and exit of third-party providers through which end use customers can participate;
- Non-discriminatory treatment for capacity (and capacity attribute sellers) between utilities and third parties;
- Competitive, technology neutral (as long as clean) price signal for capacity and capacity attributes;
- Stable, low-risk environment for DERs of all types—energy efficiency, demand response, energy storage, advanced energy management; and
- Regional cooperation and competition.

AEMA Recommendation #3

The state should consider any negative impacts to the Clean Energy Act's energy efficiency and peak demand response goals under a Fixed Resource Requirement construct.

AEMA Recommendation #4

If an alternative capacity mechanism is pursued (such as expanding Basic Generation Service), the following principles should apply:

- Allowing third party suppliers to participate;
- Allowing unbundled service procurement; and
- Ensuring capacity procurements are deliverable.

AEMA Recommendation #5

The state should consider future opportunities for additional PJM market enhancements through stakeholder processes.

- Changes to accounting for environmental externalities of emitting resources in PJM dispatches and increase MOPR floors for those resources; and
- Changes to PJM capacity market rules for self-supply options and exclusions to "state subsidy" definition under replacement rates.

Conclusion

AEMA commends the work of the BPU to properly incentivize energy efficiency, peak demand reduction, and advanced energy solutions for consumers.

AEMA urges the BPU to adopt key principles that support robust consumer participation that can in turn prevent new generation, reduce costs, and meet environmental goals.

AEMA believes that opportunities for NJ lie within PJM market participation, through regional collaboration, and in state programs and policies.

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New Jersey BPU Technical Conference on Resource Adequacy

09/18/2020

Katie Guerry

Head of Regulatory Affairs – US & Canada

Enel North America, Inc.

The Enel Group

A leader in the new energy world

1st **network** operator[1]

World's largest private player[2] in **renewables**

Largest retail **customer** base worldwide[3]

- 73 M End Users
- 46 GW Renewable capacity
- 6.3 GW Demand Response
- 33 Countries
- 69,000 Employees

1. By number of end users. Publicly owned operators not included
2. By installed capacity. Includes managed capacity for 3.4 GW
3. Including customers of free and regulated power and gas markets

Enel's Unique Market Position & Perspective

New Jersey 2019 Energy Master Plan Strategies	Enel Activities
1) Reducing Energy Consumption and Emissions from the Transportation Sector	Leading provider of "smart" electric vehicle charging
2) Accelerating Deployment of Renewable Energy and Distributed Energy Resources	Developing, owning and operating utility-scale solar/wind and aggregating DERs
3) Maximizing Energy Efficiency and Conservation, and Reducing Peak Demand	Reducing peak demand through C/I demand response and residential/office smart EV charging
4) Reducing Energy Consumption and Emissions from the Building Sector	Supporting large energy user customers to develop virtual PPAs and reduce peak demand
5) Decarbonizing and Modernizing New Jersey's Energy System	Providing of non-wires solutions to modernize the grid and zero carbon electricity generation
6) Supporting Community Energy Planning and Action in Underserved Communities	Investing in over 75 community organizations throughout USA in 2020, United Nations & NGO Climate Compacts
7) Expand the Clean Energy Innovation Economy	U.S. Innovation Hubs - new technology opportunities & access (Boston, San Francisco); Enel Foundation and U.S. Academia partnerships

Market Investment Drivers

Key Criteria Impacting Enel's Investment Decisions

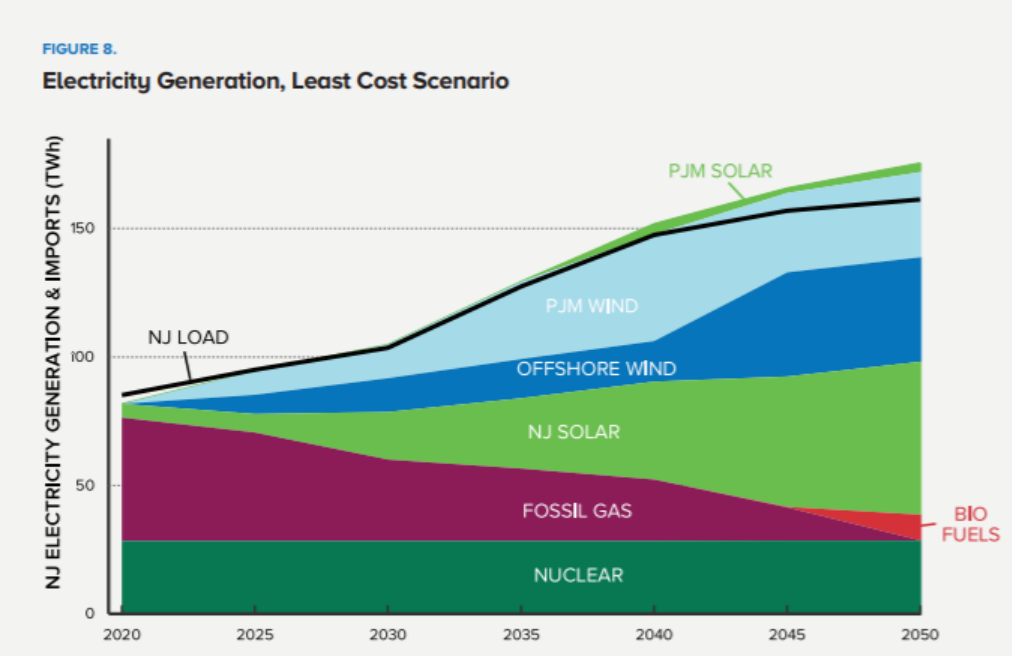
Market: PJM Interconnection Investment Criteria	Market Criteria Satisfied?
Transparent & Liquid Market	Yes
Stable Market & Policy Conditions	Yes
Open Access in All Markets –Compensatory or Other Opportunities for Valuing All Unique Attributes or Services from Resource	Yes* *(*most)*
Competitive Market Rules -Transparent & Fair	Yes
Access to Competitive Regional Market Efficiencies	Yes*

*Certain states and utility territories prohibit DR participation from third parties as a result of FERC Order 719

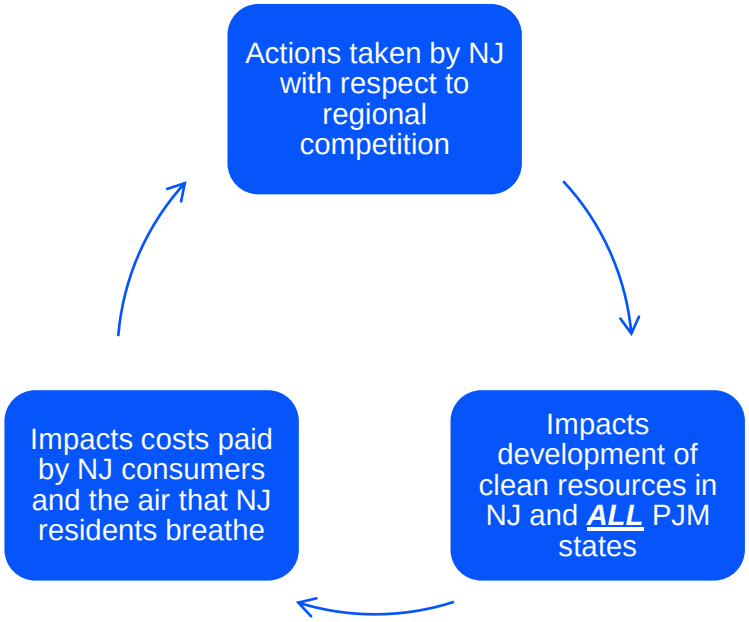
NJ Integrated Energy Plan

Access to regional markets is critical to achieving goals for least cost, clean energy

“…an increasing amount of electricity generation comes from in- and out-of state renewable resources”



NJ’s actions have far-reaching impacts



Recommendations to NJ BPU

Non RA-Based Wholesale Market Rule Reforms at PJM

- Streamline the Best Practices for Interconnection Process and Rules
- Reduce Bottle Necks in Transmission System, Increase Penetration and Reduce Costs for Clean Energy
- Appropriate valuation of clean resources through Effective Load Carrying Capability (ELCC)
- New DER Participation Models and rules for Complimentary Cost Effective Retail & Wholesale programs

Develop Principles of Alternate Regional RA to Transition from RA Attracting Clean Resources to RA Efficiently Maintains & Operates Clean Resources

- Utilizes Regional Competition, minimizes cost, increases penetration and reduces emissions
- Ensure capacity market outcomes themselves reflect state policy goals (e.g. Clean Constraints and or Co-Optimization of Clean energy & Resource Adequacy)
- Provides pathway for development of flexible, less energy-intensive resources that may see limited benefit from carbon pricing and FCEM

Leverage all possible State and Local Policy tools

- Create distribution-level retail price signals for DERs services Complimentary to Wholesale services
- Address Siting and Interconnection Barriers at Local and State Governments and Utilities
- Build Clean Energy Highways for transmission
- Tighten Environmental Restrictions & Reinforce Infrastructure for Emerging Technology (e.g.EV)

Thank You!

09/18/2020

Katie Guerry

Head of Regulatory Affairs – US & Canada

Enel North America, Inc.

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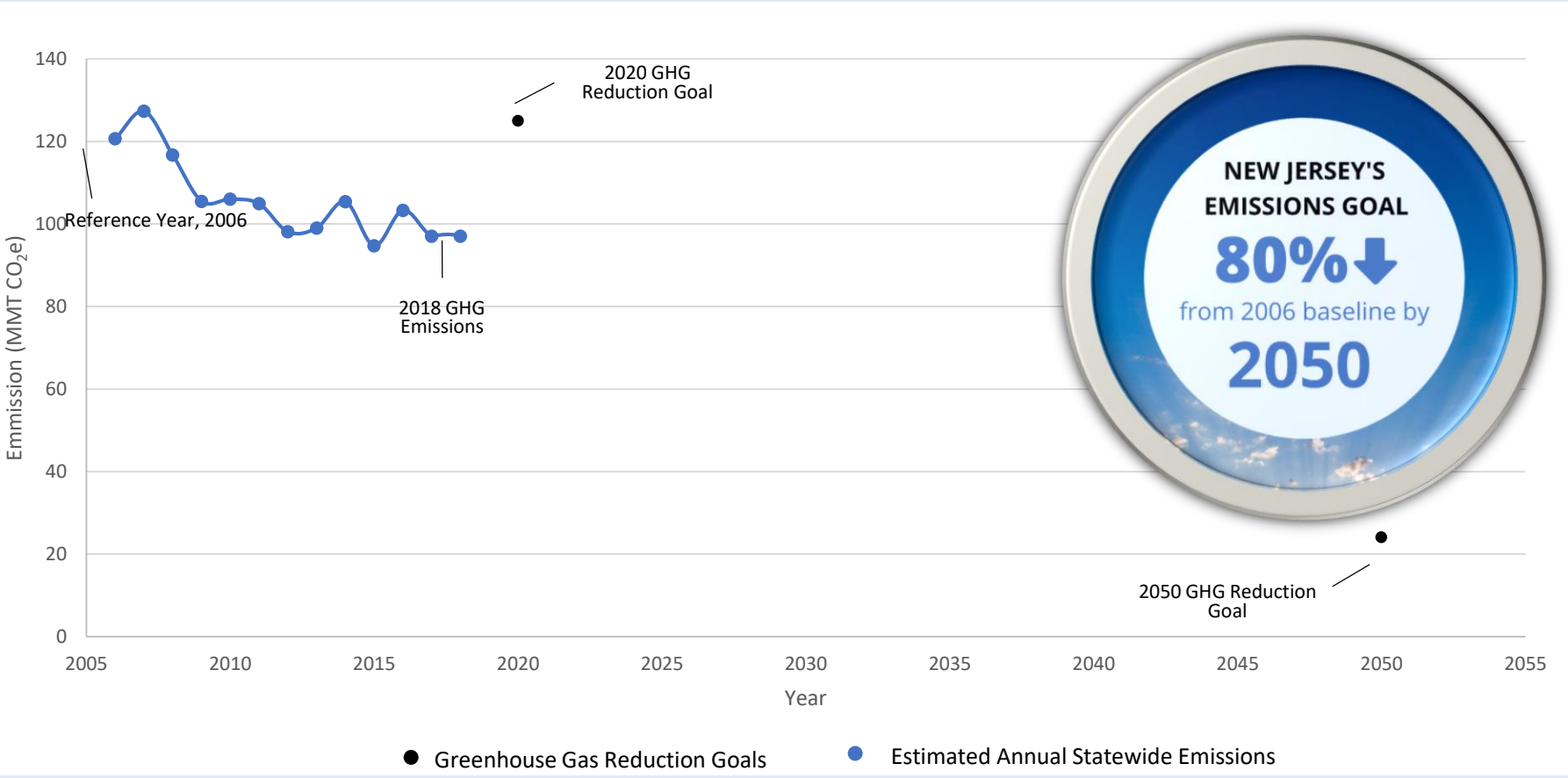
Global Warming Response Act (GWRA) – 2007, Revised 2019



Executive Order 100 & NJ PACT

- **EO 100 DIRECTED DEP TO ADOPT PROTECTING AGAINST CLIMATE THREATS ("PACT") REGULATIONS.**
- **DEP ISSUED ADMINISTRATIVE ORDER 2020-01 (NJPACT)**

NEW JERSEY PROTECTING AGAINST CLIMATE THREATS:

GWRA Report

GHG Monitoring & Reporting Program

Climate Pollutant Reduction Regulations

- Carbon Dioxide
- Short-Lived Climate Pollutants

Land Use Regulations

- Incorporate Climate Change considerations into existing rules

Reform EO 215 (1989)

- Incorporate climate change considerations into Environmental Impact Statement/Environmental Assessment

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Achieving 100% Clean Energy

New Jersey Board of Public Utilities
Investigation of Resource Adequacy Alternatives

Mason Emnett
Vice President, Competitive Market Policy
September 18, 2020

Exelon®

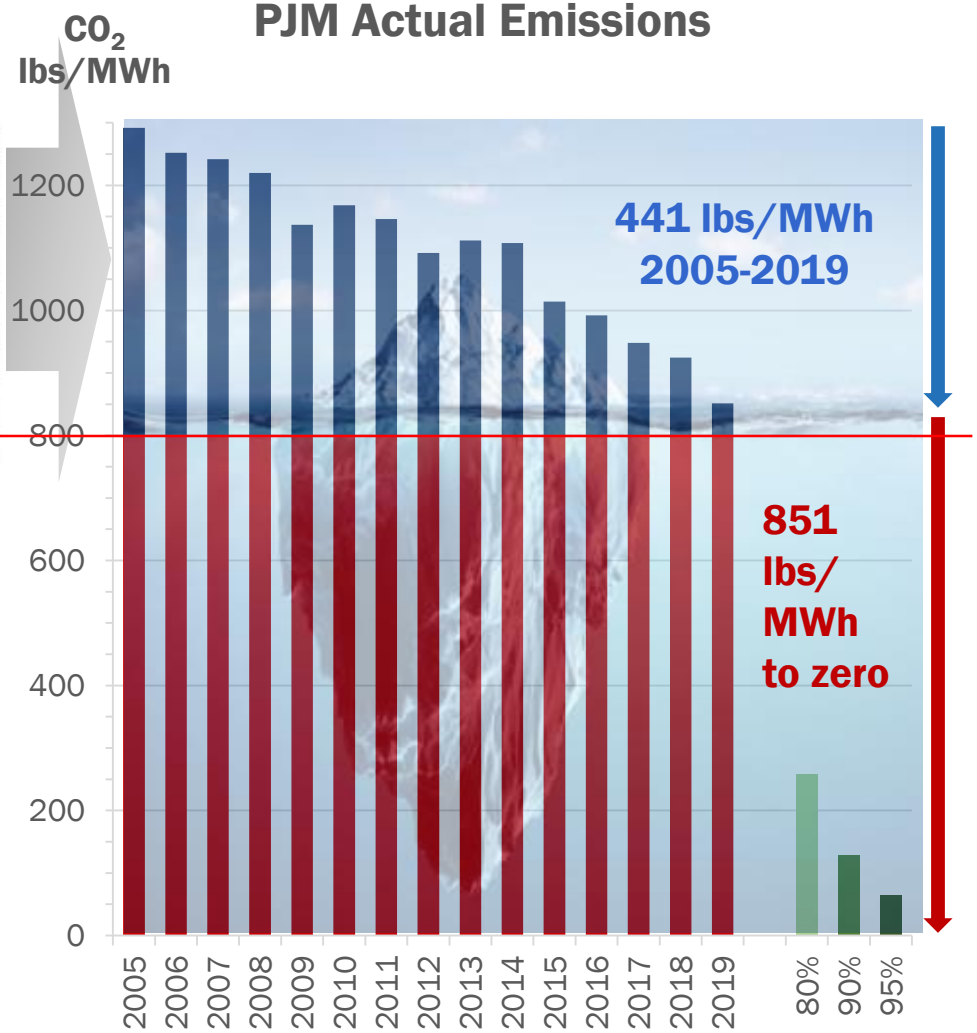
Despite reductions since 2005, PJM emission rates need to fall dramatically to meet targets

PJM's Published Data

Inside Lines – March 4, 2020

- EIA projections indicate PJM region emission reductions will level out by 2025
- Premature retirement of nuclear plants would reverse emission declines
- Backfilling generation from Illinois, New Jersey, and Ohio PJM nuclear plants with new CCGT's would increase PJM's rate by ~127 lbs./MWh
- Backfilling them with the marginal PJM unit would increase the rate by ~212 lbs/MWh, undoing half the progress of the last 15 years

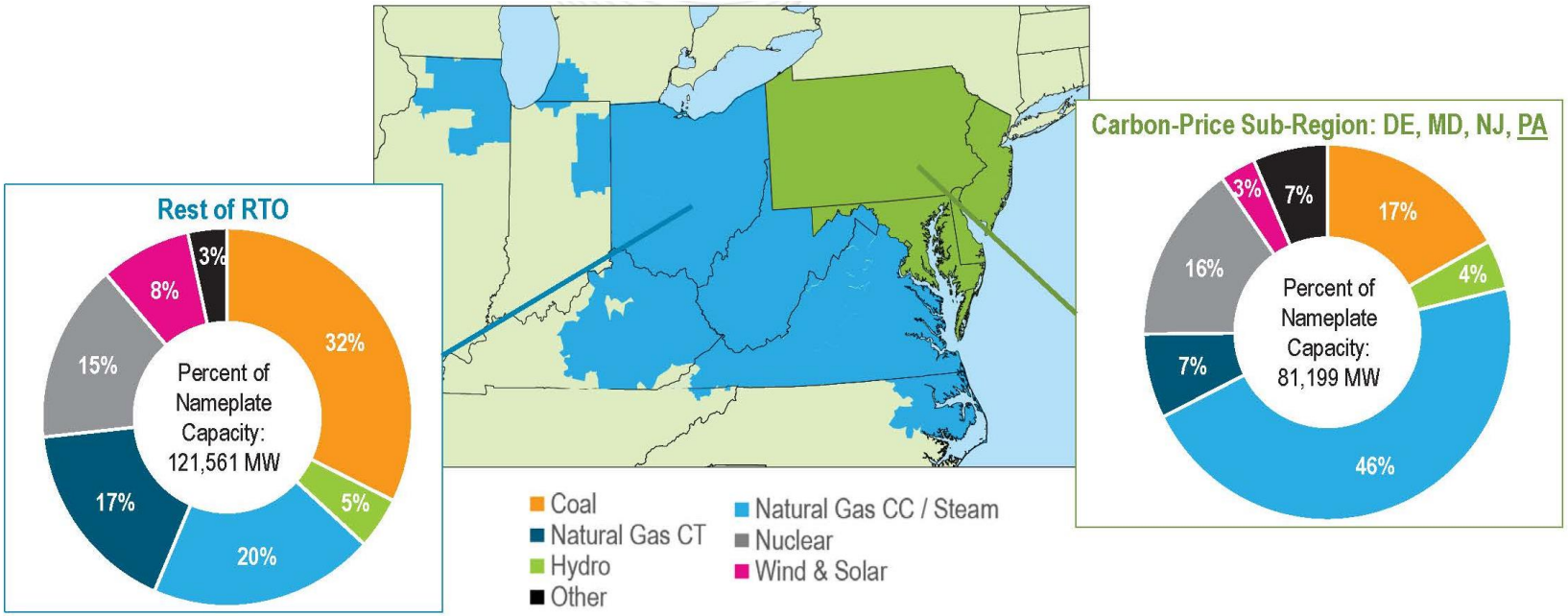
PJM Actual Emissions



- Maryland, Illinois Governor goals 100% CES by 2040 (MD) or 2030 (IL)
- Virginia, New Jersey goals 100% CES by 2050
- Chicago, Philadelphia goals 80% economy-wide by 2050

Exelon

Non-RGGI states rely more heavily on coal-fired generation



Heavier reliance on higher emitting resources by non-RGGI states complicates the potential for a meaningful region-wide carbon price in PJM

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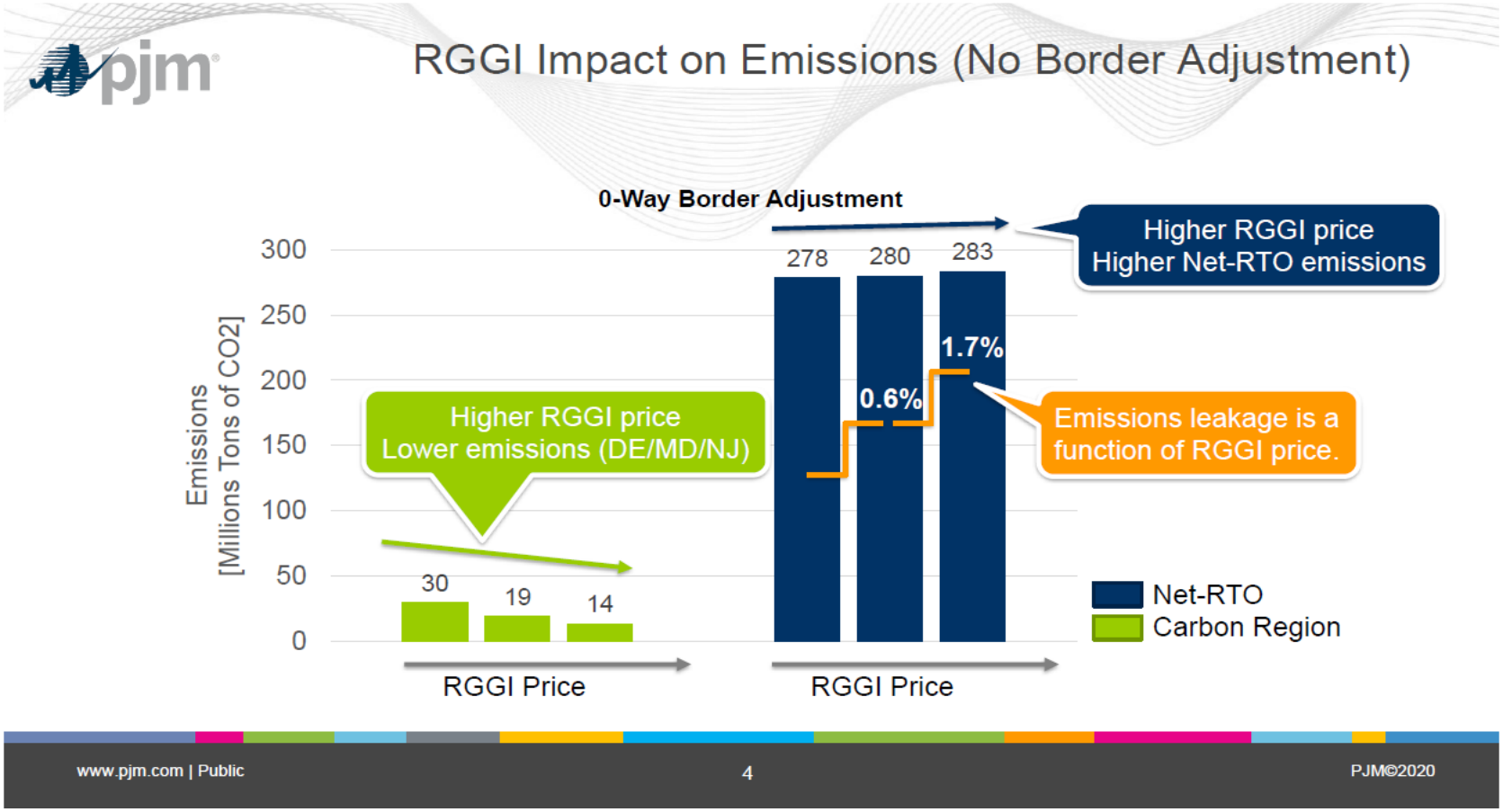
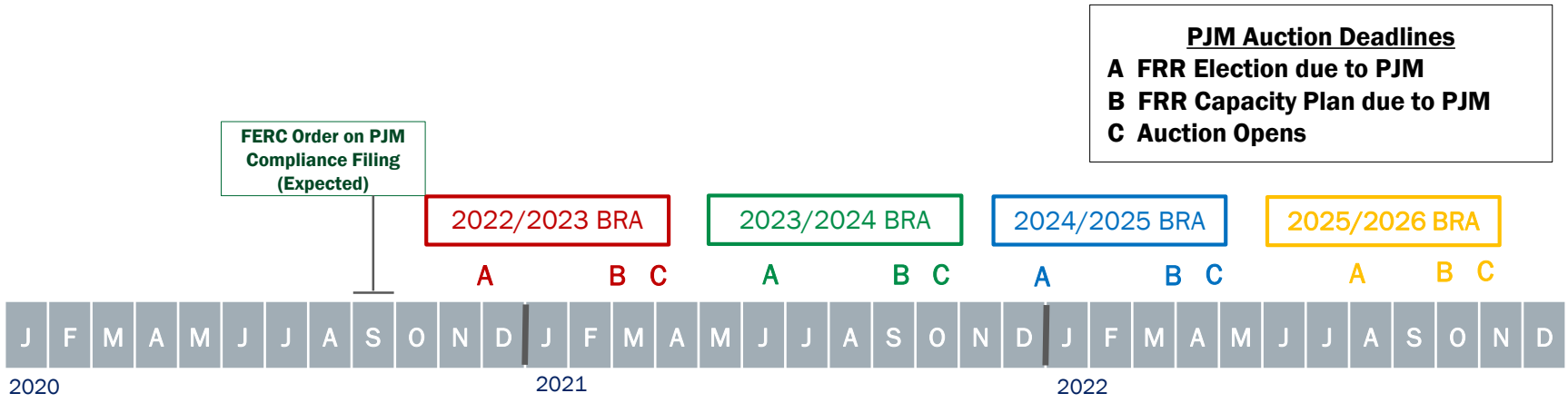
Border adjustments or other leakage mitigation rules are needed to support state carbon pricing programs such as RGGI



The lack of border adjustments or other leakage mitigation undermines the effectiveness of state carbon pricing mechanisms

New Jersey has a narrow window for adopting alternative policies in response to FERC's MOPR orders

- PJM proposes to execute the next capacity auction (2022/2023) 6.5 months after FERC acts on its MOPR compliance filing, which could result in the auction being run in January 2021 with, subsequent procurements in rapid succession every 6.5 months
- In all cases, Fixed Resource Requirement (FRR) elections and capacity plans must be provided to PJM 120 days and 30 days prior to the start of the auction, respectively



Failure to put alternative mechanisms in place quickly will result in PJM making capacity investment commitments through mid-decade under rules that penalize clean energy

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Panel 3:

- **Hannah Thonet, Senior Policy Advisor, New Jersey Board of Public Utilities**

  - Bob Kettig, Department of Environmental Protection
  - Steven Corneli, on behalf of New Jersey Conservation Foundation
  - Ray DePillo, PSEG
  - Mason Emnett, Exelon Corporation
  - Casey Roberts, Sierra Club
  - Becky Robinson, Vistra Corporation