



Constellation®

Root Causes of PJM's Resource Adequacy Challenges

Powering Reliability Through Market Design Workshop

July 29, 2026

PJM Is Asking The Right Questions – Root Causes



- *If I had an hour to solve a problem ... I would spend the first fifty-five minutes determining the proper question to ask, for once I knew the question, I could solve the problem in less than five minutes. Albert Einstein*
- **What are the root causes of the current resource adequacy challenge?**
- Structural Challenges
 - Construction timelines have doubled.
 - Capital costs have escalated sharply.
 - Regulatory uncertainty.
 - Lack of revenue certainty and competition for capital.
- Exogenous Challenges
 - Unprecedented load growth driven by new large loads.
 - Unprecedented political sensitivity to prices.
 - Continued resource retirements.
 - These exogenous challenges have accelerated and exacerbated, but not caused, PJM's resource adequacy challenges.

PJM Is Asking The Right Questions – What Problem Are We Trying to Solve



- **What is the problem we are trying to solve?**
- Addressing market fundamentals to reflect supply and demand requirements and allow price signals to incent the construction and retention of needed resources.
- Ensure that market framework minimizes consumer price volatility and has political and regulatory durability.
- These are NOT competing goals – a market that does not have political and regulatory durability will not attract the necessary capital to develop and retain resources AND a market that does not develop and retain needed resources is not durable.

New or Existing – Capital Costs Remain High, While ROI Remains Uncertain



- An important consideration – while we often think about capital investment in terms of new entry, maintaining existing resources is capital intensive, too.
 - Like a home, the homeowner does not just pay once for the home, but pays overtime for repairs (new roof or furnace) and upgrades (kitchen or bathroom).
 - The cost of maintaining and renewing the existing fleet is significant.
 - Cost of relicensing a nuclear unit: \$250 million +
 - Cost of relicensing a hydroelectric unit: \$100 million +
 - Cost of coal-to-gas conversion: \$250 - \$500 million
 - When an asset owner considers whether to relicense, refurbish, or retire an existing resource it asks many of the same capital investment questions that would be asked of a greenfield site.
- ***Powering Reliability Through Market Design:*** In a shortage, the most immediate lever to maintain reliability is preventing further exits. The design relies on high scarcity prices to signal to high-cost resources (perhaps older resources or those facing high opportunity costs given opportunities to export capacity off-system) that their capacity is critically needed.

PJM 4R Report Warning



- ***Resource Retirements, Replacements & Risks Report*** in 2023 warned of tightening market conditions.
 - The growth rate of electricity demand is likely to continue to increase from electrification coupled with the proliferation of high-demand data centers in the region.
 - Thermal generators are retiring at a rapid pace due to government and private sector policies as well as economics.
 - Retirements are at risk of outpacing the construction of new resources, due to a combination of industry forces, including siting and supply chain, whose long-term impacts are not fully known.
 - PJM's interconnection queue is composed primarily of intermittent and limited-duration resources. Given the operating characteristics of these resources, we need multiple megawatts of these resources to replace 1 MW of thermal generation.
- All of the issues raised in the 4R Report and still relevant today, with the following factors play an increased or unexpected role:
 - Load growth has accelerated and increased in size beyond what was predicated in the 4R Report.
 - Political sensitive to prices and the operation of the capacity market has increased beyond what was contemplated in the 4R Report.
 - Neither of these factors was fully incorporated into the findings of the 4R Report and while they exacerbate the challenge and make it more difficult to solve, they don't change the underlying dynamics discussed in the 4R Report.

BRA History



DY	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29
Clearing Price	\$164.77	\$100.00	\$76.53	\$140.00	\$50.00	\$34.13	\$28.92	\$269.92	\$329.17	\$333.44	\$325.00

- Delivery Years 2022/23 - 2024/25 represented low BRA clears and unsustainably low offered ICAP MWs (especially considering the recent instantaneous peak load of 162,713 MW).
 - Because of auction delays, the 2022/23 BRA occurred from 5.19 - 5.25.2021, the 2023/24 BRA occurred from 6.8 - 6.14.2022, and the 2024/25 BRA occurred from 12.7 - 12.13.2022.
- Additional extreme price volatility undermines public confidence in the market and creates uncertainty for capital looking to invest in the market.

Next Steps in Capacity Market Design



- One of the underlying considerations when developing RPM was that the vast majority of load, both large loads and retail customers, would be hedged.
- The spot market, the Base Residual Auction, would in fact be residual, used to true-up supply and demand and provide price discovery for bilateral capacity transactions.
- In practice, that has not been the case, with a significant portion of load “riding” the annual capacity market, often through state default service auctions.
- This arrangement has several negative consequences:
 - Because load is not hedged, it is more vulnerable to price volatility, including significant price increases which undermine public confidence in the market.
 - When load rides the market, supply must come along for the ride, too. Price volatility creates revenue uncertainty, disincentivizing the need capital investment in new and existing resources that would otherwise help tame price volatility.
 - Instead, PJM and stakeholders rely on a series of out-of-market actions (price caps, bidding RMR resources as price-takers) to manage price volatility. While these out-of-market actions may be successful in the short-term, preventing prices from moving up or down to their market level undercuts price signals and long-term market health and resource adequacy.
- Rather than relying on out-of-market actions, PJM and stakeholders should consider hedging mechanism that will shield ratepayers from price volatility while allowing the spot market to move so that it reflects market fundamentals and allows price signals to incent the construction and retention of needed resources.
- This could result in a politically durable resource adequacy framework that allows market prices to reflect actual needs on the system.