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Market Intelligence

Expanded PJM capacity accreditation squeezes the supply stack

August 2024



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Expanded PJM capacity accreditation squeezes the supply stack

By Tanya Peevey and Kristin Larson / Aug 13, 2024

The PJM Interconnection LLC capacity market, called the Reliability Pricing Model, helps to ensure long-term electric grid reliability in the PJM Interconnection, which serves parts of the Mid-Atlantic and Midwest US. In 2024, PJM implemented several changes to enhance market efficiency and promote competition as existing generators retire and recent extreme weather events revealed deficiencies in resource adequacy.

The Take

- Cumulative impact of PJM capacity market changes results in a demand curve with prices increased by 30% and then shifted to the left along the x-axis by 17%, partially offsetting the price increase due to the demand curve.
- An updated accreditation process now applies to gas and coal resources, dramatically decreasing their capacity contribution to reliability and squeezing the current supply available to bid into the capacity market, thereby reducing gas and coal as accredited capacity by 21% and 16%, respectively, and compressing the supply stack by 26 GW.
- The combined effect of changes in the demand curve and supply stack is to move their intersection much further up the supply stack despite a lower megawatt requirement, resulting in more expensive resources setting the clearing price. The resulting forecast capacity price of \$197.40/MW-day for the 2025–26 reliability year was a sevenfold increase over the 2024–25 base residual auction (BRA) cleared price of \$28.92. Base residual auction results for 2025–26 cleared even higher, at \$269.92, on July 30.
- In the near term, the forecast capacity price increases as the supply cannot yet satisfy the higher reserve margins of 17.8%. By 2028, forecast supply meets the reserve margin requirements for reliability, but growing demand continues to support strong capacity prices. According to the Environmental Protection Agency, power sector CO₂ emissions declined 7% in 2023. A convergence of elements contributed to the decline, including an 18% decrease in electricity generation from coal-fired power plants; an 8% jump in gas-powered output on the back of falling commodity prices; and the rising shares of renewables in the generation mix, spurred in part by Inflation Reduction Act tax credits and federal emission restrictions. As coal- and gas-fired power plants retire, capacity is being added by intermittent renewables, with more than 45 GW from solar generation.

One of the more significant changes is the expansion of the concept of effective load carrying capability (ELCC) — a measure of a resource's ability to reliably meet critical hour electricity demand — beyond intermittent generators to include fossil fuel resources. The reduced reliability of generation from fossil fuel resources was brought into focus in 2022 when a December winter storm knocked 25% of PJM's generation offline, bringing the largest US wholesale power market operator to the brink of directing emergency blackouts.

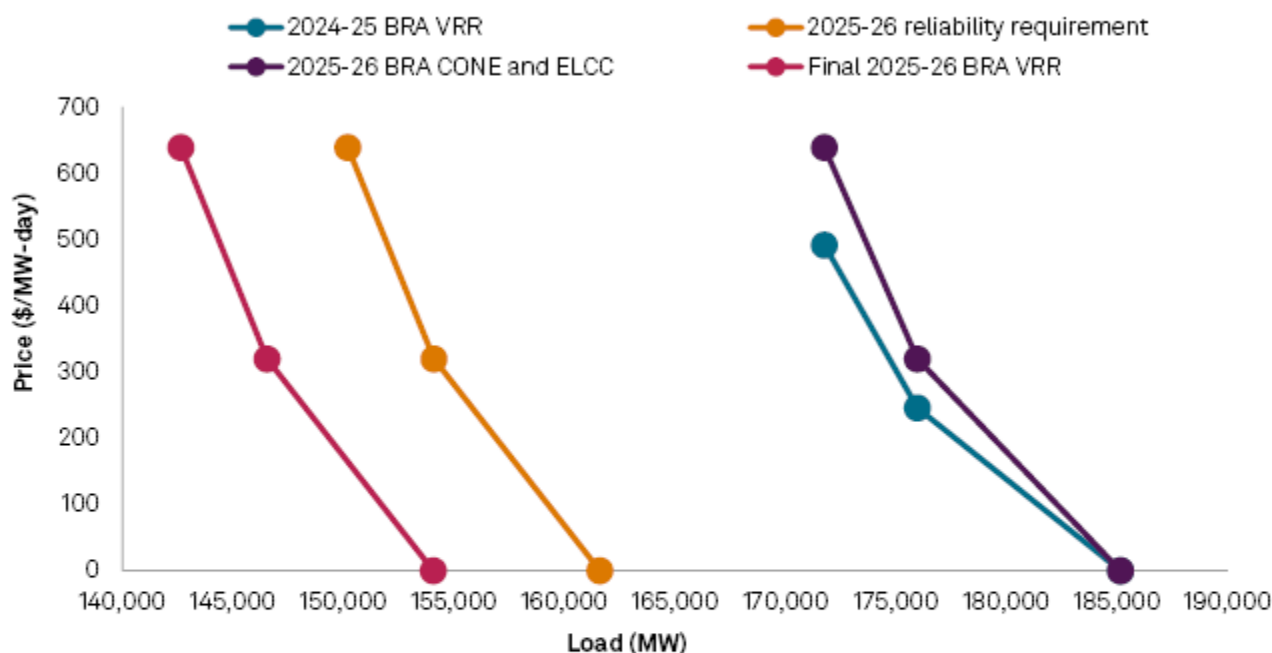
By incorporating fossil fuel resources into the ELCC framework, PJM aims to better assess the value and contribution of these resources in meeting demand during periods of renewable energy variability, more completely incorporating the ELCC concept into the market design.

Demand curve:

Ahead of the 2025-26 BRA held this past July, PJM updated several variable resource requirement (VRR) demand curve planning parameters. The most significant factors are the ELCC, cost of new entry (CONE), reliability requirement and the energy efficiency (EE) addback.

To illustrate the cumulative effect of the market changes on the demand curve, all planning parameters are rolled back, reverting everything to the 2024-25 BRA values. Then, individual or groupings of the planning parameters are updated to the 2025-26 values step by step to examine the cumulative impact, culminating in a demand curve created using only the 2025-26 BRA planning parameters.

Cumulative changes in PJM VRR demand curve with new capacity market approach



As of June 30, 2024.

VRR = variable resource requirement; BRA = base residual auction; CONE = cost of new entry; ELCC = effective load carrying capability.

Changes in the demand curve are cumulative, where the starting point is the blue line, generated using the 2024-25 BRA planning parameters, and the finish is the magenta line, generated using the 2025-26 BRA planning parameters. The purple line, "2025-26 BRA CONE and ELCC", is created by leaving all the planning parameters set to the 2024-25 values except for the CONE and ELCC as they are set to the 2025-26 values. Note, that the 2024-25 BRA Equivalent Demand Forced Outage Rate or EFORD used in formulas was replaced in the 2025-26 BRA by the ELCC for the reference resource. For the "2025-26 BRA reliability requirement", all the planning parameters are the 2024-25 values except CONE, ELCC and the reliability requirement.

Source: S&P Global Market Intelligence Power Forecast.

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The CONE increased from \$120,968/MW-year in the 2024-25 reliability year to \$130,223/MW-year in the 2025-26 reliability year, a 7.6% increase. This value is used to populate the price component of the demand curve so that prices increase as the CONE increases. Part of this formulation converts installed capacity to unforced capacity. For the 2024-25 reliability year, this was achieved using the equivalent demand forced outage rate (EFORD), but for the 2025-26 reliability year, it was replaced by the ELCC of the reference resource. This conversion value

decreased from 0.95 to 0.79. The impact of the CONE and ELCC in the Market Intelligence PJM capacity price model is to increase the demand curve prices by 30%, encouraging new entry.

Another significant change in the PJM 2025–26 BRA is the reliability requirement, which is defined in terms of unforced capacity by the forecast pool requirement (FPR). The FPR was updated in the 2025–26 BRA to multiply one plus the installed capacity by the reference resource accredited UCAP factor of 0.79 rather than the higher 0.95 value (1-EFORd) used in the 2024–25 BRA. This resulted in the FPR decreasing from 1.0894 in 2024–25 to the lower value of 0.9387 in 2025–26, driving the reliability requirement to decrease by 12% from 164,107 MW to 144,450 MW even though the installed capacity and peak load both increased in the 2025–26 BRA reliability year.

For the 2025–26 reliability year, the BRA files available in July 2024 had the EE addback values set to zero for all PJM localized deliverability areas. Relative to the values from last year, this is a decrease in the EE addback, shifting the demand curve further to the left. This, plus other less significant changes in the planning parameters, produces the final curve that includes only data from 2025–26 BRA files. The cumulative change is a shift in the demand curve to the left of 17%.

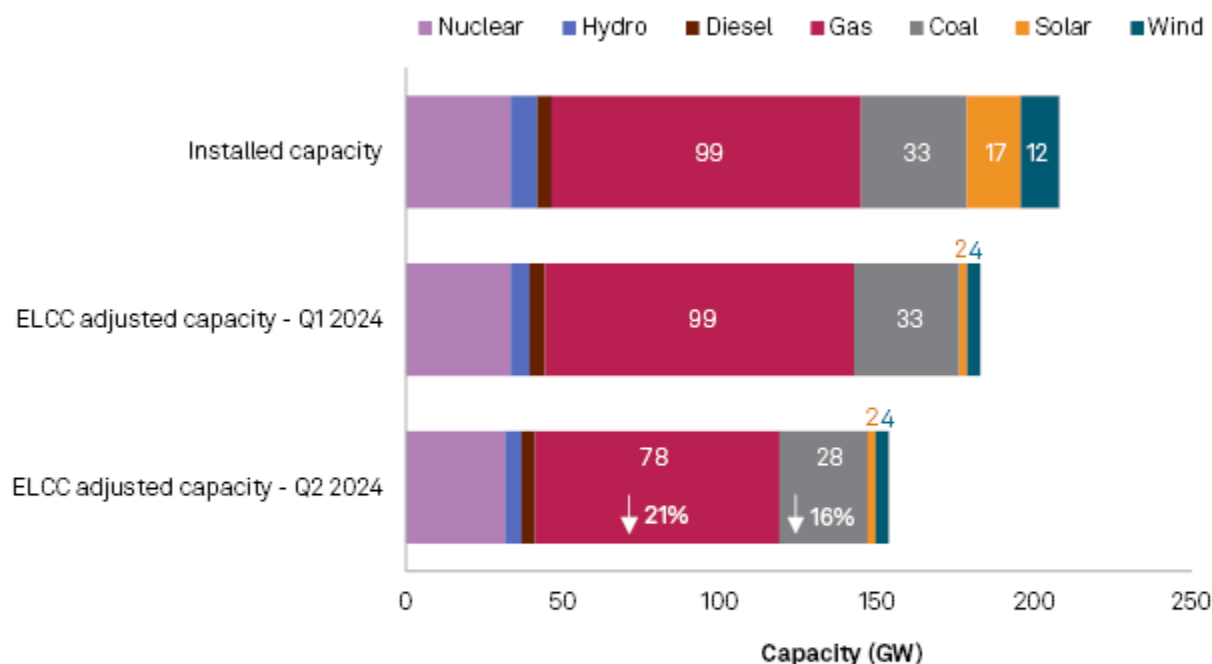
Putting these changes together produces a demand curve with higher prices shifted to the left. The shift to the left looks more significant visually, however, it is really the increase in price for a given capacity resource commitment that is more impactful.

The zero values for the EE addback occurred due to a consumer complaint filed with FERC. The complaint protested the 'addback' mechanism, stating that it puts upward pressure on capacity prices that increase consumer costs while not realizing cost reductions for consumers by allowing these resources to participate on the supply side of the market. On Aug. 2, 2024, PJM posted an updated 2025–26 BRA planning parameters file with non-zero EE addback values. These values were posted too late to be included in the second-quarter 2024 power forecast curves but will be integrated next quarter, which should shift the curve to the right and pressure the cleared prices higher.

Supply side:

In response to the December 2022 winter storm, PJM began reevaluating the capacity of all resources to contribute to the grid at peak hours. To that end, PJM expanded the resource types under the ELCC construct, adding multiple fuel types, including fossil fuel-based power plants. Previously, classes included in PJM's ELCC did not include these resources, and they could bid their full capacity into the market as a dispatchable, non-intermittent resource.

Supply side changes attributed to recent PJM update of ELCC class ratings



As of June 30, 2024.

ELCC = effective load carrying capability.

Megawatt totals include operating and planned resources aggregated by fuel type.

Source: S&P Global Market Intelligence Power Forecasting.

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The ELCC values applied to the current solar and wind assets did not change from the previous quarter, so their capacity contribution to the supply stack also did not change. Hydroelectric (pumped and non-pumped) and diesel asset accreditation dropped significantly; neither currently contribute much capacity nor are they likely to meaningfully increase their contributions. On the other hand, battery storage contributes only 311 MW and is forecast to grow nearly 30 GW by the end of 2030 according to the second-quarter 2024 power forecast. However, storage's capacity contribution to reliability will diminish, as PJM projects the low value of 59% in 2025–26 to reach as low as 38% by the 2034–35 reliability year.

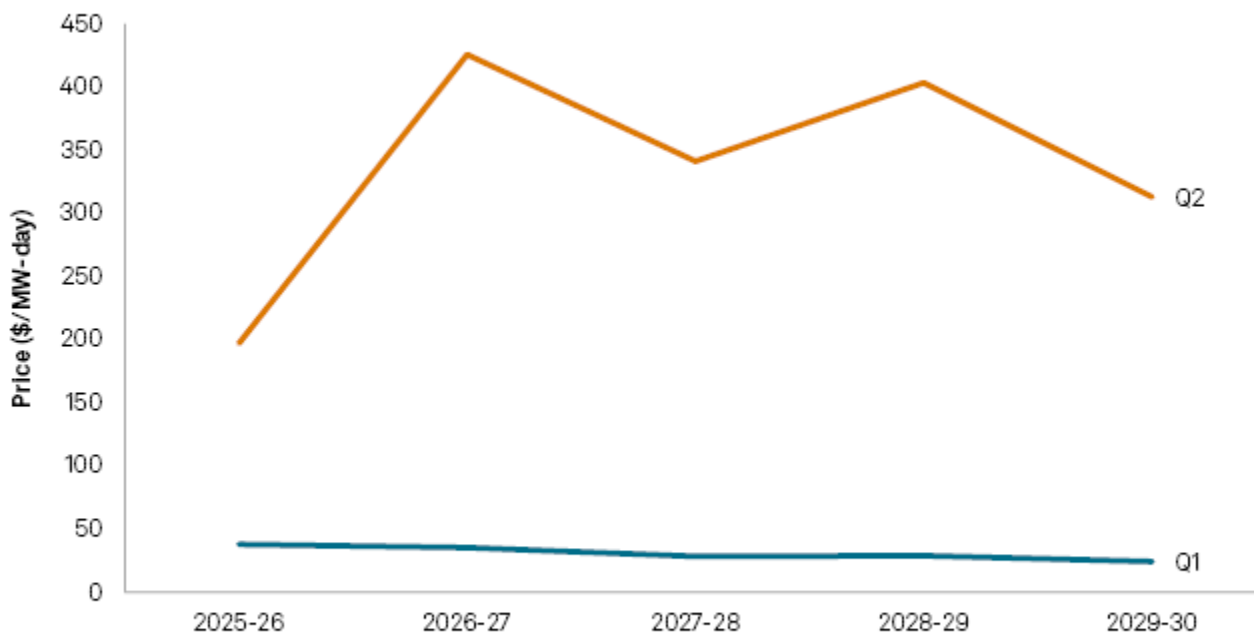
The accreditation for the most significant contributors to the current PJM supply stack — gas-fueled combined cycles and dual-fuel combustion turbines — had their accreditation drop 21 percentage points to 79%. The ELCC for non-dual fuel gas dropped even lower, with an accreditation of 62%. These changes dropped the gas contribution to the supply stack from 99 GW to 78 GW, compressing it by 21 GW.

The second largest contributor, coal, dropped 16 percentage points in accreditation. Coal, with a higher ELCC of 84% compared to gas retains more capacity. In absolute terms, the impact on the current supply stack is less than gas but not insignificant, with a capacity decrease of 5 GW.

Capacity price:

The supply-demand curve resulting from the PJM capacity market changes produced a forecast clearing price of \$197.40/MW-day across its footprint, a sevenfold increase over the 2024–25 BRA cleared price of \$28.92. The forecast price approaches the July 30, 2025-26 BRA auction result of \$269.92/MW-day, which is significantly higher than any other clearing price in the last 20 years.

Forecast PJM capacity market clearing price



As of June 30, 2024.

Source: S&P Global Market Intelligence Power Forecast.

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The capacity prices are forecast to increase further beyond the 2025–26 reliability year as the load in PJM is forecast to grow, and the forecast supply cannot keep up with the demand. In the near term, the forecast capacity price increases as the forecast supply cannot yet satisfy the higher reserve margin target of 17.8%. By 2028, forecast supply meets the reserve margin requirements for reliability, but growing demand continues to support stronger capacity prices.

Additionally, as the clearing resource is further up the supply stack, the necessary revenue to be made whole — missing money — also grows as the clearing resource, a combustion turbine or battery storage, has higher costs and/or is dispatched less often.

With significant changes in the ELCC and an increase in reserve margin requirements, it may still be an uphill battle to procure supply to meet future energy demands in PJM. Reactions to the auction results have been mixed, ranging from optimism to concerns over consumer bills and FirstEnergy Corp. CEO stating that the auction results will not spur them to invest in competitive generation.

As existing dispatchable generation may stay online with a rosier financial outlook, data center demand grows and siphons off generation, making it difficult to quantify the scale and pace of new capacity entering the market. With virtually no new generation offered in the recent capacity auction and long interconnection queues, the timeline for measuring the impacts of the capacity market changes is long. Further headwinds include near-term concerns over reliability that prompted two PJM utilities to dispute PPL Corp.'s interconnection agreement with Talen, stating that the 480 MW load would likely still need to draw from the grid and increase consumer costs.

With increasing renewable penetration and an evolving climate, the power industry has advanced its understanding of resource capabilities and the need to incorporate renewable energy sources into the grid, prompting recent changes by PJM in their capacity market, past changes by MISO to a seasonal market and proposed changes by ISONE to move to a prompt-seasonal market.

By valuing resources based on their ELCC, PJM seeks to adjust its capacity market to encourage the development of reliable and flexible resources that can effectively meet electricity demand across multiple critical hour conditions.

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CONTACT US

The Americas
+1-877-863-1306

**Europe, Middle
East & Africa**
+44 (0) 20 7176 1234

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