

FEDERAL ENERGY REGULATORY COMMISSION

AD25-7-000 | PJM Capacity Market Forum

Prefiled Statement of Manu Asthana on Behalf of PJM Interconnection, L.L.C.

For Public Use



EXECUTIVE SUMMARY

PJM welcomes this opportunity for a public discussion of the role of PJM's capacity market as a tool to provide for resource adequacy in the region we serve, covering 13 states and the District of Columbia. PJM's capacity market was first established in 2007, and the goals of the market were memorialized succinctly in testimony that PJM presented at a Commission technical conference in February of 2006.¹ At that time, PJM and its stakeholders sought a market design that would provide for resource adequacy and produce outcomes that:

- 1. Inform economically rational retirement decisions
- 2. Signal infrastructure investment when and where needed
- 3. Promote innovation

Through supply-side competition among resources (including demand response resources), the goal was to ensure that customers could benefit from the most efficient and competitive means to achieve regional reliability objectives. These goals remain as relevant today as they were when PJM's capacity market was first established in 2007. It is also important to note that the capacity market works in concert with the energy and ancillary services markets to try and achieve these goals.

As we will explain here, PJM's markets have been successful in achieving these goals. Specifically, the markets have:

- Procured over 50,000 MW (UCAP) of new resources, including over 4,100 MW (UCAP) of renewable generation and over 8,000 MW of demand response resources
- Helped facilitate the orderly entry and exit of resources in a cost-effective manner
- Fostered innovative technologies through competitive markets

The PJM bulk power system has enjoyed exceptional reliability performance, strong resource adequacy and competitive wholesale pricing over this period.

However, for over two years now, PJM has expressed growing resource adequacy concerns based on the following trends we are seeing play out across many parts of our country:

- 1. Premature, primarily policy-driven retirements of resources continue to outpace the development of new generation.
- 2. Aggressive load growth driven primarily by the advent of AI technology and data centers in our footprint, but also by increasing electrification and industrial development
- 3. Rising costs and supply chain challenges associated with construction of new generation

¹ *PJM Interconnection, L.L.C.*, Statements of Audrey A. Zibelman and Andrew Ott for Technical Conference re: Reliability Pricing Model Filed by PJM Interconnection, L.L.C., Docket Nos. ER05-1410-000 and EL05-148-000 (Feb. 2, 2006), https://elibrary.ferc.gov/eLibrary/filedownload?fileid=00DFDBBE-66E2-5005-8110-C31FAFC91712.



It is important to note that these trends are not limited to PJM, and in fact, PJM has and continues to have adequate resources to meet projected demand in the near future as demonstrated by NERC's 2025 summer assessment.



Figure 1. 2025 Summer Reliability Risk Areas²

Longer term, however, a significant part of the country, including PJM, is at risk.

² NERC 2025 Summer Reliability Assessment, Figure 1 (May 2025), available at: <u>https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2025.pdf</u> /





PJM and our members have been focused on taking action to address this risk, including:

Significant Interconnection Process Reform

With overwhelming stakeholder support and the approval of PJM's proposal by FERC in 2022, PJM launched significant reforms that moved the interconnection process from a "first-come, first-served" system of queue management to a "first-ready, first-served" system, with progress payments and milestones designed to weed out speculative projects.

That transition to the new process started in December 2023 and is expected to be completed next year. At this point PJM is nearly 60% through the interconnection backlog, with approximately 47 GW of generation through the queue with completed studies. An additional approximately 18 GW is being processed to move to the final study phase for completion this year, and an additional 56 GW (including projects from Transition Cycle 2 and Reliability Resource Initiative) will be through the queue by late 2026. We estimate that PJM's transition to our new interconnection queue process will be complete in late

³ NERC 2024 Long-Term Reliability Assessment (Dec. 2024), available at: <u>https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_Long%20Term%20Reliability%20Assessment_2024.pdf</u>



2026. New projects that come in through PJM's new cycle process that begins next spring will then be studied in 1–2 years in the normal course.

It is also worth mentioning that PJM filed, and FERC accepted, the Reliability Resource Initiative (RRI), which re-opens Transition Cycle 2 to certain projects targeted at addressing resource adequacy concerns. This will enable certain resources to be interconnected approximately 18 months sooner than they would have otherwise had to wait, which has attracted over 9 GW (UCAP) of reliable resources for the PJM region.⁴ This initiative, in addition to the approval of surplus interconnection service,⁵ will serve to expedite future interconnection requests. PJM's RRI has resulted in a mix of new generation with nearterm in-service dates and relatively high ELCC values being included in Transition Cycle 2. The following is a breakdown of those projects that were selected through the RRI:





^{*9,361} MW UCAP

Significant Investment in Interconnection Tools & Automation

- NextGen A PJM planning tool designed to further streamline the generation interconnection process by providing a comprehensive and efficient interface to track projects from application to construction
- Queue Scope Allows users to visually evaluate the potential impacts of new generation on the power grid. Integrated
 with the PJM system map, users can visualize how a generator impacts congestion on lines, as well as the potential
 transmission upgrades that would be needed to interconnect a project.

⁴ PJM Interconnection, L.L.C., <u>Reliability Resource Initiative Summary Results</u> (PDF)

⁵ PJM Interconnection, L.L.C., 190 FERC ¶ 61,083 (Feb. 11, 2025)



- Queue Destination Helps planners build models, process generator deliverability results and automate cost allocation and reports
- PowerTemplate An automation tool that assists in the drafting of generation interconnection agreements and other legal documents
- InfraTrack A resource for managing project milestones, task tracking and invoice cost allocation
- Google Tapestry Multiyear collaboration to deploy artificial intelligence that will help to further streamline PJM's planning process for connecting new generation resources to the PJM grid

Capacity Market Reforms to Produce Market Prices That Accurately Reflect Supply/Demand Conditions

- Must-Offer Requirements Reforms that will more accurately reflect the actual quantity of existing generation capacity resources in the capacity market. These changes should result in additional resources being offered in PJM's upcoming capacity auction.
- Reforms for the 2026/2027 and 2027/2028 Delivery Years that are designed to:
 - Recognize the capacity contribution of qualifying resources that are retained under reliability-must-run arrangements where such resources are reasonably expected to perform during capacity emergencies
 - Retain a combustion turbine as the reference resource used as the basis for the demand curve to mitigate against potential market volatility
- Demand Resource Updates Enhancements to more fully capture the reliability value that Demand Resources can
 provide by extending the availability window of Demand Resources to 24 hours a day throughout the year and more
 accurately accrediting Demand Resources through the Winter Peak Load change and enhanced ELCC modeling of
 Demand Resource reduction capability.

These reforms were made possible by the Commission's acceptance of PJM's various proposals. To that end, I would like to take this opportunity to thank the Commission for its continued support as we work to tackle the various resource adequacy challenges that we face.

These actions are having an impact and will help improve projected supply-demand conditions in our region. However, given the rapid pace of projected demand growth and rising costs along with supply chain challenges associated with new generation, PJM has the following concerns, which we believe need to be addressed with the benefit of robust stakeholder input:

- 1. There appears to be a growing gap between the sustained high market prices that will be needed to incentivize needed new generation and the affordability challenges being faced by consumers.
- Load serving entities in some regions appear to be primarily relying on the spot capacity market rather than using bilateral contracting first, and using the capacity market as a secondary, residual market. This is exacerbating the affordability challenges referenced above.



- 3. There is growing uncertainty around the accuracy of forward load forecasts because of the unprecedented nature of data center load growth, and there is the need to examine who should bear the risk of these forecasts being incorrect in either direction.
- 4. The risk of political intervention and litigation related to the capacity market, and the uncertainty about what future capacity market rules will be, is creating barriers to investment and forward bilateral contracting.

These are complex questions without simple and "correct" answers. Rather, they involve trade-offs that will only be durable if they have a significant consensus around them. We look forward to listening to the feedback from this conference, as well as feedback from stakeholders in our own stakeholder process as we work together to solve these challenging and consequential issues.



2025/2026**

30.081

2.408

66.354

30.549

578

PJM's Reliability Pricing Model

Since 2007, PJM's capacity market has procured adequate resources to meet the reliability requirements of the PJM region, while also helping to facilitate the energy transition. **Table 1** shows the various resources that have been procured in PJM's capacity market since the inception of the Reliability Pricing Model. This table demonstrates that PJM's capacity market has procured sufficient resources to meet loads and has also helped to facilitate needed diversity in the resource mix. PJM's resource mix contains more diversity in supply than ever in the past. This diversity (which includes significant increases in demand response) has provided a valuable benefit that has allowed PJM to weather reliability challenges.

Table 1. Cleared Unforced Capacity MW in PJM From Base Residual Auctions and Fixed Resource Requirement

| | | - | | | | | | | | | | | |
|---------------|--------|--------------------------|--------|---------|-------|-------|-------|-------|---------|--------------------|----------------------|-------|---------|
| Delivery Year | Coal | Distillate Oil (No.2) | Gas | Nuclear | Oil | Solar | Hydro | Wind | Battery | Demand Response | Energy Efficiency | Other | Total |
| 2007/2008 | 60,025 | 4,170 | 40,448 | 30,024 | 7,842 | - | 7,114 | * | - | 573 | - | 2,106 | 152,302 |
| 2008/2009 | 59,070 | 4,306 | 40,932 | 29,949 | 8,287 | - | 7,180 | 95 | - | 989 | - | 2,051 | 152,859 |
| 2009/2010 | 60,584 | 4,193 | 41,623 | 29,265 | 8,277 | - | 7,755 | 139 | - | 1,317 | - | 2,230 | 155,382 |
| 2010/2011 | 60,854 | 4,280 | 40,828 | 29,144 | 8,192 | - | 7,699 | 273 | - | 1,392 | - | 2,307 | 154,970 |
| 2011/2012 | 67,267 | 4,412 | 43,676 | 33,346 | 6,923 | * | 7,868 | 435 | - | 3,097 | * | 2,293 | 169,317 |
| 2012/2013 | 67,952 | 4,452 | 46,146 | 34,210 | 7,051 | * | 7,892 | 457 | - | 8,192 | 580 | 2,273 | 179,205 |
| 2013/2014 | 70,603 | 3,925 | 50,519 | 32,590 | 5,211 | * | 7,907 | 777 | - | 10,039 | 679 | 1,895 | 184,145 |
| 2014/2015 | 62,991 | 3,687 | 50,475 | 32,548 | 5,490 | 46 | 8,055 | 885 | - | 14,573 | 822 | 1,658 | 181,228 |
| 2015/2016 | 57,093 | 3,495 | 54,890 | 32,768 | 5,469 | 56 | 8,294 | 910 | - | 15,549 | 923 | 1,420 | 180,867 |
| 2016/2017 | 54,244 | 3,500 | 63,008 | 32,766 | 4,670 | 91 | 8,359 | 987 | - | 12,806 | 1,117 | 1,468 | 183,016 |
| 2017/2018 | 54,841 | 3,353 | 65,586 | 28,495 | 5,522 | 116 | 8,437 | 804 | - | 11,433 | 1,339 | 1,425 | 181,351 |
| 2018/2019 | 53,455 | 2,815 | 66,725 | 29,534 | 5,025 | 191 | 8,131 | 1,008 | - | 11,558 | 1,247 | 1,362 | 181,049 |
| 2019/2020 | 50,863 | 2,688 | 71,535 | 27,997 | 4,444 | 335 | 8,145 | 969 | - | 10,768 | 1,515 | 1,394 | 180,653 |
| 2020/2021 | 47,606 | 2,631 | 75,263 | 29,141 | 5,000 | 125 | 6,289 | 996 | - | 7,841 | 1,710 | 1,407 | 178,009 |
| 2021/2022 | 47,531 | 3,155 | 76,164 | 21,898 | 3,955 | 589 | 6,760 | 1,526 | - | 11,353 | 2,832 | 1,318 | 177,081 |
| 2022/2023 | 39,230 | 2,897 | 79,329 | 26,140 | 2,527 | 2,096 | 6,749 | 1,839 | - | 8,903 | 4,811 | 1,554 | 176,073 |
| 2023/2024 | 31,811 | 2,855 | 81,643 | 31,960 | 2,269 | 2,935 | 6,375 | 1,416 | * | 8,631 | 5,471 | 1,696 | 177,062 |
| 2024/2025 | 31,532 | 2,674 | 83,243 | 31,629 | 2,242 | 4,232 | 6,137 | 1,396 | * | 8,173 | 7,667 | 1,667 | 180,592 |
| | | | | | | | | | | | | | |

Capacity Plans

* Represents not enough market participants to disclose

1.460

6.342

** Marginal ELCC implemented, reducing Capacity Resource accreditation and the Reliability Requirement through the FPR

1.676

1.337

5.361

911

147.343



Table 2 shows the total amount of new capacity resources that have been added onto the PJM system, by state, since 2015, compared with the total amount of generation capacity resources that have deactivated since 2015. The table also shows total number of planned megawatts that have executed interconnection agreements or wholesale market participant agreements but are not yet in service as of May 2025.

Table 2. Changes in Estimated Accredited Capacity by State From 2015 to Present

| State | New Entry Placed Into Service Since 2015 (UCAP MW) | Deactivations** Since 2015 (UCAP MW) | Net New Entry Placed Into Service Since 2015 (UCAP MW) | Resources With Executed Interconnection Agreements/WMPA (Planned Resources) but Not In-Service (UCAP MW) | Net New Entry Since 2015 with Planned Resources (UCAP MW) |
|----------------|--|--|--|---|---|
| Delaware | 243 | 441 | (198) | 79 | (119) |
| Illinois | 3,277 | 3,016 | 261 | 984 | 1,245 |
| Indiana | 915 | 820 | 95 | 1,820 | 1,915 |
| Kentucky | 60 | 907 | (847) | 99 | (748) |
| Maryland | 2,078 | 3,114 | (1,037) | 788 | (249) |
| Michigan | 933 | - | 933 | 43 | 976 |
| New Jersey | 2,074 | 4,696 | (2,622) | 773 | (1,849) |
| North Carolina | 196 | 270 | (74) | 196 | 122 |
| Ohio | 5,582 | 9,663 | (4,081) | 1,853 | (2,228) |
| Pennsylvania | 9,025 | 5,543 | 3,482 | 439 | 3,921 |
| Tennessee | - | 33 | (33) | - | (33) |
| Virginia | 3,850 | 4,211 | (362) | 1,612 | 1,250 |
| West Virginia | 163 | 1,353 | (1,190) | 1,565 | 375 |
| TOTAL | 28,395 | 34,068 | (5,673) | 10,251 | 4,579 |



Figure 4 provides further evidence that the capacity market incentives the development of demand response as well as facilitating the changeover of the fleet in light of various state and federal environmental rules.





*Renewables include solar, wind, hydro and wood. Note: All values include capacity cleared in RPM BRA or committed in FRR plan

In PJM, nearly 70% of demand is located within states that have restructured their retail electricity markets. Due in part to the relatively low capacity market clearing prices in prior years, we remain concerned that the LSEs supplying retail customers in restructured states within the PJM footprint may have not been sufficiently incented in recent years to enter into long-term supply arrangements with capacity resources for their projected requirements. The capacity market was always intended to produce a price signal that LSEs and generators can use as a reference price when contracting for capacity outside of the RPM

While PJM's capacity market continues to procure sufficient capacity to meet the resource adequacy needs of the PJM region, it has come under increasing scrutiny as a result of tightening supply-and-demand fundamentals. As expected when power supply and demand for energy converge, the capacity market produces a price signal designed to attract investments to support additional supply to meet the region's growing energy needs. Although capacity market clearing prices in the 2025/2026 BRA increased significantly from the prior year, it is important to note that capacity charges represent a relatively small portion of the overall wholesale electricity prices. Indeed, in 2024, capacity market charges made up approximately 6.5% of total wholesale costs.







PJM's Resource Adequacy Concerns

There are considerable external headwinds that are creating resource adequacy concerns, whether those resources are located within an organized market or not. PJM has been highlighting the growing risk of a tightening supply and demand balance for some years now and provided analysis behind our concern in our Resource Retirement, Replacement & Risks report.⁶ Specifically, we identified the following challenges:

- Sustained demand growth: 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. This is especially true with hyperscale data centers that have no history of participating in the wholesale market. Unlike traditional data centers that make up about 3% of demand response capacity megawatts in PJM, hyperscale data centers have thus far been hesitant in exploring demand response or interruptible service participation pathways, indicating to PJM that the risk of interruptions, especially for customer-facing processes, far exceeds any economic value of participation under current incentive structures and market conditions.
- 2. Sustained thermal generator retirements and a slow pace of new entry: Thermal generators are retiring at a rapid pace due to certain government and private sector policies, as well as economic pressures. Retirements with date-certain deadlines enshrined in policies are at risk of outpacing the construction of new resources due to a combination of external forces, including siting and supply chain challenges, whose long-term impacts are not fully known.
- 3. **Multiple megawatts of new resources are required to replace a single megawatt of retiring generation:** PJM's interconnection queue is composed primarily of intermittent and limited-duration resources. Given the operating

⁶ Energy Transition in PJM: Resource Retirements, Replacements and Risks, February 2023. <u>https://www.pjm.com/-</u> /media/DotCom/library/reports-notices/special-reports/2023/energy-transition-in-pjm-resource-retirements-replacements-and-risks.ashx



characteristics of these resources, we need multiple megawatts of these resources to replace one megawatt of thermal generation.

These risks are now being realized, leading to tightening supply-demand conditions across our region and significantly higher capacity prices. PJM has taken several steps to enhance the capacity market rules in advance of the upcoming 2026/2027 BRA, including to recognize the resource adequacy contributions of resources with qualifying reliability must-run agreements that are reasonably expected to perform during a capacity emergency in the RPM⁷ as well as PJM's application of the capacity market must-offer requirement to all existing generation capacity resources.⁸ Additionally, PJM also updated the Demand Resource rules to more accurately reflect the supply of such resources in the capacity market by extending the availability window of Demand Resources to 24 hours a day throughout the year and more accurately accredit Demand Resource reduction capability.⁹ PJM has also retained a dual-fuel Combustion Turbine as its reference resource.

Along with the capacity market price signal designed to attract new resources, PJM has taken several steps to expedite the interconnection of new resources to meet these growing needs. For example, the Reliability Resource Initiative (RRI) has resulted in the addition of 51 projects totaling over 9,300 MW (UCAP) of generation with commercial in-service dates as early as 2027 to supplement projects already in the queue. I am also pleased to report that the RRI underscored our commitment to choosing projects based on their Effective Load Carrying Capability (ELCC) value rather than fuel type. The RRI projects include a healthy mix of nuclear, natural gas and batteries. PJM is grateful for the Commission's support of this initiative and the other section 205 filings to address specific issues to improve the performance of the capacity market.

However, various external factors outside of PJM's control, such as siting challenges, site availability and local opposition to new construction, supply chain issues, lack of long-term offtake agreements, and uncertain interest rates, have slowed the timely completion of much-needed new resources. As a result, for the first time in recent history, PJM could be at risk of facing resource adequacy challenges should these trends – high load growth, increasing rates of generator retirements and slower entry of new resources – continue.

These same external factors appear to be present across much of the nation. These factors have always been present to a certain degree, but we are facing an unusual confluence of them at this time. Likewise, the significant expected load increase is not unique to the PJM region, as the entire nation is experiencing rapid load growth attributed, in part, to the growing needs of data center loads and electrification of various sectors throughout the country.

⁷ PJM Interconnection, L.L.C., Revisions to Reliability Pricing Model, Docket No. ER25-682-000, (Dec. 9, 2024).

⁸ *PJM Interconnection, L.L.C.*, Extending the Capacity Must-Offer Requirement to All Generation Capacity Resources, Docket No. ER25-785-000, (Dec. 20, 2024).

⁹ *PJM Interconnection, L.L.C.*, Proposal to Extend Demand Resource Availability Window and Revise Calculation of Demand Resource Winter Nominated Value, Docket No. ER25-1525-000, (March 6, 2025).



Capacity Market Enhancements in PJM's Stakeholder Process

To adapt to these external factors and help mitigate against the risk of future resource adequacy challenges, as well as to address nearer-term issues such as increased winter risk, we are committed to working with stakeholders on targeted enhancements to the RPM. To that end, we are currently exploring various related issues in our stakeholder process:

- i) We are working with stakeholders to include additional winter operating capacity for thermal units in their accreditation. Before including this capacity, PJM wants to make sure the expected performance of these additional megawatts can be reasonably estimated, is dependable and is deliverable to load, given the capability of the transmission system. Given the high generator outage rates during certain prior winter events, it is important not to count on capacity that may not be there when needed. PJM is performing analysis to consider these questions and will share this work with the ELCC Senior Task Force (ELCCSTF) for deliberation.
- ii) We are considering how best to model the impacts of generator investments in improving performance. To be clear, actually observed performance improvements during extreme weather events will already flow through to future accreditation. However, we are examining if there are potential approaches that would either (a) enable more recent observations of demonstrated performance to have a greater impact on the accreditation of resources, or (b) evaluate projected but not yet demonstrated improvements in generator performance in accreditation. Discussion on this topic is currently occurring at the ELCCSTF.
- iii) We continue to proceed with the periodic review of the capacity market demand curve, cost of new entry, and energy and ancillary service methodology. PJM's independent consultant, The Brattle Group, has completed its review and provided its recommendation. PJM will now work to develop potential updates to these parameters upon stakeholder consultation and input.
- iv) In Docket No. EL25-49-000, PJM outlined a number of options that presently exist or could be developed to address these large load additions. In that docket, PJM made clear its preferences relative to the various options. Although we are moving forward to further develop these options for implementation potentially as early as the Base Residual Auction that is scheduled to be held in December of this year (associated with the 2027/2028 Delivery Year), these issues are not limited to PJM but are national in scope. As a result, we urge the Commission to issue additional guidance based on PJM's filing and the record in that docket. Such guidance would help to inform any PJM filing, our stakeholder process¹⁰ and any settlement discussions. Given the significant impact of these large load additions on the near- and medium-term load forecast, clear and timely guidance is integrally tied to the resource adequacy issues being addressed in that docket.

Additionally, PJM has the following ongoing concerns, which we believe need to be addressed with the benefit of robust stakeholder input:

¹⁰ PJM will soon be initiating a new stakeholder process to explore solutions to accommodate large load additions and their impacts to resource adequacy.



- i) There appears to be a growing gap between the sustained high market prices that will be needed to incentivize needed new generation and the affordability challenges being faced by consumers.
- ii) Load serving entities in some regions appear to be primarily relying on the spot capacity market rather than using bilateral contracting first, and using the capacity market as a secondary, residual market. This is exacerbating the affordability challenges referenced above.
- iii) There is growing uncertainty around the accuracy of forward load forecasts because of the unprecedented nature of data center load, and there is the need to examine who should bear the risk of these forecast being incorrect, in either direction
- iv) The risk of political intervention and litigation related to the capacity market, and the uncertainty about what future capacity market rules will be is creating barriers to investment and forward bilateral contracting

These are complex questions without simple and "correct" answers. Rather, they involve trade-offs that will only be durable if they have a significant consensus around them. We look forward to listening to the feedback from this conference, as well as feedback from stakeholders in our own stakeholder process as we work together to solve these challenging and consequential issues.