



## **U.S. HOUSE OF REPRESENTATIVES SUBCOMMITTEE ON ENERGY, CLIMATE & GRID SECURITY**

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**Sept. 28, 2023**

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## Executive Summary

On behalf of PJM Interconnection, L.L.C. (PJM), I am honored to present our views on the steps being undertaken on a daily and hourly basis to ensure the reliability of the electric power grid in the 13 states and the District of Columbia served by PJM. As I will note in this testimony, as the regional grid operator we face many new challenges, as well as opportunities, given the changing mix of electric generation resources combined with increasing demand for electricity, which must be reliably supplied 24 hours a day, 7 days a week.

Specifically, in this testimony, I detail:

- How PJM integrates competitive markets, reliable operations and long-term planning to attract investment in needed infrastructure and ensure reliable, efficient and cost-effective electric supplies to the 65 million Americans we serve
- Concerning trends as we see the pace of generation retirements (mostly fossil-fuel based) far exceeding the addition of new renewable generation, long-duration batteries and other storage devices to replace them
- Steps PJM is undertaking to enhance its markets, operations and planning functions to:
  - Properly accredit the relative risks of different types of generation resources for meeting winter and summer electricity demands and value those resources that present less outage risk to the system as a whole
  - Allow aggregations of resources, such as solar rooftop devices, to participate in the market and monetize the value of those resources
  - Enhance our long-range transmission planning process while reforming our interconnection queue to reduce the delays caused by speculative projects remaining in the queue
- Actions PJM has taken on the state and federal policy front, including advocating for the EPA to better incorporate reliability challenges into its Final Greenhouse Gas Rule
- The need for all of us to build into the policymaking process better up-front measures to consider the impact on needed investment in the resources required to maintain and enhance reliability into the future, while still meeting other policy goals

This Committee hearing is a helpful first step in meeting this latter objective. We look forward to continuing to work with this Committee and members on both sides of the aisle, as we have done in the past, to address these issues constructively and proactively. We are heartened by this hearing and by the Committee's great interest in these important issues, and we thank you for your consideration.

## Introduction

Chairman Duncan, Ranking Member DeGette, Chair Rogers, Ranking Member Pallone and Members of the Subcommittee:

Thank you for the invitation to participate in this hearing in order to provide PJM's perspective as it relates to electric grid reliability and our collective progression through the ongoing energy transition. My name is Stu Bresler, and I serve as Sr. Vice President of Market Services for PJM Interconnection. In this role, I oversee all aspects of each of the markets PJM operates – those include markets for capacity, Day-Ahead and Real-Time energy, ancillary services, Financial Transmission Rights, demand response operations, and interregional market coordination. I also oversee the continued evolution of these markets, including the reliable integration of renewable resources and the development of analytics around resource performance.

Based in Valley Forge, Pennsylvania, PJM ensures the reliable flow of power to 65 million customers in all or parts of 13 states and the District of Columbia. We liken our role to that of an air traffic controller, but for the electric grid. We don't own the high-voltage transmission lines that carry electricity where it is needed most, but we direct and balance the flow of that power throughout our footprint and to neighboring regions. In addition to reliable operations management, PJM also plans necessary enhancements to the grid to ensure reliability into the future and operates electricity markets within its region to competitively procure capacity and to efficiently dispatch resources to meet electricity demand, or load, in real time. The purpose of these electricity markets is to cost-effectively reinforce reliable grid operations.

My comments today are intended to:

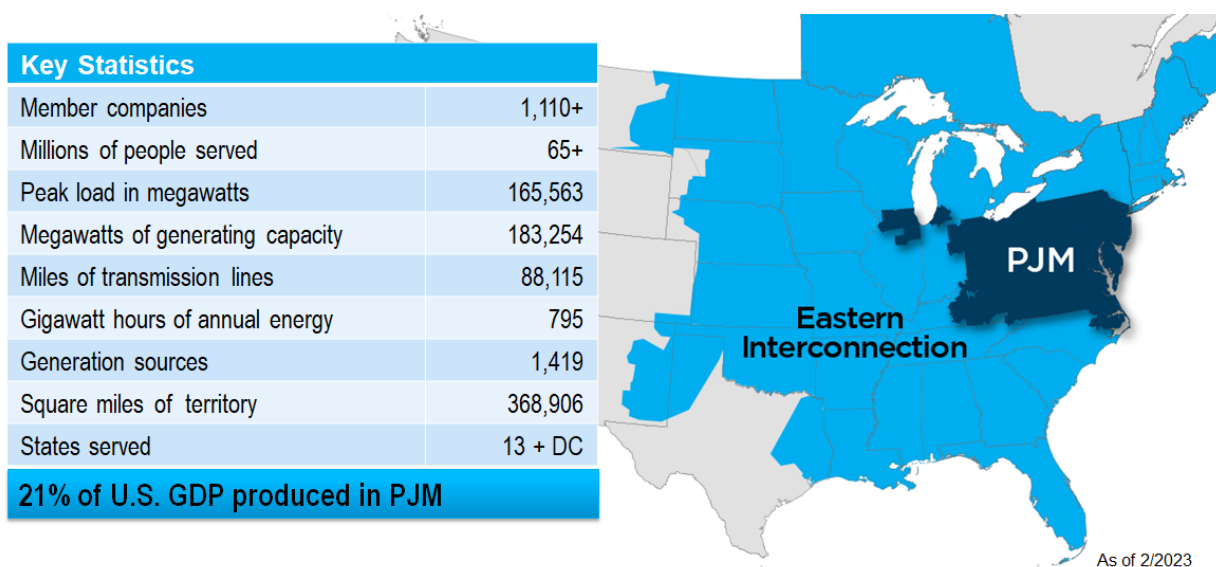
- Provide a general overview of PJM and the functions that we serve
- Explain how our markets work to support the reliability of the electric grid
- Discuss the changing resource mix and detail our analysis of the ongoing energy transition, including our concerns
- Highlight our work to ensure that grid reliability aligns with the advancement of state and federal policy objectives

## Testimony

### *PJM and Its Role*

PJM's footprint encompasses all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and Washington, D.C., as shown in **Figure 1**. As such, we are responsible for ensuring reliable and efficient delivery of electricity over the bulk electric system to one-fifth of the nation. We are fuel and technology neutral in carrying out this function, valuing resources using different fuels and technologies based on their reliability value and cost-effectiveness.

**Figure 1. PJM Service Territory**



## ***Integrating Competitive Markets and Transmission Planning***

As a large regional transmission organization, or RTO, PJM undertakes three core functions:

- Real-time operation of the bulk power grid
- Market operations to ensure the most cost-effective and efficient dispatch of resources to meet customer demand
- Planning the expansion of the electric transmission system to meet future customer needs

These three legs of the stool, as outlined in **Figure 2** below, operate in tandem to ensure that there is a reliable and economically efficient delivery of electricity to the 65 million Americans we serve, not just today but into the future.

**Figure 2. PJM's Primary Focus**



For purposes of this testimony, I will concentrate on the role of markets and transmission planning and how we are evolving those functions to meet the challenges we face as the mix of generation rapidly changes and as customer demands for reliable electricity grow significantly in this digital age.

## ***Markets Help To Reinforce Grid Reliability***

PJM's markets exist to reinforce grid reliability by ensuring that market signals work in tandem with regional reliability requirements and those of the North American Electric Reliability Corporation (NERC). For example, our capacity market is designed to procure resources available to meet projected peak demand and other contingencies three years ahead of time. Through our Day-Ahead and Real-Time energy markets, we economically dispatch the most cost-effective resources to meet the hour-by-hour demand for electricity within the physical limitations of the transmission system.

In addition, based on economics and needs, in any given hour, PJM facilitates the export or import of power to and from our interconnected neighboring systems, including: those systems to our south, such as Duke Energy in the Carolinas and the Tennessee Valley Authority; the Midcontinent Independent System Operator (MISO) to our west; and the New York Independent System Operator to our north.

In fact, our strong interconnected ties with our neighbors have allowed us to facilitate exports to our neighbors in the MISO, TVA, Duke Energy-Carolinas and the Southwest Power Pool (SPP) during tight conditions, such as those experienced in Winter Storm Elliott in December of 2022, and have allowed end-use customers within the PJM region to benefit from lower-cost supplies of electricity from our neighbors during other times of the year. These strong ties (which we refer to as “interregional transfer capability”) help to support reliable and cost-effective operations throughout the entire Eastern Interconnection.

## ***PJM Planning Works To Ensure a Reliable and Efficient Grid To Meet Future Needs***

Although electricity can be generated from a variety of sources, both fossil-fuel based and renewable, the wires themselves remain, for the most part, a natural monopoly. It is for this reason that when PJM was first organized as an independent RTO, independent transmission planning by the expert PJM staff was made one of its hallmarks. Within its planning responsibilities, PJM undertakes both “baseline planning” to build out the grid to meet future reliability and market efficiency needs, and the interconnection of new generation.

Within baseline planning, PJM works with its states to effectuate their public policy goals through various means, including what has been labeled the “State Agreement Approach.” Under this approach, states that wish to build out the transmission system to meet state public policy goals, such as state-mandated offshore wind goals, can utilize the PJM planning process to efficiently design the needed grid expansions. However, since our footprint is so diverse and not every state shares the same policy goals, the State Agreement Approach, if utilized, can help ensure that states seeking to develop transmission to meet their policy needs pay for those costs themselves, without those costs being borne by customers in other states that may not share those goals. This approach has been successful to bridge the “who pays?” divide on these issues.

Specifically, the New Jersey Board of Public Utilities approached PJM to assist it with a build-out of the grid to meet the state's offshore wind goals. This partnership has led to plans for transmission to support over 7,500 MW of new offshore wind generation to be located off the New Jersey shore. A second formal request by the NJBPU asks PJM to solicit transmission solutions for another 3,500 MW of offshore wind energy for a total of 11,000 MW by 2040.

PJM also is responsible for managing the interconnection of new generation seeking to be developed in the region. In the space of just a few years, we have seen our interconnection queue transform from one dominated by a few large natural gas projects to an interconnection queue today that is dominated by many, smaller, new renewable resources.

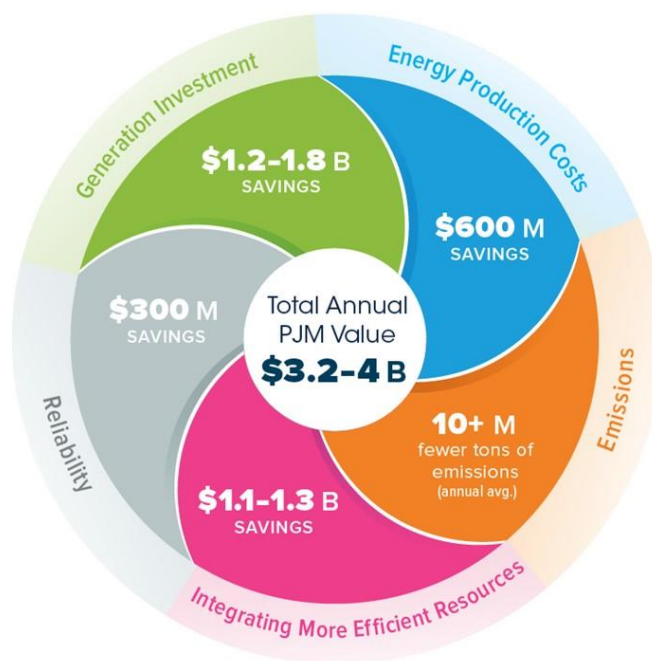
Undoubtedly, you have heard of delays in the processing of new generators' requests to interconnect. These interconnection queue delays are not limited to PJM but are being faced by virtually all of my RTO colleagues at this table. They reflect the ever-increasing demand for developing new renewable resources through public policy initiatives as well as corporate goals and customer demands. But the interconnection queue delays were also exacerbated by our interconnection queues being filled with speculative projects where developers would, at a very low cost, submit multiple hypothetical projects, even though their intentions might be only to build one such project.

With the support of the Federal Energy Regulatory Commission (FERC), we have recently launched significant queue reforms that move 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 and the wasted time, resources and study work that resulted. The transition to this new process began in July.

### ***The Integration of Markets, Operations and Planning: Real Customer Savings***

The efficiencies of this market-based approach to reliability, combined with our Planning functions and geographic scale, have resulted in real savings to customers, estimated at between \$3.4 billion and \$4 billion annually. Those savings fall into several categories as exemplified in **Figure 3**.

**Figure 3.** PJM Value Proposition



The customer savings outlined above are annual estimated savings in the delivery of electricity at the wholesale level, i.e., the delivery of electricity to "load-serving" entities, which can be your traditional utility or, in retail choice states, a competitive service provider. Individual states then have a variety of means to pass those savings through to retail end-use customers. These pass-through vehicles include: fuel-adjustment and purchased-power-adjustment clauses, which are line items in individual customer utility bills in traditionally regulated states; competitive auctions (known as default service auctions); or direct customer choice programs in states that have restructured the delivery of electricity to retail customers.

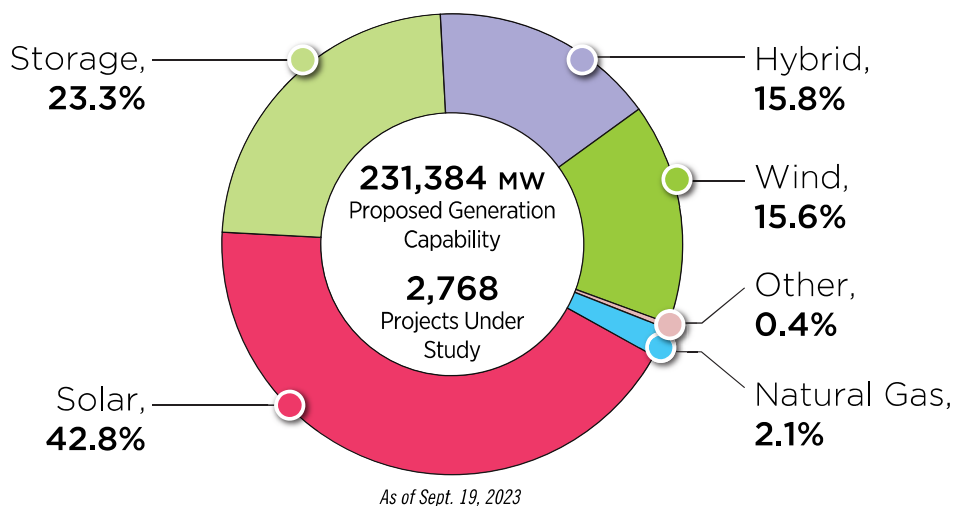
What is key is that the competitive wholesale market structure that PJM has championed over the years is fully adaptable to states that have restructured their markets, as well as those that have maintained the traditional model of a single regulated supplier of electricity (known as “vertical integration”).

### ***An Accelerating Transition of the Generation Resource Mix***

As with the entire U.S. electric grid, PJM is experiencing an accelerating transition toward intermittent renewable generation. Policies, economics and consumer choices are shifting the grid away from dispatchable, emitting generation resources toward intermittent generation with little-to-no carbon emissions.

As generation retires, the markets work to incentivize replacement generation; new requests to connect to the PJM grid are almost exclusively – approximately 97% – coming from renewable resources and batteries, including 43% solar resources and 16% wind resources, as shown in **Figure 4**. An additional 23% of interconnection requests are from storage resources and 16% from hybrids of batteries co-located with renewables, primarily solar.

**Figure 4.** Capacity Makeup of PJM New Services Queue



### ***Current Trends Raise Future Resource Adequacy Concerns***

The PJM fuel mix is balanced and diversified between different fuel types, as shown in **Figure 4** below. We have attracted investment into the PJM region in the past and, as a result, today enjoy a reserve margin of more than 20% above our peak demand forecast.

As we look further out into the future, maintaining an adequate level of generation resources, with operational and physical characteristics that support reliability, will be crucial for PJM’s ability to reliably serve electrical demand through the energy transition.

Our recent analysis observed the following four trends that, in the collective, increase the challenges we could well face in the near future in being able to procure an adequate level of generation resources with the attributes needed to maintain the level of reliability that customers in the PJM region have come to expect:

- Although relatively flat in recent times, we are seeing the potential for the rate of electricity demand to significantly increase in the future due to the electrification of transportation and heating sectors. In addition, we are seeing a significant near-term increase in the development of large data centers in our region, each of which consumes electricity in very high volumes.
- Dispatchable generators, i.e., those generators that can quickly respond to directions from PJM operators regardless of weather, are retiring at a rapid, date-certain pace, largely due to state and federal policies. Although today the category of dispatchable generators largely refers to fossil-fuel-based resources, longer-duration batteries and potentially other technologies could also serve in this role in the future to the extent they can become more cost-effective.
  - Also due to policy actions, both on the governmental and private-sector levels, replacement generation is made up of primarily intermittent and limited-duration resources, such as wind, solar and battery storage. These resources do not replace “1 for 1,” but rather require multiple megawatts to replace one megawatt of dispatchable generation due to their limited availability in certain hours of the day and seasons of the year.<sup>1</sup>
- Based on clear trends we are seeing, the pace of retirements of fossil-based resources outlined above is clearly outpacing the construction of new renewable resources. For example, in 2022, of the 30,000+ MW of generation that had fully moved through the interconnection queue, only 2,000 MW of generation projects actually went into commercial operation; and only 700 MW of that total were renewables. There are a variety of anecdotal reasons that have been cited for this lag in construction of new resources, including the impact of permitting and siting challenges, supply chain issues, and international trade issues that have impacted the availability of key components, such as solar panels. The Inflation Reduction Act created a host of new subsidies to jump-start a domestic industry in the manufacture of critical generator components. It is not at all clear, however, that this will sufficiently work to timely reverse the trend of generation retirements outpacing the development of new generation with the reliability attributes we need to maintain reliable service to customers.

PJM is committed to facilitating the government policies that help to move the nation toward a less carbon-intensive grid. Importantly, consistent with our mission, we are foremost committed to making that transition reliable and as cost-effective as possible for consumers using the power of competitive markets.

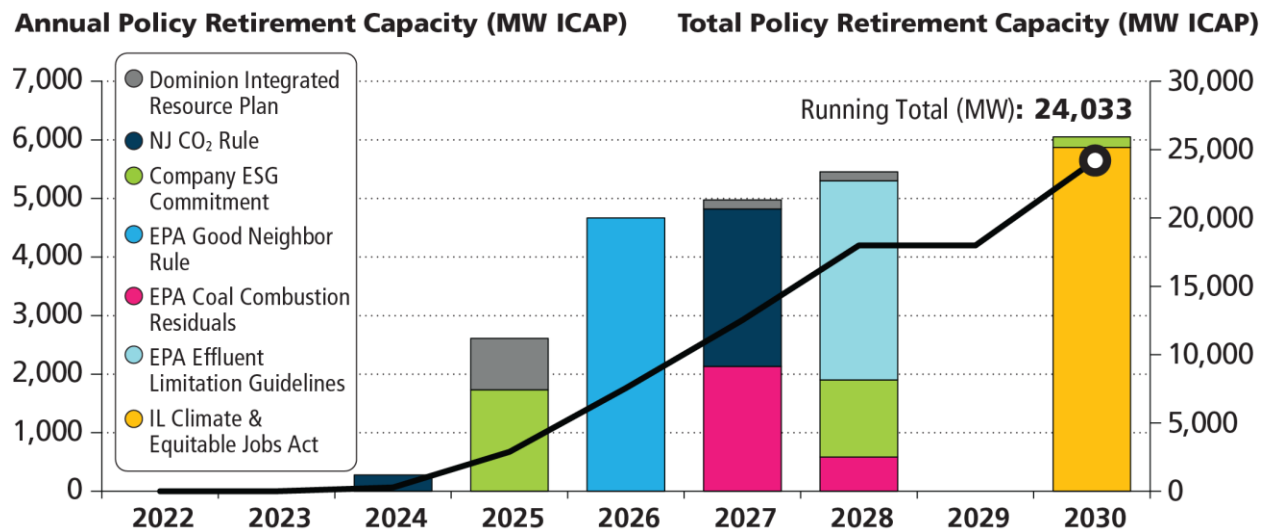
This analysis is further detailed in our most recent research paper in the Energy Transition in PJM series.<sup>2</sup> In this study, we clearly highlight our concern that, if current trends continue, we will see an elevated risk of resource adequacy shortfalls later in this decade. **Figure 5** below details the individual and collective impact of various policies on generator retirements, and **Table 1** shows the estimated eroding of PJM’s capacity reserve margin under two scenarios – one with a relatively high level of entry of new generation resources, one with a relatively low rate of entry.

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<sup>1</sup> Due to both natural resource constraints (the sun doesn’t always shine and wind doesn’t always blow) or technical and economic constraints (e.g. long-duration battery storage technology is still maturing), one megawatt of wind, solar or battery isn’t enough to replace one megawatt of dispatchable thermal generation. It takes many megawatts, and usually a range of technologies available at different times, to effectively replace a megawatt of thermal generation.

<sup>2</sup> [Energy Transition in PJM: Resource Retirements, Replacements and Risks](#) (PDF), Feb. 24, 2023.

**Figure 5. Potential Policy Retirements**



**Table 1. Reserve Margin Projections Under Study Scenarios**

| Reserve Margin        | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|-----------------------|------|------|------|------|------|------|------|------|
| <b>Low New Entry</b>  |      |      |      |      |      |      |      |      |
| 2023 Load Forecast    | 23%  | 19%  | 17%  | 15%  | 11%  | 8%   | 8%   | 5%   |
| Electrification       | 22%  | 18%  | 16%  | 13%  | 10%  | 7%   | 6%   | 3%   |
| <b>High New Entry</b> |      |      |      |      |      |      |      |      |
| 2023 Load Forecast    | 26%  | 23%  | 21%  | 19%  | 17%  | 16%  | 17%  | 15%  |
| Electrification       | 25%  | 22%  | 20%  | 18%  | 15%  | 14%  | 14%  | 12%  |

### ***PJM's Proactive Steps Moving Forward To Address These Future Challenges***

We are actively doing our part to reverse these trends. Our efforts are focused both on reforms to our own markets to incentivize investment in generation resources needed to support reliability as the generation mix evolves, to advocacy we have undertaken at both the state and federal level to ensure that reliability considerations are built into our environmental and renewable generation policies.

Specifically, in enhancing PJM's markets and planning:

1. From the perspective of evolving PJM's markets, we are about to file with FERC a set of proposals that we have developed with stakeholders to better recognize the relative contribution of dispatchable vs. intermittent resources in meeting future reliability needs. These enhancements include new analytical processes to better accredit individual generation resources based on an analysis of the risks of correlated outages across all fuel types, and to provide enhanced accreditation for those resources that install the infrastructure to operate on more than one fuel in emergencies.
2. Also from the perspective of evolving PJM's markets, we have, with the support of FERC, made the markets available to generation resources that are connected at the distribution level, such as aggregations of rooftop solar panels. This promising set of reforms will allow customers to monetize the value to the grid of their resources selling energy and other services into the system in a more direct and efficient way than is presently available.
3. We also are developing a long-range transmission planning protocol that will allow us to analyze the longer-term needs of the system under multiple long-range scenarios. PJM is already a tightly interconnected system with multiple planned and existing generators of all types located close to customer load centers. As a result, this long-range planning will allow us to efficiently plan to meet future needs without customers necessarily incurring the costs (and developers incurring the siting challenges) of constructing hundreds of miles of new transmission across multiple states.

We also recognize that we have a role in advising policymakers of the reliability impacts of proposed policies and proposing constructive means of addressing reliability needs within the four corners of any proposed policy or law. I'll highlight several that showcase how we have worked effectively over the last few years:

- In August, PJM, in coordination with MISO, ERCOT and SPP, submitted comments to the U.S. EPA to explain our collective concerns with the potential reliability impacts of the proposed EPA rule on New Source Performance Standards for Greenhouse Gas Emissions, and to propose constructive potential paths forward to address those concerns. We proposed that any Final Rule establish a new subcategory to preserve electric generators that are at risk of retirement as a result of the Rule but are identified by RTOs as needed for reliability. We also proposed: a series of "reliability check-ins" as to whether EPA's vision of new technologies – such as co-firing with hydrogen and carbon capture and sequestration that the Rule cites today as commercially available – are in fact developing as anticipated; and an allowance trading system to ensure greater flexibility in unit owner's methods of compliance with the proposed Rule. PJM, along with MISO, ERCOT and SPP, will be meeting with EPA to further discuss our comments.
- In February 2022, PJM filed comments with the New Jersey Department of Environmental Protection in response to a newly proposed rule to establish carbon emission limits on certain electric generating facilities in order to support the state's clean energy goals. Our comments focused on aligning the proposed compliance deadlines with PJM's capacity market delivery year to avoid unnecessary risks, and providing for additional reliability safeguards allowing for units to operate when needed for reliability.
- PJM worked in collaboration with Illinois government to advance reliability guidance as the state implemented its Climate and Equitable Jobs Act legislation. This guidance provides for the ability of affected generators to run as needed for reliability.

- PJM worked with EPA to coordinate timing of actions necessary to bring affected generators into compliance with the Coal Combustion Residuals rule. This included providing analysis on the impact of potential generator outages and the process PJM uses to determine timing of requested generator outages.

We seek to continue our collaborative efforts with these agencies and others throughout our footprint to help ensure that advancing clean energy policy shares a symbiotic relationship with reliability. This includes partnering with states on “reliability safety valves” to create special policy provisions for fossil resources that are subject to either emission restrictions or mandatory phase-outs. A safety valve allows for specific units to run as needed during emergencies or to preserve system reliability, with the priority of preserving reliability, not extending the operation or life of these resources that would otherwise not run or retire.

### ***Key Ingredients for Future Policies***

PJM largely leaves the determination of policy to you and your counterparts at the state level. However, we urge that reliability considerations be built into the analysis of potential policies rather than either being taken for granted or considered only as an afterthought once legislation is enacted. To date we have been able to manage reliability emergencies that are exacerbated by policy choices through various “reliability safety valves” that we sought to build into the Rules, with use of the Secretary of Energy’s Federal Power Act Section 202(c) emergency authority as a last resort when necessary. But I would stress that we all should recognize that this sector needs investment in those new technologies, along with existing resources that provide the kind of flexible and dispatchable services we need to manage the intermittent nature of wind and solar resources. As a result, we need to take the analysis of reliability impacts to the next level – choosing compliance dates and deadlines carefully and after more detailed study and analysis than has generally occurred to date in the policymaking process. We think these Committee hearings are a positive first step in that endeavor and look forward to working with this Committee on these issues going forward.

### ***Conclusion***

The PJM system today is a reliable system with an adequate capacity reserve margin. Despite that, however, recent winter storms (Uri 2021, Elliott 2022) have shown that resource adequacy will play a critical role through the energy transition. Additionally, for the first time in recent history, we 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. It’s important to note that this situation is not unique to the PJM system. These challenges are being seen across the country and throughout the world.

With that said, we believe a reliable energy transition is achievable. We at PJM are working on a range of initiatives<sup>3</sup> to help attain this goal. In our judgment, a reliable transition will also require policy changes aimed at accelerating new generation entry and more deliberately considering the pace of exits. We are committed to working with all of you on our shared responsibility to maintain a reliable and secure grid that is critical to our prosperity and national security.

I thank you for the opportunity to present my testimony today. I look forward to your questions.

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<sup>3</sup> [Ensuring a Reliable Energy Transition](#), PJM.com.