



PA House of Representatives
Republican Policy Committee

414, Main Capitol Building
Harrisburg, PA 17120
(717) 260-6144

Rep. Joshua D. Kail
Chairman

PA House Republican Policy Committee Hearing
“Electrifying Our World: Impacts on Grid Integrity & Reliability”

June 16, 2023, at 10 a.m.

Back Mountain Regional EMA
3593 State Route 118
Dallas, PA 18612

10:00 a.m. Welcome and Pledge of Allegiance

Grid Capability Panel

10:10 a.m. Stephen Bennett
Manager of Regulatory/Legislative Affairs, PJM Interconnection

10:20 a.m. Questions for Grid Capability Panel

Grid Sustainability Panel

10:50 a.m. Glen Thomas
President, GT Power Group

10:55 a.m. Robert Bair
President, Pennsylvania Building & Construction Trades Council

11:00 a.m. George Stark
Director of External Affairs, Coterra Energy

11:05 a.m. Questions for Grid Sustainability Panel

11:35 a.m. Final Comments and Conclusion



Testifier Biographies

PA House of Representatives Policy Committee Hearing *"Electrifying Our World: Impacts on Grid Integrity & Reliability"*



Stephen Bennett **Manager of Regulatory/Legislative Affairs, PJM** **Interconnection**

Currently the Manager of Regulatory/Legislative Affairs for PJM Interconnection, Stephen has previously held director and senior management positions for several prominent companies, including Energy Advocacy, LLC, PPL Energy Supply/Talen Energy, and Exelon.

Stephen holds a bachelor's degree in civil engineering, with an environmental concentration, from the University of Maryland.

PJM is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia.

Glen Thomas **President, GT Power Group**

Glen Thomas is the former chairman of the Pennsylvania Utility Commission (PUC), where he oversaw the restructuring of Pennsylvania's electricity, natural gas, and local telephone markets. Before his appointment to the PUC, Mr. Thomas served as deputy director of Governor Ridge's Policy Office, where he advised the governor on energy and environmental issues. In addition, Mr. Thomas was appointed by California Gov. Arnold Schwarzenegger to serve on the governor's transition team for energy related issues in 2003.

Mr. Thomas is also a former partner at the law firm of Blank Rome. Mr. Thomas currently serves as President of the PJM Power Providers Group, a non-profit organization dedicated to properly designed and well-functioning markets in the PJM region.

Mr. Thomas has served as president of the Mid-Atlantic Association of Regulatory Utilities Commissioners; chairman of the National Association of Regulatory Utility Commissioners Washington Action Committee; and a member of the U.S. Department of Energy's Electricity Advisory Board, the National Regulatory Research Institute's Board of Directors, the Keystone Center Energy Board, the Organization of MISO States Board of Directors, and the National Association of Regulatory Utility Commissioners Committee on International Relations, Telecommunications and Critical Infrastructure.

Mr. Thomas received his J.D. from Dickinson School of Law and his Bachelor of Arts in philosophy/religion and political science from Colgate University. He attended the Governors Center of the Terry Sanford Institute of Public Policy at Duke University, the John F. Kennedy School of Government, and the Program for Senior Executives in State and Local Government at Harvard University. He was one of the 60 civilians chosen by the Secretary of Defense to participate in the U.S. Department of Defense Joint Civilian Orientation Conference.

Mr. Thomas has been honored by the Philadelphia Business Journal and the Central Pennsylvania Business Journal as recipient of the "40 Under 40" Award. He is also a member of the Wilson High School Academic Hall of Fame.





Robert Bair

President, Pennsylvania Building & Construction Trades Council

Rob Bair serves as the President of the Pennsylvania Building & Construction Trades Council.

The Pennsylvania State Building & Construction Trades Council is made up of 16 Regional Councils and more than 115 local unions from 15 International Building Trades Unions.

The Pennsylvania State Building & Construction Trades Council and its affiliated members support and provide training to their members in order to provide the best and safest workforce.

George Stark

Director of External Affairs, Coterra Energy

George is the Director of External Affairs at Coterra Energy. He is responsible for managing all public relations, community outreach, advertising and political affairs for the company.

Prior to working with Coterra, George held numerous public policy, public relations and governmental affairs positions in both Pennsylvania and Maryland. George graduated from Dickinson College in Pennsylvania with a degree in Political Science.





PENNSYLVANIA HOUSE REPUBLICAN POLICY COMMITTEE

**Statement of Stephen Bennett on behalf of PJM
Interconnection, L.L.C.**

June 16, 2023

For Public Use

I. Introduction

Good morning, Chairman Kail and esteemed members of the House Republican Policy Committee. Thank you for the opportunity to appear before you today. My name is Stephen Bennett, and I am a Regulatory and Legislative Affairs Manager for PJM.

PJM Interconnection (PJM) is a regional transmission organization (RTO) responsible for the reliable operation of the electric grid serving 65 million customers in 13 states and the District of Columbia, including all of Pennsylvania. Ensuring a safe and reliable bulk power system – keeping the lights on – is PJM’s most important priority. This requires constant system monitoring by skilled operators and real-time coordination with other operating entities and industry sectors. PJM also strives to utilize its scale and competitive processes to keep costs low for consumers.

Reliability and affordability are cornerstones for what PJM does on a day-to-day basis.

My testimony today provides an introduction to PJM and its role as an RTO, addresses PJM’s perspectives on the reliability and resilience of the bulk power system and makes five key points. In summary:

- **The U.S. electric grid is experiencing an accelerating transition toward the use of intermittent renewable generation.** This transition is primarily driven by local, state and federal policies, combined with consumer decisions, aimed at mitigating the critical risk posed by climate change. This transition is evident in PJM’s interconnection queue, where we currently have more than 250,000 MW of generation to be studied for interconnection, 97% of which is either renewable or batteries or a hybrid of both.
- **PJM has sufficient generation to meet the needs of our system today. However, as we look further out, we are concerned by the trends we see.** Specifically, the generation fueled by fossil fuels (mostly coal and natural gas) that we rely upon to balance the grid is retiring at a significant rate. Electrification of the transportation, industrial and building sectors is poised to create material load growth. Our region is also experiencing significant data center construction, which is creating major pockets of increasing demand on the system. New generation in the queue is largely intermittent, so we need multiple megawatts to replace one megawatt of retiring generation. And, new generation is coming online slower than anticipated. If these trends continue, our models show increased risk of having insufficient resources later in this decade to maintain the reliable electric service that consumers expect.
- **This is not a concern unique to the PJM grid.** Indeed, as the North American Electric Reliability Corporation’s (NERC) recent summer assessment shows, roughly two-thirds of the U.S. (but not the PJM region) already faces increased resource adequacy risk this summer.¹
- **Industry and policymakers can take steps now to de-risk the transition.** These steps include implementation of policies that accelerate the pace of new generation and transmission entry, such as permitting reform, further interconnection reform and policies that reduce backlog in the supply chain. They also include adoption of policies that slow down the retirement or restriction of existing generation until replacement generation is deployed and operational at scale. We also encourage an approach to policymaking that expressly considers reliability impacts in the development phase of the policy and not after the fact.

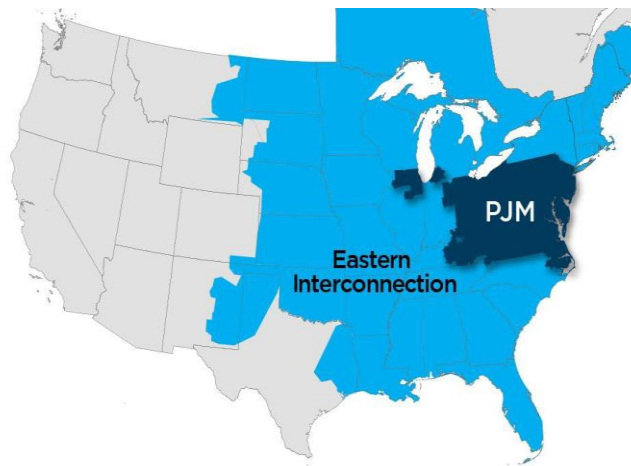
¹ [2023 Summer Reliability Assessment](#), North American Electric Reliability Corporation, May 2023.

- **PJM embraces its role to help reliably facilitate this industry transition while using competitive markets to drive efficiencies.** We have already taken significant steps toward this goal, including interconnection queue reform, which is expected to result in the processing of over 200,000 MW of new generation requests in the next three years and coordination with state and federal governments on maintaining system reliability while developing and implementing their specific energy policies. PJM, our members and our stakeholders continue to work on additional steps toward this goal, which currently include and/or will include efforts to further accelerate the interconnection of new generation, enhance our forward-looking transmission planning process, and appropriately value the reliability attributes needed to support a system that is more reliant on just-in-time fuel resources. PJM is also launching an initiative to bring all of its activities targeted at ensuring a reliable transition under a single umbrella.²

II. The Role of PJM

PJM ensures the reliable flow of power to 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-neutral in carrying out this function, valuing resources using different fuel types based on their reliability value and cost-effectiveness.**

Figure 1. PJM Service Territory

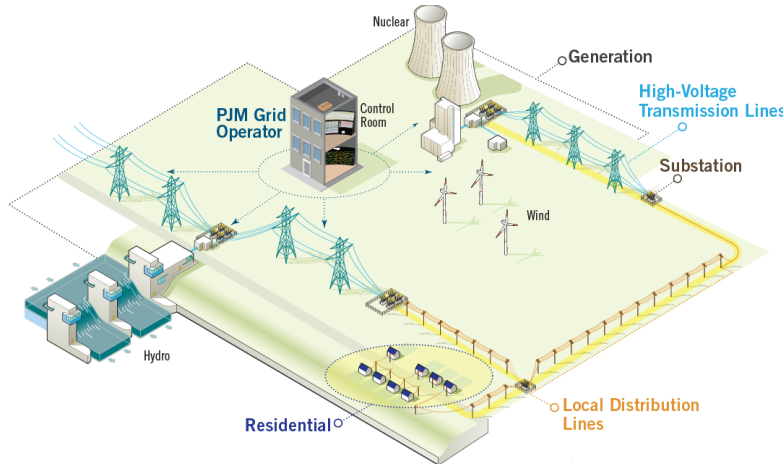


The PJM grid consists of 88,115 miles of transmission lines and approximately 1,400 generation sources of all types, including coal, natural gas, nuclear, wind, solar, batteries and hydro facilities, along with more than 500 demand response and energy efficiency resources. We are interconnected with our neighboring systems in the Eastern Interconnection, which geographically includes over two-thirds of the United States and Canada. **PJM is independent of the various market participants, and we do not own nor do we profit from any particular type of resource.**

² See PJM's [Ensuring a Reliable Energy Transition](https://www.pjm.com/ensuring-a-reliable-energy-transition) web page at PJM.com.

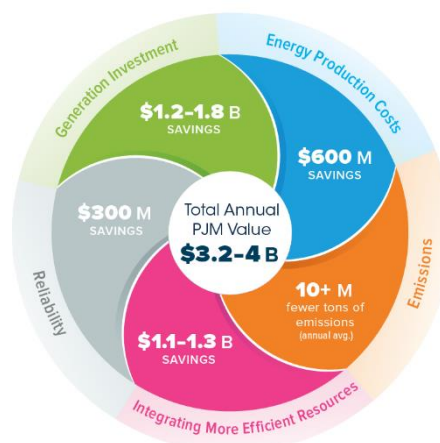
PJM is responsible for a portion of the infrastructure necessary to serve customers in its footprint. **Figure 2** is a basic diagram of how the power grid functions. Electricity is generated, then transmitted across high voltage transmission lines, and then to distribution substations where Pennsylvania’s local utilities distribute it to consumers. **PJM oversees the generation and transmission of power, which is generally referred to as the “bulk” electric system.**

Figure 2. The Distribution of Power



The scale of the PJM system provides tremendous value for grid reliability. PJM plans for and operates this system in a manner that is both reliable and cost-effective. PJM has a diverse portfolio of resources and a footprint that spans multiple states and time zones. Operating our region as one cohesive system affords us the flexibility to rely on these resources across different locations and allows us to better absorb abrupt disturbances to the system. Further, using competitive processes for the construction of transmission and competitive markets for the procurement of power, PJM is able to derive significant cost savings for consumers. **All in all, through the use of our regional scale and competition, PJM is able to save consumers approximately \$3.2–\$4.0 billion annually.**

Figure 3. PJM Value Proposition



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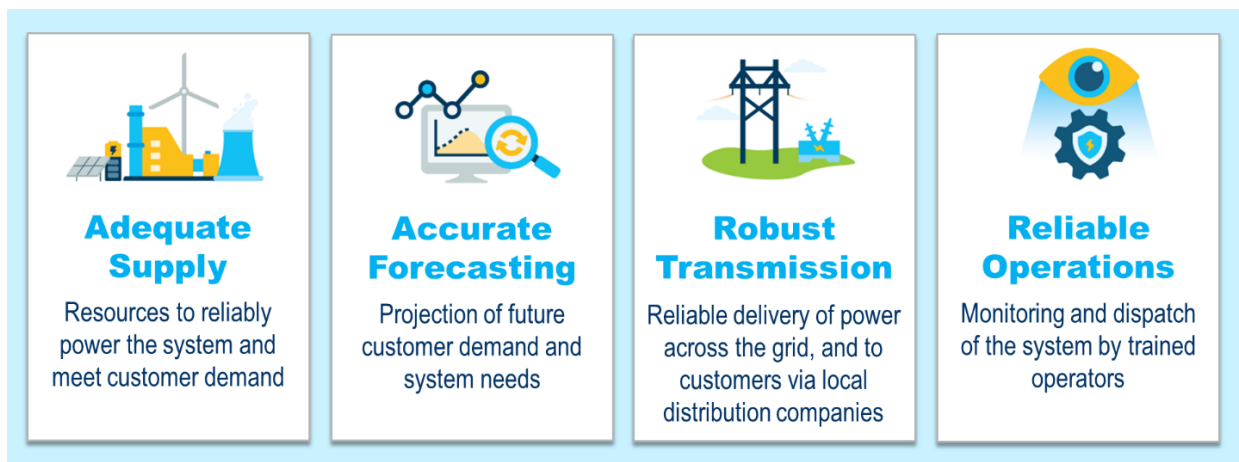
³ All numbers are estimates.

The Building Blocks of Reliability

Regardless of resource mix, the four building blocks of bulk power system reliability remain the same:

- **Adequate Supply:** There must be sufficient generation and other resources, including demand response, available on the system to meet customer demand at all times.
- **Accurate Forecasting:** Accurately predicting the demand for electricity for the next hours and days, as well as years into the future, enables reliable planning and operation of the system. Forecasts consider multiple drivers, including weather, economics and customer behavior.
- **Robust Transmission:** At its most fundamental purpose, the transmission system ensures that electricity can be delivered reliably across the grid to customers the instant it is needed. This reliability is a function of thermal, stability and short-circuit power system fundamentals. The standards for these are set by the North American Electric Reliability Corporation (NERC).
- **Reliable Operations:** Grid operators work around the clock to monitor and control the system, directing how much energy should be supplied by generators to match the demand, ensuring transmission lines and facilities stay within their safe operating limits, and constantly preparing for the unexpected.

Figure 4. Four Basic Building Blocks of Reliability



PJM Markets, Planning and Operations Work Together To Maintain a Reliable Grid

PJM's competitive wholesale markets provide a powerful tool to support reliability by providing financial incentives and encouraging competition to provide electricity where and when it's needed. The markets serve to attract investment in new generation and technology at the lowest cost. PJM's comprehensive Regional Transmission Expansion Plan (RTEP) process identifies the need for changes and additions to the system up to 15 years into the future. This approach makes the transmission planning process more efficient by considering the region as a whole, rather than as individual states or separate transmission zones. Operationally, the system enhancements arising out of the RTEP process reduce emergency procedures and alerts, increase operating margins, and improve the ability to import or export power with neighboring grid systems.

Figure 5. Markets, Planning and Operations for Reliability



PJM Is Mission Driven

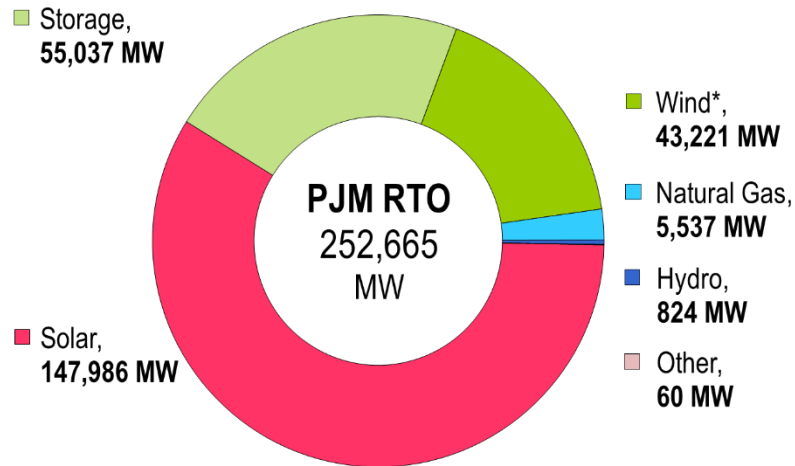
PJM is a “public utility” under the Federal Power Act and is regulated by the Federal Energy Regulatory Commission (FERC). It is also effectively a nonprofit in that we are mission driven with predetermined rates that do not allow for PJM to retain earnings. **PJM has no-profit motive, and its mission is clear: to ensure reliable power delivery on the bulk system and keep costs affordable for the 65 million consumers in our footprint.**

III. Accelerating Transition Toward Intermittent Renewable Generation

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. A look at PJM’s interconnection queue for new generation requesting access to the transmission system is evidence that we are, in fact, in a transition. As generation retires, the PJM queue represents immediate options for replacement.

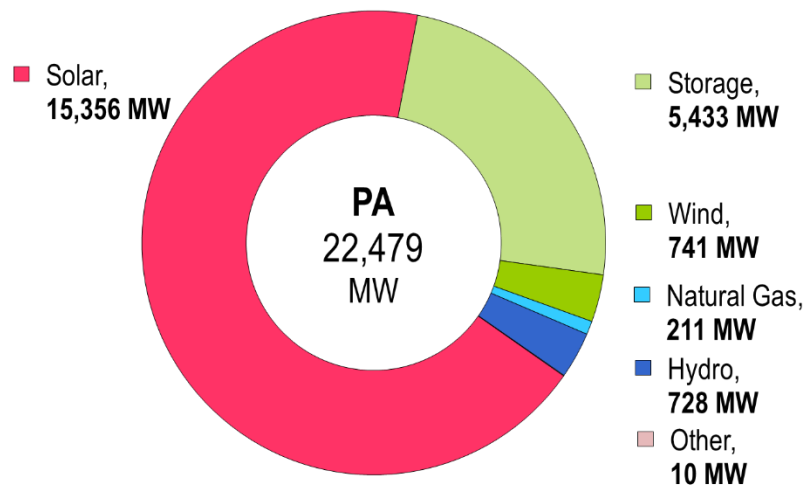
New requests to connect to the PJM grid are almost exclusively – approximately 97% – coming from renewable resources and batteries, including 59% solar resources and 17% wind resources, as shown in Figure 6. An additional 22% of interconnection requests are from storage resources, which are mostly lithium ion batteries co-located at the site of the aforementioned solar or wind resources under study.

Figure 6. PJM Queued Capacity (Nameplate as of April 1, 2023)



New interconnection requests for projects in Pennsylvania are made up of a similar combination of solar, storage and other renewables. This includes 68% solar resources and 24% storage resources, as shown in Figure 67.

Figure 7. Pennsylvania Queued Capacity (Nameplate as of April 1, 2023)



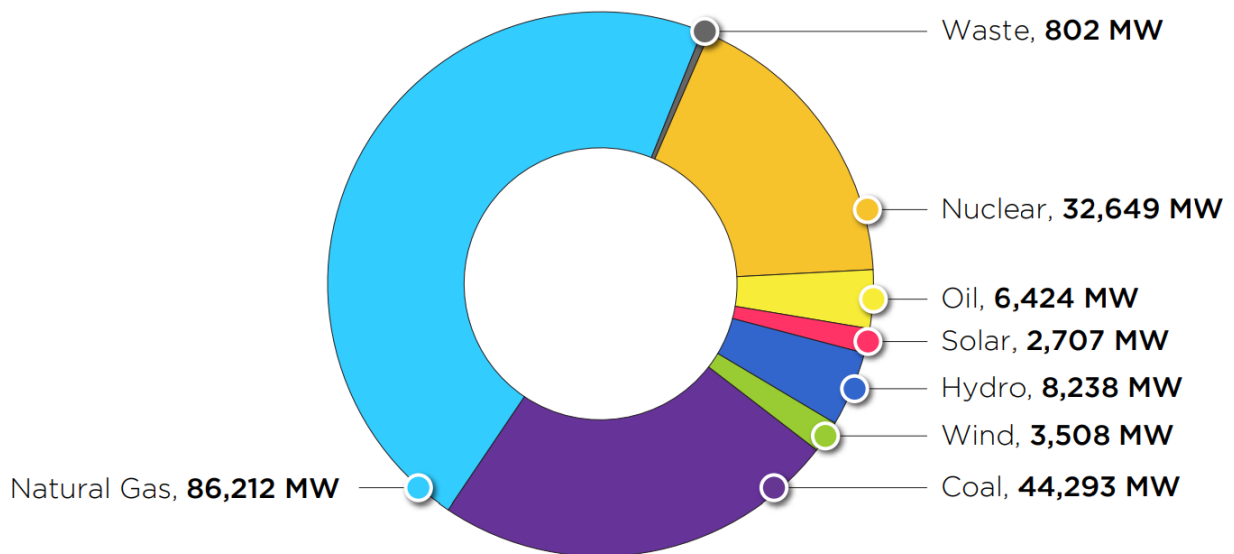
IV. Sufficient Generation Exists Today; Current Trends Raise Concerns Further Out

The current PJM fuel mix is balanced and diversified between different fuel types, as shown in Figure 8 below, and we have adequate generation resources to serve the anticipated needs of our system today. Indeed, NERC in its 2023 Summer Assessment represented the PJM region as one of the regions in the country projected to have adequate reserves for this summer.

However, as we look further out, maintaining an adequate level of generation resources, with the right operational and physical characteristics, will be essential 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 risk that we may have difficulty maintaining such an adequate level of generation resources with the necessary attributes over time.

- 1 | The rate of electricity demand is likely to continue to increase from electrification and increasing deployment of high-demand data centers in the region.
- 2 | Dispatchable generators are retiring at a rapid, date-certain pace largely due to government and private sector policies.
- 3 | Replacement generation is primarily intermittent and limited-duration resources, requiring multiple megawatts of these resources to replace one megawatt of dispatchable generation.
- 4 | 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.

Figure 8. PJM Existing Installed Capacity (Nameplate as of Dec. 31, 2022)



The pace of retirements is being driven in large part by state laws and federal environmental initiatives that create a clear near-term, date-certain requirement for generation to comply or retire. On the other hand, the pace of additions of new renewable generation is currently slower than anticipated.⁴ We are hopeful that the technological development of longer-duration batteries and other storage technologies that can address the challenges created by a large fleet of intermittent generation will create new grid management tools, but timing of commercial availability of these tools is uncertain.

This analysis is further detailed in our most recent paper in the Energy Transition in PJM series.⁵ This analysis clearly highlights our concern that, if current trends continue, we will be at elevated risk of resource adequacy shortfalls later in this decade. However, we believe this risk is avoidable through policies that accelerate the rate of entry of new generation (such as through permitting reform) and stop or slow down the exit of traditional thermal generation we currently use to balance the grid until replacement generation is installed and operating at the required scale.

The reliability challenge from prematurely losing resources we need to manage a grid dominated by intermittent renewable generation is concerning. Identifying this possible outcome now affords us an opportunity to manage this transition in an orderly and coordinated fashion that ensures the continued supply of reliable electric power.

To the industry's credit, we have managed energy transitions before, such as the fleet turnover driven by the shale gas revolution and the U.S. Environmental Protection Agency's Mercury and Air Toxics Standard Rule issued in December 2011. However, the current energy transition to a cleaner and greener fleet is much larger and affects virtually every aspect of energy supply and delivery.

If the rate of premature retirements continues to outpace the installation of replacement generation with the attributes necessary to maintain grid reliability, the nation may well face challenges with maintaining adequate supply to meet electric power demand, at the very time we are moving aggressively to electrify the transportation and home heating sectors. On the other hand, if we proactively address these challenges now, we believe we can achieve an orderly and coordinated transition that ensures the continued supply of reliable electric power.

⁴ There are a number of reasons for a lag in development of new resources. The large increase in renewable generation project development has led to rapidly expanding interconnection queues across the U.S., increasing the time it takes for a project to be approved for interconnection to the grid. Developers report delays with project siting and permitting combined with significant supply chain backlogs. This is a multifactorial problem that will require solutions to each of the barriers to new generation development.

PJM is currently embarking on a significant reform of the interconnection process targeted at moving new projects through our interconnection process much more rapidly. This process will clear the existing interconnection backlog by moving from a "first-come/first-served" paradigm to a "first-ready/first-served" paradigm. The transition to this new interconnection process will begin this summer.

We are finding that even projects that have completed our interconnection queue are still not undertaking construction at an adequate rate. For example, in 2022, we had only 2,000 MW of projects get built, of which only 700 MW were renewables, when there were over 30,000 MW of generation with signed interconnection agreements. Today, we currently have about 44,000 MW of projects that have come through our study process with either signed or pending final agreement and should be moving to construction; that should grow to about 62,000 MW by year's end. And thus far in 2023, we recently had a 1,900 MW combined-cycle gas plant come online, but we have seen only 250 MW of renewable generation start up this year.

⁵ Energy Transition in PJM: [Resource Retirements, Replacements and Risks](#) (PDF), Feb. 24, 2023.

V. Steps Industry and Policymakers Can Take Now To De-Risk the Transition

Potential Areas for Action – PJM

PJM is working with its members and stakeholders on several initiatives focused on ensuring a reliable transition, including:

- Implementing interconnection process reform that was recently approved by FERC and is expected to significantly accelerate interconnection queue throughput. PJM will also consider additional potential interconnection policy reforms with its members.
- Calibrating our reliability risk modeling and capacity market rules and generator requirements to the changing needs of the grid as we go through this transition.
- Continuing to support state policies through creative and innovative solutions, such as cooperative planning between PJM and states to meet their public policy needs under PJM's State Agreement Approach. By way of example, we recently planned targeted transmission projects with the state of New Jersey to support their offshore wind policy goals.
- Working with FERC as well as the gas pipeline industry to improve the coordination of the natural gas and electricity markets.

To capture these actions in a central location, PJM is launching an initiative to bring all of its activities targeted at [Ensuring a Reliable Energy Transition](#) under a single umbrella, as stated in the body of this testimony.

Potential Areas for Action – Policymakers

PJM cannot address these issues alone. Because policies at the state and federal level are a key factor in driving the disparate pace of retirements and replacements, the solutions require a coordinated approach to effectuating the transition. Along these lines, our conclusions and recommendation are as follows:

- Supply chain issues are plaguing many different segments of the industry, ranging from shortages of transformers to solar panels. The Inflation Reduction Act creates important incentives that will help to spur domestic manufacturing of these critical components of electricity supply and delivery. Until that domestic manufacturing develops, we will need to ensure that new federal and state policies across agencies are coordinated to take into account whether the particular policy initiative is helpful in addressing these immediate infrastructure needs.
- There is a critical need for integrating analysis of the reliability impact of specific state and federal policies prior to those policies being adopted. We remain concerned that compliance dates that impact the generation fleet are being chosen without such a rigorous analysis always being undertaken. From a process standpoint, it would be appropriate for a more thorough reliability analysis to become a standing requirement for federal and state actions that could impact reliability.
- Instead of date-certain “retire or comply” policies or policies that limit generator output on a fixed, pre-determined date, policies should tie such retirement signals or generator output restrictions to the demonstration that adequate replacement capacity is installed and operating. Currently, the nation is

developing environmental and reliability policy in separate silos with limited and not very transparent coordination between the environmental and reliability regulators. Increased coordination and synchronization of the nation's environmental and reliability needs may require discrete changes to the statutes governing each agency's mission to embrace this effort.

- Balanced permitting reform needed. By the same token, we are becoming increasingly dependent on natural gas. Additional pipelines will need to be sited to meet our reliability needs. Also, EPA's greenhouse gas proposal calls for a vast increase in co-firing of natural gas or hydrogen, or sequestration of carbon dioxide; if the rule stands, a new transportation network for hydrogen and a transportation and storage network for carbon dioxide will need to be sited, permitted and built.
- Finally, the electric grid is one of our most important infrastructure assets. It is critical to both the economy, health and security of all Americans. We need to give protection and enhancement of the grid the same level of focus that we give to our equally important environmental goals. Policies need to continually be crafted in a manner that ensures that the reliability and affordability of the grid can be maintained and enhanced as we transition to a cleaner and greener generation fleet.

VI. Proven Benefits: Using Markets and Competition 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 produce a security constrained economic dispatch across our footprint, ensuring that the most efficient and cost-effective mix of resources is called on each hour of each day to achieve reliability at the least cost to customers. In addition, based on economics and needs, in any given hour, we either export excess power supplies to our neighbors or import power from those neighbors. This helps to support reliable and cost-effective operations throughout the entire Eastern Interconnection.

Congress set the country on a path toward the development of competitive markets through the Energy Policy Act of 1992. As demonstrated by the PJM value proposition and in countless independent economic analyses, that choice has proven to be a success in ensuring a more reliable and cost-effective grid.

This quote is from a letter penned by the Clean Energy Buyers Association (CEBA), a diverse set of over 350 energy customers, including nearly one-fifth of the Fortune 500:

*"Organized wholesale electricity markets (OWMs) are fundamental to advancing CEBA's vision and goals. By leveraging the power of competition and balancing clean energy generation over large geographic regions, OWMs produce billions of dollars in benefits annually. These markets expand purchasing options and support reliable clean energy integration..."*⁶

⁶ [Organized Wholesale Electricity Markets](#), [Clean Energy Buyers Association](#) website.

We have seen this same recognition from those on both sides of the aisle who have served as FERC commissioners. A bipartisan group of former FERC commissioners wrote to FERC in June 2021, stating:

“As former FERC Commissioners and Chairs, appointed by both Republican and Democratic Presidents over the past three decades, we are united in our strongly held view that organized regional wholesale power markets, known as RTOs and ISOs, provide compelling platforms for renewable energy development and are achieving considerable consumer benefit.”⁷

The market has opened up opportunities for the export of electricity from resource-rich states like Pennsylvania to net-consuming states. This results in economic development and consumer cost savings on both sides of the transaction. The market has also allowed for the development of innovative and promising new technologies being deployed in our footprint, ranging from batteries to Smart Wires technology to opportunities for customers to receive the value of their rooftop solar devices in the market. And retail customers can receive the benefit of some or all of this activity at the wholesale level. Competitive markets are a proven tool that can deliver a more efficient energy transition.

VII. PJM Reliability Initiative: Ensuring a Reliable Energy Transition

As mentioned above, PJM has embarked on research to evaluate the anticipated changes to the system and any challenges they may present. Building on a foundation of this research, analysis and stakeholder exchange over the past several years, and further informed by lessons learned from Winter Storm Elliott in December 2022, PJM recently outlined a set of emerging risks to reliable electrical supply.



From purely a reliability perspective, PJM is well-positioned today. We have enough resources and enough essential reliability services. However, Winter Storm Elliott presented challenges for our generator fleet, and we need to support better performance of our generators going forward. This is the **immediate concern: support resource performance**.

⁷ [Letter of Nine Former Federal Energy Regulatory Commissioners and Chairs to FERC Re: Organized Wholesale Power Markets](#) (PDF), June 2, 2021.

Our near-term concern relates to a paper we released this year entitled “Energy Transition in PJM: Resource Retirements, Replacements & Risks.” That paper concludes, based upon specific and quantifiable trends,⁸ that we may not have supply to power homes and businesses toward the end of this decade. This is the **near-term concern: ensure resource adequacy**.

Finally, all generating resources do not have the same physical properties. We need our thermal resources (nuclear, gas, coal) to provide what the North American Electric Reliability Corporation (NERC) calls essential reliability services. This includes properties like inertia, flexibility and a host of other physics and grid engineering properties that we need to deliver electrons. Currently, these essential reliability services can only be provided by our thermal resources. We will continue to need these thermal resources until a replacement technology is deployable at scale. Currently, solely renewable resources cannot provide these attributes. This is the **upcoming concern: maintain and attract essential reliability services**.

PJM has launched a multiyear reliable energy transition initiative to address the identified challenges and potential solutions. The initiative proposes an initial set of actions to support reliability that PJM can take with its stakeholders, government and industry over the immediate, near-term and upcoming time frames to keep pace with these trends. **Ensuring a Reliable Energy Transition** is the name of this multiyear effort, and we encourage you to visit PJM’s website where you can see PJM’s initial proposed set of actions to try and help alleviate the immediate, near-term and upcoming reliability concerns identified.

VIII. Conclusion

PJM is a mission-driven organization whose primary focus is reliability. PJM and the entire U.S. electric grid are experiencing an accelerating transition toward intermittent renewable generation. PJM has embraced this transition through its five-year strategy, producing intensive research and analysis on the opportunities and challenges presented by such a seismic shift.

The PJM system as it stands today is a reliable system with an adequate capacity reserve margin. Despite PJM’s healthy reserve margins, however, recent winter storms (Uri 2021, Elliott 2022) have provided a sobering reminder of the critical role that resource adequacy will play through the energy transition. Further, 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. This situation is not unique to the PJM system – roughly two-thirds of North America is rated by NERC at being at elevated resource adequacy risk this summer.

This risk is not a forgone conclusion. Rather, we believe a reliable energy transition is achievable through policies that accelerate the rate of entry of new generation and stop or slow down the exit of traditional thermal generation we currently use to balance the grid, until replacement generation is installed and operating at the required scale. We at PJM are working on a range of initiatives to help achieve a reliable transition. In our judgment, a reliable transition will also require policy changes aimed at accelerating new generation entry and slowing exits.

⁸ These trends include: (i) increased demand due to data centers and electrification; (ii) significant generation plant retirements due primarily to policy drivers; and (iii) new entry of mostly renewable resources not matching the pace of these retirements. See *Energy Transition in PJM: Resource Retirements, Replacements & Risks* <https://www.pjm.com/-/media/library/reports-notices/special-reports/2023/energy-transition-in-pjm-resource-retirements-replacements-and-risks.ashx>.

As we continue on this transition, it is important to recall that the grid has successfully endured energy transitions in the past. PJM has reliably and effectively weathered these transitions due in large part to the value that comes with being a regional transmission organization with a robust planning process, efficient capacity market design, access to fuel and geographically diverse generating resources, and a highly resilient network of transmission facilities.

PJM embraces the challenge ahead. Working together with our governmental partners such as the Pennsylvania Public Utility Commission and utility transmission and generation owners, PJM is committed to facilitating the energy transition reliably and cost-effectively for the 65 million consumers in our footprint.

I thank you for the opportunity to present my testimony today. I look forward to any questions you may have.

2022 Pennsylvania State Infrastructure Report

(January 1, 2022 – December 31, 2022)

May 2023

1. Planning

- Generation Portfolio Analysis
- Transmission Analysis
- Load Forecast

2. Markets

- Capacity Market Results
- Market Analysis
- Net Energy Import/Export Trend

3. Operations

- Generator Production
- Emissions Data

- **Existing Capacity:** Natural gas represents approximately 49.2 percent of the total installed capacity in the Pennsylvania service territory while coal represents approximately 20.1 percent and nuclear 19.3 percent. In PJM natural gas and coal are 46.6 and 24.0 percent of total installed capacity, while nuclear represents 17.7 percent.
- **Interconnection Requests:** Solar represents 68.3 percent of new interconnection requests in Pennsylvania, while storage represents approximately 24.2 percent of new requests.
- **Deactivations:** 832 MW of generation in Pennsylvania deactivated in 2022.
- **RTEP 2022:** Pennsylvania's 2022 RTEP project total represents approximately \$664.35 million in investment. A portion of the projects associated with New Jersey's State Agreement Approach (SAA) are located in Pennsylvania and have an estimated cost total of \$114.11 million. SAA-affiliated projects are cost allocated to New Jersey ratepayers and are not included in Pennsylvania's 2022 RTEP project cost totals.

- **Load Forecast:** Pennsylvania's summer peak load growth is projected to range between -0.3 and 0.8 percent annually over the next ten years, depending on the service territory. The overall PJM RTO projected summer load growth rate is 0.8 percent.
- **2023/24 Capacity Market:** Pennsylvania's service territory cleared at the RTO price of \$34.13/MW-day and the MAAC price of \$49.49/MW-day for the 2023/2024 Base Residual Auction.
- **2024/25 Capacity Market:** Pennsylvania's service territory cleared at the RTO price of \$28.92/MW-day, the MAAC price of \$49.49/MW-day, and the Eastern MAAC price of \$54.95/MW-day for the 2024/2025 Base Residual Auction.
- **1/1/22 – 12/31/22 Market Performance:** Pennsylvania's average hourly LMPs were generally lower than the PJM average hourly LMP.
- **Emissions:** Pennsylvania's average CO2 emissions decreased in 2022 compared to 2021 levels

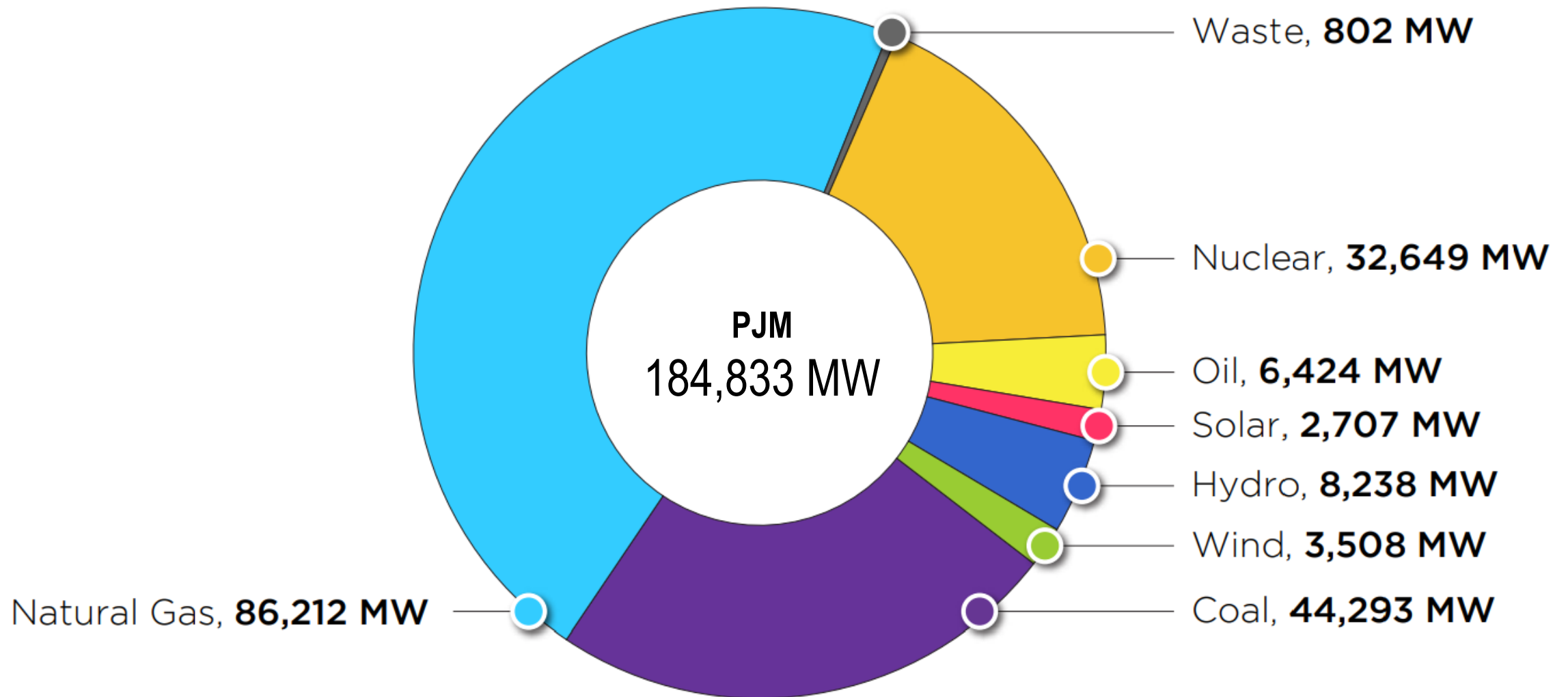


Planning

Generation Portfolio Analysis

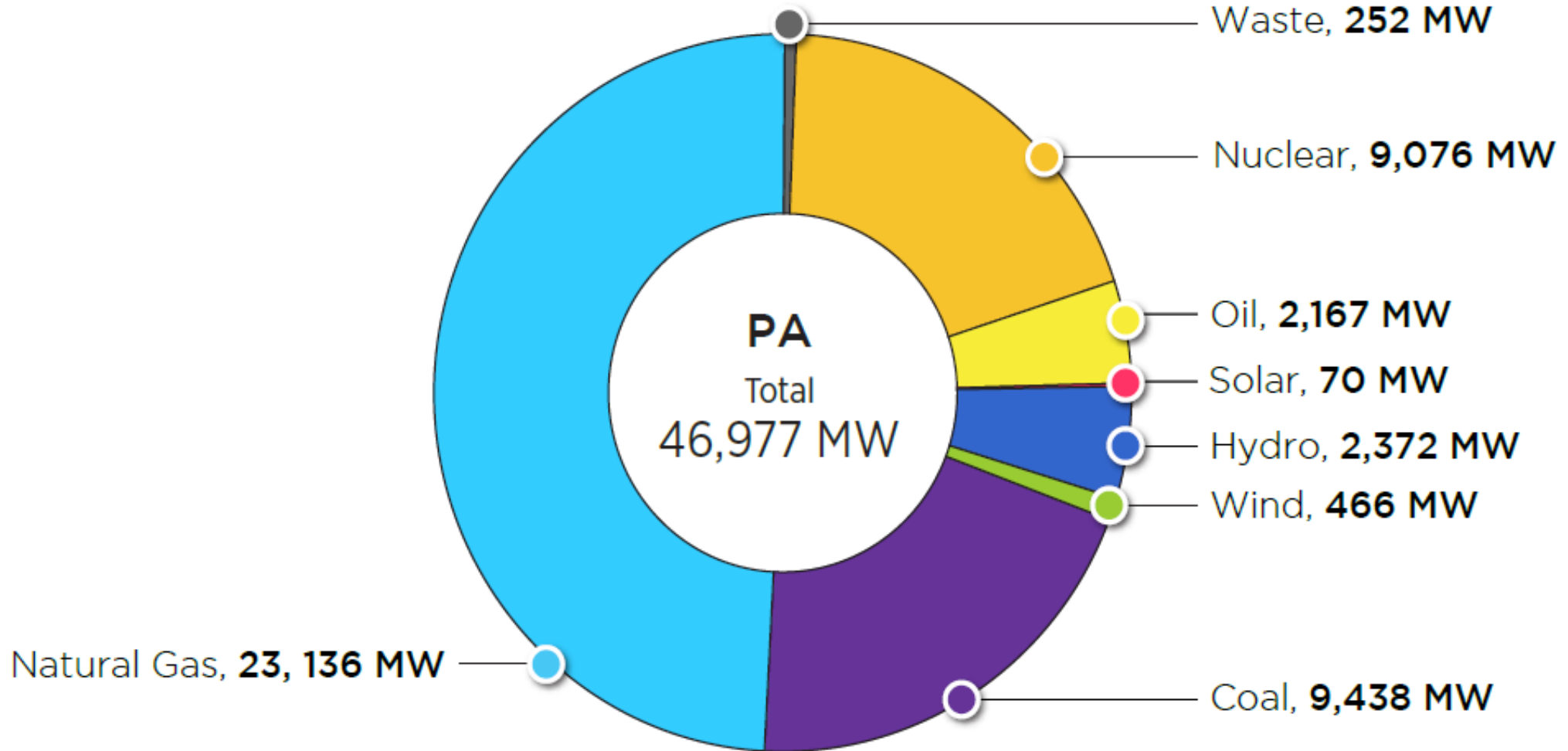
PJM – Existing Installed Capacity

(CIRs – as of Dec. 31, 2022)



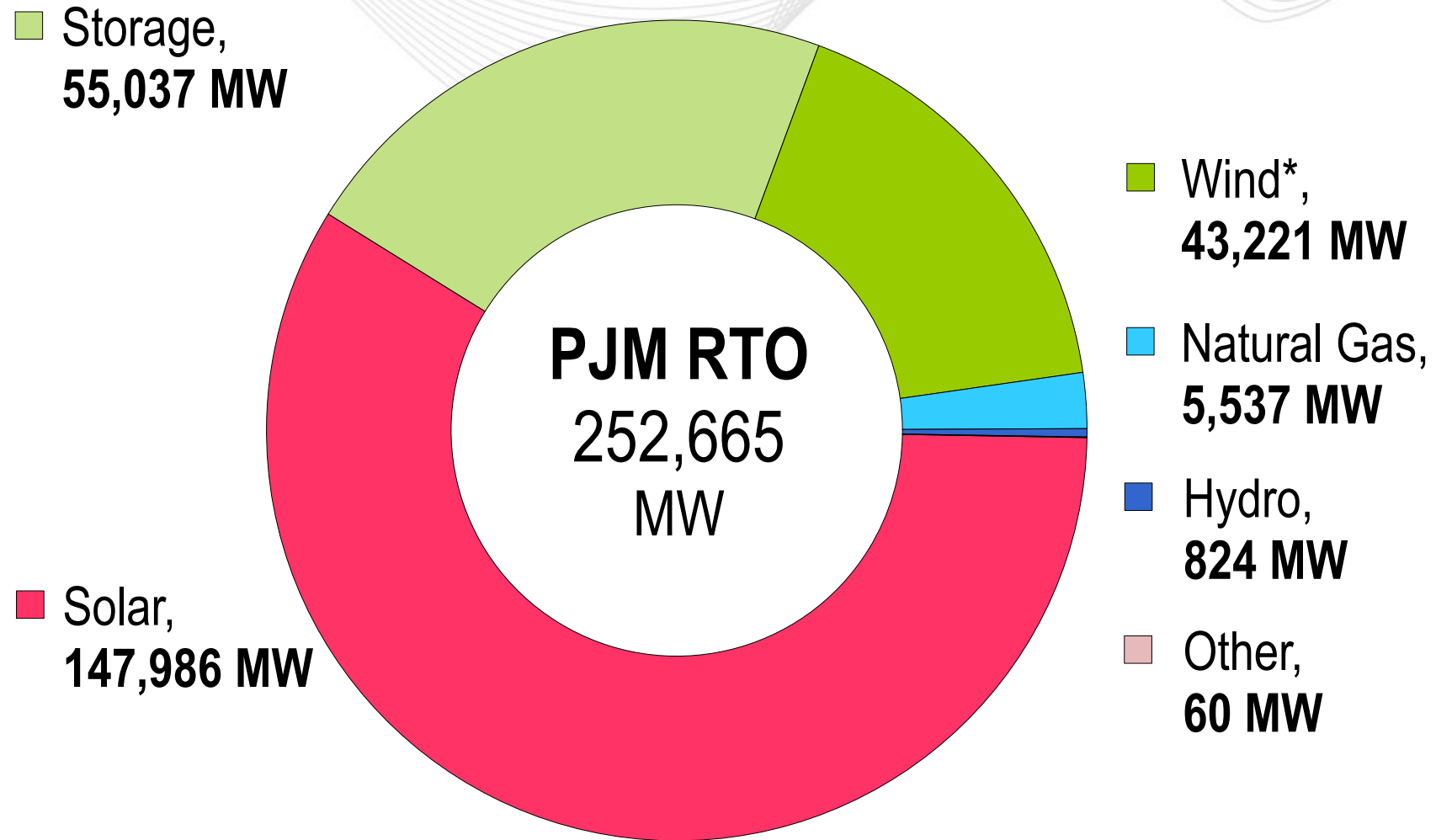
Pennsylvania – Existing Installed Capacity

(CIRs – as of Dec. 31, 2022)



PJM Queued Capacity (Nameplate) by Fuel Type

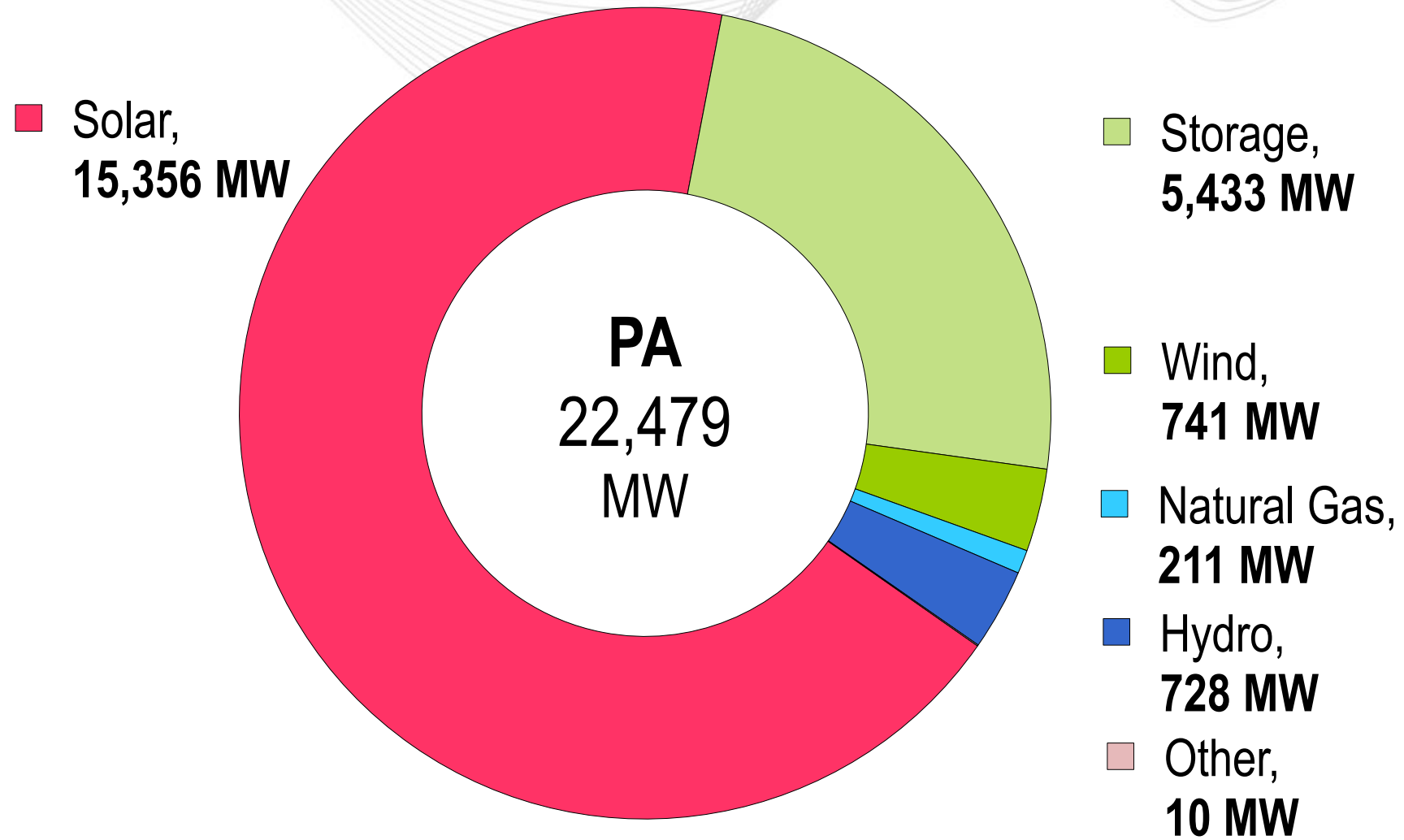
("Active" in the PJM Queue as of April 1, 2023)



*Wind includes both onshore and offshore wind

Pennsylvania Queued Capacity (Nameplate) by Fuel Type

("Active" in the PJM Queue as of April 1, 2023)





Pennsylvania – 2022 Generator Deactivations

Unit	TO Zone	Fuel Type	Request Received to Deactivate	Actual or Projected Deactivation Date	Age (Years)	Capacity (MW)
Williamsport-Lycoming CT 2	PPL	Oil	9/30/2021	4/1/2022	54	13.4
Williamsport-Lycoming CT 1						13.2
West Shore CT 2					52	14.0
West Shore CT 1						14.0
Martins Creek CT 3				6/1/2022	50	18.0
Lock Haven CT 1				4/1/2022	52	14.0
Jenkins CT 2						13.8
Jenkins CT 1						13.8
Harrisburg CT 3	PPL	Oil	9/30/2021	6/1/2022	54	13.8
Harrisburg CT 2						13.9
Harrisburg CT 1						13.4
Fishbach CT 2					52	14.0
Fishbach CT 1						14.0
Allentown CT 4					54	14.0
Allentown CT 3						14.0
Allentown CT 2						14.0
Allentown CT 1	PPL					14.0
Cheswick 1	DLCO	Coal	7/14/2021	3/31/2022	51	567.5
Harwood 2	PPL	Oil	4/27/2021	5/31/2022	53	12.3
Harwood 1			10/29/2020			12.9

Planning

Transmission Infrastructure Analysis

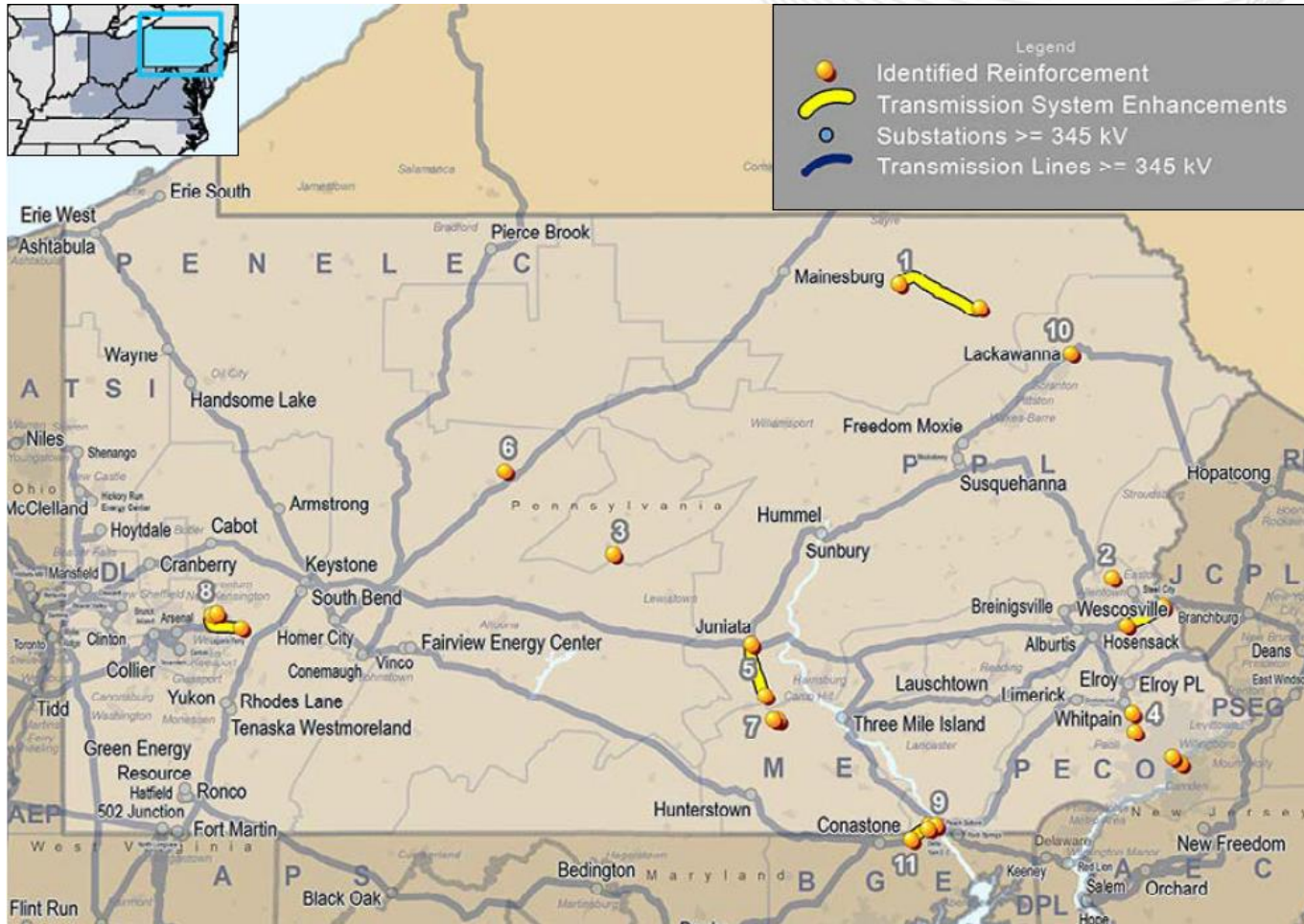
For reporting purposes, the 2022 state infrastructure reports provide maps displaying all baseline, network, and supplemental projects for the respective state. The reports also include aggregated project cost tables of these projects by Transmission Owner zone. For a detailed list of each project shown on a state's project map, please see that state's section in the **2022 Annual RTEP Report** on pjm.com:

<https://www.pjm.com/-/media/library/reports-notices/2022-rtep/2022-rtep-report.ashx>

The complete list of all RTEP projects in PJM, including those from prior years, can be found at the **RTEP Upgrades & Status – Transmission Construction Status** page on pjm.com:

<https://www.pjm.com/planning/project-construction>

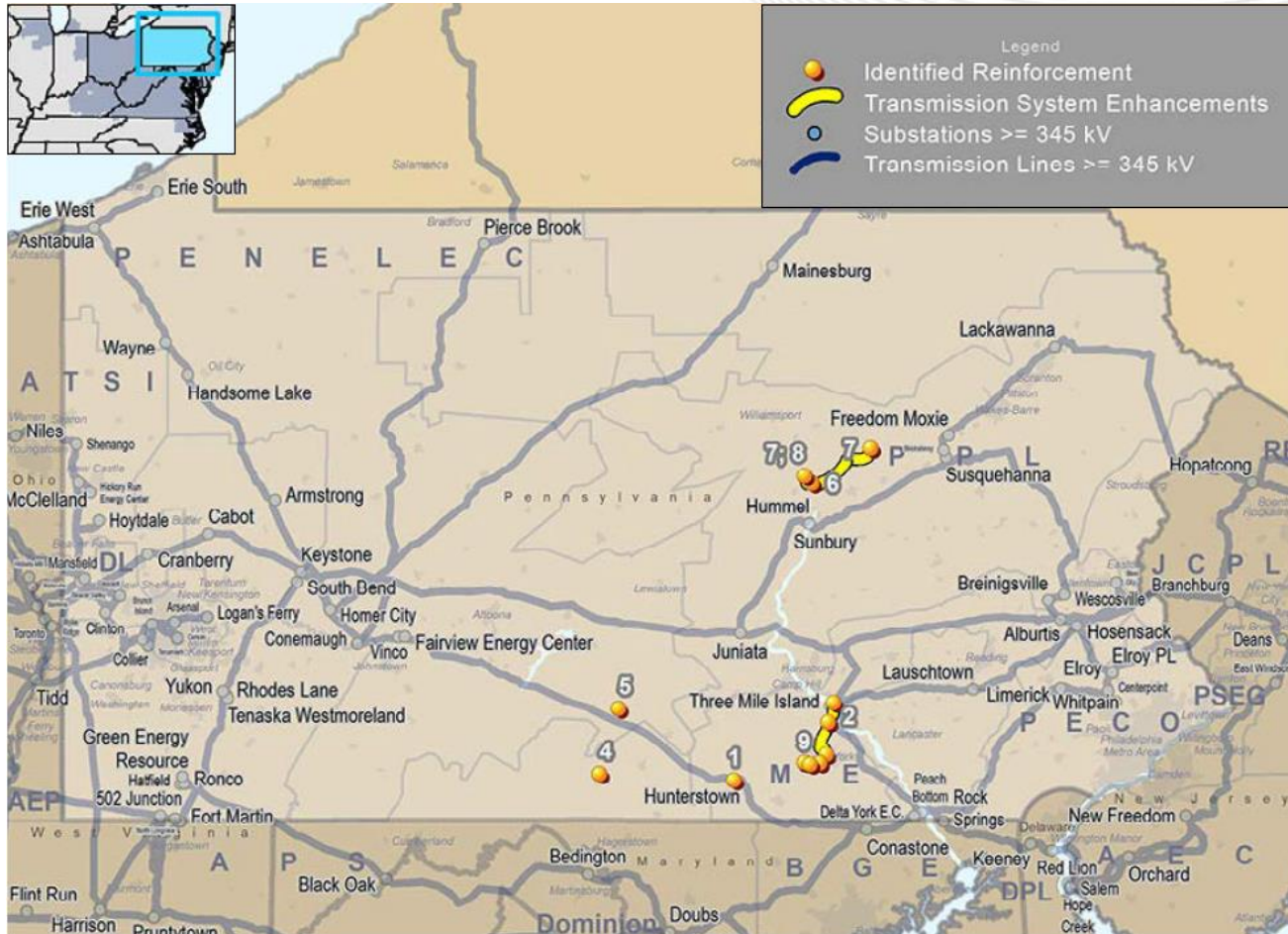
Pennsylvania – RTEP Baseline Projects



PA Baseline Projects	
TO Zone	Cost (\$M)
AP	\$1.66
DLCO	\$33.00
METED	\$8.91
PECO	\$4.42
PENELEC	\$15.74
PPL	\$28.61

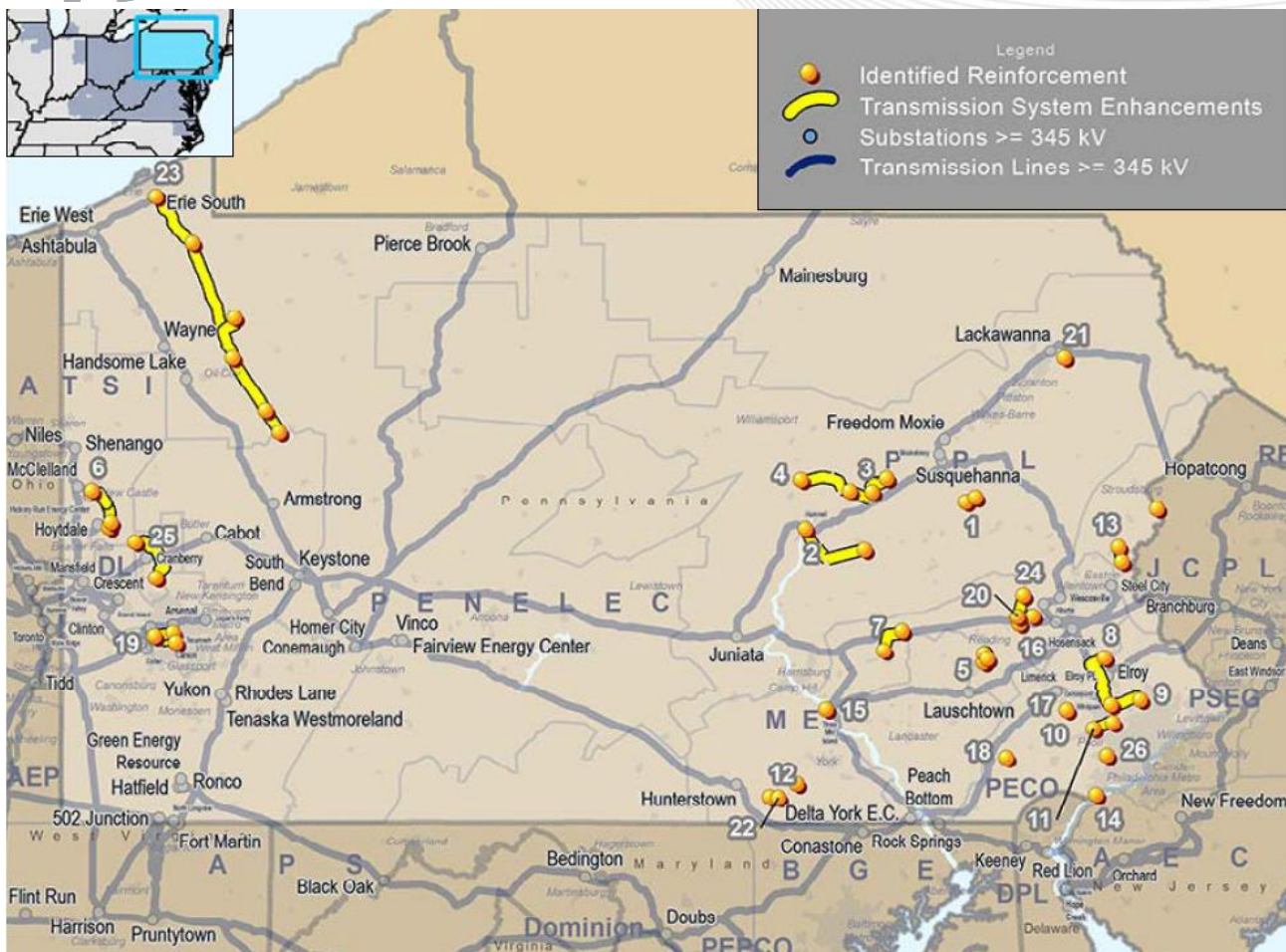
The project shown as #11 on the map is a portion of the baseline project b3737. RTEP project b3737, including all associated sub-projects, by multiple designated entities, represents the State Agreement Approach projects selected by the New Jersey Board of Public Utilities. The Pennsylvania portion of b3737 totals \$114.11(\$M), and its cost is allocated 100% to New Jersey ratepayers. This project's cost is not included in the table shown above.

Note: Baseline upgrades are those that resolve a system reliability criteria violation.



PA Network Projects	
TO Zone	Cost (\$M)
AP	\$6.12
MAIT	\$15.15
METED	\$4.30
PPL	\$1.27

Note: Network projects are new or upgraded facilities required primarily to eliminate reliability criteria violations caused by proposed generation, merchant transmission or long term firm transmission service requests, as well as certain direct connection facilities required to interconnect proposed generation projects. The costs of network projects are borne by the interconnection customer.



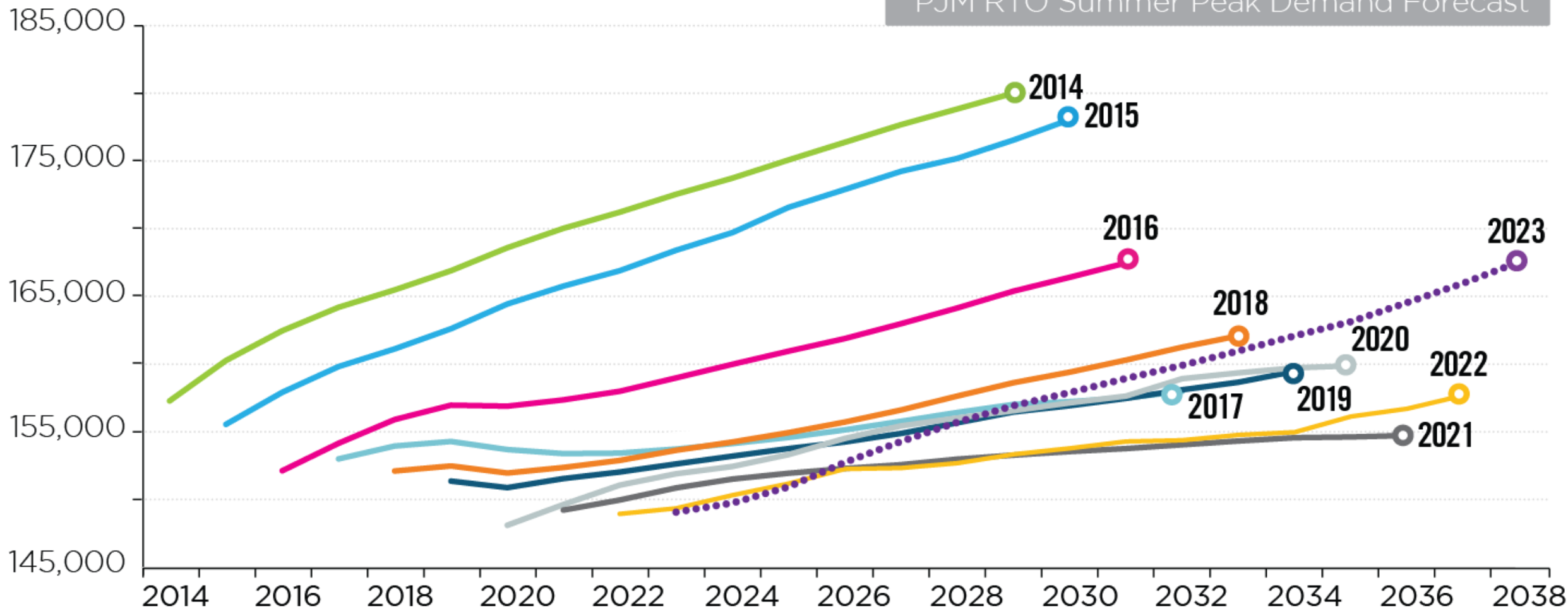
PA Supplemental Projects	
TO Zone	Cost (\$M)
ATSI	\$2.20
DLCO	\$34.00
METED	\$53.40
PECO	\$8.62
PENELEC	\$443
PPL	\$3.95

Note: Supplemental projects are transmission expansions or enhancements that are not required for compliance with PJM criteria and are not state public policy projects according to the PJM Operating Agreement. These projects are used as inputs to RTEP models, but are not required for reliability, economic efficiency or operational performance criteria, as determined by PJM.

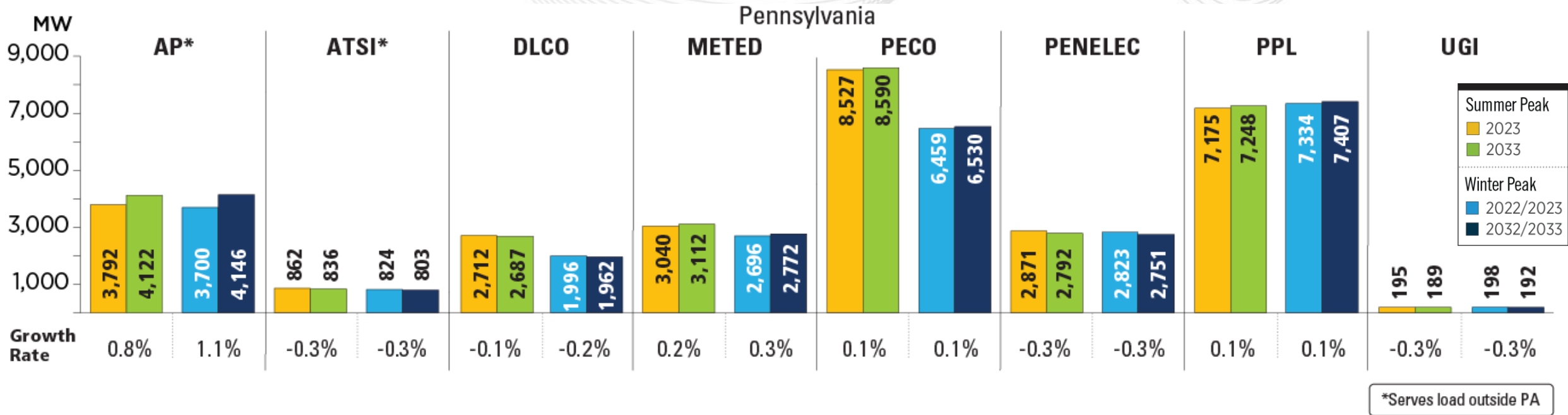
Planning Load Forecast

Load (MW)

PJM RTO Summer Peak Demand Forecast



Pennsylvania – 2023 Load Forecast Report



The summer and winter peak megawatt values reflect the estimated amount of forecast load to be served by each transmission owner in the noted state/district. Estimated amounts were calculated based on the average share of each transmission owner's real-time summer and winter peak load in those areas over the past five years.

PJM RTO Summer Peak

2023	2033
149,059 MW	160,971 MW
Growth Rate 0.8%	

PJM RTO Winter Peak

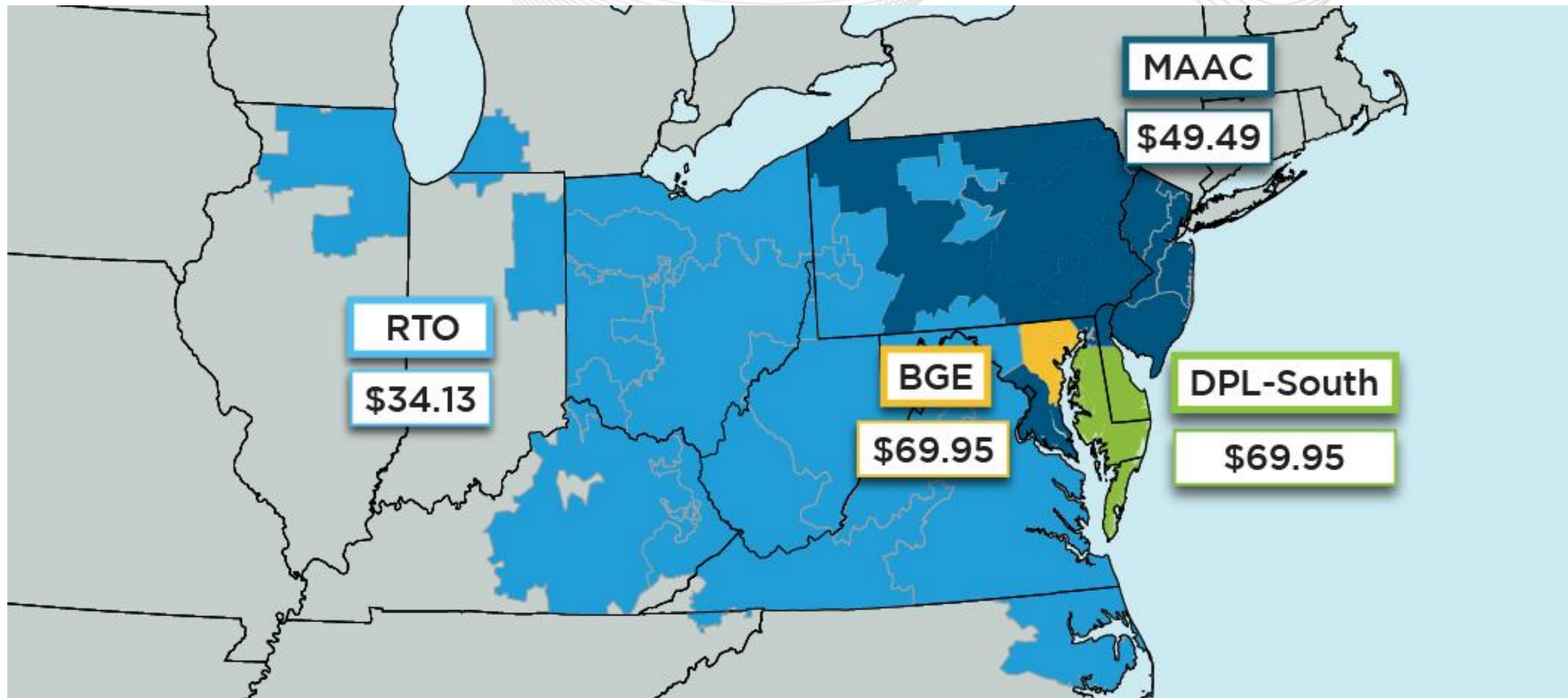
2022/2023	2032/2023
130,811 MW	144,992 MW
Growth Rate 1.0%	

Markets

Capacity Market Results

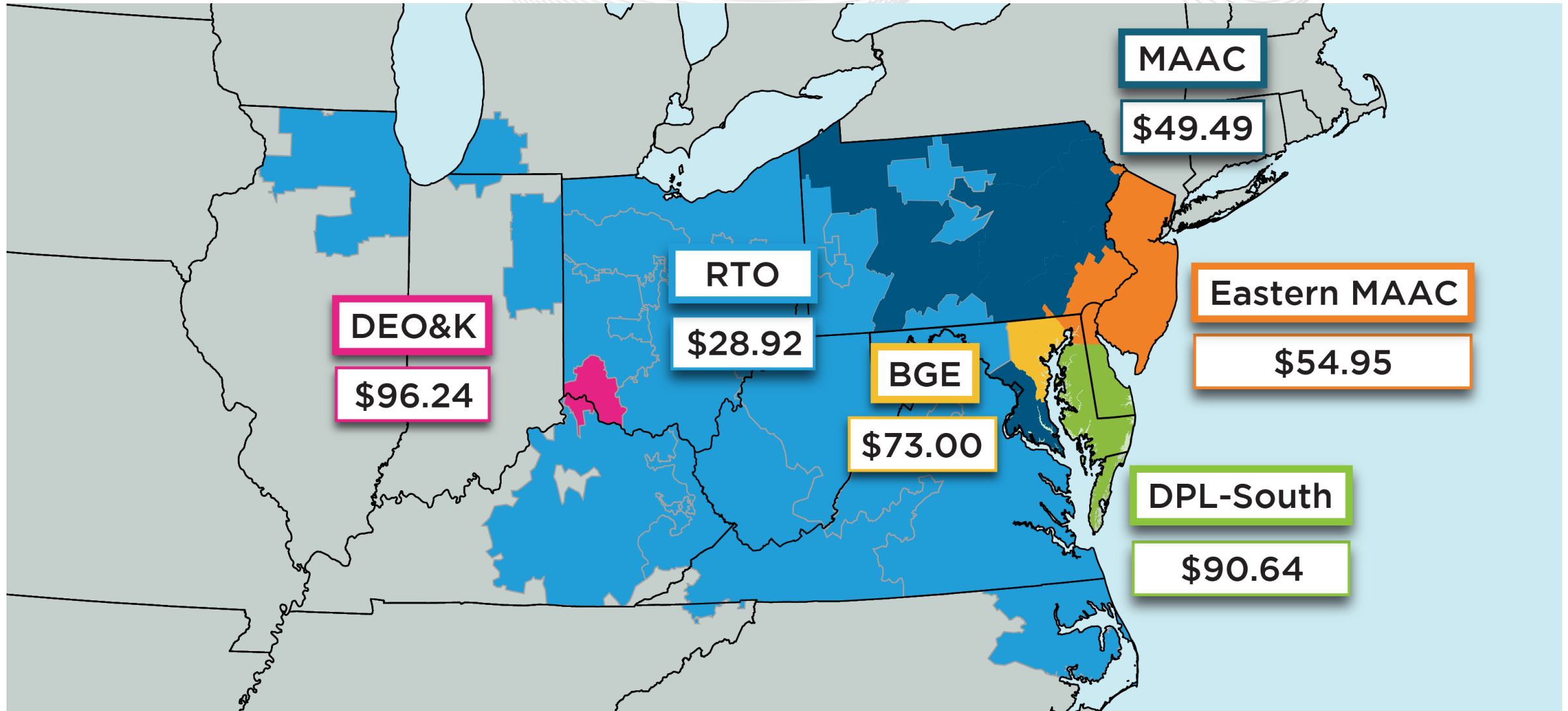


2023/24 Base Residual Auction Clearing Prices (\$/MW-Day)



2023/24 Cleared MW (UCAP) by Resource Type

	ANNUAL	SUMMER	WINTER	Total (MW)
Generation	131,256.3	47.0	474.1	131,777.4
DR	7,919.1	177.1	0.0	8,096.2
EE	5,221.1	250.0	0.0	5,471.1
Total (MW)	144,396.5	474.1	474.1	

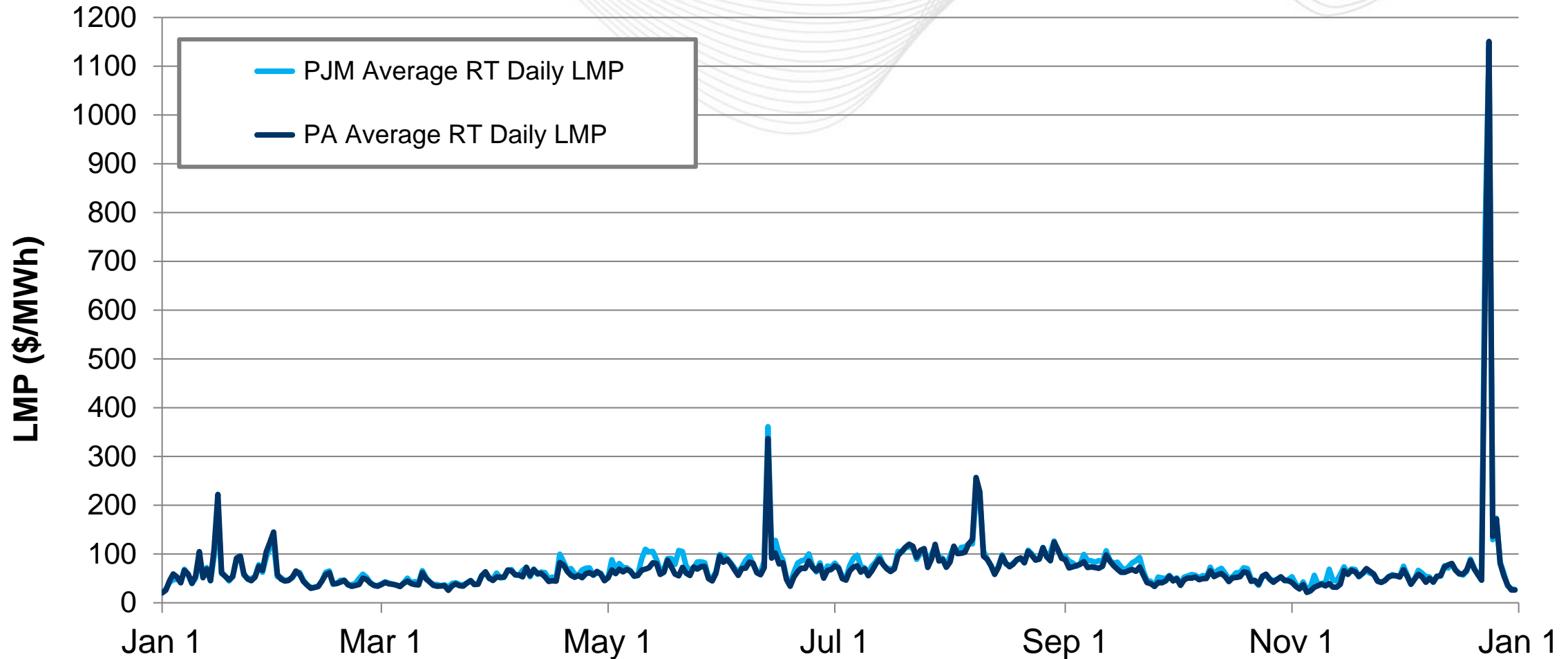


2024/2025 Cleared MW (UCAP) by Resource Type

	ANNUAL	SUMMER	WINTER	Total (MW)
Generation	131,779.3	38.2	605.6	132,423.1
DR	7,804.3	188.4	0	7,992.7
EE	7,289.7	379.0	0	7,668.7
Total (MW)	146,873.3	605.6	605.6	

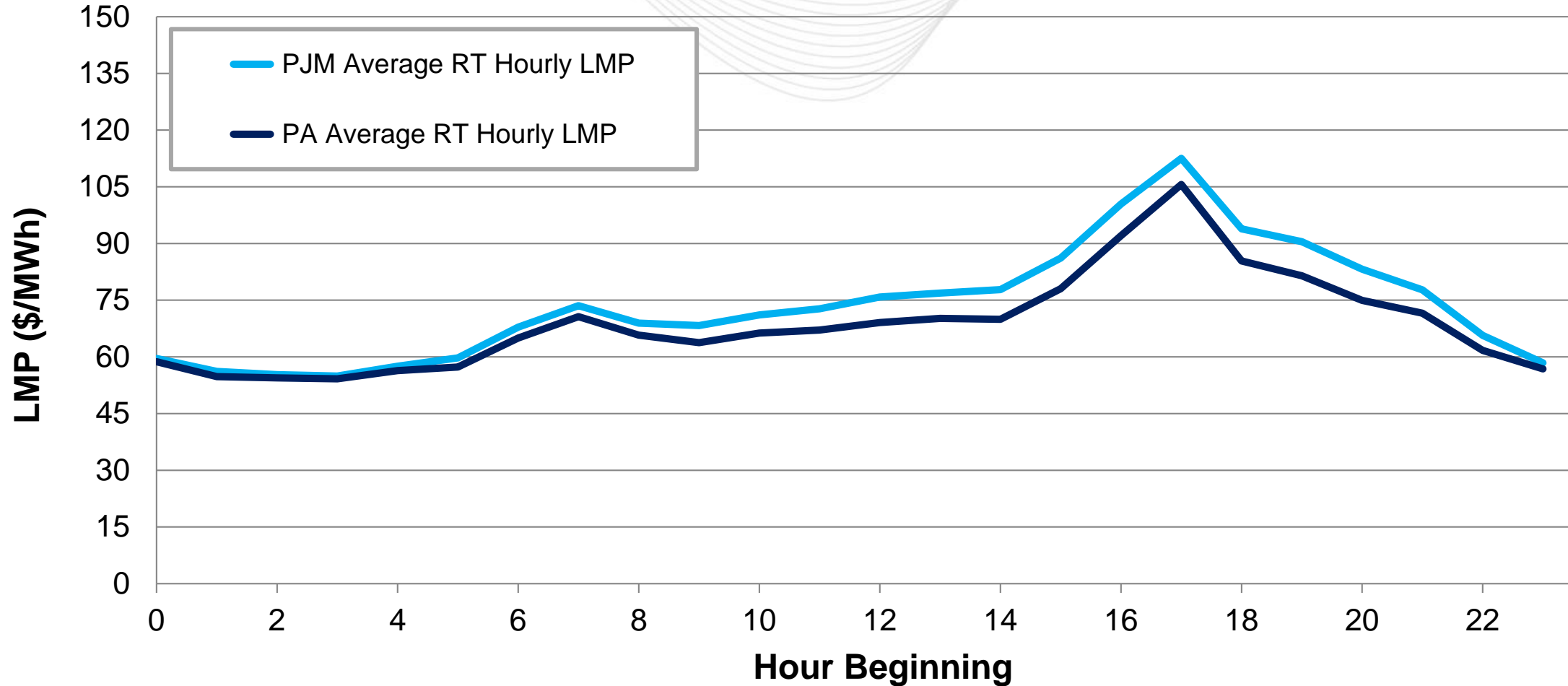
Markets

Market Analysis



Note: The significant price spike in late Dec. 2022 was a result of Winter Storm Elliott's impact on system conditions.

Pennsylvania's average hourly LMPs were generally lower than the PJM average hourly LMP.



Pennsylvania – Net Energy Import/Export Trend

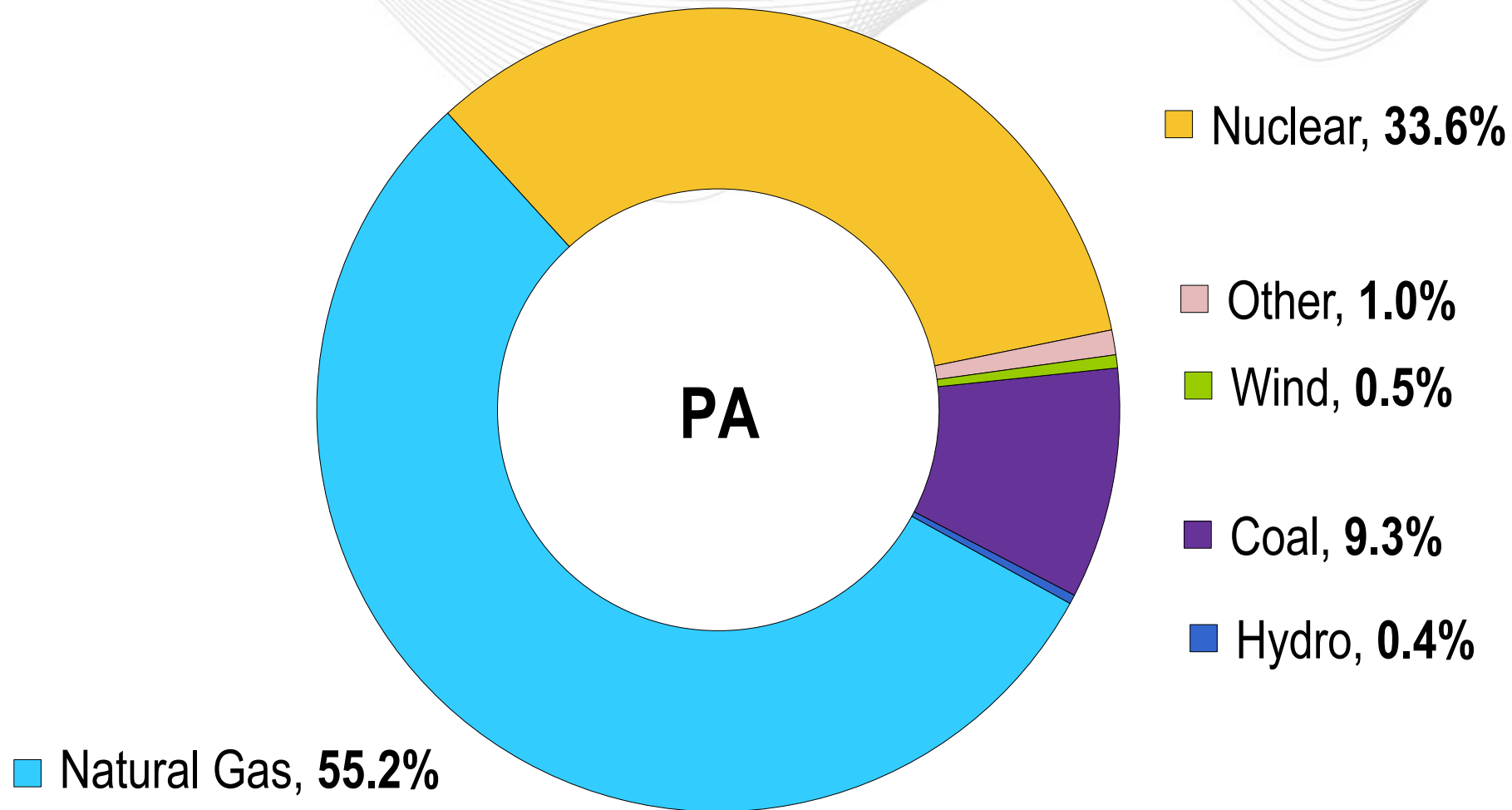
(Jan. 2022 – Dec. 2022)



Positive values represent exports and negative values represent imports.

Operations

Pennsylvania – 2022 Generator Production



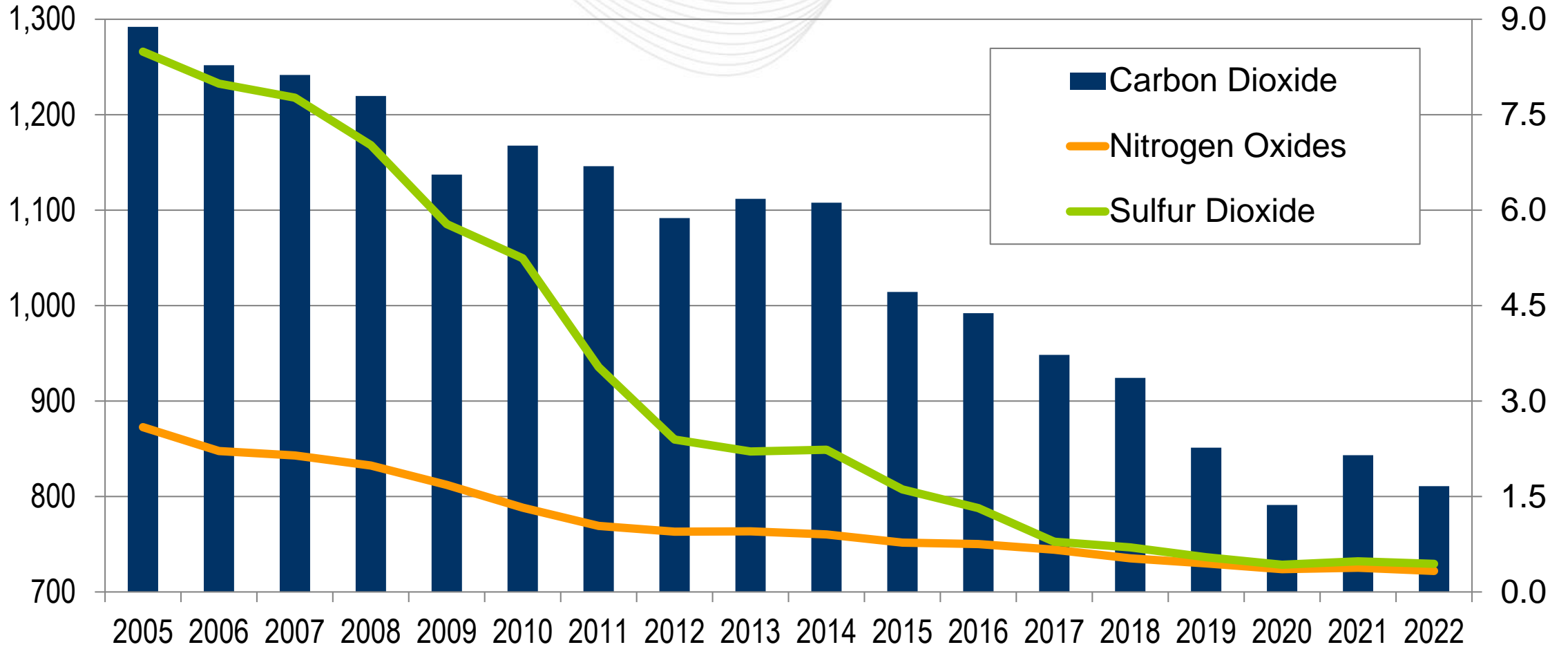
The data in this chart comes from EIA Form 923 (2022).

2005 – 2022 PJM Average Emissions

(March 2023)

CO₂
(lbs/MWh)

SO₂ and NO_x
(lbs/MWh)

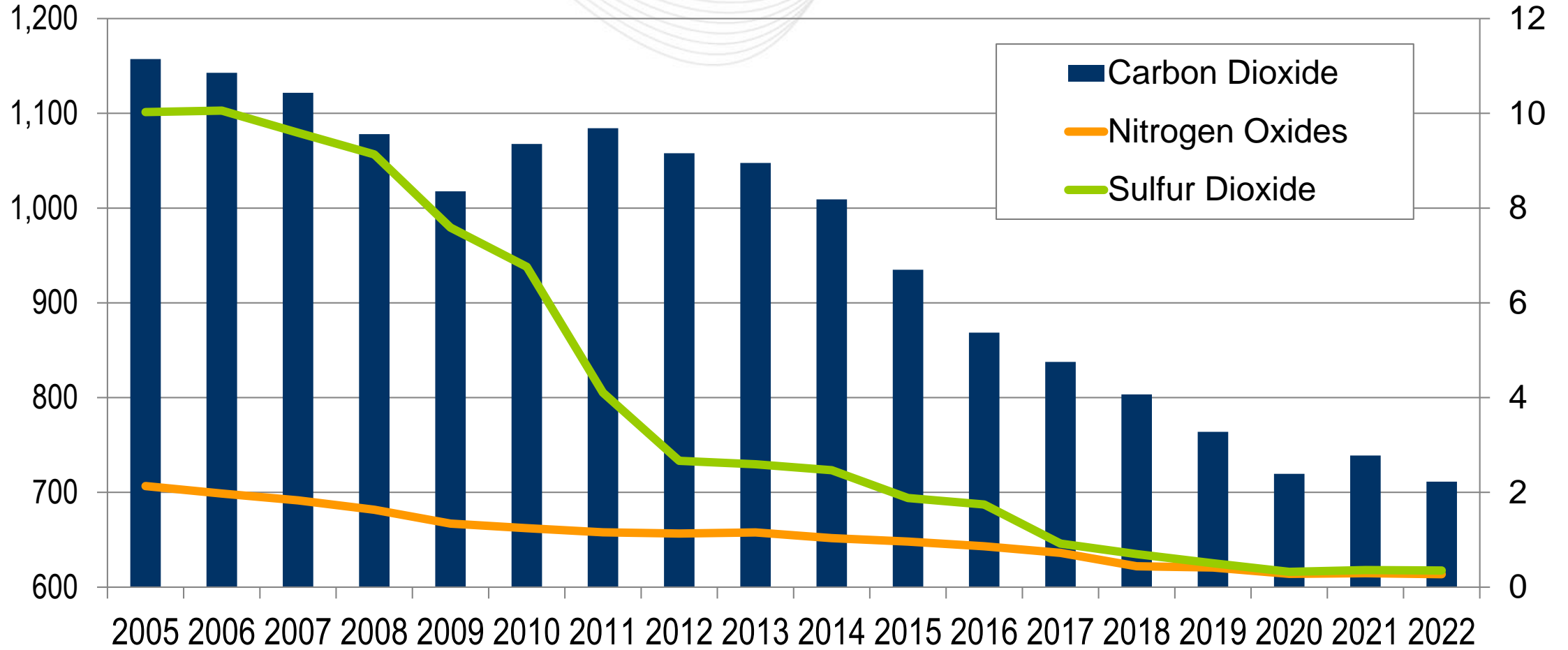


Pennsylvania – Average Emissions (lbs/MWh)

(March 2023)

CO₂
(lbs/MWh)

SO₂ and NO_x
(lbs/MWh)



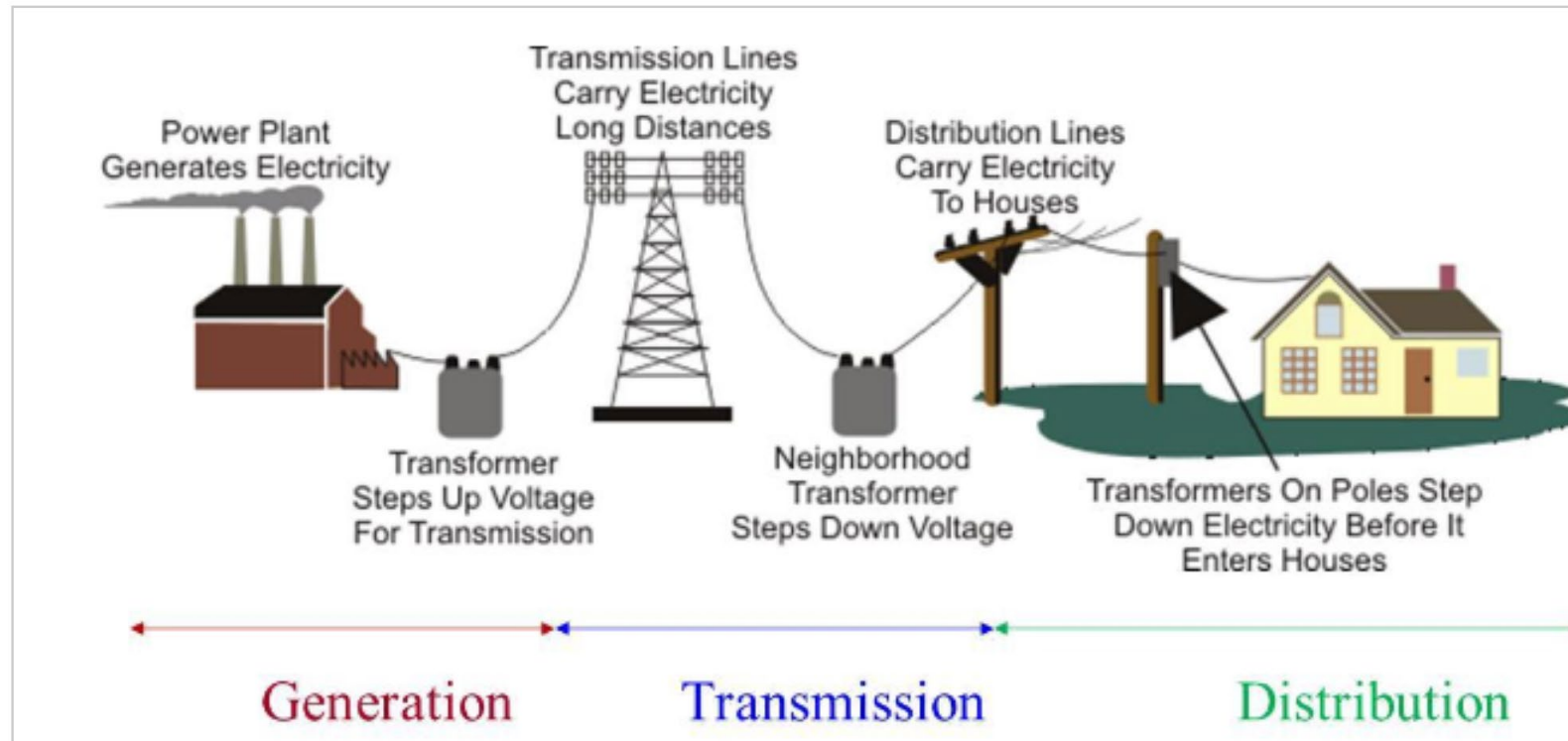


Reliability in the Balance – PJM and PA

Glen Thomas
June 16, 2023

The Power Industry – Pre-1996

Vertically Integrated



Power Market – Post-2001



Generation

- no longer utility only
- no longer regulated
- suppliers compete

Transmission

- remains utility only
- lines open to all suppliers

Distribution

- remains utility responsibility
- service remains the same
- rates remain regulated

Customers

- choose generation suppliers

Why did Pennsylvania Restructure in 1996?

- PA was in competition with other states – power prices were an important economic development driver.
- Technology and regulatory changes allowed for competition.
- Belief that empowered consumers could drive down prices and improve services.
- Desire to shift investment risk for new capacity from consumers to market participants.
- Governor Ridge's vision to make PA a leader among states and competitor among nations.

Concerns at the time

- How would reliability be achieved on a sustainable basis?
- Would competition lead to better prices?
- Were there sufficient consumer protections?
- Would Pennsylvania's embrace the opportunity to shop?
- Could Pennsylvania's consumers effectively be educated on this new ability to shop?
- Could the regional wholesale market be molded to support Pennsylvania's goals?

Has restructuring worked?

- Prior to 2020, PJM enjoyed robust reserve margins. In the last 3 years those reserve margins have deteriorated.
- Prior to 2020, energy and capacity prices were at historic lows.
- Pennsylvania's electricity rates that were once 15-20% above the national average are now consistently below the national average.
- NOx, SOx and Carbon emissions have plummeted in PA and PJM.
- For a list of power stations in PA:
https://en.wikipedia.org/wiki/List_of_power_stations_in_Pennsylvania

What is PJM?

Joined in 1927

Joined in 1956

Joined in 1965

Joined in 1981

Joined in 2002

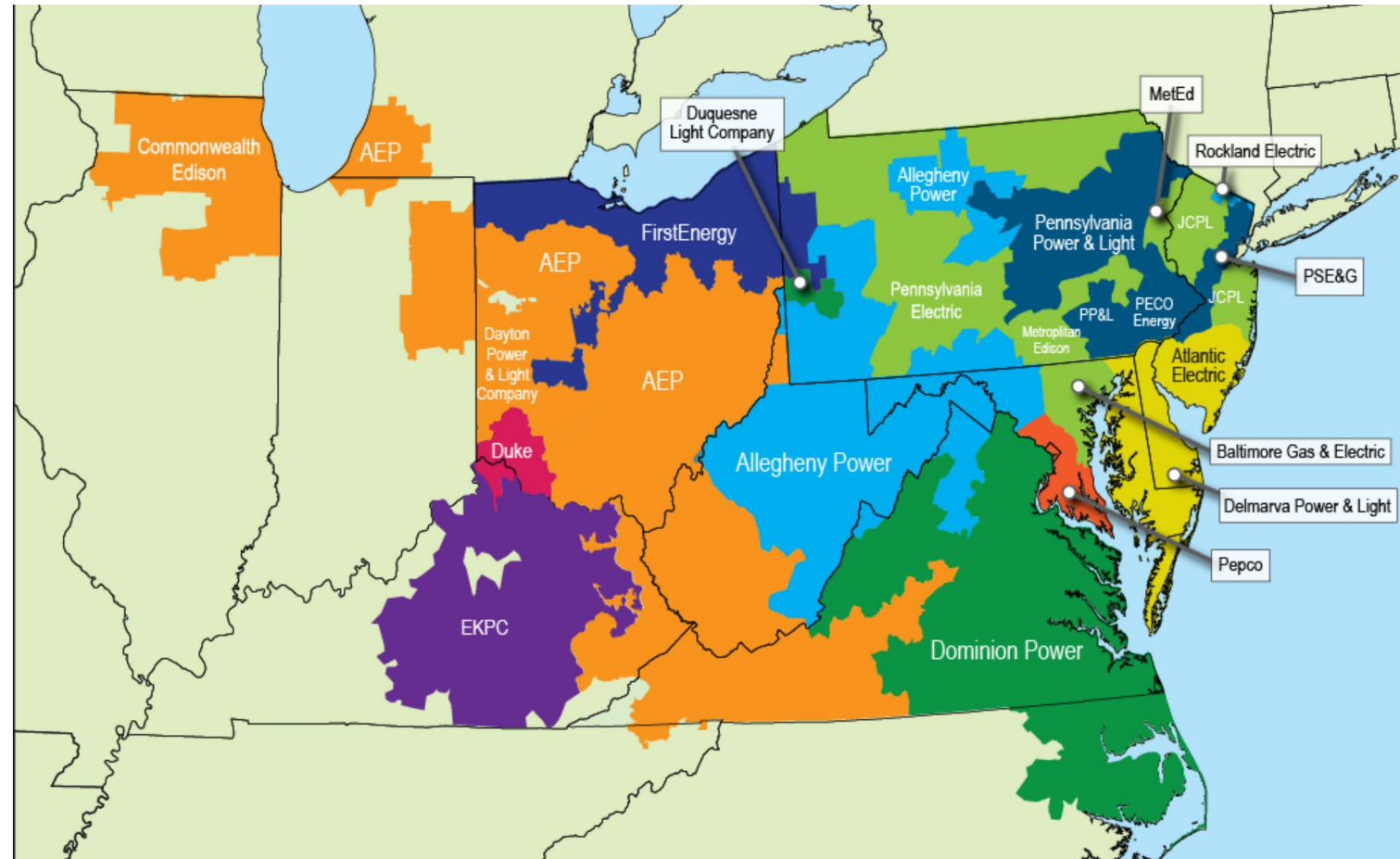
Joined in 2004

Joined in 2005

Joined in 2011

Joined in 2012

Joined in 2013



Why is PJM critical to PA's Success?

- Successful retail markets depend on functional wholesale markets.
- The market-based signal to build or retire a powerplant is a wholesale market price signal.
- Pennsylvania benefits from being in a regional grid with a diverse resource mix.
- Prior to 2020, Pennsylvania enjoyed support for its vision of a competitive wholesale market from PJM and FERC.

What trends are we seeing in the PJM Market?

- Demand is rising faster than historic rates.
- Retirements are happening faster than anticipated - PJM projects that 20% of its existing capacity will retire between now and 2030 – approximately 40 GW.
- Replacement capacity is not of the quality and quantity necessary to sustain reliability.
- As a result, at the current trajectory, PJM is not going to have sufficient power to meet the demands of consumers and prices are likely to increase.

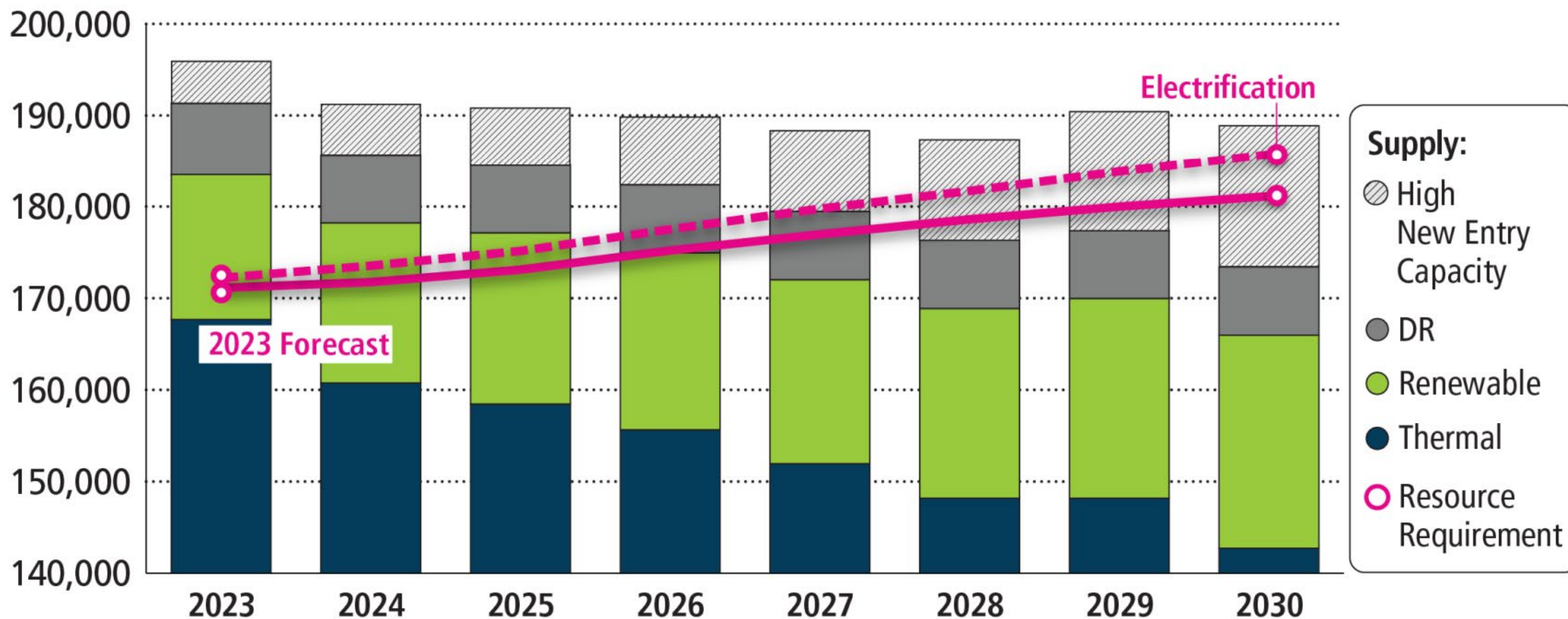
Why is demand increasing?

- Electric vehicle proliferation.
- Electric building proliferation.
- Data centers and crypto-mining.

Why are baseload resources retiring?

- Economic Pressure - PJM's Capacity Market is clearing at historically low levels. Last auction cleared at \$28/MwDay versus Cost of New Entry at \$293/MwDay
- Pressure from federal and state environmental regulations.
- State mandated closures.

MW ICAP



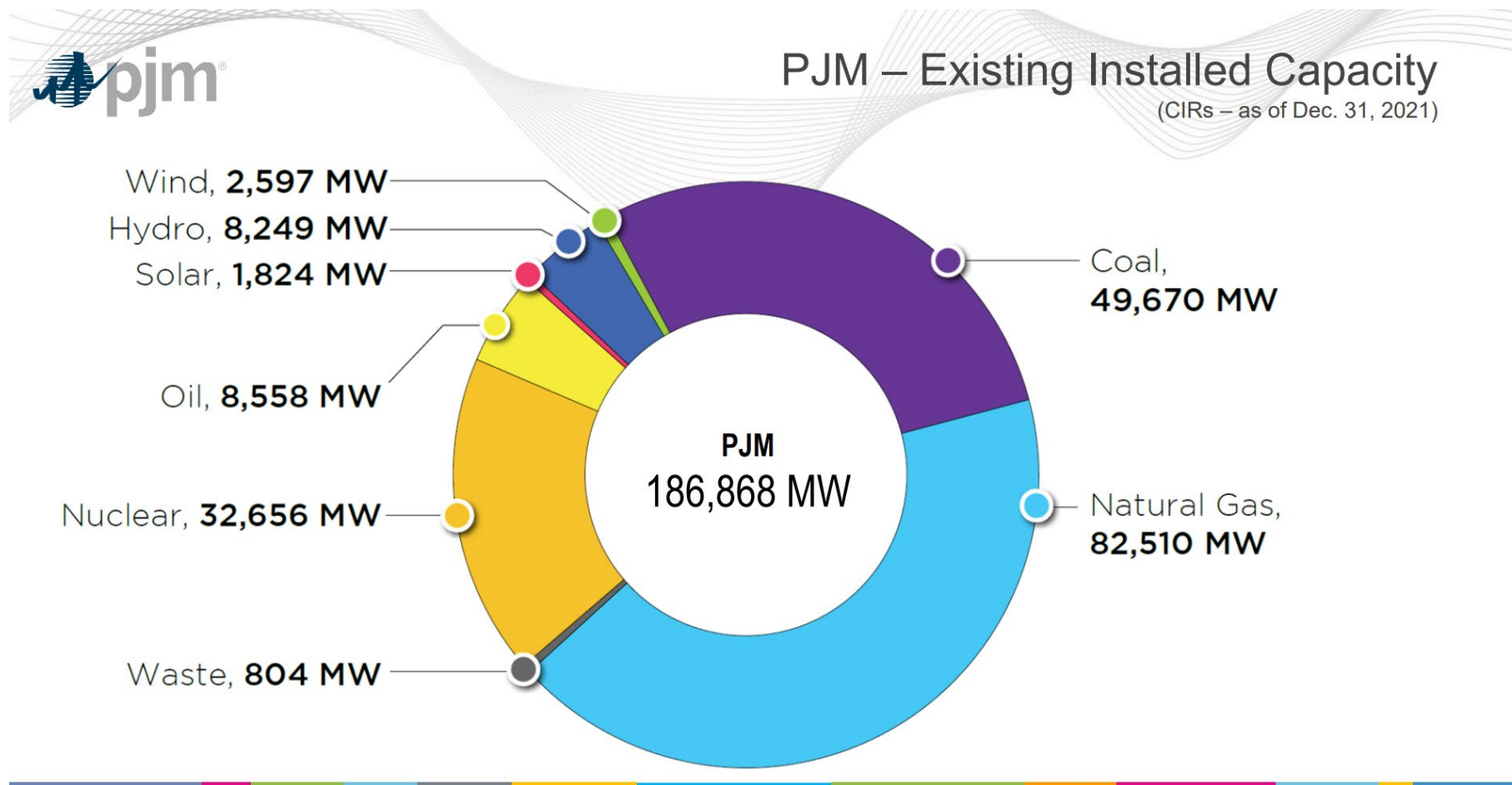


Reserve Margin Projections Under Study Scenarios

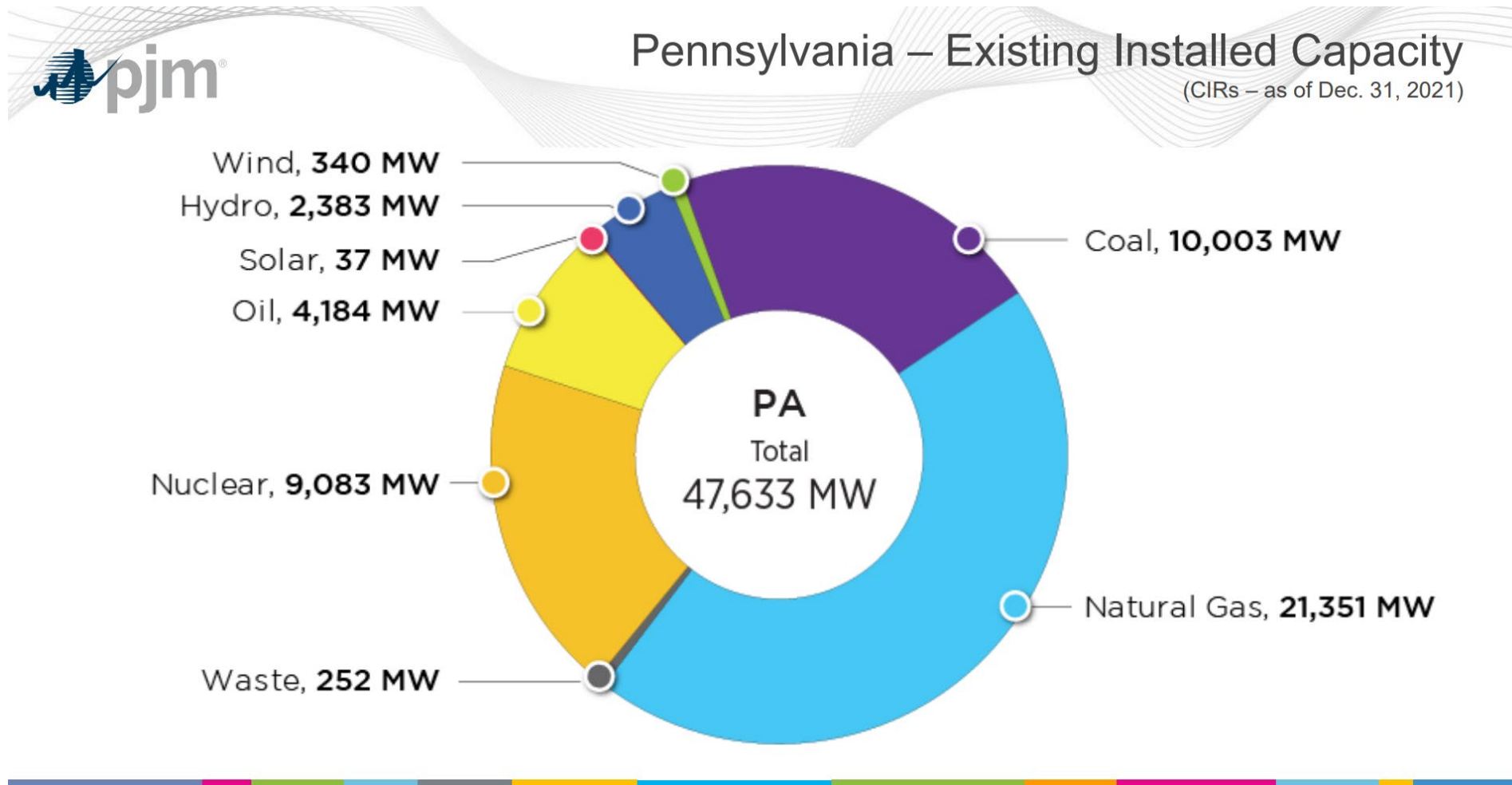
For the first time in recent history, PJM could face decreasing reserve margins should trends of high load growth, increasing rates of generator retirements, and slower entry of new resources continue.

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

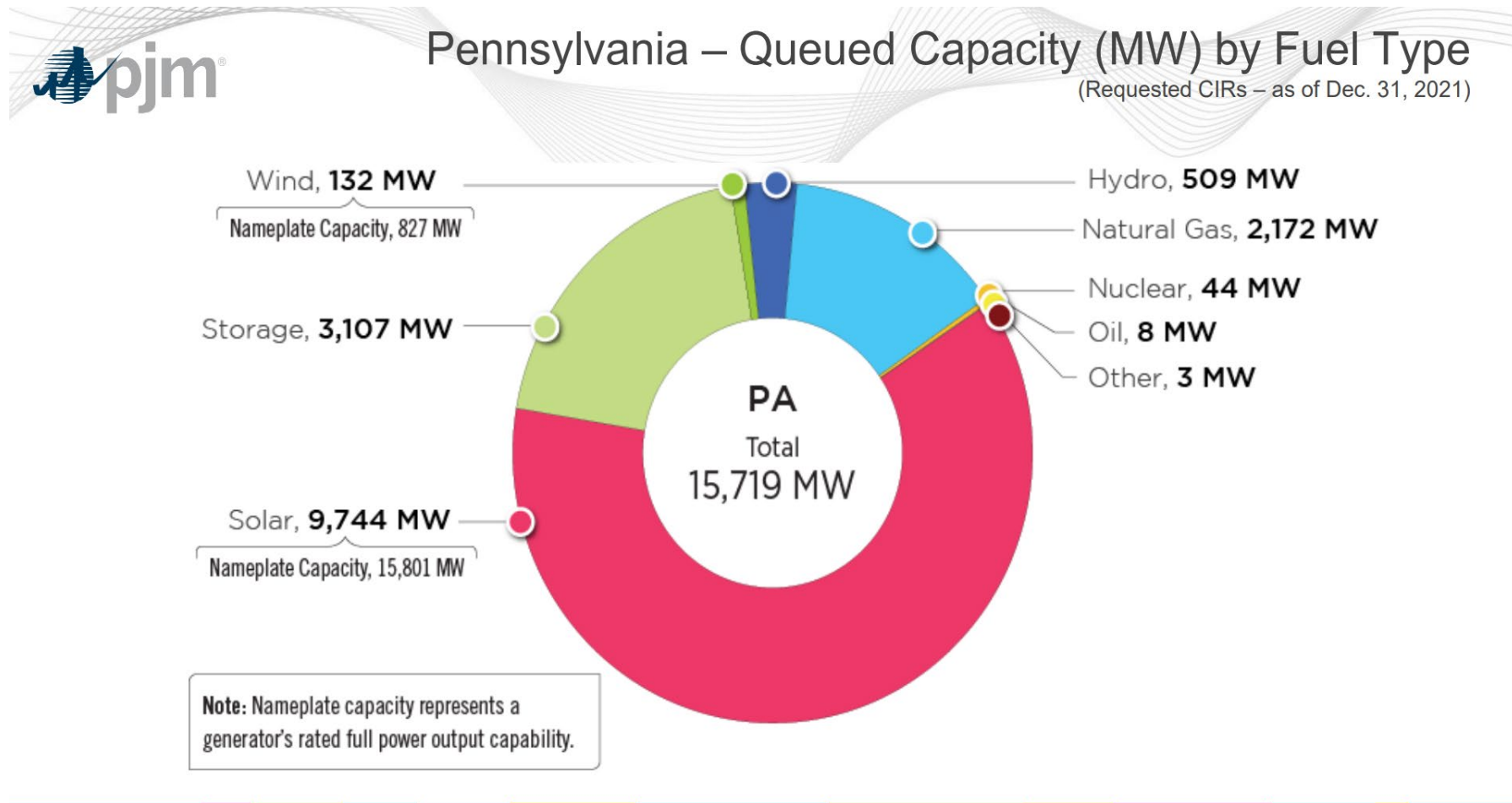
PJM Generation Mix



PA Generation Mix



PA Queue



How did we get here?

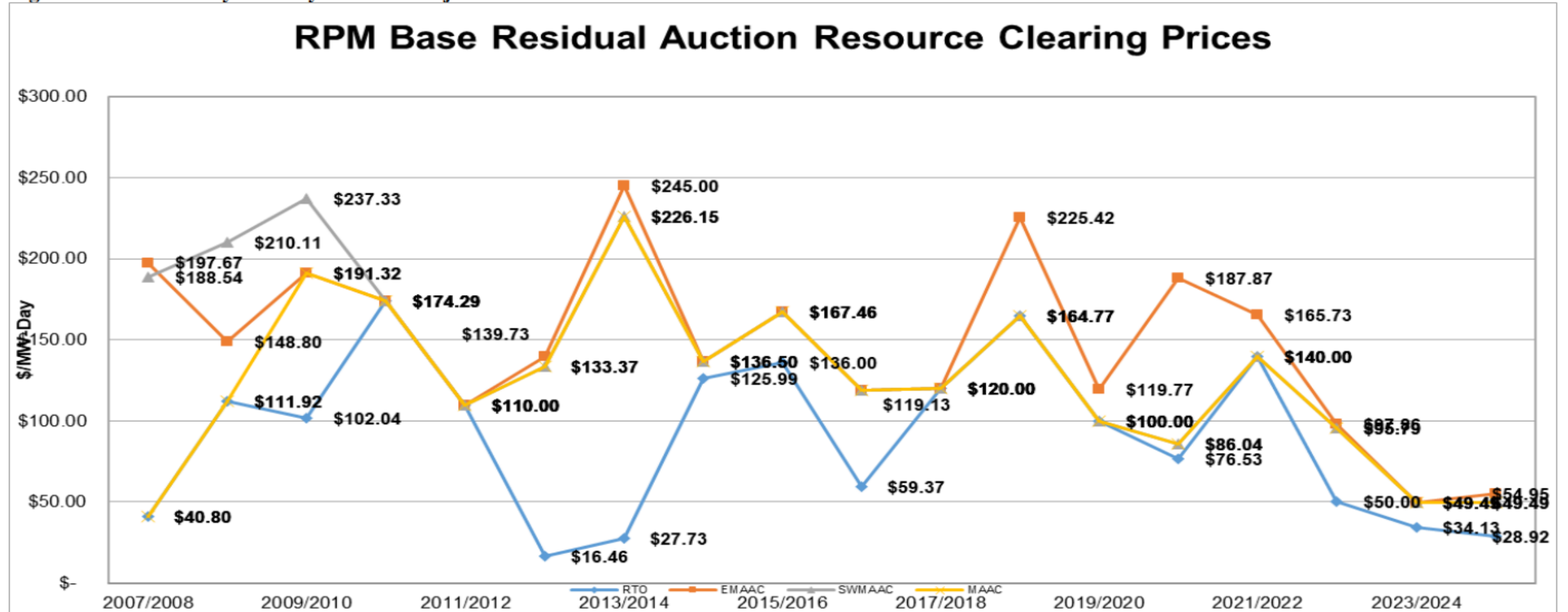
- A series of misguided decisions by PJM and FERC have made PJM a less attractive place to invest capital and encouraged existing resources to retire.
- Historically low energy and capacity prices.
- State and federal policies have led to the closure of facilities.

PJM and FERC Decisions/ Events

- Repeal of Minimum Offer Price Rule (2021)
- Imposition of onerous Capacity Market Seller Offer Caps (2021)
- Reversal of Operating Reserve Demand Curve (2022)
- Revised Capacity Market Demand Curve Parameters that discourage investment (2023)
- Change of rules in the middle of an auction to get a desired result (2023)
- Winter Storm Elliot (2022)

Historically Low Capacity Prices

Figure 1- BRA Price by Delivery Year for Major LDAs



* 2014/2015 through 2024/2025 Prices reflect the Annual Resource Clearing Prices.

State Policy - New Jersey

- Under current law and executive order:
 - New Jersey's nuclear units (3500 MW), that are directly competing with PA nuclear units, are receiving a subsidy of \$300 million through at least 2025.
 - New Jersey plans to support 11,000 MW of offshore wind by 2040 with out of market subsidies. Transmission costs are still being evaluated.
 - New Jersey has a goal of 2000 MWs of energy storage by 2030 (financing has yet to be determined)
 - On Feb 15, 2023, Governor Murphy set goal for NJ to provide for 100% of the electricity sold in the State to be derived from “clean” sources by 2035.

State Policy - Maryland

- Maryland will require that 50% of electricity consumed in the state be from renewable energy resources by 2030.
- Maryland has contracted for 2000 MWs of offshore wind and Governor Moore has a stated goal of 8500 MW's of offshore wind.
- Governor Moore has set a goal of 100% “clean” energy by 2035.

State Policy - Illinois

- Illinois will require all private coal and natural gas-fired units to reach zero emissions by either 2030, 2035 or 2045, depending on ownership, location and rates of emissions.
- Policy of state is to be 100% “clean” by 2050.
- State goal is to be 50% renewable by 2040.
- Illinois will provide \$700 million over the next 5 years to subsidize nuclear facilities in the state.
- Illinois will provide \$580 million a year to support wind and solar development.

Energy Prices around PA— 2021 Average Retail Rates

Maryland – 11.48 cents/kwh

New Jersey – 14.01 cents/kwh

New York – 16.11 cents/kwh

Pennsylvania – 9.97 cents/kwh

Ohio – 9.76 cents/kwh

National Average - 11.10 cents/kwh

Source: <https://www.eia.gov/electricity/state/>

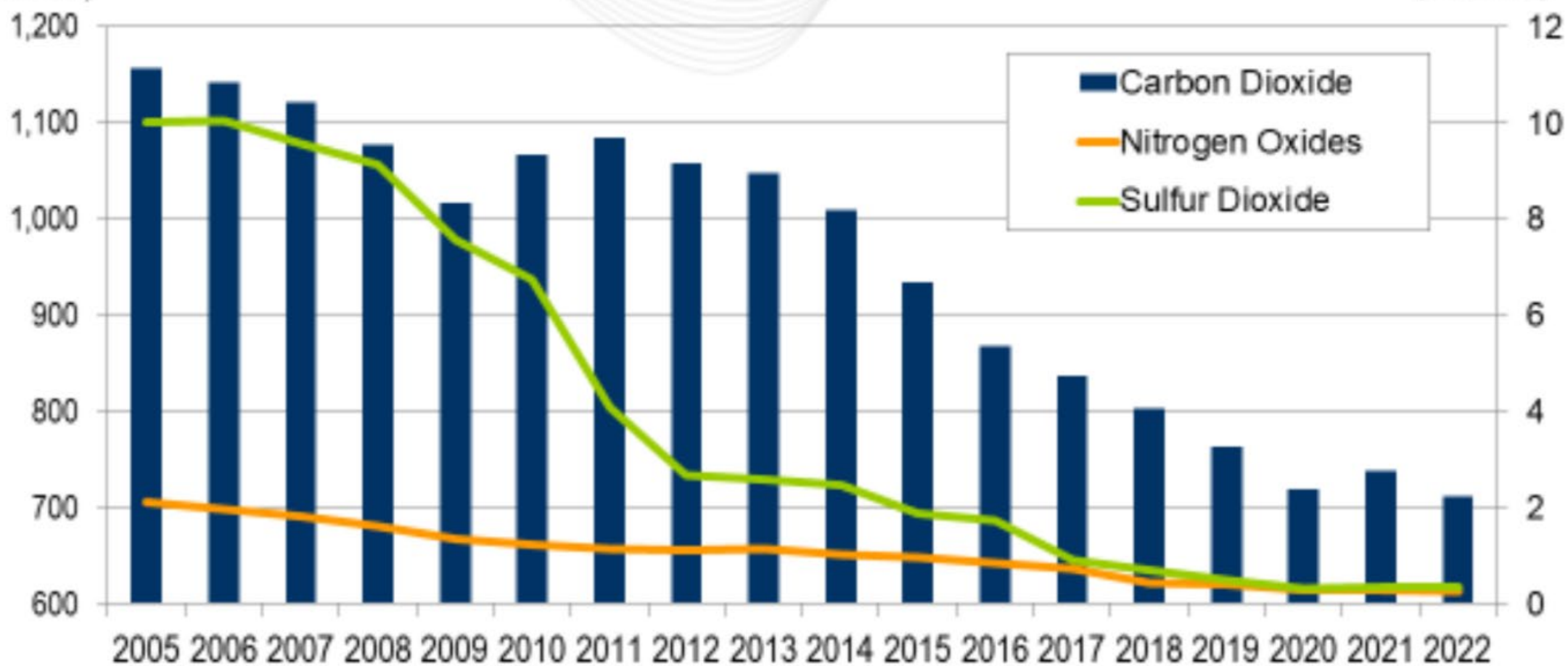



Pennsylvania – Average Emissions (lbs/MWh)

(March 2023)


CO₂
(lbs/MWh)

SO₂ and NO_x
(lbs/MWh)





What will
reverse the
current
trend?

- PJM and FERC change capacity market rules to encourage the retention of existing resources that are needed for reliability and the development of new resources.
 - Federal and state policymakers make decisions that support and not undermine reliability.
 - Federal and state policymakers consider reliability when developing environmental regulations.
 - Interconnection queue reform.
- 

What can the Legislature do?

- Get educated on PJM issues.
- Advocate for Pennsylvania's interests
- Prioritize reliability and affordability.
- Talk to colleagues in other states about the importance of power reliability and affordability.
- Pressure PJM, PUC and FERC to make decisions that support Pennsylvanians competitive model which use competitive markets to drive reliability.
- Consider a Plan B.
- Be vocal!





House Public Utilities Committee

Representative Dick Stein, Chair

Senate Energy and Utility Committee

Senator Bill Reineke, Chair

June 13, 2023

VIA ELECTRONIC DELIVERY

The PJM Board of Managers
c/o Mark Takahashi, Chairman PJM Interconnection, L.L.C.
2750 Monroe Boulevard
Audubon, PA 19043

Dear Chairman Takahashi and Board Members:

On behalf of the undersigned members of the Ohio Public Utilities Committee, and the Senate Energy and Utility Committee we write this letter to apprise you of concerns the state of Ohio has regarding our ability to sustain our energy policies given recent actions by FERC, PJM, and other states in the PJM region. We intend to take a serious look at all the publicly available facts and data and to do so, we ask for your assistance so we can most effectively evaluate our options going forward.

Ohio is proud of what our energy policy has allowed us to deliver to the families and businesses of our state. Ohio consumers are paying electricity prices that are well below the national average and no state since 2005 has reduced carbon emissions from the power sector more than Ohio. Ohio has seen billions of dollars invested in new, state-of-the-art generation plants over the past 20 years. Importantly, because our state has long embraced fair, transparent and competitive retail and wholesale power markets, all the risks associated with those investments have been borne by investors, not ratepayers. Until recently, Ohio did not worry about reliability, as the wholesale market rules developed by PJM and approved by FERC were producing robust reserve margins while driving timely entry of new resources at competitive prices and the orderly exit of older, less efficient plants.

Clearly, we want that success to continue. However, we are becoming increasingly concerned that the actions of PJM, FERC and other PJM states may jeopardize the successful, competitive market model that Ohio has nurtured. We appreciate that PJM has brought concerns related to generation retirements and looming reliability challenges to our attention. Needless to say, we are quite concerned about reports that the PJM region is on the precipice of power shortages that could lead to blackouts for our consumers that need electricity. The efficiency

and growth of our economy depends on reliable electricity of which you are entrusted with ensuring.

We look forward to further conversations with you about changes to PJM's tariff and rules that could help stave off these reliability issues and support Ohio's desire for sustainably competitive markets. However, in the short term, we need to understand how the actions of other states are impacting our state. Specifically, we are concerned about the impact that Illinois' Climate and Equitable Jobs Act, or "CEJA" will have on Ohio consumers. PJM's looming reliability challenges are clearly exacerbated by provisions in the Illinois CEJA that mandate the closure of certain facilities in that state¹ and, to address these closures, PJM has identified upgrades to the transmission system that are located mostly in Ohio and will cost upwards of \$2 billion.² We expect that Ohio ratepayers will not be burdened with costs that are caused by the policy choices of other states.

Ohio will evaluate its options to address the Illinois law that is harming Ohio's reliability and has the potential to cost our consumers hundreds of millions of dollars in transmission upgrades and higher power prices, only to export power from Ohio to Illinois. In preparation for that discussion, we have two data requests of PJM:

1. We request that PJM rerun and publish the August 3, 2022, "Illinois Generation Retirement Study" with the assumption that **no transmission upgrades** will occur in Ohio in order to allow Illinois to remain reliable following the closure's mandated by CEJA. To do so, PJM may need to look to transmission upgrades in Illinois, other states, and potentially other RTOs. Like the August 3 study, we would like to see the costs and locations associated with these non-Ohio transmission alternatives. We understand that Illinois' future reliability problems may only be solved with transmission upgrades in Ohio. If that is the case, please inform us of such with a detailed description of why Ohio is the only state that can solve the reliability challenges being created by Illinois' laws and whether PJM can assure that those extra costs will be borne by Illinois and not Ohio.
2. We want to fully understand the extent to which Illinois is creating reliability challenges in PJM that will affect other states in the region. We greatly appreciate the PJM publication of the February 23, 2023, "Energy Transition in PJM: Resource Retirements, Replacements and Risks" study which is extraordinarily helpful and troubling at the same time. We note that the CEJA law plays a prominent role in driving retirements of resources in PJM that may otherwise be capable of preserving reliability. As such, we are interested in knowing the impact of CEJA on PJM's reliability challenges. Please explain to us in writing the impact that a repeal of CEJA's mandatory closure provisions would have on PJM's ability to meet system needs in 2030 and beyond. As part of that response, please provide a revised analysis of pages 26 and 27 of the following presentation to reflect a repeal of these provisions of CEJA: <https://pjm.com/-/media/committees-groups/committees/mrc/2023/20230328-special/item-03---energy-transition-in-pjm-workshop---presentation.ashx>.

¹ <https://www.pjm.com/-/media/library/reports-notice/special-reports/2023/energy-transition-in-pjm-resource-retirements-replacements-and-risks.ashx> at 7.

² <https://www.pjm.com/-/media/library/reports-notice/special-reports/2022/2022-pjm-illinois-generation-retirement-study.ashx>

We request that PJM provide this information by July 1, 2023. Doing so will allow our respective state legislative committees sufficient time to digest the information in advance of consideration of legislative action in the fall, if necessary.

Thank you in advance for your assistance. We look forward to partnering with you as we develop a path forward for Ohio that preserves our successful energy policy and ensures system reliability without unduly burdening Ohio due to the policy choices of other states in the PJM footprint.

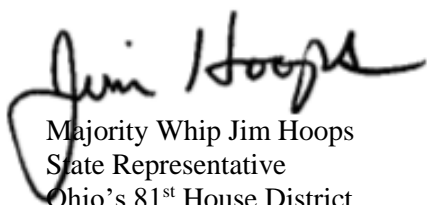
Regards,



Chairman Dick Stein
State Representative
Ohio's 54th House District



Chairman Bill Reineke
State Senator
Ohio's 26th Senate District



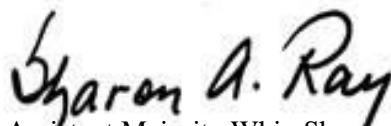
Majority Whip Jim Hoops
State Representative
Ohio's 81st House District



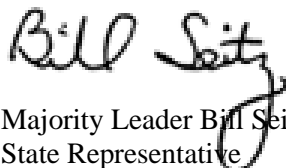
Vice Chair Monica Robb Blasdel
State Representative
Ohio's 79th House District



Bob Peterson
State Representative
Ohio's 91st House District



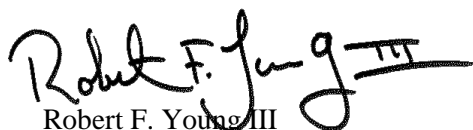
Assistant Majority Whip Sharon A. Ray
State Representative
Ohio's 66th House District



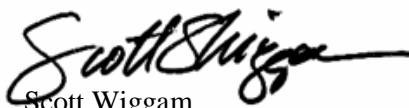
Majority Leader Bill Seitz
State Representative
Ohio's 30th House District



Sean P. Brennan
State Representative
Ohio's 14th House District



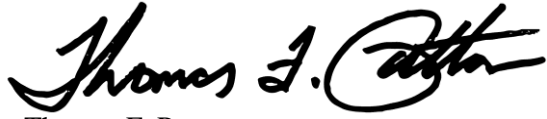
Robert F. Young III
State Representative
Ohio's 32nd House District



Scott Wiggam
State Representative
Ohio's 77th House District

A handwritten signature in black ink, appearing to read 'A. D. Holmes', with a long horizontal flourish extending to the right.

Adam Holmes
State Representative
Ohio's 97th House District

A handwritten signature in black ink, appearing to read 'Thomas F. Patton', with a large, stylized 'P' and a horizontal flourish.

Thomas F. Patton
State Representative
Ohio's 17th House District



Pennsylvania State Building and Construction Trades Council AFL-CIO

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House Republican Policy Committee

INTRO AND GRID REALITY

On behalf of the Pennsylvania Construction and Building Trades Council (PA Building Trades), I appreciate the opportunity to discuss recent events impacting grid integrity and reliability, and the impact of aggressive electrification strategies on our already vulnerable grid. Let's start with a discussion of our grid, which covers 13 states and Washington, DC and is operated by PJM Interconnection, regulated by the Federal Energy Regulatory Commission (FERC) and, without question, profoundly impacted by state and federal energy policies designed to force the premature closure of reliable, baseload thermal generation and replacement with unreliable, intermittent wind and solar power.

ALL of these organizations now warn that PJM's electricity grid is on the verge of collapse. Earlier this year, PJM stated that it faces a loss of 21 percent (40 GWs) of capacity by 2030 and a 14+ percent increase in demand. Meanwhile, virtually all (94 percent) new proposed generation within PJM will be derived from weather dependent, intermittent wind and solar. As a result, PJM warns that, by 2026, we could be faced with energy rationing (aka, "demand response"), and by 2028, we should anticipate rolling blackouts. This is a train wreck in the works.

PJM isn't the only Regional Transmission organization (RTO) to raise red flags about the fragility of our electric grid. Indeed, both FERC and the North American Electricity Reliability Corporation (NERC) have issued their own independent warnings of imminent grid collapse due to the massive buildout of weather dependent, intermittent electric generation, which has come at the direct expense of reliable, baseload thermal generation from coal, natural gas and nuclear.

HOW DID WE GET HERE AND WHAT IS BEING DONE?

It's good that PJM is here today. PJM's albeit tardy, but better-late-than-never warning that, within a few years, we could be looking at energy rationing and rolling blackouts. My members build, operate and maintain reliable thermal generation from coal, natural gas and nuclear fuel. Unfortunately, state and federal policy makers, and grid operators and environmental regulators, have not been kind to my brothers and sisters. It's as if there has been a coordinated attack to eliminate blue collar jobs within the energy industry, and now the "chickens have come home to roost." What can we do?

For starters, you might not want to pursue an overly aggressive electrification strategy as we are headed toward grid collapse and a measured well thought out approach would help to alleviate the potential issues. We think natural gas is a good thing, a blessing to Pennsylvania in the 21st Century, just as coal was a blessing in the 20th Century. That said, if that's the direction federal, state and local government want to take this country, it might make sense to wait...and, given our current grid reliability problems, largely stemming from the replacement of reliable thermal generation with unreliable weather dependent generation, you might need to wait a long time.

In terms of the immediate future, the PA Building Trades support PJM's effort to better align its energy and capacity markets with the realities of basic physics and economics, as it and FERC should have done all along. We encourage them to move forward quickly and with a strong focus on preserving our remaining coal, natural gas and nuclear generation fleet and jobs by using the capacity market as it was intended – by providing sufficient revenues and price signals to maintain and expand reliable thermal generation within the grid.

Should PJM fall short in its effort, we would urge Pennsylvania to consider seriously implementing its own capacity market. As it stands now, PJM is accountable only to FERC, and while the current FERC Chair appears to be more sensitive to electric reliability than his predecessor, the lack of accountability to PJM's member states leaves states with only two options: leave PJM and or create an independent capacity market. I'm not saying Pennsylvania should pursue this today, but if PJM doesn't fix this problem soon, it's certainly worth considering. As I recall, both Maryland and New Jersey threatened to separate from PJM and/or its capacity market, and PJM quickly bowed to that pressure and repealed a policy intended to preserve capacity investments in reliable, thermal generation.

PJM needs to make some substantial changes to how it operates the so-called capacity "market." The grid collapse warnings from PJM, FERC and NERC all revolve around the failure of the capacity market to maintain reliable capacity. How is this possible? Over a 3 year period, PJM capacity revenues collapsed from \$8.3 billion to \$2.2 billion and remain at that historically low level. Meanwhile, the total penalties for nonperformance during Winter Storm Elliott, which was about one day, was \$1.8 billion, nearly as much as the capacity revenues were available for the entire year. That is unsustainable.

PJM should start with a policy that precludes subsidized generation from using those subsidies to bid into the capacity auctions at ZERO or below zero. This serves only to artificially depress clearing prices and revenues for reliable generation. It also makes sense to allow plants to bid their estimated costs and risks, including fuel supply and price risks, and not be forced to suppress bids and clearing prices that force existing resources into premature retirement. On a per MWh basis, reliable thermal plants involve low up-front capital costs and high operating or marginal costs (i.e., fuel). For wind and solar, this is reversed, except that federal and state subsidies largely underwrite the up-front costs. This "windfall" provides a significant advantage for unreliable over reliable generation within PJM's increasingly uncompetitive "markets."

In addition, PJM acknowledged earlier this year that intermittent wind and solar, which have capacity factors of 30 and 15 percent respectively, are permitted to bid into (again, often at ZERO) and receive funds from the capacity market, but unlike thermal generation units, wind and solar are not penalized for failing to perform during high peak events. This makes no sense.

Until such time as electricity from wind and solar can be backed up 100 percent with battery storage, which is unlikely to happen in our lifetime, then wind and solar will have to be backed up 100 percent with reliable thermal generation, such as coal, natural gas and nuclear. That's just simple physics.

EFFECTIVE MORATORIUM ON NATURAL GAS GENERATION

Policies matter! The mere threat of the Regional Greenhouse Gas Initiative (RGGI) carbon tax, which if not stopped by the courts, or by the governor and legislature, has already effectively banned the construction of new natural gas plants in Pennsylvania. In the 10 years prior to the former governor's proposed RGGI regulation, my brothers and sisters within the PA Building Trades built \$14 billion in new natural gas plants throughout Pennsylvania.

Since then, not one new natural gas plant has been proposed in PA, let alone built. Meanwhile, Ohio just celebrated the opening of the massive Guernsey Power Plant, the largest natural gas plant east of the Mississippi, just as Pennsylvania was mourning the loss of the equally massive Homer City Power Plant and the cancellation of a \$1 billion natural gas plant in Clinton County after 10 years of litigation against Penn Future and the Clean Air Council. Do you know how many man hours that cost my members? As the so-called environmental groups that support the industrialization of our mountains, farms and oceans were spiking the ball over the Renovo Project, my members are now looking at the loss of thousands of man hours.

Under the recently proposed Biden Clean Power Plan, the rest of the country is about to experience what Pennsylvania lived through over the past 4 years under the RGGI threat...an effective moratorium on the construction of new natural gas plants throughout the country. Why? Because the technology doesn't exist for natural gas plants to co-fire with hydrogen at 30 percent by 2032 and 96 percent by 2038, let alone achieve 90 percent carbon capture by 2035. Obviously, Congress and the courts may have something to say about the Plan, but as long as this threat remains, no banking institution in the world will risk billions to finance plants – all of which are likely to be built with union labor - that could become obsolete within just a few years of operation.

UNSUSTAINABLE ELECTRIFICATION AMBITIONS

It is within these current grid and market realities that the federal and many state and city governments are moving to ban the sale of internal combustion engines (gas or diesel cars/trucks), ban the use of natural gas for home heating and cooking, and require the electrification of just about everything. Given what we've discussed here today, as our grid is on the verge of collapse because reliable generation is being forced to retire prematurely and as virtually all new generation projects are weather dependent, how EXACTLY is that supposed to work? Simple answer...it won't.

We are simply not prepared for an aggressive transition from natural gas appliances and internal combustion engines (i.e., gasoline and diesel) for our cars and trucks to all electric appliances and vehicles. While I think these policies are shortsighted, if there ever was a time to move in this direction, it would have been years ago, when we had an abundance of reliable, thermal generation that would have provided an insurance policy for a major uptick in electricity demand.

WHERE DO WE GO FROM HERE?

The PA Building & Construction Trades Council strongly supports the development of a Pennsylvania Energy Plan that takes advantage of all of our Commonwealth's unparalleled human, technological and natural resources. We believe the Governor, and legislative leaders and relevant committee chairs from both parties, should convene a stakeholder process similar to the one created by then-Governor Tom Ridge that developed the proposal to deregulate the generation and sale of electricity within Pennsylvania.

- The group should include stakeholders from all perspectives, but should be guided in its work with protective guardrails to ensure worker and consumer protection as the number one priority, including over carbon reduction.
- The PA Building Trades believe climate change is real. We also believe that humans play a role in climate change. However, we do not believe the threat of climate change is severe enough to cannibalize workers, consumers and communities. Nor do we believe that Pennsylvania, or the entire country for that matter, is positioned to mitigate climate change impacts even if we miraculously figured out how to eliminate ALL of our greenhouse gas emissions within a few years.
- China might be building out some wind and solar, but it is building coal capacity at a far greater rate as it continues to use coal power to manufacture our weather dependent wind and solar power, and continues to produce and refine virtually all the rare earth minerals that go into our batteries.
- Pennsylvania can and should lead the way to developing an industrial base that can compete with China when it comes to green technology. And we should do it with a carrot, not a stick.

What should a Pennsylvania Energy Plan include?

- For starters, we should be encouraging investment in large, baseload, reliable generation projects, like natural gas and next generation nuclear, as well as, technology that could lead to massive breakthroughs like fusion and hydrogen.
- We should pave the way for PA to assist the world in reducing CO2 emissions and reliance on the Russians and Chinese by building a new LNG export facility in SE PA, and encouraging investment in building Jones Act compliant LNG ships that can supply New England with lifesaving natural gas from PA, as opposed to Venezuela and Russia.
- We should encourage the investment in new intrastate pipelines, not subject to the whims of FERC, that enable direct connections between Pennsylvania natural gas producers and

electrical generation plants, just as Coterra has done with a few projects here in Northeast PA, which notably did not experience any fuel problems during Winter Storm Elliott.

- For new wind and solar projects that receive ratepayer subsidies under Tier I of our Alternative Energy Portfolio Standards (AEPS), we should close the border and stop subsidizing 81 percent of these projects located outside of Pennsylvania, and because they are ratepayer subsidized, we should make these projects subject to state procurement policies, such as the Prevailing Wage Act and the Steel Products Procurement Act.

The failure of our former governor to develop a Pennsylvania Energy Plan is precisely what led to his proposal to implement the RGGI Carbon Tax Regulation. By joining RGGI, he essentially adopted an energy plan developed by a group of Northeast and Mid-Atlantic states that have nothing in common with Pennsylvania. If the RGGI Carbon Tax is not stopped by the courts, or by the General Assembly and the Governor, it will accelerate plant closures and job losses that the mere threat of RGGI has already created.