



RELIABILITY FIRST

Agenda

Board of Directors • Risk and Compliance Committee

December 4, 2024 • 1:00 PM – 3:00 PM (ET)

North American Electric Reliability Corporation (NERC)
1401 H Street NW, Suite 410
Washington, DC 20005

Theme: Operating/Monitoring the Grid of the Future

Room: Capital Room

Attire: Business

Closed Agenda

1. **Confidential Compliance and Enforcement Matters** 12:20 pm
 Presenter: Kristen Senk, Deputy General Counsel & Director Legal and Enforcement, Matt Thomas, Director Compliance Monitoring, and Tom Scanlon, Sr. Managing Enforcement Counsel
 Description: Ms. Senk, Mr. Thomas, and Mr. Scanlon will present confidential matters.
 Reference: Confidential Documents
 Action: Information and Discussion
2. **NERC Oversight Update** 12:40 pm
 Presenter: Matt Thomas, Director Compliance Monitoring
 Description: Mr. Thomas will provide an update on the status and findings of the 2024 NERC Oversight of ReliabilityFirst.
 Reference: 2023 Align and SEL Oversight Activity Feedback: ReliabilityFirst Report

BREAK

12:50 pm

Open Agenda

3. **Call to Order and Appoint Secretary to Record Minutes** 1:00 pm
 Presenter: Joanna Burkey, Chair
4. **Antitrust Statement** 1:05 pm
 Presenter: Joanna Burkey, Chair
5. **Consent Items** 1:10 pm
 Presenter: Joanna Burkey, Chair
 Reference:
 - a) [Draft Minutes for the August 21, 2024 Risk and Compliance Committee Meeting](#)
 - b) [Registration Data \(Reference Materials\)](#)
 - c) [Enforcement Data \(Reference Materials\)](#)
 - d) [RF Committee and Subcommittee Activities \(Reference Materials\)](#)
 Action: Approve Minutes

- 6. Keynote Speaker** 1:15 pm
Presenter: Kal Ayoub, Director of the Office of Electric Reliability, FERC
Reference: [Bio](#)
- 7. Trends and Challenges in the PJM Territory** 1:40 pm
Presenter: Jason Stanek, Executive Director, Government Services, PJM Interconnection
Description: Mr. Stanek will discuss operating the grid of the future in the PJM territory, including forecasts, challenges, and mitigation strategies relating to resource adequacy.
Reference: [Presentation](#)
Action: Information and Discussion
- 8. Load Transfer Event** 2:05 pm
Presenter: Matt Parker, Director, Electric Transmission System Operations, Dominion Energy
Description: Mr. Parker will provide an overview of the July 2024 unplanned data center load transfer event, with a focus on emerging operating risks from large data center loads.
Reference: [Presentation](#)
Action: Information and Discussion
- 9. Gas-Electric Coordination: Perspective from the Gas Industry** 2:55 pm
Presenter: Mike Starck, Head of Power, EQT
Description: Mr. Starck will discuss the challenges and opportunities in the intersection between gas and electricity from the perspective of the gas industry.
Reference: [Presentation](#)
Action: Information and Discussion
- 10. Evaluation of the Committee's Performance** 2:55 pm
Presenter: Matt Thomas, Director Compliance Monitoring
Description: Mr. Thomas will lead the annual review of the Compliance Committee's Performance of Specific Duties for 2024.
Reference: [Summary of Performance of Specific Duties for 2024](#)
Action: [Accept Summary of Performance of Specific Duties for 2024](#)
- 11. Next Meeting**
• April 30, 2025
- 12. Adjourn** 3:00 pm

Roster • Risk and Compliance Committee

Joanna Burkey, **Chair** • Independent (2025)

Mèlika Carroll • Independent (2027)

Lesley Evancho • Independent (2025)

Ken Seiler • RTO (2024)

Simon Whitelocke • At-Large (2024)

**a) Draft Minutes for the August 21, 2024 Risk and
Compliance Committee Meeting**



DRAFT - Minutes

Board of Directors • Risk and Compliance Committee

August 21, 2024

ReliabilityFirst Corporation

Open Session

Call to Order – Chair Joanna Burkey called to order a duly noticed open meeting of the Risk and Compliance Committee (Committee) at 12:59 pm (ET). A quorum was present, consisting of the following members of the Committee: Joanna Burkey, Chair; Patrick Cass, Vice Chair; Lesley Evancho; Ken Seiler; and Simon Whitelocke. A list of others present during the Committee meeting is set forth in Attachment A.

Appoint Secretary to Record Minutes – Chair Burkey designated Niki Schaefer, ReliabilityFirst's (RF) Vice President and General Counsel, as the secretary to record the meeting minutes.

Antitrust Statement – Chair Burkey advised all present that this meeting is subject to, and all attendees must adhere to, RF's Antitrust Compliance Guidelines.

Consent Items – Chair Burkey introduced the following consent agenda items:

Agenda Item 3(a): Draft Minutes from May 1, 2024 Committee meeting

Agenda Item 3(b): Reference Materials - Enforcement Data

Upon a motion duly made and seconded, the Committee approved the minutes.

Keynote Speakers – Josh Levi, President of the Data Center Coalition and Aaron Tinjum, Director of Energy Policy and Regulatory Affairs from the Data Center Coalition, provided an overview of the data center industry, including its growth, energy needs and plans to address them, and opportunities for dialogue/partnership with the electric industry. They shared that they advocate for their members, who build, own and operate data centers. Mr. Levi and Mr. Tinjum discussed the typical elements inside a data center, highlighting the importance of HVAC cooling and of backup systems. Mr. Levi explained the two main types of data centers and discussed the benefits of data centers as a significant driver of the economy (providing digital infrastructure and generating substantial tax revenue).

Mr. Tinjum then discussed grid benefits of data centers, including that they are efficient and invest in distribution and transmission level infrastructure and clean energy projects. Mr. Levi noted the increasing data center demand, and the products and applications that drive that demand. He shared key siting considerations and information on global data center markets, highlighting data center markets within and adjacent to RF's footprint. Chair

Burkey shared that additional materials from Ms. Snead on Dominion's perspective on data centers are included in the agenda package. Ms. Snead highlighted the significant increasing demand in Virginia due to data centers.

Discussion followed on how to stay ahead of projected demand growth, and Mr. Seiler noted the importance of communication and education on transmission capabilities and forecasting. Mr. Tinjun noted that the Data Center Coalition is working with Edison Electric Institute to formalize collaboration efforts. Mr. Peeler added that it is important to consider data center load characteristics, because large swings in energy can hurt the grid. Vinit Gupta, ITC's Vice President of Operations, stated that data center loads are large, 24/7 loads and that NERC is looking at a task force to examine these loads. Tim Gallagher, RF's President and CEO, asked whether there are lessons for RF and NERC and if there is an opportunity to bring the different perspectives together. Mr. Tinjun reiterated the need for big picture discussions between the data center and electric industries.

Physical Security Overview and Update – Mary Berkley, AEP's Manager of System Performance Analysis, led a discussion on AEP's perspective on CIP-014 and physical security. She introduced AEP's System Performance Analysis team and gave an overview of the CIP-014 requirements. She discussed how the CIP-014 standard requires a proactive approach, with extensive coordination between departments and neighboring entities. Then Ms. Berkley spoke to the challenges associated with CIP-014 compliance, and two approaches to addressing the standard. First, she discussed a defensive approach to assure the public that critical facilities are protected against physical attacks, and showed photo examples of protections in place to protect against physical attacks. Then she discussed a proactive approach to eliminate single points of failure and add redundancy. She then covered the Standard Authorization Request (SAR) to modify CIP-014 R1 and R2 to clarify risk assessment methods and she stressed the importance of ensuring that standards are not too prescriptive, but are prescriptive enough to clearly define requirements.

Cyber Security Challenges and Approaches – Amanda Birker, Manager of Transmission Security Operations Center (TSOC) and Keith Mehle, Security Operations Analyst V from FirstEnergy, provided a perspective on key cyber security challenges and approaches. Scott Hipkins, RF Board member and FirstEnergy CSO, gave a brief introduction on key security challenges, and Ms. Birker discussed preventative, corrective and detective security controls. She explained the TSOC's origin, and Mr. Mehle then discussed threat emulation and rules for detecting malicious activity. He also shared challenges faced by TSOC and the benefits of the group. Mr. Mehle stated that the ERO can continue to support information sharing among utilities on how to mitigate risks. He also discussed the benefits of RF's state outreach work and security tabletops. There was then a question and discussion on the makeup of the TSOC and how it is structured.

Next Meeting – Chair Burkey noted that the next Committee meeting will occur on December 4, 2024, in Washington, DC. At 2:50 pm, Chair Burkey moved the Committee into closed session.

Closed Session

Confidential Compliance & Enforcement Matters – Kristen Senk, RF's Deputy General Counsel and Director of Legal & Enforcement, Tom Scanlon, RF's Senior Managing Enforcement Counsel, and Matt Thomas, RF's Director of Compliance Monitoring, presented on confidential matters. Ms. Senk discussed the enforcement workload and process. She then spoke to CIP-014 activity in the enforcement and Standards spaces. Mr. Scanlon discussed other confidential enforcement actions.

FERC/NERC Oversight Update – Mr. Thomas presented updates on confidential matters. He discussed the results of recent oversight conducted of RF by NERC.

Adjourn – Chair Burkey adjourned the Committee meeting at 3:23 pm (ET).

As approved on this 4th day of December, 2024 by
the Compliance Committee,

Niki Schaefer
*Vice President General Counsel & Corporate
Secretary*

Attachment A

Others Present During the Risk and Compliance Committee Meeting

Steve Ambrose • DTE
Allison Archer • MISO
Mary Berkley • AEP
Jeff Craigo • ReliabilityFirst
Michelle Cross • ReliabilityFirst
Hue DeLuca • ReliabilityFirst
Beth Dowdell • ReliabilityFirst
Chelsey Eppich • ReliabilityFirst
Tom Foster • PJM
Tim Gallagher • ReliabilityFirst, President & CEO
Craig Grooms • Buckeye Power
Vinit Gupta • ITC
Scott Hipkins • First Energy
Diane Holder • ReliabilityFirst
Christi Klein • ReliabilityFirst
Josh Levi • Data Center
Marcus Noel • ReliabilityFirst
Ollie Pannell • FirstEnergy
Nelson Peeler • Duke Energy
Nicholas Poluch • Talen
Tom Scanlon • ReliabilityFirst
Niki Schaefer • ReliabilityFirst
Kristen Senk • ReliabilityFirst
Colleen Sidford • NERC Board of Trustees
Antonio Smyth • ReliabilityFirst
Rachel Snead • Dominion Energy
Robert Taylor • Invenergy
Aaron Tinjum • Date Center
Brian Thiry • ReliabilityFirst
Matt Thomas • ReliabilityFirst
Jody Tortora • ReliabilityFirst
Joe Trentacosta • SMECO
Jim Uhrin • ReliabilityFirst
Simon Whitelocke • ITC

b) Registration Data (Reference Materials)



Annual Update on Registration Activities

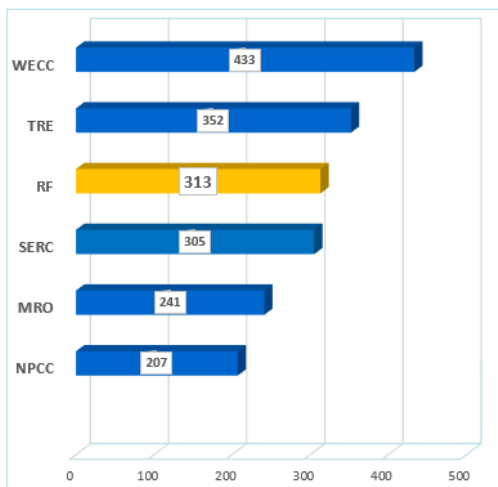
Summary: The Annual Update from the RF Registration department provides the Risk and Compliance Committee (Committee) with updates and trends from the 2024 registration activity to fulfill the Committee Charter requirement to review the current state and composition of the RF compliance registry for entities in the RF Region.

As of October 15, 2024, RF has 313 Registered Entities (up from 279 in 2023) with a total of 590 functions (see charts below). The vast majority of the registrations by function are for Generator Owner and Operators (74%) followed by Distribution Providers (7.8%) and Transmission Owners (6.8%). To date, there have been 21 new solar registrations, six new fossil registrations and three new wind registrations in the RF footprint. A new registration includes new NERC Active Compliance Registry (NCR) and/or new assets added to the entity’s generation portfolio. Nine entities were deregistered (removed from the NCR) in 2024 as well.

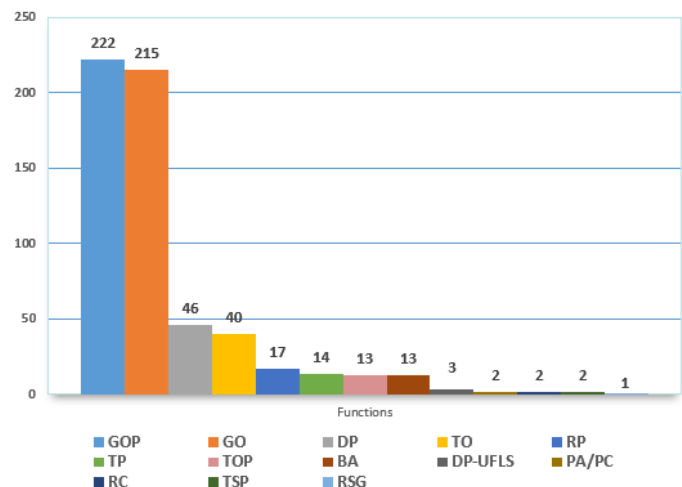
Overall, a registration trend in the RF footprint is the significant increase in new solar generation coming online as a recent slowing of fossil and wind generation registration. Currently, there are 12 new solar entity pending registration requests, totaling approximately 1900 MW.

This year RF registration staff have also been highly engaged in Phase 1 and 2 of the ERO Inverter Based Resource Registration Initiative. This includes completing revisions to the Rules of Procedure and identifying Category 2 Generator Owner/Operator candidates and outreach/education opportunities. The registration department plans to provide more detailed information on this ERO Inverter Based Resource effort to the Board in 2025.

NERC Compliance Registry (NCR) as of 10/15/2024



RF Functions



c) Enforcement Data (Reference Materials)

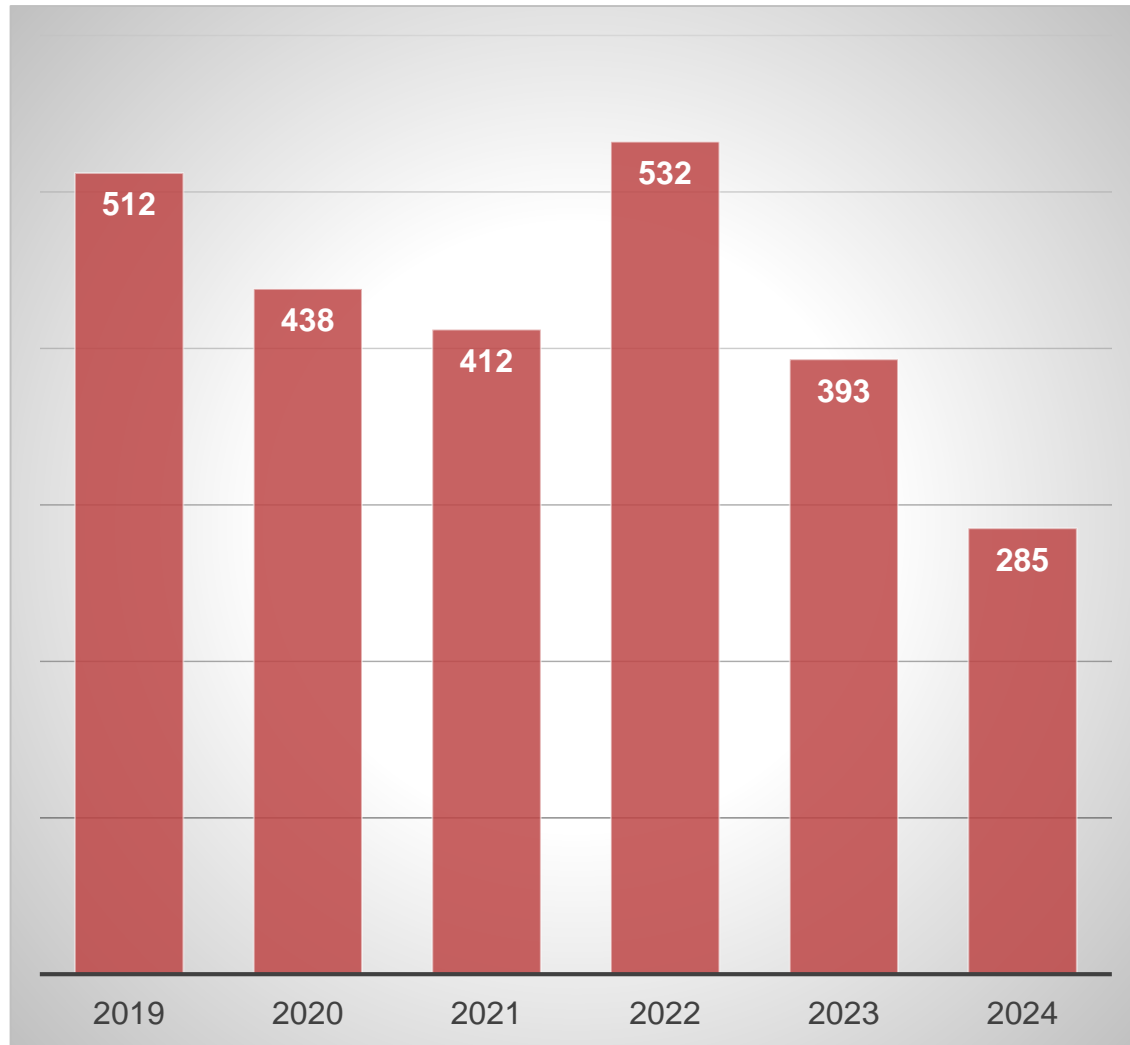
SUMMARY – ENFORCEMENT DATA

The following slides include enforcement data relating to some key enforcement metrics that ReliabilityFirst tracks.

The data shows that violation intake is down from prior years but remains high. The overwhelming majority of violations were self-reported or self-logged as opposed to identified through a compliance monitoring engagement. Regarding violations processed (i.e., filed with NERC) in 2024, most were lower risk violations. The team processed over 400 violations this year. Regarding violations remaining in ReliabilityFirst's inventory, the vast majority are considered relatively new, with 83% of those violations identified in 2023 and 2024, 16% identified in 2022, and only 1% identified in 2020-2021.

The last slide includes intake commentary (e.g., examples of the types of conduct at issue) for CIP-003-8 R2 violations based on 2024 intake (i.e., cases that were reported this year). Similar commentary was provided for CIP-010-4 R1, CIP-006-6 R2, and CIP-004-7 R4 in the Reference Materials from the August 21, 2024, Risk and Compliance Committee Meeting.

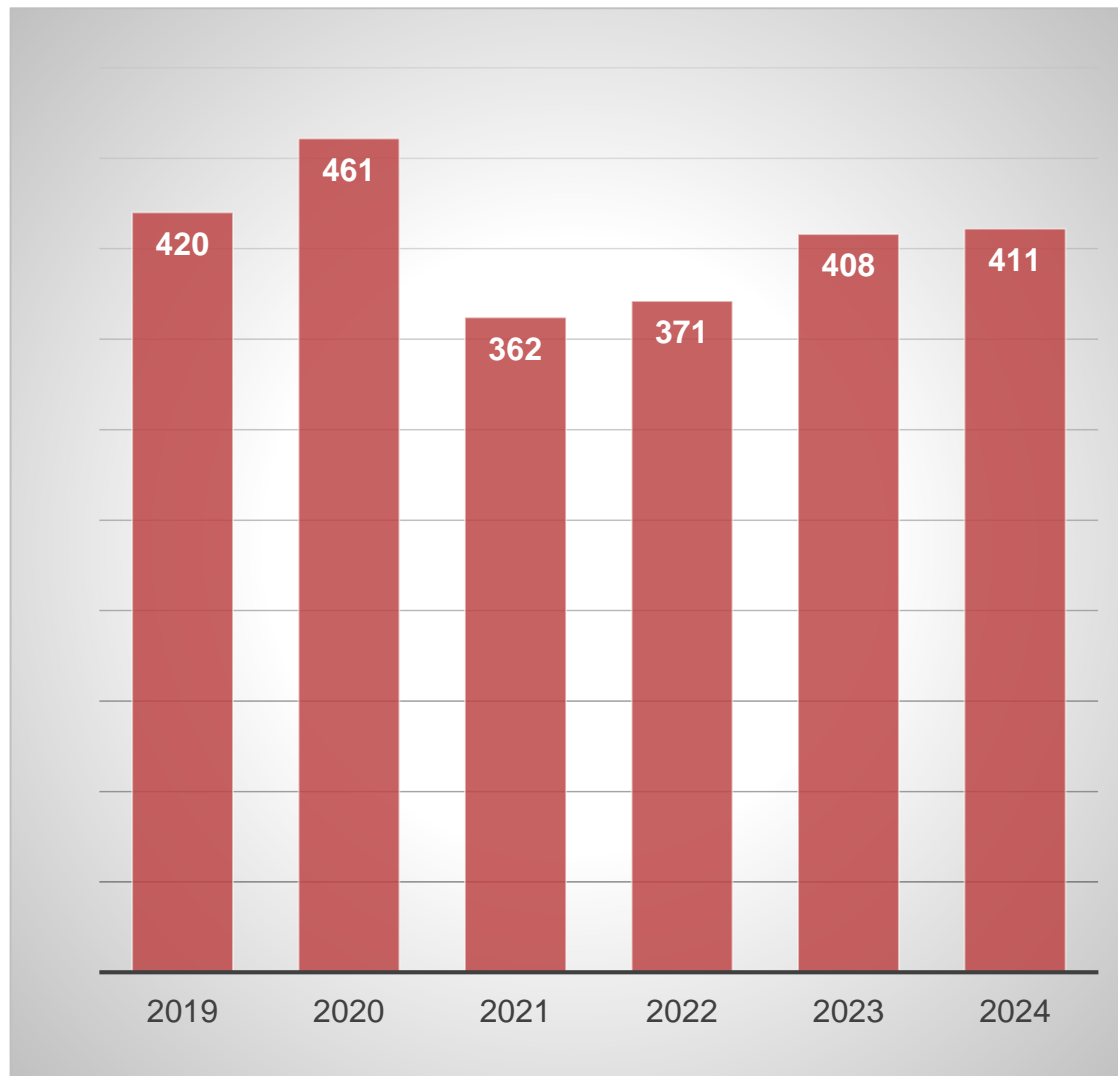
RF ANNUAL VIOLATION INTAKE



2024 Commentary:

- Year-to-date as of 11/15/2024;
- Majority self-reported/self-logged;
and
- Majority CIP.

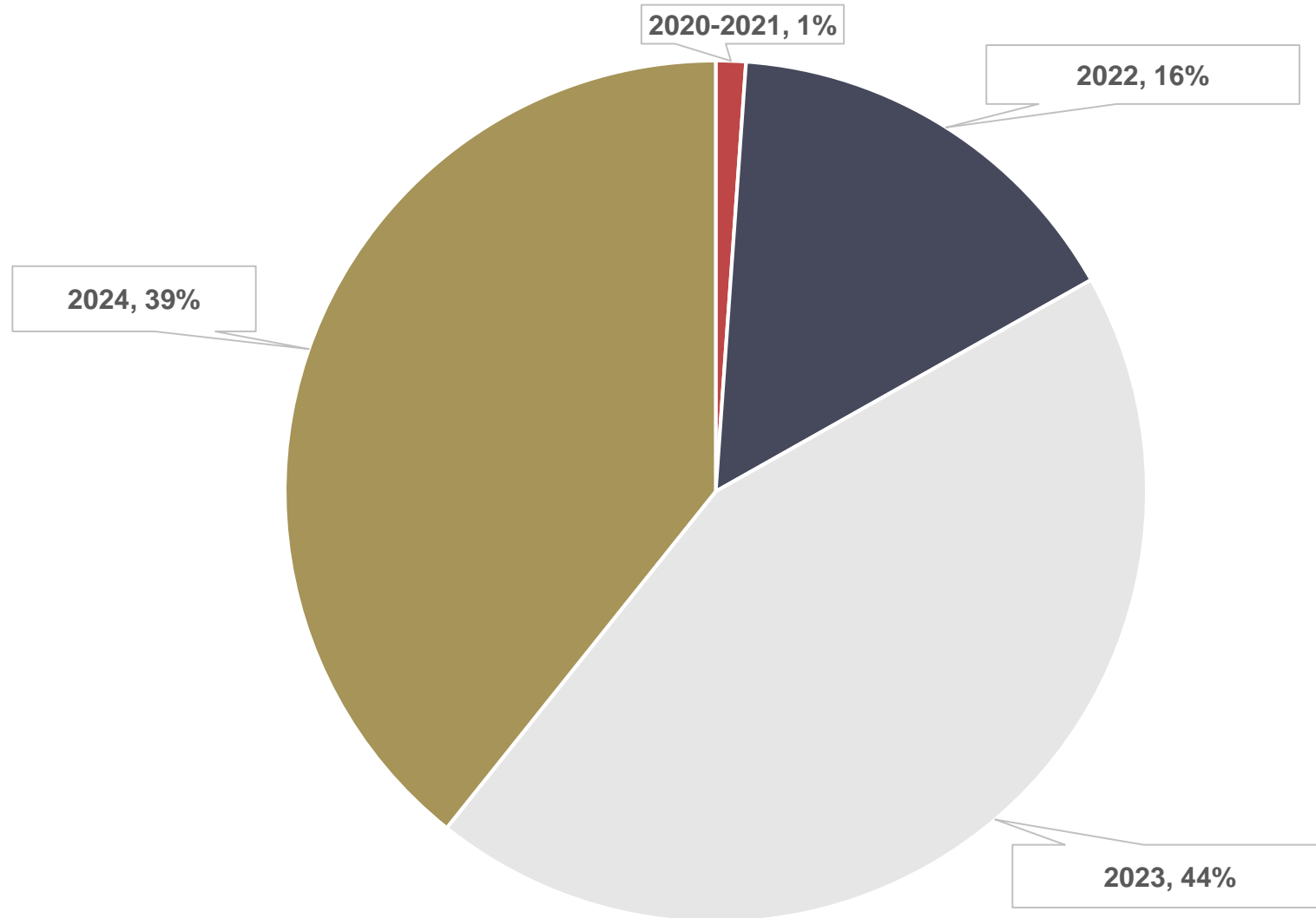
RF ANNUAL VIOLATIONS PROCESSED



2024 Commentary:

- Year-to-date;
- 87% were processed as Compliance Exceptions or Find, Fix, and Track Reports; and
- Majority CIP.

RF INVENTORY BY YEAR REPORTED



INTAKE COMMENTARY

Standard and Requirement	Summary of Requirement	2024 Intake Volume	Examples of Issues
CIP-003-8 R2	Security Management Controls (Low Impact Bulk Electric System Cyber Systems)	13	<ul style="list-style-type: none"> • Lack of awareness of the full scope of obligations (e.g., incomplete cyber security plans) • Insufficient implementation of plans to mitigate risks associated with transient cyber assets and removable media • Insufficient physical security controls (e.g., unsecure doors and failure to adhere to access protocols)

*For similar commentary on CIP-010-4 R1, CIP-006-6 R2, and CIP-004-7 R4, please refer to the Reference Materials from the August 21, 2024, Risk and Compliance Committee Meeting.

d) RF Committee and Subcommittee Activities (Reference Materials)



Annual Update of the ReliabilityFirst Stakeholder Advisory and Technical Committees

Summary

This Annual Update is to provide the Risk and Compliance Committee visibility into some of the work occurring in the RF stakeholder advisory and technical committees, which the Risk and Compliance Committee oversees. Below is background on each of the committees followed by a summary of the work that occurred to date in 2024.

Background

The Reliability Committee (RC) serves as an advisory body to the RF Board of Directors (Board). The RC provides input and advice on reliability related issues and activities and makes recommendations for improvements or enhancements. The RC also provides a forum to discuss current and emerging technical issues and risks associated with the reliability of the Bulk Power System.

The RC's responsibilities include the following:

- Provide support, expertise, and guidance to RF.
- Serve as the designated Pre-Qualified Organization pursuant to the NERC Compliance Guidance Policy, for Operations and Planning related issues.
- Provide a forum for committee member discussion on reliability issues to promote stakeholder communication, understanding, and consensus.
- Provide assignments to and oversight of the Subcommittees and Task Forces.
- Review and approve deliverables (e.g., reports and studies) from the Subcommittees and Task Forces for presentation to the Board.
- Provide support, expertise, and guidance to the Subcommittees and Task Forces.

The Transmission Performance Subcommittee, Protection Subcommittee, and Generator Subcommittee all report to the Reliability Committee.

- Transmission Performance Subcommittee (TPS) – provides a Transmission Owner/Planner forum to address transmission planning and/or performance issues (e.g., transmission assessments, outages, maps). Suppliers and marketers are not permitted to participate in Transmission Performance Subcommittee proceedings
- Protection Subcommittee (PS) – provides a protection related forum to identify, discuss, and address protective relay and control issues, including both generator and transmission protection. Discusses and provides solutions to help minimize transmission protection system misoperations. Conducts a peer review of misoperations reported via the NERC MIDAS process.

- Generator Subcommittee (GS) – provides a generator related forum to identify, discuss, and address Bulk Power System generation related issues.

Reliability Committee Update

The RC typically holds quarterly meetings done in a hybrid fashion, with most attendees opting for the virtual option.

The RC has been working on improving engagement and after the first three meetings the Chair and Vice Chair reached out to RF staff, who formed a steering committee to create a plan to improve RC member involvement. The RC Steering Committee (SC) met from May through the remainder of 2024 to plan how to improve participation and engagement. One focus was having the RC develop closer relationships with the sub-committees to ensure a mutual understanding of their roles, responsibilities, capabilities and current workloads. Then, once the RC established this baseline understanding, the SC planned to discuss what work should be assigned to the subcommittees. A potential next step would be to consider having members sharing positions on SAR's and technical documents generated by the NERC community, with the goal of providing feedback and comments to NERC and drafting teams. The RC would like to have RF continue to share emerging issues and reliability concerns and bring the RC materials to help educate and increase collaboration during the meeting.

RF plans to restart quarterly RC meetings in 2025 and will evaluate this approach and assess its effectiveness.

Transmission Performance Subcommittee Update

The TPS holds meetings during the spring, summer, and fall of each year. During 2024, the group held hybrid meetings in February, May, and October. Items of note discussed at each meeting are listed below.

February

- 1) FERC Order No. 2023: Improvements to Generator Interconnection Procedures and Agreements - Tristan Kessler (FERC) and Jason Feuerstein (FERC) provided an overview of FERC Order No. 2023.
- 2) DER Modeling Methodology Update - Brian Hallet (RF) discussed the ongoing efforts to develop a TPS DER Position Paper.
- 3) PROMOD in Long Range Transmission Planning Studies - Clayton Mayfield (MISO) presented on MISO's usage of PROMOD in Long-Range Transmission Planning (LRTP) studies

May

- 1) EMT Simulations in the Chilean Electric Grid - Victor Velar (Coordinador Electrico Nacional) gave an overview of the Chilean grid and the process his staff uses to perform EMT studies.
- 2) Hydrogen Electrolyzer Load - Mary Berkley (AEP) discussed some of the large load interconnection requests that AEP has received.
- 3) Summer 2024 Transmission Assessments - Scott Goodwin (MISO) and Stan Sliwa (PJM) presented the results of their annual summer assessments.

October

- 1) MISO 2024/25 Winter Transmission Assessment
- 2) PJM Winter 2024/25 Transmission Assessment
- 3) RF Winter 2025/26 Transmission Assessment
- 4) NERC ITCS
- 5) NERC TPL-008 – Extreme Temperature Assessment
- 6) Public Version of TPS Transmission Outage Report
- 7) RF Studies - Review scope of studies RF staff will perform in 2025

Additionally, the TPS is in the initial stages of creating two industry white papers.

1. IBR Modeling and Testing - RF staff is creating the initial version and will be using the TPS to gather industry input and validation.
2. Dynamic Analysis - A subgroup is being formed to create guidance on what constitutes good dynamic analysis. This will be useful for entities when performing their analysis to meet the requirements of various standards. This paper is scheduled to be complete by October 2025.

Protection Subcommittee Update

The PS holds four meetings per year as follows: Winter, Spring, Summer, Fall. The Winter and Summer meetings are held virtually and the Spring and Fall meeting are typically held in person at the request and discretion of the PS. Items of note discussed at each meeting are listed below:

January

- 1) Planned for the PS leadership change to occur at the Spring meeting. The Vice Chair Bernie Voges from Hoosier was elected as Chair, and Duke Energy rep, Mark McKenzie was elected as the new Vice Chair.
- 2) Misoperations Assessment Report. The PS created the Misoperations Assessment Report in 2023 to report how the RF footprint was performing in many aspects of Misoperations. The PS voted to approve the report.
- 3) Two PS members presented on PS Operations and Misoperations so the group could benefit from the Lessons Learned.

April

- 1) A PS member presented on how they handle a downed conductor with Open Phase detection. A Slido poll asked members how or if they were using Open Phase detection.
- 2) A PS member from Duke presented on their Fault Analysis process as part of an ongoing series where members walk the PS through their Fault Analysis process.
- 3) RF staff presented on Phase Angle Analysis.
- 4) Four PS members presented on PS Operations and Misoperations so the group can benefit from the Lessons Learned.
- 5) PS Leadership changes took place after this meeting.

July

- 1) A PS member presented the NERC technical report on inter-entity Short Circuit modeling.
- 2) A PS member gave a presentation on the SPCS/Proposed SARs/FERC Order 881-881a White Paper.
- 3) The PS discussed TPL-001-5 Footnote 13.

October

- 1) A PS member presented on their Relay Commissioning Contractor Vetting process
- 2) NPCC presented comparing the NPCC Risk Index Score vs. The NERC Misoperations Impact Score.
- 3) PS discussed the schedule for the next Misoperations Assessment report
- 4) PS discussed the 2025 Short Circuit Survey
- 5) A PS member presented on their implementation of PRC-027
- 6) RF staff presented on the Regional Misoperations Metrics
- 7) Four PS members presented on PS Operations and Misoperations so the group can benefit from the Lessons Learned.

Generation Subcommittee Update

RF staff opted to create a steering committee to get Generation Subcommittee (GS) members involved in next steps to increase subcommittee engagement.

RF and the Generation Subcommittee Steering Group (GSG) held numerous meetings to lay out a new approach for larger GS meetings. These meetings entailed brainstorming topics for the agenda and looking at methods to get better participation during the meetings. The GSG assisted in developing the agenda for the first large GC meeting (held in June) followed by another large group meeting in September. A GS chair has been identified and the search for a vice-chair is ongoing. This activity will continue in 2025 to ensure engagement continues. Details are provided below.

February (Generator Steering group)

1. Develop a charter for the GS and talk through the coordination of the group
2. Discuss possible topics for the larger GS
3. Decide on a date for the larger group

April (Generator Steering Group)

1. Finalize the GSG Charter
2. Finalize the topics for the larger GS and create the agenda
3. Finalize the date of the GS

June (Generator Subcommittee)

1. Restructure of the GS
2. Internal controls related to the NERC Reliability Standards. Includes examples of internal controls related to MOD-025-2 (Verification and Data Reporting of Generator Real and Reactive Power Capability and Synchronous Condenser Reactive Power Capability)
3. Cold Weather Preparedness Small Group Advisory Session– a deeper dive into ongoing ERO Enterprise efforts, which includes NERC Reliability Standard changes (i.e., EOP, IRO, TOP), Compliance Monitoring Walkdowns, and the RF Winterization Program.
4. NERC’s changes to the GADS reporting – discussing some of the changes to GADS reporting for GADS conventional, Wind, and Solar reporting

August (Generator Steering Group)

1. Discuss the feedback from the first meeting
2. Start developing the agenda for the second meeting
3. Decide on coordination of the second meeting

September

1. Met one-on-one with a candidate to serve as Chair of the GS. Michelle Struckfus accepted the chair role of the GS.

September (Generator Subcommittee)

1. Chair/Vice-Chair Discussion
2. RF presented an overview of the Regional Risk Assessment

3. RF shared Lesson Learned for Plant Operation and an overview of RF's Cold Weather Winterization program. This included a look back at site visits from this past winter and performance in the RF region
4. FERC Orders - RF provided a high-level overview of some the FERC orders and NOPRS issued by FERC and how they pertain to GO/GOPs
5. NERC/RF 101 - RF provided a high-level overview of all the services that NERC and RF provide to the register entities



Kal Ayoub
Director of the Office of Electric Reliability, FERC

Kal Ayoub, Director of the Office of Electric Reliability, brings more than 25 years of industry and regulatory experience in electric transmission and generation engineering, cybersecurity and bulk electric system reliability to the position.

Prior to joining OER as Director, he served as Chairman Willie Phillips' Critical Infrastructure and Resilience advisor.

Ayoub joined FERC in 2009, and over the years held various positions of increasing responsibility within OER, including electrical engineer, supervisory electrical engineer and Deputy Director of the Division of Cybersecurity. He was instrumental in advancing the Commission's regulatory initiatives to strengthen cybersecurity and physical security standards, enhance grid resilience and ensure the reliability and security of the bulk electric system.

Before joining FERC, Ayoub gained extensive private sector experience in the electric industry, holding key roles in performance engineering, power plant operations, project management and risk management. Notably, he contributed to establishing reliability and compliance programs in preparation for the nation's first mandatory reliability standards, which FERC approved in 2007.

Ayoub earned a Bachelor of Science in mechanical engineering from the University of Maryland Baltimore County.

Trends and Challenges



PJM: Trends and Challenges

Presented to:

**ReliabilityFirst
Risk and Compliance Committee**

Jason Stanek

Executive Director, Governmental Services

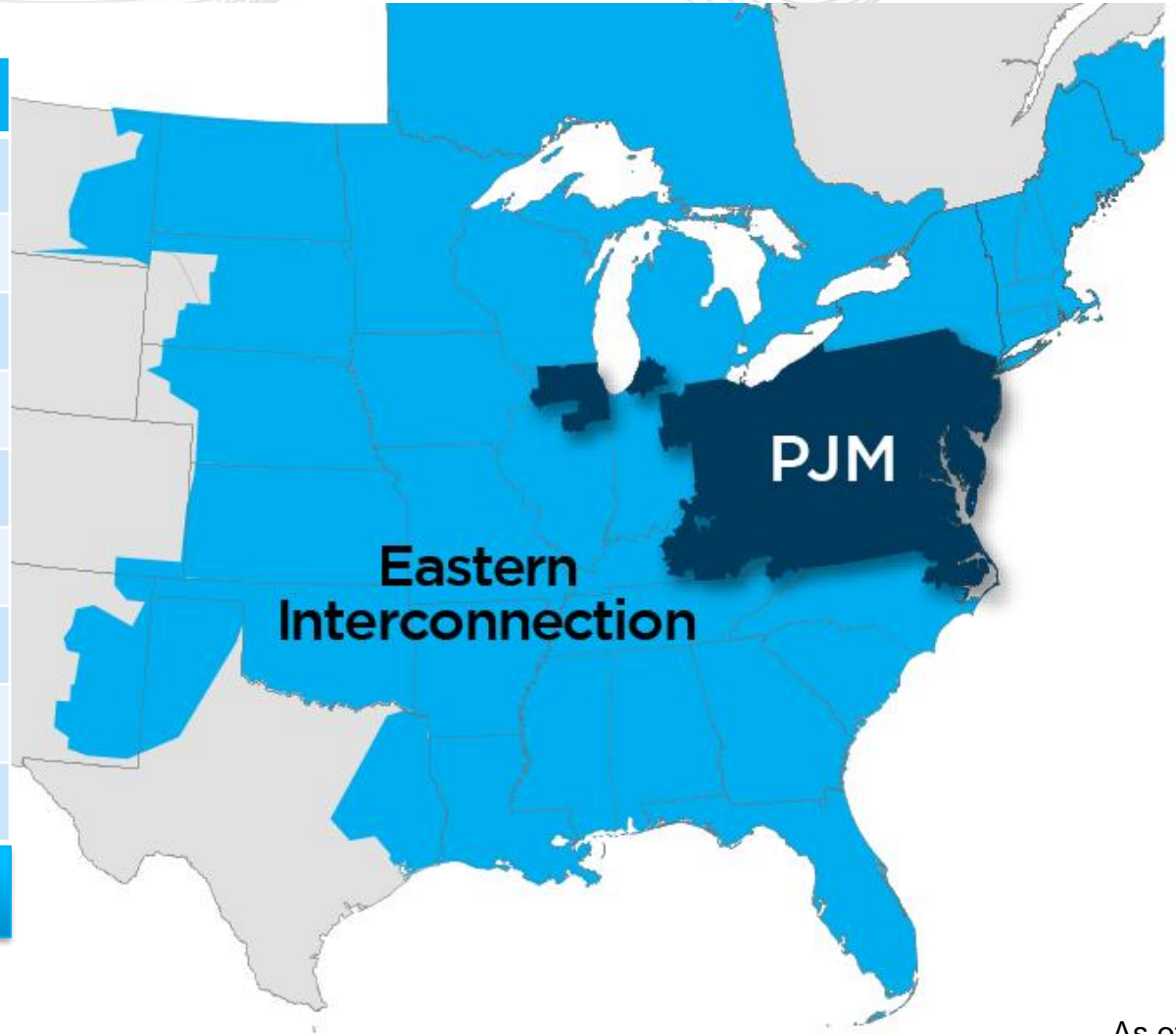
ReliabilityFirst

December 4, 2024

Key Statistics

Member companies	1,090
Millions of people served	65+
Peak load in megawatts	165,563
Megawatts of generating capacity	180,785
Miles of transmission lines	88,185
Terawatt hours of annual energy	770
Generation sources	1,439
Square miles of territory	368,906
States served	13 + DC

21% of U.S. GDP produced in PJM



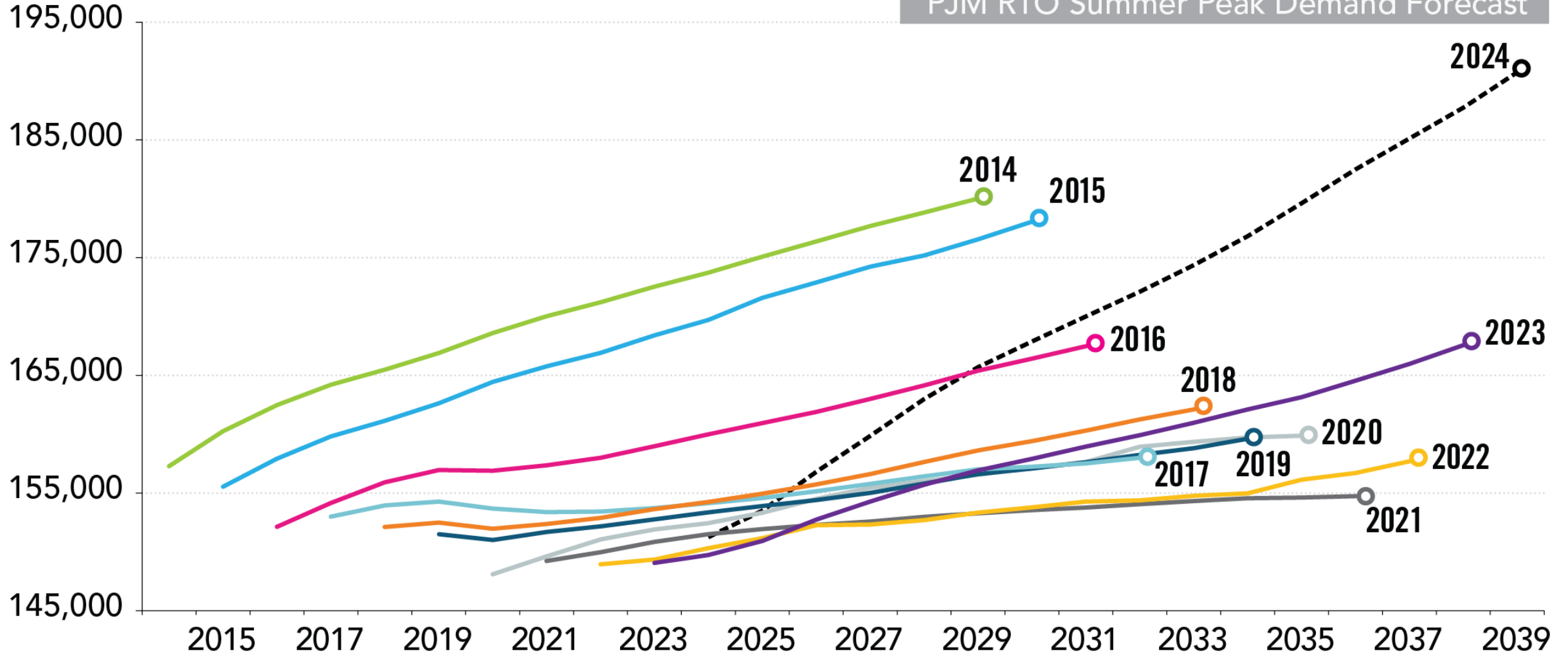
As of 2/2024

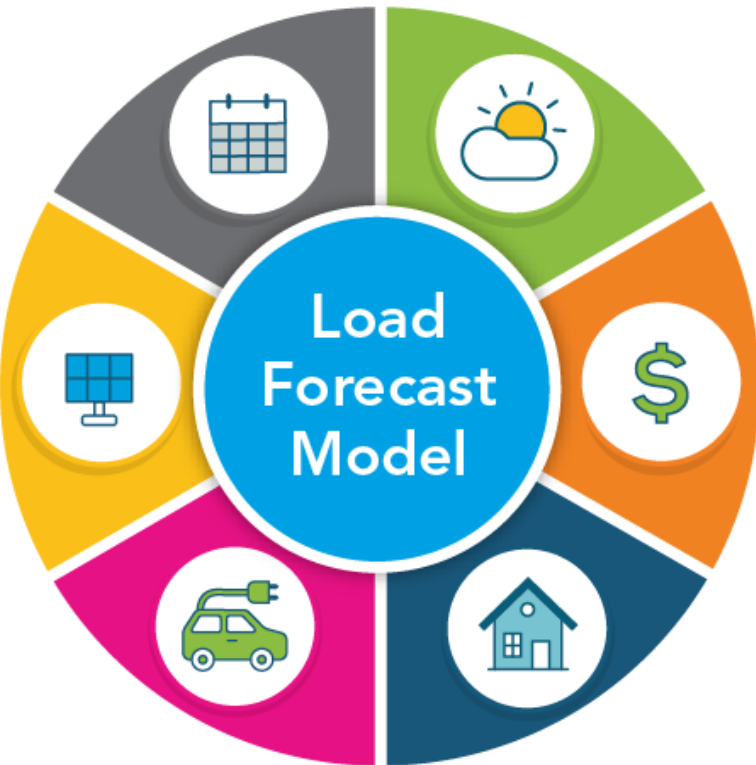


Electricity Demand Growth

Load (MW)

PJM RTO Summer Peak Demand Forecast





Weather Conditions

- Weighted-average temperature, humidity and wind speed
- Cooling and heating degree days
- 30+ weather stations across PJM



Energy Efficiency/End-Use Characteristics

- Cooling equipment saturation and efficiency
- Heating equipment saturation and efficiency
- Other equipment saturation and efficiency



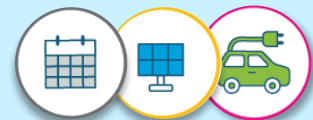
Economic

- Real personal income
- Employment
- Real industrial output
- Households
- Working-age population



Calendar/Solar Data & Electric Vehicles

- Day of week
- Month
- Weekends/holidays
- Distributed solar generation
- Plug-in electric vehicles



Electric Distribution Companies (EDCs) and Load Serving Entities (LSEs) are encouraged to provide PJM with information about large changes that may not be captured in the forecast process (“Large Load Adjustments”).

We view requests through the lens of:

Is the request significant?

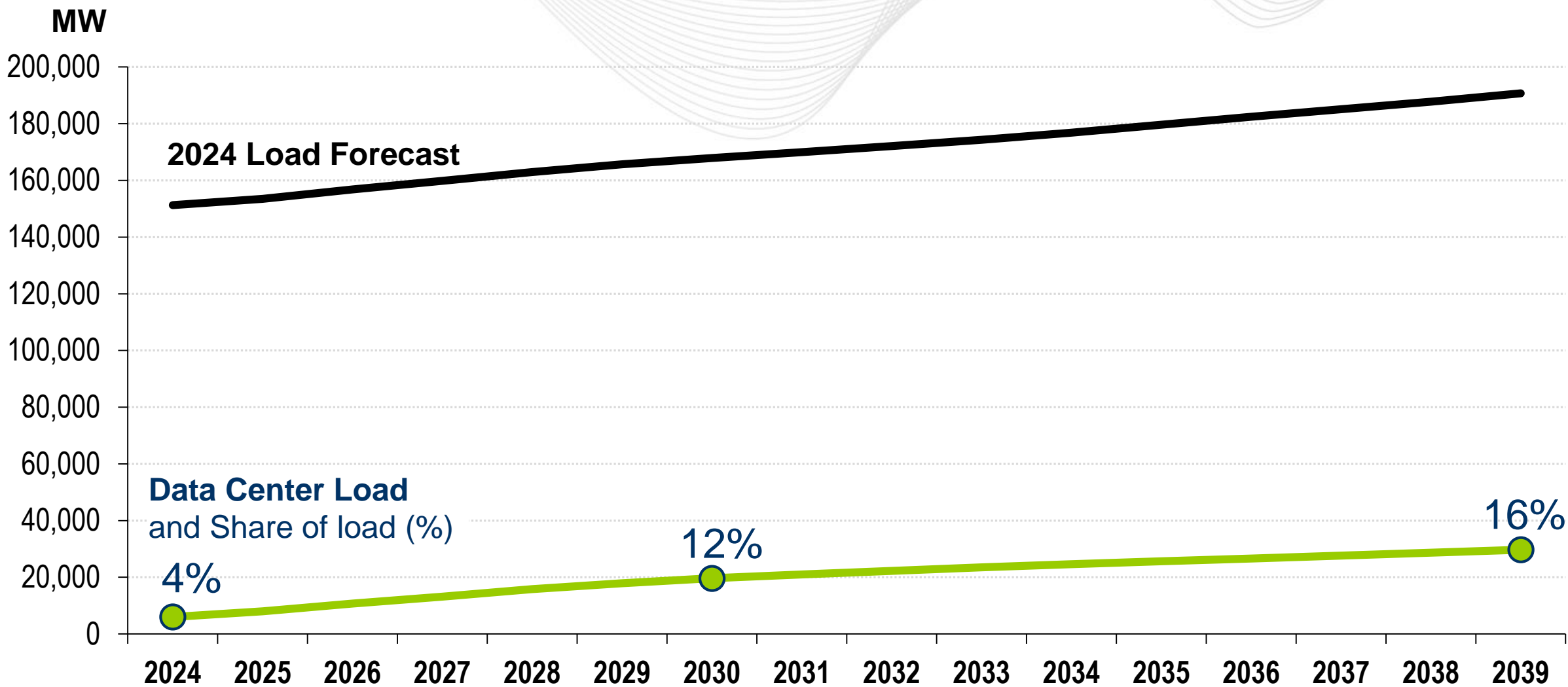
PJM reviews the magnitude or percentage of a zone’s load.

Is there risk of double counting?

- PJM reviews economic forecast to determine if load shift is captured.
- PJM obtains hourly load history to isolate impact and avoid double counting.

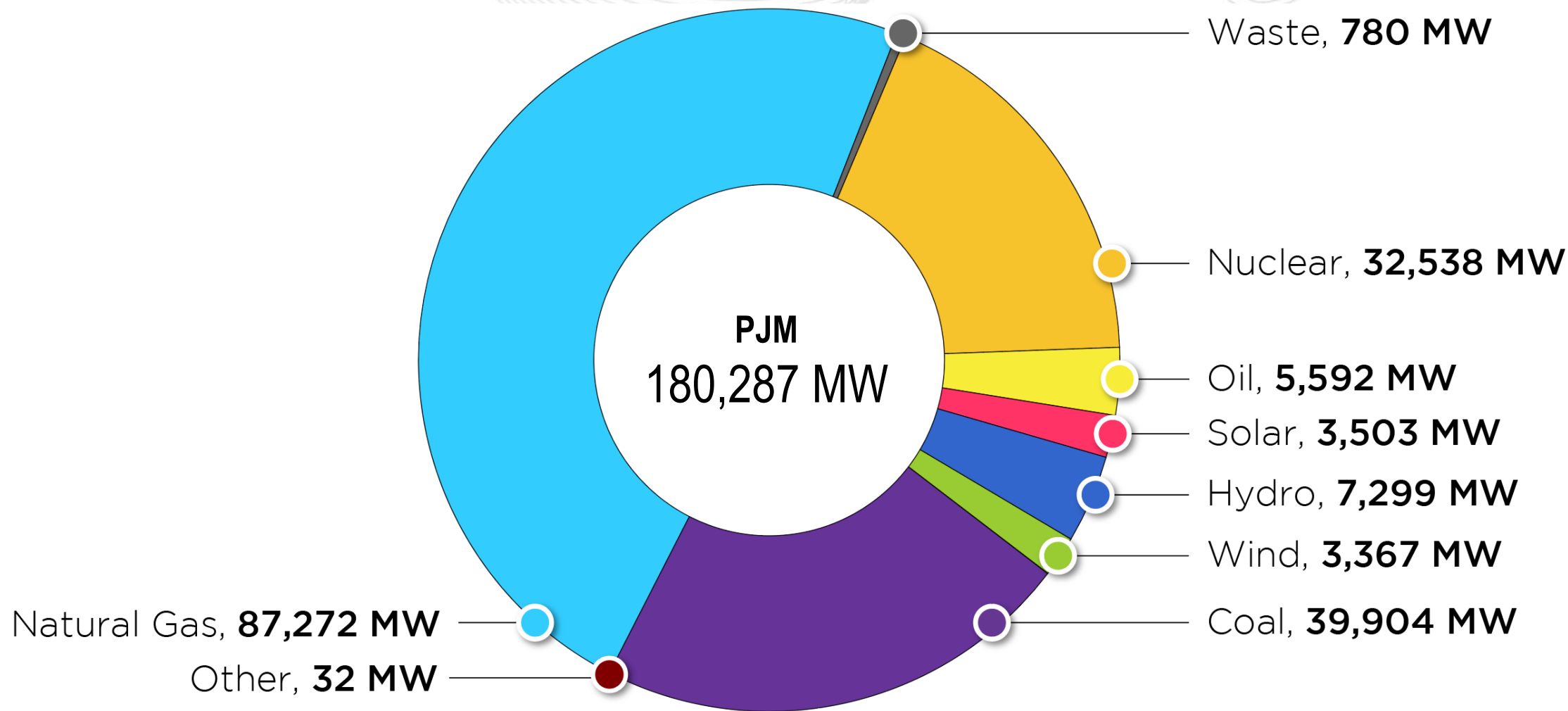


2024 Load Forecast – Summer Peak (MW)

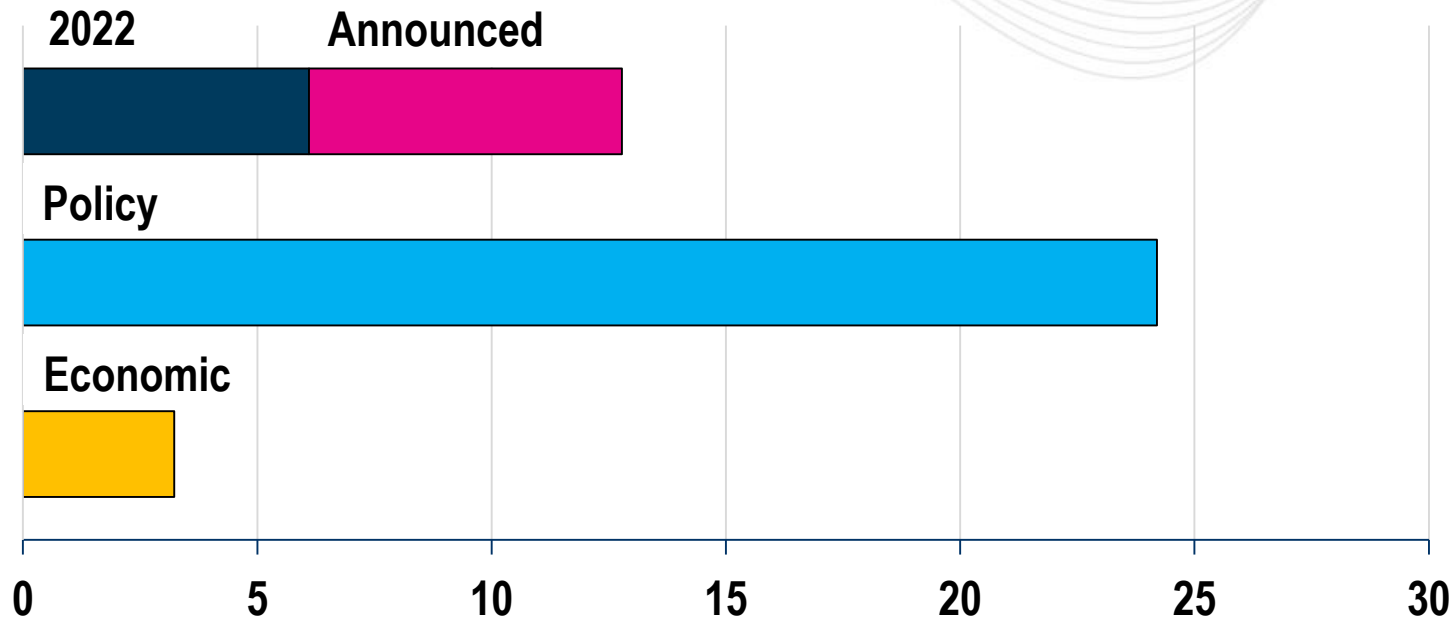


PJM Existing Installed Capacity Mix

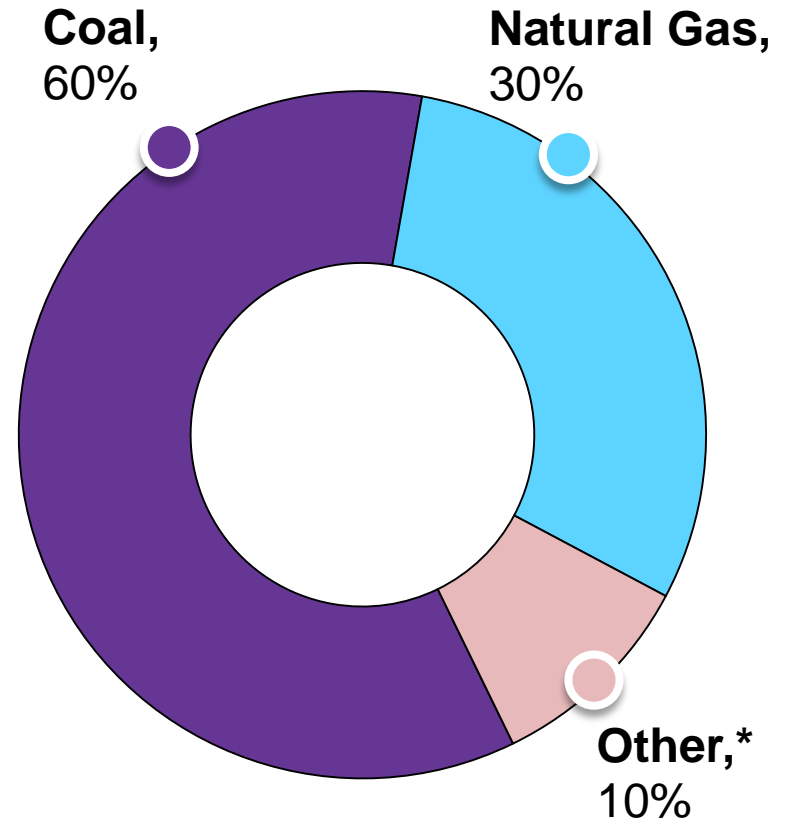
(CIRs – as of Dec. 31, 2023)



Total Forecasted Retirement Capacity (GW)



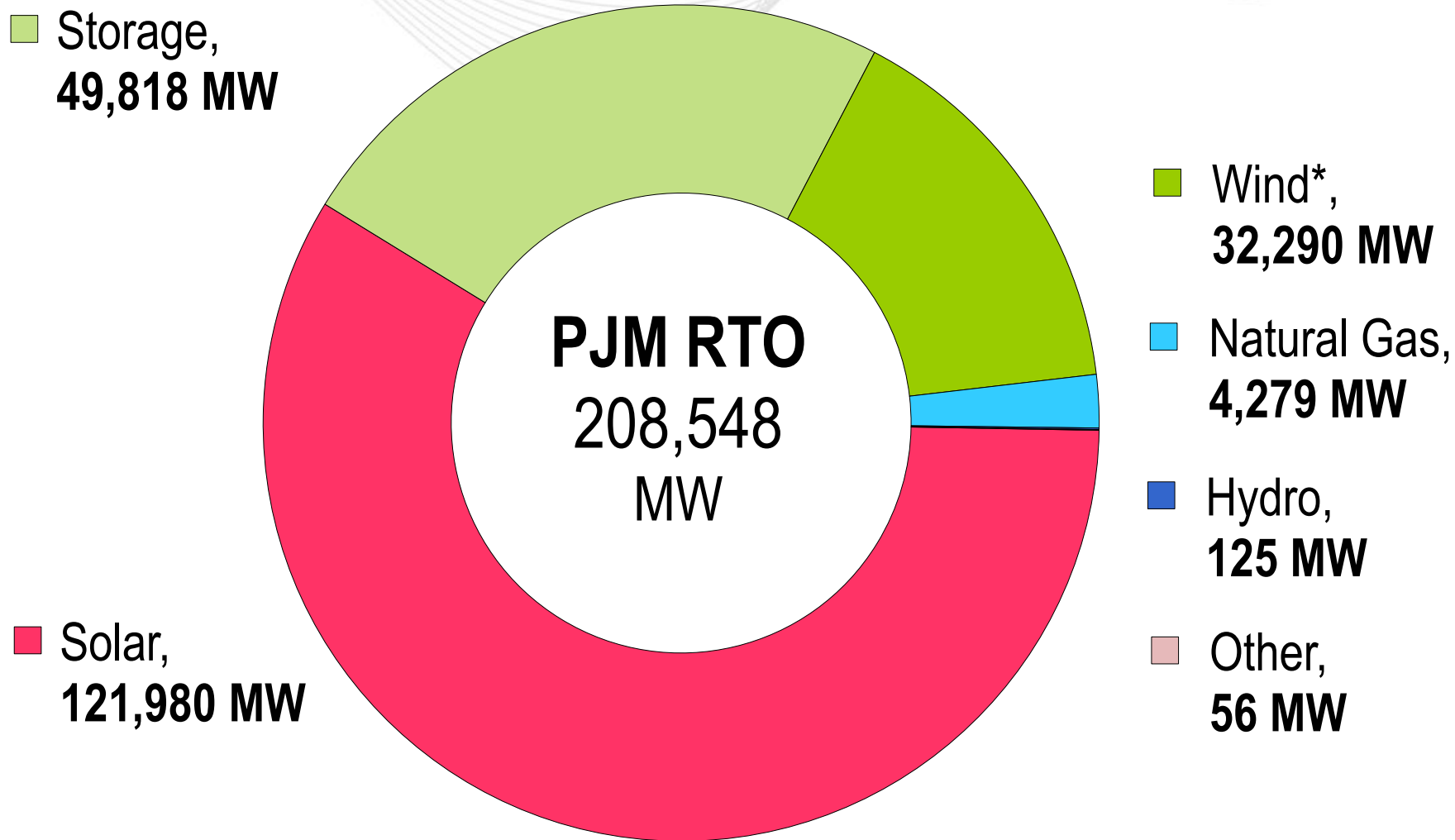
This **40 GW** represents **21% of PJM's current 192 GW** of installed generation



*Other includes diesel, etc.

PJM Queued Capacity (Nameplate) by Fuel Type

("Active" in the PJM Queue as of August 6, 2024)





ELCC Ratings – “What Can You Do For Reliability?”

Enhance reliability risk modeling in resource adequacy studies.

Improve capacity accreditation to reflect resources’ contribution during periods of risk.

Maintain the capacity performance framework, but enhance the rules and testing requirements.

Improve other areas of the market construct, including balanced market power mitigation rules.

	2025/2026 BRA ELCC Class Ratings
Onshore Wind	35%
Offshore Wind	60%
Fixed-Tilt Solar	9%
Tracking Solar	14%
Landfill Intermittent	54%
Hydro Intermittent	37%
4-hr Storage	59%
6-hr Storage	67%
8-hr Storage	68%
10-hr Storage	78%
Demand Resource	76%
Nuclear	95%
Coal	84%
Gas Combined Cycle	79%
Gas Combustion Turbine	62%
Gas Combustion Turbine Dual Fuel	79%
Diesel Utility	92%
Steam	75%

The following table provides the [ELCC Class Ratings](#) applicable to the 2025/2026 Base Residual Auction (BRA) as calculated under the methodology approved by FERC on January 30th, 2024 in FERC Docket No. ER24-99

Implemented Interconnection Reforms

April 23, 2021

Stakeholders begin queue reform through Interconnection Process Reform Task Force.



2021

April 8, 2022

Final meeting of Interconnection Process Reform Task Force



2022

Nov. 29, 2022

FERC issues order approving reforms.



July 10, 2023

Interconnection process reform transition begins.



2023

May–November 2021

Stakeholders hash out issues in seven policy workshops.



April 27, 2022

PJM Members Committee overwhelmingly endorses reform package.

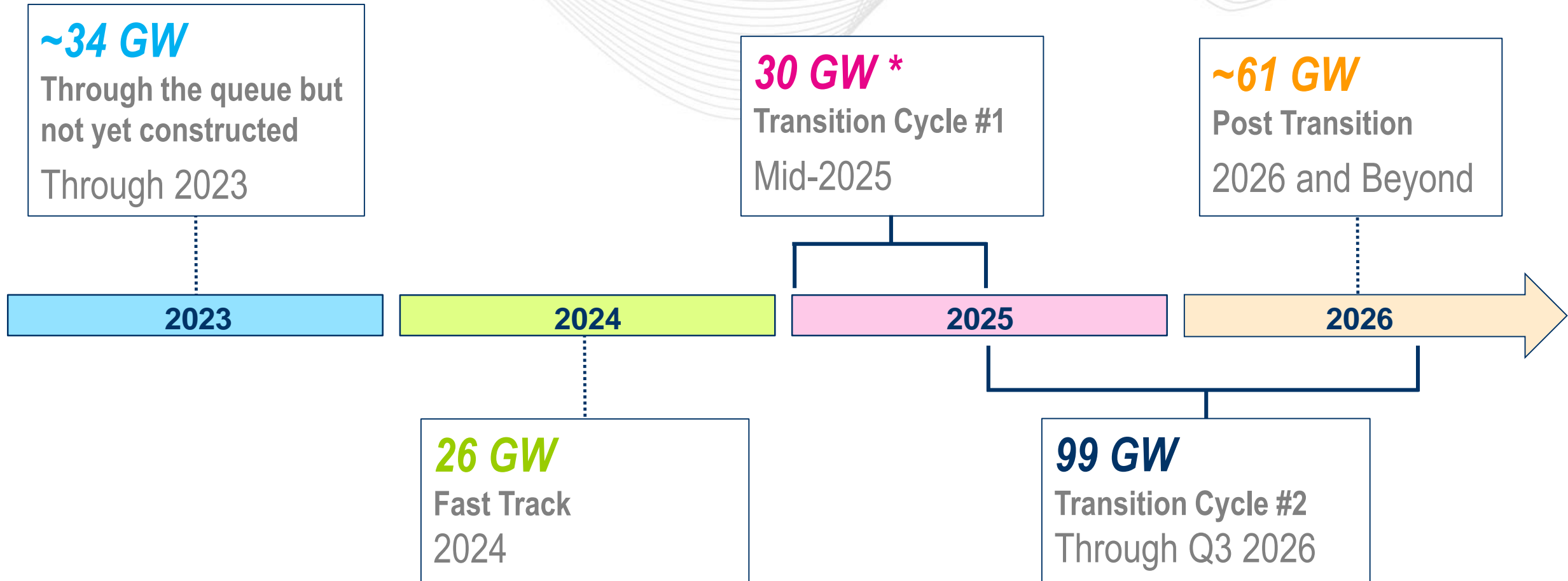


June 14, 2022

Interconnection process reform package filed with FERC.



Initial Queue Breakdown and Timeline



* TC1 was 46 GW prior to Decision Point 1.

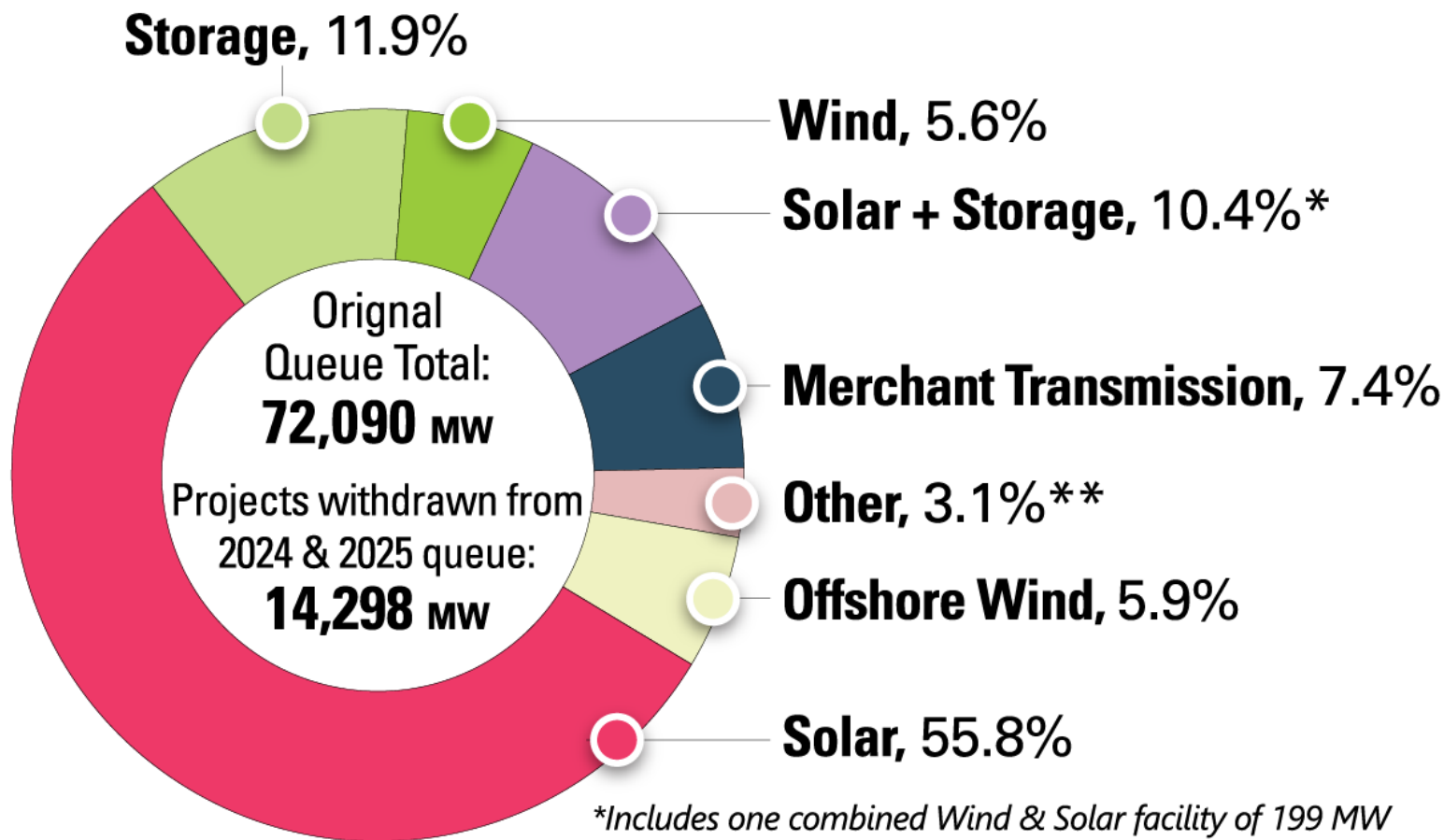


Projects To Clear PJM Interconnection Process in 2024 and 2025

Projects To Clear PJM Interconnection Process in 2024 and 2025

(Updated for Transition Cycle 1 as of Aug. 1, 2024)

By State	Number of Projects	Total Nameplate Capacity (in MW)
DE	1	120.00
IL	62	10,861.95
IN	63	11,568.64
KY	33	3,568.50
MD	6	1,245.00
MI	8	887.20
NC	21	1,542.90
NJ	20	1,204.80
OH	62	7,829.49
PA	91	3,696.10
VA	107	11,967.50
WV	14	1,154.00
Total	488	55,646.00



*Includes one combined Wind & Solar facility of 199 MW

**Other: Natural Gas (1,646.7 MW, 3.0%) and Hydro (51 MW, 0.1%)

Please note some projects have reduced project megawatts.

CIR Transfer

Target: Resources using interconnection service from a deactivating generator

Potential Outcome: Permanent modifications to the process

Reliability Resource Initiative

Target: Resources not currently in the interconnection queue

Potential Outcome: Expansion of the eligibility criteria for Transition Cycle 2 beyond active requests received prior to September 2021

Surplus Interconnection Service

Target: Operating generators that are not able to operate continually 24/7/365

Potential Outcome: Permanent modification to Surplus Interconnection Service criteria

The 2025/2026 BRA cleared enough capacity to meet the RTO reliability requirement, but the reserve margin is lower than prior years and there is minimal uncleared capacity that was offered in the auction.

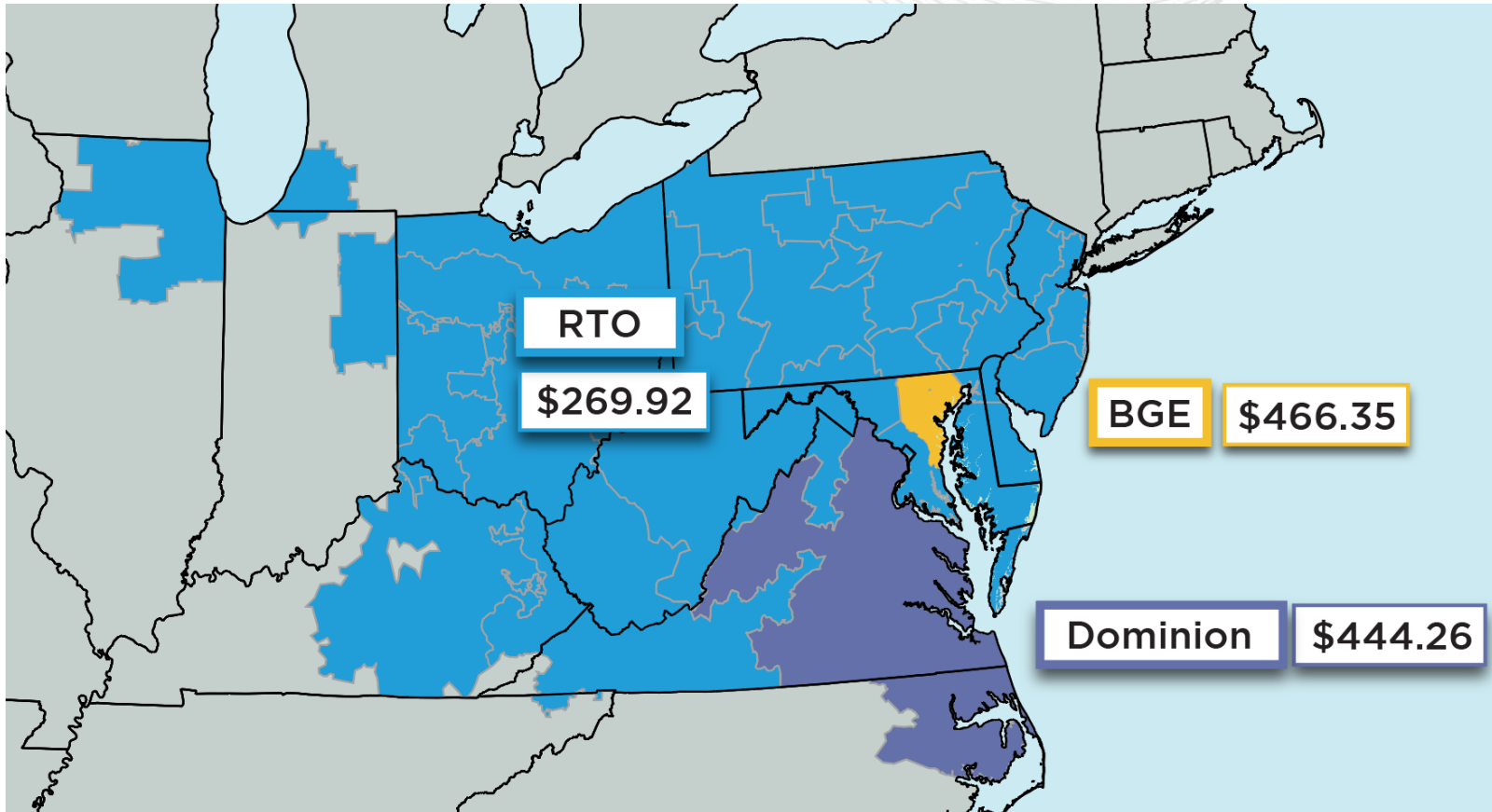
Two zones separated from the rest

- BGE and Dominion zones cleared short of their reliability requirements due to load growth and retirements.
- Prices in these LDAs are at the price caps.

The auction cleared a diverse mix of resources, including (on a UCAP basis):

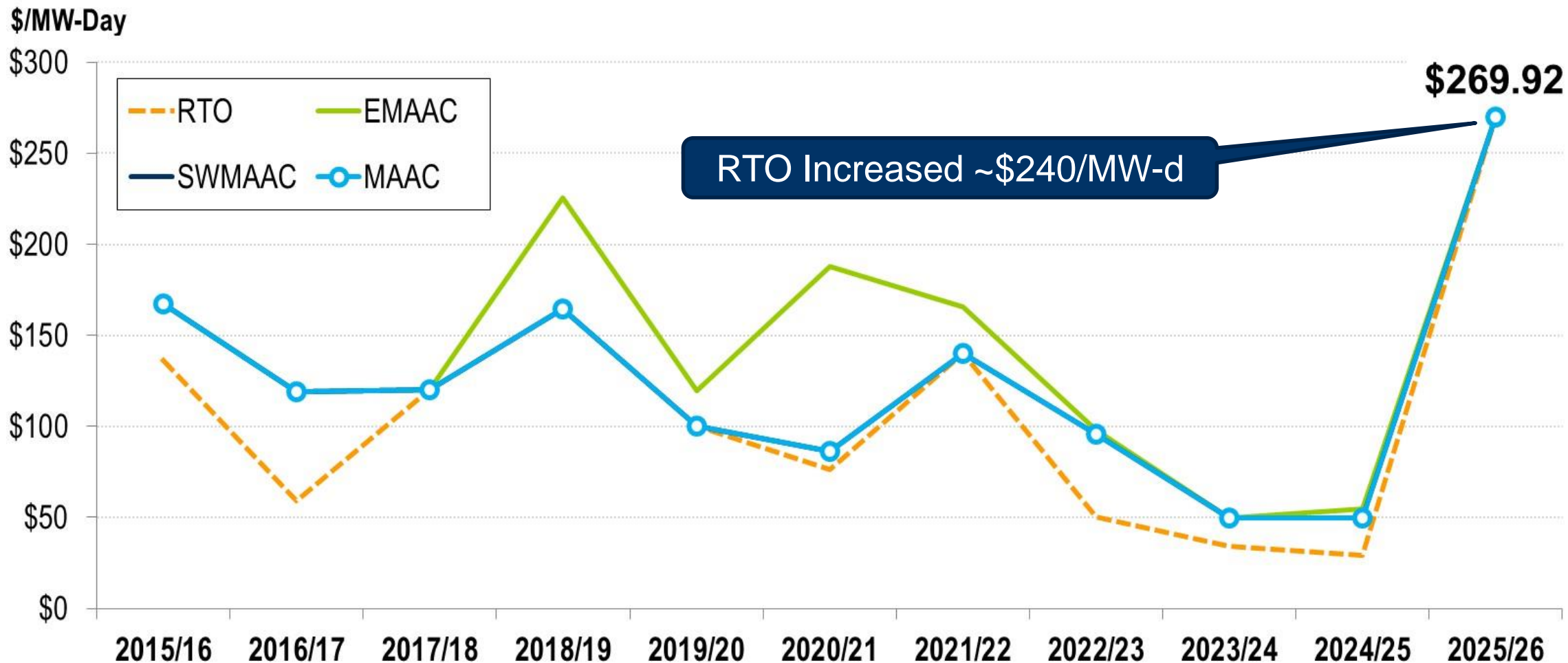
- 48% natural gas
- 21% nuclear
- 18% coal
- 1% solar
- 1% wind
- 4% hydro
- 5% demand response

Auction results send a clear investment signal across the RTO.



RTO Price Comparison

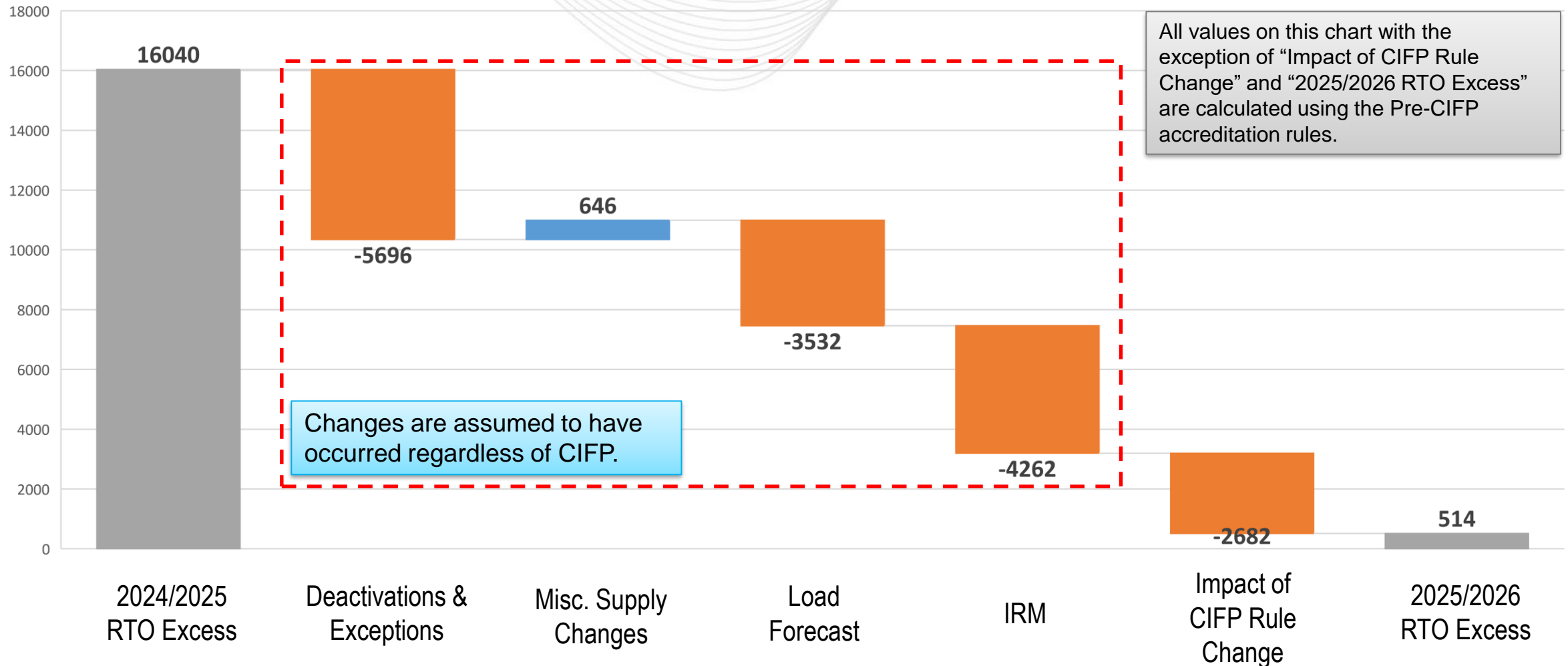
	2025/2026	2024/2025
RTO Price:	\$269.92/ MW-day	\$29/ MW-day
Reserve Margin <i>with IRM of:</i>	18.5%	20.5%
	17.8%	14.7%





Waterfall Chart of Reduction in Excess Capacity (UCAP) from 24/25 to 25/26

■ Increase ■ Decrease ■ Total



*Annual resources only; CIFP impact represents net impact of reduced supply (due to lower pool-wide average accreditation) and reduced demand (due to lower Forecast Pool Requirement).

The system has gotten much tighter since the 2024/2025 BRA.

- This is aligned with the study entitled “Energy Transition in PJM: Resource Retirements, Replacements & Risks” issued in February 2023.
- CIFP changes to risk modeling and accreditation have contributed to this but to a lesser degree than other changes that have occurred.

The capacity market is signaling the need for investment now.

The load forecast and IRM in 2026/2027 are both increasing relative to 2025/2026.

- **States should avoid policies intended to push generation resources off of the system until an adequate quantity of replacement generation is online and has been shown to be operating**
- **PJM states should address state and local challenges in the deployment of new generation resources and electricity infrastructure, and enact policy to facilitate greater/quicker construction**



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Ensuring a Reliable Energy Transition

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Ensuring a Reliable Energy Transition

“Ensuring a Reliable Energy Transition” is a multiyear initiative to preserve the reliable delivery of electricity as the grid undergoes historic transformation.

It affirms PJM’s leadership role as an independent regional transmission organization in identifying and addressing challenges to reliability amid the ongoing shift to a bulk electrical system that increasingly relies on renewable energy.

Through this initiative, PJM will clearly articulate established reliability concerns as well as actions to be taken to support reliability and alleviate these concerns. Development and implementation of these initiatives can only be done in concert with all stakeholders and government partners.

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Trending Topics

2022 Regional Transmission Expansion Plan Report WEB

Energy Transition in PJM: Resource Retirements, Replacements & Risk PDF

Winter Storm Elliott Info WEB

Ensuring a Reliable Energy Transition



ReliabilityFirst
Risk and Compliance
Committee

2024



TRUST. TEAMWORK. HEART. EVOLUTION

Today's Discussion

1. Our Challenge

2. Our Opportunity



The Premier American Natural Gas Company

The lowest cost and only domestic, large-scale integrated natural gas producer

Our Mission

Deliver Cheaper,
More Reliable,
Cleaner Energy

About Us (NYSE: EQT)

~\$36 B

Enterprise
Value

~\$22 B

Equity
Value⁽¹⁾

\$0.63/sh

Annualized
Dividend

\$5 - \$7 B

Long-Term
Debt Target

~\$2/MMBtu

2025E Unlevered
FCF Breakeven⁽²⁾

~1.1 MM

EQT Core
Net Acres

~30 Years

De-Risked
Inventory

~2.1 Tcfe

Upstream
Net Production⁽³⁾

>8.0 Bcfe/d

Gathered Volume
Throughput

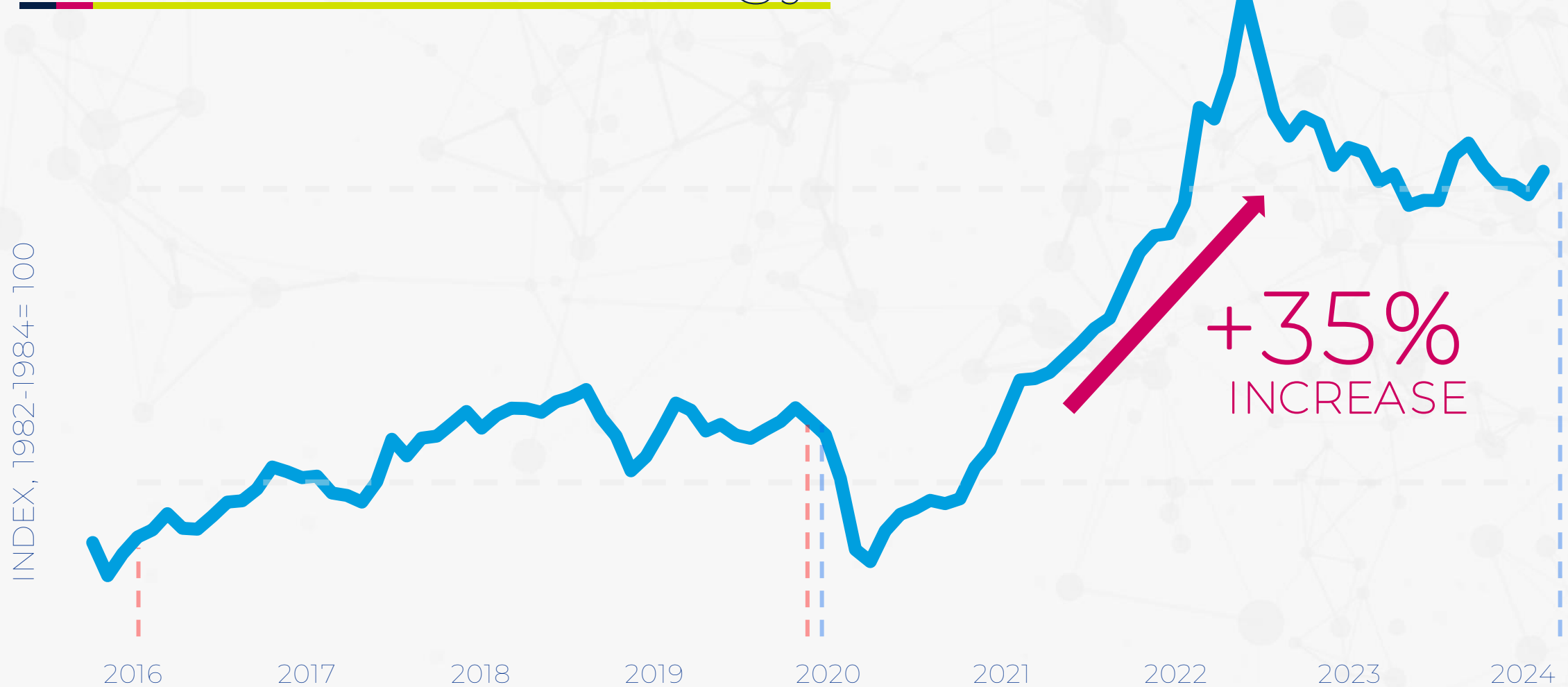
~90%

EQT Integrated
Volumes

The background features a gradient from dark blue on the left to bright pink on the right. Overlaid on this are several geometric shapes: a large dark blue triangle in the upper left, a pink circle in the upper center, and a pink triangle in the upper right. A network of small, semi-transparent circles connected by thin lines is scattered across the middle and right portions of the image, resembling a molecular or data network.

Our Challenge

US Consumer Energy Prices are Increasing



Consumer Price Index for all Urban Consumers: Energy in US City Avg.¹

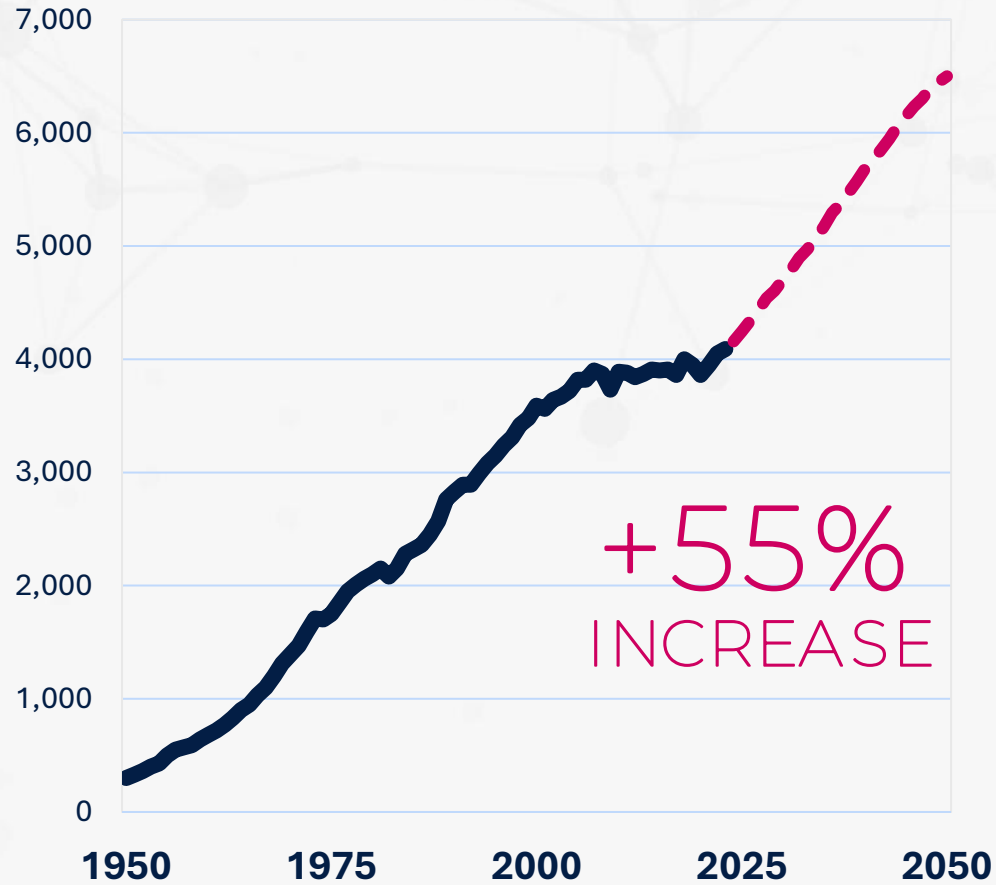


1. [HTTPS://FRED.STLOUISFED.ORG/SERIES/CPIENGSL](https://fred.stlouisfed.org/series/CPIENGSL)

SOURCE: U.S. BUREAU OF LABOR STATISTICS

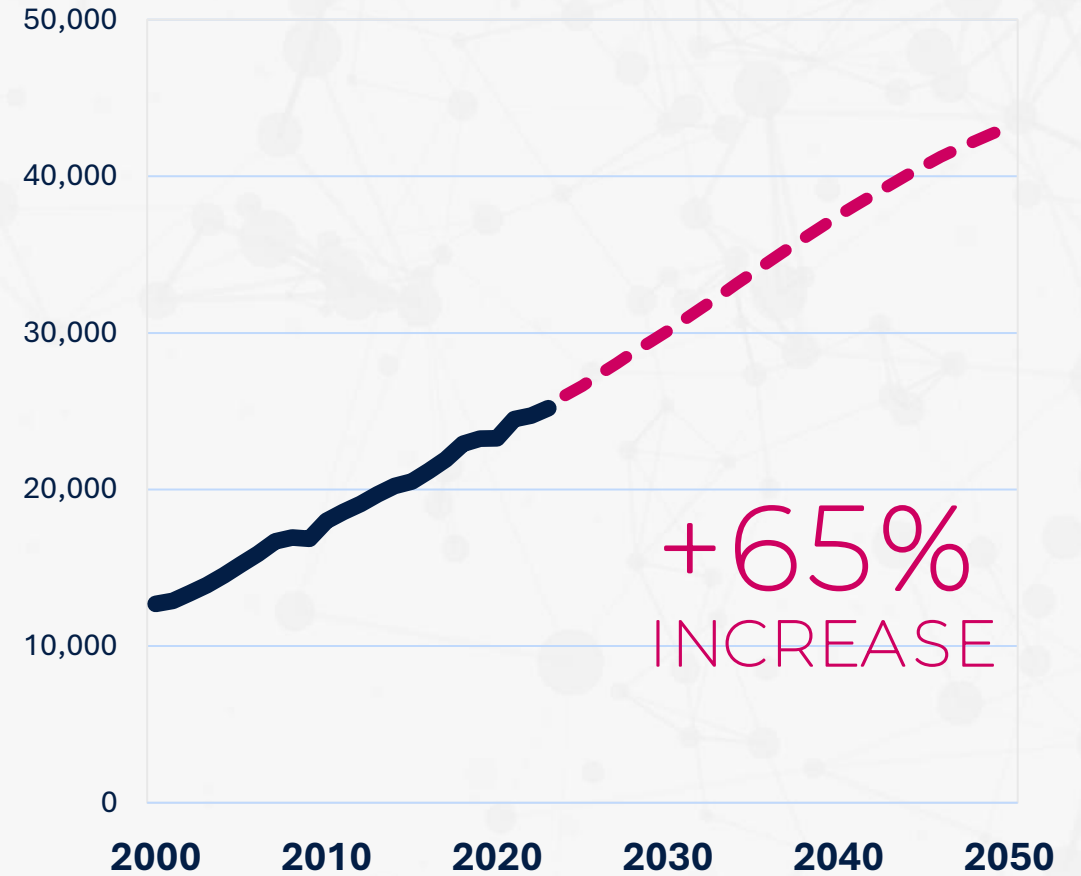
Yet power demand is also increasing

US Power Demand



Source: IHSMarkit NA Planning Case May 2024

Global Power Demand

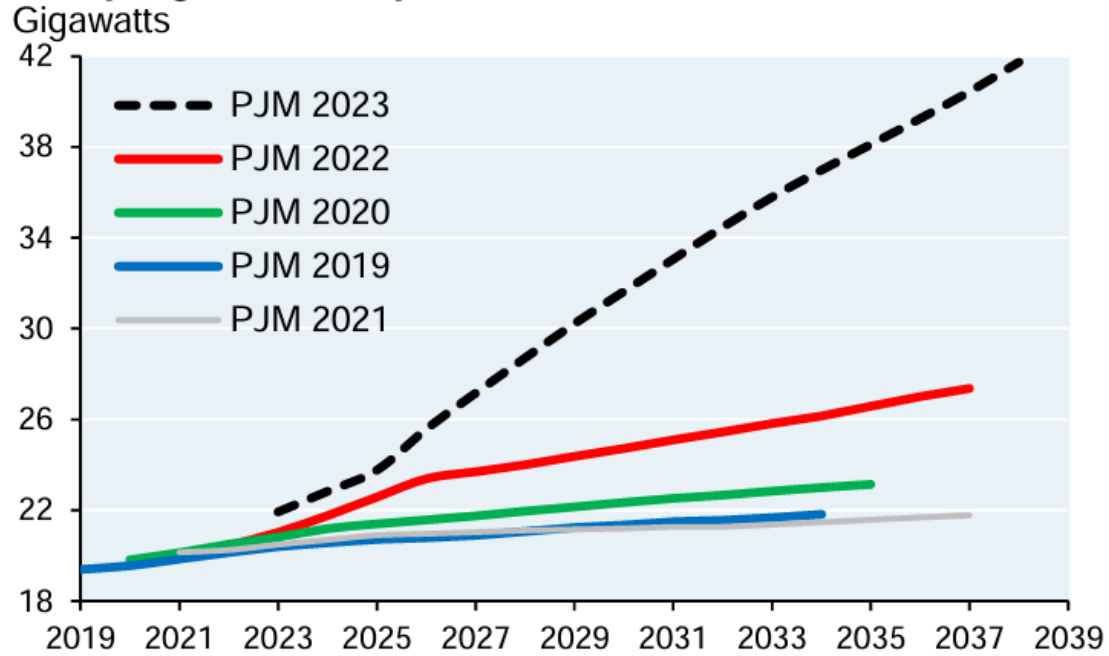


Source: Bloomberg 2024 New Energy Outlook



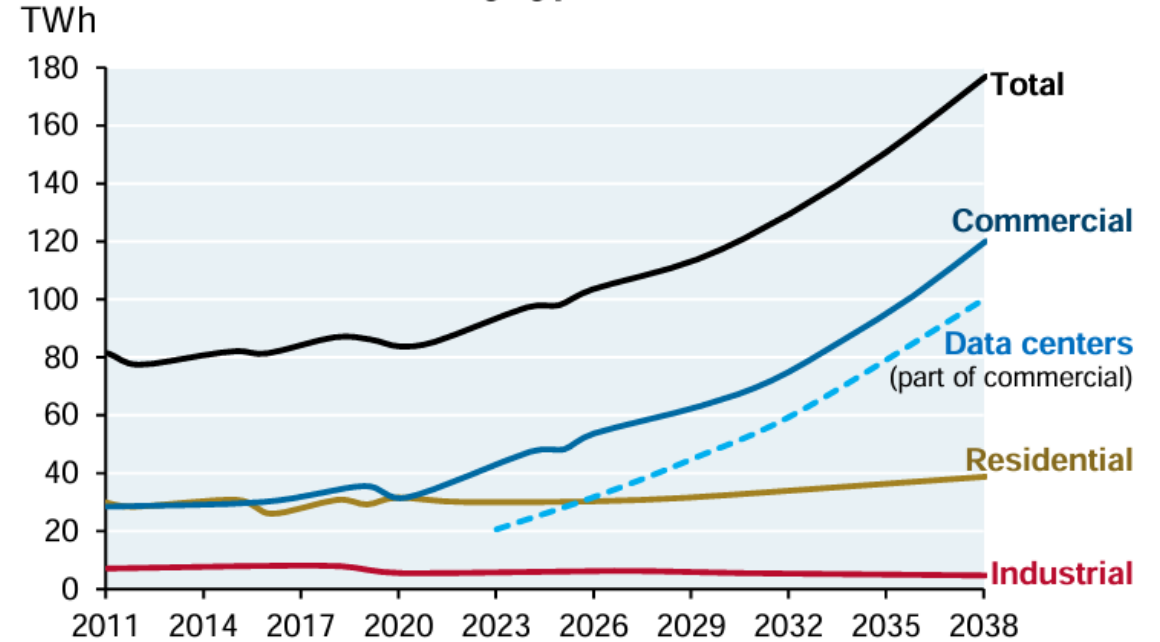
... especially in Appalachia

PJM progression of power demand forecasts



Source: PJM 2023 Power Demand Outlook, January 28, 2024

PJM demand forecasts by type



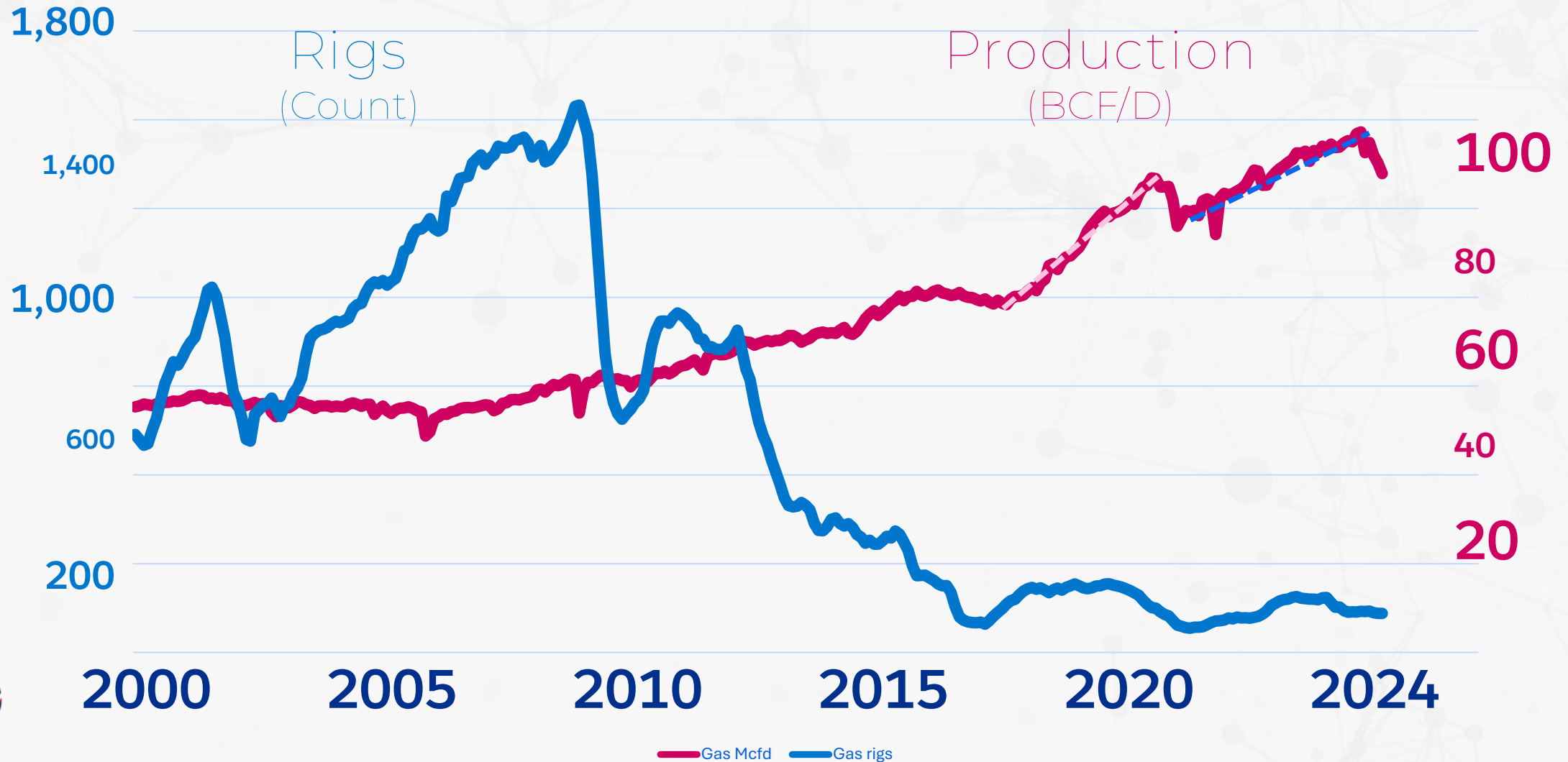
Source: Dominion Resources Integrated Resource Plan, January 28, 2024



Our Opportunity

US Natural Gas has been reliable

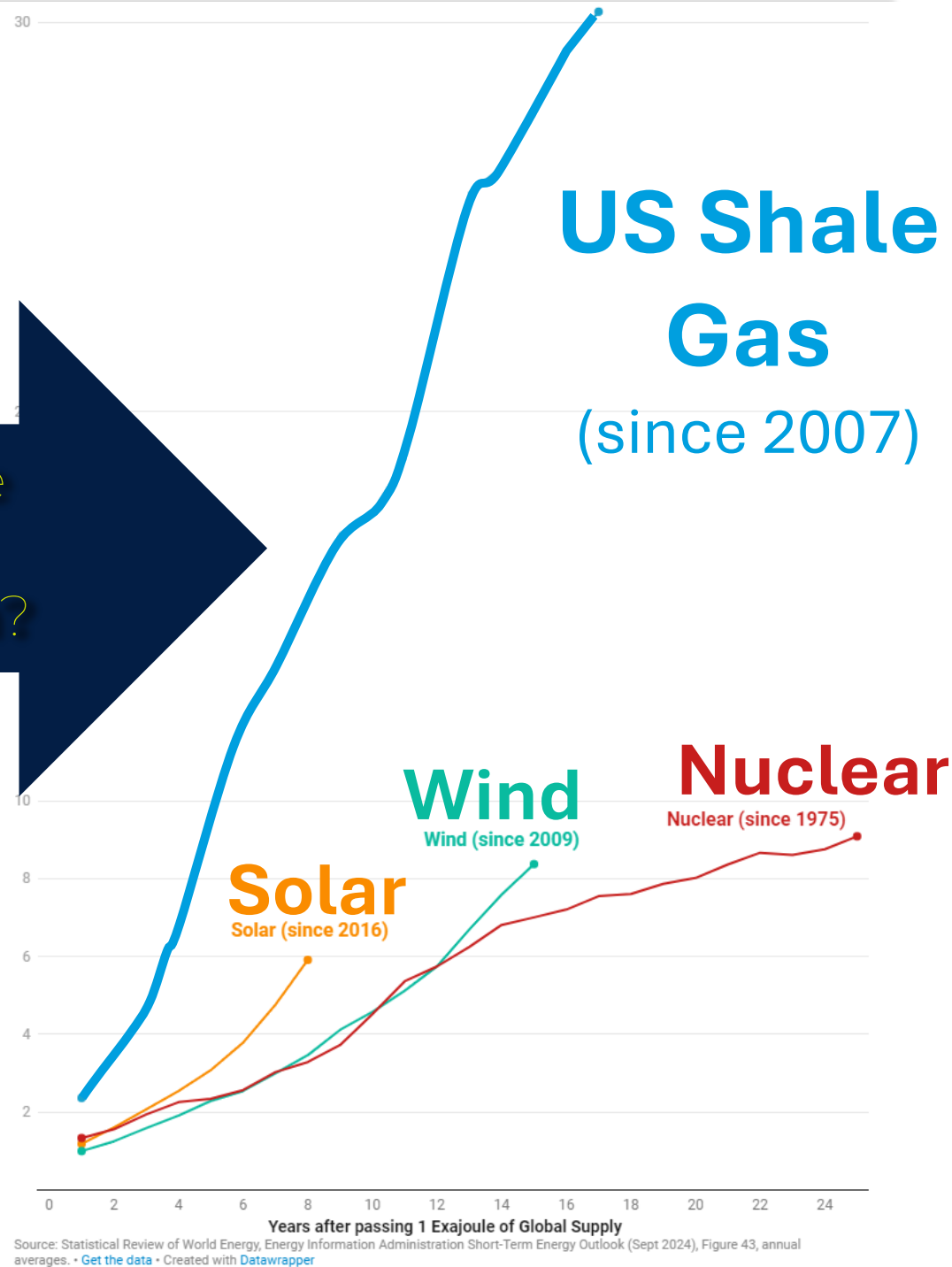
US Natural Gas Activity



Putting our success into perspective



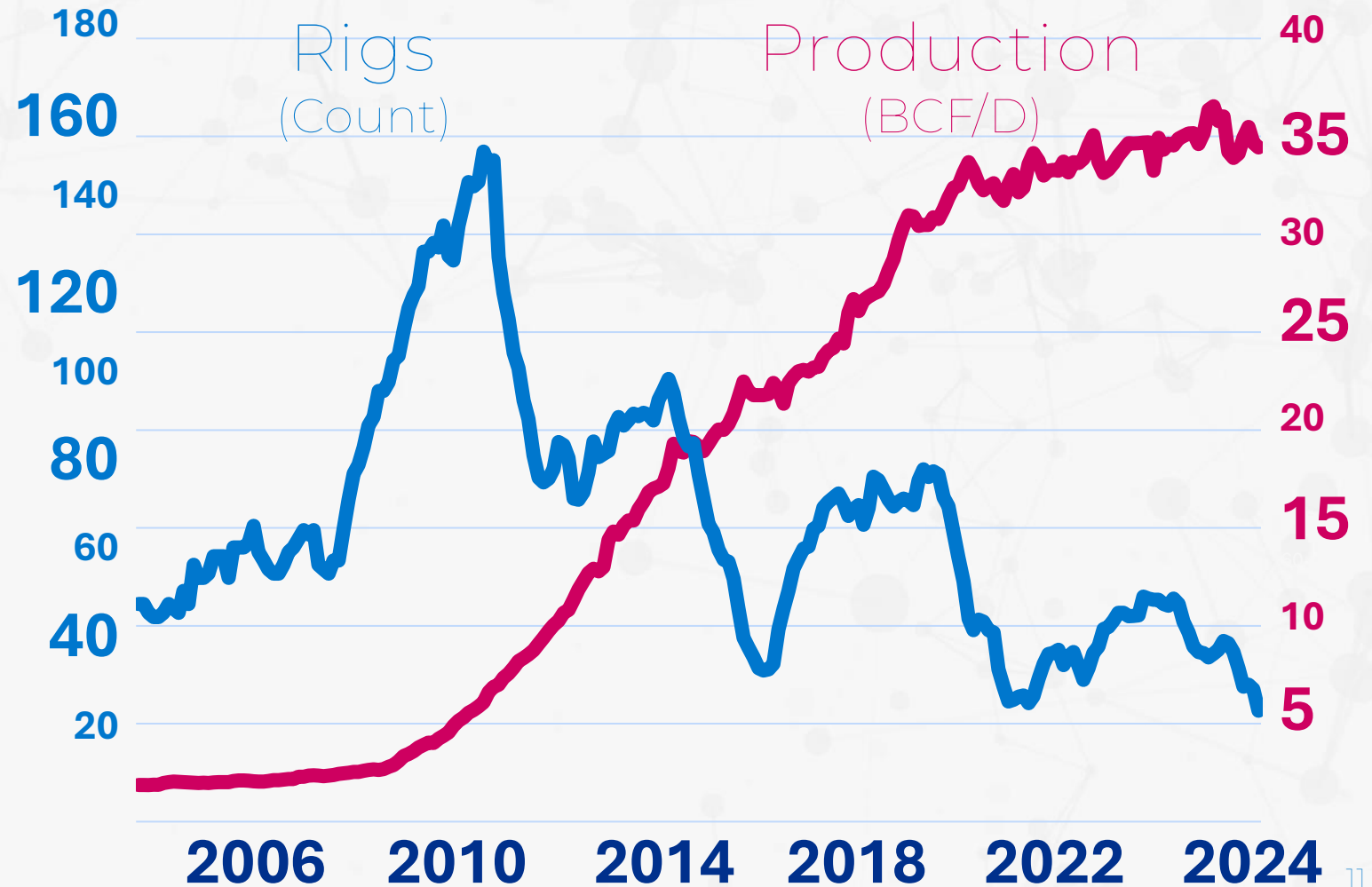
How fast have new energy sources grown?



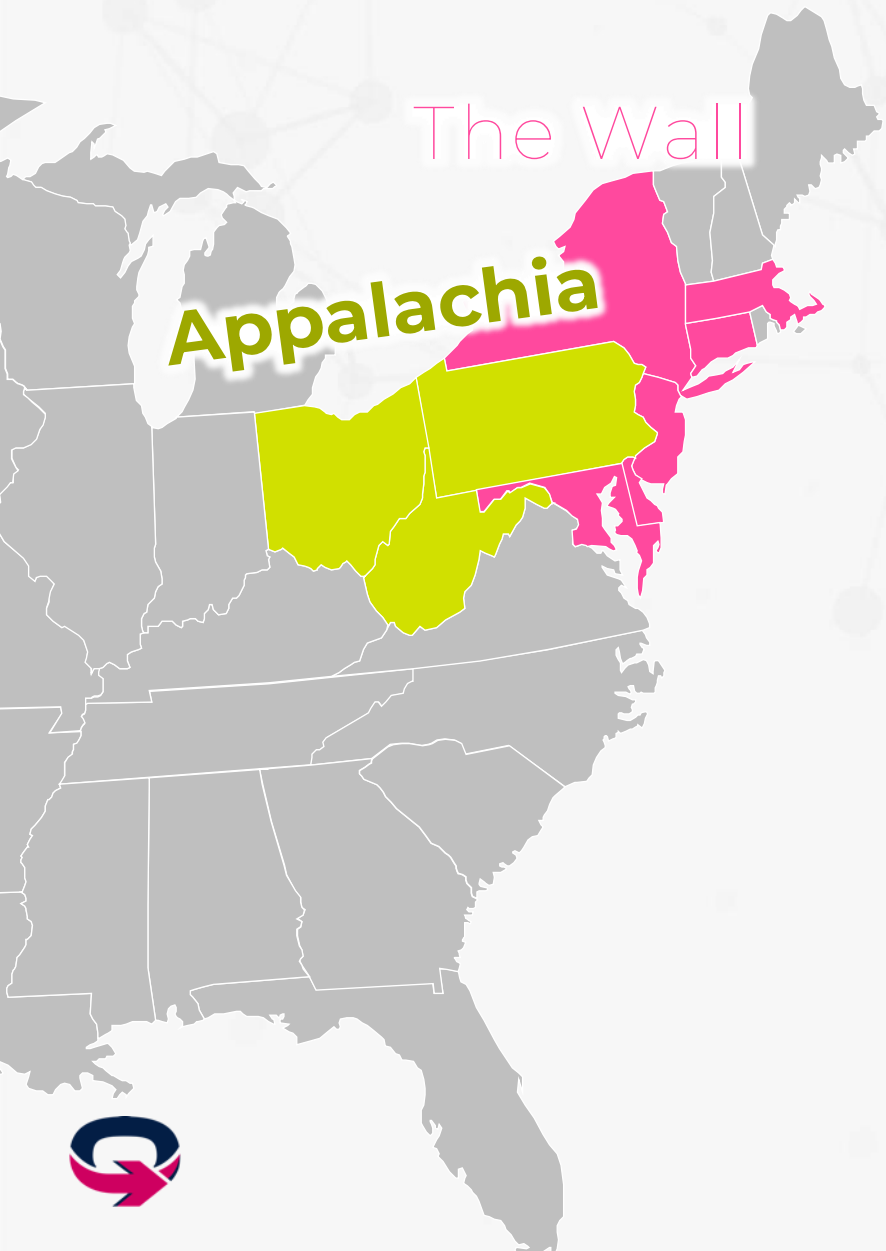
The biggest impact occurred in Appalachia



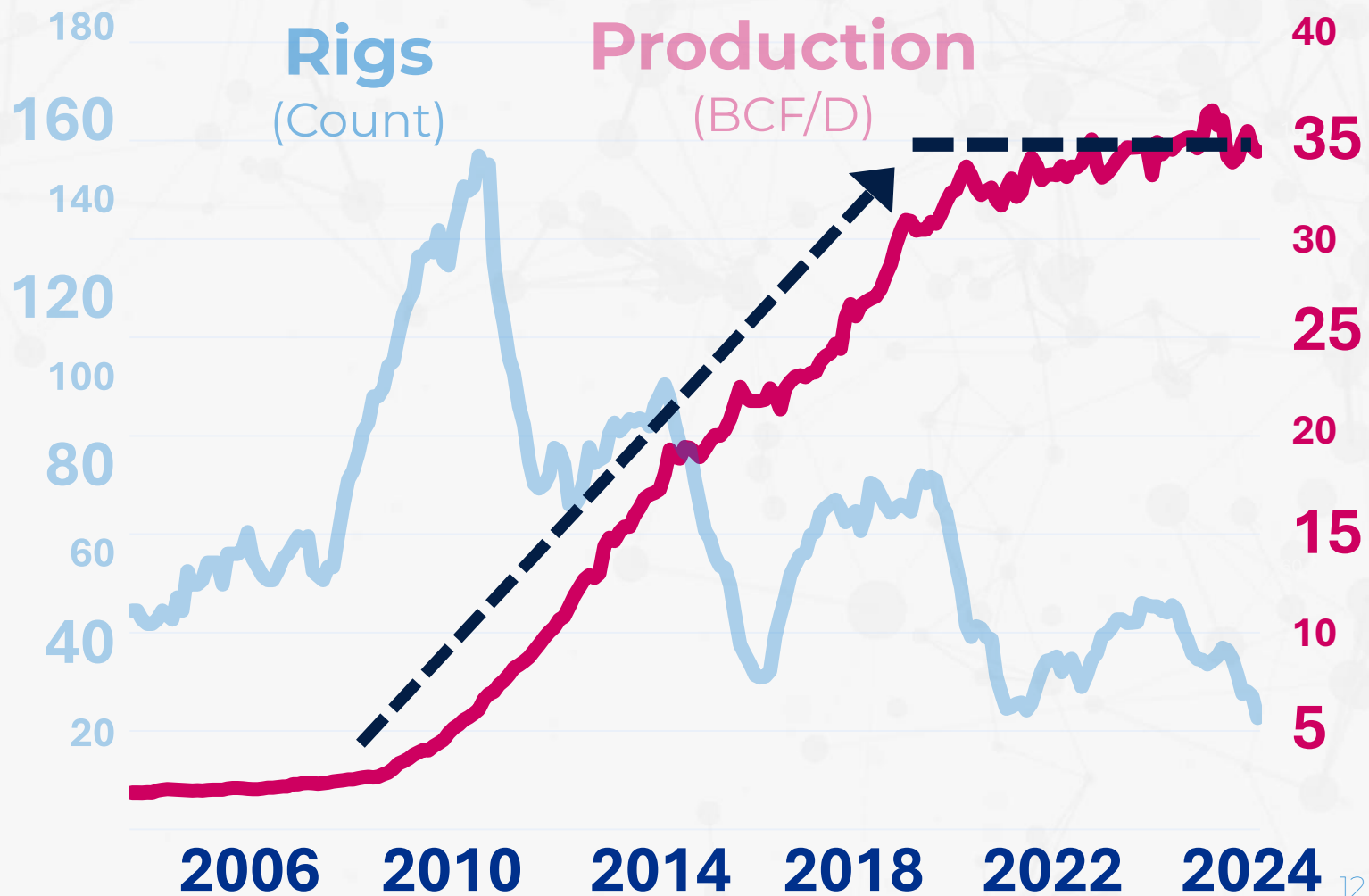
Appalachia Natural Gas Activity



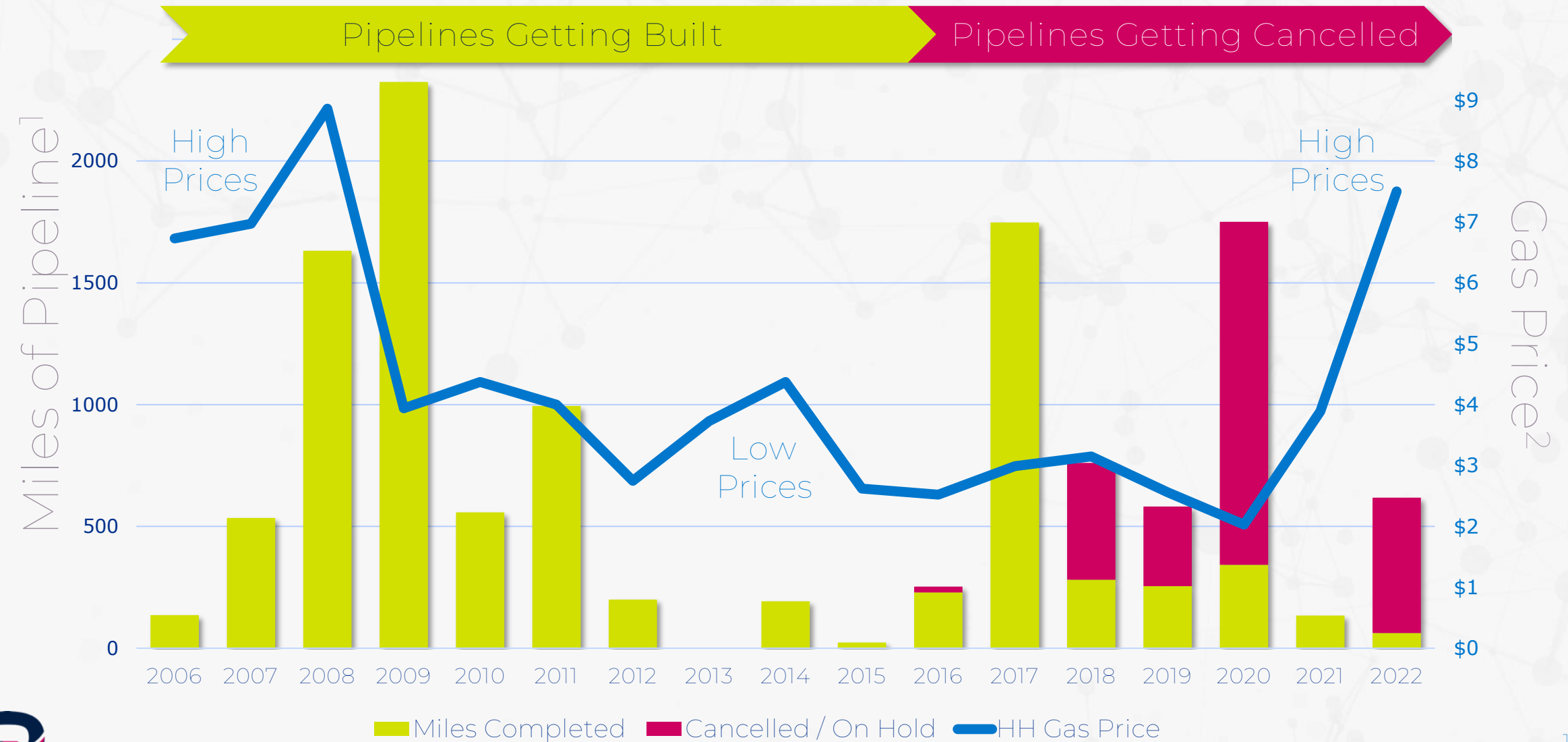
But we have hit a wall



Appalachia Natural Gas Activity



We've run out of infrastructure (transmission)



Our country requires large-scale solutions

1 Lower American Energy Bills

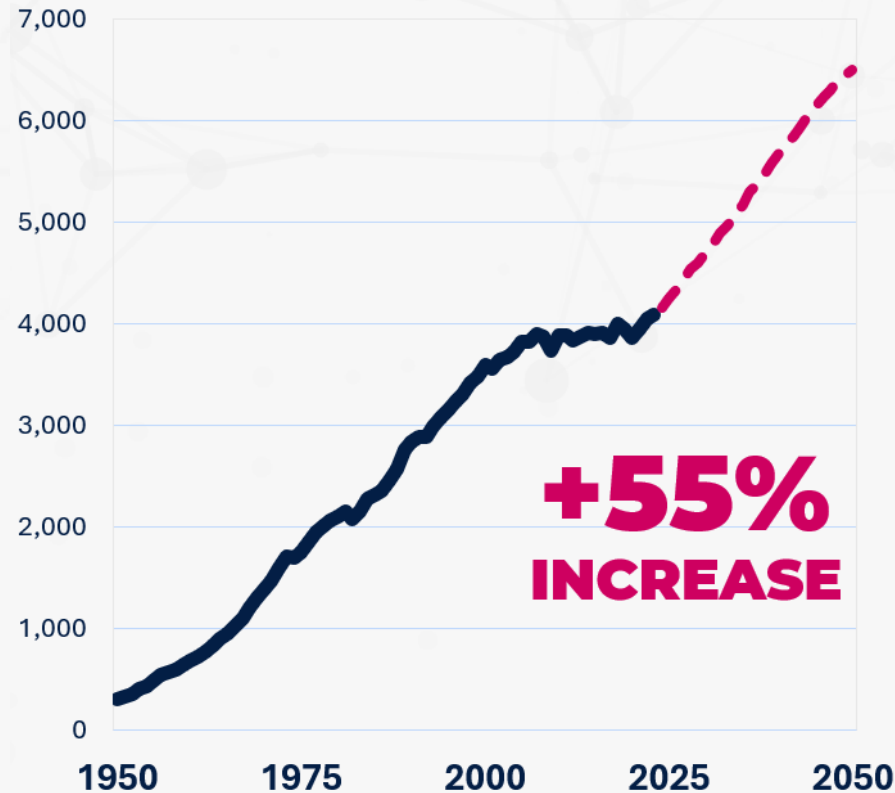


Consumer Price Index for all Urban Consumers: Energy in US City Avg.¹

SOURCE: U.S. BUREAU OF LABOR STATISTICS

Increase Supply

2 Meet future power demand



Source: IHSMarkit NA Planning Case May 2024

Build Infrastructure

3 Manage emissions



Maximize lower carbon intensity natural gas



1) Source: BloombergNEF 2022 Review, Statistical Review of World Energy.



Discussion

Summary of Performance of Specific Duties for 2024

**DRAFT SUMMARY OF
RISK and COMPLIANCE COMMITTEE'S
PERFORMANCE OF SPECIFIC DUTIES FOR 2024**

Revision: November 20, 2024

	Required Activity	Outcome	Performed Activity
1.	Review and evaluate the effectiveness, efficiency, and risk-based approach of ReliabilityFirst's compliance monitoring and enforcement programs and ReliabilityFirst's approach to addressing broader grid risks.	Complete	Accomplished during May meeting by Tom Scanlon, Enforcement Update; Accomplished by Johnny Gest in May, Regional Risk Assessment; Accomplished by December Enforcement Data Consent Agenda item
2.	Recommend for adoption by the Board amendments to or modifications of the compliance monitoring and enforcement program, as necessary or appropriate.	Not Applicable	Not applicable this year to date
3.	Review the current state and composition of the ReliabilityFirst compliance registry for Registered Entities in the Region.	Complete	Accomplished in May by Michelle Cross, Brandon Shores Case Study and the potential risks associated with planned retirements in the RF footprint. Accomplished by December Registration Data Consent Agenda item
4.	Review ReliabilityFirst's regional risk assessment and oversee facilitation and ensure effectiveness of the ReliabilityFirst stakeholder advisory and technical committees.	Complete	Accomplished by Johnny Gest in May, Regional Risk Assessment reviewing the 2024 RRA and new technical committee work; Risk and Compliance Committee Review of Regional Risk Assessment prior to publishing; RRA input obtained from industry stakeholders via RF technical committees; Accomplished by December Annual Update on RF Committee and Subcommittee Activities Consent Agenda item
5.	Review ReliabilityFirst's approach to significant enforcement actions relating to violations of Reliability Standards.	Completed	Accomplished during May, August, and December meeting (Reviewed Confidential Compliance & Enforcement Matters) by Kristen Senk and Matt Thomas.
6.	Consider any input provided by Registered Entities on risk and compliance issues and ReliabilityFirst's activities.	Completed	Presentation in August on Physical Security Overview and Update by Mary Berkley, AEP and presentation in August on Cyber Security Challenges and Approaches by Amanda Birker and Keith Mehle, FirstEnergy. Throughout the year we've also had in-person leadership discussions with several entities regarding feedback from compliance activities and enforcement actions; Presentation in December on Data Center Load Transfer Event by Jonathan Deverick, Dominion Energy
7.	Perform other activities as requested by the Board.	Complete	Accomplished throughout the year.
8.	Conduct an evaluation of the Committee's performance and charter at least annually, and adopt such Committee Charter changes, as the Committee deems appropriate, subject to approval by the Board	Complete	Accomplished in December, presenter Matt Thomas.
9.	Report regularly to the Board regarding the Committee's activities.	Complete	Accomplished during every Board of Directors meeting by Committee Chair or Co-Chair