RELIABILITY FIRST

Agenda
Board of Directors • Risk and Compliance Committee

December 2, 2026 • 12:30 PM – 3:00 PM (ET)

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

Room: Capital Room
Attire: Business Casual

Closed Agenda

1. Confidential Compliance and Enforcement Matters — 12:30 pm

Presenter: Kristen Senk, Deputy General Counsel, Tom Scanlon, Associate General Counsel and Director, Enforcement, Matt Thomas, Director, Compliance and Monitoring, ReliabilityFirst (RF)
Description: Ms. Senk, Mr. Scanlon, and Mr. Thomas will present confidential matters.
Reference: Confidential Enforcement Documents
Action: Information and Discussion

2. Adjourn Closed Session — 1:00 pm

Open Agenda

3. Call to Order and Appoint Secretary to Record Minutes — 1:10 pm

Presenter: Ken Seiler, Chair

4. Antitrust Statement — 1:15 pm

Presenter: Ken Seiler, Chair

5. Consent Items — 1:15 pm

Presenter: Ken Seiler, Chair
Reference:
a) Draft Minutes for the August 26, 2026 Risk and Compliance Committee Meeting
b) Enforcement Data (Reference Materials)
c) Annual Update of the RF Stakeholder Advisory and Technical Committees
Action: Approve Consent Items

6. PJM Operations Updates 1:20 pm

Presenter: Jason Connell, VP, Planning, PJM Interconnection LLC
Description: Mr. Connell will provide an overview of summer and winter operating conditions (expected versus experienced system performance), operation performance during any major storms, and a summary of resource retirements, additions, and major infrastructure projects determined through PJM's planning process.
Reference: Presentation
Action: Information and Discussion

7. Navigating the Integration of Inverter-Based Resources 1:45 pm

Presenter: Saurabh Vyas, P.E, General Manager, Duke Energy Corporation
Description: Mr. Vyas will provide insight into the unique challenges and characteristics associated with integrating Inverter-Based Resources into the transmission system.
Reference: Presentation
Action: Information and Discussion

8. Powering Data Centers: The Utility Perspective 2:10 pm

Presenter: Rachel Lindesmith, Director of National Accounts, FirstEnergy
Description: Ms. Lindesmith will provide an overview on the process of working with an electric utility to power a data center, including load studies, collateral, and other requirements to help provide the Committee with a deeper understanding of some challenges and considerations relating to powering data centers.
Reference: Presentation
Action: Information and Discussion

9. Risk and Data Initiative Update 2:35 pm

Presenter: Jeff Craigo, Senior Vice President Operations and Risk and Diane Holder, Vice President, Engineering and Strategic Engagement, RF
Description: Mr. Craigo and Ms. Holder will discuss plans and updates relating to operationalizing risk identification, monitoring, and mitigation efforts.
Reference: Presentation
Action: Information and Discussion

10. Charter Review and Evaluation of Committee's Performance 2:55 pm

Presenter: Matt Thomas, Director Compliance Monitoring, RF
Description: Mr. Thomas will lead the annual review of the Committee Charter and Performance of Specific Duties for 2026.
Reference:
a) Risk and Compliance Committee Charter
b) Summary of Performance of Specific Duties for 2026
Action: Accept Summary of Performance of Specific Duties for 2026

11. Next Meeting 3:00 pm

- April 28, 2027 • RF Offices

12. Adjourn 3:00 pm

Roster • Risk and Compliance Committee

Ken Seiler, Chair • Independent (2026)
Joanna Burkey • Lead Independent (2028)
Melika Carroll • Independent (2027)
Dr. Renuka Chatterjee • MISO (RTO • 2027)
Lesley Evancho • Independent (2028)
Craig Grooms • Buckeye Power (S-LSE • 2026)
Mark Mroczynski • FirstEnergy (T • 2027)

RELIABILITY FIRST

DRAFT Minutes
Board of Directors • Risk and Compliance Committee

August 26, 2026

Inn Walden
1119 Aurora Hudson Road
Aurora, OH 44202

Closed Session

Call to Order – Chair Ken Seiler called to order a duly noticed meeting of the Risk and Compliance Committee (Committee) on August 26, 2026, at 12:23 pm (ET). A quorum was present, consisting of the following members of the Committee: Ken Seiler, Chair; Melika Carroll, Vice Chair; Joanna Burkey; Lesley Evancho; and Mark Mroczynski. A list of others present during the Committee meeting is set forth in Attachment A.

Confidential Compliance & Enforcement Matters – Kristen Senk, ReliabilityFirst's (RF) Deputy General Counsel, Matt Thomas, RF's Director of Compliance Monitoring, and Tom Scanlon, Associate General Counsel and Director of Enforcement, presented on confidential matters.

Adjourn – Chair Ken Seiler adjourned the Closed Committee meeting at 1:00 pm (ET).

Open Session

Call to Order – Chair Ken Seiler called to order a duly noticed open meeting of the Committee at 1:05 pm (ET).

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

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

Approve Risk and Compliance Committee Meeting Minutes – Chair Seiler presented draft minutes for the April 29, 2026 Committee meeting. Upon a motion duly made and seconded, the Committee approved the minutes.

Keynote Speaker – Howard Gugel, Senior Vice President of Regulatory Oversight at NERC, provided an overview of emerging reliability risks. He discussed the rapidly changing resource mix, large increases in demand, extreme weather, and other threats. Mr. Gugel provided a performance update on how the system performed during record-breaking high temperatures in July. He also discussed increasing reliance on natural gas and NERC's actions to address the reliability impacts of increasing computational loads. These actions include updating the NERC registry criteria, developing new Reliability Standards, and creating technical resources like white papers, reliability guidelines, NERC alerts, and incident reviews.

Mr. Gugel then discussed inverter-based resources (IBR) and the IBR registration activities and work plan. There was discussion on the IBR registration timelines and implementation plans. There was also discussion on how NERC is using AI in the standards drafting process, as well as the role of energy analysis in reliability assessments.

DTE's Journey with AI – Steve Ambrose, Vice President and CIO at DTE Energy, presented on DTE's journey related to AI, including how DTE evolved from pilot projects to enterprise scale use and how they ensure proper AI governance and cybersecurity. He discussed how DTE's AI governance includes enterprise level oversight and includes a structured intake and review process with participation from technology, cybersecurity, legal, privacy, and business stakeholders. He also shared the levels of DTE board and board committee oversight associated with the AI program.

Mr. Ambrose discussed how advances in Frontier AI (such as Mythos) have accelerated the speed, scale, and accessibility of cyber threats, requiring more proactive responses. He described how cybersecurity controls, workforce readiness, and human judgment are all important components of a secure AI program. There was then Board discussion on the different types of US-based AI models, and strategies for selecting an AI model for broad company use vs. different AI tools for certain targeted functions. As an example, Mr. Ambrose discussed an AI tool that applies generative AI to analyze contracts and invoices to strengthen compliance and identify savings opportunities. He also shared how DTE encourages employee-led grassroots AI innovation, which has resulted in various use cases that improve efficiency.

Risk and Data Initiative – Atif Usman, RF's Director of Analytics and Risk, and Jeff Craigo, RF's Senior Vice President, provided an update on the RF risk and data initiative. Mr. Usman shared the background for the initiative, stating that RF is advancing the Regional Risk Assessment (RRA) program from a periodic assessment process to a data-driven risk management framework. He stated that the initiative is putting in place a repeatable process for identifying, prioritizing, monitoring, and mitigating reliability risks affecting the Bulk Power System (BPS) within the RF footprint.

Mr. Usman shared the goals for the RRA, which include establishing a three-year strategic risk management plan, monitoring and analyzing risk trends, developing proactive

mitigation strategies, and leveraging AI to enhance risk detection and analysis. He gave an overview of the risk framework, the Regional Risk Management Procedure, the eight risk categories, and the role of risk owners who will help identify and monitor data sets and metrics and prioritize risks. He concluded by outlining next steps in the initiative, such as finalizing a data gap analysis, assessing analytics tool needs, and further defining the periodic risk review and reporting functions.

Enforcement Trends – Tom Scanlon, RF's Director of Enforcement, provided an update on enforcement activities. He shared the annual violation intake numbers over the past five years and emphasized that a high volume of violations doesn't necessarily mean there is higher risk. Mr. Scanlon stated that the majority of violations are self-reported or self-logged by registered entities, which demonstrates the effectiveness of these mechanisms.

He presented metrics on the number of violations RF has annually processed over the past five years, which has consistently gone up each year. He also showed the number of cases closed in less than 180 days, which was 37 cases from 2022-2024 and 228 cases from 2025 to date in 2026. Mr. Scanlon highlighted the focused work and the variety of efforts that supported this efficiency gain. He then discussed enforcement priority areas, including vegetation management (FAC-003), facility ratings (FAC-008), protection and control (PRC-005, PRC-019, PRC-024, PRC-025, PRC-026, PRC-027), information protection (CIP-001, CIP-004), and asset identification (CIP-002, CIP-010). Chair Seiler then shared Mr. Scanlon's recent promotion to Associate General Counsel and Director of Enforcement.

Next Meeting – Chair Seiler noted that the next Committee meeting will occur on December 2, 2026, at the NERC offices in Washington, DC.

Adjourn - Chair Seiler adjourned the Committee meeting at 2:48 pm (ET).

As approved on this 2nd day of December 2026 by the Risk and Compliance Committee,

Niki Schaefer
Vice President, General Counsel & Corporate Secretary

Attachment A

Others Present During the Risk and Compliance Committee Meeting

Steve Ambrose • DTE
Alison Archer • MISO
Jeff Craigo • ReliabilityFirst
Michael Del Viscio • PJM
Chelsey Eppich • ReliabilityFirst
Tom Foster • PJM
Tim Gallagher • ReliabilityFirst, President & CEO
Howard Gugel • NERC
Vinit Gupta • ITC Holdings
Diane Holder • ReliabilityFirst
Christi Klein • ReliabilityFirst
Marcus Noel • ReliabilityFirst
Aubrey Patterson • AEP
Nelson Peeler • Duke Energy
Joe Pilch • ReliabilityFirst
Zee Rafi Barletta • ReliabilityFirst
Tom Scanlon • ReliabilityFirst
Niki Schaefer • ReliabilityFirst
Kristen Senk • ReliabilityFirst
Paul Spicer • WEC Energy Group
Nathan Sterrett • ReliabilityFirst
Robert Taylor • Invenergy
Brian Thiry • ReliabilityFirst
Matt Thomas • ReliabilityFirst
Jody Tortora • ReliabilityFirst
Jim Uhrin • ReliabilityFirst
Atif Usman • ReliabilityFirst
Janine Valvoda • ReliabilityFirst

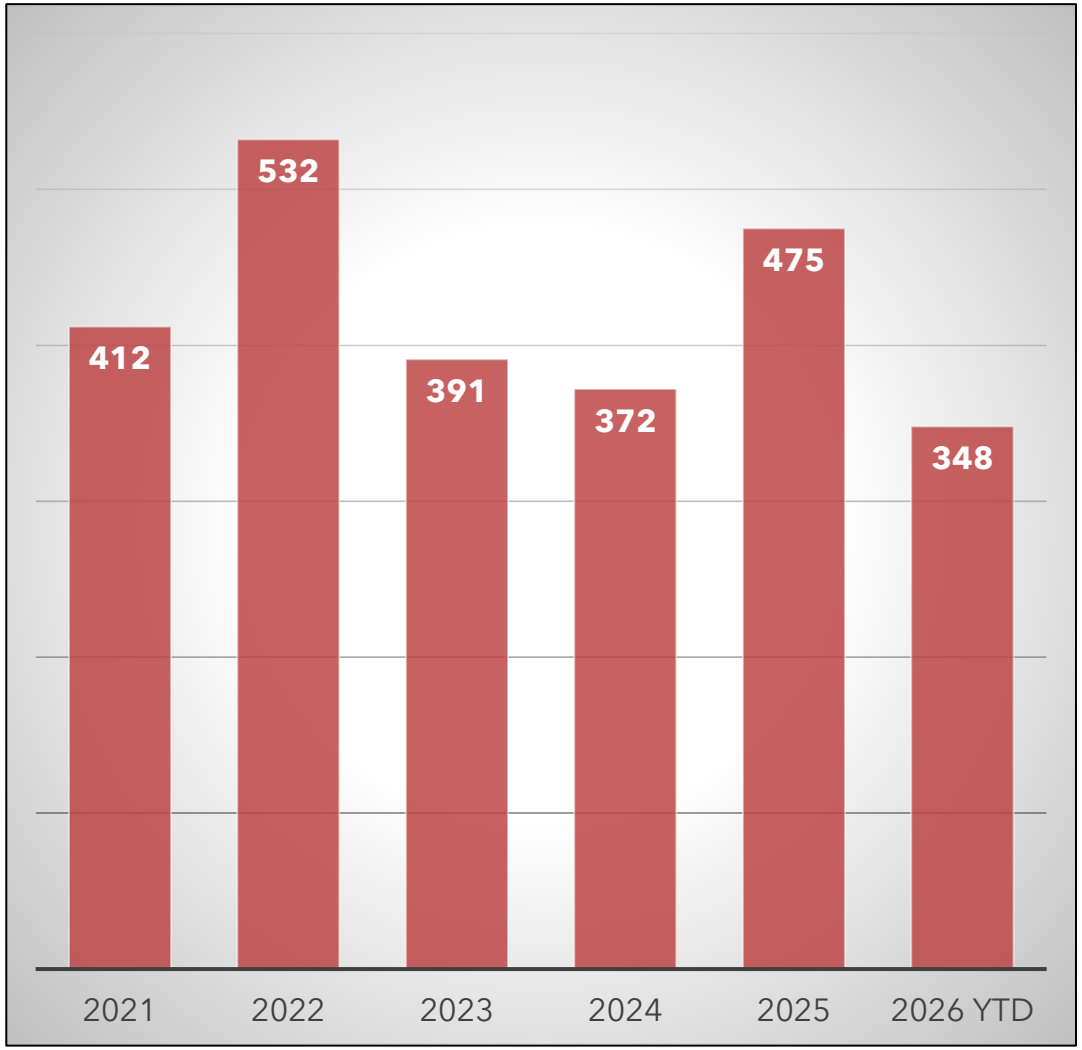
Enforcement Data (Reference Materials)

SUMMARY – ENFORCEMENT DATA

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

The data shows that violation intake remains high. At the current pace, ReliabilityFirst is on track to receive approximately 407 violations in 2026. A significant 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) between January 1, 2026, and November 8, 2026, most were lower risk violations. The team expects to process well over 500 violations by the end of 2026. There is a slide summarizing ReliabilityFirst's violation inventory—most of the cases are considered relatively new, with approximately 83.5% identified between 2025 and 2026, 13.6% identified in 2024, 2.6% identified in 2023, and 0.3% identified in 2022.

RF ANNUAL VIOLATION INTAKE

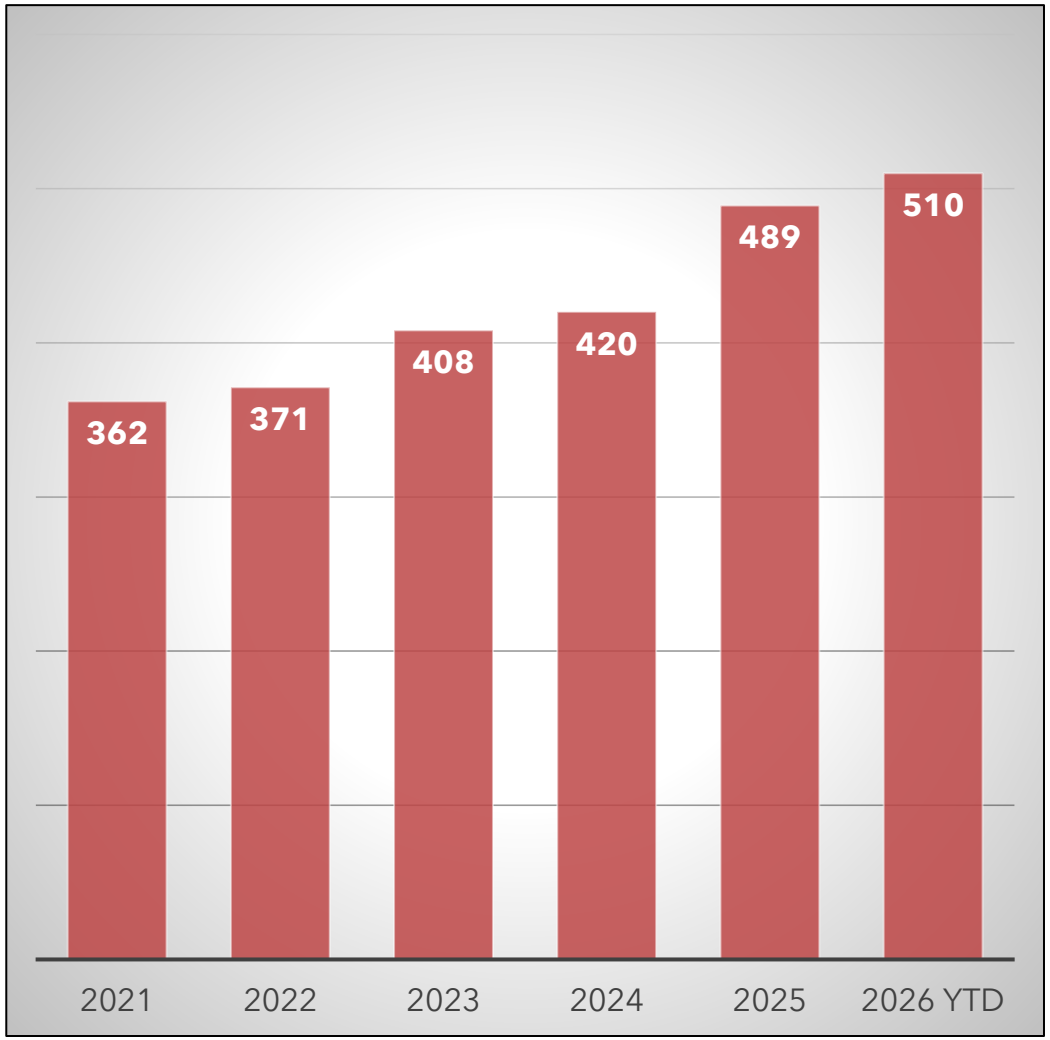


2026 Commentary:

- Year-to-date as of 11/08/2026; and
- Majority self-reported/self-logged (~83%).

FORWARD TOGETHER RELIABILITYFIRST

RF ANNUAL VIOLATIONS PROCESSED

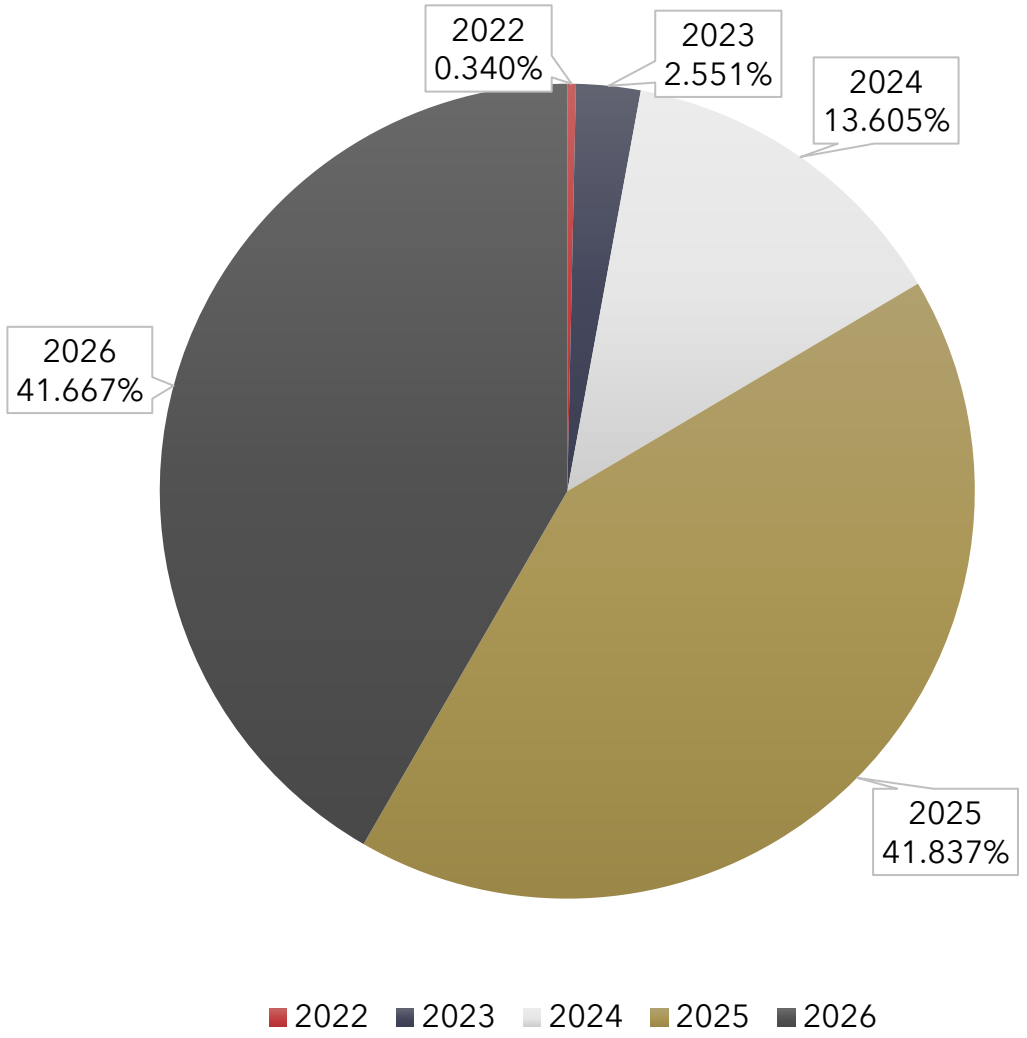


2026 Commentary:

- Year-to-date as of 11/08/2026; and
- ~85% were processed as Compliance Exceptions or Find, Fix, and Track Reports.

FORWARD TOGETHER RELIABILITYFIRST

RF INVENTORY BY YEAR REPORTED



RELIABILITY FIRST

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 ReliabilityFirst (RF) stakeholder advisory and technical committees, which the Risk and Compliance Committee oversees. During 2026, the committees supported RF's risk-management and reliability priorities by reviewing regional risks and assessments, evaluating system events and emerging reliability issues, sharing industry practices, and identifying areas for continued focus in 2027.

Reliability Committee (RC)

- Reviewed the RF Protection Subcommittee's 2025 Misoperation Assessment Report and RF Transmission Performance Subcommittee's 2025 Transmission Outage Assessment Report.
- Reviewed 2025-26 RF Regional Risk Assessment Survey Results/Risk Ranking
- Discussed and reviewed 2027 RF RRA Work Plan

Transmission Performance Subcommittee (TPS)

- RF Staff delivered 2026 Dynamic Analysis activities presentation
- Knowledge sharing on Large Load Interconnection Processes, IBR Verification Processes and Large Load Forecasting and FERC Order 881

Protection Subcommittee (PS)

- Discussed large-load disturbances and ride-through, upcoming reliability standards, relay-failure causes, and sub-synchronous oscillation challenges associated with computational loads
- Continued collaboration and assessment related to protection-system misoperations
- RF Staff presented on upcoming Standards and Relay Failure causes
- Presentation and knowledge sharing on sub-synchronous oscillation challenges with AI computational large loads

Generator Subcommittee (GS)

- Shared practices and lessons learned related to physical security for remote locations, IBR ride-through, generator performance, and large-load commissioning.
- Reviewed significant system events and generation-related reliability issues, including extreme-weather and winterization considerations.
- Identified potential Reliability Committee assignments and future training topics and continued efforts to strengthen stakeholder participation

Navigating the Integration of IBR's

December 2026








DUKE ENERGY®

BUILDING A SMARTER ENERGY FUTURE℠

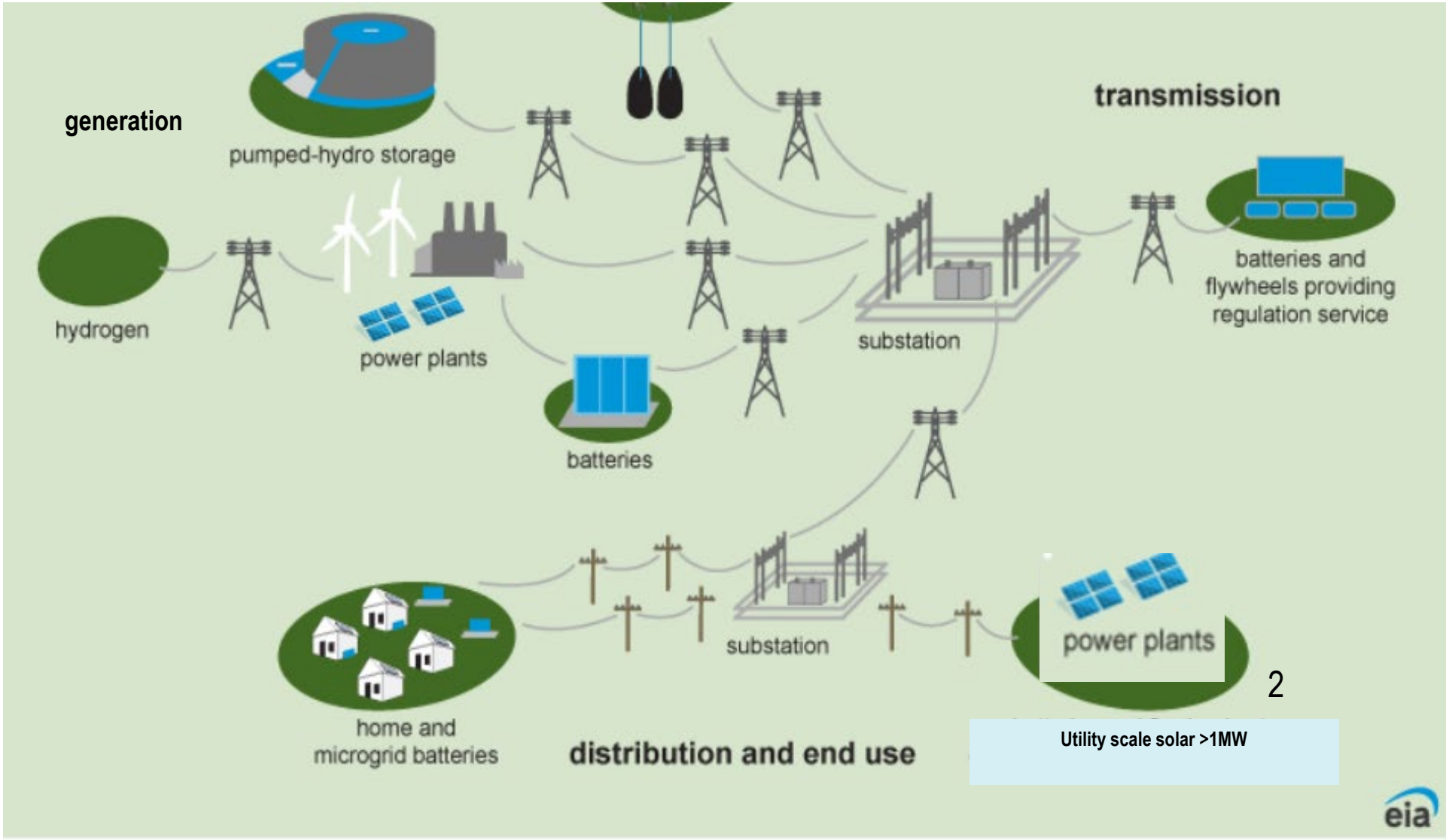
Saurabh Vyas

General Manager Grid Integration

Grid Integration

Planning for tomorrow – today

IBR and DER Integration



Types of IBR Plants

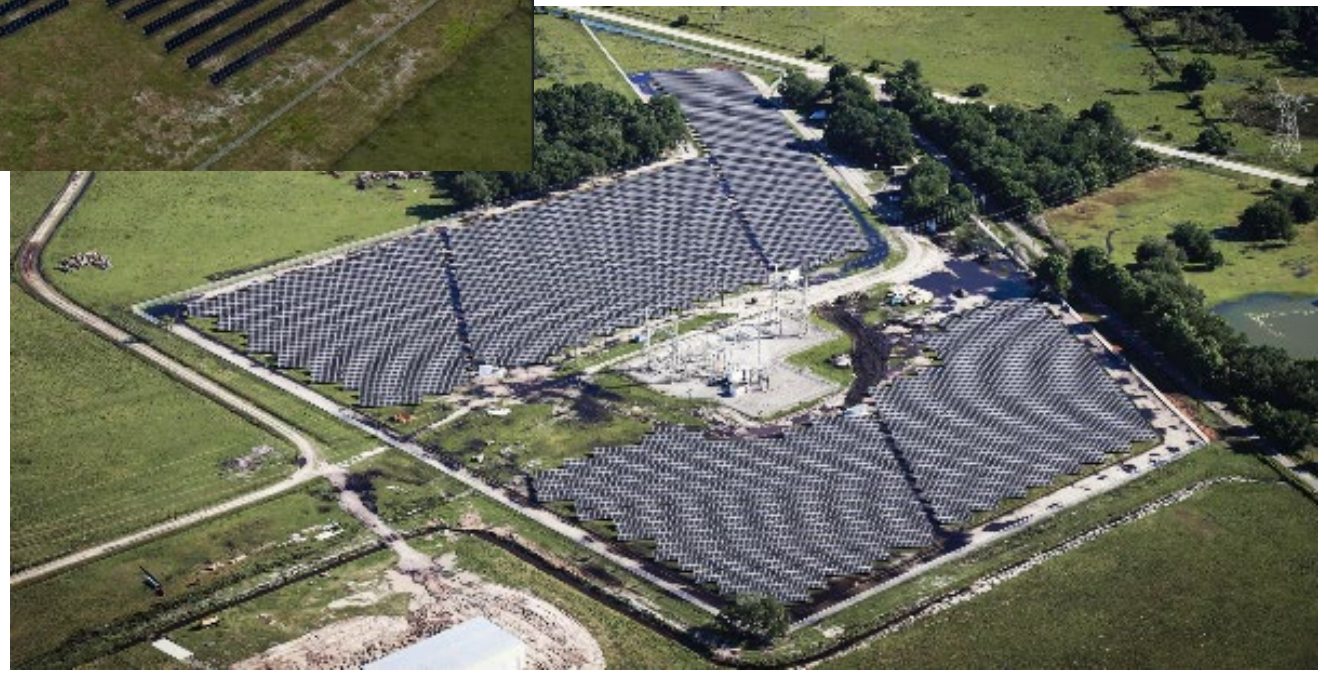
- **Solar PV Plants:** Convert sunlight into direct current (DC), which inverters change into alternating current (AC).
- **Wind Power Plants:** Modern wind turbines (Types 3 and 4)
- **Battery Energy Storage Systems (BESS):** Store and discharge electrical energy via power conversion systems.
- **Hybrid Plants:** Combinations of solar, wind, or storage co-located at a single interconnection point.

IBR: Inverter Based resources (Transmission-connected), DER: Distributed Energy resources (Distribution-connected)

IBR- Solar Plants

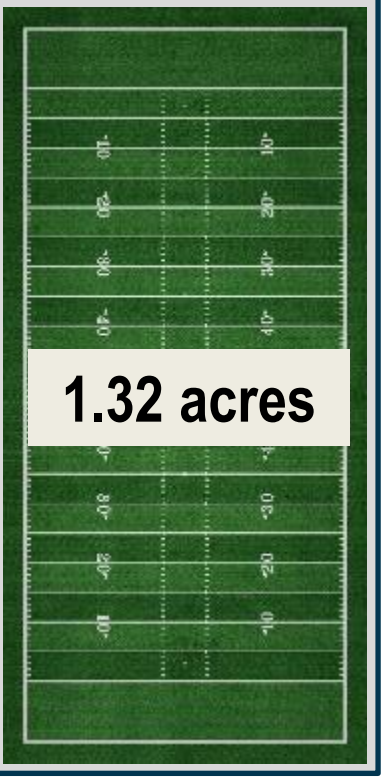


- Large land area requirement for utility scale power generation
- Solar Site configurations
  - Centralized vs Distributed
  - Inverters (String vs Central)
  - Inverters (OEM's)

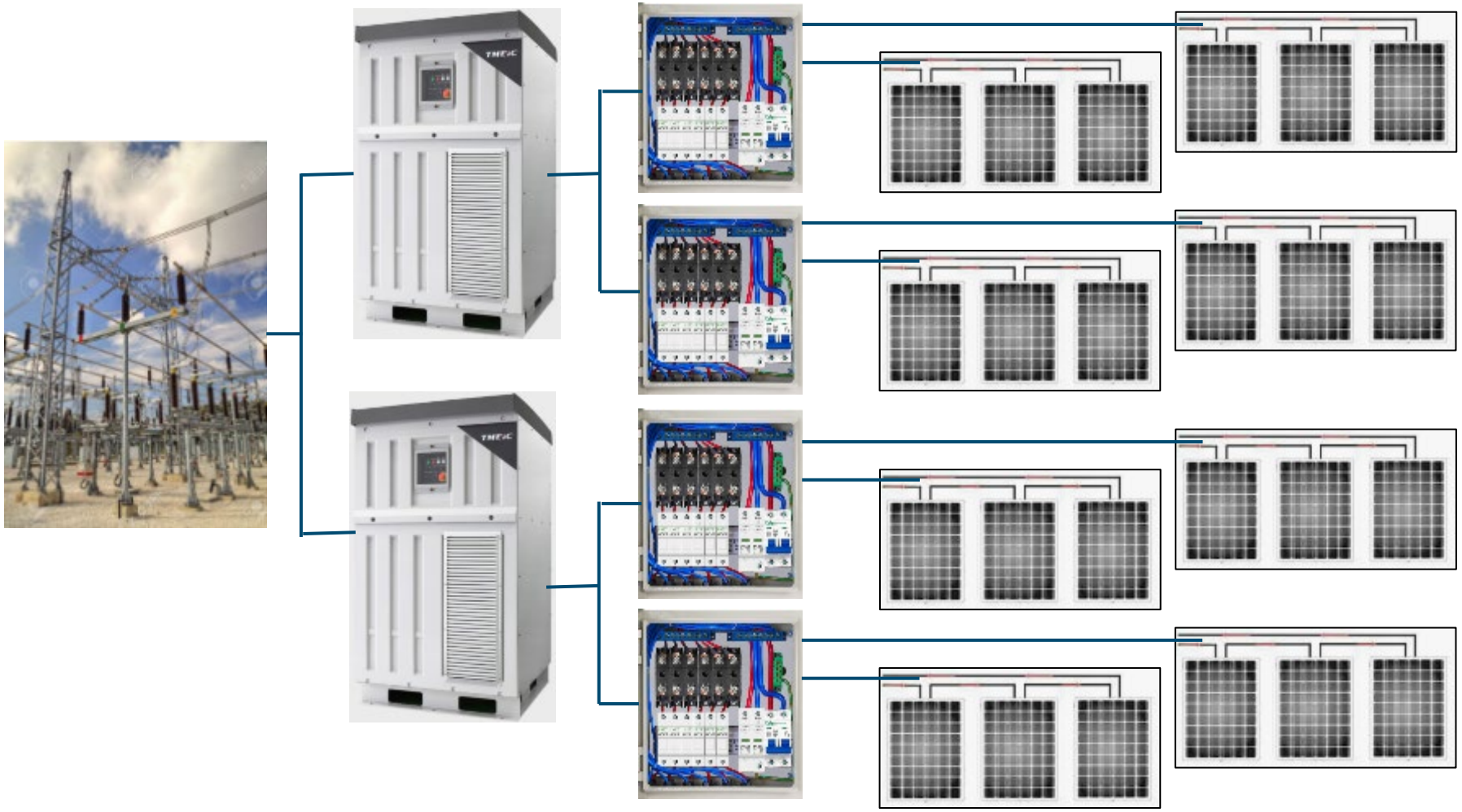


IBR Solar Plant
74.9 MWac / 100 MWdc
(625 acres)

Site = 473 Football Fields



IBR- Solar Plant: Electrical architecture



IBR- Battery Energy Storage System (BESS) Plant



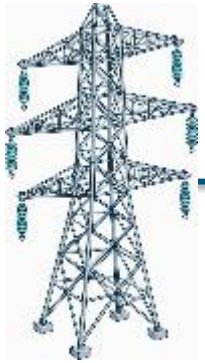




BESS Plant: Electrical architecture

Grid interface

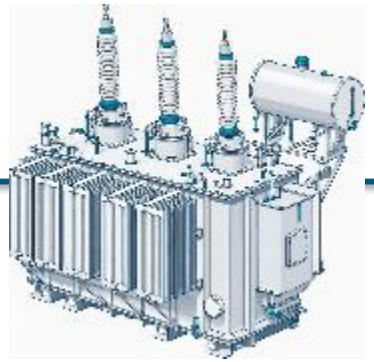
115 kV



Connects the plant to the utility grid

Main transformer

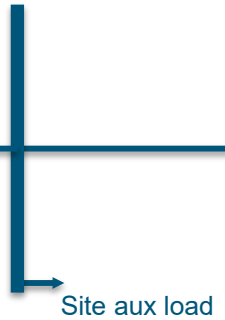
GSU: 115 / 34.5 kV
112 MVA



Transforms voltage

Collector system

34.5 kV



MV electrical network

MV transformer

34.5 kV/690V



Transforms voltage

Power conversion

Inverter , 5.37 MW per skid



Converts between AC to DC

Battery system

Battery Stack
6 enclosures per skid
Energy per enclosure: 2.436 MWh



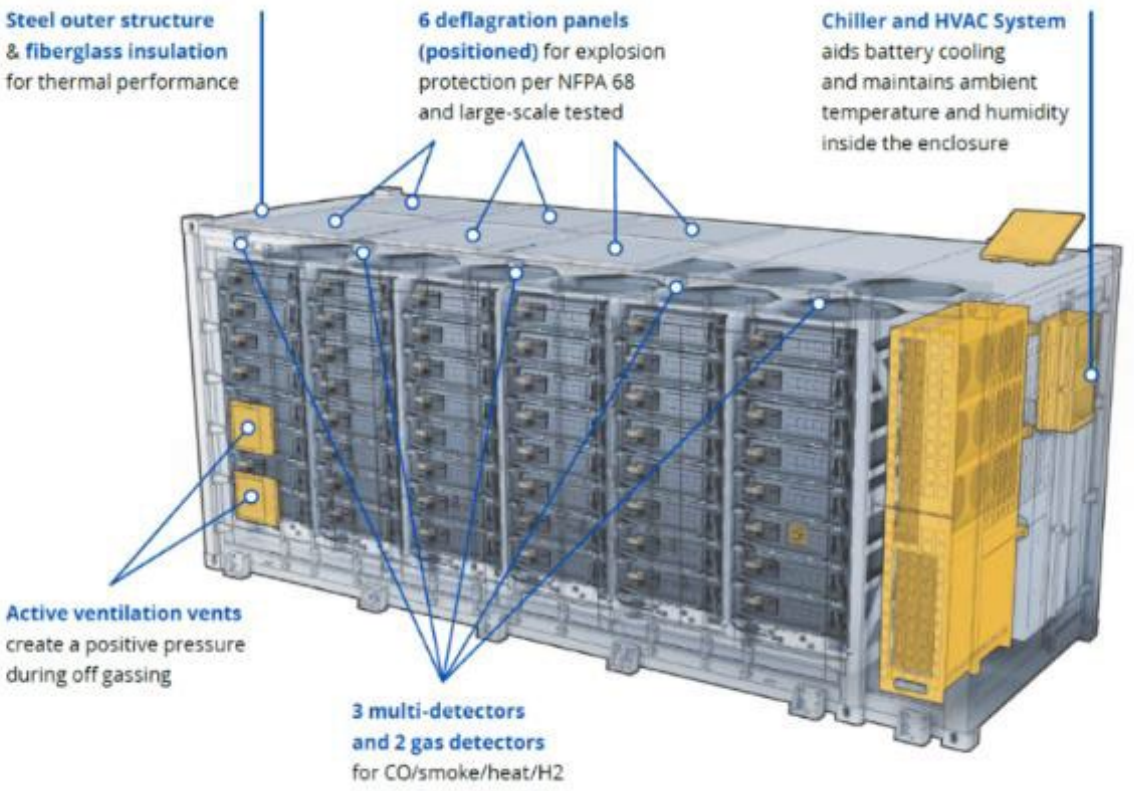
Stores energy and returns it to the grid

Inverters and MV Transformer

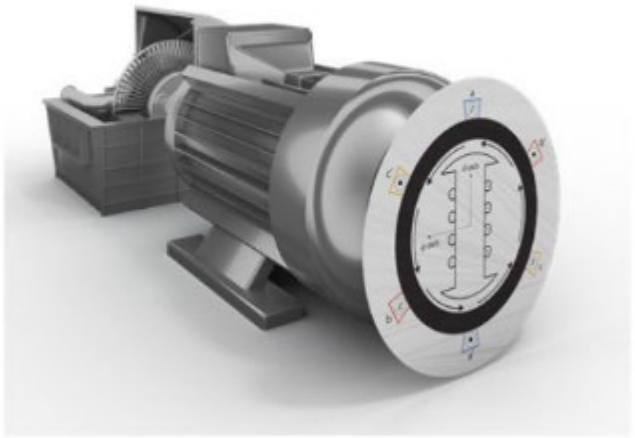


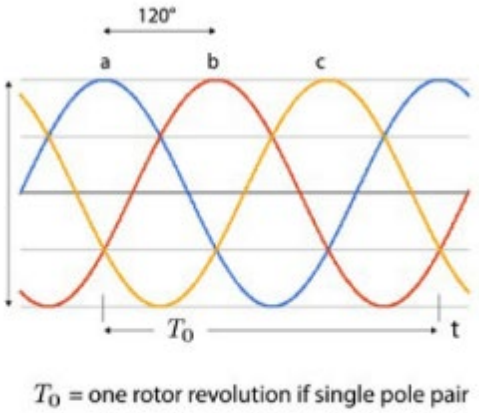
Battery system overview

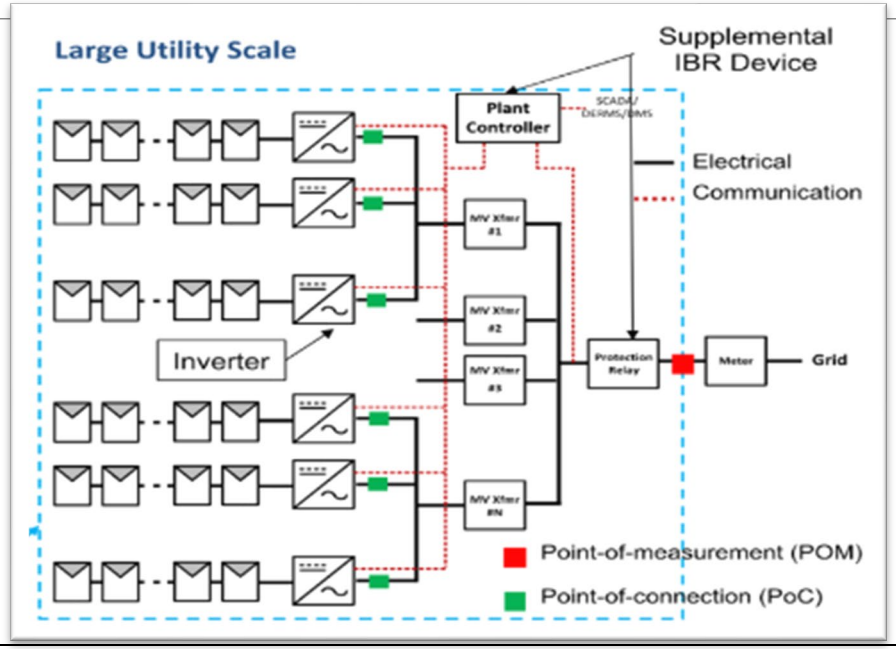




Synchronous vs Inverter Based Resources (IBR) Generators







- Synchronous generator (SGs) naturally generate a sinusoidal output voltage waveform; they are grid-forming devices
  - A de-facto voltage source on the power system
  - A large mass (the turbine/generator) is electromagnetically synchronized to the AC power system
  - Large, transient over currents in faulted conditions (4 to 7 times rated)
- Governors, which change mechanical power, are relatively slow (> 0.5 seconds)
  - Load perturbations initially met by inertial energy

- IBRs predominantly use grid-following inverters, which rely on sensed information from the grid (e.g., a voltage waveform) to produce the desired AC active and reactive power output.
- IBRs are not directly synchronized to the electric power system and must be programmed to support the electric power system and to ride through a disturbance.
- During certain disturbances, some IBRs cease to provide power to the Bulk-Power system due to how they are **configured** and **programmed**. This actual operation may conflict with the power system simulations, if the model was configured to maintain active power output and provide voltage and frequency support.

Grid Disturbances: Ride-Through

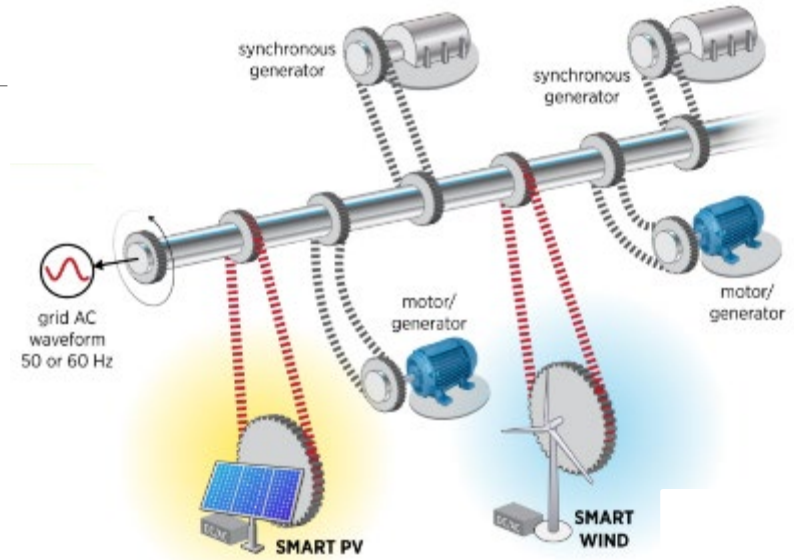
Grid Disturbances:

- *Small Disturbances:* Normal switching-type events, changes in generation and load)
- *Large Disturbances*: Fault type events (Multi-Phase or Line to Ground)

Ride Through is the capability of generators to withstand and recover from small and large disturbances inside defined limits

- Generators must remain connected, support active and reactive power injection during disturbances, and support the system to maintain overall stability.

Inverter-based resources (IBRs) have a **different** ride through response than that of synchronous generators (SGs).





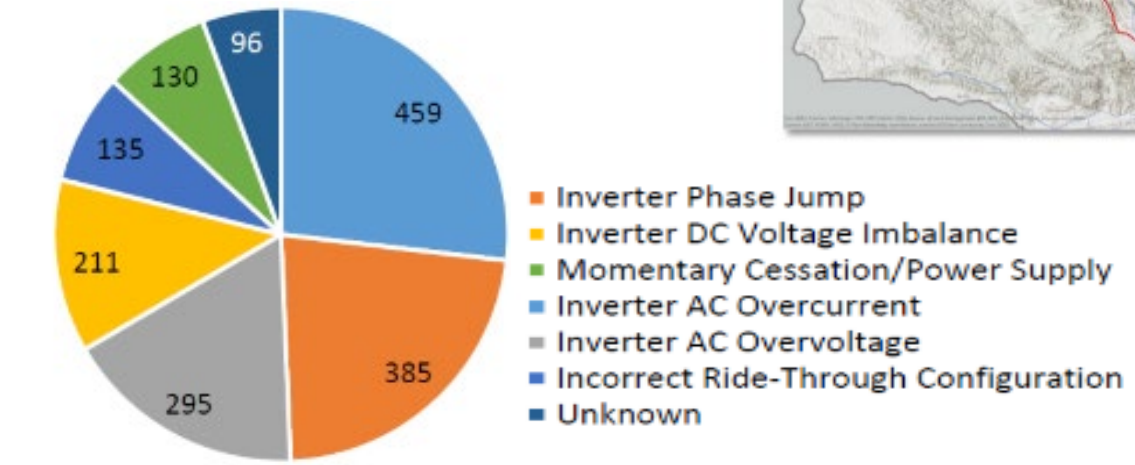
NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

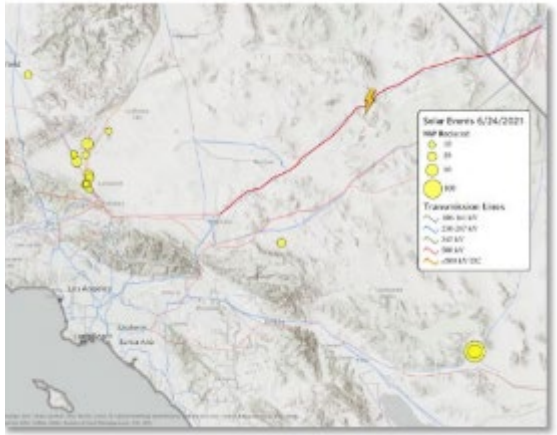
Solar Disturbance -Transmission Grid Faults

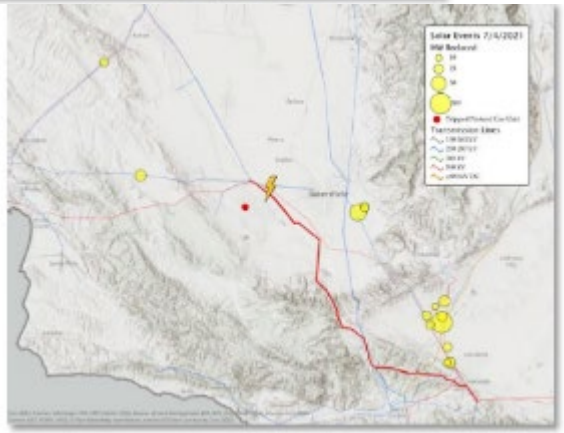


Source: NERC, 2017-2022

Causes of solar PV reduction (MW) identified by NERC (Odessa June 2022)







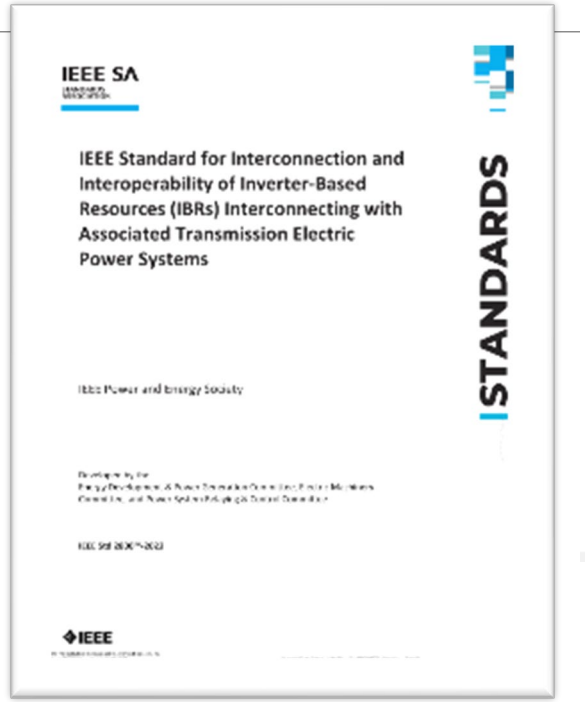
CAISO Solar: ~14GW

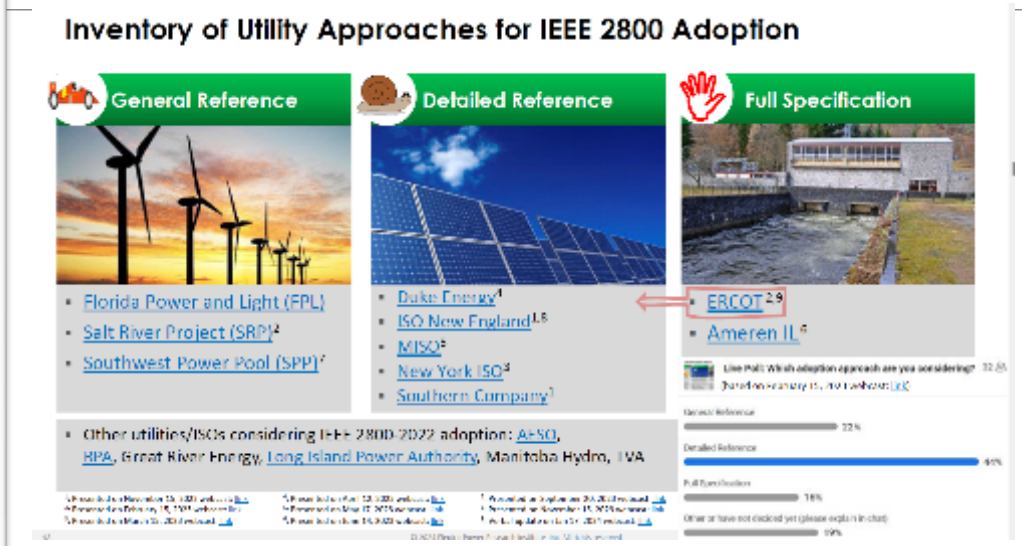
ERCOT Solar: ~10GW

Disturbance Name	Event No.	Date/Time	Fault Location	Fault Type	Clearing Times (Cycles)	Lost Generation (MW)	Geographic Impact
Blue Cut Fire	1	8/16/2016 11:45	500 kV line	Line to Line (AB)	2.49	1,178	Widespread
	2	8/16/2016 14:04	500 kV line	Line to Ground (AG)	2.93	234	Somewhat Localized
	3	8/16/2016 15:13	500 kV line	Line to Ground (AG)	3.45	311	Widespread
	4	8/16/2016 15:19	500 kV line	Line to Ground (AG)	3.05	30	Localized
Canyon 2 Fire	1	10/9/2017 12:12:16	220 kV line	Line to Line (AB)	2.85	682	Somewhat Widespread
	2	10/9/2017 12:14:30	500 kV line	Line to Line (AC)	2.86	937	Somewhat Widespread
Angeles Forest disturbance	1	4/20/2018 17:11	500 kV line	Line to Line (AB)	2.6	860	Somewhat Widespread
Palmdale Roost disturbance	1	5/11/2018 15:20	500 kV line	Line to Ground (AG)	3	630	Somewhat Widespread
San Fernando Disturbance	1	7/07/2020 11:38	230 kV line	Line to Ground (AG)	3	205	Somewhat Widespread
	2	7/07/2020 11:41	230 kV line	3 Phase	2.3	1000	Widespread
Victorville	1	6/24/2021	500 kV line	Line to Line (AB)		765	Widespread
Tumbleweed	1	7/4/2021	500 kV line	Line to Line (AB)		605	Widespread
Windhub	1	7/28/2021	500 kV line	Line to Ground (AG)		511	Widespread
Lytle Creek Fire	1	8/25/2021	500 kV line	Line to Line (AB)		583	Widespread
Odessa	1	5/9/2021 11:21	345 kV line	Line to Ground (AG)	3	1112	Widespread
	2	6/26/2021 11:14	345 kV line	Line to Ground (AG)	3	518	Widespread
Odessa	1	6/4/2022 12:59	345 kV line	Line to Ground (AG)	3	2555	Widespread

IBR Interconnection- Industry Outlook







NATF
North American Transmission Forum

NERC Findings

- Reported Solar disturbances causing bulk generation losses from Transmission grid faults in CA, ERCOT
- Mis-application of IEEE 1547
- Inconsistent modeling and study requirements
- No mutual agreement of equipment settings/models
- Little to no model "true up" at time of commissioning

NERC Recommendations

- All TOs should establish or improve clear and consistent interconnection requirements for BPS-connected IBRs
- Industry Improvements Needed
  - FERC Large Gen Interconnection Agreements (LGIA)
  - Reliability Standards for systemic issues with IBRs

Peer Utilities

- Many peers have updated IBR interconnection requirements to align w/ IEEE 2800, NERC guidelines

NATF (North America Transmission Forum)

- Participating in NATF IBR Interconnection life-cycle best practices development, kicked-off in Dec 2023

IEEE 2800: Released in April 2022, which establishes the required interconnection capability and performance criteria for inverter-based resources interconnected with transmission and sub-transmission systems.

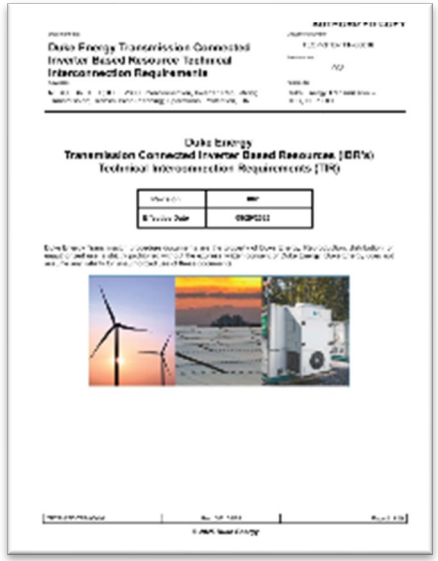
FERC Update Nov 2022 - FERC issued three orders intended to address reliability impacts from the rapid integration of inverter-based resources ("IBRs"), including solar, wind, fuel cell, and battery storage resources, on the Bulk-Power System (BPS).

FERC Order 2023: Improvements to Generator Interconnection Procedures and Agreements

FERC Order 901: Reliability Standards to Address Inverter-Based Resources

Duke Energy: Transmission Connected IBR Documents

- Everything is based on the TIR
  - WHAT are the requirements
- The other documents are used to conduct the CPR review process
- Design Evaluation
  - List of the documents reviewed to demonstrate HOW the design complies with the TIR
- Coordination Document
  - Specific details of the design
  - HOW the design complies with the TIR
- Guidelines
  - Provide guidelines, recommendations, supplemental information to help clarify how to comply with the TIR



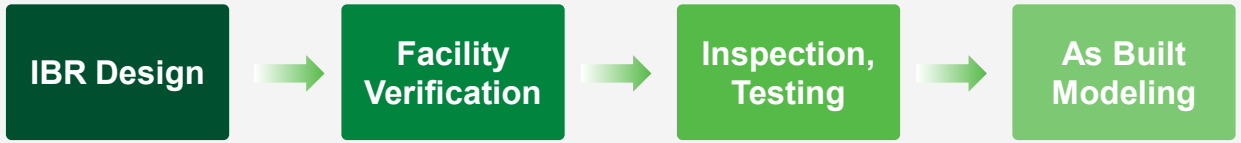
Effective developer integration and commissioning are crucial to progress from interconnection agreement to in-service

Developer Integration

Improved engagement with developers by aligning integration program with industry best practice, incl:

- Revised critical developer milestones to be more focused on IBR standards; leveraging Technical Standards Review Group (TSRG) for vital touch points
- Established IBR Facility Commissioning Practice

Inverter-based resources (IBR) integration key steps



IBR Commissioning

Deployed new commissioning program to:

- Include robust assessment of IBR integration
- Validate facility design to offer better operational certainty and improve system performance
- Provide deliberate hand-off to Energy Control Centers (ECC)

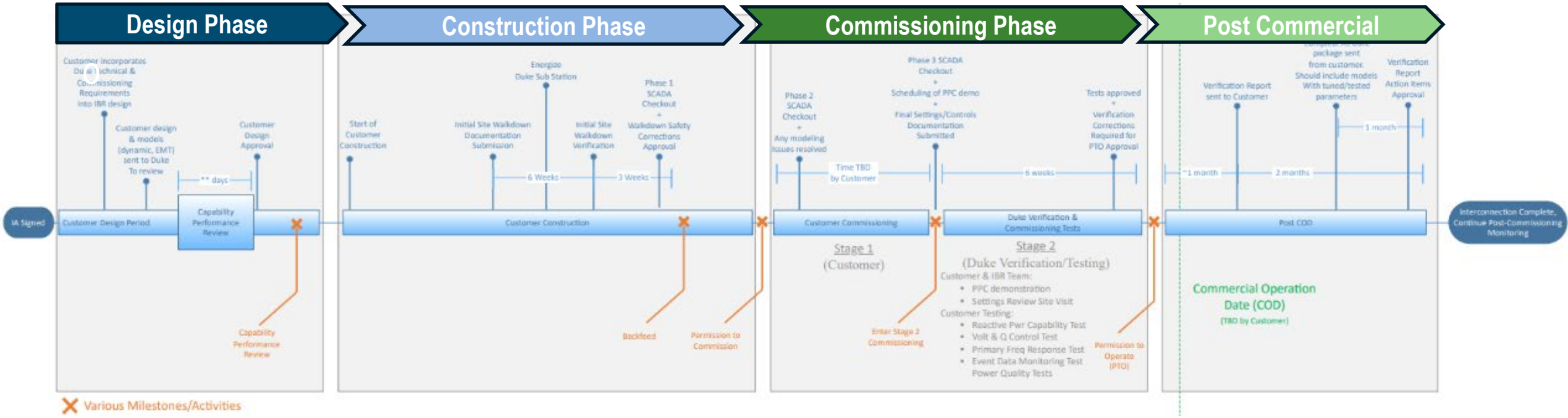
Note: IBR=Inverter-Based Resources; SCADA=Supervisory Control and Data Acquisition

Developer Milestone Examples

ID	Milestone Activity
01	Execute Interconnection Agreement
06	Customer Project Kick-Off Meeting
09	Power Plant Controller/Inverter Final Design
10	IBR Capability and Performance Requirements Review
17	Customer Substation Complete
19	Construction Walkdown Verification Complete
21	Interconnection Facilities Placed in service
25	SCADA Validation
24	IBR Facility Substation Energized (Energy Backfeed)
26	Permission to Commission Issued to Developer
27	Customer Begins Generation at Reduced Power
31	Company Verification and Commissioning Testing
28	Conditional Permission to Operate Issued (CPTO)
34	As Built Power System Models, Documentation Submitted
36	Permission to Operate Provided to Developer (PTO)

IBR Integration Process

Grid Integration
Planning for tomorrow – today

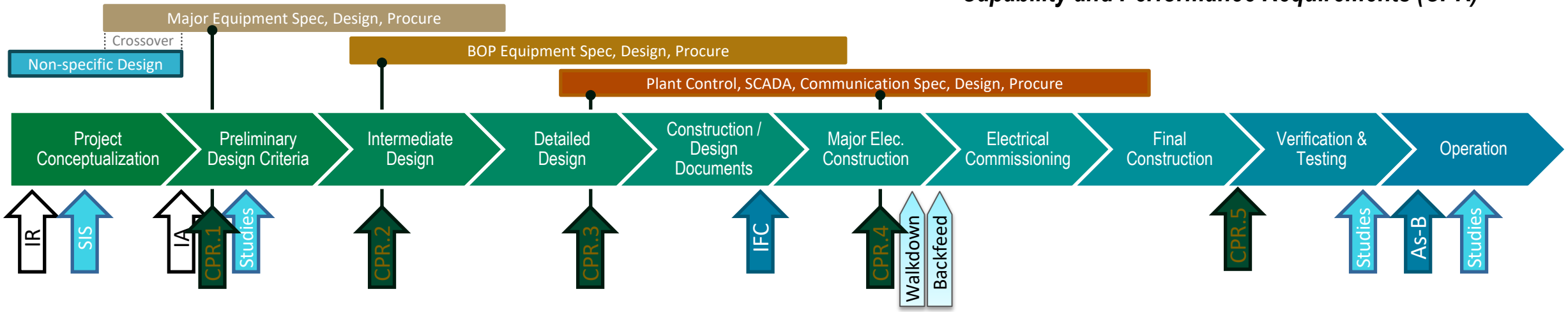


➢ Permission to Operate (PTO) Granted (MW In Operation) - Process

- PTO Pre-requisites
  - Inverters Settings/Controls site verification; Power Plant Demo - Virtual meeting w/ plant Operator to validate PPC design, settings
  - Perform IBR Plant verification testing (Reactive Power, Voltage, PQR, Power Quality), Review/Approve the test results

CPR: Aligning Reviews with the Stages of Electrical Design

**** Capability and Performance Requirements (CPR)***



CPR.1

- Substitution Notifications
- All general documents
- Plant onelines
- Equipment specifications, capability, and datasheets
- Outlines for narrative content
- Vendor specific power system models
- Harmonic & Reactive studies

CPR.2

- Updated CPR.1 documents
- Preliminary PPC narrative
- Proposed Inverter settings
- Preliminary inverter narrative
- Protection schemes and settings

CPR.3

- Any previous document updates
- Final PPC & inverter narrative
- Final Inverter settings
- Pre-commissioning plant models & parameterization
- SCADA details & specs
- Disturbance monitoring specs

CPR.4

- Any previous document updates
- Remaining CPR documents
- CPR Completion

CPR.5

- Update any CPR documents modified after Backfeed

Transmission Connected IBR Commissioning Document

AUTHORIZED COPY

Document title:	Document number:
Duke Energy Transmission-Connected IBR Commissioning Document	TECP-STD-TFP-00017
	Revision No.: 002
Keywords: IBR, Interconnection, Inverter, Regulatory, Transmission, Transmission Planning, Operations, Testing, Commissioning, Monitoring, PTO	Applies to: Duke Energy Transmission – DEC, DEP, DEF

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RISK AND DATA INITIATIVE UPDATE

Jeff Craigo, Senior Vice President, Operations and Risk

Diane Holder, Vice President, Engineering and Strategic Engagement

December 2, 2026

Washington DC

RELIABILITY FIRST

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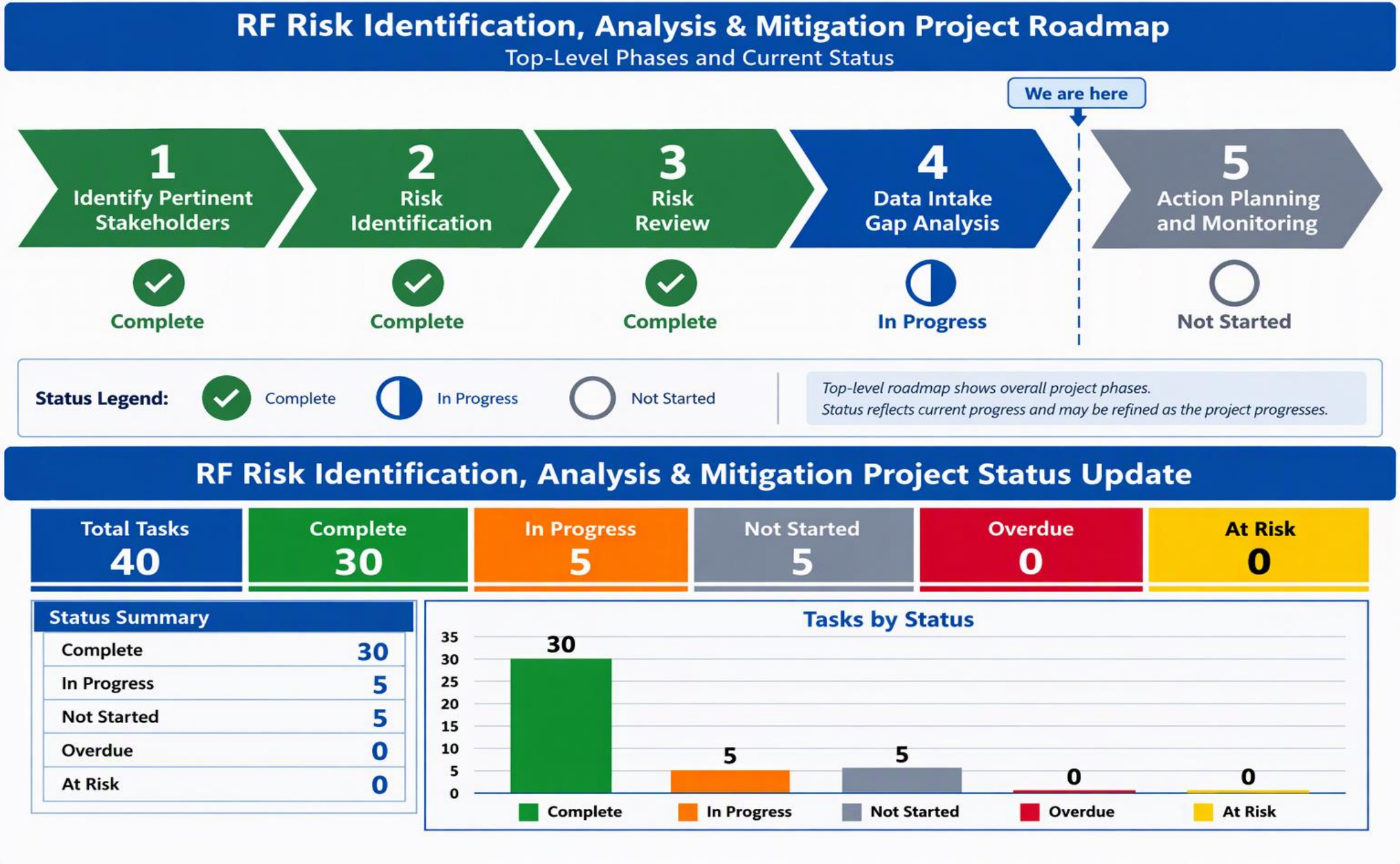
Project Plan Update



RRA OPTIMIZATION IN ACTION: SUPPLY-CHAIN METRICS

Moving from two baseline indicators to four decision-focused measures that connect vulnerabilities, asset readiness, and infrastructure delivery.

EXISTING INDICATORS

CIP-013 VIOLATION TRENDING

Are supply-chain vulnerabilities at Registered Entities increasing or decreasing?

SOLAR QUEUE DELAYS

Are supply-chain constraints delaying solar interconnections? Source: EIA.

Baseline value: identifies trends, but provides limited insight into cross-risk exposure, spare availability, and project delivery.

NEW DECISION-FOCUSED MEASURES

1 CYBER + SUPPLY-CHAIN CORRELATION	Compare CIP-008, CIP-010, and CIP-011 vulnerabilities with CIP-013 violations. Are entities with weak cyber controls more susceptible to supply-chain risk?
2 MEAN-TIME-TO-REPAIR IMPACT SCORE	Score five-year MTTR against spare inventory and reliability impact. Which BPS facilities combine limited spares with high consequence?
3 TRANSMISSION PROJECT ISD STATUS	Compare PJM and MISO need or target dates with actual in-service dates. Are reliability projects delivered when needed?
4 GENERATION QUEUE ISD STATUS	Compare PJM and MISO queue milestones with actual in-service dates. How long does it take new generation to connect to the grid?

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RRA OPTIMIZATION UPDATE: CURRENT RISK INVENTORY

Team consolidated risk statements down to 23 from 32.

RISK STATEMENTS BY CATEGORY

23 TOTAL

5	Cyber Security
4	Situational Awareness
3	Grid Transformation
3	Modeling
3	Supply Chain
2	Environmental Factors
2	Physical Security
1	Misoperations

Cyber Security has the largest current inventory (5), followed by Situational Awareness (4).

INVENTORY SUMMARY

23
ACTIVE RISK STATEMENTS
Current statements retained in the working risk inventory

8
RISK CATEGORIES
Categories represented in the current inventory

36
SUPPORTING DATA SOURCES
Sources identified to enrich risk monitoring and analysis

METRICS INVENTORY: EXISTING BASELINE AND NEW COVERAGE

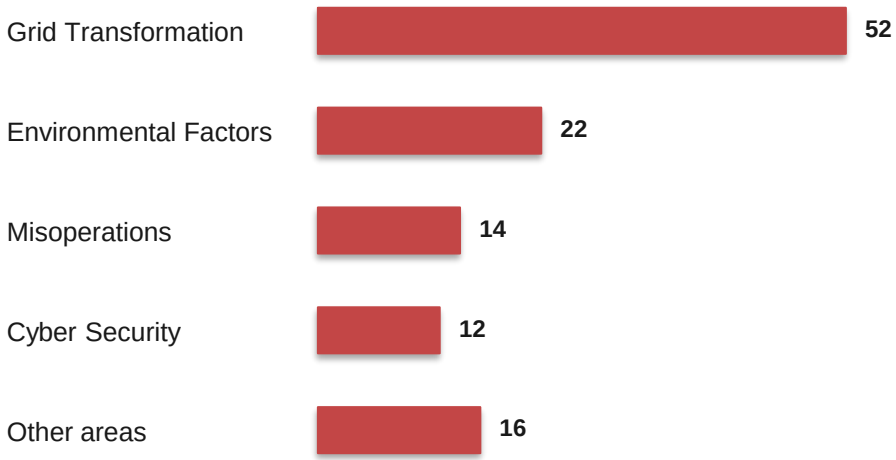
The optimized RRA builds on 116 existing metrics and adds 77+ proposed concepts to improve risk monitoring and decision support.

116 EXISTING
2025 baseline inventory

77+ PROPOSED

The combined inventory expands coverage from established indicators to emerging operational, cyber, grid-transformation, and resilience risks.

EXISTING METRICS BY RISK AREA



Other areas: Physical Security 7, Modeling 4, Situational Awareness 3, Supply Chain 2.

NEW METRIC COVERAGE

OPERATIONS & SITUATIONAL AWARENESS	Early warning, response, tool availability, latency, and signal agreement.
CYBER & PHYSICAL THREAT	Access control, credentials, vulnerabilities, AI-enabled attacks, and convergence.
GRID TRANSFORMATION & ADEQUACY	IBR penetration, firm capacity, reserve margin, computational load, and EUE.
SUPPLY CHAIN & RESILIENCE	Asset exposure, spares, mean-time-to-repair, extended outages, and external intelligence.

EXECUTING THE NEW PROCESS

The next phase moves from identifying new measures to implementing the highest-priority metrics through the approved RRA governance process.

1 PRIORITIZE

Rank metrics using risk significance, decision value, implementation effort, data availability, and urgency.

2 ASSIGN

Confirm the Risk Owner, Data Owner, and supporting team accountable for each selected metric.

3 IMPLEMENT

Develop or acquire the required data sources, calculations, analytical methods, and reporting components.

4 OPERATIONALIZE

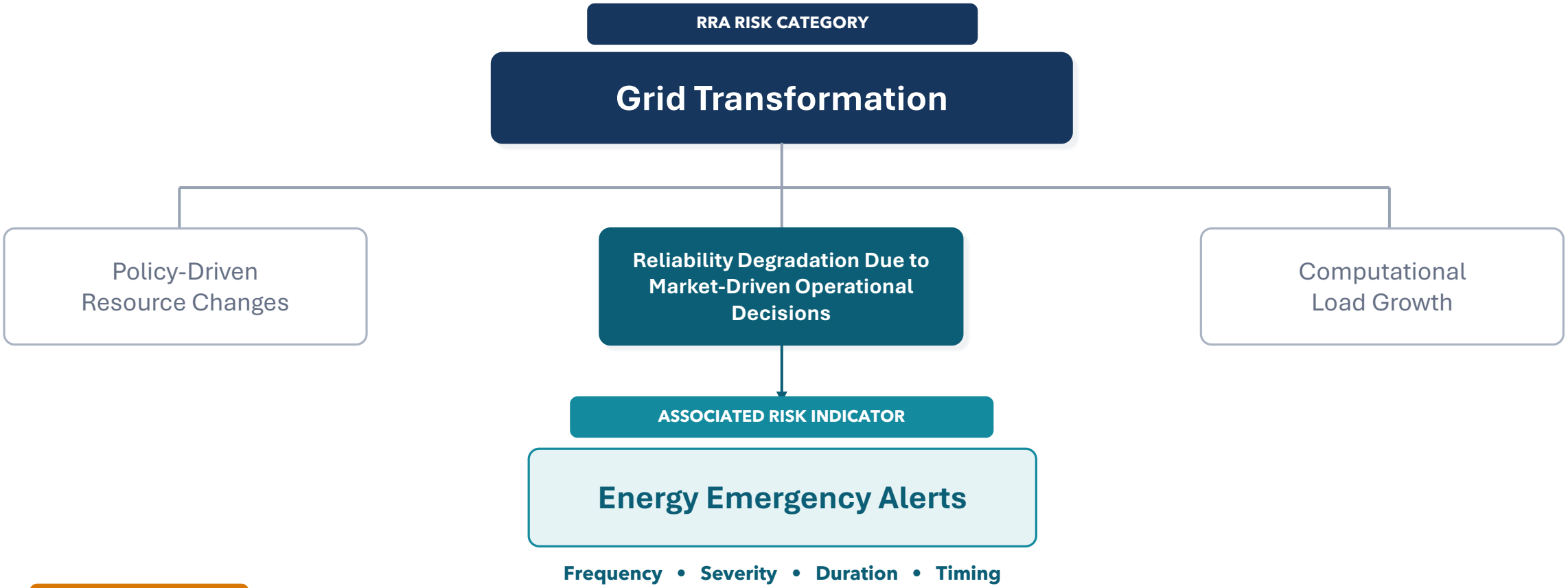
Establish recurring Risk Owner review, monitor results and trends, and refine metrics as risks and data evolve.

SUCCESS MEASURE

Highest-priority metrics enter routine monitoring with clear ownership, documented sources, and a repeatable review cadence

Grid Transformation: Connecting Risk Drivers, Indicators, and Risk Statements

An example of how the risk process is applied from a broad RRA risk through risk indicators and analysis to risk treatments.



RISK STATEMENT

"Market signals, congestion patterns, and economic dispatch outcomes may increasingly conflict with BES reliability needs, especially during stressed system conditions and local transmission constraints."

EEAs help monitor operating stress relevant to the risk. They do not establish that market decisions caused an emergency.

Determining What We Need to Understand

The risk statement and selected indicator shape the questions we ask and the operating data we examine.

WHAT DO WE NEED TO UNDERSTAND?

01 TRENDS
Is operating stress becoming more frequent or severe?

02 IMPACTS
What evidence of reliability challenges appears in actual operations?

03 CONTRIBUTING FACTORS
What conditions are associated with those challenges?

SELECTED RISK INDICATOR

Energy Emergency Alerts

Frequency **Severity** **Duration** **Seasonality**

EXAMINE ALONGSIDE RELEVANT OPERATING CONDITIONS

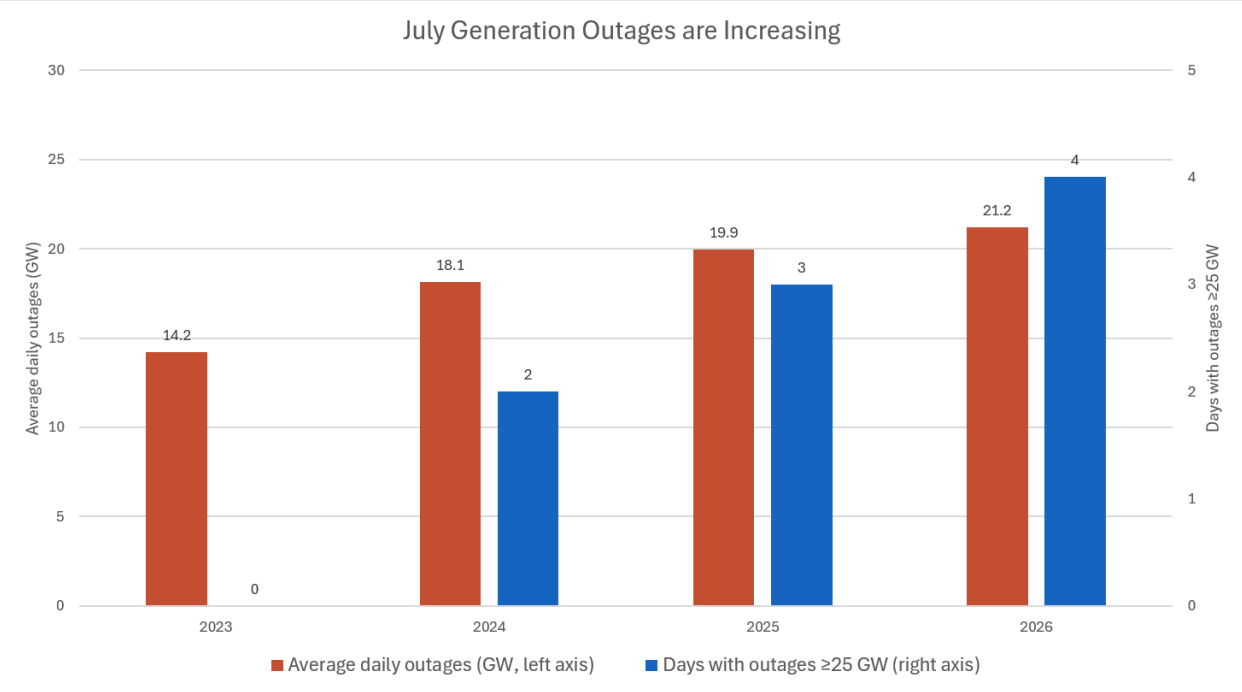
- **Temperatures**
- **Generator Outages**
- **Demand**
- **Available Reserves**

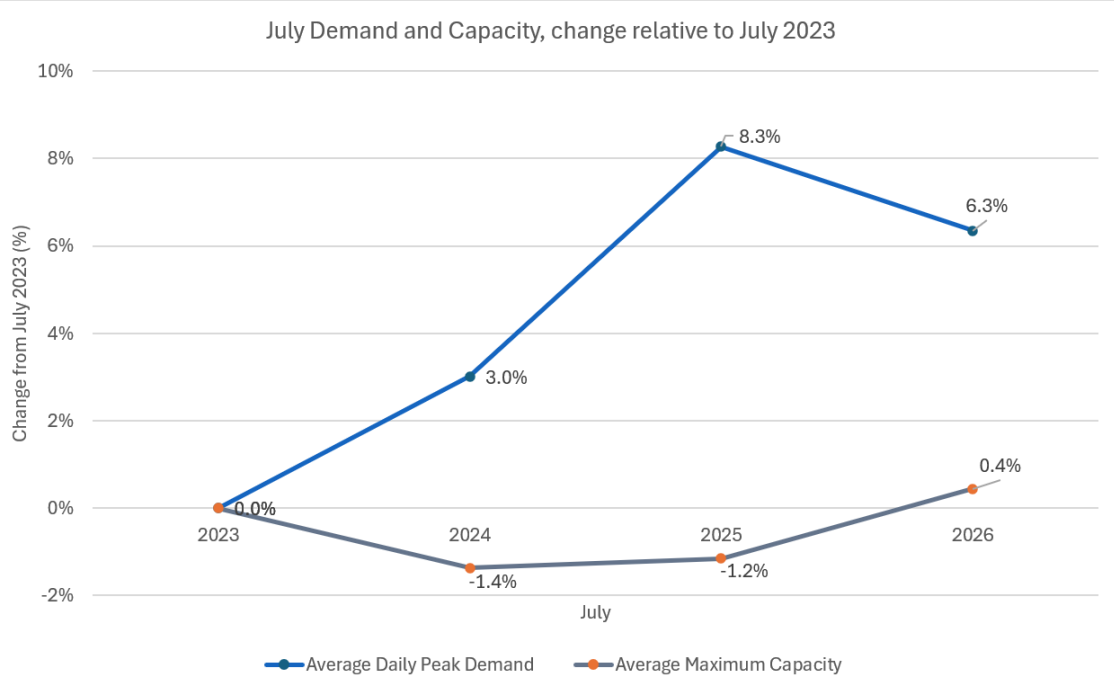
Association is the starting point. Further analysis is needed before drawing conclusions about cause.

Limited Disclosure

What Is the Data Telling Us about PJM July Operating Conditions?

PJM July Demand and Generation Outages are increasing while capacity is largely flat





Generator Outage Observations

July's average daily generation outages increased in each successive year, roughly 49% higher in 2026 than in 2023.

Days with greater than 25GW of outages are also on the rise.

Demand and Capacity Observations

Across the four Julys studied, demand grew faster than capacity: average daily peak demand was up 6.3% overall, while average maximum capacity was up just 0.4%

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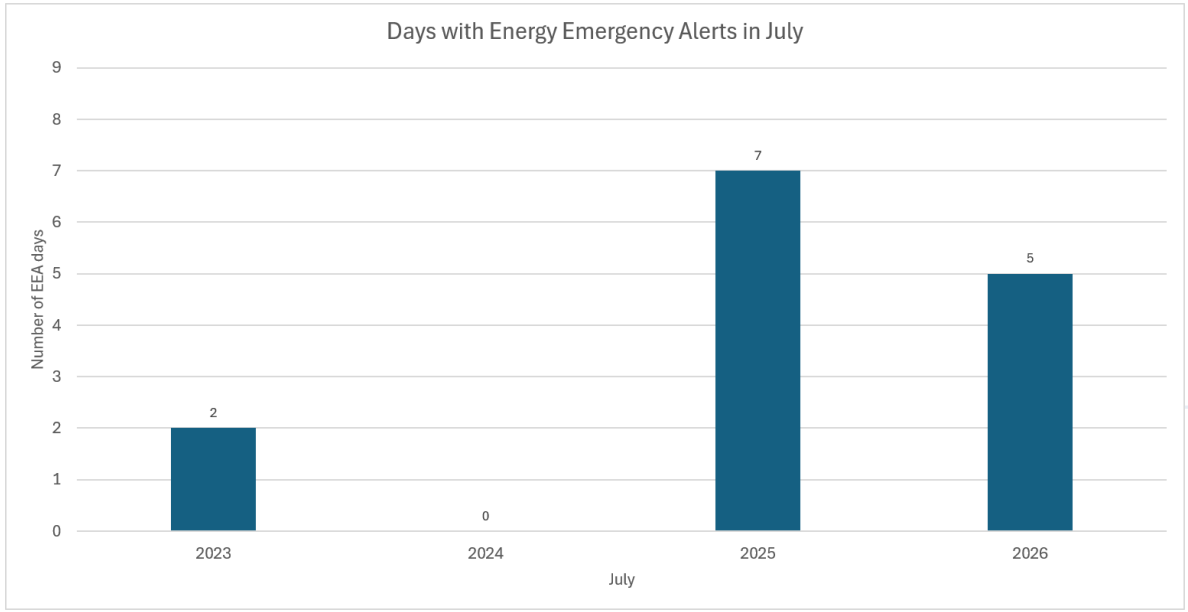
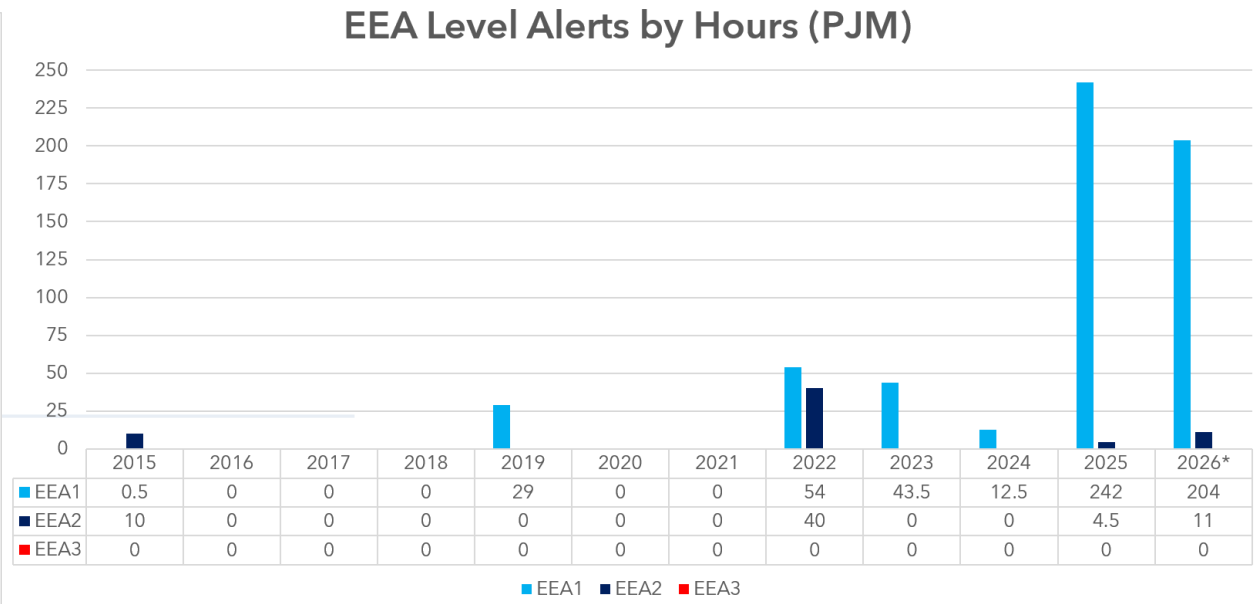
Limited Disclosure

What Is the Data Telling Us about PJM Energy Emergency Alerts?

PJM is seeing more July Alert days and elevated annual alert hours





	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026*
EEA1	0.5	0	0	0	29	0	0	54	43.5	12.5	242	204
EEA2	10	0	0	0	0	0	0	40	0	0	4.5	11
EEA3	0	0	0	0	0	0	0	0	0	0	0	0

Energy Emergency Alerts – July comparison

Energy Emergency Alert days were more frequent in the two latest Julys than in the two prior, possibly reflecting greater operating strain.

Energy Emergency Alerts – Annual Total Hours

Energy Emergency Alert hours rose sharply in 2025 and remain elevated in 2026, indicating more time operating under energy emergency conditions.

FORWARD TOGETHER RELIABILITYFIRST

Connecting Insights to Vulnerability Reduction

July provides an initial look at operating stress. Broader analysis will help focus RF's risk treatments.

VULNERABILITY-REDUCTION STATEMENT

Monitor congestion and dispatch stress indicators, incorporate market conditions into reliability assessments and operational planning, strengthen local reliability reviews for constrained areas, and define escalation triggers for pre-contingency intervention.

PRELIMINARY OBSERVATIONS AND FINDINGS

July demand grew faster than capacity across the 4 years studied.

July generation outages increased in each successive year.

Recent Julys had more EEA Days, and annual EEA Hours rose sharply in 2025 and remained elevated in 2026.

NEXT STEPS: EXPAND THE ANALYSIS

Imports and Exports: Examine how power transfers relieve or contribute to stress during EEAs.

All Months: Extend the analysis beyond July, including emerging shoulder month EEAs.

Event Conditions: Examine weather, demand, generation outages, and operator actions together to understand what is driving the alerts.

Comparable Conditions, Different Outcomes: Compare days with and without EEAs to understand what made the difference.

These findings and continued analysis help focus RF's work to address increasing operating stress.

Limited Disclosure

RF TREATMENTS

Standards set expectations. Coordination turns them into reliable performance.



1 Standards & registration

- Implementation of winterization standards EOP-012 and TLP-008
- Energy Assurance new standard development
- IBR Category 2 and emerging computational-load registration

2 Operational readiness

- Cold-weather and industry assist visits
- Tabletop exercises, alerts and lessons learned
- Studying data trends for root cause analysis

3 Technical communications

- Reliability guidelines and newsletters
- Workshops, webinars and *Tech Talk with RF*

4 Stakeholder coordination

- State testimony, briefings and one-on-one meetings
- Panels and discussions identifying the reliability risk
- Ongoing coordination across the ERO Enterprise

A complete response combines enforceable requirements with practical support, shared learning and sustained coordination.

RISK TREATMENTS IN-ACTION

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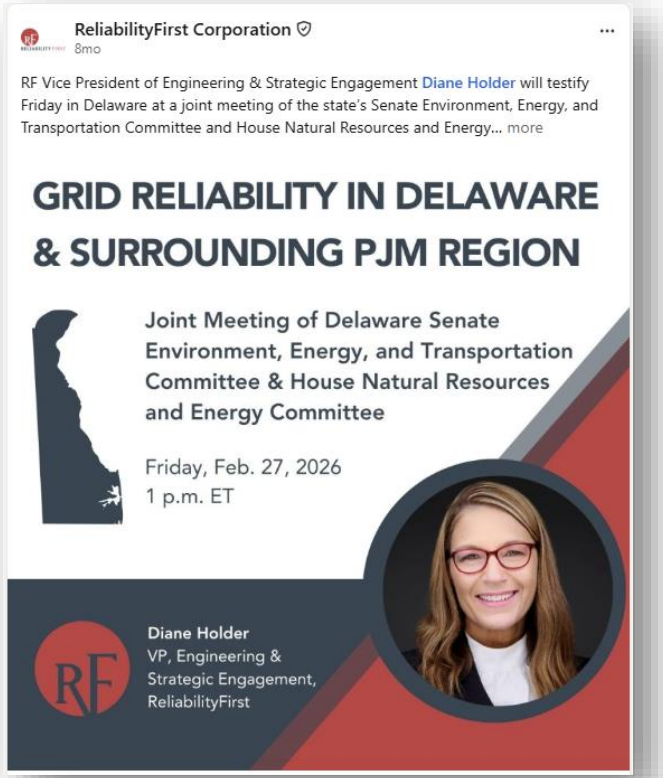
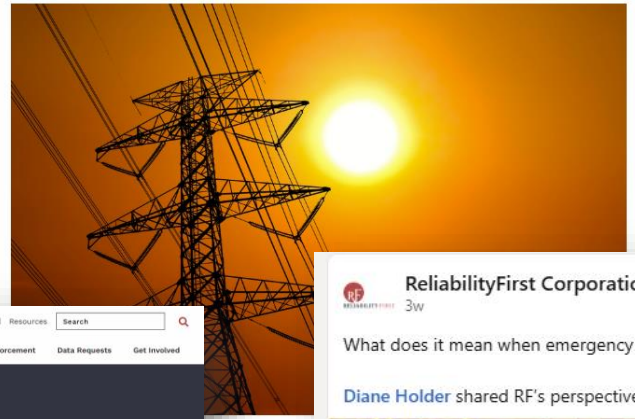
RF Vice President of Engineering & Strategic Engagement Diane Holder will testify Friday in Delaware at a joint meeting of the state's Senate Environment, Energy, and Transportation Committee and House Natural Resources and Energy... more



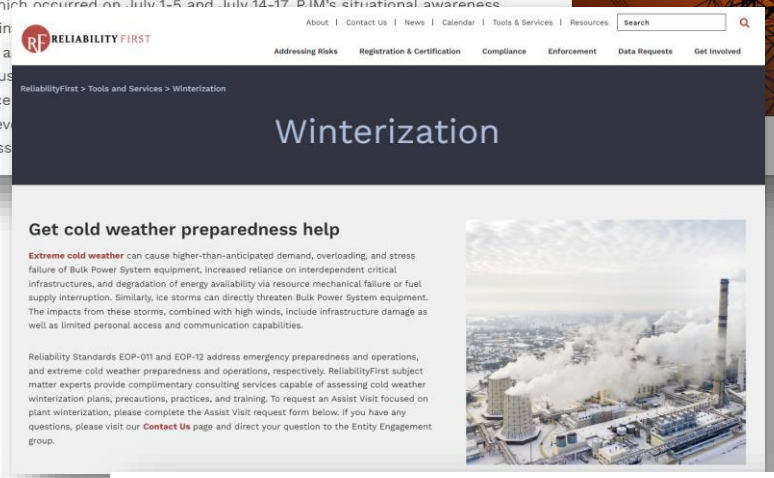
July 2026 heat dome events highlight environmental, situational awareness risk factors across RF footprint, including PJM region



By **Steven Hanson**, Energy Technical Writer, External Affairs



In July 2026, grid operator resilience was tested as the ReliabilityFirst (RF) region experienced two heat dome weather events with high temperatures that caused summer peaks in electricity demand. During the two events, which occurred on July 1-5 and July 14-17, PJM's situational awareness activities in operators a avoided cus importance the top sev Risk Assess



Return to Re

ReliabilityFirst Corporation
3w

What does it mean when emergency operating measures are needed more often?

Diane Holder shared RF's perspective on the increasing use of Energy... more



Diane Holder, RF VP of Engineering & Strategic Engagement

Speaking at the PJM Governors' Collaborative Summit on the State of the PJM Interconnection on Oct. 8, 2026

ERA-001-1 – Planning Energy Reliability Assessments

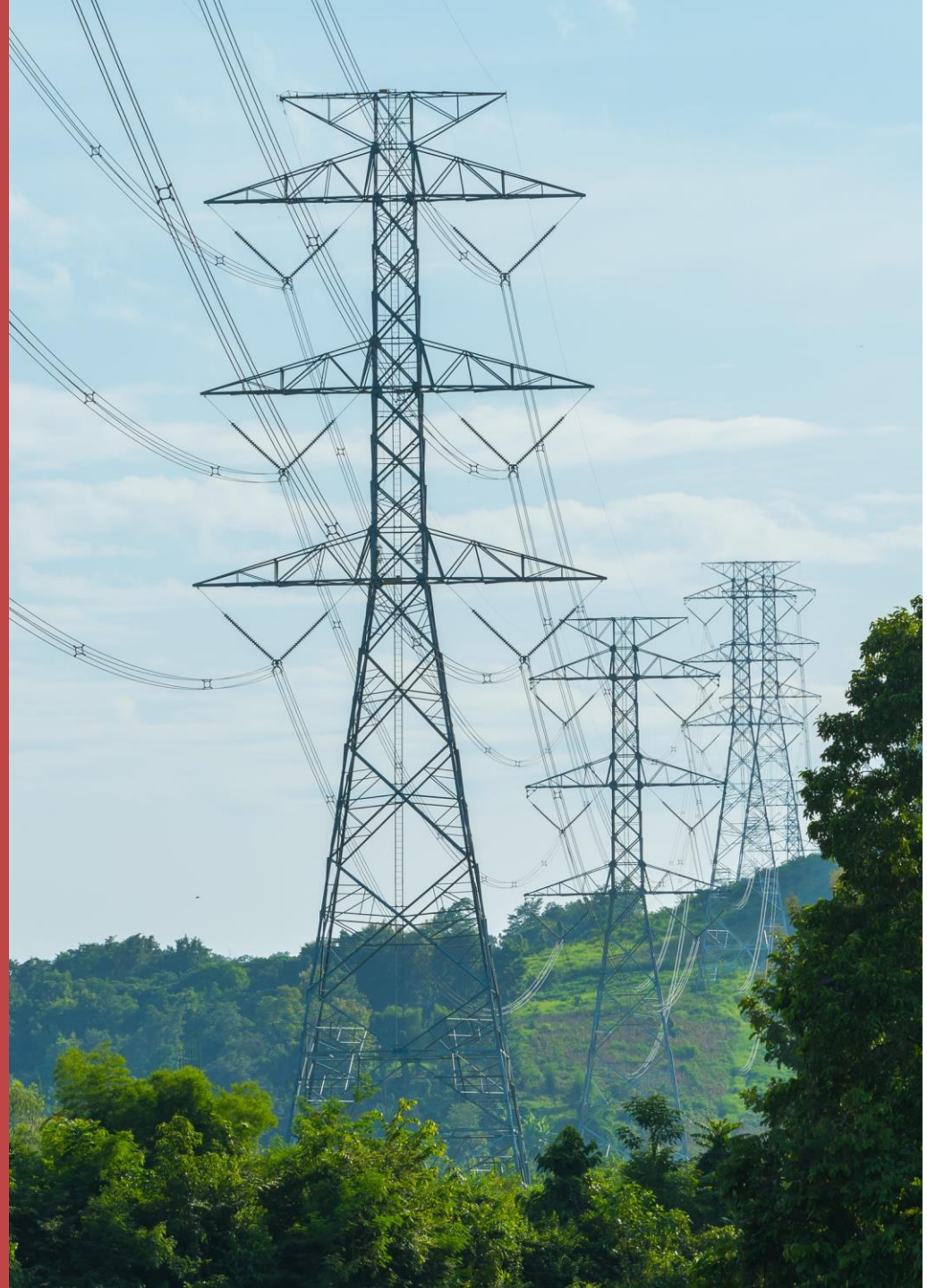
A. Introduction

1. **Title:** Planning Energy Reliability Assessments
2. **Number:** ERA-001-1
3. **Purpose:** To assess, report, and develop a plan to mitigate energy risks within the planning horizon.
4. **Applicability:**
   - 4.1. **Functional Entities:**
     - 4.1.1. Planning Coordinator
     - 4.1.2. Resource Planner
     - 4.1.3. Transmission Planner
5. **Effective Date:** See Implementation Plan for ERA-001-1.

TPL-008-1 – Transmission System Planning Performance Requirements for Extreme Temperature Events

A. Introduction

1. **Title:** Transmission System Planning Performance Requirements for Extreme Temperature Events
2. **Number:** TPL-008-1
3. **Purpose:** Establish Transmission system planning performance requirements to develop a Bulk Power System (BPS) that will operate reliably during extreme heat and extreme cold temperature events.
4. **Applicability:**
   - 4.1. **Functional Entities:**
     - 4.1.1. Transmission Planner
     - 4.1.2. Planning Coordinator
5. **Effective Date:** See Implementation Plan for Project 2023-07.

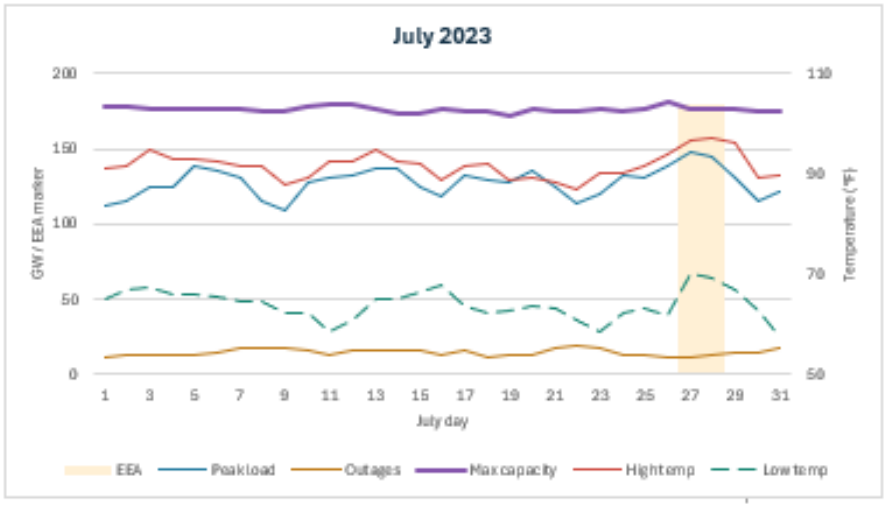


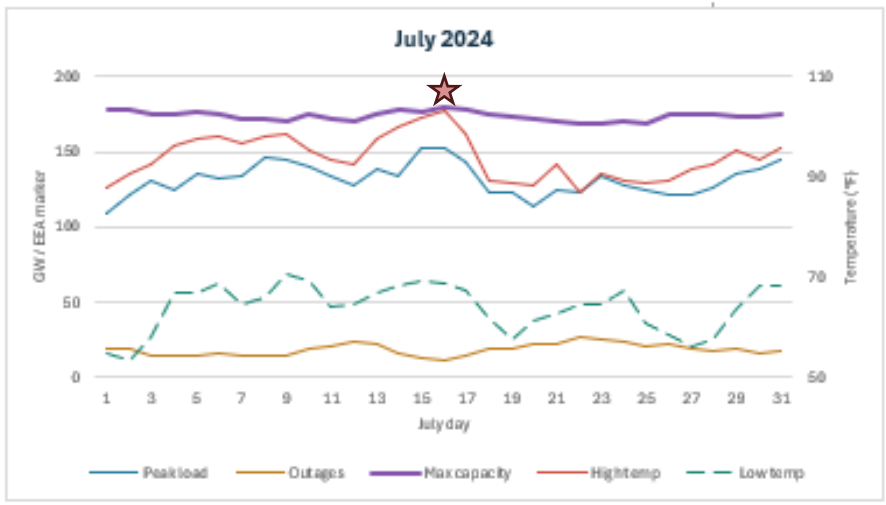
QUESTIONS & ANSWERS

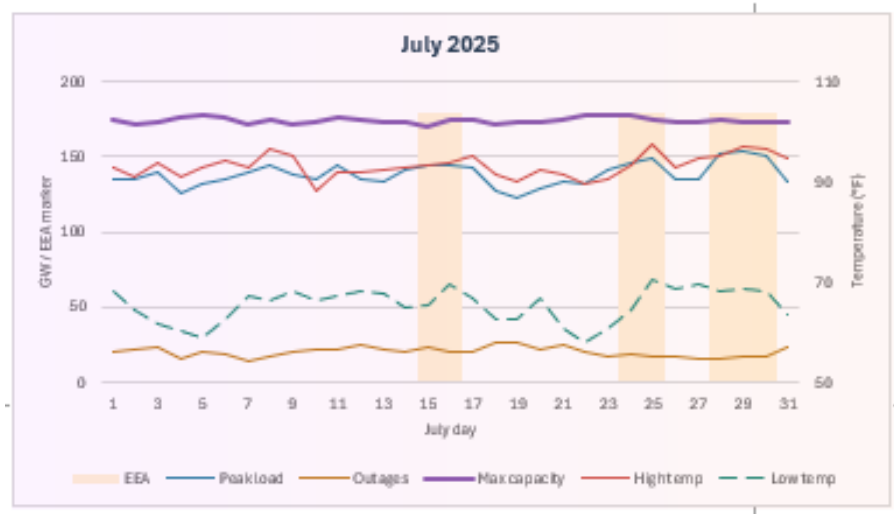
Appendix

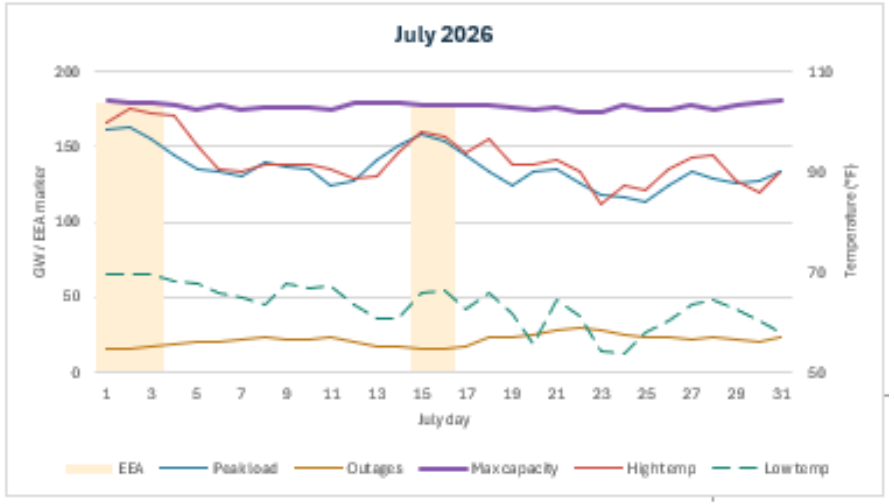
What Is the Data Telling Us?

July EEAs and operating conditions | Four-year comparison









Next Steps

The impacts of interchange need to be analyzed further. Peak Load vs Total Daily Outages needs further investigation.

★Compare July 14-16, 2024 with EEA days in other years to understand how available generation, imports/exports, and operating actions differed.

RELIABILITYFIRST
FORWARD TOGETHER

AI's Role in the Analysis

We used AI to help organize the data and identify potential trends, while applying our own technical judgment to the findings.

Prompt: Please summarize this data and identify any trends, gaps, and areas of concern

Copilot Response:

Copilot

Reasoned in 6 steps ›

Created `July Summary` with annual metrics, risk findings, monitoring priorities, and two daily trend charts covering all **124 observations** (31 days × 4 years).

Key findings

Year	Avg Peak Load
2023	127.6 GW
2024	131.5 GW
2025	138.2 GW
2026	135.7 GW

- Average outages increased **49.4%** from 2023 to 2026.
- 2026 set the highest single-day load (**162.6 GW on 7/2**) and outage level (**29.1 GW on 7/22**).

July Grid & Weather | Four-Year Analysis

July New • July 2023–2026 • 31 daily observations per year • 124 observations total

Demand and outages have grown faster than capacity. 2026 has the highest single-day peak load and average outages, despite average demand easing from 2025.

July metric	2023	2024	2025	2026
Average high temperature (°F)	91.6	93.9	93.1	92.5
Average low temperature (°F)	63.9	63.9	65.4	63.3
Highest high temperature (°F)	97.0	103.3	97.7	102.7
Average daily peak load (GW)	127.6	131.5	138.2	135.7
Highest peak load (GW)	147.6	153.1	154.4	162.6
Day of highest peak load	27	16	29	2
Average daily outages (GW)	14.2	18.1	19.9	21.2
Highest daily outages (GW)	18.1	26.8	26.1	29.1
Day of highest outages	22	22	19	22
Average max capacity (GW)	176.3	173.8	174.2	177.0
Average capacity headroom* (GW)	48.6	42.4	36.0	41.3
Lowest daily headroom* (GW)	29.6	24.4	19.0	17.4
Day of lowest headroom	27	15	29	2
Days with outages ≥25 GW	0	2	3	4
Days with headroom <25 GW	0	2	3	5
Days flagged for EEA	2	0	6	5
Missing EEA observations	0	31	0	0
High temperature / peak load correlation	0.68	0.84	0.69	0.84

FORWARD TOGETHER RELIABILITYFIRST

Risk and Compliance Committee Charter

RELIABILITY FIRST

RISK AND COMPLIANCE COMMITTEE CHARTER

The Board of Directors of ReliabilityFirst Corporation ("ReliabilityFirst") has established a Risk and Compliance Committee (the "Committee") with the general responsibilities and specific duties as described below.

COMPOSITION

The Committee shall be comprised of a least five (5) directors and all of the independent directors according to independence standards established under the governance guidelines adopted by the Board (the “Governance Standards”). Committee members shall be elected by the Board at its annual meeting and shall serve until their successors are duly elected and qualified. The Committee shall have a chair and a vice chair. The vice chair shall assume the duties of the chair in the absence of the chair at any meeting. The Committee's chair and vice-chair shall both be independent directors designated by the full Board upon the recommendation of the Nominating and Governance Committee.

RESPONSIBILITY

The primary purpose of the Committee will be to: (i) oversee the processes, procedures and program used by ReliabilityFirst to monitor compliance with and enforce Reliability Standards (including Regional Standards) in the Region in an effective, efficient, and risk based manner, (ii) monitor the results achieved through the compliance and enforcement activities of ReliabilityFirst, and (iii) oversee ReliabilityFirst’s approach to addressing significant risks to the grid.

The Committee shall have the sole authority to retain, and approve the fees and other retention terms of, legal and other advisors, as it deems necessary for the fulfillment of its responsibilities.

ATTENDANCE AND VOTING

Members of the Committee should endeavor to be present, in the designated format, (in-person or virtual), at all meetings. Three (3) Committee members shall constitute a quorum, provided a majority of the members at a meeting are independent directors. Each member of the Committee, including the chair, shall be entitled to one vote on each matter presented before the Committee. Action by the Committee may be taken at any duly called meeting at which a quorum is present upon the vote of a majority of the members present.

MINUTES OF MEETINGS

Minutes of each meeting shall be prepared and sent to Committee members for approval at the next regularly scheduled meeting and thereafter publicly posted on ReliabilityFirst's website. The Committee's minutes will be kept by the person so designated by the chair with a copy retained by the Secretary of ReliabilityFirst.

SPECIFIC DUTIES

The Committee will:

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.

2. Recommend for adoption by the Board amendments to or modifications of the compliance monitoring and enforcement program, as necessary or appropriate.

3. Review the current state and composition of the ReliabilityFirst compliance registry for Registered Entities in the Region.

4. Review ReliabilityFirst's regional risk assessment and oversee facilitation and ensure effectiveness of the ReliabilityFirst stakeholder advisory and technical committees.

5. Review ReliabilityFirst's approach to significant enforcement actions relating to violations of Reliability Standards.

6. Consider any input provided by Registered Entities on risk and compliance issues and ReliabilityFirst's activities.

7. Perform other activities as requested by the Board.

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

9. Report regularly to the Board regarding the Committee's activities.

ADOPTION AND APPROVAL

As adopted by the Compliance Committee on August 23, 2023, approved by the Board of Directors on August 24, 2023.

Summary of Performance of Specific Duties for 2026

RELIABILITY FIRST

SUMMARY OF RISK AND COMPLIANCE COMMITTEE'S PERFORMANCE OF SPECIFIC DUTIES FOR 2026

Revision: November 13, 2026

	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 August meeting by Tom Scanlon, Enforcement Trends. In August by Howard Gugel, NERC Senior Vice President, Regulatory Oversight's Keynote presentation. Accomplished in April, August and December by Enforcement Data Consent Agenda item(s).
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 April Registration Update written materials provided to Committee.
4.	Review ReliabilityFirst's regional risk assessment (RRA) and oversee facilitation and ensure effectiveness of the ReliabilityFirst stakeholder advisory and technical committees.	Complete	Accomplished in April by Johnny Gest, 2025-2026 RRA with Mr. Gest providing an overview of the latest RF RRA. In August and December, by Atif Usman and Jeff Craigo providing an update on RF's Risk and Data Initiative. In addition, RF staff has had multiple discussions in 2026 with the Committee Chair regarding the details of the RRA, the technical committees and their involvement in the RRA, and a project being worked on to mature the RRA going forward. Written materials relating to the technical committees also provided to the Committee in December
5.	Review ReliabilityFirst's approach to significant enforcement actions relating to violations of Reliability Standards.	Complete	Accomplished during April, 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.	Complete	Presentation in April on Large Load Working Group Update by Matt Veith, former co-chair of the working group; Presentations in December on PJM Operations Updates by Jason Connell, VP of Planning, PJM, Integration of IBRs by Saurabh Vyas, General Manager, Duke.
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