

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

2021-22 Winter Reliability Assessment

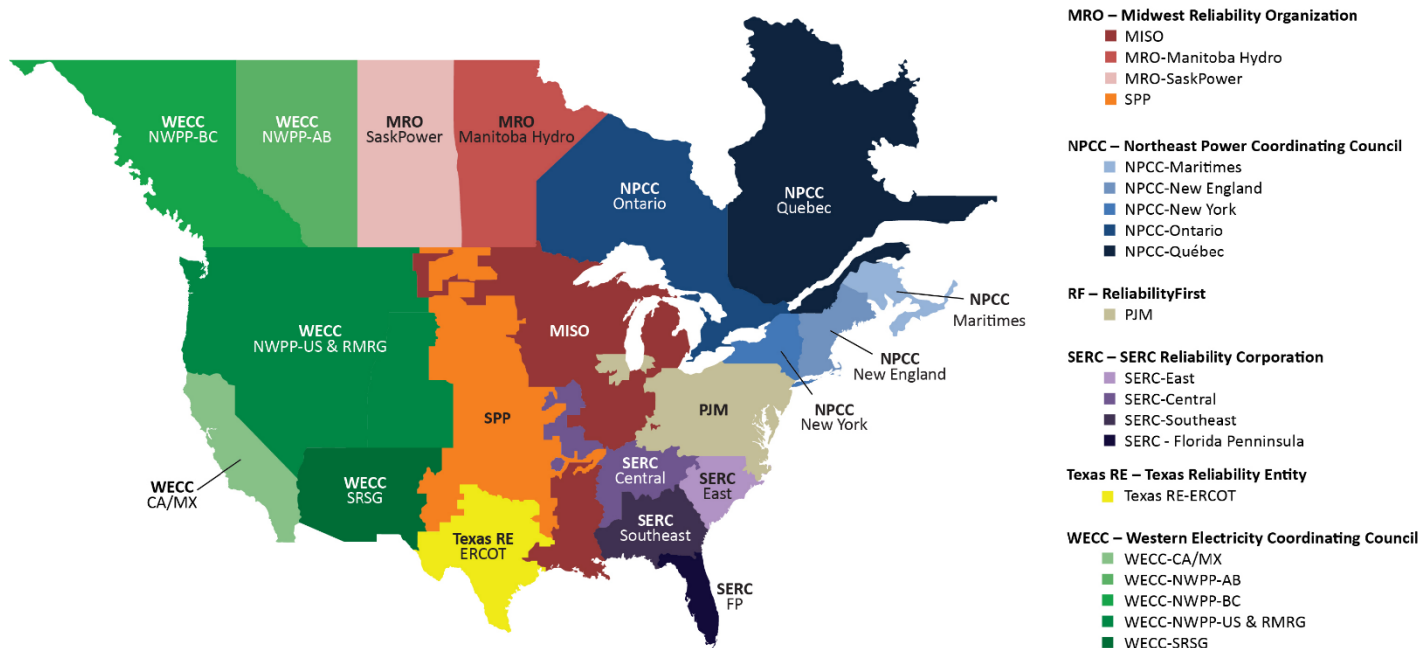
PJM Resource Adequacy Senior Task Force
January 10, 2022

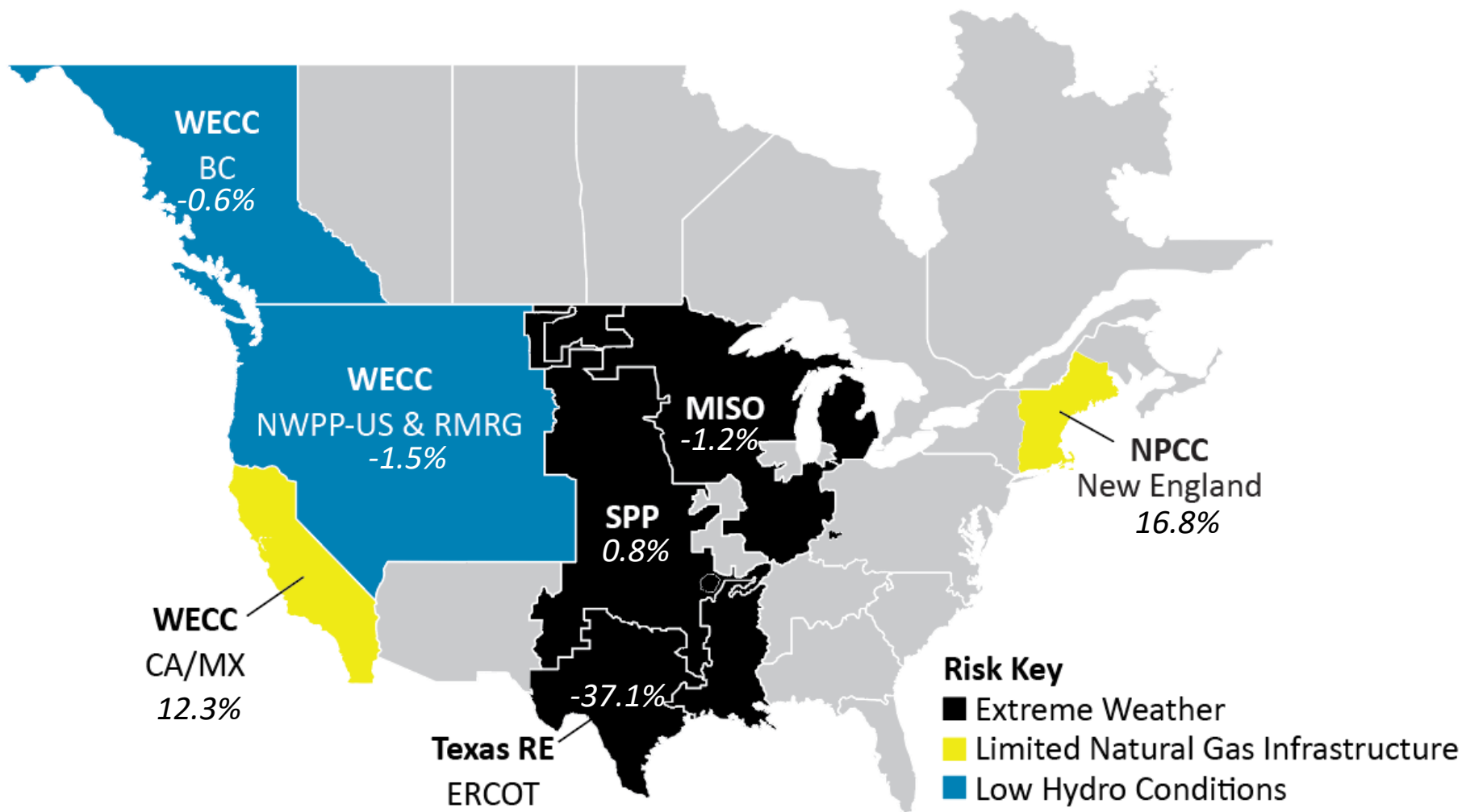
John Moura, director, Reliability Assessment and Performance Analysis
Mark Olson, manager, Reliability Assessment

RELIABILITY | RESILIENCE | SECURITY



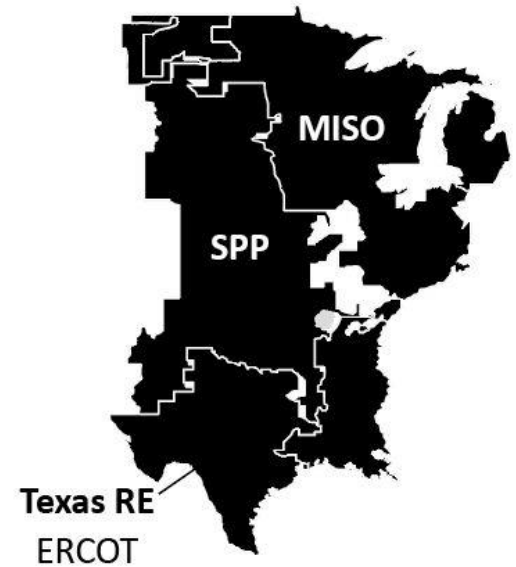
- Identify and assess areas of concern for upcoming season
- Provide electricity demand and supply projections
- Discuss industry preparations
- Coordination and Review with Regional Entities and Stakeholder Groups



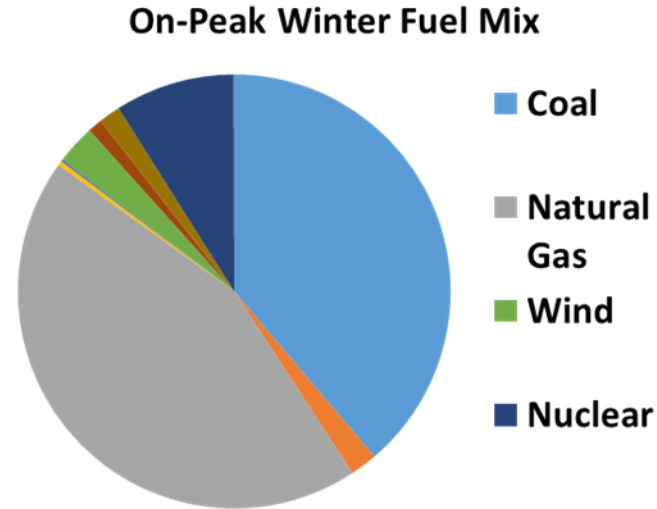
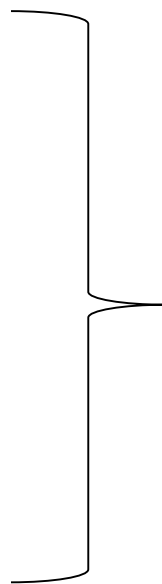
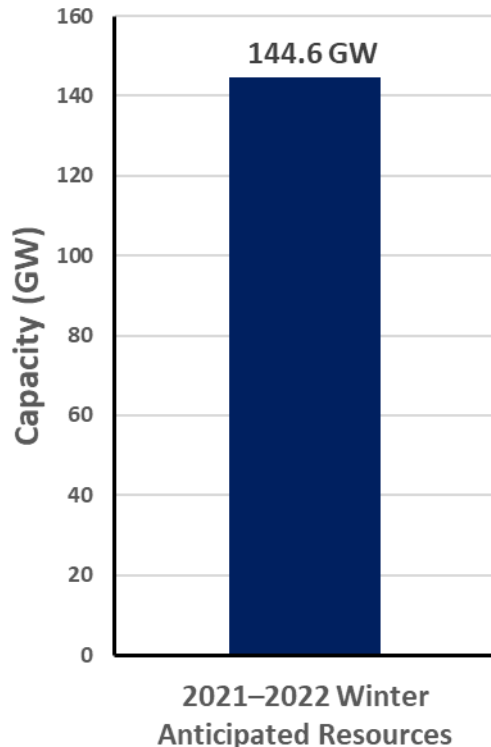


Percentages indicate the projected reserve margin under extreme conditions

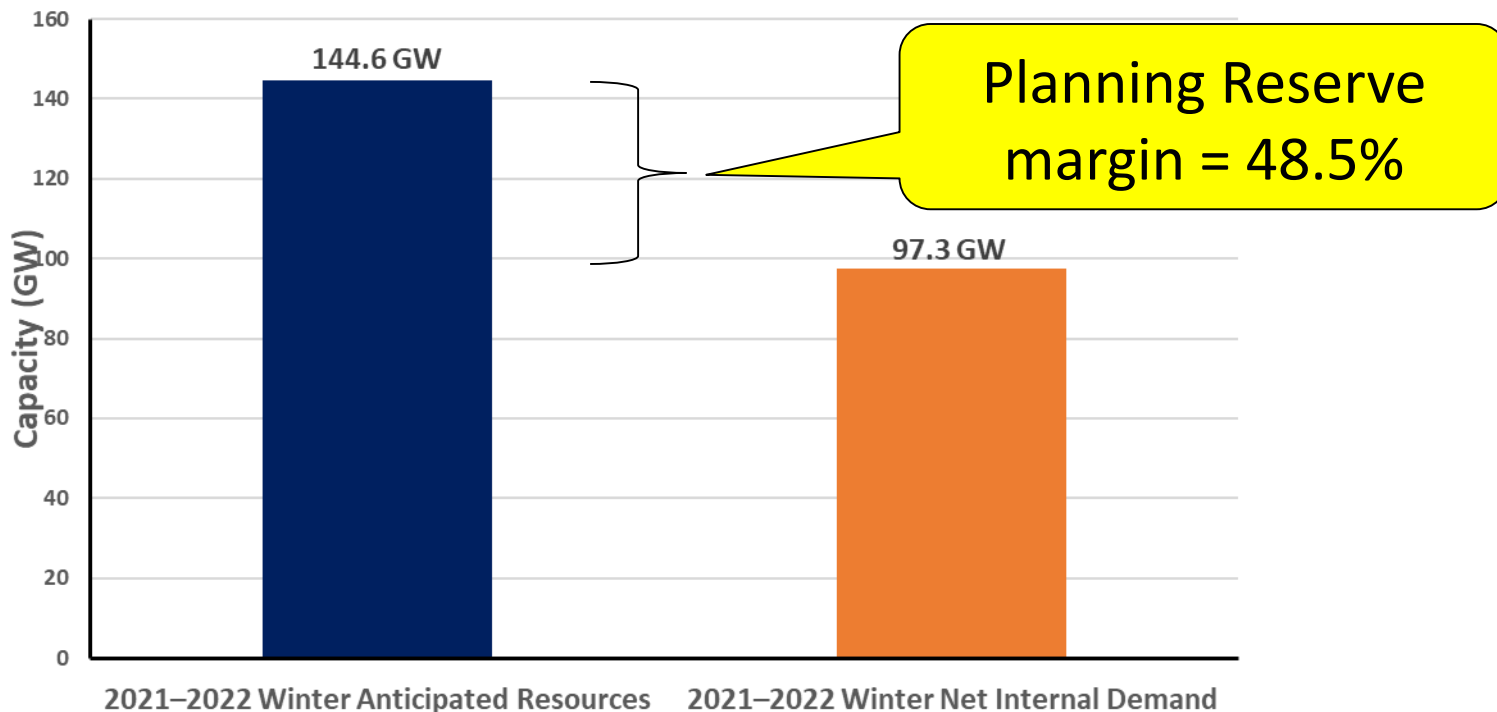
- Planned reserves based on average peak conditions can give a false indicator of risk
- NERC analyzed extreme weather risk factors
 - Higher demand levels than normal peak
 - Reduced supply due to generator outages, fuel limitations, and low temperature performance
- Analysis uses generator performance data from extreme weather events



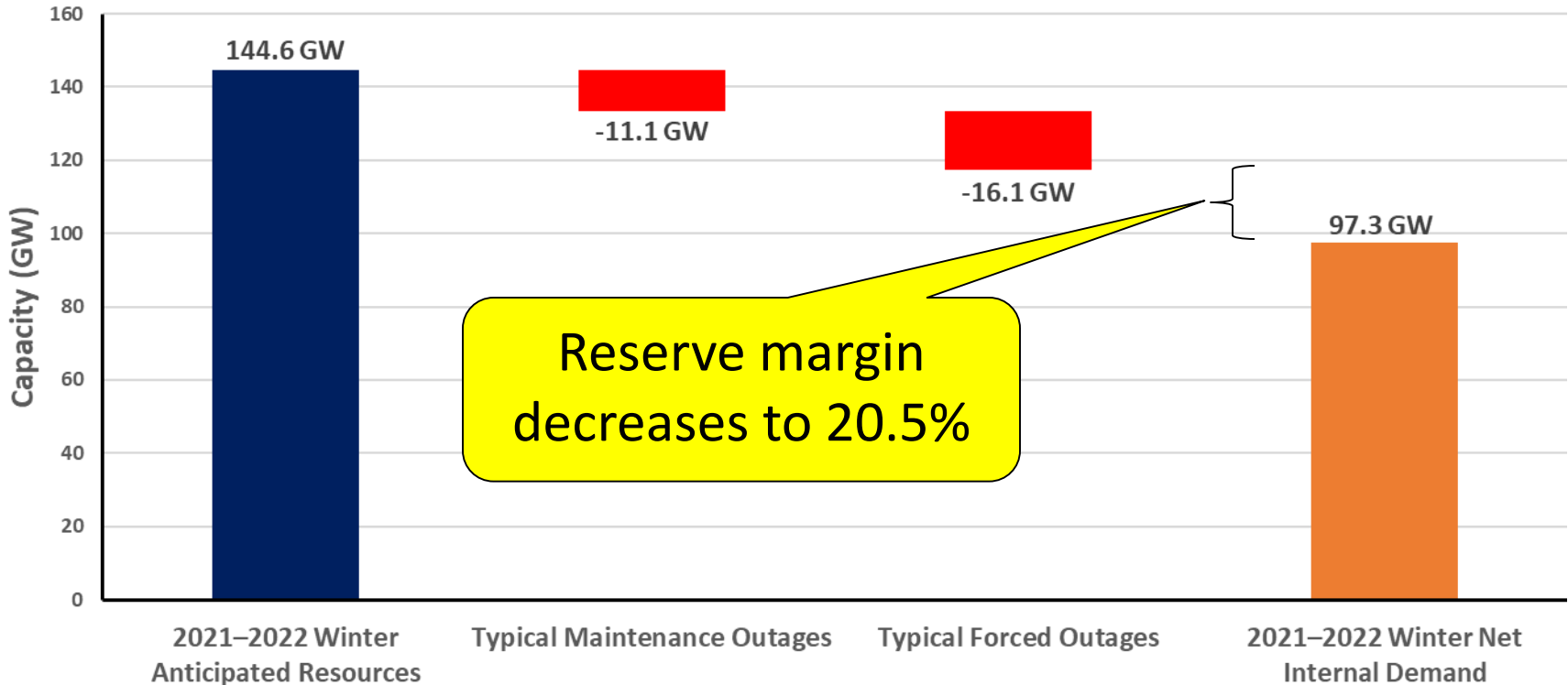
- Natural gas-fired generators provides 44% of the on-peak generation mix in MISO
 - 94% Thermal 3% Wind 3% Hydro
 - Wind contribution: 3.8 GW (17% of nameplate wind capacity)



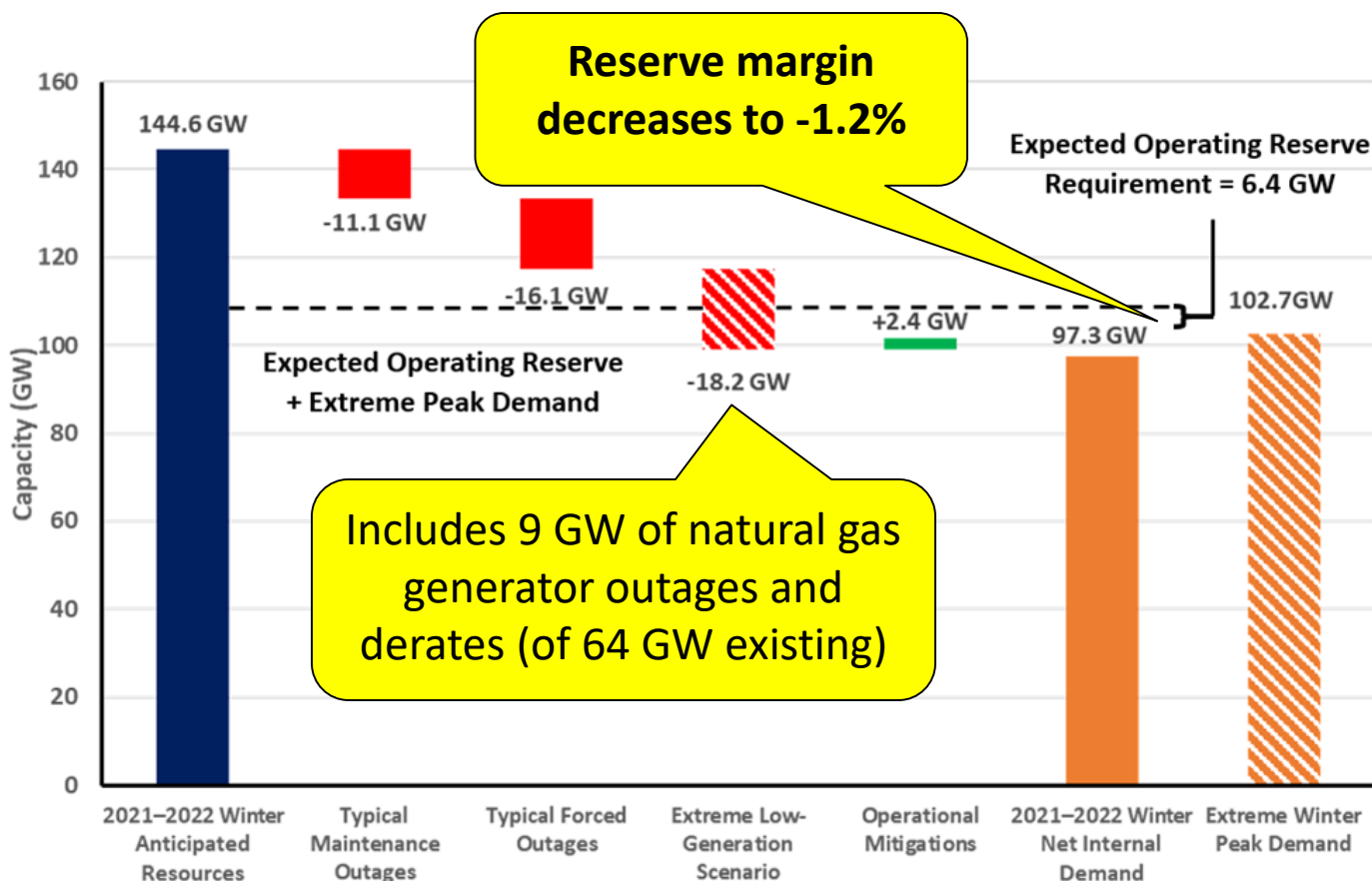
- Winter reserve margins exceed the MISO Reference Margin Level (18.3%)
- Resources are sufficient for normal winter peak demand



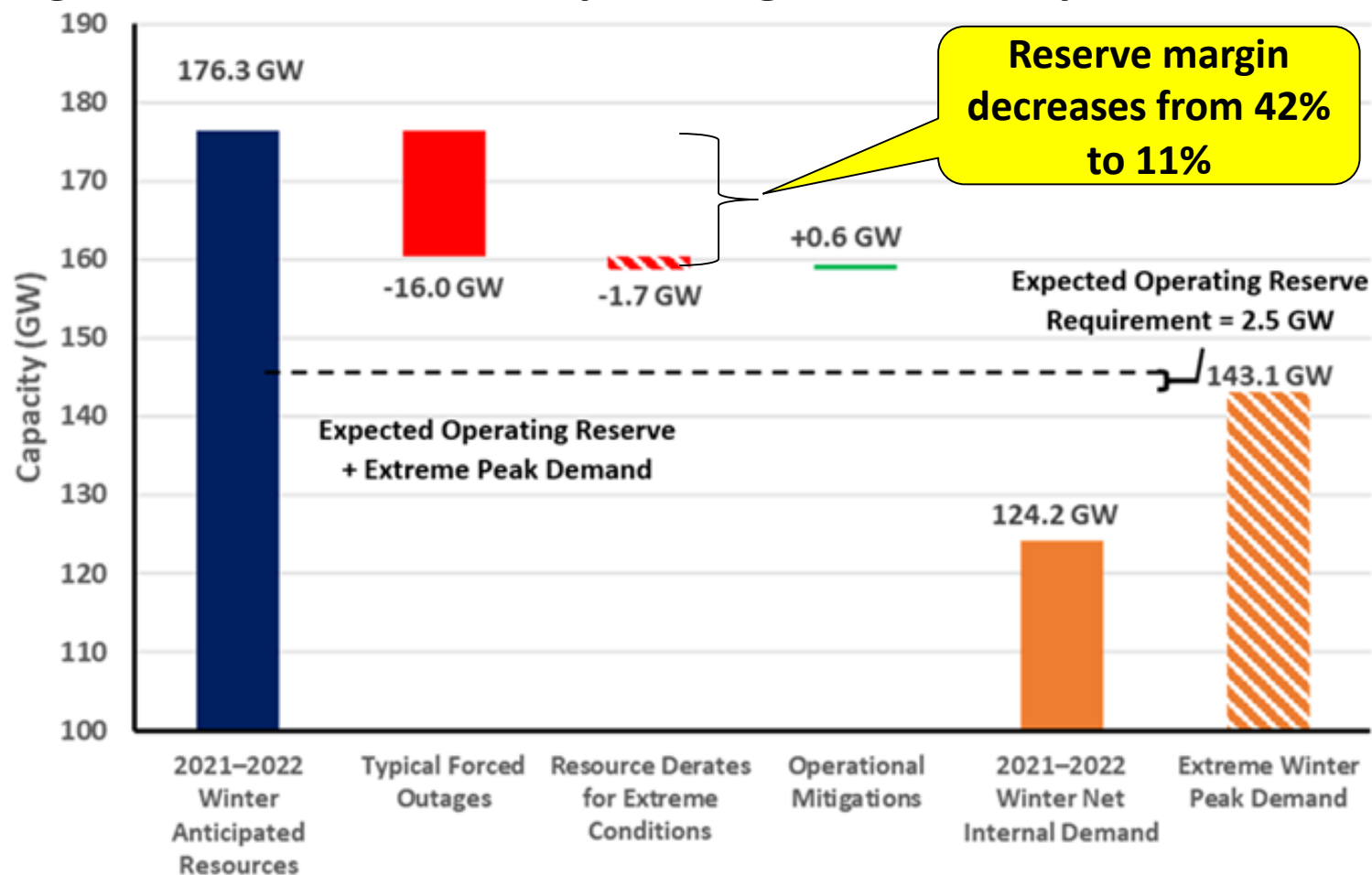
- Resources are sufficient even with normal generator outages



- Increased electricity demand and reduced supplies due to generation outages and derates results in a **shortfall**



- Above-normal demand and generator outage lowers reserve margin but **able to meet operating reserve requirements**



- Limited natural gas infrastructure to serve electric generation in extreme conditions
- Southern California – limited storage and lack of redundant supply pipelines
 - Ruptured pipeline is reducing flow into California
 - Mitigating with increased storage at Aliso Canyon
- New England – pipeline constraints during extreme cold temperatures
 - Simultaneous demand for natural gas for heating homes and operating electric generators
 - Other fuels (oil or LNG) substituted but supplies are limited



California-Mexico



ISO New England

- NERC issued an advisory to owners and operators in August
- Included mandatory questions to help NERC evaluate the Bulk Electric System’s winter readiness
- Key takeaway for grid operators: be prepared with operating plans for extreme winter weather

NERC
NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Recommendation to Industry

Cold Weather Preparations for Extreme Weather Events
Initial Distribution: August 18, 2021

Two¹ extreme cold weather² events have occurred in the past four winter seasons. The February 2021 extreme cold weather event stressed the need to ensure the safe, resilient, and reliable operation of the Bulk Electric System. The recent extreme cold weather events across large portions of North America have highlighted the need to assess current operating practices and identify some recommended improvements, so that system operations personnel are better prepared to address these challenges. The events have caused major interruptions to resources, transmission paths and ultimately, end-use customers. This alert will assist in determining the winter readiness of Reliability Coordinators (RCs), Balancing Authorities (BAs), Transmission Operators (TOPs), and Generator Owners (GOs).

[Why am I receiving this? >>](#)
[About NERC Alerts >>](#)

Status: Acknowledgement Required by Midnight Eastern on August 23, 2021
Reporting Required by Midnight Eastern on September 17, 2021

PUBLIC: No Restrictions
[More on handling >>](#)

Instructions: This Level 2 NERC Alert provides specific recommended actions that NERC registered entities should consider in response to a particular issue. Pursuant to Rule 810 of NERC’s Rules of Procedure³, NERC registered entities shall (1) acknowledge receipt of this advisory within the NERC Alert System, and (2) report to NERC on the status of their activities in relation to this recommendation (as provided below). For U.S. entities, NERC will aggregate the responses and provide an anonymized report to the Federal Energy Regulatory Commission.

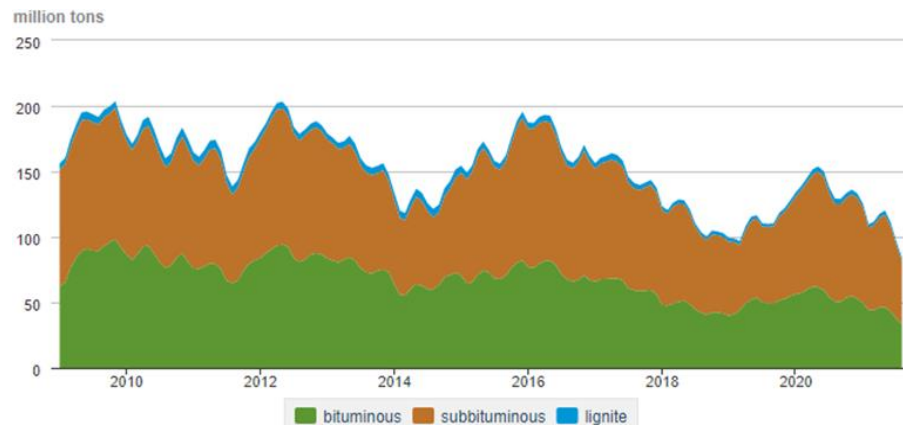
This Level 2 NERC Alert is not the same as a Reliability Standard nor does it create a mandatory obligation to take the recommended actions. Your organization will not be subject to penalties for failure to implement the recommendations. Issuance of this recommendation, however, does not alter the requirements of any approved Reliability Standard nor excuse the failure to follow the practices discussed in the recommendation if such failure

¹ The two Extreme Cold Weather events are January 2018 and February 2021
² Extreme Cold Weather as defined in the [Public Notice Review](#) dated September 2014; Extreme Cold Weather conditions occurred in lower latitudes than normal, resulting in temperatures 20 to 30° F below average.
³ <https://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx>

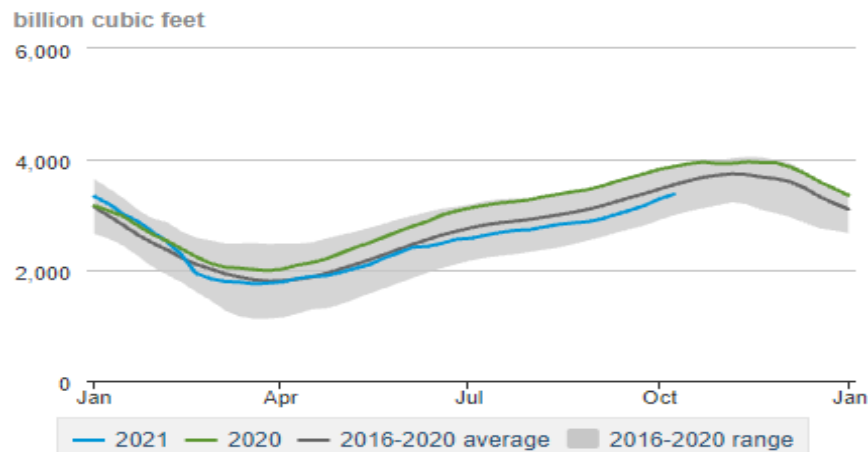
RELIABILITY | RESILIENCE | SECURITY

Alert Posted on [NERC.com](https://www.nerc.com)

- Coal stockpiles declined rapidly leading up to winter
- Natural gas in storage was below average levels
- Grid operators continue to monitor fuel levels closely



Coal Stocks by Type



Gas in Storage


Source: EIA


To reduce the risks of energy shortfalls on the BPS this winter:

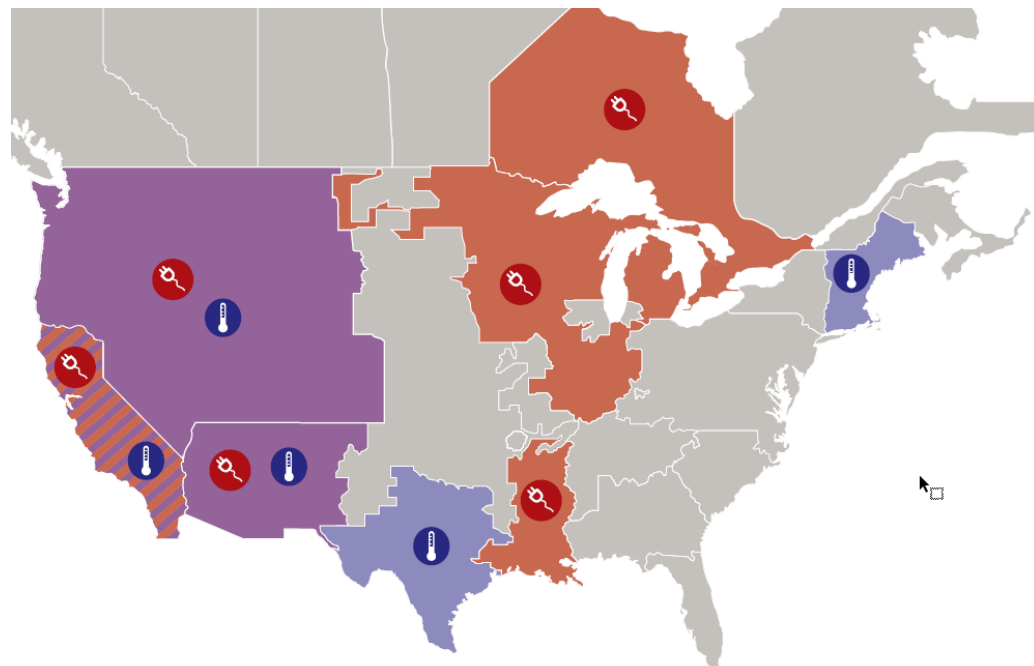
- Generators should take proactive steps to prepare for winter conditions and communicate with grid operators.
- Grid operators should prepare to implement cold weather operating plans, conduct drills, and poll generators for fuel and availability status.
- Load-serving entities should review critical loads to prevent inadvertent disruptions and ensure alert systems are in place to prepare their customers.
- Regulators should support requested environmental waivers.



Long-Term Reliability Assessment Highlights

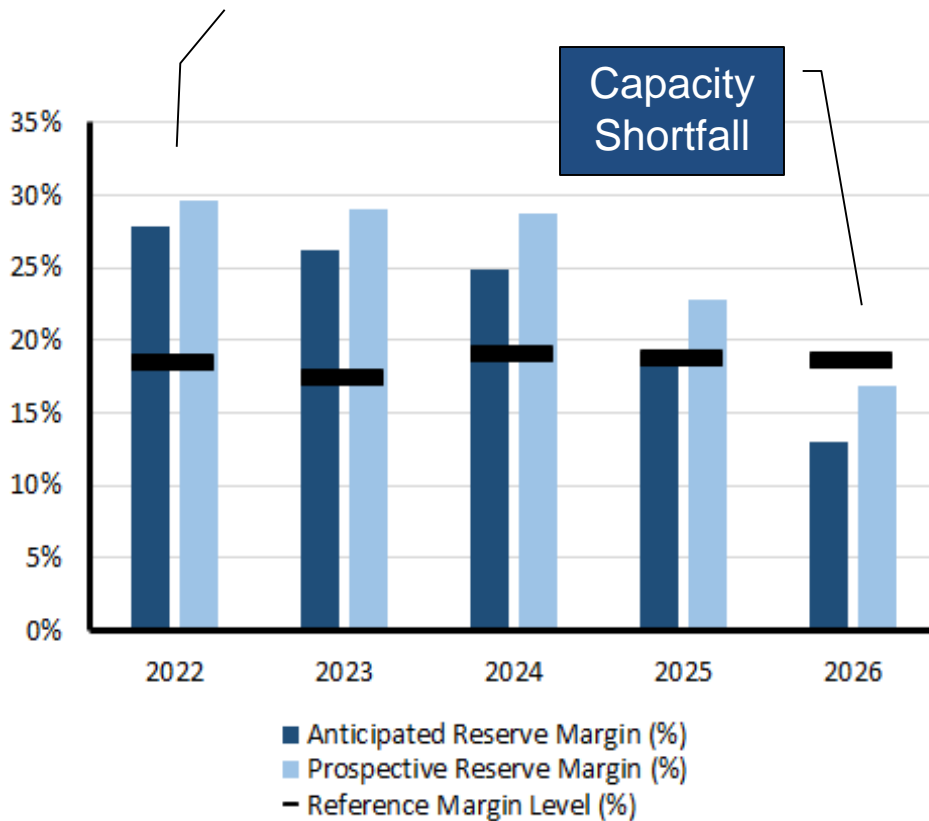
-  Resource Adequacy and Energy Sufficiency
 - **MISO, California, and Ontario** | projecting capacity shortfalls
 - **California, U.S. Northwest and Southwest** | projecting periods of insufficient energy

-  Extreme Weather Risks
 - **Texas, California, and U.S. Northwest** | Insufficient flexible generation for peak demand
 - **New England, California, and Southwest** | Natural gas infrastructure limitations



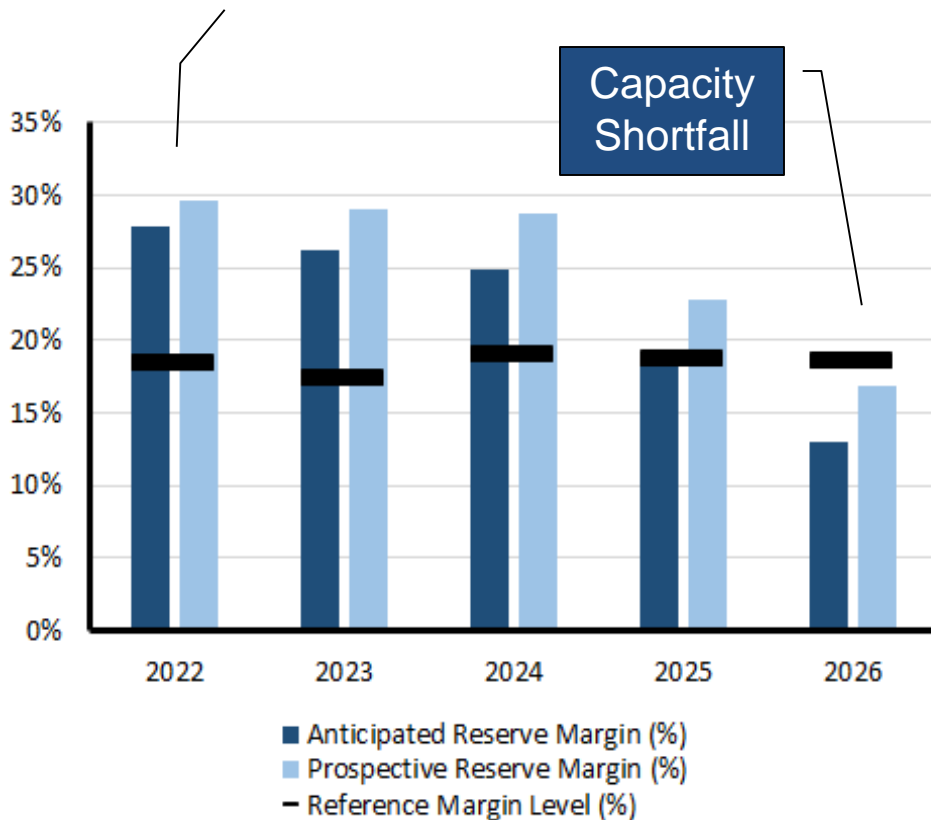
**Long-Term Reliability Assessment Risk Map
2022 - 2026**

When only looking at capacity, conditions appear reliable until 2026



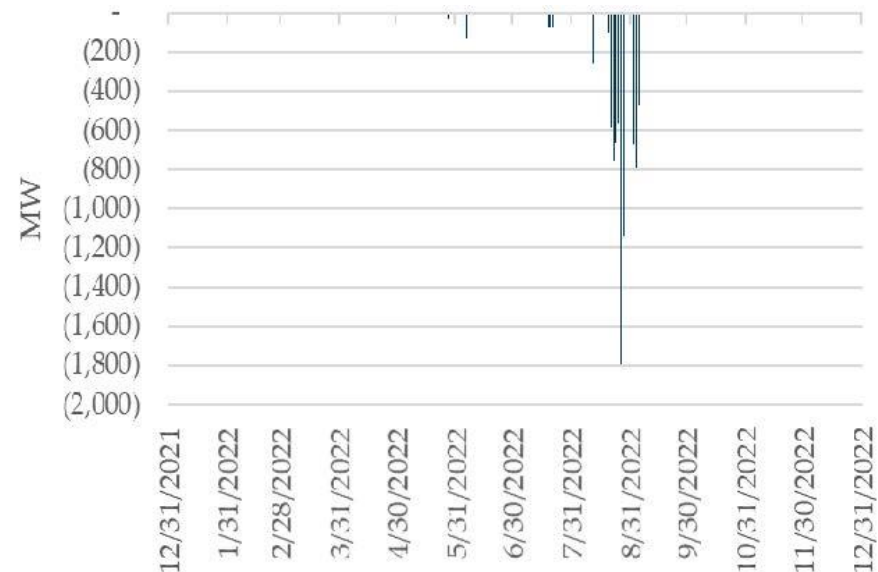
Capacity

When only looking at capacity, conditions appear reliable until 2026



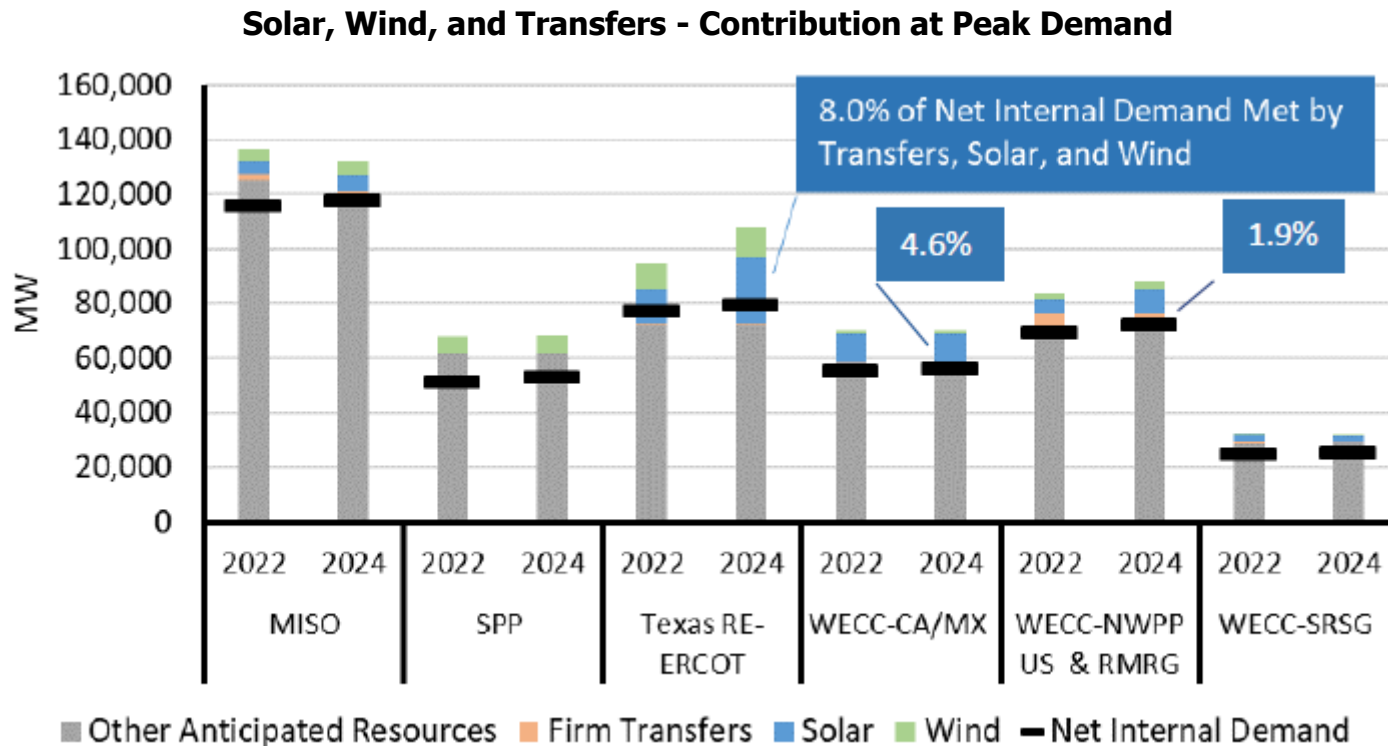
Capacity

10 Loss-of-Load Hours and 5.8 GWh of Unserved Energy in 2022

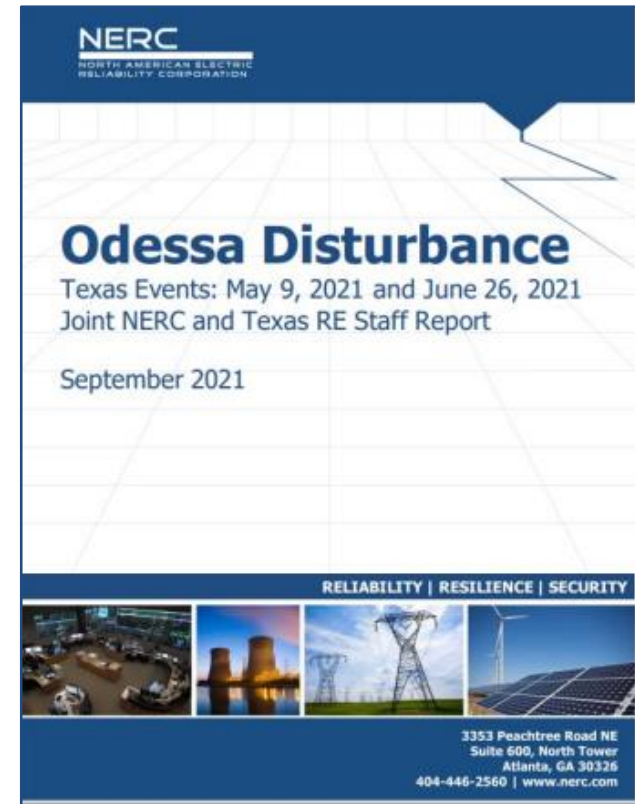


Energy

- Wide-area long duration extreme weather threatens reliability
 - More variability during winter peak electricity demand
 - Diminished output / unavailability of resources
 - Generator availability and natural gas fuel assurance



- Unexpected tripping of solar PV generation observed during grid events
- Rapid growth in solar PV resources connecting to the BPS continues
- Action needed to reduce risks
 - Adhere to NERC Reliability Guidelines
 - Improve FERC Generator Interconnection Procedures and Agreements
 - Enhance NERC Reliability Standards



- Improve BES resilience for wide-spread long-term extreme temperature events
- Deepen planning and operating focus beyond capacity adequacy, towards energy sufficiency
- Enhance and develop new Standards: cyber, weatherization, energy sufficiency, and inverter performance



2021 Cold Weather Outages Joint Inquiry

WEATHER | WINTER STORM
FREEZING FIASCO
 The Washington Post



WEDNESDAY, FEBRUARY 17, 2021
 Millions in grip of Arctic freeze

OVER A DOZEN DEAD, EXTENSIVE OUTAGES
 Much of hard-hit South to see more snow, cold

BY ANNE GOWEN, ANDREW FREEMAN, TUI CHANG AND FRANK NIXON

A crippling Arctic blast continues to swirl across the United States on Tuesday after a snowstorm left some without power and officials in some places urged residents to stay indoors.



A rare snow, 8 inches deep, blanketed Austin, Texas, on Monday, when more than 70% of the U.S. was snow-covered. Utilities in Texas instated rolling power outages and urged people to reduce electricity use. (AP/WIDEWORLD)

Bitter cold, ice, snow paralyze half of USA
 Abilene Reporter-News

Blackouts controversy heats up
 Abbott, lawmakers vent anger at grid operator after snowstorm

John C. Mueller
 Associated Press/Chris Chittum/Chris Chittum

The state's grid operator says Texas has been anything but reliable over the past 48 hours. Abbott said he is an emergency priority for lawmakers that oversees the grid. The law says Texas is without power and heat for their homes as our state faces freezing temperatures that keep the lights on in Texas. Referring ENRGT, Abbott said, will be an emergency priority for lawmakers during the 2021 legislative session. That action has free of the state's most powerful stakeholders come and evaluating signs and frustration among the Texas have been take show. A vom from seeing all from a the egg, polit

The Dallas Morning News
 Freeze grips

WINTER STORM
 Dallas, Texas, Monday, February 16, 2021
 DallasNews.com

... Texas Power Grid
 The New York Times
 Bitter Cold, Stretching From Canada to the Rio Grande



HOUSTON CHRONICLE
 FAILURES OF POWER



COLD READING
 Warned 10 years ago, regulators again face

- Texas - ERCOT
 - Total load shed 20,000 MW at peak
 - Load shed request duration: 70.5 hours
 - Customer outage across Texas: 3.7M
 - Lowest Frequency: 59.3 Hz
 - Installed capacity out of service: 52,277 MW
 - Natural Gas generation offline: 26,000 MW
 - Wind generation offline due to icing: 14,000 MW
- Midwest to Louisiana - MISO
 - Load shed: 1,430 MW
 - Installed capacity out of service: 59,000 MW
- Dakotas to Southern Plains - SPP
 - Load shed: 3,443 MW
 - Installed capacity out of service: 25,000 MW

**Additional load shedding in Northern parts of Mexico due to natural gas shortage*

- 1. Generation Freezing Issues**
- 2. Natural Gas Fuel Supply Disruptions**
- 3. Natural Gas and Electric Reliability Interdependency**
- 4. ERCOT Firm Load Shed Affected Natural Gas Facilities**
- 5. Manual and Automatic Load Shed Coordination**
- 6. Electric Reliability Coordination**



Questions and Answers