NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Reliability Risk and Grid Transformation

NASUCA Annual Meeting
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November 12, 2024

RELIABILITY | RESILIENCE | SECURITY




NERC Mission & Program Areas

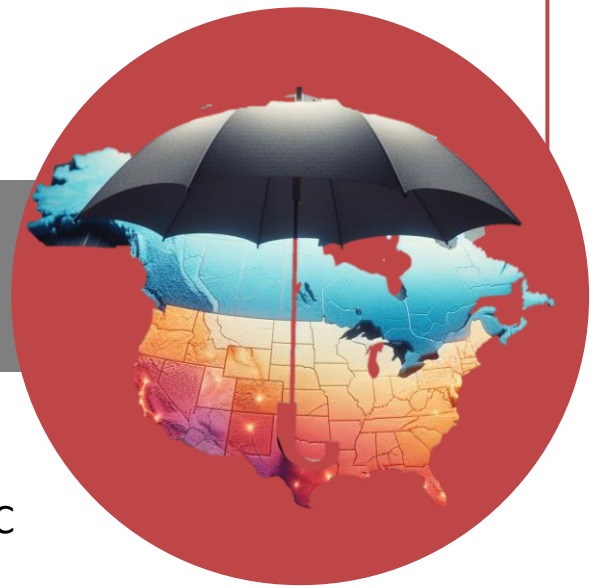
Assure the effective and efficient reduction of risks to the reliability and security of the grid.

- Propose, monitor compliance with, and enforce **mandatory reliability standards** for the North American BPS, subject to regulatory oversight and approvals of FERC in the U.S. and applicable authorities in Canada;
- Conduct **near-term and long-term assessments** of the reliability and future adequacy of the North American BPS;
- **Certify BPS operators** as having and maintaining the necessary knowledge and skills; and
- Maintain **situational awareness** of events and conditions that may threaten reliability.
- Operate the **Electricity Information Sharing and Analysis Center**, a security communications channel, providing threat awareness and analysis, mitigation strategies, and coordinates incident management.

Electric Reliability Organization (ERO) Enterprise

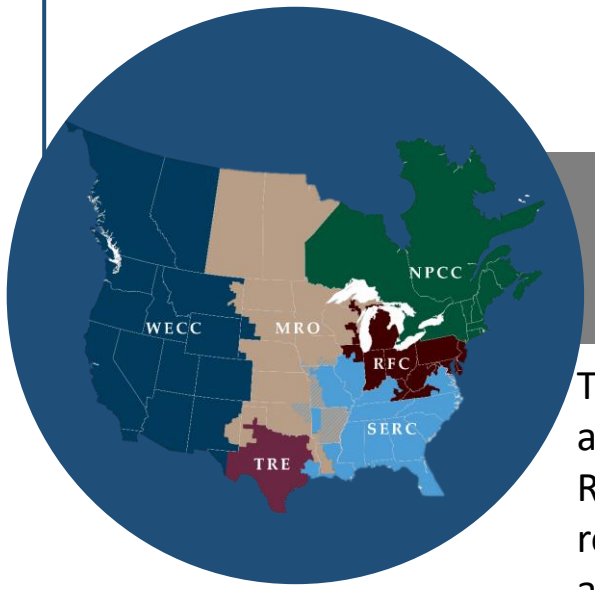
Standard Development	Assessments	Studies	Whitepapers
Over 90 Reliability Standards	Long Term and Seasonal	Risk Reliability Studies, Transfer Capability	Technical Whitepapers and Reports

Audits	Enforcement	Outreach	Regional Studies
In the field and on-site verifying compliance	Penalties for non-compliance	Webinars, Workshops, Newsletters	Sub-regional assessments and studies



NERC

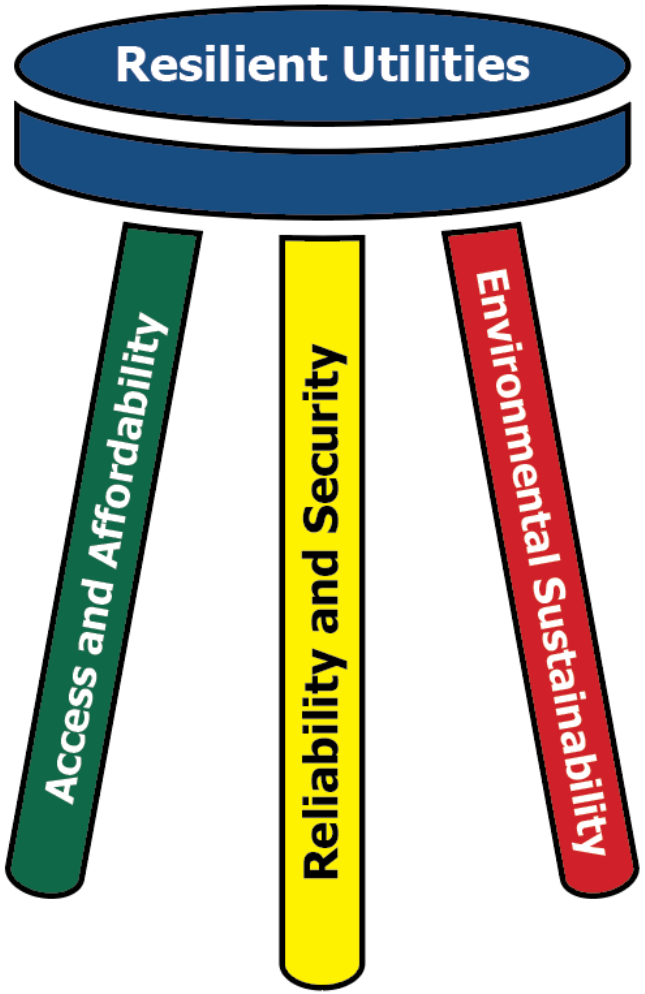
NERC as the ERO operates under specific authorities established in the 2005 Federal Power Act. NERC has oversight of the six regions and is evaluating reliability risk on an inter-national scale.



Regions

The regions have the authority to audit and enforce Entities against the NERC Reliability and Security Standards. The regions also provide studies and assessments specific to their region as well as outreach and training

Energy Policy Tri-Lemma



Hyper Complex Risk Environment

Rapidly Changing Resource Mix

- Retirements of traditional generation
- Natural gas interdependencies
- Inverter-Based Resource (IBR) integration
- DER performance and visibility

Extreme Weather Complexities

- Extreme not infrequent
- “Broader, Deeper, Longer”

Growth

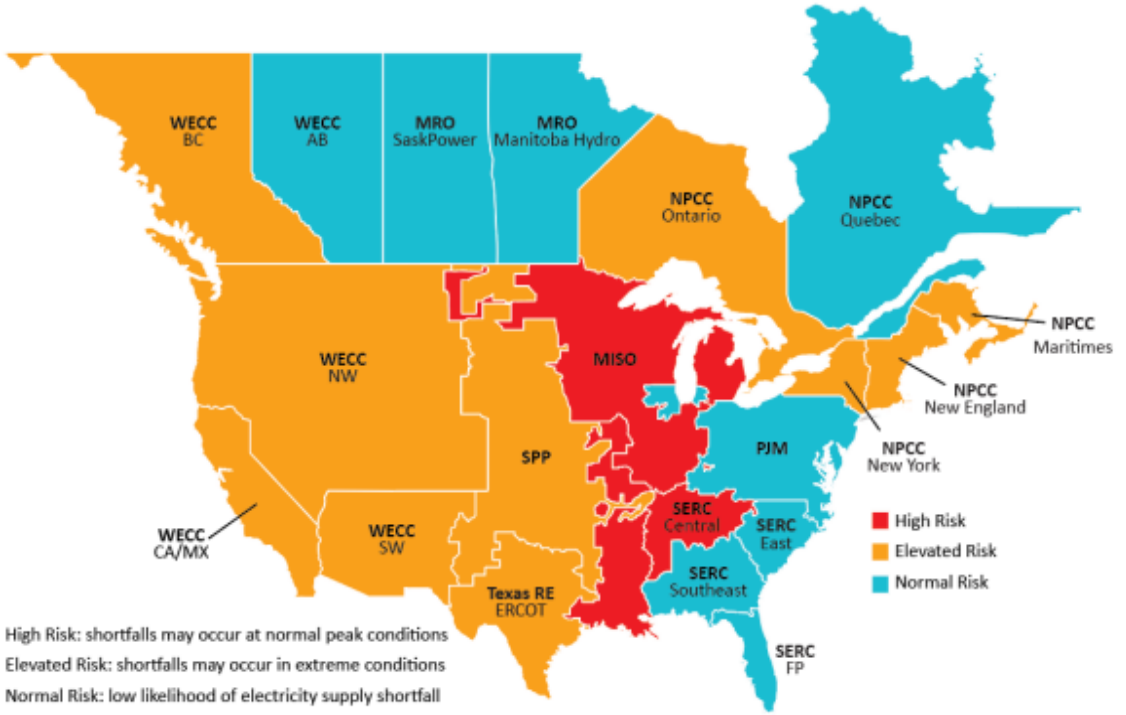
- Re-industrialization
- Technology/AI/Crypto-mining/Data Centers
- Electric Transportation
- Building Electrification

“Toxic Soup” Threat landscape

- Software vulnerabilities
- Supply chain threats
- Ransomeware
- Physical attacks

NERC 2023 Long-Term Reliability Assessment Highlights

- **Growing number of areas face capacity and energy risks in the next 10 years**
  - Generator retirements expected before sufficient replacement resources will be in service
  - Energy risks identified in areas where future resource mix is not be balanced between dispatchable and variable energy resources
- Risk assessment accounts for over 80 GW in generator retirements



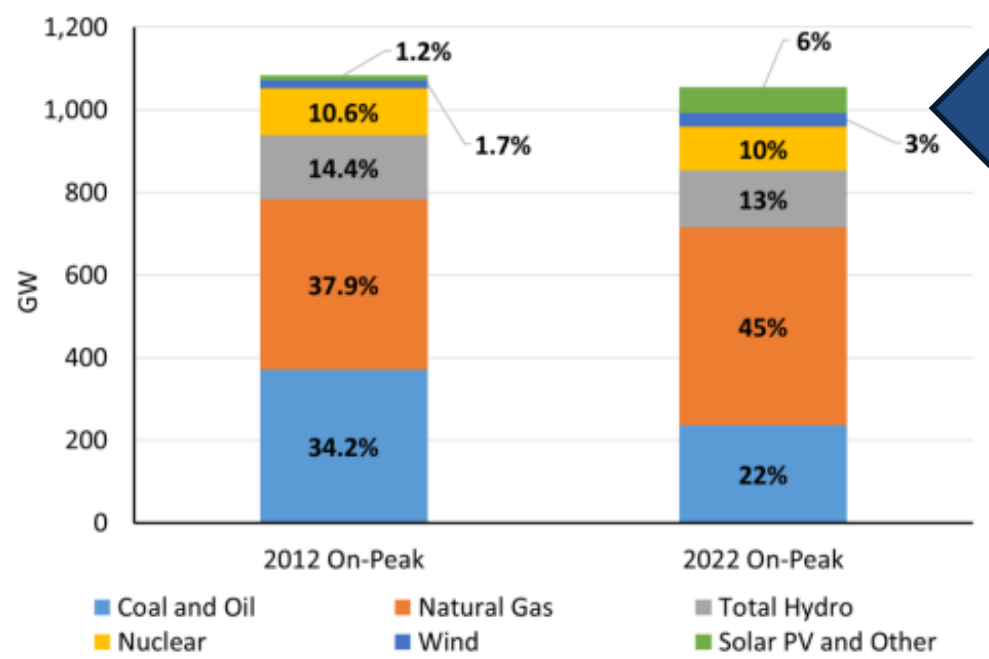
2023 - 2033 Long-Term Reliability Risk Area Summary

Risk Assessment Summary	
High	Potential for insufficient operating reserves in normal peak conditions
Elevated	Potential for insufficient operating reserves in extreme conditions
Normal	Sufficient operating reserves expected

Extreme conditions include 90/10 demand scenarios, historical high generator outage rates, and low variable energy resource scenarios

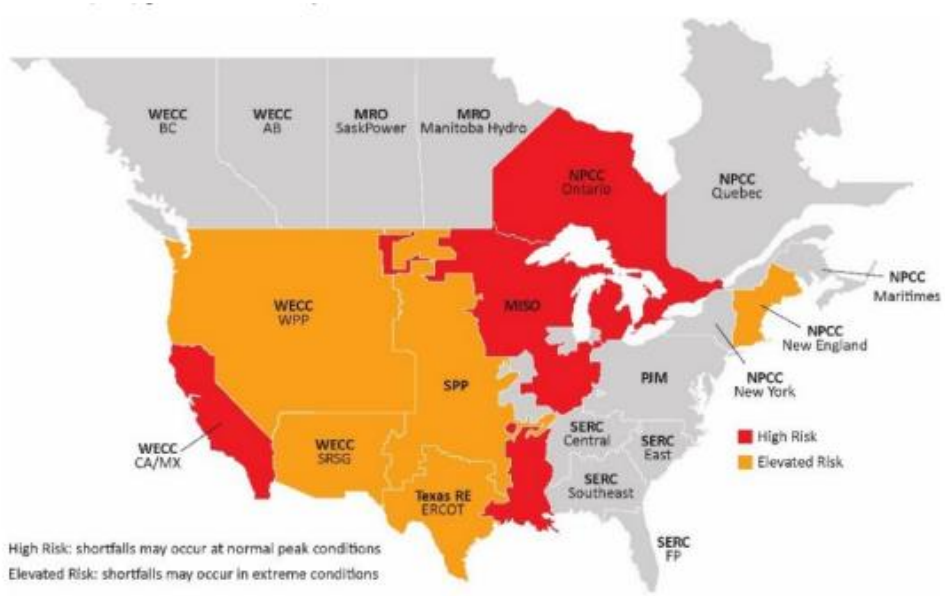
Across an Interconnected System: Less Resources Means More Reliance on Neighbors

2012 and 2022 Peak Capacity Resource Mix NERC-Wide

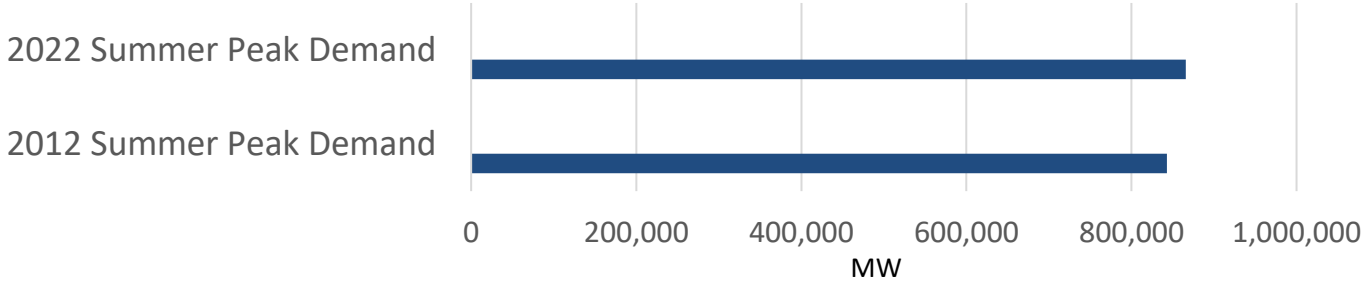


4% Decrease

2025 Risk Areas



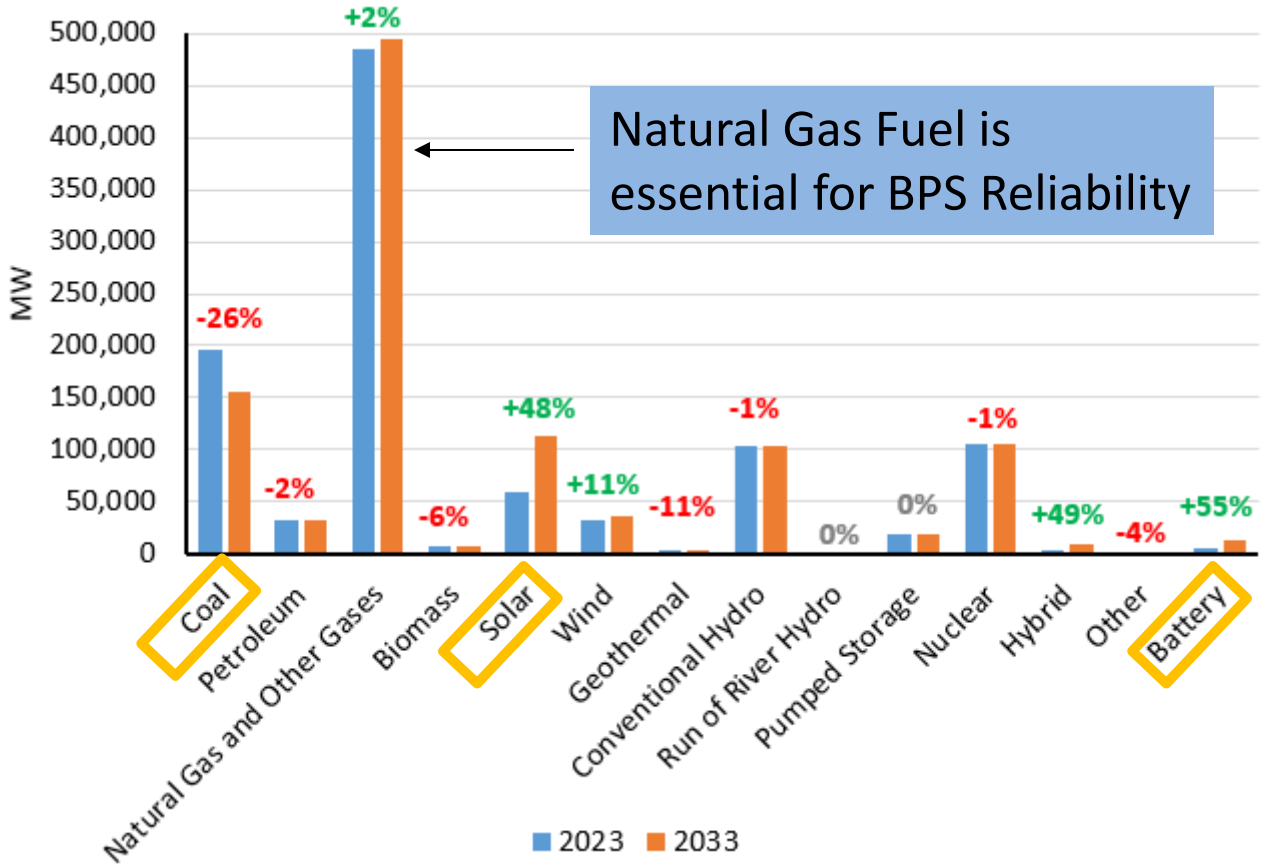
NERC-Wide Summer Peak Demand Changes 2012 and 2022



3% Increase

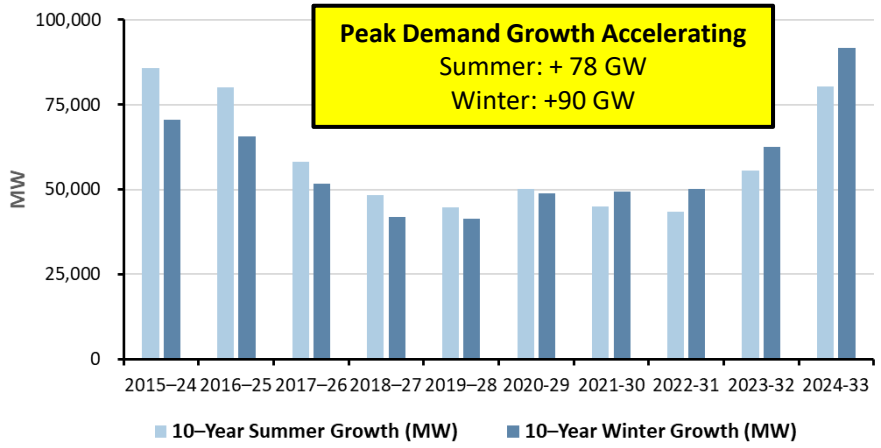
Changing Resource Mix

- **Solar, battery, and wind resource additions** – Generator retirements = Changing Resource Mix

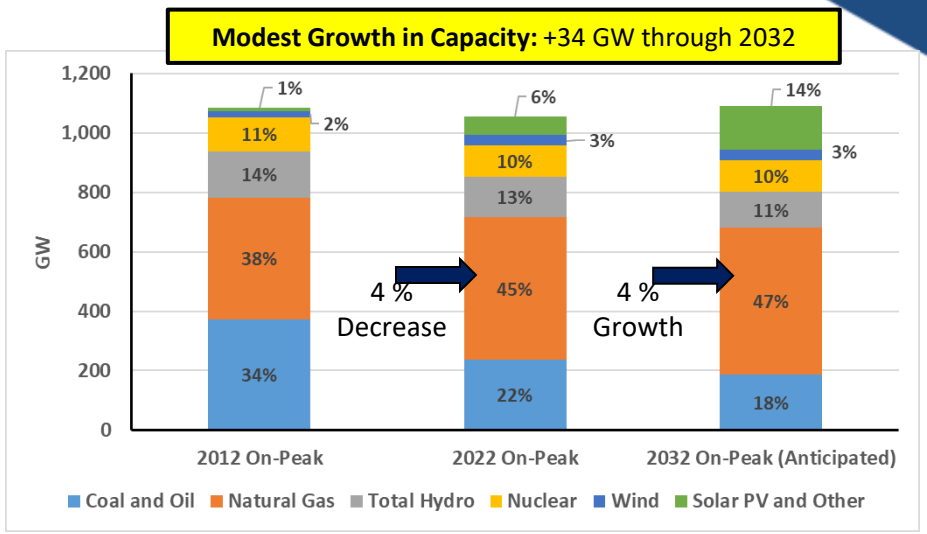


BPS On-Peak Capacity By Fuel Type

Trend: Demand Growth Outpacing Resources



10-year Peak Demand Growth Projection



Generation On-Peak Capacity

Demand

- Highest demand and energy growth rates in recent years
- Northeast and Southeast become winter peaking as early as 2028
- New load behavior is changing daily load profile, challenges operational forecasting

Supply

- Total capacity growth of 34 GW over next 10 years (Tier 1 additions – retirements)
- Most additions are Solar (69 GW)
- Retirements: 83 GW through 2033
- New emissions regulations likely to prompt additional retirements

Peak Demand Load Growth Projections

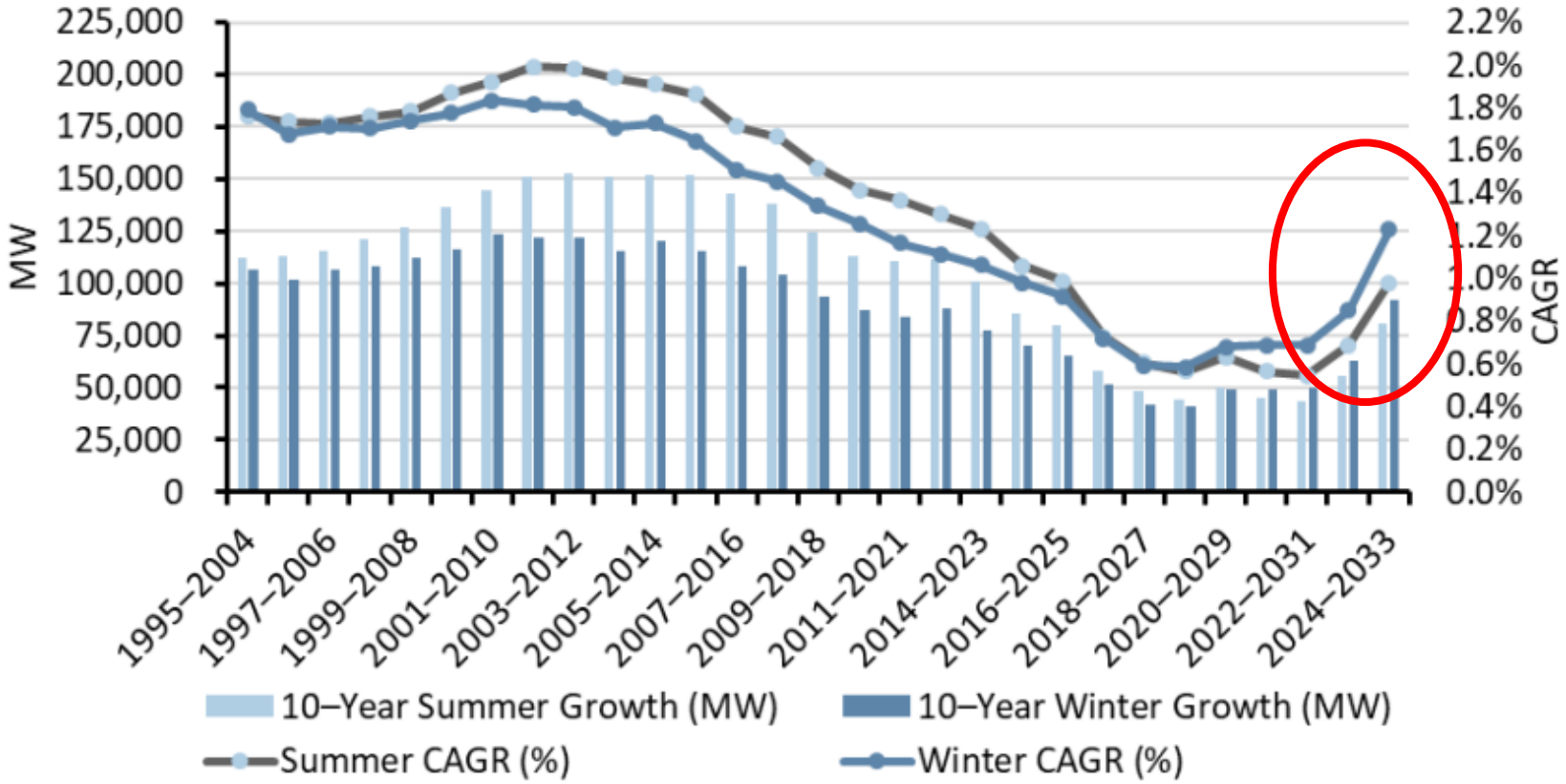
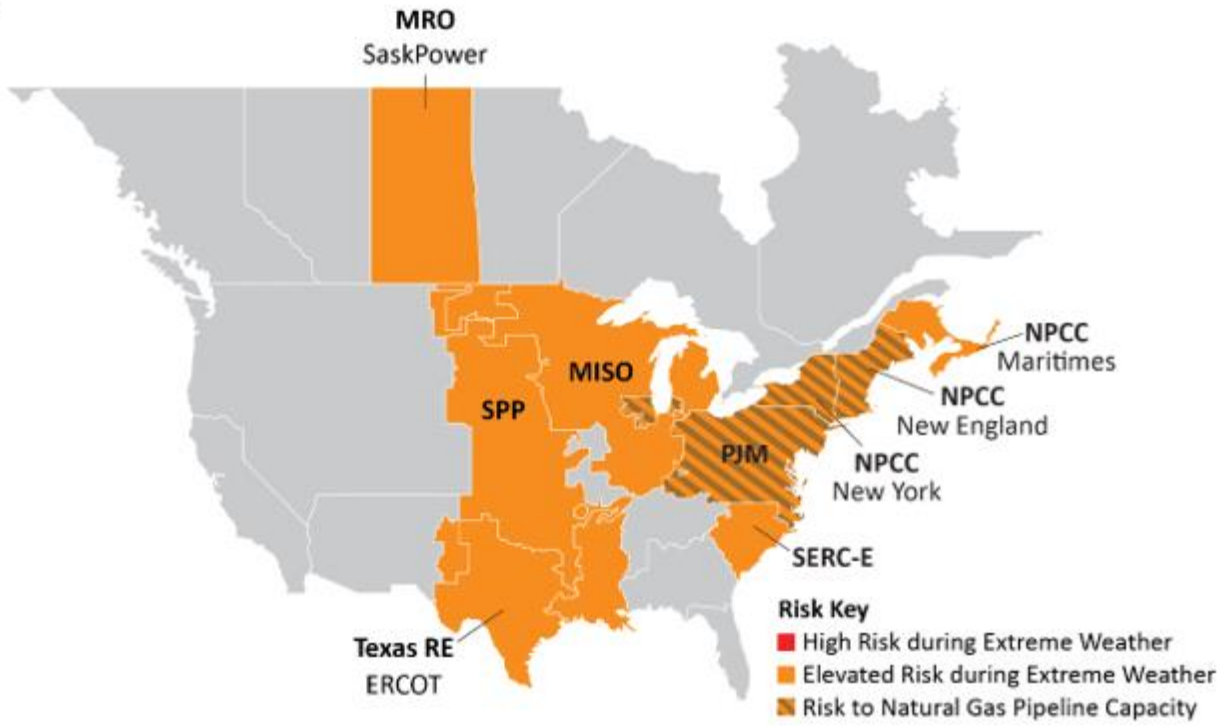


Figure 25: The 10-Year Summer and Winter Peak Demand Growth and Rate Trends

2024-2025 Winter Reliability Assessment Highlights

Wide area extreme cold events pose reliability risks

- Capacity and Energy Risk Assessment inputs
  - On-peak reserve margins
  - Operational risk analysis (waterfall chart)
  - Probabilistic energy metrics
- All assessed areas have adequate resources for normal winter peaking



2024-2025 Winter Reliability Risk Map

Seasonal Risk Assessment Summary	
High	Potential for insufficient operating reserves in normal peak conditions
Elevated	Potential for insufficient operating reserves in extreme conditions
Low	Sufficient operating reserves expected

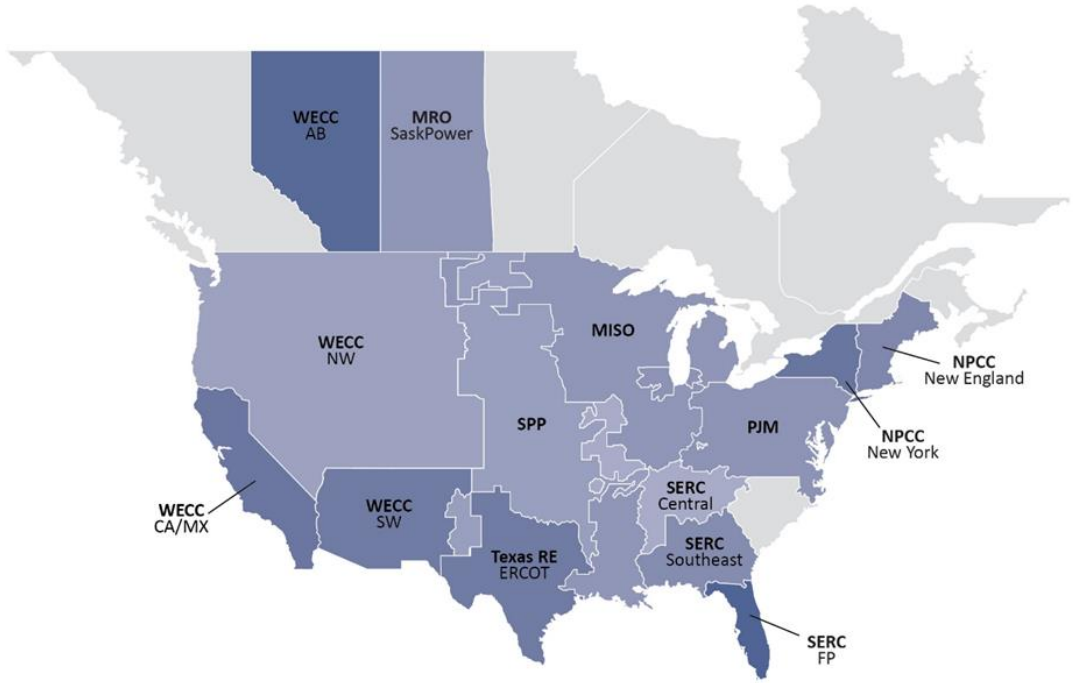
Extreme conditions include 90/10 demand scenarios, historical high generator outage rates, and low variable energy resource scenarios

2024-2025 Winter Reliability Assessment Recommendations

- **Cold Weather Preparations** – RCs, BAs, and TOPs in elevated risk areas should review seasonal operating plans and communications protocols for resolving potential supply shortfalls.
- **Generator Readiness** - Generator Owners should complete winter readiness preparation prior to December, deploy weatherization packages in advance of winter storms, and frequently check and maintain cold-weather mitigations while conditions persist.
- **Fuel** – RCs and BAs should implement generator fuel surveys to monitor the adequacy of fuel supplies.
- **Load Forecasting** – BAs should be aware of the potential for short-term load forecasts to underestimate load in extreme cold weather and be prepared to take early action to manage potential reserve deficiencies.
- **State regulators and policy makers** – assist grid owners and operators in advance of and during extreme cold weather by supporting requested environmental and transportation waivers.

Interconnected Natural Gas and Electric Systems

- Natural gas fuel is essential for winter reliability
- Weather-related generator and fuel system failures can widen the reliability impact of extreme winter events



All other assessment areas have less than 35% natural gas fired generation contribution to winter resource mix.

	Natural-Gas-Fired Generation	
	Peak Winter Capacity	Contribution to Total Winter Resource Mix
MISO	67.5 GW	46%
MRO-SaskPower	2.1 GW	46%
NPCC-New England	17.3 GW	54%
NPCC-New York	24.5 GW	66%
PJM	84.9 GW	47%
SERC-Central	22.7 GW	44%
SERC-Florida Peninsula	50.6 GW	79%
SERC-Southeast	31.5 GW	51%
SPP	27.4 GW	41%
Texas RE-ERCOT	54.2 GW	62%
WECC-AB	11.4 GW	75%
WECC-CA/MX	39.9 GW	65%
WECC-NW	31.0 GW	39%
WECC-SW	18.2 GW	62%

Natural-Gas-Fired Generation Capacity Contributions to 2023–2024 Winter Generation Mix

Winter Storm Assessments – Good News

- **Cold Weather Preparations** – In 2024, during Winter Storms Gerri (Northwest & Midwest) & Heather there was ***no*** system operator-initiated load shed. Natural gas and electric entities have shared positive steps taken to improve preparation
- Generators reported fewer derates/outages as compared to past winter storms potentially attributed to:
  - Improved winter preparedness;
  - Proactive generator commitment;
  - Improved gas generator stability due to variable, i.e., non-ratable, fuel supply methods; and
  - Incorporating operating limitations into operating plans.

Winter Storm Assessments Recommendations & Actions

Check out FERC's Dashboard Tracking Progress on Recommendations from FERC-NERC Winter Storm analyses

- **Cold Weather Preparations** – Implement *Essential Actions* in NERC Level 3 Alert (May 2023) and winter operating plans
- **Reliability Standards** – NERC filed revised reliability standards that address operations in extreme cold conditions with FERC, several of which have been approved.
- **State regulators and policy makers** – Support public appeal for reduced electricity and natural gas use and be prepared to handle requests for environmental and transportation waivers when needed for reliability
- **Load Forecasting** – Anticipate potential for underestimating load in extreme cold and take early action to reduce the risk of reserve shortfall

Next Steps

- **WRA Publication date: November 14, 2024**
- **Industry WRA Webinar: Week of November 18, 2024**

- **NERC Large Loads Task Force**

- **NERC Webinar on ITCS for State Policymakers – December 10**
  - **Registration**

Questions and Answers