Power MO: Securing Missouri's Energy Future Briefing

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Discussion Topics

- **Overview**
  - What is the Electric Reliability Organization Enterprise (ERO)?
  - Who is SERC Reliability Corporation?
  - Who is Midwest Reliability Organization?
- **Resource Adequacy**
  - What is Resource Adequacy?
  - Top Risks Relating to Resource Adequacy
    a) Regional Risks for SERC Reliability Corporation
    b) Regional Risks for Midwest Reliability Organization
- **Key Takeaways and Final Thoughts**
- **Q&A**
- **Resources and Contact Information**

Overview

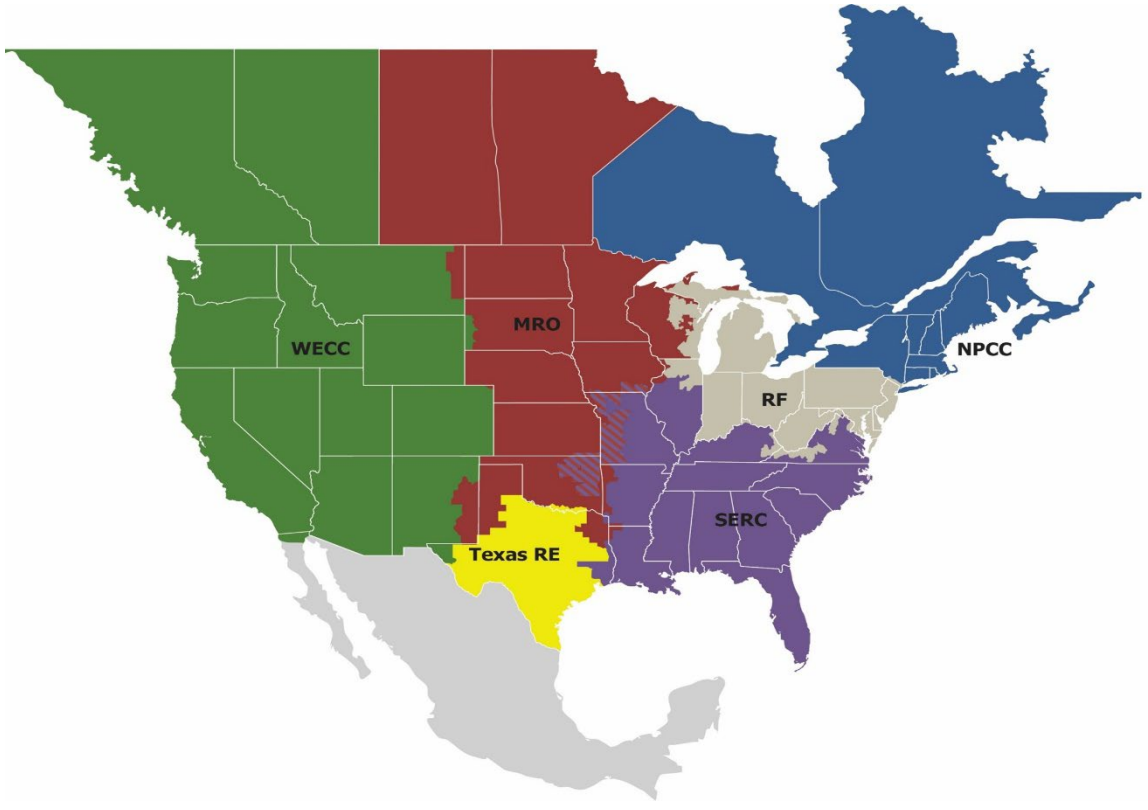
Electric Reliability Organization Enterprise

We are regulators of the electric industry

We do not own or operate grid assets or energy markets

Our mission is solely reliability and security of the bulk electric system

We are an objective and independent resource



SERC TEXAS RE WECC RELIABILITY FIRST NPCC, Inc. MIDWEST RELIABILITY ORGANIZATION NERC NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Electric Reliability Organization 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 compliance verification	Mandatory Mitigation; monetary and non-monetary sanctions 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 the NERC Reliability and Security Standards with their Entities. The regions also provide studies, assessments and evaluate Reliability Risk specific to their region as well as providing outreach and training.

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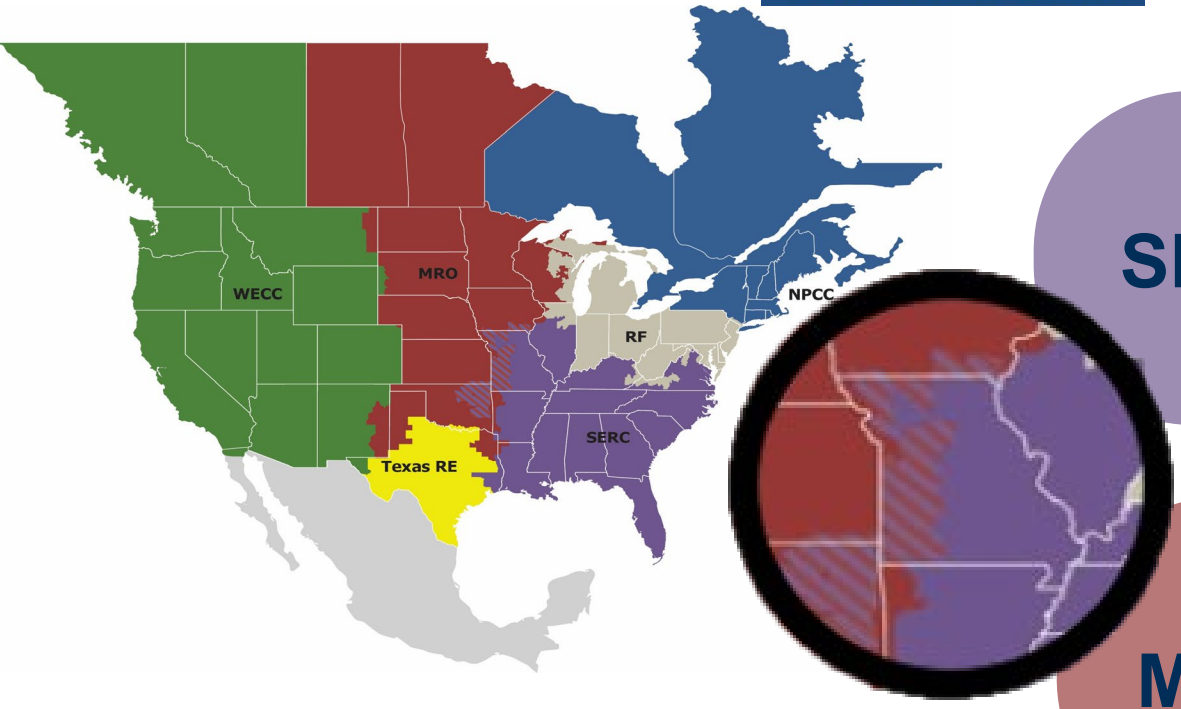
Electric Reliability Organization (ERO)

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION



SERC

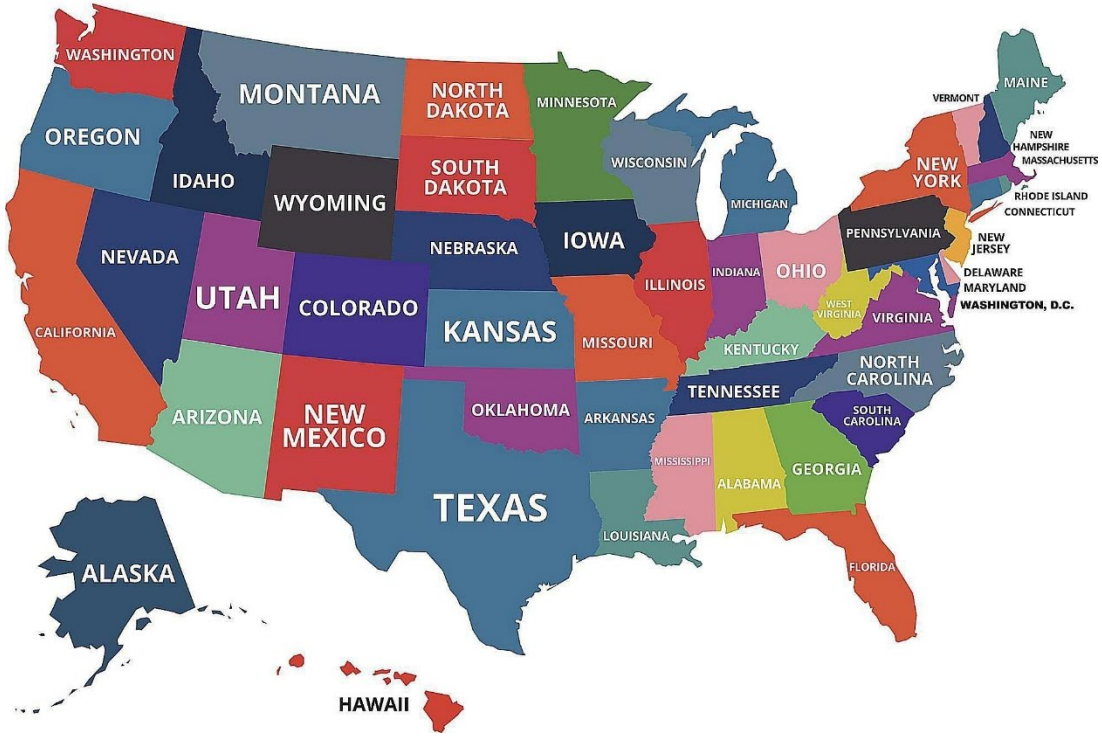
- **16** States & **97M** Est. Population
- **300+ Registered Entities**
- **122k** Miles of transmission
- **4200 Generating Units**
- **310 GW generation**
- **261 GW Forecasted load**

MRO

- **16** States, **2** Canadian Provinces & **27M** Est. Population
- **225+ Registered Entities**
- **90k** Miles of BES Lines
- **950 Active Generating Units**
- **92 GW Forecasted Load**
- **57,300 MW-wind generation**

The States

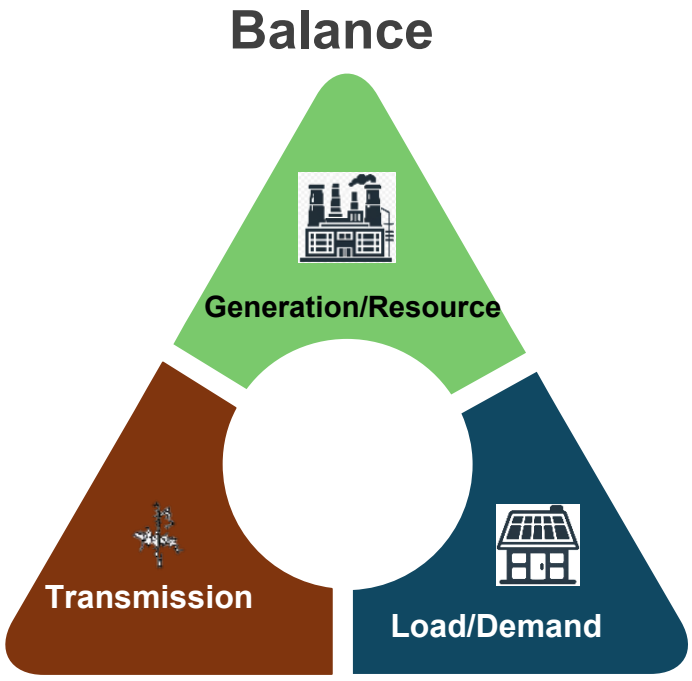
- Integrated Resource Planning
- Resource Portfolio Standards
- Price Regulation
- Distributed Generation
- Electrification Incentives
- Energy Efficiency Programs

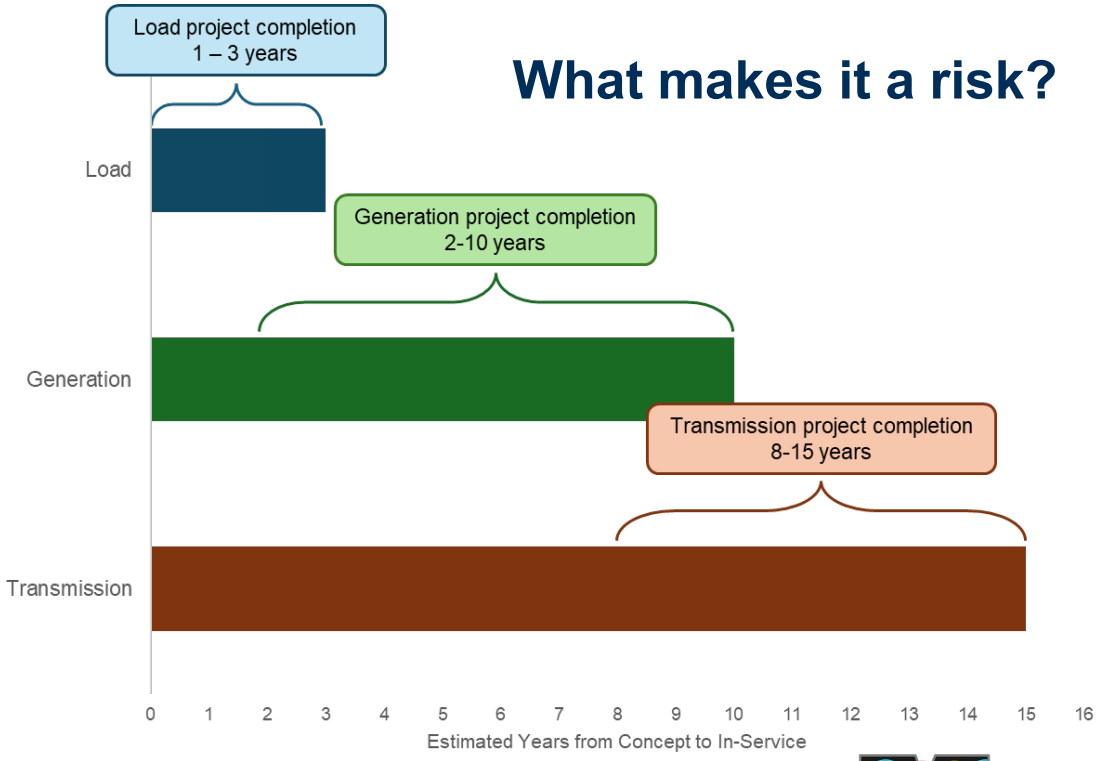


Resource Adequacy

Resource Adequacy

Generally speaking, resource adequacy is the ability of the electric system to meet the energy needs of electricity consumers. This means having sufficient generation to meet projected electric demand - FERC



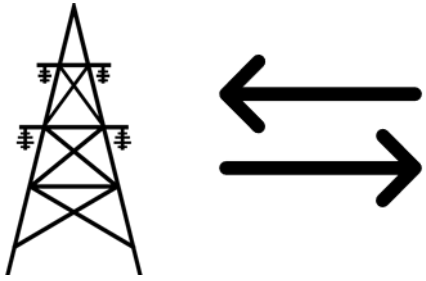


Variables To Determine Resource Adequacy

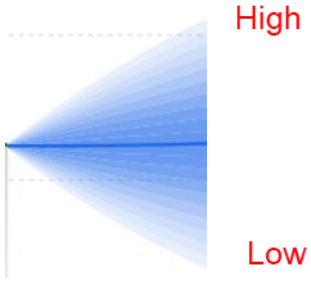
All-hours assessment (not just peak)

Impacts of weather

Gen forced and maintenance outages



Imports/exports from/to neighbors



Load forecast/growth uncertainty

Other fuel supply constraints

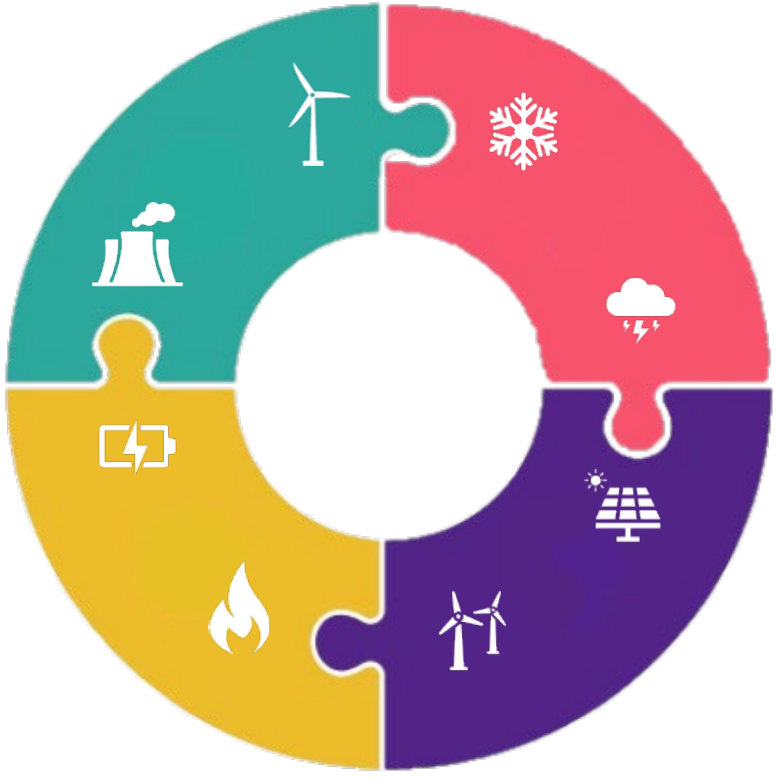
2022-2023 SERC Regional Risk Assessment
Top Risks Relating to Resource Adequacy

CHANGING RESOURCE MIX

Accelerated retirements coupled with addition of renewable resources represents new challenges in operations and planning. This new resource mix is more variable and dependent on weather conditions.

FUEL DIVERSITY/ FUEL AVAILABILITY

Coal generation continues to retire. Natural Gas fired generation makes up an increasing percentage of resources in the SERC Region. This heavy reliance on Natural Gas make fuel availability susceptible to interruptions due to extreme weather and security threats.



EXTREME WEATHER

SERC's regions is increasingly prone to more frequent extreme weather. Because of its impact on loss of situational awareness, fuel diversity and availability, VER integration, and others, it poses a high risk to the reliability of the power system.

VARIABLE ENERGY RESOURCE (VER) INTEGRATION

The SERC Region's geographic is producing a sharp rise in renewable energy resource portfolio: wind energy in the west, and going forward offshore to the east, as well as solar in the south and southeast. These VER are dependent on the weather conditions, which are uncertain and challenging to predict.

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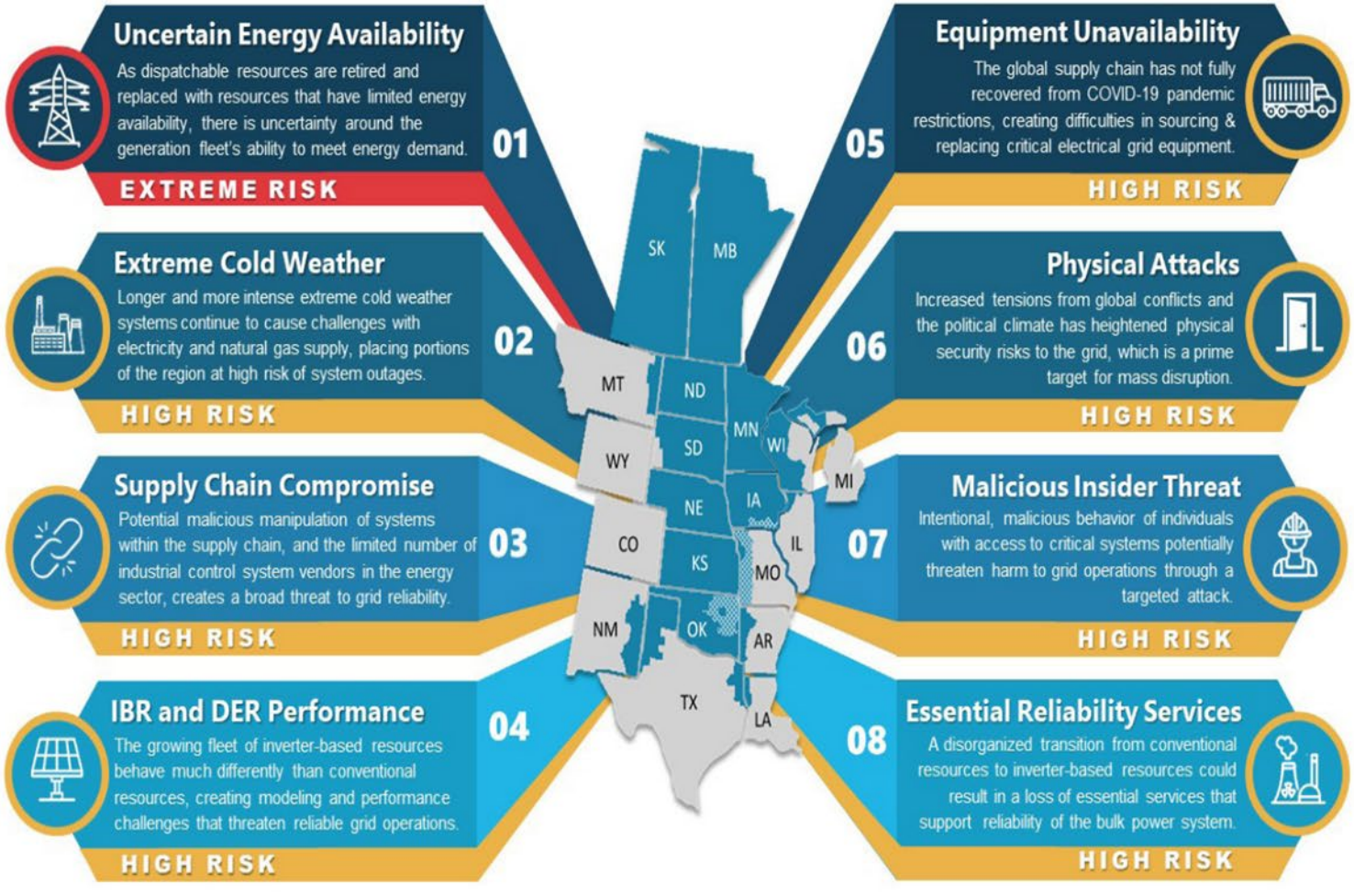
2024 Regional Risk Assessment

Top risks to the reliable and secure operation of the regional bulk power system.



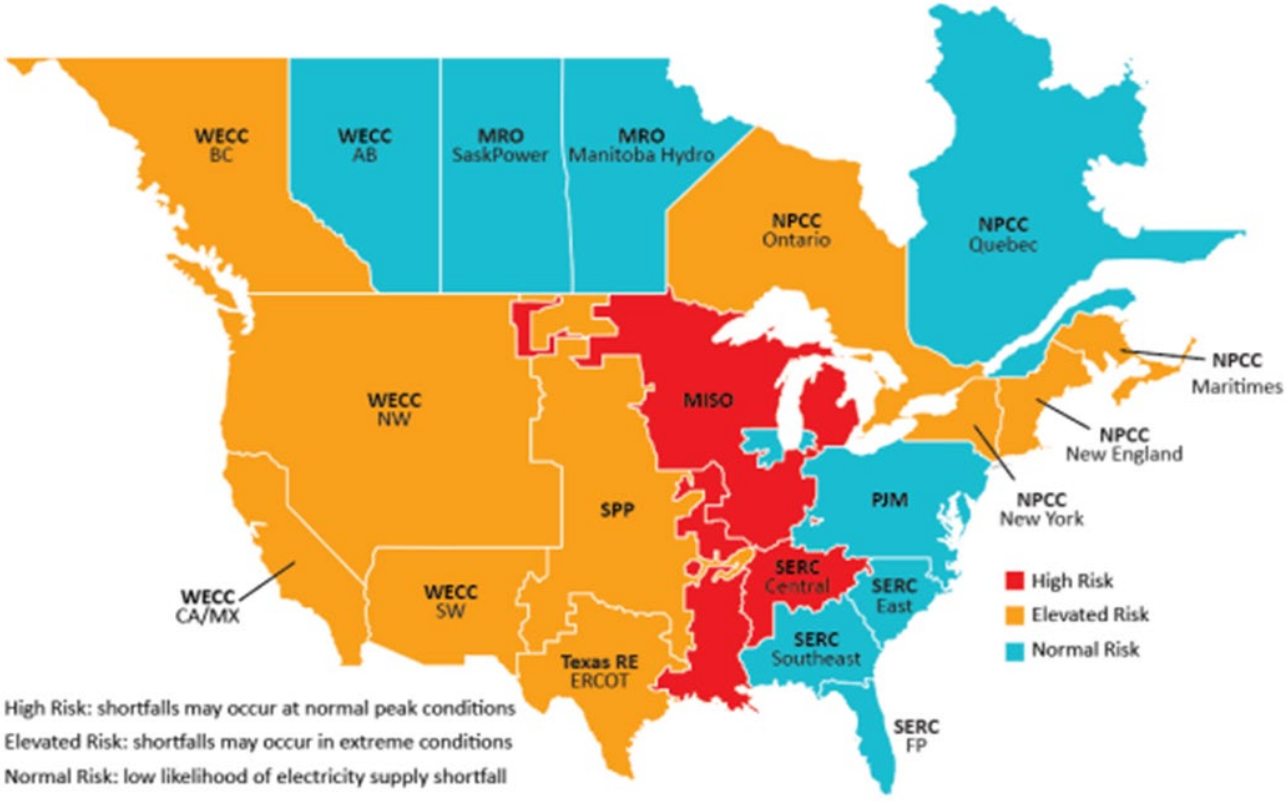
More information about bulk power system regional risk and mitigating activities can be found at www.mro.net

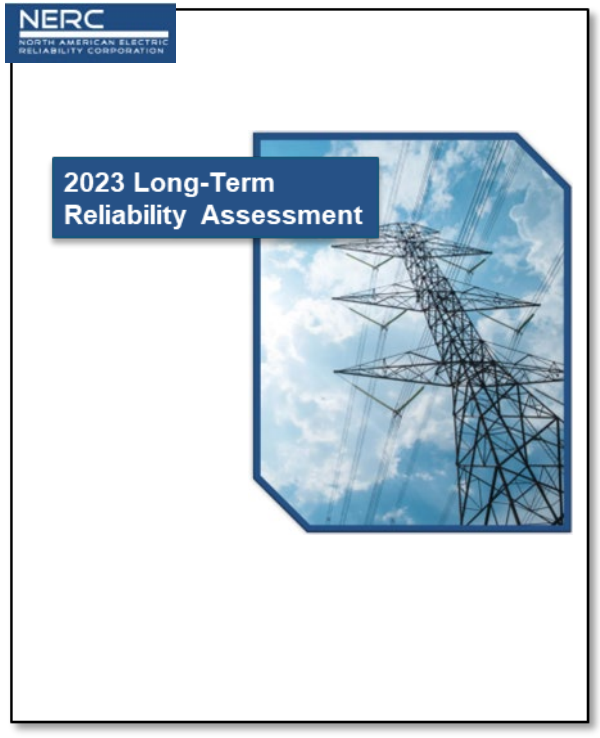
MIDWEST RELIABILITY ORGANIZATION

Energy Availability Risk

- Generation retiring faster than replacement energy is available
- More variable and weather-dependent resources increase energy supply uncertainty
- Changing load patterns are harder to predict
- Limited power transfer capability between regions
- Generation capacity assessments don’t assess energy needs for all hours of the year

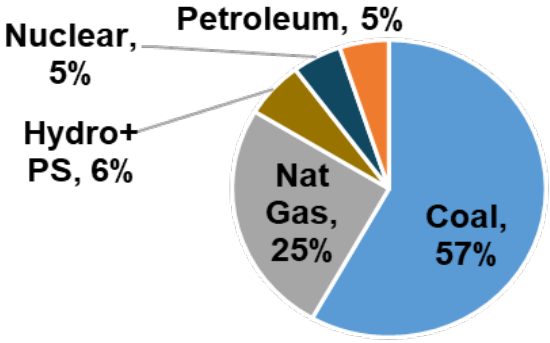
Supply Shortfall Risk 2024-2028





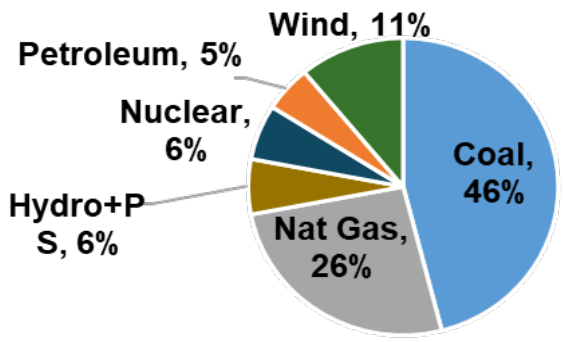
[Available on the NERC Website]

Changing Resource Mix
Existing and Tier 1 capacity 2023-2033



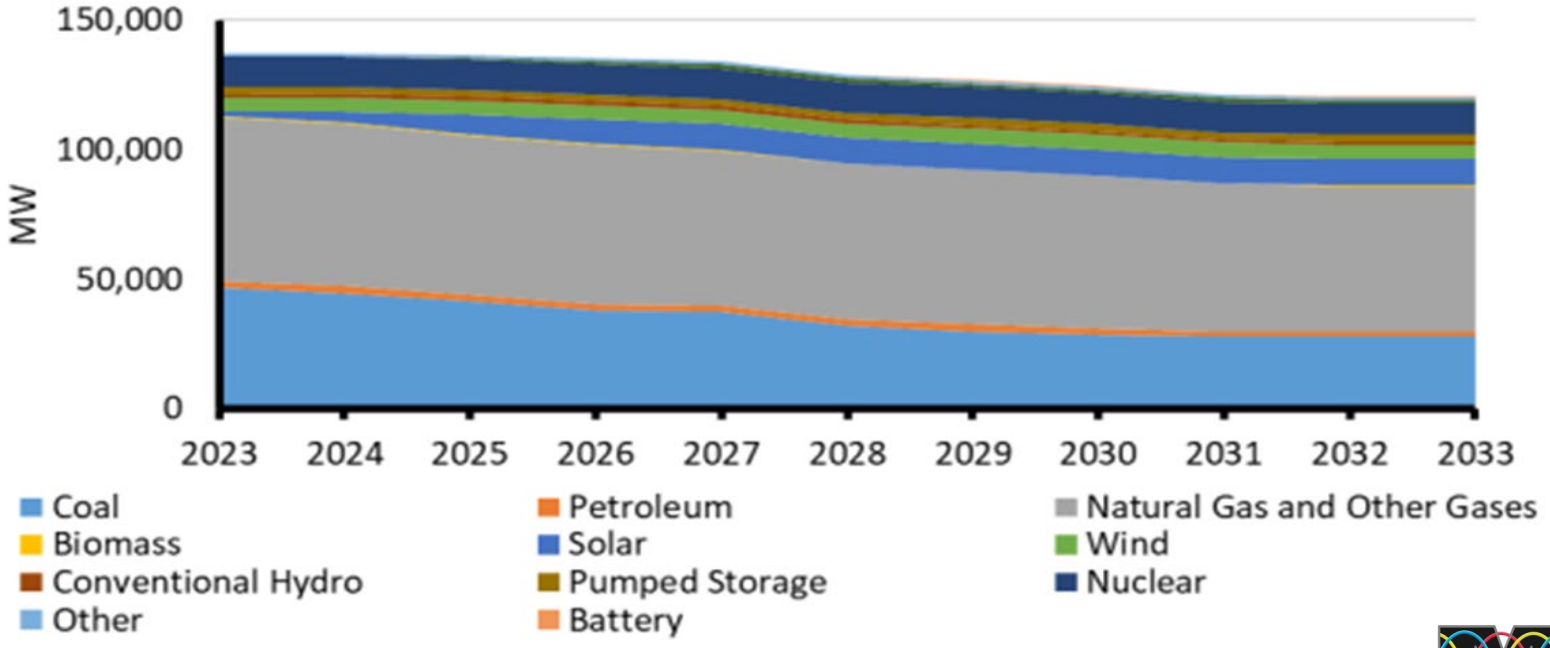
MO 2012

Source: U.S. Energy Information Administration



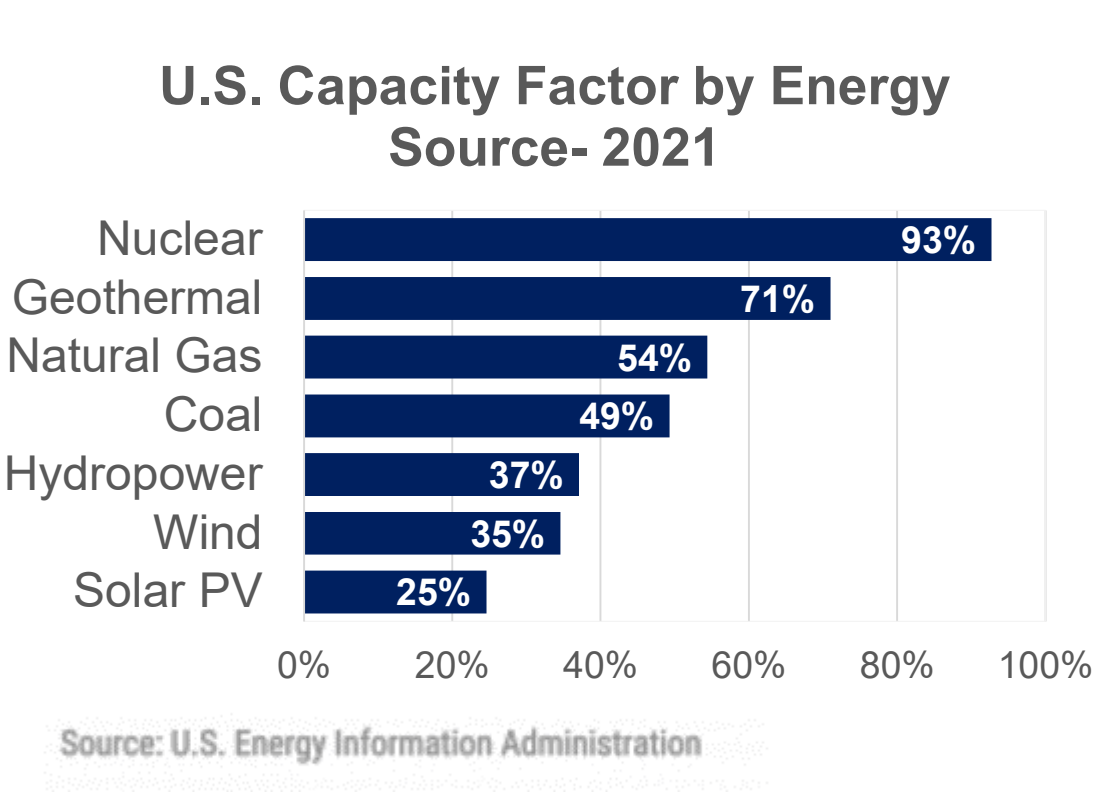
MO 2022

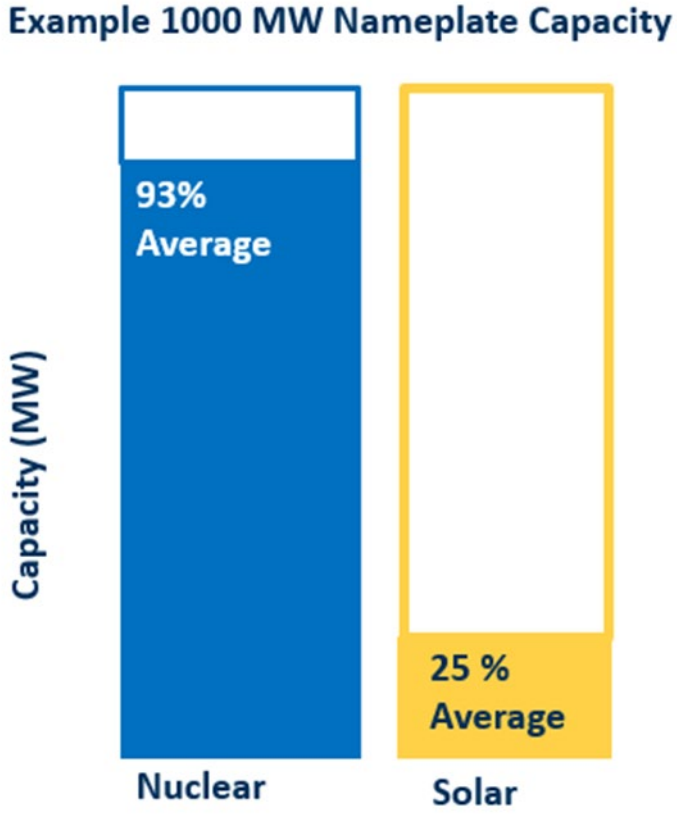
2023 NERC Long Term Reliability Assessment, MISO



Not All Megawatts (MWs) Are Created Equally

Capacity factor: Energy output/ theoretical maximum capacity





Extreme Cold Weather and Generator Availability

- Increase in grid impact from extreme cold weather
- Generation winterization challenges
- Electric/Gas infrastructure interconnectedness

Long Term Load Growth

Factors driving load growth

- Data centers
- EV Growth
- Economic development
- Electrification

DIVE BRIEF

US electricity load growth forecast jumps 81% led by data centers, industry: Grid Strategies

Data from FERC Form 714 shows grid planners expect nationwide power demand to grow 4.7% over the next five years, compared to a previous estimate of 2.6%.

2023 NERC Long Term Reliability Assessment

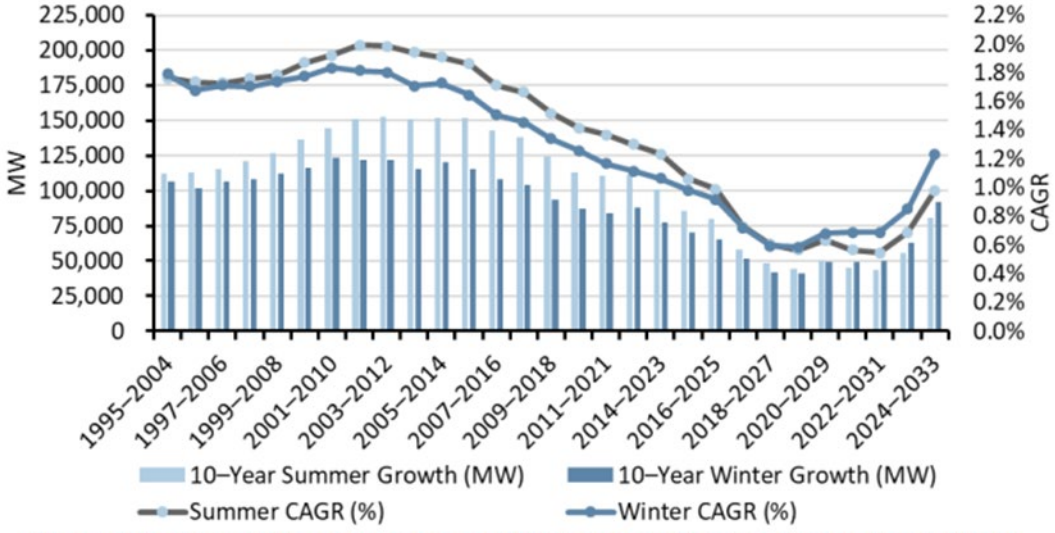
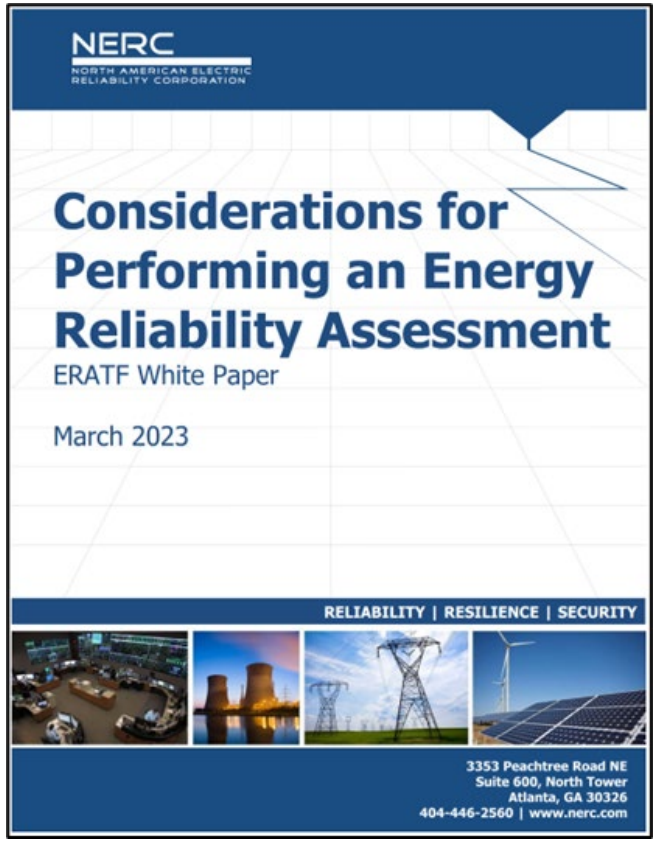


Figure 25: The 10-Year Summer and Winter Peak Demand Growth and Rate Trends

Electrification creates shift in time of peak demand from summer to winter.

Energy Reliability Assessment

- Impacts of limited resource availability and uncertainty
- Consider combined limitations applicable to all generation resources and transmission.
- Represent load uncertainty from impact of responsive load and distributed energy resources.
- Incorporate variable generation uncertainty and depletion of energy resources (Ex: energy storage and hydro).
- Include common-mode failures within regional fuel supply infrastructure.

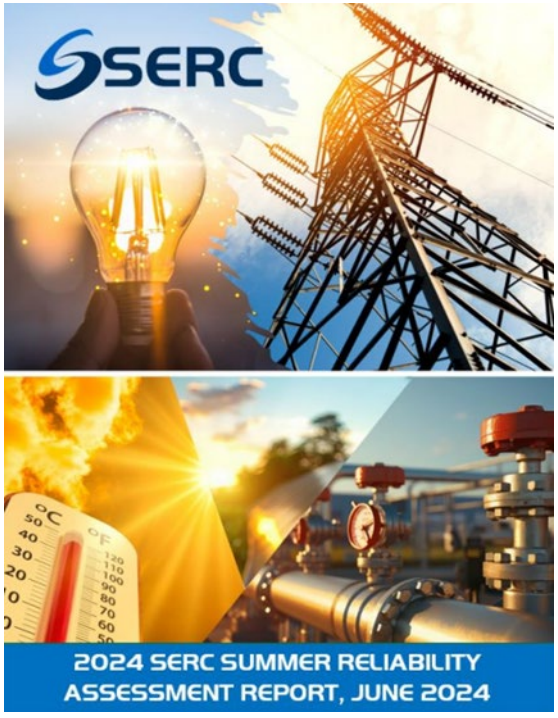


Available at nerc.com

Key Takeaways

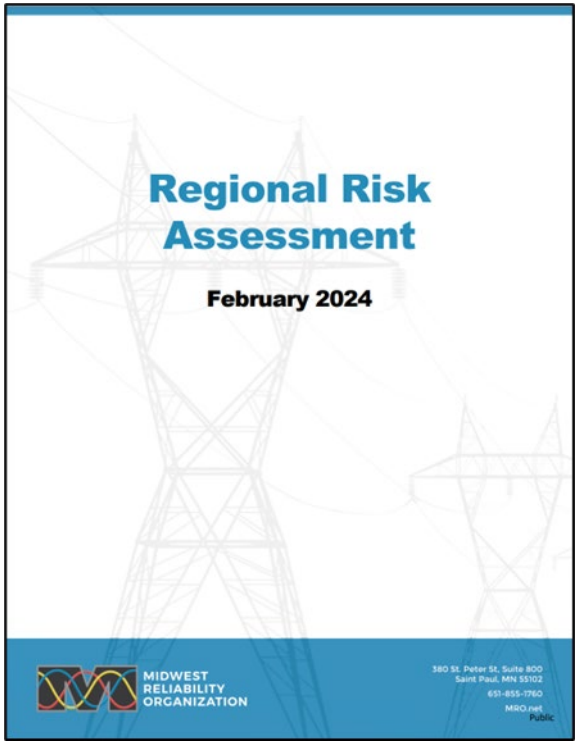
- Pace of generator retirements need to be managed to ensure adequate energy is available to meet future demand.
- Expand resource adequacy evaluations to include energy risks for all hours and seasons.
- Consider impact of electrification on future electricity demand.
- Account for extreme weather scenarios in resource planning.
- Mitigate risks from interconnected natural gas infrastructure.

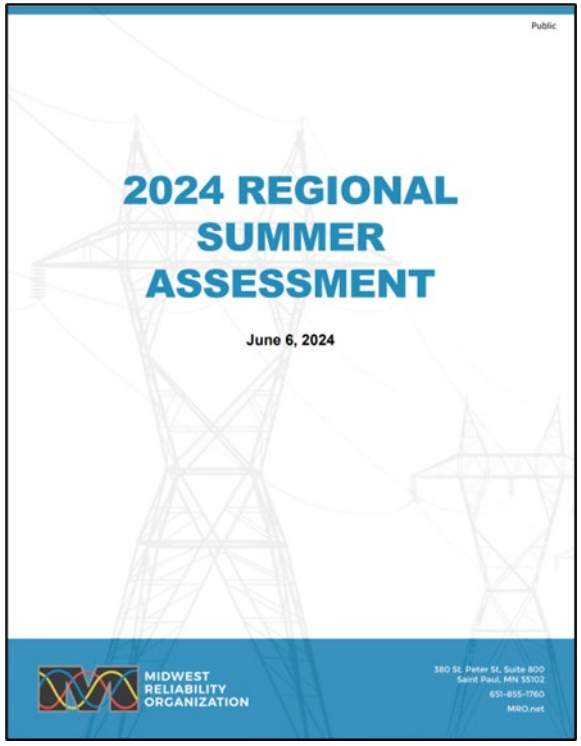
SERC Publications

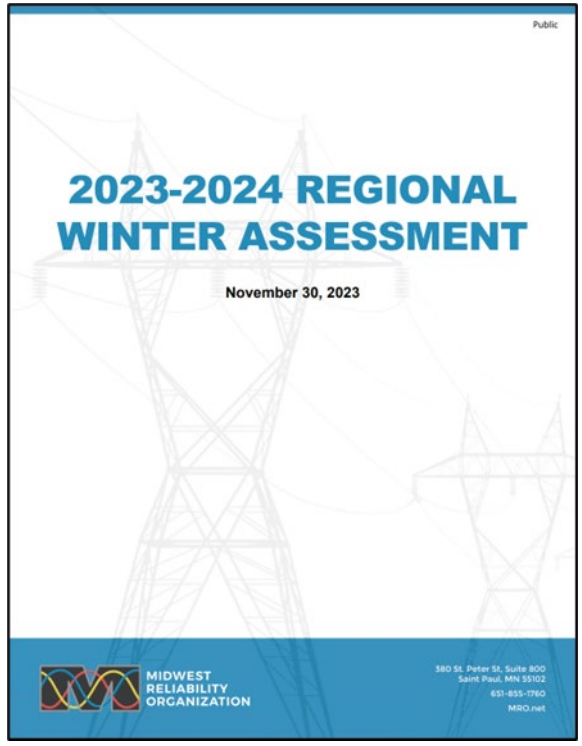


[Available at serc1.org](serc1.org)

MRO Publications







[Available at mro.net](mro.net)

MIDWEST RELIABILITY ORGANIZATION

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