Regional Risk Assessment

Executive Summary

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MIDWEST RELIABILITY ORGANIZATION

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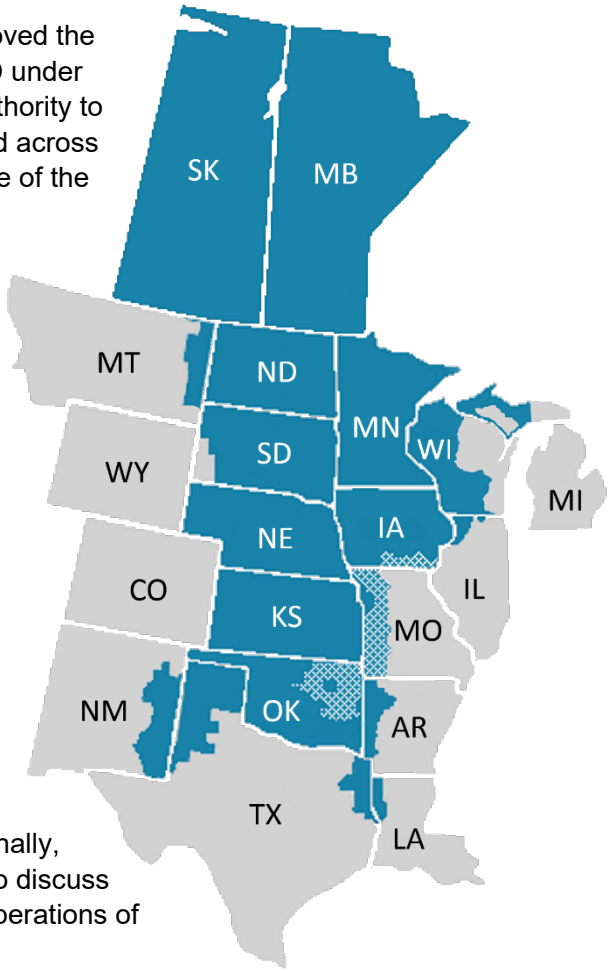
1. PREFACE

Midwest Reliability Organization (MRO) is dedicated to its vision of ***a highly reliable and secure North American bulk power system***. To ensure reliability of the bulk power system in the United States, Congress passed the Energy Policy Act of 2005, creating a new regulatory organization called the Electric Reliability Organization (ERO) to establish mandatory Reliability Standards and monitor and enforce compliance with those standards on those who own, operate or use the interconnected power grid.

In 2006, the Federal Energy Regulatory Commission (FERC) approved the North American Electric Reliability Corporation (NERC) as the ERO under section 215(e)(4) of the Federal Power Act. NERC delegates its authority to monitor and enforce compliance to six Regional Entities established across North America, including MRO. Recognizing the international nature of the grid, NERC as the ERO, along with MRO, established similar arrangements with provincial authorities in Canada.



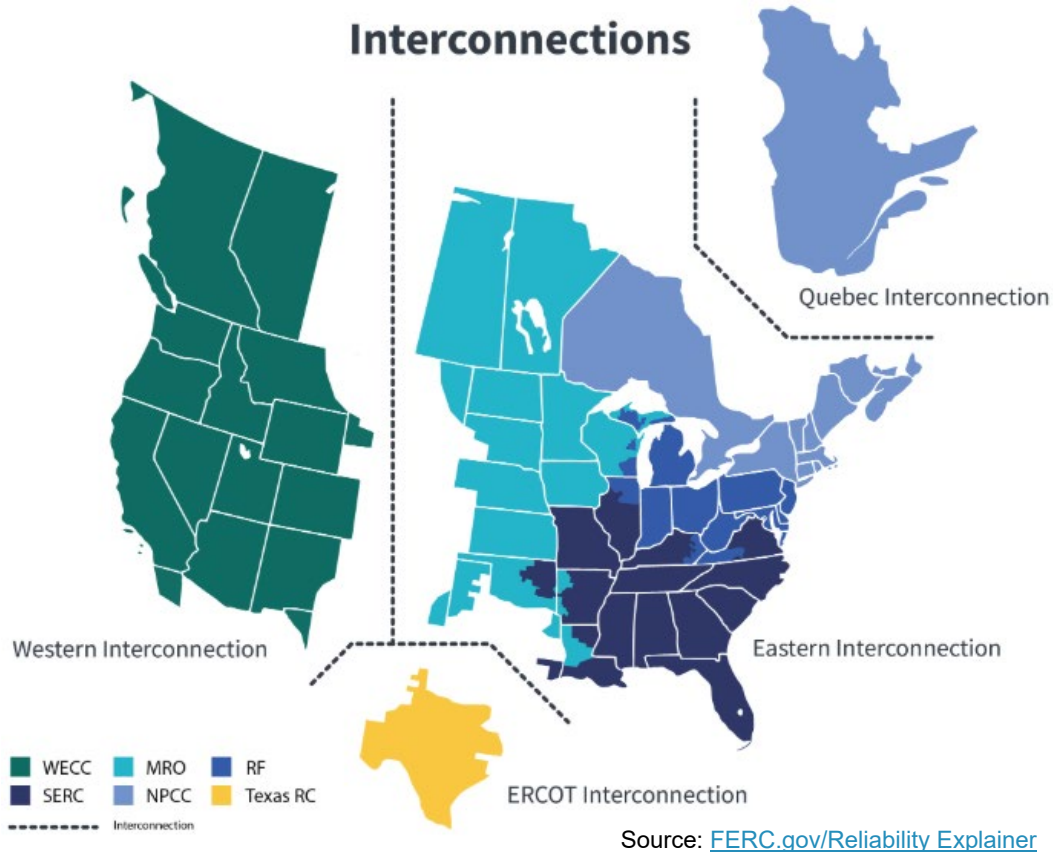
The MRO region spans the provinces of Saskatchewan and Manitoba, and all or parts of the states of Arkansas, Illinois, Iowa, Kansas, Louisiana, Michigan, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wisconsin. The region includes approximately 245 organizations that participate in the production and delivery of electric power, including Canadian utilities, cooperative and municipal utilities, investor-owned utilities, along with federal power marketing agencies, generator power marketers, and transmission system operators.

MRO's primary responsibilities are to: monitor and enforce compliance with mandatory Reliability Standards by entities who own, operate, or use the North American bulk power system; conduct assessments of the grid's ability to meet electric power demand in the region; and analyze regional system events. Additionally, MRO creates an open forum for stakeholder experts in the region to discuss important topics related to addressing risk and improving reliable operations of the bulk power system.

2. REGIONAL RISK ASSESSMENT OVERVIEW

Within the MRO footprint, over 28 million people depend on a reliable electric grid to deliver electricity from where it is produced to where it is used. Demand for electricity is rapidly increasing. More sectors of the economy are relying on electricity to support new technology, reduce planet-warming emissions, and enrich people's lives. At the same time, the way electricity is produced is undergoing a major transition, increasing the potential for system imbalances and making it harder to maintain a reliable power grid. Weather conditions are also having a greater impact on grid reliability. Not only is the supply and performance of some resources dependent on the weather, but extreme weather has become more prevalent and is necessitating enhanced system resiliency.

Protecting reliability and security of the regional power grid is the primary focus of MRO. We share an important mission with the ERO Enterprise to identify, prioritize, and assure the effective and efficient mitigation of risks to the reliability and security of the North American bulk power system. MRO's annual Regional Risk Assessment (RRA or assessment) is an important part of achieving this mission. Our regional territory spans the middle part of North America from the Canadian provinces of Manitoba and Saskatchewan all the way down to Texas. We are uniquely situated at the intersection of three North American electric grids — the Western Interconnection, Eastern Interconnection, and Texas Interconnection (see Figure 1) — and provide a critical link to delivering diverse generating resources to customers within the region and beyond.



Source: FERC.gov/Reliability Explainer

FIGURE 1 - NERC'S REGIONS AND ASSOCIATED INTERCONNECTIONS

About the Regional Risk Assessment

The RRA is developed collaboratively with industry experts that serve on MRO's Compliance Monitoring and Enforcement Program Advisory Council, Reliability Advisory Council, and Security Advisory Council. The assessment uses a variety of continent-wide and regional resources to identify the collective risks and trends challenging utilities within the region. The findings are then prioritized by a team of advisory council members and MRO staff based on the impact to reliability and security of the grid and likelihood of occurrence, the criteria for which were developed by the advisory councils in MRO's reliability risk matrix.

Risk priority levels are categorized as *extreme*, *high*, *medium* or *low*. Extreme and high risks become the focus for regional efforts to raise awareness of risk and develop and implement mitigation activities.

Key Assessment Findings

A total of fourteen risks were identified in 2025, with six rising to an extreme or high priority. For the second year in a row, *Uncertain Energy Availability* landed as the top risk to reliability of the regional bulk power system and the only extreme risk in this assessment. It is important to note that the extreme risk designation was given because of the North American-wide impact and likely occurrence of this risk.

Five other risks were identified as high priority in this assessment. While four of the five are consistent with previous risk assessments, *Nation-State Threats* is a new risk designated in the high category because of the current geopolitical climate. Table 1 lists the extreme and high risks in priority order from highest to lowest.

Table 1: Top Regional Risks

Risk	Priority
Uncertain Energy Availability	EXTREME
Generation Outages During Extreme Cold Weather	HIGH
Nation-State Threats	HIGH
Supply Chain Compromise	HIGH
Malicious Insider Threat	HIGH
Inadequate Inverter-Based Resource and Distributed Energy Resource Performance and Modeling	HIGH

Additional details on these top risks and key takeaways are included in the full report, MRO 2025 Regional Risk Assessment.

Top Regional Risks

Uncertain Energy Availability

Early retirement of thermal resources (e.g., coal and nuclear) that provide on-demand, dispatchable electricity generation creates potential energy shortfalls when replaced with variable, weather-dependent resources that may not be available when needed. This risk is amplified by increasing electricity demand (driven by electrification and the addition of large, single-point loads like data centers) and extreme weather. New approaches to assessing resource adequacy must consider the evolution of energy supply and demand to improve bulk power system planning, operation and investment decisions. Furthermore, the retirement of thermal generation must be carefully managed until adequate replacement energy is available to meet anticipated demand.

Generation Outages During Extreme Cold Weather

More frequent and longer lasting extreme cold weather systems are creating broader challenges for electricity and natural gas supply. Electric generators have experienced much higher incremental and unexpected outages during extreme cold temperatures due to equipment freezing and inadequate natural gas fuel supply. NERC Reliability Standard EOP-012-2 (effective October 1, 2024) helps to mitigate extreme cold weather challenges by ensuring generator owners have developed and implemented extreme cold weather operation plans. Greater cooperation is also taking place between the electric and natural gas industries, in part due to the Gas-Electric Harmonization Forum led by the North American Energy Standards Board (NAESB). However, work remains to be done to implement the recommendations from the NAESB forum report published in July 2023.

Nation-State Threat

Nation-state threats from China, Russia, and Iran are well funded, sophisticated, and capable of targeting North American critical infrastructure to achieve strategic and political objectives. By gaining access to and exploiting native tools within critical infrastructure operating systems, these threat actors can evade detection and strike through a variety of methods at a time when maximum damage would be inflicted. Utilities need to enhance detection methods on critical operational control systems and develop business continuity plans to respond to and recover from various attack scenarios that could be conducted by a nation-state-sponsored threat actor.

Supply Chain Compromise

Malicious manipulation of a single vendor's hardware, software, services, or delivery could impact multiple utilities that use the vendor's products and disrupt grid operations. The limited number of industrial control system vendors that are used to protect and control the bulk power system creates a broad threat to grid reliability. Understanding the inherent risk of using third-party products, utilities should require vendors to improve their respective controls and operating environments. This includes vetting vendors for foreign connections with known hostile nations.

Malicious Insider Threat

Malicious insiders are employees, contractors, or vendors integrated into the workplace that are motivated and have knowledge and legitimate access to launch an attack on a utility's systems or assets. An insider motivated by unmanaged workplace disgruntlement, ideological reasons, or financial gain can have the opportunity to compromise systems and render the systems inoperable which can degrade grid reliability. Utilities should have a robust Insider Threat Program supported by executive management that builds a culture of security and encourages employees to look out for each other and address potential insider attacks if employees notice unusual behavior. Utilities

should also limit access to critical systems and assets to employees that have a business reason for access and segment systems to minimize impact. Utilities should also have processes and procedures to vet employees before granting access to critical assets.

Inadequate Inverter-Based Resource and Distributed Energy Resource Performance and Modeling
Inverters are used to connect wind, solar, and battery generation to the bulk power system and are used to connect Distributed Energy Resources to distribution grids. Inverter-Based Resources (IBR) are a growing proportion of the electric generation fleet, which increases the grid's dependence on them to provide reliable energy. Unlike the physical response of conventional, thermal generation (e.g., coal and natural gas) resources, IBRs use configured controls to manage adverse grid conditions. Incorrect modeling of IBRs and the behavior of configured controls during grid disturbances has resulted in unexpected power losses, posing considerable risk to bulk power system reliability. Furthermore, the risk IBRs pose to reliability has not been properly considered in the planning of future grid investments. Utilities need to proactively mitigate IBR performance issues by closely monitoring grid conditions and collaborating with IBR owners and operators to set controls that ensure reliable operation.

Summary

MRO is uniquely positioned to coordinate and collaborate with various industry stakeholders to address the risks highlighted in this report. As a trusted authority on grid reliability and security, we are committed to raising awareness, providing guidance, and developing mitigation strategies for the highest risks to the regional bulk power system. Collaboration among multiple stakeholders is crucial to navigate the rapid changes and confront the many challenges facing the electricity industry, advancing our collective vision of a highly reliable and secure North American bulk power system.