

U.S. Electric System Reliability

SME Statement

Electric system reliability has become a growing concern in the U.S. as unprecedented retirements of traditional baseload sources of power generation (especially coal generation, but also nuclear and natural gas) have occurred, and will continue to occur over the next several years. Many of the coal and natural gas retirements are due to regulatory and policy pressures to phase out fossil fuel power plants and replace them with wind and solar facilities to satisfy policy objectives to lower CO₂ emissions. In 2023, coal power plants with a combined capacity of 9.52 gigawatts were retired across the U.S. As of August 2022, around 82 gigawatts of electricity generation capacity in the U.S. were planned for retirement by 2035. Coal-fired electricity accounted for nearly 64 percent of capacity retirements in the U.S. at 52.1 gigawatts. Another 26 gigawatts of natural gas capacity were planned to be retired by 2035.¹

Exacerbating the potential reliability problems associated with these retirements are delays bringing replacement sources of generation online for a number of reasons, including supply chain challenges, higher financing costs, permitting delays, and court challenges. Added to this scenario is the increased demands on the electric power sector as the nation moves toward increased electrification in buildings and transportation, and as data centers, artificial intelligence (AI), and energy-intensive industries are increasing power demands in many regions.

Background

The U.S. Energy Information Administration's (EIA's) 2023 annual energy outlook report projects that wind and solar energy will play an increasing role in meeting the country's power demands through 2050, while coal power generation will substantially decline and natural gas and nuclear power generation will remain fairly static.² In fact, growth in energy-intensive data centers, made even more energy-intensive by the fast-paced adoption of AI, has led to enormous increases in power demand in many areas of the country. "Utility projections for the amount of power they will need over the next five years have nearly doubled and are expected to grow, according to a review of regulatory filings by the research firm Grid Strategies."³ In May 2024, the Electric Power Research Institute reported that data centers could consume up to nine percent of U.S. electricity generation by 2030, more than double the current amount, which could create regional supply issues.⁴

The North American Electric Reliability Corporation's (NERC's) 2023 Long-Term Reliability Assessment (LTRA) states: "The North American bulk power system is on the cusp of large-scale growth, bringing reliability challenges and opportunities to a grid that was already amid unprecedented change. Key measures of transmission development and future electricity peak demand and energy needs, which NERC tracks and reports annually in the LTRA, are rising faster than at any time in the past five or more years."⁵ (As described on its website, NERC is an international regulatory authority whose mission is to assure effective and efficient risk reduction to grid reliability and security.)

Other authorities have issued similar warnings about threats to the reliability of the nation's electric grid, including the Federal Energy Regulatory Commission (FERC) and the grid operators for several of the major wholesale electricity markets. This is especially true for the PJM Interconnection, which covers all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia; the Midcontinent Independent System Operator (MISO), which provides power to 15 states and the Canadian province of Manitoba;⁶ and the SPP Planning Coordinator which covers all or parts of Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. Various state regulatory authorities have voiced similar concerns.

Electric Generation Requirements

Electric generating units are retired or placed out of service for a number of reasons, including the age of the unit, regulatory constraints, public policies, political pressures, and market forces. Within the past decade, these forces have exerted increasing pressure on utilities' decisionmaking. For example, the timing of federal air regulations, which coincided with a precipitous drop in natural gas prices in the early 2010s, led utilities to shutter coal-fired units rather than invest in costly environmental controls.

Federal clean energy policies outside the traditional regulatory scheme are playing a significant role in the nation's energy transition. According to S&P Global Market Intelligence,⁷ the 2022 Inflation Reduction Act, which directs almost \$400 billion in federal funding to "clean" energy, will accelerate the coal-fired power plant retirement trend that has been underway in the U.S. for the past decade. The analysts forecast that "of the 58.7 GW of coal plant capacity projected for retirement by 2030, about 24.3 GW, or 41.4%," will be a result of the Inflation Reduction Act. By 2030, "electricity demand for coal will decline by 33.6% and coal-fired power will account for just 10.4% of electricity generation."

At the state level, half of the states have enacted specific greenhouse gas reduction targets through such policies as carbon pricing, emission limits, and renewable portfolio standards, in addition to clean transportation policies. Various state energy policies have further distorted wholesale electricity markets, and have led to disputes over how to allocate costs to build-out transmission necessary to accommodate certain states' policies among other states. In March 2024, FERC Commissioner, Mark Christie, stated: "States shouldn't have to pay for transmission driven by other states' policies."⁸

Corporate clean energy goals are also significant drivers of the energy transition and these entities influence public policy and utility decision-making. The 400-plus member Clean Energy Buyers Association has set a goal to achieve a 90% carbon-free U.S. electricity system by 2030. Signatory members include major corporate customers across industry sectors such as Toyota, Honda, Boeing, McDonalds, Chevron, and Amazon.⁹

The CEO of MISO, which serves 45 million people, recently stated in a grid reliability report¹⁰ made the following points:

- There are immediate and serious challenges to the reliability of our region's electric grid. The region's generating fleet is changing even faster and more profoundly than we anticipated, and many utilities and states are decarbonizing their resource fleets.

- The transition that is underway to get to a decarbonized end state is posing material, adverse challenges to electric reliability.
- A key risk is that many existing “dispatchable” resources that can be turned on and off and adjusted as needed are being replaced with weather-dependent resources such as wind and solar that have materially different characteristics. While wind and solar produce needed clean energy, they lack certain key reliability attributes that are needed to keep the grid reliable every hour of the year. Although several emerging technologies may someday change that calculus, they are not yet proven at grid scale.
- Efforts to build new dispatchable resources face headwinds from government regulations and policies, as well as prevailing investment criteria for financing new energy projects. Until new technologies become viable, we will continue to need dispatchable resources for reliability purposes.

In December 2023, John Moura, NERC’s Director of Reliability Assessment and Performance Analysis stated: “We are facing an absolute step change in the risk environment surrounding reliability and energy assurance. In recent years, we’ve witnessed a decline in reliability, and the future projection does not offer a clear path to securing the reliable electricity supply that is essential for the health, safety, and prosperity of our communities.”¹¹

As shown below, Figure 1 in NERC’s 2023 LTRA presents grid risk forecasts in North America. The LTRA predicts “capacity deficits in areas where future generator retirements are expected before enough replacement resources are in service to meet rising demand forecasts. Energy risks are projected in areas where the future resource mix could fail to deliver the necessary supply of electricity under energy-constrained conditions. For example, subfreezing temperatures can create energy-limiting conditions by disrupting the natural gas fuel supplies to generators, leading to fuel-related derates or outages and potentially insufficient electricity supply.”¹²

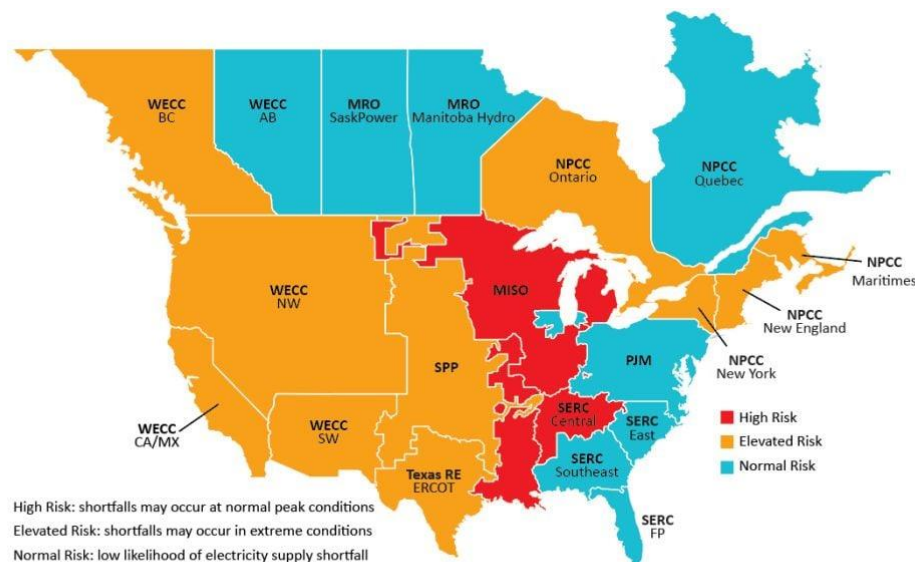


Figure 1: Risk Area Summary 2024–2028⁸

SME Position

SME shares NERC's, FERC's and others' concerns that regulations forcing the closure of coal and natural gas power plants and replacing them with intermittent wind and solar power generation are destabilizing the nation's energy grid. Under current climate policies, the loss of reliable, predictable, and 24/7 dispatchable power from coal and natural gas power plants is expected to continue to exert stress on the system and further weaken grid reliability. The resulting increased likelihood of power shortages creates both economic and national security vulnerabilities.

As stated in the October 2024 SME briefing paper entitled "Mitigation of CO₂ Emissions from Coal Fired Electric Generation," SME supports the future use of Carbon Capture and Storage (CCS) so that fossil fuels can continue to be used as a future energy source, but acknowledges that utility-scale CCS has not yet been proven to be technically or economically feasible. SME thus has concerns that the Environmental Protection Agency's May 2024 Clean Power Plan 2.0 rule, which mandates adding CCS technology to existing coal and natural gas-fired power plants, will force many of these facilities to close. The 25 states and numerous other petitioners challenging this new regulation share this concern.

Mining comes into play in all aspects of this issue, from the energy feedstocks to the critical minerals and materials needed to construct the solar panels and wind turbines for the utility-scale renewable energy systems that are replacing coal and natural gas power plants, and to build the necessary transmission and distribution facilities to connect new power sources to the grid. Other key issues include critical workforce needs to maintain grid reliability for society and the length of time that it takes to permit mining and transmission projects. Permitting reform is needed at all levels to strengthen domestic mineral supply chains, maintain grid reliability and to achieve energy transition objectives. The U.S. has a stated goal of insuring that manufacturing takes place in the U.S. At the same time the U.S. should have a goal of providing more of the materials necessary from domestic sources, in other words Making it in America and Mining it in America.

References

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⁴ <https://www.epri.com/about/media-resources/press-release/q5vU86fr8TKxATfX8IHf1U48Vw4r1DZF>

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⁶ <https://www.misoenergy.org/meet-miso/about-miso/>

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⁸ <https://www.utilitydive.com/news/FERC-transmission-cost-allocation-christie-pjm-data-center-virginia/711335/>

⁹ <https://cebuyers.org>

¹⁰ <https://cdn.misoenergy.org/2024%20Reliability%20Imperative%20report%20Feb.%2021%20Final504018.pdf?v=20240221104216>

¹¹ <https://www.nerc.com/news/Headlines%20DL/2023%20LTRA%20Media%20Release.pdf>

¹² https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2023.pdf