

Physical Security of Transmission Infrastructure

“Transmission buildout is critical to resilience as it can relieve line overloading . . . on the existing system, lessening the compounding risks that come with a strained grid that could then be tested by an extreme weather event or an attack incident. Moreover, by enabling further development of renewable energy resources over wider geographic areas, well-planned transmission expansion can make targeted attacks on the grid more difficult to plan and carry out.”

— National Commission on Grid Resilience, 2020

I. Threats and Vulnerabilities

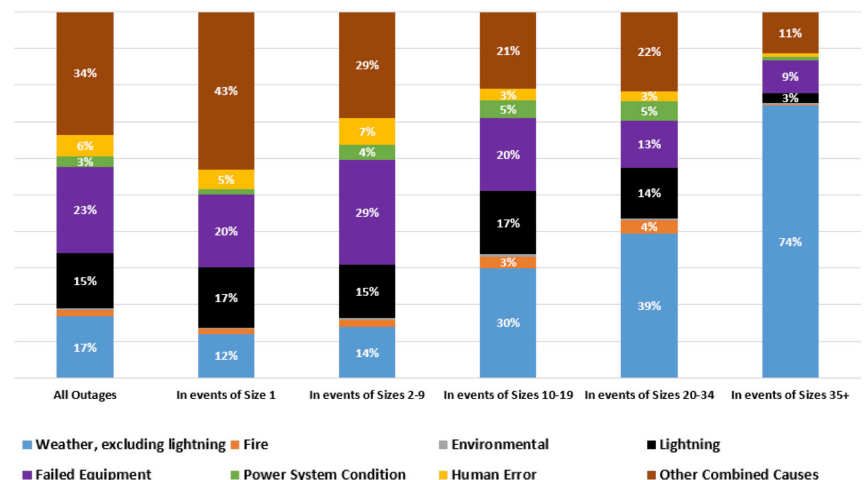
There are many potential threats to the physical security of our electric grid, including:

Extreme Weather

Extreme weather is the leading cause of electric power outages, particularly in the case of large-scale outages.¹ As extreme weather becomes more frequent, so do electric reliability concerns. Major power outage events in the U.S. increased more than 60% between 2015 and 2020.²

- In 2021, Hurricane Ida knocked out eight high voltage transmission lines that supplied power to New Orleans, causing most of the power outages to 1.2 million customers that, in some cases, lasted nearly two weeks.³
- In Texas during Winter Storm Uri, more than 4.5 million people lost power, some for four days, while temperatures were below freezing, due to a lack of transmission to import power from neighboring regions.⁴

Causes of Transmission Outages by Event Size



Outages are grouped by size based on starting time and duration. All outages in an “event” must start within five minutes of each other or start within an hour of each other and overlap in duration. If an outage cannot be grouped together with any other outage, it will be placed in an event of size 1 by itself. Source: [IEEE Power & Energy Society](#)

Aging Equipment

Most the nation’s transmission and distribution lines were constructed in the 1950s and 1960s with a 50-year life expectancy, according to the American Society for Civil Engineers, and have now reached or exceeded their intended lifespan.⁵ Regular maintenance and upgrades are needed to keep the network safe from physical harm.

Supply Chain Disruptions

The COVID-19 pandemic exacerbated supply chain bottlenecks and shortages of critical grid components, including electrical steel and semiconductors. Due to a lack of domestic manufacturing, many products must be imported. Moreover, a high degree of specialization makes it difficult to ensure an adequate supply of critical components.

Third-Party Attacks

Several recent physical and cyber attacks on the U.S. transmission system have spurred Congress,⁶ federal agencies, and state officials to increase scrutiny on grid security.

- Two people were charged with sabotaging four substations in Washington State on Christmas Day, attacks that left more than 14,000 customers without power in the Tacoma Power and Puget Sound Energy systems and caused more than \$3 million in damages.⁷
- Two power substations in North Carolina were hit with gunfire in December 2022, knocking out electricity to approximately 45,000 Duke Energy customers.⁸
- A 2021 ransomware attack on the Colonial Pipeline, one of the largest in the U.S., forced a temporary shut down of operations.⁹

According to leaked excerpts of a 2014 FERC report: "If terrorists are ever able to knock out nine of the nation's 55,000 substations, the U.S. power grid could suffer coast-to-coast blackouts lasting 18 months or more."¹⁰

II. What Is Needed?

- **Ensure the transmission network is sufficiently robust.** During periods of disruption, such as extreme weather events, integrated transmission allows regions to access diverse generation resources from across the country. A flexible and well-built out grid will protect consumers from dangerous and costly service disruptions.¹¹
 - **Federal Action:** ACEG recommends that FERC act expeditiously to issue a strengthened regional and interregional transmission planning rule and ensure that reliability and resilience considerations are incorporated into transmission planning to fully develop a well-integrated network. Further, FERC should examine its incentive structure to support resilient facilities.
 - **State Action:** States should direct utilities to examine physical security as part of their Integrated Resource Planning and certificate processes. Additionally, states should consider the reliability benefits to their customers tied to regional connectivity when evaluating the public interest in CPCN and rate filings related to transmission.
- **Facilitate policies that will increase demand for transmission components.** The Biden administration authorized use of the Defense Production Act to accelerate domestic manufacturing of electric grid components, in recognition of the way these supply chain shortages impact the economy, national security, and the clean energy transition.
 - **Federal and State Action:** ACEG recommends that utilities implement more commonly-used components that are modular and interchangeable to ensure a healthy supply in times of emergency.
- **Strengthen penalties for physical attacks on grid infrastructure.** Transmission plays a critical role in national security, health and safety, and the economy. Penalties should be appropriately serious.
 - **Federal and State Action:** ACEG recommends reviewing thresholds for federal and state penalties related to attacks on critical infrastructure, considering best practices from states across the country.



Sources

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- 5 American Society of Civil Engineers, [Policy Statement 484 - Electricity Generation and Transmission Infrastructure](#), (July 2019)
- 6 Congressional Research Service, [Electric Grid Physical Security: Recent Developments](#) (Feb. 7, 2023)
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- 10 Davide Savenije and Ethan Howland, [Could terrorists really black out the power grid?](#), Utility Dive (March 24, 2014)
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