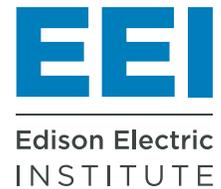


# Grid Security: Protecting Against EMPs and GMDs



## Why It Matters

Protecting the nation's energy grid and ensuring a reliable and affordable supply of energy are top priorities for America's electric companies. The energy grid's complex, interconnected technologies may be impacted by bursts of electromagnetic energy such as naturally occurring geomagnetic disturbances (GMDs) or malicious, man-made electromagnetic pulses (EMPs). To address these hazards, the electric power industry is working hard to enhance the resilience of the energy grid and to accelerate recovery from potential incidents.

The electric power industry takes a risk-based "defense-in-depth" approach to protecting critical energy grid assets from all threats. This includes: close coordination among industry members and with government partners at all levels; rigorous, mandatory, and enforceable reliability regulations; and efforts to prepare for, prevent, respond to, and recover from a wide variety of hazards.

The industry prioritizes protecting the energy grid's most critical components against the most likely threats; building in system resiliency; and developing contingency plans for response and recovery should any type of man-made or natural phenomena impact operations.

The industry works across the sector and with the Electricity Subsector Coordinating Council (ESCC); the North American Electric Reliability Corporation (NERC); the Electric Power Research Institute (EPRI); federal agencies, including the Department of Defense (DOD), Department of Energy (DOE), Department of Homeland Security (DHS), FBI, and Federal Energy Regulatory Commission (FERC); and state and local law enforcement agencies.

## How GMDs and EMPs Differ

There are important differences between man-made EMPs, such as those from directed energy weapons or nuclear detonations, and naturally occurring GMDs, such as solar flares. Each type of threat must be addressed independently, and appropriate mitigation and protection strategies must be implemented for each.

GMDs are naturally occurring events that the electric power industry has managed for decades. The industry is subject to mandatory and enforceable standards, developed by NERC under FERC oversight, to help protect the energy grid from the impacts of GMDs, and electric companies have operating processes and procedures to manage GMD risks.

There are two categories of intentional, man-made EMPs. The first, a high-level EMP caused by the detonation of a nuclear weapon in the atmosphere, is a high-consequence, low-likelihood threat that would have a potentially catastrophic impact on society. Since a nuclear attack on U.S. critical infrastructure would be an act of war or terrorism, the federal government has primary responsibility for preventing high-level EMPs as a matter of national security. The industry also is taking steps to better understand the impact of this threat to its systems to engineer greater resilience against such a catastrophic incident.

The second type of EMP is related to the use of smaller directed energy weapons against a single facility or piece of equipment. Mitigation strategies for this type of EMP threat include physical protection measures, including limiting line-of-sight and controlling access, while also relying on system redundancy. To cause significant damage to the energy grid, dozens of directed energy weapons would need to be built, deployed, and detonated in a coordinated attack without being detected or stopped by law enforcement.

## Industry and Government Initiatives and Collaboration

Policymakers and the electric power industry share the goal of developing capable, cost-effective mitigation to all threats. Because the effects of an EMP attack on the energy grid are not sufficiently understood or remain classified, crafting appropriate mitigations and making business-risk decisions to address EMP threats require more research to: better understand how EMPs could impact the grid; inform the development of EMP-resistant grid components; and develop best practices to help limit the impact of these threats.

To address these challenges, EPRI launched a research project in 2016 to provide a scientific basis for investments to mitigate EMP threats, inform response and recovery efforts, and develop other partnerships that will help the nation's critical infrastructure be better prepared for existential threats to the energy grid. As the primary liaison between senior leadership in the federal government and the industry, the ESCC is working with government partners to better understand the threat posed to energy infrastructure from a man-made EMP. The ESCC also supports EPRI's efforts.

With input from the industry, DOE released the Electromagnetic Pulse Resilience Action Plan in January 2017 that identified five goals: (1) improve and share understanding of EMP threats, effects, and impacts; (2) identify priority infrastructure; (3) test and promote mitigation and protection approaches; (4) enhance response and recovery capabilities to an EMP attack and; (5) share best practices across government and industry, nationally and internationally. The EPRI project will complement and help achieve these goals.

## Security Strategies Constantly Evolve

Addressing dynamic threats to the energy grid requires vigilance and a coordinated approach that leverages government and industry resources. Through the NERC-FERC standards process, the industry will continue to address bulk power system issues associated with GMDs. Over the next two years, EPRI will share its findings with the industry, providing the necessary information for companies to better understand the potential impact of EMP incidents and recommendations for mitigation approaches and investments.

Through the ESCC, the electric power industry will continue to strengthen its government partnerships, coordinate with other critical infrastructure sectors, engage and educate external stakeholders and the public, and make the necessary investments to make the energy grid stronger, more reliable, and more resilient in the face of any threat.

### Policy Priorities

- Maintain the ESCC and government partnerships.
- Maintain the NERC-FERC standards drafting process.
- Support federal research and development on grid security technologies and expedite technology transfer to the private sector.
- Continue to promote electric company investments in protecting the energy grid, and support the associated cost recovery of those investments.
- Support the collaborative efforts of electric companies and state and federal agencies to address threats to the energy grid.

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