

Resiliency – An Overview

Reliability and Resiliency

In the context of the bulk electric system, reliability refers to keeping the lights on, while resiliency relates to preparing for, operating through, and recovering from a high impact, low frequency (HILF) event, such as a hurricane, geomagnetic disturbance (GMD) event, or high altitude electromagnetic pulse (HEMP) attack.

While reliability will always be a critical element of the NATF's mission and vision, it has become apparent that a paradigm shift to include resiliency is prudent and necessary.

Why the Added Interest in Resiliency?

A culmination of recent events related to extreme weather (e.g., Hurricane Sandy) and sabotage has raised awareness of the need for increased focus on system resiliency. While extreme weather has occurred as long as the power system has existed, other trends and events in the last decade have increased the overall awareness of HILF events and their potential impact:

- Increased focus on enhanced physical security and resiliency against deliberate attacks against system assets, such as the 2013 attack of the Metcalf Substation in Northern California.
- Concerns about the susceptibility of the transmission system to a severe GMD event as a result of solar magnetic disturbances that could result in a system voltage collapse and blackout similar to the one experienced in Quebec in 1989.
- Concerns about the susceptibility of the transmission system to a deliberate EMP, HEMP, or IEMI (intentional electromagnetic interference) incident due to high reliance on electronic technology (e.g., computers, microprocessors, etc.).

Legislation

We have seen legislative action associated with the topic of resiliency.

- On December 1, 2014, the U.S. House of Representatives passed a bill sponsored by Representative Trent Franks that requires DHS to include EMP events in its national planning scenarios, conduct a public education campaign on EMP threats, and authorize research into EMP prevention and mitigation.
- On May 13, 2015, the U.S. House Oversight and Government Reforms Committee's subcommittees on National Security and the Interior held a hearing on the EMP threat.
- In 2014 and 2015, several state legislatures, including Maine and Texas, began looking into the need for additional regulation to address resiliency.

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How are the NATF and its Members Addressing Resiliency?

Educating themselves on the topic of resiliency and how to address it:

- **Fall 2013/Spring 2014.** Two NATF workshops (one with EPRI) to help members better understand how to plan and protect their systems from GMD events.
- **April 2014/October 2014.** NATF/EPRI workshops to educate members on the threats of EMP, HEMP, and IEMI, as well as the various techniques companies are using to improve the resiliency of their systems.
- **June 2015.** ITC/EPRI workshop to review the state of science of EMP, understand the potential threats electricity providers are facing, and identify knowledge gaps and next steps.
- **August/September 2015.** Work underway to form a joint, industry-led steering team to direct NATF and EPRI work in the area of resiliency.
- **September 2015.** Electric Grid Resiliency Modeling Industry Summit hosted by Dominion to provide an overview of new probabilistic risk-based modeling and analysis techniques for assessing power system resiliency.
- **Ongoing.** Series of NATF whitepapers on resiliency-related topics

Taking specific actions to **harden and protect** critical infrastructure:

- In the next five to seven years, one NATF member plans to invest up to \$500 million to harden its critical infrastructure against threats of attack and natural disasters.
- One NATF member has added tens of millions of dollars to the cost of construction for its new control center for hardening. In addition, several other NATF members are considering similar measures in their projects to build new control centers.
- At least one NATF member has been experimenting with a new modular control house design with EMP/IEMI-resistant qualities.

Taking specific actions to address the availability of **key spare equipment**:

- In 2006, FERC approved the EEI Spare Transformer Equipment Program (STEP), which is a coordinated approach to increasing the electric power industry's inventory of spare transformers and streamlining the process of transferring those transformers to affected utilities in the event of a transmission outage caused by a terrorist attack. More than 50 utilities are members.
- SpareConnect (formed in 2014) provides an online tool for its 90+ members (utility asset owners and operators) to connect and share transmission and generation step-up (GSU) transformers and related equipment—including bushings, fans, and auxiliary components.
- Grid Assurance, formed in June 2015 by eight NATF member companies, would provide improved responses to major events affecting the electric transmission grid by providing transmission-owning entities access to certain types of domestically stored, critical equipment.
- A summer 2015 survey on key spare equipment including power transformers not currently in the STEP, conducted by the NATF's Equipment Performance and Maintenance Practices Group.