

# Tackling the EMP Threat

By **MIKE HOWARD**

**P**rotecting the nation's energy grid is the top priority for the electric power industry. The energy grid is a network of complex, interconnected technologies that may be impacted by naturally occurring geomagnetic disturbances (GMDs) or manmade electromagnetic pulses (EMPs). To address these hazards, the electric power industry is taking steps to enhance the resilience of the energy grid and to accelerate recovery from potential incidents.

Of growing concern to the industry is the threat of a high-altitude electromagnetic pulse (HEMP), generated by the detonation of a nuclear weapon in the atmosphere. HEMP is characterized by a high-magnitude, short-duration pulse (E1), an intermediate pulse similar to lightning (E2), and a late-time component (E3), which is similar to a severe GMD event. Potential impacts can range from damage to electronic components and insulators (E1 and E2) to voltage collapse and transformer damage (E3).

In addition to industry concerns, numerous constituencies, including state and federal policymakers, are pressing to ensure the energy grid is resilient to a HEMP event. The Electric Power Research Institute (EPRI) initiated a research project to better understand the effects of such an attack on the bulk power system.

In April 2016, EPRI, the electric power industry, the Department of Energy, and several national laboratories commenced a comprehensive three-year research

project to provide a technical basis by which electric companies can address the HEMP threat by evaluating potential impacts, developing hardening and mitigation options, and creating recovery plans.

In September 2016, EPRI published its first report describing the state of knowledge of HEMP research, including publicly available information from 70 technical reports and papers. The report outlines research, testing, assessment, and mitigation efforts related to HEMP and its impact on the bulk power system. The report also includes a description of current electric company practices regarding HEMP hardening and mitigation, as well as a summary of research needs.

In February 2017, EPRI released its second report assessing the impact of E3 on bulk-power transformers on the energy grid in the continental United States. The report evaluated the impacts of E3 from a single high-altitude nuclear burst over 11 locations and includes a geomagnetically induced current (GIC) analysis and transformer thermal assessment. A subsequent report, expected to be published later this year, will evaluate the potential for voltage collapse resulting from an E3 event. The results will be used to estimate the potential for E3 to cause voltage collapse and/or widescale damage to U.S. bulk power transformers.

The next steps in EPRI's research are modeling and testing systems and components—including protective relays, SCADA, control cables,

and insulators—to determine their vulnerability to E1 and E2.

We will continue to partner with the ESCC to raise awareness and engage external stakeholders, while working closely with state and federal governments to ensure that our research efforts are coordinated to provide the industry with information needed to make critical decisions and investments. **EP**

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*The Electricity Subsector Coordinating Council (ESCC) serves as the principal liaison between the federal government and the electric power sector, with the mission of coordinating efforts to prepare for, and respond to, national-level disasters or threats to critical infrastructure. The ESCC includes electric company CEOs and trade association leaders representing all segments of the industry.*

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