



Geomagnetic disturbances, also referred to as solar magnetic disturbances, have the potential to affect the high-voltage transmission system and are of concern to the electricity industry and government. PJM Interconnection, which has experienced the impact of such intensified solar activity, has developed specific operating procedures to implement when solar activity is high and could threaten the reliability of the transmission system.

Sunspots and other solar phenomena can produce large clouds of plasma (called coronal mass ejections) that can induce electric currents in the earth and on high-voltage transmission lines. These currents can flow up from the earth or down into the earth through grounded grid equipment, mainly transformers.

High levels of these ground induced currents can cause increased reactive power consumption, harmonic currents and hot-spot heating of transformers, the combination of which could result in voltage collapse and blackout.

A major geomagnetic disturbance on March 13, 1989, struck Quebec's power grid, causing a blackout that lasted for nine hours. In that same event, a transformer at the Salem Nuclear Plant in New Jersey was severely damaged.

The National Oceanic and Atmospheric Administration's Space Weather Prediction Center monitors both solar activity and the earth's magnetic field and issues alerts and warnings to grid operators so they can prepare for the impacts of space weather events.

To help anticipate problems, PJM's members have installed special equipment to detect and measure ground induced currents that are caused by GMD.

When a solar disturbance is forecasted, PJM monitors the detectors that PJM members have installed at various locations. If sustained ground currents at a certain level are detected, PJM operates the system in a more conservative mode until the space weather event has ended.

The Federal Energy Regulatory Commission, which oversees the reliability of the nation's electric grid, has directed the North American Electric Reliability Corp. to develop reliability standards to address geomagnetic disturbances.

In the first stage, the NERC has developed a standard requiring owners and operators of the grid to implement operating procedures to mitigate GMD effects, similar to PJM's existing conservative operating procedures. The standard became effective on April 1, 2015.

In the second stage, NERC has developed another standard that identifies a "benchmark GMD event" against which asset owners and grid planners would be required to assess their equipment and develop and implement mitigation plans. The FERC approved this standard in September 2016. It also directed the NERC to develop changes that make this reliability standard consistent with the standard that went into effect in 2015.

The NERC is working to make these additions as well developing a research plan the FERC also requested as a part of its order.

*May 17, 2017*