



**New York State Reliability Council  
Executive Committee  
May Geomagnetic Storm  
June 14, 2024**

**Background:** The sun emits charged protons and electrons known as solar winds toward the earth. The intensity of solar winds can vary and is driven by events such as solar flares. The solar winds follow circular paths around the earth's geomagnetic poles and interact with the earth's geomagnetic field. The time-varying fluctuations in the magnetic field can create potential or voltage differences across the earth's surface with possible impacts to the power grid. This over-excitation may cause the following power system problems:

1. Transformer overheating resulting in premature transformer failure.
2. Increased system reactive losses resulting in the depletion of MVAR reserve.
3. Decreased bus voltages resulting in a possible system voltage collapse.
4. Increased 60 Hertz harmonics resulting in overheating and eventual tripping of static var compensators (SVCs) and shunt capacitors, protective relay misoperations, and interference with communication systems.
5. Saturation of current transformers resulting in metering errors and relay misoperations.
6. System voltage distortions resulting in improper operation of generator automatic voltage regulators and commutation failures in HVDC terminals and SVCs.

**Notification:** The NYISO receives forecasts and alerts from two sources including Solar Terrestrial Dispatch Geomagnetic Storm Mitigation System, the primary mechanism for notification of solar magnetic disturbances to the Northeast Power Coordinating Council areas, and Space Environment Services in Boulder, Colorado. Alerts issued provide NYISO a three-hour "K" index based on the earth's magnetic flux as measured in Boulder for levels of K5, indicating a geomagnetic storm, and above. The max level being a K9.

**Actions:** As captured in the NYISO's [Transmission & Dispatch Operations Manual section 4.2.11](#), a series of escalating actions are specified based on alert level and observed conditions. The Alert Level K9 that occurred on the afternoon of May 10<sup>th</sup> through the early morning of May 12<sup>th</sup> required the following actions:

- Monitored voltages and ground induced currents across the system.
- Restored out-of-service transmission facilities and delayed further transmission outages.
- Solved transmission lines and interfaces to 90% of limits to reduce system loadings.
- Activated Thunderstorm Alert cases to be solved in the market systems to reduce transmission loadings into New York City.
- Extended commitment of several generators for dynamic voltage support.

**Observations:** In coordination with the Transmission Owners, the NYISO operated the grid reliably throughout the event. The established protocols worked well to facilitate actions and communication, including with neighboring control areas throughout the Northeast Power Coordinating Council.

Voltage fluctuations and ground induced currents of up to 90 amps were observed on the system.

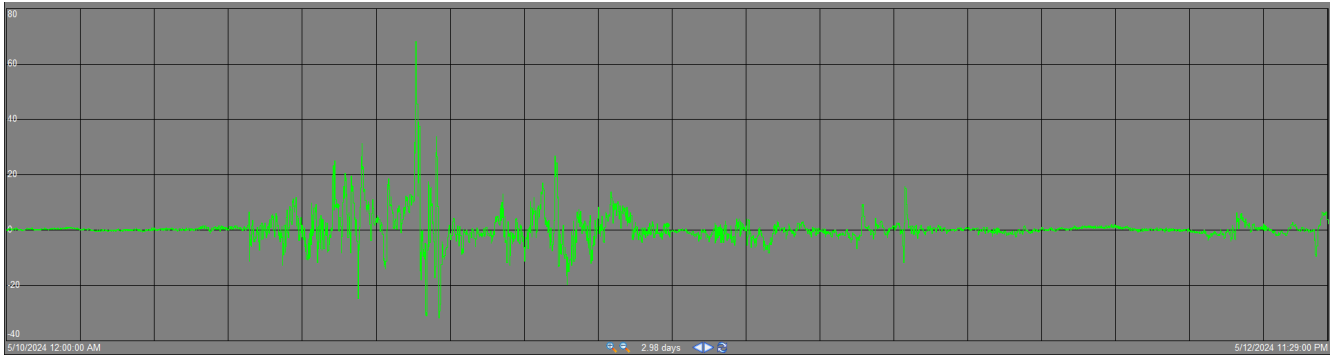


Figure 1: Metered GIC from a 345kV transformer in a favored GIC area of the state

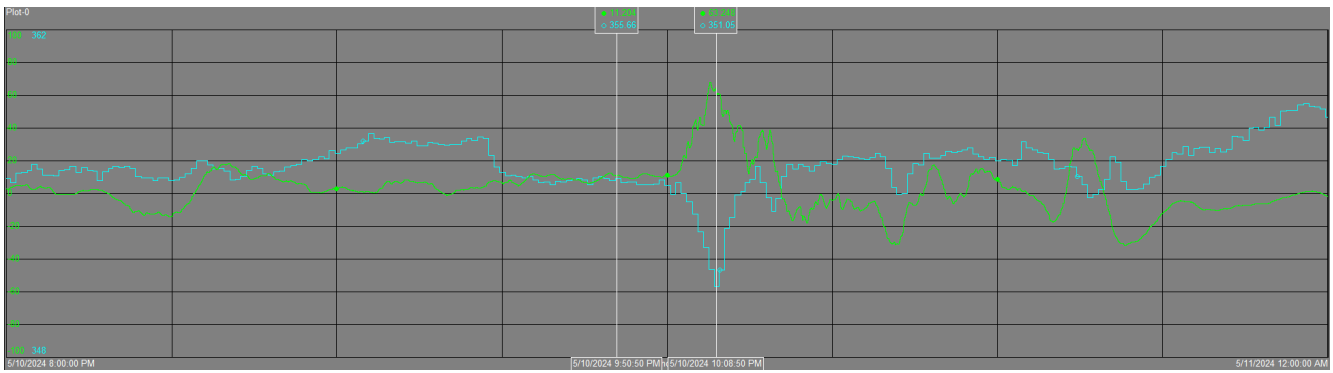


Figure 2: Station 345 kV voltage performance (blue) during the GIC changes (green)