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# “Modeling, Visualizing and Mitigating the Impacts of Geomagnetic Disturbances on the Electric Power Grid”

by

**Dr. Thomas J. Overbye**

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As never before our modern society depends on a reliable supply of electricity, and for the vast majority of people that electricity comes from the large, interconnected grids that crisscross the world. The smart grid vision is to utilize modern technology to transform the grid to provide the sustainable electric infrastructure needed to provide us with a bright future. However, there is the potential for what the North America Electric Reliability Corporation (NERC) calls High-Impact, Low-Frequency (HILF) events to plunge us into darkness. This presentation covers one such HILF risk, geomagnetic disturbances (GMDs).

GMDs, which are caused by corona mass ejections (CMEs) from the sun, have the potential to affect the power grid. This is due to the CMEs impacting the earth’s magnetic field, which in turn can induce quasi-dc electric fields in the earth (with frequencies usually much below 1 Hz). These electric fields then cause geomagnetically induced currents to flow in the high voltage grid that can cause half-cycle saturation in the power transformers, resulting in increased transformer reactive power losses resulting in widespread blackouts and, perhaps, transformer damage. This presentation provides an overview of the impact of GMDs on the grid, shows how this impact can be modeled and visualized and discusses mitigation strategies.

**Tuesday, September 8th, 2015**

**Wisnaker Engineering Building, Room 236C**

**Presentation: 11:00 a.m.**

Thomas J. Overbye is the Fox Family Professor of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign where he has taught since 1991. He received his bachelor’s, master’s and Ph.D. degrees in electrical engineering from the University of Wisconsin-Madison. His current research interests include electric power system analysis, visualization, dynamics, cyber security and power system geomagnetic disturbance modeling. Overbye is the original developer of PowerWorld Simulator, an innovative computer program for power system analysis, education and visualization. He is also a co-author of the book *Power System Analysis and Design*, and a member of the U.S. National Academy of Engineering.