A. Pulkkinen: "Space weather, geomagnetic disturbances and impact on the high-voltage transmission systems"

Geomagnetically induced currents (GIC) affecting the performance of high-voltage power transmission systems are one of the most significant hazards space weather poses on the operability of critical US infrastructure. The severity of the threat was emphasized, for example, in two recent reports: the National Research Council (NRC) report "Severe Space Weather Events--Understanding Societal and Economic Impacts: A Workshop Report" and the North American Electric Reliability Corporation (NERC) report "High-Impact, Low-Frequency Event Risk to the North American Bulk Power System." The NRC and NERC reports demonstrated the important national security dimension of space weather and GIC and called for comprehensive actions to forecast and mitigate the hazard.

In this paper we will give a brief overview of space weather storms and accompanying geomagnetic storm events that lead to GIC. We will also review the fundamental principles of how GIC can impact the power transmission systems. Space weather has been a subject of great scientific advances that have changed the wonder of the past to a quantitative field of physics with true predictive power of today. NASA's Solar Shield system aimed at forecasting of GIC in the North American high-voltage power transmission system can be considered as one of the ultimate fruits of those advances. We will review the fundamental principles of the Solar Shield system and provide our view of the way forward in the science of GIC.

Bio:

Dr. Pulkkinen is currently Associate Professor at the Catholic University of America and Associate Director of the Institute for Astrophysics and Computational Sciences. He received his PhD in theoretical physics from the University of Helsinki, Finland in 2003. Subsequently he joined the nonlinear dynamics group at NASA Goddard Space Flight Center to carry out his postdoctoral research during years 2004-2006. Dr. Pulkkinen's PhD and postdoctoral research involved studies on both ground effects of space weather and complex nonlinear dynamics of the magnetosphere-ionosphere system.

Dr. Pulkkinen has been both leading and participating in numerous space weather-related projects where scientists have been in close collaboration with industrial partners. In most of these projects, his work has involved general geomagnetic induction modeling and modeling of space weather effects on pipelines and power transmission systems. Recently Dr. Pulkkinen has been working on utilizing the established modeling capabilities in operational nowcasting and forecasting of general space weather. Dr. Pulkkinen is the main or co-author of more than 50 peer-reviewed scientific articles.