



TEXAS A&M UNIVERSITY

Department of Electrical
& Computer Engineering

TRANSFORMING ENGINEERING EDUCATION

ENERGY & POWER GROUP SEMINAR

Voltage Stability in Non-Uniform Geomagnetic Disturbances

Abstract

Geomagnetic disturbances (GMD) are rare events that threaten grid reliability, where the severity of the impact on grid health is highly uncertain. Notably, geomagnetically induced currents (GIC) produce an excess of reactive power loading due to transformer saturation, threatening voltage stability. Interface flow limits that serve to maintain voltage stability can become obsolete during a GMD due to large reactive power deviations from the nominal operating point. In this seminar, we will discuss methods to



determine GMD-informed voltage stability limits to assist in mitigation during extreme solar storms. Plausible electric fields induced by solar-level events are searched to determine new interface stability limits with respect to a base operating condition. Active power limits are discussed as a function of electric field magnitudes and current density patterns. Several numerical methods such as continuation power flow, sensitivity analysis, and finite modeling are leveraged to explore plausible non-uniform electric fields. Case studies on synthetic cases show that non-uniform electric fields can impact voltage stability worse than a uniform field. The non-uniform electric field model is used to determine interface flow limits that mitigate voltage instability in the presence of a GMD.

Luke Lowery

Ph.D. Student
Electrical & Computer Engineering
Texas A&M University

Friday, August 30

11:30 am

241 ZACH

Biography

Luke Lowery is a first year PhD student from Dallas, TX. He is passionate about mathematics, numerical methods, and visualizing data. With his advisor, Dr. Birchfield, Luke has been able to apply his skills to Energy and Power research as a proud Aggie.

FACULTY CONTACT:

Xin Chen
xin_chen@tamu.edu

TEXAS A&M ENGINEERING | engineering.tamu.edu