



PSERC WEBINAR

Modeling, Emulation, and Testing for Power Grid Cyber-Physical Security Studies

Kate Davis

Texas A&M

Power systems are cyber-physical critical infrastructure with interdependent electrical and communications networks whose security and integrity underpin resilience. Increasing cyber-physical threats along with the energy transition heighten the importance of accurate, timely, and actionable cyber-physical situational awareness. In planning the research and technology developments to improve power system cyber-physical resilience, the development and use of testbeds and realistic highly detailed models for representing the coupled cyber-physical infrastructure in real-time simulation/emulation have a major role to play. In this talk, we share our perspective and experience on the development and use of realistic power system testbeds as an essential part of understanding and vetting the cyber-physical foundation of grid resilience. The Resilient Energy Systems Lab (RESLab) at Texas A&M is designed to provide safe proving ground for the design and experimentation of new techniques, methods, and tools to improve the resilience and security of large-scale power systems. We show how these high-fidelity models and testbeds enable developing solutions to help utilities identify and improve techniques for grid defense: cyber-physical situational awareness and control under adversarial presence. Our results highlight the crucial role of data-enhanced models and a robust testing environment in achieving the long-term success and building a deployment pipeline for power system cyber-physical security research. Finally, we discuss opportunities to participate with us on accurate and trustworthy control in the emerging cyber-physical-human systems-of-systems.

APRIL 16, 2025

[LINK TO WEBINAR](#)

1:00-2:00 P.M. ET

(10:00-11:00 A.M. PT)

Dr. Kate Davis is an Associate Professor in the Department of Electrical and Computer Engineering at Texas A&M University. Dr. Davis's work has pioneered significant enhancements to power system cyber-physical security by advancing cyber-physical modeling and analysis capabilities. Prior to joining Texas A&M in 2017, Dr. Davis was a Software Engineer and Senior Consultant for PowerWorld Corporation and with University of Illinois's Information Trust Institute as a Research Scientist. Her expertise includes large scale modeling, analysis, and simulations of cyber-physical power system critical infrastructure, where she has particular interest in security-oriented control system analysis techniques. She also works to facilitate transition to practice of state-of-the-art cyber-physical situational awareness capabilities for power utilities. She was recognized as IEEE Senior Member (2018), received the Texas A&M Engineering Experiment Station Engineering Genesis Award (2019, 2024), and became a Texas A&M Engineering Experiment Station (TEES) Young Faculty Fellow (2021). She was awarded the Texas A&M Dean of Engineering Excellence Award for Associate Professor (2024). She leads the Resilient Energy Systems Lab (RESLab), the cyber-physical emulation testbed created by her group, fully functional since 2020. She is the faculty advisor for the Texas A&M student chapter of HKN and a licensed Professional Engineer in the state of Texas.

