UCF | Electrical and Computer Engineering

Spring 2017 Seminar Series

Enhancing Power System Resilience and Cyber-Physical Security

WEDNESDAY APRIL 5, 2017

1:00 AM – HEC 356

Power grid resilience and cyber-physical security are critical for national security and people's everyday life. In this talk, I will discuss several topics on enhancing the resilience and cyber-physical security of the power system. For resilience, the interactions between component failures are estimated to reveal the general outage propagation patterns, which can help identify key components and improve the simulation efficiency of cascading failures. The multi-type branching process is then applied to analyze the interdependencies between different types of outages or different infrastructure systems. I will also discuss an integrated resilience response framework that can enhance power grid resilience by providing effective and efficient responses in both preventive and emergency states. For cyber-physical security, robust dynamic state estimation algorithms and risk mitigation strategies will be presented to address cyber attacks against synchrophasor measurements. Besides, the increased penetration of distributed energy resources (DER) will significantly increase the number of devices that are owned and controlled by consumers and third parties. These devices have a significant dependency on digital communication and control, which presents a growing risk from cyber attacks. I will discuss an attack-resilient framework that aims at protecting the integrated DER and the critical power grid infrastructure from malicious cyber attacks, helping ensure the secure integration of DER without harming the grid reliability and stability.

Junjian Qi

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Dr. Junjian Qi received the B.E. and Ph.D. degrees, both in electrical engineering, from Shandong University, Jinan, China, in 2008 and Tsinghua University, Beijing, China, in 2013, respectively. Dr. Qi is currently a Postdoctoral Appointee at the Energy Systems Division, Argonne National Laboratory, Argonne, IL, USA and a joint appointed Argonne Staff at the Computation Institute, University of Chicago, Chicago, IL, USA. He is the PI or co-PI of four DOE projects on cybersecurity, extreme event modeling, cascading failure analysis, and demand response. He was a Visiting Scholar at Iowa State University, Ames, IA in February–August 2012, and a Research Associate at the Department of EECS, University of Tennessee, Knoxville, TN in September 2013–January 2015. Dr. Qi is the Secretary of the IEEE Task Force on "Voltage Control for Smart Grids" and the recipient of Argonne's inaugural Outstanding Postdoctoral Performance Award in 2016. His research interests include cascading blackouts, power system dynamics and stability, state estimation, synchrophasors, voltage control, demand responses, and cybersecurity.