TUTORIAL: Measuring and Enabling Grid Resiliency Against Weather or Cyber events.

Keeping the power on especially to the critical facilities such as hospitals and fire department during extreme outages is essential. With the development of the smart grid technology, information and communication technologies (ICT) play a significant role in the smart grid. ICT also brings cyber vulnerabilities and it is important to analyze the impact of possible cyber-attacks on the power grid and develop defense mechanisms. Additionally, increasing weather events such as Hurricane Sandy and Maria demonstrated the grid vulnerability against extreme events. There is a need for defining resiliency and formal metrics to quantify resiliency of the electric grid, or different configurations of the same network. With additional planning and design, microgrid and distributed resources can help to restore critical loads inside or even outside microgrid and hence increase the system resiliency. This tutorial will present a data-driven tool to study the resiliency of the active distribution system with microgrids and DERs in planning phase and operational phase and to assess resiliency. The information from these two phases is provided to the operator/ decision makers to make informed and proactive decisions to ensure the resilient operation of the electric power system given dynamically changing available resources. This tutorial will cover review of extreme events, basic of cyber infrastructure for the power grid, cyber vulnerabilities, common vulnerabilities and exposures (CVE) score, defining resiliency, and a tool to study the resiliency of the active distribution system for planning phase and operational phase.

LECTURER: Anurag K. Srivastava

Anurag K. Srivastava is an associate professor of electric power engineering at Washington State University and the director of the Smart Grid Demonstration and Research Investigation Lab (SGDRIL) within the Energy System Innovation Center (ESIC). He received his Ph.D. degree in electrical engineering from the Illinois Institute of Technology in 2005. In past years, he has worked in different capacity at the Réseau de transport d´électricité in France; RWTH Aachen University in Germany; Idaho National Laboratory, Pacific Northwest National Lab, PJM Interconnection, Schweitzer Engineering Lab (SEL), GE Grid Solutions, Massachusetts Institute of Technology and Mississippi State University in USA; Indian Institute of Technology Kanpur in India; as well as at Asian Institute of Technology in Thailand. His research interest includes data-driven algorithms for power system operation and control including resiliency analysis. Dr. Srivastava is a senior member of the IEEE, vice-chair of IEEE PES PEEC committee, co-chair of the microgrid working group, secretary of PES voltage stability working group, chair of PES synchrophasors applications working group, past-chair of the IEEE PES career promotion subcommittee, past-chair of the IEEE Power & Energy Society's (PES) student activities committee, and past vice-chair of the IEEE synchrophasor conformity assessment program. Dr. Srivastava is an editor of the IEEE Transactions on Smart Grid, IEEE Transactions on Power System, IET Generation, Transmission and Distribution and Elsevier Sustainable Computing. He is an IEEE distinguished lecturer and delivered more than 50 keynote/ plenary or tutorial in 20 countries, and authored more than 250 technical publications including a book on power system security and 4 pending/ awarded patents.