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ELECTRICAL & COMPUTER ENGINEERING
TEXAS A&M UNIVERSITY

S E M I N A R

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Closing the Loop around Data for Low-Carbon Power Systems

by

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Abstract: The electricity grid is transforming itself from a hierarchical, passive, and sparsely-sensed engineering system into a flat, active, and ubiquitously-sensed cyber-physical system. The emerging multi-scale data from synchrophasors, smart meters, and electricity markets offers tremendous opportunities as well as scientific challenges to dynamically learn and adaptively control a smart grid.

The first part of the talk presents the dimensionality reduction of real-world synchrophasor (PMU) data. An early anomaly detection and classification algorithm is proposed based on the switch of the core subspace. Justification of this algorithm is provided using linear dynamical system theory. This could be further leveraged for early mitigation of anomalies such as wind-induced sub-synchronous oscillations. The second part of the talk proposes a dynamic systems approach to modeling and eliciting flexibility from demand. A new Energy Coupon mechanism is proposed to extract flexibility from flat rate-based customers. This talk concludes with several open interdisciplinary research opportunities that would synergistically contribute towards a low-carbon smart grid.

Le Xie is an Assistant Professor in the Department of Electrical and Computer Engineering at Texas A&M University. He received B.E. in Electrical Engineering from Tsinghua University in 2004, S.M. in Engineering Sciences from Harvard in 2005, and Ph.D. in Electrical and Computer Engineering from Carnegie Mellon in 2009. His industry experience includes internships at ISO-New England and Edison Mission Energy Marketing and Trading. His research interest includes modeling and control in data-rich large-scale systems, grid integration of low-carbon energy resources, and electricity markets.

Dr. Xie received the National Science Foundation *CAREER Award*, and the Department of Energy Ralph E. Powe Junior Faculty Enhancement Award. He was TEES Select Young Fellow in 2013. He is an Editor of *IEEE Transactions on Smart Grid*, and the founding chair of IEEE Power and Energy Society Working Group on Big Data Analytics for Grid Operations. He and his students received the Best Paper awards at North American Power Symposium and IEEE SmartGridComm 2012. He is the founding faculty advisor of A&M Energy Club.