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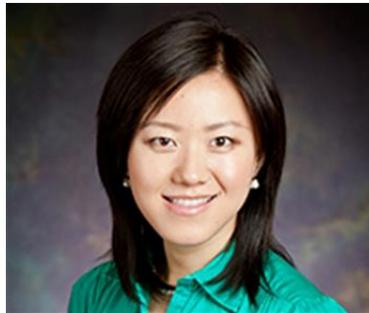
TomKat Center for Sustainable Energy
Precourt Institute for Energy
SLAC National Accelerator Laboratory
Energy and Environment Affiliates Program
Civil and Environmental Engineering
Department of Electrical Engineering

Stanford SmartGrid Seminar

Fast local voltage control under limited reactive power: Algorithms and Stability Analysis

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1:15pm-2:15pm, Thursday, Feb 12th, Y2E2 270

Abstract: One crucial aspect of the smart grid vision is to revitalize power distribution systems through transforming the generation and loads, as well as improving network architecture. Significant effort and investment have been committed to resolve the issue of losing voltage regulation along distribution feeders due to increasing penetration of distributed energy resources (DERs). This talk will first introduce the problem of regulating feeder voltage profile by controlling the limited reactive power (VAR) resources from power-electronics interfaced devices, such as solar PV panels and batteries. To tackle the communication delay and improve robustness to link failures, we will develop a local control framework using only the bus voltage measurements. This local approach is also more attractive in addressing the fast DER transients due to e.g., PV panel shadowing or uncertainties in distribution loads. A class of local control strategies will be presented in addition to the classical droop control, with the convergence-speed versus stability trade-off. Numerical simulations have demonstrated the proposed methods' effectiveness using realistic (and three-phase) distribution test cases, as well as their potential in coping with the fast transients of system disturbances.

Bio: Hao Zhu is an Assistant Professor in the Department of Electrical and Computer Engineering at the University of Illinois, Urbana-Champaign (UIUC). She received the B.E. degree from Tsinghua University, China, in 2006, and the M.Sc. and Ph.D. degrees from the University of Minnesota, Twin Cities, in 2009 and 2012, all in electrical engineering. After that, she was a postdoctoral research associate working on smart grid modeling and validation, at the Information Trust Institute, UIUC, before joining the ECE faculty in January 2014. Her current research interests include data-driven power system monitoring, grid operations and control, and energy data analytics. Dr. Zhu has co-authored 15 journal papers in IEEE publications on power systems, signal processing, and communications.