Power Systems Engineering Research Center

Distribution System Voltage Control Under Imperfect Communications

Hao Zhu
Department Electrical, Computer, and Energy Engineering
University of Illinois at Urbana-Champaign
haozhu@illinois.edu

PSERC Public Webinar
Tuesday, September 15, 2015
2:00-3:00 p.m. Eastern Time (11:00-12:00 p.m. Pacific)

Description: One crucial objective of the smart grid vision is to revitalize power distribution systems by improving network architecture. Significant effort and investment has been made to resolve the issue of loss of voltage regulation along distribution feeders due to increasing penetration of distributed energy resources (DERs). In this talk we will first give an overview of the voltage control problem in distribution systems with high penetration of DERS, and describe various decentralized solutions to the problem, such as using on-load tap changer (OLTC) transformers, capacitor banks, and distributed generations (DGs). Then we will focus on the fast voltage control problem using the VAR-capable inverters of DGs and batteries that are dependent on the availability and quality of communication links. With no communication capability, inverters can perform local voltage control by measuring bus voltage, such as in droop control design. We will present a distributed voltage control approach that is resilient to random failures of communication links using only bus-to-bus communications. Compared to existing distributed solutions, our proposed approach uses only local voltage measurements and thus has minimal requirements for sensing hardware. We will present numerical results from realistic three-phase distribution test cases. The results demonstrate the effectiveness of the proposed methods under imperfect communication scenarios.

Biography: Hao Zhu is an Assistant Professor in the Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign (UIUC). She received a Bachelor of Engineering degree from Tsinghua University, China, in 2006, and Masters of Science and Ph.D. degrees from the University of Minnesota, Twin Cities, in 2009 and 2012, all in electrical engineering. After graduation, she was a postdoctoral research associate working on power grid modeling and validation at the UIUC Information Trust Institute before joining the ECE faculty in January 2014. Her current research interests include power grid monitoring, power system operations and control, and energy data analytics.

Registration for Webinar Participation: None required. There is no charge for participating!

Participation by Webinar: There are several options for participating.

- Recommended option: We will be using the Adobe Connect webinar platform. You will be able to watch the presentation slides on your computer from the designated site https://connect.asu.edu/pserc and listen to the webinar through your computer's speakers or headphones. To join the webinar, enter firstname lastname (organization). Click here for the connection details and instructions for testing your connection. If you cannot hear the presenter, check to make sure your speaker is not muted in Adobe Connect. You may also be able to use the app "Adobe Connect™ Mobile" to participate via smartphone or tablet.
- You can also listen to the audio over the public phone bridge at 712-432-0800 (passcode: 937250#). Should you not be able to connect to the webinar, you can also download the slides from the PSERC website and listen to the audio over the phone bridge.
- You can watch the archived webinar at a different time by clicking here and then on the link for this webinar.

Asking Questions During the Webinar: You are invited to submit questions or comments during the webinar using the Adobe Connect webconferencing platform. Just enter your question into the Q&A box.

Professional Development Hour Certification: PDH certification is available for PSERC members (only). Send an email requesting PDH certification to pserc@asu.edu with the subject "PDH". *Include the name and title of each participant.*

Assistance: If you have any questions, please call 480-965-1643 or email pserc@asu.edu.

PSERC's Webinar Coordinator: Tom Overbye, University of Illinois at Urbana-Champaign, overbye@illinois.edu

Professor Overbye welcomes your feedback on PSERC webinars and suggestions for future ones.