UCF DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Spring 2016 Seminar Series

CONTROLLING FUTURE POWER GRID WITH INTELLIGENT ENDPOINTS

TUESDAY APRIL 5, 2016

11:00 AM – HEC 356

Rapid growth of renewable generation introduces highly volatile power supply and makes it costly to control the power grid purely relying on the current schemes. As a supplement, and enabled by sensing and communication technologies, a tremendous number of intelligent endpoints, such as smart buildings and appliances, electric vehicles, storage devices, and inverters, can actively participate in power system control. A fundamental issue on the control of these intelligent endpoints is to design scalable algorithms across a large network of distributed control knobs. Using an optimization-based approach, and exploiting implicit communication performed by the physics of the power network, we design distributed load-side frequency control. The developed controllers stabilize frequency, restore frequency to its nominal value, and enforce other operational constraints, with local sensing and moderate communication between neighboring nodes in the power network. Moreover, stability of the closed-loop system is analyzed by decomposing its cyber-physical structure.

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Changhong Zhao is a final-year PhD student in Electrical Engineering at California Institute of Technology. His research interest is in control and optimization of power systems, particularly on transient dynamics and stability, frequency and voltage regulation, and distributed demand-side control. He was a co-recipient of the Qualcomm Innovation Fellowship Finalist Award in 2015, and worked as a research intern at Los Alamos National Lab in 2013. He completed his undergraduate studies in the Department of Automation at Tsinghua University, Beijing, China, in 2010.