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Seminar Speaker

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Fully Distributed and Autonomous Control for Active Distribution Networks

Abstract: Conventionally, the operation of power grids depends on local droop control and centralized EMS system. However the centralized control framework meets technical challenges such as single point failure, large time delay and information privacy, especially for active distribution networks integrated with massive distributed renewable generations. This talk will introduce our recent works on fully distributed and autonomous control for active distribution networks. As an example, a fully distributed primary and secondary frequency control methods for microgrids, which is based peer-to-peer communication, will be explained. Both these two frequency control methods can minimize the generation cost and maximize the utilization of renewable energy, we name them economic frequency regulations. For the primary frequency control, we proposed a distributed quasi-Newton method for droop-free primary frequency control without central coordination. Then, a subgradient-based consensus algorithm is used for secondary frequency recovery. The equal increment rate criteria is incorporated into these algorithms to achieve a minimal regulating cost, obtained by economically distributing power among distributed energy resources. In this new control paradigm, the central EMS can be eliminated and the conventional economic dispatch module is also not needed to achieve minimal generation cost and guarantee power balance.

Bio Sketch: Dr. Wu is a full Professor with Tenure of Electrical Engineering Department, Tsinghua University, China. He is a IET Fellow, and was rewarded the prize of Distinguished Young Engineer of Chinese Electrical Engineering Society and enrolled in Program for New Century Excellent Talents in University by Ministry of Education. He is an associate Editor of IET Generation, Transmission & Distribution, Electrical Power Component and systems and Journal of Modern Power Systems and Clean Energy.

His research interests include Energy Management System, active distribution networks/microgrids management and operation control, renewable energy generation operation and control, TSA-EMT hybrid real-time simulation for AC/DC power systems. He has been the PI for 4 grants supported by National Science Foundation of China, more than 30 research projects granted from Department of Science & Technology and Industry Corporations. He has also won the second class prize of State Technology Innovation Award, and 13 prizes at provincial and ministry level.

Dr. Wu has published or preprinted more than 300 peer-reviewed papers including 40 IEEE Journal papers; He hold 99 invention patents of China and 8 USA invention patents.