

*Holcombe Department of Electrical and Computer Engineering  
Seminar Series*

**From micro to Mega-GRID: Interactions of micro grids in Active  
Distribution Networks**

Dr. Phuong Nguyen

Assistant Professor, Electrical Energy Systems Group  
Eindhoven University of Technology, the Netherlands

**Abstract**

Based on a synergy between power grid and ICT technologies, a new smart grid generation will be enabled by decentralized control via technology-based micro grids and active participation of end-users in market-based micro grids. However, adoption of such bottom-up technologies in a mega scale of the (active) distribution networks is facing challenges from coexistence of top-down grid control system and market models. In order to accelerate the adoption of a variety of micro grids in the mega scale of the distribution grids, various aspects of network planning would need to be enhanced along with advancing set of control functions for technology-based micro grids to obtain effective communication and coordination with the distribution grid. Exploiting potential flexibility of market-based micro grids is also crucial for securing local network operation and mitigating power imbalance. This creates flexibility market opportunities for involved stakeholders, thus accelerating adoption processes of developed micro grid technologies. Developed solutions would need to be validated in a whole range of test environments, from the integral software platforms to power hardware-in-the-loop laboratory experiments.

Obviously, future energy systems will become a complex cyber-physical ecosystem which would require an integrated paradigm for energy management and control systems based on various (big) data resources. Up till now, there is a limited effort putting on exploitation of big data derived from various advanced sensors and massive number of smart meters under the fast evolvement of Internet of Things (IoT) for resilience and self-management in the distribution grid and its coupled energy (heat, gas) subsystems. A synergy between energy system integration and big data, if developed properly, will lay a foundation for integral solutions to smoothen the whole energy transition.

**Biography of Speaker**

Dr. H.P. (Phuong) Nguyen (M'06) received the Ph.D. degree from the Eindhoven University of Technology, the Netherlands, in 2010. He is an Assistant Professor in the Electrical Energy Systems (EES) group at the Eindhoven University of Technology, the Netherlands. He was a visiting researcher with the Real-Time Power and Intelligent Systems (RTPIS) Laboratory, Clemson University, USA, in 2012 and 2013. At EES, he is leading a research line of using computational and distributed intelligence to enable active and intelligent distribution grids. His research of interests also includes data analytics with deep learning, real-time system awareness using (IoT) data integrity, as well as predictive and corrective grid control functions. He has published about 100 research papers in peer-reviewed top ranked journals and top class international conference. He was the program and paper review chair of the IEEE PowerTech 2015 conference at Eindhoven. He is a project coordinator (NWO project DISPATCH & DISPATCH 2), technical coordinator (ERA-NET Smart Grid Plus project m2M-GRID), and involving in both national (TKI and NWO) and European (FP7 INCREASE, H2020 Inteflex, H2020 UNITED-GRID) projects.