

# “Advanced Modeling and High Speed Real-time Simulation for Microgrid Applications”

## Abstract

Renewable energy-powered microgrids have proven a valuable technology for self-contained (off-grid) energy systems. These microgrids have also proven effective in managing the renewable energy integration in the power distribution system. The control, protection and operation strategy of microgrids are technically required to pass the hardware-in-the-loop (HIL) test before being applied in actual projects. Real-time simulation technology are proving to be a potentially valuable tool to meet future HIL demands at these microgrids. The challenges mainly come from the fast switching characteristic and the large amount of power converters in microgrids. Furthermore, the interpolation algorithm for power electronic switches cannot be used in the real-time simulation. As a result, the time-step has to be very small to accurately reflect the switching moments. For a switching frequency of 20kHz, a time-step smaller than 500ns is usually required. Achieving real-time simulations with such small time-steps requires not only the great computing power of hardware but also the high efficiency of models and simulation algorithms. This speech will discuss recent efforts to develop new models and the associated real-time simulation technology for use in microgrids.

## The Speaker

**Keyou Wang** is professor and associate chair of electrical engineering at Shanghai Jiao Tong University. He received his B.S. and M.S. degrees in electrical engineering from Shanghai Jiao Tong University, China in 2001 and 2004, respectively, and the Ph.D. degree in electrical engineering from Missouri S&T (formerly University of Missouri-Rolla), USA, in 2008. He joined SJTU since 2012 and is currently the associate chair of department of electrical engineering. His research interests include power system modeling and simulation, computational methods and power electronics applications to renewable energy systems and microgrids. He is currently serving as Associate Editor for IET Generation Transmission & Distribution and Academic Editor for CSEE Journal of Power and Energy Systems.

