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**Joint Seminar organized by IEEE Power and Energy Society Ottawa Chapter and
Department of Electronics, Carleton University**

Real-Time Simulation for Smart Grid

by

Dr. Peng Zhang, BC Transmission Corp., Vancouver, BC, Canada

DATE: Thursday September 10, 2009
TIME: 10:10 am - 11:00 am
(09:30 am - 09:10 am: Dr. Zhang will also give a lecture on **Power Distribution System**)
PLACE: Room 4124 – Building: #10, Carleton University,
1125 Colonel By Drive, Ottawa, Canada K1S 5B6 ([Campus Map – Building: #10](#))

Abstract Smart grids and sustainable energy will be powering our economy in the future, and will help meet energy challenges such as climate change and fossil fuel crisis. Real time power system simulation is a core smart grid technology that provides unprecedented observability & controllability in power systems and thus can greatly improve the system security, reliability and efficiency.

Electromagnetic transient programs (EMTP) can most closely simulate the real power system dynamics by continuously tracing the evolution of the system states in arbitrary multi-phase networks with lumped or distributed parameters. Therefore EMTP-type simulators are very appealing to be used for real-time dynamic assessment. However, their capability in real time simulation of power systems is compromised due to the small time step used and relatively slow simulation speed.

A Shifted Frequency Analysis (SFA) method has been proposed by the speaker to accelerate EMTP solutions for real-time simulation of power system dynamics. The SFA allows the use of large time steps in the EMTP solution environment to accurately simulate power system dynamics within a band centered around a fundamental frequency. The following topics will be discussed:

- How to transform the original system into a shifted frequency system,
- How to couple SFA models into an EMTP-type simulator,
- The development of a SFA-based EMTP simulation tool, and
- Future research on applications in smart grid, renewable energy, and associated hardware and software innovations

The SFA provides dynamic phasor results, which help power engineers gain better insight into the system dynamics. The proposed SFA method is the first practical step towards unifying power system slow and fast dynamic analysis methods using the EMTP.

About the Speaker: Peng Zhang holds a Ph. D. in Electrical Engineering from the University of British Columbia, Vancouver, BC, Canada. Since 2006, he has been a System Planning Engineer at BC Transmission Corporation, Vancouver, where he works on grid integration of renewable energy resources, real-time operation & power system planning. In 2003, he was a lecturer with Center for Superconducting Power Technology, Chinese Academy of Sciences, where he studied superconducting magnetic energy storage. He was with Tsinghua University from 1999 to 2002, where he did collaborative research with power utilities on reliability and economic assessment for distribution, substation and bulk systems. He worked on distribution system analysis and distribution automation at Shandong University, China between 1996 and 1999.

Admission: Free. To ensure a seat, please register by e-mail to Professor [Q.J. Zhang](#), PhD, P.Eng., IEEE Fellow, Department of Electronics Chair, Carleton University.