

Electric Power and Power Electronics Institute

INVITED SEMINAR

Wednesday, February 6th, 2013, 3:00pm – 3:50pm, ETB 1037

APPLICATIONS OF SYNCHROPHASOR DATA TO POWER SYSTEM STATE ESTIMATION AND CONTROL

Joe Chow

Professor, Electrical, Computer, and Systems Engineering
Rensselaer Polytechnic Institute

Abstract

The US power grid is currently installing close to 1,000 new phasor measurement units (PMUs) as part of the US DOE Smart Grid Investment Grant (SGIG) activity. It is envisioned that the high-sampling-rate data captured by PMUs distributed across a power grid can be used to improve the visibility across control areas and enhance system reliability. The talk will be in three parts. In the first part, the operation of a PMU will be discussed. In the second part, a phasor state estimator capable of correcting phase biases and scaling factors will be described. The application of this phasor state estimator to the central New York power system will be illustrated. With sufficient redundancy, the PMUs on 6 substations allow signal calibration and voltage calculation on 7 neighboring buses. As a result, the impact of internal and external disturbances on the major power transfer paths in central New York can be studied in greater details. In the third part, interarea mode damping using remote PMU signals will be presented. Here the emphasis is on the impact of communication delay on the damping control design. For a damping controller to be effective, it has to provide appropriate phase compensation, mostly of the lead type. In the frequency domain, signal time delay translates to phase lag. Thus to counter time delays, additional phase lead compensation is needed. One can further take the communication time delay as variable and design a bank of switching controllers whose phase compensation are a function of the time delay. Simulation results will be shown.

Biography

Joe Chow is a Professor of Electrical, Computer, and Systems Engineering and the Campus Director, NSF/DOE CURENT ERC at Rensselaer Polytechnic Institute, Troy, New York. He received his BS degrees in Electrical Engineering and Mathematics from the University of Minnesota, and the MS and PhD degrees from the University of Illinois, Urbana-Champaign. He worked at General Electric Company, Schenectady, NY, before joining RPI in 1987. His current research includes Voltage-Sourced Converter based Flexible AC Transmission Systems, and the analysis, modeling, and control of large power systems using synchronized phasor measurements. His research is supported by NSF, DOE, NYPA, NYSERDA, and several power grid operators. He has received several awards in control and power systems, and is a fellow of IEEE.