

Power Event

Wide Area Measurement and Control System

Time and Date: 09:00 – 11:00, October 20th, 2014

Place: Meeting Room S04, Building 101A, Kgs. Lyngby, DK 2800

Abstract

The operation of bulk power systems with a high level of security and reliability is a necessity nowadays as it not only affects the daily life of human beings; it is also the cornerstone of sustainable economy development and national strategic defense. An effective way to achieve such a goal is to evaluate and control the system operation via flexible utilization of wide-area information, and this has received increasing attention not just from academic researchers worldwide but also been attempted in practical applications on actual power grids. Currently, phasor measurement units (PMUs) are widely deployed in high-voltage power grids in many countries. With the technical development to ensure fast transportation of wide-area signals labelled with uniform time-stamps, wide area measurement system (WAMS) based on PMUs can already monitor and evaluate the power system state in real-time. Nevertheless, it is still rare to have practical applications that employ wide-area information for power system stability control because of the unavailability of effective control methodologies and means for dealing with signal latency.

This report is mainly focused on the recent research outcomes of Prof Sun's team including:

- 1) ***Wide-area information based validation method of load model parameters:*** This method is to select wide-area information highly correlated with the load for validation. The multi-solution issue is addressed when local information is utilized to validate the load model.
- 2) ***Short-circuit capacity based voltage stability analysis and voltage stability margin indices:*** Relationship between the short circuit capacity and the voltage stability margin of load nodes is studied. Wide-area information based closed-loop control of voltage dynamics is developed.
- 3) ***Auto-regressive prediction based methods to compensate for the distributed signal latencies in wide-area closed-loop control systems:*** The method is to realize on-line optimization of wide-area PSS parameters via perturbation and identification.
- 4) ***Coordinated control of frequency and voltage based on WAMS and regulation of highly energy-consumed loads:*** According to P-V characteristics of electrolytic aluminum, methods

have been developed to fully harness the voltage regulation capabilities of saturated reactors and AVR's of synchronous generators in a coordinated manner to rapidly identify and eliminate active power imbalance. The coordinated control strategy has been successfully deployed in an isolated power system in China.

Short Bio of the Speaker



Prof Yuanzhang Sun received the B.Eng. from Wuhan University in 1978, M. Eng. from China Electric Power Research Institute (CEPRI) in 1982 and the Ph.D. from Tsinghua University in 1988.

After his Ph.D. graduation, he was a Lecturer from 1988 to 1992, an Associate Professor from 1992 to 1997, and a Full Professor from 1997 to 2011 with Department of Electrical Engineering, Tsinghua University. He was the Dean of School of Electrical Engineering, Wuhan University, from 2005 to 2013. Now he is a Full Professor with School of Electrical Engineering, Wuhan University.

Prof Sun's research interests are power system stability and control, operational reliability of power systems, smart grid, renewable energy.