

Thursday, November 12th

Scaife Hall Auditorium

Room 125

4:30 p.m.

Refreshments at 4:00 p.m.

**Professor George Gross**

Electrical Engineering & Computer Engineering and
Institute of Government and Public Affairs
University of Illinois at Urbana Champaign

George Gross is Professor of Electrical and Computer Engineering and Professor, Institute of Government and Public Affairs, at the University of Illinois at Urbana-Champaign. His research and teaching activities are in the areas of power system analysis, economics and operations, utility regulatory policy and industry restructuring. He was formerly with the Pacific Gas and Electric Company, where, Dr. Gross founded the company's Management Science Department and held other key management, technical and policy positions. During 1992-93, Dr. Gross was at the Electric Research Power Institute to develop research directions on open access transmission. A Fellow of IEEE, Dr. Gross was awarded the *Franz Edelman Management Science Achievement Award* by the Institute of Management Science. Dr. Gross is the author of a large number of publications and book chapters. He was a Visiting Professor at the Politecnico di Milano, University of Pavia and the Politecnico di Torino during the academic year 1999 – 2000. George Gross received his undergraduate degree at McGill University in Montreal and he did his graduate studies at the University of California, Berkeley.

Dr. Gross has consulted on electricity issues with utilities, government organizations and research institutions in North America, Europe, South America, Australia and Asia. He has lectured widely and has given numerous invited presentations at leading universities and research institutions throughout the world. His numerous publications have appeared in the leading journals in the field and have been presented at a wide array of international conferences.

**Design of a Conceptual
Framework for the Vehicle-to-
Grid (V2G) Implementation**

The major increases in oil prices and the rising environmental concerns are key drivers in the growing popularity of electric and plug-in hybrid vehicles. Car manufacturers understand this trend quite well and are developing new models. For the 90% of Americans who use their cars to get to work every day, the average daily commute distance is 45 km and the average daily time that cars remain parked is 22 hours. A salient feature that these vehicles have in common is the batteries, which provide good storage capacity that can be effectively integrated into the grid.

We focus on the design of a conceptual framework needs to integrate the electric vehicles into the grid – the so-called *V2G* concept. The basic premise we use is to treat the battery vehicles as distributed energy resources that can act both as supply and demand resources. We assess the deployment of an aggregation of battery vehicles for the provision of frequency regulation – requiring very fast response times – and energy supply for peak shaving. We also investigate the impacts of the aggregated battery vehicle-charging load on the low load generation schedules and on regulation requirements. The assessment of these impacts takes into consideration the explicit representation of uncertainty and the importance of the state of charge as a key variable in the use of the batteries for the supply and demand roles. For the framework completeness, we also explore the role of the energy services provider in the *V2G* integration. The role of *V2G* in the context of renewable resource integration is discussed. In addition, we present the need for the communications/metering system to enable the integrated battery vehicles to effectively participate in the operation of the grid and electricity markets.

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