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PRESENTED BY THE WATERLOO INSTITUTE FOR SUSTAINABLE ENERGY

Friday, April 17, 2015
2:00 – 3:00 pm
CPH 4333

A PRACTICAL FRAMEWORK FOR THE IMPLEMENTATION OF THE VEHICLE-TO-GRID (V2G) CONCEPT

George Gross, Professor, Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign

The major increases in oil prices and the rising environmental concerns are key drivers in the growing interest in electric and plug-in hybrid vehicles. Car manufacturers world wide 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 cars remain parked, on average, 22 hours each day. A salient feature that these vehicles have in common is the batteries which provide good storage capability that can be effectively integrated into the grid. We focus on the design of a conceptual framework to integrate the electric vehicles into the grid – the so-called V2G concept. The basic premise is to treat the battery vehicles as distributed energy resources that can act both as supply and demand entities. 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 takes into consideration the explicit representation of uncertainty and the importance of the state of charge, or s.o.c., as a key variable in the use of the batteries for the supply and demand roles. We also explore the role of the energy services provider in the V2G integration. I will discuss the role of V2G in the context of renewable resource integration and highlight the role of the Smart Grid in the construction of the communications/metering system to enable the integrated battery vehicles to effectively participate in the operation of the grid and electricity markets.

Biography

George Gross

George Gross is a Professor of Electrical and Computer Engineering and a Professor of the 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. Dr. Gross earned his undergraduate degree at McGill University, Canada and his graduate degree at the University of California, Berkeley. He has consulted on electricity issues with utilities, government organizations and research institutions in North America, Europe, South America, Australia and Asia. He has made a broad range of contributions in areas of power system planning, operations, analysis and control. His work on smart grid issues has focused on both the technical and the regulatory aspects. The principal areas of involvement include the design of AMI architectures to ensure cyber security, the deployment of AMR for demand response, the integration of demand-side response, renewable and storage resources into the grid and the economics of smart grid implementation.

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