UNIVERSITY of HOUSTON
CULLEN COLLEGE of ENGINEERING
Department of Electrical & Computer Engineering

PhD Dissertation Announcement

Predictive Energy Management Methods for Smart Grids

Ali Hooshmand

In this dissertation, we propose energy management methods for power systems in the context of smart grids. In this regard, we consider new management problems for various configurations of smart grids, microgrids, as well as the power system generation. For different scenarios, we consider grid connection and distributed generations such as photovoltaic cells, wind turbine, and micro-gas turbines as energy sources. In addition, the effects and advantages of storage devices in smart grids operation are investigated by including them as one of the system components. For microgrids operation, we consider a microgrid both in islanded mode and grid-tied mode of operation. In these modes, we develop and solve new optimization problems which aim to minimize the cost of energy within a microgrid to supply the load and maximize the lifetime of battery units simultaneously. Next, we extend the concept and consider a network of microgrids which are able to collaborate with each other. By proposing a cooperative optimization problem for microgrids network, we will show that the total cost of energy would be minimized. On the generation side, we investigate economic dispatch problem for power systems which include renewable sources among energy providers. In this case, we will illustrate the conventional approaches for considering renewable energy sources in dispatching problem will not be functional anymore. In addition, we will develop a new method which can be an appropriate alternative for conventional approach. Finally, we will investigate the advantages of storage devices in afore-mentioned economic dispatch problem.

Model predictive control (MPC) policies, in both deterministic and stochastic forms, are employed to solve the underlying optimization problems. Several solution methods such as stochastic dynamic programming, linear programming, etc., will be employed to solve the MPC optimization problems. Numerous testbeds and experimental data including IEEE 14-bus system and California ISO data will be utilized to demonstrate the efficiency and optimality of the proposed energy management methods.

Committee Chair:	Dr. Heidar Malki	Place: 323-T2
Committee Members:	Dr. Javad Mohammadpour	Date: Friday, 11-02-2012
	Dr. Leang Shieh	Time: 10:30 AM-12:00 PM
	Dr. Zhu Han	
	Dr. Yuhua Chen	