Due to some technical and environmental constraints, expanding the current electric power generation and transmission system is not desired anymore. Alternatively, the electric power system can be restructured in a way to avoid expanding the current system. One way to achieve that is through the deployment of distributed renewable generation and storage systems.

Energy storage can be used to store energy from the utility during low-demand (off-peak) hours and deliver this energy back to the utility during high-demand (on-peak) hours. Furthermore, energy storage can be used with renewable sources to overcome some of their limitations such as their strong dependence on the weather conditions, which cannot be perfectly predicted, and their unmatched or out-of-phase generation peaks with the demand peaks. Generally, energy storage enhances the performance of distributed renewable sources and increases the efficiency of the entire power system. Moreover, energy storage allows for leveling the load, shaving peak demands, and furthermore, transacting power with the utility grid.

This research proposes an energy management system to manage the operation of distributed grid-tied micro-storage systems for stationary applications when operated with and without renewable sources. The term "micro" refers to the capacity of the energy storage compared to the grid capacity. The proposed management system employs four dynamic models: economic model, battery model, load and weather forecasting models. These models, which are the main contribution of this research, are used in order to optimally control the operation of the micro-storage system to maximize the economic return for the end-user when operated in an electricity spot market system.

Major: Electrical Engineering

Educational Career:
Bachelor's of Electrical Engineering, BS, 2005, Jordan University of Science and Technology
Master's of Electrical Engineering, MS, 2008, University of Central Florida

Committee in Charge:
Issa Batarseh, Chair, EECS Department
Linan An, Associate Professor/MMAE Department
John Shen, Professor/EECS Department
Wasfy Mikhael, Professor/EECS Department
Jiann-shiun Yuan, Professor/EECS Department

Approved for distribution by Issa Batarseh, Committee Chair, on May 31, 2011.

The public is welcome to attend.