Energy Processing for Smart Grid Technology

Task Leader: James A. Momoh, PhD, Howard University (jmomoh@howard.edu, 202-806-5350
Collaborator: Peter A. Bofah, PhD, Howard University (pbofah@howard.edu, 202-806-4819

Overall objectives

The objective of this thrust area will encompass undergraduates and first year graduate students in the field of power engineering with the aim to re-energize the interest in power system.

The outcome of this thrust will therefore enhance the work force in development of capacity upgrade for smart grid, sustain the system with appropriate RER and standards that will improve performance study.

Dissemination Strategies

•Course modules have been produced and will soon be uploaded in power point on CESaC and Howard University websites.

•To provide workshops, white papers and e-book or textbook on modern energy conversion with smart grid

Deliverables

•Integration of laboratory work in the modules has been carried out in our Power Game Laboratory set up. This laboratory highlights the practical aspects of the technical issues in the modules.

•These modules where prepared as part of the deliverables to include a self-contained textual treatment that have quality at the level of our published textbook on smart grid: **Smart Grid: Fundamentals of Design and Analysis by James A. Momoh, Ph.D**

•A developed course module to include renewable energy sources modeling and variability issues has been carried out and integrated in the text, Smart Grid: Fundamentals of Design and Analysis

•Designed case studies for studying the impact of renewable energy, storage on smart grid systems.

•Developed hands-on laboratory to integrate the PMU, smart-grid in a test-bed environment.

•Developed monitoring and assessment plan for the adaptation of the course modules in targeted PSERC schools with the purpose that evaluated outcome assessment of the course and verified its impacts on the interest of students in power engineering career and their preparation for the smart grid industry.

Description

Incorporate case studies, introduce ethics, policy and cost benefit issues using the smart grid technology. The audience will encompass undergraduates and first year graduate students in the field of power engineering.

This thrust is aimed at enhancing power modules in the university in two major broad topics critical to the Nation's objective of attaining energy independence. These two areas include: smart grid fundamentals and applications; and integration of renewable energy resources into the bulk power system.

Integration of laboratory work in the modules highlight the practical aspects of the technical issues in the modules developed.

1.2 Course objectives and Outcomes

Course Objectives	Expected Outcome
• Fundamentals of Energy Conversion and Power Electronics	To provide opportunity for the electrical engineer in understanding the dynamics of electrical power apparatus and system
• Tracking and Evaluation of the Renewable Energy Resources.	To enhance ability of the students to use new modeling tools so as to predict, adapt and handle uncertainties.
• Fundamentals of Phasor Measurement Unit	Capability to use advanced measurement tools for real time assessment of power system
• Development of Wide Area Control application for integrated renewable energy for smart grid	To develop synergy between wide-area control and substation automation
• Smart Grid Application including protection communication control and standards	To design technology penetrable energy to the grid and manage it over time
• Development of simulation and test bed of the different modules of the course materials to account for the smart grid and renewable technology proposed	Outcome will equip the students to model, analyze and synthesize future smart grid with the ability to predict and adapt to new situation awareness
• Evaluate the course module and its impact on students interest in power engineering curriculum which include RERs in the presence of adverse weather conditions and environmental impact	Outcome will help develop smart cadre of workforce that will contribute to the upgrade of power system structure and stabilize the system during post fault or in the case of any outage or uncertainties under the penetration of RER