

Fall 2018 Seminar Series

Energy Storage Integration Evaluation with Results from a 10MW PV and 1MW/2MWh Battery Experimental Facility

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Abstract: This presentation analyzes the configuration, design and operation of multi-MW grid-connected solar PV farms with integrated battery energy storage systems (BESS). The studies include practical test cases provided by a field development. The behavior of the grid connected PV and BESS combined system is studied using a modified IEEE 14-bus test system implemented in PSCAD/EMTDC. Conventional PV systems integrated with a battery connect the array and the energy storage unit to the dc-link through individual dc-dc converters for maximum power point tracking (MPPT) and battery charge control. A new system configuration, which connects the PV array and battery unit to the dc-link of the system inverter via a single dc-dc converter capable of simultaneously operating as a charge controller and MPPT device, is proposed. This dc-dc converter is controlled such that it charges/discharges the battery with the amount of power required to maintain the PV array at its MPPT reference voltage. In addition, this presentation reviews the procedures, layouts and metrics described in the new test manual issued by the Electric Power Research Institute (EPRI), in order to determine the performance, functionality and equivalent models of a utility scale BESS. For the purpose of validating the equivalent BESS model, experimental results retrieved from the LG&E KU E.W. Brown solar facility, which houses a 1MW/2MWh operational BESS, a 1MVA variable load bank and a high resolution, real time synchronized SCADA system were compared with simulation results from the model developed in PSCAD/EMTDC.

Mr. Oluwaseun Akeyo

University of Kentucky

Bio: Oluwaseun Akeyo (S'16) is a Ph.D. student at the University of Kentucky, where he is currently serving as a research assistant in the SPARK Laboratory and as a teaching assistant in the Electrical and Computer Engineering Department. He received the B. Eng degree in Electrical and Electronics Engineering from Abubakar Tafawa Balewa University (ATBU), Bauchi, Nigeria and M.S. degree in Electrical Engineering from the University of Kentucky, Lexington, KY, USA. He won the Best Presentation award at the 2018 FEEDER Summer Program and the IEEE Best Poster Paper award at the 2016 International Conference on Renewable Energy Research and Applications (ICRERA). His research focuses on power systems, power electronics, battery energy storage and renewable energy sources.