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Modeling & control analysis of grid-connected battery with renewable sources

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Which the rapid growth of battery technologies in renewable energy production, it is essential to understand the battery type and the model, to achieve a coordinated control. The research provides the grid-connected battery modeling that integrates wind. The advanced battery model utilizes the electrical equivalent (dual polarization) model for the analysis. The research involves deploying a 1 MWh energy storage system (at Reese Technology Center in Lubbock, Texas) to understand the renewable energy sources and load management, including battery applications such as ramp control, frequency response, voltage response, emergency backup and peak load leveling, when connected to the grid. In order to develop the test bed of the grid-connected battery project at Reese, the research provides the simulation results using PSCAD software on discharge and charge characteristics of the 1 MWh Lithium Manganese Oxide battery under transient fault conditions when it is tied to the grid for wind integration. Initially vector control technique was used to control the current flow and the results were validated using the experimental data. Later an emerging technique on model predictive control (for three phase bi-directional converter to integrate a battery system with the grid) was developed to compare its performance with the vector controller. The model predictive control technique is analyzed to integrate the 1MWh battery system in PSCAD simulation environment for both steady state and fault scenarios. The simulation results show the effectiveness of model predictive control technology for battery system integration with the grid.

Biography

Anitha Sarah Subburaj is an Assistant Professor at West Texas A&M University. She received her Ph.D. in Electrical Engineering in 2014 from Texas Tech University, where she worked as a Research Assistant on the project, "Advanced Battery Modeling and Evaluation". She received her ME degree from Anna University, India in 2007. She held a position as Assistant Professor, at Kumaraguru College of Technology, India for three years. Her areas of research interests are renewable energy, control systems, battery energy storage system, and battery connected to grid applications. She has published several technical papers in reputed journals.

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