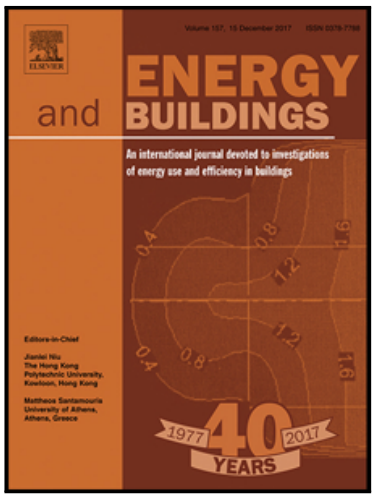

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Hybrid AC/DC Microgrid Testing Facility for Energy Management in Commercial Buildings

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Abstract

With ever increasing energy generation diversity and energy storage becoming affordable, distribution networks are becoming more complex than ever before. This complexity can be utilized to benefit the distribution networks as well as end consumers in the form of controlled Microgrids. Microgrids are not simply distributed generation and energy storage systems; solar systems and battery banks, rather a complete design of hardware and software for specific uses and users. All the different elements need to be designed to work together to provide stable, efficient and sustainable power delivery to the end user. An experimental Hybrid-Microgrid testing facility is presented in this paper that implements high-efficiency distribution architectures combining both AC and DC networks. This testing facility provides a research testbed for investigating different aspects of Microgrid systems, employing a total of 15.5 kW of reconfigurable Solar PV and 80 kWh of lithium energy storage on a 145 kVA commercial building load located at Griffith University. Implementation results along with control system simulation results are presented in this paper for distributed renewable generation, Static Synchronous Compensators, advanced control methodologies and forecasting methods for energy management purposes.

Keywords: Hybrid AC/DC Microgrid, DC Bus, Smart Grids, Static Synchronous Compensators, Control Systems, Communication and Monitoring Systems

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