A Real-Time Operation Test Result for Load Management Strategies of DC Microgrid System

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Abstract

In this poster, a real-time operation test result of load management strategies for the direct current (DC) distribution system is being proposed. The dc microgrids system is considered as a prospective system according to the increase of dc loads and dc output type distribution energy resources (DER) such as photovoltaic (PV) systems and energy storage systems (ESS). Since the dc microgrids system has many advantages such as feasible connection of DERs, reduction of conversion losses between dc output sources and loads, no reactive power issues. Among many functions of an EMS, load management is a main function in grid-connected mode. The developed real-time operation algorithm is implemented in EMS system and its main functions are confirmed in HILS test platform and DC microgrid pilot plant. The EMS system implemented the developed algorithm is operated in the KD Power DC microgrids demonstration site.

TOU(Time-of-Use) based LSM

Objective

*To minimize daily electricity tariff*
- Peak shaving: reduce demand charge
- Load shifting: reduce energy charge

Operation Strategy

EMS System Overview

Test Result

HILS Test Platform

DC Microgrid Pilot Plant

KD Power DC Microgrid

Simulation Parameters

DC Distribution System Configurations
- Structure: unipolar
- Voltage: 750 Vdc
- Grid interfaced Conv. Cap.: 100kW
- ESS Cap.: 10kW/220kWh
- Load Cap.: 0~80kW

Simulation Parameters
- Simulation Time: 24hr
- Peak Load before DSM: 80kW
- Peak Load after DSM: 69kW
- TOU tariff (₩/kW): Off-peak (63.1), Mid (109.2), Peak (166.7)

System Structure

Operation Results