Efficient Operation of Lithium-Ion Batteries Based on GPV-Forecasted PV Output

[1]Ahmad Syahiman Mohd Shah, [1]Mohamad Shaiful Abdul Karim, [1]Mohd Shawal Jadin, Airul Sharizli Abdullah, [1]Ruhaizad Ishak, [2]Yuki Ishikawa, [2]Hiroki Takahashi, [2]Suguru Odakura and [2]Naoto Kakimoto

[1]Faculty of Electrical and Electronic, Universiti Malaysia Pahang, Pekan, Pahang. asyahiman@ump.edu.my
[2]Department of Electrical and Electronic Engineering, Ibaraki University, Hitachi, Ibaraki, Japan. naoto.kakimoto.ee@vc.ibaraki.ac.jp

ABSTRACT

A load forecasting is essential in order to fulfil a demand of the consumer. Nevertheless, for a small-scale battery energy storage system (BESS) based on sole photovoltaic (PV), it needs a very strong effort to always meet a consumer's demand due to unstable meteorological conditions. An ideal PV system requires a constructive control strategy in order to alleviate its fluctuating output. In this study, an energy control scheme that executes next-day forecast of generation for the purpose of fully utilizing the stored energy in the batteries has been proposed. Experimental equipment was structured and the operation was completely administered by RX621 microcontroller. The implemented system worked very well without any distractions and it succeeded in controlling and preventing the batteries from being over-charge or over-discharge. Impressively, average consumption for September 2015 is considerably high, which suggests that the proposed control succeeded in utilizing energy corresponded to 98.6 % of the monthly-average generation.

Keywords: photovoltaic, batteries, energy management, PV forecasting