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Designing a control system based on SOC estimation of BMS for PV-Solar system

Yonis M. Yonis Buswig[1*], Ohirul Qays[1,*], Azuka Affam[1], Hani Albalawi[2], Al-Khalid Othman[1], Norhuzaimin Julai[1], Sim Sy Yi[3]

[1]Faculty of Engineering,
Universiti Malaysia Sarawak, Kuching, Sarawak, MALAYSIA

[2]Faculty of Engineering,
University of Tabuk, King Faisal Rd, Tabuk, SAUDI ARABIA

[3]Faculty of Engineering Technology,
Universiti Tun Hussein Onn Malaysia, Parit Raja, Johor, MALAYSIA

*Corresponding Author

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Abstract: One of the major challenges for battery energy stowage system is to design a supervisory controller which can yield high energy concentration, reduced self-discharge rate and prolong the battery lifetime. A regulatory PV-Battery Management System (BMS) based State of Charge (SOC) estimation is presented in this paper that optimally addresses the issues. The proposed control algorithm estimates SOC by Backpropagation Neural Network (BPNN) scheme and utilizes the Maximum Power Point Tracking (MPPT) scheme of the solar panels to take decision for charging, discharging or islanding mode of the Lead-Acid battery bank. A case study (SOC estimation) is demonstrated as well to depict the efficiency (Error 0.082%) of the proposed model using real time data. The numerical simulation structured through real-time information concedes that the projected control mechanism is robust and accomplishes several objectives of integrated PV-BMS for instance avoiding overcharging and deep discharging manner under different solar radiations.

Keywords: BMS, SOC estimation, BPNN, PV

1. Introduction

Developing countries need to make use of sufficient potential of PV power sources to cover the incremental demand of energy security. Though the PV-diesel microgrid system involving maximum supervising action as well as without having energy storage system can afford the continual power supply in the unelectrified rural area, it may not be circumstantially companionable because of the dependence on fossil-fuels and total dispatched energy cost[1][2]. Moreover, an individual PV system is an incomplete basis of electricity supplier due to the power instability produced by unpredictable solar irradiance and atmospheric temperature. Hence, MPPT is used commonly with PV solar systems to maximize power extraction from PV supply. Reference [3] presented an exhaustive literature review on on-line and off-line procedures for PV MPPT system. Reference [4] evaluated the application of Incremental Conductance, Perturb & Observe (P&O) MPPT procedure depending of European Efficiency Test EN 50530 that was specially contrived for

*Corresponding author: byonis@unimas.my, qaysakash93@gmail.com

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