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Feasibility analysis of standalone PV powered battery using SEN for smart grid

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ABSTRACT

In Smart Grid (SG) communication network, sensor integrated communication nodes namely ZigBee, Wi-Fi, and Bluetooth are increasing rapidly and crucial part of SG wireless communication. Sensor nodes are generally battery powered. With the miniaturization and high utilization of sensor nodes, the battery size is also getting smaller and smaller to fit into the same area. However, batteries are essential to power the sensor nodes and there is no alternative of the energy bank. Therefore, to provide seamless power to the nodes is a challenge when the nodes are meant for supporting distributed renewable generation for smart. Photovoltaic as the battery replacement is not often cost effective since the batteries are drained out. This paper presents a feasibility study of standalone Photovoltaic (PV) powered battery using SEN for smart grid application. The SEN is meant for SG application. In this study, we have analyzed charging characteristics of a lead-acid battery that can be recharged during day time by a PV module. The aim of this research is to study the two considerations prior to the battery is sufficient to power Sensor, ZigBee integrated System (SEN) for a long run the operation, (a) whether the optimal size of PV for recharging the battery considering three different day scenarios: average, cloudy, and full cloudy day, and (b) whether the battery is sufficient to power the SEN and discharge the battery on an average day. However, it is not sufficient for full cloudy or full rainy day. Finally, a mathematical model is obtained from regression analysis that shows battery internal resistance is exponential to voltage on both full cloudy and rainy day, but it is linear on average day.

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1. INTRODUCTION

With the development of wireless sensor and embedded system technologies, Smart Grid (SG) is becoming more popular, whereby it defines as altering the conventional grid by a modern, automated, emerging robust, bidirectional ordinance network. Internet of things and wireless communication technologies [1-3], likely piece of broad fast and an image simple rate environment in the areas of cashless customer, therefore, researchers and technologists are paying their efforts to enhance the traditional power industry by a smart power system or SG [4]. A range of wired and wireless technologies are relevant to SG communication

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