

Performance Testing of an Off-Grid Solar-Powered Automatic Lighting System at a Cemetery

Ir. Mochammad Nuruddin, S.T., MSi.

Mohammad Raja Hilmy Samudra
Study Program of Renewable Energy Engineering
Majoring of Engineering

ABSTRACT

This study aimed to evaluate the performance of an off-grid Solar Power System (PLTS) for an automatic lighting system in a cemetery area and to compare the effectiveness of two automatic control systems, namely a timer and a light sensor. The research was conducted at Sadengan Cemetery, Summersari District, Jember Regency, using a 200 Wp monocrystalline solar panel, a 20 A PWM Solar Charge Controller (SCC), a 13.5 V/30 Ah lithium battery, and a 30 W DC LED lamp. Data were collected over a period of 14 days, covering battery charging from 09:00 to 14:00 WIB and battery discharging during nighttime operation. The analyzed parameters included solar irradiance, solar panel efficiency, SCC efficiency, battery efficiency, overall PV system efficiency, and the effectiveness of the automatic control system.

The results showed that solar irradiance significantly affected the output power of the solar panel, with panel efficiency ranging from 10% to 15%. The Solar Charge Controller (SCC) achieved an average efficiency of 88%, while the battery reached 100% State of Charge (SoC) within approximately four hours, from 09:00 to 13:00 WIB. The control system evaluation indicated that the automatic timer was more energy-efficient than the light sensor, with average power consumption of 55.4% and 66.7%, respectively. The timer provided more scheduled control of the lamp's switching operation, thereby minimizing energy losses caused by fluctuations in ambient light intensity that affected the light sensor.

In conclusion, the off-grid solar-powered automatic lighting system demonstrated satisfactory performance as a reliable lighting source for cemetery areas. Furthermore, the timer-based control system proved to be more energy-efficient than the light sensor-based system and is therefore recommended for implementation in automatic solar-powered lighting applications.

Key words: *Off-grid solar power system, solar panel, automatic lighting, system efficiency, timer, light sensor.*

