ABSTRACT

Street lighting (PJU) plays an important role in supporting the safety of road users, especially at night. However, conventional PJU systems still face problems of high energy consumption and inefficiency. The use of renewable energy such as solar power and microhydro in a hybrid system is an alternative solution that is more environmentally friendly. This study designs an automatic monitoring and control system for hybrid PJU based on the Internet of Things (IoT) using INA219 and LDR sensors to monitor voltage, current, and light intensity. The solar panel angle adjustment is carried out automatically by servo based on LDR data, while the operation of the lights is automatically controlled based on the RTC. All data can be monitored in real-time through the blynk platform. This system aims to improve energy efficiency and reduce operational costs.

Test results show that the system functions well for all three energy sources, with voltage reading accuracy exceeding 94% and current reading accuracy exceeding 90%. the automatic lighting control system operates according to the RTC schedule (lights turn on at 5:30 PM–5:00 AM WIB and off at 5:00 AM–5:30 PM WIB), enabling energy savings of over 50%, and the adjustment of the solar panel angle, which operates optimally within the range of 60°, 90°, up to 120° to maximize sunlight absorption.

Translated with DeepL.com (free version) Overall, the application of Internet of Things (IoT) technology in this hybrid street lighting system has successfully improved energy efficiency and system effectiveness. With real-time monitoring via Blynk, the system can reduce operational costs and support the use of renewable energy more efficiently.

Keywords: Internet of Things (IoT), Public Street Lighting (PSL), Solar Power, Microhydro Power, Hybrid, Monitoring, Control, Real-time, Energy Efficiency.