

ABSTRACT

Rapid technological advancements impact all aspects of life, including developments in renewable energy power generation. This fosters innovation and efficiency while reducing reliance on fossil fuels. Telkom University, as an environmentally-conscious educational institution, has proactively adopted alternative energy technologies such as Solar Power Plants (PLTS) and other renewable energy sources. However, these power plants currently lack integrated control and monitoring systems, potentially leading to decreased efficiency in power usage.

This research aims to develop a prototype control device using an Automatic Transfer Switch (ATS) system for automatic switching from the primary Solar Power Plant (PLTS) to a backup Solar Power Plant (PLTS). The system also features load control based on Internet of Things (IoT) technology. With this technology, each renewable energy power plant can be monitored and controlled in real-time, allowing for early problem detection and operational efficiency improvement. The website controls power distribution to loads, integrated with a Firebase Realtime Database, enhancing power usage effectiveness.

The research results indicate that charging a battery from solar panels takes an average of 60 minutes. Testing of the power control system using DC ATS shows that automatic switching occurs when the battery voltage drops below 10.8 volts, with an average switching time of 4.9 seconds, an accuracy rate of 77.14%, and an average battery discharge time of 40.2 minutes with an accuracy rate of 96.42%. Load control testing with ESP32 and a 1-channel relay shows an average relay response time of 5.273 seconds for load on and 4.187 seconds for load off, with most response times under 3 seconds. Then for the SuS test, a value of C grade was obtained which is still in the "good" category, and the QoS test with the index "Very Good" and "Good". Furthermore, in the website functionality test, the results are responsive on various devices, with the display time of dashboard data and login features around 1.2-2.3 seconds, indicating good performance.

Keywords: Renewable Energy, Solar Power Plants, Internet of Things (IoT), Automatic Transfer Switch (ATS), Energy Control System.