

ABSTRACT

The imbalance in electricity consumption between boarding house residents often causes injustice in the distribution of electricity costs, especially when management is done manually and without transparent monitoring. Differences in the type and number of electronic devices used by each resident cause significant variations in power consumption, while boarding house owners generally set uniform electricity rates for all rooms. This problem is the background to the need for an accurate and real-time electricity monitoring and management system. In this project, an Internet of Things (IoT)-based electricity consumption monitoring and management system has been designed and implemented using NodeMCU ESP32 as the main microcontroller. The PZEM-004T sensor is used to measure electrical parameters such as voltage, current, power, and energy. The measurement data is displayed on an OLED screen and sent in real-time to the Blynk application via a WiFi connection. This system is also equipped with an automatic power outage feature using a relay module when the user's electricity balance reaches zero, and is integrated with a Telegram bot to send notifications about the balance status and electricity usage. The balance top-up feature can be done directly through the Blynk application interface. The implementation results show that the system is able to monitor electricity consumption with good accuracy, calculate usage costs based on the energy consumed, and automatically cut off electricity when the balance runs out. The system also successfully sends real-time warning notifications and allows users to top up their balance independently. With this system, electricity management in boarding houses becomes fairer, more transparent, and more efficient, both for owners and residents.

Keywords: *Internet of Things; NodeMCU ESP32; PZEM-004T; Electricity Monitoring; Boarding House.*