

ABSTRAK

RANCANG BANGUN SISTEM MONITORING DAN PERHITUNGAN TARIF DAYA LISTRIK MENGGUNAKAN ESP32 BERBASIS *WEB SERVER* (*WEBSITE*)

(2026 : xvi + 104 Halaman + 63 Gambar + 14 Tabel + 8 Lampiran)

PRITA DWI CAHYANI

062330330750

JURUSAN TEKNIK ELEKTRO

PROGRAM STUDI TEKNIK TELEKOMUNIKASI

POLITEKNIK NEGERI SRIWIJAYA

Konsumsi energi listrik rumah tangga di Indonesia terus meningkat seiring bertambahnya penggunaan peralatan listrik. Berdasarkan data Direktorat Jenderal Ketenagalistrikan Kementerian ESDM, konsumsi listrik rumah tangga pada semester pertama tahun 2025 mencapai 67,14 TWh dan meningkat 5,13% dibandingkan periode yang sama tahun 2024. Peningkatan konsumsi listrik yang tidak terkendali dapat menyebabkan pemborosan energi dan peningkatan tagihan listrik rumah tangga sehingga diperlukan tindakan pencegahan melalui pengendalian penggunaan daya listrik. Perkembangan teknologi *Internet of Things* (IoT) memungkinkan proses monitoring penggunaan listrik dilakukan secara otomatis dan *real-time*. Penelitian merancang sistem monitoring dan perhitungan tarif daya listrik berbasis web menggunakan ESP32 dan sensor PZEM-004T. Pengujian dilakukan pada 5 alat rumah tangga terdiri dari magicom, printer, speaker bluetooth, televisi dan kulkas. Hasil pengujian menunjukkan bahwa sistem mampu menampilkan data secara *real-time* dengan keterlambatan kurang dari 2 detik dan fitur ON/OFF beban bekerja dengan waktu respons sekitar 1–2 detik. Estimasi biaya listrik selama 2 jam menunjukkan bahwa kulkas memiliki biaya terbesar sebesar Rp162,09, sedangkan printer Canon memiliki biaya terkecil sebesar Rp4,82 dengan total biaya seluruh beban sekitar Rp440,-. Sistem yang dirancang mampu membantu pengguna memantau konsumsi energi yang dapat dipantau melalui *website*.

Kata kunci: ESP32, PZEM-004T, monitoring daya listrik, web server, tarif listrik, relay.

ABSTRACT

DESIGN AND DEVELOPMENT OF AN ESP32-BASED WEB SERVER SYSTEM FOR ELECTRICAL POWER MONITORING AND ELECTRICITY TARIFF CALCULATION (WEBSITE)

(2026 : xvi + 104 Halaman + 63 Gambar + 14 Tabel + 8 Lampiran)

PRITA DWI CAHYANI

062330330750

DEPARTMENT OF ELECTRICAL ENGINEERING

TELECOMMUNICATIONS ENGINEERING STUDY PROGRAM

SRIWIJAYA STATE POLYTECHNIC

Household electricity consumption in Indonesia continues to increase along with the growing use of electrical appliances. According to data from the Directorate General of Electricity, Ministry of Energy and Mineral Resources (ESDM), household electricity consumption in the first semester of 2025 reached 67.14 TWh, representing an increase of 5.13% compared to the same period in 2024. Uncontrolled electricity consumption can lead to energy waste and higher household electricity bills; therefore, preventive measures through electricity usage control are required. The development of Internet of Things (IoT) technology enables electricity consumption monitoring to be carried out automatically and in real time. This study designed a web-based electricity power monitoring and tariff calculation system using an ESP32 microcontroller and a PZEM-004T sensor. The system was tested on five household appliances, namely a rice cooker, printer, Bluetooth speaker, television, and refrigerator. The test results showed that the system was able to display data in real time with a delay of less than 2 seconds, while the load ON/OFF feature operated with a response time of approximately 1–2 seconds. The estimated electricity cost for 2 hours indicated that the refrigerator had the highest cost at IDR 162.09, whereas the Canon printer had the lowest cost at IDR 4.82, with the total cost of all loads being approximately IDR 440. The proposed system can assist users in monitoring energy consumption through a website interface.

Keywords: ESP32, PZEM-004T, electrical power monitoring, web server, electricity tariff, relay.