# DESIGN AND DEVELOPMENT OF A RESIDENTIAL ELECTRICITY CONSUMPTION MONITORING DEVICE USING ESP-NOW PROTOCOL BASED ON IOT

**Jesicha Tolesa**

*Electrical Engineering Study Program, Faculty of Science and Technology*
*University of Technology Yogyakarta*
*Jl. Ringroad Utara, Jombor, Sleman, Yogyakarta*
*E-mail: jjschatolesa@gmail.com*

**ABSTRACT**

*The increasing use of electrical energy in residential areas demands an efficient and real-time energy consumption monitoring system. This study develops an Internet of Things (IoT)-based energy consumption monitoring device using the PZEM-004T sensor, ESP32 microcontroller, and ESP-NOW wireless communication protocol. The system consists of three units: two units as data transmitters (Clients) and one unit as the main receiver (Server), capable of measuring and transmitting voltage, current, power, energy, and power factor data directly to the MQTT Panel IoT application. Testing results show that the system performs with relatively high accuracy, particularly in voltage and power factor measurements, with average errors below 1% and 5%, respectively. Although higher errors were observed in current and power measurements, the system remains feasible for residential energy monitoring. This system is expected to raise public awareness of energy consumption and encourage sustainable electricity usage.*

**Keywords**: IoT, ESP32, ESP-NOW, PZEM-004T, energy monitoring, residential, MQTT