SISTEM KONTROL DAN MONITORING PENGGUNAAN LISTRIK BERBASIS *INTERNET OF THINGS* (IOT)

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ABSTRACT

The development of Internet of Things (IoT) technology has opened significant opportunities in creating systems capable of monitoring and controlling energy consumption efficiently. This research aims to develop an IoT-based electrical monitoring and control system designed to reduce excessive electricity usage through remote control mechanisms and provide real-time energy consumption information. The system employs a PZEM-004T sensor to measure electrical parameters such as voltage, current, power, energy, frequency, and power factor. The collected data is transmitted by ESP32 and Wemos D1 Mini microcontrollers to a Node-RED server via Wi-Fi communication using the MQTT protocol, and displayed in graphical and tabular form on a web-based accessible through laptops and smartphones. In addition to monitoring, the system integrates a 4-channel relay module that allows users to remotely switch electrical loads on or off. Based on the test results, the system accurately displays measurement data with an average relay response latency of 3 to 6 seconds, depending on Wi-Fi network stability. The system effectively assists users in monitoring and controlling electrical usage, thereby helping to reduce energy waste and enhance awareness of efficient electricity utilization..

Keywords : *PZEM-004T, Node-RED, IoT, Power Monitoring, Remote Control***.**