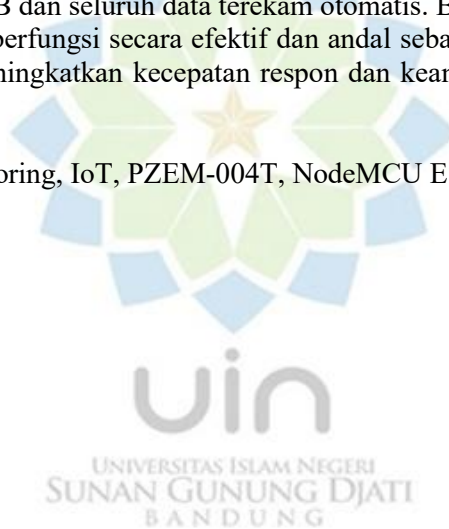


ABSTRAK

Saluran Udara Tegangan Tinggi (SUTT) 150 kV merupakan komponen penting dalam sistem transmisi listrik yang rentan terhadap gangguan sambaran petir, yang dapat menyebabkan kerusakan hingga gangguan distribusi daya. Penelitian ini bertujuan merancang sistem monitoring sambaran petir berbasis *Internet of Things* untuk mendeteksi sambaran petir dan notifikasi pesan otomatis melalui Telegram. Sistem menggunakan sensor arus PZEM-004T yang dipasang pada konduktor kaki pentanahan SUTT, dikendalikan oleh mikrokontroler NodeMCU ESP32, serta terhubung dengan Firebase dan Google Spreadsheet. Metode yang dilakukan meliputi perancangan perangkat keras dan lunak, instalasi sistem di lapangan, serta pengujian terhadap kestabilan koneksi, respon sistem, dan sinkronisasi data. Hasil pengujian menunjukkan rata-rata waktu respon pengiriman notifikasi sebesar 3,12 detik, kestabilan koneksi internet berhasil dipertahankan selama 60 menit pengujian dengan waktu rata-rata 2.38. Sistem juga berhasil mengirimkan data secara sinkron ke Telegram, Firebase, dan Spreadsheet. Kejadian sambaran petir yang nyata terdeteksi pada tanggal 2 Juli 2025 pukul 16.09 WIB serta pada 3 Agustus 2025 pukul 17.18 WIB dan 17.44 WIB dan seluruh data terekam otomatis. Berdasarkan hasil tersebut, sistem ini terbukti dapat berfungsi secara efektif dan andal sebagai alat bantu monitoring sambaran petir untuk meningkatkan kecepatan respon dan keandalan pemeliharaan pada jaringan transmisi listrik.

Kata kunci: SUTT, monitoring, IoT, PZEM-004T, NodeMCU ESP32, Telegram.



ABSTRACT

High Voltage Overhead Transmission Lines (SUTT) with a voltage level of 150 kV are critical components in the electrical power transmission system, yet they are vulnerable to lightning strikes, which can lead to equipment damage and power distribution disruptions. This study aims to design a lightning monitoring system based on the Internet of Things (IoT) to detect strikes and send real-time notifications via Telegram. The system employs a PZEM-004T current sensor installed on the grounding conductor of the SUTT tower, controlled by a NodeMCU ESP32 microcontroller, and integrated with Firebase and Google Spreadsheet. The methodology includes hardware and software design, field installation, and testing for connection stability, system response, and data synchronization. Test results show an average notification response time of 3.12 seconds, with internet connectivity maintained stably for 60 minutes and an average status response time of 2.38 seconds. The system successfully transmitted synchronized data to Telegram, Firebase, and Google Spreadsheet. Real lightning events were detected on July 2, 2025, at 16:09 WIB and on August 3, 2025, at 17:18 WIB and 17:44 WIB, with all data recorded automatically. Based on these results, the system is proven to operate effectively and reliably as a lightning monitoring tool, enhancing response speed and maintenance reliability in high-voltage transmission networks..

Keywords: High Voltage Transmission Line, lightning detection, IoT, PZEM-004T, NodeMCU ESP32, Telegram.

