ABSTRAK

Nama : Ragil Alifi Zakaria

Program Studi : Teknik Elektro

Judul : *Monitoring* dan *Data Logger pada* Pembangkit Listrik Tenaga Bayu di Lentera Bumi Nusantara

Penelitian ini merancang dan mengimplementasikan sistem monitoring dan data logger pada Pembangkit Listrik Tenaga Bayu di Lentera Bumi Nusantara menggunakan 3 unit ESP32. Sistem ini memanfaatkan protokol ESP-NOW untuk komunikasi nirkabel lokal antar *node* dan MQTT untuk pengiriman data ke *dashboard monitoring* secara *real-time,* serta penyimpanan *data logger*.

Parameter yang diukur meliputi waktu, kecepatan angin, tegangan, dan arus searah. Masing-masing *node transmitter* diletakkan secara terpisah sehingga memungkinkan penempatan sensor yang fleksibel, dengan data dikirim ke *node receiver* kemudian diteruskan ke *NodeRED*.

Hasil pengujian menunjukkan akurasi sensor yang baik. *Error* sensor PZEM-017 pada pengukuran tegangan sebesar 0,61%, arus 1,68%, dan *anemometer* 1,13%. Sistem mampu melakukan akuisisi data dengan interval 1 detik. Pengujian *Quality of Service* ESP-NOW menunjukkan performa yang baik yaitu latency rata-rata 2,3 dan 2,8 ms, jitter rata-rata 1,4 dan 2,2 ms, packet loss rata-rata 0 dan 0,2%. Sementara QoS MQTT juga berada dalam kategori baik (latency rata-rata 223,1 ms, jitter 73,2 ms, packet loss 0,5%) sesuai standar TIPHON.

Kata kunci: *Monitoring*, *Data Logger*, ESP-NOW, MQTT.

ABSTRACT

Name : Ragil Alifi Zakaria

Major : Electrical Engineering

Title : Monitoring and Data Logger at the Wind Turbine in Lentera Bumi Nusantara

This study designed and implemented a monitoring and data logging system at the Lentera Bumi Nusantara Wind Power Plant using three ESP32 units. The system utilizes the ESP-NOW protocol for local wireless communication between nodes and MQTT for real-time data transmission to the monitoring dashboard, as well as for data logging.

The measured parameters include time, wind speed, voltage, and direct current. Each transmitter node is placed separately, allowing for flexible sensor placement, with data sent to the receiver node and then forwarded to NodeRED.

Test results demonstrate good sensor accuracy. The PZEM-017 sensor *error* for voltage measurement is 0.61%, current 1.68%, and *anemometer* 1.13%. The system is capable of data acquisition at 1-second intervals. ESP-NOW Quality of Service (QoS) testing showed good performance, with average latency of 2.3 and 2.8 ms, average jitter of 1.4 and 2.2 ms, and average packet loss of 0 and 0.2%. Meanwhile, MQTT QoS also falls into the “good” category (average latency of 223.1 ms, jitter of 73.2 ms, packet loss of 0.5%) in accordance with the TIPHON standard.

Keywords: *Monitoring, data logger,* ESP-NOW, MQTT.