ABSTRACT

Wind energy is a potential renewable energy source, especially in areas with low wind speeds. However, the main problems often encountered are the instability of the wind turbine's output voltage and the low efficiency of energy utilization, which is caused by wind speed fluctuations. This study aims to measure the power generated by a low-speed wind turbine and stabilize its output voltage using an Internet of Things (IoT)-based power meter and voltage regulator system. The limitations of this study include a voltage stabilization range of 12–24V.

The methods used in this study include a power meter system to measure the wind turbine's power output in real time, and a voltage regulator to stabilize the output voltage. The entire system is controlled and monitored using IoT technology so that performance data can be monitored remotely. Tests were conducted at various wind speeds to analyze system performance under different conditions.

The implemented system successfully measured power, voltage, and current in real-time with high accuracy after calibration. The average error of the voltage sensor V1 was 0.74% and V2 was 0.28%, and the ACS712 current sensor showed good linearity. Based on the test results, starting in weak wind conditions, the power was recorded at 0 Watt, then increased gradually to reach more than 4 Watt at a speed of about 6.6 m/s. The daily power production pattern showed two peaks, namely around 1.1 Watt at 10:00 and ±1.2 Watt at 13:00, before decreasing again in the afternoon until evening.

Keywords: *Low-Speed Wind Turbine, Power meter, Voltage Regulator, Internet of Things.*