

ABSTRAK

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Judul Penelitian : Analisis Kinerja Pembangkit Listrik *Hybrid* Tenaga Surya Dan Angin Pada Kapasitas Pico

Kebutuhan akan energi listrik terus meningkat seiring perkembangan teknologi dan kehidupan modern. Sementara itu, ketersediaan sumber energi fosil semakin menipis, sehingga mendorong pemanfaatan energi terbarukan seperti tenaga surya dan angin. Penelitian ini bertujuan untuk menganalisis kinerja sistem pembangkit listrik *hybrid* skala pico yang memanfaatkan kedua sumber energi tersebut. Sistem dirancang dan diuji di lingkungan Universitas Siliwangi, Tasikmalaya. Metode yang digunakan meliputi studi literatur, perancangan sistem, pengujian unit, serta analisis data hasil pengukuran tegangan, arus, radiasi matahari, dan kecepatan angin. Hasil pengukuran menunjukkan bahwa intensitas radiasi matahari di lokasi penelitian berkisar antara 4,35–5,03 kWh/m²/hari, sedangkan kecepatan angin rata-rata 3–5,8 m/s. Sistem terdiri dari dua panel surya 360 Wp, turbin angin 8000 W, kontroler *hybrid*, dan baterai LiFePO₄ 48V 100Ah. Pengujian menunjukkan bahwa sistem dapat menghasilkan daya secara stabil. Efek bayangan pada panel surya mempengaruhi output daya secara signifikan. Sistem bekerja optimal saat kondisi cuaca mendukung. Kesimpulannya, sistem pembangkit *hybrid* skala pico ini berpotensi menjadi solusi energi alternatif yang efisien dan ramah lingkungan, terutama di wilayah dengan potensi energi surya dan angin yang cukup tinggi.

Kata Kunci : energi terbarukan, *hybrid*, tenaga surya, tenaga angin, potensi energi

ABSTRACT

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title : *Performance Analysis of Solar and Wind Hybrid Power Plants at Pico Capacity*

The need for electrical energy continues to increase along with the development of technology and modern life. Meanwhile, the availability of fossil energy sources is decreasing, thus encouraging the use of renewable energy such as solar and wind power. This study aims to analyze the performance of a pico-scale hybrid power generation system that utilizes both energy sources. The system was designed and tested in the environment of Siliwangi University, Tasikmalaya. The methods used include literature studies, system design, unit testing, and analysis of data from voltage, current, solar radiation, and wind speed measurements. The measurement results show that the intensity of solar radiation at the research location ranges from 4.35–5.03 kWh/m²/day, while the average wind speed is 3–5.8 m/s. The system consists of two 360 Wp solar panels, an 8000 W wind turbine, a hybrid controller, and a 48V 100Ah LiFePO₄ battery. Tests show that the system can generate power stably. The shadow effect on the solar panels significantly affects the power output. The system works optimally when weather conditions are favorable. In conclusion, this pico-scale hybrid power generation system has the potential to be an efficient and environmentally friendly alternative energy solution, especially in areas with high solar and wind energy potential.

Keywords: *Renewable energy, hybrid, solar power, wind power, energy potential*