

Abstrak

Iklil Mujahid Azhar ; Desain Dan Analisis Performa *Charging Station* Menggunakan *Solar Photovoltaic*

Penelitian ini bertujuan untuk menganalisis performa Pembangkit Listrik Tenaga Surya (PLTS) pada Charging Station Skala Laboratorium yang dirancang untuk mengatasi variasi intensitas sinar matahari dan kondisi iklim yang mempengaruhi efisiensi sistem. Metode penelitian mencakup pengukuran intensitas cahaya matahari, perancangan sistem panel surya, serta pengujian langsung untuk menganalisis rasio performa sistem. Hasil penelitian menunjukkan bahwa meskipun iradiasi matahari bervariasi, sistem yang dirancang mampu menyediakan daya yang cukup untuk memenuhi kebutuhan pengisian daya perangkat elektronik. Efisiensi pengisian daya bervariasi tergantung pada iradiasi dan suhu panel surya, dengan performa terbaik tercatat pada iradiasi tertinggi sebesar 7.042 W/m^2 , yang menghasilkan output daya panel sebesar 1.467 W dan energi yang masuk ke baterai sebesar 1.032 Wh . Namun, penurunan efisiensi tercatat pada suhu panel yang tinggi, yang mempengaruhi penurunan output daya. Kesimpulan penelitian ini menunjukkan bahwa desain dan kapasitas Solar Charging Station sudah optimal, namun kontrol terhadap faktor-faktor lingkungan seperti suhu panel tetap diperlukan untuk memaksimalkan efisiensi sistem. Nilai Performance Ratio (PR) sebesar 75% mengindikasikan bahwa sistem bekerja dengan efisiensi yang baik, meskipun masih ada ruang untuk optimasi lebih lanjut.

Kata Kunci: panel surya, *charging station*, iradiasi, efisiensi panel, *output* daya, rasio performa

Abstract

Iklil Mujahid Azhar; *Design and Performance Analysis of Charging Station Using Solar Photovoltaic*

This study aims to analyze the performance of Solar Power Plants (PLTS) on a Laboratory-Scale Charging Station designed to overcome variations in sunlight intensity and climate conditions that affect system efficiency. Research methods include measuring sunlight intensity, designing a solar panel system, and direct testing to analyze the system performance ratio. The results of the study indicate that although solar irradiation varies, the designed system is able to provide sufficient power to meet the charging needs of electronic devices. Charging efficiency varies depending on the irradiation and temperature of the solar panel, with the best performance recorded at the highest irradiation of 7,042 W/m², which produces a panel power output of 1,467 W and energy entering the battery of 1,032 Wh. However, a decrease in efficiency was recorded at high panel temperatures, which affected the decrease in output power. The conclusion of this study shows that the design and capacity of the Solar Charging Station are optimal, but control over environmental factors such as panel temperature is still needed to maximize system efficiency. The Performance Ratio (PR) value of 75% indicates that the system is working with good efficiency, although there is still room for further optimization.

Keywords: solar panel, charging station, irradiation, efficiency panel, output power, performance ratio

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