ANALISIS PENGARUH INTENSITAS SINAR MATAHARI DAN TEMPERATUR PERMUKAAN PANEL SURYA TERHADAP EFISIENSI PANEL SURYA *MONOCRYSTALLINE* DAN *POLYCRYSTALLINE* DI KOTA SINGARAJA

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ABSTRAK

Permasalahan ketersediaan energi dan dampak lingkungan akibat penggunaan bahan bakar fosil mendorong pengembangan energi terbarukan, salah satunya energi surya. Penelitian ini bertujuan untuk menganalisis pengaruh intensitas sinar matahari dan temperatur permukaan panel surya terhadap efisiensi panel surya tipe *monocrystalline* dan *polycrystalline* di Kota Singaraja. Penelitian dilakukan secara eksperimental di lingkungan Laboratorium Terpadu Universitas Pendidikan Ganesha, dengan sudut panel tetap sebesar 10°, serta pengumpulan data dilakukan selama tiga hari dengan total 72 data. Metode analisis menggunakan uji statistik regresi linier berganda untuk panel *monocrystalline* dan uji non-parametrik Mann-Whitney, Spearman, dan Karnel untuk panel *polycrystalline*. Hasil penelitian menunjukkan bahwa pada panel *monocrystalline*, intensitas sinar matahari dan temperatur permukaan panel tidak berpengaruh signifikan baik secara simultan ataupun parsial terhadap efisiensi (dengan catatan terdapat pelanggaran asumsi autokorelasi). Sementara itu, untuk panel *polycrystalline*, intensitas sinar matahari tidak berpengaruh signifikan, namun temperatur permukaan berpengaruh signifikan terhadap efisiensi. Rata-rata efisiensi panel *monocrystalline* sebesar 14,20%, sedangkan *polycrystalline* sebesar 11,41%.

Kata - kata kunci: intensitas sinar matahari, temperatur permukaan panel, efisiensi

ANALYSIS OF THE INFLUENCE OF SOLAR IRRADIANCE AND PANEL SURFACE TEMPERATURE ON THE EFFICIENCY OF MONOCRYSTALLINE AND POLYCRYSTALLINE SOLAR PANELS IN SINGARAJA CITY

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ABSTRACT

The issues of energy availability and environmental impacts due to fossil fuel usage have driven the development of renewable energy sources, one of which is solar energy. This study aims to analyze the influence of solar irradiance and surface temperature of solar panels on the efficiency of monocrystalline and polycrystalline solar panels in Singaraja City. The experimental research was conducted at the Integrated Laboratory of Universitas Pendidikan Ganesha, using a fixed panel tilt angle of 10°, with data collected over three days, resulting in a total of 72 data points. The analysis methods included multiple linear regression tests for the monocrystalline panels, and non-parametric tests—namely Mann-Whitney, Spearman, and Kernel—for the polycrystalline panels. The results showed that for the monocrystalline panels, neither solar irradiance nor surface temperature significantly affected efficiency, whether simultaneously or partially (noting a violation of the autocorrelation assumption). Meanwhile, for the polycrystalline panels, solar irradiance did not have a significant effect, but surface temperature significantly influenced efficiency. The average efficiency of monocrystalline panels was 14.20%, while polycrystalline panels had an average efficiency of 11.41%.

Keywords: solar irradiance, panel surface temperature, efficiency