

ABSTRAK

Analisis Pengaruh Sudut Kemiringan Panel *Monocrystalline* dan Beban Listrik Terhadap Efisiensi PLTS 400 WP *Off-Grid Parallel System*

(Ade Nadia, 2026, Laporan Skripsi, 70 Halaman, 10 Tabel, 14 Gambar)

Peningkatan kebutuhan energi listrik dan dampak lingkungan dari penggunaan bahan bakar fosil mendorong pemanfaatan energi terbarukan, salah satunya melalui pembangkit listrik tenaga Surya (PLTS). Kinerja PLTS dipengaruhi oleh berbagai faktor, terutama sudut kemiringan panel surya dan beban listrik yang digunakan. Penelitian ini bertujuan untuk menganalisis pengaruh sudut kemiringan panel *monocrystalline* dan beban listrik terhadap efisiensi PLTS 400 WP *off-grid parallel system*. Landasan teori dari penelitian ini meliputi prinsip kerja sel fotovoltaik, efisiensi panel surya, serta faktor-faktor yang memengaruhi kinerja PLTS. Penelitian menggunakan metode eksperimen dengan pengujian langsung pada sistem PLTS 400 WP. Variabel bebas berupa sudut kemiringan panel (0° , 8° , 16° , 24° dan 32°) serta beban listrik (100, 200, 300, 400 dan 500 watt), sedangkan data yang dikumpulkan meliputi tegangan, arus, daya, dan efisiensi sistem. Hasil penelitian menunjukkan bahwa peningkatan sudut kemiringan panel menyebabkan efisiensi total sistem menurun, sedangkan peningkatan beban listrik meningkatkan efisiensi total sistem. Sudut kemiringan 0° menghasilkan efisiensi sistem tertinggi pada seluruh variasi beban, sedangkan beban 500 W memberikan efisiensi tertinggi pada setiap variasi sudut kemiringan. Dengan demikian, kombinasi kondisi operasi paling optimal pada penelitian ini diperoleh pada sudut kemiringan panel 0° dengan beban listrik 500 W.

Kata kunci: *PLTS off-grid, panel surya monocrystalline, sudut kemiringan, beban listrik, efisiensi sistem.*

ABSTRAK

Analysis of the Effect of Monocrystalline Panel Tilt Angle and Electrical Load on the Efficiency of a 400 WP Off-Grid Parallel System Solar Power Plant

(Ade Nadia, 2026, Thesis, 70 Pages, 10 Tabels, 14 Images)

The increasing demand for electrical energy and the environmental impacts associated with fossil fuel consumption have encouraged the utilization of renewable energy sources, particularly through photovoltaic (PV) power generation systems. The performance of a photovoltaic (PV) system is influenced by several factors, primarily the solar panel tilt angle and the applied electrical load. This study aims to analyze the effect of monocrystalline solar panel tilt angle and electrical load variations on the efficiency of a 400 WP off-grid parallel photovoltaic system. The theoretical framework covers the operating principles of photovoltaic cells, solar panel efficiency, and factors affecting PV system performance. An experimental method was employed by conducting direct performance tests on a 400 WP photovoltaic system. The independent variables consisted of panel tilt angles of 0°, 8°, 16°, 24°, and 32°, and electrical loads of 100 W, 200 W, 300 W, 400 W, and 500 W. The measured parameters included voltage, current, output power, and overall system efficiency. The results indicate that increasing the panel tilt angle decreases the overall system efficiency, whereas increasing the electrical load improves the overall system efficiency. The highest system efficiency for all load variations was achieved at a panel tilt angle of 0°, while the highest efficiency for all tilt angle variations was obtained under a 500 W load. Therefore, the optimum operating condition of the investigated photovoltaic system was achieved at a panel tilt angle of 0° with a 500 W electrical load.

Keywords: Solar Power Plant (SPP), Monocrystalline Solar Panel, Tilt Angle, Electrical Load, Efficiency.