

***1,1 kWp Hybrid Design and Construction Solar Power Plant in Tito's Garage,  
Jember***

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***ABSTRACT***

*Indonesia has a solar energy potential of approximately 207.8 GW; however, its utilization remains relatively low compared to the available resources. At the same time, small and medium enterprises (SMEs) continue to rely heavily on electricity supplied by PLN to support their daily operations. This dependence contributes to higher operational costs and limits the adoption of environmentally friendly renewable energy sources. Tito Garage Jember, an SME engaged in vehicle maintenance and repair services, still uses PLN electricity as its primary energy source. Therefore, the implementation of a hybrid photovoltaic (PV) system can serve as an alternative solution to improve energy sustainability. This study aimed to design, install, and evaluate the performance of a 1.1 kWp hybrid photovoltaic power system at Tito Garage Jember. The research methods included literature review, field survey, system design, fabrication, installation, and performance testing. The analysis showed that the workshop's daily energy demand was 3,437.17 Wh with a total connected load of 3,228 W. The hybrid PV system was designed using two 550 Wp photovoltaic modules, a 1000 W inverter, and a 24 V 100 Ah battery integrated with the PLN grid. The installed panel tilt angle was 22°, while the calculated optimum tilt angle was 15.26°. Performance testing indicated that the PV input power ranged from 643 W to 1,864 W with an average value of 1,253 W, whereas the output power ranged from 203 W to 452 W with an average value of 327 W. The solar panel efficiency varied between 2.81% and 6.81%, with an average efficiency of 4.82%. The developed hybrid PV system was able to supply a portion of the workshop's electricity demand and has the potential to reduce dependence on PLN electricity while promoting renewable energy utilization in the SME sector.*

***Keywords:*** hybrid PLTS, installation, photovoltaic modules, solar energy, SMEs