

Implementation of Hybrid Solar Power Plants for Electrical Energy Needs in Public Street Lighting at Miftahul Hasan Pakusari Islamic Boarding School, Jember

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ABSTRACT

This implementation research aims to implement a Hybrid Solar Power Plant (PLTS) system as a source of electrical energy for public street lighting (PJU) at Miftahul Hasan Islamic Boarding School and analyze the obstacles during the implementation process. The research methods used include literature studies, site surveys, system design, procurement of tools and materials, installation, and testing and evaluation of system performance. The implemented hybrid PLTS system consists of a 550 Wp solar panel, a 500 W inverter, a 60 A solar charge controller, a 120 Ah lithium battery, a timer, and an Automatic Transfer Switch (ATS). The load used is five 15 W LED lamps with a total power of 75 W and the total daily energy requirement after adding a tolerance factor is 1035 Wh. Based on the results of the performance analysis on March 29, 2026 at 09.00 WIB, the solar panel produced 59.06 W of power (voltage 13.80 V and current 4.28 A) with an estimated battery charging time of 5 hours. The implementation results show that the power capacity of the hybrid solar PV system is very adequate to meet the operational needs of all lighting loads continuously while providing a power backup. The implementation of an automatic control system using a timer and ATS has proven effective in increasing operational efficiency without manual intervention. Technical obstacles encountered include roof leaks during the installation of the mounting structure and the limited structural strength of the panel box supports in supporting the battery load, which were successfully overcome through the use of flashband and sealant and repositioning the battery to the top of the outside of the panel box.

Keywords: Automatic Control System, Hybrid Solar Power Plant, Implementation, Public Street Lighting.