DESIGN AND DEVELOPMENT OF A SOLAR POWER PLANT USING A DUAL-AXIS SOLAR TRACKER TO SUPPORT WATER QUALITY AND AUTOMATIC FEEDING SYSTEMS IN NILE TILAPIA HATCHERY PONDS

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ABSTRACT

With the increasing population and technological advancements, global energy demand continues to rise. Fossil fuels have been the primary energy source; however, their usage leads to negative environmental impacts such as air pollution and greenhouse gas emissions. To address these issues, Solar Power Plants (PLTS) offer a highly promising solution, as they utilize renewable solar energy and convert it into electricity. This study focuses on the development of a PLTS prototype equipped with a solar tracking system to supply power to a monitoring system for water quality and an automatic feeding system in Nile tilapia hatchery ponds. Based on calculations and testing, the total energy demand for the system is 70.77 Wh, and with an additional 20% reserve to account for weather variability, the required energy increases to 84.92 Wh. Test results indicate that the dual-axis solar tracker operates with 100% accuracy. The system is also equipped with voltage, current, and power monitoring features. Measurements show that a 50 Wp solar panel equipped with a dual-axis tracker can produce 207.55 Wh of energy between 08:00 and 15:00 Western Indonesian Time (WIB). These results confirm that the PLTS system with a dual-axis solar tracker effectively meets the power requirements for monitoring water quality and operating the automatic feeding system in Nile tilapia hatchery ponds.

Keywords: *Renewable Energy, PLTS, Solar Tracker, Monitoring.*