ANALYSIS OF THE EFFECT OF MIRROR REFLECTORS ON POWER OUTPUT OPTIMIZATION IN FLOATING SOLAR POWER PLANTS

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Abstract

Floating Solar Power Plants (FSPP) are a potential renewable energy solution, but their power output is highly influenced by fluctuating solar intensity. This research aims to analyze the optimization of power output in a floating solar power plant with the addition of mirror reflectors. The research method used is experimental, comparing the performance of series-connected solar panels, both without reflectors and with the addition of reflectors at various angles of 30°, 45°, and 60°. Data was collected over four days from 09:00 to 15:00 WIB, including measurements of light intensity, current, and voltage. The results show that the use of mirror reflectors significantly increases power output. The 60° reflector angle yielded the most optimal performance, with the highest light intensity reaching 1210 W/m², a current of 3.90 A, a voltage of 14.22 V, and an input power (Pin) of 349.20 Watts. Although the highest peak output power (Pout) was recorded at the 45° angle (51.76 Watts), the highest average Pout (29.76 Watts) and the highest peak efficiency (23.39%) were achieved with the 60° angle. It is concluded that the addition of a mirror reflector at a 60° angle is the most effective method for optimizing power harvesting in floating solar power plants.

Keywords: Floating Solar Power Plant, Mirror Reflector, Power Optimization, solar panels, Energy Efficiency.

INTRODUCTION

Renewable energy is an energy source that comes from sustainable natural processes and can be renewed continuously, including solar, wind, and water energy. The use of renewable energy is becoming increasingly important in the global context to reduce dependence on fossil energy and overcome climate change(Nadandi et al., 2021). Indonesia, as a country located around the equator with a tropical climate, has a very abundant solar energy potential and great opportunities for its development. With optimal management, these resources can make a significant contribution to the national energy mix, where the potential for daily electrical energy from the sun is estimated to reach 4.8 kWh/m² (Nadhiroh et al., 2022).

In response to this potential, many researchers are competing to develop photovoltaic (PV) technology. The energy derived from solar radiation is photon energy that is directly converted into electricity through solar panels composed of solar cells. This technology generates direct current (DC) electricity which can then be converted into alternating current (AC) with the help of an inverter to meet conventional electricity needs (Nadhiroh et al., 2022).