

ABSTRACT

Solar Power Plants (PLTS) are an effective renewable energy solution, particularly for remote areas. However, security aspects are often overlooked, despite the fact that disturbances from humans or animals can significantly reduce performance and cause losses. This study designs a 5 MW PLTS in Namlea, Maluku, integrated with a perimeter security system based on intrusion detection. The planning process was conducted using PV Syst simulation software, resulting in an optimal design with 10,092 Longi 500 Wp panels, two SG2500-HV-20 inverters, and an estimated annual energy production of 8,310,685 kWh with a performance ratio (PR) of 76.71%. The security system includes PIR sensors, cameras, and YOLO–OpenCV algorithms, tested in eight scenarios (day and night), achieving 91.25% detection accuracy and 93.25% component effectiveness. The system also features an alarm and real-time notification via Telegram. The results indicate that technical planning and perimeter security can be effectively integrated to enhance protection and operational reliability of PLTS.

Keyword: *5 MW Solar Power Plant, PV Syst Simulation, Perimeter Security System, Automated Video Surveillance, Solar Plant Protection*