

**Techno-Economic Analysis of an Off-Grid Solar Photovoltaic Cemetery
Lighting System with Automatic Control in Sadengan Village, Jember**
Supervisor : Yuli Hananto, S.TP., M.Si.

Much. Faris Hidayatullah
Renewable Energy Engineering Study Program
Department of Engineering

ABSTRACT

This study aims to analyze the technical and economic feasibility of an off-grid Solar Power Plant (PV) based cemetery lighting system with automatic control in Sadengan Village, Jember Regency. The research was motivated by the limited lighting facilities in the cemetery area and the high potential of solar energy as an independent renewable energy source. A descriptive quantitative method was employed through field observations, interviews, literature review, and technical and economic analyses. The technical analysis evaluated the energy demand, PV system components, and automatic control performance, while the economic feasibility was assessed using Cash Flow, Net Present Value (NPV), Internal Rate of Return (IRR), Benefit Cost Ratio (BCR), and Payback Period (PBP). The results indicate that the lighting demand of 300 Wh/day can be supplied by an off-grid PV system using a 30 W LED lamp operating for 10 hours per day. Economically, the initial investment of IDR 2,913,050 provides a net saving of approximately IDR 9,740 per month or IDR 2,337,720 over a 20-year project lifetime. However, the feasibility analysis yielded an NPV of –IDR 1,567,761, an IRR of 4.01%, a BCR of 0.80, and a payback period of approximately 25 years, indicating that the project is not financially feasible under the assumptions applied. Nevertheless, the off-grid PV system offers environmental benefits, energy independence, and improved safety and convenience for the surrounding community.

Keywords: off-grid photovoltaic system, techno-economic analysis, cemetery lighting, solar energy, investment feasibility.