

ABSTRACT

The electricity demand at train stations is significant to support operations such as lighting, passenger information systems, ticketing, and other supporting facilities. Currently, the majority of electricity is still supplied by PLN, which is dominated by fossil-fueled power plants, resulting in carbon emissions. To support the energy transition towards the 2060 Net Zero Emission target, utilizing renewable energy is a strategic solution, one of which is through on-grid solar power plants (PLTS).

This study aims to determine the optimal size of an on-grid PLTS system that can be implemented at Padalarang Station, taking into account electricity load data, solar radiation potential, and energy regulations in Indonesia. Simulations were conducted using MATLAB software to assess sensitivity to PV price fluctuations, to simulate the optimal PV system size at Padalarang Station, and to calculate annual energy production. Additionally, parameters analyzed included Net Present Value (NPV), Return on Investment (ROI), and Payback Period (PP).

The results of this Final Project research indicate that the optimal capacity of the PV system is 25 kWp with the use of a 25 kW inverter at a system price of Rp12,500,000/kWp. This system produces a positive NPV of Rp. 378,029,480, ROI of 117.76%, and a Payback Period of 24 years, which is still within the 25-year project operation period. Thus, the implementation of on-grid PLTS at Padalarang Station is technically and economically feasible, and is able to support the reduction of carbon emissions while reducing the station's electricity costs.

Keywords: Photovoltaic (PV) system size, On-grid, Railway Station, Net Present Value (NPV), Renewable Energy