

Investigation of Potential of Solar Photovoltaic System as an Alternative Electric Supply on the Tropical Island of Mantanani Sabah Malaysia

ABSTRACT

This article reports on the potential use of a photovoltaic solar system on Mantanani Island. This island has its attractions in terms of flora and fauna as well as the uniqueness of its local community. The electricity supply status of the island is minimal, and the local electricity provider only provides two units of electrical generator that only supply energy from 18:00 to 06:00. This study is motivated by the hypothesis that if the target resident can obtain a better electricity supply, they can generate higher income and improve their standard of living. This study aims to identify the status of solar energy sources, estimate the basic electrical load, and conduct a techno-economic analysis of homestay enterprises of residents. Geostationary satellite data on solar energy resources were gathered and analyzed using Solargis. The electricity load was calculated based on the daily routine activities of the residents and usage of primary electrical appliances. Techno-economic analysis was done by determining the key parameters to calculate the return on investment and payback period. The results showed that Mantanani Island had great potential for implementing a photovoltaic system, by the estimated value of the total annual solar energy and peak sun hour of 1.447 MWh/m²/y and 4.05 h, respectively. The variation in total monthly solar energy was minimal, with a range of only 61.3 Wh/m². The calculated electrical load was 7.454 kWh/d. The technoeconomic assessment showed that the return on investment was MYR 3600 per year. However, the value of the payback period varies according to the value of the cost of capital spent. Regarding the cost of capital of this study, the shortest and longest payback periods achievable were 2.78 and 13.89 years, respectively. This calculation is in line with a photovoltaic system with a capacity of 2.2 kWp.