Junior Science Communications
Faculty of Applied Sciences, UiTM Shah Alam
https://journal.uitm.edu.my/ojs/index.php/JSC

E-ISSN 2637-0689
Vol 31 2024

Colloquium on Applied Sciences-CAS 2023
17-18 July 2023, Faculty of Applied Sciences, UiTM Shah Alam, Malaysia

Sizing and Design Performance Evaluation for Standard Housing of Grid-Connected Photovoltaic Systems in Malaysia

Nur Farah Najwa Kahiruddin[a], Nurmalessa Muhammad[ab*]

Structured Abstract

Background: The objective of this research is to assess the effectiveness of a solar energy system designed for residential buildings, employing photovoltaic technology. Implementing such a system can lead to decreased electricity usage, resulting in cost savings and reduced investment. This study primarily aims to develop an efficient solar photovoltaic setup capable of fulfilling the entire energy requirement of a proposed residential structure without relying on traditional energy sources. The presence of a well-suited photovoltaic system can contribute to lower electricity bills for the user and a reduction in overall household energy consumption.

Methods: The methodology involved in this study was performed the analysis and data collection of the electrical energy used in the house. The mathematical method used in sizing and designing solar lighting systems. For this study, the location of the experiment conducted is located at Perumahan Felda Lepar Utara 2 in Bandar Pusat Jengka, Pahang. The project is to install a suitable solar PV system for a house at a selected location.

Results: For this study, PVsyst software has been used to compare the calculation result with the mathematical design mode. The study outlines the expenses associated with deploying a comprehensive GCPV system for a standard residence, considering a budget allocation of RM10,000 that includes annual maintenance operating costs. The simulation results indicate that the return on investment (ROI) is projected to be realized after 10.5 years post-installation and stands at 89.8%. With consideration of Malaysia's latest feed-in-tariff, the study employed a feed-in-tariff rate of 0.3947 due to the energy capacity falling below 4 kW.

Conclusion: The sizing of the selected GCPV system design has been done throughout this study. The quantity that will be used for the PV module is 6 and 1 inverter in the calculation for the mathematical design model. This calculation gives the same result as the calculation in PVsyst software. Thus, it proves that the mathematical calculation design was done correctly.

Keywords: Grid-connected, Photovoltaic (PV) system, PVsyst software, energy consumption

*Correspondence: nurmalessa@uitm.edu.my

[a]School of Physics and Materials, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia

[b]Solar Photovoltaic Energy Conversion Technology Research Applications (SPECTRA), Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia