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Research paper

Low Cost Solar Powered Telecenters for Malaysian Rural Areas: Case Study in Pos Sinderut, Pahang, Malaysia

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Abstract

The main objective of this project is to design and analyze the cost benefits solar PV system for rural telecenter. The project focused on designing the main solar system and solar panel energy performance based on translucency. The task that was carried out in this project was the selection of the suitable system that will suit the operation well while keeping the design cost as low as possible. In this project, the design of the solar panel system was focused on the electric loads and its cost benefit. Homer software was used to evaluate the solar panel system. Meant for ways of communications for indigenous people, the Solar Photovoltaic system is one of the popular solution for off-grid rural community power supply. The optimized combination for a particular rural site can be predicted based on NASA's data of Solar Global Horizontal Irradiance (GHI). In this project, Pos Sinderut was chosen as the site, and the data load was measured. In our preliminary findings, it was found that the model on site was not suitably designed and maintained. The data parameters that was used for the on-site installed model was also not possible to be calculated when the model was simulated using Homer Software. As a result, we proposed a new model design by optimizing the load of VSAT and charging station based on the amount of solar PV and batteries that was supplied. This paper shows the significance of preliminary designs based on the irradiance and the usage load of the specific site before any installation should be commenced. It also showed how the site should be maintained properly in order to ensure a chosen site is sustainable for the rural community, post-installation.

Keywords: *Solar Panel System, rural areas, Homer Software, cost benefits, PV system, energy performance.*

1. Introduction

Due to the growing demand for energy with a cost-effective method with respect to the environmental issues and social priorities, there is a need for a sustainable energy system. Such system provides the possibility to move toward sustainable development and getting all people of the world to effective, accessible, clean and safe energy. Today, about 1.3 billion people (mainly in developing countries and rural areas) do not have access to electrical energy [1].

Electrification is one of the infrastructures required by the people in the world for the benefits of education, health, industries, employment, transportation and others. However, it is estimated that 85 percent of the 1.2 billion people in the world living without access to electricity reside in rural areas, which is attributable to the marginalization of the poor as well as their long distance from established electrical grids.

In Malaysia, 809 out of more than 10,000 schools lack 24hrs electricity. Most of these school are located in Sabah and Sarawak [2]. The important components of rural electrification in Malaysia are renewable energy (RE) based power generation, optimization, hybrid power, system integration, and monitoring solar irradiance in Malaysia is 1,643 kWh/m^2. Thus, this country is among the leading users of solar PV in the world [3].

Sabah and Sarawak encounter high volumes of rainfall that average 3,540 mm/year. This large amount of water can be a source of hydro power [4]. Moreover, the northern wind in the area reaches roughly 15 m/s. International interest has increased with respect to rural electrification by hybrid renewable systems, including large-scale PV, wind, and hydro. The combination of PV, wind, hydro and biomass energy may enhance rural electrification significantly while reducing environmental pollution [5]. Thus, the application of hybrid power generation is promising especially in rural areas, where transport and communication are difficult [6].

1.1 Homer software

Homer software simulates the behavior of energy-power delivering systems and their cost during the life cycle. In simulation, Homer software describes technical specifications and cost during the life cycle of renewable sources system for hourly data per year. The next step is the calculation of the system configuration and the strategy for operation of the power delivery parts. The software is to inspect how these parts work for the calculated year. This is the amount of money spent for a system and the costs of services over its life cycle. When the system is modelled, and each component is being set, the calculation can be conducted. The software calculates the options that the users have, which were being set by deciding the search space and choose the best option of sizing of all the components that is in the system.