FEASIBILITY STUDY OF SOLAR PV INSTALLATION IN UiTM SARAWAK

RESEARCH MANAGEMENT INSTITUTE (RMI)
UNIVERSITI TEKNOLOGI MARA SARAWAK
94300 KOTA SAMARAHAN, SARAWAK
MALAYSIA

BY:

NUR FARAHIAH BINTI IBRAHIM
ZAHARI BIN ABU BAKAR
WAN SUHAIFIZA BINTI W. IBRAHIM

OCTOBER 2016

5.0 CONTENTS

6.1 PROPOSED EXECUTIVE SUMMARY

Solar power generation has always been considered as a sensible approach to sustainable green energy, further fortified by Malaysia's high solar insolation. Malaysia's 10th Entry Point Project under the Economic Transformation Plan has put an emphasis on renewable solar energy. Under this initiative, renewable energy is to generate 985 MW or 5.5% of total energy production by 2015 with solar photovoltaic (PV) to contribute at least 65 MW to the total country's energy generation. 2013 Sustainable Energy Development Authority (SEDA) annual report shows that approved installation of solar PV plant in Malaysia amounted to 209 MW for the year 2013, a significant 39% of total proposed renewable energy (RE) produced in Malaysia with 5% production by individual small-scale solar PV [1].

The purpose of this research is to determine the feasibility of solar PV lighting installation in Universiti Teknologi MARA (UiTM) Sarawak. Factors to be considered are the initial deployment cost, operation cost and payback period. These installations will be used at various strategic locations for example open pathway, car parks, open longue and student's walkway. An energy efficient lighting system would have to be selected, taking into consideration the colour rendering index (CRI), life-expectancy, energy usage, effective light distribution and cost. The solar PV installation is then to be designed and effectively sized to avoid an over-sized and costly setup [2]. This research can be divided into two main tasks; collection of data (on-site insolation, peak sun hour (PSH), daily solar energy generation) and analysis of said data (lighting and energy requirement, solar PV performance, cost). With the research, it is expected that the feasibility of such implementation could be concluded.

6.2 ENHANCED EXECUTIVE SUMMARY

Solar power generation has always been considered as a sensible approach to sustainable green energy, further fortified by Malaysia's high solar insolation. The latest SEDA statistic shows that commissioned RE under the FiT agreement totals 398 MW with 69.5% or 276.5 MW is sourced from solar PV. In the year 2016 alone, a total of 84.43 MW of new installation was approved by SEDA. Initial on-site solar insolation and PSH is measured for the research period of nine months from September 2015 to May 2016. There were two studies conducted in this research. Initial analysis of the collected data is used to determine the financial calculation for a SEDA FiT contract for a small scale solar installation. A second study was to determine the feasibility and the sizing of an off-grid solar street lighting installation at UiTM Sarawak. Data collected from the research is critical in determining the outcomes of these studies as outlined in section 6.6.1 and 6.6.2 of this report. It is found that off-grid solar street lighting is only financially viable for new installation where wiring and grid connectivity would be costly. On the other hand, FiT contract agreement shows a promising financial return to UiTM Sarawak (Refer Table 5, Section 6.6.3) with the abundant building rooftop and vast open field. It is recommended that a small scale solar PV (4-24 kW) to be implemented in UiTM Sarawak with FiT agreement. Calculation proves that with a FiT contract, such an installation has an ROI of less than four years and an average nett profit of 26.8% over deployment cost per year.

6.3 INTRODUCTION

Malaysia is gearing towards renewable energy source and is blessed with an excellent geographical location, providing abundant solar energy. Improvement in solar panel efficiency and reduction in panel cost has made solar energy a very viable option for RE and is being adopted in utility-scale installation around the world with one of the lowest levelized cost of electricity index. Malaysian government is committed in the development of renewable energy especially on solar photovoltaic (PV) and has encouraged the installation of solar PY system by introducing the Feed-in Tariff (FiT) in 2011.

Energy generated in PV system depends mainly on solar energy available at selected site. Geographical location, ambient temperature, clearness index, tilt angle and orientation of PV panel are the main factors that affect PV generation. Among other alternatives energy available, PV system is the most promising renewable energy in Malaysia, since the system is clean, environment friendly, and this country is blessed with high intensity solar energy. However, solar is grossly underutilized, despite Malaysia is endowed with solar energy. There are several states in Malaysia which is still not fully electrified, especially in rural states of Sarawak and Sabah (66.91% and 67.05%). However, solar energy is unpredictable, as solar radiation is varies and frequently changes, depend on weather and climate changes. Due to that, energy generated usually does not match with load demand. Hence, battery is needed as backup power supply. Before installation, it is important to ensure that the system will not be oversized or undersized; hence designers have to make some pre-feasibility study on the system.

In order to efficiently and economically utilize the solar energy, system sizing and economic analysis is necessary. Electricity consumption is very important in system sizing, as well as economic analysis, since overproduction can worsen economical results. Large self-consumption is desirable, to obtain lowest investment with full use of PV array and/or battery bank.