

# PERFORMANCE ANALYSIS OF 4kW SOLAR PV FiT SYSTEM AT PERLIS

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## ABSTRACT

*Fit in Tariff (FiT) system provide everyone the chance to produce their own renewable energy (RE), make profit and help to conserve the environment. FiT system using solar energy as the source of renewable energy. Since the solar irradiance are fluctuate depending on the sunshine, the FiT system should be analysis in order to get earlier return of investment. This project shows the analysis of the performance 4kW solar PV FiT system at Perlis. The annual and monthly yields gathered are based on the year of 2015 and 2016. Every year, the performance of the solar PV system is different due to the temperature, irradiance, shading and soiling at the installed location. The data was taken on installed inverter, which is already stored for 2 years data. The analysing by using the equipment such as Solar Path Finder and infrared thermometer. The reading for irradiance also needs to be gathered to ensure the problem are analyse. Based on the annual yield gathered, in the year 2016 decrease a bit compare with the year of 2015. The result also shown in the month of May, Jun and July, the shading at the installed location are higher compare with other month. Overall result can be concludes that FiT system in Perlis are good for apply.*

Keywords: PV FiT System, Renewable Energy, Solar PV

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## 1.0 INTRODUCTION

In this era, the energy consumption is increasing in time. The pattern will keep increasing if there is no action being done. The renewable energy sector less contribute in the energy consumption. When the energy consumption is increasing, the oil production is keep decreasing. The alternative way to produce the energy is by using the renewable energy. In Malaysia, the total electricity generation is at 137,909 GWh. Malaysia consumes between 4,000 to 5,000 Wh per sq.m per day (C. T. Boon Sung, 2015). Because of this, Malaysia has introduces several renewable energy program. One of them are Small Renewable Energy Power (SREP) programme. This program encourages a production of renewable energy by small power generators (10MW) and allow the generating electricity to utilities to be sold. Research and Development that related to solar has been done since the 6<sup>th</sup> Malaysia plan (Muhammad-Sukki, F., Ramirez-Iniguez, R., Abu-Bakar, S. H., Mcmeekin, S. G., Stewart, B. G., & Chilukuri, M. V., 2011). Approximate around RM 157 million ringgit had been given to research about green technology including solar energy. A new law which is Renewable Energy Law has been introduced under the 10<sup>th</sup> Malaysia Plan. This law included also the Feed-In Tariff (FiT). This law targets at domestic users that can generate electricity. Under the FiT scheme, when the owner generated electricity, the owner will get paid to the amount of the generated electricity. The generation and the import meter is required under this scheme. The electricity that has been generated will be transfer to the national grid. Under this scheme, the owner consumer will finance themselves.

## 2.0 FACTORS EFFECTING PERFORMANCE PV FiT SYSTEM

With every power generated by using the renewable energy, there are factors that can affect the performance of the generation. There will always be an obstacle when wanted to use the solar power effectively. The components that can turn affected by

climate factor and associated losses can be the reason of affecting the performance of PV system. Before installed the PV system at the location, the planner must have an idea which location is suitable to installed the PV system. If the designated location is not suitable for the PV system, the performance can be affected. There are few factors have taken into account that can affect the performance of PV system. That's included of temperature of PV panel, irradiance, shading and soiling (B.Mondoc & F.Pop, 2010)

### 3.0 METHODOLOGY

The data for the monthly and annually yield can be gathered using the Sunny Explorer software. This software is used because it can be connected with the inverter by using Bluetooth. The data gathered must be analyses. The causes for the power to be different need to identified. The shading is one of the factors that can affect the performance. Therefore, the shading need to measured by using Solar Path Finder. When the PV panel is being covered by the shade, the electricity produce will be lower. Thus, making the performance lower. By using the Solar Path Finder, the shaded region around the installed PV system can be identified. The result will show which specific time and month of that place will be covered by shade. The device will be located at the places or near the installed PV system. The result will shows the percentage for potential available radiation of the sun at that specific place. The temperature at the solar PV can also affect the performance of the system. Therefore, an equipment must be used to detect the temperature at the solar PV. The equipment that will be used are the infrared thermometer. The equipment will shots an infrared to the solar PV and get the temperature of the panel. To make the value more accurately, shoots the infrared at various PV panel and calculate the average value.

### 4.0 RESULT

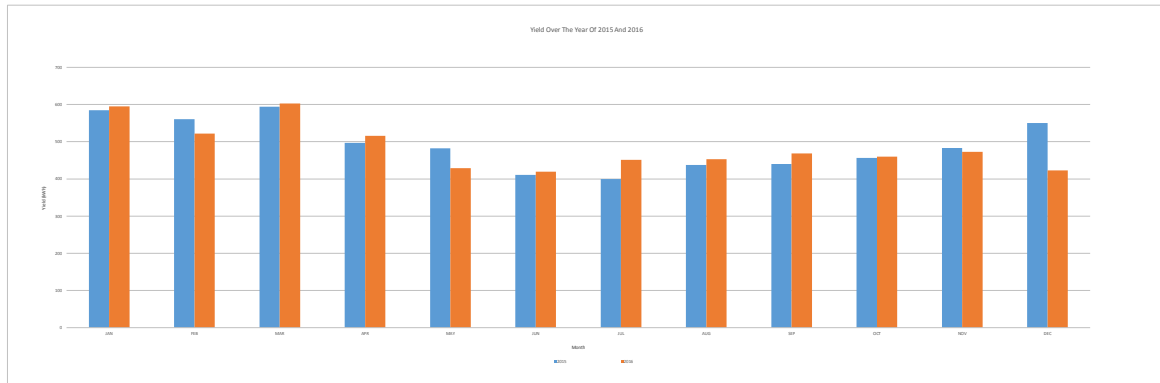


Figure 4.1 : Yield Over The Year Of 2015 And 2016

The data gathered for the PV system are based in the year of 2015 and 2016. Figure 4.1 shows the data gathered for the selected 4kW FiT PV system at Perlis. From Figure 4.1, the highest value for the both in 2015 and 2016 are in the month of March which the value are 594.55 kWh and 602.81 kWh respectively. This shows that, in the month of March produces more energy than other month. The lowest value for 2015 are in the month of July which the value are 399.74 kWh and for 2016 are in the month of June which the value are 419.71 kWh. The average month yield for both 2015 and 2016 are 491.43 kWh and 484.48 kWh respectively. The equipment Solar Path Finder shows the shading of the surroundings at the installed locations. The Figure 4.2 show the shading percentage for whole a years by using solar path finder. Result shows for each month in a year how many percentage does the solar PV system will get the potential energy from the sun

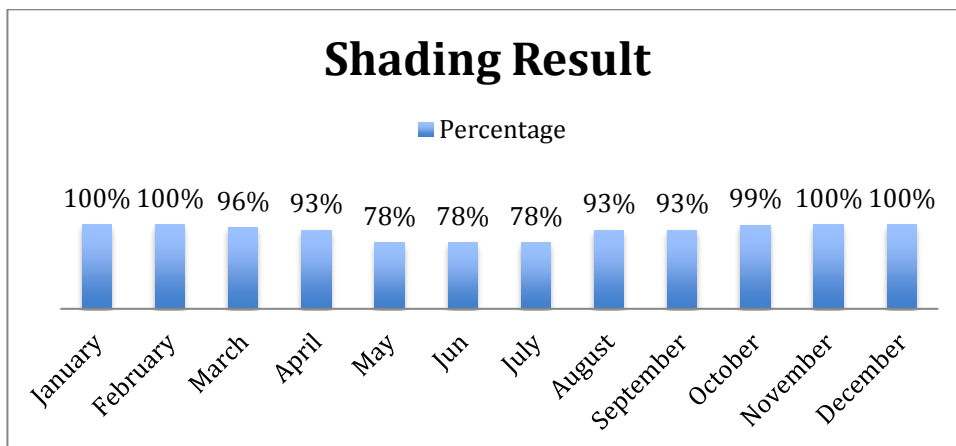


Figure 4.2 : Shading result from path finder

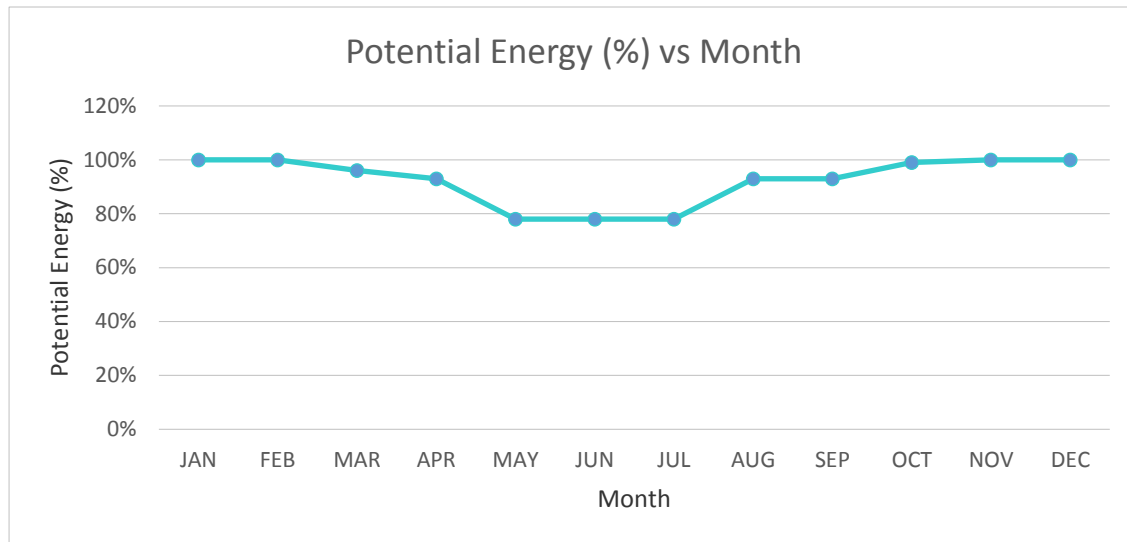


Figure 4.3 : Potential Energy vs Month

Based on Figure 4.3, there are a linear line which shows a constant value for potential energy in percentage that can be gathered in the month of May, June, and July at 78%. On this three month also shows the lowest percentage for the potential energy that can be harvest. For the upcoming year of 2017, the predicted energy yield that based on Solar Path Finder can be measured. By using the average monthly yield of the previous year, the predicted energy can be measured. Table 4.3 shows the predicted energy yield in the year of 2017.

## CONCLUSION

By referring to the findings, it show that FiT system at Perlis are good to installed since the average irradiance is high and the availability of sun is more than 3.5 hours. But some of the strategies can be suggested to make the PV system work effectively. Firstly, it is important to start with no cost or low cost technique. Thus, these PV system able to work perfect since the FiT system are to be work for 21 years. If the PV work perfect in Perlis it able to prefer the fastest return of investment for user.

## ACKNOWLEDGMENT

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