

Analysis of Photovoltaic Cells Performance at University of Bangka Belitung

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Abstract Photovoltaic as a renewable source of electrical energy is utilized at University of Bangka Belitung (UBB) as a source of additional electrical energy. With a capacity of 280 Wp per unit, the photovoltaic performance needs to be maintained so that their performance is getting better. After cleaning with cleaning fluid, the photovoltaic voltage output has increased from 13.7 - 16.8 volt to 17.4 - 22.6 volt. After cleaning the photovoltaic, the current output also increased from 0.33 - 1.8 A to 1.5 - 7.6 A. The real power generated also increased from 4.5 - 29.7 Watt to 26 - 164 Watt.

Keywords: photovoltaic, voltage, current, real power

1. Introduction

University of Bangka Belitung is currently supplied by electricity sourced from PLN with a total power supply of 690 kVA [1]. The availability of electrical energy is to supply all existing facilities and infrastructure at Universitas Bangka Belitung. In the framework of developing green energy at Universitas Bangka Belitung, photovoltaics are also available as a backup electricity supply. The number of photovoltaics currently available is 680 units, with each panel powering 280 Wp, as can be seen in figure 1.

Several buildings, campuses, and public facilities that have used photovoltaics or as a source of electrical energy include Kayubihi, Bangli [2], Department of Electrical Engineering, Universitas Brawijaya [3], one of the villages in Banjarnegara district [4]



Figure 1. Photovoltaic at Universitas Bangka Belitung

However, the existence of photovoltaics needs attention for treatment. Because over time, various solid materials that stick to the surface of the photovoltaic can cause the performance of the solar panel to decrease, so various methods are applied so that the performance of the photovoltaic can increase with good efficiency [5] - [11].

In this study, a comparison of photovoltaics' performance will be carried out before and after cleaning with cleaning fluid. Several parameters will be used as an indicator of the performance of the photovoltaics, where 1 (one) unit has a capacity of 280 Wp. This will be a recommendation to improve the performance of 680 photovoltaic units at Bangka Belitung University as a source of backup electrical energy and support the use of new and renewable energy to reduce carbon emissions.

2. Materials and Methods

1. The parameters measured are voltage, current, and output power on the solar panel using an energy meter as a measuring tool and using a battery as a load to be able to measure the output current of the photovoltaic as in figure 2.
2. To measure the value of solar radiation using a solar power meter is carried out at the same time.
3. Measurements were taken by taking data every 30 minutes on the photovoltaics, before and after cleaning, as seen in figure 3.



Figure 2. Measurement of voltage, current, and real power



Figure 3. Measurements of photovoltaic before and after cleaning

3. Results and Discussions

In table 1 shows measurements of solar radiation in the Bangka Belitung University environment, which are measured directly from 06.30 A.M to 06.00 P.M.

Table 1. Solar Irradiance at Universitas Bangka Belitung

Time (A.M/P.M)	Solar Irradiance (W/m ²)
6:30	176.8
7:00	180.1
7:30	181.2
8:00	197.5
8:30	244.6
9:00	339.4
9:30	370.4
10:00	410
10:30	653.7
11:00	970.3
11:30	1093
12:00	1131
01:30	1207
01:00	1231
01:30	1284
02:00	967.7
02:30	773.6
03:00	657.8
03:30	538.4
04:00	324.9
04:30	267
05:00	179.5
05:30	144.9
06:00	140.4

In figure 4 is the output measurement data from the photovoltaic before and after cleaning. In the conditions, before it was cleaned, the voltage output from the photovoltaic was around 13.7 - 16.8 volts. While in the cleaned condition, the output voltage of the photovoltaic is at 17.4 - 22.6 volts. While on the photovoltaic nameplate, the maximum output voltage is 36.1 volts.

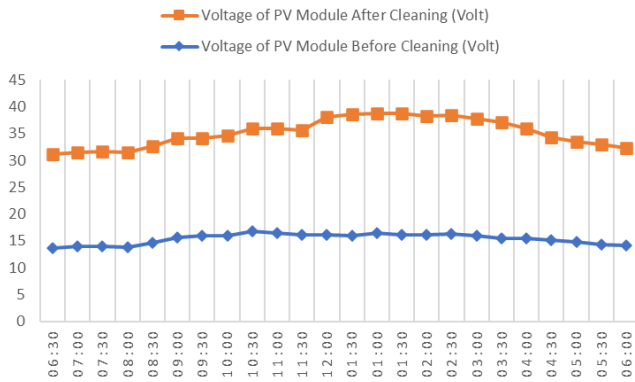


Figure 4. The voltage output of photovoltaic

Figure 5 is the current output measurement data from the photovoltaic before and after cleaning. The current output from photovoltaic ranges from 0.33 - 1.8 A in the condition before it is cleaned. Whereas in the cleaned conditions, the current output of photovoltaic is at 1.5 - 7.6 A. While on the photovoltaic nameplate, the output current maximum is 7.76 A

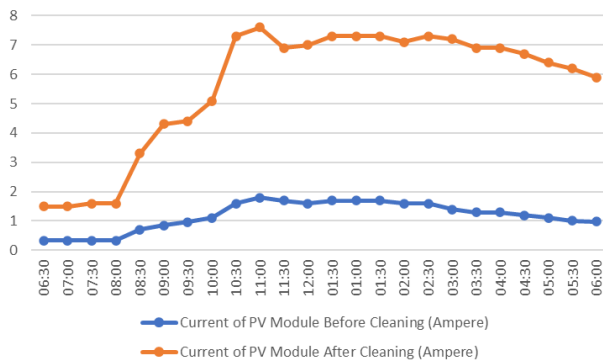


Figure 5. Current output from photovoltaic

Meanwhile, figure 6 shows the real power measurement data from photovoltaic before and after cleaning. In the pre-cleaning condition, real power from the photovoltaic is around 4.5 - 29.7 Watt. Meanwhile, in the cleaned condition, real power from photovoltaic is at 26 - 164 Watt. While on the nameplate, the maximum power of photovoltaic is 280 W.

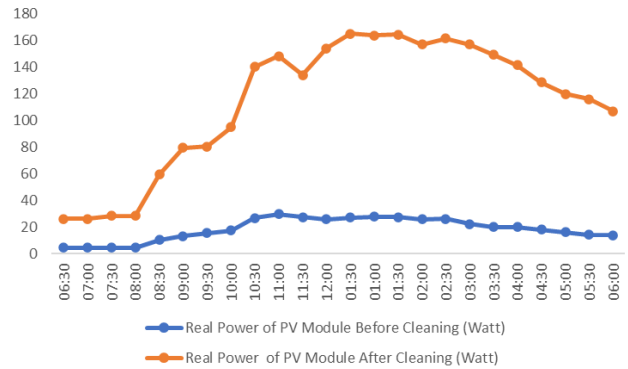


Figure 6. Real power from photovoltaic

4. Conclusion

After cleaning with cleaning fluid, the performance of the solar panels has increased the voltage output from 13.7 - 16.8 volts to 17.4 - 22.6 volts. For the current output from 0.33 - 1.8 A before cleaning to 1.5 - 7.6 A. The power generated from the solar panels has also increased from 4.5 - 29.7 Watt to 26 - 164 Watt.

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