PERFORMANCE VALIDATION OF PV VOLTAIC SYSTEM USING PVSYST

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ABSTRACT: As the electrical energy consumption goes on increasing, there will be a continuous demand to increase the power generation from the renewable resources. Among different forms of renewable energy, the solar photovoltaic systems are growing at a faster rate in the recent years. The performance of the PV system depends upon various parameters such as solar irradiance, temperature, etc. In this paper the performance of a PV Voltaic system is obtained using PVsyst software. A solar panel of 375 watts is taken as an example, and the characteristic of a PV Module is simulated with varying incident radiation, shunt resistance, series resistance and temperature. The results are compared with the observations made by conducting an experiment on the same panel. The comparison validates the suitability of the PVsyst software for performance evaluation.

Key Words: Photovoltaic, Power, PVsyst, irradiance and characteristics

I.INTRODUCTION

Energy is a vital requirement to sustain and improve the standard of our daily lives. With the exponential growth in population, rapid spread of technology and advancement of globalization, energy consumption in the developing countries like India, is rising at a very fast pace. Like many of the developing countries, India is also facing a shortage of energy.

Like most other places, solar energy has the promise and potential to solve the energy crisis of India, as it is available throughout the country. It is projected that by the year 2030, the solar PV electricity will be a strong means of energy generation to dominate upon other sources of energy. At present there are various methods and packages to simulate and study the performance of PV system. PVsyst is one such package available. In this work an attempt is made to simulate the PV system using the PVsyst software to demonstrate its suitability for performance evaluation.

II. METHODOLOGY

The PVsyst software is chosen looking to few features like:

- Provision to identify the weaknesses of the system design through Loss diagram.
- Results include several dozens of simulation variables.
- Performance analysis used for grid connected, stand-alone and DC grid PV systems

To demonstrate, a panel is selected with the specifications given in table 1, as an illustration to obtain I_V characteristics and performance using PVsyst. A total of five panels are used to get 370 watts.

Maximum Power(P_{max})	74Wp
Maximum Current	4.5A
Maximum Voltage	16.4V
Open Circuit Voltage	21V
Short Circuit Current	5A
Maximum System Voltage	1000V
Cell Temperature	25^{o}C

TABLE 1. PANEL SPECIFICATIONS

The characteristics are obtained and shown in figures [1],[2],[3]&[4]for irradiance, temperature, resistance variation including a graph for standard test conditions

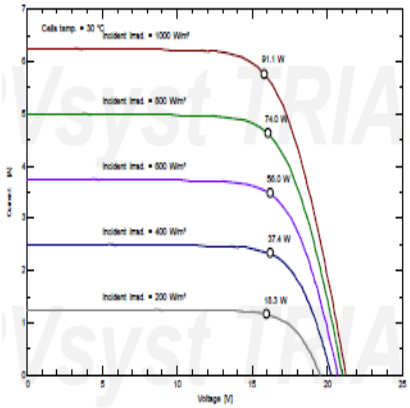

FIGURE 1

From the figure 1, voltage verses current characteristics is obtained by running the software at cell temperature of 30^{o}C. It is observed that power varies with the variation in the incident irradiation. When irradiation is 1000 w/m2 maximum power is 91.1watts and if the irradiation is 200w/m2,then minimum power is 18.3watts.

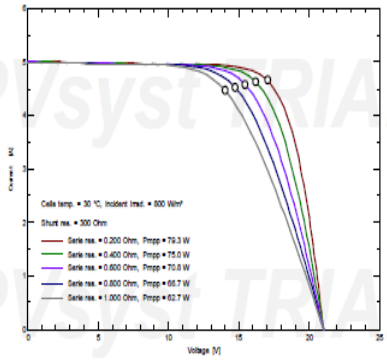

FIGURE 2

From the Figure 2, The change in the power is observed at a temperature of 30°C. The series resistance value is changed assuming that the load resistance will be in series with the Rise. When the series resistance is 0.2 ohms, the maximum power transferred to the load is 79.3 watts and if the resistance is 1 ohm the minimum power is 62.7watts.As the resistance increases the power decreases accordingly.

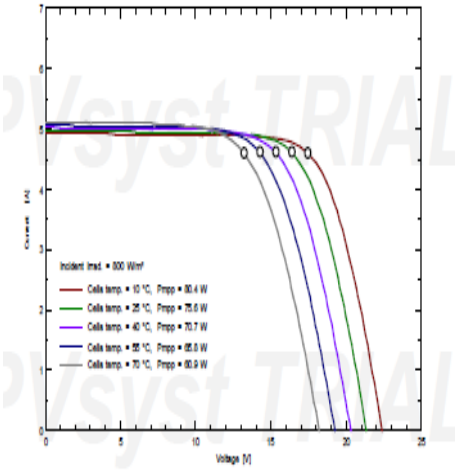

FIGURE 3

From the Figure 3**,**Voltage verses current characteristics is also obtained with varying temperature as shown in Figure 3, If temperature increases voltage decreases and at cell temp of 10^0C gives the maximum power of 80.4Wp. Temperature is inversely proportional to power due to the fact that the matter exhibits negative temperature coefficient.

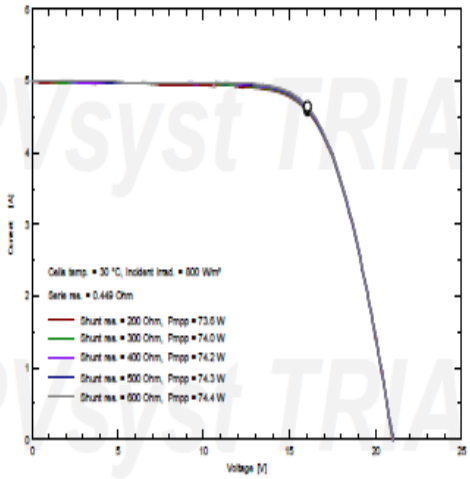

FIGURE 4

The Voltage verses current characteristics is obtained by varying the shunt resistances as shown in Figure 4,If resistance increases current decreases and a resistance of 600 ohm transfer the maximum power of 74.4Wp

An experiment is conducted using the same panel and the observations are tabulated by using Standard test values and also the graph is drawn as shown in Figure 5.

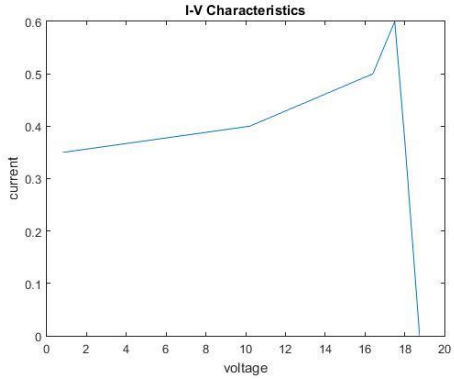

FIGURE 5

III. RESULTS AND DISCUSSIONS

The simulation results for various parameters are obtained using PVsyst by considering the varying parameters. The results of typical standard test values are considered for drawing an inference. The change in the I-V characteristics and power are as per the expectation. Further, the characteristics are also obtained through experimentation on the same panel. The performance is compared at standard test conditions. The comparison reveals that simulation results obtained using PVsyst software matches with that of the experimentation.

IV. CONCLUSION

The PVsyst software is used to simulate PV system and experimentation is also done on the same panel. The characteristics obtained by both the methods are very close. The parameters are almost matching with the manufacturer's specifications. Thus, the use of PVsyst software serve as an effective tool for the performance evaluation of pv systems and gives better insight for practicing professionals and researchers.

REFERENCES

1.Rekhashree,Dr.J.SRajashekar,Dr.H.Naganagouda"Study on Design and Performance Analysis of Solar PV Rooftop Standalone and On Grid System Using PVSYST"Volume: 05 Issue: 07 | July 2018

2. Parvathy Suresh, Jaimol Thomas "Performance Analysis of Stand-alone
PV Systems Under Non-Uniform Operating Conditions Using PVsyst" ISSN: 2349-5812 Volume 1, Number 4 (2014) pp. 19-25

3. Vasanthkumar, Dr. S. Kumarappa, and Dr.H.Naganagouda,"DesignandDevelopment of 5MW Solar PV Grid Connected Power Plant Using PVSYST", IRJET, volume: 04, Issue: 08, Aug – 2017.

4.www.pvsyst.com

5. Najibhamisu Umar , Birinchi Bora, Chandan Banerjee , B. S. Panwar "Comparison of different PV power simulation softwares: case study on performance analysis of 1 MW grid-connected PV solar power plant" IJESI ISSN (Online): 2319 – 6734

