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Studying the possibility of using PV Solar software system to choose the appropriate panels: Mini Review

Fatima Tariq Ahmed[1*], Hazim H. Hussain[2], Naseer K. Kasim[3]
[1,2] Department of Atmospheric Science, College of Science, Mustansiriyah University, Baghdad, Iraq
[3]Ministry of Electricity, Training and Energy Research Office, Baghdad, Iraq

[*]*Corresponding author: fatimatariqahmed@gmail.com*

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Abstract:
In recent, the world has seen a shift toward alternative energy, which was chosen for a variety of reasons, including economic feasibility, environmental output, operational cost, and processing unit independence. Alternative or clean energy is divided into several categories, some of which are generated by solar cells and others by fans. In this study, we examined one of these types by investigating the possibility of selecting the appropriate solar cells through the use of a simulation software system for reality (climatic and spatial conditions).
Keywords: PV system, error, temperature , solar cell

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Introduction

Oil is considered one of the main sources of energy production, despite the climatic, health and environmental damage it causes [1]. Based on the literature, the possibility of depleting oil reserves was observed at the conclusion in the century when most industries, vehicles, and residential complexes consume energy from fuel suppliers [2]. For the past, some productive groups have tended to exploit some other sources as a successful alternative to compensate for some of the people losses or replace energy options, as the world moves towards electronic governance systems, computer software systems are being developed that can extrapolate conditions and use those conditions with the least amount of effort and top productive return. [3,4,5].
Amongst these software systems, what was employed to create virtual solar cellular material that conveyed a whole considered the sort of cellular material as well as the readiness to create the mandatory amount to extend [6,7], there are software system that have a range of Its work is within the scope of the design and may need periodic updating to keep pace with climate changes, and for your sake, we will review in this paper some of those software system and compare them with the real output of solar cells used to generate electric power.

Systems Properties

In general, each software system has a specific algorithm language, but there are almost universally supported aspects, which are the variables that can be controlled by the user. On this basis, three systems were reviewed, used by a number of researchers.

PV Solar system is a simulation software that was created in Geneva to aid in the calculation of the workings and operations of PV systems.
This software aids in the design of the system's configuration and also allows for the calculation of the amount of energy generated. The output is based on a simulation of the sizing system, which is further influenced by the

geographical location of the PV system. Several simulation variables may be included in the results, which can be displayed in monthly, daily, or hourly values [8, 9].
it has been used by many researchers and interested people to evaluate the performance of real systems.
It used by Amine.H, Bouchaib.H, et al., published a paper in Casablanca titled Performance Indicators For Grid-Connected PV Systems, based on data collected over two years. This study was compared to three technologies: monocrystalline, polycrystalline silicon, and amorphous silicon, and they discovered that the annual monthly average of performance ratio for monocrystalline, polycrystalline silicon, and amorphous silicon is 76.7%. [10]
B. Shiva Kumar and K. Sudhakar evaluated the performance of a grid-connected solar PV power plant (10MW) The data was collected manually by SCADA System and compared as a result of the performance ratio ranged from 97.5 % to 73.88% while monthly average system efficiency 10.12% with simulation softwares PV syst and PV_GIS and found that they are largely identical. Where the annual monthly average of ambient temperature and solar radiation are 27.3°C and 162 kWh/m2. [11]
Nibras.M.Obaid, et al, evaluated a first performance PV solar system in Baghdad-Iraq On-grid (15KWp). The range of performance ratio (PR) vary between 66 % in July and 83% in December. In 2018, the efficiency was 13.27% .Monthly Average Solar Radiation and Ambient Temperature 142 kWh/m2 and 21°C . Annual energy yield was 1585.16 and after using PVsyst Software the expected annual energy yield was 1631 with an inaccuracy of 2.8% of the actual value due to the difference between rainy and cloudy days in winter and hot weather in summer and the speculative data in PVsyst Software. The annual performance rate of 75.55% was excellent compared to the stations of the world under the real operating conditions for the climate of Baghdad city.[12]
VS Chandrika, et al, They made an evaluation of the system efficiency for PV connected-grid 250 kWp under different ventilation conditions in southern India. The Three Systems (BIPV) Building Integrated Photovoltaic without ventilation, (BIPV_V) building integrated photovoltaic ventilated, (FSPV) free-standing PV. PVsyst software was used to simulate these systems. Electrical efficiency for BIPV/BIPV_V and FSPV system is 14.75%, 15.25% and 15.45% respectively. The highest performance percentage was 0.82% while the lowest performance rate was 0.70%. This research will help architects and the general public design roofs using GPV systems that are more aesthetically pleasing while also providing noise reduction and thermal insulation in equatorial temperature zones. [13]

Michael Dioha , et al , compare the performance of PV solar system for three silicon base technologies: (a-Si) amorphous crystalline , (mc-Si) monocrystalline, (pc-Si) polycrystalline in 6 geographical regions in Nigeria. The PVsyst software package is used. PR of pc-Si plants in the range 79.0% (Sokoto) - 82.2% (Uyo); mc-Si 81.2% (Sokoto) - 83.0% (Uyo); and a-Si 83.9% (Sokoto) - 86.8% (Uyo). The system efficiency of pc-Si, mc-Si, and a-Si plants from12.58% - 13.08%, 14.65% - 14.97%, and 9.08%- 9.38% respectively. The average daily sunshine hours and solar irradiation ranges from 4 – 9 hours and 3.5 - 7 kWh/m2 respectively [14].
David A. Quansah ,et al , they did Outdoor performance of five solar hotovoltaic (PV) systems using five distinct solar cell technologies polycrystalline (pc-Si), monocrystalline (mc-Si), copper indium disulfide (CIS) thin-film, amorphous silicon (a-Si), HIT (Heterojunction Incorporating Thin Film) in Ghana. PR is 70.8%, 48.8%, 69.8%, 63.4% and 71.3% for a-Si, CIS, HIT, mc-Si and pc-Si, respectively. According to the performance statistics, the CIS technology is the least suitable, whereas p-Si is the most suitable solar PV technology for the site in question, followed by a-Si, HIT, and mc-Si. If space is an issue, the HIT-based approach is the best option [15].
Chong Li published a paper on grid-connected PV system performance evaluation using monocrystalline silicon (m-Si), polycrystalline silicon (p-Si), cadmium telluride (CdTe) thin film, copper indium selenide (CIS) thin film, heterojunction with intrinsic thin layer (HIT), and hydrogenated amorphous silicon single-junction PV modules (a-Si:H single-PV), The findings revealed that the performance of grid-connected PV power systems is influenced by factors such as geographical location, PV solar module types, and environment conditions such as solar radiation and ambient temperature. Furthermore, based on energy output and efficiency, HIT PV power technology is the best alternative, while CdTe and p-Si are the least suitable for this application [16].
Satish Kumar Yadav, a complete performance analysis of a 5 kW rooftop SPV power plant has been given. The impact of temperature on plant performance has been observed. The annual average system efficiency 10.02%. The annual average daily performance ratio was 76.97%. The annual average monthly ambient temperature varied between 13.23 °C to 37.84 °C [17].
Sandhya Thotakura , et al , They evaluated the performance of a megawatt scale rooftop PV solar system for an educational institution in dry and humid climates in India. Validation is performed by comparing the simulated results to the actual results. There are 23 inverters and solar panels in this system. The average mean bias error (MBE) was 5.33 %(PVGIS), 12.33% (PV Watts), and 30.64 %(PV Syst), with the average normalized mean bias error (NMBE) being 2.954 %(PVGIS), 7.88 %(PV Watts) , and 22.75 %(PV Syst) . Performance ratio of the solar PV plant is around 88%.PV Syst had higher energy yields and PR in the comparison simulation analysis. There was difference between simulated and observed energy performance [18].
F. Cherfa , et al , They evaluated the performance of the first grid-connected PV system in Algeria. The system has pumped 10 981 kWh of energy into the grid per year. The monthly average system efficiency of 62% to 77%.

With an annual performance rate of 71%. The annual average for ambient temperature 18.2 °C. The results show that the power generated by the grid-connected power plant meets the requirements. In comparison to international standards, the requirements for such systems are more stringent [19].
Chandrakant Dondariya , et al , conducted study in India about Performance simulation of grid-connected rooftop solar PV system for small households. The study used various simulation software such as PV*SOL, SISIFO, PVGIS and SolarGIS. PV*SOL demonstrates to be easy, fast, and reliable software tool for the simulation of a solar PV system. The performance ratio is 75.01% [20].
Surabhi Sharma, et al, conducted study in academic institution about solar photovoltaic system design by using PVsyst. for a 54kW the performance ratio 79.14% in the fixed building , for 10kW the performance ratio 81.51% in one floor and a 300W the performance ratio 81% in one room . The annual average for ambient temperature and solar radiation 27.27°C and 1974.4 kWh/m2 PVsyst gives a detailed report and result of the system [21].
Sonali Goel and Renu Sharma published a paper about Analysis and simulated performance of PV system a grid-connected (11.2 kWp) in Bhubaneswar- India by using PVSyst and HelioScope software .The system is made up of 40 polycrystalline silicon modules that are slanted at a 21° angle towards the south. The annual average ambient temperature and solar irradiation is 26.16 °C and 1783.9 kWh/m^2. The performance ratio for Measured, PVSyst and HelioScope is 81%, 78.07% and 75.20%, respectively [22].
Chaita , et al , published a paper about Performance Evaluation of Rooftop PV Solar Plant 3.5 kWp in Thailand. The average daily PR was between 59% to 76.4%. The maximum hourly average solar radiation and ambient temperature were 1149.1 W/m^2, 37.79 °C, respectively [23].
Nibras M.Obaid, et al. conducted a study on Performance Assessment of HIT PV Solar system under Iraq-Baghdad climate,discovered that performance ranged from 83 % to 67% , and system efficiency ranged from 14.8 % to 11.47 % when the efficiency at STC is 17 percent, where the annual monthly average ambient temperature and solar irradiation are 31°C and 180.9 kWh/m2, respectively[24].
S. Sathish Kumar and C. Nagarajan published a paper about Analysis Performance-Economic and Energy Loss of 80 KWp Roof Top on- Grid PV Power Plant.the performance ratio ranged from 71.3% to 82.1%. The system efficiency was 4.16%. The annual average ambient temperature and solar irradiation is 33.10˚C and 1908.96 kWh/m^2 [25].

Conclusion

1- The simulation results of solar PV generally deviate from the actual performance, due to the impact of factors like soiling, shading, array mismatch and wiring losses.
2- The system has been successfully used as a proactive guide to learn how to prepare solar cells.
3- The system compared to the rest of the available systems, the recovery rate was high and close to the value of the real system, and the error rate was low.

PVsyst has some limitation as follows:

1- Program screen cannot be maximized therefore can be tedious to see all parameters if using a small monitor.
2- Inability to handle detailed shadow analysis
3- No single line diagram

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