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RESEARCH ARTICLE

THE ANALYSIS OF PERFORMANCE THE PRODUCTION OF ENERGY BY USING PHOTOVOLTAIC SYSTEM BY ESTABLISHING THE PANEL OF SUNCELL IN DIFFERENT LOCATIONS TO GET IN MAXIMUM ENERGY

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ABSTRACT

This study has been carried out in Afyonkarahisar –Dazkırı region which is dealing with setting up the network to obtain the performance production of electricity by using Monocrystalline suncell panel by locating them according to 15degrees (angle) of deflection according to sundirection with respect to the ceiling to be able to get 100 Wp power of electricity from one building by using PV software program. The data's of the average of the sun a day, month and average temperature of weather of Dazkırı region from State general director of Meteorology of Turkey Republics. In addition to use the data of average of sun day and month by using software program MATLAB. By this way the maximum production of l sun cell panel has obtained by adding important factors. It has obtained maximum of electricity by using the photovoltaic system with 35°. The adjustment of location of suncell panel according to the monthly periodhas provided 4,8 % of ratio increasing in performance. If the suncell panel location adjusts according to seasons the performance would be increased by 3,4 %. The changing of the suncell panel is not easy in practice. According to the calculation of electricity flow of electricity which has produced with different angles (locations) has showed by graphics.

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INTRODUCTION

Photovoltaic's (PV) system has been observed in 1893 first by Becquerel, the voltage between electrodes immersed in electrolyte, which depends on the light falling on the electrolyte (Nogueira *et al*., 2015). Although the use of so much far, the rapid growth of photovoltaic systems has taken place in the last quarter century. As the result of oil crisis in 1970, the energy costs of energy had raised with high ratio, so the demand to photovoltaic became necessary. In addition, fossil energy of using fuel production results in environmental pollution, has been found to lead to environmental disasters such as global warming and seasonal changes. For these reasons humans have turned its attention to renewable energy sources. Solar energy has high potential energy and is raw energy which takes part among the most widely used as renewable energy sources because of being free. Due to the increasing of the use of photovoltaic systems in the last quarter of a century; the production technology of the semiconductor material that forms the main structure of the development of photovoltaic systems which has developed (Som and Al-Alawi, 1992). In the present PV systems are get progressive as parallel with low cost of many years ago and has got much higher quality than before (Shukla and Khare, 2014). The cost of PV cells in 1974 to about $ 200 / watt, while 2000's the cost has been reduced to 2 $ / watt (Abdelkader *et al*., 2010). PV modules which were produced in the first years consisted only with a combination of small battery cells. Today the sematerials which produced as a single piece with the modern technology and can be used almost thirty years without need to get any maintenance. By taking in consider the thanks to the long life of the panels which are used can be used for long time. The cost depends on the usage of device for long period. So ıt can treted as cheap (Ghazali *et al*., 2012; Bergmann *et al*., 2002).

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The study which has implemented in this project; the network of suncell panel has settled system on the roof of building in Afyonkarahisar the Dazkırı region with the board of 100Wp power mains connection with monocrystalline solar panels of 15 have produced with different slope as monthly and annual energy production by making calculations with pvsyst package to provide the determination of the angle at which the maximum energy production has been obtained. The production of renewable energy monthly has been achieved by determining the angle at essential how much energy is realized, by changing the terms of the production of photovoltaic systems as monthly and seasonally.

MATERIALS AND METHODS

Most of the variables affecting energy production of photovoltaic panels; sunshine duration, the values of average temperature and sunlight. To increase the efficiency of performed study must be determined the variables very well. Last decade, the average time between taking the sun and average temperature data for the years 2004-2014 was calculated by Turkish State Meteorological Service. The average monthly sunshine duration is shown in Figure 1.

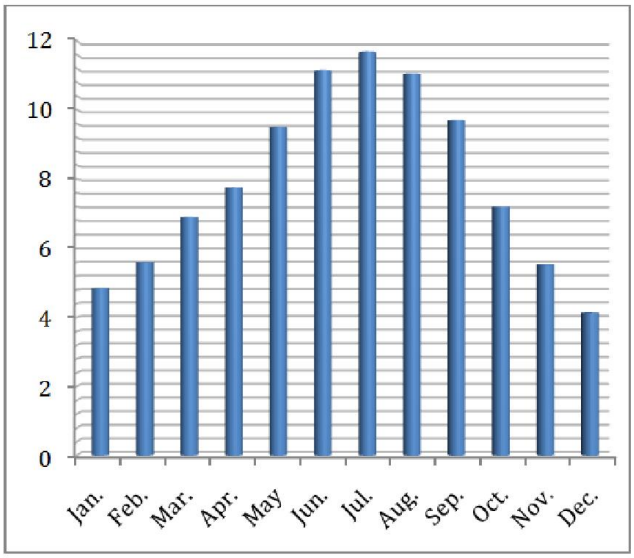

Figure 1. The average monthly sunshine duration (hours)

The established system which has started in access in Afyonkarahisar according to monthly data when the daily average temperature of Dazkırı obtained as a 4 to 6 hours of sun in the winter time, this period is increased to 10 to 12 hours during summer months. In this period there are a direct effect on the energy production of photovoltaic panels. The production of energy from photovoltaic systems while low quantity of sun in the winter so the sun becomes in the summer as max energy production with respect to increasing of sun. The data as Daily monthly average temperatures are Figure 2.
There is an inverse relationship between temperature and energy output of photovoltaic systems. Reduction in photovoltaic energy production occurs with increasing temperature. Figure 2.3 MATLAB prepared Dazkırı of town on a monthly basis. The production of energy using photovoltaic systems has most important as the value of solar radiation. The rise of the value of solar radiation significantly increases the energy production of photovoltaic systems. When the MATLAB program has used for Dazkiri district which prepared for Dazkırı region according to monthly average daily solar radiation in the winter months about 2-3 kW / in summer while this reaches to 6-7 kW, so the energy production is increasing in summer.

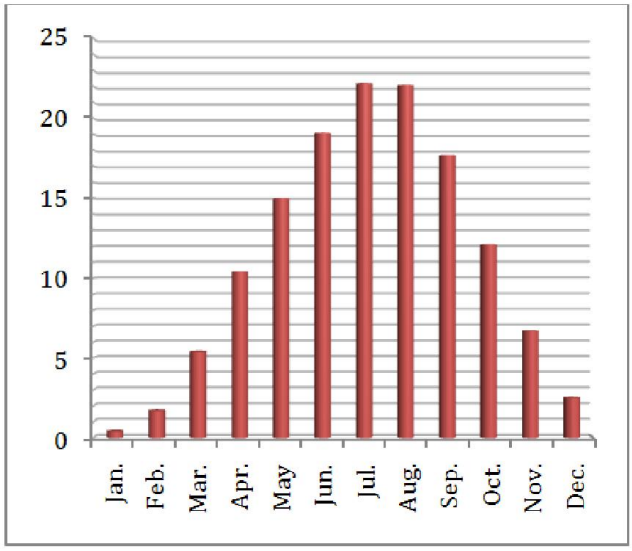

Figure 2. The average daily temperature on a monthly basis

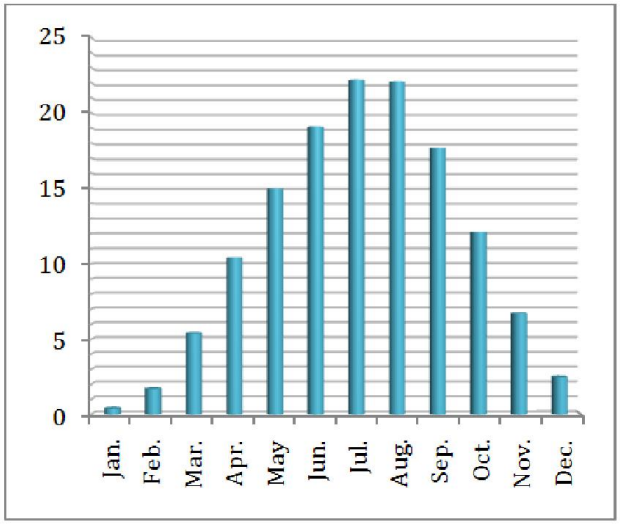

Figure 3. Dazkırı of monthly average daily solar radiation values

PVsyst Program

Pvsyst program; which developed by architect, to meet the needs of engineers and researchers. Sizing of photovoltaic systems are used as very effective in the simulation and performance evaluation. Meteorological data can be entered from outside the program to get more efficient results. Simulation for different inclined angles and different photovoltaic technologies, has carried out to get economic analyzes which performed. In Table 1 photovoltaic panels and inverters used in the system's technical data are given

Photovoltaic Panels		Inverter	
Producer	Aike Solar	Producer	Siemens
Model	Aike100-18-Mono	Model	Sinvert PVM12UL
Power	100Wp	Power	60 W
Efficiency	%14,75	Efficiency	%98,1
V_{DC}	18,66 V	Min MPP	125 V
I_{SC}	5,36 A	Maks MPP	450 V
V_{mpp}	22,75 V	Maks PV Voltage	500 V
I_{mpp}	5,92 A	Input Voltage	480 V
Length and Width	1196 x 554	Height and Depth	280 x 944

RESULTS

In Afyonkarahisar Dazkırı, the roof of a building which planned to be adapted and connected photovoltaic system which is setting up of the monthly amount of energy is produced by a total of 15 different angles starting from 0° to 70° angle with interval 5° has been calculated.

Mont	0°	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
Jan.	3248	3639	4007	4342	4644	4915	5150	5349	5512	5641	5732	5789	5239	5797	5747
Feb.	3986	4322	4659	4902	5143	5349	5516	5651	5751	5819	5850	5848	5814	5747	5645
Mar.	7120	6898	7164	7384	7560	7693	7784	7829	7831	7791	7708	7581	7214	7200	6946
Apr.	7998	8799	8351	8455	8514	8529	8502	8425	8309	8146	7943	7689	7391	7046	6654
May	9718	9727	9871	9754	9769	9845	9494	9289	9037	8741	8396	7998	7545	7264	6513
Jun.	9995	9993	9949	9858	9710	9505	9257	8978	8671	8315	7903	7431	6919	6373	5802
Jul.	9902	9992	9987	9982	9975	9982	9975	9750	9460	9096	8675	8191	7649	7052	6445
Aug.	9579	9765	9896	9964	9979	9936	9847	9723	9545	9310	9016	8667	8258	7793	7246
Sep.	7611	7975	8284	8538	8741	8839	8984	9028	9022	8963	8853	8690	8476	8207	7886
Oct.	5730	8313	6620	6993	7317	7590	7814	7985	8112	8191	8220	8205	8124	8032	8083
Nov.	3882	4350	4786	5177	5529	5840	6106	6331	6513	6654	6756	6815	6836	6815	6758
Dec.	2724	3087	3421	3738	4020	4274	4494	4686	4843	4970	5065	5131	5160	5163	5131

The production of maximum energy seems to be taken place every month at different angles. Table 2 shows the maximum monthly amount of energy produced at different angles. In terms of photovoltaic systems has made much impact on energy production. During the winter months was realized in summer among the highest ratio of energy production varies between 45° and 55° and 10°-0°. These changes in solar radiation and sunshine duration which varies depending on the angle of incidence angle on worldwide. The highest monthly production of photovoltaic energy systems in Figure 4.(wh / month) are shown.

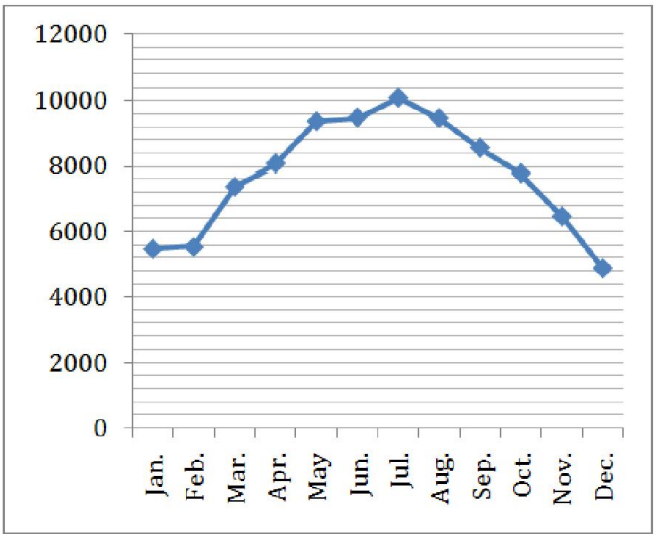

Figure 4.The highest energy production of the photovoltaic system on a monthly basis data (when / month)

When the analyze of monthly energy production has done; the energy production on a monthly basis has increased during the winter of 3000 watt / h and has reached to 5000 in summer, for the ratio of watt / hour. Energy production is increasing approximately as 67% during the summer months. For certain cause of the increase is so high; the increase is a rise in the value of solar radiation and sunshine duration of sunshine duration. In Figure 5, which has produced 15 different angles of the annual energy production of photovoltaic systems (wh / year) it is shown.

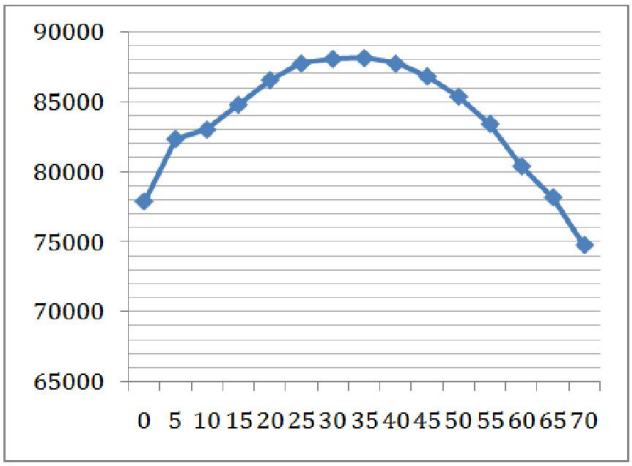

Figure 5. Annual energy production of a photovoltaic system that has produced for 15 different angles (when / year)

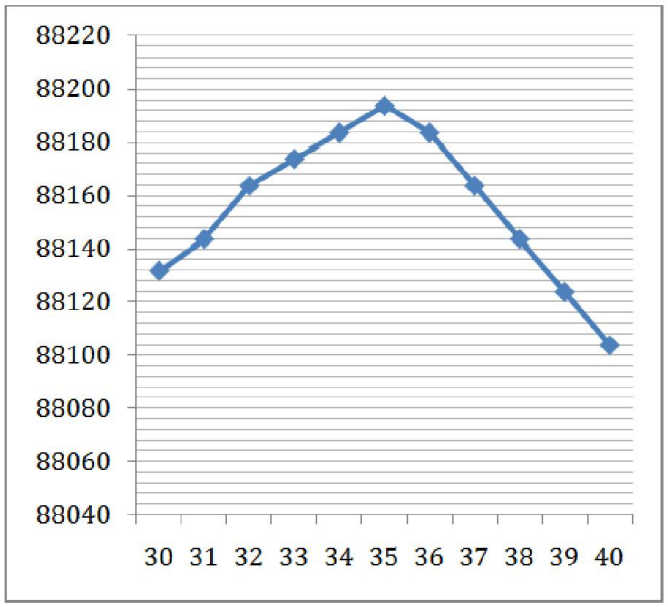

Figure 6. The annual energy production of a photovoltaic system (when / year)

When looking at different angles for annual energy production; the lowest production becomes when 37 277 / year with as a maximum of 70° takes place when energy production is 43 965 / year with 35° has also occurred. Instead of 70° to 35° installation of photovoltaic systems could be made with an energy for gaining of 17%. As shown in Figure 6as an annual energy production of the photovoltaic system (when / year) are shown. Dazkırı is located in the northern latitudes 37°. For open the literature as the most effective system of photovoltaic system is installed however it is equal to the latitude of the place. In Dazkırı the 35° angle was found to be the most effective and efficient for photovoltaic system

Conclusion

The increasingly of amaging environmental depletion and pollution of fossil fuels has led people to create and use of renewable energy sources. Renewable energy sources in our country hasnot used for energy production as much as in developed countries. These resources like renewable energies are endless and easily accessible like solar energy. Also these are most important resources for next generations.

The reason of choosing these kind of resource, related to solar cells which can be converted directly into electrical energy. The most important reason for not using the system the costs especially in our country because it is higher than that fossil fuels systems, which will be established with respect to this study. By the means of this study the most effective and efficient operations of photovoltaic systems may be installed with an optimal oblique angle which has obtained by these calculations. Optimal angle of the photovoltaic system has been identified in Dazkırı as 35 degrees. The angle of the photovoltaic system is provided with a 4.8% change in energy savings each month. Changes in the seasonality of the slope of the photovoltaic system energy savings about rate of 3.4%.

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