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Research Article

COMPARATIVE STUDY OF PHOTOVOLTAIC ARRAY OPTIMUM TILT ANGLE AND ORIENTATION WITH MULTI-OBJECTIVE CONSIDERATION

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Keywords
Optimization,
Tilt Angle,
Orientation Angle,
Hybrid System.

Abstract
Photovoltaic (PV) solar energy system converts sunlight to electricity and referred as one of promising system for production of a renewable energy resources. Tilt angle and orientation have important effect on PV output. Positioning of PV system using tilt angle and orientation, therefore, according to path of radiation of sunlight is very critical to obtain more efficient energy conversion from PV panels. In this study, determination of optimum tilt angle and orientation studied for a grid-connected hybrid wind-PV-battery system. Firstly, general calculations of PV completed using a numerical method as follow: annual solar radiation (Wh/m^2), annual energy production using radiation and temperature (Wh/m^2), energy production using radiation, temperature and wind speed (Wh/m^2). Secondly, cost of electricity for a grid-connected wind-PV-battery hybrid systems ($/year) depending on solar radiation, weather conditions and electricity market data were obtained using numerical method. It founded that optimum tilt angle varied between 26° - 27° for first three scenario and for the last case is 9°. As for orientation, it changed from south to west for all cases. Moreover, it seems that results of this study might be a reference and preliminary study for scientist and researcher/engineers to simplify designing and evaluating PV system.

FARKLI DURUMLAR İÇİN FOTOVOLTAİK PANELLERİN OPTİMUM EĞİM VE AZİMUT AÇILARININ BELİRLENMESİ VE KARŞILAŞTIRILMASI

Anahtar Kelimeler
Optimizasyon,
Eğim Açısı,
Azimut Açısı,
Hibrit Sistem.

Öz
Fotovoltaik (PV) güneş enerji sistemleri, yenilenebilir enerji sistemleri arasında güneşe en bağımlı kaynaktır ve güneş ışınımı olduğunda enerji üretmektedir. PV sistemlerin tasarım ve analizlerinde en önemli gereksinim maksimum ışınımın PV panel yüzeyine düştüğü eğim ve azimut açısıdır. Bu çalışmada farklı durumlar için PV panellerin optimum eğim ve azimut açılarının hesaplanması için matematiksel bir yaklaşım sunmaktadır. Bu çalışmadaki analizler ile optimum eğim ve azimut açılarının tespit edilmesinde; (1) eğimli yüzeydeki yıllık toplam ışınım (Wh/m^2), (2) ışınım ve sıcaklığı temel alan yıllık enerji üretimi (Wh/m^2), (3) ışınım, sıcaklı ve rüzgâr hızını temel alan yıllık enerji üretimi (Wh/m^2), ve (4) şebekeye bağlı rüzgâr-PV-batarya-yük sisteminin yıllık toplam elektrik maliyetinin ($/yıl) güneş ışınımı, hava verileri ve elektrik piyasası verileri ile hesaplanması dikkate alınmıştır. Bu çalışmadaki farklı durumlar için sonuçlar değişkenlik göstermektedir. Ayrıca elde edilen sonuçlar geleneksel olarak güneye doğru olan yönlendirme durumu ile farklılık göstermektedir. Optimum eğim açısı ilk üç durum için 26° - 27° civarında iken son durum için 9° olarak elde edilmiştir. Optimum azimut açısı ise tüm durumlar için güneyden batıya doğru kaymıştır. Bu çalışmada elde edilen sonuçlar, PV sistem tasarımı veya analizi yapacak mühendisler için faydalı olacaktır.

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1. Introduction

Renewable energy sources studied intensively in recent years from academia and industry because insufficient amount of fossil fuel is remained for energy production in addition to its environmental effects. Therefore, researchers have turned their attention to more efficient utilization of renewable energy sources in recent years (Arikan et al., 2013). Photovoltaic (PV) systems introduced for renewable energy production and utilization of PV systems increased in proportional to energy demands (Kekezoglu et al., 2013). PV systems simply convert solar energy into electric power to provide electricity for areas where electric supply system is not available or connected to electrical grid for selling electricity back to grid (Zhou et al., 2015).

Determination of system performance for application areas is critical to find out optimum design of PV systems (Kacira et al., 2004). There are many parameters effecting output power of PV system, Tilt angle and orientation among other parameters are key factors for high yield energy from PV panels. Economic value of the produced electricity is another concern for optimal placement of PV system. Because produced energy from PV system does not perfectly synchronized with circulating load on electricity grid (Rhodes et al., 2014). Therefore, installation of the PV panel considering only production performance of panel might not be optimal design to achieve electricity that is more economical. Designing PV system by considering economic value of produced energy may require for shifting orientation from south to west. Such economic value based investigation of PV systems mentioned in (Rhodes et al., 2014).

There are several studies related to analytical modelling of PV arrays to obtain optimum tilt angle (Lewis, 1987; Elsayed, 1989; El-Kassaby, 1988; Bakirci, 2009; Benghamen, 2011). These studies summarized and more details can find about optimization of tilt angle of solar panel in (Yadav and Chandel, 2013). Moreover, researcher in this field also determined the optimum tilt angle of PV arrays using experimental results and measurements (Kaldellis and Zafirakis, 2012; Brinder et al., 2011; Nakamura et al., 2011; Wada et al., 2011; Hiraoka et al., 2003; Asl-Soleimani et al., 2001; John et al., 2012).

Majority of studies related with PV array mentioned that the optimum orientation of PV system to collect maximum radiation from sunrays would be southern orientation when northern hemisphere selected for installation. As for southern hemisphere, placement of PV system would be toward to northern orientation. This assumption is acceptable for the clear sky, however, variable weather conditions and non-uniform distribution of radiation due to fog or smog affects the optimal orientation of PV panel (Rhodes et al., 2014). Latitude is another important parameter on calculation of optimum tilt angle. This approximation ignores environmental conditions and gives valuable results, however, it has disadvantages when more accurate results are essential (Yadav and Chandel, 2013).

Two different methods mostly used to generate electricity from solar energy in Turkey. First is unlicensed solar plant with 1 MW maximum output power. Other is licensed solar power plant and it can generate electricity more than 1 MW. There are many unlicensed PV power plants having permission for installation, however, licensed solar plants established in Turkey for years (Minister of Energy and Natural Resources of Turkey, http://www.enerji.gov.tr/en-US/Mainpage).

In this study, wind-PV-battery hybrid model introduced and optimum tilt angle and orientation studied by considering output of PV panel using proposed model. A 1 m x 1m PV module surface chosen for calculation of optimum tilt angles and orientation by considering (1) annual solar radiation (Wh/m^2), (2) annual PV production (Wh/m^2) based on solar radiation and temperature, (3) annual PV production (Wh/m^2) based on solar radiation, temperature and wind speed based. In addition to above-mentioned three cases, yearly electricity cost ($/year) of wind-PV-battery hybrid system was also determined based on economic value. This study might provide valuable information to literature by comparing output of PV array with different optimum tilt angles and orientations. Section 2 includes description of methodology used in this study. Results of different approaches obtained and compared in Section 3 and Section 4 gives conclusion of this study.

2. Methodology

Determination of optimum tilt angle and orientation accomplished using five different data that obtained in Istanbul, Turkey: solar radiation from sun, ambient temperature, wind speed, hybrid system including wind turbine, battery system and PV array and price of generated electricity by considering different cases. As mentioned in introduction section of paper, maximum solar radiation, maximum output energy and placement of a PV panel with desired economic value are highly depend on the position of PV system according to sun rays. Therefore, effects of tilt angle and orientation on PV performance is main purpose of this study. Placement site, local economic data, environmental conditions are parameters that are determine optimum placement of a PV panel. Process steps of this study shown in Figure 1.

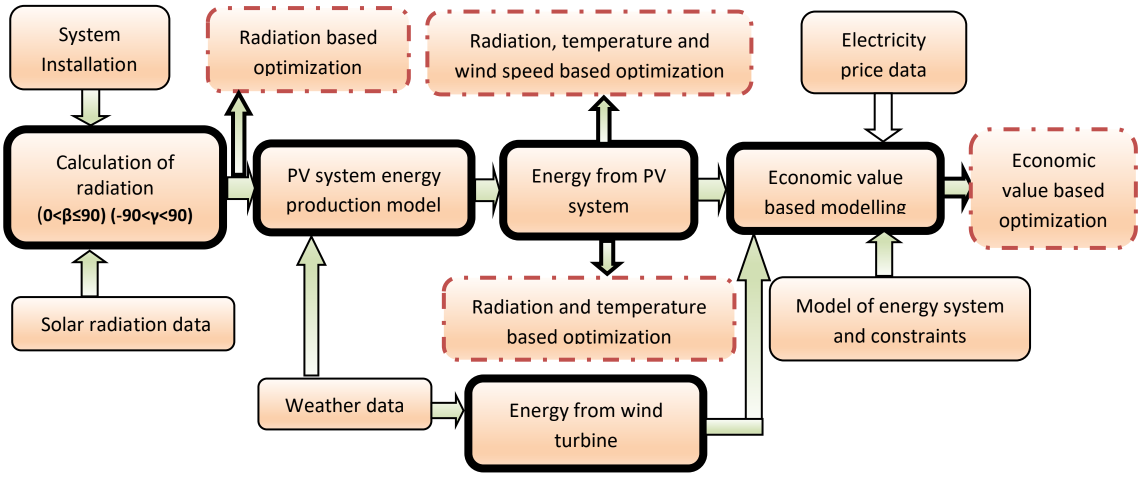

Figure 1. Process steps used in this study

The methodology consists of three parts; (1) calculation of total solar radiation on a panel, (2) modelling of grid-connected hybrid system including wind, PV and battery and (3) modeling of a PV system considering economic value of produced energy. In order to use the methodology proposed in this study, a case study has been determined for Istanbul-Turkey. Optimum tilt and orientation angles for different cases calculated using a program written in MATLAB.

2.1. Solar Radiation Model

The total radiation (I) is depends on two different parameters: direct (I_b) and diffused (I_d) radiation. Sum of these two parameters give us total radiation as shown in Eq. (1). Diffused radiation has also relation with clearness index (k_T) of sky and k_T is inversely proportional with extraterrestrial radiation (I_o) and proportional with total radiation as described in Eq. (2)-(3) (Beckman and Duffie, 1980).

$$I = I_b + I_d \tag{1}$$

$$\frac{I_d}{I} = \begin{cases} 1.0 - 0.09k_T & k_T \leq 0.22 \\ 0.9511 - 0.1604k_T + 4.388k_T^2 - 16.638k_T^3 + 12.336k_T^4 & 0.22 < k_T \leq 0.80 \\ 0.165 & k_T > 0.80 \end{cases} \tag{2}$$

$$k_T = \frac{I}{I_0} \tag{3}$$

Isotropic sky model is commonly used method to calculate solar radiation on a tilted surface of PV panel. Similar to calculation of total radiation on a horizontally placed PV panel as mentioned in Eq. (1), sum of reflected, direct and diffused radiation is equals to total radiation on a tilted PV array (Liu and Jordan, 1963). More detail about calculation of total radiation on a tilted plane given as below. Field of view of the tilted surface in the sky is equals to diffused radiation. However, field of view of a tilted PV array surface to ground is proportional to reflected radiation. The relation between diffused and reflected radiation to total radiation is show in Eq. (4) (Kacira et al., 2004).

$$I_T = I_b R_b + I_d\left(\frac{1+\cos\beta}{2}\right) + I\rho\left(\frac{1-\cos\beta}{2}\right) \quad (4)$$

where β is the angle between ground and PV array, ρ is ground albedo (0.2), and R_b is normalization of beam radiation from a tilted surface to horizontal direction as shown in Eq. (5)-(7) (Beckman and Duffie, 1980).

$$R_b = \frac{\cos\theta}{\cos\theta_z} \quad (5)$$

$$\cos\theta = \sin\delta\sin\varphi\cos\beta - \sin\delta\cos\varphi\sin\beta\cos\gamma + \cos\delta\cos\varphi\cos\beta\cos\omega + \cos\delta\sin\varphi\sin\beta\cos\gamma\cos\omega + \cos\delta\sin\beta\sin\gamma\sin\omega \quad (6)$$

$$\cos\theta_z = \cos\varphi\cos\delta\cos\omega + \sin\varphi\sin\delta \quad (7)$$

where δ is the declination, φ is the local latitude coordinate (latitude of Istanbul = 41°), γ is the surface orientation, and ω is the hour angle.

2.2. Hybrid System Model

Hybrid system used in this study including wind turbine, PV, battery and public park area shown in Figure 2. This system connected to electric grid system to supply electricity. Wind turbine with a 2.4 kW power rating established on 30 m long tower at the public park area. Power curve of wind turbine used in this hybrid system calculated as shown in Figure 3. Energy production of the wind turbine obtained via look-up table according to the power curve given in Figure 3. Public park area selected for installation of hybrid system. Structure of PV electricity production model constructed considering two different scenarios. First based on PV production due to solar radiation and temperature. Second scenario of PV production model designed based on solar radiation, temperature and wind speed.

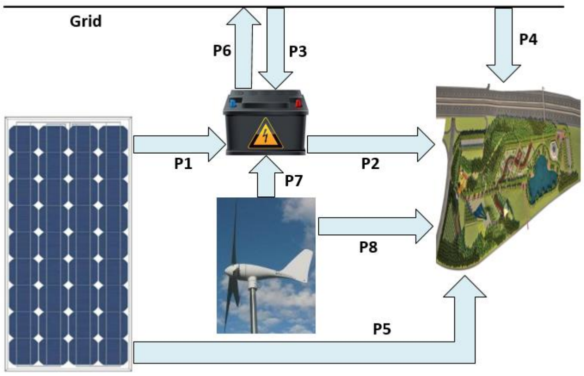

Figure 2. Grid connected hybrid system consist of a wind tribune, PV array, battery and public park area

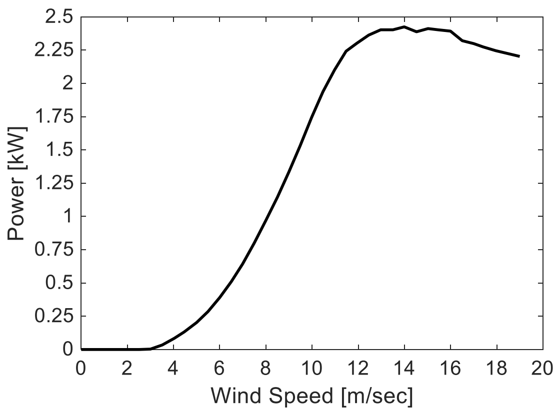

Figure 3. Power curve of the wind turbine with 2.4 kW rated power

Electricity production due to solar radiation and temperature modeled using Eq. (8) and Eq. (9) (Rhodes et al., 2014). DC to AC conversion efficiency and system losses ignored in this model.

$$P_{pv} = \eta_{pv}\eta_{other} I_T \tag{8}$$

$$\eta_{pv} = \eta_{ref}\left[1-\beta_{ref}\left[T_a - T_{ref} + \left(T_{c,N} - T_N\right)\frac{I_T}{I_N}\right]\right] \tag{9}$$

where P_{pv} is PV power density (W/m^2), β_{ref} temperature coefficient of PV, η_{pv} is conversion ratio of PV panel, η_{other} is other factors (mismatch, wiring, connection, etc.) which are decrease conversion efficiency of PV system. This parameter is a constant with a value of 0.93. T_a is ambient temperature (°C) and I_N is incident radiation (800 W/m^2) at normal operating condition temperature (Rhodes et al., 2014). The PV panel is made of mono-crystal and its properties given in Table 1.

Table 1. Properties of PV module

PROPERTIES	VALUE
Reference conversion ratio (η_{ref})	12%
Temperature coefficient (β_{ref}) (Chow, 2003)	0.0045
Reference temperature (T_{ref})	25 °C
Nominal operating cell temperature ($T_{c,N}$) (Rhodes et al., 2014)	45 °C
Nominal operating condition temperature (T_N) (Rhodes et al., 2014)	20 °C

Cell temperature of PV array calculated using Eq. (10) and then wind speed is determined using this value (Tamizh et al., 2003; Ayaz et al., 2017; Durusu and Erduman, 2018).

$$T_c = 1.14\left(T_a - T_{ref}\right) + 0.0175\left(I_T - 300\right) - k_r w_s + 30 \tag{10}$$

where T_c is PV cell temperature (°C), k_r is wind speed coefficient with a value of 1.509 and w_s is wind speed (m/sec). Calculation of T_c value and putting T_c into Eq. (9) is provides PV efficiency as described in Eq. (11).

$$\eta_{pv} = \eta_{ref}\left[1-\beta_{ref}\left[T_a - T_{ref} + T_c - T_N\left(\frac{I_T}{I_N}\right)\right]\right] \tag{11}$$

Additional parameters of PV and battery are as following. Battery has 70 kWh capacity with a 85% charge and 100% discharge efficiency. Battery´s depth of discharge accepted as 50% and battery's initial state of charge is 40 kWh. As for PV array, its maximum capacity is 20 kW. Annual solar radiation, ambient temperature and wind speed variation in Istanbul, Turkey shown in Figure 4.

2.3. Economic Value Model

Modeling of economic value based energy production proposed to minimize cost of electricity for hybrid system. Optimal control method applied to increase efficiency of hybrid system to obtain most efficient power flows of hybrid system with an advantage of minimum cost and maximum benefit. As described in Eq. (13) and Eq. (16)-(21), objective function and constrains are linear functions, therefore, power flow control can be described as linear programming problem is best fitted approach to solve power flow control problem as given in Eq. (12) (Zhou et ai., 2015).

$$\min \quad f(x), s.t \begin{cases} Ax \le b \\ A_{eq}x = b_{eq} \\ lb \le x \le ub \end{cases} \tag{12}$$

where f(x) is objective function, A and b are inequality coefficient, A_{eq} and b_{eq} are denotes equality coefficient, lb and ub refers to upper and lower bounds of variables, respectively (Zhou et al., 2015). There are constrains for proposed energy economic model. First related to cost of electricity used from electrical grid. Second constrain is income of electricity as supply to the electrical grid. System wear cost is third constrains of model. The daily cost of electricity formulated as in Eq. (13) and it assumed as objective function (Zhou et al., 2015).

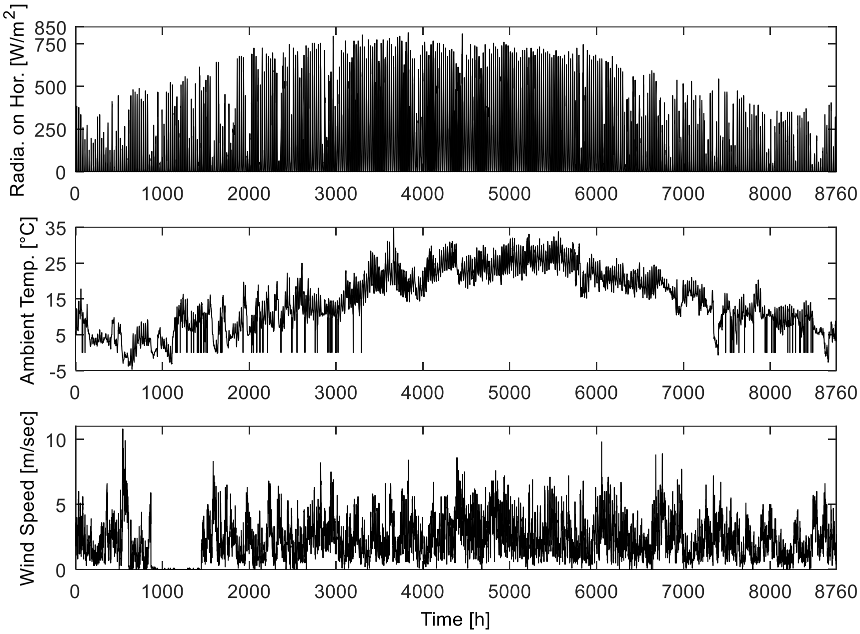

Figure 4. Annual variation of solar radiation, ambient temperature and wind speed in Istanbul

$$J = \sum_{t=0}^{23} p(t)\left[P_3(t) + P_4(t)\right] - \sum_{t=T_p} r_p p_p P_6(t) + C_h \tag{13}$$

$$C_h = \sum_{t=0}^{23} \alpha\left[P_2(t) + P_6(t)\right] + 24\sigma \tag{14}$$

where p(t) is electricity selling price , p_p is electricity selling price in peak load period, r_p is contracted ratio of the peak price (0.65), C_h is wear cost of the system, a is battery wear cost coefficient (0.001) and σ is wear cost of other components (0.002) (Zhou et al., 2015). Daily electricity price variation with all taxes given in Eq. (15) (Electricity price, http://gazelektrik.com/enerji-piyasalari/elektrik-fiyatlari#uc-zamanli).

$$p(t) = \begin{cases} p_p, & t \in T_p, \quad T_p = [17,22) \\ p_o, & t \in T_o, \quad T_o = [22,06) \\ p_s, & t \in T_s, \quad T_s = [06,17) \end{cases} \tag{15}$$

where p_p= 0.2154 $/kWh is the price in peak load period; p_o= 0.0770 $/kWh is the price for the off-peak period; p_s= 0.1423 $/kWh is the price for the standard period. Considering above-mentioned parameters, control variables in objective function have to satisfy several constraints as shown in following equations (Zhou et al., 2015; Akdemir et al., 2018):

1- PV output power constraint:

$$P_1(t) + P_5(t) \le P_{pv}(t) \tag{16}$$

2- Wind turbine output power constraint:

$$P_7(t) + P_8(t) \le P_{wt}(t) \tag{17}$$

3- Power balance constraint (P_l is load demand):

$$P_2(t)+P_4(t)+P_5(t)+P_8(t)\le P_l(t) \quad (18)$$

4- Battery state-of-charge constraint (S is battery state-of-charge):

$$S^{\min}\le S(t)\le S^{\max} \quad (19)$$

5- Power flow constraint:

$$0\le P_i(t)\le P_i^{\max} \quad i=1,2,\ldots,8 \quad (20)$$

6- State-of-charge terminate constraint:

$$S(0)\le S(24) \quad (21)$$

Figure 5 shows demand profile of hybrid system through a week. Demand profile measurements started on Tuesday, 3 December, 00.00 am and completed on Monday, 9 December; 11.00 pm. Annual demand profile of hybrid system obtained by assuming weekly demand profile of system is same during the year.

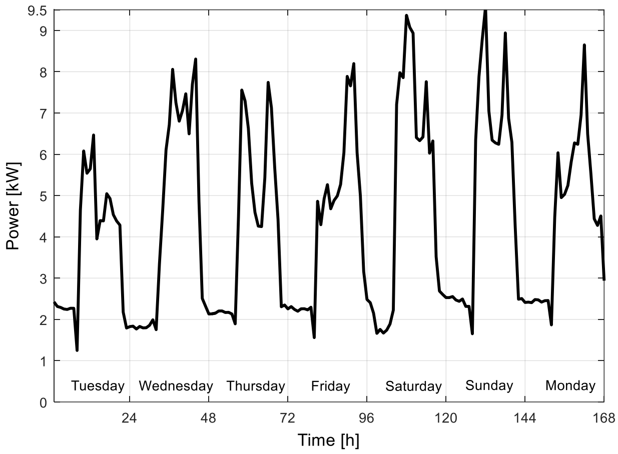

Figure 5. Demand profile of the hybrid system through week

It was assumed that each output of flow (P_i, i= 1, 2...8) has a maximum power with a 15 kW. More information can found about system structure and constraints in Zhou et al. (2015).

3. Results and Discussion

PV output is proportional with solar radiation. Annual total radiation on the surface of PV array with various tilt angle and orientation calculated using Eq. (4) and results shown in Figure 6. According to Figure 6, the annual solar radiation at different tilt angle and orientation varied between 677 kWh/m^2 to 1420 kWh/m^2. It was concluded that the peak total solar radiation more than 1420 kWh/m^2 can achieved with tilt angles between 21° - 31°and orientation from -10° to 12°. Total solar radiation increases gradually until tilt angle and orientation are reach the value of 26° tilt angle and 2° orientation, respectively. Total annual solar radiation value decreased gradually as tilt angle and orientation exceed value of 26° and 2°, respectively. Maximum total solar radiation on PV panel obtained when rotating PV array with an orientation 2° from south to west and tilts angle 26° from horizontal to vertical direction. Maximum annual solar radiation at the optimum tilt angle and orientation measured as 1423578.81 Wh/m^2.

Figure 7 shows output power of PV array (Wh/m^2/year) under different tilt angle and orientation considering radiation and temperature. Annually generated PV outputs at different tilt angle and orientation have a minimum value of 74 kWh/m^2 and a maximum value of 150 kWh/m^2. Moreover, it concluded that optimum tilt angle (26°) and orientation (2°) of radiation and temperature based PV model is same as with the radiation based tilt angle and orientation. Similar to annual total radiation, maximum annual PV output power of radiation and temperature based PV model at the optimum tilt angle and orientation measured as 150912.83 Wh/m^2.

Effect of wind speed on total power (Wh/m^2) also studied and result compared with radiation and temperature based PV output power. Figure 8 shows total power considering radiation, temperature and wind speed. As seen in Figure 8, the total energy values higher compared to Figure 7 because wind speed effect on PV cell temperature did not ignored. Wind speed is inversely proportional with cell temperature and therefore, it increases PV efficiency. Total PV production using radiation, temperature and wind speed data result in changes of optimum orientation and tilt angle. It concluded that maximum annual PV production measured as 155152.84 Wh/m^2 using optimum tilt (27° horizontals to vertical) and orientation (2° from south to west).

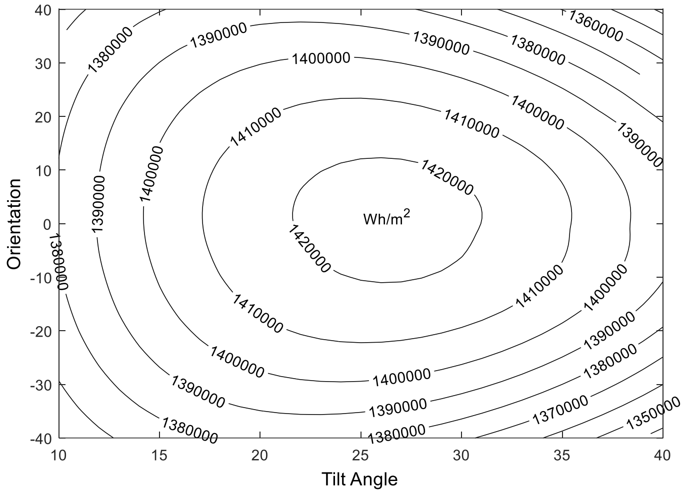

Figure 6. Annual solar radiation on surfaces of PV array under various tilt angle and orientation

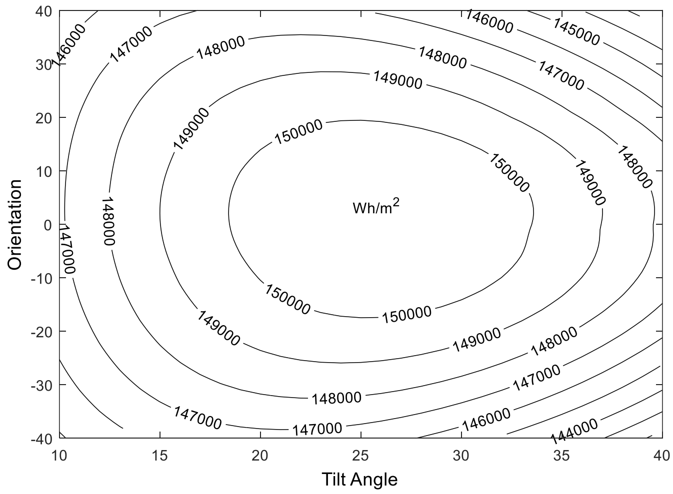

Figure 7. Annual power of PV based on radiation and temperature

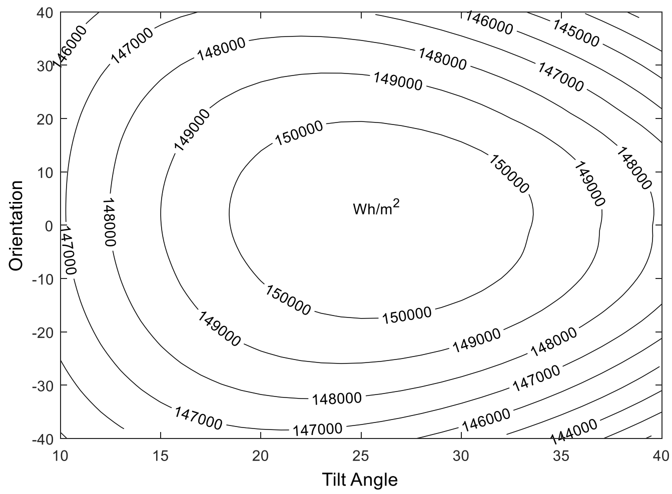

Figure 8. Annual PV output power based on radiation, temperature and wind speed

Economic value based optimization of tilt angle and orientation also investigated based on economic value of produced electricity using linear optimization method. This method performed to find optimum value of tilt angle and orientation by considering economic value approach. The value of tilt angle changed between 0° - 90° and orientation varied from -90° to 90°. These values increased in step of 15° and used for linear optimization method as input parameters. Choosing step of tilt angle and orientation as 15° enabled to use optimization area more effectively. Output of linear optimization method showed that 15° tilt and 30° orientation were suitable values for optimization of economic value of produced electricity. Optimization with an interval of results show that the economic value based optimum tilt angle and orientation are around the 15° and 30°, respectively. Linear optimization method performed second times using in step of 1° for tilt angle and orientation to obtain more results that are accurate. In this case, tilt angle started from 0° until 30° and minimum and maximum value of orientation were 15° and 45°, respectively. Optimization result of economic value variations depending on the different tilt angle and orientation shown in Figure 9. It was proved that that the annual electricity cost as a function of tilt angle and orientation were varied from less than 1650 $ - 1710 $. Optimum economic value achieved when orientation selected as 34° from south to west and tilts angle 9° from horizontal to vertical direction. Minimum electricity cost was calculated as 1633.40228 $ by considering optimum value of tilt angle and orientation.

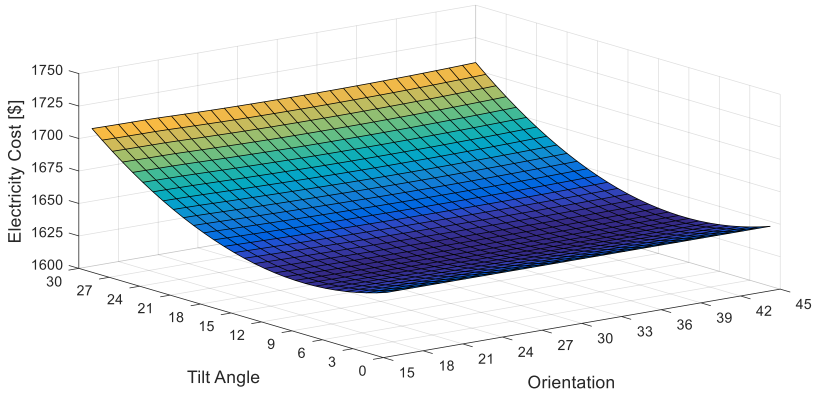

Figure 9. Cost of electricity as a function of orientation and tilt angle

Cost of electricity for a week was also calculated as 110.67684 $ to show advantages of hybrid system. Cost of electricity using hybrid system with optimum parameters (orientation and tilt angle), was founded 31.4116 $. This can be translated as 79.2652 $ cost reduction of electricity compared to system without hybrid system. Hybrid system consisting wind turbine, PV array and battery with shorter payback time of period is possible using optimum tilt angle and orientation of economic value model.

Four different scenario considered and studied in this study. These modelling results confirmed that orientation changed from south to west to optimized PV panel efficiency. Moreover, optimum tilt angle founded on 26° - 27° for combination of wind-PV-battery system modelling and 9° for economic value modelling. Optimization results of economic value modelling might modified depending on demand profile and market price of electricity. Modelling results of economic value based optimization completed using Figure. 5 and Eq. (15). Output results of radiation and PV production obtained for per square meter, therefore, so there are no relation between these results and demand/electricity price.

Modelling results of different scenario under various parameters summarized in Table 2. As shown in Table 2, our results are completely different compared to reference values of tilt angle (41°) and orientation (south = 0°). In other word, our result showed that hybrid PV system is superior over previously announced systems in literature. System that is more effective is possible using proposed model of this study with a value of 2.321%.

Table 2. Optimum positioning results for different scenario

SCENARIO	OPTIMUM POSITION	UNIT	OPTIMUM VALUE	REFERENCE (41°/0°)	DEVIATION (%)
Radiation	26°/2°	kWh/m^2/year	1423.57881	1388.75595	2.507
Rad./Temp.	26°/2°	kWh/m^2/year	150.91283	150.91283	2.417
Rad./Temp./Wind	27°/2°	kWh/m^2/year	155.15284	155.63362	2.321
Economic Value	9°/34°	$/year	1633.40228	1817.30789	-10.119

5. Conclusion (Result and Discussion)

In this paper, we have discussed various aspect of hybrid PV system with different position (orientation and tilt angle). Annual solar radiation, energy generation and economic value of generated energy were calculated using developed model in this study for a one year in Istanbul, Turkey. Input of model are environmental and economic conditions. Optimization results of PV array under different positioning provides to scientists' reference information to build more efficient hybrid PV systems. Four different scheme of PV systems considered to calculation and determination of optimum tilt angle and orientation. These are (1) total solar radiation, (2) PV production based on solar radiation and temperature, (3) PV production based on solar radiation, temperature and wind and (4) economic value and cost of electricity. The purpose of four different scheme was to find influence of electricity markets, demand, wind speed and temperature on optimum PV positioning. Our results indicated that the optimum tilt angle of a wind-PV-battery hybrid system become different when system is connected to the grid compared to tilt angle of maximum PV power and maximum solar radiation scheme. Economic value model studied due to show sustainability of energy, however, for other three models considered to obtain maximum energy and radiation. It expected that results of this study might be a reference and preliminary study for scientist and researcher/engineers to simplify designing and evaluating PV system. Moreover, more effective designing and building of roof with optimum orientation and tilt angle can provide to obtain maximum energy from PV system and thus, reduction of cost of electricity. Optimum tilt angles was founded on 26° - 27° for combination of wind-PV–battery system modelling and 9° for economic value modelling. As for orientation, it changed from south to west to increase output of PV system. It seems that hybrid system efficiency is very low due to deviation between our result and a reference study (2.321% - 10.119%), this gives a significant results and feasible investment as considering life time of PV system more than 20 years. As a future study, this study can be generalize to the national level with lots of local data.

Conflict of Interest

The authors declared no conflict of interest.

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