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Advances in Natural and Applied Sciences

Country Jordan

Subject Area and Category
- Agricultural and Biological Sciences
  - Agricultural and Biological Sciences (miscellaneous)
- Biochemistry, Genetics and Molecular Biology
  - Biochemistry, Genetics and Molecular Biology (miscellaneous)
- Chemical Engineering
  - Chemical Engineering (miscellaneous)
- Engineering
  - Engineering (miscellaneous)

Publisher American-Eurasian Network for Scientific Information Publications (AENSI)

Publication type Journals

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Coverage 2009-2012 (cancelled)

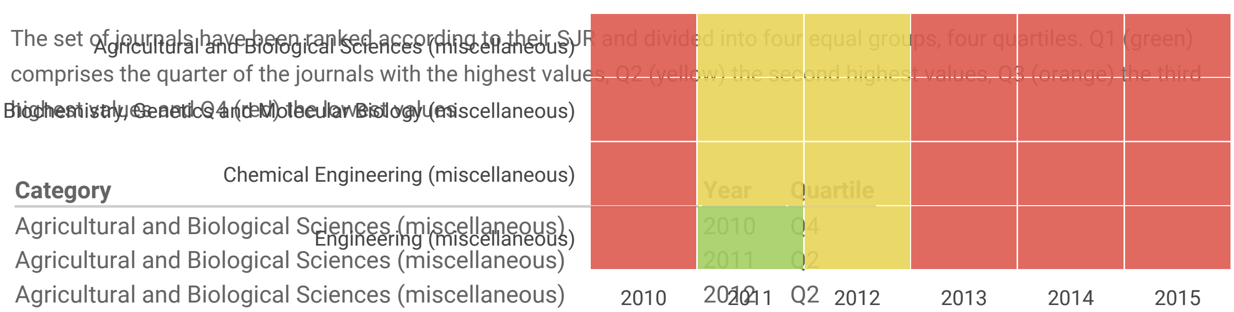
16

H Index

Quartiles

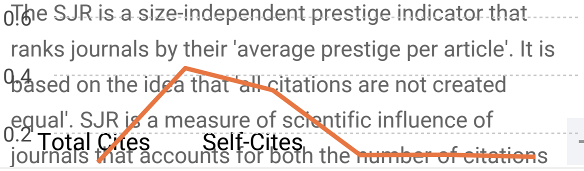
The set of journals have been ranked according to their SJR and divided into four equal groups, four quartiles. Q1 (green) comprises the quarter of the journals with the highest values, Q2 (yellow) the second highest values, Q3 (orange) the third highest values and Q4 (red) the lowest values.

Category	Year	Quartile
Agricultural and Biological Sciences (miscellaneous)	2010	Q4
Agricultural and Biological Sciences (miscellaneous)	2011	Q2
Agricultural and Biological Sciences (miscellaneous)	2012	Q2



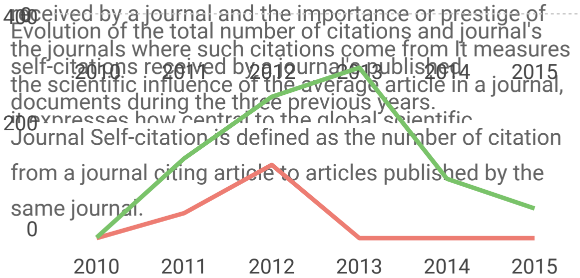
SJR

Citations per document



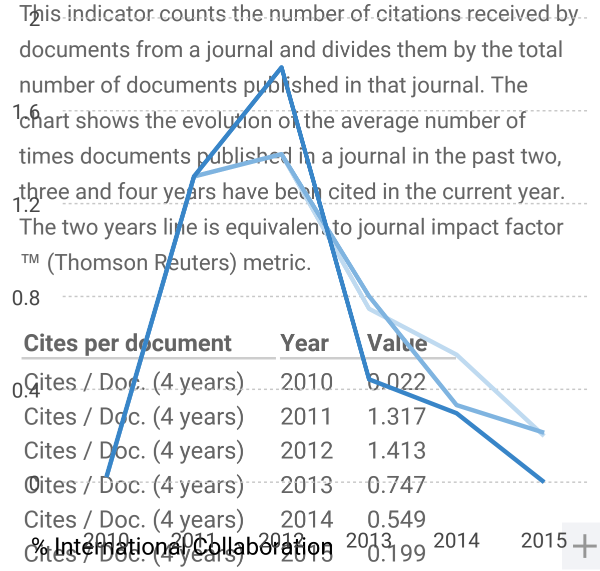
The SJR is a size-independent prestige indicator that ranks journals by their 'average prestige per article'. It is based on the idea that 'all citations are not created equal'. SJR is a measure of scientific influence of journals that accounts for both the number of citations received by a journal and the importance or prestige of the journals where such citations come from It measures the scientific influence of the average article in a journal, it expresses how central to the global scientific

Total Cites Self-Cites



Evolution of the total number of citations and journal's self-citations received by a journal's published documents during the three previous years.
Journal Self-citation is defined as the number of citation from a journal citing article to articles published by the same journal.

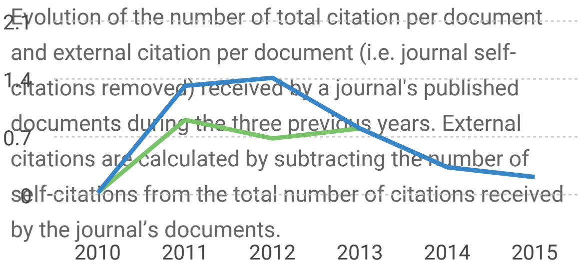
Cites	Year	Value



This indicator counts the number of citations received by documents from a journal and divides them by the total number of documents published in that journal. The chart shows the evolution of the average number of times documents published in a journal in the past two, three and four years have been cited in the current year. The two years line is equivalent to journal impact factor ™ (Thomson Reuters) metric.

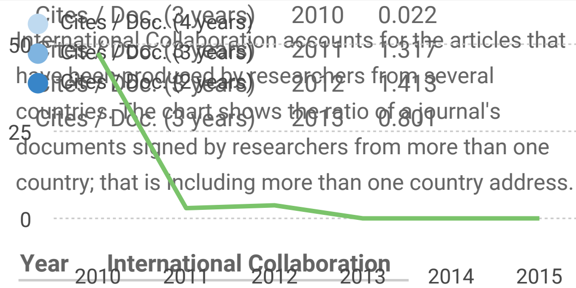
Cites per document	Year	Value
Cites / Doc. (4 years)	2010	0.022
Cites / Doc. (4 years)	2011	1.317
Cites / Doc. (4 years)	2012	1.413
Cites / Doc. (4 years)	2013	0.747
Cites / Doc. (4 years)	2014	0.549
Cites / Doc. (4 years)	2015	0.199
Cites / Doc. (3 years)	2010	0.022
Cites / Doc. (3 years)	2011	1.317
Cites / Doc. (3 years)	2012	1.413
Cites / Doc. (3 years)	2013	0.801

External Cites per Doc Cites per Doc



Evolution of the number of total citation per document and external citation per document (i.e. journal self-citations removed) received by a journal's published documents during the three previous years. External citations are calculated by subtracting the number of self-citations from the total number of citations received by the journal's documents.

% International Collaboration



International Collaboration accounts for the articles that have been produced by researchers from several countries. The chart shows the ratio of a journal's documents signed by researchers from more than one country; that is including more than one country address.

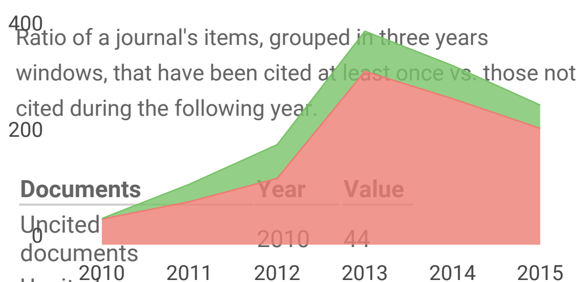
Year	International Collaboration
2010	47.46

Citable documents Non-citable documents

Not every article in a journal is considered primary research and therefore "citable", this chart shows the ratio of a journal's articles including substantial research (research articles, conference papers and reviews) in three year windows vs. those documents other than research articles, reviews and conference papers.

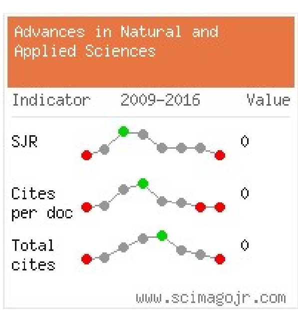
Documents	Year	Value

Cited documents Uncited documents



Ratio of a journal's items, grouped in three years windows, that have been cited at least once vs. those not cited during the following year.

Documents	Year	Value
Uncited documents	2010	44
Uncited documents	2011	74



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Measurements of Wind and Solar Energies in Najaf, Iraq

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ABSTRACT
A modern new technology weather station is implemented in this work to address the weather dry bulb temperatures (DBT), solar intensity and wind speed in Najaf city (Iraq 44 °E, 31° N) over a period of one year from April 2015 to March 2016. The investigation covers Wind speed, solar radiation and dry bulb temperatures (DBT). Meteorological data are illustrated from continuous collecting over one year. Where the results showed that the temperatures distribution in Najaf city has a trend of excessive increase during the summer, it could be the highest in the Middle East. Same thing is observed regarding to the solar energy, where the global radiation recorded the highest level according to the collected data and NASA SSE model. On the other side, the wind speed over one year did not record considerable level and thus, utilizing solar energy in Najaf city is worthy to be considered rather than investing based on wind speed.

KEYWORDS: Solar energy, wind speed , Middle East weather, Weather station

INTRODUCTION

In the last decades, seeking an alternative energy sources has become a serious challenge that many researchers and organization have been trying to defeat. The most investable energy source is the solar energy by direct sun light heat or utilizing photovoltaic (PV) system. The precise forecast prediction has many advantages of optimizing the method for investing the solar energy. For instance, using PV system with its higher performance efficiency requires precise forecast and clear weather environments [17], [20], [21], [13], [14]. Moreover, even though PV system is supposed to operate better with high solar intensity, however it has been proven that PV system performance decreases when the DBT increases excessively [15], [16], [18]. One more advantage of obtaining accurate weather forecast is to precisely estimate the optimal saving energy and reducing consumption in the building industry, in addition to heating and cooling loads calculations [12]. Some locations on the planet have long sunshine hours and some have very short sunshine hours. Iraq is one of the spots which has significantly long sunshine hours where Iraq receives about 3000 hours of global radiation within a year for one city, namely Baghdad, where the solar radiation is within range of 416W/m ^{2} in January and 833W/m^2 in June [1]. First studies about estimating global solar radiation in Iraq used theoretical and experimental based calculations [2]. The solar energy utilization by using tremble walls during winter in Iraq is confirmed by [5], [6]. Chaichan [7] successfully showed that solar energy can be stored in salt gradient ponds to be utilizing for the building warming. It is crucial to precisely present an accurate data measurements to evaluate the ability of implementing solar energy in Iraq [8]. On the other hand [9] presented a mathematical representation that correlated humidity, DBT and solar radiation over a period, where the correlation is reported to be accurate in the assessment of solar radiation. Furthermore, the solar map is illustrated for the entire area of

Iraq by collecting data from 24 weather station all over the country [10]. Many other studies a thorough literature review can be found in [4], [3]. Many researchers have conducted studies that investigate the wind energy in Iraq, where 23 stations are used for the investigation, and the collected data showed that the wind velocity reaches its maximum reading in the morning and the mid-day which varied in range of 5 to 10 m/s. Trend of wind velocity tends to be higher during summer [11]. In this paper we specify the weather characteristics for Najaf city in Iraq by using modern technology represented in (Davis) weather station to accurately specify the possibility of practically using solar or wind energy and the associated challenges. This work will continue forward to address the problem of low efficiency for the PV systems that has been used in Iraq, specially the region which is subjected to excessive temperature increase during summer.

II. Experimental Setup, Procedure And Uncertainty:

In this work a weather station is implemented where the weather station (Davis) is installed at 10 m from the ground in the building of Engineering Technical College in the city of Najaf in Iraq (44 ºE, 31 ºN), where the data was collected over a period of year starting from April 2015 to March 2016. The Davis weather station is shown in Fig. (1-a) and the specifications of Davis weather station are shown in table (I), and the data are collected and displayed every 10 minutes using Vantage Pro2 as shown Fig. (1-b).

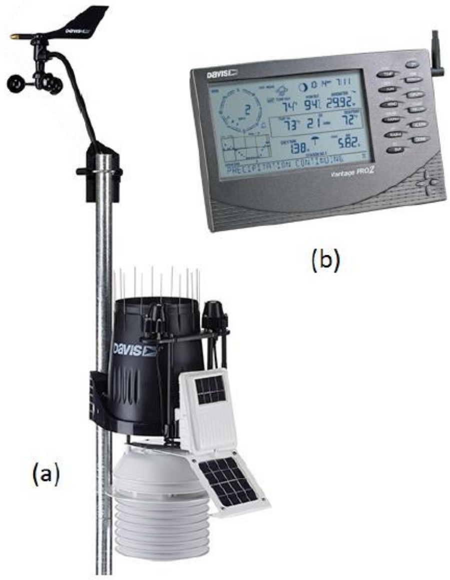

Fig. 1: (a) Davis weather station and (b) Vantage Pro2

The DBTs, solar radiation, relative humidity and wind speed of air are measured where the measurements were performed by using the mentioned instruments with their respective sensitivities. Uncertainties of the measured parameters following the procedure given in [22]. The uncertainty values of the experimental data for the base system using the above procedure with details given in table I are summarized in Tables II.

Table I: Specification Of The Weather Station Davis

Item	Specifications	Details
Barometric Pressure	Resolution and Units	1 W/m2
	Range	0 to 1800 W/m2
	Range	410 to 820 mm Hg
	Update Interval	50 seconds to 1 minute (5 minutes when dark)
	Temperature Coefficient	-0.12% per oC; reference temperature = 25 oC
Solar Radiation	Resolution and Units	0.01” Hg, 0.1 mm Hg, 0.1 hPa/mb (userselectable)
	Range	410 to 820 mm Hg
	Accuracy	±0.3%
Wind	Resolution and Units	0.4 m/s
	Range	0 to 89 m/s
	Update Interval	2.5 to 3 seconds
	Accuracy	±0.5%
Temperature	Resolution and Units	0.1 oC
	Range	-40 o to +65 oC
	Update Interval	10 to 12 seconds
	Accuracy	±0.3%

Table II: Uncertainty For Experimental Results.

Measured parameters	Mean value	Total uncertainty value	Total uncertainty (%)
Ambient DBT, ºC	45	±0.8	±0.12
Ambient relative humidity, %	10	±0.5	±1.6
Solar radiation, W/m2	1000	±5	±6.5
Wind speed, m/s	1.3	±0.6	±7.2

RESULTS AND DISCUSSION

It obvious from the data measured by the weather station, the daily minimum, maximum and mean DBT as well as maximum and mean global radiation are higher during summer time and lower during winter. Figures (2) trough (8) show the daily minimum, maximum and mean DBT and maximum and mean global radiation as well as the wind speed over a period of one year starting from April 2015 to March 2016. Figure (2) shows the yearly variations in DBTs, and when the solar radiation is almost 921 W/m2 the corresponding maximum temperature was 50.4 ºC during summer. On the other hand, the collected data shows that the daily maximum DBT was 50.4 ºC recorded on July 30th. Whereas, monthly average DBT was recorded as 42.2 ºC on July 15th and on 29 January is the date where the minimum DBT was recorded as 0.9 ^{0}C. Figure (3) illustrates daily and monthly DBT variations over each month. In July both maximum monthly average daily (39.9 ºC) and maximum daily (50.4 ºC) DBTs are recorded. Whereas in January the minimum average monthly DBT was 0.9 ºC.

The daily maximum radiation intensity (1071 W/m^2) was recorded on May 10th as shown in Fig. (4), whereas highest daily average solar radiation of 587 W/m^2 was recorded on Jun 8th. Daily mean solar radiation values were high during the period of 4 April -5 December. Average daily energy input for the whole year was 27.17 KWh/m ^{2}/day, which agrees with the global solar map for Iraq cities [1]. Figure (4) also shows downward excursions in winter, especially in January and December. These excursions can be explained as a result of the dust storms, rainy weather and higher air mass in winter where the unclear sky weather reduces the absorption of solar radiation on ground. Figure (5) shows the Daily averages for each month in addition to peak daily global solar radiations for the complete year. The highest monthly average daily radiation (514 W/m^2) was recorded in Jun, whereas the highest daily peak (1071W/m^2) was recorded in May. On the other hand, the lowest monthly average daily solar radiation of 352 W/m^2 was recorded in October and the monthly average mean values of global solar radiation are less than 5% which shows that the seasonal variation of the mean values is significant. Next we compared our measurements of the monthly mean daily values of global solar radiation for Najaf (KWh/m ^{2} day) with the larger time-series data of the NASA SSE model [23] as shown in Fig. (6). Our measurements data agree with that of the NASA SSE model with slight deviation which supports our results.

According the data presented by NASA SSE model and data measured by Davis weather station, the annual mean global radiation as well as DBT for Najaf are one of the highest among the other Middle East cities. That is obviously observed in Figs. (2) through (5), where in general, high DBT implies high solar radiation. The effect of wind speed is rarely considered since there is lack of aggregated data presented. However, wind speed is crucial parameter to be considered when study the performance of PV system [26], [27]. The study of characteristics of wind speed is important research tasks in wind engineering [25]. It is worthy to mention that in most recent studies that deal with estimating/predicting the operating cell temperature do not the effect of wind in cooling, rather, it is limited to DBT and radiation intensity [24]. Figure (7) illustrates various DBT min. and max. levels and average wind speed over one complete year period.

The highest daily maximum and monthly average wind speed are 16.3 m/s and 4.9 m/s on 30th of August and 18th of January, respectively. Whereas the minimum wind speed was recorded as 0.2 m/s on 26th of May. Figure (8) shows the average daily wind speed variations over monthly in addition to various wind speed levels, namely max. and min speeds. The highest maximum daily wind speed was 10.34 m/s and average daily wind speed was 3.24 m/s which was recorded in July. On other hand, in November the wind speed is recorded as 0.44 m/s as monthly minimum.

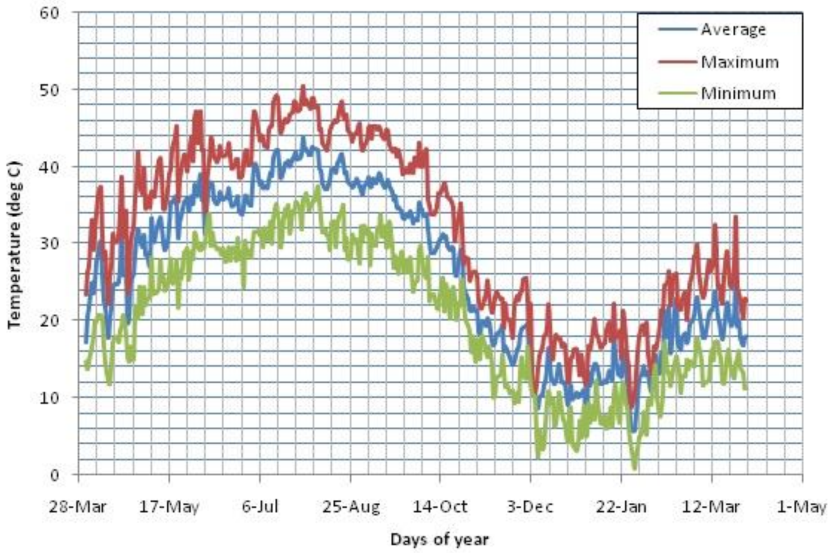

Fig. 2: Monthly maximum, minimum and average ambient temperature over one year.

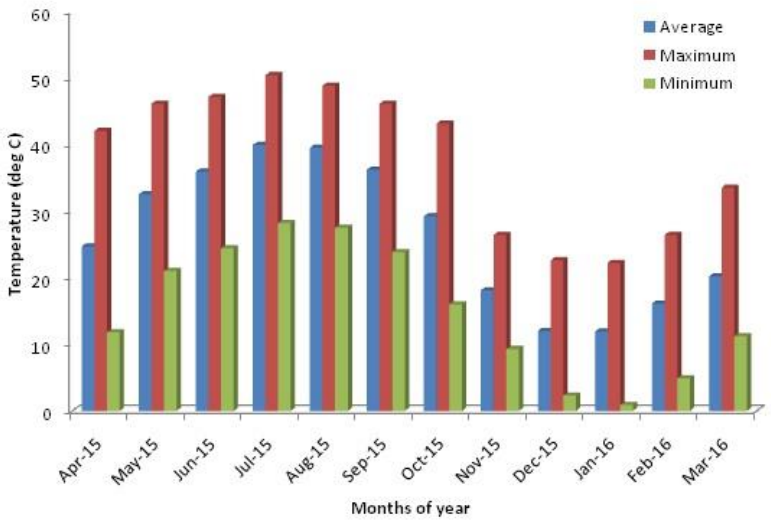

Fig. 3: Monthly maximum, minimum and average ambient temperature.

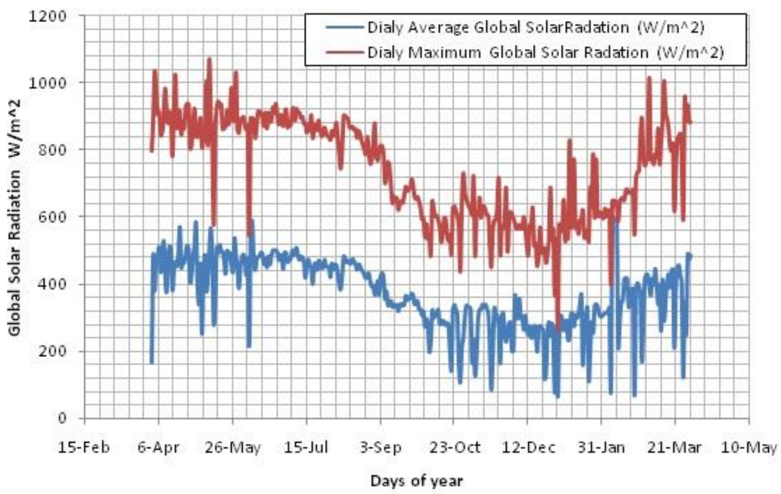

Fig. 4: Monthly maximum and average global solar radiation over one year

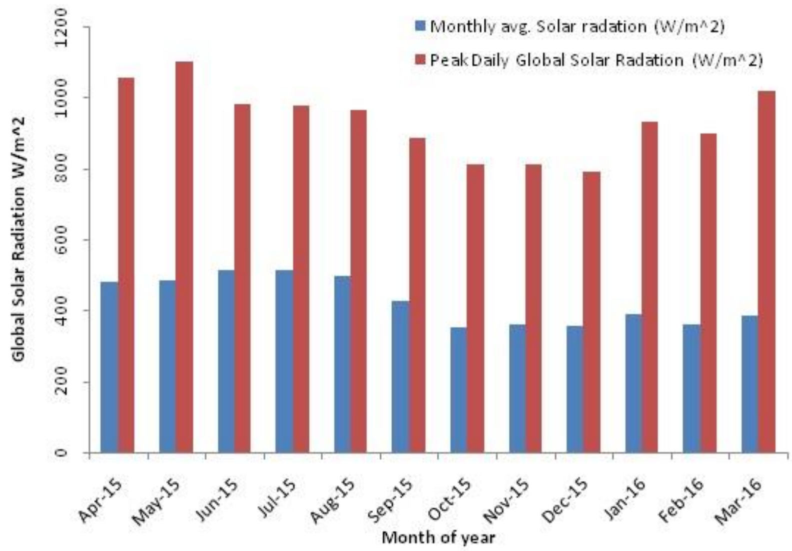

Fig. 5: Monthly maximum and average global solar radiation.

Fig. 6: Solar radiation comparison with NASA SSE model.

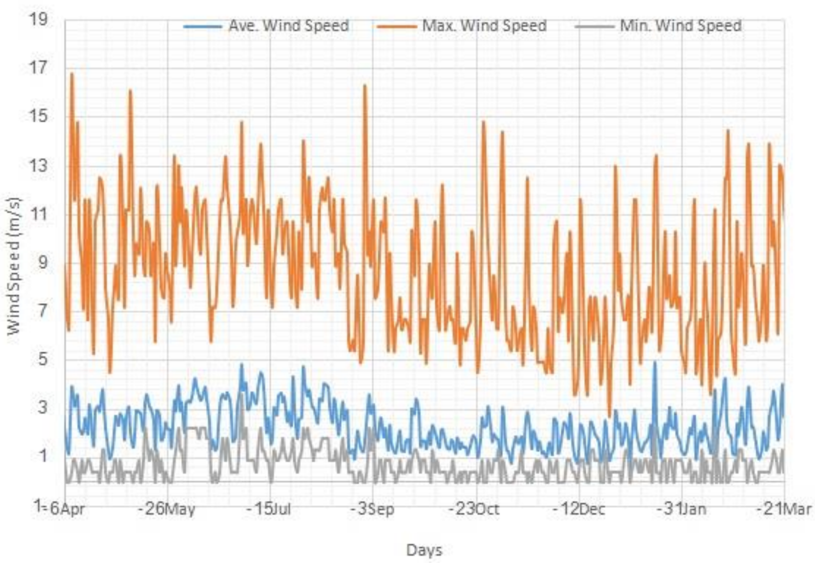

Fig. 7: Monthly maximum and average global solar radiation.

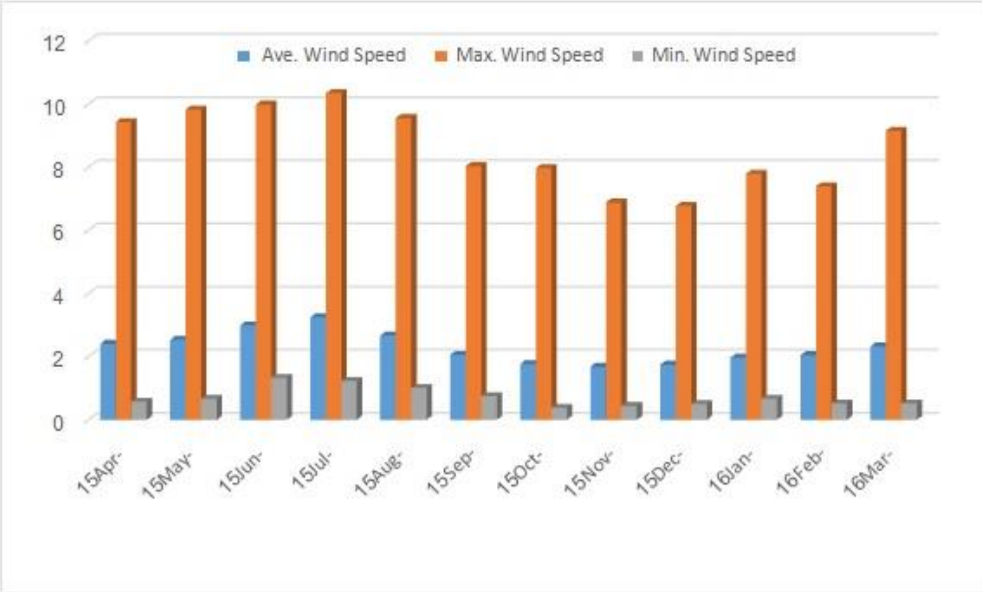

Fig. 8: Monthly maximum, minimum and average wind speed over one year.

Conclusions:

This work presents a study about the weather characteristics, wind speed and global solar radiation over one year (April 2015 to March 2016) in Najaf city in Iraq. Where meteorological data are measured by using modern advanced technology represented by (Davis) weather station. The collected data showed that the amount of solar energy in Najaf city is more significant and utilizable than the wind energy. The results showed that average solar intensity over for daily data is higher within the period April-August and lower over the winter. The maximum daily average solar intensity was recorded on June-8 as 587 W/m^2, whereas in May-10 it was recorded as 1071 W/m^2, both values match the solar radiation map for Najaf city. Also, in Najaf city the max. DBT temperature exceeds 50 ^{o}C during summer and peak daily maximum and monthly average DBT were 50.4 ^{o}C and 42.2 ^{o}C on July 15th and 30th respectively. The results showed good agreement with the NASA SSE model for the weather forecasting. The highest daily maximum and monthly average wind speed were 16.3 m/s and 4.9 m/s on 30th of August and 18th of Jan, respectively whereas, the minimum wind speed was recorded 0.2 on 26th of May. The results can be implemented for the future recommendations about using wind energy or PV systems since the excessive temperature increase plays crucial role in using renewable energy, this issue lies in the scope of our future work.

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