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TOO MANY OUTAGES WITH EVER INCREASING TARRIFF: SOLAR ENERGY ALTERNATIVE FOR ILALE-KEJI, OWO, ONDO STATE, NIGERIA

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Abstract

The ever increase in tariff and frequent power outages at Ilale-keji in Owo local government of Ondo state necessitated this research. The frequent power outage started several years in most part of the area. Presently, a section of the area has not been supplied for over a year now due to the damage of the distribution transformer in the area. Ignorantly, inhabitants are contributing money to fund the procurement of another transformer for the electricity company operating in the area. The researcher saw the need to provide an alternative power supply for the residence of this area. Considering various alternatives, solar energy was adjudged the best due to the abundant sun radiation available in this area. The voltages produced by a 100Watt solar panel had been observed and recorded for a period of twenty-six weekends. The highest amount of voltage recorded was 22.13V while the lowest was 21.29V. A bar chart was used to illustrate the average voltages recorded per weekends. A pie chart was used to represent the percentage of students that left home during examination periods and those that do not leave home. It was found that 58% of the students relocated during examination period while 42% didn't relocate. Questionnaire were issued to 50 students in other to know their grades.

(Keywords) index Terms: Energy, Outages, Panel, Power, Radiation, Solar, Sun, Tariff, Transformer, Voltages.

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Introduction

The need to search for alternative and renewable source of power supply for Ilale-keji area in Owo local government of Ondo state is very important at this time. Solar power supply is very reliable in Nigeria. Nigeria is blessed with the abundance of solar radiation throughout the year (Abdullahi et al 2017). It is essential that this priceless resource used appropriately and efficiently in all spheres of life as a result of the rise in the intensity of solar radiation reaching the planet (Adagunodo et al 2022). Any country with sustainable mechanisms should be able to satisfy the future rise in energy demand without expanding its dependency on non-renewable resources via energy mix, conservation and renewable energy source (Sanni et al 2019). Due to irregular power supply in some area and non-supply of power to some areas within the community, several ugly and abnormal events had occurred. Reports of burglary during night and day were heard on every meeting of the landlords. House burglary would have been checked or reduced if there is regular power supply. The use of CCTV camera would have been possible if there is regular power supply. Also, surveillance by the security agents would be better at night if power is available. Access to information is a problem at Ilale-keji as electronics devices such as phone, radio, television set among others cannot be charged regularly and connected to power source. Due to economic hardship few people that have generating set cannot afford to buy fuel. Vacated houses are noted in the community, this is so due to unavailable power supply. Many house owners will relocate if urgent step is not taking to provide an alternative power supply to Ilale-keji community. It had been noticed that students most especially those in the post primary level left their parents' home and relocated to relations homes during examination period. Those who did not relocate are noted not to perform well in their examinations, they rarely get 'C' grade in their examinations. This information was obtained through interaction and use of questionnaire with fifty students within the community.

The peak sun hour in Ilale-keji is not less than eight hours but due to variability in sun's irradiance a value ranging between 4.8 to 5 hours is used during design of solar systems. The use of Photovoltaic system is a non-inertia source (Kaleem et al 2024). It does not require any external source for it to start working. The net power of the photovoltaic system is influenced by several elements such as panel efficiency, ambient temperature, sun irradiance and panel size (Alam et al 2020). Photovoltaic PV output can be influenced by climate change (Hui-min et al 2024). Solar irradiance contributes the most to solar PV output (Jessa et al 2023). The quantity of sun's energy that gets to the PV panel determines the amount of energy it will produce based on its capacity. Solar variability corresponds to strong variation of the solar irradiance caused mainly by the cloud (Monica et al. 2022). Solar PV output cannot be constant throughout the day, but on the average, it must be given a high percentage of its capacity before it can give a consistent voltage

that will ensure a stable solar power supply. The ability of power system to keep a consistent voltage at all buses in the presence of a disturbance is known as voltage stability. The risk of voltage instability in the power system networks has been identified as a key issue in the design and operation of the power system (Ibrahim et al 2023). Under partially shaded conditions, the single cell and parallel modules exhibit a decrease in output current (Xiaoxue et al 2022). A good solar design procedure will guarantee an efficient solar power system as enough tolerance is needed in the determination of solar devices capacities. Despite the advances in PV (photovoltaic) and concentrated solar power system CSP (concentrated solar power) systems, inappropriate planning and design could impede the extensive penetration of solar energy (Joshua et al 2024). Issue of increasing the efficiency in photovoltaic systems has become the focus of many manufacturers, developer and researcher in the field of solar energy to find ways to increase their efficiency (Al-AdlamI et al 2018).

The use of solar power is environmentally friendly it has no emission, no moving part or rotating part and it is cost effective. Renewable energy is good for the planet as it helps in reducing excessive pollution and brings social cohesion as well (Al-Adlami et al 2018). Lastly, among the various EH (Energy Harvesting) sources, solar energy is an appealing energy resources because of its renewability, flexibility, diversity, abundance and low-cost implementation (Pay et al 2023).

PROBLEM STATEMENT

It was noted within Ilale-keji area in Owo local government of Ondo State that public supply of electricity had irregular with ever increasing in the tariff from the distribution company. Due to this irregular power supply there has been increase in the robbery attack at night in this area.

OBJECTIVE

The objective of this paper is to ascertain the prospect of solar energy as an alternative source of power supply to Ilale-keji in Owo local government, Ondo state, Nigeria. Also, it reveals the importance of solar energy supply over the public power supply to this area.

RESEARCH QUESTIONS

The research questions are as follows;

- Why are people unable to pay the monthly electricity bill on regular basis?
- Why the frequent looting and robbery in Ilale-keji Owo local government area?
- Why are the students in the study area not performing well in their examinations?

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Study Area

The study was carried out in Ilale-keji, Owo local government, Ondo state, Nigeria. The community is within Owo , the headquarter of Owo local government which lies between latitude 7^{o} 15^{1}N and longitude 5^{o} 35^{1}E and it is about 150 metres above sea level (Malumi et al 2016).

Data Collection methods

This study depends on primary data as obtained from the measurement of voltage produced on hourly basis by the 100Watt solar panel for a period of twenty-six weekends. Also, questionnaires were used to determine the effects of frequent power outages on fifty post primary students that offer nine subjects in the area. Fifty copies of questionnaires were distributed to fifty students. There are only three questions. These are as follows:

DATA COLLECTED AND RESULTS ANALYSIS

A) Solar Panel's Voltage Reading

Data were collected for twenty-six weekends using a Voltmeter and a 100 W solar panel

Statistical Tool

The average value of the data collected for twenty-six weeks were calculated and represented on the bar chart.

TABLE 1: AVERAGE VOLTAGES FOR 26 WEEKENDS

PERIOD	AVERAGE VOLTAGE
Weekend 1	21.57
Weekend 2	22.13
Weekend 3	21.89
Weekend 4	21.54
Weekend 5	21.54
Weekend 6	21.34
Weekend 7	21.53
Weekend 8	21.58
Weekend 9	21.63
Weekend 10	21.29
Weekend 11	21.49
Weekend 12	21.74
Weekend 13	21.76
Weekend 14	21.60

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PERIOD	AVERAGE VOLTAGE
Weekend 15	21.53
Weekend 16	21.59
Weekend 17	21.61
Weekend 18	21.53
Weekend 19	21.60
Weekend 20	21.54
Weekend 21	21.67
Weekend 22	21.30
Weekend 23	21.41
Weekend 24	21.39
Weekend 25	21.31
Weekend 26	21.66

From the table, the average recorded was not less than 21 volts, hence solar power would be reliable in the community.

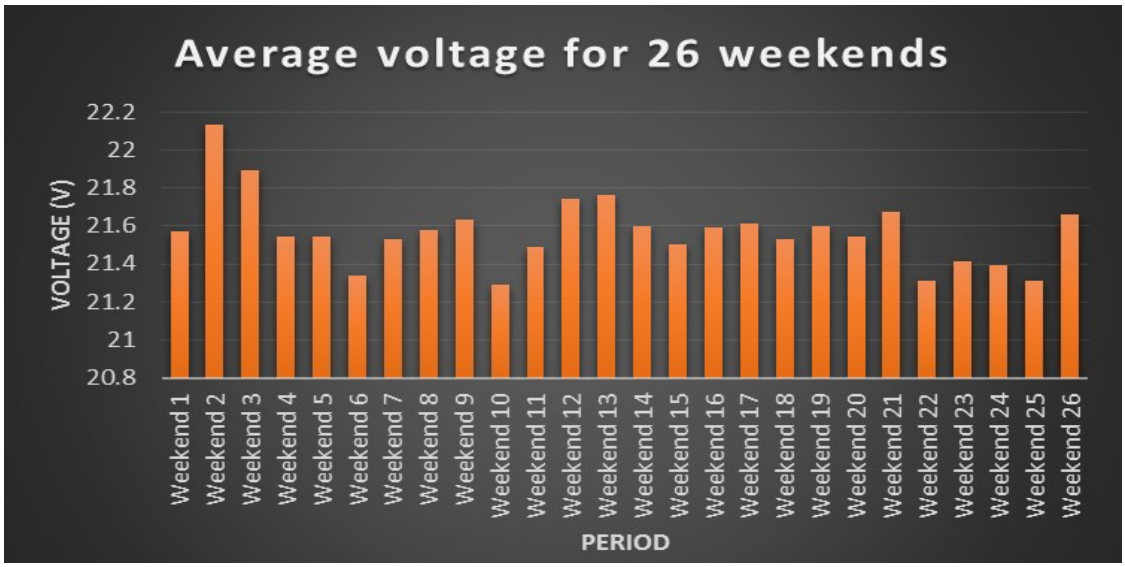


Figure 1: Bar chart showing the average voltages recorded for 26 weekends

This bar chart illustrated that the potential of solar power supply is high in this community as the least voltage generated is not less than 21 volts.

B) Questionnaire data

Information from the questionnaire will be used to draw two pie charts, these pie charts will reflect the percentage of the students who relocated and those who didn't relocate

during examination periods. Also, the other pie chart will illustrate the percentage of every grade scored by the students. Fifty students were given the questionnaire.

Questionnaire Analysis 1

Those who relocated due to electricity outage = 29

Therefore, $\frac{29}{50} \times 100$

$= 58\%$

Also,

$\frac{58}{100} \times 360^{o}$

$= 208.8^{o}$

While,

Those who didn't relocate due to electricity outage = 21

Therefore, $\frac{21}{50} \times 100$

$= 42\%$

Also,

$\frac{42}{50} \times 360^{o}$

$= 151.2\%$

Statistical Tools

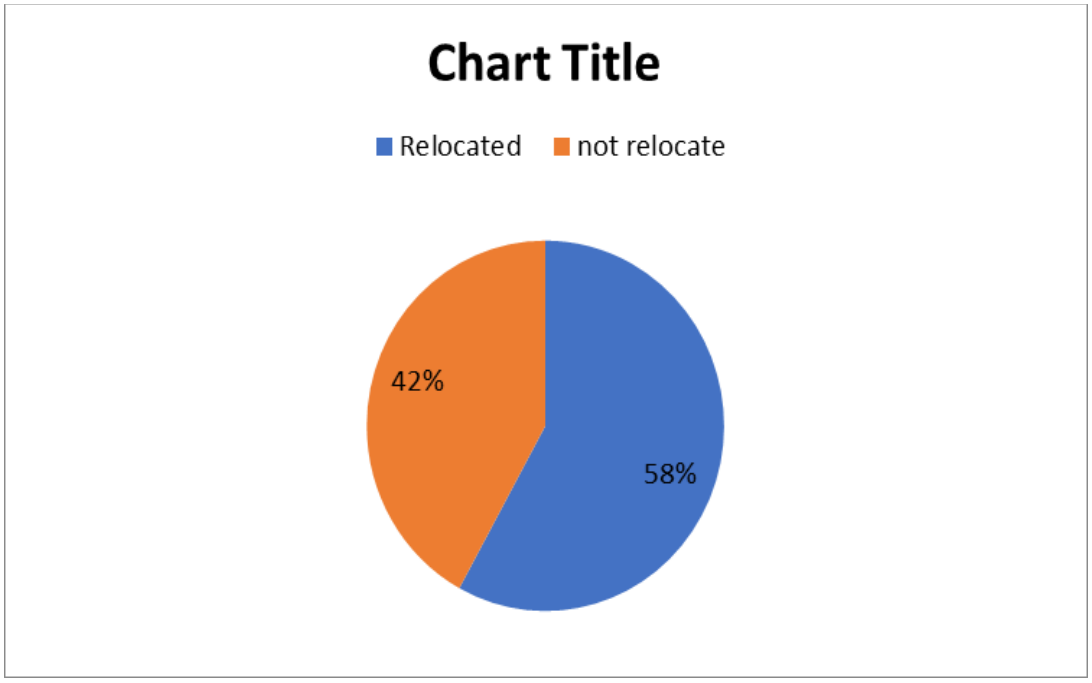


Figure 2: Pie chart showing percentage of the students who relocated and those that didn't relocate

The pie chart indicated that the irregular power supply has adverse effect on students as 58% of them relocated.

Questionnaire Analysis 2

Number of grades scored by 50 students offering nine subjects each i. e. $9 \times 50 = 450$ different grades

A grade = 43

B grade = 52

C grade = 99

D grade = 120

E grade = 102

F grade = 34

For 'A' grades = $\frac{43}{450} \times 100$ = 9.6%

Hence, $\frac{9.6}{100} \times 360^{o}$ = 34.56^{o}

For 'B' grades = $\frac{52}{450} \times 100$ = 11.6%

Hence, $\frac{11.6}{100} \times 360^{o}$ = 41.76^{o}

For 'C' grades = $\frac{99}{450} \times 100$ = 22%

Hence, $\frac{22}{100} \times 360^{o}$ = 79.2^{o}

For 'D' grades = $\frac{120}{450} \times 100$ = 26.6%

Hence, $\frac{26.6}{100} \times 360^{o}$ = 95.76^{o}

For 'E' grades = $\frac{102}{450} \times 100$ = 22.6%

Hence, $\frac{22.6}{100} \times 360^{o}$ = 81.36^{o}

For 'F' grades = $\frac{34}{450} \times 100$ = 7.6%

Hence, $\frac{7.6}{100} \times 360^{o}$ = 27.36^{o}

Statistical Tools

Table 28: Student's grades versus percentage

GRADE	PERCENTAGE
A	**9.6%**
B	**11.6%**
C	**22%**
D	**26.6%**
E	**22.6%**
F	**7.6%**

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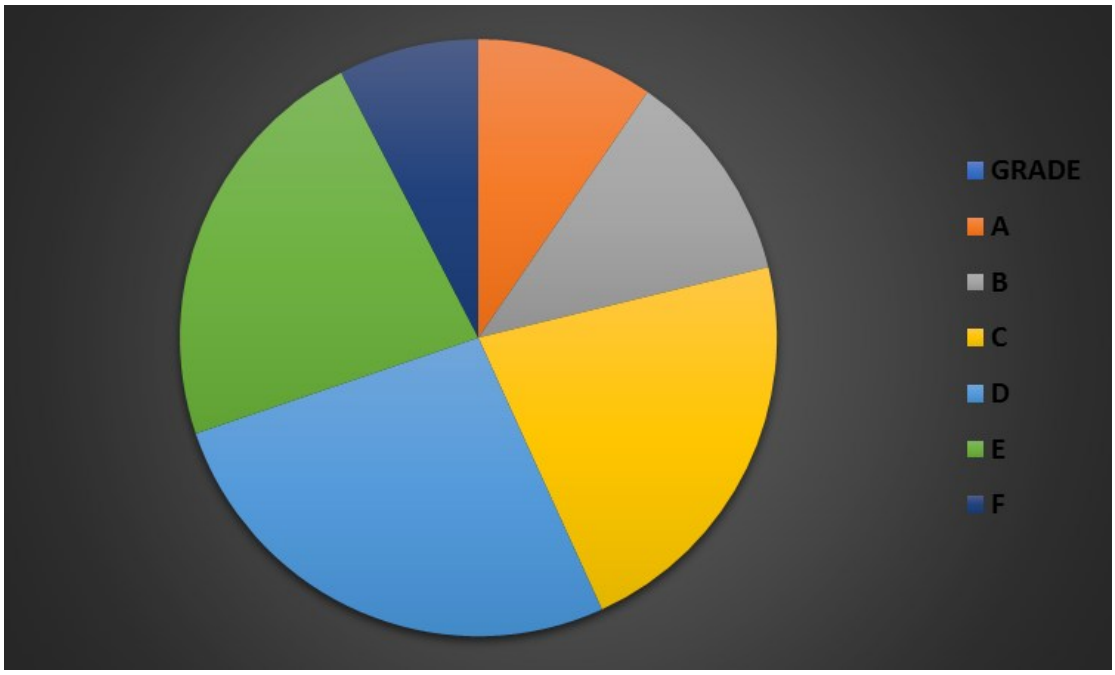


Figure 3: Pie chart showing different grades scored

The pie chart indicates that most of the students in this area scored grade 'C' and 'D'

DISCUSSION OF THE RESULTS

It is obvious from the bar chart that the average voltage recorded for the period of twenty six weekends were not less than 21 V. this reveals that the use of solar energy as an alternative source would be feasible. The highest average voltage reading was 22.13 V while the lowest reading was 21.29 V.

Also, the percentage of the students that relocated during examination was 58% representing 208.8° on the pie chart (figure 2) while those that didn't relocate was 42% percent represented as 151.2° on the pie chart. On the figure 3, the number of students that scored 'A' was represented by 34.56° equivalent to 9.6%,'B' was represented by 41.76° equivalent to 11.6% ,'C' was represented by 79.2° equivalent to 22% ,'D' is represented by 95.76° equivalent to 26.6%,'E' is represented by 81.36° equivalent to 22.6% and 'F' is represented by 27.36° equivalent to 7.6%. A larger population of the students scored grade 'D' due to irregular supply and non-supply (in some areas) of electricity to the area of study.

CONCLUSION

Base on the available statistics, Ilale-keji community has the potential for harvesting solar energy for her power supply and other energy needs. Most of the problems such as burglary, students' relocation during examination periods among others would be

averted if solar power supply is available for the residence of the community. The use of CCTV camera would be possible as regular solar power supply will make it reliable. Also, students will no longer relocate during examination periods. Security men would be able to see distant locations better at night. Solar energy supply would cut down the cost of living as water pumping and food cooking would be carried out with solar power.

RECOMMENDATION

In order to make life easy for the residence of Ilale-keji community;

- I recommend the use of solar power supply so that problems of insecurity and students' location during examination periods would be stopped. Students in the community will record better academic success if solar power supply is available.
- I recommend a joint community based solar powered lighting project that will cover the whole community.
- The use of individual solar powered CCTV camera is also recommended.
- Lastly, I recommend the use of small capacity solar system for small household that cannot afford a higher capacity solar system.

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