Energy Audit Report

Dayanand Education Society's

Dayanand College of Pharmacy

Barshi road, Latur Dist. Latur, Maharashtra - 413531

Energy Audit Conducted by

KEDAR KHAMITKAR & ASSOCIATES

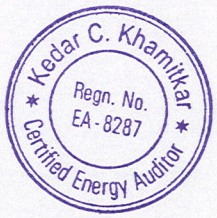
Empanelled Consultant Mahaurja, Govt. of Maharashtra Institution

M: 9850244701 Email. : urjabachat@gmail.com

Energy Audit Completion Certificate

This is to certify that following utility has been carried out Building Energy audit as per Guidelines of MEDA (Government of Maharashtra Institution)

Name of Institute	Dayanand College of Pharmacy
Details of Facilities Audited	All departments, Library, Class room etc.
Duration for which Energy Audit has been conducted	April 2016 to March 2022
Name of Energy Auditor	Kedar Khamitkar
Certificate No.	EA 8287



Kedar Khamitkar

- Energy Auditor, Certified by Bureau of Energy Efficiency, Ministry of Power, Govt. of India
- Empanelled Consultant MAHAURJA , Govt. of Maharashtra Institution

Energy Audit Analysis Report

K.K. & Associates CEA team has been Conducted Detailed Energy Audit of **M/s Dayanand College of Pharmacy** Building Located at Latur- District Maharashtra

During Energy Audit We have found Environmental Consciousness and Sustainability initiatives in their Campus.

1. Percentage of Annual Power requirements met through Renewable Energy Sources Current year data is **75**%
2. Percentage of Annual Lighting power requirement met through LED Bulbs (Current Year Data) = **65** %

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Preface

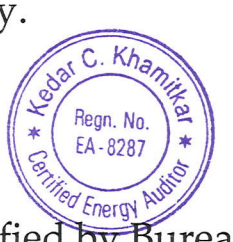
An energy audit is a study of a Building or facility to determine how and where energy is used and to identify methods for energy savings. There is now a universal recognition of the fact that new technologies and much greater use of some that already exist provide the most hopeful prospects for the future.

Data collection for energy audit of the Dayanand College of Pharmacy Institute was conceded by EA Team for the period of 8th April 2022 to 20th April 2022. This audit was over sighted to inquire about convenience to progress the energy competence of the campus.

All data collected from each Classroom, Library, and Laboratory etc. The work is completed by considering how many Tubes, Fan, A.Cs, Electronic instruments, etc. in each room. How much was participation of each component in total electricity consumption.

Acknowledgement

We express our sincere gratitude to the authorities of Dayanand College of Pharmacy Institute for entrusting and offering the opportunity of energy performance assessment assignment.
We are thankful to **Principal & Office Staff** for their positive support in undertaking the task of system mapping and energy efficiency assessment of all electrical system, utilities and other workshop equipment. The field studies would not have been completed on time without their interaction and guidance. We are grateful to their cooperation during field studies and providing necessary data for the study.



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Note: This report is based on the present operating status of the Institute. The recommendations are based on various operational parameters examined by the team and the information supplied to the team by the management of Dayanand Pharmacy College, Latur.

Introduction

Dayanand College of Pharmacy took its humble birth in the precious hands of Dayanand Education Society, imparting professional and legal education to the young and aspiring youth of this region to pursue their career as independent professionals.

The Dayanand College of Pharmacy has excellent Pharmacy setup that allows the students to get a better grasp of the practical subject knowledge. Their Prime focus is always laid on research as this sole factor shall contribute greatly towards a successful career ahead. Institute have numerous state-of-the-art labs of various departments like Pharmaceutics, pharmaceutical chemistry, Pharmacology, supported by well-trained lab technicians where students get to perform Practical's under guidance of experienced Faculty.

General: Dayanand College of Pharmacy Institute entrusted the work of conducting a detailed Energy Audit of campus with the main objectives are as bellows:

- To study the present pattern of energy consumption
- To identify potential areas for energy optimization
- To recommend energy conservation proposals with cost benefit analysis.

Chapter: 1 Executive Summary

SN	Recommendation	Saving (Rupees)	Investment (Rupees)	Payback (Yrs.)	Remark
1	Replacing Fan with 5 star energy saving Fan or BLDC fan	70000	3.25 Lakhs	4.6	**Long Term**
2	Improve Lighting System - Use of reflectors	16743	75000	4.47	**Long Term**
3	Use of motion sensor in corridors, passage and toilets	6000	8000	1.33	**Short Term**
4	Improve Effectiveness Solar Power Plant	10500	5000	6 Months	**Short Term**
5	**Awareness Project** - Conduct Training Program	@10%	NA	NA	**No Investment**

Specific Energy Consumption (SEC):

Specific Energy Consumption (SEC) is defined as energy usage per Square meter of area. It is calculated total electrical kWh/total area of the campus. By calculating SEC, we can crudely target the factors of energy efficiency or inefficiency

The average cost of energy is around Rupees **4.68**/Month.

The Specific Energy Consumption (SEC) is the ratio of energy required per square meter.

Total Electricity Consumption **32000** kWh /Year

Total Built-up Area = **3228.66** Sq. Meter

In this case the SEC is evaluated as electrical units consumed per square meter of area.

It is calculated as under for (Electricity): **9.92** kWh/Sq. Meter

Chapter : 2 Energy Audit Methodology

As per the energy conservation Act, 2001 [pass by the government of India], Energy audit is defined as "The verification , monitoring and analysis of the use of energy including submission of technical report containing recommendation for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption consist of four phases."

The Methodology of the Audit is presented in the following chart:

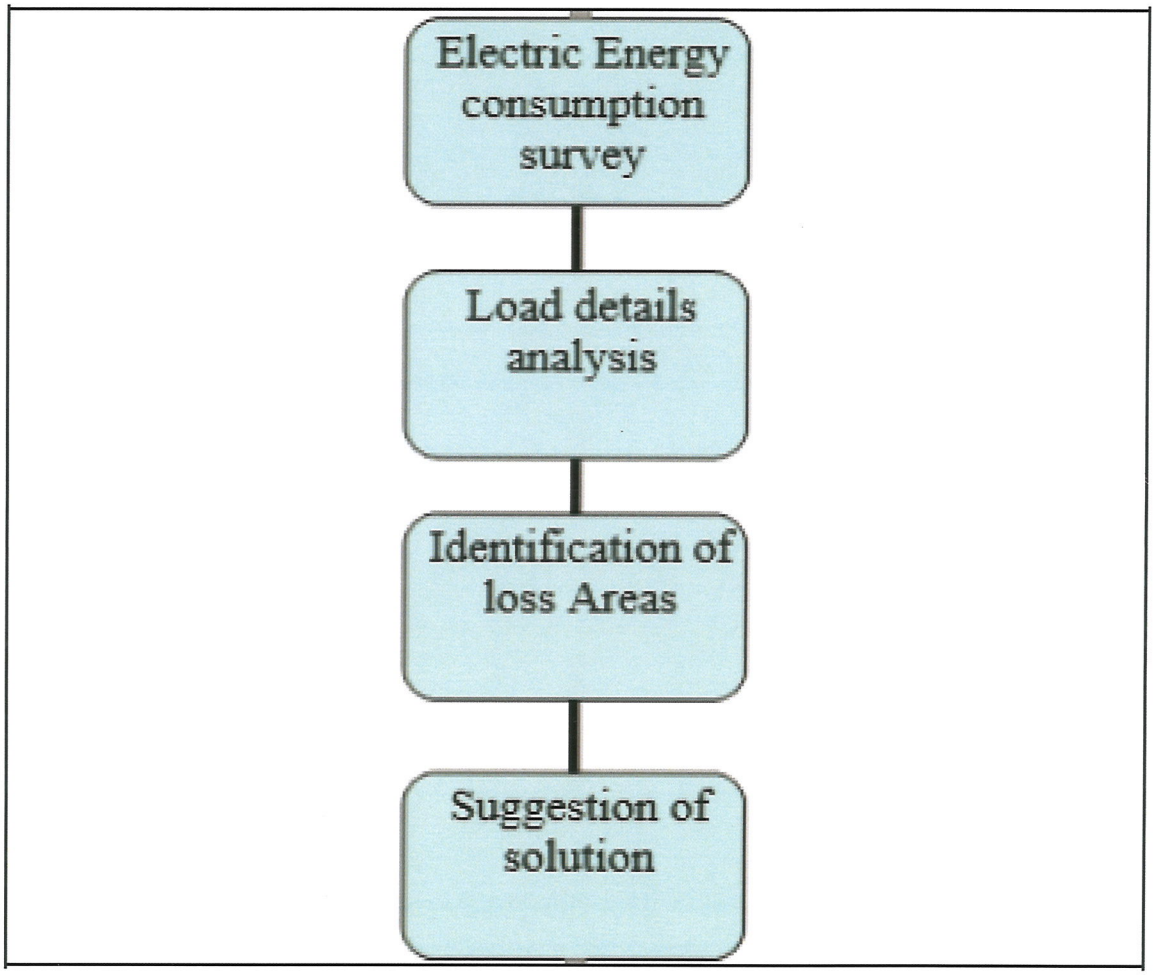


Chart – 1 : Methodolody of Audit

Energy Audit Study is divided into following steps

1. Historical data analysis:

The historical data analysis involves establishment of energy consumption pattern to the established base line data on energy consumption and its variation with change in production volumes.

2. Actual measurement and data analysis:

This step involves actual site measurement and field trials using various portable Measurement instruments. It also involves input to output analysis to establish actual operating Equipment efficiency and finding out losses in the system.

3. Identification and evaluation of Energy Conservation Opportunities:

This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential of energy saving and investment required to implement the Proposed modifications with payback period.

4. **Energy Audit Instruments used**

a) Power Quality Analyser

b) Lux Meter

c) IR Thermometer

d) Wattmeter

HIOKI – 3197 Power Quality Analyser

Electric power quality study is a systematic analysis to identify power qualities issues, look for the root causes and recommendations for improvement in an electrical system. Those issues are such as surges, harmonics, high frequency noise, transient voltages, wave distortion, interruptions, frequency variations, etc. Power quality studies are also meant a focused and systematic approach to solve complex problems in a power system.

Chapter : 3 Study of Electrical System

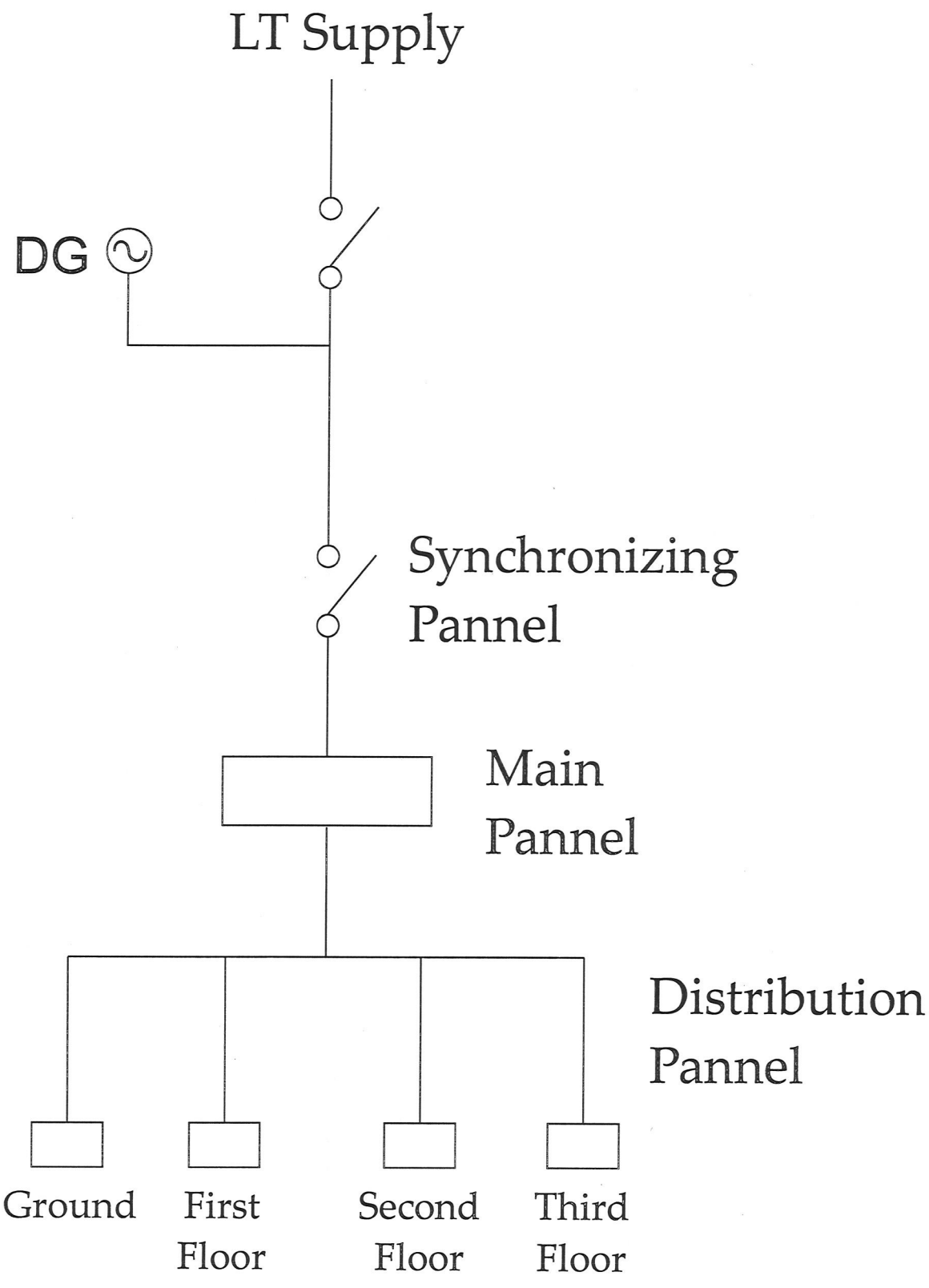
Source of Energy: Dayanand College of Pharmacy receives Electricity from three different Sources.

a. Electricity from MSEDCL
b. Electricity from High Speed Diesel Generator
c. Electricity from Solar Power Plant

Table No 3.2.1: Meter Details:

	Consumer No.	**610551351427**
Details of Electricity Demand	Tariff	073 LT-X B I 0-20KW Pub Ser oth
Sanctioned Load	18	KW

Single Line Diagram



b. Electricity from High Speed Diesel Generator:

There is one DG set of capacity 40 kVA installed in the college. There is hardly any power cut so the running hour of DG set is very less.

HSDG : Diesel Generator

Suggestion: **Install KWH Energy Meter**

c. Electricity from Solar Power Plant

M/S Dayanand Pharmacy College has been installed Solar Power plant of **18 KW** Capacity

Generated **25503** Units/Year

Exported **15162** Units/Year

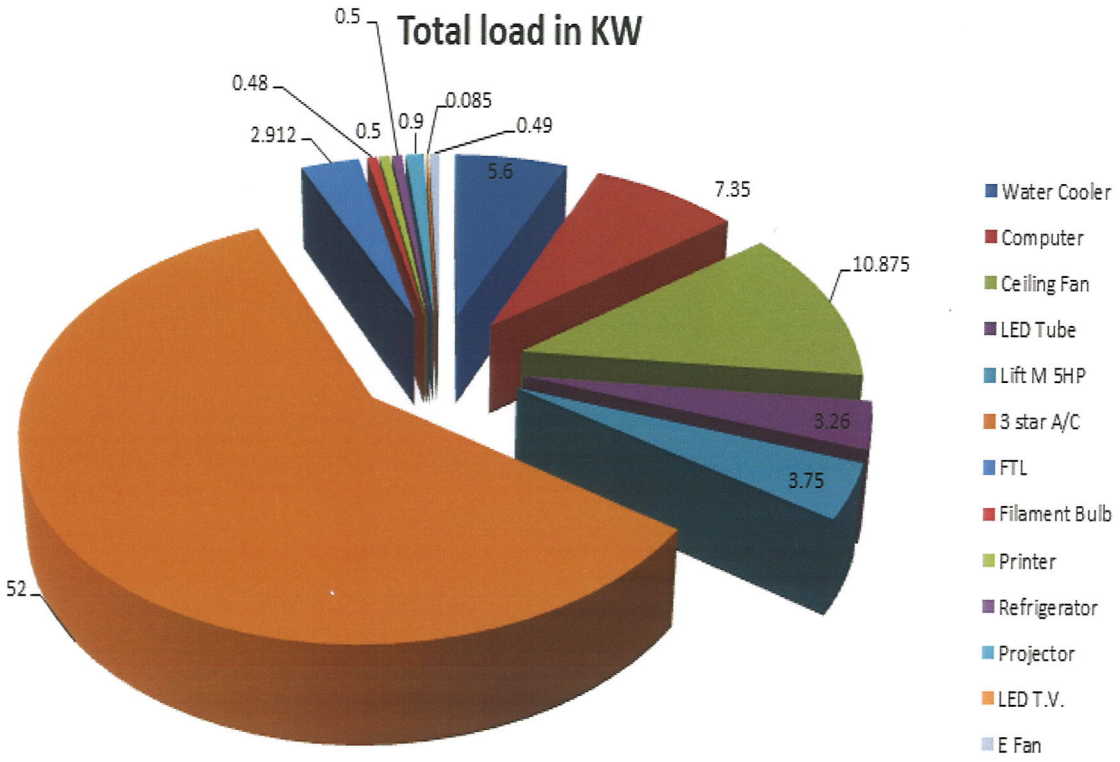
Connected Load Details

The load utilization survey of institute is represented in Table as follows:

Following are the major consumers of electricity in the facility:

- Ceiling Fan - **75** Watt / Exhaust Fan – 35W
- Computers System 150 -Watt
- Lighting FTL -52W; LED Tube – 20 W
- Air-Conditioning: **VESTAR** 1.5 Ton BEE 3 Star -5200 Watt
- Printers 250Watt
- Xerox machines 1500 Watt
- Refrigerator 250W
- Other Electronic Equipment 2500 W

Connected Load Details



Maximum load found for Air-conditioning System which is **52** KW

Department wise Electricity Consumption:

Ground Floor	Room	Tube		Fan		AC BEE 3 Star 1.5 TR (5200W)	Computer
		FTL 52 w	LED 20 w	Ex 35W	Ceiling 75 W		
1	Principal office	0	2	0	2	1	1
2	Vice Principal	0	2	0	1	0	0
3	Porch	0	3	0	1	0	0
4	Kitchen room	1	0	0	1	0	0
5	Meeting Room	0	3	0	4	1	0
6	Office	0	5	0	4	0	5
7	Faculty Room	0	3	0	2	0	2
8	Pharmacy Chem 2	9	4	4	3	0	0
9	Pharmacy Chem 1	5	2	2	1	0	0
10	Central instrumental	4	2	1	1	0	1
11	NSS Lab	7	3	2	2	0	0
12	NSS Lab 2	1	5	2	1	0	0
13	Tablet Punching M R	2	0	0	0	0	0
14	Stationary store reprography	1	0	0	0	0	0
15	Porch	0	6	0	0	0	0

1st Floor	Room	Tube		Fan		AC BEE 3 Star 1.5 TR (5200W)	Computer
		FTL 52W	LED 20W	E Fan 35W	C Fan 75W		
1	Faculty Room	0	3	0	2	0	1
2	Pharmacognosy Lab	0	10	0	4	0	1
3	Pharmacy Chem Lab	5	0	1	3	0	0
4	Boys Common Room	1	4	1	1	0	0
5	Store	1	1	1	1	0	1
6	Machine Room	2	0	0	1	0	0
7	Pharmaceutics Lab	3	1	0	4	0	0
8	Pharmaceutics Lab 2	4	0	0	4	0	0
9	Hap Pharmacology Lab (D)	4	3	0	7	0	0
10	Porch	0	4	0	0	0	0

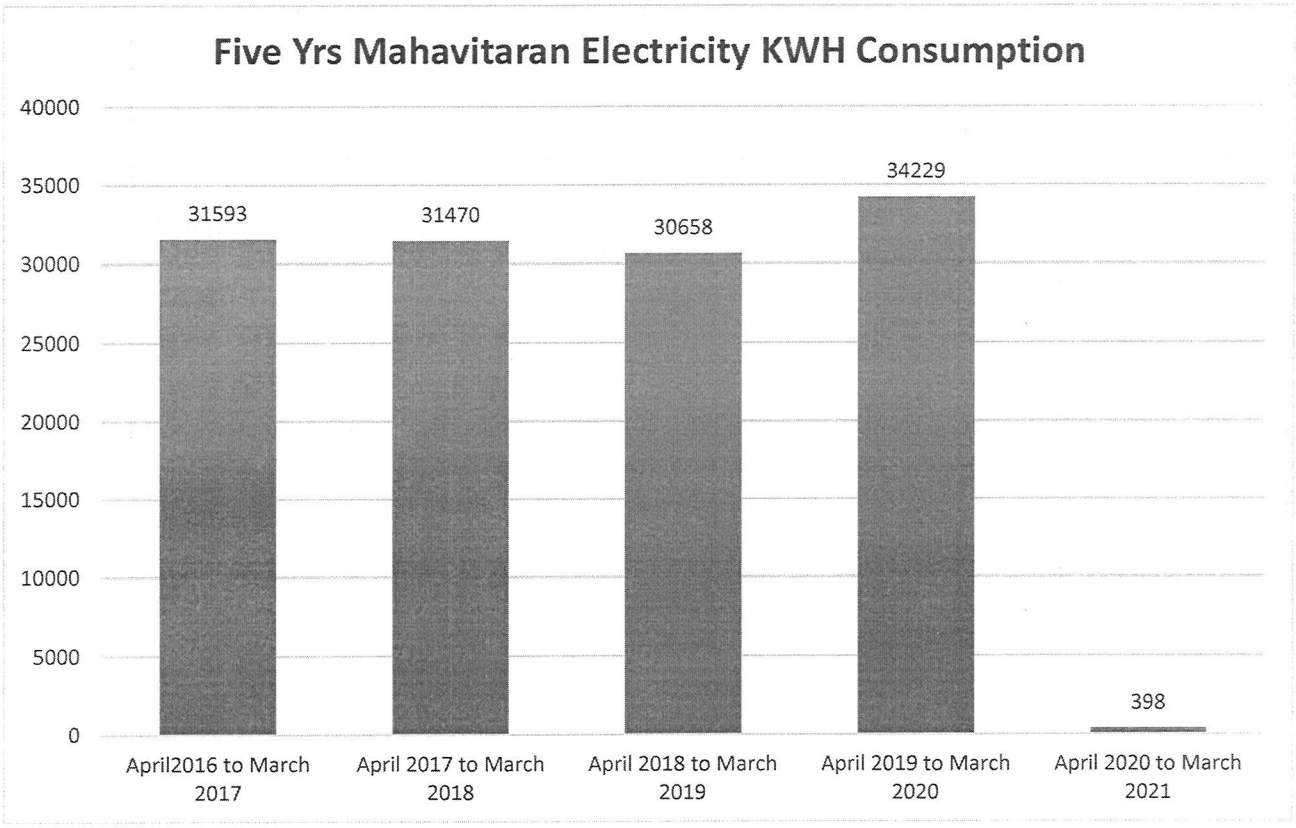
2nd floor	Room	Tube		Fan		AC BEE 3 Star 1.5 TR (5200W)	Computer
		FTL 52W	LED 20W	E Fan 35W	C Fan 75W		
1	First Aid Sick Room	0	0	0	1	0	0
2	Computer Lab	0	9	0	3	0	26
3	Exam Room	0	4	0	1	0	1
4	Reading Room	0	4	0	6	0	5
5	Library	2	3	0	2	0	1
6	Faculty Room	0	3	0	3	0	2
7	Teaching Room 3	0	2	0	5	0	0
8	Teaching Room 2	0	3	0	6	0	0
9	Teaching Room 1	0	4	0	5	0	0
10	Ladies Common Room	3	0	0	4	0	0
11	Sport	0	0	0	1	0	0
12	M Phar Q.A.	0	14	0	9	0	2
13	Porch	0	4	0	0	0	0

3rd floor	Room	Tube		Fan		AC BEE 3 Star 1.5 TR (5200W)	Computer
		FTL 52W	LED 20W	E Fan 35W	C Fan 75W		
1	Tutorial Room	0	4	0	4	0	0
2	Exam Room	0	2	0	2	0	0
3	Teaching Room 4	0	4	0	5	0	0
4	Teaching Room 5	0	2	0	3	0	0
5	Teaching Room 6	0	2	0	3	0	0
6	Pharmacology Lab	0	4	0	10	0	0
7	Quality Assurance Lab	0	1	0	4	0	0
8	Regulatory Affairs Lab	0	1	0	4	0	0
9	Seminar Hall	0	23	0	14	8	0
10	Porch	0	3	0	0	0	0

Chapter : 4 Historical Data Analysis:

KWH: Five years Mahavitaran Electricity Consumption record

SN	Year	KWH
1	April2016 to March 2017	**31593**
2	April 2017 to March 2018	**31470**
3	April 2018 to March 2019	**30658**
4	April 2019 to March 2020	**34229**
5	April 2020 to March 2021	**398**



Mahavitran Electricity Bill Payment History

Details of the 12 month Electricity Bills

Bill Month	Consumption (Units)	Bill Demand (KVA)	Bill Amount
Feb 2022	0	0	373
Jan 2022	0	0	373
Dec 2021	0	0	373
Nov 2021	0	0	373
Oct 2021	0	0	373
Sep 2021	0	0	373
Aug 2021	0	0	373
Jul 2021	0	0	373
Jun 2021	0	0	373
May 2021	0	0	373
Apr 2021	0	0	373
Mar 2021	0	0	362

Chapter : 5 Performance Evaluation

a) Existing Fan system (75Watt)

Total number of fans used in the campus = 145 Nos.

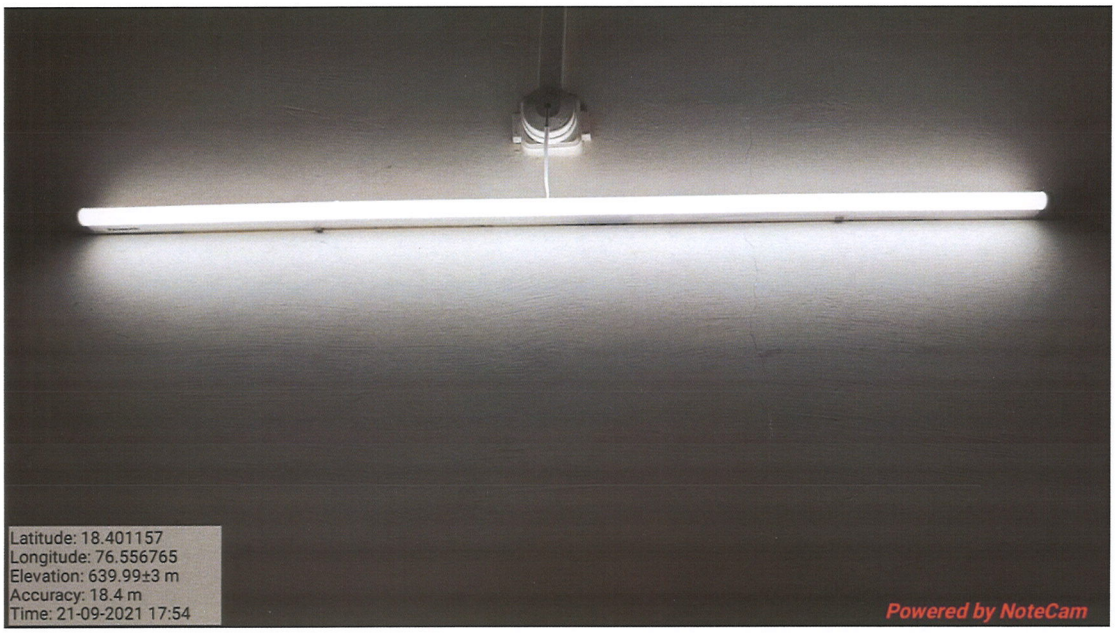
@280 days Working 6 Hrs.

- Number of fans to be replace = 145Nos.
- The Total Current Consumption =18270 kWh
- The Expected fan Consumption =6820 kWh
- Total KWh saved per year = 11500 kWh/year

Suggestions: Replace existing Inefficient Fan System (75W) with Five Star BLDC (28W)

b) **Lighting System :** Lux level in the class room at the entrance wall was found less. It is advisable to improve light intensity.

Existing LED Tube are installed without reflectors.



Suggestions: Improve effectiveness of Lighting System

Light globes generally disperse light in all directions from the source. If a ceiling mounted light does not direct the light back down to the working plane, more fittings will be required to achieve the required lux levels. So the effectiveness of the reflectors (or minimizing losses due to poor reflectors) is important. Reflectors should be both reflective as well as carefully designed to disperse light effectively on the working plane at the design height of the fitting (e.g., light should not be concentrated in one area, providing too much light, whilst falling short of required levels in another area).

Increase Lighting Efficiency by using reflectors

Silver Reflectors. This is the reflector that reflects the most light.

White Reflectors. More flexible between indoor and outdoor use.

1. Gold Reflectors 2. Black Reflectors 3. White Reflectors

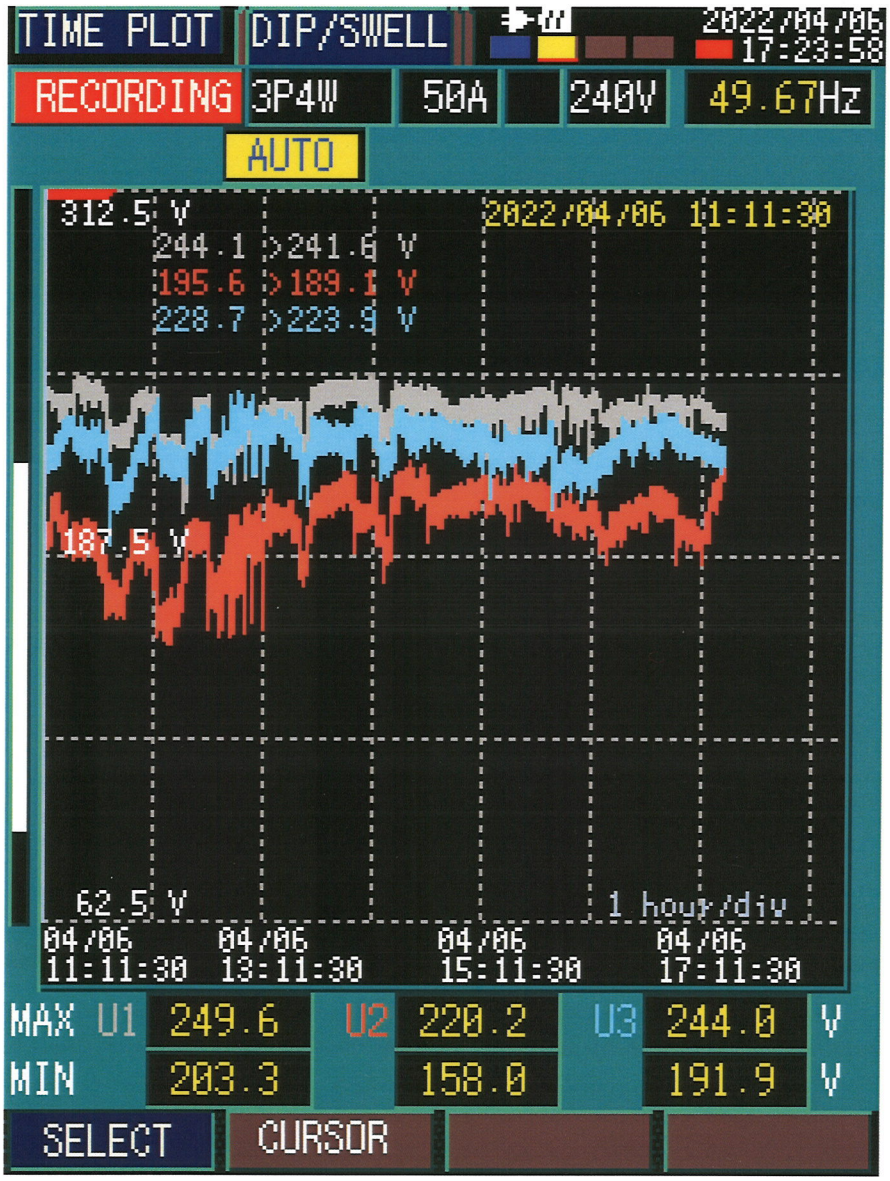
Proposed:-

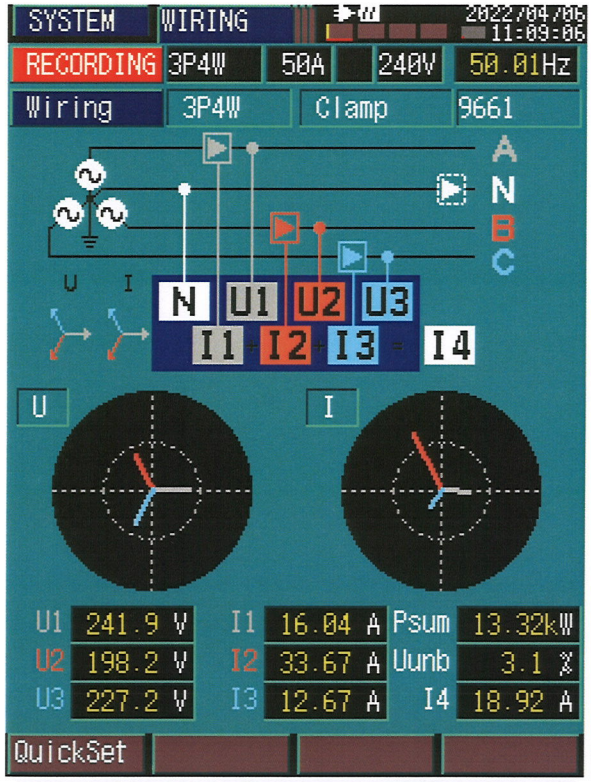
Although once known mainly for LEDs in white light, general illumination applications are today's most energy-efficient and rapidly-developing lighting technology.

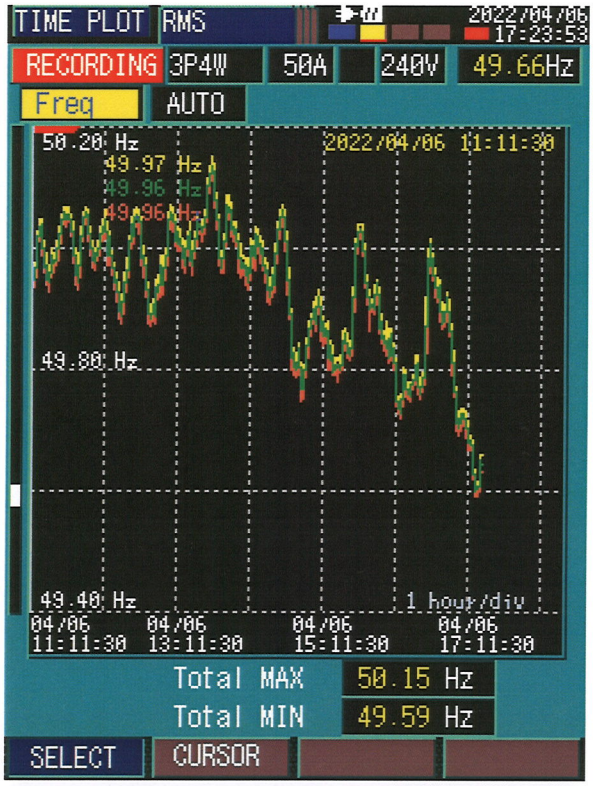
Use motion sensors: In places where lights are necessary but are not used continuously.

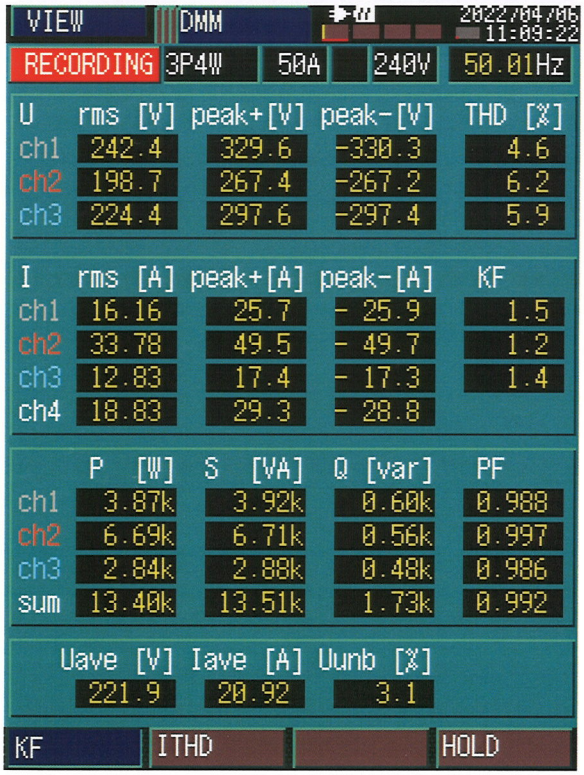
c)Power Quality Analysis :

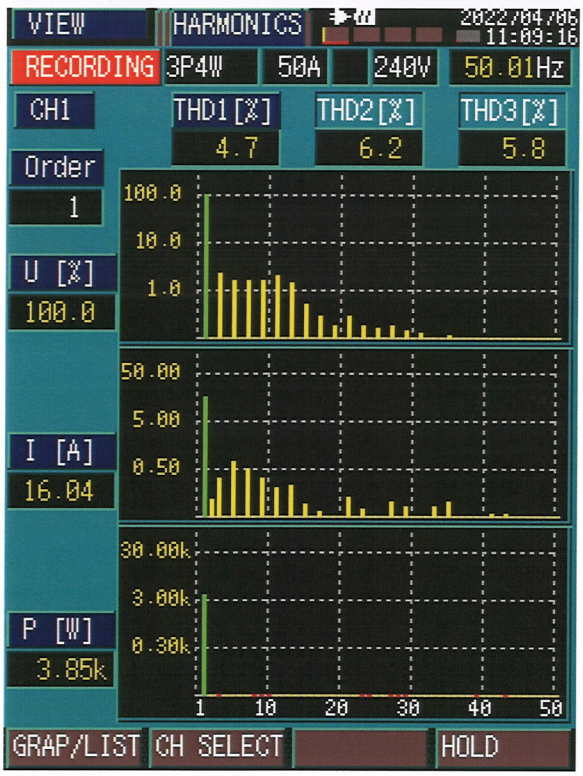
Good power quality saves money and energy. Direct savings to consumers come from lower energy cost and reactive power tariffs. Indirect savings are gained by avoiding circumstances such as damage and premature aging of equipment.




SYSTEM
WIRING
2022/04/06
11:09:06
RECORDING
3P4W
50A
240V
50.01Hz
Wiring
3P4W
Clamp
9661
A
N
B
C
U
I
N
U1
U2
U3
I1
I2
I3
I4
U
I
U1 241.9 V
U2 198.2 V
U3 227.2 V
I1 16.04 A
I2 33.67 A
I3 12.67 A
I4 18.92 A
Psum 13.32kW
Uunb 3.1 %
QuickSet


TIME PLOT
RMS
2022/04/06
17:23:53
RECORDING
3P4W
50A
240V
49.66Hz
Freq
AUTO
50.20 Hz
49.97 Hz
49.96 Hz
49.96 Hz
2022/04/06 11:11:30
49.80 Hz
49.40 Hz
1 hour/div
04/06 11:11:30
04/06 13:11:30
04/06 15:11:30
04/06 17:11:30
Total MAX 50.15 Hz
Total MIN 49.59 Hz
SELECT
CURSOR


VIEW
DMM
2022/04/06
11:09:22
RECORDING
3P4W
50A
240V
50.01Hz
U rms [V] peak+[V] peak-[V] THD [%]
ch1 242.4 329.6 -330.3 4.6
ch2 198.7 267.4 -267.2 6.2
ch3 224.4 297.6 -297.4 5.9
I rms [A] peak+[A] peak-[A] KF
ch1 16.16 25.7 - 25.9 1.5
ch2 33.78 49.5 - 49.7 1.2
ch3 12.83 17.4 - 17.3 1.4
ch4 18.83 29.3 - 28.8
P [W] S [VA] Q [var] PF
ch1 3.87k 3.92k 0.60k 0.988
ch2 6.69k 6.71k 0.56k 0.997
ch3 2.84k 2.88k 0.48k 0.986
sum 13.40k 13.51k 1.73k 0.992
Uave [V] Iave [A] Uunb [%]
221.9 20.92 3.1
KF
ITHD
HOLD


VIEW
HARMONICS
2022/04/06
11:09:16
RECORDING
3P4W
50A
240V
50.01Hz
CH1
THD1[%] 4.7
THD2[%] 6.2
THD3[%] 5.8
Order
1
U [%]
100.0
I [A]
16.04
P [W]
3.85k
100.0
10.0
1.0
50.00
5.00
0.50
30.00k
3.00k
0.30k
1
10
20
30
40
50
GRAP/LIST
CH SELECT
HOLD

Conclusion & Future Scope

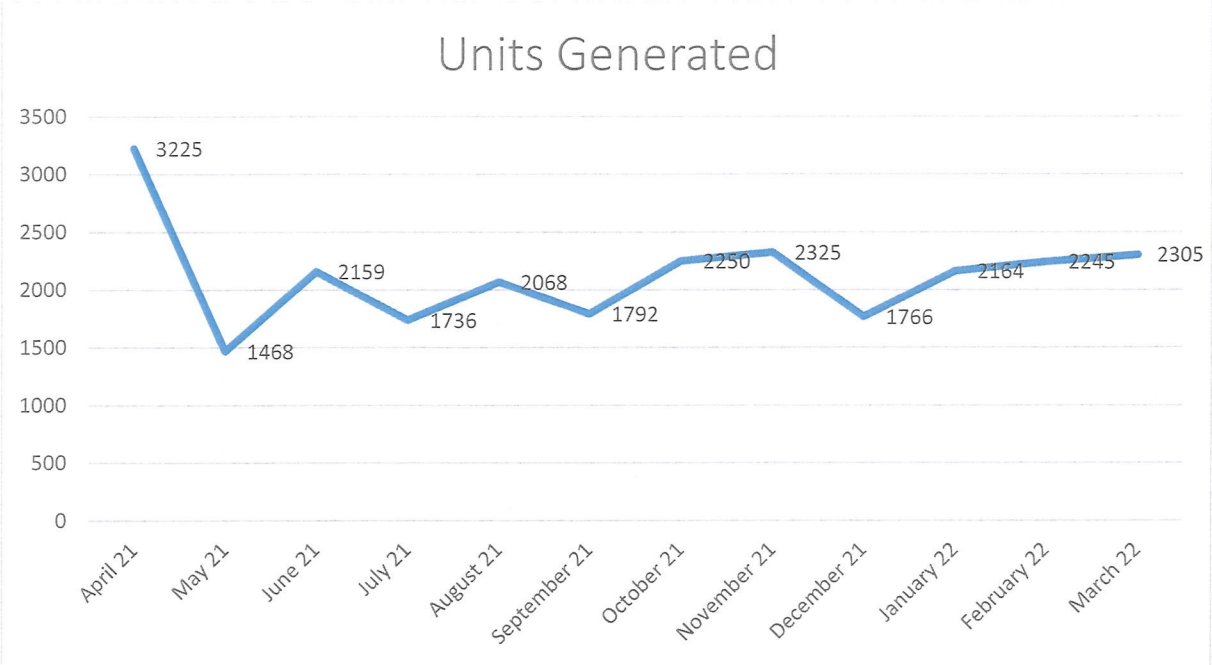
Install Voltage Stabilizer: A voltage stabilizer is a necessity in today's time, and it ensures that the home appliances are getting the desired power for optimum functioning. It is definitely an asset to protect all the electric goods in the house from the various power surges and fluctuations. These issues can result in permanent damage to the appliances and various other problems. We can easily say that a voltage stabilizer is crucial in keeping equipment running and in good condition.

Chapter : 6 Performance of Solar Power Plant

Institute has been installed on-Grid Solar Roof Top System capacity 18KW

Sr. No.	Month	Import Units	Export Units	Generation Units
1	April	694	2352	3225
2	May	273	1155	1468
3	June	527	1345	2159
4	July	569	944	1736
5	August	574	1095	2068
6	September	741	973	1792
7	October	574	1387	2250
8	November	728	1458	2325
9	December	690	886	1766
10	January	648	1278	2164
11	February	502	1313	2245
12	March	1167	976	2305

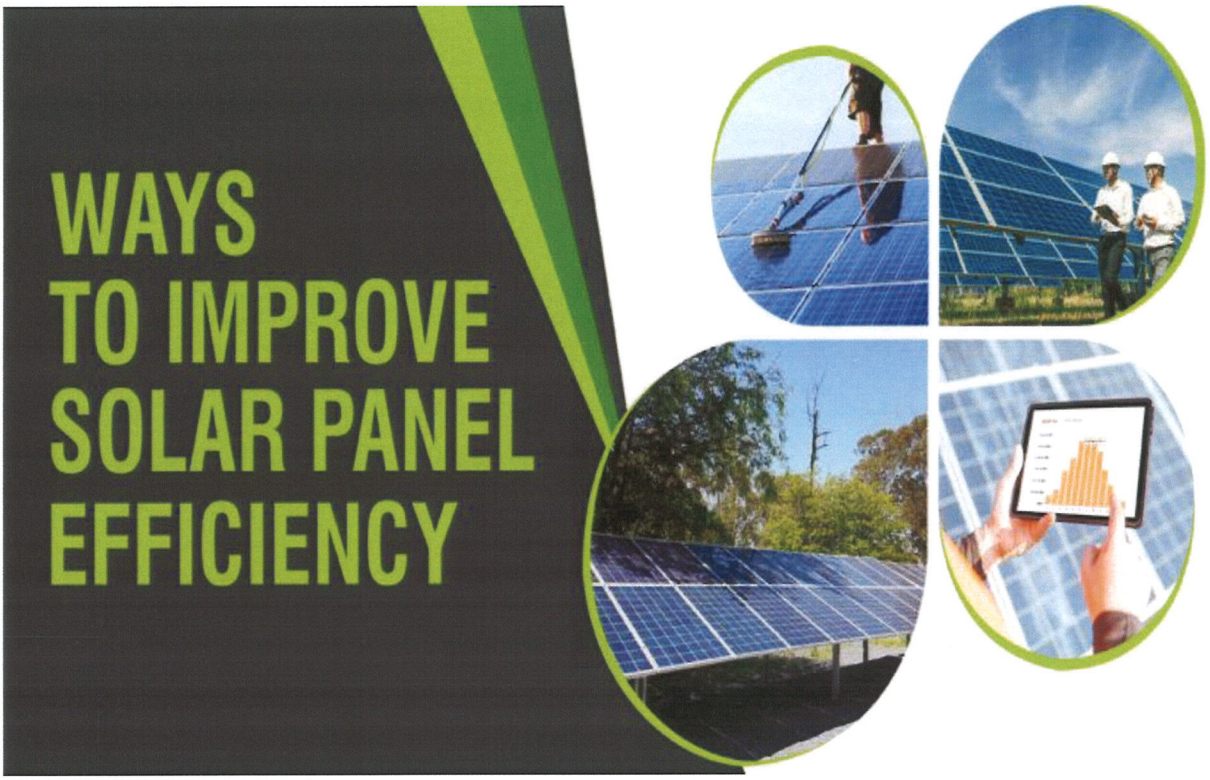
Performance of 18 KW Capacity Solar Power Plant



Conclusion & Future Scope

The generation of the solar panel is not uniform throughout the year. The actual installed model of 18 KW grid connected solar roof top system of one educational building is examined found less output in the month of May21; July21; Sept 21 & Dec 21. Suggested to improve.

Suggestion: Improve PV Panel effectiveness



Suggestions : **Clean your solar panels :**

Since solar panels don't have any moving parts, they require very little maintenance. However, it's best to clean your solar panels occasionally as dust and dirt can accumulate on the surface, reducing efficiency.

How often you should clean your solar panels depends on several factors such as how frequently it rains and how much it costs you to have them cleaned.

Over the course of a year, dust and dirt may only cause a 5% decline in output. However, if they get very dirty — perhaps in a location that does not get regular rainfall — the output decline can be greater than 20%. Therefore, cleaning your solar panels once a year is a pretty good idea.

Chapter : 7 General Recommendations

USE OF ELECTRICITY DURING PEAK HOUR AND OFF PEAK HOUR

The applicable electricity tariff is not also based on timing of the day but it may not be applicable in case of domestic LT/ HT type connection. This will also helpful in maintaining the demand graph. It is recommended to avoid use of electrical gadget for cleaning, watering etc. during the peak hours. This type of work should be operational during the off peak hour.

Create Awareness:

- All Class Rooms and labs to have Display Messages regarding optimum use of electrical appliances in the room like, lights, fans, computers and projectors. Save electricity.

1. There has to be Institute level student community that keeps track of the energy consumption Parameters of the various departments, class rooms, halls, areas, meters, etc

2. Energy auditing inside the campus has to be done on a regular basis and report should be made public to generate awareness.

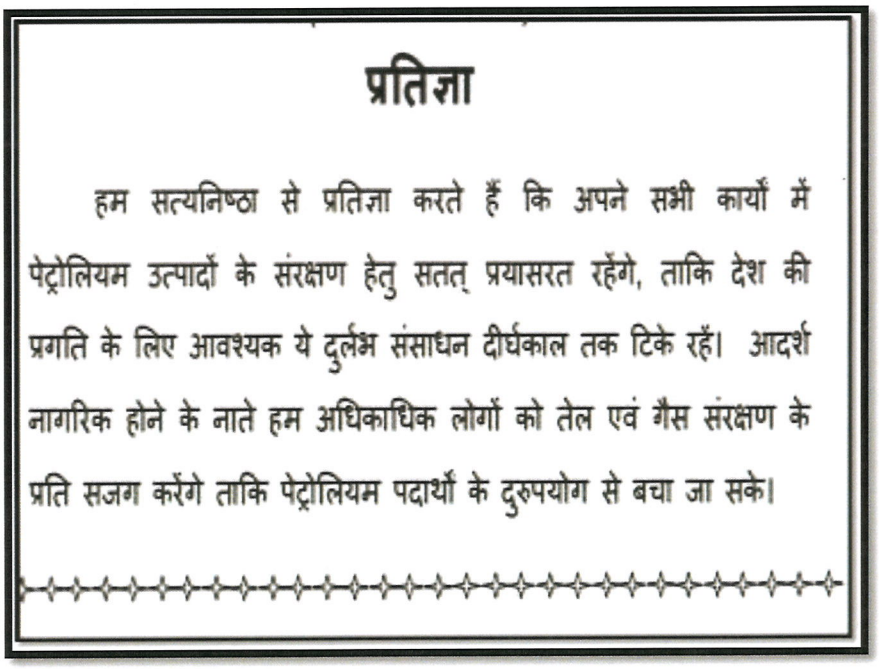
3. Need to create energy efficiency/ renewable energy awareness among the college campus i.e. solar, wind, Biogas energy. College should take initiative to arrange seminars, lectures, paper presentation competition among students and staff for general awareness.

Display the stickers of save electricity

Save nature everywhere in the campus. So that all stakeholders encouraged to save the electricity.

- Most of the time, all the tube lights in a class room are kept ON, even though, there is sufficient light level near the window opening. In such cases, the light row near the window may be kept OFF.
- All projectors to be kept OFF or in idle mode if there will be no presentation slides.
- All computers to have power saving settings to turn off monitors and hard discs, say after10 minutes/30 minutes.
- The comfort/Default air conditioning temperature to be set between 24°C to26°C.

Energy is one of the major inputs for the economic development of any country. In this paper we have suggested necessary replacements and showed the net savings after analysing the amount of wattage consumed by different devices. By this analysis, if we implement Energy Efficient Equipment, we can conserve power being wastage with current devices without disturbing the output and we can use it for some other devices. By using Energy Efficient Devices, we can save and reduce shortage of Power and can reduce power inflation.



प्रतिज्ञा

हम सत्यनिष्ठा से प्रतिज्ञा करते हैं कि अपने सभी कार्यों में पेट्रोलियम उत्पादों के संरक्षण हेतु सतत् प्रयासरत रहेंगे, ताकि देश की प्रगति के लिए आवश्यक ये दुर्लभ संसाधन दीर्घकाल तक टिके रहें। आदर्श नागरिक होने के नाते हम अधिकाधिक लोगों को तेल एवं गैस संरक्षण के प्रति सजग करेंगे ताकि पेट्रोलियम पदार्थों के दुरुपयोग से बचा जा सके।