

Energy Audit Report 2021-22



"अ नो भद्रा क्रतवो यत्न विश्रतः"

Dayanand Education Society's
Dayanand College of Art

Barshi road, Latur Dist. Latur, Maharashtra - 413531



Energy Audit Conducted by

KEDAR KHAMITKAR & ASSOCIATES

Energy Auditor : Empanelled Mahaurja, Govt. of Maharashtra

M: 9850244701 Email : urjabachat@gmail.com



Energy Audit Completion Certificate

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

Name of Institute	Dayanand College of Art
Details of Facilities Audited	All departments, Library, Class room etc.
Date for which Energy Audit has been conducted	12 th July 2022
Name of Energy Auditor	Kedar Khamitkar
Certificate No.	EA - 8287



Kedar Khamitkar

Energy Auditor

(Certified by Bureau of Energy Efficiency,
Ministry of Power, Gov. of India)

Empanelled Consultant MAHAURJA,
(Govt. of Maharashtra)



Kedar

❖ Energy Audit Completion Certificate ❖

**This is to certify that following utility has
carried out Energy Audit
in recognition of the organization efforts for
sustainable development.**

Name of the Institute	: Dayanand Education Society's Dayanand College of Arts, Latur
Date of Energy Audit	: 12/07/2022
Name of Energy Auditor	: KEDAR KHAMITKAR Certified by BEE (Bureau of Energy Efficiency) Ministry of Power, Govt. of India
Registration No	: EA - 8287



Kedar

Kedar Khamitkar
Energy Auditor

Certified by BEE,
Ministry of Power, Govt. of India

Issued Date : 25/07/2022

Empaneled with

महाऊर्जा

महाराष्ट्र ऊर्जा विकास अभिकरण
(Govt. of Maharashtra Institution)

Kedar Khamitkar & Associates, Latur

Reg no. MEDA/ECN/CR-14/2020-21/EA-17

ऊर्जा
संवर्धन
संशोधन ... उत्तम विचार



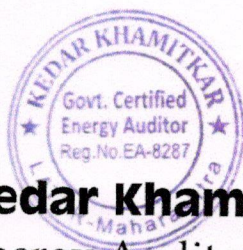
Note : Certificate is based on organisation compliance on energy audit
recommendations and continual maintenance of the system & conduction of surveillance audit

Energy Audit Analysis Report

KKAL Energy Audit team has been Conducted Detailed Energy Audit of **M/s Dayanand College of Art** 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 **34%**
2. Percentage of Annual Lighting power requirement met through LED Bulbs (Current Year Data) = **100 %**



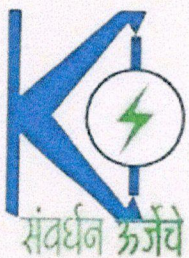
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Preface

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 Art Institute was conceded by EA Team for the period of 10th – 12th July 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 Office 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

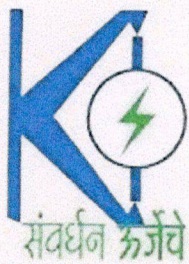
We express our sincere gratitude to the authorities of Dayanand College of Pharmacy Institute for entrusting and offering the opportunity of energy performance assessment assignment.

We are thankful to **Principal Dr. Shivaji Gaikwad Sir & 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.



Kedar



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(Govt. of Maharashtra)

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 College of Art, Latur.

Introduction

Dayanand Education Society, Latur was established in May 1961. Latur, then, was a Taluka place in Osmanabad District. Aspiring students from poor and middle class families could not get any facility for higher education, except for going to Mumbai, Pune or Hyderabad. For a candidate from economically backward family leaving Latur for pursuing higher education was rather dream like. So to make the flow of education reach to the grass root level, to the sons and daughters of farmers and workers community, renowned personalities and business persons like Late. Manikraoji Sonavane, Late. Raja Narayanlalji Lahoti, Late. Chandrashekherdada Bajpai, Late. Madanlalji Biyani, Shri. Shantibhai Shah, Late. Nathmalji Innani, Late. Ranaba Mandade, Late. Ramgopalji Rathi, Late. Tamanappa Utage, Late. Keshavraoji Sonavane instituted Dayanand Education Society in May 1961. In June 1961, under the aegis of Dayanand Education Society Arts, Commerce and Science colleges started functioning. The College has 25 well equipped and spacious class rooms to facilitate academic activities. The rooms are well furnished. The College has ICT Classrooms with the provision of LCD Projectors, Multimedia learning, and internet access.

The foundation stone was laid at the auspicious hands of the then Governor of Maharashtra Hon. Shri Prakasa in 1961.

The college also offers Post Graduate education in English, Hindi and Marathi on Grant- in-aid basis and Music and Public Administration on Non-grant basis. Center for Distance Education- Swami Ramanand Teerth Marathwada University, Nanded has also been added into the available facilities. Arts College Library is one of the biggest which possesses over 92,000 books on various subjects.

Infrastructure information:

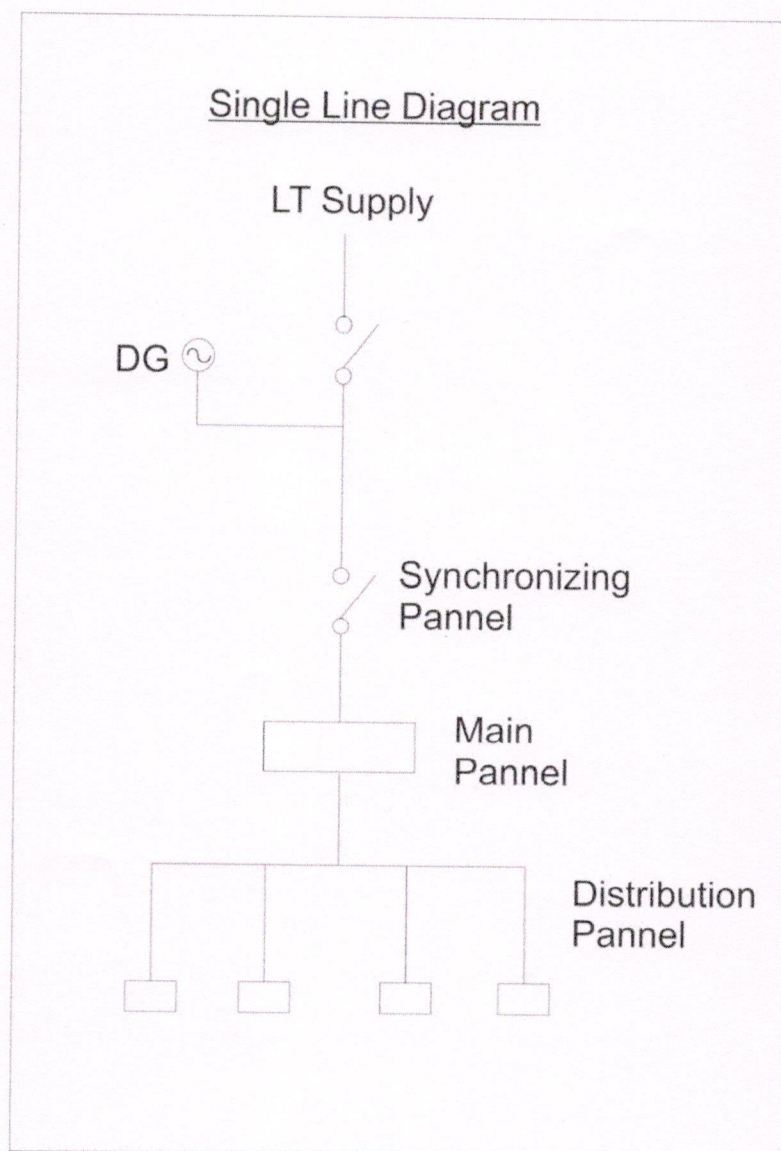
The institution has a lush green spacious campus of 22.5 acres in the heart of the city. The campus accommodates various colleges of the Dayanand Education Society, Latur. Over 6 acres of area has been utilized for the playgrounds. The Society has constructed shopping complex, a spacious auditorium, canteen, and adequate parking slots. The institution through IQAC timely assesses and upgrades its infrastructural facilities like adequate number of classrooms, library resources, reading-rooms, information spaces, playgrounds, hostels, various units like NSS and NCC and strives to keep them in line with the growth and need of the changing scenario.

In order to create and enhance the infrastructure that facilitates effective teaching and learning, the policy is framed according to the strength of students and faculties. The college building comprises of class-rooms, store room, staff room, N.C.C. Room, sports room, ladies room, language lab etc. The students are provided other amenities like pure drinking water and clean toilets. The noteworthy feature of infrastructural amenities is that our college has a well-equipped and spacious library building. It has a rich collection of useful textbooks and rare reference books. The institution strives to update its faculty with the latest happenings in the field of education. Taking into account the role of ICT in teaching-learning processes, the Institution has equipped every department with Laptops, and computers with Internet facility. E-access to the libraries, books and journals, articles and primary and secondary resources regarding the subject topics have been used by the faculties along with the library resources. This has been helping teacher-student community to keep themselves abreast with the latest developments in the respective domains of knowledge.

Objectives of Energy Audit campus:

Dayanand College of Art 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 116 Ceiling Fans with 5 star energy saving Fan or BLDC fan	40000	2.55 Lakhs	5.5	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	NA	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 4.57/Month.

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

Total Electricity Consumption 23488 kWh /Year (Including Solar)

Total Built-up Area = 3870 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): 6.06 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:

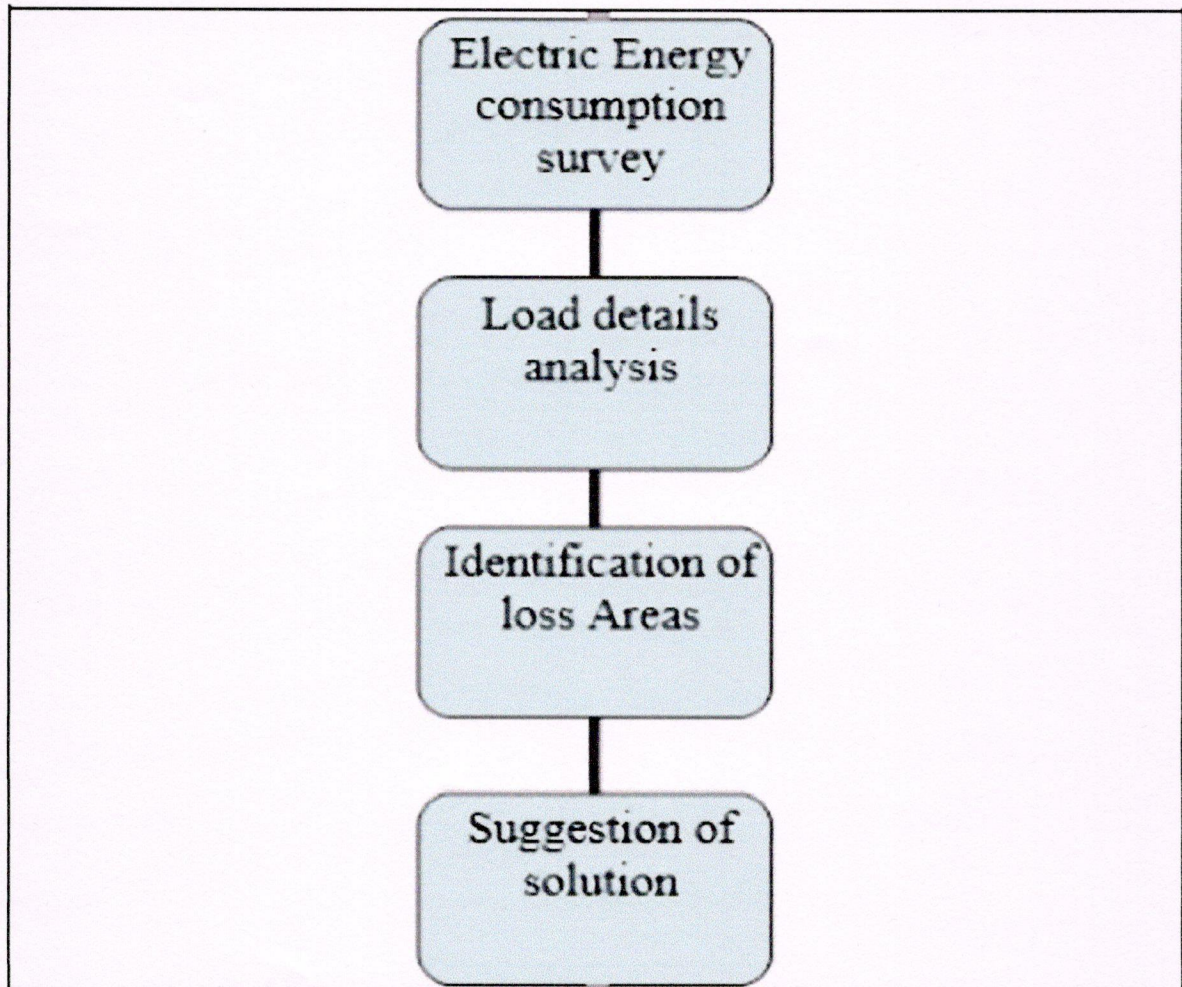


Chart - 1 : Methodology of Audit

Energy 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** for Energy Audit

- 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 quality 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

Sources of Energy:

Dayanand College of Art receives Electricity from three different Sources.

- Electricity from MSEDCL
- Electricity from High Speed Diesel Generator
- Electricity from Solar Power Plant

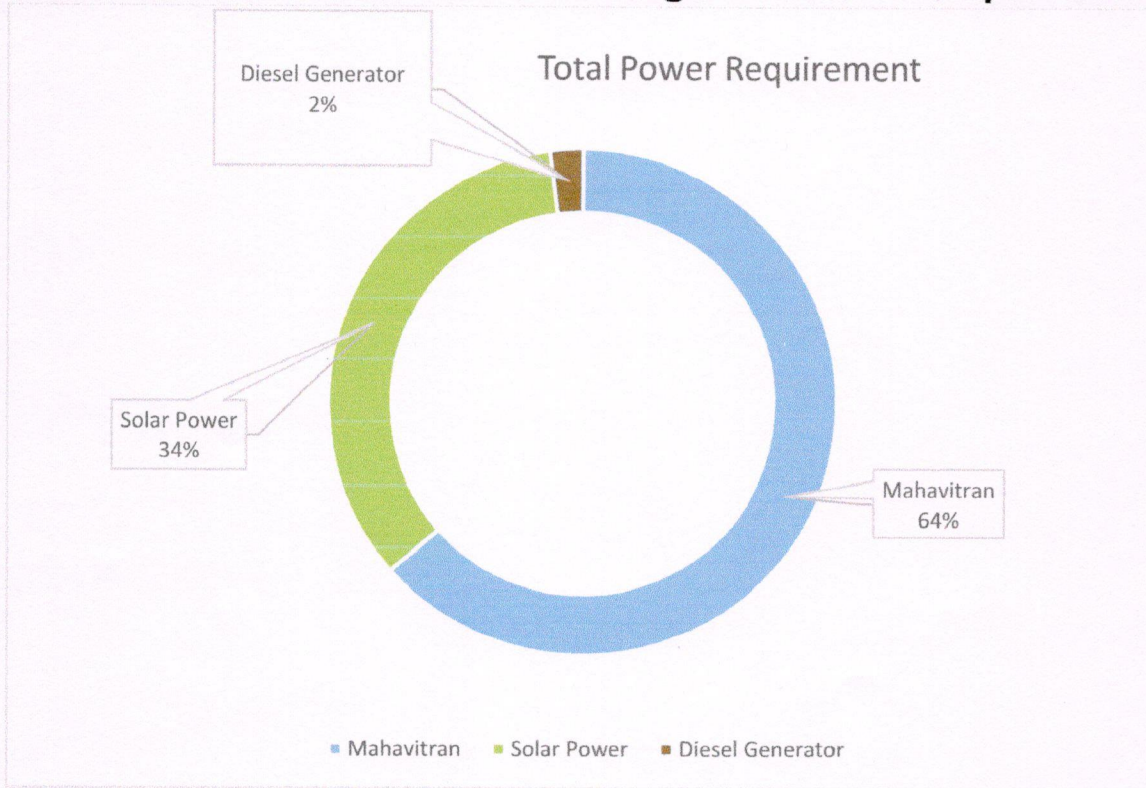
Table No 3.2.1: Meter 'A' Details:

	Consumer No.	610550031054
Details of Electricity Demand	Tariff	073 /LT VII(B) Public Service 0-20KW Oth
Sanctioned Load	09	KW

Table No 3.2.1: Meter 'B' Details:

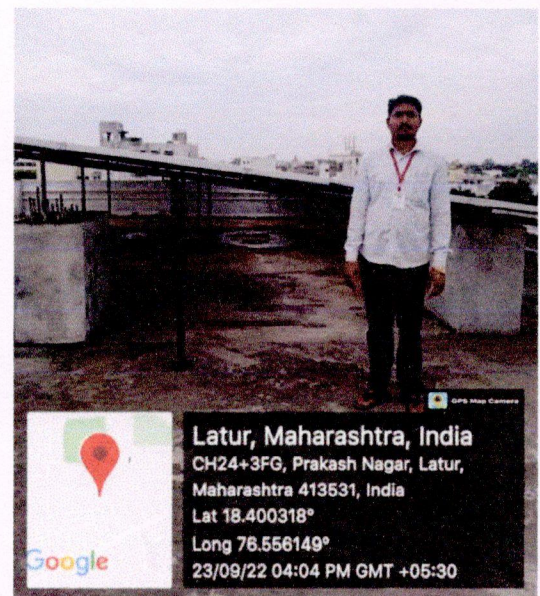
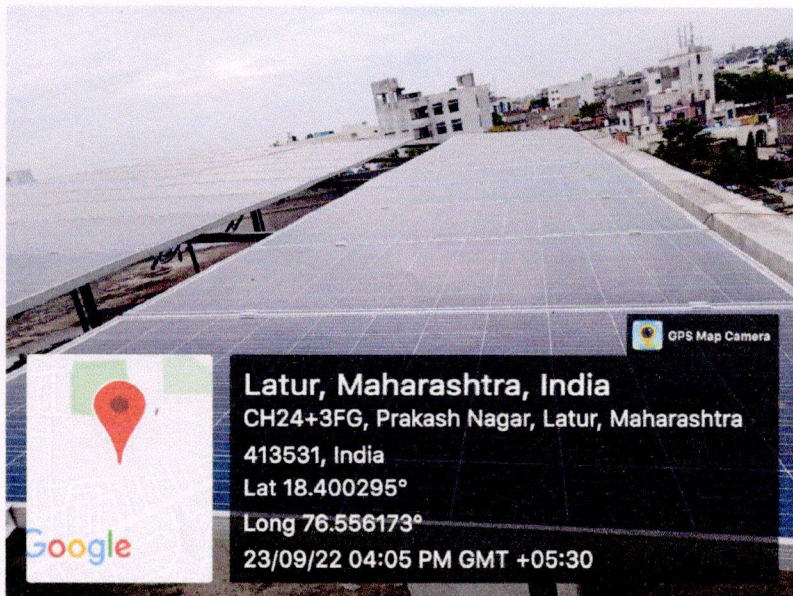
	Consumer No.	610550740551
Details of Electricity Demand	Tariff	073 LT-X B I 0-20KW Pub Ser oth
Sanctioned Load	10	KW

Power Management: Observations: there are three sources which fulfills the college Power requirement



Electricity Supply from Solar Power Plant

Dayanand College of Art has been installed Solar Power plant of 10 KW Capacity Generated 22947 Units/Year as per online record.



Connected Load Details

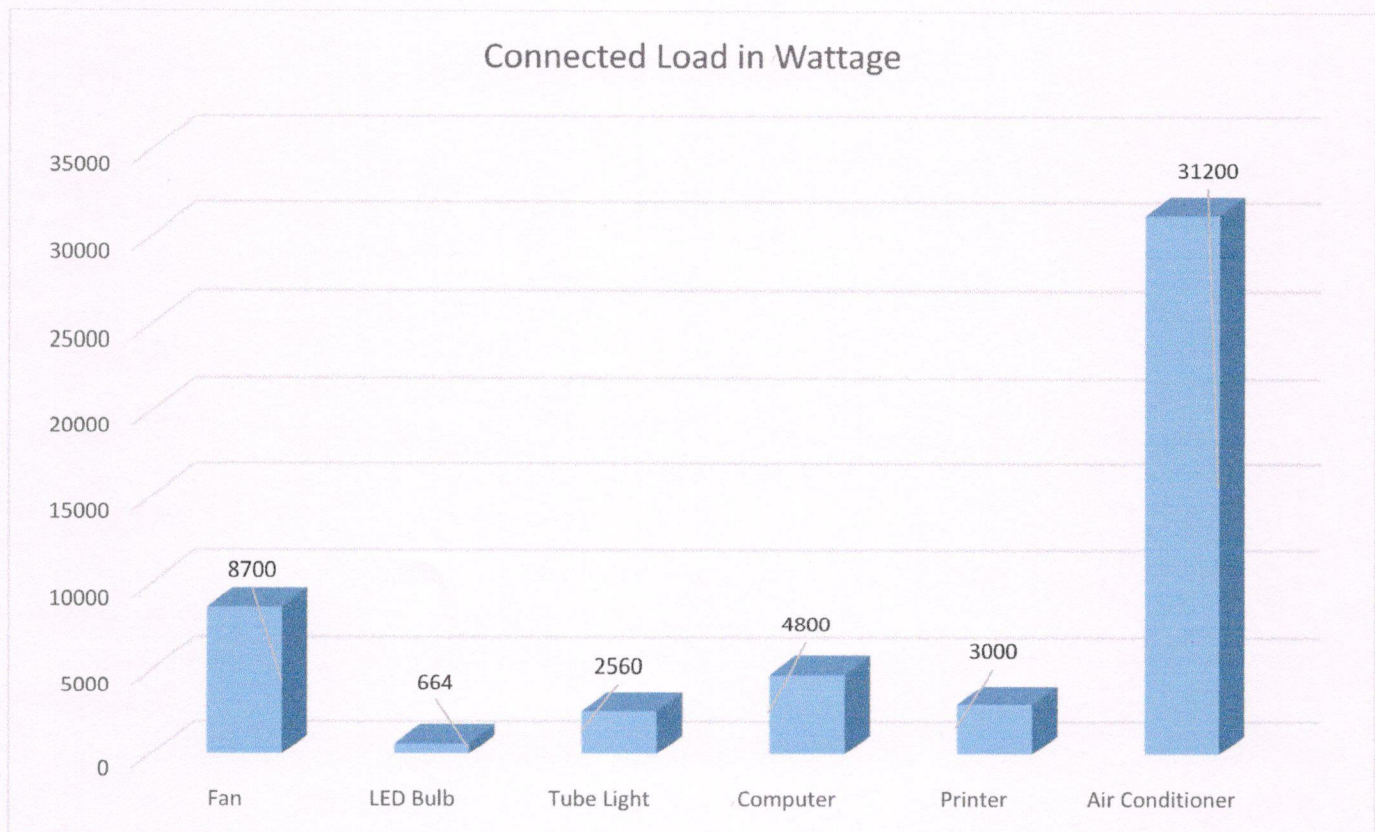
The load utilization survey of institute is represented in Table as follows:

SN	Location	Fan	LED Bulb	Tube Light	Computer	Printer	Air Conditioner
1	Hall No. 6	5		6			
2	Hall No. 7	6	15				2
3	Hall No. 14	2		4			
4	Hall No. 15	3		6			
5	Hall No. 16	3		4			
6	Hall No. 17	3		6			
7	Hall No. 18	3		2			
8	Hall No. 39	4		5			
9	Hall No. 34	2	8		1		
10	Hall No. 8	4		4			
11	Hall No. 44	2		4	1		
12	Hall No. 5	2		2	1		
13	Hall No. 19	1		1	1		
14	Hall No. 9	2		3	1		
15	Hall No. 40	3		7	1	1	
16	Hall No. 36	4		5	1		
17	Hall No. 21	2		2	1		
18	Hall No. 21	2		2	1		
19	Hall No. 8	1		2	1		
20	Hall No. 45	2		3	1		

SN	Location	Fan	LED Bulb	Tube Light	Computer	Printer	Air Conditioner
21	Hall No. 38	3		5	1		
22	Hall No. 14 A	2		4	1		
23	Hall No. 11	2		2	1		
24	Jr. Sup.	1	4		1		
25	JR VIP	1	4				
26	Hall No. 22	3	2				
27	Hall No. 23	3	2				
28	Hall No. 24	1		1			
29	Hall No. 4		4				
30	Hall No. 27	4		4			
31	Hall No. 28	2		4			
32	Hall No. 29	2		2			
33	Hall No. 32	4		4			
34	Hall No. 33	2		2			
35	Hall No. 35	2		4			
36	Hall No. 37	6		6			
37	Hall No. 41	4		4			
38	Hall No. 42	2		2			
39	Hall No. 58	2		4			
40	Hall No. 1	2	19		1	1	4
41	Hall No. 2	12	25	12	16	10	

Major consumers of electricity in the facility:

SR	Appliance	Quantity	Watt	Total
1	Fan	116	75	8700
2	LED Bulb	83	8	664
3	Tube Light	128	20	2560
4	Computer	32	150	4800
5	Printer	12	250	3000
6	Air Conditioner	6	5200	31200
			Total Wattage	50924



Maximum load found Air-conditioning System which is **31 KW**

Chapter : 4 Performance Evaluation

a) Fan system

Total number of fans used in the campus = 116 Nos.

@280 days Working 6 Hrs.

- Number of fans to be replace = 116Nos.
- The Total Current Consumption =14616 kWh
- The Expected fan Consumption =5456 kWh
- Total KWh saved per year = 9160 kWh/year

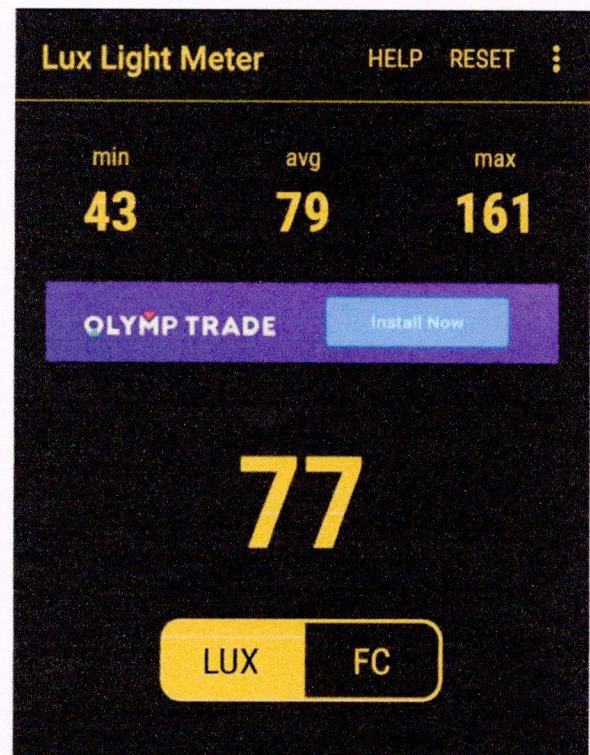
Suggestions: Replace existing Inefficient Fan System (75W) with Five Star BLDC (28W)



b) Lighting System:



Observations: Existing Condition LED Tube are installed some places without reflectors.



Suggestion: Lux level was found less. It is advisable to improve light intensity.

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).

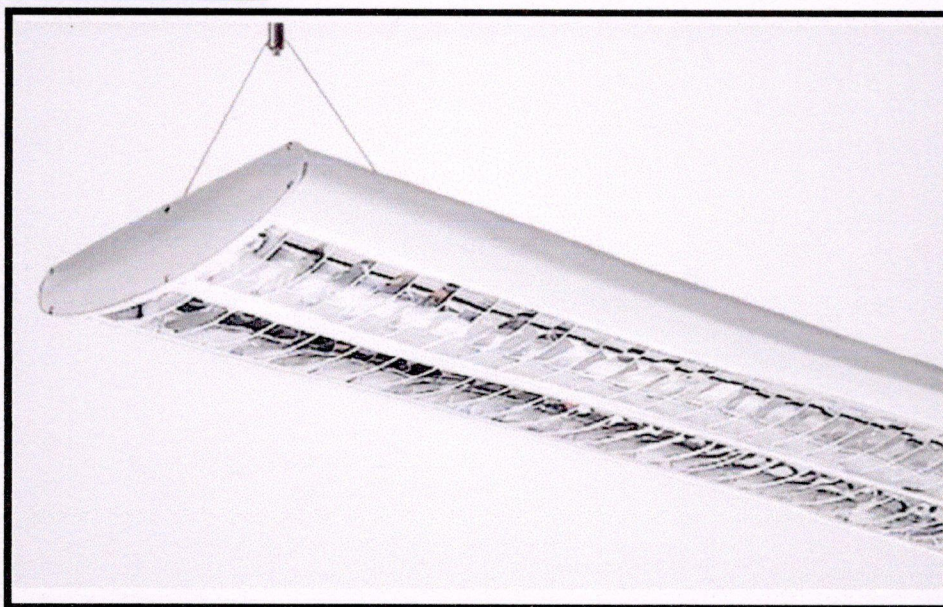
Increase Lighting Efficiency by using reflectors

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:-

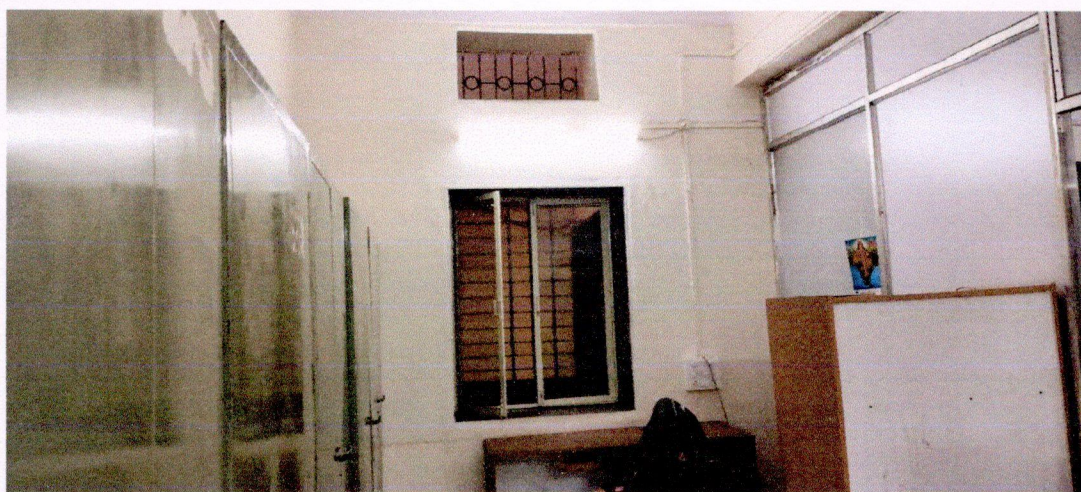


The standard unit for measuring the light level intensity is termed as LUX level. It is also known as illumination or illuminance. It calculates the intensity of light the falls on the surface like - floors or walls in the lighting design.

illuminance (lux)	Activity	Area
100	Casual seeing	Corridors, changing rooms, stores
150	Some perception of detail	Loading bays, switch rooms, plant rooms
200	Continuously occupied	Foyers, entrance halls, dining rooms
300	Visual tasks moderately easy	Libraries, sports halls, lecture theatres.
500	Visual tasks moderately difficult	General offices, kitchens, laboratories, retail shops.
750	Visual tasks difficult	Drawing offices, meat inspection, chain stores.
1000	Visual tasks very difficult	General inspection, electronic assembly, paintwork, supermarkets.
1500	Visual tasks extremely difficult	Fine work and inspection, precision assembly.
2000	Visual tasks exceptionally difficult	Assembly of minute items, finished fabric inspection.

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:



Install Sensors in places where lights are necessary but are not used continuously.

c) **Power Quality Analysis:**

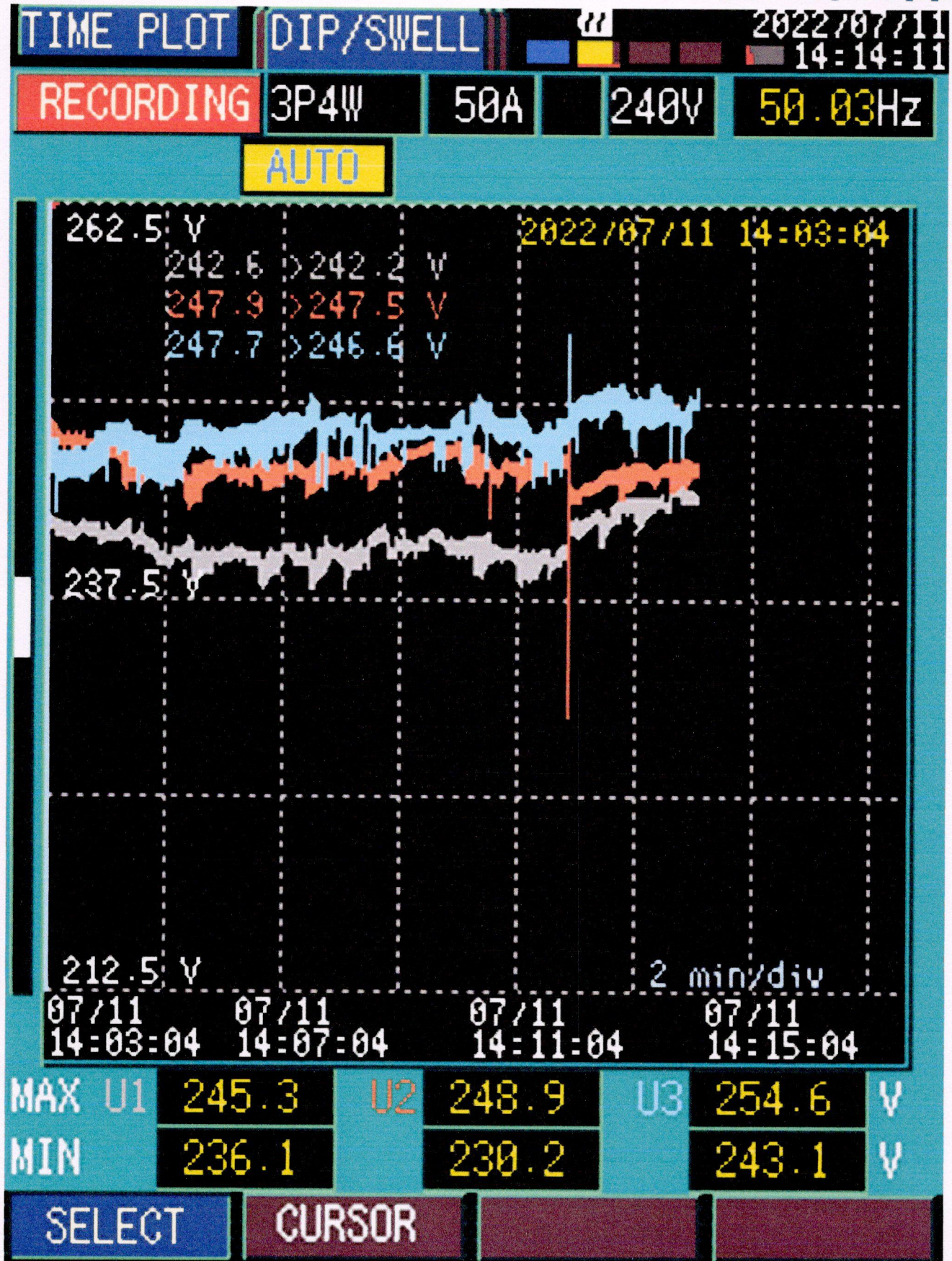
Good power quality saves money and energy. Direct savings to consumers come from lower energy cost and reactive power tariffs. Indirect savings are gained by avoiding circumstances such as damage and premature aging of equipment.



Energy Audit team has been carried out Power Quality Analysis work in the presence of Honorable Principal Dr. Shivaji Gaikwad Sir & Staff.

The P&QR performs several functions in one: Power quality monitor--**measures voltage and frequency profiles, voltage dips and surges, loss or supply, harmonic content, flicker, voltage and current imbalance**

Power Quality Analysis report: Poor Quality Supply



Conclusion & Future Scope Improve Power Quality

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.

Install Voltage Stabilizer: 20 KVA Capacity

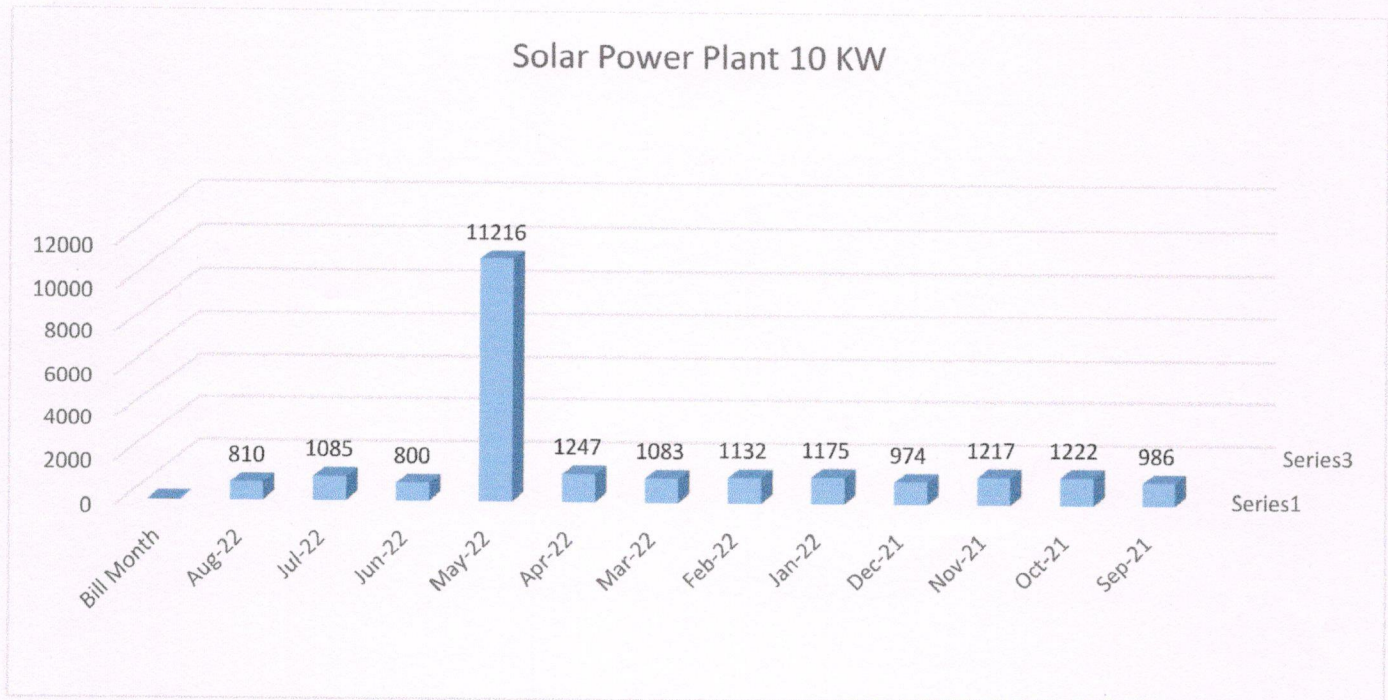


Chapter : 5 Performance of Solar Power Plant

Institute has been installed on-Grid Solar Roof Top System capacity 10KW

Bill Month	IMPORT Units	EXPORT Units	GENERATION Units
Aug-22	781	686	810
Jul-22	617	545	1085
Jun-22	690	710	800
May-22	742	740	11216
Apr-22	970	693	1247
Mar-22	799	651	1083
Feb-22	554	766	1132
Jan-22	636	792	1175
Dec-21	628	649	974
Nov-21	741	837	1217
Oct-21	543	856	1222
Sep-21	541	693	986
Total	8242	8618	22947

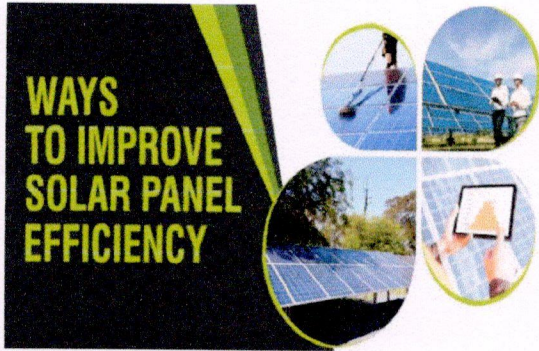
Performance of 10 KW Capacity Solar Power Plant



Conclusion & Future Scope

The generation of the solar panel is not uniform throughout the year. The actual installed model of 10 KW grid connected solar roof top system of building is examined found less output in the month of June 22 & Aug 22. 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 : 6 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 be 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:

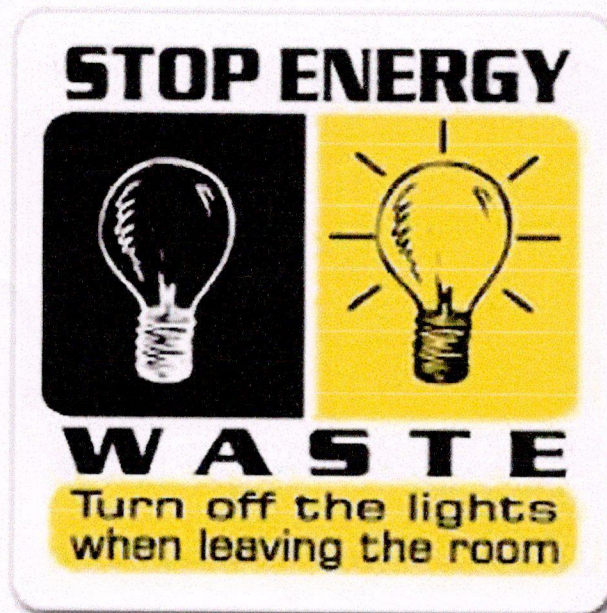
© All Class Rooms and labs to have Display Messages regarding optimum use of electrical appliances in the room like, lights, fans, computers and projectors. Save electricity.

1. There has to be Institute level student community that keeps track of the energy consumption Parameters of the various departments, class rooms, halls 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 after 10 minutes/30 minutes.
- ⊙ The comfort/Default air conditioning temperature to be set between 24°C to 26°C.



Chapter : 7 Conclusion

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 सतत 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।

Annexure: Implemented Measures

Dayanand College has been initiated Awareness project joint initiative with PCRA, Ministry of Petroleum & Natural Gas Government of India.

Topic: Fuel Conservation in Domestic Sector



Institutional Training Program by PCRA, Government of India
Topic: Efficient use of Energy & Resources

Domestic Workshop Topic: Efficient use of LPG



Topic: Efficient use of Energy & Resources

Awareness Project Media Report On World Environment Day

पुरोगामी विचाराचे
एकमत

page- 8
12 Jun 2022

पीसीआरएच्या इंधन बचतीतून पर्यावरण संरक्षण स्वच्छता सप्ताहाचा समारोप

लातूर : प्रतिनिधी

पीसीआरए यांच्या वतीने ऊर्जा आणि संसाधनांचा कार्यक्षम वापर या विषयांवरती डोमेस्टिक वर्कशॉप आयोजित करण्यात आला. या वर्कशॉपचा समारोप झाला.

अध्यक्षस्थानी महाविद्यालयाचे प्राचार्य डॉ. शिवाजी गायकवाड हे होते. इंधन बचतीसाठी ऊर्जा ऑडिटर केदार खमितकर यांनी मार्गदर्शन केले. या वेळी त्यांनी इंधन संरक्षण की जिम्मेदारी, जनगण की भागीदारी घरगुती गॅसचा अतिरिक्त वापर टाळा, इंधन वाचवा आणि बचत वाढवा असा संदेश दिला, कोळसा, तेल, वायू, इंधन लाकूड इत्यादी जाळल्यामुळे वातावरणातील प्रदूषण वाढते त्यात कार्बन ऑक्साईड्स, सल्फर, नायट्रोजन व इतर हानिकारक पदार्थांचा समावेश आहे, असे प्रतिपादन खामितकर यांनी केले. कार्यक्रमास महाविद्यालयाचे उपप्राचार्य प्रा. अनिल माळी, पर्यवेक्षक डॉ. दिलीप नागरगोजे, नवनाथ भालेराव, राष्ट्रीय सेवा योजना कार्यक्रम अधिकारी प्रा.



विलास कोमटवार, प्रा. सुरेश क्षीरसागर, प्रा. गोपाल वाहेती प्रा. शैलेश सूर्यवंशी प्रा. संदीप जगदाळे आणि शिक्षकेत्तर कर्मचारी, विद्यार्थी, विद्यार्थीनींनी सहभाग नोंदवला.

यावेळी पर्यायी अपारंपरिक ऊर्जा-सौर ऊर्जा कुकर या विषयावरती डाक्यूमेंट्री फिल्म दाखविण्यात आले. इंधन वाचवण्याचा सर्वोत्तम उपाय म्हणजे जेव्हा खरोखरच गरज असेल, तेव्हा गाडी चालवणं. अन्यथा चालत

किवा सायकलवर जाण्याचा पर्याय निवडणं च योग्य ठरेल असे कार्यक्रमात सांगण्यात आले.

यावेळी प्रत्येक सहभागीना ऊर्जा बचतीची मार्गदर्शक पुस्तिका मोफत प्रदान करण्यात आले. कार्यक्रमाचा समारोप राष्ट्रीय इंधन संरक्षण प्रतिज्ञेने करण्यात आला. कार्यक्रमाचे सुत्रसंचालन आणि आभार प्रा. दिनेश जोशी यांनी केले.

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