Energy Audit Report

(2022-23)

Dayanand College of Pharmacy

Barshi road, LaturDist. Latur- 413531 Maharashtra

Energy Audit Conducted by

Kedar Khamitkar & Associates

Energy Auditor

(Empanelled Mahaurja, Govt. of Maharashtra Institution)

M: 9850244701 Email. : urjabachat@gmail.com

Requirements for the NAAC

CEA Team has been Conducted Detailed Energy Audit of **M/s. Dayanand College of Pharmacy, Latur** Building Located at Latur – Maharashtra.
During Energy Audit We have found Environmental Consciousness and Sustainability initiatives in their Campus.

1. Percentage of Annual Lighting power requirement met through LED Bulbs

   (Current Year Data) = **67** %

2. Percentage of Annual Power requirements met through Renewable Energy Sources

   (Current year Data) = **71**%

KEDAR KHAMITKAR
Govt. Certified Energy Auditor
Reg.No.EA-8287
LATUR-Maharashtra

Kedar Khamitkar
Energy Auditor
(Certified by Bureau of Energy Efficiency, Ministry of Power, Gov. of India)
Empanelled Energy Auditor MAHAURJA , Govt. of Maharashtra Institution

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Executive Summary

The objective of the audit was to study the energy consumption pattern of the facility, identify the areas where potential for energy/cost saving exists and prepare proposals for energy/cost saving along with investment and payback periods. The salient observations and recommendations are given below.

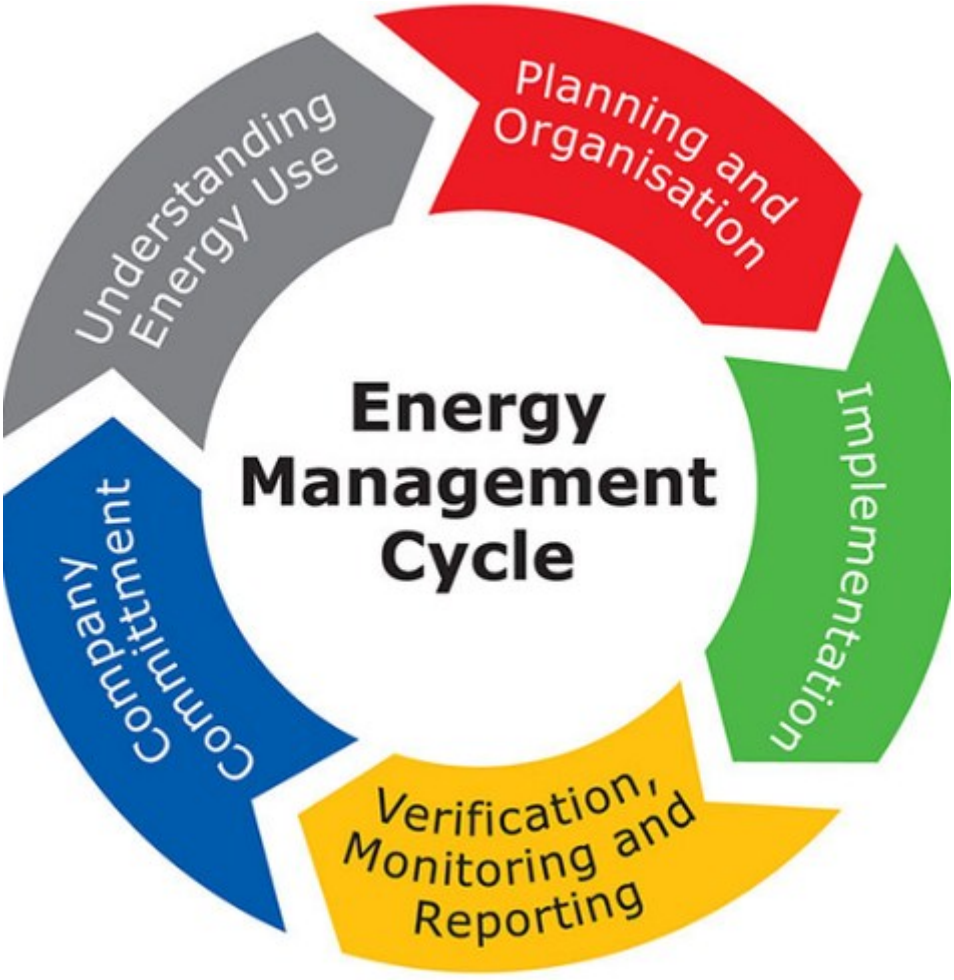
Sr.	Recommendations	Savings	Investment	Payback
1	**Improve Energy Efficiency in Fan System :** Replace Existing Inefficient Ceiling Fans with Efficient BLDC fans (Qty. 161 Nos.)	7300 KWh/Yr.	Rs. 2.41 Lakhs	3.3 Yrs.
2	**Improve Power Quality :** Install Voltage Servo Stabilizer of 100 KVa Capacity	1500 KWh/Yr.	Rs. 0.45/- Lakhs	2.6 Yrs.
3	**Improve Lighting system:** a) Install LED with reflectors b) Install Occupancy sensors with Timing control	2500 KWh/Yr.	Rs. 0.75 Lakhs	3 Yrs.
4	**Install Solar streetlights** (5 Poles 150 watt)	3000 KWh/Yr.	Rs. 1.28 Lakhs	4.2 yrs.
5	**Conduct 'Save Energy Program'**	-	No Investment	Immediate

Preface

An energy audit is a study of a plant 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, Latur was conceded by EA Team on April 17, 2023. This audit was over sighted to inquire about convenience to progress the energy competence of the campus.

All data collected from each classroom, Laboratory, 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 Education Society's Dayanand College of Pharmacy & Honorable Principal Dr. K. L. Satpute Madam for entrusting and offering the opportunity of energy performance assessment assignment.

We are thankful to Institute 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 Mr. V.R. Chavan, Mr. M.S.Shaikh, Mr. I.P. More and Mr.P.S.Kale sir for their cooperation received during field studies and providing necessary data such as Electricity bills, Electrical equipment's data for the study.

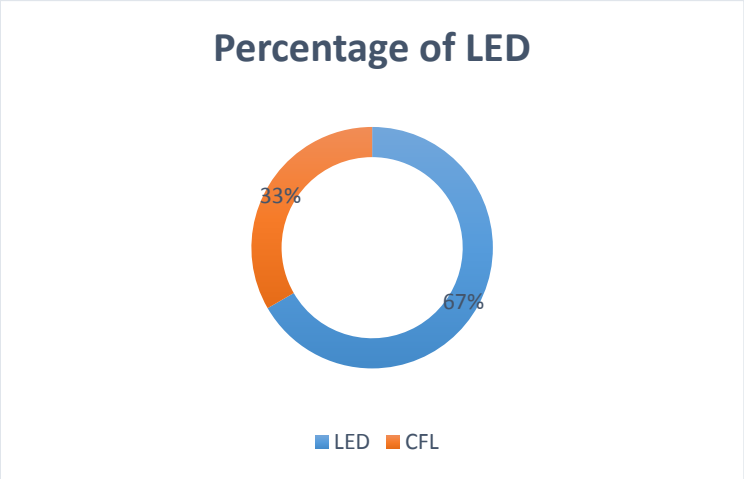
Kedar Khamitkar

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

Requirements for NAAC

1. Percentage of Annual Power requirements met through LED at DCOPL

Type	Total
LED Lights Connected Load	5296
CFL Bulb Connected Load	2650
Total Lighting Load	**7946**

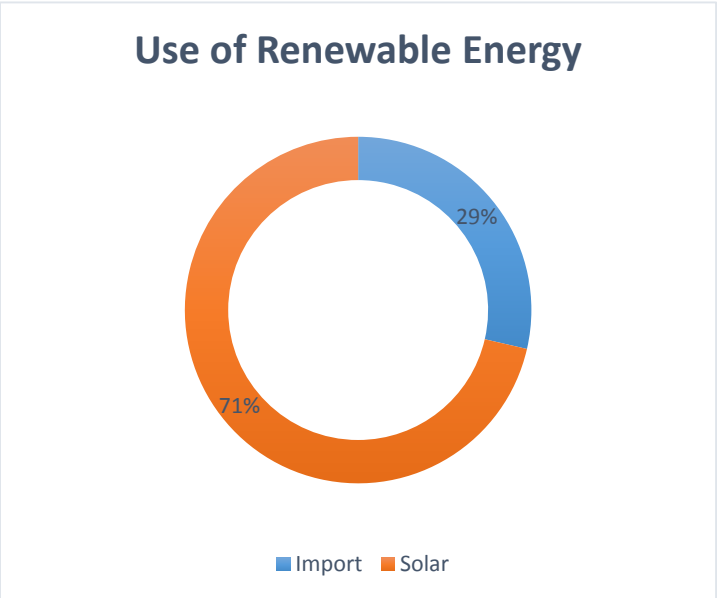


Observations:
Percentage of Annual Power requirements met through LED Bulb/Tube Current year data is **67**%

Suggestions:
Replace **33**% Inefficient CFL lighting with Efficient LED Lighting

2. Percentage of Annual Power requirements met through Renewable Energy

Average Renewable Energy units generated	17280	KWH
Nonrenewable Energy (Mahavitaran) imported	6924	KWH
Annual Total Power Requirement	**24204**	**KWH**



Observations: Percentage of Annual Power requirements met through Renewable Energy Sources Current year data is 71%

Suggestions: Reduce Import from MAHAVITRAN

- Install solar streetlights
- Install Motion sensors

Energy Performance Index (EPI)

Electrical Energy received to Dayanand College of Pharmacy, Latur campus from MSEDCL Maharashtra State Electricity Distribution Company Limited.

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

Total Electricity Consumption 6924 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.

Observations:

EPI calculated as under (for Electricity): 2.14 KWh/Sq. Meter

As per BEE Star Rating Guidelines Existing Dayanand College of Pharmacy, Latur Buildings may be considered as 5 Star.

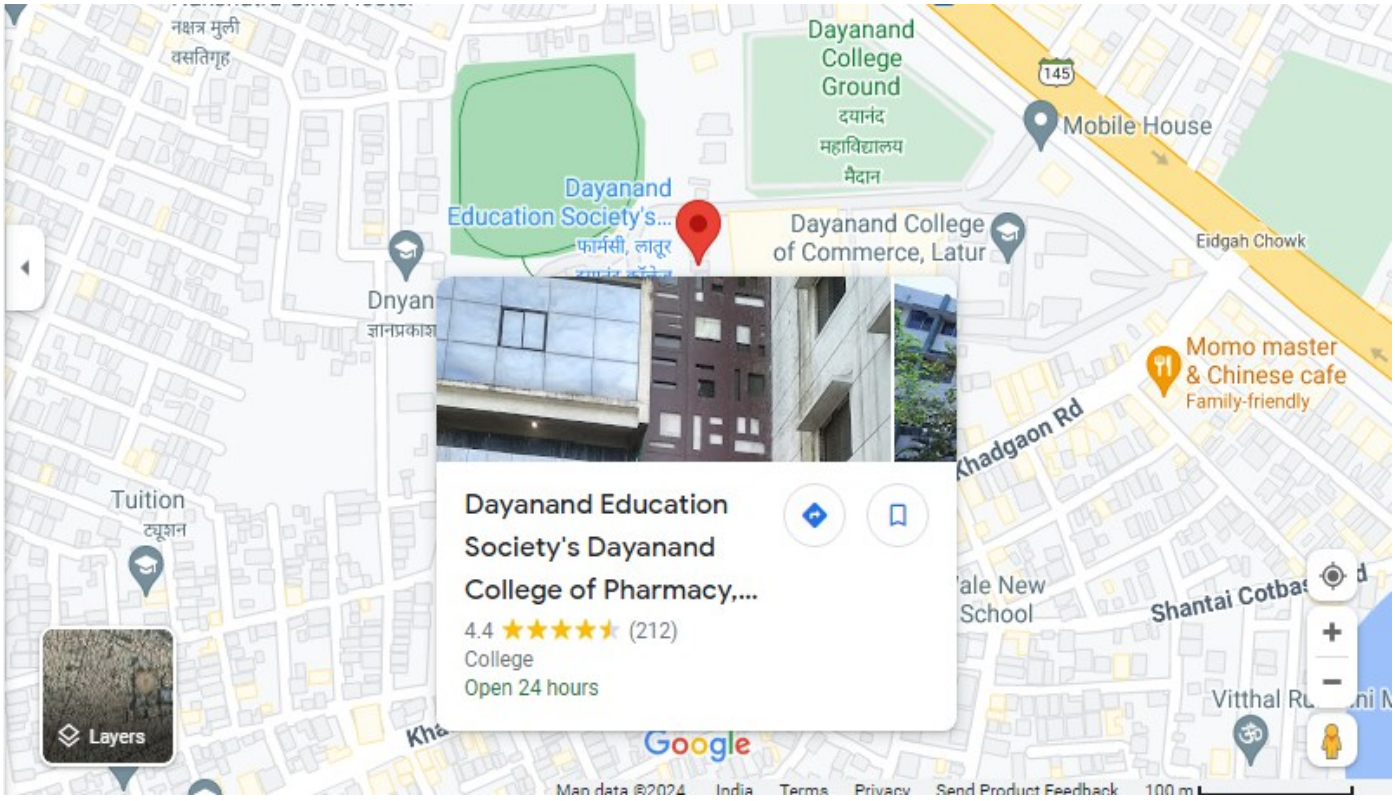
EPI KWH/Sq. Meter/Year	Star Label
80-70	1 Star
70-60	2 Star
60-50	3 Star
50-40	4 Star
Below 40	**5 Star**

Energy Conservation Building Codes

Chapter: 1 Introduction

Dayanand Education Society's Dayanand College of Pharmacy was established in the year 2009 with the vision "To nurture the future pharmacists with a focused approach for overall professional development and excellence". Our college is approved by DTE Maharashtra & PCI New Delhi, affiliated to MSBTE and Swami Ramanand Teerth Marathwada University, Nanded Maharashtra.

The Dayanand College of Pharmacy offers Diploma, Degree & PG (Pharmaceutics, Pharmaceutical Quality Assurance, Pharmacology, and Regulatory Affairs) courses in Pharmacy.



Address : Barshi Rd, Prakash Nagar, Latur- 413531 Maharashtra

Chapter 2: Energy Audit Objectives

Dayanand College of Pharmacy Building entrusted the work of conducting a detailed Energy Audit of campus with the main objectives given bellow:

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

Scope of Work, Methodology and Approach:

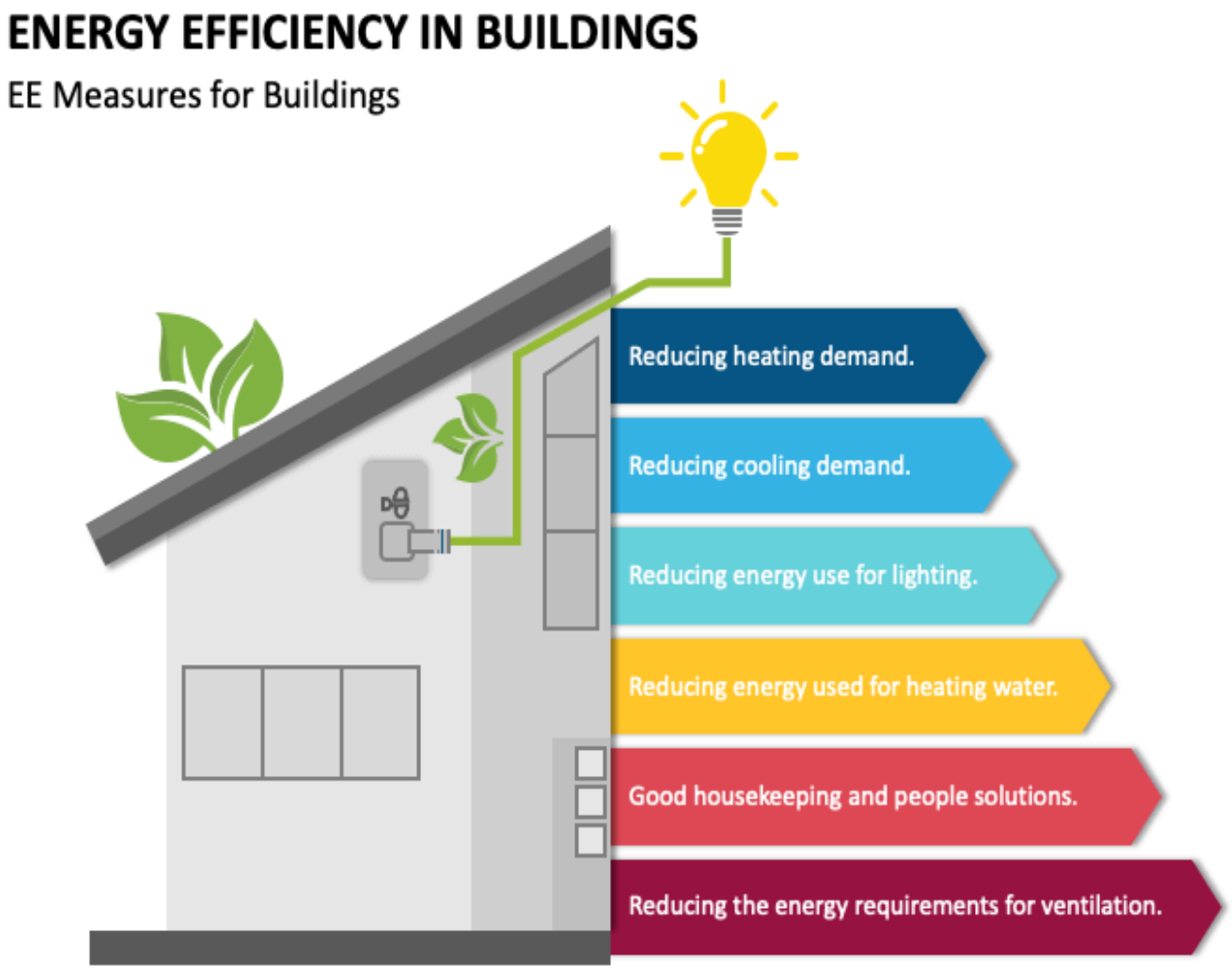
Scope of work and methodology were as per the proposal .While undertaking data Collection, field trials and their analysis, due care was always taken to avoid abnormal situations so as to generate normal/representative pattern of energy consumption at the facility.

Approach to Energy Audit:

We focused our attention on energy management and optimization of energy efficiency of the systems, sub systems and equipment's. The key to such performance evaluation lies in the Sound knowledge of performance of equipment's and system as a whole.

Energy Audit:

The objective of Energy Audit is to balance the total energy inputs with its use and to identify the energy conservation opportunities in the stream. Energy Audit also gives focused Attention to energy cost and cost involved in achieving higher performance with technical and financial analysis. The best alternative is selected on financial analysis basis.



Chapter: 3 Energy Audit Methodology

Energy Audit Study is divided into following steps

1. Historical data analysis:

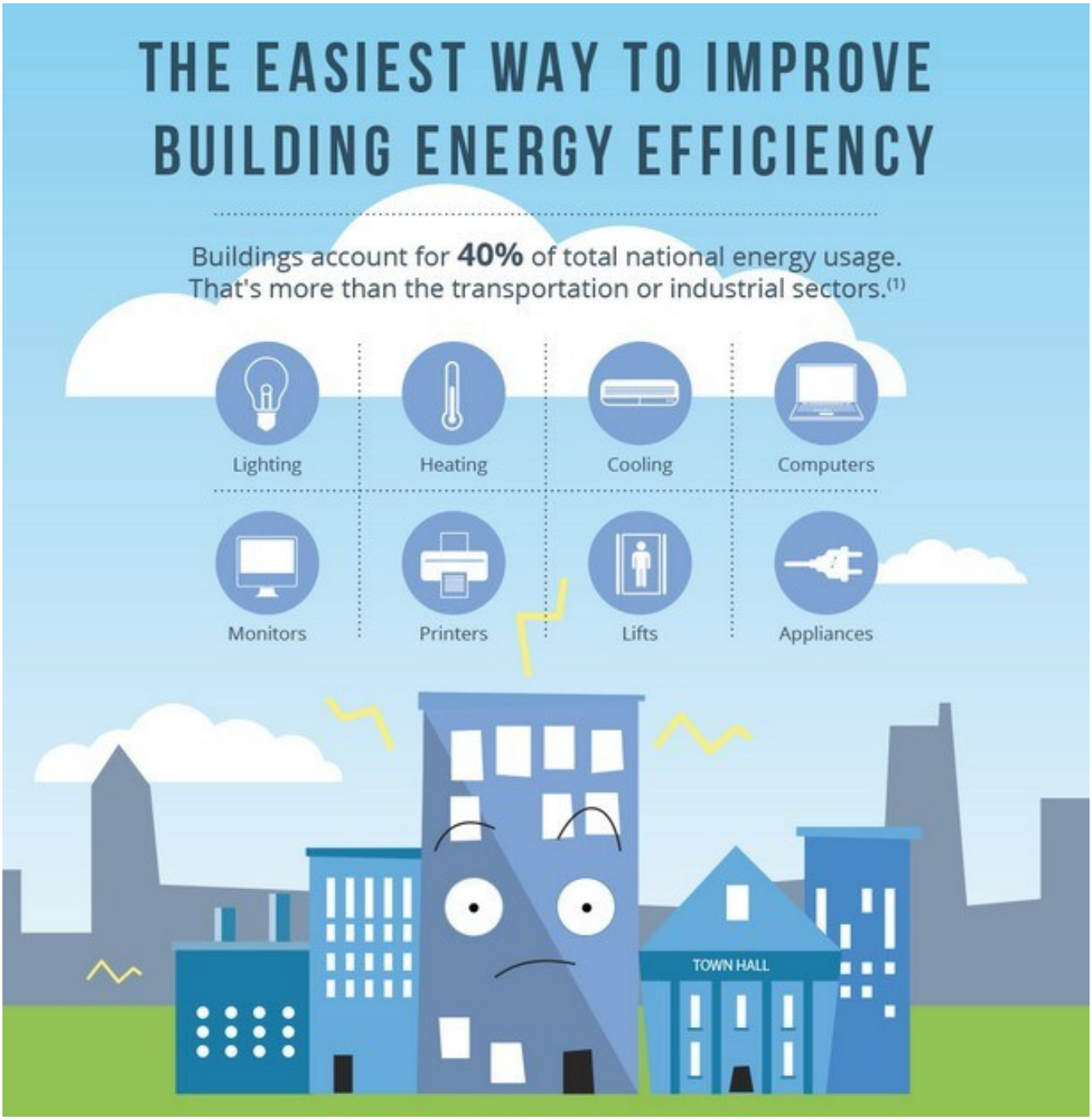
The historical data analysis involves establishment of energy consumption pattern to the established base line data on energy consumption and its variation with change in production volumes.

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:

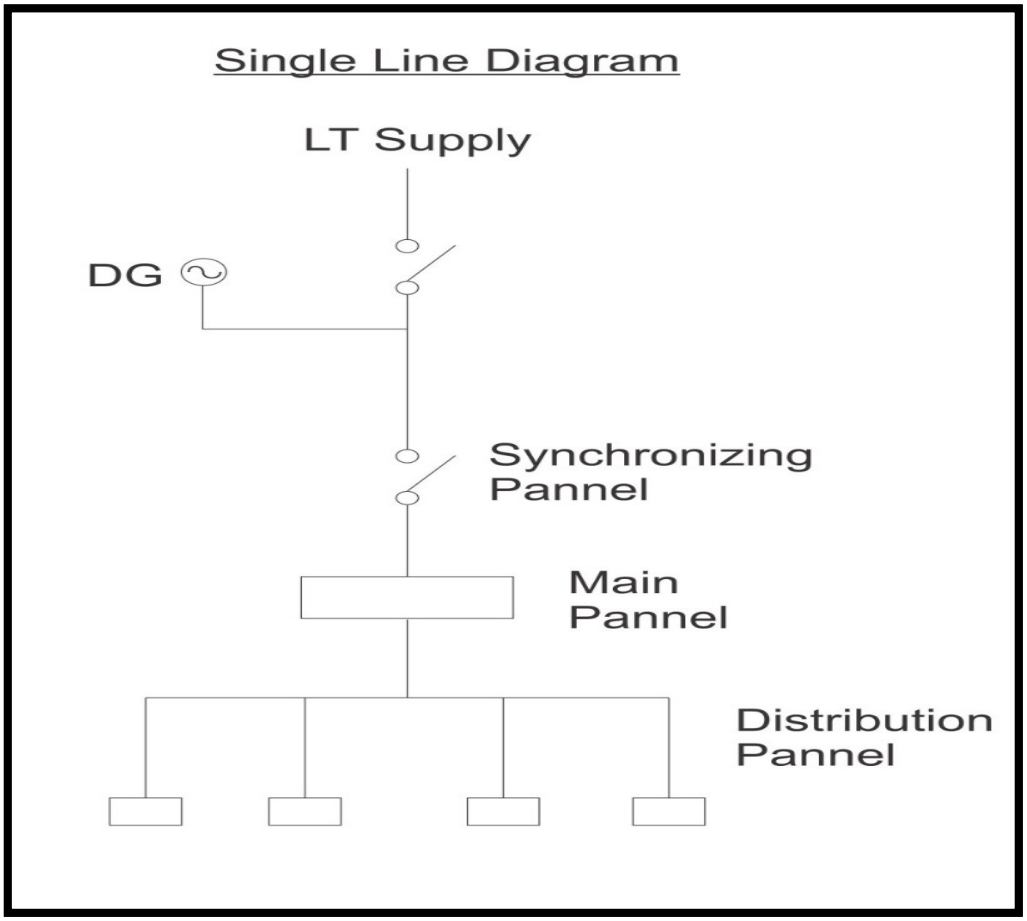
This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential of energy saving and investment required to implement the Proposed modifications with payback period.



Chapter: 4. Study of Electrical Systems

Electrical Energy Sources:

1. **The electrical supply to the Institute comes from MSEDCL LT supply.**
2. **Solar Power Plant Capacity 18 KW**
3. **Diesel Generator 62.5 KVA**



Observations: 1. Electricity generated KWh from Diesel Generator record not available
2. MSEDCL has been installed one common Energy meter in Campus which distributes electrical energy to DCOPL building.

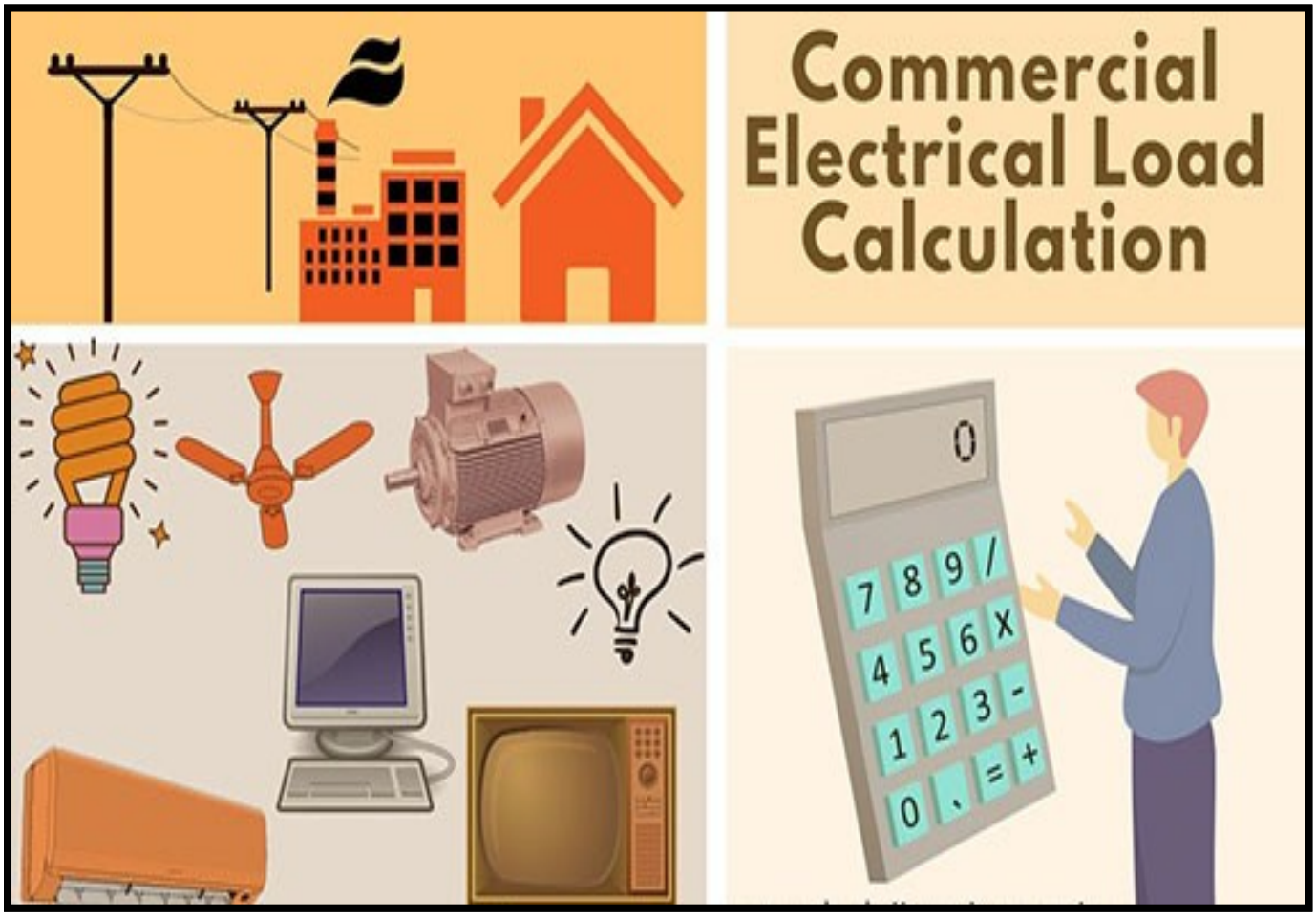
MSEDCL LT Supply Meter - A Consumer No. 610551351427

Suggestions: Measure fuel consumption per KWH of electricity generated periodically from D.G. set

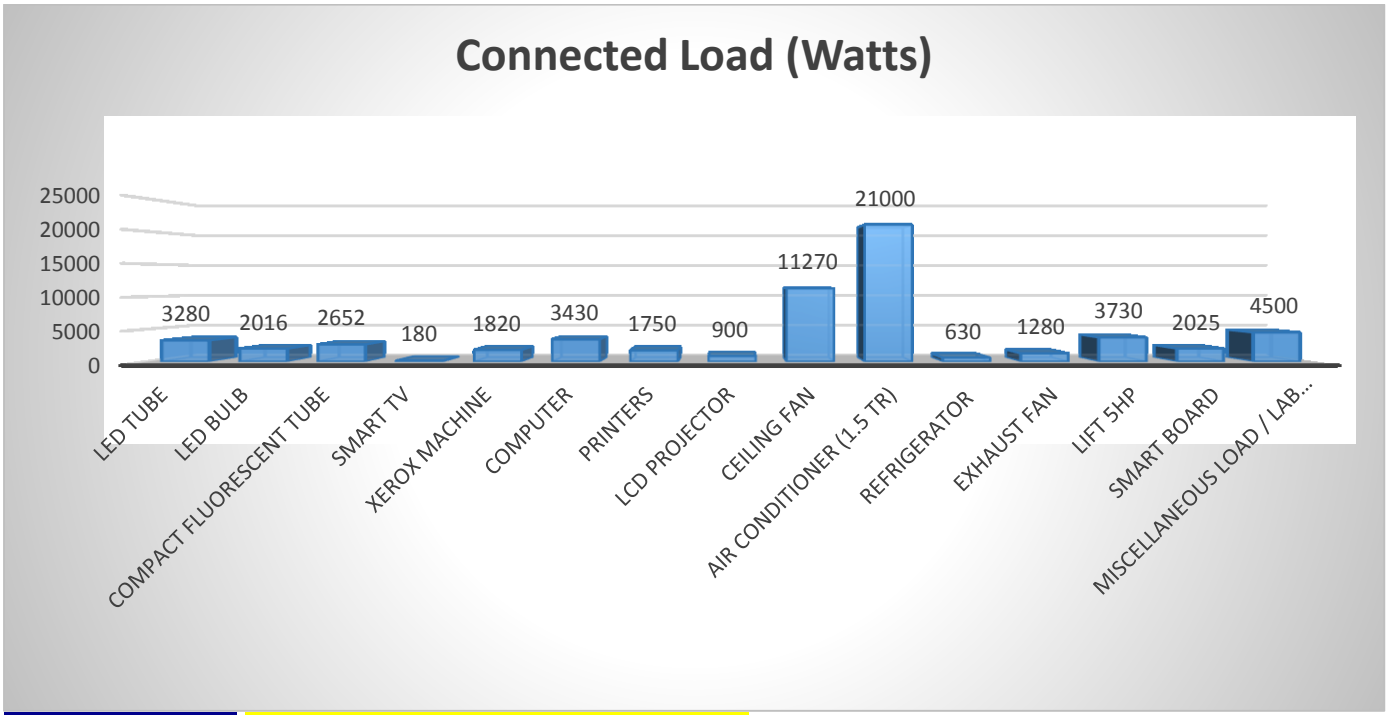
Connected Load Details

Major Energy use and Areas: In the College Campus Electrical energy is used for various applications like: Computers, Printers, Xerox machines, LCD Projector, Router System, Lighting, Fans, Flood light, Pumping Motor, Air-Conditioning & Other Laboratory Equipment's etc.

Sr.	Name of Appliances	Watt	Qty.	Wattage
1	LED Tube	20	164	3280
2	LED Bulb	18	112	2016
3	Compact fluorescent Tube	52	51	2652
4	Smart TV	90	2	180
5	Xerox Machine	1820	1	1820
6	Computer	70	49	3430
7	Printers	250	7	1750
8	LCD Projector	300	3	900
9	Ceiling Fan	70	161	11270
10	Air Conditioner (1.5 TR)	1500	14	21000
11	Refrigerator	210	3	630
12	Exhaust fan	40	32	1280
13	Lift 5HP	3730	1	3730
14	Smart Board	225	9	2025
15	Miscellaneous Load / Lab Instruments			4500
			Total	**60463**



Graphical View Air Conditioning system contributes highest load i.e. 21 Kilowatts.



Observations **AC unit is running less efficiently.**

Suggestion's The air around outside AC unit can be particularly hot, especially outdoor unit stands in direct sunlight with no trees around.

An outdoor unit of an AC generates heat from direct sunlight.

Optimum placement includes a wall facing north or south; east and west walls are best to avoid, if possible, since they receive more sun exposure throughout summer months, which makes your air conditioner work harder and end up costing you more in energy fees

Install Heat Proof Cover. Improve performance of Air-conditioning System.

Chapter: 5. Performance Evaluation

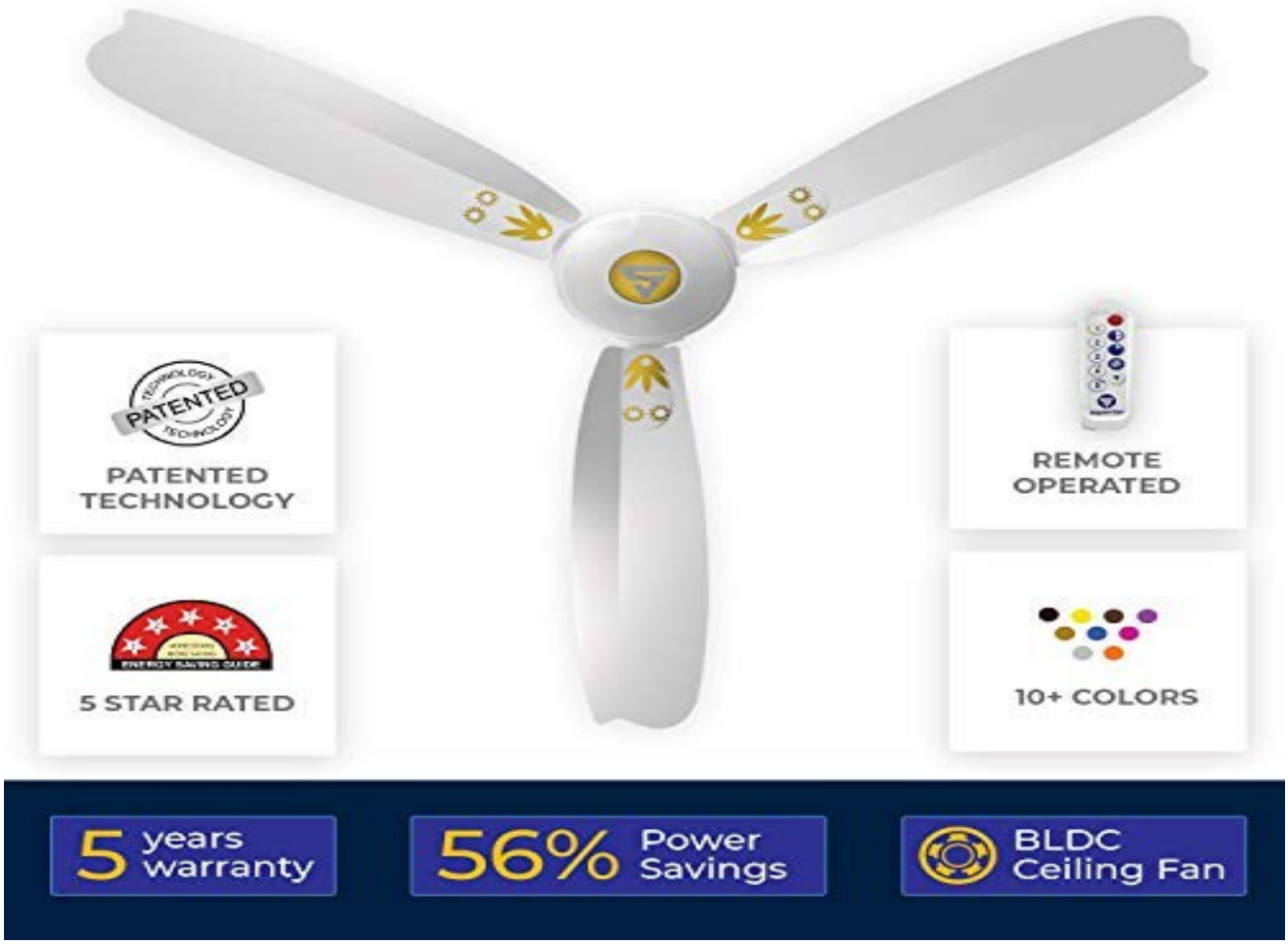
5.1 Fan System:

Total number of fans used in the DCOPL campus = **161** No's

Consider @180 days Working 6 Hrs.

- Number of fans to be replace = **161** Nos.
- The Total Current Consumption =**12170** kWh
- The Expected fan Consumption = **4850** kWh
- Expected Saving per year = **7300** kWh/year

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



General Observations based on Electricity Bill:

Total Annual Electricity Imported from Mahavitran 6924 KWH/year

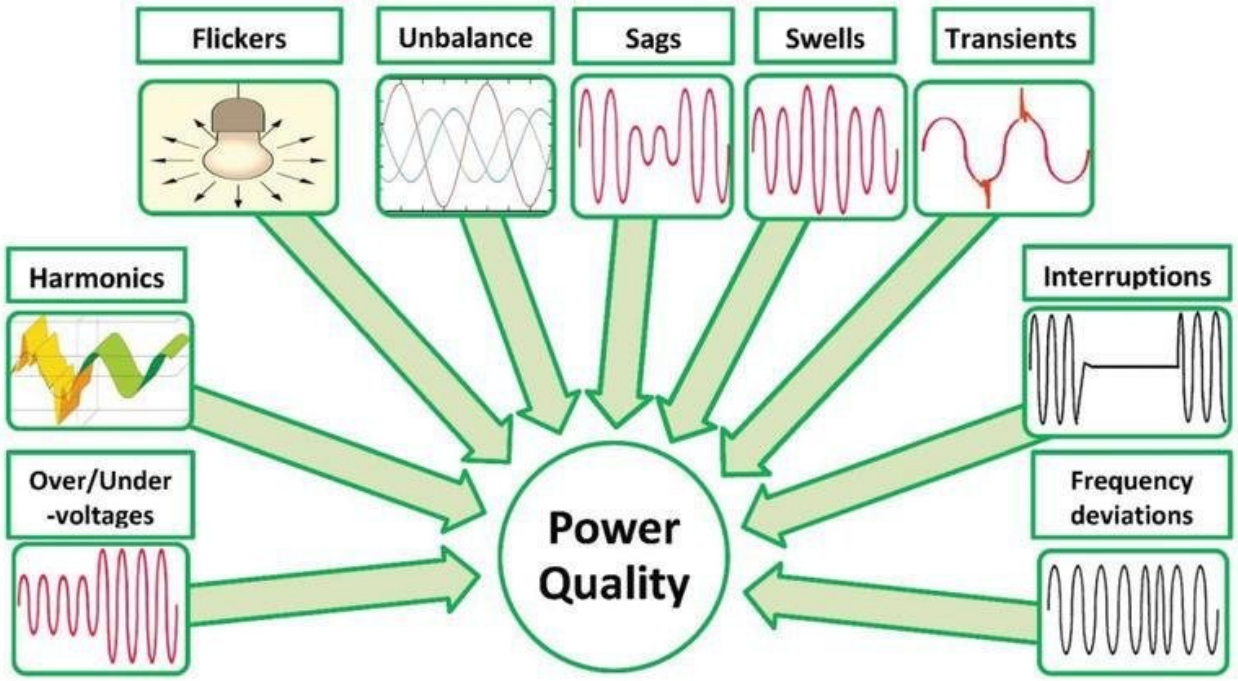
Ceiling fans contributes 11.27 KW connected load

Suggestion: Improve Energy Efficiency. Install Energy Efficient BLDC Fan system.
Removal of existing ceiling fans of 70watt with energy saver fan of 28 watts.

5.2 Monitor Power Quality Supply

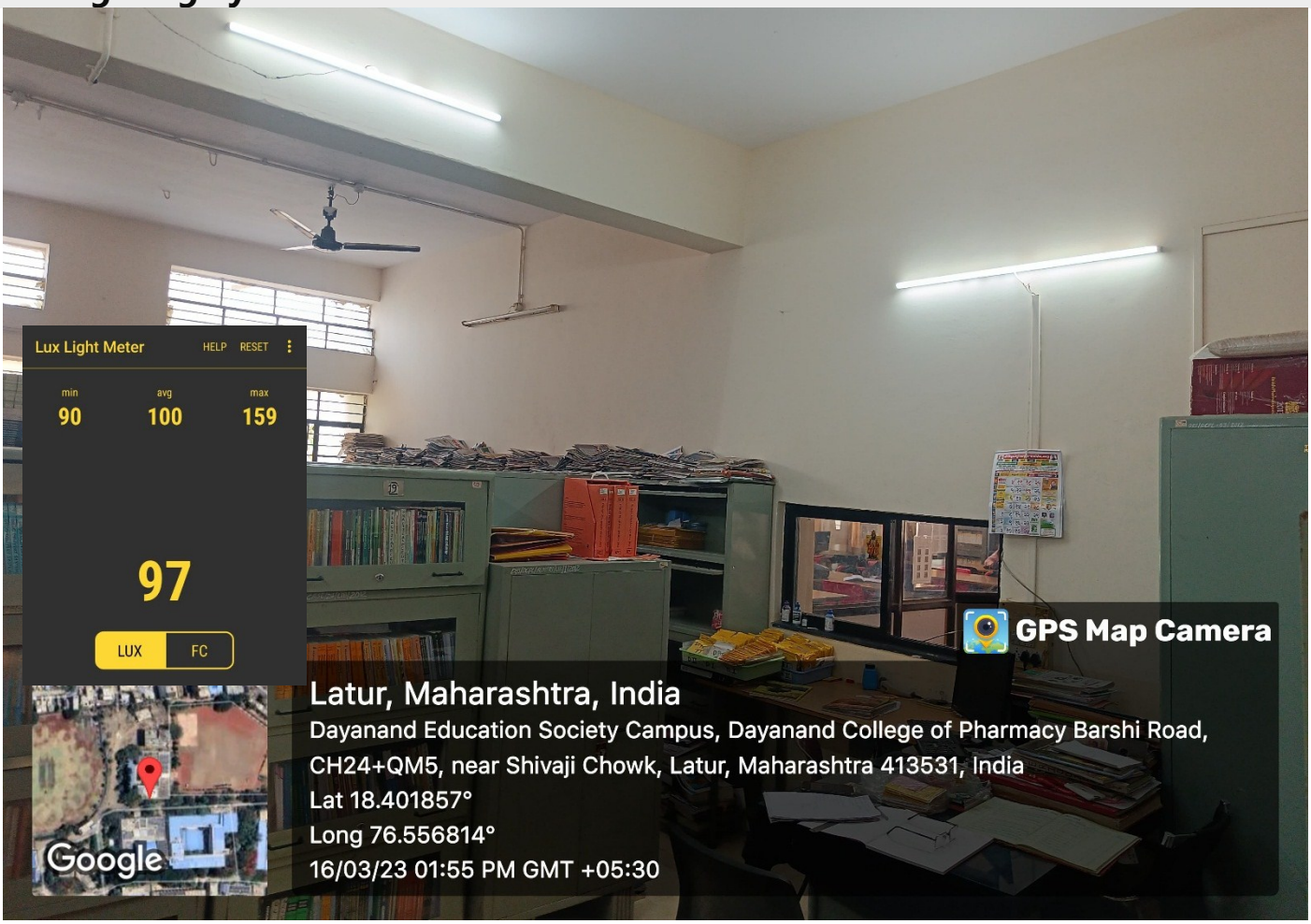
Power quality issues can affect the operation of critical loads and can have the negative impact on operation. This power quality analyser can monitor the cost of energy wasted due to poor power quality.

Power quality refers to the level of consistency, reliability, and stability of electrical power.



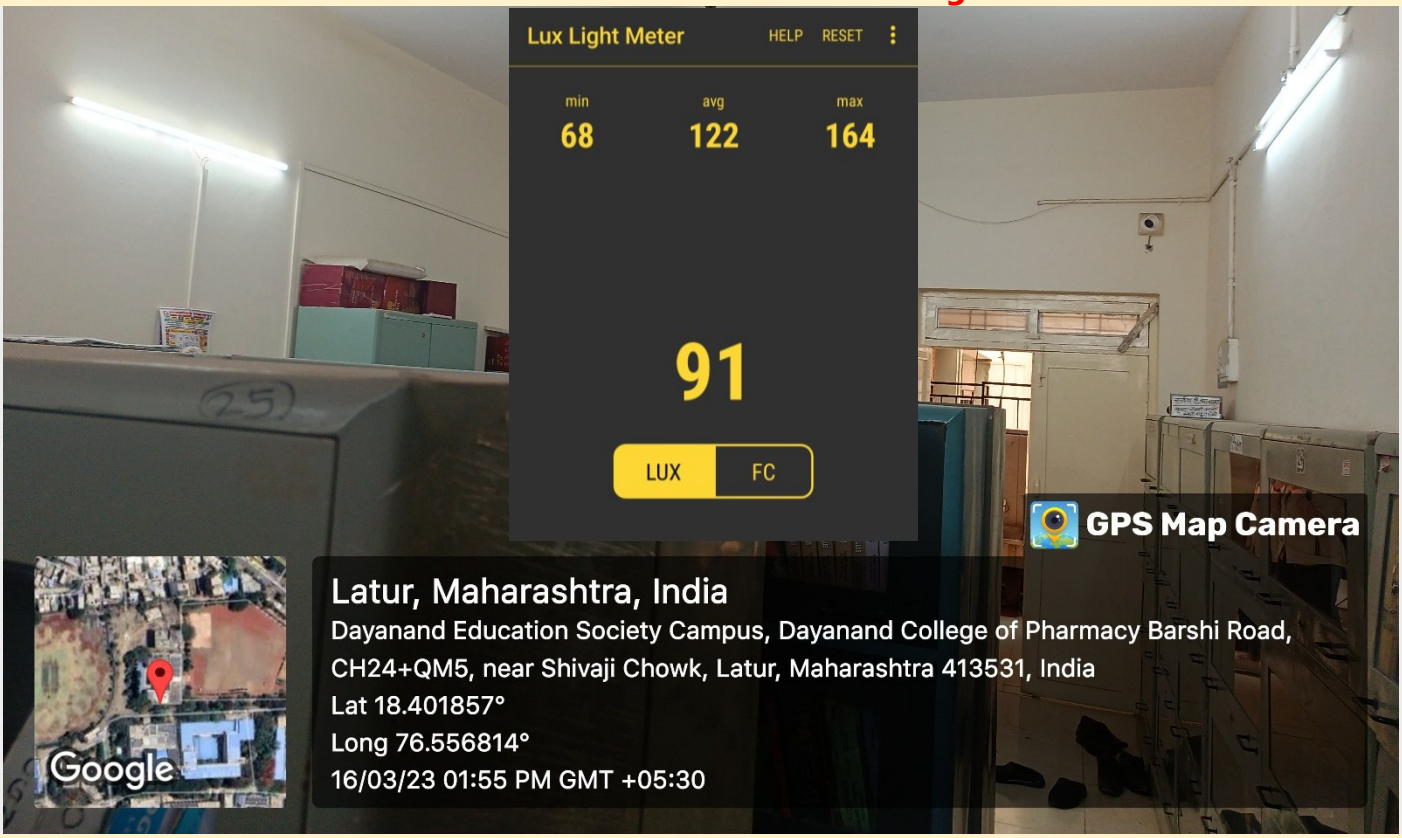
Suggestions: Install Voltage Servo Stabilizer of 100 KVa Capacity

5.3 Lighting System : Lux level Measurements at DCOPL



Observations:

Measured Lux Level found LOW: Max 159 Min 90 & Average 100



Measured Lux Level found LOW: Max 164 Min 68 & Average 122

Observations : In the DCOPL campus Majority LED Tube are installed without reflectors.

Suggestions: Increase Lighting Efficiency by using reflectors.

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).

Proposed:- Improve effectiveness of Lighting System.

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

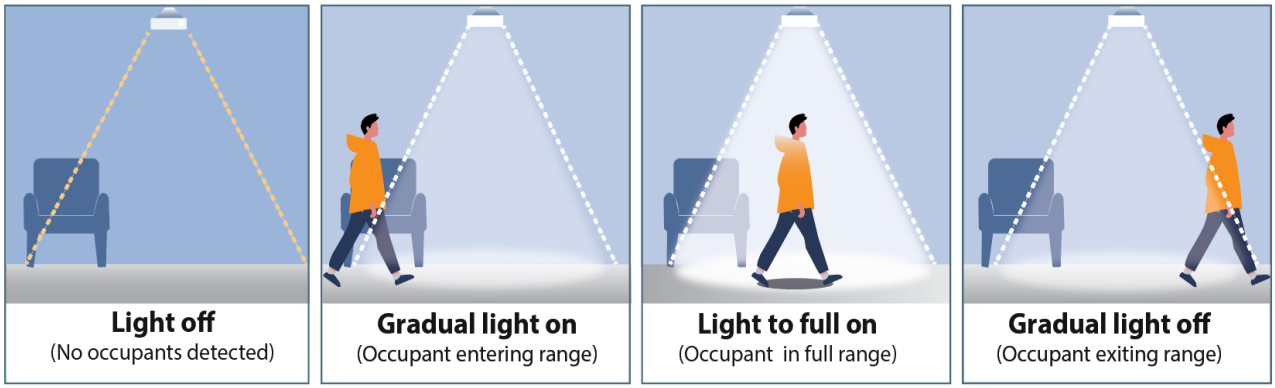
White Reflectors. More flexible between indoor and outdoor use.

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

Recommended LUX Level

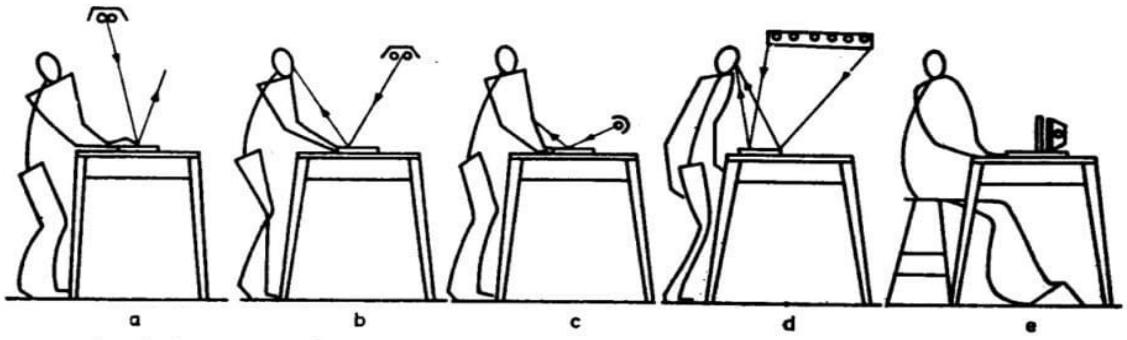
Area	Recommended Min. Illumination (in LUX)
1. Bathroom	100-150
2. Entrance – hall	200
3 Consultation room	100
4. Corridor , General	300
5. Ward	150-300
6. Delivery Room	400
7. Diagnostic x ray , Work Place	300
8. Doctors office	300
9. Enquiry Office	500
10. Nursing Station (Day)	300
11. Nursing Station (Night)	30-100
12. Kitchen	300
13. Laboratory , Pathology	300-500
14. Maternity Department	400
15. Operating Theatre	10000-50000
16.. Toilets	100-150
17. Store	100
18. Pharmacy	300
19. Scrub Area, Operating Rooms	300
20 Mortuary	200

Suggestions: Install occupancy sensors to reduce Losses.



Chapter: 6 Guidelines for Identified Energy Saving Opportunities

• Use day lighting effectively by locating work stations requiring good illuminance near the windows.
• Minimize illuminance in non- task areas by reducing the wattage of lamps or number of fittings
• Avoid use of incandescent/tungsten filament lamps. The power consumed by these lamps is 80% more than the fluorescent lamps (discharge) for same lumen output.
• Use electronic ballasts in place of conventional ballast for fluorescent lamps.
• Task lighting saves energy, utilize it whenever possible.
• All surfaces absorb light to some degree and lower their reflectance. Light colored surfaces are more efficient and need to be regularly painted or washed in order to ensure economical use of light.
• Maintenance is very important factor. Evaluate present lighting maintenance program and revise it as necessary to provide the most efficient use of lighting system.
• Clean luminaries, ceilings, walls, lamps etc. on a regular basis.
• Controls are very effective for reducing lighting cost. Provide separate controls for large ratings.
• Install switching or dimmer controls to provide flexibility when spaces are used for multiple purpose and require different amounts of illumination for various activities.
• Switching arrangements should permit luminaries or rows of luminaires near natural light sources like windows or roof lights to be controlled separately.
• Separate lighting feeder and maintain the feeder at permissible voltages by using transformers. • Install occupancy sensors for indoor cabin light controls



a — Luminaire located to prevent reflected glare; reflected light does not coincide with angle of view.
b — Reflected light coincides with angle of view.
c — Low-angle lighting to emphasize surface irregularities.
d — Large-area surface source and pattern are reflected toward the eye.
e — Transillumination from diffuse source.

FIG. 2 EXAMPLES OF PLACEMENT OF SUPPLEMENTED LUMINAIRES

Conduct Institutional Training / Awareness Program
14th December 'National Energy Conservation day'

The National Energy Conservation Day is organised on 14th December every year by the Bureau of Energy Efficiency (BEE) with an aim to showcase India's achievements in energy efficiency and conservation. BEE - Ministry of Power celebrate every year Energy Conservation Week from 14th December – 20th December.

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.

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.

Chapter: 7 Best Practices & Activities

I. Institute has been declared their Environment Policy

Policy Document On Environment and Energy Usage

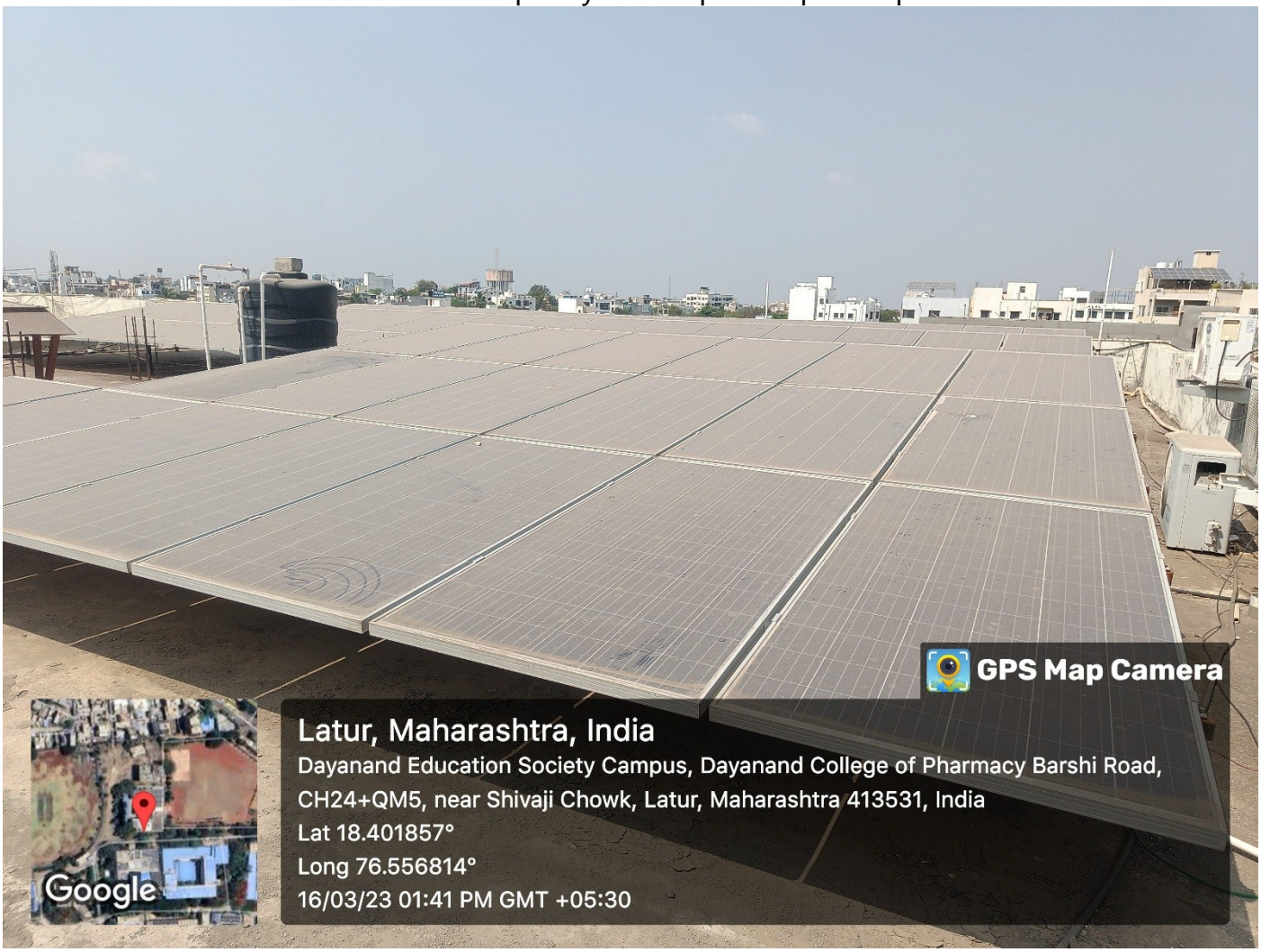
- To install LED bulbs in the complete campus to save energy
- To operate institute building in most efficient energy manner.
- Maximum use of Renewable Energy.
- Encourage a culture of Energy conservation on campus.
- To take additional measures to continuously improve our energy consumption.
- To develop and maintain Energy Management System based on ISO: 50001.
- To encourage use of advanced technology to minimize energy consumption.
- To engage in dialogue with the government agencies, and actively work with the local organizations in the areas of environment, energy efficiency and sustainable development.
- To strengthen our employees' and students' environmental knowledge and skills in order to improve our own environmental performance.
- To provide information and training opportunities on energy saving measures.
- To train our employees and students through our Enviro Club to make them 'Go Green Specialists' and partners to plant trees each year.

Principal

2. Solar Power Plant at DCOPL Campus

Use of renewable Energy:

Institute has been installed **18** KW Capacity Rooftop solar power plant.



Observations :

1. Percentage of Annual Power requirements met through renewable energy Sources is **71**%

2. Electricity Generation from Solar Power Plant **17280** Units/Year

3. Electricity Imported from Mahavitran **6924** Units / Year

Suggestions :

1. Install Solar Street Lights to Minimize Electricity Import during Night.

2. Install Occupancy Sensors to minimize electricity unknown losses.

3. Install Solar Pumping system.

3. Best Practices & Activities : Use of Natural daylight

Exposure to natural light helps our bodies produce Vitamin D, improves our circadian rhythms and sleep patterns, helps us to focus, enables us to get more done, and even makes us happier. Ensuring we get enough of this vital resource is key to our physical and psychological wellbeing.

Observations: Students & staff using maximum use of Natural daylight

Chapter 8: Conclusion

A total Investment of Approx. Four lakhs & Eighty Nine thousand rupees (Rs. 4.89/- Lakhs) amount is estimated for the energy efficiency improvement & renewable energy projects

Energy Savings expected around 14300 KWH/year.