

## CERTIFICATE

This is to certify that Greenex Environmental, Pune has done Green and Environment Audit of Dayanand College of Pharmacy, Latur on 10 March 2023 for the year 2022- 2023.

Place: Pune

Date: 10 March 2023



Arati Bhosale  
Managing Director  
Greenex Environmental

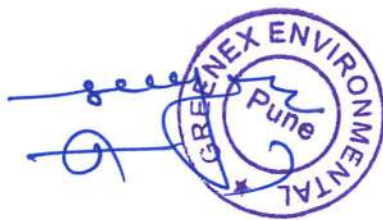
**Green and Environment Audit  
Report  
For  
Dayanand College of Pharmacy,  
Latur**



By

**GREENEX ENVIRONMENTAL**

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## ACKNOWLEDGEMENT

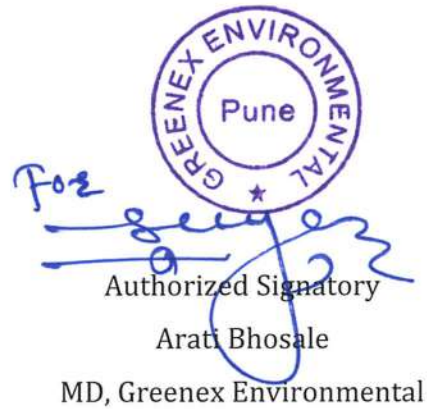


Green Audit Assessment Team is thankful to the Principal of Dayanand College of Pharmacy for assigning the Green Audit task. We appreciate the cooperation that we received from the faculties and students during the audit process. In an addition we convey our special thanks to the Principal Dr. Satpute K. L. for his conscious support and encouragement from the very beginning and throughout the process.

## DISCLAIMER

Green Audit team has prepared this report on the basis of primary data collected from in and around the college premises. All reasonable due care has been taken in its preparation; details contained in this report have been compiled in good faith based on information gathered.

Prepared By:  
Green Audit Team,  
Greenex Environmental.

A circular purple stamp with the text "GREENEX ENVIRONMENTAL" around the perimeter and "Pune" in the center. A handwritten signature in blue ink is written over the stamp. To the left of the signature, the word "For" is written in blue ink. Below the signature, the text "Authorized Signatory" is printed, followed by "Arati Bhosale" and "MD, Greenex Environmental" in black text.

For  
Authorized Signatory  
Arati Bhosale  
MD, Greenex Environmental

## **INTRODUCTION**

### **DAYANAND EDUCATION SOCIETY, LATUR**

Dayanand Education Society was established in the May, 1961. Latur is a city in Osmanabad district of Indian state of Maharashtra, and is one of the largest cities of the Marathwada region. The city is a tourist hub surrounded by many historical monuments as well. Presently the institute covers Science, Law, Commerce, Arts, Architecture and Pharmacy departments serving junior & senior sections of education. The dignitaries and visionary personalities viz. Manikrao Sonavane (elder brother of Keshavrao Sonawane), Chandrashekhar Vajpeyi, Ramgopal Rathi and Keshavrao Sonawane established Dayanand Education Society. Manikrao Sonavane is also the chairman of market committee, promised an assurance to the farmers of Latur to contribute for the education development. Keshavrao Sonavane, Co- Operative Minister of the Maharashtra state also laid his contributions to such a noble cause by fulfilling needed formalities. Earlier the college was affiliated to Dr. Babasaheb Ambedkar Marathwada University Aurangabad; however, the formation of a Swami Ramanand Teerth Marathwada University in Nanded has facilitated the Dayanand Education Society affiliation.

The Area of whole campus is 22 Acres and has 8 education institutes as follows:

- i. Dayanand College of Commerce
- ii. Dayanand College of Arts
- iii. Dayanand Science College
- iv. Dayanand College of Law
- v. Dayanand College of Pharmacy
- vi. Dayanand College of Animation
- vii. Dayanand College of Fashion Designing and Interior Decoration
- viii. Dayanand College of Architecture
- ix. Dayanand Institute of Pharmacy

### Infrastructure inside campus

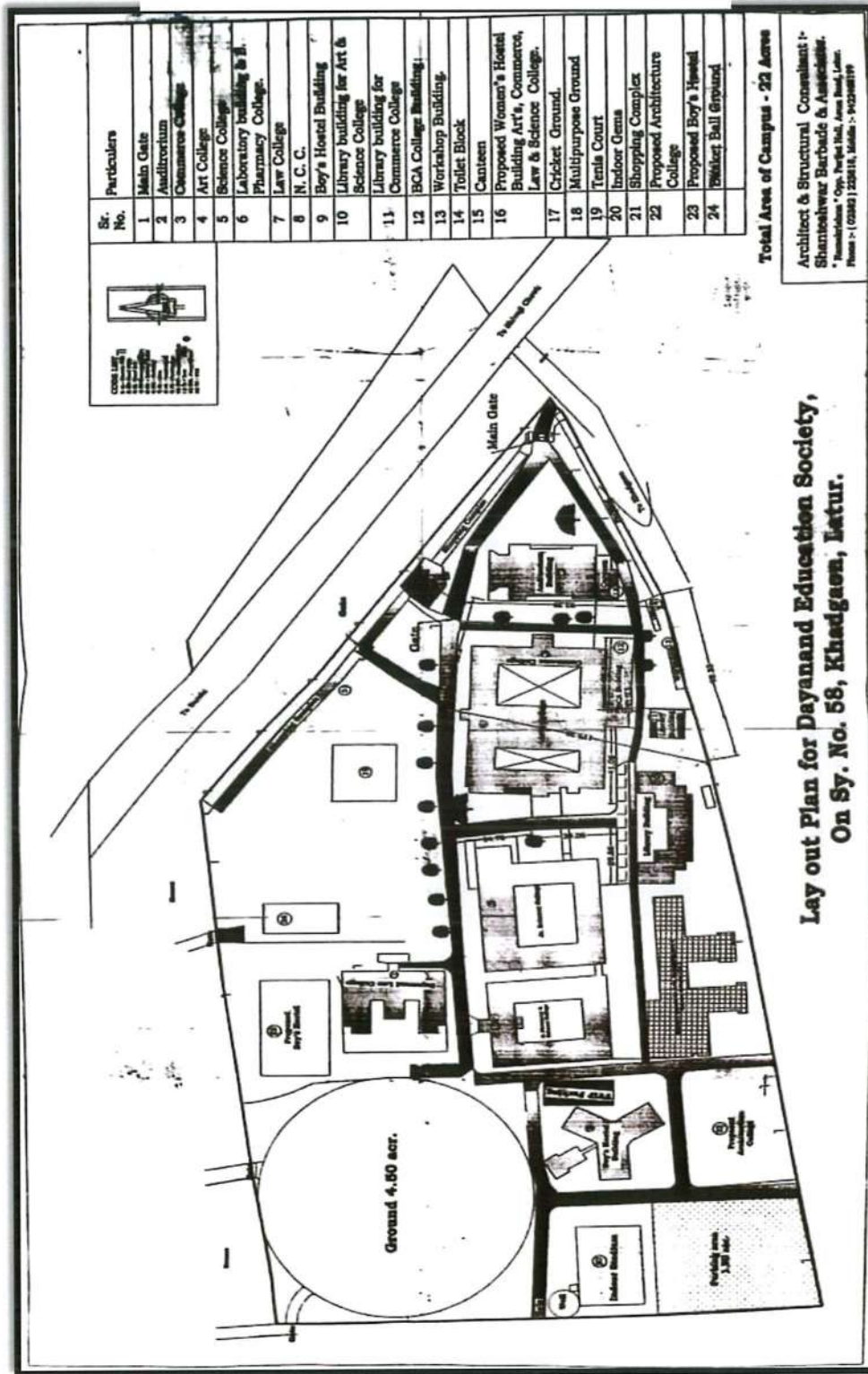
Dayanand Education Society has 15 buildings in the campus namely:

- i. Dayanand College of Commerce
- ii. Dayanand College of Art
- iii. Dayanand Science College
- iv. Dayanand College of Law
- v. Dayanand College of Pharmacy
- vi. Dayanand Institute of Pharmacy
- vii. Dayanand College of Animation
- viii. Dayanand College of fashion designing and interior decoration
- ix. Dayanand College of Architecture
- x. Girl's Hostel
- xi. Boy's Hostel
- xii. Library
- xiii. Auditorium
- xiv. Indoor Stadium and Gymnasium
- xv. Cricket Ground





**Dayanand Education Society campus**



**Lay out Plan for Dayanand Education Society,  
On Sy. No. 58, Khadgaon, Latur.**

Layout Plan of DES

## DAYANAND COLLEGE OF PHARMACY

Dayanand education society's Dayanand College of Pharmacy was established in the year 2009 in the heart of city of Dayanand education Campus, Latur by Dayanand education society's President Shri. Laxmi Raman Lahoti and secretary Shri. Rameshji Biyani to impart the quality education. Dayanand College of Pharmacy is affiliated to Swami Ramanand Teertha University, Nanded, approved by AICTE, PCI and is situated in pollution free sprawling campus spread over **22.5** acres, The college caters D. Pharm, B. Pharm and M. Pharm with the latest equipment, spacious air-conditioned smart lecture halls, computer lab and seminar hall along with good library facilities. DCOP has been successful in providing and maintaining high quality in teaching Pharmaceutical Sciences. The college has committed itself to become a center for excellence in pharmaceutical education and research and be a leader in the field of pharmaceutical sciences including pharmacy practice with the objective of strengthening the healthcare of the country.

It is located at the center of the educational institute the total Library Area is 2000Sq. Ft. There is one stock room, one Reference Section, one Circulation Section & One Reading Room for students & faculty. The seating capacity of the reading room is 150. The library is a member of DELNET which provides online e-resources such as E-books, to read and download, full-text medical books, theses& dissertations in addition the library is a member of the National Digital Library which provides e-books & journals in various fields globally.

The computer laboratory is equipped with 65 computers having internet access available to all students. Above facility is accompanied by specialized language lab software through which the student can improve their English language understanding. Students take benefits of LMS system to access their study material & exam modules.

The Central Instrument room has Centrifuges, Rotary Evaporators and several other instruments to facilitate research activities. Students have become well conversant in using sophisticated analytical instruments like UV Visible Spectrophotometer, Fluori meter etc.

The Dayanand Education Society's Dayanand College of Pharmacy animal facility is located in the campus, away from noise and pollution, providing an excellent environment for animal care. The facility is equipped for small animal experimentation with quarantine, and

experimental rooms for rodents and rabbits. Animal experimentation is under the control of the Institutional Animal Ethics Committee of DES Dayanand College of Pharmacy and animal use is regulated as per the guidelines of CPCSEA New Delhi.

The DES Dayanand College of Pharmacy, Animal facility provides investigators with the infrastructure for experimentation on mice, Rat and rabbits. The Animal facility is equipped with modern equipment's like Individually Ventilated caging (IVC) systems, Animal changing station, Haematology, analyser, etc.

Total attendants of the college are 621 out of which 551 are students and 70 are teaching and non-teaching staff members.



Image showing Dayanand Pharmacy College

### VISION OF THE COLLEGE

To nurture the future pharmacists with focused approach for overall professional development and excellence.

### MISSION OF THE COLLEGE

#### Transferring Knowledge into Wisdom

1. To inculcate the academic and research environment amongst staff and students.
2. To maintain high standards of pharmacy education through excellent infrastructure and learning resources.
3. To provide the students all the learning facilities along with understanding of ethical values and morality.
4. To develop the students to face the challenges of the academia, industry and society.

### GOALS AND OBJECTIVES

- Pharmacy Graduates prepared for higher studies and career growth.
- Pharmacy Graduates encouraged to acquire knowledge and competency as per the need of pharmaceutical and allied industries
- Pharmacy Graduates motivated to serve the community by creating awareness about social and healthcare services.

### PROGRAM OUTCOMES (POS)

**PO1:** Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

**PO2:** Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

**P03:** Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

**P04:** Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

**P05:** Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.

**P06:** Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g., health care professionals, promoters of health, educators, managers, employers, employees).

**P07:** Pharmaceutical Ethics: Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

**P08:** Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

**P09:** The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

**PO10:** Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO11:** Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-access and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

### **DAYANAND EDUCATION SOCIETIES AMENITIES**

Dayanand educational society offers overall development of the students. In order to make students well-equipped, trained and thriving; various facilities are constructed and availed to the students. It includes the following:

**a) Boys' hostel**

The College Boys Hostel has 42 rooms and a capacity of 140. Students have access to all necessary facilities, 24-hour water supply, power back-up, a reading room, etc. The hostel administration tries its best to give students a comfortable stay.

**b) Girls' Hostel**

The College girl's hostel managed by the Society, has all 133 rooms. Out of these, 132 rooms are utilized for the hostelries; one room is utilized for the health center, and one for the visitors. In all 400 girls, students can be occupied in the hostel. These girl students from the same stream are accommodated in each room. The hostel provides the best facilities at reasonable rates.

**c) Library**

The College Library has 68799 books available to date. Reading Room, Night Library, Internet facility are available in the library. Library computerization is also completed. Automation software is using the "SOUL 2.0" (INFLIBNET Centre, Ahmadabad). OPAC facility available in the "SOUL 2.0" by Title, Author, Subject, Class No, ISBN, Publisher, Accession Number, Series/Note/Volume, Free Text search and Boolean search for the books.

**d) Auditorium**

The College has established a Magnificent Auditorium which can comfortably host for all activities and large-scale international conferences. It is fully air conditioned and properly ventilated to make experience pleasant for guests. With a seating capacity of 1000+, this auditorium is perfect for all events and is famous in the region.

**e) Canteen**

The College Canteen has separate sitting arrangements for girls and staff is provided. All the food items are reasonably priced so that Students and Staff can have the best food. All the Hygiene Standards are duly followed and strict instructions are given to the Canteen staff.

**f) Sanstha Office**

The College has a Sanstha office to look after the overall working of the campus and office. The office co-ordinates the admission and other documentation for students. It holds official records to marks, examination and other documents.

**g) Gym**

The well-equipped gym is provided to support the overall physical well-being of everyone.







**Dayanand Education Society Boys Hostel**



**Dayanand Education Girls' Hostel**



**Dayanand Education Ground**



**Dayanand Education Badminton Court and Gym**



**Dayanand Education Society Library**



**Dayanand Education Society ground**

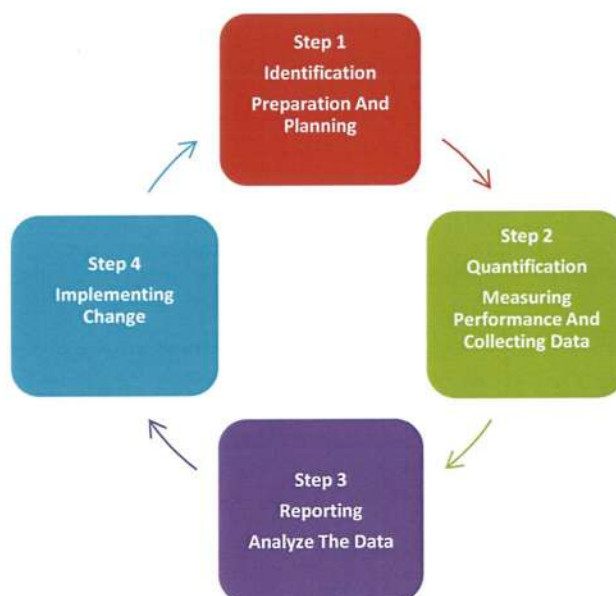
## GREEN AND ENVIRONMENT AUDIT

### GREEN AUDIT

Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience.

Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings in resource consumption. It can also be used to determine the type and volume of generated waste, which can be used for a recycling project or to improve waste minimization plan. It creates health consciousness and promotes environmental awareness, values and ethics in our practices. It provides staff and students a better understanding of green impact on campus.

Thus, it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.



The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institutes which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric carbon-di-oxide from the environment. **Green Audit is assigned to the Criteria 7 of NAAC, National Assessment and Accreditation Council** that declares the institutions as Grade A, Grade B or Grade C according to the scores assigned at the time of accreditation. Moreover, it is a part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

Therefore, the purpose of the green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

#### **NEED FOR GREEN AUDIT**

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Green Audit is the most efficient ecological tool to solve environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiatives for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

The major objective of performing Green Audit is controlling the pollution. It also helps in improving the safety and to making sure the prevention and reduction of the waste. It also provides performance reviews of working facilities and its possible impact on the surroundings. Audits enable the management of an organization to see exactly what is happening within the organization and to check the operation (or otherwise) of systems and procedures. Environment auditing can help to reveal the likely weaknesses of an organization's strategy, therefore reducing the risk of unexpected events. A properly prepared and conducted environment audit will bring real benefits to an organization committed to act on the results.

### **ENVIRONMENT AUDIT**

An environment audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. In this way they perform an analogous (similar) function to financial audits. There are generally two different types of environment audits: compliance audits and management systems audits. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guideline.

The Supreme Audit Institution (SAI) in India is headed by the Comptroller and Auditor General (CAG) of India who is a constitutional authority. The audit conducted by CAG is broadly classified into Financial, Compliance and Performance Audit. Environment audit by SAI India is conducted within the broad framework of compliance and performance audit.

Environment auditing is a systematic, documented, periodic and objective process in assessing an organization's activities and services in relation to:

- Assessing compliance with relevant statutory and internal requirements
- Facilitating management control of environmental practices
- Promoting good environmental management
- Maintaining credibility with the public
- Raising staff awareness and enforcing commitment to departmental environmental policy
- Exploring improvement opportunities
- Establishing the performance baseline for developing an Environmental Management System (EMS)

### **GOALS OF GREEN AUDIT**

- To achieve compliance standards and establish a report with regulatory bodies.
- To identify needs, strengths, and weaknesses of the educational institute.
- To review management systems and identify liabilities.
- To assess environmental performance of the educational institute with the help of direct assessment.
- To promote environmental awareness among the staff and students.
- To conserve non-renewable resources for betterment of future.
- The long-term goal is to collect the baseline data in terms of environmental parameters, calculate its impact on the environment and recommend measures to reduce them.

### **OBJECTIVES OF ENVIRONMENT AUDIT**

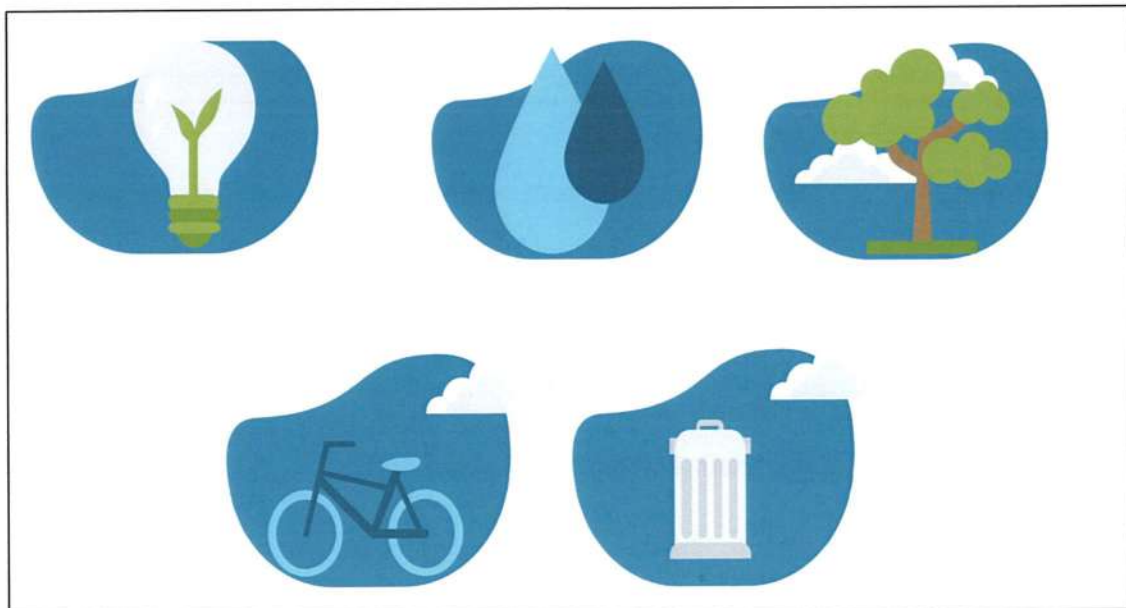
- To assess environmental performance.
- To promote environmental awareness.
- To improve production safety and health.
- To conserve natural resources.
- To reduce waste.
- To assess compliance with a regulatory requirement.

### **BENEFITS OF GREEN AND ENVIRONMENT AUDIT**

- Recognize the cost saving methods through waste minimization and management.
- Point out the prevailing and forth coming impacts on environment.
- Ensures conformity with the applicable laws.
- Empower the organizations to frame a better environmental performance.
- Portrays a positive image of an institution.
- Promotes the alertness for environmental guidelines and duties.

## TARGET AREAS OF GREEN AND ENVIRONMENTAL AUDITING

- i. **Energy Conservation and Management:** This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles.
- ii. **Water Quality and Conservation:** This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures.
- iii. **Biodiversity Conservation:** All plant and animal species - including microorganisms - are a part of biodiversity. All types of gardens, lawns and trees are considered in this aspect.
- iv. **Waste Management:** This indicator addresses all types of waste from college and associated amenities. The minimization, safe handling, and ultimate elimination of these materials are essential to the long-term health of the planet.
- v. **Carbon Footprint:** This aspect is for quantifying the carbon emissions from all the parts of the institution and quantifying how much of it is sequestered with the help of mitigatory measures such as use of renewable source of energy and green belt.





## **METHODOLOGY**

### **DATA COLLECTION**

In preliminary data collection phase, exhaustive data collection is performed using different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons, etc. Questionnaire prepared to conduct the green audit in the campus is in accordance with the guidelines, rules, acts and formats prepared by Ministry of Environment and Forest, New Delhi, Central Pollution Control Board and other statutory organizations. The data covers the target areas to summarize the present status of environment management in the campus.

### **SURVEY BY QUESTIONNAIRE**

Baseline data for green audit report preparation was collected by questionnaire survey method. Most of the guidelines and formats are based on broad aspects. Therefore, using these guidelines and formats, combinations, modifications and restructuring was done and sets of questionnaires were prepared as solid waste, energy, water, biodiversity, carbon footprint. All the questionnaires comprise of group of modules. The first module is related to the general information of the concerned department, which broadly includes name of the department, month and year, total number of students and employees, visitors of the department, average working days and office timings etc. The other modules are related to the present consumption of resources like water, energy, or the handling of solid and hazardous waste.

### **DATA ANALYSIS**

The data required for the analysis is taken from the data collected and includes: calculation of energy consumption through analysis of latest electricity bill of the college, measuring water consumption, calculation of carbon footprint, etc. The data from questionnaire and survey forms is tabulated for the convenience of data availability. Observations and recommendations are built according to the analysis done in this step.

## RECOMMENDATIONS AND REPORTING

Based on the data analyzed, some recommendations are suggested. Depending upon the observations of the audit and calculations, the report is drafted and various recommendations are suggested to become more sustainable.

## DETAILED ANALYSIS

### I. WATER QUALITY AND CONSERVATION

We investigated the relevant method that can be adopted and implemented to balance the demand and supply of water. The overall objective of studying about water consumption is to identify opportunities to make system or building water use more efficient.

The data collected from the college is examined and verified. Water consumption data tabulated below is then used for analysis and reporting.

#### a) Water consumption

Water is consumed for drinking as well as domestic purpose. The water requirement is fulfilled from the common well for domestic purpose, from Municipal Corporation for drinking purpose and treated water is used for gardening. There is RO system installed, which filters the water for drinking. The filtered water is provided to all the students through taps installed at every floor.

| Parameter                  | Quantity         | Total water consumption |
|----------------------------|------------------|-------------------------|
| Total overhead tanks       | 3                | 12 m <sup>3</sup>       |
| Capacity of each tank      | 2 m <sup>3</sup> |                         |
| Total capacity             | 6 m <sup>3</sup> |                         |
| Underground tank           | 6 m <sup>3</sup> |                         |
| Frequency of water filling | Daily once       |                         |

#### b) Waste water generation

The generation of waste water is not quantified but as per the standards 80% of the water used gets converted to waste water. Therefore, the waste water generation is 9.6 m<sup>3</sup>/ day. The institute has a common facility to treat the waste water with capacity 30 m<sup>3</sup>/ day but not all of the waste water gets treated in the STP.

#### c) Rain water harvesting

Rainwater harvesting is the process used to conserve rainwater by collecting, storing, conveying and purifying of rainwater that runs off from rooftops, parks, roads, open grounds, etc. for later use. The rainwater can also be conserved by recharging the ground water through recharge pits.

Rain water harvesting is performed through recharge pit.

## Observations and Recommendations

- i. *Water overflow:* To avoid water wastage due to overflow, auto on/ off system should be installed.
- ii. *RO treatment plant:* the units and solvents used were not named. All the units of the plant should be named properly and the operator should be made well aware of the solvents used and also about the system. The good practice observed here was the reject water being reused.
- iii. *Cleaning of tanks:* tank cleaning is practiced at a regular interval. The records of cleaning and maintenance should be maintained and the dates of cleaning should be marked on all the tanks and tap systems (filters).
- iv. *Waste water:* The quantification of daily waste water generation should be done. As most of the water does not get treated, a separate small scale STP for individual college should be setup so that all the water is treated and gets utilized for gardening and reuse. This will reduce the fresh water consumption of the college. The chemical water from laboratories should be collected and treated separately in effluent treatment plant (ETP) and the solid sludge waste generated from ETP should be sent for further safe disposal to CHWTSDF (Common Hazardous Waste Treatment, Storage and Disposal Facility).
- v. *Water testing:* testing of water should be done at regular intervals to check whether potable water parameters are in limit and a record should be maintained.
- vi. *Water meter:* water meters should be installed to get a clear understanding of daily water requirement and consumption.
- vii. *Additional water conservation techniques that can be followed:* drip irrigation system for gardening should be used to avoid excess water use and loss of water during gardening.
- viii. The standards suggest water consumption for institution as 45 lit/ capita/ day. Considering 621 occupants in the college, total water consumption required is 27.945 m<sup>3</sup>/ day. But the water consumed in the college is 12 m<sup>3</sup>/ day which is less than required. Measures suggested as above should be implemented to become more efficient.

*(Note: A detailed water audit can be conducted for quantification of water consumption and waste water generation)*

## II. ENERGY CONSERVATION AND MANAGEMENT

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles. An energy source utilized by all the departments and services of the college i.e. electricity is considered. Data for the same was collected and is reported below.

### a) Electricity consumption

The connected load and sanctioned load by MSEDCL is 18 kW. Upon studying the electricity bills and energy audit report, total electricity consumption is 19386.85 kWh/ year.

### b) Renewable energy initiatives

Solar power plant of 18 KWp is installed.



### Observations and Recommendations

The energy conservation is a well-focused area. About 100% of the annual electricity requirement is fulfilled by the renewable source i.e., solar. Also, the additional units generated are sent to the grid. The students and all the staff members are made well aware of the energy conservation policy of college and

also followed properly by all of them. Measures to conserve electricity such as implementation of LED lights, sensory fans, etc. have been implemented.

### III. Waste Management

Human activities create waste, and the way these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health. Solid waste can be divided into three categories: bio-degradable, non-biodegradable and hazardous waste. Bio-degradable wastes include food wastes and, canteen waste. Non-biodegradable wastes include plastic, tins and glass bottles etc. Unscientific management of these wastes may cause harmful discharge of contaminants into soil and water supplies, and produce greenhouse gases contributing to global climate change respectively. We collected the details of solid waste generation using questionnaires and observations and tabulated them below. E-waste is among the fastest growing solid waste classes and represents a serious hazard for the environment which needs to be focused upon and quantified.

| Type of Waste   | Waste Generation (Kg/Month) | Disposal Method  |
|-----------------|-----------------------------|--|
| Dry Waste       | 50 kg                       | The dry wastes are collected on regular basis in the dust bins kept at various places in the college. The vehicle from MNC, Latur collects it daily basis.                           |
| Wet Waste       | 50 kg                       | Wet wastes are collected on regular basis in the dust bins kept at various places in the College. Then it is sent to Compost Manure Project installed by Dayanand Education Society. |
| Hazardous Waste | 40 kg                       | Hazardous Waste that is microbe culture is generated in the College, which is treated in the microbe culture pit   |
| Glass Waste     | 10 kg                       | Scrap Vendor   |

Total waste generated is 1.8 t/ year (1800 kg/ year). As per NBC, 0.1 kg waste is generated per capita per day. Therefore, solid waste generated is very less as compared to the standard values as suggested by the National Building Code and CPCB.

### Observations and Recommendations

- i. *Waste segregation and quantification:* The waste generated is segregated at the college level. The disposal system is well defined and followed. The waste should be properly quantified as of what amount of paper, plastic, biodegradable waste is generated per month and a record of quantification should be maintained. The first step towards reducing waste is to quantify it and it should be followed.
- ii. *Bin labeling:* The bins should be labeled as dry waste, wet waste or e-waste. A separate bin to collect e-waste should be set at point accessible to all.
- iii. *Awareness:* The college authorities are completely aware of waste segregation and correct disposal method. The e-waste collection should be focused on. Not only computers, but LCD, bulbs, CD drives, chargers, replaced parts of electronic equipment's etc. should be quantified and collected.
- iv. The plastic and paper waste are collected and handed over to the scrap dealer or sent with municipal solid waste which is the best practice followed in the college.
- v. *E-waste generation:* records of e-waste generated should be kept and a separate labeled bin should be placed to collect e- waste. A proper disposal method i.e. collection and selling to e-waste vendor is being followed. More awareness about what all comprises of e-waste, its collection and proper disposal system should be created.
- vi. The biodegradable waste (garden waste) is composted in a common facility of Dayanand Institute. A separate composting unit like vertical composting can be installed and the compost can be used for the plants in the college premises.
- vii. The college has received the permission for animal testing unit. The waste developed from this unit will be hazardous and should be disposed with utmost care. The waste comes under biomedical waste (BMW). The waste should be sent to nearest Common Biomedical Waste Treatment Facility (CBMWTF) for further disposal.

#### IV. Biodiversity Conservation

The term biodiversity (from “biological diversity”) refers to the variety of life on Earth at all its levels, from genes to ecosystems, and can encompass the evolutionary, ecological, and cultural processes that sustain life.

This aspect addresses all the flora and fauna of the campus. The college has a medicinal garden. The flora and fauna spotted in the college premises is listed and described below.

| Sr .no | Common name of plant | Botanical name              | Quantity | Total |
|--------|----------------------|-----------------------------|----------|-------|
| a)     | Gulmohar             | <i>Delonix regia</i>        | 08       | 72    |
| b)     | Chafa                | <i>Plumeria</i>             | 07       |       |
| c)     | Ashoka               | <i>Saruca asoca</i>         | 09       |       |
| d)     | Badam                | <i>Terminalia catapa</i>    | 08       |       |
| e)     | Palm                 | <i>Roystonea regia</i>      | 04       |       |
| f)     | Mango                | <i>Mangifera indica</i>     | 06       |       |
| g)     | Anjir                | <i>Ficus carcia</i>         | 01       |       |
| h)     | Christmas Tree       | <i>Araucaria columnaris</i> | 02       |       |
| i)     | Kadulimb             | <i>Azadirachta indica</i>   | 05       |       |
| j)     | Bamboo               | <i>Bambusa Vulgaris</i>     | 15       |       |
| k)     | Pimpal               | <i>Ficus Religiosa</i>      | 01       |       |
| l)     | Karanji              | <i>Pongamia Pinnata</i>     | 03       |       |
| m)     | Shatavari            | <i>Asparagus racemosus</i>  | 02       |       |
| n)     | Apta                 | <i>Bauhinia racemosa</i>    | 01       |       |

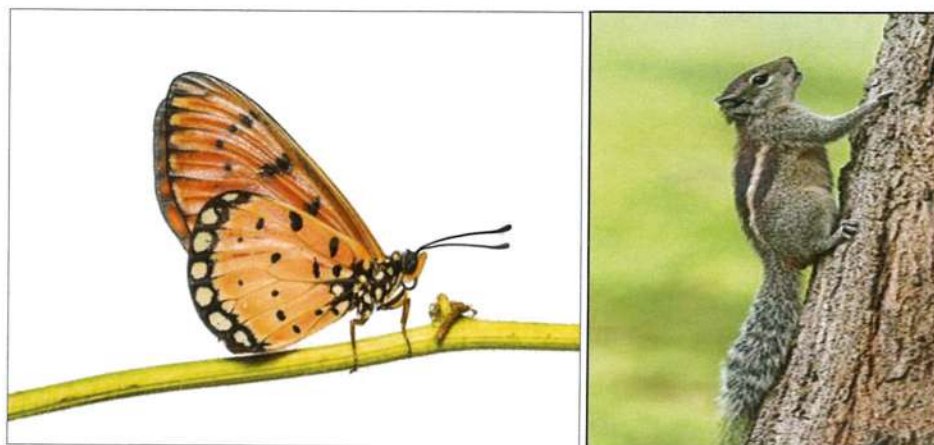
**Plants in the premises**





| Sr. No. | Species Name         | Scientific Name                |
|---------|----------------------|--------------------------------|
| a)      | House Crow           | <i>Corvus splendens</i>        |
| b)      | House Sparrow        | <i>Passer domesticus</i>       |
| c)      | Domestic Pigeon      | <i>Columba livia domestica</i> |
| d)      | Crow Pheasant        | <i>Centropus sinensis</i>      |
| e)      | Indian Palm Squirrel | <i>Funambulus palmarum</i>     |
| f)      | Tawny coster         | <i>Acraea terpsicore</i>       |
| g)      | Common crow          | <i>Corvus brachyrhynchos</i>   |





#### **Observations and Recommendations**

The college has a well-developed and maintained green belt area which provides a natural habitat for a variety of tree dwelling species of animals and birds. Trees which can sequester more carbon viz. Neem (Kadu limb), Pimpal, etc. should be planted. Drip Irrigation should be implemented to water all the plants for optimum usage of water.

## V. Carbon Footprint

A **carbon footprint (CF)** is the total amount of **greenhouse gases** (including carbon dioxide and methane) that are generated by our actions.

The carbon footprint of your university or other organization is the sum of all greenhouse gas emissions induced from activities such as electricity use, staff and students commute, water use, etc. of the institution, as measured in CO<sub>2</sub> equivalents. The carbon footprint is performed to understand what measures can be taken on institute level to lower the impacts on environment and move towards being a sustainable and efficient institute.

There are many existing and evolving standards for calculating carbon footprints but in truth no footprint is precise. For more complicated activities these uncertainties are greatly multiplied. The standards suggest the below given parameters to be considered for calculating the carbon footprint of the college/institute.

### Scope 1- Direct GHG emissions

It includes sources that are owned or controlled by the institute such as burning of LPG gas or diesel in DG set.

### Scope 2- Indirect GHG emissions

It includes GHG emissions from the generation of purchased electricity consumed by the company.

### Scope 3- Indirect GHG emissions

Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities taking place in the college or institute. Some examples of scope 3 activities are water consumption, waste water treatment, students and staffs commute, etc.

The parameters considered for the colleges' carbon footprint are as given below:

| Classification/Scope  | Sources  |
|-----------------------|--|
| Scope 1<br>(Direct)   | Equipment's usage such as DG Set and LPG in the college. |
| Scope 2<br>(Indirect) | Electricity Use  |
| Scope 3<br>(Indirect) | Staff and students commute                               |
|                       | Water consumption  |
|                       | Wastewater treatment                                     |
|                       | Solid waste generation                                   |

#### a) Carbon footprint calculations

##### (a) Scope 1

Direct GHG emissions

| Fuel type   | Fuel consumption | Total emissions (t CO <sub>2</sub> eq. /year) |
|---|------------------|---|
| Diesel  | 100 lit/ year    | 0.264   |
| LPG   | 76 kg/ year      | 0.237   |
| <b>Total Category 1 emissions (tCO<sub>2</sub> eq. /year)</b> |                  | <b>0.501</b>                                  |

##### (b) Scope 2

Indirect GHG emissions due to purchased electricity from grid

| Category  | Consumption (kWh/ year) | Total emissions (t CO <sub>2</sub> eq. /year) |
|---|-------------------------|---|
| Electricity   | 19386.85                | 15.316  |
| <b>Total Category 2 emissions (tCO<sub>2</sub> eq. /year)</b> |                         | <b>15.316</b>                                 |

**(c) Scope 3**

Indirect GHG emissions

(a) Staff and students Commuting

| Types of vehicles   | No. of passengers/vehicles | Total (Km/year) | Total emission (t CO <sub>2</sub> eq. /year) |
|---|----------------------------|-----------------|--|
| 2 wheelers  | 200                        | 2500            | 20.850                                       |
| Public Transport  | 400                        | 2500            | 15.160                                       |
| <b>Total emissions due to employee commuting (t CO<sub>2</sub>eq./year)</b> |                            |                 | <b>36.01</b>                                 |

(b) Water consumption and waste water generation

| Category  | Quantity (m <sup>3</sup> /year) | Total emissions (t CO <sub>2</sub> eq. /year) |
|---|---------------------------------|---|
| Water consumption   | 3360                            | 0.504   |
| Waste water generation  | 2688                            | 0.731   |
| <b>Emissions due to waste water generation and water supply (t CO<sub>2</sub> eq./year)</b> |                                 | <b>1.235</b>                                  |

(c) Solid waste generation

| Category   | Quantity (t/year) | Total emissions (t CO <sub>2</sub> eq. /year) |
|--|-------------------|---|
| Solid waste  | 1.8               | 0.0383  |
| <b>Emissions due to solid waste generation (t CO<sub>2</sub> eq./year)</b> |                   | <b>0.0383</b>                                 |

| Category   | Emissions (t CO <sub>2</sub> eq. /year) |
|--|---|
| Staff and student Commuting                                    | 36.01                                   |
| Water consumption and waste water generation                   | 1.235                                   |
| Solid waste generation   | 0.0383                                  |
| <b>Total Category 3 emissions (t CO<sub>2</sub> eq. /year)</b> | <b>37.283</b>                           |

**Total emissions**

| Scope   | Gross emissions (t CO <sub>2</sub> eq./year) |
|---|--|
| 1   | 0.501  |
| 2   | 15.316                                       |
| 3   | 37.283                                       |
| <b>Total gross emissions (t CO<sub>2</sub> eq. /year)</b> | <b>53.1</b>                                  |

**b) Avoided emissions**

Trees have the ability to store carbon which is known as carbon sequestration. This is one method which can reduce the emissions. Use of renewable source of energy such as solar power plant helps in reducing electricity consumed from grid. These two methods help in reducing the carbon footprint of the college.

(1) Carbon sequestration by 72 trees=18 t CO<sub>2</sub> eq./year

(2) Renewable source of energy (solar power plant of 18 kW) =21.330 t CO<sub>2</sub> eq./year

**c) Net emissions**

The net emissions are emissions calculated after subtracting the carbon sequestered and solar electricity used from the emissions that are taking place due the activities happening in the college.

Total net emissions= Gross emissions – Avoided emissions

Total net emissions=53.1-39.33= 13.77 t CO<sub>2</sub> eq. /year

Therefore, carbon footprint of the college is 13.77 t CO<sub>2</sub> eq. /year.

Around 74.07 % reduction of emissions is observed due to carbon sequestration and use of solar energy.

More trees should be planted to further move towards becoming carbon neutral.

## ACTIVITIES AND INITIATIVES UNDERTAKEN BY THE COLLEGE

Various activities like tree plantation drives, cleanliness drives, workshops to create awareness have been conducted in college.

### Guest lecture on "Need for Protecting Environment"







“Glimpses showing students at Cleanliness drive”







## **CONCLUSION**

Green Audit is the most efficient way to identify the strengths and weaknesses of environmental & sustainable practices to find a solution for environmental challenges. Green Audit is also one kind of a professional approach towards a responsible way in utilizing economic, financial, social and environmental resources. It “adds value” to the management approaches and is being adapted by the college. Such approach of identifying, evaluating and managing environmental risks (known and unknown) makes the institute sustainably appreciable.

The college is doing a commendable work presently but there is scope for further improvement, particularly in consumption of water & waste water management especially for sanitation use and directing that to advance STP treatment and generated solid waste should be quantified and sequenced stepwise for category segregation. The college also needs to focus on hazardous waste management. The college in recent years being accountable to the environmental impacts & most of its actions also took concrete efforts to act in an environmentally responsible manner. Even though the college does perform very well, the recommendations in this report highlight many ways in which the college can work to continually improve its actions and become a further sustainable institution.

# 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](mailto: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**

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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# ENERGY AUDITS



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



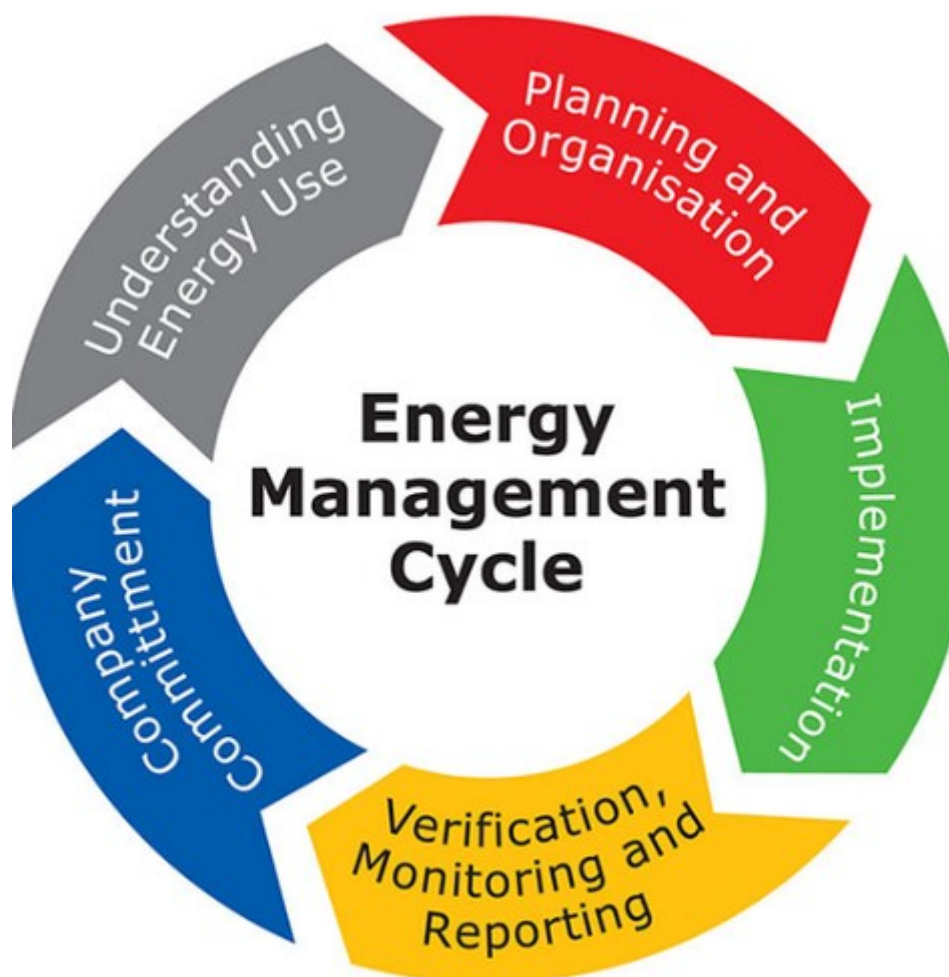


## Preface

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*

**Kedar Khamitkar**

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

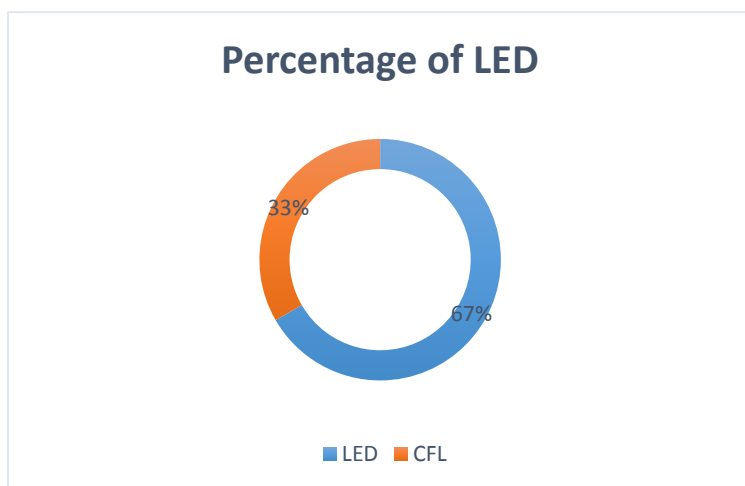
## प्रतिज्ञा

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 इन सीमित संसाधनों की आपूर्ति अधिक समय तक सम्भव हो सके। आदर्श नागरिक होने के नाते हम लोगों को पेट्रोलियम पदार्थों के व्यर्थ उपयोग से बचने तथा पर्यावरण संरक्षण हेतु स्वच्छ ईंधन का प्रयोग करने के लिए जागरूक करेंगे।

## 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        |
| <b>Total Lighting Load</b> | <b>7946</b> |



**Observations:**

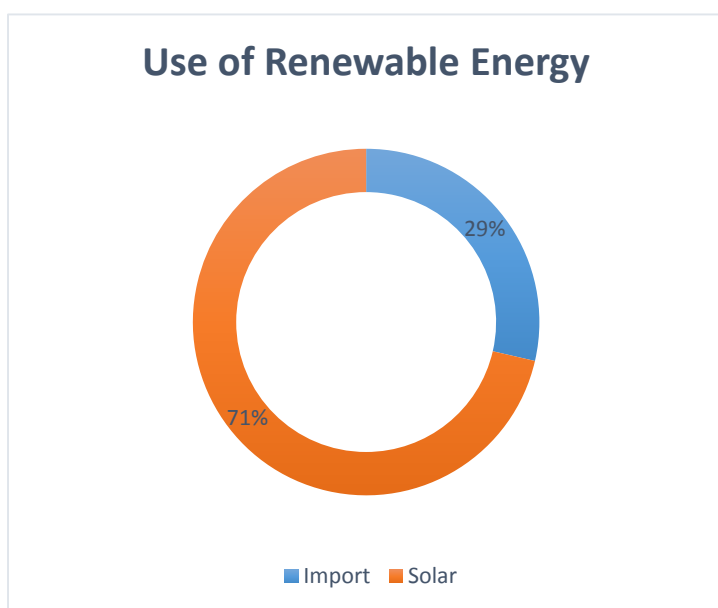
Percentage of Annual Power requirements met through LED Bulb/Tube Current year data is **67%**

**Suggestions:**

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

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

|   |              |            |
|---|--------------|------------|
| <b>Average Renewable Energy units generated</b>   | 17280        | KWH        |
| <b>Nonrenewable Energy (Mahavitaran) imported</b> | 6924         | KWH        |
| <b>Annual Total Power Requirement</b>             | <b>24204</b> | <b>KWH</b> |



**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.**

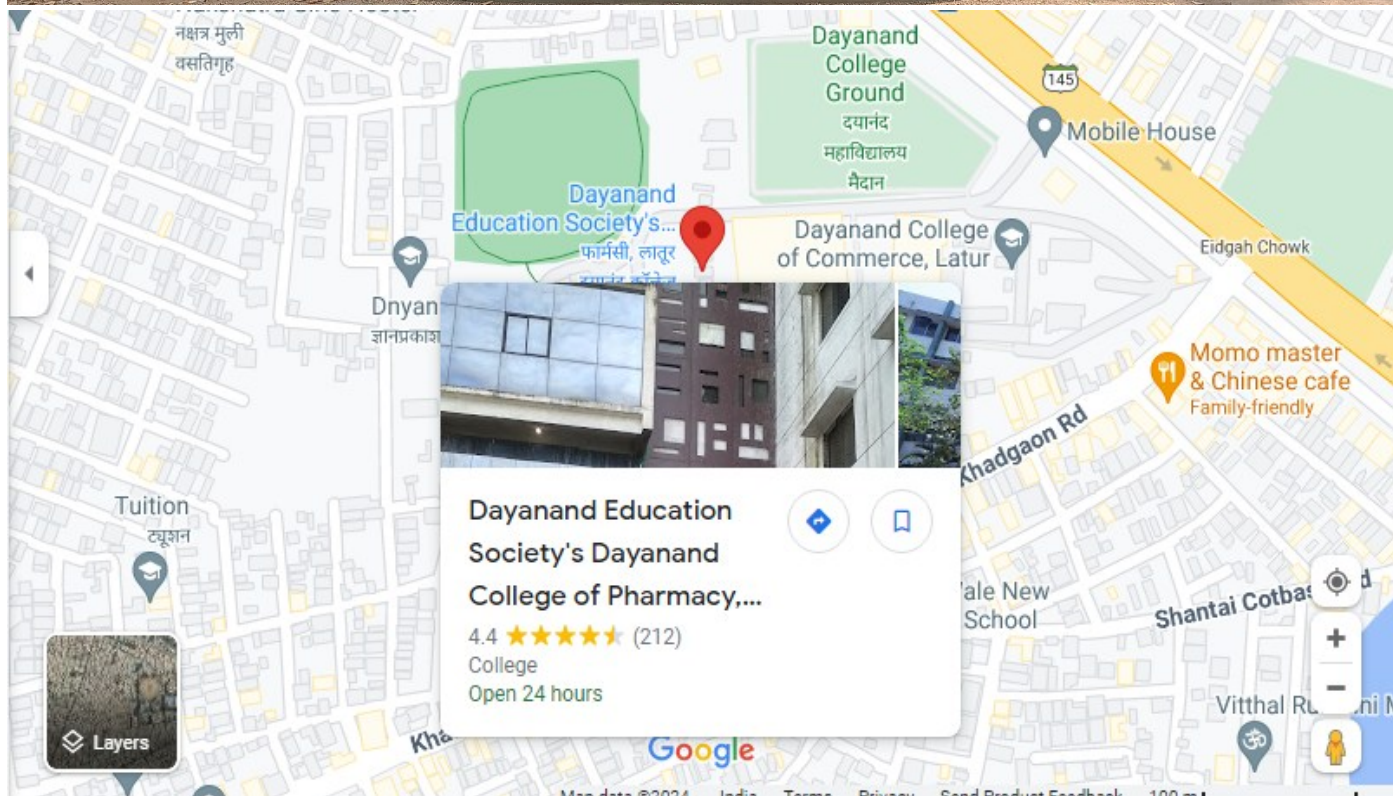
| EPI KWH/Sq. Meter/Year | Star Label    |
|------------------------|---------------|
| 80-70                  | 1 Star        |
| 70-60                  | 2 Star        |
| 60-50                  | 3 Star        |
| 50-40                  | 4 Star        |
| <b>Below 40</b>        | <b>5 Star</b> |



## 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.

## ENERGY EFFICIENCY IN BUILDINGS

### EE Measures for Buildings



## Chapter: 3 Energy Audit Methodology

Energy Audit Study is divided into following steps

### 1. Historical data analysis:

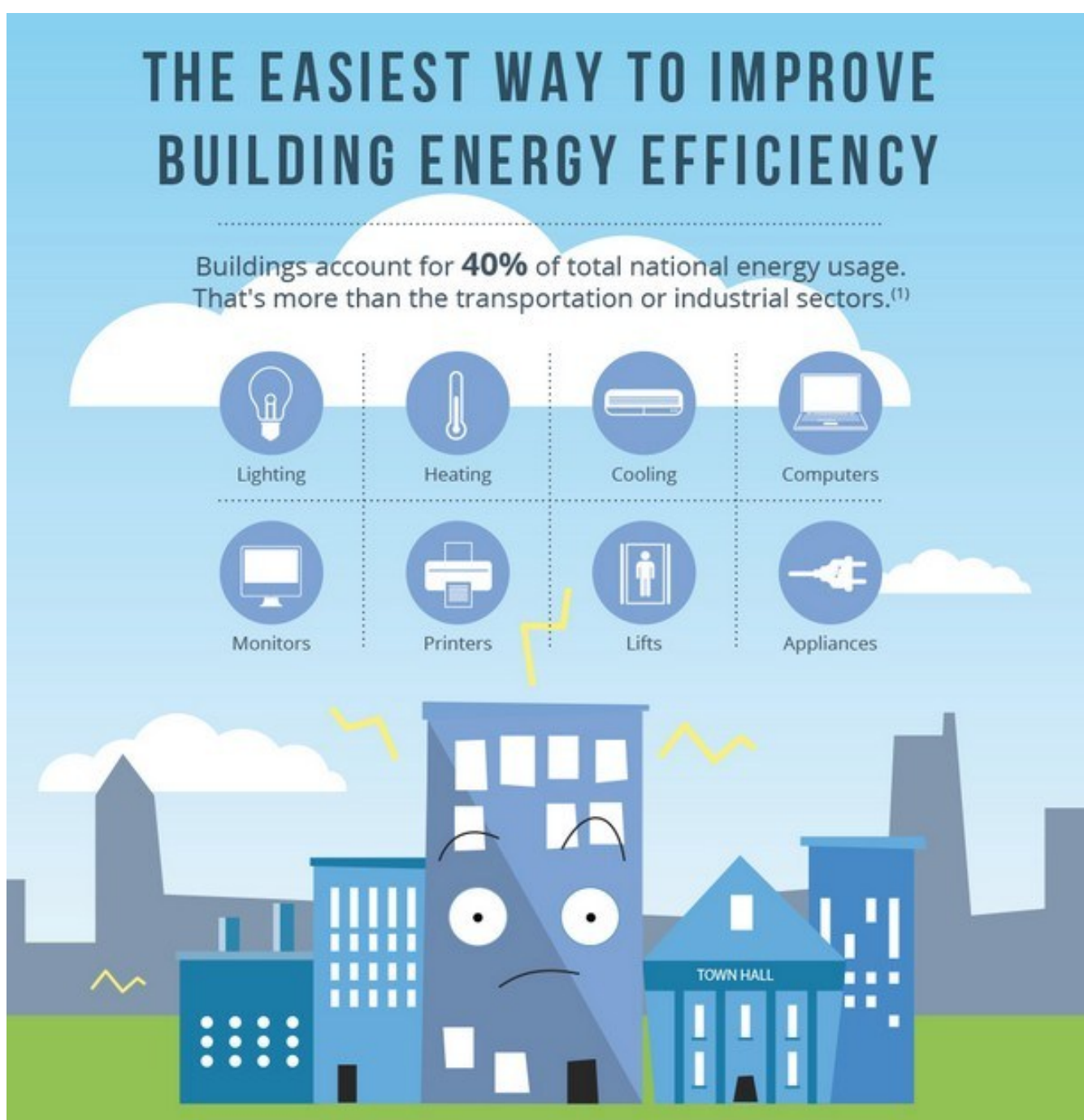
The historical data analysis involves establishment of energy consumption pattern to the established base line data on energy consumption and its variation with change in production volumes.

### 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:

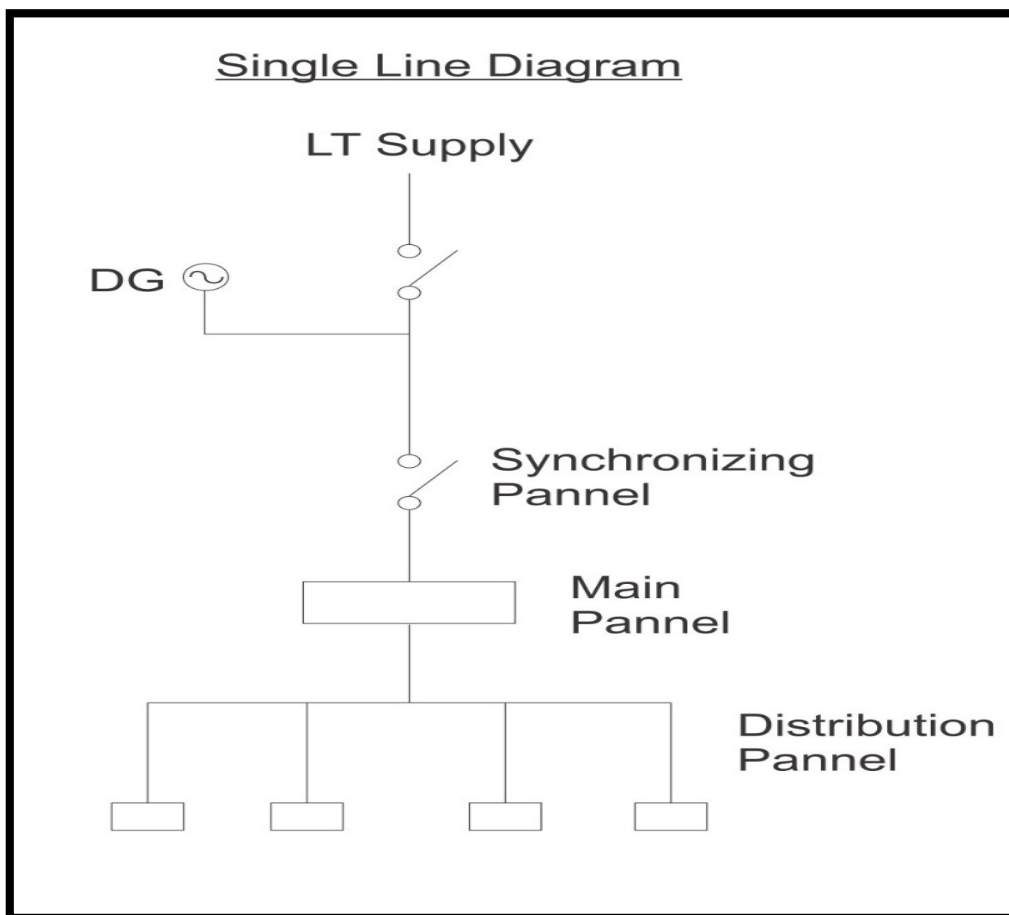
This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential of energy saving and investment required to implement the Proposed modifications with payback period.



## 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

# ENERGY EFFICIENCY

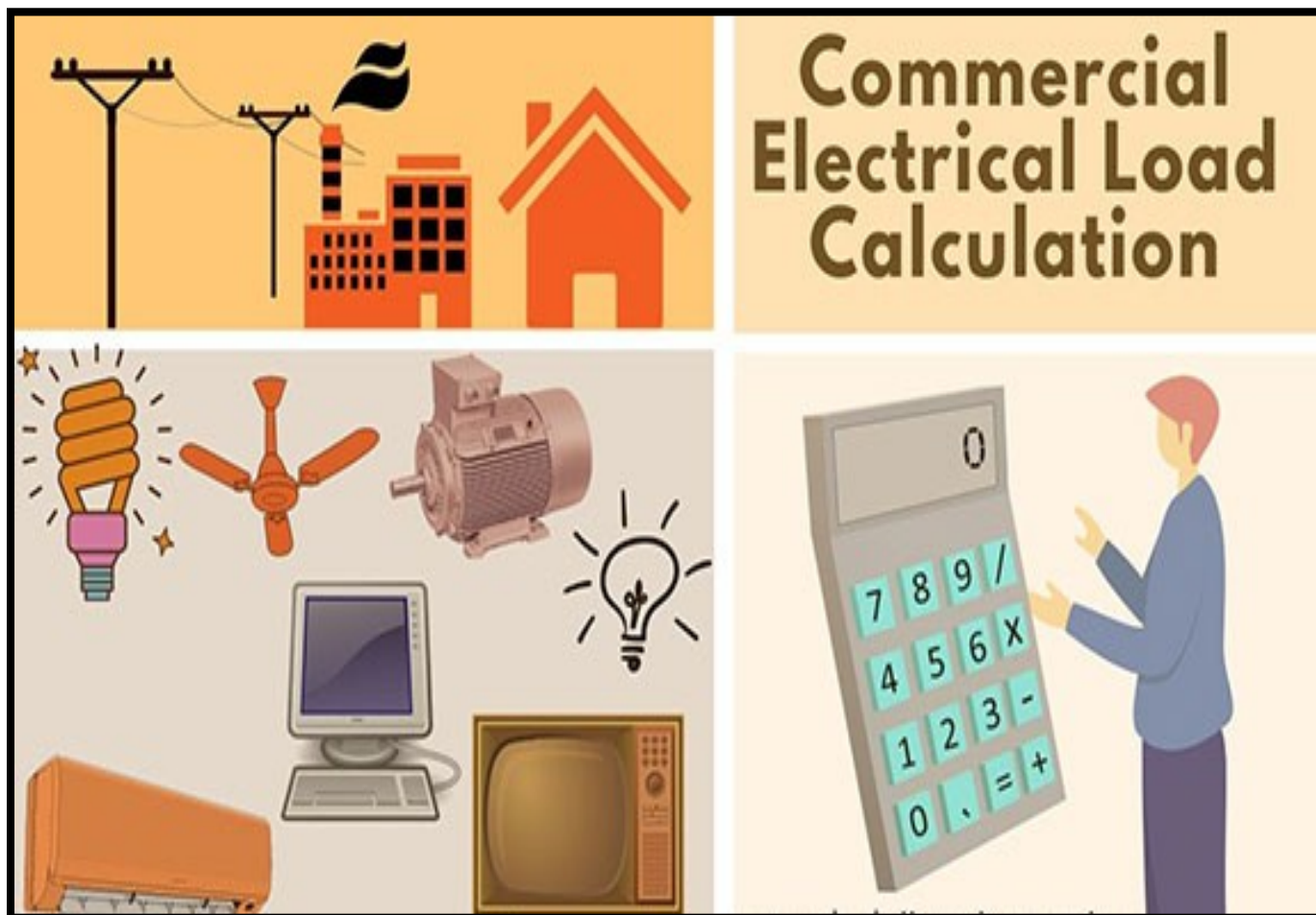




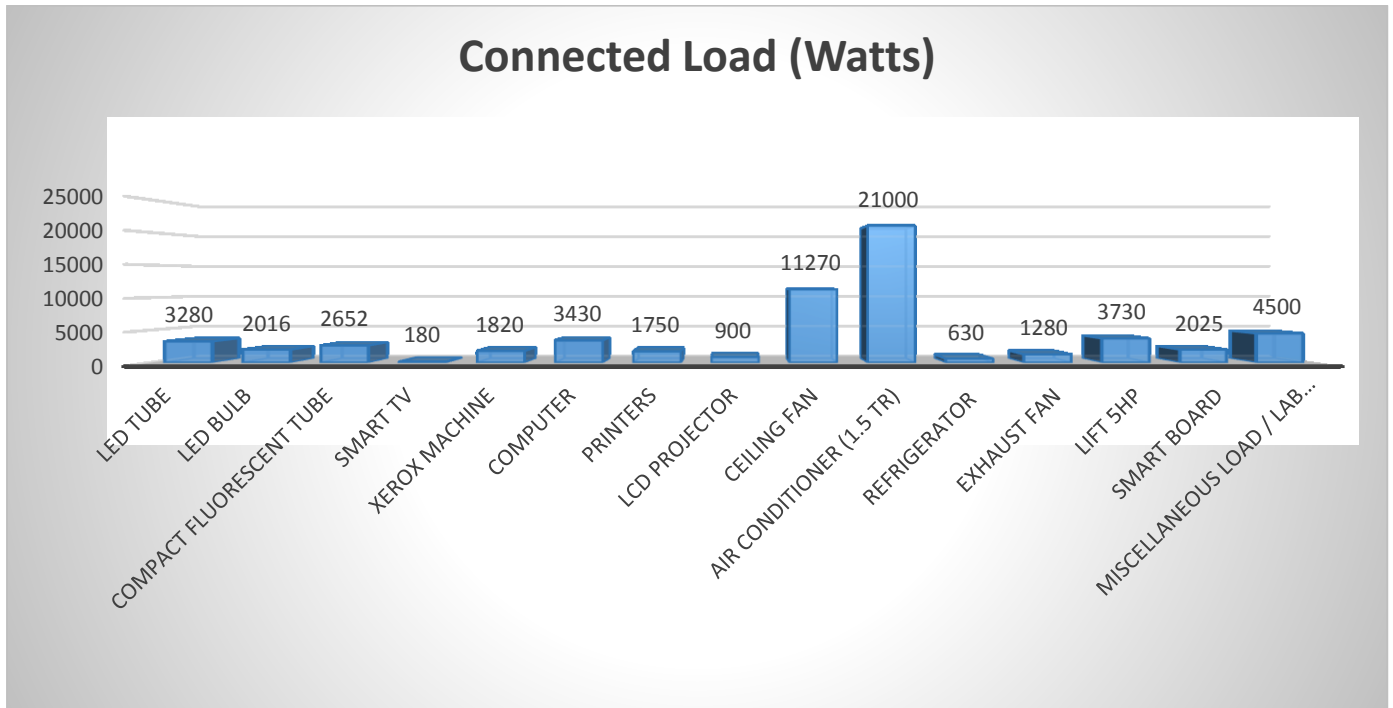
### Connected Load Details

**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         |
|     |                                      |      | <b>Total</b> | <b>60463</b> |



**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

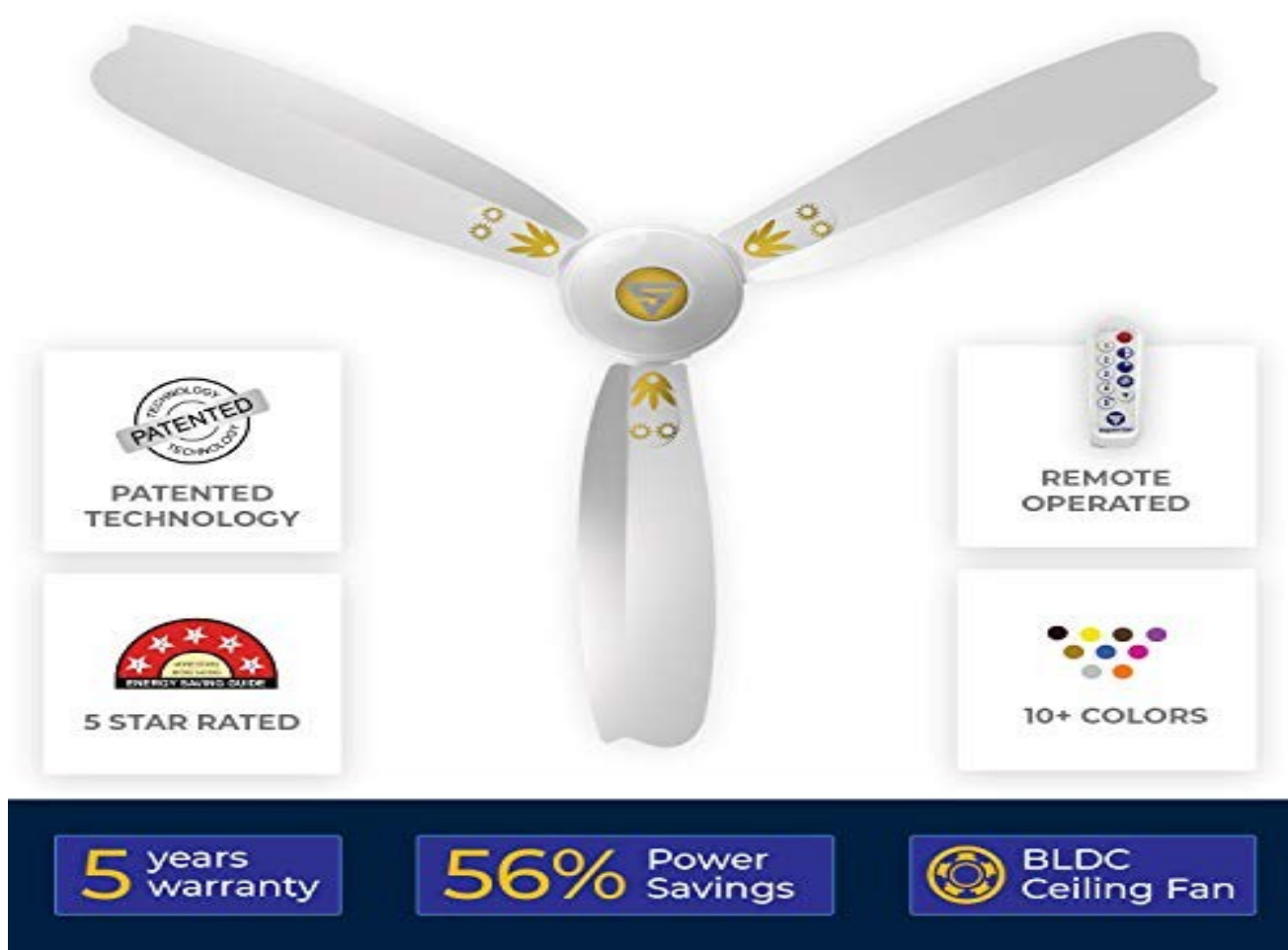
### 5.1 Fan System:

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 Mahavitrans 6924 KWH/year**

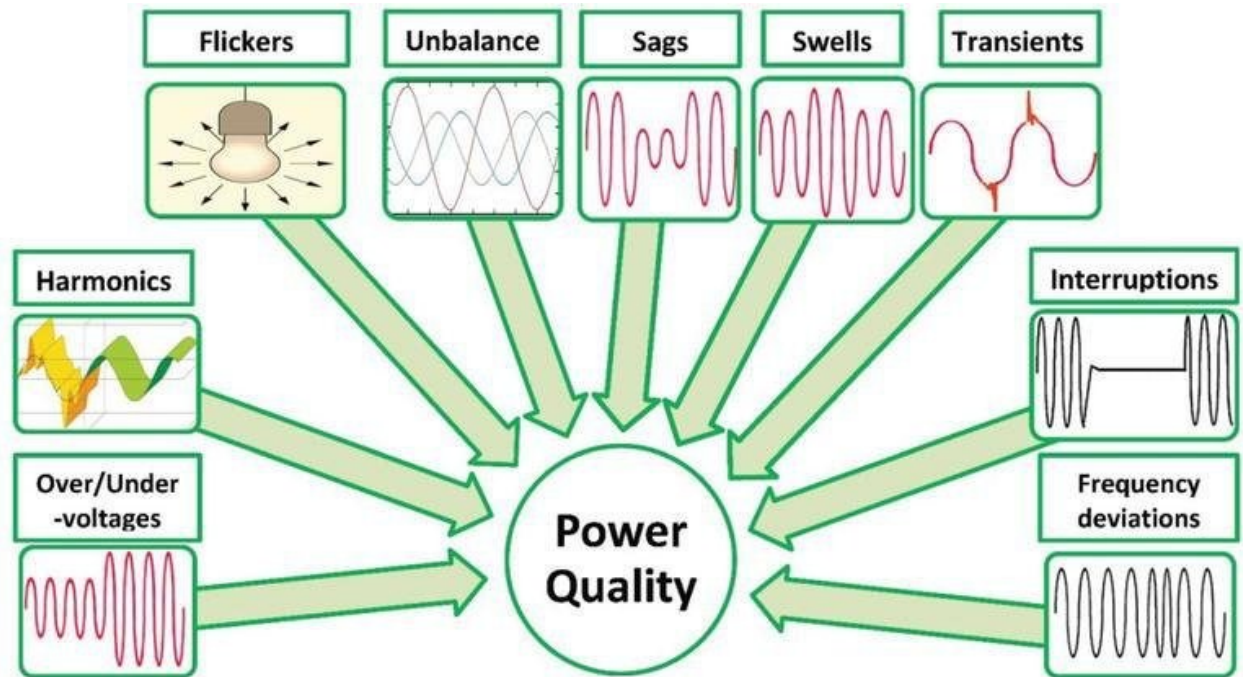
**Ceiling fans contributes 11.27 KW connected load**

**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.

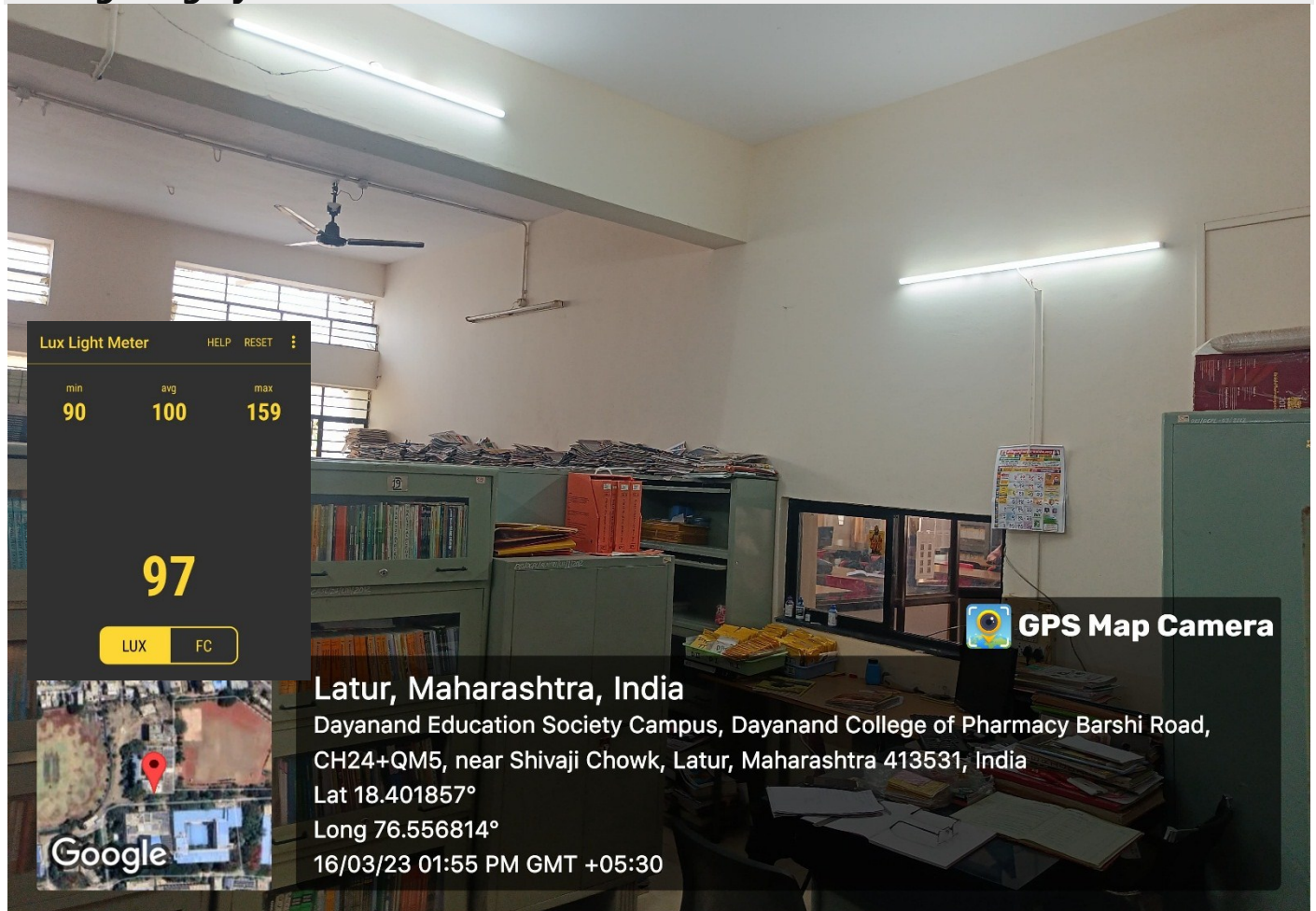
Power quality refers to the level of consistency, reliability, and stability of electrical power.



**Suggestions:** Install Voltage Servo Stabilizer of 100 KVa Capacity

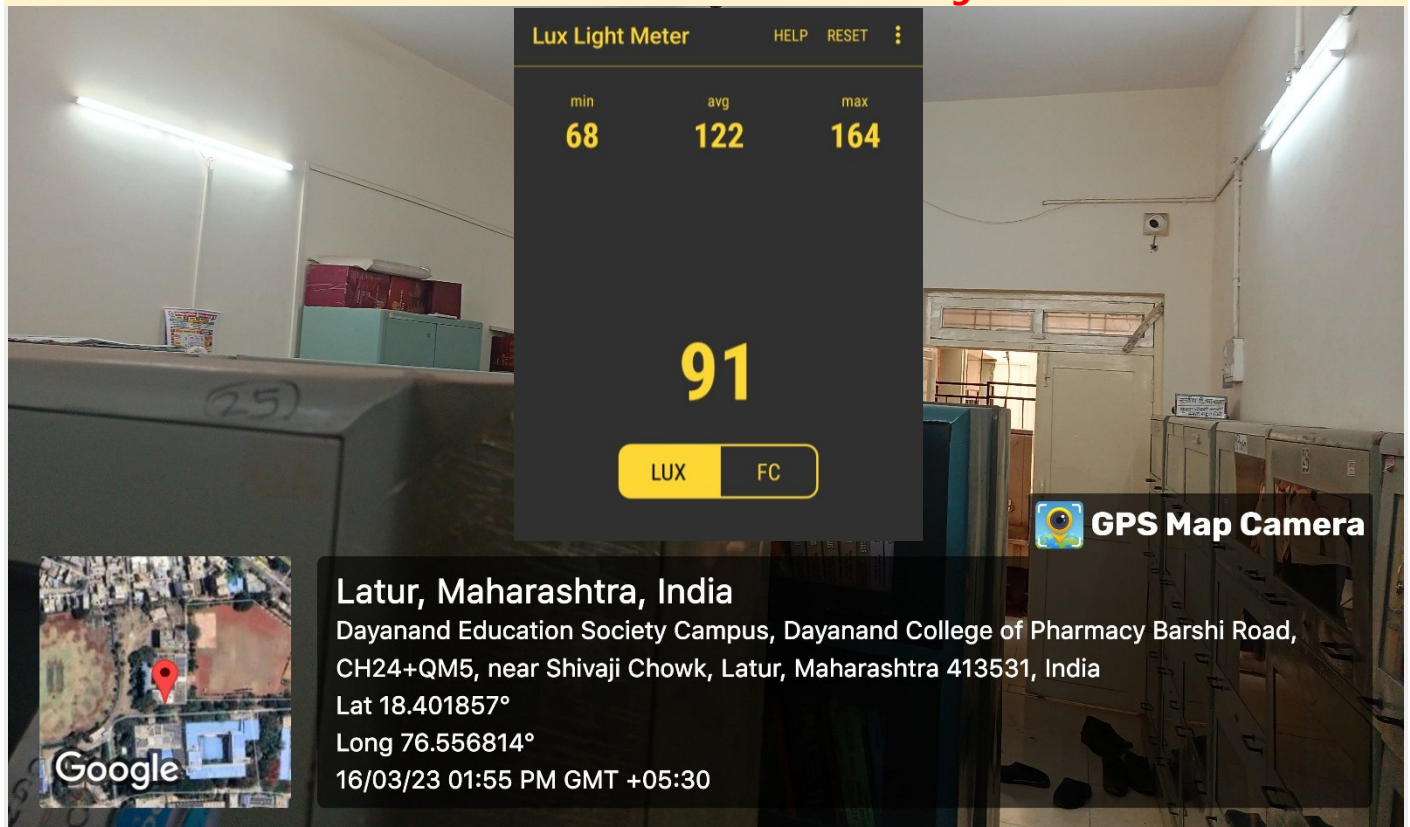


### 5.3 Lighting System : Lux level Measurements at DCOPL



#### 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.

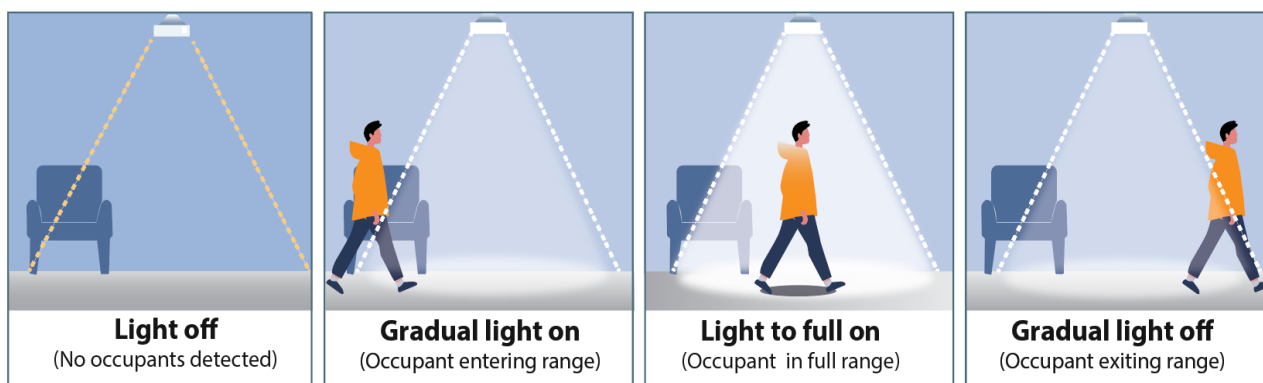
**White Reflectors.** More flexible between indoor and outdoor use.

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

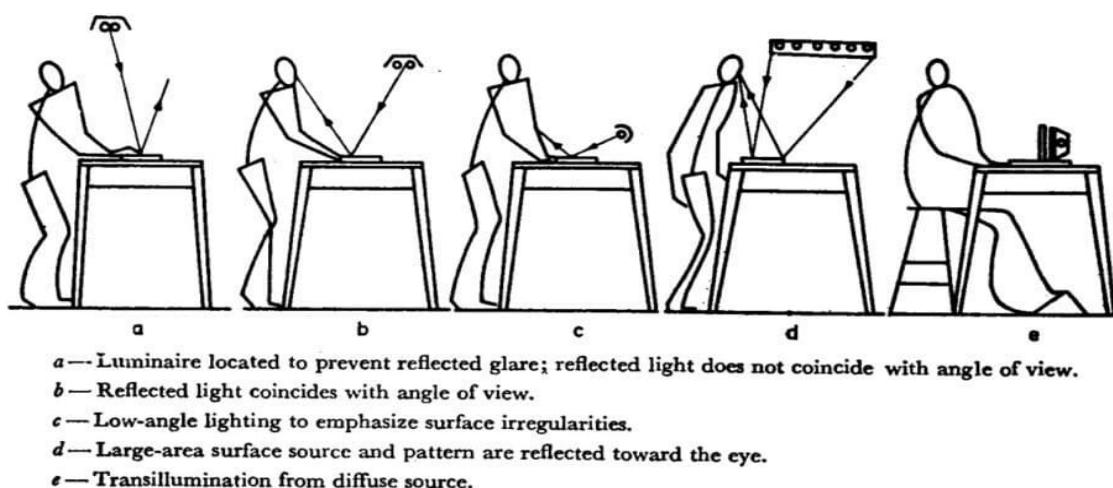


FIG. 2 EXAMPLES OF PLACEMENT OF SUPPLEMENTED LUMINAIRES



## Conduct Institutional Training / Awareness Program 14<sup>th</sup> 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 – 20<sup>th</sup> 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 after 10 minutes/30 minutes.
- The comfort/Default air conditioning temperature to be set between 24°C to 26°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.

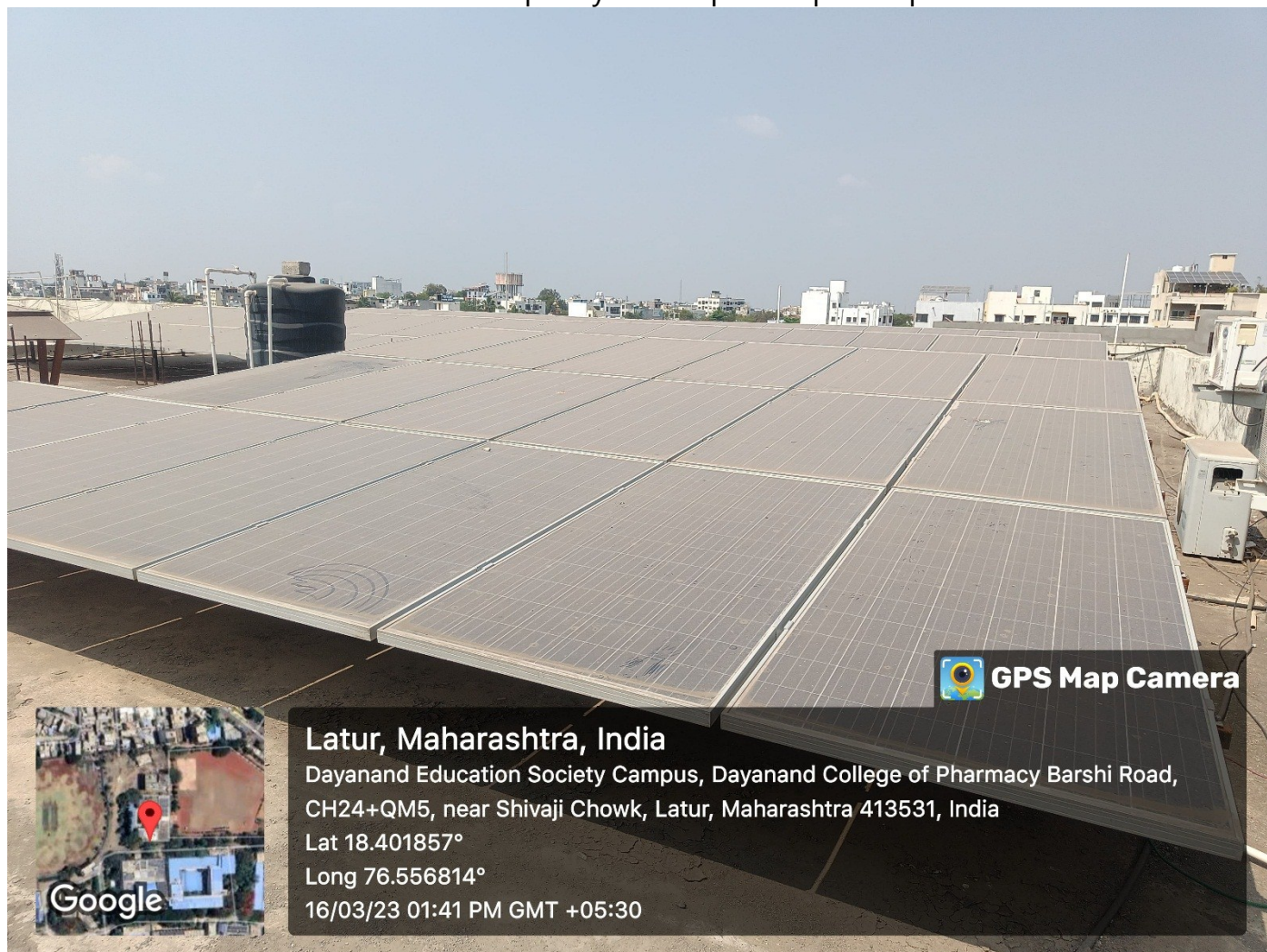
**Principal**



## 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 Mahavitrans **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.**

# Energy Efficiency in Buildings

Checking Energy Efficiency at the Designing Stage by following Energy Conservation Building Code (ECBC)

BEE, Ministry of Power, Govt. of India launched Energy Conservation Building Code (ECBC) in 2007. The main features of ECBC are:

- To provide minimum requirements for the energy efficient design and construction of buildings.
- It considers five climatic zones in India, sets minimum energy performance standards for large commercial buildings or building complexes that have a connected load of 500 kW or greater.
- The code is also applicable to all buildings with a conditioned floor area of 1,000 m<sup>2</sup> (10,000 ft<sup>2</sup>) or greater, and is recommended for all other buildings also.
- The provisions of this code apply to:
  - (a) Building envelopes, except for unconditioned storage spaces or warehouses
  - (b) Mechanical systems and equipment, including heating, ventilating, and air conditioning
  - (c) Service hot water heating
  - (d) Interior and exterior lighting
  - (e) Electrical power and motors.

