ENERGY AUDIT

STUDY PERIOD (ONE YEAR) 2024 - 2025

Sustainability study

AUDIT REPORT

Studied for

CMR Engineering Educational Society's

CMR Engineering College

Kandlakoya Village, Medchal Road,

Hyderabad- 501401, Telangana, India

Studied in the capacity of

Accredited and Certified

Green Building Professional

Studied by

Greenvio Solutions

Email: greenviosolutions@gmail.com

Background reference image Janko Ferlic on pexels

Disclaimer

The Audit Team has prepared this report for **CMR Engineering Educational Society's CMR Engineering College** located at *Kandlakoya Village, Medchal Road, Hyderabad-501401, Telangana, India* based on input data submitted by the Institute analysed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase wise or as a whole depending on the decision taken by the internal team. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

The audit is a thorough study based on the inspection and investigation of data collected over a period of time and should not be used for any legal action. This is the property of Greenvio Solutions and should not be copied or regenerated in any form.

The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm with the Project Head - Ar. Nahida Shaikh who is as an Accredited and Certified Green Building Professional-Architect. Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing excellent quality services within the stipulated time frame.

The Study is conducted in capacity of Accredited & Certified Green Building Professional with extensive experience.

Ar. Nahida Abdulla

Greenvio Solutions

Developing Healthy and Sustainable Environments

We are an Environmental and Architectural Design Consultancy firm

Sustainable Academe is our department for Conducting Audits

Palghar District, Maharashtra- 401208

sustainableacademe@gmail.com

Acknowledgement

The Audit Assessment Team extends its appreciation to **CMR Engineering Educational Society's CMR Engineering College, Telangana** for assigning this important work of Energy Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are extended are due to everyone from the Management.

We are also thankful to Institute's Task force who have played a major role in data collection.

Sustainable Academe
Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

Contents

1. Introduction

1.1 About the Institution

Established in 2010, CMR engineering college is one of the top premier private Engineering colleges in Hyderabad spreads over the vast area of 10 acres. The CMR College is authorized under All India Council for Technical Education (AICTE), New Delhi and affiliated to JNTUH. In the further journey, the college is also rated 5 Star under Institution Innovation Council, Ministry of Education, Govt of India & Achieved ARIIA Ranking.

2. Overview

2.1 Summarised Populace analysis for 2024-25

2.1.1 Students data

The data (shared by Institute) shows there were 3,049 male and 1,582 female students.

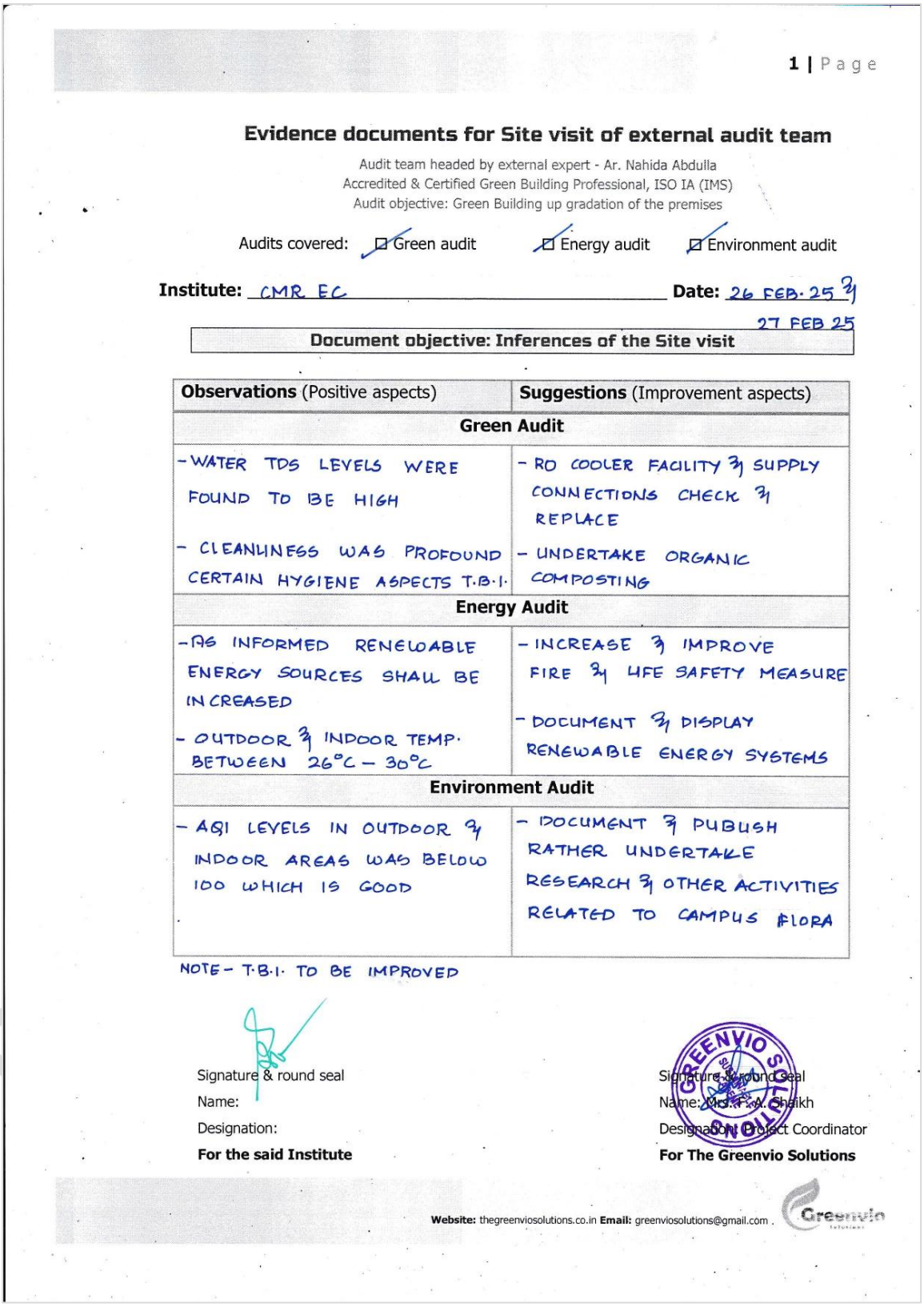
Thus total 4,631 students.

2.1.2 Staff data

The data (shared by Institute) shows there were 376 staff members.

Thus, total populace stands at 5,007 nos.

3. Observation



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Evidence documents for Site visit of external audit team

Audit team headed by external expert - Ar. Nahida Abdulla
Accredited & Certified Green Building Professional, ISO IA (IMS)
Audit objective: Green Building up gradation of the premises

Audits covered: ☑ Green audit ☑ Energy audit ☑ Environment audit

Institute: CMR EC **Date:** 26 FEB. 25 &
27 FEB 25

Document objective: Inferences of the Site visit

Observations (Positive aspects)	**Suggestions** (Improvement aspects)
Green Audit	
- WATER TDS LEVELS WERE FOUND TO BE HIGH - CLEANLINESS WAS PROFOUND CERTAIN HYGIENE ASPECTS T.B.I.	- RO COOLER FACILITY & SUPPLY CONNECTIONS CHECK & REPLACE - UNDERTAKE ORGANIC COMPOSTING
Energy Audit	
- AS INFORMED RENEWABLE ENERGY SOURCES SHALL BE INCREASED - OUTDOOR & INDOOR TEMP. BETWEEN 26°C – 30°C	- INCREASE & IMPROVE FIRE & LIFE SAFETY MEASURE - DOCUMENT & DISPLAY RENEWABLE ENERGY SYSTEMS
Environment Audit	
- AQI LEVELS IN OUTDOOR & INDOOR AREAS WAS BELOW 100 WHICH IS GOOD	- DOCUMENT & PUBLISH RATHER UNDERTAKE RESEARCH & OTHER ACTIVITIES RELATED TO CAMPUS FLORA

NOTE - T.B.I. TO BE IMPROVED

Signature & round seal
Name:
Designation:
For the said Institute

Signature & round Seal
Name: Mrs. F. A. Shaikh
Designation: Project Coordinator
For The Greenvio Solutions

Website: thegreenviosolutions.co.in **Email:** greenviosolutions@gmail.com .

Plate 1: Evidence files related to inferences

4. Investigation

The micro-climate temperatures of the site depends upon various factor including through evapotranspiration, trees and other vegetation cool the air around them. (Reference and further edited with details from dnr.louisiana.gov)

The base temperature for thermal comfort in India is 24°C (75°F) – Reference study https://www.researchgate.net/post/What_is_the_base_temperature_for_thermal_comfort_in_India#:~:text=The%20base%20temperature%20for%20thermal%20comfort%20in%20India%20is,C%20(75%C2%B0F).

The following results were carried out during visit on ***26 February 2025***.

S. No.	Space	Location	Result (^{0}C)	Should be (^{0}C)	Requires improvement
1.	F-Block	Indoor	26	24	Not really
2.	F-Block	Outdoor	28	24	
3.	A-Block server room	Indoor	28	24	
4.	Transformer area	Outdoor	30	24	
5.	C-Block	Indoor	30	24	

Table 1: Results for the micro-climate temperature study

5. Documentation

Section 1 – Life safety management

5.1 Facilities study

The facilitie include fire extinguishers, PASS boards, hose reel etc.

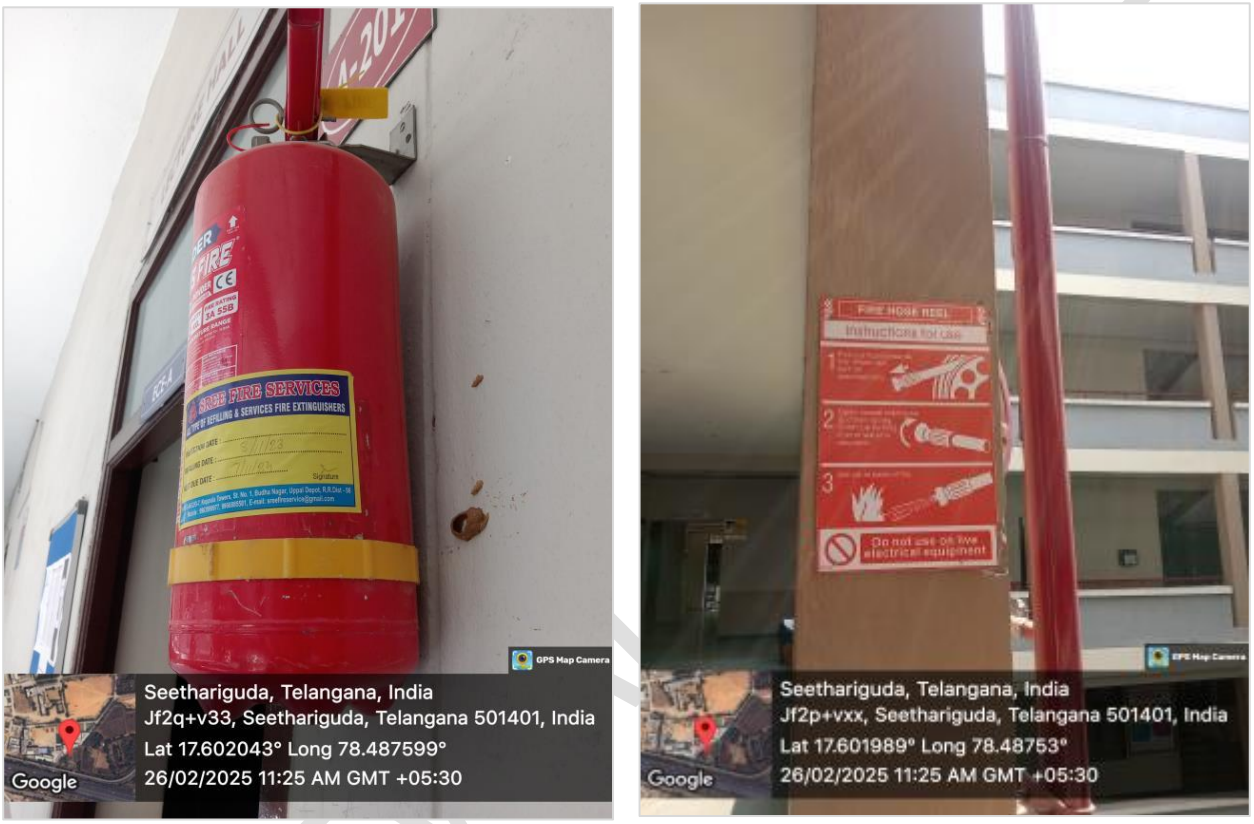

Plate 2: Fire and lie safety measures

Section 2 – Energy generation & expense incurred

5.2 Load distribution study

5.2.1 Categorization

The campus has HOSTEL and EDUCATIONAL facility thus the type of load can be stated as 'MIXED USE'

5.2.2 Primary sources of energy consumption

- **Electrical (Metered) –** Light, Fans, Equipments, Pumps comprise these sources.
- **Alternate sources of energy consumption –** The source includes 296 solar panels in Institute rooftop and 8 solar hot water heaters in hostel; In addition there are eight gas cylinders and one induction stove.

Plate 3: Solar panels and hot water heater system

5.2.3 Secondary sources of energy consumption

The sources were are documented below:

Name	Nos.
UPS	24
Inverters	4
Batteries	402
Gas cylinders	8

Table 2: Secondary sources

5.3 Technical payload study

The data related to electricity bills is documented below.

Sr. No.	Month	Year	Amount	(A) Total units consumed	(B) Solar units generated	(C = A-B) Gross units consumed after deduction
Academic year between 2024-25						
1	June	2024	6,76,358	61,784	4,323	57,461
2	July	2024	5,12,563	47,166	3,652	43,514
3	August	2024	5,84,923	53,236	4,421	48,815
4	September	2024	6,67,637	61,413	4,125	57,288
5	October	2024	6,01,303	54,001	4,072	49,929
6	November	2024	6,65,337	60,915	3,560	57,355
7	December	2024	7,11,474	66,213	3,925	62,288
8	January	2025	5,30,663	45,773	4,177	41,596

Table 3: Details of the electrical consumption

The observation related to above information states:

- The **total amount** spent is **Rs. 49,50,258/-**
- **Total units** consumed was **4,18,246 kWh (Only Electrical)**
- The **total units** consumed in past one year is **32,255 kWh (Only solar)**
- **Alternate source of energy is available through 296 solar panels.**
- **Percentage of energy met by alternate Renewable source is 7.15%**

Section 3 – Energy consumption

5.4 Calculated electrical consumption study

(Energy consumption by the electrical appliances study)

The following documentation is based on the consumption practice on a regular working day.

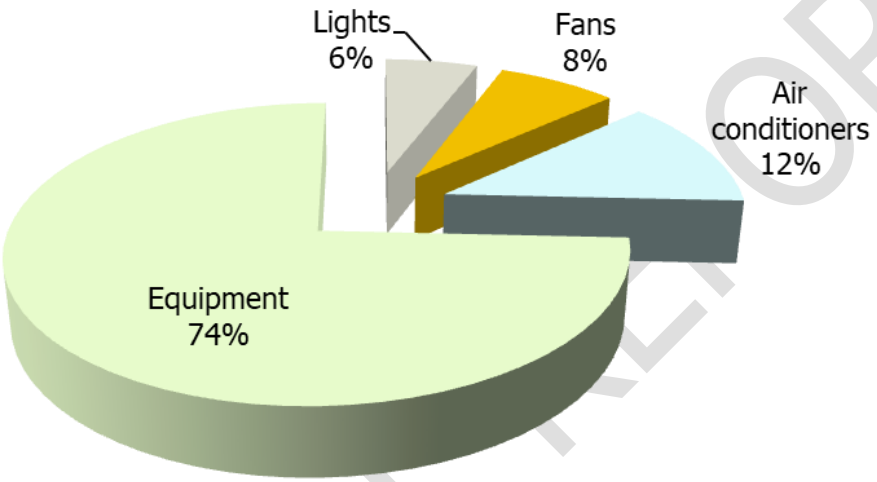

Figure 1: Summary of the calculated electrical consumption as per inventory

The above graph shows that equipment consume 74% whereas air conditioners consume 12% while fans consume 8% and lights consume 6% each of total calculated electrical energy.

5.5 Lights

5.5.1 Types of lights based on the numbers

There are **2,609 LED lights on the premises.**

5.5.2 Types of lights based on the power consumption

The energy consumption of lights is **98,084 kWh** of energy with the **LED lights consuming 100** of the total power consumed by lights.

5.6 Fans

5.6.1 Types of fans based on the numbers

There are **1,371 fans** on the premises as follows:

S. No.	Type	Nos.
1	Ceiling fans	1,311
2	Exhaust fans	59
3	Pedestal fan	1

Table 4: Summary of the types of fans in the premises

5.6.2 Types of fans based on the power consumption

The energy consumption of fans is **1,26,998 kWh** of the energy.

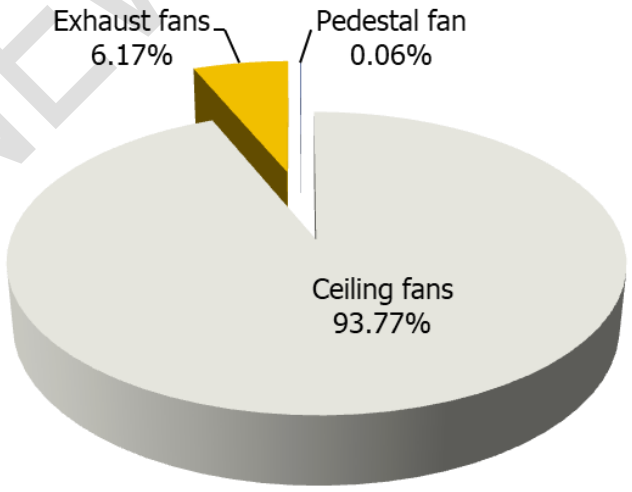

Figure 2: Types of fans based on power consumption

The above analysis shows Ceiling fans (Regular) consume 93.77% whereas the exhaust fans consume 6.17% and the pedestal fans consume 0.06% of total power consumed by fans.

5.7 Air conditioners

5.7.1 Types of air conditioners based on the numbers

There are **80 air conditioners** on the entire premises**.**

5.7.2 Building-wise consumption analysis

The energy consumption of air conditioners is **2,07,675 kWh** of energy.

5.8 Equipment

Only the major appliances information has been documented.

5.8.1 Types of Equipment

There are **2,897 nos. of equipment** in the premises.

5.8.2 Types of equipment as per their energy contribution

The energy consumption of equipment is **12,49,367 kWh** of energy.

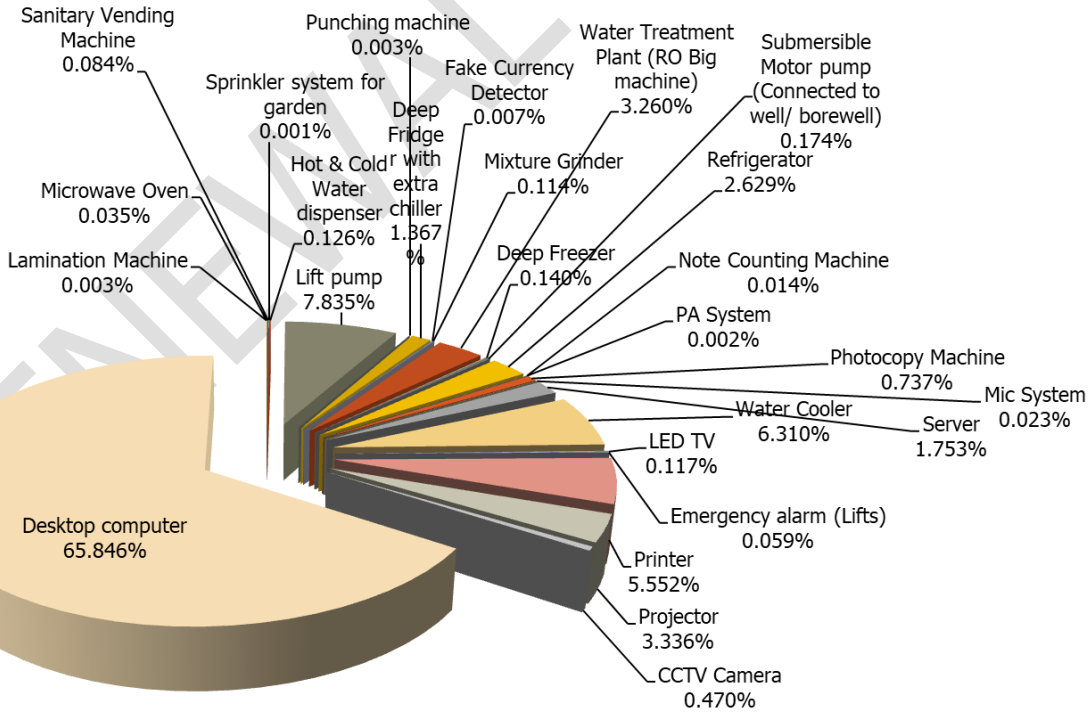

Figure 3: Energy consumed by types of equipment in the educational sector based on the usage study

The above summary shows that **desktop computer consumes more energy at 65.85%** while the **lift pump consumes 7.84%** whereas **water cooler consumes 6.31%** and **printer consumes 5.55%** these are major consumers as compared to other equipment.

Section 4 – Building safety

No urgent measures required in this regards.

5.5 Comparison study

A. Calculated Electrical requirement (in kWh) as per inventory

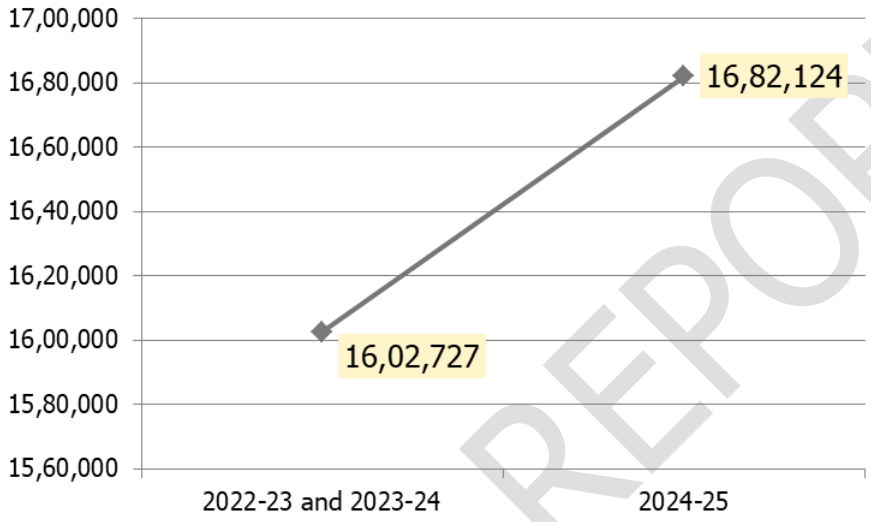

Figure 4: Comparative study of electrical requirement in kWh

There has been an increase of 79,397 kWh in the energy requirement. This highlights a positive update.

B. Energy generation – Nos. of solar panels

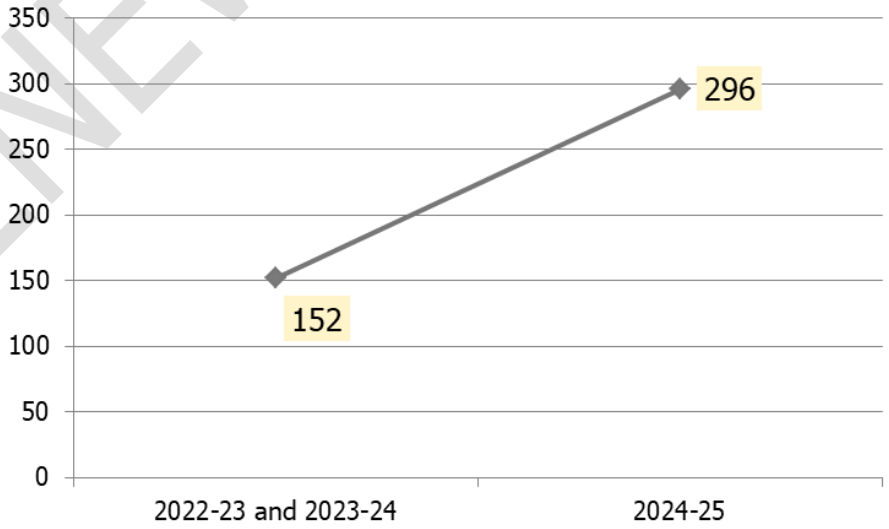

Figure 5: Comparative study of electrical requirement in kWh

There has been an increase in the nos.

6. Compliance

The compliance study was carried out through investigative ways. This was done to understand extent of implementations based on previous reports.

- Original report study was for June 2022 to May 2023 and June 2023 to May 2024
- Renewal study is currently done for June 2024 onwards

6.1 Compliance status in form of Action taken report

The inputs are documented below:

6.1.1 Earth pit zones

Action plan

- Add sign board about„ Outdoor Electrical area“
- Code the earthing pits in the courtyard.

Action Taken

- Signboards labeled "Outdoor Electrical Area" have been installed near all earthing pits to ensure visibility and awareness.
- The earthing pits in the courtyard have been coded and marked properly for easy identification and maintenance.

6.1.2 DG and Transformer area

Action plan

- Add safety signages such as “Danger-do not touch “etc.
- Add signboards about the usage suchas- Transformer areas & Diesel Generator area etc.
- Every user in this space should compulsorily jacket, helmet, gloves, boots while working and being a part of this space.
- Code the earthing pits in the courtyard.
- Add additional fire extinguishers

Action Taken

- Safety Signages Installed:
- "Danger – Do Not Touch" warnings are prominently displayed near transformers and DG sets.
- Clear usage signboards such as "Transformer Area" and "Diesel Generator Area" have been placed for proper identification.

6.1.3 Mandatory safety gear enforcement

Action Taken

- Personnel working in these areas are now required to wear jackets, helmets, gloves, and boots for safety.
- Regular training sessions are conducted to ensure compliance with safety protocols.
- Earthing Pit Coding Extended:
- The earthing pits in the courtyard have been properly coded and maintained for safety inspections.

6.1.4 Fire safety enhancements

Action Taken

- Additional fire extinguishers and safety measures have been installed in the DG and Transformer areas to meet safety standards.
- Periodic fire safety drills are conducted to ensure preparedness among staff and students.
- Energy-efficient LED lighting has been installed across campus to reduce power consumption.
- Awareness programs on energy conservation are being conducted for students and staff.
- Routine maintenance and energy audits are scheduled to monitor and improve energy efficiency on campus.

6.1.5 General safety aspects

Action plan

- Rubber flooring in the laboratories to avoid an electric shock.
- Introduce "PASS" information board about how to use Fire extinguisher and
- "FIREZONE"display board where safety equipments are kept.

Action Taken

- "PASS" Information Boards have been introduced, explaining the proper use of fire extinguishers (Pull, Aim, Squeeze, Sweep).
- "FIRE ZONE" Display Boards have been installed, marking the locations of fire safety equipment, including extinguishers, fire blankets, and emergency exits.

Electromechanical systems - Electrical and Lighting - Non-LED lights

Action plan

- The current light analysis shows that Non-LED lights consume anywhere between 50W to54Wandevenmorewheninuse;these should be replaced with LED lights which consume on an average 12-16W when in use.

Action Taken

- Phase-wise replacement of non-LED lights with LED alternatives in high-consumption areas like lecture halls, labs, and common areas is done.
- Bulk procurement of LED lights to reduce costs and replacement is under process.
- LED Tube Lights & Bulbs (12W–16W) - Highly energy-efficient compared to traditional tube lights and CFLs; Lifespan of up to 50,000 hours, reducing the need for frequent replacements.
- Solar-Powered LED Streetlights - Utilizes solar energy, reducing reliance on electricity. Automatically switches on at dusk and off at dawn, ensuring energy conservation.

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Electromechanical systems-Electrical and Lighting - Ceilingfans

Action plan

- It willbe suggestedtoeitherreplace regular fans with energy efficient; the replacement can be done when fans get damaged or are not in working condition.

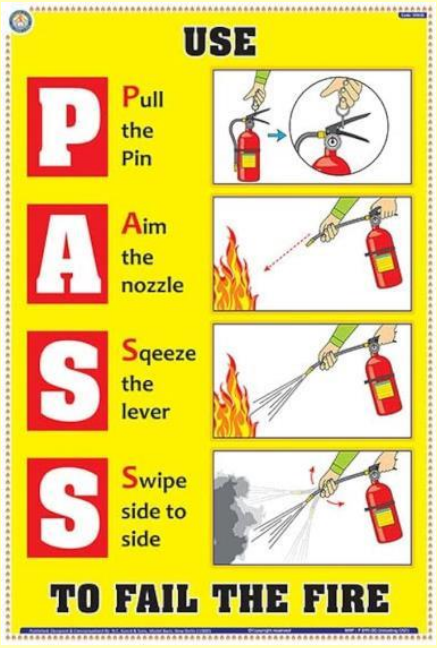
Action Taken

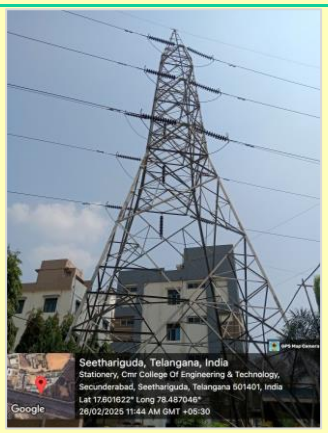
- The previously installed **ceiling fans consuming 45W** have been **systematically replaced** with **energy-efficient BLDC (Brushless DC Motor) ceiling fans consuming only 14W** when in use.
- The **new BLDC fans** result in a **69% reduction in energy consumption**, significantly lowering electricity costs.
-
- Fans installed in **lecture halls, laboratories, and faculty rooms** have been upgraded first as part of the initial phase of replacement.
- The **remaining old fans** will be replaced as they **become non-functional** to ensure **a gradual and cost-effective transition**.

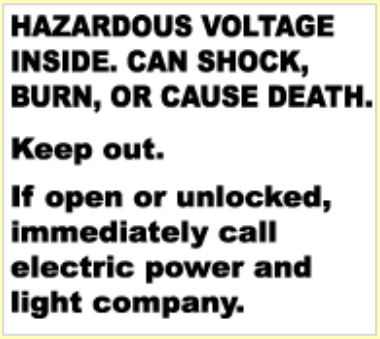
7. Suggestion

The suggestion (inference) would act as a 'PLAN OF ACTION' to implement all the suggestions in a detailed manner.

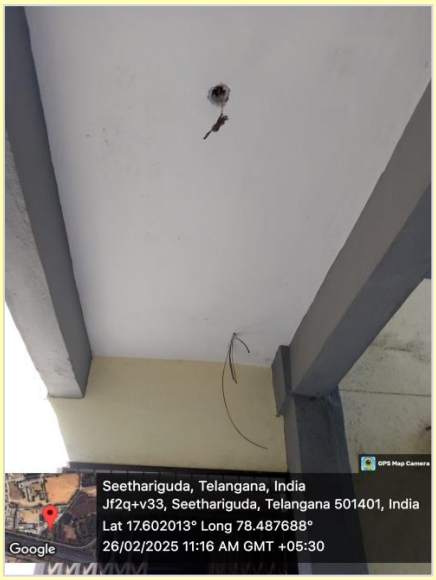
- Conduct the 'Before' and 'After' study with photos
- Document the same in 'Action taken report'

S. No.	Aspect with evidence if any	Suggestion
1.	Fire and life safety aspect **Aspect area:** **Lift safety**	Introduce sigange 'DO NOT USE LIFT IN CASE OF FIRE' ➲ Intrdouce fire escape route pland ○ Highlight the corridors in light green highlighter ○ Signify the outline of staircase block ○ Include a ✘ symbol on lift and note on plan 'Do not use lift' ○ Highlight the locations of fire extinguisher in a blue or brown box and mention same in legend ○ Include 'You are here' indication on the route plan ○ Include the 'LIFT INSPECTION CERTIFICATE' atleast in A3 size inside and outside the lft
2.	Fire and life safety aspect **Aspect area:** **Fire 'PASS BOARD'**	Wherever there is a fire extinguisher display the PASS board in English and local language; in case they are not displayed  Source: Amazon

3.	Fire and life safety aspect **Aspect area:** **'How to use Fire Hose Reel?'**	Introduce the board mentioning 'HOW TO USE FIRE HOSE REEL?' in every block where the system is available.
4.	Fire and life safety aspect **Aspect area:** **Fire water pump**	Introduce the board mentioning location of 'FIRE WATER PUMP' in every block where the system is available.
5.	Fire and life safety aspect **Aspect area:** **Relocate fire water pump in B-Block**	Relocate the position of 'Fire water pump' system in B-Block from inside to outside the block
6.	Fire and life safety aspect **Aspect area:** **Systems mandate**	Recheck the facilities according to the thumb rule - If a room contains: ➲ More than 10 electronic appliances OR ➲ More than 10 electrical appliances OR ➲ Air conditioner OR ➲ Equipments with more than 500 watts in 2 or more nos. OR ➲ Combustible materials such as gas cylinders, or similar These must have fire safety measures both inside and outside the room for example fire extinguisher inside and sand bucket outside.
7.	Fire and life safety aspect **Aspect area:** **Rubber mats and Danger Zone**	  ➲ Display a 'DANGER ZONE' and 'SAFETY' signboard outside the server room and transformer area. ➲ Include 'RUBBER MATS' along all side in inside and outside these areas

		Server room  **Transfromer area**  
8.	Fire and Life safety aspect **Aspect area:** **Exposed electrical wiring**	  Certain areas were observed to have exposed and double load on electrical wiring; Appropriate concealing and fabrication should be undertaken for these areas using cable concealers  Image reference: Amazon

9.	Energy generation aspect **Aspect area:** **Solar panels**	  Include specification in ground floor of each block where the systems are installed with information about: ➲ Do and Don't for the specific type of plant ➲ Plant name ➲ Capacity ➲ Location ➲ Type of renewable energy system ➲ Nos. of units ➲ Installation date, month and year ➲ Energy generated per day and annually ➲ Energy consumption actual requirement per day and annually ➲ Energy saved per day and annually ➲ Last maintenance date and vendor ➲ Institute name and logo
10.	Energy consumption aspect **Aspect area:** **Dust accumulation and outdoor air conditioner units & inverter sheds**	  Outdoor units of air conditioner are exposed adding to electricala & heat load. They should be covered as heat-proof facility

		
11.	Energy consumption aspect **Aspect area:** **Removal of unwanted switches**	  **Remove** any unwanted switch/ swtichboard/ wires/ appliances such air conditioner outdoor unit, non-working LED lights in ceiling of passage areas OR **include signage as 'NOT ACTIVE'** 

12.	Energy consumption aspect **Aspect area:** **Dust management**	 Remove the dust accumulation from the ceiling fans
13.	Structural safety aspect **Aspect area:** **Safety signages**	Include 'Restricted area ZONE' board for access near terrace area   ***Sample signages***

Table 5: Observation based suggestion study of the campus

8. Compilation

The study is based on the data collected, analyzed, rechecked, and confirmed through multiple modes. For the quality study, some standards/ notes have been referred to. These are listed and noted below. However, no direct references have been used anywhere. These are used as a base to analyze and study the data collected.

Specific references for study related to energy

- https://www.energy.gov/eere/buildings/zero-energy-buildings
- https://www.dsaarch.com/zero-net-positive-energy
- U.S. Energy Information Administration
- https://www.happysprout.com/inspiration/what-is-smart-gardening/
- https://ieeexplore.ieee.org/document/6779316
- https://www.murata.com/en-global/apps/industry/security/entranceandexitsystem
- https://www.energuide.be/en/questions-answers/what-are-the-alternatives-to-air-conditioning/2121/
- IGBC Green Campus rating system Abridged Reference Guide
- GEM Sustainability Certification Rating Program
- Inference study reference images
    - https://seors.unfccc.int/applications/seors/attachments/get_attachment?code=NG125PFE4WHMWSYAK8TCAKIHMWX0F4QD
    - https://housing.com/news/smart-gardening/
    - https://solarpowerproject.in/solar-panels-for-parking-lots.php