

# ENERGY AUDIT

STUDY PERIOD (TWO YEARS) 2022 – 2023 AND 2023 – 2024

Sustainability study

## AUDIT REPORT

Studied for

**Maris Stella College  
(Autonomous)**

No.16 N.H.Service Road, Near Benz Circle,  
Beside LepI, Vijayawada 520008, India

Studied in the capacity of

Accredited and Certified GBP



Website: <https://thegreenviosolutions.co.in/>

Email: [greenviosolutions@gmail.com](mailto:greenviosolutions@gmail.com)

# Disclaimer

The Audit Team has prepared this report for the **Maris Stella College (Autonomous)** located at No.16 N.H.Service Road, Near Benz Circle, Beside Lepl, Vijayawada 520008, 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](mailto:sustainableacademe@gmail.com)



# Acknowledgement

The Audit Assessment Team extends its appreciation to the **Maris Stella College (Autonomous), Andhra Pradesh** 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.

Our heartfelt thanks extended to Chairpersons of entire process **Dr.Sr.Kulrekha Mudartha**, (Principal) and **Dr.Sr.Leena Quadras**, (Correspondent) for the valuable inputs.

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

- ➔ **Teaching members** – **Dr.G.Little Flower**, Professor; **Dr.C.Krishnaveni**, Professor; **Dr.Sr.P.Japamalai**, Professor; **Dr.Sr.K.Ramana**, Asso.Professor; **Sr.Sahaya Arokia Mary**, Asst.Professor
- ➔ **Non-teaching staff members** – **Mr.Yunus**, **Mr.Moses**, Electrician and **Mrs.Aruna**, Sweeper
- ➔ **Admin staff members** – **Mrs.K.V.L.Prasuna**, Admin

We appreciate the cooperation of the **entire Teaching, Non-teaching, and Admin staff** for their support while collecting the data.

## Sustainable Academe

Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

# Contents

<b>Disclaimer .....</b>	<b>1</b>
<b>Acknowledgement .....</b>	<b>2</b>
<b>Contents.....</b>	<b>3</b>
<b>1. Introduction.....</b>	<b>4</b>
<b>2. Overview .....</b>	<b>5</b>
<b>3. Research .....</b>	<b>7</b>
<b>4. Evidence.....</b>	<b>8</b>
<b>5. Documentation .....</b>	<b>9</b>
<b>6. Suggestion .....</b>	<b>19</b>
<b>7. Compilation.....</b>	<b>21</b>

**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:** Maus Stella College (A), Vijayawada      **Date:** 21.02.2024

**Document objective: Inferences of the Site visit**

Observations (Positive aspects)	Suggestions (Improvement aspects)
<b>Green Audit</b>	
<ul style="list-style-type: none"> <li>- Waste management &amp; outreach program through compost &amp; agriculture department</li> <li>- Water harvesting, bio-remediation &amp; excellent water management</li> </ul>	<ul style="list-style-type: none"> <li>- Continue with current practice</li> <li>- Increase documentation &amp; reflective practice</li> </ul>
<b>Energy Audit</b>	
<ul style="list-style-type: none"> <li>- Approx. Rs. 5,000/- awarded every year (2021) for consumption</li> <li>- Approx. 75% lighting are energy efficient fans</li> </ul>	<ul style="list-style-type: none"> <li>- Continue with the current practice &amp; undertake smart &amp; sensor based facilities</li> </ul>
<b>Environment Audit</b>	
<ul style="list-style-type: none"> <li>- Good green cover &amp; pocket landscapes all over campus</li> <li>- Excellent maintenance &amp; well managed premises</li> </ul>	<ul style="list-style-type: none"> <li>- Continue the green cover expansion all over premises</li> </ul>

  
 Signature & round seal  
 Name: Dr. Lakshmi  
 Designation: Principal  
**For the said Institute**

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



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: [x] Green audit [x] Energy audit [x] Environment audit

Institute: Maris Stella College (A), Vijayawada Date: 21.02.2024

Document objective: Proof of the Site visit



Meeting with the core team

Induction Meeting



Seminar on Trash to Treasure



Exit Meeting



Investigation of the systems

Signature & round seal
Name: Dr. Keerthika
Designation: Pr. in-charge
For the said Institute

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

# 1. Introduction

## 1.1 About the statements of the Institute

### 1.1.1 Vision

The Institute proposes "Empower, Enrich, Excel, Transform: To contribute to a just and equitable society through quality education for leadership and social responsibility in an environment of academic excellence and sound values."

### 1.1.2 Mission

The Institute adheres and focuses "To empower young women through a transformative education to form intellectually competent, morally upright, socially committed and spiritually inspired women imbued with the values of humanism in the service of society."

## 1.2 Assessment of the Institute

### 1.2.1 Affiliations

The Institute is affiliated to **Krishna University**, a state university at Andhra Pradesh, India.

### 1.2.2 Certification

The College has received the following Certifications

- **AISHE** – The All India Survey of Higher Education code is C-25318
- **ISO** – Received the ISO 9001,14001 and 50001 Certifications

### 1.2.3 Recognitions

The College has been recognized under section 2(f) and 12(B) of the UGC Act, 1956 by University Grants Commission, New Delhi.

## 2. Overview

### 2.1 Summarised Populace analysis for 2023-2024

#### 2.1.1 Students data

The data (shared by the Institute) shows there were **1,703 students**.

#### 2.1.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	05	14	19
2	Teaching staff	12	59	71
3	Non-Teaching staff	17	18	35
<b>Total Staff Members</b>		<b>34</b>	<b>91</b>	<b>125</b>

*Table 1: Staff data of the Institution for 2023-2024*

The staff data shows the Institute premises **125 Staff Members**.

### 2.2 Summarised Populace analysis for 2022-2023

#### 2.2.1 Students data

The data (shared by the Institute) shows there were **1,857 students**

#### 2.2.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	05	15	20
2	Teaching staff	12	58	70
3	Non-Teaching staff	13	17	30
<b>Total Staff Members</b>		<b>30</b>	<b>90</b>	<b>120</b>

*Table 2: Staff data of the Institution for 2022-2023*

The staff data shows the Institute premises had **120 Staff Members**.



## **2.3 Total site and building spread area**

The **total site area is 20** and the **total Built-up area of the Institute is 3,10,065 sq. ft.**

## **2.4 Establishment**

The Institute was established in **1962**.

## **2.5 Operation and Maintenance of the premises**

The interview session was held with the staff regarding the operation and working hours. The Institution is open for 290 working days with the timings being 09:00 hours to 17:00 hours.

DETAILED REPORT

## 3. Research

### 3.1 About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution sustainable and healthy premises for its inhabitants.

### 3.2 Analysis of the Green Building Study Audit

The procedure included detailed verification as follows:

- Investigation
- Technical discussion with team
- Observations
- Inferences

### 3.3 Strategy adopted for Green Building Study Audit

The strategies included data collection from the admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collection, and preparation of the Report.

### 3.4 Activities undertaken for the Green Building Study Audit

- Discussion with the Institute
- Allotment and Initiation by the Institute
- Site visit at the Institute
- Submission of the files

**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: MARIS STELLA COLLEGE (AUTONOMOUS) Date: 21/02/2024

**Document objective: Induction Meeting attendance sheet**

S. No.	Name	Committee	Designation	Signature
1.	Mrs. F. A. Shaikh	External	Project Coordinator	
2.	Ar. Nahida Abdulla	External	Project Head	
2	Dr. Sr. Leona Quadras		Correspondent	
4	Dr. Sr. Kuntretho Mubarek		Principal	
5	Dr. C. Krishnaveni		IQAC coordinator	
6	Ms. G. Usha Kumar		Vice-Principal	
7	Dr. G. Little flower		Dean, Student Affairs	
8	Dr. V. N. Mayadevi		" "	
9	Dr. S. Vanitha		Dean, Academic Affairs	
10	Dr. Sr. P. Jaganmala		" "	
11	Sr. A. Sahaya Mary		Supervisor, HOD, Dept of SW	
12	Dr. G. Benth P. Suresh		Head, dept of Technology	
13	Dr. Lakshmana Swayam		Head, dept of ARD	
14	Ms. K. Prathima		Admin Incharge	
15	Sr. Venice D' Souza		Bursar	

Signature & round seal  
 Name: Dr. Kuntretho  
 Designation: Principal  
**For the said Institute**

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



**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: MARIS STELLA COLLEGE (AUTONOMOUS) Date: 21/02/2024

**Document objective: Exit Meeting attendance sheet**

S. No.	Name	Committee	Designation	Signature
1.	Mrs. F. A. Shaikh	External	Project Coordinator	
2.	Ar. Nahida Abdulla	External	Project Head	
3.	Dr. Sr. Leena Quadras		Correspondent	
4.	Dr. Sr. Katrekhe Mudashe		Principal	
5.	Dr. C. Krishnaven		IQAC Coordinator	
6.	Ms. G. Usha Kumari		Via Principal	
7.	Dr. S. Little Flower		Dean, Student Affairs	
8.	Dr. V. N. Manjudevi		" "	
9.	Dr. S. Vanikathe		Dean, Academic Affairs	
10.	Dr. S. P. Sefunda		" "	
11.	Sr. A. Sahaya Mary		Superior, Head, Dept. of SW	
12.	Dr. G. Benesh P. Srinade		Head, Dept. of History	
13.	Dr. Leelashree Swamy		Head, Dept. of ARD	
14.	Ms. K. V. Prudence		Admin Incharge	
15.	Sr. Veronica O'Souza		Bursar	

Signature & round seal  
 Name: Dr. Katrekhe  
 Designation: Pr. Principal  
**For the said Institute**

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



## 4. Evidence



**Plate 1: Discussion with the team**



**Plate 2: Investigation of the system**



**Plate 3: Seminar on subject related to Sustainability for the stakeholders**

Note: the text mentioned in ***maroon colored italics bold font*** represents a suggestion.

## 5. Documentation

### 5.1 Sources of energy consumption

#### 5.1.1 Primary sources

- **Electrical (Metered)** – Light, Fans, Equipments, Pumps comprise these sources.
- **Alternate sources** – The facilities are documented below:

S. No.	Name	Nos.
1	Solar panels	170
2	Solar hot water heater system	10

*Table 3: Details of the alternate sources of energy consumption*



*Plate 4: Rooftop solar panels in premises (Source: Institutes official media handle)*

#### 5.1.2 Secondary sources

The premise uses batteries, UPS as backup for administrative purposes. The details of the existing sources are documented below:

S. No.	Name	Nos.
1	UPS	9
2	Inverters (college, hostel)	5
3	Batteries	214
4	Gas cylinders (Food Sc 3 & Hostel 10, phy 4, chem 5)	22
5	Induction stove	1

*Table 4: Details of secondary sources of energy consumption*

## 5.2 Actual electrical consumption as per bills

The information was shared for the meters:

S. No.	Month	Year	Amount	(A) Total units consumed	(B) Solar units generated	(C = A-B) Gross units consumed after deduction
<b>Academic year 1</b>						
1	June	2022	-	1,985	782	1,203
2	July	2022	1,91,419	14,301	350	13,951
3	August	2022	2,35,686	15,506	396	15,110
4	September	2022	1,20,932	10,473	717	9,756
5	October	2022	1,30,445	11,337	676	10,661
6	November	2022	90,638	6,661	843	5,818
7	December	2022	83,125	6,633	1,358	5,275
8	January	2023	62,886	4,874	2,057	2,817
9	February	2023	60,067	3,783	1,318	2,465
10	March	2023	79,900	5,615	1,189	4,426
11	April	2023	94,273	6,299	1,286	5,013
12	May	2023	91,807	7,041	928	6,113
<b>Academic year 2</b>						
13	June	2023	1,02,082	8,190	785	7,405
14	July	2023	1,36,138	9,153	645	8,508
15	August	2023	1,86,707	10,555	772	9,783
16	September	2023	1,71,312	10,493	722	9,771
17	October	2023	1,60,314	9,941	1,074	8,867
18	November	2023	1,52,833	9,888	618	9,270
19	December	2023	86,625	6,733	1,484	5,249
20	January	2024	70,385	4,890	1,399	3,491

*Table 5: Details of the electrical consumption*

- ⇒ The **total amount** spent in past two years is **Rs. 23,07,574/-**
- ⇒ The **total units** consumed in past two years ~ **1,64,351 units (Electrical + solar)**

***The study suggests that there could be an awareness poster displaying detail about the renewable energy, mode incorporated, energy produced and utilised for sensitization of the stakeholders.***

### 5.3 On-site investigation



*Plate 5: On-site transformer connected to all blocks*

The positive part is the shade provided to the facility; **the study suggests that:**

- **A safety barricade with 'Danger zone' can be undertaken**
- **Certain sand buckets can be placed near to the area for fire safety**



*Plate 6: Outdoor units of the air conditioners in the campus*

The positive part is that these are taken care of to be dust free and maintained well.

**The study suggests a temporary shade can be provided over units to keep them away from direct sun exposure as that can increase heat load during summers.**

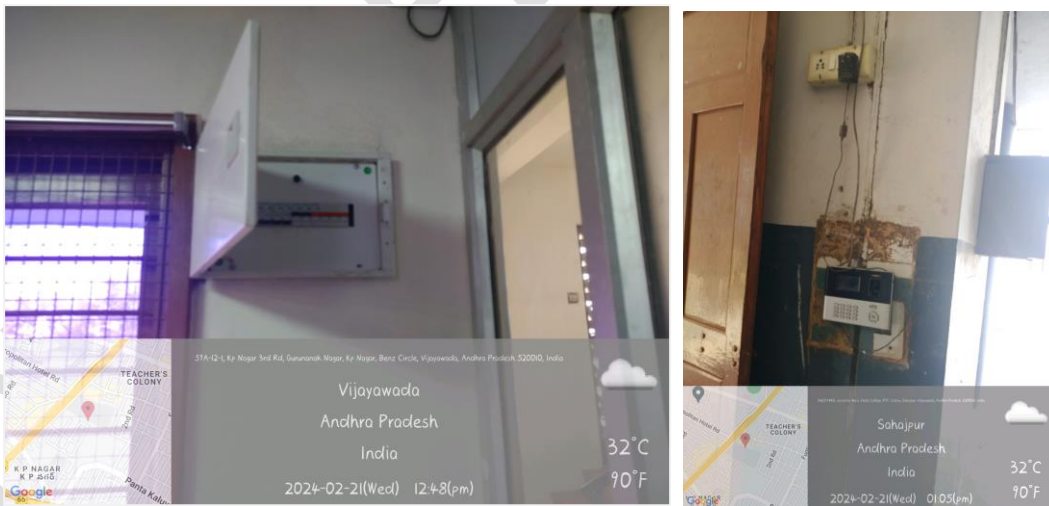




**Plate 7: Solar panels on academic blocks rooftop (Source: Institutes official media handle)**

**The study suggests that:**

- ➔ **The rooftop should be repainted with 'Cooltop' material**
- ➔ **The exposed wiring about system on rooftop can be fabricated with 'Restricted entry' board displayed.**



**Plate 8: Switch boards and wiring facilities**

**The study suggests**

- ➔ **Documenting every switchboard (SB1, SB); main boards as 'MB1, MB2'**
- ➔ **All switches could be named and numbered as per appliance**
- ➔ **Whichever wiring has become old to be replaced and fabricated**



**Plate 9: Street lights in the gardens**

**The study suggests that:**

- ➔ **The wirings can be concealed and fabricated to avoid any direct contact**
- ➔ **There could a display board 'Do not touch the wiring'**



**Plate 10: Streetlights in the campus**

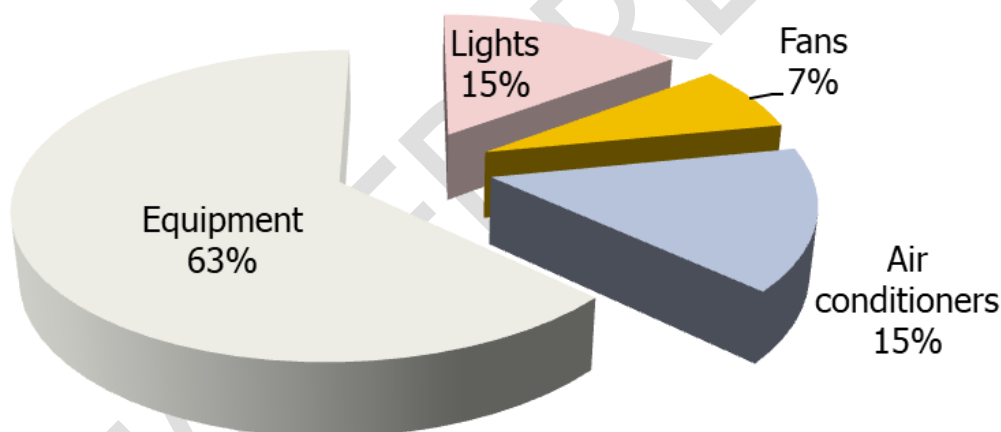
**The study suggests to explore options for 'Solar street lights'**

## 5.4 Calculated Electrical Consumption as per inventory

The electricity bills provide actual consumption data. The following is the calculated consumption. It is done to understand the percentage of energy usage in the premises by various applications. It is based on the inventory collected and interviews with the staff.

The additional data such as wattage is taken from market research. In terms of electrical consumption, the main sources are lights, fans, air conditioner, and equipment. The inventory and data collection for sources of energy consumed in the premise is summarised in the following sections.

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



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

The above graph shows that equipment consume 63% whereas the lights and air conditioners consume 15% each while the fans consume 7% of the total calculated electrical energy.

## 5.5 Lights

### 5.5.1 Types of lights based on the numbers

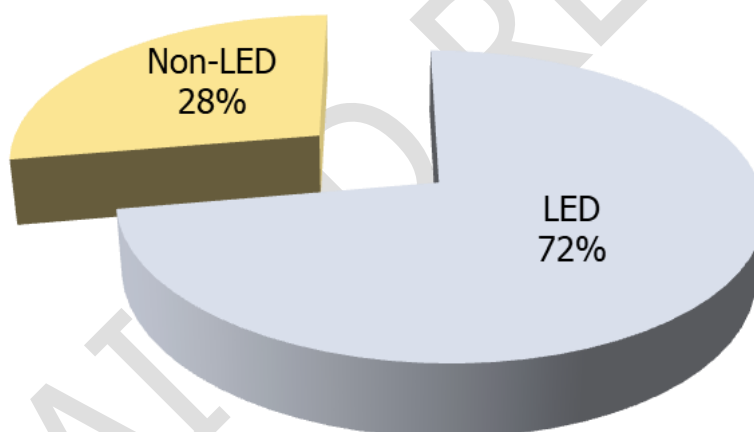
There are **1,393 lights on the premises**; the following table shows the various types of lights on the premises.

S. No.	Type	Nos.
1	<b>LED lights</b> (Energy efficient appliance)	1,041
2	<b>Non-LED lights</b> (Non-Energy efficient appliance)	352

*Table 6: Summary of the types of lights on-premise*

### 5.5.2 Types of lights based on the power consumption

The energy consumption of lights is **1,23,729 kWh** of energy.



*Figure 2: Energy consumed by types of lights in the premise based on the usage study*

The analysis of the types of Lights on-premises (percentage of energy consumed by specific type of light) shows that the **LED lights consume 72%** whereas the **Non-LED lights consume 28%** of the total power consumed by lights.

## 5.6 Fans

### 5.6.1 Types of fans based on the numbers

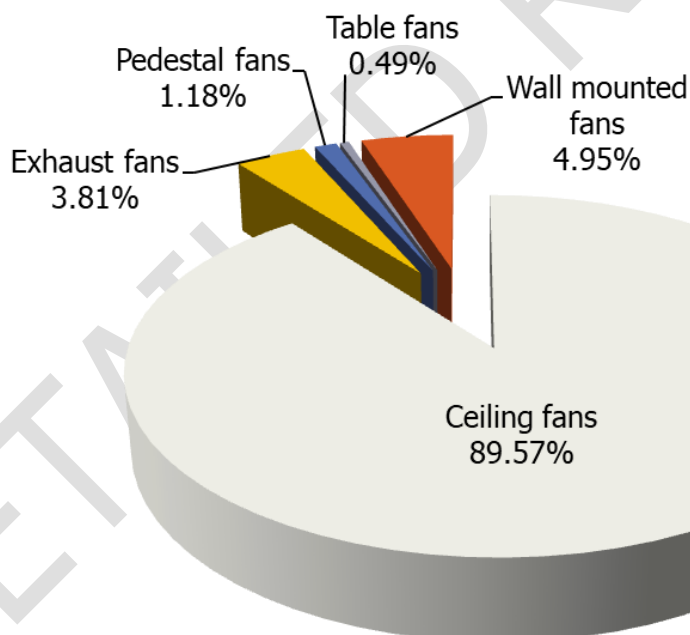
There are **793 fans** on the premises as follows:

S. No.	Type	Nos.
1	Ceiling fans	705
2	Exhaust fans	26
3	Pedestal fans	11
4	Table fans	5
5	Wall mounted fans	46

*Table 7: 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 **58,936 kWh** of the energy.



*Figure 3: Types of fans based on power consumption*

The above analysis shows **Ceiling fans consume 89.57%** whereas the while the **wall mounted fans consume 4.95%** while the **exhaust fans consume 3.81%** whereas the **pedestal fans consume 1.18%** and the **table fans consume 0.49%** of the total power consumed by fans.

## 5.7 Air conditioners

### 5.7.1 Types of air conditioners based on the numbers

There are **48 air conditioners** in the entire premises.

### 5.7.2 Building-wise consumption analysis

The energy consumption of air conditioners is **1,25,250 kWh** of energy.

### 5.7.3 About the replacement of current air conditioners

- The current air conditioners are well maintained.
- Though there is not an immediate requirement for replacement.
- Whenever the Institute undergoes redevelopment there can be provisions for replacement with energy-efficient appliances or new air conditioners that require less power consumption.

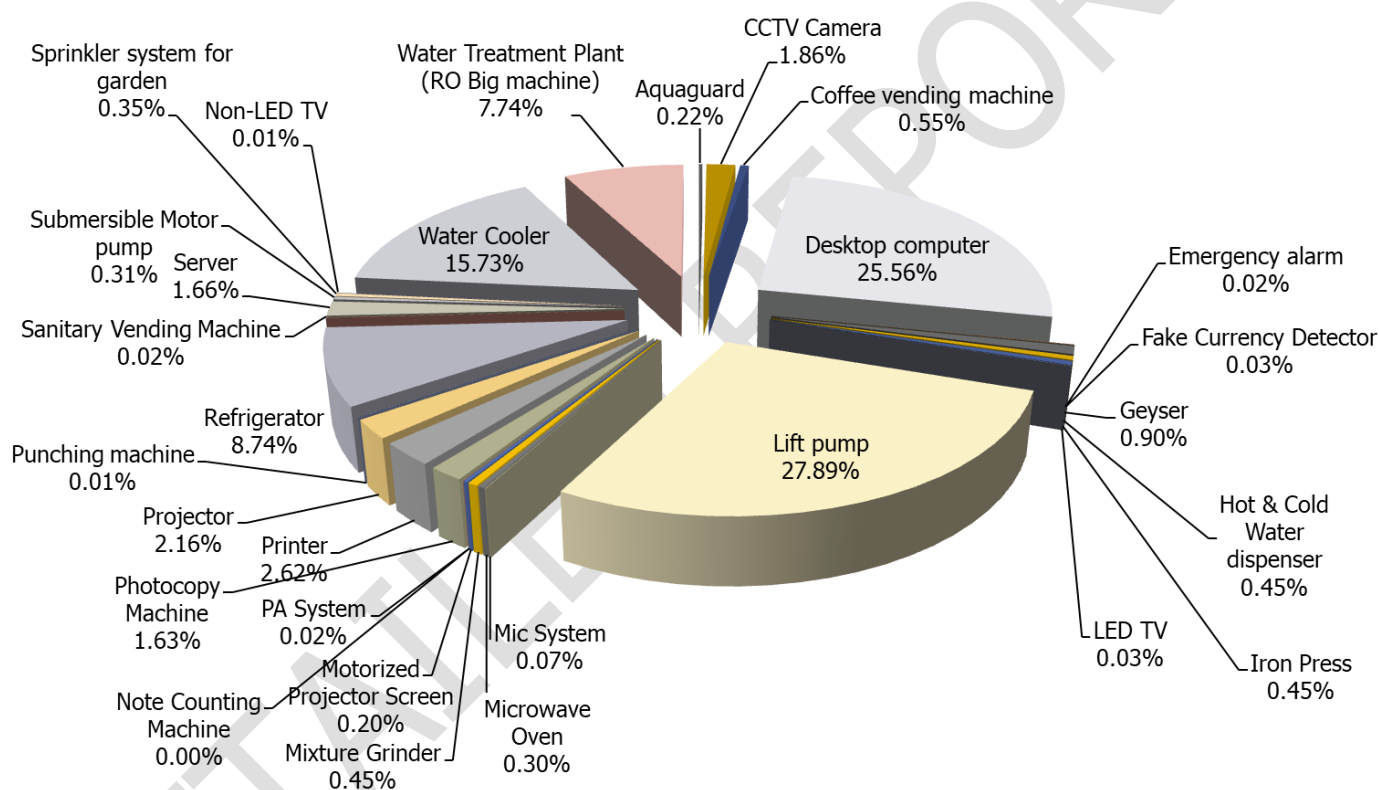
## 5.8 Equipment

### 5.8.1 Types of Equipment

There are **897 nos. of equipment** (Excluding the scientific equipment in laboratories) in the Educational sector.

### 5.8.2 Types of equipment as per their energy contribution

The energy consumption of equipment is **5,26,415 kWh** of energy.



**Figure 4: Energy consumed by types of equipment in the educational sector based on the usage study**

The above summary shows that the **lift pump consumes 27.89%** while the **desktop computer consumes more energy at 25.56%** whereas the **water cooler consumes 15.73%** and the **water treatment plant (RO big machine) consumes 7.74%** these are the maximum consumers as compared to other equipment.

## 6. Suggestion

### 6.1 Section-wise suggestions

The following suggestions are to be considered as a ***first priority*** to be executed within the next 1.5 to 2.5 years from the date of the Report submission.

#### 6.1.1 Electromechanical systems - Electrical and Lighting

##### Section 1 - Non-LED lights

The current light analysis shows that Non-LED lights consume anywhere between 50W to 54W and even more when in use; these should be replaced with LED lights which consume on an average 12-16W when in use.

Our technical research shows that there would be a reduction of an average of **67% reduction** in energy consumption if replaced with energy efficient appliance. It will be suggested to either replace these now if the Institute can have certain plans else the replacement can be done when fans get damaged or are not in working condition.

##### Section 2 - Ceiling fans

The current Fans are in proper working conditions and maintained well. The ceiling fans are in more quantity and consume at least 45W when in use. These should be replaced with energy efficient fans consuming 14W when in use.

Our technical research shows that there would be a reduction of an average of **69% reduction** in energy consumption if replaced with energy efficient appliance. It will be suggested to either replace these now if the Institute can have certain plans else the replacement can be done when fans get damaged or are not in working condition.



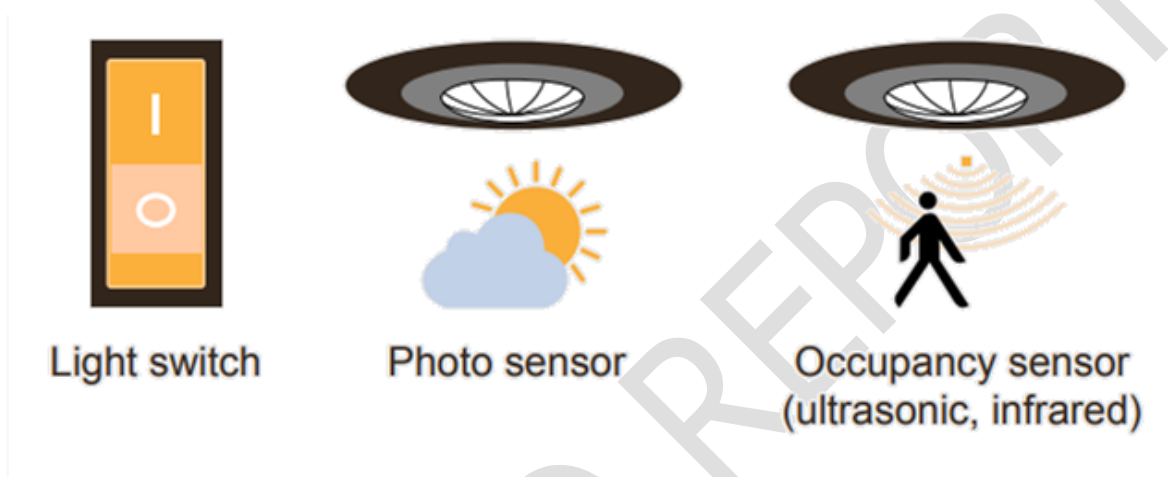
## 6.2 General suggestions

The following are consolidated study related to 'entire Institute' should be considered as **second priority** once section wise recommendations are implemented.

### 6.2.1 Alternatives towards Smart premises mechanisms

#### 6.2.1.1 Facility management systems, controls

(Includes electromechanical systems – Electrical, Water)



**Plate 11: Understanding the lighting concepts**

Source: [https://seors.unfccc.int/applications/seors/attachments/get\\_attachment?code=NG125PFE4WHMWSYAK8TCAKIHMWX0F4QD](https://seors.unfccc.int/applications/seors/attachments/get_attachment?code=NG125PFE4WHMWSYAK8TCAKIHMWX0F4QD)

#### 6.2.1.2 Smart gardening

The Institute can undertake a Smart Gardening system using IoT Technology. This will result in saving time by scheduling time for watering; saving money through automated water schedules tracking dampness of soil to know when, how much water garden needs.



**Plate 12: Solar farm concept for the Institute (For reference purpose only)**

Image source: <https://housing.com/news/smart-gardening/>

Data source: <https://www.happysprout.com/inspiration/what-is-smart-gardening/>

## 7. 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://housing.com/news/smart-gardening/>
- ➔ Inference study reference image

[https://seors.unfcc.int/applications/seors/attachments/get\\_attachment?code=NG125PFE4WHMWSYAK8TCAKIHMWX0F4QD](https://seors.unfcc.int/applications/seors/attachments/get_attachment?code=NG125PFE4WHMWSYAK8TCAKIHMWX0F4QD)

