

# ENERGY AUDIT

STUDY PERIOD (TWO YEARS) 2021 - 2022 & 2022 - 2023

Sustainability study

## AUDIT REPORT

Studied for

**Government Degree College,  
Pattikonda**

Main road, Kotha Peta, Pattikonda,  
Kurnool (District), Pattikonda – 518380,  
Andhra Pradesh, India

Studied in the capacity of

Accredited and Certified  
Green Building Professional



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

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

# Disclaimer

The Audit Team has prepared this report for the **Government Degree College, Pattikonda** located at Main road, Kotha Peta, Pattikonda, Kurnool (District), Pattikonda – 518380, Andhra Pradesh, 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 Hon'ble Management and Institute. 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.

## 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 thanks the **Government Degree College, Pattikonda, 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 Governing body.**

Our heartfelt thanks are extended to the Chairperson of the entire process **Dr. R. Madhuri** (Principal) for the valuable inputs.

We are also thankful to Institute's Task force who have played a major role in data collection - **Dr. Md. Osman Ahmed**, IQAC Coordinator; **Ms. Vasantha** and **Mr. Rajesh**

We highly appreciate the assistance 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>7</b>
<b>3. Research .....</b>	<b>9</b>
<b>4. Observation .....</b>	<b>10</b>
<b>5. Documentation .....</b>	<b>11</b>
<b>6. Suggestion .....</b>	<b>18</b>
<b>7. Compilation.....</b>	<b>21</b>

# 1. Introduction

## 1.1 About the Institution

**The Government Degree College, Pattikonda,** Kurnool Dist. was established with an initial strength of 88 students with B.A., & B.Com courses in 1988 in Government Junior College. Since its inception, it has been striving hard to impart quality and job oriented education to the students of socially and economically backward area of Kurnool district.

Innovative teaching and learning methods are adopted which include student centered learning, seminars, G.Ds and assignments. Besides Mana T.V. Guest lectures and invited lectures enhance the quality of education with values and latest concepts. Field trips are arranged to broaden the outlook of the students. Academically backward students are identified and special care is taken to sharpen their skills by conducting remedial coaching

**Cerment cell is making relentless efforts to address the problems of the girl students.** Apart form conducting various competitions for the girls, if instils confidence to face the challenges of the society bravely. Grievance Redressal cell is taking all steps to solve the issues of the students. Students are given freedom to express their grievances without hesitancy.

**Eco club is at its best in maintaining greenery in the campus.** On the games and sports front, physical education department deserves great appreciation as it is putting untiring efforts in shaping students into bright and talented.

Being a socially responsive organization, the institution is putting all its endeavours to improve the lot of the stake holders through value based education and relevant community development activities. **The College anticipates a good number of its students will become socially responsible citizens who can make society a better place to live in.**



## 1.2 About the statements of the Institute

### 1.2.1 Vision

The Institute proposes "To provide quality education to the students of poor, down trodden and privileged of rural, backward and side-lined area of Pattikonda and achieve academic excellence."

### 1.2.2 Mission

The Institute adheres and focuses towards:

- To provide quality education through effective curriculum design and implementation.
- To emancipate from legal, socio and economic restrictions.
- To help the students in the development of their personality, life skills, communicative skills for acquiring better and fruitful employment.
- To encourage staff to utilize ICT enabled methods in teaching and learning process to make it effective.
- To sensitize the students towards social concern human rights gender quality and environmental issues.

## 1.3 Assessment of the Institute

### 1.3.1 Affiliations

The Institute is affiliated to **Rayalaseema University**, a state University in Pasupula, Andhra Pradesh, India.

### 1.3.2 Certification

The Institute has received the following Certifications

- **ISO 9001** – Quality Management Systems
- **ISO 50001** – Energy Management Systems
- **All India Survey of Higher Education** (AISHE) - wherein the code is C-26248.

### 1.3.3 Recognitions

The courses provided and the Institute are recognised under the **section 2(f) and 12 (B) of the University Grants Council Act, 1956.**

### 1.3.4 Accreditation

The following are details of the accreditation awarded by the National Assessment & Accreditation Council (NAAC) to the College.

Cycle	First	Second
<b>CGPA</b>	70	2.3
<b>Grade</b>	B	B
<b>Year</b>	2007	2015

*Table 1: NAAC Accreditation details of the Institute*

The College is due to enter its next cycle of NAAC.

## 2. Overview

### 2.1 Summarised Populace analysis for 2022-2023

#### 2.1.1 Students data

The data (shared by the Institute) shows there were **460 male and 265 female students**.

#### 2.1.2 Staff data

S. No.	Type	Male	Female	Total
1	Teaching staff	19	03	22
2	Non-Teaching staff	06	01	07
Total Staff Members		25	04	29

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

The staff data shows the Institute premises had a total of **29 Staff Members**.

### 2.2 Summarised Populace analysis for 2021-2022

#### 2.2.1 Students data

The data (shared by the Institute) shows there were **222 male and 135 female students**.

#### 2.2.2 Staff data

S. No.	Type	Male	Female	Total
1	Teaching staff	19	03	22
2	Non-Teaching staff	06	01	07
Total Staff Members		25	04	29

*Table 3: Staff data of the Institution for 2021-2022*

The staff data shows the Institute premises had a total of **29 Staff Members**.



## 2.3 Institute area

The **site area is 6.5 acres** for an approximately **754 footfalls**.

## 2.4 Institute Infrastructure

### 2.4.1 Establishment

The Institute was established in **1988**.

### 2.4.2 Spatial Organisation

There are provisions for staircase for accessibility on the premises, whereas there are amenities such as CCTV, a first aid room, etc.

The Institute is located prettyclose to nature and hence has a very fresh environment which is absolutely pollution free and healthy.

The Building is a Reinforced Cement Concrete (RCC) framework building.

## 2.5 Operation and Maintenance of premises

The interview session was held with the staff regarding the operation and working hours. The Institution is open from Monday to Saturday with the timings being 10:00 am to 17:00 hours.

## 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

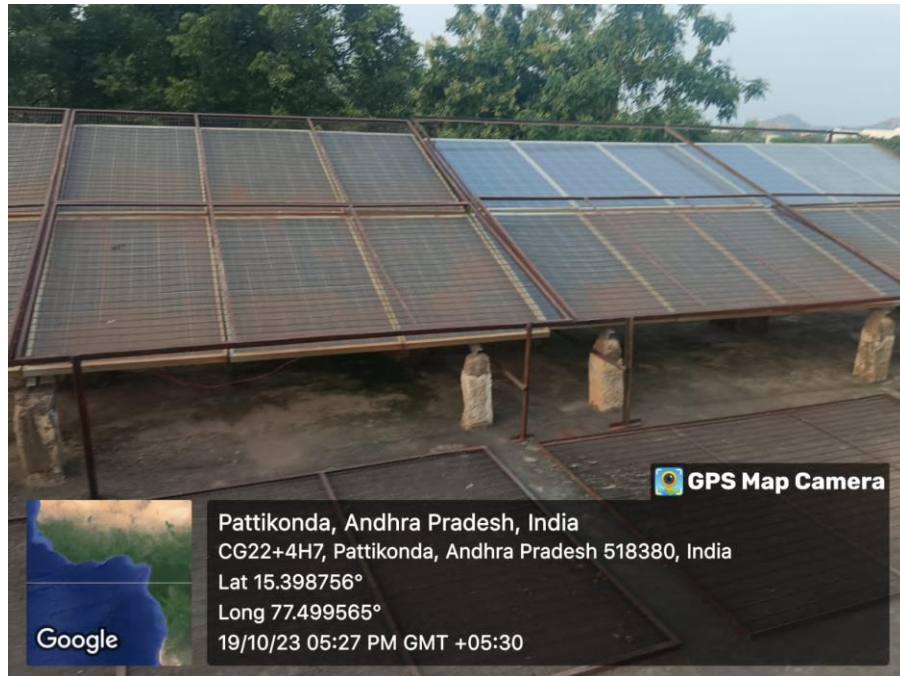
The strategies included data collection from the admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collection, and preparation of the Report.

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

- Discussion with the Institute
- Allotment and Initiation by the Institute
- Data collection
- Submission of the files

## 4. Observation

The section showcases the facilities available in the premises



*Plate 1: Ground mounted solar power plant in the premises*



*Plate 2: Electrical systems in the premises*

## 5. Documentation

The premise uses following sources of energy consumption.

### 5.1 Primary sources of energy consumption

- **Electrical (Metered)** – Light, Fans, Equipments, Pumps comprise these sources.
- **Renewable energy** – There are sources to harness solar energy available in the form of '**SOLAR PANELS**'.

### 5.2 Secondary sources of energy consumption

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

S. No.	Name	Nos.
1	UPS	6
2	Inverters	1
3	Batteries	3
4	Gas cylinders	1
5	Induction stove	1

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

### 5.3 Actual Electrical Consumption as per Bills

The Institute has alternate sources of energy but in substantially low quantity; however it spends a certain sum of money towards electrical expenses on a monthly basis. We would suggest increasing the alternate sources of energy to meet the required demand.

S. No.	Month	Amount	(A) Total units consumed	(B) Solar units generated	(C = A-B) Gross units consumed after deduction
<b>Academic year 2021-2022</b>					
1	June	8,925	357	50	307
2	July	5,131	208	60	148

<b>3</b>	August	2,799	337	65	272
<b>4</b>	September	6,204	360	58	302
<b>5</b>	October	8,841	366	60	306
<b>6</b>	November	3,249	390	0	390
<b>7</b>	December	7,159	473	62	411
<b>8</b>	January	11,133	482	63	419
<b>9</b>	February	14,225	357	0	357
<b>10</b>	March	17,776	420	66	354
<b>11</b>	April	-158	556	80	476
<b>12</b>	May	5,059	529	70	459
<b>Academic year 2022-2023</b>					
<b>13</b>	June	8,862	333	0	333
<b>14</b>	July	4,636	463	0	463
<b>15</b>	August	10,336	576	0	576
<b>16</b>	September	15,804	610	0	610
<b>17</b>	October	22,173	754	0	754
<b>18</b>	November	0	555	0	555
<b>19</b>	December	-80	409	0	409
<b>20</b>	January	5,379	521	0	521
<b>21</b>	February	-80	458	0	458
<b>22</b>	March	-80	501	0	501
<b>23</b>	April	5,125	561	0	561
<b>24</b>	May	9,829	584	0	584

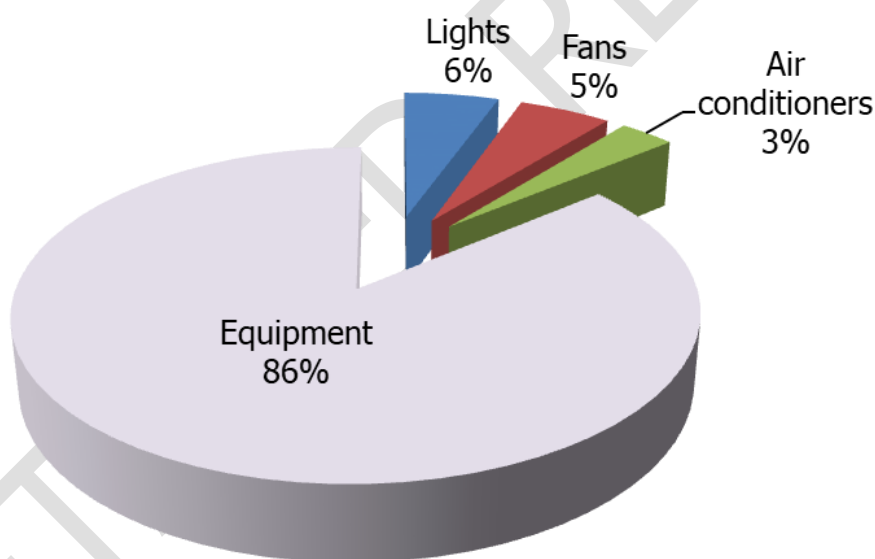
*Table 5: Details of electricity bill consumption*

## 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 consumes 86% whereas the lights consume 6% while the fans consume 5% and the air conditioners consume 3% each of the total calculated electrical energy.



## 5.5 Lights

### 5.5.1 Types of lights based on the numbers

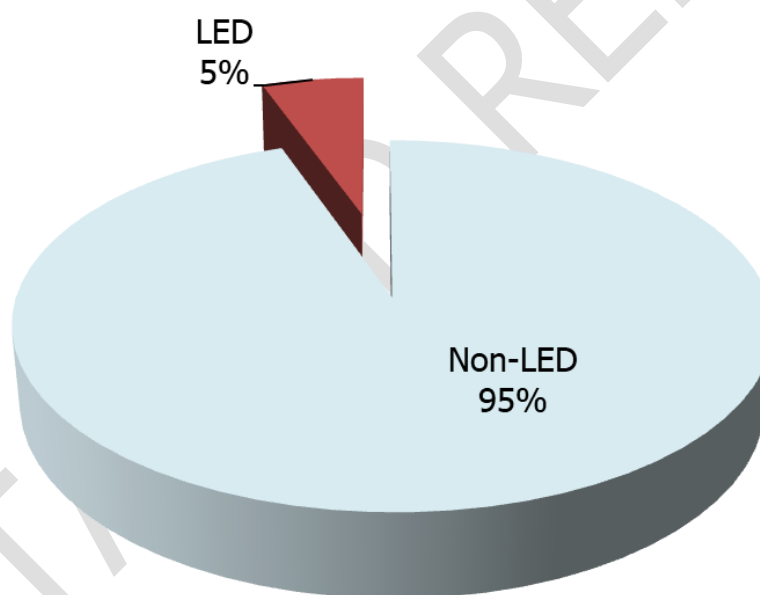
There are a total of **80 numbers of lights on the premises**; the following table shows the various types of lights on the premises.

S. No.	Type	Nos.
1	<b>LED lights</b> <i>(Energy efficient appliance)</i>	10
2	<b>Non-LED</b> <i>(Non-Energy efficient appliance)</i>	70

*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 **6,195 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 shows **Non-LED lights consume 95%** whereas the **LED lights consume 5%** of the total power consumed by lights.

## 5.6 Fans

### 5.6.1 Types of fans based on the numbers

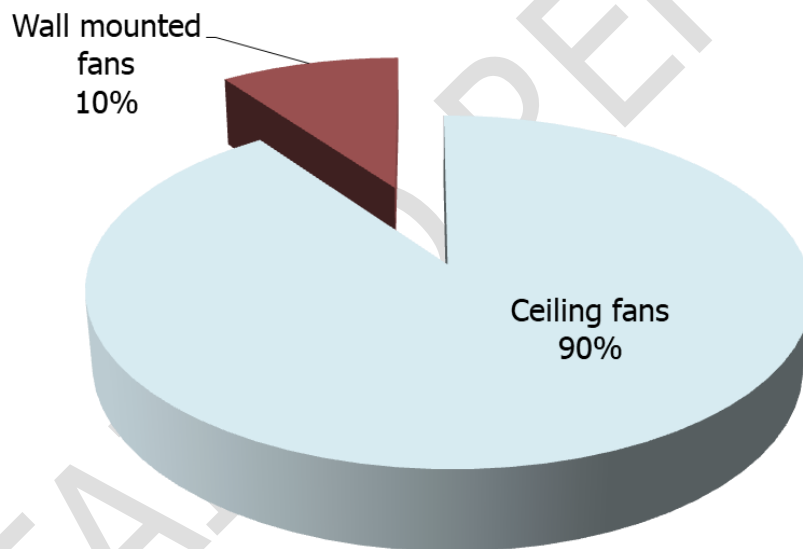
There are a total of **70 nos. of fans** on the premises as follows:

S. No.	Type	Nos.
1	Ceiling fans	62
2	Wall Mounted fans	08

*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 **6,035 kWh** of the energy.



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

The above analysis shows the **Ceiling fans consume 90%** whereas the **wall mounted fans consume 10%** of total power consumed by fans.

## 5.7 Air conditioners

The main purposes of a Heating, Ventilation and Air-Conditioning (HVAC) system are to help maintain good indoor air quality (IAQ) through adequate ventilation with filtration and provide thermal comfort. A well-functioning HVAC system can improve air circulation and reduce the risk of airborne illnesses in commercial buildings, scientific labs, and Institutes.

The importance of indoor air quality frequently goes unnoticed despite its profound impact on our daily lives. While individuals may notice uncomfortable temperatures or unpleasant odours, the quality of indoor air are frequently neglected HVAC systems are present in all buildings. While we commonly associate heating and cooling systems with adjusting temperatures in households and offices, refrigeration and HVAC systems serve a multitude of critical roles beyond these contexts. For instance, refrigeration systems are indispensable in preserving food freshness in grocery stores and restaurants, while HVAC systems promote energy efficiency in large commercial and industrial establishments. Additionally, HVAC systems play a critical role in establishing and maintaining a healthy indoor environment in sensitive spaces.

HVAC systems maintain a comfortable and healthy indoor environment by bringing in fresh, outside air and circulating it. This exchange of air is a crucial factor in maintaining healthy oxygen levels and reducing indoor air pollutants in indoor work environments.

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

There are **4 air conditioners**, out of which **2 are not in working conditions**; hence the **study is done for 2 units only**.

### 5.7.1 Building-wise consumption analysis

The energy consumption of air conditioners is **3,600 kWh** of energy.

### 5.7.2 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.

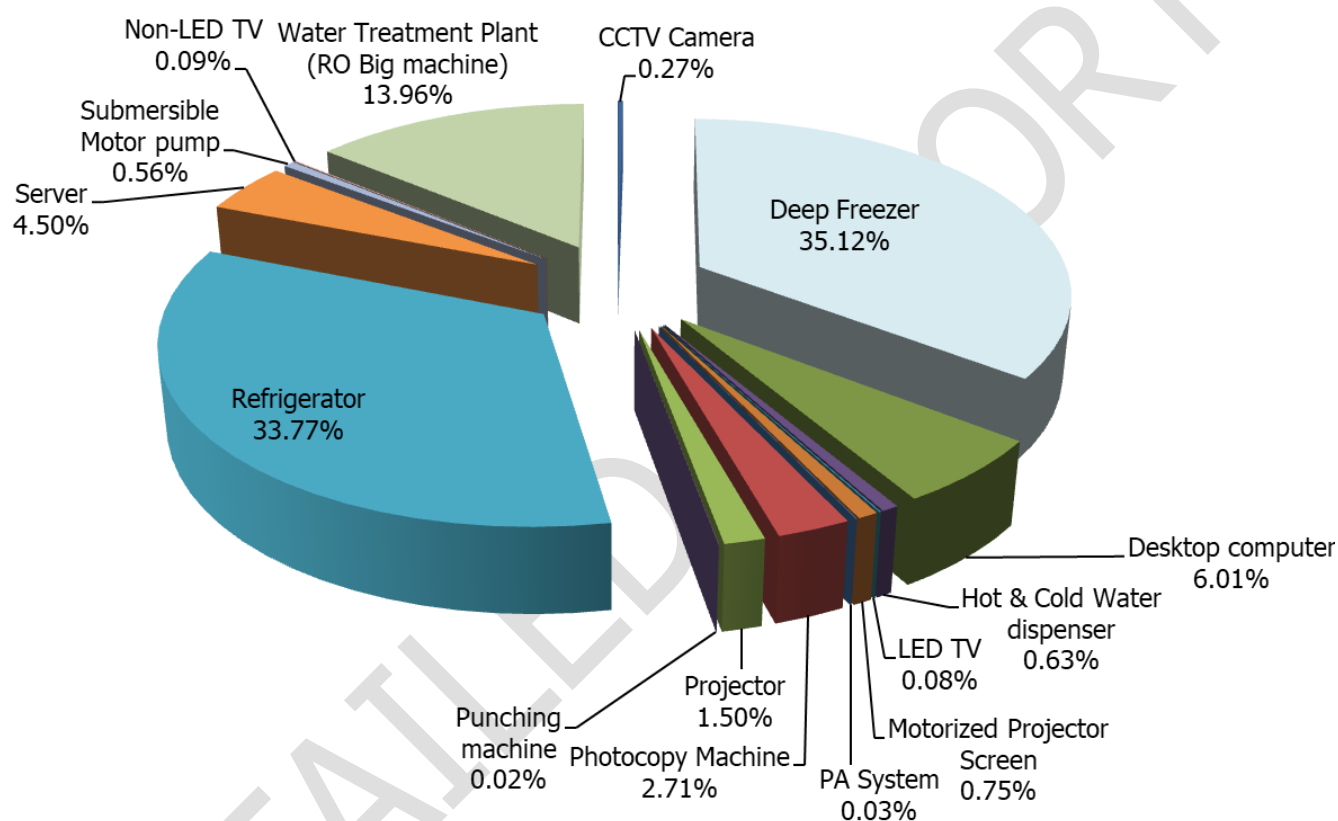
## 5.8 Equipment

### 5.8.1 Types of Equipment

There are **51 nos. of equipment** in the Educational sector.

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

The energy consumption of equipment is **97,276 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 **deep freezer consumes more energy at 35.12%** while the **refrigerator consumes 33.77%** the **water treatment plant (RO big machine) consume 13.96%** and the **desktop computer consumes 6.01%** 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** for implementation. These **should be executed within the next 1.5 to 2.5 years from the date of the Report submission**. The Institute can execute a plan after discussion with Project Head.

#### 5.1.1 Electromechanical systems - Electrical and Lighting

##### Sub-section 1 – Non - LED Lights

The current light analysis shows that the College has Non-LED lights in majority areas, these should be replaced with LED lights which consume on an average 16-20W when in use.

Our technical analysis shows that there would be a reduction of an average of **60% reduction** in energy consumption through lights specifically as a part of the electro-mechanical system if all **Non-LED lights** are replaced on all floors and buildings with an energy-efficient appliance whenever the College undergoes renovation.

##### Sub-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 60W when in use. These should be replaced with energy efficient fans consuming 35W when in use.

Our detailed study states that is all the **ceiling fans on all floors** if replaced with star rated appliance results in a reduction of average of **42% reduction** in energy consumption if replaced with energy efficient appliance. It will be suggested to either replace these now if College 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 details are consolidated study recommendations related to 'entire Institute' and should be considered as **second priority** for implementation, once the section wise recommendations are implemented. The following recommendations should be **implemented within 2.5 to 3.5 years from the date of the Report submission.**

### 6.2.1 Alternatives to increase renewable energy

#### 6.2.1.1 Solar farms

This option can be explored with due discussion with the surrounding and adjacent farmland owners. This will serve as a noble project and will provide dual benefits to farm land and University w.r.t to electricity bill power reduction.



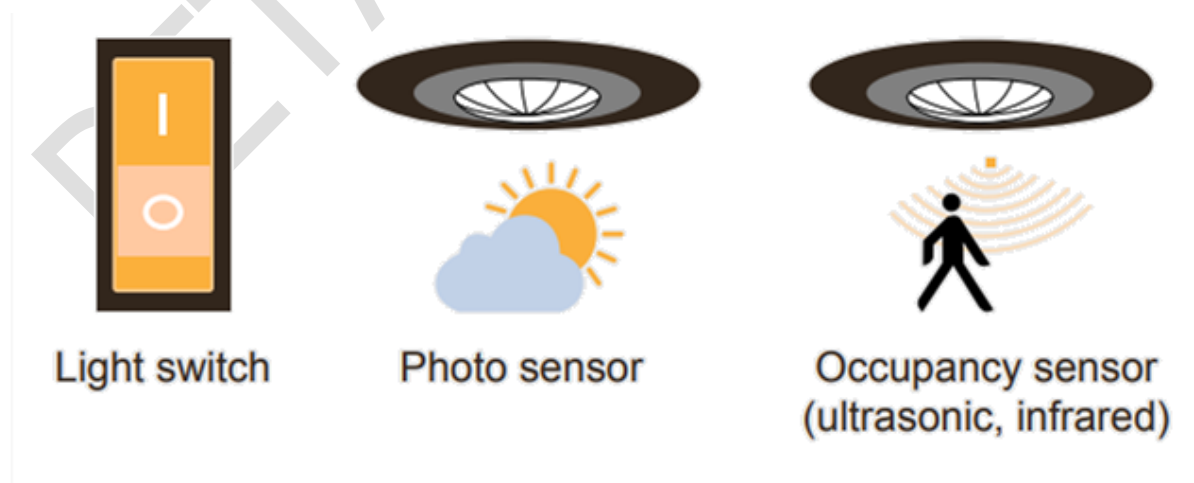
*Plate 3: Solar farm concept for the Institute (For reference purpose only)*

*Image source: Zsuzsa Bóka from Pixabay*

### 6.2.2 Alternatives towards Smart premises mechanisms

#### 6.2.2.1 Facility management systems, controls

(Includes electromechanical systems – Electrical, Water)



*Plate 4: 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)



The above diagram provides a detailed study of how the system controls should be incorporated in the premises as far as lighting systems are considered. The suggestions for this sub-section are listed below.

- ➔ Install PIR control of the lighting in the toilet areas.
- ➔ Install low flow taps with automatic shut off in the toilets.
- ➔ Install push button timer control in all rooms lighting and ceiling fans.
- ➔ Install Power Electronics control of the Foyer notice board lighting.
- ➔ Installation of intelligent lighting controller will help in controlling the lighting energy.
- ➔ Use of photo sensor switch for street light controlling helps in conserving the lighting energy.

## 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 - Zsuzsa Bóka from Pixabay
- ➡ Inference study reference image - <https://solarpowerproject.in/solar-panels-for-parking-lots.php>

