ENERGY AUDIT

STUDY PERIOD (ONE YEAR) 2023 - 2024

Sustainability study

AUDIT REPORT

Studied for

Institute of Engineering,
Technical Campus, Bhaddal (Ropar)

Village: Bhaddal, P.O.Mianpur,
Rupnagar – 140108, Punjab

Studied in the capacity of

Accredited and Certified
Green Building Professional

Studied by

Website: https://thegreenviosolutions.co.in/
Email: greenviosolutions@gmail.com

Background reference image Janko Ferlic on pexels

Disclaimer

The Audit Team has prepared this report for **Institute of Engineering, Technical Campus, Bhaddal (Ropar)** located at *Village: Bhaddal, P.O.Mianpur, Rupnagar – 140108, Punjab* 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

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Acknowledgement

The Audit Assessment Team extends its appreciation to **Institute of Engineering, Technical Campus, Bhaddal (Ropar), Punjab** 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

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1. Introduction

1.1 About the Institution

1.1.1 Vision

The Institute proposes

- *To impart high-caliber professional education in the state of Punjab, especially to the underprivileged population in the Kandi area, with the aim of improving their socio-economic conditioneconomic condition.*
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1.1.2 Mission

The Institute's focuses and adheres towards:

- *To establish state-of-the-art technical and professional institutes andtheir subsidiary institutes in the Kandi area.*
- *To plan and implement rural development programs in the area surrounding the Institute.*
- *To raise awareness about education, health and socio-economic development among the rural populace of the area.*
- *To achieve Excellence in each and every pursuit and to raise the standards of the Institute so as to attain an autonomous status.*

2. Overview

2.1 Summarised Populace analysis for 2023-24

2.1.1 Students data

The data (shared by Institute) shows there were 435 students. (Male and female)

2.1.2 Staff data

Above data documents 61 staff members.

Thus, total populace stands at 496 nos.

3. Documentation

Section I – Life safety management

3.1 Facilities study

The life safety measures include the following:

Plate 1: Fire extinguisher in the premises

Section II – Energy generation & expense incurred

3.2 Load distribution study

3.2.1 Categorization

The campus has EDUCATIONAL and RESIDENTIAL (Hostel) facility thus the type of load can be stated as 'MIXED USE'

3.2.2 Primary sources of energy consumption

Electrical (Metered) – Light, Fans, Equipments, Pumps comprise these sources.

3.2.3 Secondary sources of energy consumption

Alternate sources of energy consumption – Ther sources include the following:

Source	Nos.
Solar hot water heaters	5
Solar street lights	10

Table 1: Secondary sources of energy consumption

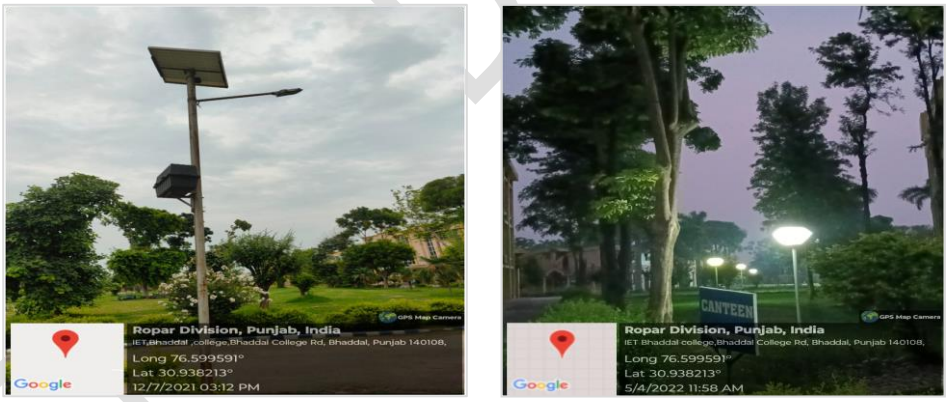


Plate 2: Solar hot water heater and solar street lights

Note: The above photos are previous dated as current date photos were not shared.

3.2.4 Tertiary sources of energy consumption

Source	Nos.
Batteries	100
Gas cylinders	60
Generator	2
UPS	5

Table 2:Secondary sources of energy consumption

3.3 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 2023-2024						
1	June	2023	4,50,710	29,535	0	29,535
2	July	2023	2,20,040	16,380	0	16,380
3	August	2023	2,65,420	22,380	0	22,380
4	September	2023	3,20,920	28,845	0	28,845
5	October	2023	2,86,150	26,505	0	26,505
6	November	2023	2,88,600	16,965	0	16,965
7	December	2023	2,02,860	16,800	0	16,800
8	January	2024	1,96,940	15,135	0	15,135
9	February	2024	1,93,490	15,045	0	15,045
10	March	2024	1,79,560	13,875	0	13,875
11	April	2024	1,66,600	17,295	0	17,295
12	May	2024	2,56,580	23,205	0	23,205

Table 3: Details of the electrical consumption

The observation related to above information states:

- The **total amount** spent is **Rs. 30,27,870/-**
- **Total units** consumed was **2,41,965 kWh (Only Electrical)**
- The **total units** consumed in past one year is **zero (Only solar)**
- **Alternate source of energy is available through solar hot water heaters and solar street lights; but their contribution to energy bills reduction is nil.**
- **Percentage of energy met by alternate Renewable source is zero.**

Section III – Energy consumption

3.4 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.

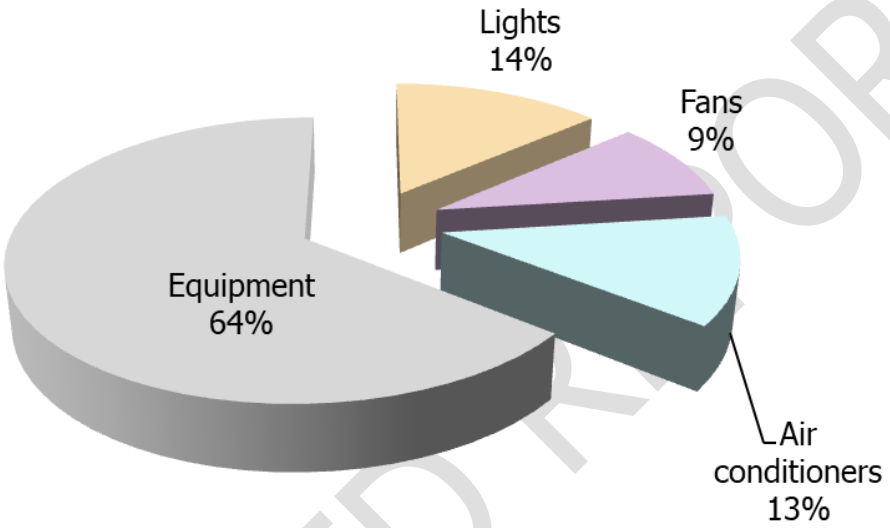


Figure 1: Summary of the calculated electrical consumption as per inventory

The above graph shows that equipment consume 64% whereas air conditioners consume 13% while lights consume 14% and the fans consume 9% of total calculated electrical energy.

3.5 Lights

3.5.1 Types of lights based on the numbers

There are **852 lights on the premises;** the following table shows the various types of lights on the premises.

S. No.	Type	Nos.
1	**LED lights** *(Energy efficient appliance)*	830
2	**CFL (Non-LED)** *(Non-Energy efficient appliance)*	22

Table 4: Summary of the types of lights on-premise

3.5.2 Types of lights based on the power consumption

The energy consumption of lights is **71,714 kWh** of energy.

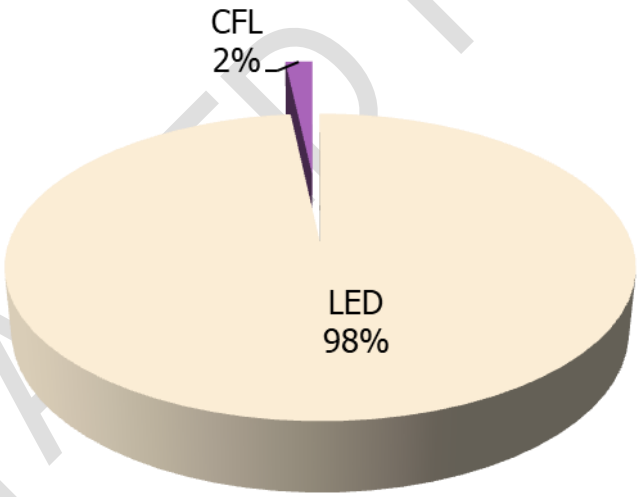


Figure 2: Energy consumed by types of lights in the premise based on the usage study

The analysis of the types of Lights on-premises shows **LED lights consume 98%** whereas the **CFL (Non-LED) lights consume 2%** of the total power consumed by lights.

3.6 Fans

3.6.1 Types of fans based on the numbers

There are **833 fans** on the premises as follows:

S. No.	Type	Nos.
1	Ceiling fans	760
2	Exhaust fans	57
3	Table fans	3
4	Wall fans	13

Table 5: Summary of the types of fans in the premises

3.6.2 Types of fans based on the power consumption

The energy consumption of fans is **48,861 kWh** of the energy.

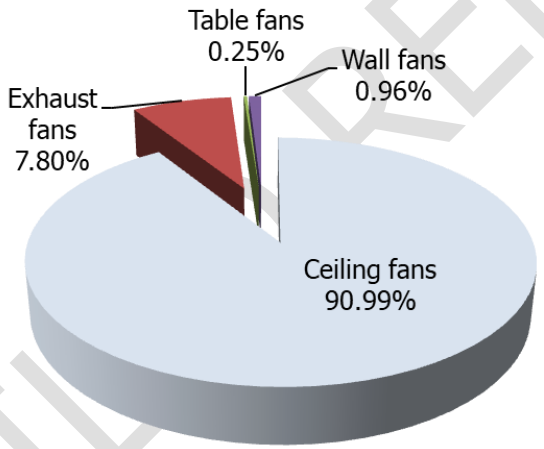


Figure 3: Types of fans based on power consumption

The above analysis shows Ceiling fans (Regular) consume 90.99% whereas the exhaust fans consume 7.80% while the wall fans consume 0.96% and the table fans consume 0.25% of total power consumed by fans.

3.7 Air conditioners

3.7.1 Types of air conditioners based on the numbers

There are **51 air conditioners** on the entire premises**.**

3.7.2 Building-wise consumption analysis

The energy consumption of air conditioners is **65,700 kWh** of energy.

3.8 Equipment

Only the major appliances information was shared.

3.8.1 Types of Equipment

There are **472 nos. of equipment** in the premises.

3.8.2 Types of equipment as per their energy contribution

The energy consumption of equipment is **3,37,679 kWh** of energy.

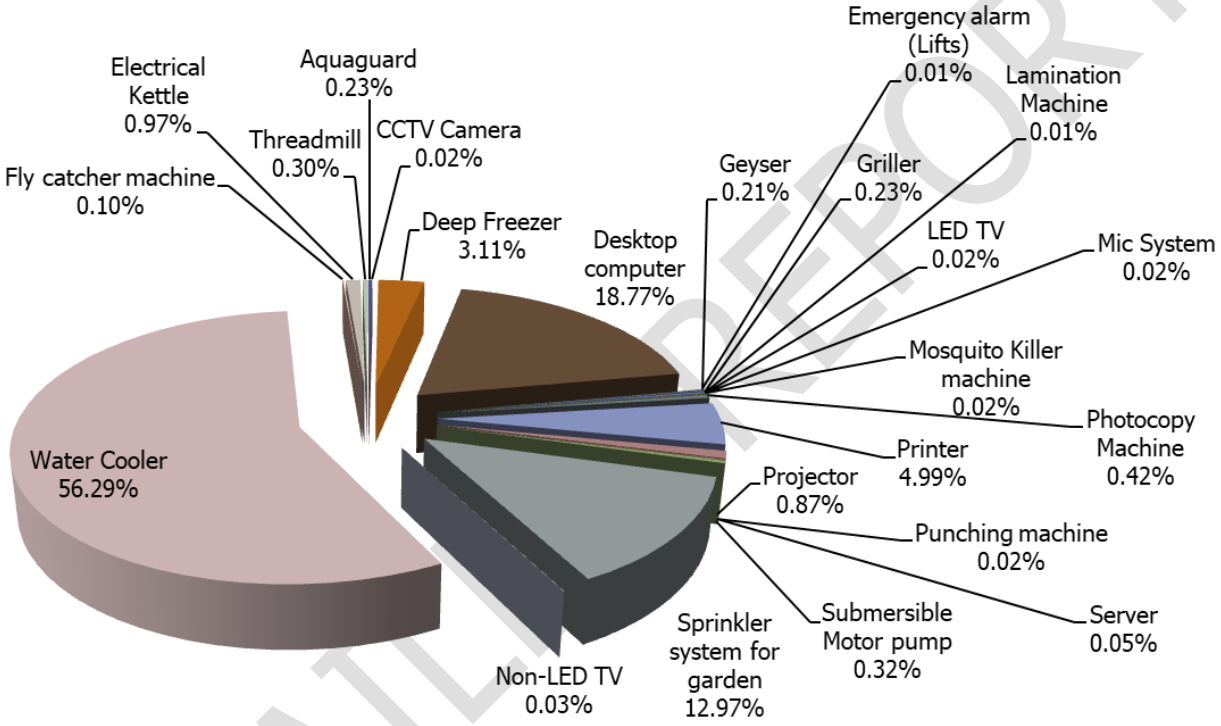


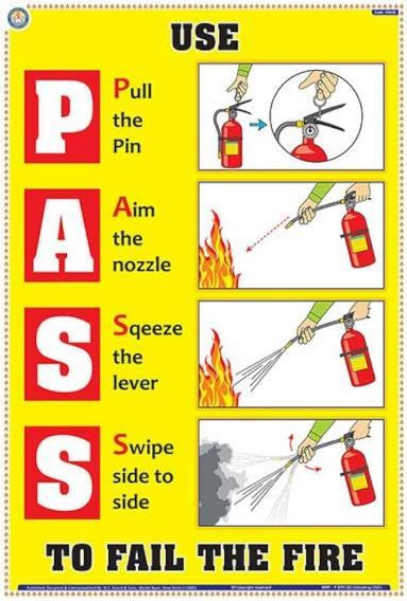
Figure 4: Energy consumed by types of equipment in the educational sector based on the usage study

The above summary shows that **wter cooler consumes more energy at 56.29%** while the **desktop computer consumes 18.77%** whereas **sprinkler system for garden consumes 12.97%** and **printer consumes 4.99%** these are major consumers as compared to other equipment.

4. 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:** **Signages and display for awareness**	Wherever there is a fire extinguisher display the PASS board in English and local language  Source: Amazon
2.	Fire and life safety aspect **Aspect area:** **Lift safety**	Introduce sigange 'DO NOT USE LIFT IN CASE OF FIRE' ➲ Intrdouce fire escape route plan ○ 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

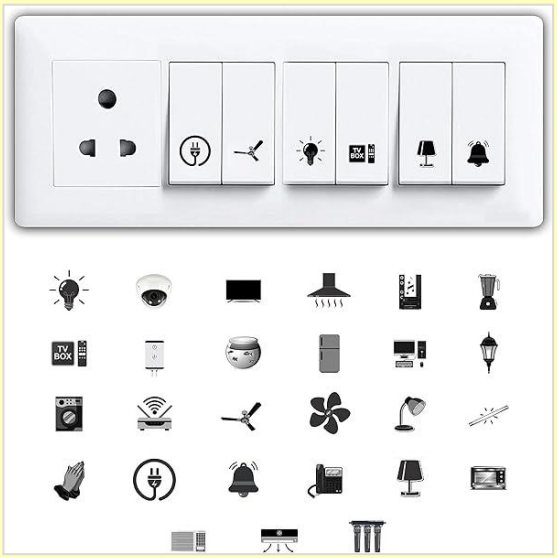
3.	Energy generation aspect **Aspect area:** **Solar panels**	Explore opportunity for renewable soucres such as rooftop solar panels and geothermal energy
4.	Energy consumption aspect **Aspect area:** **Signages for the switches**	The switches should be indicated as follows:  Image source: Amazon
5.	Structural safety aspect **Aspect area:** **Safety signages**	Include 'Restricted area ZONE' board for access near terrace area  ***Sample aignages***

Table 6: Observation based suggestion study of the campus

5. 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 include Amazon and others