ENERGY AUDIT

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

Sustainability study

AUDIT REPORT

Studied for

S. P. Mandali's

R. A. Podar College of Commerce and Economics (Autonomous)

L.N. Road, Matunga,

Mumbai – 400019, Maharashtra, India

Studied in the capacity of

Accredited and Certified GBP

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 the **S. P. Mandali's R. A. Podar College of Commerce and Economics (Autonomous)** located at *L.N. Road, Matunga, Mumbai – 400019, Maharashtra, 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.

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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 the **S. P. Mandali's R. A. Podar College of Commerce and Economics (Autonomous), Maharashtra** 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 the Chairpersons of entire process **Dr. Shobana Vasudevan,** (Principal) and **Dr. Vinita Pimpale** (Vice Principal) for the valuable inputs.

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

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

Sustainable Academe

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Contents

1. Introduction

1.1 About the Institute

R.A.Podar College of Commerce and Economics (Autonomous), Mumbai has had a long history, which commenced with the freedom struggle of India. The visionaries of that time realized that they should start an institution which would inculcate the indigenous values and have the thrust of social and cultural value system that are typical to the grand heritage of our country.

In August 1940, the trust known as 'Shikshana Prasaraka Mandali', Pune, made an application to the Bombay University for permission to start a Commerce College. The Industrialist and Philanthropist and a visionary, Seth Ramdeoji Anandilal Podar was deeply interested in the cause of education. He wished to build an institution in the memory of his brother Ramniranjan Anandialal Podar who had died at a young age. At the cost of Rs.1,50,000/- he constructed the building that houses the college today, and gifted it to the S.P. Mandali on the 7th of February 1941.

The Senate of Bombay University granted permission to start the College initially for a period of two years, with 150 students on its rolls. The College building with its famed clock tower was handed over by Seth Ramdeoji Anandilal Podar to the S.P. Mandali. Barrister M.R. Jayankar inaugurated the college building formally. The college was named "Ramniranjan Anandilal Podar College of Commerce". The Mandali has been rendering notable service under its motto of unflinchingly carrying out the mission undertaken and has kept up its well-defined objectives. The objectives in regard to Commerce education has been to extend popular and reasonably affordable higher education in Maharashtra and to develop an institution that would impart appropriate education both in Commerce and Economics.

The institution first started the B. Com. Degree course in 1942 and the word Economics was added to the name of the College. It has now become 'Ramniranjan Anandilal Podar College of Commerce and Economics'. The College received permanent affiliation from the University of Mumbai on 17th August, 1950.

1.2 Assessment of the Institute

1.2.1 Affiliations

The courses provided by the College have received their affiliation through the **University of Mumbai,** a public state university in Mumbai.

1.2.2 Certification

The College has received the following Certifications

- **AISHE** – The All India Survey of Higher Education code is C-34086
- **NIRF** – Participated and received rank in National Institutional Ranking Framework

1.2.3 Recognitions

The College has achieved the following recognitions:

- **Autonomous Status** - The College was conferred Autonomous status by the University Grants Commission (UGC).
- **Recognition of UGC** – The College has been recognized under section *2 (f) and 12(b) of the UGC Act, 1956* by University Grants Commission, New Delhi.

1.2.4 Accreditation

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

Cycle	First	Second	Third
CGPA	N.A.	3.63	3.68
Grade	A+	A	A+
Year	2004	2011	2017

Table 1: NAAC Accreditation details of the Institute

The College is due to enter its Fourth 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 **5,066 students.**

2.1.2 Staff data

S. No.	Type	Male	Female	Total
1	Teaching staff	15	30	**45**
2	Non-Teaching staff	30	09	**39**
Total Staff Members		**45**	**39**	**84**

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

The staff data shows the Institute premises **84 Staff Members.**

2.2 Summarised Populace analysis for 2021-2022

2.2.1 Students data

The data (shared by the Institute) shows there were **4,965 students**

2.2.2 Staff data

S. No.	Type	Male	Female	Total
1	Teaching staff	12	32	**44**
2	Non-Teaching staff	30	09	**39**
Total Staff Members		**42**	**41**	**83**

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

The staff data shows the Institute premises had **83 Staff Members.**

3. Research

3.1 Site & Institute Building Spread Area

The Institute spread over **0.62 acres** with a built-up area comprising of **5,055 sq. m.**

3.2 Institute Infrastructure – Spatial Organisation

2.3.1 Establishment

The Institute established and began its operations in **1941.**

2.3.2 Spatial Organisation

The Institute has the following spatial features:

- Heritage and historic building made of stone with a striking feature of clock tower
- Amenities such as common room for girls, hall for programmes, library and more
- Facilities such as drinking water, washrooms, biometric, and more
- Special features such as 'Green Gym' in outdoor areas

4. Evidence

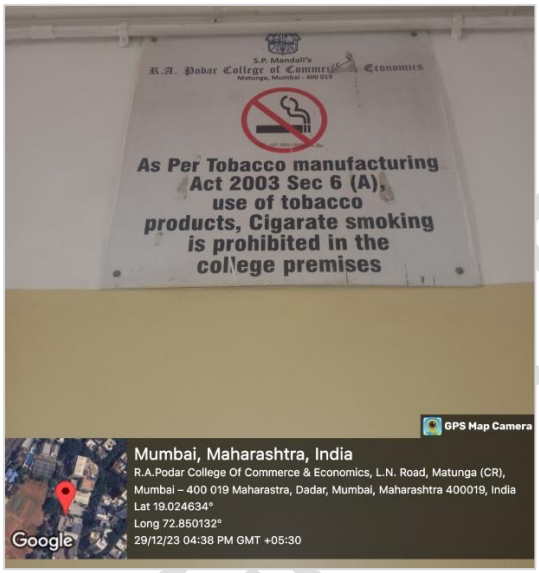

Plate 1: Group photo with the team and display about 'Tobacco free campus' measures undertaken

Plate 2: Investigation of the system – Seating areas, fire extinguisher and e-waste bins

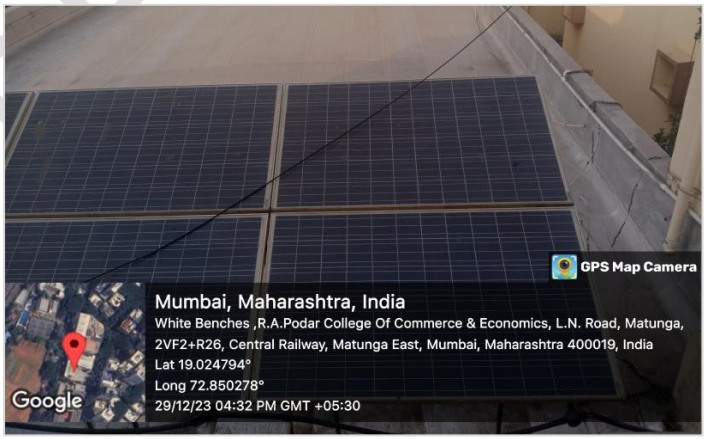

Plate 3: Rooftop solar panels and green gym

5. Documentation

5.1 Primary sources of energy consumption

- **Electrical (Metered) –** Light, Fans, Equipments, Pumps comprise these sources.
- **Renewable energy –** The **alternate sources** are available as **solar panels in one nos. on the rooftop solely connected to the library for functioning.**

5.2 Secondary sources of energy consumption

The existing sources are documented below:

S. No.	Name	Nos.
1	UPS	10
2	Induction stove	2

Table 4: Details of secondary sources of energy consumption

The observation related to above information states that the current sources and their available nos. are fine. However, additional inverters and batteries can be thought of.

5.3 Actual electrical consumption as per bills

The information was shared for the following meters:

- No: 202-028-305*9
- No: 202-003-824*7
- No: 598-149-003*2
- No: 598-153-003*0
- No: 598-149-013*5
- No: 598-149-011*1
- No: 598-149-001*9
- No: 598-153-001*7

S. No.	Month	Year	Amount	Units consumed
Consumer No: 202-028-305*9				
1	June	2022	88,012	35
2	July	2022	-	-
3	August	2022	25,040	35
4	September	2022	52,050	35
5	October	2022	58,040	35
6	November	2022	57,606	35
7	December	2022	47,600	35
8	January	2023	48,150	35
9	February	2023	49,310	35
10	March	2023	80,180	70
11	May	2023	53,143	35
12	July	2023	1,95,081	70
13	September	2023	21,670	35
14	October	2023	87,040	35

Consumer No: 202-003-824*7				
1	March	2023	39,360	70
2	May	2023	12,108	40
3	July	2023	24,360	40
4	September	2023	25,490	40
5	October	2023	12,520	40

Consumer No: 598-149-003*2				
1	June	2022	100	3
2	July	2022	90	3
3	August	2022	90	3
4	September	2022	90	3
5	October	2022	100	3
6	November	2022	90	3
7	December	2022	90	3
8	January	2023	90	3
9	February	2023	100	3
10	March	2023	30	3
11	April	2023	1,610	3
12	May	2023	1,460	3
13	July	2023	370	3

Consumer No: 598-153-003*0				
1	June	2022	10,360	32.1
2	July	2022	13,270	32.1
3	August	2022	18,360	32.1
4	September	2022	21,450	32.1
5	October	2022	20,110	32.1
6	November	2022	21,770	32.1
7	December	2022	24,590	32.1
8	January	2023	25,650	32.1
9	February	2023	23,260	32.1
10	March	2023	22,760	32.1
11	April	2023	17,410	32.1
12	May	2023	16,140	32.1
13	June	2023	14,990	32.1
14	July	2023	17,040	32.1
15	August	2023	25,570	32.1
16	September	2023	31,261	32.1
17	October	2023	26,989	32.1
18	November	2023	29,640	32.1

Consumer No: 598-149-013*5				
1	June	2022	15,840	40.3
2	July	2022	22,950	40.3
3	August	2022	38,080	40.3
4	September	2022	44,410	40.3
5	October	2022	42,290	40.3
6	November	2022	40,410	40.3
7	December	2022	39,820	40.3
8	January	2023	40,090	40.3
9	February	2023	29,440	40.3
10	March	2023	36,440	40.3
11	April	2023	35,960	40.3
12	May	2023	48,280	40.3
13	June	2023	27,050	40.3
14	July	2023	45,490	40.3
15	August	2023	54,110	40.3
16	October	2023	1,27,860	40.3
17	November	2023	62,190	40.3

Consumer No: 598-149-011*1				
1	June	2022	510	3.35
2	July	2022	520	3.35
3	August	2022	540	3.35
4	September	2022	1,200	3.35
5	October	2022	1,470	3.35
6	November	2022	1,420	3.35
7	December	2022	1,300	3.35
8	January	2023	1,810	3.35
9	February	2023	1,240	3.35
10	March	2023	1,220	3.35
11	April	2023	1,440	3.35
12	May	2023	2,000	3.35
13	June	2023	1,750	3.35
14	July	2023	2,150	3.35
15	August	2023	520	3.35
16	September	2023	560	3.35
17	October	2023	530	3.35
18	November	2023	540	3.35

Consumer No: 598-149-001*9				
1	June	2022	7,210	7.35
2	July	2022	8,460	7.35
3	August	2022	16,390	7.35
4	September	2022	21,400	7.35
5	October	2022	24,000	7.35
6	November	2022	14,750	7.35
7	December	2022	8,130	7.35
8	January	2023	14,650	7.35
9	February	2023	12,040	7.35
10	March	2023	9,550	7.35
11	April	2023	7,470	7.35
12	May	2023	15,210	7.35
13	June	2023	8,660	7.35
14	July	2023	14,240	7.35
15	August	2023	22,310	7.35
16	September	2023	26,198	7.35
17	October	2023	35,492	7.35
18	November	2023	18,690	7.35

Consumer No: 598-153-001*7				
1	August	2023	2,760	3

Table 5: Details of the electricity bills consumption

The observation related to above information states:

- The **total amount** spent in past two years is **~Rs. 20,97,789/-**
- The **average amount** spent every month is **~Rs. 87,408/-**
- The **total units** consumed in past two years is **~2,253 units (Electrical + solar)**
- The **average units** consumed every month are **~94 units (Electrical + solar)**
- **Alternate source of energy is available in form of solar panels on the rooftop connected to only one meter.**
- **The percentage of energy met by alternate (solar (renewable)) source is very negligible.**

Inference about the observation states:

- The Campus is located in an urban area, there is space on the rooftop to expand the renewable sources by certain nos. the same should be undertaken.
- The rooftop panels were assessed and they were free of any storage or combustible materials, well maintained.
- In addition, there were excellent measures to keep the rooftop cool with appropriate paint and fabrication work.
- However, certain awareness posters in and around campus will be beneficial.

Plate 4: Rooftop solar panels in the terrace area

The study suggests that there is scope to extend the solar panel on the terrace area as there is space available for the same.

Plate 5: Space below the rooftop solar panel

The study suggests that no storage material should be placed near the panels and the terrace area as well.

Plate 6: Access to the solar rooftop area and clock tower

The study suggests that there could be a display stating 'Danger zone' and watch your steps as this area is quite risky to access being very small. If possible the parapet height (Image one above) can be increased.

Plate 7: Solar panels on the rooftop

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.

5.4 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 in summarised in the following sections.

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

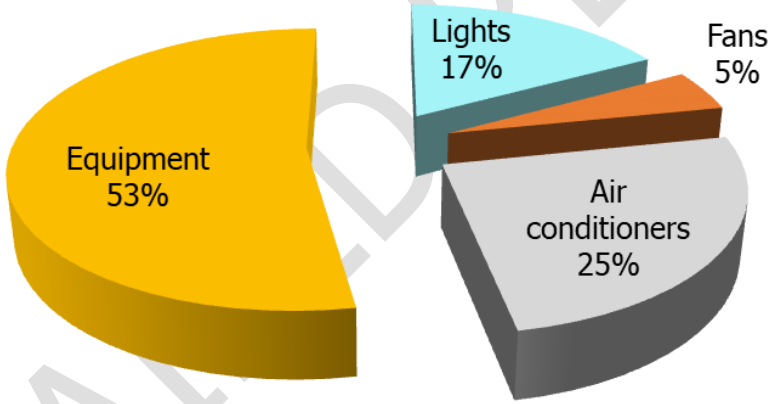

Figure 1: Summary of the calculated electrical consumption as per inventory

The above graph shows that equipment consume 53% whereas the air conditioners consume 25% while the lights consume 17% and the fans consume 5% of the total calculated electrical energy.

5.5 Lights

5.5.1 Types of lights based on the numbers

There are **655 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)*	207
2	**Halogen lights** *(Non-Energy efficient appliance)*	11
3	**Non-LED lights** *(Non-Energy efficient appliance)*	437

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 **53,181 kWh** of energy.

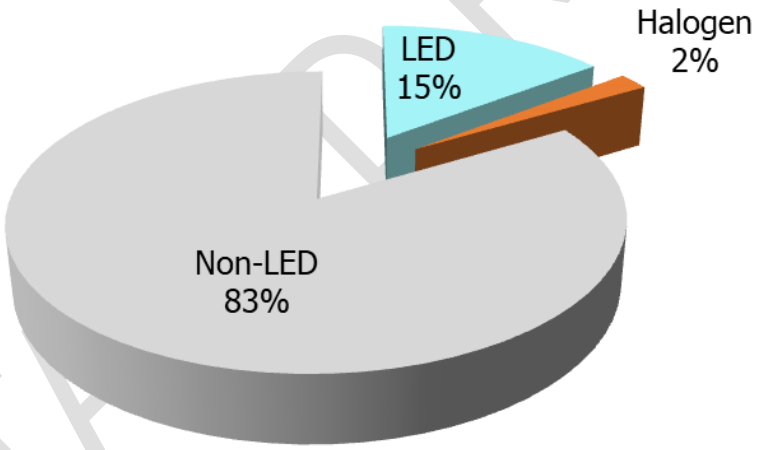

Figure 2: Energy consumed by types of lights in the premise based on the usage study

The analysis of the types of Lights on-premises shows **Non-LED lights consume 83%** whereas the **LED lights consume 15%** while the **Halogen lights consume 2%** of the total power consumed by lights.

5.6 Fans

5.6.1 Types of fans based on the numbers

There are **163 fans** on the premises as follows:

S. No.	Type	Nos.
1	Ceiling fans	140
2	Wall mounted fans	17
3	Exhaust fans	6

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 **14,653 kWh** of the energy.

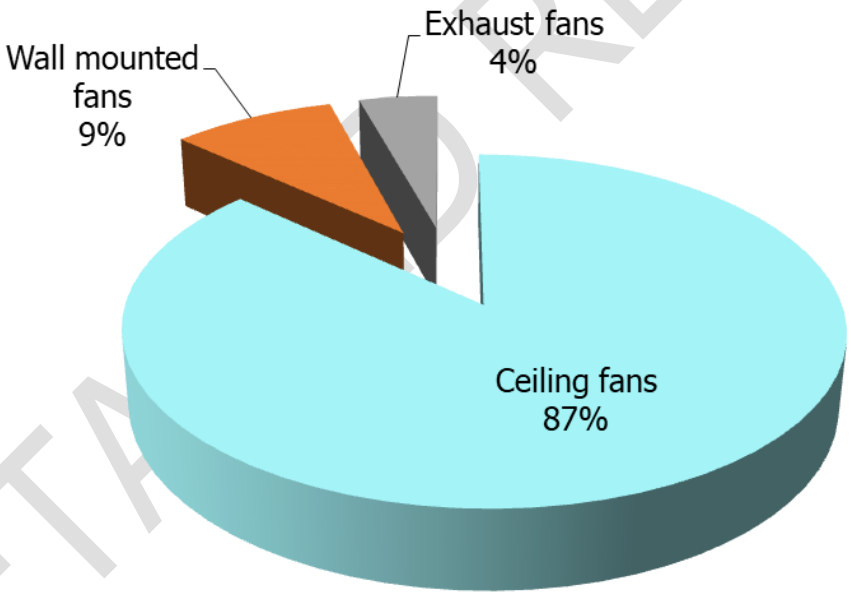

Figure 3: Types of fans based on power consumption

The above analysis shows **Ceiling fans consume 87%** whereas the **wall-mounted fans consume 9%** while **exhaust fans consume 4%** of total power consumed by fans.

5.7 Air conditioners

5.7.1 Types of air conditioners based on the numbers

There are **thirty-nine air conditioners** in the entire premises**.**

5.7.2 Building-wise consumption analysis

The energy consumption of air conditioners is **78,553 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 **339 nos. of equipment** in the Educational sector.

5.8.2 Types of equipment as per their energy contribution

The energy consumption of equipment is **1,64,380 kWh** of energy.

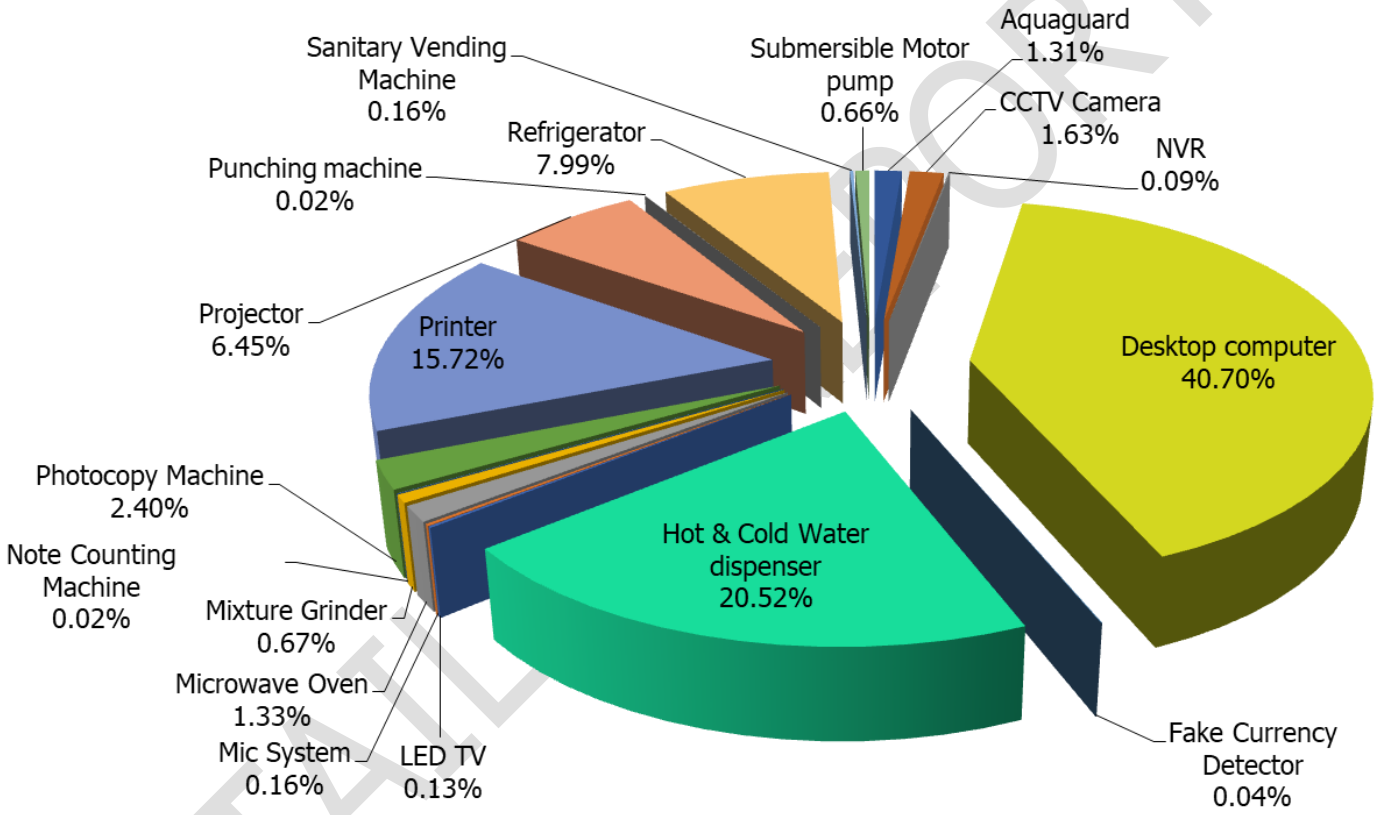

Figure 4: Energy consumed by types of equipment in the educational sector based on the usage study

The above summary shows that the **desktop computer consumes more energy at 40.70%** while the **hot & cold water dispenser consumes 20.52%** whereas the **printer consumes 15.72%** and the **refrigerator consumes 7.99%** these are the maximum consumers as compared to other equipment.

Note: As per the data collected, quite a few equipments were not in working conditions though they have been excluded measures should be taken to either replace them or repair them at the earliest.

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.**

- **Earth pit zones**
  - Add signboard about 'Outdoor Electrical area'
  - Code the earthing pits in the courtyard.

- **DG and Transformer area**
  - Add safety *signages* such as 'Danger-do not touch' etc.
  - Add *signboards* about the usage such as 'Transformer areas' and '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

- **General safety aspects**
  - Rubber flooring in the laboratories to avoid an electric shock.
  - Introduce *'PASS' information board* about how to use Fire extinguisher and *'FIRE ZONE' display board* where safety equipments are kept.

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 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.

6.2.2 Alternatives towards Smart premises mechanisms

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 8: 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.unfccc.int/applications/seors/attachments/get_attachment?code=NG125PFE4WHMWSYAK8TCAKIHMWX0F4QD

Energy Policy (Usage Certificate)

As per the Indian Green Building Standards

Prepared by

External Expert: Ar. Nahida Abdulla

(ASSOCHAM GEM Certified Professional – Registration no. 22/718)

Greenvio Solutions

An environmental and architectural design consultancy (Socio-environ responsibility)

Motto: Developing Healthy and Sustainable Environments

greenviosolutions@gmail.com

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

Proposed for the prestigious

S. P. Mandali's

R. A. Podar College of Commerce and Economics (Autonomous)

L.N. Road, Matunga, Mumbai – 400019, Maharashtra, India

Date of preparation of policy: 29 December 2023

Policy no: GV/ PL/ 12-23/ ZK-1

Energy Policy

DISCLAIMER *– This policy has been prepared by team 'Greenvio Solutions' based on audit. The inferences are used as a base in formulating the policy. The implementation is dependent on Institutional capabilities. Thus, presented plan of action is a feasible document to be practiced by the stakeholders.*

Policy statement

The said policy is applicable for the **academic year 2021-2022 and 2022-2023.** The study emphasizes on the existing consumption patterns, strategies adopted, and inferences that can improve power and utilization pattern.

Policy usage (Energy loads)

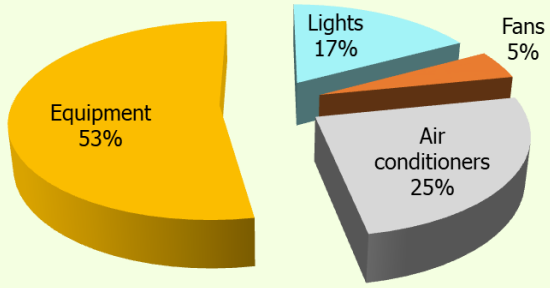

Figure 1: Summary of the calculated electrical consumption

The calculated electrical load (power consumption) Of the premises is **3,10,767 kWh** (electrical study)

The adjacent graph shows **equipment consume 53%** while the **air conditioners consume 25%** whereas the **lights consume 17%** and **fans consume 5%** of total calculated electrical energy.

Policy objectives

- Regularize the energy usage as a consistent activity.
- Explore the opportunity to increase renewable mode as alternate sources of energy.
- Undertake sensor based facilities in phases to upgrade and march towards smart campus facilities.
- Spread awareness about carbon-free strategies to stakeholders.

Policy implementation

- Increase **stakeholder sensitization** about importance of energy conservation.
- **The usage of renewable energy sources to utilize maximum energy as possible.**
- **Reduce the conventional lights consumption** which stand at **45,398 kWh out of the 53,181 kWh consumed by lights** further replace the same with energy efficient appliances to make the premises a 100% energy efficient appliance premises.
- **Reduce the air conditioning loads consumption** which stand at **78,553 kWh,** further devise sources to utilize natural ventilation for comfort purposes.
- **Reduce the conventional fans consumption** which stand at **12,717 kWh out of the 14,653 kWh consumed by fans** further replace the same with energy efficient appliances to make the premises a 100% energy efficient appliance premises.

Policy history

The AICTE Environment Policy 2020 was referred to draft this policy.