GREEN, ENERGY AND ENVIRONMENT AUDIT REPORT OF

PANDIAN SARASWATHI YADAV ENGINEERING COLLEGE

Sivagangai

EXECUTED BY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
&
DEPARTMENT OF MECHANICAL ENGINEERING

INDUSTRY- INSTITUTE PARTNERSHIP CELL

CENTRE OF EXCELLENCE IN ENERGY STUDIES

KONGU ENGINEERING COLLEGE

PERUNDURAI
ERODE – 638 060
TAMILNADU

Estd : 1984

June 2024

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Acknowledgement

The Industry Institute Partnership Cell (IIPC) of Kongu Engineering College (KEC) expresses the gratitude to the Management of **Pandian Saraswathi Yadav Engineering College, Arasanoor, Thirumansolai Post, Madurai-Sivagangai Highway, Tamil Nadu - 630 561** for providing an opportunity to conduct Environment, Green and Energy audit inside their college premises. The KEC Energy Audit team wishes to thank **Pandian Saraswathi Yadav Engineering College** for giving them the opportunity to carry out the energy audit in their institution and for providing all support to the team during the audit. We extend our thanks to **Pandian Saraswathi Yadav Engineering College** Principal, HODs, IQAC team, NAAC coordinators, other Faculty members from various department and the Electrical Maintenance team for their support and for providing various information enabling the successful completion of the audit , which has facilitated the submission of this report.

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CONTENTS

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1.	EXECUTIVE SUMMARY

Pandian Saraswathi Yadav Engineering College had agreed to provide access to Kongu Engineering College to undertake Environmental/Green and Energy Audit related measurements at their campus. This Audit has been conducted by a team of faculty members from Mechanical and Electrical Engineering Department of Kongu Engineering College. As there is no standard model for such an audit, the committee brainstormed and evolved a questionnaire. The data was collected, compiled and was finally analyzed by the audit team members. The remaining data which involved measurement using sophisticated instruments were done by the audit team members. By and large, the audit reveals a healthy environment in the campus. The committee has made short term and long-term suggestions to protect environment at higher levels and it is hoped that this will receive due attention of authorities and all stakeholders of the College.

1.1 About the Institution

Pandian Saraswathi Yadav Engineering College (PSYEC) is started in the year 2000, located on Madurai - Sivagangai state Highway, 27th km from Madurai which is known as "Athens city" of India. The campus is spread over 60+ acres of land and in serene atmosphere free from pollution and it is highly conducive for studies. PSYEC it is evident in the quality of the education that combines academic excellence and shaping competent professionals for better employability. PSYEC offers 10 Undergraduate programmes and 5 Post graduate programmes.

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2.	OBJECTIVES OF THE AUDIT STUDY

The goals of the present environmental/green and energy audits typically include:

- To recognize, diagnose and resolve the environmental problems.
- To recognize the effects of an organization on the environment and vice versa.
- To identify and control the impact of activities of organizations on environment.
- To suggest the best protocols for sustainable development of organization and environment.
- To assess environmental performance and the effectiveness of the measures to achieve the defined objectives and targets.
- To identify the different pressures on organization to improve their environmental performance.
- To ensure that the natural resources are utilized properly as per national policy of environment.
- To establish the parameters for maintaining health and welfare of the community of the organization.
- To set the procedure for disposal of all types of harmful wastes.
- To reduce energy consumption.
- To give preference to the most energy efficient and environmentally sound appliances.
- To minimize the consumption of water and monitor its quality.
- To identify the risks of hazards and implement the policies for safety of stakeholders.
- To facilitate the stakeholders with different aspects of disaster management.
- To train all stakeholders of the organization and empower them to contribute and participate in the environmental protection.

To achieve the mentioned objectives, following stages are implemented. It includes three stages viz. pre-audit stage, audit stage and post-audit stage. Each of these stages comprises a number of clearly defined objectives, with each objective to be achieved through specific actions and these actions yielding results in the form of outputs at the end of each stage.

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3.	INTRODUCTION TO ENVIRONMENTAL/GREEN AUDIT

The various activities carried out in the academic institutions affects the environment in which it is situated. To address the issues, the institutions can successfully use auditing strategies to monitor their environmental-energy related activities. An "environmental audit" is a "systematic, documented, periodic and objective review to meet environmental requirements". Although environmental audits may be performed in many ways for different purposes, the reasons for performing an audit and the goals to be achieved will determine the type of environmental audit to be performed. Green audit is the tool of management system used methodologically for protection and conservation of the environment. It is also used for the sustenance of the environment. The audit suggests different standard parameters, methods and projects for environmental protection. The green audit is useful to detect and monitor sources of environment pollution and it emphasizes on management of all types of wastes, monitoring of energy consumption, monitoring of quality and quantity of water, monitoring of hazards, safety of stakeholders and even the management of disasters.

Figure 1: Green Campus

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3.1 WATER MANAGEMENT

The college has adequate provisions for water storage. Seven bore-wells is used as the source of water. Recharging of ground water and rainwater harvesting are implemented by the college thereby conserving the water from its inception. This recharging and harvesting has been very helpful to augment the ground water. Rainwater harvesting is available in all the buildings. RO is installed in the campus with the capacity of 2000 LPD for satisfying the drinking needs. Grey water from the RO plant is used for irrigating the garden. The administration takes much efforts to save water. This can be seen from the slogans placed at most of the places.

Figure 2: RO System

Figure 3: Rain Water Harvesting System

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3.2 SOLID WASTE MANAGEMENT

The campus is cleaned on daily basis. Waste bins are placed in corridors, office and staff rooms. The waste generated in the campus includes wrappers, glass, metals, paper, etc. Old newspapers, used papers, files, etc. are given for recycling to external agencies. Glass, metals and other non-biodegradable wastes are given to external agencies where they are segregated and disposed/ recycled according to the nature of the waste. Non-biodegradable and plastic wastes are disposed by Municipal collection centre.

Figure 4: Dust Bin for Solid Waste Management

Slogans placed at appropriate places help students understand the importance of food and impact of plastics. Bio degradable wastes are decomposed using composite pit and used as manures.

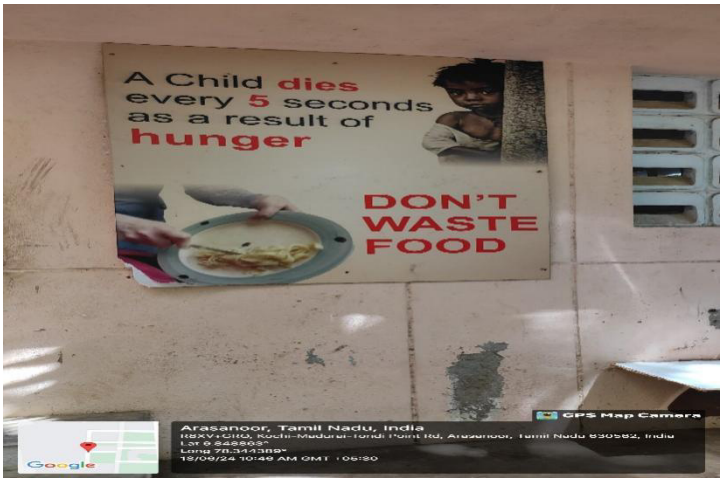

Figure 5: Slogan to create awareness to reduce food wastes

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3.3 LIQUID WASTE MANAGEMENT

Sewage, Laboratory, hostel and canteen effluent waste are the major liquid waste. Effective drainage system is found in all buildings for managing sewages. The laboratory waste water does not contain hazardous chemicals and periodical monitoring is done by the maintenance team. The college will be strict on the source reduction of chemical waste. Laboratories are purchasing chemicals for particular purposes and share surplus chemicals with other laboratories inside the campus.

3.4 E WASTE MANAGEMENT

Electronic goods are put to optimum use; the minor repairs are set right by the Laboratory assistants and teaching staff; and the major repairs are handled by the Technical Assistant and are reused. UPS Batteries are recharged / repaired / exchanged by the suppliers. E-waste like non-functional computers, equipment's and the other metal and wood waste are periodically collected by third party vendor for recycling.

3.5 GREEN COVER

The college is occupied with nearly 702 trees. Apart from that many rare species of plants are also grown in the botanical garden of the college. Such a green cover helps in reducing the CO_2 levels in and around the vicinity of the campus.

Figure 6. Green Cover in the campus

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3.6 TRANSPORTATION

College has 13 buses Most of the students use college bus for the transportation. Usage of common transportation helps in reducing the CO_2 emissions associated with the fuel usage due to individual vehicles. Battery car is also available in the college for moving within in the campus.

3.7 BASIC AMENITIES

The basic amenities are present inside the campus itself. Cafeteria, gym, walking lane, and photocopying facility are available for the use of students and staffs. Also ramp are available in building for physically challenged students.

Figure 7. Basic Facilities

3.8 GREEN EDUCATION

Events related to green practices are organized frequently through students' associations. National Service Scheme (NSS) unit is actively functioning in the institution and contributes towards inculcating green practices among the students and staff.

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4.	INDOOR AIRQUALITY

Indoor air quality (IAQ) refers to the quality of the air inside buildings as represented by concentrations of pollutants and thermal (temperature and relative humidity) conditions that affect the health and performance of occupants. It has become one of the most important issues of environment and health worldwide considering the principle of human rights to health that everyone has the right to breathe healthy indoor air. With the help of Indoor Air Quality meter (Extech EA80), CO_2 level, relative humidity and dry bulb temperatures can be measured. The measurements are carried out based on the protocol given by Central Pollution Control Board, Ministry of Environment and Forests, Govt. of India and the norms are discussed briefly in the subsequent sections. Indoor air quality test was carried out at different locations of the institution. Carbon dioxide levels are within the ASHRAE 55-1992 limit in the outdoor and indoor. The instrument used in the present audit was Extech Make EA80 Model of Indoor air quality meter. The range of the instrument is given below

CO_2 range : 0 to 6,000ppm
Temperature range : -4 to 140°F (-20 to 60°C)
Humidity range : 10 to 95%RH

Figure 8. Indoor air quality meter

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4.1 AIR QUALITY MEASUREMENTS

Table 1. Air Quality Measurements

Standard Level of CO_2			**ASHRAE and OSHA standards: 1000 ppm**		
Standard Level of Relative Humidity			**30 – 60 % (ASHRAE)**		
Standard Level of Temperature			**26 - 30°C ±3°C (ASHRAE)**		
S.No.	**Location**	**CO_2 Level (ppm)**	**Relative Humidity (%)**	**Temperature (°C)**	**Comments & Recommendation**
Admin BLock					
1.	Ground Floor- Principal office	401	68.1	34	Within the limits
2.	Office	396	67.1	34.5	Within the limits
3.	1st Floor- Lecture Hall	376	66.1	33.9	Within the limits
EEE Block					
4.	Library-Ground floor	401	68.6	34.2	Within the limits
5.	Power Electronics Lab- 1st Floor	392	68.4	34.1	Within the limits
6.	2nd Floor- Lecture Hall	380	67.5	33.8	Within the limits
Civil / Mechanical Block					
7.	Ground Floor- Laboratory	384	68.5	34.1	Within the limits
8.	1st Floor- CAD Lab	376	68.1	33.2	Within the limits
9.	1st Floor- Lecture Hall	392	69.2	33.8	Within the limits
ECE Block					
10.	Ground Floor- Canteen	401	69.2	34.5	Within the limits
11.	1st Floor- Lecture Hall	420	69.4	34.1	Within the limits
CSE/IT Block					
12.	1st Floor- Computer Lab	399	68.7	29	Within the limits
13.	2nd Floor- Lecture Hall	386	68.6	34.3	Within the limits

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4.2 COMFORT LEVEL

Discomfort can be caused to the occupants due to

- Inadequate ventilation
- High temperature and humidity levels
- High levels of CO_2

Ventilation should be distributed effectively in spaces, and stagnant air zones should be avoided. ASHRAE recommends relative humidity levels between 30 and 60 percent for optimum comfort. Higher humidity may result in microbial growth. A consistently implemented good-housekeeping plan is essential to eliminate or reduce the microbial growth in the building.

Damp indoor environments have been associated with many serious health effects, including asthma, hypersensitivity, and sinusitis. Moisture incursion leading to dampness can result from water leaks and/or by condensation due to high humidity. Common sources of moisture in buildings include: plumbing; roof and window leaks; flooding; condensation on cold surfaces, e.g., pipe sweating; poorly-maintained drain pans; and wet foundations due to landscaping or gutters that direct water into or under the building. Water vapor from unvented or poorly-vented kitchens, showers or steam pipes can also create conditions that promote microbial growth. Well-designed, well-constructed and well–maintained building envelopes are critical to the prevention and control of excess moisture and microbial growth by avoiding thermal bridges and preventing intrusion by liquid or vapor-phase water. Management of moisture requires proper control of temperatures and ventilation to avoid high humidity, condensation on surfaces, and excess moisture in materials.

CO_2 is a colourless, odourless, and tasteless gas. It is a product of completed carbon combustion and the by-product of biological respiration. ASHRAE states that CO_2 concentrations in acceptable outdoor air typically range from 300-500 ppm. Adverse health effects from CO_2 may occur since it is an asphyxiate gas. The CO_2 levels can be used as a rough indicator of the effectiveness of ventilation, and excessive population density in a structure. CO_2 increases in buildings with higher occupant densities, and is diluted and removed from buildings based on outdoor air ventilation rates. Therefore, examining levels of CO_2 in indoor air can reveal information regarding occupant densities and outdoor air

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ventilation rates. High CO_2 levels may indicate a problem with overcrowding or inadequate outdoor air ventilation rates.CO_2, a by-product of normal cell function, is removed from the body via the lungs in the exhaled air. Exposure to high levels of CO_2 can increase the amount of this gas in the blood, which is referred to as *Hypercapnia* or *Hypercarbia*. As the severity of hypercapnia increases, more symptoms ranging from headache to unconsciousness appear, and it can also lead to death.

The traditional means of dealing with IAQ is through ventilation with outdoor air, but this approach assumes that the outdoor air is cleaner than the indoor air. In many locations and for many contaminants, this is not the case, and insufficiently treated ventilation air can actually make IAQ worse. Poor outdoor air quality includes regionally elevated outdoor contaminant levels, as well as local sources such as motor vehicle exhaust from nearby roadways and contaminants generated by activities in adjacent buildings. Some green building programs recommend across-the-board increases in ventilation rates, but such recommendations may be counterproductive in areas with poor outdoor air quality unless accompanied by appropriate and effective increases in filtration and air cleaning.

4.3 INFERENCES

- Carbon-di-oxide levels are within the ASHRAE 55-1992 limit in the outdoor and indoor. For indoor condition, CO_2 level should be less than 1000 ppm. CO_2 levels are well within the limits in all places.
- ASHRAE recommends relative humidity levels between 30 and 60 percent for optimum comfort. The humidity is within the limit in most of the places. The buildings are well planned and natural circulation of air is felt in all places.
- The average ambient temperature in the campus is found to be 32°C.
- Tree plantation is highly promoted and it is evidenced through the presence of trees in many areas where buildings have not been constructed.
- Awareness programmes on environmental consciousness are organized and it is evidenced through the student participation in the respective activities.

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5.	LIQUID AND GASEOUS FUEL CONSUMPTION

LPG cylinders are used in the college hostel. On a average, 10 cylinders per month are used. Diesel and Petrol are being used for vehicles and generator. The number of bikes and cars used per day are 200 and 10 respectively.

The table 2 displays Diesel Consumption and expenditure on diesel for transport during the academic year 2022-2023.

Table 2. Diesel Consumption details for generator

S.NO	Month	Total Diesel Consumption by Generator in Litres	Total Expenditure on Diesel for Generator in Rupees
1	June 2022	54	5050
2	July 2022	53	4988
3	August 2022	54	5050
4	September 2022	53	4988
5	October 2022	54	5050
6	November 2022	54	5050
7	December 2022	53	4990
8	January 2023	55	5210
9	February 2023	55	5200
10	March 2023	102	10,250
11	April 2023	55	5200
12	May 2023	102	10,250

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Diesel Consumption by generator for the academic year 2022-2023 is depicted in the figure 9.

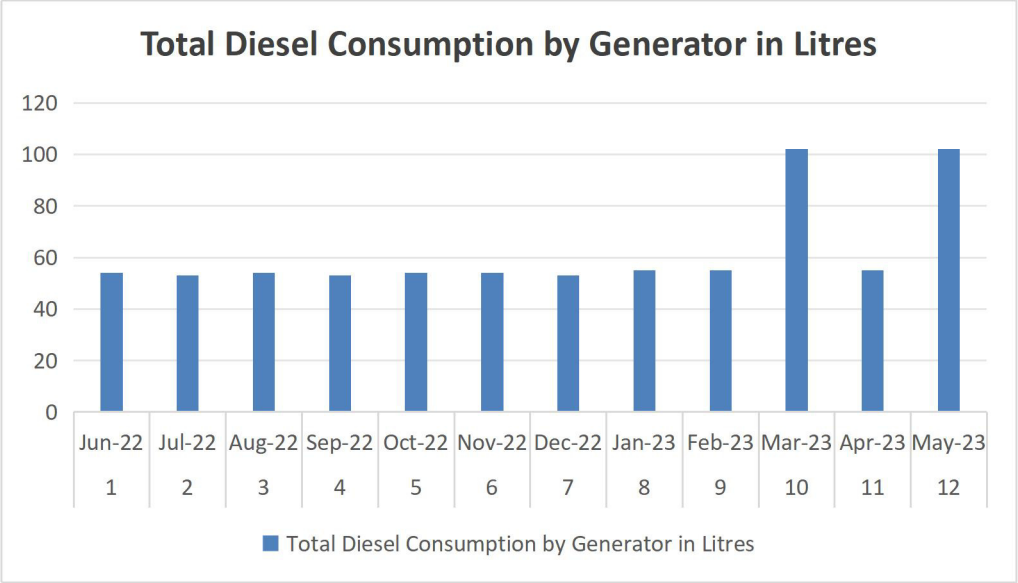

Figure 9. Total Diesel Consumption by Generator in Litres

Figure 10 illustrates the expenditure on Diesel Consumption by the generator for the academic year 2022-2023

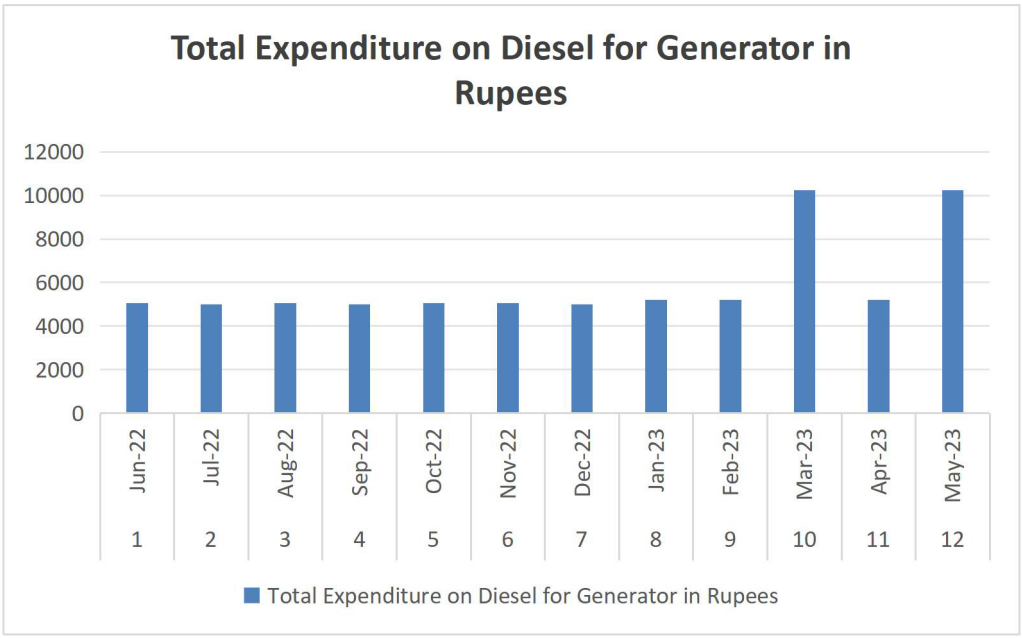

Figure 10. Amount Spent in Rupees on Diesel for Generator

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The table 3 provides data on Diesel Consumption and expenditure for transport during the academic year 2022-2023

Table 3. Total Diesel Consumption details for Transportation

S.NO	Month	Total Diesel Usage for Transportation (in Litres)	Total Cost of Diesel for Transportation in rupees
1	June 2022	1675	1,62,713
2	July 2022	1682	1,70,141
3	August 2022	1521	1,53,301
4	September 2022	1488	1,48,355
5	October 2022	1558	1,56,182
6	November 2022	1789	1,68,941
7	December 2022	2199	2,04,177
8	January 2023	2113	1,95,743
9	February 2023	2214	2,15,954
10	March 2023	2675	2,64,444
11	April 2023	2501	2,43,477
12	May 2023	2702	2,79,923

Diesel Consumption for transport for the academic year 2022-2023 is depicted in the figure 11.

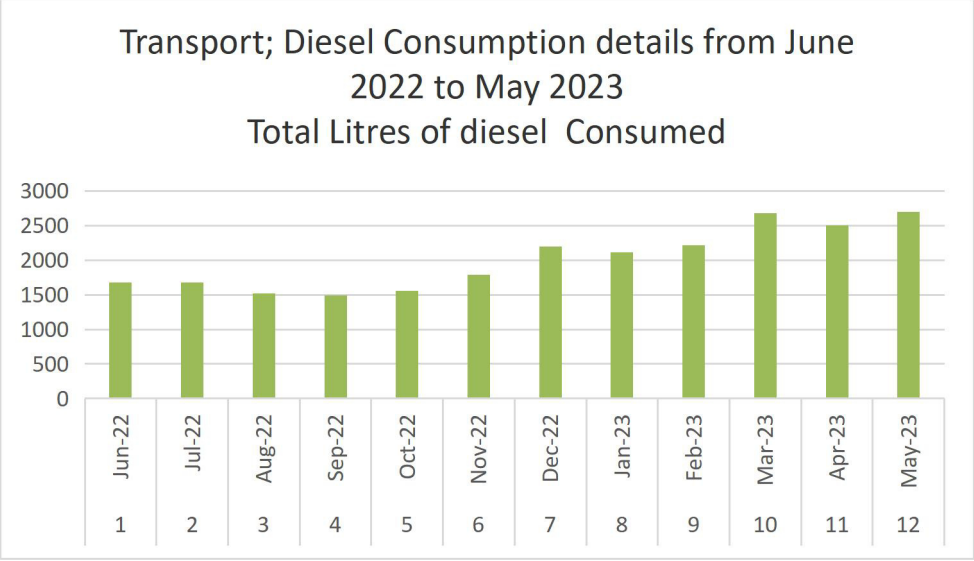

Figure 11. Total Diesel Usage for Transportation

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Amount spent on Diesel Consumption for transport for the academic year 2022-2023 is depicted in the figure 12.

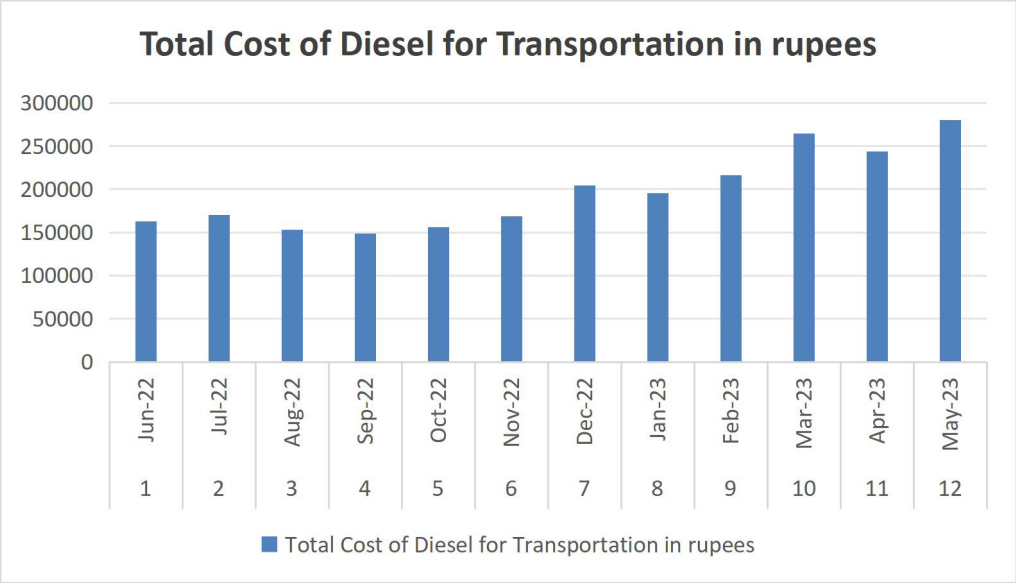

Figure 12. Total Cost of Diesel for Transportation in Rupees

The table 4 below shows LPG consumption and expenditure (in Rs.) for the hostel mess during the academic year 2022-2023.

Table 4. LPG Consumption and Expenditure at Hostel Mess

S.NO	Month	LPG Cylinders used	Amount Spent in Rs.
1	June 2022	10	18,000
2	July 2022	11	20,350
3	August 2022	10	18,000
4	September 2022	10	18,000
5	October 2022	11	20,350
6	November 2022	10	18,000
7	December 2022	10	18,000
8	January 2023	11	20,350
9	February 2023	10	18,000
10	March 2023	11	20,350
11	April 2023	10	18,000
12	May 2023	12	21,600

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The figure 13 below illustrates the LPG consumption at the hostel mess for the academic year 2022-2023

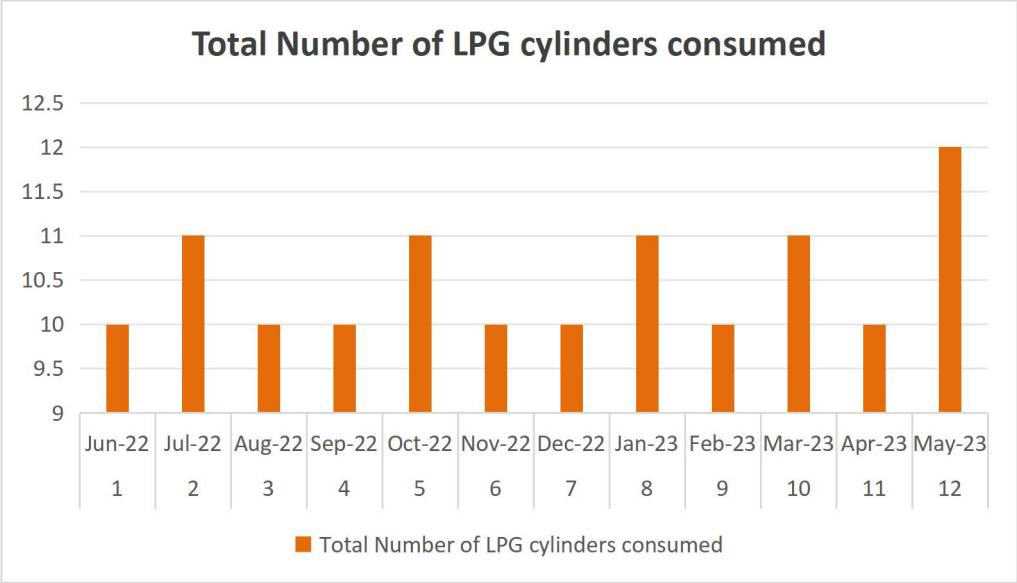

Figure 13. Total Number of LPG cylinders consumed

The figure 14 below shows the expenditure on LPG consumption at the hostel mess for the academic year 2022-2023.

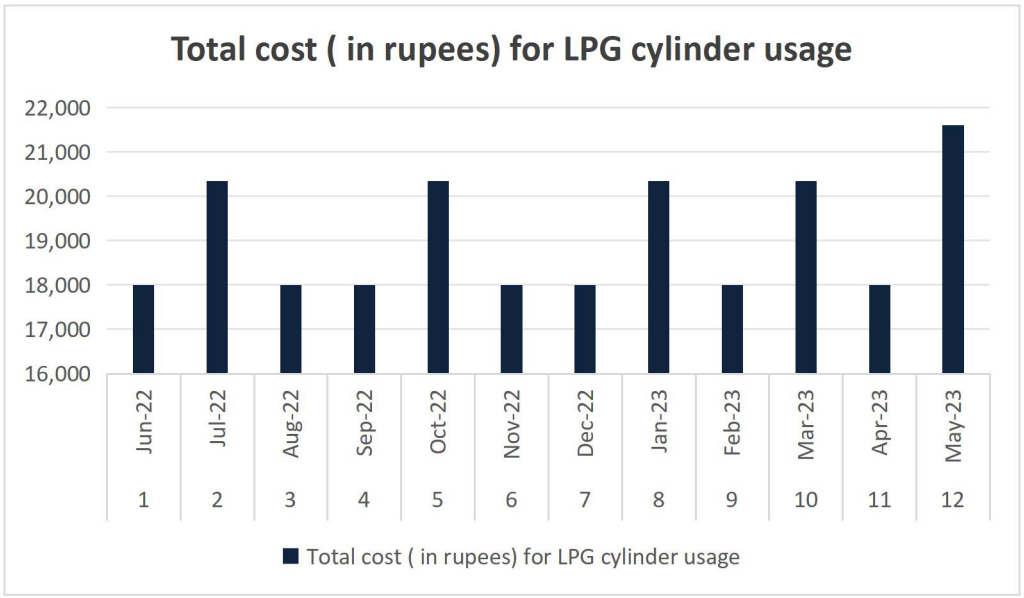

Figure 14. Total cost (in rupees) for LPG cylinder usage

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6.	ENERGY AUDIT

6.1 INTRODUCTION

An energy audit is an examination of the total energy used in a particular building or industry. The analysis is designed to provide a relatively quick and simple method of determining not only how much energy is being consumed but where and when. The energy audit will identify deficiencies in operating procedures and in physical facilities. Once these deficiencies have been identified, it will be apparent where to concentrate efforts in order to save energy. The energy audit is the beginning of and the basis for an effective energy-management programme. Human settlements encompass a variety of buildings. Regardless of the building involved, the audit procedure is basically the same. No two buildings are identical regarding energy usage. This is due to the possible variables affecting the buildings, e.g., occupancy rates, the building's size and orientation, its geographic location, the type of heating and cooling systems, the amount and types of equipment in use, the type of construction, the level of insulation and so on. Because each building is unique, it is difficult to generalize about energy-consumption patterns, and so it is necessary to conduct an energy audit for each building. This energy audit is aimed at obtaining a detailed idea about the various end use energy consumption activities and identification, enumerating and evaluating the possible energy saving opportunities.

6.2 ELECTRICITY CONSUMPTION

This energy audit is aimed at obtaining a detailed idea about the various end use energy consumption activities and identification, enumerating and evaluating the possible energy saving opportunities. It is a customary practice to conduct Energy audit every year in the Institute in order to estimate the energy consumption pattern. The present level of energy consumption of the institution has been analyzed, averaged by collecting utility bills from June 2022 to May 2023. The same is detailed in this report.

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Table 5 and 6 presents a comprehensive breakdown of electric energy consumption over the period from June 2022 to May 2023 for Service #5437009358 and Service #5437009432 respectively. The table details the monthly usage in kilowatt-hours (kWh), highlighting any fluctuations or trends that occurred throughout the academic year. This data serves as a vital reference for understanding the consumption patterns and guiding future energy management strategies. By analyzing this information, stakeholders can identify areas for potential efficiency improvements and implement measures to optimize electric energy usage in the future.

Table 5: Electric Energy Consumption details from June 2022 to May 2023

Service # 5437009358			
S.NO	**Month**	**Total Electrical Units Consumed (kWh)**	**Amount Spent on Electricity in Rupees**
1	June 2022	1880	21927
2	July 2022		
3	August 2022	1250	16957
4	September 2022		
5	October 2022	1250	16954
6	November 2022		
7	December 2022	4170	89187
8	January 2023		
9	February 2023	1250	50227
10	March 2023		
11	April 2023	2010	57176
12	May 2023		

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Table 6: Electric Energy Consumption details from June 2022 to May 2023

Service # 5437009432			
S.NO	**Month**	**Total Electrical Units Consumed (kWh)**	**Amount Spent on Electricity in Rupees**
1	June 2022	5060	43142
2	July 2022		
3	August 2022	4560	39192
4	September 2022		
5	October 2022	4560	39192
6	November 2022		
7	December 2022	11910	79995
8	January 2023		
9	February 2023	6240	63987
10	March 2023		
11	April 2023	6620	67423
12	May 2023		

This Figure 15 and 16 illustrates the overall electric energy consumption, measured in kilowatt-hours (kWh), over a specified period for Service #5437009358 and Service #5437009432 respectively. By depicting the total units consumed, this graph provides a clear visual representation of the energy usage trends and patterns.

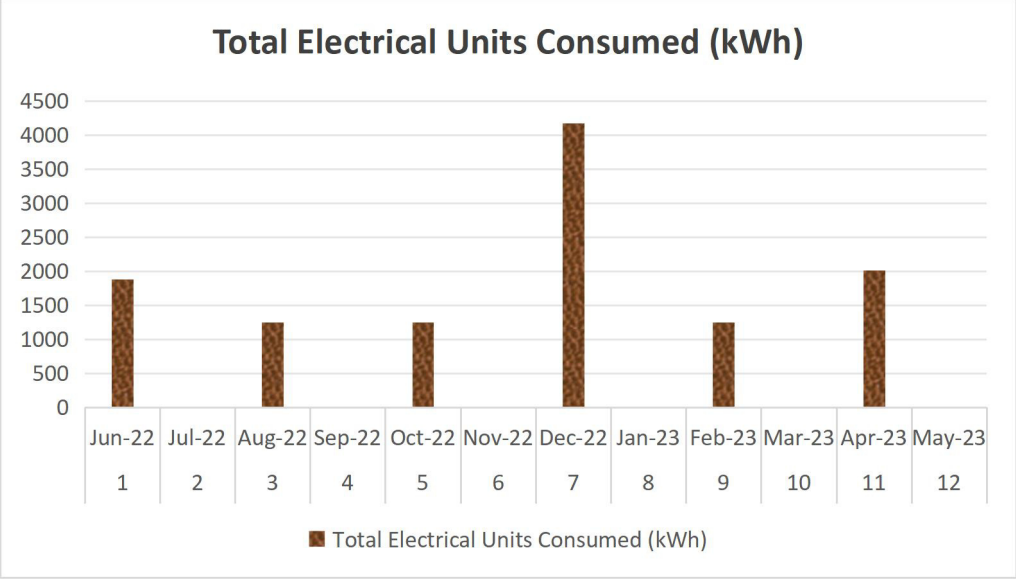

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Figure 15. Service # 5437009358 -Total Electrical Units Consumed (kWh)-

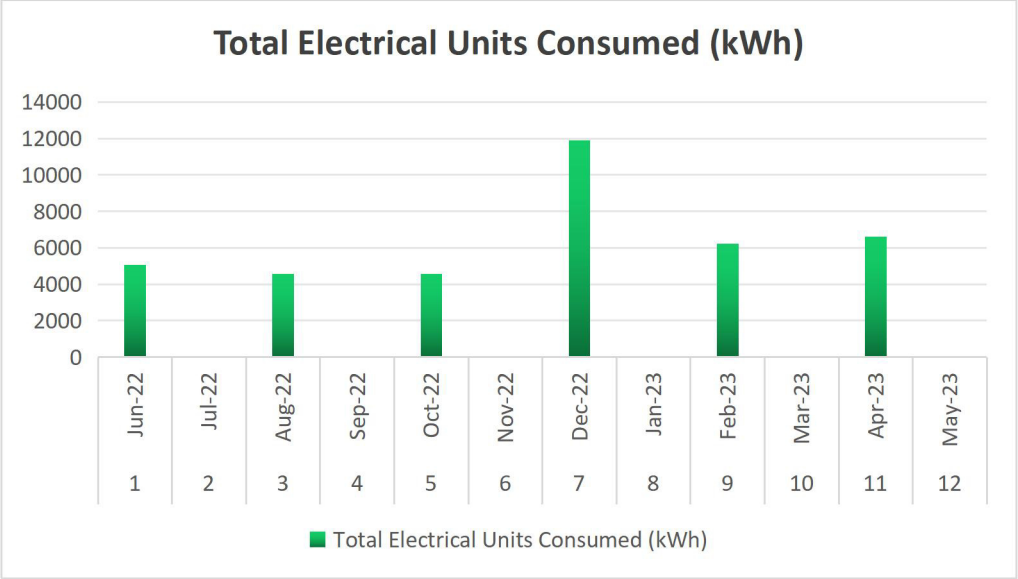

Figure 16. Service # 5437009432 -Total Electrical Units Consumed (kWh)-

This figure 17 and 18 provides a visual representation of the expenditure on electricity, denoted in Indian Rupees (Rs.), over a specific period.

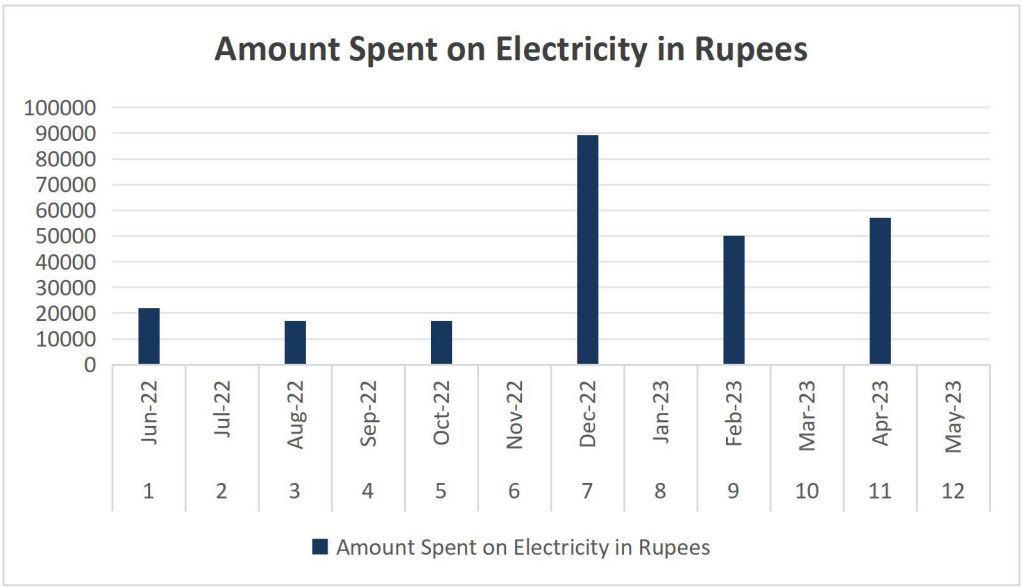

Figure 17. Service # 5437009358-Amount Spent on Electricity in Rupees

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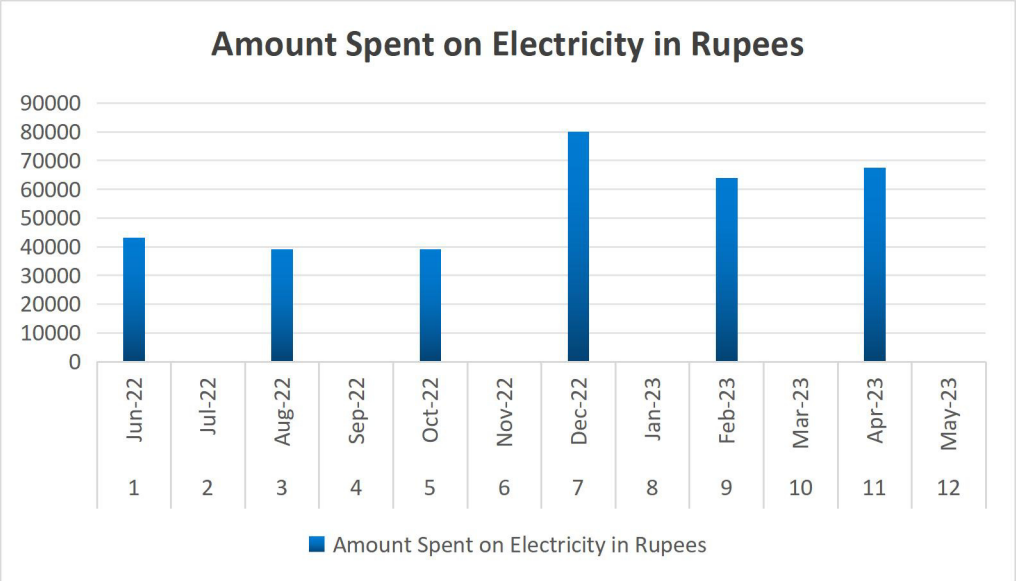

Figure 18. Service# 5437009432-Amount Spent on Electricity in Rupees

Table 7 presents a comprehensive breakdown of electric energy consumption over the period from April 2022 to May 2023 for different services.

Table 7: Service # 05437009313- Electric Energy Consumption details from June 2022 to May 2023

Service # 05437009313			
S.NO	**Month**	**Total Electrical Units Consumed (kWh)**	**Amount Spent on Electricity in Rupees**
1	June 2022	4890	45,229
2	July 2022	5671	51,396
3	August 2022	3890	37,321
4	September 2022	5727	73,565
5	October 2022	3680	70,805
6	November 2022	6181	94,338
7	December 2022	5391	86,792
8	January 2023	4150	75,128
9	February 2023	4136	74,995
10	March 2023	5834	91,025
11	April 2023	7493	1,06,626
12	May 2023	6012	92,838

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This Figure 19 illustrates the overall electric energy consumption measured in kilowatt-hours (kWh), over a specified period. By depicting the total units consumed, this graph provides a clear visual representation of the energy usage trends and patterns.

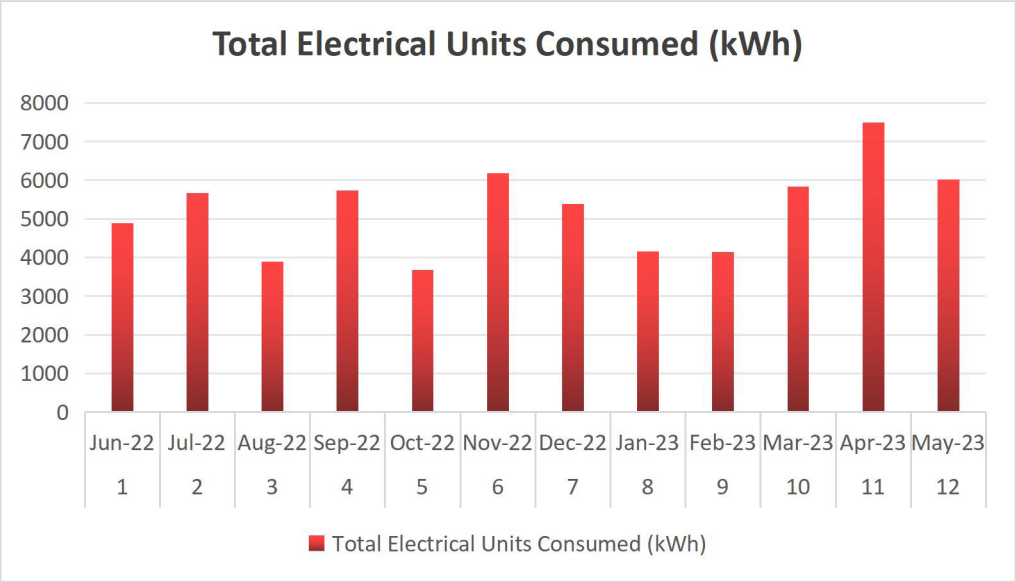

Figure 19. Service # 05437009313-Total Electrical Units Consumed (kWh)

This figure 20 provides a visual representation of the expenditure on electricity denoted in Indian Rupees (Rs.), over a specific period.

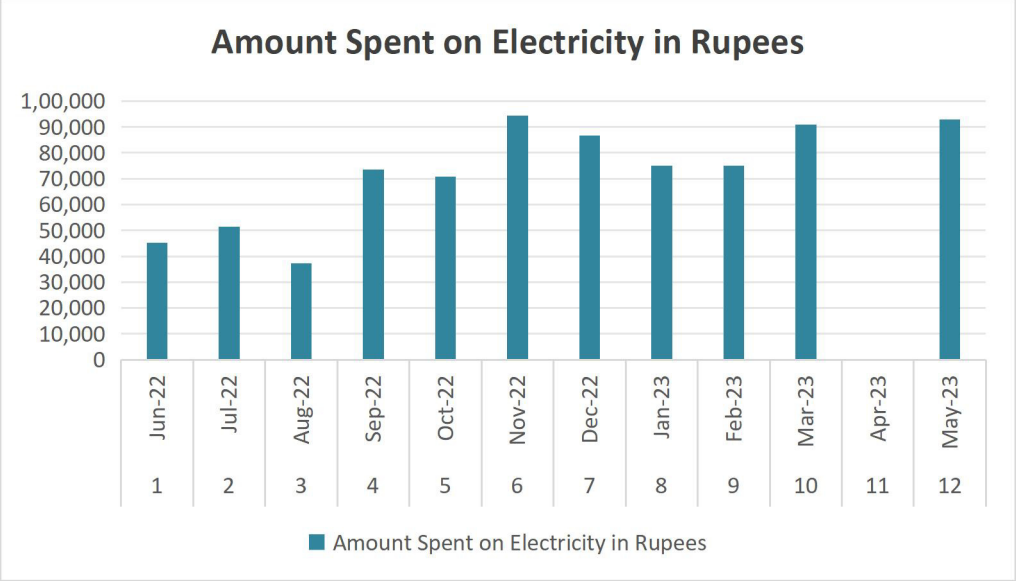

Figure 20. Service # 05437009313-Amount Spent on Electricity in Rupees

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7.	CARBON FOOTPRINT AND TOTAL ENERGY CONSUMPTION

Carbon footprint Carbon foot print is the total amount of Green House Gases (GHGs) emitted in terms of carbon dioxide by a person, institute, company, state or country. Carbon footprint is typically given in tons of CO_2 equivalent per year. For calculation of carbon foot print the basic data regarding direct and indirect sources of emission of Green House Gases is needed. How we get around and commute to and from college each day has an impact on the environment through the emission of greenhouse gases into the atmosphere by the burning of fossil fuels (such as petrol). The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions. A matured tree absorbs about 22 to 40 kg of CO_2 per year.

S.No.	Description	Type of fuel and their conversion process		
		Electrical energy consumed	Diesel	LPG
1	Annual Energy Consumption	116816 kWh	24861 lit	2470 kg
2	CO_2 Emission standards	0.95 kg/kWh	2.68 kg/lit	2.983kg/k
3	Total CO_2 emission(tonne/Annum)	184.97 tonnes		
4	Total No. of students and staff	737		
5	Per capita CO_2 emission per year	0.251 tonne (+)		
6	No. of Matured Trees	702		
7	CO_2 neutralised due to matured trees (tonne/Annum)	15.44 tonnes		
8	CO_2 to be neutralised per capita per year	0.23 tonnes(-)		

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8.	ENERGY SAVING OPPORTUNITIES

8.1 Lighting:

SAMPLE CALCULATION FOR ENERGY SAVING

DESCRIPTION	FTL FITTINGS	LED FITTINGS
	40W	**18W**
No. OF FITTINGS	100	**100**
WATTS	40	**18**
TOTAL WATTS	4000	1800
CONSUMPTION UNITS PER DAY	40.000	**18.000**
RUNNING COST PER DAY	272.00	**122.40**
SAVINGS LED INSTEAD OF FTL IN WATTS	2200	
UNITS SAVINGS PER DAY	22.000	
UNITS SAVINGS PER MONTH	**550.000**	
RUNNING HOURS PER DAY	10	
PRESENT KSEB UNITS COST Rs.	6.80	
COST SAVINGS PER DAY Rs.	149.60	
COST SAVINGS PER MONTH Rs.	**3740.00**	
LED LIGHT FITTING TOTAL EXPENSES Rs. (100*Rs.650)	**65000.00**	
COST RETURN PERIOD IN DAYS	434	
COST RETURN PERIOD IN MONTHS	14.48	
COST RETURN PERIOD IN YEARS	**1.19**	

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8.2 Fan:

SAMPLE CALCULATION FOR ENERGY SAVING

DESCRIPTION	NORMAL FAN	**BLDC FAN**
	80W	**30W**
No. OF FITTINGS	100	**100**
TOTAL WATTS	8000	**3000**
CONSUMPTION UNITS PER DAY	80.000	**30.000**
RUNNING COST PER DAY	544.00	**204.00**
SAVINGS BLDC INSTEAD OF NORMAL FAN IN WATTS	5000	
UNITS SAVINGS PER DAY	50.000	
UNITS SAVINGS PER MONTH	**1250.000**	
RUNNING HOURS PER DAY	10	
PRESENT KSEB UNITS COST Rs.	6.80	
COST SAVINGS PER DAY Rs.	340.00	
COST SAVINGS PER MONTH Rs.	**8500.00**	
BLDC FAN TOTAL EXPENSES Rs. (100*Rs.3250)	**325000.00**	
COST RETURN PERIOD IN DAYS	956	
COST RETURN PERIOD IN MONTHS	31.86	
COST RETURN PERIOD IN YEARS	**2.62**	

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7.3 Air Conditioner:

8.3 Air Conditioner:

SAMPLE CALCULATION FOR ENERGY SAVING

Model	Star Rating	EER	Cooling Capacity	Power Consumption (Watts/Hr)	No. of Watts saved / Hr to 0 Star Level	No. of Units saved / 8 Hr.	**Savings (Rs / Yr) (300Days)
Split AC	5 Star	3.59	6212	1732	1268	10.1	19240
Split AC	3 Star	3.12	6044	1938	1062	8.5	16192
Split AC	2 Star	3	6610	2210	791	6.3	12001

(Actual may vary)

- **Raising AC setting by 1° can save 6% power**
- **Typically the temperature is set at 20-21 degree Celsius, whereas, the comfort number is 24-28 degree Celsius.**
- **A change from 20 degree Celsius to 24 degree Celsius, has the potential to save about 24 per cent of power.**
-
- **A c from 20 degree Celsius to 24 degree Celsius, has the potential to save about 24 per cent of power.**

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9.	BEST PRACTICES

- The energy is also conserved by using natural light in the classrooms.
- LED bulbs and CFLs are being used in all possible locations as an energy conservation measure.
- Training programme conducted on Energy Conservation, Environment Impacts and Fuel Savings for Students, Staffs and Faculty Members (for the specified period) by any external agencies

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10	OBSERVATIONS, RECOMMENDATIONS AND GENERAL SUGGESTIONS

10.1 OBSERVATIONS

(i) Water saving plumbing fixtures may be provided in common utility areas

(ii) Energy saving air-conditioners may be purchased for new building expansion.

(iii)Use of appropriate slogans can be seen in many areas within the campus. This can remind the students/staff to have a sense of environment consciousness.

(iv) Programmes are being regularly conducted for planting saplings and creating awareness about efficient energy usage.

(v) Water metering facility may be provided for monitoring the water consumption and planning for future.

(vi) Natural ventilation and day lighting is used in many places. Sun films may be provided for windows in air-conditioned laboratories.

(vii) An Internal Audit Team may be formed and an audit may be carried out six months once.

(viii) Equipment ID (Labeling) for major equipment like Air-conditioners, Water coolers etc. may be done for ease of maintenance.

(ix) Grey water is used for gardening purposes. It can be used, but soil testing has to be done where the grey water is used. The grey water from RO plant has high alkalinity and it can reduce the percolation capacity of the soil. This can cause water logging problems in case of rain.

(x) Diesel consumption in generator need to be recorded for every operation.

(xi) It is good practice of testing the Earth Electrode and maintaining the minimum Earth Electrode resistance at college campus area.

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10.2 GENERAL SUGGESTIONS

1. Class rooms and laboratory's to display messages regarding optimum use of electrical appliances like lights, fans, computers in the room
2. All computers to have power saving settings to turn off monitors and hard discs, say after 10 minutes / 30 minutes.
3. The comfort air conditioning temperature to be set between 24˚C to 28˚C.
4. It is recommended to replace fluorescent light by LED whenever they get fused.
5. It is recommended to install more solar PV panel.
6. Vehicle pass may be issued as a sticker and that can be pasted in the vehicles belonging to Faculty, Staff and Students. This is to track the number of vehicles commuting inside the campus and to prevent the entry of unauthorized vehicles. This will help to find the percentage of institute population using own vehicles.
7. Safety precautions/ Warning signs need to be displayed near to the chemical storage points such as Chemistry Laboratories.
8. All Faculty and non-teaching staff should be made aware of common safety procedures and location of centralized facility like RO Plant, Rain water harvesting tanks, etc.
9. Awareness programme on energy and environment consciousness may be organized at regular intervals. Each department may plan at-least one such programme in a year and Clubs like NSS, Rotary, etc may be involved.
10. Responsibility chart (Name and In-charge) may be made available at RO, Gardening and Transport Offices/rooms as like in laboratories. This will be a first level of motivation and bring better attachment to towards institution.
11. Green, Environment and Energy Audits to be conducted every year, and progress can be analyzed by creating action taken report on the recommendations.
12. Switching to digital forms, electronic means of communication helps in avoiding paper wastage.
13. Eliminate or reduce paper processes by scanning paperwork that you produce or receive from others.
14. Instead of using several paper documents or records, compile important information into a shared, accessible folder in a Google Drive and keep it updated.

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Regn. No. EA-13164

Certificate No. 6461

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Ms. Logeswaran T

son / daughter of Mr. Thangamuthu

has passed the National Certification Examination for Energy Auditors held in October - 2011, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as ***Certified Energy Manager*** *as well as* ***Certified Energy Auditor.***

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India

Date : *1st February, 2012*

Controller of Examination

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IGBC

Confederation of Indian Industry

The Indian Green Building Council

hereby certifies that

Logeswaran T

has successfully demonstrated knowledge on the Green Building Design & Construction, Building Standards & Codes, IGBC Resources & Processes and Green Design Strategies & their Impacts, required to be awarded the title of

IGBC Accredited Professional

K S Venkatagiri
Executive Director
CII-Godrej GBC

V Suresh
Chairman
Indian Green Building Council

Gurmit Singh Arora
Vice-Chairman
Indian Green Building Council

10115

18 December 2021

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Certificate 73531799 / 159674238

LOGESWARAN T

has been awarded a Certificate of Achievement for

ISO 14001:2015 - Environmental Management Systems Auditor/Lead Auditor Training Course

by passing the written examination and continuous assessment this learner has successfully passed all the course assessment requirements

Held at SGS India Private Limited
Completed on 28 April 2022 - 2 May 2022
Exam taken on 2 May 2022

This course meets the formal training requirements for individuals seeking certification under the CQI and IRCA Auditor Certification Scheme and for this purpose is valid for five years from the date of completion of the exam.

Course Number 17972 - PR 315
Certificated by the Chartered Quality Institute (CQI) and International Register of Certified Auditors (IRCA)

Authorised by

H Crick
UK Business Manager

A Mangan
Global Training Manager

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End of the Report

Thank You

R
RAJA

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CHIEF CO-ORDINATOR

INDUSTRY - INSTITUTE PARTNERSHIP CELL

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