KEY INDICATOR: 7.1

7.1.6: Quality audits on environment and energy are regularly undertaken by the institution:

Certified that the following are the green audit reports along with certifications obtained from recognized bodies.

Registrar

Registrar
Tamilnadu Physical Education
and
Sports University
Chennai - 600 127.

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An ISO 9001:2015 Certified Organization

Environmental Testing & Analysis, Calibration of Instruments

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Regional Office : Pondicherry, Coimbatore & Andra Pradesh
Contact : 8778740104, 9384381615 | Email : igniteengg@gmail.com

AMBIENT AIR MONITORING

Report No	**IES-NO-AR-72-155-2023**	**Report Date:**	**30.03.2023**
Customer Name & Address		Sample Reference No:	IES-NO-AR-72-155-2023
M/s. **TAMILNADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY CHENNAI**		Sample Description:	Ambient Air
		Sample Drawn by:	Laboratory
		Sample Collected Date:	28.03.2023
		Qty of sample Received:	Filter Paper(2nos) & Approx 25ml Solution(4nos)
		Sample Received On:	28.03.2023
		Test Commenced On:	28.03.2023
		Test Completed On:	30.03.2023
		Sampling Method:	IES-SOP-ARS-01 to 11
		Sample Mark:	Near to Admin Block

S.No	Name of the Test	Test Method	Units	Results	Max. Annual Average Limits Of NAAQs
1.	Ammonia (as NH_3)	CPCB Guidelines,Volume I, NAAQMS/36/2012-13	$\mu g/m^3$	<5.0	100
2.	Arsenic (as As)	CPCB Guidelines,Volume I, NAAQMS/36/2012-13	$\mu g/m^3$	<0.1	6.0
3.	Benzene (as C_6H_6)	IS 5182 (Part 11): 2006 (Reaffirmed 2017)	$\mu g/m^3$	<0.5	5.0
4.	Benza (α) Pyrene(as $C_{20}H_{12}$)	CPCB Guidelines,Volume I, NAAQMS/36/2012-13	$\mu g/m^3$	<0.5	1.0
5.	Carbon Monoxide (as CO)	Instruments Manual Based SOP No.EL-SOP-ARS-17	$\mu g/m^3$	<1.2	2.0
6.	Lead (as Pb)	IS 5182 (Part 22): 2004 (Reaffirmed 2014) Clause No.5	$\mu g/m^3$	<0.5	0.5
7.	Nickel (as Nil)	CPCB Guidelines,Volume I, NAAQMS/36/2012-13	$\mu g/m^3$	<1.0	20
8.	Oxidants (as Ozone O_3)	IS 5182 (Part IX)- 19747 (Reaffirmed 2014)	$\mu g/m^3$	<10.0	100
9.	Oxidants of Nitrogen (as Ozone NO_2)	IS 5182 (Part 6): 2006 (Reaffirmed 2017)	$\mu g/m^3$	18.1	40
10.	Particulate Matter (as PM_{10})	IS 5182 (Part 23): 2006 (Reaffirmed 2017)	$\mu g/m^3$	32.1	60
11.	Particulate Matter (as $PM_{2.5}$)	EPA 40 CFR Part 50-Appendix L	$\mu g/m^3$	25.1	40
12.	Sulphur Dioxide (as SO_2)	IS 5182 (Part 2): 2001 (Reaffirmed 2017)	$\mu g/m^3$	9.3	50

<----------END OF REPORT---------->

NOTES:
The Concentrations of the parameters tested in the above Location are within the prescribed annual average limits of **NAAQs tolerance limits.**

Report Confirmed by

ENGINEERING - OSSE DIVISION - IGNITE

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AMBIENT AIR MONITORING

Report No	**IES-NO-AR-72-156-2023**	**Report Date**	**30.03.2023**
Customer Name & Address		Sample Reference No:	IES-NO-AR-72-155-2023
M/s **TAMILNADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY CHENNAI**		Sample Description:	Ambient Air
		Sample Drawn by:	Laboratory
		Sample Collected Date:	28.03.2023
		Qty of sample Received:	Filter Paper(2nos) & Approx 25ml Solution(4nos)
		Sample Received On:	28.03.2023
		Test Commenced On:	28.03.2023
		Test Completed On:	30.03.2023
		Sampling Method:	IES-SOP-ARS-01 to 11
		Sample Mark:	Near to Boys Hostel

S.No	Name of the Test	Test Method	Units	Results	Max. Annual Average Limits Of NAAQs
1.	Ammonia (as NH_3)	CPCB Guidelines,Volume I, NAAQMS/36/2012-13	$\mu g/m^3$	6.3	100
2.	Arsenic (as As)	CPCB Guidelines,Volume I, NAAQMS/36/2012-13	$\mu g/m^3$	<0.1	6.0
3.	Benzene (as C_6H_6)	IS 5182 (Part 11): 2006 (Reaffirmed 2017)	$\mu g/m^3$	<0.5	5.0
4.	Benza (α) Pyrene(as $C_{20}H_{12}$)	CPCB Guidelines,Volume I, NAAQMS/36/2012-13	$\mu g/m^3$	<0.5	1.0
5.	Carbon Monoxide (as CO)	Instruments Manual Based SOP No.EL-SOP-ARS-17	$\mu g/m^3$	<1.1	2.0
6.	Lead (as Pb)	IS 5182 (Part 22): 2004 (Reaffirmed 2014) Clause No.5	$\mu g/m^3$	<0.5	0.5
7.	Nickel (as Nil)	CPCB Guidelines,Volume I, NAAQMS/36/2012-13	$\mu g/m^3$	<1.0	20
8.	Oxidants (as Ozone O_3)	IS 5182 (Part IX)- 19747 (Reaffirmed 2014)	$\mu g/m^3$	<10.0	100
9.	Oxidants of Nitrogen (as Ozone NO_2)	IS 5182 (Part 6): 2006 (Reaffirmed 2017)	$\mu g/m^3$	24.2	40
10.	Particulate Matter (as PM_{10})	IS 5182 (Part 23): 2006 (Reaffirmed 2017)	$\mu g/m^3$	42.1	60
11.	Particulate Matter (as $PM_{2.5}$)	EPA 40 CFR Part 50-Appendix L	$\mu g/m^3$	21.0	40
12.	Sulphur Dioxide (as SO_2)	IS 5182 (Part 2): 2001 (Reaffirmed 2017)	$\mu g/m^3$	12.3	50

<----------END OF REPORT---------->

NOTES:

The Concentrations of the parameters tested in the above Location are within the prescribed annual average limits of **NAAQs tolerance limits.**

Report Confirmed by

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NOISE MONITORING

Report No	**EL-NO-NE-26-755-2023**	**Report Date:**	**30.03.2023**
Customer Name & Address ***M/s. TAMILNADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY*** ***CHENNAI-127***		Sample of Reference No:	IES-NO-IN-26-755-2023
		Sample Description:	Light
		Monitoring By:	Laboratory
		Monitoring Date:	30.03.2023
		Data received On:	30.03.2023
		Sampling Method:	IS:9989- 1981 (Reaffirmed 2001)
		Monitoring unit:	Db (A)

S.no	Name of the Location	Monitoring Distance in m	Monitoring Time	Day Time (6.00 a.m -10.00 p.m)		
				Minimum	Maximum	L Equivalent
1.	Central Library	Site	11 AM –12PM	58.9	59.3	57.3
2.	Office	Site	11 AM –12PM	60.9	65.3	62.1
3.	VC Room	Site	11 AM –12PM	57.0	59.0	55.6
4.	Canteen	Site	11 AM –12PM	59.2	61.5	60.0
5.	Computer Lab	Site	11 AM –12PM	55.1	62.1	57.3
Permissible Limit For Noise as Per The Factories Rules 1950				Maximum 90.0		

<---------End of Report--------->

NOTES:

The sound levels tested in the above locations are within the prescribed limits of **Factories rules 1950 Standard Limits**

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Regional Office : Pondicherry, Coimbatore & Andra Pradesh
Contact : 8778740104, 9384381615 | Email : igniteengg@gmail.com

ILLUMINATION MONITORING

Report No	**IES-NO-IN-26-756-2023**	**Report Date:**	**30.03.2023**
Customer Name & Address ***M/s. TAMILNADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY CHENNAI-127***		Sample of Reference No:	IES-NO-IN-26-756-2023
		Sample Description:	Light
		Monitoring By:	Laboratory
		Monitoring Date:	30.03.2023
		Data Received On:	30.03.2023
		Sampling Method:	IS:9989- 1981 (Reaffirmed 2001)
		Monitoring unit:	Db (A)

S.no	Name of the Location	Monitoring Distance in m	Monitoring Time	Day Time (6.00 a.m -10.00 p.m)		
				Minimum	Maximum	L Equivalent
1.	Central Library	0.9	11 AM –12PM	349	431	409
2.	Office	0.9	11 AM –12PM	228	239	242
3.	VC Room	0.9	11 AM –12PM	304	322	320
4.	Canteen	0.9	11 AM –12PM	561	567	212
5.	Computer Lab	0.9	11 AM –12PM	423	446	434
Permissible Limit For Light as Per The Factories Rules, 1950				Maximum 65		

<----------End of Report---------->

NOTES:

The above Location Light levels are fulfill the necessities of **Factories Rules 1950 standard.**

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TEST REPORT

Sample Ref No: EES/AS/544/2023	Date of Sampling: 28.03.2023
Issued To:	Report Date/Report No: 30.03.2023

M/s. TAMILNADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY
Melakottaiyur Chennai-600127

Page 1 of 1

Group :Atmospheric Pollution Discipline : Chemical Testing Sample Description : Indoor Air Quality Sampling Method : IS 5182, NIOSH & SOP	Sample Drawn By/Date : IES/28.03.2023 Received On : 28.03.2023 Analysis Commenced On : 28.03.2023 Analysis Completed On : 30.03.2023

Sl. No	Sampling Location	UNIT	RESULT Carbon-di-oxide (CO_2)	ASHRAE LIMITS
1	Central Library	ppm	385	1000
2	Office	ppm	415	
3	Principal Room	ppm	488	
4	Canteen	ppm	414	
5	Computer Lab	ppm	377	
6	Biomechanics	ppm	471	

ASHRAE- American Society of Hearing Refrigerating and Air-Conditioning Engineers,

IGNITE Engineering

------End of Report---------

IGNITE ENGINEERING TESTING DIVISION

Authorized Signatory

Note 1. Test result shown in this test report relate only to the items tested

2. This test Report shall not be reproduce anywhere except in full and in same format without the approval of the Laboratory

GREEN &ENVIRONMENT AUDIT REPORT

TAMILNADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY

MELAKOTTAIYUR,CHENNAI-600127

MARCH 2023

QRO CERTIFICATIONS

CHENNAI

TABLE OF CONTENTS

Executive Summary

The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institute which will pave way for sustainable development.

TNPESU believes that there is an urgent need to address these fundamental environmental problems and reverse the trends. The purpose of the audit was to ensure that the practices followed in the campus are in accordance with the Green Policy adopted by the institution.

It works on the several facets of 'Green Campus' including Water Conservation, Tree Plantation, Waste Management, Paperless Work, and Alternative Energy. With this in mind, the specific objectives of the audit was to evaluate the adequacy of the management control framework of environment sustainability as well as the degree to which the Departments are in compliance with the applicable regulations, policies and standards. It can make a tremendous impact on student health and learning college operational costs and the environment. The criteria, methods and recommendations used in the audit were based on the identified risks.

Introduction

Green audit was initiated with the beginning of 1970s with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. It is known as the systematic identification, quantification, recording, reporting and analysis of components of environmental diversity.

It is the duty of organizations to carry out the Green Audits of their ongoing processes for various reasons such as; to make sure whether they are performing in accordance with relevant rules and regulations, to improve the procedures and ability of materials, to analyze the potential duties and to determine a way which can lower the cost and add to the revenue.

Green Audit is assigned to the Criteria 7 of NAAC, National Assessment and Accreditation Council which is a self-governing organization of India that declares the institutions as Grade a, Grade B or Grade C according to the scores assigned at the time of accreditation. The intention of organizing Green Audit is to upgrade the environment condition in and around the institutes, colleges, companies and other organizations. It is carried out with the aid of performing tasks like waste management, energy saving and others to turn into a better environmental friendly institute.

About the College

The Tamil Nadu Physical Education and Sports University established by an Act of the Government of Tamil Nadu in 2004, is unique and the first of its kind in India as an affiliatory University, exclusively for Physical Education and Sports Accredited with ISO 9001 – 2015 Certification for Quality Management System It has been recognized as a premier institution of higher learning for job-oriented courses.

The campus is spread over an area of 127 acres of land with Huge built up area .The college offers Under Graduate Courses and Post Graduate and Research courses in Sports and Allied Fields & There are 421 students and 30 teaching faculty in the college which is promising to grow rapidly.

The College offers job-oriented courses, extra-curricular activities and technologically advanced facilities accessible to the faculty, the students and the support staff. Here, each individual is encouraged to step beyond the confines of academic and administrative disciplines to explore and intervene in the larger interests of the TNPESU community that thrives on participation and the desire to venture into newer vistas.

Objectives of the Study

The main objective of the green audit is to promote the Environment Management and Conservation in the College Campus. The purpose of the audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

The main objectives of carrying out Green Audit are:

- To introduce and aware students to real concerns of environment and its
- Sustainability.
- To secure the environment and cut down the threats posed to human health by analyzing the pattern and extent of resource use of the campus.
- To establish a baseline data to assess future sustainability by avoiding the
- Interruptions in environment that are more difficult to handle and their corrections requiring high cost.
- To bring out a status report on environmental compliance.

Benefits of green audit

- Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the college.
- Impart environmental education through systematic environmental Management approach and Improving environmental standards
- To create a green campus.
- To enable waste management through reduction of waste generation, solid- waste and water recycling.

Methodology

In order to perform green audit, the methodology included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. The study covered the following areas to summarize the present status of environment management in the campus:

- Water management
- Energy Conservation
- Waste management
- E-waste management
- Green area management
- Environment Monitoring

Observations and Recommendations

Water Use

The study observed that the main source of water for the institute is received from two bore wells. Water is used for drinking purpose, toilets and gardening. The waste water from the RO water purifier is used for gardening purpose. During the survey, no loss of water is observed, neither by any leakages, or by over flow of water from overhead tanks. The data collected from all the departments is examined and verified. On an average the total use of water in the college is 30,000 L/day, which include 23,000 L/day for domestic, 5,000 L/day for gardening purposes and 2,000 L/day for drinking purpose.

Pond inside the Campus

Rain water harvesting units are also functional for recharging ground water level. The rain water collected from all floors of the building and Harvested in the recharge well available inside the campus .

Rain Water Harvesting Implemented inside the campus

Recommendations

- There is a need for monitoring and controlling overflow and periodically supervision drills should be arranged.
- Minimize wastage of water and use of electricity during the reverse osmosis process and ensure that the equipment used are regularly serviced and in good condition.
- The cleaning products used by staff should have a minimal detrimental impact on the environment. They should be biodegradable and non-toxic.
- Ensure that all cleaning products used by college staff have a minimal detrimental impact on the environment, i.e. they are biodegradable and non-toxic, even where this exceeds the Control of Substances Hazardous to Health (COSHH) regulations.
- Gardens should be watered by using drip/sprinkler irrigation system to minimize water use.

Waste Management

This indicator addresses waste production and disposal of different wastes like paper, food, plastic, biodegradable, construction, glass, dust etc. Furthermore, solid waste often includes wasted material resources that could otherwise be channeled into better service through recycling, repair, and reuse. Solid waste generation and management is a burning issue. Unscientific handling of solid waste can create threats to everyone. The survey focused on volume, type and current management practice of solid waste generated in the campus.

Observations

Liquid waste management

They have a **Mini RO plant** in all the blocks which is easily access to all the students &staffs to provide water for drinking and Cooking Purpose in Mess & Canteen

Purified Water in all the Blocks

Solid waste management

Waste generated from tree droppings and lawn management is major solid waste generated in the campus. Separate dustbins are provided for Bio-degradable and Plastic waste in order to segregate them at the source itself. Single sided used papers are reused for writing and printing in all the departments to minimize the usage of papers. Important and confidential reports/ papers are sent for pulping and recycling after completion of their preservation period.

Chemical waste generated in laboratories that are potentially hazardous are segregated. Very less plastic waste (0.1Kg/day) is generated by some departments, office, garden etc Metal waste and wooden waste is stored and sent to authorized scrap agents for further processing. Glass bottles are reused in the laboratories.

The college had Placed separate bins to collect biodegradable and non-biodegradablewaste generated in the campus.

Separate Bins for Degradable & Non Bio Degradable

Plastic Free Campus

Recommendations

- The amount of waste generated from classrooms and staff rooms can be minimized.
- Full use of all recycling facilities provided by City Municipality and private suppliers can be utilized for waste disposal.
- Sufficient, accessible and well-publicized collection points can be made available for recyclable waste, with responsibility for recycling clearly allocated.
- If Biomedical Waste Accumulated Ensure to Proper Government Authorized Vendor to collect it.
- Solid Waste Management awareness Training Recommended for all the works one who are Involved in Gardening & Sweeping Work

E-waste Management

E-waste is a consumer and business electronic equipment that is near or at the end of its useful life. This waste makes up about 5% of all municipal solid waste worldwide. It is hazardous than other waste because electronic components contain cadmium, lead, mercury, and Polychlorinated biphenyls (PCBs) that can damage human health and the environment.

Observations

E-waste generated in the campus is of minimal quantity. It is being effectively managed, keeping in mind the environmental hazards that may arise if not disposed properly.

The cartridges of laser printers are refilled outside the college campus. Administration Awareness programmes are being conducted regarding E-waste Management in various departments. The E- wastes and defective items from computer laboratories are being stored properly.

The dismantled hardware of personal computers are used in PC trouble shooting lab. This is put to use to conduct practical courses for Students and The dismantled electronic spare parts are immediately sold for reuse. The minimal amount of e-waste that is generated after reusing is sent to recycler at specific intervals.

E-Waste is Properly Collected in the campus

E-Waste is Properly Collected and Disposed Frequently

Recommendations

- Use reusable resources and containers and avoid unnecessary packaging wherever possible.
- The management should take an initiative to purchase recycled resources when they are available.
- Recycle or safely dispose of white goods, computers and electrical appliances.
- The Management engage proper Vendor to dispose the E Waste frequently.

Green Area Management

This includes the plants, greenery and sustainability of the campus to ensure that the buildings conform to green standards. This also helps in ensuring that the Environmental Policy enacted, enforced and reviewed using various environmental awareness programmes.

Observations

Campus is located in the vicinity of many trees (species) to maintain the bio-diversity. Various tree plantation programs are being organized at college campus and surrounding villages through NSS (National Service Scheme) unit. This program helps in encouraging eco-friendly environment which provides pure oxygen within the institute and awareness among villagers. The plantation program includes various type of indigenous species of ornamental and medicinal wild plant species.

The college cultivates vegetables for its own use through organic farming initiatives.

Green Area Management Inside The campus

Green Belt Across The campus

MIYAWAKI FOREST

A Miyawaki forest has been planted in the north-east corner of the campus Miyawaki is a technique pioneered by the Japanese botanist, Akira Miyawaki that helps build dense, native forests. The approach ensures plants to grow 10 times faster and the resulting plantation will be 30times denser than usual. It involves planting dozens of native species in the same area, and becomes maintenance-free after the first three years.

Miyawaki Forest Inside The campus

World Environment Day Celebrated Inside The campus

Sanitary Napkin Incinerator

To educate and create awareness of use of Sanitary Napkins and provide easy access to Sanitary Napkins by installation Simple Vending Machines in our girls toilet so that Girls/Women get habituated to use this Sanitary Napkins for their better health care. Secondly, to solve the problem of sanitary napkin disposal by installing incinerators which shall reduce spread of infection due to unhygienic disposal of sanitary napkins, reduce environmental pollution due to non-biodegradable sanitary napkins and reduce clogging of public drainage system due to spongy nature of napkins.

Sanitary Napkin Incinerator inside The Campus

Recommendations

- Review periodically the list of trees planted in the garden, allot numbers to the trees and keep records. Assign scientific names to the trees.
- Promote environmental awareness as a part of course work in various curricular areas, independent research projects, and community service.
- Create awareness of environmental sustainability and take actions to ensure environmental sustainability.
- Establish a College Environmental Committee that will hold responsibility for the enactment, enforcement and review of the Environmental Policy. The
- Environmental Committee shall be the source of advice and guidance to staff and students on how to implement this Policy.
- Ensure that an audit is conducted annually and action is taken on the basis of audit report, recommendation and findings.
- Indoor plantation to inculcate interest in students, Bonsai can planted in corridor to bond a relation with nature.
- Green library should be established.

Sanitation and Hygiene

Unsafe operation of educational institution can lead to transmission of diseases. It can cause negative impacts to students, their families, institute reputation and overall development. Therefore, good health and sanitation practices are very important especially considering the ongoing Covid'19 pandemic.

The provision of safe water and sanitation facilities is a first step towards a healthy physical learning environment. However, the mere provision of facilities does not make them sustainable or ensure the desired impact. Hygiene practices are employed as preventative measures to reduce the incidence and spreading of disease. Hygiene education aims to promote those practices that will help prevent water and sanitation-related diseases as well as inculcating healthy behaviours in the future generation of

adults. Therefore, the combination of facilities, correct behavioural practices and education are meant to have a positive impact on the health and hygiene conditions of the community as a whole, both nowand in the future.

1.Drinking water: Clean water as per drinking water standards have been ensured to students through Reverse Osmosis plant. RO plants of different capacity (6 nos.) have been installed.

2.Water Supply: Adequate and clean water supply through Public Water Supply and borewell system has been ensured.

3.Sanitation: Adequate number of urinals/toilets have been operational in main Campus, Hostel, and Other areas. No open and flowing latrines were noticed. Sanitation facilities are found to be proper and adequate.

4.Waste Management: Waste management bins are placed at each block to store and dispose through municipality. During audit, no unattended waste dumping was noticed.

5.Awareness: Hygiene awareness posters especially related to Covid'19 is displayed atvarious locations in the campus. Overall, campus follows very good sanitation practices.

Green Initiatives and Best Practices

The list of few important green initiatives and good environmental practices adopted by the campus is given below.

- Rainwater harvesting pits are constructed at appropriate locations to improve local ground water table.
- Installed solar Plant to meet partial power requirement of the Campus
- Replaced 60% of CFL lights with LED lights as part of energy conservation measures. Also, some of the old fans were replaced with energy efficient super fans.
- Engagement of authorized paper recycling vendor to manage bulk paper waste generated.
- Establishment of Organic Cultivation
- Celebration Of World Environment Day and creating Environment Awareness to all Students & Staffs
- Restricted movement of vehicles inside the campus. Parking space inside campus is provided for vehicles, however, no movement of vehicles inside campus is encouraged.
- Awareness posters on resource conservation, good sanitation and hygiene drive.
- Strictly follow the Plastic Free zone inside the campus is Encouraged.

Environmental Monitoring

As part of green audit of campus, the Green Audit Assessment Team has carried out the environmental monitoring of campus. This includes Illumination, Noise level, ventilation and indoor Air quality of the class rooms. It was observed that Illumination and Ventilation is adequate considering natural light and air velocity present. Noise level in the campus is well below the limit.

The following surveys were conducted:

1. Ambient air quality by NABL approved air sampler
2. Lux monitoring
3. Noise monitoring
4. Co2 Monitoring

Ambient Air Quality Monitoring

Ambient air quality monitoring can help in providing a strategic solution towards air purificationand help lead a safer life. Also, air quality monitoring in the college campus not only develops trust among the parents but ensures that the administration cares about their Students and Staff.

Ambient Air Quality Monitoring Inside the Campus

Lux&Noise Monitoring

Illumination is one of the most important environmental factors in the classroom. Many Doctors have discovered that lighting settings have significant impact on students' performance. So Lux monitoring can help in providing a Comfort Vision Environment to Students.

When assessing noise exposure in campus environments, it can be difficult to determine whether the level of sound has reached a point where it interferes with student learning and staff productivity, or worse, becomes a threat to their health and well-being.

Lux & Noise Monitoring Inside The Campus

C02 Monitoring

CO2 levels can provide a direct indication of the CFM per person ventilation rate in College classrooms and can provide an ongoing indication if code required ventilation rates are being maintained. It is important to Maintain that CO2 levels a contaminant or pollutant at the levels normally measured in buildings (400 to 2000 ppm).Measurement Based On ASHRAE Standards

Co2 Monitoring Inside The Campus

Conclusion

Green audit is a systematic approach to understand the existing environmental practices and identify areas of improvement for attaining an eco-friendly approach to the sustainable development of the college. The report is prepared based on the site visit observations and information provided by the campus.

Overall, TNPESU has taken many environmentally friendly approaches and campaigns in the area of energy, water, solid waste, sanitation and green cover, which is highly commendable.

.The environmental awareness initiatives taken by the management are substantial. The installation of water recycling plants, paperless work system and Solar & Biogas Plant practices are remarkable. Besides, environmental awareness programmes initiated by the administration prove the campus is going green. Few recommendations are added for waste management and waste reduction using alternate eco-friendly and scientific techniques. This may lead to the prosperous future in context of Green Campus and thus aid in a sustainable environment and community development.

Acknowledgement

We are grateful to the management and committee members of Tamilnadu Physical Education and Sports University to award this prestigious project on green auditing. Further we sincerely thank the college staff for providing us the necessary facilities and co-operation during the audit. This ample co-operation helped us a lotin making this audit possible and successful.

FOR IGNITE ENGINEERING

ER.P.VIVEK M.E
LEAD GREEN ASSOCIATE
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ER.S.KARTHIGA M.E(Ph.d)
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ENERGY AUDIT REPORT

TAMILNADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY

March 2023

Report by

QRO CERTIFICATIONS

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1. ABOUT THE COLLEGE

The Tamil Nadu Physical Education and Sports University established by an Act of the Government of Tamil Nadu in 2004, is unique and the first of its kind in India as an affiliatory University, exclusively for Physical Education and Sports. After obtaining the accent from his Excellency the president of India on 5th August 2005, the said act came into force with effect from 15th September 2005. Accredited with ISO 9001 – 2015 Certification for Quality Management System It has been recognized as a premier institution of higher learning for job-oriented courses The College maintains high standards of excellence in the academic sphere and in the physical amenities and facilities intended to implement the educational programme. The College endeavours to enroll students who hold high standards of performance, discipline and achievement.

VISION

"To engage in relentless pursuit of Excellence in the promotion and development of Physical Education and Sports through innovative programmes in teaching, coaching, research and outreach activities and evolve a holistic approach to the betterment of human resources through a harmonious blend of body, mind and spiri**t"** "

MISSION

1. To create an ideal academic environment for Learning, Scholarship, Professionalism, and Collaboration that fosters Excellence in active student learning and professional growth.
2. To design and introduce innovative, integrated, inter-disciplinary curriculum in Physical Education and various Sports and games and allied areas and provide Leadership to the Profession.
3. To offer unique graduate, Post-graduate and research Programmes in Physical Education, Sports and allied fields.
4. To produce competent health conscious Physical Education teachers at various levels, who will be fully equipped to impart instruction in Physical Education and undertake physical activity programmes for children and youth.
5. To develop High-Tech research facilities and contribute to the body to knowledge through scholarly work and publications, and disseminate the findings to the professionals, faculty and students.

2. INTRODUCTION

The Energy Conservation Act, 2001 defines Energy Audit as "the verification, monitoring, and analysis of the use of energy including submission of technical report containing recommendations for improving energy efficiency with cost-benefit analysis and an action plan to reduce energy consumption".

It is an analysis of energy flows for energy conservation and to find energy losses. It is a process of collection of detailed data related to energy usage and comparison of collected results.It is a process by which we can reduce the amount of energy input to the system without a negative impact on the output.

It includes Inspection, Survey and Analysis of energy flows for energy conservation in a building, a process, or a system to reduce the amount of energy input into the system without negatively affecting the output(s) plugged. It is the quickest, cheapest, and cleanest way to reduce energy consumption.

An energy audit, sometimes referred to as an energy survey or an energy inventory, is an examination of the total energy used in a particular property. 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 also identify deficiencies in operating procedures and in physical facilities. Once these deficiencies have been identified, it will be apparent where to concentrate efforts to save energy. The energy audit is the beginning of and the basis for an effective energy-management programme.

Increasingly in the last several decades, the demand to lower increasingly expensive energy costs and move towards a sustainable future has made energy audits greatly important.

3. OBJECTIVES OF ENERGY AUDIT

4. BENEFITS OF ENERGY AUDIT

- Energy audits will evaluate your facility “as a whole”, their goal is not to evaluate single measures but to consider a wide range of available alternatives (Electrical, Mechanical, Envelope and Water).
- It will analyse your historical energy use and find potential issues using statistical methods.
- The audit will not only inform you of opportunities but provide you with financial analysis. This will enable prioritization based on financial benefit and return on investment.
- Provide you with solid, easy-to-understand technical information regarding the proposed energy conservation measures
- Provide you with benchmark information to help you understand your energy use performance compared to others in your field and area.
- Provide you with an emissions analysis to help you understand the benefits of your decisions from an environmental standpoint.
- Understand where energy is used, and which areas are worth focusing on the most (energy hogs).
- The cost-benefit analysis of the audit report would help decision-makers prioritize opportunities and evaluate them as investments.
- These indicators would include, rate of return, net present value, cash flow analysis, and payback.

5. STAGES OF ENERGY AUDIT

A structured methodology to carry out an energy audit is necessary for efficient working. An initial study of the site should always be carried out, as the planning of the procedures necessary for an audit is most important.

The stages of an energy audit are:

- Phase – I Pre-audit phase
- Phase – II Audit phase
- Phase – III Post-audit phase

Phase – I Pre-audit phase

An initial site visit may take one day and gives the Energy Auditor/Engineer an opportunity to meet the personnel concerned, familiarize him with the site, and assess the procedures necessary to carry out the energy audit.

During the initial site visit, the Energy Auditor/Engineer should carry out the following actions:-

- Discuss with the site's senior management the aims of the energy audit.
- Discuss economic guidelines associated with the recommendations of the audit.
- Analyse the major energy consumption data with the relevant personnel.
- Obtain site drawings where available - building layout, steam distribution, compressed air distribution, electricity distribution etc. the site accompanied by engineering/production.

The main aims of this visit are: -

- To finalise the Energy Audit team
- To identify the main energy-consuming areas/plant items to be surveyed during the audit.
- To identify any existing instrumentation/ additional metering required.
- To decide whether any meters will have to be installed prior to the audit eg. kWh, steam, oil, or gas meters.
- To identify the instrumentation required for carrying out the audit.
- To plan with time frame
- To collect macro data on plant energy resources, major energy consuming centers
- To create awareness through meetings/ programme

Phase – II Audit phase

The information to be collected during this audit phase includes:

- Energy consumption by type of energy, by department, by major items of process equipment, by end-use
- Material balance data (raw materials, intermediate and final products, recycled materials, use of scrap or waste products, production of by-products for re-use in other industries, etc.)
- Energy cost and tariff data
- Process and material flow diagrams
- Generation and distribution of site services (eg.compressed air, steam).
- Sources of energy supply (e.g. electricity from the grid or self-generation)
- Potential for fuel substitution, process modifications, and the use of co-generation systems (combined heat and power generation).
- Energy Management procedures and energy awareness training programs within the establishment.

Phase – III Post-audit phase

- Plan and schedule an action plan for implementing the corrective measures.
- Follow-up and periodic review.

6. ENERGY MANAGEMENT

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliance, natural gas, and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. The study carried out also analyzed the use of alternate energy resources that are eco-friendly.

7. OBSERVATIONS

The source of energy for all the buildings within the campus is electricity only. The institution consumes about **1800kW/Month**. However, **20KW** of the daily electricity requirement is supplied from **solar energy**.

The campus contains Lights and fans in use. The entire campus including common facility centers are equipped with LED lamps and LED tube lights, except at few locations. Besides this, photovoltaic cells are also installed in the campus as an alternate renewable source of energy.

Computers are set to automatic power saving mode when not in use. Solar water heaters are installed in hostel buildings and staff quarters as to promote renewable energy. Also, campus administration runs switch–off drill on regular basis. Equipment like Computers is used in power saving mode.

7.1 Solar panels

Solar panel systems are extremely durable and require little to no maintenance over their productive lifetime, which can span 25 years or more. Solar systems are also extremely easy to maintain. The main maintenance that these panels require is an occasional dusting to remove dirt, leaves, or any other fragments. Each kilowatt-hour (kWh) of solar that is generated will substantially reduce greenhouse gas emissions like CO_2, as well as other dangerous pollutants such as sulfur oxides, nitrogen oxides, and particulate matter.

Solar panels in the campus

Photo voltaic cells control unit

7.2 Diesel generator

The college campus is Equipped With Diesel Generators for power backup.The generators were tested for their efficiency, and physical and operating conditions and found to be fit.

Diesel Generator Inside the Campus

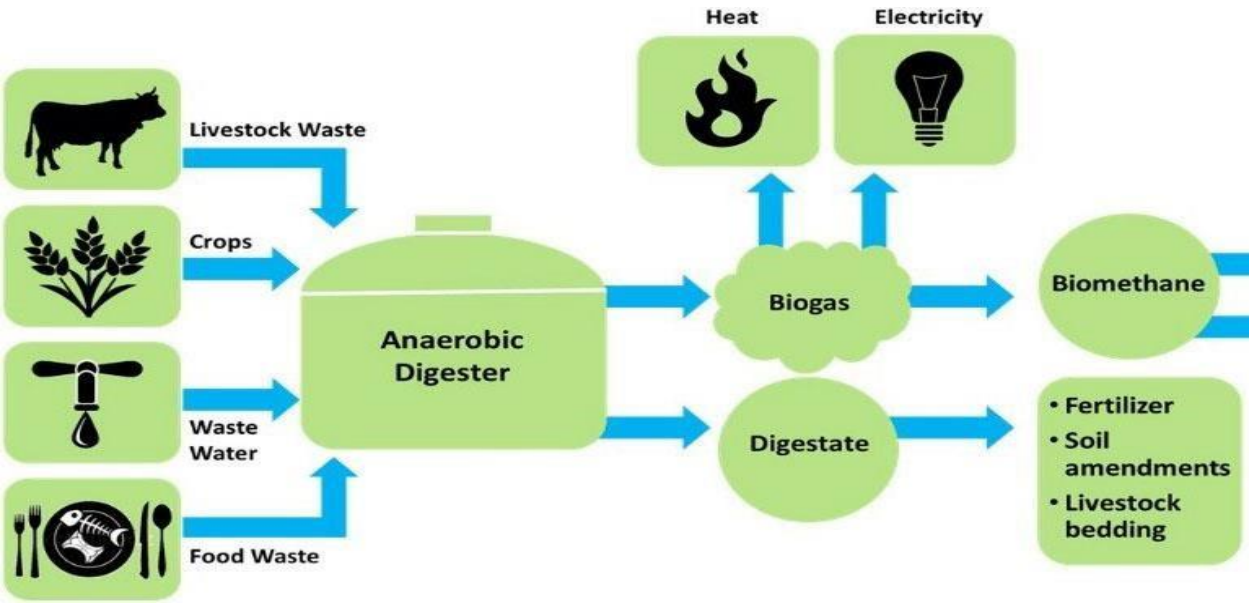
7.3 Biogas Plant

In TNPESU, kitchen waste is used to generate thermal energy for cooking and heating. The biogas produced from food waste, decomposable organic material,and kitchen waste, consisting of methane and a little amount of carbon dioxide is an alternative fuel for cooking gas (LPG).

Kitchen waste is processed and moistened to produce a suspension that subsequently undergoes a fermentation process. Fermentation produces biogas – a valuable energy source – that is desulphurised by biological means. Also, the waste materials can be disposed of efficiently without any odour or flies and the digested slurry from the bio-gas unit can be used as organic manure in the garden.

The major components of the bio-gas plant are a digester tank, an inlet for feeding the kitchen waste, a gas holder tank, an outlet for the digested slurry, and the gas delivery system for taking out and utilizing the produced gas.

The College campus is equipped With $1m^3$ Capacity Biogas Plant to promote the use of alternate energy.Eco-friendly technology allows to produce renewable natural gas in the form of biomethane.The facility processes about10kg of kitchen waste every day. The major waste is organic waste from College hostels, as well as leftover food from campus canteens and expired food.



Biogas production

Biogas Plant Installed inside the Campus

8.Carbon Foot Printing

Carbon Footprint refers to the potential climatic impact (Global Warming) of the Greenhouse Gases (GHG) emitted directly or indirectly due to an organization's activities. A Carbon Footprint Disclosure of any educational institution is very important to understand such that its key emission sources can be identified and necessary mitigation measures can be adopted for carbon reduction.In today's date, very few colleges disclose their carbon emissions. TNPESU has taken a initiative to compute its carbon footprint and set a benchmark for other Colleges/Universities. The college has adopted a carbon reduction strategy to undertake this project.

8.1 Objectives Of Carbon Foot Printing

- Identify key emission sources of GHG at the campus
- Compute Scopes of emissions for operations carried out at TNPESU Campus
- Analyze the results and provide cost effective & efficient measures for reducing the GHG emissions.

8.2 CARBON FOOT SURVEY & ESTIMATION INSIDE THE CAMPUS

Sl.No	Mode of Transport	No of Vehicles	Travellers	To & Fro Km/Per
1	Two Wheelers (Single/Shared)	15	20	20
2	Own Car (Single/Shared)	25	20	15
3	Mini Bus / Private Van	3	200	30
4	Public Transportation / College Bus	-	3000	30

Sl.No	Description	Emission Rate	Annual Consumption/Quantity	Eqt.Co_2 Tonnes/Year
I	Electrical Energy consumption	0.80 kg/kwh	12884kwh	103.91
	Diesel consumption	2.653 kg of Co_2/litre	6000litres	15.92
	LPG	2.983 kg of Co_2/kg	1786kg	5.33
	Fire Wood	1.65-1.80 kg of Co_2/kg	28 T	46.2
II	Food Waste	1.9 kg of Co_2/kg	3.75 T	7.125
	Paper Waste	1.725 kg of Co_2/kg	5.85 T	10.09
	Water Waste	0.298 kg of Co_2/kl	1760kl	0.524
	Plastic Waste	6 kg of Co_2/kg	200 kg	1.2
	Glass/Other	0.77 kg of Co_2/kg	10	0.065
	Sanitary Napkin	0.5 kg of Co_2/kg	2275 kg	1.1375
III	Two Wheelers	2.38 kg of Co_2/L	10000*250/50=50000	103
	Own Car	2.653 kg of Co_2/L	800*250/20=10000	26.52
	Mini Bus / Van	2.653 kg of Co_2/L	90*250/8=2812	7.46
IV	Events	Approx	500*8*1.5=6000kg	15.91
Total				**155.836**

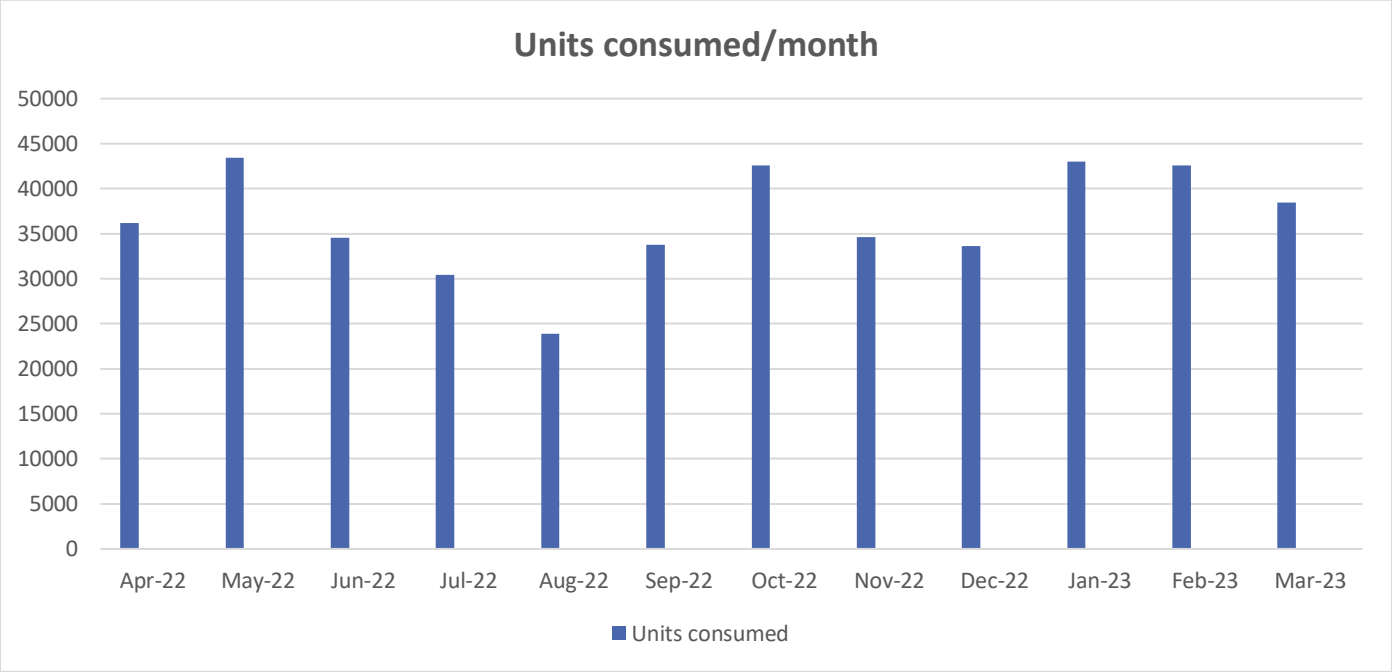
Recommendations

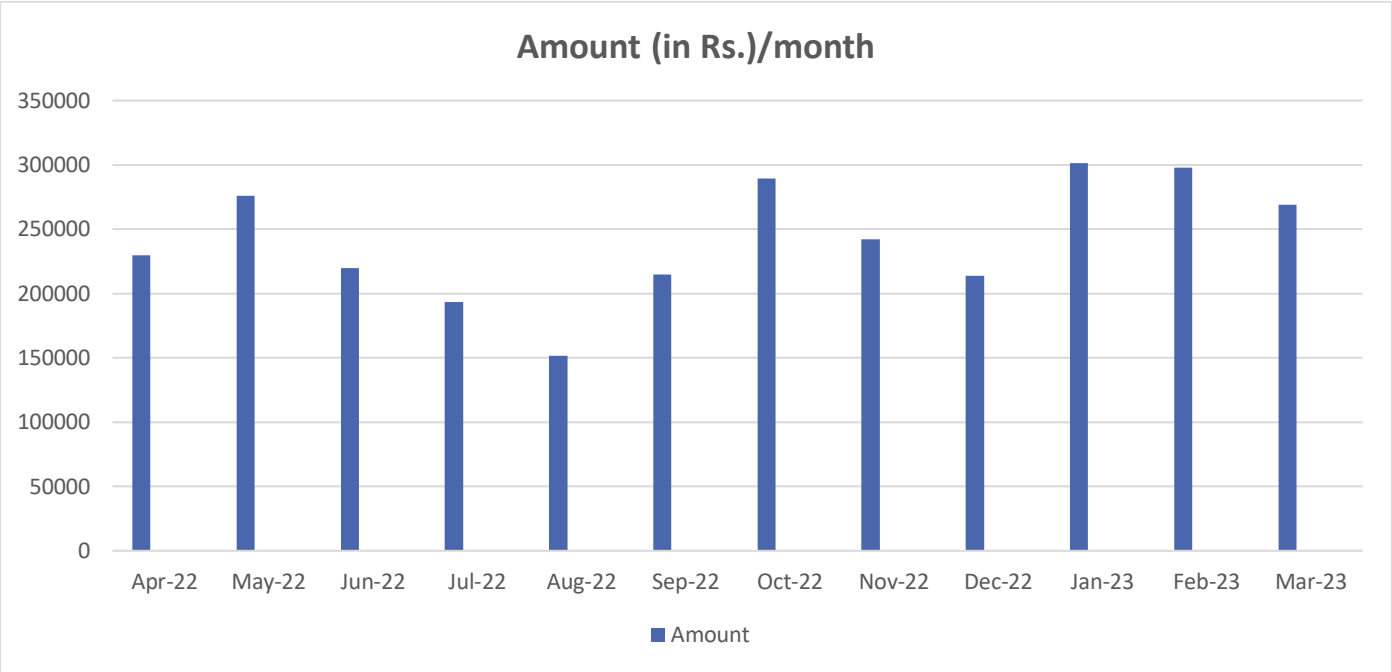
- Regular maintenance of the air conditioners and refrigerators should be done and records should be maintained
- Reheating of food can be done on induction / microwave minimizing the use of LPG.
- sub-metering system for electricity usage may help to identify high energy consumption areas.
- The systems (computers, laptops, air conditioners, refrigerators etc.) should be procured for the college considering the latest energy efficient technologies in the markets. (For ex All in One Units etc.)
- Occupancy sensors should be installed in the classrooms and offices.

9. POWER CONSUMPTION ANALYSIS

The power consumed by the college for a year on a monthly basis is depicted below:

S.No	Month/year	Units consumed (kw/h)	Bill amount
1	03/2023	38430	269010
2	02/2023	42569	297983
3	01/2023	43037	301259
4	12/2022	33615	213988
5	11/2022	34604	242228
6	10/2022	42557	289600
7	09/2022	33797	214610
8	08/2022	23879	151631
9	07/2022	30425	193198
10	06/2022	34580	219583
11	05/2022	43441	275850
12	04/2022	36157	229596





9.1 POWER QUALITY AUDIT

A power quality audit checks the reliability, efficiency, and safety of an organization's electrical system. The audit verifies the following aspects:

The continuity of the power supply: It checks if the power in the network is available on a regular basis and can ensure the efficient operation of the equipment.

The quality of the voltage: It checks if there are no low or high-frequency disturbances in the network capable of damaging the system components.

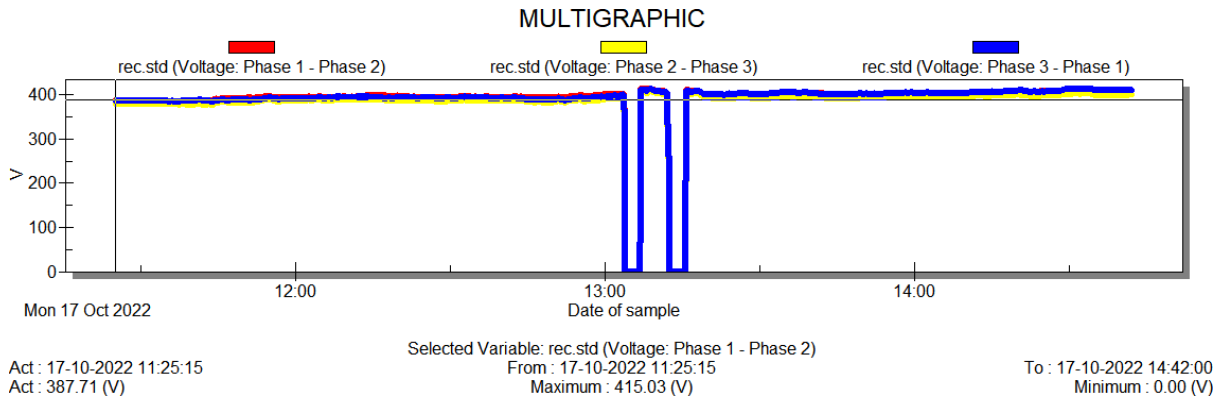
Benefits Of Power Quality Analysis

- Assist in preventative and predictive maintenance
- Identify source and frequency of events
- Establish precise location and timing of events
- Develop maintenance schedules
- Monitor and trend conditions
- Analyse harmonics, Flicker, Transients frequency variation,voltage variations (sag & swell).
- Ensure equipment performance
- Assess the sensitivity of process equipment to disturbances
- Evaluate performance against specifications

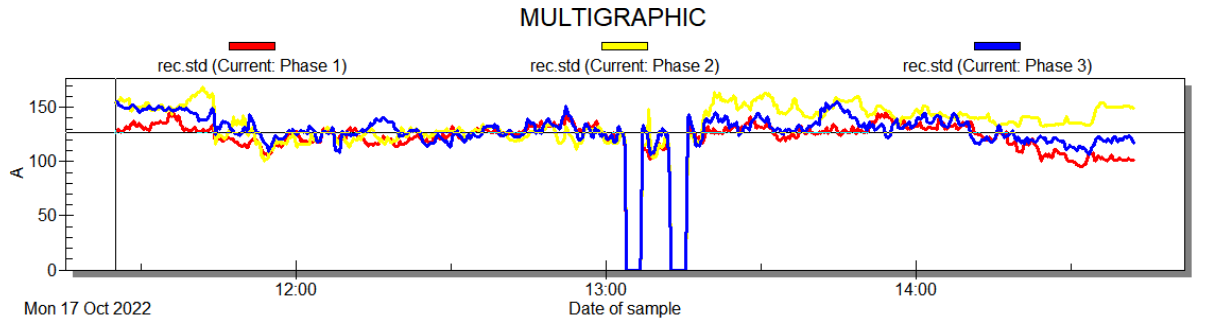
Observations

TRANSFORMER LT SIDE

Voltage profile



Current profile



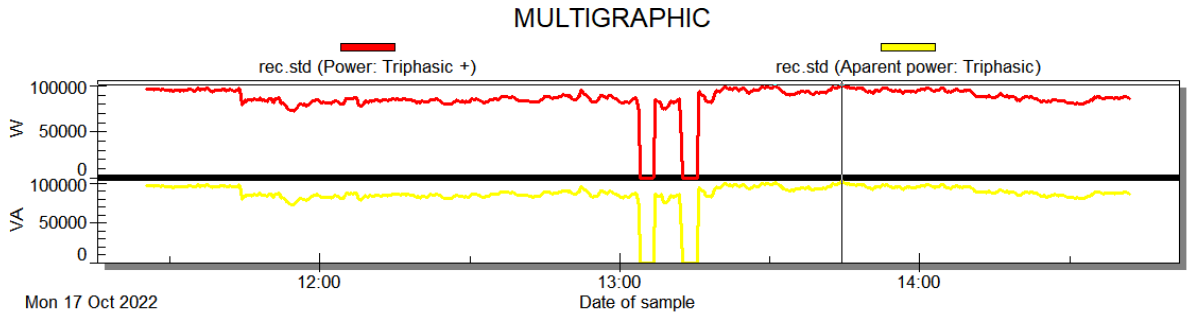
Selected Variable: rec.std (Current: Phase 1)

Act : 17-10-2022 11:25:15
Act : 127.1841 (A)

From : 17-10-2022 11:25:15
Maximum : 145.8516 (A)

To : 17-10-2022 14:42:00
Minimum : 0.0000 (A)

Load Profile



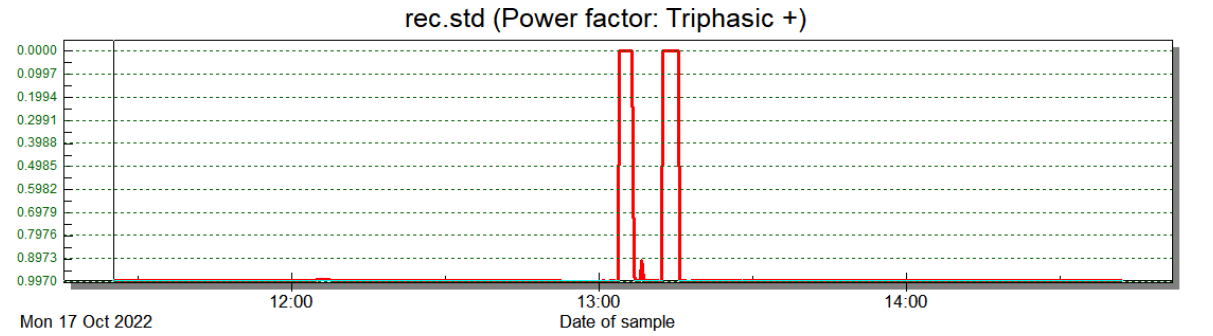
Selected Variable: rec.std (Power: Triphasic +)

Act : 17-10-2022 13:44:30
Act : 101257.0 (W)

From : 17-10-2022 11:25:15
Maximum : 101257.0 (W)

To : 17-10-2022 14:42:00
Minimum : 0.0 (W)

Power Factor Profile

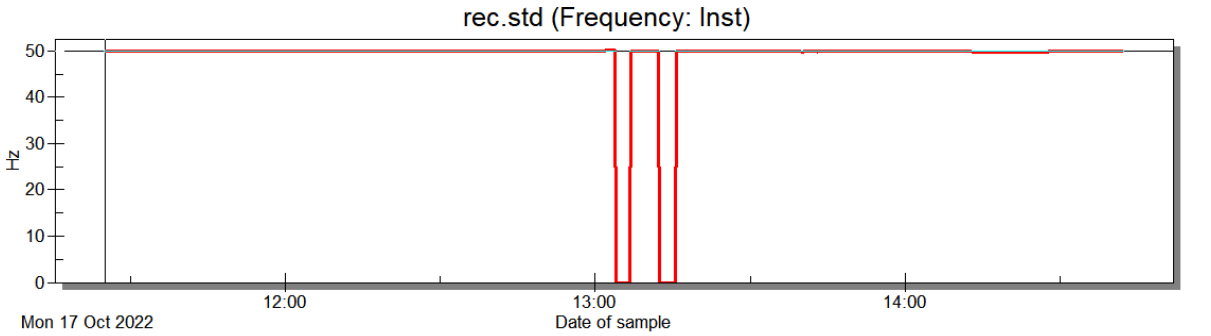


Act : 17-10-2022 11:25:15
Act : 0.992

From : 17-10-2022 11:25:15
Maximum : 0.000

To : 17-10-2022 14:42:00
Minimum : 0.997

Frequency

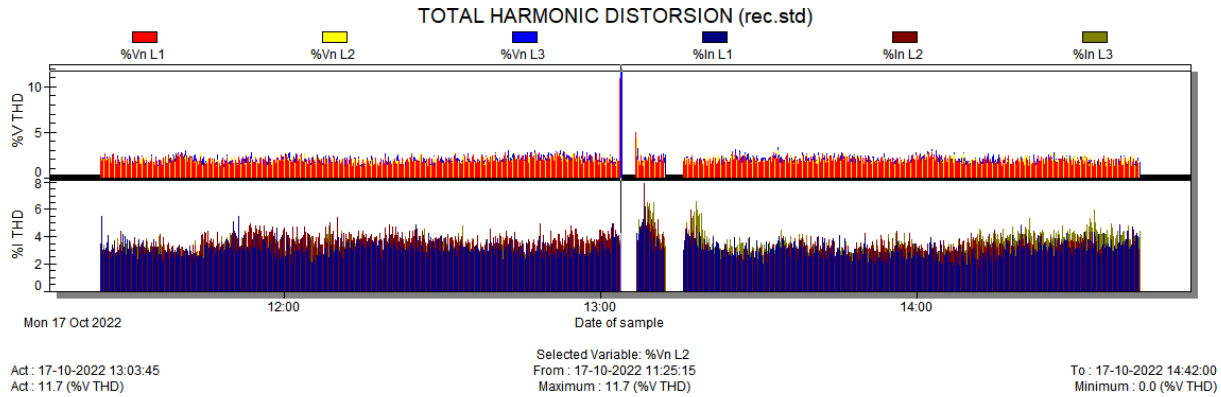


Act : 17-10-2022 11:25:15
Act : 49.96 (Hz)

From : 17-10-2022 11:25:15
Maximum : 50.13 (Hz)

To : 17-10-2022 14:42:00
Minimum : 0.00 (Hz)

Total Harmonic Distortion



Individual Harmonics

Individual Harmonics							
As per IEEE-519, 2014, permissible % of individual voltage harmonics is 5 % Current harmonics for <11 order is 10 %	Order of Harmonics	Voltage			Current		
		R	Y	B	R	Y	B
	3	0.21	0.36	0.41	2.18	3.16	2.04
	5	0.38	0.84	1.01	0.57	0.74	1.6
	7	1.45	1.2	1.23	0.47	1.17	1.44
	9	0.22	0.23	0.42	0.67	0.66	0.56
	11	0.34	0.27	0.55	0.47	0.59	0.29

Summary:

S. No	Description	Remarks	
1	Location	INCOMING MAIN POWER HOUSE	
2	Voltage	Incoming voltage is varying from 379.3 V to 387.7 V.	
3	Load Current, A	Varying from 101.3A A to 127.18 A.	
4	Power, Kw	Varying from 98.45 kW to 101.257 kW.	
5	Power, kVA	Varying from 98.23 kVA to 101.885 kVA.	
6	THD Voltage (%)	R	1.8
		Y	2.2
		B	2.6
7	THD current (%)	R	2.8
		Y	3.8
		B	2.8
8	Power Factor	Varying from -0.99 to 0.99	
9	Frequency, Hz	Varying from 49.8 Hz to 50.13 Hz.	
10	Any Interruption observed. if yes details	Yes. Power cut From 13:04:15 to 13:06:45 and 13:12:30 to 13:15:30	
11	Voltage Sags	No	
12	Over voltage	No	
13	Voltage unbalance, %	Varying from 0.5 % to 1.4 %.	
14	Current unbalance, %	Varying from 0.1 % to 12.8 %.	

Remarks:

- Current unbalance is slightly higher than acceptable level.

11. RECOMMENDATIONS

- The management should support more of renewable and carbon-neutral electricity options in any energy- purchasing consortium, with the aim of supplying all college properties with electricity that can be attributed to renewable and carbon-neutral sources.
- The campus administration should run switch–off drills on regular basis.
- 5–star rated Air Conditioners, Fans and CFLs should be used.

12. CONCLUSION

Energy Rating

After the complete survey and analysis of the campus as per ISO 50001:2018 energy management system standards, we rate the campus **Score 4/5.**

Energy Conservation is the wave of the future. The world is quickly moving towards Energy sustainability. An energy-efficient organization is a step toward the direction of renewable energy, environmental protection, and sustainable living. Thus, concluded that by energy auditing we identify cost-effective ways to improve the comfort and efficiency of buildings.

13. ACKNOWLEDGEMENT

We are grateful to the management and committee members of Tamilnadu Physical Education and Sports University to award this prestigious project on energy auditing. Further, we sincerely thank the college staff for providing us with the necessary facilities and cooperation during the audit. This ample co-operation helped us a lot in making this audit possible and successful.

FOR QRO CERTIFICATIONS

ER.P.VIVEK M.E

CHARTERED ENGINEER &COMPETENT PERSON

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Website : www.tuv-nord.com/in

Date: 4th March 2021

Certification

This is to certify that the **Tamil Nadu Physical Education & Sports University** has successfully completed **Energy, Environment and Green Audit** as per **NAAC criterion 7** located at Melakottaiyur, Chennai.

Audit Month: February 2021

Period of study: 2019-20 & 2020-21

N Pradeep Kumar

Associate Vice President – Certification, Tamil Nadu Region

GREEN AUDIT REPORT

For

TAMIL NADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY

Melakottaiyur, Chennai.

By

TÜV INDIA PRIVATE LIMITED,
TÜV NORD GROUP
2nd floor, Dhun Building, 827,
Anna Salai, Mount Road, Chennai – 600 002

March 2021

ACKNOWLEDGEMENT

TUV India Pvt Ltd wishes to thank all the staff and Management of **Tamil Nadu Physical Education and Sports University (TNPESU),** Chennai Management & Technical Team for the kind cooperation and assistance extended to our Auditors during the course of the Green audit.

Auditors

S Prabhu Kiran

Prakash G

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1. EXECUTIVE SUMMARY

Green Audit of Tamil Nadu Physical Education and Sports University was carried out by TUV India Pvt Ltd team during Feb 2021.

The approach taken in this facility included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and associated systems & equipment, including the electrical, lighting & AC systems, and operational & maintenance procedures. Sample measurements were taken using various instruments like ALM Power Analyzer, clamp meter, Infrared Thermometer, Lux meter, Humidity meter, CO_2 meter, etc. Operational Data were also collected from the past records. The study covered the following areas to summarize the present status of environment management in the campus:

- Water management
- Energy Conservation
- Waste management
- Green area management

The report accounts for the energy consumption patterns of the Tamil Nadu Physical Education and Sports University based on actual assessment. The report compiles a list of possible actions to conserve and efficiently access the available scarce resources and their saving potential was also identified.

The overall annual energy consumption is 21,82,442 kWh/annum. The annual greenhouse gas emissions equivalent for electricity is **1855 tons of CO_2** (0.85kg of CO_2 emits /kWh of unit generation).

Total Global Warming Impact in CO2 Equivalent

S.No	GHG source	Tonnes of CO2 Equivalent
1	Road Transport	1.77
2	Electricity	1855
3	HVAC System	1.2
4	DG Operation	2.24
Total GHG Emission		**1860.21**

Overall 31% **i.e. 6,77.081.6 kWh** unit's savings identified on above mentioned categories with average payback of **53 months** and reduced annual greenhouse gas emissions equivalent to **575.5 tons of CO_2.**

2. List of Performance Improvement Measures at Tamil Nadu Physical Education and Sport University, Chennai.

S No	ECM Description	Annual Energy savings kWh	Annual savings, Lacs.	Cost of Measure, Lac.	Payback Months
1	PIM 1: Water saving through the efficient dual flush water closet	1281.6 L/Annum	0.11	0.05	6
2	PIM 2: Tube light lamps to be changed with appropriate LED lamps to reduce power consumption	2520	0.25	0.5	24
3	PIM 3: Replacing old celling fan to Super fans	16,128	1.64	4.8	35
4	PIM 4: Install Solar PV in roof top to reduce overall power consumption	6,57,100	67	300	53
Total		**6,77,081.6**	**69**	**305.35**	**53**

3. PROJECT BACKGROUND

The Tamil Nadu Physical Education and Sports University (TNPESU) is India's first state university for Physical Education and Sports located at Melakottaiyur, Chennai. It was established by an Act of the Government of Tamil Nadu in 2004. The University is UGC approved and offers regular and distance learning UG, PG, Diploma, Certificate and PG Diploma programmes in the fields of Physical Education, Yoga, Exercise Physiology, Bio-Mechanics, Sports Management, Sports Psychology and Sociology, Advanced Sports Training and Sports Technology. Tamil Nadu Physical Education and Sports University has a "B++" grade accreditation by the National Assessment and Accreditation Council [NAAC]. Tamil Nadu Physical Education and Sports University has an area of 125 acres which is spread in the outer of Chennai city.

Tamil Nadu Physical Education and Sport University major facilities: -

- Indoor & Outdoor stadium
- Health Centre
- Food Court
- Recreational Center
- Sports Pavilion and Gymnasium

4. GREEN AUDIT

The main objective of the green audit is to promote the Environment Management and Conservation in the College Campus. The purpose of the audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

The main objectives of carrying out Green Audit are:

- To introduce and aware students to real concerns of environment and its sustainability
- To secure the environment and cut down the threats posed to human health by analyzing the pattern and extent of resource use on the campus.
- To establish a baseline data to assess future sustainability by avoiding the interruptions in environment that are more difficult to handle and their corrections requires high cost.

Green Audit also includes the preliminary analysis and more detailed energy calculations-financial analysis of proposed Performance Improvement Measures (PIM). The financial analysis provides the facility team the understanding of the financial benefits in implementing specific Performance Improvement Measures. Utility bills were collected for three months' period to allow the auditor to evaluate the facility's energy/demand rate structures and energy usage profiles. A detailed financial analysis is performed for each measure based on implementation cost estimates; site-specific operating cost savings, and the customer's investment criteria. Sufficient detail is provided to justify project implementation.

5. ELECTRICAL SYSTEM

The electrical power is availed from Telangana Southern Power Distribution Company Limited (TSSPDCL). The power is distributed through LT panel located in the Facility Area. The power is distributed to the college through transformer of loading position 11KV/433V, 315kVA distribution transformer.

There is 1 No. of 45 kVA & 1 Nos. of 160 kVA DG set for the backup to handle any grid power interruption.

HT 11/433V

TR#1 315kVA

DG-1
63 kVA

- Administrative Block
- Academic Block
- Gents Hostel
- Ladies Hostel
- Gents Mess Hall
- Ladies Mess Hall
- Electric Panel Room 1
- Electric Panel Room 2
- Vice Chancellors Quarters
- Registrars Quarters
- Assistant Professors Quarters
- Office Assistants Quarters
- Indoor Stadium
- Sports Hostel

5.1 ELECTRICAL BILL ANALYSIS

The Energy bill data were analyzed from Jan 2020 to Dec 2020, the total electricity bill for the year 2020 is Rs.21,82,442 and energy unit consumption is 2,19,190 kWh.

Month	Energy Consumption kWh	Energy Cost Rs	Unit Cost Rs/kWh
Jan-20	29,630	2,54,219	8.58
Feb-20	23,147	2,13,051	9.20
Mar-20	21,979	2,05,635	9.36
Apr-20	11,098	1,36,540	12.30
May-20	14,638	1,59,019	10.86
Jun-20	14,800	1,60,048	10.81
Jul-20	13,937	1,54,568	11.09
Aug-20	16,138	1,68,544	10.44
Sep-20	18,948	1,84,108	9.72
Oct-20	18,974	1,86,603	9.83
Nov-20	15,920	1,67,160	10.50
Dec-20	19,981	1,92,947	9.66
Total	**219,190**	**21,82,442**	**10.20**

Table: Energy Bill Analysis Jan'20 to Dec'20

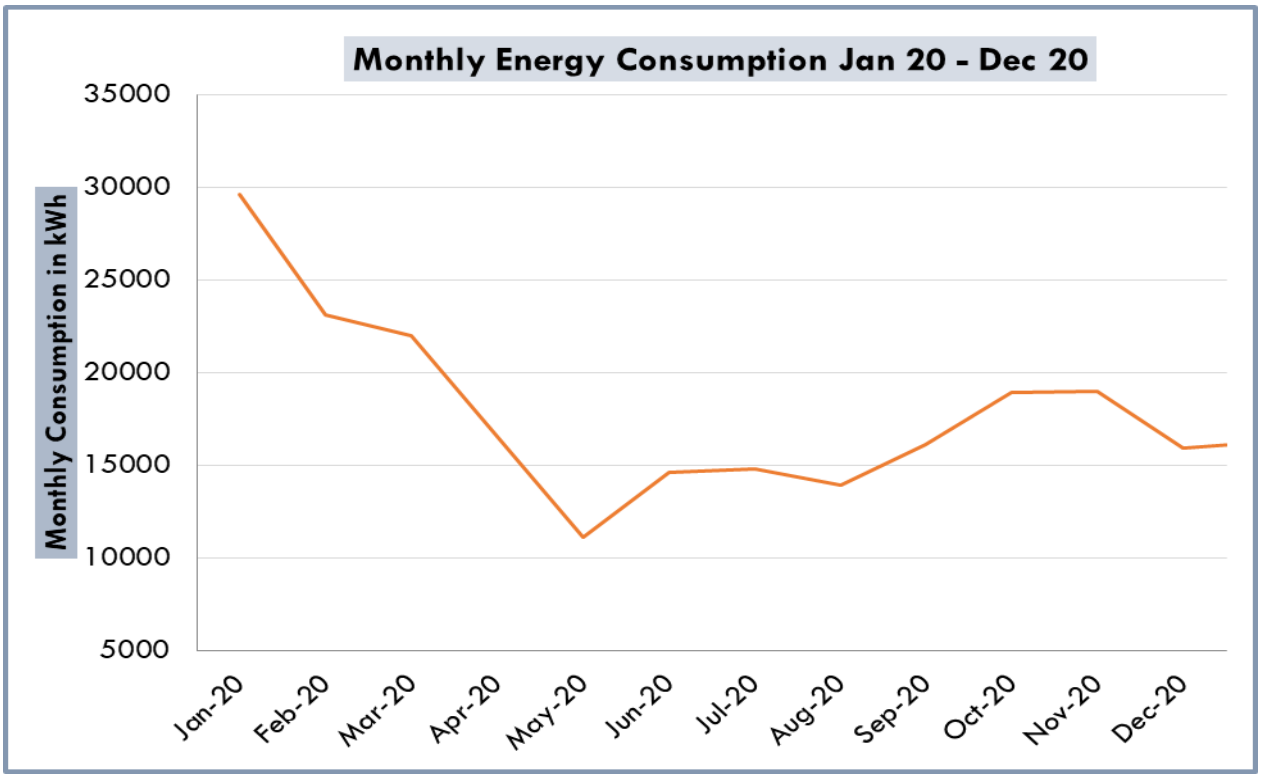

Chart: kWh Consumption analysis – During Jan 2020 energy consumption is high

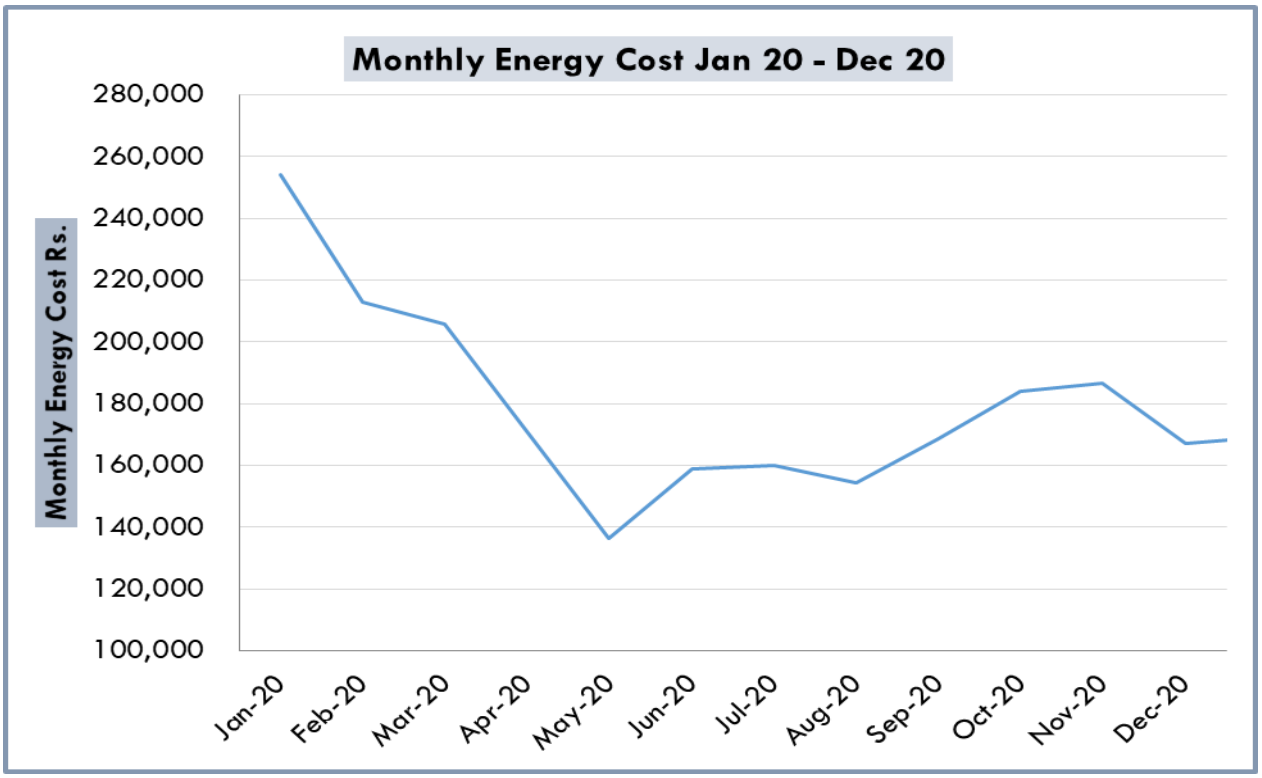

Chart: Monthly Energy Cost Analysis – During Jan 2020 energy cost is high

5.2 UNIT COST ANALYSIS

The Energy bill data from Jan 2020 to Dec 2020 were analyzed. Per unit cost for the period of study was calculated to be Rs 10.20/kWh.

Month	Energy Consumption kWh	Energy Cost Rs	Unit Cost Rs/kWh
Jan-20	29,630	2,54,219	8.58
Feb-20	23,147	2,13,051	9.20
Mar-20	21,979	2,05,635	9.36
Apr-20	11,098	1,36,540	12.30
May-20	14,638	1,59,019	10.86
Jun-20	14,800	1,60,048	10.81
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Nov-20	15,920	1,67,160	10.50
Dec-20	19,981	1,92,947	9.66
Total	**219,190**	**21,82,442**	**10.20**

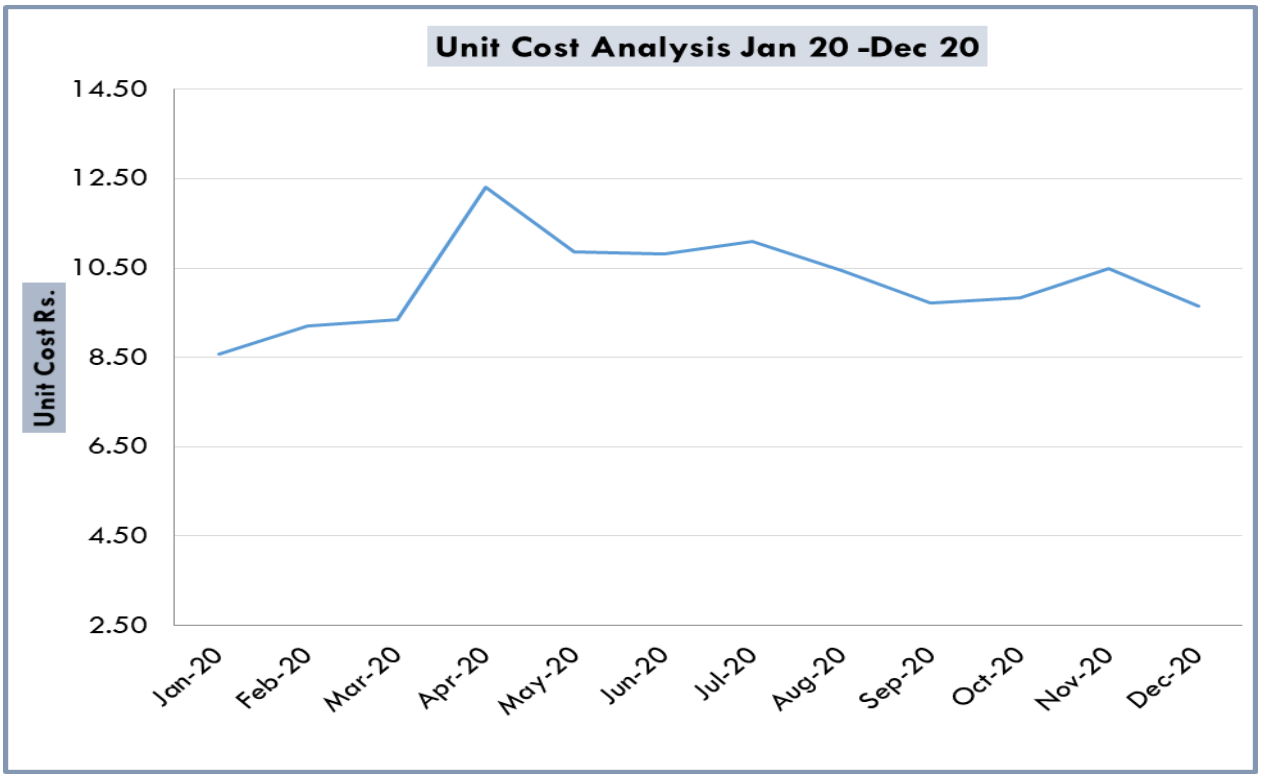


Chart: Monthly Unit Cost – During Apr 2020 Unit Cost Rate is high.

5.3 LIGHTING ANALYSIS

Good lighting is necessary to enable work to be done well and in comfort. A facility with bad lighting is an inefficient one, though it may look attractive. Poor lighting can be combated by good eyesight and by keenness on work but at the eventual expenses of efficiency, wellbeing and comfort. Hence, the designer of the building should pay sufficient attention to the need for good lighting.

The lighting details of the facility were studied. The various type of light fitting used are 15W LED, 20W LED, 30W LED & 36W TL lamps.

5.4 LIGHTING ANALYSIS

S. No	Description	LUX Level	Baseline Lux Level as per NBC	Remarks
1	Principal Room	170, 195, 210, 280,324	300	Ok
2	Library Hall	200, 260, 230, 162,290,332	300	Ok
3	Auditorium	117, 135, 180, 190, 210, 340	300	Ok
4	Server Room	120, 140, 280,320	200	Ok
5	Gents Mess Hall	210,280,320,440	200	Ok
6	Ladies Mess Hall	230,260,310,460	200	Ok
7	Gents Hostel Room	210,280,260,320	50	Ok
8	Ladies Hostel Room	265, 285, 330	50	Ok
11	Lecture Hall 1	250,320,380	300	Ok
12	Lecture Hall 2	230,260,340	300	Ok
13	Lecture Hall 3	220,250,330	300	Ok
14	Lecture Hall 4	250,275,315	300	Ok
15	Lecture Hall 5	235,285,350	300	Ok
16	Lecture Hall 6	270,290,340	300	Ok

Comments:

Lux level is measured during day light availability and it is very good level compared to NBC standards.

5.5 LIGHTING POWER DENSITY

S No	Description	Fixture Details	Fixture Wattage	No. of fixtures	Total Wattage	Area Sq.ft	Actual LPD W/sq.ft	ASHRAE LPD W/sq.ft
1	Gents Mess Hall	36 W TL	36	15	540	2064	0.26	1.21
2	Ladies Mess Hall	36 W TL	36	15	540	1160	0.47	1.21
3	Library Reading Hall	36 W TL	36	48	1728	2760	0.63	0.93
4	Ladies Hostel room 1	36 W TL	36	15	540	1456	0.37	1.21
5	Ladies Hostel room 2	36 W TL	36	15	540	1456	0.37	1.21
6	Ladies Hostel room 3	36 W TL	36	15	540	1456	0.37	1.21
7	Gents Hostel Room 1	36 W TL	36	15	540	1456	0.37	1.21
8	Gents Hostel Room 2	36 W TL	36	15	540	1456	0.37	1.21
9	Gents Hostel Room 3	36 W TL	36	15	540	1456	0.37	1.21
10	Class Room G15	20 W LED	20	12	240	520	0.46	1.24
11	Class Room G16	20 W LED	20	12	240	520	0.46	1.24
12	Class Room G17	20 W LED	20	12	240	520	0.46	1.24
13	Class Room G18	20 W LED	20	12	240	520	0.46	1.24
14	Academic Block Lobby 1	36 W TL	36	4	144	220	0.65	0.9
15	Academic Block Lobby 2	36 W TL	36	4	144	220	0.65	0.9
16	Admin Block Lobby	36 W TL	36	2	72	140	0.51	0.9

Comments:

LPD is within in the ASHRAE limit. We recommended to replace the 36 W TL to 20 W LED for better energy savings.

6. HEATING VENTILATING & AIR CONDITIONING (HVAC)

In College campus for human thermal comfort, sum of 152 TR capacities of split units installed, in Library computer lab, Admin Block and Academic Block are installed in the campus to meet the cooling requirement. Along with this, for ventilation in the facility, ceiling and exhaust fans are installed.

6.1 PERFORMANCE ANALYSIS OF SPLIT UNITS

Admin Block Server Room AC 1		
Description	**Name Plate Details**	
Make	Voltas	
Motor Power, kW	1.77	
Rated Current, A	7.9	
Refrigerant & Charge	R-22, 1.13 kg	
Capacity, TR	2	
Star Rated	5 Star	
Inside Air Flow, CMH	1080	
Performance Analysis		
Description	**Actual**	**Units**
Motor running current	5.8	A
Voltage	227.2	V
PF	0.91	
Motor power	1.51	kW
Supply air quantity	110	CFM
Supply air temperature	19.3	°C
Relative humidity	62	%
Return air temperature	21.8	°C
CO_2 Level	765	PPM

Comments:

Power consumption is within the design limit and CO_2 level is within limits.

Admin Block Server Room AC 2		
Description	**Name Plate Details**	
Make	Voltas	
Motor Power, kW	1.77	
Rated Current, A	7.9	
Refrigerant & Charge	R-22, 1.13 kg	
Capacity, TR	2	
Star Rated	5 Star	
Inside Air Flow, CMH	1080	
Performance Analysis		
Description	**Actual**	**Units**
Motor running current	5.6	A
Voltage	221.9	V
PF	0.9	
Motor power	1.48	kW
Supply air quantity	105	CFM
Supply air temperature	21.1	°C
Relative humidity	61	%
Return air temperature	22.7	°C
CO_2 Level	756	PPM

Comments:

Power consumption is within the design limit and CO_2 level is within limits.

Academic Block Health Care Room AC 1		
Description	**Name Plate Details**	
Make	LLOYD	
Motor Power, kW	1.59	
Rated Current, A	7.0	
Refrigerant & Charge	R-22, 1.08 kg	
Capacity, TR	1.5	
Star Rated	3 Star	
Performance Analysis		
Description	**Actual**	**Units**
Motor running current	6.7	A
Voltage	223.7	V
PF	0.9	
Motor power	1.5	kW
Supply air quantity	96	CFM
Supply air temperature	21.5	°C
Relative humidity	65	%
Return air temperature	22.9	°C
CO_2 Level	670	PPM

Comments:

Power consumption is within the design limit and CO_2 level is within limits.

6.2 INDOOR AIR QUALITY

Indoor air quality (IAQ) is a term which refers to the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants. IAQ can be affected by various gases, volatile organic compounds etc. Source control, filtration and the use of ventilation to dilute contaminants are the primary methods for improving indoor air quality in most buildings. Determination of IAQ involves the collection of air samples at various locations of the building.

During the course of audit, the Indoor air quality survey was carried out at various locations in the building.

S.No	Area	Temperature	CO_2 ppm	Relative Humidity %
1	Auditorium	21.6	640	61
2	Library Computer Lab - 1	23.4	810	60
3	Health Care room	20.8	670	65
4	Admin Block Server room	19.9	765	61

Comments:

On an overall observation, the occupant comfort temperature shall be maintained at 24◦C, & Humidity needs to be maintained at < 60%. CO2 level is good.

7 WATER

Drinking Water for the entire college is taken from quarry and it treated by proper RO system. RO water system are installed in each block to meet the drinking water requirement. For flushing, irrigation and cleaning purpose water is taken from the same quarry, water is pumped to the raw water sump then the OHT at terrace levels.

7.1 PERFORMANCE ANALYSIS OF WATER FAUCETS

Water flow is measured in faucets of College toilets wash basin, urinals & water closets.

S. No.	Description	NBC Baseline (LPM)	Actual (LPM)
1	First floor gents toilet wash basin 1	1.5	7.1
2	First floor gents toilet wash basin 2	1.5	6.8
3	Ground Floor ladies toilet tap 1	3	17.0
4	Ground Floor ladies toilet tap 2	3	18.9
5	Wash basin tap 1	1.5	11.0
6	Wash basin tap 2	1.5	13.0
7	Water Closets	6	6.0
8	Academic Block first floor Wash basin tap 1	1.5	7.5
9	Academic Block first floor water closet 1	6	6.0
10	Academic Block first floor water closet 2	6	6.0
11	Admin Block ground floor Wash basin tap 1	1.5	5.5
12	Admin Block ground floor water closet 1	6	6.0

Comments: Water flow in the faucets and tap are high in above highlighted area comparing to the NBC standard. The baseline standards are as per the NBC 2016 part no: 9 section 1 table – 2.

7.2 PERFORMANCE ANALYSIS OF DOMESTIC WATER PUMPS

Water Pump-1

Description	Bore Well Water Pump -1
Installed motor power, kW	3.75
No. of Phase	3
Description	**Readings**
Voltage, V	404.8
Current, A	4.8
Power Factor, PF	0.943
Power consumption, kW	3.17

Comments:

Power consumption is within the design limit. Water meter shall be installed in outlet of the quarry motor pipe to measure the water consumption from the quarry and consumption in each block. Quarry water Consumption Record shall be maintained on daily, monthly basis to arrive at the water balancing.

Sump Water Pump-1

Description	Sump Water Pump -1
Make	C R I
Capacity, m^3/hr	9
Motor current, A	3.0
Motor RPM	2880
Installed motor power, kW	1.1
Head, m	32
Description	**Readings**
Voltage, V	421
Current, A	2.1
Power Factor, PF	0.787
Power consumption, kW	0.9

Comments:

Power consumption is within the design limit. Water meter shall be installed at the overhead tank outlet to measure the water consumption from the terrace tank. Water Consumption Record shall be maintained on daily, monthly basis to arrive at the Water balancing.

Sump Water Pump -2

Description	Sump Water Pump -1
Make	C R I
Capacity, m^3/hr	9
Motor current, A	3.0
Motor RPM	2880
Installed motor power, kW	1.1
Head, m	32
Description	**Readings**
Voltage, V	421
Current, A	2.8
Power Factor, PF	0.823
Power consumption, kW	1.69

Comments:

Power consumption is within the design limit. Water meter shall be installed at the overhead tank outlet to measure the water consumption from the terrace tank. Water Consumption Record shall be maintained on daily, monthly basis to arrive at the Water balancing.

7.3 WATER NEUTRALITY

Presently quarry water is used to meet the entire buildings water requirement.

Strategies for Water Neutrality: -

a. **Low flow aerators.**

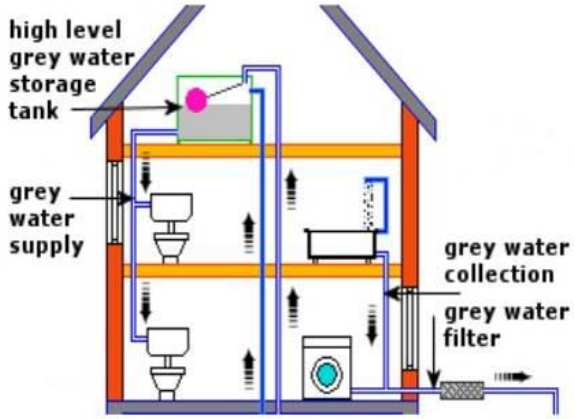
To reduce the fresh water consumption, by installing the aerators for faucets in all common area restrooms, landscape irrigation, canteen etc. This measure reduces the water consumption by 40% from the baseline of NBC.

b. Sewage Treatment Plant

To reduce the potable water consumption by installing the sewage treatment plant (STP). In the college campus 2 hostel blocks are there and totally per day water consumption is 120 KL per day. So the waste water generation will be around 120 KL per day. So the recommended STP plant size will be 120 KLD. This treated water will be used for landscape irrigation & toilet flushing purpose.

c. Dual Plumbing System.

To reduce the potable water consumption by installing the dual flush system (3/6 LPF). To further reduce the fresh water consumption, use the STP treated water as mentioned above.



d. Native Plant Species.

For landscape irrigation, fresh potable water is being used. To reduce water consumption for landscape, in some places drip irrigation method is being used. However, in some places hose pipe irrigation is being used and this result in more water consumption. It is recommended to install drip irrigation for all shrubs & tree type species and sprinkler irrigation for turf area. To reduce the water consumption by replacing the drought tolerant/xeriscape species.

7.4 WATER QUALITY ANALYSIS

In College campus, drinking water is taken from tanker lorry (Costly) and municipal corporation water. Normally, for drinking water daily consumption of lorry water - 8000 liters and municipal water - 250 liters, so totally 8250 liters per day is consumed. For landscape irrigation, floor cleaning & toilet flushing water is taken from two bore well and the total dissolved solid (TDS) level is given below.

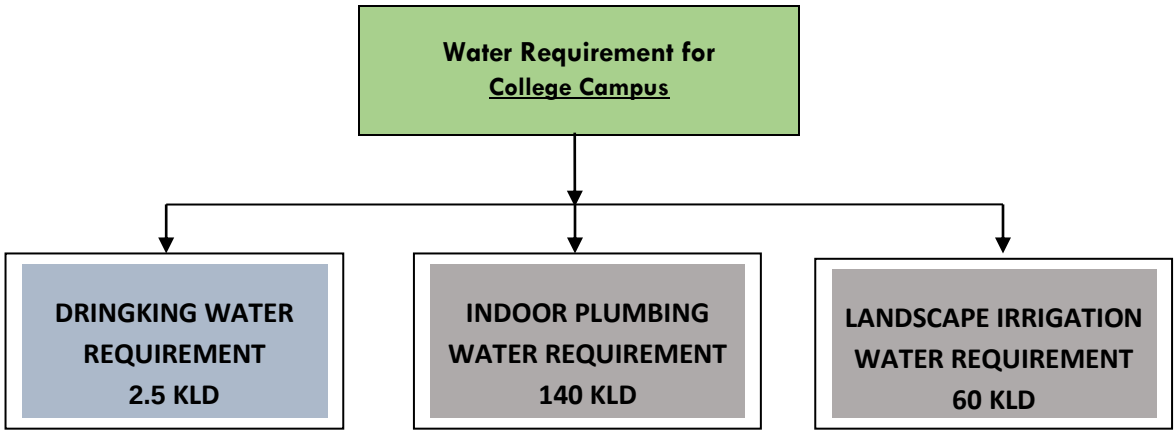
Location	Water TDS level	Temperature in ° C
Quarry Water	640	31.4
Ground Floor Water Cooler	260	27.6
Second Floor Water Cooler	253	25.6

Comments:

As per the WHO recommended drinking water TDS level is < 300. In our campus drinking water TDS level is within the limit. For quarry, water treatment system is required to reduce the TDS level.

7.5 WATER BALANCE CHART

Source of drinking water is from the quarry water, to underground reservoir, it is transferred to Overhead tank and supplying the water with the help RO systems. And same quarry water is in usage to meet the landscape irrigation, cleaning & toilet purpose. There is no sewage plant installed in this plant, sewage is connected through the municipal sewerage line.



7.6 RAINWATER HARVESTING SYSTEM

In college campus rainwater is collected and recharge the ground with the help of a quarry water reservoir and Melakottaiyur Lake and the lake and reservoir is located near to the college campus. Rainwater trenches are built according to the slope of the surface level and it connect the roof and non-roof rainwater to rainwater harvesting system.

8 WASTE MANAGEMENT SYSTEM

In college campus, separate dry waste and wet waste type of waste collection bins are provided for collection of waste. All waste generated from the building operation was analyzed. A waste audit was performed on 28/02/2021 at Tamil Nadu Physical Education and Sports University, Chennai to identify opportunities to divert waste streams from landfills and to determine further source reduction opportunities.

Waste Treatment:

Different types of waste are collected from the hostel mess & other places are sent to Municipal. In the college campus is the common solid waste management center for segregation and effective management of waste generated in the college premises. The unit has specific sections where solid waste is segregated as 'wet' and 'dry'. The dry waste such as plastics, papers, cartons, e-waste and scrap are separated and sent to 'recycle vendor' for recycling. The organic waste such as dried leaves and kitchen refuse from the canteen are used for composting.

Month	Cardboard Waste, Kg	Paper Waste, Kg	Plastic Waste, Kg	Bottle Kg	Total Waste, Kg
Mar-19	-	338	-	-	**338**
Apr-19	-	338	-	-	**338**
May-19	-	2082	-	-	**2082**
Jun-19	-	1106	-	-	**1106**
Sep-19	133	6697	108	16	**6954**

Oct-19	42	3651	71	20	**3784**
Nov-19	57	108	29	-	**194**
Dec-19	131	87	92	30	**340**
Jan-20	133	19	41	-	**193**
Feb-20	90	164	99	54	**407**
Mar-20	27	61	46	-	**134**
Jan-21	41	7	105	-	**153**
Feb-21	3802	3070	126	9	**7007**

Waste Audit Procedure:

- Waste auditing was carried out by sorting and measuring the building's waste over a given time period, i.e. 24 hours' time. And Audit team selected a time period of 16th Feb 2021.
- The Audit Team was equipped with all necessary safety and personal protective devices including safety glasses, respirator masks, coveralls and gloves.
- The Audit team has taken the waste audit form and marked the following types:
    - Papers
    - Tissue paper
    - Pet bottles
    - Plastic covers
    - Printed hard paper
    - Food waste
- Each waste type was separated and measured for the weight through a weighing scale. The values were entered in the waste audit form and compared against the total weight of all wastes.

9 GREEN HOUSE GAS EMISSION

Climate change resulting from human activities is now recognised as one of the most pressing environmental issues facing the world's population. In addressing this problem, governments, the international community and industry are moving to control emissions of greenhouse gases (GHGs), setting targets such as those agreed at the Kyoto Conference in 1997. These moves will continue in the future and, inevitably, businesses and other organizations will increasingly have to account for and report on GHG emissions.

In the college campus total occupants is 847 (approx..) and 367 students are stay in the college hostel and we consider the total travel distance per day is 20 km(approx..) and GHG emission for per kilo meter is 0.000185 tCO_2 / Km. So per day CO_2 emission level is 1.77 tCO_2 for travelling. The total energy unit consumption is 21,82,442 kWh per year and CO2 emission factor for electricity is 0.85. It is equivalent to 1855 tons of CO2. For HVAC system installed capacity is 152 TR and charged refrigerant quantity is 60.5 GWP tons and standard refrigerant gas leakage is 2%, It is equivalent to 1.2 tons of CO2. For Diesel operated 63 KVA DG is installed in site and one-year fuel consumption is 839 liters and CO2 emission factor for diesel is 0.00268 tCO2/liter. So one year CO2 emission from DG is 2.24 tCO2.

Total Global Warming Impact in CO2 Equivalent

S No	GHG source	Tonnes of CO2 Equivalent
1	Road Transport	1.77
2	Electricity	1855
3	HVAC System	1.2
4	DG Operation	2.24
Total GHG Emission		**1860.21**

10 SITE OBSERVATION REPORT

Site Observation Report (SOR)			
Report No.	C&A/SOR/01	**Date**	28.02.2021
Location	College Campus		
Observation Images			

Description
Treated drinking water is provided for the whole campus.
Potential Sustainability Measures
Purified drinking water dispenser is kept at each floor level.

Site Observation Report (SOR)			
Report No.	C&A/SOR/02	**Date**	28.02.2021
Location	Hostel Mess		

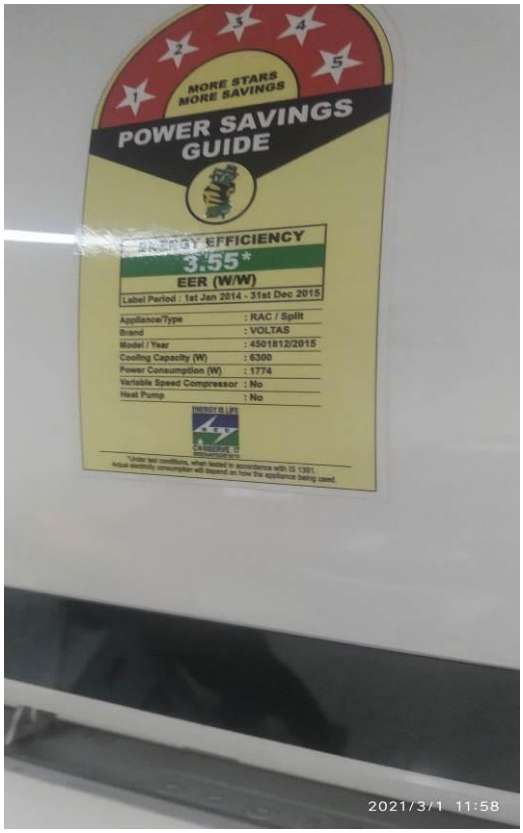
Observation Images

Description

In hostel canteen 20 m3 bio gas plant is installed.

Potential Sustainability Measures
It is recommended to use the cattle dung use in the bio gas plant.

Site Observation Report (SOR)			
Report No.	C&A/SOR/03	**Date**	28.02.2021
Location	HVAC System		
Observation Images			



Description
High Efficient AC System.
Potential Sustainability Measures
It reduces the power consumption and it is highly efficient.

Site Observation Report (SOR)			
Report No.	C&A/SOR/04	**Date**	28.02.2021
Location	Dust Bin		

Observation Images

Description
Different type waste collection bins are kept for the collection of waste.

Potential Sustainability Measures
This measure helps in reducing the segregation of waste at source.

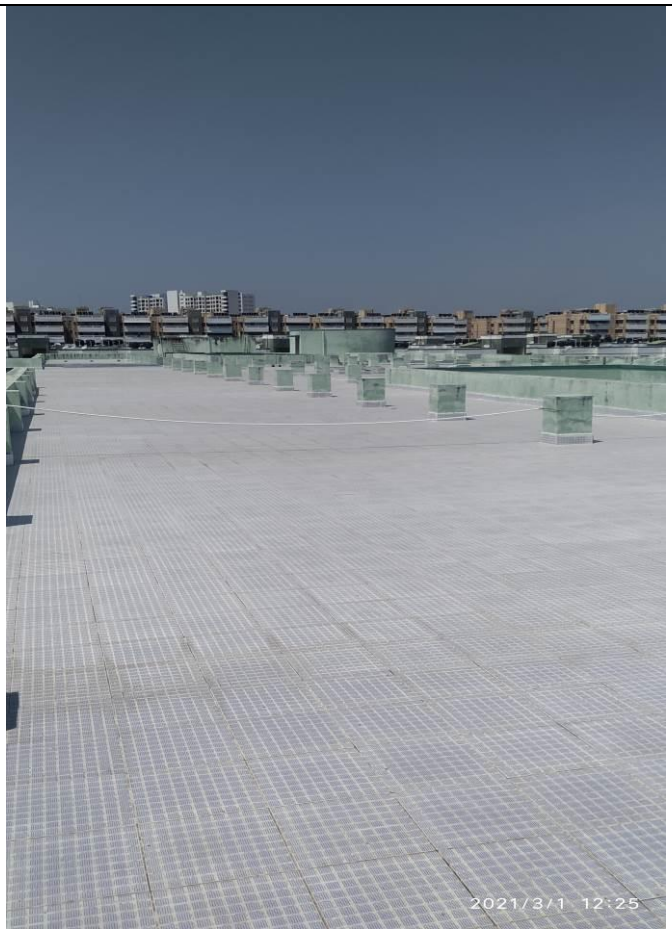
Site Observation Report (SOR)			
Report No.	C&A/SOR/05	**Date**	28.02.2021
Location	Hostel Mess		

Observation Images

Description

Good ventilation and Day light is available in the hostel mess
Potential Sustainability Measures
In the hostel mess good daylight and ventilation are available, it gives good atmosphere to the students have their food.

Site Observation Report (SOR)			
Report No.	C&A/SOR/06	**Date**	28.02.2021
Location	Academic Block Terrace		
Observation Images			



Description
Cooling tiles are installed in the academic block terrace area

Potential Sustainability Measures
This helps in reducing the HVAC consumptions and maintain the good thermal comfort.

Site Observation Report (SOR)			
Report No.	C&A/SOR/07	**Date**	28.02.2021

Location	Rest Room
Observation Images	

Description
In rest rooms water urinals are installed.
Potential Sustainability Measures
To reduce water consumption, these urinals shall be replaced with Water less urinals.

Site Observation Report (SOR)			
Report No.	C&A/SOR/08	**Date**	28.02.2021

Location	Roof Top Solar PV

Observation Images

Description

Work Order is released for Roof top solar PV.

Potential Sustainability Measures

20kVA solar photovoltaic energy plant is going to install in the roof top and it is connecting with net metering.

11 PERFORMANCE IMPROVEMENT MEASURES (PIM'S)

PIM 1: Water saving through the efficient dual flush water closet

Annual Water Savings	1281.6 L/annum
Recurring Annual Savings Potential	Rs. 0.11 Lakhs
One-time Cost of Implementation	Rs.0.05 Lakhs
Payback period	6 Months

Present System:

Presently average water flow in the faucets is 8 LPM it is high compared to the NBC Standards. This leads to lot of water consumption.

Proposed System:

It is recommended to install low flow aerator based faucets in the flow rate of 2.4 LPM as per the standards in common/lavatory rooms. This saves huge of water consumption.

Description	Value	Units	Formula
Average measured flow	8	LPM	A
Average usage per day	60	min/day	B
No of taps	60	Nos.	C
Annual water consumption	8,640	KL/yr	D =(AxBxCx300)/1000
Water consumption cost (Approx..)	9	Rs/KL	E
Present Water Consumption cost	77,760	Rs/Yr	F=ExD
After installing aerators 70% water reduction	2.4	LPM	G
Annual water Savings	7358.4	KL/yr	H =((A-G)xBxCx365))/1000
Annual Saving, Rs	0.11	Lakhs	I=HxE
Investment, Rs	0.05	Lakhs	J
Payback period	6	Months	K=J/Ix12

PIM 2: Tube light lamps to be changed with appropriate LED lamps to reduce power consumption

Annual Energy Savings	2520 kWh/annum
Recurring Annual Savings Potential	Rs. 0.25 Lacs
One-time Cost of Implementation	Rs. 0.5 Lacs
Payback period	24 months

Present System

During the survey, it is observed that some class room and exterior lights are 36W tube lamps are installed with electronic/electromagnetic ballast. These lamps are outdated and power consumption is higher with low lumens output.

Proposed System

It is recommended to replace 15W LED lamps. It gives more lumens and reduces power consumption.

Description	Value	Units	Formula
Total power consumption in Exterior Lighting	1	kW	A
Present Annual Operating Hours	4,200	hrs	B
Present Annual Energy Consumption	4,200	kWh	C=AxB
Proposed Power consumption after installing LED lamps (considering 40% reduction)	0.4	kW	D = (A-(A*40%))
Proposed Energy Consumption	1680	kWh	E=DxB
Proposed Energy savings in Units	2520	kWh	F=C-D
Power cost	10.2	Rs/kWh	G
Annual Power cost savings	0.25	Rs	H =FXG
One-time cost of implementation	0.5	Rs	I
Payback period	24	Months	J=I/H x12

PIM 3: Replacing old celling fan to Super fans

Annual Energy Savings	16,128 kWh/annum
Recurring Annual Savings Potential	Rs. 1.64 Lakhs
One-time Cost of Implementation	Rs. 4.8 Lakhs
Payback period	35 Months

Present System:

Presently there is old model high energy consumption fans are installed at campus; it is consuming more energy.

Proposed System:

It is recommended to install super fans to reduce the power consumption and armature coil failure.

Description	Value	Units	Formula
Annual Energy Consumption	53760	kWh/yr	A
Proposed Fan Annual Energy Consumption	30	%	B
Annual Energy Savings	16128	kWh/yr	C =BX10%
Unit power cost	10.2	Rs/kWh	D
Annual Cost Savings	1.64	Rs Lakhs	E
One time implementation cost	4.8	Rs lakhs	F
Payback	35	Months	G=F/E x 12

PIM 4: Install Solar PV in roof top to reduce overall power consumption

Annual Energy Savings	657, 000 kWh/annum
Recurring Annual Savings Potential	Rs 67 Lakhs
One-time Cost of Implementation	Rs 300.0 Lakhs
Payback period	53 Months

Present System:

Presently TNEB power supply is catering to whole building facility, this leads the power consumption.

Proposed System:

To avoid the TNEB power consumption, this can be avoided by installing Solar PV on Roof Top

Description	Value	Units	Formula
Area of the roof required for PV	40000	Sq.ft	A
Area required for 1 kW PV	100	sq.ft	B
Potential of PV panels	400	kW	C
Average Units generation per kW panel	1,800.0	kWh/day	E = C X 4.5 kWh
Annual Energy Generation	657,000	kWh	F = E X 365
Unit power cost	10.2	Rs/kWh	G
Annual Cost Savings	67	Rs Lakhs	H
One time implementation	300	Rs lakhs	I
Payback	53	Months	J=I/H x 12

12 Good Practices at Tamil Nadu Physical Education & Sports University Campus

During Conserve's Audit, it is observed that M/s Tamil Nadu Physical Education and Sport University has already adopted the following Performance Improvement Measures in its facility;

12.1 LED Lights in Building facility

LED street light is installed in the college campus is a good replacement of Energy. It reduces the EB energy consumption.

12.2 Solar PV System

Solar PV is installed in the roof top of 20kW is a good replacement of Energy. It reduces the EB energy consumption.

12.3 Bio Gas

Food Waste is converted to bio gas; it is a good example of waste to Energy. It is reducing the hostel mess LPG consumption.

12.4 Green Campus

The college total site is 125 acers and more than 100 acer is complete green vegetation is retained.

12.5 Shuttle Service

College is operating a shuttle service for students and it is connecting Tambaram bus depot to college. It reduces the overall CO2 footprint to a great extent with avoiding individual transport.

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