Annai Hajira Women's College
Melapalayam, Tirunelveli – 05
(A Unit of As-Sathiq Educational Society)
(Affiliated to Manonmaniam Sundaranar University)
Website : www.annaihajirawomenscollege.ac.in
Phone:0462-2353067,2353067 e.mail: principal@annaihajirawomenscollege.ac.in

CRITERION VII

INSTITUTIONAL VALUES AND BEST PRACTICES

7.1.3
Quality audits on environment and energy Regularly undertaken by the Institution.

7.1.3 Green audit/environmental audit report from recognized bodies

1. Green audit / Environment audit
2. Energy audit

Submitted to
THE NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL (NAAC)
November - 2023

Annai Hajira Women's College
Melapalayam, Tirunelveli

(A Unit of As- Sadiq Educational Society)
(Affiliated by Manonmaniam Sundaranar University)

GREEN, ENERGY, ENVIRONMENT AUDIT REPORT 2022-2023

ANNAI HAJIRA WOMEN'S COLLEGE

(Affiliated to Manonmaniam Sundaranar University)

Melapalayam, Tirunelveli - 627 005

Tamil Nadu, India

Energy Environment Green Audit Report

2022-23

Prepared by

Energy Awareness and Audit Cell

National Engineering College,

K.R. Nagar, Kovilpatti - 628 503.

NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University, Chennai)
K. R. Nagar, Kovilpatti – 628503, Thoothukudi Dist., Tamilnadu

Estd : 1984

Phone: +91 9500417696, +91 8056931350,
Email: energyaudit@nec.edu.in,
Web: www.nec.edu.in

ENERGY AWARENESS & AUDIT CELL

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the Energy, Environment and Green audit has been conducted at **ANNAI HAJIRA WOMEN'S COLLEGE, Melapalayam** during **01.09.2023** & **02.09.2023**. The recommendations for Energy, Environment and Green audit have been given in the report. We thank the management of Annai Hajira Women's College, Melapalayam, Tirunelveli for providing the opportunity to conduct the audit and we also appreciate Annai Hajira Women's College for taking these initiatives.

Er. K. SUDALAIYANDI	**Er. R. VIGNESH KUMAR**	**Er. R. JAYA VENKATESH**
ENERGY AUDITOR	**ENERGY AUDITOR**	**ENERGY AUDITOR**
EA-34488/22	**EA-34502/23**	**EA-34505/22**

ACKNOWLEDGEMENT

ENERGY AWARENESS AND AUDIT CELL (EAAC) of National Engineering College, K.R. Nagar, Kovilpatti, Thoothukudi district, Tamilnadu – 628503, is thankful to the management Principal, Faculty and Technical team members of **ANNAI HAJIRA WOMEN'S COLLEGE**, Melapalayam, Tirunelveli District, Tamil Nadu -627005, for providing an opportunity to conduct a detailed Energy, Environment and Green Audit process for the college promises.

It is our great pleasure which must be recorded here that the management of ANNAI HAJIRA WOMEN'S COLLEGE extended all possible support and assistance resulting in expeditious completion of the audit process. The audit team appreciates the cooperation and guidance extended during course of site visit and measurements. We are also thankful to the all those who gave us the necessary inputs and information to carry out this very vital exercise of Green audit.

Finally, we offer our sincere thanks to all the members in the energy division/ technical/non-technical and office members who were directly and indirectly involved with us during collection of data and conducting field measurements.

Audit Team Members	
Mr. K. Sudalaiyandi	BEE Certified Energy Auditor - EA34488/22
Mr. R. Vignesh Kumar	BEE Certified Energy Manager - EA 34502/22
Mr. R. Jaya venkatesh	BEE Certified Energy Auditor - EA 34505/22
Dr. R. Vijayakumar	Energy Consultant
Dr. W. BenoWincy	Energy Consultant

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

1. INTRODUCTION TO ENERGY-ENVIRONMENT-GREEN AUDIT

1. 1. Preface about the Institution:

AnnaiHajira Women's College, an unaided minorityinstitution, affiliated to ManonmaniamSundaranar University,Tirunelveli, was established by As-Sathiq Educational Society inMelapalayam, in the year 2004.

By the grace of Almighty, AnnaiHajira Women's College,fostered by the highly Service minded people of Melapalayam forthe cause of Women empowerment, is bound to grow, fromstrength to strength and serve as a beacon of light ensuringimpressive growth for the generations to come.

Our Institution serves with the deep vision of promotingexemplary learning for students of Islamic community and allsections of students from underprivileged society at affordablecost, empowering them with varied skills, refining them withsound value system, moulding their personality holistically andthus producing excellent role models contributing to the growthof our great nation.

UG Programme:

- B.Sc. Mathematics (2 Sections)
- B.Sc. Computer Science
- B.Com. (2 Sections)
- B.A. English
- B.Sc. Physics
- B.Sc. Chemistry.

Diploma:

Diploma Course in Mubaliga

1. 2. Vision

To provide cost-effective and quality higher education to cater the educational needs of the Muslim community and other socially and

economically backward students and to inculcate ethical and moral values in the students and encourage them to become integrated, honest and responsible citizens.

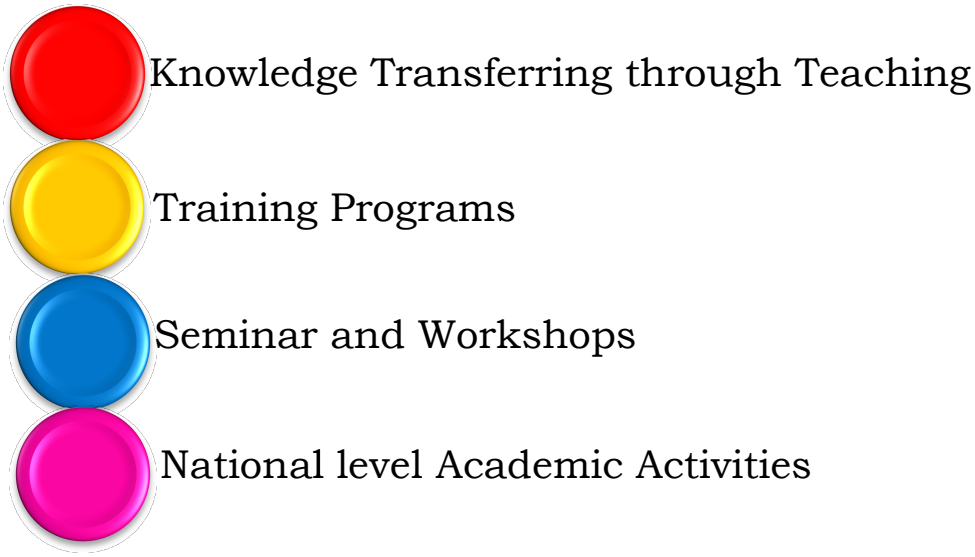
1. 3. Mission

- Educating students for career success
- To make every decision to support the career and personal development of the learners
- Our curriculum, teaching and services demonstrate that we value the diverse profiles of our learners.

1.4. Quality Policy:

The aim of the Society in starting **ANNAI HAJIRA WOMEN'S COLLEGE** is both to create an awareness among the members of the community to the imperative need for making womenfolk highly educated and make available the necessary facilities for the young women to pursue Higher Education in an environment that does not violate established norms of ethical values and tenets of Sharia. These goals of the Society are steadily being realized by the grace of Almighty.

1. 5. Major Activities in the Institution:



1. 6. Scope of the Audit Process :

Energy Audit:

- Conduct a detailed energy audit in the college campus with a main focus to identify judicious usage of electrical and thermal energy (where, when, why and how energy is being utilized).
- To ascertain the best practices to be followed in energy conservation, energy management, recommended safety measures and continuous energy monitoring system.

Environmental Audit:

- Identification of history of activities, present environmental practices followed, monitoring records and known sources of environmental issues inside the college.
- Adoption of natural resources as input (such as energy and water), processing and utilization and generation of wastes (including hazardous and toxic),
- Handling and storage of all types of wastes (Solid, liquid and grouses), transportation of waste from source to yard, reuse and recycling possibilities, storage mechanism and effective disposal.
- Measurement of effectives of pollution control (air, water and soil pollution), maintenance logs, emission test reports and routine analytical reports.
- Providing constant awareness to all stakeholders on Environment impacts, risk analysis and Ecology.

Green Audit:

- Assessment on Campus greenery in terms of matured trees, flowing shrubs, bushes, medical plants, adoption of green energy generation and utilization, reduction of CO_2 due to green energy system and identification of possible implementation and enhancement of current greenery practices.

1. 7. Outcomes of the Audit Process:

- Recommendations based on field measurement with achievable **Energy Conservation** (ENCON) proposals under **No cost/Low cost and Cost investmentcategories**.
- Minimization of present energy cost by adjusting and optimizing energy usage and reduction of energy wastage without affecting the regular activities.
- Determination of operating efficiency of each electrical system (more specifically on individual machines), comparison of design values and to identify feasible technical ways to improve it further in a cost effective manner.
- Formation of methodology for long term road map for energy savings and continuous improvements.
- Use as a basis for the development of environmental management policies or efforts to improve the existing plants.
- Identification of possible cost and energy saving from energy conservation, waste reduction, reuse and recycling.
- Development of rule based system to become a sustainable environment inside the college campus and nurture the importance of less energy and less environmental impacts.
- Formation of methodology for long term road map for maintaining green environment within the campus and encourage the stakeholders for continuous improvements.

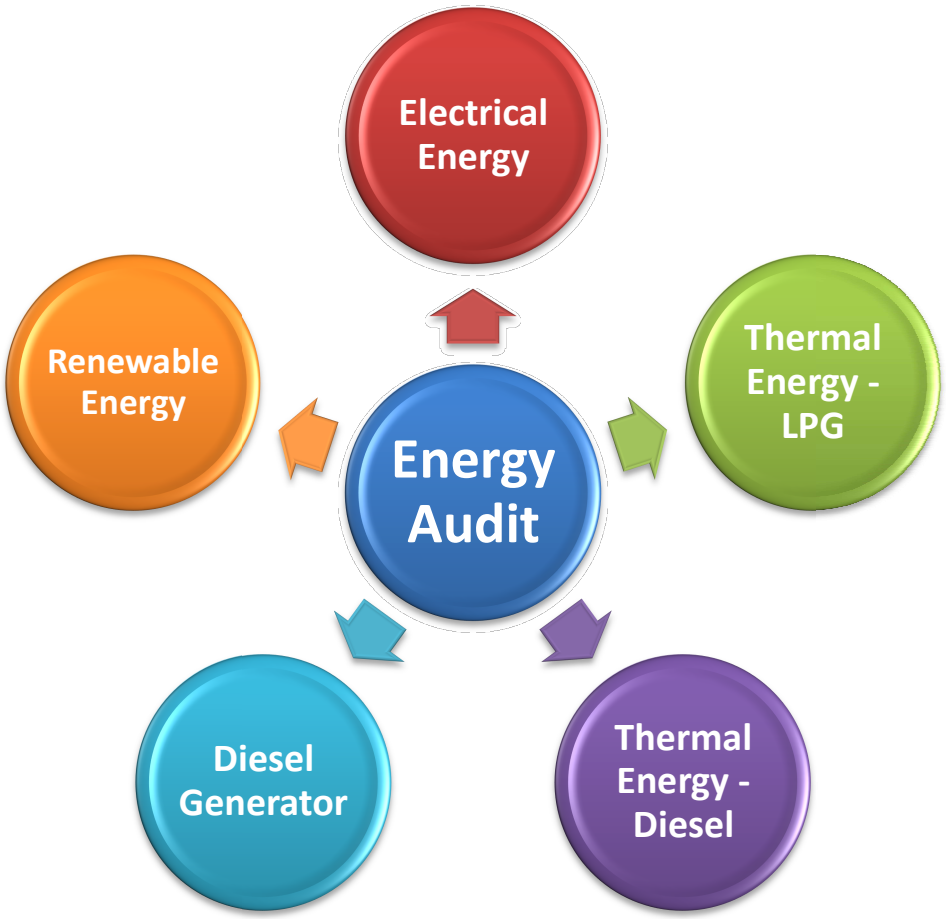
1. 8. Audit Approach:

The audit team completed the assessment of energy consumption in the College premises and operating hours of each systems, appliance and instruments in labs using two approaches namely i) Objective Approach in which a detailed measurement was taken and ii) Subjective Approach in which a field data collected from the maintenance department.

1. 9. Standards Used:

- Bureau of Energy Efficiency (BEE) Guidelines to conduct thedetailed energy audit process.
- The Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard (Revised Edition) released by World Resources Institute & World Business Council for Sustainable Development – 2014.

1. 10. Coverage in Energy Audit Process:



1. 11. Focus Areas in the Environment & Green Audit Process:

1. • Energy Utilization
2. • CO_2 Estimation
3. • Water Management
4. • Solid Waste Management
5. • Chemicals/Acids/Salts Management
6. • Matured Trees
7. • CO_2 Neutralization

1. 12. List of Members Involved in Data Collection & Audit Process:

Name of the Team Member	Role and Responsibility
Dr. S. Uma, Asso.Prof. / Tamil	Convenor
Dr. S. Subbammal @ kala, HOD/English	Data Collection in Chemical, Acids, Salts data collection, Fuel consumption in canteen, DG and Fuel consumed, Campus greenery, RO and Solid waste management, System, UPS, E-waste, and Rain Water Harvesting
Mrs. V. Nagajothi, AP/Commerce	
Dr. K.M.N. Syed Ali Fathima, AP/Computer	
Mrs. R. Shunmuga Sundari, AP/English	
Ms. S. Nandhini, AP/ English	
Dr. R. Lavanya, AP/Physics	Data Collection for Energy Audit
Dr. S. Anantha Lakshmi, HOD /Maths	Data Collection for Green Audit
Mr. S.M. Mohamed Sha Alam, Electrician	Data collection & assistance in Energy Audit

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART –A: ENERGY AUDIT REPORT

2. Study on Energy Consumption & Generation Pattern

GIST

1. Average power consumption of Annai Hajira Women's College is Rs.24,724/- per month in 2022 - 2023.
2. Major Energy consumption from the energy analysis is Diesel (Transport & Power), which is 76% of the overall Energy spent.
3. Electricity cost for Annai Hajira Women's College is Rs.14.42 per unit including all charges for the year 2022-2023.
4. As a low hang fruit, by replacing older tube light with LED tube light, savings per year is about Rs.12,777/- with return on investment of 10 months.
5. As a best option, by replacing older CFL bulbs with LED bulbs, savings per year is Rs.6,208/- with return on investment of 13 months
6. As an easy picking, by replacing older fan with BLDC fan, savings per year is about Rs.3,00,499/- with return on investment of 25 months.
7. Replacing older ACs with Star rated inverter ACs, savings per year is about Rs.1,47,793/- with return on investment of 16 months.

Recommentation for Energy Conservation

Sl. No.	Topic	Descriptions	Investment (Rs.)	Return on Investment	Page No.
1.	Replacement of T8 Lights to LED Lights	There are around 71 T8 Lights in the campus which consumes 30W. LED lights will consume only 20W. Replacement of T8 Lights with LED lights (Savings= 2.84 Units per Day)	10,650/-	10 months	33
2.	Replacement of CFL Lights to LED Lights	There are around 69 CFL Lights in the campus which consumes 15W. LED lights will consume only 10W. Replacement of CFL Lights with LED lights (Savings= 1.38 Units per Day)	6,900/-	13 months	33
3.	Replacement of older fans with BLDC	There are around 251 older fans in the campus. BLDC fans are up to 50% more efficient Replacement of older fans with super fan (Savings= 67.77 Units per Day)	6,27,500/-	25 Months	34
4.	Replace Older ACs to 1.5 TR Star rated inverter ACs	There are 2 Number of 1.5 TR AC and 3 Number of 2 TR AC in the campus. Replace Older ACs to 1.5 TR Star rated inverter ACs	2,00,000/-	16 Months	34

Sl. No.	Topic	Descriptions	Investment (Rs.)	Return on Investment	Page No.
		(Savings= 32.85 Units per Day)			
5.	Installed Solar utilization	More than 50% of the power produced from solar has been exported to grid. Hence it is recommended to improve the solar power utilization through altering the load distribution.			
6.	Power Quality Analysis	From power quality analysis it is inferred that red phase Is over loaded comparing to Yellow & Blue phases. Nearly 50% of the red phase load is given to blue phase. This will affect the equipment performance. Hence it is recommended to regulate the power distribution among three phases.			35
7.	Energy Bill Analysis	From the chart, it is clear that only 25 to 35 percentage of the demand is utilized. Hence the contract demand can be reduced to 50% of the present demand for the present loading condition.			
8.	Indoor air quality audit	Measure RH and CO_2 levels if required.			

Energy Consumption Pattern (Electrical and Thermal):

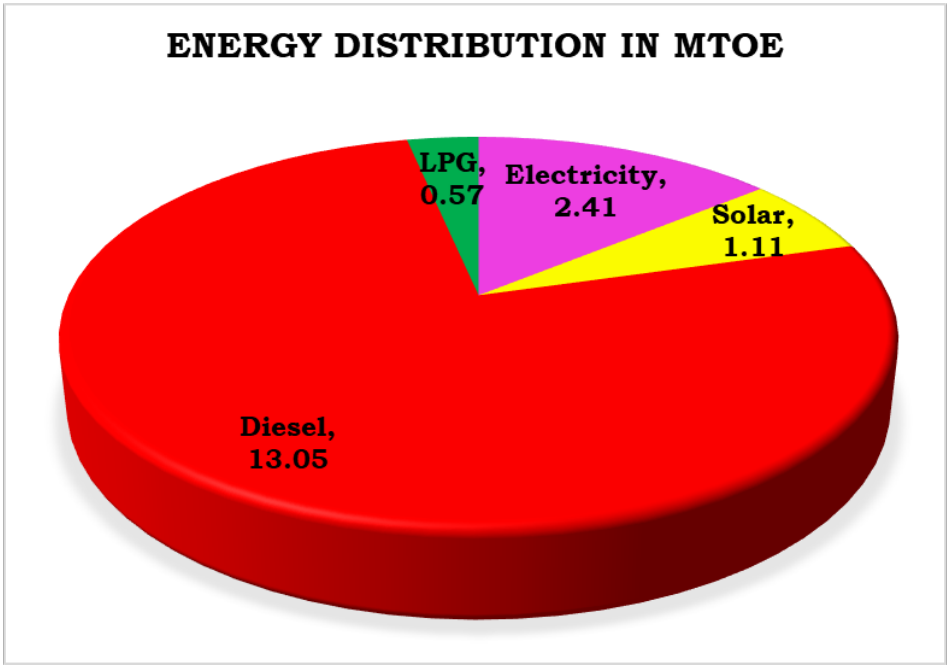
Sl. No.	Description	Details		
Electrical Energy (Consumption)				
1.	Name of the consumer	Secretary		
2.	Type of Utility Supply, Service No.& Tariff	Low Tension Consumer Sc. No: 07-005-171-656 Tariff II (LM2B2) Low Tension Consumer Sc. No: 07-005-171-335 Tariff V (LM51)		
3.	Tariff Structure	Rs.8.7/kWh Rs.9.7/kWh		
4.	Energy Suppliers	Tamilnadu Generation & Distribution Corporation (TANGEDCO)		
5.	Permitted Demand	38 kW + 13 kW		
6.	Annual Electricity Consumption (kWh) (2022-23)	Bimonthly Min: 3328	Bimonthly Ave:3690	Bimonthly Max: 4865
		23244 kWh/Annum		
7.	Capacity of Diesel Generator (DG) Set	25 kVA-1 No.- Internal fuel tank (Air Cooled)		
		DGs are properly earthed (Body & Neutral)		
Thermal Energy (Consumption)				
8.	Types of Thermal Energy Used	Liquefied Petroleum Gas (LPG)	Cooking	
		Diesel	Transport + DG	
9.	Annual LPG consumption (2022-23)	Ave: 62.7kg/ Bimonthly		
		376.2 kg/ Annum		
10.	Annual Diesel Consumption (22-23)	Bimonthly Min:839	Bimonthly Ave:1836.5	Bimonthly Max:3531

		11,019 Litre/ Annum
General Loads (Both Electrical and Thermal)		
11.	Lighting System	Indoor lighting: Florescent Tube Light (FTL), Led Tube light, Led Bulb & CFL
12.	Fan Loads (Ceiling)	All the Indoor ceiling fans are conventional fans.
13.	HVAC System	Unitary air conditioning system installed in the computer labs & Smart Class room
		Five AC units are Non BEE star rated.
		Outdoor Units are mostly placed in top of the window shades.
		A Welcome step in the energy conservation is- All the air conditioned rooms are set with 24^{o}C as room temperature as per BEE norms.
14.	Motors and Pump loads	Mainly used for water pumping.
15.	Uninterrupted Power System (UPS)	All the computer, server, surveillance system, telephonic units are connected with UPS
Renewable Energy Systems		
16.	Solar PV System	10 kW Grid tied SPV system is installed

Energy Contribution

Table 1 - Contribution of energy consumption & Energy conversion (Represented in MTOE)

Energy Carrier	Annual Consumption	Conversion Factor	Energy (M Cal)	MTOE	Contribution %
Electricity (TANGEDCO)	28,026.8	860 kcal/kWh	24103	2.41	14.061
Electricity (Solar)	12,894.80	860 kcal/kWh	11089	1.11	6.476
Diesel	11,019	11840 kcal/litre	130520	13.05	76.138
LPG	376.2	12500 kcal/kg	5718	0.57	3.326



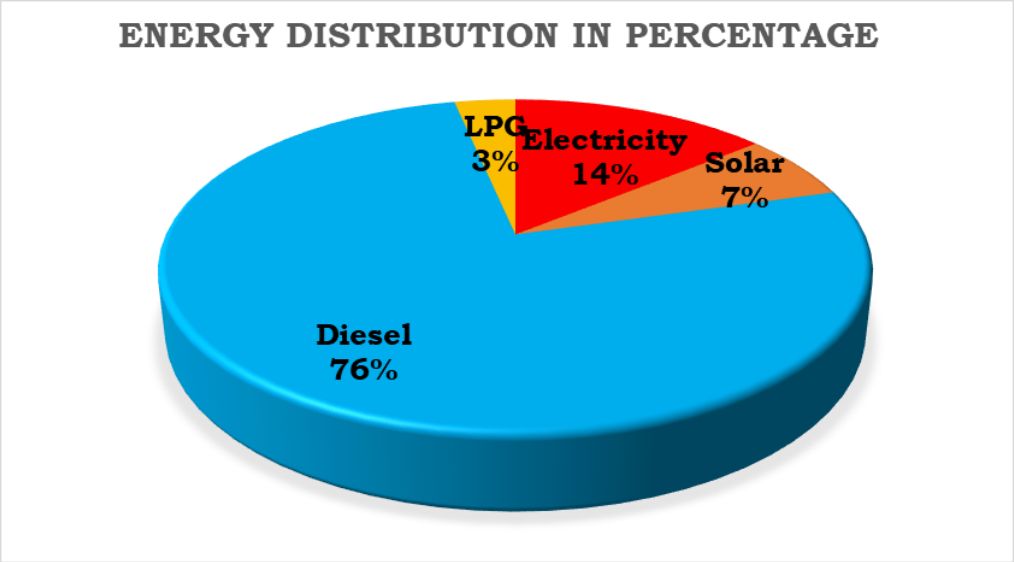


Fig. 1&2 Contribution of Energy consumption represented in MTOE and Percentage

Fig. 1 & 2 describes the energy distribution of the college in metric tonne of oil equivalent (MTOE) and Percentage wise. Diesel shows major contribution in this energy usage.

Table 2 - Electricity bill analysis for Hostel

Month	kWh	Contract Demand (kW)	Recorded Demand (kW)	Power Factor	CC Charges(Rs.)	Electricity Tax (Rs.)	Fixed Charges(Rs.)	Total bill (Rs.)	Unit Charges as per TNEB (Rs./kWh)
July-Aug 2022	1880	13	4.4	0.94	15134	791.7	1820	17745.7	9.44
Sep-Oct 2022	2210	13	3.98	0.99	21359	1107.3	2556	25023.41	11.32
Nov-Dec 2022	1690	13	3	0.97	16857	872.89	2600	20330.64	12.03
Jan-Feb 2023	2150	13	4.28	0.97	21457	1122.8	2600	25179.85	11.71
Mar-Apr 2023	2300	13	4.14	0.98	22954	1197.7	2600	26751.7	11.63
May-Jun 2023	1610	13	3.32	0.96	16067	843.4	2600	19511.2	12.12

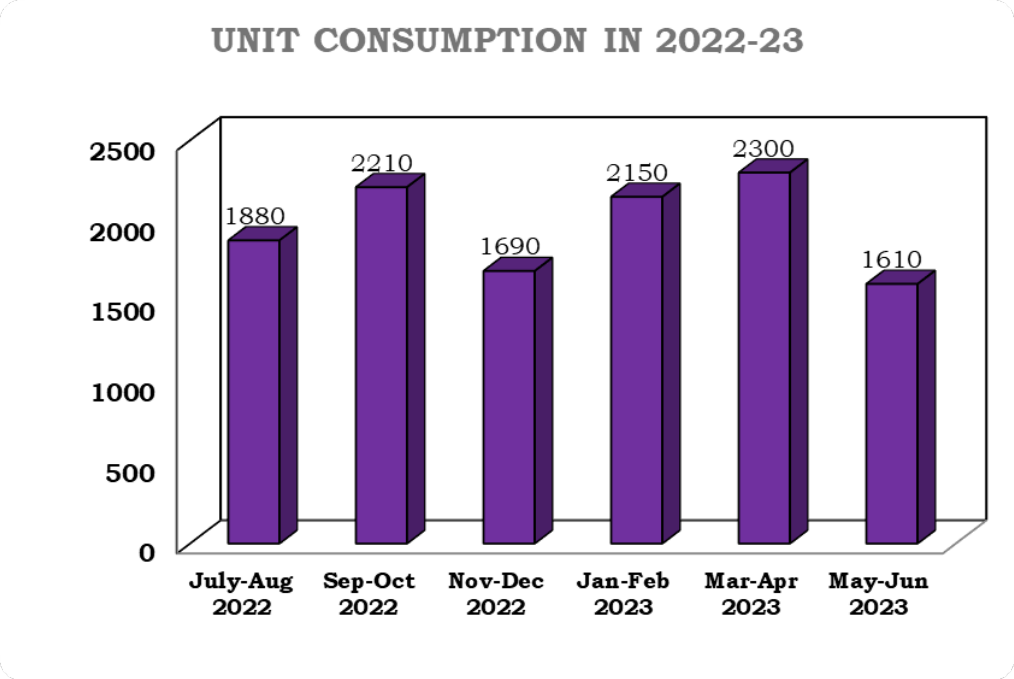


Fig.3: Unit consumption for the year 2022-2023

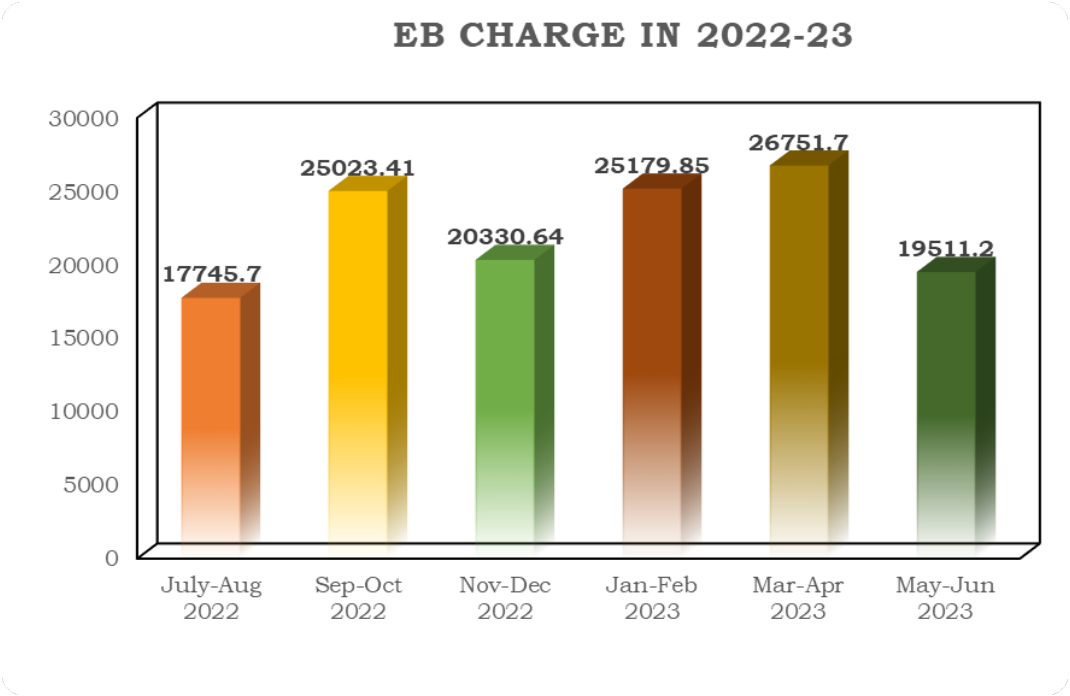


Fig.4: Power consumption charges for the year 2022-2023

Table-3: Electricity bill analysis for College

Month	Used Unit	Contract Demand	Actual Demand	Power Factor	Consumption Charges	E-Tax	Demand Charge	Network Charges	Deductions	Total EB Charge	Charge /Unit
July-Aug 2022	1736.07	38	5.57	0.78	13020.53	687.03	4560	4758.05	3230.03	19795.58	11.40
Sep-Oct 2022	2655.87	38	13.02	0.82	23083.77	1287.2	7220	5259.62	2991.19	33859.39	12.75
Nov-Dec 2022	1638.18	38	12.72	0.78	14620.76	861.04	7600	5457.5	2269.13	26270.17	16.04
Jan-Feb 2023	1443.36	38	8.31	0.77	12874.77	733.74	7600	5104.72	2067.92	24245.31	16.80
Mar-Apr 2023	2112.58	38	11.37	0.84	18844.22	1062.2	7600	5368.44	2360.22	30514.65	14.44
May-Jun 2023	1817.94	38	11.43	0.78	16216.03	930.8	7600	5368.44	2644.08	27471.19	15.11

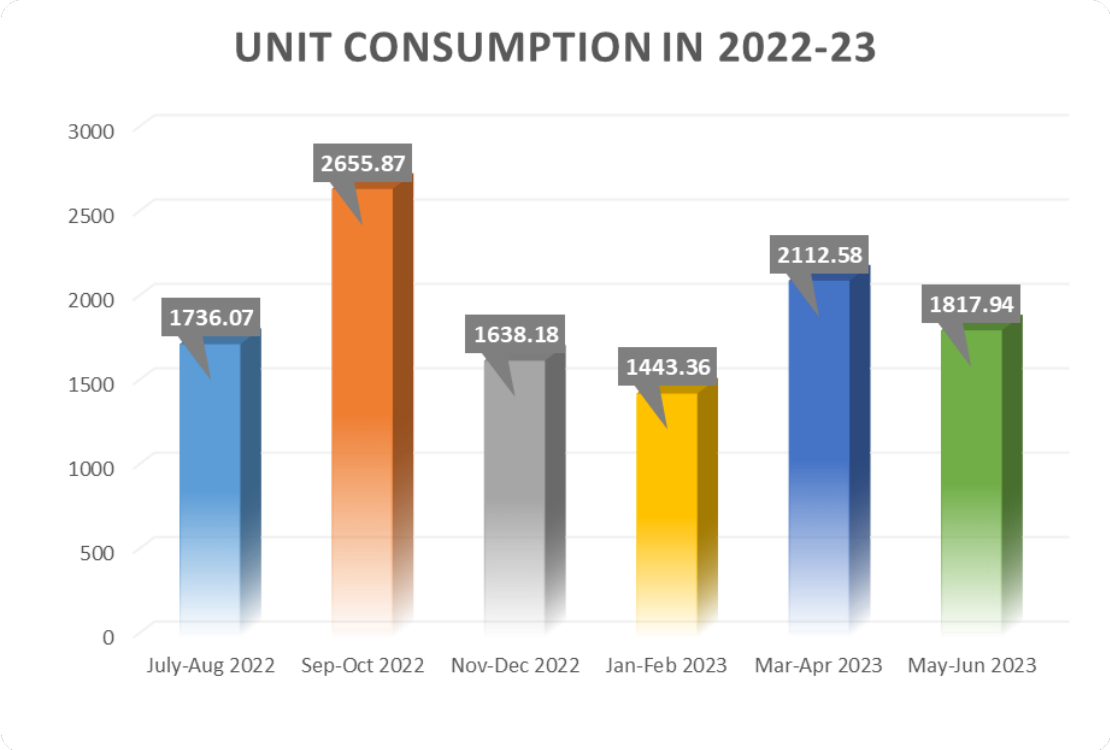


Fig.5: Unit consumption for the year 2022-2023

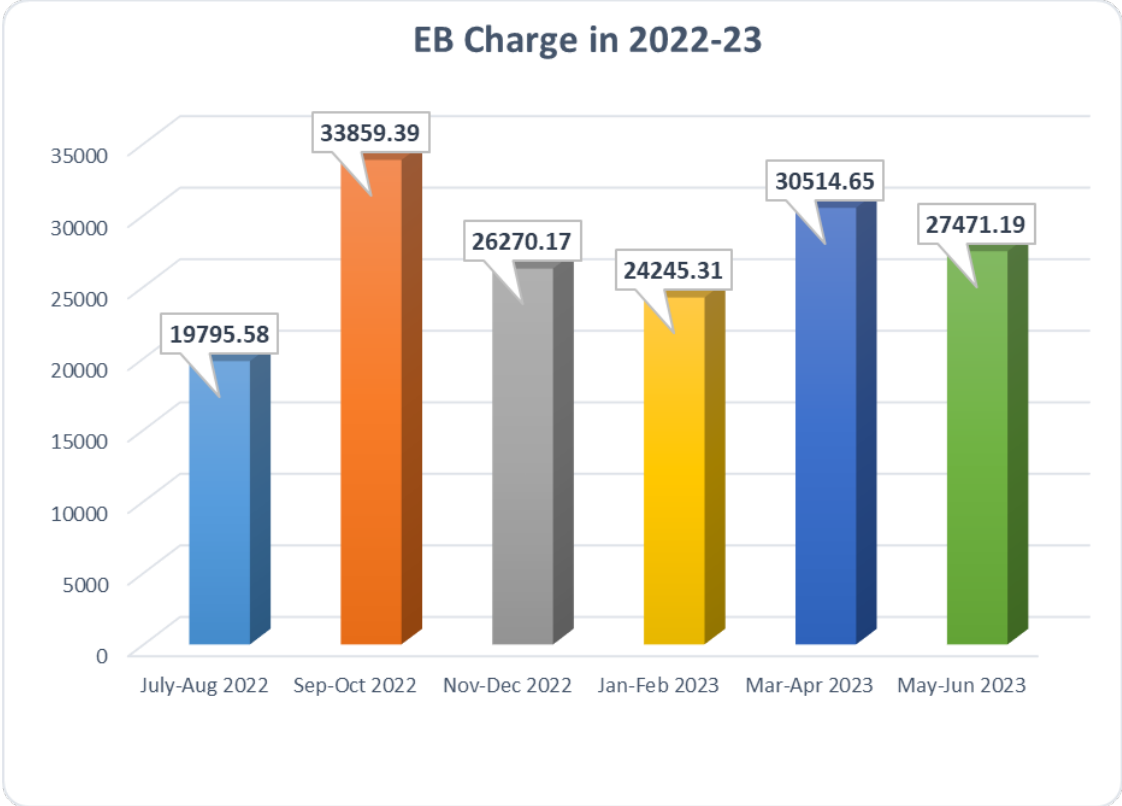


Fig.6: Power consumption charges for the year 2022-2023

Table-4: Annual Consumption of Electrical & Thermal Energy Parameters

Sl. No.	Month	Units Consumed (kWh)	Diesel Consumed (Litres)	LPG consumed (kg)	Electricity Charges (Rs.)	Diesel Charges (Rs)	LPG Charges (Rs)	Total Expenses (Rs)	Total No. of Students	Expenses (Rs)/Student
1	July-Aug 2022	3616.07	2828	79.2	37541.28	267811.6	6237.79	311590.67	591	527.23
2	Sep-Oct 2022	4865.87	3531	79.2	58882.8	334385.7	6237.79	399506.29	591	675.98
3	Nov-Dec 2022	3328.18	1303	59.4	46600.81	123394.1	4678.34	174673.25	591	295.56
4	Jan-Feb 2023	3593.36	1408	79.2	49425.16	133337.6	6237.79	189000.55	591	319.80
5	Mar-Apr 2023	4412.58	1110	59.4	57266.35	105117	4678.34	167061.69	591	282.68
6	May-Jun 2023	3427.94	839	19.8	46982.39	79453.3	1559.45	127995.14	591	216.57

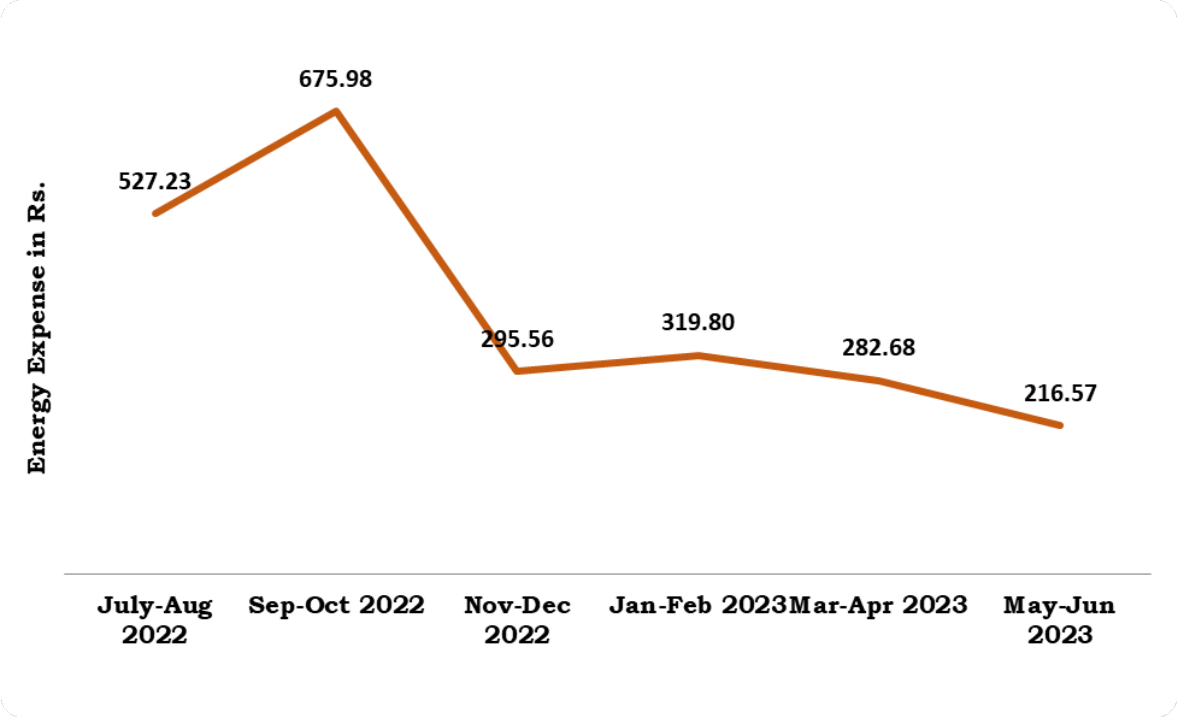


Fig.7: Per Capita Energy Expenses for the year 2022-2023

Maximum demand

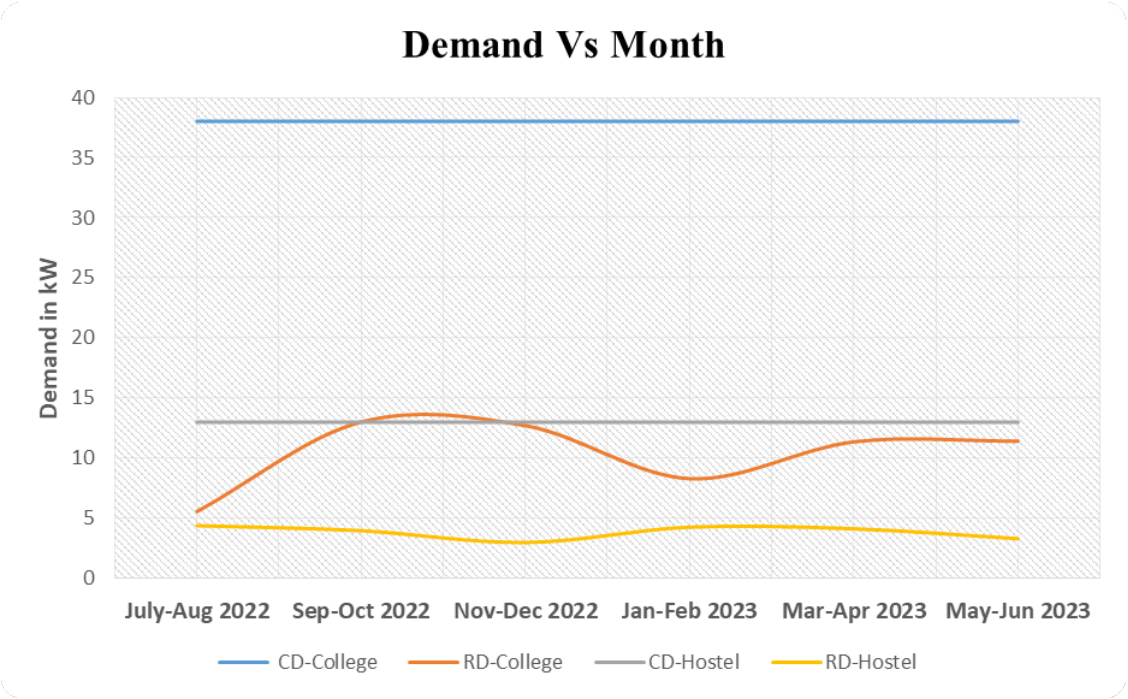


Fig.8: EB Power Demand details for the year 2022-2023

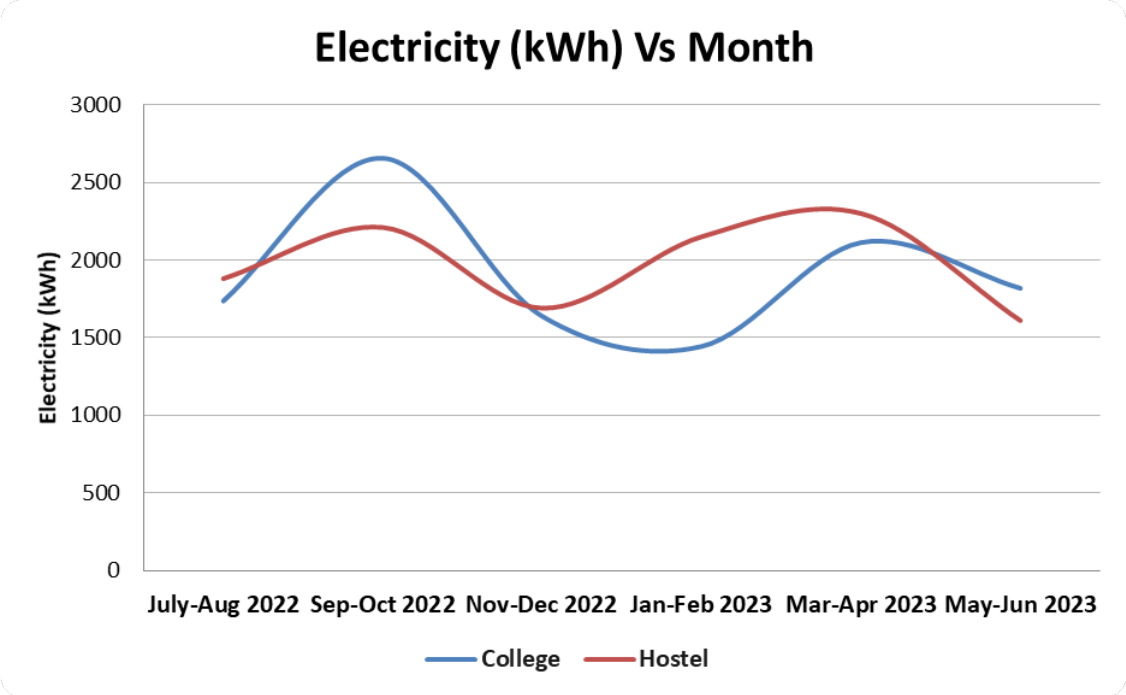


Fig.9: Power consumption comparison for the year 2022-2023

Lighting Assessment:

Table-5: Details of Illuminance (Lux) level

ROOM	With/ Without Lighting	Average LUX Value
Hostel entrance	W	170
	Wo	82
Warden room	W	70
	Wo	9
Dining hall	W	81
	Wo	27
I floor veranda	W	136
	Wo	56
Room 8	W	84
	Wo	32
Room 9	W	87
	Wo	35
Room 10	W	89
	Wo	34
Room 11	W	83
	Wo	21
Sick room	W	65
	Wo	28

ROOM	With/ Without Lighting	Average LUX Value
Computer lab	W	225
	Wo	178
Record room	W	140
	Wo	8
B.Com Lab	W	106
	Wo	83
II B.Com	W	155
	Wo	70
I B.Com-Batch 1	W	189
	Wo	70
Smart class room	W	214
	Wo	139
I B.A English	W	146
	Wo	64
III B.A. English	W	124
	Wo	76
II B.A. English	W	170
	Wo	125

Research & Dev. Cell	W	57
	Wo	18
Fine arts	W	63
	Wo	26
Counselling cell	W	89
	Wo	52
Room 1	W	85
	Wo	47
Career guidance cell	W	112
	Wo	63
Room 2	W	98
	Wo	46
Room 3	W	69
	Wo	37
Room 4	W	68
	Wo	18
Room 5	W	71
	Wo	20
Room 6	W	80
	Wo	49
Room 7	W	85
	Wo	53
Auditorium	W	268
	Wo	178
Canteen	W	182
	Wo	74
Stationery store	W	201
	Wo	12
Library	W	315
	Wo	55
Tailoring room	W	178
	Wo	59
Board room	W	149
	Wo	73
IQAC	W	93
	Wo	37
Office room	W	297
	Wo	123
Principal room	W	316
	Wo	222
III B.Com Sec A	W	141
	Wo	118
II B.Sc CSE	W	181
	Wo	118
III B.Sc CSE	W	229
	Wo	144

III Maths	W	184
	Wo	124
II Maths	W	296
	Wo	202
I Maths	W	353
	Wo	272
Physics Staff room	W	207
	Wo	104
Chemistry staff room	W	192
	Wo	82
Tamil staff room	W	196
	Wo	87
Maths staff room	W	190
	Wo	87
English staff room	W	193
	Wo	93
Commerce staff	W	79
	Wo	162
Dark room	W	225
	Wo	8
Physics lab	W	220
	Wo	141
I B.Com-Batch 2	W	676
	Wo	447
II B.Com-Batch 2	W	272
	Wo	239
III B.Com	W	340
	Wo	219
Smart class room	W	161
	Wo	9
I Chemistry	W	505
	Wo	302
II Chemistry	W	568
	Wo	437
III B.Sc Chemistry	W	445
	Wo	368
I B.Sc CSE	W	289
	Wo	146
Chemistry lab	W	297
	Wo	107
I Physics	W	548
	Wo	414
II Physics	W	518
	Wo	401
III Physics	W	515
	Wo	464

Table-6: Details of Illuminance (Lux) level required for different activity

Illuminance (lux)	Activity	Area
100	Casual seeing	Corridors, changing rooms, stores
150	Some perception of detail	Loading bays, switch rooms, plant rooms
200	Continuously occupied	Foyers, entrance halls, dining rooms
300	Visual tasks moderately easy	Libraries, sports halls, lecture theatres
500	Visual tasks moderately difficult	General offices, kitchens, laboratories, retail shops
750	Visual tasks difficult	Drawing offices, meat inspection, chain stores
1000	Visual tasks very difficult	General inspection, electronic assembly, paintwork, supermarkets
1500	Visual tasks extremely difficult	Fine work and inspection, precision assembly
2000	Visual tasks exceptionally difficult	Assembly of minute items, finished fabric inspection

BEE Standard Illuminance (Lux) Values are given in the below table. With reference to Table 5&6 the lighting of all rooms can be optimized for better visibility and energy conservation.

Connected Load details:

Table-7: Lighting Connected Load details for all locations

LOCATION	T8 (30 W)	LED Bulb (10 W)	Focus LED (30W)	LED tube (20 W)	LED BULB (15 W)	CFL(15W)	ZW Bulb (5W)	Bulb(ICL) 60W	WATTAGE (kW)
Hostel entrance	2	2							0.08
Warden room	1	1				1	1		0.06
Dining hall	21	12		3	1	5	2		0.91
I floor veranda	5	8				2			0.26
Room 8	1					1	1		0.05
Room 9	1					1	1		0.05
Room 10	1					1	1		0.05
Room 11	1								0.03
Sick room	1	1					1		0.045
Research & Dev. Cell	1	1					1		0.045
Fine arts	1	1					1		0.045

Counselling cell	1	1					1		0.045
Room 1	1	1					1		0.045
Career guidance cell	1					1			0.045
Toilet		2				2			0.05
Room 2	1					1	1		0.05
Room 3	1	1					1		0.045
Room 4	1						1		0.035
Room 5	1	1					1		0.045
Room 6	1					1	1		0.05
Room 7	1					1	1		0.05
Auditorium	4	1	11	12		2			0.73
Canteen	1								0.03
Stationery store	4			2		4			0.22
Library	11	4	5						0.52
Tailoring room	4	4				3	1		0.21
MB front veranda				2					0.04
Board room				2					0.04
IQAC				2					0.04
Office room				5					0.1
Principal room				2		5			0.115
III B.Com Sec A				2					0.04
II B.Sc CSE				2					0.04
III B.Sc CSE				2					0.04
Computer lab				9		1			0.195
Record room				2					0.04
B.Com Lab				2					0.04
Examination cell				1					0.02
Toilet		2				3			0.065
II B.Com				4					0.08
I B.Com-Batch 1				4					0.08
Smart class room				2					0.04
I B.A English				2					0.04
III B.A. English				2					0.04
II B.A. English				2					0.04

III Maths				2					0.04
II Maths				2					0.04
I Maths				2					0.04
Physics Staff room				1					0.02
Chemistry staff room				3					0.06
Tamil staff room				2					0.04
Maths staff room				2					0.04
English staff room		3		3					0.09
Toilet								2	0.12
Commerce staff				5					0.1
Toilet				2					0.04
Dark room				1					0.02
Physics lab				6					0.12
I B.Com-Batch 2				2					0.04
II B.Com-Batch 2				2					0.04
III B.Com				2					0.04
Smart class room				2					0.04
I Chemistry				2					0.04
II Chemistry				2					0.04
III B.Sc Chemistry				2					0.04
I B.Sc CSE				6					0.12
Chemistry lab		1		15					0.31
Toilet				2		2			0.07
I Physics				2					0.04
II Physics				2					0.04
III Physics				2					0.04
II floor varanda		3				12			0.21
I floor varanda		4		3		3			0.145
Ground floor		9		6	1	3			0.27
Campus					11				0.165
NSS room	1								0.03
Sports room	1								0.03
Prayer Hall		3		4		14			0.32
Total	71	66	16	153	13	69	18	2	**7.77**

Table-8: Fan - Connected Load details for all locations

LOCATION	Fan (75 W)	Pedestal FAN (60W)	Ex Fan (150W)	Wall Fan (60W)	WATTAGE (kW)
Hostel entrance					0
Warden room					0
Dining hall	13		1		1.125
Ist floor varanda	1				0.075
Room 8					0
Room 9	2				0.15
Room 10	1				0.075
Room 11					0
Sick room					0
Research & Dev. Cell					0
Fine arts					0
Counceling cell	2				0.15
Room 1					0
Career guidance cell	2				0.15
Toilet					0
Room 2	2				0.15
Room 3					0
Room 4	2				0.15
Room 5					0
Room 6					0
Room 7	1				0.075
Auditorium	30				2.25
Canteen	1				0.075
Stationery store	4				0.3
Library	23				1.725
Tailoring room	8				0.6
MB front varanda	1				0.075
Board room	2				0.15
IQAC	5				0.375
Office room	4			1	0.36
Principal room	2				0.15
III B.Com Sec A	4				0.3
II B.Sc CSE	4				0.3
III B.Sc CSE	4				0.3
Computer lab	9				0.675
Record room		2			0.12
B.Com Lab	2				0.15
Examination cell	1				0.075
Toilet					0
II B.Com	4				0.3

I B.Com-Batch 1	4				0.3
Smart class room	1				0.075
I B.A English	4				0.3
III B.A. English	4				0.3
II B.A. English	4				0.3
III Maths	4				0.3
II Maths	4				0.3
I Maths	4				0.3
Physics Staff room	3				0.225
Chemistry staff room	2				0.15
Tamil staff room	3				0.225
Maths staff room	3				0.225
English staff room	4				0.3
Toilet					0
Commerce staff	3				0.225
Toilet					0
Dark room	1				0.075
Physics lab	6				0.45
I B.Com-Batch 2	4				0.3
II B.Com-Batch 2	4				0.3
III B.Com	4				0.3
Smart class room	4				0.3
I Chemistry	2				0.15
II Chemistry	2				0.15
III B.Sc Chemistry	2				0.15
I B.Sc CSE	6				0.45
Chemistry lab	5		2		0.675
Toilet					0
I Physics	4				0.3
II Physics	4				0.3
III Physics	2				0.15
II floor varanda					0
I floor varanda					0
Ground floor					0
Campus					0
NSS room	1				0.075
Sports room	2				0.15
Prayer Hall	17				1.275
Total	251	2	3	1	**19.455**

Table-9: Air conditioner Connected Load details

LOCATION	AC 2 TR	AC 1.5 TR	Wattage (kW)
Computer lab	2	2	9.44
Smart class room	1		2.75
Total	3	2	**12.19**

Table-10: Other Connected Load details

Sl.No	APPLIANCE DETAIL	QTY	WATTAGE	Load in kW
1	CCTC Camera	33	20	0.66
2	Bell	3	30	0.09
3	Speaker	17	30(14), 40(2), 100(1)	0.6
4	Projector	7	150	1.05
5	Computer	77	100	7.7
6	Amplifier with Mic	2	100	0.2
7	Printer with scanner	9	100	0.9
8	Printer with scanner	7	100	0.7
9	LAN Server	2	50	0.1
10	UPS Controlling Unit	11	100	1.1
11	Smart board	3	100	0.3
12	landline phone	4	20	0.08
13	Air cooler	1	125	0.125
14	TV 40 inch	1	125	0.125
15	RO water purifier	3	200	0.6
16	CCTV server	2	125	0.25
17	Monitor	2	60	0.12
18	Mixy	1	600	0.6
19	Grinder	1	750	0.75
20	Fridge 180L 4*	1	200	0.2
21	Fridge 190L 1*	1	300	0.3
22	Vegitable cutter	1	200	0.2
23	Freezer	1	350	0.35
24	RO water purifier	1	60	0.06
25	Kettle	1	450	0.45
26	Xerox machine	1	200	0.2
27	Cash counting machine	1	100	0.1
28	Sanitary napkin destroyer	1	500	0.5
29	Demineralized plant	1	250	0.25
30	Hot Air Oven	2	1000	2
31	Vaccum pump	1	375	0.375
32	Centrifuge setup	1	750	0.75
33	Jet motor	1	750	0.75
34	Pump	1	1125	1.125
35	Pump	1	375	0.375
	Total	195		**24.035**

Table-11: Connected Load details

Particulars	load in KW	% of load
Lightings	7.77	12.26
Fans	19.46	30.71
AC	12.25	19.33
Others	24.035	37.69
Total	**63.52**	

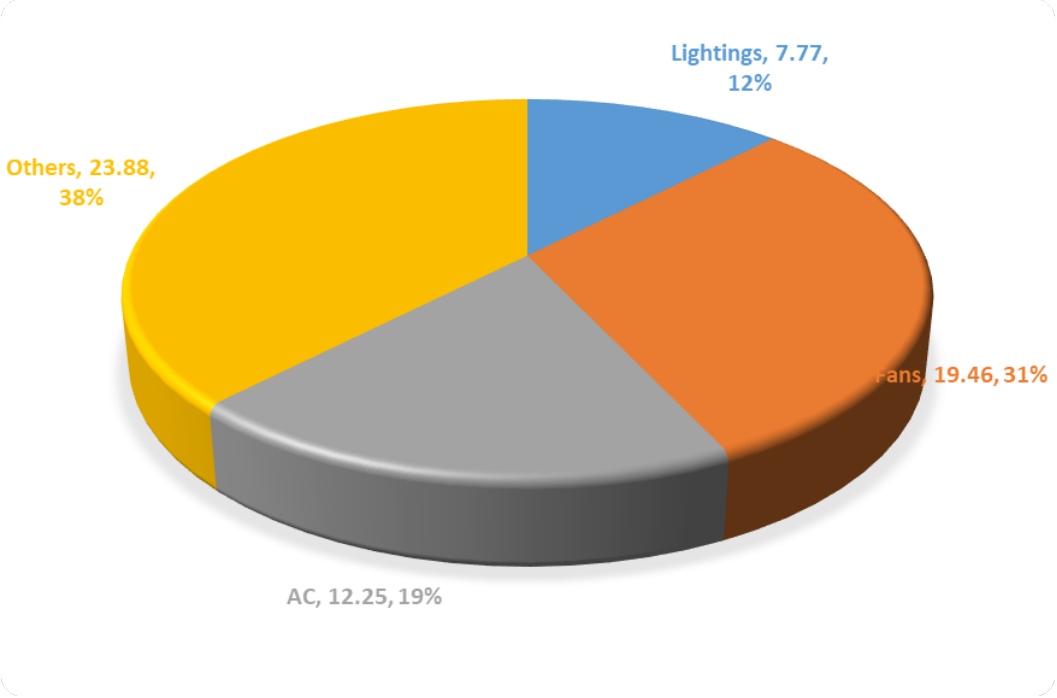


Fig.10: Connected Load Distribution for the year 2022-2023

Table-12: Lighting system type wise distribution

Sl.No	Type of fitting	Wattage	Total Quantity	Load in kW	Daily working hrs	Monthly working days	Monthly kWh	% Load
1	T8 (30 W)	30	71	2.13	4	26	221.52	27.41
2	LED Bulb (10 W)	10	66	0.66	4	26	68.64	8.49
3	Focus LED (30W)	30	16	0.48	4	26	49.92	6.18
4	LED tube (20 W)	20	153	3.06	4	26	318.24	39.38
5	LED BULB (15 W)	15	13	0.195	4	26	20.28	2.51
6	CFL(15W)	15	69	1.035	4	26	107.64	13.32
7	ZW Bulb (5W)	5	18	0.09	4	26	9.36	1.16

8	Bulb(ICL) 60W	60	2	0.12	4	26	12.48	1.54
						Total	**808.08**	

Observations:

- In lighting system about 60% of the load has been converted to energy saving LED bulbs
- However remaining 40 % are T8 and CFL bulbs only

Table-13: Type wise Fan Distribution

Type	Wattage	Quantity	Load in kW	Daily working hrs	Monthly working days	Monthly kWh	% Load
Fan (75 W)	75	251	18.825	6	26	2936.7	96.76
Pedestal FAN (60W)	60	2	0.12	6	26	18.72	0.62
Ex Fan (150W)	150	3	0.45	6	26	70.2	2.31
Wall Fan (60W)	60	1	0.06	6	26	9.36	0.31
					Total	**3034.98**	

Observations:

- Fan contributes 30% of the connected load and almost all fans are conventional type only.

Table-14: AC Load distribution

Sl.No	Type of fitting	Wattage	Total Quantity	Load in kW	Daily working hrs	Monthly working days	Monthly kWh	% Load
1	AC 2 TR	2750	3	8.25	6	26	1287	67.68
2	AC 1.5 TR	1970	2	3.94	6	26	614.64	32.32
						Total	**1901.64**	

Observations:

- All 5 air-conditioning systems are not star rated systems
- Running conditions are more than Rated values

ECM 1 - Replace Older T8 lights to 20W LED tubes

	Present Scenario	Proposed Scenario
Total Number lights	71	71
Wattage (W)	30	20
Total hours of operation	4	4
Total Units consumed	8.52	5.68
Total Unit savings per day		2.84
Electricity Cost(Rs./Unit)		14.42
Annual Cost savings(Rs)		₹12,777.27
Initial Investment(Rs.150/LED 20W)		₹10,650.00
Payback period		**10 months**

ECM 2 - Replace Older 15W CFL to 10W LED bulb

	Present Scenario	Proposed Scenario
Total Number lights	69	69
Wattage (W)	15	10
Total hours of operation	4	4
Total Units consumed	4.14	2.76
Total Unit savings per day		1.38
Electricity Cost(Rs./Unit)		14.42
Annual Cost savings(Rs)		₹6,208.68
Initial Investment(Rs.100/LED 10W)		₹6,900.00
Payback period		**13 months**

ECM 3 - Replace Older fans to BLDC

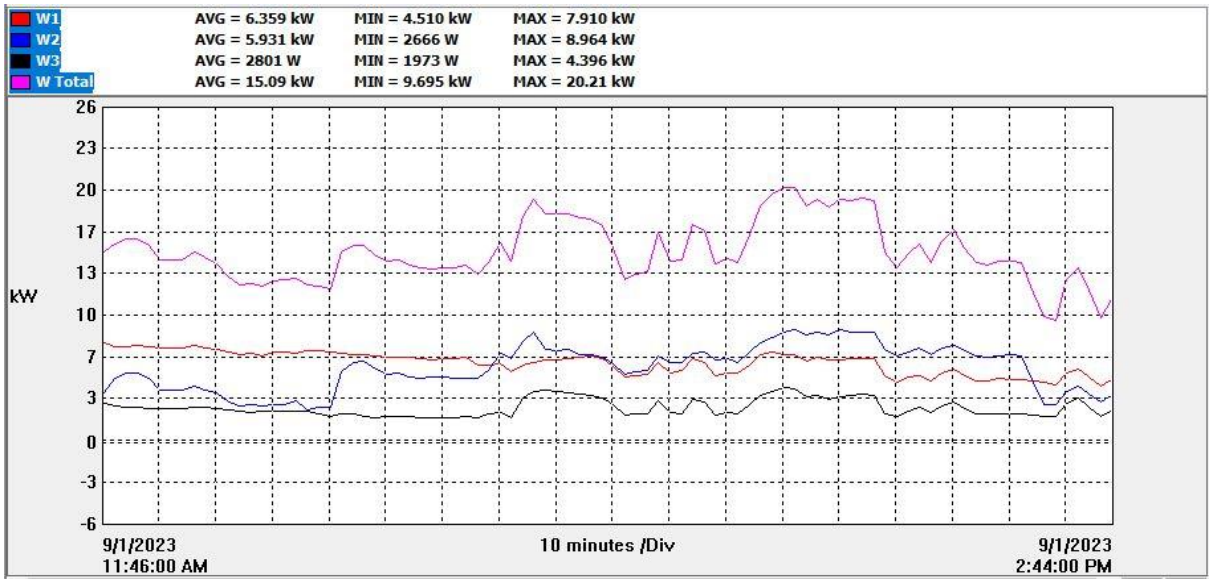
	Present Scenario	Proposed Scenario
Total Number Fans	251	251
Wattage (W)	75	30
Total hours of operation	6	6
Total Units consumed	112.95	45.18
Total Unit savings per day		67.77
Electricity Cost(Rs./Unit)		14.42
Annual Cost savings(Rs)		₹3,04,899.94
Initial Investment(Rs.2500/BLDC)		₹6,27,500.00
Payback period		**25 months**

ECM 4 - Replace Older ACs to 1.5 TR Star rated inverter ACs

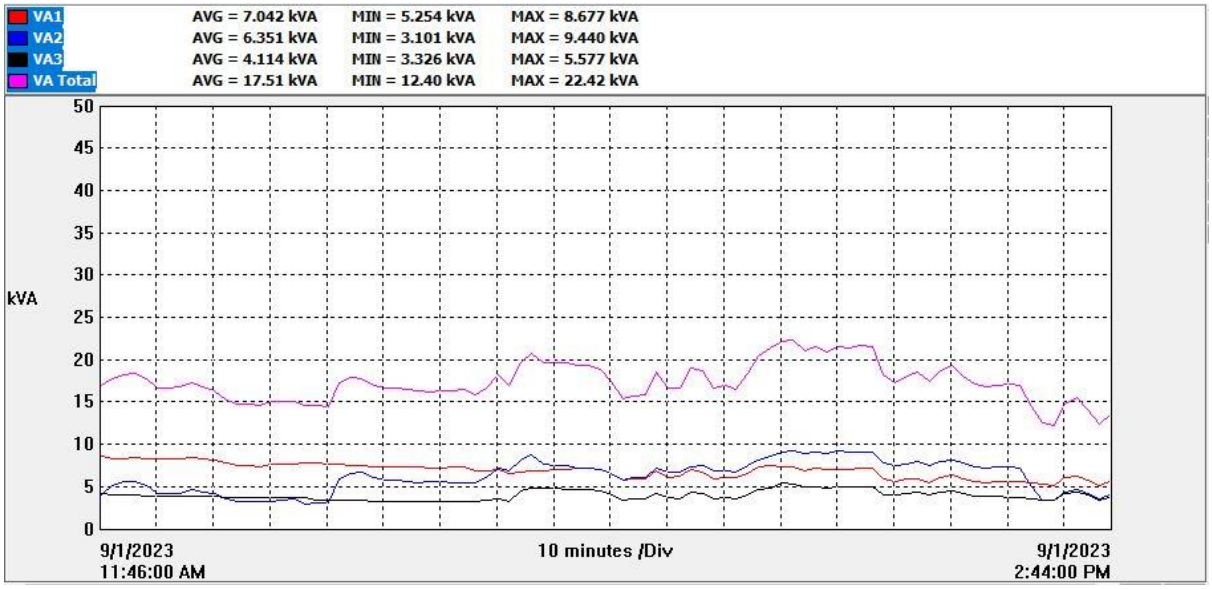
		Present Scenario	Proposed Scenario
Total Number of 1.5 TR AC		2	5
Total Number of 2 TR AC		3	-
Wattage (W)	1.5 TR AC	2000	1355
	2 TR AC	2750	-
Total hours of operation		6	6
Total Units consumed		73.5	40.65
Total Unit savings per day			32.85
Electricity Cost(Rs./Unit)			14.42
Annual Cost savings(Rs)			₹1,47,793.46
Initial Investment(Rs.40000/1.5 TR 5* AC)			₹2,00,000.00
Payback period			**16 months**

PQ Analysis Report

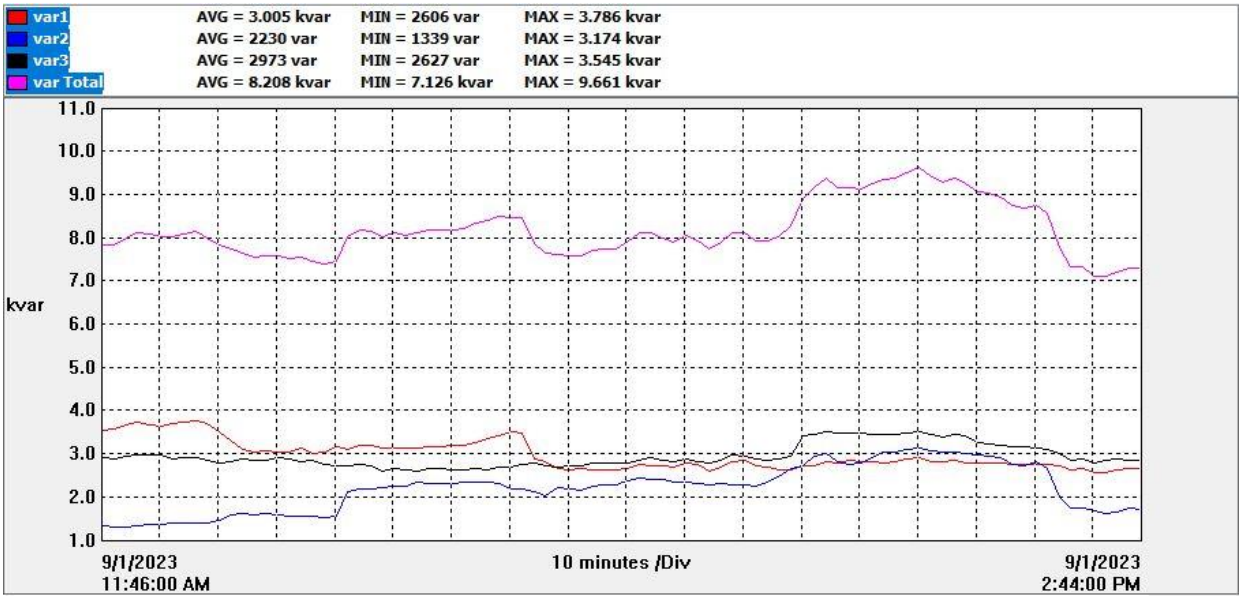
For College:



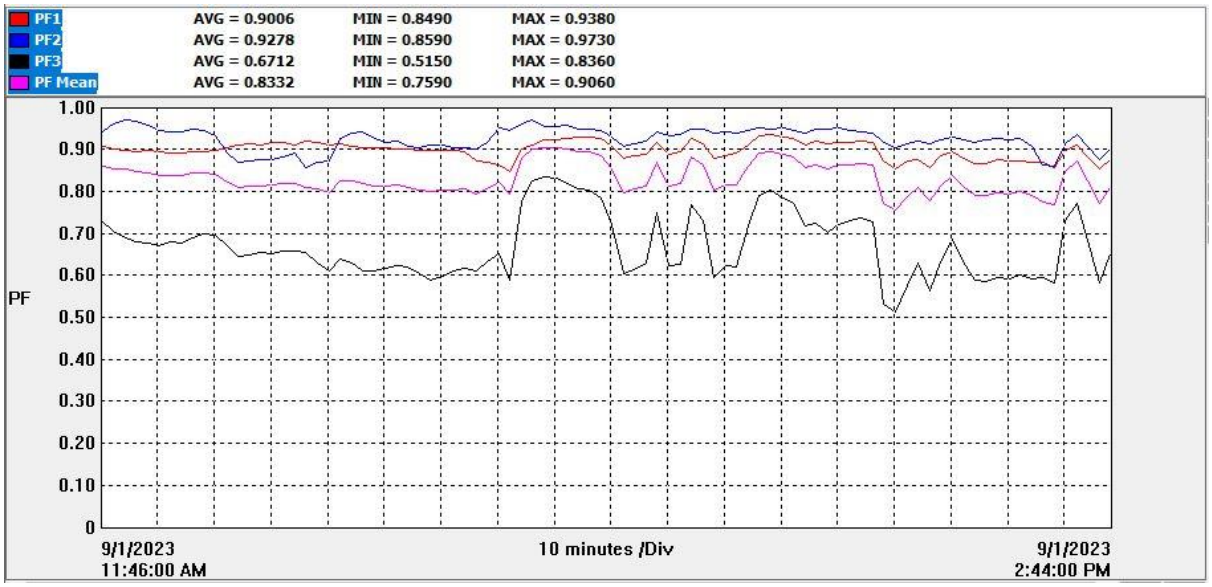
Inference: Phase III (Blue) is under loaded. Try to distribute equally.



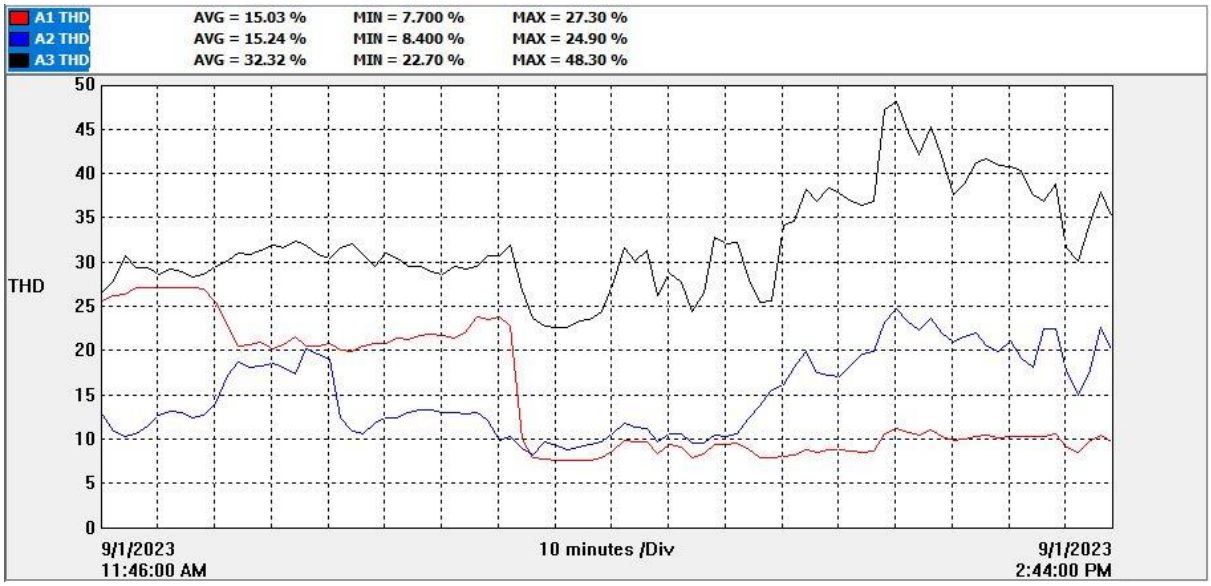
Inference: Improper distribution in the phases was noted.



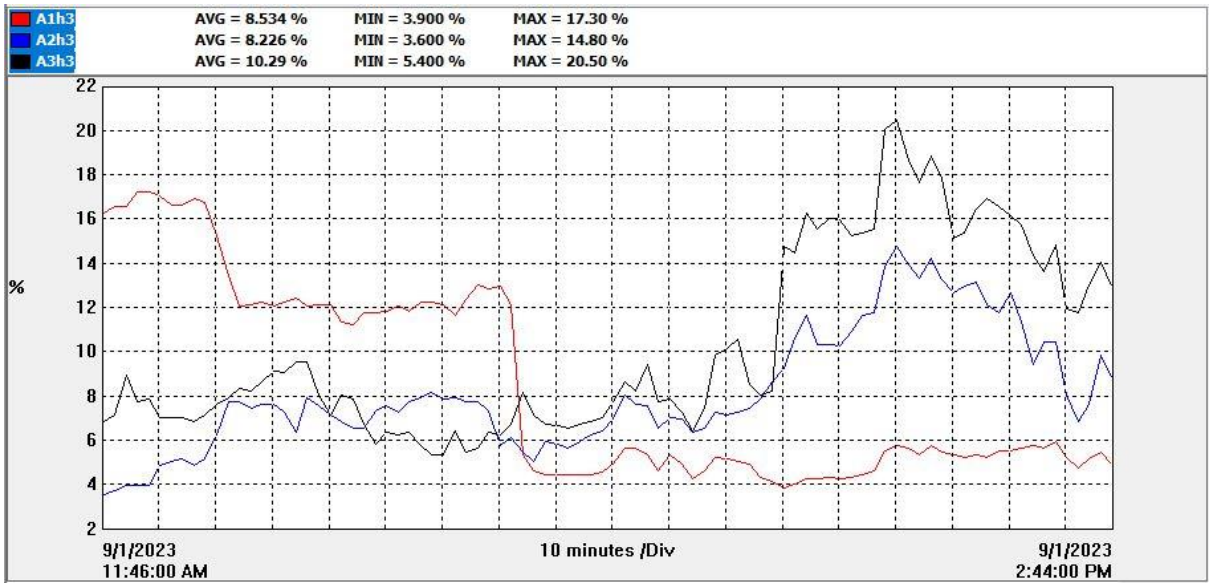
Inference: No abnormality was noted.



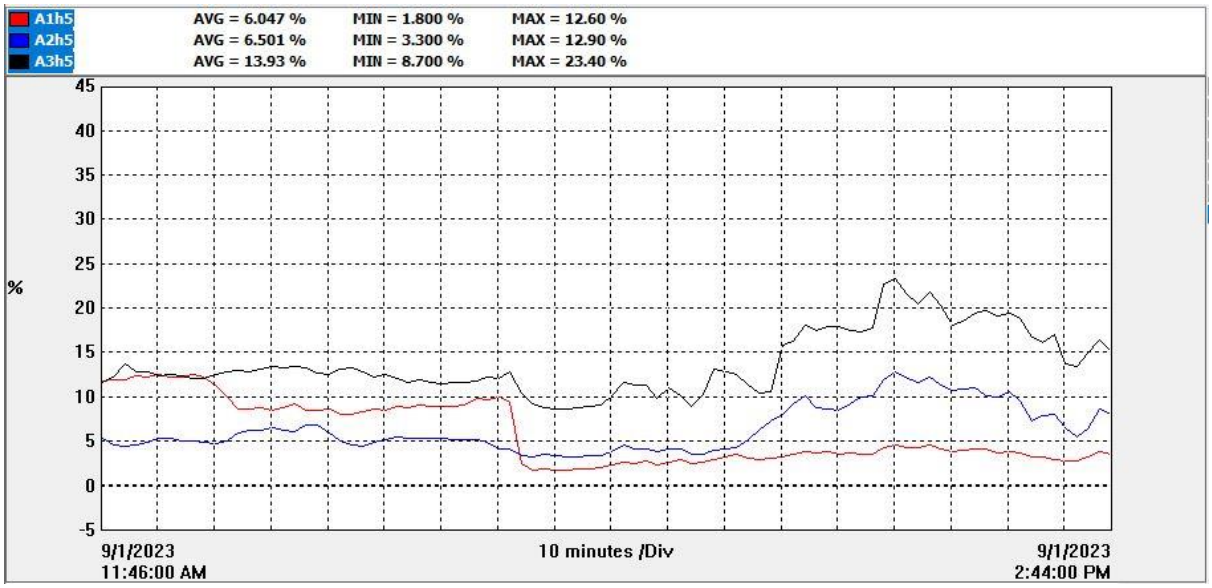
Inference: Phase I & II seems to be good. Abnormality found in Phase III.



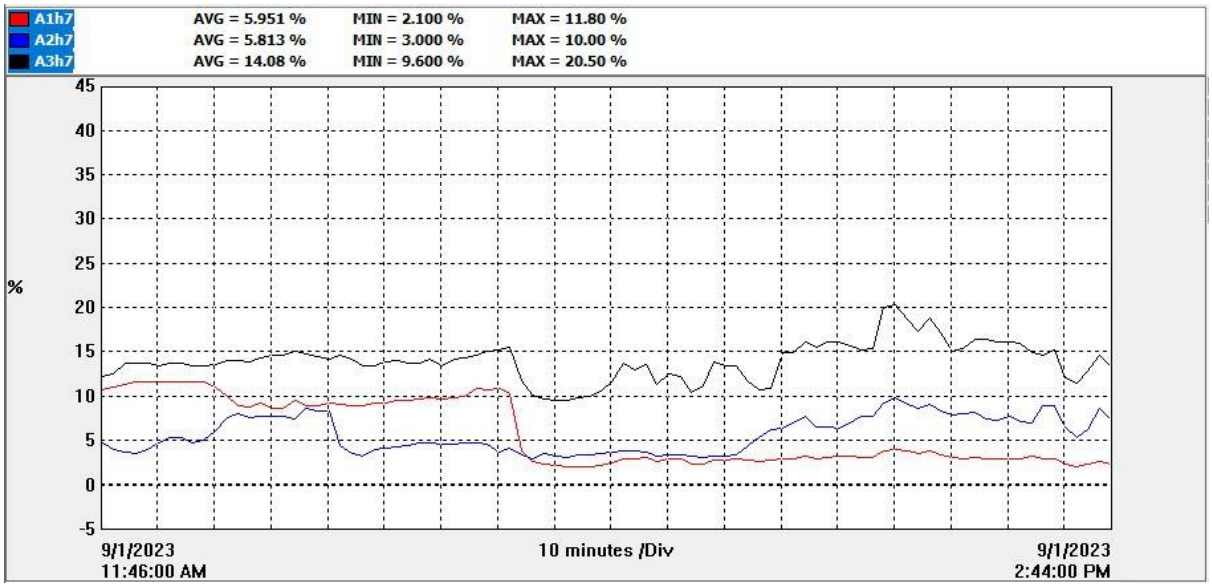
Inference: Abnormality found in Phase III. Try to balance the harmonics.



Inference: No abnormality found.

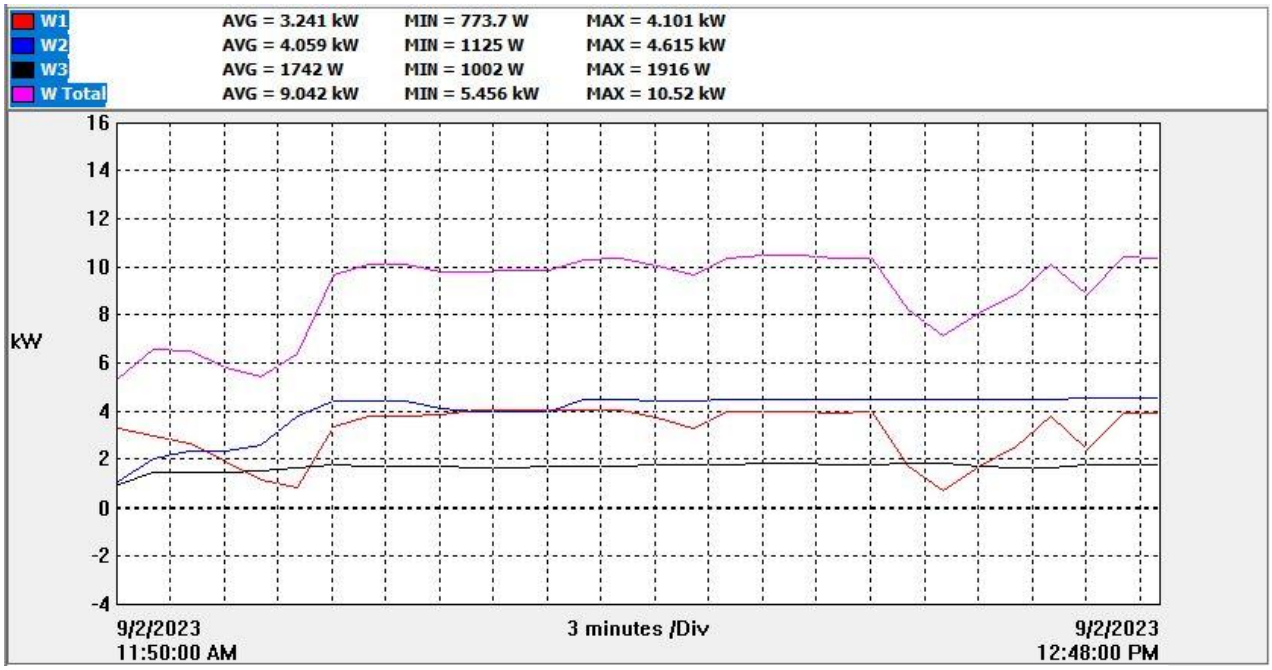


Inference: Abnormality found in Phase III. It seems to be double than other phases.

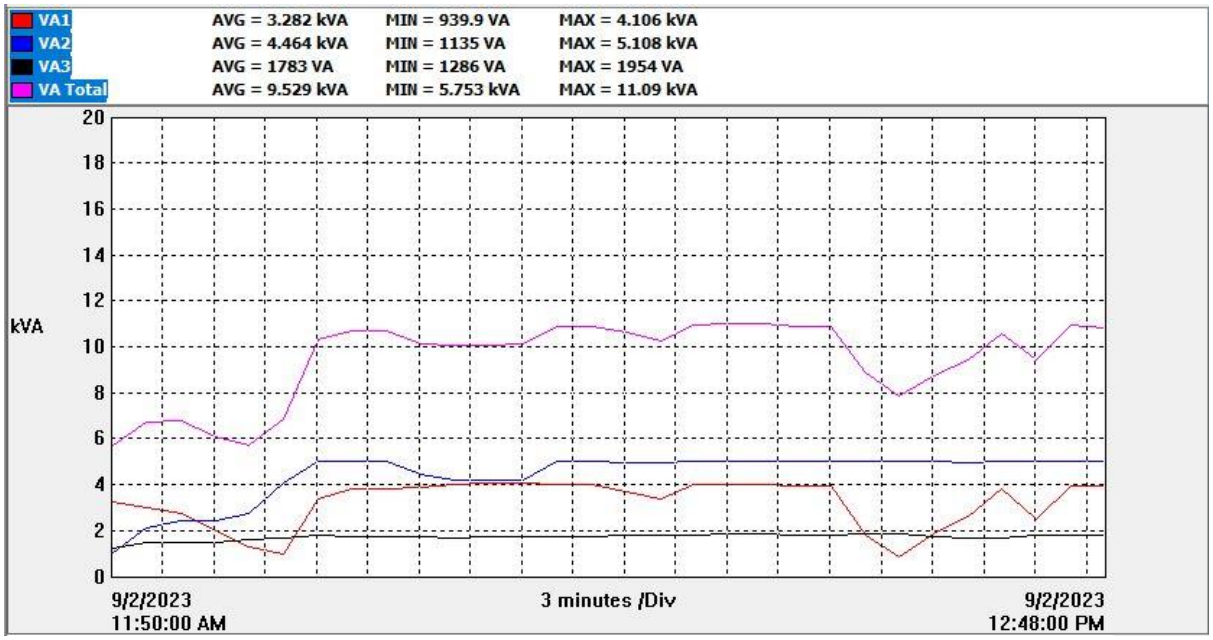


Inference: Abnormality found in Phase III. Harmonic filters are needed to balance the distribution.

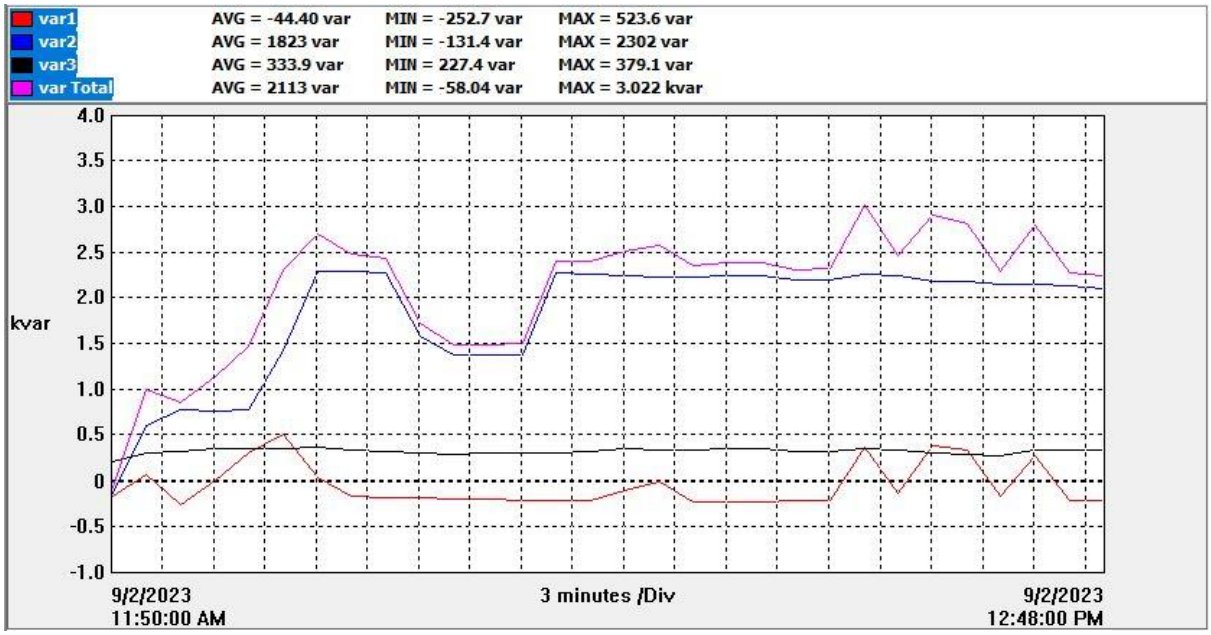
For Hostel:



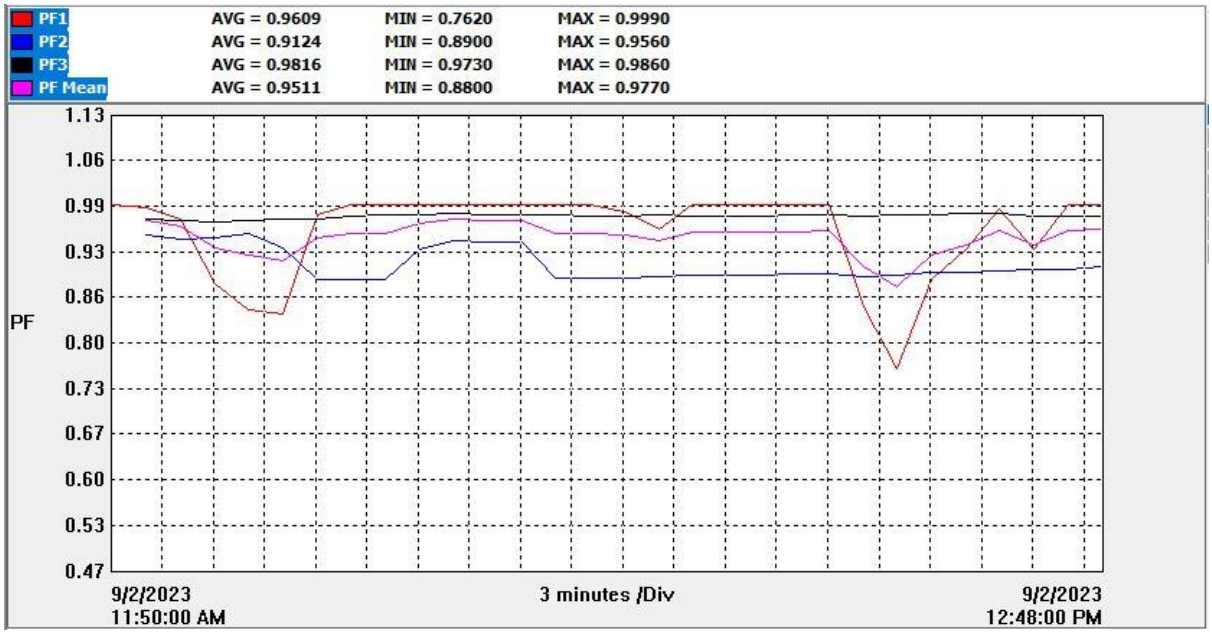
Inference: Imbalance in power distribution. Phase III (Blue) is under loaded.



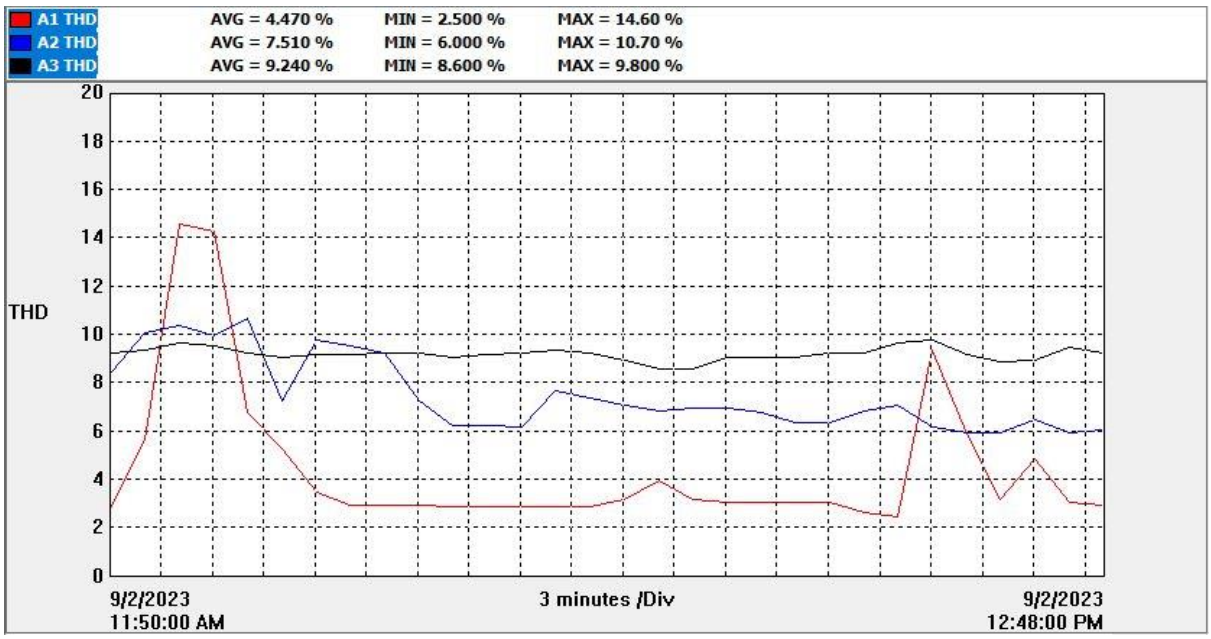
Inference: Improper distribution in power (kVA). Try to balance the load in phase III (Blue)



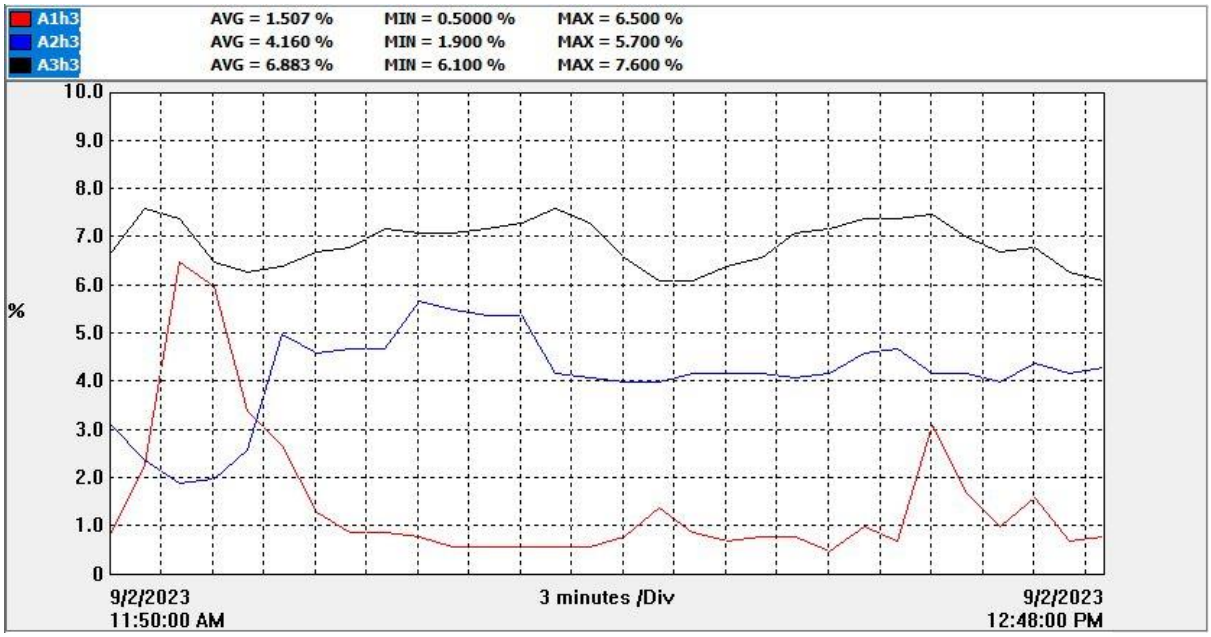
Inference: Abnormality found in power (kVAr) distribution. Need to balance the load.



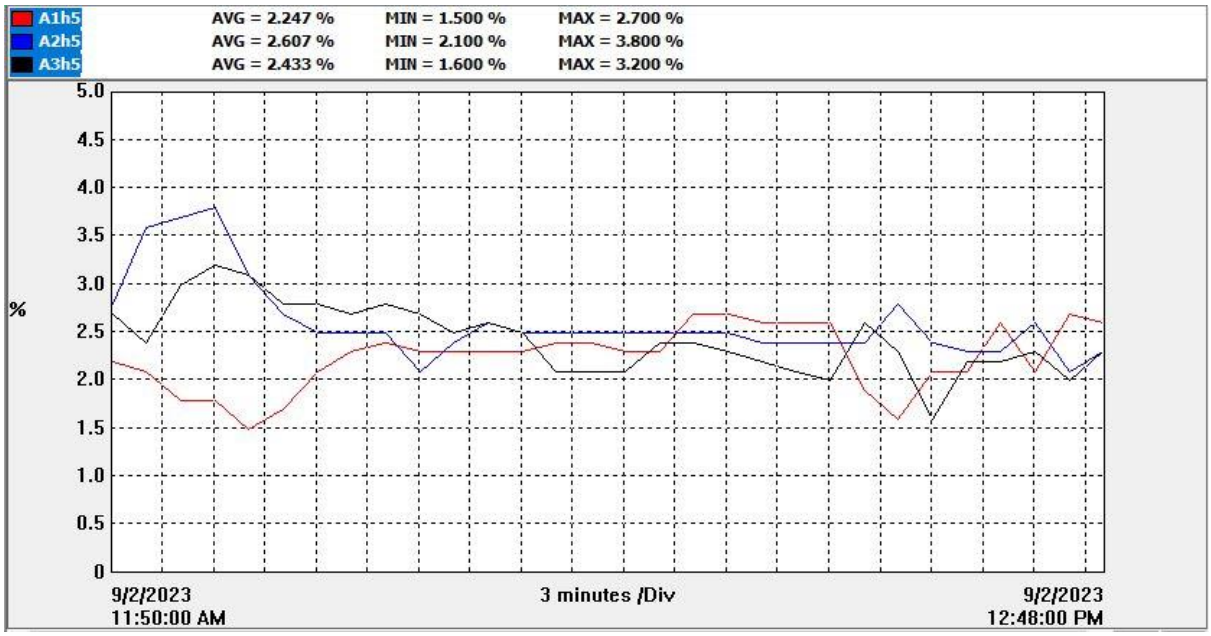
Inference: Power factor maintained above 0.9. It seems good.



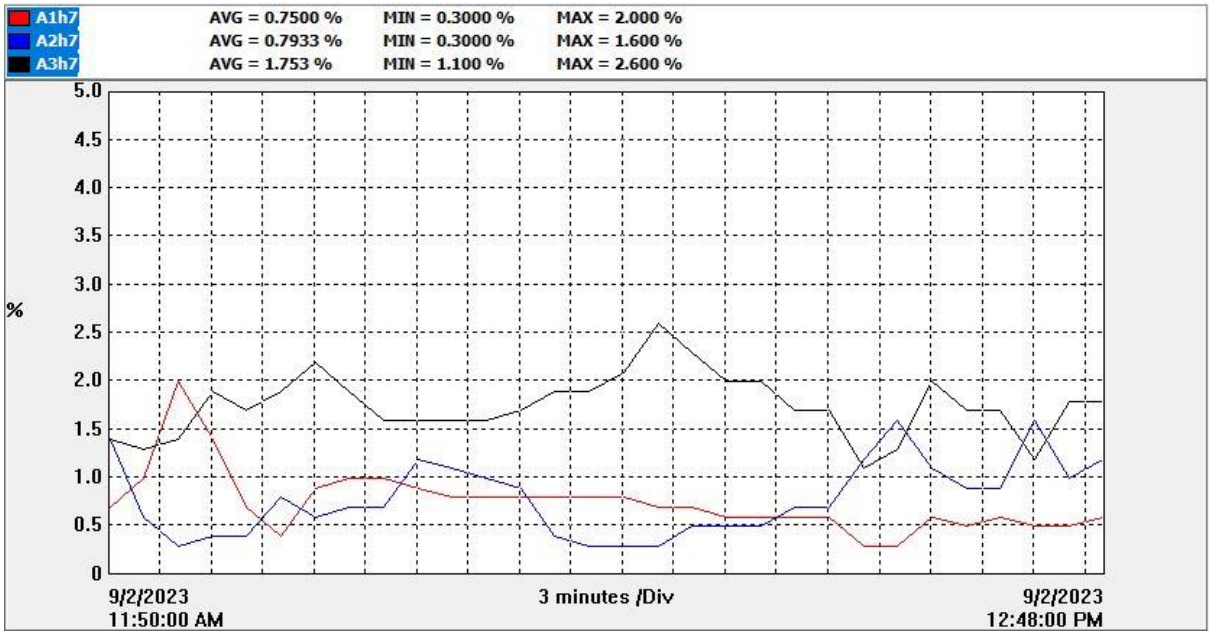
Inference: Harmonics disorder seems to be improper. Try to balance the harmonics.



Inference: Abnormality found. Need to add harmonic filters.



Inference: 5th harmonics seems to be normal.



Inference: Disorder is found in phase III. Need Harmonic filter.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART –B: ENVIRONMENTAL AUDIT REPORT

3. ESTIMATION OF CO_2 EMISSION AND NEUTRALIZATION (ELECTRICITY, DIESEL & LPG)

3.1: Assessment of Annual Energy Usage:

Table-15 shows the types of energy carriers used for their regular operation in the college campus along with the application area and their source.

Table-15: Energy Carriers, Application area and their sources used for college operation

S. No.	Type of Energy Carrier	Application area	Source of procurement
1.	Electricity (HT)	Powering to all electrical/electronic / HVAC equipment	From TANGEDCO
2.	Diesel	Transport vehicles and Diesel Generator (Captive Generation)	From authorized distributor
3.	Liquefied Petroleum Gas (LPG)	Used only for cooking	
4.	Matured Trees	The college is located in a lush greenery and nearly 179 no's of various varieties of matured trees are available with more than 10 years old.	

3.2: Environmental System: CO_2 Balance Sheet (2022-23):

Environment audit is to assess the CO_2 emission and neutralization in the college and is a best tool to chalk out the plans to reduce it from the present values. Table-16 provides the balance sheet indicating various energy carriers associated with the regular activities of the college and their CO_2 mapping.

Table-16: Environmental System: CO_2 Balance Sheet (2022-23)

S. No.	Energy Consumption & CO_2 Emission			CO_2 Neutralization		
	Description	**Energy Quantity (Annum)**	**CO_2 Emission (Tons/Annum)**	**Description**	**Energy Usage**	**CO_2 Neutralized (Tons/Annum)**
1.	Electrical Energy	28,026.8kWh	25.78	CO_2 Neutralized due to Matured Trees	179 nos.	3.88
2.	Diesel (Transport + DG)	11,019 liters	29.75	CO_2 Neutralized due to Solar PV system	12,894.80 kWh	11.86
3.	LPG Consumption	376.2 kg	1.13			
4.	**Total-Emission**		**56.66**	**Total-Neutralized**		**15.74**
Balance CO_2 to be Neutralized = 40.92 Tons/Annum & Per Capita CO_2 Consumption = 0.063 Tons/Annum [1]						

([1] Total strength of students - 591 + Teaching and technical staff – 57 = 648)

Observations:

1. In the campus, the CO_2 emission from the diesel usage is the highest which is of 29.75 tons/annum.
2. The total electrical consumption in the college campus is 28026.8 kWh per annum for both college and hostel which contributed to the CO_2 emission of 25.78 tons/annum.
3. Due to the less LPG consumption, the CO_2 emission from LPG is low which is of 1.13tons/annum. However, it is suggested to use an efficient firewood stove to cook food using biomass which could reduce the emission from the LPG.
4. Due to the management's effort, 10 kW capacity solar PV panel has been installed to contribute 80% of the total energy consumption in 2022-23. This had led to the CO_2 neutralization up to 11.86 tons/annum.
5. The campus has grown several varieties of trees which have contributed to the CO_2 neutralization of 3.88 tons/year. They had a vision of eliminating complete CO_2 emission by implanting more new plants and trees.
6. The college is now trying to neutralize its CO_2 emission through various initiatives like i) Installation of rooftop solar PV systems, ii) Reduction of LPG consumption, iii) Planting more no. of trees and iv) implementation of various energy conservation measures (FTL to LED conversion, conventional fan to BLDC Fan, judicious use of all types of energy etc.,).

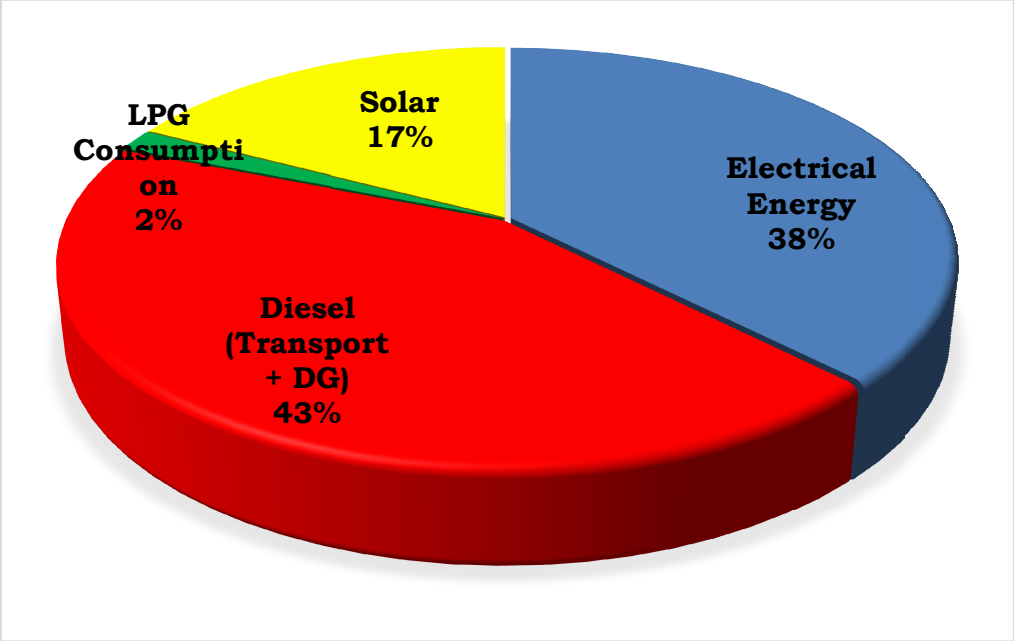


Fig.11: Percentage of CO_2emission in the college campus from various sources

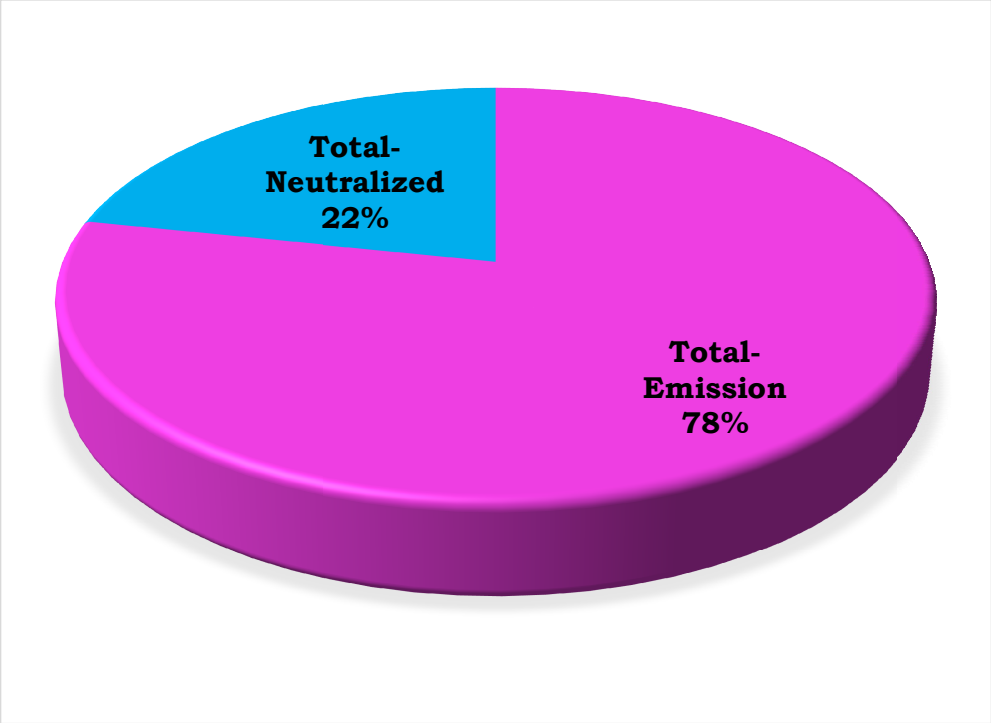


Fig.12: Percentage of CO_2emitted and CO_2 neutralized inside the campus

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

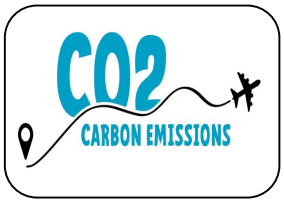
4. TRANSPORT & REFRIGERANT GASES IN AIR CONDITIONING SYSTEM

4.1. List of Transport Vehicles:

The college is committed to provide green environment not only in the campus; but also to the entire atmosphere. The list of transporting vehicles available in the college campus along with their fuel type and usage are represented in Table 17.

Table 17: List of Transporting Vehicles available in the College.

S.No.	Type of Vehicle	Make, Model & Year of Manufacture	Vehicle Number	Date of FC	Non Polluting Vehicle
1	Van	2008, VE COMMERCIAL /EICHER 10.50	TN72AC4340	24-04-2023	Yes
2	Bus	2011, SML ISUZU LTD. /SWARAJ MAZDA SUPER	TN72AJ9995	13-04-2023	Yes
3	Bus	2014, Eicher Motors Ltd./Eicher10.90HSD	TN72BA0147	19-04-2022	Yes
4	Bus	2022, Eicher Motors Ltd./Eicher10.90RHDECAB	TN72P0012	13-04-2023	Yes
5	Bus	2012, SML ISUZU LTD. /SWARAJ MAZDA ZT54	TN72AM9879	8/5/2023	Yes
6	Bus	2017, Ashok Leyland Ltd./LT1309.3D4RB/C	TN72BH5776	14-02-2022	Yes
7	Bus	2019, Ashok Leyland Ltd./LT1309.3D4RB/C	TN72BP1144	24-03-2022	Yes



Annual fuel consumption for transport (**2022 - 23**) is **11,019 Litres** which contributes CO_2 Emission of **29.75 Tons/Annum**

Form 59

[See rules 115 (2)]

Pollution Under Control Certificate

Authorised By :
State Transport Department

Date	:	**08/05/2023**
Time	:	**10:42:25 AM**
Validity upto	:	**07/11/2023**

Certificate SL. No.	:	TN07200010021314
Registration No.	:	TN72AM9879
Date of Registration	:	24/Sep/2012
Month & Year of Manufacturing	:	August-2012
Valid Mobile Number	:	******4186
Emission Norms	:	BHARAT STAGE III
Fuel	:	DIESEL
PUC Code	:	TN0720001
GSTIN	:	
Fees	:	(GST to be paid extra as applicable)
MIL observation	:	No

Vehicle Photo with Registration plate
60 mm x 30 mm

Sr. No.	Pollutant (as applicable)	Units (as applicable)	Emission limits	Measured Value (upto 2 decimal places)
1	2	3	4	5
Idling Emissions	Carbon Monoxide (CO)	percentage (%)		
	Hydrocarbon, (THC/HC)	ppm		
High idling emissions	CO	percentage (%)		
	RPM	RPM	2500 ± 200	
	Lambda	-	1 ± 0.03	
Smoke Density	Light absorption coefficient	1/metre	2.45	0.53

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC operator
60mm x 20 mm

Authorised Signatory

4.2. List of Air Conditioning System along with its Refrigerant:

The list of ACs indicating their quantity, tonnage, refrigerant, GWP and ODP are shown in Table-18.

Table-18: List of Multi-variant AC System, Type of Refrigerant, GWP and ODP Values

S.No.	Location	Tonnage (TR)	Quantity	Refrigerant Used	Global Warming Potential (GWP)	Ozone Depletion Potential (ODP)
1	Computer Lab	2	2	R22	1810	Medium
2	Computer Lab	1.5	2	R22	1810	Medium
3	Seminar Hall	2	1	R22	1810	Medium

Note:

- The most environment-friendly refrigerants that are available in Indian market currently are “R-290” and “R-600A”. They are Hydrocarbons and their chemical names are “Propane” for R-290 and “Iso-Butane” for R-600A.
- They are completely halogen free, have no ozone depletion potential and are lowest in terms of global warming potential. They also have high-energy efficiency but are highly flammable as they are hydrocarbons.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

5. WATER UTILIZATION, CONSERVATION & WATER MANAGEMENT

5.1. Source of Water, Storage and Distribution:

Water is one of the main consumable in the college campus. ANNAI HAJIRA WOMEN'S COLLEGE gets the water from three different sources i) Fresh water from the bore well, ii) Rain Water Harvesting (RWH) and iii) Purified water from RO Plant. Different source of water, location of storage along with their application is given in the table.

Table 19: Types of water used in college campus along with application.

Type of water	Source	Location of storage	Application
Fresh water	Bore water – 01 No. with 350 feet depth.	1.5 HP Compressor motor pump used to lift the water to overhead tank of 4,500 litre capacity.	Utensil Cleaning, Hand wash, toilet, labs and also for gardening purpose.
Fresh water	Bore water– 01 No. with 150 feet depth.	1HP jet pump is used to store water in separate sump with a 1,000 litre capacity.	For College RO plant
Fresh water	Corporation water sump of 24,000 litre capacity.	0.5 HP submersible Pump is used to store water in separate sump of 5,000 litre capacity (5 Nos. of 1000 litre capacity each), 2 Nos. of 1,000 litre capacity	For Hostel washing, bathing & restroom For Hostel Kitchen For RO in Hostel & Library
Rain water	Rain Water collected through i) buildings	Percolated to underground	Used to increase the ground

	run offs and ii) road runoffs		water level
Treated water	From RO plant	Treated water from the RO plant used for drinking and cooking purpose.	

Fig. 13. Overhead sintex tank for RO plant

Fig.14. Overhead sintex tank for hand wash, toilet, other applications.

5.2. Reverse Osmosis (RO) Plant for Drinking Application:

- The college management is keen on providing uninterrupted, safe and healthy drinking water to all the students and staff members throughout the year.
- This water is being checked in an accredited laboratory and ensures that the water is potable.
- The specifications of RO Plant and distribution of potable water to the entire campus is given in Table.

S. NO.	Parameters	Description
1.	Total no. of RO Plant	06 Nos. (College – 03 Nos., Hostel – 02 Nos. and Library – 01No.)
2.	Capacity of each RO Plant	➢ 50 Litre/hour in College & Hostel. ➢ 15 Litre/hours in Library.
3.	Source of raw water	Bore water (stored in overhead sintex tank of 1,000 litre capacity)
4.	% of RO & grey water output	1/3rd of RO water and 2/3rd of grey water(For every 3,000 ml of raw water input, 1,000 ml of RO water is the output)
5.	Usage of grey water	Routed to Garden plant.
6.	Cleaning schedule of membrane	Once in 2 month.
7.	Change of membrane	Yearly once based on TDS value increases
8.	Functioning of RO Plant	➢ DC motor runs for 4-6 hours per day and then turned off. ➢ Based on requirement it is operated.
9.	Quality of RO water	Maintained between 25 – 75 TDS.

		(Measured TDS value is 55.3 during auditing)
10.	RO water storage	➢ Stored in 100 litre capacity food grade stainless steel tank – 03 Nos. (College -01 No. & Hostel – 02 Nos.) ➢ Stored in 100 litre capacity plastic tank – 02 Nos. (College -02 Nos.) ➢ Stored in 15 litre capacity plastic tank – 01 Nos. (library)
11.	Quality of water & testing certificates	Yearly once both RO and grey water quality was tested in a NABL accredited laboratory
12.	Cost of RO Water	=(load x average charge consumption) =(14.42 x ((200 w x 2 hr)+(375 x 0.167 hr))/1000) = **Rs. 7 per litre** (approximately)
13.	Best Operating Procedures to be done	➢ Recommended to backwash based on the color of the water. ➢ Paste the Dos and Don'ts Chart. Also paste the plant operating sequence. ➢ Recommended to use food grade stainless steel water tank for storing RO water in all the areas.

Fig.15. RO water plant at Library

Fig.16. RO water plant at College & Hostel

5.3. Water Control Taps for General Application:

In the college, the Open able taps (Both Metal & PVC) are employed for all water distribution and utilization application and hence the user has to utilize only the required quantity of water and wastage of water was eliminated.

Fig.17. Fresh water distribution to prayer hall.

Fig.18. Fresh water distribution to Hostel.

Fig.19. Fresh water distribution to College.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

6.USAGE OF CHEMICALS, SALTS & ACIDS (STORAGE, HANDLING, AND BEST OPERATING PRACTICES)

6.1: Policy of Chemicals/Salts/Acids used in the Laboratory:

The science department uses chemicals for experimental applications and is having strict safety rules of thumb for handling and storage as follows.

- Well trained faculty and lab assistants are only allowed to handle the chemicals safely and have knowledge about the hazardous nature of each and every chemical.
- Strictly following the manufacturer's instruction on the container in order to prevent accidents.
- Volatile or highly odorous chemicals, fuming acids are stored in a ventilated area.
- Chemicals are stored in eye level and never on the top shelf of storage unit.
- All stored chemicals; especially flammable liquids are kept away from heat and direct sunlight. Also reactive chemicals are not stored closely.
- Hazardous and corrosive chemicals are kept on sand platform to avoid corrosion.
- First aid box and fire extinguishers are readily available in the laboratory.

6.2: General Instructions given to the Students while working in the Laboratory:

- Never work in the lab unless a demonstrator or a teacher is present.
- Never taste any chemicals and don't allow chemicals to come in contact with your skin.
- Don't throw waste into the sink; rather they must be thrown into the waste pins.
- Keep all the doors and windows open while working the laboratory.
- Sulphuric acid must be diluted only when it is in cold condition.
- Reagent bottles must never be allowed to accumulate on the work bench.
- Containers used for reactions must be properly labeled.

- Working space should be cleaned immediately.
- Protection and safety is most important.
- While entering the laboratory, everyone must wear lab coat and shoes.
- Prior knowledge on hazardous property of the chemicals is must.
- Seek the advice of faculty and technical staffs during emergency.
- Know the location of first aid box and fire extinguishers located in the laboratory.
- Don't attend any self-medical practices either for you or for your fellow students.

6.3: Storage of Chemicals/Salts/Acids:

Less concentrated chemicals, salts and acids are stored in proper racks, cupboards and high concentrated acids are stored in separate area filled with sand. Storage practices are represented below in Fig. 20, 21, 22&23.

Fig.20. Storage of Chemicals in the flask.

Fig.21. Storage of concentrated acid in sand base.

Fig.22. Storage of dissolved acids and salts.

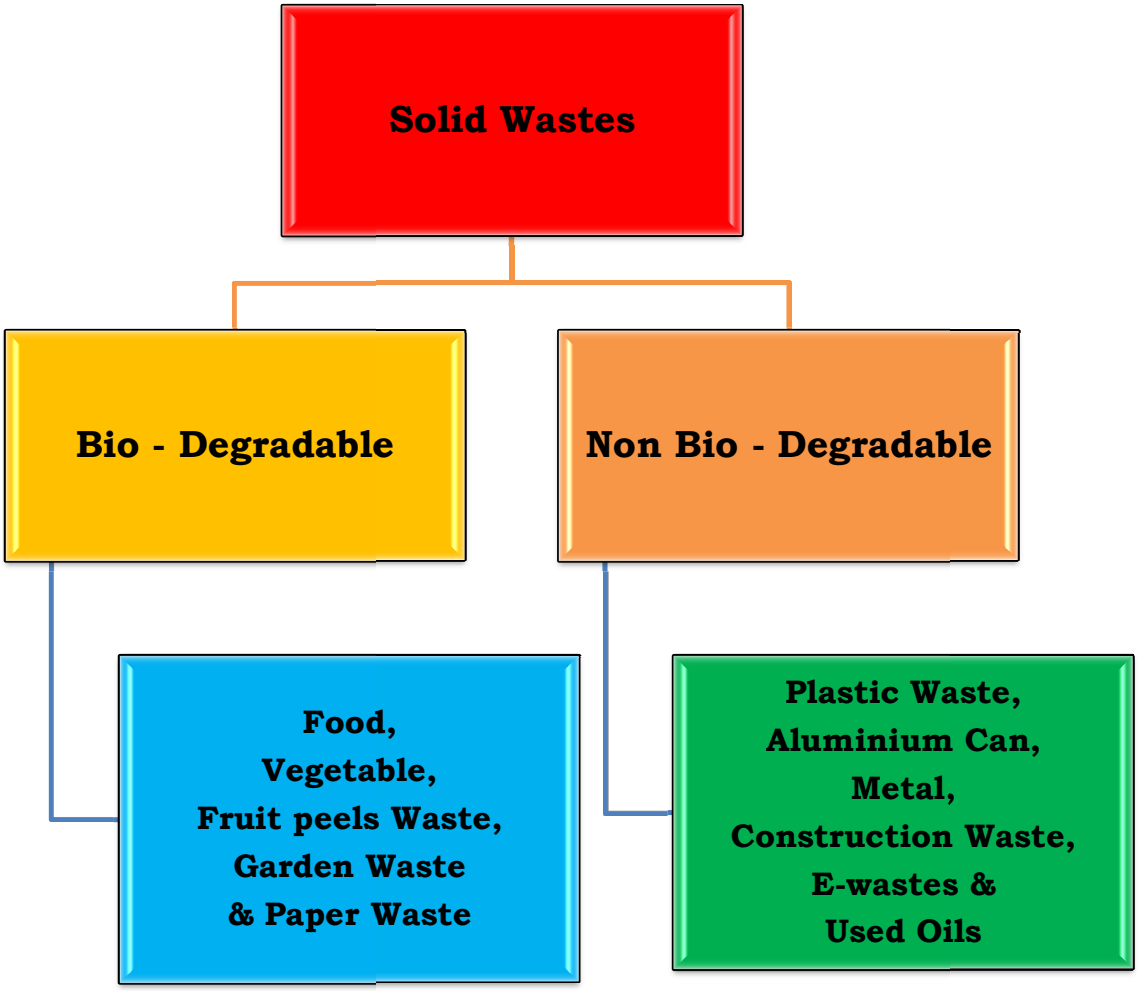
Fig.23. Storage of different salts in the lab.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

7. WASTE HANDLING & MANAGEMENT

7.1. Solid Waste Management System:

Different types of wastes generated inside the college promises are represented in the below block diagram.



7.2. Process of Waste Management:

The college management practiced some methods to treat the waste generated and Table-20 shows the process of treating the solid waste generated inside the college campus.

Table-20: Process of Waste Management

S. No.	Waste Type	Waste Treatment
Bio Degradable Waste Management		
1.	Food & Vegetable Waste	Collected in separate bucket for two days and then dumped in to the biogas plant.
2.	Garden Wastes and Plant Leaves	Daily collected and dumped in an organic manure pit and also vermin-compost.
3.	Paper Waste	Collected and stored in a separate place. Sale to third party for recycling.
Non-Bio Degradable Waste Management		
4.	Plastics	Banned in the college campus. Chemical/salt storage plastic Containers, waste from canteen etc., being disposed to 3rd Party.
5.	Construction Wastes	Mostly used by their own construction and used for internal land filling
6.	Metals	Construction metals or from any other sources are stored in a separate place. Sale to thirty party for recycling.
7.	Transport Oil + Tyres	Oils are taken by service center's itself while replacing new one. Tyre's are stored in a separate place and sale to 3rd party.
8.	Transport Vehicle and Computer Batteries	Procuring new batteries with buyback offer (old battery replacement)
9.	Used edible oil	Used cooking oils are kept in separate place and sold to 3rd party for recycling.
10.	E-Waste Management	Separately given below. Sale to third party.

7.3. List of Approved E-Wastes:

E-Waste – Electrical	E-Waste – IT & Communication
• Motors and Starters • Fans, Lamps and Luminaries • Electrical Drives • Broken/Fired Cables • Power Distribution Panels • Analog & Digital Measuring Instrument	• Copier/Printers • Power Stripes & Power Supplies • UPS/Servo Stabilizers/Inverters • Batteries • Wi-fi-Modems, Routers, Toggle Network Cables, Switches, Hubs • Audio & Video Equipment's/Remote • Printed Circuits Boards

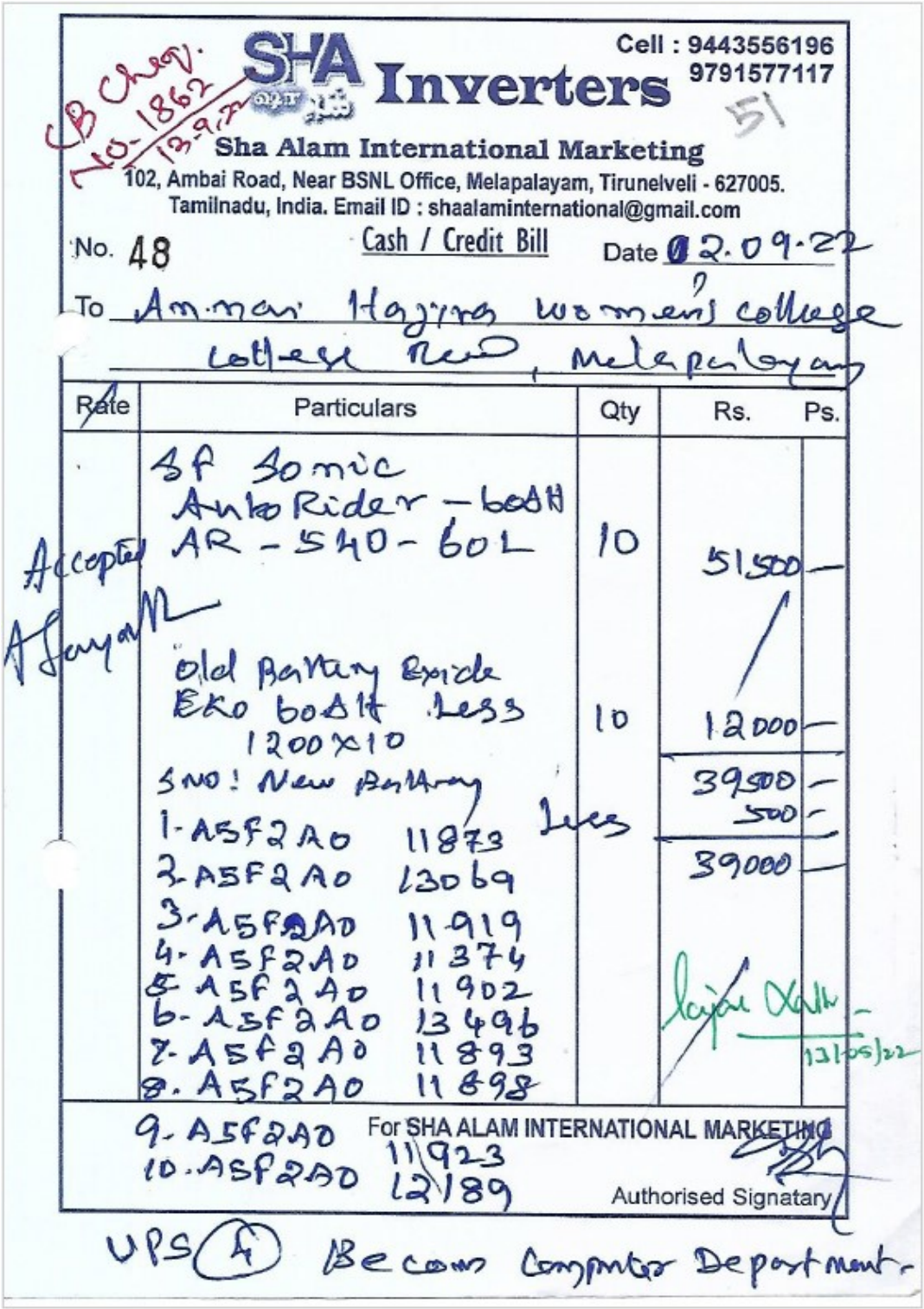
Fig 24: Food waste collected in bucket

Fig 25: Collected Food waste is dumped in biogas plant and gas is stored in tyre tubes.

Fig.26: Wooden and Carton Box wastes stored in a separate place

Fig. 27: Manure preparation from garden waste

Fig. 28: Collection of garden waste and paper waste



SB Chq. No-1862 13-9-22

SHA Inverters

Cell : 9443556196
9791577117

51

Sha Alam International Marketing
102, Ambai Road, Near BSNL Office, Melapalayam, Tirunelveli - 627005.
Tamilnadu, India. Email ID : shaalaminternational@gmail.com

No. 48 Cash / Credit Bill Date 12.09.22

To Ammar Hajira women's college
College Road, Melapalayam

Rate	Particulars	Qty	Rs.	Ps.
	SF Sonic Auto Rider – 60AH			
Accepted	AR - 540 - 60L	10	51,500	—
A Jayam				
	Old Battery Exide Eko 60AH Less 1200x10	10	12000	—
	5 No! New Battery		39500	—
	1-A5F2A0 11873	Less	500	—
	2-A5F2A0 13069		39000	—
	3-A5F2A0 11919			
	4-A5F2A0 11374			
	5-A5F2A0 11902			
	6-A5F2A0 13496			
	7-A5F2A0 11893			
	8-A5F2A0 11898			
	9-A5F2A0 11923			
	10-A5F2A0 12189			

For SHA ALAM INTERNATIONAL MARKETING

Authorised Signatary

13/09/22

UPS (4) Becomes Computer Department.

Fig.29.Sample bill indicating the replacement of old battery while purchasing the new batteries

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART –C: GREEN AUDIT REPORT

8. ASSESSMENT ON LIST OF MATURED TREES AND GREEN ENERGY GENERATION

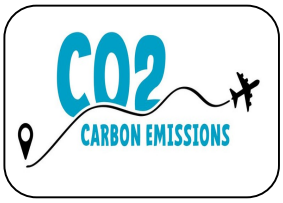
8.1. Campus Greenery:

The college is completely covered with matured trees grown for more than 10 years. The total number of matured trees available in the college campus is 179 with 23 varieties of trees. Apart from the mature trees; preserving the ecology; the entire college campus is planted with various flowing shrubs and pushes. Table-21 shows the list of matured trees available inside the college campus.

Table-21: List of Matured Trees Available in the College Campus

S.No.	Location (Wing/Block/Area)	Name of the Tree	Botanical Name	Quantity
1.	Main Building	Neem	Azadirachtaindica	67
2.	Center Garden	Neem	Azadirachtaindica	1
3.	Hostel	Neem	Azadirachtaindica	7
4.	Library	Neem	Azadirachtaindica	14
5.	Main Building	Millettiapimmata	Pongamiapinnata	28
6.	Center Garden	Millettiapimmata	Pongamiapinnata	1
7.	Hostel	Millettiapimmata	Pongamiapinnata	4
8.	Library	Millettiapimmata	Pongamiapinnata	8
9.	Main Building	Almond Tree	Prunusdulcis	11
10.	Center Garden	Almond Tree	Prunusdulcis	1
11.	Main Building	Drumstick Tree	MoringaOleifera	3
12.	Main Building	Malabar Plum	Syzgiumcumiri	2
13.	Main Building	Silver date palm tree	Phoenix Sylvestris	2
14.	Main Building	Cake Tree	Albizzia Amara	1
15.	Center Garden	Lemon	Citrus Limon	1
16.	Center Garden	Lime	Citrus aurantifolia	1
17.	Main Building	Teak	Tectonagrandis	1
18.	Center Garden	Custard apple	Annonasquamosa	2
19.	Main Building	Guava	Psidiumguajava L.	1
20.	Center Garden	Guava	Psidiumguajava L.	1

21.	Main Building	Tamarind tree	Tamarindusindica	1
22.	Main Building	Jackfruitt Tree	Artocarpusheterophyllus	1
23.	Main Building	Oleander	Nerium Oleander	2
24.	Center Garden	Oleander	Nerium Oleander	2
25.	Main Building	Mango Tree	Mangiferaindica	2
26.	Center Garden	Mango Tree	Mangiferaindica	2
27.	Hostel	Mango Tree	Mangiferaindica	2
28.	Main Building	Palmyra Palm tree	Borassusflabelliefer	2
29.	Main Building	Banana Tree	Musa acuminata	2
30.	Main Building	Coconut tree	cocosnucifera	2
31.	Center Garden	Indian Goosberry	PhyllanthusEmblica	1
32.	Center Garden	Ceylonebony	Diospyrosebenum	1
33.	Center Garden	Bannimara	Prosopis Cineraria	1
34.	Center Garden	Wood Apple	Aeglemarmelos	1
			Total	**179**



Total No. of Matured Trees available in the college campus is 179 which contributes for reduction of 3.88 Tons of CO_2 emission/Annum

In addition to the existing matured trees a total of 26 nos. of shrubs of 17 varieties are planted to increase the green source and also reduce the carbon emission per capita. List of shrubs with count is given in the table.

Table 22: List of Shrubs (Bushes)

S. No.	Location (Wing/Block/Area)	Name of the Shrubs	Botanical Name	Quantity
1.	Centre Garden	Holy Basil	Ocimum Tenuiflorum	4
2.	Centre Garden	Purble fruited egg plant	Solanumtrilobatum	1
3.	Centre Garden	Insulin olant, costusigneus	Chamaecostuscuspidatus	1

4.	Centre Garden	Air Plant	Pryophyllumpinnattum	1
5.	Centre Garden	Malabar nut	Justiuiaadhadoda	1
6.	Centre Garden	Creat	Andrographispaniculata	1
7.	Centre Garden	Common Globe Amarandh	Gomphrenaglovosa	1
8.	Centre Garden	Great Basil	Ocimum basilicum	1
9.	Centre Garden	Westindian pea	Sesbaniagrandiflora	1
10.	Centre Garden	Betal	Piper betle	2
11.	Centre Garden	Suger Destroyer	Gymnemasyluestre	1
12.	Centre Garden	Hybiscus	Hybiscusrosa - snesis	2
13.	Centre Garden	Rose	Rosa rubginosa	5
14.	Centre Garden	Indian pennywork	Centellaasiatica	1
15.	Centre Garden	Allspice	Pimeentadioica	1
16.	Centre Garden	Pandan plant	Pandanusamaryllifoliu s	1
17.	Centre Garden	Star fruit	Averrhoacarambola	1
Total				**26**

Fig.30. Sample 1 matured Tree in college campus.

Fig.31. Sample 2 matured Tree in college campus.

Fig.32. Sample newly planted plants in college campus.

Fig.33. Conversion of waste material for useful plantation by students.

Fig. 34: Geographical View of the college

8.2. Power Generation using Solar Photovoltaic System:

- In order to promote more green generation inside the college campus, the management has installed 10 kW grid tied Solar Photovoltaic systems in college roof top (Prayer Hall) and generates energy.
- Indeed it is good practice to use renewable energy based system for energy generation by avoiding conventional methods (electricity based).
- The specifications of the solar photovoltaic system installed on the college roof top are provided in the table below:

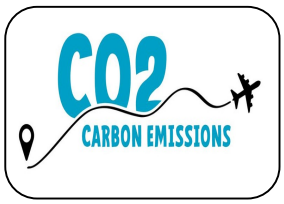
Total plant Capacity	10 kW
Panel Capacity	30 Nos. of 325 W panel
Location	College roof tap (Prayer Hall)
Panel Orientation (Direction)	South Facing

Type of PV panel	Polycrystalline
Application	Grid tied (Electrical need)
No. of Unit generated/Month (Approx.)	2149.13 Unit (kWh)
Year of Installation	August2020

Fig.35. Installed 10kW solar PV plant at college rooftop.

Table 23: Energy Generation through Solar PV System

S. No.	Description	Parameters
1.	Average solar radiation per Day for (latitude, longitude: 8.684, 77.714)	5.185 kW/m^2/Day
2.	Active work hours/day	04 hours
3.	Electrical Energy production per day	= (Plant Capacity * No. of working hours/day * SPV plant efficiency) = (10 kW * 04 * 0.8) = 32 kWh
4.	Electrical Energy production per month	= (32 * 30) = 960 kWh
5.	Electrical Energy production per Annum (**This energy is Saving**)	= (960* 12) = **11,520kWh (Approximately)** **= 12,894.8 kWh** **(Actual for 22-23)**



Annual energy saved from the roof top solar photovoltaic system (with electrical equivalent) is 12,894.8 kWh which reduces 11.86 Tons of CO_2 Emission/Annum.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

9. AUDIT SUMMARY & CONCLUSION

SUMMARY OF THE AUDIT PROCESS:

In order to make the ANNAI HAJIRA WOMEN'S COLLEGE campus is 100 % energy efficient, Environmental sustainability and lush Greenery the audit team recommends to implements the following measures:

I. Energy Conservation & Management:

- Regularly clean the solar PV system as per the prepared schedule and improve the efficiency.
- In a phased manner, ceiling fans may be converted from conventional into **BLDC fans**. Also change the T8 and CFL into LED with adequate illumination levels.
- It is recommended to replace the older non rated ACs to New star rated inverter ACs.
- It is recommended to reduce the demand based on actual requirement.
- Prepare a policy plan to convert the distributed UPS layout into centralized UPS and save energy. This step also saves the maintenance time due to reduction in no. of batteries.
- Regularly conduct i) Illumination study, ii) Thermal comfort study, iii) Flue gas study on DG, iv)water quality assessment (for all type of water utilized) and v) Indoor and ambient air quality study.

II. Water Conservation & Management:

- **Quantify the amount of water utilized by each buildings** / each floors by connecting digital water flow meter and optimize the water usage.
- It is highly recommended to install **automated water level controller** to reduce the fresh water loss via over flow and effective utilization of water.
- Prepare and maintain a **Single Line Diagram** (SLD) for water distribution network.

- It is highly recommended to install **Sewage Treatment Plant** (STP) for reuse the treated water for toilet flushing system as this is much essential for the AICTE, UGC norms of treated water usage.
- Use the treated water at the maximum in whatever possible areas and try to minimize the fresh water intake (from any source).
- Set a policy and fix a target for usage of treated water; ensure that the plan is being executed without any deviation. Increase the % of usage of treated water year by year.
- Try to reduce water tapped from the ground water source since it is not environmental friendly.
- Paste water and energy savings slogans at appropriate places.
- Generate your own power and water for regular activities and move towards **Net Zero Energy and Net Zero Water Building**.
- Retrofit aerator based water taps for good water savings.
- Captures almost 100% rain water harvesting through i) Recharging pits and ii) Open well type storage pits.
- Properly follow scientific method of handling chemicals/Acids/Salts and safe disposal through 3rd party.
- Water treatment log recorded with inlet, treated and outlet water quantity.
- It is **appreciated** that, waste water from chemistry lab is completely treated with **potassium alum** for reusable water for gardening.
- With advent of smart technologies, it is possible to have centralized monitoring in real-time using Internet of Things (IoT), Geographic Information System (GIS) software, etc. as per **Jal Jeevan Mission**, Department of Drinking Water & Sanitation Ministry of **Jal Shakti**.
- Awareness camp must be conducted to all the stakeholders at regular interval. Through this initiative; Painting, Photography, Slogan and Poster making contest are conducted to create consciousness among the students and faculties.

III. Impart Training to Faculty and Technical Staffs:

- Energy Conservation & Management
- Training on Environmental impact and assessment
- Fire and Safety (Operation and Handling)
- Electrical maintenance & Safety
- Electrical wiring, layout preparation & maintenance
- AC & Battery Maintenance
- Emergency Preparedness
- E-Waste and Chemicals Handling
- Solid waste management
- Training for Transport employees (Improvement in fuel economy, reduce accidents, vehicle cleanness, 100 % attendance, student friendly approach and overall maintenance of the vehicle)
- Training for Faculty and Students on Vehicle Operation (Preferably by PCRA or any other authorized service providers)
- Training for kitchen employees (LPG savings, improvement in productivity, equipment operation and best practices to be followed)
- General medical camps for employees
- Training on Stress management and Yoga

IV. Way Forward towards Energy & Environmental Sustainability:

❖ Prepare an exclusive Energy and Environment Policy based on the energy and environment practices followed in the campus. This must reflect the following:

- Present energy consumption & generation,
- Projection of energy need,
- Commitment by the college to conserve energy (in terms of percentage),
- Road map to achieve the commitment,
- Facilities need to achieve the same,
- Roles and responsibilities of all stake holders,

- Interim and final review mechanism,
- Corrective measures if the results deviates from the committed value and
- Benchmarking, Case study preparation, Knowledge sharing and rewards.

❖ Implement ENCONs and best operating practices proposed in the audit report and measure the results.

❖ Adopt effective waste management policy and reduce the food print of waste generation (Net zero waste campus).

❖ Practice appropriate ISO standards for system management. The audit team highly recommends to follow;

- ISO-9001 (Quality Management System)
- ISO-14001 (Environmental Management System)
- ISO-50001 (Energy Management System)

❖ Working towards **Net Zero Energy and Net Zero Water Campus** and achieve **Platinum rated Global Leadership campus** (as per **IGBC rating**) and/or **5-star rated campus** (as per **GRIHA rating**) and/or **GEM-5 rated campus** (as per **ASSOCHEM GEM rating**).

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

Annexure:

AUTHORISED CERTIFICATES OF THE AUDITORS

Reg No.: EA-34488/22 Certificate No.: 10838

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr./ Mrs./ Ms. **SUDALAIYANDI K**

son / daughter of Mr. **KANTHASAMY** *has passed the National certification Examination for Energy Auditors held in* ***JULY 2022*** *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 Accredited Energy Auditor and issuance of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

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

Place : Chennai, India
Date : **9th November 2022**

Digitally Signed:DEVERAPALLI SREENIVASULU
Wed Nov 09 18:25:30 IST 2022
CoE, NPC AIP Chennai

Controller of Examination

Reg No.: EA-34505/22 Certificate No.: 10839

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr./ Mrs./ Ms. **JAYA VENKATESH**

son / daughter of Mr. **RAJARATHINAM** *has passed the National certification Examination for Energy Auditors held in* ***JULY 2022*** *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 Accredited Energy Auditor and issuance of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

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

Place : Chennai, India
Date : **9th November 2022**

Digitally Signed:DEVERAPALLI SREENIVASULU
Wed Nov 09 18:25:18 IST 2022
CoE, NPC AIP Chennai

Controller of Examination

Reg No.: EA-34502/23

Certificate No.: 10909

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr./ Mrs./ Ms. **VIGNESH KUMAR**

son / daughter of Mr. **RAMALINGAM** *has passed the National certification Examination for Energy Auditors held in* ***March 2023*** *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 Accredited Energy Auditor and issuance of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

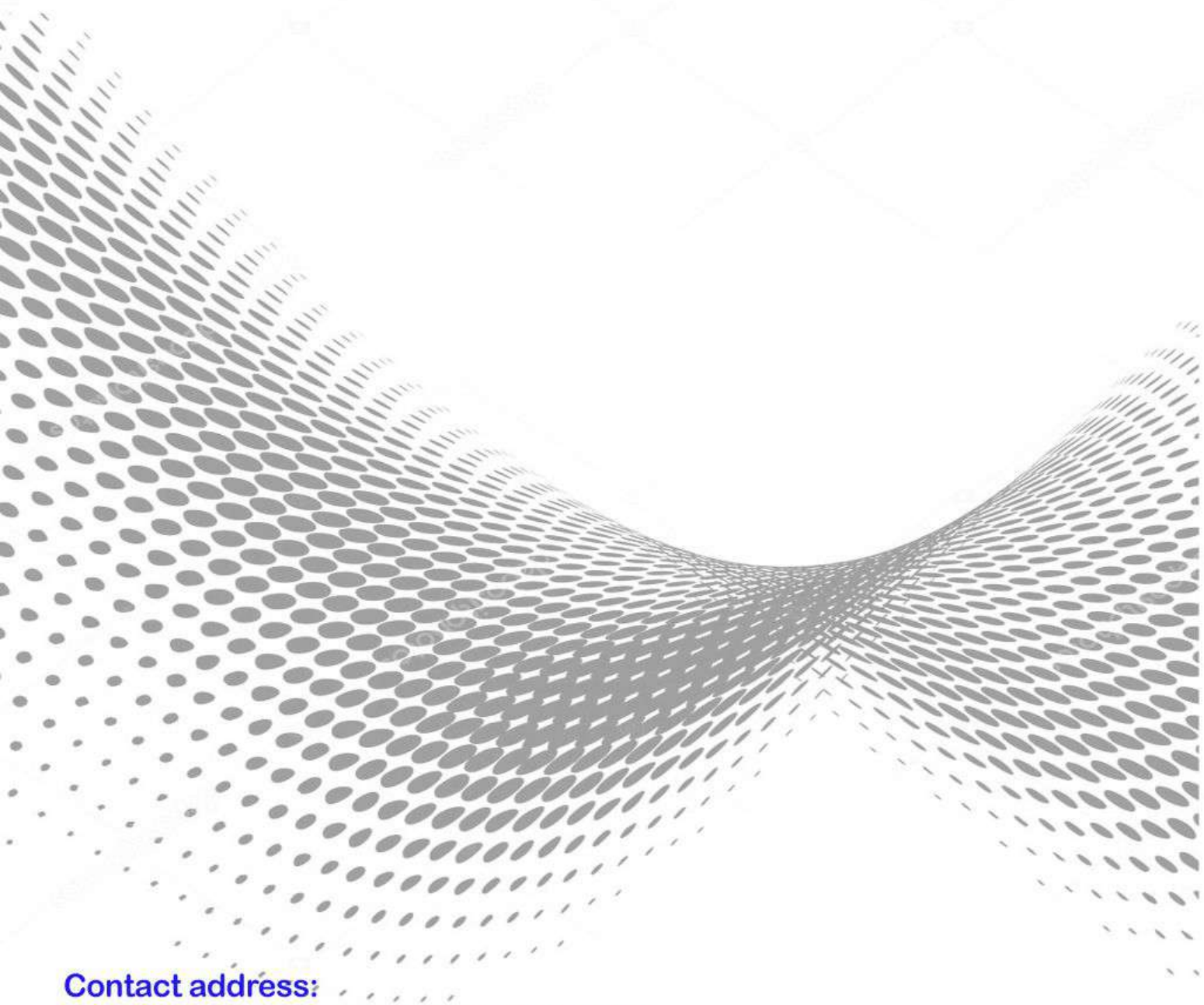
This certificate is valid till the Bureau of Energy Efficiency issues an official certificate.

Place : Chennai, India

Date : **07th July 2023**

Digitally Signed: DEVERAPALLI SREENIVASULU
Fri Jul 07 08:36:51 IST 2023
CoE, NPC AIP Chennai

Controller of Examination



Contact address:

Energy Awareness and Audit Cell (EAAC),

Department of Mechanical Engineering,
National Engineering College,
K.R. Nagar, Kovilpatti-628 503,
Tuticorin District, Tamil Nadu, India.

Website: www.nec.edu.in
E-mail: energyaudit@nec.edu.in
necenergycell@gmail.com
Phone: +91-9500417696