WAVOO WAJEEHA WOMENS COLLEGE OF ARTS & SCIENCE

ENERGY ENVIRONMENT GREEN AUDIT REPORT 2022_2023

Prepared by:
Energy Awareness and Audit Cell,
National Engineering College,
K.R Nagar, Kovilpatti – 628 503.

TO WHOM SO EVER IT MAY CONCERN

This is to certify that the Energy, Environment and Green audit has been conducted at Wavoo Wajeeha Women's College of Arts & Science, Kayalpattinam has been conducted during 02.08.2023 & 03.08.2023. The recommendations for Energy, Environment and Green audit have been given in the report. We thank the management of Wavoo Wajeeha Women's College of Arts & Science, Kayalpattinam, Thoothukudi for providing the opportunity to conduct the audit and we also appreciate Wavoo Wajeeha Women's College of Arts & Science for taking these initiatives.

Mr. K. Sudalayandi M.E., (Ph.D) EA – 34488/22	
Mr. R. Vignesh Kumar M.E., (Ph.D) EA – 34502/23	
Mr. R. Jaya Venkatesh M.E., (Ph.D) 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 **WAVOO WAJEEHA WOMEN'S COLLEGE OF ARTS & SCIENCE**, Kayalpatnam, Thoothukudi District, Tamil Nadu -628204, 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 WAVOO WAJEEHA WOMEN'S COLLEGE OF ARTS & SCIENCE 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 Auditor - EA 34502/23
Mr. R. Jaya venkatesh	BEE Certified Energy Auditor - EA 34505/22
Dr. R. Vijayakumar	Energy Consultant
Dr. W. Beno Wincy	Energy Consultant

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

1. INTRODUCTION TO ENERGY-ENVIRONMENT-GREEN AUDIT

1. 1. Preface about the Institution:

Alhaj Wavoo S. Seyed Abdur Rahman and his family founded the Wavoo Wajeeha Women's College of Arts and Science in Kayalpatnam in 2006 with the noble goal of bringing high-quality higher education to females in remote places where it was previously a privilege for a select few.

UG Programme:

- B.A., Tamil Literature,
- B.A., English Literature,
- B.A., Economics,
- B.Com., Commerce,
- BBA., Business Administration,
- B.Sc., Mathematics,
- B.Sc., Physics,
- B.Sc., Computer Science,
- B.Sc., Information Technology.

PG Programme:

- M.A., Tamil Literature,
- M.A., English Literature,
- M.Sc., Mathematics,
- M. Com., Commerce.

Diploma:

- Diploma in Islamic Theology (1 year)

1. 2. Vision

To give females in rural areas with higher education without regard to their caste, creed, or religion, bringing out their natural talents to create individuals who are highly qualified, morally upright, socially disciplined, and technically capable.

1. 3. Mission

1. Since our primary goal is to teach, we have made an effort to assemble a team of professors that are highly qualified, seasoned, and devoted. Students have the exceptional chance to learn from academics from various universities who routinely speak to them.
2. Getting the students to have huge aspirations and assisting them in realizing those dreams will undoubtedly help the college find its specialty. Additionally, the Trust intends to expand its educational initiatives in new directions.
3. By introducing student services, opportunities have been created to help kids from rural areas build integrated personalities.
4. May Allah grant us success in achieving the objectives set forth and a prosperous future for the pupils.

1. 4. Quality Policy:

Wavoo Wajeeha Women's College of Arts and Science is committed to improve the Quality Management System effectiveness in order to meet the regulatory requirements and expectations of students and relevant interested parties. This is achieved through quality placement support and students exposure to National level programs of practical relevance as well as Faculty Development.

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 investment categories**.
- 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.

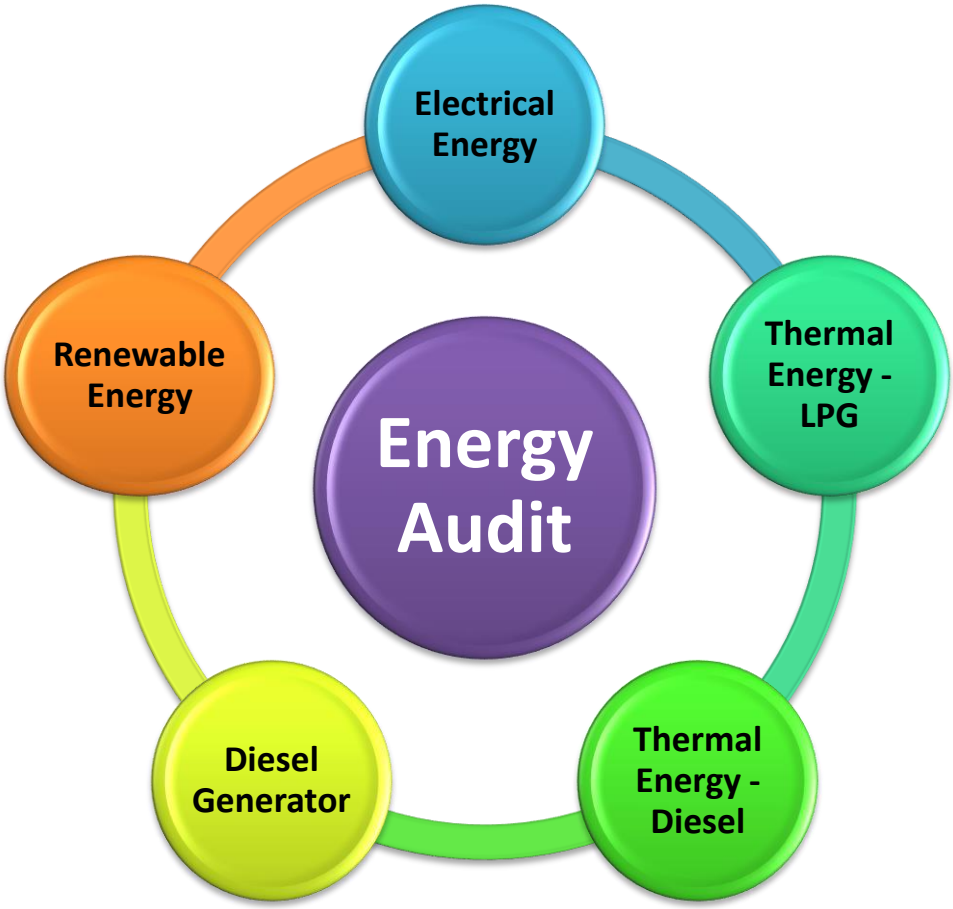
1. 8. Audit Approach:

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.

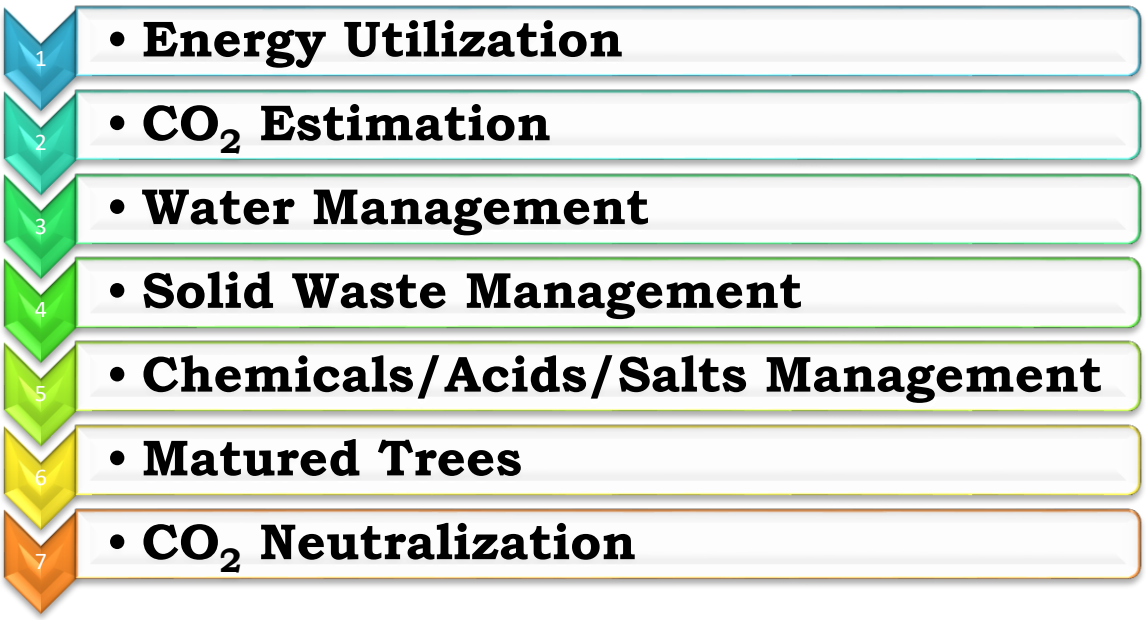
1. 9. Standards Used:

- Bureau of Energy Efficiency (BEE) Guidelines to conduct the detailed 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. 12. List of Members Involved in Data Collection & Audit Process:

Name of the Team Member	Role and Responsibility
Dr. R.ArunaJothi Head of the Department Department of Tamil Literature	Chemical, Acids, Salts data collection, Fuel consumption in canteen.
Mr. E.Maharajan Transport Manager Maintenance Department	DG and Fuel consumed, Campus greenery, RO and Solid waste management.
Mr. S.A.M. YasarArabath System. Admin Maintenance Department	System, UPS, E-waste, and Rain Water Harvesting
Mr.M.A.AbdulJabbar Tech.Support (Electrical) Maintenance Department	Electrical data collection, Lighting, Fan.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART –A: ENERGY AUDIT REPORT

2. Study on Energy Consumption & Generation Pattern

Recommentation for Energy Conservation

Sl. No.	Topic	Descriptions	Investment (Rs.)	Return on Investment	Page No.
1.	Install OnGrid/ OffGrid Solar system	OnGrid/ Off Grid Solar system for 15 kW capacity can be installed through which 60 units per day can be produced on an average. (Savings= 60 Units per Day)	850000/-	46 Months	33
			1500000/-	82 Months	33
2.	Replacement of older fans with BLDC Older fans can be given as **donation to govt. schools**.	There are around 249 older fans in the campus. BLDC fans are up to 50% more efficient Replacement of older fans with super fan (Savings= 89.64 Units per Day)	622500/-	23 Months	33
3.	Power Quality Analysis	From power quality analysis it is inferred that red phase Is under loaded comparing to Yellow & Blue phases. Nearly 50% of the blue phase load is given to Red phase. This will affect the equipment performance. Hence it is recommended to regulate the power distribution.			

Sl. No.	Topic	Descriptions	Investment (Rs.)	Return on Investment	Page No.
4.	Energy Bill Analysis	From the chart, it is clear that only 60 to 70 percentage of the demand is utilized. Hence the contract demand can be reduced to 80% of the present demand for the present loading condition.			
5.	Indoor air quality audit	Measure Room temperature, LUX level, RH and CO2 levels if required.			
6.	Solar Street Light	The existing streetlights can be replaced with solar street lights as an initiative of Green Campus			
7.	Street Light Automation	Street lights can be automated with motion detection sensor to save power.			

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: 07-470-364-835 Tariff II (LM2B2)		
3.	Tariff Structure	Rs. 8.5/kWh + 5% of CC as peak hour charge		
4.	Energy Suppliers	Tamilnadu Generation & Distribution Corporation (TANGEDCO)		
5.	Permitted Demand	48 kW		
6.	Annual Electricity Consumption (kWh) (2022-23)	Bimonthly Min: 6590	Bimonthly Ave:7792	Bimonthly Max: 10550
		46750 kWh/Annum		
7.	Capacity of Diesel Generator (DG) Set	62.5 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: 85.2 kg/ Bimonthly		
		511.2 kg/ Annum		
10.	Annual Diesel Consumption (2022-	Bimonthly Min:7618.96	Bimonthly Ave:9275.9	Bimonthly Max:11379.88

	23)	55655.55 Litre/ Annum
General Loads (Both Electrical and Thermal)		
11.	Lighting System	Indoor lighting: Conversion of Florescent Tube Light (FTL) into LED in a phased manner
		Outdoor lighting: All the street lightings are LED based energy efficient lamps.
12.	Fan Loads (Ceiling)	Most of the Indoor ceiling fans are conventional fans.
13.	HVAC System	Unitary air conditioning system installed in the computer labs
		Three AC units are Non BEE star rated and 1 AC is BEE 2-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	3.2 kW battery operated system for office electrical appliances.

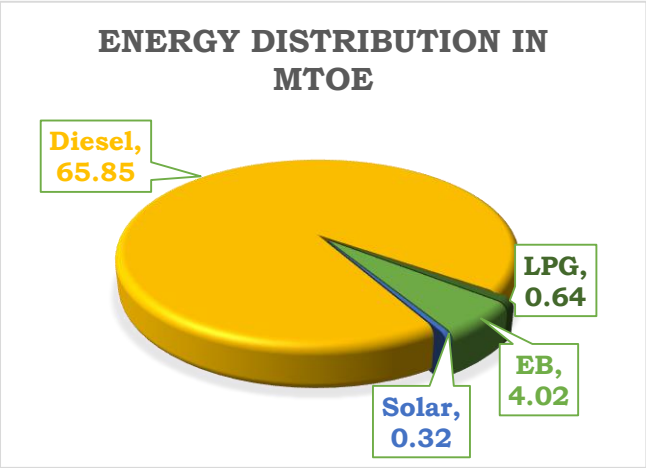
Energy Contribution

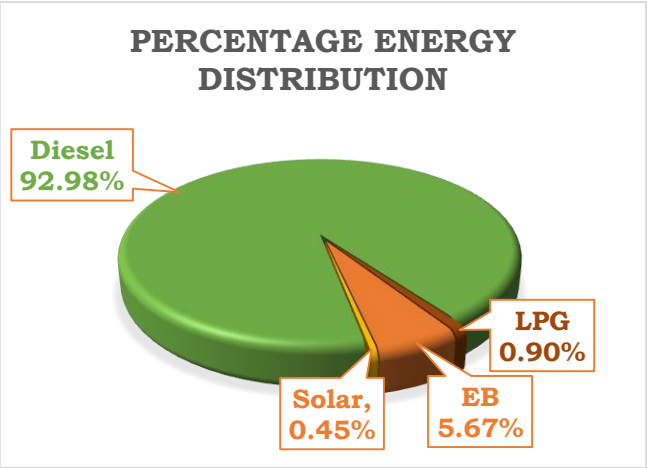
Table 1 - Contribution of energy consumption & Energy conversion (Represented in MTOE)

Energy Carrier	Annual Consumption	Conversion Factor	Energy (M Cal)	MTOE	Contribution %
Electricity (TANGEDCO)	46750	860 kcal/kWh	40205	4.02	5.67
Electricity (Solar)	3677	860 kcal/kWh	3162.22	0.32	0.45
Diesel*	55655.55	11840 kcal/litre	658961.7	65.85	92.98
LPG	511.2	12500 kcal/kg	6390	0.64	0.90

(*Note: Specific Gravity of diesel is 0.8263 kg/litre & the above data as per 2022-23)

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

Table 2 - Electricity bill analysis

Month	kWh	Contract Demand (kW)	Recorded Demand (kW)	PF	CC Charges(Rs.)	Electricity Tax (Rs.)	Fixed Charges(Rs.)	Total bill (Rs.)	Unit Charges as per TNEB (Rs./kWh)
July-Aug 2022	7450	48	30.72	0.91	55875	2979.8	5760	64615	8.67
Sep-Oct 2022	10550	48	33.95	0.92	91533.9	4908.8	9376	105819	10.03
Nov-Dec 2022	6590	48	33.49	0.9	58815.8	3280.8	9600	71697	10.88
Jan-Feb 2023	6870	48	27.25	0.9	61280.4	3344	9600	74224	10.80
Mar-Apr 2023	8060	48	32.06	0.91	71895.2	3924.8	9600	85420	10.60
May-Jun 2023	7230	48	29.02	0.9	64491.6	3524.6	9600	77616	10.74

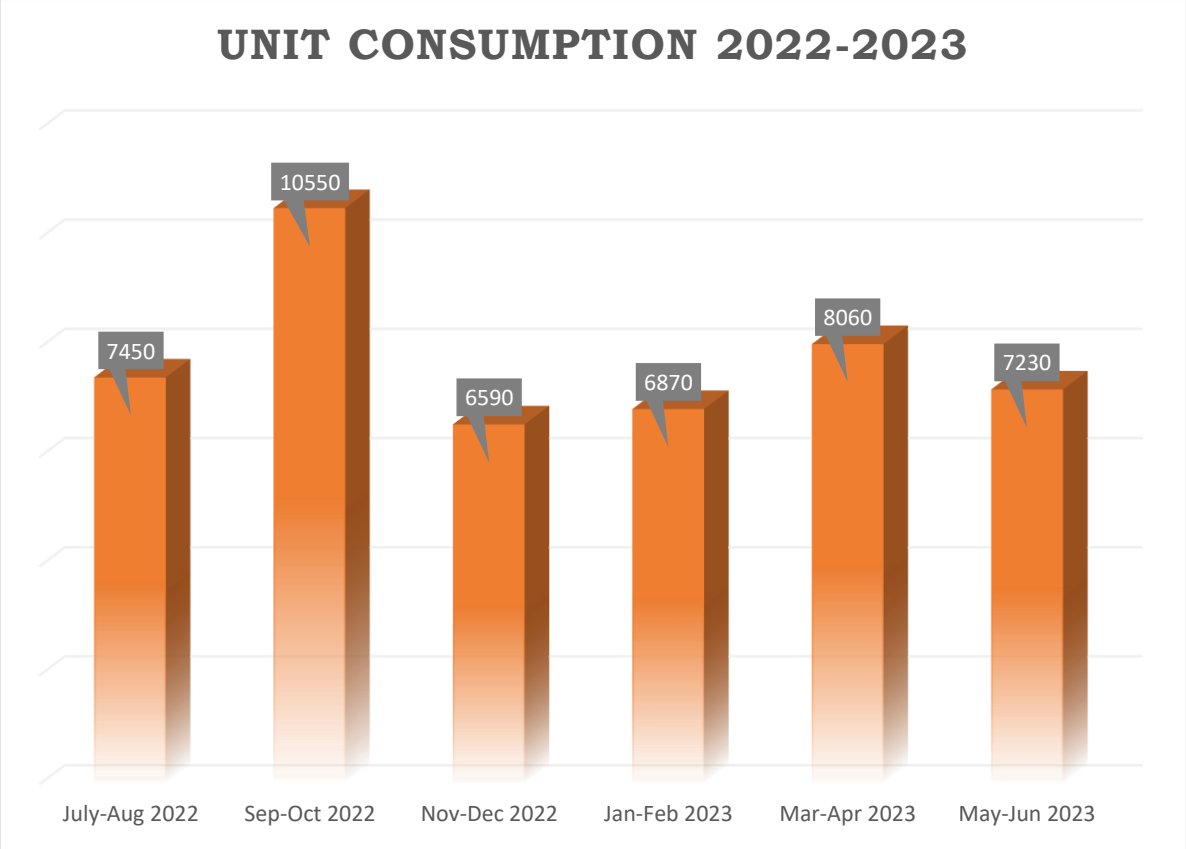


Fig.3: Unit consumption for the year 2022-2023

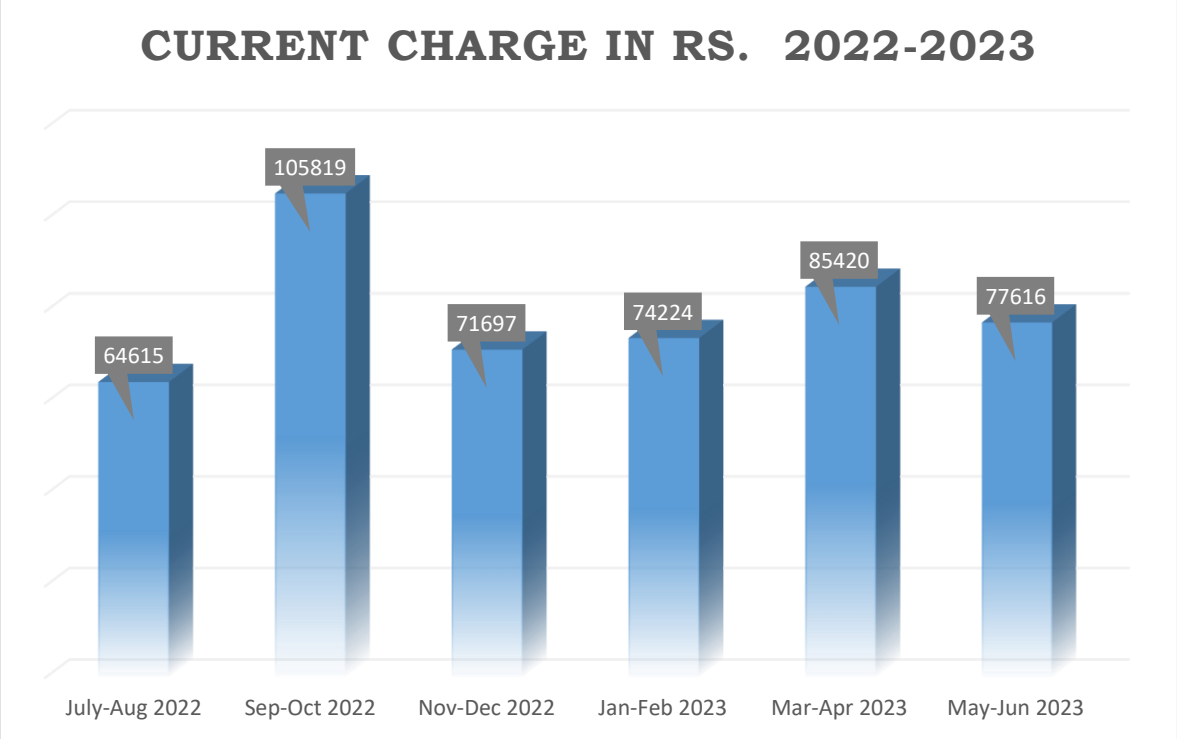


Fig.4: Power consumption charges for the year 2022-2023

Table-3: Annual Consumption of Electrical & Thermal Energy Parameters (2022-23)

Sl.No.	Month	Units Consumed (kWh)	Energy Generated (kWh) from Solar	Total Energy Consumed (kWh)	LPG consumed (kg)	Diesel Consumed (Litres)	Electricity Charges with solar (Rs.)	Electricity Charges without solar (Rs.)	Diesel Charges (Rs)	LPG Charges (Rs)	Total Expenses (Rs)		Total No of Students	Expenses/Student (Rs.)	
											With solar	without Solar		With solar	without Solar
1	July -Aug 2022	7450	604	8054	85.2	8806.32	64615	69853.6	833958.5	6710.35	905283.9	910522.4	1160	780.42	784.93
2	Sep-Oct 2022	10550	577	11127	85.2	11379.88	105819	111606.4	107767 5	6710.35	119020 4	119599 1	1160	1026.03	1031.03
3	Nov-Dec 2022	6590	578	7168	85.2	7618.96	71697	77985.5	721515.5	6710.35	799922.9	806211.3	1160	689.59	695.01
4	Jan-Feb 2023	6870	622	7492	85.2	10763.38	74224	80944.1	101929 2	6710.35	110022 6	110694 7	1160	948.47	954.26
5	Mar-Apr 2023	8060	633	8693	85.2	8809.05	85420	92128.5	834217	6710.35	926347.4	933055.9	1160	798.58	804.36
6	May-Jun 2023	7230	663	7893	85.2	8277.96	77616	84733.48	783922.8	6710.35	868249.2	875366.6	1160	748.49	754.63

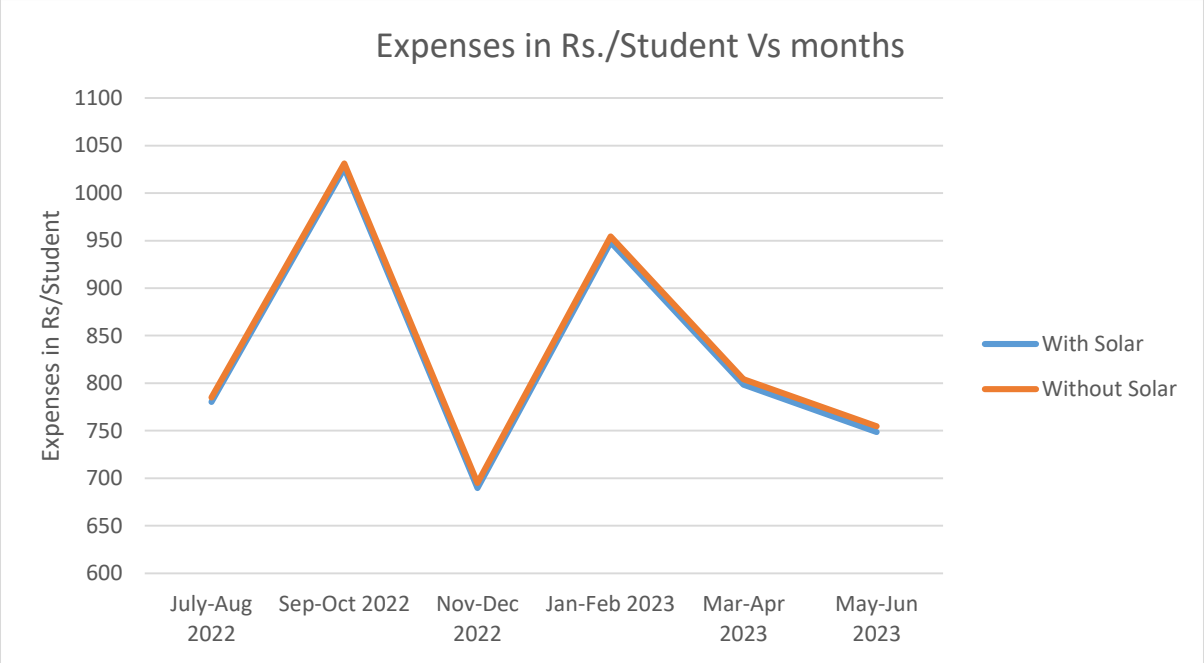


Fig.5: Per Capita Energy Expenses for the year 2022-2023

Maximum demand

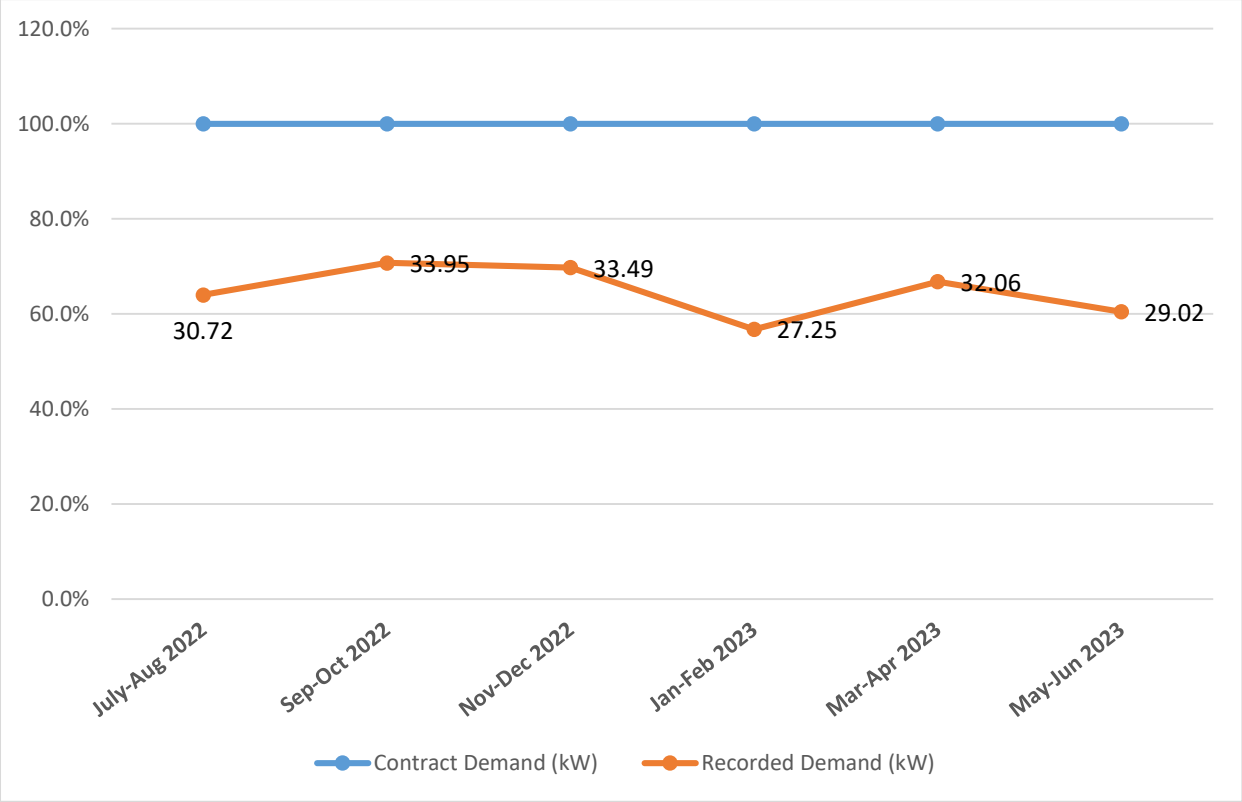


Fig.6: EB Power Demand details for the year 2022-2023

From the chart, it is clear that only 60 to 70 percentage of the demand is utilized. Hence the Contract demand can be reduced to 80 % of the present demand for the present loading condition.

DG set performance assessment:

DG sets are used mainly in case of power failure and shutdown maintenance incidents. DG sets performance assessment was carried out at 62.5 kVA DG set. The results are as follows:

Table-4: DG Set performance analysis (2022-23)

Parameter	Unit	Value
DG capacity (A)	kVA	62.5
Run hrs (B)	hr	0.5
kVA generated (C)	kVA	54.05
Diesel Consumed for 30 min (D)	L	15
Avg Voltage (E)	V	415
Avg Current (F)	A	76.36
Average PF (G)		0.885
kWh Generated (H=C*G)	kWh	47.83
SEC (I=H/2D)	kWh/Litre	**1.6**
Percentage Loading (J=C/A)		**86.48**
Efficiency ((H*860.4)/(2D*0.8263*11000))*100		**15.09%**

At 86% loading condition the standard Diesel Generator efficiency is about 35%. During the efficiency study it was observed that the efficiency if DG set is only 15.09%.

Lighting Assessment:

Table-5: Details of Illuminance (Lux) level

ROOM	With/Without Lighting	Average LUX Value
PRINCIPAL ROOM	W	114
	Wo	32
PRINCIPAL	W	239

ROOM	With/Without Lighting	Average LUX Value
	W	125
CR 205	WO	66
DEPT OF	W	56.7

Room Inner Area	Wo	32
OFFICE	W	134.3
	Wo	54.3
RECORD ROOM	W	157
	Wo	91.7
DIRECTOR ROOM	W	155
	Wo	106.7
CR 108	W	151.7
	Wo	81
CR 109	W	166
	Wo	61.2
PRAYER HALL	W	214.3
	Wo	123
CR 112	W	160.5
	Wo	115.7
CR 113	W	160
	Wo	95
CR 110	W	110.3
	Wo	57.7
DEPT CS 114	W	174
	Wo	84.7
CR 115	W	257.7
	Wo	181.3
INFO TECH LAB	W	3.7
	Wo	74
CS LAB	W	118.3
	Wo	8.7
CR 118	W	196.7
	Wo	143.7
CR 119	W	128
	Wo	78
CR 120	W	97.3
	Wo	17.3
RECPTION 102 A	W	134.7
	Wo	78.7
MD ROOM 102	W	208
	Wo	61
ELECTRICIAN ROOM 103	W	217.7
	Wo	162.7
CR 202	W	230
	Wo	150.7
PHYSICS 204	Wo	12.7
PHYSICS LAB 203 A	W	222.3
	Wo	152.3
SEWING MACHINE LAB 212	W	174.3
	Wo	109.7
CR313	W	187.3
	Wo	132.3
CR312	W	168.3
	Wo	149.7
CR311	W	178.7
	Wo	143.7
CR309	W	342.3
	Wo	329
CR308	W	132
	Wo	73.7
CR307	W	134.7
	Wo	87
CR306	W	142
	Wo	78.7
Dept of economics	W	111.7
	Wo	28.7
CR304	W	190
	Wo	96.7
Tamil dept 303	W	114.3
	Wo	86
CR302	W	173.7
	Wo	123.7
CR301	W	180.3
	Wo	112.3
CR318	W	162.7
	Wo	69
CR317	W	288.7
	Wo	295.3
ENGLISH DEPT 316	W	143.3
	Wo	58
Dept of Commerce	W	103
	Wo	69.3
CR314	W	182.7
	Wo	147.7
CR320 NAAC Room	W	125.7
	Wo	110.7

	W	112.3
CR 201	Wo	63
	W	333.3
AUDITORIUM	Wo	46
	W	60
STAFF ROOM	Wo	19.7
	W	144.3
CR 214	Wo	94.3
	W	170
CR 213	Wo	148.3
	W	124.7
CR 211	Wo	85.7
	W	148
CR 210	Wo	84
DEPT OF	W	81
BBA	Wo	34.3
	W	152.7
LIBRARY 208	Wo	57.3
	W	129.7
CR 206	Wo	84

PG Class Rooms		
	W	340
135	Wo	256.7
	W	236.7
133	Wo	174
	W	320.7
132	Wo	253
	W	373.3
131	Wo	306.7
	W	247.3
130	Wo	188.3
	W	128.3
129	Wo	65.7
	W	383.3
128	Wo	290
	W	487.3
127	Wo	421.7
	W	390.7
126	Wo	355

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 and Fan Connected Load details for all locations

LOCATION	T8 (30 W)	Tube light (40 W)	SUPER FAN (28 W)	Fan (75 W)	LED tube (20 W)	LED BULB (15 W)	WALL FAN(55 W)	CFL(11 W)	WATTAGE
PRINCIPAL	3		7						286
PRINCIPAL+ INNER					1		1		75
OFFICE			7						196
RECORD ROOM	2			2					210
DIRECTOR ROOM	2			2					210
CAREER GUIDANCE	2			2					210
CR 108	2			5	1				455
CR 109	2			5	2				475
TOILET GROUND FLOOR		4							160
PRAYER HALL	1			6	5				580
CR 112	5			5					525
CR 113	3			2					240
CR 110	6			5					555
DEPT CS 114	1			3	1	1			290
CR 115	5			5	1				545
INFO TECH LAB				7					525
CS LAB	4			7	2				685

CR 118	2			5	2				475
CR 119	2			4	2				400
CR 120	4			9					795
Toilet						1			15
Sick room	1			1					105
RECPTION 102 A	3		3						174
MD ROOM 102			6			1			183
ELECTRICIAN ROOM 103				1	1				95
CR 202	1			4	1				350
CR 201				2	4				230
AUDITORIUM	9			12	1	2			1220
STAFF ROOM	1			2	1				200
CR 214				3		2			255
CR 213				3		2			255
Toilet						1		1	26
CR 211				5		2			405
CR 210	1			4		1			345
DEPT OF BBA	2			2					210
PRAYER HALL				2					150
LIBRARY 208	14			15		2			1575
CR 206	2			3	2				325
CR 205	1			3	1				275
DEPT OF PHYSICS 204	1			2					180

PHYSICS LAB 203 A	3			6				1	551
SEWING MACHINE LAB 212				4	2				340
Toilet						1			15
CR313	2			5					435
CR312				5	1				395
CR311	1			6					480
CR310									0
CR309	2			5					435
CR308	2			5					435
Toilet						2			30
CR307				3	2				265
CR306	1			4		1			345
Dept of economics	1			2		1			195
CR304	1			4		1			345
Tamil dept 303	1			4					330
CR302	1			3					255
CR301	2			4					360
Toilet						1			15
CR318	2			3					285
CR317	1			4					330
ENGLISH DEPT 316	3			3					315
Dept of Commerce				3				2	247
CR314	1			3					255
CR320 NAAC Room	1			3					255
PG									

135				6	3				510
133				3	2				265
132				3	2				265
131				3	2				265
130				3	2	1			280
129				3	2	1			280
128				3	2	1			280
127				3	2				265
126				3	2				265
VARANDA	2			2	6	15		15	720
PG VARANDA						4			60
PG Toilet						3			45
Total	**109**	**4**	**23**	**249**	**58**	**47**	**1**	**19**	**24878**

Table-8: Other Connected Load details

Sl.No	APPLIANCE DETAIL	QTY	WATTAGE
1	Induction stove-1600W	6	9600
2	Computer	124	22320
3	Printer	12	480
4	Wifi Modem & LAN	28	280
5	Scanner cum printer	4	160
6	Scanner	1	40
7	Xerox machine	1	300
8	Fridge	1	250
9	Amplifier with mic	3	450
10	AC	4	6000
11	TV-50 inch	4	400
12	Ceiling light (2 CFL)	15	150
13	Projector	2	600

14	CCTV camera	38	190
15	Kettle	1	1500
16	TV-35 inch	1	40
17	Ceiling light LED	6	90
18	CCTV system	1	200
19	Table fan	1	55
20	Focus light-200W	3	600
21	Speaker big	2	160
22	Ahuja speaker-10W	16	160
23	Street light-30W	11	330
24	LED bulb in surrounding	6	90
25	Street light-60W	2	120
26	LED tube in surrounding	1	20
TOTAL			**44585**

Total Connected Load = 24878+44585 = **69463 Watts**

Energy Performance Assessment of lighting system:

Sl.No	Type of fitting	Wattage	Total Quantity	Load in kW	Daily working hrs	Monthly working days	Monthly kWh
1.	T8	30	109	3.27	4	30	392.4
2.	LED tube	20	58	1.16	4	30	139.2
3.	LED BULB	15	47	0.705	4	30	84.6
4.	CFL	11	19	0.209	4	30	25.08
5.	Tube light	40	4	0.16	4	30	19.2

Type wise lighting Distribution

Type	Quantity	kW load	% Load
LED lights	233	641.28	97.09
FTL	4	19.2	2.91

Observations: Almost all the CFL lamps are replaced with energy saving LED lights.

Type wise Fan Distribution

Type	Quantity	kW load	% Load
Super Fan (28W)	23	0.644	3.33%
Normal Fan (75W)	249	18.675	96.67%

Observations: Energy Saving Opportunity still exists in Fans.

Power Quality Analyzer Results

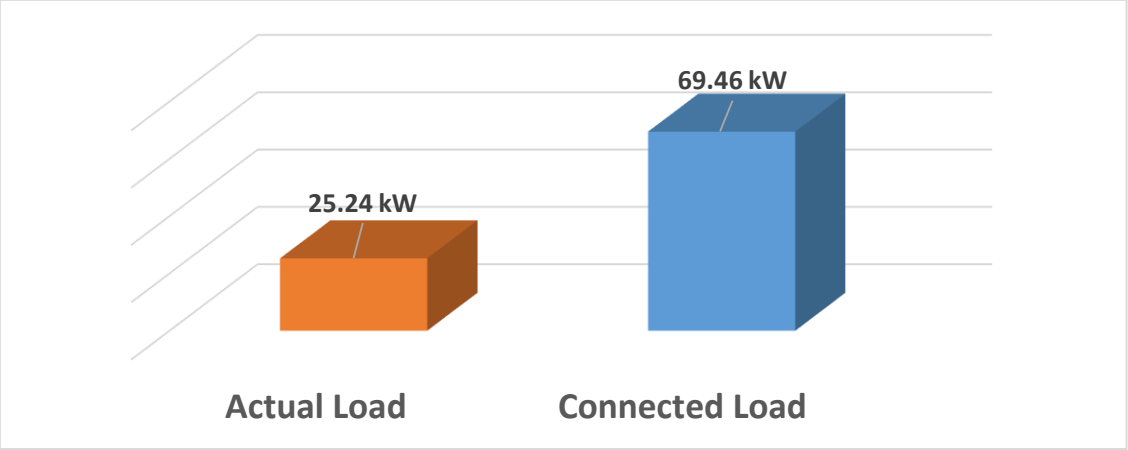


Fig.7: Actual Load Vs Connected Load

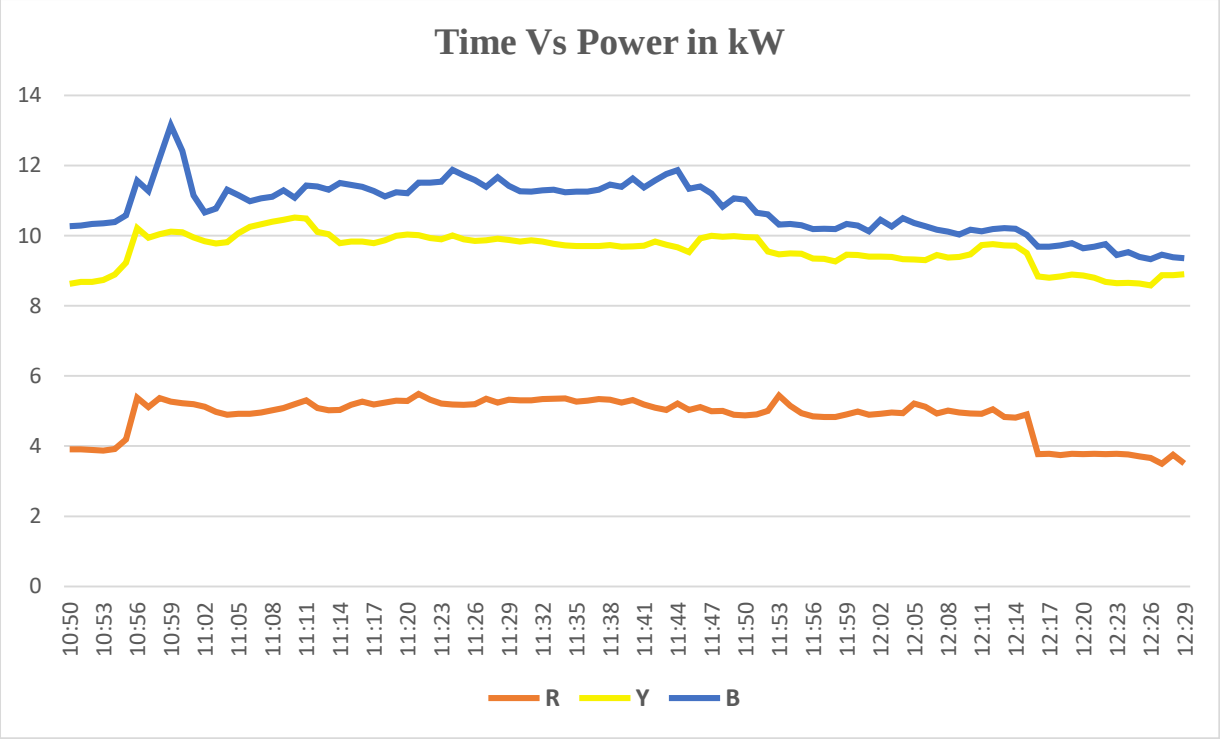


Fig.8: Actual Power drawn in kW

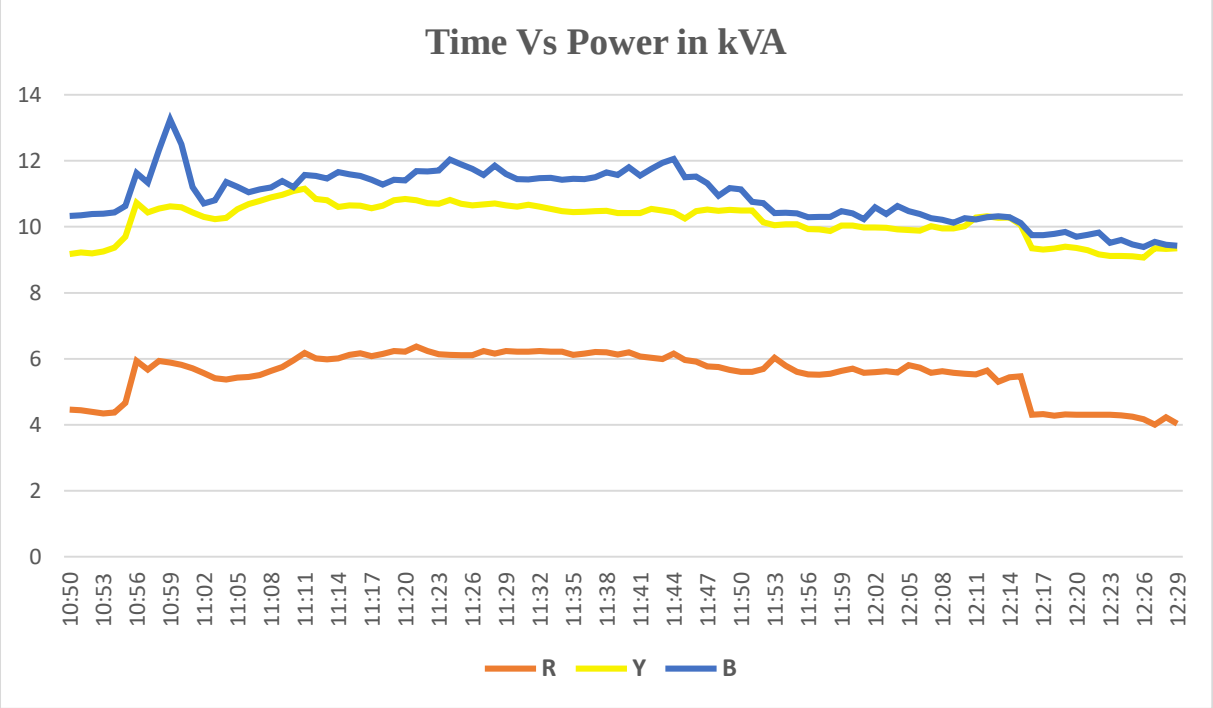


Fig.9: ApparentPower drawn in kVA

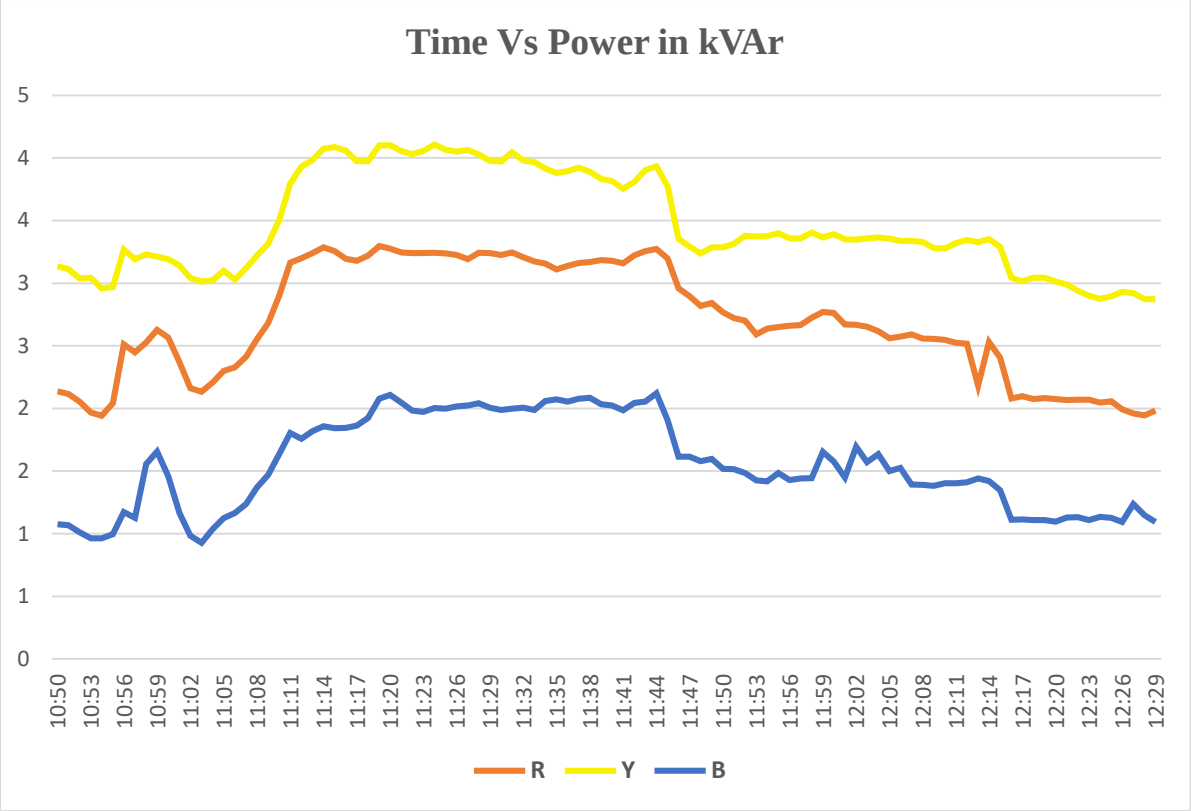


Fig.10: ReactivePower drawn in kVAr

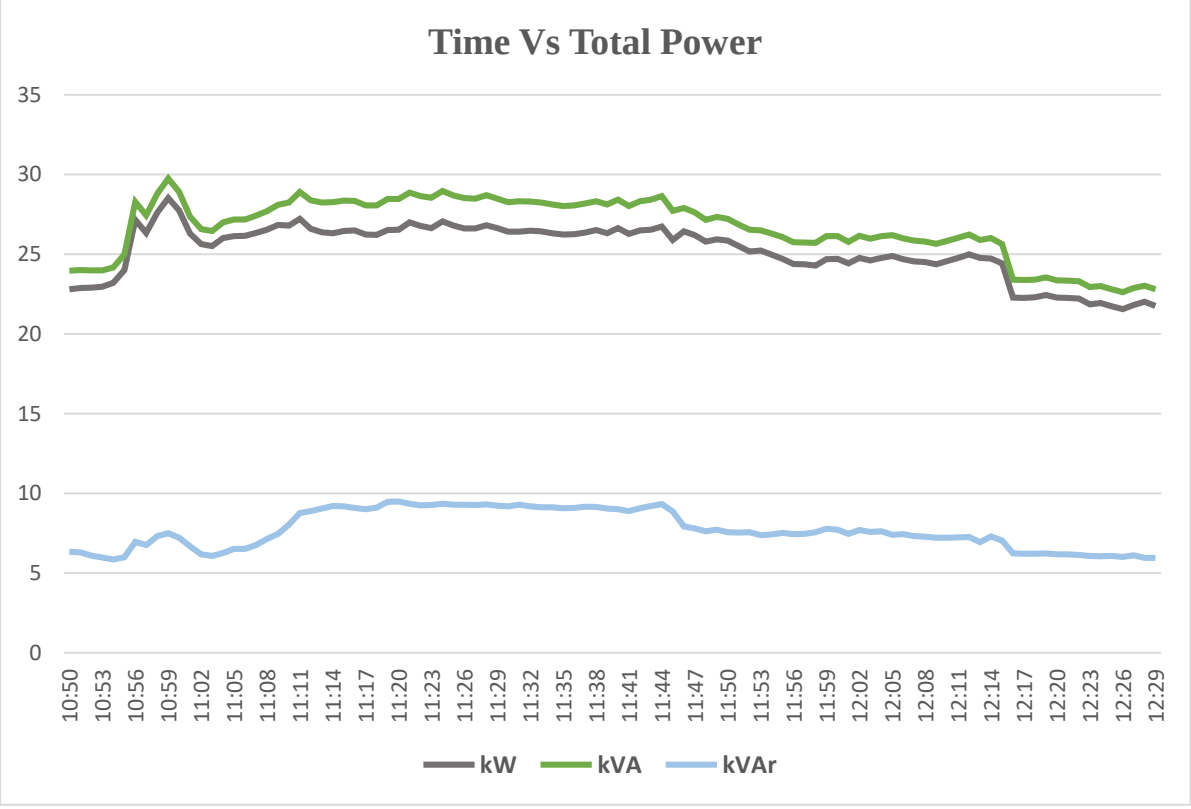


Fig.11: Comparison of Active, Reactive and Apparent Power

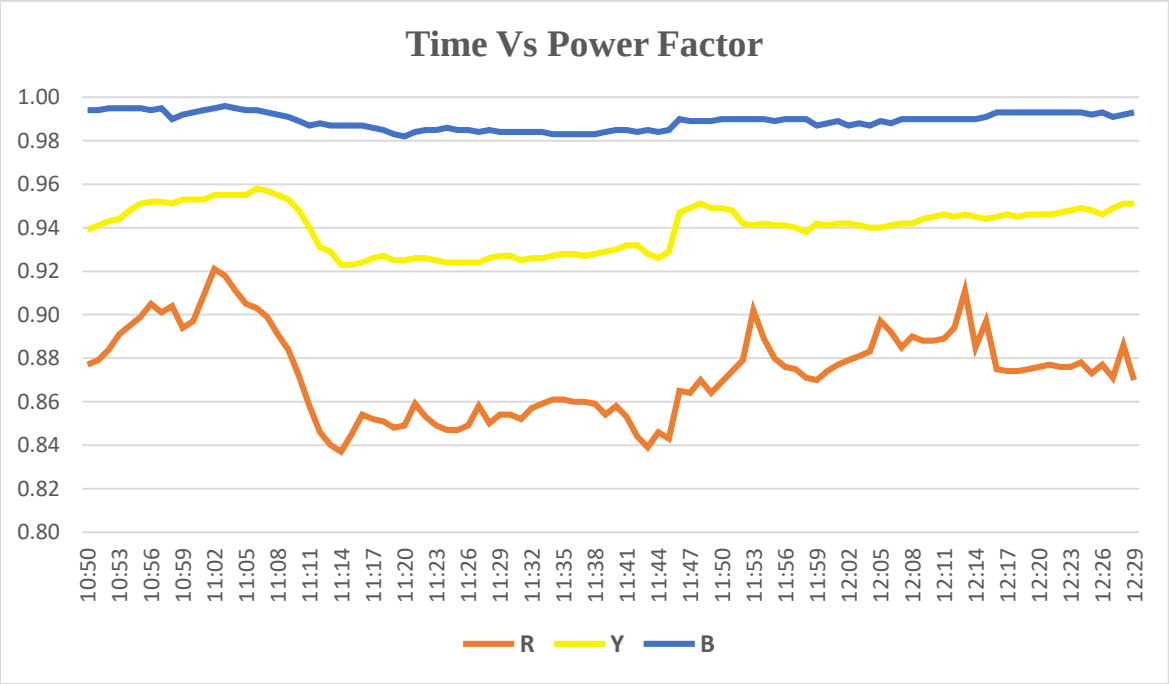


Fig.12: Power Factor in all three phases

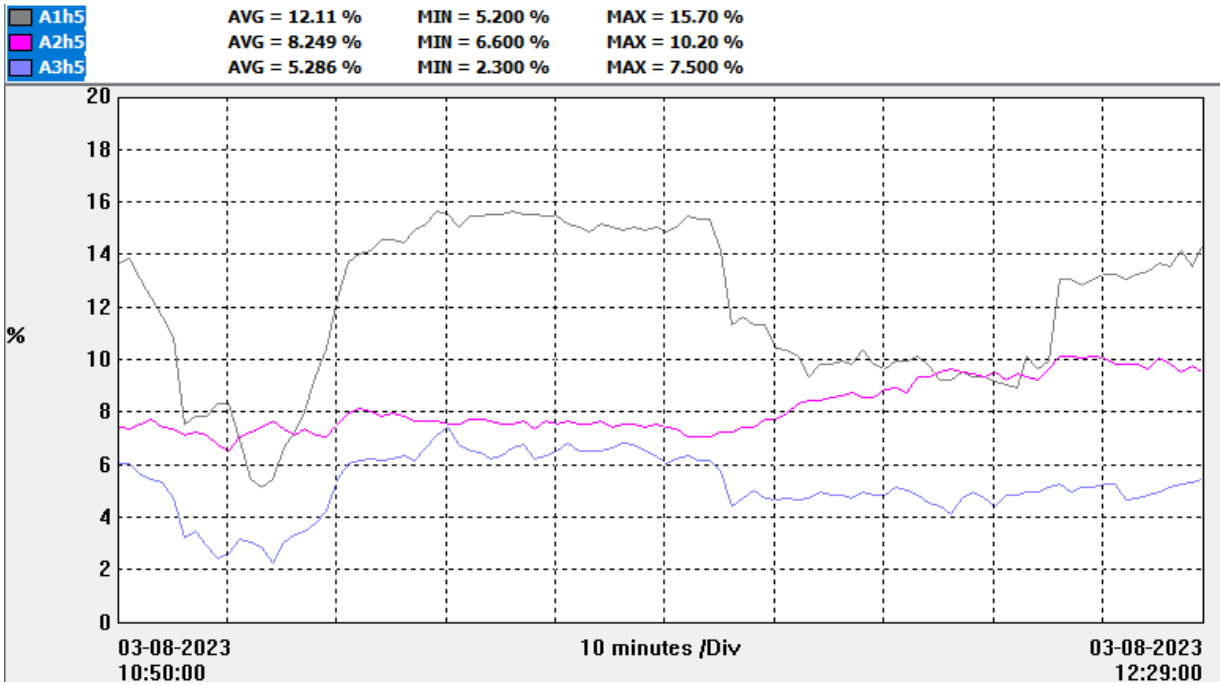


Fig.13: 5th Harmonic analysis shows normal

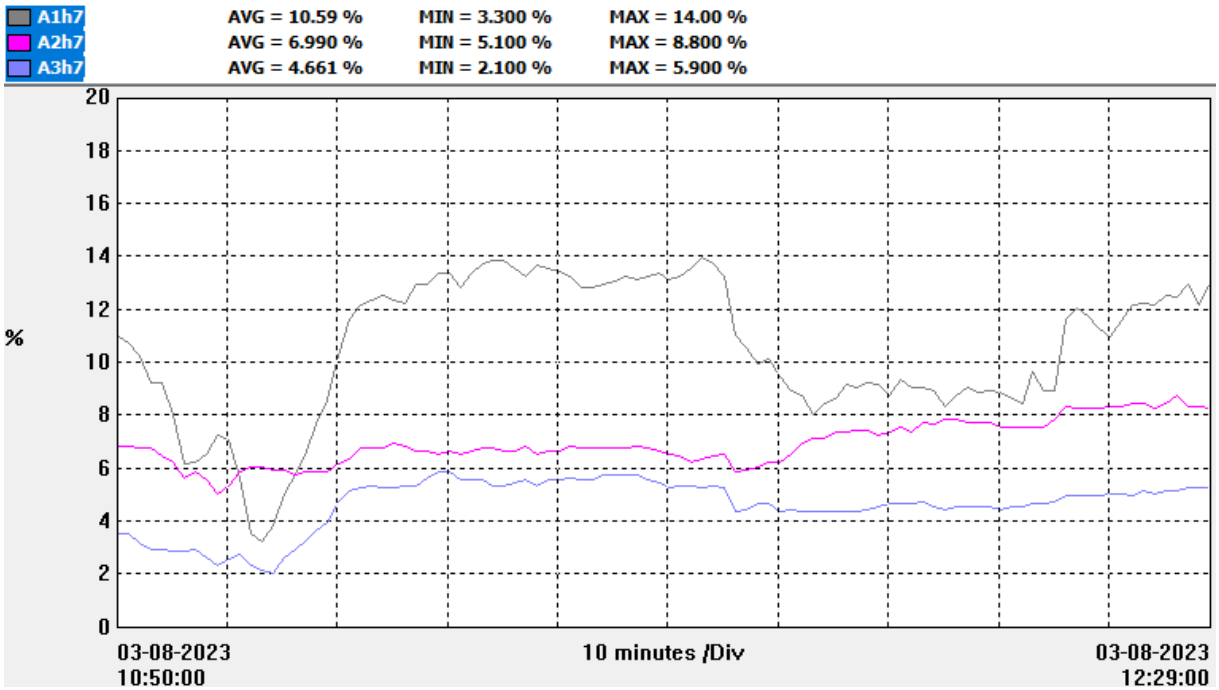


Fig.14: 7th Harmonic analysis shows normal

ECM 1 – Install On Grid/ Off Grid Solar System

Solar Panel to be installed	15 kW
Total hours of operation	4 hrs
Total Units Production	60

	On Grid System	Off Grid System
Total Unit savings per day	60	60
Electricity Cost	Rs.10/Unit	Rs.10/Unit
Annual Cost savings	Rs.219000/-	Rs.219000/-
Initial Investment	Rs.850000/-	Rs.1500000/-
Payback period	**46 months**	**82 months**

ECM 2- Replace Older fans to BLDC

Present Scenario		Proposed Scenario	
Total Number Fans	249	Total Number of Super Fans	249
Wattage	75W	Wattage	30W
Total hours of operation	8 hrs	Total hours of operation	8 hrs
Total Units consumed	149.4	Total Units consumed	59.76
Total Unit savings per day		89.64	
Electricity Cost		Rs.10/Unit	
Annual Cost savings		Rs.327186/-	
Initial Investment(Rs.2500/Super Fan)		Rs.622500/-	
Payback period		**23 months**	

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-7 shows the types of energy carriers used for their regular operation in the college campus along with the application area and their source.

Table-9: 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 107 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-8 provides the balance sheet indicating various energy carriers associated with the regular activities of the college and their CO_2 mapping.

Table-10: 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	46,750 kWh	43.01	CO_2 Neutralized due to Matured Trees	107 nos	2.33
2.	Diesel (Transport + DG)	55,655.55 liters	150.27	CO_2 Neutralized due to Solar PV system	3,677 kWh	3.38
3.	LPG Consumption	511.2 kg	1.53			
4.	**Total-Emission**		**194.81**	**Total-Neutralized**		**5.71**
Balance CO_2 to be Neutralized = 189.1 Tons/Annum & Per Capita CO_2 Consumption = 0.14 Tons/Annum [1]						

([1] Total strength of students - 1263 + Teaching and technical staff – 113 = 1,376)

Observations:

1. The above table shows that, in the college campus, a maximum of CO_2 is emitted from consuming diesel. For transportation 55002 litres and for diesel-powered generators 652.98 litres were consumed and in total around 55655.55 litres of diesel was consumed during 2022-23. It is recommended to the management to look after making proper arrangements in the bus routes in order to reduce diesel consumption and CO_2 emission.
2. Electrical consumption from Electricity Board was found to be 46750 kWh from the installed solar PV system was 3677 kWh. It shows that 7.8% of electrical is shared by the solar PV system. Thus, a small quantity of CO_2 has been neutralized by the management plan for solar PV installation.
3. In the college campus the LPG consumption is found as 511.2 kg per year. The adoption of efficient biomass cooking stoves can save LGP consumption and reduce overall CO_2 emission.
4. The college is now trying to neutralize its CO_2 emission through various initiatives like i) Installation of roof top 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 fans, Energy efficient motor replacement, judicious use of all types of energy etc.,).

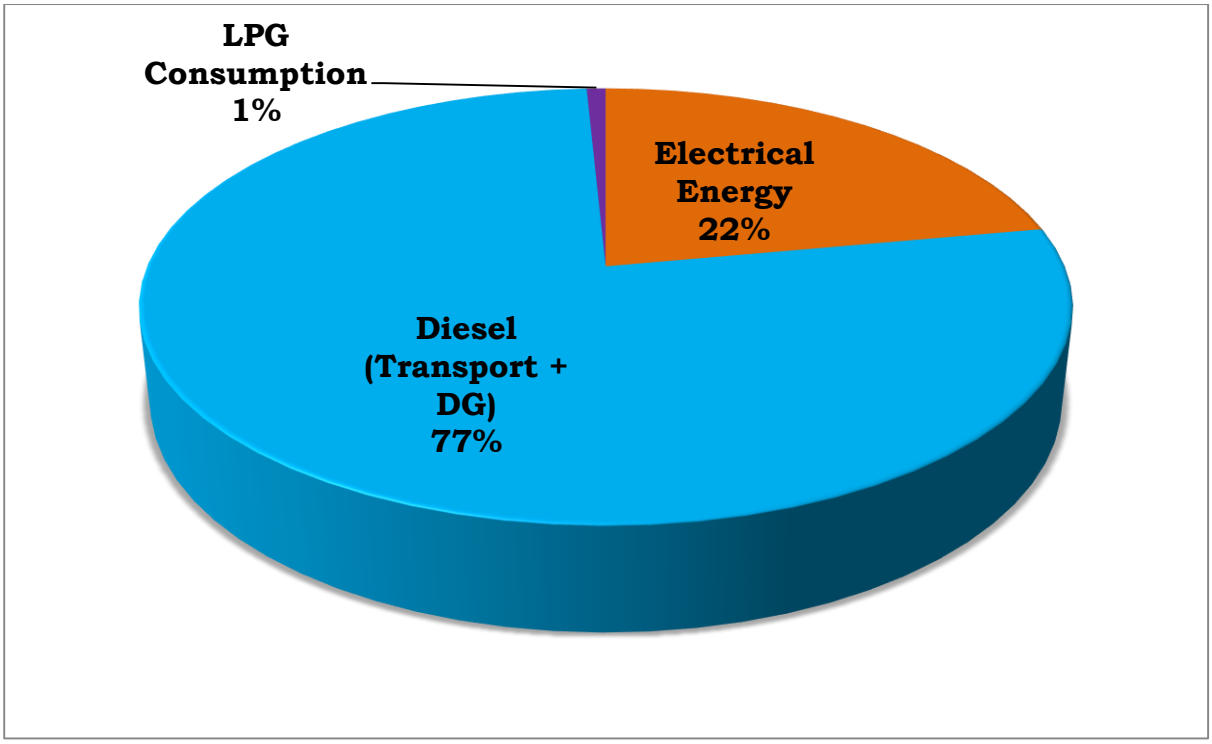


Fig.15: Percentage of CO_2emission in the college campus from various sources

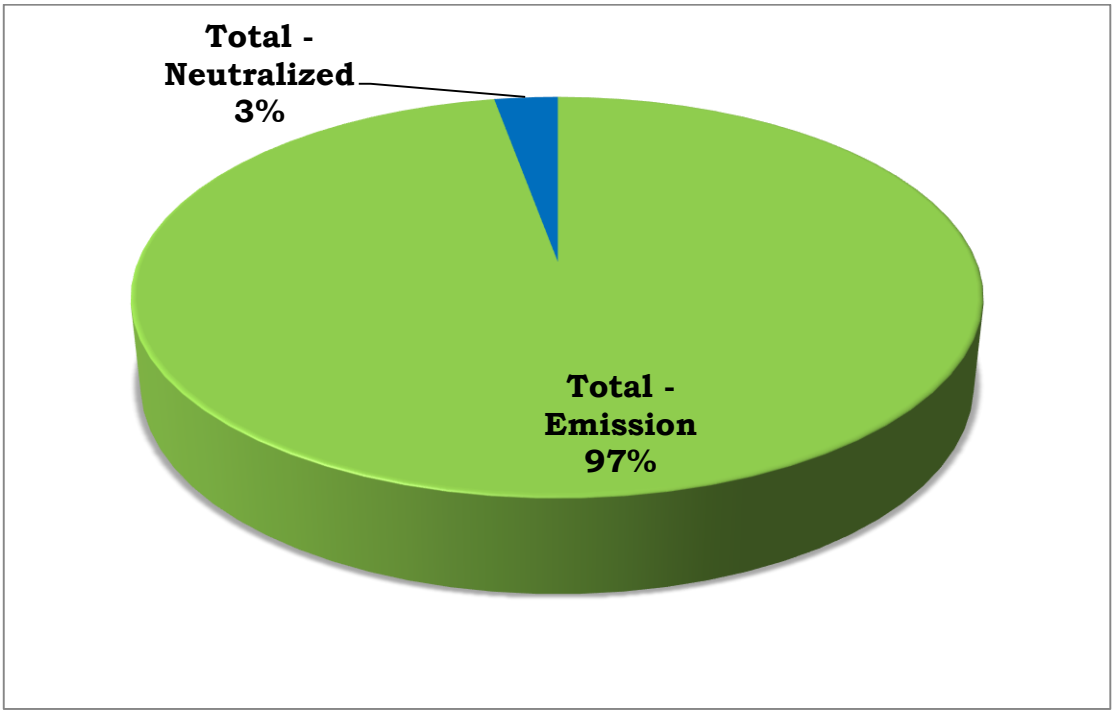


Fig.16: Percentage of CO_2emitted and CO_2 neutralized inside the campus

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

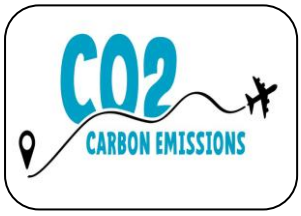
4. TRANSPORT & REFRIGERANT GASES IN AIR CONDITIONING SYSTEM

4.1. List of Transport Vehicles:

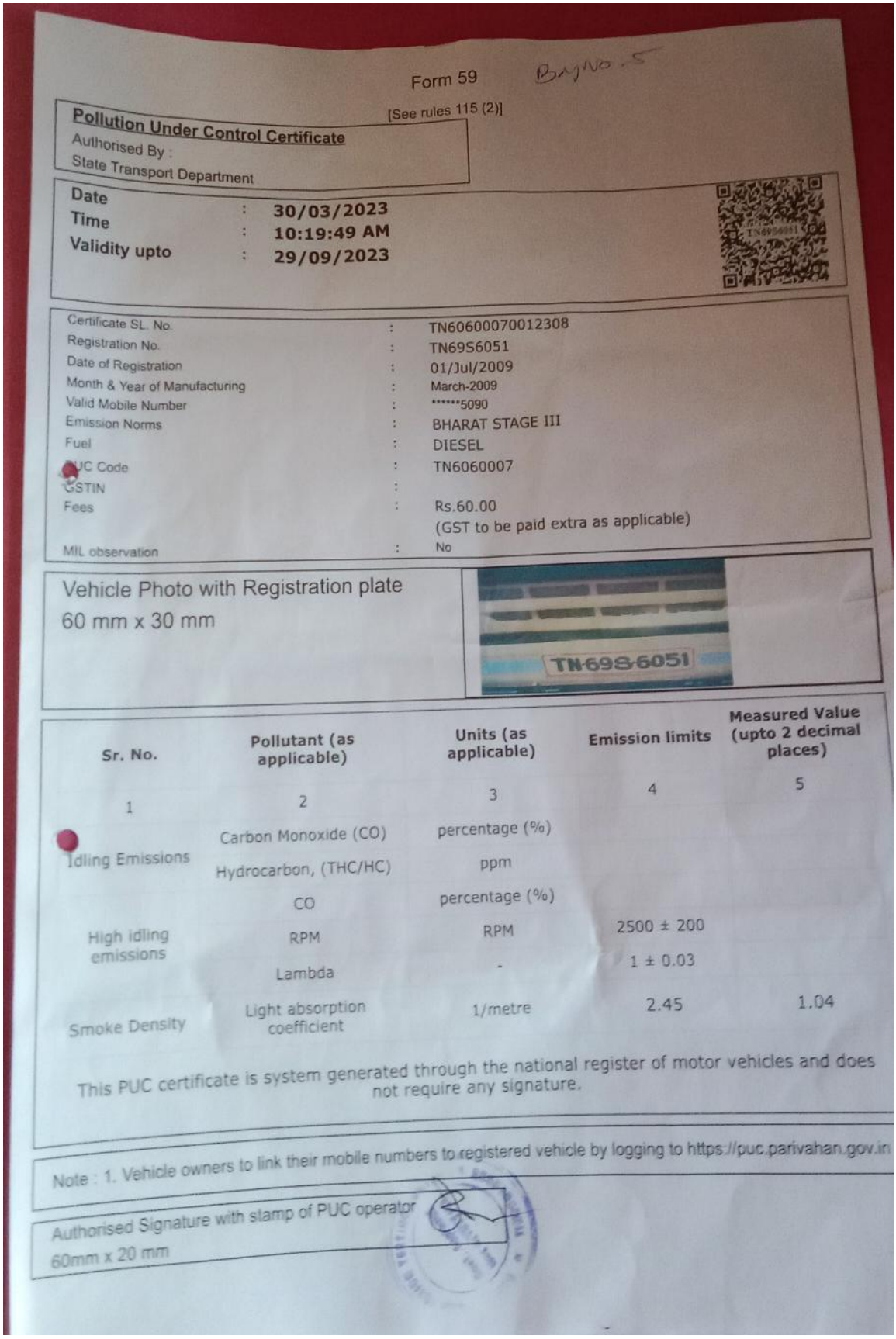
The college is committed to provide green environment not only in the campus; but also to the entire atmosphere. The list of transporting vehicles available in the college campus along with their fuel type and usage are represented in Table.

Table 11: 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	EICHER & 2018	TN B 9022	3/1/2024	Yes
2	Van	SML T 3500 & 2014	TN 69 AR 1877	4/26/2024	Yes
3	Van	SML T 3500 & 2007	TN 69 U 8589	4/20/2024	Yes
4	Bus	ASHOK LEYLAND & 2008	TN 69 S 2333	4/25/2024	Yes
5	Van	SML T 3500 & 2009	TN 69 S 6051	3/30/2024	Yes
6	Bus	ASHOK LEYLAND &2009	TN 69 S 6078	2/21/2024	Yes
7	Van	SML T 3500 & 2010	TN 69 AY 1401	4/20/2024	Yes
8	Bus	ASHOK LEYLAND & 2010	TN 69 AY 1402	5/9/2024	Yes
9	Van	SML T 3500 & 2011	TN 69 AY 8377	4/19/2024	Yes
10	Van	SML T 3500 & 2011	TN 69 AY 8380	3/30/2024	Yes
11	Bus	ASHOK LEYLAND & 2013	TN 69 AT 5830	1/30/2024	Yes
12	Bus	SML S7 & 2014	TN 69 AR 1872	3/30/2024	Yes
13	Bus	MORCOPOLO & 2015	TN 92 0416	3/29/2024	Yes
14	Bus	ASHOK LEYLAND & 2017	TN 92 8107	3/23/2024	Yes
15	Bus	ASHOK LEYLAND & 2017	TN 92 A 8566	3/30/2024	Yes
16	Van	TATA 407 & 2006	TN 69U 5578	7/19/2024	Yes



Annual fuel consumption for transport (**2022 - 23**) is **55,655.55 Litres** which contributes CO2 Emission of **150.27 Tons/Annum**



Form 59 [See rules 115 (2)]

Pollution Under Control Certificate

Authorised By :
State Transport Department

Date	:	30/03/2023
Time	:	10:19:49 AM
Validity upto	:	29/09/2023

Certificate SL. No.	:	TN60600070012308
Registration No.	:	TN69S6051
Date of Registration	:	01/Jul/2009
Month & Year of Manufacturing	:	March-2009
Valid Mobile Number	:	******5090
Emission Norms	:	BHARAT STAGE III
Fuel	:	DIESEL
PUC Code	:	TN6060007
GSTIN	:	
Fees	:	Rs.60.00 (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	1.04

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

Fig.17: Sample Pollution Certificate of a Transport Vehicle

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-14.

Table-12: 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	Electronics Lab	2	2	R22	1810	Medium
3	Secretary Room	1.5	2	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. (Kindly refer: https://www.bijlibachao.com/airconditioners/comparison-of-various-refrigerants-r-410a-r-22-r-290-r-134a-used-forairconditioners-and-refrigerators.html.

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. WAVOO WAJEEHA WOMEN'S COLLEGE OF ARTS AND SCIENCE gets the water from three different sources i) Fresh water from the bore well, ii) Rain Water Harvesting (RWH) and iii) Purified water can from third party. Different source of water, location of storage along with their application is given in the table.

Table 13: Types of water used in college campus along with application.

Type of water	Source	Location of storage	Application
Fresh water	Well water (Near	3 HP under water pump used to lift the water to overhead tank of 1,50,000 litre capacity	Utensil Cleaning, Hand wash, toilet, labs and also for gardening purpose.
Fresh water	Bore water (Near transport) – 01 No. with 20 feet depth.	3HP pump is used to store water in separate sump with a capacity of 1200 litre capacity	Gardening and drip irrigation purpose.
Rain water	Rain Water collected through i) buildings run offs and ii) road runoffs	Percolated to underground	Used to increase the ground water level
Purified water	Purchased from third party	Purchased as 30L water can	Cooking and drinking purpose

5.2. Purified Water for drinking applications:

- The college management is keen on providing uninterrupted, safe and healthy drinking water to all students and faculty members throughout the year.
- In order to fulfill the drinking water need management purchased purified water can from third party with sufficient quantity.
- Quality of the water (TDS value) is being checked frequently and ensures that the water is potable.
- Details about purified water are given in the table.

S. No.	Description	Quantity
1.	Purified water can (30L) per Month	800 Nos.
2.	Cost per unit purified water can	Rs. 30
3.	Drinking water cost per month	=(water can quantity *unit price) = (800*30) = Rs. 24,000/-
4.	Drinking water cost per Annum	= (24,000 * 12) = **Rs. 2, 88, 000/-**

Fig18. Storage of purified water can for drinking application

Fig19. Fresh water distribution to wash rooms and toilet

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 are 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 chemicals.
- 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 labelled.

- 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: Chemical vessels storage

Fig. 21: Salt Storage

Fig. 22: Diluted acid Storage

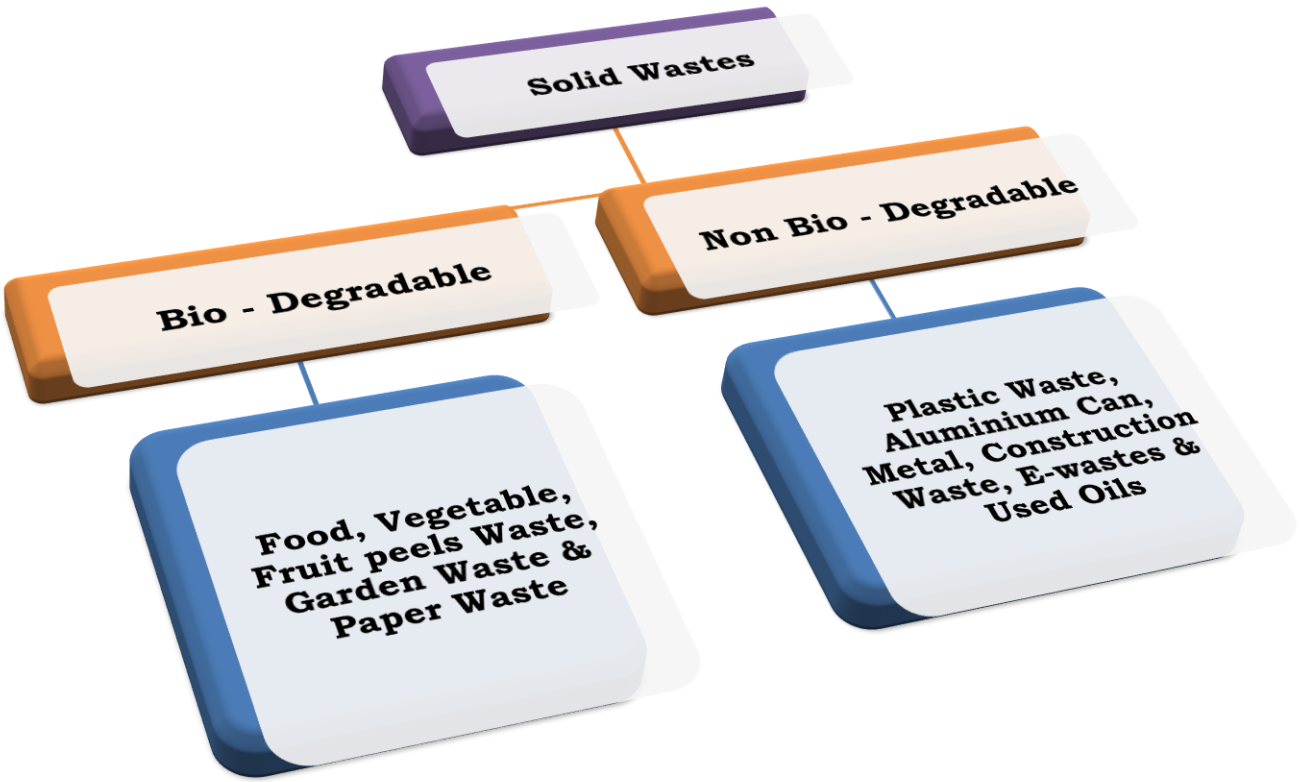
Fig. 23: Concentrated acid Storage

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-17 shows the process of treating the solid waste generated inside the college campus.

Table-14: Process of Waste Management

S. No.	Waste Type	Waste Treatment
	Bio Degradable Waste Management	
1.	Food & Vegetable Waste	Collected & given to Farming Plan to produce Biogas from food

		waste.
2.	Garden Wastes and Plant Leaves	Daily collected and dumped in a yard
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 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	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.

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	• Copier/Printers • Power Stripes & Power Supplies • UPS/Servo Stabilizers/Inverters • Batteries

• Power Distribution Panels • Analog & Digital Measuring Instrument	• Wi-fi-Modems, Routers, Toggle Network Cables, Switches, Hubs • Audio & Video Equipment's/Remote • Printed Circuits Boards

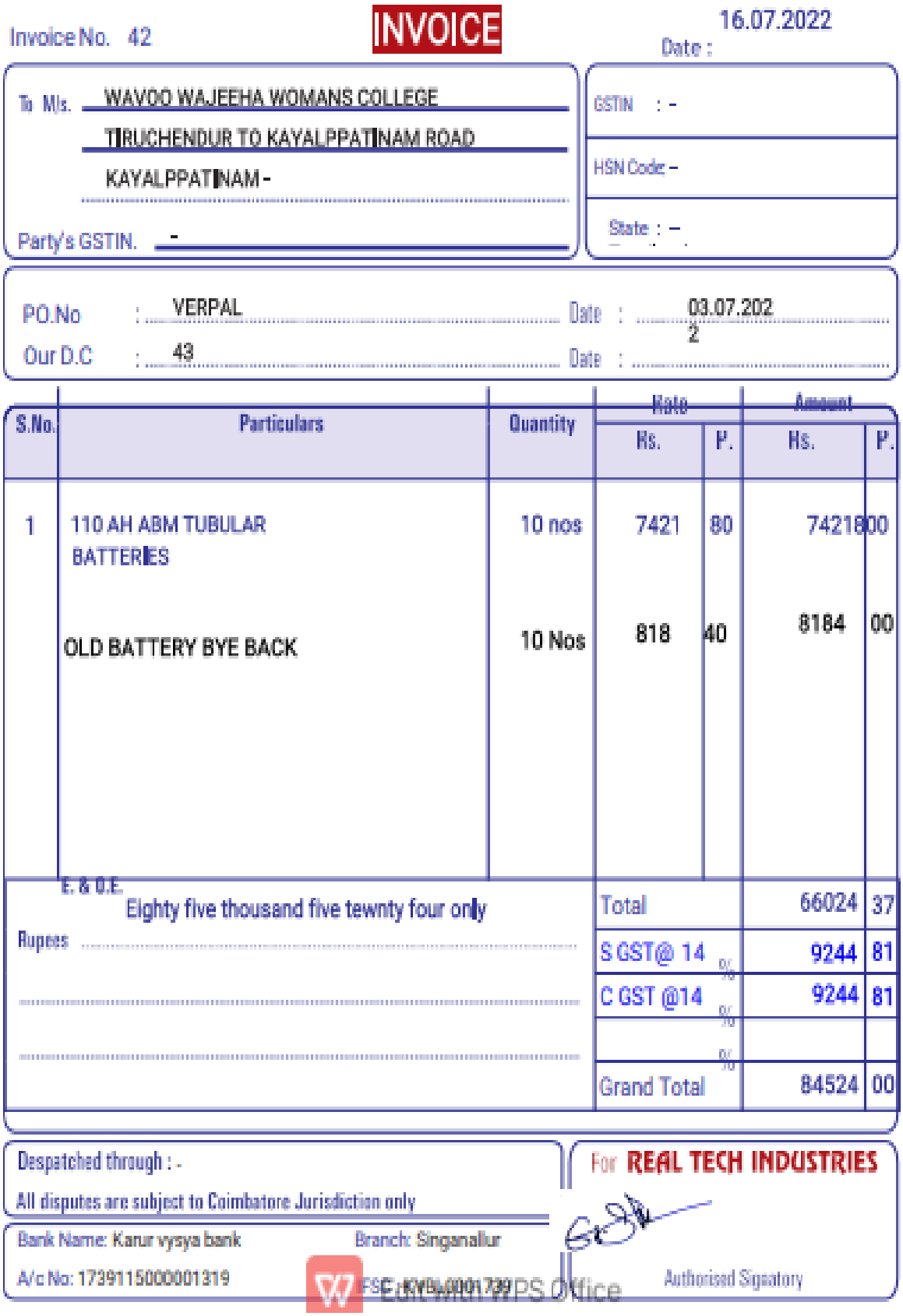
Fig 24: Food waste collected in bucket

Fig 25: Collected Food waste is stored in storage tank for farming

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

Fig. 27: 1 m^3 capacity Biogas plant

Fig. 28: Manure preparation from garden waste



INVOICE

Invoice No. 42

Date : 16.07.2022

To M/s. WAVOO WAJEEHA WOMANS COLLEGE
TIRUCHENDUR TO KAYALPPATINAM ROAD
KAYALPPATINAM -

Party's GSTIN. -

GSTIN : -

HSN Code: -

State : -

PO.No : VERPAL Date : 03.07.2022

Our D.C : 43 Date :

S.No.	Particulars	Quantity	Rate Rs.	Rate P.	Amount Rs.	Amount P.
1	110 AH ABM TUBULAR BATTERIES	10 nos	7421	80	74218	00
	OLD BATTERY BYE BACK	10 Nos	818	40	8184	00
					Total	66024 37
					S GST@ 14 %	9244 81
					C GST @14 %	9244 81
					%	
					Grand Total	84524 00

E. & O.E.

Rupees Eighty five thousand five tewnty four only

Despatched through : -

All disputes are subject to Coimbatore Jurisdiction only

For REAL TECH INDUSTRIES

Authorised Signatory

Bank Name: Karur vysya bank Branch: Singanallur

A/c No: 1739115000001319 IFSC: KVBL0001739

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

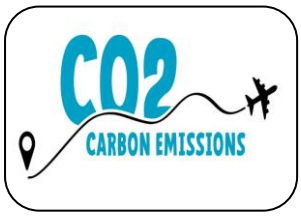
8. ASSESSMENT ON LIST OF MATURED TREES AND GREEN ENERGY GENERATION

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 107 with 9 varieties of trees. Apart from the mature trees; preserving the ecology; the entire college campus is planted with various flowing shrubs and pushes. Table-15 shows the list of matured trees available inside the college campus.

Table-15: List of Matured Trees Available in the College Campus

S. No.	Location (Wing/Block /Area)	Name of the Tree	Botanical Name	Quantity
1	Right side	Neem tree	Azadirachta Indica	12
2	Backside	Neem tree	Azadirachta Indica	7
3	Left side	Neem tree	Azadirachta Indica	9
4	Front side	Neem tree	Azadirachta Indica	17
5	Right side	Coconut-tree	Cocos Nucifera	6
6	Front side	Coconut-tree	Cocos Nucifera	10
7	Right side	Portia tree	Thespesia Populnea	1
8	Left side	Portia tree	Thespesia Populnea	8
9	Front side	Vatanarayani	Delonix Elata	4
10	Left side	Vatanarayani	Delonix Elata	4
11	Front side	Fig tree	Ficus Carica	5
12	Backside	Teak tree	Tectona Grandis	4
13	Front side	Java plum tree	Syzygium Cumini	4
14	Front side	Casuarina tree	Casuarina Equisetifolia	10
15	Left side	Palmyra palm	Borassus Flabellifer	6
			Total	**107**



Total No. of Matured Trees available in the college campus is 107 which contributes for reduction of 2.33 Tons of CO_2 emission/Annum

In addition to the existing matured trees a total of 31 nos. of shrubs and 675 Nos. of new trees of 7 varieties were planted to increase the green source and also reduce the carbon emission per capita. List of new plants with count is given in the table.

Table 16: List of Newly planted Trees Available in the College Campus

S. No.	Location (Wing/Block /Area)	Name of the Tree	Botanical Name	Quantity
1	Left side	Teak tree	Tectona Grandis	150
2	Front side	Mahogany tree	Swietenia Macrophylla	200
3	Front side	Red sandal wood	Pterocarpus Santalinus	150
4	Right side	Almond tree	Prunus Dulcis	100
5	Back side	Sugar apple tree	Annona Squamosa	25
6	Left side	Jack fruit tree	Artocarpus Heterophyllus	25
7	Left side	Mango tree	Mangifera Indica	25
			Total	**675**

Table 17: List of Shrubs (Bushes)

S. No.	Location (Wing/Block /Area)	Name of the Shrubs	Botanical Name	Quantity
1	Left side	Caesalpinia	Caesalpinia pulcherrima	4
2	Front side	Nanthiya Vattam	Ervatamia Coronaria	5
3	Front side	Rose Shoe plant	Hibiscus rosa-sinensis	3
4	Right side	Basella	Basella rubra	6
5	Back side	Jasmine	Jasminum sambac	4
6	Left side	Maruthani	Lawsoniainermis	5
7	Left side	Swollen fingergrass	Chloris barbata	4
Total				**31**

Fig. 30: Geographical View of the college

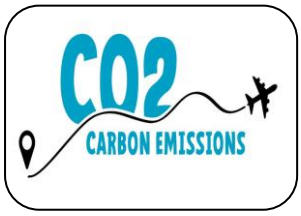
8.2. Power Generation using Solar Photovoltaic System:

- In order to promote more green generation inside the college campus, the management has installed 3.2 kW Solar Photovoltaic systems in college roof top and generates energy for computer system application.
- 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	3.2 kW
Panel Capacity	8 Nos. of 400W panel
Location	College roof tap
Panel Orientation (Direction)	South Facing
Type of PV panel	Polycrystalline
Application	Computer System applications
No. of Unit generated/Month (Approx.)	298 Unit (kWh)
Year of Installation	2021

Table 18: Energy Generation through Solar PV System

S. No.	Description	Parameters
1.	Average solar radiation per Day for (latitude, longitude: 8.53, 78.1)	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) = (3.2 kW * 04 * 0.8) = 10.24 kWh
4.	Electrical Energy production per month	= (10.24 * 30) = 307.2 kWh
5.	Electrical Energy production per Annum (**This energy is Saving**)	= (307.2 * 12) = **3686.4 kWh**



Annual energy saved from the roof top solar photovoltaic system (with electrical equivalent) is 3,686.4 kWh which reduces 3.391 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 WAVOO WAJEEHA WOMEN'S COLLEGE OF ARTS AND SCIENCE campus 100 % energy efficient, Environmental sustainability and lush Greenery the audit team recommends to implements the following measures:

I. Energy Conservation & Management:

- It is recommended to install another **15kW capacity Solar PV plant** to reduce the electrical demand the site which also helps to neutralize the carbon emission.
- 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 remaining FTL into LED with adequate illumination levels.
- Uneven distribution of electrical loading was evident in power quality analyzer. It is recommended to maintain a uniform distribution in all the three phases to minimize the failure in future.
- It is recommended to reduce the demand based on actual requirement.
- Recommended to install **solar assisted street lights** in ground area.
- Implement **Energy Management System** (EMS) to accurately measure & monitor energy flow.
- It is recommended to install APFC in the future will installing higher capacity solar PV plant.
- 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.
- Implement **automatic street light controller** to turn on and off based on different time in a day. Use astrological timer for better results and energy savings.

- Prepare suitable formats for all energy consumption and regularly follow to records. At regular interval, conduct internal audits to assess the effectiveness of the practice. Make proper corrections; if it deviates from the standard operating procedure.
- 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:

- Quantity 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.
- 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

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

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**

Controller of Examination