

# ENERGY AUDIT REPORT

Year 2023-2024



**HOLY CROSS COLLEGE (AUTONOMOUS)**

**Nagercoil  
Tamilnadu 629004.  
INDIA**

**TJ Solution  
4/101, Raja Sir Muthiah Nagar,  
Bye- Pass Road,  
Ellis Nagar,  
Madurai - 625 016.**

## CERTIFICATE

### Energy Audit 2023 -2024

This is to certify that **HOLY CROSS COLLEGE (AUTONOMOUS), NAGERCOIL**, has conducted a detailed **Energy Audit** of their campus and has submitted the necessary data and credentials for scrutiny. The activities and measures carried out by the College have been verified based on the field visit and reports submitted and were found to be **EXCELLENT**. The efforts taken by the faculty and students towards environment and sustainability are highly appreciated and commendable.



**U.Chandra Kumar B.E -BEE Accredited auditor  
(AEA-0244)**

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#### **TJ Solutions**

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Madurai – 625 016      Email : [tjsolutionsmadurai@gmail.com](mailto:tjsolutionsmadurai@gmail.com)  
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## ACKNOWLEDGEMENT

We at TJ Solutions, Madurai are thankful to the Principal for giving us the opportunity to carry out the Energy audit of HOLY CROSS COLLEGE(Autonomous), Nagercoil- 629004, Tamil Nadu, India. TJ Solutions team is also thankful to all other supporting Officers / Staff of the above institute for their wholehearted support, hospitality and the courtesy extended to the Audit team during the course of the visit.

The following officers from TJ Solutions under the guidance of Mr.U.Chandra Kumar B.E., Certified Energy Auditor, have carried out the Energy Audit.

Name	Qualifications	Certification Number
Mr.Chandrakumar	BEE Accredited Energy auditor	AEA-0244
Mr. N. Tamil selvan	B.Sc.,	ISO Lead Auditor / Energy Consultant
Mrs.Tamil selva parvathi	MSc.,DTC.,PGDESD.,	Environmentalist
Mr. R.Manikandan	DEEE	Electrical Data Analyst
Er.A.Rajendran	B.E	Electrical Engineer C. Licence Holder; C 39095
Er. P.Delepan	B.E	Assistant Engineer (Electrical / Energy)



## Summary of Audit

Energy audit of HOLY CROSS COLLEGE (Autonomous), Nagercoil and HOSTEL

was carried by TJ solutions. The Audit team has gone through the data related to TNEB GRID Electrical Energy, Diesel Generator Electrical Energy, Solar PV Power Electrical Energy, Solar Water Heater, BIOGAS generation and Diesel & Biomass consumption. A study was also carried out on Renewable energy utilisation and Energy Conservation measures to reduce energy consumption.

During the visit it was observed that the Holy Cross college strictly follows reduce, reuse and recycle policy to limit energy usage and also to replace non-renewable energy sources with renewable energy sources. The concept of energy conservation is disseminated among the students and staff through various seminars/workshops and training programs.

We hope that the results presented in the energy auditing report will serve as a guide for the institution on the existing energy related practices and resource usage.

**The audit outputs and recommendations are summarised as follows**

Total Electrical Energy consumption from TNEB Grid alone- 1,56,747 units

Total Electrical Energy consumption - 1,86,935.6 units

Renewable energy from Solar PV power plants- 28,433.4 units

Lot of initiatives are taken to conserve Energy by the institution.



## **ENERGY SAVING POTENTIALS AND RECOMMENDATIONS**

No. of fans 464

Existing fan – 60 W

Energy Efficient Fan – 30 W

Power Saving /Fan – 30 W

Usage /day -12 hours

Energy saving/day – 360 WH

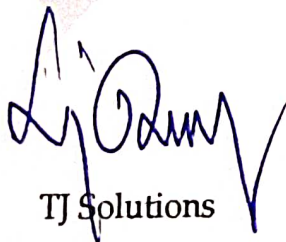
Hostel occupied/year – 300 days

Energy saving potential/year – 50,112 units

- Conventional fans can be replaced by energy efficient fans in a phased manner.
- Remaining Conventional Tube lights shall be replaced with LED tube lights in a phased manner.
- 5 Star rating Energy efficient electrical equipment has been installed and shall be procured.
- Smart sensors shall be used in higher capacity AC systems to reduce the power consumption.
- Automatic power (sensor based) switch off systems are installed and may be introduced in required areas.
- A Flow metre for Biogas plant shall be provided to study the performance
- Sophisticated energy management systems (EMS) can provide detailed insights and control over energy usage.
- Upgrading to high-performance materials and technologies can yield substantial energy savings.
- Develop and support comprehensive sustainability programs that involve students, faculty, and staff.



- Initiatives can include sustainability challenges, educational workshops, and integration of energy conservation principles into the curriculum.
- Expand EV charging infrastructure across campus to support the adoption of electric vehicles.
- We are happy to submit this detailed energy audit report to the HOLY CROSS COLLEGE(Autonomous),Nagercoil.



TJ Solutions

Madurai



**CHANDRA KUMAR.U**  
BEE Accredited Energy Auditor  
(AEA 0244)



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# 1. TNEB GRID ELECTRICAL ENERGY CONSUMPTIONS

Sl. No.	Service no	Name	Load KW	Year 2023 -2024	
				Type	Total Consumed Units
1	7123014168	Hostel	5	LM51	2480
2	7123014169	Hostel	4	LM51	330
3	7123014170	Hostel	11	LM51	12772
4	7123014171	Hostel	6	LM51	14730

Sl. No.	Service no	Name	Load KW	Year 2023 -2024	
				Type	Total Consumed Units
1	7123014167	College -LAB	50	LM2B1	64696
2	7123014181	College	42	LM2B1	51435
3	7123014166	Library	3	LM51	2809
4	7123014335	Sericulture	1	LM61	94
5	7123014180	Botany	7	LM51	255
6	7123014321	Computer LAB	17	LM51	4868
7	7123010534	Zoology	9	LM51	2278





## 2. List of electrical equipments in college and hostel

- ❖ Number of Generators - 2
- ❖ Total number of CFL bulbs - 428
- ❖ Number of LED lights - 562
- ❖ Number of fans - 464
- ❖ Number of Air Conditioners - 27
- ❖ Number of Solar Street lights - 17
- ❖ Total Electrical Equipments in Lab - 93
- ❖ Number of Computers - 457
- ❖ Number of Smart Classrooms - 72
- ❖ Number of photocopier printers - 9

## 3. Energy audit and its purposes.

Energy audit is a systematic study or survey to identify how energy is being used in a building or plant, and identifies energy savings opportunities.

During energy audit the Basic Electrical Parameters in AC & amped systems - Voltage (V), Current (I), Power factor, Active power (kW), apparent power (demand) (KVA), Reactive power (KVAR), Energy consumption (kWh), Frequency (Hz), Harmonics, etc. will be measured which will provide details of the following,

1. Voltage fluctuations level
2. Voltage unbalance level
3. Power factor and required KVAR addition
4. Harmonics level
5. Condition of capacity banks
6. Earth leak current value
7. Maximum demand reached
8. Power Consumption patterns
9. Cable Terminals conditions
10. Cable conditions
11. Batteries condition
12. Equipment's performance
13. Earth pit condition

Based on Energy audit Report:

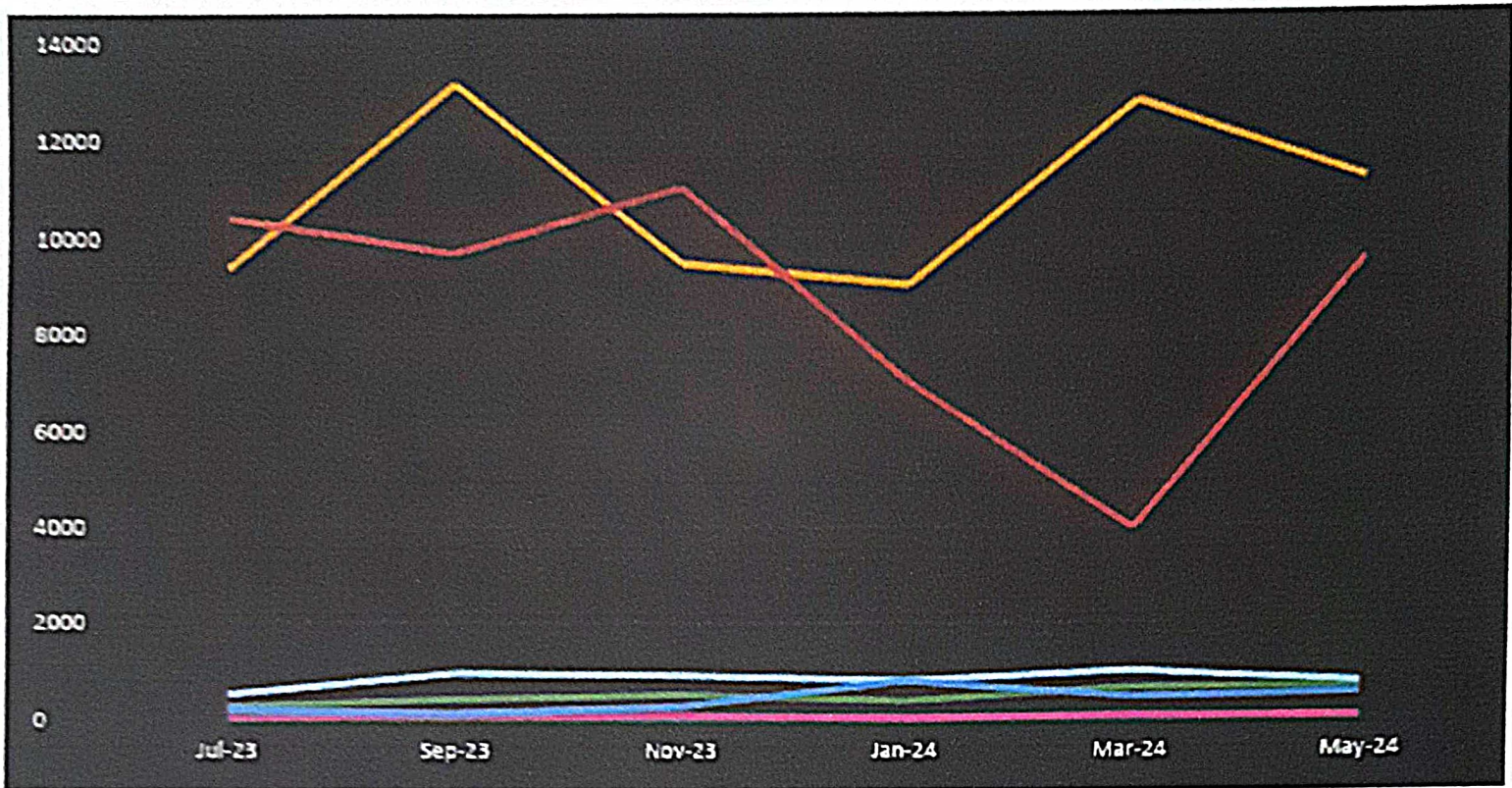
- Corrective action to reduce energy losses
- Improve the Electrical Safety of the system
- Improve the Performance of the equipments
- Do preventive maintenance and quality control programs
- Minimise energy costs/waste.



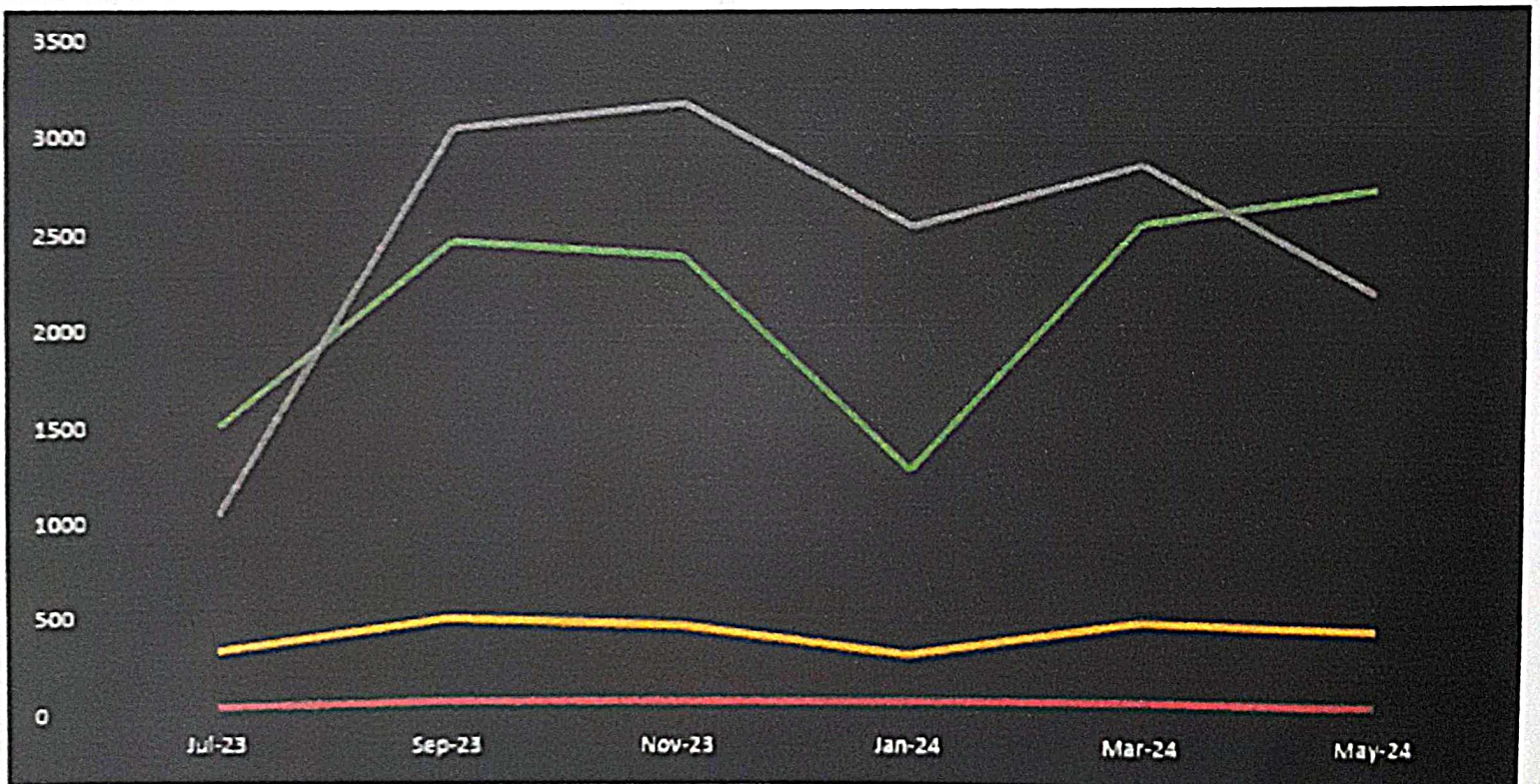


#### 4. GRAPHICAL COMPARISON OF TNEB READING FOR SIX MONTHS:

4.1 Bar Graph for College Feeder Power Consumption Units for a Year :



4.2 Bar Graph for Hostel Feeder Power Consumption Units for a Year:





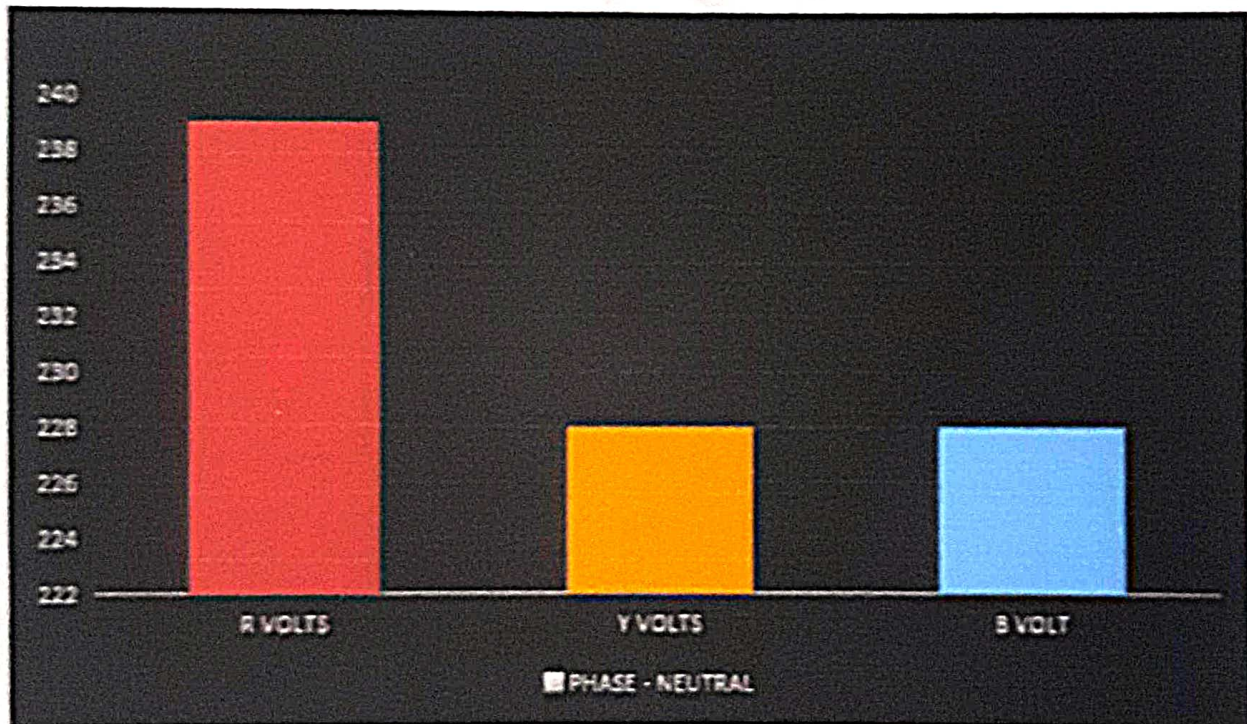
**5.1 TNEB Energy Meter Reading While Testing for (123-014-167) Town Feeder:**

KWH	KVAH	PRPF	AVPF	MD KW
354135.11	424210.96	0.92	0.941	53.1

**5.1.1 TNEB Energy Meter Reading While Testing for (123-014-181) TVL Feeder:**

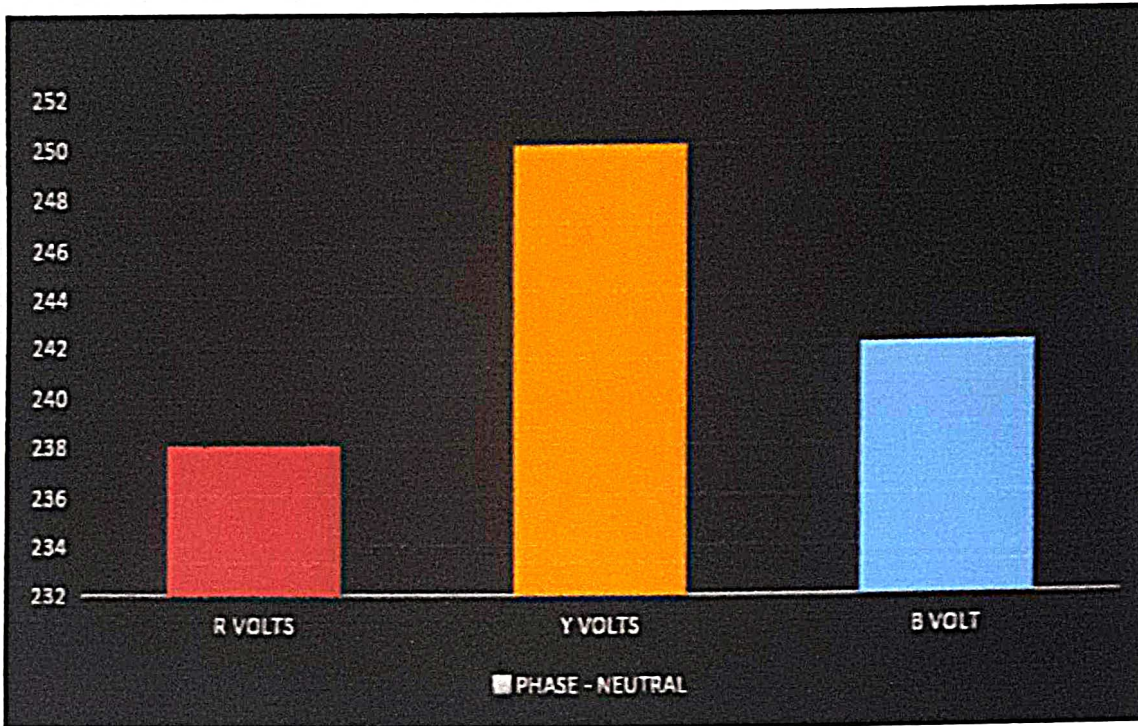
KWH	KVAH	PRPF	AVPF	MDKW
36811.3	41657.3	0.967	0.955	57.0

**5.2 Voltage Measurement Details (123-014-167) Town Feeder:**





### 5.2.1 Voltage Measurement Details (123-014-181) TVL Feeder:

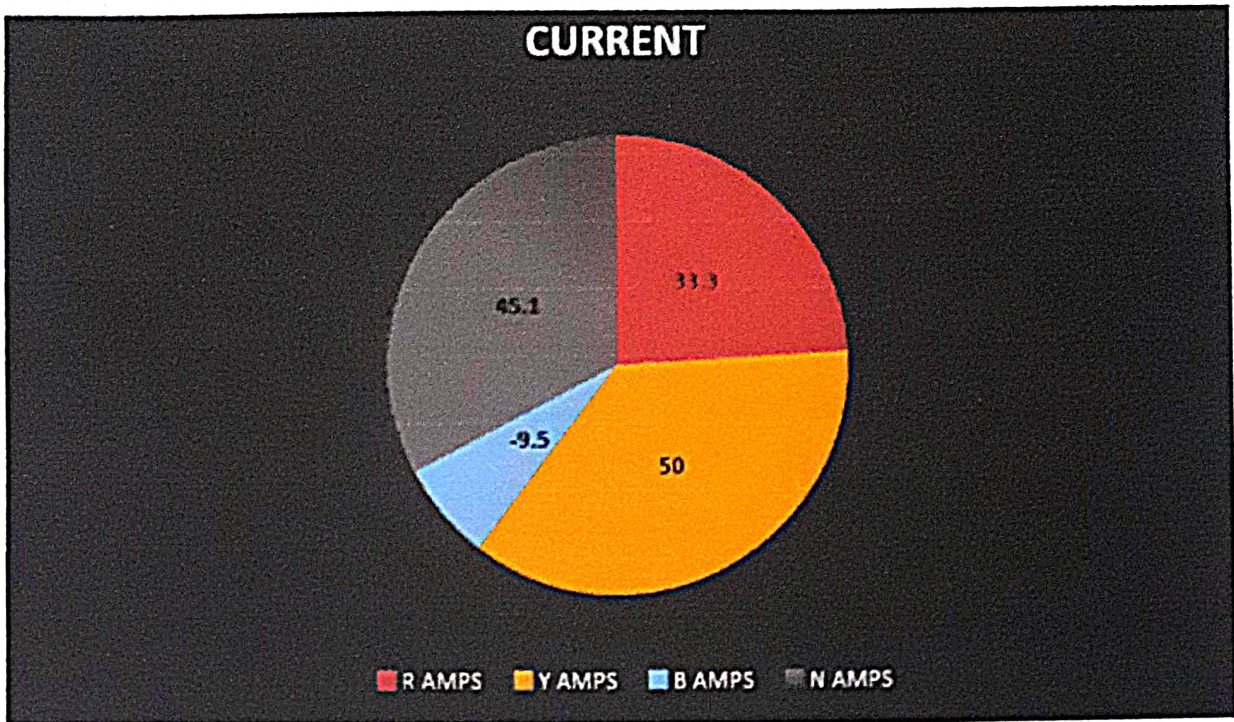


### 5.3 Current Measurement Details (123-014-167) Town Feeder:

R Current	Y Current	B Current	N Current
R = 33.4 A	Y = 50.0 A	B = -9.56A	N = 45.1

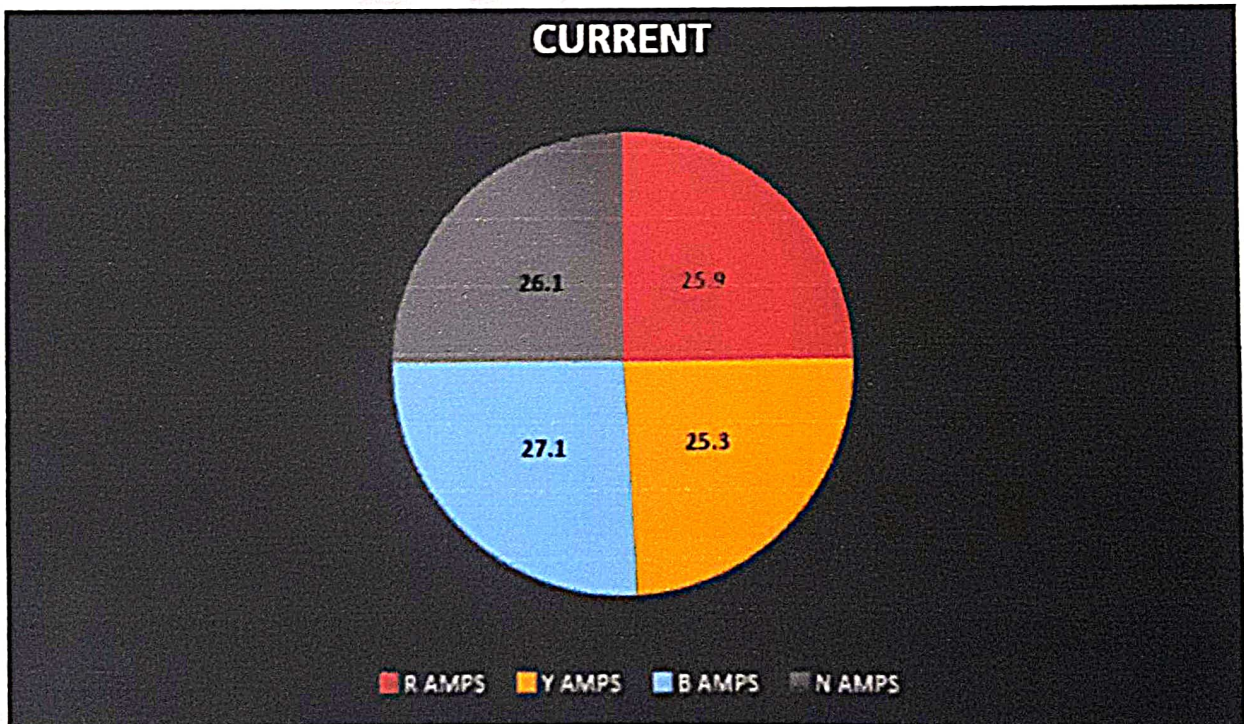






### 5.3.1 Current Measurement Details(123-014-181) TVL Feeder:

R Current	Y Current	B Current	N Current
R = 25.9 A	Y = 25.3 A	B = 27.1 A	N = 26.1 A





## 6. DIESEL POWER ELECTRICAL ENERGY GENERATION

Diesel Generator- Electrical energy generation in 2023-2024

Sl. No	Location	Unit Consumption	Diesel Consumption (L)	Units/Litre
1	HOLY CROSS (Autonomous), Nagercoil	1,755	585	3
	<b>TOTAL</b>	<b>1,755</b>		

## 7. SOLAR PV ELECTRICAL ENERGY GENERATION

Sl. No	Solar Capacity KW	Solar Power Generation Units
1	19	28433.5

## 8. TOTAL ELECTRICAL ENERGY CONSUMPTION

Sl.no	Source of electrical energy	No of units
1	TNEB Grid	156747
2	Diesel generators	1755
3	Solar power plants	28433.4
	<b>Total</b>	<b>186935.6</b>

## 9. SOLAR THERMAL-SOLAR WATER HEATER

In the college hostel, to provide hot water for bathing purpose, 200 LPD solar water heater systems was installed

Capacity - 2, 00 LPD -1Nos





## 10. BIO GAS / BIO-MASS CONSUMPTION

Bio gas consumed during the year 2023-2024 - 396 Units / Year.

Biomass consumed during the year 2023-2024 - 6000 Kg / Year.

## 11. Energy Conservation -Implementation & Achievement

### Renewable Energy- Solar PV Power Plants :

Solar Power plant installed at HOLY CROSS COLLEGE(Autonomous),Nagercoil- 19 KW

Consumption of Grid electrical energy reduced in HOLY CROSS COLLEGE (Autonomous) , Nagercoil during the year 2023-2024 due to usage of Solar Power Plant is 28,433.4 units

### Renewable Energy- Solar Thermal-Water Heaters :

Solar Water Heater installed capacity at the hostel- 200 LPD

Grid electrical energy(equivalent) saved due to Solar water heaters -3000 units / Years.

### Renewable Energy- Solar Street Light :

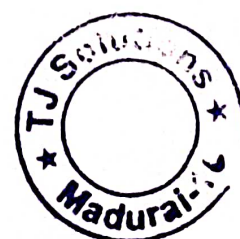
Solar Street Light installed capacity- 17 Lights of 50 W

Grid electrical energy(equivalent) saved due to Solar Street light -2482 units / Years.

**Total renewable energy usage in HOLY CROSS COLLEGE(Autonomous)  
AND HOSTEL during the year 2023-2024**

### Renewable Energy usage

SI. No.	Renewable Energy	Electrical Energy/Equivalent Electrical Energy
1	Solar Photovoltaic	28433.4 units- Electrical Energy
2	Solar Thermal	3000 units- Equivalent Electrical Energy
3	Solar Street Light	2482 Units- Equivalent Electrical Energy
	Total	33915.5 units



## 12. THE ENERGY CONSERVATION ACTIVITIES FOLLOWED :

- The fans, lights, air-conditioners and other electronic and electrical equipment are switched off when not in use.
- Computers are switched to sleep mode or hibernate mode automatically when not in use
- Electrical equipment like CROs, Oscillators, Sodium lamps are switched off in the laboratory when the students complete their observations.
- At the end of every practical session, Computer monitors and UPS are switched off.
- In addition, post occupancy activities like utilizing renewable energy, minimizing waste generation to the least, proper disposal of E-waste and Bio-waste to the authorized recycler are carried out.
- 5 Star rating Energy efficient electrical equipment has been installed.
- Automatic power(sensor based) switch off systems may be installed in required areas



## 13. COMMON OBSERVATION & FEEDBACK

### Battery rooms

- Petroleum jelly is applied to battery terminals to avoid corrosion
- Water levels in the batteries are maintained
- Fire extinguishers in the area are in good condition
- History card to be maintained for all UPS and batteries
- Unwanted materials (Not related to UPS/Battery) not to be kept in the battery room.
- Cable identification tag to be provided.
- Battery earth pits conditions to be checked periodically

### Earth Pits:

- Earth pit identification to be done
- Resistance value to be checked periodically & marked
- Records to be maintained for all earth pits
- Earth pits which are disturbed due to construction activities are to be restored as early as possible.





### Electrical Energy Measurements

S.No.	Source of Electrical Energy	No. of Units		
		2021-2022	2022-2023	2023-2024
1.	TNEB Grid	119229	132952	156747
2.	Diesel Generators	750	900	1755
3.	Solar	6387	6387	28433.4
4.	Solar water heater	3000	3000	3000
	<b>TOTAL ENERGY CONSUMPTION</b>	<b>126366</b>	<b>140239</b>	<b>186935.6</b>

### Renewable Energy Usage

S.No.	Renewable Energy	Electrical Energy/Equivalent Electrical Energy in Units		
		2021-2022	2022-2023	2023-2024
1.	Solar Photovoltaic	6387	6387	28433.4
2.	Solar Thermal	3000	3000	3000



3.	Solar Street Light	-	-	2482
	<b>Total</b>	<b>9387</b>	<b>9387</b>	<b>33915.5</b>

### Energy Saving Potentials

No. of fans 464

Existing fan – 60 W

Energy Efficient Fan – 30 W

Power Saving /Fan – 30 W

Usage /day -12 hours

Energy saving/day – 360 WH

Hostel occupied/year – 300 days

Energy saving potential/year – 50,112 units





## Biogas plant

Two bio gas plants have been installed in the College premises with the capacity of 6 cubic meters each. The feeders for the bio gas plants consists of cow dung from the cows of the small diary unit, food waste and other degradable solid waste. 10 cubic meter capacity bio gas plant will produce 5 cubic meter bio gas per month. If this is converted into LPG cylinder, the monthly equivalent of LPG to bio gas is 10 LPG cylinders with 14.2 kg. capacity. Based on this calculation, one 6 cubic meter bio gas plant produces 6 LPG cylinders of 14.2 kg. per month and the annual production of LPG cylinder equivalent per plant is 72 LPG cylinders. Thus the two bio gas plants produce 144 LPG equivalent of bio gas.

### FORMULA TO CALCULATE CARBON EMISSION BY LPG

LPG: Input Value (in kg./Yr) X 2.983 (Emission Factor) = Output value (in kg. of CO<sub>2</sub>). Based on this formula, the carbon emission from LPG cylinder equivalent of two bio gas plants is calculated below:

Bio gas plants 2 (12 cubic meters @ 6 cubic meter each)

$(144 \text{ LPG} \times 14 \text{ kg.}) \times (2.983 \text{ Emission Factor}) = 6013.7 \text{ Kg. of CO}_2 = 6000 \text{ kg (approx.)}$

Total reduction of Carbon Foot Print per year through two bio gas units is 6000 kg. or 6 tons of CO<sub>2</sub>.



## 14. ENERGY SAVING POTENTIALS & RECOMMENDATIONS

- Conventional Fans shall be replaced with energy efficient fans in a phased manner.
  - o Conventional Fans power consumption is around 60 watts
  - o Energy efficient Fans power consumption is 30 watts
- Remaining Conventional Tube lights shall be replaced with LED tube lights in a phased manner
- 5 Star rating Energy efficient electrical equipment shall be procured
- Smart sensors shall be used in higher capacity AC system to reduce the power consumption
- Automatic power switch off systems may be introduced in required areas
- Flow meter for Biogas plant shall be provided to know the performance of the Biogas plant and utilize the plant to a maximum capacity
- Earth pits conditions to be checked in the hostel.
- Energy conservation training program for all staff shall be planned periodically
- Some more displays on energy conservation shall be put up in suitable locations
- Connect the correct sequence of all phases.
- Replace the new Fuse link in Y phase.
- Load share is must in college lab service.

Date :



*Chandra Kumar U*

Energy Auditor Signature

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