

ENERGY AUDIT REPORT

Year 2022-2023



HOLY CROSS COLLEGE (AUTONOMOUS)

Nagercoil
Tamilnadu 629004.
INDIA

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

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ACKNOWLEDGEMENT

We at TJ Solutions, Madurai are thankful to the Principal for giving us the opportunity to carry out Energy audit of HOLY CROSS COLLEGE, Nagercoil-629004, Tamilnadu, India. TJ Solutions team is also thankful to all other supporting Officers / Staffs 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. S. Balraj M.E.,Ph.D., Certified Energy Auditor, have carried out the Energy Audit.

Name	Qualifications	Certification Number
Mr.S.Balraj	M.E.,Ph.D.,Energy auditor	EA-15051
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 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 utilization 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 staffs 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 summarized as follows

Electrical Energy consumption from TNEB GRID alone - 132952 units

Total Total Electrical Energy consumption - 140239 units

Renewable energy from Solar PV power plants- 6387 units

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



ENERGY SAVING POTENTIALS & RECOMMENDATIONS

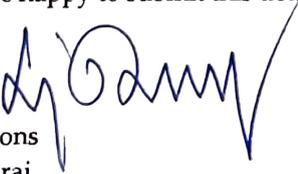
- Conventional Fans shall be replaced with energy efficient fans in a phased manner.

Fans	Existing Fan	Energy Efficient Fan	Power Savings/fan	usage /day	Energy saving/day	GRG Hostel occupied / year	Energy saving potential /year
No	Watts	Watts	Watts	Hrs	WH	Days	Units
339	60	30	30	12	360	300	36,612

- 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 is installed and may be introduced in required areas.
- Flow meter for Biogas plant shall be provided to study the performance.
- In future, Green building should be constructed on basis of ECBC norms 2017.

We are happy to submit this detailed energy audit report to the **HOLY CROSS COLLEGE**

TJ
Solutions
Madurai



CERTIFICATE

Energy Audit-July -2023

This is to certify that **Holy Cross College, Kurusady 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 energy conservation and utilization of renewable energy are highly appreciated and commendable.

Dr.S.BALRAJ,M.E.,Ph.D.,

B. S. Balraj
22/7/23
Dr.S.BALRAJ, M.E.,Ph.D.,
Certified Energy Auditor,
B.E.E. Reg.No: EA-15051

TJ Solutions

Dr.S.Balraj,M.E.,Ph.D., - (EA -15051 – Certified Energy Auditor)

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1. TNEB GRID ELECTRICAL ENERGY CONSUMPTIONS

Sl. No.	Service no	Name	Load KW	Year 2022 -2023			
				Type	Average cost/unit Rs	unit consumed	Bill amount Rs
1	7123014168	Hostel	5	LM51	104.5	300	8731
2	7123014169	Hostel	4	LM51	11.7	2520	27066
3	7123014170	Hostel	11	LM51	10.1	12260	133909
4	7123014171	Hostel	6	LM51	9.5	12630	130555

Sl. No.	Service no	Name	Load KW	Year 2022 -2023			
				Type	Average cost/unit Rs	unit consumed	Bill amount Rs
1	7123014167	College -LAB	50	LM2B1	7.2	42292	459148
2	7123014181	College	42	LM2B1	6.5	53290	489002
3	7123014166	Library	3	LM51	13.8	1780	21012
4	7123014335	Sericulture	1	LM61	47.9	40	6555
5	7123014180	Botany	7	LM51	119.5	470	12335
6	7123014321	Computer LAB	17	LM51	12.3	5160	68664
7	7123010534	Zoology	9	LM51	12.2	2210	27722

2. List of electrical equipments in college and hostel

- ❖ Number of Generators - 2
- ❖ Total number of CFL bulbs - 428
- ❖ Number of LED lights- 202
- ❖ Number of fans- 427
- ❖ Number of Air conditioners - 21
- ❖ Number of Street lights - 10
- ❖ Total Electrical Equipments in LAB - 93
- ❖ Number of Computers and laptops - 291
- ❖ Number of Projector - 4
- ❖ Number of Televisions - 13
- ❖ Number of Invertors- 19
- ❖ Smart class room-32

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

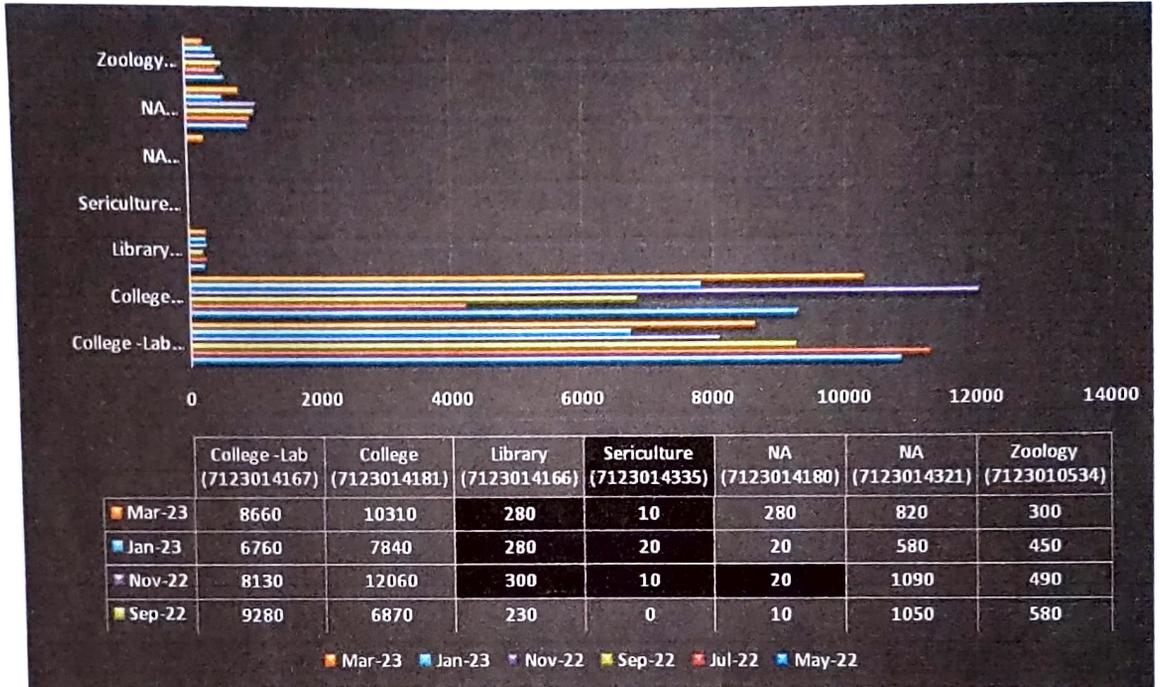
Based on Energy audit Report:

- 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
- Minimize energy costs/waste.

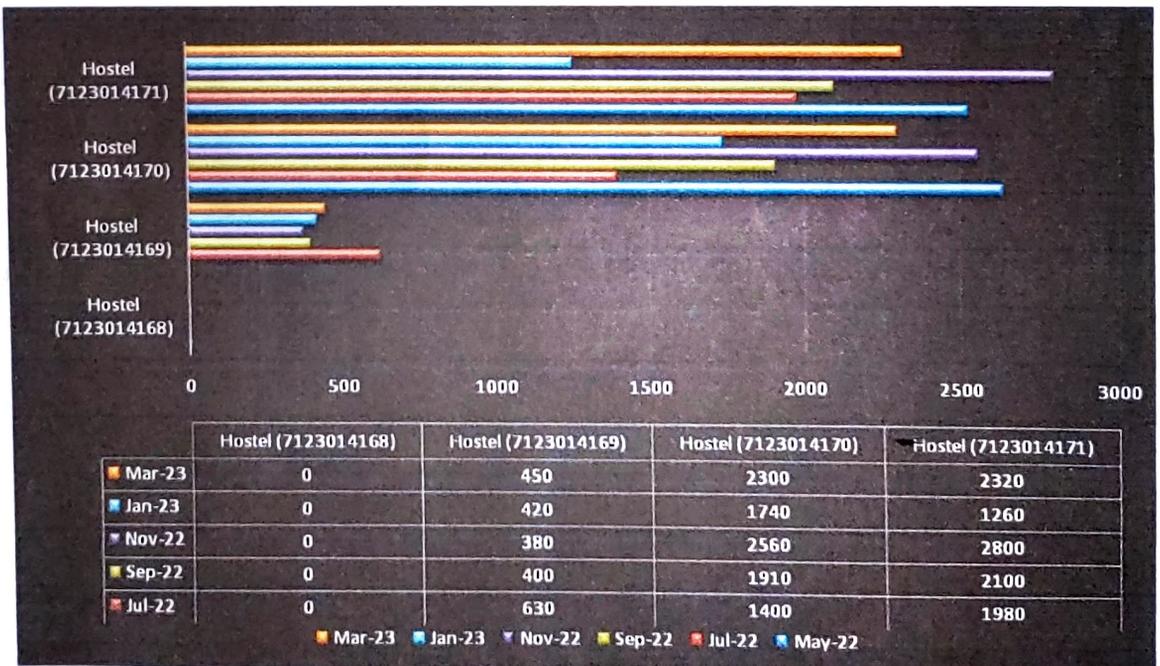


4. GRAPHICAL COMPARISON OF TNEB READING FOR SIX MONTHS:

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 MEASUREMENT OF ELECTRICAL PARAMETERS:

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

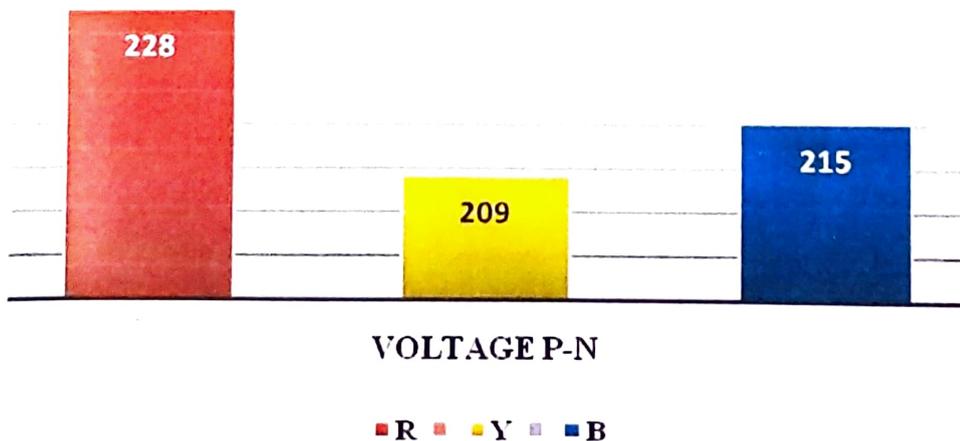
KWH	KVAH	PRPF	AVPF	FREQUENCY
277621.83	338972.95	0.90	0.894	50 HZ

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

KWH	KVAH	PRPF	AVPF	FREQUENCY
346130.2	422172.6	0.96	0.896	49.6 HZ

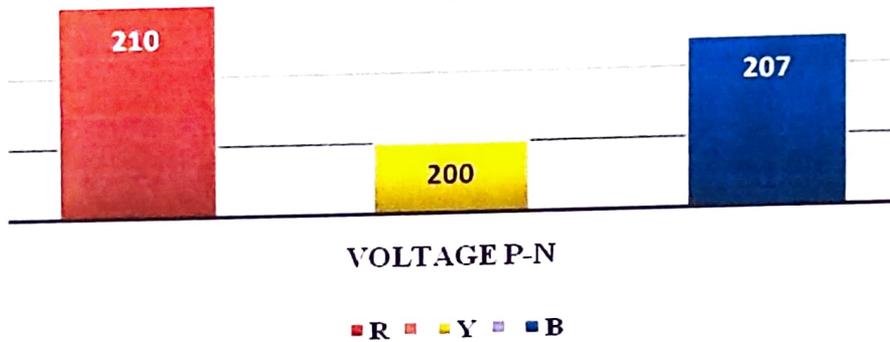
5.2 Voltage Measurement Details (123-014-167) Town Feeder:

PHASE TO NEUTRAL VOLTAGE WAVEFORM



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

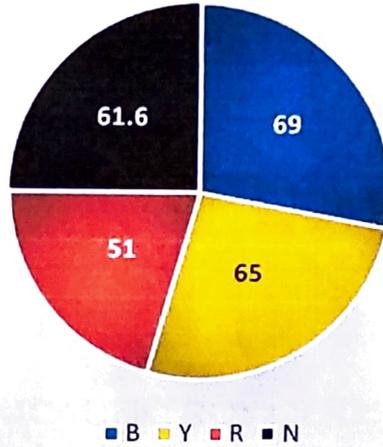
PHASE TO NEUTRAL VOLTAGE WAVEFORM



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

R Current	Y Current	B Current	N Current
R = 51 A	Y = 65 A	B = 69A	N = 61.6A

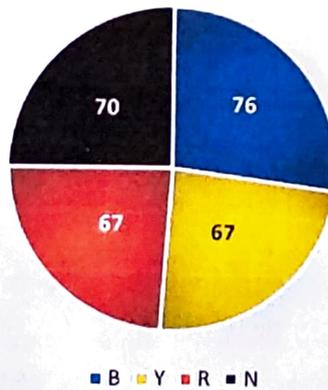
CURRENT PIE CHART



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

R Current	Y Current	B Current	N Current
R = 67 A	Y = 67 A	B = 76 A	N = 70 A

CURRENT PIE CHART



6. DIESEL POWER ELECTRICAL ENERGY GENERATION

Diesel Generator- Electrical energy generation in 2022-2023

Sl. No	Location	Unit Consumption	Diesel Consumption (L)	Units/ Liter
1	HOLY CROSS	900	300	3
	TOTAL	900		

7. SOLAR PV ELECTRICAL ENERGY GENERATION

Sl. No	Solar Capacity KW	Solar Power Generation Units
1	5	6387

8. TOTAL ELECTRICAL ENERGY CONSUMPTION

Sl.no	Source of electrical energy	No of units
1	TNEB Grid	132952
2	Diesel generators	900
3	Solar power plants	6387
Total		140239

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. LPG CONSUMPTION

No of students & staffs stayed in the hostel during the year 2022-2023- 2682

No. of days the hostel was occupied with students during the year 2022-2023 – 220

LPG gas cylinders consumed during the year 2022-2023 – 614 nos.

Quantity of LPG gas consumed for cooking – 11555 kg

11. Energy Conservation -Implementation & Achievement

Renewable Energy- Solar PV Power Plants :

Solar Power plant installed at HOLY CROSS COLLEGE-5 KW

Consumption of Grid electrical energy reduced in HOLY CROSS COLLEGE during the year 2022-2023 due to usage of Solar Power Plant is 6387 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.

Total renewable energy usage in HOLY CROSS COLLEGE AND HOSTEL during the year 2022-2023

Renewable Energy usage

SI. No.	Renewable Energy	Electrical Energy/Equivalent Electrical Energy
1	Solar Photovoltaic	6387 units- Electrical Energy
2	Solar Thermal	3000 units- Equivalent Electrical Energy
	Total	9387 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.

14. ENERGY SAVING POTENTIALS & RECOMMENDATIONS

- Conventional Fans shall be replaced with energy efficient fans in a phased manner.
 - Conventional Fans power consumption is around 60 watts
 - 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 staffs shall be planned periodically
- Some more displays on energy conservation shall be put up in suitable locations
- A power saving day is to be observed every year.
- Lightning Arrester must be installed in the college campus

