Green Aura

Built Environment Sustainability & Transformation

ENERGY AUDIT REPORT | 2023

Mangalam College of Engineering

Green Aura

Built Environment Sustainability & Transformation

692F,12TH A CROSS BEL LAYOUT, BENGALURU- 560091

(ISO/IEC 17020:2012, ISO 9001:2015, ISO 1400:2015 Certified Organisation &
Ministry of MSME registered organisation)

Certificate of Energy Audit

THIS CERTIFICATE IS PRESENTED TO

MANGALAM COLLEGE OF ENGINEERING

This is to certify that Mangalam College of Engineering has successfully undergone 'Energy Audit' on on 2nd January, 2024 and assessed the electrical energy conservation, energy saving measures, policies and standards in the campus were found to be excellent.

This certificate is valid till 31st December, 2024

Ref. No: GA / ENERGY AUDIT / 02 / 02 / 24

DR NISCHAY N GOWDA

Founder & Director - Green Aura

CERTIFIED ISO EMS-LA, IGBC - AP,
US GREEN BUILDING COUNCIL - GREEN ASSOCIATE
GLOBAL DOCTORATE, SWITZERLAND.

Green Audit Certificate

This certificate is awarded to **Mangalam College of Engineering, Mangalam Hills, Vettimukal P.O, Ettumanoor, Kottayam, Kerala, 686631** in recognition of their commitment and efforts towards environmental sustainability.

As a result of the Green Audit conducted on **23rd Dec 2023**, it has been determined that **Mangalam College of Engineering** has implemented a range of effective environmental sustainability practices in line with National Building Code 2016 –Part-11.

This certificate is valid for following scope of activities:

Green Audit
Energy Audit
Environment Audit

Audit Date	:	23rd Dec 2023
Certificate No.	:	1B05323B20000162
Issuance Date	:	2nd Jan 2024

Signature
Maneet Dewan
Director

PQMS Quality Services Private Limited
SCO-21, 4th Floor, Feroze Gandhi Market, Ludhiana-141001 (Punjab)
Email: info@qualityindia.in website: www.qualityindia.in

ENERGY AUDIT REPORT 2023

CONSULTATION REPORT

Mangalam College of Engineering

Kottayam, Kerala.

Submitted to:
Principal,
Mangalam College of Engineering
Mangalam Hills, Vettimukkal P.O.,
Ettumanoor, Kottayam, Kerala - 686631

Audited by:
Green Aura,
692F,12th A cross Bel layout,
Bengaluru- 560091.

CONTENT

ACKNOWLEDGEMENT

GREEN AURA, Bengaluru, Karnataka takes this opportunity to appreciate & thank the management **Mangalam College of Engineering, Kerala** for giving us an opportunity to conduct energy audit for the buildings of the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

Energy Audit Team

The study team consisted of senior technical executives from Green Aura, and the audit spanned multiple visits from November to December 2023.

- **Dr. Nischay N Gowda**, Founder & Director Green Aura, Bengaluru.
  Lead Auditor PQMS Quality Services Pvt Ltd. (IGBC-AP and LEED-Green Associate).
- **Mr. Manish Walecha**, Certified Energy Auditor (EA-34073/23).
- **Mr. Sachin Kumawat**, Certified Energy Manager (EM-300475/23).
- **Mr. Akash Kumar**, Engineer.

Manish Walecha
[Certified Energy Auditor]
EA-34073/23

Dr Nischay N Gowda,
Director

EXECUTIVE SUMMARY

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures in the college.

ENERGY INITIATIVE TAKEN BY COLLEGE MANAGEMENT

- **SOLAR PHOTOVOLTAIC ROOFTOP PLANT INSTALLATION**

College has total installed total 100 KWp grid connected solar roof top system.
It's Appreciable. Total solar unit generation is 82,440 Units Jan-2023 to Nov-2023.

AREAS FOR IMPROVEMENT

- **POWER FACTOR IMPROVEMENT**
  The average power factor is was 0.94. It is recommended to maintain the power factor 0.995 or unity.
- **LIGHTING SYSTEM**
- Replacement of "conventional T-12 (40 Watt)" tube light by Energy Efficient LED lighting fixture T-5 (18Watt or 20 Watt) in college, have great potential for energy saving.
- Installation of "timer control on straight light and focus light on building" recommended for energy saving in the campus.
- Installation of motion sensor in non-working area (wash room, electrical room. etc.) recommended for energy saving in the campus.

- **CEILING FAN.**
  It is recommended to replace "conventional ceiling fan (80 Watt)" by energy efficient star rated BLDC based i.e. energy efficient fan (28 Watt) in college building etc. It has great potential for energy saving.
- **AIR CONDITIONER (WINDOW AND SPLIT)**
  Replacement of "Window and Split AC (1500 to 2000 Watt)" by energy efficient 5 star rated AC (750 to 560 Watt) in all building, Guest house, class rooms, and faculties cabin etc. It has great potential of energy saving.
- **IOT BASED ENERGY MONITORING SYSTEM IN PLACE OF SUB METER: -**
  Installation of "Cloud based (IoT based) energy monitoring system" including harmonic measurement (total voltage and current harmonic distortion %) in every building. It will be good initiative for energy monitoring by management.

- **ENERGY MANAGEMENT WORKSHOP AND TRAINING**
- Develop energy management policies for college. Establish a procurement policy that is energy saving and eco-friendly.
- Conduct awareness and training programs for faculty, student and non-teaching staffs. Conduct seminars, workshops and exhibitions on energy management education.
  Involve All Stakeholders - Encourage involvement of government, founder members, and industry for supporting interdisciplinary research, education, policy formation, and information exchange in energy management system

ENERGY CONSERVATION MEASURES FOR ELECTRICAL SYSTEM

Case Study	Section	Identification	Observation	Recommendation	Annual energy saving (kWh)	Annual cost saving (Rs.)	Invest-ment (Rs.)	Simple payback Period
1	Lighting System	1440 No. FTL tube light	Power consumption by T-12 LED (08 to 10-watt blast power)	Replacement of conventional (T-12) with (T-5 Watt)	46,080	7,14,240	360,000	6 Month
2	Ceiling Fan	1002 No ceiling fan working with 80 Watt	Power consumption by existing ceiling fan (80 Watt)	Replacement of 80W conventional ceiling fan by 28W BLDC energy efficient ceiling fan	50,019	7,75,308	20,04,000	2.7 Year

CHAPTER-01
INTRODUCTION OF ENERGY AUDIT

1.1 About Energy Audit

An energy audit is a systematic process of evaluating and analyzing the energy consumption and efficiency of a building, facility, or organization to identify opportunities for energy savings and improved energy performance. The primary goal of an energy audit is to assess how energy is used, wasted, or potentially conserved within a given system or operation.

1. Identify Energy Consumption: - Determine how and where energy is being used within a facility or organization, including electricity, natural gas, heating oil, water, and other energy sources.

2. Quantify Energy Efficiency: - Assess the efficiency of energy-consuming systems and equipment, such as HVAC (heating, ventilation, and air conditioning) systems, lighting, appliances, and industrial processes.

3. Identify Energy Conservation Measures (ECMs):- Identify specific opportunities to reduce energy consumption and improve energy efficiency. This may involve upgrading equipment, optimizing operations, or implementing energy-efficient technologies

4. Estimate Cost Savings: - Calculate potential energy and cost savings associated with implementing recommended ECMs. This helps organizations prioritize energy-saving initiatives based on return on investment (ROI).

5. Prioritize Recommendations: - Present a list of recommendations, along with their associated costs and benefits, to help stakeholders make informed decisions about which energy-saving measures to pursue.

6. Promote Sustainability: -Energy audits can contribute to sustainability efforts by reducing greenhouse gas emissions and environmental impact, which is particularly important in the context of climate change mitigation

The GREEN AURA, Bangalore, Karnataka carried out the energy audit at the site to find loopholes in the energy consumption pattern for Mangalam College of Engineering. A technical report has been prepared as per the data basis & need of the requirement of the project.

1.2 Objectives of Energy Auditing

The primary object of an energy audit is to assess and analyze the energy usage and efficiency of a building, facility, or process. Energy audits are conducted to achieve several specific goals and objectives, including

1. Identify Energy Efficiency Opportunities.
2. Fixing of energy saving potential targets for individual cost centers
3. To reduce operational costs.
4. To reduce energy consumption per unit product output.
5. Improve Energy Performance.
6. Relating energy inputs and production output
7. To find and apply effective planning for more effective use of energy throughout the industry works.
8. Identifying potential areas thermal and electrical energy efficiency.

1.3 Energy Audit Methodology

An energy audit is a systematic process of evaluating and analyzing energy usage in a facility or organization to identify opportunities for energy efficiency improvements. The goal of an energy audit is to reduce energy consumption, lower energy costs, and minimize environmental impacts. There are different levels of energy audits, ranging from a basic walkthrough audit to a comprehensive investment-grade audit.

1. Preparation and Planning

- Define the scope and objectives of the energy audit.
- Gather historical energy consumption data and utility bills.
- Assemble a team of auditors with expertise in energy systems, including HVAC, lighting, electrical, and building envelope.
- Obtain building plans, equipment manuals, and other relevant documentation.
- Schedule the audit and secure necessary permissions and access to facilities

2. Site Assessment

- Conduct a walkthrough of the facility to understand its layout, systems, and operations.
- Identify and document key energy-consuming equipment and systems.
- Collect data on operating hours, temperature settings, and occupancy patterns.
- Note any maintenance issues or equipment malfunctions that may affect energy efficiency.
- Perform basic energy benchmarking to compare the facility's energy performance with industry standards or similar facilities

3. Data Collection and Analysis

- Install energy monitoring equipment, such as data loggers, to track energy usage in real-time if necessary.
- Collect data on energy consumption for each identified system and equipment.
- Analyze energy bills to determine cost breakdown and seasonal variations.
- Calculate energy consumption and efficiency metrics (e.g., kWh, BTUs, Energy Use Intensity, etc.).
- Identify energy waste, anomalies, or deviations from expected performance.

4. Data Collection and Analysis

- Develop a list of energy-saving recommendations based on the audit findings.
- Prioritize recommendations based on cost-effectiveness, payback period, and potential energy savings.
- Provide detailed specifications for implementing each recommendation, including estimated costs and potential incentives or rebates.
- Consider both low-cost/no-cost measures (behavioral changes, maintenance improvements) and capital-intensive measures (equipment upgrades, retrofits)

5. Reporting and Documentation

- Compile the audit findings, recommendations, and supporting data into a comprehensive audit report.
- Include a summary of potential energy savings, estimated costs, and return on investment (ROI) for each recommendation.
- Present the report to key stakeholders, such as management, facility operators, and decision-makers.

6. Monitoring and Verification

- After implementing energy-saving measures, monitor energy consumption to verify actual savings.
- Adjust operations and maintenance practices as needed to maintain energy efficiency.
- Periodically review and update the energy management plan to ensure continuous improvement.

CHAPTER-02
POWER SUPPLY SYSTEM

2.1 Transformer

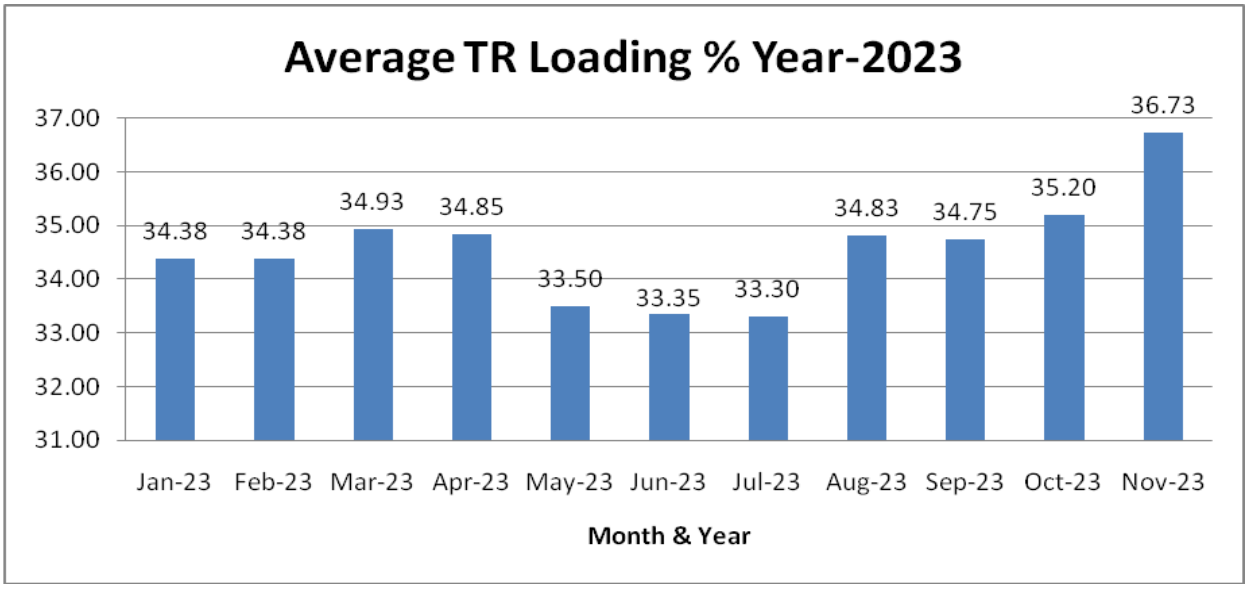
The power supply for the college is taken from Kerala State Electricity Board Limited with the help of 11 KV, T II (B). There is one Step down transformer capacity is 400 KVA. The contract demand of the college is 200 KVA. The details are given in following table.

Sr. No.	Items	Technical Specification
1	Make	Unipower Transformers Pvt. Ltd.
2	Year	2005
3	Rating (KVA)	400
4	Voltage (HV/ LV)	11000/433
5	Current Rating (HV/ LV)	21/ 534
6	Frequency (Hz)	50
7	Impedance at 75°C (%)	4.7
8	Vector group	Dyn-11 9
9	Type of cooling	ONAN

1000 KVA Transformer

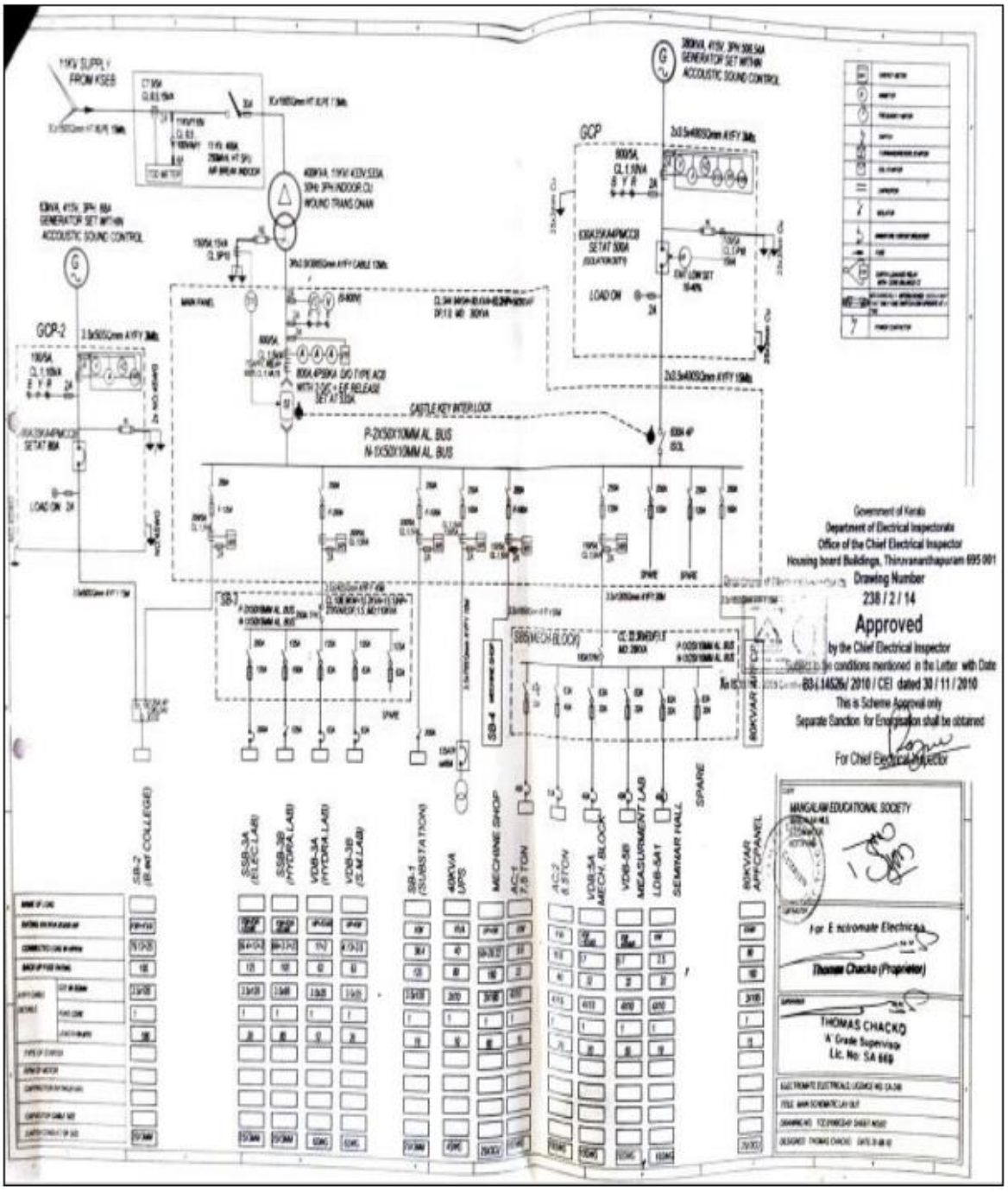
Loading of the Transformer: -

Sr. No.	Month & Year	Maximum Demand (KVA)	TR Loading %
1	Jan-23	137.5	34.38
2	Feb-23	137.5	34.38
3	Mar-23	139.7	34.93
4	Apr-23	139.4	34.85
5	May-23	134	33.50
6	Jun-23	133.4	33.35
7	Jul-23	133.2	33.30
8	Aug-23	139.3	34.83
9	Sep-23	139	34.75
10	Oct-23	140.8	35.20
11	Nov-23	146.9	36.73
Average TR Loading %			**34.56**



Observation: -

- Transformer loading is 34.56 % which is low. It should be maintaining within range 45 % to 50%.



Transformer Single Line Diagram

2.2 DG SETS

The college campus has 01 Nos. of DG set and the capacity is 380 KVA. It supplies emergency power during the grid power failure.

Sr. No.	Parameter	Technical Specification of DG set
1	Make	POWERICA (CMMINS)
2	Capacity (KVA)	380 KVA
3	Rated Voltage	415 V
4	Full load current	529A
5	Power factor	8
6	RPM	1500
7	Phase	3

DG Set (380 KVA)

2.3 GRID CONNECTED SOLAR PHOTOVOLTAIC SYSTEM (100 KWp)

There is a 100 KWp solar photovoltaic rooftop grid-connected system installed on various buildings. System details are given below:

Solar plant details

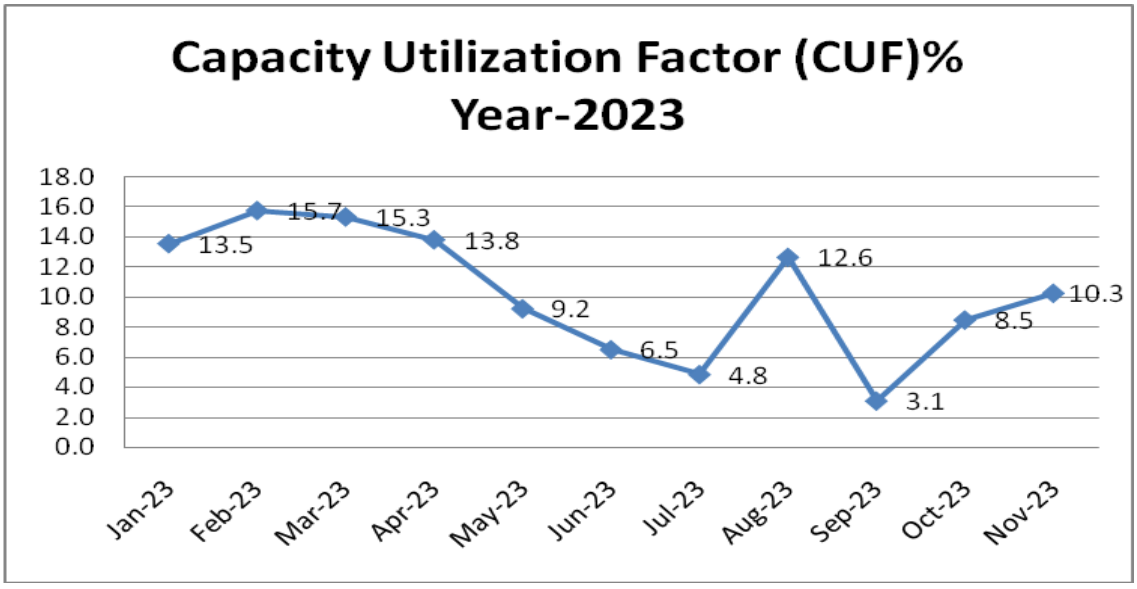
Sr. No	Description	Technical Specification
1	Plant Information	
1.1	Plant capacity	100 KWp
1.2	Locations	College campus
1.3	Latitude & Longitude	30.340085 N & 77.876712 E
2	**PV Panel Details**	
2.1	Make	Vikram solar
2.2	Panel Type	Poly-crystalline
2.3	Panel Wattage	320 Wp
2.4	No of PV Panels	315
2.5	Total Capacity	100 KWp
3	**Inverter Information**	
3.1	Make	DELTA
3.2	Model	RPI M50A
3.3	Capacity	50 KVA
3.4	Quantity	2 (50 KVA)

Solar panel

Solar Inverter

Solar unit generation Year-2023: -

Sr. No.	Month & Year	Solar Unit Generation (KWp)	No of Days	Capacity Utilization factor (CUF)%
1	Jan-23	10,080	31	13.5
2	Feb-23	10,580	28	15.7
3	Mar-23	11,400	31	15.3
4	Apr-23	9,940	30	13.8
5	May-23	6,860	31	9.2
6	Jun-23	4,680	30	6.5
7	Jul-23	3,600	31	4.8
8	Aug-23	9,400	31	12.6
9	Sep-23	2,220	30	3.1
10	Oct-23	6,300	31	8.5
11	Nov-23	7,380	30	10.3
Total		**82,440**	**334**	**10.3**



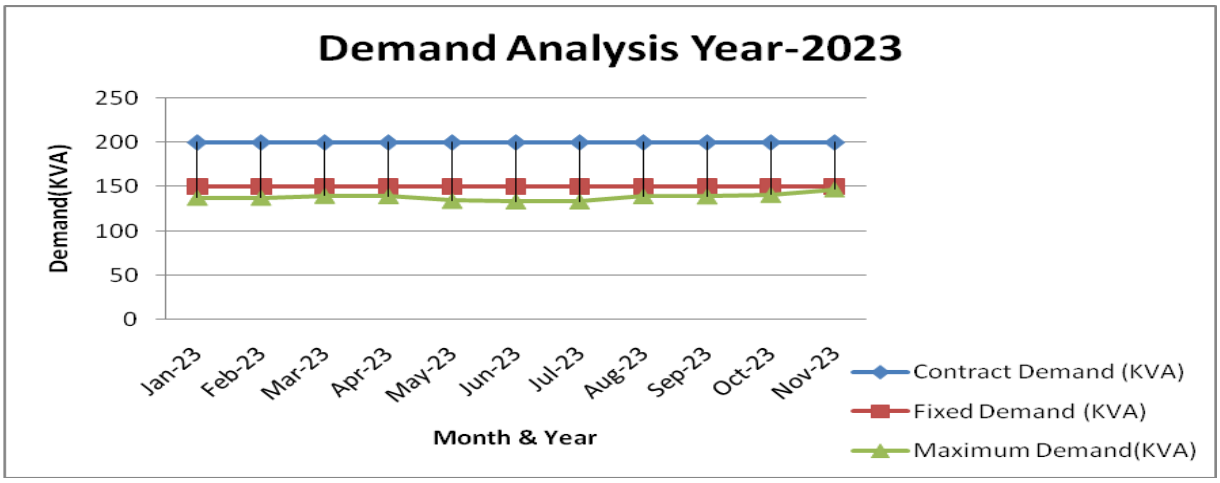
Observation: -

- College has installed 100 KWp solar system
- Total solar unit generation is 82,440 KWp in the year-2023. And CUF is 10.3 %.

CHAPTER-03
ENERGY CONSUMPTION ANALYSIS

Energy audit team was analysed Electricity bills of Jan-23 to Nov-23. The details of sanctioned load 200 KVA are as below.

Sr. No.	Month & Year	Contract Demand (KVA)	Billing Demand (KVA)	Maximum Demand (KVA)
1	Jan-23	200	150	137.5
2	Feb-23	200	150	137.5
3	Mar-23	200	150	139.7
4	Apr-23	200	150	139.4
5	May-23	200	150	134
6	Jun-23	200	150	133.4
7	Jul-23	200	150	133.2
8	Aug-23	200	150	139.3
9	Sep-23	200	150	139
10	Oct-23	200	150	140.8
11	Nov-23	200	150	146.9
	Minimum Demand (KVA)			**133.2**
	Maximum Demand (KVA)			**146.9**
	Average Demand (KVA)			**138.25**



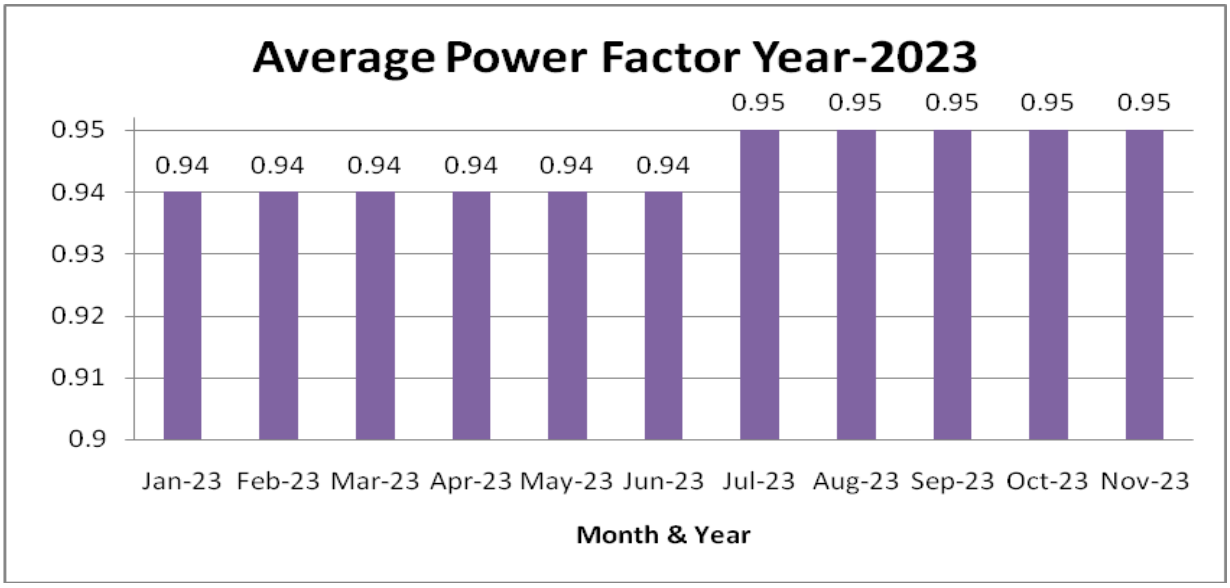
Graphical Presentation of Demand analysis year-2023

Observation:

It was observed that the contract demand of the campus is 200 KVA. There is a variation in maximum demand. It is a maximum of 146.9 KVA in the Month of Nov-2023 and a minimum of 133.2 KVA in Jul - 2023

Monthly Power factor analysis Year-2023

Sr. No.	Month & Year	Power Factor
1	Jan-23	0.94
2	Feb-23	0.94
3	Mar-23	0.94
4	Apr-23	0.94
5	May-23	0.94
6	Jun-23	0.94
7	Jul-23	0.95
8	Aug-23	0.95
9	Sep-23	0.95
10	Oct-23	0.95
11	Nov-23	0.95
Total		**0.94**



Graphical representation of average power factor year 2023

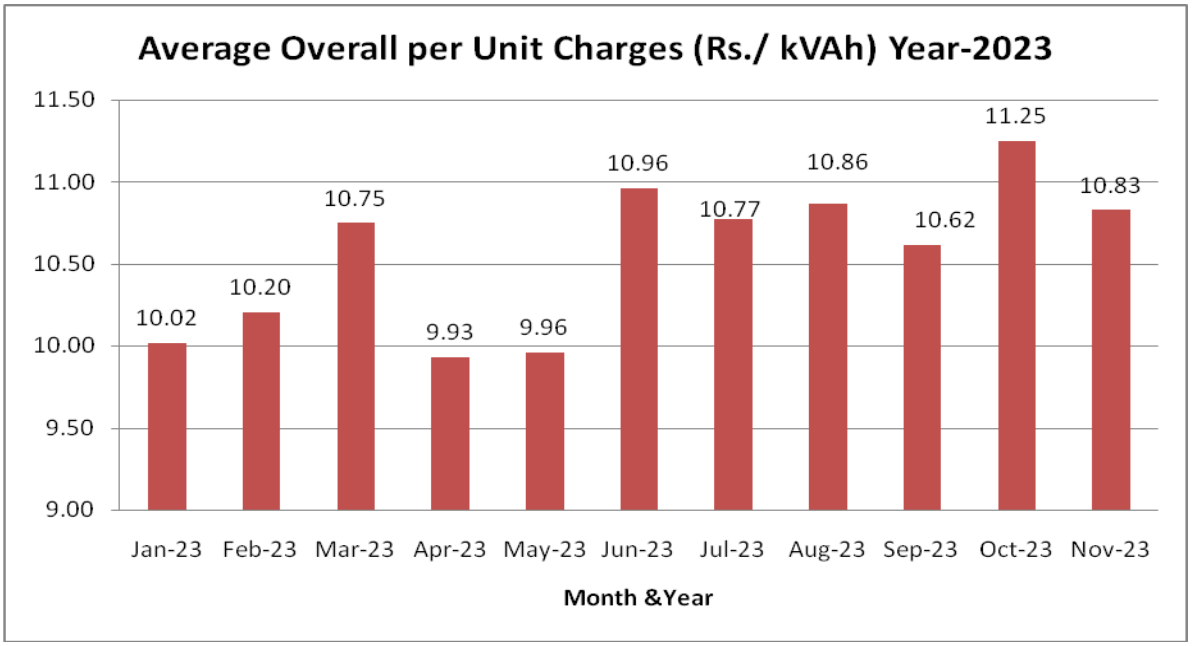
Observation:

The average power factor was 0.94 form Jan -2023 to Nov -2023. It is recommended to maintain power factor unity or 0.995

Monthly electrical energy consumption 2023

The monthly electrical consumption for the campus is given in the table.

Sr. No.	Month & Year	Unit Consumption (KVAh)	Amount (Rs.)	Overall per unit charges (Rs. / kVAh)
1	Jan-23	28,314	2,83,588	10.02
2	Feb-23	28,518	2,90,941	10.20
3	Mar-23	33,303	3,57,930	10.75
4	Apr-23	29,535	2,93,327	9.93
5	May-23	28,764	2,86,536	9.96
6	Jun-23	36,681	4,02,024	10.96
7	Jul-23	34,065	3,,67,010	10.77
8	Aug-23	32,388	3,51,881	10.86
9	Sep-23	35,586	3,77,773	10.62
10	Oct-23	33,726	3,79,417	11.25
11	Nov-23	32,382	3,50,633	10.83
Total		**3,53,262**	**37,41,060**	**10.56**



Graphical representation of actual per-unit charges for the year -2023

Observation:

It was found that total energy consumption from Jan-23 to Nov-23 was 3, 53,262 units. The average annual energy charge is Rs 10.56 /kVAh.

CHAPTER-04
CONNECTED LOAD SYSTEM

4.1 Lighting Details of the campus are as below

Sr. No	Location/ Name of Building	Electrical Equipments	Rated Power (Watt)	Quantity No.
1	Main building	Tube Light (FTL)	40	324
		LED	20	6
		Ceiling Fan	60	211
		Exhaust Fan	150	14
		Split AC	1.5	14
		PC	75	237
		Camera	35	52
		Printer	75	31
		Photocopy M/c	550	2
		water purifier	25	2
		POJECTOR	30	18

Sr. No	Location/ Name of Building	Electrical equipment	Rated Power (Watt)	Quantity No.
1	New building	Tube Light (FTL)	40	318
		Ceiling Fan	60	184
		Exhaust Fan	150	8
		Split AC	1.5	8
		PC	75	269
		Camera	35	20
		Printer	75	21
		water purifier	25	2
		POJECTOR	30	36

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	CBSE	Tube Light (FTL)	40	158
		Tube Light (LED)	20	4
		Ceiling Fan	60	126
		Exhaust Fan	150	8
		Split AC	1.5	3
		PC	75	4
		Printer	75	4
		water purifier	25	2
		PROJRCTOR	30	2

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Poly Technique	Tube Light (FTL)	40	72
		Ceiling Fan	60	60
		Exhaust Fan	150	6
		Split AC	1.5	1
		PC	75	4
		Printer	75	4
		water purifier	25	1
		PROJERCTOR	30	6

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	State School	Tube Light (FTL)	40	60
		Ceiling Fan	60	48
		Exhaust Fan	150	4
		PC	75	4
		Printer	75	3
		water purifier	25	2
		PROJERCTOR	30	2

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Ladies Hostel	Tube Light (FTL)	40	124
		Ceiling Fan	60	90
		Exhaust Fan	150	6
		SPLIT AC	1.5 TON	4
		TV	100	1

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Arts College	Tube Light (FTL)	40	144
		Tube Light (LED)	20	6
		Ceiling Fan	60	93
		Exhaust Fan	150	5
		Split AC	1.5	1
		PC	75	75
		Printer	75	4
		water purifier	25	1
		PROJERCTOR	30	4

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Canteen	Tube Light (FTL)	40	10
		Ceiling Fan	60	20
		water purifier	25	1
		REFRIGERATOR	300	2

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Food court	Tube Light (FTL)	40	10
		Ceiling Fan	60	6
		water purifier	25	1
		REFRIGERATOR	300	1

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Centre kitchen	Tube Light (FTL)	60	14
		Ceiling Fan	60	8
		water purifier	25	1
		Refrigerator	300	1

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Store	Tube Light (FTL)	40	6
		Ceiling Fan	60	3
		PHOTO STAT MACHINE	100	4
		PC	75	2

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	State School	Tube Light (FTL)	40	60
		Tube Light (LED)	20	6
		Ceiling Fan	60	48
		Exhaust Fan	150	4
		PC	75	4
		Printer	75	3
		water purifier	25	2
		PROJERCTOR	30	2

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Mechanical Workshop	Tube Light (FTL)	40	20
		Ceiling Fan	60	10
2	Thermal Engineering Lab	Tube Light (FTL)	40	16
		Ceiling Fan	60	10
3	Electrical Workshop	Tube Light (FTL)	40	3
		Ceiling Fan	60	4
4	Civil Workshop	Tube Light (FTL)	40	2
		Ceiling Fan	60	4

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Fluid Mechanics & Hydraulics Machines Lab	Tube Light (FTL)	40	16
		Ceiling Fan	60	10
		Motor	2206	12
		Motor	3677	3

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Manufacturing Technology Lab	Tube Light (FTL)	40	12
		Ceiling Fan	60	16
		Motor	2206	19

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Mechanical Measurements Lab	Tube Light (FTL)	40	10
		Ceiling Fan	60	10
		Centrifugal Blower	735	1
		Reciprocating Compressor	1470	2

Sr. No	Location/ Name of Building	Electrical Equipment	Rated Power (Watt)	Quantity No.
1	Power Electronics Lab	Tube Light (FTL)	40	16
		Ceiling Fan	60	4
		Split AC	1500	3

Street Lights in College Campus

Sr. No	Type of Lights	Rated Power (Watt)	Quantity No.
1	Metal Halide	250 Watt	3
2	LED	100 Watt	5
3	Solar Light	30 Watt	2

Sr. No	Type of Lights	Rated Power (Watt)	Quantity No.
1	PC	75	603
2.	Camera	35	92
3	Printer	75	70

Lighting Details Summary

Sr. No	Type of Lights	Rated Power (Watt)	Quantity No.	Total Load (kW)
1	Tube light (40w)	40	1440	57.6
2	LED Tube light (20 w)	20	10	0.2
3	HPSV	400	4	1.6
4	Metal Halide	250	3	0.75
5	Led (100w)	100	5	0.5
		Total	**1462**	**60.65**

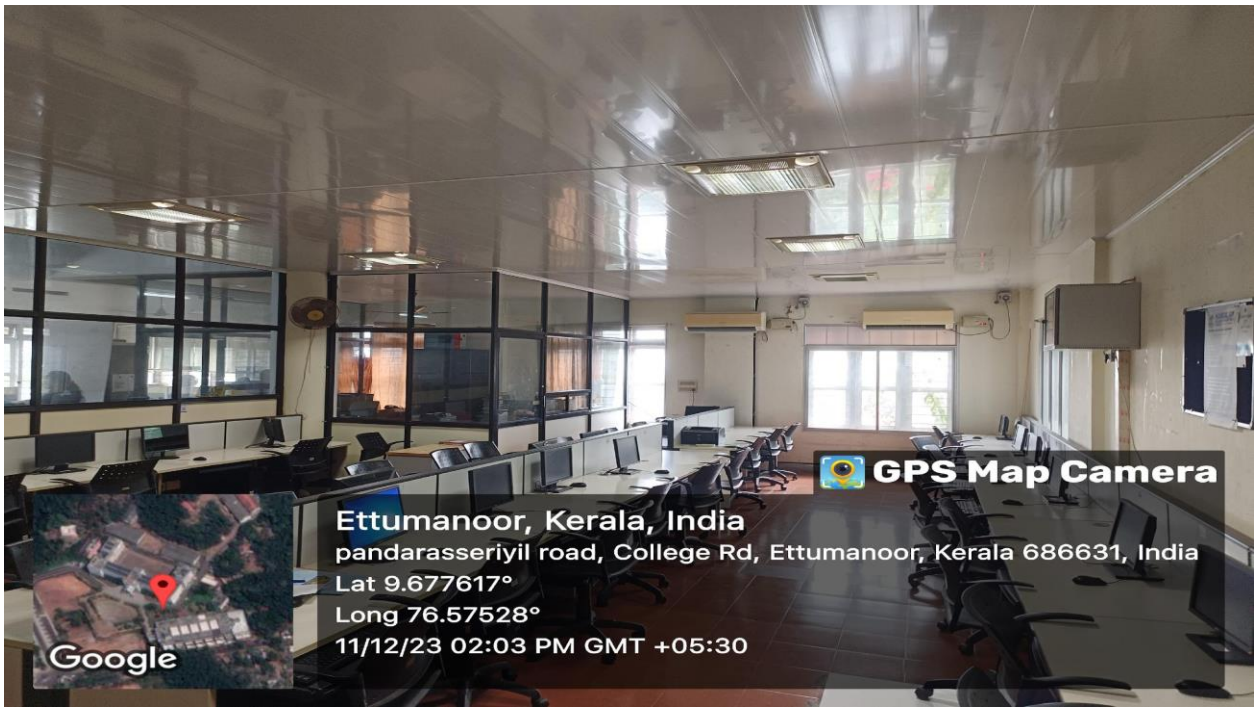
Ceiling Fan & Ex- Fan Summary

Sr. No	Type of Fans	Rated Power (Watt)	Quantity No.	Total Load (kW)
1	Ceiling fan	80	1002	80.16
2	Ex-fan (12")	70	35	2.45
3	Ex-fan (15")	90	20	1.8
		Total	**1057**	**84.41**

AC Details

Sr. No	Type of ACs	Rated Power (Watt)	Quantity No.	Total Load (kW)
1	AC Sprit (1.5 ton)	1900	27	51.3
	Air Condition Load	**1900**	**27**	**51.3**

Photograph of Electrical Equipment's: -



CHAPTER- 5
ENERGY CONSERVATION MEASURES

Case Study No. -01

Replacement of conventional 40 Watt to energy-efficient LED tube light 20 Watt in phase manner: -

Sr. No	Items	Parameters	Units
1	Power Consumption by T-12 FTL	40	Watt
2	No of T-8	1440	Nos.
3	Working Hrs./Day	8	Hrs./Day
4	Working Days/Year	250	Days/Year
5	Rated Power of Energy Efficient T-5 (LED)	20	W
6	Expected Energy Saving	57600	kWh/Year
7	Load Factor	0.8	
8	Expected Annual Energy Saving	46080	kWh/Year
9	Overall, Per Unit Charges	10.5	Rs./kWh
10	Expected Money Saving	4,83,840	Rs./Year
11	Cost of T-5	220	Rs./ Pieces
12	Investment on New LED Light Purchasing	316800	Rs.
13	Maintenance Investment@5%	15,840	Rs.
14	Total Investment	332,640	Rs
15	Simple Pay Back Period	8	Month

Total Calculated Monetary Saving Potential in lighting = Rs 4, 83,840/-

Note: - Energy savings depend on the operation hour per day and the load factor of the systems.

Case Study No. 2

Replacement of 80 W conventional ceiling fan by 28W BLDC Energy Efficient ceiling fan in Phase manner

Sr. No	Item	Parameter	Unit
1	Rated Power of Ceiling Fan	80	W
2	No. of Fan	1002	Nos
3	Working Hrs./Day	8	Hrs./Day
4	Working Days/Year	150	Days/Year
5	Energy Efficient BLDC Fan Rated power	28	W
6	Energy Saving Potential	62524.	kWh/Year
7	Load Factor	0.8	
8	Expected Annual Energy Saving	50,019	kWh/Year
9	Per Unit Charges	10.5	Rs/kWh
10	Expected Money Saving	5,25,208	Rs./Year
11	Cost of New Ceiling Fan	2,000	Rs./Pieces
12	Investment on New Fan Purchasing	20,04,000	Rs.
13	Maintenance Investment@5%	1,00,200	Rs.
14	Total Investment	2,104,200	Rs.
15	Simple Pay Back Period	4.0	Year

Total Calculated Monetary Saving Potential in Ceiling Fan = Rs 5, 25,208/-

Note: - Energy savings depend on the operation hour per day and the load factor of the systems.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