ENERGY AUDIT REPORT

T K M COLLEGE OF ENGINEERING

Kollam

OTTOTRACTIONS
Energy - Engineering - Environment

ISO 9001-2015, ISO 14001- 2015, ISO/IEC- 17020 - 2012, ISO 14067-2018

Executed by

OTTOTRACTIONS
Energy-Engineering-Environment

2024-25

Accredited Energy Auditor: AEA-33
Empanelled Accredited Energy Auditor: EmAEA-33
Bureau of Energy Efficiency,
Government of India.

Empanelled Energy Auditor: EMCEEA-0211F,
EMC (Energy Management Centre-Kerala.)

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Energy Audit Report

T K M College of Engineering, Kollam

Report No: EA 1211/EA
2025

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Empaneled Accredited Energy Auditor, AEA 33
Bureau of Energy Efficiency
Government of India

Empaneled Energy Auditor, EMCEEA-0211F,
Energy Management Centre
Government of Kerala.

Authorized Energy Auditor, GEDA/ENC/EAC: Autho/2014/8/103/2316,
Gujarat Energy Development Agency
Government of Gujarat

Empaneled Energy Auditor, India SME Technology Services Ltd
A joint Venture of SIDBI, SBI, Indian Bank, Oriental Bank of Commerce
& Indian Overseas Bank

About OTTOTRACTIONS

Established in 2005, OTTOTRACTIONS is a renowned organization with extensive expertise in energy, engineering, and environmental services. We hold the distinction of being the first Accredited Energy Auditor from Kerala authorized to conduct Mandatory Energy Audits for Designated Consumers under the Energy Conservation Act of 2001. Our excellence in energy auditing was recognized by the Government of Kerala with the prestigious "Kerala State Energy Conservation Award 2009."

OTTOTRACTIONS is an ISO 9001:2015, ISO 17020:2012, ISO 14001:2015 and ISO 14067: 2018 certified organization, underscoring our commitment to quality and excellence in service delivery. With a proven track record, we have successfully completed over 3,000 audits across various domains, including Energy Audit, PAT, Electrical Safety Audit, Green Audit, Environmental Audit, Biodiversity Audit, Water Audit, and Air Audit.

Acknowledgment

We were privileged to work together with the administration and staff of T K M College of Engineering, Kollam. We are grateful to them for the timely help extended to complete the audit and bringing out this report.

With gratitude, we acknowledge the diligent effort and commitments of all those who have helped to bring out this report.

We also take this opportunity to thank the bona-fide efforts of audit team for unstinted support in carrying out this audit.

We thank our consultants, engineers and backup staff for their dedication to bring this report.

Thank you.

For OTTOTRACTIONS

B V Suresh Babu
Accredited Energy Auditor
AEA 33, Bureau of Energy Efficiency
Government of India

Contents

Certification

This is to certify that

The data collection has been carried out diligently and truthfully;

All data monitoring devices are in good working condition and have been calibrated or certified by approved agencies authorised and no tampering of such devices has occurred;

All reasonable professional skill, care and diligence had been taken in preparing the energy audit report and the contents thereof are a true representation of the facts;

Adequate training provided to personnel involved in daily operations after implementation of recommendations; and

The energy audit has been carried out in accordance with the Bureau of Energy Efficiency (Manner and Intervals of Time for the Conduct of Energy Audit) Regulations, 2010.

SURESH BABU B V
ACCREDITED ENERGY AUDITOR (AEA 33)
BUREAU OF ENERGY EFFICIENCY
GOVERNMENT OF INDIA

Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
TKM College of Engineering, Kollam					
Sl No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 189 No's T8 (40W) Lamps to 18W LED Tube	0.57	0.74	9.2	6985
2	Energy Saving in Lighting by replacing existing 92 No's T12 (55W) Lamps to 18W LED Tube	0.28	0.26	12.8	2441
3	Energy Saving by replacing existing 1707 No's in-efficient ceiling fans with Energy Efficient Five-star fans	51.21	11.67	52.6	110122
4	Energy Saving in Split AC's by replacing existing in-efficient 6 No's 1 TR AC's with Energy Efficient Five star labelled or Inverter type AC's	2.40	0.37	78.6	3456
5	Energy Saving in Split AC's by replacing existing in-efficient 16 No's 1.5TR AC's with Energy Efficient Five star labelled or Inverter type AC's	8.40	0.66	152.9	6221
6	Installation of 550kWp Solar Power Plant	302.50	100.12	36.3	752813
7	Installation of 30Kg/day Biogas plant	0.40	0.51	9.4	13430
	Total	**365.75**	**114.33**	**50.25**	**895467.90**
(The saving are projected as per the assumed operation time observed based in the discussions with the plant officials. The data of saving percentages are taken from BEE guide books and field measurements.)					

1 Introduction

A detailed energy audit has been carried out at T K M College of Engineering, Kollam by OTTOTRACTIONS in May 2025. During the energy audit energy saving opportunities has been identified to help improving efficiency of the facility. OTTOTRACTIONS is an Accredited Energy Auditor of Bureau of Energy Efficiency and Empaneled Energy Auditor of Energy Management Centre, Government of Kerala.

This energy audit report complies with the clauses in *Energy Conservation Act, 2001* on mandatory energy audit (**Form 4** [refer regulation 6(2)] guidelines for preparation of energy audit report) and complies with the G.O (Rt) No.2/2011/PD dated 01.01.2011 issued by Government of Kerala on mandatory energy audit.

1.1. General Building details and descriptions

TKM College of Engineering, the oldest engineering college in private sector in the state of Kerala, was established in 1958 by Janab Thangal Kunju Musaliar, a reformer, philanthropist and businessman under the aegis of the TKM College Trust, in Kollam district of Kerala. The institution has been a torchbearer for social and technological transformation since its inception and has touched the lives of countless individuals from around the nation, both directly and indirectly. Over a period of six decades, the college produced thousands of brilliant engineers, many of whom are stalwarts in their fields across the globe.

Having started with a humble beginning of 120 students in three basic streams of engineering, the college today stands with the highest intake of 1000 plus students per year in nine UG programs and about 250 students in 10 PG programs. All the departments are approved research centres of APJ Abdul Kalam Technological University and about 100 scholars pursue their doctoral studies in these departments.

The college has been selected by the AICTE as the "Margadarshan" Institute for mentoring three neighboring institutions, including two engineering colleges and one polytechnic. Additionally, a Technology Business Incubation Centre, named "SEEDS-97" (Startup Enabled Entrepreneurship Development Centre), was established by the 1997 Alumni batch.

The affiliation was with the University of Kerala till 2015 and from 2015 onwards it is affiliated with APJ Abdul Kalam Technological University (APJAKTU). It is also approved by the All India Council for Technical Education (AICTE), New Delhi. The college carries NBA accreditation to all B.Tech programs and two M.Tech programs, out of which the UG programmes inCivil and Mechanical engineering won the coveted six years accreditation. NAAC has accredited the college with A grade and in NIRF, the college has been included in the band of 201-250 in the year 2019. The College is an approved research center of There are 200 plus faculty members and 150 technical and ministerial staff in the college. The college has the highest annual student intake (more than 1000) among all peer level institutions in the state. APJAKTU for all streams and approved QIP Centre of Ministry of Education (formerly, MHRD) for Mechanical and Civil Engineering. Currently there are 87 doctoral scholars under the supervision of the institute faculty. The major research facilities include Computational Fluid Dynamics (CFD) centre, Nanotechnology Research Centre, SPACE Technology Lab, Biomechanics Lab, Structural Engineering Lab, Structural Dynamics Lab, Dynamic testing Facility using horizontal shake table, Geotechnical Engineering Laboratory, VLSI Design Lab, Advanced Communication Laboratory.

The College runs on a well- structured platform, that offers various infrastructure facilities such as the Central library, Department libraries, Central and Departmental Computer facilities, Hostels for boys and girls of various semesters, Career Guidance and Placement Cell, Innovations and Entrepreneurship Development Cell, Cooperative Society Store, Medical Cell and Sports facilities like Football court, Basket Ball courts, Tennis Court, Volley Ball court, Shuttle-Badminton Court, Multi-Gymnasium, Table Tennis Hall and a Cricket pitch. The College has a common auditorium and seminar halls for various departments, equipped with modern audio-visual presentation devices. The students participate regularly in events conducted by various student branches like the NSS, NASA, IEEE., ISTE, SSA., IICE and the college union. Various professional bodies such as IEI, SAE, IETE, ISHARAE, ASCE, ICI, AIChE, CSI organize seminars, hands-on workshops, hardware and software training programs, hackathons, competitions and other such activities which give opportunity to students and faculty members to enhance their skills and enrich their knowledge in areas beyond the prescribed curriculum.

Occupancy Details		
Particulars	2023-24	2024-25
Total Students	4165	4399
Staffs	400	395
Total Occupancy of the college	4565	4794

For calculating specific energy consumption, the total built-up area is considered.

Energy audit team

The Energy Audit team is listed below. Besides this list various domine experts also participated in this project.

1. Suresh Babu B V, Accredited Energy Auditor, AEA 33
2. B. Zachariah, Chief Technical Consultant
3. Abin Baby, Project Engineer
4. Jomon J S, Project Engineer
5. Vishnu S S, Project Engineer
6. Reshma S P, Data Analyst
7. Anjana B S, Project Assistant

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Building Description

The energy audit has been carried out at TKM College of Engineering , Kollam. The following is the baseline data of this building.

Form-A									
BASELINE DATA SHEET FOR GREEN AUDIT									
1	Name of the Organisation	TKM College of Engineering, Kollam							
2	Address (include telephone, fax & e-mail)	TKMCE Karicode, Kollam-691005 Phone +91 474-2712024 email : principal@tkmce.ac.in							
3	Year of Establishment	1958							
4	Name of building and Total No. of Electrical Connections/building	TKMCE (1), Hostel (8)							
5	Total Number of Students	Boys	2614	Girls	1785	Total	4399		
6	Total Number of Staff	395							
7	Total Occupancy	4794							
8	Total area of green cover	21.725 acre							
9	Type of Electrical Connection	HT	1	LT	8				
10	Total Connected Load (kW)	880							
11	Average Maximum Demand (KVA)	338							
12	Total built up area of the building (M^2)	61962							
13	Number of Buildings	5							
14	Average system Power Factor	0.91							
15	Details of capacitors connected	Nil							
16	Transformer Details (Nos., kVA, Voltage ratio)	TR 1	TR 2	TR 3	TR 4				
		500							
17	DG Set Details (kVA)	DG1	DG2	DG3	DG4	Remarks			
		500	200						
18	Details of motors	Rating		Nos.		Remarks			
		5 to 10		2					

3

Energy and utility system description

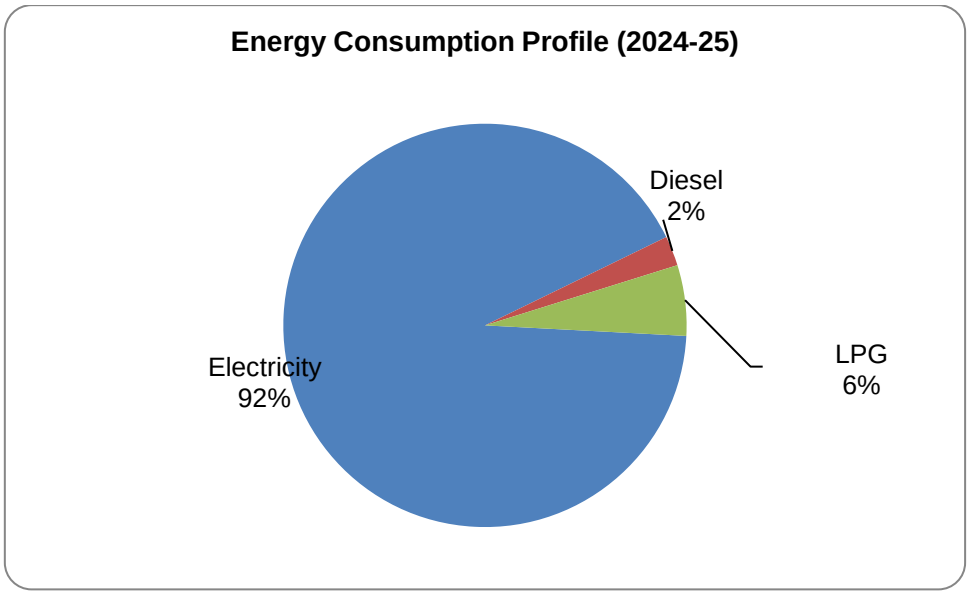
3.1.1 Electricity

Electricity is purchased from KSEBL under a HT and 8 LT Connections, the details are given below. A 500kVA and 200kVA Diesel Generator is in operation at this campus

Electricity Connection Details		
TKM College of Engineering, Kollam		
1	Name of the Consumer	TKM College of Engineering, Kollam
2	Tariff	HT II (A) General, LT 7A Ndom, LT 6B Ndom, LT-6F Ndom
3	Consumer Numbers	1345640003139
		1145647010821
		1145648028054
		1145645035291
		1145640011786
		1145640027878
		1145645030263
		1145644020143
		1145640013074
4	Connected Load Total (kW)	880
5	Annual Electricity Consumption (kWh)	981596

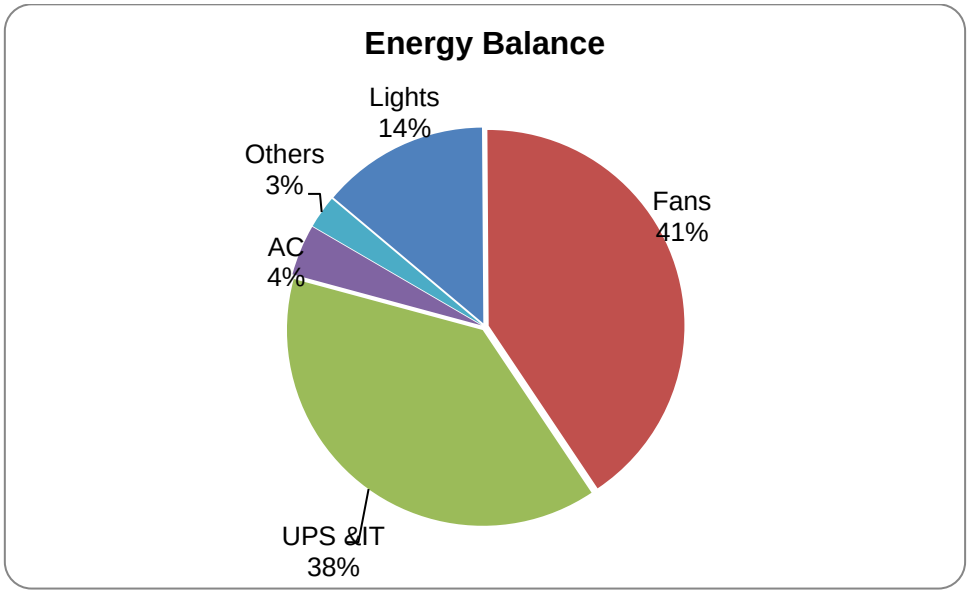
3.2. Thermal Energy / Transportation

LPG is used for cooking in the canteen and Lab. Diesel is used to operate Diesel Generator and Transportation.



4

Energy Balance



In this facility, a comprehensive analysis of energy consumption breakdown highlights the following distribution:

Fans contribute the most, constituting 41% of the total energy consumption. This includes various fans utilized throughout the facility for ventilation and air circulation purposes.

Lighting accounts for 14% of the energy usage. This encompasses the illumination needs across different areas within the building, including offices, corridors, Classrooms and Lab areas.

Miscellaneous uses make up 3% of the energy consumption. These miscellaneous uses may include small appliances, equipment, or other electrical devices not categorized under specific areas.

The combined energy consumption of Uninterruptible Power Supply (UPS) and Information Technology (IT) systems amounts to 38%. This includes the power required to run IT infrastructure, servers, and associated backup systems.

Air conditioning systems represent the remaining 4% of the total energy consumption. This includes both heating and cooling systems employed to maintain optimal indoor temperatures for comfort and operational requirements.

Understanding this breakdown is crucial for implementing targeted energy-saving strategies aimed at optimizing efficiency and reducing overall energy consumption in the facility

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Performance evaluation of major utilities and process equipment's /systems.

5.1. List of equipment and process where performance testing was done.

5.1.1. Electrical System

5.1.2. Lighting & Fans

5.2. Results of performance testing

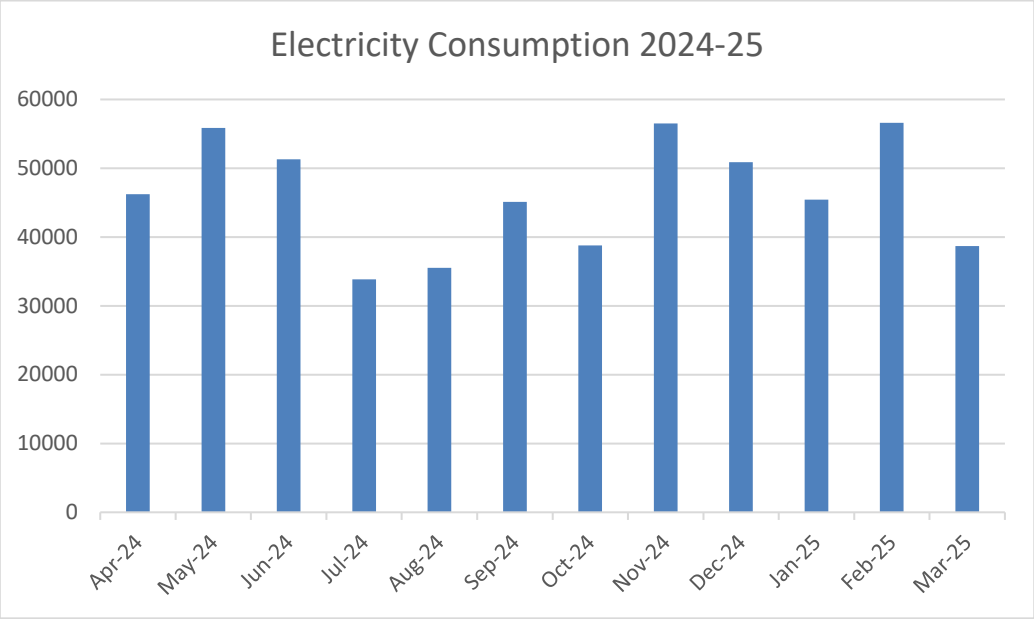
5.2.1. Electrical System

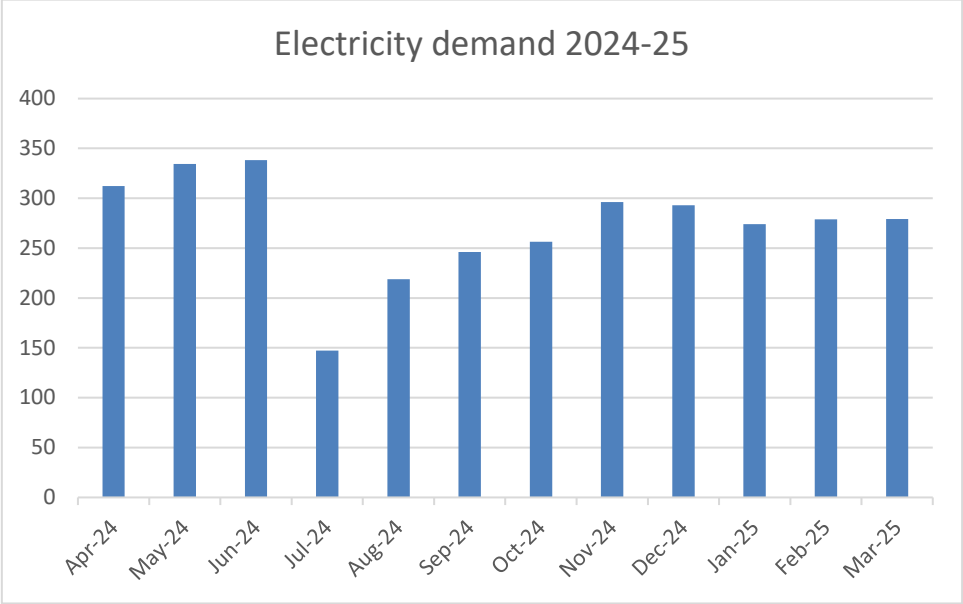
The average unit cost of electricity is **10.60 Rs/kWh**. This is taken as the basis for the financial analysis of electrical energy efficiency projects. The information on average energy consumption is taken from the historical electricity bill analysis.

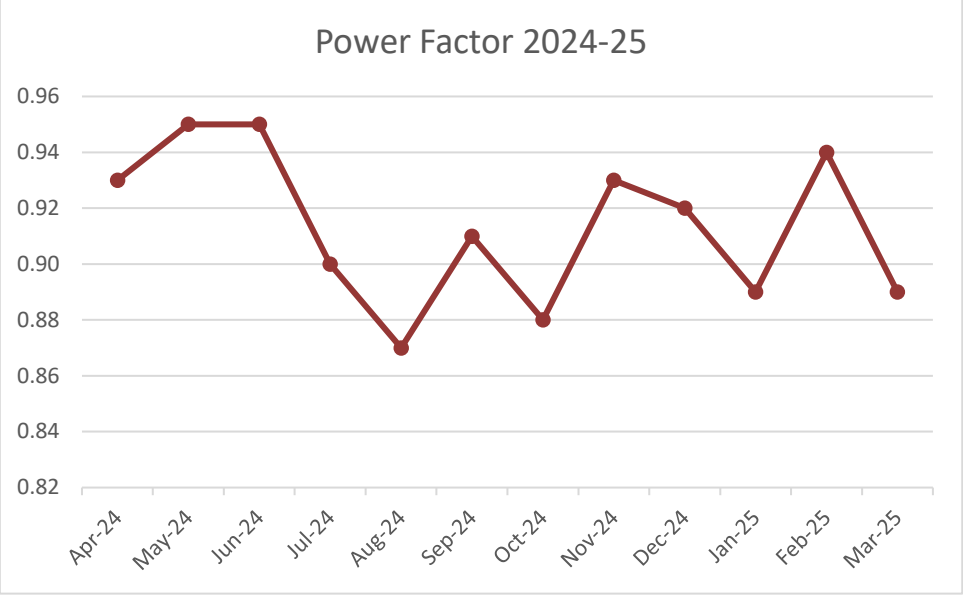
Electricity Consumption

Annual Electricity Consumption (kWh)				
Sl No	**Consumer No**	**2023-24**	**2024-25**	**Connected Load (kW)**
1	1345640003139	535656	554756	612
2	1145647010821	39514	40320	24
3	1145648028054	125244	127800	79
4	1145645035291	43806	44700	18
5	1145640011786	30200	30816	22
6	1145640027878	24143	24636	20
7	1145645030263	84119	85836	59
8	1145644020143	45888	46824	30
9	1145640013074	25390	25908	16
TOTAL		953959	981596	880

Electricity Bill Analysis 2024-25




Electricity demand 2024-25
400
350
300
250
200
150
100
50
0
Apr-24
May-24
Jun-24
Jul-24
Aug-24
Sep-24
Oct-24
Nov-24
Dec-24
Jan-25
Feb-25
Mar-25


Power Factor 2024-25
0.96
0.94
0.92
0.90
0.88
0.86
0.84
0.82
Apr-24
May-24
Jun-24
Jul-24
Aug-24
Sep-24
Oct-24
Nov-24
Dec-24
Jan-25
Feb-25
Mar-25

Solar

The campus is equipped with two grid-tied solar power plants, with capacities of 18 kWp and 75 kWp, located at the college and hostel respectively. The details of solar generation for the year 2024-25 are provided below.

Solar Power Plant Grid Tied		
Location	**Capacity (kWp)**	**2024-25**
		Annual generation (kWh)
College	18	22995
Hostel	75	95813
Total kWh		118808

Diesel

The campus is equipped with two diesel generators, one with a capacity of 500 kVA and another with 200 kVA. The details of Diesel consumption are given below.

Electricity Generated through DGs			
Year	Generator	kWh /yr	cost
	in L		in Rs
2023-24	2697	8089.7	261029
2024-25	4509	13526.3	436448

LPG

LPG is consumed in Canteen and laboratory operations

LPG Consumption Details		
Particulars	2023-24	2024-25
No Cylinders	226	231
Canteen/Lab LPG Consumption in kg	4294.0	4389.0
Total in kg	4294.0	4389.0

Base Line Energy Data			
TKM College of Engineering, Kollam			
Sl No	Particulars	2023-24	2024-25
1	Electricity KSEBL (kWh)	953959	981596
2	Electricity DG (kWh)	8090	13526
3	Electricity Solar , Off grid (kWh)	0	0
4	Electricity (KSEB + DG + Off grid) kWh	962049	995122
5	Electricity Grid Tied (kWh)	118808	118808
6	Diesel (L)	2078.0	2117.3
7	LPG (kg)	4294.00	4389.00
8	Biogas generated/year (kg)	0.00	0.00

Energy Consumption Profile			
Sl No	Fuel	2023-24	2024-25
		(kCal)	
1	Electricity	827362090	855805162
2	Diesel	21819000	22231255
3	LPG	51528000	52668000
4	Biogas	0	0
Total		900709090	930704417

Lux Measurement

Lux per watt (lm/W) is a measure of luminous efficacy, indicating the amount of light (in lumens) produced per unit of electrical power consumed (in watts). In the context of lighting on a college campus, lux per watt is a critical metric that reflects the efficiency of the lighting system in converting electrical energy into visible light

A higher lux per watt value signifies that the lighting system is more energy-efficient, as it produces more lumens of light output for each watt of electricity consumed. This efficiency is essential for several reasons in a college campus setting.

Firstly, energy efficiency helps to reduce electricity consumption, leading to cost savings for the institution. By optimizing lux per watt, colleges can minimize their energy bills while still maintaining adequate lighting levels across campus facilities.

Secondly, energy-efficient lighting contributes to sustainability efforts by reducing the carbon footprint of the campus. Lower energy consumption means fewer greenhouse gas emissions associated with electricity generation, aligning with environmental conservation goals.

Moreover, efficient lighting enhances the overall quality of illumination on the campus. Adequate lighting levels are essential for creating safe and comfortable learning environments in classrooms, libraries, study areas, and outdoor spaces. By ensuring optimal lux per watt, colleges can provide well-lit spaces conducive to student productivity, concentration, and well-being.

Additionally, in the context of ongoing sustainability initiatives and the increasing focus on energy conservation in educational institutions, monitoring and optimizing lux per watt can serve as a performance benchmark. It allows colleges to track

improvements in lighting efficiency over time, identify areas for further optimization, and demonstrate their commitment to sustainable practices to students, faculty, and the broader community.

In summary, lux per watt is a crucial metric in college campus lighting as it reflects the efficiency, cost-effectiveness, sustainability, and quality of illumination provided. By prioritizing energy-efficient lighting solutions and optimizing lux per watt, colleges can create well-lit, environmentally friendly, and conducive learning environments for their students and faculty.

Sl.No	Location	Avg
1	Library	112
2	EE Software Lab	123
3	Civil Library	132
4	Simulating Lab	164
5	Water Research Lab	167
6	Library	145
7	Mechanic Library	198
8	MCA Classrooms	251
9	Corridor	256
10	MCA Lab	120
11	Chemical Lab	165
12	Research Lab	187
13	Software Lab	198
14	Library	167
15	Ideal Lab	189
16	Carpentry	198
17	M/c Lab	158
18	CIM Lab	194
19	Doctor's room	159
20	canteen	106
21	store	153

6

Energy efficiency in utility and process system

The Energy Performance Index (EPI) is commonly computed by dividing the total energy consumption of the entire building by its total floor area. This calculation yields a crucial metric for evaluating the effectiveness of a building's energy utilization. By offering a standardized measure that adjusts for the energy requirements relative to the building's size, the EPI provides valuable insights into the energy efficiency of the structure.

This metric serves as a key tool for assessing and benchmarking energy performance. By accounting for both energy consumption and building size, the EPI offers a comprehensive understanding of how efficiently energy resources are utilized within the building. It allows stakeholders to compare the energy efficiency of different buildings, regardless of their size or occupancy.

Moreover, the EPI facilitates the identification of areas for potential improvement in resource utilization. Buildings with higher EPI values may indicate inefficiencies in energy usage, prompting further investigation into the underlying causes. This analysis can lead to targeted strategies for enhancing energy efficiency, such as upgrading equipment, improving insulation, or implementing energy-saving measures.

Overall, the Energy Performance Index is a valuable tool for evaluating, benchmarking, and improving the energy efficiency of buildings. Its standardized calculation method and consideration of both energy consumption and building size

provide a nuanced understanding of energy performance, enabling stakeholders to make informed decisions and drive sustainable improvements in resource utilization.

OTTOTRACTIONS- ENERGY AUDIT			
TKM College of Engineering, Kollam			
Energy Performance Index (EPI)			
Sl No	**Particulars**	2023-24	2024-25
1	Total building area (m^2)	61962	61962
2	Annual Energy Consumption (kCal)	900709090	930704417
3	Annual Energy Consumption (kWh)	1047336	1082214
4	Total Energy in Toe	90.07	93.07
5	Specific Energy Consumption kWh/m^2	16.90	17.47

The Energy Performance Index (EPI) is

17.47 kWh/m^2

The EPI of 2024-25 may be taken as benchmark. The EPI of 2024-25 may be taken as benchmark. A comparison of the Energy Performance Index (EPI) over the past four years indicates a rising trend in energy consumption. The EPI has increased from 15.05 in 2021–22 to 16.90 in 2023–24, and further to 17.47 in 2024–25, reflecting a consistent decline in energy efficiency.

7

Evaluation of energy management system

Energy management policy

There is no written energy policy available, but environment policy is available which includes energy conservation also. A draft energy management policy is given below. The management may constitute an energy management policy and display the same in the plant to motivate the staff.

T K M COLLEGE OF ENGINEERING,

KOLLAM

ENERGY POLICY
(Draft)

We are committed to optimally utilize various forms of energy in a cost effective manner to effect conservation of energy resources. We are committed to conserve the energy which is a scarce resource with the requisite consistency in the efficiency, effectiveness in the cost involved in the operations and ensuring that production quality and quantity, environment, safety, health of people are maintained. We are also committed to increase the renewable energy share of the total energy we use.

We are also committed to monitor continuously the saving achieved and reduce its specific energy consumption by minimum of 2% every year.

Date ----------

Head of the Institution

7.1. Energy management monitoring system

- **Energy Management Cell** has to be constituted with an objective to revise action plan for energy conservation thereby reducing the production cost.
- Energy conservation tips/ posters are displayed in crucial points.
- Use of renewable energy has to be encouraged.

7.2. Training to staff responsible for operational and documentation.

- The staff and students need to be made more aware of the importance of energy saving and management.
- Log books shall be maintained to record Electricity Consumption and Diesel consumption.
- Meter reading shall be taken and compared with KSEB regularly.
- Better operating practices regarding appliances and fixtures should be taught to the staff.

7.3. Best Practices

- Have solid Waste management program.
- Have different social and environmental clubs
- Conducted Energy Conservation Training Programs.
- Conducted Green Audit.
- Two grid-tied solar power plants have been installed with capacities of 18 kWp and 75 kWp.

8

Energy Conservation Measures and Recommendations

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal Code 1	
Energy Saving in Lighting by replacing existing 189 No's T8 (40W) Lamps to 18W LED Tube	
Existing Scenario	
189 numbers of T8(40 W) lamps were identified during the energy audit field survey in the facility. During discussion with officers it is observed that the average utility of these fittings are of 30%.	
Proposed System	
The existing T8 may be replaced to LED Tube of 18W in phased manner and the savings will be of 55% (inclusive of improved light output and reduced energy consumption)	
Financial Analysis	
Annual working hours (hr)	2400
No of fittings	189
Total load (kW)	7.56
Annual Energy Consumption (kWh)	12701
Expected Annual Energy saving for replacing all fittings (kWh)	6985
Cost of Power	10.60
Annual saving in Lakhs Rs (1st year)	0.74
Investment required for complete replacements [@Rs 300 per fittings](Lakhs Rs)	0.57
Simple Pay Back (in Months)	9.19

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal Code 2	
Energy Saving in Lighting by replacing existing 92 No's T12 (55W) Lamps to 18W LED Tube	
Existing Scenario	
92 numbers of T12(55 W) lamps were identified during the energy audit field survey in the facility. During discussion with officers it is observed that the average utility of these fittings are of 30%.	
Proposed System	
The existing T12 may be replaced to LED Tube of 18W in phased manner and the savings will be of 67% (inclusive of improved light output and reduced energy consumption)	
Financial Analysis	
Annual working hours (hr)	2400
No of fittings	92
Total load (kW)	5.06
Annual Energy Consumption (kWh)	3643
Expected Annual Energy saving for replacing all fittings (kWh)	2441
Cost of Power	10.60
Annual saving in Lakhs Rs (1st year)	0.26
Investment required for complete replacements [@Rs 300 per fittings](Lakhs Rs)	0.28
Simple Pay Back (in Months)	12.80

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal Code 3	
Energy Saving by replacing existing 1707 No's in-efficient ceiling fans with Energy Efficient Five star fans	
Existing Scenario	
There are 1707 numbers of ceiling fans installed in the facility with minimum 8 hrs a day operation. All are conventional type and most of them are very old.	
Proposed System	
There is an energy saving opportunity in replace the existing fans with new five star labelled fans. The five star labelled fans give a savings up to 30% with higher service value (air delivery/watt).	
Financial Analysis	
Annual working hours (hrs)	2400
Total numbers of ordinary fans	1707
Total load (kW)	136.56
Annual Energy Consumption (kWh)	196646
Expected Annual Energy saving, for total replacement(kWh)	110122
Cost of Power (Rs)	10.60
Annual saving in Lakhs Rs (1st year)	11.67
Investment required for a total replacement (Lakhs Rs) [@3000 Rs per Fan with 50W at full speed]	51.21
Simple Pay Back (in Months)	52.64

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal Code 4	
Energy Saving in Split AC's by replacing existing in-efficient 6 No's 1 TR AC's with Energy Efficient Five star labelled or Inverter type AC's	
Existing Scenario	
There are 6 numbers of 1 TR Split AC's rated with 3 star or below are installed in the facilty with minimum 9 hrs operation in a day. During discussion with staffs it is observed that the average utility of these fittings are of 80%.	
Proposed System	
There is an energy saving opportunity in replacing the existing Split AC's with five star labelled Inverter type Split AC's. The five star labelled Inverter type AC's give a savings up to 36% with higher Energy Efficiency Ratio (EER, W/W).	
Financial Analysis	
Annual working hours (hrs)	2400
Total number of AC's installed	8
Total load (kW)	9.60
Annual Energy Consumption (kWh)	11520
Expected Annual Energy saving, for total replacement(kWh)	3456
Cost of Power (Rs)	10.60
Annual saving in Lakhs Rs (1st year)	0.37
Investment required for total replacement (Lakhs Rs) [@30000 Rs per tonnage for five star labelled Inverter type AC]	2.40
Simple Pay Back (in Months)	78.62

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal Code 5	
Energy Saving in Split AC's by replacing existing in-efficient 16 No's 1.5TR AC's with Energy Efficient Five star labelled or Inverter type AC's	
Existing Scenario	
There are 16 numbers of 1.5TR Split AC's rated with 3 star or below are installed in the facility with minimum 9 hrs operation in a day. During discussion with staffs it is observed that the average utility of these fittings are of 80%.	
Proposed System	
There is an energy saving opportunity in replacing the existing Split AC's with five star labelled Inverter type Split AC's. The five star labelled Inverter type AC's give a savings up to 36% with higher Energy Efficiency Ratio (EER, W/W).	
Financial Analysis	
Annual working hours (hrs)	2400
Total number of AC's installed	16
Total load (kW)	28.80
Annual Energy Consumption (kWh)	20736
Expected Annual Energy saving, for total replacement(kWh)	6221
Cost of Power (Rs)	10.60
Annual saving in Lakhs Rs (1st year)	0.66
Investment required for total replacement (Lakhs Rs)[@35000 Rs per tonnage for five star labelled Inverter type AC]	8.40
Simple Pay Back (in Months)	152.87

Energy Saving Proposal	
Installation of 550kWp Solar Power Plant	
Existing Scenario	
There is a good potential of solar power electricity generation. The availability of sunlight is very high. There are some canopies available in the proposed site, but by having proper trimming of trees this may be avoided. If the SPVs are place in the roof top it will help improving RTTV (Roof Thermal Transmit Value) of the building.	
Proposed System	
It is proposed to have a Solar Power Plant of 550kW at the beginning stage. The state and central government is pushing and giving good assistance to the installation. It can be installed as an internal grid connected system which is much cheaper than off grid system. Now days the technology provides trouble free grid interactive and connected system. The installation will provide 25yrs trouble free generation with only 20% efficiency loss at the 25th year.	
Financial Analysis	
Proposed Solar installed Capacity (kW)	550
Total average kWh per day expected (3.5kWh/day average)	2062.50
Total annual Generating Capacity (kWh)	752813
Cost of energy generated annually Lakhs Rs	100.12
Investment required (INR lakh)(Approx)	302.50
Simple Pay Back (in Months)	36.26
Life cycle in Yrs	25
Total Saving in Life Cycle (Approx) RS lakh	2503.10

Installation of 30Kg/day Biogas plant	
Capacity of Bio gas plant(Kg/day)	30
Average Calorific Value of biogas (kCal/m3)	3500
Annual Generation of Biogas Plant	3300
Daily production of biogas (kCal)	52500
LPG Saving in a day (kg)	4.375
Annual LPG Saving (Kg)	809
Investment required (in Lakhs)	0.4
Annual Cost saving (in Lakhs)	0.51
Expected Annual Energy saving (kWh)	13430
Simple Pay Back (In Months)	9.39

Technical Supplement

TKM College of Engineering, Kollam												
Sl.No	Location		Lights							Fans		
			T8	T12	LED B	LED sq	LED T	LED 18W	LED 20W	CF	PF	WF
1	Main Block	TF Room	1	1	1							
2		M/c Lab	12	1			11			16	1	2
3		Centralized UPS Room										
4		IQAC					2			2		
5		Principal Room										
6		EC Classrooms*10	10				30			60		
7		Server Room										
8		Library					6			6		
9		EE Software Lab							22	8		
10		EE Class rooms*15	15				45			90		
11		Civil transportation Lab										
12		ALUMINI Association Office										
13		Civil Library	2	1			4			6		
14		Simulating Lab							18	6		
15		Civil classroom*12	12				36			72		
16		Water Research Lab		2			14			7		
17	Mechanical Block	Staff Roomx 3						42		30	3	30
18		Classrooms*6					12			30		
19		Library	2				1			2		
20		Mechanic Library	4				1			5		
21		ME Classrooms*10		30						50		

22	Chemical Block	MCA Classrooms	33				11			5		
23		Corridor	5	1			2					
24		MCA Lab	8	3			1			9		
25		Chemical Lab		6			2			6		
26		Research Lab	8							3		
27		Software Lab	14				2			6		
28		lab x 4	12				9			6		
29		Library	6							4		
30		Classrooms x 10		30			30			70		
31	Somanath Building Block	Ideal Lab	12			2	2		6	10		
32		Staff Roomx 3					15			12		
33		Carpentry		7			18			13		1
34		M/c Lab	14	10			14			14		
35		CIM Lab	8							3		
36		Rooms x 3	6				3			6		
37		Classroom x 16						96		112		
38	Cantee n/ Store Block	Doctor's room	2							1		
39		canteen	3				8			12		
40		store					4			2		
41	Auditorium						42			2		
42	Trust Hostel						129			129		
43	Golden Jubilee Hostel						256			256		
44	Campus Hostel						100			100		
45	International Students hostel						65			65		
46	Modern hostel						101			51		
47	Ladies Hostel (Main)						135			135		
48	UGC A,B,C & D						267			202		
49	Working Women's Hostel						165			83		

TKM College of Engineering, Kollam													
Sl.No	Location		IT			UPS			AC				
			PC	Projector	Printer	1kVA	120 kVA	7.5kVA	Window AC	1TR	4TR	1.5 TR	
1	Main Block	TF Room				1							
2		M/c Lab	2		1								
3		Centralized UPS Room					2			2			
4		IQAC								1			
5		Principal Room									2		
6		EC Classrooms*10		10									
7		Server Room								3			
8		Library	2		2								
9		EE Software Lab	80	1								4	
10		EE Class rooms*15		15									
11		Civil transportation Lab								1			
12		ALUMINI Association Office								1			
13		Civil Library	6		2								
14		Simulating Lab	40	1	3							2	
15		Civil classroom*12		12									
16		Water Research Lab	2		1								
17	Mechanical Block	Staff Room x 3			3								
18		Classrooms*6		6									
19		Library	1										
20		Mechanic Library	3		1								
21		ME Classrooms*10		10									

22	Chemical Block	MCA Classrooms										
23		Corridor										
24		MCA Lab	81	2	2						2	
25		Chemical Lab	2									
26		Research Lab	3									
27		Software Lab	46		2							2
28		lab x 4										
29		Library	3		1							
30		Classrooms x 10		10								
31	Somanath Building Block	Ideal Lab	9		1			1				8
32		Staff Room x 3	3		2							
33		Carpentry										
34		M/c Lab										
35		CIM Lab							3			

Electricity Bill Details (2023-2024)											
Month	Name of the Consumer				TKM College of Engineering, Kollam						
	Contract demand (kVA)		300		Consumer number & Section			1345640003139			
	Tariff		HT II (A) GENERAL					Kilikolloor			
	kWh				kVA			PF	PF Penalty / Incentive	` (Total)	Rs/kWh
	Z1	Z2	Z3	Total	Z1	Z2	Z3				
Apr-23	39872	5960	9808	55640	271	81	53	0.94	0	533565	**9.59**
May-23	34712	5396	9948	50056	308	86	94	0.93	0	496496	**9.92**
Jun-23	20780	3388	6560	30728	159	45	69	0.84	0	311809	**10.15**
Jul-23	31532	5256	8516	45304	265	74	56	0.91	0	444625	**9.81**
Aug-23	22168	4348	7784	34300	178	55	52	0.85	0	370411.48	**10.80**
Sep-23	26924	4628	8064	39616	233	68	56	0.87	0	424478.5	**10.71**
Oct-23	26512	4632	8088	39232	247	75	51	0.88	0	409886.56	**10.45**
Nov-23	32452	5184	9028	46664	83	55	263	0.91	0	482966.29	**10.35**
Dec-23	39328	5792	9564	54684	279	85	57	0.94	0	549485.69	**10.05**
Jan-24	30344	5232	9120	44696	289	82	59	0.90	0	485743.38	**10.87**
Feb-24	28396	5728	9516	43640	239	76	58	0.92	0	458450.4	**10.51**
Mar-24	36252	6084	8760	51096	316	103	57	0.95	0	570874.37	**11.17**

Electricity Bill Details (2024-2025)											
Month	Name of the Consumer				TKM College of Engineering, Kollam						
	Contract demand (kVA)		300		Consumer number & Section			1345640003139			
	Tariff		HT II (A) GENERAL					Kilikolloor			
	kWh				kVA			PF	PF Penalty / Incentive	` (Total)	Rs/kWh
	Z1	Z2	Z3	Total	Z1	Z2	Z3				
Apr-24	31260	5944	9012	46216	312	93	66	0.93	0	518034	**11.21**
May-24	39764	6244	9860	55868	335	128	72	0.95	0	595243	**10.65**
Jun-24	32020	7308	11984	51312	338	137	112	0.95	0	549799	**10.71**
Jul-24	19104	5280	9472	33856	147	69	58	0.90	0	376991	**11.14**
Aug-24	23364	4384	7760	35508	219	63	51	0.87	0	380626	**10.72**
Sep-24	30388	5408	9336	45132	246	72	57	0.91	0	468359	**10.38**
Oct-24	24224	5408	9136	38768	257	74	62	0.88	0	429905	**11.09**
Nov-24	39804	6416	10292	56512	296	94	66	0.93	0	565757	**10.01**
Dec-24	35224	6032	9628	50884	293	127	77	0.92	0	520369	**10.23**
Jan-25	30476	5568	9372	45416	274	100	82	0.89	0	455505	**10.03**
Feb-25	39948	6372	10268	56588	279	76	61	0.94	0	538303	**9.51**
Mar-25	25596	4796	8304	38696	279	80	57	0.89	0	443717	**11.47**

KERALA STATE ELECTRICITY BOARD LIMITED

Office of the Special Officer(Revenue), Pattom,Thiruvananthapuram

DEMAND CUM DISCONNECTION NOTICE FOR MARCH 2025

(As per CHAPTER VII OF KERALA ELECTRICITY SUPPLY CODE -2014)

Cons#	1345640003139	Bill Date	07-Mar-2025	Due Date	14-Mar-2025	DC Date	29-Mar-2025	Bill.No	21028112196279 Ver : 0
LCN	25/22/2237	Tariff	HT II (A) GENERAL			CD	804170	BG	0

TKM COLLEGE OF ENGINEERING (25/22/2237)
TKM College of Engineering, Kollam,

KOLLAM,,
Mobile no--9496412024

SBI Virtual A/c No(IFS Code:SBIN0070493)-KSEBHT25C22C2237

Consumer GSTIN_ID- /KSEB (L)GST ID=32AAECK2277NBZ1

Arrears as on 31-Jan-2025			
Disputed	0	Undisputed	0

Contract Demand(kVA)	75% of CD (KVA)	130% of CD (KVA)	Connected Load (KW)
300.0	225.0	390.0	612

Date of Previous Reading	31-Jan-2025
Date of Present Reading	28-Feb-2025

Average		
MD (kVA)	Consumption (kWh)	PF
268.50	44831	0.90

principal@tkmce.ac.in			
Supply Voltage	11 kV	HT	
Billing Type	DPS		
Section	Kilikolloor.		
Circle	Kollam		

Reading Details of meter 22002740-Working (KVA,KWh,KVAh & KVArh) for 02-2025

1. Energy Consumption(KWh)

Zone	FR	IR	MF	Units
1	222394.00	215995.00	4.000	25596
2	38979.00	37780.00	4.000	4796
3	64852.00	62776.00	4.000	8304
			Total	38696

2. Energy Consumption(KVAh)

Zone	FR	IR	MF	Units
1	232372.00	225571.00	4.000	27204
2	43942.00	42536.00	4.000	5624
3	78880.00	76270.00	4.000	10440
			Total	43268

Ave.PF=KWh/KVAh 0.89

3. Energy Consumption(KVArh) Lag and kVARh (Lead)

Zone	FR	IR	MF	Units	FR	IR	Units
1	4539.00	4392.00	4.000	588	31825.00	30619.00	4824
2	56.00	56.00	4.000	0	18109.00	17409.00	2800
3	19.00	18.00	4.000	4	43070.00	41511.00	6236
			Total	kVArh(Lag) 592	kVArh(Lead)		13860

4. Demand (KVA)

	Readings	MF	Units
1	69.776	4.000	279.1
2	20.017	4.000	80.07
3	14.275	4.000	57.1
5.Factory Lighting			0.0
6.Colony Lighting			0.0
7.Generator			0

INVOICE

	Unit	Rate	Amount (Rs)
1.Total Demand Charge			
a. Demand Charge - Normal	279.0	450.000	125550.00
b. Demand Charge - Peak	0.0	450.000	0.00
c. Demand Charge - Off peak	0.0	450.000	0.00
d. Excess Demand Charge	0.0	225.000	0.00
e. Excess Demand Charge(Peak)	0.0	225.000	0.00
f. Excess Demand Charge (Off	0.0	225.000	0.00
Sub Total (a+b+c+d+e+f)			**125550.00**
2.Total Energy Charges			
a. Energy charges - Normal	25596	6.15000	157415.40
b. Energy charges - Peak	4796.0	9.22500	44243.10
c. Energy charges - Off peak	8304.0	4.61250	38302.20
Sub Total(a+b+c)			**239960.70**
3.PF Incentive / Disincentive			0.00
Total Energy Charge			**239960.70**
4.Energy Charges on Lighting load			
a.Factory Lighting	0	0.2	
b.Colony Lighting	0	0.2	0.00
Sub Total(a+b)			
5.Electricity Duty	239961	0.100	23996.07
6.Ele. Surcharge (*)	38696	0.025	967.40
7.Duty on self generated energy	0	0.15	0.00
8.Penalty for non-segn. of light load			

	Amount
9.Other Charges	
Miscellaneous EC	50921.00
Reconnection Fee	0.00
Monthly Fuel Surcharge	2321.76
Green Energy Charge	0.00
10.Total(add 1 to 9)	**443716.93**
Plus/Minus (Round off)	0.07
UnDisputed Arr Amount	0.00
Less 1. Advance / Credit	
2. CD Interest	0.00
3. CD/Oth Ref	0.00
Net Payable	**443717.00**

(Rupees Four Lakh Forty Three Thousand Seven Hundred Seventeen Only)

E & O.E

Balance Advance at Credit, if any

1.As per Regulation 130 of Kerala Electricity Supply Code 2014 any complaint regarding accuracy of a bill shall be first taken up with the officer designated to issue the bill (Special Officer(Revenue)). For Enquiry,please contact:0471 2514323,2514262. Please follow our official Facebook page fb.com/ksebl for information &announcements.(Please see the instructions overleaf)

2.The connection will be disconnected without further notice,if the amount is not remitted on or before the DC date above

(*): Charged as per Section 3 of The Kerala State Electricity Surcharge (Levy and Collection) Act,1989

SPECIAL OFFICER (REVENUE)

Please Detach and enclose with the DD

1345640003139 **21028112196279** **Rs.443717.00** **March 2025**

TKM COLLEGE OF ENGINEERING (25/22/2237)

DD/Payment Instruction | Name of the | Date D D M M Y Y Y Y | Signature