MES PONNANI COLLEGE

www.mesponnanicollege.ac.in

Govt. Aided Institution | Affiliated to the University of Calicut
Estd. : 1968 | Recognized under UGC 2(f) & 12(B)
NAAC Re-accredited (II Cycle) with 'A' Grade

ENERGY AUDIT

ATHUL ENERGY CONSULTANTS PVT LTD
4th FLOOR, CAPITAL LEGEND BUILDING,
KORAPPATH LANE, ROUND NORTH, THRISSUR, KERALA-680020
Ph: +91 735611199/0-6
Web: www.athulenergy.com
E-Mail: info@athulenergy.com

ENERGY AUDIT

MES COLLEGE PONNANI

MALAPPURAM

Kerala

EXECUTED BY

ATHUL ENERGY CONSULTANTS PVT LTD

4th FLOOR, CAPITAL LEGEND BUILDING,
KORAPPATH LANE, ROUND NORTH, THRISSUR, KERALA-680020

Ph: +91 735611199/0-6 Web: www.athulenergy.com E-Mail: info@athulenergy.com

BRIEF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

We express our sincere gratitude to the MES College Ponnani Malapuram for giving us an opportunity to carry out the project of Energy Audit. We are extremely thankful to all the staffs for their support to carry out the studies and for input data, and measurements related to the project of Energy audit.

College Team Members

1

2

3

4

Also congratulating our Energy audit team members for successfully completing the assignment in time and making their best efforts to add value.

ELECTRICAL SAFETY & ENERGY AUDIT TEAM

1. **Mr. Santhosh A**
   Registered Energy Auditor of Bureau of Energy Efficiency (BEE – Govt. of India)
   Accredited Energy Auditor No – EA 7597

2. **Mr. Ashok KMP**
   Registered Energy Manager of Bureau of Energy Efficiency (BEE – Govt. of India)
   Energy Manager No – EA 25612

3. **Mr. Jaideep P P,** Project Engineer - ME, Energy Engineering.

Yours faithfully

Managing Director
Athul Energy Consultants Pvt Ltd

1. ENERGY CONSUMPTION & COST ANALYSIS

The energy consumption and cost for the college campus premises are listed below- Monthly

Location	Average Units	Average Cost
	kWh	**Rs**
College Building -1	4193	48986
College Building-2	1677	13461
Mosque &Gents Hostel	557	4619
Library	1088	8077
Ladies Hostel	179	2451

Table 1: ENERGY CONSUMPTION & COST ANALYSIS

2. ENERGY SAVING PROPOSALS

The following table shows the energy saving proposals

kW	**Particulars**	**Annual energy Savings (kWh)**	**Annual Financial Savings (Rs.)**	**Investment (Rs)**	**Simple payback Period (Months)**
1	Replacement of ceiling fans with BLDC/BEE star rated fans	2500 **or** 1500	20375 **or** 12225	92000 **or** 68000	54 **or** 67
2	Replacement of existing Tube fitting with LED. T-12-9, T-8 -88 and T-5 -22	4780	38957	29750	9
3	Installation of 20kw solar on grid system	24000	195600	1200000	74

TABLE 2: ENERGY SAVING PROPOSALS

3. AUDIT SUMMARY - ACTIONS

The actionable summary of the audit report is given in the table below.

Sl No:	Particulars	Location	Action to be taken	Remarks
1	Replacement of ceiling fans with BLDC fans	Classrooms, Staff rooms	Change the existing old ceiling fans with BLDC fans	Energy consumption will come down
2	Replacement of old split AC with New 5 star rated ones	Computer Labs, Office Rooms	Change the old existing ACs with 5 star ACs.	Energy consumption will come down
3	Replacement of Fluorescent lights with LED	Class rooms, Staff rooms	Replace with LED lights.	Energy consumption will come down

TABLE 3: ENERGY AUDIT SUMMARY – ACTIONS

4. ENERGY AUDIT SUMMARY & RECOMMENDATIONS

The summary of the report with respect to each section is as follows.

1. **Electricity consumption analysis:**

- Presently 5 LT connections in the college premises. Which we suggested to change into single HT connection. This is useful for college for overall billing and for reliability in supply from KSEB.
- College is benefitted with space in its roof top hence they can go for more solar installations in their facility and go for zero billing and claimed as solar powered college or Green college**.**
- **Air conditioners:** Replacement of old AC's with new energy efficient star rated AC's.
- **Light loads:** Majority of the lighting fixtures are fluorescent type (T12). By replacing these loads with LED light fittings will reduce the overall power consumption.
- **Ceiling fan loads:** Ceiling fans are installed in majority of the areas by replacing it with Brushless DC fans which consumes in the range of 25 to 30W at full speed, instead of 70W in normal fans, will reduce the power consumption considerably. Also while purchasing new fans priority should be given for BLDC

5. GENERAL DETAILS

The general details of the MES College are given below in table.

Sl.No:	Particulars	Details
1	Name of the College	MES College
2	Address	Ponnani South
		Malappuram - 679586
3	Contact Person	Capt. Mohammed Koya
4	Contact Phone numbers & Fax	0494-2666077
		09946003502
5	E-mail ID	principalmesponnani@gmail.com
6	Type of Building	Educational Institution
7	Annual Working Days	210
8	No: of Shifts	Day Shift (One) (9AM -4PM)

TABLE 4: GENERAL DETAILS

ENERGY AUDIT

OBJECTIVES

An energy audit is a key to assessing the energy performance of facility and for developing an energy management program. The typical steps of an energy audit are:

- Preparation and planning
- Data collection and review
- Plant surveys and system measurements
- Observation and review of operating practices
- Data documentation and analysis
- Reporting of the results and recommendations

1.1. Definition of energy auditing

In the Indian Energy Conservation Act of 2001 **(BEE 2008)**, an energy audit is defined as:

"The verification, monitoring and analysis of the use of energy and submission of technical report containing recommendations for improving energy efficiency with cost-benefit analysis and an action plan to reduce energyconsumption."

1.2. Objectives of Energy Auditing

The objectives of an energy audit can vary from one plant to another. However, an energy audit is usually conducted to understand how energy issued within the plant and to find opportunities for improvement and energy saving. Sometimes, energy audits are conducted to evaluate the effectiveness of an energy efficiency project or program. In BCM College as per the request, we have assessed the energy consumption and saving opportunities at present scenario.

Methodology for the study

The methodology adopted for energy audit starts from historical energy data analysis, power quality analysis, monitoring of operational practices, system evaluation, cost benefit analysis of the energy conservation opportunities, and prepare plan for implementation. The proposals given in the report includes economical energy efficiency measures to reduce facilities unnecessary energy consumption and cost. The energy conservation options, recommendations and cost benefit ratio, indicating payback period are included in this report.

Details Work

The Scope of Work includes:

1. Historical energy data analysis.
2. Electrical, Mechanical and Thermal energy analysis.
3. Power Quality Analysis.
4. Identification of Energy saving opportunities.
5. Cost Benefit Analysis.

ABOUT MES COLLEGE

The last five decades have witnessed the remarkable transformation in the educational status of Muslims in Kerala, supposedly the most backward in education. The driving force behind this effort has been M.E.S., the largest educational agency of the Muslim community in India having thousands of life members and hundreds of institutions. The movement started under the great leadership of late Dr. P.K. Abdul Gafoor in 1964 at Calicut, was supported by a large number of professionals and businessmen and in a short span of time, it spread to all Districts, Taluks and even to the Panchayaths in Kerala and other parts of India and abroad. As on today it is the largest Muslim service organization in the country. It has also well-established units in Middle East countries like Saudi Arabia, Qatar, Oman, Dubai, Abu Dhabi, Kuwait, etc. and still the organization is growing fast, extending its services further to reach every nook and corner of the world. MES is the largest corporate educational agency of Muslims in India, with more than 150 institutions including Medical College, Dental College, Engineering Colleges, College of Nursing, Arts and Science colleges, Training Colleges, CBSE schools, State syllabus Higher Secondary Schools and Industrial Training Centres with more than 60,000 students and around 15,000 employees. Hospitals, Orphanages, Old age homes, Special Schools for Mentally Challenged, Cultural complexes and various hostels draw up the broad canvas of the services offered and activities undertaken by the society. The idea of a college at Ponnani actually emanated from the brain of late Dr. P.K. Abdul Gafoor Sahib, while addressing a public meeting organized by M.E.S. Ponnani unit in 1967. In the keynote address, he unequivocally stated that M.E.S. was ready to start a College here at Ponnani, provided the Ponnani M.E.S. units mobilize the required land and 1 lakh rupees. It was a great source of inspiration for the energetic members of the Ponnani unit. They took it up as a challenge and managed to accomplish all the requirements within a short duration. A sprawling 32 acres of land was obtained from the government and they also raised an amount of 1.25 lakhs rupees by means of public contribution. The long-cherished dream thus became a reality when the college came into existence in 1968 under the patronage of M.E.S. President late Dr. P.K. Abdul Gafoor, Sri. E.K. Imbichi Bava and Sri. C.H. Mohammed Koya, being then the Ministers of Kerala. The college enjoys 2(f) and 12(B) status of UGC and is affiliated to University of Calicut. At present it provides higher education to more than 1400 students in five Post Graduate courses and nine Under Graduate courses. Among five Post Graduate departments, three departments are recognized as Research Centres by Calicut University. There are 69 Teaching faculties and 25 Non-teaching staff in our college. The college was re- accredited by the NAAC at A level in September 2012. Ponnani lies on the western outskirts of Malappuram district. The college is situated in Ponnani municipal area and its campus stretches to the west side of Tippu Sultan road. This is the only higher education center between Tirur and Guruvayoor in the coastal belt of Malappuram district. The National Highway 66, the K.S.R.T.C. bus depot and the private bus stand make commuting very easy

for the students. Kuttipuram railway station is 18 kms towards northeast and Guruvayoor railway station in 29 kms towards south.

Vision

To immortalize the legendary Ponnani wisdom and tradition, whilst assimilating the ever-altering spirit and ingenuity of the academic firmament.

Mission

To ensure the scholastic, social and cultural emancipation and empowerment of people of the environs especially of the fisher folk whose rights and privileges have been suppressed and trampled upon for centuries owing to the historical, political and social reasons.

Objectives

We endeavor to fulfill the fair aspirations of all stakeholders and to disseminate the fame of institution as an epitome of excellence in all walks by setting the following objectives: -

- Developing a culture of equality, secular outlook, all-inclusiveness and impartiality.
- Embracing innovative curricular, co -curricular and extracurricular activities from the globalized world.
- Setting an exceptional academic ambience ensuring the collaboration and contribution of all stakeholders.
- Promoting scientific temperament and rationale thinking as envisioned in the Constitution of India.
- Empowering the vulnerable sections of the society through committed and unswerving programs.
- Providing a life-oriented education to students, making them agents of transformation for the wellbeing of the Nation.

Core Values

1. Social Equity
2. Ethical Justice
3. Civic Responsibility
4. Accountability and Transparency
5. Intellectual Integrity
6. Inclusive Employment


IDENT'S GATE

ELECTRICITY CONSUMPTION ANALYSIS

1. BASELINE DATA & CONSUMPTION

Base Line Data	College Building-1	College Building -2	Mosque &Gents Hostel	Library	Ladies Hostel
Electricity provider	**KSEBL**				
Supply Voltage	**415V**				
Tariff	LT-6A Three Phase	LT-6A Three Phase	LT-6A Three Phase	LT-6A Three Phase	LT-6B Three Phase
Consumer No:	1165812011133	1165817011 2751	1165818013416	1165816008843	1165812034240
Billing Period	Monthly	Monthly	Bimonthly	Bimonthly	Monthly
Connected Load (kW)	78.80	18.51	9.36	5.54	15.625
Contract Demand(kVA)	86.68	-	-	-	-
Average monthly electricity consumption (kWh)	4193	1677	557	1088	179
Average fixed charges (Rs/month)	31070	1235	1300	780	203
Average Tariff rate for energy consumption, (Rs / kWh)		6.5	5.7	5.7	6.3
Fixed charges (Rs/kW)	14250	66.7	133.89	140.79	81.92
Average monthly electricity cost (Rs)	48986	13461	4619	8077	2451

TABLE 5 : BASELINE DATA

Inference

i. College Building Spaces major share of energy consumption.

ii. Auditorium and Library bills comes in bimonthly.

2. ELECTRICITY BILLS ANALYSIS

The Electricity bills analysis of the college and other buildings are given below:

College Building -1

Electricity connection	KSEB
Consumer No	1163812011133
Contract Demand	86.68kVA
Connected Load	78203 W
Tariff	LT-6A /Three
Month & Year	February -2019
Consumption (kWh)	4193
Fixed charges (Rs)	14520
Energy charge (Rs)	31070
Duty (Rs)	3107
Fuel surcharge	271
Meter rent (Rs)	15
tax	3
Total amount to be paid (Rs)	48986

TABLE 6: EB BILLS – COLLEGE BUILDING

College Building-2

Electricity connection	KSEB
Consumer No	1165817011275
Connected Load	5000Watts
Tariff	LT-6A /Three
Month & Year	February -2019 Bimonthly
Consumption (kWh)	374
Fixed charges (Rs)	650
Energy charge (Rs)	2132
Duty (Rs)	213.2
Fuel surcharge	33.04
Meter rent (Rs)	30
tax	5.4
Total amount to be paid (Rs)	3064

TABLE 7: EB BILLS – COLLEGE BUILDING

Mosque & Gents Hostel

Electricity connection	KSEB
Consumer No	1165818013416
Connected Load	180 Watts
Tariff	LT-6A /Three
Month & Year	February -2019, Bimonthly

Consumption (kWh)	30
Fixed charges (Rs)	130
Energy charge (Rs)	171.25
Duty (Rs)	17.1
Fuel surcharge	2.65
Meter rent (Rs)	0
tax	0
Total amount to be paid (Rs)	321

TABLE 8: EB BILLS – MOSQUE& GENTS HOSTEL

Library

Electricity connection	**KSEB**
Consumer No	1165816008843
Connected Load	8000
Tariff	LT-6A /Three
Month & Year	February -2019, Bimonthly
Consumption (kWh)	850
Fixed charges (Rs)	1040
Energy charge (Rs)	4845.7
Duty (Rs)	484.57
Fuel surcharge	75.08
Meter rent (Rs)	30
tax	5.4
Total amount to be paid (Rs)	6481

TABLE 9: EB BILLS – LIBRARY

Ladies Hostel

Electricity connection	**KSEB**
Consumer No	1165812034240
Connected Load	26000 Watts
Tariff	LT-6A /Three
Month & Year	February -2019, Bimonthly
Consumption (kWh)	3298
Fixed charges (Rs)	4160
Energy charge (Rs)	23086
Duty (Rs)	2308.6
Fuel surcharge	291.3
Meter rent (Rs)	30
tax	5.4
Total amount to be paid (Rs)	29882

TABLE 10: EB BILLS – LADIES HOSTEL

3. CONSUMPTION ANALYSIS

The average monthly energy consumption details of the college buildings are given below:

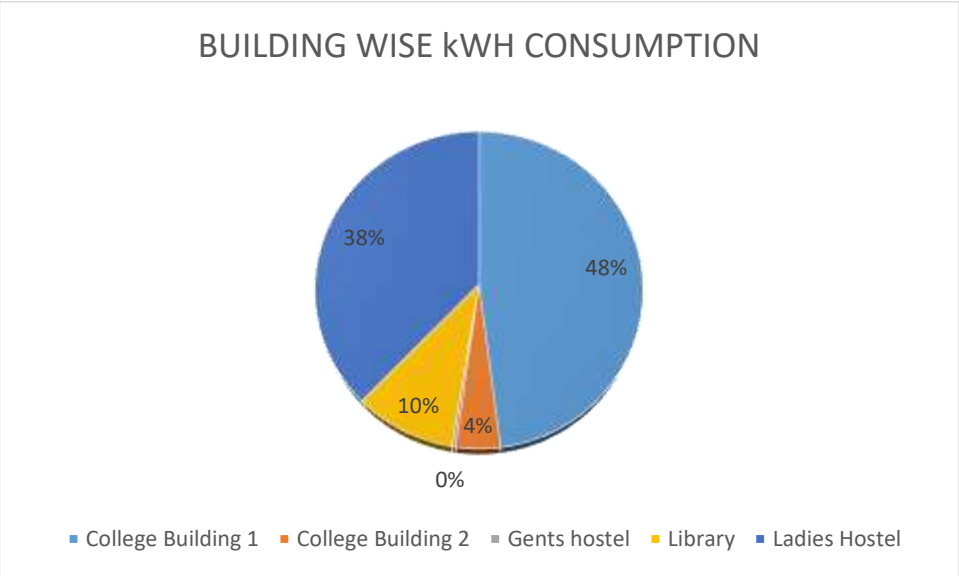


FIGURE 1: CONSUMPTION ANALYSIS

Inference

i. College buildings spaces more than 52% of the energy consumption.

ENERGY PERFORMANCE DETAILS

The objective of this subsection is to establish how the facility is performing in terms of energy consumption

MAIN INCOMER TO COLLEGE

The EB Incomer was logged by using the power quality analyzer Krykard ALM 35.

Logged details are given below in the table -8

Measurement values – 433 V side				
Actual Energy for 24 Hrs	kWh	**23.33**		
Apparent Energy for 24 Hrs	kVAh	**23.93**		
Power Factor		**0.97**		
Particulars	**Units**	**Minimum**	**Maximum**	**Average**
Active Power	kW	0	21.20	11.73
Apparent Power	kVA	0	21.92	12.03
Reactive Power	kVAr	0	3.493	1.58
Voltage Line	Volts	0	424.4	393.6
Current	Amps	0	39.2	16.68
THD V	%	0.6	7.8	1.09
TDD A	%	6.2	50.7	16.05
Voltage Imbalance	%	0	1.9	0.49
Current Imbalance	%	0	88.6	21.16

CONNECTED LOAD DETAILS

LIGHT LOADS

Floor/Area	Location	Equipment	Watts	Count	Total Watt
Ground Floor	Fist Room	LED(Ceiling)	3	3	9
		LED	9	1	9
	GIS Lab	LED(Ceiling)	3	6	18
	Sophisticated Analytical Facility	LED		6	
	Cooperative Store	LED Tube	18	1	18
		LED	9	1	9
	106	LED	9	1	9
	Chemistry Instrument Room	LED Tube	20	2	40
	Store Room (Che)	T5 Tube light	28	1	28
		Led Tube	18	2	36
	Chemistry Lab	LED Tube	18	17	306
	Chemistry (112)	Led Tube	18	1	18
	113	Led Tube	18	1	18

	114	Led Tube	18	1	18
	115	T5 Tube light	28	1	28
	116	T5 Tube light	28	2	56
	117 (Lang Dept)	T5 Tube light	28	2	56
		LED	9	1	9
	118	T8 Tube light	36	1	36
	119	T5 Tube light	28	1	28
	120	T5 Tube light	28	2	56
	121	T5 Tube light	28	2	56
	122	T5 Tube light	28	1	28
	123	T5 Tube light	28	2	56
	137 (Phy Dept)	T8 Tube light	36	3	103
		LED Tube	18	1	18
	136(Smart Room)	T5 Tube light	28	2	56
	135	T8 Tube light	36	2	72
	Bsc Phy Lab	T5 Tube light		2	
	134	Led Tube 10	18	10	180
	Msc Phy Lab	Led Tube	18	8	144
		LED	9	1	9
	127(Research lab)	Led Tube	18	3	54
Sports Area (Ground Floor)	Sports Room area	Led Tube	18	3	54
		T5 Tube light		1	
		LED	9		18
	Sports Staff Room	LED Tube	18	1	18
		LED	9	1	9
	Weightlifting Room	LED Tube	18	2	36
		LED	9	1	9
	Sports Storeroom	LED Tube	18	1	18
Sports Area (First Floor)	Gym	Led Tube	18	6	108
		LED	9	1	9
	MSK Hall	LED	15	20	300
Mosque	Outside	LED	9	7	63
		LED Tube	18	3	54
		T5 Tube light	28	2	56
	Inside	LED	20	4	80
		LED	9	8	72
	Prayer Room (ladies)	LED	9	4	36
Men's Hostel		Spot LED	20	1	20
		Led Tube	18	4	72
	Dining area	Led Tube	18	2	36

Library	Outside	Spot LED	20	2	40
	Inside	LED	9	1	9
		LED Tube	18	42	756
		LED	9	11	99
Commerce Dept (Ground Floor)	Outside	Spot LED	20	1	20
	Veranda	LED Tube	18	6	108
	Dept Room	LED tube	18	4	72
		LED	9	1	9
	303	LED Tube	18	2	36
Commerce Dept (First Floor)	Seminar Hall	Led Tube	18	3	54
	306	LED Tube	18	1	18
Commerce Dept (Second Floor)	307	LED Tube	18	2	36
	308	LED Tube	18	2	36
Golden Jubilee Block (Second Floor)	421	T8 Tube light	2	36	72
	422	T8 Tube light	36	2	72
	423	LED Tube	18	1	18
		T5 Tube light	28	1	28
	424	T8 Tube light	36	2	72
	425	T8 Tube light	36	2	72
Golden Jubilee Block (First Floor)	415	T5 Tube light	28	2	56
	414	T5 Tube light	28	2	56
	413	Led Tube	18	1	18
	412	T8 Tube light	36	2	72
	411	T8 Tube light	36	1	36
		Led Tube	18	1	18
Golden Jubilee Block (Ground Floor)	Commerce Computer lab	LED Tube	18	1	18
		LED	9	1	9
	401	LED	9	1	9
		T8 Tube light	36	2	72
	402	T8 Tube light	36	1	36
		LED Tube	18	1	18

	403	LED Tube	18	2	36
		LED	9	1	9
	404	T8 Tube light	36	2	72
		LED Tube	18	1	18
Canteen		LED	9	5	45
		LED Tube	18	14	252
Boys Room		T8 Tube light	36	1	36
Security Room		LED Tube	18	1	18
		LED Spot	20	1	20
		T8 Tube light	36	1	36
HM Hall		LED Tube	18	7	126
		LED	9	4	36
Girls Room		LED Tube	18	6	108
		LED	9	6	54
Ladies Hostel (Ground Floor)	Matrons Room	CFL	10	1	10
	G24	CFL	10	1	10
	G23	LED	7	1	7
	G22	CFL	10	1	10
	G21	T8 Tube light	36	2	72
		LED	9	1	9
	G20	LED	9	9	81
		T8 Tube light	36	1	36
	G18	LED	9	1	9
	G11	LED Tube	18	1	18
	G10	LED	7	1	7
	G8	LED	7	1	7
		LED Tube	18	1	18
	G9	LED	9	1	9
	G7	CFL	15	1	15
	G6	LED	9	1	9
	G5	LED	9	1	9
	G4	CFL	15	1	15
		LED	9	1	9
	G3	T5 Tube light	28	1	28
	Veranda	T8 Tube light	36	3	108
		LED Tube	18	4	72
		CFL	15	1	15
	G17	CFL	15	1	15
	G16	LED	9	1	9
	G15	LED	9	1	9
	Dining room	LED Tube	18	1	18

		T8 Tube light	36	1	36
	Kitchen	LED Tube	18	5	90
Ladies Hostel (First Floor)	F1	LED	9	1	9
		T8 Tube light	36	1	36
	F2	T8 Tube light	36	2	72
	F3	CFL	15T	1	15
		LED	9	1	9
	F4	LED	9	1	9
	F5	T8 Tube light	36	2	72
	F6	T8 Tube light	36	1	36
	F8	T8 Tube light	36	2	72
		LED	9	1	9
	F9	LED	9	9	81
	F10	T8 Tube light	36	1	36
	F14	T8 Tube light	36	1	36
	F15	T8 Tube light	36	1	36
	F16	T8 Tube light	36	2	72
		LED Tube	18	2	36
		LED	9	2	18
	F13	T8 Tube light	36	1	36
	F12	LED	7	1	7
	F11	T8 Tube light	36	1	36
	Room	T8 Tube light	36	1	36
		CFL	15	2	30
		LED Tube	18	2	36
IT BLOCK	Dept of Computer	LED Tube	18	10	180
		LED	9	2	18
	Class Room	LED	7	1	7
Main Block	Outside	LED Spot	50	1	50
Geo Block (First Floor)	Research	CFL	15	1	15
	202	T8 Tube light	36	2	72
	Staff Room	T8 Tube light	36	2	72
	Project Room	T8 Tube light	36	1	36
		LED	9	1	9
	207	LED Tube	18	3	72
	Petrology Lab	LED	3	15	45
		T8 Tube light	18	3	72
	Remote Sensing Lab	T8 Tube light	36	5	180
	Staff Room	T8 Tube light	36	2	72
	Geo-Chemical Lab	T8 Tube light	36	3	108
	203	T12 Tube light	40	5	200

	209	LED Tube	18	3	54
	Office	LED Tube	18	3	54
		T8 Tube light	36	2	72
		LED	9	6	54
	Managing Committee Office	LED	13	3	39
	214	LED Tube	18	3	54
		LED	15	1	15
	216	T8 Tube light	36	1	36
	217	T8 Tube light	36	1	36
	IQAC	T8 Tube light	36	4	144
	Botany lab	LED Tube	18	5	90
		T12 Tube light	40	4	160
	Zoology lab	LED Tube	18	26	468
	224	T8 Tube light	36	1	36
		LED Tube	18	1	18
	Zoology Museum	LED Tube	18	2	36
	223	LED TUBE	18	2	36
	226	T8 Tube light	36	1	36
	228	CFL	10	1	10
		T8 Tube light	36	2	72
	Instrumentation Room	LED	9	5	45
	Micro bio lab	T8 Tube light	36	2	72
		LED Tube	18	2	36
		LED	9	1	9
Second Floor	Research Room	LED Tube	18	4	72
	Aqua Museum	Led Tube	18	4	72
		LED	10	4	40
	229	T8 Tube light	36	1	36
	225	LED Tube	18	1	18
	Management S.Hall	LED	3	16	48

FAN LOADS

Floor/Area	Location	Equipment	Watts	Count	Total Watt
Ground Floor	GIS Lab	Fan	60	1	60
	Cooperative Store	Fan	60	1	60
	106	Fan	60	1	60

	Chemistry Instrument Room	Fan	60	1	60
	Store Room (Che)	Fan	60	1	60
	Chemistry Lab	Fan	60	1	60
		Exhaust Fan	60	3	180
	Chemistry (112)	Fan	60	1	60
	113	Fan	60	1	60
	114	Fan	60	1	60
	115	Fan	60	1	60
	116	Fan	60	2	120
	117 (Lang Dept)	Fan	60	2	120
	118	Wall Fan	60	1	60
	119	Fan	60	1	60
	120	Fan	60	2	120
	121	Fan	60	2	120
	122	Fan	60	2	120
	123	Fan	60	3	180
	137 (Phy Dept)	Fan	60	4	240
	136(Smart Room)	Fan	60	2	120
	135	Fan	60	2	120
	Bsc Phy Lab	Fan	60	1	60
	134	Fan	60	6	360
		Wall Fan	60	1	60
	Msc Phy Lab	Fan	60	3	180
	127(Research lab)	Fan	60	2	120

Sports Area (Ground Floor)	Sports Staff Room	Fan	60	1	60
Sports Area (First Floor)	Gym	Wall Fan	60	6	360
	MSK Hall	Wall Fan	60	2	120
		Fan	60	11	660
Mosque	Inside	Fan	60	17	1020
	Prayer Room (ladies)	Fan	60	4	240
Men's Hostel		Fan	60	9	540
	Dining area	Fan	60	2	120
Library	Inside	Fan	60	16	960
Commerce Dept (Ground Floor)	Dept Room	Fan	60	3	180
	303	Fan	60	2	120
Commerce Dept (First Floor)	Seminar Hall	Fan	60	2	120
		Wall Fan	60	3	180
	306	Fan	60	2	120
Commerce Dept (Second Floor)	307	Fan	60	2	120
	308	Fan	60	2	120
Golden Jubilee Block (Second Floor)	421	Fan	60	2	120
	422	Fan	60	2	120
	423	Fan	60	1	60
		Wall Fan	60	1	60
	424	Fan	60	2	120
	425	Fan	60	2	120

Golden Jubilee Block (First Floor)	415	Fan	60	2	120
	414	Fan	60	2	120
	413	Fan	60	1	60
		Wall Fan	60	1	60
	412	Fan	60	2	120
	411	Fan	60	2	120
Golden Jubilee Block (Ground Floor)	Commerce Computer lab	Fan	60	1	60
	401	Fan	60	2	120
	402	Fan	60	2	120
	403	Fan	60	1	60
	404	Fan	60	3	180
Canteen		Fan	60	10	600
Boys Room		Fan	60	2	120
Security Room		Fan	60	1	60
HM Hall		Fan	60	4	240
Girls Room		Fan	60	2	120
Ladies Hostel (Ground Floor)	Matrons Room	Fan	60	1	60
	G24	Fan	60	1	60
	G23	Fan	60	1	60
	G22	Fan	60	1	60
	G21	Fan	60	2	120
	G18	Fan	60	1	60
	G11	Fan	60	1	60
	G10	Fan	60	1	60
	G8	Fan	60	1	60
	G9	Fan	60	1	60
	G7	Fan	60	1	60

	G6	Fan	60	1	60
	G4	Fan	60	1	60
	G3	Fan	60	2	120
	G17	Fan	60	1	60
	G16	Fan	60	1	60
	G15	Fan	60	1	60
	Dining room	Fan	60	2	120
Ladies Hostel (First Floor)	F1	Fan	60	1	60
	F2	Fan	60	3	180
	F3	Fan	60	2	120
	F4	Fan	60	2	120
	F5	Fan	60	2	120
	F6	Fan	60	1	60
	F8	Fan	60	2	120
	F10	Fan	60	1	60
	F14	Fan	60	1	1
	F15	Fan	60	1	60
	F16	Fan	60	4	240
	F13	Fan	60	1	60
	F12	Fan	60	1	60
	F11	Fan	60	1	60
	Room	Fan	60	1	60
IT BLOCK	Dept of Computer	Fan	60	xx	xx
	Class Room	Fan	60	2	120
Geo Block (First Floor	202	Fan	60	2	120
	Staff Room	Fan	60	1	60
		Wall Fan	60	1	60
	Project Room	Wall Fan	60	1	60
	207	Fan	60	1	60
	Remote Sensing Lab	Fan	60	3	180
	Staff Room	Fan	60	1	60

	Geo-Chemical Lab	Fan	60	1	60
	203	Fan	60	2	120
	209	Fan	60	1	60
	Office	Fan	60	7	420
		Wall Fan	60	1	60
	214	Fan	60	3	180
	216	Fan	60	2	120
	217	Fan	60	1	60
	IQAC	Fan	60	2	120
	Botany lab	Fan	60	4	240
	Zoology lab	Fan	60	5	300
	224	Fan	60	1	60
		Exhaust Fan	60	1	60
	Zoology Museum	Fan	60	1	60
	223	Fan	60	1	60
		Wall Fan	60	1	60
	226	Fan	60	1	60
	228	Fan	60	2	120
	Micro bio lab	Fan	60	1	60
Second Floor	Research Room	Fan	60	2	120
	Aqua Museum	Fan	60	2	120
		Wall Fan	60	1	60
	229	Fan	60	1	60
	225	Fan	60	1	60
	Management S. Hall	Fan	60	5	300

TABLE 11: CONNECTED LOADS – COLLEGE BUILDING

SUMMARY OF LOADS

The details of the loads installed in the college are given below:

Sl.No:	Particulars	Total Load
		kW
1	Light Loads	16.765
2	Fan Loads	22.26
3	Computers & UPS loads	77.27
4	Pump	51.707
5	Amplifier and Projector	5
6	Air Conditioners	12.827
	Total	**185.829**

TABLE 12: CONNECTED LOAD

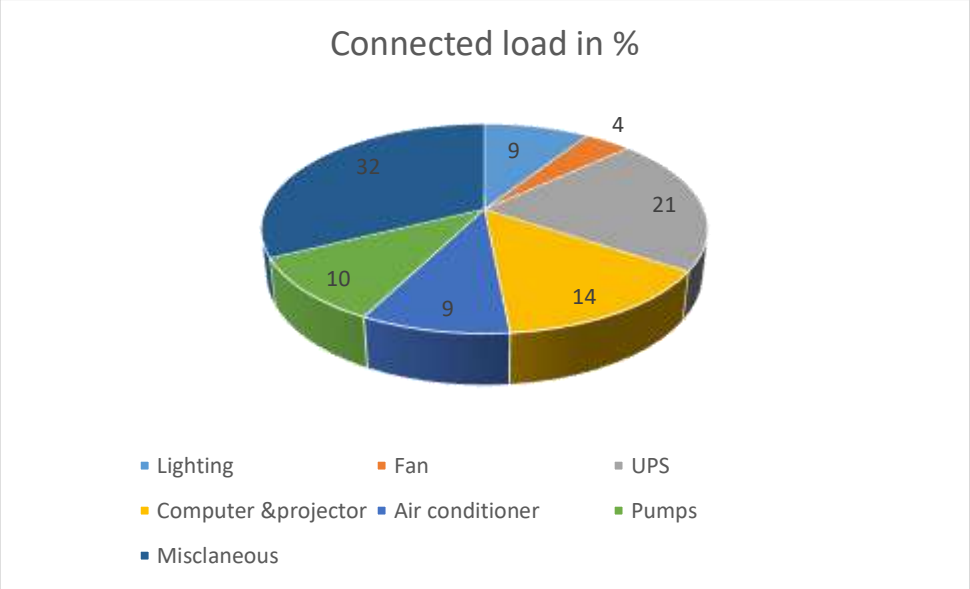


FIGURE 2: CONNECTED ELECTRICAL LOAD

LUX MEASUREMENTS

According to National Lighting code-2010 BIS to determine the overall energy efficiency of lighting system using measurements and methods, which is applicable to all commercial buildings. One of the methods is Illuminance method, which is the most practicable one. Details are given in the section. Lux levels of some areas are given in the Table. The lux levels mentioned as satisfactory need to be improved.

Sl. No.	AREA	Measured Lux	Required Lux	Remarks
1	Chemistry classroom	150	150	Satisfactory
2	Chemistry Lab	165	150	Good
3	Commerce class	170	150	Good
4	Botany lab	180	150	Good
5	Office	180	150	Good
6	Microbiology	180	150	Good
7	Entrance	250	150	Good
8	Geology museum	145	150	Satisfactory
9	Sports centre	290	150	Good
10	Computer Science	220	150	Good
11	Hostel ladies	160	150	Good
12	Hostel Boys	170	150	Good
13	Library	190	150	Good

Table 13: LUX MEASUREMENT

ANNEXURE-1

ENERGY SAVING PROPOSALS - 1

REPLACEMENT OF CEILING FANS IN THE OFFICE WITH ENERGY EFFICIENT BLDC FANS

Background

A BLDC fan takes in AC voltage and internally converts it into DC using SMPS. The main difference between BLDC and ordinary DC fans is the commutation method. A commutation is basically the technique of changing the direction of current in the motor for the rotational movement. In a BLDC motor, as there are no brushes, so the commutation is done by the driving algorithm in the Electronics. The main advantage is that over a period, due to mechanical contact in a brushed motor the commutators can undergo wear and tear, this thing is eliminated in BLDC Motor making the motor more rugged for long-term use. To explain, BLDC technology in simpler terms, BLDC uses a combination of Permanent Magnets and Electronics to achieve the kind of efficiency and performance, it delivers. A BLDC fan composes of 3 main components: - 1. Stator 2. Rotor 3. Electronics

Proposal

Replace the ceiling fans with BLDC in the as per preference of operating hours as office areas., staff rooms and in security cabin and in hostels the calculation for the savings is given in the table.

Particulars	Units	BLDC fan	With BEE star rated
Existing Ceiling Fans	Watts	60	60
Proposed BLDC Fans	Watts	35	45
Difference in Wattage	Watts	25	15
Avg No: of working hours/day	Hrs	10	10
No: of working days per year (Average)		250	250
No: of working hours per annum	Hrs	2500	2500
Number of Fans operating	Nos	40	40
Energy Saving per Annum	**kWh**	**2500**	**1500**
Cost per kWh	Rs	8.15	8.15
Annual Financial Savings	**Rs**	**20375**	**12225**
Cost of BLDC Fans	Rs	2500	1900
Salvage value of fan	Rs	200	200
Investment for Fans	Rs	92000	68000
Simple Payback period	Months	54	67

TABLE 14: EC PROPOSAL 1

ENERGY SAVING PROPOSALS – 2

REPLACEMENT OF FLUORESCENT TUBES WITH ENERGY EFFICIENT LED LIGHTS

At present LED lights are used in very few areas. Replacement of Fluorescent lights to be done in phase manner with LED lights.

Particulars		T-12	T8	T-5
Existing Fluorescent lights	Watts	44	40	28
Proposed LED light	Watts	18	18	18
Difference in Wattage	Watts	26	22	10
Avg No: of working hours/day	Hrs	8	8	8
No: of working days per year (Average)	Nos	250	250	250
No: of working hours per annum	Hrs	2000	2000	2000
Number of Lights operating	Nos	9	88	22
Energy Saving per Annum	**kWh**	**468**	**3872**	**440**
Cost per kWh (Average)	Rs	8.15	8.15	8.15
Annual Financial Savings	**Rs**	**3814**	**31557**	**3586**
Cost of LED light	Rs	250	250	250
Investment for LED lights	Rs	2250	22000	5500
Simple Payback period	Months	7	9	18

Summary

Annual Energy Savings	kWh	4780
Total Financial Savings	Rs	38957
Total investment	Rs	29750
Payback period	Months	9

TABLE 15: EC PROPOSAL 2

Reason for change in the lighting system

- Lighting quality can have a dramatic influence on the attitude and performance of working persons, if they have an environment that with proper uniform lighting.
- In addition to the lumens per watt which is a lighting quantity calculation lighting quality and life of lighting system is also to be considered.
- Lighting quality can be divided into Uniformity, Glare, Colour rendering Index, coordinated colour temperature.
- In case of consistency and in uniformity, the life time of LED is far better than CFL s and FTLs.
- Deterioration of lumens or lux level in FTLs and CFL are more as compared with LED which is consistent during in its life time.
- Considering VCP (Visual Comfort Probability) LED is better option than FTLs and CFL because the glare value is lesser.
- The LED are whitish in colour than FTLs which is giving a better feeling of brightness to the persons occupied or working
- CCT of LED is 5000k which is white as compared with lesser CCT for FTLS of 4500 k
- There is no mercury content in the LED as compared with CFL and FTL s hence it is environmentally supportive.
- The life cycle data of tube lights with LED is given in the table below.

Type of lamp	Typical life in Hours	Cost per lamp	No: of lamps required during LED lifetime (led 60,000 Hours)	Replacement cost per lamp	Approximate maintenance expense for replacement	Total cost per lamp
T12	5000	45	12	540	500	1040
T8	5000	45	12	540	500	1040
T5	5000	100	12	1200	500	1700
LED	60000	800	1	800	0	800

Table 16: Lifecycle data of light types

ENERGY SAVING PROPOSAL-3

INSTALLATION OF 20 kW SOLAR ON GRID SYSTEM

The Sun is an inexhaustible, reliable and non-polluting source of power. Since the inception of life on earth, the only energy that was available came from the sun. The time is now approaching when mankind will again depend upon the sun as dominant energy source. We are aware that fossil fuels are not going to last forever. A growing worldwide concern for conservation of energy has reignited our interest in ecologically sustainable materials, processes and sources of energy.

Of the numerous renewable sources of energy known to mankind, Solar Photo Voltaic or SPV is one that has the potential to supply power for our future needs. The advantages of solar power are:

- The solar energy is more evenly distributed in the world than wind or biomass.
- It is well proven and demonstrated technology
- It promises to be most cost-effective renewable power at high volumes.
- The solar energy potential in India is immense due to its convenient location near the Equator. India receives nearly 3000 hours of sunshine every year, which is equivalent to 5000 trillion kWh of energy.

Solar Grid Tie mode system of **20 kW as rooftop**, can install in the MES College-Ponnani without any modification in the electrical system.

Summary:

Particulars	Unit	Values
Proposed system	kW	20
Average Energy Consumption	kWh/day	80
Average Energy Consumption	kWh/year	24000
Average utility electricity cost	Rs	8.15
Annual Financial Savings	Rs	195600
Investment (subsidized & in grid tied mode)	Rs	12,00000
Simple payback period	Months	74

Table 17: ECPROPOSAL3

ANNEXURE-2

1. LED specification

The Department of Electronics and information technology issued "Electronics and information Technology goods order 2012" on 3rd October 2012 the following standards for LED lamps are covered.

1. IS 15885 (Part -2/section 13)
2. IS 16102 (Part-1): 2012

As per this order LED manufactures to get their product tested from BIS recognised labs.

Thus, the following electrical parameters and standards should ensure while purchasing LED in future based on the BIS standards. These are the minimum technical requirements for the acceptance of LED. Also, the LED test certificates as per the various standards mentioned below should be examined while purchasing.

Sl no	Parameters	Requirements	Applicable IS
1	Light source	SMD LED chip	LM 80/IS 16106
2	System Efficacy	>= 110 lumen /watt	IS 16106:2012
3	LED Driver Efficiency	Minimum 85%	
4	**Harmonics**	**Maximum 10%**	**IS 16102-2-2012**
5	**Power factor**	**Minimum 0.95**	**IS 16102-2**
6	Frequency	50 Hz ±3%	LM-79 report
7	Operating voltage	110V – 320V	LM 79 report
8	Surge voltage	>4 kV	LM 79 report
9	Ambient temp	-10 to 50 deg C	LM 79 report
10	Degree of protection	IP 66	IS 10322
11	CRI	Minimum 70	IS 16102 - 2

TABLE 18: LED SPECIFICATION

2. BLDC SPECIFICATION

Normal trend of one ceiling fan working hours with present cost while replacing with BLDC fan and the payback period is given in below table.

Number of working hours/day for a single ceiling fan	**Hours**	9	10	11	12	13	14	15	16	17	18	19	More than 20
Simple payback period after replacement with BLDC	**Years**	5	5	4	4	4	3	3	3	3	3	3	2

The BLDC fan test certificates as per the various standards mentioned below should be examined while purchasing.

Sl no	Parameters	Requirements	Applicable IS
1	Air delivery	215 CMM	IS 374 - 2019
2	Harmonics	Maximum 10%	IS 374 - 2019
3	Power factor	Minimum 0.95	IS 374 - 2019
4	Frequency	50 Hz ±3%	IS 374 - 2019
5	Insulation resistance	>2 MΩ	IS 374 - 2019
6	Speed	350 rpm	IS 374 - 2019
7	Maximum temperature rise	70 deg C	IS 374 - 2019
8	Degree of protection	IP 65	IS 10322

Table 19: BLDC specification

ABBREVIATIONS

APFC	:	Automatic Power Factor controller
AVG	:	Average
BDV	:	Breakdown voltage
BEE	:	Bureau of energy efficiency
CEA	:	Central electrical authority
CFL	:	Compact fluorescent lamp
CFM	:	Feet cube per minute
DB	:	Distribution Board
DG Set	:	Diesel Generator Set
EC	:	Energy Conservation
FD	:	Forced draft
HPSV	:	High-pressure sodium vapour
HT	:	High Tension
ID	:	Induced draft
IEC	:	International electro technical commission
IEEE	:	The Institute of electrical and electronics engineers
IS	:	Indian Standard
KG	:	Kilogram
KVA	:	Kilo Volt Ampere
KVAH	:	Kilo volt Ampere Hour
KVAR	:	Kilo volt-ampere
KW	:	Kilo Watts
KWH	:	Kilowatt-hour
LED	:	Light emitting diode
MAX	:	Maximum
MH	:	Metal halide
NEMA	:	National Electrical Manufacturers Association
OLTC	:	On load tap changer
ONAN	:	Oil natural air natural
PCC	:	Point of common coupling
PSI	:	Pound square inch
RMD	:	Registered Maximum demand
SEC	:	Specific electricity consumption
SFU	:	Switch Fuse Unit
SLD	:	Single Line Diagram
TDD	:	Total demand distortion
THD	:	Total harmonics distortion
TOE	:	Tonne of oil equivalent
UPS	:	Uninterruptible power supply
VFD	:	Variable frequency drive

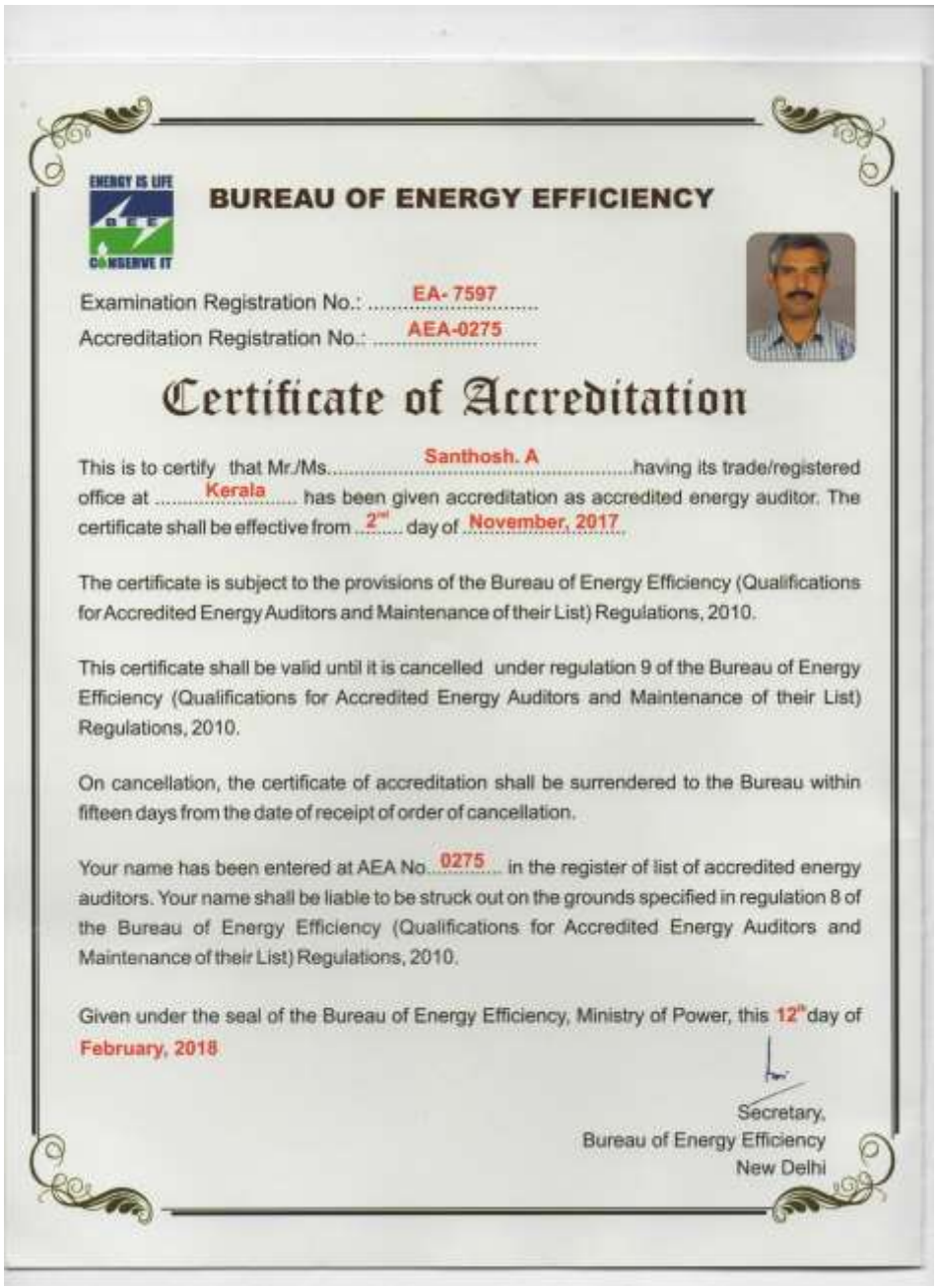
INSTRUMENTS USED

SL.NO	EQUIPMENT DESCRIPTION	MAKE & MODEL
1	Power energy & harmonic Analyser	Krykard ALM 35
2	Thermal Imager	FLIR E50

TABLE 20: INSTRUMENTS USED

REFERENCES

1. BEE energy audit books
2. CEA regulations of grid connectivity-2007
3. IEEE Std. 519-1992.
4. National lighting code - 2010



BUREAU OF ENERGY EFFICIENCY

Examination Registration No.: EA- 7597

Accreditation Registration No.: AEA-0275

Certificate of Accreditation

This is to certify that Mr./Ms. Santhosh. A having its trade/registered office at Kerala has been given accreditation as accredited energy auditor. The certificate shall be effective from 2nd day of November, 2017

The certificate is subject to the provisions of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

This certificate shall be valid until it is cancelled under regulation 9 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

On cancellation, the certificate of accreditation shall be surrendered to the Bureau within fifteen days from the date of receipt of order of cancellation.

Your name has been entered at AEA No. 0275 in the register of list of accredited energy auditors. Your name shall be liable to be struck out on the grounds specified in regulation 8 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

Given under the seal of the Bureau of Energy Efficiency, Ministry of Power, this 12th day of February, 2018

Secretary,
Bureau of Energy Efficiency
New Delhi