ENERGY AUDIT – 2018

BISHOP CHULAPARAMBIL MEMORIAL COLLEGE FOR WOMEN

Kottayam

Kerala

EXECUTED BY

ATHUL ENERGY CONSULTANTS PVT LTD

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ACKNOWLEDGEMENTS

We express our sincere gratitude to the **BISHOP CHULAPARAMBIL MEMORIAL COLLEGE FOR WOMEN** 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.

1	Prof. Josephina Simon	Principal
2	Fr. Philmon Kalathra	Secretary Corporate Educational Agency of Colleges
3	CA Reshma Rachel Kuruvilla	Asst. Professor in Commerce
4	Dr. Peter K Monai	Head Department of Botany
5	Mr. Jimmy K Stephen	System Administrator
6	Mr. Shiju Joseph	Mechanic on Contract

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)
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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	1762	27562
Auditorium	557	4619
Library	1088	8077
Computer Centre	179	2451

TABLE 1: ENERGY CONSUMPTION & COST ANALYSIS

2. ENERGY SAVING PROPOSALS

The following table shows the energy saving proposals

Sl. no	Energy conservation measures	Annual Energy Savings	Annual Financial Savings	Investment	Simple payback period
		kWh	**Rs**	**Rs**	**Months**
1	Replacement of ceiling fans with BLDC fans or with Energy Efficient fans	7040 or 3300	64064 or 330030	4,20,000 or 1,40,000	42 or 24
2	Replacement of Fluorescent tubes with energy efficient LED lights	11424	103958	60,000	7

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	Classrooms, 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 BCM College are given below in table.

Sl.No:	Particulars	Details
1	Name of the College	Bishop Chulaparambil Memorial College
2	Address	Kottayam Kumily Road
		Kottayam - 686001
3	Contact Person	Dr. Stephy Thomas
4	Contact Phone numbers & Fax	0481-2562171
		0481-2560307
5	E-mail ID	bcmktym@yahoo.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 BCM COLLEGE

BCM College was founded by His Excellency Bishop Thomas Tharayil, a pioneer in women's education in the Christian Community of Central Travancore. A priest true to heaven and an educationalist concerned with the progress of the world, Bishop Thomas Tharayil founded this institution in honour of his illustrious predecessor, His Excellency Bishop Alexander Choolaparambil, in 1955, with a student community of 63 girls. Bishop Thomas Tharayil felt that women's education was the key to social progress.

Prof. V.J. Joseph was the first principal of this college which began with eight members on the teaching staff and one member in the non-teaching staff. The college was formally inaugurated by Cardinal Valerian Gratius. As per the University specification a lady Principal, Sr. Fidelius of the Mangalore Carmel Convent was appointed.

From its humble beginnings, the college has made steady progress and is now one of the foremost Women's Colleges in Kerala with over 1400 students.

The college motto is SAPIENTIA ET GRATIA i.e. WISDOM AND GRACE, the two essential qualities in a woman. Believing that the true purpose of education is the overall development of personality, the college tries to promote spiritual and moral growth along with intellectual development. It is expected that when a student leaves the portals of B.C.M. after her education, she will have become what our founder visualized as the ideal educated woman, one who combines in her wisdom and grace.

ELECTRICITY CONSUMPTION ANALYSIS

1. BASELINE DATA & CONSUMPTION

Base Line Data	College	College	Auditorium	Library	Computer Centre
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:					
Billing Period	Monthly	Monthly	Bimonthly	Bimonthly	Monthly
Connected Load (kW)	17.595	18.51	9.36	5.54	15.625
Average monthly electricity consumption (kWh)	1847	1677	557	1088	179
Average fixed charges (Rs/month)	1170	1235	1300	780	203
Average Tariff rate for energy consumption, (Rs / kWh)	6.5	6.5	5.7	5.7	6.3
Fixed charges (Rs/kW)	66.5	66.7	133.89	140.79	81.92
Average monthly electricity cost (Rs)	14101	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

Consumer No: 1146341002304										
Connected Load			17.595 kW							
Month		Jan-19	Mar-19	Apr-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19
Monthly Consumption	kWh	1687	2076	1105	1593	2719	1586	1583	1612	2666
Average Consumption	kWh	1655	1711	1850	1850	1850	1817	1784	1701	1594
Fixed Charges	Rs	900	900	900	900	1125	1170	1170	1170	1170
Energy Charges	Rs	10628.5	13079.42	6962.15	10036.7	17583	10309.3	10290.2	10478.4	17329.3
Duty	Rs	1062.85	1307.942	696.215	1003.67	1758.3	1030.93	1029.02	1047.84	1732.93
Metre Rent	Rs	15	15	15	15	15	15	15	15	15
Total Cost	Rs	12606.3	15302.362	8573.37	11955.4	20481.3	12525.2	12504.2	12711.2	20247.2

TABLE 6: EB BILLS – COLLEGE BUILDING

❖ College Building

Consumer No: 1146349002303											
Connected Load			18.51 kW								
Month		Dec-18	Jan-19	Mar-19	Apr-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19
Monthly Consumption	kWh	1882	1442	2215	982	1661	2173	1409	1582	1565	1862
Average Consumption	kWh	1956	1956	1956	1956	1956	1956	1783	1669	1563	1519
Fixed Charges	Rs	950	950	950	950	950	950	1235	1235	1235	1235
Energy Charges	Rs	11857	14011.3	13954.8	6186.64	10464.9	14052.6	9159.3	10283.9	10172.9	12103.9
Duty	Rs	1185.7	1401.13	1395.48	618.664	1046.49	1405.26	915.93	1028.39	1017.29	1210.39
Metre Rent	Rs	0	9	15	15	15	15	15	15	15	15
Surcharge	Rs	282.3	0	82	0	0	0	0	0	0	0
Total Cost	Rs	14275	16371.4	16397.3	7770.3	12476.4	16422.8	11325.2	12562.2	12440.2	14564.2

TABLE 7: EB BILLS – COLLEGE BUILDING

❖ Auditorium

Consumer No: 1146346002305						
Connected Load			9.36 kW			
Month		Jan-19	Jun-19	Aug-19	Oct-19	Dec-19
Monthly Consumption	kWh	844	652	374	481	434
Average Consumption	kWh	173	309	342	264	251
Fixed Charges	Rs	1000	1000	1230	1300	1300
Energy Charges	Rs	4642.4	3586	2114.86	2742.13	2473.92
Duty	Rs	464.24	358.6	211.486	274.213	247.392
Metre Rent	Rs	30	30	30	30	30
Total Cost	Rs	6136.64	4974.6	3586.35	4346.34	4051.312

TABLE 8: EB BILLS – AUDITORIUM

❖ Library

Consumer No: 1146345005597						
Connected Load			5.54 kW			
Month		Jan-19	Jun-19	Aug-19	Oct-19	Dec-19
Monthly Consumption	kWh	1303	845	1234	1063	994
Average Consumption	kWh	562	623	556	544	524
Fixed Charges	Rs	600	600	738	780	780
Energy Charges	Rs	8209.71	4647.85	7963.96	6910.35	5666.72
Duty	Rs	820.971	464.785	796.396	691.035	566.672
Metre Rent	Rs	30	30	30	30	30
Total Cost	Rs	9660.68	5742.64	9528.36	8411.39	7043.392

TABLE 9: EB BILLS – LIBRARY

❖ Computer Centre

Consumer No: 1146344019074								
Connected Load			15.625 kW					
Month		Dec-18	Jan-19	Apr-19	Jun-19	Jul-19	Aug-19	Sep-19
Monthly Consumption	kWh	158	196	88	217	260	179	154
Average Consumption	kWh	196	204	176	193	203	212	203
Fixed Charges	Rs	1120	1120	1120	1120	1253.33	1280	1280
Energy Charges	Rs	996.06	1285.78	554.86	1367.59	1638.17	1128.38	971.13
Duty	Rs	99.606	128.578	55.486	136.759	163.817	112.838	97.113
Metre Rent	Rs	15	15	15	15	15	15	15
Surcharge	Rs	23.7	0	0	0	0	0	
Total Cost	Rs	2254.37	2549.36	1745.35	2639.35	3070.32	2536.22	2363.24

TABLE 10: EB BILLS – COMPUTER CENTRE

3. CONSUMPTION ANALYSIS

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

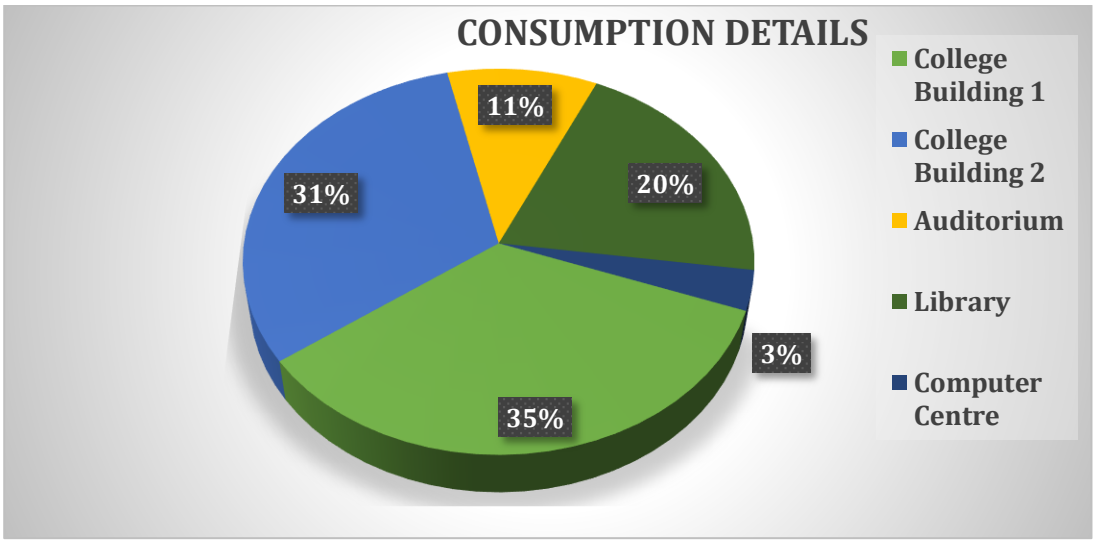

FIGURE 1: CONSUMPTION ANALYSIS

Inference

i. College buildings spaces more than 60% of the energy consumption.

CONNECTED LOAD DETAILS

The connected load details of various areas in the college are given below:

- **College Building (Consumer No: 1146341002304)**

Sl.No:	Particulars	Rated Power	Quantity	Total Load
		Watts	Nos	kW
1	T12	40	75	3
2	T8	36	2	0.072
3	T8 (2 Feet)	18	4	0.072
4	LED Light	18	1	0.018
5	Lamp	25	2	0.05
6	Lamp	15	22	0.33
7	Lamp	3	3	0.009
8	Lamp	9	1	0.009
9	Circle Type Down Lamp	9	51	0.459
10	Square Type Down Lamp	9	6	0.054
11	LED Strip	30	1	0.03
12	LED Strip	60	5	0.3
13	Street Lamp	40	1	0.04
14	Wall Fan	60	6	0.36
15	Pedestal Fan	60	1	0.06
16	Ceiling Fan	60	54	3.24
17	Exhaust Fan	60	9	0.54
18	Projector	500	3	1.5
19	Projector	900	1	0.9
20	Printer	900	1	0.9
21	Printer	575	1	0.575
22	DVR	60	2	0.12
23	UPS 1	7500	1	7.5
24	UPS 2	3500	1	3.5
25	UPS 3	600	2	1.2
26	UPS 4	650	1	0.65
27	Inverter	1000	1	1
28	Air Oven	1000	1	1
29	Hot Air Oven	250	3	0.75
30	Centrifuge	373	6	2.238
31	Distillation Unit	2000	1	2
32	Refrigerator	106	1	0.106
33	Refrigerator	201	1	0.201
34	Refrigerator	306	2	0.612
35	Lamination Air Flow Cabinet	1500	1	1.5
36	Purifier	15	3	0.045
37	Purifier	80	2	0.16
38	Cooler	280	1	0.28
39	Air Conditioner	1438	1	1.438
40	Air Conditioner	1625	1	1.625

41	Air Conditioner	1100	1	1.1
42	Air Conditioner	1050	1	1.05
43	Water Bath	1500	2	3
44	Deionizer	80	1	0.08
45	Induction Cooker	1900	2	3.8
46	Heater	1000	2	2
47	Vacuum Cleaner	1400	1	1.4
48	Amplifier	1000	2	2
49	Remi ultra-centrifuge	3000	1	3
50	Electro photometer	500	1	0.5
51	Rotary Shaker	480	1	0.48
52	Electron Microscope	120	1	0.12
53	BOD Incubator	1500	1	1.5
54	Deep Freezer	280	1	0.28
55	Coffee Maker	500	1	0.5
56	Motor	746	1	0.746
TOTAL kW			**59.99**	

TABLE 11: CONNECTED LOADS – COLLEGE BUILDING

Summary of the Loads

Sl. No:	Particulars	Total Load
		kW
1	Light Loads	4.443
2	Fan Loads	4.2
3	Computers & UPS loads	19.845
4	Other Power Loads	26.298
5	Air Conditioners	5.213
TOTAL		**59.99**

TABLE 12: SUMMARY OF LOADS– COLLEGE BUILDING

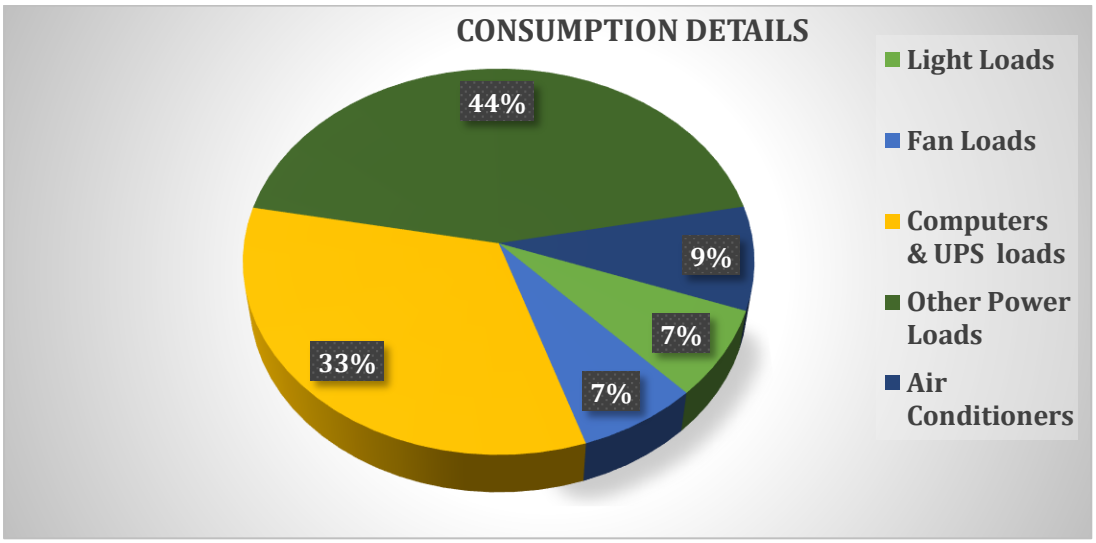

FIGURE 2: SUMMARY OF LOADS– COLLEGE BUILDING

➢ **College Building (Consumer No: 1146349002303)**

Sl.No:	Particulars	Rated Power	Quantity	Total Load
		Watts	Nos	kW
1	T12	40	79	3.16
2	T8	36	23	0.828
3	T8 (2 Feet)	18	4	0.072
4	Lamp	25	1	0.025
5	Lamp	15	55	0.825
6	CFL	60	3	0.18
7	CFL	15	4	0.06
8	Square Type Down Lamp	18	17	0.306
9	Square Type Down Lamp	60	5	0.3
10	Street Lamp	40	7	0.28
11	Wall Fan	60	7	0.42
12	Pedestal Fan	60	46	2.76
13	Ceiling Fan	60	122	7.32
14	Exhaust Fan	60	4	0.24
15	Projector	500	1	0.5
16	Projector	900	5	4.5
17	Projector	6000	2	12
18	Printer	900	3	2.7
19	Printer	575	4	2.3
20	Printer	720	2	1.44
21	Computer	250	12	3
22	DVR	60	7	0.42
23	UPS 1	600	9	5.4
24	UPS 2	2000	1	2
25	UPS 3	3000	2	6
26	UPS 4	575	2	1.15
27	Autoclave	1500	2	3
28	Hot Air Oven	250	5	1.25
29	Centrifuge	373	4	1.492
30	Weighing Machine	60	2	0.12
31	Distillation Unit	2000	1	2
32	Refrigerator	106	1	0.106
33	Refrigerator	120	1	0.12
34	Cooler	280	2	0.56
35	Lamination Air Flow Cabinet	1500	2	3
36	Mufle Furnace	1500	1	1.5
37	LED Display	60	3	0.18
38	Purifier	18	3	0.054
39	Cooler	160	2	0.32
40	Cooler	575	1	0.575
41	Network Switch	140	1	0.14
42	Air Conditioner	1438	2	2.876
43	Autoclave	3000	1	3
44	Incubator	250	1	0.25

45	Projector	60	1	0.06
46	Sanitary napkin destroyer	100	1	0.1
47	Water Bath	1500	2	3
48	Heating Mandle	600	1	0.6
49	Deionizer	60	1	0.06
TOTAL				82.549

TABLE 13: CONNECTED LOADS – COLLEGE BUILDING

Summary of the Loads

Sl.No:	Particulars	Total Load
		kW
1	Light Loads	6.036
2	Fan Loads	10.74
3	Computers & UPS loads	41.47
4	Other Power Loads	21.427
5	Air Conditioners	2.876
TOTAL		**82.549**

TABLE 14: SUMMARY OF LOADS– COLLEGE BUILDING

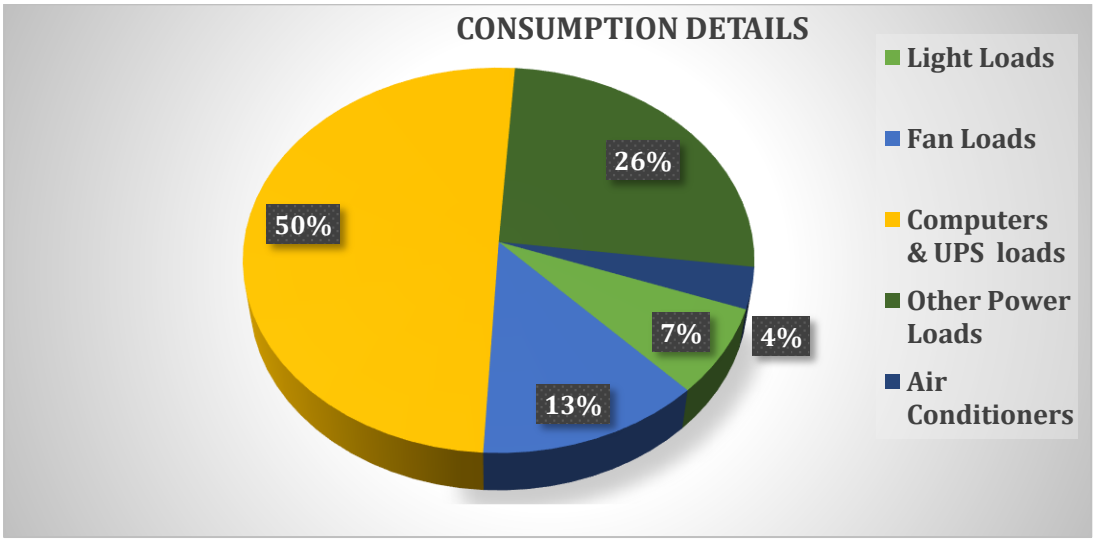

FIGURE 3: SUMMARY OF LOADS– COLLEGE BUILDING

➢ **Library (Consumer No: 1146345005597)**

Sl.No:	Particulars	Rated Power	Quantity	Total Load
		Watts	Nos	kW
1	T12	40	55	2.2
2	T8	36	5	0.18
3	CFL	25	2	0.05
4	CFL	15	10	0.15
5	CFL	3	1	0.003
6	CFL	60	10	0.6
7	Down Lamp	9	3	0.027
8	Wall Fan	60	1	0.06
9	Ceiling Fan	60	52	3.12
10	UPS 1	1000	2	2
11	UPS 2	2000	1	2
12	Copier	1280	1	1.28
13	TV	90	1	0.09
14	Projector	575	1	0.575
15	Printer	600	1	0.6
16	UPS	500	3	1.5
17	Oven	2000	1	2
TOTAL			16.435 kW	

TABLE 15: CONNECTED LOADS – LIBRARY

Summary of the Loads

Sl.No:	Particulars	Total Load
		kW
1	Light Loads	3.21
2	Fan Loads	3.18
3	Computers & UPS loads	7.955
4	Other Power Loads	2.09
TOTAL		16.435 kW

TABLE16:SUMMARYOF LOADS– LIBRAY

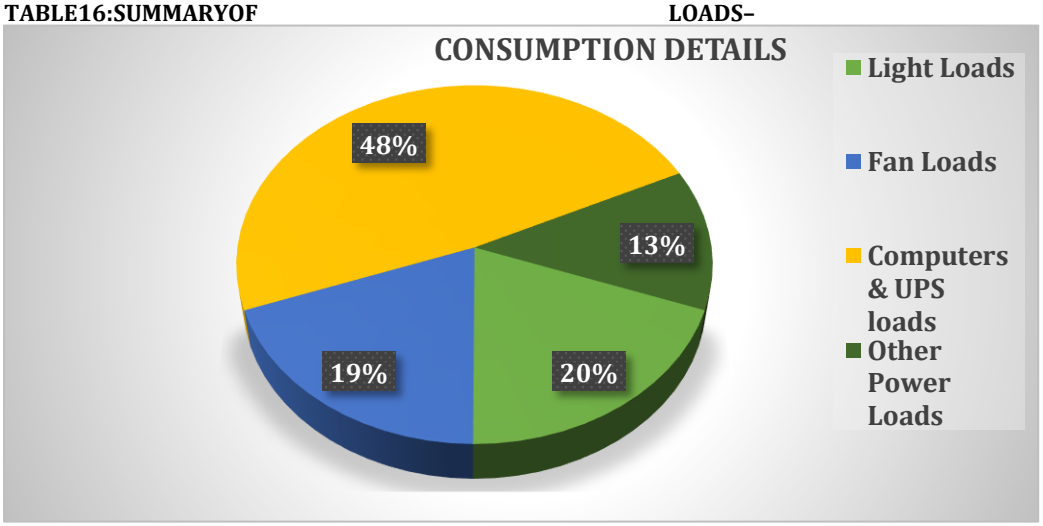

FIGURE 4: SUMMARY OF LOADS– LIBRARY

➢ **Auditorium (Consumer No: 1146346002305)**

Sl.No:	Particulars	Rated Power	Quantity	Total Load
		Watts	Nos	kW
1	LED	18	1	0.018
2	T8	36	1	0.036
3	T8 (2 Feet)	18	3	0.054
4	T5	28	33	0.924
5	CFL	30	3	0.09
6	CFL	3	1	0.003
7	CFL	85	2	0.17
8	CFL	60	6	0.36
9	Doom Lamp	85	2	0.17
10	Spot Lamp	50	1	0.05
11	Spot Lamp	18	2	0.036
12	Street Lamp	40	1	0.04
13	Square Type Down Lamp	30	21	0.63
14	Square Type Down Lamp	18	5	0.09
15	Square Type Down Lamp	3	5	0.015
16	Ceiling Fan	60	56	3.36
17	Exhaust Fan	60	3	0.18
18	Bell	120	1	0.12
19	Cooler	280	1	0.28
20	Motor	1119	1	1.119
21	Amplifier	5000	1	5
22	Curtain Motor	373	1	0.373
TOTAL				**13.118 kW**

TABLE 17: CONNECTED LOADS – AUDITORIUM

Summary of the Loads

Sl.No:	Particulars	Total Load
		kW
1	Light Loads	2.686
2	Fan Loads	3.54
3	Amplifier	5
4	Other Power Loads	1.892
TOTAL		**13.118 kW**

TABLE 18: SUMMARY OF LOADS– AUDITORIUM

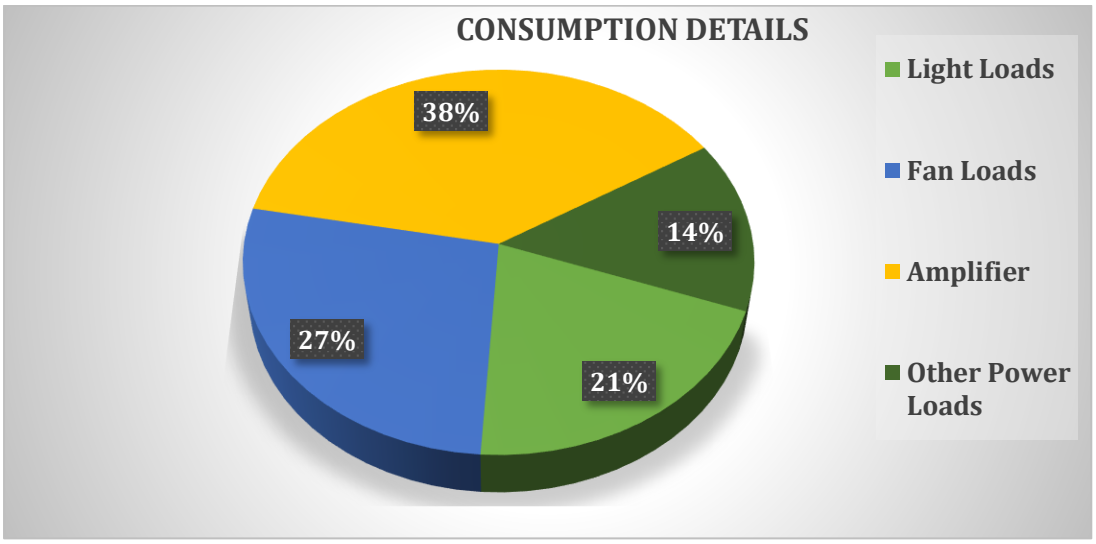

FIGURE 5: SUMMARY OF LOADS– AUDITORIUM

- **Computer Centre (Consumer No: 1146344019074)**

Sl.No:	Particulars	Rated Power	Quantity	Total Load
		Watts	Nos	kW
1	Square type down lamp	30	13	0.39
2	Ceiling Fan	60	10	0.6
3	Air Conditioner	1438	1	1.438
4	Air Conditioner	1650	2	3.3
5	UPS	5000	1	5
6	UPS	3000	1	3
TOTAL			**13.728**	

TABLE 19: CONNECTED LOADS – COMPUTER CENTRE

Summary of the Loads

Sl.No:	Particulars	Total Load
		kW
1	Light Loads	0.39
2	Fan Loads	0.6
3	Computers & UPS loads	8
4	Air Conditioners	4.738
TOTAL		**13.728**

TABLE 20: SUMMARY OF LOADS– COMPUTER CENTRE

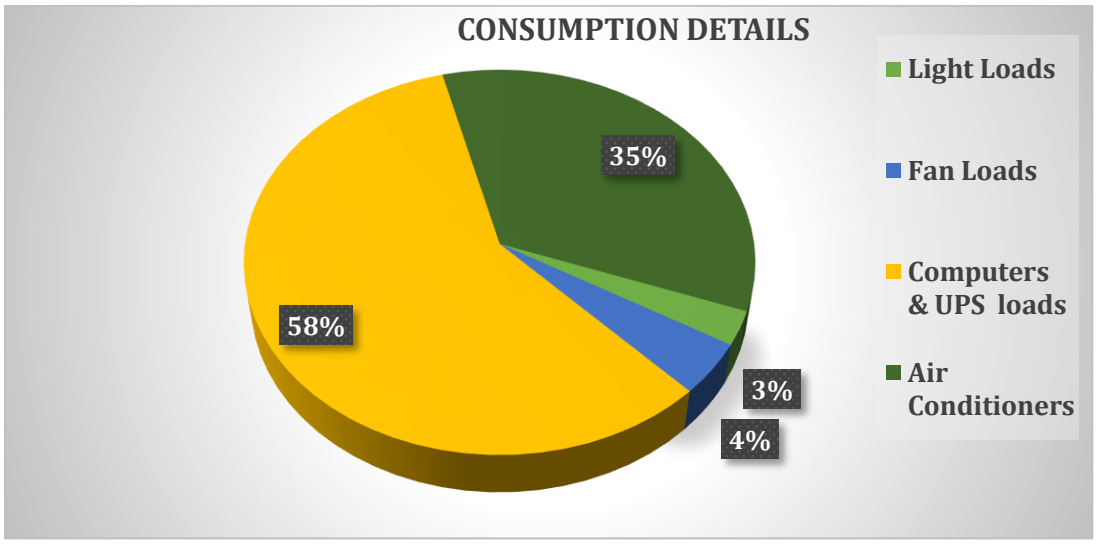

FIGURE 6: SUMMARY OF LOADS– COMPUTER CENTRE

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	Other Power Loads	51.707
5	Amplifier	5
6	Air Conditioners	12.827
	Total	**185.829**

TABLE 21: LIGHT DETAILS

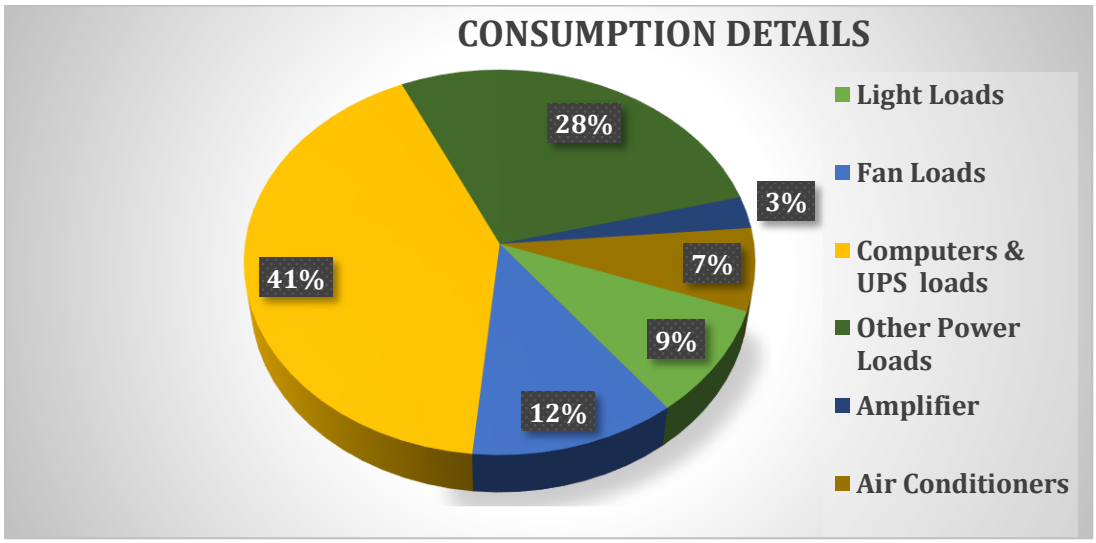

FIGURE 7: SUMMARY OF CONNECTED LOADS

Inference

- There are around **16.765 kW** of lighting loads are installed.
- Majority of the light fittings are Fluorescent tubes.
- LED lights are installed in some areas also.

Suggestions

- Replace the Fluorescent tubes with LED lights.
- Maximize the use of sunlight in classrooms.
- Switched off the lights after the use.
- Provide Timer controllers for Board lights.
- Provide proper labelling for the electrical panels.

RENEWABLE ENERGY

Solar plant: College installed 100kW solar power plant in its facility showing their dedication to sustainability and environmental protection.

Bio gas plant: For treating the bio degradable food wastes from college and hostels canteens. The biogas plant convert food wastes into methane gas and usable bio fertilizers which will used for plants.

E charging: College is agreed in principle to install a E- charging station in college, which shows the advance level of thinking by college authorities

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 below.

Particulars	Unit	With BLDC	With BEE star rated
Power of existing ceiling fans at full speed	Watts	60	60
Power of replacing fan	Watts	28	45
Difference in Wattage	Watts	32	15
Avg No: of working hours/day	Hrs	5	5
No: of working days per year (Average)	Nos	220	220
No: of working hours per annum	Hrs	1100	1100
Number of Ceiling Fans operating	Nos	200	200
kWh Saving per Annum	kWh	7040	3300
Cost per kWh (Average)	Rs	9.1	9.1
Annual Financial Savings	Rs	64064.00	30030.00
Cost of replacing Fan per piece	Rs	2500	1100
Investment for replacing Fan	Rs	500000	220000
Salvage value per fan	Rs	400	400
Total salvage value	Rs	80000	80000
Simple Payback period	Months	42	24
Investment for replacing fan		420000	140000

TABLE 22: 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	Unit	Value
Power of Fluorescent lights	Watts	52
Proposed LED light	Watts	18
Difference in Wattage	Watts	34
Avg No: of working hours/tube/day	Hrs	8
No: of working days per year (Average)	Nos	210
No: of working hours per annum	Hrs	1680
Number of Lights operating	Nos	200
kWh Saving per Annum	Rs	11,424.00
Cost per kWH (Average)	Rs	9.1
Annual Financial Savings	Rs	1,03,958.40
Cost of LED tube	Rs	300
Investment for LED lights	Rs	60,000
Simple Payback period	Months	7

TABLE 23: EC PROPOSAL 2

ANNEXURE-2

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 24: LED 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 25: 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

ENERGY IS LIFE
BEE
CONSERVE IT

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

Energy Management Centre - Kerala
(Department of Power, Govt of Kerala)

CERTIFICATE OF EMPANELMENT

This is to certify that ***M/s. Athul Energy Consultants Pvt Ltd*** *(4/2, Capital Legend, Korapath Lane, Round North, Thrissur – 680 020) is empanelled as Energy Audit firm in Energy Management Centre Kerala to conduct mandatory energy audit as per Government of Kerala G.O (Rt) No.2/2011/PD dated 01.01.2011.*

Empanelment No:
EMCEEA- 0811F-2

Scope/Area	Building	Industry -Electrical	Industry Thermal
	Yes	Yes	Yes

This empanelment is valid up to 20th December 2020
Issuing Date: 01/01/2018
Place: Thiruvananthapuram

Director,
Energy Management Centre Kerala