

ENERGY AUDIT REPORT

SAINTGITS COLLEGE OF APPLIED SCIENCES

KOTTAYAM

Executed by



2022


OTTOTRACTIONS
Energy - Engineering - Environment
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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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SAINTGITS COLLEGE OF APPLIED SCIENCES

PATHAMUTTOM





Energy Audit Report
SAINTGITS COLLEGE OF APPLIED SCIENCES
Report No: EA 973
2022-December



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

OTTOTRACTIONS established in 2005, is an organization with proven track record and knowledge in the field of energy, engineering, and environmental services. They are the first Accredited Energy Auditor from Kerala for conducting Mandatory Energy Audits in Designated Consumers as per Energy Conservation Act-2001. Government of Kerala recognized and appreciated OTTOTRACTIONS by presenting its prestigious “The Kerala State Energy Conservation Award” for the best performance as an Energy Auditor.

Acknowledgment

We were privileged to work together with the administration and staff of Saintgits College of Advanced Sciences for their 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.

B V Suresh Babu
Accredited Energy Auditor
AEA 33, Bureau of Energy Efficiency
For OTTOTRACTIONS

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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)

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Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
Saintgits College of Applied Sciences, Pathamuttom					
Sl No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 257 No's T12 (55W) Lamps to 18W LED Tube	0.77	0.913	10.13	6819
2	Energy Saving by replacing existing 260 No's in-efficient ceiling fans with Energy Efficient Five-star fans	7.80	1.310	71.44	9784
3	Installation of 50kWp Solar Power Plant	27.50	8.50	38.84	63875
	Total	8.57	2.22	81.58	16603.04
(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.)					

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Introduction

A detailed energy audit has been carried out at Saintgits College of Applied Sciences, Pathamuttom by OTTOTRACTIONS in December 2022. During the energy audit energy saving opportunities has been identified to help improving energy 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. The energy audit has identified energy conservation opportunities and recommended projects to improve energy efficiency of the facility.

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

Saintgits College of Applied Sciences is a new generation Arts and Science college launched in 2004. It has maintained high standards in academic as well as extra-curricular activities ever since it launched with a full capacity of students. With a scientifically planned teaching methodology, combined with some of the best and experienced faculty and state-of-the-art infrastructure, the institute has set a benchmark in graduate studies.

In addition to the syllabus, the institution always caters to the all-round growth of the youth and with this objective in mind we offer value-added programs. This institution is well known for campus placement and ensures higher education in esteemed national and international universities and institutes.

Occupancy Details	
Particulars	2021-22
Total Students	1000
Staffs	54
Total Occupancy of the college	1054

For calculating specific energy consumption, the total built-up area is taken into account.

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. Devan J, Project Engineer
5. Jomon J S, Project Engineer

2

Process description

The energy audit has been carried out at Saintgits College of Applied Sciences. The following is the baseline data of this building.

BASELINE DATA SHEET FOR GREEN AUDIT						
1	Name of the Organisation	Saintgits College of Applied Sciences, Pathamuttom				
2	Address (include telephone, fax & e-mail)	Kottukulam Hills, Pathamuttom P.O, Kottayam, Pin – 686532, Kerala Tel:+91 481 2433787, +91 9544327772, Email: scas@saintgits.org				
2	Year of Establishment	2004				
3	Name of building and Total No. of Electrical Connections/building	Old Building, Deceinial block				
4	Total Number of Students	Boys		Girls		Total
5	Total Number of Staff	54				
6	Total Occupancy	1054				
7	Total area of green cover	50%				
8	Type of Electrical Connection	HT	1	LT	-	
9	Total Connected Load (kW)	88				
10	Average Maximum Demand (KVA)	43				
11	Total built up area of the building (M ²)	7400				
12	Number of Buildings	1				
13	Average system Power Factor	0.83				

14	Details of capacitors connected	NA					
15	Transformer Details (Nos., kVA, Voltage ratio)	TR 1					
15	DG Set Details (kVA,)	DG1	DG2	DG3	DG4	DG5	Remarks
		30					
16	Details of motors	Rating		Nos.		Remarks	
		5 to 10		3			
		10 to 50					
		Above 50					
17	Brief write-up about the firm and the energy/environmental conservation activities already undertaken.	Installed LED Bulbs, Solar power plant etc.					
18	Contact Person & Telephone number	Principal					
		Tel:+91 481 2433787, +91 9544327772,					

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Energy and utility system description

3.1.1 Electricity

Electricity is purchased from KSEB under HT II (B) GENERRAL, the details are given below. A 30kVA Diesel Generator are in operation at this campus

Base line Data (Electricity Bill)	
Code	EA 973
Facility	Saintgits College of Applied Sciences
Provider	KSEB
Contract Demand (kVA)	80
Connected Load (KW)	88
Tariff	HT II (B) GENERAL
Consumer Number	1346370050721
Energy Charge Rs/ kWh Z1	6.2
Energy Charge Rs/ kWh Z2	9.3
Energy Charge Rs/ kWh Z3	4.65
Demand Charge Rs/ kVA	440
Excess Demand Rs/kVA	220
Energy Bill Analysis interval	2021-22

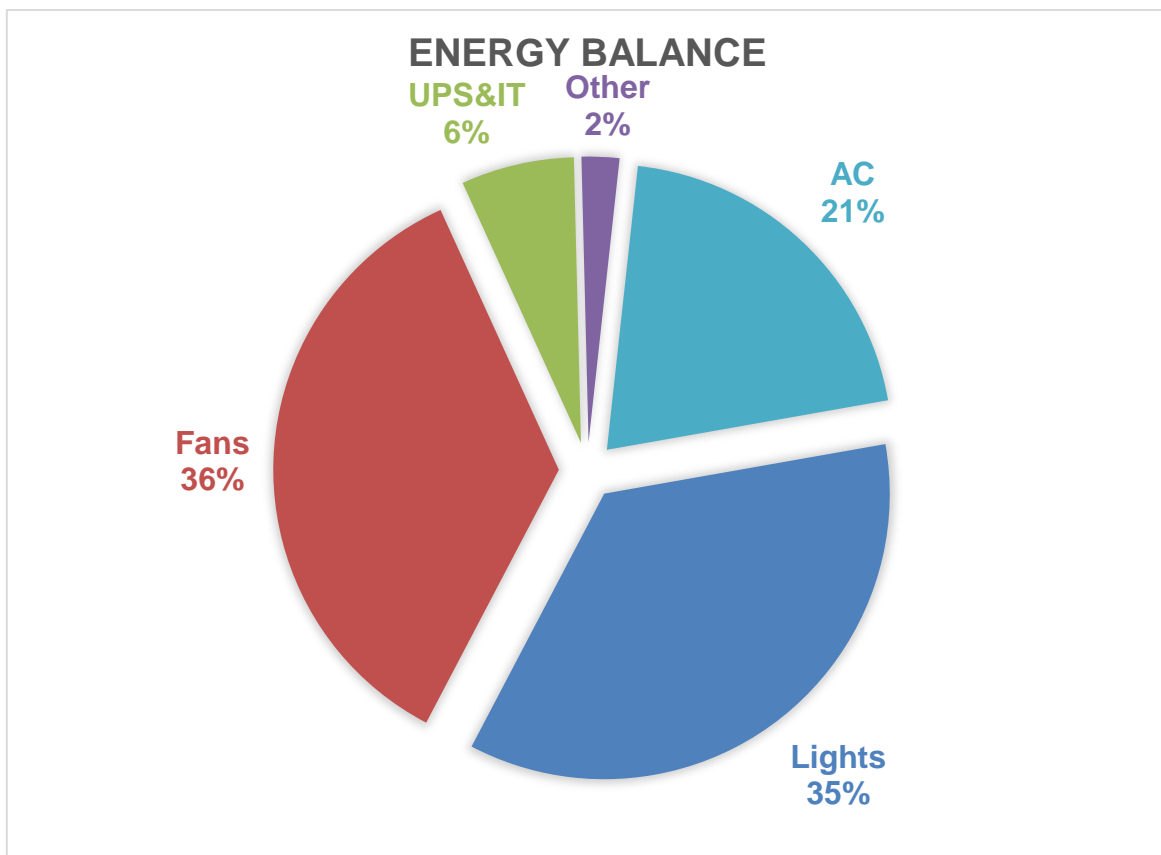
3.2. Thermal Energy / Transportation

There are six bus operated from college for transportation. LPG is used for cooking in the canteen and diesel is used to operate Diesel Generators.

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Energy Balance



36 % of the total energy consumed in this facility is used to operate Fans. Lighting uses 35% AC uses 21%, Others uses 13% and IT Equipment uses 4%.

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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 **13.40 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. The electricity is fed from 2 different LT Connections.

Electricity Consumption

Electricity Bill Details (2021-22)												
Month	Name of the Consumer				Saintgits College of Applied Sciences							
	Contract Demand(kVA)		80		Consumer number & Section			1346370050721				
	Tariff		HT II (B)					Vakathanam				
	kWh				kVA			PF	PF Incentive	PF Penalty	Rs (Total)	Rs/kwh
	Z1	Z2	Z3	Total	Z1	Z2	Z3					
Apr	4367	379	1080	5826	34	5	18	0.99	0	0	65555	11.25
May	2633	368	787	3788	31	5	15	0.99	0	0	53056	14.01
Jun	1529	325	633	2487	23	5	9	0.76	0	2548	46001	18.50
Jul	2190	361	670	3221	25	6	11	0.69	0	4711	53761	16.69
Aug	3100	390	779	4269	29	7	11	0.75		4632	60255	14.11
Sep	3191	411	807	4409	32	7	12	0.78		3967	60572	13.74
Oct	3201	395	729	4325	30	6	12	0.77		4170	60279	13.94
Nov	3465	396	787	4648	34	6	15	0.81		3314	61367	13.20
Dec	5312	391	867	6570	43	6	22	0.85		3045	74332	11.31
Jan	5306	560	1049	6915	41	21	22	0.87		2364	76218	11.02
Feb	4826	421	1043	6290	42	7	22	0.85		2901	72013	11.45
Mar	4750	365	853	5968	40	7	22	0.87		2024	68862	11.54
				58716	43			0.8317			752271	13.40

Diesel

The campus has One Diesel Generator and one College bus set in operation. The details of Diesel consumption is given below.

Diesel Consumption Details				
	Transportation	Generator	Total	cost
	in L	in L	in L	in Rs
21-22	5091	595	5687	540228

Car milege	15 km/l
Daily run	30 km
Daily consumption for 3 cars	6 L
Annual consumption for 3 cars	1320 L
Annual diesel cost for cars	125400 Rs
Bus milege	7 km/l
Daily run	40 km
Daily consumption for 6 buses	17.1429 L
Annual consumption for 6 buses	3771 L
Annual diesel cost for buses	358286 Rs

Annual Electricity Consumption (kWh)		
Consumer No	2021-22	Connected Load (kW)
1346370050721	58716	88
Total	58716	88

Base Line Energy Data		
Saintgits College of Applied Sciences, Pathamuttom		
		2021-22
1	Electricity KSEB (kWh)	58716
2	Electricity Solar - Off grid (kWh)	0.00
3	Electricity (KSEB + Off grid) kWh	58716
4	Electricity Grid Tied (kWh)	6388
5	Diesel (L)	5687
6	LPG (kg)	0.00
7	Biogas (m3)	0.00

Energy Consumption Profile		
Sl No	Fuel	2021-22
		(kCal)
1	Electricity	50495760
2	Diesel	59709379
3	LPG	0
4	Biogas	0
Total		110205139

Solar Power Plant

Solar Power Plant	
Capacity (kWp)	Annual Generation
5	6388

Lighting

Saintgits College of Applied Sciences, Pathamuttom															
SI No		Light								FAN			AC		
		T12	T8	T5	CFL	ICL	LEDT	LEDB	LED (40w)	CF	EF	WF	2TR	1.5TR	1TR
1	Old building	198					77			157			9		
2	Deceinial block	59					127			103				3	1
	Total	257	0	0	0	0	204	0	0	260	0	0	9	3	1
	Wattage	55	40	28	30	100	18	30	40	80	60	55	2000	500	4000
	Power	14.135	0	0	0	0	3.672	0	0	20.8	0	0	18	1.5	4

Saintgits College of Applied Sciences, Pathamuttom		
SI. No	Location	Avg. Lux
1	Office	96
2	Class rooms	94
3	Laboratory	128
4	Computer room	112
5	Staff rooms	96
6	Principal room	95

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Energy efficiency in utility and process system

The specific energy consumption is normally taken as the ratio of total energy consumed to the total area of building.

OTTOTRACTIONS- ENERGY AUDIT		
Saintgits College of Applied Sciences, Pathamuttom		
Energy Performance Index (EPI)		
SI No	Particulars	2021-22
1	Total building area (m ²)	7400
2	Annual Energy Consumption (kCal)	110205139
3	Annual Energy Consumption (kWh)	128146
4	Total Energy in Toe	11.02
5	Specific Energy Consumption kWh/m ²	17.32

The Energy Performance Index (EPI) is

17.32 kWh/m²

The EPI of 2021-22 may be taken as benchmark.

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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.

HHMSPB NSS COLLEGE FOR WOMEN, THIRUVANANTHAPURAM

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.

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
- Conducted Green Audit.
- Have different social and environmental clubs
- Installed LED bulbs
- Conducted Energy Conservation Training Programs
- Installed Solar Power Plants

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Energy Conservation Measures and Recommendations

Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
Saintgits College of Applied Sciences, Pathamuttom					
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2	Energy Saving by replacing existing 260 No's in-efficient ceiling fans with Energy Efficient Five star fans	7.80	1.310	71.44	9784
3	Installation of 50kWp Solar Power Plant	27.50	8.50	38.84	63875
	Total	8.57	2.22	81.58	16603.04
(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.)					

OTTOTRACTIONS- ENERGY AUDIT	
Energy Saving Proposal Code	
Energy Saving in Lighting by replacing existing 257 No's T12 (55W) Lamps to 18W LED Tube	
Existing Scenario	
257 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	257
Total load (kW)	14.14
Annual Energy Consumption (kWh)	10177
Expected Annual Energy saving for replacing all fittings (kWh)	6819
Cost of Power	13.39
Annual saving in Lakhs Rs (1st year)	0.91
Investment required for complete replacements [@Rs 300 per fittings](Lakhs Rs)	0.77
Simple Pay Back (in Months)	10.13

Energy Saving Proposal	
Energy Saving by replacing existing 260 No's in-efficient ceiling fans with Energy Efficient Five star fans	
Existing Scenario	
There are 260 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	260
Total load (kW)	18.20
Annual Energy Consumption (kWh)	34944
Expected Annual Energy saving, for total replacement(kWh)	9784
Cost of Power (Rs)	13.39
Annual saving in Lakhs Rs (1st year)	1.31
Investment required for a total replacement (Lakhs Rs)[@3000 Rs per Fan with 50W at full speed]	7.80
Simple Pay Back (in Months)	71.44

Energy Saving Proposal	
Installation of 50kWp Solar Power Plant	
Existing Scenario	
<p>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 placed on the roof top it will help in improving RTTV (Roof Thermal Transmittance Value) of the building.</p>	
Proposed System	
<p>It is proposed to have a Solar Power Plant of 50kW 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.</p>	
Financial Analysis	
Proposed Solar installed Capacity (kW)	50
Total average kWh per day expected (3.5kWh/day average)	175.00
Total annual Generating Capacity (kWh)	63875
Cost of energy generated annually Lakhs Rs	8.50
Investment required (INR lakh)(Approx)	27.50
Simple Pay Back (in Months)	38.84
Life cycle in Yrs	25
Total Saving in Life Cycle (Approx) RS lakh	212.38

Technical Supplements

Saintgits College of Applied Sciences, Pathamuttom															
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Aug	3100	390	779	4269	29	7	11	0.75		4632	60255	14.11
Sep	3191	411	807	4409	32	7	12	0.78		3967	60572	13.74
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Dec	5312	391	867	6570	43	6	22	0.85		3045	74332	11.31
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Mar	4750	365	853	5968	40	7	22	0.87		2024	68862	11.54
				58716	43			0.8317			752271	13.40

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