SREE NARAYANA COLLEGE, CHATHANNUR

ENERGY AUDIT 2023-24

SREE NARAYANA COLLEGE

Chathannoor, Kollam, Kerala 691579

(NAAC Re-accredited with 'A' Grade Affiliated to University of Kerala)

CERTIFICATE

This is to certify that SREE NARAYANA COLLEGE CHATHANNUR, affiliated to Un versity of Kerala, has suc cessfully undergone an **'Energy Audit.'** The assessment of electrical energy conservation and energy-saving measures are carried out by the Physics and Chemistry departments of the college in associate with IQAC Sree Narayana College Chathannur.

Principal

Sree Narayana College, Chathannur

PRINCIPAL
SREE NARAYANA COLLEGE
CHATHANNUR

ENERGY AUDIT REPORT

SREE NARAYANA COLLEGE

CHATHANOOR

Contents

Introduction

A detailed energy audit has been carried out at Sree Narayana College, Chathanoor in November 2023. During the energy audit energy saving opportunities has been identified to help improving energy efficiency of the facility. 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

Sree Narayana College, Chathannur situates at Karamcode, near to the KSRTC Bus Station Chathannur in Kollam district in Kerala. The College is managed by the Sree Narayana Trusts, Kollam, one of the leading educational agencies in the state. It is affiliated to the University of Kerala, and has 12 B recognition from the UGC.

The first Principal of the college was the noted academician Prof. K. Udayakumar. Ever since its inception in 1981, Sree Narayana College, Chathannur has catered to the educational and intellectual needs of young men and women from the rural areas of south Kollam.

The college offers degree courses in Mathematics, Commerce, Chemistry & Industrial Chemistry and History. At the Post-Graduate level, the college offers M.Sc Mathematics, MSC chemistry and M.Com (Finance stream). Various clubs and study centers function to encourage and nurture the aesthetic and literary talents of its members.

Conscious of its inceptual obligation, it takes education to the doorsteps of the poor and marginalized sections of the society and endeavours to mould a humane, intellectually progressive, morally awakened and socially committed group of young men and women.

Occupancy Details	
Particulars	2023-2024
Total Students	482
Staffs	41
Total Occupancy of the college	523

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

Energy audit team

1. The Energy Audit team is listed below.
   Department of Physics and Department of Chemistry

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Process description

The energy audit has been carried out at Sree Narayana College, Chathanoor. The following is the baseline data of this building.

Form-A											
BASELINE DATA SHEET FOR GREEN AUDIT											
1	Name of the Organisation	Sree Narayana College, Chathanoor									
2	Address (include telephone, fax & e-mail)	Karamcode P.O., Chathannoor, Kerala 691579									
3	Year of Establishment	1965									
4	Name of building and Total No. of Electrical Connections/building	SN College ,2 LT Connection									
5	Total Number of Students	Boys		Girls		Total	600				
6	Total Number of Staff	30									
7	Total Occupancy	630									
8	Total area of green cover (hectare)	8.75									
9	Type of Electrical Connection	HT		LT	2						
10	Total Connected Load (kW)										
11	Average Maximum Demand (KVA)										
12	Total built up area of the building (M^2)	4550									
13	Number of Buildings	3									
14	Average system Power Factor	0.98									
15	Details of capacitors connected	NA									
16	Transformer Details (Nos., kVA, Voltage ratio)	TR 1									
		NA									
17	DG Set Details (kVA,)	DG1	DG2	DG3	DG4	DG5	Remarks				
18	Details of motors	Rating		Nos.		Remarks					
		5 to 10		1							
		10 to 50									
		Above 50									

Energy and utility system description

3.1.1 Electricity

Electricity is purchased from KSEB under LT-6A GENERAL, the details are given below.

Electricity Connection Details		
Sree Narayana College, Chathanoor		
1	Name of the Consumer	Sree Narayana College, Chathanoor Chathanoor
2	Tariff	LT-6A General
3	Consumer Number	1145751027868, 1145754004277
4	Annual Electricity Consumption (kWh)	127053

3.2. Thermal Energy / Transportation

Thermal Fuel Consumption	
Sree Narayana College, Chathanoor	
	2023-24
Annual LPG consumption in kg	228
Annual Diesel consumption in L	300.00
Annual petrol consumption in L	0
Annual Biogas consumption in m3	0


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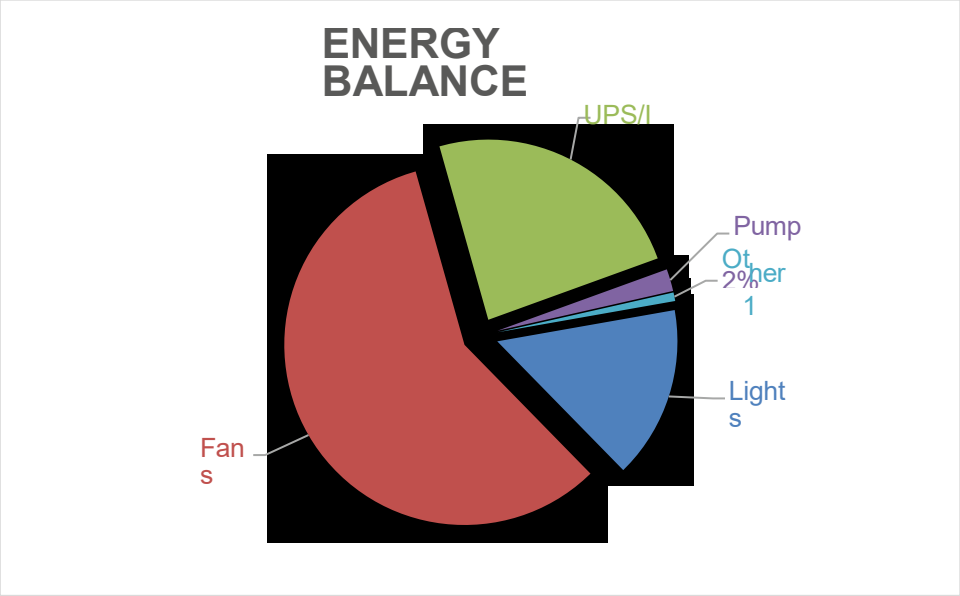
Energy Balance



58 % of the total energy consumed in this facility is used to operate Fans. Lighting uses 15% Pumps uses 15%. IT Equipment uses 24% and Others uses 1%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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 **9.25 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 two LT Connection.

Electricity Consumption

Annual Electricity Consumption (kWh)		
Sl.No	**Consumer No**	**2023-24**
1	1145751027868	
2	1145754004277	
	Total	**127053**

Diesel

Diesel Consumption Details		
	Total	cost
	in L	Rs
23-24	300	28800

LPG

LPG Consumption Details	
Particulars	2023-24
No Cylinders	12
Canteen LPG Consumption in kg	228
Total in kg	228

Base Line Energy Data		
Sree Narayana College, Chathanoor		
		127053
1	Electricity KSEB (kWh)	17516
2	Electricity Solar Consumption (kWh)	2555
3	Electricity (KSEB + Solar) kWh	20071
4	Electricity Solar Export (kWh)	0
5	Diesel (L)	300.00
6	LPG (kg)	228
7	Biogas (m^3)	0.00

Energy Consumption Profile			
Sl No	Fuel	2022-23	
		kCal	kWh
1	Electricity	17260937	20071
2	Diesel	3150000	300
3	LPG	2736000	228
4	Biogas	0	0
Total		23146937	26915

Solar Power Plant

Solar Power Plant	
Particulars	Remarks
Capacity kWp	2
Annual Generation	2555

Lighting

Sree Narayana College, Chathanoor											
Sl.No	Location	Lights			Fans		IT			Others	
		T12	LEDT	LEDB	CF	WF	Printer	Projector	PC	Mixer	Fridge
1	Staffroom		2		2				1		
2	PG Maths		2		2	1	1		1		
3	Class 1		2		4						
4	BSc Maths		2		4						
5	Class 2		2		4						
6	Physics Lab		2		8						
7	Department of Chemistry		9		2	1	1				1
8	Chemistry Lab		4		2						
9	Outdoor		2		1						
10	Chemistry Lab 2		4		2						
11	NCC office		1		1						
12	Office		2		2				1		
13	Passage		5								
14	10 Rooms		10		20						
15	Study Hall		6		8						
16	Store			1	2						
17	Kitchen		2		1					1	1
18	Dining room		6		6						
19	Office		4		5		2		2		

20	Principal		4		3		2		2		
21	Library		6		3						
22	PG		2		2	1	1		1		
23	Classroom		2	1	1						
24	Mcom		2		2						
25	MSc		1		1						
26	Mcom 2				1						
27	Computer Lab		4					1	20		
28	Room No 8		2		2						
29	Room No 9		2		2						
30	Room No 7		2		2						
TOTAL		1	94	1	95	3	6	1	28	1	1

LUX MEASUREMENTS

Sree Narayana College, Chathanoor		
Sl.No	Location	Lux Avg
1	Staffroom	71
2	PG Maths	73
3	Class 1	84
4	BSc Maths	67
5	Class 2	68
6	Physics Lab	73
7	Department of Chemistry	76
8	Chemistry Lab	81
9	Chemistry Lab 2	87
10	NCC office	56
11	Office	67
12	Study Hall	64
13	Store	98
14	Office	65
15	Principal	67
16	Library	78
17	PG	71
18	Classroom	73
19	Mcom	84
20	MSc	67
21	Mcom 2	68
22	Computer Lab	73
23	Room No 8	76
24	Room No 9	81
25	Room No 7	84

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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 are of building.

OTTOTRACTIONS- ENERGY AUDIT		
Sree Narayana College, Chathanoor		
Energy Performance Index (EPI)		
Sl No	Particulars	2023-24
1	Total building area (m²)	3250
2	Annual Energy Consumption (kCal)	23146937
3	Annual Energy Consumption (kWh)	26915.04319
4	Total Energy in Toe	2.31
5	Specific Energy Consumption kWh/m²	8.28

The Energy Performance Index (EPI) is

8.28 kWh/m²

The EPI of 2023-24 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.

SREE N6R6Y6N6 CO¡¡EGE, CH6TH6NOOR

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 service 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 Plant
- Installed LED tubes

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Energy Conservation Measures and Recommendations

Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
Sree Narayana College, Chathanoor					
Sl No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Lakhs Rs)/Yr	Months	kWh/Yr
1	Energy Saving by replacing existing 95No's in-efficent ceiling fans with Energy Efficient Five star fans/BLDC Fans	2.38	0.278	102.68	3344
	Total	**2.38**	**0.28**	**102.68**	**3344**
(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.)					

Energy Saving Proposal Code 3	
Energy Saving by replacing existing 95No's in-efficent ceiling fans with Energy Efficient Five star fans/BLDC Fans	
Existing Scenario	
There are 95 numbers of ceiling fans installed in the facilty 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 55% with higher service value (air delivery/watt). The operating factor is taken as 50%	
Financial Analysis	
Annual working hours (hrs)	1760
Total numbers of ordinary fans	95
Total load (kW)	7.60
Annual Energy Consumption (kWh)	5350
Expected Annual Energy saving, for total replacement(kWh)	3344
Cost of Power (Rs)	8.30
Annual saving in Lakhs Rs (1st year)	0.28
Investment required for a total replacement (Lakhs Rs)[@2500 Rs per Fan with 30W at full speed]	2.38
Simple Pay Back (in Months)	102.68

Energy Saving Proposal Code 4	
Installation of 15 kWp 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 install a 20kWp Solar Power Plant in addition to the existing one. 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)	15
Total average kWh per day expected (3.5kWh/day average)	52.50
Annual generation kWh	19163
Cost of energy generated annually Lakhs Rs	1.59
Investment required (INR lakh)(Approx)	8.25
Simple Pay Back (in Months)	62.25
Life cycle in Yrs	25
Total Saving in Life Cycle (Approx) RS lakh	39.76

Technical Supplements

Sree Narayana College, Chathanoor

Sl.No	Location	Lights			Fans		IT			Others	
		T12	LEDT	LEDB	CF	WF	Printer	Projector	PC	Mixer	Fridge
1	Staffroom		2		2				1		
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20	Principal		4		3		2		2		
21	Library		6		3						
22	PG		2		2	1	1		1		
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