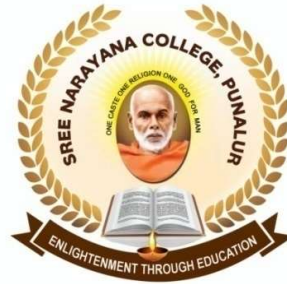


# ENERGY AUDIT REPORT 2023 - 2024



## SREE NARAYANA COLLEGE

CHEMMANTHOOR, PUNALUR P.O,

KOLLAM

## **Energy Audit Report**

An assessment of energy consumption, energy sources used, energy management, lighting devices used and other appliances used by the campus community is an important aspect of sustainability of the community. Hence this is a relevant aspect of the assessment. The audit team assessed the number of electrical appliances and their respective uses in terms of consumption of energy per month in KWh. This indicates the energy management of the campus. Based on the assessment we made suggestions and recommendations.

An energy audit is an examination, survey, and analysis of energy flows for the purpose of locating areas where energy can be saved in a building, process, or system without having a negative impact on the output.

### **Need for energy audit**

An energy audit is a study of plant or other structure to ascertain how and where energy is used as well as to find ways to save energy. The energy conservation methods assist in reducing the cost of any construction and saving energy. Our ecosystem loses out from each unit of energy usage due to pollution, the depletion of conventional energy sources, and increased need for generating capacity. Saving a unit of energy benefits the environment and energy resources in addition to saving money.

### **Electricity consumption of the college**

1. Electricity charges per month – ~ Rs. 30000/ month
2. Number of Gas cylinder – 4 cylinders
3. Cost of gas cylinder – Rs. 6800/month
4. Number of Generators – 1
5. Cost of Generator Fuel – Rs.5000 /month

### Checklist of Electrical/Electronic Equipments in the Institution

SL.No	Devices	No.
1.	CFL bulbs	3
2.	LED bulbs	67
3.	Tube Lights	251
4.	Incandescent Bulbs	3
5.	Fans	119
6.	Computers	44
7.	Refrigerators	4
8.	Water Pump	3
9.	Photostat Machine	3
10.	Printers	17
11.	Projector	5
12.	Inverters	2
13.	Generator	1
14.	Scanner	2
15.	Water Purifier	1
16.	Router	2
17.	CCTV	1
18.	Induction Stove	1
19.	Amplifier	1
20.	Induction Cooker	1
21.	Laptop	1

### Checklist of Laboratory Equipments in the Institution

SL.No	Instruments	No.
1.	Laser set up	1
2.	e/k	1
3.	J.J Thomson	2
4.	Hall Effect	1
5.	G M Counter	1
6.	Photo Electric Effect	1
7.	Steffans Cons	1
8.	Spectrometer for Absorption Spectrum	2
9.	Ultrasonic Dufractometer	2
10.	Quinck's Method Apparatus	1
11.	UV Vis Spectrophotometer	1
12.	Laboratory Oven	1
13.	Industrial Oven	1
14.	Spectrophotometer	1
15.	Colorimeter	1
16.	Digital pH Meter	1
17.	Magnus Microscope	2
18.	Microtome	1
19.	Autoclave	1
20.	Incubator	1
21.	Muffle Furnace	1
22.	Hot Air Oven	1
23.	High Speed Centrifuge	1
24.	Electric Weigh Balance	1
23.	UV Visible Spectrophotometer	1
24.	Centrifuge	1
25.	Digital Polari meter	1
26.	Digital MP Apparatus	1
27.	Digital Colorimeter	1
28.	Digital Water bath	1
29.	Potentiometer	1
30.	Conductometer	1
31.	pH meter	1
32.	Double Distillation Unit	1
33.	Electronic Balance	1
34.	FTIR Spectrophotometer	1
35.	Hot Air Oven	1
36.	Heating Mantle	1
37.	Hot Plate	1
38.	Magnetic Stirrer	1
39.	Rotary Evaporator	1
40.	Ultrasonic eleoner	1
41.	CHN Instrument	1

## Energy Usage Audit Sheet

### 1. Energy usage of CFL bulbs

Department/Area	Number of CFL bulbs	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal Office	2	15	0.015	5.28	7.2
Room No. 56	1	15	0.015	47.52	2.7
<b>Total Energy Usage per Month (kWh)</b>					<b>9.9</b>

### 2. Energy usage of LED bulbs

Department/Area	Number of LED bulbs	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal Office	6	10	0.01	8	14.4
Office Room	7	10	0.01	8	16.8
Staff Room 1	7	10	0.01	8	16.8
Staff Room 2	4	10	0.01	8	9.6
Room No. 52	8	8	0.008	6	11.52
Room No. 53	8	8	0.008	6	11.52
Room No. 54	8	8	0.008	6	11.52
Room No. 55	8	8	0.008	6	11.52
Room No. 14	1	8	0.008	6	1.44
Room No. 13	2	8	0.008	6	2.88
Room No. 12	2	8	0.008	6	2.88
Hall	6	10	0.01	8	14.4
<b>Total Energy Usage per Month (kWh)</b>					<b>125.28</b>

### 3. Energy usage of Fans

Department/Area	Number of Fans	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal Office	4	40	0.04	8	38.4
Office Room	6	40	0.04	8	57.6
Staff Room 1	2	40	0.04	8	19.2
Staff Room 2	2	40	0.04	8	19.2
Staff Room 3	4	40	0.04	8	38.4
Staff Room 4 (Zoology)	4	40	0.04	8	38.4

Staff Room 5 (Chemistry)	7	40	0.04	8	67.2
Staff Room 6 (Physics)	3	40	0.04	8	28.8
Auditorium	11	40	0.04	5	66
NCC Room	1	40	0.04	4	3.52
IQAC Room	2	40	0.04	6	10.56
Seminar Hall	6	40	0.04	5	36
Hall	1	40	0.04	4	4.8
Examination Section	4	40	0.04	8	38.4
1 DC BSc Physics	3	40	0.04	6	21.6
2 DC BSc Physics	4	40	0.04	6	28.8
3 DC BSc Physics	4	40	0.04	6	28.8
1 <sup>st</sup> MSc Physics	2	40	0.04	6	14.4
2 <sup>nd</sup> MSc Physics	2	40	0.04	6	14.4
BSc Physics Lab	7	40	0.04	4	35.2
MSc Physics Lab Electronics	4	40	0.04	4	14.08
MSc Physics Lab General	3	40	0.04	3	7.92
Computer Lab	2	40	0.04	6	14.4
Computer Lab (Attached with IQAC Room)	2	40	0.04	5	12
Zoology Lab	6	40	0.04	5	36
Instrumentation Lab Zoology	3	40	0.04	4	10.56
MSc Chemistry Lab	9	40	0.04	4	42.24
3 DC BSc Chemistry	6	40	0.04	6	43.2
Store Room Chemistry	1	40	0.04	4	3.52
BSc Chemistry Lab	15	40	0.04	4	52.8
Store Room Chemistry Lab	4	40	0.04	4	14.08
1 <sup>st</sup> MSc Chemistry	2	40	0.04	6	14.4
2 <sup>nd</sup> MSc Chemistry	2	40	0.04	6	14.4
Chemistry Library	2	40	0.04	2	3.52
Room No. 12	3	40	0.04	6	21.6
Room No. 13	3	40	0.04	6	21.6
Room No. 14	3	40	0.04	6	21.6
Room No. 15	3	40	0.04	6	21.6
Room No. 16	3	40	0.04	6	21.6
Room No. 17	3	40	0.04	6	21.6
Room No. 18	3	40	0.04	6	21.6
Room No. 20	3	40	0.04	6	21.6
Room No. 33	2	40	0.04	6	14.4
Room No. 34	2	40	0.04	6	14.4
Room No. 43	2	40	0.04	6	14.4
Room No. 44	2	40	0.04	6	14.4
Room No. 52	3	40	0.04	6	14.4
Room No. 53	3	40	0.04	6	14.4
Room No. 54	3	40	0.04	6	14.4

Room No. 55	3	40	0.04	6	21.6
Room No. 56	2	40	0.04	6	14.4
Room No. 57	2	40	0.04	6	14.4
Room No. 58	2	40	0.04	6	14.4
Room No. 59	2	40	0.04	6	14.4
Library and Reading Room	6	40	0.04	8	42.24
Reference Room	2	40	0.04	8	14.08
Stack Room	4	40	0.04	8	38.4
Canteen	4	40	0.04	8	38.4
Hostel	32	40	0.04	10	384
Regional Development Committee Room	2	40	0.04	6	14.4
<b>Total Energy Usage per Month (kWh)</b>					<b>1777.12</b>

#### 4. Energy usage of Tube lights (CFL)

Department/Area	Number of Tube lights	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal Office	3	40	0.04	8	28.8
Office Room	8	40	0.04	8	76.8
Staff Room 1	3	40	0.04	8	28.8
Staff Room 2	1	40	0.04	8	9.6
Staff Room 3	2	40	0.04	8	19.2
Auditorium	7	40	0.04	3	25.2
Seminar Hall	5	40	0.04	3	18
NCC Room	1	40	0.04	5	6
IQAC Room	3	40	0.04	4	14.4
Examination Section	3	40	0.04	4	14.4
2 DC BSc Physics	1	40	0.04	6	7.2
1 <sup>st</sup> MSc Physics	1	40	0.04	6	7.2
2 <sup>nd</sup> MSc Physics	1	40	0.04	6	7.2
BSc Physics Lab	7	40	0.04	4	33.6
MSc Physics Lab Electronics	4	40	0.04	4	19.2
MSc Physics Lab General	3	40	0.04	4	14.08
Computer Lab	4	40	0.04	5	24
Computer Lab (Attached with IQAC Room)	4	40	0.04	5	24
2 <sup>nd</sup> MSc Chemistry	1	40	0.04	4	4.8
Room No. 12	1	40	0.04	6	7.2
Room No. 13	1	40	0.04	6	7.2
Room No. 14	2	40	0.04	6	10.56

Room No. 15	3	40	0.04	6	21.6
Room No. 16	3	40	0.04	6	21.6
Room No. 17	2	40	0.04	6	14.4
Room No. 18	2	40	0.04	6	14.4
Room No. 33	2	40	0.04	6	14.4
Room No. 34	2	40	0.04	6	14.4
Room No. 52	2	40	0.04	6	14.4
Room No. 53	2	40	0.04	6	14.4
Room No. 54	2	40	0.04	6	14.4
Room No. 55	2	40	0.04	6	14.4
Library and Reading Room	6	40	0.04	6	43.2
Reference Room	4	40	0.04	6	28.8
Stack Room	7	40	0.04	5	42
Ladies Amenity Centre	4	40	0.04	3	14.4
Regional Development Committee Room	2	40	0.04	5	8.8
<b>Total Energy Usage per Month (kWh)</b>					<b>703.04</b>

#### 5. Energy usage of Tube lights (LED)

Department/Area	Number of Tube lights	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal Office	3	9	0.09	8	6.48
1 DC BSc Physics	3	9	0.09	6	4.86
2 DC BSc Physics	2	9	0.09	6	3.24
3 DC BSc Physics	3	9	0.09	6	6.48
1 <sup>st</sup> MSc Physics	2	9	0.09	6	3.24
2 <sup>nd</sup> MSc Physics	3	9	0.09	6	6.48
Corridor	5	9	0.09	5	6.75
Staff Room 4 (Zoology)	6	9	0.09	8	12.96
Staff Room 5 (Chemistry)	9	9	0.09	8	19.44
Staff Room 6 (Physics)	3	9	0.09	8	6.48
BSc Physics Lab	6	9	0.09	4	6.48
MSc Physics Lab Electronics	2	9	0.09	4	2.16
Zoology Lab	10	9	0.09	5	13.5
Instrumentation Lab Zoology	5	9	0.09	4	6.75
3 DC BSc Chemistry	6	9	0.09	6	4.86



1 <sup>st</sup> MSc Chemistry	2	9	0.09	6	3.24
2 <sup>nd</sup> MSc Chemistry	1	9	0.09	6	1.62
BSc Chemistry Lab	20	9	0.09	4	21.6
MSc Chemistry Lab	14	9	0.09	4	15.12
Store Room Chemistry	1	9	0.09	4	1.08
Store Room Chemistry Lab	5	9	0.09	4	5.4
Chemistry Library	2	9	0.09	4	2.16
Ground Floor	4	9	0.09	8	63.36
First Floor	7	9	0.09	8	110.88
Room No. 33	1	9	0.09	6	1.62
Room No. 34	1	9	0.09	6	1.62
Room No. 35	2	9	0.09	6	3.24
Room No. 43	2	9	0.09	6	3.24
Room No. 44	2	9	0.09	6	3.24
Room No. 57	1	9	0.09	6	1.62
Room No. 59	2	9	0.09	6	3.24
<b>Total Energy Usage per Month (kWh)</b>					<b>352.44</b>

## 6. Energy usage of Computer/Laptop

Department/Area	Number of Computer/Laptop	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal Office	3	100	0.10	8	72
Office Room	5	100	0.10	8	120
Staff Room 1	1	100	0.10	8	24
Staff Room 2	1	100	0.10	8	24
Staff Room 3	3	100	0.10	8	72
Staff Room 4 (Zoology)	2	100	0.10	8	48
Staff Room 5 (Chemistry)	1	100	0.10	8	24
Staff Room 6 (Physics)	1	100	0.10	8	24
BSc Physics Lab	5	100	0.10	6	120
Examination Section	1	100	0.10	6	24
NCC Room	1	100	0.10	8	24
Computer Lab	15	100	0.10	8	360
Computer Lab (Attached with IQAC Room)	12	100	0.10	6	216
Room No.56	1	50	0.05	6	9
<b>Total Energy Usage per Month (kWh)</b>					<b>1161</b>

## 7. Electrical Equipments and their Energy Consumption

Department/Area	Name of the appliance/ Equipment	Number of appliance/ equipment	Power consumed (watts)	Power in (kW)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal Office	Photostat	1	1000	1	4	90
	Table Fan	1	52.7	0.0527	6	9.486
	UPS	3	900	0.9	8	648
	Amplifier	1	500	0.5	4	60
	Television	2	150	0.15	2	13.2
	Printer	1	40	0.04	4	3.52
Office Room	Photostat	1	1000	1	4	15
	Printer	5	40	0.04	6	26.4
	Inverter	1	3000	3	6	396
	Induction Cooker	1	1600	1.6	4	140.8
	Speaker	1	1000	1	1	15
Staff Room 1	Printer	1	40	0.04	4	3.52
	UPS	1	900	0.9	8	158.4
Staff Room 4 (Zoology)	Printer	2	40	0.04	4	7.04
	Exhaust Fans	2	60	0.06	4	10.56
	UPS	2	900	0.09	8	31.68
Staff Room 5 (Chemistry)	Scanner with Printer	1	25	0.025	4	2.2
	UPS	1	900	0.9	8	158.4
Staff Room 6 (Physics)	Projector	1	1200	1.2	4	105.6
	Printer	1	40	0.04	4	3.52
	UPS	1	900	0.09	8	15.84
	Table Fan	1	55	0.055	6	7.26
	Tower Fan	1	110	0.11	6	14.52
BSc Physics Lab	UPS	3	900	0.09	8	47.52
	Printer	1	40	0.04	4	3.52
	Speaker	1	1000	1	1	15
	Inverter	1	3000	3	6	396
	Filament Bulb	1	60	0.06	3	3.96
	Tower Fan	1	110	0.11	6	14.52
	Potentiometer	3	40	0.04	3	7.92
	Heating Mantle	2	450	0.45	3	59.4

MSc Physics Lab Electronics	Printer	1	40	0.04	3	2.64
	Inverter	1	3000	3	6	396
	Filament Bulb	1	60	0.06	3	3.96
MSc Physics Lab General	Electronic Balance	1	5	0.005	3	0.33
	Centrifuge	1	180	0.18	3	11.88
	Heating Mantle	5	450	0.45	3	148.5
	Magnetic Stirrer	2	600	0.6	3	79.2
	Induction Cooker	1	1600	1.6	3	105.6
	Filament Bulb	1	60	0.06	3	3.96
	Potentiometer	2	40	0.04	3	5.28
	Spectrometer (Bulb)	4	240	0.24	3	63.36
	SVL Transformer	2	100	0.1	3	13.2
	Zener Diode Experiment	2	10	0.01	3	1.32
	Laser set up	1	450	0.45	3	29.7
	e/k	1	1000	1	3	45
	J J Thomson	2	1	0.001	3	0.132
	Hall Effect	1	500	0.5	3	33
	GM Counter	1	100	0.1	3	6.6
	Photo electric Effect	1	12	0.012	3	0.792
	Steffans cons	1	60	0.06	3	3.96
	Spectrometer for absorption spectrum	2	12	0.012	3	1.584
	Ultrasonic dufractometer	2	50	0.05	3	6.6
	Quinck's method Apparatus	1	200	0.2	3	13.2
UV VIS Spectrophotometer	1	250	0.25	3	16.5	
Instrumentation Lab (Zoology)	Air Oven	2	2200	2.2	3	290.4
	Centrifuge	1	180	0.18	3	11.88
	Spectrophotometer	1	30	0.03	3	1.98
	Colorimeter	1	0.6	0.0006	3	0.0396
	Digital pH meter	1	5	0.005	3	0.33
	Magnus Microscope	2	100	0.1	3	13.2
	Microtome	1	30	0.03	3	1.98
	Autoclave	1	1500	1.5	3	99
	Incubator	1	200	0.2	3	13.2
	Muffle furnace	1	3000	3	3	198
	Electric Weigh Balance	1	5	0.005	3	0.33
	UV visible Spectrophotometer	1	150	0.15	3	9.9
	High Speed Centrifuge	1	500	0.5	3	33
	Digital Polarimeter	1	1	0.001	3	0.066
	Digital MP Apparatus	1	100	0.1	3	6.6
	Digital Colorimeter	1	12	0.012	3	0.792
	Digital Waterbath	1	1480	1.48	3	97.68

MSc Chemistry Lab	Potentiometer	2	40	0.04	3	5.28
	Conductivity Meter	4	180	0.18	3	47.52
	Air Oven	3	2200	2.2	3	435.6
	Inverter	7	3000	3	3	1386
	Electric Stove	20	1800	1.8	3	2376
	Refrigerator	2	780	0.780	24	1123.2
	pH Meter	1	5	0.005	3	0.33
	Double Distillation Unit	1	5.5	0.0055	3	0.363
	Electronic Balance	1	5	0.005	3	0.33
	FTIR Spectrophotometer	1	24	0.024	3	1.584
	Heating Mantle	1	450	0.450	3	29.7
	Hot Plate	1	750	0.750	3	49.5
	Magnetic Stirrer	1	8.5	0.0085	3	0.561
	Rotary Evaporator	1	1060	1.06	3	69.96
	Ultrasonic cleaner	1	100	0.1	3	6.6
CHN Instrument	1	250	0.25	3	16.5	
Store Room Chemistry	UPS	1	900	0.9	5	99
Room No. 20	Printer	2	40	0.04	5	8.8
	Music System	2	1000	1	5	220
	UPS	1	900	0.9	5	99
Room No. 11	Scanner with Printer	1	50	0.05	4	4.4
Room No. 56	Printer	1	40	0.04	4	3.52
	Speaker	1	100	0.1	5	15
	Filament Bulb	1	60	0.06	2	2.64
	Electric Bell	1	0.5	0.0005	6	0.066
Examination Section	Printer	1	40	0.04	5	4.4
Hostel	Refrigerator	1	780	0.780	24	561.6
	Television	1	220	0.220	4	19.36
	Mixer Grinder	1	750	0.750	4	45
	Incinerator	1	1200	1.2	6	108
Canteen	Refrigerator	1	780	0.780	24	561.6
	Water Purifier	1	60	0.06	24	43.2
Ladies Amenity Centre	Incinerator	1	1200	1.2	6	216
Auditorium	Amplifier	1	500	0.5	5	75
First Floor	Water Purifier	1	60	0.06	8	10.56
Corridor	Speaker	2	100	0.1	5	15
	Electric Bell	1	0.5	0.0005	6	0.066
<b>Total Energy Usage per Month (kWh)</b>						<b>11915.7</b>

The Total Energy Utilization of the college for different purposes is approximately **16044.48** kWh/month.

## Suggestions

- It's important to maintain solar panels properly and combine them with other renewable energy sources.
- Conduct additional staff and student awareness campaigns about energy conservation.
- Switch to LED monitors in favour of computers and TVs.
- More energy efficient fans need to be installed.
- Each year, observe a power-saving day.
- Systems for automatic power switches off could be introduced.
- To reduce power loss due to eddy current, electricity in campus buildings should be disconnected from the main building supply after occupancy.
- More frequent use of generators should be avoided.
- Immediate energy savings can be achieved from the effective usage of lights, Fans. The following activities, having no/low investment, can be adopted in these areas.
- Replace the existing Fluorescent Tube lights and with LED lights, (see the Executive Summary).
- Replace the existing CFL with LED bulbs, (see the Executive Summary).
- Replace old/ inefficient fans with BEE star rated (BLDC) ceiling fans (see the Executive Summary).
- Utilize BEE 5 star labeled appliances, as far as possible.
- Maintain standard Electrical wiring, to avoid energy loss.
- Avoid very old and obsolete appliances and replace with energy efficient and environment friendly appliances.
- Keep the computers in sleep/shut down mode, when not in use.(i.e, during lunch time)
- Regular cleaning of glass panes of Windows, light fixtures, Fans and other appliances, to get maximum output.
- Utilize the natural lights and wind, as far as possible, to reduce energy consumption.
- An Energy Conservation cell/club can be constituted and arrange Energy Conservation awareness programs. Create awareness among the students & employees, about the importance and practice of Energy Conservation and monitor, regularly, the energy conservation activities.
- Investigate possibilities of using renewable energy solutions and take steps to implement the same.
- Promote use of Electric Vehicles by employees and support e mobility through installation of EV charging stations.