

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

Report

On

ENERGY AUDIT

For

**S.I.C.E.S. Degree College of Arts, Science & Commerce,
Ambarnath (W)**

Prepared

By

**Senergy Consultants Pvt Ltd
Mumbai**

December – 2020

Helping You to Conserve Energy

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

Contents

Sr. No	Description	Page
I	Introduction	3
II	Executive Summary	4
III	Electrical System & Bill	5
IV	Lighting System	7
V	Air Conditioners	10
VI	Renewable Energy	11

Helping You to Conserve Energy

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

I

Introduction

Energy Audit was undertaken at SICES Degree College of Arts, Science & Commerce, Jambhul Phata, Ambarnath West, Thane 421 505, during the month of December 2020.

The organization is very keen to optimize energy cost wherever possible and to further optimize energy consumption and identify opportunities for energy saving, M/s Senergy Consultants Pvt Ltd was assigned to carry out Energy Audit of the premises.

This Audit Report presents the analysis of the data collected, observations made at the facility and is governed by the objectives, scope of work, methodology etc. discussed in the ensuing paragraphs.

Team:

The team members of the audit study.

- Mr. Ravindra Datar
- Mr. Nitesh Kharche

Acknowledgment:

We wish to express our gratitude towards Dr Harshal Bachhav for having given us the opportunity for conducting the study and the support provided during the study.

We are also thankful to Dr Shrikant Chavan for extending the necessary help and co-operation from their side.

Helping You to Conserve Energy

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

II Executive Summary

The premises were evaluated against the various criteria laid down by the National Assessment and Accreditation Council (NAAC). The major observations are

1. Electrical System & Bills
 - a. The average cost of the power procured from electricity board is Rs 69.18/- per kWh.
 - b. The power factor was observed to be lower than unity during most of the period, leading to power factor penalty & higher power cost. It is suggested to improve & maintain the power factor at unity to reduce the power costs.
 - c. The contract demand is higher. It is suggested to reduce the contract demand from 82.22 kVA to 25 kVA after consideration of the future expansion, which can reduce the charges of billed demand and electricity duty.
 - d. There is solar energy system installed on college rooftop for power generation.

2. Lighting System
 - a. The usage of natural lighting has been maximized.
 - b. Energy efficient light fittings have been installed at all locations.
 - c. The fans with standard efficiency have been provided wherever required. It is suggested to consider possibility of replacing the fans with high efficiency fans with BLDC motors may be ascertained; especially while making new purchases.
 - d. The fans & lights are switched off when not in use.

3. Air Conditioning System
 - a. The air conditioners are switched off, when not in use.
 - b. The hall temperature was observed to be 24 to 26 °C; which are standard values.
 - c. The system is properly maintained.

Potential Saving Area:

Major savings can be achieved by

1. Improving and maintaining power factor at unity.
2. Reducing contract demand from 82.22 KVA to 25 KVA.

Helping You to Conserve Energy

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

III Electrical System & Bill

Electricity Bill

The electricity for the entire premises is supplied by Maharashtra State Electricity Distribution Co. Ltd. (HT) connection. The details of energy consumption with costs are as under.

Consumer Name: M/S South Indian Children's Education Society			Consumer No.: 021920006067		
Tariff Category: LT-X A III (VII A III revised Apr'20)			Maharashtra State Electricity Distribution Co. Ltd.		
Meter No.: 055-X007741			Contract Demand: 82.22 KVA		
Description	Unit	Nov-19	Dec-19	Jan-20	Average
Energy Consumption	KWH	289	381	252	307
Maximum Demand	KVA	15	22	10	16
Billed Demand	KVA	33	33	33	33
Power Factor		0.130	0.150	0.130	0.137
PF Incentives	Rs	0	0	0	0
PF Penalty	Rs	5115	5280	5003	5133
Demand Penalty	Rs	0	0	0	0
Demand Charges	Rs	10659	10659	10659	10659
Bill	Rs	21041	22167	20572	21260
Cost	Rs/KWH	72.81	58.18	81.63	69.18

The average cost of the power procured from electricity board is Rs 69.18/- per kWh.

Power Factor:

The higher power factor entails substantial incentive and reduces maximum demand; while penalty is slapped if the power factor drops below 0.95.

The power factor was observed to be around 0.14. It is suggested to maintain unity power factor on continuous basis which can maximize the saving and reduce the power costs.

The incentive is paid on the entire current bill amount including charges for energy, maximum demand, fuel adjustment charges (FAC) and reliability charges but excluding taxes and duties.

The incentive structure for power factor is as under.

Sr No	Power factor	Power Factor Range	Incentive
1	0.96	0.955 to 0.964	0.5%
2	0.97	0.965 to 0.974	1.0%
3	0.98	0.975 to 0.984	1.5%
4	0.99	0.985 to 0.994	2.5%
5	1.00	0.995 to 1.000	3.5%

Helping You to Conserve Energy

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

The penalty structure for power factor is as under.

Sr No	Power factor	Power Factor Range	Penalty
1	0.89	0.885 to 0.894	1.0%
2	0.88	0.875 to 0.884	1.5%
3	0.87	0.865 to 0.874	2.0%
4	0.86	0.855 to 0.864	2.5%
5	0.85	0.845 to 0.854	3.0%
6	0.84	0.835 to 0.844	3.5%
7	0.83	0.825 to 0.834	4.0%
8	0.82	0.815 to 0.824	4.5%
9	0.81	0.805 to 0.814	5.0%

Maximum Demand:

If recorded demand is more than 65% of Contract demand then billed demand is 65% of recorded demand and If recorded demand is less than 65% of Contract demand then billed demand is 40% of contract demand.

The recorded maximum demand was observed to be below 22 KVA.

Saving Potential by Reducing Contract Demand from 82.22 KVA to 25 KVA and Maintaining Power Factor at Unity

Description	Unit	Nov-19	Dec-19	Jan-20	Average
Maximum Demand	KVA	13.1	18.7	8.7	13.5
Billed Demand	KVA	10.0	12.2	10.0	10.7
Demand Charges	Rs	7622	6904	7622	7382
Electricity Duty	Rs	1601	1450	1601	1550
PF Penalty	Rs	5115	5280	5003	5133
Total	Rs	9222	8354	9222	8933

It is suggested to install automatic power factor correction system (APFC) with minimum rating of individual capacitor for fine controlling of power factor and reduce the contract demand from 82.22 kVA to 25 kVA after consideration of the future expansion, which can reduce the charges of billed demand and electricity duty.

The expected savings shall be around Rs 1.07 Lakh per year.

The investment shall not be more than Rs 50,000/-. The payback period shall be around 5.6 months.

Helping You to Conserve Energy

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

IV Lighting System

Institute has replaced all conventional lights with energy efficient LED lights.



The details are as under.

Location	LED Tube Light
	18 W
Ground Floor	
Gymkhana Room No.2	8
Passage Area	9
Security Room	2
Basement	
Electrical Panel Room	2
Class No.1	2
Passage Area-1	5
Passage Area-2	4
First Floor	
Room No.13	4
Room No.16	4
Passage 1	6
Passage 2	3
Boys Toilet	1
Girls Toilet	1
Second Floor	
Room No.35	8
Room No.33B	2

Helping You to Conserve Energy

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

Location	LED Tube Light
	18 W
Room No.36	4
Room No.37	4
Room No.38	4
Room No.39	7
Room No.40	4
Room No.41	4
Room No.43	8
Room No.44	8
Room No.45	13
Passage 1	3
Passage 2	6
Girls Toilet	1
Boys Toilet	1
Third Floor	
Room No.20	6
Room No.21	4
Room No.22	4
Room No.23	4
Room No.24	4
Room No.25	4
Room No.26	4
Room No.27	4
Room No.28	4
Room No.29	4
Room No.30	14
Room No.31	8
Room No.32	8
Library	12
Passage 1	3
Passage 2	6
Girls Toilet	1
Boys Toilet	1

The efficacy of LED lamps is 100 to 140 lumen per watt as against 80-90 for TFLs; 60 to 70 for PLs, 10 to 15 for GLS and 50 to 60 for MV lamps. The light emittance of LED is typically 120 to 140° Cone as against 360° for all the other fittings. It is therefore possible to save 30 to 60% energy by replacing various lamps with LED.

Helping You to Conserve Energy

**Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce**

Illumination Level

- The illumination level is generally as per the norms; the illumination level is higher mainly due to usage of day light.



- The use of daylight has been maximized through windows.
- The lamps are strategically located to optimize usage of day light.
- The practice of switching off the lamps in the unoccupied areas has been followed.
- It is not economical to provide occupancy sensors for the class rooms due to lesser light fitting and practice of switching off the lamps during unoccupied area.
- There are no major improvements / saving potential in this area.

Helping You to Conserve Energy

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

V

Air Conditioners

Air conditioning system is basically provided to maintain comfortable ambience inside the premises by maintaining the temperature (and relative humidity, at times) at appropriate levels. The performance of human being is optimal at the temperature of 24 ± 2 °C and at relative humidity (RH) of $60 \pm 5\%$.

The warmer and humid air from the premises is drawn and fed to the Air Conditioning System by a circulating fan. This air is chilled in an evaporator by vaporizing the refrigerant and is distributed throughout the conditioned area. The refrigerant is pressurized by a compressor and subsequently cooled and condensed by an air-cooled condenser. The compressor and condenser are placed in an outdoor unit, located on the external side of the premise. While the circulating fan and evaporator is placed in an indoor unit located inside the premises.

The details are as under.

Location	Type	Capacity	Quantity
Ground Floor Office	Split	1.5 Ton	2
CS Lab	Split	1.5 Ton	2
IT Lab	Split	1.5 Ton	2
Auditorium	Split	1.5 Ton	4

Observations:

- The air conditioners are switched off, when not in use.
- The hall temperature was observed to be 24 to 26 °C; which are standard values.
- The overall condition of indoor as well as outdoor units is satisfactory.

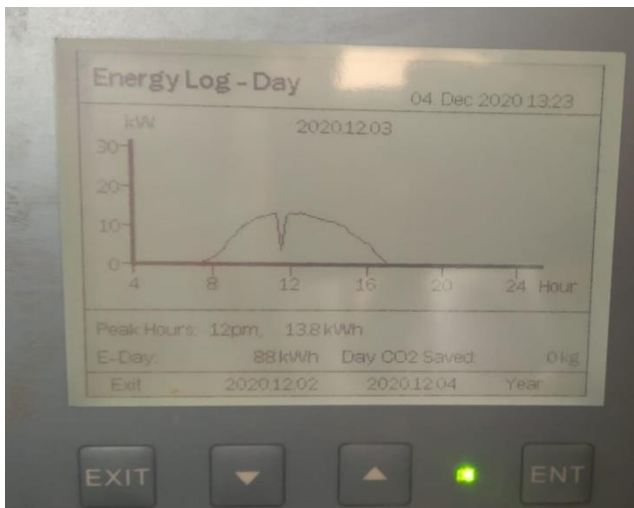
Helping You to Conserve Energy

Energy Audit Report
S.I.C.E.S. Degree College of Arts, Science & Commerce

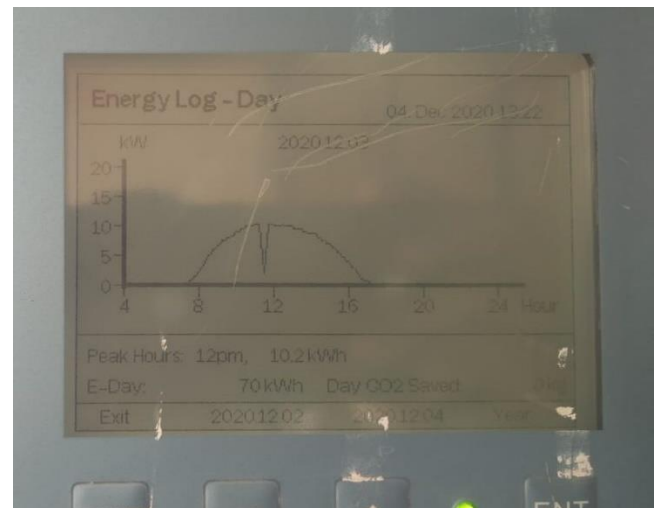
VI Renewable Energy

Solar Photovoltaic:

The organization has installed solar energy system with NET metering as there is enough space available on roof. The total installed capacity of solar energy system is 53 kW.



Meter 1 - Solar System



Meter 2 - Solar System

The total solar power generation is 158 kWh for 03rd December 2020.

Solar Thermal:

There is no application of solar thermal system and does not find attractive in this case.

Helping You to Conserve Energy