Youth Education & welfare Society's National Senior College,

National Campus, Maulana Azad Road, Sarda Circle, Nashik-01

(MAHARASHTRA)

NAAC Re-accredited "B" Grade (CGPA 2.16)

Internal Quality Assurance Cell(IQAC)

Energy Audit Report

(2021-22)

Report By

SOLASTA

Energy Solutions, Services & Maintenance

Website: www.solasta.in

Contact: +91 8007552123 **Email**: solastasustain@gmail.com

Address: 7, Dattakunj , Anand Nagar , Gangapur Road, Nashik-13

Date: 30/06/2022

INDEX

Sr. No.	Particulars	Page No.
	Preface, Acknowledgement, Summary.	3
	Abbreviations	6
1	Chapter 1: Introduction of Energy Audit	7
2	Chapter 2: About Institute	8
3	Chapter 3: Energy Consumption Profile	9
4	Chapter 4: Data Analysis	13
5	Chapter 5: Actual Measurements and their Analysis	16
6	Chapter 6: Study of Air Conditioners	17
7	Chapter 7: Energy Conservation Proposals	18
8	Chapter 8: Energy-Saving Recommendations	20
9	Chapter 9: References	21
10	Work Compilation Certificate	22
11	Certificate	23

Preface

Data collection for the energy audit of the **Youth Education & welfare Society's National Senior College** was approved by the team for the period of June 21 to May 22.

An energy audit survey was completed by the firm **SOLASTA Energy Solutions, Services & Maintenance** with the help of faculty members of the Physics, and Economics Department. Data was collected for each classroom, laboratory, office, library, and Auditorium of the campus in previous years and updated year by year. The work is completed by considering how many tubes, fans, ACs, electronic instruments, etc. are installed in every room.

We appreciate the effort put in by YEWS management for creating awareness of Energy Audit and its role in energy saving amongst all of us. We appreciate Hon. Management of the college for encouraging us by providing this opportunity to do the energy audit and participate in the energy-saving program. Through this, we have cleared the vision of the Institution towards a Green campus and saving nature. We appreciate for various efforts taken by the college.

Main Building

Acknowledgement

We are very much thankful to **Principal Dr Mr S. B. Nahire Sir** for motivating us and giving us the opportunity for an energy audit. We would like to express our thanks to the Head of all Department, respected staff, faculty members and students who have taken part in this audit survey etc. We tried our best to present this energy report as per the requirements of the college and our expertise work.

Annex Building

Summary

Energy Audit Committee

Sr.No.	Names	Designation
1	Principal. Dr S.B. Nahire	Chairperson
2	Prof. M.P. Mule	IQAC Co-Ordinator
3	Mr Tousif Mirza	Energy Audit Co-Ordinator
4	Dr Reshma Khan	Member
5	Dr Seema Jagtap	Member
6	Mr Noor Mohammad Peer Mohammad	Member
7	Mr Akshay Bhalekar	Member

The objective of the audit was to study the energy consumption pattern of the college, identify the areas where the potential for energy/cost saving exists and prepare proposals for energy/cost saving along with investment and payback periods.

The salient observations and recommendations are given below:

Youth Education & welfare Society's National Senior College uses energy in the following forms:

1) From MSEDCL

Electrical energy is used for various applications, like Computers, Lighting, Air-Conditioning, Fans, Laboratory Equipment, Printers, Xerox machines, CCTV, UPS, LCD Projector, Router systems, Floodlights, Pumping motors, and Exhaust fans. etc.

After the measurement and analysis, we propose herewith the following aspect regarding the efficient use of energy:

Abbreviations

AHU	Air handling unit
APFC	Automatic Power Factor Controller
DG	Diesel generator
ECP	Energy Conservation Proposal
GCV	Gross Calorific Value
HVAC	Heating, Ventilation and Air Conditioning
HSDG	High-speed diesel Generator
PF	Power Factor
SEC	Specific Energy Consumption
TR	Tons of Refrigeration
UOM	Unit of Measurement
MAHADISCO	Maharashtra State Electricity Distribution Company

Chapter: 1

Introduction to Energy Audit

- **General:**

The **Youth Education & welfare Society's National Senior College** entrusted the work of conducting a walk thorough Energy Audit of campus with the main objectives as given below:

- ✓ To study the present pattern of energy consumption
- ✓ To identify potential areas for energy optimization
- ✓ To recommend energy conservation proposals with cost-benefit analysis.

- **Scope of Work, Methodology and Approach:**

The scope of work and methodology were as per the proposal. While undertaking data collection, and analysis, due care was always taken to avoid abnormal situations to generate normal/representative patterns of energy consumption at the facility.

- **Approach to Energy Audit:**

We focused our attention on energy management and optimization of energy efficiency of the systems, subsystems and equipment. The key to such performance evaluation lies in the sound knowledge of the performance of types of equipment and system as a whole.

- **Energy Audit:**

The objective of an Energy Audit is to balance the total energy inputs with their use and to identify the energy conservation opportunities in the stream. Energy Audit also gives focused attention to energy cost and the cost involved in achieving higher performance with technical and financial analysis. The best alternative is selected on a financial analysis basis.

Energy Audit Methodology: Energy Audit Study is divided into the following steps:

1. **Historical Data Analysis:**

The historical data analysis involves the establishment of an energy consumption pattern to the established baseline data on energy consumption and its variation with changes in production volumes.

2. **Actual data analysis:**

This step involves actual trial measurement It also involves input-to-output analysis to establish actual operating equipment efficiency and find out losses in the system.

3. **Identification and evaluation of Energy Conservation Opportunities:**

This step involves the evaluation of energy conservation opportunities identified during the energy audit. It gives the potential for energy saving and investment required to implement the proposed modifications with a payback period.

Chapter: 2

About Institute

Sr. No.	Particulars	Details
1	Name of the Institute:	Youth Education & welfare Society's National Senior College, Nashik-422001
2	Address:	National Campus, Mulana Azad Road, Sarada Circle, Nashik-01
3	Affiliation:	Affiliated to Savitribai Phule, Pune University, Pune-07 College ID: PU/NS/AC/106/2007 ISO 9001:2015 Certified AISHE ID-C-41751
4	Year of Establishment:	Established: July 2007
5	NAAC Accreditation:	NAAC Accredited "B" Grade (CGPA 2.16)
6	Contact:	Phone: 0253 2594973 Email: nationalseniorcollege@gmail.com Website: www.yewsnational.org
7	Courses Offered:	XIth and XIIth
		B. A./B.Com./B.Sc.
		BBA
		BSC computer science
		Arts- English, Hindi, Geography, Politics, Library, Physical Educator, Sports, Economics,

Chapter: 3

Energy Consumption Profile

3.1 Source of Energy:

Youth Education & welfare Society's National Senior College uses Energy in the following forms:

A. Electricity from MSEDCL :

National Senior College receives Electricity from,
NASIK (U) CIRCLE: 595 NASIK NASIK URBAN DN. I: 040 CITY S/D

B. Electrical Supply Details:

The electrical supply to National Senior College comes from MSEDCL supply at 11 kV, which is stepped down to 415 V by a transformer and distributed to multiple departments through multiple MCBs, RCCBs, and isolators.

Study of Electrical Demand:

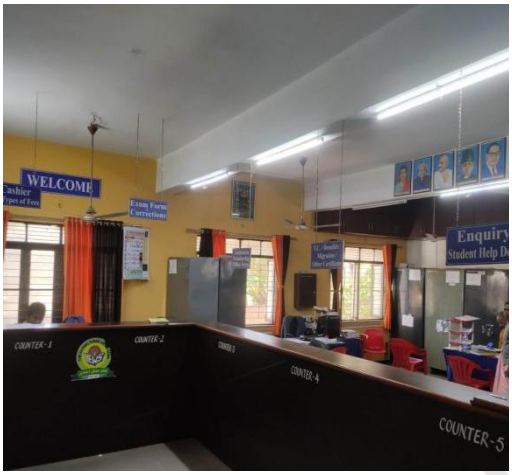
There is a 3-phase single meter installed on the premises. The details of the meters are as under:

Energy Meter Details:

Sr. No.	Details of Electricity Demand	Tariff	88LT-VII B I
	Meter No:	**076-00214839**	
1	Sanctioned Load	50	kw
2	Contract Demand	62.00	kvA
3	Recorded Maximum Demand	19	KW

3.2 Following are the major consumers of electricity in the facility:

- Computers
- Lighting
- Air-Conditioning systems
- Fans
- Laboratory Equipment
- Printers
- CCTV
- UPS
- LCD Projector
- Router system
- Flood light
- Pumping motor

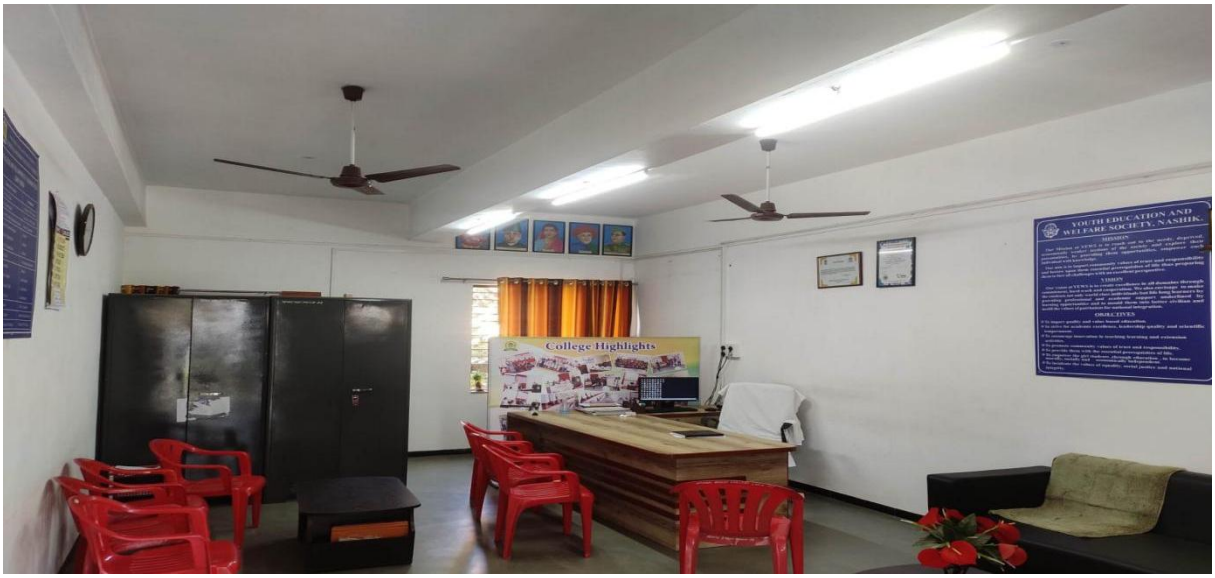


Admin. Office

Exam Section

I.T. Lab

Electronics Lab



Principal Office

Class Room

IQAC Office

Chapter: 4

Data Analysis

4.1. Study of Variation of Monthly Units consumption & Power Factor:

In this Chapter, we study the details of the 12-month Electricity Bills.

TABLE 1: Variation in Units Consumption:

Sr. No.	Month	Units in kWh
1.	May 22	2428
2.	April 22	3261
3.	Mar 22	3727
4.	Feb 22	2275
5.	Jan 22	2049
6.	Dec 21	2691
7.	Nov 21	2314
8.	Oct 21	2895
9.	Sept 21	2182
10.	Aug 21	2227
11.	July 21	2154
12.	June21	2006

4.2 Conclusion: Variation of PF/ load Factor:

- For a power factor of 0.99, the effective incentive will amount to a 5% (five per cent) reduction in the energy bill and for a unity power factor; the effective incentive will amount to a 7% (seven per cent) reduction in the energy bill.

- As per the MSEDCL tariff, whenever the average power factor in a month, is less/more than 0.95, incentives/penalties are offered which we need to have to take into consideration

- Similarly, for improvement/ to constantly maintain the power factor, If we more focus on averaging the power factor to 0.95, we will get incentives instead of a penalty.

- The power factor maintained in the year June 2021 to May 2022 is around **p.f. 0.98** On an Average (Ref. Electricity bills)

- Load factor variation affects the power factor simultaneously, and should maintain a constant load profile.

4.3 Study of Month-wise Electricity Bill Variation:

TABLE 2: Variation in Electricity Bill:

Sr. No.	Month	Electricity Bill Amount (Rs.)
1	May 22	38490
2	April 22	46462
3	Mar 22	51516
4	Feb 22	35350
5	Jan 22	32963
6	Dec 21	39675
7	Nov 21	35581
8	Oct 21	41372
9	Sept 21	33815
10	Aug 21	34565
11	July 21	33764
12	June21	32150
	Total Annual Bill=	**455703/-**
	Average Monthly Bill=	**37975/-**

Conclusion: Slightly Variation in Monthly Electricity Bill has been identified.

Chapter: 5
Actual Measurements and their Analysis

5.1 Load Consumption:

Sr. No.	Name of Appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Usage per Day Hr.	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	FTL	40	6	240	6	1440
2	Fan	80	312	24960	6	149760
3	PC	60	115	6900	6	41400
4	Printer: Standby mode: 30-50w/	printing mode:300-500w	33	9900	2	19800
5	LED 18 W	18	370	6660	6	39960
	LED 20 W	20	24	480	6	2880
6	Xerox machine	650	2	1300	2	2600
7	Fax machine	30	1	30	2	60
8	CCTV	10	29	290	24	6960
9	Water Cooler	2.8kwh/day	2	5.6	2	11200
10	TV LED	80	2	160	4	640

11	Chandelier	60	1	60	4	240
12	LCD Projector	282	8	2256	2	4512
13	Charging socket	25	30	750	6	4500
14	P.A.System	560	1	560	2	1120
15	Exhaust fan	60	8	480	4	1920
16	Electric bell	5	3	15	1	15
17	Refrigerator	2kwhr/day	3	6	8	48000
18	Flood light	100	4	400	8	1200
19	Loudspeaker	100	1	100	1	100
20	Microwave	3000	1	3000	1	3000

5.2 Department-wise load Distribution:

A) School Building & College building:

Sr. No.	Premises	Existing Load During (2021-22) in Watts
1	Principal Office	6574
2	Administration Office:	1081
3	Management, NSC & School, Primary Office:	16872
4	Laboratories no. 34,35,36,37,38:	3616
5	Computer Lab no. 27, 46:	6062
6	All Dept No.: 56,64,65,74:	4918
7	Classrooms:(1,2,3,4,5,6)	18304
8	Gymkhana	500
9	Prayer Room, Auditorium & Seminar Hall:	3864
10	IQAC, Physical Edu., Competitive Cell, Library, NSS:	4270
11	Veranda, campus, canteen, other:	16583

**** This is the total load consumption considered approximately. Actual load consumption might be different according to the actual use of power for a particular period.***

Chapter: 6

Study of Air Conditioners

In the facility for air conditioning, there is no centralized system with AHU (air handling unit), mostly split air conditioners are proposed.

6.1 Observations and suggestions:

1. Normal air conditioning temperature should be kept as high as possible (I.e.24 Deg.cels.). By thumb rule, an increase of 3 degrees in indoor air temperatures can save 1% of electricity.
2. The ventilation in the area is provided with the installation of natural ventilation arrangements in classrooms. Natural ventilation will also minimize the requirement for exhaust fans.

6.2 Carbon Di-Oxide Emission Initiative:

* College initiated appreciable activities for Energy Saving Awareness like the use of LED and replacing old light sources with new LED.

* Need to Create other energy efficiency / renewable energy awareness among the college campus i.e. solar, wind, and Biogas energy.

* College should also initiate arranging seminars, lectures, and paper presentation competitions among students and staff for general awareness.

Chapter: 7

Energy Conservation Proposals

7.1 Providing Energy Efficient Solution::

The **energy-saver circuits/inverter Based Air Conditioners, intelligently reduce the operating hours** of the compressors either by timing or temperature difference logic without affecting human comfort. This can save around 15% to 30% of the electricity depending on the weather conditions and temperature settings. While choosing Ac for campus this point should be considered

It is recommended that new energy-efficient BEE STAR labelled (3 Star and above) air conditioners should install whenever possible.

TABLE 7: Energy Efficiency Improvement:

Sr. No.	Recommendations	Annual Saving Potential (Rs.)	Estimated Investment (Rs.)	Pay Back Period (Years)	Remarks (Feasibility)
1.	Solar Street Light, Solar High mast, Solar Garden Light.	As Per Requirement	30000		Mid Term
2.	Solar On-Grid Rooftop System	30kw or as required	As per requirement	4.5 or 5yrs	Mid Term

- **The total energy cost with an overall payback period of 4.5 to 5 Years for technical and economical feasibility.**

7.2 Lighting System:

Observations and suggestions:

- It is found that FTL, Bulbs, and CFLs are installed and replaced with LEDS
- light or electric gadgets left ON when not needed which is wasting energy and money, causing pollution that is unnecessary, we can surely avoid this.
- **Stand-by power can use up to 8% of a household's total electricity.**

For most homes, a 10% reduction in electricity consumption can save 15000 more a year off our electricity bill and nearly ¾ of a ton of CO2 pollution. A 20% reduction in average consumption will save Approximately 30,000 and over 1.5 tons of CO2.

7.3 Don't forget to power down these things when not in use:

- Lights
- Projectors
- Air Conditions
- Exhaust and ceiling or table fan
- Printers and scanners
- Battery and phone chargers
- Computers
- TV
- PA Systems
- Pantry /Canteen gadgets such as blenders, kettles, toasters, Induction etc.

CHAPTER: 8

Energy Saving Recommendations

General Recommendations:

- Care should be taken to keep lights in the classroom off and keep them ON whenever necessary.
- Try to get the benefit of the TOD time slot i.e. -01.50 rate at night in addition to the actual rate per unit consumption for **electric motor pumping purposes during 2200 – 0600 Hrs.**
- Use Solar Street Light, Solar High mast, and Solar Garden Light on Premises.

Executive Recommendations:

1. Form Institute level student community that keeps track of the energy consumption Parameters of the various departments, classrooms, halls, areas, and energy meters. Etc

2. Energy auditing inside the campus has to be done regularly and guidelines should be made public to departments to create awareness.

Chapter: 9

References

1) "Energy Management, Audit and Conservation" by Barun Kumar De

2) "Guide to Energy Management" by Barney L

3) "Energy Audits: A Workbook for Energy Management in Buildings" by Tarik Al–Shemmeri

4) "Fundamentals of Energy Conservation and Audit" by Agarkar Santosh Vyankatro and Mateti Naresh Kumar

5) "Industrial Energy Conservation (UNESCO Energy Engineering)" by Charles M Gottschalk

6) Msedcl Energy Bills/ CPL

SOLASTA
Energy Solutions, Services & Maintenance
Website : www.solasta.in
Contact: +918007552123 Email: solastasustain@gmail.com
Address: 7, Dattakunj Appt., Anand Nagar, Gangapur Road, Nashik-422013

WORK COMPLETION REPORT

- Name of Work Project : Energy Audit of Youth Education & Welfare Society's National Senior College, Sarda circle, Nashik-422001
- Work Order Number : AY 2021-22
- Work Period : From 20/06/2022 To 30/06/2022

This is to Certify that SOLASTA Energy Solutions, Services & Maintenance has successfully completed Energy audit at Youth Education & Welfare Society's National Senior College, Sarda circle, Nashik-422001. The work of energy audit is completed on 30/06/2020 for year 2021-22.

Thanking you and assuring you for our best service always.

Audit Report BY,

Er. Anil S. Dube
BEE Certified Energy Auditor
Regn.No.EA-4973

Mr. Anil S. Dube

FOR SOLASTA,

SOLASTA
Energy Solutions, Services & Maintenance

Mr. Pushpendra P. Pagar
Proprietor

Date: 30/06/2022
Place: Nashik

Regn. No. EA-4973

No. 2487

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Ms. Anil Siddhanarayan Dube

son / daughter of Mr. Siddhanarayan Dube

has passed the National Certification Examination for Energy Auditors in 2006, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India

Date : 30th April 2007

Controller of Examination