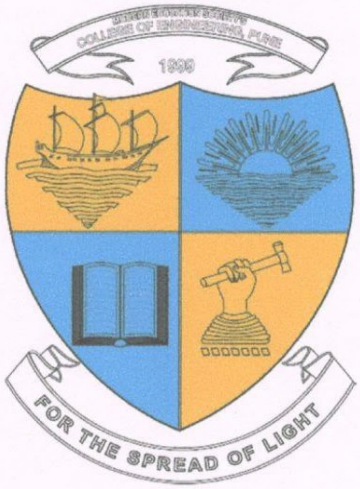
ENERGY AUDIT REPORT

of

Modern Education Society's
College of Engineering, Pune 411 001



Year: 2020-21

Prepared by:

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: enrichcons@gmail.com

ENRICH CONSULTANTS * Pune *

MAHARASHTRA ENERGY DEVELOPMENT AGENCY
An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary,
Aundh, Pune, Maharashtra 411067
Ph No: 020-35000450
Email: eec@mahaurja.com, Web: www.mahaurja.com

ECN/2021-22/CR-14/1577 — 22nd April, 2021

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with ***MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)*** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : **M/s Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School, Parvati,
Pune - 411009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : ***MEDA/ECN/2021-22/Class A/EA-03***

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **21st April, 2023** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

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Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/MESCOE/20-21/01

Date: 20/8/2021

CERTIFICATE

This is to certify that we have conducted Energy Audit at Modern Education Society's College of Engineering, Pune 411 001, in the Academic year 2020-21

.The College has adopted following Energy Efficient practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Maximum usage of Day Lighting
- Installation of **8 kWp** Roof Top Solar PV Plant
- Installation of 5000 LPD Solar Water Heating System at Hostel block.

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Enrich Consultants,

ENRICH CONSULTANTS * Pune *

A Y Mehendale,
Certified Energy Auditor
EA-8192

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Modern Education Society's College of Engineering, Pune 411 001, for awarding us the assignment of Energy Audit of their Campus for the Academic Year: 2020-21.

We are thankful to:

- Dr. S. S. Sarawade, I/C Principal
- Dr. P. P. Mane, IQAC Coordinator

We are also thankful to other Staff members for helping us during the field study.

EXECUTIVE SUMMARY

1. Modern Education Society's College of Engineering Pune consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	46213	41.59
2	Maximum	5925	5.33
3	Minimum	672	0.60
4	Average	3851.08	3.47

3. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment
- Maximum Usage of Day Lighting
- Installation of 8 kWp Roof Top Solar PV Plant & Solar Water Heating System.

4. Usage of Alternate Energy:

- The College has installed Roof Top Solar PV Plant of Capacity **8 kWp.**
- Energy purchased from MSEDCL is **46213 kWh.**
- Energy generated by Roof Top Solar PV Plant is **9600 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **17.20 %.**

5. Usage of LED Lighting:

- The Total Annual Lighting Demand of the College is **16408 kWh.**
- The Total Annual LED Lighting Demand is **16408 kWh.**
- The percentage of Annual LED Lighting to Annual Lighting Demand is **100 %.**

6. Assumptions:

1. 1 kWh of Electrical Energy releases **0.9 Kg** of CO_2 into atmosphere
2. Daily working hours-**4 Nos** (For Lighting Calculations)
3. Annual working Days-**90 Nos** (For Lighting Calculations)
4. Annual Solar Energy Generation Days: **300 Nos.**

7. References:

- For CO_2 Emissions: www.tatapower.com
- For Roof Top Solar PV Plant Energy generation: www.solarrooftop.gov.in

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ABBREVIATIONS

LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
IQAC	:	Internal Quality Assurance Cell
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
CFL	:	Compact Fluorescent Light
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO_2 emissions
3. To study usage of Alternate Energy
4. To study usage of LED Lighting

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of Institution	Modern Education Society's College of Engineering
2	Address	19, Late Prin. V. K. Joag Path, Wadia College Campus, Pune 411 001
3	Year of Establishment	July 1999
4	Affiliation	Savitribai Phule Pune University

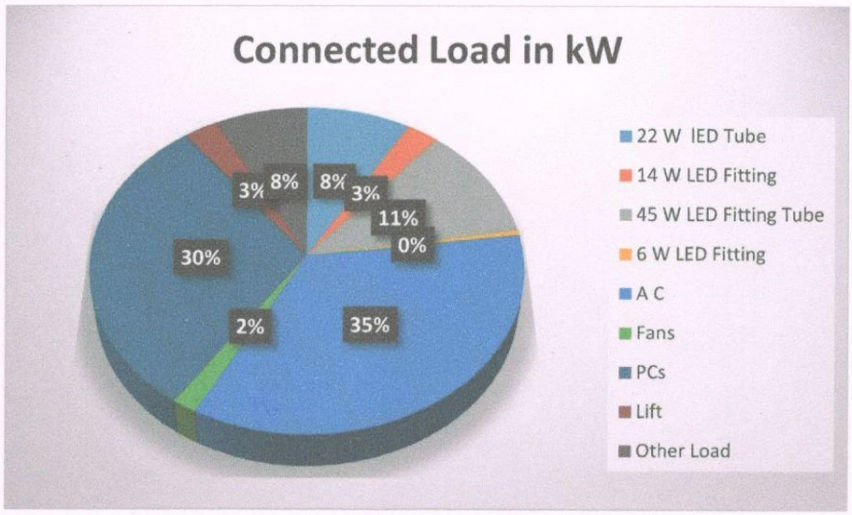
CHAPTER-II
STUDY OF CONNECTED LOAD

The major contributors to the connected load of the College include:

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Load/Unit	Qty	Load in kW
1	22 W LED Tube	22	765	16.83
2	14 W LED Fitting	14	370	5.18
3	45 W LED Fitting	45	504	22.68
4	6 W LED Fitting	6	148	0.888
5	A C	1875	37	69.38
6	Fans	52	62	3.224
7	PCs	150	400	60
8	Lift	5595	1	5.595
9	Other Load	150	100	15
10	**Total**			**199**

Chart No 1: Study of Connected Load:



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CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of Electrical Energy Consumption.

Table No 3: Electrical Bill Analysis- 2020-21:

No	Month	Energy Consumed, kWh
1	Jul-20	672
2	Aug-20	1891
3	Sep-20	2213
4	Oct-20	4550
5	Nov-20	3660
6	Dec-20	3921
7	Jan-21	4110
8	Feb-21	5470
9	Mar-21	5925
10	Apr-21	4667
11	May-21	4641
12	Jun-21	4493
13	Total	46213
14	Maximum	5925
15	Minimum	672
16	Average	3851.08

Chart No 2: Variation in Monthly Energy Consumption:

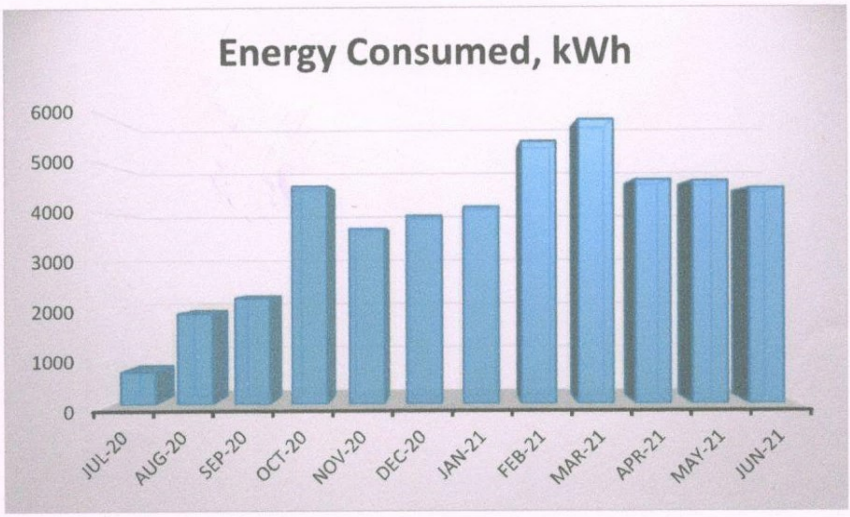

Table No 4: Variation in Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh
1	Total	45356
2	Maximum	13444
3	Minimum	2158
4	Average	3779.67

CHAPTER-IV
CARBON FOOTPRINTING

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities.

In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets.

Basis for computation of CO_2 Emissions:

- 1 kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

Table No 5: Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Jul-20	672	0.60
2	Aug-20	1891	1.70
3	Sep-20	2213	1.99
4	Oct-20	4550	4.10
5	Nov-20	3660	3.29
6	Dec-20	3921	3.53
7	Jan-21	4110	3.70
8	Feb-21	5470	4.92
9	Mar-21	5925	5.33
10	Apr-21	4667	4.20
11	May-21	4641	4.18
12	Jun-21	4493	4.04
13	Total	46213	41.59
14	Maximum	5925	5.33
15	Minimum	672	0.60
16	Average	3851.08	3.47

Chart No 3: Month wise CO_2 Emissions:

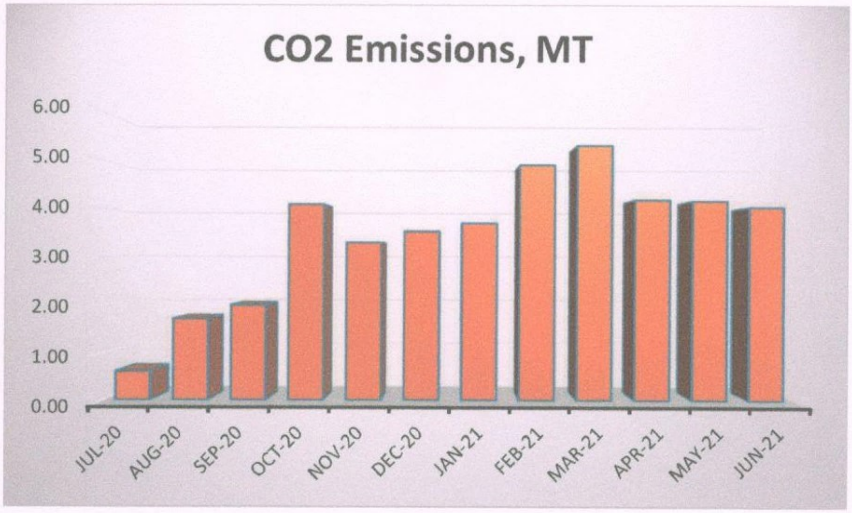

Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh	CO2 Emissions, MT
1	Total	46213	41.59
2	Maximum	5925	5.33
3	Minimum	672	0.60
4	Average	3851.08	3.47

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **8 kWp.**

In the following Table, we compute the percentage of Usage of Alternate Energy to Annual Energy Demand of the College.

Table No 7: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Energy Purchased from MSEDCL	**46213**	kWh
2	Installed Roof Top Solar PV Plant Capacity	8	kWp
3	Average Daily Energy Generated	4	kWh/kWp
4	Annual Generation Days	300	Nos
5	Annual Solar Energy Generated	**9600**	kWh
6	Total Energy Demand = (1) + (5)	55813	kWh
7	% of Usage of Alternate Energy to Total Annual Energy Demand= (5)*100/ (6)	**17.20**	%

Photograph of Roof Top Solar PV Plant:

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CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

In this chapter, we compute the percentage of usage of LED Lighting to Annual Lighting power requirement.

Table No 8: Percentage of Usage of LED Lighting to Annual Lighting Load:

No	Particulars	Value	Unit
1	No of 22 W LED Tube Lights	765	Nos
2	Demand of 22 W LED Tube Light	22	W/Unit
3	Total Electrical Load of 22 W LED Fittings	**16.83**	kW
4	No of 14 W LED Tube Lights	370	Nos
5	Demand of 14 W LED Tube Light	14	W/Unit
6	Total Electrical Load of 14 W LED Fittings	**5.18**	kW
7	No of 45 W LED Fitting	504	Nos
8	Demand of 45 W LED Fitting	45	W/Unit
9	Total Electrical Load of 45 W LED Fittings	**22.68**	kW
10	No of 6 W LED Fitting	148	Nos
11	Demand of 6 W LED Fitting	6	W/Unit
12	Total Electrical Load of 6 W LED Fittings	**0.888**	kW
13	Total Lighting Load=3+6+9+12	**45.578**	kW
14	Total LED Lighting Load= 3+6+9+12	**45.578**	kW
15	Average Daily Usage Period	4	Hours
16	Annual Working Days	90	Nos
17	Annual Total Lighting Load = 13*15*16	**16408**	kWh
18	Annual LED Lighting Load = 14*15*16	**16408**	kWh
19	**Annual Lighting Requirement met by LED= 18*100/17**	**100**	**%**