NAAC

National Assessment and Accreditation Council

LOKNAYAK BAPUJI ANEY MAHILA MAHAVIDYALAYA, YAVATMAL

NAAC Accredited with Grade 'B'

Academic Year

2022-2023

Criterion VII

Energy Audit

7.1.6

ENERGY AUDIT REPORT

OF

Loknayak Bapuji Aney Mahila Mahavidyalaya, Yavatmal – 445 001

Year: 2021-22

Prepared by:

Engress Services

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: engress123@gmail.com

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

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: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2022-23/CR-43/1709 10th May, 2022

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 Engress Services
Yashshree, 26, Nirmal Bag Society,
Near Muktangan English School,
Parvati, Pune – 411 009.

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

Registration Number : ***MEDA/ECN/2022-23/Class A/EA-32.***

- 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 **09th May, 2024** 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 (FC)

ENGRESS SERVICES * PUNE *

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: engress123@gmail.com

Ref: EC/LBA/21-22/17

Date: 11/12/2022

CERTIFICATE

This is to certify that we have conducted Energy Audit at Loknayak Bapuji Aney Mahila Mahavidyalaya in the Academic year 2021-22.

The College has adopted following Energy Efficient practices:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting

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

For Engress Services,

A Y Mehendale,
Certified Energy Auditor
EA-8192

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ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Loknayak Bapuji Aney Mahila Mahavidyalaya,Yavatmal for awarding us the assignment of Energy Audit of their Campus for the Academic Year: 21-22.

We are thankful to all the Principal and Staff members for helping us during the field study.

EXECUTIVE SUMMARY

1. Loknayak Bapuji Aney Mahila Mahavidyalaya,Yavatmal 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 Purchased, kWh	CO_2 Emissions, MT
1	Total	865	0.778
2	Maximum	465	0.418
3	Minimum	0	0
4	Average	72.083	0.064

3. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Maximum Usage of Day Lighting
- Installation of 10 kWp Solar PV Plant

4. Usage of Alternate Energy:

- The College has installed Roof Top Solar PV Plant of Capacity 10 kWp
- Energy Purchased from MSEDCL in 21-22 is 865 kWh
- Energy Generated by Roof Top Solar PV Plant in 2021-22 is 12000 kWh
- Percentage of Usage of Alternate Energy to Annual Energy Demand is 93.27 %

5. Usage of LED Lighting:

- The Total Lighting Load is 1.395 KW.
- The Total LED Lighting Load is 1.395 KW.
- 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. 100 LPD Solar Thermal System saves 1500 kWh of Electrical Energy per Annum.
3. Average Energy generated by 1 kWp Solar PV Plant: 4 kWh/Day.
4. Annual Solar Energy Generation Days: 300 Nos.

7. References:

- For CO_2 Emissions: www.tatapower.com

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
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

1.2Table No 1: General Details of the College:

No	Head	Particulars
1	Name of Institution	Loknayak Bapuji Aney Mahila Mahavidyalaya
2	Address	Awadhoot Wadi, Datta Chowk,Yavatmal-445 001
3	Affiliation	S.G.B.Amravati University, Amravati

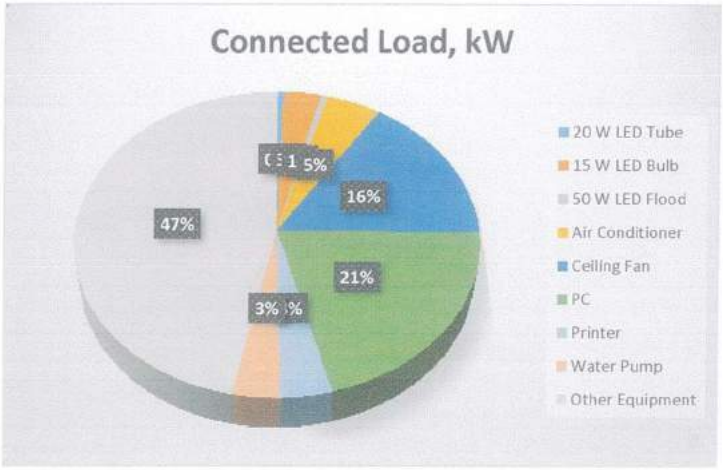
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	20 W LED Tube	8	20	0.16
2	15 W LED Bulb	69	15	1.035
3	50 W LED Flood	4	50	0.2
4	Air Conditioner	1	1500	1.5
5	Ceiling Fan	96	54	5.184
6	PC	44	150	6.6
7	Printer	8	150	1.2
8	Water Pump	1	1119	1.119
9	Other Equipment	100	150	15
10	**Total**			**32**

Chart No 1: Study of Connected Load:



CHAPTER-III

STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 3: Electrical Bill Analysis- 2021-22:

No	Month	Energy Purchased, kWh
1	Apr-21	0
2	May-21	0
3	Jun-21	0
4	Jul-21	465
5	Aug-21	210
6	Sep-21	190
7	Oct-21	0
8	Nov-21	0
9	Dec-21	0
10	Jan-22	0
11	Feb-22	0
12	Mar-22	0
13	Total	865
14	Maximum	465
15	Minimum	0
16	Average	72.083

Chart No 2: Variation in Monthly Energy Consumption:

Table No4: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	865
2	Maximum	465
3	Minimum	0
4	Average	72.083

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 taking into account the usage of the Electrical Energy.

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 No5: Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Apr-21	0	0
2	May-21	0	0
3	Jun-21	0	0
4	Jul-21	465	0.418
5	Aug-21	210	0.189
6	Sep-21	190	0.171
7	Oct-21	0	0
8	Nov-21	0	0
9	Dec-21	0	0
10	Jan-22	0	0
11	Feb-22	0	0
12	Mar-22	0	0
13	Total	865	0.778
14	Maximum	465	0.418
15	Minimum	0	0
16	Average	72.083	0.064

Chart No 3: Month wise CO_2Emissions:

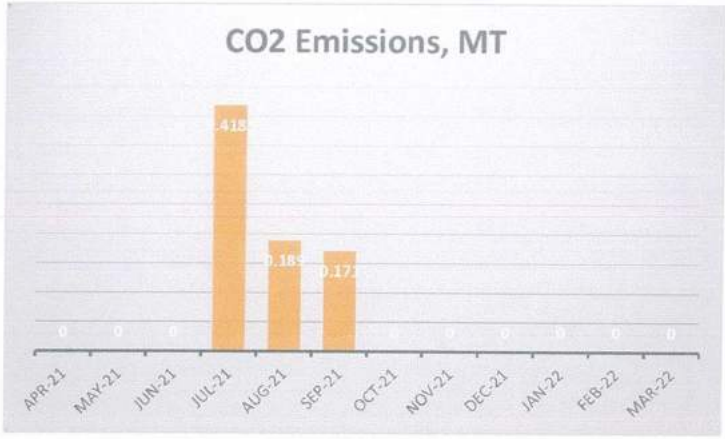


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	865	0.778
2	Maximum	465	0.418
3	Minimum	0	0
4	Average	72.083	0.064

CHAPTER V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **10 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	865	kWh
2	Installed Roof Top Solar PV Plant Capacity	10	kWp
3	Average Daily Energy Generated	4	kWh/kWp
4	Annual Generation Days	300	Nos
5	Annual Solar Energy Generated	12000	kWh
6	Total Energy Demand = (1) + (5)	12865	kWh
7	% of Usage of Alternate Energy to Total Annual Energy Demand= (5)*100/ (6)	93.276	%

Photograph of Roof Top Solar PV Plant:

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 Total Lighting Load:

No	Particulars	Value	Unit
1	No of 20 W LED Tube Lights	8	Nos
2	Demand of 20 W LED Tube Light	20	W/Unit
3	Total Electrical Load of 20 W LED Fittings	**0.16**	kW
4	No of 15 W LED Tube Lights	69	Nos
5	Demand of 15 W LED Tube Light	15	W/Unit
6	Total Electrical Load of 15 W LED Fittings	**1.035**	kW
7	No of 50 W LED Tube Lights	4	Nos
8	Demand of 50 W LED Tube Light	50	W/Unit
9	Total Electrical Load of 50 W LED Fittings	**0.2**	kW
10	Total Lighting Load=3+6+9	**1.395**	kW
11	Total LED Lighting Load= 3+6+9	**1.395**	kW
12	**% of Annual LED Lighting to Total Lighting Load= 10*100/11**	100.00	%

1.1.6 Table No-3: National Environmental Plans & Policy Documents:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research Institute)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency
10	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

1.2 Objectives:

1. Study Resource Consumption& CO_2 Emissions
2. Study of CO_2 Emission Reduction
3. Study of Indoor Air Quality Parameters
4. Study of Indoor Comfort Condition Parameters
5. Study of Waste Management
6. Study of Rain Water Harvesting
7. Study of Environment Friendly Initiatives

1.3 General Details of College: Table No 4:

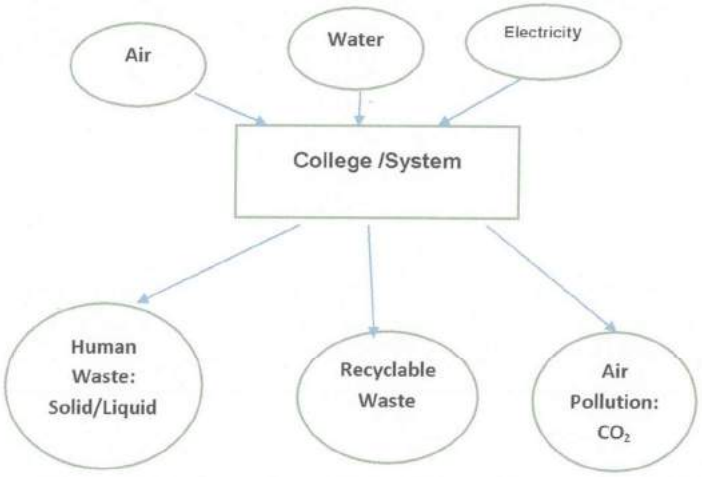
No	Head	Particulars
1	Name of Institution	Loknayak Bapuji Aney Mahila Mahavidyalaya
2	Address	Awadhoot Wadi, Datta Chowk,Yavatmal-445 001
3	Affiliation	S.G.B.Amravati University, Amravati

CHAPTER-II
STUDY OF CONSUMPTION OF RECOURCES & CO_2 EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

We try to draw a schematic diagram for the College System & Environment as under.
Chart No 1: Representation of College as System & Study of Resources & Waste



Now we compute the Generation of CO2 on account of consumption of Electrical Energy.

The basis of Calculation for CO_2 emissions due to usage of Electrical Energy are as under

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

Table No 5: Study of Consumption of Electrical Energy & CO_2 Emissions: 2021-22:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Apr-21	0	0
2	May-21	0	0
3	Jun-21	0	0
4	Jul-21	465	0.418
5	Aug-21	210	0.189
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7	Oct-21	0	0
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12	Mar-22	0	0
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Chart No 2: Month wise CO_2Emissions:

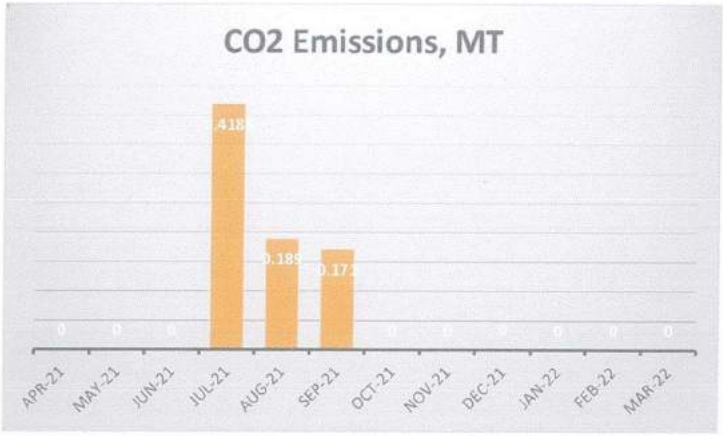

Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	865	0.778
2	Maximum	465	0.418
3	Minimum	0	0
4	Average	72.083	0.064

CHAPTER III
STUDY OF CO_2 EMISSION REDUCTION

The College has installed Roof Top Solar PV Plant of Capacity **10 KWp.** In the following Table, we compute the percentage of reduction in Annual CO2 Emission.

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

No	Particulars	Value	Unit
1	Installed Roof Top Solar PV Plant Capacity	10	kWp
2	Average Daily Energy Generated	4	kWh/kWp
3	Annual Generation Days	300	Nos
4	Annual Solar Energy Generated	12000	kWh
5	1 kWh of Electrical Energy Emits	0.9	Kg of CO_2
6	Reduction in CO_2 emission by Solar PV Plant =(4)*(5)	10.8	MT/Annum

Photograph of Roof Top Solar PV Plant:

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
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General Manager (EC)

ENGRESS SERVICES

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

Ref: EC/LBA/21-22/17 Date: 11/12/2022

CERTIFICATE

This is to certify that we have conducted Green Audit at Loknayak Bapuji Aney Mahila Mahavidyalaya in the Academic year 2021-22.

The College has adopted following Green Initiatives:

- Usage of Energy Efficient LED Light Fitting
- Maximum Usage of Day Lighting
- Provision of Separate bins for Dry & Wet Waste
- The College has installed Septic Tank and is cleaned periodically.
- Implementation of Rain Water Harvesting Project
- Maintenance of good Internal Road
- Tree Plantation in the campus
- Creation of awareness by Display of Posters on Resource Conservation

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Engress Services,

A Y Mehendale,
Certified Energy Auditor, EA-8192
ASSOCHAM GEM Certified Professional: GEM: 22/788

ENGRESS SERVICES * PUNE *

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ACKNOWLEDGEMENT

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3. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient LED Lighting fittings.
- Maximum Usage of Day Lighting.
- Installation of 10 kWp Solar PV Plant.

4. Usage of Renewable Energy & CO_2 Emission Reduction:

- The College has installed solar roof-top Power Plant of Capacity 10 KWp.
- The Energy Generated by Roof Top Solar PV Plant in 21-22 is 12000 kWh.
- The reduction in Annual CO_2 Emission in 21-22 is 10.8 MT.

5. Waste Management:

5.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

5.2 Liquid Waste Management:

The College has installed Septic and is cleaned periodically.

5.3 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

5.4 Sanitary Waste Incinerator:

The College has installed Sanitary Waste Incinerator for sanitary waste disposal.

6. Rain Water Harvesting:

The College has installed the Rainwater Harvesting project, the rain water falling on the terrace is collected and is used for increasing the under the underground water level.

7. Green & Sustainable Initiatives

- Maintenance of good Internal Road
- Maintenance of Internal Garden
- Display of Posters on Resource Conservation
- Best Practices and Initiative for Social Awareness

8. Notes & Assumptions:

1. 1 kWh of Electrical Energy releases 0.9 Kg of CO_2 into atmosphere
2. Average Energy generated by 1 kWp Solar PV Plant : 4 kWh/Day
3. Annual Solar Energy Generation Days: 300 Nos

9. References:

- For CO_2 Emissions: www.tatapower.com
- For Roof Top Solar Energy Generation: www.solarrooftop.gov.in
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI & Water Quality Standards: www.cpcb.com

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
kWh	Kilo Watt Hour
LPD	Liters Per Day
Kg	Kilo Gram
MT	Metric Ton
CO_2	Carbon Di Oxide
Qty	Quantity