ENERGY AUDIT REPORT

of

Bareilly International University, Bareilly

Pilibhit Bypass Road Bareilly,
Uttar Pradesh 243 006 India

Year: 2022-23

Prepared by:

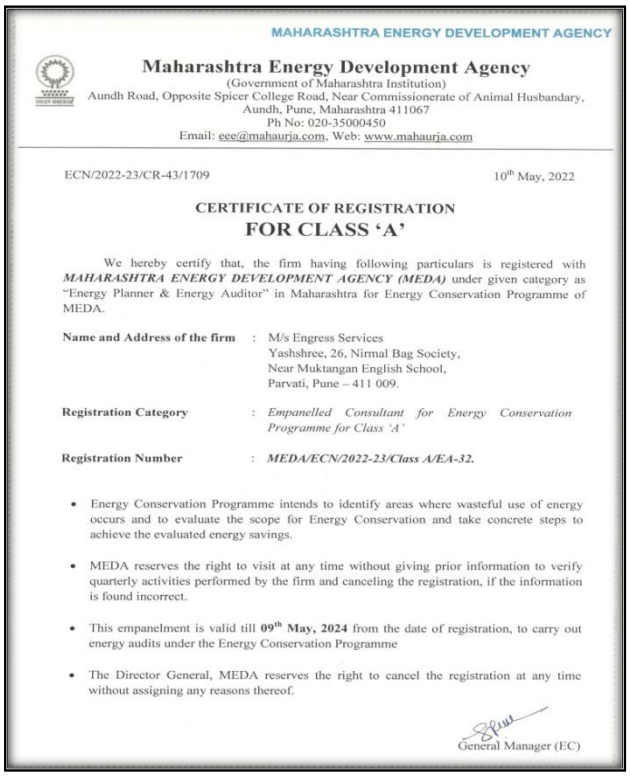
ENGRESS SERVICES

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

SUSHIL KUMAR THAKUR

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Registration Certificates



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 (EC)

MEDA Registration Certificate



Certificate of Registration

This is to Certify that
Quality Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK 1, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

has been assessed and found to conform to the requirements of
ISO 9001:2015
for the following scope :

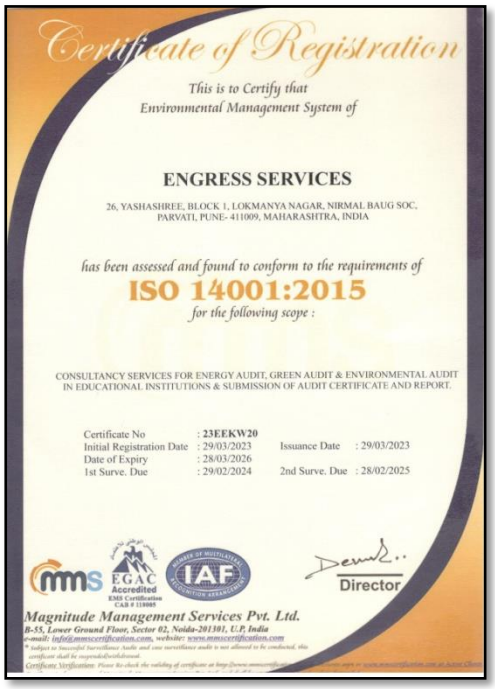
CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT.

Certificate No	: 23EQKC13		
Initial Registration Date	: 27/03/2023	Issuance Date	: 27/03/2023
Date of Expiry	: 26/03/2026		
1st Surve. Due	: 27/02/2024	2nd Surve. Due	: 27/02/2025

Director

Magnitude Management Services Pvt. Ltd.
B-55, Lower Ground Floor, Sector 02, Noida-201301, U.P, India
e-mail: info@mmscertification.com, website: www.mmscertification.com

ISO: 9001-2015 Certificate



Certificate of Registration

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Environmental Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK 1, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

has been assessed and found to conform to the requirements of
ISO 14001:2015
for the following scope :

CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT.

Certificate No	: 23EEKW20		
Initial Registration Date	: 29/03/2023	Issuance Date	: 29/03/2023
Date of Expiry	: 28/03/2026		
1st Surve. Due	: 29/02/2024	2nd Surve. Due	: 28/02/2025

Director

Magnitude Management Services Pvt. Ltd.
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e-mail: info@mmscertification.com, website: www.mmscertification.com

ISO: 14001-2015 Certificate

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ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Bareilly International University, Bareilly for awarding us the assignment of Energy Audit of their Campus for the Year: 2022-23.

We are thankful to all the staff members for helping us during the field study.

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EXECUTIVE SUMMARY

1. Bareilly International University, Bareilly consumes Energy in the form of **Electrical Energy;** used for various Electrical Equipment, office & other facilities.

2. Present Connected Load & Annual Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load	1356	kW
2	Annual Energy Consumption	4234833	kWh
3	Annual CO_2 Emissions	3811.34	MT

3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	4234833	kWh
2	Total Built up area of Institute	107000	m^2
3	Energy Performance Index =(1) / (2)	39.57	kWh/m^2

4. Study of Lighting Power Density & % of LED Lighting:

No	Particulars	Value	Unit
1	Lighting Power density	1.24	W/m^2
2	% of Usage of LED Lighting to Total Lighting Load	71.46	%

5. Renewable Energy & Energy Efficiency Projects:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Maximum usage of Day Lighting

6. Assumption:

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

7. References:

- Audit Methodology: www.mahaurja.com
- Energy Conservation Building Code: ECBC-2017: www.beeindia.gov.in
- For CO_2 Emissions: www.tatapower.com

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ABBREVIATIONS

LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
BEE	:	Bureau of Energy Efficiency
ECBC	:	Energy Conservation Building Code
MEDA	:	Maharashtra Energy Development Agency
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

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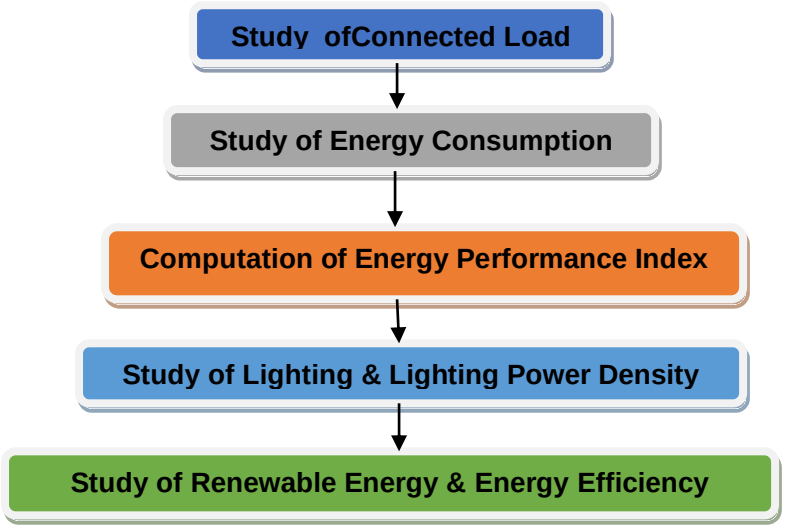
CHAPTER-I
INTRODUCTION

1.1 Introduction:

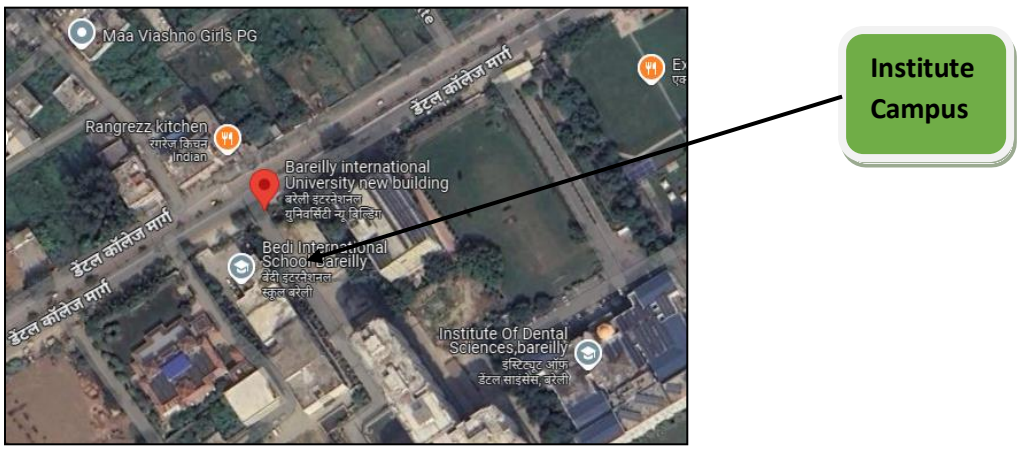
An Energy Audit is conducted at Bareilly International University, Bareilly. The guidelines followed for conducting the Energy Audit are:

- BEE India's Energy Conservation Building Code: ECBC-2017
- Maharashtra Energy Development Agency (www.mahaurja.com)
- Tata Power: www.tatapower.com

1.2Audit Procedural Steps:



1.3 Institute Location Image:



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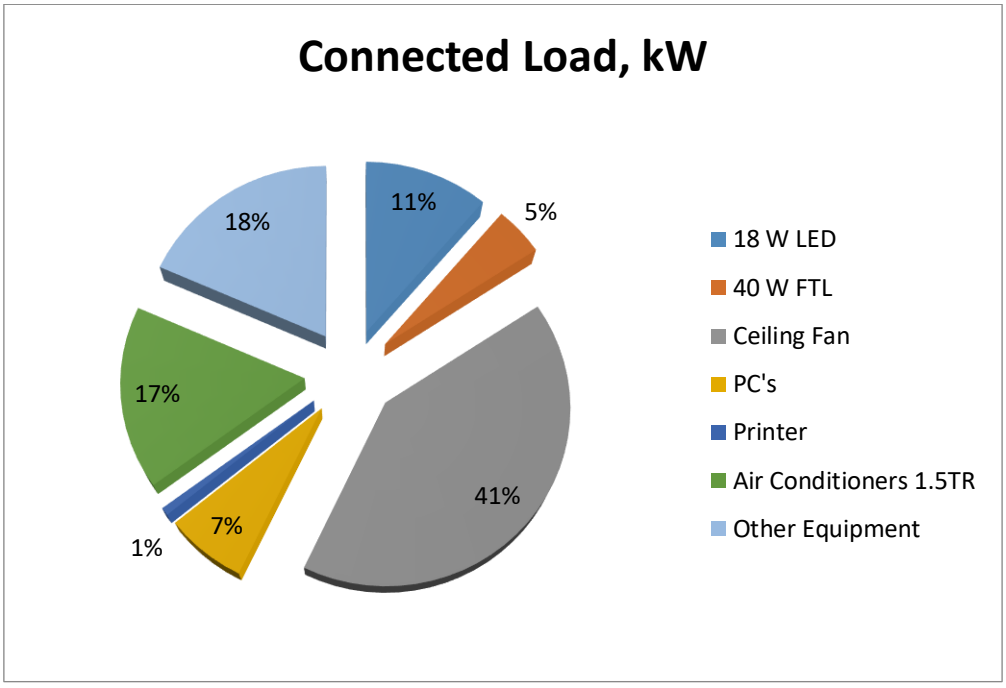
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 1: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	18 W LED	8512	18	153.216
2	40 W FTL	1530	40	61.2
3	Ceiling Fan	8621	65	560.365
4	PC's	635	150	95.25
5	Printer	65	150	9.75
6	Air Conditioners 1.5TR	205	1104	226.32
8	Other Equipment	250	1000	250
9	**Total**			**1356**

Chart No 1: Study of Connected Load:



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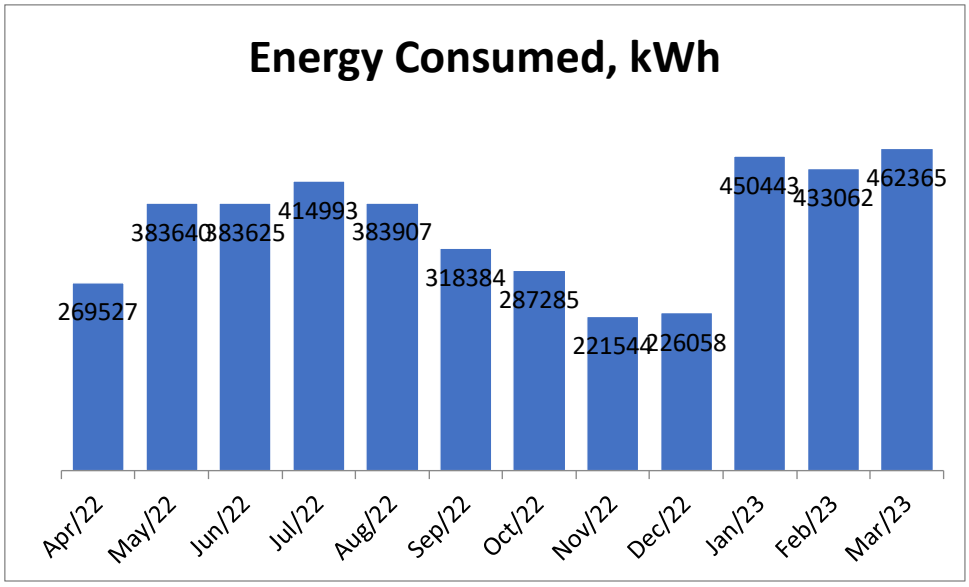
CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 2: Electrical Bill Analysis- 2022-23:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Apr-22	269527	242.57
2	May-22	383640	345.28
3	Jun-22	383625	345.26
4	Jul-22	414993	373.49
5	Aug-22	383907	345.52
6	Sep-22	318384	286.55
7	Oct-22	287285	258.56
8	Nov-22	221544	199.39
9	Dec-22	226058	203.45
10	Jan-23	450443	405.40
11	Feb-23	433062	389.76
12	Mar-23	462365	416.13
13	Total	4234833	3811.35
14	Maximum	462365	416.13
15	Minimum	221544	199.39
16	Average	352902.75	317.61

Chart No 2: Variation in Monthly Energy Consumption:



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Table No 3: Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh	CO2 Emissions, MT
1	Total	4234833	3811.35
2	Maximum	462365	416.13
3	Minimum	221544	199.39
4	Average	352902.75	317.61

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CHAPTER-IV
STUDY OF ENERGY PERFORMANCE INDEX

Energy Performance Index: Energy Performance Index of a Building is its Annual Energy Consumption in Kilo Watt Hours per square meter of the Building

It is determined by:

$$\text{EPI} = \frac{\text{(Annual Energy Consumption in kWh)}}{\text{(Total Built-up area in m}^2\text{)}}$$

Now we compute the EPI for the Institute as under:

Table No4: Computation of Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	4234833	kWh
2	Total Built up area of Institute	107000	m^2
3	Energy Performance Index =(1) / (2)	39.57	kWh/m^2

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CHAPTER V
STUDY OF LIGHTING

Terminology:

1. Lumen is a unit of light flow or luminous flux. The lumen rating of a lamp is a measure of the total light output of the lamp. The most common measurement of light output (or luminous flux) is the lumen. Light sources are labeled with an output rating in lumens.

2. Lux is the metric unit of measure for illuminance of a surface. One lux is equal to one lumen per square meter.

3. Circuit Watts is the total power drawn by lamps and ballasts in a lighting circuit under assessment.

4. Installed Load Efficacy is the average maintained illuminance provided on a horizontal working plane per circuit watt with general lighting of an interior. Unit: lux per watt per square metre (lux/W/m²)

5. Lamp Circuit Efficacy is the amount of light (lumens) emitted by a lamp for each watt of power consumed by the lamp circuit, i.e. including control gear losses. This is a more meaningful measure for those lamps that require control gear. Unit: lumens per circuit watt (lm/W)

6. Installed Power Density. The installed power density per 100 lux is the power needed per square metre of floor area to achieve 100 lux of average maintained illuminance on a horizontal working plane with general lighting of an interior
Unit: watts per square metre per 100 lux (W/m²/100 lux) 100 Installed power density (W/m²/100 lux)

7. Lighting Power Density: It is defined as Total Lighting Load in a room divided by the Area of that Room in square meters.

In this Chapter we compute: Lighting Power Density of a Class Room. We also compute the percentage usage of LED Lighting to total Lighting Load of the Institute.

Table No 5: Computation of Lighting Power Density:

No	Particulars	Value	Unit
1	No of 18 W LED Tube Lights in Class Room	10	Nos
2	Demand of 18 W LED Tube Light	18	W/Unit
3	Total Lighting Load in the Class Room= **(1) * (2)**	**180**	W
4	Area of Class Room	145	m^2
5	Lighting Power Density = **(3)/ (4)**	**1.24**	W/m^2

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Now, we compute the usage of LED Lighting to Total Lighting Load, as under.

Table No 6: Percentage Usage of LED Lighting to Annual Lighting Load:

No	Particulars	Value	Unit
1	No of 40 W FTL Fittings	1530	Nos
2	Demand of 40 W FTL Fitting	40	W/Unit
3	Total Electrical Load of 40 W FTL Fittings	**61.2**	kW
4	No of 18 W LED Tube Lights	8512	Nos
5	Demand of 18 W LED Tube Light	18	W/Unit
6	Total Electrical Load of 18 W LED Fittings	**153.216**	kW
7	Total Lighting Load = 3+6	**214.416**	kWh
8	LED Lighting Load = 6	**153.216**	kWh
9	**Annual Lighting Requirement met by LED= 8*100/7**	**71.46**	**%**

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CHAPTER-VI
STUDY OF RENEWABLE ENERGY & ENERGY EFFICIENCY

As on today, University has installed Solar Rooftop Power Plant of 166 Kw. Also University has planned to install 110 Kwp of Solar Rooftop plant on the University Building in the upcoming year.

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MEDA Registration No: ECN/2022-23/CR-43/1709
ISO: 9001-2015 Certified (Cert No: 23EQKC13),
ISO: 14001-2015 Certified (Cert No: 23EEKW20)

ENERGY AUDIT CERTIFICATE

Certificate No: ES/BIU/22-23/01 **Date: 26/04/2023**

This is to certify that we have conducted an Energy Audit at Bareilly International University, Bareilly, in the Year 2022-23.

The University 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

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

For Engress Services,

ENGRESS SERVICES PUNE

A Y Mehendale,
B E-Mechanical, M Tech- Energy
BEE Certified Energy Auditor, EA-8192

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