ENERGY AUDIT REPORT

of

Janata Shikshan Prasarak Mandal's

PHULSING NAIK MAHAVIDYALAYA

PUSAD - 445 216

Year: 2022-23

Prepared by:

ENGRESS SERVICES

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ENGRESS SERVICES PUNE

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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/PNM/22-23/01

Date: 18/05/2023

This is to certify that we have conducted an Energy Audit at Phulsing Naik Mahavidyalaya Pusad, in the Year 2022-23.

.The Institute has adopted following Energy Efficient practices:

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

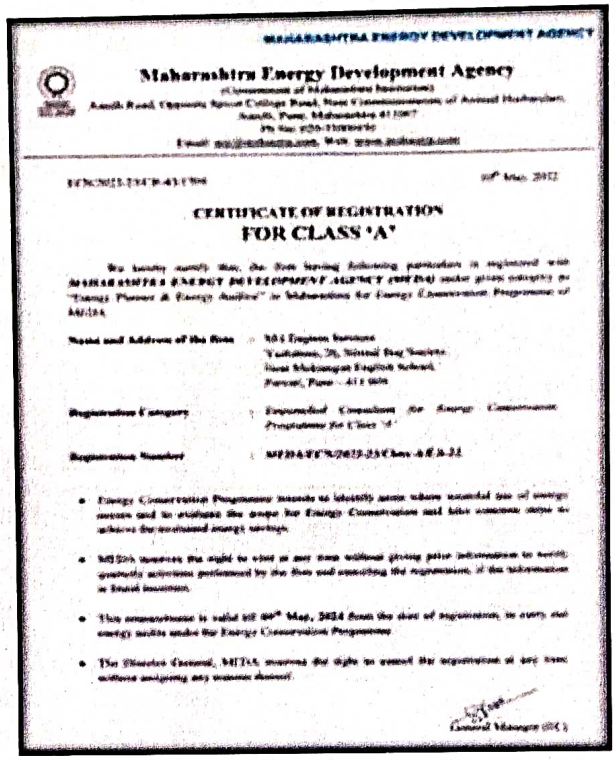
We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Engress Services,.

ENGRESS SERVICES PUNE

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

Registration Certificates



Maharashtra Energy Development Agency

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

MEDA Registration Certificate

Certificate of Registration

This is to Certify that
Quality Management System of

ENGRESS SERVICES

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

Director

Magnitude Management Services Pvt. Ltd.

ISO: 9001-2015 Certificate

Certificate of Registration

This is to Certify that
Environmental Management System of

ENGRESS SERVICES

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

Director

Magnitude Management Services Pvt. Ltd.

ISO: 14001-2015 Certificate

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ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Phulsing Naik Mahavidyalaya, Pusad 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.

EXECUTIVE SUMMARY

1. Phulsing Naik Mahavidyalaya, Pusad 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	51.22	kW
2	Annual Energy Consumption	26807	kWh
3	Annual CO_2 Emissions	24.12	MT

3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	26807	kWh
2	Total Built up area of Institute	15692.26	m^2
3	Energy Performance Index =(1) / (2)	**1.67**	kWh/m^2

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

No	Particulars	Value	Unit
1	Lighting Power density	1.13	W/m^2
2	% of Usage of LED Lighting to Total Lighting Load	9.52	%

5. Renewable Energy & Energy Efficiency Projects:

- Usage of Energy Efficient LED Fittings
- 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

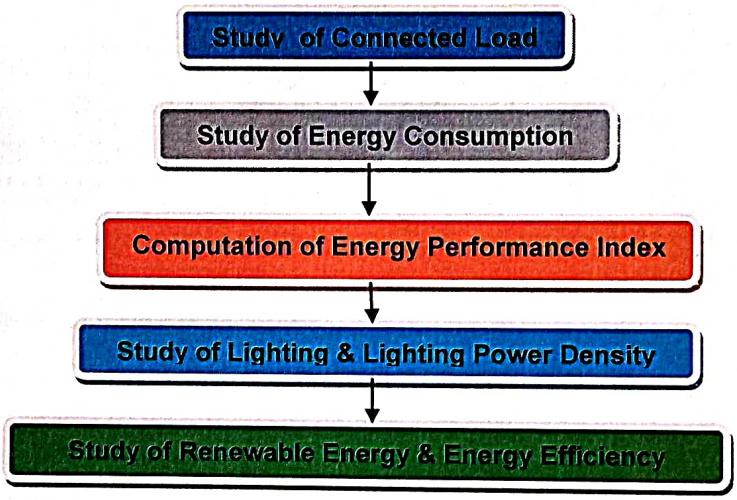
CHAPTER-I
INTRODUCTION

1.1 Introduction:

An Energy Audit is conducted at Phulsing Naik Mahavidyalaya, Pusad.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

1.2 Audit Procedural Steps:



1.3 Institute Location Image:

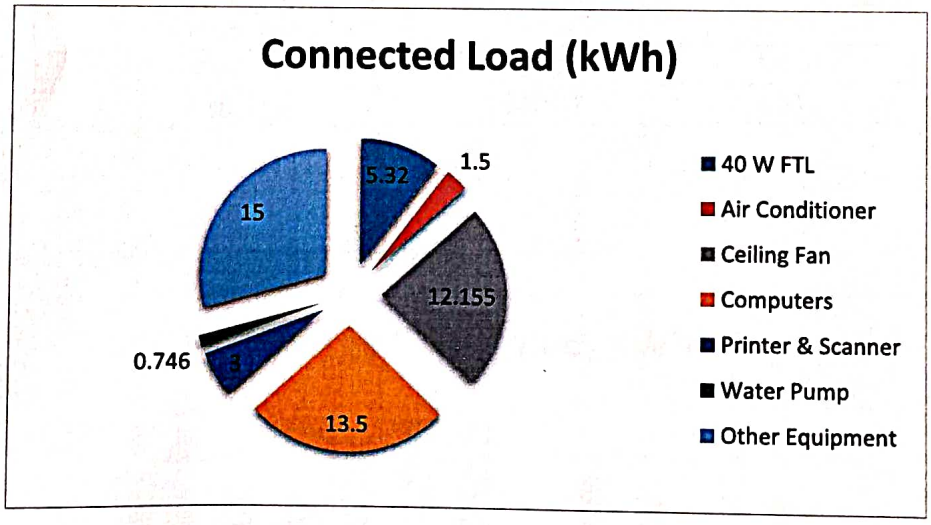
CHAPTER-II
STUDY OF CONNECTED LOAD

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	20 W LED	28	20	0.56
2	40 W FTL	133	40	5.32
3	Air Conditioner	1	1500	1.5
4	Ceiling Fan	187	65	12.155
5	Computers	90	150	13.5
6	Printer & Scanner	20	150	3
7	Water Pump	1	746	0.746
8	Other Equipment	100	150	15
9	**Total**			**51.221**

Chart No 1: Study of Connected Load:



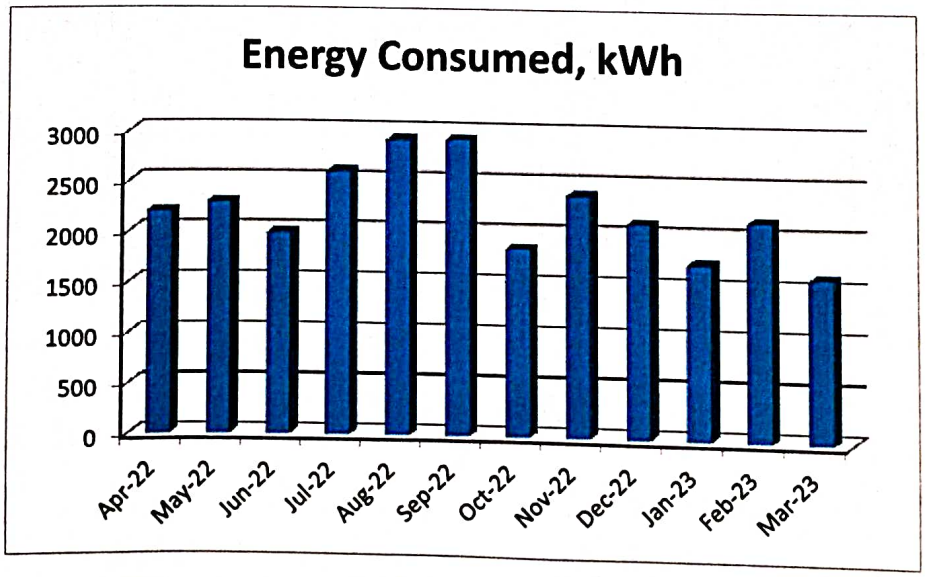
CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

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

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

No	Month	Energy Consumption	CO_2 Emissions, MT
1	Apr-22	2201	1.980
2	May-22	2294	2.064
3	Jun-22	1985	1.7865
4	Jul-22	2600	2.34
5	Aug-22	2919	2.627
6	Sep-22	2930	2.637
7	Oct-22	1860	1.674
8	Nov-22	2390	2.151
9	Dec-22	2121	1.908
10	Jan-23	1736	1.562
11	Feb-23	2159	1.943
12	Mar-23	1612	1.450
13	Total	26807	24.126
14	Maximum	2930	2.637
15	Minimum	1612	1.450
16	Average	2233.92	2.010

Chart No 2: Variation in Monthly Energy Consumption:



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:

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

Now we compute the EPI for the Institute as under:

Table No 4: Computation of Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	26807	kWh
2	Total Built up area of Institute	15962.26	m^2
3	Energy Performance Index =(1) / (2)	**1.67**	kWh/m^2

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	6	Nos
2	Demand of 18 W LED Tube Light	20	W/Unit
3	Total Lighting Load in the Class Room= **(1) * (2)**	**120**	W
4	Area of Class Room	105.75	m^2
5	Lighting Power Density = **(3)/ (4)**	**1.134**	W/m^2

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	Qty of 40 W LED Light Fittings	133	Nos
2	Load per Fitting	40	W/Unit
3	Total Load of 40 W LED Fitting	**5.32**	kW
4	Qty of 20 W LED Light Fittings	28	Nos
5	Load per Fitting	20	W/Unit
6	Total Load of 20 W LED Fitting	**0.56**	kW
7	Total Lighting Load=3+6	**5.88**	kW
8	Total LED Lighting Load=6+9	**0.56**	kW
9	% of Total Lighting Demand met by LED Lighting=8*100/7	**9.52**	%

CHAPTER-VI
STUDY OF RENEWABLE ENERGY & ENERGY EFFICIENCY

6.1 Usage of Renewable Energy:

As on today College has not install solar roof-top PV plant, Solar thermal water heating plant; the percentages of uses of alternate energy to the annual energy demand work to be zero percent.

6.2 Energy Efficiency Measures Adopted:

- The Institute has adopted Energy Efficient LED Lighting.