

# ENERGY AUDIT REPORT

PUNE VIDYARTHI GRIHA'S,  
College of Engineering and Technology & G K Pate (Wani)  
Institute of Management,  
Vidyanagari, Parvati, Pune 411 009



Year: 2023-24

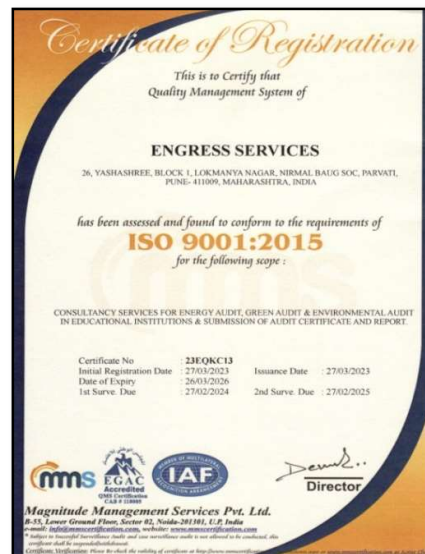
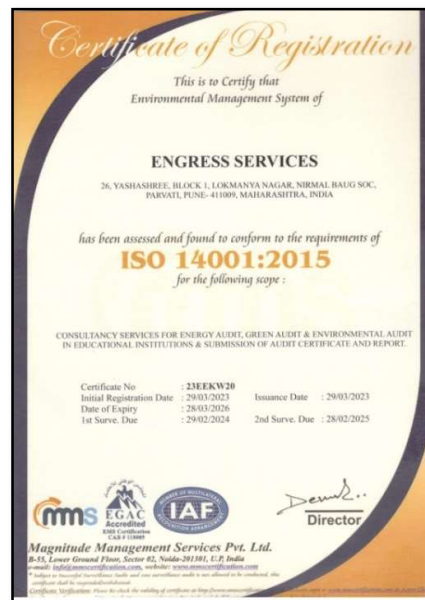
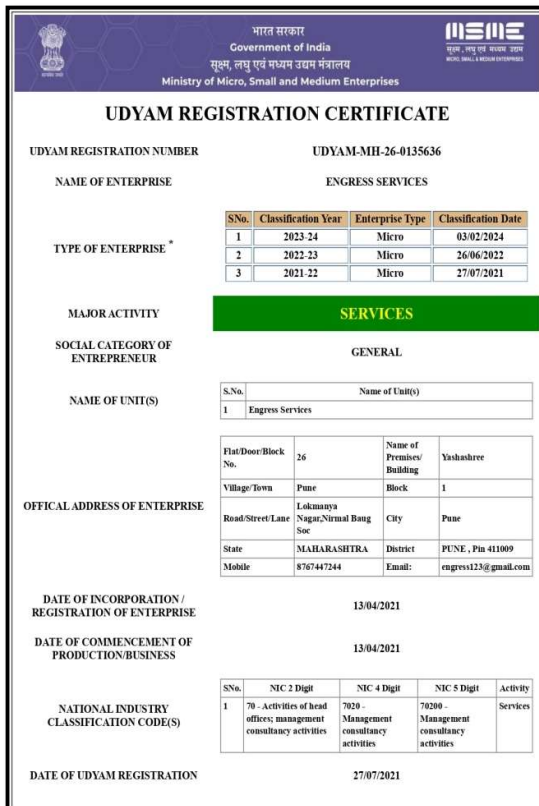
Prepared by:

## ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society  
Near Muktangam English School, Parvati, Pune 411009  
Phone: 09890444795 Email: [engress123@gmail.com](mailto:engress123@gmail.com)



**REGISTRATION CERTIFICATES: BEE, UDYAM, MEDA, ISO-9001 & 14001:**



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## **ACKNOWLEDGEMENT**

We Engress Services, Pune, express our sincere gratitude to the management of Pune Vidyarthi Griha's College of Engineering and Technology & G K Pate (Wani) Institute of Management, Vidyanagari, Parvati, Pune 411 009 for awarding us the assignment of Energy Audit of their Campus for the Year: 2023-24.

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

## EXECUTIVE SUMMARY

1. Pune Vidyarthi Griha's College of Engineering and Technology & G K Pate (Wani) Institute of Management, Pune consumes Energy in the form of **Electrical Energy**: used for various Equipment & other facilities.

### 2. Present Connected Load & Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load	227	kW
2	Annual Energy Consumed	254276	kWh

### 3. Per Capita Energy Consumption:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	254276	kWh
2	No of students studying in the College	2401	Nos
3	Per Capita Energy Consumption = (1) / (2)	106	kWh/Annum

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

No	Particulars	Value	Unit
1	Lighting Power density	8	W/m <sup>2</sup>
2	% of Usage of LED Lighting to Total Lighting Load	31.23	%

### 5. Renewable Energy & Energy Efficiency & Awareness Projects:

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment
- Installation of **5 kWp** Roof Top Solar PV Vehicle Charging Station
- Sensor Based Light Operation in Wash Rooms
- Started **Energy Club** in the College
- Partnering with Energy Swaraj Foundation

### 6. Assumption:

1. **1 kWh** of Electrical Energy releases **0.9 Kg** of **CO<sub>2</sub>** into atmosphere

### 7. References:

- Audit Methodology: [www.mahaurja.com](http://www.mahaurja.com)
- Energy Conservation Building Code: ECBC-2017: [www.beeindia.gov.in](http://www.beeindia.gov.in)
- For CO<sub>2</sub> Emissions: [www.tatapower.com](http://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
CFL	:	Compact Fluorescent Light
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO <sub>2</sub>	:	Carbon Di Oxide
MT	:	Metric Ton

## CHAPTER-I INTRODUCTION

### 1.1 Introduction:

An Energy Audit is conducted at Pune Vidyarthi Griha's College of Engineering and Technology & G K Pate (Wani) Institute of Management, Vidyanagari, Parvati, Pune 411 009.

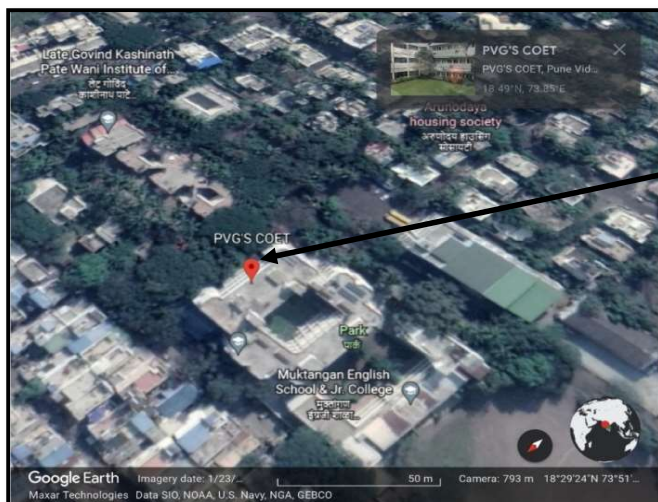
The guidelines followed for conducting the Energy Audit are:

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

### 1.2 Key Study Points:

No	Particulars
1	Study of Present Connected Load
2	Study of Present Energy Consumption
3	Study of Per Capita Energy Consumption
4	Study of Lighting
5	Study of Energy Efficiency & Renewable Energy

### 1.3 College Location Image:



College  
Campus

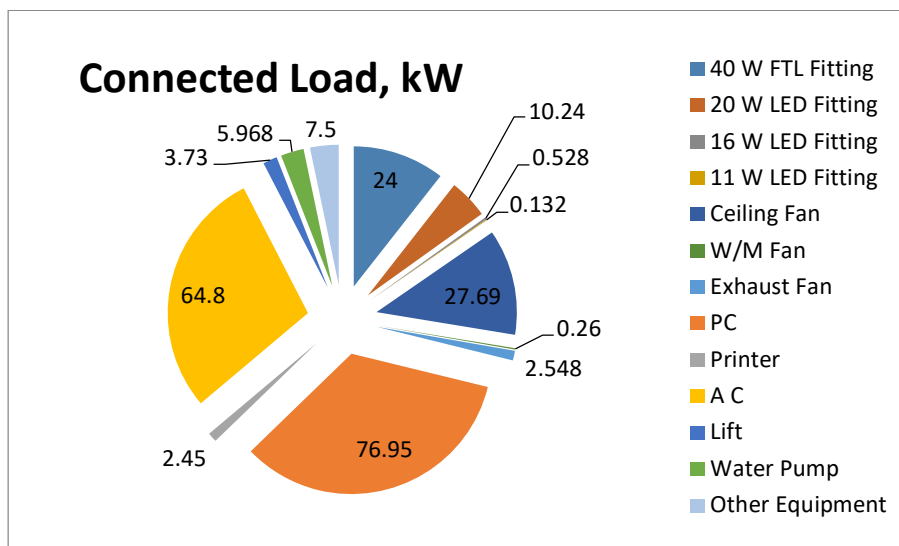
## CHAPTER-II STUDY OF CONNECTED LOAD

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

**Table No 1: Study of Equipment wise Connected Load:**

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL Fitting	600	40	24
2	20 W LED Fitting	512	20	10.24
3	16 W LED Fitting	33	16	0.528
4	11 W LED Fitting	12	11	0.132
5	Ceiling Fan	426	65	27.69
6	W/M Fan	5	52	0.26
7	Exhaust Fan	49	52	2.548
8	PC	513	150	76.95
9	Printer	14	175	2.45
10	A C	36	1800	64.8
11	Lift	1	3730	3.73
12	Water Pump	1	5968	5.968
13	Other Equipment	50	150	7.5
<b>14</b>	<b>Total</b>			<b>227</b>

**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 Energy Consumption Analysis- 2023-24:**

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Apr-23	20278	18.25
2	May-23	27064	24.36
3	Jun-23	21936	19.74
4	Jul-23	18914	17.02
5	Aug-23	23924	21.53
6	Sep-23	21726	19.55
7	Oct-23	27946	25.15
8	Nov-23	17136	15.42
9	Dec-23	15550	14.00
10	Jan-24	17484	15.74
11	Feb-24	21582	19.42
12	Mar-24	20736	18.66
13	Total	254276	228.85
14	Maximum	27946	25.15
15	Minimum	15550	14.00
16	Average	21189.67	19.07

**Chart No 2: Variation in Monthly Energy Consumed, kWh:**



## **CHAPTER-IV**

### **STUDY OF PER CAPITA ENERGY CONSUMPTION**

**Per Capita Energy Consumption Index:** Per Capita Energy Consumption Index of an educational Institute/College is its Annual Energy Consumption in Kilo Watt Hours per student studying in the Institute/College.

It is determined by:

$$\text{Per Capita Energy Consumption Index} = \frac{\text{Annual Energy Consumption in kWh}}{\text{(Total No of students studying)}}$$

Now we compute the EPI for the College as under:

**Table No 3: Computation of Energy Performance Index:**

<b>No</b>	<b>Particulars</b>	<b>Value</b>	<b>Unit</b>
<b>1</b>	Total Annual Energy Consumed	254276	kWh
<b>2</b>	No of students studying in the College	2401	Nos
<b>3</b>	Per Capita Energy Consumption =(1) / (2)	<b>106</b>	kWh/Annum

## 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/m<sup>2</sup>)

**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. 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 the Lighting Power density and the percentage usage of LED Lighting to total Lighting Load of the College.

**Table No 4: Computation of Lighting Power Density: R-412:**

No	Particulars	Value	Unit
1	Qty of 40 W Fittings in Room No: 412	16	Nos
2	Load of 40 W Fitting	40	W/unit
3	Total Load of 16 Nos, 40 W Fittings	<b>640</b>	W
4	Built up area of Class Room: GF-07	<b>80</b>	m <sup>2</sup>
5	<b>Lighting Power Density = (3)/(4)</b>	<b>8</b>	W/m <sup>2</sup>

**Table No 5: Percentage Usage of LED Lighting to Total Lighting Load:**

<b>No</b>	<b>Particulars</b>	<b>Value</b>	<b>Unit</b>
1	No of 40 W FTL Fittings	600	Nos
2	Load per Unit of 40 W FTL Fitting	40	W/unit
3	Total Load of 40 W FTL Fittings	24	kW
4	No of 20 W LED Fittings	512	Nos
5	Load per Unit of 20 W LED Fitting	20	W/unit
6	Total Load of 20 W LED Fittings	10.24	kW
7	No of 16 W LED Fittings	33	Nos
8	Load per Unit of 16 W LED Fitting	16	W/unit
9	Total Load of 16 W LED Fittings	0.528	kW
10	No of 11 W LED Fittings	12	Nos
11	Load per Unit of 11 W LED Fitting	11	W/unit
12	Total Load of 11 W LED Fittings	0.132	kW
13	Total LED Lighting Load= 6+9+12	10.9	kW
14	Total LED Lighting Load= 3+6+9+12	34.9	kW
<b>15</b>	<b>% of LED to Total Lighting Load=13*100/14</b>	<b>31.23</b>	<b>%</b>

## CHAPTER-VI STUDY OF RENEWABLE ENERGY & ENERGY EFFICIENCY

### 6.1 Usage of Renewable Energy:

The College has installed Solar PV based Vehicle Charging Station of Capacity 5 kWp.

#### Photograph of 5 kWp Capacity Solar PV Based Vehicle Charging Station:



### 6.2 Energy Efficiency Measures adopted:

- The College has LED Fittings.& Usage of BEE STAR Rated Equipment
- Sensor Based Light Operation in Wash Rooms
- Started **Energy Club** in the College
- Partnering with **Energy Swaraj Foundation**

#### Photograph of Sensor based Light Operation and STAR Rated AC:

