Late Chindhuji Laxmanrao Purke Shikshan Prasarak Mandal's

Indira Gandhi Kala Mahavidyalaya,

Ralegaon - 445402, Dist. Yavatmal (M.S.)

Affiliated to Sant Gadge Baba Amravati University

Website -www.igkmralegaon.org **E-mail - igkm490@gmail.com**

ENERGY AUDIT

Index

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: engress123@gmail.com
UDYAM Regn. No: UDYAM-MH-26-0135636,
MEDA Regn. No: ECN/2023-24/CR-43/1709
ISO: 9001-2015 Certified (Cert No: 23EQKC13),
ISO: 14001-2015 Certified (Cert No: 23EEKW20)

ENERGY AUDIT CERTIFICATE

Certificate No: ES/IGC/23-24/01 **Date: 30/05/2024**

This is to certify that we have conducted Energy Audit at Indira Gandhi Kala Mahavidyalaya, Ralegaon, Yavatmal, in the Academic year 2023-24.

.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

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

ENGRESS SERVICES

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Tel: 09890444795 Email: engress123@gmail.com
UDYAM Regn. No: UDYAM-MH-26-0135636,
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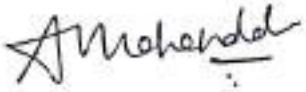

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B E-Mechanical, M Tech- Energy
BEE Certified Energy Auditor, EA-8192

ENERGY AUDIT REPORT

INDIRA GANDHI KALA MAHAVIDYALAYA,

RALEGAON DIST: YAVATMAL 445 402

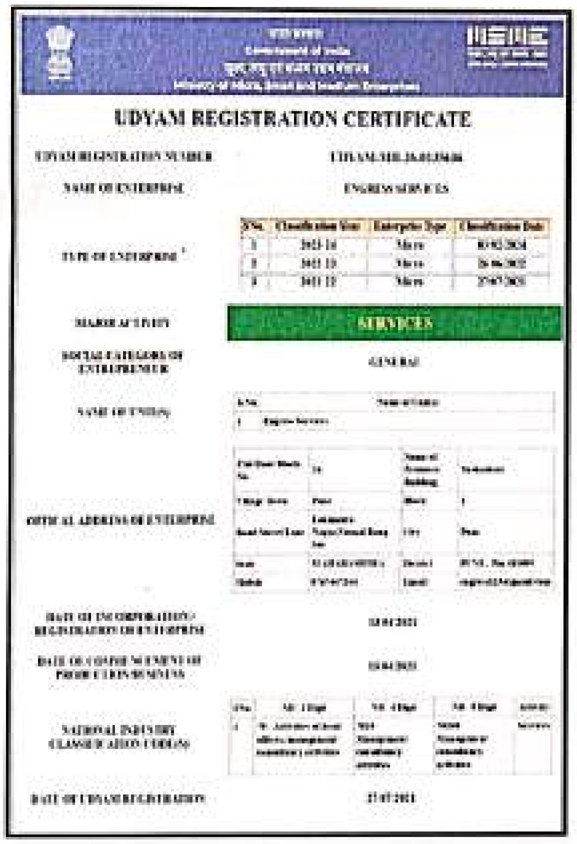
Year: 2023-24

Prepared by:

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: 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 Indira Gandhi Kala Mahavidyalaya, Ralegaon, Yavatmal 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. Indira Gandhi Kala Mahavidyalaya, Ralegaon, Yavatmal consumes Energy in the form of Electrical Energy; used for various Electrical Equipment, office & other facilities.

2. Present Connected Load & Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load	**26**	kW
2	Annual Energy Consumed	**8336**	kWh

3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	8336	kWh
2	Total Built up area of Institute	2134.29	m^2
3	Energy Performance Index =(1) / (2)	**3.90**	kWh/m^2

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

No	Particulars	Value	Unit
1	Lighting Power density	**0.48**	W/m^2
2	% of Usage of LED Lighting to Total Lighting Load	**100**	%

5. Renewable Energy & Energy Efficiency Projects:

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment

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

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 Introduction:

An Energy Audit is conducted at Indira Gandhi Kala Mahavidyalaya, Ralegaon, Yavatmal.

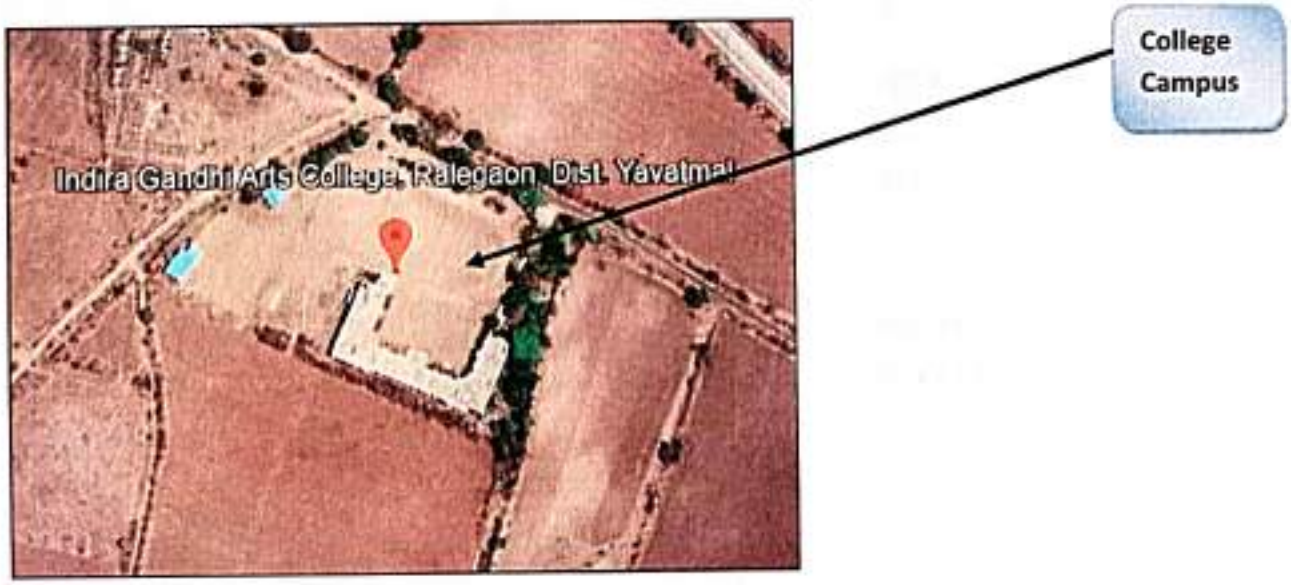
The guidelines followed for conducting the Energy Audit are:

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

1.2 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:



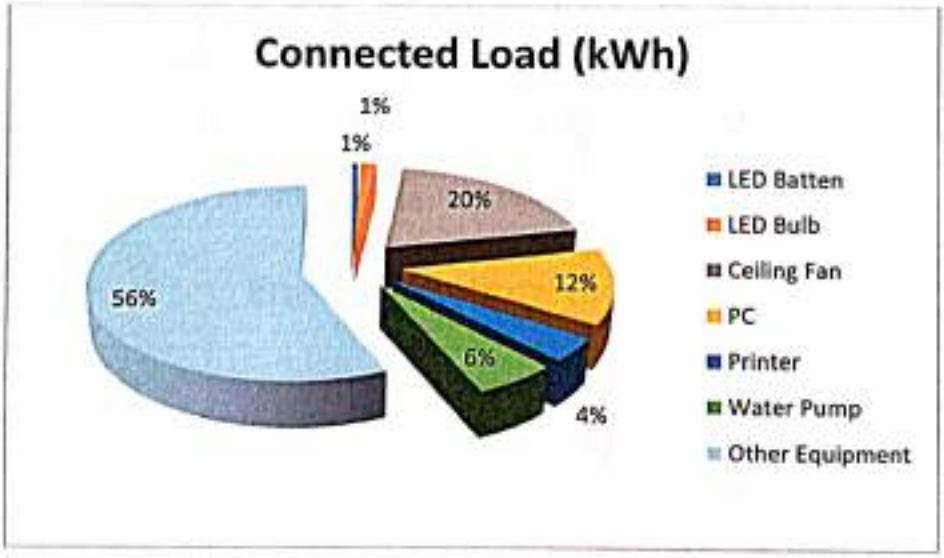
CHAPTER-II
STUDY OF CONNECTED LOAD

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	LED Batten	7	20	0.1
2	LED Bulb	40	9	0.4
3	Ceiling Fan	80	65	5.2
4	Computers	22	150	3.3
5	Printer	7	150	1.1
6	Water Pump	1	1492	1.5
7	Other Equipment	100	150	15.0
8	**Total**			**26**

Chart No 1: Study of Connected Load:



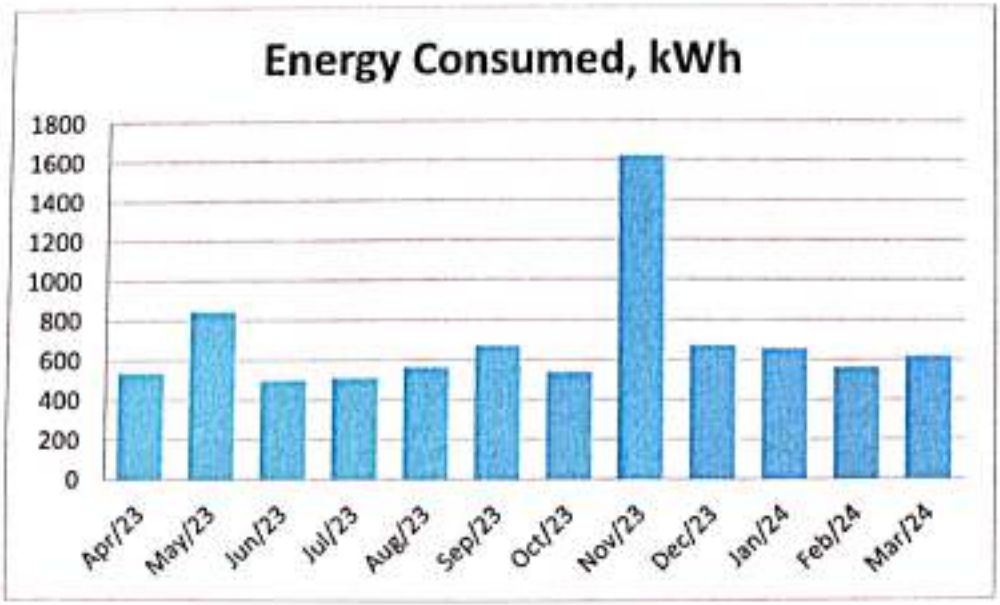
CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 2: Electrical Energy Consumption Analysis- 2023-24:

No	Month	Energy Consumption (kWh)	CO2 Emissions MT
1	Apr-23	540	0.49
2	May-23	848	0.76
3	Jun-23	504	0.45
4	Jul-23	515	0.46
5	Aug-23	565	0.51
6	Sep-23	673	0.61
7	Oct-23	542	0.49
8	Nov-23	1626	1.46
9	Dec-23	675	0.61
10	Jan-24	660	0.59
11	Feb-24	565	0.51
12	Mar-24	623	0.56
13	Total	8336	7.50
14	Maximum	1626	1.46
15	Minimum	504	0.45
16	Average	694.667	0.63

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 Capita Energy Consumption Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	8336	kWh
2	No of students studying in the College	550	Nos
3	Per Capita Energy Consumption **=(1) / (2)**	**15.15**	kWh

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. 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:

No	Particulars	Value	Unit
1	No of 9 W LED Bulbs in Class Room	4	Nos
2	Demand of 9 W LED Bulbs	9	W/Unit
3	Total Lighting Load in the Class Room= **(1) * (2)**	**36**	W
4	Area of Class Room	73.9	m²
5	Lighting Power Density = **(3)/ (4)**	**0.48**	W/m²

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

No	Particulars	Value	Unit
1	Qty of 20 W LED Light Fittings	7	Nos
2	Load per Fitting	20	W/Unit
3	Total Load of 20 W LED Fitting	**0.14**	kW
4	Qty of 9 W LED Light Fittings	40	Nos
5	Load per Fitting	9	W/Unit
6	Total Load of 9 W LED Fitting	**0.36**	kW
7	Total Lighting Load=3+6	**0.5**	kW
8	Total LED Lighting Load=6+9	**0.5**	kW
9	% of Total Lighting Demand met by LED Lighting=8*100/7	**100.00**	%

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.

ENGRESS SERVICES

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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/IGC/22-23/01 **Date: 06/07/2023**

This is to certify that we have conducted an Energy Audit at Indira Gandhi Kala Mahavidyalaya, Ralegaon, Yavatmal, 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,

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ENERGY AUDIT REPORT

OF

INDIRA GANDHI KALA MAHAVIDYALAYA,

RALEGAON DIST: YAVATMAL 445 402

Year: 2022-23

Prepared by:

ENGRESS SERVICES

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Phone: 09890444795 Email: engress123@gmail.com

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

REGISTRATION CERTIFICATES

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

Ashyut Tashawant Mehendale

Tashawant

AUDITOR CERTIFICATE

Maharashtra Energy Development Agency

CERTIFICATE OF REGISTRATION

FOR CLASS 'A'

MEDA Registration Certificate

Certificate of Registration

ENGRESS SERVICES

ISO 9001:2015

IAF

ISO: 9001-2015 Certificate

Certificate of Registration

ENGRESS SERVICES

ISO 14001:2015

IAF

ISO: 14001-2015 Certificate

INDEX

ACKNOWLEDGEMENT

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

EXECUTIVE SUMMARY

1. **Indira Gandhi Kala Mahavidyalay, Ralegaon, Yavatmal** 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	26.40	kW
2	Annual Energy Consumption	9062	kWh
3	Annual CO_2 Emissions	8.15	MT

3. **Energy Performance Index:**

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	9062	kWh
2	Total Built up area of Institute	2134.29	m^2
3	Energy Performance Index =(1) / (2)	**4.24**	kWh/m^2

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

No	Particulars	Value	Unit
1	Lighting Power density	0.48	W/m^2
2	% of Usage of LED Lighting to Total Lighting Load	100	%

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

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 Indira Gandhi Kala Mahavidyalay, Ralegaon, Yavatmal. The guidelines followed for conducting the Energy Audit are:

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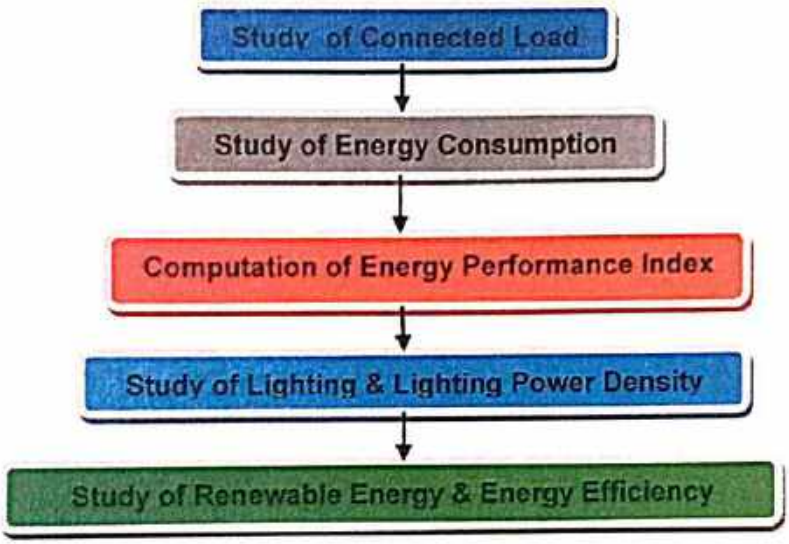
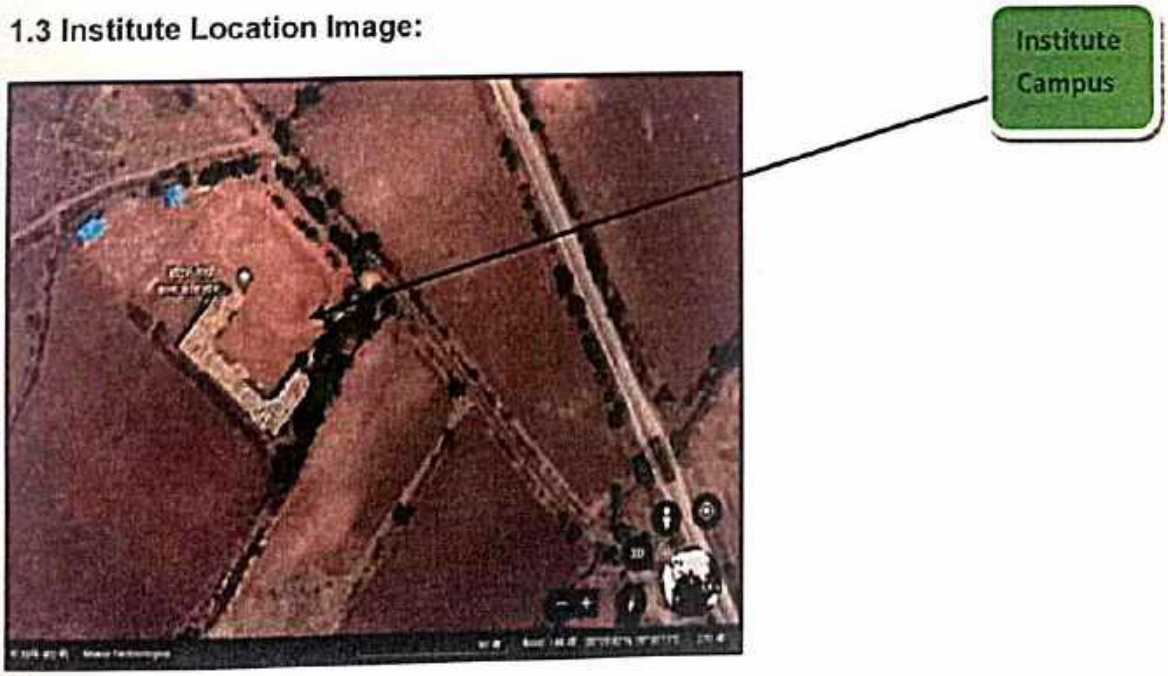
- Maharashtra Energy Development Agency (www.mahaurja.com)
- Tata Power: www.tatapower.com

1.2 Audit Procedural Steps:



1.3 Institute Location Image:



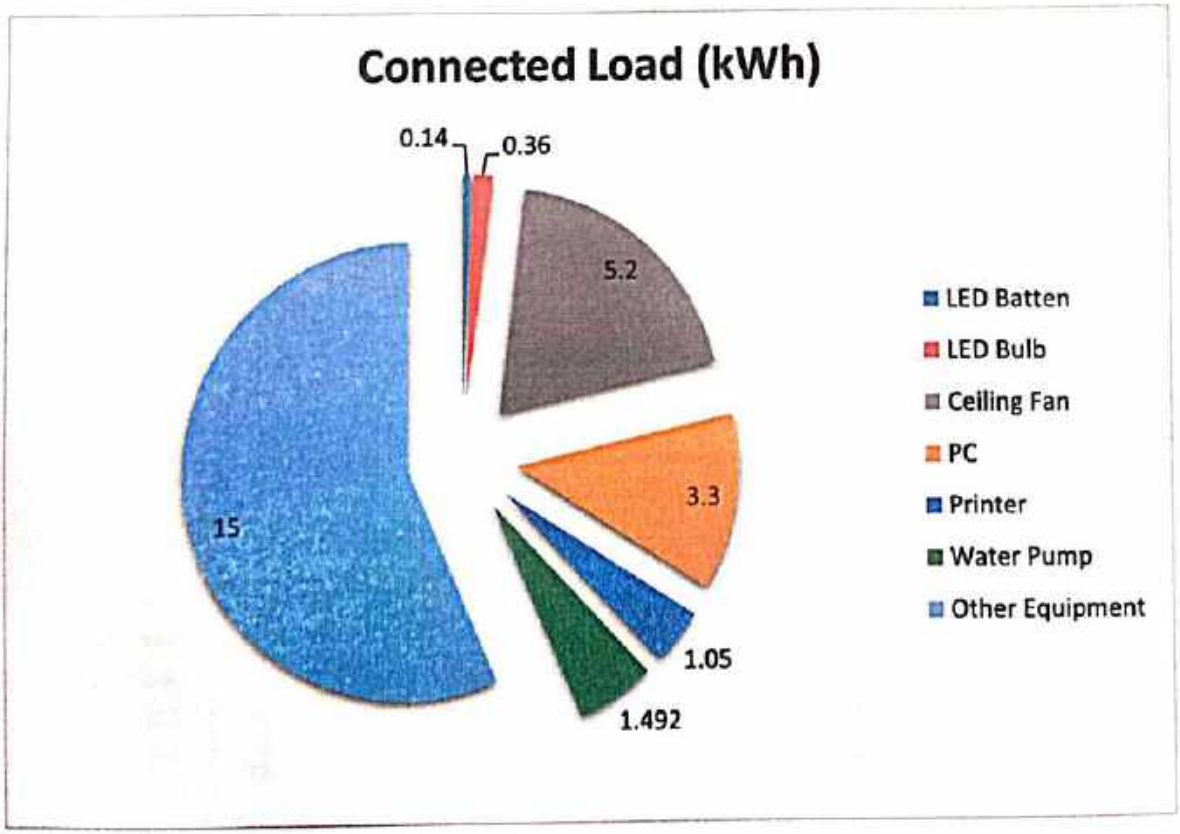
CHAPTER-II
STUDY OF CONNECTED LOAD

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	LED Batten	7	20	0.14
2	LED Bulb	40	9	0.36
3	Ceiling Fan	80	65	5.2
4	PC	22	150	3.3
5	Printer	7	150	1.05
6	Water Pump	1	1492	1.492
7	Other Equipment	100	150	15
8	**Total**			**26.402**

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 Consumed, kWh	CO_2 Emissions, MT
1	Apr-22	853	0.767
2	May-22	945	0.850
3	Jun-22	1004	0.903
4	Jul-22	545	0.490
5	Aug-22	407	0.366
6	Sep-22	673	0.605
7	Oct-22	542	0.487
8	Nov-22	1626	1.463
9	Dec-22	675	0.607
10	Jan-23	680	0.612
11	Feb-23	533	0.479
12	Mar-23	579	0.521
13	Total	9062	8.155
14	Maximum	1626	1.463
15	Minimum	407	0.366
16	Average	755.167	0.679

Chart No 2: Variation in Monthly Energy Consumption:

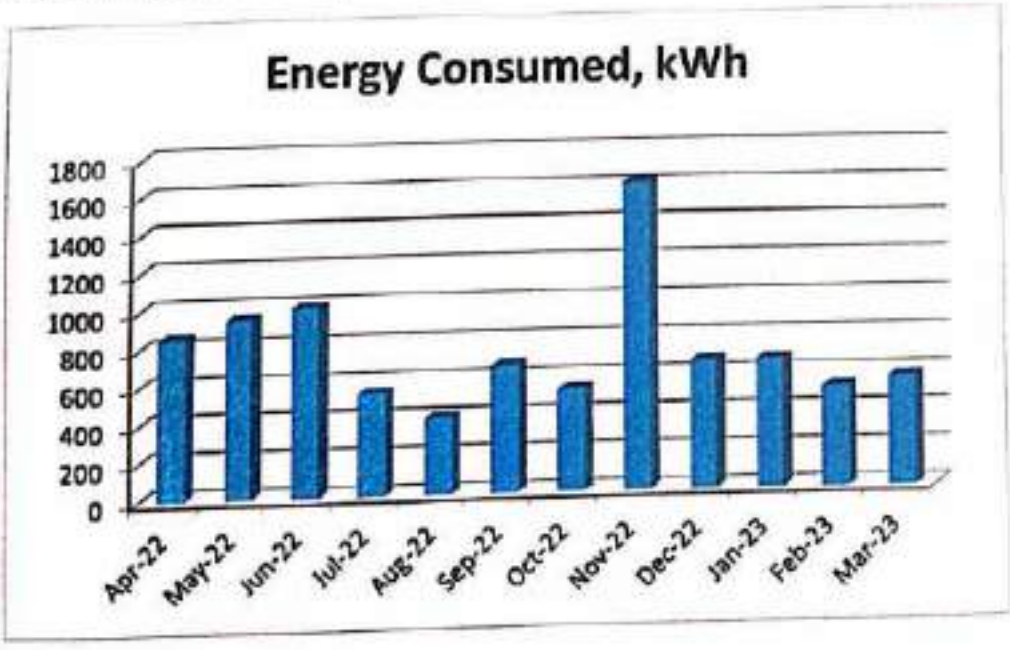


Table No 3: Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	9062	8.155
2	Maximum	1626	1.463
3	Minimum	407	0.366
4	Average	755.167	0.679

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	9062	kWh
2	Total Built up area of Institute	2134.29	m^2
3	Energy Performance Index =(1) / (2)	**4.24**	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 9 W LED Bulbs in Class Room	4	Nos
2	Demand of 9 W LED Bulbs	9	W/Unit
3	Total Lighting Load in the Class Room= (1) * (2)	36	W
4	Area of Class Room	73.9	m^2
5	Lighting Power Density = (3)/ (4)	0.48	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 20 W LED Light Fittings	7	Nos
2	Load per Fitting	20	W/Unit
3	Total Load of 20 W LED Fitting	**0.14**	kW
4	Qty of 9 W LED Light Fittings	40	Nos
5	Load per Fitting	9	W/Unit
6	Total Load of 9 W LED Fitting	**0.36**	kW
7	Total Lighting Load=3+6	**0.5**	kW
8	Total LED Lighting Load=6+9	**0.5**	kW
9	% of Total Lighting Demand met by LED Lighting=8*100/7	**100.00**	%

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

Enrich Consultants

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Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/IGC/21-22/06

Date: 25/05/2022

CERTIFICATE

This is to certify that we have conducted Energy Audit at Indira Gandhi Kala Mahavidyalay, Ralegaon, Yavatmal - 445 402 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 Enrich Consultants,

ENRICH CONSULTANTS * PUNE *

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

ENERGY AUDIT REPORT

OF

INDIRA GANDHI KALA MAHAVIDYALAY, RALEGAON DIST: YAVATMAL 445 402

Year: 2021-22

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

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)

Enrich Consultants

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

Ref: EC/IGC/21-22/06

Date: 25/05/2022

CERTIFICATE

This is to certify that we have conducted Energy Audit at Indira Gandhi Kala Mahavidyalay, Ralegaon, Yavatmal - 445 402 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 Enrich Consultants,

ENRICH CONSULTANTS * PUNE *

A Y Mehendale,
Certified Energy Auditor
EA-8192

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ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of at Indira Gandhi Kala Mahavidyalay Ralegaon, 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. Indira Gandhi Kala Mahavidyalay, Ralegaon, Yavatmal - 445 402 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	5457	4.911
2	Maximum	777	0.699
3	Minimum	287	0.258
4	Average	454.75	0.409

3. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Maximum Usage of Day Lighting

4. Usage of Alternate Energy:

- As on today College has not installed solar rooftop power plant, solar thermal water heating plant. It is recommended to install solar power rooftop system and solar thermal water heating plant on the college building as per availability of funds.

5. Usage of LED Lighting:

- The Total Annual Lighting Demand of the College is 233.28 kWh.
- The Total Annual LED Lighting Demand is 233.28 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. 100 LPD Solar Thermal System saves 1500 kWh of Electrical Energy per Annum.
3. Daily working hours-4 Nos (For Lighting Calculations)
4. Annual working Days-120 Nos (For Lighting Calculations)

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	Indira Gandhi Kala Mahavidyalay
2	Address	Kalamb Road,Ralegaon,Dist: Yavatmal 445 402
3	Affiliation	Sant Gadge Baba Amravati University

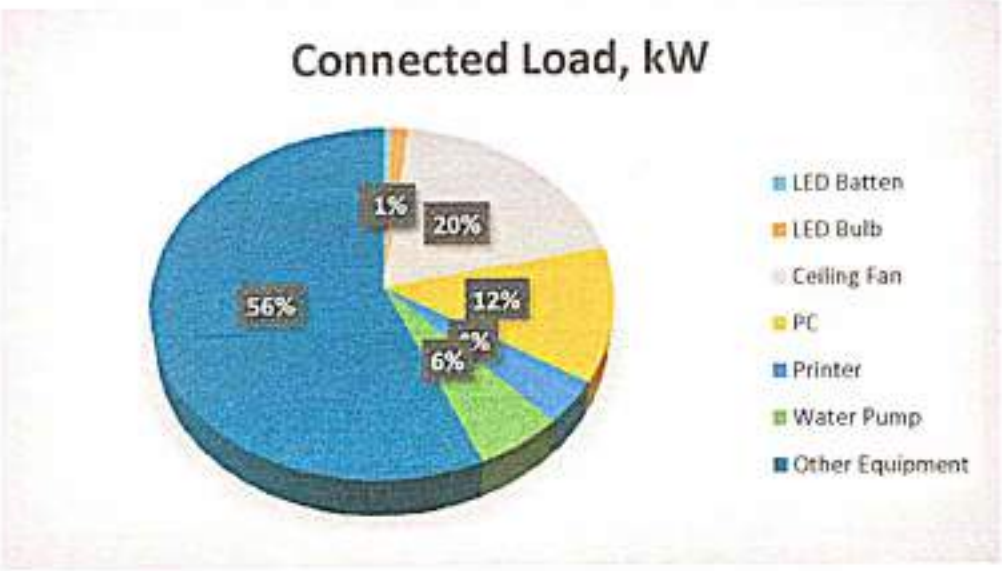
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	LED Batten	7	20	0.14
2	LED Bulb	40	9	0.36
3	Ceiling Fan	80	65	5.2
4	PC	22	150	3.3
5	Printer	7	150	1.05
6	Water Pump	1	1492	1.492
7	Other Equipment	100	150	15
8	**Total**			**27**

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	485
2	May-21	643
3	Jun-21	777
4	Jul-21	304
5	Aug-21	287
6	Sep-21	439
7	Oct-21	382
8	Nov-21	500
9	Dec-21	425
10	Jan-22	409
11	Feb-22	325
12	Mar-22	481
13	Total	5457
14	Maximum	777
15	Minimum	287
16	Average	454.75

Chart No 2: Variation in Monthly Energy Consumption:

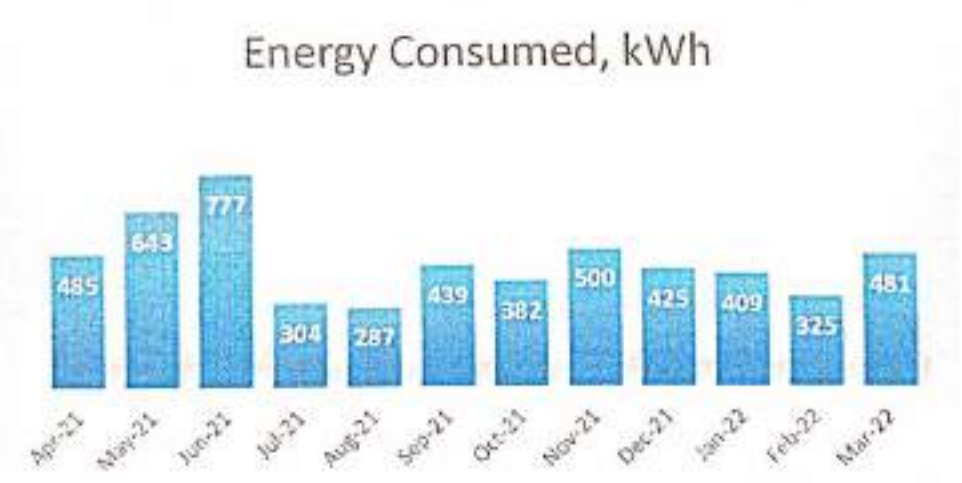


Table No4: Variation in Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh
1	Total	5457
2	Maximum	777
3	Minimum	287
4	Average	454.75

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 Purchased, kWh	CO_2 Emissions, MT
1	Apr-21	485	0.4365
2	May-21	643	0.5787
3	Jun-21	777	0.6993
4	Jul-21	304	0.2736
5	Aug-21	287	0.2583
6	Sep-21	439	0.3951
7	Oct-21	382	0.3438
8	Nov-21	500	0.45
9	Dec-21	425	0.3825
10	Jan-22	409	0.3681
11	Feb-22	325	0.2925
12	Mar-22	481	0.4329
13	Total	5457	4.9113
14	Maximum	777	0.6993
15	Minimum	287	0.2583
16	Average	454.75	0.4092

Chart No 3: Month wise CO_2Emissions:

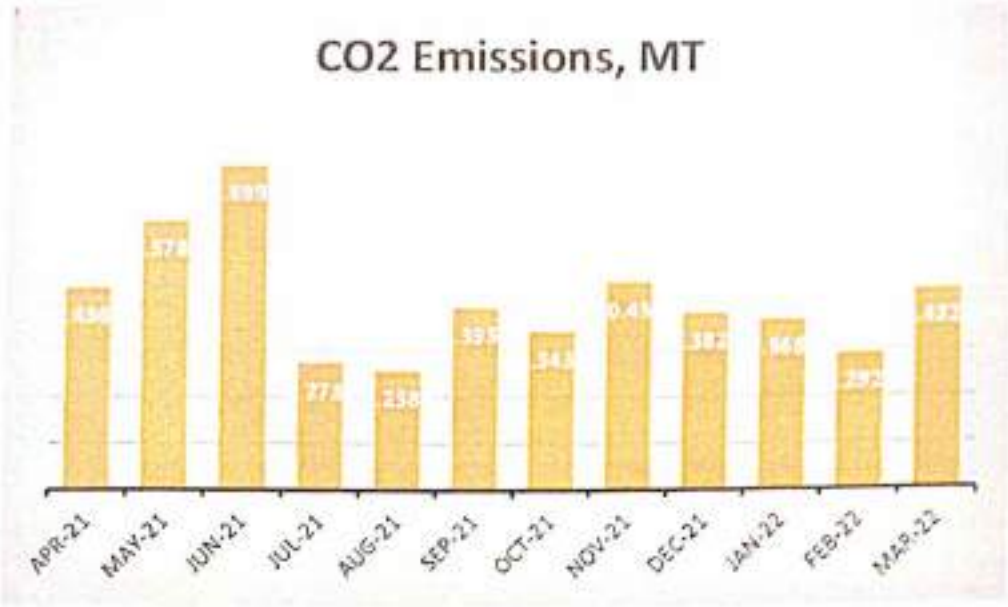


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Purchased, kWh	CO2 Emissions, MT
1	Total	5457	4.9113
2	Maximum	777	0.6993
3	Minimum	287	0.2583
4	Average	454.75	0.4092

CHAPTER V
STUDY OF USAGE OF ALTERNATE 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.

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:

1	No of 9 W LED Bulb Light Fittings	40	Nos
2	Demand of 9 W LED Bulb Light Fitting	9	W/Unit
3	Total Electrical Load of 9 W LED Bulb Light Fittings	**0.36**	kW
4	No of 18 W LED Tube Lights	7	Nos
5	Demand of 18 W LED Tube Light	18	W/Unit
6	Total Electrical Load of 18 W LED Fittings	**0.126**	kW
7	Total Lighting Load=3+6	**0.486**	kW
8	Total LED Lighting Load= 6	**0.486**	kW
9	Average Daily Usage Period	4	Hours
10	Annual Working Days	120	Nos
11	Annual Total Lighting Load = 7*9*10	**233.28**	kWh
12	Annual LED Lighting Load = 8*9*10	**233.28**	kWh
13	**Annual Lighting Requirement met by LED= 12*100/11**	**100.00**	%