



Omkar Shikshan Prasarak Mandals
Arts, Commerce and Science College, Gadhinglaj,

Dist. Kolhapur

ENERGY AUDIT REPORT

2020-21 And 2021-22



Prepared and Certified By

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Mr. Anand Gholap (Internal Auditor)

June, 2023

Energy Audit Certificate

Is awarded for 2020-21 and 2021-22 to the Esteemed Institution

Omkar Shikshan Prasarak Mandals
Arts, Commerce and Science College, Gadhinglaj, Dist. Kolhapur

As part of Institutions initiatives for a Healthy and Sustainable Institute the audit was conducted.

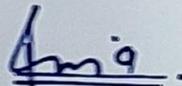
We appreciate the immense efforts taken by staff and students towards the Energy Management and Conservation. And the report has been prepared by us based on the document submitted by college.

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INDEX

Sr. No.	Description	Page No.
1	Preamble	4-5
2	College profile	6-7
3	Energy Policy	8
4	Geographical information	10
5	Scope of Energy Audit	11
5.1	Energy consumption	12
5.2	Energy requirements	12
5.4	Efforts for carbon neutrality	15-18
6	Suggestions	18

LIST OF TABLES

Table No.	Description	Page No.
1	Details of area	10
2	Land use pattern	10
3	Geographical details of the college area	10
4	Sources of Energy Consumption	12
5	Energy consumption	13
6	Electricity produced from different sources	16
7	Carbon foot prints	17
	Details of CO ₂ emitted due to bulbs	18

LIST OF FIGURES

Table No.	Description	Page No.
1	College organogram	9
2	Google earth map	11
3	Energy consumption	14

ENERGY AUDIT REPORT

1: PREAMBLE:

Energy sector has played a very important role in development of human race. Various forms of energy are used in industrial as well as domestic sector. Energy resources can be divided mainly into two types i.e., renewable resources and non-renewable resources. The renewable resources of energy mainly include solar energy, wind energy, water energy etc. The non-renewable resources include coal, petroleum, natural gas etc.

Now-a-days, 90 percent of our energy needs are fulfilled by non-renewable resources, which has led to increase in environmental pollution level. The burning of coal leads to release of Sulphur dioxide, which in turn causes acid rain. The carbon dioxide release from various industrial activities has caused significant increase in the level of greenhouse gases, which is main cause of global warming. Along with this, various other major and minor pollutants are environment friendly. More use of renewable energy resources ensures sustainability.

The energy audit mainly focuses on evaluating the use of energy in institutions generated through renewable and non-renewable means of energy and promoting the use of renewable resources for environmental sustainability.

Introduction

Energy audit is an inspection, survey and analysis of energy flows for energy conservation in building or a system to reduce the amount of energy input into the system without adding a negative impact on the output. Energy audits are means to understand the flow of energy starting from the source to its final use.

As per the Energy Conservation Act, 2001, Energy auditing is the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption.

Green audits are assigned to criteria 7 of the National Assessment and Accreditation Council, which is a self-governing organization that provides various institutions with grades based on their criteria for accreditation.

Essentially requirement for an Energy Audit is a part of the criteria 7 and is vital to the accreditation process. This accreditation provides a college with an opportunity to present itself as an esteemed institution without impeccable values, infrastructural advantage and endless opportunities it could provide its students.

Need for Energy Audits:

Energy audits help analyse and determine good institutional practices; whether they are eco-friendly or sustainable. With the world constantly changing, development, unfortunately, results in large-scale utilization of natural resources. Now natural resources are not just used for the supply of products. Energy, water are all basic commodities that are used generously by all. With the threat of depleting resources looming over our heads, it is imperative to determine how much we use and where we waste resources to ensure efficient usage. Energy audits provide opportunities to determine the same and help the organization to reflect, improve and expand their processes and shift to clean green resource utilization. Apart from this, it helps instil consciousness among people as part of the institution towards the environment and sustainable resource utilization.

Goals of Energy Auditing:

- Identification of strengths and weaknesses in green practices.
- Analyze and suggest solutions for problems identified.
- Identify and assess environmental risk.
- Motivate staff for optimal sustainable use of available resources.
- Increase environmental awareness throughout the campus.
- Collect baseline data of environmental parameters and prepare plans for issues before they become problems.

Objectives of Energy Audit:

- Analyze current practices and determine their impact on the environment.
- Identify and analyze significant environmental issues.
- Continuous assessment for better environmental performance.
- Establish and implement a green energy strategy in the campus and sensitize the faculty and students.

Benefits to Educational Institutions:

- Improve the energy utilization within and outside the campus premises.
- Help recognize cost-effective green strategies that enable conservation of energy.
- Empower people linked to the organization to move towards conscious environmental thinking and practice.
- It helps improve the image and builds a positive impression of the institution for its green and clean resource use.

2.0: COLLEGE PROFILE:

About College:

The Institute named 'Omkar Shikshan Prasarak Mandal' come into existence in 1996 in Gadhinglaj Kolhapur district in southern Maharashtra (India). Our aim is to provide higher education at affordable price to Socio-Economically backward students in the city area and surrounding villages this was our motto behind the establishment of the institute.

Our institute established Arts, Commerce and Science College in June, 1998 and our first batch of B.A. passed out in April 2001. Initially we had three full time departments viz. Political Science, Economics and Marathi, after taking into consideration the need of students English and History departments were started from June 2011 and June 2012 respectively. We acquired our salary grant from government of Maharashtra from June 2004 for the degree college.

In 2004 management decided to start Junior college and sought the permission for the same immediately in June 2004 and hence institution started Rajarshree Shahu Junior College.

In 2008 the institution constructed an independent building to run these two with Co-Operation of community it has recruited quality teaching and non-teaching staff for betterment of the institution.

Shri. Rajan J. Pednekar is the founder president of the institute, and Shri.Gajanan Gijavanekar is the founder seceratry of the institute. Smt. Anuya Kiran Gune also served as the president of the institute. We are going with able leadership of Honorable president Shri. Rajan Pednekar right now. Our institution is making progress with his all trustees including Vice President Dr. Rutuja Pednekar-Bandivadekar and Secretary Advt. Vijayalaxmi Kadane and Treasurer Shri. Uddhavrao Ingavale.

Vision

“Education for deprived sections of society and promoting the values of Liberty, Equality, Fraternity and justice”

Mission:

“Producing youths for nation building”

Goals:

- Providing quality education to students residing in rural and hilly area.
- Developing scientific attitude among students.
- Mental, cultural, psychological and physical developments of the students through curricular and co-curricular activities.
- Promoting the values incorporated in the constitution of India.
- Inculcating the value of 'Health in Wealth.'
- Promoting the use of ICT in higher education.

NAME AND ADDRESS OF COLLEGE:

Name of college:	ARTS, COMMERCE & SCIENCE COLLEGE GADHINGLAJ
Address	132/12, Sarswati Nagar, Gadhinglaj,
Pin:	416502
Website:	www.aesc.ac.in
Status of the institution:	Permanent Affiliation
Type of institution:	Co-Education
a. By gender	Co-Education
b. By shift	Day Time
Sources of funding:	Grant in Aid
a. Date of establishment of the college:	June 1998
b. University to which the college is affiliated:	Shivaji University, Kolhapur
Details of UGC recognition:	
Under section	
a. 2 (f)	8-7/2016 (CPP-I/C), 7 th November 2016
b. 12 (B)	8-7/2016 (CPP-I/C), 7 th November 2016

COURSE OFFERED BY COLLEGE:

Sr. No.	Programme level	Name of programme
1.	U.G.	B.A.
2.	U.G.	B.Com.
3.	P.G. (Distance Education)	M.A.

3.0 ENERGY POLICY:

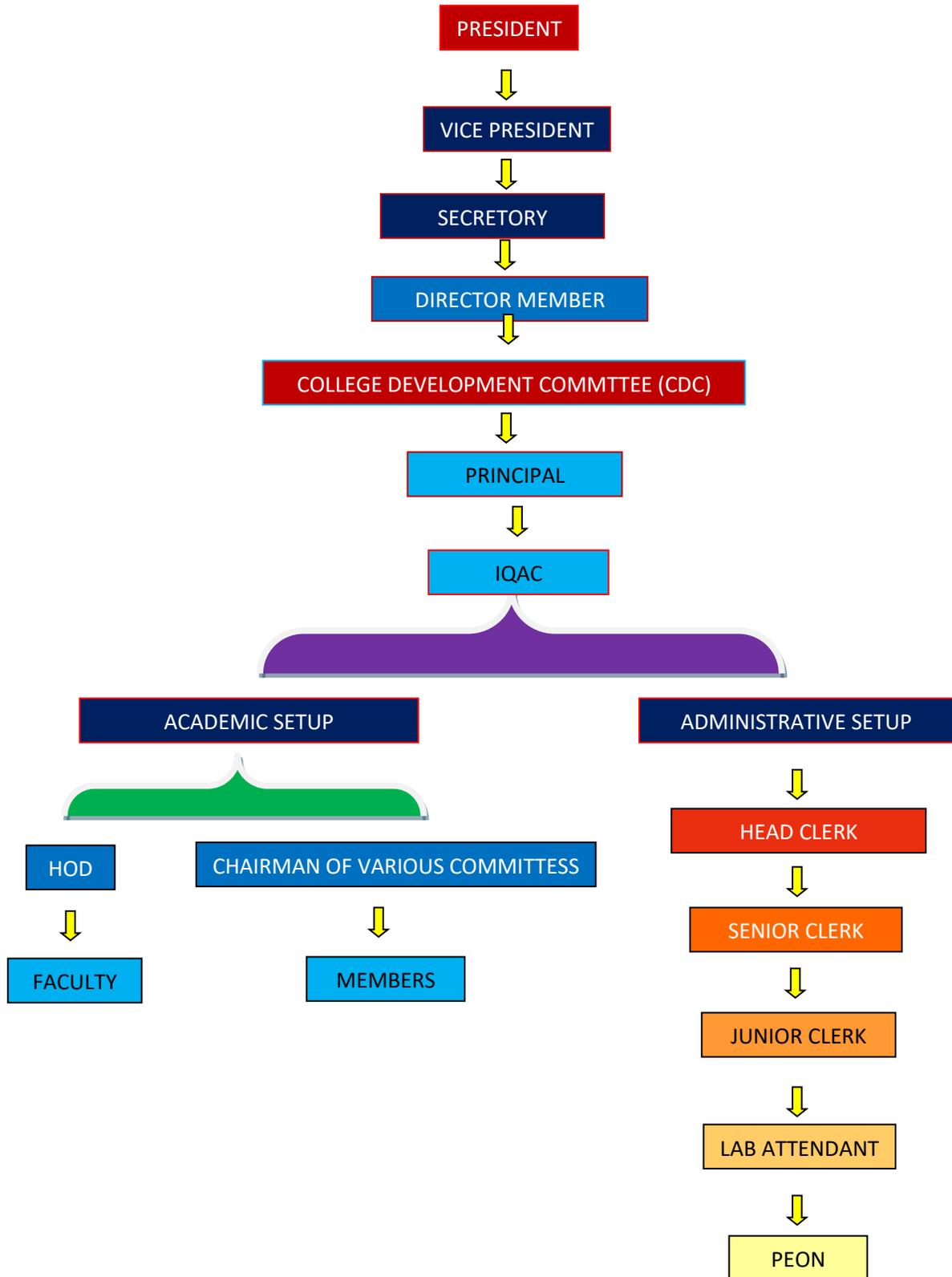
A key component of the College Sustainability Program is energy conservation. Listed below are several guidelines that are intended to manage and reduce energy consumption on all college campus. These guidelines should be followed by all faculty, staff, administration, and students. The Energy usage Policy of college is to manage energy in such a systematic way to minimize its impact on the environment. It will help us to embed efficiency and environmental awareness into our everyday activities, thus helping us to realize our responsibilities and commitment to conservation of natural resources and to limit its usage.

Policies:

- To assess source energy usage and measure its impact on the environment.
- To install photovoltaic solar panels for the generation of alternate energy.
- To install LED bulbs in the whole campus to save energy.
- To develop systematic waste management mechanism.
- To develop rainwater harvesting unit.
- To undertake tree plantation drive.
- To monitor and respond to emerging environmental and energy issues. To strengthen our employees' and students' environmental knowledge and skills to improve our own environmental performance.

- **COLLEGE ORGANOGRAM:**

Organogram of the college is given in below : **Figure 1**



4.0 GEOGRAPHICAL INFORMATION:

DETAILS OF AREA:

Table no. 1: Location of the campus and area in sq. mts.is given below:

Location	Rural
Area	1141.48 Sq. Mt

3.1.3 LAND USE PATTERN OF COLLEGE:

Table No.2: land use pattern of college

Land use pattern	Area (m²)
Total area	1141.28 Sq. Mt
Area occupied by buildings	348.33 Sq. Mt
Ground	307.5 Sq. Mt
Open space	485.45 Sq. Mt

Table No. 3: Geographical details of the college area

Latitude (N)	Longitude (E)	Elevation (m) MSL
16.221692	24.341112	623 mt

Location of the college area is shown on Google Earth map (Figure No. 2)



5.0 SCOPE OF ENERGY AUDIT IN TERMS OF ENVIRONMENTAL ASPECTS:

- 5.1 Energy Conservation: Energy conservation is the effort made to reduce the consumption of energy by using less of an energy service. This can be achieved either by using energy more efficiently (using less energy for a constant service) or by reducing the amount of service used
- 5.2 Use of Renewable Energy: Renewable energy is useful energy that is collected from renewable resources, which are naturally replenished on a human timescale, including carbon neutral sources like sunlight, wind, rain, tides, waves, and geothermal heat.
- 5.3 Efforts for Carbon Neutrality: carbon-neutral (or carbon neutrality) is the balance between emitting carbon and absorbing carbon emissions from carbon sinks.

5.1: ENERGY CONSUMPTION:

Number of rooms under use in college: 21

Details of various sources of energy consumption units are given in table No.4.

Table No.4: Sources of Energy Consumption

Sr.No.	Energy sources	Electricity/generator/solar lamps
a.	No. of Computers	11
b.	No. of tube lights	12
c.	Number of LED bulbs	32
d.	No. of UPS	02
e.	No. of fans	13
f.	No. of fridge	01
g.	No. of CCTV	08
h.	Electric pumps of 1 HP	01
i.	No. of smart T.V.	01
j.	No.of printers and Xerox machine	03
k.	Mixer	01
l.	Oven	01
m.	Bell	01
n.	Bio-metric Machine	01
o.	LCD Projector	01

5.2: ENERGY REQUIREMENT: sanctioned load (6.6 kw)

Electricity supplied from the Maharashtra State Electricity Board is the main source energy for the activities on the campus. In addition to the regular supply, energy consumed (KW) during the last year is shown in tabular as well as graphical form.

Electricity supplied from the Maharashtra State Electricity Board is the main source energy for the activities on the campus. In addition to the regular supply, energy consumed (KW) during the last year is shown in tabular as well as graphical form.

Table No. 5: Energy consumption during the Year 2020-21 and 2021-22

Consumer No - 253510096211

Sr. No.	Months	Consumption (In units) 2020 - 2021	Consumption (In units) 2021 - 2022
1	June	273	95
2	July	70	101
3	August	85	103
4	September	69	90
5	October	121	189
6	November	72	118
7	December	105	114
8	January	79	99
9	February	84	111
10	March	21	107
11	April	228	139
12	May	75	121
	Average	106.83	115.58

Figure 4: Graphical representation of energy consumption during 2020-21

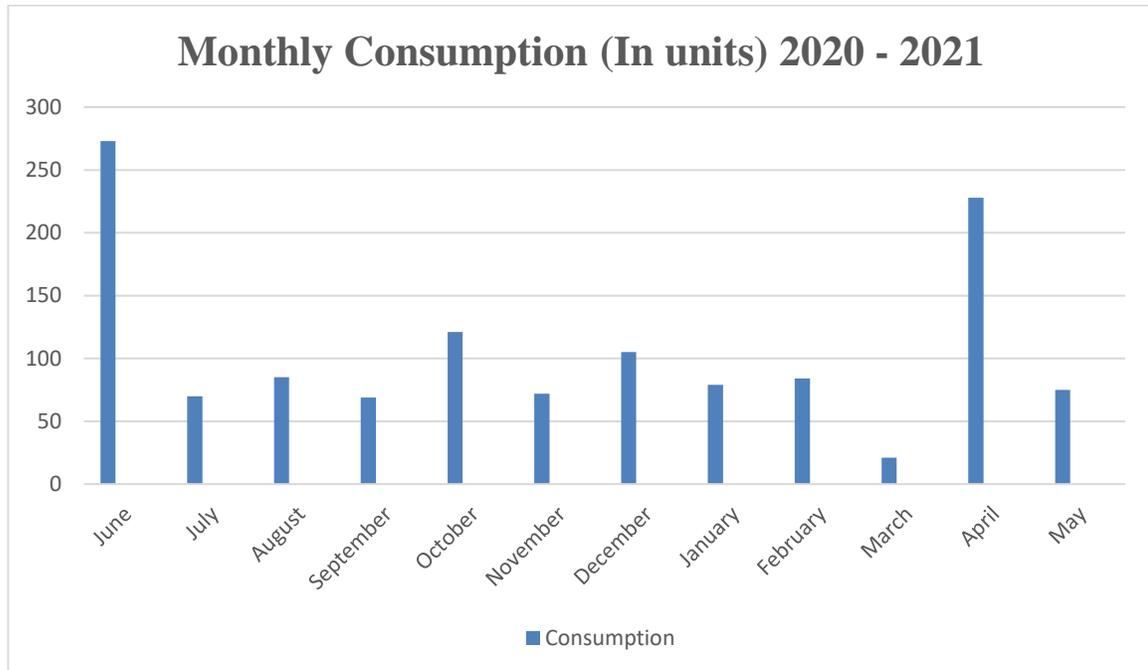
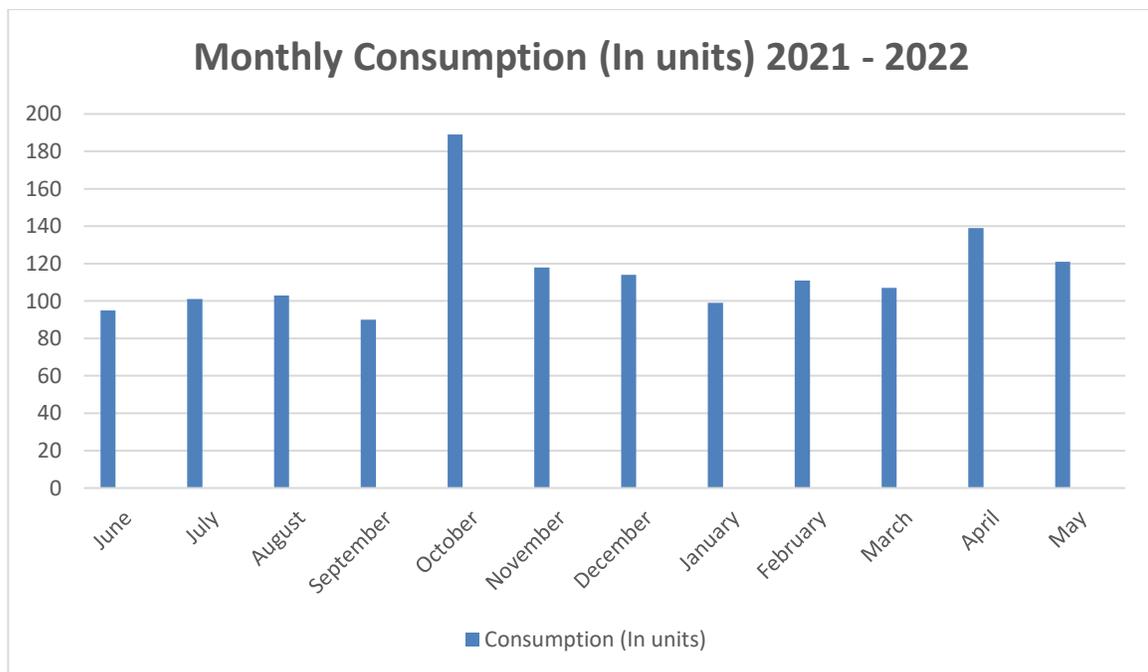


Figure 5: Graphical representation of energy consumption during 2021-22



Energy conservation measures taken up by the College:

From the energy consumption pattern of the year 2020 - 21, it is found that there was increase of energy consumption in the month of April and June as compared other months. Thereafter, the energy consumption is gradually decreasing in January to March. Maximum energy requirement was 273 units during month of June and minimum 21 was in March.

From the energy consumption pattern of the year 2021 - 22, it is found that there was increase of energy consumption in the month of October. Other than that the energy consumption is on the regular basis close to the average consumption of 115.58 units. Maximum energy requirement was 189 units during month of October and minimum 90 units was in September, The energy consumption decrease during the last two years is mainly due to switching over the use of LED bulbs in place of high energy consuming 40-Watt tube lights.

The requirement is met from the Maharashtra Electricity Board. College is aware of environmental impacts of consumption of conventional energy supplied by MSEB. Hence, college has adopted following measures to minimize the energy consumption.

1. Switching over to the use of LED bulbs as a replacement to conventional high energy consumption bulbs
2. College has encouraged use of e-mail instead of sending notices and faxing documents.
3. Most of the fans carry three stars rating of electrical appliances.
4. Increased use of flat-screen LCD monitors rather than CRT monitors
5. Awareness amongst students was carried out and accordingly sign boards are displayed at strategic locations for conservation of energy and students positively responding.

5.3: EFFORTS FOR CARBON NEUTRALITY:

Thinking about carbon footprints is a simple way of thinking about ways to reduce environmental pollution. By reducing our carbon footprints, each one of us can contribute to making the earth a safer, better place to live. Estimates suggest that almost half of our carbon footprint is due to electricity and 17% is due to lighting alone.

Carbon footprint is the amount of Green House Gases like carbon dioxide, methane, nitrous oxide emissions emitted by a building, organization etc. It relates to the amount of greenhouse gases we are producing in our day-to-day lives through burning fossil fuels for electricity, heating, transportation etc.

Arts, Commerce & Science, Mahavidyalaya Gadhinglaj College, carbon footprint for indoor lighting in office building is considered. The performance of the building by using LED lights reduces the building carbon foot print. The carbon foot print is for –

1. Incandescent Light
2. CFL
3. LED Lights

Electricity:

By and large, half of our carbon footprint is due to electricity and 17 % is due to lighting alone. Electricity in turn can be produced by coal, natural gas, petroleum, and other. Electricity is produced from different sources and how much GHG released is shown in table no. 6.

Table No. 6: Electricity produced from different sources

Source	Million metric tons of CO ₂ emission for 1 year	Electricity generation (Billion kWh) for 1 year
Coal	1788	1882
Petroleum	106	119
Natural gas	337	562
Other	14	22
Non fossil fuels	None	1106
Total	2245	3621

Since close to 2245 million metric tons of CO₂ emitted by total electricity generation per year. A single kilowatt-hour of electricity will generate 619 grams of CO₂ emissions.

1. Incandescent Light

Incandescent lamp is a source of light which produce light when the filament is being heated. It can release 80% electrical energy converted into heat energy. We can calculate how much CO₂ will be emitted by 40-watt incandescent bulb.

Power Consumption- 40 watts

- Operation per day- 10 hours
- Power Consumption per annum-146000 watt
- Electricity per hour (kwh) - 0.04 (1 kWh=619g CO₂ can be released)
- Lighting Carbon Emission per year/lamp (146*619g) -90.3 kg.

A single 40 watts incandescent bulb will generate 90.3 kilograms of CO₂ for every year. The reduction of carbon footprint is none for this lamp.

2. Compact Fluorescent Light

CFL produce less heat and more visible light compare than incandescent lamp. We can calculate how much CO2 will be emitted by 14-watt incandescent bulb.

Power Consumption- 14 watts

- Operation per day- 10 hours
- Power Consumption per annum-51100 watt
- Electricity per hour (kwh) – 0.014 (1 kWh=619 g CO2 can be released)
- Lighting Carbon Emission per year/lamp- (51.1*619g) - 31.6 kg.

A single 14 watts CFL lamp will generate 31.6 kilograms of CO2 for every year. The reduction of carbon footprint is none for this lamp. CFL contains harmful mercury which creates mercury emission. Estimated suggestion led lights only will reduce our carbon foot print over than other lights.

3. LED Lights

LED lights consumes low power and energy efficient over than other lights. Not even a single point we can't compare led lights with other lighting. We can calculate how much CO2 will be emitted by 8-watt LED lamp -

- Power Consumption- 8 watts
- Operation per day- 10 hours
- Power Consumption per annum-29200 watt
- Electricity per hour (kwh) – 0.008 (1 kWh=619 g CO2 can be released)
- Lighting Carbon Emission per year/lamp (29.2 *619g) - 18 kg.

A building's carbon footprint from led lighting can be reduced by 68%.

- Reduction in Carbon Footprint (tons)-0.122(12.28 kg)

The 8-watt LED equivalent will only be responsible 18 kilograms of CO2 over the same time span.

Table No. 7: Carbon foot prints

	Incandescent Bulb	LED light
Power Consumption(watt)	40	8
Electricity(kwh)	0.04	0.008
Hours of Operation Per Day	10	10
Carbon Emissions (tons) per year/lamp	0.903	0.18

Reduction in Carbon Footprint (tons) / lamp	--	0.12
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- LED light can reduce our carbon footprint by 0.12 tons per year.
- Led light does not contain mercury; it is a big benefit for this lamp.
- Incandescent, it is 5.8 mg from power plant.

The 8-watt LED equivalent will only be responsible 18 kilograms of CO₂ over the same time span.

Based on above comparisons, LED emerges as the BEST option to reduce carbon footprint.

At ARTS, COMMERCE & SCIENCE, MAHAVIDYALAYA GADHINGLAJ, all together there are 21 rooms (including, class rooms, offices, labs etc.) 29 LED lights and 13 tube lights

Details of CO₂emitted from these lights is given in table 8.

Table No. 8: Details of CO₂ emitted due to bulbs

Light	No. of bulbs	CO ₂ emitted per lamp / year	Total CO ₂ emitted kg per year
LED	9 (8 watt)	18 kg.	162
	23 (9 watt)	25.55 kg	587.65
CFL	02 (12 watt)	27.08 kg	55.6
CFL	01 (18watt)	38.93 kg	38.93
Tubes	11 (36watt)	77.86 kg	856.46
Total			1700.7

CO₂ emitted from utilizing all types of bulbs per year is 738 kg/yr. Presently, College has taken initiative to replace Incandescent bulbs and CFL bulbs by LED. During the last year energy consumption of LED bulbs against the total energy requirement has been decreased. This has shown substantial reduction in the CO₂ emission per year. If all 46 bulbs and tubes are replaced by 8-Watt LED bulbs, CO₂ emitted per year would be 46 x 18 kg = 828 kg / year. This means college can reduce CO₂ by 872.7 kg / year (1700.7-828 kg). It is suggested to replace all bulbs by LED bulbs in a phase manner. Further, all the fans should be replaced in phased manner energy efficient five-star rating fans.

6.0: Suggestions:

The college has taken a good number of good initiatives for the sustainable energy consumption. However, to get better result following suggestions may be considered by the college in a phased manner.

- Annual Power requirement met through LED bulbs 20.89 %. Further, all the fans should be replaced in phased manner energy efficient five-star rating fans.
- Replacement of conventional bulbs has contributed significantly in the reduction of CO₂.
- A solar system should be installed to meet the entire energy requirement in a phased manner.
- It is also suggested to use solar energy as an alternate of energy for street light.

Overall, the performance of Institute is good in green initiative front and can take somemore green initiatives for sustainable future.