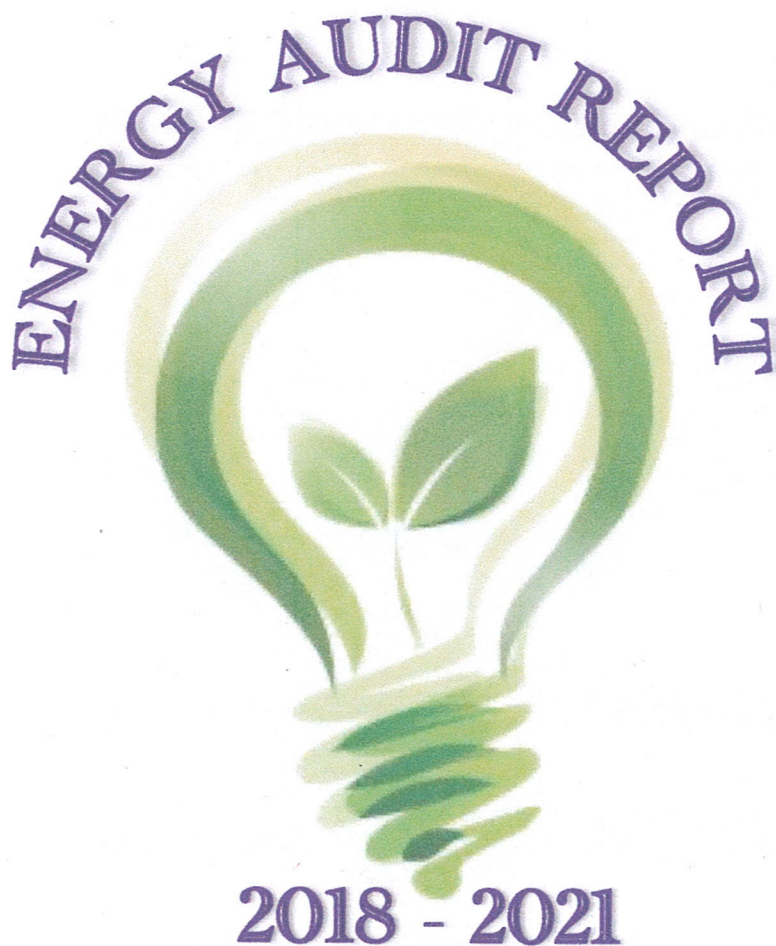


Energy Audit Report



**Mahatma Gandhi Arts, Science &
Late N. P. Commerce College, Armori
Dist. Gadchiroli (M.S.), 441208**



Prepared by
Dr. C. D. Mungmode
Associate Professor, Department of Physics
M. G. Arts, Science & Late N. P. Commerce
College, Armori

To,

The Principal,
M. G. Arts, Science
& Late N. P. Commerce College, Armori

Subject: Submission of Energy Audit Report (2018-2021).

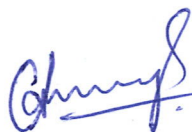
Dear Sir,

I am very pleased to submit detailed "Energy Audit Report (2018-2021)" that is required for preparation of "Green Audit Report" of the college which was decided to prepare in IQAC meeting.

I have tried my level best to include all the relevant data, information and the explanation to make the report informative and comprehensive.

The energy audit was conducted for academic year 2018-2019 to 2020-2021 in accordance with the applicable standards.

I am submitting the Energy Audit Report for your kind perusal.



Dr. C. D. Mungmode
Associate Professor, Department of Physics
M. G. Arts, Science & Late N. P. Commerce College,
Armori



"RIGHT PLACE FOR BRIGHT FUTURE"
MANOHARBHAI SHIKSHAN PRASARAK MANDAL ARMORI'S
**MAHATMA GANDHI ARTS, SCIENCE &
LATE NASARUDDINBHAI PANJWANI COMMERCE COLLEGE**

ARMORI Dist. Gadchiroli (M.S.) 441 208
Affiliated to Gondwana University, Gadchiroli
Re-accredited by NAAC 'A' with 3.02 CGPA

PRINCIPAL

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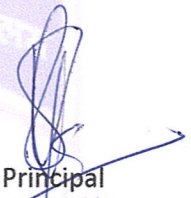
Letter No. _MGC/_

Date _____

Certificate

This is to certify that the Department of Physics of the college has conducted detailed 'Energy Audit' of the college for the academic years 2018-2019 to 2020-2021. The Energy Audit was conducted with applicable standards. It gives detailed information about consumption and yield of electricity on the college campus. The recommendations suggested in the report will be considered positively for implementation.




Principal
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Late N.P. Commerce College
ARMORI, Dist. Gadchiroli



CONTENTS

1.0	Introduction
2.0	Objective
3.0	Methodology Adopted
4.0	Electricity Consumption in Administrative Offices
5.0	Electricity Consumption in Departments, Laboratories, Library and IQAC
6.0	Electricity Consumption in Classrooms, Seminar Hall, Indoor Stadium, Corridor & Ground
7.0	Total Yield Vs Total Consumption
8.0	Environment Conservation
9.0	Recommendations

1.0 Introduction:

Electricity plays an important role in the development of human civilization. Numerous electrical appliances have made human life easy. Currently, about 30% of the total residential electricity is used by lighting followed by refrigerators, fans, electric water heaters, and TVs. Approximately 4 % of total residential electricity is used for standby power, which is apparently small amount of power that many modern appliances consume when they are not actively turned on. Modern electrical appliances consume less electricity as compare to old ones which ultimately results into low carbon emission, helping the environment conservation. The Department of Physics conducted energy audit at the college campus which will help in energy management. The college has administrative block, laboratories, indoor stadium, auditorium and classrooms. Various electrical appliances have been installed in all these blocks which consumes electricity generated from Solar PV System installed in the college campus and electricity supplied by Maharashtra State Electricity Distribution Company Limited (MSEDCL). The college has installed **on grid Solar Photovoltaic (PV) System**, having annual energy yield of 35000 kWh. The production of electricity is started from June 2018. The electricity generated during sunny days is consumed by the college and remaining electricity is provided to MSEDCL which is used during needy hours.

2.0 Objective:

To conduct observation and data based energy audit of the energy consumption of electrical appliances within the college campus and to determine how further energy saving can be achieved.

3.0 Methodology Adopted:

- Visual inspection and data collection
- Observations and energy consumption verification.
- Calculation, analysis and identification of energy saving opportunities.

4.0 Electricity Consumption in Administrative Offices

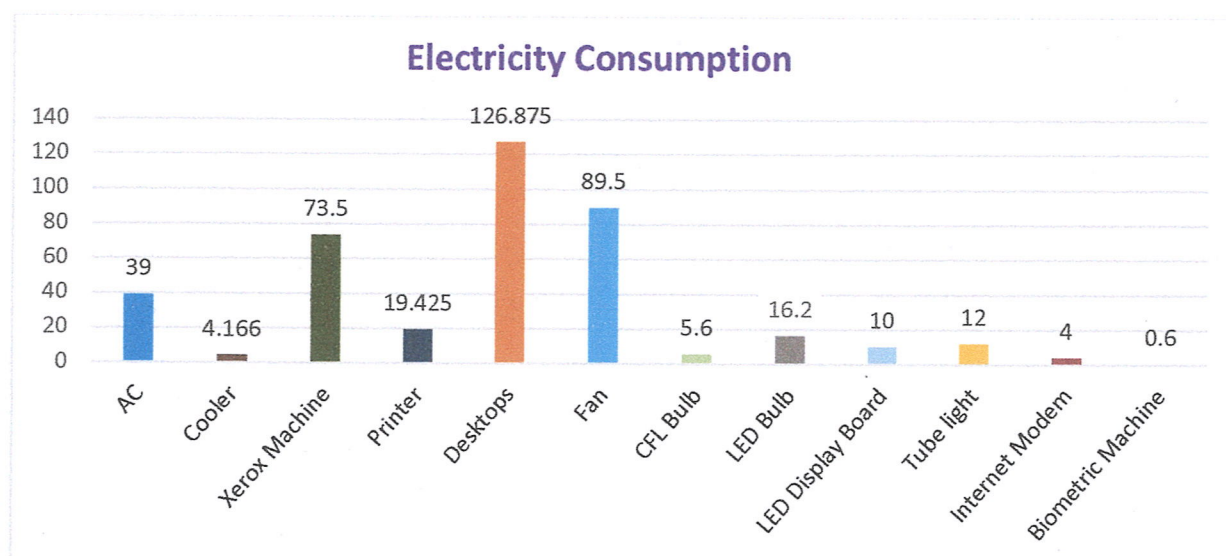
Administrative offices consist of Principle office, clerical section, management office and YCMOU office. The data was collected by actual observation from these offices and the calculation is done. The electricity consumption by the equipment is shown in following table.




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Sr. No.	Equipment	No. of Units	Avg. Wattage/unit	Avg. Daily Use/unit (Hours)	Total Consumption (kWh/month) (25 Days/month)
1.	AC (1.5 Ton)	1	1.56 kW	1	39
2.	Cooler	2	200 Watts	5 (2 Month)	50 (2 Month) = 4.166
3.	Xerox Machine	1	1.47 kW	2	73.5
4.	Laser/Inkjet Printer	3	259 Watts	1	19.425
5.	Desktops (All in One)	7	145 Watts	5	126.875
6.	Table Fan	2	55 Watts	2	5.5
7.	Ceiling Fan	8	60 Watts	7	84
8.	CFL Bulb	1	32 Watts	7	5.6
9.	LED Bulb	36	18 Watt	1	16.2
10.	LED Display Board	1	50 Watt	8	10
11.	T12 Fluorescent Tube light	3	40 Watts	4	12
12.	Biometric Machine	1	3 Watts	8	0.6
13.	Internet Modem	2	10 Watts	8	4
Total Power Consumption					400.866 kWh/month



(Signature)

The electric equipment in Administrative Offices consume about 400.866 kWh electricity per month. The major electric is consumed by Desktops i.e. 126.875 kWh/month followed by ceiling fans (84 kWh/month) and Xerox machine (73.5 kWh/month). Other equipment consumes less electricity as they are less in number. The electricity consumption for lighting purpose is less due to use more number of LED bulbs.

5.0 Electricity Consumption in Departments, Laboratories, Library and IQAC

The electricity is used in all Science Departments as most of the departments use electrical operated laboratory equipment. The details of major equipment and its power consumption is given in following table.

Sr. No.	Equipment	No. of Units	Avg. Wattage/unit	Avg. Daily Use/unit (Hours)	Total Consumption (kWh/month) (25 Days/month)
1.	Laser Printer	4	259 Watts	0.25	6.475
2.	Desktops	32	145 Watts	1	116
3.	Ceiling Fan	63	60 Watts	2.5	236.25
4.	CFL Bulb	16	32 Watts	6	76.8
5.	LED Bulb	13	18 Watt	6	35.1
6.	Incandescent Bulb	3	30 Watt	4	9
7.	LED Tube light	6	24 Watt	6	21.6
8.	T12 Fluorescent Tube light	31	40 Watts	4	124
9.	T8 Fluorescent Tube light	4	32 Watt	6	19.2
10.	Biometric Machine	1	3 Watts	Off Condition	00.00
11.	Projector	4	297 Watts	0.5	14.85
12.	Internet Modem	3	10 Watts	6	4.5
13.	Refrigerator	2	150 Watts	6 hrs. Compressor +	70.2 (30 Days)



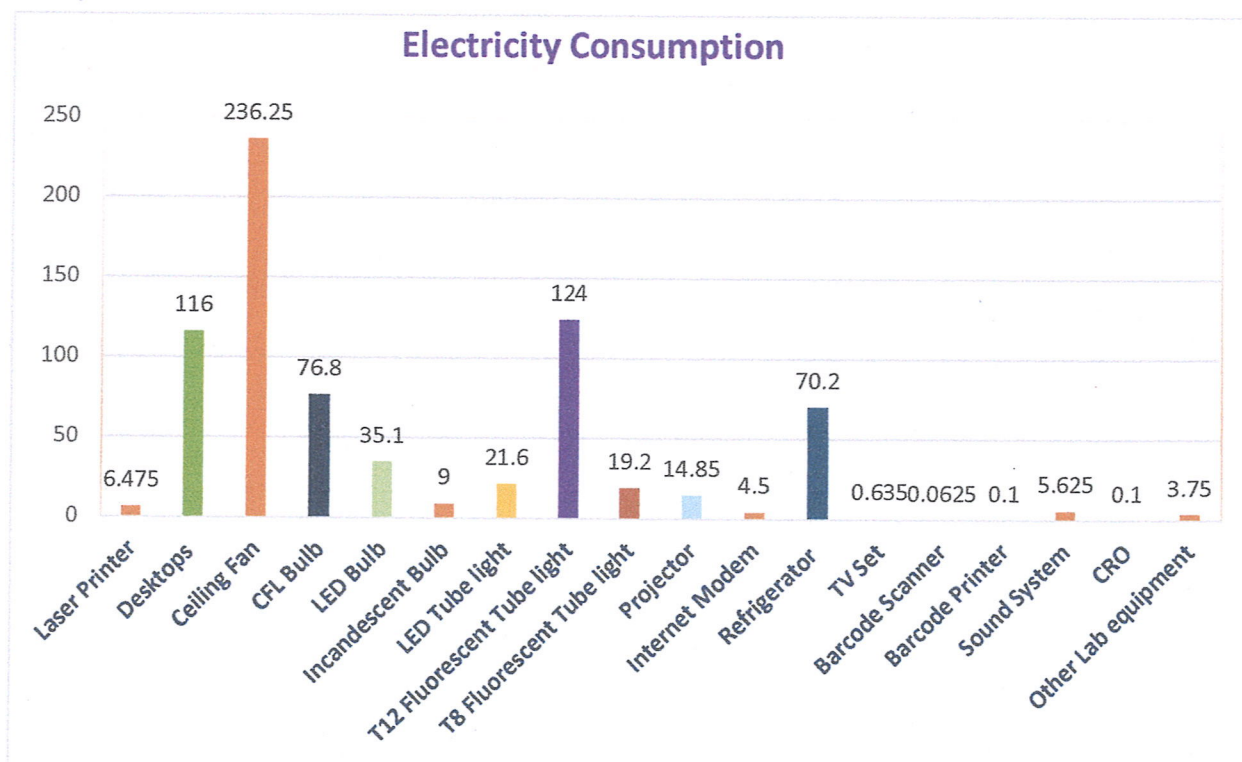
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6

				18 hrs. non- compressor	
14.	TV Set	1	50 Watts	0.5	0.635
15.	Barcode Scanner	1	2.5 Watts	1	0.0625
16.	Barcode Printer	1	20 Watts	0.2	0.1
17.	Sound System	1	300 Watts	0.75	5.625
18.	CRO	1	40 Watts	0.1	0.1
19.	Other Lab equipment	10	15 Watt (average)	1	3.75
Total Power Consumption					744.2475 kWh/month



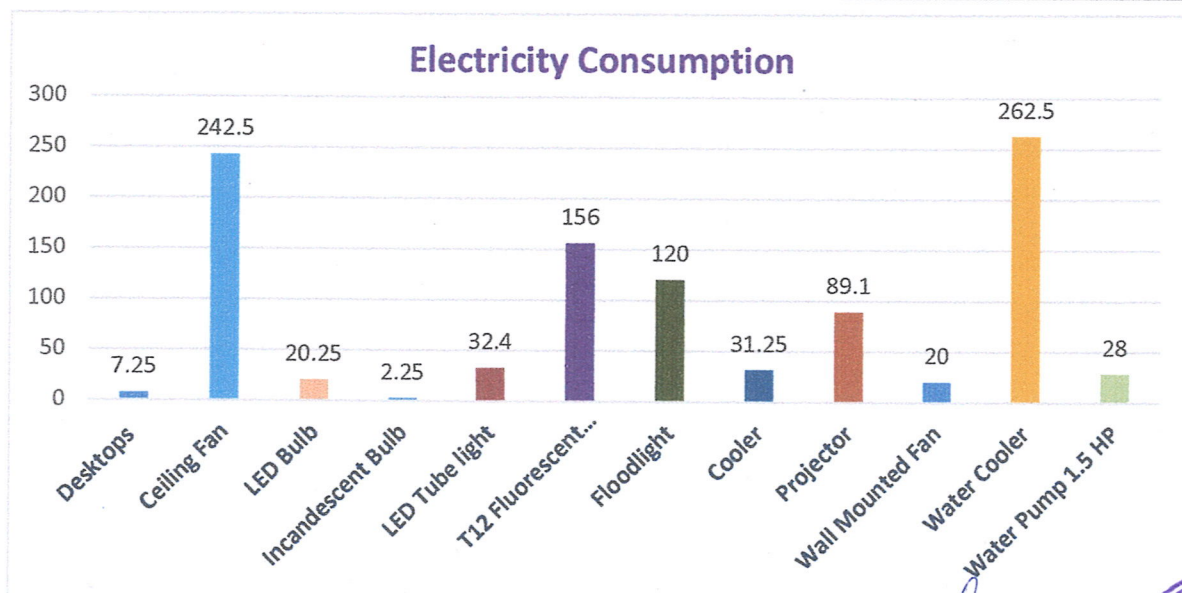
The major electricity consumption is done by ceiling fan which is equal to 236.25 kWh/month followed by Fluorescent Tube light (124 kWh/month) and Desktops (116 kWh/month). Other equipment consumes less electricity as their number is less. Electricity consumption in these sections can be reduced by replacing conventional tube lights and bulbs with LED bulbs/ tube light.

(Signature)

6.0 Electricity Consumption in Classrooms, Seminar Hall, Indoor Stadium, Corridor & Ground

The details of electricity consumption in classrooms, seminar hall, indoor stadium and remaining area of the college campus is given in following table.

Sr. No.	Equipment	No. of Units	Avg. Wattage/unit	Avg. Daily Use/unit (Hours)	Total Consumption (kWh/month) (25 Days/month)
1.	Desktops	1	145 Watts	2	7.25
2.	Ceiling Fan	97	50 Watts	2	242.5
3.	LED Bulb	90	18 Watt	0.5	20.25
4.	Incandescent Bulb	1	30 Watt	3	2.25
5.	LED Tube light	18	24 Watt	3	32.4
6.	T12 Fluorescent Tube light	52	40 Watts	3	156
7.	Floodlight	4	100 Watts	10	120 (30 Days)
8.	Cooler	5	500 Watts	0.5	31.25
9.	Projector	6	297 Watts	2	89.1
10.	Wall Mounted Fan	10	80 Watts	1	20
11.	Water Cooler	4	750 Watts	3.5	262.5
12.	Water Pump 1.5 HP	2	1.12 kW	0.5	28
Total Power Consumption					1011.5 kWh/month



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6

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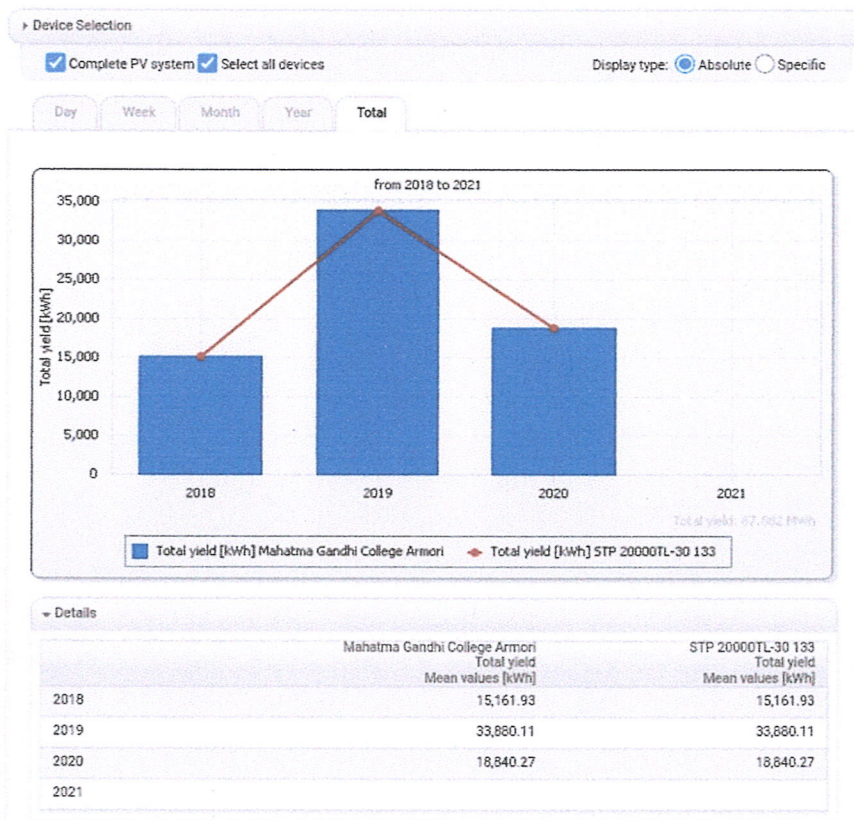
Majority of electricity is consumed by water cooler (262.5 kWh/month) followed by ceiling fans (291 kWh/month).

Total consumption of electricity in the college by all blocks is around **2,156 kWh/month** or **25,872 kWh/annum**. The annual energy yield of Solar PV System is **35,000 kWh**. Hence, the college is generating excess electricity than it needs and extra generated electricity has been feeding to **MSEDCL**. The data of electricity produced by the solar pv system and electricity consumption during June 2018 to September 2021 is summarized in following charts.

7.0 Total Yield Vs Total Consumption

During June 2018 to September 2020, the college has total electricity yield 67,882 kWh, whereas total electricity consumption (Internal energy supply + External energy supply) in this duration is 47,951 kWh.

Analysis - Mahatma Gandhi College Armori - Sunny Portal | Mahatma Gandhi College Armori



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7

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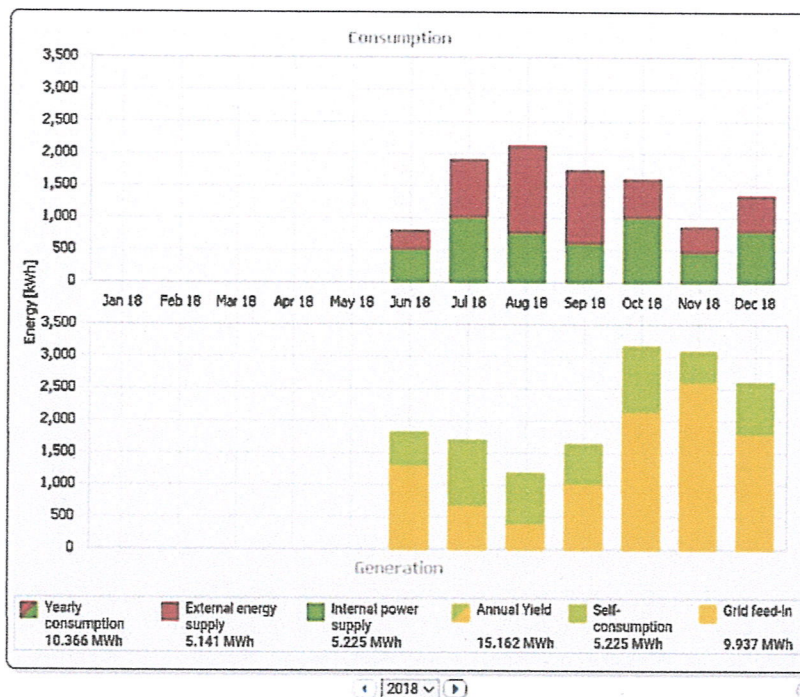
Energy Balance

Current Day Month Year **Total**



Balance

Total consumption	47.951 MWh	Total yield	67.882 MWh
External energy supply	22.444 MWh	Self-consumption	25.507 MWh
Internal power supply	25.507 MWh	Grid feed-in	42.375 MWh
Self-sufficiency quota	53 %	Self-consumption rate	38 %

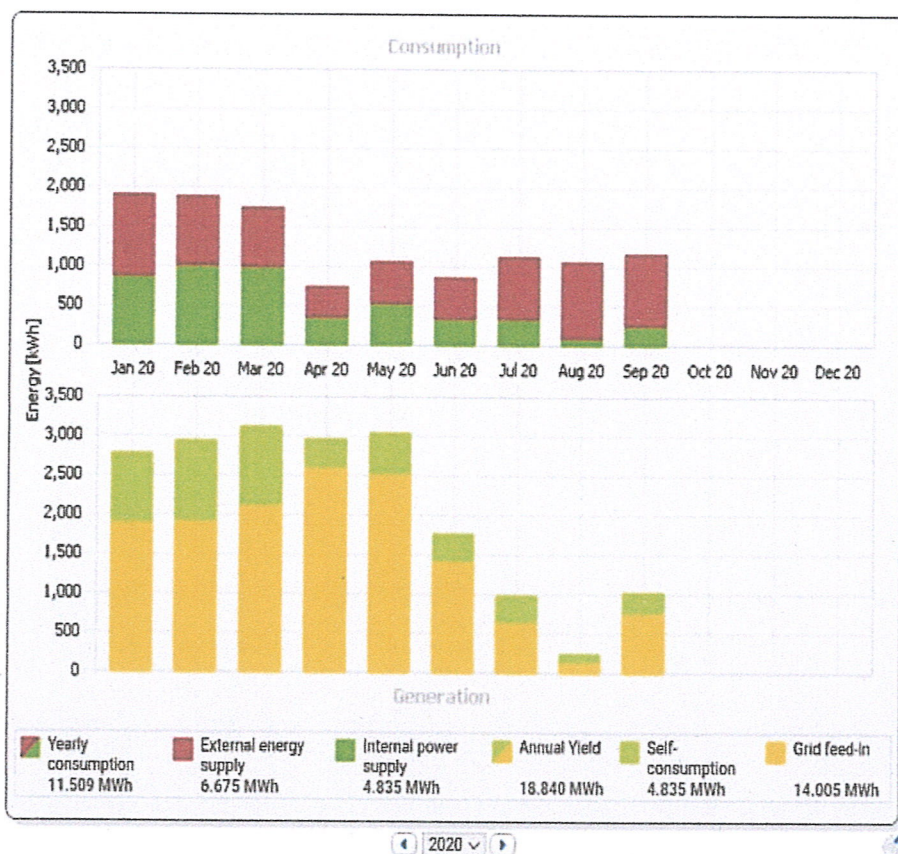
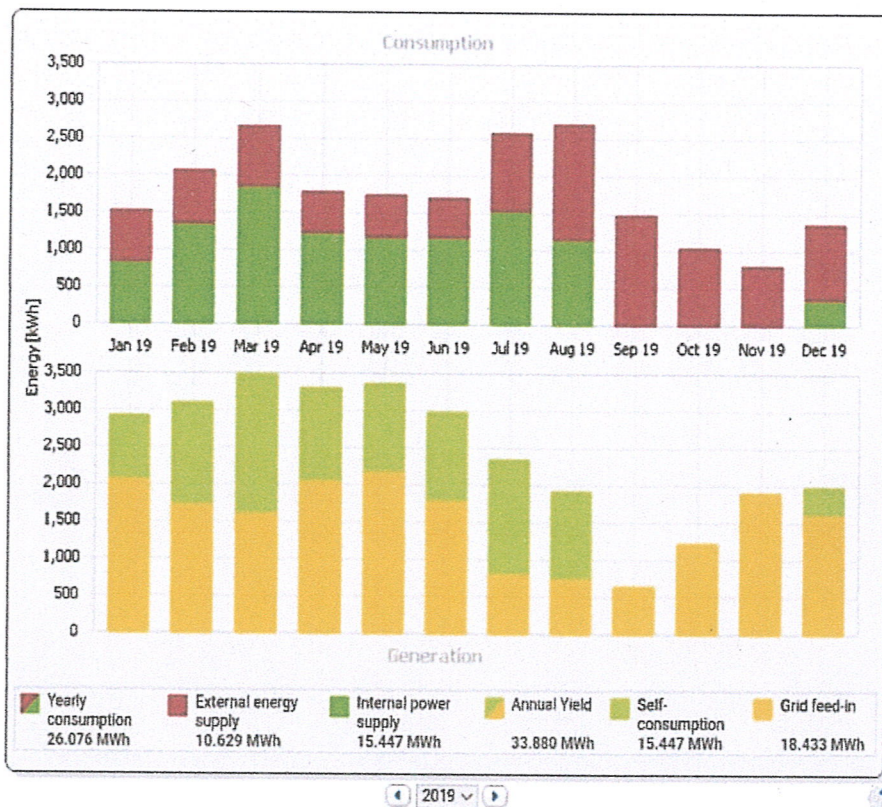


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The electricity consumption and electricity generation for last six months i.e. April 2021 to Sept. 2021 taken from MSEDCL is summarized as follows.

SOLAR CONSUMPTION DETAILS			
Bill Month	IMPORT Units	EXPORT Units	GENERATION Units
SEP-2021	704	1443	1509
AUG-2021	696	1377	1377
JUL-2021	341	1853	1916
JUN-2021	288	2002	2039
MAY-2021	206	2544	2578
APR-2021	869	2064	2071



महाराष्ट्र स्टेट इलेक्ट्रिसिटी डिस्ट्रीब्यूशन कंपनी लि.

बीज पुरवठा देयक माह: SEP-2021

Website :www.mahadiscom.in
GSTIN of MSEDCL 27AAECM2933K1ZB
BILL NO.(GGN): 000001319481440

HSN code 27160000

ग्राहक क्रमांक: 490510119522
THE PRINCIPAL M.G. VIDHYALYA HELTH C
AT-POSTARMORI DIST-GADCHIROLI ARMORI 442401
मोबाइल/ ईमेल: 78*****94/***oriurban@gmail.com

देयक दिनांक: 16-SEP-21
देयक रक्कम रु: 0.00

देय दिनांक: 06-OCT-21
या तारखे नंतर भरल्यास: 0.00

बिलिंग युनिट: 4339 :ARMORI S/DN.
दर संकेत: 073 /LT VII(B) Public Service 0-20KW Oth
पोल नं: 00000000
पी.सी./चक्र-मार्ग-क्रमांक/डि.सी.: 0 / 40-0014-0974 /4339079
मिटर क्रमांक: 055XC463498
रिडिंग ग्रुप: 00

पुरवठा दिनांक: 10-Jan-07
मंजूर भार: 18 KW
सुरक्षा ठेव जमा(रु): 18,130.00
चालु रिडिंग दिनांक: 10-SEP-21
मागील रिडिंग दिनांक: 10-AUG-21

चालु रिडिंग	मागील रिडिंग	गुणक अवयव	युनिट	समा. युनिट	एकूण
31072	30368	01	704	-704	0

NORMAL
Bill Period:1.03 Month(s) /

MSEDCL Bill for the Month of September 2021

The data is also collected from the solar meter installed in the college and electricity bill of MSEDCL. From the meter reading, total electricity yield by the solar PV system from June 2018 up to September 2021 is 90666 kWh; the electricity consumption from external energy supply (MSEDCL) in this duration is 31,072 kWh whereas electricity consumption from internal (solar) power supply is 31,905 kWh. Hence, the total




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electricity consumption by the college in this duration is 62,977 kWh. *Therefore, the Rooftop Solar PV System has generated 27,689 kWh excess electricity which is exported to MSEDCL for community use.*

8.0 Environment Conservation

The college has been producing electricity by renewable energy source i.e. Solar PV System with annual production of approximately 35,000 kWh. The college not only become energy self-sufficient but also provide approximately 10,000 kWh electricity annually to the community through MSEDCL.

Benefits of Solar PV System installed in the college campus are as follows:

- ◆ Use of green energy source do not produce greenhouse gas emission which reduces air pollution.
- ◆ The installed Solar PV System in the college decreases approximately 24.8 Metric Tons per annum CO₂ emission in the environment.
- ◆ It reduces hazardous toxic waste that would be produced from thermal power plant or nuclear power plant.
- ◆ It reduces consumption of water.

The carbon dioxide-equivalent greenhouse gas emissions data is calculated by using calculator provided on the website of US Environmental Protection Agency (EPA). Other equivalent ways to express those emissions are also presented.

The screenshot shows the EPA Greenhouse Gas Equivalencies Calculator interface. The 'If You Have Energy Data' tab is selected. The input field for energy is set to 35000 kilowatt-hours of electricity. The 'Calculate' button is green. Below the input, the 'Equivalency Results' section shows '24.8 Metric Tons' as the Carbon Dioxide Equivalent. A breakdown of emissions is provided: 5.4 from passenger vehicles driven for one year and 62,337 from miles driven by an average passenger vehicle.

Category	Value
Passenger vehicles driven for one year	5.4
Miles driven by an average passenger vehicle	62,337

Equivalency Results

[How are they calculated?](#)

The sum of the greenhouse gas emissions you entered above is of Carbon Dioxide Equivalent. This is equivalent to:

24.8 Metric Tons

Greenhouse gas emissions from

5.4



Passenger vehicles driven for one year

-or-

62,337



Miles driven by an average passenger vehicle

CO₂ emissions from

2,791



gallons of gasoline consumed

-or-

2,437



gallons of diesel consumed

-or-

27,415



Pounds of coal burned

-or-

0.328



tanker trucks' worth of gasoline

-or-

3



homes' energy use for one year

-or-

4.5



homes' electricity use for one year

-or-

<https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>



12


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0.137



railcars' worth
of coal burned

57.4



barrels of oil
consumed

1,014



propane
cylinders used
for home
barbeques

0



coal-fired
power plants
in one year

3,017,210



number of
smartphones
charged

Greenhouse gas emissions avoided by

8.4



Tons of waste
recycled
instead of
landfilled

1.2



Garbage
trucks of
waste recycled
instead of
landfilled

1,055



trash bags of
waste recycled
instead of
landfilled

0.005



Wind turbines
running for a
year

<https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

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Solar PV System installed on the College Rooftop

9.0 Recommendations

The college has become energy self-sufficient due to installation of Solar PV System and supplying extra electricity to community through MSEDCL. Still some of the recommendations are given bellow to reduce electricity consumption.

- * Old Fluorescent Tube Lights can be replaced by LED lights to reduce electricity consumption.
- * Old Desktops and instruments can be replaced with ones having energy efficient certification.
- * Old Ceiling fans can also be replaced by energy efficient fans.
- * Switch off equipment when they are not in use.
- * Replace faulty equipment.

Dr. C. D. Mungmode
Department of Physics



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