



Report  
On  
Energy Audit  
At

Shri Saraswati Vidya Prasarak Mandal's  
Smt. Padambai Kapurchandji Kotecha Mahila Mahavidyalay,  
Bhusawal.  
(Year 2022-23)



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Date: 21/08/2023

## CERTIFICATE

This is to certify that we have conducted **Energy Audit** at Shri Saraswati Vidya Prasarak Mandal's Smt. Padambai Kapurchandji Kotecha Mahila Mahavidyalay, Bhusawal as per the guidelines of Maharashtra Energy Development Agency ([www.mahaurja.com](http://www.mahaurja.com)) in the year 2022-**23. The college is zero energy building.**

The College has already adopted **Energy Efficient** practices like:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of **20 kW** Roof Top Solar PV Power Plant.
- Installation of 500 liter hot water solar thermal system for hostels
- Installation of 5 nos of Solar PV Street Lights.

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

NutanUrja Solutions,

  
K G Bhatwadekar,

Certified Energy Auditor,

EA - 22428







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## Acknowledgement

We at NutanUrja Solutions, Pune, express our sincere gratitude to the management of Shri Saraswati Vidya Prasarak Mandal Smt. Padambai Kapurchandji Kotecha Mahila Mahavidyalaya, Bhusawal for awarding us the assignment of Energy Audit of their college premises.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures through energy savings. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.



## Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO<sub>2</sub> emissions. College consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

### 1. Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

**Table no 2.1: Details of energy consumption**

Sr no	Parameter	Energy consumed, (kWh)	CO2 Emission (MT)
1	Total	0	0
2	Maximum	0	0
3	Minimum	0	0
4	Average	0	0

### 2. Energy Conservation Projects already installed

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

### 3. Key Observations

1. Usage of LED lights.
2. Usage of star rated equipment.
3. Maintained a good power factor.
4. There are about 111 Nos old T-8 type fittings which need to be replaced by 20 W LEDs.

### 4. Percentage of Usage of Alternate Energy

The College has installed a Roof Top Solar PV Plant. The percentage of usage of Alternate Energy to Annual Energy Requirement is 100 %.





### 5. Percentage of Usage of LED Lighting

The College has various Types of Light fittings, namely: LED, FTL & CFL. The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 16.87%.

### 6. Recommendations

The total energy imported by college from MSEB is zero. The college buildings can be called as zero energy building. There are not much energy saving recommendations for colleges.

- Replacement of 170 Nos T-8 fittings with 20W LED fittings

### 7 Notes & Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-300 Nos
3. Average Rate of Electrical Energy : Rs 11/- per kWh



## Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power



## 1. Introduction

Shri Saraswati Vidya Prasarak Mandal's Smt. Padambai Kapurchandji Kotecha Mahila Mahavidyalay is located in Bhusawal. The college Provides quality higher education to the women to equip them with modern views and knowledge along with social commitment and to bring them to the main stream for building better Society and stronger Nation. The college works for enrichment of women through quality higher education for better Society and stronger Nation.

### 1.1 Objectives

1. To study present level of Energy Consumption
2. To Study Electrical Consumption
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study various measures to reduce the Energy Consumption

### 1.2 Audit Methodology:

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

### 1.3 General Details of College

Table No-1.1: Details of college

No	Head	Particulars
1	Name of Institution	Shri Saraswati Vidya Prasarak Mandal's Smt. Padambai Kapurchandji Kotecha Mahila Mahavidyalay, Bhusawal.
2	Address	Smt. Padambai Kapurchandji Kotecha Mahila Mahavidyalay , 3Q4J+M37, Parijat Chowk, Shanti Nagar, Bhusawal, Maharashtra 425201
3	Affiliation	Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon.





## 2. Study of connected load

In this chapter, we present details of various connected electrical equipment and electrical load.

**Table No-2.1: Location wise study of Electrical fittings in various buildings**

No	Location	FTL (40W)	LED tube (20W)	CFL	Computers (65W)	Fan	1.5TR Star rated AC
1	Office	2	4		6	7	
2	Principal Cabin		4	8	1	2	1
3	Vice-Principal Cabin		6		1	4	
4	IQAC		12		2	2	
5	Office: Passage		4			1	
6	Gym	5				5	
7	Canteen	3				3	
8	A-21:Class Room	2				2	
9	A-20:Class Room	2	1			1	
10	A-19:Class Room	1	1			1	
11	A-18:Class Room	1	1			2	
12	A-17:Class Room	2				1	
13	A-16:Class Room	1	1			2	
14	A-15:Class Room	1				1	
15	A-14 :Sr.Exam Room	3			2	3	
16	A-12 :Smart Class Room		10		1	3	
17	A-5 : Jr. Exam Room	1	1			1	
18	A- 4:Class Room	1	2			3	
19	A-3 :Staff Room	2	1			2	
20	A-1,A-2: Computer Sci Lab	7	3		43	10	
21	A-13:Ladies Common Room		2			1	
22	A-6: Gym office	2	3		1	2	
23	A:Passage		4				
24	Central Library	9	12		3	14	
25	B-6 : Electronics Lab	3				3	
26	B-4,B-5:Physics Lab	3	4		1	5	
27	B-2,B-3:Chemistry lab	4	4			4	



28	B-1:Chemistry lab PG	2	3		1	4	
29	B-7: :Class Room		1			1	
30	B- 8 :Class Room		1			1	
31	B 9:Class Room		2			2	
32	B-10: Zoology lab	2	2		1	4	
33	B-11,B-12: Botany and BT lab	9			1	6	
34	B:Passage		2				
35	C- 6:Class Room	1				1	
36	C-5 :Class Room	1				2	
37	C-4:Class Room	1	1			5	
38	C-3:Social Science Dept.	1	1		1	5	
39	C-2:Language Dept.	1			8	4	
40	C-1: Comm. and Mgt Dept.	1		4	11	5	
41	C-7:Class Room	2				1	
42	C-8:Class Room	2				2	
43	C-9:Class Room	2				2	
45	C-10: Seminar Hall		7		1	9	
46	Hostel old floor 1	8	5			11	
47	Hostel old floor 2	4	10		1	12	
48	H:Passage		5				
49	Hostel New	12	2			12	
50	H: Passage		4				
51	Cultural Hall	4	6			7	
	<b>Total</b>	<b>108</b>	<b>132</b>	<b>12</b>	<b>86</b>	<b>175</b>	<b>1</b>

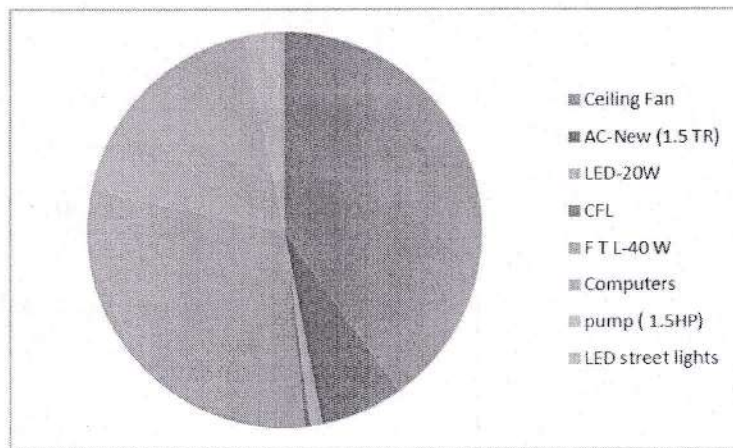
Apart from above load, the college has pump, LED street lights, CFLs and street lights on streets and grounds. Individual fitting wise load is as under.



**Table No 2.2: Equipment wise Connected Load**

No	Equipment	Qty	Load, W/Unit	Load, kW
1	Ceiling Fan	175	65	11.4
3	AC-New (1.5 TR)	1	1838	1.8
5	LED-20W	41	20	0.8
6	CFL	12	24	0.3
7	F T L-40 W	111	40	4.4
8	Computers	77	65	5.0
9	pump ( 1.5HP)			0.8
10	LED street lights	4	35	0.1
	Total			24.7

Data can be represented in terms of PIE chart as under,



**Figure2.1: Distribution of connected load.**





### 3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-23	0	422
2	May-23	0	422
3	Apr-23	0	422
4	Mar-23	0	384
5	Feb-23	0	384
6	Jan-23	0	384
7	Dec-22	0	384
8	Nov-22	0	384
9	Oct-22	0	384
10	Sep-22	0	384
11	Aug-22	0	384
12	Jul-22	0	384
	Total	0	4,722

Monthly variation in electricity bill is as follows,

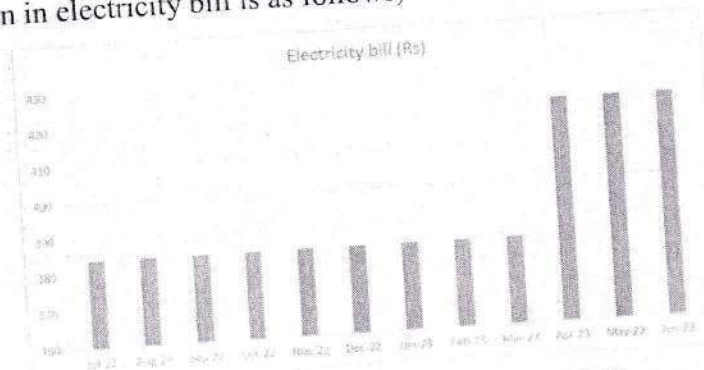


Figure 3.1: Month wise electricity bill



Key observations of electricity bill are as follows,

**Table no 3.2: Key observations**

Sr no	Parameter	Energy consumed, (kWh)	CO2 Emission (MT)
1	Total	0	0
2	Maximum	0	0
3	Minimum	0	0
4	Average	0	0

It can be seen from above figures and tables that, the total energy imported by college from MSEB is zero. The college buildings can be called as zero energy building.

Definition of zero energy building is as follows.

**Zero Energy Building**

An energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy



#### 4. Carbon Footprinting

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO<sub>2</sub> emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

#### 2. Basis for computation of CO<sub>2</sub> Emissions:

The basis of Calculation for CO<sub>2</sub> emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO<sub>2</sub>** into atmosphere.

Based on the above Data we compute the CO<sub>2</sub> emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

**Table 4.1: Month wise Consumption of Electrical Energy & CO<sub>2</sub> Emissions**

No	Month	Energy (kWh)	CO <sub>2</sub> Emissions, MT
1	Jun-23	0	0
2	May-23	0	0
3	Apr-23	0	0
4	Mar-23	0	0
5	Feb-23	0	0
6	Jan-23	0	0
7	Dec-22	0	0
8	Nov-22	0	0
9	Oct-22	0	0
10	Sep-22	0	0
11	Aug-22	0	0
12	Jul-22	0	0
	<b>Total</b>	<b>0</b>	<b>0</b>





The total energy imported by college from MSEB is zero. The college buildings is zero energy building. CO<sub>2</sub> emissions due to Electrical Energy is zero.



## **5. Study of utilities**

### **5.1 Study of Lighting**

In the facility, the lighting system can be divided mainly in to parts, indoor lighting and outdoor lighting. There are 107 FTL fittings with Electronic/ magnetic chokes, 41 LEDs and 12 number of CFL lights in indoor lightings. There are 4 No of. There are 4 FTL fittings with Electronic/ magnetic chokes and 4 no of solar LED streetlights LEDs in outdoor lightings. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings.

### **5.2 Air-conditioners**

There is 1 no of star rated new AC of 1.5Tr capacity.

### **5.3 Ceiling Fans**

At building facility, there are about 175Nos Old Ceiling Fans, which consumed about 65 W of Electrical Energy. It is recommended to replace these old Fans with BEE STAR Rated Ceiling Fans.

### **5.4 Water Pumps**

There is 1 no of water pump with 1.5HP capacity.





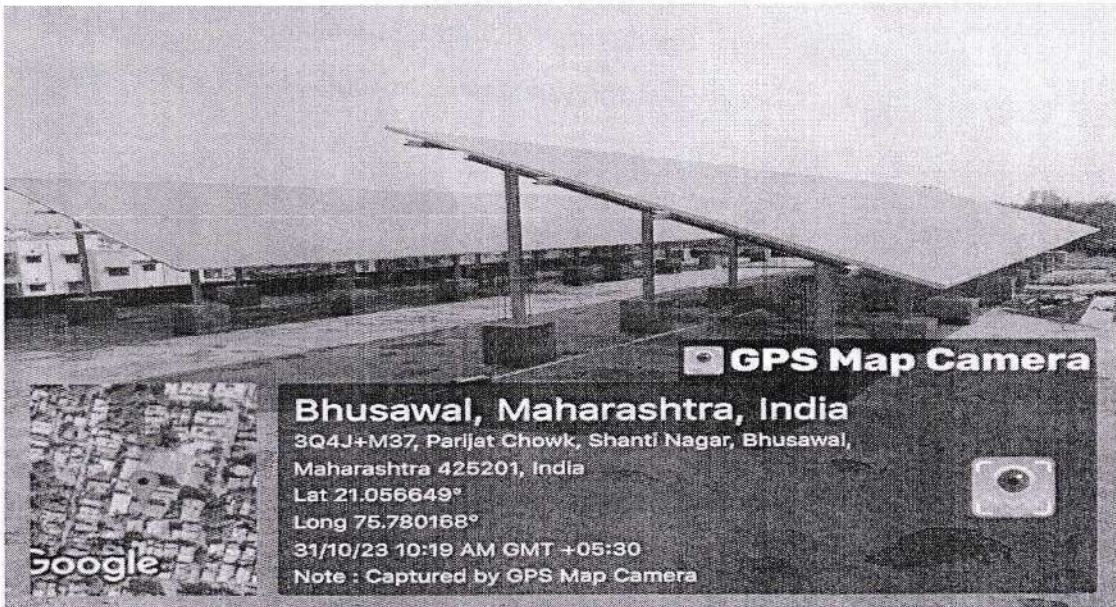
## 6. Study of usage of alternate energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Roof Top Solar PV System. The Installed Capacity of Solar PV Plant is **20kWp**.

**Table 6.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement**

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	0	kWh/Annum
2	Energy Generated by Roof Top Solar PV System	30,000	kWh/Annum
3	% of Usage of Alternate Energy to Annual Energy Requirement	<b>100</b>	<b>%</b>

### Photograph of Solar PV plant



The total energy imported by college from MSEB is zero. The college buildings can be called as zero energy building.

Definition of zero energy building is as follows.

### Zero Energy Building

An energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy.





## 7. Study of usage of LED lighting

In this chapter we study the lighting system of college and compute the percentage of total load catered by LED lighting.

**Table 7.1: Total lighting load**

No	Particulars	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	111	40	4.44
2	CFL	12	24	0.288
	<b>LED lighting load</b>			
1	LED tube	41	20	0.82
2	LED street lights	4	35	0.14
	<b>Total LED lighting load</b>			<b>0.96</b>
	<b>Total Lighting load</b>			<b>5.688</b>

It can be seen that out of total lighting load 16.87% load is LED lighting load.



## 8. Recommendations

The total energy imported by college from MSEB is zero. The college buildings can be called as zero energy building. There are not much energy saving recommendations for colleges.

- Replacement of 111Nos T-8 fittings with 20W LED fittings