

Report  
on  
Energy Audit  
at  
Shriman Bhausaheb Zadbuke Mahavidyalaya,  
Barshi (Solapur), Maharashtra

Year: 2020-21

*Prepared by*

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## Certificate of ENERGY AUDIT

This is to certify that **Shriman Bhausaheb Zadbuke Mahavidyalaya Barshi - 413 401** has conducted **ENERGY AUDIT** in December 2021 for year **2020-21** for knowing present energy consumption, exploring energy saving opportunities, distributing electrical load equally, mitigate greenhouse gas emission to the environment. This energy audit is also important in terms of increasing the use of equipments running on various non-conventional energy resources.

**Date:** 30/12/2021



**(Dr. Mohite R.M.)**  
**Convener, Energy Audit**



**(Shri. R.A. Kamble)**  
**Chairmen, Energy Audit**

## Energy Audit Team

Name	College	Designation
Shri. Raghunath Anil Kamble	Shriman Bhausahab Zadbuke Polytechnic college Puri, Tal-Barshi	HOD, Electrical Department
Dr. Rajkumar Mukund Mohite	Shriman Bhausahab Zadbuke Mahavidyalaya Barshi	HOD, Physics Department
Shri. Amol Sharad Umbre	Shriman Bhausahab Zadbuke Mahavidyalaya Barshi	Asstt. Teacher
Shri. Sudhir Anant Deshmukh	MCVC, Shriman Bhausahab Zadbuke Mahavidyalaya Barshi	Teacher
Shri. Bhalchandra Jagganath Dhole	MCVC, Shriman Bhausahab Zadbuke Mahavidyalaya Barshi	Teacher
Shri. Kale Dattatray Maruti	MCVC, Shriman Bhausahab Zadbuke Mahavidyalaya Barshi	Teacher (Pract.)
Shri. Sudhir Subhash Sevkar	Shriman Bhausahab Zadbuke Mahavidyalaya Barshi	Lab. Attendant



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## **ACKNOWLEDGEMENT**

We express our sincere gratitude to the management of **Shriman Bhausahab Zadbuke Mahavidyalaya, Barshi** for awarding us the assignment of Energy Audit of the college.

We are thankful to:

- Dr M.B. Gadekar, Principal
- Prof Dr.G.R. Kashid, IQAC Coordinator

We are thankful to various Head of Departments & other teaching and non-teaching staff members for helping us during the field measurements. Thanks also to the office staff for providing all the information required for the energy audit.

## EXECUTIVE SUMMARY

1. Shriman Bhausaheb Zadbuke Mahavidyalaya, Barshi consumes Energy in the form of Electrical Energy used for various gadgets, e-learning equipments, laboratory equipments, Office & other facilities.

2. Present Level of Energy Consumption:

No	Value	Maximum Demand, kVA	Energy Consumed, kWh	Power Factor	CO <sub>2</sub> emissions, MT
1	Maximum	74.163	3471	0.75	2.776
2	Minimum	36.12	1045	0.75	0.836
3	Average	55.141	1370.8	0.75	1.096

3. Various Majors Adopted for Energy Conservation:

The various projects already implemented by the College are

- Maintenance of good Power Factor
- Usage of Electronic chokes for Tube light fittings
- Usage of LEDs at some locations.
- Campaign and awareness programs for energy saving

4. Percentage of Lighting Power Requirements met by LED bulbs:

No	Parameter	Value	Unit
1	Total Annual Lighting requirement of the College	4.116	kW
2	Annual Lighting Load met by LED bulbs	0.928	kW
3	% of LEDs to total Lighting Load	22.54	%

5. Recommendations:

No	Recommendation	Energy Saving, kWh/Annun	CO <sub>2</sub> reduction, MT/Annun	Monetary Saving, Rs	Investment, Rs	Payback period, Months
1	Replacement of 77 Nos FTL fittings by 20 W LEDs	1108	0.88	10082	11550	13
2	<b>Total</b>	<b>1108</b>	<b>0.88</b>	<b>10082</b>	<b>11550</b>	<b>13</b>

## 6. Notes & Assumptions:

1. 1 Unit of Electrical Energy releases **0.8 Kg of CO<sub>2</sub>** into atmosphere
2. Daily working hours-08 Nos
3. Annual working Days-180 Nos
4. Average Rate of Electrical Energy : **Rs 9.10/- per kWh**

## ABBREVIATIONS

CFL	:	Compact Fluorescent Lamp
LED	-	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Ltd.
MT	-	Metric Ton
V	:	Voltage
I	:	Current
kW	:	kilo-Watt
kVA	:	Active Power
kVAr	:	Reactive Power
P F	:	Power Factor

## CHAPTER-I

# INTRODUCTION

Adverse effects of global warming are being seen in the form of impending cyclones, unseasonal rains, and changing seasons. The main cause of global warming is the depletion of natural resources. Natural resources are used to generate electricity from which greenhouse gases are released into the atmosphere. If you want to avoid global warming, we need to avoid wastage of electricity. Even today, many houses in India are in darkness due to lack of electricity. Unrealistic use of electricity on the one hand and scarcity on the other is an unfortunate reality. Proper and careful use of electricity is the responsibility of all of us. The college uses electricity for various equipments as well as for lighting. Planned use of electricity can protect the environment and also save money. The main objective of the energy audit is to study the load of electrical equipments and suggest various measures for energy saving.

### Objectives:

1. To study present level of Energy Consumption
2. To Study the present CO<sub>2</sub> emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study Scope for usage of Renewable Energy
5. To study various measures to reduce the Energy Consumption

### Audit Methodology:

1. Study of connected load
2. Study of Electrical Energy Consumption pattern
3. Study of Lighting Load and Usage of LED Lights
4. To prepare the Report with various Energy conservation measures

**Table No-1: General Details of College:**

No	Head	Particulars
1	Name	Shriman Bhausaheb Zadbuke Mahavidyalaya Barshi
2	Address	P.B. No-16, Zadbuke Marg, Latur Road, Barshi-413 401, Dist-Solapur, Maharashtra
3	Courses Offered	BA, BSc, BBA, BCA



## CHAPTER-II

# STUDY OF CONNECTED LOAD

In this chapter, we present the details of various Electrical loads as under

2.1 Table No-2: Details of various Electrical Equipment:

No	Location	40 W Tube	18 W CFL	20 W LED Tube	7 W LED	Fan 80 W	PC	Printer/Scanner / Xerox	Inverter	Projector with Sound System
1	Principal's office	01	02		01	01	01	01		
2	Vice Principal's Office	01				01				
3	Office	01		05	01	05	05	01/01/01	01	
4	Seminar Hall	02								
5	Multimedia Hall	06				06	01			01
6	Admission Room			01		01				
7	NSS			01		01				
8	IQAC Office	01	01			02	02	01		
9	Library	05		06		07	01			
10	Security Room					01				
11	Staff Room	03				02				
12	Physics Dept.	04		01		04				
13	Chemistry Dept.	08		04		04				
14	Biology Dept.	06		02		04				
15	Math/Stats Dept	04				02	04			
16	Micro. Dept.	08	01			02	02	01		
17	Geo. Dept			01		01	01	01		
18	Hindi Dept.	01			01	01				
19	Marathi Dept.	01				01				
20	MCVC Dept.	08				02				
21	BBA/BCA Dept.	03	01	21		10	42	01		
22	Mandal's Office	04	01		01	03				
23	Security Office	02		03		01				
24	Nutan School	03				03				

25	English Dept	01				01				
26	Gymkhana	02				01	01			
27	Table Tennis Hall	02								
<b>Total</b>		<b>77</b>	<b>06</b>	<b>45</b>	<b>04</b>	<b>67</b>	<b>60</b>	<b>08</b>	<b>01</b>	<b>01</b>

Table No-3 : Details of various Laboratory Electrical Equipment:

Sr. No.	Department	Name of the equipment	No's	Wattage	Average use per Month (hrs)
1	Physics	Filament Bulbs/Na-He-lamp	07	60×4 35×3	2
2		CRO	03	40×3	1
3		Function generator	02	85×2	1
4		Other equipments	-	40	1
5	Microbiology	Fridge	02	780×2	720
6		Incubator	01	450	3
7		Hot air oven	01	1750	1/2
8		Laminar air flow, Illuminator	01	280	1/2
9		Centrifuge	01	300	1/2
10		Water bath, Hot plate	02	1000	1/2
11		Distillation Unit	01	600	1
12		Autoclave	01	750	1/2
13		Rotary shaker	01	250	1/2
14		Microscope, colony counter	02	100	1
15	Biology	Fridge	01	100	---
16	Chemistry	Oven	01	900	1/2
17		Fridge	01	1000	720
18		Centrifugal, Digital Balance	01	300	1/2
19		Distillation Unit	01	600	1
20		Heater	06	750×6	1
21	MCVC	Motor 1 Phase	4	745	1/2
22		Motor 3 Phase	2	5hp - 3728 3hp- 2237	1/2
<b>Total</b>			<b>42</b>	<b>21731</b>	<b>1457</b>

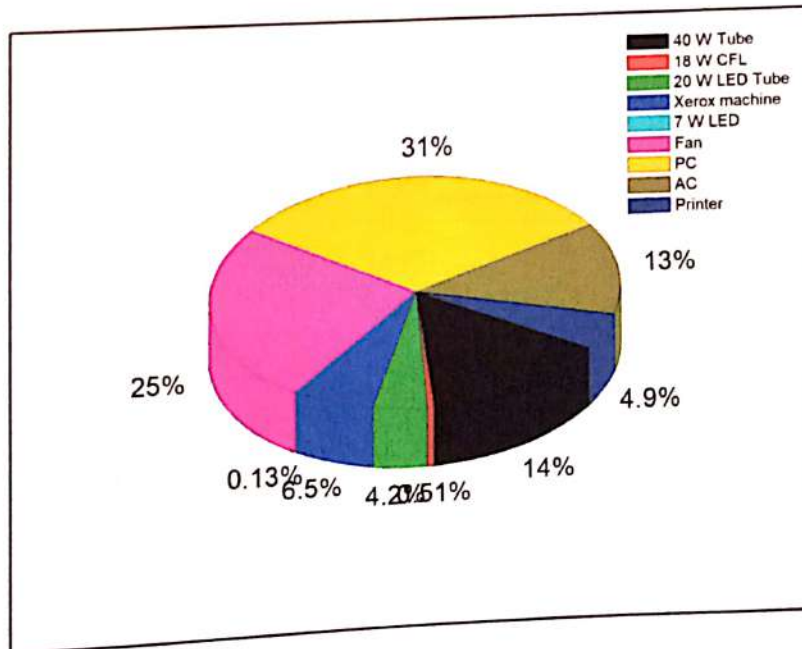
Now we present the Connected Load- Electrical Equipment wise as under:

**Table No-4: Connected Load:**

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W Tube	77	40	3.080
2	18 W CFL	06	18	0.108
3	20 W LED Tube	45	20	0.9
4	Xerox machine	01	1373	1.373
5	7 W LED	04	7	0.028
6	Fan	67	80	5.360
7	PC	60	110	6.600
8	AC	02	1375	2.750
9	Printer	07	150	1.050
10	Pump	01	2238	2.238
11	Laboratory Equipments	42	21731	24.731
12	<b>Total</b>	<b>279</b>	<b>27142</b>	<b>48.209</b>

Now we present the same in a PIE Chart as under:

**Chart No-1: Details of Connected Load:**



**Note: From the above Table, we observe that out of Total Connected Load of 48.2 kW, the load due to PCs is 6.6 kW & of Lighting is about 4.116 kW.**

## CHAPTER-III STUDY OF ELECTRICAL ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Bills

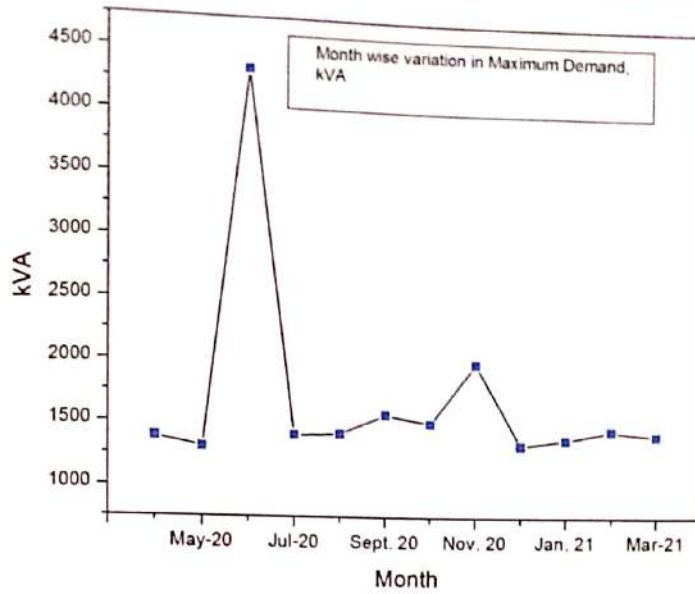
**Table No-5: Electricity Bill Details:**

Month	Electricity Meter Units					
	*****333	*****723	*****731	*****715	*****837	*****979
April 20	09	307	445	266	07	74
May 20	03	307	445	266	02	22
June 20	32	631	2018	518	01	271
July 20	00	283	617	134	01	93
August 20	00	196	654	146	00	141
September 20	00	283	654	139	00	188
October 20	10	254	654	140	09	141
November 20	00	362	654	297	00	289
December 20	00	148	654	165	00	104
January 21	00	181	654	151	01	122
February 21	00	183	654	191	05	138
March 21	00	177	654	182	02	121
<b>Total</b>	<b>54</b>	<b>3312</b>	<b>8757</b>	<b>2595</b>	<b>28</b>	<b>1704</b>
<b>Total</b>						<b>16450</b>

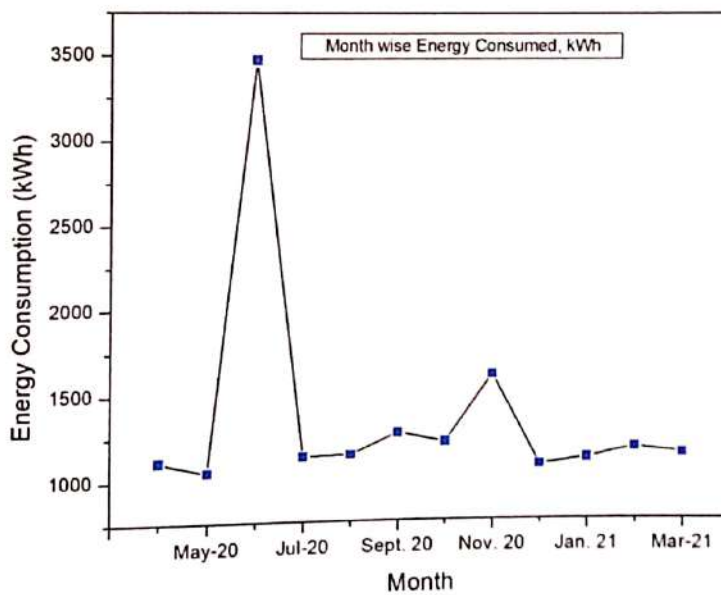
**Table No 6: Electrical Bill Analysis- 2018:**

No	Month	Energy Consumed, kWh	MD, kVA	Power Factor
1	April 20	1108	1385	0.84
2	May 20	1045	1306	0.87
3	June 20	3471	4338	0.82
4	July 20	1128	1410	0.92
5	August 20	1137	1421	0.78
6	Sept. 20	1264	1580	0.81
7	Oct. 20	1208	1510	0.74
8	Nov. 20	1602	2002	0.68
9	Dec. 20	1071	1338	0.73
10	Jan. 21	1109	1386	0.86
11	Feb. 21	1171	1463	0.83
12	March 21	1136	1420	0.76
13	Maximum	3471	4338	0.8
14	Minimum	1045	1306	0.76
15	Average	1370.8	1712	0.82

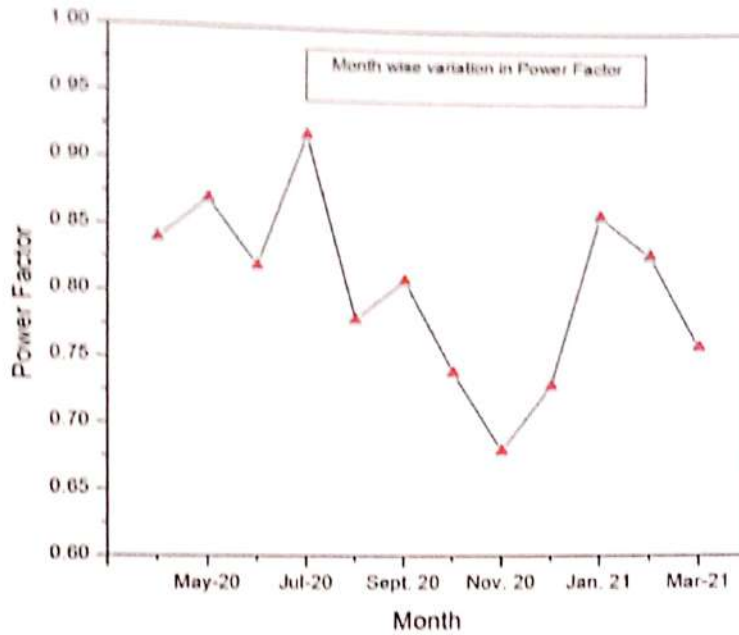
**Graph 1: To study the variation of Monthly Maximum Demand, kVA:**



**Graph 2: To study the variation of Monthly Energy Consumption, kWh:**



**Graph 3: To study the variation of Monthly Power Factor:**



**Key observations:**

No	Value	Maximum Demand, kVA	Energy Consumed, kWh	Power Factor
1	Maximum	62	6976	0.95
2	Minimum	35	12	0.867
3	Average	45	2285.17	0.92

**Recommendation:**

Reduce 400 unit connected load per month on meter number 333010232731 and divide it into 333010082837 and 333012526333. The committee has studied in this regard and it is possible to distribute the load on the meter. Doing the same distribution will reduce the extra connected load on the same meter and reduce the electricity bill.

## 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 usage of the various forms of Energy used by the College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets.

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

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

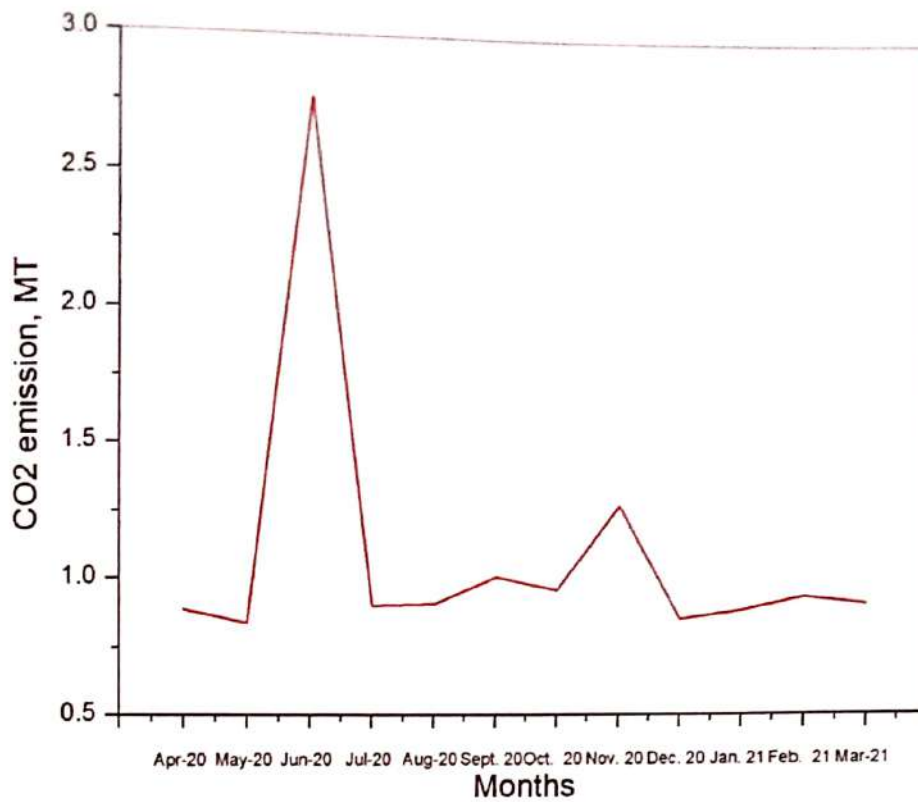
- 1 Unit (kWh) of Electrical Energy releases 0.8 Kg of CO<sub>2</sub> into atmosphere

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.

Table No 7: Month wise CO<sub>2</sub> Emissions:

Sr. No	Month	Energy Consumed, kWh	CO <sub>2</sub> emissions, MT
1	April 20	1108	0.8864
2	May 20	1045	0.836
3	June 20	3471	2.776
4	July 20	1128	0.902
5	August 20	1137	0.9096
6	Sept. 20	1264	1.011
7	Oct. 20	1208	0.966
8	Nov. 20	1602	1.281
9	Dec. 20	1071	0.857
10	Jan. 21	1109	0.887
11	Feb. 21	1171	0.937
12	March 21	1136	0.909
13	Maximum	3471	2.776
14	Minimum	1045	0.836
15	Average	1370.8	1.096

Graph 4: Representation of Month wise CO<sub>2</sub> emissions:



**Key observations:**

No	Value	CO2 emissions, MT
1	Maximum	2.776
2	Minimum	0.836
3	Average	1.096

**Conclusion:** Annual 13.16 MT CO<sub>2</sub> released into atmosphere due to the use of electricity in the college.

**Recommendation:**

Plants absorb greenhouse gases, which helps mitigate climate change. Plant as many trees as possible in the college campus. Create **Climate-friendly garden** and **Botanical garden**.



## CHAPTER-V

# STUDY OF USAGE OF LED LIGHTS

The College has 40 W filament Tubes, 18 W CFL, 20 W LED & 7 W LED fittings at various locations like corridors, Laboratories, offices etc. In the following Table we compute the total Lighting Load of the College.

**Table No-8: Lighting Load Study of College:**

No	Particulars	Value	Unit
1	Number of 40 W Tubes in the campus	77	No's
2	Number of 18 W CFLs in the campus	06	No's
3	Number of 20 W LED in the campus	45	No's
4	Number of 7 W LEDs in the campus	04	No's
6	Individual Load of 40 W FTL	40	W/Unit
7	Individual load of 18 W CFL	18	W/Unit
8	Individual load of 20 W LED	20	W/Unit
9	Individual load of 7 W LED ,	7	W/Unit
11	Total Electrical load of 77 No's FTL fittings	3.080	kW
12	Total Electrical load of 06 No's 18 W CFLs	0.108	kW
13	Total Electrical load of 45 No's 20 W LED	0.9	kW
14	Total Electrical load of 04 No's 7 W LEDs	0.028	kW
16	Total Lighting Load of the campus= $(11)+(12)+(13)+(14)$	4.116	kW
17	Total LED Lighting Load	0.928	kW

In the following Table, we present the Percentage of Lighting Power Requirement met by the LED fittings:

**Table No-9: Computation of % of total Lighting Power met by LED Lighting:**

No	Particulars	Value	Unit
1	LED Lighting Load of institute	0.928	kW
2	Total Lighting Load of Institute	4.116	kW
3	Number of Working Hours/Day	4	hrs
4	Number of Annual working Days	180	No's
5	Annual Lighting Load	2963.5	kWh/Annum
6	Annual Lighting Power requirement met by LED Lights	668	kWh/Annum
7	% of Total Lighting Load met by LED Light	<b>22.54</b>	%

**Important Suggestion:** At night, the way to the IQAC office, the main office, chemistry department corner as well as the road near the playground is dark. There is a need to install a total of 5 LED bulbs illuminated on the solar panel.

**Specifications:**



Light power 45 W

Storage Capacity: 10000 mAh

Waterproof IP65

118 LED bulbs

10-12 Hrs continuous illumination

500 LM Bright White

**\*Total Cost of 5 Solar power LED floodlight lamp is 18,000 Rs.**

## CHAPTER- VI

# ENERGY CONSERVATION PROPOSALS

### ECP-1: Replacement of 77 No's old filament light tubes Fittings with 20 W LED Fittings:

Although the College has replaced about 45 Old, filament light tube fittings with 20 W LED fittings, it is recommended to replace all the FTL fittings with 20 W LED fittings, in a phased manner.

In the following Table, we present the saving potential for replacement of 77 no's fittings.

No	Particulars	Value	Unit
1	No of Old FTL fittings	77	Nos
2	Load of an individual FTL fitting	40	W/Unit
3	Load of a 20 W LED fitting	20	W/Unit
4	Saving achievable on replacement	20	W/Unit
5	Daily usage period	04	Hrs/Day
6	Daily Energy saved	6.160	kWh/Day
7	Annual Working Days	180	Days/Annum
8	Annual Energy Saved	1108	kWh/Annum
9	Annual reduction in CO2 emissions	0.88	MT/Annum
10	Rate of Electrical Energy	9.1	Rs/kWh
11	Annual Monetary Saving	10082	Rs lumpsum
12	Investment required	11550	Rs lumpsum
13	Simple Payback period	13	Months

### Summary of Recommendations:

No	Recommendation	Energy Saving, kWh/Annum	CO <sub>2</sub> reduction, MT/Annum	Monetary Saving, Rs	Investment, Rs	Payback period, Months
1	Replacement of 77 Nos FTL fittings by 20 W LEDs	1108	0.88	10082	11550	13
2	<b>Total</b>	<b>1108</b>	<b>0.88</b>	<b>10082</b>	<b>11550</b>	<b>13</b>

## Report Submission

We, the Committee members of the Energy Audit, are submitting the report to the **Principal, Shriman Bhausahab Zadbuke Mahavidyalaya Barshi** and **IQAC Coordinator** today on 30/12/2021.



(Shri. R.A. Kamble)  
Chairmen, Energy Audit



(Dr. R.M. Mohite)  
Coordinator, Energy Audit



(Shri. A.S. Umbare)  
Member, Energy Audit



(Shri. S.A. Deshmukh)  
Member, Energy Audit



(Shri. B.J. Dhole)  
Member, Energy Audit



(Shri. D.M. Kale)  
Member, Energy Audit

