



# Nutan Urja Solutions

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Ref: NU/EAC/09

Date: 28/10/2021

## **CERTIFICATE**

This is to certify that we have conducted **Energy Audit** at

Nagpur Shikshan Mandal's

**Shri Binzani City College**

Umrer Road, Nagpur



as per the guidelines of Maharashtra Energy Development Agency  
([www.mahaurja.com](http://www.mahaurja.com))  
for the years 2018-19, 2019-20 and 2020-21.

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

- **Usage of Energy Efficient LED Fittings**
- **Usage of Energy Efficient BEE STAR Rated equipment**

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



*K. G. Bhatwadekar*  
**K. G. Bhatwadekar**  
Certified Energy Auditor,  
EA - 22428



**Report**  
**On**  
**Energy Audit**  
**At**  
**Nagpur Shikshan Mandal's**  
**Shri Binzani City College**  
**Umrer Road, Nagpur**



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Report on Energy Audit: Nagpur Shikshan Mandal's Shri Binzani City College, Nagpur

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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	Maximum	4573	3.66
2	Minimum	2372	1.90
3	Average	3354	2.68
4	Total	40252	32.20

### 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 177Nos old T-8 type fittings which need to be replaced by 20 W LEDs.
5. There are 2Nos, 1.5 TR Old ACs which need to be replaced with STAR Rated ACs.



#### 4. 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 17.4 %.

#### 5. Recommendations

Table no 1: Recommendations for energy savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 177 Nos T-8 fittings with 20W LED fittings	3894	28036.8	113457	49
2	Replacement of 142 Nos Old Ceiling Fans with STAR rating fans	1846	13291.2	308708	279
3	Replacement of 2 Nos Old 1.5 TR Acs with STAR rating Acs	2000	14400	105750	88
	<b>Total</b>	<b>7740</b>	<b>55728</b>	<b>527915</b>	<b>114</b>

#### 7 Notes & Assumptions

1. Annual working Days-250Nos
2. Average Rate of Electrical Energy : Rs 7.2/- 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. Binzani City College, Nagpur** one of the oldest and premier educational institutions, was established on 17th July 1930. It is run under the aegis of **Nagpur Shikshan Mandal, Nagpur**. It is affiliated to **Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur**. The college has an imposing building. It is in five separate blocks. It has a huge play ground, a rich library and a well-equipped Physical Education Dept.

### 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	Nagpur Shikshan Mandal's Shri Binzani City College, Nagpur
2	Address	Shri Binzani City College, Umrer Road, Sakkardara Sq., Nagpur, Maharashtra 440024.
3	Affiliation	Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

## 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	Fans	ACS (1.5Tr)	Computers
1	Principal office	0	2	7	4	2	3
2	Control room	3			1		2
3	NAAC room	4			2		2
4	IQAC	2	2		1		
5	Staff room		8		5		1
6	Wash room	3					
7	Pri. Passage	1	1	3	1		
8	Office	1	10	2	6		8
9	Commerce Dept	1		1			
10	Program	2	1		2		
11	Pravin	7			4		
12	Hall	10	4	1	13		
13	H-L	2		2			
14	H-R	0		2			
15	D. Water	1					
16	Room 4	4	1		5		
17	Room 5	5			5		
18	Room 6	4	1		5		
19	Room 7	4	1		5		
20	4 Passage	1		2			
21	Room 8	4			2		
22	Room 9	3			2		
23	Room 10	4			2		
24	Room 11	1	5		2		1
25	Room 12	2	4		1		
26	8 Passage	2		4			
27	Wash room	1			1		





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28	NSS	2			2		
29	Room 14	3			2		
30	Room 15	2			2		
31	P01 Passage	2					
32	Room 16	2			2		
33	Room 17	1			2		
34	Room 18	2			2		
35	P01 Passage	1					
36	Wash room	3					
37	Room 20	4			2		
38	Room 21	2			2		
39	Room 22	2			2		
40	Room 23	2			2		
41	Room 24	2			2		
42	Room 25	3			3		
43	Room 26	2					
44	Room 27	6					
45	20 Passage	2					
46	NCC room	2					1
47	BCCA class	2			2		
48	BCCA office	4			5		
49	Computer lab	6			6		41
50	Eng Lab	5			3		18
51	Library washroom	1					
52	Library office	2	3	1	2		
53	Library	25	11	6	12		
54	Political Sci Dept	3	1		3		
55	Psychology Dept	11			5		
56	Record room	1	1				
57	Sports Dept		21		10		
	<b>Total</b>	<b>177</b>	<b>77</b>	<b>31</b>	<b>142</b>	<b>2</b>	<b>77</b>

Apart from above load, the school has pumps, LED street lights. Individual fitting wise load is as under.



Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	177	40	7.1
2	LED-20W	77	20	1.5
3	CFL	31	24	0.7
4	LED street lights	3	35	0.1
5	Ceiling Fan	142	65	9.2
6	AC-Old (1.5 Tr)	2	2200	4.4
7	Computers	77	65	5.0
8	Two pumps (2HP, 1HP)			2.3
	Total			30.4

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

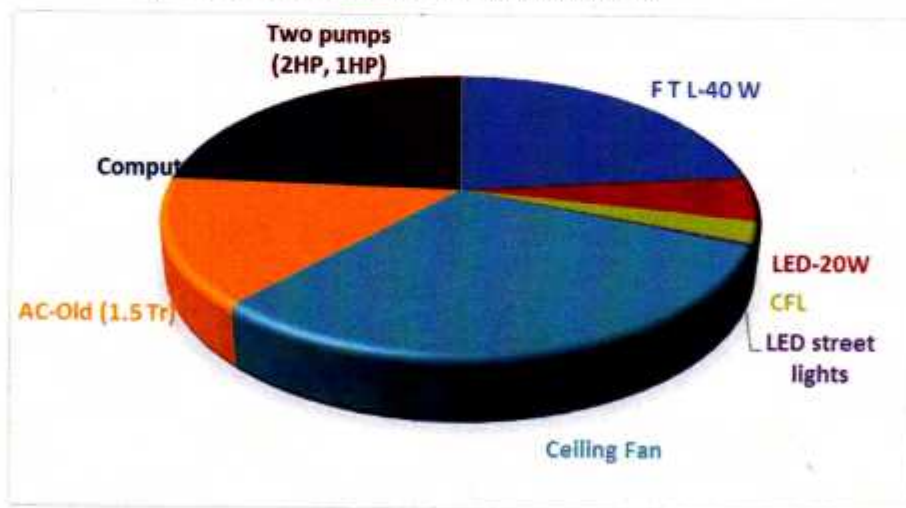


Figure2.1: Distribution of connected load.





### 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	Sep-21	4214	19,250
2	Aug-21	3300	17,360
3	Jul-21	3296	15,700
4	Jun-21	3437	12,350
5	May-21	3605	11,750
6	Apr-21	4573	10,070
7	Mar-21	2372	13,010
8	Feb-21	3212	13,520
9	Jan-21	2814	11,630
10	Dec-20	2933	12,120
11	Nov-20	3560	16,749
12	Oct-20	2936	13,963
	Total	40252	167,472

Variation in energy consumption is as follows,

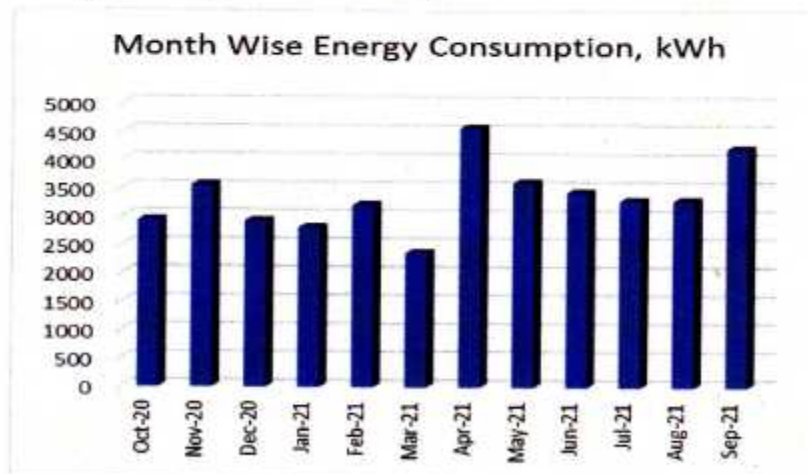


Figure 3.1: Month wise energy consumption



Monthly variation in electricity bill is as follows,

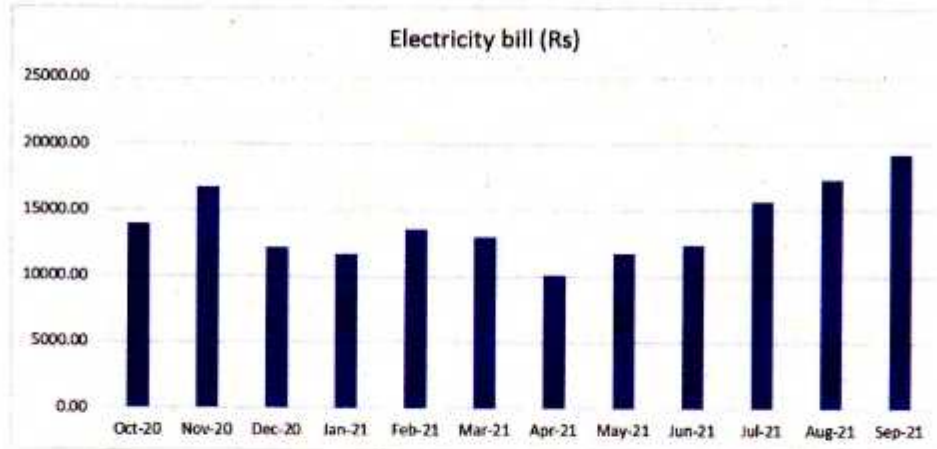


Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emmision (MT)
1	Maximum	4573	3.66
2	Minimum	2372	1.90
3	Average	3354	2.68
4	Total	40252	32.20





#### 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

**Table4.1: Month wise Consumption of Electrical Energy & CO<sub>2</sub> Emissions**

No	Month	Energy Consumed, kWh	CO <sub>2</sub> Emissions, MT
1	Sep-21	4,214	3.37
2	Aug-21	3,300	2.64
3	Jul-21	3,296	2.64
4	Jun-21	3,437	2.75
5	May-21	3,605	2.88
6	Apr-21	4,573	3.66
7	Mar-21	2,372	1.90
8	Feb-21	3,212	2.57
9	Jan-21	2,814	2.25
10	Dec-20	2,933	2.35
11	Nov-20	3,560	2.85
12	Oct-20	2,936	2.35
	<b>Total</b>	<b>40252</b>	<b>32.20</b>

In the following Chart we present the CO<sub>2</sub> emissions due to usage of Electrical Energy.



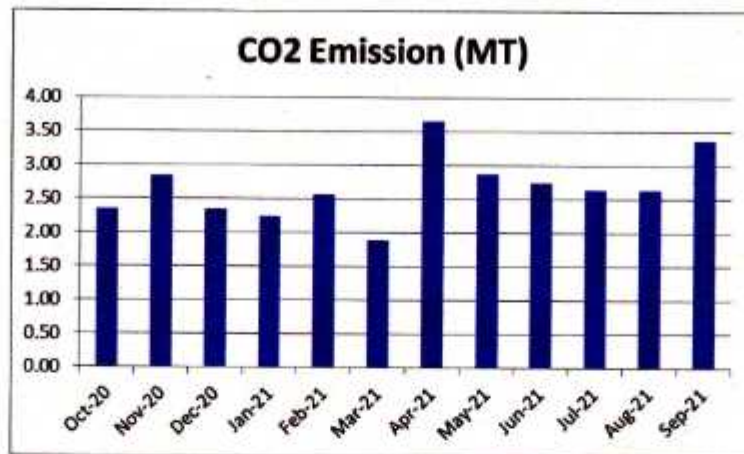


Figure 4.1: Month wise CO2 Emission

## 5. 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 5.1: Total lighting load

No	Particulars	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	177	40	7.08
2	CFL	31	24	0.744
	<b>LED lighting load</b>			
1	LED tube	77	20	1.54
2	LED street lights	3	35	0.105
	<b>Total LED lighting load</b>			<b>1.645</b>
	<b>Total Lighting load</b>			<b>9.469</b>

It can be seen that out of total lighting load 17.4% load is LED lighting load.





## 6. Energy conservation proposals

### 6.1 Replacement of T-8 FTLs with 20 W LED fittings

In the facility, there are about 177 Nos, T-8, FTL fittings with Electronic/magnetic chokes. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of T-8 fittings	177	Nos
2	Energy Demand of T-8 fitting	40	W/Unit
3	Energy Demand of 18 W LED fitting	18	W/Unit
4	Reduction in demand	22	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	15.576	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	3894	kWh/Annum
9	Rate of Electrical Energy	7.2	Rs/kWh
10	Annual Monetary saving	28036.8	Rs/Annum
11	Cost of 18 W LED Tube	641	Rs/Unit
12	Investment required	113457	Rs lump sum
13	Simple Payback period	49	Months



## 6.2 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 142 no of fans. It is recommended to replace these old fans with STAR Rated fans.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	142	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
3	Energy Demand of STAR Rated Fan	52	W/Unit
4	Reduction in demand	13	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	7.384	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	1846	kWh/Annum
9	Rate of Electrical Energy	7.2	Rs/kWh
10	Annual Monetary saving	13291.2	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	308708	Rs lump sum
13	Simple Payback period	279	Months





### 6.3 Replacement of 1.5 TR Old ACs with STAR Rated ACs

During the Audit, it was observed that there are 2 Nos, of 1.5 TR old ACs. It is recommended to replace these old ACs with STAR Rated ACs.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of 1.5 TR Old ACs	2	Nos
2	Energy Demand of Old 1.5 TR AC	2.15	kW/Unit
3	Energy Demand of New AC	1.15	kW/Unit
4	Reduction in demand	1	kW/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	8	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	2000	kWh/Annum
9	Rate of Electrical Energy	7.2	Rs/kWh
10	Annual Monetary saving	14400	Rs/Annum
11	Cost of STAR Rated 1.5 TR AC	52875	Rs/unit
12	Investment required	105750	Rs lump sum
13	Simple Payback period	88	Months



#### 6.4 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 177 Nos T-8 fittings with 20W LED fittings	3894	28036.8	113457	49
2	Replacement of 142 Nos Old Ceiling Fans with STAR rating fans	1846	13291.2	308708	279
3	Replacement of 2 Nos Old 1.5 TR Acs with STAR rating Acs	2000	14400	105750	88
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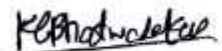
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1	Maximum	3180	2.54
2	Minimum	1607	1.29
3	Average	2265	1.81
4	Total	27176	21.74

### 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 177 Nos old T-8 type fittings which need to be replaced by 20 W LEDs.
5. There are 2 Nos, 1.5 TR Old ACs which need to be replaced with STAR Rated ACs.



#### 4. 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 17.4 %.

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#### 7 Notes & Assumptions

1. Annual working Days-250 Nos
2. Average Rate of Electrical Energy : Rs 7.2/- 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

Sl. No.	Equipment	Power (kW)	Quantity	Total Power (kW)
1	LED Bulbs	10	1000	10
2	LED Tubes	20	100	20
3	LED Strips	5	100	5
4	LED Downlights	15	100	15
5	LED Floodlights	30	10	30
6	LED Tracklights	10	100	10
7	LED Panel Lights	25	100	25
8	LED Recessed Lights	15	100	15
9	LED Surface Mount Lights	10	100	10
10	LED Emergency Lights	5	100	5





## 1. Introduction

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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

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2	Address	Shri Binzani City College, Umred Rd, Sakkardara Rd, Raghuji Nagar, Nagpur, Maharashtra 440009.
3	Affiliation	Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur



## 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	Fans	ACS (1.5Tr)	Computers
1	Principal office	0	2	7	4	2	3
2	Control room	3			1		2
3	NAAC room	4			2		2
4	IQAC	2	2		1		
5	Staff room		8		5		1
6	Wash room	3					
7	Pri. Passage	1	1	3	1		
8	Office	1	10	2	6		8
9	Commerce Dept	1		1			
10	Program	2	1		2		
11	Pravin	7			4		
12	Hall	10	4	1	13		
13	H-L	2		2			
14	H-R	0		2			
15	D. Water	1					
16	Room 4	4	1		5		
17	Room 5	5			5		
18	Room 6	4	1		5		
19	Room 7	4	1		5		
20	4 Passage	1		2			
21	Room 8	4			2		
22	Room 9	3			2		
23	Room 10	4			2		
24	Room 11	1	5		2		1
25	Room 12	2	4		1		
26	8 Passage	2		4			
27	Wash room	1			1		
28	NSS	2			2		
29	Room 14	3			2		
30	Room 15	2			2		
31	P01 Passage	2					
32	Room 16	2			2		
33	Room 17	1			2		

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34	Room 18	2			2		
35	P01 Passage	1					
36	Wash room	3					
37	Room 20	4			2		
38	Room 21	2			2		
39	Room 22	2			2		
40	Room 23	2			2		
41	Room 24	2			2		
42	Room 25	3			3		
43	Room 26	2					
44	Room 27	6					
45	20 Passage	2					
46	NCC room	2					1
47	BCCA class	2			2		
48	BCCA office	4			5		
49	Computer lab	6			6		41
50	Eng Lab	5			3		18
51	Library washroom	1					
52	Library office	2	3	1	2		
53	Library	25	11	6	12		
54	Political Sci Dept	3	1		3		
55	Psychology Dept	11			5		
56	Record room	1	1				
57	Sports Dept		21		10		
	<b>Total</b>	<b>177</b>	<b>77</b>	<b>31</b>	<b>142</b>	<b>2</b>	<b>77</b>

Apart from above load, the school has pumps, LED street lights. Individual fitting wise load is as under.

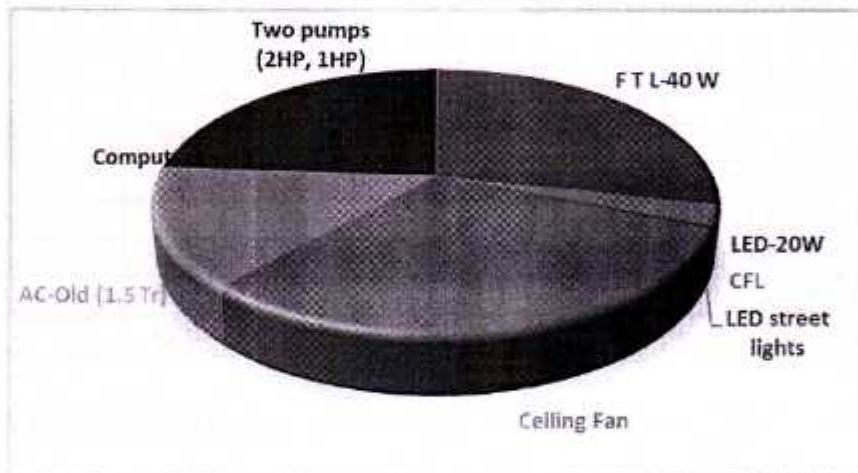




**Table No 2.2: Equipment wise Connected Load**

No	Equipment	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	177	40	7.1
2	LED-20W	77	20	1.5
3	CFL	31	24	0.7
4	LED street lights	3	35	0.1
5	Ceiling Fan	142	65	9.2
6	AC-Old (1.5 Tr)	2	2200	4.4
7	Computers	77	65	5.0
8	Two pumps (2HP, 1HP)			2.3
	Total			30.4

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



**Figure 2.1: Distribution of connected load.**

### 3. Study of Electrical Energy Consumption

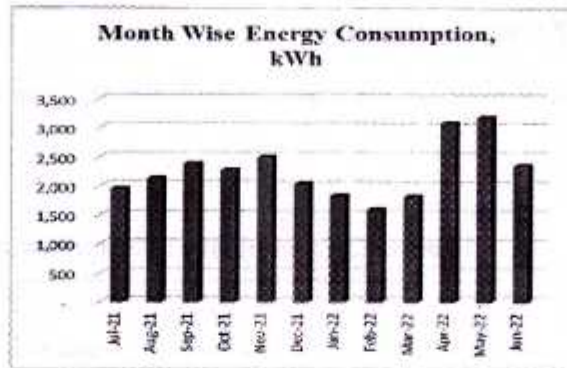
In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

**Table no 3.1: Summary of electricity bills**

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-22	2,355	19,140
2	May-22	3,180	9,430
3	Apr-22	3,080	40,200
4	Mar-22	1,822	15,050
5	Feb-22	1,607	13,450
6	Jan-22	1,837	15,180
7	Dec-21	2,042	16,960
8	Nov-21	2,503	20,190
9	Oct-21	2,276	18,480
10	Sep-21	2,387	17,443
11	Aug-21	2,137	13,870
12	Jul-21	1,950	19,221
	<b>Total</b>	<b>27,176</b>	<b>218,614</b>

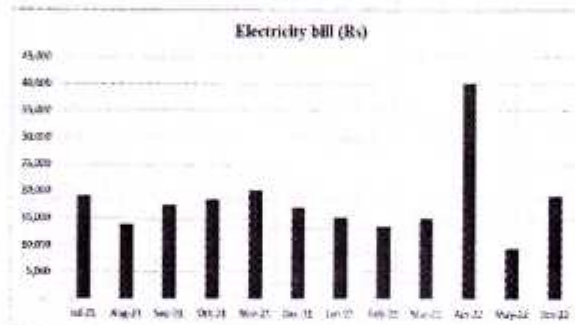
Variation in energy consumption is as follows,





**Figure 3.1: Month wise energy consumption**

Monthly variation in electricity bill is as follows,



**Figure 3.2: Month wise electricity bill**

Key observations of electricity bill are as follows,

**Table no 3.2: Key observations**

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	3,180	2.54
2	Minimum	1,607	1.29
3	Average	2,265	1.81
4	Total	27,176	21.74



#### 4. Carbon Foot printing

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 Consumed, kWh	CO <sub>2</sub> Emissions, MT
1	Jun-22	2,355	1.88
2	May-22	3,180	2.54
3	Apr-22	3,080	2.46
4	Mar-22	1,822	1.46
5	Feb-22	1,607	1.29
6	Jan-22	1,837	1.47
7	Dec-21	2,042	1.63
8	Nov-21	2,503	2.00
9	Oct-21	2,276	1.82
10	Sep-21	2,387	1.91
11	Aug-21	2,137	1.71
12	Jul-21	1,950	1.56
	<b>Total</b>	<b>27176</b>	<b>21.74</b>

In the following Chart we present the CO<sub>2</sub> emissions due to usage of Electrical Energy.



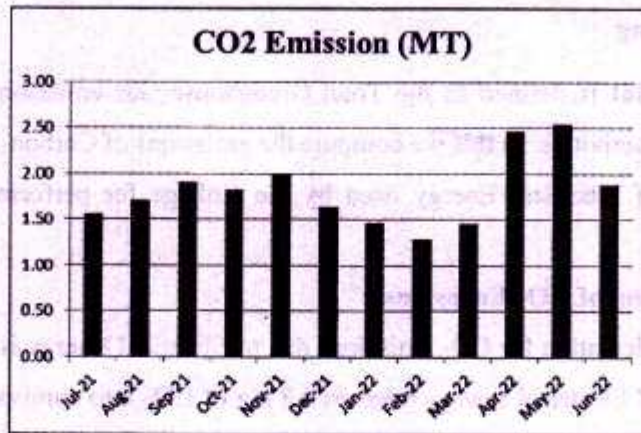


Figure 4.1: Month wise CO2 Emission

Month	CO2 Emission (MT)
Jul-21	1.55
Aug-21	1.70
Sep-21	1.90
Oct-21	1.80
Nov-21	2.00
Dec-21	1.65
Jan-22	1.45
Feb-22	1.30
Mar-22	1.45
Apr-22	2.45
May-22	2.50
Jun-22	1.85
Total	18.30





### 5. 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 5.1: Total lighting load**

No	Particulars	Qty	Load, W/Unit	Load, kW
1	F T L-40 W	177	40	7.08
2	CFL	31	24	0.744
	<b>LED lighting load</b>			
1	LED tube	77	20	1.54
2	LED street lights	3	35	0.105
	<b>Total LED lighting load</b>			<b>1.645</b>
	<b>Total Lighting load</b>			<b>9.469</b>

It can be seen that out of total lighting load 17.4% load is LED lighting load.





## 6. Energy conservation proposals

### 6.1 Replacement of T-8 FTLs with 20 W LED fittings

In the facility, there are about 177 Nos, T-8, FTL fittings with Electronic/magnetic chokes. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of T-8 fittings	177	Nos
2	Energy Demand of T-8 fitting	40	W/Unit
3	Energy Demand of 18 W LED fittin	18	W/Unit
4	Reduction in demad	22	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	15.576	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	3894	kWh/Annum
9	Rate of Electrical Energy	7.2	Rs/kWh
10	Annual Monetary saving	28036.8	Rs/Annum
11	Cost of 18 W LED Tube	641	Rs/Unit
12	Investment required	113457	Rs lump sum
13	Simple Payback period	49	Months



## 6.2 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 142 no of fans. It is recommended to replace these old fans with STAR Rated fans.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	142	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
3	Energy Demand of STAR Rated Fan	52	W/Unit
4	Reduction in demad	13	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	7.384	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	1846	kWh/Annum
9	Rate of Electrical Energy	7.2	Rs/kWh
10	Annual Monetary saving	13291.2	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	308708	Rs lump sum
13	Simple Payback period	279	Months



### 6.3 Replacement of 1.5 TR Old ACs with STAR Rated ACs

During the Audit, it was observed that there are 2 Nos, of 1.5 TR old ACs. It is recommended to replace these old ACs with STAR Rated ACs.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of 1.5 TR Old ACs	2	Nos
2	Energy Demand of Old 1.5 TR AC	2.15	kW/Unit
3	Energy Demand of New AC	1.15	kW/Unit
4	Reduction in demad	1	kW/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	8	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	2000	kWh/Annum
9	Rate of Electrical Energy	7.2	Rs/kWh
10	Annual Monetary saving	14400	Rs/Annum
11	Cost of STAR Rated 1.5 TR AC	52875	Rs/unit
12	Investment required	105750	Rs lump sum
13	Simple Payback period	88	Months



#### 6.4 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 177 Nos T-8 fittings with 20W LED fittings	3894	28036.8	113457	49
2	Replacement of 142 Nos Old Ceiling Fans with STAR rating fans	1846	13291.2	308708	279
3	Replacement of 2 Nos Old 1.5 TR Acs with STAR rating Acs	2000	14400	105750	88
	<b>Total</b>	<b>7740</b>	<b>55728</b>	<b>527915</b>	<b>114</b>

