Report

On

Green Audit

At

Nandurbar Taluka Vidhayak Samiti's

G. T. Patil Arts, Commerce and Science College,

Nandurbar

Prepared by

Nutan Urja Solutions

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Contents

Acknowledgement 2

Executive Summary 3

Abbreviations 5

1. Introduction 6

1.1 Objectives 6

1.2 Audit methodology 6

2. Study of Electrical Energy Consumption 7

3. Carbon Foot printing 9

4. Study of Usage of Alternate Energy 11

5. Study of Rain Water Harvesting 12

6. Study of Waste Management 13

6.1 Solid Waste Management 13

6.2 e-Waste Management 13

7. Study of Green Practices 14

7.1 No of students who don't use own Vehicle for coming to Institute 14

7.2 Usage of Public Transport 14

7.3 Pedestrian Friendly Roads 14

7.4 Plastic Free Campus 14

7.5 Paperless Office 15

7.6 Green Landscaping with Trees and Plants 15

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Executive Summary

Green Audit of Nandurbar Taluka Vidhayak Samiti's G. T. Patil Arts, Commerce and Science College, Nandurbar is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

1. Present Energy Consumption

Nandurbar Taluka Vidhayak Samiti's G. T. Patil Arts, Commerce and Science College, Nandurbar uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

Table no 1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO_2 Emission (MT)
1	Maximum	1,213	0.97
2	Minimum	-	-
3	Average	636	0.51
4	Total	7,627	6.10

2. Various Measures Adopted for Energy Conservation

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. Usage of Renewable Energy

The collage has installed 52.5 kW Solar PV Power Plant.

4. Rain Water Harvesting

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

5. Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

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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

The Nandurbar Taluka Vidhayak Samiti was established in the year 1961. As per the need of the student and the society, Nandurbar Taluka Vidhayak Samiti started first senior college in the town with faculties of Arts and Commerce in the year 1964. In the same college science faculty was opened in 1969. In 1974 this college was named as Gajamal Tulshiram Patil College Nandurbar. Shree Gajamal Tulshiram Patil was a social reformer and great politician. G.T. Patil Arts, Commerce & Science College, is located in Nandurbar. The College has today become one of the premier institutions of the town.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present CO_2 emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. 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

2. Study of Electrical Energy Consumption

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

Table no 2.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-22	0	17349
2	May-22	830	19013
3	Apr-22	1213	20327
4	Mar-22	1047	19660
5	Feb-22	825	15253
6	Jan-22	509	12305
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8	Nov-21	491	3378
9	Oct-21	408	3378
10	Sep-21	300	2599
11	Aug-21	308	2656
12	Jul-21	724	5660
	Total	**7,627**	**1,39,083**

Variation in energy consumption is as follows,

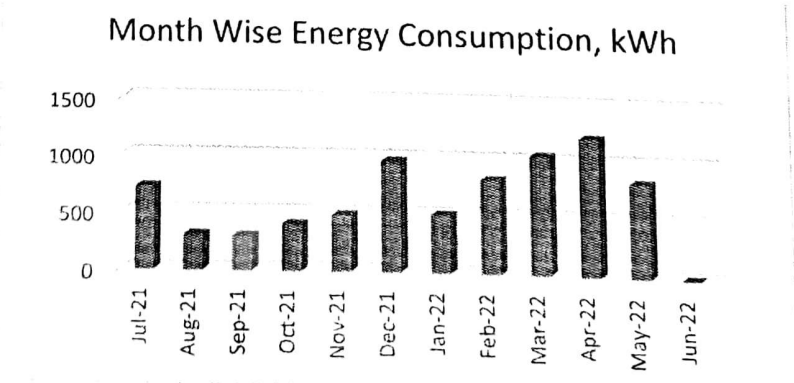

Figure 2.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

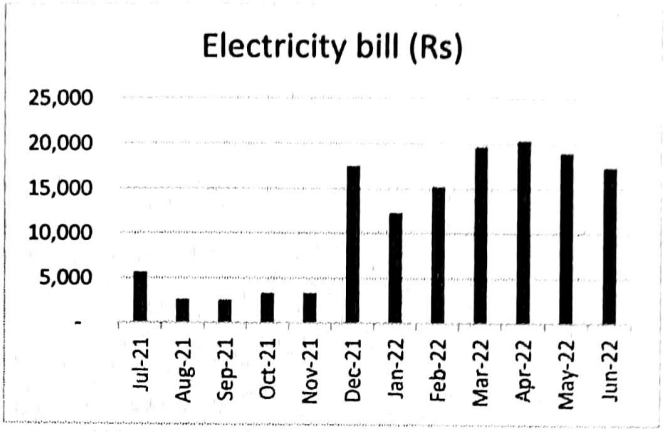

Figure 2.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 2.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO_2 Emmision (MT)
1	Maximum	1,213	0.97
2	Minimum	-	-
3	Average	636	0.51
4	Total	7,627	6.10

3. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 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_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 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 3.1: Month wise Consumption of Electrical Energy & CO_2 Emissions

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Jun-22	-	0.00
2	May-22	830	0.66
3	Apr-22	1,213	0.97
4	Mar-22	1,047	0.84
5	Feb-22	825	0.66
6	Jan-22	509	0.41
7	Dec-21	972	0.78
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In the following Chart we present the CO_2 emissions due to usage of Electrical Energy.

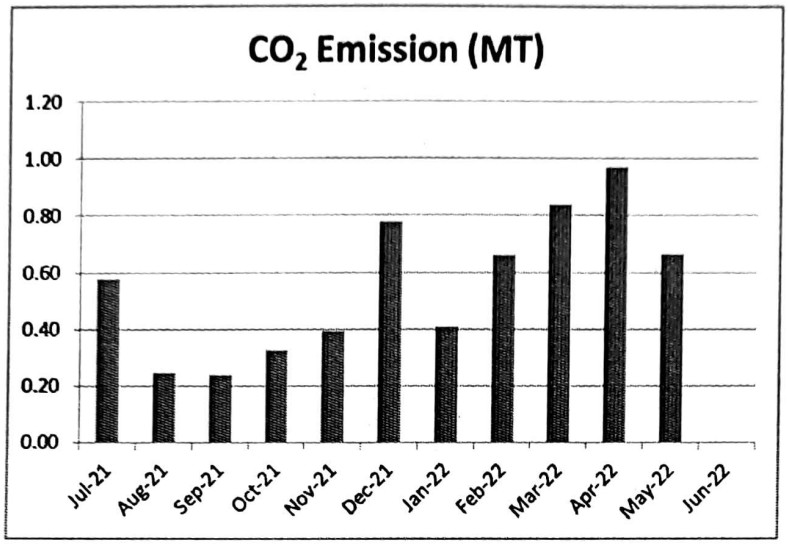

Figure 3.1: Month wise CO_2 Emission

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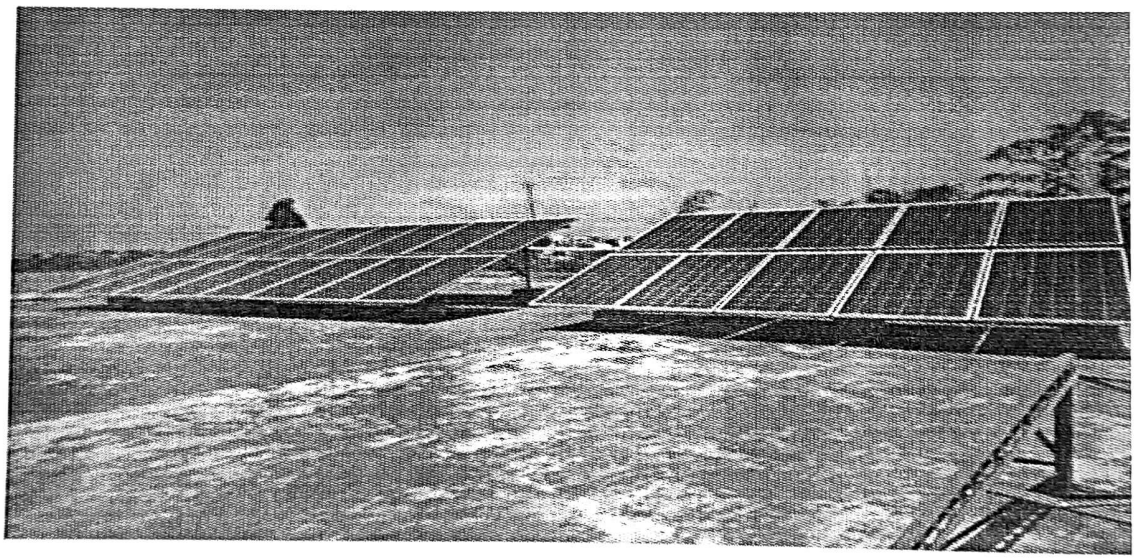
4. Study of Usage of Alternate Energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The College has installed Solar PV System of 52.5 kW capacity.

Table 4.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	7,627	kWh/Annum
2	Energy Generated by Roof Top Solar PV System	78750	kWh/Annum
3	Total Energy Requirement of College	86,377	kWh/Annum
4	% of Usage of Alternate Energy to Annual Energy Requirement	91	%

Photograph of Solar PV plant



5. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

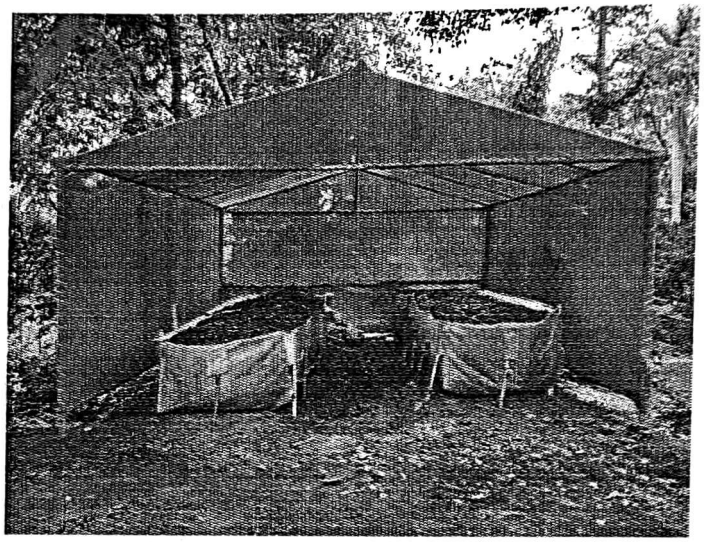
Photograph of Rain Water Harvesting pipe

6. Study of Waste Management

6.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

Photographs of Bio Composting Storage Tanks:



6.2 e-Waste Management

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

7. Study of Green Practices

7.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 60% students use own Automobile.

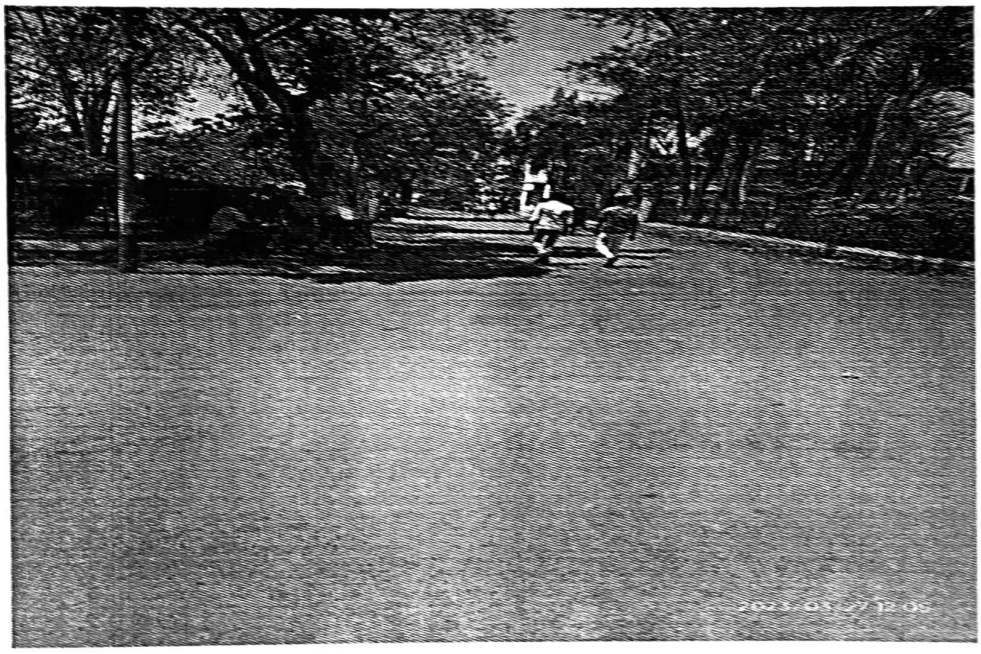
7.2 Usage of Public Transport

During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Some students use bicycles. The average number of students is approximately 40 %. Institute encourages students to not to use automobiles.

7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Photograph of Road within campus



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The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste

- Usage of paper tea cups in the Institute canteen
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The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

7.6 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

Figure 7.1: Beautiful maintained Garden of college

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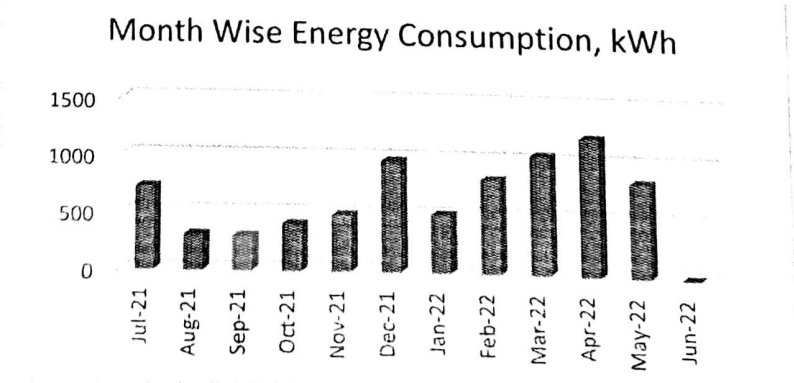

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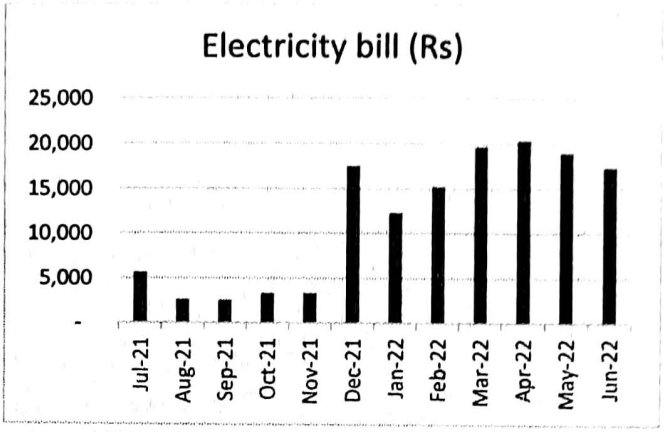

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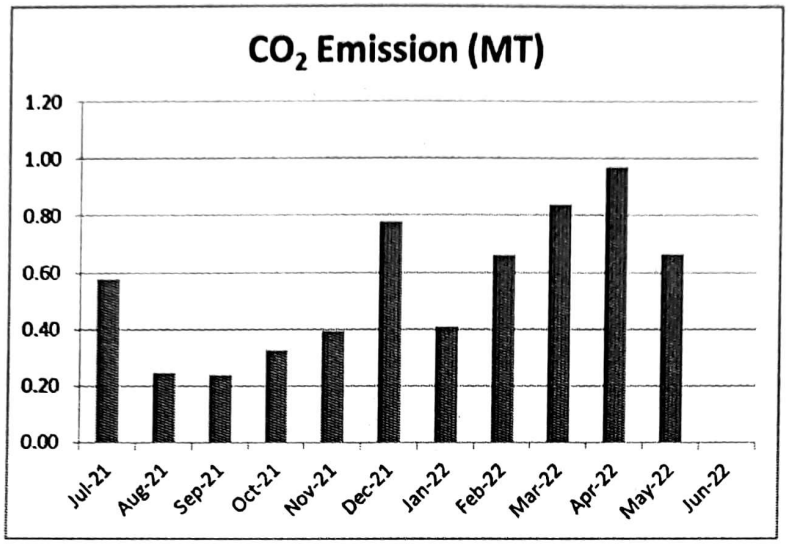

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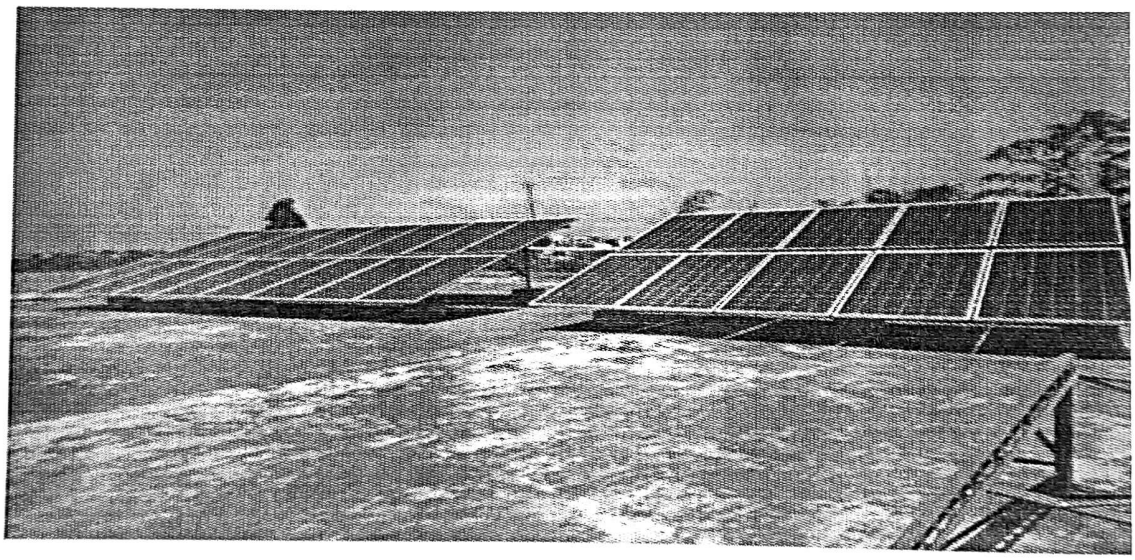

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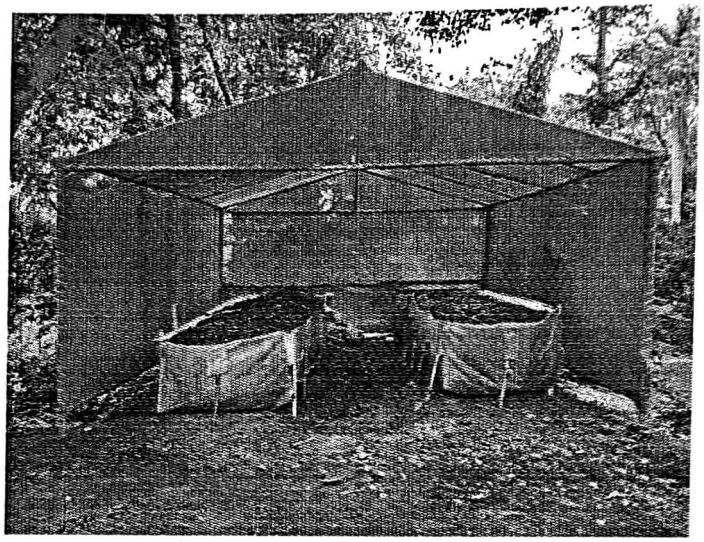

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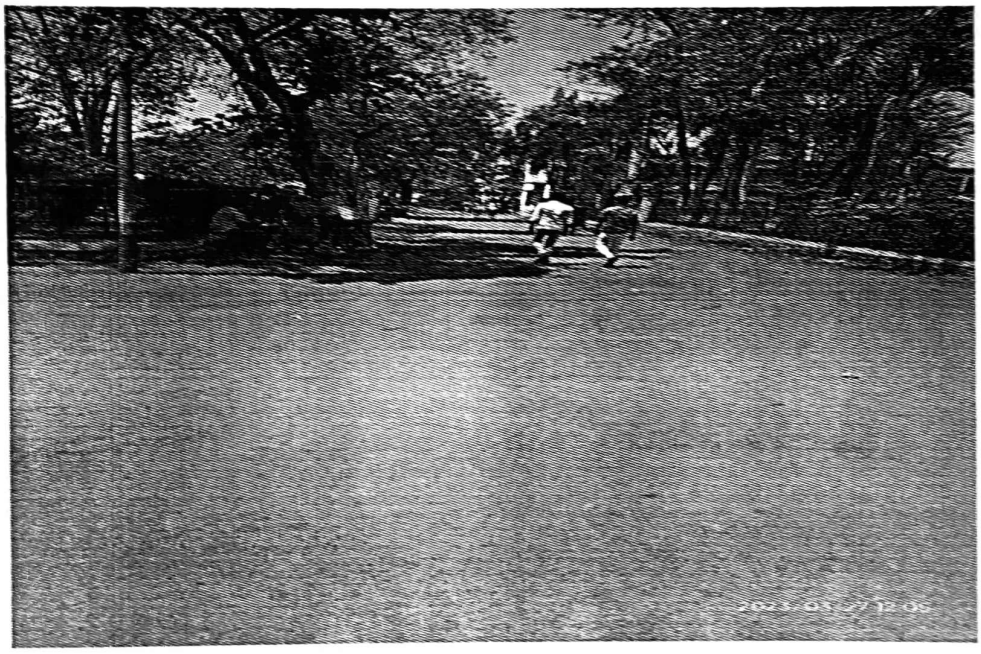

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Vidhayak Samiti's G. T. Pati

2021-22.

The College has already adopted following projects for

Efficient.

- Installation of Bio Composting Pit
- Installation of Rain Water Harvesting System
- Installation of 52.5 kW Solar PV Power Plant.

We appreciate the support of Management, involvement of fac

in the process of Energy Conservation & making the campus Gre

Nutan Urja Solutions,

Nutan Urja Solutions

K G Bhatwadekar,
Certified Energy Auditor,
EA – 22428

Contents

Acknowledgement 2
Executive Summary 3
Abbreviations 5
1. Introduction 6
1.1 Objectives 6
1.2 Audit Methodology: 6
1.3 General Details of College 6
2. Study of connected load 7
3. Study of Electrical Energy Consumption 12
4. Carbon Foot printing 14
5. Study of utilities 16
5.1 APFC Panel 16
5.2 Study of Lighting 16
5.3 Air-conditioners 16
5.4 Ceiling Fans 16
5.5 Water Pumps 16
6. Study of usage of alternate energy 17
7. Study of usage of LED lighting 18
8. Energy conservation proposals 19
8.1 Replacement of Old T-8 FTLs with 20 W LED fittings 19
8.2 Replacement of old fans with STAR Rated fans 20
8.3 Summary of Savings 21

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Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO_2 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.

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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. 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 91 %.

5. Percentage of Usage of LED Lighting

The College has various Types of Light fittings. The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 49 %.

6. 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 115 Nos T-8 fittings with 20W LED fittings	2,300	25,300	73,715	35
2	Replacement of 211 Nos Old Ceiling Fans with STAR rating fans	2,743	30,173	458,714	182
	Total	**5,043**	**55,473**	**532,429**	**115**

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**

Nutan Urja Solutions

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

The Nandurbar Taluka Vidhayak Samiti was established in the year 1961. As per the need of the student and the society, Nandurbar Taluka Vidhayak Samiti started first senior college in the town with faculties of Arts and Commerce in the year 1964. In the same college science faculty was opened in 1969. In 1974 this college was named as Gajamal Tulshiram Patil College Nandurbar. Shree Gajamal Tulshiram Patil was a social reformer and great politician. G.T. Patil Arts, Commerce & Science College, is located in Nandurbar. The College has today become one of the premier institutions of the town.

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	Nandurbar Taluka Vidhayak Samiti's G. T. Patil Arts, Commerce and Science College, Nandurbar
2	Address	Nehru Nagar, Nandurbar – 425412
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)	CFL	LED tube (20W)	LED bulb (12W)	Computers (65W)	Fans	1.5 Tr AC
	Main Administrative Building							
1	Dadasaheb Cabin		1	1	16	1	1	1
2	Principal Cabin			8		2	2	1
3	Administration Dept.			2		1	2	
4	LC / TC Dept.	2		1			2	
5	Adminision Dept.	3				2	2	
6	Article Dept.			2			1	\
7	Vice Principal Cabin	2		4			3	1
8	Article & Comp. Dept.	1		3		3	2	
9	Vice Principal Junior College Cabin			2			1	
10	Varanda outside Office			3				
11	Main Gate Near Chemistry	2		2				
	College Main Buiding							
12	Chemistry Lab MSc / Staff Room	1		7	1	1	3	
13	Chemistry Varanda			2				
14	Physical Lab (Chemistry)	3		3			1	
15	Water & Soil Testin Lab	1		3		5	1	

	(Chem)							
16	PG Lab (Chemistry)	6					2	
17	Physics Lab	6		4			4	
18	Electronics Lab	2		7			4	
19	Physics Research Lab			4		1	2	
20	Cap Office	1		4	1	1	2	
21	Iqacc Office			6		4	2	
22	Staff Room	3		3			3	1
23	Computer Lab			3		6	2	
24	Psychology Dept.		4	4		1	3	
25	Exam Dept. Room No. 18			1		1	2	
26	Room No. 19			2			2	
27	Microbiology Dept.	1		1			2	
28	Microbiology Dept. UG Lab	1		5			4	
29	PG Lab			1			1	
30	Zoology Dept. UG Lab	5		2		1	5	
31	PG Lab			2			2	
32	Seminar Hall			18			12	6
33	Computer Lab 1			4		20	4	
34	Computer Lab 2	2		4		15	4	1
35	Computer Lab 3			4		18	4	
36	Library Ground Floor	7		14		1	7	
37	Library First Floor	7		9		6	6	
38	Gymnasiam Hall	2		4			8	
39	Play Ground	4		8				
40	Canteen			4			1	
41	English Language Lab			4			2	
42	NSS	1					1	

43	Student Walfare	1					1	
44	Geography Dept.	11				8	6	
45	Mini Cyber 2 Branch				2	4	1	
46	Nano Chemistry Research Lab	6				2	2	2
47	Room 1	1						
48	Room 2	1					1	
49	Room 3	1					1	
50	Record Room	1						
51	Guest Room			2			1	1
52	YCMOU Office			4			2	
	Ground Floor							
53	Class Room 1			1			1	
54	Class Room 2			1			2	
55	Class Room 3			1			2	
56	Class Room 4			1			2	
57	Class Room 5			1			2	
58	Class Room 6			1			2	
59	Class Room 8	1		2			3	
60	Class Room 9			2			3	
	First Floor							
61	Class Room 12			1			2	
62	Class Room 13			1			2	
63	Class Room 14			1			2	
64	Class Room 15			1			2	
65	Class Room 16			1			2	
66	Class Room 18			1			2	
67	Class Room 19			2			2	
68	Class Room 20			3			3	
69	Class Room 21			3			3	

70	Class Room 22			3			3	
71	Class Room 23			2			2	
72	Class Room 24			2			2	
73	Class Room 25			2			2	
74	Class Room 26			2			2	
75	Boy's Hostel Ground Floor	1		5			2	
76	Boy's Hostel First Floor	11					6	
77	Girl's Hostel Ground Floor	10	2				9	
78	Girl's Hostel First Floor	7	9				11	
79	Health Club		2	10			8	
80	Fitness Centre			11				
	Total	**115**	**16**	**211**	**20**	**104**	**211**	**14**

Apart from above load, the college has pumps, 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	115	40	4.6
2	CFL	16	24	0.4
3	LED Tube-20W	211	20	4.2
4	LED bulb	20	12	0.2
5	Computers	104	65	6.8
6	Ceiling Fan	211	65	13.7
7	AC (1.5Tr)	14	1838	25.7
8	LED focus Street light	10	35	0.4
9	Pump (20HP)			14.9
	Total			54.7

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

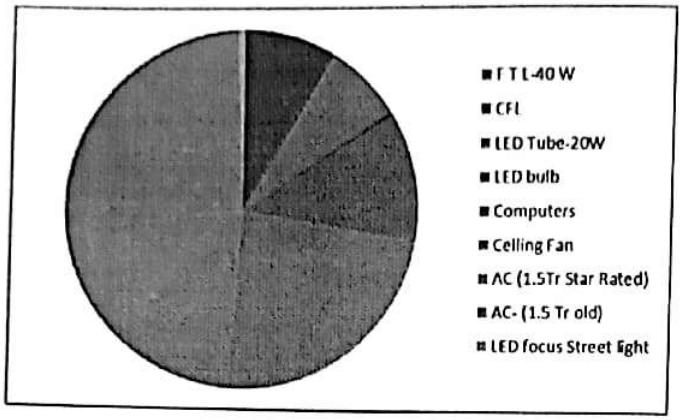

Figure 2.1: Distribution of connected load.

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	-	0.00
2	May-22	830	0.66
3	Apr-22	1,213	0.97
4	Mar-22	1,047	0.84
5	Feb-22	825	0.66
6	Jan-22	509	0.41
7	Dec-21	972	0.78
8	Nov-21	491	0.39
9	Oct-21	408	0.33
10	Sep-21	300	0.24
11	Aug-21	308	0.25
12	Jul-21	724	0.58
	Total	**7,627**	**6.10**

Variation in energy consumption is as follows,

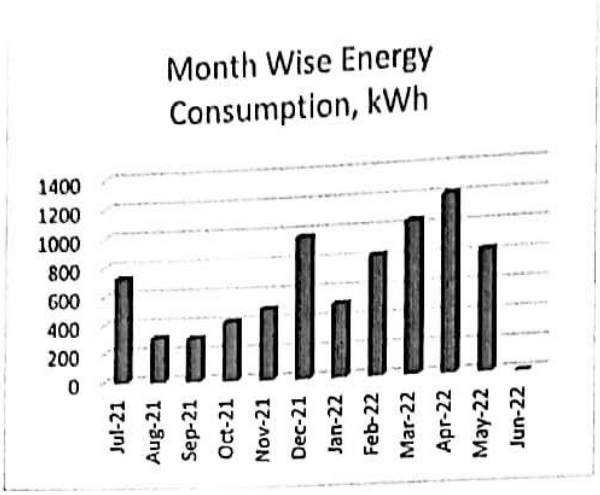

Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

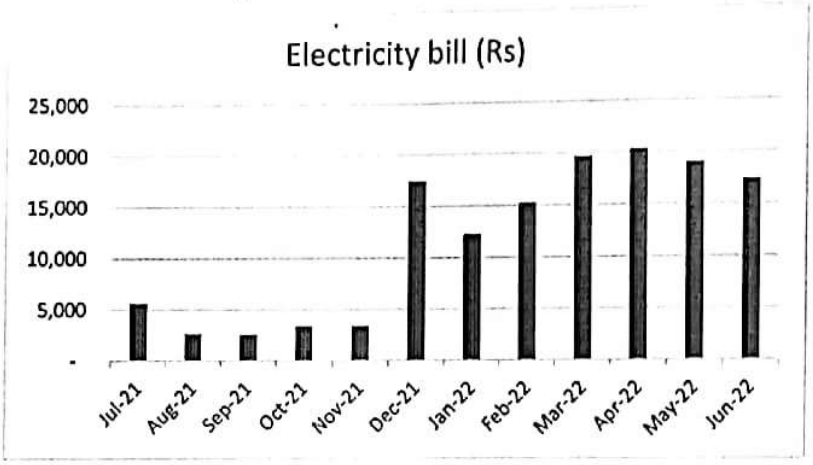

Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (kWh)	CO_2 Emission (MT)
1	Total	1,213	0.97
2	Maximum	-	-
3	Minimum	636	0.51
4	Average	7,627	6.10

4. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 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_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 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_2 Emissions

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Jun-22	-	0.00
2	May-22	830	0.66
3	Apr-22	1,213	0.97
4	Mar-22	1,047	0.84
5	Feb-22	825	0.66
6	Jan-22	509	0.41
7	Dec-21	972	0.78
8	Nov-21	491	0.39
9	Oct-21	408	0.33
10	Sep-21	300	0.24
11	Aug-21	308	0.25
12	Jul-21	724	0.58
	Total	**7,627**	**6.10**

In the following Chart we present the CO_2 emissions due to usage of Electrical Energy.

Rain Water Harvesting

Vermicompost

Solar Energy