

Report
On
Energy Audit
At
Nashik Gramin Shikshan Prasarak Mandals
Brahma Valley Institute of Management
Anjneri Nashik
(Year 2018-19)



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Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Nashik Gramin Shikshan Prasarak Mandals Brahma Valley Institute of Management, Anjneri, Nashik 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 CO₂ 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, (Units)	CO2 Emission (MT)
1	Maximum	39,650	31.72
2	Minimum	14,214	11.37
3	Average	28,434	22.75
4	Total	3,41,203	272.96

2. Energy Conservation Projects already installed

1. Usage of LED lights at some indoor locations
2. 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 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 58%.

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 23 Nos T-8 fittings with 20W LED fittings	460	5,060	14,743	35
2	Replacement of 27 Nos Old Ceiling Fans with STAR rating fans	351	3,861	58,698	182
3	Installation of 100kW grid connected PV panel	150,000	1,650,000	5,000,000	36
	Total	150,811	1,658,921	5,073,441	37

6. 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

Brahma Valley Educational Campus is located in the outskirts of Anjaneri, (Trimbakeshwar High-Way Nashik) comprising a sprawling campus of about 35 acres land. The campus is situated in the valley surrounded by hills & reflects the beauty of nature. This place is also known as the birth place of Lord Hanuman and is close to Trimbakeshwar Temple which is one of the 12 Jyotirlingas of Lord Shiva which adds to the holiness and beauty of this area.

Braham Valley Institute of Management has achieved strong growth and reputation in a very short time. The college has students joining from all over the state and beyond .The students are all very enthusiastic. College has a dynamic faculty to cater to their needs. Braham Valley Institute of Management is preparing competent professional managers. The academic quality of the institute is the vital factor and creative learning is provided by experienced faculty.

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	Nashik Gramin Shikshan Prasarak Mandals Brahma Valley Institute of Management, Anjneri, Nashik
2	Address	Brahma Valley Institute of Management, Nashik, Anjaneri, Trimbak Road, Nashik, Maharashtra 422 213.
3	Affiliation	Savitribai Phule Pune University

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)	LED bulb (12W)	CFL	Computers (65W)	Fans
1	Principal Office			4	1	2	2
2	Admin Office		4				1
3	Exam Section	1					1
4	Principal Wash Room				1		
5	Faculty Room (Staff Room)		3				1
6	Seminar Hall			8			4
7	Tutorial Room	4					2
8	Computer Center	14				32	7
9	Reading Room	4					2
10	Library		6			1	3
11	Tutorial Room		2				2
12	Board Room			4			2
13	Corridore		5	4			
	Total	23	20	20	2	35	27

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	23	40	0.92
2	LED Tube-20W	20	20	0.40
3	LED bulb	20	12	0.24
4	CFL	2	24	0.05
5	Computers	35	65	2.28
6	Ceiling Fan	27	65	1.76
7	LED focus Street light	20	35	0.70
8	Pumps (5HP)			3.73
	Total			6.18

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

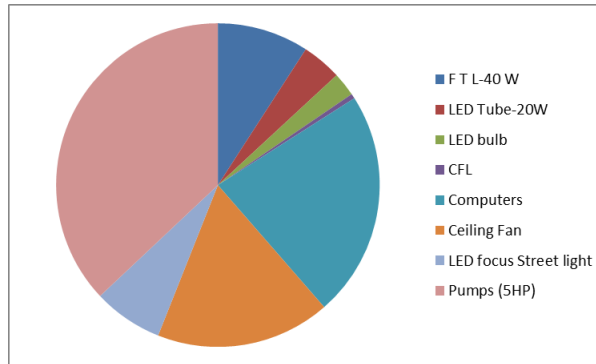


Figure 2.1: Distribution of connected load.

3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption. Nashik Gramin Shikshan Prasarak Mandals Brahma Valley Institute of Management, Anjneri, Nashik is situated in Brahma Valley Educational Campus. Entire Campus is having single energy meter for all institutes situated in campus. The bill analysis is carried for electricity bills of entire campus.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-19	14214	141220
2	May-19	16868	168370
3	Apr-19	19567	198868
4	Mar-19	26305	260502
5	Feb-19	30022	296941
6	Jan-19	35051	349994
7	Dec-18	30618	306737
8	Nov-18	18106	179085
9	Oct-18	37846	376494
10	Sep-18	36966	411615
11	Aug-18	39650	429063
12	Jul-18	35990	382062
	Total	3,41,203	35,00,951

Variation in energy consumption is as follows,

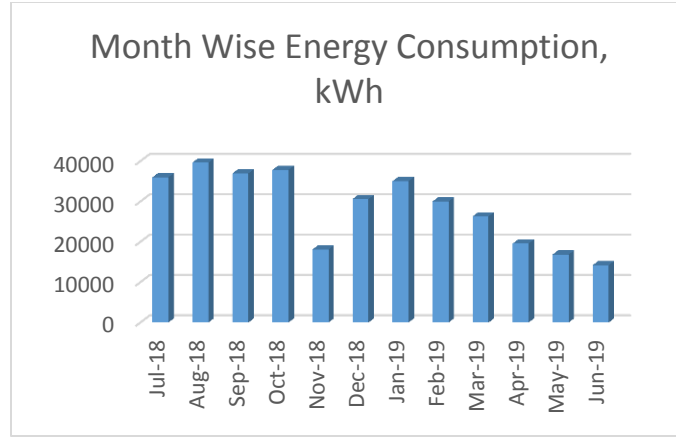


Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

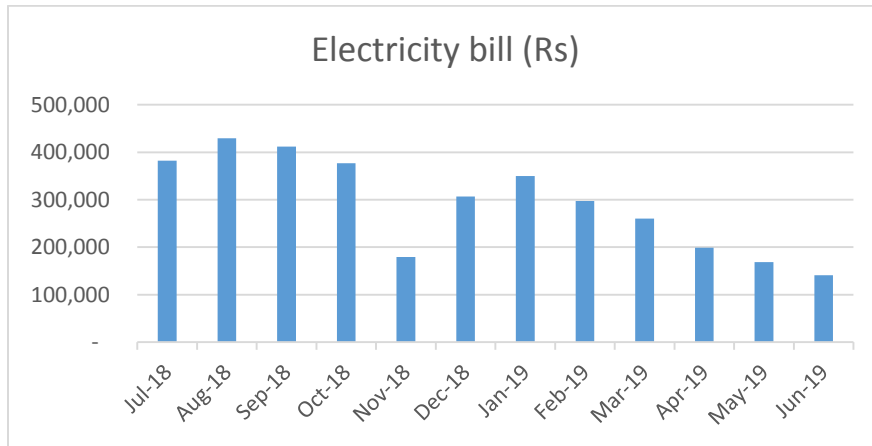


Figure 3.2: Month wise electricity bill

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	39,650	31.72
2	Minimum	14,214	11.37
3	Average	28,434	22.75
4	Total	3,41,203	272.96

4. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO₂ 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 CO₂ Emissions:

The basis of Calculation for CO₂ emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere.

Based on the above Data we compute the CO₂ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

Nashik Gramin Shikshan Prasarak Mandals Brahma Valley Institute of Management, Anjneri, Nashik is situated in Brahma Valley Educational Campus. Entire Campus is having single energy meter for all institutes situated in campus. CO₂ emissions due to Electrical Energy is calculated for entire campus.

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

Table 4.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-19	14,214	11.37
2	May-19	16,868	13.49
3	Apr-19	19,567	15.65
4	Mar-19	26,305	21.04
5	Feb-19	30,022	24.02
6	Jan-19	35,051	28.04
7	Dec-18	30,618	24.49
8	Nov-18	18,106	14.48
9	Oct-18	37,846	30.28
10	Sep-18	36,966	29.57
11	Aug-18	39,650	31.72
12	Jul-18	35,990	28.79
	Total	3,41,203	272.96

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

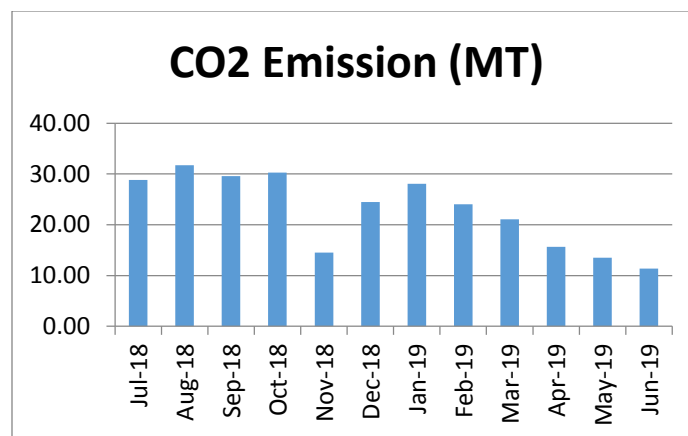


Figure 4.1: Month wise CO2 Emission

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 23 FTL fittings with Electronic/ magnetic chokes , 20 nos of LED tubes, 20 nos of LED bulbs. It is recommended to install the 20 W LED Tube light fittings in place of these old T-8 fittings. There are 20 No of LED street lights.

5.2 Ceiling Fans

At building facility, there are about 27 Nos 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.

5.3 Water Pumps

There are in total 1 Water pumps with 5HP.

6. Study of usage of alternate energy

In this Chapter, we study the Usage of Alternate/Renewable Energy to Annual Energy Requirement of the College. The Brahma valley campus has installed Roof Top solar thermal hot water system of 2,000 liters capacity. The college have also installed 5 nos of solar PV street lights.

Photograph of Solar Thermal Hot Water System



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	23	40	0.92
2	CFL	2	24	0.05
	LED lighting load			
1	LED tube	20	20	0.40
2	LED bulbs	20	12	0.24
3	LED street lights	20	35	0.70
	Total LED lighting load			1.34
	Total Lighting load			2.31

It can be seen that out of total lighting load 58% load is LED lighting load.

8. Energy conservation proposals

8.1 Replacement of Old T-8 FTLs with 20 W LED fittings

In the facility, there are about 23 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	23	Nos
2	Energy Demand of T-8 fitting	40	W/Unit
3	Energy Demand of 20 W LED fittin	20	W/Unit
4	Reduction in demad	20	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	1.84	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	460	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	5060	Rs/Annum
11	Cost of 20 W LED Tube	641	Rs/Unit
12	Investment required	14743	Rs lump sum
13	Simple Payback period	35	Months

8.2 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 27 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	27	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	1.404	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	351	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	3861	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	58698	Rs lump sum
13	Simple Payback period	182	Months

8.3 Installation of Solar PV panel

It is recommended to install 100 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of 100kW PV unit	100	kW
2	Energy saving	150000	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetary savings	1650000	Rs/ Annum
5	Investment required	5000000	Rs lump sum
6	Simple payback period	36	Months

8.4 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 23 Nos T-8 fittings with 20W LED fittings	460	5,060	14,743	35
2	Replacement of 27 Nos Old Ceiling Fans with STAR rating fans	351	3,861	58,698	182
3	Installation of 100kW grid connected PV panel	150,000	1,650,000	5,000,000	36
	Total	150,811	1,658,921	5,073,441	37