



Maratha Vidya Prasarak Samaj's

**Karmaveer Kakasaheb Wagh Arts, Science and
Commerce College, Pimpalgaon (B.),
Tal. Niphad, Dist. Nashik-422209**

ENERGY AUDIT REPORT (2020-2021)

PREPARED BY

Mr. V. S. Jadhav

Smt. A. M. Wagh

SUBMITTED TO

Dr. D. B. Shinde

Principal

Introduction

Energy Audit is “the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption”.

The energy audit provides the vital information base for overall energy conservation covering essentially energy utilization analysis and evaluation of energy conservation measures. Energy audit attempts to balance the total energy inputs with its use and serves to identify all the energy streams in the system.

Objectives

The primary objective of Energy Audit is to reduce energy consumption per unit of product output or to lower operating costs.

- To monitor the energy consumption in the college.
- To survey and measure the use of renewable energy in the college.
- To prepare a detailed report of energy consumption and its ration.
- To report the variations in energy consumption of the college.

Need for energy auditing:

The electric system having wired networking, safety devices and the ultimate load like lights, fans, pump, projectors, audio video equipments deviate from their performance due to several reasons like aging of devices, aging of wires used, humidity etc. The deviation results in loss of electric energy in the form of heat. It is possible to avoid this loss through the routine auditing system which helps in identifying the performance of the whole electric system. It is possible to identify any leakage in the system through auditing. The leakage if any observed will be rectified. This regular auditing activity keeps all the electrical and electronic devices last for a long time. This system avoids the electrical short circuits. Thus, the electrical energy in an educational institution is optimally used with minimum wastage.

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uses energy in the following forms:

A. Electricity from MSEDCL

B. Diesel for generator

C. Solar Panel

Electrical energy is used for various applications, like:

- Computers
- Lighting
- Air-Conditioning
- Fans
- Other Lab Equipment

1. As per previous audit in 2019-20 the total number of LED is 193 so in current year replace a tube light with LED so total number of LED 378 so power saving increases around 14 %.

2. As per previous recommendation in science lab installed a solar power so in current year solar power order is placed.

2. The current average energy consumption is around **5966 unit (KWH)/month.**

HISTORICAL DATA ANALYSIS

A. Study of Variation of Monthly Units consumption:

The details of the 12-month Electricity Consumption is given in table below.

Table No. 1 Variation in Units Consumption

Month	Meter 1 (4495)	Meter 2 (1255)	Meter 3 (0169)	Meter 4 (0177)	Meter 5 (7721)	Meter 6 (0193)	Meter 7 (5494)	Units kWh
Jul 2021	1450	600	194	845	371	28	3500	6988
Jun 2021	1480	350	92	697	366	32	880	3897
May2021	2340	350	92	702	366	35	880	4765
Apr 2021	2337	350	92	704	366	53	1947	5849
Mar 2021	2646	350	92	711	318	20	971	5108
Feb 2021	2977	400	92	676	331	31	730	5237
Jan 2021	2359	200	92	695	449	55	940	4790
Dec 2020	2150	200	92	6712	3201	55	3057	15467
Nov 2020	2188	200	92	899	223	33	1201	4836
Oct 2020	2069	200	92	899	223	270	1201	4954
Sep 2020	2326	200	92	899	223	53	1201	4994
Aug 2020	2045	200	92	899	223	53	1201	4713
Total	26367	3600	1206	15338	6660	718	17709	71598
Average							5966 unit(kwh)/month	

B. Diesel Generator:

Data Template: Kirloskar diesel, 25kVA liquid cooled,3 PH 3R 1040 with standard controlled panel, Having cost 370000/-.

C. Annual power requirement met by renewable energy sources (KWH) Data Requirements (As per data template in section B)

- Power requirement met by renewable energy sources.
- Total Power requirement. -

As 3000 watt of electrical heating coil of electrical geyser requires approximately 3.50kWh (units) to heat 100 liters of water at 50°C to 60°C so for 6000 liters of water heating process requires $60 \times 3.50 = 210\text{kWh}$.

The solar water heater at college ladies' hostel is of capacity 6000 LPD so that the energy consumption met by renewable energy source that means solar water heater is about 210kwh per day hence for 230 days (excluding holidays and rainy season) energy consumption is $230 \times 210 = 48300\text{kwh}$

Formula:

$$\begin{aligned}\% \text{ Renewable energy used} &= \frac{\text{Annual power requirement met by renewable energy sources}}{\text{Annual power requirement}} \times 100 \\ &= (48300/71598) \times 100\end{aligned}$$

$$\% \text{ Renewable energy used} = 67.45\%$$

Data Template

Specification: Jain Solar Water heating system (Sunrise model) Flat plate collector, closed loop (1500×4000) capacity 6000 LPD

Installation date 25/11/2010

Percentage of annual lightning power requirements met through LED bulbs. (Current year Data)

Annual lightning power requirements met through LED bulbs (in KWH)

Data Requirements (As per data template in section B):

- Lighting power requirement met through LED bulbs
- Total Lighting Power requirement.

Formula:

$$\begin{aligned}\% \text{ Lightning power through LED} &= \frac{\text{Annual lightning power requirements met through LED bulbs}}{\text{Annual lightning power requirements}} \times 100 \\ &= (19958/71598) \times 100\end{aligned}$$

$$\% \text{ Lightning power through LED} = 27.87\%$$

Replacing Fluorescent Tube Lights (FTL) with LED Tube Lights

The 36W FTLs are replaced with the LED tube lights 18W. These changes can be made at the places where the life is higher. Usually minimum of 3 years warranty is given and approximate burning hours is 40 000. (15 years considering 8 hours per day running) Following calculations are done for the 8 hours working:

Power consumption by 36 W FTL with conventional choke = 40W/Tube Light

Equivalent LED tube light = 18W/Tube Light

Savings in power = 22 W/Tube Light

Yearly operating hours = 8 h/day $\times$ 300 = 2400 h/year/Tube Light

Yearly savings = 2400 $\times$ 22 W = 52.8 kWh/year/Tube Light

For 378 tube lights yearly saving, 378 $\times$ 52.8kWh= 19958kWh

Average Cost of electricity = Rs. 8/kWh

Saving= 52.8 kWh $\times$ 8 = Rs. 422.4/year/tube light

Approximate investment on single LED Tube lights = Rs.1000

Number of Tube Lights to be replaced = 378

Total Yearly Saving = 378 $\times$ 422.4 = Rs. 159667/year

Total Investment = 378 $\times$ Rs. 1000 = Rs. 378000

Survey in college for Energy Audit Report 2020-21

Sr No.	Name of the department	Tube light	LED	Ceiling Fan	Computer	Printer	Xerox machine	Projector
1	Physics	24	37	21	10	01	0	01
2	Electronics	0	14	09	09	02	0	02
3	Chemistry	16	32	12	04	03	0	01
4	Botany	0	27	11	01	01	0	01
5	Zoology	0	25	10	05	01	0	01
6	Microbiology	0	09	05	01	01	0	0
7	Mathematics	0	02	01	01	01	0	0
8	Computer	04	16	12	38	02	0	02
9	Marathi	0	02	01	01	01	0	0
10	English	02	05	03	06	02	0	01
11	Hindi	0	01	01	01	01	0	0
12	Economics	0	0	0	0	0	0	0
13	Politics	0	01	01	01	01	0	0
14	Geography	02	0	01	02	01	0	0
15	History	0	02	01	01	01	0	0
16	Psychology	0	01	01	01		0	0
17	Physical education	0	10	02	02	01	0	0
18	Library	33	08	24	13	03	0	0
19	Commerce	0	03	01	06	01	0	0
20	Office	0	16	07	15	13	01	0
21	Sr.Exam section	02	04	03	03	02	02	0
22	Jr. Exam section	01	01	02	03	01	0	0

23	IQAC	0	07	01	02	02	0	0
24	NSS	01	0	0	0	0	0	0
25	NCC	02	02	0	0	0	0	0
26	Staff room	0	05	02	0	0	0	0
27	All classroom	32	65	38	0	0	0	0
28	Hostel (66) room	80	19	73	03	0	0	0
29	Junior staff room	0	03	01	0	0	0	0
30	Seminar hall	0	36	08	0	0	0	0
31	Store room office	04	04	01	0	0	0	0
32	Prin. cabin	01	10	04	01	01	0	0
33	Total porch	08	10	0	0	0	0	0
34	Ground, parking	07	01	0	0	0	0	0
35	M.C.V.C	12	0	05	02	01	0	0
	Total	231	378	262	132	25	03	09

Lighting System

Observations:

- It is found that FTL, Bulbs, CFLs is installed in the facility so less energy is consume.
- It is recommended that some tube lights in this area be switched off when sufficient daylight is available.
- Presently there are no reflectors installed for tube lights.

General Recommendations

1. All Class Rooms and labs to have Display Messages regarding optimum use of electrical appliances in the room like lights, fans, computers and projectors.
2. Most of the time, all the tube lights in a class room are kept ON, even though, there is sufficient light level near the window opening. In such cases, the light row near the window may be kept OFF is implemented.
3. All projectors to be kept OFF or in idle mode if there will be no presentation slides are implemented.
4. All computers to have power saving settings to turn off monitors and hard discs, say after 10 minutes/30 minutes is implemented.
5. The comfort air conditioning temperature to be set between 24°C to 26°C.
6. Solar Street Light system should be installed in the campus.
7. All class teachers inform that in classroom when there is last lecture then teacher or student should switch off the light.

CONCLUSION

- Data generated in energy audit is useful for understanding the energy distribution and utilization of college.
- The college needs maximum 71598 KW of electricity. In other words, college needs 5966 Units/month and solar energy generation device generates only 210 KWH per day.
- Energy Use and Conservation This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, natural gas and vehicles.
- Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment.
- The total average energy consumption is determined as 5966 KWH/month.
- The entire campus including common facility centre are equipped with LED lamps, CFL lamps and tube lights.

Mr. V. S. Jadhav
Chairman
Energy Audit Committee

Dr. D. B. Shinde
Principal