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# Reducing Electricity Consumption in Educational Institute: A Case Study

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**ABSTRACT:** Now days the rise in energy demand is an increasing pressure for any government. Today Energy demand in our country is increasing exponentially. Energy conservation can be the best solution for raising energy demand. An energy audit is an inspection, survey and analysis of energy flows.Theenergy conservation for system to reduce the amount of energy input into the system without negatively affecting the output. This paper is intended to raise awareness of the important of energy auditing by considering the conventional lighting loads of an educational institution and replacing with energy efficient lighting lamps and comparing results.

**KEYWORDS:** Energy Audit, Lighting load, Energy conservation.

## I.INTRODUCTION

The present day electricity supply is incapable to meet the emerging demands, thus, the electricity crisis has become a grave issue that must be addressed at extreme priority. Energy conservation and energy efficiency are a part of the Government's strategy to decouple economic growth from growth in energy consumption and reduce the energy intensity of the economy says Annual Ministry of Power (MoP) report 2004-05 [1].The Energy auditing has been conducted at the Technical Institute Campus [4].Equipment wise analysis has been performed [5].

In this paper to analyze the Electricity Profile of an Educational Institute- Shri Vishnu Engineering College for Women(Autonomous),Andhra Pradesh, India, and recommend possible solutions to save electricity in all possible capacity.

## II. ENERGY AUDIT

According to the definition in the ISO 50002 standard, an energy audit is a systematic analysis of energy use and energy consumption within a defined energy audit scope, in order to identify, quantify and report on the opportunities for improved energy performance. The institutional building is considered here because of the uncontrolled and unpredictable usage of light, fans and air conditioning facilities in number of classrooms, practical rooms, auditoriums and also rooms with computer facilities and UPS.


Fig1.Energy Audit Process Diagram

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Energy audit analysis in general order involves:

- Analysis of the energy consumable systems and the utility bills.
- Survey about the condition of the system.
- Understanding the need of the consumer.
- Evaluating the possible energy conservation measures and
- Estimating the energy savings potential.

## III. TYPES OF ENERGY AUDITING

Basically there are three types of energy audit:

Walk-Through Audit (WTA)
This audit consists of a walk-through inspection of a facility to identify maintenance, operational or deficient equipment issues and also to identify areas that need further evaluation. The results of a Walk-Through Audit include an identification of energy saving opportunities, a qualitative analysis of the implementation of energy saving measures and an estimation of its potential energy saving.
General audit
The general audit also called mini-audit, complete site energy audit expands on the preliminary audit .Utility bills are collected for a 12 to 36 month period to allow the auditor to evaluate the facility's energy demand rate structures and energy usage profiles. This type of audit will be able to identify all energy-conservation measures appropriate for the facility, given its operating parameters.

Investment Grade Audit (IGA):
This audit is a detailed account of energy use, including a quantitative study of the implementation with detailed investments and operational and maintenance costs and an analysis of the investment model.

## IV. THE ENERGY AUDITING OF EDUCATIONAL BUILDING

An educational building is selected for the energy auditing due to the fact that the number of people involved in an educational building is huge and the possibility of energy conservation is more.

In any educational institute the energy wastes due to lighting load. The lighting load consumes more than 20% of the total electrical energy consumption. Replacing the regular tube lights employing electromagnetic ballast with Compact Florescent Lights (CFLs) and Light Emitting Diodes (LEDs) is discussed in the paper. The total tube light load of the building is around 61.63kW employing 350 lamps.

## V. ESTIMATION OF LOADS

Block-1 of SVECW consists of Administrative office, Basic Science department and Electrical engineering, lighting load, Fans load and Acs loads of all these departments are considered for calculating total load.

Block-2 of SVECW consists of Mechanical Engineering, Electronics and communication engineering, lighting load, Fans load and Acs loads of all these departments are considered for calculating total load.

Block-3 of SVECW consists of Civil Engineering, CSE&IT engineering, lighting load, Fans load and Acs loads of all these departments are considered for calculating total load.

During audit the several places are identified, as the place for easy and efficient energy savings. A count on lighting is done after proper identification and calculation about the replacement of the light as it should not affect the consumers need. In the analysis, the energy consumption of tube lights, CFLs and LEDs are evaluated and compared.

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**Florescent tubes:**
The usage of 40 W tube light consumes the specified energy: Total number of tube lights being 512, total energy consumed by the tube lights is (512X40)*1 = 20.48 kW hour. Assuming 7 working hours a day and 22 working days per month, total energy consumption by the tube lights are 20.48*7*22= 3153.92 kWh..

**CFLs:**
Replacing the 40W tube lights with 12 watts CFLs, total energy consumed by 512 CFLs is, 512*12*1 =6.14 kW hour. Assuming 7 working hours a day and 22 working days per month, total energy consumed by the CFLs are 6.14*7*22=945.56 kWh. Net saving units (3153.92kwh-945.56kwh) 2208.36 kwh per day.

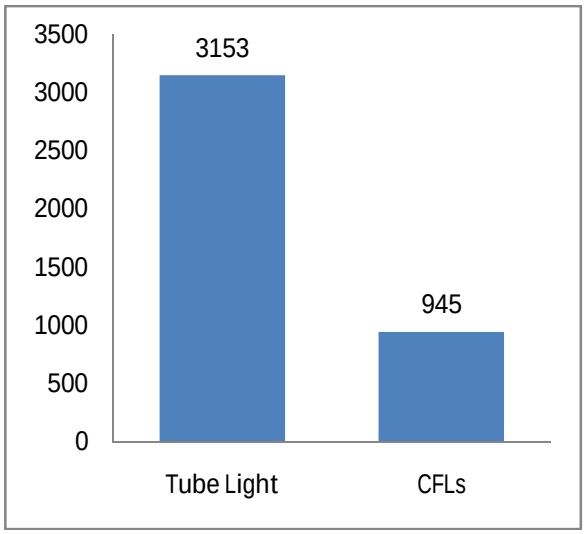


Fig 2. The energy consumption (Kwh) comparison between tube lights along with CFL.

**Fans:**
Total number of Ceiling fans with 80w rating is 480 with 10 hours daily usage is 80w*480*10hrs usage=384000 watts per day 384 kWh daily Consumption.

In Ceiling Fans if we replace with Energy Efficient Fans then, 80w*480*10hrs=384000 watts per day, 48w *480*10hrs=230400 watts per day, 230.40 kWh daily Consumption.Net savings=153.60 kwh.

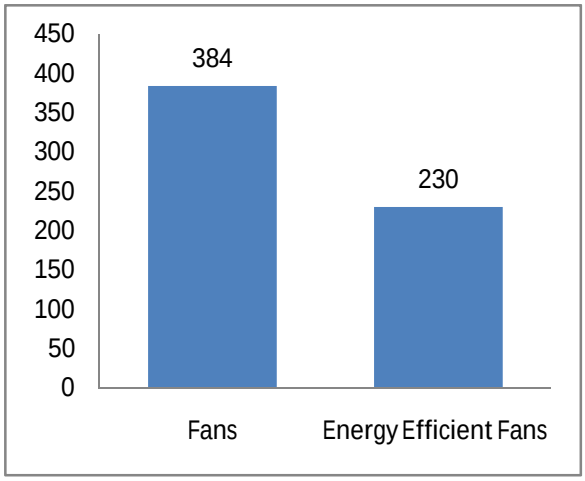


Fig 3. The energy consumption (Kwh) comparison between fans along with Energy efficient fans.

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**Air condition units:**

Air conditioner 1.5 Ton=2400watt*5hrs=12000 watts per day=12 kWh per day.
Total 32 nos. Total consumption 32*12=384kwh per day AC require 1.5 ton is 2400 w but 5 star require only 1600w*5hrs=8000watts per day=8kwh per day Total 32nos.Total consumption 32*8=256kwh per day Net savings =128kwh.

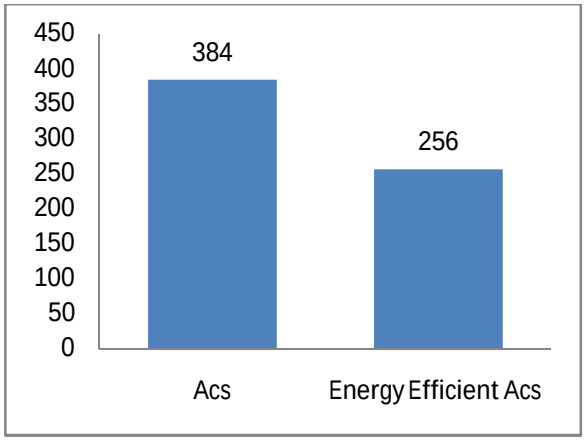


Fig 4. The energy consumption (Kwh) comparison between Normal Acs along with Energy efficient Acs.

With normal appliances the units consumed are: 3912 units per day
But replacing normal appliances with Energy Efficient Appliances the units consumed is 1431 units only.
There 2489 units savings per day i.e., 2489units*30days=74430 units saved per month and 74430*12months=893160units saved per year.

## VI. CONCLUSION

In this paper analyzed the amount of wattage consumed by different devices. It shows that replacing the conventional tube lights, fans and Acs with energy saving CFLs, Energy efficient fans and energy saving Acs, reduces the energy consumption drastically. A simple change in system can conserve energy bring down to a greater extent .By using Energy Efficient Devices we can save and reduce shortage of Power and can reduce power inflation.

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