

Energy Audit Report

(2023-24)



Jaykaranti Shikshan Prasarak Mandal's
Swami Vivekanand Mahavidyalaya
P-74 MIDC, Kalamb Road, Latur (Maharashtra)



Energy Audit Conducted by



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Energy Auditor

(Empanelled Mahaurja, Govt. of Maharashtra Institution)

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ENERGY AUDITS



Executive Summary

The objective of the audit was to study the energy consumption pattern of the facility, identify the areas where potential for energy/cost saving exists and prepare proposals for energy/cost saving along with investment and payback periods. The salient observations and recommendations are given below.

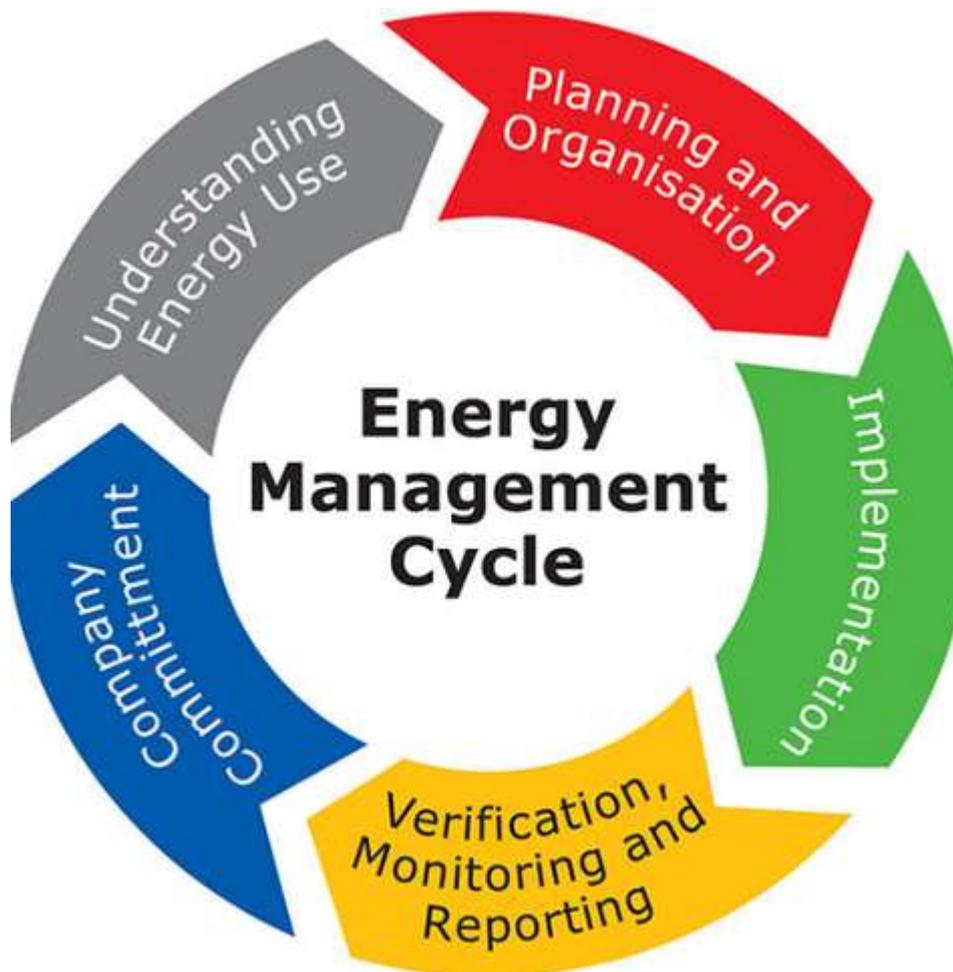
Sr.	Recommendations	Savings	Investment	Payback
1	Improve Energy Efficiency in Fan System : Replace Existing Inefficient Ceiling Fans with Efficient BLDC fans (Qty. 27 Nos.)	1800 KWh/Yr.	Rs. 0.48 Lakhs	2.6 Yrs.
2	Install Additional Rooftop Solar Power plant Capacity 50KWp	48000 KWh/Yr.	Rs. 22.50 Lakhs	4.6 Yrs.
3	Improve Power Quality Supply Install 50KVA Air Cooled Three Phase Servo Voltage Stabilizer	5000 KWh/Yr.	Rs. 0.75 Lakhs	1.5 Yrs.
4	Conduct 'Save Energy Program'	-	No Investment	Immediate



Preface

An energy audit is a study of a facility to determine how and where energy is used and to identify methods for energy savings. There is now a universal recognition of the fact that new technologies and much greater use of some that already exist provide the most hopeful prospects for the future. Data collection for energy audit of swami Vivekanand Mahavidyalaya, Latur was conceded by EA Team on 15th Dec 2024. This audit was over sighted to inquire about convenience to progress the energy competence of the campus.

All data collected from each classroom, Laboratory, Library. The work is completed by considering how many Tubes, Fan, Computers, Electronic instruments, etc. How much was participation of each component in total electricity consumption.



Acknowledgement

We express our sincere gratitude to the Principal Dr. S. D. Bondage Sir for entrusting and offering the opportunity of energy performance assessment assignment. We are thankful to College Staff members for their positive support in undertaking the task of system mapping and energy efficiency assessment of all electrical system, utilities and other workshop equipment. The field studies would not have been completed on time without their interaction and guidance. We are grateful to their cooperation during field studies and providing necessary data for the study.



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- Empanelled MAHAURJA , Govt. of Maharashtra Institution

प्रतिज्ञा

हम सत्यनिष्ठा से प्रतिज्ञा करते हैं कि अपने सभी कार्यों में पेट्रोलियम उत्पादों के संरक्षण हेतु सतत प्रयासरत रहेंगे, ताकि देश की प्रगति के लिए आवश्यक इन सीमित संसाधनों की आपूर्ति अधिक समय तक सम्भव हो सके। आदर्श नागरिक होने के नाते हम लोगों को पेट्रोलियम पदार्थों के व्यर्थ उपयोग से बचने तथा पर्यावरण संरक्षण हेतु स्वच्छ ईंधन का प्रयोग करने के लिए जागरूक करेंगे।

Requirements for the NAAC

Energy Audit Team has been Conducted Detailed Energy Audit of swami Vivekanand Mahavidyalaya Building Located at Latur – Maharashtra. During Energy Audit We have found Environmental Consciousness and Sustainability initiatives in their Campus.

1. Percentage of Power requirement met through renewable Energy Sources

(Current Year Data) = 39 %

2. Energy Performance Index = 49.24 KWh/Sq. Meter

-Built-up Area 2305 Sq. Meter

- Electricity Consumption = Import from Mahavitrans + D.G. Generation

$$= 113280 + 232 = \underline{113512} \text{ KWh/year}$$



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Energy Auditor

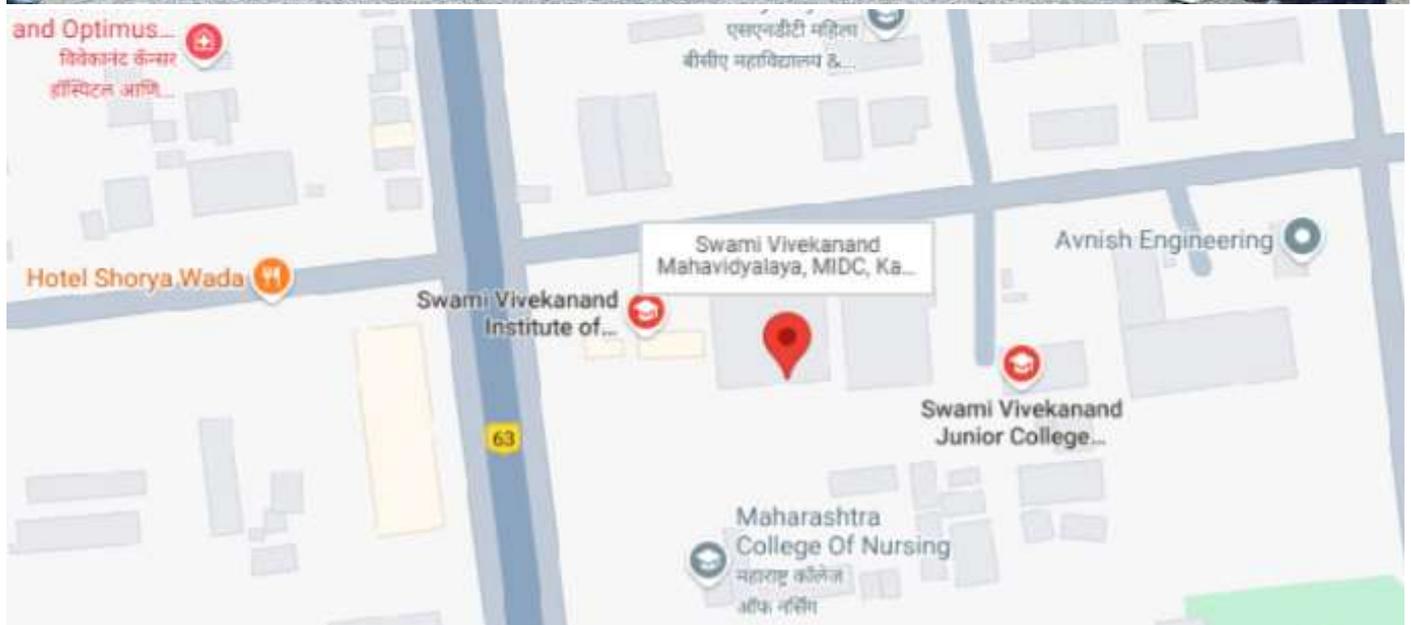
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Chapter: 1 Introduction

Swami Vivekanand Mahavidyalaya, M.I.D.C., Latur aspires to become a strong center for educational excellence capable of responding to emerging educational challenges and needs in a fast changing society. With its core values of fairness, honesty and integrity. Jaykaranti Shikshan Prasarak Mandal Latur will always strive hard to build character, sharpen the intellect and encourage critical thinking among students through modern education retaining traditional values and the trust encourage to the rural and urban student for knowledge, science and technology. Swami Vivekananda College started in 2020-21 with B.A., B.Com. and B.Sc. College is started the courses of Yashwantrao Chavan Maharashtra Open University these are B.A., B.Com. B.A. in M.C., and B. Lib. The Distance Education from Swami Ramanand Teerth University is established in M.A. and M.Com. from 2024-25 The new degree courses are stated about computer subject. B.Sc. (C.S.), B. A. Computer Animation and Web Designing, B. Sc. Information Technology. , B. Sc. Software Engineering. A dedicated group of student of NSS are actively participating in social work.



Address : JSPM Campus, P-74, MIDC, Kalamb Road, Maharashtra 413531

Chapter 2: Energy Audit Objectives

Swami Vivekanand Mahavidyalaya, Latur entrusted the work of conducting a detailed Energy Audit of campus with the main objectives given below:

- To study the present pattern of energy consumption
- To identify potential areas for energy optimization
- To recommend energy conservation proposals with cost benefit analysis.

Scope of Work, Methodology and Approach:

Scope of work and methodology were as per the proposal. While undertaking data Collection, field trials and their analysis, due care was always taken to avoid abnormal situations so as to generate normal/representative pattern of energy consumption at the facility.

Approach to Energy Audit:

We focused our attention on energy management and optimization of energy efficiency of the systems, sub systems and equipment's. The key to such performance evaluation lies in the Sound knowledge of performance of equipment's and system as a whole.

Energy Audit:

The objective of Energy Audit is to balance the total energy inputs with its use and to identify the energy conservation opportunities in the stream. Energy Audit also gives focused Attention to energy cost and cost involved in achieving higher performance with technical and financial analysis. The best alternative is selected on financial analysis basis.

ENERGY EFFICIENCY IN BUILDINGS

EE Measures for Buildings



Chapter: 3 Energy Audit Methodology

Energy Audit Study is divided into following steps

1. Historical data analysis:

The historical data analysis involves establishment of energy consumption pattern to the established base line data on energy consumption and its variation with change in production volumes.

2. Actual measurement and data analysis:

This step involves actual site measurement and field trials using various portable Measurement instruments. It also involves input to output analysis to establish actual operating Equipment efficiency and finding out losses in the system.

3. Identification and evaluation of Energy Conservation Opportunities:

This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential of energy saving and investment required to implement the Proposed modifications with payback period.



Chapter: 4. Study of Electrical Systems

Electrical Energy Sources:

1. The electrical supply to the JSPM Group of Institutes comes from MSEDCL LT supply.
2. Solar Power Plant (Capacity 75 KWp)
3. Diesel Generator 30KVA + 30KVA (Two Unit)



Observations: Electrical Safety measures need to review!

The audit also found that *some electrical equipment was not properly maintained* and that staff training on electrical safety was inadequate. **Rubber Mats not found.**

1. -Install Safety Distribution Panel board.
2. -Install Sign Boards. Prohibition, Warning, Mandatory and Emergency.
3. Install Safety Guard to D.G. Set
4. MSEDCL has been installed one common Energy meter in Campus which distributes common electrical energy to other colleges / Department in the same campus.

Suggestions: Install sub meters to all departments / buildings

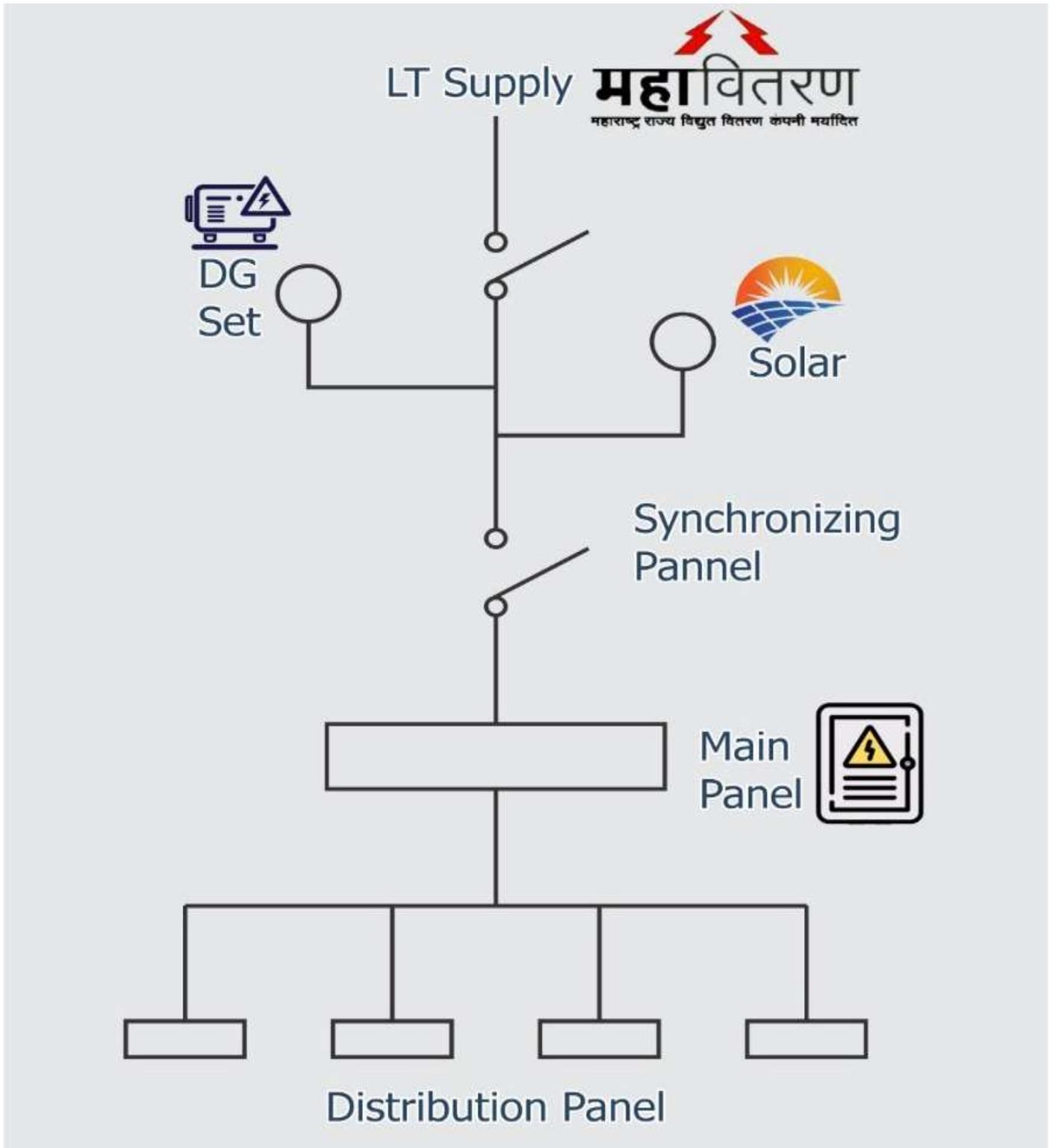
Sub Meter can measure energy used for different departments, building equipment, or any other electrical load.

MSEDCL Supply

The electrical bills Oct 23 to Nov 24 have been studied.

MSEDCL LT Supply Meter -

	Consumer No.	610551944339
Details of Electricity Demand	Tariff	88 LT-VII B I
Sanctioned Load	25	KW



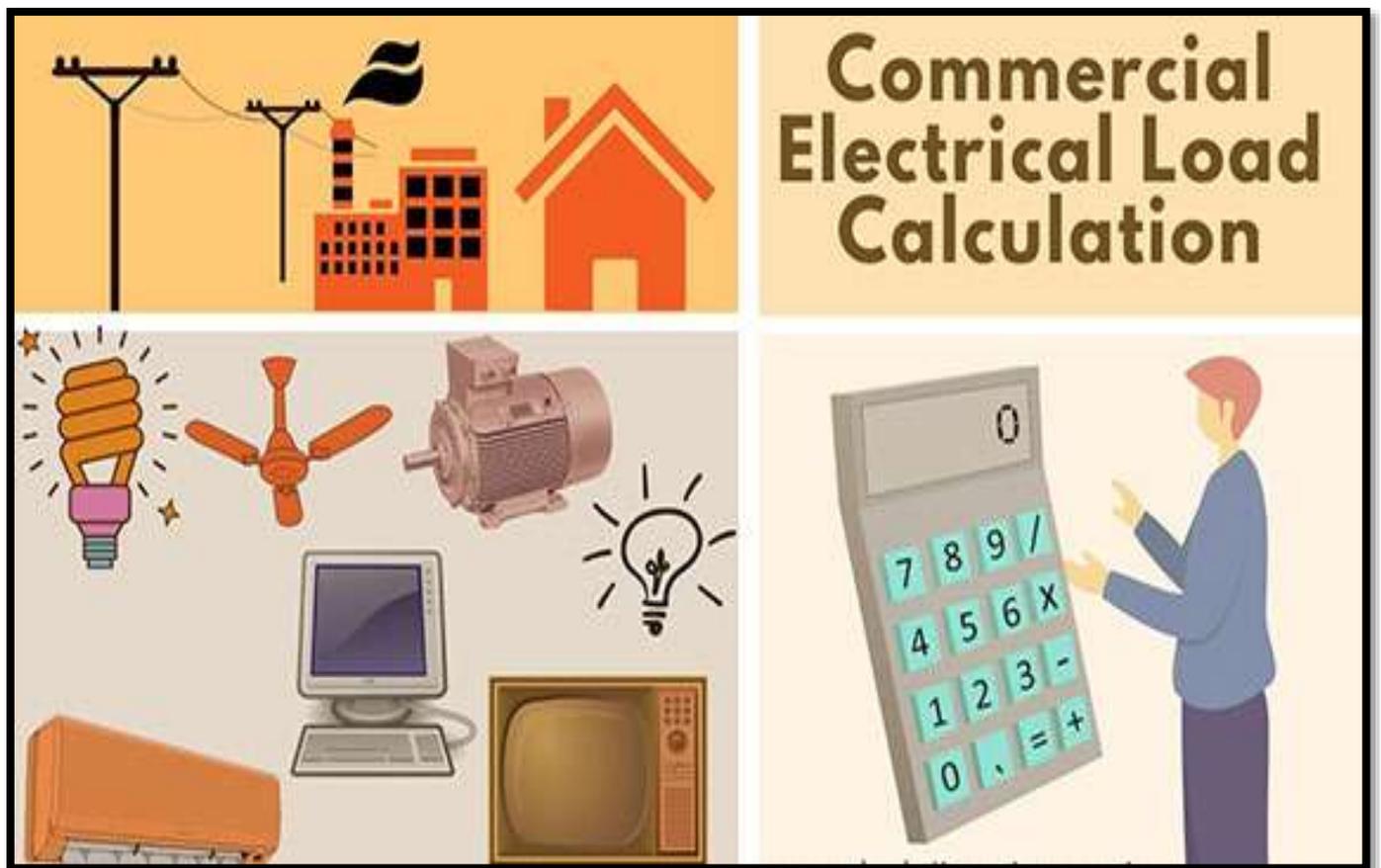
Connected Load Details

Major Energy use and Areas: In the College Campus Electrical energy is used for various applications like: Computers, Printers, Lighting, Fans, Flood light, & Other Equipment etc.

Sr.	Appliance	Qty.	Watt	Total
1	LED Bulb	38	20	760
2	Ceiling Fan	27	70	1890
3	Computer	108	175	18900
4	Printer	02	250	500
5	Water Pump	1	3730	3730
6	Streetlight LED	5	100	500
7	Miscellaneous Load		1500	1500
			Total KW	27.78

Observations : Ceiling Fan (70 Watt) Contributes 1890 Watt

Suggestions : Improve Energy Efficiency in Fan System:
 Replace Existing Inefficient Ceiling fan of 70watt with five star 28 Watt BLDC Fan.



Annual Electricity Consumption Historical Electricity Bill:

Bill Month	KWh	KVA	Bill Amount
Oct-24	10,357	33	1,87,076.36
Sep-24	8,612	31	1,54,983.21
Aug-24	9,441	29	1,62,908.85
Jul-24	8,659	26	1,47,397.14
Jun-24	7,678	29	1,39,231.26
May-24	6,069	18	96,849.84
Apr-24	10,487	29	1,77,015.52
Mar-24	11,313	33	1,90,087.44
Feb-24	10,960	29	1,70,211.39
Jan-24	10,968	25	1,65,317.93
Dec-23	10,870	23	1,61,085.47
Nov-23	7,866	29	1,31,755.01
	113,280		96,849.84

General Observations based on Electricity Bill:

Annual Electricity Imported from Mahavitrans 113280 KWh/Year

Suggestions :

1. Install Additional Solar power plant of 50 KWp capacity for the reduction in electric bill.
2. Use Maximum Natural daylight – Initiate Save Energy Program



Chapter: 5 Performance Evaluation

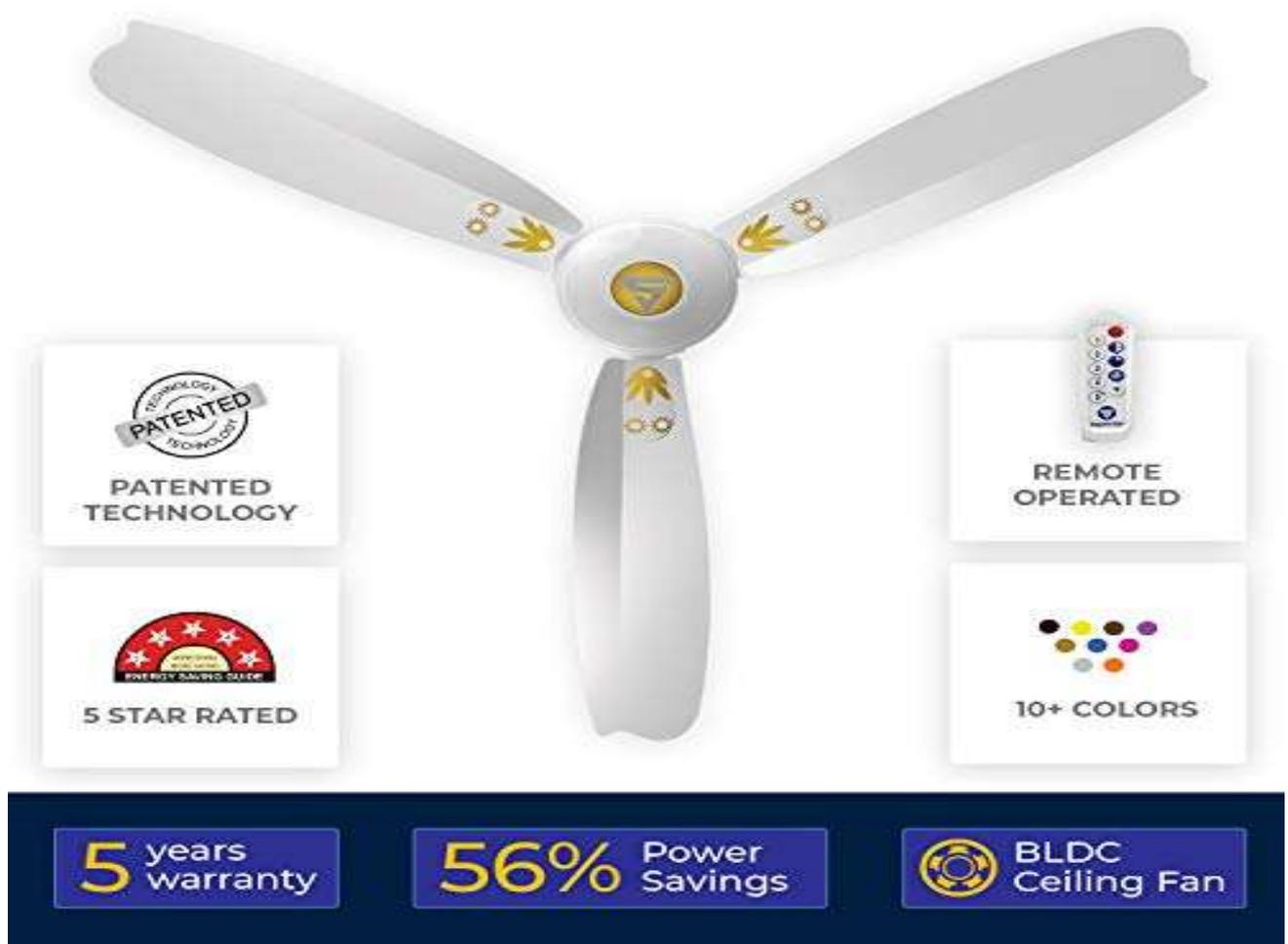
5.1 Fan System:

Total number of fans used in the campus = **27** No's

Consider @200 days Working 8 Hrs.

- Number of fans to be replace = **27** No's.
- The Total Current Consumption = 3025 KWh
- The Expected fan Consumption =1200 KWh
- Expected Saving per year = 1825 KWh/year

Suggestions: Replace existing Inefficient Fan System (70W) with Five Star BLDC (28W)



5.2 Improve Power Quality (PQA)

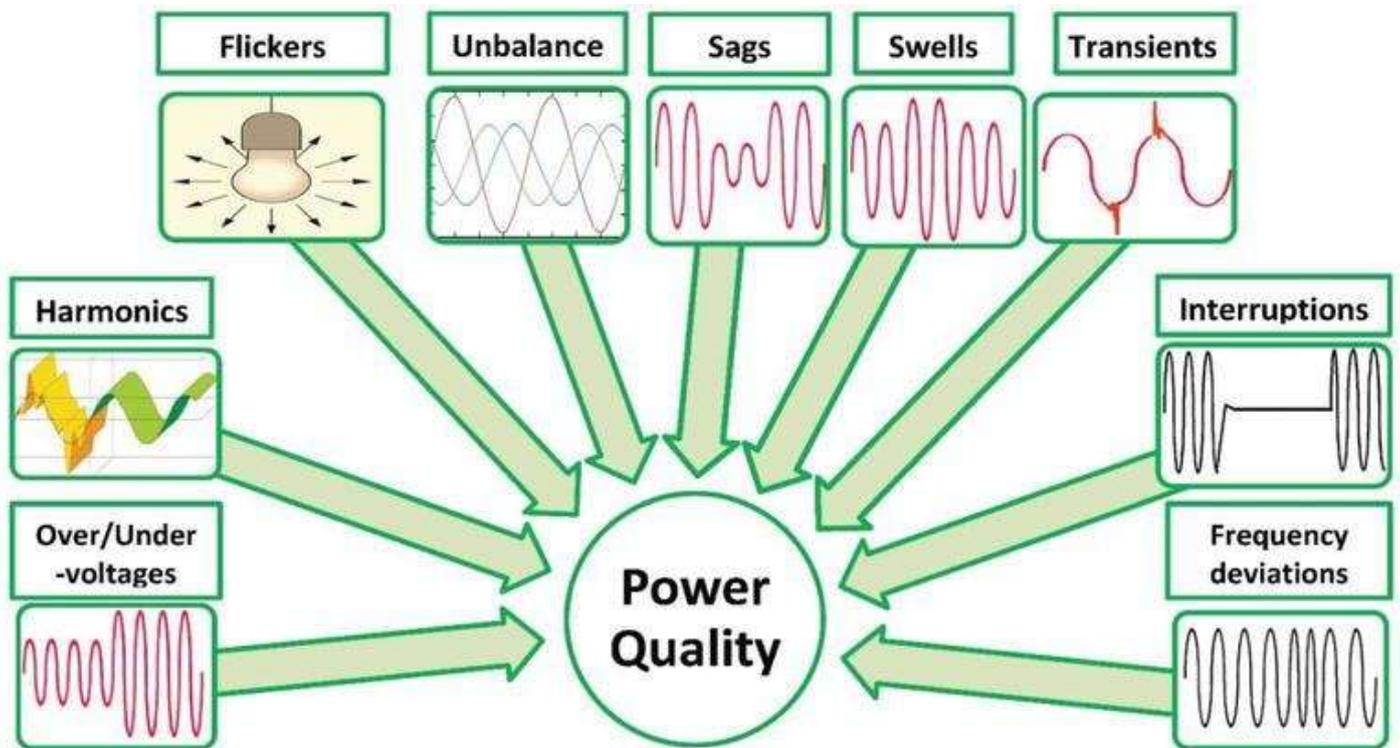
Power quality issues can affect the operation of critical loads and can have the negative impact on operation. This power quality analyser can monitor the cost of energy wasted due to poor power quality. The wider range of measurement function and measurement method in this analyser is the ideal tool and for the calculation of errors.

Factors that affect power quality:

Voltage fluctuations. Voltage fluctuations, such as sags, swells, or interruptions, can cause significant power quality issues. ... Harmonics. ... Power factor. ... Frequency variations.

Voltage level:

Power quality refers to the level of consistency, reliability, and stability of electrical power.



Suggestions:

Install Three Phase 50 kVA Oil Cooled Servo Stabilizer.



5.3 Lighting System: Lux level at different Locations found low

The total output of visible light from a light source is measured in lumens. Typically, the more lumens a light fixture provides, the brighter it is. One lux is equal to one lumen per square meter (lux = lumens/m²)



Observations: In the campus Majority Existing LED Tube are installed without reflectors.

Majority Measured Lux Level found LOW:

Suggestions: Improve effectiveness of Lighting System.

Increase Lighting Efficiency by using reflectors.

Light globes generally disperse light in all directions from the source. If a ceiling mounted light does not direct the light back down to the working plane, more fittings will be required to achieve the required lux levels. So the effectiveness of the reflectors (or minimizing losses due to poor reflectors) is important. Reflectors should be both reflective as well as carefully designed to disperse light effectively on the working plane at the design height of the fitting (e.g., light should not be concentrated in one area, providing too much light, whilst falling short of required levels in another area).

Proposed:-

Silver Reflectors. This is the reflector that reflects the most light.

White Reflectors. More flexible between indoor and outdoor use.

1. Gold Reflectors
2. Black Reflectors
3. White Reflectors



Recommended LUX Level in Commercial Buildings

Activity	Illumination (lux, lumen/m ²)
Public areas with dark surroundings	20 - 50
Simple orientation for short visits	50 - 100
Working areas where visual tasks are only occasionally performed	100 - 150
Warehouses, Homes, Theaters, Archives	150
Easy Office Work, Classes	250



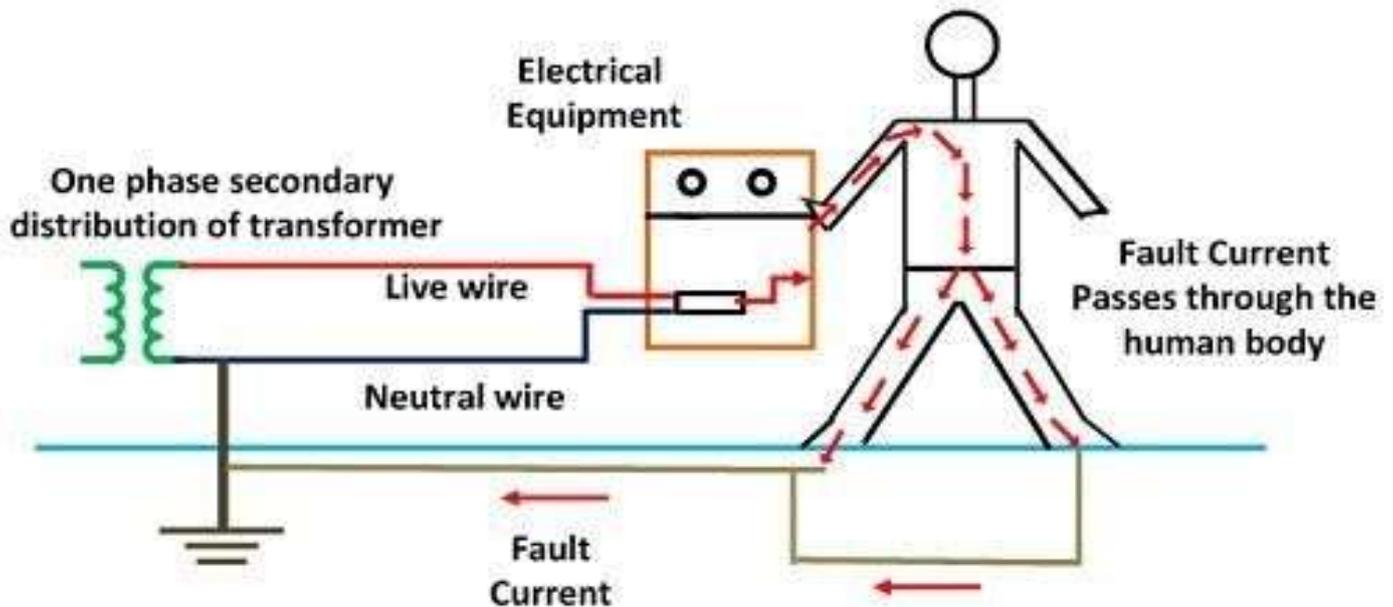
Suggestions: Install occupancy sensors to reduce Losses.

Chapter: 6 Guidelines for Identified Energy Saving Opportunities

- Use as much natural day light as possible by use of translucent roofing sheets.
- Use day lighting effectively by locating work stations requiring good illuminance near the windows.
- Minimize illuminance in non- task areas by reducing the wattage of lamps or number of fittings
- Avoid use of incandescent/tungsten filament lamps. The power consumed by these lamps is 80% more than the fluorescent lamps (discharge) for same lumen output.
- Use electronic ballasts in place of conventional ballast for fluorescent lamps.
- Task lighting saves energy, utilize it whenever possible.
- All surfaces absorb light to some degree and lower their reflectance. Light colored surfaces are more efficient and need to be regularly painted or washed in order to ensure economical use of light.
- Maintenance is very important factor. Evaluate present lighting maintenance program and revise it as necessary to provide the most efficient use of lighting system.
- Clean luminaries, ceilings, walls, lamps etc. on a regular basis.
- Controls are very effective for reducing lighting cost. Provide separate controls for large ratings.
- Install switching or dimmer controls to provide flexibility when spaces are used for multiple purpose and require different amounts of illumination for various activities.
- Switching arrangements should permit luminaries or rows of luminaires near natural light sources like windows or roof lights to be controlled separately.
- Separate lighting feeder and maintain the feeder at permissible voltages by using transformers. • Install occupancy sensors for indoor cabin light controls

Electrical Safety: Earth Resistance

Ideally a ground should be of zero ohms resistance. There is not one standard ground resistance threshold that is recognized by all agencies. However, the NFPA and IEEE have recommended a ground resistance value of 5.0 ohms or less. The use of chemical elements around the electrode of earthing systems reduces the earth resistance which improves the efficiency of these systems.



Electrical System Without Earthing

Circuit Globe

Conduct Institutional Training / Awareness Program 14th December 'National Energy Conservation day'

The National Energy Conservation Day is organised on 14th December every year by the Bureau of Energy Efficiency (BEE) with an aim to showcase India's achievements in energy efficiency and conservation. BEE - Ministry of Power celebrate every year Energy Conservation Week from 14th December – 20th December.

Create Awareness:

All Class Rooms and labs to have Display Messages regarding optimum use of electrical appliances in the room like, lights, fans, computers and projectors. Save electricity.

1. There has to be Institute level student community that keeps track of the energy consumption Parameters of the various departments, class rooms, halls, areas, meters, etc.
2. Energy auditing inside the campus has to be done on a regular basis and report should be made public to generate awareness.
3. Need to create energy efficiency/ renewable energy awareness among the college campus i.e. solar, wind, Biogas energy. College should take initiative to arrange seminars, lectures, paper presentation competition among students and staff for general awareness.

Display the stickers of save electricity

Save nature everywhere in the campus. So that all stakeholders encouraged to save the electricity.

- 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.
- All projectors to be kept OFF or in idle mode if there will be no presentation slides.
- All computers to have power saving settings to turn off monitors and hard discs, say after 10 minutes/30 minutes.
- The comfort/Default air conditioning temperature to be set between 24°C to 26°C.

USE OF ELECTRICITY DURING PEAK HOUR AND OFF PEAK HOUR

The applicable electricity tariff is not also based on timing of the day but it may not be applicable in case of domestic LT/ HT type connection. This will also be helpful in maintaining the demand graph. It is recommended to avoid use of electrical gadget for cleaning, watering etc. during the peak hours. This type of work should be operational during the off peak hour.



Chapter 7: Conclusion

A total Investment of Approx. Twenty Three Lakhs & Seventy Three Thousand rupees (Rs. /- 23.73 Lakhs) amount is estimated for the energy efficiency improvement & renewable energy projects.

Energy Savings expected around 54800 KWh/year.

Energy Efficiency in Buildings

Checking Energy Efficiency at the Designing Stage by following Energy Conservation Building Code (ECBC)

BEE, Ministry of Power, Govt. of India launched Energy Conservation Building Code (ECBC) in 2007. The main features of ECBC are:

- To provide minimum requirements for the energy efficient design and construction of buildings.
- It considers five climatic zones in India, sets minimum energy performance standards for large commercial buildings or building complexes that have a connected load of 500 kW or greater.
- The code is also applicable to all buildings with a conditioned floor area of 1,000 m² (10,000 ft²) or greater, and is recommended for all other buildings also.
- The provisions of this code apply to:
 - (a) Building envelopes, except for unconditioned storage spaces or warehouses
 - (b) Mechanical systems and equipment, including heating, ventilating, and air conditioning
 - (c) Service hot water heating
 - (d) Interior and exterior lighting
 - (e) Electrical power and motors.

