

Energy Audit Report

(2021-22)



Prahladrai Dalmia Lions College of Commerce & Economics

Sunder Nagar, S. V. ROAD, Malad (West), Mumbai – 400064



Energy Audit Conducted by

Kedar Khamitkar & Associates

Energy Auditor

(Empanelled Mahaurja, Govt. of Maharashtra)

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ENERGY EFFICIENCY IN BUILDINGS

EE Measures for Buildings



Preface

An energy audit is a study of a Building or 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 the Prahladrai Dalmia Lions College of Commerce & Economics building was conceded by EA Team on 22nd March 22. This audit was over sighted to inquire about convenience to progress the energy competence of the campus.

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



Acknowledgement

We express our sincere gratitude to the authorities of Prahladrai Dalmia Lions College of Commerce & Economics for entrusting and offering the opportunity of energy performance assessment assignment.

We are thankful to Principal & Office Staff 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.



Kedar Khamitkar
Energy Auditor

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।

Introduction about the Institute:

The Lions Club of Malad - Borivli, an international social organization realized the necessity of establishing a Commerce College in the western suburb of Mumbai - Malad in 1972 to cater to the needs of the society. The vision envisaged by the stalwarts of the Club was finally converted into reality and the foundation stone of the college was laid in April, 1972. The College endeavor's to groom its students as icons of tomorrow, potentially contributing to Commerce trade, industry and management. At present the college has the junior college section that caters to Higher Secondary Certificate Examination and at the Degree College level we have B.Com in the aided section. In an attempt to foster specialized skills in non-traditional areas we have the following courses under the affiliation of University of Mumbai in the unaided section:

SN	Head	Particulars
1.	Name	Prahladrai Dalmia Lions College of Commerce & Economics
2.	Address	Sunder Nagar, S. V. ROAD, Malad (West), Mumbai – 400064 (M.S.)
3.	Degree Courses Offered	BMS; B.Com; BAMMC; BSc; BIM; M.com

The infrastructural facilities include a language laboratory, a conference room with state of the art technology and a separate section for examination related work, Internal Quality Assurance Cell, an auditorium and a computer laboratory.



☉ **Scope of Work, Methodology and Approach:**

Prahladrai Dalmia Lions College of Commerce & Economics entrusted the work of conducting a detailed Energy Audit of campus with the main objectives are as bellows:

- ☉ 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 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.



Requirements for NAAC

Energy Auditor team has been Conducted Detailed Energy Audit of **M/s Prahladrai Dalmia Lions College of Commerce & Economics** Building Located at Sunder Nagar, S. V. ROAD, Malad (West), Mumbai

1. Energy Performance Index 20.02

2. Percentage of LED 81%

During Energy Audit We have found Environmental Consciousness and Sustainability initiatives in their Campus.

Date of Audit: 22nd March 22

Place: Malad (West), Mumbai



Kedar

Kedar Khamitkar

- Energy Auditor

(Certified by Bureau of Energy Efficiency,
Ministry of Power, Gov. of India)

- Empanelled Consultant MAHAURJA,
(Govt. of Maharashtra Institution)

EE Measures for Buildings



Chapter: 1 Executive Summary

Sr.	Recommendation	Saving	Investment	Payback
1	Replacing Fan (70W) Qty. 215 with 5 star energy saving BLDC fan (28W)	9750 KWH/year	Rs. 3.22/- Lacs	3.30 Yrs.
2	Install motion sensor (Streetlight /Each Class room) switches prevent wastage of electricity	2000 KWH/Year	Rs.10000/-	0.5 Yrs.
3	Install Rooftop Solar Power Plant 50 KW	64000 KWH/Year	Rs. 17.5/- Lakh	2.73 Yrs.
4	Awareness Project - Conduct Training Program	-	No Investment	Immediate



Specific Energy Consumption (SEC):

Specific Energy Consumption (SEC) is defined as energy usage per Square meter of area. It is calculated total electrical kWh/total area of the campus. By calculating SEC, we can crudely target the factors of energy efficiency or inefficiency

Total Electricity Consumption 75671 kWh /Year

Total Built-up Area = 3778.87 Sq. Meter

Energy Performance Index:

EPI calculated as under (for Electricity): 20.02 KWH/Sq. Meter/Year



Observations:

As per BEE Star Rating Guidelines Existing Pralhadrai Dalmia Lions College of Commerce & Economics Building may be considered as 5 Star.

EPI KWH/Sq. Meter/Year	Star Label
80-70	1 Star
70-60	2 Star
60-50	3 Star
50-40	4 Star
Below 40	5 Star

Chapter: 2 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:

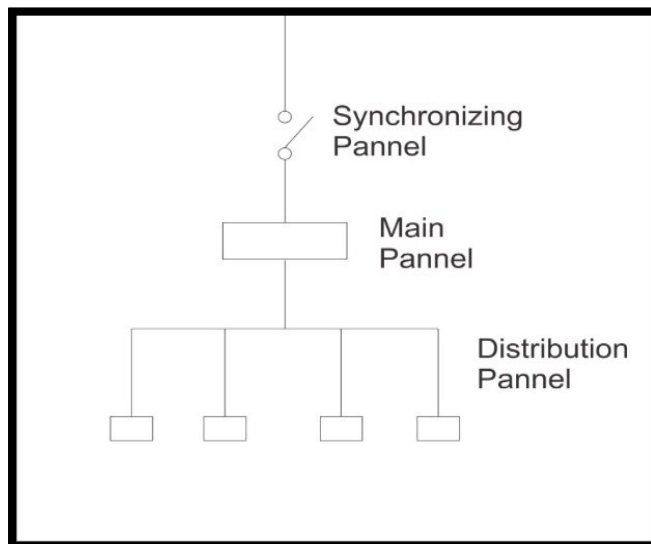
This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential of energy saving and investment required to implement the Proposed modifications with payback period.



Chapter: 3 Study of Electrical System

Source of Energy:

Institute receives Electricity from Electricity Distribution Company
 Adani Electricity Mumbai Limited (AEML) **L.T. Supply**



Number of Electrical Meters installed in the Campus: 06 Nos.

Con. Number	150203360	150203369	150203377	150203371	150201435	150203356	TOTAL
Apr-21	341	594	2372	31	573	947	4858
May-21	107		1431	70	641	1221	3470
Jun-21	136	301	1514	67	770	1607	4395
Jul-21	227	448	1696	75	786	2139	5371
Aug-21	479	755	1727	176	867	2098	6102
Sep-21	367	943	1814	95	924	1990	6133
Oct-21	404	1090	2255	122	807	1802	6480
Nov-21	626	1083	2261	100	762	1451	6283
Dec-21	695	1418	2721	223	779	1440	7276
Jan-22	619	729	1856	153	713	1031	5101
Feb-22	698	910	2295	472	865	1490	6730
Mar-22	1955	2284	3548	1408	953	3324	13472
	6654	10555	25490	2992	9440	20540	75671
Supply	Residential	Residential	Residential	Public service - OT	Residential	Public service - OT	
Tariff	LT - I (B)	LT - I (B)	LT - I (B)	LT - IV (B)	LT - I (B)	LT - IV (B)	

Chapter: 4 Details of Connected Load:

Following are the major consumers of electricity in the facility:

Sr.	Appliance	Watt	Qty.	Total
1	Ceiling fans	70	215	15050
2	Exhaust Fan	50	34	1700
3	Air Conditioner	2000	71	142000
4	LED Tube	20	280	5600
5	CFL	52	26	1352
6	Streetlight	75	25	1875
7	Refrigerator	250	6	1500
8	Computers	150	157	23550
9	Laptop	45	13	585
10	Miscellaneous			10000
			Total	203212

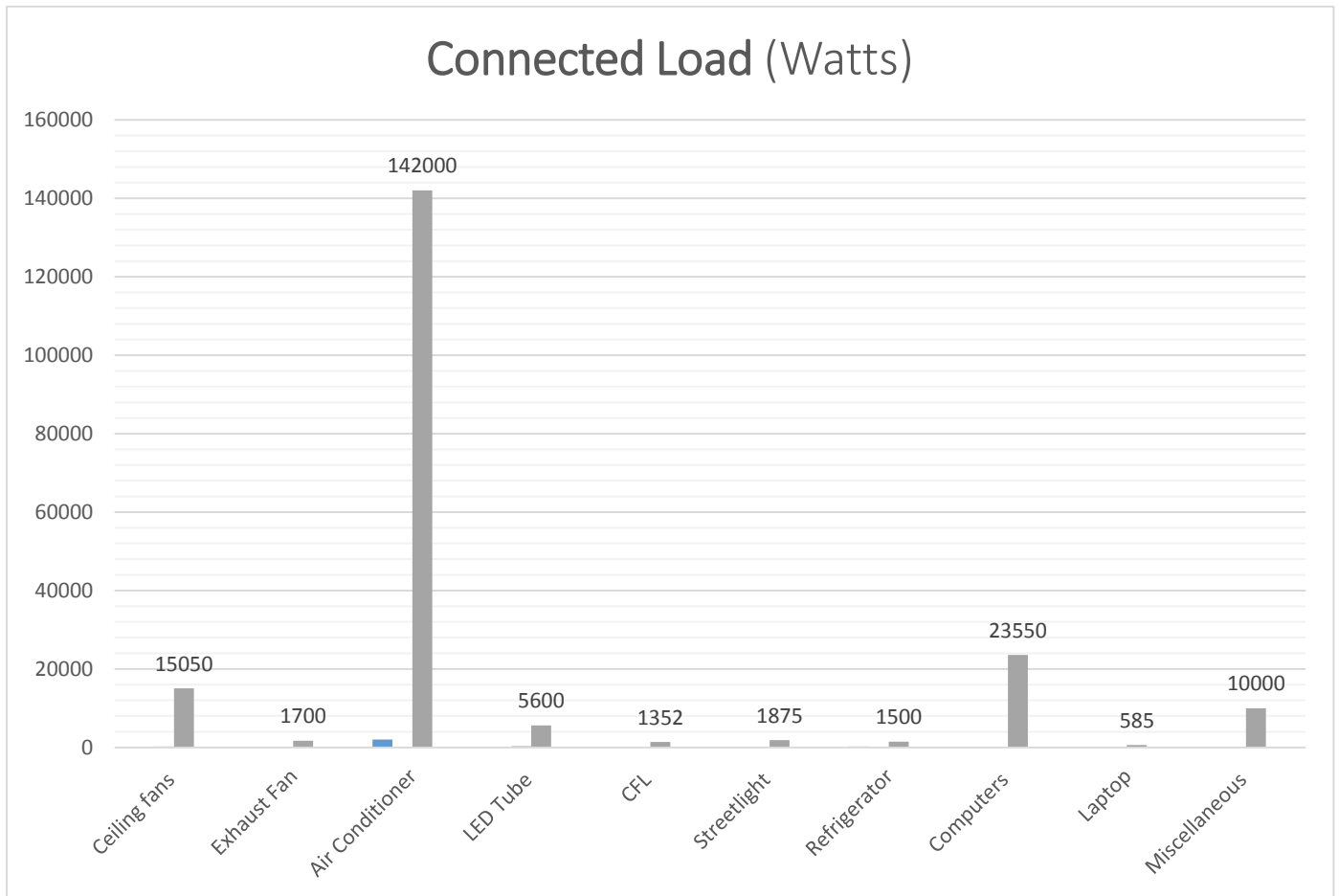
Observations:

Total Connected Load @203.2 KW

Type of Electrical load ?



Connected Load Graphical View:

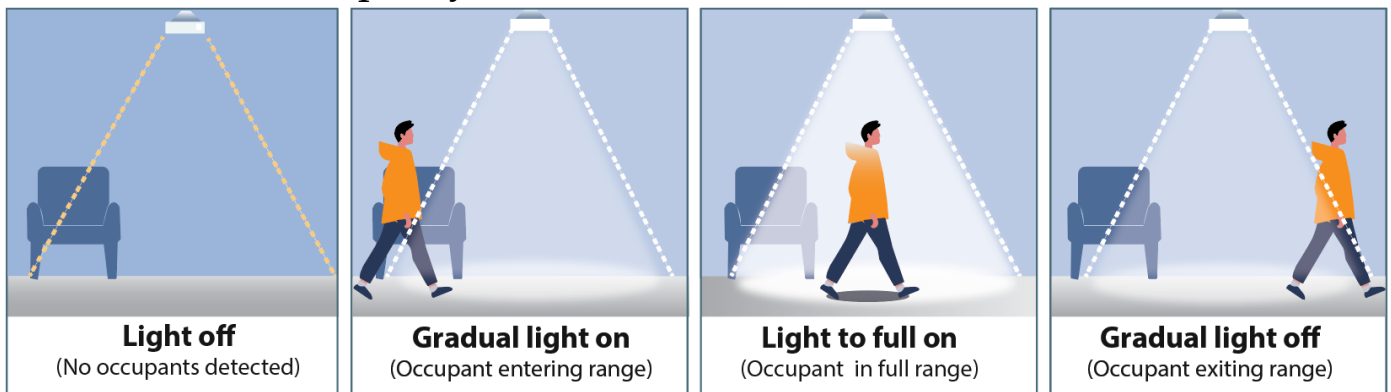


Observations:

Ceiling Fan contributes 15050 watt

Suggestions:

1. Install BLDC Fan (28W) Electricity Consumption can be reduced Existing Fan consumes (70W)
2. Install occupancy sensors “Auto Switch off when not needed “



Chapter: 5 Historical Energy Consumption Data Analysis

In this Chapter, we study the details of the 12 month Electricity Bills and their monthly total campus unit's consumption.

Month	KWH
Apr-21	4858
May-21	3470
Jun-21	4395
Jul-21	5371
Aug-21	6102
Sep-21	6133
Oct-21	6480
Nov-21	6283
Dec-21	7276
Jan-22	5101
Feb-22	6730
Mar-22	13472

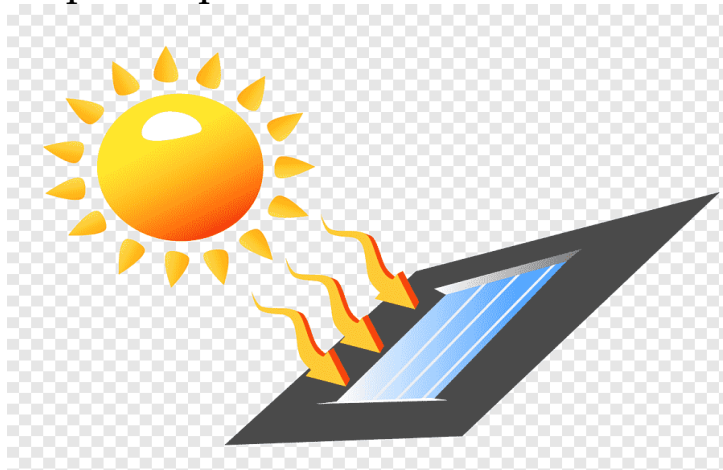
History Electricity KWH/Month

Observations:

Annual Electricity Consumption 75671 KWH

Suggestions:

Install Rooftop solar power plant of 60 KW for Zero Consumption Bill.



Chapter: 6 Performance Evaluation

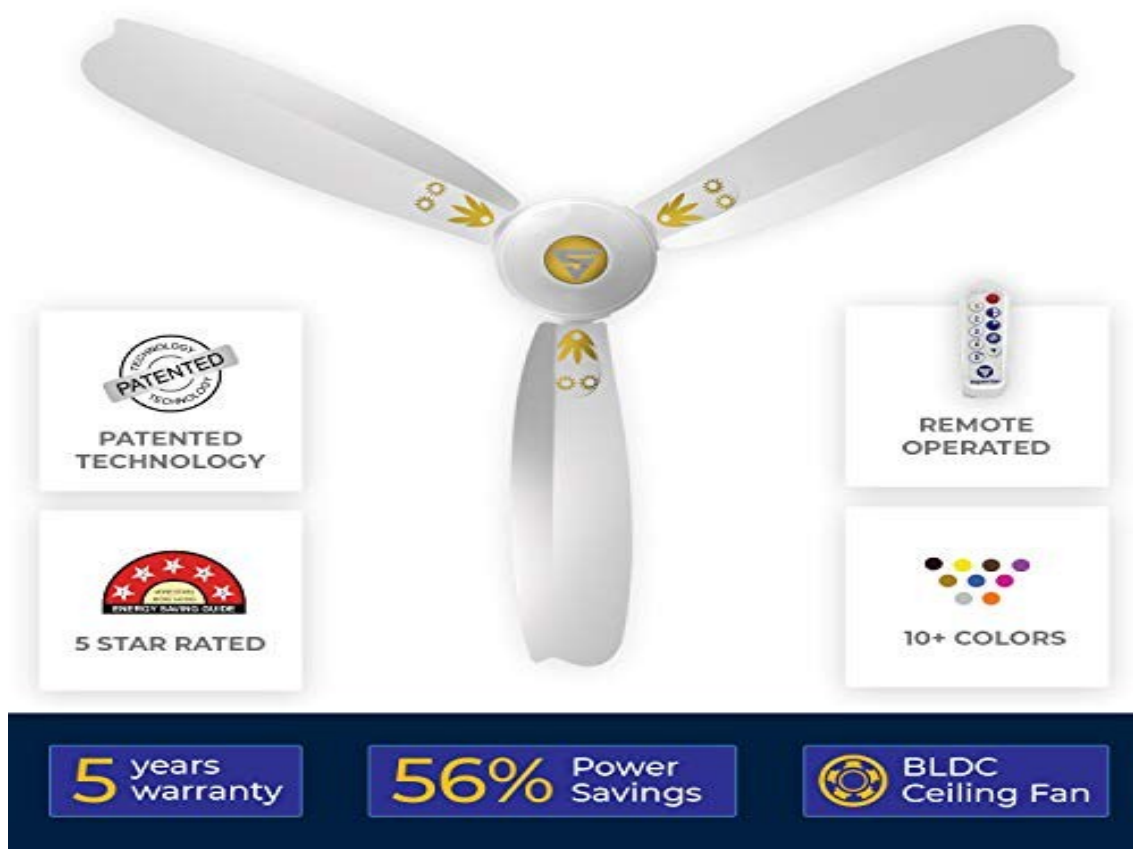
a) Existing Ceiling Fan system Found Inefficient

Total number of fans used in the campus = 215 Nos.

- Number of fans to be replace = 215 Nos. (Consider 6Hrs/day @180 days/year)
- The Total Current Consumption =16250 kWh
- The Expected fan Consumption =6500 kWh
- Total KWh saved per year = 9750 kWh

Suggestions:

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



b) Improve Power Quality :

Unbalanced Voltage: Voltage unbalances will cause **extra power loss, reduce system efficiency, reduce motor life cycle**, etc. Also some abnormal functioning and maintenance conditions also cause voltage imbalance and result in negative impacts on equipment and systems. An unbalance of **1%** is acceptable as it doesn't affect the cable. But above 1% it increases linearly and at 4% the de-rating is 20%. This implies that- 20% of the current flowing in the cable will be unproductive and thus the copper losses in the cable will increase by 25% at 4% unbalance.

Good power quality saves money and energy. Direct savings to consumers come from lower energy cost and reactive power tariffs. Indirect savings are gained by avoiding circumstances such as damage and premature aging of equipment.

Suggestion : Install Voltage Stabilizer 50 KVA capacity to Improve Power Quality for energy conservation and reduction in Maintenance Cost.



Chapter : 7 General Recommendations

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.

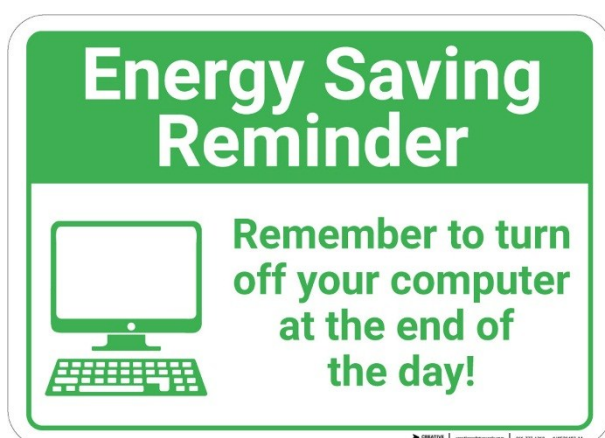
1. There has to be Institute level student community that keeps track of the energy consumption Parameters of the various departments, class rooms, halls, areas, meters, etc.
2. Energy auditing inside the campus has to be done on a regular basis and report should be made public to generate awareness.
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

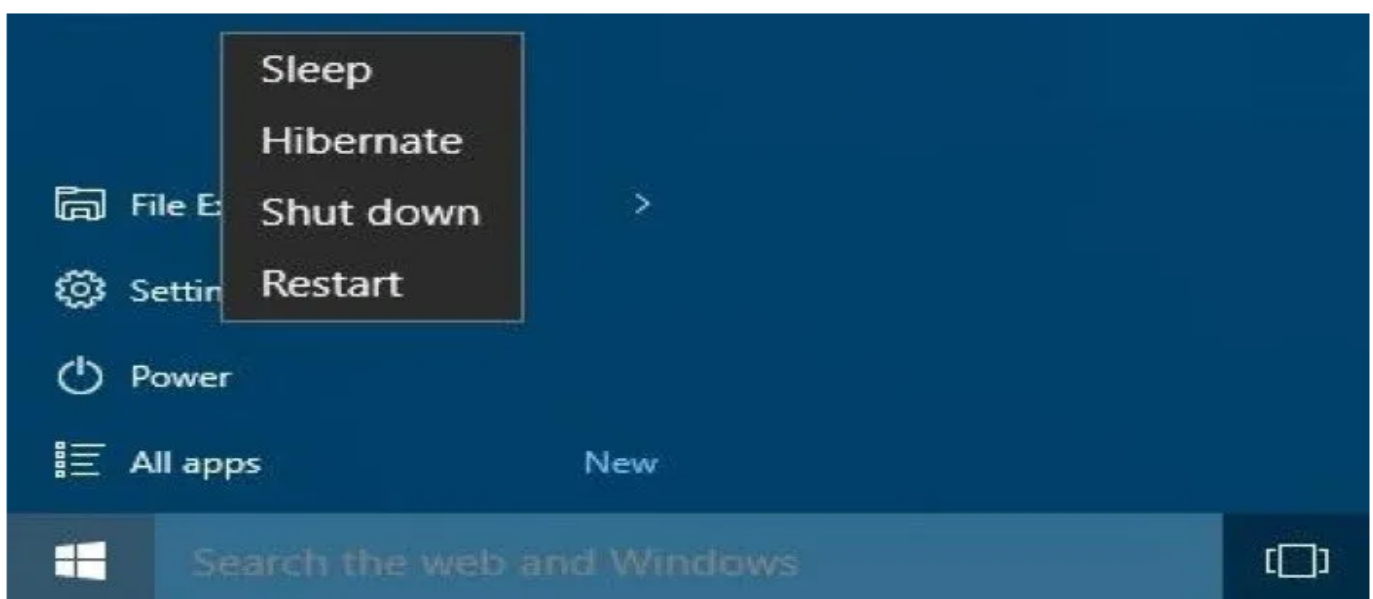
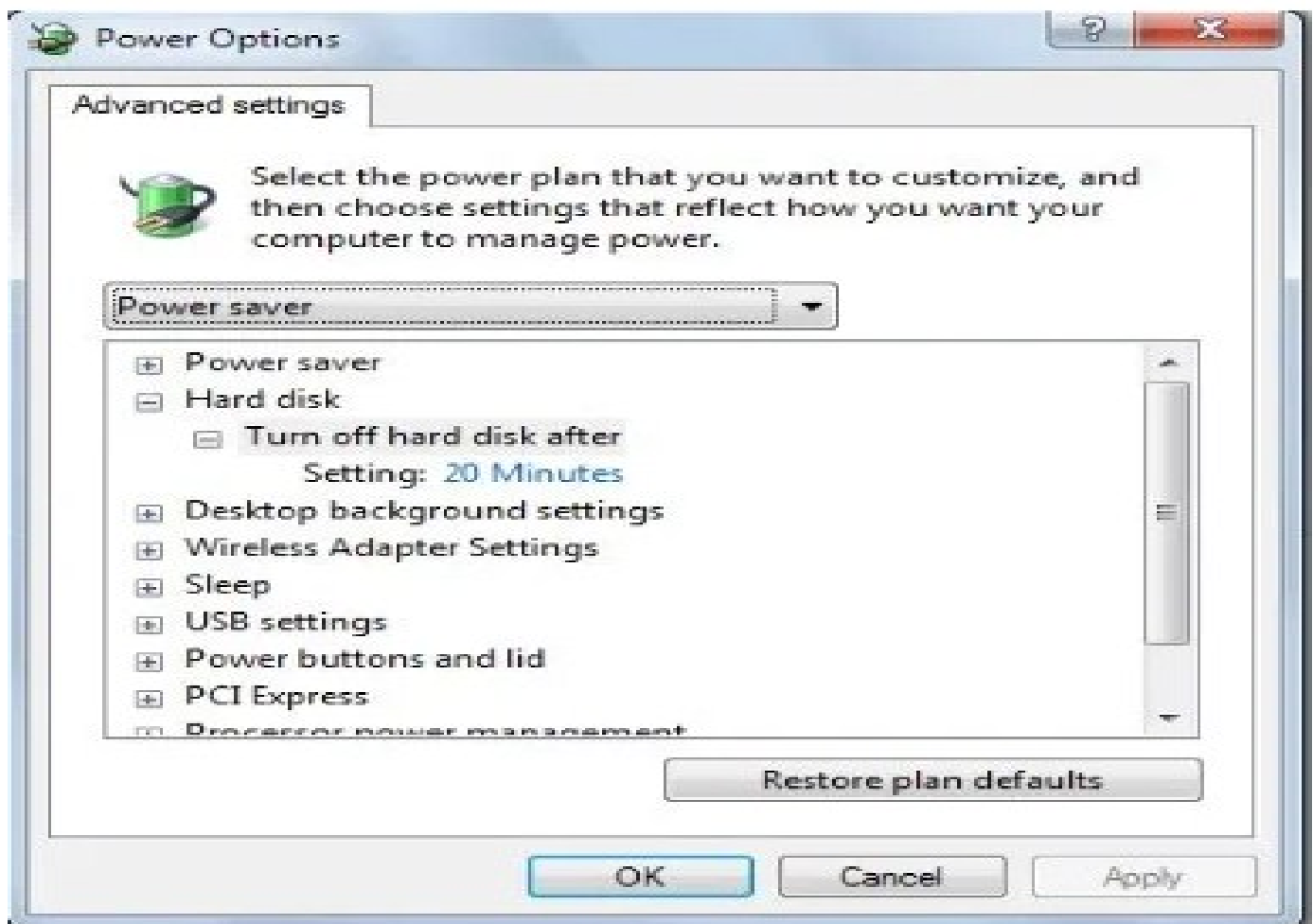
Save nature everywhere in the campus. So that all stakeholders encouraged to save the electricity.

- ⊙ 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.



Make your Monitor use less Power

Decrease brightness of the monitor. 100% brightness isn't required all the time. All external monitors have buttons to adjust the brightness.



Maintain lux level (illumination level) as per BEE GOI

Activity	Illuminance (lx, lumen/m ²)
Public areas with dark surroundings	20 - 50
Simple orientation for short visits	50 - 100
Areas with traffic and corridors - stairways, escalators and travelators - lifts - storage spaces	100
Working areas where visual tasks are only occasionally performed	100 - 150
Warehouses, homes, theaters, archives, loading bays	150
Coffee break room, technical facilities, ball-mill areas, pulp plants, waiting rooms,	200
Easy office work	250
Class rooms	300
Normal office work, PC work, study library, groceries, show rooms, laboratories, check-out areas, kitchens, auditoriums	500
Supermarkets, mechanical workshops, office landscapes	750
Normal drawing work, detailed mechanical workshops, operation theaters	1000
Detailed drawing work, very detailed mechanical works, electronic workshops, testing and adjustments	1500 - 2000
Performance of visual tasks of low contrast and very small size for prolonged periods of time	2000 - 5000
Performance of very prolonged and exacting visual tasks	5000 - 10000
Performance of very special visual tasks of extremely low contrast and small size	10000 - 20000

ENERGY EFFICIENCY



Chapter 8: Conclusion

A total Investment of Rs. 20.82/- Lakhs (Approx. Twenty Lakh & Eighty Two Thousand) amount is estimated for the energy efficiency improvement projects.

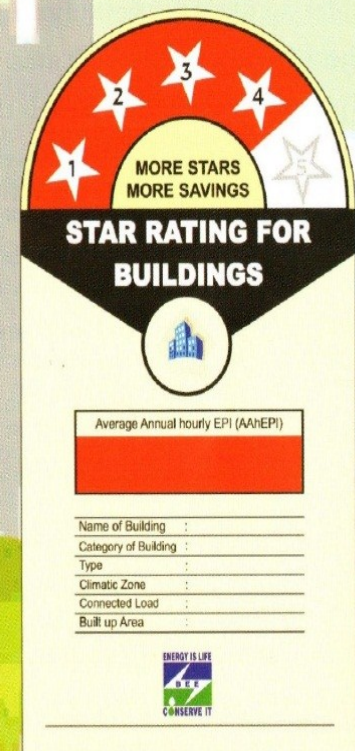
Energy Savings expected around 75750 KWH/year.

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.





प्रतिज्ञा

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