ASIAN COLLEGE OF EDUCATION

The College accredited by NAAC

Sirhind Road, Patiala, Punjab

Conducted by

Certified Energy Auditors

PREFACE

Data collection for energy audit of Asian College of Education, Patiala was carried out by the team during September, 2025. This audit was conducted to seek opportunities to improve the energy efficiency of the campus. Reduction of energy consumption while maintaining or improving human comfort, health and safety were of primary concern. Beyond simply identifying the energy consumption pattern, this audit sought to identify the most energy efficient appliances. Moreover, some daily practices relating common appliances have been provided which may help reducing the energy consumption.

The report accounts for the energy consumption patterns of the academic area, central facilities and hostels based on actual survey and detailed analysis during the audit. The work encompasses the area wise consumption traced using suitable equipment's. The analysis was carried out with software MS-Excel. The report compiles a list of possible actions to conserve and efficiently access the available scarce resources and their saving potential was also identified. We look forward towards optimization that the authorities, students and staff would follow the recommendations in the best possible way.

The report is based on certain generalizations and approximations wherever necessary. The views expressed may not reflect the general opinion. They merely represent the opinion of the team guided by the interviews of consumers.

We are grateful to the Asian Educational Institute for their keen interest in energy solutions' portfolio and giving us an opportunity to conduct an energy audit of their college Campus Patiala-Sirhind Highway, Opposite Tricone City, Patiala, Punjab.

The audit team comprised of:

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COLLEGE MANAGEMENT

With the advent of energy crisis and exponential hikes in the cost of different forms of energy, Energy Audit is manifesting its due importance in Industrial, Commercial, and Educational Establishments.

It was with this objective that we were entrusted by Asian College of Education, at Campus Patiala-Sirhind Highway, Opposite Tricone City, Patiala, Punjab.

The study primarily covers the:

- Present energy scenario of the Asian College of buildings.
- Detailed analysis of the data obtained through onsite measurements using portable gadgets, discussions with concerned personnel etc.
- Recommendations for energy savings in all possible areas with cost benefit analysis.
- Technical specifications for any retrofit option.

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1.INTRODUCTION

The objective of Energy Audit is to promote the idea of Energy Conservation in the Campus of Asian College of Education, Patiala. The purpose of the energy audit is to identify, quantify, describe and prioritize cost saving measures relating to energy use in the Hostels, Departments and Institute Central Facilities.

The work eligible for Energy Audit Study should be directed towards:

- Identification of areas of energy wastage and estimation of energy saving potential in Hostels, Departments and Institute Central Facilities.
- Suggesting cost-effective measures to improve the efficiency of energy use.
- Estimation of implementation costs and payback periods for each recommended action.
- Documenting results & vital information generated through these activities.
- Identification of possible usages of co-generation, renewable sources of energy (say Solar Energy) and recommendations for implementation, wherever possible, with cost benefit analysis.

ASIAN COLLEGE OF EDUCATION, PATIALA

Asian College of Education, Patiala, Punjab established in 2015 affiliated to Punjabi University Patiala and is approved by NCET. The college offers full-time ITEP (Integrated Teacher Education Programme), Middle and Secondary Stages, dual major Holistic Bachelor's Degree etc.

The Asian College of Education, Patiala is an only Institute accredited by NAAC for both Degree and Education Colleges.

1.1 PROGRAMMES/COURSES OFFERED

- ITEP (Integrated Teacher Education Programme)
- Offering Middle and Secondary Stages
- IETP is a dual major Holistic Bachelor's Degree

The Institute having Boys & Girls Hostels, Canteen and Auditorium, etc.

1.2 ANALYSIS OF AREA OF USE

Identifying where energy is used is useful because it identifies which areas the audit should focus on and raises awareness of energy use and cost. The results of the analysis can be used in the review of management structures and procedures for controlling energy use.

Analysis of energy use can be done by installing sub-meters in different Institute locations to pinpoint actual energy usage per area. This is a good source data for allocating energy use. With this information, spreadsheet can be created and charts useful for analysis may be generated.

Important Points to Consider When Collecting Load Data:

a. **Usage** – The usage of the equipments in terms of hours per day and days per year is collected from key persons in Hostels, departments etc. It is important to ensure the accuracy of this data because much of the potential for energy savings lies on wise allocation of the equipment's operating hours.

b. **Actual power consumed** – Actual power consumption is measured by Wattmeter.

c. **Supplementary Information** – Some other supplementary information is also collected such as state of insulation in case of ACs or availability of natural light etc.

1.2.1 IDENTIFICATION OF TARGET AREAS

Opportunities for energy savings can range from the simplest, such as lighting retrofits, to the most complex such as the installation of a solar PV grid connected plant. After the preliminary identification of opportunities, more time should be spent on those which have shorter payback periods.

1.2.2 COST BENEFIT ANALYSIS

The identified energy conservation opportunities should be analysed in terms of the costs of implementing the project versus the benefits that can be gained. Say for example, if we wish to install an energy saving equipment's to save the energy, we must calculate the total cost of installation and compare that with the savings derived from equipment's.

1.3 ACTION PLAN TO SET IMPLEMENTATION PRIORITY

After passing the cost benefit test, an action plan should be developed to ensure that the opportunities identified are implemented. The action plan should include all the major steps for implementing the opportunity as well as the people responsible. Furthermore, there should be a plan for monitoring the results.

2. ENERGY AUDIT METHODOLOGY

The methodology adopted for this audit was a three-step process comprising of:

1. **Data Collection** – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, interviewing key persons, and measurements.
2. **Data Analysis** - Detailed analysis of data collected was done using MS-Excel. The database generated by MS-Excel was used for producing graphical representations.
3. **Recommendation** – On the basis of results of data analysis and observations, some steps for reducing power consumption without affecting the comfort and satisfaction were recommended along with their cost analysis.

2.1 DATA COLLECTION

For suggesting any corrective measures to reduce power consumption, it is first necessary to know the power consumption pattern in detail. For this, the exhaustive data collection exercise was performed at all the departments, academic centres, hostels, and other supporting entities such as library, computer centre, auditorium, canteen etc.

Following steps were taken for data collection:

- The team went to each department, centre, hostels etc.
- Information about the general electrical appliances was collected by observation and interviewing.
- The power consumption of appliances, rated power was used (CFL for example).
- The details of usage of the appliances were collected by interviewing key persons e.g. Warden (in case of hostels), caretaker (in case of departments) etc.

- Light intensity was measured using luxmeters at the places where light intensity was either very low or very high.
- In case of Air Conditioning, insulation was checked by visual inspection.

Approximations and generalizations were done at places with lack of information.

2.2 DATA ANALYSIS

In data analysis, the data collected is processed to draw significant conclusions to pinpoint loopholes and identify the areas to focus upon. Analysis of the power consumption observations obtained was used to obtain the power consumption pattern and also to get the information about the points where electric power is wasted.

2.3 RECOMMENDATION

Energy as well as cost analysis of different appliances were performed and recommendations were made based on the capital cost recovery time.

Following were the steps involved in this process:

- The capital cost involved in replacing an appliance and/or process was estimated. The energy saving by the move was calculated in terms of price of energy per year.
- These two costs were compared to calculate the capital cost recovery time which is defined as the total time by which the saving in energy bill balances the capital cost involved.

If capital cost recovery time is less than the product life, the move can be supported. Some other recommendations were also made which are based on lighting intensity, AC insulation etc.

3. ANALYSIS OF POWER CONSUMPTION

With the use of MS-Excel, we have analysed the power consumption by equipment, application as well as location. Here is the summary of the analysis presented in form of charts for better understanding.

3.1 OVERALL CAMPUS

There are 16 classrooms, 04 laboratories, 3 staff rooms, one auditorium, one central canteen, one hostel and supporting infrastructures like central library and administrative block (Main Building) in Asian Group of Colleges campus. The campus has a connected load of 8kW. The consumption detail for last 12 months from November 2024 to October 2025 is as shown graphically below. The College has already installed the Grid connected Solar Power Plant of 11.7kW, which is generating 40-50kWh per day depending upon the season. The electricity power consumption per month is after the reduction of power generated by the Solar Plant as per PSPCL bill.

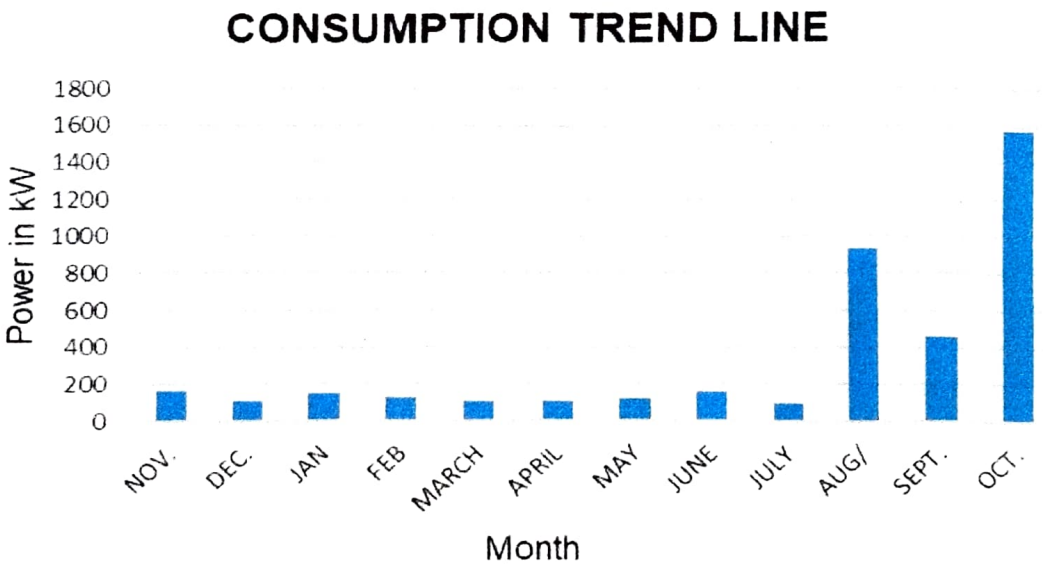

Fig. 3.1 Variation of Power Consumption Per month

The following figure shows trend line for kVAh consumption in 2024-25

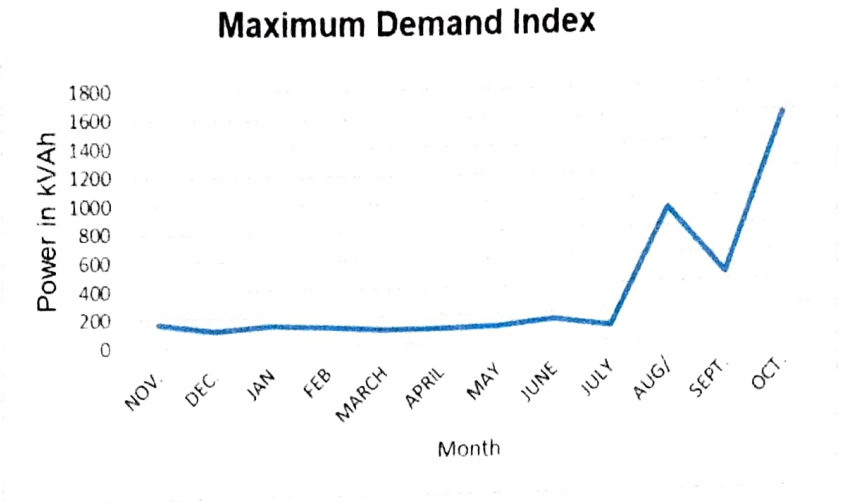

Fig 3.2 Trend line for kVAh consumption

From the above trend lines, it is seen that power consumption is peaking in month of August and October reflected in bills for month of November. The power factor is havering around 0.90.

3.1.1 LOCATION WISE ANALYSIS OF CAMPUS:

The location wise distribution of power consumption in the campus has been shown in the following chart

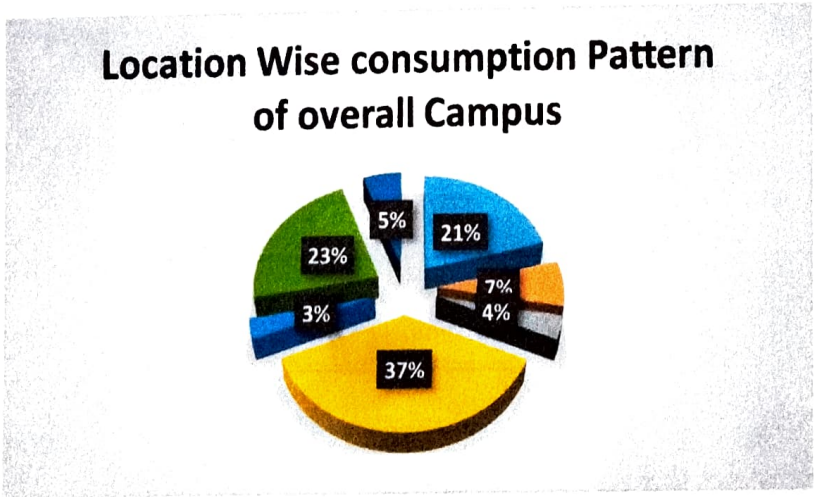

Fig 3.3 Location wise consumption pattern

As the chart suggests, major power consuming areas are central facilities (23%) and classrooms (37%). After that there are laboratories & auditorium (21%), hostel rooms (7%), toilets (5%), other offices (4%), canteen (3%).

Laboratories & auditorium with 21% share in power consumption are very important area to focus for improving energy efficiency of the campus. In case of computer labs, wise use of computers and ACs is required to reduce the consumption. In other auditorium also, wise use of lighting and other appliances can largely reduce the consumption.

Rooms in hostels are major contributor to energy inefficiency due to poor practices. Also, for any replacement of old light fittngs, it is advised that LED tube lights should be used for lighting and star rated/BLDC fans should be used. Corridors and toilets are the areas where automation through use of sensors can be used to reduce the consumption largely.

3.1.2 APPLICATION WISE ANALYSIS OF CAMPUS:

Application wise analysis of overall campus has been carried out to find out the application areas with relatively higher power consumption. The results of the application wise analysis of power consumption in Asian College of Education have been summarized in the following chart

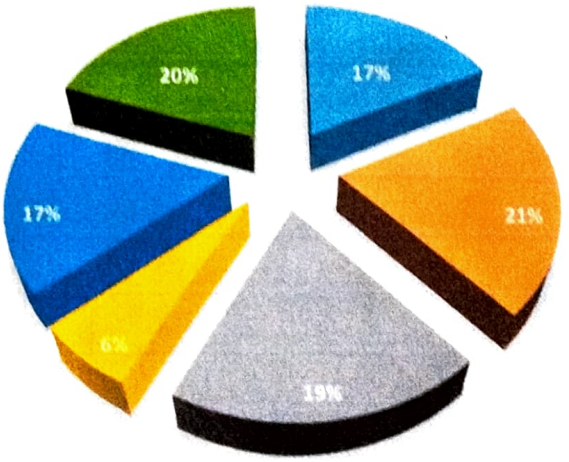

Fig 3.4 Application wise consumption pattern of overall campus

It's quite clear from the chart that maximum power is used in comfort applications (16%) such as room coolers, air conditioners, room heaters etc. To reduce the consumption in these applications, awareness about the energy conservation is very important and effective step.

Lighting with 21% of total power consumption is an application where energy efficiency can be achieved very easily by replacing old appliances by new efficient ones.

Office applications include computers, printers, scanners, Xerox machines etc. and contribute as high as 17% of total consumption. Replacing CRT monitors by LCD monitors can drastically reduce consumption of this application area.

Air circulation appliances (fans) having share of 17%, are also among major culprits in energy inefficiency.

Washing/bathing/cleaning include geysers, water coolers, water purifiers etc. accounting for 6% of total consumption.

Others include various load on power plugs which has a share of 20% of load.

3.1.3 EQUIPMENT WISE ANALYSIS OF CAMPUS:

Equipment wise analysis has been performed in order to identify the equipments, within same application area, which consume more power as compared to others. During equipment wise analysis of the overall campus, the equipments with power consumption less than 1% of total power consumption of the campus were ignored so as to make the analysis results simple and easy to observe. Following chart summarizes the results of equipment wise analysis of power consumption

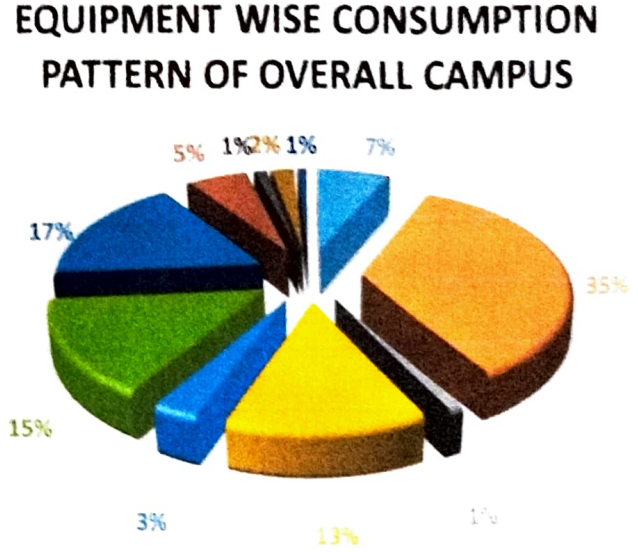

Fig 3.5 Equipment wise consumption pattern of overall campus

AC consumes 17% of total power. For lighting, dominant appliance is the conventional Ballast [Choke] tube light with 13% share and relatively efficient electronic Ballast[Choke] tube lights and lamps have negligible share. CFL & LEDs have 3% share in total power consumption.

Computers also have a contribution of 15% to total power consumption.

Resistance regulated fans have 42% share (35% new fans and 7% old fans) and electronic regulated fans and efficient wall fans have negligible share in total power consumption.

Geysers with 5% share in total consumption are another significant contributor. Water coolers (2%) and refrigerators (1%) are other significant appliances.

3.1.3.1 Classrooms

The college has 16 classrooms having 64 FTLs including a very few LED baton lights and 96 fans. The following pie chart shows the energy usage of fans viz a viz FTLs.

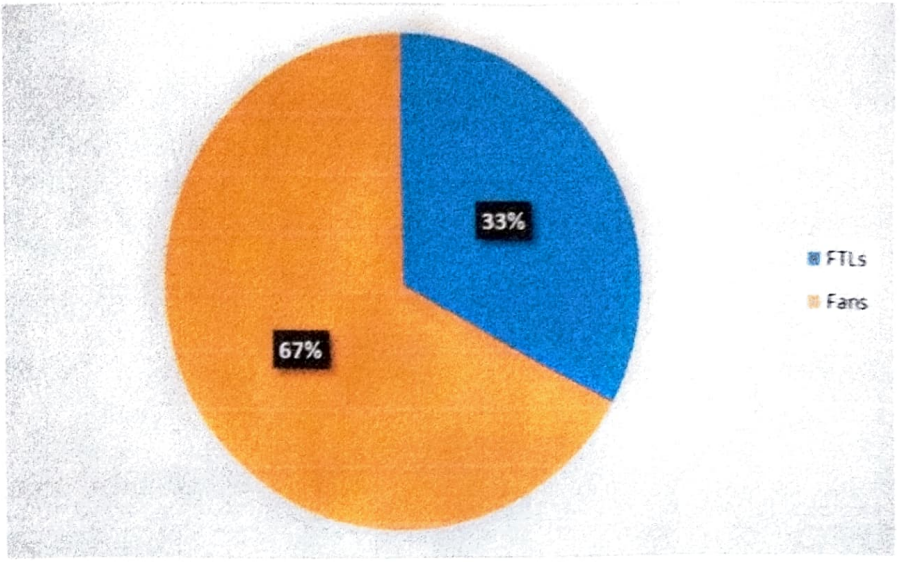

Fig 3.6 Equipment wise energy consumption in classrooms

3.1.3.2 Laboratories

The College has 4 different laboratories including the computer laboratories and one store. The total number of fans is 25 and FTLs is 20 (approx.) including mirror optic fittings installed in computer labs, 2 exhaust fans, 2 wall fans, two LED lamps, on 2 split ACs. The energy consumption distribution is as shown below:

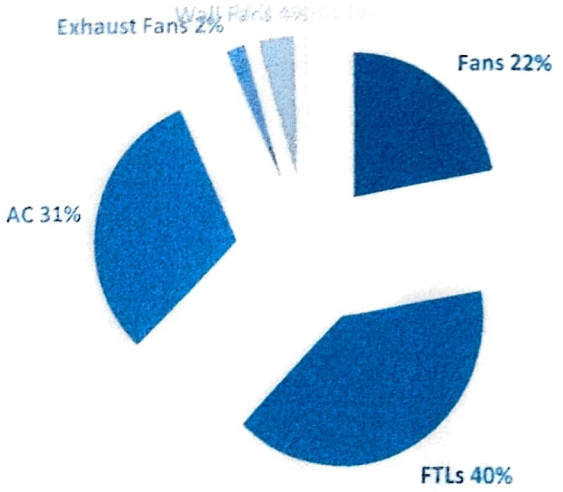

Fig 3.7 Equipment wise energy consumption in Laboratories

3.2 HOSTELS

There are in one hostel in Asian College of Education, Patiala having 8 rooms. The Capacity of the hostel is approximately 50-55 students.

Most of the rooms are 6-8 seaters. Each room having, six tube light and four ceiling fans.

3.3 INSTITUTE CENTRAL FACILITIES

The energy audit of following units has been conducted and analyzed under Institute Central Facilities:

1. Administrative Block
2. Central Library
3. NSS & NCC rooms
4. Canteen
5. Management & Principal Office
6. Others which include Sports complex, Auditorium.

3.3.1APPLICATION WISE ANALYSIS OF INSTITUTE CENTRAL FCILITIES:

Application wise analysis of power consumption in College Central Facilities indicates the domination of comfort (AC, room cooler, room heater etc.) and office (computer, printer, scanner, xerox machine etc.) appliances in these units and others include Refrigerator, water cooler, coffee machine and power plug load. Following chart gives the distribution of power consumption among different application areas in Institute Central facilities:

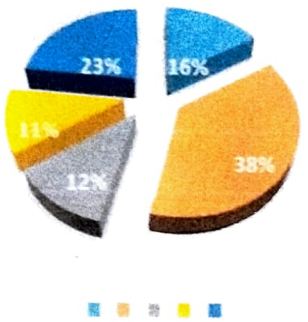

Fig 3.8 Application wise Analysis of Central Facilities

Comfort has a maximum of 38% share in total power consumption. Most of the places in the Institute Central Facilities are air conditioned and also their usages are relatively higher.

Office appliances have a share of 11% and dominant in this is the consumption of computers. During the data collection, most of the computers in Library, Computer Center as well as in offices were found to be in standby mode.

Lighting accounts for 12% of the total power consumption in Institute Central Facilities. Here dominant lighting appliance shifts from conventional tube lights & CFLs with LED. Most of the places in Institute Central Facilities use FTLs for lighting.

The per cent consumption of air circulation appliances is as low as 16% due to use of old fans. Other major loads share 23% of the total power.

3.3.2 EQUIPMENT WISE ANALYSIS OF INSTITUTE CENTRAL FACILITIES:

Equipment wise analysis of power consumption in Institute Central Facilities makes the picture clearer. Following chart summarizes the results

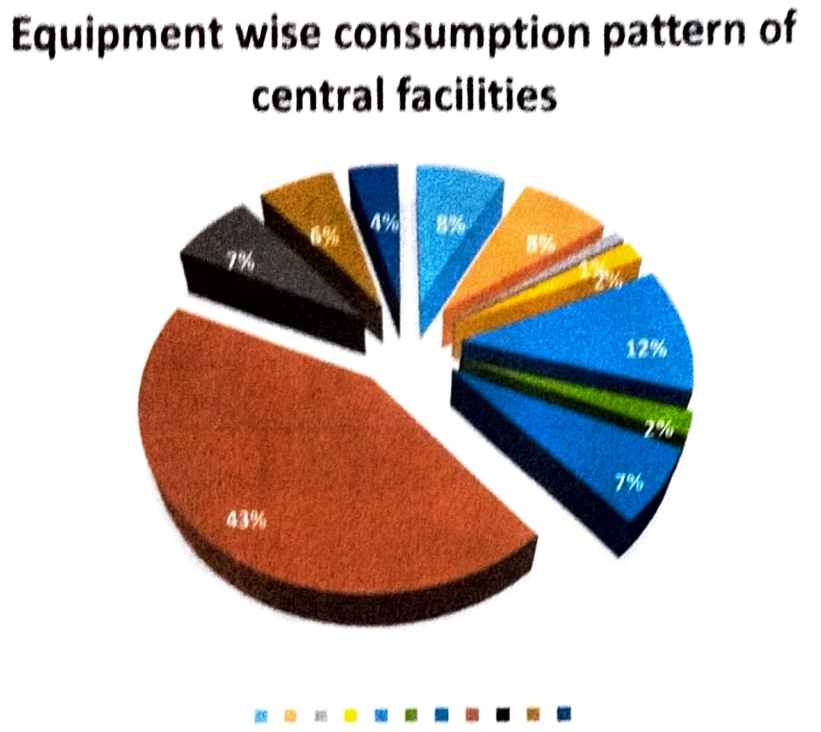

Fig 3.9 Equipment wise Analysis of Central Facilities

It is important to state here that this equipment wise analysis has been carried out by ignoring a large number of appliances having consumption less than 1% to make the analysis work simpler.

ACs are found to be consuming as much as 43% of the total power consumption in Institute Central Facilities.

Computers account for 7% of total power consumption in Institute Central facilities.

CFLs and conventional tube lights have shares of 2% and 12% respectively in the total power consumption of Institute Central facilities.

Fans account only for 19% (8% new and 8% old) power consumption.

3.4 Exterior Lighting

LED lights, 1000W each, 08-12 are dominant lighting source in the external lighting.

3.5 Solar Power Plant

The Asian College of Education, Patiala has already Installed 11.7 kW Grid connected Solar Power Plant to extract the Solar Power as a renewable energy source. The power generated from solar power plant is integrated with the LT supply. The generated electricity can be used directly during the day. The approximate generation from solar power plant lies 40-50 kWh per day depending upon the available sunlight.

3.6 Power Supply System

The Power Supply to the Asian Educational Institute is sourced from:

- Transformer -Punjab State Power Corporation Limited with Load of 94.58 kW
- DG Sets – 2 Nos. DG sets of 50 kVA & 5 kVA rating.

The Three Phase, Four Wire 415/230V is obtained from the PSPCL Transformer. The rated specifications of the transformer & DG Sets are given below:

Transformer:

Rating of Transformer:	100kVA, 3-Phase, 4-Wire
Voltage Rating:	415/230V
Current Rating:	140 Ampere
Frequency:	50Hz
Connections:	Delta/Star

Fig.3.10 PSPCL Transformer

3.7 DG Set Details:

Table-1 DG Set Details

Diesel-Generator Details			
Engine		AC Generator	
Make: Mohindra & Mohindra		Make: Stamford	
Model	4725GM	Rated (kVA)	50
Rated (HP)/Kw	72/53	Voltage (Volts)	415
Engine No.	V4E10S2542	Current (Amps)	70
		Power Factor	0.8
		Speed (rpm)	1500
Year of Mfg	31 May 2010	Year of Mfg	2010

FIG 3.11 DIESEL GENERATOR

TABLE-2 ANNUAL ENERGY CONSUMPTION DATA

Particulars	Values
Power Supply from PSPCL Transformer	Asian College of Education has one Utility Transformer connection from Punjab State Power Corporation Limited with load of 94.58 kW. Billing is done on kVAh basis.
Supply Voltage	415/230V
Units Billed (PSPCL supply)	Period from November 2024 to October 2025 4111 kWh (after reduction of Solar Power Generation Units) Annual Bill: Rs 42,330
Self-Generated Power through DG Set	Two DG sets of 50 kVA & 5 kVA rating are installed in the College. There is no energy meter installed on the DG sets; thus, the annual kWh generation is not available. The 1/3 of the total power generated by the DG is used by Asian College of Education.

Solar Power Plant	11.7 kW Grid connected solar power plant, generating 40-50 units per day depending upon the Sun Light/sessions.
Particulars	**Values**
Total Power Consumption & Bill	
Annual Electricity Consumption (PSPCL Connection + DG Power)	Period: Oct.-24 to Oct.-25 Transformer: 4111 kWh per annum DG Power 3200 kWh per annum **Total 7311 kWh per annum**
Energy Bill (PSPCL Connection + DG Set)	Period: Nov.-24 to Oct.-25 PSPCL: Rs 42330 per annum DG Power Rs 36000 per annum **Total Rs 78330 per annum**

Table-3 Annual Energy Consumption in TOE Terms

Source of Energy	Annual Consumption	Calorific Value	kCal/annum	TOE/ annum	Total Bill (Rs/ annum)
Power Purchased from the PSPCL	4111 kWh	860 kCal/ kWh	3535460	0.35	42330
HSD for DG Sets	400Ltr	9783 kCal/ltr	3913200	0.39	36000
Total				**0.74**	**78,330**

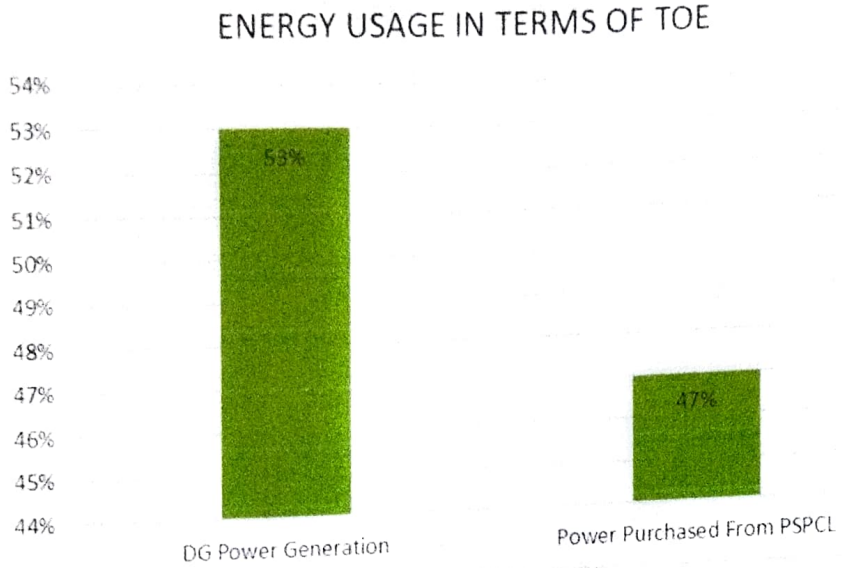

Fig 3.12 Energy Usage in Terms of TOE

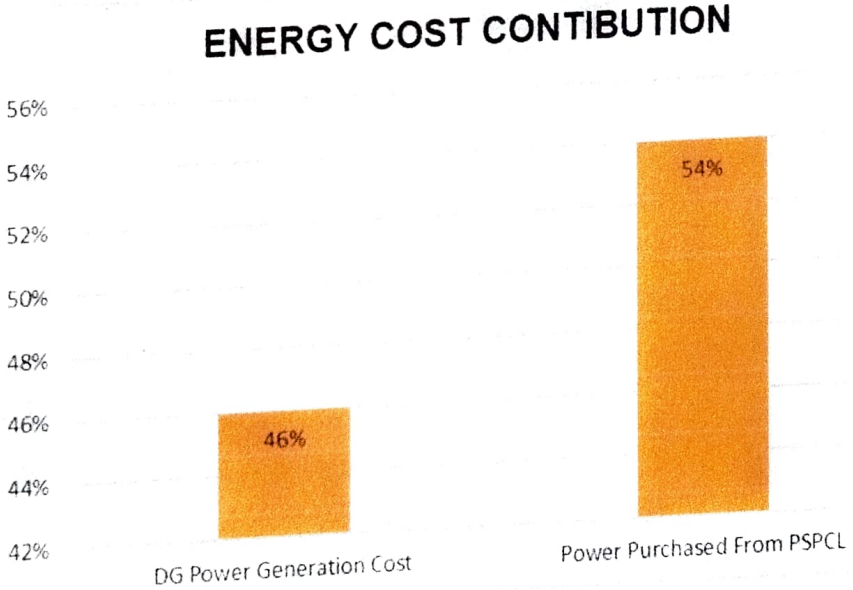

Fig 3.13 Energy Cost Contribution

4.RECOMMENDATIONS FOR BETTER ENERGY EFFICIENCY

Based on the analysis of the power consumption data, certain steps have been recommended for improving energy efficiency of the campus. Complete cost analysis of implementation of recommended measures has been performed wherever necessary. Also, a number of general measures for energy efficiency have been listed. Described below are some important recommendations for better energy efficiency:

TABLE-4 DETAILS OF INSTALLED EQUIPMENT'S IS AS FOLLOWS

S.NO.	EQUIPMENT	RATING (WATTS)	NUMBER	TOTAL LOAD (KW)
1	CEILING FANS	60	170	10.2
2	FLUORESCENT TUBE LIGHTS	40+5 BLAST LOSS =45	165	7.42
3	LED TUBE LIGHTS	28 (FOR SAME LUMENS)	25	0.7
4	FLOODLIGHTS	1000	10	10.00
5	AIR CONDITIONERS	2500	10	25.0
6	SUBMERSIBLE PUMP	1500	1	1.5
7.	PARK LIGHTS	200	10	2.0
TOTAL LOAD				**56.82**

4.1 AIR-CONDITIONING SYSTEM:

BETTER PRACTICES FOR AC:

The Asian College of Education has in total 10 ACs which make a very large part of total energy consumption of the campus. Most of the AC's are without star rating. Also, there are several non-star rated / 2 star rated ACs. Some of them are very old and consume lot more energy than the models available today.

Summarized below are some guidelines for most efficient use of ACs:

Proper Insulation – Good quality insulation must be maintained in the air-conditioned rooms by keeping all doors and windows closed properly so as to prevent cool air go out and hot air come in.

Curtains – Always keep curtains on windows to prevent direct sunlight inside the room to avoid heating of cooled air. This reduces AC load significantly.

Maintenance – Proper maintenance and cleaning of ACs is required at regular intervals to make it work at highest efficiency. Any dirt in filter may reduce efficiency of ACs very significantly.

Operating – The ACs should be switched on 15 minutes before actual use and should be switched off before leaving the room.

RECOMMENDATIONS: -

Replacement of 2 Star ACs with 5 Star Rated / Inverter A/Cs

Star rating of ACs is a dynamic & continuous process and the Indian Seasonal Energy Efficiency Ratio of the ACs is upgraded from time to time. However, it is not viable to replace all the ACs and upgrade them to the latest star rating levels. Therefore, the Institute could consider replacement of ACs of 2 star/ non-Star rating with five star rated / inverter ACs.

With technology advancements, today the 5 Star rated split ACs have an energy efficiency ratio of more than 3.5 w/w as against 2.62 w/w for the existing 2 star/non-star ACs. Therefore, replacement of the 2 Star/non-star ACs with 5 star rated / Inverter ACs has been suggested. Initially 05 number ACs should be replaced in the first stage.

TABLE-5 ENERGY SAVING, INVESTMENTS & SIMPLE PAYBACK PERIOD

PARTICULARS	EXISTING 2 STAR RATED ACS	NEW 5 STAR RATED / INVERTER ACS
DESIGN COOLING CAPACITY	6245 W	6245 W
DESIGN POWER INPUT	2385 W	1787 W
DESIGN SPECIFIC POWER CONSUMPTION	1.34 KW/TR	1.0 KW/TR
DESIGN ENERGY EFFICIENCY RATIO	2.62 W/W	3.50 W/W
EQUIVALENT POWER SAVING	0.60 KW PER AC	
NUMBER OF 2 STAR A/CS CONSIDERED FOR REPLACEMENT	05 NOS	
TOTAL POWER SAVING	3.0 KW	

Particulars	Existing 2 star rated Acs	New 5 star rated / Inverter Acs
Working Hours per annum (08 hrs/day x 200 days/annum)	2100 hrs/annum	
Annual Power Saving	6300 kWh/annum	
Weighted average power rate	Rs 10.54 per kWh	
Monetary Benefits	**Rs. 66,402/annum**	
Estimated Investment (for 05 AC's each with cooling capacity of 6245 watts)	Rs. 2.0 Lakhs	
Simple Payback period	36-37 months	
Annual reduction in TOE	0.54 TOE/annum	
Annual Emission Reduction	0.52 tCO2/annum	

4.2 Replacement of conventional lights with LED Lights

The conventional tube lights (TL) have low efficacy and can be replaced by the high efficacy LED lights for the same lumen output. Therefore, it is suggested that conventional Lights

(approximately 95 number out of total 190 tube lights) which are yet to be replaced may be replaced with energy efficient LED lights of appropriate rating.

Table-6 Energy Saving, Investments & Simple Payback Period

Existing Scenario				Post Implementation scenario	
Type of Lights	Wattage	Qty	Total Wattage	Wattage of Proposed LED Light	Total wattage of new LED Lights
Tube Light	40+5 =45	95	4275	28	2660
Total			**4275**		**2660**

Particulars	Values
Power Saving Potential	1.62 kW
Annual Operational hours considering 50% utilization factor	1650 hours
Weighted average power rate	Rs 10.54 per kWh
Energy Saving potential	2673 kWh per annum
Net Monetary Benefit	**Rs 28,173 per annum**
Estimated Investment for 95nos of 28 W LED Tube Lights (@Rs 200 per LED light of 20 W)	Rs 19,000
Simple Payback Period	08-09 months
Annual reduction in TOE	0.23 TOE/annum
Annual Emission Reduction	0.23 tCO2/annum

Corridors and toilets have large potential of saving energy by use of automation tools. Motion sensors can be used there to automatically switch on the light when there is any movement and switch off the light when there is no movement. This can greatly reduce the total load in corridors and toilets.

4.3 Installation of Energy Efficient Ceiling Fans

As listed above around 170 ceiling fans are installed in the Education College campus.

These ceiling fans are of 60 W ratings.

With advancements in the technology, super-efficient ceiling fans having a power consumption of around 30 watts (Energy Efficient BLDC Motor Ceiling Fan) are now available these could replace the conventional 60 watt ceiling fans.

As a long-term measure, replacement with BLDC super energy efficient ceiling fans could be considered in a phased manner. As all the fans cannot be replaced in one go. Replacement could be considered as a failure replacement policy initially replacement of around 25% ceiling fans has been considered for estimation of savings

Table-7 Energy Saving, Investments & Simple Payback Period

Particulars	Values
Total number of ceiling fans installed	170 nos
Number of ceiling fans considered for initial replacement (25%)	50 nos
Average Power drawn by the existing ceiling fans	60 W
Average Power drawn by the new energy efficient ceiling fans	30 W

Particulars	Values
Net power saving per ceiling fan	30 W
Working hours per annum	2400 hrs per annum
Energy Saving potential	3600 kWh per annum
Weighted average power rate	Rs 10.54 per kWh
Monetary Benefit	**Rs 37,944 per annum**
Estimated Investment	Rs 1,05000
Simple Payback Period	36-37 months
Annual reduction in TOE	0.31 TOE/annum
Annual Emission Reduction	0.29 tCO2/annum

Cumulative Energy Efficiency Measures

Table-8 Cumulative Energy Saving Measures, Investments & Payback Period

Particular	Annual Energy Saving				Estimated Investment in Rs.	Simple Pay-back Period in (Months)
	kWh	TOE	tCO_2	Rs.		
Replacement of 2 star rated ACs with 5 Star Rated / Inverter A/Cs	6300	0.54	0.52	66,402	2,00000	36-37
Replacement of conventional lights with LED Lights	2673	0.23	0.23	28,173	19,000	8-9
Installation of Energy Efficient Ceiling Fans	3600	0.31	0.29	49,327	37,944	36-37
Total	**12,573**	**1.08**	**1.04**	**1,43,602**	**2,56,944**	**24-30**

Table-9 Energy Saving Potential

Particulars	In Monetary terms	In TOE Terms
Power Purchased from PSPCL	Rs 42,330/annum	0.35 TOE/annum
HSD for DG Sets	Rs 36000/annum	0.39 TOE/annum
Total	**Rs 78,330/annum**	**0.74 TOE/annum**
Energy Savings Identified	Rs 1.22 Lakhs/annum	0.90 TOE/annum
Percentage Energy Saving Potential	**64%**	**82%**

Lighting

- Wipe lamps clean at regular intervals. Lamps that are exposed to substantial amounts of dirt, dust, grease, or other contaminants should be cleaned more frequently than lamps in a relatively clean atmosphere
- Maintain luminary efficiency by properly cleaning the reflecting surfaces and shielding media
- Replace lens shielding that has yellowed or become hazy with a clear acrylic lens with good non-yellowing properties. A clear glass lens can be considered if it is compatible with the luminary and does not present a safety hazard
- Clean ceilings, walls, and floors frequently to improve reflective qualities
- If day lighting contributes to lighting, wash windows frequently to maintain illumination levels
- Replace all lamps used for area illumination after they have been in service for a substantial portion (approximately 70 percent) of their rated life, instead of simply replacing lamps one at a time as they burn out.

Fans

- Check for excessive noise and vibration and correct as necessary
- Clean fan blades
- Inspect and lubricate bearings regularly
- Inspect drive belts for proper tension. Adjust or replace as necessary to ensure

proper operation

- Keep inlet and discharge screens on fans free of dirt and debris