

# GOVERNMENT COLLEGE ROPAR

(Affiliated To Punjabi University, Patiala)



**Criterion 7 –Institutional Values and Best Practices**



# Government College Ropar

## Energy Audit





To

Government College Ropar

Rupnagar - 140001

Punjab, India

Subject: Energy Audit Report.

Sir,

Please find enclosed herewith the Energy audit report of Government College Ropar, Rupnagar, Punjab.

Dr. Sarbjeet Kaushal  
Incharge  
Testing & Consultancy Cell  
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Enclosed: As above



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# **ENERGY AUDIT REPORT**

## **For**

### **Government College Ropar**





## PREFACE

Data collection for energy audit of the Government College Ropar was carried out by the team during June, 2023. This audit was carried out to look for ways to improve the campus's energy efficiency. The fundamental goal was to reduce energy use while maintaining or improving human comfort, health, and safety. This audit tried to find the most energy-efficient appliances in addition to merely analyzing the patterns of energy consumption. Additionally, some routine maintenance procedures for typical appliances have been offered that may aid in lowering energy consumption.

The report provides information on the academic area's energy usage patterns based on a detailed analysis of the audit's data and a real-world inspection of the central facilities, hostel, and academic area. Utilizing the appropriate technology, the work includes tracking consumption by geographic area. The report develops a list of feasible measures to preserve and utilize the few resources that are now accessible, and their potential for cost savings was also noted. The best possible implementation of the recommendations is something we anticipate from the administration, students, and staff.

Where appropriate, the report relies on generalizations and approximations. The opinions stated might not represent the majority perspective. They only reflect the team's viewpoint as determined by the consumer interviews.



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## 1. INTRODUCTION

Government College Ropar, one of the premier institutions of modern Punjab, is the legacy of pre-partition days. Late S. Baldev Singh, the first defence minister of free India deserves special mention. He was the man whose vision and personality ultimately led to the establishment of this college on 6th June 1945. The foundation stone of the main block of the college was laid in 1949 & the main building was completed in 1951. Later, two more buildings, one for the Geography deptt. and other for the Physical Education department were constructed. The college also has spacious library block, an auditorium, an open-air theater vast play round and a boys' hostel, apart from principal's and Hostel Supdt.'s residence, lecture theaters, laboratories, class rooms and well-maintained lawns. This institute serves the needs of a large number of pupils from nearby villages and small towns. The college is affiliated to Punjabi University, Patiala and offers graduate as well as Postgraduate level courses.

### 1.1 OBJECTIVE OF ENERGY AUDIT EXERCISE

The objective of Energy Audit is to promote the idea of Energy Conservation in the Campus of Government College Ropar. The goal 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.
- The identification of potential applications for co-generation and renewable energy sources (such solar energy) and recommendations for deployment, whenever practical, with cost-benefit analysis.

### 1.2 ANALYSIS OF AREA OF USE





To identify where energy is consumed is beneficial since it identifies the areas that the audit should concentrate on and increases knowledge of energy consumption and cost. The research findings can be applied to the evaluation of management systems and practices for energy usage control.

Submeters can be installed in various plant locations to track actual energy usage per area, allowing for the analysis of energy use. This is a reliable data source for dividing up energy use. The facility manager can also provide a list of every piece of apparatus used and its associated operating times. With this data, a spreadsheet may be made, and charts that are good for analysis can be produced.

#### **Important Points to Consider When Collecting Load Data:**

- a) **Usage** -The usage of the equipment in terms of hours per day and days per year can be obtained from key personnel in hostels, departments, etc. The potential for energy savings depends in large part on the efficient allocation of the equipment's running hours, so it is crucial to maintain the correctness of this data.
- b) **Actual Power consumed**- Actual power consumption is gauged using Wattmeters.
- c) **Additional Data** - Additional data is also gathered, including the insulation level of air conditioners and the presence of natural light.

### **1.3 IDENTIFICATION OF TARGET AREAS**

From the simplest energy-saving opportunities, like lighting upgrades, to the most challenging ones, like the construction of a cogeneration plant. Following the initial identification of prospects, more work should be spent on those that have quicker payback times.

### **1.4 COST BENEFIT ANALYSIS**

The identified energy conservation opportunities should be analyzed in terms of the costs of implementing the project versus the benefits that can be gained.

### **1.5 ACTION PLAN TO SET IMPLEMENTATION PRIORITY**

Once the cost-benefit test has been passed, an action plan should be created to guarantee that the opportunities found are taken advantage of. All of the crucial actions for putting the opportunity into practice should be listed in the action plan, together with the individuals in charge. A plan for tracking the outcomes should also exist.





## 2. ENERGY AUDIT METHODOLOGY

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

1. **Data Collection** – In the preliminary data collection phase, data collection was performed using different tools such as observation, interviewing key persons, and measurements.
2. **Data Analysis** - Detailed analysis of data collection was done.
3. **Recommendation** – A few measures for reducing power usage without compromising comfort and satisfaction were suggested along with a cost analysis based on the findings of data analysis and observations.

### 2.1 DATA COLLECTION

It is first required to understand the power consumption pattern in detail before offering any corrective methods to reduce power consumption. A thorough data collection activity was conducted for this at all the departments, academic centers, hostels, and others like the library, computer, etc.

**For data gathering, the following steps were taken:**

- The team visited each department, centre, hostel, etc. Observation and questionnaire were used to gather data about common electrical appliances.
- The amount of power utilised by appliances at their rated power (using CFLs as an example).
- Key individuals such as the Warden (for hostel) or caretaker (for departments) were interviewed to learn more about how the appliances were used.
- When it came to air conditioning, insulation was examined visually.

### 2.2 DATA ANALYSIS

In data analysis, the gathered information is processed to derive significant conclusions that can be used to detect problems and focus on certain areas. Analysis of the power consumption measurements revealed the patterns of power consumption as well as the sites where electrical energy is wasted.



## **2.3 RECOMMENDATION**

Energy and cost studies of various appliances were conducted, and recommendations based on the capital cost recovery period were made.

Following were the steps involved in this process:

- A capital cost estimate was made for replacing a process or an item. The amount of energy saved by the change was determined using the annual cost of energy.
- The capital cost recovery time, which is defined as the entire amount of time it takes for the savings in energy expenses to equal the capital costs involved, was calculated by comparing these two prices.

## **3. ANALYSIS OF POWER CONSUMPTION**

We have examined the power usage by equipment, application, and location. Here is a summary of the analysis that has been provided as charts for easier comprehension.

### **3.1 OVERALL CAMPUS**

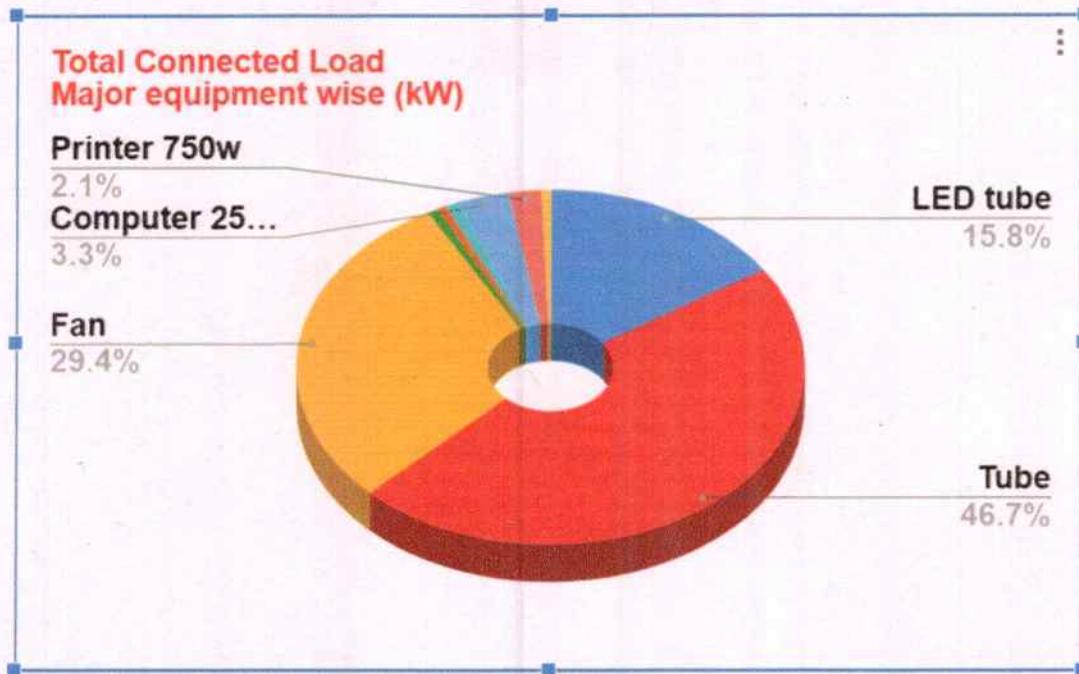
There are 1 hostels, Six academic blocks and supporting infrastructures like library, Auditorium and canteen in Govt College Ropar campus. The campus has a sanctioned load of 48.1KW against which the college is consuming 27.39KW (approx.)

### **3.2 APPLICATION WISE ANALYSIS OF CAMPUS:**

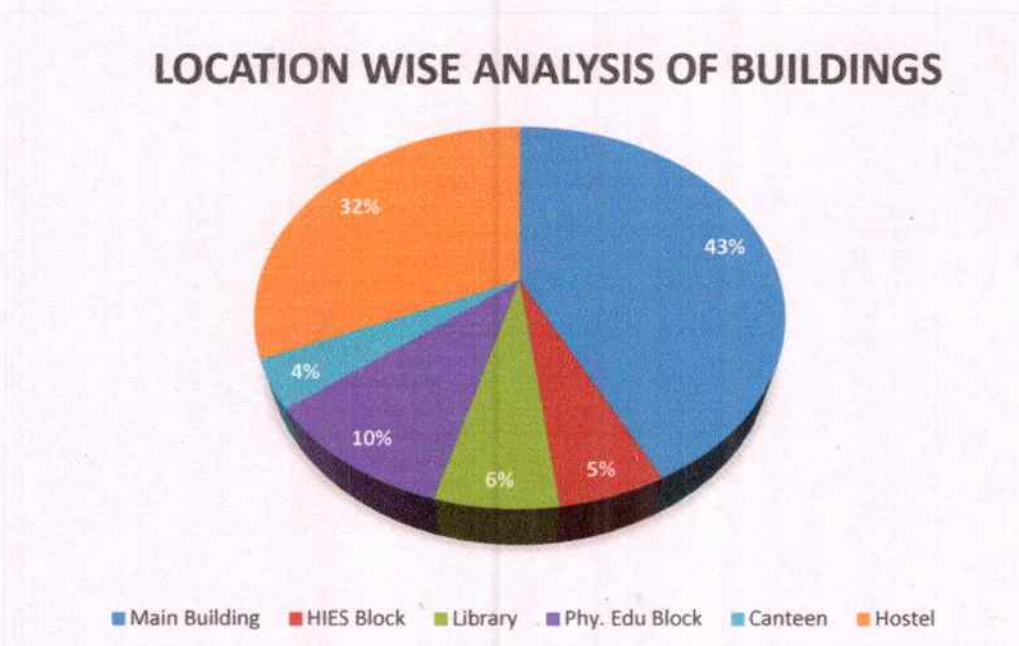
Application wise analysis of overall campus has been carried out to find out the application areas with relatively higher power consumption. The results of the application wise analysis of power consumption in Govt College Ropar campus have been summarized in the following chart







**3.3 LOCATION WISE ANALYSIS OF BUILDINGS** Application wise analysis of power consumption in Institute Central Facilities indicates the domination of comfort 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:



- **Energy load & consumption patterns**

Full detail of equipment available in the college is shown in following table

| Equipment         | Number | Wattage (W) | Total Load (kW) |
|-------------------|--------|-------------|-----------------|
| LED tube          | 205    | 20          | 4.1             |
| Tube              | 608    | 40          | 2.432           |
| Fan               | 383    | 80          | 3.838           |
| Wall Fan          | 9      | 80          | 0.72            |
| Exhaust Fan       | 7      | 1000        | 7               |
| Exhaust Fan       | 11     | 200         | 2.2             |
| Computer 250 w    | 43     | 250         | 1.075           |
| Printer 750w      | 27     | 750         | 2.025           |
| Interactive Panel | 8      | 500         | 4               |

#### 4. Action Plan:

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:

##### 4.1 Replacing Conventional Ballast [Choke] FTLs With Led:

The dominant light source at most places in the campus is traditional 40W FTLs with conventional Ballast [Choke] which consumes 8-10W. As per our data collection, the campus has in total 608





conventional Ballast [Choke] FTLs. If these conventional Ballast [Choke]s are replaced by LED FTL, a lot of power can be saved

Total No. of conventional Ballast [Choke] FTLs in Campus = 608

Average Power of conventional Ballast [Choke] FTL = 52W

Average Power of LED FTL = 28W

Power saved per FTL =  $(52-28) \text{ W} = 24\text{W}$

Total Power saving =  $608 * 24\text{W} = 14592\text{W} = 14.59\text{kW}$

Average Use of FTL per year =  $200 * 7\text{h} = 1400\text{h}$

Total Energy saved per year =  $14.59 * 1400 \text{ kWh} = 20426\text{kWh}$

Saving in Rs. Per year =  $20426 * 9 = \text{Rs. } 183834$

Average Cost of Replacing each FTL = Rs. 300

Total Cost of Replacing all Conventional Ballast [Choke] FTLs =  $300 * 608 = \text{Rs. } 182400$

Capital Cost Recovery time =  $183834 / 182400 = 1 \text{ yr}$

Hence, the capital cost recovery time for replacing all conventional Ballast [Choke] FTLs of the campus is around 1 year Approx.

#### **4.2 Replacing Old Fans With New Fans**

Most of the buildings in the college campus are very old fans. According to the data collected, there are a total of 383 fans. A saving of 44 W per fan can be obtained by replacing the old fans with new ones.

##### ***Cost Analysis of Replacing old fans with new fans***

Total no. of old fans in campus = 383

Average power of old fan = 72 W

Average power of new fan (BLDC) = 28W

Power saved per fan = 44W



Total Power saving=  $383*44= 16.85\text{kW}$

Average use of fans per year=  $200*8= 1600\text{ hrs}$

Total Energy saved per year = $16.85*1600= 26960\text{ kWh}$

Saving in Rs. Per year = Rs 242640

Average Cost of Replacing per fan = Rs 2800

Total Cost of Replacing all fans = Rs 1072400

Capital Cost Recovery time = 4.42yrs

Hence, the capital cost recovery time for replacing all old fans is approx. 4.42 years.

  
Auditor Signature







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