Guru Nanak College, Budhlada

NAAC Accredited 'A' Grade, Star College Status by DBT Govt. of India &
Skill Hub Institute selected by NSDC, Govt. of India
Under the management of S.G.P.C. Sri Amritsar Sahib
Affiliated with Punjabi University, Patiala & Approved by AICTE

ENERGY AUDIT REPORT 2021-22

PRINCIPAL

DR. KULDIP SINGH BAL

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Energy Audit Team

We, the external Energy Audit Committee members carried out the Energy Audit of Guru Nanak College Budhlada- 151502 (Mansa) Punjab, assessed the energy consumption and energy conservation practices conducted in the Campus and supporting documents presented by the internal committee were examined and certified.

Internal Committee

1. Dr. Narinder Singh, Coordinator IQAC
2. Dr. Gurjasjeet Kaur Assist. Prof. Department of English
3. Dr. Rishi Kumar Assist. Prof. Department of Physics
4. Dr. Hardeep Singh Assist. Prof. Department of Physics

External Committee

Sr. No.	Name and Designation	Signature
1.	Dr Gulshan Kumar Jawa Associate prof. Department of Chemical Engineering & Technology SLIET Longowal (Punjab)	
2.	Sh. Jagmail Singh Rtd. S.D.O. PSPCL Budhlada (Punjab)	
3.	Dr. Jaspal Singh, Department of Sciences, Mata Sundari University Girls College, Mansa (Punjab)	16/4/2022
4.	Dr. Rajpal Singh, Department of Physics, Government Rajindra College, Bathinda (Punjab)	
5.	Dr. Prabhjot Singh, Department of Physics, Government Rajindra, College Bathinda (Punjab)	

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16 APR 2022

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1. Introduction

An energy audit is a survey in which the study of energy flows for the purpose of conservation is examined at an Organization. It refers to a technique or system that seeks to reduce the amount of energy used in the Organization without impacting the output. The audit includes suggestions of alternative means and methods for achieving energy savings to a greater extent. In general, the primary objective of an energy auditing and management of energy consumption is to offer goods or services at the lowest possible cost and with the least amount of environmental impact. The need for an energy audit is to identify the savings potential and cost reducing methods, understand the ways in which energy is used, where, the waste occurs and find the scope for improvement.

An energy audit is proposed and conducted to ensure that energy saving practices are implemented and followed in Educational Institutions and Industrial sectors in a sustainable way. Preparation and completion of a questionnaire, physical examination of the campus, observation and examination of documentation, key person interviews, data analysis, measurements and suggestions are all part of the audit process. Energy audit involves several facts including energy savings potential, energy management, finding alternatives, etc. With these facts in mind, the audit's specific objectives are to assess the competence of the

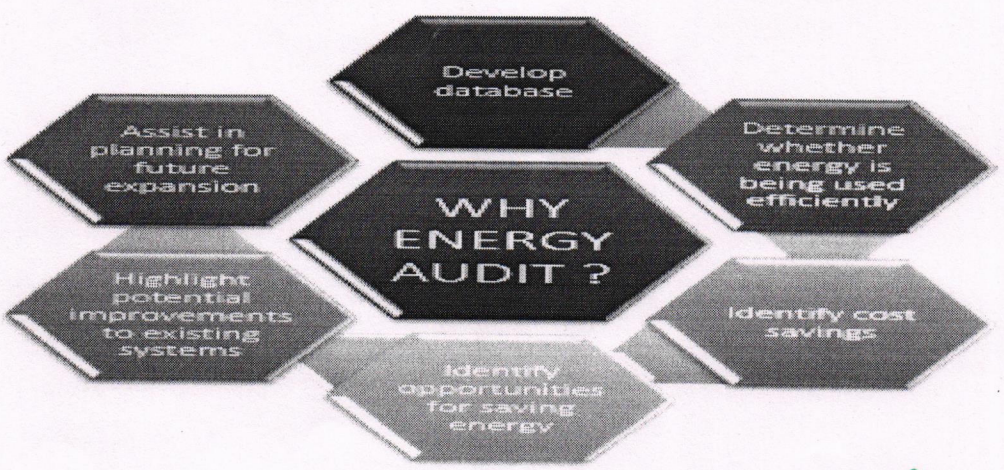
sustainability management and control system, as well as the departments' compliance with applicable rules, policies and standards.

Energy audit programme provide aid in maintaining a focus on energy price variations, energy supply availability and efficiency, determining an appropriate energy mix, identifying energy-saving technology, retrofitting for energy-saving equipment and so on. In general, an energy audit process dealt with the driving conservation concepts into reality by giving technically possible solutions within a specified time limit while also considering the economic and other organizational issues. It also dealt with the reveal ways to cut operating expenses or reduce energy usage in terms of savings.

2. Need for an Energy Audit

In any Organization, the three top operating expenses are often found to be energy, labour and materials. If one were to relate to the manageability of the cost or potential cost savings in each of the above components, energy would invariably emerge as a top ranker, and thus energy management function constitutes a strategic area for cost reduction. Energy Audit will help to understand more about the ways energy and fuel are used, and help in identifying the areas where waste can occur and where scope for improvement exists. The Energy Audit would give a positive orientation to the energy cost reduction, preventive maintenance and quality control programmes. In general, Energy Audit is the translation of conservation ideas into realities, by lending technically feasible solutions with economic and other organizational considerations within a specified time frame. The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. Energy Audit provides a Reference point for managing energy in the organization and also provides the basis

for planning a more effective use of energy throughout the organization. It also increases overall consciousness among the people working in institution towards an environment.



3. Aims and Objectives of an Energy Audit

An energy audit is a useful tool for developing and implementing comprehensive energy management plans of an Organization. The aim of an energy audit is to identify the energy efficiency, conservation and savings opportunities at the premises of the audit sites in a systematic manner. The audit process is carried out as per the following.

- Review of energy saving opportunities and measures implemented in the campus.
- Identification of additional various energy conservation measures and saving opportunities.
- Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management.
- Providing a technical information on how to build an energy balance as well as guidance to be sought for particular applications.
- Detailed analysis on the calculation of energy consumption, analysis of latest electricity bill of the campus, understanding the tariff plan provided by the central and State Electricity Board.
- List ways that the use of energy in terms of electricity, electric stove, kettle, microwave, LPG, firewood, Petrol, diesel and others.
- Analysis of electricity bill amount for the last years and amount paid for water consumption for human beings and watering to the plants.
- Use of incandescent (tungsten) bulb and CFL bulbs, fans, air conditioners, cooling apparatus, heaters, computers, photo copiers, inverter, generators and laboratory equipment and instruments installed in the organization (for example:60-watt bulb x 6 hours' x number of bulbs = kwh).

- Alternative energy sources / nonconventional energy sources are employed / installed in the organization (photovoltaic cells for solar energy, windmill, energy efficient stoves, Biogas, etc.).
- Creating awareness among the stakeholders on energy conservation and utilization.

4. Benefits of an Energy Audit

- **Reduced Energy Expenses:** The most obvious benefit is that the less energy the Organization uses, the less money that the Organization will have to spend on energy costs.
- **Identify Problems:** An energy audit can also help to identify any issues that the various equipment might have.
- **Personalized Recommendations:** It can help to learn about new energy-efficient technologies, to customize a plan, recommending which upgrades will give the most return on investment. These might include updated lighting systems, a new HVAC system, weatherization measures like insulation and air sealing, and more, which can significantly reduce energy expenses.

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- **Show Environmental Concern:** By taking steps to be more energy efficient, the Organization will be showing the employees and students that the organization cares about the impact on the environment.
- **Increased Property Value:** Using the recommendations of an energy auditor to make facility more energy efficient could also help to increase its overall worth. Things like solar panels, high-efficiency LED lighting, and weatherization procedures are all things that contribute to a higher property value.
- **Longer Equipment Lifespan:** An energy auditor might recommend to update some of the equipment for maximum energy savings. If the Organization decide to upgrade, it will not only save on energy costs, but also expect the equipment to last a long time.
- **Energy audit evaluation:** Energy audits will evaluate the Organization "as a whole", the goal is not to evaluate single measures but to consider a wide range of available alternatives (Electrical, Mechanical, Envelope and Water).
- **Energy audit Opportunities:** The audit will not only inform about the opportunities but also provide information with financial analysis. This will enable prioritization based on financial benefit and return on investment. It provides technical information regarding the proposed energy conservation measures.
- **Energy audit quality analysis:** A good quality audit will analyse the historical energy use and find potential issues using statistical methods. Provide information with emissions analysis to help understand the benefits of the decisions from an environmental standpoint. Understand where energy is used and which areas are worth focusing on the most. Provide benchmark information to help understand the energy use performance compared to others.

5. Energy Audit Methodology

In order to conduct an energy audit, several methods are adopted in the audit sites in which walk-through audit is conducted. The balance of total energy inputs with total energy outputs and identification of all energy streams in a facility are taken into account. The amount of energy used by each of its energy streams are calculated. During the audit, physical verification of Lighting, Ceiling, Table and Exhaust Fans, A/C machines, Solar panels, Heaters, Generators, Uninterrupted power supply machines and verification of installed energy efficient system's capacities are carried out. Inspection of when the cost or prospective cost savings in each of the above components are considered, energy always wins, and the energy management task becomes a key cost reduction area. The energy audit assisted in better understanding how energy and fuel are used in the Organization as well as identifying waste factors and development potential towards energy savings opportunities. Finally, after the audit process, the energy audit included suggestions for energy cost reduction, preventive maintenance and quality control activities, all of which are critical for the utility operations in the auditee (Organization).

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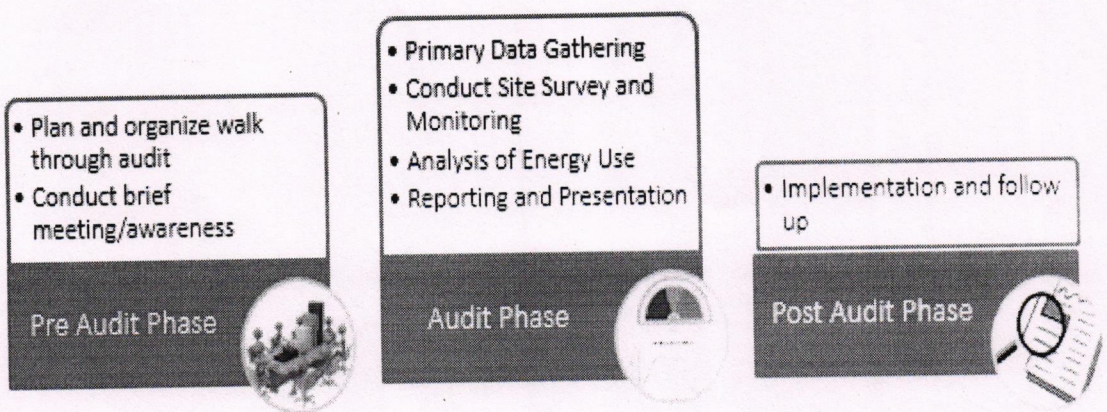
5.1. Detailed Energy Audit Methodology

A comprehensive audit provides a detailed plan for a facility, since it evaluates all major energy using systems. This type of audit offers the accurate estimate of energy savings and cost. It considers the interactive effects of all projects, accounts for the energy use of all major equipment, and includes detailed energy cost saving calculations and project cost. In a comprehensive audit, one of the key elements is the energy balance. This is based on an inventory of energy using systems, assumptions of current operating conditions and calculations of energy use. This estimated use is then compared to utility bill charges. Detailed energy auditing is carried out in three phases: Phase I, II and III.

Phase I - Pre Audit Phase
Phase II - Audit Phase
Phase III - Post Audit Phase



5.2. Comprehensive Energy Audit

Depending on the nature and complexity of the site, a comprehensive audit can take from several weeks to several months to complete. Detailed studies to establish, and investigate, energy and material balances for specific plant departments or items of process equipment are carried out. Whenever possible, checks of plant operations are carried out over extended periods of time, at nights and at weekends as well as during normal daytime working hours, to ensure that nothing is overlooked.

The audit report will include a description of energy inputs and product outputs by major department or by major processing function, and will evaluate the efficiency of each step of the Organization. Means of improving these efficiencies will be listed, and at least a preliminary assessment of the cost of the improvements will be made to indicate the expected payback on any capital investment needed. The audit report should conclude with specific recommendations for detailed engineering studies and feasibility analyses, which must then be performed to justify the implementation of those conservation measures that require investments. The comprehensive energy audit may be useful to identify the consuming areas to be surveyed during the audit and to identify any existing instrumentation/ additional metering required. A care should be taken to identify the instrumentation required for

carrying out the audit and to plan with time frame including the collection macro data on major energy consuming centers. It will be definitely useful for energy management towards energy savings opportunities.

6. About the College

Guru Nanak College, affiliated to Punjabi University, Patiala (listed in 12(b) & 2(f) sections of UGC Act 1956) is situated on the outskirts of Budhlada city - a small town of district Mansa in Punjab. To tribute the 500th birth anniversary of **"Sri Guru Nanak Dev Ji",** it was started in 1971 by some eminent personalities of the region to keep in mind the noble cause of making affordable education accessible to all the people of this backward, rural and remote area. In the beginning, it was functioning under the local management but later on handed over to SGPC (Shiromani Gurdwara Parbandhak Committee, Sri Amritsar Sahib), an apex and philanthropic body of the Sikhs committed to serving humanity, on 09 November 1994 due to meagre financial resources and some other executive problems. It was followed by some significant reforms in both college functioning and infrastructure. The growth of the college has been at a phenomenal pace since 2008 with a radical adjustment in a number of courses, faculty, infrastructure and other teaching learning resources. At present, it has become the foremost organization in the area, having 16 PG and 12 UG courses (including 03 skill-development vocational and industry oriented courses), 151 faculty members, 4446 students (2042 girls and 2404 boys) with state-of-the-art infrastructure and technology to provide quality education. In addition to it, the institute was awarded 'A' grade assessed by NAAC in1st cycle during 2017.

6.1. Motto, Vision, Mission and Objectives, Quality Policy

Motto- earning with Perseverance; Rising with Honour

Vision- 'Enlightening Human Minds and Social Empowerment through Education'

Mission- Transforming the youth into a productive asset of society through value-based quality education focusing on their all-round development so that they are able to contribute to the progress of society to their utmost potential.

Objectives-

- ✓ To achieve excellence in teaching and learning.
- ✓ To inculcate social, moral and spiritual values among the students.
- ✓ To sensitise the students towards social issues and make them responsible citizens.
- ✓ To make the students skilled and productive.
- ✓ To groom the students intellectually with a scientific temper, providing congenial ambience.
- ✓ To enable the youth to become tomorrow's leaders of change.

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- ✓ To provide educational opportunities for the under-privileged sections of society.
- ✓ To ensure all round development of the students through extra-curricular activities.

Quality Policy

The institute is committed to promoting and supporting all-round effective learning and teaching with a view to contributing to development through increasing equal access and participation in higher education. Our quality policy aligns with our vision, mission and objectives. The policy aims to achieve perfection and excellence in every step we take to shape the future of the younger generation towards a brighter tomorrow. To this end, each academic program is designed to hone students' skills inside and outside the classroom. Each program allows them to discover something beyond the syllabus and motivates them to read between the lines. We believe that children are agents of change, and every effort is made to engage them in meaningful discussions. Our Quality Policy seeks to celebrate and recognize quality in teaching and learning and to ensure that the premier quality education is always with us in every field.

7. Overview of Administration block and other buildings of GNC

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View of Administrative Block

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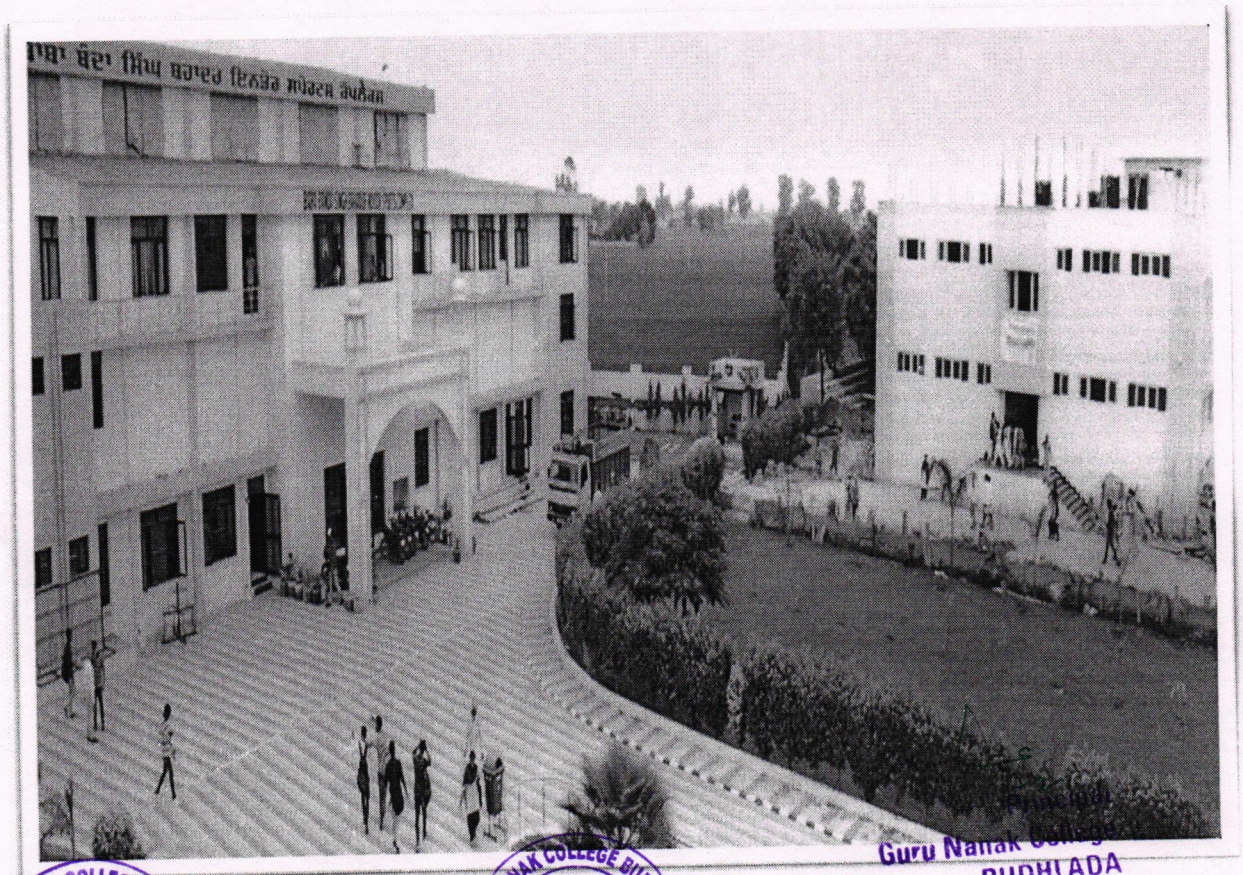

8. Detailed analysis

Annual lighting power requirement met through LED bulbs, Tubes and other lights (in KWh)	17735.9

Auditing for Energy Management may be studied in terms of energy savings and opportunities. This indicator addresses energy consumption, energy sources, energy monitoring, lighting, vehicle movement, electrical and electronics appliances, and transportation. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. However, energy saving and opportunities may be taken into consideration while energy is extensively used. An old incandescent (tungsten) bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10W which indicated the positive indication on energy savings. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. In addition, suggestions and recommendations might be given after auditing which in turn useful for energy savings. It is therefore essential that any environmentally responsible institution examine its energy use practices at least once in two years using internal and external auditors.

The conduct of energy audit is playing important role in any organization in terms of energy management. It is able to measure the impact of energy potential in an organization so that we can determine better ways to manage the impact on environment. It is necessary to know how much the organization is contributing towards sustainable development in terms of energy management is being done. It is therefore to recommend to measure the carbon footprint in each organization which may be useful for maintaining the eco-friendly campus to the stakeholders.

Electricity Load of Guru Nanak College campus approved by Punjab State Power Corporation Limited (PSPCL) is 219.42 KW. Average units of energy consumed per month is 10,000- 15,000 to maintain its volumetric activities throughout the year. The average expenditure per month is around Rs. 1,00,000- 1,50,000/-. Different measures of the college for efficient power consumption are as follows:

- Most of the PCs and LED screens in the campus have the feature of auto screen off to save electricity.
- The college has been replacing the old filament bulbs, CFL bulbs and tube lights by low energy consuming LED bulbs and LED tubes and bulky high-power consuming fans by energy efficient fans.
- Underground water pumping motor of power 7.5hp, which works for almost 4 hours a day, has an inbuilt feature of auto power cut to save energy and water.
- Outer lighting is maximum on solar lights.

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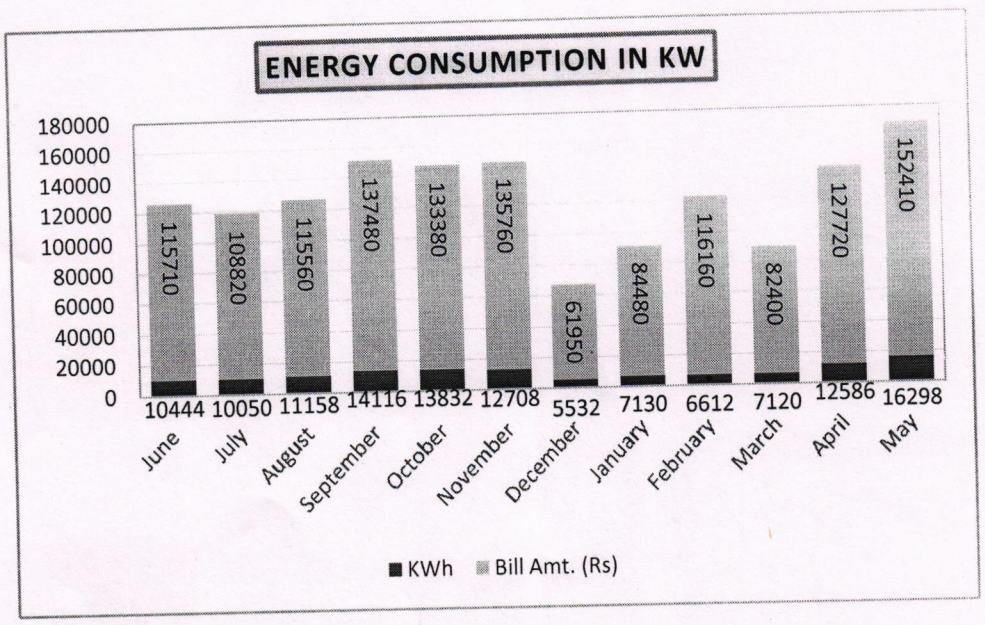
Using Solar energy and Sensor based lights for outer Lighting .	4%
Percentage Lighting through LED Bulbs and Tubes	64%

8.1. Energy Consumption and Cost Profile

The following chart shows the profile of energy consumed and the cost for one year by the stakeholders.



Energy consumption Profile of the campus

Energy review is done through: Analysis of energy bills, measurement by sub-meters installed in different areas. Records of bills and analysis are in place. The campus has large number of lights installed indoor and outdoor. The lighting sources includes LED bulbs, LED Tubes, ordinary lights, Solar lights, sensor based lights etc. The following pie chart shows the data on power consumption by different types of lights installed in the campus. The following graph shows the share of different types of lighting sources in the campus. The pie chart shows that the LED Bulbs shares the 31%, LED tubes shares the 33% of the total consumption for lighting, whereas the 32% is shared by the normal CFL and other energy inefficient lights.

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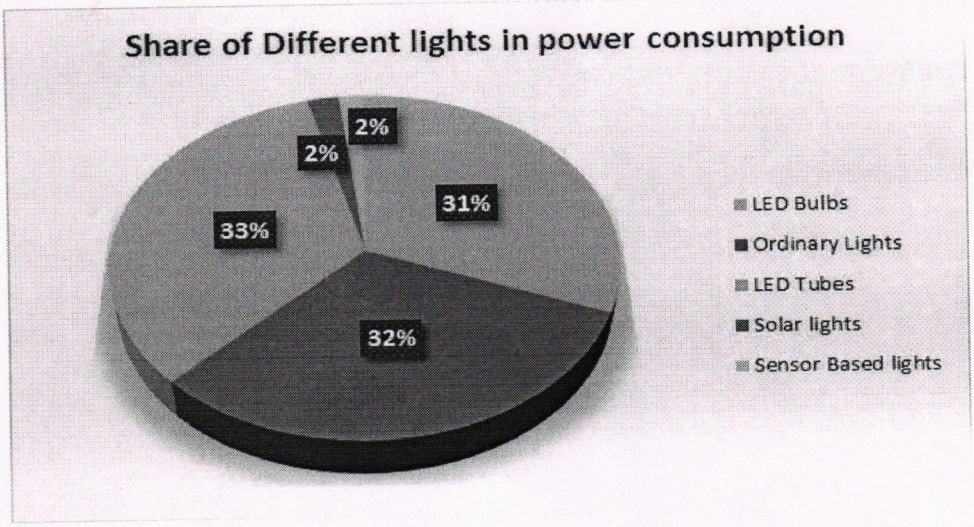

9. EnergyResource Management and Conservation Practices

The college has planned to conserve energy and power saving at different levels by use of LEDs, solar lights, energy efficient and power saving equipment's (energy star certified AC's, Projectors, RO's, Water coolers etc.). College area are divided into four major group all area interconnected with proper power supply, the LED lights has been installed in Library, Administration Block, Computer Science Block, Seminar Hall, Conference room and Principal office etc. Alternative energy sources of energy (Solar lights) and Sensor based lights have been installed at various places inside the campus. Electrical appliances like fans, tube lights, desktop computers, are beingjust switched off immediately,if they are not in use. The students are also being motivated to adopt energy conservation methods.

10. Summary

Energy Audit is one of the important tools to check the balance of use of energy and power resources and its sensible use. Energy auditing is the process of identifying and determining whether institutional practices are eco-friendly and sustainable. It is a process of regular identification, quantification, documenting, reporting and monitoring of the appliances in various partsof the campus. Guru Nanak College, Budhlada has conducted a "Energy Audit" in the academic year 2021-2022. The main objective to carry out energy audit is to check the various practices followed by GNC and to conduct a well-defined audit report to understand whether the GNC is on the track of conservation of energy, natural resources and sustainable development.

11. Conclusion:

Thus, the Guru Nanak College has in recent years considered the environmental impacts of most of its actions and has made concrete efforts to act in an environmentally responsible

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manner. As always, there is scope for further improvement; and Guru Nanak College is committed to take more initiatives towards sustainable development.

12. Recommendations for improving the energy efficiency and energy conservation in the Organization

The energy audit included key suggestions for energy cost reduction, preventive maintenance and quality control activities, all of which are critical for utility operation in the audit sites.

- Procurement of equipment with energy efficiency (4-5 star rated equipment) during replacement may be considered.
- Sub meters in all the buildings for energy monitoring is recommended so that energy load required and energy consumption in each building may be noted.
- Optimal water usage and temperature settings may be used which are coming under automatic process towards energy savings.
- Continuous monitoring and analysis of energy consumption by dedicated team may be planned within the campus.
- Turn off electrical equipment when not in use
- Maintain appliances and replace old appliances in all laboratories.
- Use computers and electronic equipment in power saving mode.
- Installation of Solar power plant/lights for more energy conservation in the campus.
- Sensor based lightsmust be installed in common areas of the campus.
- Monthly use of electricity in the College is very high which may be reduce to a greater extent by means of undertaking a periodical energy audit.
- Replace lights (Old filament bulbs, CFL, tube lights, halogen street lights) with LEDs and other energy efficient lights.
- There are fans of older generation and non-energy efficient which can be phase out by replacing with new energy efficient fans.
- Regular monitoring of equipment in all laboratories and immediate rectification of any problems.
- Increase in Energy conservation promotional activities for spreading awareness at campus.

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