

ENERGY AUDIT

2022-2023



Prepared by

Internal Quality Assurance Cell

KHAGARIJAN COLLEGE, NAGAON: ASSAM

ENERGY AUDIT2022-2023

Khagarijan College

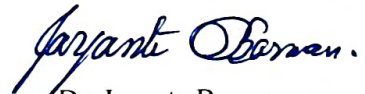
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ACKNOWLEDGEMENTS

The Internal Energy Audit Evaluation Committee offers due gratitude to the Principal of Khagarijan College for assigning this important task of Energy Audit upon the selected group of individuals. The committee expresses due gratitude to:

- Khagarijan College Management Committee
- Principal of the Khagarijan College – Dr. Ramesh Nath
- Vice-Principal of the Khagarijan College – Dr. Jonaram Nath
- IQAC Co-Ordinator of Khagarijan College – Dr. Rameswar Kurmi
- External Energy Audit Evaluator
- Faculty members of Khagarijan College
- Office Staff members of Khagarijan College

We also offer due credit and heartfelt gratitude to all who helped us carry out this vital exercise and gave all necessary inputs. We are also thankful to all the members who were actively involved while collecting the data, conducting field measurements, tabulating the data and analyzing the same.

INTRODUCTION

An energy audit is a systematic process of evaluating and analyzing the energy consumption and efficiency of a building, facility, or industrial process. The primary goal of an energy audit is to identify opportunities for energy savings and improvements, leading to increased energy efficiency, cost savings, and reduced environmental impact. It is a comprehensive examination of how energy is used within a system and provides insights into potential areas for optimization. For academic institutions, energy audits can play a crucial role in promoting sustainability, cost savings, and compliance with environmental regulations.

As defined by Energy Conservation Act, 2001, Energy auditing refers to “the verification, monitoring and analysis of the use of energy including submission of technical reports containing recommendations for improving energy efficiency with cost benefit analysis”. Energy Auditing aims to understand the usage and calculate the same with reference to necessary guidelines.

As such an energy audit report provides valuable insights and recommendations that can significantly benefit an academic institution in several ways like cost savings by outlining the specific measures and actions that, when implemented, can lead to reduced energy consumption and lower utility bills; highlighting inefficiencies in energy use within the institution; helping in assessing the condition and efficiency of existing equipment and systems; give a roadmap for long-term energy management as well as strive for continuous improvement to reduce carbon footprint.

This audit report serves as a comprehensive tool for guiding an academic institution toward sustainable and cost-effective energy management. It aligns with broader environmental goals, enhances operational efficiency, and contributes to the institution's overall success and responsibility as a community leader.

The aim of this report is to contribute to the larger picture of energy consumption by analyzing the usage of the institution and throwing light on the scopes of conservation by carefully calibrating the consumption to a stable level. This report is our mite in contributing to the larger picture of effective energy management and conservation.

OVERVIEW OF KHAGARIJAN COLLEGE

Khagarijan College stands as a prominent institution of higher education in the Nagaon district of Assam, serving as an esteemed center of learning nestled in picturesque

surroundings. Established in September 1972, the college takes its name from the original name of Nagaon, 'Khagarijan,' with 'Khagari' referring to the reeds along riverbanks and 'Jan' representing a type of rivulet. The college is strategically located near the 'Putakollongjan,' a branch of the river Kollong. Affiliated with Gauhati University and registered under the University Grants Commission Act, 1956, sections 2(F) and 12(B), the institution actively preserves and revitalizes the ancient roots and heritage of Nagaon town.

Since its founding, Khagarijan College has served as a guiding light for education and the moral upliftment of students. Its unwavering commitment to the pursuit of knowledge has remained a steadfast objective, overcoming numerous obstacles. Beyond knowledge dissemination, the college strives to instill new values relevant to the evolving needs of the contemporary generation.

With a devoted teaching and administrative staff, the college diligently prepares students for successful careers, enabling them to confront the challenges of life while nurturing their character and personality to become responsible citizens. The institution takes pride in the countless students who have graduated, leaving a lasting impact in various spheres of social, political, and academic life.

OBJECTIVES

Energy Audit aims at analyzing the consumption of energy and its usage. As per the Energy Audit Manual of the Energy Management Centre, Government of Assam, the primary objective of energy audit is to determine “ways to reduce energy consumption per unit of product output or to lower operation costs”.

The specific objectives are:

- To identify the inefficient or inadequate management of energy usage in the campus.
- To improve upon the identified areas so as to better manage energy conservation
- To identify other scopes in the campus to bring forth innovative measures for energy conservation.

- To assess the overall performance of the college regarding energy consumption and usage.

METHODOLOGY

The task of this audit undertaken by Khagarijan College is to identify the energy usage pattern and figure out areas with scope for improvement so as to recommend an action plan for proper management of the same.

The energy audit was conducted during summer and winter season, so as to review the data of energy usage and identify conservation opportunity. The methodology keeps track of the following:

- 1) Inventory of various electrical load
- 2) Study of the APDCL bills to work out the average cost of power.
- 3) Identification of various energy conservation measures and opportunities.
- 4) Review of Awareness programmes if any for optimum use of electricity as well as its saving.
- 5) Review of implemented non-conventional energy installation and applications in college campus as well as its quantification.

The Method used for Energy Audit is a Preliminary Audit. A Preliminary audit uses existing data to scrutinize the existing energy consumption patterns extensively and identify the areas for improvement

SYSTEMS STUDIED DURING ENERGY AUDIT

- Lighting fixtures in the campus have been physically verified and recorded.
- The implemented usage of non-conventional energy installation and applications in college have been reviewed.
- Electricity bills from APDCL are verified and analyzed to work out the cost of power.
- Awareness programmes regarding proper usage of electricity and energy conservation if any are reviewed as an important initiative of the college towards the goal of sustainable energy use.

- Any innovative strategy or method used for catering to energy conservation have been reviewed and analyzed to understand the efforts of the college.

ENERGY AUDIT TEAM

Internal Energy Audit Committee

1. Chairman: Dr Ramesh Nath, Principal, Khagarijan College, Nagaon, Assam
2. Convenor: Ms. Rupali Talukdar, Assistant Professor, Dept of Economics
3. Members: Ms. Maitreyee Dutta, Assistant Professor, Dept of English
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DATA COLLECTION

For the purpose of this audit, audit groups for specific areas were formed. Data was collected through

- Inspection and observation
- Identification of energy consumption
- Calculations and analysis
- Validation

Data analysis

The gathered data was then quantified and separated according to the following criteria:

- Energy consumption by end use
- Estimated energy use block-wise
- Consumption equipment-wis

Energy Audit Process and Schedule

Date: 22/06/2023

TIME	PROGRAMME
10:00 AM	Welcome and briefing by Principal and others
10:30 AM	Visit to the departments by the members
11:00 AM	Visit to academic building, administrative building, and physical verification of other infrastructure
12:30 PM	Interaction with Management and other staff of the college
2:00 PM	Tabulation of Data

After the physical on-site verification, the data was tabulated and the Energy Audit Report was submitted to the College Authority

DATA ANALYSIS

Table 1: Estimated energy consumption in KWH during summer

Items	Number	Power in W/item	TIME consumed (In hours)	Days	TOTAL Power consumption in KWH
Tube light	97+10 used	20	4	24	19.2
LED	194+131 used	12	2	24	75.45
Ceiling Fan	150+71 used	60	3	24	306
Exhaust Fan	8	35	0.5	24	3.36
AC	4	1000	4	24	384
Freeze	4	250	0.5	24	12
Computer	30+38 used	200	2	24	364.80
Printer	9	30	0.5	24	3.24
Xerox machine	3	2000	0.5	24	72
TV	2	40	1	24	1.92
Aqua guard	8	100	0.5	24	9.6
Inverter	8	1500	1	24	288
Water Motor	4	746	0.5	24	35.808
CCTV	40	50	24	30	1440
100 W LED	7	100	10	30	210
Total					3225.378

Estimated Energy Consumption during Summer

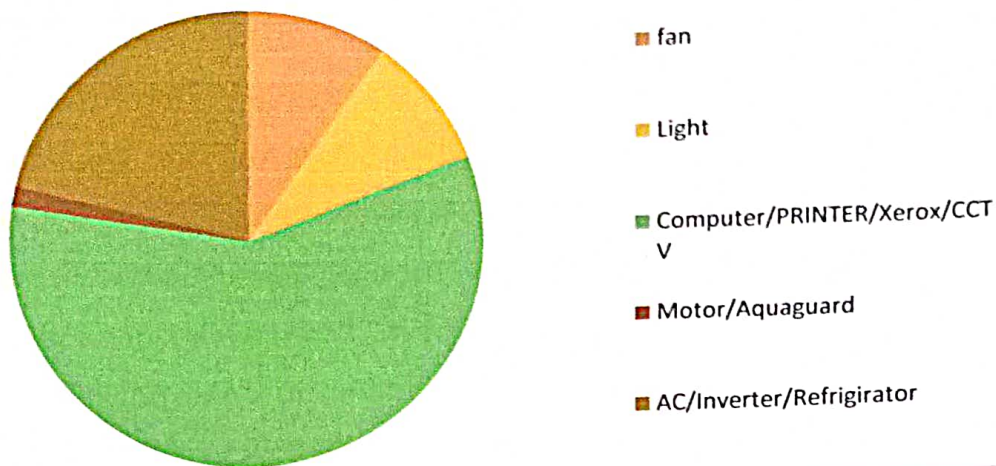


Fig 1: Energy consumption use (summer)

Table 2: Estimated energy consumption in KWH during winter

Items	Number	Power in W/item	TIME consumed (In hours)	Days	TOTAL Power consumption in KWH
Tube light	97+10 used	20	4	24	19.2
LED	194+131 used	12	2	24	75.45
Ceiling Fan	150+71 used	60		24	0
Exhaust Fan	8	35	0.5	24	3.36
AC	4	1000		24	0
Freeze	4	250	0.5	24	12

Computer	30+38 used	200	2	24	364.80
Printer	9	30	0.5	24	3.24
Xerox machine	3	2000	0.5	24	72
TV	2	40	1	24	1.92
Aquaguard	8	100	0.5	24	9.6
Inverter	8	1500	1	24	288
Water Motor	4	746	0.5	24	35.808
CCTV	40	50	24	30	1440
100 W LED	7	100	10	30	210
Total					2535.378

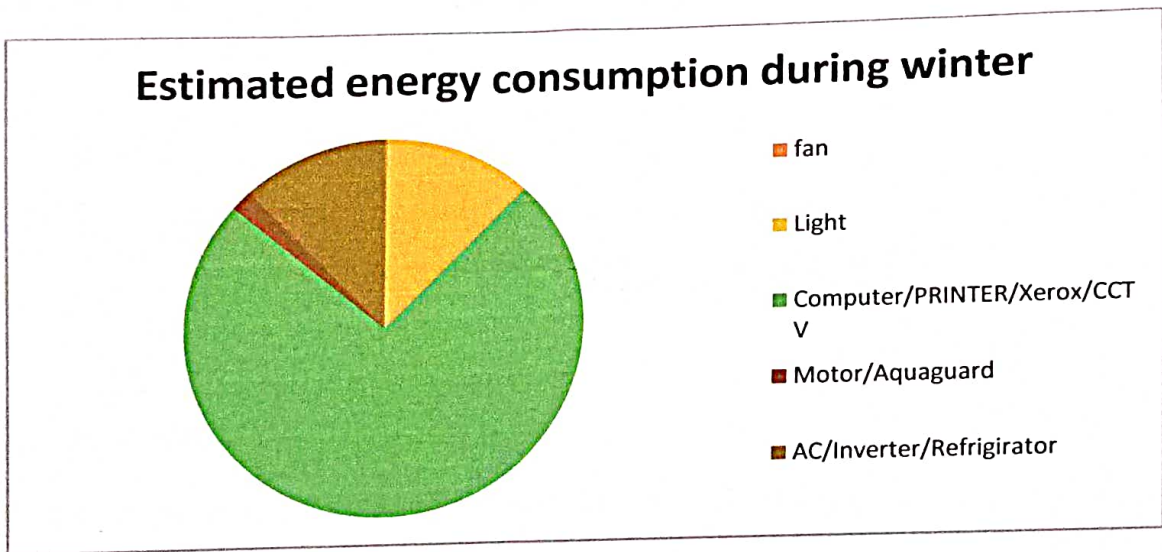


Fig 2: Energy consumption by and use (winter)

FINDINGS AND RECOMMENDATION OF THE AUDIT

Findings	Recommendation
The electrical wirings of many buildings were found to be old and inefficient	Need to replace old electrical cables with newer alternatives.
There seems to be a lack of judicious use of power among students and staff. During the study, it was found that lights, fans and computers were kept on in vacant rooms.	Students and staffs should be encouraged constantly to use energy judiciously. Posters and pamphlets should be distributed and notices about saving energy should be posted in notice boards throughout the campus.
Many departments still use bulbs causing heavy power loss.	Filament bulbs and CFLs should be replaced with LEDs.
AC, Refrigerators and freezers used in many departments use obsolete technology and hence cause power loss.	Gadgets and equipment should be repaired and/or replaced with latest ones to save energy (with five-star rating).
It is noticed that resistive regulators are used in many rooms of the college.	Resistive regulators should be replaced by electronic regulators.
It is noticed that desktops are mostly used in the college.	Desktops must be replaced by laptops to save energy.

AREAS OF IMPROVEMENT

Areas of Attention

Based on the physical observation and the analysis of data collected, certain areas have been identified as areas of attention.

1. Old wiring cables in many parts of the campus leading to loss of energy.
2. Use of large numbers of indicators on boards.
3. Proper lighting facilities in classrooms.
4. Increase awareness among students and bearers.

Scopes for Saving Energy

This study could identify the following scopes for saving energy in the campus:

- Updating of technologies in laboratory equipment.
- Replacing old electrical cables.
- Replacing tube lights with LEDs.
- Ensuring even lighting facilities in all class rooms.
- Turning off electrical equipment when not in use.
- False ceilings in classroom for maintaining optimum room temperature
- Using computers and electronic equipment in power saving mode.
- Establishment of solar panels.

Immediate areas of improvement

Based on the study, the following areas were identified as those requiring immediate improvement:

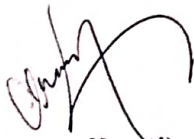
1. Replacing tubes with LEDs
2. Repairing and updating laboratory equipment
3. Encouraging students and staff to switch off electrical instrument.

CONCLUSION

The Energy Audit at Khagarijan College has successfully concluded, encompassing a comprehensive examination of all specified objectives. The committee has proposed several recommendations for improvement, including the replacement of outdated wiring, filament bulbs, and tubes. Additionally, the suggestion to install a master switch in a prominent location, directly overseen by the Head of Department (HOD) or supervising staff, aims to prevent power wastage in unoccupied rooms.

A well-structured electrical wiring plan for the campus is also advised, facilitating the identification of unused points and enabling efficient rewiring. In addition to the awareness sessions on energy conservation, it is recommended to incorporate further training and lecture sessions for both students and staff to enhance understanding. A potential energy saving of around 10% can be achieved if everyone ensures the diligent switching off of lights, fans, and electrical instruments not in use.

To promote responsible energy use, the installation of Instruction cum Request signboards near switchboards is suggested, guiding users and discouraging misuse and wastage of power. Despite the college's initiation of solar energy usage, there is considerable room for improvement and an increase in the adoption of solar energy.



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