

# ENERGY AUDIT

2023-2024



Prepared by

**Internal Quality Assurance Cell**

**KHAGARIJAN COLLEGE, NAGAON: ASSAM**

## ACKNOWLEDGEMENTS

The Internal Energy Audit Evaluation Committee extends heartfelt gratitude to the Principal of Khagarijan College for entrusting us with the significant task of conducting the Energy Audit. We also express sincere thanks to:

- The Khagarijan College Management Committee
- Dr. Ramesh Nath, Principal of Khagarijan College
- Dr. Jonaram Nath, Vice-Principal of Khagarijan College
- Ms. Bichitra Pegu, IQAC Coordinator of Khagarijan College
- External Energy Audit Evaluators
- Faculty and staff members of Khagarijan College

Special thanks are due to all individuals who contributed their time and effort toward data collection, field measurements, and analysis.

## **ENERGY AUDIT TEAM**

### **Internal Energy Audit Committee**

1. Chairman: Dr Ramesh Nath, Principal, Khagarijan College, Nagaon, Assam
2. Convenor: Ms. Maitreyee Dutta, Assistant Professor, Dept of English
3. Members: Mr. Ujjal Paul, Assistant Professor, Dept of Economics

### **External Audit Evaluators**

1. Dr Hrishikesh Talukdar,  
Assistant Professor,  
Dept of Physics  
ADP College, Nagaon
2. Dr Jayanta Barman,  
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## CONTENTS

- 1} Acknowledgements
- 2} Introduction
- 3} Overview of the College
- 4} Objectives
- 5} Methodologies
- 6} Systems studied during Audit
- 7} Energy Audit Team
- 8} Data Collection
- 9} Data Analysis
- 10} Findings and Recommendations
- 11} Areas of Improvement
- 12} Conclusion

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## **INTRODUCTION**

An energy audit is a systematic evaluation of energy usage and efficiency within a facility aimed at identifying areas for improvement. The ultimate goal is to enhance energy efficiency, achieve cost savings, and minimise environmental impact. In the context of academic institutions, energy audits are crucial for fostering sustainability and operational efficiency. As defined by the Energy Conservation Act of 2001, energy auditing entails the “verification, monitoring, and analysis of energy use, including technical recommendations for improving efficiency with cost-benefit analysis.” This report provides insights into Khagarijan College's energy consumption patterns and identifies opportunities for optimization, aligning with broader sustainability objectives. Energy Auditing aims to understand usage and calculate it with reference to necessary guidelines.

The 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 is 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. This report aims to contribute to the larger picture of energy consumption by analysing the institution's usage and shedding light on the scope of conservation by carefully calibrating the consumption to a stable level.

## **OVERVIEW OF KHAGARIJAN COLLEGE**

Established in 1972, Khagarijan College, named after the historic term for Nagaon, 'Khagarijan,' is a premier educational institution in Assam. Affiliated to Gauhati University and recognised under sections 2(F) and 12(B) of the UGC Act of 1956, the college blends academic excellence with cultural heritage preservation. Overcoming

numerous challenges, the institution remains committed to fostering knowledge, values, and societal contributions.

Since its establishment, Khagarijan College has served as a guiding light for education and the moral upliftment of students. Its unwavering commitment to pursuing knowledge has remained a steadfast objective, overcoming numerous obstacles. With a devoted teaching and administrative staff, the college diligently prepares students for successful careers, enabling them to confront life's challenges while nurturing their character and personality to become responsible citizens. The institution takes pride in the countless students who graduated, leaving a lasting impact in various social, political, and academic spheres.

## **OBJECTIVES**

Energy Audits aim to analyse energy consumption and usage. According to the Energy Audit Manual of the Energy Management Centre, Government of Assam, the primary objective of energy audits 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 on the campus.
- To improve upon the identified areas to better manage energy conservation
- To identify other scopes on campus and bring forth innovative measures for energy conservation.
- To assess the overall performance of the college regarding energy consumption and usage.

## **METHODOLOGY**

This audit, undertaken by Khagarijan College, aims to identify the energy usage pattern and identify areas for improvement, as well as recommend an action plan for proper management. The energy audit was conducted during summer and winter to assess seasonal variations in energy consumption. Key activities included:

1. Inventorying electrical loads.
2. Review APDCL bills to analyse average power costs.
3. Identifying energy conservation opportunities.
4. Evaluating awareness programs for energy conservation.
5. Analyzing non-conventional energy installations on campus.

A preliminary audit methodology was employed, utilizing existing data to scrutinise consumption patterns and identify areas for improvement.

## **SYSTEMS STUDIED DURING ENERGY AUDIT**

1. Verification of lighting fixtures.
2. Review of non-conventional energy applications.
3. Analysis of electricity bills.
4. Assessment of energy conservation awareness initiatives.
5. Evaluation of innovative energy-saving strategies.



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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: 19/06/2024**

<b>TIME</b>	<b>PROGRAMME</b>
10:00 AM	Welcome and briefing by the 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

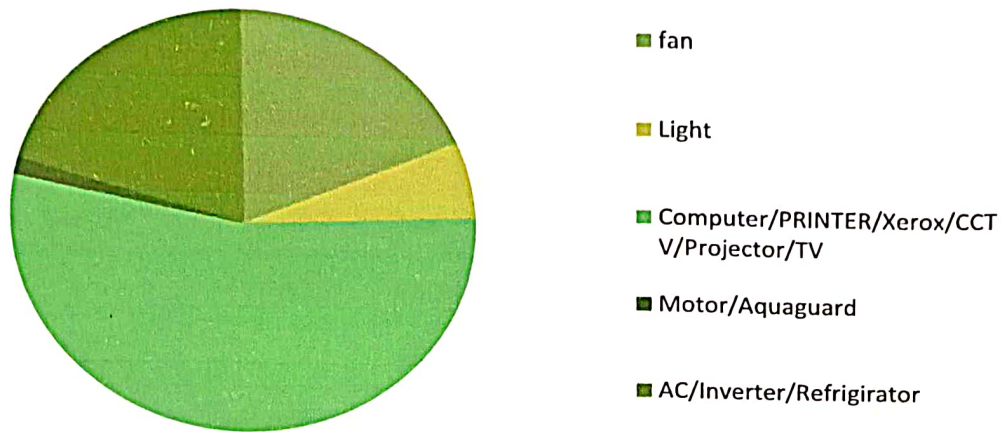
After the physical on-site verification, the data was tabulated and the Energy Audit Report was submitted to the College Authority

## DATA ANALYSIS

**Table 1: Estimated energy consumption in KWH during summer**

<b>Items</b>	<b>Number</b>	<b>Power in W/item</b>	<b>TIME consumed (In hours/day)</b>	<b>Days</b>	<b>Total Power Consumption in KWH</b>
Tube light	62+10 used	20	4	24	19.2
LED	190+55 used	12	2	24	31.68
Ceiling Fan	87+80 used	60	6	24	691.2
Exhaust Fan	8	35	1	24	6.72
AC	5	1000	4	24	480.0
Fridge	3	250	6	24	108.0
Computer	48+20 used	200	4	24	384.0
Printer	13	30	1	24	9.36
Xerox machine	5	2000	0.5	24	120.0
TV	3	40	0.5	24	1.44
Aqua guard	5	100	1	24	12.0
Inverter	5	1500	1	24	180
Water Motor	4	746	0.5	24	35.80
CCTV	42	50	24	30	1512
100 W LED	7	100	10	24	168
<b>Total</b>					<b>3759.4</b>

## Estimated Energy Consumption during Summer

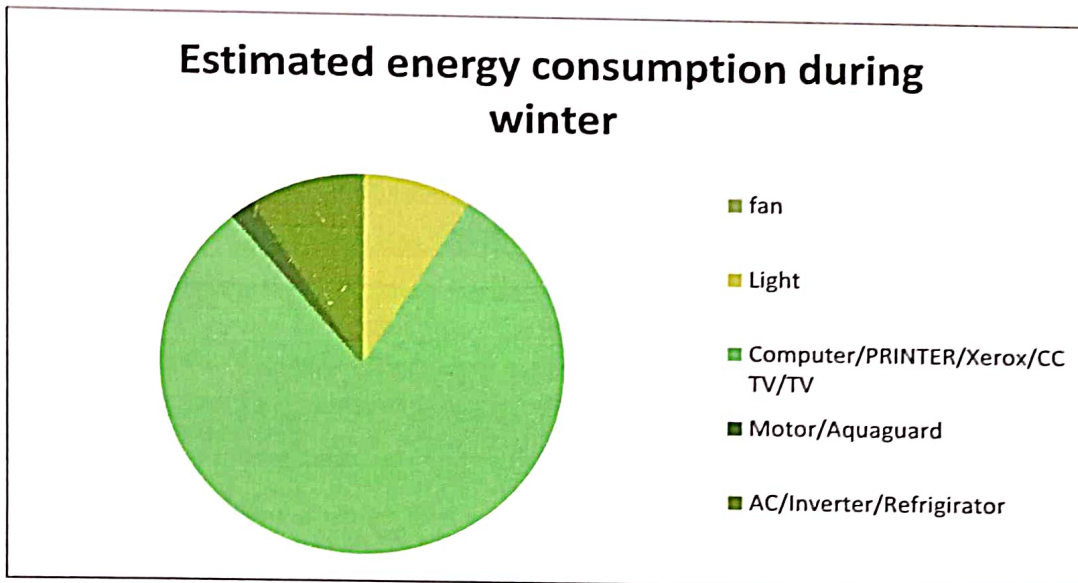


**Fig 1: Energy consumption use (summer)**

**Table 2: Estimated energy consumption in KWH during winter**

Items	Number	Power in W/item	TIME consumed	Days	Total Power Consumption in KWH
			(In hours/day)		
Tube light	62+10 used	20	4	24	19.2
LED	190+55 used	12	2	24	31.68
Ceiling Fan	87+80 used	60	-	24	-
Exhaust Fan	8	35	0.5	24	3.36
AC	5	1000	-	24	-
Fridge	3	250	3	24	54
Computer	48+20 used	200	4	24	384

Printer	13	30	1	24	9.36
Xerox machine	5	2000	0.5	24	120
TV	3	40	0.5	24	1.44
Aqua guard	5	100	1	24	12
Inverter	5	1500	1	24	180
Water Motor	4	746	0.5	24	35.80
CCTV	42	50	24	30	1512
100 W LED	7	100	10	24	168
<b>Total</b>					<b>2530.84</b>



**Fig 2: Energy consumption (winter)**



## FINDINGS AND RECOMMENDATION OF THE AUDIT

<b>Findings</b>	<b>Recommendation</b>
Massive energy consumption occurs during summer due to excessive heating in classrooms and offices. The electrical wiring of many buildings is dated and needs to be changed.	Improve building insulation to reduce the energy required for heating and cooling, especially in classrooms and offices. Old electrical cables need to be replaced with new ones
AC and refrigerators used in many departments use obsolete technology, causing power loss.	To save energy, gadgets and equipment should be repaired and/or replaced with the latest ones (with a five-star rating).
It is noticed that resistive regulators are used in many college rooms.	Electronic regulators should replace resistive regulators.
It has been noticed that desktops are mostly used in college.	Laptops must replace desktops to save energy.
There seems to be a lack of judicious use of power among students and staff.	Conduct regular workshops and seminars for students and staff to educate them on energy-saving techniques. Introduce a reward system for departments or individuals demonstrating significant energy savings.

## AREAS OF IMPROVEMENT

### Immediate Priorities:

1. Replace outdated lighting with LEDs.
2. Repair and upgrade laboratory equipment.
3. Implement energy-saving practices among staff and students.

### Long-Term Goals:

1. Install solar panels.
2. Enhance energy-saving awareness programs.
3. Establish a centralized power control system.


## CONCLUSION

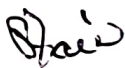
The Energy Audit at Khagarijan College highlighted significant opportunities for improving energy efficiency and reducing consumption. Recommendations include upgrading electrical systems, enhancing awareness programs, and increasing the adoption of solar energy. The college can achieve substantial energy savings with diligent implementation, contributing to environmental sustainability and cost efficiency. 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.


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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