ENERGY AUDIT REPORT

2018-2023

N. C. Autonomous College
Jajpur, Odisha – 755001

1. Introduction

An energy audit is a survey in which the study of usage of energy and its conservation feasibility 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 extend. Conventionally, electrical energy is generated by means of fossil fuels, hydraulic and wind. The availability of fossil fuels and their depletion rate, insist the need for alternate renewable energy systems and conservation of electric energy. The need for an energy audit is to identify the savings potential and cost reducing methods, understand the ways in which fuel 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 is implemented and followed in Educational Institutions 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. In addition, 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.

2. 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 different energy consumption areas and safety measures implemented.
- Identification of energy conservation measures and saving opportunities.
- Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management.
- Creating awareness among the stakeholders on energy conservation and utilization.
- Providing a technical information on how to build an energy balance as well as guidance to be sought for particular applications.
- Suggesting the energy savings opportunities and implementing the energy management practices to address the energy issues at the institutional level.

3. About the Institute

N. C. Autonomous College, Jajpur stands sui generis as the Nodal College of the district. The college came into existence in 1946 and it is named after Late Choudhury Narasingha Charan Mohapatra of Kodandpur, the key donor of the institution. The foundation of this college fulfilled a long-cherished dream of the local people. The classes were held in Jajpur High School from 1946 to 1952. Thereafter the college was shifted to its present campus about two kilometers to the west of Jajpur Town. The college is affiliated to Utkal University. The government took over the management of the college in 1962. It has grown into a full–fledged college with honours facilities in Arts and Science by the end of seventies. The department of commerce started in 1980. It was declared as one of the lead colleges of the state by the government in 1990. The college has been accorded autonomous status in 1999-2000.

The college offers Bachelor Degree Programmes in English, Economics, History, Political Science, Sociology, Sanskrit, Odia, Philosophy, Physics, Chemistry, Mathematics, Botany, Zoology and Commerce. The institution was elevated to a Post Graduate college in 1980. The PG Department of History started functioning in this year and the PG Department of Mathematics started in 1990. Apart from the above programmes, the Self-Financing Wing offers BBA and BCA, MSW and M.Sc.(Computer Science). The institute aims for opening of additional Master Degree Programmes in Economics, English, Sociology, Pol. Science, Sanskirt, Odia, Library Science, Physics, Chemistry, Botany, Zoology and Commerce from 2023-24 and Bachelors Degree Programs in Hindi, Education, Psychology, Geography, Geology,

The college provides accommodation (staff quarters) to 18 teachers, besides one for the Principal. There are two Boys' hostels, two Women's hostels and one TRW hostel. Apart from the above, the college has basic basic facilities like gym, auditorium, canteen, post office, indoor stadium, sport complex (under construction).

The institution provides co-education to both boys and girls. As this is a rural based college, the girls outnumber the boys.

4. Procedures followed in the Energy Audit

In order to conduct an energy audit, several methods are adopted in the audit sites. The balance of total energy inputs with total energy outputs and identification of all energy streams in a facility are noted. The three major areas where maximum energy consumption occurs are the academic zone, hostel zone and faculty colony. Comprehensive inspections in these areas are carried out for the audit and finally, 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 organization. Steps involved in the audit process are as follows.

Step 1: Opening meeting among the audit team

Step 2: Planning and organizing the energy audit

Step 3: Conduct a walk-through audit at different sites

Step 4: Macro data collection and observation
Step 5: Analysis of data collected from different sections
Step 6: Best practices followed in the Organization towards energy savings
Step 7: Recommendations for further improvement

5. Data Collection and Observations

Current level operation and practices within the campus are assessed and then the data regarding the number of electrical loads connected in each section are collected. The power ratings of each component and their respective hours of operation are also observed and documented for preparing the recommendations to the institution.

Sl. No.	Section where audit is conducted
1.	Transformers and control panels
2.	Administrative block
3.	Science block
4.	Commerce block
5.	Class rooms
6.	All laboratories
7.	Auditorium, smart class rooms, conference room etc.
8.	Sports room/Gymnasium
9.	Hostels
10.	Faculty colony

5.1. Systems studied during the energy audit

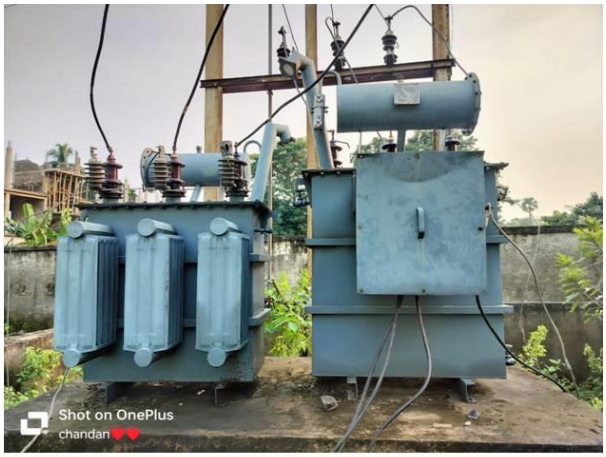
- Physical verification of lights, fans, AC machines, Laboratories equipments etc.
- Verification of installed energy efficient systems.
- Inspection of Solar panel, Generators, Uninterrupted power supply machines.
- Inspect and verify the maintenance aspects of installed Generators and additional backup power sources.
- Analyze the electricity consumption rate by going through the bills and vouchers.
- Review the potential usage of alternative energy resources.
- Review the energy conservation awareness among the stakeholders for optimum use of electricity and its savings.

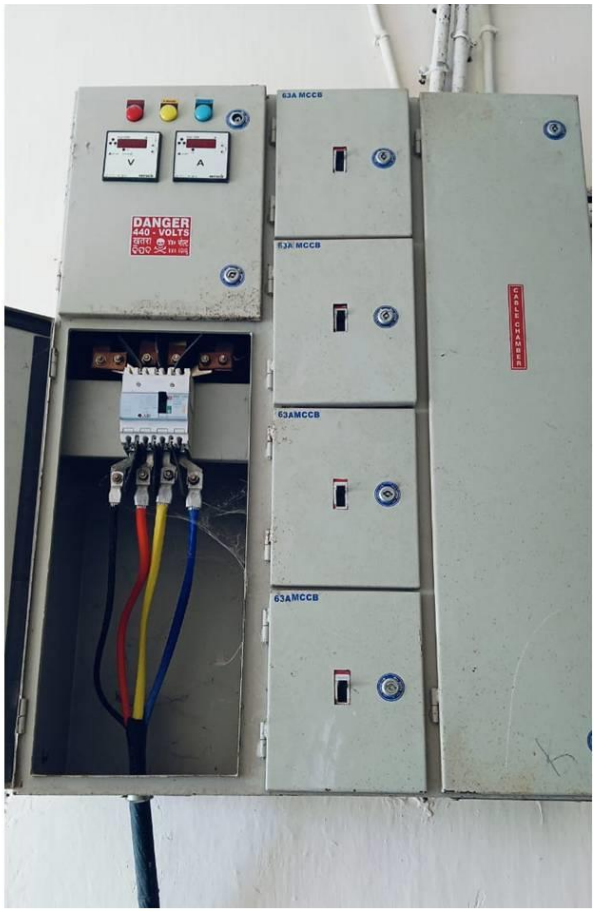
5.2. Power supply and Equipment

Transformers installed

Sl. No.	Avg. Load Capacity (kVA)	Quantity
1	25	01
2	63	02
3	125	01
4	150	02
5	200	03
Total		**09**

Al though the installed transformers are adequate to supply electricity for day-to-day requirement of academic and residential purpose of the college, however, keeping in the view of future increase in student strengths, new UG/PG departments, New laboratories, New arts block, sports centre, Centre of excellence laboratories, new hostels, auditorium etc., the college will in need of additional high capacity transformers to be installed for smooth functioning.

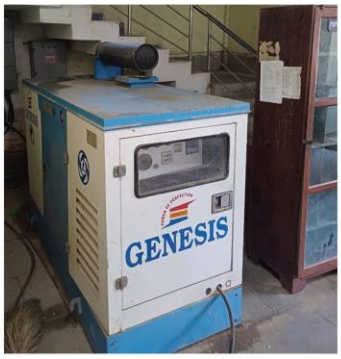


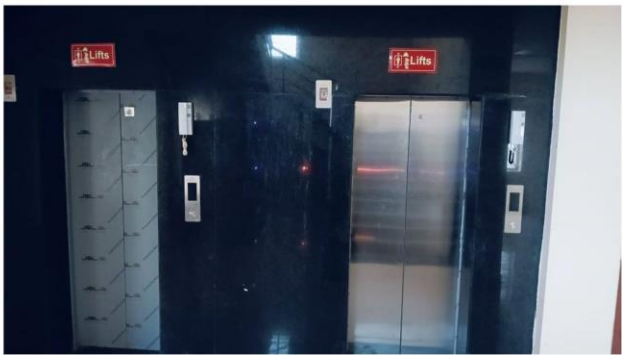


5.3. Major household/infrastructure equipments

Sl. No.	Items	Rating/Capacity	Quantity
1	Fan	70W	1193
2	Bulb/Tubelight	28W/40W	1631
3	AC	1.5 T	51
4	Water purifier	300W	13
5	Computer	150W	40
6	Printer/Xerox machine	150W	15
7	Water pump	5HP	04
8	Street lights	40W	10

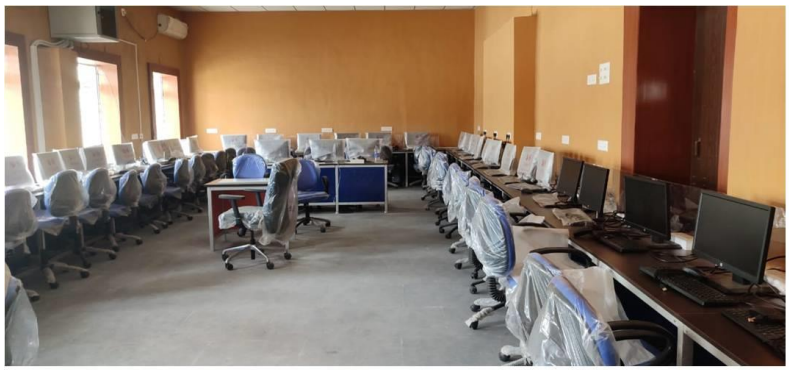
While the electricity consumption rate is maximum during evening and night in the residential zones, the maximum load occurs in the academic and administrative zones in the day time. However, more loading is anticipated in near future taking increase in student strengths, new UG/PG departments, New laboratories, New arts block, sports centre, Centre of excellence laboratories, new hostels, auditorium etc. into consideration.

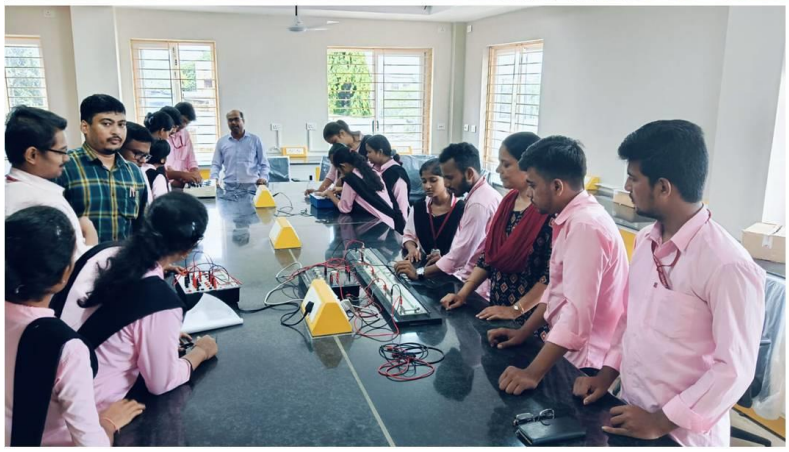


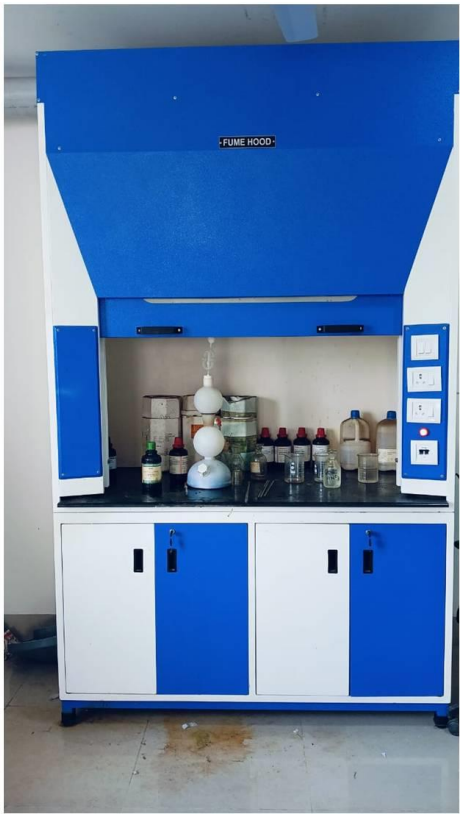


5.4. Major laboratory equipments

As all the science laboratories require operation of high end scientific equipments and computers, therefore, dedicated and continuous supply of electricity has been taken into consideration. However, since requirement of more lab equipments is anticipated in near future due to increase in student strengths, new UG/PG departments, New laboratories, Centre of excellence laboratories etc, therefore new transformer as well as dedicated wiring will be required in the academic zone to address the challenges.







5.5. Energy Consumption and Cost Profile

The following table shows the profile of energy consumed and the cost for last few years by the college stake holders.

Year	Approx. electricity bill amount (Rs.)					
	College	BMP Boys Hostel	Old Ladies Hostel	Second Women's Hostel	Faculty Colony	**Total**
2018-19	5,00,000	3,60,000	1,90,000	2,20,000	1,30,000	14,00,000
2019-20	12,00,000	5,40,000	1,95,000	2,30,000	1,45,000	23,10,000

2020-21	2,86,743	2,30,000	1,05,000	1,15,000	1,52,000	888,743
2021-22	10,71,132	7,20,000	2,07,000	2, 80,000	1,60,000	24,38,132
2022-23	8,37,852	7,44,000	2,07,500	2,98,000	1,68,000	22,55,352
Total	**38,95,727**	**25,94,000**	**9,04,500**	**11,43,000**	**7,55,000**	**92,92,227**

6. Best Practices followed in the Organization

- Electrical wires, switch boxes and stabilizers were properly covered.
- Air Ventilation and Day lighting facilities were made at Indoor and Outdoor seminar halls, auditorium and stadium for vigorous air circulation.
- Energy efficient appliances were used.
- Faulty electrical equipments are repaired/removed at earliest in order to avoid any kind of unwanted situations.

7. Recommendations for improving the energy efficiency and energy conservation

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

- Suggested to protect all Transformer, Generators and UPS with fencing and keep the awareness boards and safety signs on 'Dangers' and 'Warnings, etc.
- Advised to cover Electrical wires, switch boxes, inverters, and stabilizers not to cause any problem to the staff and student members
- Advised to replace old generation computers and TVs with LED monitors and old incandescent (tungsten) bulbs with LED lights and install automatic street solar lights.
- Instructed to replace Overhead Projectors with LCD projectors to reduce the power consumption.
- Suggested to install more Roof top solar power plants
- Suggested to properly check switching off lights and fans in classrooms whenever not in use. More student counseling and awareness is required.

10. Conclusions

Considering the fact that the institution is a well-established, long time run establishment with good reputation, there is significant scope for conserving energy and make the campus as self-sustained in it. The energy conservation initiatives taken up by the institution are substantial. Few recommendations, in addition, can further improve the energy savings of the college. This may lead to the prosperous future in context of Green Campus & thus sustainable environment and community development.

Energy audit team members

1. Dr. G. P. Sahoo
2. Dr. P. P. Mohapatra
3. Dr. S. K. Goi
4. Dr. A. P. Mishra
5. Dr. S. Pati

Compiled by

(Dr. Guruprasad Sahoo)
Assistant Prof. (Stage-I) & Head
Post Graduate Dept. of Physics)

Principal
Principal,
N. C. (Auto) College, Jajpur