

Energy Audit 2019-2024




Nalbari College, Nalbari, Assam-781335

Energy audit certificate


This is to certify that the 'energy audit' for Nalbari College, P.O.: Nalbari, Nalbari - 781335, (Assam) has been conducted from 2019 to 2024, evaluate its energy consumption patterns, identify areas of inefficiency, and recommend measures for improvement. This audit typically outlines the findings of the energy audit, including energy-saving opportunities, potential cost savings, and suggested actions to enhance energy efficiency and reduce energy consumption.


Place: Nalbari

Date: 11/05/2024


11/5/24
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Nalbari College, Nalbari
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1. Introduction

Nalbari college, situated in the vibrant academic landscape of Assam, India, stands committed to this global initiative. In alignment with its mission to foster a culture of sustainability and responsible stewardship, the college has undertaken a comprehensive energy audit spanning the period from 2019 to 2024. This audit seeks to evaluate and analyse the college's energy consumption patterns, identify areas of inefficiency, and propose actionable strategies to optimize energy usage. By scrutinizing the campus's energy infrastructure, operational practices, and behavioural dynamics, this audit endeavours to cultivate a culture of energy consciousness and propel the institution towards a greener and more sustainable future. In the following sections, we will delve into the methodology, findings, and recommendations derived from the energy audit of Nalbari college, offering insights into the institution's journey towards a more energy-efficient and environmentally conscious future.

1.1 Methodology: The entire energy audit practice based on the development of questionnaires and field survey and data collection, followed by analysis of the collected data set.

1.1.1. Questionnaires:

- What are the sources of energy in the college campus (Electricity, Petrol, Diesel, Solar energy, and others)?
- What is the typical daily energy consumption in different campus buildings (e.g., classrooms, laboratories)?
- How many electrical equipment installed in the departments, classroom, and administrative block?
- What is the electricity bill in the last five years?
- What is the amount spent for the purchasing of diesel for generator set for last five years?
- Are there any energy-efficient practices currently in place within the college facilities (e.g., use of LED lighting, motion sensors, energy-efficient appliances)?
- Are there any renewable energy sources utilized on campus (e.g., solar panels, wind turbines)?
- How often are maintenance checks performed on energy-consuming equipment to ensure optimal efficiency?
- Are there any energy-saving policies or initiatives in place within the college (e.g., energy conservation campaigns, incentives for energy-efficient behaviours)?
- How does the college track and monitor its energy consumption and efficiency over time?
- Are there any potential areas for improvement identified by students, faculty, or staff regarding energy usage within the college?

1.1.2. Data collection

The committee members of the energy audit with the help of administrative office staff and students collected the data sets like energy sources, energy equipment installed in the

department and classrooms, energy consumption pattern, electricity bill, fuel consumption, yearwise expense etc. in different sites of the college. The data recorded were further substantiated through survey and discussions.

1.2. Observation

1.2.1. Energy sources and consumption areas in Nalbari college

- The main energy source in Nalbari college is the electricity source supplied through overhead line from state electricity department (APDCL). The transformer installed in the college campus have the capacity of 100 kVA. Power is distributed to different units of the college from this transformer.
- In case of load shedding, the power demand is fulfilled through diesel fuel-based generator system.
capacity of the generator: 20 kVA
Power efficiency: ~80%
- Inverter based power backup system in selected departments and units.
- Solar panel with capacity of 20kW. Although, the solar panel was installed during 2023, it becomes functional from the current year, i.e. 2024.
- The highest amount of energy consumption was noted in the hostel, followed by library, science block, canteen, digital classroom, and administrative block.

1.2.2. Energy consumption:

The electrical energy consumption pattern per year from 2018-2024 was determined from the electricity bill paid. Similarly, the diesel consumption was calculated from the purchasing voucher. The cost incurred during the installation/repairing of the solar panel is also included here. The detailed is documented in tabular form as under –

Table 1.1. Details of energy consumption per year

Sl No.	Year	Electricity bill (INR)	Diesel charges (INR)	Solar panel installation/repairing charges (INR)
01	2019-20	4,64,329/-	98,900/-	
02	2020-21	3,13,453/-	54,300/-	
03	2021-22	5,24,760/-	60,100/-	
04	2022-23	4,97,908/-	62,500/-	
05	2023-24	5,85,340/-	54,700/-	1,75,000/-

1.2.3. Comparison between maximum electricity demand (KV_a) and Contract electricity demand (KV_a) in a year

Maximum electricity demand is the highest level of electrical power consumption during a specific period. Likewise, the contract demand is the amount of electric power that a customer demands from utility in a specified interval. We have analysed both the parameter for a complete financial year 2023-2024. The findings are tabulated as under

Table 1.2. Month-wise comparison between maximum electricity demand (KV_a) and Contract electricity demand (KV_a) considering 2023-2024 as the standard.

Sl No.	Month	Maximum electricity demand (KV _a)	Average electricity demand (KV _a)	Contract electricity demand (KV _a)
01	April, 2023	34.36		67
02	May, 2023	33		67
03	June, 2023	33.36		67
04	July, 2023	20.56		67
05	August, 2023	36.46		67
06	September, 2023	35.88	26.405	67
07	October, 2023	43.08		67
08	November, 2023	22.68		67
09	December, 2023	11.88		67
10	January, 2024	13.56		67
11	February, 2024	13.56		67
12	March, 2024	18.48		67

1.2.4. Key Findings and Observations of Energy Usages in the last five years (2019-2024)

- a) Total electricity charges :23,85,790/-
- b) Total cost incurred in diesel as generator fuel :3,30,500/-
- c) Total cost of energy {electricity(a) + Diesel(b)} :27,16,290/-
- d) Solar panel installation : Free installation
- e) Solar panel repairing :1,75,000/-
- f) Average cost of energy per month :45,272/-
- g) Average cost of energy per year :5,43,264/-
- h) Average in maximum electricity demand (KV_a) :26.405

* The solar panel was installed in the college during 2023. However, it remained non-functional due to technical issues. During 2023-2-24, the panel was repaired again and installed properly. Therefore, the overall energy cost will be reduced from the upcoming financial year.

** The contract electricity demand could be reduced as the average of the maximum electricity demand is 26.405 during the financial year 2023-2024. This will save additional budget incurred as electricity charges yearly.

1.3. Energy-saving policies or initiatives in place within the college

- Solar panels installed in the RCC roof of the college building.
- Installation of solar street lights inside the college campus.
- New construction projects give more priority on the energy efficient design principles.
- Older buildings are under the process of retrofitting to improve insulation, upgrade windows, and implement other energy-saving measures.
- Colleges is deploying smart meters and building automation systems to monitor and optimize energy usage in real-time, identifying areas for improvement and adjusting energy settings accordingly.
- Turn OFF electrical equipment's when not in use.
- CFLs and other lights are being replaced by more efficient LED.
- Use of computer and electronic equipment's in power saving mode.

1.4. Recommendations for better energy efficiency

Improving energy efficiency within colleges requires a multifaceted approach that encompasses both technical solutions and behavioural changes. Here are some recommendations for enhancing energy efficiency:

a) No investment/low-cost measures:

- i. Rooms need to be well ventilated for maximized sunlight.
- ii. The ceiling fans need to be cleaned for better motor efficiency of the fan.
- iii. Use minimum amount of light and fan inside the classrooms. Switch off the fan and light if not required.
- iv. Try to avoid air-conditioners. Maximize the use of low energy consuming electrical fans.
- v. The switches of the ceiling fan and light inside the classroom should be arranged in such a way that we can minimize their unnecessary use.
- vi. Install a master switch outside each classroom, so that anyone can switch off the light and fan of the classroom from outside if it is locked.
- vii. Optimize the use of existing infrastructure and resources, such as scheduling classes and activities in a way that minimizes energy consumption, consolidating space usage to reduce heating and cooling needs, and implementing water-saving measures.
- viii. The college authority and teaching staff need to aware the students about the future

benefits of energy conservation.

b) Long term planning/high investment

- i. Implement campus-wide policies and guidelines to promote energy conservation, such as setting thermostat limits, implementing power management settings on computers, and encouraging the use of energy-efficient appliances and equipment.
- ii. Replace the overhead power supply line with underground system. Frequent storm and heavy rain are common in Assam during the monsoon season. Sometimes, it causes heavy destruction in the overhead electricity supply system. Extra cost incurred in this period as college need to purchase additional diesel to run the generator. Similarly, the repairing of the overhead electrical line is an extra burden on the college fund. The overall recurring expenditure can be cut down with the installation of the underground electrical supply system.

c) During the survey, the audit team found the high contract electricity demand. Additional cost is incurred annually due to the allocation of extra contract electricity demand. The college authority needs to discuss with the competent authority of IRCA, APDCL, Rangia to reduce the amount into an optimum level.

1.5. Overall consolidated findings of the energy audit

- i. Assessment and future probable electrical load calculation is adequate.
- ii. The college is paying the monthly electricity bill continuously.
- iii. Monthly electricity consumption is not above the benchmark level.
- iv. The college is giving much emphasis on reducing the power consumption and replace the non-renewable energy source with renewable energy.
- v. The competent college authority is giving importance on energy conservation awareness among the stakeholders of the college.

1.6. Post audit phage

Energy audit is a regular practice. This is required for the proper management of the energy sources. Minimum energy utilization and innovative energy saving ingenuities need to be followed for a sustainable future. College needs to give emphasis on the recommendations of the of the audit team before the next audit.

1.7. Supplementary materials used during energy audit

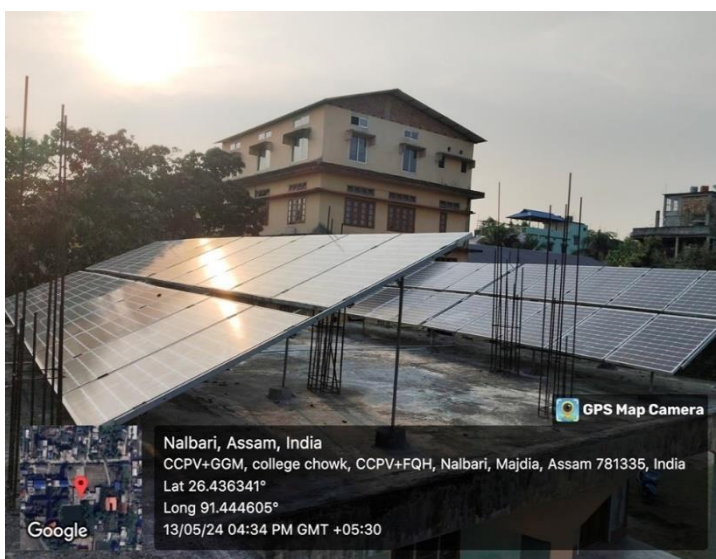
Table 1.3. Account of electrical stuffs in the departments/classrooms of Nalbari college

Sl no	Department/ Room	No of Laptop	No of desktop computer	No. of printer	No. of projector	No. of refrigerator	No. of fan	No. of light	Other electronic devices
1	Principals' Office & Administrative Block	01	12	06		01	14	25	Air conditioner 02
2	Assamese	NIL	01	01	01	NIL	05	05	Pure drop water filter 01
3	Economics	NIL	02	01	01	NIL	07	06	NIL
4	Education	NIL	01	NIL	NIL	NIL	04	03	NIL
5	English	NIL	03	01	01	NIL	02	03	Pure drop water filter 01
6	Geography	02	10	01	01	NIL	10	15	Pure drop water filter 01
7	History	NIL	01	01	01	NIL	12	09	NIL
8	Philosophy	NIL	01	NIL	NIL	NIL	02	01	NIL
9	Political Science	NIL	01	01	01	NIL	04	05	NIL
10	Sanskrit	NIL	01	01	01	NIL	05	03	NIL
11	Botany	NIL	05	01	01	01	11	07	Pure drop water filter 01
12	Chemistry	01	02	01	01	01	15	25	Pure drop water filter 01
13	Mathematics	01	01	01	01	NIL	05	07	NIL
14	Physics	01	03	01	01	NIL	07	06	Pure drop water filter 01

Sl no	Department/ Room	No of Laptop	No of desktop computer	No. of printer	No. of projector	No. of refrigerator	No. of fan	No. of light	Other electronic devices
15	Statistics	01	20	01	01	NIL	04	02	Pure drop water filter 01
16	Zoology	NIL	01	01	02	01	27	18	Pure drop water filter 01
17	Geology	NIL	01	NIL	NIL	NIL	01	02	NIL
18	Computer Application	NIL	02	01	01	NIL	08	04	NIL
19	Computer Application lab	NIL	30	04	01	NIL	10	10	NIL
20	Central computer laboratory	NIL	30	04	01	NIL	08	06	NIL
21	Library	NIL	18	03	NIL	NIL	41	60	Pure drop water filter 01
22	IQAC	01	02	02	01	NIL	02	08	Air conditioner 01
23	NRC	NIL	04	01	NIL	NIL	03	02	NIL
24	PGA	NIL	NIL	NIL	NIL	NIL	12	08	NIL
25	R-09	NIL	NIL	NIL	NIL	NIL	05	04	NIL
26	R-10	NIL	NIL	NIL	NIL	NIL	05	05	NIL
27	BOT-01	NIL	NIL	NIL	01	NIL	04	02	Air conditioner 01
28	BOT-02	NIL	NIL	NIL	NIL	NIL	04	06	NIL
29	R-07	NIL	NIL	NIL	NIL	NIL	06	05	NIL
30	R-08	NIL	NIL	NIL	NIL	NIL	04	03	NIL
31	ZOO-01	NIL	NIL	NIL	NIL	NIL	04	02	NIL
32	ZOO-02	NIL	NIL	NIL	NIL	NIL	04	02	NIL

Sl no	Department/ Room	No of Laptop	No of desktop computer	No. of printer	No. of projector	No. of refrigerator	No. of fan	No. of light	Other electronic devices
33	ZOO-03	NIL	NIL	NIL	NIL	NIL	04	02	NIL
34	ZOO-04	NIL	NIL	NIL	NIL	NIL	04	03	NIL
35	ZOO-05	NIL	NIL	NIL	NIL	NIL	04	03	NIL
36	CHEM-01	NIL	NIL	NIL	NIL	NIL	02	02	NIL
37	CR	NIL	NIL	NIL	NIL	NIL	11	08	NIL
38	NB-02	NIL	NIL	NIL	NIL	NIL	05	04	NIL
39	BB-01	NIL	NIL	NIL	NIL	NIL	04	02	NIL
40	BB-02	NIL	NIL	NIL	NIL	NIL	03	06	NIL
41	BB-11	NIL	NIL	NIL	NIL	NIL	03	04	NIL
42	AB-11	NIL	NIL	NIL	NIL	NIL	05	04	NIL
43	AB-12	NIL	NIL	NIL	NIL	NIL	04	04	NIL
44	Examination Room	NIL	NIL	NIL	NIL	NIL	02	06	NIL
45	Teachers' Common Room	NIL	02	NIL	NIL	01	04	06	NIL
46	AB12	NIL	NIL	NIL	NIL	NIL	02	02	NIL
47	AB13	NIL	NIL	NIL	NIL	NIL	05	02	NIL
48	AB14	NIL	NIL	NIL	NIL	NIL	04	02	NIL
49	AB21	NIL	NIL	NIL	NIL	NIL	03	02	NIL
50	AB22	NIL	NIL	NIL	NIL	NIL	03	03	NIL
51	Digital Class room	NIL	NIL	NIL	NIL	NIL	01	24	Air conditioner 03
52	KMBH1	NIL	NIL	NIL	NIL	NIL	02	02	NIL
53	KMBH2	NIL	NIL	NIL	NIL	NIL	02	02	NIL
54	KMBH3	NIL	NIL	NIL	NIL	NIL	02	02	NIL
55	KMBH4	NIL	NIL	NIL	NIL	NIL	02	02	NIL

Sl no	Department/ Room	No of Laptop	No of desktop computer	No. of printer	No. of projector	No. of refrigerator	No. of fan	No. of light	Other electronic devices
56	KMBH21	NIL	NIL	NIL	NIL	NIL	06	02	NIL
57	SB01	NIL	NIL	NIL	NIL	NIL	06	05	NIL
58	SB02	NIL	NIL	NIL	NIL	NIL	06	04	NIL
59	SB03	NIL	NIL	NIL	NIL	NIL	04	02	NIL
60	SB04	NIL	NIL	NIL	NIL	NIL	03	02	NIL
61	SB05	NIL	NIL	NIL	NIL	NIL	02	02	NIL



20 kW capacity Solar panel is installed on the roof of science block

Solar street light in the college campus

