MADHAB CHOUDHURY COLLEGE, BARPETA
ASSAM-781301

Energy Audit Report-2023

Prepared by

M.C. College, Barpeta-781301

Table of content

Acknowledgement

We give our sincere thanks to Dr. Prakash Sarma, principal of our college for giving us the opportunity to involved in energy audit process. At the same time, we are very much grateful to APDCL authorities, Barpeta Electrical Circle for guiding and supplying the essential information related to energy audit. We would also like to acknowledge Mr. Gautam Jyoti Saharia, Assistant General Manager, T&C Div., Pathsala, APDCL for helping us by providing necessary data required for the preparation of this energy audit. Finally, we are grateful to all the teaching and non-teaching staff of our college for supporting us throughout the whole exercise.

Introduction

M.C. College authority has entrusted the task of conducting energy audit and energy management study to a group of teachers. The field work and data collection were carried out during the period from August 2022 and July 2023.

The study encompassed the examination of the existing pattern of energy use in the college and identification of area were energy and monetary savings could be achieved by employing suitable techno- economic measures.

The report gives the details of observations of the team along with appropriate recommendations and supporting calculations. We hope that the findings of the team will supplement the efforts of the management in bringing the energy consumption of office to the lowest possible level.

The report prepared by the Energy Audit Committee comprising of the following group of members–

M.C. College, Barpeta **Energy Audit Committee**		
1.	Chairperson	Dr. Prakash Sarma, Principal, M.C. College, Barpeta.
2.	Co-ordinator	Dr. Malay Kr. Barman, Associate Professor, Dept. of Physics
3.	Members	1. Mr. Champak Deuri, Associate Professor, Dept. of Education 2. Dr. Bipul Sarma, Associate Professor, Dept. of Mathematics 3. Dr. Nibedita Gogoi, Assistant Profesor, Dept. of Chemistry 4. Dr. Arjun Adhikari, Assistant Professor, Dept. of Botany 5. Mr. Nabajyoti Ojah, Office staff, M.C. College, Barpeta 6. Mr. Khanjan Jyoti Pathak, B.sc. 4th Sem., Dept. of Physics 7. Mr. Manash Jyoti Deka, B,Sc. 2nd SEM, Dept. of Mathematics

Why energy audit?

We understand an energy audit determines the amount of energy consumption affiliated with a building and the potential savings associated with the energy consumption. Additionally, an energy audit is designed to understand the specific condition that are impacting the performance and comfort in our facility to maximize the overall impact of energy focused building improvements.

An energy audit is a systematic review of the energy consuming installations in a building or premises to ensure that energy is being used sensitively and efficiently. An energy audit usually commences with the collection and analysis of all information that may affect the energy of the building or premises then follows with reviewing and analysing the condition and performance of various building services installations and building management with an aim at identifying areas of inefficiency and suggesting means for improvement.

Through implementation of the suggested improvement measures, building owners can get the immediate benefit for paying less for energy bills. On the other hand, lowering of energy consumption in buildings will lead to the chain effect that less feasible fuel will be burnt for electricity generation by the power supply companies and relatively less pollutants and greenhouse gases will be introduced in the atmosphere, thus contributing to conserve the environment and to enhance sustainable development.

Executive Summary:

Assignment was conducted and the following areas have been covered in the study-

1. Electricity Bill
2. Distribution Network
3. DG Sets
4. Air Conditioning Load
5. Solar Power
6. Other electrical appliances

Electricity Bill: The electricity supply for M.C. College, Barpeta is provided by Assam Power Distribution Company Limited. The details of consumer are as given below-

Consumer Name: Principal M.C. College

Tariff Category: HT IV Bulk Supply (Government Education)

Consumer account number: 063000000003

Dedicated DTR capacity: 250kVA

Contract Demand: 75kVA

Connected Load: 200kW

Table 1: Monthly Energy Consumption

Month	Consumption (kWh)	Power factor	Maximum Demand (in kVA)
Jan-21	779.30	0.99	13.20
Feb-21	3135.18	0.98	15.20
Mar-21	3800.58	0.99	13.84
Apr-21	227.79	0.97	4.60
May-21	2820.32	0.88	6.40
Jun-21	2237.00	0.90	8.80
Jul-21	2912.00	0.94	13.20
Aug-21	3137.00	0.94	6.80
Sep-21	4181.00	0.96	19.00
Oct-21	4589.00	0.96	28.40
Nov-21	3809.00	0.92	20.40
Dec-21	3665.00	0.92	12.80
Jan-22	3214.00	0.92	10.60
Feb-22	3214.09	0.94	12.00
Mar-22	3142.72	0.98	24.00
Apr-22	4615.54	0.97	24.00
May-22	4824.93	0.97	34.00

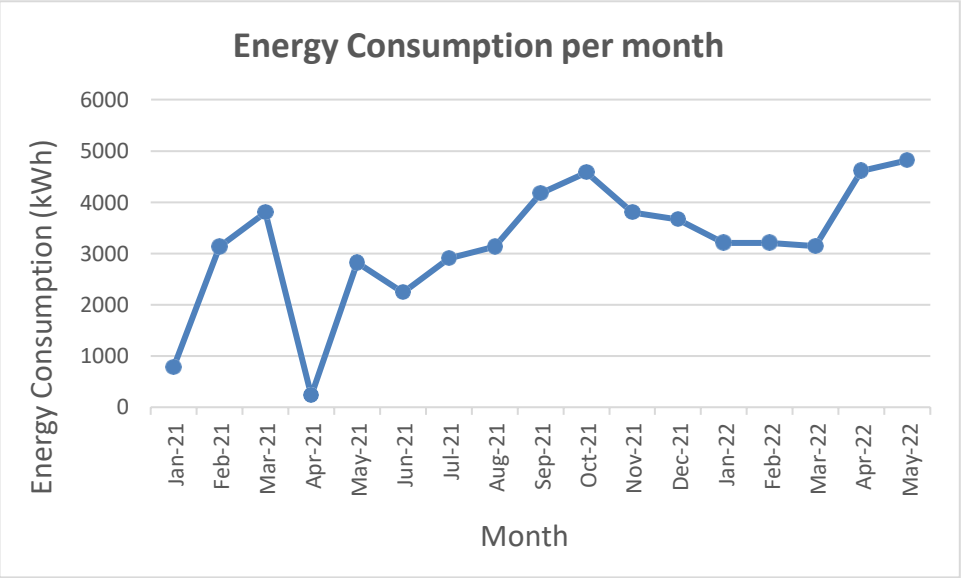


Figure 1: Graphical representation of monthly energy consumption

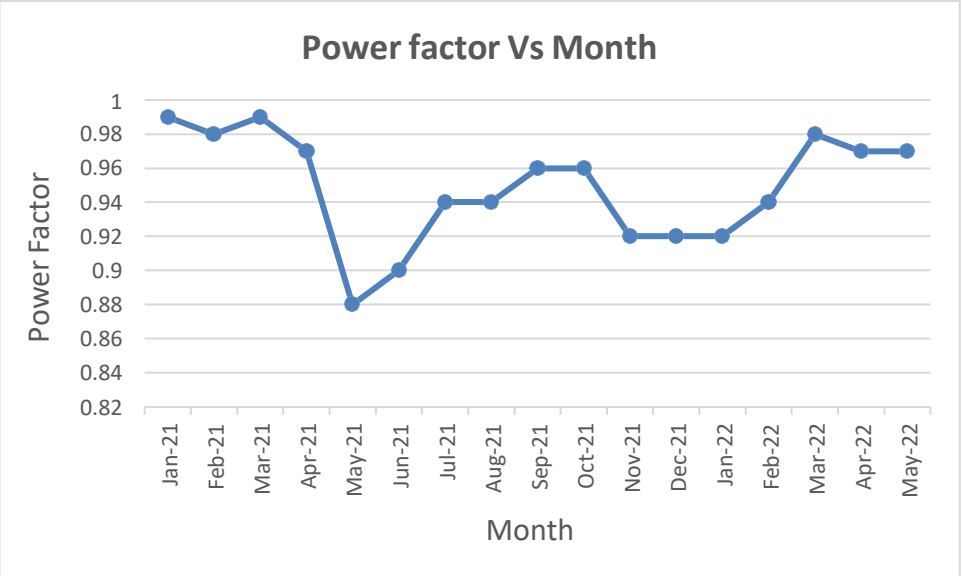


Figure 2: Graphical representation of Power factor versus Month

Distribution Network: Our College has a transformer purely dedicated for this institute. The capacity of this transformer is 250 kVA , 11/0.433kV Dyn11 (Figure 3).

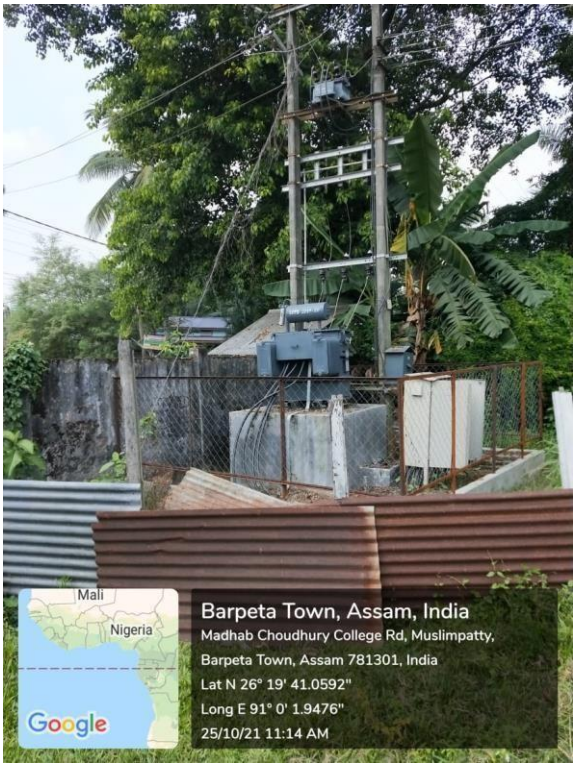


Figure 3: Dedicated 250kVA Distribution Transformer of the college located nearby Department of Zoology with metering system

DG Sets: There are three generators in the college campus

a) One is located near by the college gate having capacity 30kVA with single phase output.
b) One is located in front of the college library having capacity 30 kVA with single phase output.
c) The third one generator is located near to Seminar Hall with capacity loading 35 kVA with three phase output.

Figure 3: Diesel Generator (DG)

Air Conditioning Load: There are four AC in the college campus having capacity1.5 Ton (three star rated).

Figure 4: Air Conditioner (AC)

Solar Power: It is important for the environment as it replaces the negative effects of fossil fuels with more environmentally friendly alternatives.

Due to the local nature of electric energy production through sources like solar and wind power, the energy infrastructure is more flexible and less dependent on centralized sources that can lead to disruption as well as being less resilient to weather related climate change.

Green energy also represents a low-cost solution for the need of many parts of world. This will improve as costs continue to fall, further increasing the accessibility of green energy especially in the developing world.

M.C. College has installed photo voltaic plate of size 1.0m x1.6m where number of plates is 100. Normally 20 ampere AC is generated after conversion from DC. This output current is directly connected to load line.

At the same time there are six dedicated street light system supported by isolated six similar arrangement, where 12 Volt battery for each post and 5-Watt LED source produces light.

Figure 5: Solar Street light in the college campus

Other electrical appliances: Mainly energy is used in the following list of electrical appliances (Table 2). (Bot: Botany, Zoo: Zoology; Phy: Physics, Chem: Chemistry, Phil: Philosophy, PSc: Political Science, Eco: Economics, Eng: English, Math: Mathematics, Asm: Assamese, Comp: Computer Science, Anth: Anthropology, Edu: Education, Hist: History, Geo: Geography, Lib: Library, Mhos: Men's hostel, Whos: Women's hostel, AC: Air conditioner, LED: Light Emitting diode, SemH: Seminar Hall, Off: office, Audi: Auditorium)

Table 2: List of electrical appliances along with numbers used in the college premises

	Tube Flou	Led tube	Bulb	CFL	Led bulb	Fan	AC	Refrigerator	Vending Mechine	Comp	Lap top	Printer	Pump	Motor	Misc
Bot	03	-	01	-	08	15	1	-	-	08	-	01	-	-	30
Zoo	09	-	-	-	-	12	-	-	-	02	-	01	-	-	05
Phy	10	-	-	-	13	23	-	-	-	10	-	01	-	-	6
Chem	16	24	06		06	41	-	1	-	3	-	-	01	-	12+8
Phil	02	-	-	-	04	10	-	-	-	-	-	-	-	-	-
PSc	-	-	02	-	-	02	-	-	-	-	-	-	-	-	01
Eco	01	-	-	-	-	02	-	-	-	-	-	-	-	-	01
Eng	01	-	-	-	-	01	-	-	-	-	-	-	-	-	01
Math	08	-	-	-	-	13	-	-	-	01	-	01	-	-	01
Ass.	01	-	-	-	-	02	-	-	-	01	-	01	-	-	03
Comp-	10	-	-	-	-	09	-	-	-	18	-	01	-	-	-
Anth	-	27	-	-	-	10	-	01	-	01	-	-	-	-	-
Edu	08	-	-	-	-	10	-	-	-	-	-	-	-	-	1+6
Hist	01	-	-	-	-	01	-	-	-	-	-	-	-	-	-
Geo	-	18	08	-	-	10	-	-	-	-	-	-	-	-	-
Lib	7	24	1	1	-	45	-	-	-	20	-	01	-	-	1+1
Off	-	36	-	-	-	11	3	-	-	6	4	7	-	-	4+4
Audi	-	4		10	-	22	-	-	-	-	-	-	-	-	-
SemH		40				33		01	-	15	-	-	-	-	31
Pavalion	14	-	-	-	-	18	-	-	-	-	-	-	-	-	2
MHos	26	-	02	-	-	29	-	-	-	-	-	-	-	01	01
WHos	11				122	57			02					03	6+1

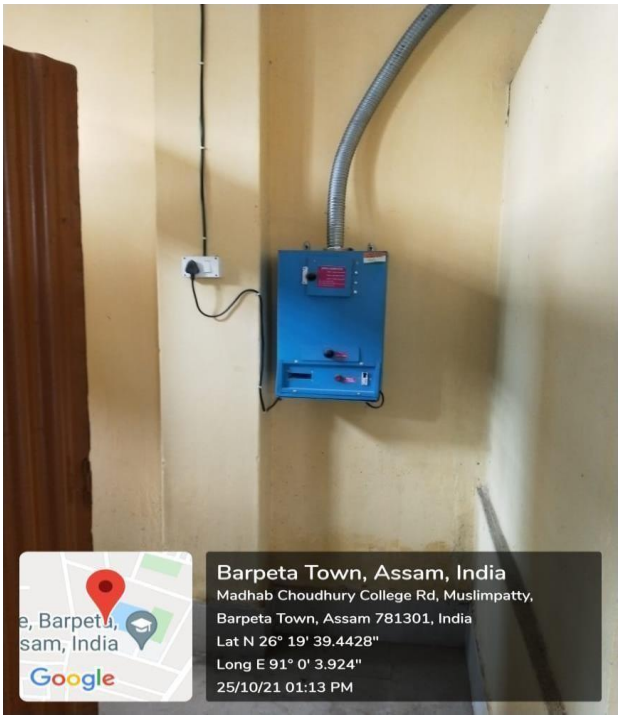
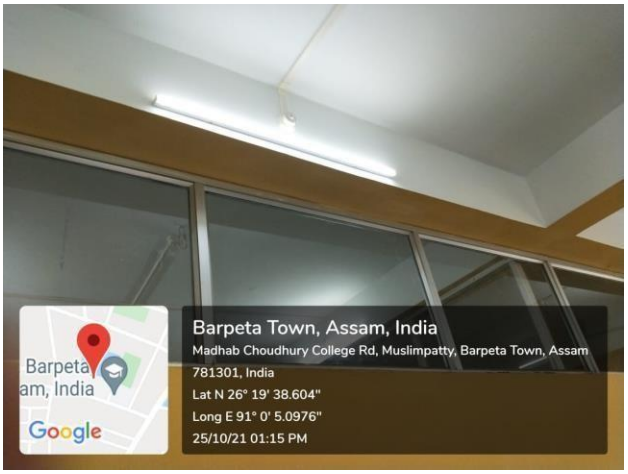


Figure 6: Incinerator machine to maintain hygiene among the students



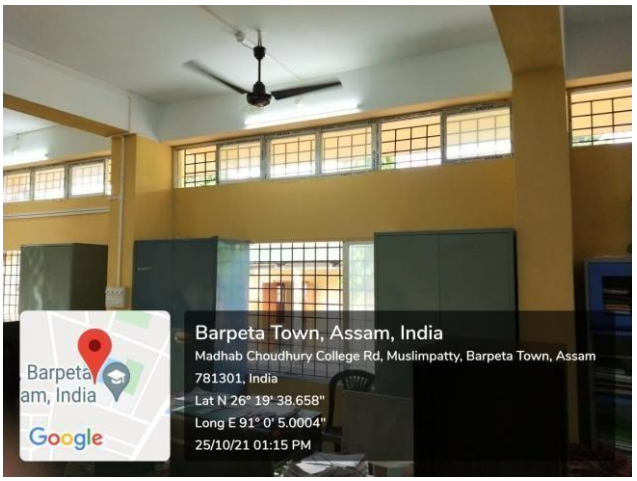


Figure 7: LED Tube light & Fan

Best Practices

1. Rain Water harvesting: The college has made a provision of storing the rain water in the college campus. The collected water is used in the zoology laboratory. This stored water is in fact one means of sustaining the use of electricity which is required to run the water motor to draw water from the ground.

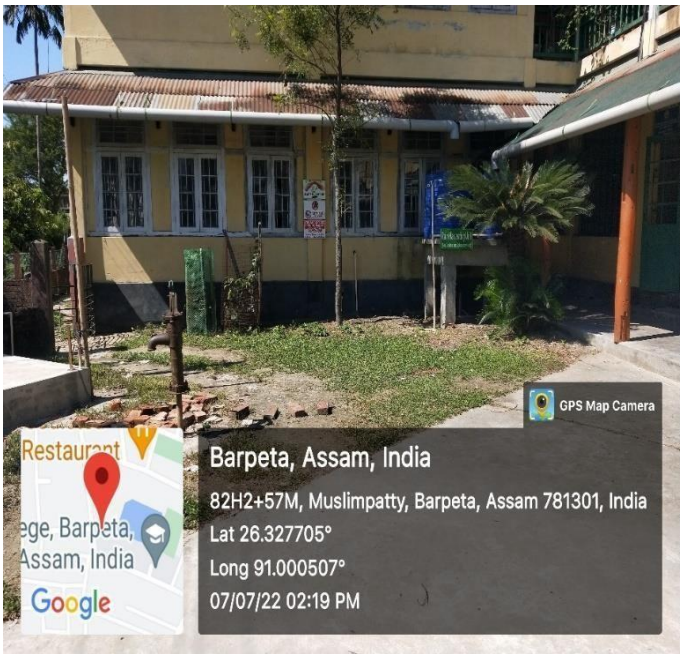


Figure 8: Rain water harvesting unit

2. The college has installed Solar panel covering 160 m^2 area over the roof top of library Building and used generated electricity in the college during working days. Solar energy converted into electricity which reduce the bill amount proportionate to amount produced. In holidays generated energy fed to the grid.

3. Solar energy supported street light which saves non negligible amount of electrical energy.

4. The college authority already replaced many conventional lights with large number of LED source. These LED sources are better in the sustainable use of electricity than the other sources, thereby reducing the use of electrical energy in the campus.

5. DG sets are rarely used. (Use only in emergency)

Figure 9: Solar Inverter system for interfacing of ON-GRID 20kWp Solar Roof Top system with APDCL mains. DC generated from solar panels converted to AC for usage.

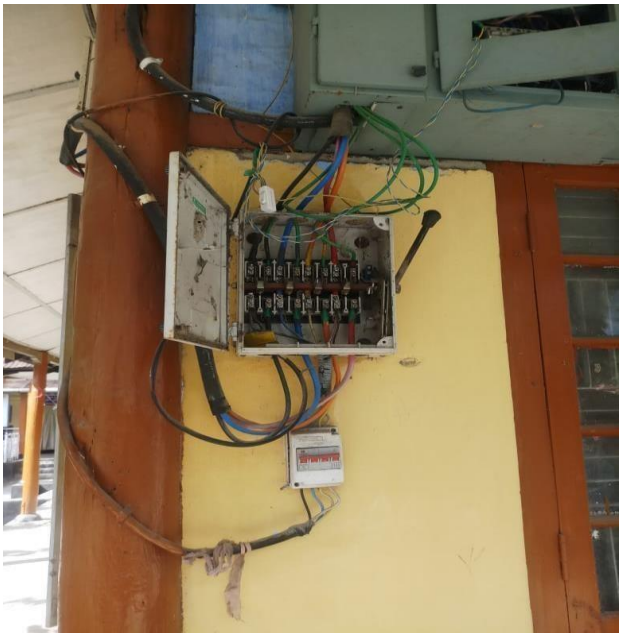


Figure 10: Alternating current obtained from Roof Top Solar Plant is directly interfaced with APDCL supply contributing to energy demand of the college during daytime/solar generation period and thereby reducing overall consumption from APDCL.

Suggestions:

1. There should periodically checkup of some electrical appliances, specially which are relatively old.
2. Higher energy efficient new ceiling fan can be fitted removing the very old ones.
3. If some wirings are based on aluminum wires those should be rewired with copper wire, equipment earthing connections to be checked for leakages and prevent any from electrical hazard.
4. The college has South direction facing roofs which are optimum for placement of solar plates in Solar Roof Top plants installation which can contribute a step towards energy saving, green energy solutions and overall reduce the energy bill served.