

To

The Principal

Barpeta Girls' College

Sub.: Energy Audit Report

Dear Sir,

After completing the study on the electrical infrastructure of the college on 17 June, 2024, the collected data has been analysed and presented in the enclosed report. An earnest effort has been made from our side to portray the existing scenario of your institute from energy consumption and conservation point of view with potential for saving energy. I believe that you shall find my observations & recommendations constructive and make a sincere effort to implement the proposed schemes for the projected benefits.

I take this opportunity to express my gratitude and thanks to the authority and management for keeping faith on my ability and taking a positive approach.

Regards.

Arup Bharali
20/06/2024

(Dr. Arup Bharali)

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ENERGY AUDIT REPORT



Barpeta Girls' College
Kalayahati, Barpeta, Assam

Submitted to the
Principal, Barpeta Girls' College

By-
Dr. Arup Bharali
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Introduction

Energy Audit is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility. It helps an institution to understand the energy flows into different segments inside the premises. The said Audit again assist the stakeholders in identifying the areas where waste can occur and where scope for conservation exists. As per the Indian Energy Conservation Act, 2001, Energy Audit is defined as "the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption". The Energy Audit would give a positive orientation to minimise the energy costs / waste, to minimise environmental effects through preventive maintenance and quality control activities. Such an audit programme will help to keep focus on change of habits which causes enormous wastages of energy, appropriate energy mix, identify energy conservation technologies, retrofit for energy conservation equipments, etc.

Aims and Objectives of the Energy Audit

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.

- Analysis of latest electricity bill of the campus,
- Study of energy flow in different segments.
- Review of energy saving opportunities and measures implemented in the audit sites.
- Identification of additional energy sources and saving opportunities.
- Providing a technical information on how to build an energy balance as well as guidance to be sought for particular applications.

Activities carried out during Energy Audit

- Formation of Energy Conservation Committee (ECC).
- Analyse the electricity consumption through APDCL based on the previous year electricity bills.
- Data collection regarding power distribution in different blocks inside college premises.
- Physical verification of lighting, fans load fixtures and electrical wirings.
- Inspection of Generators, Uninterruptible Power Supply (UPS), etc. on the aspect of maintenance and consumption.
- Verification of installation of safety systems.
- Verification of installed energy efficient systems.
- Review the potential usage of alternative energy resources.
- The energy conservation awareness among the stakeholders for optimum use of electricity and its savings were reviewed.

- Recommendation of various methods for cost reduction by saving power, power waste reduction, etc.
- Submission of Report to ECC.

Formation of Energy Conservation Committee (ECC)

As a part of energy audit exercise, energy auditor visited Barpeta Girls' College on 17 June, 2024. The purpose was to have first hand information of electrical loads, consumption pattern and prospect of saving energy. Conserving energy is always a team work and a collaborative action. So keeping in view of energy conservation, an Energy Conservation Committee (ECC) was formed with principal as the team leader. Following members are included in the ECC:

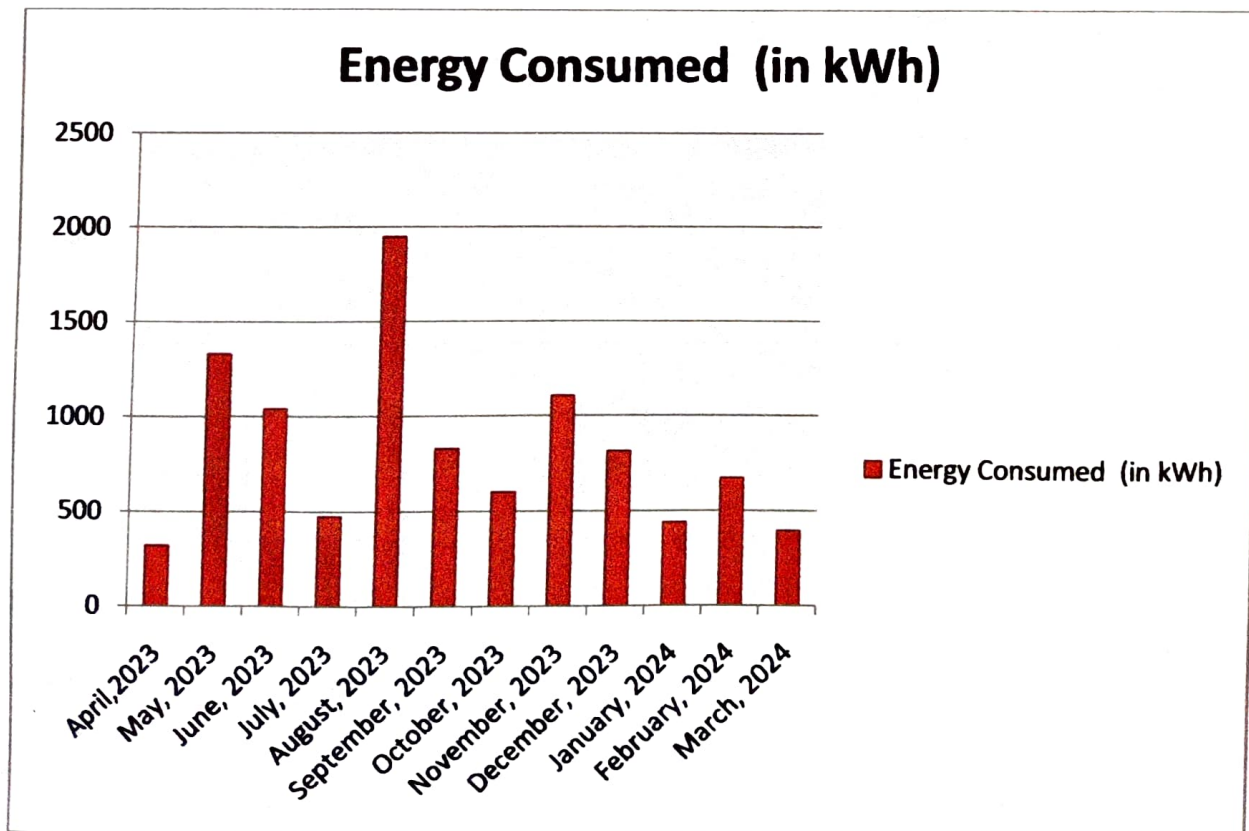
1. Dr. Birinchi Kumar Das, Principal, Barpeta Girls' College (Chairman)
2. Dr. Akbar Ali Ahmed, Coordinator, IQAC (Member)
3. Zahidul Islam Khan, Dept. of English, (Member)
4. Dr. Banjit Tahbilder, Dept. of Assamese, (Member)
5. Abu Bakkar Siddique Dept. of Education, (Member)
6. Sri Ripujit Das, UDA, Barpeta Girls' College
7. Jamiran Begum, General Secretary, Student Union, (Member)
8. Babita Das Guardian (Women Member)
9. Sri Jaygopal Das (Guardian Member)
10. Bhogneswar Das (Guardian Member)

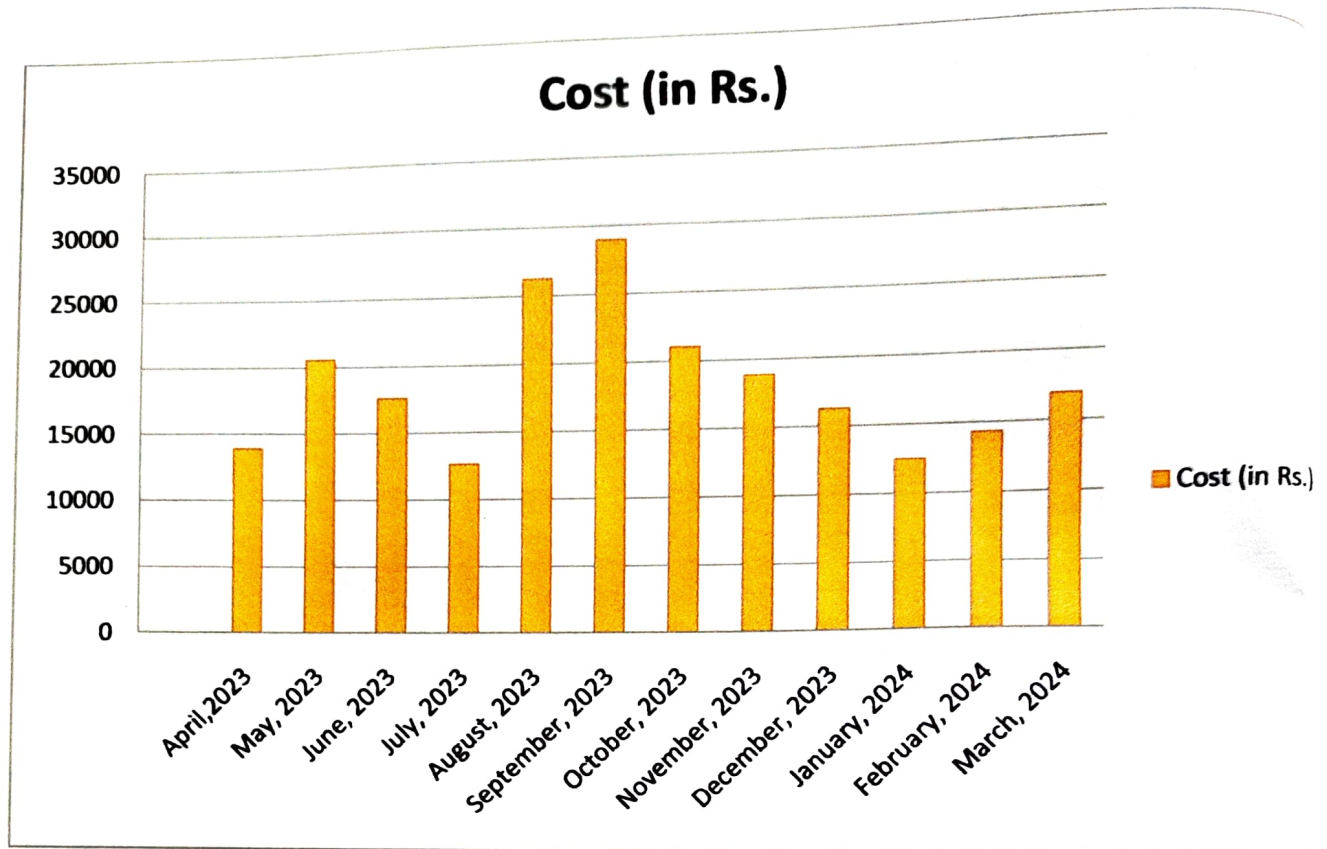
Energy Consumption and Cost based on APDCL Bills

The following table and chart show the profile of energy consumed and the cost for one year by the institution.

| Month | Energy Consumed (in kWh) | Cost (in Rs.) |
|--------------------|-------------------------------------|----------------------|
| April, 2023 | 321 | 13883 |
| May, 2023 | 1330 | 20566 |
| June, 2023 | 1040 | 17622 |
| July, 2023 | 473 | 12673 |

| | | |
|--------------------------|-------------|---------------|
| August, 2023 | 1947 | 26239 |
| September, 2023 | 827 | 28945 |
| October, 2023 | 600 | 21000 |
| November, 2023 | 1105 | 18875 |
| December, 2023 | 812 | 16272 |
| January, 2024 | 439 | 12516 |
| February, 2024 | 670 | 14343 |
| March, 2024 | 393 | 16902 |
| Total | 9957 | 219836 |
| Average per month | 830 | 18320 |





Blockwise / Sectionwise Power Distribution

Load contracted: 37kVA

| Consumers Room Description | AC/ Fridge | Tube light | Fan Watt (W) | X LED (W) | CFL (W) | Socket (A) | Computer (W) | Printer/ Scanner/ Projector/ Camera/ Xerox (W) |
|-------------------------------|-------------|------------|------------------|----------------|---------|------------|-------------------------|--|
| Administrative Block | | | | | | | | |
| Principal Office | 1 (1.5 ton) | 1 (20 W) | 02 (2x70= 140 W) | 02 (2x9= 18 W) | - | 03 1x6=6 A | 1 Laptop 2 Desktop | Printer=1 (2.1A x 220 V) |
| Conference Room (Principal's) | - | - | 02 (2x70= 140 W) | - | - | - | - | - |
| Main Office | - | - | 04 (4x70= 28 W) | 04 (4x9= 36 W) | - | 03 3x6=18A | 02-laptop 02 Desktop | 01-Laser 3.3A 01-multipurpose 2.5 A |

| | | | | | | | | |
|-------------------------------|---|---|------------------------|----------------------|---|---------------|---|------------------------------------|
| Digital Classroom | - | - | 08 (8x70= 560 W) | 02 (2x9= 18 W) | - | 03 3x6=18A | - | - |
| Toilet Block | - | - | - | 02 (8x9= 72 W) | - | - | - | - |
| Generator Set | - | - | - | 01 (2x9= 18 W) | - | - | - | Xerox-01 2.4A |
| Drinking Water Machine | - | - | - | - | - | - | - | - Drinking 01 220 V 50 Hz |

AcademicBlock

| | | | | | | | | | |
|-----------------------------------|-------------|---|--------------------------|------------------------|----------------------|---|----|---------------|----------------------|
| Departments and classrooms | Ass | - | 1 (20 W) | 03 (3x70= 210 W) | - | - | -- | - | - |
| | Eng | - | 1 (20 W) | 01 (1x70= 70W) | - | - | - | 01 Desktop | - |
| | Eco | - | 1 (20 W) | 02 (2x70= 140 W) | - | - | - | 01 Desktop | - |
| | Edu | - | 1 (20 W) | 02 (2x70= 140 W) | - | - | - | 01 Desktop | - |
| | PSc | - | 1 (20 W) | 02 (2x70= 140 W) | - | - | - | 01 Desktop | 01- Laser 3.3A |
| | HSc | - | 1 (20 W) | 02 (2x70= 140 W) | - | - | - | - | - |
| | Phil | - | 1 (20 W) | 02 (2x70= 140 W) | - | - | - | 01 Desktop | - |
| | Anth | - | 2 (40 W) | 02 (2x70= 140 W) | - | - | - | - | - |
| Class Rooms | 1 | - | 6 (6x20 =120 W) | 08 (8x70= 560 W) | - | - | - | - | - |
| | 2 | - | 2 (40 W) | 04 (4x70= 280 W) | - | - | - | - | - |
| | 3 | - | 2 (40 W) | 04 (4x70= 280 W) | - | - | - | - | - |
| | 4 | - | - | 03 (3x70= 210 W) | 02 (2x9= 18 W) | - | - | - | - |
| | 5 | - | 1 (20 W) | 04 (4x70= 280 W) | 01 (9 W) | - | - | - | - |

| | | | | | | | | | |
|---------------------------|----|---|----------------------------|-------------------------|----------------------|---|---------------|---------------|---------------------------|
| | | | 280 W) | | | | | | |
| | 6 | - | 2 (2x20= 40 W) | 03 (3x70= 210 W) | - | - | - | - | - |
| | 7 | - | 2 (2x20= 40 W) | 05 (5x70= 350 W) | - | - | - | - | - |
| | 8 | - | 1 (20 W) | 03 (3x70= 210 W) | - | - | - | - | - |
| | 9 | - | 1 (20 W) | 07 (7x70= 490 W)- | - | - | - | - | - |
| | 10 | - | 6 (6x20 =120 W) | 03 (3x70= 210 W) | - | - | - | - | - |
| | 11 | - | 2 (2x20= 40 W) | 03 (3x70= 210 W) | - | - | - | - | - |
| | 12 | - | 2 (2x20= 40 W) | 03 (3x70= 210 W) | - | - | - | - | - |
| | 13 | - | 2 (2x20= 40 W) | 03 (3x70= 210 W) | - | - | - | - | - |
| | 14 | - | 2 (2x20= 40 W) | 03 (3x70= 210 W) | - | - | - | - | - |
| Central Library | - | - | 04 (4x20 =80W) | 10 (10x70= 700 W) | 06 (6x9= 54 W) | - | 03 3x6=18A | 04 Desktop | Xerox-01 2.4A |
| Hostel-1 (AT) | - | - | 16 (16x20 =320 W) | 12 (12x70= 840 W) | - | - | - | - | - |
| Hostel-2 (RCC) | - | - | 12 (12x20 =240 W) | 12 (12x70= 840 W) | - | - | - | - | - |
| Conference Hall | - | - | 05 (5x70= 350 W) | 06 (6x9= 54 W) | - | - | - | 01 Desktop | Projector- 01 2.5 A |
| Girls 'Common Room | - | - | 02 (2x70= 140 W) | 03 (3x9= 27 W) | - | - | - | - | - |

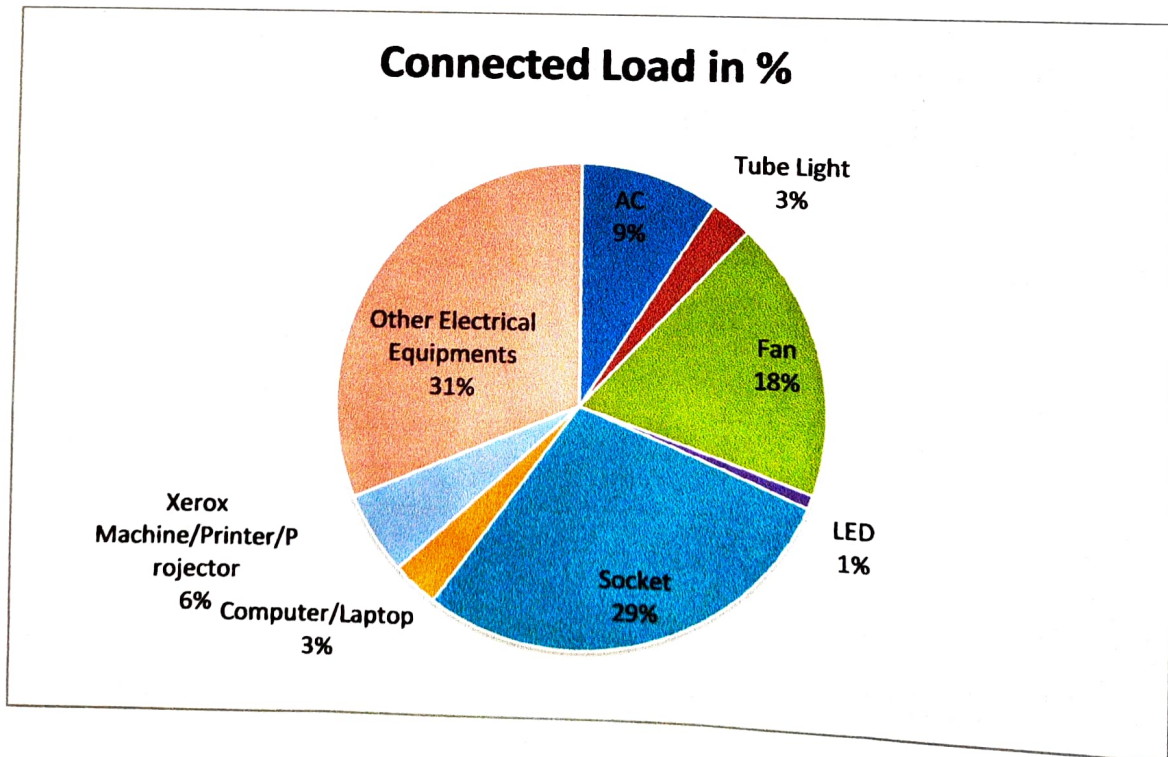
| | | | | | | | |
|---|---|-----------------------|------------------------|---|---|---------------|------------------|
| | | 140 W | 27 W) | | | | |
| Canteen | - | 01 (1x70= 70 W | 03 (3x9= 27 W) | - | - | - | - |
| Examination Board | - | 02 (2x70= 140 W | 03 (3x9= 27 W) | - | - | 01 Desktop | Xerox-01 2.4A |
| Vice Principal Room cum IQAC | - | 02 (2x70= 140 W | 02 (2x9= 18 W) | - | - | 01 Desktop | - |
| Indoor Stadium | - | 01 (1x70= 70 W | 10 (10x9= 90 W) | - | - | - | - |
| Corridor | - | - | 12 (12x9= 108 W) | - | - | - | - |
| Generator Shed | - | - | 1 (1x9= 9 W) | - | - | - | - |
| Students' Day Home | - | 02 (2x70= 140 W | 2 (2x9= 18W) | - | - | - | - |
| KKHSOU Room | - | 02 (2x70= 140 W | - | - | - | - | - |

Load in Other Electrical Equipments:

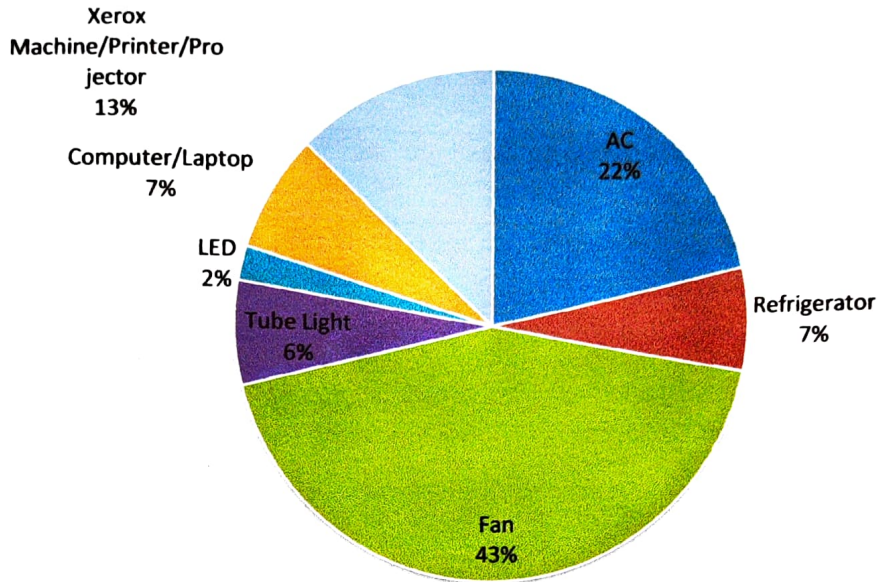
| SI No. | Equipments | Quantity | Power Rating per set (kW) | Condition |
|--------|--------------------------------------|--------------|---------------------------|-----------|
| 1 | water pumps | 03 | 0.7 | Working |
| 2 | water cooler | 01 | 0.7 | Working |
| 3 | inverters with 12V tubular batteries | 01 | 0.02 | Working |
| 4 | PC attached UPS | 14 | 0.7 | Working |
| 6 | Rice Cooker / Oven / Electric Kettle | 03 | 1.0 | working |
| 7 | Refrigerator | 02 | 0.7 | Working |
| 8 | CCTV | 15 | 0.01 | Working |
| | | Total | 17.17 | |

Analysis of Load Distribution

| Sl. No. | Items | Connected Load in kW |
|---------|---------------------------------|----------------------|
| 1 | AC | 5 |
| 2 | Refrigerator | 1.5 |
| 2 | Tube Light | 1.5 |
| 3 | Fan | 10 |
| 4 | LED | 0.5 |
| 5 | Socket | 15.8 |
| 6 | Computer/Laptop | 1.7 |
| 7 | Xerox Machine/Printer/Projector | 3 |
| 8 | Other Electrical Equipments | 17.17 |
| | Total Load connected | 54.67 |
| | Load contracted | 37kVA |



Demand Load during working hours (in %)



Generation of Electricity using fossil fuels

DG sets

No. of DG Sets: **02** (30kVA, 15 kVA)

Generation of Electricity using renewable energy sources

Solar Light: NIL

Solar Panel: NIL

Analysis of Electrical Distribution System:

| Sl. No. | PARTICULARS | OBSERVATION |
|---------|--------------------------------------|-------------|
| 1 | Is distribution of load satisfactory | YES |
| 2 | Condition of electrical wiring | GOOD |

| | | |
|----|---|------------------------------|
| 3 | Type of wiring | OPEN |
| 4 | Whether electrical equipment's are operating at specified voltage or current (within the tolerance range) | YES |
| 5 | Rating of fuses/junction box are as per standards | YES |
| 6 | Whether single isolating switch is available for the whole premises | YES |
| 7 | Earth pits identified | YES |
| 8 | Conduction of earthing | FAIR |
| 9 | Earth connection to equipment's – proper/ not proper | PROPER |
| 11 | Weather DG sets are provided with neutral earthing. Weather DG sets have logbooks | YES NO |
| 12 | Cable laying condition | GOOD |
| 13 | Cable Terminations | PROPER |
| 14 | Meter and main condition | GOOD |
| 15 | Panel Board Condition | GOOD |
| 16 | LED Lights & Energy Saving Appliances | SCOPE FOR IMPROVEMENT |
| 17 | Higher (4*/5*) rating devices installed: | SCOPE FOR IMPROVEMENT |

| | | |
|----|----------------------------------|--------------|
| 18 | Rating of cables as per standard | YES |
| 18 | Generator Capacity & Condition | 45 kVA, GOOD |
| 19 | Solar light | NIL |
| 20 | Solar Panel | NIL |

Recommendations for improving the energy efficiency and energy conservation

- The load connected is found to be 55kW against the contracted load of 37kW. As the connected load is much higher than the contracted load, it is suggested to increase the load contracted.
- Reduce the load connected, and hence consumption of electrical energy, by (i) removing the unnecessary sockets installed (ii) replacing ordinary fans and other electrical equipments with high rated ones, (iii) replacing tube lights with LED bulbs.
- Remove faulty lightings to avoid leakage of current.
- The illumination level of class rooms and toilets need to be optimized.
- All class rooms should have a MCB (miniature circuit breaker) to put off electrical appliances after classes are over.
- Organise awareness programmes on energy saving and energy conservation among the stakeholders. Display hoardings in prominent places in the campus to highlight about need to save power.
- Procurement of equipment with energy efficiency (4-5 star rated equipment) during replacement may be considered.
- Separate connections for different blocks, e.g. office, class rooms, Library, Conference Hall, Hostels, are to be made for saving energy and to ensure safety for the stakeholders.
- It is suggested to replace the open wiring by concealed wiring for safety purpose.
- More motion sensor bulbs, solar lights and panels may be installed.
- Optimal water usage will reduce the energy consumption.
- Don't keep the electrical equipments in "standby mode". Always turn off when not in use.
- The college may opt for electricity generation from solar energy to reduce impact on environmental compared to DGs.
- The DG set needs to be maintained with an annual maintenance contract. A log book needs to be in place to assess performance of the DG set.
- The power supply to the hostels should be separated from the college supply. A separate supply should be provisioned to monitor the consumption pattern of energy by hostellers.

Acknowledgement

I am grateful to the Management, the Principal and the members of IQAC of Barpeta Girls' College, Barpeta, Assam, for providing necessary facilities and co-operation during the Energy Audit process. This helped me in making the audit a success. Further, I hope that the Institution will boost the new generations to take care of the electrical energy conservation, energy saving measures and sustainability in compliance with the applicable regulations, policies and standards in the College Campus.

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20/06/2024

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