

A REPORT ON ENERGY AUDIT AT DIMORIA COLLEGE, KAMRUP (M), ASSAM

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SUBMITTED TO
THE PRINCIPAL
DIMORIA COLLEGE
KHETRI KAMRUP (M) ASSAM
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1. Background

With population of world having reached seven billion (700 Crores) demand for resources is bound to increase. India as a developing country with a population of 130 crores plus is no different. With climate change looming large scientists and leaders throughout the world have called for reducing dependence on fossil fuel. On the contrary India has to import 80% of its fossil fuel to move its economy. About 70% of Electricity in India is generated from fossil fuel of which major component is coal. India has to depend on fossil fuel to sustain its GDP and to raise quality of life of its people. In contrast burning of fossil fuel like coal, diesel and petrol emanates CO₂ leading to accumulation of greenhouse gases in atmosphere. Accumulation of greenhouse gases in atmosphere is an anthropogenic factor leading to global warming. Human activities like burning of fossil fuel for power generation, industrial production and transportation have had a telling effect on pollution of land, air and sea, degradation of land, melting of glaciers and so on. We have only one earth to live. In order to reduce adverse impact of climate change emission of greenhouse gases have to be reduced. It is at this juncture that electricity and water need to be used efficiently. We need to remove inefficiencies in use of electricity so as to use it efficiently. Dimoria College is embarking on a road map to use electricity efficiently. It has taken the lead to carry on energy audit.

2. Introduction to Energy Audit

Energy Audit is a better way to increase energy efficiency and reduce energy consumption. An energy audit is an assessment of the energy consumed within a time frame in a given location to find out inefficiencies.

As per Energy Conservation Act, 2001, Energy Audit is defined as “the verification, monitoring and analysis of use of energy including submission of technical report containing recommendation for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption”.

In the provision of the Energy Conservation Act, 2001 the Bureau of Energy Efficiency has been set up under the ministry of power. The parliament of India passed the bill on conservation of energy bill in 2001 there by enlisting a set of rules to make efficient use of energy.

3. Scope of Work

3.1 Assessment of actual operating load and scope for optimizing

- Review of existing electrical load in the campus
- Review of electrical load based on actual requirement

3.2 Study of individual units and means to conserve electrical power

- Study of existing use of power
- Review of unit wise electrical load based on requirement
- Recommendation for saving electricity

3.3 Energy conservation in Air-conditioning and water pumping system

- Observation in use of power and water
- Methods to save power and water

3.4 Diesel Generator (DG) set

- Existing standard of operation
- Performance of DG set in terms of specific fuel consumption (SFC-Kwh/lit)
- Recommendation for optimum use of DG set

4. Energy Scenario of Dimoria College

Dimoria college is located in a sprawling campus of about 24 bighas of land dotted with administrative block, Academic blocks with library, various departments with science and art streams, auditorium and canteen with power supplied by A.P.D.C.L.

Sl. No.	Data on power supply	Values
1	Rating of Distribution Transformer	150 kva
1	Connected Load	120kw
2	Contract Demand	106 Kva
3	Billed Electricity Consumption in kwh ((Jan21-Jan'22)	
4	Annual cost of Electricity Consumption@Rs.7.45/unit	Rs.249621.49
5	Annual bill for Maximum Demand @Rs.180/kva	Rs.165359.96
6	Annual cost of electricity charges	Rs.443355.00
7	Working hours (Administrative and Academic)	8 Hrs

8	Sub-metering of individual units	Nil
9	Average annual cost of operating DG set	Rs.35000.00

5. Methodology for Energy Audit

The methodology for energy audit consists of preliminary audit, audit and post audit stages.

Step 1- Building a team for Energy conservation (ECC).

During preliminary audit an Energy Conservation Committee (ECC) is formed with Principal as the team leader. The idea of Energy Audit is a collective effort. It is essential that an energy conservation team is formed to carry forward the objective of energy audit. A meeting is scheduled between the auditor and the team to start with process. Agenda of the meeting focuses on objectives, scope of works, rules and regulations, roles and responsibilities of team members and description of scheduled project activities. During meeting the team is enlightened about power system within the campus, energy system specifications, standard operating practices, importance of saving electricity and safety measures to be adopted during operation of various electrical equipment.

Step- 2. Walk in Audit

After formation of ECC members along with energy auditor goes round the entire campus to take stock of various electrical power consuming devices including lighting system, fan, and various laboratory equipment in science blocks.

Step-3. Documents verification

In this phase various documents like energy bills, agreements with utility are verified, log sheets of DG set are looked into to ascertain if the pattern of energy consumption are tallying.

Step-4. Identification of energy consuming devices

After a study of the facilities energy consuming devices are identified and where appropriate field measurements are collected to substantiate findings.

Step-5. Bills by utility for analysis

This is one of the steps where bills served by utilities have to be verified to ascertain if cost incurred on electricity charges are reasonable. It also seeks to verify balance between energy actually required and energy consumed.

Step-6. Evaluation and feasibility of Energy Conservation Measures.

After walk in audit, scrutiny of relevant data, information based on available documents, measurements where required feasibility of conservation measures is studied with pay back method. This may be segregated to short-, medium- and long-term period.

Step-7. Preparation of Audit finding report

The findings and recommendations of audit are documented in the audit report. This report includes description of the existing power network within the campus and focuses on areas of major energy consuming locations. A discussion with the Energy conservation Committee highlights the need for saving energy. This will lead to save cost on electricity consumption and recommends the short, medium and long-term measures. These Energy saving measures try to rationalize the use of electricity and estimates payback period after implementation of the recommendations.

Step -8. Post audit period

The energy conservation measures will bring benefits of energy and costs saving only after the recommendations are implemented. The onus is on the user and stake holders of the institution to implement the ECM. The energy auditor has to highlight the importance of implementing ECM so as to achieve broader goal of efficient use of energy as stated in the Energy Conservation Act 2001.

6. Energy conservation committee, Walk-in-audit, observation and evaluation

6.1 Energy Conservation Committee (ECC)

As a part of energy audit exercise energy auditor visited Dimoria College on 22nd Feb, 2022. 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. The management of Dimoria College was committed to exercise of energy audit. In the process of forming ECC and to ensure full participation of stake holders including teachers, staff and students an energy conservation committee is formed with principal as the team leader. ECC included following members.

1. Dr. Biman Kumar Bhatta, Principal, Dimoria College – Chairman.
2. Mr. Manabjyoti Barkakaty, Dept. of Geography, IQAC Coordinator – Member.
3. Dr. SAI Choudhury, Dept. of Botany – Member.
4. Mrs. Jonali Barman, Dept. of Eco-restoration – Member.
5. Mr. Bhaskar Jyoti Deka, Dept. of Physics – Member.
6. Sri. Madan Chandra Das. – Member.
7. Mr.Nabajyoti Deka, President, Students Union – Member.

6.2 Walk in audit and observation:

Walk in audit forms a part of preliminary audit. In this exercise energy auditor along with Energy Conservation Team (ECC) takes a round of the college campus to observe use of electrical energy at different blocks and departments of the college and have objective assessment. The purpose of walk-in - audit is to have an insight into electrical network and power consuming devices and explore if there was any possibility of saving power. The devices included lights both LED & CFL, Fans, plug points (both 6 and 16 amps), computers, projectors, audio visual systems, incinerators, diesel generator, water pumps, air conditioners and so on. The team went round different blocks of college including office of principal, administrative block, Central library, departments and Class rooms of Zoology, Botany, Physics, Mathematics, Chemistry and related laboratories of science departments. The team also had a round of department of environmental science, anthropology, departments and class rooms of History, Economics, Geography, Political Science, Education, English, Assamese, Sociology, Folklore, Philosophy and canteen toilets etc. This was a learning experience

for members and energy auditor to observe and evaluate the need for electricity at locations in an objective manner. This walk-in audit helped the team to judge whether there can be saving of power by its optimum use.

Some observations during walk in audit

- There were a number of plug points (6 and 16 amps) in the science laboratories which were rarely used.
- CFL lamps used for illumination needed to be replaced by LED lamps to save power.
- The DG set was used occasionally and had no logbook for record.
- The 150 kva transformer needs to be checked for oil level. If oil level is low it has to be topped up to ensure cooling of coils of transformer. The terminal joints of conductors needed to be checked for any loose connections to avoid energy loss due to spark.
- There was a scope to install roof top solar system on roof facing south direction.
- Water taps in toilets needed to be leak proof to prevent wastage of water.
- Air filters of air conditioners needed to be cleaned as a part of annual maintenance contract to save power.
- All class rooms should have a MCB (miniature circuit breaker) to put off electrical appliances after classes are over.
- There could be some hoarding in prominent places in the campus to highlight about need to save power.
- There was substantial use of day light in some of class rooms which could help save grid power.
- The illumination level of class rooms and toilets need to be optimized.

6.3 Data Collection

Walk in audit is followed by data collection, information related to bills served by the utility (Assam Power Distribution Company Limited), log book of DG Set, and other relevant documents related to use of electricity.

Relevant data have been tabulated in various tables for scrutiny and analysis.

- Table-1 shows list of room wise electrical devices installed starting from Principal's office room.
- Table-2 shows list of devices used in college. Connected load is calculated on assumption that they are in used daily for 6 hours for 30 days a month. Monthly power consumption is estimated on same basis.
- Table- 3 illustrates monthly energy bills for power consumption of college on the basis of bills served by the utility.
- A pie chart illustrates the component of billed amount for energy, maximum demand and electricity duty as component of total electricity bills served by the utility for a year.
- The pie chart illustrates components of electrical loads like light, fan, pump, AC load and others.

6.4 Analysis and Evaluation:

- It was evident from walk in audit that there were 378 no of 6A and 119 no of 16A plug points which increased connected load and could be done away with. It is to be reviewed if such numbers are actually required.
- In all utility bills the contract demand was mentioned as 106 kva. However the recorded kva was not available in the utility bills. The utility (APDCL) should mention recorded maximum demand in

energy bills. It will help us to determine actual required maximum demand and to review requirement of contract basis.

- All CFL lamps need to be removed and replaced by LED lights.
- There were a number of shops within the college boundary with power in single phase power from college transformer. It adds extra load to the transformer. This entire establishment should be separated with a different connection from the utility so as to reduce load on the transformer.
- The power supply to the hostels should be separated from the college transformer. Instead a separate supply should be provisioned. College authorities will be in a position to monitor the consumption pattern of energy by hostels and will be able to load it on the users.
- 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

Table-1 shows location of electrical devices in each of rooms on page 11.



Figure: Solar lamps installed in the campus

13. Acknowledgement:

We express our thanks and gratitude to the management of Dimoria College for giving us the opportunity to conduct the Energy Audit at Dimoria College.

We are also grateful to Dr. Biman Kumar Bhatta, Principal, Dimoria College, Khetri, Assam for his valuable comments/feedback and for support with which we could prepare this audit report.

We express our sincere thanks to all other concerned officials for their support and guidance during the exercise of energy audit.

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