

ENERGY AUDIT 2018-2019



Govt.Brennen College, Dharmadam, Thalassery

INTERNAL QUALITY ASSURANCE CELL

ENERGY AUDIT TEAM

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PREFACE

Energy has been identified as a crucial and balancing factor in the indices for sustainable development since the Earth Summit in 1992. Especially in the contemporary scenario, it is acknowledged that the heavy and unbalanced energy consumption adversely affects energy price and economic growth, and most countries now give priority to energy conservation methods. The Energy Conservation Act, 2001, defines Energy auditing 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 . It facilitates a systematic approach to the energy management in a system, trying to balance the total energy input with its use. It identifies all the energy streams in a system and quantifies the use of energy according to its discrete functions. It is a study to determine how and where energy is used, and to identify methods for energy savings. The Energy Auditing for a day is the index of the consumption which normalizes the situation of Energy crisis by providing the schemes for conservation of energy. The opportunities lie in the use of existing renewable energy technologies, greater efforts at energy efficiency and the dissemination of latest technologies The energy audit of Government Brennen college was carried out by the students of the Department of Physics on behalf of IQAC, under the supervision of the Energy Audit team. This report is our effort in contributing to the larger picture of effective energy management and conservation. As is known, energy auditing is an on-going process, a part of a larger procedure to ensure long- term sustainable development.

We have enlisted plausible solutions based on the outcome of our analysis of data, and our recommendations, which can be implemented wholeheartedly in the campus in order to ensure minimizing energy waste and maximizing energy potential. We hope in all earnest that these will be given its due and that the audit will be fruitful in terms of energy conservation.

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1 INTRODUCTION

Government Brennen college ,Thalassery is an educational system affiliated to Kannur university ,which was established in 1862 by Sir Edward Brennen.Significant advances the college made in academic and research activities were matched with parallel improvements in the technical and infrastructure facilities of the campus, which makes it retain its position of excellence across time. It has 18 teaching departments housed in 10 blocks of buildings spread across 16.5 acres. The vast campus and the large number of rooms being in use as classrooms and other facilities necessitated the implementation of a separate transformer for the college. The amount of the electricity bill was climbing steadily across the years . The expansive network of cables was found to be in conflict with the growing branches of trees, and thus the entire electric cables were laid in underground ducts, which was in sync with environment protection also. This audit was undertaken in order to verify how effective these steps were, and also to identify loop holes, if any, in the existing practices, along with outlining measures for enhancing energy utilization.

2 OBJECTIVES

The Energy Audit Manual of the Energy Management Centre, Government of Kerala, defines the primary objective of any energy audit as determining ways to reduce energy consumption per unit of product output or to lower operating costs (www.keralaenergy.gov.in). The recommendations of the study will become a basis for future schemes of better energy consumption and preservation throughout the organization.

Specific objectives of the study are:

- Verify the steps adopted for energy management in the campus
- Spot the inefficient or inadequate practices, if any
- Improve the energy preserving measures and methods
- Identify potential energy saving opportunities
- Formulate feasible steps and measures to be adopted in the campus

3 METHODOLOGY

Energy audits are primarily classified into

- Preliminary Audit
- Detailed Audit

A Preliminary Audit uses existing data to look extensively at the existing energy consumption patterns and identifies the areas for improvement, sets reference points, and identifies areas for more in-depth study. A Detailed Audit is more comprehensive and is carried out in phases, evaluating all major energy using systems. It estimates energy savings and cost, and accounts for the energy use of all major equipments. Since the Detailed Audit is meant for industry, and because of the limited size and the amount of energy consumption of the institution, the Preliminary Audit method was chosen for this year.

4 DATA COLLECTION

For the purpose of this audit, audit groups for specific areas were formed. Data was collected through

- Visual inspection and observation
- Verification/ Identification of energy consumption
- Detailed calculations, analyses
- Validation

As a first step, the team outlined a time-frame for the project as follows:

Forming Audit group	November 2018
Inspection and data collection	November-January 2019
Data analysis	February 2019
Drafting of the report	March 2019
Submission of final report	26 March 2019

This was strictly adhered to, and the work was completed in the stipulated time, the final report submitted to the Principal in March 2019.

4.1 Division of work

A team of 2 students were formed in November 2018. One faculty from Energy audit team was put in charge of different blocks and necessary suggestions were given by the entire faculty in the department. They gathered the data under the guidance of the teachers.

5 DATA ANALYSIS

The gathered data was then quantified and segregated according to the following criteria:

1. Energy consumption by end use
2. Average energy use block-wise
3. Equipment-wise Consumption of Departments
4. Month-wise energy consumption

The quantified data are presented below as figures and tables for easy reference. Figure 1. Shows the energy consumption by end use.

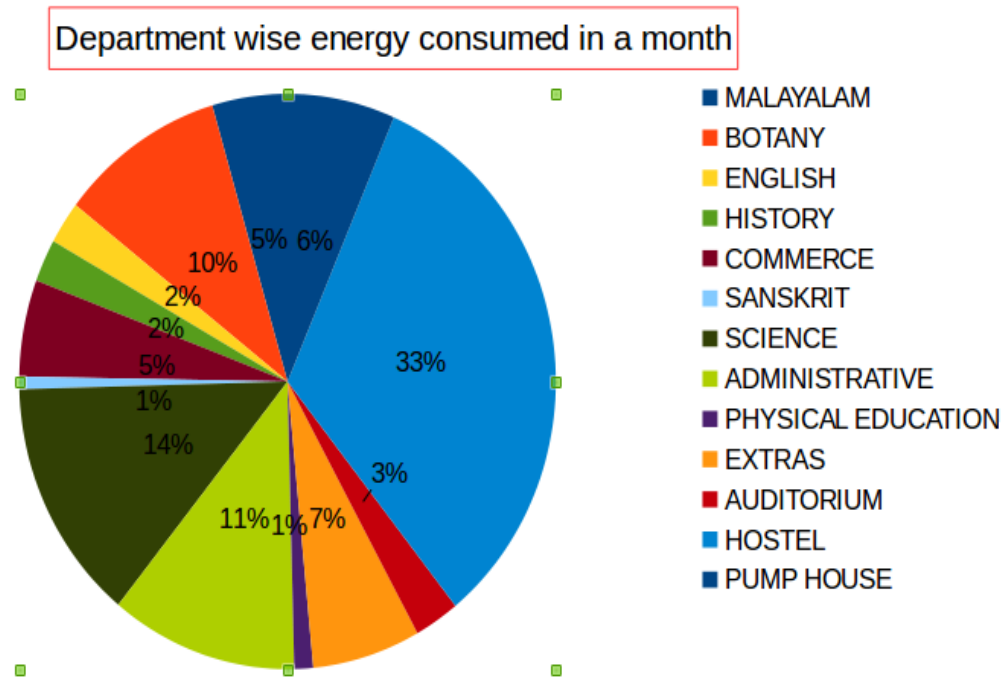


Figure 1: Energy consumption by end use

The block-wise consumption of energy in percentage is shown in Table 1.

Block	consumption in percentage
Malayalam block	4.52
Botany block	9.96
English block	2.4
Commerce block	5.43
History block	2.4
Sanskrit block	0.7
Science block	13.7
Administrative block	11.25
Physical education block	1.132
Auditoriums	2.71
Hostels	32.75
Pump house	6.48
Extras	6.51

Table 1: Block-wise contribution to the total power consumption

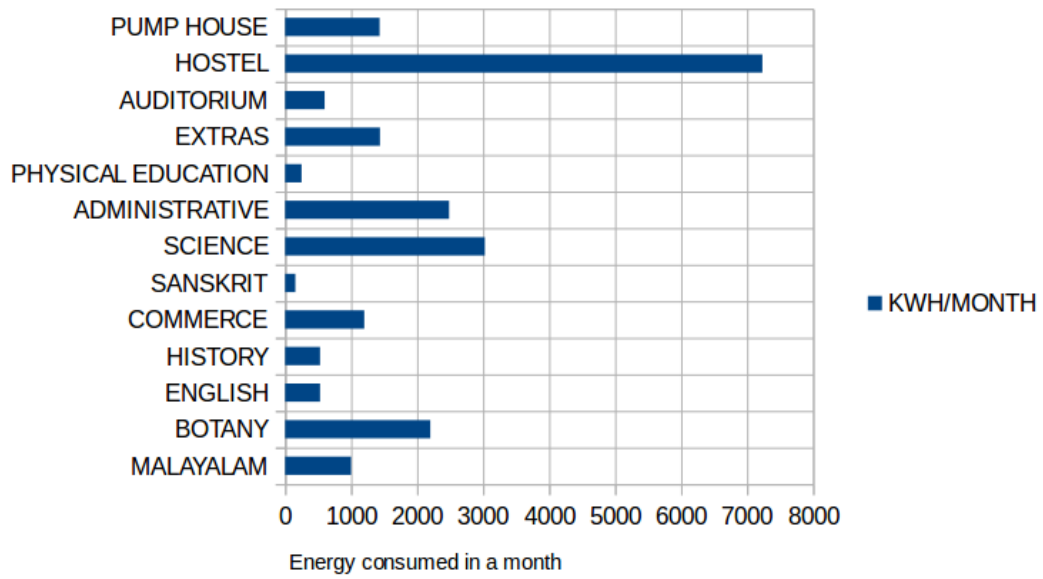


Figure 2: Month wise energy consumption

ENERGYAUDIT																			
Department	Tube	Led tube	Bulb	Cfl	Led bulb	Ceiling fan	Wall fan	Pedal fan	Ac	Fridge	Heater	Compu-ler	Laptop	Printer	Pump	Cooler/purifier	Lab equipments	Misc	Total wattage in dept
Physics	880	342	60	0	0	1350	50	250	1300	200	0	1050	200	40		0	9000	360	15082
Mathematics	160	209	60	0	9	825	0	0	0	0	0	150	200	60		1750	6000	360	9783
Chemistry	760	114	60	80	0	1425	0	300	0	200	0	450	50	40		0	12000	20	15499
Zoology	1040	361	0	0	0	2250	0	0	0	400	0	450	100	80		0	7000	190	11871
Office	0	133	0	40	63	600	200	200	2600	0	0	2850	100	240		0	0	0	7026
Office misc	0	228	0	40	144	750	0	100	3900	0	0	300	100	40		1750	0	70	7422
Hindi	0	323	0	0	0	1575	0	0	0	0	0	150	0	20		0	0	1500	3568
English	320	38	0	0	0	1650	0	0	1300	0	0	150	150	40		0	1950	189	5787
Malayalam	240	209	0	0	9	1800	0	0	0	0	0	300	0	20		0	0	0	2578
Economics	280	0	0	20	0	750	0	0	0	0	0	0	0	20		0	0	0	1070
Statistics	200	0	0	0	0	975	0	0	0	0	0	150	0	20		0	6750	40	8135
Botany	1880	152	120	80	18	2625	0	0	1300	200	0	750	50	20		750	15800	170	23915
Urdu	320	133	120	20	9	750	0	0	0	0	0	300	0	20		750	0	50	2472
Arabic	640	38	0	20	0	525	0	50	0	0	0	450	0	40		0	0	50	1813
Sanskrit	200	0	60	20	0	375	0	0	0	0	0	450	0	60		0	0	20	1185
Commerce	360	1026	0	0	27	3375	0	0	0	0	0	150	0	60		1750	1650	320	8718
History	0	247	0	20	0	1050	0	50	0	0	0	150	0	20		0	0	40	1577
Politics	0	95	0	20	0	450	0	50	0	0	0	150	0	20		0	0	20	805
Philosophy	0	209	0	0	9	825	0	50	0	0	0	450	50	20		0	0	0	1613
Library	0	2204	120	0	18	7125	0	100	1300	0	0	4800	0	60		1750	0	0	17477
Mini auditorium	0	209	0	0	18	1500	0	0	0	0	0	0	0	0		0	0	0	1727
Main auditorium	0	798	0	0	144	3225	0	0	0	0	0	0	0	0		0	0	0	4167
Mens hostel	1920	0	0	300	9	3825	0	0	0	200	0	0	0	0		750	0	0	7004
Ladies hostel	0	836	60	0	504	3450	0	0	0	200	0	0	0	0		0	0	0	5050
Canteen	40	0	0	20	9	300	0	0	0	400	0	0	0	0		750	0	0	1519
Old library	1000	0	0	0	0	450	100	0	0	0	0	300	0	0		0	0	0	1850
Computer lab	120	0	0	0	0	600	0	0	0	0	0	1950	0	60		0	0	300	3030
NSS+NCC+Store	80	95	0	0	0	450	0	0	0	0	0	0	0	0		0	0	1400	2025
Seminar halls	200	171	0	40	9	1725	0		13000	0	0	0	0	0		0	0	0	15145
Physical education	240	0	0	0	0	600	600	50	0	200	0	150	0	20		0	0	0	1860
Misc	320	0	0	80	0	150	0	0	0	200	0	150	0	20		0	0	0	920
Total wattage	11200	8170	660	800	999	47325	950	1200	24700	2200	0	16200	1000	1040	23872	10000	60150	5100	

Figure 3: Equipment wise consumption of Departments

6 MAJOR FINDINGS

Since this was a Preliminary Audit, the findings are formulated as per the norms for this stipulated by the Energy Audit Manual of the Government of Kerala.

1. Establish energy consumption in the organization-

From the quantitative analysis of the gathered data, the following findings have been reached.

- (a) **The laboratories record the highest consumption based on end use**
- (b) The Hostels record the highest rate of consumption
- (c) Laboratory equipments show the highest rate of consumption equipment-wise
- (d) water supply systems contribute a lion share in electrical consumption
- (e) The time slots in the Afternoon record the highest consumption on a normal working day.

2. Identify the easiest areas of attention

Based on the physical observation and the analysis of data collected, certain areas have been identified as areas of attention.

- (a) Old wiring cables in many parts of the campus leading to loss of energy
- (b) Old water pipelines in several parts of the campus leading to waste of energy
- (c) Use of incandescent bulbs in certain rooms
- (d) Electric supply still depending on State Electricity Board, instead of solar panels
- (e) Use of old equipments such as refrigerators in laboratories
- (f) Uneven lighting facility certain classrooms are under-illuminated, certain classes have more lights than required.

3. Estimate the Scope for Saving

The study could identify a large scope for saving energy in the campus, including

- (a) Updating of technologies in laboratory equipments.
- (b) Replacing old electrical cables and pipelines.
- (c) Replacing incandescent bulbs with LEDs.
- (d) Ensuring even lighting facilities in rooms.
- (e) Use of Solar panels as a main source of lighting, especially common areas and grounds.
- (f) Replacing old gadgets in laboratories.

4. Identify immediate areas of improvement

Based on the study, certain areas were identified as requiring immediate improvement. These are

- (a) Replacing incandescent bulbs with LEDs
- (b) Repairing and updating laboratory equipments.
- (c) Encouraging students and staff to switch off electrical gadgets and turn off the water taps when not in use.

5. Identify areas of more detailed study

The study could also identify certain areas that necessitated more detailed study and long-term planning. These were

- (a) Planning the electrical wiring more efficiently, doing away with unused power points and redundant electrical gadgets.

(b) Installing solar panels in possible buildings/ blocks.

Table 3. Summarizes the findings and recommendations of the audit.

7 FINDINGS AND RECOMMENDATIONS

Most of the power consumption is used for lighting, electric fans, computers and water pumping
The peculiar heritage structure of buildings, with most of the rooms blessed with natural light and ventilation helps in reducing the number of lighting and ventilating equipments and gadgets.
New buildings to be constructed should follow the pattern and assure natural light and air passage, to reduce loss of energy
The electrical wiring of many buildings was found to be old and inefficient
Replace old electrical cables with new ones
Poor plumbing lines leads to loss of water and subsequent loss of power resulting from over
Replace old pipelines with new ones, and latest motors for pumping water.
There are a number of unused sockets and redundant power points causing power wastage.
The number of sockets should be verified and ensured that only the good ones are being used.
There seem to be a lack of judicious use of power among students and staff. During the study, it was found that lights, fans and computers were kept on working mode in many rooms, without a single person present.
Students and staff should be exhorted constantly to use energy judiciously. Posters and pamphlets should be distributed and notices about saving energy should be posted at major points of campus
Even lighting distribution system should be ensured.
Many Departments still use incandescent bulbs causing heavy power loss
Incandescent bulbs should be replaced with LEDs Except for a small solar unit in Physics Department, the entire power requirement is met from the KSEB line.
More solar panels should be installed in key areas of the campus, and loads for common areas and grounds should be met from these.

AC, refrigerators and freezers used in many departments use obsolete technology and hence cause power loss.

Gadgets and equipments should be repaired and/or replaced with latest ones to save energy.
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Proper switching off of the gadgets and equipments should be ensured strictly.
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8 CONCLUSIONS AND SUGGESTIONS

1. A well-prepared electrical wiring plan for the campus, which would help identify unused points of power and also in re-wiring the buildings.
2. Electric fans should be serviced and bearings replaced wherever necessary.
3. The scope for non-conventional energy should be utilized. Even though the heritage nature of buildings and Government restrictions may not help in wide installation of roof top solar panels, certain locations like the top of library building can be used for installing solar panels which would cut down power consumption.
4. Installation of a suitable Bio-gas plant to save energy used for heating water in Science laboratories.
5. Rigorous training for both students and staff to inculcate awareness for the need of energy conservation. If everyone ensures switching off lights, fans and electrical gadgets that are not in use, roughly 10% to 15% of energy saving is possible.
6. A master switch located at a prominent place which can be directly supervised by the HoD/supervising staff would help avoid power wastage in closed rooms.
7. A healthy competition may be encouraged between departments by honoring those departments that produce higher savings by good practices. An element of weight-based on the above lines may be considered for allocation of funds.
8. It is suggested that a permanent body under the chairmanship of a senior teacher may be established in the College for periodical review of energy usage and concurrent energy audit. Representatives of students, staff and PTA may be included in the body. Conversion of ordinary tubes into LED tubes can save a major share of power consumption Effective use of classrooms and laboratories by switching off electrical gadgets after use Replacement of low

power consuming equipments in laboratories instead of old ones Encouraging the application of solar energy.

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