



SRR & CVR Government Degree College (A)

Vijayawada, NTR District, Andhra Pradesh, India – 500004

Affiliated to Krishna University, Machilipatnam

(Accredited with 'A' by NAAC : Bengaluru)

AN ISO - 9001:2015 CERTIFIED INSTITUTION



ENERGY AUDIT REPORT: 2023- 2024

Prepared by

Department of Physics & Electronics

Preface

Data collection for energy audit of **SRR & CVR Government Degree College (A)** was conducting an Energy Audit for the period of April 2023 to April 2024.

The purpose of this audit was to advance the campus's energy competency by asking about convenience. In order to reduce energy consumption while fostering or humanizing comfort, safety and health were the main concerns. The primary goal of this audit was to identify the energy-efficient appliances. Additionally, a number of daily procedures pertaining to common appliances have been made available in order to help decrease energy expenditures.

Energy audit survey was completed by B. Sc Physics & Electronics students under the guidance of their faculty members. The data collection process was carried out using a combination of visual surveys, direct measurements, and records review. In direct measurements, data collected from each classroom, laboratory, every room. In which, the data is consolidated by measuring the number of tubes, fans, A.Cs, electrical & electronic instrument, etc in each room.

Acknowledgement

Energy Audit is a system is key instrument in knowing the present level of efficiency of the various components and establishing the areas of shortfall for improvement.

We express our sincere thanks to Dr. K. Bhagya Lakshmi, Principal and Smt. P. Sailaja, Vice- Principal, Incharge of department of Physics & Electronics. We take this opportunity to convey our sincere thanks and gratitude for the kind cooperation extended by the teaching and non-teaching staff.

We ensure that this report will be quite useful for energy management to intensify and implement energy conservation measures in the organization and achieve desired savings.

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1. MEMBERS OF ENERGY AUDIT COMMITTEE

1. Dr A Asirvadam
Lecturer in Physics
Co-ordinator.
2. L. Santhi
Asst. Engineer
APEPDCL, Govt. of AP
Vijayawada, Advisor
3. Smt P Sailaja
In-charge of Department of Physics & Electronics
Vice – Principal, Member
4. Dr J Nageswara Rao
Lecturer in Physics
IQAC Coordinator, Member
5. K. Pandu
College Electrician, Member
6. Students
Department of Physics & Electronics
Members

Committee Chairman

2. About the College

The Institution owes its existence to two illustrious persons, Sri Rajah Venkatadri Apparao Bahudur, Zamindar of Nuzvid and Sri. Chunduri Venkata Reddy, Local Industrialist & Philanthropist. The former started the college in 1937 as a private college in perpetuation of the memory of his father, Sri Rangayya Appa Rao Bahdur and the later shared the responsibility of running the Institution as a committee College along with the founder Zamindar. Then the College was named as “Sri Rajah Rangayya Appa Rao and Chunduri Venkata Reddy College” (S.R.R. & C.V.R. College). This was the first and foremost college in Vijayawada catering to the needs of Higher Education to the people in and around Krishna District.

The College is spread over an area of about seven acres of land situated in a prime locality of Machavaram, which is in the corporation limits of Vijayawada. The college is only one Government college in the Capital city of Andhra Pradesh. The main buildings of the college were constructed between 1940 and 1942 and were inaugurated on 07-02-1942 by the then Vice Chancellor of Andhra University, Waltair, Dr. Cattamanchi Ramalinga Reddy, M.A. (Cantab) D.Litt., a distinguished educationist and academician of Andhra Pradesh and since then it has been a part of the academic, intellectual, social and cultural history of Vijayawada.

The College, located in the heart of the city is accessible by road and rail transport system and has state-of-the-art infrastructure. After successfully running the College for two decades, the erstwhile management handed over the College to the Govt. of A.P. with effect from 01-07-1958 by means of a G.O.Ms. No. 1691 Edn.Dt.29-6-1958. Then the College was named as S.R.R. & C.V.R. Government College, Vijayawada. From 2010-11, the College affiliated to Krishna University, Machilipatnam. The College was recognized by U.G.C. under 2 (f) and 12 (b) from the academic year 1978-79.

The aim of institution is to provide quality higher education to the students of this region particularly those coming from economically and socially backward, and other weaker sections keeping in view the avowed policies of the Government of Andhra Pradesh and the guidelines issued by the Commissioner of Collegiate Education, A.P. from time to time and

to train the students in various vocational streams and job orientated professional skills and soft skills. This also aims at inculcating educational, social and cultural values.

The college has a glorious history of having intellectual stalwarts like the first Jnanapith Awardee, Kavisamrat Sri Viswanatha Satyanarayana and Sri.Jonnalagadda Satyanarayana on the faculty. The Institution has sent out generations of students who have become eminent and useful citizens of our country. The Institution also has the unique distinction of having the largest number of alumni who have become reputed academicians, personalities, experts, statesmen and celebrities in various fields both in India and abroad. Among the luminaries, the College mentions with pride the names of Sri. N.T.Rama Rao, former Chief Minister of Andhra Pradesh, His Excellency Sri.P.S.Rama Mohana Rao, former Governor of Tamilnadu, His Excellency Sri.V.Rama Rao, former Governor of Sikkim. The Alumni also comprises numerous bureaucrats, professionals, politicians, social workers, writers and artistes etc.

The college has been offering traditional courses since 1937 but from the academic year 1998-1999 onwards, the college included restructured programmes in Science, Arts, and Commerce, providing thus a wide platter of course combinations at an affordable and serviceable fee to orient students towards research and workplace demands that keep changing in the present challenging environment. A total number of 36 undergraduate programs and 10 postgraduate programs were offered during the year 2021-22. The total strength of the undergraduate programmes is 2302 and the total strength of the Postgraduate programmes is 270. This is a co-educational institution and it is always in demand for admissions. Students from the scheduled castes, scheduled tribes, and listed backward classes account for 68% of the total admitted strength and the remaining 32% of students belong to economically backward and underprivileged sections of the society.

The institution went for NAAC accreditation in 2004 and was awarded B++ Grade with 81.25 percentage. The college was reaccredited with 'B' Grade (CGPA 2.70) by NAAC in 2011 and completed its third cycle in 2017 with 'B+' Grade (CGPA 2.6). The college **is an autonomous college**. It was granted autonomous status by the University Grants Commission (UGC) in 2016. This autonomous status allows the college to have more flexibility in its academic and administrative decisions. The institution secured NIRF ranking between 151-200 in 2019 and between 101-150 band in 2020 at all India level. The college has been accredited with an 'A' grade by the National Assessment and Accreditation Council (NAAC).

This achievement is a significant milestone for the college, recognizing its commitment to quality education and overall institutional performance.

Some key features of SRR & CVR Government Degree College, Vijayawada, include:

Academic Excellence:

- **Diverse Courses:** Offers a wide range of undergraduate and postgraduate courses in Arts, Science, Commerce, and Computer Science.
- **Experienced Faculty:** Highly qualified and experienced faculty members dedicated to providing quality education.
- **Strong Academic Focus:** Emphasis on academic excellence and student success.
- **Focus on Research:** Encouragement for students and faculty to engage in research activities and publications.
- **Academic Calendar:** A well-structured academic calendar to ensure smooth conduct of classes, examinations, and other academic activities.
- **Student-Centric Approach:** Focus on student needs and providing a supportive learning environment.

Infrastructure:

- ✓ **Modern Facilities:** Well-equipped laboratories, libraries, and classrooms to facilitate learning.
- ✓ **Smart Campus Initiatives:** Focus on incorporating virtual, digital, and e-learning methods.
- ✓ **Adequate Infrastructure:** Provides necessary infrastructure for students' academic and extracurricular activities.

Student Life:

- ❖ **Active Student Community:** Vibrant student community engaged in various extracurricular activities, sports, cultural events, and social service initiatives.
- ❖ **Student-Centric Approach:** Focus on student needs and providing a supportive learning environment.
- ❖ **Opportunities for Growth:** Encourages students to participate in research activities and other academic pursuits.

- ❖ **Excellent placement record:** The College has a strong placement record, with many of its students securing placements in top companies.
- ❖ **Student Clubs and Organizations:** Opportunities for students to develop leadership skills and interests through clubs like NSS, NCC, Debating Club, Literary Club, etc.
- ❖ **Sports Facilities:** Well-maintained sports facilities for various sports like cricket, football, basketball, volleyball, and indoor games.
- ❖ **Cultural Activities:** Regular cultural events, festivals, and competitions to showcase the rich cultural heritage of India.
- ❖ **Guest Lectures and Workshops:** Opportunities for students to interact with industry experts and academicians through guest lectures and workshops.
- ❖ **Counseling Services:** Counseling services to address the academic, emotional, and psychological needs of students.

Other Features:

- **Affordable Education:** Government College offering quality education at affordable fees.
- **Strong Alumni Network:** A strong network of successful alumni who contribute to the college's growth and development.

3. Introduction to Energy Audit

An energy audit is a systematic survey in which the study of energy flows for the purpose of conservation is examined at an Organization. It refers to a technique or system that seeks to reduce the amount of energy used in the Organization without impacting the output. The audit includes suggestions of alternative means and methods for achieving energy savings to a greater extent. Energy Audit is an effective means of establishment present efficiency levels and identifying Potential areas of improvement in energy consumption. Energy audit of utility systems largely helps, which are given below:

Steps Involved in an Energy Audit:

1. **Pre-Audit Preparation:** Gathering historical energy consumption data and understanding the building's or facility's operation.
2. **Site Assessment:** An on-site inspection of the building or facility, including the identification of energy-using systems and equipment.
3. **Energy Use Analysis:** Examining how energy is consumed across the facility and identifying any patterns of waste or inefficiency.
4. **Recommendations:** Providing suggestions for energy-saving measures such as improving insulation, upgrading lighting, optimizing HVAC systems, or installing energy-efficient appliances.
5. **Cost-Benefit Analysis:** Analyzing the cost of implementing recommended measures versus the savings they would generate, including payback periods and return on investment.
6. **Report & Action Plan:** Delivering a final report that outlines the findings, recommended improvements, and actionable steps for energy savings.

By adopting student building programmes, the Indian government is also fostering energy efficiency and awareness at the school level. Energy audits are a crucial component of India's efforts to increase its energy intensity, quality, and efficiency. The Indian government is encouraging the Energy Conservation Act of 2001 increased India's energy efficiency. The act gives the Bureau of Energy Efficiency and the federal government to figure out how to promote and advance productivity of energy across the board. The Indian government is also encouraging energy. By implementing student building capabilities; schools/colleges may increase efficiency and awareness programmed as part of a campaign to promote energy

conservation.

Energy today has become a key factor in deciding the product cost at micro level as well as in dictating the inflation and the debt burden at the macro level. Energy cost is a significant factor in economic activity. The work's scope and technique followed the proposal exactly. Due care was always made to prevent aberrant circumstances during data collection, field testing, and their analysis in order to provide a normal/representative pattern of energy use at the institution.

Data collection was done in the sectors such as sources of energy and energy consumption pattern, college records and documents were verified several times to clarify the data received through survey and discussions. Documents such as electricity bills, registers of electricity were collected and reviewed. College and its premises were visited and analyzed by the audit teams to gather information.

The foundation of an energy audit is that its conclusions are backed up by records and factual data. To make sure those past actions, activities, events, and procedures are carried out correctly and in accordance with system requirements, the audit process aims to track past actions, activities, events, and procedures on a sampling basis. Energy audits are a process component. Energy audits are valuable because they are conducted at regular intervals and their findings might show improvement or change over time, despite the fact that they are individual events.

Although policies, processes, established systems, and objectives are used as a test in audits, there will always be some amount of subjectivity involved. To determine how well energy management equipment is functioning is the main goal of any energy audit. To make sure that the organization's energy performance satisfies the objectives set forth in its energy strategy, each of the three components is essential.

4. Energy Consumption Profile

An energy consumption profile is a detailed analysis of how energy is used across a building, facility, or industrial process. It provides insights into the patterns and trends of energy consumption, helping to identify areas for improvement and opportunities for energy savings. The audit identifies all electrical equipment consuming power (e.g., lighting, HVAC systems, motors, pumps, machinery, and office equipment). It measures how much power each piece of equipment consumes and determines whether it is operating at optimal efficiency. This profile is essential for understanding where energy is being spent, when it is being consumed, and how efficiently it is being utilized.

S.No	Connected Load	Power KW	Usage Locations	Load Factor (%)
1	Lighting System	25	Principal room, staff rooms, Class rooms, seminar halls, Labs of various departments, Gym and Library	17.86
2	Fan System	32	Principal room, staff rooms, Class rooms, Labs of various departments, Gym and Library	22.86
3	Air conditioning/ Cooling System	27	Principal room, office room, computers labs, Recording Studio, class rooms, seminar halls.	19.29
4	Electronic & Digital system	23	Computers, virtual class rooms, Digital podium, Recording studio, biometric devices, printers and Xerox machine	16.43
5	Gym	12	Physical Education Department	8.57
6	Other Appliances	21	Electrical, Electronic and Digital devices at various departments	15.00

Total **140**

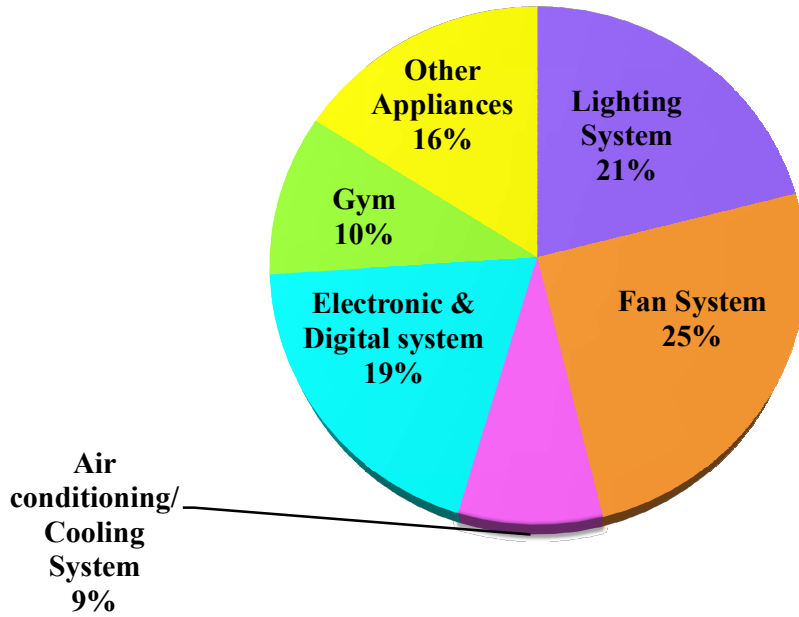
Load is calculated based on the below formula

$$\text{Load Factor (\%)} = \frac{\text{Individual Power}}{\text{Total Power}} * 100$$

A higher load factor indicates that the energy demand is spread more evenly over time. This typically results in better energy efficiency because equipment and systems are running more continuously and at stable loads, which can reduce the need for oversized

equipment and minimize energy wastage. A low load factor means that energy demand fluctuates significantly, often with high peaks and low troughs. This could indicate inefficient energy usage, where systems are either underutilized for long periods or must work harder during peak periods, leading to higher energy costs.

Load Distribution



5. Analysis

This analysis provides the basis for developing an action plan aimed at reducing energy consumption, cutting costs, and improving overall energy efficiency. The services offered are monitored, verified and analyzed on the aspects of energy consumption. In all these areas lighting systems forms the major consumer of electrical energy. Three phase electricity service connections available in the campus are provided by Andhra Pradesh Central Power Distribution Corporation Limited. The electricity consumption charges are audited and studied for the load demand requirement and efficient consumption of energy. Potential areas in which scope of energy conservation and saving opportunities are available have been identified and suggested for implementation.

Total power requirement of Various Equipment

S.No.	Equipment/Utility	Rating/Capacity (W)	Quantity	Usage per Day	Total Power Consumption in a day (W)
1	Tube Lights	42	100	9	37800
2	LED Bulbs	25	425	9	95625
3	Fan(Ceiling, Pedastal and table)	75	293	9	197775
4	LCD Projectors	20	9	4	720
5	TV	100	6	4	2400
6	AC (Split, Window)	2000	18	6	216000
7	RO Water Plat	4000	1	10	40000
8	Digital Podium	220	1	2	440
9	Computers	60	149	8	71520
10	Scanners	250	3	1	750
11	Water Coolers	550	5	9	24750
12	Laptops	50	52	8	20800
13	Xerox Machines	500	3	2	3000
14	Printers	350	24	3	25200
15	CCTV Cameras	12	16	24	4608
16	Lab Equipment(ALL labs)	3000	1	3	9000
17	UPS	1000	1	8	8000
18	Sound System	700	1	0.5	350

Total: 758738

Total power requirement of all Instruments -758738 W per Day
 Total Power Consumption per Month- 22762140 W per Month

The internal committee gathered the information from various resources available in the campus. In the part of gathering data, the details of 12 months Electricity Bills are considered for analysis. Also, observed the consumption of power in the various months. This historical energy usage data (e.g., monthly or annual consumption) is helpful to identify trends or anomalies. This historical energy usage data (e.g., monthly or annual consumption) is helpful to identify trends or anomalies.

Details in Units Consumption & Bill amount month wise

	Total Billed Units	Total Bill Amount (Rs.)
Apr-23	13986	128864
May-23	13178	123379
Jun-23	7088	85121
Jul-23	18682	164995
Aug-23	15344	148946
Sep-23	13228	128414
Oct-23	11406	121146
Nov-23	12831	128194
Dec-23	14602	139351
Jan-24	8366	91031
Feb-24	7359	77411
Mar-24	11107	105078
Apr-24	12917	124057
Total:	160094	1565987

Year wise consumption of units

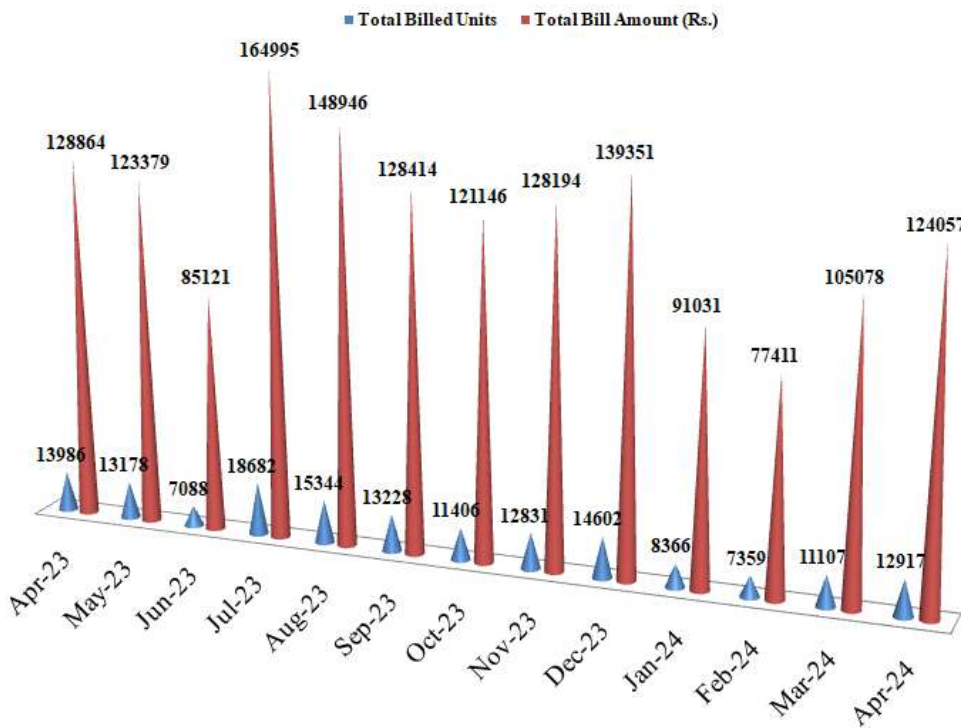
S. No	Bill Year	Net Units Consumed	Solar Units
1	2019-2020	22907	2356
2	2020-2021	107993	2388
3	2021-2022	84936	1308
4	2022-2023	132486	600
5	2023-2024	147177	450

The number of electrical components directly impacts power consumption because each additional device or system adds to the total energy demand. As the number of components increases, more energy is required for their operation, maintenance, and cooling, leading to a higher total power consumption. The following major key factors identified for

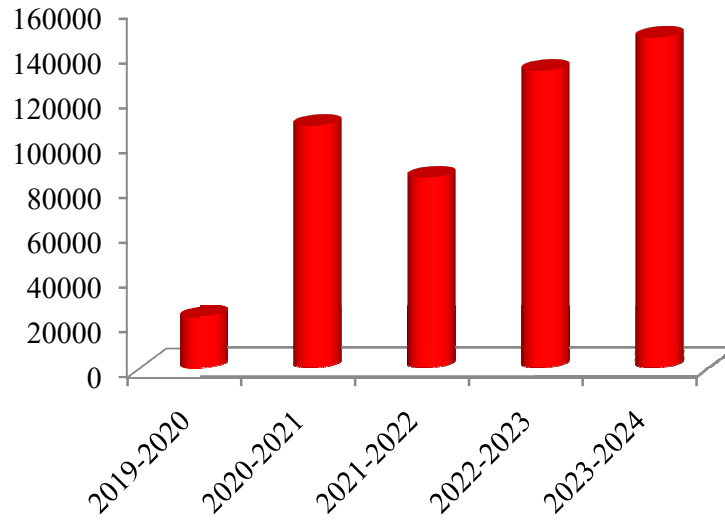
the increase of power consumption

- In order to provide quality education more number of Lab equipment and computers were added to facilitate the students.
- Due to increase in Number of programs, laboratories and class rooms were often operated for more time than previous.
- As more students rely on internet access for online learning through Wi-Fi networks.
- Uneven changes in temperature and humidity.

Units & Power in various months



Net Units Consumed - Year wise



Solar panels produce significantly less power on cloudy days or in areas with low sunlight, limiting their effectiveness in regions that experience such conditions frequently. While solar panel efficiency has improved over the years, they typically convert only around 15-22% of sunlight into electricity, meaning a significant amount of potential energy is lost. Though the solar panels were installed on the terraces of Science block, the power produced has declined as they were under repair. The lack of suitable technical assistance in our location is a significant barrier to us. Lack of separate financial assistance for maintenance we could not rely on solar power.

7. Observations

Audit committee identified the following things during the visit.

- ❖ Electronic appliances such as computer, printer, Xerox machine etc. are still ON even though they are turned off.
- ❖ Few Appliances (like electrical lab equipments, computers) are draining power in STANBY MODE even though there is no immediate need of them.
- ❖ Faulty light fittings which are left without bulb and faulty bulb which is intact are also vampire loads.
- ❖ Unbalance load at different phases, as per observation and power measurement.
- ❖ At some locations cable had burnt due to unbalanced load and heating occurred.
- ❖ No smart control panel for safety and power monitoring.
- ❖ Loose connection at some places like electrical panel,etc.
- ❖ No external switches to power off the lights/fans once room doors are locked.

8. Recommendations

Based on the analysis of the power consumption data, certain steps have been recommended for improving energy efficiency of the campus. Complete cost analysis of implementation of recommended measures has been performed where ever necessary. Also, a number of general measures for energy efficiency have been listed.

- ✓ Electronic appliances are not in usage should always be either unplugged or disconnected from the power sockets (i.e., Switch off the loudspeakers, printers, Xerox machines if you are not using them)
- ✓ Better to avoid keeping the appliances on 'STANBY MODE'.
- ✓ Remove faulty lightings.
- ✓ Display messages about how to utilize the room's electrical appliances, such as lights, fans, laptops, and projectors, must be placed in all classrooms and labs. Conserve energy. Post stickers with the messages "**Save electricity, save the environment and save energy**" all over the campus. So that everyone involved is incentivized to conserve energy.
- ✓ Even when there is enough light near the window opening, the majority of the time, and all the tube lights in a classroom are kept on. The light row near the window may be left off in these circumstances.
- ✓ Installing VFDs allows fans to adjust their speed based on demand, which can significantly reduce energy consumption compared to running at full speed continuously.
- ✓ All computers on campus should have power-saving features that, for example, switch off monitors and internal hard drives after 10 or 30 minutes.
- ✓ The comfort/Default air conditioning temperature to be set between 24°C to 26°C.
- ✓ Lights in the toilet area may be kept OFF during daytime
- ✓ The left over FTL/Ordinary bulb need to be replace by smart LED Tube/LED Bulb
- ✓ Need to replace ordinary CRT monitor by LED

9. Conclusions

Energy auditing is a crucial technique for determining how much energy is used on a campus. It can provide insight into energy usage and cost analyses. Campus would benefit from an energy audit or monitoring programme that would assist identifies areas for improvement. Energy audit is a strategy or a monitoring technique that falls under the purview of the Bureau of Energy Efficiency. Additionally, it lists the many instruments that have been used at colleges, rates them according to their power consumption, and offers advice for changing the placement and kind of materials to cut down on energy use. On the basis of daily energy consumption, it is possible to estimate monthly and yearly electricity consumption. Accordingly, a graph between months and the monthly energy consumption amount has been shown. After implementing the recommendations of energy audit by the committee, it is expected that the quantity of electrical energy saving per year can be achieved as 20% to 30% and total cost of power saving of electrical bill per year can be 20% to 30%.