ENERGY AUDIT REPORT - 2024-25

S.V.K.P. & Dr.K.S. RAJU ARTS & SCIENCE COLLEGE (A)

PENUGONDA-534320

1. Introduction

An energy audit is a 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 include suggestions of alternative means and methods for achieving energy savings to a greater extend. Conventionally, electrical energy is generated by means of fossil fuels, hydraulic and wind. The availability of fossil fuels and their depletion rate, insist the need for alternate energy systems and conservation of electric energy. In general, the primary objective of an energy auditing and management of energy consumption is to offer goods or services at the lowest possible cost and with the least amount of environmental impact (Backlund and Thollander, 2015). The need for an energy audit is to identify the savings potential and cost reducing methods, understand the ways in which fuel is used, where, the waste occurs and find the scope for improvement.

An energy audit is proposed and conducted to ensure that energy from Fossil Fuel to be minimized through saving practices are implemented and followed in Educational Institutions and Industrial sectors in a sustainable way. Preparation and completion of a questionnaire, physical examination of the campus, observation and examinationofdocumentation,keypersoninterviews,dataanalysis,measurementsand suggestions are all part of the audit process. Energy audit involves several facts including energy savings potential, energy management, finding alternatives, etc. (Cabrera *et al.*, 2010) With these facts in mind, the audit's specific objectives are to assess the competence of the sustainability management and control system, as well as the departments' compliance with applicable rules, policies, and standards. It has the potential to have a significant influence on the organization's operational cost as well as the environmental impact (Singh *et al.*, 2012).

Energy Conservation Building Code (ECBC) is established in the year 2017 which provides minimum requirements for the energy-efficient design and construction of buildings across India. Energy- efficiency labels are information affixed to manufactured products and usually communicate the product energy performance (Ingle, 2014). BEE has developed a scheme for energy efficiency labeling of buildings coinciding with the star ratings of the building at accelerating energy efficiency activities. BEE Star Rating Scheme is based on actual performance of the building as well as equipment in terms of specific energy usage termed as 'Energy Performance Indicator' by means of star ratings labeled items used which will be useful for energy savings in a sustainable manner (Mishraand and Patel, 2016).

Energy audit programme provide aid in maintaining a focus on energy price variations, energy supply availability and efficiency, determining an appropriate energy mix, identifying energy-saving technology, retrofitting for energy-saving equipment and so on. In general, an energy audit process dealt with the driving conservation concepts into reality by giving technically possible solutions within a specified time limit while also considering the economic and other organizational issues (Asnani and Bhawana,2015).

It also dealt with the uncover ways to cut operating expenses or reduce energy use per unit of production in terms of savings. It serves as a "benchmark" (reference point) for managing energy in the organization for planning more energy- efficient use across the board (Cabrera *et al*., 2010).

2. Need for an Energy Audit

In an organization, the top three operating expenses are energy, labour and materials .Relating the manageability of the cost or potential cost savings in each of the above components, energy management is found to be the top ranker, and thus energy management constitutes the essential part in reducing the cost. Energy Audit helps in understanding the ways energy and fuel are being used in any organization, and identifies the areas where wastes occur and the scope for improvement exists. The Energy Audit gives a positive orientation to the energy cost reduction, preventive maintenance quality control programmes and will help to keep focus on variations which occur in the energy costs, availability, and reliability of supply of energy. The main objective of Energy Audit is to find ways to reduce energy consumption per unit of product output. The Energy Audit provides a "bench-mark" (Reference point) and a basic planning for managing energy and for more effective use of energy throughout the organization.

The Eco friendly-campus concept essentially focuses on the efficient use of energy conservation and its savings opportunities in a sustainable way. It also gives importance for reduction of contribution to carbon emissions, carbon footprint calculation, use of star rated equipment, encouraging energy use conservation practices in all buildings, reduce the organization's energy consumption, reduce wastes to landfill, and integrating environmental considerations into all contracts and services considered to have significant environmental impacts.

Auditing for Energy Management may be studied in terms of energy savings and opportunities. In general, energy cannot be seen, but we know it is there in wire, pipes and other non-living materials because it shows visible effects in the forms of heat, light and power. The energy consumption, energy sources, energy monitoring, lighting, vehicle movement, electrical and electronics appliances, and transportation are addressed by this indicator. Energy usage is an important aspect of campus sustainability and requires no explanation for its inclusion in the assessment. However, energy saving, and opportunities may be taken into consideration while energy is extensively used. An old incandescent bulb uses approximately 50W to100Wwhile an energy efficient LED uses only less than 10W which shows the positive indication on energy savings. Energy auditing deals with the conservation methods to reduce its consumption related to environmental degradation. In addition, suggestions and recommendations might be given after auditing which in turn useful for energy savings.

Thus it is essential for any environmentally responsible institution to review its energy use practices periodically using at management level as well as through internal and external auditors.

The conduct of energy audit using internal and external energy auditors is playing important role in any organization interms of energy management. The Energy audit is able to measure the impact of energy potential in an organization so that it helps in determining the better ways to manage the impact on environment. In addition to liquid and solid wastes, biomedical and electronic wastes energy potential and biodiversity audits, attempts may be made to measure the carbon footprint in the organization based on the amount of carbon emissions created by the electrical appliances, vehicles, and human population. It takes into consideration the measure of bulk of CO_2equivalents exhaled by the organization by which the carbon footprint accounting is done. It is necessary to know how much the organization is contributing towards sustainable development in terms of energy management is being done. It is therefore recommended to measure the carbon footprint in each organization which may be useful for maintaining the eco friendly campus to the stakeholders.

3. Aims and Objectives of an Energy Audit

An energy audit is a useful tool for developing and implementing comprehensive energy management plans of an organization. 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.

- Review of energy saving opportunities and measures implemented in the audit sites and identification of additional various energy conservation measures and saving opportunities.
- Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management.
- Providing a technical information on how to build an energy balance as well as guidance to be sought for particular applications.
- Detailed analysis on the calculation of energy consumption, analysis of latest electricity bill of the campus, understanding the tariff plan provided by the central and State Electricity Board.
- List ways that the use of energy in terms of electricity, electric stove, kettle, microwave, LPG, firewood, Petrol, diesel and others.
- Analysis of electricity bill amount for the last two to three years, amount paid for LPG cylinders for last one year and amount paid for water consumption for human beings and watering to the plants.
- Use of incandescent (tungsten) bulb and CFL bulbs, fans, air conditioners, cooling apparatus, heaters, computers, photo copiers, inverter, generators and laboratory equipment and instruments installed in the organization (for example- 60-watt bulb x 6 hours x number of bulbs = Wh).
- Alternative energy sources / nonconventional energy sources are employed / installed in the organization (photovoltaic cells for solar energy, windmill, energy efficient stoves, Biogas, etc.).
- Creating awareness among the stakeholders on energy conservation and utilization.

4. Benefits of an Energy Audit

- **Reduced Energy Expenses:** The most obvious benefit is that the less energy the Organization uses, the less money that the Organization will have to spend on energy costs.
- **Identify Problems:** An energy audit can also help to identify any issues that the equipment might have. For example, the auditor could find small leaks in the compressed air system. These leaks would cost a significant amount of money if it is not noticed. Auditors can also detect dangerous health risks like the carbon monoxide that's emitted from equipment that hasn't been vented properly. With a regular energy audit, the organization will be able to address these kinds of issues promptly to help ensure the health and safety of the staff members.
- **Increased Employee Comfort:** During the audit, the Organization might learn about changes that have been made regarding insulation and air sealing. Completing these enhancements will help create a more reliable and more efficiently cooled or heated space for the employees. In turn, more comfortable employees tend to be more productive, so not only will the Organization save on energy costs, but may also improve overall well-being.
- **Personalized Recommendations:** Working with an energy expert can help learn about new energy-efficient technologies. The professional will customize a plan, recommending which upgrades will give the most return on investment. These might include updated lighting systems, a new HVAC system, weatherization measures like insulation and air sealing, and more. While some of the recommendations might have a substantial up-front cost that many of them will pay for themselves in a short period of time with significantly reduced energy expenses.
- **Show Environmental Concern:** By taking steps to be more energy efficient, the Organization will be showing the employees and clients that the organization cares about the impact on the environment.
- **Increased Property Value:** Using the recommendations of an energy auditor to make facility more energy efficient could also help to increase its overall worth. Things like solar panels, high-efficiency LED lighting, and weatherization procedures are all things that contribute to a higher property value.
- **Longer Equipment Lifespan:** An energy auditor might recommend to update some of the equipment for maximum energy savings. If the Organization decide to upgrade, it will not only save on energy costs, but also expect the equipment to last a long time. This is because newer, more energy-efficient equipment doesn't have to work as hard as older, outdated units to provide the same level of performance.
- **Energy audit evaluation:** Energy audits will evaluate the Organization "as a whole", the aim is to consider a wide range of available alternatives (Electrical, Mechanical, Thermal Water and Transportation).
- **Energy audit Opportunities:** The audit will not only inform about the opportunities but also provide information with financial analysis. This will enable prioritization based on financial benefit and return on investment. It provides technical information regarding the proposed energy conservation measures.

- **Analysing the quality of Energy Audit:** A good quality audit will investigate the historical energy usage and find the essential issues using statistical methods. It provides information with emissions analysis to help understand the benefits of the decisions from an environmental standpoint. The audit provides benchmark information to help compare the energy use performance with others.

5. Procedures followed in an Energy Audit

In order to conduct an energy audit, several methods are adopted in the audit sites in which walk-through audit is conducted. The balance of total energy inputs with total energy outputs and identification of all energy streams in a facility are taken into account. The amount of energy used by each of its energy streams are calculated as per the methodology mentioned in the Manual. The top three operating expenses of the Organization are typically observed to be energy (both electrical and thermal), labour and materials. During the audit, physical verification of Lighting, Ceiling, Table and Exhaust Fans, A/C machines, Solar panels, Heaters, Generators, Uninterrupted power supply machines and ventilators load fixtures and verification of installed energy efficient system's capacities are carried out. Inspection of when the cost or prospective cost savings in each of the above components are considered, energy always wins, and the energy management task becomes a key cost reduction area. The energy audit assisted in better understanding how energy and fuel are used in the Organization as well as identifying waste factors and development potential towards energy savings opportunities. Finally, after the audit process, the energy audit included suggestions/ recommendations for energy cost reduction, preventive maintenance and quality control activities, all of which are critical for the utility operations in the auditee (Organization).

The audit involved visiting the campus and physical verification of the loads and sources installed. The 5analyzing5pus is divided into different sections and those sections are audited in which electrical fittings and energy supply are monitored. The production process flow is studied and electricity consumption are measured. Location of the electrical machines, conditions of them and their accessories are inspected through physical verification is observed. The energy bill from the supply utility company (Example: Tamil Nadu Electric Generation and Distribution Corporation Limited, Chennai) is audited and assessed for the load demand requirement and efficient consumption of energy. Stakeholders are interacted with the scope for improvement and energy management during the audit. Potential areas in which the scope of energy conservation and saving opportunities available in the current context have been identified and suggested for implementation to the Organization.

The audit involves visiting physical position of load & carry out inventory of load. Due measurement of electrical load of equipment & circuit is carried out. Energy bill received from TNEB is audited & studied for KWH requirement & how efficiently energy is used. Various positions are interacted, familiarized with energy audit & involved for successful & result oriented energy audit. Energy conservation & saving opportunities are identified during round & measurement for implementation.

Preliminary Energy Audit Methodology

Preliminary energy audit gives a quick access to:
Estimating and establishing energy consumption in the organization
Estimate the scope of audit
Identify the areas of maximum energy consumption
Identify the areas of improvement
Setting benchmark
Performing Preliminary energy audit uses existing data.

Detailed Energy Audit Methodology

The detailed Energy audit offers the most accurate estimation of energy savings and cost. A comprehensive audit provides a detailed energy implementation plans for a facility, as it evaluates all major energy consumption systems. It considers the effects of all projects, accounts for the energy use of all major equipment, and includes detailed energy cost saving calculations and project cost. Energy Balance is the key element in detailed energy audit. The estimated use is compared to utility bill charges. There are three phases in detailed energy audit

Phase I- Pre-Audit Phase
Phase II- During-Audit Phase
Phase III- Post Audit Phase

8. Potential and Magnitude of Energy Audit

A systematic and structured method is necessary for an efficient working of energy audit process. An initial site study is carried out for planning the procedures necessary for an audit.

Initial Site Study and Preparation for Detailed Auditing

An initial site study visit might take one or two days and gives the Energy Auditor an opportunity to meet the concerned person (Auditee),to familiarize with the site and to assess the procedures necessary to carry out the energy audit.
During the initial site visit the Energy Auditor carries out the following actions:-

Discussing the aims of the energy audit with the audit study site's management.
Discussing the economic factors associated with the recommendations of the audit.
Analysing the major energy consumption data with the concerned person.
Obtaining the available audit site drawings–building layout, electricity distribution, steam distribution, compressed air distribution, etc. Conducting Walk-through audit around site.

The main aims of this visit are:

Finalising the Audit team members
Identifying and 6analyzing the main energy consuming areas during the audit.
Identifying existing instrumentation/additional metering required.
To decide if any meters will have to be installed prior to the audit eg .KWh, steam, oil/ gas meters. Identifying the instruments required for carrying out the audit.
Planning the time management
Collecting the macro data on major energy consuming areas.
Conducting awareness meetings/programmes.

9. Comprehensive Energy Audit

A comprehensive audit can take from several weeks to several months depending on the nature and complexity of the site to complete the audit process. Detailed study is carried out to establish, and investigate, energy and material balances for specific departments. Possible check so plant operations were carried out over extended periods of time, at nights and at week ends as well as during normal daytime working hours, to ensure that nothing is over looked.

The audit report includes list of energy inputs and product outputs by major department or by major processing function and estimates the efficiency of each step of the Organization. The methods for improving the efficiency will be listed, and also includes preliminary assessment of the cost of the improvements and expected payback on any capital investment needed. The audit report concludes with specific recommendations for detailed engineering studies and feasibility analysis. The comprehensive energy audit is useful in identifying the major energy consuming areas to be surveyed during then audit and to identify any existing instrumentation/additional metering required. Proper care should be taken while identifying the instrumentation required for carrying out the audit and to plan the time management for collecting the macro data from energy consuming areas. The audit report is definitely useful for energy management.

The information to be collected during the detailed audit includes:

1. Energy consumption by type of energy, by department/area, by type of process equipment, by end-use
2. Energy cost and tariff data
3. The distribution and generation of site services (eg. Electricity, Compressed air, steam).
4. Sources of energy and its supply(e.g. electricity from the grid or self-generation)
5. Potential alternative for fuel substitution, process modifications, and the use of co-generation systems (combined heat and power generation).
6. Energy conservation and management awareness strain in programs with in the organization

The Audit team collects the following base line data:

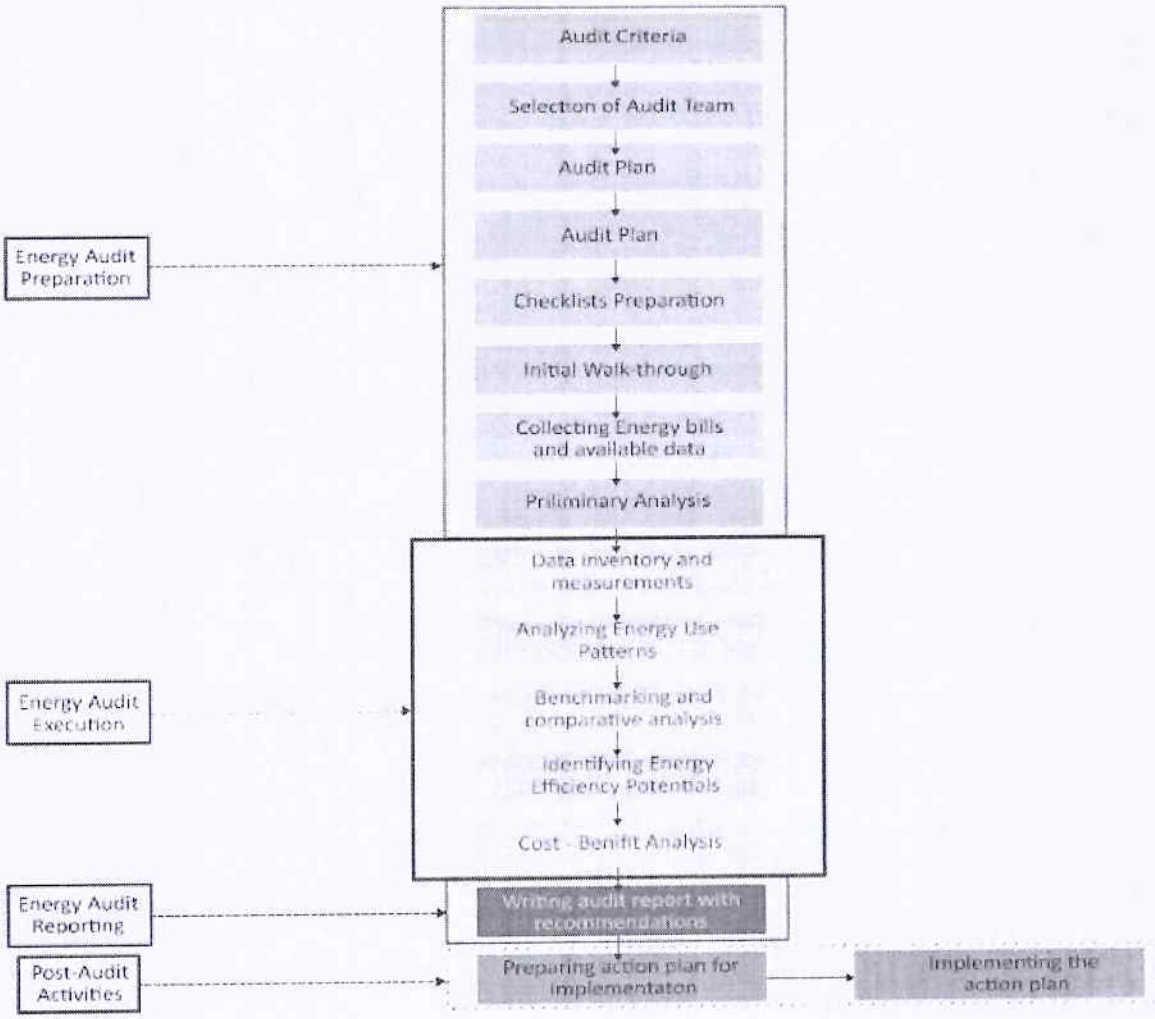
S.NO	ROOM NO	LIGHTS	FANS	SYSTEMS	PRINTERS	REFREGI-RATORS	AIR CONDI TI-ONERS
1	OFFICE	4	4	5	4	1	1
2	MANAGEMENT	5	4				
3	PRINCIPAL ROOM	4	3	1	1	1	1
4	LIBRARY (UG)	29	18	10	2		
5	5	2	2				
6	6	4	5				
7	4	4					
8	3	2					
9	COMMERCE	4	2	1	1		
10	POLITICS	3	2		1		
11	ECONOMICS	2	2	1	1		
12	MATHS	3	2	1	1		
13	ENGLISH	2	2	1	1		
14	BOTANY- I	7	4	1			
15	BOTANY- II	7	4		I		
16	ZOOLOGY	4	4	1	I	1	
17	ZOOLOGY LAB	7	17		1		
18	MICRO BIOLOGY	4	4	1		1	
19	BIO-CHEMISTRY	5	3				
20	BIO-TECHNOLOGY	5	3	1	1		
21	COMPUTERS	12	3	20	2		3
22	PHYSICS	26	21		2	1	
23	ELECTRONICS	11	10		2		
24	CHEMISTRY	23	4	1		1	
25	TELUGU& HINDHI	2	2	1			
26	HISTORY	4	2	1			
27	22	1	3				
28	23	1	2				
29	24		2				
30	25	4	4	1			
31	27	4	4				
32	28		4				
33	29		4				
34	30		4				
35	31	1	3				
36	32	1	3				

37	33	1	3				
38	34	1	3				
39	35		4				
40	36	3	4				
41	M.SC ZOOLOGY		4				
42	CENTRAL LAB	5	2	1	1		1
43	M.SC ZOOLOGY LAB	7	4				
44	M.SC BOTANY LAB	4	4				
45	LIBRARY(PG)	18	12	1	3		
46	MBA LIBRARY	2					
47	MBA	6	4				
48	MBA-II	3	4				
49	NCC	2	2				
50	SPECILIZATION	2	2				
51	MCA LIBRARY	4	4				
52	MCA LAB	11		62	2		6
53	PG FACULTY ROOM	5	3				
54	SEMINAR HALL	26	24	1			7
55	I MCA	4	5				
56	II MCA	4	4				
57	PLACEMENT CELL	6	6	1			2
58	HRD CENTRE	6	6	17	1		2
59	GIRLS HOSTEL	40	35			1	
60	BOYS HOSTEL	35	25			1	
61	STORES	4	2		2	1	
TOTAL		396	323	131	32	9	23

TOTAL ENERGY CONSUMPTION IN KILO WATTS

S.NO	LIGHTS 5 Hrs/Day	FANS 5 Hrs/Day	SYSTEMS 6 Hrs/Day	PRINTERS 3 Hrs/Day	REFRIGERATORS 6 Hrs/Day	AIR CONDITI-ONERS 5 Hrs/Day
1	79.2	129.2	55.02	19.2	43.2	138

Flow chart of Energy Audit Methodology



ENERGY AUDIT COMMITTEE : 2024-25

1. Dr. Y.V.V.APPA RAO	Principal & Chairman
2. Sri K.SASI KUMAR	IQAC Co-ordinator
3. Sri C.S.ANAND KUMAR	Co-ordinator
4. Smt. G.JYOTHI	Auditor
5. Sri P.B.V.A.S.RAVI KIRAN	Auditor
6. Sri D.V.S.SARMA	Auditor

S.V.K.P & Dr K.S Raju Arts &Science College,Penugonda

Electrical Bills for the year 2024-2025

.NO	MONTH	MAIN GATE	MCA GROUND FLOOR	PHYSICS	PG CHEMISTRY BLOCK	ADMINISTRATIVE BLOCK	UG CHEMISTRY BLOCK	UG COMPUTERS	GIRLS WAITING ROOM
1	APR	1,319.00	13,538.00	1,377.00	7,505.00	2,261.00	2,261.00	5,758.00	24,544.00
2	MAY	1,652.00	17,113.00	1,556.00	11,653.00	2,618.00	2,618.00	6,004.00	28,171.00
3	JUN	1,681.00	17,378.00	1,228.00	7,349.00	1,813.OO	1,813.00	6,286.00	27,122.00
4	JUL	1,307.00	17,613.00	1,128.00	6,805.00	1,429.00	1,429.00	5,269.00	21,802.00
5	AUG	1,458.00	18,115.00	1,463.00	7,939.00	1,835.00	1,835.00	4,405.00	25,459.00
6	SEP	1,513.00	15,216.00	1,406.00	6,106.00	1,492.00	1,492.00	5,842.00	22,955.00
7	OCT	1,148.00	17,689.00	1,432.00	7,573..00	1,588.00	1,588.00	5,664.00	22,804.00
8	NOV	1,451.00	17,271.00	1,292,00	8,869.00	1,507.00	1,507.00	5,635.00	22,577.00
9	DEC	1,468.00	14,318.00	1,414.00	6,372.00	1,497.00	1,497.00	3,694.00	18,111.00
10	JAN	1,776.00	13,083.00	1,198.00	5,217.00	1,572.00	1,572.00	3,878.00	20,194.00
11	FEB	2,071.00	9,961.00	1,288.00	4,161.00	1,770.00	1,770.00	3,626.00	16,080.00
12	MARCH	1,930.00	16,657.00	1,420.00	7,487.00	1.740.00	1,740.00	4,972.00	20,801.00
	TOTAL	18,774.00	187,952.00	16,202.00	87,036.00	131,587.00	21,122.00	61,033.00	270,620.00
Grand total		794.326.00							

Signature of the Principal

PRINCIPAL
S.V.K.P & Dr.K.S.Raju ARTS & SCIENCE COLLEGE (A)
Accredited by NAAC With 'A' Grade
PENUGONDA - 534 320,W.G.Dt.A.P.

S.V.K.P. & Dr.K.S. RAJU A&S COLLEGE(A) PENUGONDA 534320

S.V.K.P. & Dr. K.S. Raju Arts & Science College

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Accredited by NAAC with grade 'A'

Dr.Y.V.V.APPARAO M.Sc., Ph.D.,

PRINCIPAL

PENUGONDA - 534 320.

West Godavari District

Andhra Pradesh

Dt 10-03-2025

ENERGY AUDIT CERTIFICATE

This is to certify that Internal Energy Audit for S. V. K. P & Dr K. S Raju Arts & Science College(A), Penugonda has been conducted during April 2024 to 2025 March to assess energy costs, availability and reliability of supply of energy, energy conservation technologies and ways to reduce energy consumption.

Co – ordinator

Auditors

1. G. Jyothi
2.
3. DWS

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Certificate

HYM International Certifications Pvt. Ltd.

Certified that the Energy Management System of

SRI VASAVI KANYAKA PARAMESWARI AND

DR.KALIDINDI SURYANARAYANA RAJU ARTS AND SCIENCE COLLEGE

Penugonda, West Godavari District, Andhra Pradesh, India

has been assessed and found to be in accordance with the requirements of the Energy standards

ISO 50001 : 2018

for the following scope of certification

PROVIDING U.G. COURSES B.A., HONOURS (HISTORY), B.A., HONOURS (ECONOMICS),B.SC., HONOURS (MATHEMATICS) B.SC. HONOURS(PHYSICS) B.SC., HONOURS (CHEMISTRY), B.SC., HONOURS(ELECTRONICS), B.SC, HONOURS (BOTANY), B.SC., HONOURS (ZOOLOGY), B.SC., HONOURS(COMPUTER SCIENCE), B.SC., HONOURS (BIOTECHNOLOGY), B.SC., HONOURS (BIOCHEMISTRY), B.COM.HONOURS(GENERAL), B.COM. HONOURS (COMPUTER APPLICATIONS) BCA., HONOURS PG COURSES MCA,M.B.A M.SC., ORGANIC CHEMISTRY, M.SC.ZOOLOGY, M.SC., BOTANY, M.SC., AQUACULTURE

Certification Number: HYM/UAS/ENMS/9186414/30
Initial Date : 22/12/2022
Issue Date : 21/12/2025
Expiry Date : 21/12/2026

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