

TECHNICAL REPORT OF ENERGY AUDIT



Submitted to



**SRI KRISHNA ARTS AND SCIENCE COLLEGE
SUGUNAPURAM, KUNIAMUTHUR P.O,
COIMBATORE – 641 008, TAMIL NADU.**

Date of Audit: 18.03.2021

Submitted by



NATURE SCIENCE FOUNDATION

(A Unique Research and Development Centre for Society Improvement)

An ISO 9001:2015 & 14001:2015 Certified and

Ministry of MSME Registered Organization

**No. 2669, LIG-II, Gandhi Managar, Peelamedu
Coimbatore - 641 004, Tamil Nadu, India.**

Phone: 0422 2510006, Mobile: 9566777255, 9566777258

Email: director@nsfonline.org.in, directornsf@gmail.com

Contents

S.No.	Details of Reports	Page No
1.	Introduction	1
2	Need for an Energy Audit	2
3.	Aims and Objectives of an Energy Audit	3
4.	Benefits of an Energy Audit	4
5.	Procedures followed in an Energy Audit	5
6.	Types of Energy Audit	6
6.1.	Preliminary Energy Audit Methodology	6
6.2.	Detailed Energy Audit Methodology	6
6.3.	Potential and Magnitude of Energy Audit	6
6.4.	Comprehensive Energy Audit	7
7.	Carbon footprint by measuring Carbon dioxide level in the Campus	8
8.	Energy Audit Process	10
8.1.	Steps involved in an Energy Audit	11
8.2.	Systems studied during the Energy Audit	11
8.3.	Planning and organizing the Energy Audit	11
8.4.	Walk-through Audit Process	11
8.5.	Macro Data collection and observation	11
8.6.	Measurements in the Energy Audit process	12
9.	About the Institution	12
10.	Audit Details	16
11.	Observations of the Energy Audit	16
11.1.	Facilities visited during the Energy Audit	16
11.2.	Systems Studied during the Energy Audit	16
11.3.	Energy Consumption and Cost Profile	17
11.4.	Power supply Equipment and Major Load	18
11.5.	Quantitative and Qualitative Measurement	20
11.6.	Measurement of Carbon dioxide level in the Campus	23
11.7.	Ways to reduce Carbon Footprint	24
11.8	Light Intensity Measurement	25
12.	Best Practices followed in the Organization	26
13.	Recommendations for improving the energy efficiency and energy conservation in the Organization	32
14.	Recommendations on Carbon Footprint in the Organization	32
15.	Conclusions	33
16.	Acknowledgement	33
17.	References	34
18.	Certificates of Nature Science Foundation	36
19.	Certificates of Energy Auditors	45

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 includes suggestions of alternative means and methods for achieving energy savings to a greater extent. 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 minimised 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 examination of documentation, key person interviews, data analysis, measurements and 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. It also provides two additional sets of incremental requirements for buildings to achieve enhanced levels of energy efficiency that go beyond the minimum requirements. Bureau of Energy Efficiency (BEE) came into force in 2002 towards implementation of energy saving practices in an Organization. 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 labelling 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 labelled items used which will be useful for energy savings in a sustainable manner (Mishra 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 Ecofriendly-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 to 100W while 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 in terms 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 CO₂ equivalents 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 ecofriendly 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 6hours x number of bulbs = kwh).
- 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 entire campus 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 level of carbon dioxide might be measured in different places across the Organization campus using a portable CO₂ Analyzer to calculate the carbon footprint. It may be useful to check where carbon emission is prominent which could be taken into account to reduce.

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.

6. Types of Energy Audit

The Energy Audit types depends on the following factors:

- Industry/ Organization type and its function
- Intense and the extent to which final audit is required, and
- The magnitude of cost reduction

Thus Energy Audit can be classified into the following types.

- 1) Preliminary Energy Audit
- 2) Detailed Energy Audit
- 3) Potential and magnitude of Energy Audit
- 4) Comprehensive Energy Audit

6.1. 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.

6.2. 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

6.3. 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 analysing 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 or 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.

6.4. 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 checks of plant operations were carried out over extended periods of time, at nights and at weekends as well as during normal daytime working hours, to ensure that nothing is overlooked.

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 it 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 the 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 training programs within the Organization.

The audit team collects the following baseline data:

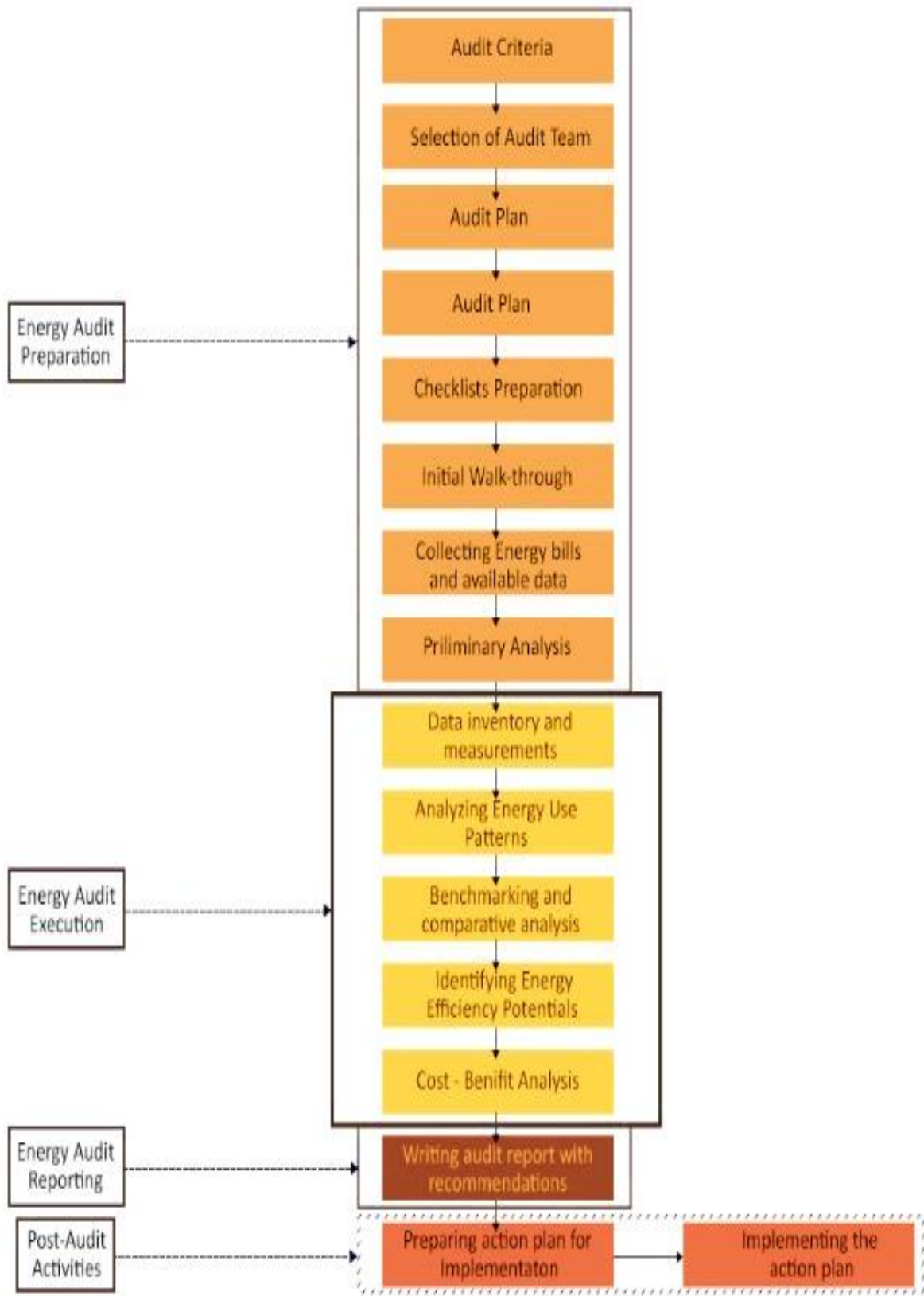
- Major Equipment details, process/technology used
- Water consumption
- Fuel usage
- Capacity utilisation
- Electrical energy consumption
- Steam consumption
- Yield/ Efficiency

7. Carbon footprint by measuring Carbon dioxide level in the Campus

The level of Carbon dioxide is measured in different places across the Organization campus using a portable CO₂ Analyzer (Non dispersive infra-red meter). In addition, CO₂ meter is also displayed the readings of atmospheric temperature, relative humidity, and dew point in the places, where the level CO₂ is measured. The meter started measurements of CO₂ level in the atmosphere after powered ON and updated the readings every second in the display screen. If the operating environment is changed (example from high to low temperature) which took 30 seconds for CO₂ sensor to respond and 30 minutes for flexibility in relative humidity. The meter features an audible alarm to give warnings when CO₂ concentration exceeds the set limit. It emits beeps (Abt.80Db) when CO₂ level goes over the set value and stops when any key (except SET) is pressed, or the readings fall below the set values.

The Carbon footprint per year is calculated (www.carbonfootprint.com) based on electricity usage per year in which CO₂e emission from electricity and the sum of transportation per year in terms of number of the shuttle buses service operated by the Organization and number of cars, motorcycles and trucks entering in the Organization campus. These factors are multiplied with total number of trips in each day and approximate travel distance of vehicles covered in each day with a coefficient (0.01) to calculate the emission of CO₂e in metric tons per year.

Humans contribute to a massive increase of carbon dioxide emissions by burning fossil fuels, deforestation, and other industrial activities. Methane (CH₄) is largely released by fossil fuels like coal, oil, and natural gas industries. Anthropogenic activities are responsible for almost all of the increase in greenhouse gases in the atmosphere over the last 150 years. The largest source of greenhouse gas emissions from human activities is from burning fossil fuels for electricity, heat, and transportation.



Flow chart of Energy Audit Methodology



Calculating Carbon footprint

8. Energy Audit Process

Energy audit is a sequence of tasks performed in a planned manner. It requires discussion, survey, collection of data, analysis, and reporting.



Opening Meeting for the conduct of Energy Audit

8.1. Steps involved in an Energy Audit

- Step 1: Opening meeting among the audit team and auditee
- Step 2: Planning and organizing the energy audit
- Step 3: Conduct a walk-through audit at different sites
- Step 4: Macro data collection and observation
- Step 5: Analysis of data collected from the Organization
- Step 6: Best practices followed in the Organization towards energy savings
- Step 7: Recommendations for further improvement
- Step 8: Exit meeting after the audit to discuss about the audit findings

8.2. Systems studied during the Energy Audit

- Physical verification of lighting, fan a/c machines, ventilators load fixtures.
- Verification of installed energy efficient systems.
- Inspection of Solar panel, Generators, Uninterrupted power supply machines.
- Inspect and verify the maintenance aspects of installed Generators and additional backup power sources.
- Analyse the electricity consumption through the supply utility company (Example: Madhyanchal Vidyut Vitran Nigam Limited).
- Review the potential usage of alternative energy resources.
- Review the energy conservation awareness among the stakeholders for optimum use of electricity and its savings.

8.3. Planning and organizing the Energy Audit

Planning and organizing are the integral part of the energy audit. An initial visit to the audit sites is organized and the areas to be inspected are listed. Following the listing, information on the energy consumption of various blocks in the recent past is obtained, and a planned analysis is carried out.

8.4. Walk-through Audit Process

Simple audit, screening audit or visual audit are the other names, by which walk-through audits are addressed. The main purpose of the walk-through audit is to obtain general information about the sites in which electrical energy is being used at the maximum. More specific information has been obtained from the maintenance and operational people during the time walk-through audit. It also included a walk-through of the facility to become familiar with the building's operation and a brief evaluation of facility utility bills (amount paid for electricity) and other operating data. During the audit the primary problem areas are discovered.

8.5. Macro Data collection and observation

Current level operation and practices within the campus are assessed and then the data regarding the number of electrical loads connected in each section are collected. The power ratings of each component and their respective hours of operation are also observed and documented for preparing the recommendations to the Organization.

8.6. Measurements in the Energy Audit process

An energy audit required measurements, such as the energy identification and quantification, and these quantities necessitate the instruments used in a consistent way. Some of the basic electrical parameters are monitored during the energy audit such as Voltage (V), Current (I), Power factor, active power (kW), apparent power (demand in KVA), energy consumption (kWh), frequency (Hz), harmonics, illumination level, etc. Temperature and heat flow, radiation, air and gas flow, liquid flow, speed, air velocity, noise and vibration, dust concentration, TDS, pH, moisture content, relative humidity, flue gas analysis – CO₂, O₂, CO, SO₂, NO₂, combustion efficiency are the mechanical, thermal and other parameters that are analysed during the audit depending upon the requirements

9. About the Institution

9.1. About Sri Krishna Arts and Science, Coimbatore, Tamil Nadu

Sri Krishna Arts and Science College with a vision of "Fitness for Purpose" established in the year 1997 is an autonomous Institution imparting Quality Education imbining scientific and artistic knowledge to the needs of the current generation. SKASC offers 32 Undergraduate Programmes 13 Post Graduate Programmes 7 Research Programmes and one Integrated Programme. From a student strength of 623 in the academic year 2004-2005 the college had grown extensively in infrastructure, technical developments and quality Faculty strength to incorporate 8197 in the year 2020-2021.



The Learning Model of Sri Krishna Arts and Science College is "Vision to Wisdom Approach". To augment this the college has Evolving Curriculum that is designed at par with the UGC standards of Choice Based Credit System. The college follows Knowledge-based Learning, Industry-Exposure & Training and Capstone Evaluation Model that are all linked with the Outcome- based Education which enable the students to be job-ready right when they complete their degree at Sri Krishna Arts and Science College.

SKASC has enabled e-learning and m-learning facilities for the students which includes web-based learning, virtual classroom and digital collaboration. Students can log on to virtual classroom right from the day of admission at SKASC and learn their subjects 24/7. The college has got the highest number of Google Classroom users world over.

Vision of SKASC

The Vision of the college is "FITNESS FOR PURPOSE" by preparing students for placements both during and outside the course work.

- Strengthening the research activities in the departments.
- Encouraging the consultancy and extension services involving students and faculty.
- Creating a brand equity and brand image by carrying out activities with the motto "Knowledge, Love and Service".

Mission of SKASC

The Mission of the college is to prepare both boys and girls for the pressing demands of tomorrow keeping in mind the need to shape and mould a generation of young men and women with knowledge, character, true and genuinely cultivated spirit of service and far-reaching imagination

9.2. About Nature Science Foundation, Coimbatore, Tamil Nadu.

NSF is an ISO 9001:2015 & 14001:2015 certified and registered with Ministry of Micro, Small and Medium Enterprise (MSME), Government of India Organization functioning energetically towards the noble cause of nature conservation and environmental protection. NSF is managed by a board of trustees of NSF Public Charitable Trust under the TN Societies registration Act 1975 (TN Act 27 of 1975) on 29th November, 2017 at Peelamedu, Coimbatore- 641 004, Tamil Nadu, India with Certificate of Registration No. 114 / 2017. In addition, NSF has 12A, 80G and Form 10AC certificates for income tax exemption and implanting various Government schemes. The main motto of the NSF is to “Save the Nature to Save the Future” and “Go Green to Save the Planet”. NSF Branch Offices are also functioning effectively at Gorakhpur, Uttar Pradesh and Faridabad, Haryana, India to adopt the ‘Go Green Concept’ in a big way. NSF family is wide spread across India with over 115 state-wise Lead auditors to conduct Green and Environment Audits.

NSF is functioning strenuously to conduct different awareness programmes and implement various schemes to public and school / college students towards the noble cause of nature protection. Some of the programmes are also being organized for the benefit of tribal communities to create the supply chain for biodiversity conservation studies. The objectives along with vision and mission are illustrated to promote educational and environmental awareness programmes through social activities for enhancing the quality of life and to conserve nature from environmental pollutants using traditional and modern technologies for sustainable land management. NSF is educating the tribal community children through social service and towards the upliftment of tribes as a whole and make them as entrepreneurs.

International Eco Club Student Chapter (IECSC) has been established for Student volunteers and faculty members are encouraged to conduct National and International events, Student Technical Symposium, Distinguished lecture programme, Environment day celebration, Ozone day celebration, Project model exhibition, Awareness programmes on Environmental pollution, Biodiversity and Natural resources conservation etc. with the financial support of the Foundation. NSF is being released ‘Magazine’ and ‘Newsletter’ biannually to share the information about Environmental awareness programmes on biodiversity conservation, seminar on soil conservation, water management and solid waste management, restoration and afforestation programmes in Western Ghats of southern India.

In order to encourage the students, members of faculty, academicians, scientists, entrepreneurs and industrial experts those who are involving in nature protection and biodiversity conservation studies across the world, NSF tributes the

deserved meritorious candidates with various awards and honours such as 'Best Faculty Award', 'Best Women Faculty', 'Best Scientist Award', 'Best Student Award', 'Best Research Scholar Award', 'Best Social Worker Award', 'Young Scientist Award', 'Life-Time Achievement Award' and 'Fellow of NSF'. These award and honours will be given to the deserved meritorious candidates during the 'Annual Meet and Award Distribution Ceremony' which will be conducted every year during the first week of January.

NSF has introduced various types of Audits such as 'Eco Audit', 'Green Audit', 'Energy Audit', 'Hygienic Audit' Water & Soil Audit, Plastic Waste Management Audit, Biomedical Waste Audit, Solid Waste Management Audit, E-Waste Management Audit, Academic & Administrative Audits including ISO certification process to Academic Institutions, R&D Organizations and Industries towards the accreditation process as well as maintaining a hygienic eco-friendly environment to the stakeholders in their campus. All audits will be conducted as per the Checklist prepared by the NSF ISO Criteria and in compliance with Government Law and Environmental Legislations including World / Indian Green Building Council and the concept of Swachh Bharath Abhiyan under Clean India Mission. Green campus and Environment Policy, Purchase Policy, Energy Policy, MoU, International Eco Club student Chapter. Audit processes are being conducted through the certified Auditors as per the following

Audit	Certified Auditors	Certified Auditors
Green Audit	IGBC - Indian Green Building Council GBCRS - Green Building Code and Green Ratings Systems GRIHA – Green Rating for Integrated Habitat Assessment	<ul style="list-style-type: none"> • Mrs. S. Rajalakshmi • Dr. R. Mary Josephine • Dr. B. Mythili Gnanamangai • Er. Ashutosh Kumar Srivastava • Er. N. Shanmugapriyan
Energy Audit	BEE - Bureau of Energy Efficiency LEED - Leadership in Energy and Environmental Design CII-GreenCo – GreenCo Rating System Felicitator	<ul style="list-style-type: none"> • Er. D. Dinesh Kumar • Er. N. Shanmugapriyan • Dr. N. Balasubramaniam • Dr. P. Thirumoorthi • Dr. G. Muruganath
Environment Audit	IGBC -Indian Green Building Council ASSOCHAM - Associated Chambers of Commerce and Industry of India FSRS – Fire Safety & Rescue Services	<ul style="list-style-type: none"> • Mrs. S. Rajalakshmi • Dr. A. Geetha Karthi • Dr. R. Mary Josephine • Dr. B. Mythili Gnanamangai • Er. Ashutosh Kumar Srivastava • Er. N. Shanmugapriyan
Hygiene Audit	FSMS – Food Safety Management System & Occupational Safety & Health (ISO 22000:2018) SBICM - Swatch Bharath under India Clean Mission	<ul style="list-style-type: none"> • Mrs. Gaanaappriya Mohan • Er. Ashutosh Kumar Srivastava • Dr. R. Sudhakaran • Dr. N. Saranya
Waste Management Audits	Water Audit, Soil Audit, Biomedical Waste Audit, Solid Waste Management Audit as per the IGBC, GRIHA and BEE	<ul style="list-style-type: none"> • Mrs. Gaanaappriya Mohan • Er. Ashutosh Kumar Srivastava • Dr. R. Sudhakaran • Er. N. Shanmugapriyan
Academic & Administrative Audits	Academic & Administrative Audits as per the NAAC Criteria	<ul style="list-style-type: none"> • Dr. B. Anirudhan • Dr. B. Shreeram
ISO Certification	QMS (9001:2015), EMS (14001: 2015), OHS (45001: 2018), ISMS (27001:2018), FSMS (22000: 2018), QMSMD (13485: 2016), EnMS (50001: 2018)	<ul style="list-style-type: none"> • Er. Ashutosh Kumar Srivastava • Mrs. S. Rajalakshmi • Dr. A. Geetha Karthi • Mrs. Gaanaappriya Mohan • Dr. R. Mary Josephine

10. Audit Details

Date/Day of Audit	: 18.03.2021
Institution Name	: Sri Krishna Arts and Science College Sugnapuram, Kuniamuthur Post Coimbatore, Tamil Nadu.
Audited by	: Nature Science Foundation, Coimbatore, Tamil Nadu, India.
Audit type	: Energy Audit
Name of ISO EMS Auditor	: Mrs. S. Rajalakshmi, Chairman & ISO EMS Auditor
Name of Energy Auditor	: Dr. N. Balasubramaniam (BEE) certified Bureau of energy Efficiency
Name of Lead Auditor	: Ms. V. Sri Santhya Assistant Director, NSF

11. Observations of the Energy Audit**11.1. Facilities visited during the Energy Audit**

Date	Section where Energy Audit is conducted
18.03.2021	Administrative Block
	Power House
	Faculty Rooms
	Classrooms
	Seminar Halls
	Multipurpose
	Laboratories
	Computer Lab
	Well, Sump and pumps.
	Sewage Treatment Plant
	Library

In the sections, the services offered are monitored, verified, and analysed on the aspects of energy consumption. In all these areas lighting systems forms the major consumer of electrical energy. The electric supply consumed in the institute is from the state supply grid only. For renewable energy, 12 streets light which are through Solar power is connected. In case of emergency, two generators are installed.

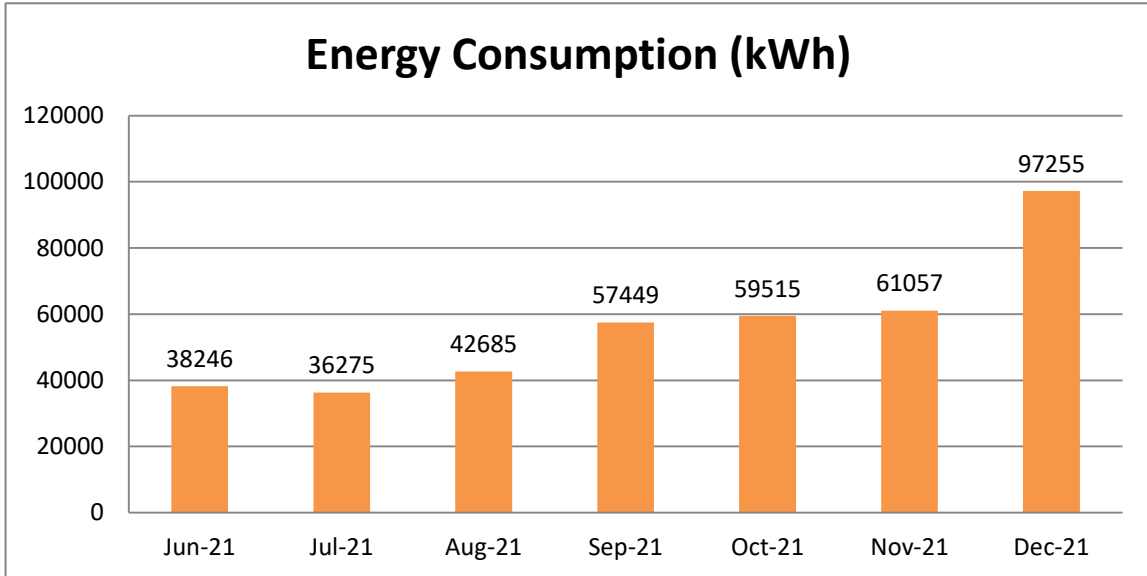
11.2. Systems Studied during the Energy Audit

1. Lighting fixtures are verified physically.
2. Installation of energy efficient lighting systems are verified.
3. Installation of safety systems are verified
4. Installation of power backup systems (generators and UPS) are verified on the aspect of maintenance and consumption.
Electricity consumption through the state supply grid bills was analysed.

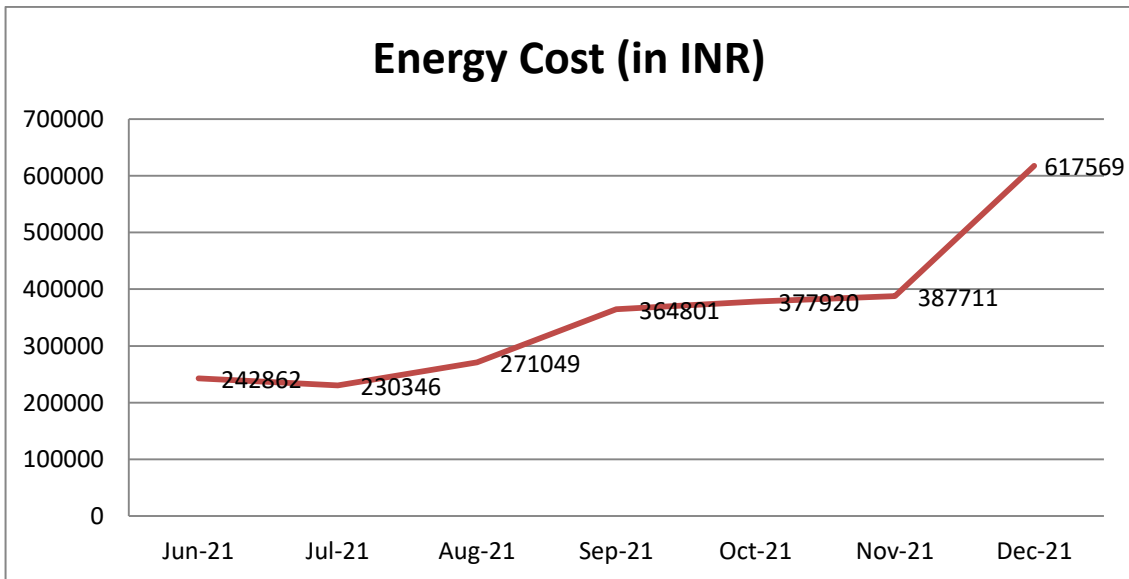
- 5. The energy conservation awareness among the stakeholders for optimum use of electricity and its savings are reviewed.

11.3. Energy Consumption and Cost Profile

The following chart shows the profile of energy consumed and the cost for one year by the SKASC.



Energy Consumption Profile of SKASC



Energy cost profile of SKASC

11.4. Power supply Equipment and Major Loads

Table 1. Major Equipment related to Electrical energy utilization at SKASC

S.No	Major and Minor Equipment, Instrument and Machineries	Rating/Capacity	Quantity (No's)
1	LED Tube Lights	-	
	Computer Department	-	13896
	ECS Department	-	71
	Bio Science Department	-	142
	CSHIM Department	-	66
	Psychology Department	-	432
	CDF Department	-	3456
	HOD & Staff Room	-	291
	Library Block	-	1508
2	Fluorescent Lamps	-	-
3	CFL	-	-
4	LED Focusing Light	-	-
5	LED Bulb	-	-
6	Solar Water Heater	8kW 16kW	10 6
7	Solar Panel	-	-
8	UPS	10 kVA 20 kVA 30 kVA	3 6 4
9	LCD Projectors	Optoma	161
10	Refrigerators	-	1
11	Veranda Light Load	-	-
12	Lift	-	1
13	Water Doctor	-	-
14	Water Purification System	-	-
15	AC Split, Window and Centralized AC)	-	25
	Vertical Voltas	3 ton	23
16	Air Cooler	-	-
17	Portable Fans	-	-
18	Celling Fans(Computer Department)	-	6545
	ECS Department	-	32
	Bio Science Department	-	38
	CSHIM Department	-	22
	Psychology Department	-	495
	CDF Department	-	1980
		-	
19	Generators	500kVA	1
20	Pumps (Motors)	5HP	5
	Bore motor	5HP	2

	STP Motor	5HP	2
21	Vacuum Cleaner	-	-
22	Drip & Sprinklers Irrigation	-	-
23	Ventilators	-	-
24	Exhaust Fans	-	45
25	Insect Trap	-	-
26	Automatic Lights	-	-
27	Internet Connectivity	Server room	1
28	Podium Containing Mike	-	-
29	Speakers	-	-
30	Amplifiers	-	-
31	Sensors	-	-
32	Computers	Laptop & Desktop	1024
33	Dot- Matrix Printers	-	-
34	Laser Printers	-	45
35	Xerox Machines	-	-
36	Scanners	-	-
37	Camera	-	-
38	Intercom	-	-

Table 2. Annual Energy Consumption of Fuels

S.No	Month	Units Consumed (kWh)	Diesel Consumption (Litres)	Petrol Consumption (litres)	LPG Consumption (kg)
1.	June 2021	5360	3.14	NA	-
2.	July 2021	3836	2.62		
3.	August 2021	2112	2.81		
4.	September 2021	2512	3.06		
5.	October 2021	41524	2.69		
6.	November 2021	1577.7	2.92		
7.	December 2021	3994.9	2.74		

Table 3. Energy Consumption and Cost Profile

S.No	Months	Rating/Capacity Units in kWh	Cost (Rupees)
1.	June 2021	38246	242862
2.	July 2021	36275	230346
3.	August 2021	42685	271049
4.	September 2021	57449	364801
5.	October 2021	59515	377920
6.	November 2021	61057	387711
7.	December 2021	97255	617569

The sum of electricity usage per year = 392,482 kWh

The CO₂ emission from electricity = (Electricity usage per year in kWh/1000) x 0.84
 = (392,482 /1000) x 0.84 = 329.68488 MT per year

Table 4. Transportation Facilities available in the campus

S.No	Type of Vehicle	Fuel Used	No. of Vehicles	Non Pollution Certified (Y/N)
1.	Bus	Diesel	13	Yes, all buses have pollution certificate (PUC)

Table 5. 11.5 Quantitative and Qualitative Measurement at SKASC

S.No	Requirements and checklists of the audit	Conformity		
		Yes	No	NA
1.	Have internal Energy audit procedures been developed and implemented in the Organization?		✓	
2.	Have programmes for the achievement of energy efficiency and conservation objectives been established and implemented as on today in the campus?	✓		
3.	Has a Management Representative, Electrical Engineer, Staff in charge been assigned for energy savings on power consumptions?	✓		
4.	Have programmes for the achievement of prescribed financial outlay for current bills for each building in the campus towards power consumptions?		✓	
5.	Has the organization ensured that personnel performing environmental specific tasks have the required knowledge on energy audit (e.g. education, training programme, seminar, workshop, camp, etc.)?	✓		
6.	Are objectives and targets documented towards energy audit periodically and any Register is made?		✓	
7.	Any analysis of energy flows for energy conservation in terms of the amount of energy input into the system without negatively affecting the output in buildings		✓	
8.	Implications of alternative energy efficiency measures sufficient to satisfy the financial criteria of sophisticated investors		✓	
9.	Identification of the most efficient and cost-effective Energy Conservation Opportunities (ECOs) or Measures (ECMs) taken by the Management	✓		
10.	Are the following energy efficiency and conservation aspects considered in sufficient detail?	✓		
	a. Fluorescent (tube) lights, Incandescent lamp and sodium vapour lights are replaced with LED		✓	
	b. Number of Uninterruptible pow	✓		

	er supply (UPS) and Power generators for power back-up to alternative current supply facility in each building			
	c. Number of solar panels, solar lights, <u>solar water heaters</u> , electric water heater installed	✓		
	d. Automatic sprinkler system used for irrigation purpose		✓	
	e. Ultra-violet lights and any other harmful lights used with safety precautions		✓	
	f. Attempt in reducing the energy expense and carbon footprint	✓		
	g. Disposal facility for hazardous arise from electrical gadgets, equipment and installation	✓		
	h. Renewable energy utilization (solar panel, wind mill)		✓	
	i. Natural / Mechanical air ventilation at Indoor / Outdoor auditorium, stadium, seminar halls, etc.	✓		
	j. Sign boards indicating Switch OFF / ON, Danger at Electrical equipment and Power transformers in the campus	✓		
11.	Signing of MoU with Govt. and NGOs to ensure about the energy conservation and efficiency in the campus		✓	
12.	Conduction of awareness programmes and outreach programmes on the energy conservation and efficiency	✓		
13.	The details of public transport, battery operated / electric vehicles, biofuel use, exhaust fans, boiling water system, chillers and geysers on energy savings mode		✓	
14.	Projects and Dissertation works on the energy conservation and efficiency carried out by students and staff members	✓		
15.	Steps taken to take care of daylighting, AC machines heat emission and ecofriendly Refrigerators, etc.	✓		
16.	Use of water metering, based energy efficiency practices, remote waterlines, automation of electrical fittings and gadgets to save energy		✓	
17.	Are all monitoring electrical equipment appropriately maintained and calibrated?	✓		
18.	Are any energy conservation technologies and retrofit for energy conservation equipment being implemented?	✓		
19.	Skylight roof ratio, fenestration plan and Daylight illuminance in building construction towards energy efficiency*	✓		
20.	Any Automatic Lighting Shutoff with occupancy Sensors and Timers, Exterior / Interior lighting control facility*		✓	
21.	Have any rooms and guest suites a master control device at the main room entry that controls all permanently installed luminaires and switched receptacles*		✓	

22.	Total electricity usage divided by total campus' population (kWh per person)	✓		
23.	The ratio of renewable energy production divided by total energy usage per year	✓		
24.	Total carbon footprint divided by total campus' population (metric tons per person)		✓	
25.	Elements of green building implementation as reflected in all construction and renovation policies	✓		
26.	Greenhouse gas emission reduction awareness programme to the stakeholders	✓		
27.	Computers, Lap tops, IPod, Dot matrix Printer, Laser printers, Xerox Machines, Scanners, Server, Fax machine, Inverter with UPS	✓		
28.	<p>Equipment, Instruments and Machineries related to Life Sciences and Biological Sciences including Biotechnology, Nanotechnology, Food Technology, etc.</p> <p>Electronic Balances, pH Meter, Hot-air-oven, Microwave oven, Laminar Air Flow, Autoclave, Microscopes, Electroponic, Apparatus, Chromatography devices, Grinders, Mixers, Deep Freezers, BOD incubators, COD digester, Extraction apparatus, Incubators, Co2 incubators, Heating Mantle, Vacuum pump, Vortes Mixer, Magnetic stirrer, Gel rocker, Semicator, Growth chambers, Air curtains, Acrators, Spectrophotometers, Calorimeters, Turbidity meter, Colony counter water bath, Dry bath, Thermocycler, Gene gun, Gel documentation system, Trans illuminator, Ice maker, ELISA reader & Water, Aquarium, zebra fish/animal house facility, Mechanical & Orbital Shakers, cyclo mixer, Lyophilizer, Incinerators, Fermenters, Reactors, Particle size Analyser, XRD, FTR, Muffle furnace</p>		✓	
29.	<p>Chemical Sciences and Engineering Equipment/Machines</p> <p>Distillation unit, Flow through straight pipe, packed bed distillation, Roll crusher, jaw crusher, sieve analysis machine, Shell and tube heat exchangers, plate and frame filter press, Fume hood, Fluorimeter, Venturimeter, Orifice meter, Nephelometer, Membrane Filtration Apparatus, Sieve set Machine, Jar test apparatus</p>		✓	
30.	<p>Electrical, Electronics and Communication Engineering Equipment/Machines</p> <p>DC Shut motor, DC Series motor, DC Compound motor, DC Shunt motor, DC Compound generator, Dc</p>	✓		

series generator, Single phase & Three phase transformers, Loading rheostat, Single phase & three phase, inductive & capacitive load, Power electronics trainer kits, Three phase squirrel cage induction motor, Three phase slip ring induction motor, AC generator, Stabilizers, synchronizer, Half and fully controlled converters, Buck, Boost and buck-boost converters, Single phase and three phase inverters, synchros, CRO, DS, CRO.			
---	--	--	--

11.6. Measurement of Carbon dioxide level in the Campus

Despite a massive increase in global warming, environmental changes and human population including many commercial activities now-a-days, the amount of carbon in Earth's atmosphere is playing an important role which act as a global indicator for checking the purity of the atmosphere. Using a portable CO₂ Analyzer, the level of carbon dioxide was measured in different places across Sri Krishna Arts and Science College, Coimbatore, Tamil Nadu. The observation showed that the concentration of CO₂ in the atmosphere is found to be within permissible limits and which did not exceed the critical limit of CO₂. It is further revealed that all the selected locations are having pure air with good oxygen level which are free from pollutants (Table 6).

Carbon footprint, amount of CO₂ emissions associated with all the activities of the College or other entities like building construction and anthropogenic activity by human beings includes direct emissions, such as those that result from fossil-fuel combustion from direct burning, transportation, industrial activities, as well as emissions from electricity generation. In addition, the carbon footprint also contributes to the greenhouse emission. College is adopting sustainable green campus for future projects.

Table 6. Measurement of CO₂ Concentration in Sri Krishna Arts and Science College, Coimbatore, Tamil Nadu

S.No.	Different locations of the Organization's campus	Carbon dioxide level (ppm)	Remarks
1.	Class Room	456	Within Permissible Limits
2.	Library	510	Within Permissible Limits
3.	Computer Lab	386	Within Permissible Limits
4.	Parking Area	526	Within Permissible Limits
5.	Canteen	432	Within Permissible Limits
6.	Auditorium	532	Within Permissible Limits

Reference of Set values of CO₂ level

As per ASSRAE 62 2019 standards 700 PPM for indoor and 1000 PPM form outdoor is the permissible limits

Calculation of Carbon Footprint at SKASC

The Carbon footprint calculation can be conducted based on the stage of calculation as stated in www.carbonfootprint.com, which is the sum of electricity usage per year.

$$\begin{aligned} &\text{The CO}_2 \text{ emission from electricity} \\ &= (\text{electricity usage per year in kWh}/1000) \times 0.84 \\ &= (392,482 \text{ kWh}/1000) \times 0.84 \\ &= 329.6 \text{ MT per year} \end{aligned}$$



CO₂ level measurement at various locations of Sri Krishna Arts and Science College, Coimbatore Tamil Nadu

11.7. Ways to reduce Carbon Footprint

Evaluating and understanding the CO₂ emission can reduce the negative impact on the environment. Tiny changes can bring good impacts like when it comes to transportation, food, clothing, waste, etc., the following tips helps in reducing the carbon footprint.

Food

- Consumption of local and seasonal products.
- Limiting the consumption of meat and beef.
- Adopting sustainable fishing.
- Avoiding plastic packaging and practising the use of reusable bags.
- Sense of buying only necessary things.

Clothing

- Taking good care of clothes.
- Buying second hand products or borrowing
- Using the clothes made from recycled products with eco label

Transport

- Adopting carpooling practice, using cycles and public transport
- Usage of No Pollution certified vehicles.

Energy and waste

- Turning down the heating.
- Short showers
- Proper usage of water while brushing teeth or cleaning the dishes
- Proper care while charging the batteries.
- Selecting star rated equipment and EU Energy labelled products
- Reduce and recycle of wastes.

11.8. Light Intensity Measurement

Light intensity or light output is used to measure whether a particular light source provides enough light for an application needed. There is a well-established light level recommendation for a wide range of applications in lighting industry and also for the type of space. Understanding the light intensity helps to properly evaluate whether the space has adequate lighting conditions or not. Light intensity is measured in terms of lumens per square foot (foot-candles) or lumens per square meter (lux). Measuring the amount of light that falls on a surface allows evaluating if the particular space has sufficient light to perform the tasks.

A light meter (lux meter) is used to measure the amount of light in a space/on a particular work surface. The light meter consists of a sensor that measures the light falling on it and provides the user with a measurable illuminance reading. Light meters are an especially useful tool for measuring light for safety or over-illumination. The light intensity is usually measured by taking initial reading, where the lightings are turned off (Baseline measurement) and the final reading is taken by turning on the lights in the particular space (illuminated level). Subtracting the baseline measurement from illuminated level gives the light intensity of the particular room/ space.



**Light Intensity Measurement
Equipment used at Sri Krishna Arts and Science College, Coimbatore**

Table 7. Light Intensity Measured at various locations of Sri Krishna Arts and Science College, Coimbatore, Tamil Nadu

Sl.No	Locations	Light Intensity (Lux)	Recommended Level (as per NBC 2016) (Lux)
1.	Class Room	254-443	200 – 500
2.	Computer Lab	330-389	150 – 300
3.	Veranda	346-495	200 – 500
4.	Library	323-411	200 – 500
5.	Auditorium	389-452	200 – 500

12. Best Practices being followed in the SKASC

- Lux level are merely average at all places
- In Computer labs thin films were pasted in order to avoid heat inside the classrooms.
- Transformer, Generators and UPS are protected properly with fencing and kept awareness boards on ‘Dangers’ and ‘Warnings’.
- Most of places, sign board of ‘Switch ON’ and ‘Switch OFF’ are kept towards saving energy measures to the stakeholders.
- Electrical wires, switch boxes and stabilizers are properly covered without any damage which will cause any problems to the staff and student members.
- Power factor is maintained near to unity with APFC.
- Replaced old generation computers and TVs with LED monitors.
- Establishment of a system of carpooling among the staff members and students to reduce the number of four wheelers coming to the College.
- Discouraging the students and research scholars using two wheelers for their commutation in the campus.
- Switching off the lights, fan, air conditioners, equipment and instruments when they are not in use.
- Systematic representation chart of power flow was placed in the Power house
- Warning and Danger sign boards were placed in all power house room, UPS room.
- Natural Light is illuminated in the campus, labs, corridors and in the stairs.
- Fire Extinguisher were placed in the power house and in the Ups room
- Sub metring for individual buildings most of the roof with 100-150 KW with net metering in block B were under proposal.



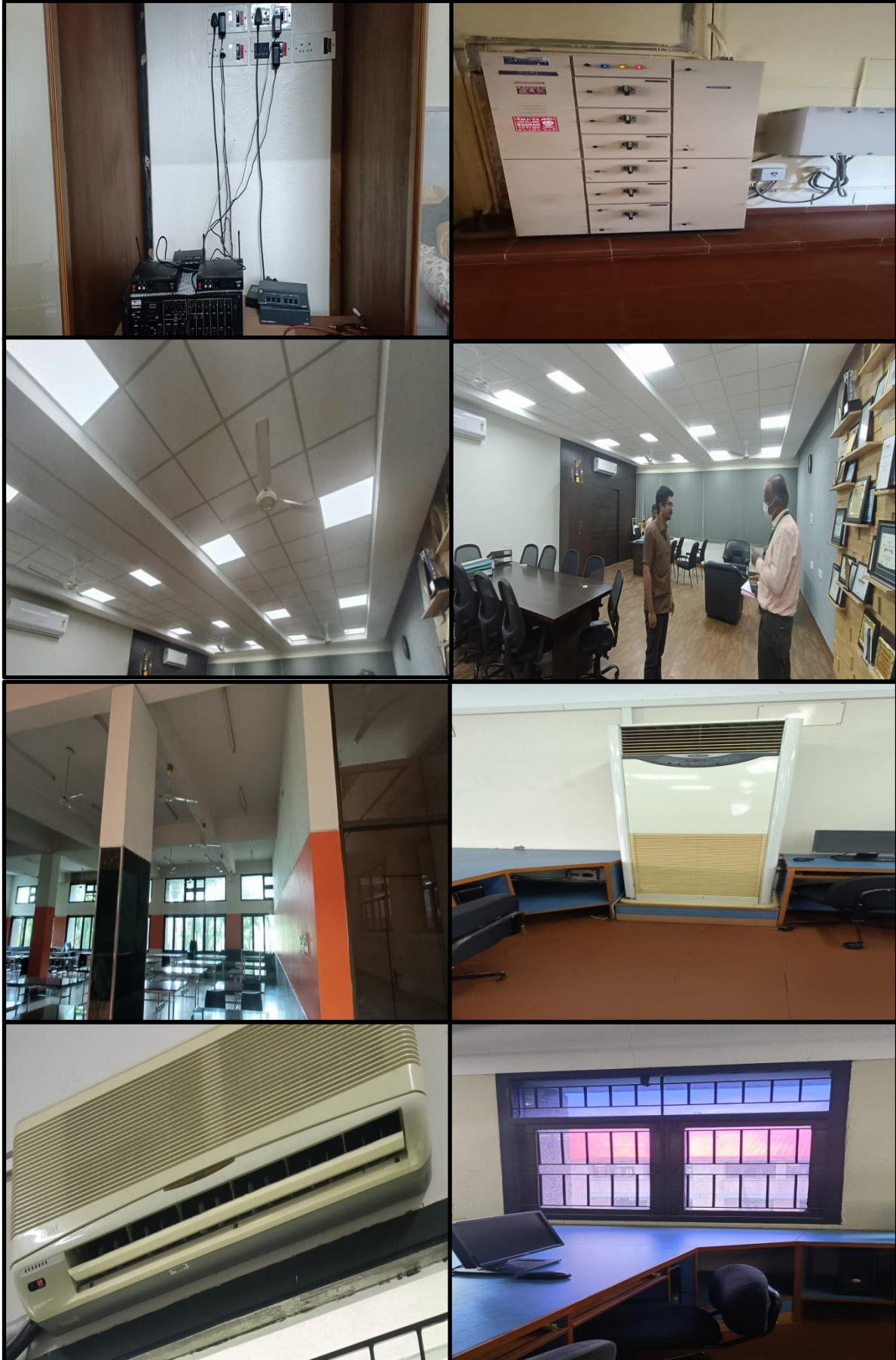
Walk-through Audit Conducted at various Sri Krishna Arts and Science, Coimbatore.



Best Practise followed by the Institutions



Best Practice followed by the institutions



Walk-through Audit Conducted at various Sri Krishna Arts and Science College, Coimbatore, Tamil Nadu



Best Practices followed by the Institution

13. Recommendations for improving the energy efficiency and energy conservation in the Organization

The energy audit included suggestions for energy cost reduction, preventive maintenance, and quality control activities, all of which are critical for utility operation in the audit sites..

- Procurement of equipment with energy efficiency (4-5 star rated equipment) during replacement may be considered.
- Optimal water usage and temperature settings may be used which are coming under automatic process towards energy savings.
- Continuous monitoring and analysis of energy consumption by dedicated team may be planned within the campus.
- Motion sensors can be implemented in future for the possibilities of reduction of light consumption for individual cabins
- Green signing boards with energy saving efficiency can be encouraged at campus.
- Solar street lights can be recommended in future where possible
- Use computers and electronic equipment in power saving mode.
- Automatic switches with occupancy sensors in common areas.
- Regular monitoring of equipment in all laboratories and immediate rectification of any problems.
- Internal energy policy such as preventive maintenance and breakdown maintenance policy should be implemented.
- Plan for diesel consumption need to be implemented.
- Energy meter Provision in the building to be implemented.
- CFL can be replaced with LED
- .In Computer labs in future the vertical Voltas AC can be replaced with 3* rated AC.
- Schematic representation char is required at power house.
- Solar Panel in future can be recommended to lower the energy consumption
- In Future tube lights can be replaced with LED lights.
- Gas type Fire Extinguisher shall be used f\at Power house and in UPS room.

14. Recommendations on Carbon Footprint in the Organization

- Encourage students and staff members to use bicycles and battery operated vehicles to reduce fuel consumption and carbon emission.
- Establish a more efficient cooking systems like biogas operated machineries to save fossil gas in hostel kitchen and canteen.
- More use of generators, inverters, and UPS every day should be discouraged which could save electrical energy.
- Large number of ventilation and exhaust systems may be placed in auditorium, seminar and conference halls to reduce the carbon dioxide level among the participating students, scholars and staff members.

15. Conclusions

Considering the fact that the organization is a well-established, long time run establishment with good reputation, there is significant scope for conserving energy and make the campus as self-sustained in it. The energy conservation initiatives taken up by the institution are substantial. Energy efficient lighting schemes, awareness created among stakeholders and necessary power backups are being practiced by the institution. There are some best Practices followed on Energy Audit in the Sri Krishna College of Technology, Coimbatore, Tamil Nadu like Transformers, Generators and UPS are protected properly with fencing and kept awareness boards on ‘Dangers’ and ‘Warnings’. It is observed that the most of places, sign board of ‘Switch ON’ and ‘Switch OFF’ are kept towards saving energy measures to the stakeholders. Electrical wires, switch boxes and stabilizers are properly covered without any damage which will cause any problems to the staff and student members. Few recommendations, in addition, can further improve the energy savings of the Organization. This may lead to the prosperous future in context of Energy Efficiency Campus and thus sustainable environment and community development to the stakeholders in coming years to come.



Closing Meet of the Audit

16. Acknowledgement

Nature Science Foundation, Coimbatore, Tamil Nadu, India is grateful to the Management Committee Members: Principal of Sri Krishna Arts and Science College, Coimbatore, Tamil Nadu for providing us the grateful opportunity Dr. S. Maragatham Director of SKASC for providing us able guidance through which our audit would not have been successful. We are also thankful Coordinators of Energy, who had extended full support in conducting the audit and making it a grand success.

17. References

- Asnani, J. and Bhawana, S. 2015. Study of awareness and habits among home makers during purchasing electrical household equipment. *International Journal of Applied Home Science* **2** (7&8): 201-206.
- Backlund, S. and Thollander, P. 2015. Impact after three years of the Swedish energy audit programme. *Energy*, **82**: 54-60.
- Bae, S.H. and Seol, I. 2006. An exploratory empirical investigation of environmental audit programs in S&P 500 companies. *Management Research News* **29** (9): 573-579.
- Buckman, A.H., Mayfield, M. and Beck, S.B.M. 2014. What is a smart building?. *Smart Sustainable Built Environment* **3** (2): 92-109.
- Cabrera, E., Pardo, M.A., Cobacho, R. and Cabrera, Jr, E. 2010. Energy audit of water networks. *Journal of Water Resources Planning and Management*. **136** (6): 669-677.
- Cardozo, N.H., da Silveira Barros, S.R., Quelhas, O.L.G., Filho, E.R.M. and Salles, W. 2019. Benchmarks analysis of the higher education institutions participants of the Green Metric World University Ranking. Springer, Universities and Sustainable Communities: Meeting the Goals of the Agenda 2030, World Sustainability Series. pp. 667-683.
- Choy, Er.A. and Karudan, R. 2016. Promoting campus sustainability: A conceptual framework for the assessment of campus sustainability. *Journal of Social Sciences and Humanities* **11** (2): 112-118.
- Fachrudin, H.T., Fachrudin, K.A. and Utami, W. 2019. Education activities to realize green campus. *Asian Social Science* **15** (8): 18-27.
- IGBC, 2021. Indian Green Building Council. <https://igbc.in/igbc/>
- Ingle, A., Moezzi, M., Lutzenhiser, L. and Diamond, R. 2014. Better home energy audit modelling: incorporating inhabitant behaviours. *Building Research & Information* **42** (4): 409-421.
- Lauder, A., Sari, R.F., Suwartha, N. and Tjahjono, G. 2015. Critical review of a global campus sustainability ranking: Green Metric. *Journal of Cleaner Production* **108**: 852–863.
- Leon-Fernandez, Y. and Dominguez-Vilches, E. 2015. Environmental management and sustainability in higher education: The case of Spanish Universities. *International Journal of Sustainability in Higher Education* **16**: 440-455.
- Mishraand, U. and Patel, S. 2016. Awareness regarding energy efficiency star labelling on household appliances amongst the consumers of Vadodara city. *International Journal of Applied Home Science* **3** (9&10): 330-338
- Padmini, E. 2007. *Biocharacterization Calculations and Biostatistics*. Books and Allied (P) Ltd, Kolkata, India.
- Peters, G.F. and Romi, A.M. 2014. Does the voluntary adoption of corporate governance mechanisms environmental risk disclosures? Evidence from greenhouse gas emission. *Journal of Business Ethics* **125** (4): 637-666.
- Pramanik, A.K. 2013. *Environmental Audit and Indian Scenario, Environmental Accounting and Reporting*. Deep and Deep Publications, New Delhi, India. p.312.
- Shriberg, M. 2002. Institutional assessment tools for sustainability in higher

- education: strengths, weaknesses, and implications for practice and theory. *International Journal of Sustainability in Higher Education* **3** (3): 254-270.
- Singh, M., Singh, G. and Singh, H. 2012. Energy Audit: A case study to reduce lighting cost. *Asian Journal of Computer Science and Information Technology* **2** (5): 119-122.
-

Certificates of
Nature Science Foundation,
Coimbatore, Tamil Nadu.

1. ISO Certificates
2. MSME Certificate
3. NGO Darpan NITI Aayog
4. 12A Certificate
5. 80G Certificate
6. 10AC Certificate

QUALITY MANAGEMENT SYSTEM

Certificate of Registration



This is to Certify That The Quality Management System of



NATURE SCIENCE FOUNDATION

LIG II, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641004, TAMILNADU, INDIA.

has been assessed and found to conform to the requirements of

ISO 9001:2015

for the following scope :

PROVIDING ENVIRONMENT, ENERGY, GREEN AND HYGIENE AUDITS
TO ACADEMIC INSTITUTIONS AND ORGANISATIONS
AS PER THE OWN CHECKLIST AND AWARDS TO
MERITORIOUS CANDIDATES.

Certificate No	20DQHY90	
Initial Registration Date	: 08/01/2021	Issuance Date : 08/01/2021
Date of Expiry*	: 07/01/2024	
1st Surve. Due	: 08/12/2021	2nd Surve. Due : 08/12/2022

DIRECTOR

ROHS Certification Pvt. Ltd.

408, Madhuban Building, 55, Nehru Place, New Delhi - 110 019, India

phone : +91.11.41525522 | e-mail : info@rohscertification.co.in | website : www.rohscertification.co.in


The Registration is not a Product Quality Certificate, *Subject to successful completion of surveillance audits, Visit for verification on www.rohscertification.co.in
Certificate is the property of ROHS and return when demanded



eiaCI
مركز الإمارات العالمي للاعتماد
Emirates International Accreditation Centre
035-CB-QMS


ENVIRONMENTAL MANAGEMENT SYSTEM

Certificate of Registration



ROHS

This is to Certify That The Environmental Management System of



NMF

NATURE SCIENCE FOUNDATION

LIG II, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641 004,
TAMILNADU, INDIA.


has been assessed and found to conform to the requirements of

ISO 14001:2015

for the following scope :


PROVIDING CONSULTANCY SERVICES FOR ENVIRONMENT, ENERGY, GREEN, HYGIENE, SOIL AND WATER, WASTE MANAGEMENT, BIOMEDICAL WASTE MANAGEMENT, E-WASTE MANAGEMENT, PLASTIC WASTE MANAGEMENT AND ACADEMIC AND ADMINISTRATIVE AUDITS TO EDUCATIONAL INSTITUTIONS AND INDUSTRIAL SECTORS AS PER THE OWN CHECKLISTS, START UP THE INTERNATIONAL ECO CLUB STUDENT'S CHAPTER, OFFERING LEAD AUDITOR COURSE ON ENERGY AND ENVIRONMENT, AWARDS TO MERITORIOUS CANDIDATES.

Certificate No	22DEJI67	
Initial Registration Date	: 21/05/2022	Issuance Date : 21/05/2022
Date of Expiry*	: 20/05/2025	
1st Surve. Due	: 21/04/2023	2nd Surve. Due : 21/04/2024




DIRECTOR
ROHS Certification Pvt. Ltd.

B-5, 1st Floor, Sector-2, Mohali, Gurgaon (Haryana) India - 122001
e-mail : info@rohs-certification.co.in | web@rohs-certification.co.in
The Registration is not a Product Quality Certificate. *Subject to successful completion of surveillance audits. Valid for registration as an environmental management system certification in the context of ISO14001 and other rules described.



IAF
REGISTRATION ASSOCIATION



eiaC
Environmental Institute of Accreditation and Certification
CB-EMS-035

UDYAM REGISTRATION NUMBER		UDYAM-TN-03-0073706				
NAME OF ENTERPRISE		M/S NATURE SCIENCE FOUNDATION				
TYPE OF ENTERPRISE *		MICRO				
MAJOR ACTIVITY		SERVICES				
SOCIAL CATEGORY OF ENTREPRENEUR		GENERAL				
NAME OF UNIT(S)		S.No. Name of Unit(s) 1 Green Campus, Energy and Environment Management Audits				
OFFICIAL ADDRESS OF ENTERPRISE		Flat/Door/Block No.	LIG-II,2609	Name of Premises/ Building	GANDHIMAA NAGAR	
		Village/Town	Gandhimaanagar S.O	Block	LIG-II	
		Road/Street/Lane	Peelamedu	City	Coimbatore South	
		State	TAMIL NADU	District	COIMBATORE , Pin 641004	
		Mobile	9566777255	Email:	chairmansmf@gmail.com	
DATE OF INCORPORATION / REGISTRATION OF ENTERPRISE		28/11/2017				
DATE OF COMMENCEMENT OF PRODUCTION/BUSINESS		12/03/2020				
NATIONAL INDUSTRY CLASSIFICATION CODE(S)		S.No.	NIC 2 Digit	NIC 4 Digit	NIC 5 Digit	Activity
		1	69 - Legal and accounting activities	6920 - Accounting, bookkeeping and auditing activities; tax consultancy	69201 - Accounting, bookkeeping and auditing activities	Services
		2	85 - Education	8542 - Cultural education	85420 - Cultural education	Services
		3	85 - Education	8549 - Other education n.e.c.	85499 - Other educational services n.e.c.	Services
DATE OF UDYAM REGISTRATION		26/02/2022				

* In case of graduation (upward/reverse) of status of an enterprise, the benefit of the Government Schemes will be availed as per the provisions of Notification No. S.O. 2119(E) dated 26.06.2020 issued by the Mo MSME.

Disclaimer: This is computer generated statement, no signature required. Printed from <https://udyamregistration.gov.in> & Date of printing:- 26/02/2022

For any assistance, you may contact:

1. District Industries Centre: COIMBATORE (TAMIL NADU)

2. MSME-DI: CHENNAI (TAMIL NADU)

Visit : www.msme.gov.in ; www.dcmsme.gov.in ; www.champions.gov.in

Follow us @minmsme & @msmechampions

BE A CHAMPION with the Ministry of MSME

The screenshot displays the NGO DARPAN website. At the top left, there are logos for the Government of India, NGO, and DARPAN. The text "NITI Aayog, Government of India" is on the top right. A navigation menu includes "Home", "About Us", "NGO Directory", "Search NGOs", "Report", "Guidelines", "Circulars", "Help", "Apply Grant", and "Blacklisted NGOs". A "Login/Register" link is on the right. The main banner features a group of people and the text "NGO DARPAN" and "In order to strengthen services of the portal, Government has decided to make PAN Number of VOs/NGOs mandatory." Below the banner, a light blue bar says "Please Update Your Profile". A teal bar says "Welcome, Nature Science Foundation". A light blue box at the bottom displays "Your Unique Id: TN/2018/0187711".

NGO DARPAN

NITI Aayog, Government of India

Home About Us NGO Directory Search NGOs Report Guidelines Circulars Help Apply Grant Blacklisted NGOs

Login/Register

NGO DARPAN

In order to strengthen services of the portal, Government has decided to make PAN Number of VOs/NGOs mandatory.

Please Update Your Profile

Welcome, Nature Science Foundation

Your Unique Id: TN/2018/0187711



PROCEEDINGS OF THE COMMISSIONER OF INCOMETAX (EXEMPTIONS),
III FLOOR, ANNEXE BLDG. NO.121, MAHATMA GANDHI SALAI, CHENNAI-34

Present : G.M.DOSS, I.R.S
Commissioner of Income Tax (Exemptions)

** URNo. AACTN7857J/05/18-19/T-1105

Dated:03/09/2018

Sub: Registration u/s. 12AA of the Income tax Act 1961 - in the case of

"Nature Science Foundation"
LIG-II, 2669, Gandhimaa Nagar, Peelamedu, Coimbatore – 641 004.

Ref : Application in form 10 A filed on 28/03/2018

ORDER UNDER SECTION 12AA OF THE INCOME TAX ACT 1961.

1. The above Trust/Society/Association/ Company/ others/, bearing PAN AACTN7857J was constituted by Trust Deed / Memorandum of Association dated 29/11/2017 registered with Sub-Registrar's Office/ Registrar of Societies/Registrar of Companies/others on 29/11/2017.
2. ~~The Trust Deed / Memorandum of Association has subsequently been amended / modified / altered by a Codicil / Supplementary Deed / Amendment Deed / Alteration to Memorandum of Association/others dated XX/XX duly registered on XXXX.~~
3. The above TRUST filed an application seeking Registration u/s 12 AA of the Income tax Act, 1961.
4. On going through the objects of the TRUST and its proposed activities as enumerated in the Trust Deed / Memorandum of Association, I am satisfied about the genuineness of the TRUST as on date.
5. The application has been entered at Sl.No.1105 maintained in this office. The above Trust is accordingly registered as a PUBLIC CHARITABLE TRUST u/s 12 AA of the Income Tax Act, 1961 with effect from 29/11/2017.
6. It is hereby clarified that the Registration so given to the Trust/Institution is not absolute. Subsequently, if it is found that the activities of the Trust/Institution are not genuine or are not being carried out in accordance with the objects and clauses of the Trust Deed / Memorandum of Association submitted at the time of registration or modified with the approval of the Commissioner of Income-tax (Exemptions), Chennai or there is a violation of the provisions of Section – 13, the Registration so granted shall be cancelled as provided u/s 12 AA (3) or 12AA(4) of the Income Tax Act. Further, this approval is also subject to the Trust/Society/Association/Company/ Others/ complying to the provisions of the proviso to sec 2(15) of the Income Tax Act 1961.
7. Granting of Registration u/s 12AA does not confer any automatic exemption of income from taxation. The Trust/Institution should conform to the parameters laid down in Sections 11, 12, 13 and 115 BBC of the I.T. Act, 1961, to claim exemption of its income on year to year basis before the Assessing Officer.

** This Unique Registration No. URNo. AACTN7857J/05/18-19/T-1105 Should be mentioned in all your future correspondence.




Sd/-
(G.M.DOSS, I.R.S)
Commissioner of Income-tax(Exemptions), Chennai.

Copy to:

1. The Assessee.
2. The ACIT(Exemptions), Coimbatore Circle.
3. Office Copy.

//CERTIFIED TRUE COPY//


(N SRINIVASA RAO)
Asst. Commissioner of Income-tax (H.Qs)(Exemptions),
Chennai.



GOVERNMENT OF INDIA
INCOMETAX DEPARTMENT
OFFICE OF THE COMMISSIONER OF INCOME TAX (EXEMPTIONS)
Aayakar Bhawan, Annexe III Floor, 121 M.G. Road, Chennai 600 034

URN No. AACTN7857J/05/18-19/T-1105/80G

Date: 10.04.2019

Name of the Trust-/Society /Company/Institution : NATURE SCIENCE FOUNDATION
Address : LIG II 2669, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641 004
PAN : AACTN7857J
Date of Application : 12.11.2018

Received
Raj S. Ponnur
17/07/19
17/07/2019

APPROVAL UNDER SECTION 80G(5)(vi) OF THE INCOME TAX ACT, 1961

The aforesaid Trust-/Society/Company/Institution has been registered u/s.12AA of the Income Tax Act with effect from 29.11.2017 vide AACTN7857J/05/18-19/T-1105 dated 03.09.2018. It is certified that donation made to **NATURE SCIENCE FOUNDATION at LIG II 2669, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641 004** shall qualify for deduction u/s 80G(5)(vi) of the Income Tax Act, 1961, subject to the fulfillment of conditions laid down in clauses [i] to [v] of sub-section (5) of section 80G of the I.T Act, 1961.

- This approval shall be valid in perpetuity with effect from **A.Y. 2019-20** unless specifically withdrawn. **The details and validity of the certificate is available @ office.incometaxindia.gov.in**
- The Return of Income along with the Income & Expenditure Account, Receipts and Payments Account and Balance Sheet should be submitted annually to the Assessing Officer having jurisdiction over the case.
- No change in the Trust Deed/Memorandum of Association shall be effected without the prior approval of the undersigned i.e. **Commissioner of Income Tax (Exemptions), Chennai**.
- Every receipt issued to a donor shall bear the **Unique Registration Number** i.e. URN No. **AACTN7857J/05/18-19/T-1105/80G** and date of this order i.e. **10.04.2019**.
- Under the provisions of section 80G(5)(i)(a), the institution/fund registered u/s.12A, u/s.12AA(1)(b) or approved u/s.10(23C), 10(23C)(vi)(via), etc., shall have to maintain separate books of accounts in respect of any business activity carried on and shall intimate this office within one month about commencement of such activity.



Sd/-
(G.M.DOSS, I.R.5)
Commissioner of Income Tax (Exemptions)
Chennai.

Copy to:

- The applicant
- Guard File
- The DCIT(Exemptions) Coimbatore Circle.

//Certified True Copy//

(N. SRINIVASA RAO)
Assistant Commissioner of Income-tax (H.qrs)
(Exemptions), Chennai.

FORM NO. 10AC

(See rule 17A/11AA/2C)

Order for registration

1	PAN	AACTN7857J
2	Name	NATURE SCIENCE FOUNDATION
2a	Address	
	Flat/Door/Building	LIG-II, 2669
	Name of premises/Building/Village	GANDHIMAA NAGAR
	Road/Street/Post Office	Coimbatore South
	Area/Locality	COIMBATORE
	Town/City/District	Gandhimaanagar S.O
	State	Tamil Nadu
	Country	INDIA
	Pin Code/Zip Code	641004
3	Document Identification Number	AACTN7857JE2021501
4	Application Number	739995830271021
5	Unique Registration Number	AACTN7857JE20215
6	Section/sub-section/clause/sub-clause/proviso in which registration is being granted	01-Sub clause (i) of clause (ac) of sub -section (1) of section 12A
7	Date of registration	03-11-2021
8	Assessment year or years for which the trust or institution is registered	From AY 2022-23 to AY 2026-2027
9	Order for registration:	
	a. After considering the application of the applicant and the material available on record, the applicant is hereby granted registration with effect from the assessment year mentioned at serial no 8 above subject to the conditions mentioned in row number 10.	
	b. The taxability, or otherwise, of the income of the applicant would be separately considered as per the provisions of the Income Tax Act, 1961.	
	c. This order is liable to be withdrawn by the prescribed authority if it is subsequently found that the activities of the applicant are not genuine or if they are not carried out in accordance with all or any of the conditions subject to which it is granted, if it is found that the applicant has obtained the registration by fraud or misrepresentation of facts or it is found that the assessee has violated any condition prescribed in the Income Tax Act, 1961.	
10	Conditions subject to which registration is being granted	
	The registration is granted subject to the following conditions:-	

o. This certificate cannot be used as a basis for claiming non-deduction of tax at source in respect of investments etc. relating to the Trust/ Institution.	
p. All the Public Money so received including for Corpus or any contribution shall be routed through a Bank Account whose number shall be communicated to Office of the Jurisdictional Commissioner of Income Tax.	
q. The applicant shall comply with the provisions of the Income Tax Act, 1961 read with the Income Tax Rules, 1962.	
r. The registration and the Unique registration number has been instantly granted and if, at any point of time, it is noticed that form for registration has not been duly filled in by not providing, fully or partly, or by providing false or incorrect information or documents required to be provided under sub-rule (1) or (2) of rule 17A or by not complying with the requirements of sub- rule (3) or (4) of the said rule, the registration and Unique Registration Number (URN), shall be cancelled and the registration and URN shall be deemed to have never been granted or issued.	
Name and Designation of the Registration Granting Authority	Principal Commissioner of Income Tax/ Commissioner of Income Tax (Digitally signed)



Certificates of Energy Auditors

1. ISO Environment Management System (14001:2015) of Mrs. S. Rajalakshmi, Founder & Chairman of NSF.
2. Indian Green Building Council (IGBC AP) Accredited Professional of Dr. B. Mythili Gnanamangai, Vice-Chairman of NSF.
3. Associated Chambers of Commerce and Industry of India (ASSOCHAM), of Dr. B. Mythili Gnanamangai, and Er. Ashutosh Kumar Srivastava, Board of Directors (North Zone) of NSF.
4. Bureau of Energy Efficiency (BEE), LEED AP and GRIHA Certificates of Er. D. Dinesh Kumar, Energy Auditor of NSF.



Certificate of Training

TNV hereby certifies that

S. Rajalakshmi

has successfully completed the 5 days

Auditor / Lead Auditor Training Course which meets the training requirements of the Exemplar Global and has been declared as competent in the following competency units

- EM: Environmental Management System
- AU: Management Systems Auditing
- TL: Leading Management Systems Audit Teams

ISO 14001:2015

Issue Date: 17th Jun. 2021

Training Date : 20th to 24th May. 2021

Certificate Number : 2106170721010105

Authorised Signatory
(Pragya Singh)

This course is certified by Exemplar Global vide registration number TN006669

Note: The course conforms to the principles and practice of ISO 14001:2015 Management Systems for compliance with standards. This certificate remains in force until 2023. This certificate is recognized by Exemplar Global. For any information or queries, please write to: Mail: info@isomindia.com







BUREAU OF ENERGY EFFICIENCY



Examination Registration No. : **EA-14056** Serial Number **9176**

Certificate Registration No. : **9176**

Certificate For Certified Energy Manager

This is to certify that Mr./Mrs./Ms. **Dinesh Kumar D**
 Son/Daughter of Mr./Mrs. **R M Dhanasekaran** who has passed the National
 Examination for certification of energy manager held in the month of **October 2011** is
 qualified as certified energy manager subject to the provisions of Bureau of Energy Efficiency
 (Certification Procedures for Energy Managers) Regulations, 2010.

This certificate shall be valid for five years with effect from the date of award of this certificate
 and shall be renewable subject to attending the prescribed refresher training course once in every
 five years.

His /Her name has been entered in the Register of certified energy manager
 at Serial Number **9176** being maintained by the Bureau of Energy Efficiency under the
 aforesaid regulations.

Mr./Mrs./Ms. **Dinesh Kumar D** is deemed to have qualified
 for appointment or designation as energy manager under clause (f) of Section 14 of the Energy
 Conservation Act, 2001 (Act No.52 of 2001).

Given under the seal of the Bureau of Energy Efficiency, this **7th** day
 of **February, 2013**

Secretary
 Bureau of Energy Efficiency
 New Delhi

Digitally Signed: RAKESH KUMAR RAI

Sun Mar 01 10:58:55 IST 2020

Secretary, BEE New Delhi

Dates of attending the refresher course	Secretary's Signature	Dates of attending the refresher course	Secretary's Signature
22.12.2019			



