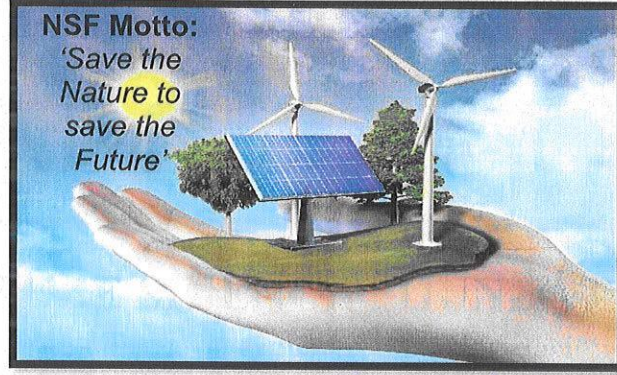


# TECHNICAL REPORT OF ENERGY AUDIT



*Submitted to*

**KRUPANIDHI COLLEGE OF PHARMACY  
BANGALORE, KARNATAKA**

*Date of Audit: 10.11.2021*

*Submitted by*



## NATURE SCIENCE FOUNDATION

*(A Unique Research and Development Centre for Society Improvement)*

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## 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	14
11.	Observations of the Energy Audit	16
11.1.	Facilities visited during the Energy Audit	16
11.2.	Systems Studied during the Energy Audit	17
11.3.	Energy Consumption and Cost Profile	18
11.4.	Power supply Equipment and Major Load	18
11.5.	Quantitative and Qualitative Measurement	24
11.6.	Measurement of Carbon dioxide level in the Campus	26
11.7.	Ways to reduce Carbon Footprint	27
11.8	Light Intensity Measurement	28
12.	Best Practices followed in the Organization	30
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	32
16.	Acknowledgement	33
17.	References	33
18.	Certificates of Nature Science Foundation	35
19.	Certificates of Energy Auditors	45


  
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## 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).

  
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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.

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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 CO<sub>2</sub> 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

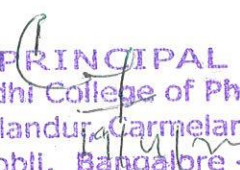
An energy audit is a useful tool for developing and implementing comprehensive energy management plans of an organization. The aim of an energy audit is to identify the energy efficiency, conservation, and savings opportunities at the premises of the audit sites in a systematic manner. The audit process 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.

  
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#### 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.

  
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- **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 CO<sub>2</sub> 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.

  
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## 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.

  
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- 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.

  
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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

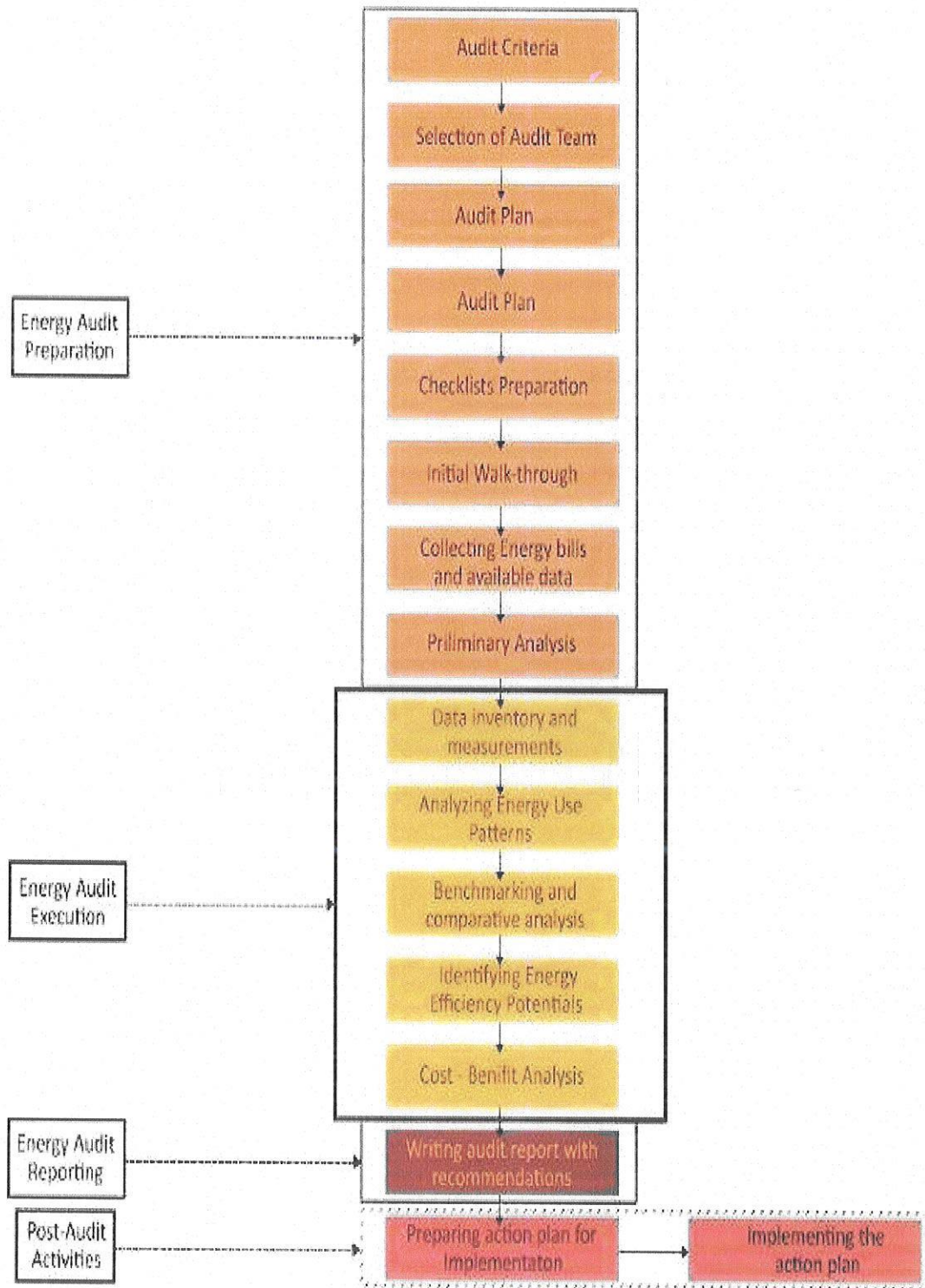
#### **7. Carbon footprint by measuring Carbon dioxide level in the Campus**

The level of Carbon dioxide is measured in different places across the Organization campus using a portable CO<sub>2</sub> Analyzer (Non dispersive infra-red meter). In addition, CO<sub>2</sub> meter is also displayed the readings of atmospheric temperature, relative humidity, and dew point in the places, where the level CO<sub>2</sub> is measured. The meter started measurements of CO<sub>2</sub> 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 CO<sub>2</sub> sensor to respond and 30 minutes for flexibility in relative humidity. The meter features an audible alarm to give warnings when CO<sub>2</sub> concentration exceeds the set limit. It emits beeps (Abt.80Db) when CO<sub>2</sub> level goes over the set value and stops when any key (except SET) is pressed, or the readings fall below the set values.

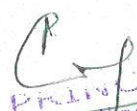
The Carbon footprint per year is calculated ([www.carbonfootprint.com](http://www.carbonfootprint.com)) based on electricity usage per year in which CO<sub>2</sub>e emission from electricity and the sum of transportation per year in terms of number of the shuttle buses service operated by the Organization 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 CO<sub>2</sub>e 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 (CH<sub>4</sub>) 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.

  
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**Flow chart of Energy Audit Methodology**

  
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**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 at Krupanidhi College Of Pharmacy, Bangalore, KA by Nature Science Foundation, Coimbatore, Tamilnadu.**

  
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### 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.

  
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### 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 – CO<sub>2</sub>, O<sub>2</sub>, CO, SO<sub>2</sub>, NO<sub>2</sub>, 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 Krupanidhi College of Pharmacy

Krupanidhi College is a Christian institution managed by Krupanidhi Educational Trust. Krupanidhi is an educational dream that started out as a small structure in Koramangala in Bangalore some 30 years ago and is a huge, renowned, 11-acre campus today. The college was founded by three eminent educationists, Dr. Prof. Suresh Nagpal (M.Pharma, Ph.D), Mrs. Geetha Nagpal (MBA), and philanthropist Sunil Samson Dhamanigi (M.Pharma), making them the pioneers in the field of pharmacy education. It is also the first college to start Physiotherapy in Bangalore.

Their main goal is to holistically nurture their students by providing them with top quality education using cutting edge, effective teaching methods in an affable and comfortable environment. Today, Krupanidhi has a pharmacy college, a Physiotherapy College, a Nursing College, a business school, a degree college, a pre-university college, a residential PU college & an International School under its wings. It has three campuses and close to 6,000 students from more than 20 countries studying across the various colleges, making it a multi-cultural, diverse educational institute.


#### Vision

Krupanidhi's Vision encapsulates what the visionaries have in mind for the students – We don't just polish stones; we carve them & make monuments out of them. Understanding the fact that today's world is extremely competitive. The teaching practices at Krupanidhi go beyond classroom lectures and are well-rounded to include case studies, industrial visits and even internships, which allow the students to get a taste of the industry.

**“A world filled with our alumni working hand in hand towards building a nation which is a force to reckon with”.**

#### Mission

- Krupanidhi's Mission is to ensure the all-round development of the students, which is why the faculty is hand-picked.

  
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- They give attention to every student, thereby ensuring that even the average student does well. This enables the students to establish a great relationship with their teachers, bettering their bonds as well as the college environment.
- To ensure that students from all backgrounds and scholastic aptitudes excel and perform to their best.


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

NSF is the ISO 9001:2015, 14001:2015, 45001:2018 & 50001:2018 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


  
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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.

#### 10. Audit Details

<b>Date / Day of Audit</b>	: 10.11.2021
<b>Venue of Audit</b>	: Krupanidhi College of Pharmacy, Bangalore - 560 035, Karnataka.
<b>Audited by</b>	: Nature Science Foundation, Coimbatore, Tamil Nadu, India.
<b>Audit type</b>	: Energy Audit
<b>Name of Auditing Chairman</b>	: Dr. S. Rajalakshmi Jayaseelan, Chairman of NSF & ISO QMS, EMS, OHSMS, EnMS Auditor.
<b>Name of IGBC AP Auditor</b>	: Dr. B. Mythili Gnanamangai, Vice Chairman of NSF, Indian Green Building Council Accredited Professional.
<b>Name of Subject Expert-I</b>	: Mr. Shri Sudheer Kumar Peteti Lead auditor, NSF
<b>Name of Subject Expert-II</b>	: Mr. Ariga Sarath Kumar Lead Auditor, NSF
<b>Name of Subject Expert-III</b>	: Er. D. Dinesh Kumar, Certified Lead Auditor, IGBC, ASSOCHEM, GRIHA & LEED
<b>Name of the Energy Auditor</b>	: Dr. N. Balasubramanian, Certified Bureau of Energy Efficiency Auditors of NSF.
<b>Name of the Eco Auditor</b>	: Er. S. Srinivash, Tamil Nadu Fire and Rescue Services, Coimbatore.
<b>Name of Eco &amp; Green Officer</b>	: Ms. S. Kavi Malar, Environment, Energy & Green Council Programme Officer, NSF.

  
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<b>Audit</b>	<b>Certified Auditors</b>	<b>Certified Auditors</b>
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"> <li>• Dr. S. Rajalakshmi</li> <li>• Dr. R. Mary Josephine</li> <li>• Dr. B. Mythili Gnanamangai</li> <li>• Er. N. Shanmugapriyan</li> </ul>
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"> <li>• Er. D. Dinesh Kumar</li> <li>• Er. N. Shanmugapriyan</li> <li>• Dr. N. Balasubramaniam</li> <li>• Dr. P. Thirumoorthi</li> <li>• Dr. G. Muruganath</li> </ul>
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"> <li>• Dr. S. Rajalakshmi</li> <li>• Dr. A. Geetha Karthi</li> <li>• Dr. R. Mary Josephine</li> <li>• Dr. B. Mythili Gnanamangai</li> <li>• Er. N. Shanmugapriyan</li> </ul>
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"> <li>• Mrs. Gaanaappriya Mohan</li> <li>• Dr. R. Sudhakaran</li> <li>• Dr. N. Saranya</li> </ul>
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"> <li>• Mrs. Gaanaappriya Mohan</li> <li>• Dr. R. Sudhakaran</li> <li>• Er. N. Shanmugapriyan</li> </ul>
Academic & Administrative Audits	Academic & Administrative Audits as per the NAAC Criteria	<ul style="list-style-type: none"> <li>• Dr. B. Anirudhan</li> <li>• Dr. B. Shreeram</li> </ul>
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"> <li>• Dr. S. Rajalakshmi</li> <li>• Dr. A. Geetha Karthi</li> <li>• Mrs. Gaanaappriya Mohan</li> <li>• Dr. R. Mary Josephine</li> </ul>



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## 11. Observations of the Energy Audit

### 11.1. Facilities visited during the Energy Audit

Date	Section where Energy Audit is conducted
10.11.2021	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.

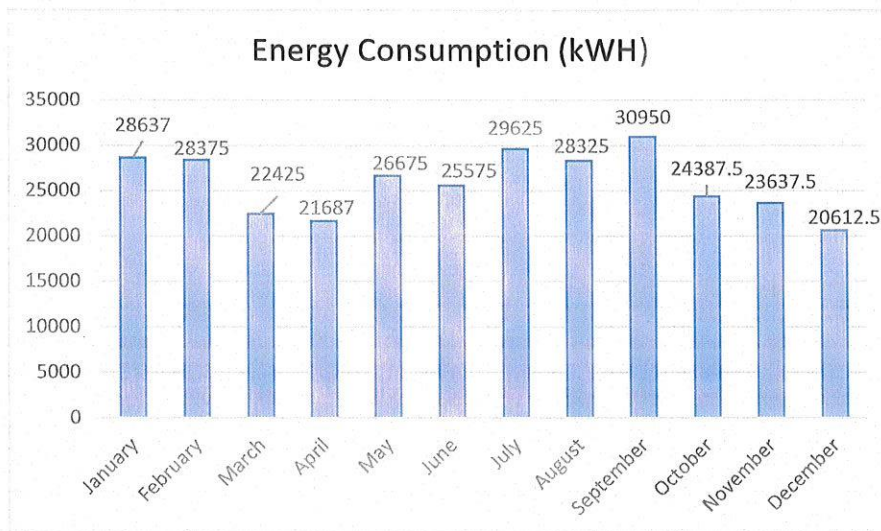
### 11.2. Systems Studied during the Energy Audit

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.

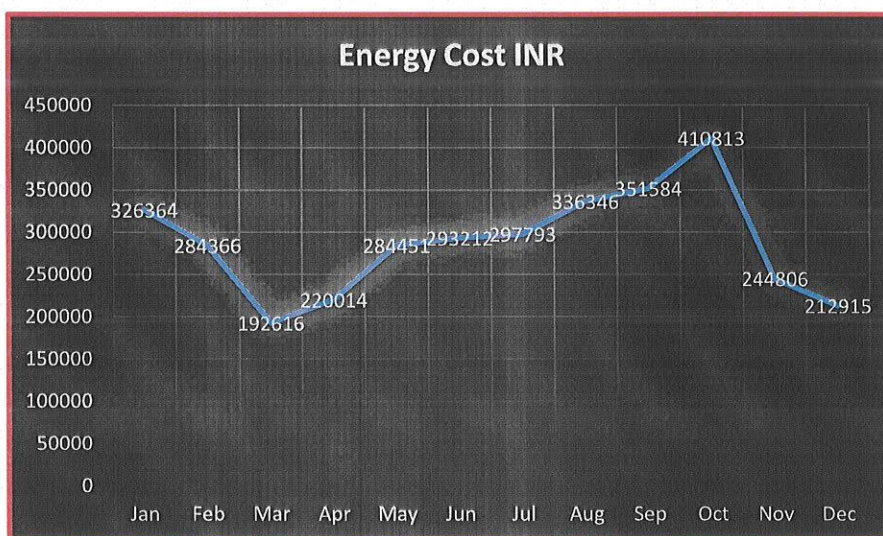
### 11.3. Energy Consumption and Cost Profile

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


  
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**Energy Consumption profile - Krupanidhi College of Pharmacy, Bangalore, KA**



**Energy cost profile - Krupanidhi College of Pharmacy, Bangalore, KA**


  
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#### 11.4. Power supply Equipment and Major Loads

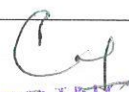
**Table 1. Major Equipment related to Electrical energy utilization at Krupanidhi College Of Pharmacy, Bangalore, KA**

S.No.	Major and Minor Equipment, Instrument and Machineries Utility on day-to-day basis	Rating / Capacity	Quantity (Nos)
1.	LED Tube Lights(18 W LED TUBE LIGHT (4 Feet)	18W	847
	8 W LED TUBE LIGHT (2 Feet)	-	-
	18 W LED Surface Mounting	-	-
	10 W LED Fall Ceiling	-	-
	20W LED T/L	-	-
2.	Fluorescent Lamps(40 W T/L)	10W	512
	20 W T/L 1X4	-	-
3.	Halogen Lamps	-	-
4.	Sodium Vapour Lamp	-	-
5.	CFL 18 W	-	-
	CFL 36 W	-	-
6.	LED Focusing Light 200 W		
	LED Focusing Light 100 W	100W	28
	LED Focusing Light 50 W	50W	18
7.	Tube Lights		
8.	Solar Water Heater	6KW	4
9.	Solar Panel	50W	20
10.	UPS	2KVA	1
	UPS	7KVA	1
	UPS	600KVA	320
11.	LCD Projectors		56
12.	Refrigerators	260 LTRS & 24 LTRS	4 & 4
13.	Varanda Light load	-	-
14.	Varanda LED Light Load	-	-
15.	Solar Street Lights	-	-
	Street Lights LED 100 W	-	-
	Street Lights LED 80 W	-	-
16.	Lift	-	-
17.	Water Doctors / Hot and Cold	-	-
18.	RO Water Plant	-	-
	Water Purification System	-	8
19.	AC ( Split, Window and Centralized AC)	-	34
	Standing AC	-	-
	Cassette AC	-	-
	Window AC	-	-


	Window AC	-	-
	Window AC	-	-
	Split AC	-	-
	Split AC	-	-
	Split AC	-	-
20.	Stabilizers	-	-
21.	Inverters & Converters	-	-
22.	Air Cooler	-	-
23.	Ceiling Fans	-	449
24.	Pedestal Fans	-	-
25.	Table Fans	-	-
26.	wall moun -fans	-	-
27.	Generators 20 KVA	-	-
	Generators 50 KVA	-	-
	Generators 62.5 KVA	-	-
	Generators 120 KVA	-	-
	Generators 250 KVA	250 KVA	1
	Generators 320 KVA	-	-
	Generators 600 KVA	-	-
28.	Pumps	-	-
		-	-
		-	-
		-	-
		-	-
		-	-
29.	Motors	-	-
		-	-
		-	-
		-	-
30.	Compressors	-	-
		-	-
31.	Vacuum Cleaner	2 HP	5
32.	Biogas Plant		
33.	Drip & Sprinklers Irrigation	5 HP	5
34.	Ventilators		
35.	Exhaust Fans	4 HP	28
		Small	60
36.	Insect Trap		
37.	Automatic Lights		
38.	Internet Connectivity	100MBPS	2
39.	Podium containing Mike		4
	Speakers 150 W		42
	Speakers 100 W		
	Speakers 40 W		
	Amplifiers 400 W.		6
	Amplifiers 250 W		

  
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	Amplifiers 200 W		
	Radio		
	Camera		304
	Sensors		240
40.	Computers		
	Laptops		
	iPad		
	Dot matrix Printer		
	Laser printers		36
	Xerox Machines		5
	Scanners		6
	Server		
	Inverter with UPS 20 KVA	-	-
	Inverter with UPS 30 KVA	-	-
	Inverter with UPS 40 KVA	-	-
	Inverter with UPS 120 KVA	-	-
41.	<b>Equipment, Instruments and Machineries related to Life Sciences and Biological Sciences including Biotechnology, Nanotechnology, Food Technology etc.</b> Electronic Balances	-	-
	pH Meter	-	-
	Hot-air-Oven	-	-
	Microwave Oven	-	-
	Laminar Air Flow	-	-
	Autoclave	-	-
	Microscopes	-	-
42.	<b>Chemical Sciences and Engineering Equipment / Machines-</b> Distillation Units	-	-
	Fluorimeter	-	-
	Venturimeter	-	-
	Orifice meter	-	-
	Nephelometer	-	-
	Membrane Filtration Apparatus	-	-
	Sieve set machine	-	-
	Jar test apparatus	-	-
	<b>Electrical, Electronics and Communication Engineering Equipment / Machines</b> DC Shunt motor	-	-
	DC Series motor	-	-
	DC Compound motor	-	-
	DC Shunt motor	-	-
	DC Compound generator	-	-

  
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43.	DC series generator	-	-
	Single phase & Three phase transformers	-	-
	Single phase & Three phase auto transformers	-	-
	Loading rheostat	-	-
	single phase&Threephase	-	-
	Inductive&Capacitive load	-	-
	Power electronic trainer kits	-	-
	Three phase squirrel cage induction motor	-	-
	Single phase & Three phase 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	-	-
	DSO	-	-
	Microprocessor trainer kits	-	-
	Microcontroller trainer kits	-	-
	Audio trainer kits	-	-
	Digital electronics trainer kits	-	-
	Flip-flops	-	-
	Counters	-	-
	Half adder	-	-
	Full adder circuits	-	-
44.	<b>Mechanical Engineering Equipment/Machines</b>	-	-
	Lathe machine,	-	-
	Milling machine	-	-
	Drilling machine	-	-
	Slotting machine	-	-
	Shaping machine	-	-
	Cylindrical	-	-
	Grinding	-	-
	Coordinate Measuring	-	-
	Universal testing devices	-	-
	Thermal Conductor	-	-
	Air Compressor	-	-
	Single Cylinder 4 Stroke Diesel Engine	-	-
	CNC Turning Centre	-	-
	Kaplan turbine	-	-
	Pelton wheel turbine	-	-
	Francis turbine	-	-
	Venturimeter	-	-
	Orifice meter	-	-
	Nephelometer	-	-
CAD & CAM machines	-	-	
Tensile strength apparatus	-	-	

  
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	Younggus modules apparatus	-	-
	XRD machines	-	-
46.	<b>Civil Engineering Equipment / Machines</b>	-	-
	Compressing testing machine	-	-
	Universal testing machine	-	-
	Loading Frame, Flow Cytometer	-	-
	Total Station	-	-
	Theodolites	-	-
	Flexure testing machine	-	-
	Sieve set	-	-
	Slump cone apparatus	-	-
	Compaction factor apparatus	-	-
	Torsion testing & Izod impact testing machines	-	-
	Hardness testing machine	-	-
	Beam deflection test apparatus	-	-
	Centrifugal Pump	-	-
	Gear Pump	-	-
	Submersible pump	-	-
	Reciprocating Pump	-	-
	Pelton Wheel turbine	-	-
	Francis turbines / Kaplan turbine	-	-
	Conductivity meter	-	-
	Jar test apparatus	-	-
	BOD incubator	-	-
	COD digester	-	-
	Direct shear apparatus	-	-
	Triaxial shear apparatus	-	-
	Hydrometer	-	-
	Relative Density apparatus	-	-
	Vee Bee Consistometer	-	-
CBR Apparatus	-	-	
Turbidity meter	-	-	

**Table 2. Annual Energy Consumption of Fuels**

S.No	Month	Units Consumed (kWh)	Diesel Consumption (Liters)	Petrol Consumption (Liters)	LPG Consumption (kg)
1	January	-	2000	NIL	-
2	February	-	200		-
3	March	-	400		-
4	April	-	370		-
5	May	-	200		-

  
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6	June	-	402		-
7	July	-	400		-
8	August	-	200		-
9	September	-	200		-
10	October	-	400		-
11	November	-	210		-
12	December	-	390		-

**Table 3. Energy Consumption and Cost Profile**

SL. No	Months	Cost in Rs.	Rating / Capacity units in kWh
1.	January 2021	326364	28637
2.	February 2021	284366	28375
3.	March 2021	192616	22425
4.	April 2021	220014	21687
5.	May 2021	284451	26675
6.	June 2021	293212	25575
7.	July 2021	297793	29625
8.	August 2021	336346	28325
9.	September 2021	351584	30950
10.	October 2021	410813	24387.5
11.	November 2021	244806	23637.5
12.	December 2021	212915	20612.5

The sum of electricity usage per year.

The CO<sub>2</sub> emission from electricity

= (electricity usage per year in kWh/1000) x 0.84

= (320911.5/1000) x 0.84

=269.57 MT

**Table 4. Transportation Facilities available in the campus**

Sl. No	Type of Vehicle	Fuel Used	No. of Vehicles	Non Pollution Certified (Y/N)
1	Bus	Diesel	15	Yes

*Cy*  
19/11/20

**Table 5. 11.5 Quantitative and Qualitative Measurement at KCP, Bangalore, KA**


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 incharge 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 CFL / LED	✓		
	b. Number of Uninterruptible power supply (UPS) and Power generators for power back-up to alternative current supply facility in each building	✓		
	c. Number of solar panels, solar lights, solar water heaters, electric water heater installed	✓		
	d. Automatic sprinkler system used for irrigation purpose	✓		



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Chikkabellandur, Carmelaram Post,  
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	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, IoT 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*		✓	

  
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22.	Total electricity usage divided by total campus' population (kWh per person)			NA
23.	The ratio of renewable energy production divided by total energy usage per year			NA
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		✓	

### 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 CO<sub>2</sub> Analyzer, the level of carbon dioxide was measured in different places Krupanidhi Group of Institutions, Bangalore,KA. The observation showed that the concentration of CO<sub>2</sub> in the atmosphere is found to be within permissible limits and which did not exceed the critical limit of CO<sub>2</sub>. 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 CO<sub>2</sub> 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 CO<sub>2</sub> Concentration in KCP, Bangalore, KA.**

S.No.	Different locations of the Organization's campus	Carbon dioxide level (ppm)	Remarks
1.	Canteen	430	Within Permissible Limits
2.	Library	452	Within Permissible Limits
3.	Class Room	592	Within Permissible Limits
4.	Open Place	425	Within Permissible Limits

### Reference of Set values of CO<sub>2</sub> level

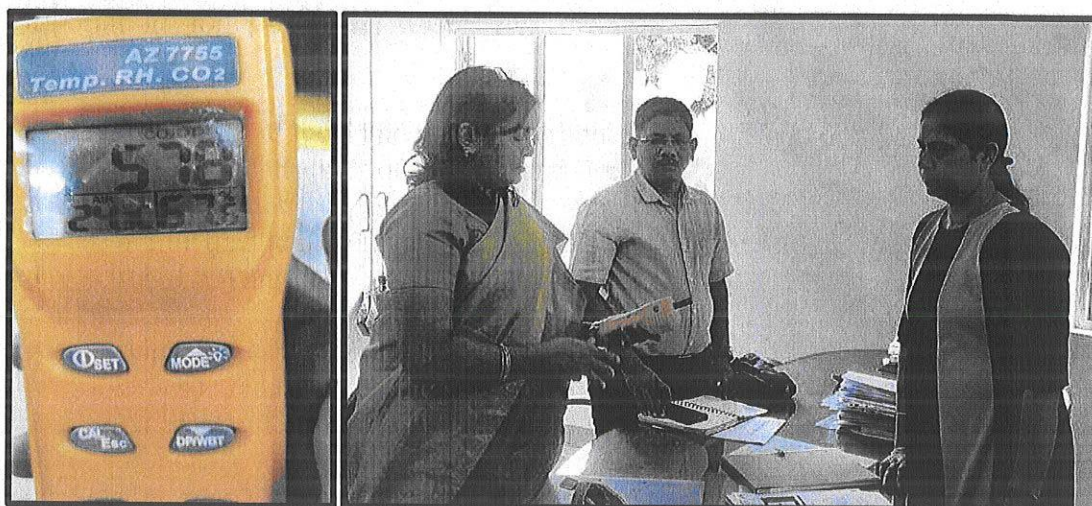
*As per ASSRAE 62 2019 standards 700 PPM for indoor and 1000 PPM form outdoor is the permissible limits*

  
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### Calculation of Carbon Footprint at KCP, Bangalore, Karnataka

The Carbon footprint calculation can be conducted based on the stage of calculation as stated in [www.carbonfootprint.com](http://www.carbonfootprint.com), which is the sum of electricity usage per year.

$$\begin{aligned} &\text{The CO}_2 \text{ emission from electricity} \\ &= (\text{electricity usage per year in kWh}/1000) \times 0.84 \\ &= (320911.5/1000) \times 0.84 \\ &= 269.57 \text{ MT per year} \end{aligned}$$



Measurement of CO<sub>2</sub> Level at different places in KCP, Bangalore, KA

#### 11.7. Ways to reduce Carbon Footprint

Evaluating and understanding the CO<sub>2</sub> 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

  
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- 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.

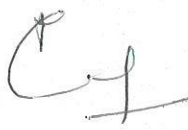
### 11.8. Light Intensity Measurement

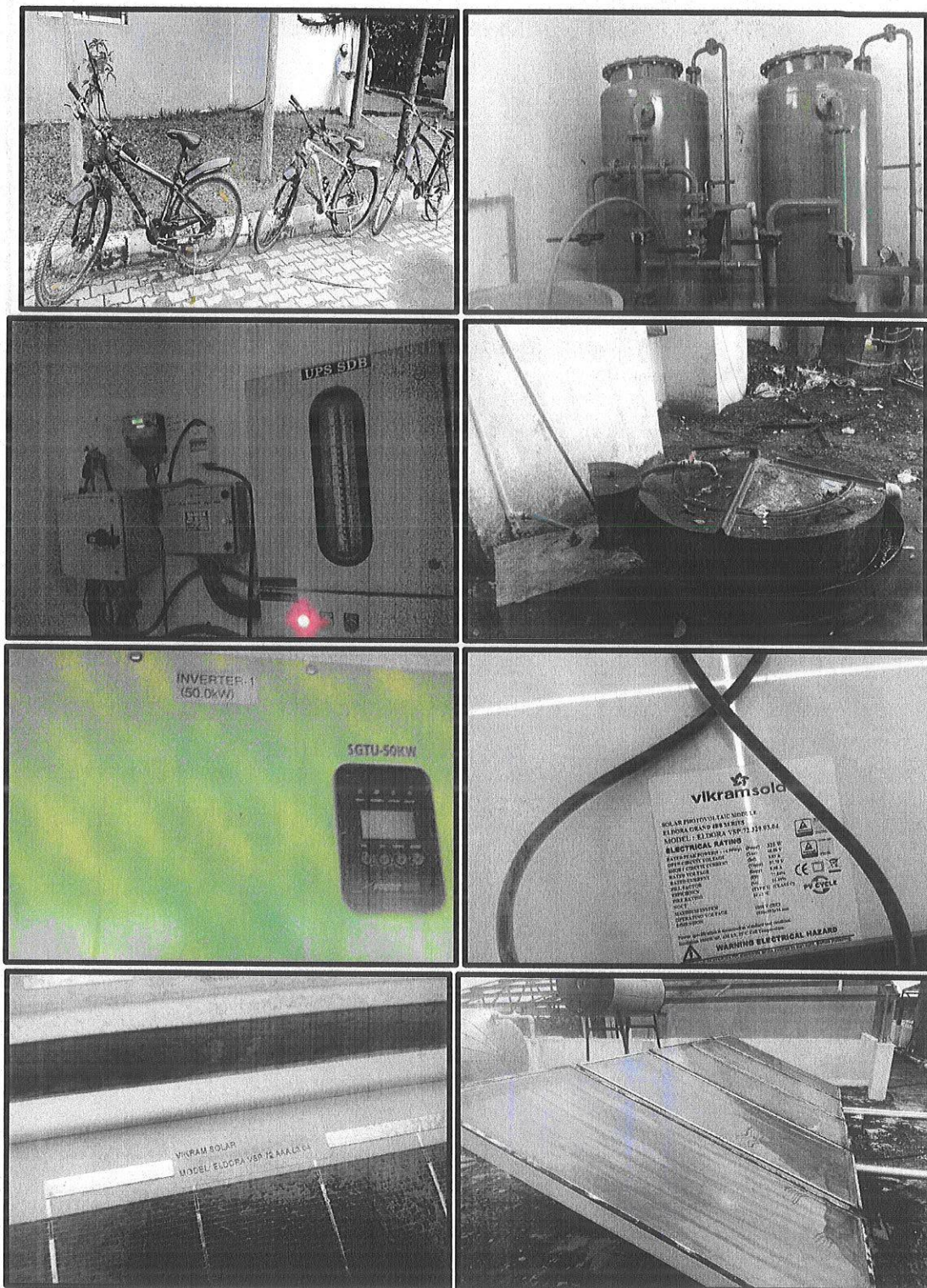
Light intensity or light output is used to measure whether a particular light source provides enough light for an application needed. There is a well-established light level recommendation for a wide range of applications in lighting industry and also for the type of space. Understanding the light intensity 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

**Table 7. Light Intensity Measured at various locations KCP, Bangalore, KA.**

Sl.No	Locations	Light Intensity (Lux)	Recommended Level(as perNBC 2016) (Lux)
1.	Canteen	334-475	200 – 500
2.	Library	211-345	150 – 300
3.	Computer Lab	256-425	200 – 500
4.	Open Place	399-456	200– 500

  
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**Best Practices followed at Krupanidhi College of Pharmacy,  
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**12. Best Practices being followed in the KCP, Bangalore, KA**

- Lux level are merely average at all places
- No Artificial lights in the corridors.
- UPS 2\* rated windows A/C with given automated switches.
- In classrooms 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.
- Installed roof top solar power plant.
- Power factor is maintained near to unity with APFC.
- Replaced old generation computers and TVs with LED monitors.
- Usage energy efficient light-emitting diode (LED) bulbs instead of incandescent and CFL bulbs.
- 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.
- Electric bicycles were introduced by students.
- 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.
- Central Workshop was given with enough daylight without any artificial light.



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### 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
- In parking areas the charging stations for bicycles and bikes can be provided
- 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 in each building to be implemented.
- Albido Painting can be recommended at the roof top.
- Research projects and Students project deals with Renewable energy and energy conservation activities can be encouraged.

### 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

  
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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 Krupanidhi Group of Institutions, Bangalore, Karnataka 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.

#### 16. Acknowledgement

Nature Science Foundation, Coimbatore, Tamil Nadu, India is grateful to the Management Committee Members: Principal Krupanidhi Group of Institutions, Bangalore, Karnataka for providing us the grateful opportunity to conduct audit in their campus. We are grateful to NAAC Director & IQAC Coordinator 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

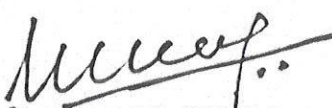
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Partha Bagchi  
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Mobile	9566177255	Email:	chabramanuf@gmail.com																				
DATE OF INCORPORATION / REGISTRATION OF ENTERPRISE		28/11/2017																					
DATE OF COMMENCEMENT OF PRODUCTION/BUSINESS		12/03/2020																					
NATIONAL INDUSTRY CLASSIFICATION CODE(S)		<table border="1"> <thead> <tr> <th>S.No.</th> <th>NIC 2 Digit</th> <th>NIC 4 Digit</th> <th>NIC 5 Digit</th> <th>Activity</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>69 - Legal and accounting activities</td> <td>6920 - Accounting, bookkeeping and auditing activities; tax consultancy</td> <td>69201 - Accounting, bookkeeping and auditing activities</td> <td>Services</td> </tr> <tr> <td>2</td> <td>85 - Education</td> <td>8542 - Cultural education</td> <td>85420 - Cultural education</td> <td>Services</td> </tr> <tr> <td>3</td> <td>85 - Education</td> <td>8549 - Other education n.e.c.</td> <td>85499 - Other educational services n.e.c.</td> <td>Services</td> </tr> </tbody> </table>		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
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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 provision of Notification No. S.O. 2119(E) dated 26.06.2020 issued by the Mo MSME.

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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 Condition / Supplementary Deed / Amendment Deed / Alteration to Memorandum of Association/others dated XX/XX duly registered on XX/XX.~~

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 BFC 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.Qrs)(Exemptions),  
Chennai.

F.2984

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Chikkabellandur, Carmelaram Post,  
Varthur Hobli, Bangalore - 560 035



GOVERNMENT OF INDIA  
INCOMETAX DEPARTMENT  
OFFICE OF THE COMMISSIONER OF INCOME TAX (EXEMPTIONS)  
Ayyakar Bhawan, Annex 3 Floor, 121 M.G. Road, Chennai 600 034

URNo. 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  
Rajiv E. Panwar  
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. URNo. 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.S)  
Commissioner of Income Tax (Exemptions)  
Chennai.

Copy to:

1. The applicant
2. Guard File
3. The DCIT(Exemptions) Coimbatore Circle.

//Certified True Copy//

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


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## FORM NO. 10AC

(See rule 17A/11AA/3C)

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:-	

  
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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)

Digitally signed by S.B. CHENKIL MATHEW  
Date: 2022.04.19 15:52:35 IST


Digitally Signed by  
S.B. CHENKIL MATHEW  
Date: 2022.04.19  
15:52:35 IST

*P*  
*19/4/22*  
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INCOME TAX DEPARTMENT

## Certificates of Energy Auditors

1. ISO Environment Management System (14001:2015) of Dr. 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.
4. Bureau of Energy Efficiency (BEE), LEED AP and GRIHA Certificates of Er. D. Dinesh Kumar, Energy Auditor of NSF.
5. ISO Energy Management System (50001:2018) of Dr. D. Vinothkumar, Joint Director of NSF

  
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## 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: 17<sup>th</sup> Jun, 2021

Training Date : 20<sup>th</sup> to 24<sup>th</sup> May, 2021

Certificate Number : 2106170721010105

Authorised Signatory  
(Pragyosh Singh)

This course is certified by Exemplar Global vide registration number TN00

Note: The course conforms to the principles and practices of ISO 14001:2015 Management Systems for compliance with standards. This certificate remains valid for 5 years. This certificate is recognized by Exemplar Global. For more information, please write to: Mail: info@isoindia.com

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## 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).

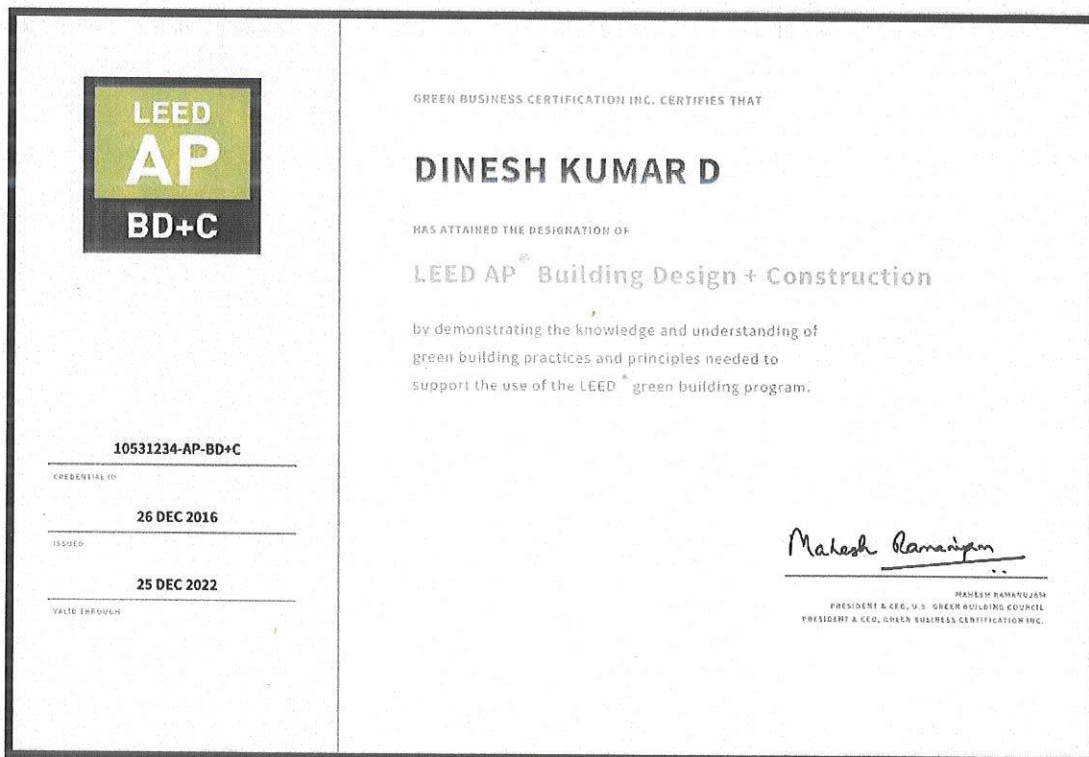
Given under the seal of the Bureau of Energy Efficiency, this **7<sup>th</sup>** day of **February, 2013**


Digitally Signed: RAKESH KUMAR RAI  
Sun Mar 01 10:58:55 IST 2020  
Secretary, BEE New Delhi

Secretary  
Bureau of Energy Efficiency  
New Delhi

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

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BEE  
CONSERVE IT

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**BUREAU OF ENERGY EFFICIENCY**  
विद्युत मंत्रालय, भारत सरकार  
MINISTRY OF POWER, GOVERNMENT OF INDIA

प्रमाणित किया जाता है कि

श्री/श्रीमती दिनेश कुमार ने ऊर्जा संरक्षण भवन निर्माण संहिता के तिर 7 दिसेंबर '16 से 8 दिसेंबर '16 तक एमएनआईटी / सीईपीटी / आईआईआईटी द्वारा आयोजित मास्टर ट्रेनर सर्टिफिकेट कार्यक्रम को सफलता पूर्वक सम्पन्न कर लिया है।

This is to certify that

Shri/Smt. Dinesh Kumar has successfully completed the Master Trainer Certificate Programme conducted by MNIE/CEPT/IIT from 7 December '16 to 8 December '16 for the Energy Conservation Building Code.

नई दिल्ली, 07.12.16  
New Delhi, \_\_\_\_\_

अमन वाक  
महानिदेशक  
Director General

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**QCS MANAGEMENT PVT LTD**



The CPD Accreditation Office

## Certificate of Successful Attainment

*This is to certify that*

**DR. D. VINOTH KUMAR**

HAS SUCCESSFULLY COMPLETED THE FIVE DAYS (40 HOURS)

**LEAD AUDITOR COURSE**

BY PASSING THE WRITTEN EXAMINATION BASED ON

**ISO 50001:2018**

**ENERGY MANAGEMENT SYSTEMS**

Examination Date: 15/07/2022

Certificate issue Date: 22/07/2022

Certificate registration number: QCS/TR/C/0056

Total Course duration: 40 hours CPD Credits Earned: 32

Remarks: Roughly one hour of study time equals to 1 CPD Credit.

This certificate can be validated online from the industry wide Global Professional Register at [www.qcspl.com](http://www.qcspl.com).

  
**Partha Bagchi**  
 (Managing Director)

**QCS MANAGEMENT PVT LTD**

Accredited by "CPD Accreditation Office UK"

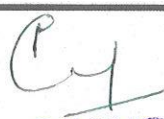
H.O: 37E/1(310) 2<sup>ND</sup> STREET, MODERN PARK, SANTOSHPUR,  
 KOLKATA-700075, WEST BENGAL, INDIA

BRANCHES: INDONESIA, BANGLADESH, QATAR, SAUDI ARABIA,  
 TURKEY, UAE

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