# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

***AUDIT CONDUCTED FOR***

# SRI SARADA COLLEGE OF EDUCATION

## (AUTONOMOUS)

**Sarada College Road, Fairlands, Salem - 636 016,**
**Tamil Nadu, India**

***DATE OF AUDIT***

**05 APRIL 2023**

***AUDIT CONDUCTED BY***


**RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING**

**(Chennai ♦ Coimbatore ♦ Erode)**

**Mobile: +91- 80567 19372, 99420 14544 (Whatsapp) E-mail: ramkalamcect@gmail.com**



Signed By:S SANTHI
Digitally Signed
Salem
Signing Date:25.04.2023 21:53

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# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## 1. ACKNOWLEDGEMENT

# *ACKNOWLEDGEMENT*

**RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING,** Coimbatore – 641 062 is thankful to the Management, Principal, Faculty and Technical team members of **SRI SARADA COLLEGE OF EDUCATION (AUTONOMOUS),** Sarada College Road, Fairlands, Salem - 636 016, Tamil Nadu, India for providing an opportunity to conduct a detailed Energy, Environment and Green Audit process in the college premises.

It is our great pleasure which must be recorded here that the Management of SRI **SARADA COLLEGE OF EDUCATION (AUTONOMOUS)** extended all possible support and assistance resulting in thorough completion of the audit process. The audit team appreciates the cooperation and guidance extended during the course of site visit and measurements. We are also thankful to all those who gave us the necessary inputs and information to carry out this very vital exercise of green audit.

Finally, we offer our sincere thanks to all the members in the engineering division/ technical / non-technical divisions and office members who were directly and indirectly involved with us during collection of data and while conducting field measurements.

| ***Management Team Members*** | |
|---|---|
| **YATISWARI VINAYAKAPRIYA** | Secretary |
| **YATISWARI GUHAPRIYA** | Representative of the Educational Agency |
| **Dr. S. SANTHI** | Principal |
| **Dr. V. PRIYA** | IQAC Co-ordinator |

| ***Audit Team Members*** | |
|---|---|
| **Dr. S.R. SIVARASU, Ph.D.,** | **BEE Certified Energy Auditor (EA-27299)**<br>Lead Auditor-ISO-14001:2015 (EMS),<br>IGBC AP, GRIHA CP, CII CP in SWM<br>Carbon Footprint Auditor & Implementor<br>**Mobile: +91- 80567 19372, 99420 29372** |

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

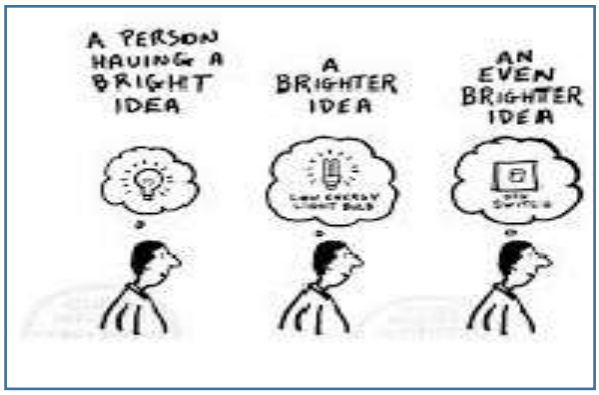
## 2. LIST OF FIGURES, GRAPHS & TABLES

***FIGURES, GRAPHS & TABLES:***

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## 3. INTRODUCTION TO

## ENERGY-ENVIRONMENT-GREEN AUDIT



***3.1: Preface about the Institution:***

- Sri Sarada College of Education was established in the year **1968-69** by the dynamic effort of **Mrs. Seetha Lakshmi Ramaswamy** (Yatiswari Sarada Priya) under the presidentship of Srimath Swami Chidbhavananda of Sri Ramakrishna Tapovanam, Tirupparaithurai.
- With the aim of moulding the future teachers with intellectual, moral and spiritual values, Sri Sarada College Education Trust, Salem propels the institution in the promising path. It is one of the Government aided college and it was affiliated to the **University of Madras from its inception to 1998**.
- **Autonomy status** was conferred in the year **1988-89**. It was an affiliated college of Periyar University from 1998-2008. Since 2008, Sri Sarada College of Education has been **affiliated to Tamil Nadu Teachers Education University, Chennai.**
- The NACC has accredited the institution with a **Three-star status in 1999**. In March 2007, the college was reaccredited with 'A' grade.
- The college successfully retained the **'A' grade in the III cycle also in September 2014**. The College has been recognized by **NCTE to conduct Teacher Education Programmes**.

***3.2: Vision:***

- To make **"Quality"** the defining element of teacher education through a combination of self and external quality evaluation promotion and sustenance initiatives

***3.3: Mission:***

- ✓ To empower women student teachers and prospective teacher educators as Agents of Social Change through an integrated education of Head, Heart, and Hand
- ✓ To inculcate intellectual, emotional, moral, and spiritual values among the students' teachers and prospective teacher educators for the advancement of the society
- ✓ To train the student teachers to improve the cultural heritage and traditional treasures of the land so that they become masters of themselves and servants of the mankind
- ✓ To equip the prospective teachers to keep abreast of the recent developments in the field of education, practice needed skills and develop a positive attitude towards teaching profession
- ✓ To prepare future teachers to address the national and global demands by facilitating field oriented, constructive and individualized learning experiences

***3.4: Quality Policy:***

- **Sri Sarada College of education** is an institution of higher education, is committed to offer quality education as the way of life with competent teaching faculty and other learning resources to ensure students' holistic development and transformation required for human resource development.

### 3.5: Core Values:

Contribution to national development by serving the cause of social justice, ensuring equality and increasing access to higher education.

- ❖ Fostering global competencies by developing high calibre at nationally comparable and internationally acceptable standards with innovative, creative and entrepreneurial capacities to realize networking with the neighbourhood and fostering a closer relationship between the world of work and living
- ❖ Inculcating a value system in students the college gives main focus through its entire campus experiences and multifarious activities to enhance the qualities of co-operation and mutual understanding
- ❖ Promoting the use of technology as a learning resource as well as managing the activities of the institution namely documentation and electronic data management
- ❖ Quest for excellence through establishment of IQAC for quality sustenance and enhancement

### *3.6: Major Activities in the Institution:*


### *3.7: Scope of the Audit Process:*

- **Energy Audit:** To conduct a detailed energy audit in the college campus with a main focus to identify judicious usage of electrical and thermal energy (where, when, why and how energy is being utilized).
- **Environmental Audit:** Identification of history of activities, present environmental practices followed, monitoring records and known sources of environmental issues inside the college.
- **Green Audit:** Assessment on Campus greenery in terms of mature trees, flowering shrubs, bushes, medicinal plants, adoption of green energy generation and utilization, reduction of $CO_2$ due to green energy system and identification of possible implementation and enhancement of current greenery practices.

### *3.8: Outcomes of the Audit Process:*

- Recommendations based on field measurement with achievable **En**ergy **Con**servation (ENCON) proposals under **No cost/Low cost and Cost investment categories**

- **Minimization of present energy cost** by adjusting and optimizing energy usage and reduction of energy wastage without affecting the regular activities
- **Identification of possible cost and energy saving from energy conservation, waste reduction, reuse and recycling**
- Formation of methodology for long term road map for maintaining green environment within the campus and encourage the stakeholders for continuous improvements

***3.9: Audit Approach:***

The audit team completed the assessment of energy consumption in the factory premises and operating hours of each machines (system) using two approaches namely **i) Objective Approach** in which a detailed measurement was taken and **ii) Subjective Approach** in which field data is collected from the maintenance department.

***3.10: Standards Used:***

- Bureau of Energy Efficiency (BEE) Guidelines to conduct the detailed energy audit process
- **ISO 14064-Part-1** – Specification with guidance at the organization level for quantification and reporting of GHG emissions and removals (Second Edition)
- **ISO 14064-Part-2** – Specification with guidance at the project level for quantification, monitoring and reporting of GHG emissions reductions or removal enhancement (Second Edition-2019)
- **ISO 14064-Part-3** – Specification with guidance for the verification and validation of GHG statements (Second Edition-2019)
- The Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard (Revised Edition) released by World Resources Institute & World Business Council for Sustainable Development – 2014
- Ministry of Environment, Forest and Climate Change Notification on **"Battery Waste Management Rules, 2020" & "E-Waste (Management) Rules, 2016", & "Solid Waste Management Rules, 2015"s**

***3.11: Audit Schedule:***

| S. No. | Activity | Focused Area and Location of Audit |
|---|---|---|
| 1. | Introduction Meeting | Meeting with core committee members |
| 2. | Electrical Energy, Equipment's / Systems | Assessment on Power House, Transformer, DG, Earthing & Periodic maintenance. |
| 3. | HVAC System | Capacity/Star rating, Gas used, Temperature setting, Maintenance records & Best operating practices. |
| 4. | Un-interrupted Power Supply (UPS) | Assessment on capacity, Location, Battery system, Maintenance practices & earthing. |
| 5. | Lighting System | Assessment on both Interior and Exterior lighting |
| 6. | Water Distribution System | Water source, storage, distribution, RO plant & Best operating practices. |

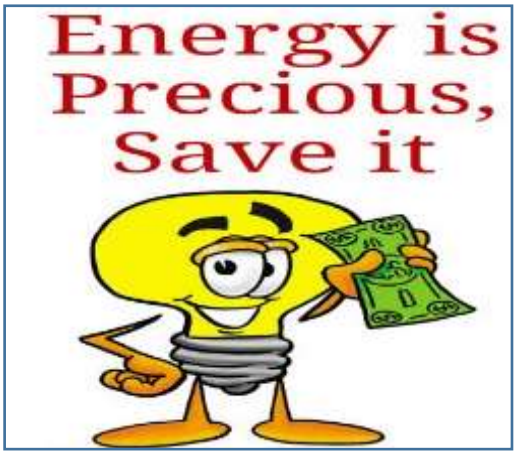
| | | |
|---|---|---|
| 7. | Rain Water Harvesting (RWH) | Collection points, Capacity, Storage, Post Treatment, Effective utilization and Periodic Measurements. |
| 8. | Solid Waste Management (SWM) | Nature of wastes generated, collection, segregation, transportation, disposal, policy documents & best practices. |
| 9. | E-Waste Management | Types of E-waste generated, collection, storage, Policy documents, MoU with 3rd party recycler |
| 10. | Green Coverage | Assessment on mature trees, location/coverage, flowering shrubs and saplings |
| 11. | Closing Meeting | Concluding meeting with members, Explained about the audit process & suggestion for improvements |

***3.12: List of Members Involved in Audit Process & Data Collection:***

| S. No. | Faculty Details | Designation |
|---|---|---|
| 1. | Dr. S. SANTHI | Principal |
| 2. | Dr. V. PRIYA | IQAC Co-ordinator |
| 3. | Dr. R. SELVAMATHI SUGIRTHA | Environmental Club In-Charge |
| 4. | Dr. V. ARULSELVI | Environmental Staff In-Charge |

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## 4. EXECUTIVE SUMMARY



## ***EXECUTIVE SUMMARY***

***Energy Analysis:***

A detailed audit was conducted in **SRI SARADA COLLEGE OF EDUCATION (AUTONOMOUS),** Sarada College Road, Fairlands, Salem - 636 016, Tamil Nadu, India. The audit team has come out with ***3 Energy Conservation Proposals (ENCONs)*** and the summary of all the ENCONs are given below:

| S. No. | Description | Parameters | | |
|---|---|---|---|---|
| | | Present | After | Savings |
| 1. | Annual Energy Consumption | 12,230 kWh | 8,905 kWh | **3,325 kWh** |
| 2. | Annual Energy Cost | Rs. 1,09,103 | Rs. 78,190 | **Rs. 30,913** |
| 3. | Initial Investment Required | – | – | **Rs. 1,00,000** |
| 4. | Simple Payback Period | – | – | **Nearly 3.2 Years** |
| 5. | % Savings | **27 % Electrical** | | |

**Table-1: Energy Conservation Proposal (ENCON) along with Annual Energy and Financial Savings**

| S. No. | Proposed Energy Conservation Measures | % Saving & Source | Estimated Savings | | Initial Investment (Rs.) | Payback Period |
|---|---|---|---|---|---|---|
| | | | Annual Energy Savings | Monetary Savings (Rs.) | | |
| 1. | Replacement of Fluorescent Lamps with Energy Efficient Lamps (Swap FTL to LED Lamps) | 50 % on Lighting | 625 kWh | 5,813 | 10,000 | 1.7 Years |
| 2. | Replacement of Existing Convention Ceiling Fans into EC BLDC Fans | 50 % on Fans Load | 2,700 kWh | 25,110 | 90,000 | 3.6 Years |
| **Total** | | | **3,325 kWh** | **30,913** | **1,00,000** | – |
| **3. Installation of Roof Top Solar Photovoltaic Power Plant (SPP) and Reduction in the Energy Billing** | | | | | | |

**Audit Conducted and Verified by**

**(Dr. S.R. SIVARASU)**

**Dr. S.R. SIVARASU,Ph.D.,**
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# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## PART-A: ENERGY AUDIT REPORT

## 5. STUDY ON ENERGY CONSUMPTION & GENERATION PATTERN

***5.1: Assessment of Existing Electrical and Thermal Energy Systems:***

| S. No. | Description | Details |
|---|---|---|
| **Electrical Energy (Consumption)** | | |
| 1. | Name of the customer | **SRI SARADA COLLEGE OF EDUCATION** |
| 2. | Type of Utility Supply, Tariff | Low Tension (LT) supply with connected load of 49 kW; LT-II-B-2 |
| 3. | Capacity of Diesel Generator (DG) Set | **25 kVA** (Internal fuel tank – 50 L capacity) **– 1;** Air cooled separate earthing done |
| **Annual Energy Consumption** | | |
| **Electricity from EB** | **Electricity from DG** | **Diesel Consumption** |
| kWh | 35 kWh | 10 Litres |
| **General Loads** | | |
| 4. | Lighting System | • **Indoor lighting**: Conversion of Florescent Tube Light (FTL) into LED in a phased manner<br>• **Outdoor lighting:** All the street lightings are LED based energy efficient lamps |
| 5. | Fan Loads (Ceiling) | • All the indoor ceiling fans are conventional fans. |
| 6. | HVAC System | • Unitary air conditioning system installed in the required places<br>• Most of the AC units are **BEE star rated** (3-Star) rated). |
| 7. | Motors load | • Mainly used for water distribution & purification |
| 8. | Uninterrupted Power System (UPS) | • Computers, surveillance systems, projectors, telephonic units are connected with UPS **(nearly 23.5 kVA)** with a backup time of **15-30 min.** |
| **Installation of Renewable Energy Sources (Roof Top-Off Grid Solar PV Plant)** | | |
| 9. | Specification of Root-Top Solar PV Plant | • 2 kW solar plant feeding power to the main building loads through an inverter<br>• 2 kW solar plant feeding power to the Library loads through an inverter<br>• Bother are connected via a dedicated batter system (Tubular 12V, 60 Ah battery bank) |

**Table-2: Annual Energy Consumption and Energy Generation (2021-22)**

| S. No. | Month | Units Consumed (kWh) | Amount Paid (Rs.) | Rs./kWh | Energy from Solar PV Plant (kWh) |
|---|---|---|---|---|---|
| 1. | Mar-21 | 1,320 | 10,922 | 8.27 | 900 |
| 2. | May-21 | 510 | 6,007 | 11.78 | 300 |
| 3. | Aug-21 | 780 | 7,631 | 9.78 | 450 |
| 4. | Oct-21 | 340 | 4,951 | 14.56 | 210 |
| 5. | Dec-21 | 915 | 8,452 | 9.24 | 380 |
| 6. | Feb-22 | 930 | 8,006 | 8.61 | 420 |
| Total | | 4,795 | 45,969 | – | 2,660 |
| Average | | 799.2 | 7,661.5 | 10.4 | 443.3 |

**Table-3: Annual Energy Consumption and Energy Generation (2022-23)**

| S. No. | Month | Units Consumed (kWh) | Amount Paid (Rs.) | Rs./kWh | Energy from Solar PV Plant (kWh) |
|---|---|---|---|---|---|
| 1. | Apr-22 | 2,750 | 19,585 | 7.12 | 1,575 |
| 2. | Jun-22 | 2,490 | 18,003 | 7.23 | 1,610 |
| 3. | Aug-22 | 2,080 | 15,516 | 7.46 | 1,590 |
| 4. | Oct-22 | 1,580 | 16,828 | 10.65 | 1,545 |
| 5. | Dec-22 | 1,500 | 18,120 | 12.08 | 1,495 |
| 6. | Feb-22 | 1,830 | 21,051 | 11.50 | 1,470 |
| Total | | 12,230 | 1,09,103 | – | 9,285 |
| Average | | 2,038 | 18,184 | 9.3 | 1,548 |

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

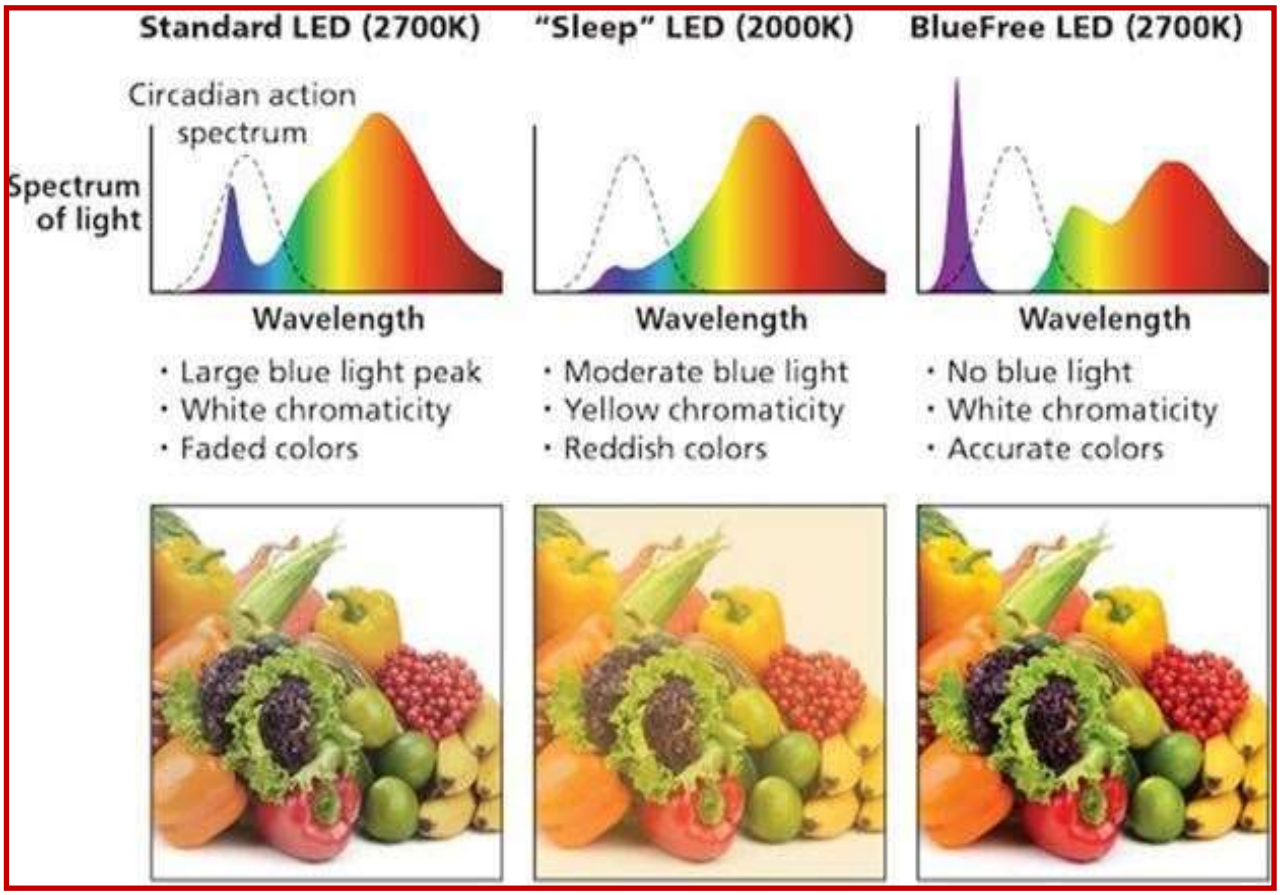
## PART-A: ENERGY AUDIT REPORT

## 6. ENERGY CONSERVATION PROPOSALS (ENCONs)

| ENCON-I | Replacement of Fluorescent Lamps with<br>Energy Efficient Lamps (Swap FTL to LED Lamps) |
|---|---|
| Assessment Area | Compact Fluorescent Lighting System located in college area with magnetic/electronic choke fitting |
| Observations | College Area – All Building Area |
| Assessments | • The college is now replacing FTL and CFL into LED and this step must bring considerable amount of energy saving.<br>• A 36 W FTL consumes 40 W including power consumption of the Choke.<br>• Lighting loads are more sensitive to voltage variations. Supplying a constant voltage provides i) Reduction of breakdown of lamps and luminaries and ii) Considerable amount of energy saving.<br>• In order to reduce the lighting bulb failures, it is necessary to supply a safe working voltage (say about 210 V) through a dedicated Servo Stabilizer (SS) connected at the output of the lighting DB. |
| Recommendation (Target) | • College administration has to replace the FTL to LED (20 W with choke) of branded round LED tube fitting without Blue Tinge. |

***Energy and Financial Saving Calculation:***

| Parameters | Description | |
|---|---|---|
| Replacement Lighting Quantity | 36 W FTL of **25 Nos** contributes nearly **1.0 kW (40 W including choke)** | |
| Power rating of new lamps | LED-18 W (One to One – 20 W including choke) with the total power consumption of (50 X 20 W) = **0.5 kW** | |
| Approx. Operating Hours (Average assumed value) | **6 hours/day & 250 days/Annum = 1,250 Hours/Annum**<br>(Actual operating hours may change) | |
| Energy Calculation | **Before** | **After** |
| Power Consumed (Approx.) | 1.0 kW | 0.5 kW |
| Expected Power Savings | – | 0.5 kW |
| Annual Energy Saving | – | **625 kWh** |
| Annual Financial Saving | – | **Rs. 5,813 /-** |
| **(625 kWh x Rs.9.30/kWh = Rs.5,815/-)** | | |
| Initial Investment | - | **Rs. 10,000/-** |
| (Considering Rs.400/Lamp fittings of branded LED Day Cool Light) | | |
| **Simple Payback** | **–** | **Nearly 1.2 Years** |
| **$CO_2$ Reduction** | **–** | **0.51 Tons/Annum** |



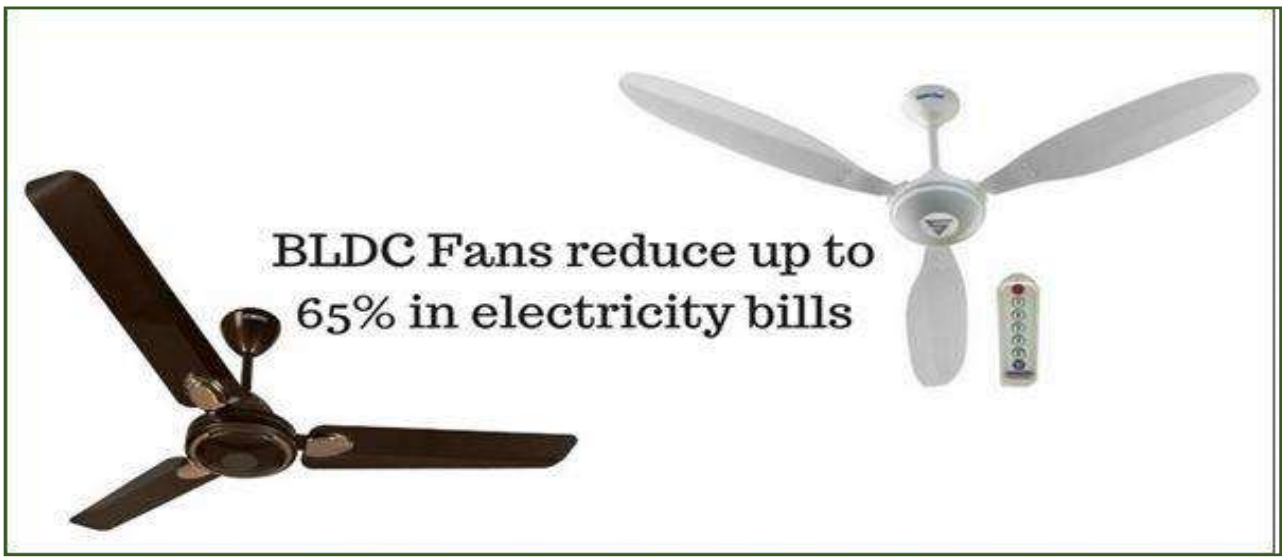

| Tube Light with Copper Choke | | | | | | |
|---|---|---|---|---|---|---|
| **V** | **I** | **W** | **VA** | **VAR** | **PF** | **Lumens** |
| 200 | 0.278 | 31.96 | 55.60 | 45.50 | 0.5748 | 877 |
| 210 | 0.313 | 35.65 | 65.73 | 44.22 | 0.5424 | 971 |
| 220 | 0.346 | 39.25 | 76.12 | 65.22 | 0.5156 | 1033 |
| 230 | 0.377 | 42.70 | 86.71 | 75.47 | 0.4924 | 1089 |
| 240 | 0.415 | 46.96 | 99.60 | 87.83 | 0.4715 | 1157 |
| 250 | 0.438 | 49.70 | 109.5 | 97.57 | 0.4539 | 1163 |
| **LED Light** | | | | | | |
| 200 | 0.137 | 20.83 | 27.40 | 17.80 | 0.7602 | 1315 |
| 210 | 0.126 | 21.10 | 26.46 | 15.97 | 0.7974 | 1280 |
| 220 | 0.122 | 20.44 | 26.84 | 17.40 | 0.7615 | 1267 |
| 230 | 0.120 | 19.68 | 27.60 | 19.35 | 0.7130 | 1277 |
| 240 | 0.108 | 19.97 | 25.92 | 16.52 | 0.7704 | 1270 |
| 250 | 0.105 | 19.27 | 26.25 | 17.82 | 0.7341 | 1275 |

| ENCON-II | Replacement of Existing Convention Ceiling Fans into Electronically Commutated BLDC Fans |
|---|---|
| Assessment Area | Energy conservation in ceiling fans located in the college campus |
| Observations | College area including all Buildings, Class, Lab, Faculty cabins, Auditorium & Other areas |
| Assessments | • BLDC fans operate in less energy with same air delivery. Similarly, these fans generate lesser noise, runs with inverter supply, remote control-based speed control, aesthetic look and better lifespan.<br>• Conventional fans consume 1 unit of electricity for approximately 12-13 hours of running period, whereas the BLDC fans consume the same 1 unit of electricity for nearly 28-29 hours. |
| Recommendation (Target) | • Recommended to replace the existing conventional fans into EC BLDC fans in a phased manner and ensure good energy saving. |

***Energy and Financial Saving Calculation:***

| Parameters | Description | |
|---|---|---|
| Total No. of Fans available | Consider **50 Nos** of conventional fans which accounts for **3.5 kW** | |
| Approx. Operating Hours (Average assumed value) | **5 hours/day & 300 days/Annum = 1,500 hours/annum** (Actual operating hours may change) | |
| Energy Calculation | **Before** | **After** |
| Power Consumed (Approx.) | 3.5 kW | 1.75 kW |
| Expected Reduction of Power | – | **1.75 kW (50 % ↓)** |
| Annual Energy Saving | – | **2,700 kWh** |
| **(2,700 kWh x Rs.9.30/kWh = Rs.25,110/-)** | | |
| Annual Financial Saving | – | **Rs. 25,110/-** |
| Initial Investment | - | **Rs. 90,000/-** |
| (Considering Rs. 2,000/fan - Salvage value of Rs. 200/fan for old fan = Rs. 1,800/fan) | | |
| **Simple Payback** | **–** | **Nearly 3.6 Years** |
| **$CO_2$ Reduction** | **–** | **2.2 Tons/Annum** |

(Note: BLDC fans consume **less power when it operates at low speeds** which further saves energy. Further a conventional fan draws nearly about **100 VA**, whereas the EE fan draws only **30 VA.** This will be more beneficial for HT consumer as direct reduction of kVA rating).




## Economics of Ceiling Fans in India

| | Regular Fan | BEE 5 Star Rated Fan | Super Efficient Fan |
|---|---|---|---|
| Price | Rs 1500 | Rs 1940 | Rs 2600 |
| Regulator Cost | Rs 200 | Rs 200 | Rs 0 |
| Wattage | 75 Watts | 50 Watts | 35 Watts |
| Air Delivery | 230 cum/min | 210-220 cum/min | 230 cum/min |
| Units Consumed Per Year | 180 Units | 120 Units | 84 Units |
| Electricity Cost Per Year | Rs 900 | Rs 600 | Rs 420 |
| Electricity Cost For 10 Years | Rs 10800 | Rs 7200 | Rs 5000 |

Assumptions: 1) Usage of 12 hours per day for 200 days. 2) Electricity Cost of Rs 5 per unit. 3) Electricity cost to increase by 4% every year for 10 years. 4) Prices as available on Internet on Aug 2013. 5) Calculations are for 1 Fan. 6) Electricity consumption is at top speed.

Bijli Bachao! ...because saving electricity saves money



| | | Speed Positions | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Super Fan | Power (W) | 3.8 | 7.7 | 13.8 | 22.7 | 35.0 |
| 5-Star rated Fan | | 13 | 24 | 30 | 40 | 55 |
| Regular Fan | | 13 | 26 | 39 | 48 | 76 |

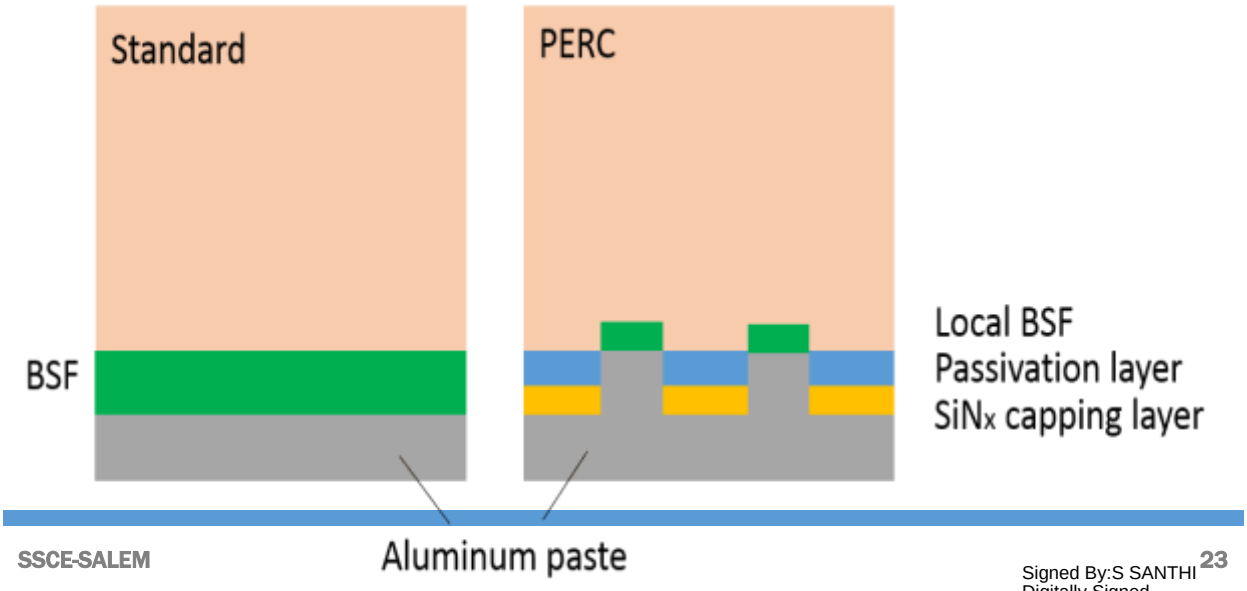
| ENCON on RES | Installation of Roof Top Solar Photovoltaic Power Plant (SPP) and Reduction in the Energy Billing |
|---|---|
| Assessment Area | Electrical Distribution System (Energy Utilization Pattern) |
| Observations | • All the electricity consumers (irrespective of their tariff structure) are eligible to install SPP in their roofing; start generating power and being fully utilized by the consumer (connecting the inverter output to any of the SSB or in the MV panel). |
| Assessments | • Installation of renewable energy-based power generation might be mandatory in future (as per policies of either state or central or both). Some bankers are now insisting that the consumer has to install a quantum of renewable energy system to reduce their carbon footprint when they avail top-up loads for expansion activities.<br>• Further; during the environment assessment; power generation from the solar plant is being utilized to neutralize the $CO_2$ emission. Hence it will be value added utility for the company. |
| Recommendation (Target) | • The open terrace on the factory is completely vacant (also not affected by building, tree and any other artificial shading) which may be used to install appreciable capacity of Solar Photovoltaic Power Plant.<br>• After measuring the terrace; appropriate power capacity of SPV plant must be installed. However, the audit team recommends to install **100 kW roof top solar PV plant** initially and later on expand if required. |
| **Technology Driven Solar System** | • **Mono PERC Solar PV System:** With a technology that combines rear wafer surface passivation and local rear contacts to maximize light capture, mono PERC solar modules are paving the way for dramatically increased PV system efficiency.<br>• The standard monocrystalline cell presents a uniform Back Surface Field (BSF), whereas the mono PERC solar cell presents local BSF atop passivation and SINx capping layers, which significantly improves the capture of light and electrons.<br>• The advantages of Mono PERC PV system are;<br>◆ High-performance mono PERC cell structure.<br>◆ Exceptional performance under low-light and high temperature conditions.<br>◆ Higher energy density/square foot.<br>◆ Increased light absorption, as unabsorbed light is reflected back to the solar cell.<br>◆ Extended cable lengths for easier installation; |

| | |
|---|---|
| | ◆ Superior anti-reflective coating captures more light to deliver increased efficiency.<br>◆ Enhanced junction box sealing protects against moisture and extends product life.<br>• **Back Sheets in PV Panels:** The primary function of the PV back sheet material is to offer protection to the solar module's various components throughout its lifetime.<br>• This in turn ensures loss-free energy generation for the solar panel. The solar back sheet should be able to resist active environmental elements such as moisture, temperature changes, chemical substances and physical damages for years on end.<br>• The active electrical elements found within the modules must also be insulated to ensure the safety of surroundings. |

***Energy & Financial Saving Calculation:***

| Parameters | Units | Description |
|---|---|---|
| Power capacity of the proposed SPP | kW | 10 |
| Maximum sun shine hour (Solar hour) | Hours | 4.5 |
| Annual Operating Days | Days | 320 |
| Maximum energy generated from SPP | kWh | 14,400 |
| Annual Financial Saving | Rs. | 1,33,920/- |
| **Initial Investment** (Assessment, erection, commissioning & testing) | Rs. | **4,00,00 Lakhs** |
| Simple Payback Period | | **3.0 Years** |

(Note: Installation of RES especially solar plants; the total cost of the system is being claimed in depreciation which is more beneficial for the consumer. The first-year depreciation is 60% of the total investment which makes solar attractive and quicker Return on Investment).



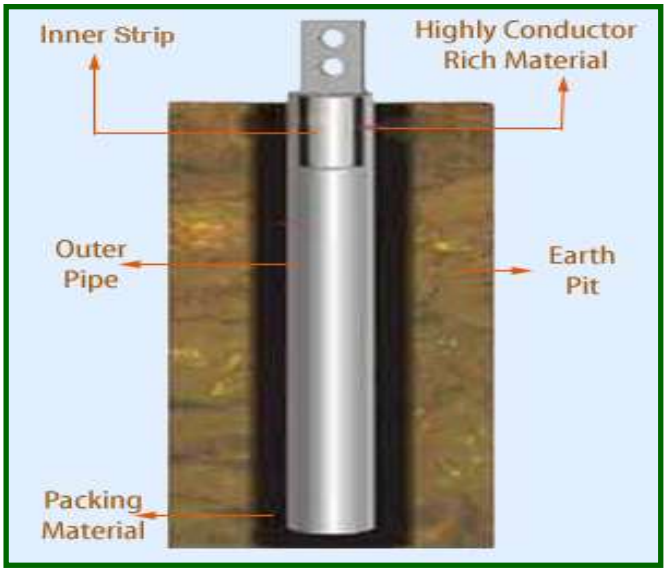
# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## PART-A: ENERGY AUDIT REPORT

## 7. BEST OPERATING PRACTICES FOR ENERGY CONSERVATION & MANAGEMENT

***Practice-1: Maintenance Free Earthing System:***

University/college earthing system must be in good condition as it is prone to malfunction and gives rise to harmonic and multiply the same into the electrical network. Plan for maintenance free earthing and this maintains the Ohmic values in the long run over decades.



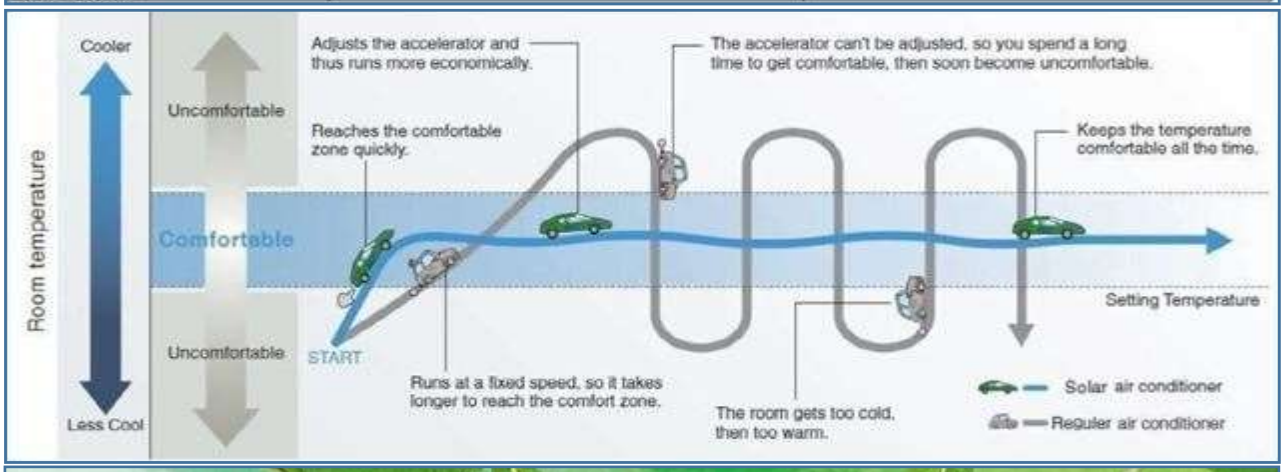

***Practice-2: Retrofit of AIRCON Energy Saver & Optimization of Air Conditioning Operation:***

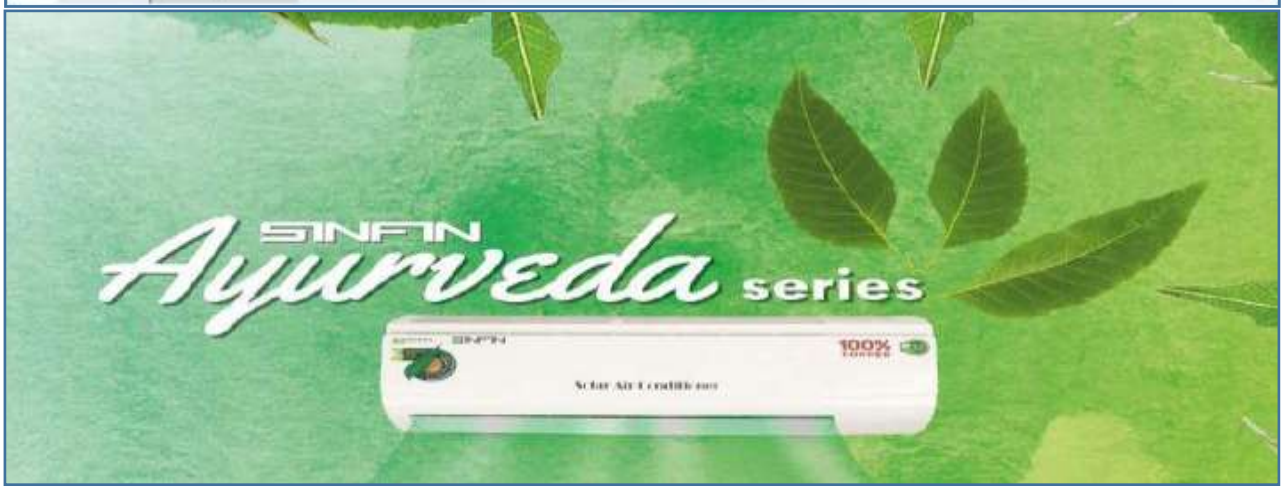
- Energy Conservation in Air Conditioning Systems having lesser value of EER & older installation
- The running hour of each AC units differ and purely depends on need at the respective rooms/laboratories
- Install AIRCON energy saver gadget which works on dynamic un-saturation principle with the sensor algorithms so that the air conditioners run hours are cut by 20 to 25 %.

***Practice-3: Recommendations for BLDC AC System:***

- Similar to Fan, now BLDC based AC is available in the market which consumes less amount of energy (Power) during its starting and running condition. This AC operates at same tonnage capacity and offer 100 % same cooling effect compared to conventional inverter AC
- Because of less power consumption, this AC can also be operated in Solar PV system. Further the noise associated with compressor running is so less and provides quiet operation

| | Conventional Air Conditioner | Solar Air Conditioner |
|---|---|---|
| **Wattage** | 2000watt | 800watt |
| **Starting Load** | 3500watt | 100watt |
| **Running Amp** | 7 to 9 Amp | 2 to 4.5Amp |
| **Electric saving** | ------- | Upto 80% |
| **Jerk Load** | High Jerk | No Jerk |
| **Compressor** | Rotary / Hermetic | BLDC MGM |
| **Solar Compatibility** | | |
| **Direct Solar Compatible** | N.A. | 1500watt Solar Panel (can run through Solar Panel (DC Voltage) |
| **Solar Compatibility** | 5kwatt Solar Plant with Inverter & Battery | Only 1.5kwatt & 1750VA PCU |
| **Unit Consumption on Electricty (per 10Hrs)** | 17 to 20Units | 5 to 7 Units |



***Practice-4: Dedicated Servo Stabilizer for Lighting System:***

- Life expandability on the lighting system has been achieved by applying regulated voltage to the lighting and their associated circuit components. In order to reduce the lighting failures, it is necessary to supply a safe working voltage through a dedicated Servo Stabilizer (SS) this reduces the failures of bulbs and the circuit components.
- Install a dedicated unbalanced type servo stabilizer (with suitable power rating may be 15 kVA-3-Phase input; 3-Phase output) through which all the lighting loads may be connected to ensure the optimum voltage of say 210 V.

| Input Voltage Variations | Possible reduction in Breakdown | | Possible Approx. Power Savings | |
|---|---|---|---|---|
| | Motor Load (Below 10 HP) | Lighting Load | Motor Load (Below 10 HP) | Lighting Load |
| 380-400 V | NIL | NIL | NIL | No SS required |
| 400-420 V | 5 % | 10 % | 3 % | 5 % |
| 420-440 V | 10 % | 20 % | 5 % | 10 % |
| 440-460 V | 40 % | 40 % | 7 % | 20 % |
| 460-480 V | 60 % | 60 % | 10 % | 30 % |

***Practice-5: Centralized Fan Speed Control:***

- In order to save energy; it is highly recommended to install a centralized fan speed control unit in newly built class rooms (commerce building)
- The speed of all the fans in the class room is being controlled by a single voltage regulator and the control knob is kept at nearly 70 % of speed position


***Recommendations:***

- Centralized regulator must be implemented in for conventional fan control as Power consumption under low speed operation is not that much appreciable
- Instead of that, BLDC-Electronically commutated fans are more energy efficient; especially when they run at low speed and saves huge amount of energy
- Further the speed was set at 70 % for all sessions. However it may further be reduced to 50 or 40 % during winter season and enhance the possibility of energy saving

***Practice-6: Display of Monthly Energy and Water Consumption:***

- Electricity and Water consumption is the major energy utilities consumed in the college premises. The consumption pattern is not constant.
- All the stack holders should know the facts of usage of energy metrics along with its financial debuts.
- Display the monthly consumption of electricity and their cost. Also display the water consumption at appropriate places and encourage to save the energy.

***Practice-7: Formation of Green Energy Team (GET):***

- In order to train the students to conserve the energy, each sections of the loads may be allotted with some group of students with a faculty mentor. These groups may fix up a target for energy conservation and start working on it
- An incentive mechanism to the group of students conserving less energy will be a moral example for other students
- It is essential and the right time to form an Energy Management Team comprising of the following members with their roles and responsibilities as shown in Table-4:

**Table-4: Roles of Responsibilities of Green Energy Team (GET)**

| S. No | Members | Roles | Responsibilities |
|---|---|---|---|
| 1. | Management Commitment | Overall Monitoring | • Encourage members to carry out the activities<br>• Propose possible think tank ideas to be implemented in the college campus |
| 2. | Head of the Institution | Team Head | • Monitoring all energy related activities<br>• Report to the Management |
| 3. | Heads of various Departments | Team Manager | • Assessing the energy target<br>• Monitoring the energy performance<br>• Revising the target based on performance<br>• Monitoring energy conservation projects/activities/implementation |
| 4. | Faculty members from various department | Team Members | • Identify the viable energy saving projects<br>• Prepare the detailed work plan/time frame<br>• Project guides for energy related projects<br>• Pre and post project implement study<br>• Rework if there is any deviation |
| 5. | Student volunteers | Energy Ambassadors | • Responsible for energy consumption of identified areas<br>• Floor in-charge for energy utilities<br>• Development of hardware/software model of the energy saving projects<br>• Testing and Implementation |

- Energy conservation is a collective effort and involve all the stakeholders of the campus
- Educate all the faculty, staff and students about the need for the energy conservation
- Energy conservation related projects are to be implemented in the college premises
- Nominate brand ambassadors for energy saving among students (for each building/floor)
- Cash incentives/awards may be given to the prominent energy achievers
- Circulate the success stories as energy conservation measures

***Practice-8: Fire Extinguishers (FE) System:***

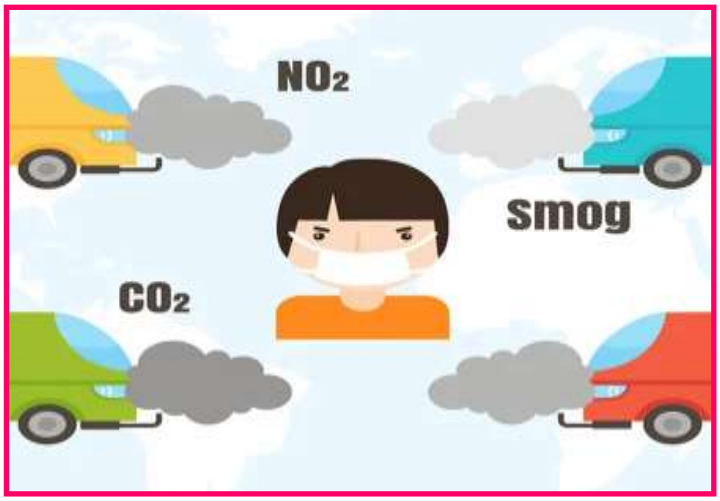
- A good amount of team members should be given training in FE handling and the list (along with photo) must be pasted in prominent places
- The FEs with $CO_2$ will harm the ozone layer or contribute to global warming
- Try with environmental and user-friendly Halons in the Fes
- Recommended to provide Training to the Faculty, Securities & Students also
- Place a board near to each FEs; indicating the persons who can handle the FEs at any emergency situation.

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## 8. ESTIMATION OF $CO_2$ EMISSION & NEUTRALIZATION

**(ELECTRICITY & MATURE TREES)**

## PART-B: ENVIRONMENT AUDIT REPORT



***8.1: Assessment of Annual Energy Usage:***

Table-5 shows the types of energy carriers used for their regular operation in the college campus along with application area and their source.

**Table-5: Energy Carriers, Application area and their sources used for College Operation**

| S. No. | Type of Energy Carrier | Application Area | Source of Procurement |
|---|---|---|---|
| 1. | Electricity (LT Service) | Powering to all electrical / electronic / HVAC equipments | From TANGEDCO |
| 2. | Mature Trees | **100** mature trees of different varieties with more than 10 years old. | |

***8.2: Environmental System: $CO_2$ Balance Sheet:***

The following tables provide the balance sheet indicating various energy carriers associated with the regular activities and their $CO_2$ mapping.

**Table-6: Environmental System: $CO_2$ Balance Sheet**

| S. No. | Annual Energy Consumption & $CO_2$ Emission | | | Annual $CO_2$ Neutralization | | |
|---|---|---|---|---|---|---|
| | Description | Energy Quantity | $CO_2$ Emission (Tons) | Description | Parameters | $CO_2$ Neutralized (Tons) |
| 1. | Electrical Energy | 12,230 kWh | 10.0 | Solar PV | 9,285 kWh | 7.6 |
| | | | | Mature Trees | 100 Nos | 2.2 |
| Total Emission | | | 17.1 | Total-Neutralized | | 9.8 |
| It is observed that the Sri Sarada College of Education, Sale, is Almost Net Zero Carbon Emission Campus | | | | | | |
| Balance $CO_2$ to be Neutralized = 0.2 Tons/Annum & Per Capita $CO_2$ Consumption = 1.4 kg/Annum [1] | | | | | | |

([1] Total strength of students, teaching and technical staff = 139)

***8.3: Calculation Table:***

For Electricity $= \left[\text{kWh x } \frac{0.82 \text{ kg of CO2 emission}}{\text{kWh}}\right]$

A mature tree is able to absorb nearly $CO_2$ at a rate of 21.8 kg/annum; hence total $CO_2$ to be neutralized is $\frac{(21.8\ x\ 100\ )}{1{,}000} = 2.2\ \frac{\textbf{Tons}}{\textbf{Annum}}$

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## PART-B: ENVIRONMENT AUDIT REPORT

# 9. REFRIGERANT GASES IN AC SYSTEM

# &

# CLEANING AGENTS

***9.1: List of Air Conditioning System along with its Refrigerant:***

Most of the AC system has **R-22** as refrigerant which has **Global Warning Potential (GWP) of 1,810** and **Ozone Depletion Potential (ODP) is Medium**.

**Table-7: List of Multi-variant AC System available in the SSCE**

| S. No. | Location | Star Rating & TR Capacity | Quantity | Refrigerant Used |
|---|---|---|---|---|
| 1. | Guest Room | 3 Star / 1.5 Ton | 1 | R-22 |
| 2. | Controller Room | 3 Star / 1.5 Ton | 1 | R-22 |
| 3. | Seminar Hall | 3 Star / 1.5 Ton | 2 | R-22 |
| 4. | Theatre | 3 Star / 1.5 Ton | 2 | R-22 |
| 5. | Computer Room | Window AC – 2 Ton | 3 | R-410 A |

- **Note:** The most environment-friendly refrigerants that are available in Indian market currently are "R-290" and "R-600A". They are Hydrocarbons and their chemical names are "Propane" for R-290 and "Iso-Butane" for R-600A.
- They are completely halogen free, have no ozone depletion potential and are lowest in terms of global warming potential. They also have high-energy efficiency but are highly flammable as they are hydrocarbons. (Kindly refer: https://www.bijlibachao.com/air-conditioners/comparison-of-various-refrigerants-r-410a-r-22-r-290-r-134a-used-for-air-conditioners-and-refrigerators.html).

| Refrigerant | Global Warming Potential | Ozone Depletion Potential |
|---|---|---|
| R-22 | 1810 | Medium |
| R-410A | 2088 | Zero |
| R-32 | 675 | Zero |
| R-134A | 1430 | Zero |
| R-290 | 3 | Zero |
| R-600A | 3 | Zero |

***9.2: Use of Chemical for Vessels & Floor Cleaning:***

In order to maintain hygiene in the College campus; the administration regularly clean the floors and restrooms. In addition to this, the hostel management has to monitor i) the cleaning of vessels, kitchen floor, dining hall, store room and gas station. Table-6 shows the cleaning agents used to clean the above mentioned area;

**Table-8: Cleaning Agents used for Floor and Toilet Cleaning**

| S. No. | Cleaning Agent | Application |
|---|---|---|
| 1. | Soap Oil & Bleaching Powder | Floor Cleaning |
| 2. | Cleaning oil | Toilet Cleaning |
| 3. | Fragrant Faneuil | Fresher |

***9.3: Recommendations: Eco Friendly – Green Cleaning Agents:***

- On an average; the cleaning agents used today have about 62 harmful chemicals like Paraben, Phosphates or Chlorides. A lot of them are multi-purpose cleaners
- It is recommended to use natural ingredients like orange peel extract & vinegar. It leaves a mild and pleasant fragrance after use. The formula is free from all harmful chemicals & toxins. It is pH-neutral, gentle on the skin as well as on the surface where it is used
- Also these products are **IGBC GreenPro** certified. GreenPro is a mark of guarantee that the product is environment friendly throughout its life cycle
- Fig. 2 shows the sample eco-friendly Green Pro certified cleaning agents


**Fig.2: Green Pro Certified Eco-Friendly Cleaning Agents (ZERODER)**

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## PART-C: GREEN AUDIT REPORT

# 10. WATER UTILIZATION, CONSERVATION & WATER MANAGEMENT

***10.1: Source of Water, Storage and Distribution:***

Table-9 shows the source of water, location of storage along with their application.

**Table-9: Source of Water, Location of Storage and Application**

| Type of Water | Source | Application |
|---|---|---|
| Well Water | Located near the hostel | Drinking & Cooking |
| Rain Water | Collected from i) buildings run off and ii) road run-offs | Used to increase the ground water level |

***10.2: Treated Water for Drinking Application:***

- The college management is keen on providing uninterrupted, safe and healthy drinking water to all; throughout the year.
- Water dispenser are provided at appropriate places offering the treated RO water for the students (Both Normal and Hot temperature)
- The overhead tanks storing the well water are cleaned at regular intervals and the water management team has been maintaining a cleaning schedule


**Fig.1: Water Source inside the College (Open Well)**


**Fig.2: Water Dispenser & Water Usage**

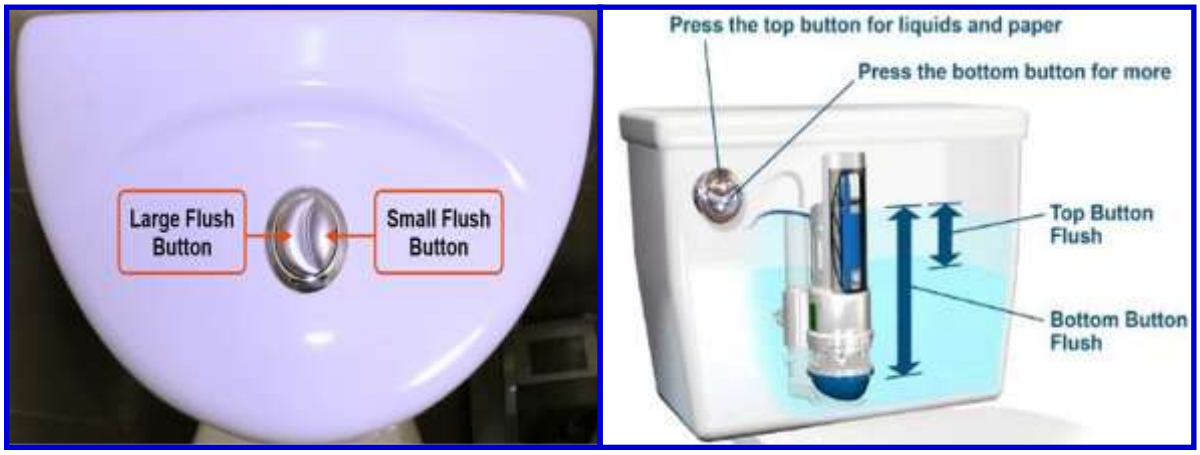
***10.3: Water Savings in Foreign Toilets:***

- The list of availability of Indian & Foreign style toilets are presented in the below Table-10.

***Table-10: List of Indian & Foreign Style Toilets***

| S. No. | Location | No. of Toilets | |
|---|---|---|---|
| | | Indian | Foreign |
| 1. | Ground Floor | 5 | 5 |
| 2. | Main Building-I Floor | 1 | – |
| 3. | Main Building-II Floor | 1 | – |
| 4. | Main Building-II Floor | 1 | – |
| 5. | Block No II-I Floor | 2 | – |
| 6. | Hostel area | 10 | – |
| **Total** | | **20** | **5** |

- In general the flush tank capacity may be 8 to 10 Liters (depends on make and model). Water savings also leads to power saving it saves the operating duration of the water pumps directly.



***10.4: Rain Water Harvesting (RWH) – from Building Roof Area & Run-off Area:***

- The audit team appreciates the effects taken by the management of **SRI SARADA COLLEGE OF EDUCATION (AUTONOMOUS),** for harvesting the rain water almost in all buildings.
- The roof area is so arranged to collect the rainwater and then passed through proper piping system, and then bring back to the RWH pits which are located close to each pit
- The building run off are collected through each pit mostly located in each building. Common area and road run-off are properly collected and routed to nearby water body.


***10.5: General Recommendations for Rain Water Harvesting:***

- Similar to numbering, all the RWH has been fitted with their specifications indicating their i) year of installation, ii) approximate average rainfall and duration, and iii) filter cleaning schedule (if any).
- Conduct a GIS based study on the improvement of ground water table especially before the rainy session and after rainy session.


**Fig.3: Sample Rain Water Harvesting (RWH): Storage and Name Board Representation**

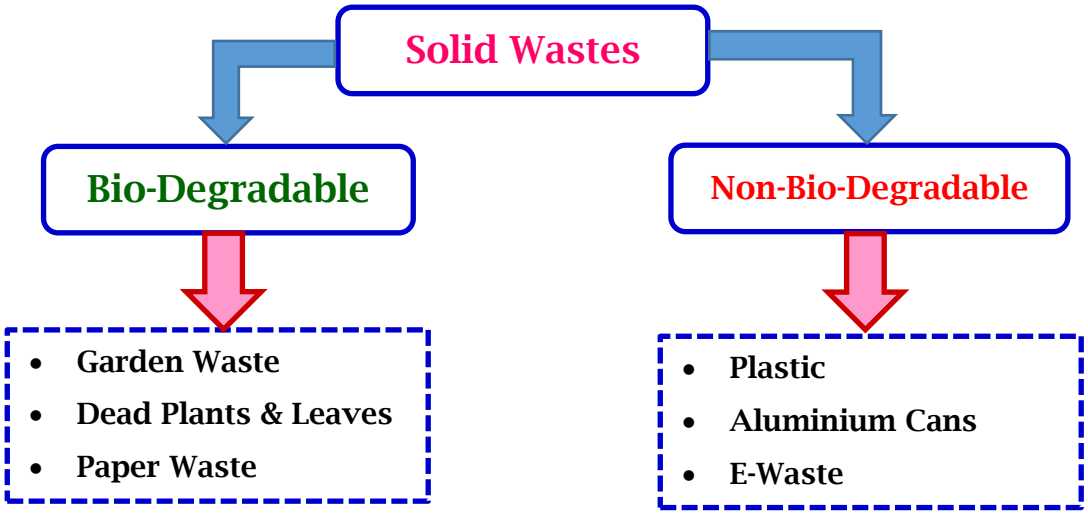
# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## PART-C: GREEN AUDIT REPORT

# 11. WASTE HANDLING & MANAGEMENT

***11.1: Solid Waste Management System:***

Different types of wastes generated inside the college premises are represented in the block diagram given below.




***11.2: Solid Waste Management:***

The college management practised some methods to treat the waste generated and Table-11 shows the process of treating the solid waste generated inside the college campus.

**Table-11: Process of Waste Management**

| S. No. | Waste Type | Waste Treatment |
|---|---|---|
| **Bio-Degradable Waste Management** | | |
| 1. | Garden Wastes and Plant Leaves | Daily collected and dumped in a yard |
| 2. | Paper Waste | Collected and stored in a separate place |
| | | Sold to third party for recycling |
| **Non-Bio-Degradable Waste Management** | | |
| 3. | Plastics | Banned in the college campus (Welcome step). |
| 4. | Batteries | Procuring new batteries with buyback offer (old battery replacement) |
| 5. | E-Waste Management | Used for sale to third party for recycling |

***11.3: General Note:***

- Prepare a flow chart for collection of E-waste from Generation to Disposal and paste it on appropriate places
- An electronic weighing scale (with suitable capacity) must be installed in the storage yard and should be properly calibrated
- One emergency lamp (with UPS supply) must be installed along with suitable fire extinguisher. Ensure proper ventilation in the yard
- Form rule for declaring the waste as E-Waste & Assign the singing authorities
- Identify a third-party vendor to procure the E-waste from the college

- Establish MoU with that party. Disseminate the following information at appropriate places i) E-Waste Policy, ii) Process Methodology, iii) Copy of MoU with third party vendor, iv) Contact persons mobile number and E-mail.
- Identify certain vehicle to carry the waste from generation to storage yard
- Provide training to the man power who are handling the waste
- Maintain separate Delivery Challan, Billing, weighing mechanism for handling the E-Waste
- Update the status of E-waste (through digital circular) to all the concerned management representatives, faculty members and staff at regular intervals (month wise is good)


SRI SARADA COLLEGE EDUCATIONAL TRUST
SALEM – 636 016.

MISCELLANEOUS RECEIPT

No. 1081 Date 11.7.22

Name Newgen Energy Systemms

Class Sale of old battery 4 Nos × 1800/-
(SSCoE Education)

Received the sum of Rupees Seven thousand two hundred only.

Rs. 7200/-

Vinayaka Priya
For Secretary

Antony

SRI SARADA COLLEGE EDUCATIONAL TRUST
SALEM – 636 016.

**Fig.4: Solid Waste Management (Collection, Segregation, Storage & Safe Disposal)**

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

## PART-C: GREEN AUDIT REPORT

# 12. ASSESSMENT ON MATURE TREES, GREEN ENERGY GENERATION & BIO-DIVERSITY

***12.1: Campus Greenery:***

The college is completely covered with mature trees grown for more than 10 years. The total number of mature trees available in the college campus is ***100 with many varieties of trees.***

**Table-12: List of Mature Trees available in the College Campus**

| S. No. | Location | Name of the Tree | Botanical Name | Quantity |
|---|---|---|---|---|
| 1. | Surrounding the entire campus | Rosy trumpet | Bignoniaceae | 15 |
| 2. | | Spanish cherry | Sapotaceae | 10 |
| 3. | | Fountain tree | Bignoniaceae | 8 |
| 4. | | Indian almond | Combretaceae | 12 |
| 5. | | Alexdranian Laurel | Clusiaceae | 10 |
| 6. | | Pongam tree | Fabaceae | 5 |
| 7. | | Neem | Meliaceae | 10 |
| 8. | | Indian Laurel | Moraceae | 13 |
| 9. | | Fountain tree | Bignoniaceae | 12 |
| 10. | | Betel nut | Arecaceae | 05 |
| **Total** | | | | **100** |


Total No. of Mature Trees available in the college campus is 100 which contributes for reduction of 2.2 Tons of $CO_2$ emission/Annum

***12.2: Roof Top Solar Photovoltaic System:***

The college has installed solar PV plants with a capacity of 4 kW (2 + 2), generate and feed power to the i) Main Building and ii) Library.

**Table-13: Technical Specifications of the Roof Top Solar PV Panel**

| | |
|---|---|
| Total Capacity (kWp) | 4 kW |
| Location of SPV Plant | Roof of the Main Building |
| Panel Orientation & Availability of Tracking | North – South & Nil |
| No. of Inverters | 2 Nos |
| Power Rating | 250 W & 265 W |
| Synchronizing Point | Main Building & Library |
| Year of Installation | 2014 |


Expected Energy saving from solar PV system (from the installation) is ***9,285 kWh*** which reduces **7.6 Tons of $CO_2$ Emission**

**Fig.5: 4-kW Roof Top Solar Plant & Inverter System**

***12.3: Recommendations to Grow Indoor Plants as Natural Air Purifier:***

- Indoor plants not only do plants look good while bringing life to our living space, they also help purify the air, according to a NASA study that explains that even a small plant inside the workspace can help remove at least three household toxins (benzene, formaldehyde, and trichloroethylene)

**TULSI: Generates more oxygen per day**

**Aloe Vera:**

- **Removes benzene and formaldehyde**
- **Eliminate harmful microorganism and absorb dust**

**Snake Plant:**

- **Removes Xylene, Benzene, Formaldehyde, Trichloroethylene toxins.**

**Spider Plant:**

- **Removes CO and Formaldehyde**
- **Absorbs Nicotine**

**Money Plant (Devil IVY):**

- **Best air purifying plant**
- **Remove benzene & Formaldehyde**

**Bosten Fern:**

- **High humidity application**
- **Remove xylene & Formaldehyde**

**Chrysanthemum:**

- **Removes Ammonia, Xylene, Benzene & Formaldehyde**

**Kimberly Queen Fern:**

- **Works well in carriage**
- **Absorb vehicular exhaust**

***12.4: Bio-Diversity in the Campus:***

- Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world.
- Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life.
- Biodiversity supports everything in nature that we need to survive: food, clean water and shelter.
- **SRI SARADA COLLEGE OF EDUCATION (AUTONOMOUS) is blessed with more varieties of resident birds (species always living inside the campus)** and amphibians (Amphibians are small vertebrates that need water, or a moist environment, to survive).

***12.5: Recommendations to maintain Bio-Diversity:***

- **Bird Sighting and Survey:** Conduct a dedicated bird sighting and identify the list of birds both residing birds and migratory birds available in the college campus
- Prepare the list of birds with their local name, scientific name, their average life time, nesting facility created by the bird and photo of the bird. Show case the result to all the stake holder and inculcate a habit of friendly environment
- Discuss with the ornithologists and facilitate the environment with more birds coming to the campus and especially migratory birds.
- **Reptile & Amphibian survey:** Similar to bird survey; conduct a survey to list the amphibians available in the campus
- Amphibian and reptile surveys are often performed as part of the Green Audit process or terrestrial survey. These surveys are effective at detecting the presence of even the most elusive species.

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

# 13. AUDIT SUMMARY & CONCLUSION

***I. Energy Conservation & Management – Electrical Energy:***

- In a phased manner, ceiling fans must be changed from conventional fans into BLDC fans. Also change FTL into LED with adequate illumination levels
- Implement automatic street light controller to turn on and off based on different time in a day. Use astrological timer for better results and energy savings
- Diesel flow meter must be fitted with each DG and calculate the UPL accurately
- Prepare suitable formats for all energy consumption and regularly follow the records. At regular intervals conduct internal audits to assess the effectiveness of the practice. Make proper corrections; if it deviates from the standard operating procedure

***II. Water Conservation & Management:***

- Install Sewage Treatment Plant (STP) of suitable capacity and treat the waste water
- To check the quantity of water utilized by each buildings by connecting digital water flow meter and optimize the water usage
- Prepare and maintain a Single Line Diagram (SLD) for water distribution network
- Try to reduce water tapped from the ground water source since it is not environmentally friendly
- Paste water and energy saving slogans at appropriate places
- Generate your own power and water for regular activities and move towards Net Zero Energy and Net Zero Water Building
- Retrofit aerator-based water taps for good water savings. For hand washing applications, all the pipes must be fitted with aerators
- Captures almost 100 % rain water harvesting through i) Recharging pits and ii) Open well type storage pits
- Install sensor-based water controller in each Over Head Tanks and reduce the water waste and power required to operate the pump
- Awareness campus must be conducted to all the stakeholders at regular interval. Through this initiative; Painting, Photography, Slogan and Poster making contest are conducted to create consciousness among the students and faculties

***III. Waste Management:***

- Cotton, Syringe, Needles are to be kept separately as these are treated as Bio-Medical wastes
- **Yellow dust bins** must be placed to collect these bio-medical wastes
- After COVID; mask, sanitizer bottles, gloves and other medical items must be trashed only through the yellow bins
- This must be informed to all the students and stakeholders. Suitable steps have to be taken to disseminate this information
- All the solid wastes are to be properly stored in a separate place and should be maintained as a record mentioning its quantity

- **Reduction of Paper:** Workout a policy to move towards paperless office. Present system of paper usage may be reviewed and wherever possible; digitalize the activities and reduce the paper
- Make attendance report, feedback, payments, salary slip in digital platform and if necessary take prints (only office copy)
- Adopt College Management System (CMS) and try to automate
- Automation saves energy, saves man power, saves paper, leads to better transparency, efficient man power utilization and thus saves cost

***IV. Impart Training to Faculty and Technical Staffs:***

- **Energy Conservation and Management**
- **Environmental impact and assessment**
- **Fire and Safety (Operation and Handling)**
- **Electrical maintenance, AC, Battery Maintenance & Safety**
- **Emergency Preparedness**
- **E-Waste & Solid Waste Management**
- **General Medical Camps for Employees**

***V. Way Forward towards Energy & Environmental Sustainability:***

- Prepare an exclusive **Energy and Environment Policy** based on the energy and environment practices followed in the campus. This must reflect the i) Present energy consumption & generation, ii) Projection of energy need, iii) Commitment by the college to conserve energy (in terms of percentage), iv) Road map to achieve the commitment, v) Facilities needed to achieve the same, vi) Roles and responsibilities of all stake holders, vii) Interim and final review mechanism, viii) Corrective measures, if the results deviates from the committed value and ix) Benchmarking, Case study preparation, Knowledge sharing and rewards
- Implement ENCONs and best operating practices proposed in the audit report and measure the results
- Working towards Net Zero Energy and Net Zero Water Campus and achieve **Platinum rated Global Leadership campus (as per IGBC rating)** and/or **5-star rated campus** (as per GRIHA rating) and/or **GEM-5 rated campus** (as per ASSOCHEM GEM rating)

# COMPLETION OF THE REPORT

This report is prepared as a part of the Energy, Environment and Green Audit process conducted at **SRI SARADA COLLEGE OF EDUCATION (AUTONOMOUS),** Sarada College Road, Fairlands, Salem - 636 016, Tamil Nadu, India by **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING,** Coimbatore – 641 062.

# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

***ANNEXURE:***

**AUTHORISED CERTIFICATES OF THE AUDITOR**

Reg No.: EA-27299

Certificate No.: 9645/19

# National Productivity Council

(National Certifying Agency)

## PROVISIONAL CERTIFICATE

*This is to certify that Mr./ Mrs./ Ms.* **SIVARASU SULUR RATHINAVELU**

*son / daughter of Mr.* **P RATHINAVELU** *has passed the National certification Examination for Energy Auditors held in September 2018, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India. He / She is qualified as* ***Certified Energy Manager*** *as well as* ***Certified Energy Auditor****.*

*He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for Accredited Energy Auditor and issuance of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.*

*This certificate is valid till the Bureau of Energy Efficiency issues an official certificate.*

Digitally Signed by:K V R RAJU
Mon Apr 22 16:22:42 IST 2019
Controller of Examination, NPC AIP Chennai

Place : Chennai, India
Date : **22nd April, 2019**

**Controller of Examination**

TÜV NORD

**ISO 14001:2015 Lead Auditor**
**(Environmental Management Systems)**
**Training course**

it is hereby certified that

**Dr. S. R. Sivarasu**

has successfully completed the above mentioned course and examination

08th - 12th December 2017

Coimbatore, India

Certificate No. 3521 2982 02
Delegate No. 71968

for TÜV NORD CERT GmbH

Essen, 2018-01-11

Course 18125 is certified by CQI/IRCA and meets the training requirements for those seeking certification under the IRCA EMS auditor certification scheme.

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.com

CQI | IRCA CERTIFIED COURSE

CQI | IRCA APPROVED TRAINING PARTNER

IGBC

Confederation of Indian Industry

The Indian Green Building Council

hereby certifies that

**Sivarasu S R**

has successfully demonstrated knowledge on the Green Building Design & Construction, Building Standards & Codes, IGBC Resources & Processes and Green Design Strategies & their Impacts, required to be awarded the title of

IGBC Accredited Professional

**K S Venkatagiri**
Executive Director
CII-Godrej GBC

**V Suresh**
Chairman
Indian Green Building Council

**Gurmit Singh Arora**
Vice-Chairman
Indian Green Building Council

200239

20 June 2020

GRIHA

# GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT

## GRIHA CERTIFIED PROFESSIONAL CERTIFICATE

This is to certify that

*Sivarasu sr*

has qualified as a **GRIHA** Certified Professional For V. 2015

Date of issue: 18th September 2020

Note : This certification is valid only for GRIHA version 2015.

Chief Executive Officer
GRIHA Council

Confederation of Indian Industry

This is to certify that

**SIVARASU S R**

is a

**CII Certified Professional in Sustainable Waste Management**

**K S Venkatagiri**
Executive Director
CII - Godrej GBC

**Pradeep Bhargava**
Chairman
CII GreenCo Council

IGBC

e-Learning

Issued by CII Sohrabji Godrej Green Business Centre

HSSERisk Academy

# CERTIFICATE

## OF APPRECIATION

EMPOWERING PEOPLE THROUGH KNOWLEDGE TRANSFER

THIS CERTIFICATE IS AWARDED TO

*Sivarasu Rathinavelu*

FOR SUCCESSFUL COMPETION OF TRAINING COURSE ON

ISO 14064-1:2018
ISO 14064-2:2019
ISO 14064-3:2019
ISO 14066:2011
ISO 14067:2018

AND CERTIFY HIM/ HER AS

**IMPLEMENTOR & AUDITOR**
**CARBON FOOTPRINT MANAGEMENT**

This certificate is awarded for successful completion of Global Virtual Training course conducted from August 27, 2021 to September 01, 2021. It's serves as a proof of his/her knowledge, competence and ability to implement, verify and validate carbon footprint as per above mentioned standards and methods. This certificate was awarded on August 01, 2021.

01.09.21
DATE

SIGNATURE

0100202110006

HSSE Risk
MANAGEMENT SERVICES
www.hsserisk.com