

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

DETAILS OF THE CLIENT

KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Nanjanapuram, Erode - 638 107, Tamil Nadu, India



DATE OF AUDIT

28 MAY 2021

(Audited and Accounted from June-2020 to May-2021)

AUDIT CONDUCTED AND SUBMITTED BY

RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING

(Chennai ♦ Coimbatore ♦ Erode)

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1.0: Preface about the Institution:

- **Kongu Arts and Science College, an Autonomous Self Financing Co-Educational Institution** affiliated to **Bharathiar University, Coimbatore** is located in a serene atmosphere at Nanjanapuram village, Erode, Tamilnadu. It was established in the year **1994** by the Kongu Vellalar Institute of Technology Trust. The Trust with 41 dedicated Trustees has built a strong foundation for the Institutional development and it is due to their tireless efforts, the Institution has carved a niche for itself in the academic circle. It is an **ISO 9001-2015** certified Institution and it has also been re-accredited by **NAAC with B+ grade in 2018**. Enthroning its gracious educational contribution, the Institution had received its **Autonomous status in the year 2015-16**
- Since inception, the College has been playing a pivotal role in the great expansion of knowledge of the rural youth coupled with the basic essence of Ethics and Social responsibility

1.2: Vision:

- To impart knowledge and skills to rural youth in order to meet their intellectual and social aspirations and cultural and technical needs of the society

1.3: Mission Statement:

- ✓ To develop an effective curriculum and optimise institutionalized student's activities
- ✓ To involve learners in practical life situations
- ✓ To expose students to rural realities
- ✓ To sensitize learners to National heritage and values

1.4: Objectives:

- To mould the rural youth as self-reliant and socially responsible citizens
- To facilitate the learners to hone their leadership qualities
- To equip the learners with updated technological knowledge
- To enhance the research activities of the rural youth and uplift them to serve the educational needs of the society

1.5: Quality Policy:

We are committed to instil Knowledge and Values to the students by providing quality education to meet the global challenges.

This will be achieved by:

- Well framed Syllabus to satisfy the needs of learners and on par with the global standard and industry requirements
- Committed and Planned teaching
- Continual upgradation of the Facilities and Resources

1.6: Major Activities in the Institution:



1.7: 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)
- To ascertain the best practices to be followed in energy conservation, energy management, recommended safety measures and continuous energy monitoring system
- **Environmental Audit:** Identification of history of activities, present environmental practices followed, monitoring records and known sources of environmental issues inside the college
- Adoption of natural resources as input (such as energy and water), processing and utilization and generation of wastes (including hazardous and toxic)
- Handling and storage of all types of wastes (Solid, liquid and gases), transportation of waste from source to yard, reuse and recycling possibilities, storage mechanism and effective disposal
- Measurement of effectiveness of pollution control (air, water and soil pollution), maintenance logs, emission test reports and routine analytical reports
- Providing constant awareness to all stakeholders on Environment impacts, risk analysis and Ecology
- **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 CO₂ due to green energy system and identification of possible implementation and enhancement of current greenery practices

EXECUTIVE SUMMARY

2.1: Analysis of Energy Audit Process:

A detailed audit was conducted in KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS), Nanjanapuram, Erode - 638 107, Tamil Nadu, India and the summary of the audit process is represented below:

S. No.	Description	Parameters
1.	Present Annual Energy Consumption	2,34,796 kWh + 4,560 kg of LPG
2.	Proposed % of Energy Savings	10.0 % Electrical + 5.0 % LPG
3.	Proposed Annual Energy Savings	23,480 kWh + 228 kg of LPG
4.	Proposed Financial Savings	Rs. 2.13 Lakhs
5.	Initial Investment Required	Rs. 4.00 Lakhs
6.	Simple Payback Period	Nearly 1.9 Years

2.2: Analysis of Environment Audit Process and CO₂ Balance Sheet:

S. No.	Energy Consumption & CO ₂ Emission			CO ₂ Neutralization		
	Description	Energy Quantity	CO ₂ Emission (Tons/Annum)	Description	Energy Usage	CO ₂ Neutralized (Tons/Annum)
1.	Electrical Energy	1,31,718 kWh	108.0	Solar PV System	31,805 kWh	26.1
2.	Diesel (Transport + DG)	20,756 Litres	54.8	Mature Trees	786 No's	17.1
3.	LPG Consumption	2,375 kg	7.1	Solar Thermal	7,600 kWh	6.2
				Biogas	3,825 kg	11.5
4.	Total Emission		169.9	Total-Neutralized		60.9
Balance CO₂ to be Neutralized = 109.0 Tons/Annum & Per Capita CO₂ Consumption = 0.03 Tons/Annum¹						

Audit Conducted and Verified by



(Dr. S.R. SIVARASU)

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3.1: Observations - Electrical and Thermal Energy Systems:

1. The college is using all types of energy judiciously and accountable
2. Due to COVID lockdown; the consumption of both electrical and LPG consumption are less
3. Electrical maintenance is now recording per day electricity consumption regularly
4. Diesel consumption and generator's running hours are properly recorded
5. Both supply side and building side earth pits are regularly tested and the values are within the Indian Standard (Also based on the soil condition)
6. Month wise LPG consumption is recorded
7. The annual consumption of electrical and thermal energy consumption from June-2020 to May-2021 is presented in the below table

Table-1: Annual Consumption of Electrical & Thermal Energy Parameters (2020-21)

S. No.	Month	Units Consumed (kWh)	Energy Generated (kWh)		LPG Consumed (kg)	Diesel Consumed (Litres)	
			from DG	From SPV		For DG	For Transport
1.	Jun-20	18,101	3,044	3,886	380	1,225	4,960
2.	Jul-20	15,962		5,902	380		4,800
3.	Aug-20	16,159		5,847	380		4,950
4.	Sep-20	16,576		5,204	190		4,800
5.	Oct-20	15,895	332	10,575	190	145	4,580
6.	Nov-20	14,857	244	7,574	0 ^{&}	105	4,350
7.	Dec-20	16,252		8,237	0 ^{&}		3,990
8.	Jan-21	14,346		7,785	570		4,920
9.	Feb-21	25,293	496	8,118	950	295	4,850
10.	Mar-21	32,610		9,584	1,140		4,950
11.	Apr-21	21,269		7,539	190		4,870
12.	May-21	27,476		0 ^{\$}	190		4,365
Average		19,566	343	6,688	380	148	4,699
Total		2,34,796	4,116	80,251	4,560	1,770	56,385
<p>➤ The cost of the electricity for SC No. 168 is Rs.8.50/kWh & for SC No. 169 is Rs.8.70/kWh. Similarly the cost of the LPG is Rs.52.51/kg.</p> <p>➤ Note: Due to continuation of the lockdown; the energy consumption pattern was reduced.</p> <p>➤ \$ - Due to COVID lockdown the power generation from SPV shutdown.</p> <p>➤ & - Earlier LPG stock was used.</p>							

3.2: Observations - Environmental Audit Process:

1. All the transport vehicles are having pollution certificates and maintaining the emission level within the Pollution Control Board limits
2. Chemicals, Acids and Salts used in the science departments are properly handled and disposed
3. The management wisely thinking and implemented a comprehensive Solid Waste Management (SWM) system. Based on the SWM procedure, all the degradable wastes are properly collected, segregated, stored and disposed
4. All types of non-gradable wastes are disposed through third party at regular interval

3.3: Observations - Green Audit Process:

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 786 with 20 varieties of trees.



Total No. of Mature Trees available in the college campus is **786** which contributes for reduction of **17.1 Tons of CO₂ emission/Annum**

3.4: Roof Top Solar Photovoltaic System:

- The installed solar PV plants with a capacity of 50 kW + 40 kW = **90 kW** in total, generate and feed power to the respective LT services and are utilized by the campus load.
- All the conductive parts are properly earthed at respective buildings and ensures safety.

Table-2: Specifications of Roof Top Solar PV Plant

Total Capacity (kWp)	50 kWp	40 kWp
Specifications of Individual Panel		
Location of SPV Plant	Main Block	BCA Block
Panel Orientation	North-South ; Fixed Orientation	
Availability of Tracking	MPPT (Software Based)	
Total No. of Panels	216 Nos	168 Nos
DC Bus Voltage	689 V	
Inverter Specifications		
No. of Inverters, Make & Model	1 No. DELTA - RPI M50	2 No's of Delta - RPI - M20A
Power Rating	55 KVA	20 kW each

Output Voltage and Frequency	400/230 V, 3P-4W, 50 Hz				
General Specifications					
Number of DC Earthing & Inverter Earthing	2 Each				
Frequency of Panel Cleaning	Monthly Twice (No schedule available)				
Average Units Generated per Day	200-250 Units per day		160-200 Units per day		
Year of Installation	2015		2014		
Annual Energy Generation/Year	2017-18	2018-19	2019-20	2020-21	2021-22
	1,20,777	1,30,613	87,650	80,251	31,805
Overall Energy Generation (Last 5-Years) - 4,46,746 kWh*					

(* Accounted up to October 2022)



Overall energy saving from solar PV system is **4,51,096 kWh** which reduces **369.9 ons of CO₂ Emission/Annum.**

3.5: Hot Water Generation using Solar Thermal System:

- The management has installed Solar Thermal system in the staff quarter's roof top and generates hot waters for bathing application



Annual energy saved from the solar hot water system used for bathing is **7,600 kWh** which reduces **6.2 Tons of CO₂ Emission/Annum.**

3.6: Bio-gas Plant Generating Cooking Gas:

- KONGU ARTS AND SCIENCE COLLEGE has implemented a Bio-gas (natural fuel) plant generating energy from food, vegetable wastes and toilet solids daily generated in mess and canteen
- Food waste generated from cooked rice, cut portions of vegetables and non-used



Annual savings of LPG is around **3,825 kg** which reduces **11.5 Tons of CO₂ Emission / Annum.**

4.0: RECOMMENDATIONS OF THE AUDIT PROCESS:

I. Energy Conservation & Management – Electrical Energy:

- Monitor the health of the APFC & FC. Fine tune reactive power based on the load condition
- Regularly clean the solar PV panel as per the prepared schedule and improve the power generation
- Optimize the STP blower operation and conserve the energy
- Check the belt tension and slippage by measuring the speed at regular intervals
- 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 Energy Management System (EMS) to accurately measure & monitor energy flow

II. Energy Conservation & Management – Thermal Energy:

- Regularly clean the stove burners and ensure that the flame should be in light bluish colour
- Use TCC painting on hot surfaces and reduce the exposed energy
- Try with radiant burner in dosa making machines and save energy.
- In future; plan to replace the existing Vapour Off Take (VoT) LPG layout into Liquid Off Take (LoT) system which saves good amount of LPG by reducing the left over LPG in the cylinder
- Efficiency of the boiler can be improved by regularly adopting the blow down process

III. Water Conservation & Management:

- 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 environmental 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
- Use the treated water at the maximum in whatever possible areas and try to minimize the fresh water intake (from any source)

- Set a policy and fix a target for usage of treated water; ensure that the plan is being executed without any deviation. Increase the % of usage of treated water year by year

IV. Waste Management:

- Cotton, Syringe, Needles are to be kept separately as these are treated as Bio-Medical wastes
- Fix flow meter in bio-gas output and continuously measure the gas output
- The food waste must be weighted and marked in a record before keeping into the digester unit. This must be checked with the amount of gas generated using suitable calculation and check with the designed output
- **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

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

COMPLETION OF THE REPORT

This report is prepared as a part of the Energy, Environment and Green Audit process conducted at **KONGU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)**, Nanjanapuram, Erode - 638 107, Tamil Nadu, India by **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING**, Coimbatore - 641 062.