GREEN AUDIT & CARBON FOOT PRINT REPORT
TECHNICAL REPORT NO. 50/2019

Shri Guru Gobind Singhji Institute of Engineering and Technology

GESTS

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GREENFIELDS ENGINEERS TECHNOLOGICAL SOLUTIONS

Hyderabad, Telangana

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1. Introduction

Green Audit

Green Audit is defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The 'Green Audit' aims to analyse environmental practices within and outside the Institute, which will have an impact on the eco-friendly ambience and sustaianbale ecosystem. It is an useful tool that can be used to understand existing practices and resource use to highlight the prospects of introducing resource effiency in the ecosystem. Green audit gives awareness on scope for improvement of environment and ecosystem of campus. Thus it is imperative that Shri Guru Gobind Singhji Institute of Engineering and Technology (SGGSIET), Nanded evaluate its own status on environemental sustainability and contribute toward a sustainable future.

On this background it becomes essential to adopt the system of the Green Campus for SGGSIET which will lead to resource efficiency and sustainable ecosystem and at the same time reduce a greenhouse gas emission into atmospeheres. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Green audit is assigned to the criteria 7 of NAAC, National Assessment and Accreditation Council which is a self governing organization of India which declares the institutions as Grade A, B or C according to the scores assigned during the accreditation. Moreover, it is part of Corporate Social Responsibility of SGGISIET to ensure that it contribute towards a sustainable future.

1.1 About Institute

Established in 1981, Shri Guru Gobind Singhji Institute of Engineering and Technology (SGGSIET), Nanded, is one of the promising leader institutions in technical education, research, and technology transfer. Since its inception, the institute is dedicated to students' centric learning and believes in pursuing academic excellence. It is having neat, clean and green campus spread over a land of 46 acres. It receives 100% grant-in-aid from Government of Maharashtra.

In less than 25 years of its inception, the Institute has made a mark in technical education and quality research which got endorsed by a third-party survey constituted by Government of Maharashtra and headed by Dr. F. C. Kohli, Chairman, TCS. Through that survey conducted in 2004, SGGSIE&T, Nanded is identified as an Institute which can be raised to the level of Center of Excellence along with three other well-established organizations such as College of Engineering, Pune; VJTI, Mumbai and ICT, Mumbai. The institute offers 10 undergraduate and 10 postgraduate programs. It also offers Ph.D. programs in most of the areas of Engineering under Swami Ramanand Teerth Marathwada University, Nanded and is also selected as a research center for faculty under QIP of Ministry of HRD, Government of India, New Delhi. Schemes of NDF of AICTE, Vishweshwarayya Ph. D. scheme of MeitY, Maulana Azad Scheme, and Institute research scholar scheme are the funded schemes for pursuing Ph. D. is available in the institute. The institute is granted autonomous status by the University Grants Commission since 2004. The

Institute has state-of-art equipment and machinery for teaching, research, consultancy and extension services. It has received substantial financial assistance for laboratory development and research from various funding agencies like AICTE, DST, BARC, NRB, etc.. apart from funding received under the three phases of world bank assisted TEQIP and from Government of Maharashtra. Institute has established DST-FIST sponsored laboratories. Faculty research abilities and efforts have culminated into establishment of a “Center of Excellence” in the area of Signal and Image Processing under TEQIP. In addition, the institute has established a center of excellence in Metal Forming, VLSI, and Solar Energy. The Institute fosters a very progressive and pragmatic approach in providing its services to all of its stakeholders.

The Institute has collaborations with a number of premier institutes (including foreign universities) and industries through which substantial opportunities like internships, credit transfers, and industry relevant projects. Recently the institute has signed MoUs for academic collaboration with Foreign Universities like CUNY CREST and Civil Engineering Department, The City University of New York, USA, Oakland University Michigan, USA, SAI Technologies, USA and Universiti Teknologi Petronas, Malaysia. MoU’s are also signed with Industry associations such as CMIA, Aurangabad, NIMA, Nashik, industries like TCS, Indus Aviation Pune, ChipSpirit Banglore, Mentor Graphics (A Siemens Business), etc.

The institute has established the industry supported laboratories like E-PASS laboratory sponsored by Emerson Automation Solution, Mumbai, Center for VLSI Design and Verification by Mentor Graphics, USA and NVDIA GPU Education Center, Pune giving a fillip to the research and skill development activities. The research culture of the institute has been proven through publication in peer-reviewed journals and reputed international conferences.

Institute has an excellent track record of publications with recent statistics as 1200+ peer-reviewed publications, 8000+ research citations, 25 patents filed and two awarded. Many faculty members act as reviewers for international journals and have published 46 books. Establishment of Innovation Laboratory, incubation center and participation of students in various innovation projects is a key feature of the institution. Institute organizes national level STTP, workshops, seminars, conferences regularly. Institute hosted three prestigious international conferences last year in collaboration with national and international premier institutes.

Students at SGGS bagged AIR-1 three times and several students in the top 100 in GATE examination every year. Also, students design and build a new vehicle every year by participating in Baja and Supra competitions. Students get exposure to a multidisciplinary and innovative project in the institute Innovation laboratory, which is kept open 24 X 7. Institute provides conducive environment and encouragement for improving student’s personality through students associations, various clubs, UPSC chapter, support for GATE, career guidance, organization of annual National level Technical event “PRAGYAA”, annual state-level sports event ZENITH, and cultural activities through UTSAV. Institute also supports initiatives for the overall development of students through participation in socially relevant projects and activities. Language laboratory and foreign language certificate courses such as German, Spanish and French, etc. are available to the students and faculty. Students bagged First prize in Smart India Hackathon 2017 to Team: Alphas for a

solution to the problem statement of Department of Biotechnology, Government of India. Another Team “continuum” was one among the first ten teams in Smart India Hackathon for the Problem statement of Department of Rural Development, Government of India. This year (2019) the vehicle secured third prize in Baja Competition, first prize in one of the Smart India Hackathons.

Institute boasts for having 25+ Placement MNC partners. Average placement record for the last five years is above 60%. Training and Placement Cell maintains a strong bond between the Institute and the Industry. The institute is having a very active Alumni network with SEAA (SGGS Engineers Alumni Association) as its front end registered organization.

Alumni Meet is organized annually on the campus. Recently, Alumni Meets were organized Abroad: the USA Meets 2015 at New Jersy and San Jose, Gulf Meet 2016 at Dubai, USA Meets 2016 at New Jersy, San Jose, and Atlanta.

The Institute has two buildings for boys’ hostel to accommodate 600 students and three buildings for girls’ hostel to accommodate 618 girls. In addition to this, the institute provides family accommodation to full-time Ph.D. students, guest rooms, medical attention, and hygienic food courts and mess. Institute library has separate two-storied blocks of 12400 Sq. ft. surrounded by lush green area. It has a stock of more than 56000 books and 4000 bound volumes of national and international journals. Institute currently subscribes 72 National and 59 International journals annually. Reading room of the library is having a capacity of 250 students, where readers find a conducive environment for reading and study. Library automation and subscription to many e-journals such as IEEE, ASCE, ASME, Springer and Science Direct, etc. have made the library a rich knowledge resource and repository. We make use of Turnitin for plagiarism check. Institute provides the common facilities like Auditorium, Open Air Theater, Departmental stores, and canteens on campus. The campus is having round the clock security, uninterrupted power supply, High-Speed internet (1GBPS from NKN and 300 MBPS from Jio) with Wi-Fi Connectivity throughout the campus. Institute operates a very efficient transport system with a fleet of 08 buses.

On the sports front, the institute provides indoor facilities such as air-conditioned well-equipped Gymnasium, Table tennis hall. Outdoor sports spacious arena include a volleyball court, basketball court, cricket turf wicket ground, 400 m athletic track, tennis clay court with floodlights and badminton court.

1.2 Vision and Mission

VISION

“Education of Human Power for Technological Excellence”

MISSION

- Dissemination of knowledge by offering world-class education
- Right to information for all stakeholders
- Promotion of sustainable industrialization to the development of appropriate technologies

- Continuing education programs for the reengineering of the regional socio-economic system in the light of dynamic, global technological changes
- Contribution to national wealth through innovation

Long range Goals:

- Strive for the center of excellence in all disciplines of the Institute
- Create a conducive environment for top class education, research, development, and extension
- Develop collaborative arrangements with premier institutions in India and abroad
- Become a world-class role model institute to attract international faculty and students
- Intervene for sustainable development of the region and improvement in the quality of life

Short range Goals:

- To strive for quality teaching, research and extension services
- To achieve the overall development of students and society
- To incorporate flexibility in curriculum design
- To adopt a dynamic student's evaluation system
- To introduce regional need-based courses
- To make the system responsible for maintaining the time schedule
- To develop strong relations with industries, institutes, and society
- To nurture industrial development based on regional resources
- To create, preserve and disseminate technical knowledge
- To promote competitive merit and excellence as the sole guiding criterion in the overall development of students
- To uplift the society by addressing the local and regional technical needs

1.3 Total Campus Area & Built-up area

The total area of the Institute is 46.47 acres (188057.42 Sq.M) in which built-up area is 43859.2 Sq.M.

Total Campus Area	188057.42 Sq.M
Built-up Area	43859.2 Sq.M

Table 1 Built-up and Total Campus Area

Built-up Area:

S.No	Department/Amenity	Built-up Area (Sq.M)
1	Civil Engineering	1250.00
2	Chemical Engineering	1053.07
3	Computer Science and Engineering	1504.97
4	Electrical Engineering	1250.00
5	Electronics and Telecommunication Engineering	2840.59
6	Instrumentation Engineering	1250.00
7	Information Technology	1460.82

8	Mechanical Engineering	1380.33
9	Production Engineering	1800.00
10	Textile Technology	1250.00
11	Administrative Building	5700.00
12	Classroom Complex	815.00
13	Departmental Building	6110.76
13	Godavari Hostel	1980.00
14	Krishna Hostel	4012.86
15	Nandagiri Boys Hostel	1770.00
16	Sahyadri Boys Hostel	10167.28
17	Devagiri Girls Hostel	960.00
18	Auditorium	1363.30
19	Rectors Quarter	190.00
20	Director Quarter	190.00
21	A-Type Quarter	490.00
22	C-Type Quarter	470.00
Total		**43859.2**

Table 2: Built-up area of the campus by building wise

2. Green Audit

2.1 Introduction:

The green audit study is involved in the assessment of the energy management, water management, waste management, use of renewable energy sources, implementation of rainwater harvesting structures and efforts of carbon sequestration methods.

This assessment requires data collection from the institute and an analysis of the components related to sustainable development.

Before visiting the institute set of questionnaires was shared with the Institute for data requirement under green audit study. Subsequently, on 26/06/2019 in Shri Guru Gobind Singhji Institute of Engineering and Technology (SGGSIET), Nanded a kick-off meeting was conducted with the staff and explained the overall requirements under green audit. This meeting held in the Institute also provided an opportunity data requirement and also had a discussion on the realities associated with the audit. The meeting provided an opportunity to gather information.

Figure 1 Management's Commitment

The management has shown keen interest and commitment towards the green audit. They are already in the process of implementing many environmentally friendly initiatives in the Institute like a rooftop solar plant, biogas plant, and rainwater harvesting etc. The management has also shown very interest in implementation of best practices based on the green audit study.

2.2 Objectives of the Study & Investigation

Green Audit is the most efficient study to understand and manage environmental problems. This study provides an opportunity to create a clean and healthy environment in the campus. The main objective of the study is to assess the energy management, water management, waste management, use of renewable energy sources, implementation of rainwater harvesting structures and efforts of carbon sequestration methods. This study also assesses the carbon footprint of the institute.

2.3 Areas of Green Audit

The green audit study focused on the following areas;

1. Water Management
2. Energy Management

3. Waste Management
4. Green Campus Management
5. Carbon Footprint of the campus

2.4 Methodology

The main objective of the study was to assess the best practices followed in the campus for environmentally friendly and sustainable development. The methodology is followed in the study was; preparation of questionnaire for the data collection, kick-off meeting with the management committee, a physical inspection of the institute, collection of documents and review of the same, interviewing responsible persons and data analysis and recommendations.

The methodology followed for the audit was comprised of three steps;

2.4.1 Data Collection:

In this phase, extensive data collection was collected using different tools such as physical observation, a survey with responsible persons and measurements. Data Collection was involved in qualitative collection method from primary and secondary sources.

- General information was collected through observation and interview.
- The project team visited each department, administrative buildings, common facility centers, library, canteen, and hostels.
- The energy consumption was collected from the tariff bills.
- Waste generation was measured directly at the source.

2.4.2 Data Analysis

Detailed analysis of data collected includes computation of energy consumption, analysis of electricity bill of the campus for one year, understanding the tariff plan provided by the Maharashtra State Electricity Distribution Co. Ltd. Data related to water usage were also analyzed using appropriate methodology.

2.4.3 Recommendations

Based on the data analysis and observations, some steps for reducing power and water consumption were recommended. Proper treatment methods for waste were also suggested.

2.5 Water Management

Nanded District lies between 18°16' to 19°55' North latitude and 76°56' and 78°19' east longitude in the eastern part of Marathwada Region, which corresponds to Aurangabad Division of Maharashtra. The district is bounded by Nizamabad, Medak and Adilabad districts of Telangana on the east, by Bidar District of Karnataka on the south, by Parbhani and Latur districts of Marathwada on the west, and Yavatmal District of Vidarbha region on the north. The geographical area of the district is 10502 sq km.

The climate of the district is generally dry except in monsoon season. The district gets 89% of the rain from south west monsoon. The rainfall increases from west to east. Average annual rainfall is in the range of 767 to 1285 mm with an average of 47 rainy days. The mean daily maximum and maximum temperatures are 13.1°C and 42° during December and during May respectively. The relative humidity is high during SW 4 monsoon season when it ranges between 60% and 80%. Winds are generally light during October to March and they get strength in the later half of the summer and south west monsoon season. Thunderstorms occur in summer and monsoon months. Their frequency being higher in June and September. Dust raising winds are common during summer afternoons. The main water bearing formation of the district is Alluvium, Deccan trap basalt and Granite.

On the other hand, the Hydrogeology of the area mostly comprises of the Basalt – Weathered/facture/joint vesicular/massive under phreatic and semi-confined to confined conditions with Alluvium – Sand and Gravel. The following table gives the abstract of the Ground Water Scenario of the district.

S.No	Description	Values	Remarks
1	Premonsoon Depth to Water Level	2.93 to 13.98 m bgl	
2	Postmonsoon Depth to Water Level	1.9 to 7.93 m bgl	
3	Premonsoon Water Level Trend	Rise: Negligible to 0.52 m/year Fall: 0.01 to 1.09 m/year	
4	Postmonsoon Water Level Trend	Rise: 0.01 to 0.68 m/year Fall: Negligible to 1.34 m/year	
5	Ground water exploration	72 (37 EW+26 OW+9 PZ)	
6	High yielding well	38 (Discharge > 3 lps)	
7	Depth Range	12.85 – 208 m	
8	Quality of ground water	Good suitable for drinking & irrigation purposes excluding few areas	
9	Occurrence of heavy metals	Traces of Pb, Mn & Cd in Tupa MIDC area & Nanded	

Table 3 Abstract of the Ground Water Scenario

SGGSIET, Nanded is the one institute in Nanded, depended on both Municipal Supply Water and Underground Water. It has been revealed during the investigation that the total demand of water for the entire institute is 250 – 300 KLD only and with this lesser quantity of water the institute is more focussing on the judicious use of water. Since, this institute itself has started with Water Management course as of the major subject right from the 1981 onwards and as one of the prime responsibility towards the environment, the institute is

being imparting training, demonstrating, educating and making awareness towards the judicious use of water, water conservation and harvesting.

During the course of study and investigation, it has been observed that the entire institute is well planned with the Paved areas and Unpaved areas (Greenery, Garden and Open grounds) and water demand to these areas in addition to the primary use is being systematically categorize with Municipal Supply and Underground water sources. It is has been observed that this Municipal water supply is being tapped through pumping from 7.5km away from the institute and this pumping main is connected to the Over Head Tank of the institute from where the water is being distributed through closed conduits by gravity to the respective departments/blocks/hostels etc in a controlled manner. The following table gives the details of the occupants of the water usage – *theoretically following the CPHEEO Norms.*

Theoretical Water Demand – As per CPHEEO					
S.No	**Description**	**Total No. Occupants**	**Theoretical Water Demand**		**Remarks**
			Water Demand (lpcd)	**Total Quantity (lpd)**	
1	Academic Blocks (3119)				
	Residence Scholars - Hostel	1346	135	181710	
	For Hostel Mess (Including Cooking)* - Boys & Girls		--	2978	Bottled Water
	Day Scholars	1773	45	79785	
2	Director & Rector Quarters	6	135	810	
3	A & C type Quarters	56	135	7560	
4	Teaching and Non-teaching staff	229	45	10305	
5	Other Skilled and Unskilled staff	242	45	10890	
GRAND TOTAL		**3652**		**294038.00**	

Table 4 Theoretical Water Demand – As per CPHEEO

** Bottled Water Consumption – As stated by the Institute.*

This Municipal water is supplied to the respective blocks and again from each block the water is being treated with Reverse Osmosis and is being consumed. On the other hand, with respect to the water bill (Reference No. ME/WW/&D/NWMC/2019 336,434, Dated: 31st March 2019) the total water consumption during the October 2018 to March 2019 is has follows:

ACTUAL MUNICIPAL WATER CONSUMPTION									
S.No	**Period of Consumption**		**Total No. of Days**	**Meter Reading**		**Consumption**		**Per Day Demand**	**Remarks**
				Initial Reading	**Final Reading**	**Cum**	**Liters**	**Liters**	
1	01/10/2018	31/03/2019	182	18522	23729	52070	52070000	286098.90	
	Add Bottled Water							2978.03	
	Grand Total							**289076.93**	

Table 5 ACTUAL MUNICIPAL WATER CONSUMPTION

Now, referring to the Table No. 1 & 2 it reveals that though the Actual Theoretical Water Demand is 294 KLD but the Municipal Consumption is 289 KLD i.e., about 98.30% of Municipal water is being used effectively.

On the other hand, for the unpaved areas, underground sources (About 7 bore wells) are being in use. These bore wells are also well planned and connected to the respective greenery, ground and garden areas such that the load of pumping and energy consumption is reduced to the extent possible. The following at table gives the details of the bore wells and its related features.

DETAILS OF EXISTING BORE WELLS										
S.No	**BH No.**	**Location**	**Depth**	**Pump Size**	**Areas of Greenery Serving**	**Yr. of Drilling**	**No. of Hours Bore Well Runs**		**Present Condition of the Bore wells**	
			Ft.	**HP**			**Summer**	**Rainy/ Winter**	**W**	**NW**
1	**1**	In front of BSNL Office	300	2	Front Garden	2013	2.00	5.00	Yes	No
2	**2**	Near Bus Parking	300	7.5	Krishna hostel, Admin building, Devagiri, (civil,textile,production)buildings	2019	2.00	6.00	Yes	No
3	**3**	Admin Building Back Side	300	7.5	Admin, Class room complex & Auditorium	2005	0.50	3.00	Yes	No
4	**4**	Back Side of E & T Engg Dept	300	7.5	Krishna hostel, Rector Quarter, Director Quarter & C-type	2013	3.00	5.00	Yes	No
5	**5**	Electronics Front Side	250	2	To Gardening for Front Landscape of campus & Infront of Electrical Eng Block	2003	2.00	6.00	Yes	No
6	**6**	Front Side of Departmental Building	65	3	To Departmental, Devagiri, C-Type & Rector Quarter		4.00	10.00	Yes	No
7	**7**	Near Nalla Bridge	300	---	Not Yet Commissioned	2019	---	---	---	---
8	**8**	Sahayadri Hostel Watchment Cabin Back Side	300	3	---	2015	2.50	6.00	No	Yes
9	**9**	Near New boys hostel mess substation	250	10	Near Sahayadri Hostel	2019	6.00	10.00	Yes	No

NOTE: W – Working; NW – Not Working

Table 6 DETAILS OF EXISTING BORE WELLS

This bore well water is being used to maintain the flora and fauna of the entire institute which is occupying about 26.65 acres of the total area (Built up area – 8.28 acres, Roads – 4.87 acres and Open Nallah – 0.85 acres – Reference to the contour layout map of institute). With this maintenance of flora and fauna within the institute it is clearly indicating that the underground water which is being taken is again giving back to the same source through maintenance and development of greenbelt.

And also, with one step ahead the institute is implemented the Rain Water Harvesting Structures for two blocks (Electronics & Textile Departments) wherein all the Rooftop rain water is being conveyed through the closed conduits and allowed to percolate/recharge the underground aquifer through filtration system.

Overall, the Water Management within the Institute is being taken up in well planned and controlled (as by understanding the precious and limited resource) in a sustainable manner.

2.5.1 Recommendations

- It is recommend to take up the Rain Water Harvesting Structure to all the blocks/Departments
- Planning of the entire Institute (for all types are areas) can be made rain water harvesting structure (small scale/medium scale/large scale reuse and recycle of water) in the lines of Zero Liquid Discharge concept
- Monitoring and Controlling of overflow of water through awareness and drills
- Monitoring and managing the filtration systems (RO's), its accessories and equipment's such that reduction in wastage of water and use of electricity.
- Periodical exercises and surprise visits by the concerned officials for the different departments, hostels and other areas to check the quantity of water being used and its management systems
- Minimum usage of water for the cleaning, washing and mobbing of the institute premises and is related equipment's and should maintain well below the permissible limits.

2.6 Energy Use

The institute has four transformers rated 400 KVA, 350 KVA, 250 KVA and 630 KVA over which a load is distributed as follows:

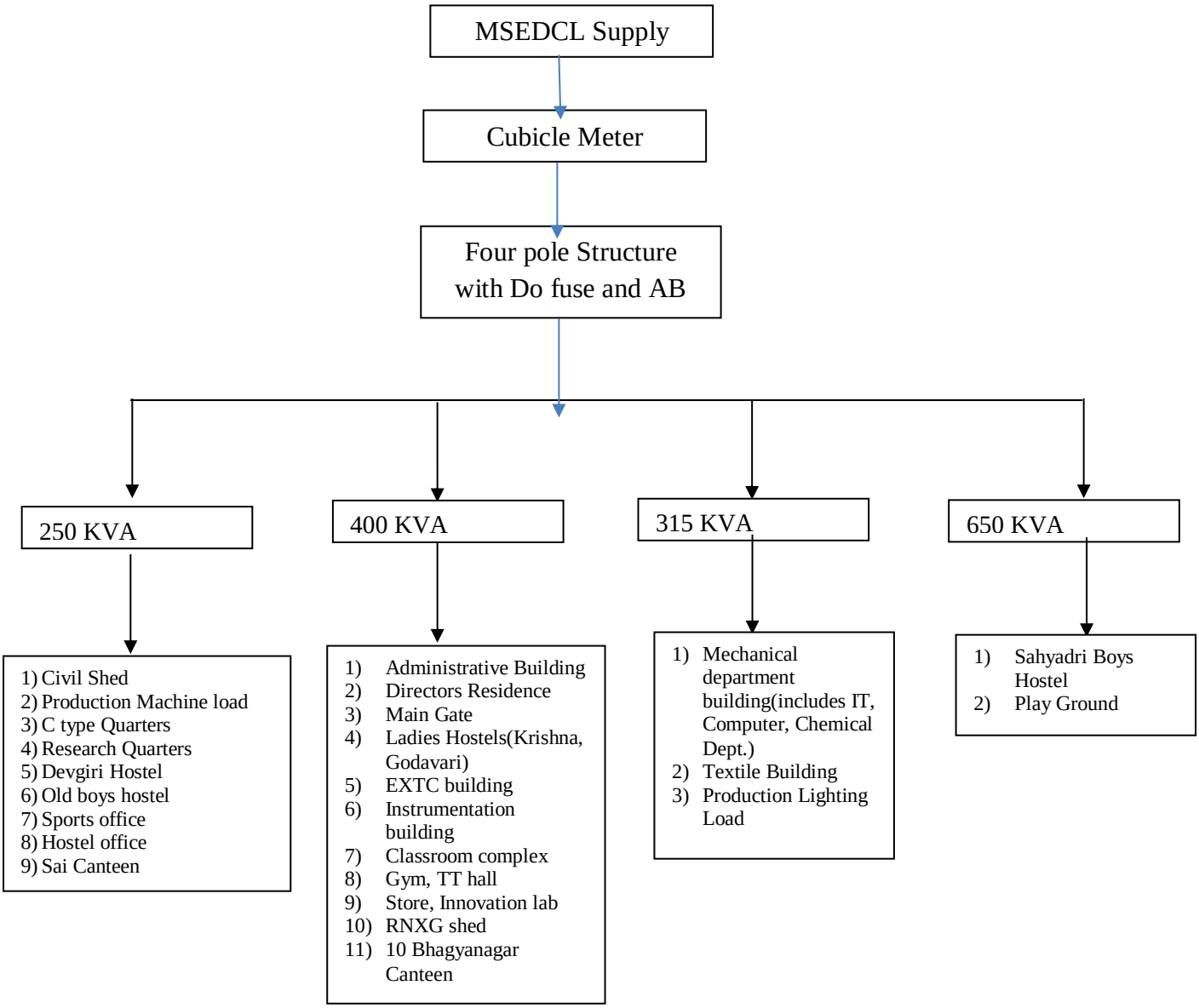

Figure 2 Substation Layout

During the audit, all the department electrical appliance and load details were collected by considering average operating hours of each load energy consumption which is used for estimation of electricity consumption for the campus. The detailed energy consumption of each building is presented below.

Location	Energy consumption (KWH)		
	Daily	Monthly	Yearly
Electrical dept.	131.8	3690.4	40594.4
Instrumentation	69.68	1951.04	21461.44

dept.			
EXTC dept	426.32	11936.96	131306.56
Textile dept.	43.57	1219.96	13419.56
Civil dept.	92.41	2587.48	28462.28
Production dept.	59.49	1665.72	18322.92
Mechanical dept.	104.26	2919.28	32112.08
Chemical dept.	44.05	1233.4	13567.4
CSE dept.	184.77	5173.56	56909.16
IT dept.	118.66	3322.48	36547.28
Admin Building	417.58	11692.24	128614.64
A Complex	43.92	1229.76	13527.36
Shed 1	83.16	2328.48	25613.28
Shed 2	78.71	2203.88	24242.68
Director Quarter	5.5	154	1694
Rector Quarters	7	210	2520
C Type Quarters	9	270	3240
Nandagiri hostel	136.54	4096.2	45058.2
Girls Hostel	242	7260	79860
Shyadri Hostel	587.55	17626.5	193891.5
Devgiri Hostel	56.78	1703.4	18737.4
Street light	80.45	2413.5	28962
Main gate	8.16	244.8	2937.6
Water Motors	304.35	8521.8	102261.6
Electrician quarter	11.41	319.48	3514.28
Total	**3347.12**	**95974.32**	**1067377.62**

Table 7 ***Daily energy consumption of different section of the institute.***

The daily energy consumption is represented in the below diagram which shows that Shyadri hostel consumes the largest amount of electricity in the campus.

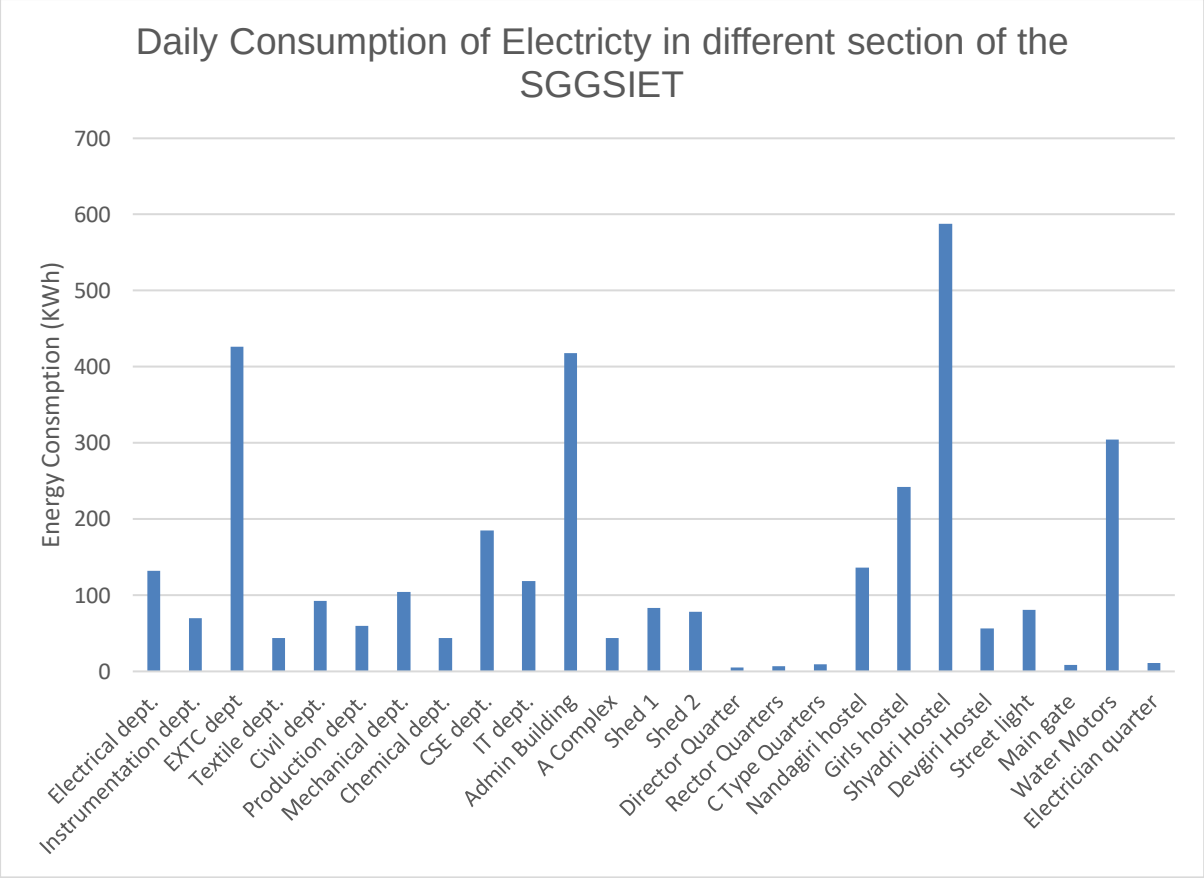

Figure 3 Daily energy consumption location wise

2.6.1 SGGS Energy Consumption Scenario

The SGGSIET campus import the electricity from Maharashtra State Electricity Distribution Co. Ltd.. The total electricity that was imported by the SGGSIET during the year 2017 and 2018. The monthly energy consumption of the campus is presented below for the years 2017 and 2018.

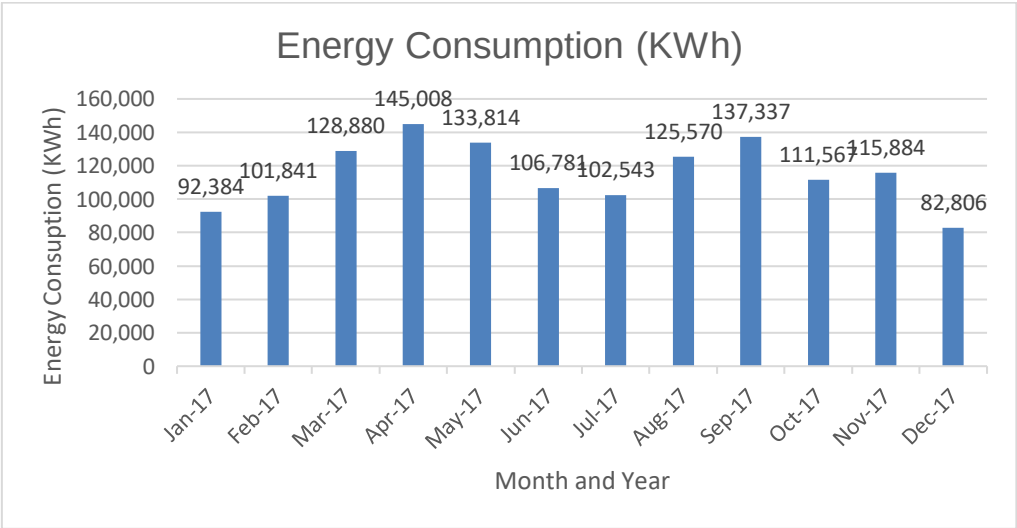

Figure 4 Energy Consumption in the year 2017

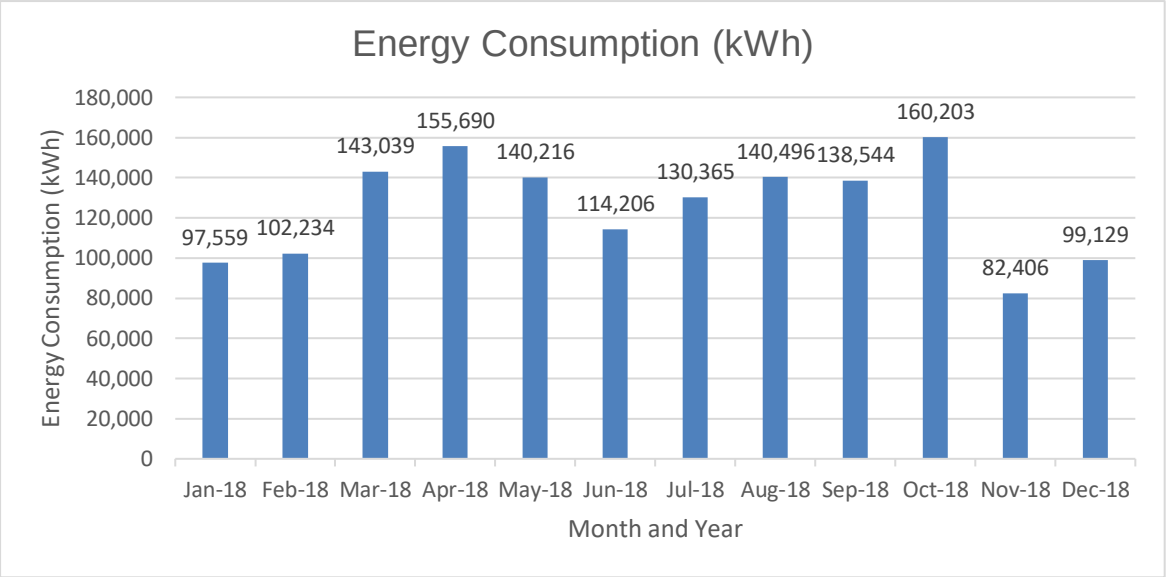

Figure 5 Energy consumption in the year 2018

The total energy consumption figure for the year 2017 and 2018 shows that the energy consumption is increasing year on year basis.

The electricity bill comprises two parts; one related to the energy consumed (per kWh or per unit energy consumed and other is the maximum demand charge (per KVA or maximum demand during the month). There also exists a penalty for low power factor. In addition to this, the energy charge includes a component based on time of use. The Time of Day (TOD) tariff as per the Maharashtra State Electricity Distribution Co. Ltd.

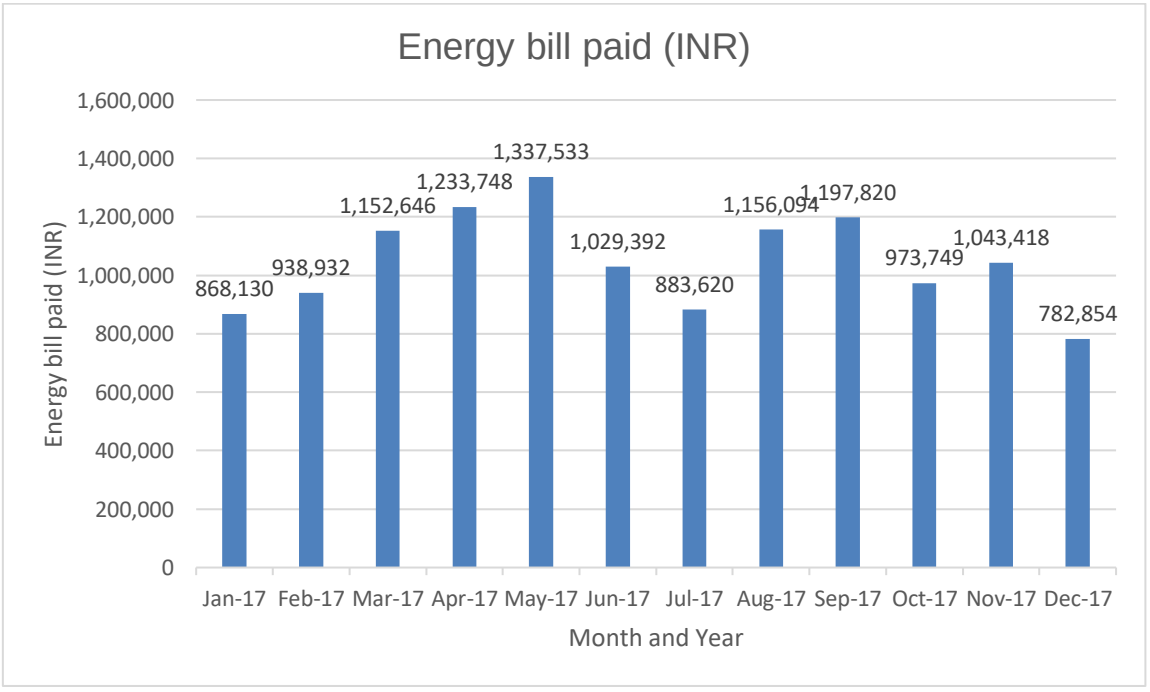

Figure 6 Energy consumption bill paid for each month in the year 2017.

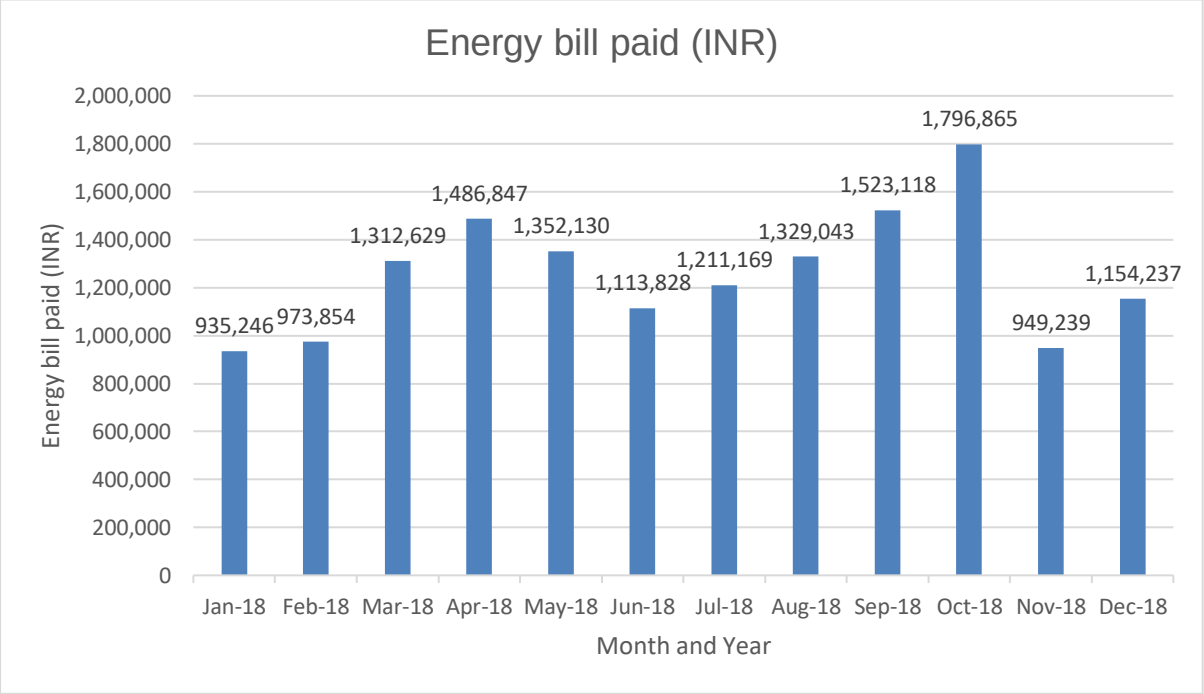

Figure 7 Energy consumption bill paid for each month in the year 2018.

2.6.2 Electricity use in the campus

Lighting and Fans

The institute has about 2091 Fluorescent tube lights in different departments and labs. Out of which 1091 tube lights fitted with electronic ballast and rest are with electromagnetic ballast. The institute is having 1980 fans in different departments, labs, and hostels. Out of which about 780 fans are fitted with resistance type regulator and rest are with the electronic regulator.

Department/Building	FAN	FLT and TFL Light	CFL	LED
Admin Building	238	521	0	0
Textile Engineering	61	138	0	0
Instrumentation Engineering	51	139	0	0
Information Technology	120	652	0	0
Production Engineering	61	102	0	0
Mechanical Engineering	82	318	0	0
Hostel	902	1284	200	303
Others	63	143	0	0
Chemical Engineering	66	160	0	0
Civil Engineering	117	260	0	0
Complex	45	112	0	0
Computer Science	111	655	0	0
Electronics and Communication	63	404	0	0

Total	**1980**	**4888**	**200**	**303**

Table 8 Total Fans and Lights in the campus

Air Conditioners

The total air conditioners are in the campus are 110 ,the detailed capacity of the ACs with department wise presented below.

AC Loads in various departments:

Department/Capacity	1 ton	1.5 ton	2 ton	3 ton
Admin Building	0	12	0	4
Electrical Dept.	0	0	0	2
Instrumentation Dept.	0	0	0	2
Electronics Dept.	17	4	2	16
Civil Dept.	3	0	0	0
Textile Dept.	0	0	0	3
Mechanical Dept	0	5	0	0
Computer Science Department.	0	0	10	4
I.T Department.	0	4	0	0
Chemical Department.	0	1	0	0
Production Department.	0	7	0	0
Sports Complex	0	6	0	0
Hostels	2	0	0	0
Complex Halls	0	0	0	4
Director, Rector and C-Type Quarters	0	2	0	0
Total	**22**	**41**	**12**	**35**

Table 9 Total ACs in the Campus

Computer/Printers

The total computers and printers on the campus are given below;

Department/Building	Computers	Printers
Admin Building	222	8
Electrical Dept.	52	4
Instrumentation Dept.	47	11
Electronics Dept.	316	6

Civil Dept.	41	5
Textile Dept.	33	7
Mechanical Dept	110	4
Computer Science Department.	217	5
I.T Department.	185	4
Chemical Department.	34	3
Production Department.	36	5
Innovative Lab	6	4
Hostels	0	0
Complex Halls	0	0
Director, Rector and C-Type Quarters	1	0
EMC Section	1	0
Total	**1301**	**66**

Table 10 Total Computers and Printers on the campus

In the campus, there is a total of about 1301 computers and about 66 printers in the departments.

- **Solar Water Heaters**

The institute has already commissioned Solar water heaters in 5 the buildings details are presented below;

Sr. No	Location	Capacity in LPD	KWH
1	Hostel Section	500	26.378
2	Hostel Section	100	5.275
3	Director Residence	250	13.188
4	Warden Residence	100	5.275
5	Ladies Hostel	2100	110.78
	Total KWh		**160.896**

Table 11 ***Solar Water Heaters***

It is saving 1608 units of energy per day which would have otherwise been consumed from the grid.

Observations

- The energy consumption in the month of October is very high and less in November to February in the year 2018. There is increasing trend in electricity consumption at the campus year on year basis. a deviation in the month of October when we compare the energy consumption of both the years 2017 and 2018.
- The daily energy consumption of shyadri hostel is very high followed by EXTC department, admin building, and water motors.
- SGGSIET has already installed solar water heater that is replacing grid electricity.

2.7 LPG Gas Consumption

In Shri Guru Gobind Singhji Institute of Engineering and Technology (SGGSIET), Nanded there are 5 hostels in which 2 are boys hostels and 3 are girls hostels and having two mess one for girls and one for boys. The campus is also having one major canteen which also uses LPG gas for cooking. There is currently a total of 1356 students are staying in the hostels.

Month and Year	No of Gas Cylinder Consumption of Boys Hostel (17KG)	No of Gas Cylinder Consumption of Girls Hostel (17KG)	Total LPG in Kgs
Jan-18	52	55	1819
Feb-18	55	57	1904
Mar-18	54	55	1853
Apr-18	56	48	1768
May-18	45	43	1496
Jun-18	52	50	1734
Jul-18	38	40	1326
Aug-18	55	60	1955
Sep-18	52	60	1904
Oct-18	53	60	1921
Nov-18	46	60	1802
Dec-18	50	40	1530
Total	**608**	**628**	**21012**

Table 12 LPG Gas consumption during the year 2018

In addition, canteen is consuming 2528 kgs of LPG for one year.

Total LPG consumption for one year is 23540 kgs.

Observations

- Total LPG consumption for one year is 23540 kgs.
- LPG consumption was least in July month.
- LPG consumption was maximum in August month.
- The LPG consumption per student is 17.36 kg

The LPG consumption in the future will be reduced because a biogas plant has already been constructed with a capacity 10 cubm with a digester of 25 cubm which will use food waste from hostel and canteen and generate 4.5 kg equivalent LPG gas per day. The biogas plant will be commissioned shortly, which will address the treatment of existing biodegradable waste generated on the campus.

The proposed biogas plant will generate 1642.5 kg of biogas per annum, which would reduce 6.97% of LPG gas requirement.

2.8 Diesel Consumption by DG set

The institute has two DG sets rated 125 KVA and 250 KVA. During the audit, it was observed that the log book has maintained and running hour details and diesel consumption details are maintained.

Summary of Diesel Consumed by the DG set during the year 2018 is presented below. The total diesel used by the DG sets during the year 2018 was 2100 Ltrs.

S.No	Year	DG Set Capacity (KVA)	Diesel Consumed (Ltrs)
1	2018	125	900
2	2018	250	1200
Total			2100

Table 13 Diesel Consumption by DG Sets

2.9 Fuel Consumption

The campus has a total 8 buses providing bus facility for the students and also has one Innova car, Ambassador and Ambulance Van. The institute is maintaining the fuel consumption data in the log book.

Month-Year/Vehicle Type and Number	MH26/N9067/Bus	MH26/N3267/Bus	MH26/N3268/Bus	MH26/B7823/Bus	MH26/9883/Bus	MH/BE0836/Bus	MH23/BE0933/Bus	MH26/BE0934/Bus	MH26/V3314/ Innova	MH26/5.80/Ambassador Car	MH26/BE1820/Ambulance Van
Jan-18	1998	2518	2905	990	1456	2275	1963	2615	2223	Nil	Nil
Feb-18	2285	2050	2050	551	1811	2346	1913	2177	2019	Nil	Nil
Mar-18	2819	2525	2249	1120	2204	2745	2743	2280	3423	Nil	73
Apr-18	2300	2096	2181	708	1920	2574	2260	2330	1320	Nil	58
May-18	1257	1169	1096	0	324	2845	2720	2652	2721	110	4
Jun-18	1348	1574	1289	0	80	2750	2698	2378	1431	208	19
Jul-18	2527	2611	2466	0	755	2420	2583	2520	788	101	7
Aug-18	2571	2438	2065	1327	1210	2536	2700	2820	905	105	39
Sep-18	1595	2274	2352	937	1354	2551	2199	2550	1146	135	52
Oct-18	2901	3144	2965	1794	2568	2911	1097	3429	1299	95	27
Nov-18	1155	1962	1987	103	95	2858	1100	2521	1466	151	10
Dec-18	2283	2019	2642	692	1419	1929	2254	1850	1108	198	49
Total Distance Travelled (KM)	25039	26380	26247	8222	15196	30740	26230	30122	19849	1103	338
Diesel Consumed (Ltrs)	6260	6595	6562	2055	3800	7688	6558	7530	1881	95	71

Table 14 Fuel consumption by a transportation facility

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2.10 Fuel Consumption though traveling

The audit team was also collected the travel data of employees/students during the year 2018. The summary of the travel data made by employees/students is presented below by mode of travel.

S.No	Mode of Travel	No of Persons Travelled	Total distance traveled (KM)
1	Bus	29	35382
2	Taxi	76	56194
3	Train	223	213807
4	Air	21	140160

Table 15 Fuel Consumption through traveling

However, the type of vehicles, train, cars, and flight was not available. Thus, the total fuel consumption associated with it has been excluded.

Observations

- Total Diesel consumption for 2018 in the vehicle is 49095L
- DG set is being used in case of exigencies only.

Recommendations

Instal Solar Power on the rooftop of Institute

- **SOLAR IMPLEMENTATION**

The institute has the potential for solar rooftop installations. As a first step, SGGSIET is intending to install a solar rooftop capacity of 650 KW in 5 buildings of the campus in the identified area of 7500 Sq.M.

The below table shows the areas where the solar rooftop would be implemented and expected commission of this plant by August 2019.

S.No	Name of building	Rooftop area in Sq.M
1	Administrative Building	2000
2	Electronics and Telecommunication Engg Department	1000
3	Instrumentation and Electrical Engg Department	1000
4	Departmental Building	1700
5	Sahyadri Boys Hostel	1800
Total Area		**7500**

Table 16 Solar Rooftop Area

The proposed solar plant would generate average electricity of 2496 kWh per day.

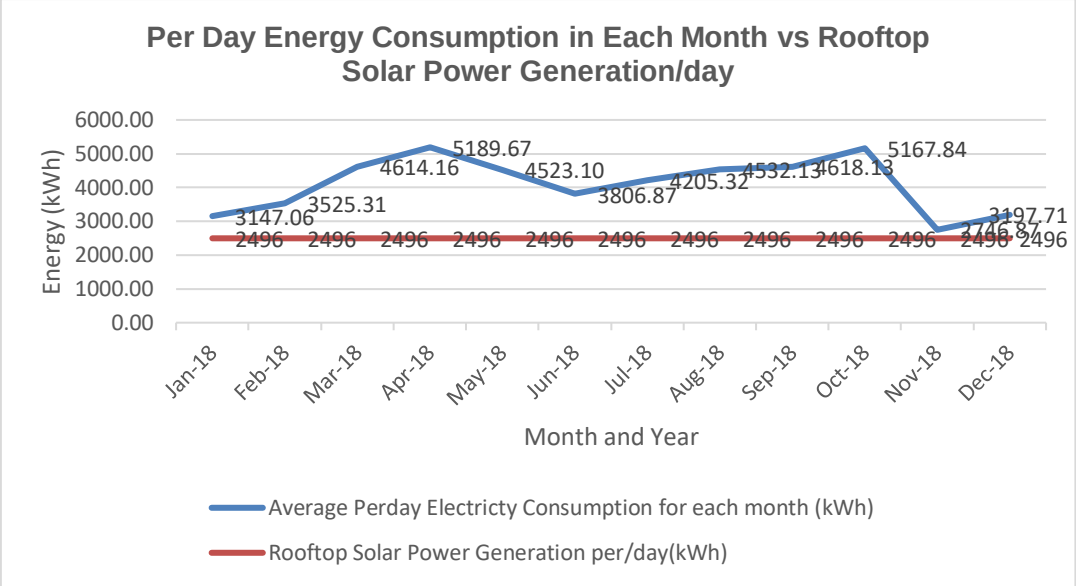

Figure 8 Per Day Energy Consumption in Each Month vs Rooftop Solar Power Generation/day

By implementing the Solar rooftop project the institute can reduce its electricity consumption by 60.57% of energy consumption from the grid. The proposed solar power plant will be commissioned under a net metering scheme.

Recommendations

1. Replace Electromagnetic ballast by 28W electronic ballast in FTL.
2. The lighting that is currently used in departments is 36W T8 FLT, we propose them to be replaced by the more energy efficient 28W T5 FLT.
3. Replacing 28W FTLs in the corridors of buildings by 14W LED.
4. The 3 Ton AC users can be made to switch off the AC 15 Minutes prior to leaving the office.
5. Adopt a normal energy saving power mode setting on the computer.
6. Street lights all over the campus can be connected through solar.
7. Replacement of Geysers with Solar water heaters.
8. In future for replacing ACs, replace ACs with 5 start energy saving ACs
9. Install Solar rooftop at the facility for displacing electricity from the grid

2.11 Waste Management

In the waste, management audit was focused on assessment and types of waste that are generated by the institute. By this assessment, it helps the institute to determine how the institute can reduce the amount of waste that an institution generates. In most workplaces, cardboard, paper, plastics, metals, and food constitute the majority of what goes in the garbage. Pollution from waste is aesthetically unpleasant and results in a large amount of litter in our communities which can cause health problems. Solid waste can be divided into two categories: general waste and hazardous waste. General wastes include what is usually thrown away such as garbage, paper, tins, and glass bottles. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals and petrol. Unscientific landfilling results in contamination of soil and water bodies, and it also produce greenhouse gases contributing to global climate change.

Observations

During the waste assessment study, total waste that is being generated at the campus is assessed. The measurement has taken at source level for the one day.

- Average wet waste generated per day :-201 kg/day.
- Average Dry waste generated per day : 2.5 kg/day
- E-Waste Collected – 162 kg/year

Waste Management practices in place

4 large Waste bins for plastic collection has been placed in the campus.
The vermicomposting plant is not in operation. Thus, garden waste can be processed by reviving the plant oprtaion.

Recommendations

1. Carry out number of awareness programme on waste segregation
2. Provide all over the campus two separate bins for wet waste and dry waste by adjacent to each other.
3. The existing vermicomposting plant is not functioning. The plant can be revived with minimal inputs and can treat garden waste.

2.12 Green Campus Management

SGGSIET have a focus on energy efficiency, conserving resources and enhancing environmental quality by educating for sustainability and creating healthy, living and learning environments. In SGGSIET Trees play an important ecological role within the campus environment, as well as support improved public health and provide aesthetic benefits to campus. SGGSIET is maintaining good greenery and trees on the campus.

Observations

Total number of plant species identified – 450

Greenery area inside the Institute is – 107848 Sq.M

Total campus area – 188057.42 Sq.M

Suggestions to Improve Green Cover in the campus

- Bush gardens
- Terrace cultivation of vegetables
- Green corridors
- Canopy climbers through walkways
- Plantation of natural species

2.13 Illumination, Noise level, Ventilation and Indoor Air quality

As part of green audit of SGGSIIET campus, the Illumination, Noise level, Ventilation and Indoor Air quality of the class room was also auditied. It was observed that Illumination and Ventilation is adequate in the class room considering natural light and air flow present.

As per Indian standards the desirable noise pollution for educational institutions in daytime is 50 dbA. Noise levels were measured noise measuring app, NoiseTube (version: 2.0.2), at 20 points within the campus at three different timings (8–10 am, 12–2 pm, and 3–5 pm). The results show higher noise levels during morning and evening. It has also been found out that noise level in front of gate where main road is there is higher and touches >80 dbA.

3. Carbon Footprint Study of the Campus

3.1 Introduction

Climate change is one of the greatest challenges facing nations, governments, institutions, business and mankind today.

Global warming and climate change are the foremost challenges facing mankind today. They will undoubtedly continue to be important politically and economically for generations to come. They will only be tackled effectively if actors at all levels in society including governments, businesses, communities, and individuals take responsibility for, and attempt to minimize, their greenhouse gas emissions.

As among the source of direct and indirect emissions institutions like SGGSIET has a large part to play in reducing greenhouse gases (GHGs) emission reductions. Increasingly, companies will need to understand and manage their GHG risks in order to maintain their license to operate, to ensure long-term competitiveness, and to comply with national or regional policies aimed at reducing their GHG emissions.

Improving the understanding of the institute's GHG emissions by compiling a GHG inventory makes good business sense. Institute that responds positively to the challenges of climate change and looks closely at their impact on the environment can help to combat climate change and derive benefits in terms of lower costs, particularly energy and transport costs and educating the future generation towards climate change mitigation. They are also likely to be better equipped to identify and manage the risks that this impact can bring and to attract more investment accordingly.

3.2 Scope

This carbon footprint report has been prepared in full accordance with the Greenhouse Gas Protocol (GHG), the most widely used international carbon calculation methodology, compatible with other GHG standards such as the ISO 14064, which also allows for direct integration with national and international greenhouse gas (GHG) registries.

The emitting activities covered in this carbon footprint report for 2018 includes direct emissions resulting from SGGSIET owned or controlled equipment and emissions from purchased electricity (referred to as Scope 1and 2 emissions respectively);. It is important to highlight that under the GHG Protocol, the reporting of both direct emissions and indirect emissions, resulting from purchased electricity, are compulsory. The other indirect emissions under scope 3 emissions are not reported due to lack of data.

SGGSIET has gone to all reasonable lengths to ensure the accuracy of this report.

3.3 Methodology and Scope

The carbon footprint gives a general overview of the SGGSIET greenhouse gas emissions, converted into CO2 -equivalents and it is based on reported data from internal and external systems. The purposes of the carbon indicators are to measure the carbon intensity per unit of product, in addition to showing environmental transparency towards external stakeholders.

The carbon footprint reporting approach undertaken in this study follows the guidelines and principles set out in the "Greenhouse Gas Protocol Corporate Accounting and Reporting Standard" (hereafter referred to as the GHG Protocol) developed by the Greenhouse Gas Protocol Initiative and international standard for the quantification and reporting of greenhouse gas emissions -ISO 14064. This is the most widely used and accepted methodology for conducting corporate carbon footprints.

The study has assessed carbon emissions from the SGGSIET Campus. This involves accounting for, and reporting on, the GHG emissions from all those activities for which the company is directly responsible.

The items quantified in this study are as classified under the ISO 14064 standards:

The report calculates the greenhouse gas emissions from the SGGSIET Campus. This includes electricity, LPG consumption as well as emission associated with diesel consumption in the institute vehicle. The emission associated with air travel, waste generation, administration, and marketing related activities has been excluded from the current study. Emissions from business activities are generally classified as scope 1, 2 or 3 areas classified under the ISO 14064 standards .

Scope 1: Direct emissions (mandatory reporting)

- This level concerns all emissions from sources owned or controlled by the SGGSIET Campus. For SGGSIET campus, scope 1 includes All direct emissions from the SGGSIET owned or controlled sources, such as institute vehicles, and heat generation (LPG). The study has chosen to use the Emissions Factors for the fossil fuel used and the same has been multiplied with the fossil fuel heat input for the purposes of calculating GHG emissions. The study has made all efforts possible to use the best available emissions factors available at the time and has cited the source of all emission factors used.

- There are three Tiers presented in the *2006 IPCC Guidelines* for estimating emissions from fossil fuel combustion. The study has considered Tier 1 method. The Tier 1 method is fuel-based since emissions from all sources of combustion can be estimated on the basis of the quantities of fuel combusted (usually from national energy statistics) and average emission factors.

- The quality of these emission factors differs between gases. For CO_2, emission factors mainly depend upon the carbon content of the fuel. Combustion conditions are relatively unimportant. Therefore, CO_2 emissions can be estimated fairly accurately based on the total amount of fuels combusted and the averaged carbon

content of the fuels. Hence, for CO_2 in general, a Tier 1 method based on fuel carbon and fuel amount used will often suffice and the same approach is used in the report for calculating the GHG emissions from the combustion of fuels.

- The activity data for calculating the GHG emissions is the amount of fuel combusted. The direct measurement has been used as the preferred method for the data collection of fuel combusted to calculate the emissions so as to reasonably minimize the uncertainty. When there is no accessibility to the direct measurement, emissions have been calculated through the application of documented models or facility-specific correlation or through the mass balance approach.

Scope 2: Indirect emissions (mandatory reporting)

- This level concerns all emissions from purchased energy. In the case of SGGSIET, this means the purchase of electricity from the local discom (Maharashtra State Electricity Distribution Co. Ltd) which is connected to the Indian Grid. The electricity CO_2 emission factor is calculated from the India electricity production mix, which is the emission factor used for the Indian Grid. The emission factor for grid electricity in India is given by Central Electricity Authority.

Scope 3: Other Indirect Emissions

- All other indirect emissions as a consequence of the activities of the institute that occur from sources neither owned nor controlled by the company (e.g. outsourced distribution).

- Emissions covered under Scopes 1 and 2 are mandatory for reporting, while Scope 3 emissions can be reported on a voluntary basis. The study considers emission from scope 1,2 and 3. However, in the current study scope, 3 has not been reported due to the limitation of appropriate data availability.

The study has reported on all Scope 1 & 2 Emissions and no sources of emissions are considered in the other indirect emissions category or scope 3.

- **Scope 1 Emissions Include:**

LPG consumption at canteen
Fuel Consumption in the vehicle
Transportation of materials, products, waste, and employees

- **Scope 2 Emissions Include:**

Purchased electricity

- **Scope 3 Emissions Include:**

Emissions due to transportation from vehicles not owned by the company
Upstream and Downstream emissions of the fuel used
Emissions from waste disposal facilities

3.4 Carbon Footprint results:

3.4.1 Fuel consumption

Many studies have shown that "Carbon embodied in institute typically mostly represents emission associated with energy consumption". This estimate includes CO2 emitted while energy generation for meeting energy requirement at the kitchen.

The facility is currently using LPG for cooking in the kitchen. Total LPG consumption for the year 2018 is 23540 kgs. HSD is being used in the DG set for power generation. 2100 lts of diesel is being used in the year 2018

The following table details the Emission Factors used for calculating the GHG inventory for the combustion of fuels in stationary sources (LPG in kitchen and HSD in DG set).

Fuel	Emission factor(tCO_2/TJ)
HSD	74.1
LPG	63.1

Table 17 Source: Chapter 2: Stationary Combustion, 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Net Calorific Value of LPG :10950Kcal /kg(Source: https://www.total.co.in/pro/lpg-b2b/know-more-about-totalgaz-b2b/substituting-other-fuels-with-lpg.html)

Net Calorific value of HSD: 10100 Kcal/kg (Source: http://www.cea.nic.in/reports/others/thermal/tppd/data_petroleum_fuels.pdf)

Total Heat Input from LPG usage at Kitchen= LPG Quantity (kg)*(NCV(KCal/kg) =23540(kgs)*10950(KCal/kg)= 257325000 KCal

Total Emission associated with usage of LPG at the facility (tCO2e)= Emission Factor for LPG (tCO2e/TJ)* Heat Input LPG (Kcal)* Conversion from Kcal to TJ (4.184*10^(-9)=63.1(tCO2e/TJ)*257325000(Kcal)*4.184*10^9(TJ/Kcal)=67.93 tCO2e

Total Heat Input from HSD usage in DG set= HSD Quantity (lts)*(NCV(KCal/kg) *density of HSD (kg/lts)=2100(lts)*10100(KCal/kg)*0.845(kg/lts)= 17922450 KCal

Total Emission associated with usage of HSD in DG set at the facility (tCO2e)= Emission Factor for HSD (tCO2e/TJ)* Heat Input HSD (Kcal)* Conversion from Kcal to TJ (4.184*10^(-9)=74.1(tCO2e/TJ)*17922450(Kcal)*4.184*10^9(TJ/Kcal)=5.55 tCO2e

3.4.2 Transportation

The unit also uses vehicles for its internal use and it consumes diesel which is sourced locally. Emission associated with the diesel consumption from the unit's vehicle is a minor

contributor to the unit's emission. The unit had consumed 49095 liters of diesel during the year 2018.

The following table details the Emission Factors used for calculating the GHG inventory for the combustion of fuels in mobile sources (i.e. in the vehicles used for transportation).

Fuel	Emission factor(tCO_2/TJ)
HSD	74.1

Total Heat Input from HSD usage in vehicle= HSD Quantity (lts)*(NCV(KCal/kg) *density of HSD (kg/lts)=49095(lts)*10100(KCal/kg)*0.845(kg/lts)= 419001277.5 KCal

Total Emission associated with usage of HSD in vehicle (tCO2e)= Emission Factor for HSD (tCO2e/TJ)* Heat Input HSD (Kcal)* Conversion from Kcal to TJ (4.184*10^(-9)=74.1(tCO2e/TJ)*419001277.5(Kcal)*4.184*10^9(TJ/Kcal)=129.9 tCO2e

3.4.3 Electricity Import

Electricity used in the site is the significant contributors towards GHGs emission from the unit. Electricity used onsite is the most direct, and typically the most significant, a contributor to a unit's carbon footprint. The electricity is being sourced from the Maharastra State Electricity Distribution Company which is in turn connected to the national grid. Thus, using an average fuel mix of generating electricity, carbon dioxide intensity of electricity for national grid is assumed to be 0.9613 KgCO2/Kwh (Reference: Central Electricity Authority (CEA) Baseline Carbon Dioxide Emission database http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/database_11.zip)

Electricity Purchased from the grid

S.No	Month and Year	Energy Consumption (KWh)	Energy bill paid (INR)
25	Jan-18	97,559	935,246
26	Feb-18	102,234	973,854
27	Mar-18	143,039	1,312,629
28	Apr-18	155,690	1,486,847
29	May-18	140,216	1,352,130
30	Jun-18	114,206	1,113,828
31	Jul-18	130,365	1,211,169
32	Aug-18	140,496	1,329,043
33	Sep-18	138,544	1,523,118
34	Oct-18	160,203	1,796,865
35	Nov-18	82,406	949,239
36	Dec-18	99,129	1,154,237
Total (Jan 18 - Dec 18)		**1,504,087**	**15,138,205**

Emissions from the electricity Import

Total energy consumed from the grid for the year 2018 was 1504.807 MWh.
The total emission from the grid is = 1504.807 * 0.9613
=1446 tCO2e

3.4.4 Other Emissions Excluded

This study did not evaluate the carbon sequestration potential of existing plantation activities and emission from the staff commuting, food supply, official flights, paper products, water supply, and waste disposal and recycling due to limited data availability.
The current study identifies areas where data monitoring, recording and archiving need to be developed for enlarging the scope of mapping of GHGs emission in the future years. Accordingly, a set of tools and record keeping procedure will be developed for improving the quality of data collection for the next year carbon footprint studies.

3.4.5 Results

The Figure below shows the summary of GHG emission from the SGGSITE facility. The total emission from the unit is 1649.97 tCO2e during the Jan 2018to Dec 2018. The results generated illustrates that Burning of fossil fuel results in approximately 12% GHG gases emissions and the import of electricity from the grid contributes 88% GHG emission into the atmosphere. The results also demonstrate that the import of electricity is the most significant GHG contributor, which is approximately 88% of the total of all emission associated with the facility for the year 2018.

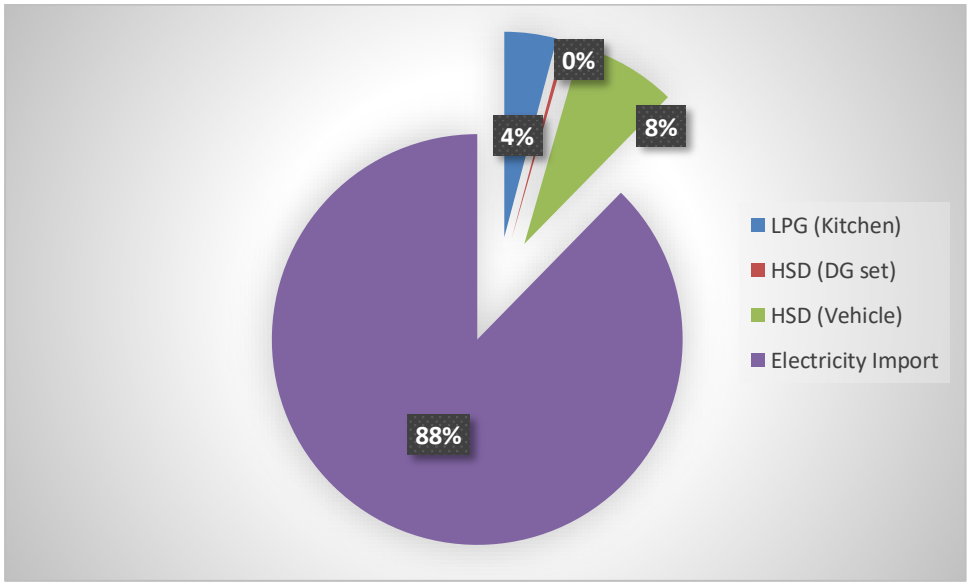

Figure 9 GHG emission percentage based on sources

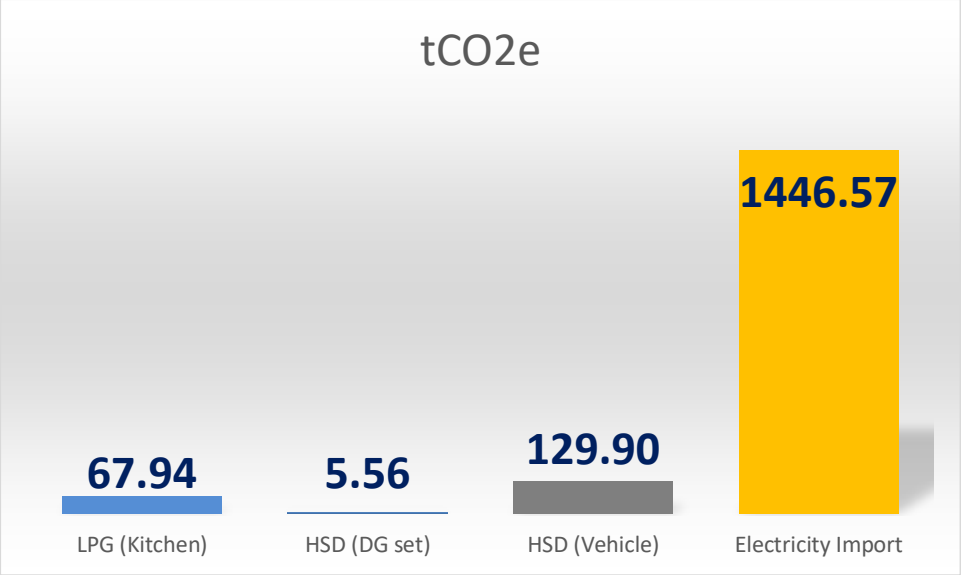

Figure 10 Total tCO2e emitted from each source

4. Conclusion

As part of green audit of campus, the environmental monitoring of SGGSIET was carried out that includes land use study, energy use, water use, Illumination, Noise level, waste management, Ventilation and Indoor Air quality and carbon footprint analysis.

Considering the fact that SGGSIET is an engineering Institute, there is significant environmental and conservation research has been carried out by by faculties and students. It was found that awareness on conservation, green energy and waste management are substantial. The installation of solar water heaters, dust bin for plastic waste, ongoing work on biogas digesters are noteworthy. Besides, environmental awareness programmes initiated by SGGSIET shows the campus is working towards resposnble futures.

SGGSIET has demonstrated its commitment to studying and evaluating emissions of greenhouse gases for its campus. With this carbon footprint analysis SGGSIET has taken the first step in an iterative cycle of activity to measure, understand and take action to reduce its GHG emissions. Measurement is the necessary first step and one of the main goals of the study was to allow SGGSIET to select a baseline year (chosen to be 2018) against which to measure progress in the future.

Few recommendations are added for green energy and waste management using ecofriendly and scientific techniques. This may lead to address the root causes of some of the greatest challenges facing our planet today—ecological destruction and changing climate.

Annexure-1:Pictures during the Audit

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- - End of the Report - -