GREEN AUDIT REPORT

Of

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES

Sangivalasa, Visakhapatnam

By

TÜV INDIA PRIVATE LIMITED

TÜV NORD GROUP

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June 2022

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ACKNOWLEDGEMENT

TUV India wishes to thank all the staff and Management of ***Anil Neerukonda Institute of Technology & Science*** management, teaching & non-teaching for the kind cooperation and assistance extended to our Auditors during the course of the Green Audit.

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1. Executive Summary

Green Audit of Anil Neerukonda Institute of Technology & Sciences was carried out by TUV India during June 2022. The approach taken in this facility included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and associated systems & monitoring equipment. The study covered the areas of Green management to summarize the present status in the campus:

- Waste management
- Green area management

The report accounts for the waste management measures of the *Anil Neerukonda Institute of Technology & Sciences* based on actual assessment. The report compiles a list of possible actions to conserve and efficiently access the available scarce resources and their saving potential is also identified.

Fig: Greenery around ANITS campus

2. Project Background:

2.1 Objective

The scope of work includes gap analysis of the college campus as per applicable regulations and standards relating to sustainability practices.

2.2 Methodology

The Study team having diversified experience in Green Audits, Energy Audits, Water Audits, ISO 14001, ISO 45001, ISO 14064, ISO 50001, GRI reporting, AA1000AS, GHG Accounting and Sustainability validations/ Verifications along local EHS legislations is identified and formed to conduct the study.

The team verified all applicable environmental aspects as per the GRI (Global Reporting Initiative) Sustainability Reporting Standards for the entire campus including the EHS (Environment and Health Safety) safety requirements to evaluate institution's intent towards the Sustainability and EHS safety in combating climate change as well as their role towards carbon neutrality, GHG mitigation measures, communications to stakeholder and their concerns.

2.3 About TÜV India

TÜV India Private Limited was incorporated in India in the Year 1989 and is a premier organization in the field of Testing, Certification, Inspection and Training. The company is a subsidiary of TÜV Nord group, which has been working for last 150 Years in the field of Quality, Safety, Health, Standardization, Certification, and Inspection. It has presence in over 70 countries and offers expert services through a global network. With more than 15000 professionals worldwide TÜV Nord has a turnover of over 1 billion Euros. TÜV India offers entire range of services in certification and inspection in India and South Asia with our contingent of professionally qualified and industry experienced Auditors and Inspectors. With a strong team of qualified Engineers having diversified experience in the field of Building Construction, Maintenance, quality assurance, examination of Buildings in distress and related rehabilitation works. We at TÜV ensure to optimize customer operational efficiencies and thereby maximize customer satisfaction

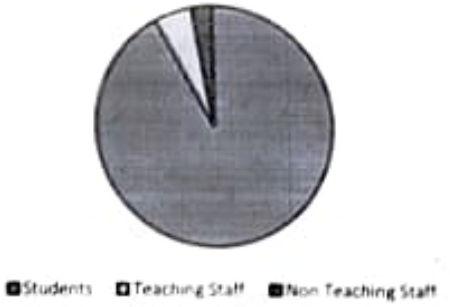
2.4 About the Institution

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (ANITS), was established in the academic Year 2001-02 with the approval of the *ALL INDIA COUNCIL FOR TECHNOLOGY EDUCATION (AICTE)*, New Delhi and the Government of Andhra Pradesh and is affiliated to ANDHRA UNIVERSITY (AU), Visakhapatnam.

"ANITS" is located in a plot of 12 acres' area in Sangivalasa Village of Bheemunipatnam Mandalam and is approximately 300 meters from the Chennai - Kolkata Highway.

The campus has a population of around 4,766 of which, 4636 are only day users. Of the total population, 92.02% are Students, while teaching and supporting staff account for 5.24 % and 2.72 %, respectively.

ANITS - Campus Population



2.5 Infrastructure:

The college campus is spread over an area of over 12 Acres with amenities like Central library, Class Rooms & Seminar Halls, Transport, Hostels for Boys & Girls, Cafeteria, Medical and Sports.

3.0 GREEN AUDITING AT ANITS

The purpose of the audit was to ensure that the practices followed in the campus are in accordance with the Green Policy adopted by the institution. The criteria, methods and recommendations used in the audit were based on the identified risks.

The methodology includes:

a. Preparation and filling up of questionnaire
b. Physical inspection of the campus
c. Observation and review of the documents
d. Interviewing responsible persons and data analysis
e. Recommendations

DATA COLLECTION

Data collection phase was performed using different tools such as observation, survey communicating with responsible persons and measurements. Data collection was done from the primary sources. Following steps were taken for data collection:

- The team visited each department, centers, Library, canteen, gardens, campus etc.
- Data on the general information was collected by observation and interview.
- Plants were identified using standard taxonomic books.
- Waste generated was assessed at the source of production

4.0 SCENARIO AT ANITS CAMPUS

The wastes generated from academic and administrative divisions only could be taken in to account, as the total institution could not be covered for certain limitations. The wastes generated from the academic and administrative divisions are characterized into

(a) Wet Waste;

(b) Paper & Board waste;

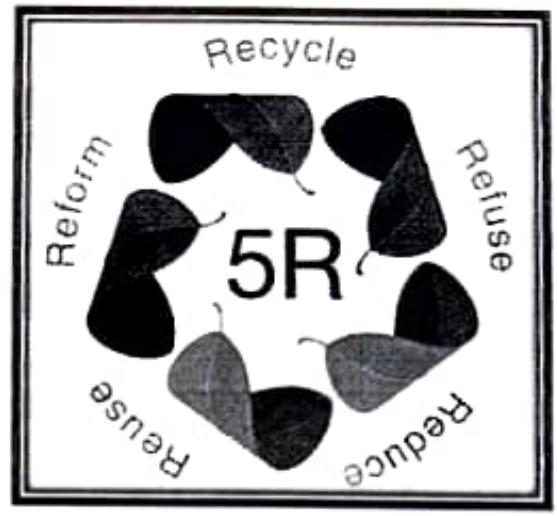
(c) Metallic waste;

(d) Plastic Waste;

(e) Battery waste

(f) E-waste.

The waste management is one area where the institution is focusing on application 5 R's principle. The Institution has initiated several good initiatives in the field of solid waste management. Within each building or facility, at all common places, at convenient points, semi-closed dust/waste bins were placed to dispose all types of dry wastes.



Disposal of Wet-waste & Dry Waste:

One large bin is placed near the major entries of each building/ Department. The wet wastes are cleared on daily basis and are transferred to the compost area. On the other hand, the dry wastes are cleared from their bins twice a week, and are transferred to the common place where they are segregated to different waste types and disposed to authorized vendors. All the students are encouraged to examine the dry waste and to take up team projects to develop innovative systems for the use of such wastes or their minimization.

Figure: Large Bins placed at the entry point of all Departments

Figure: Wet waste & Dry Waste Bins placed in every floor

5.0 WASTE MANAGEMENT

Waste Management of the campus was a methodically process which was used determine the amount and types of waste that are generated by an organization. Information from this assessment helped the management to determine how we can reduce the amount of waste that an institution generates. In most work places, cardboard, paper, plastics, metals and food constitute the majority of what goes in the garbage. Pollution from waste is aesthetically unpleasant and results in large amount of litter in the campus premises which can cause health problems.

Plastic bags and discarded ropes and strings can be very dangerous to birds and other animals. General wastes include what is usually thrown away in the campus 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 landfills may contain harmful contaminants that leach into soil and water supplies, and produce greenhouse gases contributing to global climate change. The auditor diagnosed the prevailing waste disposal policies and suggests the best way to combat the problems.

Solid Waste management is important for an eco-friendly campus. Different types of solid wastes in the college are generated, its collection and management are very challenging. The following data provide the details of the waste generated and the disposal method are recommended to the college.

Types of Solid waste	Particulars	Recommended Disposal method
Plastic waste	Pen, refill, plastic water bottles, wrappers, other plastic containers, print cartridges, polythene bags	Direct selling to authorized recycler
E-waste	Computer , electronic parts, old and damaged equipment	Direct selling to authorized recycler
Construction waste	Damage furniture, Construction wood waste (Workshop)	Reuse after maintenance and recycle
Bio-degradable waste	Food waste, organic waste, green waste	Can be used as manure in gardening
Paper waste	Paper waste in the examination department	Direct selling to authorized recycler
Glass waste	Broken Glassware from labs	Direct selling to authorized recycler
Sanitary waste	Sanitary Napkins	Open pit and burning

6.0 Hygiene in the Campus

The campus has state of the art infrastructure like laboratories, central library, central canteen and conference halls. In order to maintain good hygiene, the premises are cleaned regularly. During a physical inspection, the audit team found the campus to be very hygienic.

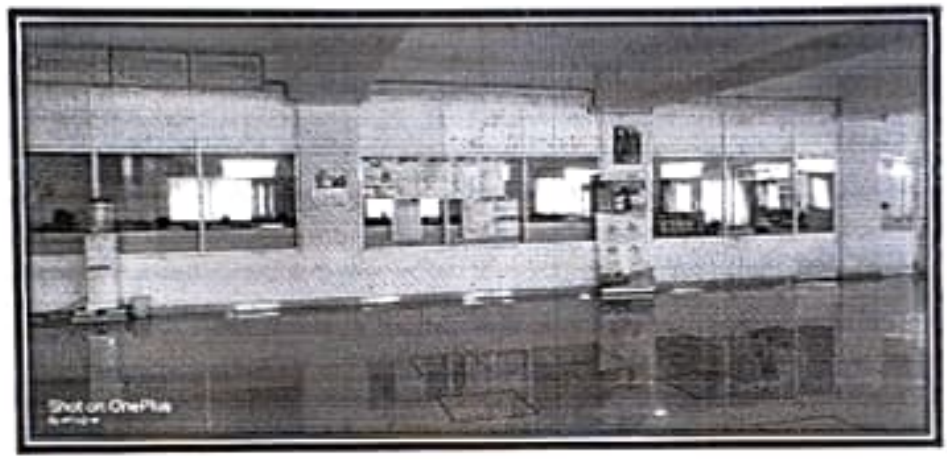


Fig: Hygiene at Central Library

Fig: Hygiene at Chemical Laboratory

Good Practices in ANITS

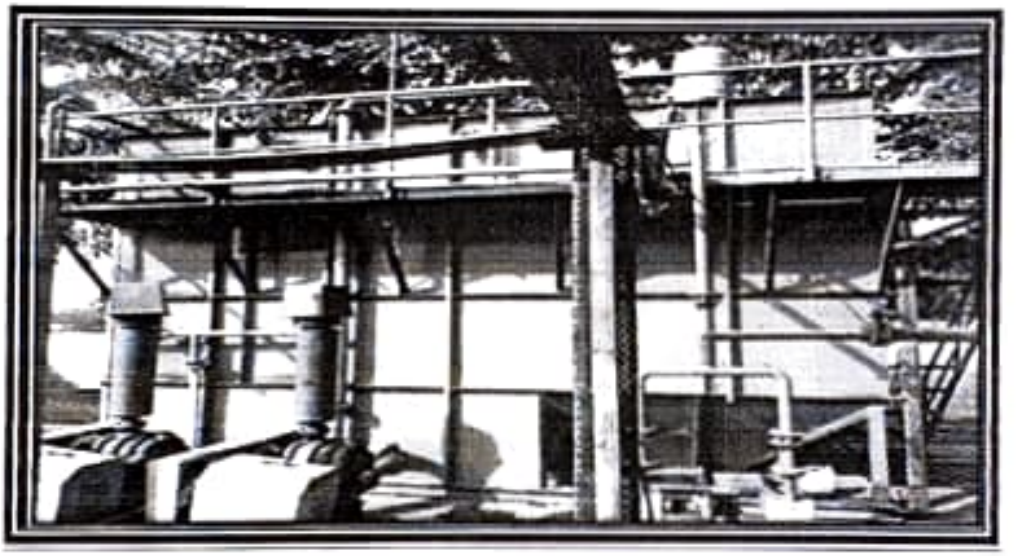
- The Institute is conducting awareness programs on various waste management practices for students, teaching & non – teaching staff
- The Institute is segregating Dry Waste & Wet Waste separating for safe disposal of wastage generated in campus.
- The management has installed a Sewage Treatment Plant in campus which will be utilized to safely dispose the waste water generated from laboratories, central canteen and other departments in campus

Awareness on Solid Waste Management

An Awareness program on Solid Waste Management was conducted in the month of June 2022 in association with the NSS Unit of ANITS College with an objective to inculcate the habit of waste management and cleanliness of the college campus among the students, teaching & non - teaching staff

SEWAGE TREATMENT PLANT

The management have installed a common Sewage treatment plant for the Institute and Hospital located advance to the campus. It is utilized to treat the waste water generated in the campus premises



4.0 AUDIT RECOMMENDATION

- It is recommended to form a Waste management committee and draft rules, guild lines and policies for enhancing the process of Waste Management in the campus.
- It is recommended to recycle of waste papers generated in examination department from a authorized recycler.
- It is recommended to increase the number of display boards on environmental awareness such as – save water, save electricity, no wastage of food/water, no smoking, switch off light and fan after use, plastic free campus etc.
- It is recommended to propose a Environmental Club for students and conduct exhibition of recyclable waste products.

5.0 CONCLUSION

The green audit reports assist in the process of attaining an ecofriendly approach to the sustainable developement of the college. The results presented in the green auditing report will serve as a guide for educating the college community on the existing environment related practices and resource usage at the college as well as spawn new activities and innovative practices.

This may lead to the prosperous future in context of Green Campus and thus sustainable environement and community development. It has been shown frequently that the practical suggestions, alternatives, and observations that have resulted from audits have added positive value to the audited organization.

An outside view, perspective and opinion often helps staff who have been too close to problems or methods to see the value of alternative approaches.

6.0 REFERENCE STANDARDS & REGULATIONS

- GRI Standards
- GHG Protocol Corporate Standard
- National Building Code 2016
- ISO 14064
- ISO 14040/44 Life Cycle Assessment
- True Rating Methodology for Waste Management
- Standards & Biodiversity by IISD

GREEN AUDIT REPORT

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (A)

(ANITS)

Sangivalasa, Bheemunipatnam Mandal, Visakhapatnam,

Andhra Pradesh-531162, India

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ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (A)

(ANITS)

Sangivalasa, Bheemunipatnam Mandal, Visakhapatnam,

Andhra Pradesh-531162, India

GREEN AUDIT ASSESSMENT TEAM

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4	Dr. R. Satish	Assistant Professor, Department of EEE	Member	R. Satish
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PREAMBLE

Anil Neerukonda Institute of Technology and Sciences (ANITS), with the approval of the All-India Council for Technical Education, New Delhi and the Govt. of Andhra Pradesh, was established in the Academic Year 2001–02 by Anil Neerukonda Educational Society (ANES) which was founded by Dr.N.B.R. Prasad, an NRI philanthropist from the USA in memory of his son Late Anil Neerukonda to provide quality educational services in the fields of Technology and Sciences. The institute is affiliated to one of the oldest universities of India, Andhra University, Visakhapatnam. The institute is located in Sangivalasa, in Bheemunipatnam Mandal of Andhra Pradesh and is at a distance of 30 km from Visakhapatnam. Started with an intake of 220, the institute presently offers 9 undergraduate programmes in ECE, EEE, CSE, CSE (DS), CSE (AI& ML), IT, Mechanical, Civil & Chemical and 6 post graduate programmes in Communications Systems, Control Systems, Computer Science & Technology, Machine Design, Biotechnology & Soil Mechanics with an intake of 1080 in UG and 99 in PG courses respectively. In the path of providing the highest quality education and continuous improvement in academic and research activities, the institute was first accredited by NBA in 2008 for four programmes and for 5 programmes in 2013 and 2016. NBA accreditation for 7 UG programmes in under progress. The institute was recognized as research center by Andhra University and recognized under 2(f) & 12(b) of UGC act in 2013. ANITS was accredited by NAAC. In order to have flexibility to incorporate the latest developments in science & technology and brining in requirements of the industry into curriculum, ANITS become Autonomous in 2015-16. The institute was recognized as Skill Excellence Center by Govt., of Andhra Pradesh in 2017.

VISION AND MISSION STATEMENTS OF THE INSTITUTION:

Vision

ANITS envisions emerging as a world-class technical institution whose products represent a good blend of technological excellence and the best of human values.

Mission

To train young men and women into competent and confident engineers with excellent communicational skills, to face the challenges of future technology changes, by imparting holistic technical education using the best of infrastructure, outstanding technical and teaching expertise and an exemplary work culture, besides molding them into good citizens.

Campus and Physical Infra:

ANITS has a campus of 4.54 hectares, managed with green development concepts. As per the land management documents of the Institution, an area of 7978.60 m^2 is under built up area, while the remaining area is under Open category, either under Play fields or under parks and green belt.

	Land use Type	Extent (m^2)
1	Total area	45484
2	Built up Ground area	7978

Campus Population:

The campus has a population of around 4,766 of which, 4636 are only day users. Of the total population, 92.02% are Students, while teaching and supporting staff account for 5.24 % and 2.72 % respectively

Green Campus & Green Audit Initiative

ANITS, as a lead institute of the region, is committed to educate its students and employees on environmental concerns and sustainability and to make the campus Carbon Neutral Campus within 5 years from the year 2020 – 2021. Towards this, Green Audit of the institution is initiated along with several Sustainability initiatives beyond the recommendations of the AICTE, so as to ensure that the campus complies with the Sustainable Development Goals (SDGs) and will be a role model to all other Institutions.

Based on the decision of the management, the Institute Principal has entrusted the work to green audit committee for assisting the institute in achieving the goal of the institute.

SCOPE, OBJECTIVES & STRATEGY FOR ANITS GREEN AUDIT

Green audit enables to identify and provide opportunities to promote sustainable development practices, enhance environmental quality, improve health, hygiene and safety, save resources and achieve values of virtue. Green Audits are a sub-set of Environmental audits and can be a highly valuable tool for educational institutions in a wide range of ways to improve their environmental and economic performance and thereby their reputations. The scope of the Green Audit for ANITS is so designed that the process and audit outcome should not only define the state of various environmental components, but also help the institution to compare its own programmes and activities over different years and to compare with other peer institutions. Other benefits should include, educating the students and employees on the

environmental issues; identify areas for improvement and prioritize the implementation of future projects. An effective and systematic scheme was designed and adopted to establish the baseline data for various environmental conditions. The aim of green auditing is to help the institution to adopt sustainable development practices and to inculcate these concepts in the minds of young engineers and through them to the nation.

General and Specific Objectives of Green Auditing

The general objective of green audit is to prepare a baseline report on the status of wastes generated and to mitigate resource wastage and improve resource quality and sustainable practices by involving the campus community and through them to reach the public.

The specific objectives are:

- To monitor the energy consumption pattern of the college.
- To suggest sustainable energy usage and water conservation practices.
- To assess the water usage and its quality, within the college campus.
- To find out various sources for generation and mitigation of different wastes.
- To suggest measures to improve biodiversity within the college campus.

GREEN AUDIT SUMMARY RESULTS

The Green audit of 2020-2021 covers the period between June 2020 to May 2021. However, the last two months of this period (April 2021 to May 2021) being the Covid19 lockdown period, those two months information on the resources consumption and conservation do not reflect the true status. Hence, the effective period for the Audit is only 10 months.

1. LAND USE:

The Green status of the land use in the ANITS, with nearly 32% of the area under open uses, can be considered as very good land use planning. The per capita open area is around 3.624 m^2 which is fairly very good and among similar level institutions under private sector, the status is **High healthy**

	Land Use	Extent (m^2)	Extent (ha)	% of Land Area
1	Built-up Ground Coverage	7978.60	0.80	17.54
2	Total Parking Area	8974.74	0.90	19.73
3	Tot-Lot + Play Ground Areas	5306.16	0.53	11.67
4	Roads and Tracks	5951.80	0.59	13.08
5	Vacant Site Area	17272.70	1.72	37.98
	TOTAL AREA	**45484**	**4.54**	

The land use can be considered as highly balanced as per the norms for institutions of higher learning. Though the vacant site area, was marked for greening, the total open area (areas under roads and Tracks; Playground areas and more than 80% of the Parking areas are left open to sky, thereby enabling free wind flow, good harvesting of rain waters through natural percolation.

2. WATER

ANITS well aware of the importance of water and has a dedicated water management cell. Water is used for different purposes like, Drinking; Other domesticated uses; Laboratories; House Keeping and Greenery. For all the uses, ANITS depends upon ground water only as there was no public supply facility.

ANITS taps around 40 KLD of water from 4 bore wells, and has an installed capacity of 40 KLD above ground storage tanks. The mean distribution of the water for different uses is as follows:

S.No	Purpose	Quantity (KLD)	(% Total)
1	Drinking	6	15
2	Other Domestic Uses	14	35
3	Laboratories & Other facilities	18	45
4	Greenery	2	5

On the whole, the drinking water availability is at 1.2 litres/head and 99 % of the campus population stays in the campus for less than 8 hours, the drinking water availability is reasonably good compared to the standard of 5 litres/head/24hrs. ANITS has a R.O. Plant with an installed capacity of 6000 litres/day, and through which Reject water of 10000 litres/day will be generated for an operating period of 6 hours. More than a half of which is used for floor washes and the remaining for the greenery. The RO plant water also is used by neighbouring sister institution of the ANITS group. Department of chemistry analyses the water samples collected from RO unit for all the important parameters on a quarterly basis

3. ENERGY

ANITS is one of the few institutions in India to have pioneered in the energy conservation and use of renewable energy sources. Basically it uses three types of Energy sources: (1) Electricity from the Public supply and (2) Electricity from the Own Solar plants and (3) Diesel (HSD).

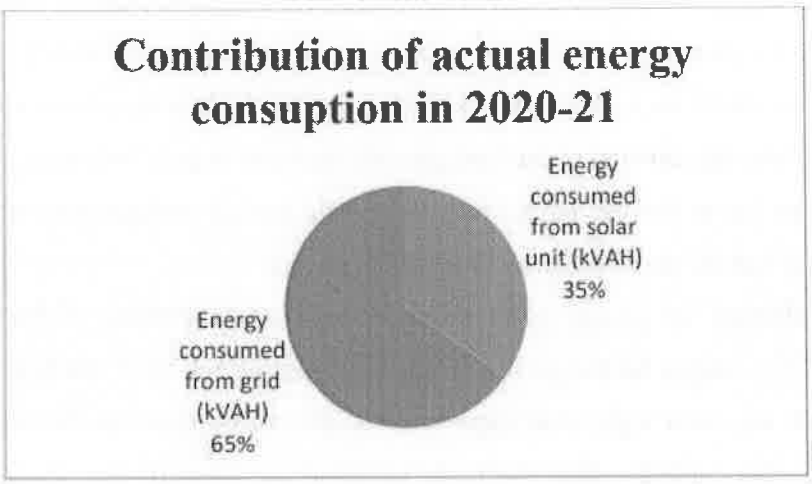
An energy audit is a study of a plant, building or facility to determine how much energy is used and to identify methods for energy savings. Proper balancing in implementation of the new technologies and already existing technology provide the most hopeful prospects for the future. The opportunities lie in the use of existing renewable energy technologies, enhancing the energy efficiency and the distribution of these technologies.

Date collection for energy audit of Anil Neerukonda Institute of Technology and Sciences (ANITS) Campus for the period of April 2020 to March 2021 has been done by the team. This audit was over sighted to inquire about the convenience to develop the energy competence of the campus. This audit is essential to identify the energy proficient appliances/instruments. The data is collected from each classroom, laboratory and every room by considering the number of tubes, fans, ACs, electronic instruments, water purifiers, printers, xerox machines, pumps, projectors etc., present in each room

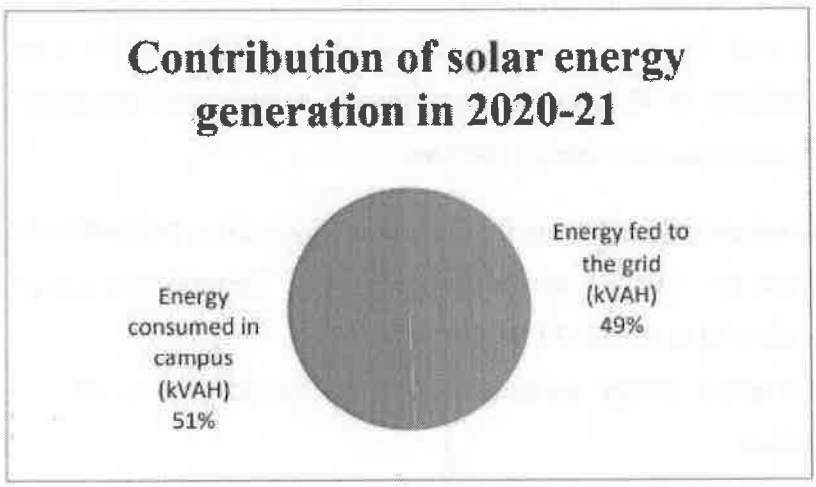
Institute has 450 kVA solar power generation system with 1364 panels installed and is connected to the grid. The energy units consumed from the public supply is exclusive of this power. Thus, addition of this power, accounts for a per capita production of 1963.85 Units/Annum. Highlights of the energy audit are

I. The total connected load as per the present energy audit is 2423.64 kVA.
II. The institute has 450 kVA solar power generation. The total solar energy generation in the year 2020-21 is 4,92,227 kVAh/Annum.
III. The total actual energy consumption in the campus during 2020-21 is 7,16,806 Units/Annum.
IV. The college has paid total 40,15,795/- Rs/Annum for the electricity bill in 2020-21 which is equivalent to 31.33% of the actual energy consumed. This is due to the availability of solar plant in the campus.
V. The contract demand is 450 kVA and monthly minimum consumption is 360 kVA. The average measured maximum demand maintained in the year is 120.99 kVA.
VI. The institute has two capacitor banks of ratings 30 kVAR and 15 kVAR. The Average power factor maintained during the year is 0.9967.
VII. The institute has a 500 kVA diesel generator set to supply the back-up power

The actual energy consumed in 2020-21 is 7,16,806 Units/Annum. Out of this, the solar unit is contributing 2,49,537 Units/Annum (i.e., 34.81%). The remaining 4,67,269 Units/Annum (i.e., 65.19%) are consumed from the grid



The solar unit is generated 4,92,227 Units/Annum in 2020-21. Out of this 2,42,690 Units/Annum (i.e., 49.30%) are fed to the grid. The remaining 2,49,537 Units/Annum (i.e., 50.70 %) are used in the campus



4. WASTE MANAGEMENT

Solid waste management:

- The dry solid waste is put by the respective departments in a collection pit located within the campus. This dry solid waste is collected every day in the morning and campus is kept clean with as inspiration from Swatch Bharat Mission, Twin-Bin system is being used in the Institute to segregate recyclable and biodegradable waste.
- The used papers and notebooks are collected every semester and recycled. This activity is an exclusive initiative of our students under various clubs.
- Chemical and hazardous waste from laboratories if any are disposed as per norms.
- The campus is Wi-Fi enabled and hence all communication is made online minimizing paper usage.
- Usage of plastic cups, plates and cutlery are banned in the campus as a green initiative.
- Organic waste is composted and used for manure.

Liquid waste management:

- Sewage Treatment Plant (STP) of 200 KL/day capacity is in use both in the Institution campus and Hostel. The treated water is used for flushing and gardening purpose.
- Two STP'S with capacities 300 KLD and 200 KLD are under the premises of ANH, handling waste water from hospital, the Institution campus and hostel.
- Aeration process is being used in the treatment of waste water.
- Liquid chemicals from Chemistry and Environment Engineering Lab are disposed as per safety norms.

E-waste management:

- All Computers, batteries and electronic machinery is purchased under Buy-Back agreement.

Wastes Generation:

The wastes generated from academic and administrative divisions only could be taken in to account, as the total institution could not be covered for certain limitations during this first audit. The wastes generated from the academic and administrative divisions are characterized into

(a) Wet Waste;

(b) Paper & Board waste;

(c) Metallic waste;

(d) Plastic Waste;

(e) Battery waste

(f) E-waste.

The waste generated from the two divisions, from a sampling of 1 month is presented below:

Waste Type	**Sources**	**Qty**	**Disposal**
Wet Waste	Dining Halls & Messes	60 kg/day	Compost
Paper & Board	Administrative & Academic	4.7 kg/day	Authorized Vendors
Metallic	All	0.21 kg/day	Authorized Vendors
Plastic	All	0.36 kg/day	Authorized Vendors
E-waste	All	0.2 kg/day	Authorized Vendors

The waste management is one area where the institution is focusing on application of 5 R's principle so as to enable the young learners for innovations. The Institution has initiated several good initiatives in the field of solid waste management. Within each building or facility, at all common places, at convenient points, semi-closed dust/waste bins were placed to dispose all types of dry wastes. However, for the disposal of Wet-waste, one large bin was placed near the major entries of the buildings. The wet wastes are cleared on daily basis and are transferred to the compost area. On the other hand, the dry wastes are cleared from their bins twice a week, and are transferred to the common place where they are segregated to different waste types and disposed to authorized vendors. All the students are encouraged to examine the dry waste and to take up team projects to develop innovative systems for the use of such wastes or their minimization.

5 Ecological Activities

Environmental and Sustainability Initiatives of ANITS is to realize its Vision of making its campus a Carbon Neutral campus and also to empower its students and employees in addressing the environmental and sustainability challenges of the nation, introduced several activities to create awareness and educational activities. These activities are generally taken up at the department level, while some activities on certain days of international or national importance, the activities are taken up at the Institutional level.

1. **Swachh ANITS:** The programme was initiated at the Institutional level and coordinated by the NSS wing of the Institution. The programme aims at training the students in the Participatory Management of the Campus and also creates awareness among the students on the Swatch missions of the country. The programme for the year was launched in August 2019, and continued till the end of the academic year. About 120 students (10 to 12 volunteers from each department) have participated in this programme.

2. One student One plant:

Department of Mechanical Engineering, ANITS Successfully organized "One student – One plant" on 11th March 2021. The Program was Organised under U TOO CAN Club. It was organised for inculcating the habit of plantation of saplings in the students. It was organised to understand the importance of trees and how trees protect ecological balance in nature.

3. Save The Beaches: ANITS, as part of its environmental initiatives organizes World Ozone Day every year on September 16th, so as to educate the young engineers on the importance of use of Ozone Depleting Substances in various technologies and gadgets. The programme is conducted at the Institute level.

Concluding Remarks and Audit recommendations

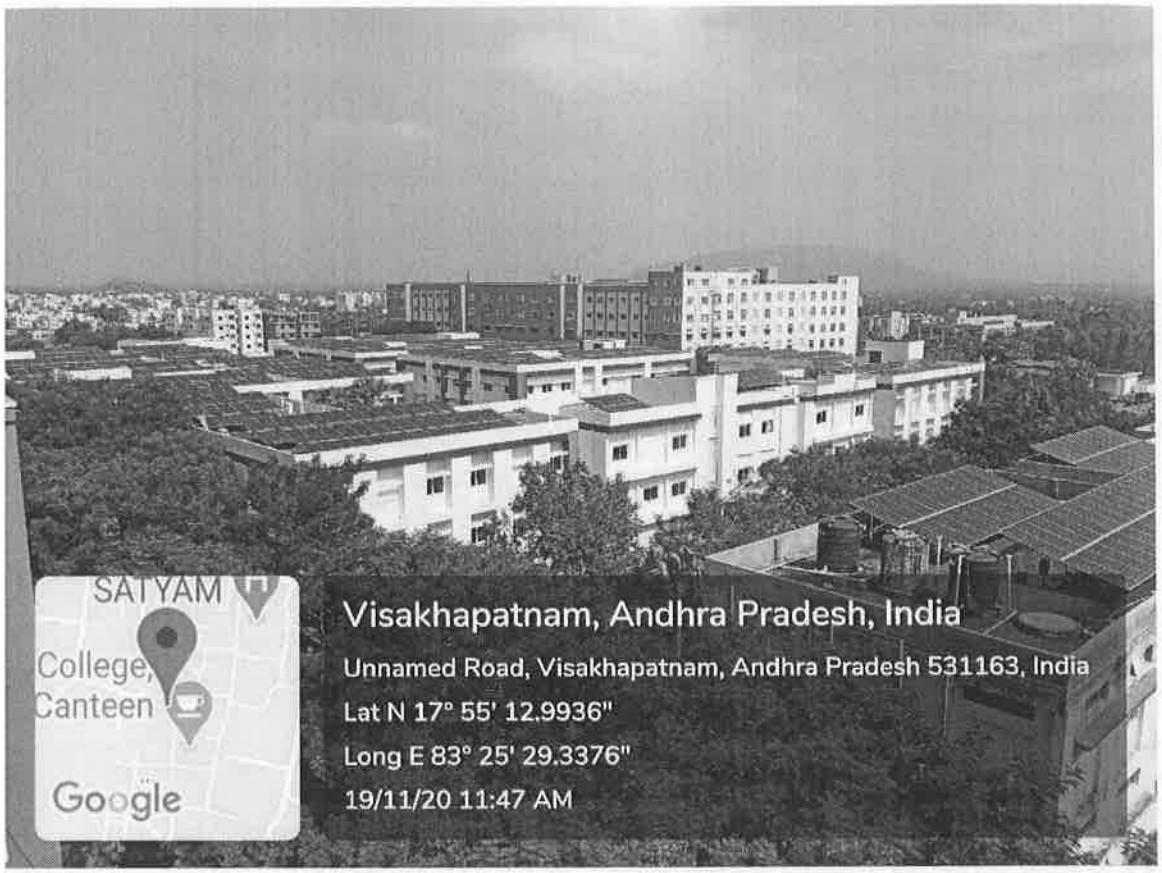
As an environment friendly institution, the institute has solar energy with a capacity of 450kVA, wheeling to eastern power grid and uses LED bulbs for power conservation. The college a solid waste management system, Sewage Treatment Plant (STP) of 200 KL/day capacity and e-waste management system. Good water conservation facilities such as rain water harvesting pits, bore well recharge system and waste water recycling system are available in the campus. Certain green campus initiatives and barrier free disabled friendly facilities are created. The Institute is adopting vehicle free campus for the students to curb environmental pollution. An inclusive environment is created by maximum participation of stakeholders through various committees, delegating powers, NSS/ club activities. As a mark of respect and showcasing constitutional obligations, various events on days of national significance such as world water day, World environment day, International yoga day, No plastic day etc and activities in tune to the government initiatives such as Swachhbharat etc., are organized in the institute. 2 villages were adopted under UBA (Unnat Bharat Abhiyan) scheme.

The audit team, appreciates the well-designed layout planning of the institute, ensuring 38 % of the land area under open category uses. However, the utilization of the open category lands needs to be further maximized and documented. Although the greenery is good in terms of the extent and numbers, effective planning can enhance the diversity, productivity and sequester more carbon so as to realize the objective of making the campus C-neutral. Although the waste management is in places, it needs more documentation of wastes related to metal plastic, battery and E wastes generated and disposed.

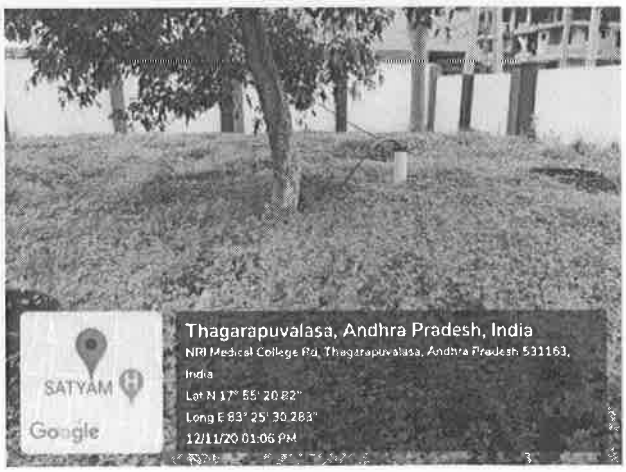
GALLERY

Green ANITS Campus

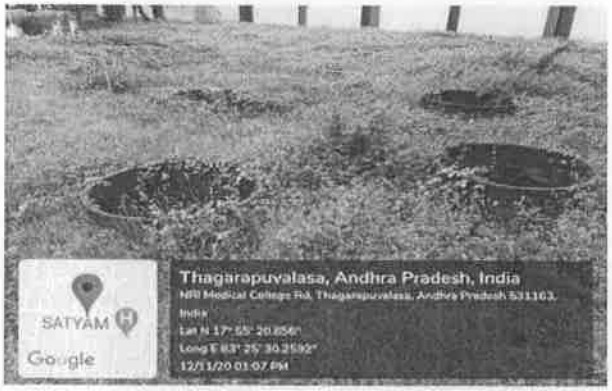
Solar Energy panels

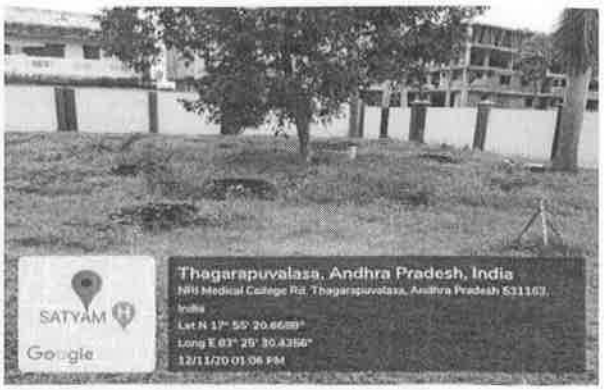


Borewells

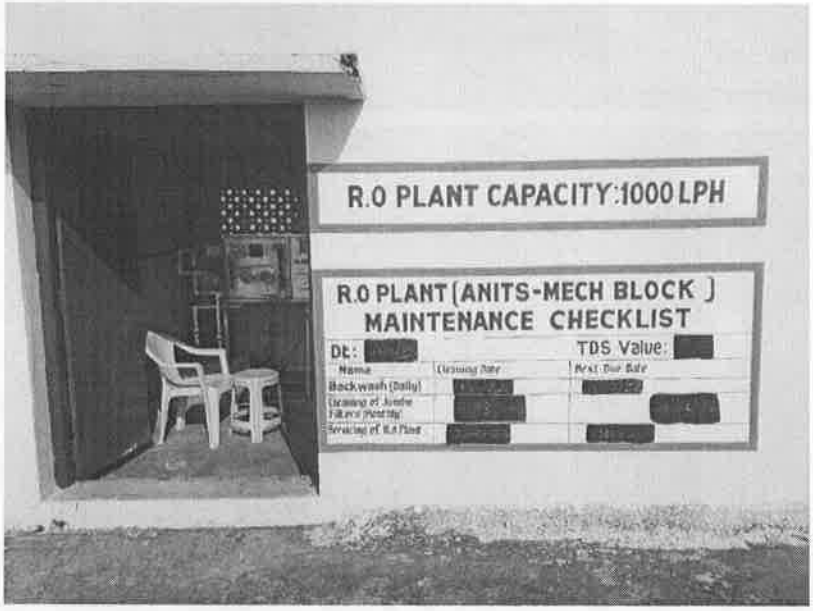


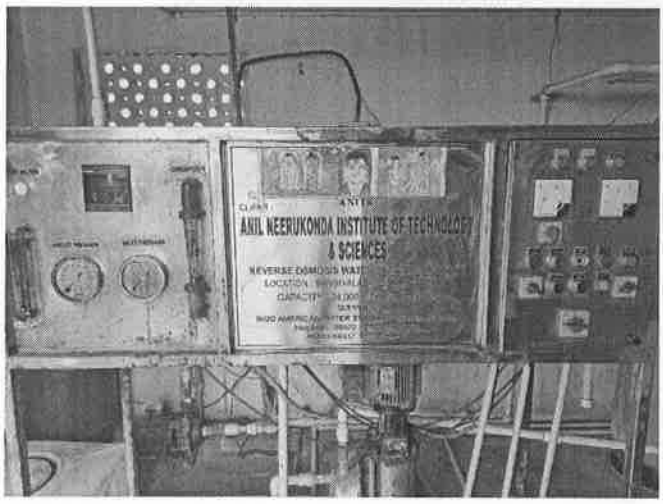
Rainwater Harvesting Pits

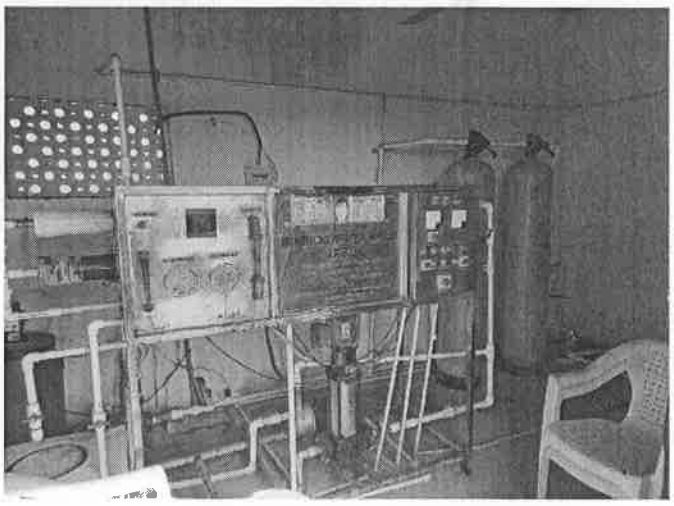




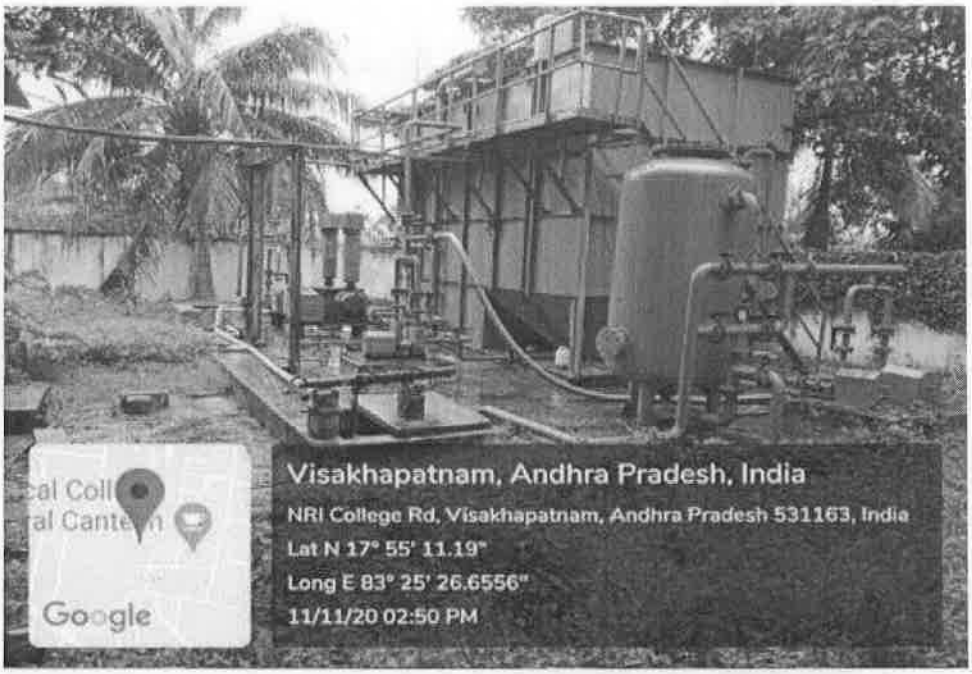
Reverse Osmosis unit

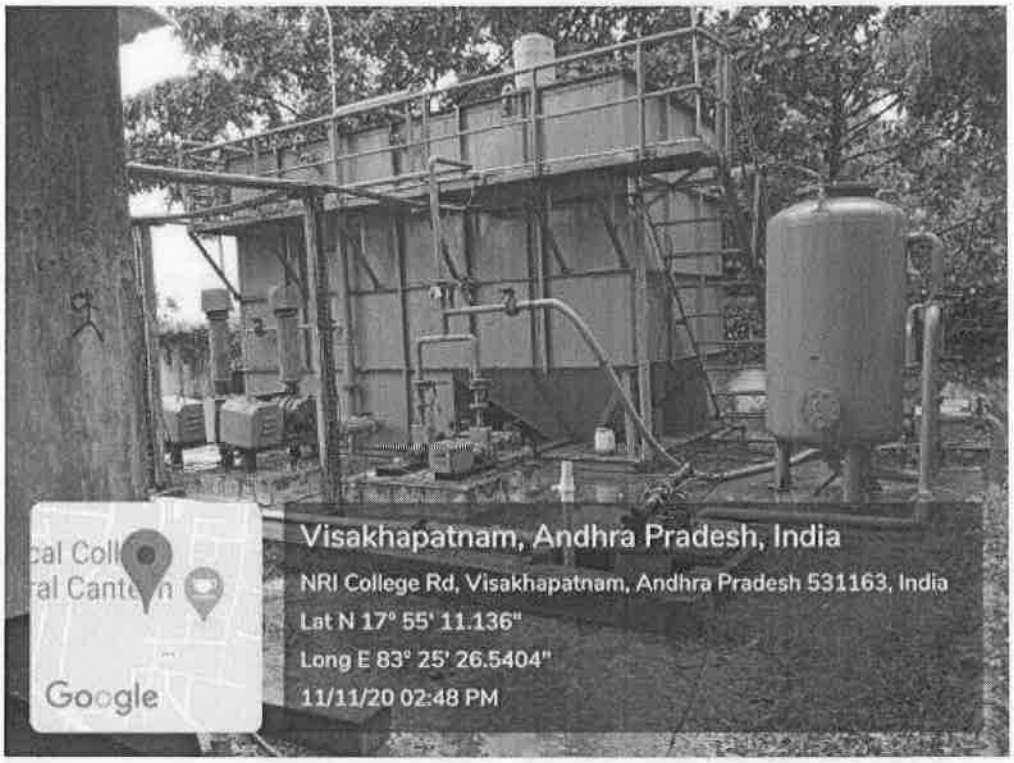




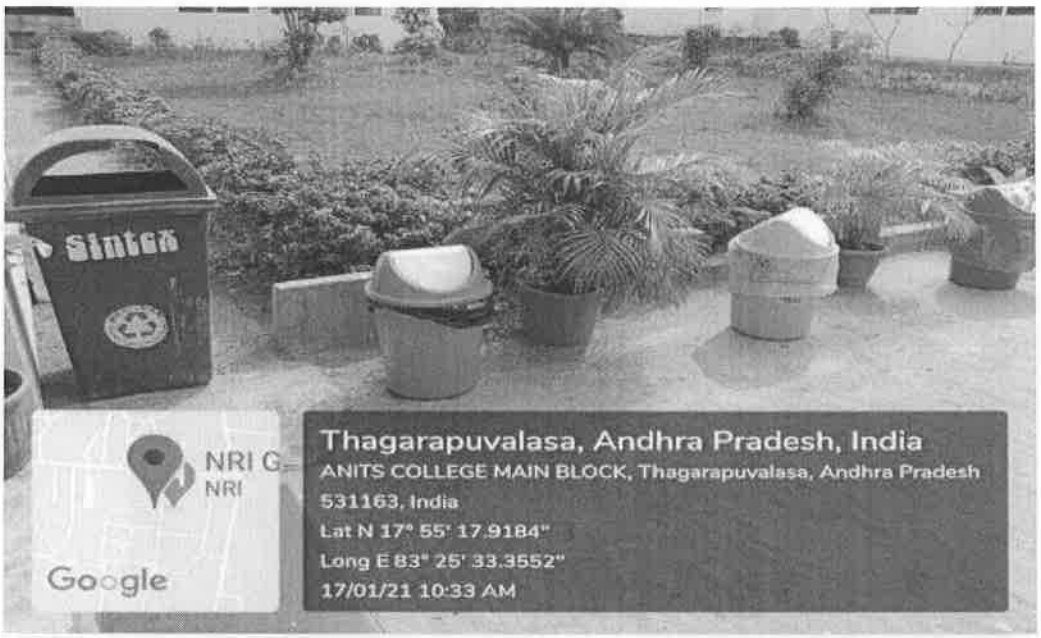


Liquid Waste Treatment and Solid Segregation System





Segregation of waste material in the campus



One Student – One Plant Program

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES (A)

DEPARTMENT OF MECHANICAL ENGINEERING

(Permanently Affiliated to Andhra University, AICTE, Accredited by NBA, NAAC with grade 'A')

Sangivalasa-531162, Bheemunipatnam Mandal, Visakhapatnam Dt.

Phone 08933-225083, 226395

ANITS

One Student - One Plant on 13th March 2021

Active Participation of Faculty coordinators and Students on "**One Student - One Plant**"

13.3.21

HOD

Mech. Engg.

PROFESSOR & HEAD
Department of Mechanical Engineering
ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
Sangivalasa-531 162 VISAKHAPATNAM Dist. A.P.

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES

GREEN AUDIT REPORT 2019 TO 2020

Audit Team

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(Chief Environmental Consultant)

K. Srinija Aparna

(Environmental Consultant)

Sanchari Biswas ***(Associate consultant)***

P.V.R Sravya

(Assistant Professor, Civil Department)

I. PREAMBLE

Anil Neerukonda Institute of Technology and Sciences (ANITS), with the approval of the All India Council for Technology Education, New Delhi and the Govt. of Andhra Pradesh, was established in the Academic Year 2001–02 to provide quality educational services in the fields of Technology and Sciences. The institute is affiliated to one of the oldest universities of India, Andhra University, Visakhapatnam.

1. Vision and Mission Statements of the College:

VISION

ANITS envisions emerging as a world-class technical institution whose products represent a good blend of technological excellence and the best of human values.

MISSION

To train young men and women into competent and confident engineers with excellent communicational skills, to face the challenges of future technology changes, by imparting holistic technical education using the best of infrastructure, outstanding technical and teaching expertise and an exemplary work culture, besides molding them into good citizens..

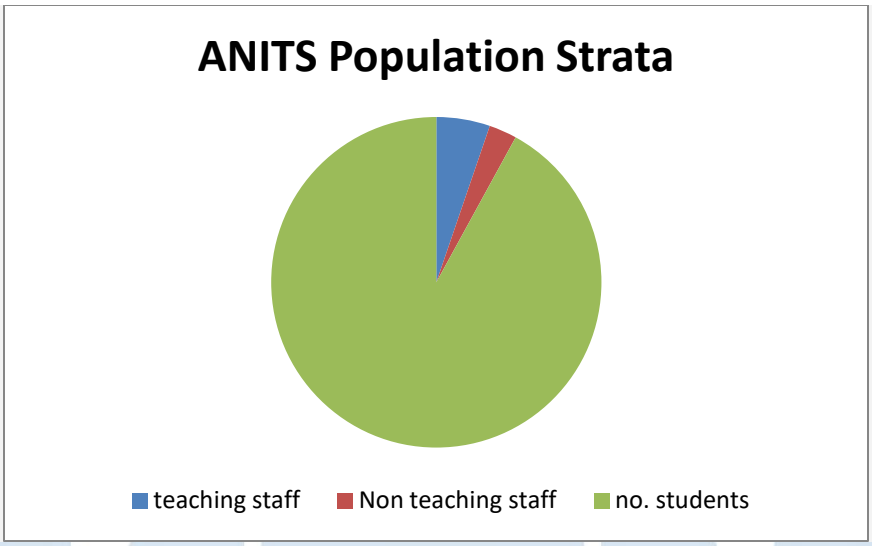
2. Campus and Physical Infra:

ANITS has a campus of 4.31 hectares, managed with green development concepts. As per the land management documents of the Institution, an area of 7978.60 m^2 is under built up area, while the remaining area is under Open category, either under Play fields or under parks and green belt.

	Land use type	Extent (m^2)
1	Total Area	45484.00
2	Built up Ground Area	7978.60

Campus Population:

The campus has a population of around 4,766 of which, 4636 are only day users. Of the total population, 92.02% are Students, while teaching and supporting staff account for 5.24 % and 2.72 %, respectively.



II Green Campus & Green Audit Initiative

ANITS, as a lead institute of the region, is committed to educate its students and employees on environmental concerns and sustainability and to make the campus ***Carbon Neutral Campus*** within 5 years from the year 2019 – 2020. Towards this, Green Audit of the institution is initiated along with several Sustainability Initiatives beyond the recommendations of the AICTE, so as to ensure that the campus complies with the ***Sustainable Development Goals*** (SDGs) and will be a role model to all other Institutions.

Based on the Decision of the Management, the Institute Principal has entrusted the work to M/s ENVIRO KAMKAR (LLP), Visakhapatnam for assisting the institute in the conduct of the Green Audit (GA).

III. SCOPE, OBJECTIVES & STRATEGY FOR ANITS GREEN AUDIT

Green audit enables to identify and provide opportunities to promote sustainable development practices, enhance environmental quality, improve health, hygiene and safety, save resources and achieve values of virtue. Green Audits are a sub-set of Environmental audits, and can be a highly valuable tool

for educational institutions in a wide range of ways to improve their environmental and economic performance and thereby their reputations.

The scope of the Green Audit for ANITS is so designed that the process and audit outcome should not only define the state of various environmental components, but also help the institution to compare its own programmes and activities over different years and to compare with other peer institutions. Other benefits should include, educating the students and employees on the environmental issues; identify areas for improvement and prioritize the implementation of future projects.

An effective and systematic scheme was designed and adopted to establish the baseline data for various environmental conditions. The aim of green auditing is to help the institution to adopt sustainable development practices and to inculcate these concepts in the minds of young engineers, and through them to the nation.

1. General and Specific Objectives of Green Auditing

The general objective of green audit is to prepare a baseline report on the status of (i) biodiversity and other resources, (ii) wastes generated and to mitigate resource wastage and improve resource quality and sustainable practices by involving the campus community and through them to reach the public.

The specific objectives are:

- To prepare a checklist of flora and fauna diversity in and around the college campus.
- To suggest measures to improve biodiversity within the college campus.
- To monitor the energy consumption pattern of the college.

- To assess the water usage and its quality, within the college campus.
- To suggest sustainable energy usage and water conservation practices.
- To find out various sources for generation and mitigation of different wastes.

2. Strategy for Green Audit at ANITS:

This being for the first time for the ANITS of conducting a Green Audit, the audit programme was developed after detailed deliberations initiated by the management, staff and the external auditors, M/s. EKR. The GA period was synchronized with the academic year (June 2019 to May 2020). The whole process was divided into three stages:

A) **Pre-Audit Stage**: During this stage, with the Principal of the Institution on Chair, the GA Team was constituted with five Core Members (Three from the Institution and the remaining two from the third party consultant organization, EKR. The Institutional members, have involved all the department and other unit heads of the ANITS, comprising the teaching, administrative and other allied units of the institution and the GA protocols, requirements for collecting the audit evidences and the implementation schedules were prepared.

B) **Audit Stage**: During this stage, collection and validation of the audit evidences are the main activities which are on day-to-day basis and require systematic book keeping and data base development. This being the first ever audit for the ANITS, the procedures and methods were reviewed on monthly basis by the core team and validation of GA evidences were streamlined for the primary sectors of Landuse, Water, Air Quality,

Greenery, wastes generated and safe disposal of wastes. Along with these, training and awareness programmes for the Students, Teaching staff and supporting staff are conducted by the EKR. At the end of this stage, during May 2020, the audit results were analyzed and the audit report was presented to the Management of the ANITS.

C) **Post-Audit Stage:** This stage includes management's review of the GA report issue terms of reference to initiate the GA for the next year.

***

IV, GREEN AUDIT SUMMARY RESULTS

The Green audit of 2019-2020 covers the period between June 2019 to May 2020. However, the last two months of this period (March 20th 2020 to May 31st 2020) being the Covid19 lockdown period, those two months information on the resources consumption and conservation do not reflect the true status. Hence, the effective period for the Audit is only 10 months.

1. LAND USE:

The Green status of the land use in the ANITS, with nearly 32% of the area under open uses, can be considered as very good land use planning. The per capita open area is around 3.624 m^2, which is fairly very good and among similar level institutions under private sector, the status is **High healthy**.

#	Land Use	Extent (m^2)	Extent (ha)	% of Land Area
1	Built-up Ground Coverage	7978.60	0.80	17.54
2	Total Parking Area	8974.74	0.90	19.73
3	Tot-Lot + Play Ground Areas	5306.16	0.53	11.67
4	Roads and Tracks	5951.80	0.59	13.08
5	Vacant Site Area	17272.70	1.72	37.98
	TOTAL AREA	**45484.00**	4.54	

The land use can be considered as highly balanced as per the norms for institutions of higher learning. Though the vacant site area, was marked for greening, the total open area (areas under roads and Tracks; Play ground areas and more than 80% of the Parking areas are left open to sky, thereby enabling free wind flow, good harvesting of rain waters through natural percolation.

GREENERY:

The present one being the 1st ever GA for this institute, the audit for the greening was limited to the ***Tree Cover*** only, while the other vegetation strata was not considered as most of them are either annuals or ornamental exotics. results indicate that about 80% of the Open Areas in the campus are covered with vegetation.

The general pattern of the vegetation is more ***peripheral*** to the individual blocks than to the campus boundary. The campus has a boundary length of around 1200 m, while 42% of the length has matured tree cover. Similarly, the areas between different building blocks also have dense tree cover (Fig. 1).

In terms of species diversity, number of trees and biomass quantities, the assessment was made and the results indicate that, the diversity of the tree cover and biological productivity from the available land has good scope for improvement. However, the present state of the tree species diversity and their enumeration are reported.

A total of 634 individual trees belonging to 17 tree species were recorded in the ANITS campus (Table T). Their composition indicates that most of them are native species of economic importance. The distribution of the trees into different girth classes (Table G) indicate that 70% of the trees are aged less than 20 years old, revealing that most of them were planted after the campus is initiated.

Table T: Tree Populations of ANITS campus:

No.	Family	Scientific Name	Vernacular Name	No.
1	ANACARDIACEAE	*Mangifera indica*	Mango	46
2	APOCYNACEAE	*Cascabela thevetia*	Pachha Ganneru	56
3	ARECACEAE	*Borrasus flabellifer*	Thati	58
4	ARECACEAE	*Cocos nucifera*	Coconut	47
5	ARECACEAE	*Dypsis lutescens*	Areca Palm	37
6	*COMBRETACEAE*	*Terminalia catappa*	*Badam*	40
7	FABACEAE	*Delonix regia*	Thurai	48
8	FABACEAE	*Caesalpinia pulcherrima*	Pamidi Thangedu	22
9	FABACEAE	*Dalbergia sissoo*	Indian Rosewood	1
10	FABACEAE	*Millettia pinnata*	Kanuga	42
11	FABACEAE	*Peltophorum pterocarpum*	Konda Chinta	6
12	FABACEAE	*Saraca asoca*	Ashoka	62
13	MELIACEAE	*Azadirachta indica*	Neem	49
14	MORACEAE	*Ficus religiosa*	Ravi	6
15	MYRTACEAE	*Psidium guajava*	Guava	52
16	MYRTACEAE	*Syzygium cumini*	Neredu	3
17	RUBIACEAE	*Neolamarcia cadamba*	Kadamba	42
18	SAPINDACEAE	*Sapindus emarginatus*	Kunkudu	17
TOTAL				**634**

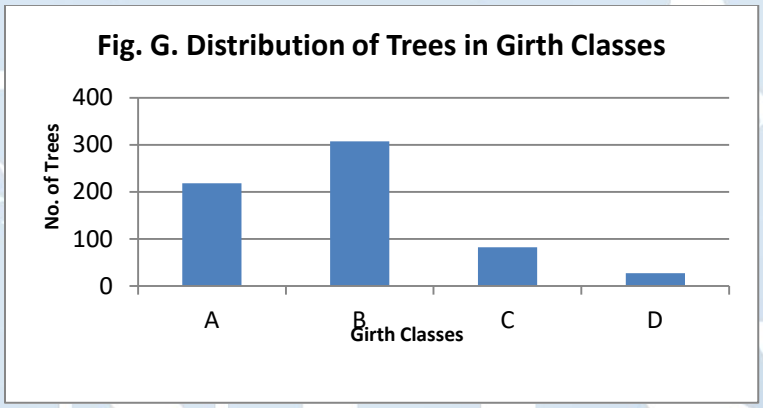
Table G. Distribution of Tree populations in to different Girth Classes.

No.	Scientific Name	Vernacular Name	Girth Classes				No.
			A	B	C	D	
1	*Mangifera indica*	Mango	-	36	7	3	46
2	*Cascabela thevetia*	Pachha Ganneru	29	27	-	-	56
3	*Borrasus flabellifer*	Thati	-	12	37	9	58
4	*Cocos nucifera*	Coconut	-	29	12	6	47
5	*Dypsis lutescens*	Areca Palm	-	27	7	3	37
6	*Terminalia catappa*	*Badam*	18	20	2	-	40
7	*Delonix regia*	Thurai	21	24	3	-	48
8	*Caesalpinia pulcherrima*	Pamidi Thangedu	3	19	-	-	22
9	*Dalbergia sissoo*	Rosewood	-	1	-	-	1
10	*Millettia pinnata*	Kanuga	31	11	-	-	42
11	*Peltophorum pterocarpum*	Konda Chinta	2	4	-	-	6
12	*Saraca asoca*	Ashoka	5	44	9	4	62
13	*Azadirachta indica*	Neem	13	30	4	2	49
14	*Ficus religiosa*	Ravi	4	2	-	-	6
15	*Psidium guajava*	Guava	52	-	-	-	52
16	*Syzygium cumini*	Neredu	-	2	1	-	3
17	*Neolamarcia cadamba*	Kadamba	26	16	-	-	42
18	*Sapindus emarginatus*	Kunkudu	34	3	-	-	17
		TOTAL	218	307	82	27	**634**
A = <40 cm; B = 41 – 90 cm; C = 91 – 140 cm; D = > 140							

The two interesting native species are (1) Neolamarcia cadamba, a sacred tree species popularly called as Kadamba; and (2) Dalbergia sissoo, called Rose wood tree, a highly commercial wood species. Of these two species, the former is in good numbers, while the second one is a lone individual.

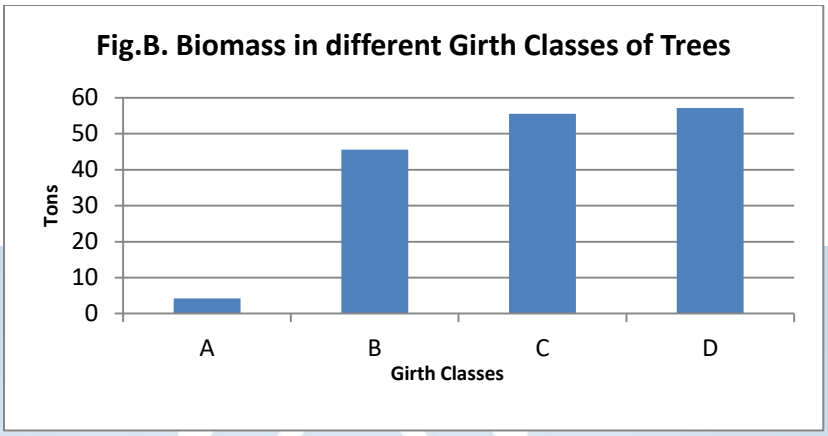
Trees Enumeration:

The tree species were enumerated and the results are presented in Annexure – F2. The results indicated that there are nearly 634 trees. Of six are fruit bearing trees and account for 32.33% of the trees. Among the remaining lot, palm species dominate and account for 22.4% of the trees. By age distribution as was estimated from the Girth classes (Fig. G), majority were in the two lower age classes (A and B).



a) Biomass of Trees:

Woody biomass was estimated through ecological methods, and the top nine species which were high in numbers have contributed significantly to the biomass. On the whole, all the tree strata together have contributed 162.35 tons of biomass, with a mean of 0.256 t/tree. The stocks in different girth classes of the trees are shown in Fig. B.



b) Carbon Stocks:

With the tree biomass, the Carbon stocks in the ANITS campus lands was estimated using standard stock assessment methods based on the formula of C in the Above Ground Biomass (AGC) + C in Below Ground Biomass (BGC)+ Soil Organic Carbon (SOC). In case of SOC, only the "*Vacant Land Site" of 17272 m2* of area was taken in to consideration, as this area only can sequester the SOC in future. The Carbon stock in the AGC was estimated at 82.8 tons C; while the stocks in the BGC and SOC were estimated at 21.5 tons C and 323.8 tons C, respectively. ***The scope for improvement is significant.***

Associated Fauna:

A good number of animal species associated with the ANITS campus greenery indicate that the greenery is provisioning biodiversity services. Some of the Avian (Bird) species, and other animals observed and identified by the students are presented in this report and these mostly include 16 species of Birds; 5 species of Butterflies; and one squirrel species. Only such species, which are very frequently observed in the campus are included in this.

Butterfly species	
Common Name	Scientific Name
Common tiger	*Danaus genutia*
Lime butterfly	*Papilio demoleus*
Common pieroot	*Castalius rosimon*
Common crow butterfly	*Euploea core*
Dark Blue Tiger	*Tirumala septentrionis*
Avian Species	
Common Name	Scientific Name
Indian roller	*Caoracias benghalensis*
Cattle egret	*Bubulcus ibis*
Green bee eater	*Merops orientalis*
Blue rock pigeon	*Columba livia*
Common Myna	*Acridotheres tristis*
Black Drongo	*Dicrurus macrocercus*
Black kite	*Milvus migrans*
House crow	*Corvus splendens*
Jungle crow	*Corvus macrorhynchos*
Alexandrine parakeet	*Psittacula eupatria*
Rose Ringed Parakeet	*Psittacula krameri*
Spotted Dove	*Streptopelia chinensis*
Common Myna	*Acridotheres tristis*
Common House sparrow	*Passer domesticus*
Common Koel	*Eudynamys scolopaceus*
Mammalian species	
Common Name	Scientific Name
Indian squirrel	*Funambulus palmarum*

2. WATER:

ANITS well aware of the importance of water and has a dedicated water management cell. Water is used for different purposes like, Drinking; Other domesticated uses; Laboratories; House Keeping and Greenery. For all the uses, ANITS depends upon ground water only as there was no public supply facility.

ANITS taps around 40 KLD of water from 6 bore wells, and has an installed capacity of 40 KLD above ground storage tanks. The mean distribution of the water for different uses is as follows:

No.	Purpose	Quantity (KLD)	(% Total)
1	Drinking	6	15
2	Other Domestic Uses	14	35
3	Laboratories & Other facilities	18	45
4	Greenery	2	5

On the whole, the drinking water availability is at 1.2 litres/head and 99 % of the campus population stays in the campus for less than 8 hours, the drinking water availability is reasonably good compared to the standard of 5 litres/head/24hrs. The ANITS has a R.O. Plant with an installed capacity of 6000 litres/day, and through which Reject water of 10000 litres/day will be generated. More than a half of which is used for floor washes and the remaining for the greenery. The RO plant water also is used by neighboring sister institution of the ANITS group.

3. ENERGY:

ANITS is one of the few institutions in India to have pioneered in the energy conservation and use of renewable energy sources. Basically it uses three types of Energy sources: (1) Electricity from the Public supply and (2) Electricity from the Own Solar plants and (3) Diesel (HSD).

The Institute during the audit year has consumed 2867/day units with a mean of 87194 units per month. However, the monthly variations were very high and ranged from a low of 43766 units in January to a high of 120240 units in September. From September to January, the consumption decreased gradually, despite the fact that the period may have peak academic activity. This indicates that the energy efficiency can be enhanced further in its use.

The declined power consumption from September to January indicates could be due to reduced use of Air conditioners. The Institution has a total of 332 air conditioners together have a cooling capacity of 500 tons. The illumination and air circulation in the facilities needed examination.

On the whole, the per capita electricity consumption in the institute is around ***219 units/annum***, which is reasonably good in Educational Institutions.

The Institute has 450 KVA solar power generation systems with 1364 panels installed and is connected to the grid. Therefore, Energy units consumed from the public supply are exclusive of this power. Thus, addition of this power, accounts for a per capita production of 19 units/annum.

The second major use sector for energy is Transportation sector of the Institute. On all working days, the Institute's fleet of Buses and vehicles ply a part of the campus population. The audit results indicate, the Institute's transportation by buses covers a distance ranging from 28400 km/month to 65822 km/month, with a mean of 44946 km/month. The transportation consumption of oil ranges from 6600 litres/month to 15380 litres/month, with a mean of 11483 litres/month. Another 884 litres/month of HSD is consumed by administrative vehicles. Thus, the institution transportation covers around 35% of the campus population. The remaining 65% attend by various means, like, public transport (16%), private hired transport vehicles mostly 3 wheeler rickshaw (27%) vehicles, and about 8% of the population uses their own vehicles as was revealed from the rapid survey.

By maximizing the entropy of the transportation data, it is estimated that all the travel trips of the campus population had a per capita HSD consumption was arrived at 83.82 liters/annum.

ANITS also uses LPG fuel for its hostel messes and in some laboratories also. The evidences revealed that the annual consumption of LPG in all the facilities for the year 2019-2020 was 560 kg.

On the whole, during the year 2019-2020, the ANITS has CO_2 emission of 867 tons from use of electricity, and 356 tons from HSD Oil consumption, and 1.7 tons from LPG consumptions. Thus from the three major sources of energy, around 1224 tons of CO_2 emissions were released. However, by way of solar power generation of 93960 kWh, about 86 tons of CO_2-e could be saved or mitigated.

4. WASTES GENERATION:

The wastes generated from academic and administrative divisions only could be taken in to account, as the total institution could not be covered for certain limitations during this first audit. The wastes generated from the academic and administrative divisions are characterized into

(a) Wet Waste;

(b) Paper & Board waste;

(c) Metallic waste;

(d) Plastic Waste;

(e) Battery waste

(f) E-waste.

The waste generated from the two divisions, from a sampling of 1 month is presented below:

#	Waste Type	Sources	Qty	Disposal
	Wet Waste	Dining Halls & Messes	60 kg/day	Compost
	Paper & Board	Administrative & Academic	4.7 kg/day	Authorized Vendors
	Metallic	All	0.21 kg/day	Authorized Vendors
	Plastic	All	0.36 kg/day	Authorized Vendors
	E-waste	All	0.2 kg/day	Authorized Vendors

The waste management is one area where the institution is focusing on application 5 R's principle so as to enable the young learners for innovations. The Institution has initiated several good initiatives in the field of solid waste management. Within each building or facility, at all common places, at convenient points, semi-closed dust/waste bins were placed to dispose all types of dry wastes. However, for the disposal of Wet-waste, one large bin was placed near the major entries of the buildings. The wet wastes are cleared on daily basis and are transferred to the compost area. On the other hand, the dry wastes are cleared from their bins twice a week, and are transferred to the common place where they are segregated to different waste types and disposed to authorized vendors. All the students are encouraged to examine the dry waste and to take up team projects to develop innovative systems for the use of such wastes or their minimization.

5 ECOLOGICAL ACTIVITIES

Environmental and Sustainability Initiatives

ANITS, to realize its *Vision* of making its campus a ***Carbon Neutral*** campus and also to empower its students and employees in addressing the environmental and sustainability challenges of the nation, introduced several activities to create awareness and educational activities. These activities are generally taken up at the department level, while some activities on certain days of international or national importance, the activities are taken up at the Institutional level.

1. SWACH ANITS:

The programme was initiated at the Institutional level and coordinated by the NSS wing of the Institution. The programme aims at training the students in the ***Participatory Management of the Campus*** and also creates awareness among the students on the **Swatch missions** of the country. The programme for the year was launched in **August 2019**, and continued till the end of the academic year. About 120 students (10 to 12 volunteers from each department) have participated in this programme.

2. ECO GANESHA CAMPAIGN:

***Eco Ganesha Campaig*n** is one of the regular public outreach programme of **ANITS** conducted every year with the aim of using eco-friendly idols of Ganesha, so as to protect the water bodies from pollution of hazardous chemicals.

Around the time of latter half of August 2019, prior to Ganesha Chathurdhi festival, the **Green Club (GC)** based at the Civil Engineering department, first conducts the ECO friendly Ganesh Idol Competition amongst students, and promote producing chemical free and easily water submersible idols of Ganesha in good numbers.

In the second step, these idols will be distributed among the students and employees of ANITS. Finally, the students will distribute the idols through a campaign for Eco-friendly Ganesha at the nearby village, Thagarapuvalasa; and also at different places where ANITS students are residing. Later, at the end of the event, Principal Prof T.V Hanumantha Rao, will participate and distribute the Best Idol Making Students as a token of appreciation.

3. SAVE THE BEACHES:

ANITS, as part of its environmental initiatives organizes *World Ozone Day* every year on September 16th, so as to educate the young engineers on the importance of use of Ozone Depleting Substances in various technologies and gadgets. The programme is conducted at the Institute level. As a part of the programme, a public outreach campaign also is conducted at a prominent public place in the

city. On 18th September, 2019, a campaign was undertaken for the Beach users or visitors of the city to make them aware of using the beaches in an environmental friendly way. In this context, ANITS students have organized a Beach Cleaning programme by collecting waste and debris for a stretch of 2 km length of beach stretch at Rushikonda beach, Visakhapatnam.

4. VANAM MANAM

VANAM MANAM is a plantation program conducted every year by ANITS supporting the state's mission of "***Vana Mahotsava"*** during the 1st week of October. During this year (2019-2020) ANITS has designed the programme to plant fruit bearing trees and other species that attract birds and other lower animals to the campus. About 150 students from all the departments and faculty have participated in the programme and planted species like, Guava, pomegranate, Bur flower in and around the campus. The4 programme was led by Senior faculty members, Ms. P.V.R. Sravya, Mr. J. Harshavardhan Reddy and Mr. C.H. Srinivas.

Besides these special events, the students have several assignment models built in their curriculum modules, as was also recommended by the AICTE's

Environmental Policy, and were presented before the audit team. However, the audit team recommended the assessment of these in the next year's audit programme, as they need to be first approved by the concerned academic body.

V AUDIT RECOMMENDATIONS

- ANITS by the time the next Audit is initiated should review and revise its environmental policy, to incorporate updates of the nation's policies. The new policy will be the basis of the next green audit for the year 2020 - 2021.
- The audit team, appreciates the well designed layout planning of the institute, ensuring 38 % of the land area under open category uses. However, the utilization of the open category lands need to be further maximized and documented.
- Although the greenery is good in terms of the extent and numbers, effective planning can enhance, the diversity, productivity and sequester more carbon, so as to realize the objective of making the campus C-neutral.
- Water management is very good, and needs appreciation of using huge amounts of R.O reject water for greenery and floor washes. However, the audit team recommends for the focus on enhancing rain waters harvesting from roof tops and through percolation pits.
- The Auditors appreciate the Management for replacing most electrical lights with energy efficient (LED) systems; generation of Solar power and reduced use of air-conditioning systems. However, the energy use from transport system can be improved significantly. Focus is to be made that the Institute buses should achieve 5 km/l from the present mean of 4.27 km/l.
- The Institute can further enhance its Solar Power production. Presently, the

solar power accounts for around 10% of the total power consumption. Considering the present annual expenditure of Rs. 90 lakhs/annum, the institute can plan for a 1 MW solar power plant, and can not only realize the investment in 5 years, but also can make the campus Carbon neutral.

- Although the waste management is in places, it needs more documentation of wastes related to metal plastic, battery and E wastes generated and disposed.

Enviro KAMKAR LLP

Team

Dr. VINAY SAGAR

K.Srinija Aparna

SANCHARI BISVAS

Help us to assist you to develop green India.

ENERGY AUDIT REPORT

Of

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES

Sangivalasa, Visakhapatnam

PRAGNANAM BRAHMA
ANITS

By

TÜV INDIA
TÜV NORD GROUP

TÜV INDIA PRIVATE LIMITED

TÜV NORD GROUP

3RD FLOOR, 304 AND 304/A, ASHOKA BHOOPAL CHAMBERS,
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June 2022

SYED AHAMED MOHIUDDIN
ASSESSOR - SUSTAINABILITY

HEAD - CERTIFICATIONS

ACKNOWLEDGEMENT

TUV India wishes to thank all the staff and Management of ***Anil Neerukonda Institute of Technology & Science*** management, teaching & non-teaching for the kind cooperation and assistance extended to our Auditors during the course of the Energy Audit.

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Table of Contents

1. Executive Summary

Energy Audit of Anil Neerukonda Institute of Technology & Sciences was carried out by TUV India during June 2022. The approach taken in this facility included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and associated systems & monitoring equipment, including the electrical, lighting & HVAC systems, water management and operational & maintenance procedures. The study covered the following areas to summarize the present status of environment management in the campus:

- Energy management
- Water management

The report accounts for the energy consumption, water consumption and management measures of the *Anil Neerukonda Institute of Technology & Sciences* based on actual assessment. The report compiles a list of possible actions to conserve and efficiently access the available scarce resources and their saving potential is also identified.

2. PROJECT BACKGROUND:

2.1 Objective

The scope of work includes gap analysis of the college campus as per applicable regulations and standards relating to electricity consumption, water consumption, and safety practices.

2.2 Methodology

The Study team having diversified experience in Energy Audits, Water Audits, Green Audit, ISO 14001, ISO 45001, ISO 14064, ISO 50001, GRI reporting, AA1000AS, GHG Accounting and Sustainability validations/ Verifications along local EHS legislations is identified and formed to conduct the study.

The team verified all applicable environmental aspects as per the GRI (Global Reporting Initiative) Sustainability Reporting Standards for the entire campus including the EHS (Environment and Health Safety) safety requirements to evaluate institution's intent towards the Sustainability and EHS safety in combating climate change as well as their role towards carbon neutrality, GHG mitigation measures, communications to stakeholder and their concerns.

2.3 About TÜV India

TÜV India Private Limited was incorporated in India in the Year 1989 and is a premier organization in the field of Testing, Certification, Inspection and Training. The company is a subsidiary of TÜV Nord group, which has been working for last 150 Years in the field of Quality, Safety, Health, Standardization, Certification, and Inspection. It has presence in over 70 countries and offers expert services through a global network. With more than 15000 professionals worldwide TÜV Nord has a turnover of over 1 billion Euros. TÜV India offers entire range of services in certification and inspection in India and South Asia with our contingent of professionally qualified and industry experienced Auditors and Inspectors. With a strong team of qualified Engineers having diversified experience in the field of Building Construction, Maintenance, quality assurance, examination of Buildings in distress and related rehabilitation works. We at TÜV ensure to optimize customer operational efficiencies and thereby maximize customer satisfaction.

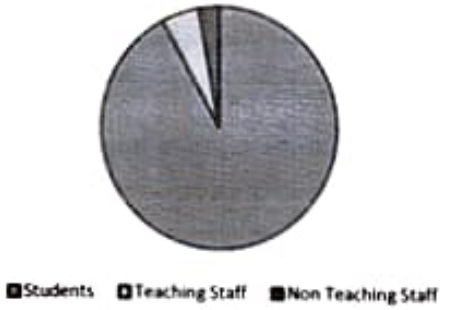
2.4 About the Institution

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (ANITS), was established in the academic Year 2001-02 with the approval of the *ALL INDIA COUNCIL FOR TECHNOLOGY EDUCATION (AICTE)*, New Delhi and the Government of Andhra Pradesh and is affiliated to ANDHRA UNIVERSITY (AU), Visakhapatnam.

"ANITS" is located in a plot of 12 acres' area in Sangivalasa Village of Bheemunipatnam Mandalam and is approximately 300 meters from the Chennai - Kolkata Highway.

The campus has a population of around 4,766 of which, 4636 are only day users. Of the total population, 92.02% are Students, while teaching and supporting staff account for 5.24 % and 2.72 %, respectively.

ANITS - Campus Population



Infrastructure:

The college campus is spread over an area of over 12 Acres with amenities like Central library, Class Rooms & Seminar Halls, Transport, Hostels for Boys & Girls, Cafeteria, Medical and Sports.

3. Energy Scenario at ANITS

The energy consumption in *ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (ANITS)* campus includes three types of energy sources:

(1) Electricity from the Public supply – Eastern Power Distribution Company Limited – A.P

(2) Electricity from the Own Solar plant

(3) Diesel (HSD)

The Institute during the audit year has consumed 2274/day units with a mean of 69,192 units per month. However, the monthly variations were very high and ranged from a low of 48948 units in January to a high of 94176 units in November. From November to February, the consumption decreased gradually, despite the fact that the period may have peak academic activity. The declined power consumption from November to January indicates could be due to reduced use of Air conditioners.

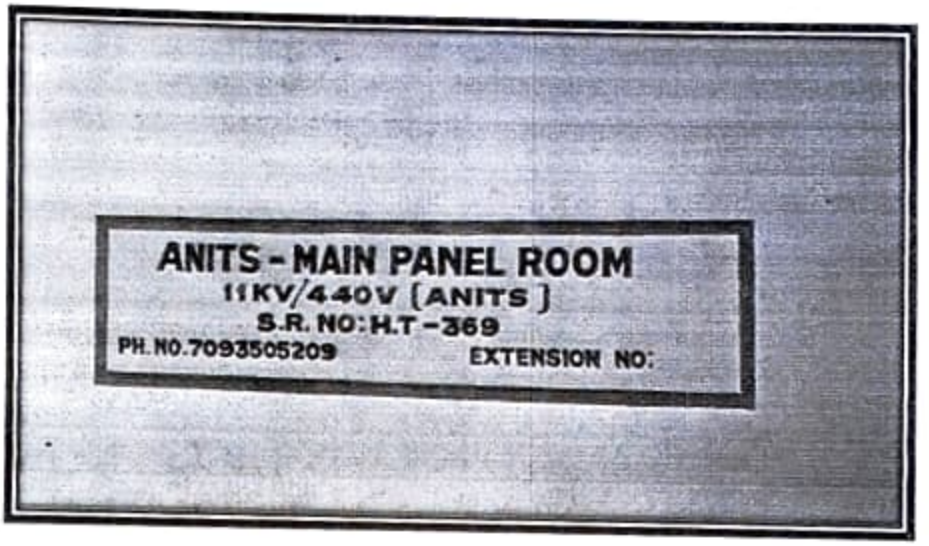
The Institution has a total of split air conditioners together have a cooling capacity of 500 tons. The illumination and air circulation in the facilities needed examination.

On the whole, the per capita electricity consumption in the institute is around 174 units/annum, which is reasonably good in Educational Institutions.

Considering the monthly consumption data, it has been recorded that 830311 units of electricity has been consumed by the institute among which it is observed that November month has utilized the highest amount of Electric energy i.e. 94176 units, and lowest i.e. 48948 units in the month of January.

3.1 Electricity from Grid

The campus has Contacted Maximum Demand (CMD) of 450 KVA from Eastern Power Distribution Limited of Andhra Pradesh State. Main Panel room of 11Kv/440V is situated in the campus and are equipped with all safety measures.



Appliances and their power consumption rates in Campus

The campus is equipped with state of the art infrastructure and are listed below,

S. no	Name of appliance	Power Rating(Watt)	Quantity	Power Consumption (Watt)	Average usage per day (hr.)	Power Consumption/day (Watt)
A	B	C	D	E = C X D	F	G = E X F
1	Ceiling fans	80 W	1686	134880	6	809280
2	Pedestal fans	55 W	43	2365	6	14190
3	Tube lights (LED)	20W	1469	29380	6	176280
4	Desktops	50 W	783	39150	6	234900
6	Printers	50 W	67	3350	2	6700
7	AC's	2000 W	332	664000	4	2656000
8	LCD projectors	280 W	116	32480	2	64960

9	Wireless routers	6 W	37	222	24	5328
10	Window AC's	1400W	3	4200	4	16800
11	CC camera	10 W	153	1530	24	36720

Electrical Bill Analysis of ANITS Campus

The Energy bill data were analyzed from March 2021 to February 2022, the total electricity bill for the academic year 2021 - 2022 is Rs. 80,48,184 and energy unit consumption is 8,30,311kWh.

Month	Energy Consumption (kWh)	Energy Cost (INR)	Unit Cost/kWh
Mar-21	71696	703821	9.82
Apr-21	66657	558548	8.38
May-21	45978	368212	8.01
Jun-21	48085	463018	9.63
Jul-21	58462	591223	10.11
Aug-21	88154	905666	10.27
Sep-21	87862	910919	10.37
Oct-21	92010	889008	9.66
Nov-21	92958	836470	9.00
Dec-21	64021	661056	10.33
Jan-22	48948	477990	9.77
Feb-22	65480	682253	10.42
Total	**830311**	**8048184**	**9.69**

Table 1: Energy Bill Analysis March 2021 to February 2022

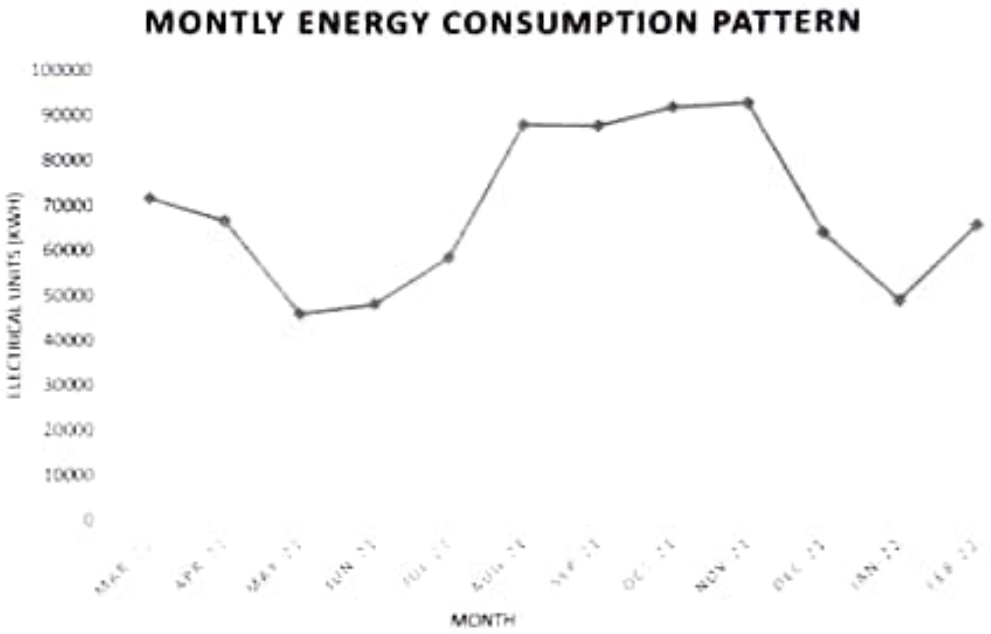


Figure 1: kWh Consumption analysis – During November 2021 energy consumption is high

3.2 SOLAR ENERGY

Institute has 450 KVA solar power generation systems with 1364 panels installed and is connected to the grid. Therefore, Energy units consumed from the public supply are exclusive of this power.

The solar panels are installed on the roof top of every department and the power generation details are mentioned in the below table from Jan 2021 to May 2022. The average plant load factor (PLF) of the solar power plant is 8.94 %. The monthly power generation is recorded by the management and the details are presented below,

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	1080 0
Month - Jan 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	4544	13.1 5%	7277	14.6 5%	7420	14.1 2%	7159	14.4 1%	7231	14.5 6%	4815	12.6 2%	6598	13.2 8%	45044	13.9 0%

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	1080 0
Month - Feb 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	4685	15.0 6%	7341	16.4 2%	7504	15.8 6%	1130	2.53 %	6269	14.0 2%	4900	14.2 7%	6871	15.3 7%	38702	13.2 7%

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	1080 0
Month - Mar 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	4557	13.1 9%	7063	14.2 2%	7239	13.7 7%	6748	13.5 8%	6986	14.0 6%	4735	12.4 1%	6807	13.7 0%	40056	12.3 6%

Location	Residency boys &Girls hostel,	Chemical block	CSE block	CSE block	EEE block	G-Block	ECE Block	

INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	10800
Month - Apr 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	5360	1.02 %	8416	1.11 %	8609	1.07 %	5859	0.77 %	9188	0.42 %	6002	1.03 %	7697	1.01 %	45111	0.91 %

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
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Month - May 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	5446	15.7 5%	8633	17.3 8%	9011	17.1 4%	8725	17.5 6%	219	0.44 %	5937	15.5 6%	8570	17.2 5%	46541	14.3 6%

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	10800
Month - Jun 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF

TOTAL	4888	14.6 %	7389	15.3 %	7530	14.8 %	7317	15.2 %	12	0.02 %	4995	13.5 %	7182	14.9 %	39317	12.5 %

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1818	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	1080 0
Month - Jul 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	4980	14.4 %	7377	14.8 %	7807	14.8 %	7585	15.2 %	0	0.00 %	5184	13.5 %	3888	7.83 %	36821	11.3 %

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1818	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
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Month - Aug 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	5140	1.33 %	7608	1.37 %	8003	1.36 %	7793	1.40 %	0	0.00 %	5302	1.24 %	0	0.00 %	33846	0.93 %

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1818	System ID	1928	System ID	1840	System ID	1863	Total	
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Month - Sept 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	4771	1.36 %	7936	1.45 %	7446	1.19 %	7296	1.44 %	0	0.00 %	4959	1.19 %	0	0.00 %	31807	0.87 %

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1930	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1861	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.04 9	MW	0.43
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	10320 0
Month - Oct 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	5208	15.5 8%	7078	14.7 4%	7901	15.5 5%	7836	16.1 0%	1368	2.84 %	5301	14.3 7%	2576	5.36 %	37269	11.8 8%

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1930	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1861	Total	
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Month - Nov 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	4029	12.0 6%	4879	9.12 %	6374	12.5 5%	6263	13.0 4%	0	0.00 %	4224	11.4 5%	0	0.00 %	25269	8.07 %

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	10800
Month - Dec 2021	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	4830	1.56 %	6752	1.91 %	7384	1.97 %	7299	2.06 %	0	0.00 %	4901	1.80 %	1654	0.47 %	32820	1.42 %

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	10800
Month - Jan 2022	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	5552	16.0 5%	7367	14.8 3%	8424	16.0 3%	8264	16.6 3%	0	0.00 %	5556	14.5 6%	0	0.00 %	35163	10.8 5%

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1910	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	10800

Month - Feb 2022	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	4959	15.9 4%	7318	16.3 9%	7732	16.3 9%	1630	1.65 %	3234	7.23 %	5077	14.7 8%	1907	8.74 %	33867	11.6 1%

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1930	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act Units Per Day	1656	Act.Units Per Day	10800
Month - Mar 2022	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	4557	13.1 8%	7063	14.2 2%	7239	13.7 7%	6748	13.5 8%	6086	14.0 6%	4735	12.4 1%	6807	13.7 0%	40056	12.3 8%

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1930	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	
	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	10800
Month - Apr 2022	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	5360	1.02 %	8418	1.11 %	8609	1.07 %	5858	0.77 %	3168	0.42 %	6002	1.03 %	7687	1.01 %	45111	0.91 %

Location	Residency boys &Girls hostel,		Chemical block		CSE block		CSE block		EEE block		G-Block		ECE Block			
INVERTERS	System ID	1843	System ID	1930	System ID	1834	System ID	1838	System ID	1928	System ID	1840	System ID	1863	Total	

	KVA	48	KVA	69	KVA	73	KVA	69	KVA	69	KVA	53	KVA	69	KVA	450
	MVA	0.04 8	MW	0.06 9	MW	0.07 3	MW	0.06 9	MW	0.06 9	MW	0.05 3	MW	0.06 9	MW	0.45
	Act.Units Per Day	1152	Act.Units Per Day	1656	Act.Units Per Day	1752	Act.Units Per Day	1656	Act.Units Per Day	1656	Act.Units Per Day	1272	Act.Units Per Day	1656	Act.Units Per Day	1080 0
Month - May 2023	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF	Units	PLF
TOTAL	5446	15.7 6%	8633	17.3 8%	9011	17.1 4%	8725	17.5 6%	219	0.44 %	5937	15.5 5%	8570	17.3 5%	46541	14.3 8%

The technical description and capacity of solar power plant is presented below,

Solar Panels

#	PANEL INFO	EEE	ECE	CSE	CHEMICAL	MECH	IT	GIRLS HOSTEL
1	COMPANY	ORB Energy	ORB Energy	ORB Energy	ORB Energy	ORB Energy	ORB Energy	ORB Energy
2	INVERTER	Schneider	Schneider	Schneider	Schneider	Schneider	Schneider	Schneider
3	Modules	209	209	209	209	220	160	148
4	POWER	330Wp	330Wp	330Wp	330 Wp	320 Wp	330 kWP	330 kWP
5	TOTALPOWER(KWP)	68.97kWp	68.97	68.97	68.97 kWP	72.6 kWP	52.8 kWP	48.84 kWP
6	INVERTER RATING	66 kVA	66kVA	66kVA	66 kVA	66 kVA	66 kVA	66 KVA
7	INVERTERS	01	01	01	01	01	01	01

3.3 Fuel Consumption

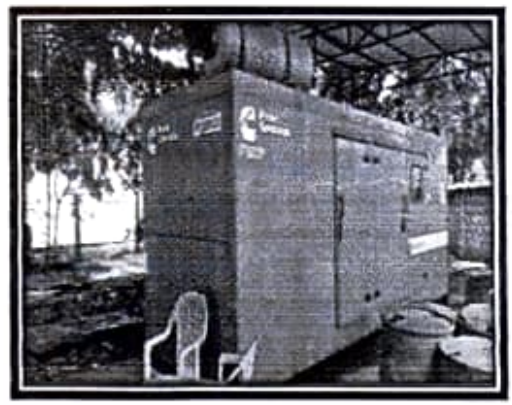
Diesel fuel is the second major use sector for energy in the Institute. The audit results indicate, the Institute's transportation by buses covers a distance ranging from 28400 km/month to 65822 km/month, with a mean of 44946 km/month. The transportation consumption of Diesel ranges from 6600 liters/month to 15380 liters/month, with a mean of 11483 liters/month. Another 884 liters/month of HSD is consumed by administrative vehicles. Thus, the institution transportation covers around 35% of the campus population.

The remaining 65% attend by various means, like, public transport (16%), private hired transport vehicles mostly 3 wheeler rickshaw (27%) vehicles, and about 8% of the population uses their own vehicles as was revealed from the rapid survey. By maximizing the entropy of the transportation data, it is estimated that all the travel trips of the campus population had a per capita HSD consumption was arrived at 83.82 liters/annum.

ANITS campus also uses LPG fuel for its hostel messes and in some laboratories also. The evidences revealed that the annual consumption of LPG in all the facilities for the year 2021-2022 was 560 kg.

Fuel Consumption in Transportation

Fuel Consumption in DG Set



Campus infrastructure in various Departments.

#	Name of the Department	Annexure number
1	Computer Science Engineering	Annexure I
2	Mechanical Engineering	Annexure II
3	Electronics & Communication Engineering	Annexure III
4	Chemical Engineering	Annexure IV
5	Electrical & Electronics Engineering	Annexure V
6	Information Technology	Annexure VI
7	Civil Engineering	Annexure VII
8	Administration	Annexure VIII
9	GIRLS HOSTEL (BLOCK A & B)	Annexure IX
10	BOYS HOSTEL (BLOCK A & B)	Annexure X

Annexure I – Computer Science Engineering

S No	Room	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers	Window AC's
1	101 -CR	5		4					1		
2	102 -FC	3		3							
3	103 -FC	3		3	1	1					
4	104 -CR	5		5					1		
5	105 -FC	2		2			1				
6	106 -FC	4	2	4		1	1				
7	107-L		1		37				1		3
8	108 -FC	2		3	5		1	1			
9	109 -SR	1		3				2			
10	110-L		1		36			3			
11	111-L	4		2	15						
12	Lobby			4							
13	201-cabin	4	1	3	2						
14	202-L		1		1	2		3	1		
15	203 -FC	2		2	1	1	1	1			

16	205 -CR	7		5					1	1	
17	206 -CR	7		5					1		
18	207 -CR	8		8	60	3		4	1		
19	208-L	6		5		2					
20	209-O	3		3	1	1	1				
21	301-LB	4		3							
22	302-L			4				2			
23	303-CR			4	1	1	1	1			
24	304-SR	2		2	2	2					
25	306-CR	7		5					1		
26	307-CR	7		5					1		
27	309-CR	7		5							
28	310-FR	3		2	1	1					
29	311-FR	3		2							
30	312-FR	3		2	1	1					
31	313-CR	7		5					1		
32	401-L	12		10	16	1		3			
33	402-FR	2		2	1	1					
34	403-FR	2		2							
35	404-CR	5		4					1		
36	405-CR	5							1		
37	407-CR	7		5					1		
38	408-L	1			36	1					
39	409-CR	8							1		
40	Lobby	1		3							
41	TOTAL	152	6	129	217	19	6	20	14	1	3

Annexure II - Mechanical Engineering

S No	Room	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers
1	101 -L	16		19						
2	102 -FD	5		4						
3	103 -EC	5		3	2	1	2		1	
4	103A – FR	1		1						
5	104-FR	2		3	1	1	2	1		
6	105-L	1		6	1			2		
7	105 A-FR	1		1	1	1				
8	106-L	5		4						

9	107-L	6		3						
10	108-L	13		10	1					
11	LOBBY			5						
12	201-DH	12		10						
13	202-CR	5		3					1	
14	203-CR	5		4					1	
15	204-CR	5		5						
16	205-CR	5		3						
17	206-CR	6		5					1	
18	207-CR	6		4						
19	208-DH	10		14						
20	LOBBY			5						
21	301-L	5	1	11	70	2		6	1	
22	303-L	2		2						
23	304-FR	1		1	1					
24	305-FR	1		1						
25	306-FR	1		1						
26	307-FR	1		1						
27	308-FR	1		1						
28	309-FR	1		1						
29	310-FR	3		2						
30	311-31LIBRARY	3		2	2					
31	312-FR	3		2	1	1				
32	314-FR	4		2						
33	315-CR	5		3					1	
34	317-FR	1		1						
35	318-FR	1		1						
36	319-FR	1		1						
37	320-FR	2		1						
38	321-FR	1		1						

Annexure III – Electronics & Communication Engineering

1	GF	Geo Technical Engineers Lab	6		4						
10	Gf	Faculity Room	2								
11	Gf	Environment Eng lab	8		2						
12	Gf	Concrete Technology Lab	11		8						
13	Gf	Serveying Lab	1		2						
14	Gf	Lobby			5						
15	1st floor	Store Room			1						
16	1st floor	M tech Class room	3		2						
17	1st floor	Staff Room	2		2	1	1				
18	1st floor	Seminar Hall				1	1		3	1	
19	1st floor	HOD office	3		5	2	2		1		
2	107	Staff Room	2		2						
20		Staff Room	1		1						
21	1st floor	Tutorial Class Room	3		2						
22	1st floor	Staff Room	2		1						
23	1st floor	Computer lab	2			42	1	1	3	1	
24	1st floor	Class Room	6		4						
25	1st floor	Department Library	3		2	1	1				
26	1st floor	Staff Room	1		1						
27	1st floor	Staff Room	1		1	1	1				
28	1st floor	Class Room	6		4						
29	1st floor	Class Room	6		4						
3	GF	Environment Engineering Lab	8		2						
30	1st floor	Lobby			11						
31	2nd floor	Exam cell	25		24						
32	2nd floor	Spot Valuetion Room	6		11				3		
33	2nd floor	Dept Controller of Examination Room	4		3	1		1			
34	2nd floor	Processing Hall	6		12						
35	2nd floor	Exam cell	1		1						
36	2nd	Printing Room	2		3	3		1	1		

	floor										
37	2nd floor	Exam cell	3		3	1		1	1		
38	2nd floor	Central Examination Co-ordinator	3		4						
39	2nd floor	Examination Cell	6		4	3					
4	GF	Concrete Technology Lab	11		8						
40	2nd floor	Record Room	2		3						
41	2nd floor	Coding & Decoding section	3		2						
42	2nd Floor	Lobby	4		5		1				
5	GF	Serveying Lab	1		2						
6	GF	Lobby			5						
7	1st Floor	Store Room			1						
8	1st Floor	M.Tech Class Room	3		2						
9	Gf	Geo Technical Eng Lab	6		6						
S No	Room	Utility	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers

Annexure IV – Chemical Engineering

S No	Room	Utility	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers
1	D-102	*Mechanical Operation Lab/Heat transfer Lab*	7		7						
2	D-103	*Staff Room*	3		2						
3	D-104& 105	*Chemical Technology Lab*	12		10	1	1	1			

4	D-106	HOD	2		2	1	1		1		
5	107	Seminar Hall		12	7				3	1	
6	108	Seminar Hall	12		9	1			3	1	
7	Gf	Lobby			4						1
8	201	Faculity Room	2		2	1	1	1	1		
9	D-202	CR LAB	8		6						
10	D-2013	Dept Library	1		2	3	1	1	1		
11	D-204&203	Biotechnology Lab	11		10						
12	D-206	Staff Room	2		2						
13	D-211	Seminar Hall	11		4						
14	D-209	Faculity Room	3		2	1					
15	D-208	Comuter Lab	7		4	16					
16	1st Floor	Lobby			3						1
17	302	Class room	5		6						
18	303	Class room	5		6						
19	304	Class room	5		6					1	
20	305	Class room	5		6						
21	306	Faculity Room	3		2						
22	308		7		4						
23	312	Class room	7		4						
24	2nd floor	Lobby			4						1
25	402	Process Dynamicy Central Lab				1					
26	403	Class room	5		4						
27	404	Mass Transfer lab	12		10						
28	406	Faculity Room	2		2						
29	408	Class room	7		4						
30	412	Class room	7	4							
31		LOBBY			4						
32		TOTAL	151	16	138	25	4	3	9	3	3

Annexure V- Electrical & Electronics Engineering

S No	Room	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers
1	101 -L	14		12						
2	102 -FR	2		2	2	2	1	1		
3	105 -L	11		12						

4	107 -L	10		9						
5	108 -L	10		9	1					
6	LOBBY		2	7					1	
7	201-CR	5	1	4						
8	202-CR	5		4						
9	203-FR	3		2						
10	204-WH	1	1	1						
11	205-L	12		10						
12	207-L	13		11						
13	208-FR	2		2	1	1				
14	209-LB	4	1	3	1	1				
15	210-FR	4	1	1						
16	LOBBY			2						1
17	301-CR	5		4					1	
18	302-CR									
19	303	3		3						
20	L	1		4	38	1		3		
21	306-EH	5		2	1	1	1			
22	307-CR	7		4						
23	309-FR	3		2	1					
24	310-FR	3		2						
25	311-FR	3		2	1					
26	312-FR	7		5					1	
27	LOBBY			4						1
28	313-SR			2						
29	401-CR	8		4						
30	402-CR	8		2						
31	403-FR	2		2						
32	404-FR	2		2						
33	405-CR	8		4						
34	406-CR	6		3						
35	408-CR	7		5						
36	409-CR	3		2						
37	410-CR	3		2	1					
38	412-CR	10		5						
39	LOBBY			2						1
40	TOTAL	190	0	158	47	6	2	4	3	3

Annexure VI – Information Technology

S No	Room	Utility	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers
1	301	WT LAB	1		8	28			1	1	
2	302	JAVA LAB	1		8	40	2	2	2		1
3	303	Project LAB	2		14	60	3	1	5	1	2
4	305	HOD	3		3	2	2	4	1		1
5	306	Faculty Cabin	2		1	1		1		1	
6	307	Class Room	6		6						
7	308	Staff Room	2		2	2					
8	309	Staff Room	2		2	2	1	1			
9	310	Class Room	6		6					1	
10	311	Class Room	6		5					1	
11	2nd floor	Lobby			3	4					
12	401	Class Room	6		5	1				1	
13	402	Class Room	6		5	1				1	
14	403	Faculty Cabin	2		2						
15	404		2		2	2		1			
16	406	Staff Room	6		4	3		2			1
17	407	De Lab									
18	408	Faculty Room	8		7	2	1	1			
19	409	Faculty Room	7		4	5	1	2			1
20	3rd floor	Lobby			3						
21	502& 503	IT Lab				130	2		11		
22	504	Faculty Cabin	4		2						
23	505	Faculty Cabin	2		2	1	1	1	1		
24	506	Faculty Cabin	4				1				
25	507	Class Room		6	4						
26	508	Staff Room	2		2						
27	509	Staff Room	2		2						
28	510	Class room	6		5						
29	511	Class room	6		5	1				1	
30		Lobby			8						

Annexure VII – CIVIL Engineering

S No	Room	Utility	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers
1	GF	Geo Technical Engineers Lab	6		4						
2	107	Staff Room	2		2						
3	GF	Environment Engineering Lab	8		2						
4	GF	Concrete Technology Lab	11		8						
5	GF	Surveying Lab	1		2						
6	GF	Lobby			5						
7	1st Floor	Store Room			1						
8	1st Floor	M.Tech Class Room	3		2						
9	Gf	Geo Technical Eng. Lab	6		6						
10	Gf	Faculty Room	2								
11	Gf	Environment Eng. lab	8		2						
12	Gf	Concrete Technology Lab	11		8						
13	Gf	Surveying Lab	1		2						
14	Gf	Lobby			5						
15	1st floor	Store Room			1						
16	1st floor	M tech Class room	3		2						
17	1st floor	Staff Room	2		2	1	1				
18	1st floor	Seminar Hall				1	1		3	1	
19	1st floor	HOD office	3		5	2	2		1		
20		Staff Room	1		1						
21	1st floor	Tutorial Class Room	3		2						
22	1st floor	Staff Room	2		1						
23	1st floor	Computer lab	2			42	1	1	3	1	
24	1st floor	Class Room	6		4						
25	1st floor	Department Library	3		2	1	1				
26	1st floor	Staff Room	1		1						
27	1st floor	Staff Room	1		1	1	1				
28	1st floor	Class Room	6		4						
29	1st floor	Class Room	6		4						
30	1st floor	Lobby			11						
31	2nd floor	Exam cell	25		24						
32	2nd floor	Spot Valuation Room	6		11				3		

33	2nd floor	Dept. Controller of Examination Room	4		3	1		1			
34	2nd floor	Processing Hall	6		12						
35	2nd floor	Exam cell	1		1						
36	2nd floor	Printing Room	2		3	3		1	1		
37	2nd floor	Exam cell	3		3	1		1	1		
38	2nd floor	Central Examination coordinator	3		4						
39	2nd floor	Examination Cell	6		4	3					
40	2nd floor	Record Room	2		3						
41	2nd floor	Coding & Decoding section	3		2						
42	2nd Floor	Lobby	4		5		1				
43	3rd floor	Exam Cell	6		8						
44	3rd floor	Exam Cell	9		12						
45	3rd floor	Exam Cell	12		8						
46	3rd floor	Sports Room	5		5						
47	3rd floor	Gym	8	1	4						
48	3rd floor	Lobby			8						
49	5th floor	Dept. of Physics	19		13						
50	5th floor	Staff room	3		2	1	1	1	1		
51	5th floor	Staff room	2		1						
52	5th floor	Staff room	3		1						
53	5th floor	Staff room	2	7	1			1			
54	5th floor	Staff room	3		1						
55	5th floor	Staff room	3		1						
56	5th floor	Staff room	3		1	1	1				
57	5th floor	Staff room	3		1	1					
58	5th floor	Basic Science And Humanities	3		1	1	1				
59		HOD ROOM	3		2	1	1	1	1		
60		Staff Room	1		1	1	1				
61		Staff Room	1		1	1	1				

62		Staff Room	1		1	1	1	1			
63		Staff Room	5		2	1	1	1			
64		Chemistry Lab	2		3	1	1				
65		Staff Room	3		1						
66		Lobby			9						
		TOTAL	244	0	240	66	17	9	14	2	0

Annexure VIII – Administration

S No	Room	Utility	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers
1	*Gf*	Director Room	1		2	1		1	1		
2	*Gf*	Secretarial Room	2		7	1	1	2	1		
3	*Gf*	Conference Room							2	1	1
4	*Gf*	Principal Room	4		5	1		2	1		
5	*Gf*	Office Room	1			1					
6	*Gf*	Office Room	11		11	10		2			
7	*Gf*	Store Room	3		3						
8	*A-108*	HOD	1		2	1	1	1	1		
9	*A-109*	Faculty Room	8		7	2					
10	*A-110*	Class Room	5								
11	*A-111*	Class Room	8		5						
12	*A-112*	Class Room	8		5						
13	*113*	Class Room	6		6						
14	*Gf*	Lobby	7		11						
15	*1st floor*	201	1		23	66	3		5	1	
16	*1st floor*	202	15		9	1	2			2	
17	*1st floor*	203	1		3	1	1	1	1		1
18	*1st floor*	204	6		9	3	2	3			
19		Office Room	1		2	1	1	1			
20		Class room	32		20	4	1				1
21		Lobby			6						
22	*2nd floor*	Auditorium				1				1	1
23	*2nd floor*	302	1		2				1		
24	*2nd floor*	303	1		1				1		
25	*2nd floor*	304	1		1				1		
26	*2nd floor*	305	1		1				1		
27	*2nd floor*	308	2		3				1		

28	2nd floor	309			15				6		1
29	2nd floor	310	1		2	1			1		
30	2nd floor	311	40		34						1
	2nd floor	Lobby	2		5						
		TOTAL	170	0	200	95	12	13	24	5	6

Annexure IX - Girls Hostel

S. no	Name of appliance	Power Rating (Watt)	Quantity	Power Consumption (Watt)	Average usageper day (hr)	Power Consumption/day (Watt)
A	B	C	D	E=C X D	F	G=E X F
			1st floor			
1	Ceiling fans	80 W	13	0	12	0
2	Tube lights (LED) 4'feet	20W	6	120	6	720
3	Tube lights 4' feet	36 W	47	1692	6	10152
			2nd Floor			
1	Ceiling fans	80 W	12	0	12	0
2	Tube lights (LED) 4'feet	20W	14	280	6	1680
3	Tube lights 4' feet	9 W	48	432	6	2592
			3rd Floor			
1	Ceiling fans	36 W	12	0	12	0
2	Tube lights (LED) 4'feet	20 W	11	220	6	1320
3	Tube lights 4' feet	9 W	58	522	6	3132
			4th Floor			
1	Ceiling fans	36 W	12	0	12	0
2	Tube lights (LED) 4'feet	20 W	5	100	6	600
3	Tube lights 4' feet	9 W	63	567	6	3402

Annexure X- Boys Hostel

S. no	Name of appliance	Power Rating(Watt)	Quantity	Power Consumption (Watt)	Average usage per day(hr)	Power Consumption /day (Watt)
A	B	C	D	E=C X D	F	G=E X F
			A Block			
1	Ceiling fans	80 W	132	10560	12	126720
2	Tube lights (LED) 4 feet	20W	30	600	6	3600
3	Tube lights (LED) 1 feet	9 W	02	18	6	108
4	LED Bulbs	8W	12	96	6	576
5	Tube lights 4' feet	36 W	142	5112	6	30672
6	Tube lights 2' feet	20 W	08	160	6	960
7	Water cooler	2.8kwh/day	1	2800	day	2800
			B Block			
1	Ceiling fans	80 W	212	16960	12	203520
2	Tube lights (LED) 4 feet	20W	32	640	6	3840
3	Tube lights (LED) 1 feet	9 W	96	864	6	5184
4	LED Bulbs	8W	81	648	6	3888
5	Tube lights 4' feet	36 W	216	7776	6	46656
6	Tube lights 2' feet	20 W	50	1000	6	6000
7	Water cooler	2.8kwh/day	1	2800	day	2800

Good Practices in Energy Management:

- The management has installed a rooftop Solar Power plant which is accounts for around 10% of the total power consumption.
- The management have replaced most of the lighting with energy efficient LED lighting. The split Air – Conditioners installed in the campus are five star rated from Bureau of Energy Efficiency.

Audit Recommendations:

- It is recommended to draft an Energy Management policy and continuously monitor the consumption pattern of the Institution.
- It is recommended to maintain a log book and monitor the fuel consumption of Diesel Generator.
- It is recommended to conduct a Third Party Electrical Safety Audit annually in the campus premises.

4.0 WATER CONSUMPTION SCENARIO AT ANITS

The water is consumed in the *ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (ANITS)* campus for different purposes like drinking, gardening, cleaning and firefighting.

The campus depends upon ground water and municipal water for its daily needs. The campus utilizes 40 KLD of water from 4 bore wells, and has an installed capacity of 40 KLD above ground storage tanks. The mean distribution of the water for different uses is as follows

The drinking water consumption is estimated at 1.2 liters/head and 99 % of the campus population stays in the campus for less than 8 hours, the drinking water availability is reasonably good compared to the standard of 5 liters/head/24hrs.

Bore Well 1

Bore Well 2

Bore Well 3

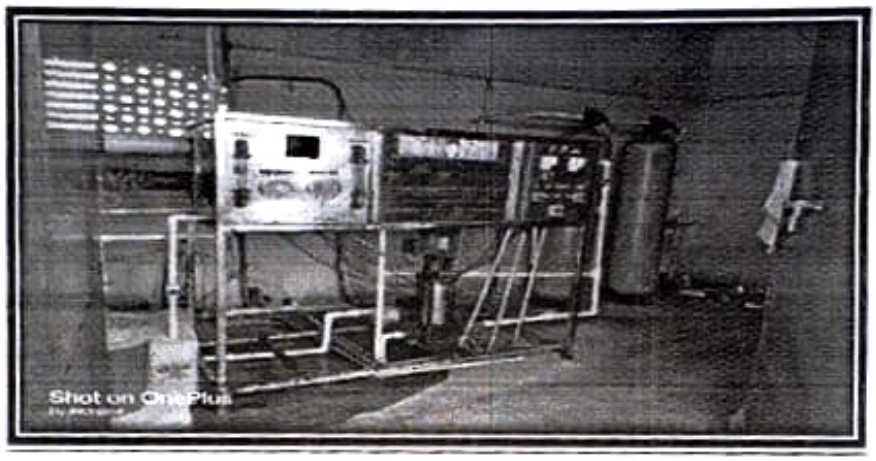
Bore Well 4

Good Practices in Water Management:

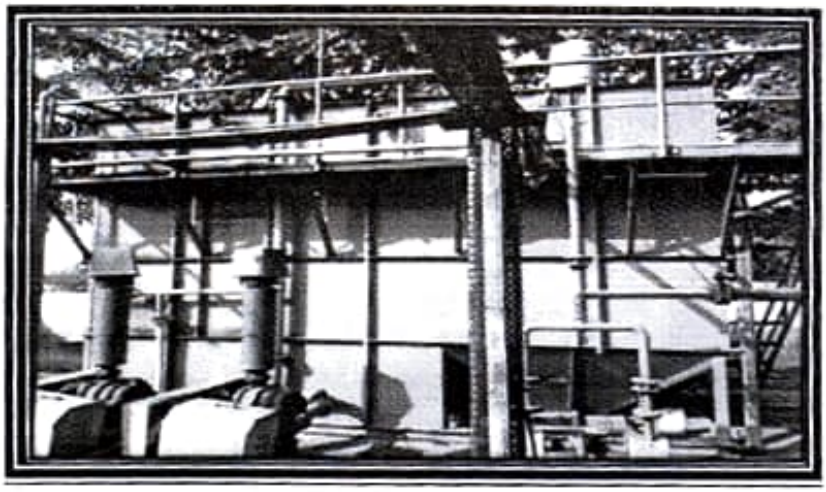
- The management has installed Rainwater harvesting pits in campus which will enable the runoff rain water during rainy season to percolate in the water harvesting pits which will restore the ground water level.
- The management has installed a R.O System in the campus with a capacity of 24000 LPD which will be utilized for safe drinking water and the R.O reject water of 10000 LPD will be generated and is used for cleaning and gardening purpose.
- The management has installed a Sewage Treatment Plant in campus which will be utilized to safely dispose the waste water generated from laboratories, central canteen and other departments in campus.

Rain Water Harvesting

Reverse Osmosis Plant



Sewage Treatment Plant



Audit Recommendations:

- It is recommended to install water meters near bore wells to quantify the water utilization and prepare a water balance for the campus.
- It is recommended to maintain a log book and monitor the TDS, Hardness and pH of input and output water from the R.O Plant.
- Drip irrigation for gardens and vegetable cultivation can be initiated.
- It is recommended to install the low flow aerators for faucets in all common areas, restrooms and canteen and etc.

5.0 REFERENCE STANDARDS & REGULATIONS

- GRI Standards
- GHG Protocol Corporate Standard
- National Building Code 2016
- ISO 14064
- ISO 14040/44 Life Cycle Assessment
- ISO 46001 Water Efficiency Management
- ISO 14046 Water Footprint Standards
- True Rating Methodology for Waste Management
- Standards & Biodiversity by IISD
- IS 5216 - Guide for Safety Procedures and Practices in Electrical Work

Energy Audit Report

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (A)
(ANITS)

Sangivalasa, Bheemunipatnam Mandal, Visakhapatnam,

Andhra Pradesh-531162, India

Preface

An energy audit is a study of a plant, building or facility to determine how much energy is used and to identify methods for energy savings. Proper balancing in implementation of the new technologies and already existing technology provide the most hopeful prospects for the future. The opportunities lie in the use of existing renewable energy technologies, enhancing the energy efficiency and the distribution of these technologies.

Date collection for energy audit of Anil Neerukonda Institute of Technology and Sciences (ANITS) Campus for the period of April 2020 to March 2021 has been done by the team. This audit was over sighted to inquire about the convenience to develop the energy competence of the campus. This audit is essential to identify the energy proficient appliances/instruments. The data is collected from each classroom, laboratory and every room by considering the number of tubes, fans, A.Cs, electronic instruments, water purifiers, printers, xerox machines, pumps, projectors etc., present in each room.

This report is just the first step, a mere mile marker towards our destination of achieving energy efficiency and we would like to emphasize that an energy audit is a continuous process. The team has compiled a list of potential actions to save and efficiently utilize the limited resources and identified their savings potential. The next step would be to prioritize their execution. The team look forward with optimism that the institute authorities, staff and students shall ensure the maximum execution of the recommendations and the success of this work.

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES (A) (ANITS)

ENERGY AUDIT TEAM

S. No	Name	Designation	Role
1	Prof. G. Raja Rao	Professor& HOD Dept. of EEE	Coordinator
2	Dr. V. Murali	Associate Professor, Dept of EEE	Member
3	Dr. R. Satish	Assistant Professor, Dept of EEE	Member
4	Dr. T. Narasimhulu	Assistant Professor, Dept of EEE	Member
5	Dr. K. Venkata Rao	Deputy Executive Engineer, AP Transco	Industrial Expert

Highlights

I. The total connected load as per the present energy audit is 2423.64 kVA.

II. The institute has 450 kVA solar power generation. The total solar energy generation in the year 2020-21 is 4,92,227 kVAh/Annum.

III. The total actual energy consumption in the campus during 2020-21 is 7,16,806 Units/Annum.

IV. The college has paid total 40,15,795/- Rs/Annum for the electricity bill in 2020-21 which is equivalent to 31.33% of the actual energy consumed. This is due to the availability of solar plant in the campus.

V. The contract demand is 450 kVA and monthly minimum consumption is 360 kVA. The average measured maximum demand maintained in the year is 120.99 kVA.

VI. The institute has two capacitor banks of ratings 30 kVAR and 15 kVAR. The Average power factor maintained during the year is 0.9967.

VII. The institute has a 500 kVA diesel generator set to supply the back-up power.

Contents

Introduction

The energy audit is an inspection, survey and analysis of energy flows in building process or system to understand the energy dynamics of the system. The main objective of the energy audit in an occupied building is reduction of energy consumption without compromising the human comfort, health and safety. Energy audit is not only for the identification of the sources of energy use, it is to prioritize the energy uses according to the greatest to least effective opportunities for energy savings.

Energy audit will indicate the energy consumption, energy efficiency measures of the building. The energy manager can compare and analyze the trend in energy consumption against past and future levels for a proper energy management. The main part of the energy audit report is energy savings proposals comprising technical and economic analysis of projects. Looking at the final output, an energy audit can also define as a systematic search for energy conservation opportunities. This information can be transformed into energy savings project. It will facilitate the energy manager to draw up an action plan listing in the order of priority. Adopting this activity as a routine or part of the organizations culture gives life to energy management. Controlling the energy use by energy audit is known as Energy Management by facts.

Sustainable development of any nation is possible through the interminable energy management. India's industrial demand accounted for 44 % of electrical power requirement, transport 17 %, domestic household 14 %, agriculture 7 %, pubic lighting and other miscellaneous applications accounted for the rest. Coal, Oil and gas reserves of India are estimated to last just 100 years, 17.5 years and 40.2 years respectively at the current reserve to production (R/P) ratio. So this is the peak time to reduce energy consumption and efficiently use the same. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation: it will lead to adequate rating of equipments, using high efficiency equipment and change of habits which causes enormous wastage of energy. By observing all these studies, lack of electricity and huge electricity demands, it is necessary to plan to being self sufficient in electricity requirement.

In the present study, institute electricity audit has been taken up. In this study practical laboratories, instruments, fans, air conditioners, computers, printers, Xerox machines, pumps, lift, etc., are considered. All the calculations have been done by collecting exact data from survey on the basis of rating or user of the particular instrument for how often/long they use that and all other required detail.

Fig.1 ANITS Campus

Survey and data collection

Data like number of lights, fans, ACs, printers etc., is collected by the ANITS EEE department technical staff and the data has also been verified by the team. The team has also did walk-through survey in laboratories and interacted with the in-charges for relevant information. The energy audit survey was also assisted by an industrial expert.

Table 1: Connected load in Administrative block (A)

Administrative Block (A)					
Description	**Power (W)**	**No's**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
CFL Bulbs	20	200	4000	4	5
Fans	60	170	10200	10.2	12.75
ACs	7000	24	168000	168	210
LCD Projectors	275	5	1375	1.375	1.72
Water Coolers	1550	1	1550	1.550	1.94
Printers	250	13	3250	3.250	4.06
Computers	160	95	15200	15.2	19
UPS	8000	3	24000	24	30
UPS	4000	2	8000	8	10
UPS	800	7	5600	5.6	7
Total:	--	--	241175	241.175	310.47

Table 2: Connected load in ECE block (B)

ECE Block (B)					
Description	**Power (W)**	**No's**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
CFL bulbs	20 W	172	3440	3.440	4.3
Fans	60	169	10140	10.140	12.675
ACs	7000	15	105000	105	131.25

LCD Projectors	275	10	2750	2.750	3.44
Water Coolers	1550	1	1550	1.550	1.94
Printers	250	3	750	0.750	0.94
Computers	160	119	19040	19.040	23.8
UPS	8000	2	16000	16	20
UPS	4800	1	4800	4.8	6
UPS	2400	1	2400	2.4	3
Total:	--	---	165870	165.870	207.34

Table 3: Connected load in CSE block (C)

CSE Block (C)					
Description	**Power (W)**	**No's**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
CFL Bulbs	20	129	2580	2.580	3.23
Fans	60	152	9120	9.120	11.4
ACs	7000	23	161000	161	201.25
Exhaust Fans	60	6	360	0.360	0.45
LCD Projectors	275	14	3850	3.850	4.81
Water Coolers	1550	2	3100	3.1	3.88
Printers	250	6	1500	1.5	1.88
Computers	160	217	34720	34.720	43.4
UPS	8000	3	24000	24	30
UPS	4800	8	38400	38.4	48
UPS	4000	1	4000	4	5
Total:	--	--	282630	282.630	353.29

Table 4: Connected load in Chemical block (D)

Chemical Block (D)					
Description	**Power (W)**	**No's**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
CFL Bulbs	20	138	2760	2.760	3.45
Fans	60	151	9060	9.060	11.33
ACs	7000	11	77000	77	96.25
Exhaust Fans	60	6	360	0.360	0.45
LCD Projectors	275	3	825	0.825	1.03
Water Coolers	1550	1	1550	1.550	1.94
Printers	250	3	750	0.750	0.94
Computers	160	25	4000	4	5
Refrigerator	750	1	750	0.750	0.94
UPS	4000	1	4000	4	5
Total Labs	--	--	33500	33.5	41.88
Total:	--	--	134555	134.555	168.2

Table 5: Connected load in EEE block (E)

EEE Block (E)					
Description	**Power (W)**	**No's**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
CFL Bulbs	20	158	3160	3.160	3.95
Fans	60	190	11400	11.4	14.25
ACs	7000	5	35000	35	43.75
Exhaust Fans	60	6	360	0.360	0.45
LCD Projectors	275	9	2475	2.475	3.09
Water Coolers	1550	3	4650	4.650	5.81
Computers	160	47	7520	7.520	9.4
UPS	8000	1	8000	8	10
Total Labs	--	--	225300	225.300	281.63
Total:	--	--	297865	297.865	372.33

Table 6: Connected load in Mechanical block (F)

Mechanical Block (F)					
Description	**Power (W)**	**No's**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
CFL Bulbs	20	276	5520	5.520	6.9
Fans	60	254	15240	15.240	19.05
ACs	7000	21	147000	147	183.75
Exhaust Fans	60	9	540	0.540	0.675
LCD Projectors	275	10	2750	2.750	3.44
Printers	250	4	1000	1	1.25
Computers	160	99	15840	15.840	19.8
UPS	8000	2	16000	16	20
Total Labs	---	--	34000	34	42.5
Total:	--	--	237890	237.890	297.36

Table 7: Connected load in IT block (G)

IT Block (G)					
Description	**Power (W)**	**No's**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
CFL Bulbs	20	120	2400	2.4	3
Fans	60	94	5640	5.64	7.05
ACs	7000	18	126000	126	157.5
Water Coolers	1550	1	1550	1.550	1.94
LCD Projectors	275	10	2750	2.750	3.44
Printers	250	7	1750	1.750	2.19
Computers	160	318	50880	50.880	63.6
UPS	60000	1	60000	60	75
Total:	---	---	250970	250.97	313.71

Table 8: Connected load in Civil block (H)

Civil Block (H)					
Description	**Power (W)**	**No's**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
CFL Bulbs	20	264	5280	5.280	6.6
Fans	60	259	15540	15.540	19.43
ACs	7000	22	154000	154	192.5
Water Coolers	1550	1	1550	1.550	1.94
LCD Projectors	275	4	1100	1.1	1.38
Speakers	10	4	40	0.04	0.05
Printers	250	1	250	0.250	0.31
Computers	160	76	12160	12.16	15.2
Xerox Machine	1800	4	7200	7.2	9
Xerox Machine	1000	5	5000	5	6.25
Lift	5500	1	5500	5.5	6.88
UPS	8000	4	32000	32	40
UPS	4000	8	32000	32	40
UPS	800	6	4800	4.8	6
Total Labs	--	--	28000	28	35
Total:	--	--	304384	304.42	380.53

Table 9: Connected load in General Power & Hostels

General Power & Hostels					
Description	**Power (W)**	**No's**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
CFL Bulbs	20	252	5040	5.04	6.3
Fans	60	49	2940	2.940	3.68
Water Coolers	1550	2	3100	3.100	3.88
Refrigerator & Others	--	--	5000	5	6.25
Water Pumps	2238	2	4476	4.476	5.60
Water Pumps	1492	2	2984	2.984	3.73
Total:	--	--	23540	23.54	29.43

Table 10: Total connected load in ANITS Campus

Total Connected Load				
S. No	**Description**	**Total Power (W)**	**Total Power (kW)**	**Total Power (kVA)**
1	**Administrative block**	241175	241.175	310.47
2	**ECE block**	165870	165.870	207.34
3	**CSE block**	282630	282.630	353.29
4	**Chemical block**	134555	134.555	168.2
5	**EEE block**	297865	297.865	372.33
6	**Mechanical block**	237890	237.890	297.36
7	**IT block**	250970	250.97	313.71
8	**Civil block**	304384	304.42	380.53
9	**General power & Hostels**	23540	23.54	29.43
Total		**1938879**	**1938.915**	**2423.64**

Solar Energy

Institute has 450 kVA solar power generation system with 1364 panels installed and is connected to the grid. The energy units consumed from the public supply is exclusive of this power. Thus, addition of this power, accounts for a per capita consumption of 1963.85 Units/Day.

Table 11: Solar system at ANITS Campus

Campus Solar System								
S. No	**Panel Info.**	**EEE block**	**ECE block**	**CSE block**	**Chemical block**	**Mech block**	**IT block**	**Girls Hostel**
1	Company	ORB Energy	ORB Energy	ORB Energy	ORB Energy	ORB Energy	ORB Energy	ORB Energy
2	Inverter make	Schneider	Schneider	Schneider	Schneider	Schneider	Schneider	Schneider
3	No. of Modules	209	209	209	209	220	160	148
4	Power	330 Wp	330 Wp	330 Wp	330 Wp	330 Wp	330 Wp	330 Wp
5	Total Power (kWp)	68.97kWp	68.97kWp	68.97kWp	68.97kWp	72.6 kWp	52.8 kWp	48.84 kWp
6	Inverter Rating	66 kVA	66 kVA	66 kVA	66 kVA	66 kVA	66 kVA	66 kVA
7	No. of Inverters	01 No	01 No	01 No	01 No	01 No	01 No	01 No

Fig. 2 Bird Eye view of ANITS Campus

Table 12: Total energy consumption (kVAh), Solar share (kVAh), Measured maximum connected load (kVA) and electricity bill (Rs.) paid by college (from April 2020 to March 2021)

S. No	Month	Energy consumed from grid (kVAh)	Maximum demand (kVA)	Bill paid (Rs.)	PF
1	Apr	32030	99.92	135982	1
2	May	35254	123.6	231972	0.99
3	June	34923	106	346449	0.99
4	July	34890	112.32	327189	1
5	Aug	39197	126.96	402848	1
6	Sep	41216	122.08	389423	0.99
7	Oct	36726	113.52	320297	1

8	Nov	30540	100.48	225889	1
9	Dec	29760	96.16	211556	1
10	Jan	36663	119.44	287842	1
11	Feb	43862	144.56	432527	1
12	Mar	72208	186.88	703821	0.99
		Total: 4,67,269	**Avg.: 120.99**	**Total: 40,15,795**	**Avg.: 0.9967**

Table 13: Solar energy generation, energy fed to the grid, energy consumption from grid and actual energy consumed

S. No	Month	Solar generation (kVAh)	Energy fed to the grid (Solar Share) (kVAh)	Electricity consumed from Solar Unit (kVAh)	Actual energy consumed (kVAh)
1	Apr 2020	50628	34534	16094	48124
2	May	51976	32180	19796	55050
3	June	30951	13706	17245	52168
4	July	33655	16236	17419	52309
5	Aug	27695	10874	16821	56018
6	Sep	34852	14724	20128	61344
7	Oct	38616	19028	19588	56314
8	Nov	47563	28810	18753	49293
9	Dec	48410	31728	16682	46442
10	Jan	45044	23318	21726	58389
11	Feb	38702	11914	26788	70650
12	Mar	44135	5638	38497	110705
Total		**4,92,227**	**2,42,690**	**2,49,537**	**7,16,806**

Results and Discussion

As far as the energy audit is concerned, electricity audit is the main concern regarding educational institutions. The details of the energy consumption is given in the following Figures.

Fig. 3 shows the month wise total energy consumption, energy consumption from grid and energy consumed from solar unit.

Fig. 4 shows the month wise measured maximum demand.

Fig. 5 shows the month wise electricity bill paid.

Fig. 6 shows the month wise total energy generation from solar unit, energy fed to the grid and energy consumed from solar unit.

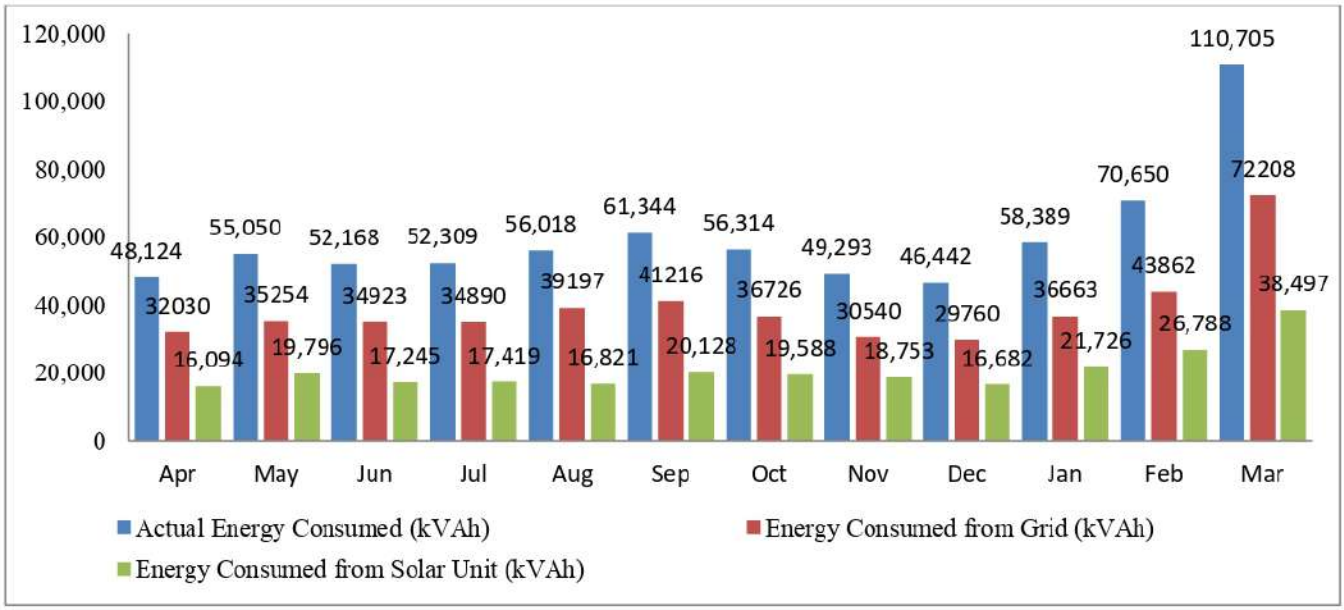


Fig. 3 Month wise total energy consumption, energy consumption from grid and energy consumption from solar unit

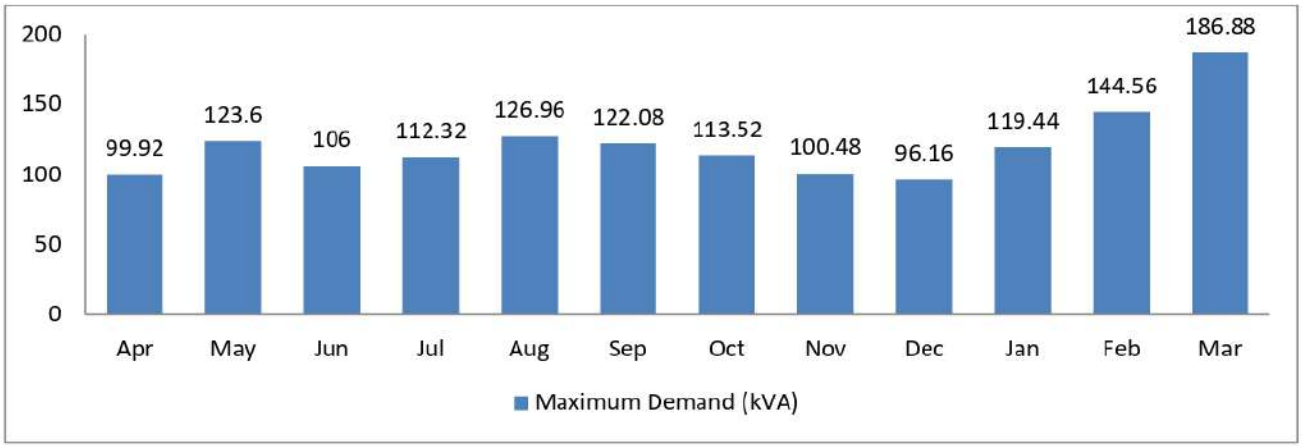


Fig. 4 Month wise measured maximum demand

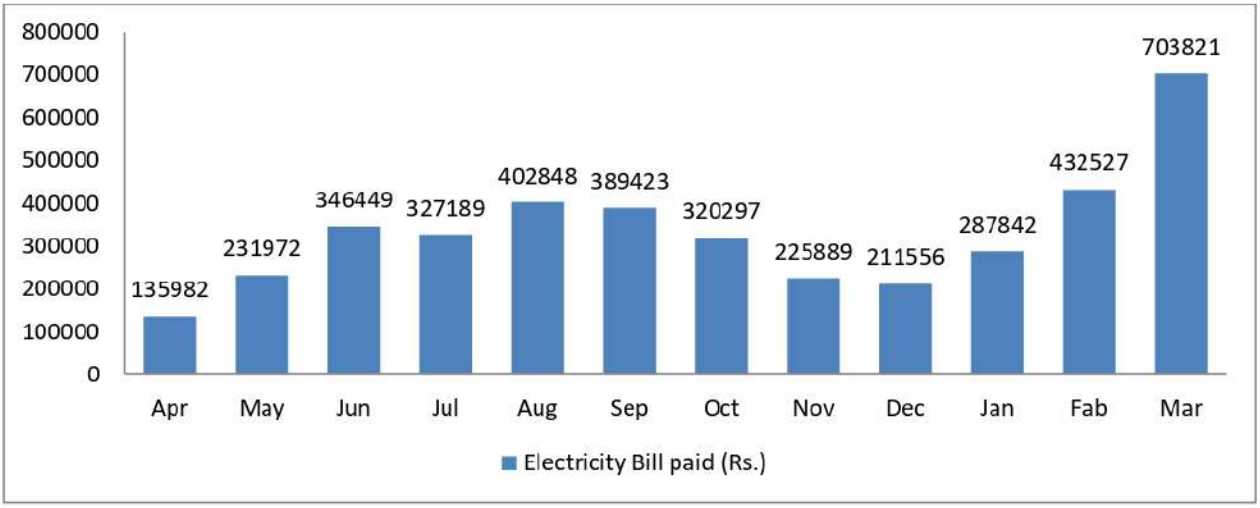


Fig. 5 Month wise electricity bill paid

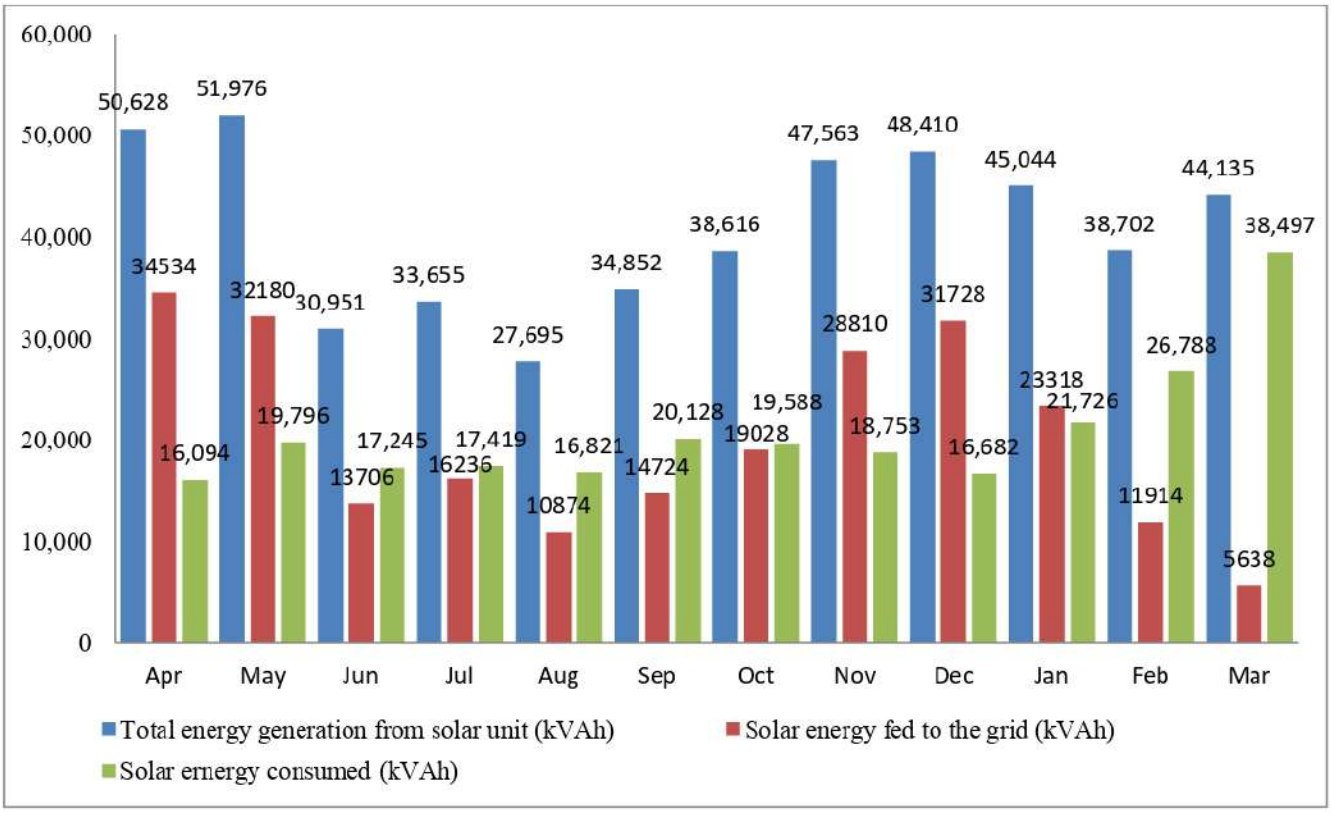
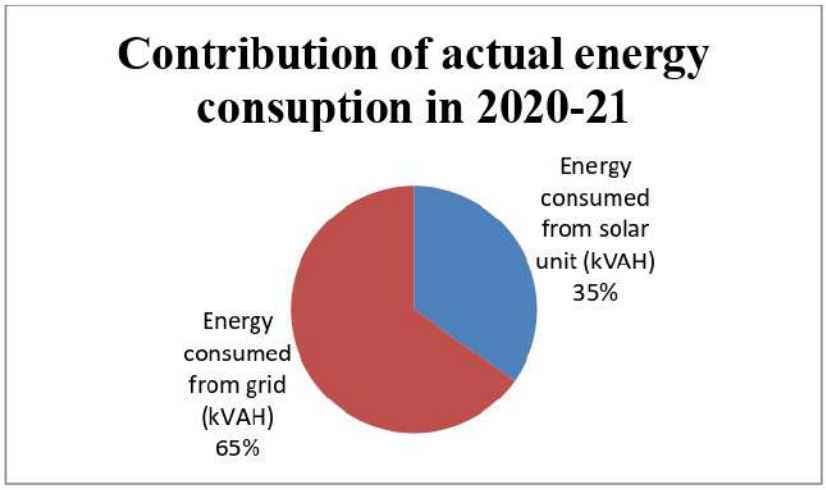
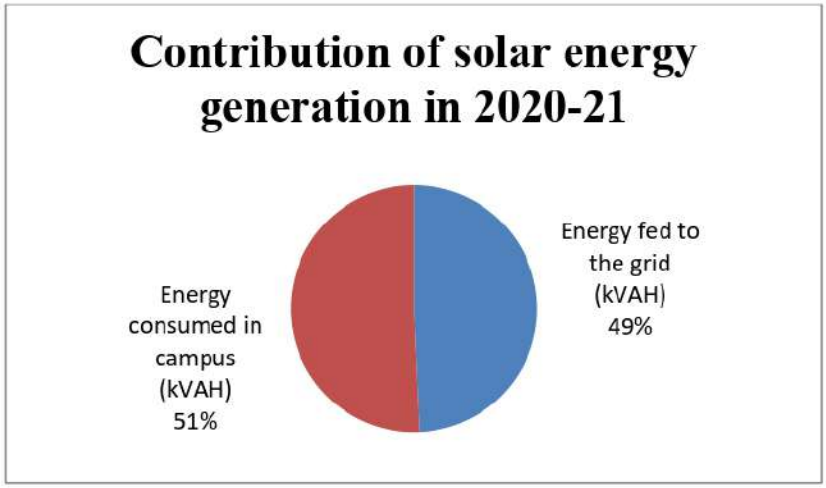


Fig. 6 Month wise total energy generation from solar unit, energy fed to the grid and solar energy consumed.

The actual energy consumed in 2020-21 is 7,16,806 Units/Annum. Out of this, the solar unit is contributing 2,49,537 Units/Annum (i.e., 34.81%). The remaining 4,67,269 Units/Annum (i.e., 65.19%) are consumed from the grid.



The solar unit is generated 4,92,227 Units/Annum in 2020-21. Out of this 2,42,690 Units/Annum (i.e., 49.30%) are fed to the grid. The remaining 2,49,537 Units/Annum (i.e., 50.70 %) are used in the campus.



It is observed in 2020-21 that, the actual energy consumption is 7,16,806 Units/Annum. And the total solar energy generation is 4,92,227 Units/Annum (i.e., 68.67% of the actual energy consumed). The college has paid a total of 40,15,795/- Rs/Annum for the electricity bill which is equivalent to the bill for 2,24,579 Units/Annum (i.e., 31.33% of the actual energy consumed). Hence, ANITS has saved more than Rs. 80 Lakh/Annum in electricity bill during 2020-21 because of the use of solar power.

Recommendations

1. AC energy savers can be used to reduce the energy consumption of AC by 30-40 %.
2. LED bulbs can be used to save more electricity. The luminary distributions in rooms needs to be improved.
3. Street lights can be replaced with 7 W lithium battery based solar street or solar mass lights.
4. Solar off-grid system can be installed to supply back-up power instead of 500 kVA diesel generator set. The diesel generation set is not eco-friendly and also involves the consumption of costly diesel.
5. The institute has two 3 HP and two 2 HP water pump sets. These can be replaced with solar water pump sets.

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ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES

ENERGY AUDIT REPORT

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Preface

ANITS have entrusted the Energy Audit work to M/s ENVIRO KAMKAR LLP. There after both teams i.e ANITS and Enviro KAMKAR has formed a collaboration in the working process. The work has initially started with the minutes of the meeting with ANITS principal, there after decision has been taken by the both the teams for the entire process. The external Energy audit team (team Enviro KAMKAR) has made sure to gather the entire consumption data of the campus for further analysis and presented. And, ANITS as an internal Audit team has given the esteemed support in gathering and segregating the data in this exercise.

ANITS-ENTRANCE

Acknowledgment

Team Enviro KAMKAR LLP is very great full to the principal of ANITS Engineering college and for the entire administrative team for trusting and relaying on us for Energy Audit. It is an honorable opportunity to work for ANITS and we will always be delighted to assist you further more in more such works to be the best green Institute in India.

Energy Audit

Introduction

The National Environmental Policy (NEP) 2006, of India has made Environmental audit a mandatory to all industries, and the industries need to submit EA report every year in the prescribed format. The audit reveals how environmental friendly the industry is, and also enable the industries to improve their performance in the conversation of natural resources. The process is several industries has led several innovative interventions in the management of the environment. The NEP also prescribes the role of educational institutions in buildings capacity of all citizens of the country to perform their fundamental duty to the environment as delineated in articles 21 and 51 A (G). Realizing the need and importance of all these major agencies of educational governance like UGC, AICTE and School boards have recommended for the green audits and Energy audits in the educational institutions and have made it mandatory for accrediting the institutions. Enviro KAMKAR LLP facilitates the Green and Energy audits in the Educational institutions and participates as a third party auditor.

The objectives of the Energy Audit:

- To recognize the initiations taken by the institutions towards the Environment and energy resources
- To provide baseline data to enable institute to evaluate and manage the energy consumption.
- To provide recommendations to reduce energy consumption.

- To give preference to meet energy efficient and environmentally sound appliances.
- To make sure the institute is complying all the standards according to NEP,UGC, and AICTE.

Data collection from various Departments of ANITS

#	Name of the department	Annexure number
1	CSE	***Annexure I***
2	MECHANICAL	***Annexure II***
3	ECE	***Annexure III***
4	CHEMICAL ENGINEERING	***Annexure IV***
5	EEE	***Annexure V***
6	IT	***Annexure VI***
7	CIVIL	***Annexure VII***
8	ADMINISTRATION	***Annexure VIII***
9	GIRLS HOSTEL (BLOCK A& B)	***Annexure IX***
10	BOYS HOSTEL (BLOCK A & B)	***Annexure X***

INTERNAL VIEW OF ANITS CAMPUS

Table: Appliances and their power consumption rates in Campus & Girls Hostel

S. no	Name of appliance	Power Rating(Watt)	Quantity	Power Consumption (Watt)	Average usage per day (hr.)	Power Consumption/day (Watt)
A	**B**	**C**	**D**	**E=C X D**	**F**	**G=E X F**
1	Ceiling fans	80 W	1686	134880	6	809280
2	Pedestal fans	55 W	43	2365	6	14190
3	Tube lights (LED)	20W	1469	29380	6	176280
4	Desktops	50 W	783	39150	6	234900
6	Printers	50 W	67	3350	2	6700
7	AC's	2000 W	332	664000	4	2656000
8	LCD projectors	280 W	116	32480	2	64960
9	Wireless routers	6 W	37	222	24	5328
10	Window AC's	1400W	3	4200	4	16800
11	CC camera	10 W	153	1530	24	36720

Table: Power consumption pattern in Boys hostels

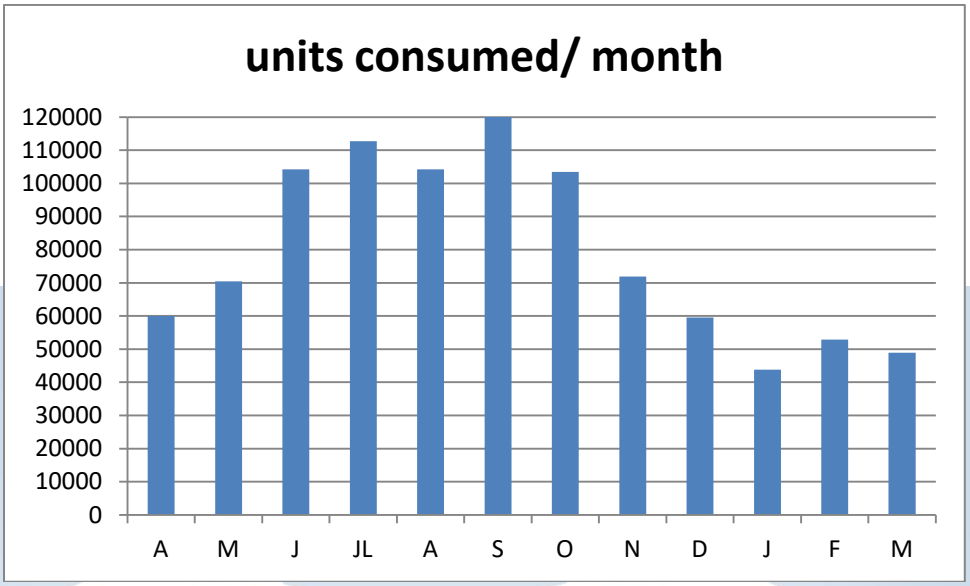
S. no	Name of appliance	Power Rating(Watt)	Quantity	Power Consumption (Watt)	Average usage per day (hr.)	Power Consumption/day (Watt)
A	B	C	D	E=C X D	F	G=E X F
			A Block			
1	Ceiling fans	80 W	132	10560	12	126720
2	Tube lights (LED) 4'feet	20W	30	600	6	3600
3	Tube lights (LED) 1'feet	9 W	02	18	6	108
4	LED Bulbs	8W	12	96	6	576
5	Tube lights 4' feet	36 W	142	5112	6	30672
6	Tube lights 2' feet	20 W	08	160	6	960
7	Water cooler	2.8kwh/day	1	2800	day	2800
			B Block			
1	Ceiling fans	80 W	212	16960	12	203520
2	Tube lights (LED) 4'feet	20W	32	640	6	3840
3	Tube lights (LED) 1'feet	9 W	96	864	6	5184
4	LED Bulbs	8W	81	648	6	3888
5	Tube lights 4' feet	36 W	216	7776	6	46656
6	Tube lights 2' feet	20 W	50	1000	6	6000
7	Water cooler	2.8kwh/day	1	2800	day	2800

ANITS is one of the few institutions in India to have pioneered in the energy conservation and use of renewable energy sources. Basically it uses three types of Energy sources: (1) Electricity from the Public supply and (2) Electricity from the Own Solar plants and (3) Diesel (HSD).

The Institute during the audit year has consumed ***2867/day*** units with a mean of ***87194*** units per month. However, the monthly variations were very high and ranged from a low of ***43766 units*** in January to a high of ***120240*** units in September. From September to January, the consumption decreased gradually, despite the fact that the period may have peak academic activity. This indicates that the energy efficiency can be enhanced further in its use.

The declined power consumption from September to January indicates could be due to reduced use of Air conditioners. The Institution has a total of 332 air conditioners together have a cooling capacity of ***500 tons***. The illumination and air circulation in the facilities needed examination.

On the whole, the per capita electricity consumption in the institute is around ***219 units/annum***, which is reasonably good in Educational Institutions.



Considering the monthly consumption data, it has been recorded that ***952377*** units of electricity has been consumed by the institute among which it is observed that September month has utilized the highest amount of Electric energy i.e. ***120000 units***, and lowest i.e. ***43766 units*** in the month of January. The following table presents the Energy bill of the same units.

Fig: Pie- chart depicting Annual Power consumption (Departmental - wise)

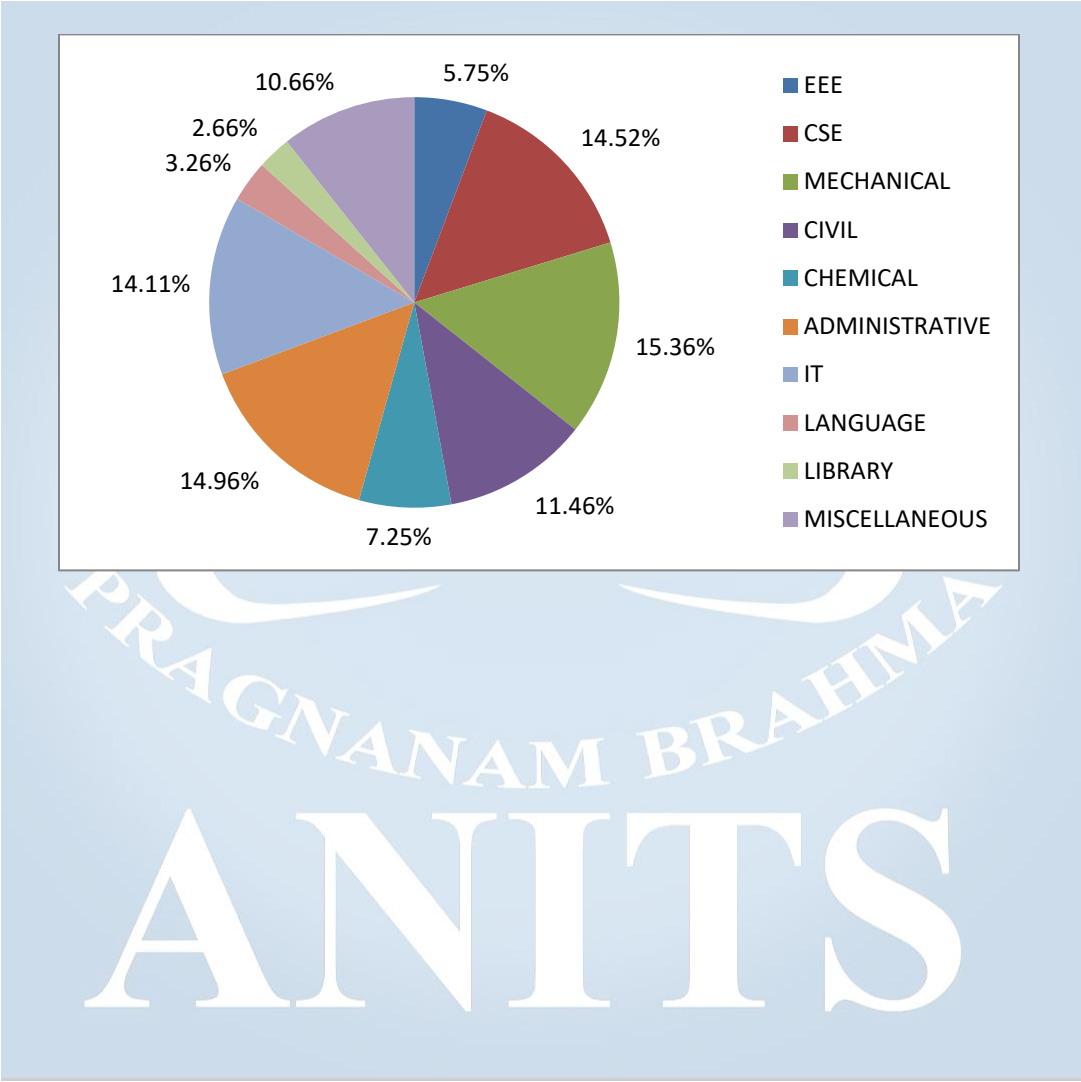


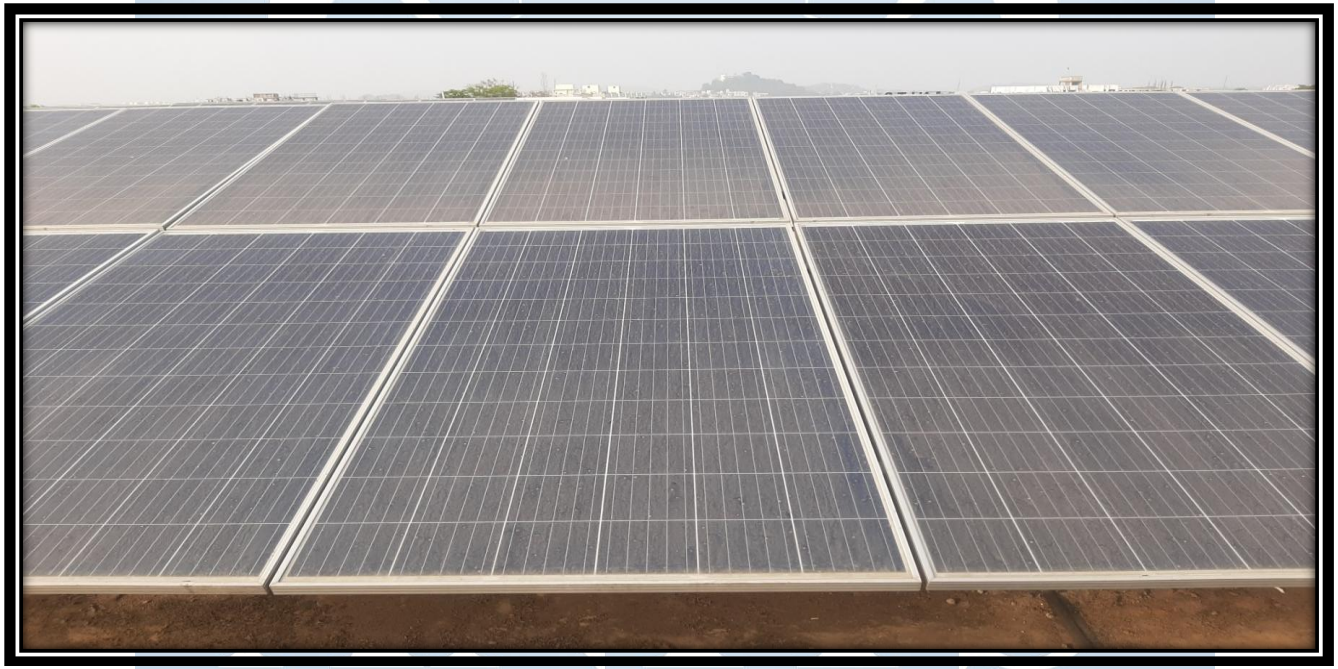
Table : Emission patterns of $C0_2$, SO_2, NO monthly wise

S. no	Month	No. of units	$C0_2$ in MT(0.91 kg/kWh)	SO_2 in MT(6.94 g/kWh)	NO_2 in MT(4.22 g/kWh)
1	April	60006	54.6	416.4	253.2
2	May	70467	64.1	489.0	297.4
3	June	104277	94.9	723.7	440.0
4	July	112725	102.6	782.3	475.7
5	August	104250	94.9	723.5	439.9
6	September	120240	109.4	834.5	507.4
7	October	103442	94.1	717.9	436.5
8	November	71896	65.4	499.0	303.4
9	December	59512	54.2	413.0	251.1
10	January	43766	39.8	303.7	184.7
11	February	52836	48.1	366.7	223.0
12	March	48960	44.6	339.8	206.6
	TOTAL	**952377**	**866.7**	**6609.5**	**4019.0**

Reference for calculation: Mittal, Moti & Sharma, Chhemendra & Singh, Richa. (2012). Estimates of Emissions from Coal Fired Thermal Power Plants in India. 2012, International Emission Inventory Conference

Solar Energy

Institute has 450 KVA solar power generation systems with 1364 panels installed and is connected to the grid. Therefore, Energy units consumed from the public supply are exclusive of this power. Thus, addition of this power, accounts for a per capita production of **19** units/annum.



SOLAR MODULES

Campus Solar Panels								
#	**PANEL INFO**	**EEE**	**ECE**	**CSE**	**CHEMICAL ENG**	**MECH**	**IT**	**RESIDENTIAL GIRLS HOSTEL**
1	COMPANY	ORB Energy	ORB Energy	ORB Energy	ORB Energy	ORB Energy	ORB Energy	ORB Energy
2	INVERTER	Schneider	Schneider	Schneider	Schneider	Schneider	Schneider	Schneider
3	NO.OF MODULES	209	209	209	209	220	160	148
4	POWER	330Wp	330Wp	330Wp	330 Wp	320 Wp	330 kWP	330 kWP
5	TOTAL POWER(KWP)	68.97kWp	68.97	68.97	68.97 kWP	72.6 kWP	52.8 kWP	48.84 kWP
6	INVERTER RATING	66 kVA	66kVA	66kVA	66 kVA	66 kVA	66 kVA	66 KVA
7	NO.OF INVERTERS	01	01	01	01	01	01	01

FUEL ENERGY

Fuel Energy second major use sector for energy is Transportation sector of the Institute. On all working days, the Institute's fleet of Buses and vehicles ply a part of the campus population. The audit results indicate, the Institute's transportation by buses covers a distance ranging from ***28400 km/month*** to ***65822 km/month***, with a mean of ***44946 km/month***. The transportation consumption of oil ranges from 6600 litres/month to 15380 litres/month, with a mean of ***11483 litres/month***. Another ***884 litres/month*** of HSD is consumed by administrative vehicles. Thus, the institution transportation covers around ***35%*** of the campus population. The remaining ***65%*** attend by various means, like, public transport ***(16%),*** private hired transport vehicles mostly 3 wheeler rickshaw ***(27%)*** vehicles, and about ***8%*** of the population uses their own vehicles as was revealed from the rapid survey.

By maximizing the entropy of the transportation data, it is estimated that all the travel trips of the campus population had a per capita HSD consumption was arrived at ***83.82 liters/annum.***

ANITS also uses LPG fuel for its hostel messes and in some laboratories also. The evidences revealed that the annual consumption of LPG in all the facilities for the year 2019-2020 was ***560 kg.***

On the whole, during the year 2019-2020, the ANITS has CO_2 emission of ***867 tons*** from use of electricity, and 356 tons from HSD Oil consumption, and ***1.7*** tons from LPG consumptions. Thus from the three major sources of energy, around ***1224*** tons of CO_2 emissions were released. However, by way of solar power generation of ***93960 kWh***, about **86** tons of CO_2-e could be saved

mitigated.

Recommendations and Conclusions

- The Auditors appreciate the Management for replacing most electrical lights with energy efficient (LED) systems; generation of Solar power and reduced use of air-conditioning systems. However, the energy use from transport system can be improved significantly. Focus is to be made that the Institute buses should achieve 5 km/l from the present mean of 4.27 km/l.
- The Institute can further enhance its Solar Power production. Presently, the solar power accounts for around 10% of the total power consumption. Considering the present annual expenditure of Rs. 90 lakhs/annum, the institute can plan for a 1 MW solar power plant, and can not only realize the investment in 5 years, but also can make the campus Carbon neutral.

Annexure

Annexure I – CSE											
S No	Room	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers	Window AC's
1	101 -CR	5		4					1		
2	102 –FC	3		3							
	103 –FC	3		3	1	1					
	104 –CR	5		5					1		
	105 –FC	2		2			1				
	106 –FC	4	2	4		1	1				
	107-L		1		37				1		3
	108 –FC	2		3	5		1	1			
	109 –SR	1		3				2			
	110-L		1		36			3			
	111-L	4		2	15						
	Lobby			4							
	201-cabin	4	1	3	2						
	202-L		1		1	2		3	1		
	203 –FC	2		2	1	1	1	1			
	205 –CR	7		5					1	1	
	206 –CR	7		5					1		
	207 –CR	8		8	60	3		4	1		
	208-L	6		5		2					
	209-O	3		3	1	1	1				
	301-LB	4		3							
	302-L			4				2			
	303-CR			4	1	1	1	1			
	304-SR	2		2	2	2					
	306-CR	7		5					1		
	307-CR	7		5					1		
	309-CR	7		5							
	310-FR	3		2	1	1					
	311-FR	3		2							
	312-FR	3		2	1	1					
	313-CR	7		5					1		
	401-L	12		10	16	1		3			
	402-FR	2		2	1	1					
	403-FR	2		2							
	404-CR	5		4					1		
	405-CR	5							1		
	407-CR	7		5					1		
	408-L	1			36	1					
	409-CR	8							1		
	Lobby	1		3							
	TOTAL	152	6	129	217	19	6	20	14	1	3

CR-CLASS ROOM,
FR-FACULTY ROOM,
L-LABORATORY,
FC-FACULTY CABIN

Annexure II - Mechanical										
S No	**Room**	**Ceiling fans**	**Pedestal fans**	**Tube lights**	**Desktops**	**UPS**	**Printers**	**AC's**	**LCD projectors**	**Wireless routers**
1	101 -L	16		19						
2	102 -FD	5		4						
3	103 -EC	5		3	2	1	2		1	
4	103A –FR	1		1						
5	104-FR	2		3	1	1	2	1		
6	105-L	1		6	1			2		
7	105 A-FR	1		1	1	1				
8	106-L	5		4						
9	107-L	6		3						
10	108-L	13		10	1					
11	LOBBY			5						
12	201-DH	12		10						
13	202-CR	5		3					1	
14	203-CR	5		4					1	
15	204-CR	5		5						
16	205-CR	5		3						
17	206-CR	6		5					1	
18	207-CR	6		4						
19	208-DH	10		14						
20	LOBBY			5						
21	301-L	5	1	11	70	2		6	1	
22	303-L	2		2						
23	304-FR	1		1	1					
24	305-FR	1		1						
25	306-FR	1		1						
26	307-FR	1		1						
27	308-FR	1		1						
28	309-FR	1		1						
29	310-FR	3		2						
30	311-31LIBRARY	3		2	2					
31	312-FR	3		2	1	1				
32	314-FR	4		2						
33	315-CR	5		3					1	
34	317-FR	1		1						
35	318-FR	1		1						
36	319-FR	1		1						
37	320-FR	2		1						
38	321-FR	1		1						

39	323-CR	5		5						
40	324-DH	14		10						
41	Lobby									
42	401-SD			6	16	1		4	1	
43	401B-CH			6				2		
44	404-CR	2		6						
45	405-FR	1		2						
46	406-FR	1		1	1					
47	407-FR		1	1						
48	408-FR	1		1						
49	409-FR	1		1						
50	410-FR	1		1						
51	411-CR	8		1					1	
52	413-FR	4		5	2	1				
53	414-CR		7	4						
54	416-FR	1		4						
55	418-CR	7		1					1	
56	420-CR	7		4						
57	421-SH			24				6	1	
58	LOBBY			9						
59	LAB	22		10						
60	LAB	13		7						
61	WS	20		13						
62	LOBBY			3						
	TOTAL	254	9	276	99	8	4	21	10	0

Annexure III – ECE											
S No	Room	Utility	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers
1	GF	Geo Technical Engineers Lab	6		4						
2	107	Staff Room	2		2						
3	GF	Environment Engineering Lab	8		2						
4	GF	Concrete Technology Lab	11		8						
5	GF	Serveying Lab	1		2						
6	GF	Lobby			5						
7	1st Floor	Store Room			1						
8	1st Floor	M.Tech Class Room	3		2						
9	Gf	Geo Technical Eng Lab	6		6						
10	Gf	Faculity Room	2								
11	Gf	Environment Eng lab	8		2						
12	Gf	Concrete Technology Lab	11		8						
13	Gf	Serveying Lab	1		2						
14	Gf	Lobby			5						
15	1st floor	Store Room			1						
16	1st floor	M tech Class room	3		2						
17	1st floor	Staff Room	2		2	1	1				
18	1st floor	Seminar Hall				1	1		3	1	
19	1st floor	HOD office	3		5	2	2		1		
20		Staff Room	1		1						
21	1st floor	Tutorial Class Room	3		2						
8i22	1st floor	Staff Room	2		1						
23	1st floor	Computer lab	2			42	1	1	3	1	
24	1st floor	Class Room	6		4						
25	1st floor	Department Library	3		2	1	1				
26	1st floor	Staff Room	1		1						
27	1st floor	Staff Room	1		1	1	1				
28	1st floor	Class Room	6		4						
29	1st floor	Class Room	6		4						
30	1st floor	Lobby			11						
31	2nd floor	Exam cell	25		24						
32	2nd floor	Spot Valuetion Room	6		11				3		
33	2nd floor	Dept Controller of Examination Room	4		3	1		1			
34	2nd floor	Processing Hall	6		12						
35	2nd floor	Exam cell	1		1						
36	2nd floor	Printing Room	2		3	3		1	1		
37	2nd floor	Exam cell	3		3	1		1	1		
38	2nd floor	Central Examination Co-ordinator	3		4						
39	2nd floor	Examination Cell	6		4	3					
40	2nd floor	Record Room	2		3						
41	2nd floor	Coding & Decoding section	3		2						
42	2nd Floor	Lobby	4		5		1				
43	2nd floor	Exam Cell	6		8						

44	3rd floor	Exam Cell	9		12						
45	3rd floor	Exam Cell	12		8						
46	3rd floor	Sports Room	5		5						
47	3rd floor	Gym	8	1	4						
48	3rd floor	Lobby			8						
49	5th floor	Dept of Physics	19		13						
50	5th floor	Staff room	3		2	1	1	1	1		
51	5th floor	Staff room	2		1						
52	5th floor	Staff room	3		1						
53	5th floor	Staff room	2	7	1			1			
54	5th floor	Staff room	3		1						
55	5th floor	Staff room	3		1						
56	5th floor	Staff room	3		1	1	1				
57	5th floor	Staff room	3		1	1					
58	5th floor	Basic Science And Humanities	3		1	1	1				
59		HOD ROOM	3		2	1	1	1	1		
60		Staff Room	1		1	1	1				
61		Staff Room	1		1	1	1				
62		Staff Room	1		1	1	1	1			
63		Staff Room	5		2	1	1	1			
64		Chemistry Lab	2		3	1	1				
65		Staff Room	3		1						
66		Lobby			9						
		TOTAL	244	0	240	66	17	9	14	2	0

Annexure IV – Chemical Engineering.											
S No	**Room**	**Utility**	**Ceiling fans**	**Pedestal fans**	**Tube lights**	**Desktops**	**UPS**	**Printers**	**AC's**	**LCD projectors**	**Wireless routers**
1	D-102	*Mechanical Operation Lab/Heat transfer Lab*	7		7						
2	D-103	*Staff Room*	3		2						
3	D-104& 105	*Chemical Technology Lab*	12		10	1	1	1			
4	D-106	*HOD*	2		2	1	1		1		
5	107	*Seminar Hall*		12	7				3	1	
6	108	*Seminar Hall*	12		9	1			3	1	
7	Gf	*Lobby*			4						1
8	201	*Faculity Room*	2		2	1	1	1	1		
9	D-202	*CR LAB*	8		6						
10	D-2013	*Dept Library*	1		2	3	1	1	1		
11	D-204&203	*Biotechnology Lab*	11		10						
12	D-206	*Staff Room*	2		2						
13	D-211	*Seminar Hall*	11		4						
14	D-209	*Faculity Room*	3		2	1					
15	D-208	*Comuter Lab*	7		4	16					
16	1st Floor	*Lobby*			3						1
17	302	*Class room*	5		6						
18	303	*Class room*	5		6						
19	304	*Class room*	5		6					1	
20	305	*Class room*	5		6						
21	306	*Faculity Room*	3		2						
22	308		7		4						
23	312	*Class room*	7		4						
24	2nd floor	*Lobby*			4						1
25	402	*Process Dynamicy Central Lab*				1					
26	403	*Class room*	5		4						
27	404	*Mass Transfer lab*	12		10						
28	406	*Faculity Room*	2		2						
29	408	*Class room*	7		4						
30	412	*Class room*	7	4							
31		*LOBBY*			4						
32		TOTAL	151	16	138	25	4	3	9	3	3

Annexure V- EEE										
S No	**Room**	**Ceiling fans**	**Pedestal fans**	**Tube lights**	**Desktops**	**UPS**	**Printers**	**AC's**	**LCD projectors**	**Wireless routers**
1	101 –L	14		12						
2	102 –FR	2		2	2	2	1	1		
	105 –L	11		12						
	107 –L	10		9						
	108 –L	10		9	1					
	LOBBY		2	7					1	
	201-CR	5	1	4						
	202-CR	5		4						
	203-FR	3		2						
	204-WH	1	1	1						
	205-L	12		10						
	207-L	13		11						
	208-FR	2		2	1	1				
	209-LB	4	1	3	1	1				
	210-FR	4	1	1						
	LOBBY			2						1
	301-CR	5		4					1	
	302-CR									
	303	3		3						
	L	1		4	38	1		3		
	306-EH	5		2	1	1	1			
	307-CR	7		4						
	309-FR	3		2	1					
	310-FR	3		2						
	311-FR	3		2	1					
	312-FR	7		5					1	
	LOBBY			4						1
	313-SR			2						
	401-CR	8		4						
	402-CR	8		2						
	403-FR	2		2						
	404-FR	2		2						
	405-CR	8		4						
	406-CR	6		3						
	408-CR	7		5						
	409-CR	3		2						
	410-CR	3		2	1					
	412-CR	10		5						
	LOBBY			2						1
	TOTAL	190	0	158	47	6	2	4	3	3

Annexure VI - IT											
S No	**Room**	**Utility**	**Ceiling fans**	**Pedestal fans**	**Tube lights**	**Desktops**	**UPS**	**Printers**	**AC's**	**LCD projectors**	**Wireless routers**
1	301	WT LAB	1		8	28			1	1	
2	302	JAVA LAB	1		8	40	2	2	2		1
3	303	Project LAB	2		14	60	3	1	5	1	2
4	305	HOD	3		3	2	2	4	1		1
5	306	Faculity Cabin	2		1	1		1		1	
6	307	Class Room	6		6						
7	308	Staff Room	2		2	2					
8	309	Staff Room	2		2	2	1	1			
9	310	Class Room	6		6					1	
10	311	Class Room	6		5					1	
11	2nd floor	Lobby			3	4					
12	401	Class Room	6		5	1				1	
13	402	Class Room	6		5	1				1	
14	403	Faculty Cabin	2		2						
15	404		2		2	2		1			
16	406	Staff Room	6		4	3		2			1
17	407	De Lab									
18	408	Faculity Room	8		7	2	1	1			
19	409	Faculity Room	7		4	5	1	2			1
20	3rd floor	Lobby			3						
21	502& 503	IT Lab				130	2		11		
22	504	Faculity Cabin	4		2						
23	505	Faculity Cabin	2		2	1	1	1	1		
24	506	Faculity Cabin	4				1				
25	507	Class Room		6	4						
26	508	Staff Room	2		2						
27	509	Staff Room	2		2						
28	510	Class room	6		5						
29	511	Class room	6		5	1				1	
30		Lobby			8						

31		TOTAL	94	6	120	285	14	16	21	8	6

Annexure VII - CIVIL											
S No	**Room**	**Utility**	**Ceiling fans**	**Pedestal fans**	**Tube lights**	**Desktops**	**UPS**	**Printers**	**AC's**	**LCD projectors**	**Wireless routers**
1	GF	Geo Technical Engineers Lab	6		4						
2	107	Staff Room	2		2						
3	GF	Environment Engineering Lab	8		2						
4	GF	Concrete Technology Lab	11		8						
5	GF	Serveying Lab	1		2						
6	GF	Lobby			5						
7	1st Floor	Store Room			1						
8	1st Floor	M.Tech Class Room	3		2						
9	Gf	Geo Technical Eng Lab	6		6						
10	Gf	Faculity Room	2								
11	Gf	Environment Eng lab	8		2						
12	Gf	Concrete Technology Lab	11		8						
13	Gf	Serveying Lab	1		2						
14	Gf	Lobby			5						
15	1st floor	Store Room			1						
16	1st floor	M tech Class room	3		2						
17	1st floor	Staff Room	2		2	1	1				
18	1st floor	Seminar Hall				1	1		3	1	
19	1st floor	HOD office	3		5	2	2		1		
20		Staff Room	1		1						
21	1st floor	Tutorial Class Room	3		2						
22	1st floor	Staff Room	2		1						
23	1st floor	Computer lab	2			42	1	1	3	1	
24	1st floor	Class Room	6		4						
25	1st floor	Department Library	3		2	1	1				
26	1st floor	Staff Room	1		1						
27	1st floor	Staff Room	1		1	1	1				
28	1st floor	Class Room	6		4						
29	1st floor	Class Room	6		4						
30	1st floor	Lobby			11						
31	2nd floor	Exam cell	25		24						
32	2nd floor	Spot Valuetion Room	6		11				3		
33	2nd floor	Dept Controller of Examination Room	4		3	1		1			
34	2nd floor	Processing Hall	6		12						
35	2nd floor	Exam cell	1		1						
36	2nd floor	Printing Room	2		3	3		1	1		
37	2nd floor	Exam cell	3		3	1		1	1		
38	2nd floor	Central Examination Co-ordinator	3		4						
39	2nd floor	Examination Cell	6		4	3					

40	2nd floor	Record Room	2		3						
41	2nd floor	Coding & Decoding section	3		2						
42	2nd Floor	Lobby	4		5		1				
43	3rd floor	Exam Cell	6		8						
44	3rd floor	Exam Cell	9		12						
45	3rd floor	Exam Cell	12		8						
46	3rd floor	Sports Room	5		5						
47	3rd floor	Gym	8	1	4						
48	3rd floor	Lobby			8						
49	5th floor	Dept of Physics	19		13						
50	5th floor	Staff room	3		2	1	1	1	1		
51	5th floor	Staff room	2		1						
52	5th floor	Staff room	3		1						
53	5th floor	Staff room	2	7	1			1			
54	5th floor	Staff room	3		1						
55	5th floor	Staff room	3		1						
56	5th floor	Staff room	3		1	1	1				
57	5th floor	Staff room	3		1	1					
58	5th floor	Basic Science And Humanities	3		1	1	1				
59		HOD ROOM	3		2	1	1	1	1		
60		Staff Room	1		1	1	1				
61		Staff Room	1		1	1	1				
62		Staff Room	1		1	1	1	1			
63		Staff Room	5		2	1	1	1			
64		Chemistry Lab	2		3	1	1				
65		Staff Room	3		1						
66		Lobby			9						
		TOTAL	244	0	240	66	17	9	14	2	0

Annexure VIII – Administration											
S No	Room	Utility	Ceiling fans	Pedestal fans	Tube lights	Desktops	UPS	Printers	AC's	LCD projectors	Wireless routers
1	*Gf*	Director Room	1		2	1		1	1		
2	*Gf*	Secretarial Room	2		7	1	1	2	1		
3	*Gf*	Conference Room							2	1	1
4	*Gf*	Principal Room	4		5	1		2	1		
5	*Gf*	Office Room	1			1					
6	*Gf*	Office Room	11		11	10		2			
7	*Gf*	Store Room	3		3						
8	*A-108*	HOD	1		2	1	1	1	1		
9	*A-109*	Faculity Room	8		7	2					
10	*A-110*	Class Room	5								
11	*A-111*	Class Room	8		5						
12	*A-112*	Class Room	8		5						
13	*113*	Class Room	6		6						
14	*Gf*	Lobby	7		11						
15	*1st floor*	201	1		23	66	3		5	1	
16	*1st floor*	202	15		9	1	2			2	
17	*1st floor*	203	1		3	1	1	1	1		1
18	*1st floor*	204	6		9	3	2	3			
19		Office Room	1		2	1	1	1			
20		Class room	32		20	4	1				1
21		Lobby			6						
22	*2nd floor*	Auditorium				1				1	1
23	*2nd floor*	302	1		2				1		
24	*2nd floor*	303	1		1				1		
25	*2nd floor*	304	1		1				1		
26	*2nd floor*	305	1		1				1		
27	*2nd floor*	308	2		3				1		
28	*2nd floor*	309			15				6		1
29	*2nd floor*	310	1		2	1			1		
30	*2nd floor*	311	40		34						1
	2nd floor	Lobby	2		5						
		TOTAL	170	0	200	95	12	13	24	5	6

Annexure IX						
S. no	Name of appliance	Power Rating(Watt)	Quantity	Power Consumption (Watt)	Average usage per day (hr)	Power Consumption/day (Watt)
A	B	C	D	E=C X D	F	G=E X F
1st floor						
1	Ceiling fans	80 W	13	0	12	0
2	Tube lights (LED) 4'feet	20W	6	120	6	720
3	Tube lights 4' feet	36 W	47	1692	6	10152
2nd Floor						
1	Ceiling fans	80 W	12	0	12	0
2	Tube lights (LED) 4'feet	20W	14	280	6	1680
3	Tube lights 4' feet	9 W	48	432	6	2592
3rd Floor						
1	Ceiling fans	36 W	12	0	12	0
2	Tube lights (LED) 4'feet	20 W	11	220	6	1320
3	Tube lights 4' feet	9 W	58	522	6	3132
4th Floor						
1	Ceiling fans	36 W	12	0	12	0
2	Tube lights (LED) 4'feet	20 W	5	100	6	600
3	Tube lights 4' feet	9 W	63	567	6	3402

Annexure X- Boys Hostel						
S. no	**Name of appliance**	**Power Rating(Watt)**	**Quantity**	**Power Consumption (Watt)**	**Average usage per day (hr)**	**Power Consumption/day (Watt)**
A	**B**	**C**	**D**	**E=C X D**	**F**	**G=E X F**
			A Block			
1	Ceiling fans	80 W	132	10560	12	126720
2	Tube lights (LED) 4'feet	20W	30	600	6	3600
3	Tube lights (LED) 1'feet	9 W	02	18	6	108
4	LED Bulbs	8W	12	96	6	576
5	Tube lights 4' feet	36 W	142	5112	6	30672
6	Tube lights 2' feet	20 W	08	160	6	960
7	Water cooler	2.8kwh/day	1	2800	day	2800
			B Block			
1	Ceiling fans	80 W	212	16960	12	203520
2	Tube lights (LED) 4'feet	20W	32	640	6	3840
3	Tube lights (LED) 1'feet	9 W	96	864	6	5184
4	LED Bulbs	8W	81	648	6	3888
5	Tube lights 4' feet	36 W	216	7776	6	46656
6	Tube lights 2' feet	20 W	50	1000	6	6000
7	Water cooler	2.8kwh/day	1	2800	day	2800

Anil Neerukonda Institute of Technology and Sciences- Annexure IX			
500 kVA Generator Fuel Consumption Report.			
Month & Year	***Usage of Gen Set in hours (tentatively)***	***Diesel Consumption per (lit/hour)***	***Total consumption (liters)***
March 2019	11.08	35	387.8
April 2019	10.11	35	353.85
May 2019	24.05	35	841.75
June 2019	45.14	35	1579.9
July 2019	10.06	35	352.1
August 2019	15.09	35	528.15
September 2019	21.02	35	735.7
October 2019	19.11	35	668.85
November 2019	9.05	35	316.75
December 2019	6.22	35	217.7
January 2020	10.05	35	351.75
February 2020	11.08	35	387.8
March 2020	13.04	35	456.4
April 2020	10.12	35	354.2
Total			**7532.7**

Transport Fuel Consumption XI

#	Month	Total liters of fuel consumed by each of 21 buses	Average liters of fuel consumed by each of 21 buses
1	April 2019	3839	182.8
2	May 2019	3959	188.52
3	june	7746	368.85
4	july	10474	498.76
5	August	10232	487.23
6	September	10495	497.76
7	October	10302	490.57
8	November	11708	557.52
9	December	12505	595.47
10	Jan 2020	8409	400.42
11	Feb 2020	10465	498
12	March 2020	5387	256.52
	TOTAL	105521	

Sewage Treatment Plant -Annexure XII

S.no	Compartments	Company	Type/Frame No./Model No./mechine No..	Voltage	Current	Power	Horse Power	RPM	Number of pumps/Motars
1	Air Blower Motors	Crompton Greves	Freame No. 1832 M.J	415V	10.35 A	5.5	7.5	1450	2 motors
2	Sewge Transfer Pums	Crompton Greves	Mechine No. NDA 2 M.J	415V	2.42	1.1	1.5	2820	2
3	Sludge Feed Pumps	Crompton Greves	Mechine No. NDA 2 M.J	415V	2.42	1.1	1.5	2820	2
4	Filter Feed Pumps	Kirloskar	Mechine no. KDS - 225++	415V	3.9 A	1.5	1.5	2842	2
5	Booster Pumps	Grund Fos	CR 10-05-A-FJ-A-E-HQQE	415V	8.15/4.7A	2.2	3	2899	3
6	Everest Blower Motors	Everest Blopwer Motors	M5075	415V	NA	0.5kg/cm2	200m3	1300	2
7	Cutter Pumps	Aquatex	ASP 22P	415V	5.7 A	2.2	3	2900	4

E2e

Sewage treatment Plant

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ENVIRO KAMKAR LLP

Team :

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Help us to assist you to develop green India.