



CERTIFICATE OF EXCELLENCE

THIS IS CERTIFY THAT

KALINGA UNIVERSITY

HAS SUCCESSFULLY

COMPLETED THE

GREEN

AUDIT PROGRAM

CONDUCTED ON

25 FEBRUARY 2023

CERTIFICATE NO. **SMPL/2023/C-0023**

DATE OF ISSUE **01-03-2023**

Samarth Suri

AUTHORISED SIGNATORY

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CERTIFICATE OF EXCELLENCE

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HAS SUCCESSFULLY
COMPLETED THE **ENVIRONMENT**

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GREEN AUDIT REPORT



**KALINGA
UNIVERSITY**
RAIPUR | INDIA

**Kotni, Near Mantralaya, Naya Raipur – 492101, Chhattisgarh,
India.**

Audit Date – 25th February, 2023

Audit Conducted by:

SAMARTH™
GROUP

M/S SAMARTH MANAGEMENT PRIVATE LIMITED
212, BHERA ENCLAVE, PASCHIM VIHAR, DELHI – 110087



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ABOUT KALINGA UNIVERSITY

Kalinga University, Raipur has emerged as a centre of excellence of higher education in Central India. Strategically located in the Smart City of New Raipur, this University has started carving a niche for itself in the education domain and is rising as a shining star on the horizon of quality education.

About Raipur – Raipur is the Capital of Chhattisgarh and New Raipur is the New Capital of Chhattisgarh in the making. New Raipur is the fourth planned city of India with wide roads and miles of greenery and is pollution free. It is the first Integrated and Smart City of the country. A cosmopolitan city which is also the hub of higher education hosts IIM, IIT, IIIT, National Law University, CIPET, NIT and AIIMS. In addition it also hosts most National and International brands of Food and Retail Outlets.

Establishment - Established in 2013, this university has been able to win the confidence of over 7000 students. Meritorious students from all over the country and various foreign countries namely Afghanistan, Bangladesh, Nepal, Nigeria, South Korea and Uganda have chosen this University for their education and career.

Schools of Excellence - A centre for Doctoral research programmes in various fields. Currently the University is serving the student community through various UG and PG programs namely Engineering, Law, Pharmacy, Arts & Humanities, Science, Commerce & Management, Biotechnology, Information Technology, Library Science, Fashion Design & Interior Design.

Academics and Faculty - All schools are headed by senior professors having excellent academic credentials and experience of teaching, publications and research. They are ably supported by the well qualified faculty members who come from top educational institutions and the Industry. Students also get an opportunity to learn from a distinguished panel of experts drawn from various industries, who regularly come for guest lectures.

Infrastructure – Kalinga boasts of World Class Infrastructure and student facilities with student centric approach. Highest attention is paid to hands-on learning approach and students are encouraged to come up with innovative ideas for projects and practical's. The University has more than 75 laboratories and workshops, all well equipped with the latest, state of the art apparatus and tools. Special emphasis is given to the development of communication skills through the language lab. More than 1200 computers are available for the use of the students.

The Library has a collection of over 79,000+ books and also offers Digital content through membership of DELNET, National Digital Library and NPTEL. Various magazines and journals are available for the use of the faculty and students.

Infrastructure consists of Student Hostel facilities, Green Acres, Canteen, Food Mess, Gymnasium, Fully Wi-Fi Campus, ATM, Mini Market, Student hangout Areas, Sports Complex, Re-creation Halls with Indoor Games and Music and recreation activities.

Industry Orientation and Leadership - Industry interaction is an integral part of the curriculum and Industrial visits, internships on live projects and mentoring by the Industry leaders are regular features. The University has developed excellent connections with the top Industries of the region by taking memberships of leading industrial associations like Confederation of Indian Industries, PHD Chamber of Commerce and Industry, Federation of Indian Chamber of Commerce and Industry, Indian Importers Chamber of Commerce and Industry. The University has an active chapter of Young Indians in which students get an opportunity to interact extensively with the Industry leaders and attend various corporate seminars and events.



Life Changing Experience - Kalinga is a Life Changing experience where the stress is on over all development of students. NCC, NSS and Various other clubs and societies offer opportunities to students to showcase their talent and learn under the guidance of experts. Music, dance and martial arts trainers are available for the students. Coaches of different games and sports like Cricket, Football, Basketball, Volleyball and athletics are also available for sharpening the talent of the students.

HIGHLIGHTS OF KALINGA UNIVERSITY

1	Research oriented, student centric university attracting students from all parts of India and over 22 foreign countries.
2	8th Private University in the country approved under Section 12B by UGC.
3	The best Private University in Central India Award by ASSOCHAM in 2020.
4	44th Rank in top Universities in the country as per survey done by outlook-icare in 2019.
5	30th Rank in top universities in the country established after the year 2000 as per survey done by India Today in 2018.
6	Management Department Ranked as 7th Best in the country as per survey by Competition Success Review in 2018.
7	Engineering Department Ranked as 3rd Best in the country as per survey by Competition Success Review in 2019.
8	State of the art Library with over 80,000 books and E access to various journals and databases including DELNET, NPTEL, NDL, J-Gate (Social Science), J-Gate (Science and Technology), INSPEC Database of Elsevier & Web of Science.
9	Free of cost Coaching classes for Competitive exams and IT skills in Collaboration with Bosch, NIIT, and BT for all students.
10	Free of Cost Hobby classes for Self defense and Martial arts , Instrumental and Vocal Music for hostel students.
11	Central Instrumentation Facility with world class Scientific apparatus and research databases.
12	Innovation and Incubation Cell to support startups and entrepreneurship of students.
13	Accredited by NAAC with B+ grade.
14	Listed in Rank Band 101-150 in University category in NIRF Ranking 2022 as well as 2023.
15	"Free of cost" Value Added courses available for all students.
16	Unique policy of acquiring "Extra Credits" for Various Co-curricular & academic activities.
17	Mentoring of all students by dedicated faculty members.
18	Extra classes for slow learners.
19	Regular field visits, guest lectures, case studies, role plays, mock sessions etc.
20	Soft skills classes for all students.
21	Activities, internship & placement opportunities for all students.



ABOUT SAMARTH MANAGEMENT PRIVATE LIMITED

M/s SAMARTH MANAGEMENT PRIVATE LIMITED is a Management and Environmental Consulting Organization working in the Environmental field since 2004. The organization has a team of Environment Experts with wide knowledge in the subject. SMPL is providing services for various sectors such as

- Preparing Environment Impact Assessment (for Building & Construction Projects, Small and big manufacturing units, Hospitals, Educational Institutions, Hotels etc.)
- Samarth Management Private Limited has prepared Green Audit reports for various institutes and organizations.
- Team involved in this auditing and report preparation is given below:

NAME	DESIGNATION
Ms. Palak Ahuja	Auditor
Mr. Sagar Mahour	Auditor



1. INTRODUCTION

The green audit aims to analyze environmental practices within and outside the university campuses, which will have an impact on the eco-friendly atmosphere. Green audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of the university environment. It was initiated with the motive of inspecting the effort within the institutions whose exercises can cause threat to the health of inhabitants and the environment. Through the green audit, a direction as to how to improve the structure of the environment and there are several factors that have determined the growth of carried out the green audit.

1.1. NEED FOR GREEN AUDITING

Green auditing is the process of identifying and determining whether institutions' practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, are becoming habitual for everyone especially, in common areas. Now, it is necessary to check whether our processes are consuming more than required resources? Whether we are handling resources carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it into a green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institutions towards an environment.

1.2. GOALS OF GREEN AUDIT

University has conducted a green audit with specific goals as:

- Identification and documentation of green practices followed by university.
- Identify strength and weakness in green practices.
- Analyze and suggest solutions for problems identified.
- Assess facility of different types of waste management.
- Increase environmental awareness throughout campus
- Identify and assess environmental risk.
- Motivates staff for optimized sustainable use of available resources.
- The long-term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issues before they become a problem.

1.3. OBJECTIVES OF GREEN AUDIT

- To examine the current practices, which can impact on the environment such as resource utilization, waste management etc.



- To identify and analyze significant environmental issues.
- Setup goal, vision, and mission for Green practices on campus.
- Establish and implement Environment Management in various departments.
- Continuous assessment for betterment in performance in green

1.4. BENEFITS OF GREEN AUDIT TO EDUCATIONAL INSTITUTIONS

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Empower the organization to frame a better environmental performance.
- It portrays a good image of the institution through its clean and green campus.

Finally, it will help to build a positive impression for the upcoming NAAC visit through green initiatives.

2. OBJECTIVE AND SCOPE

The broad aims/benefits of the eco-auditing system would be

- Environmental education through systematic environmental management approach
- Improving environmental standards
- Benchmarking for environmental protection initiatives
- Sustainable use of natural resources in the campus.
- Financial savings through a reduction in resource use
- Curriculum enrichment through practical experience
- Development of ownership, personal and social responsibility for the College campus and its environment
- Enhancement of University profile
- Developing an environmental ethic and value systems in young people

3. EXECUTIVE SUMMARY

A Green audit is a snapshot in time, in which one assesses campus performance in complying with applicable environmental laws and regulations. Though a helpful benchmark, the audit almost immediately becomes outdated unless there is some mechanism in place to continue the effort of monitoring environmental compliance.



This audit report contains observations and recommendations for improvement of sustainability consciousness.

1. Energy use

As part of its focus on energy management, Kalinga University will strive towards ensuring:

- 1.1 Inspection of the campus facilities every semester to identify, maintain and repair faulty or broken equipment on campus, such as ICT equipment, electrical devices, electrical panels, etc.
- 1.2 Appropriate investment on developing renewable sources of energy on campus such as solar cells panel.
- 1.3 Adoption of energy efficient equipment/appliances and fixtures such as LED lights, sensor operated lights, Solar lights in open areas etc. within the campus.

2. Water Management

As part of its focus on water management, Kalinga University will strive towards ensuring:

- Inspection of the campus facilities every semester to identify and repair any faulty installations such as pipes, taps, flushes, etc. which may lead to leaks and wastage of water.
- Adoption of rain water harvesting techniques and proper utilization of the same.
- The exploration of water recycling mechanisms through collaborations with appropriate organizations.
- Installation of sensor operated water taps in washrooms to prevent wastage of water.
- Utilization of STP outlet water for gardening purposes to reduce usage of water.

3. Waste Management

As part of its focus on waste management, Kalinga University will strive towards ensuring:

- Adoption of waste segregation methods such as appropriately placed dustbins for dry and wet-waste.
- Appropriate e-waste management practices for collection, disposal or recycling of such waste.
- Minimal use of paper in the campus in all aspects of administrative and academic functioning by utilizing ERP and emails to the extent possible
- Minimal use of plastic on campus to reduce non-recyclable waste
- Adoption of appropriate practices to reduce/recycle/treat municipal waste within the campus premises such as collaborations with companies/NGOs for recycling
- Minimize hazardous waste and appropriate management of such waste
- Disposal of waste to authorized recyclers to ensure responsible disposal.

4. Landscaping and gardening

- As part of its focus on building a green campus, Kalinga University will strive towards ensuring:
Expansion of green cover in the campus through investments in gardening and landscaping activities.
- Active engagement with the community for increasing green cover in the surrounding areas.



4. KALINGA UNIVERSITY INFRASTRUCTURE

Kalinga boasts of World Class Infrastructure and student facilities with student centric approach. Highest attention is paid to hands on learning approach and students are encouraged to come up with innovative ideas for projects and practical's. The University has more than 75 laboratories and workshops, all well equipped with the latest, state of the art apparatus and tools. Special emphasis is given to the development of communication skills through the language lab. More than 1200 computers are available for the use of the students.

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Table 1: Green Area at Kalinga University Campus

GREEN AREA AT KALINGA UNIVERSITY CAMPUS			
S.NO	PARTICULARS	AREA	
		SQUARE METER	SQUARE FEET
A1+A2	HORSE GARDEN	2461	26476.5
A3	PORCH GARDEN	140	1506
A4	KHO KHO GARDEN	1596	17170
A5	CIRCLE GARDEN	94.98	1021
A6	KABADDI GARDEN	1595	17159
A7	OLD BOYS HOSTEL GARDEN	1015	10919
A8	BOTANICAL GARDEN	1980	21301
A9	MINI CANTEEN GARDEN	352.8	3796
A10	ELEPHANT FOUNTAIN GARDEN	29.4	316.3
A11	MAIN CANTEEN GARDEN	847.3	9115.59
A12	GIRLS HOSTEL	595	6401.24
A13	INTERNATIONAL BOYS HOSTEL	304.7	3278.08
A14	NEW BOYS HOSTEL	3680	8071.28
A15	SPORTS GROUND (16 Acre)	64782.86	696960
GRAND TOTAL AREA		79474.04	855013.511
GRAND TOTAL AREA IN ACRES = 18.36 ACRES			
PREPARED BY : DEPARTMENT OF CIVIL ENGINEERING , NAYA RAIPUR C.G.			



Table 2: Details of Trees and Plants in Campus

S.No.	AREA	LOCAL NAME	BOTANICAL NAME	NUMBERS
1	Finger Garden	Paper Flower	Bougainvillea Glabra	480
2		Chhatim Tree	Alstonia Scholaris	5
3		Gulmohar	Delonix Regia	14
4		Badam, Almond	Terminalia Catappa	7
5		Palm	Syagrus Romanzoffiana	15
6		Shami Plant (Sonapatti)	Bauhinia Racemosa	4
7		Cape Honeysuckle	Tecoma Capensis	6
8		Canna	Canna Indica	29
9		Morning Glory	Ipomoea Carnea	3
10	Basketball Area (Inside)	Badam, Almond	Terminalia Catappa	2
11		Gulmohar	Delonix Regia	11
12		Kaner	Nerium Oleander	1
13		Chandni Plant	Tabernaemontana Divaricata	2
14		Paper Flower	Bougainvillea Glabra	9
15	Basketball Area (Outside)	Kadam	Neolamarckia Cadamba	6
16		Palm	Syagrus Romanzoffiana	6
17		Gulmohar	Delonix Regia	5
18		Badam, Almond	Terminalia Catappa	5
19		Yellow Bells	Tecoma Stans	23
20		Yellow Trumpetbush	Tecoma Trumpet Vine	88
21		4 O'clock	Mirabilis Jalapa	16
22		10 O'clock Plant	Portulaca Grandiflora	30
23	Gol Chowk Area	Paper Flower	Bougainvillea Glabra	51
24		Red Leaf Plant	Acalypha	25
25		Cape Honeysuckle	Tecoma Capensis	2
26		Gudhal	Hibiscus Rosa Sinensis	2
27		Morning Glory	Ipomoea Carnea	3

28	Parking Area	Palm	Syagrus Romanzoffiana	6
29		10 O'clock Plant	Portulaca Grandiflora	172
30		Kadam	Neolamarckia Cadamba	3
31		Ashoka Plant	Saraca Asoca	3
32		Gulmohar	Delonix Regia	5
33		Chhatim Tree	Alstonia Scholaris	3
34		Paper Flower	Bougainvillea Glabra	468
35	Mini Market Area	Gulmohar	Delonix Regia	13
36		Kadam	Neolamarckia Cadamba	4
37	Pond Area	Kaner	Cascabela Thevetia	1
38		Babul Plant	Vachellia Nilotica	16
39		Canna	Canna Indica	4
40		Aak	Calotropis Procera	2
41		Peepal Plant	Ficus Religiosa	1
42		Chhatim Tree	Alstonia Scholaris	39
43		Khajur	Date Palm	256
44		Mango	Mangifera Indica	16
45		Kadam	Neolamarckia Cadamba	4
46		Madhavi Latha	Hiptage Benghalensis	5
47		Cape Honeysuckle	Tecoma Capensis	5
48		Gulmohar	Delonix Regia	14
49		Cape Honeysuckle	Tecoma Capensis	5
50		Paper Flower	Bougainvillea Glabra	476
51		Shami Plant (Sonapatti)	Bauhinia Racemosa	3
52	Main Building Area	Gulmohar	Delonix Regia	36
53		Shami Plant (Sonapatti)	Bauhinia Racemosa	1
54		Bamboo	Bambusa Vulgaris	48
55		Badam, Almond	Terminalia Catappa	6
56		Chhatim Tree	Alstonia Scholaris	3
57		Palm	Syagrus Romanzoffiana	26
58		Bamboo Palm	Areca Palm Tree	30



59		Gulmohar	Delonix Regia	39
60		Petunia	Petunia	8
61	Girls Hostel Area	Cape Honeysuckle	Tecoma Capensis	29
62		Gulmohar	Delonix Regia	2
63		Bamboo Palm	Areca Palm Tree	35
64		Palm	Syagrus Romanzoffiana	8
65		10 O'clock Plant	Portulaca Grandiflora	33
66	New Pharmacy Building	Kadam	Neolamarckia Cadamba	28
67		Cape Honeysuckle	Tecoma Capensis	8
68		Petunia	Petunia	8
69	Boy International Hostel	Gulmohar	Delonix Regia	58
70		Palm	Syagrus Romanzoffiana	6
71		Amaltas	Cassia Fistula	12
72		Madhavi Latha	Hiptage Benghalensis	8
73		Bamboo Palm	Areca Palm Tree	34
74	General Boys Hostel	Bamboo Palm	Areca Palm Tree	15
75		Gulmohar	Delonix Regia	79
76		Paper Flower	Bougainvillea Glabra	58
77		10 O'clock Plant	Portulaca Grandiflora	97
78		Palm	Syagrus Romanzoffiana	18
79	Botanical Garden	Gulmohar	Delonix Regia	76 Approx.
80		Adhusa, Vasaka	Adhatoda Vasica	24
81		Ashoka	Saraca Asoca	1
82		Physic Nut, Biodiesel Plant	Jatropha Curcas	2
83		Lipstick Tree	Bixa Orellana	2
84		Cowplant, Periploca Of The Woods, Gurmar	Gymnema Sylvestre	1
85		Basil, Tulsi	Ocimum Sanctum	
86		Madar	Calotropis Procera	
87		Origano	Origanum Vulgare	
88		Frangipani, Champa	Plumeria Alba	



89		Shatavari	Asparagus Racemosus	2
90		Parijat, Night Flowering Jasmine	Nyctanthes Arbor-Tristis	4
91		Water Hyssop, Herb Of Grace	Bacopa Monnieri	3
92		Aloe Vera	Aloe Vera	18
93		Air Plant, Cathedral Bells, Life Plant	Bryophyllum Pinnatum	23
94		Babul	Acacia Nilotica	4
95		Banana, Kela	Musa × Paradisiaca	1
96		Hadjod And Pirandai	Cissus Quadrangularis	4
97		Bottlebrushes	Callistemon	1
98		Chinese Chastetree	Vitex Negundo	3
99		Neem	Azadirachta Indica	2
100		Peepal	Ficus Religiosa	2
101		Curry Tree	Murraya Koenigii	1
102		Sago Palm	Cycas Revoluta	14
103		Guduchi, And Giloya,	Tinospora Cordifolia	3
104		Asian Pigeonwings, Bluebellvine, Blue Pea, Butterfly Pea.	Clitoria Ternatea	2
107		Rhoeo Discolor, Moses-In-The-Cradle	Tradescantia Spathacea	2
108		Lemon	Citrus Limon	1
109		Lemon Grass	Cymbopogon	1
110		Cactus	Mammillaria	1
111		Pudina	Mintha	17
112		Asthma-Plant	Euphorbia Hirta	1
113		Jungle Geranium, Flame Of The Woods Or Jungle Flame	Ixora Coccinea	3
114		Henna Tree, The Mignonette Tree	Lawsonia Inermis	2
115		Queen Palm	Syagrus Romanzoffiana	9



116		Bird Of Paradise Flower	Strelitzia Reginae	2
117		Ti Plant	Cordyline Fruticosa	9
119	Old Boys Hostel	Malabar Madhu Malati	Combretum Malabaricum	12
120		Palm	Syagrus Romanzoffiana	2
121		Gulmohar	Delonix Regia	5
122		Badam, Almond	Terminalia Catappa	5
123	Butterfly Garden	Paper Flower	Bougainvillea Glabra	159 Approx.
124		Gudhal	Hibiscus Rosa Sinensis	1
125		Gulmohar	Delonix Regia	14
126		Shami Plant (Sonapatti)	Bauhinia Racemosa	2
127		Badam, Almond	Terminalia Catappa	5
128		Palm	Syagrus Romanzoffiana	2
129	Horse Garden	Badam, Almond	Terminalia Catappa	9
130		Shami Plant (Sonapatti)	Bauhinia Racemosa	3
131		Palm	Syagrus Romanzoffiana	17
132		Cape Honeysuckle	Tecoma Capensis	6
133		Ticoma	Tecoma Stans	15 Approx.
135	Small Canteen Area	Petunia	Petunia	89 Approx.
136		Ticoma	Tecoma Stans	14 Approx.
137		Gulmohar	Delonix Regia	1
138		Badam, Almond	Terminalia Catappa	1
139		Chhatim Tree	Alstonia Scholaris	3
140		Shami Plant (Sonapatti)	Bauhinia Racemosa	29 Approx.



5. GREENERY IN THE CAMPUS





5.1 FULLY AUTOMATED LIBRARY



The Library at Kalinga University Raipur is more like an integrated Knowledge Resource Centre that is stocked with large numbers of Books, Magazines, Indian & International Journals, Online Journals and other Online Resources supporting all aspects of Studies and Research.

- Kalinga University has 79,000+ books and is also subscribed to various National and International Journals.
- It has a reading room capacity for 400 students that is divided into 2 halls of 200 each.
- The University is also member of several Online/Digital Libraries including National Digital Library (NDL), Developing Library Network (DELNET), NPTEL, Manupatra (For Law Students), J-Gate (Social Science), J-Gate (Engineering and Technology), INSPEC Database by Elsevier and Web of Science. Students are given free access to these e-resources through their ERP login.



5.2 DIGITAL LIBRARY

A. DELNET was started at the India International Centre Library in January 1988 and was registered as a society in 1992. It was initially supported by the National Information System for Science and Technology (NISSAT), Department of Scientific and Industrial Research, Government of India. It was subsequently supported by the National Informatics Centre, Department of Information Technology, Ministry of Communications and Information Technology, Government of India and the Ministry of Culture, Government of India.

DELNET has been established with the prime objective of promoting resource sharing among the libraries through the development of a network of libraries. It aims to collect, store, and disseminate information besides offering computerized services to users, to coordinate efforts for suitable collection development and also to reduce unnecessary duplication wherever possible.

It has over 2,50,00,000 E Resources including E Books, E journals, Multimedia Content, dissertations, PhD Thesis and research papers.

B. The National Digital Library of India (NDL) is a project under the Ministry of Human Resource Development, India. The objective is to collect and collate metadata and provide full text indexes from several national and international digital libraries, as well as other relevant sources. It is a digital repository containing textbooks, articles, videos, audio books, lectures, simulations, fiction and all other kinds of learning media. The NDLI provides access to many books in English and various Indian languages.

C. The National Programme on Technology Enhanced Learning (NPTEL) was initiated by seven Indian Institutes of Technology. The main goal of NPTEL Phase II was to build on the engineering and core science courses launched previously in NPTEL Phase I. An additional 600 web and video courses were created in all major branches of engineering, physical sciences at the undergraduate and postgraduate levels and management courses at the postgraduate level. Several improvements such as indexing of all video and web courses and keyword search were implemented.

- Largest online repository in the world of courses in engineering, basic sciences and selected social sciences subjects.
- Online web portal <http://nptel.ac.in> – more than 471 million+ views.
- YouTube channel for NPTEL – most subscribed educational channel, 1.5 million+ channel subscribers, 404 million+ views.
- More than 56000 hours of video content.
- Most accessed library of peer-reviewed educational content in the world.
- 52000+ hours of transcribed content; 51000+ hours of subtitled videos.



6. WASTE MANAGEMENT

Management of the various types of Degradable and Non-Degradable waste at the campus

There are different types of waste that are produce-

- **Biodegradable Waste**
- **Non-Biodegradable Waste.**

Biodegradable materials are those, which degrade or break down in a natural manner. In other words, their decomposition happens with the help of natural agents like sunlight, microorganisms, water, ozone and more which turns it into organic manure.

Non-biodegradable substances are materials which do not degrade easily. As they are synthesized and do not occur naturally, degradation is impossible with these products. Therefore, when they stay in the ecosystem for a long period and do not decompose, they harm our environment.

The Institution adopts several measures for management of the various types of degradable and non-degradable waste at the campus.

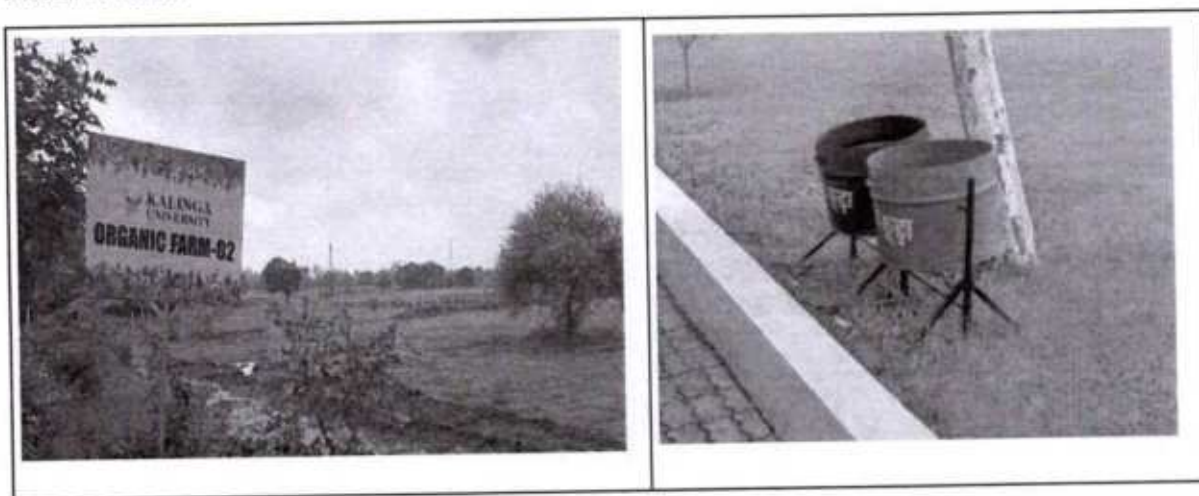
Some of them are -

- i. The Institution provides small dustbins in every class room and faculty rooms and encourages students and faculties to throw their waste specifically in the dustbins.
- ii. Kalinga University has ensured installation of big dustbins near the Canteen area to promote amongst students the habit of disposing waste in bins.
- iii. The Institution also encourages the use of 2 different dustbins i.e., Green Dustbin and Blue Dustbin. The same is done to segregate the waste.
- iv. At each floor of the institute, near the washrooms big dustbins have been kept.
- v. Incinerators are used for waste management.



6.1 USE OF DEGRADABLE WASTE

Due to the canteen in the college premises itself; there is a lot of degradable waste generated. This includes, vegetable peels, leftover food etc. All this waste is collected and used in the compost pit dug in the college itself. This not only helps in proper management of waste but also aids in the growth of other plants as the compost is later used as Organic Compost or Organic Natural Fertilizer.



6.2 SOLID WASTE

The university campus has the capacity to house the following population:

1. Students – 1200 (residents)
2. Teaching staff - 600
3. Non-teaching staff – 400
4. Students – 2800 (day engagement)

The solid waste generated from the campus in 2022-23 has been estimated based on the following (Assuming 0.3 kg/per capita daily solid waste generation):

The solid waste is collected through bins (blue and green). Blue bins are for dry waste, while the green bins are for wet wastes. Fallen leaves, flowers and other organic materials are collected through manual sweeping and transported to vermicomposting plants.

The university also generates plastic wastes depending on the usage. However, considering that around 48,000 TPA of plastic waste is generated in the state with a population of 32,941,966 in 2021. The average plastic waste per capita comes around 1.45 kg per capita annually, which translates to 0.4 gm per capita daily.

The inert and other solid wastes are collected and stored before being discarded to authorized agencies on a regular basis. The university is steadily moving towards achieving zero plastic thought. The university encourages segregation and has



placed several blue and green bins across the campus site.

The sources of solid wastes are as follows:

1. Hostel Canteen – cut fruits and vegetables, eggshells, peels, skins, meat leftovers, etc.pl
2. General campus – crunchies packet, plastic water bottles, packaging, used and won out fabric and clothes, used paper, cardboards, stationery items, etc.
3. Fallen leaves, flowers, dried stems, road, and kerb side dusts, etc.

There is solid waste generated from laboratories and offices.



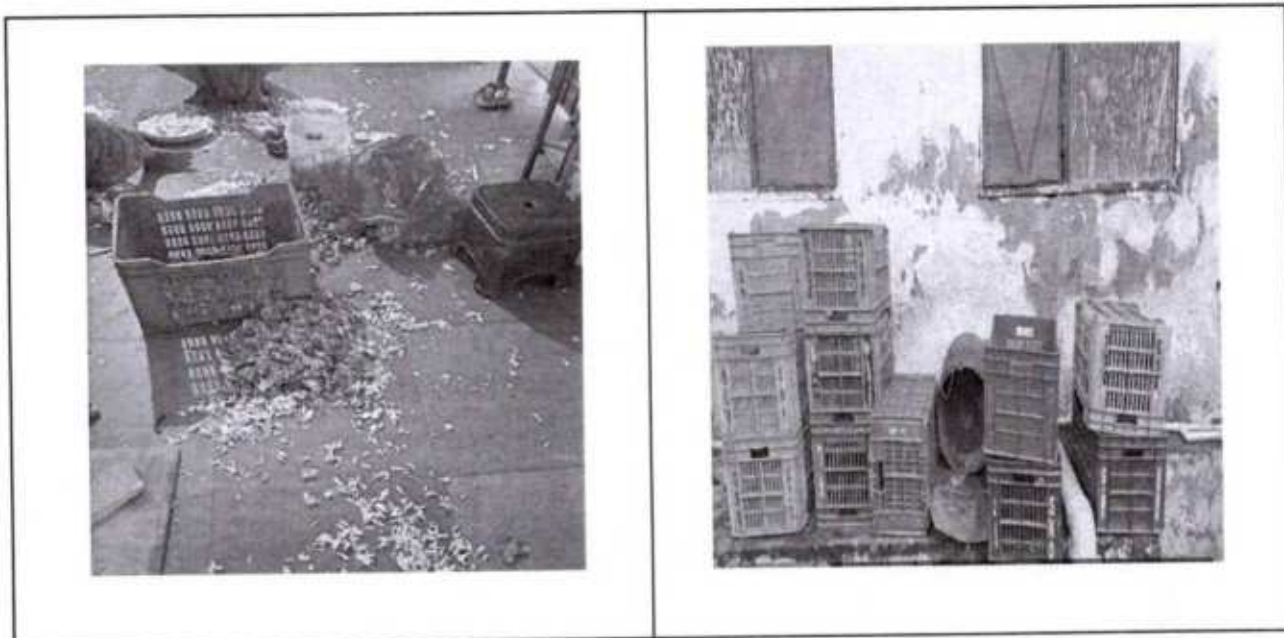
6.3 FOOD WASTE

The food waste is generated from various locations:

1. Hostel canteens
2. Offices
3. Small campus stalls
4. Restaurant

These are collected in boxes and sent for composting. There are also visits by municipal authorities daily for picking up garbage and municipal waste.





6.4 E- WASTE

The university has several sources of e-waste such as from laboratories, hostels, and offices. Some of the equipment which are deemed fit for up scaling and refurbishing are completed in these two aspects and donated for primary school use in nearby villages.

University is committed to practicing sustainable development and the management of E-waste is an important aspect of the sustainability goal. E-waste is collected and segregated in reusable and non-usable items. The life of electronic equipment is extended by appropriate upkeep and minor repairs carried out by University's own technical experts. Flip flops, memory chips, motherboard, compact discs, cartridges etc generated by electronic equipment such as Computers, Radio, TV, Phones, Printers, Fax and Photocopy machines are recycled properly. Instead of buying a new machine, a buyback option is taken for technology upgradation.

The e-waste generated from hardware which cannot be reused or recycled is being disposed of centrally through authorized



vendors. Kalinga University has MoU with Adatte E- Waste Management Private Limited, New Delhi for E-Waste disposal.



6.5 BIOMEDICAL WASTE

The biomedical wastes are generated from the campus, especially from laboratories and hostels. However, the quantity is small.



6.6 HAZARDOUS WASTE

The university generates hazardous waste from laboratories. A very small proportion of the hazardous waste is also generated from hostels and offices, especially used cells and batteries.



7. WATER

MANAGEMENT

The university has installed groundwater extraction systems inside the campus to meet water demand. The groundwater is pumped to overhead tanks and passed through RO. Filtered water is supplied for drinking purposes. Raw water is utilized for laundry, washing and bathing purposes. Cooking water supplied is of drinking quality.

The tank capacity at various locations is provided in Table 3

Table 3: Water storage quantity in Campus

S. No.	Block	Quantity
1.	Main Building	40,000 ltr
2.	Academic Block	20,000 ltr
3.	Indus Hostel	50,000 ltr
4.	Bhramputra Hostel	40,000 ltr
5.	Everest Hostel	20,000 ltr

The water requirement as per NBC 2016 is provided in Table. This quantity is at a higher estimate. The water consumption is around 75% of the estimated quantity. The staffing pattern for the university is 600, out of which 200 are administrative, 400 teaching and 200 working staff. There are two restaurants with seating capacity of 10 indoors and 30 outdoors. The campus also houses canteens. There are 3500 non-resident students who travel from their place of residence to the campus by bus and personal transport. The annual holiday for students has been estimated to be around 75 days spread over two to three months along with leave with respect to medical and personal reasons.

Table 4: Water demand as per NBC for Kalinga University

S.No	Establishment	Number	Persons	NBC standard	Quantity
1.	Hostels	4	1200	135	1,62,000



2.	Offices	45	200	45	27,000
3.	Restaurant	2	10 (indoors) 30 (outdoors)	70	1,400 4,200
4.	Non-resident students		3500	45	1,57,500
5.	Total requirement				3,52,100
6.	Say				350 KLD

The supply is also obtained from tankers of 4 KL capacity. This water is utilized for drinking purposes. The approximate distribution of water is provided in table 5.

Table 5: Number of tankers utilized by Hostels

S.No	Establishment	Number of tankers
1.	Brahmaputra	210
2.	Girls hostel	18
3.	Gole chowk	18
4.	Tree/Garden	76
5.	Sports Ground	22
6.	Makhana	13
	Total	325

The total tankers received in a month are an average of 640-650 KL. It translates to around 80-90 tankers per day. This would then indicate a volume of 80-90 KLD. This indicates that the tankers cater to 25%-30% of the total water demand.

The main storage inside the campus is at gole chowk of 35 KL. The underground tank at Brahmaputra hostel is of 15 KL capacity.

The wastewater generated is therefore, $350 \text{ KL} \times 80\% = 280 \text{ KL}$

The groundwater sampling reveals the following results.

Sampling was also undertaken from the artificial pond created by the university authorities. The pond is 200 KL capacity.

7.1 RAIN WATER HARVESTING

Conserving and preserving water are a key issue that has been addressed by the University in the form of Rain water harvesting. The campus has been practicing rainwater mechanisms in a site area of 33.98 acres approx. where there are 31 rain water harvesting pits all over campus. This mechanism ensures an increase in the water table index. The details of the

rainwater harvesting system have been designed by a certified architect and have been implemented throughout the campus.

Average yearly rainfall data of Chhattisgarh tabulated below: -

Table 6: Average yearly rainfall data of Chhattisgarh

	Avg. Temperature °C (°F)	Min. Temperature °C (°F)	Max. Temperature °C (°F)	Precipitation / Rainfall mm (in)	Humidity (%)	Rainy days (d)
January	13.5 °C (56.4) °F	7.6 °C (45.6) °F	20.1 °C (68.2) °F	23	0	66%
February	17 °C (62.6) °F	10.5 °C (50.9) °F	23.8 °C (74.8) °F	31	-1	59%
March	22.8 °C (73) °F	15.3 °C (59.6) °F	30.2 °C (86.3) °F	20	0	45%
April	29.4 °C (85) °F	21.2 °C (70.1) °F	37 °C (98.6) °F	13	0	27%
May	33.1 °C (91.6) °F	25.6 °C (78.1) °F	40 °C (104) °F	19	0	30%
June	33.4 °C (92.1) °F	28 °C (82.4) °F	38.7 °C (101.6) °F	71	-2	45%
July	30.2 °C (86.4) °F	26.9 °C (80.4) °F	34.1 °C (93.4) °F	197	-7	69%
August	29 °C (84.2) °F	26 °C (78.8) °F	32.6 °C (90.7) °F	180	-7	75%
September	28.2 °C (82.7) °F	24.1 °C (75.4) °F	32.7 °C (90.9) °F	90	-3	69%
October	25.8 °C (78.4) °F	19.3 °C (66.8) °F	32.4 °C (90.4) °F	14	0	52%
November	20.8 °C (69.4) °F	14.3 °C (57.7) °F	27.8 °C (82) °F	5	0	52%
December	15.5 °C (59.9) °F	9.2 °C (48.6) °F	22.4 °C (72.3) °F	7	0	60%

Dimension of Rain Water Harvesting Pits and Desilting Pits as appended below: -

Water Harvesting Pits

- Depth - 3 Mtr
- Diameter - 3 Mtr
- Volume - $3 \times 3 \times 670$ (average rainfall in mm) $\times 8 = 3216$ Liters/pit $\times 31$ Nos pits
- Total = 99696 Liters

Desilting Pits

- Depth - 03 Mtr
- Area - 3×3 Mtr

7.2 SEWAGE TREATMENT PLANT

The wastewater is generated from campus from the following areas:

1. Canteen
2. Restaurants
3. Hostels
4. Offices
5. Generator room

There are five STPs installed in the campus at various locations.

Table 7: STP and their location with capacity and operational time.

S.No	STP capacity (KL)	Location	Operation status
1	40	Pacific Hostel	Operation hours 8-10 hrs
2	30	Brahmaputra Hostel	Operation hours 8-10 hrs

3	30	Indus Hostel	Operation hours 8-10 hrs
4	40	Canteen	Operation hours 8-10 hrs
5	40	Administrative Block	Operation hours 8-10 hrs

The STPs are maintained by the university staff. These STPs were installed during 2020.

Treatment Capacity:

The wastewater treatment plant is designed to treat 30,000 Liters/Day to 1 Lakh Liters/Day Sewage generated from Unit. The treated effluent will be used for gardening, horticulture, and flush water in toilets.

There are 6 buildings-

1. Admin Building
2. Pharmacy Building
3. Old Boys Hostel
4. Girls Hostel
5. International Boys Hostel
6. New Boys hostel.

Admin Building and Pharmacy Building Sewage treatment plants can be common as there are no distances between them. There will be separate Sewage treatment plants for the other four buildings. As per the people's strength we have designed plants of different capacities for different buildings.

For Admin building and under construction pharmacy building we recommend a plant of 100 KLD.

DESIGN BASIS

Treatment Capacity:

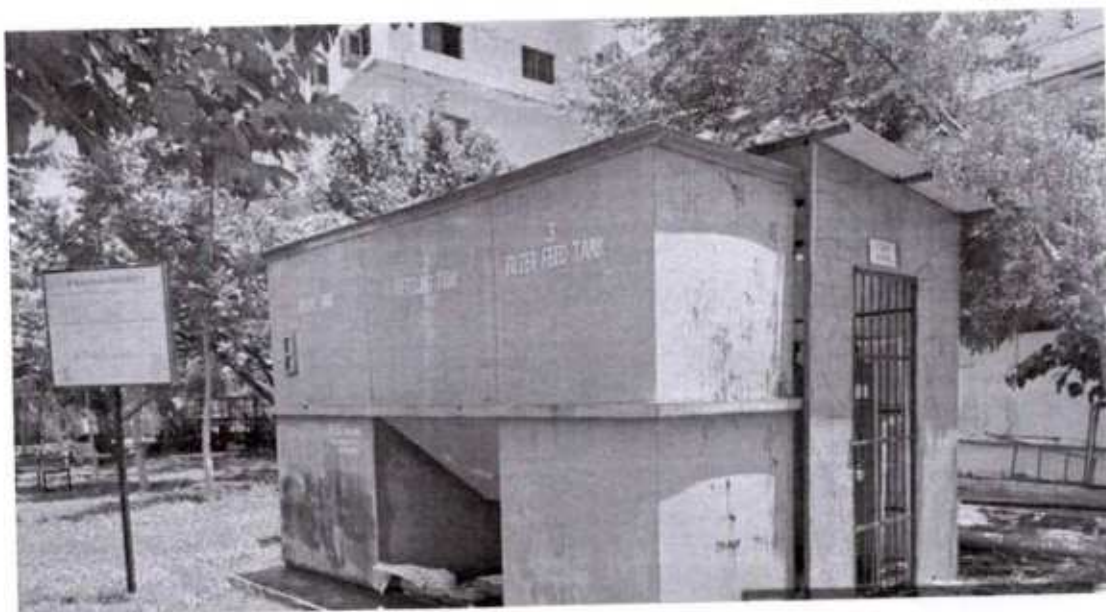
The wastewater treatment plant is designed to treat 30,000 Liters/Day to 1 Lakh Liters/Day Sewage generated from the unit. The treated effluent will be used for gardening, horticulture and flush water in toilets.

As per the site visit, there are 6 buildings-

1. Admin Building
2. Pharmacy Building
3. Old Boys Hostel
4. Girls Hostel
5. International Boys Hostel
6. New Boys hostel.



Admin Building and Pharmacy Building Sewage treatment plants can be common as there are no distances between them. There will be separate Sewage treatment plants for the other four buildings. As per the people's strength we have designed plants of different capacities for different buildings.



8. ENERGY MANAGEMENT

8.1 DIESEL GENERATOR DETAILS

The Kalinga University has installed 2# of Diesel Generator. The following table provides the Diesel generator capacity in the University.

S. No	Equipment Name	Make	Capacity in (kVA)
1	Diesel Generator - 01	Greaves	250 kVA
2	Diesel Generator - 02		250 kVA



8.2 TRANSFORMER DETAIL

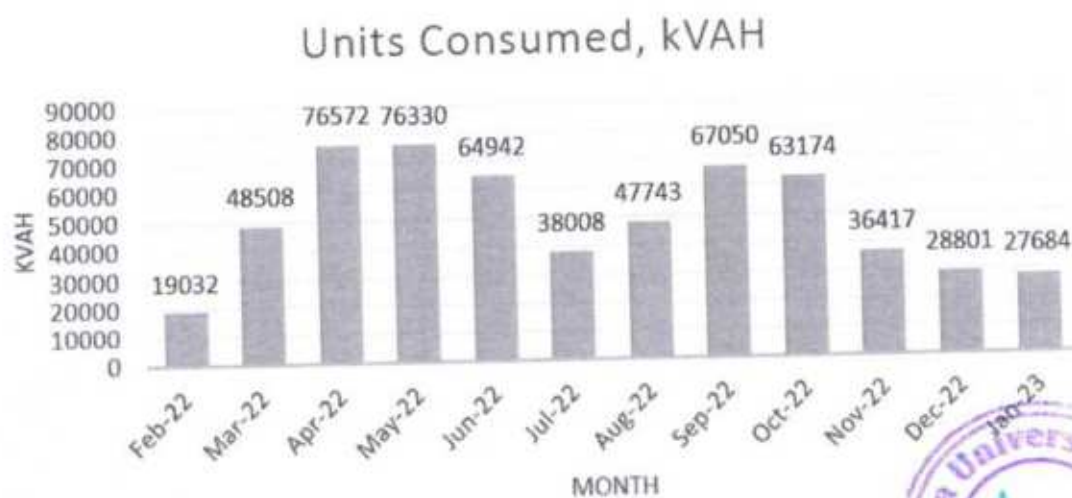
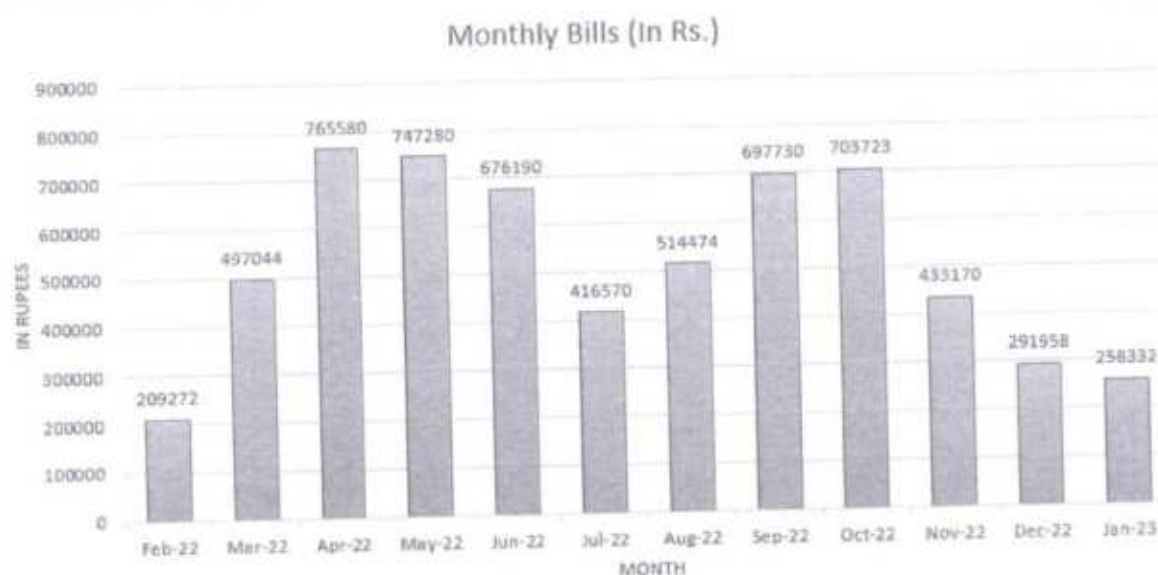
The Kalinga University has installed one Transformer of 300 kVA. The following table provides the transformer capacity in the University.

S.NO	Rated Specification	TRF
1	KVA	300
2	HV VOLTAGE	11000
3	LV VOLTAGE	433
4	AMP HV	15.75
5	AMP LV	416.37

6	MAKE	Power Star
7	DATE OF INSTALLATION	2015
8	VECT GROUP	Dyn11

8.3 ELECTRICITY TREND

The below graph represents the total electricity consumption trends for the year 2022-23 of Kalinga University.



8.4 ALTERNATE SOURCES OF ENERGY AND ENERGY CONSERVATION MEASURES AT THE CAMPUS

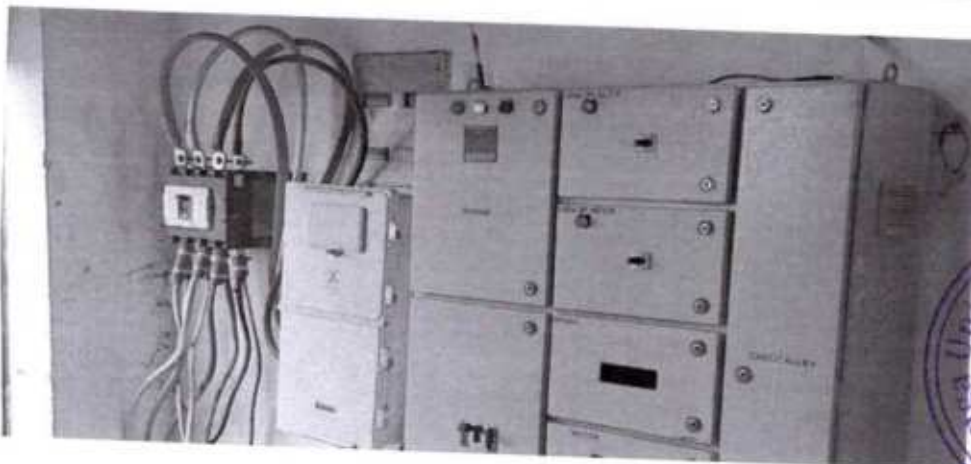
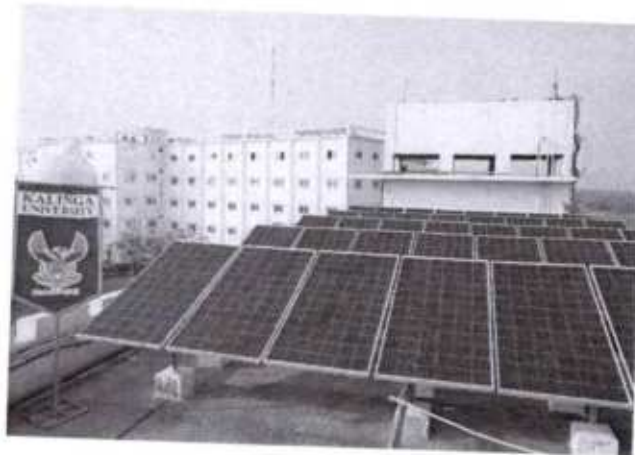
The Institution has facilities for alternate sources of energy and energy conservation measures

1. Solar energy
2. Use of LED bulbs/power efficient equipment
3. Other measures

Solar energy

Institute has taken initiative to install solar lights in the garden and also intends to increase campus wide solar light usage. The 300 KW solar Power Plant is being maintained nicely. This system is further to be provided with battery backup so that solar power can be used at night also.

Kalinga University has set up Solar Panels generating 300 KV (200 KV + 100 KV) of electricity, which is directly linked to the grid. Apart from the above, the university has 24 solar street lights.



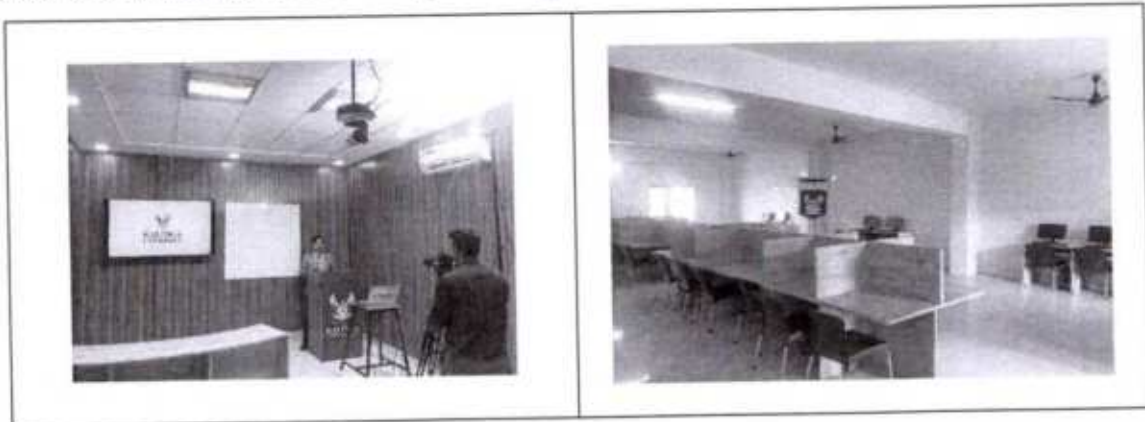
Use of LED bulbs/power efficient equipment

Power crisis is one of the most common problems in India. With the help of LEDs, we can eliminate this shortage by minimizing the wastage of electrical power or saving our generated power. Light-emitting diodes (LED) are one of today's most energy-efficient and rapidly developing lighting technologies. Quality LED light bulbs last longer, are more durable, and offer comparable or better light quality than other types of lighting.

Energy Savings with use of LED is a highly energy efficient lighting technology, and has the potential to fundamentally change the future of lighting.

LED bulbs were used for newly constructed buildings and some of the incandescent and fluorescent tube lights were replaced with LED bulbs. Majority of the class rooms, laboratories, administrative blocks, computer centers, libraries, seminar halls and staff rooms were provided with LED lighting systems which are supposed to be energy efficient. Now, the power consumption through lighting systems is about 20 percent by LED bulbs.

This initiative is very low cost and also power saving. It also minimizes the electric bills of the institute. Moreover, it creates an opportunity for minimizing the load shedding in the campus.



Other Measures

- Energy efficient electronic gadgets are used and maintained regularly to achieve energy conservation.
- Campaigns on awareness on energy conservation are made available in all relevant locations.
- Unwanted usage of power is discouraged in the Institute.
- Institute has conducted various awareness drives in campus to ensure saving water & electricity.
- Star rated refrigeration system
- Invertors
- Use of induction in pantry
- Awareness on how to conserve energy during the day time



8.5 TRANSPORTATION WITHIN CAMPUS

Battery vehicles technology is shaping the future of mobility in many parts of the world. Battery vehicles are around 3-5 times more efficient than internal combustion vehicles in utilizing energy.

A group of final year students of Mechanical Engineering of Kalinga University have created a battery vehicle prototype which is lightweight and with a customized motor controller.

Kalinga University has battery operated carts & bicycles for commuting within the campus.

The university has a vehicle parking system inside the campus. Only very selected vehicles are allowed to ply. Staff, students, and visitors must park their vehicles at designated places.

The university has deployed golf carts and battery-operated rickshaws inside the campus for movement. Moreover, the campus has beautiful pathways for pedestrian movements.



9. GREEN CAMPUS INITIATIVES BY Kalinga University

Plastic Free Campus:

Universities can generate enormous amounts of plastic waste, which is toxic to people and the environment, and never goes away.

- i Kalinga University is a Plastic Free Campus. We aim to measurably reduce plastic waste and pollution in our campus and the world around us. To achieve this we have undertaken following steps:
- ii Kalinga University has banned use of single-use plastics in canteens, cafes, Mini Market complex in the university premises and hostels, etc.
- iii In regular intervals, we carry out awareness drives and sensitisation workshops on the harmful impacts of single-use plastics.
- iv Encourage all students to avoid bringing non-bio-degradable plastic items to the University.
- v We encourage students to sensitize their respective households about the harmful effects of plastics and make their households also 'plastic-free'.
- vi We have installed necessary alternative facilities like water units to avoid the use of plastic water bottles, and encourage the use of alternative solutions like cloth bags, paper bags, etc, instead of plastic bottles, bags, cover, and other goods on campus.



10. SUMMARY

Green Audit is one of the important tools to check the balance of natural resources and its judicious use. Green auditing is the process of identifying and determining whether institutional practices are eco-friendly and sustainable. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area.

Kalinga University has conducted a "Green Audit" in the academic year 2022-2023. The main objective to carry out a green audit is to check the green practices followed by Kalinga University and to conduct a well-defined audit report to understand whether Kalinga University is on the track of sustainable development.



11. CONCLUSION

From the green audit following are the conclusions, which can be taken for improvement in the campus.

- a. All departments generate paper waste. Especially academic buildings. Using both sides of paper for printing and writing is good practice and use the other side of used paper for rough work.
- b. Rainwater is collected from the rooftop to recharge the groundwater level table.
- c. E- waste is segregated, handled and disposed properly in an eco-friendly manner.
- d. Wear Mask Signages are provided in the facility.
- e. Reducing the use of one-time use plastic bottles, cups, folders, pens, bouquets, decorative items will be useful to solve the problem of plastic pollution to some extent.



12. RECOMMENDATIONS

Following are some of the key recommendations for improving campus environment:

- i. Install a water meter to record water usage in the college Kalinga University premises.
- ii. The solid waste should be reused or recycled at maximum possible places.
- iii. An environmental policy document has to be prepared with all the recommendations and current practice carried by Kalinga University.
- iv. A frequent visit should be conducted to ensure that the generated waste is measured, monitored and recorded regularly and information should be made available to administration.



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ENERGY AUDIT REPORT



**KALINGA
UNIVERSITY**

KALINGA UNIVERSITY

Address - Village Kotni Near Mantralaya, Naya Raipur,
492101 (CG) India

Audit Date – 23rd and 24th February 2023

Audit Conducted by:

SAMARTH
GROUP

M/S Samarth Management Private Limited

192, Bhera Enclave, Paschim Vihar, New Delhi, Delhi, 110087.



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Executive Summary

Summary of Energy Conservation Measure

Summary of Energy Conservation Measures					
S. No	Energy Conservation Measure	Annual Savings Electricity		Investment	Payback
		kWh	Rs. Lakhs	Rs. Lakhs	Month
Payback Time					
1.	Replace 2/3star Air Conditioners with 5-star ACs (9 Nos. initially)	31588.2	2.3	3.2	16.7
2.	Installation of BLDC Fans in place of normal Fans	133120	13.3	62.4	55.2
Total		164708	15.6	65.6	51 Months

Observation

- Air Conditioners and Fans shall be changes in Phased Manner
- Regular (Daily) Monitoring of Power Factor shall be done.
- MDI is increasing in summer months. It shall be monitored to keep it less than contract demand (300KVA) to avoid penalty.
- Power Generation from Solar Plant shall be monitored monthly to evaluate Solar performance for provision of additional Solar PV plant to save energy cost.
- Energy Meter to be installed in DGs to evaluate performance of Diesel Generators.
- Posters related to Energy conservation to be displayed in common areas for awareness of Students and University staff.
- University level events may be organised for exploration of new methods of Energy Conservation.

Introduction

Kalinga University is committed to sustainability and seeks to enhance energy efficiency in its operations. The energy audit, conducted between 23-02-2023 and 24-02-2023, evaluates the current energy consumption patterns and identifies areas for improvement.

About University

Kalinga University, Raipur has emerged as a Center of excellence of higher education in Central India. Strategically located in the Smart City of New Raipur, this University has started carving a niche for itself in the education domain and is rising as a shining star on the horizon of quality education.

Establishment - Established in 2013, this university has been able to win the confidence of over 7000 students. Meritorious students from all over the country and various foreign countries namely Afghanistan, Bangladesh, Nepal, Nigeria, South Korea and Uganda have chosen this University for their education and career.

Infrastructure – Kalinga boasts of World Class Infrastructure and student facilities with student centric approach. Highest attention is paid to hands on learning approach and students are encouraged to come up with innovative ideas for projects and practical. The University has more than 75 laboratories and workshops, all well equipped with the latest, state of the art apparatus and tools. Special emphasis is given to the development of communication skills through the language lab. More than 1200 computers are available for the use of the students.

The library has a collection of over 79,000+ books and offers Digital content through membership of DELNET, National Digital Library and NPTEL. Various magazines and journals are available for the use of the faculty and students.

Infrastructure consists of Student Hostel facilities, Green Acres, Canteen, Food Mess, Gymnasium, Fully Wi-Fi Campus, ATM, Mini Market, Student hangout Areas, Sports Complex, Re-creation Halls with Indoor Games and Music and recreation activities.

Objectives

- Assess and analyse energy usage across campus.
- Identify energy-intensive areas and equipment.
- Propose cost-effective energy-saving measures.
- Promote renewable energy integration.

Auditor Team

1. Mrs. Seema Suri (EA-0048) (Certified Energy Auditor)
2. Mr. Samarth Suri (Audit Manager)
3. Mr. Sagar Mahour (Engineer)
4. Mr. Sanjeev Sharma (Engineer)



Approach & Methodology

A team of 2 Auditor/Engineers were involved in carrying out the study, the general scope of which was as follows:

- Identify areas of opportunity for energy saving and recommend an action plan to bring down total energy cost
- Conduct energy performance evaluation and process optimization study
- Conduct efficiency test of equipment and make recommendations for replacement (if required) by more efficient equipment with projected benefits
- Suggest improved operation & maintenance practices
- Provide details of investment for all the proposals for improvement
- Evaluate benefits that accrue through investment and payback period
- Analyse various energy conservation measures and to prioritize based on the maximum energy saving & investment i.e. short, medium and long term.

Prioritization	Payback Period
Short Term Project	Less than 6 months
Medium Term Project	Between 6 to 12 months
Long Term Project	More than 12 months

Discuss with the plant personnel, the individual Energy Saving Projects (ESPs) for agreement for implementation.

Methodology

The general methodology followed is captured in the following figure –



The study was conducted in 3 stages:

- Stage 1: Walk through audit to understand process energy drivers, measurability and formulation of audit plan.
- Stage 2: Detailed Energy audit.
- Stage 3: Off-site work for data analysis and report preparation



Instrument Used

The following portable instruments were used for data measurement:

- 3 – phase Power Analyzer
- Single phase Power Analyzer
- Ultrasonic Water Flow Meter
- Anemometer
- Hygrometer
- Sling Hygrometer
- Digital Thermometer
- Infrared Thermometer
- Pressure gauge
- Thermal Imager
- Flue Gas Analyzer
- Lux Meter



Observation and Analysis

Electricity Supply and Network

Electricity & fuel (Diesel) are major energy sources of the University. Electricity is supplied from CSPDCL (Chhattisgarh State Power Distribution Company Limited)

Total Consumption of Electricity from Grid in the period of was

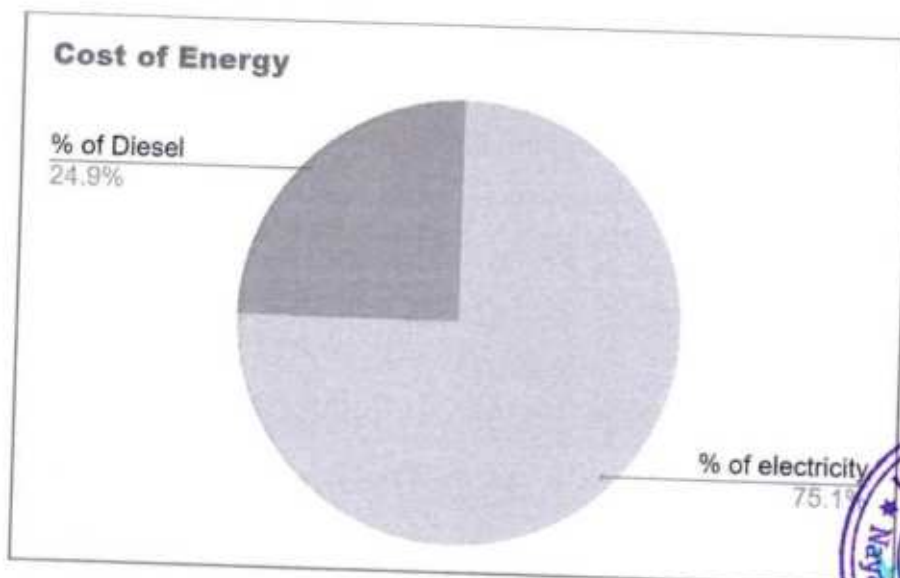
- Total KWH: 584020
- Electricity Charges: Rs. 62,11,323/-

The Diesel as a thermal energy source is used mainly in DG Sets of 2 X 250 KVA

- Total Consumption of Diesel in the Feb-22 to Jan-23 was
- Total Diesel in Liters – 22094
- Cost of Diesel: Rs. 20,58,497/-

Kalinga University has set up Solar Panels generating 300 KV (200 KV + 100 KV) of electricity, which is directly linked to the grid. Apart from the above, the university has 24 solar street lightings.

Electricity (INR)	Diesel (INR)	Total Cost of Energy	% of electricity	% of Diesel
6211323	2058497	8269820	75.10	24.89

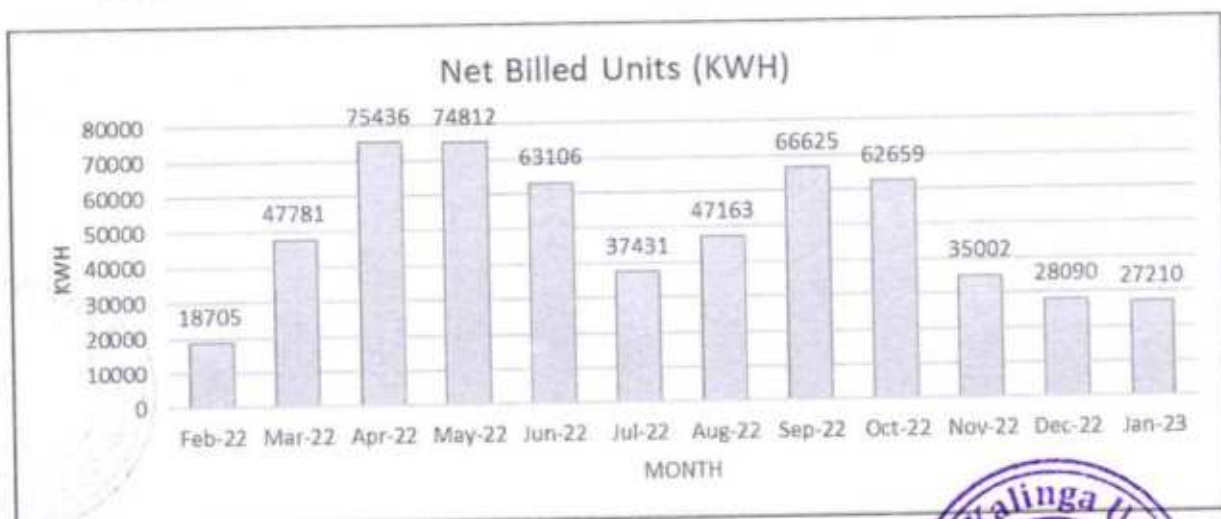


Analysis of Electricity Bills

Kalinga University has two electrical connections with a total contract demand of 300 kVA. Power Supply is received from CSPDCL (Chhattisgarh State Power Distribution Company Limited). Monthly Electricity Billing has been studied for a period of one year. All parameters have been studied & tabulated in Table

Sr. No.	Billing Month	No. of Days	Working Hours	Sanctioned Load, Kw/CD	Units Consumed, kWh	Units Consumed, kVAH	Solar Generated	Net Billed Units =	MDI	Average P.F.	Total Bill, Rs.
1	Feb-22	28	9	300	18705	19032	0	18705	80	0.98	209272
2	Mar-22	31	9	300	47781	48508	0	47781	203	0.99	497044
3	Apr-22	30	9	300	75436	76572	0	75436	242	0.99	765580
4	May-22	31	9	300	74812	76330	0	74812	263	0.98	747280
5	Jun-22	30	9	300	63106	64942	13.5	63106	273	0.97	676190
6	Jul-22	31	9	300	37431	38008	1099	37431	158	0.98	416570
7	Aug-22	31	9	300	47163	47743	847	47163	215	0.99	514474
8	Sep-22	30	9	300	66625	67050	52.5	66625	242	0.99	697730
9	Oct-22	31	9	300	62659	63174	0	62659	238	0.99	703723
10	Nov-22	30	9	300	35002	36417	2307	35002	154	0.96	433170
11	Dec-22	30	9	300	28090	28801	7263	28090	108	0.98	291958
12	Jan-23	30	9	300	27210	27684	7733	27210	117	0.98	258332
TOTAL					584020	594261	19315	584020	273	0.98	6211323

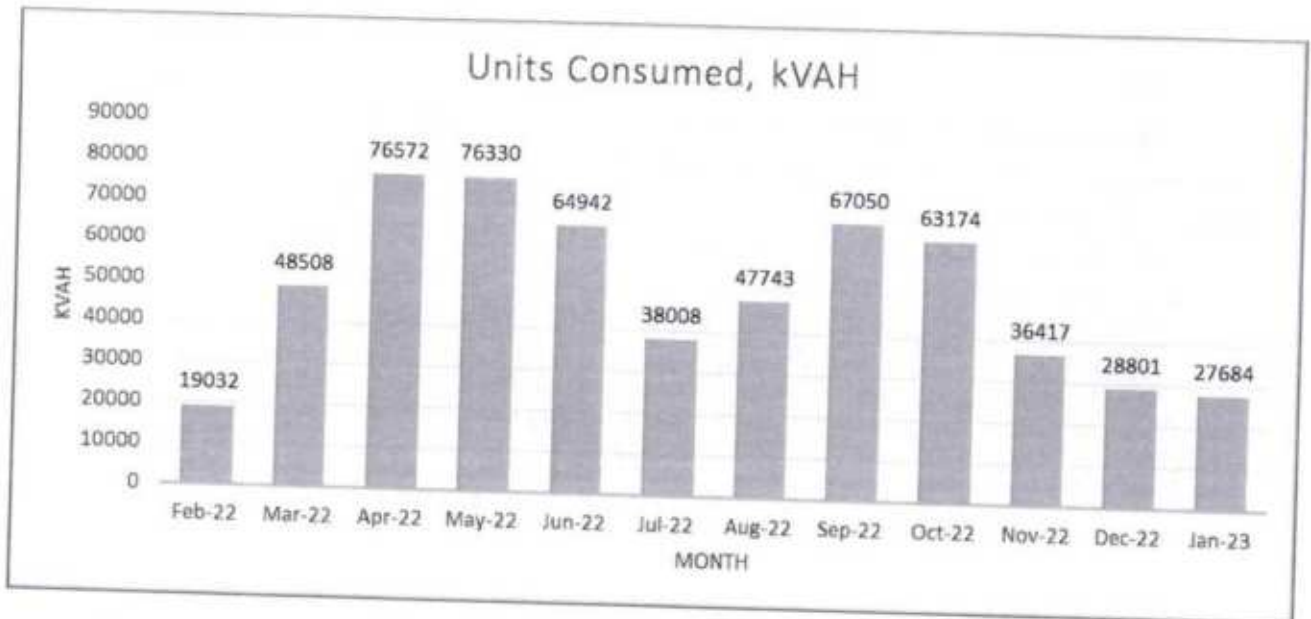
- Net Billed Unit in the Last 12 Month period



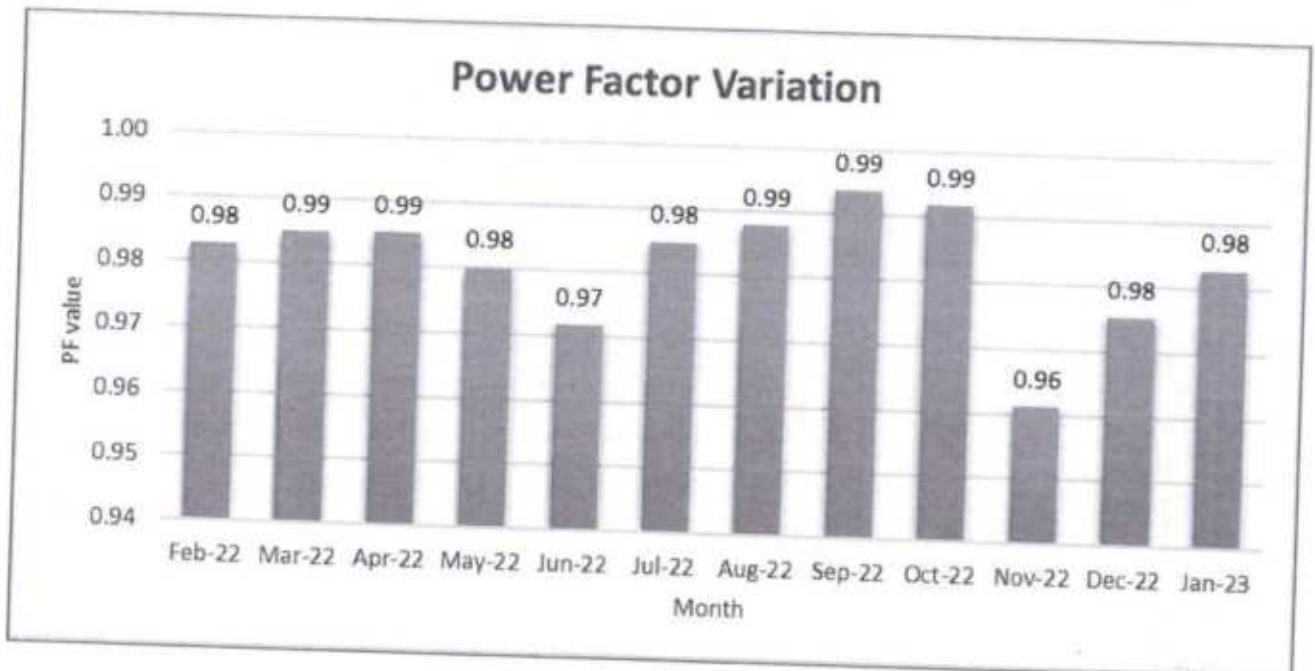
It can be seen from figure, that electricity consumption in the month of Apr-22 is the highest.



- Unit Consumed (KVAH)

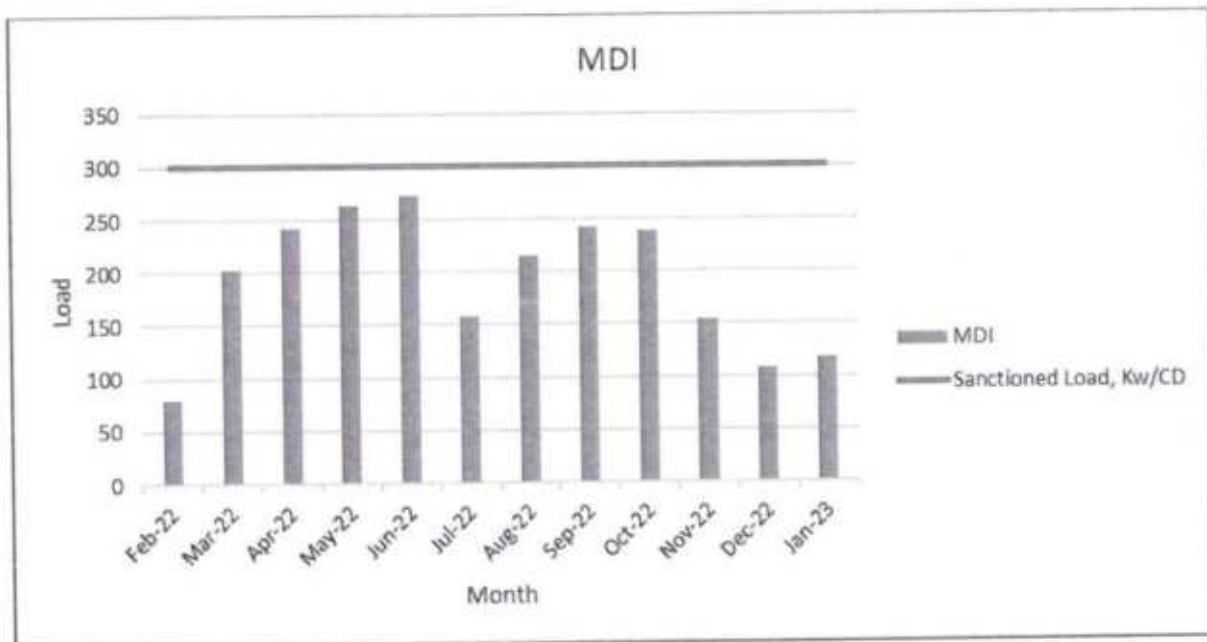


- Power Factor Variation



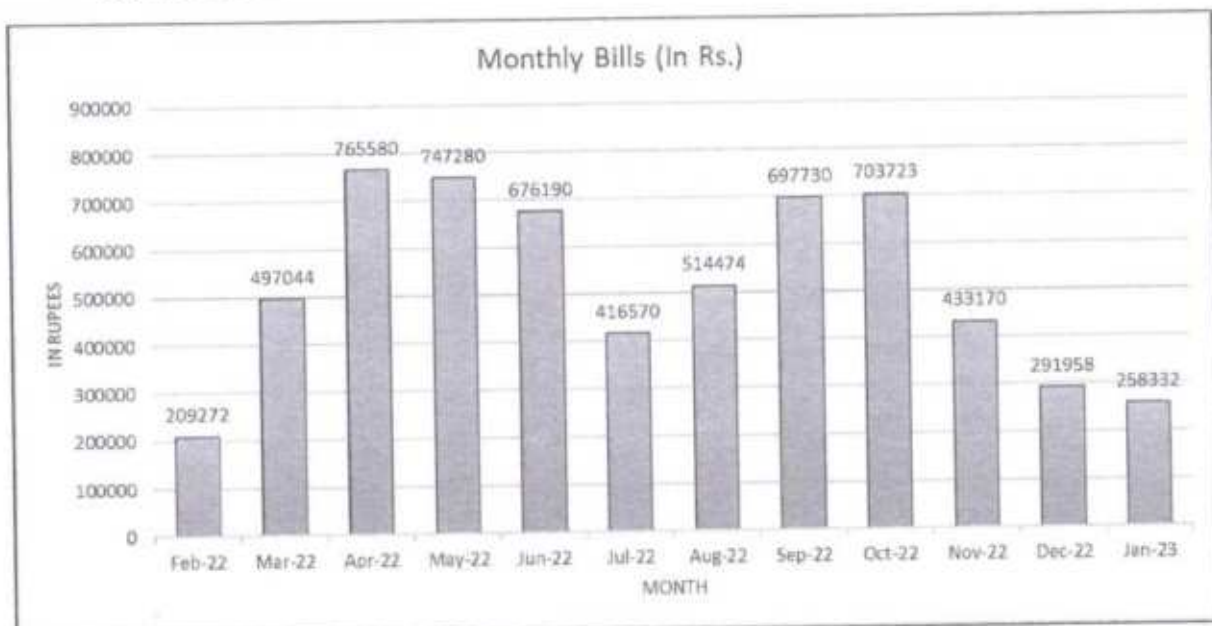
- MDI





Maximum demand load in Jun 22 (273 KVA) is the highest in the last 12-month period.

- Monthly Bill



Maximum Electricity bill was 7,65,580/- in April 22 from Feb 2022 to Jan 2023 period.

Solar Power System

Kalinga University has set up Solar Panels generating 300 KW (200 KW + 100 KW) of electricity, which is directly linked to the grid. Apart from the above, the university has 24 solar street lightings.

- Average Sunshine Data of Raipur

Month	Temperature	Average Sunshine (Hours)
January	28	11.4
February	32	11.6
March	36	11.8
April	40	12.34
May	47	12.97
June	37	12.93
July	31	6.04
August	30	5.9
September	31	10.91
October	31	11.45
November	29	11.21
December	27	11.4

Transformer

Kalinga University has two electrical connections. One HT with a total contract demand of 300 kVA. The other one is LT connection for two hostels. Power Supply is received from CSPDCL (Chhattisgarh State Power Distribution Company Limited) at 11 KV. Subsequently, the voltage is stepped down by one (1) transformer of 300 kVA from 11 kV to 0.433 kV. Transformer rated specifications are shown below.

Transformer Rate Details

Sr. No.	Particulars	TR # 1
1	Make	Power Star
2	KVA	300
3	Volts at HV/LV	11000/433
4	Phases	3
5	Frequency	50

Transformer Load Survey

During the site visit, 24-hour log of Transformer (300 kVA) (23rd February 2023 to (24th February 2023) was made to record the load profile of Transformer,

which includes the variations in the voltage, current, power factor, kW, kVA, Vthd, Ithd etc. Details of the load profile are provided in the below table and figure.

TR-1 300 KVA Load Measurement Data

Main Incomer LT Side		Transformer (300 kVA)
Particulars	Phase	Average Measured Values
Voltage (Volts) (L-L)	Phase "R"	410
	Phase "Y"	417
	Phase "B"	420
Current (Amps)	Phase "R"	63
	Phase "Y"	58
	Phase "B"	55
	Neutral	12
Load (KW)	Phase "R"	43.40
	Phase "Y"	41.05
	Phase "B"	39.61
	Total	123.66
Apparent Power (KVA)	Phase "R"	44.74
	Phase "Y"	41.89
	Phase "B"	40.01
	Total	126.64
Power Factor (P.F.)	Phase "R"	0.97
	Phase "Y"	0.98
	Phase "B"	0.98
Voltage THD %	Phase "R"	4.1
	Phase "Y"	4.9
	Phase "B"	2.5
Current THD %	Phase "R"	8.7
	Phase "Y"	4.1
	Phase "B"	

Transformer Loading

Description	Transformer Capacity	Power factor	Maximum Apparent power	Average Apparent Power	Max Loading	Average Loading
	kVA	PF	kVA	kVA	%	%
TR1	300	0.98	273	126.64	91	42.2

Observation Based on Ranking

- The measurement taken at the transformers includes data logging for every 5 seconds for 24 hours and during the logging period it was found that the average Voltage (L-L) for the transformer is 420V, which is slightly on the higher side. Therefore, it is suggested to maintain the Voltage level at 400 ± 10 by changing the tap position of the transformer.
- The average P.F. is 0.98, which is satisfactory.
- Voltage and Current harmonics are within limits.

Effects of High and Low Voltage

Wide Voltage fluctuation is a common phenomenon all over the country. Generally, the voltage is very low during the daytime and high during night hours. Therefore, Industrial Units running round the clock, face the problem of both Low and High Input Voltage. Also, voltage fluctuation is a seasonal phenomenon and increases in the summer season. Moreover, on holidays, peak hours, rainy days and when the agricultural load is switched off, the voltage rises sharply in the feeder lines. There are few consumers of electricity, during such days, leading to comparatively lower voltage drop in the feeder lines; as a result, consumers suffer from high voltage which is more dangerous.

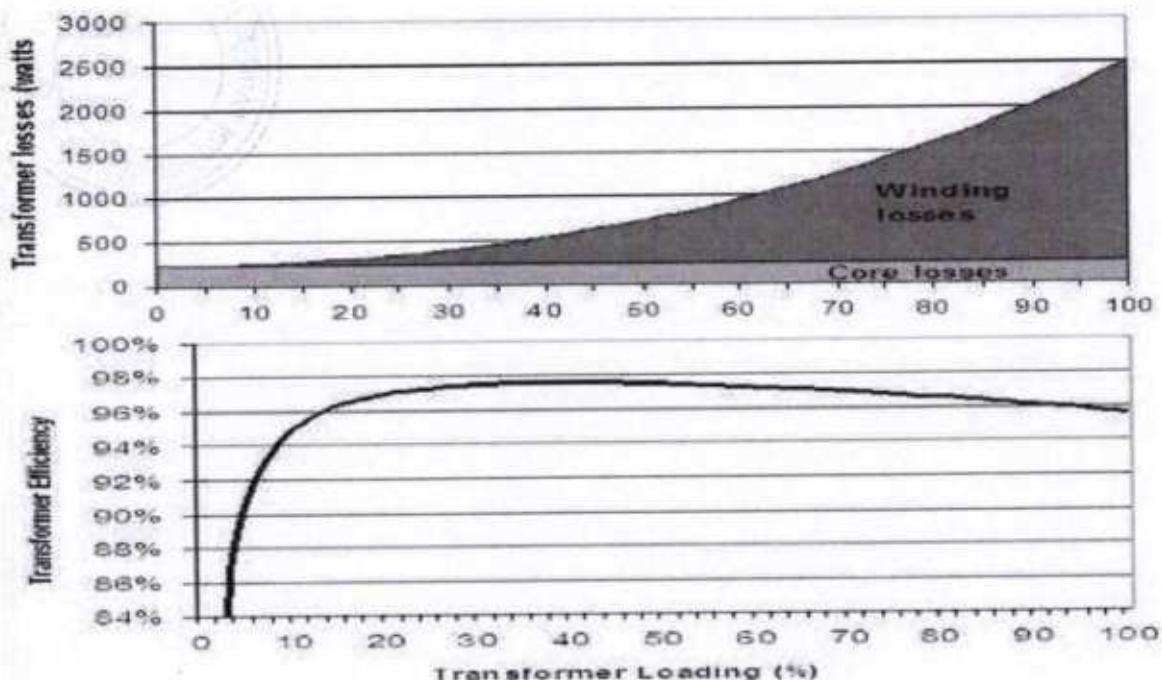
Most electrical equipment is designed for 230 volts (single-phase) or 410 volts (3-phase) and operates with optimum efficiency at its rated voltage. 50% of industrial load consists of motors. Due to continuously varying voltage and especially during peaks, electric motors draw considerably high current at high voltage which increases energy consumption, increases MDI and reduces power factor etc. These excessive power losses of motors generated at higher voltage results in premature failure of electrical equipment.

Similar is the case with single-phase equipment such as bulbs and tubes, when voltage increases above 230 volts. For example, at 270 volts, the power

consumption of 60 W bulb increase by almost 40% and the life of the bulb reduces from normal 1000 Hours to mere 100 Hours only (as per analysis report of ISI marked bulb manufacturers)

Transformer Loading & Efficiency

The efficiency of the transformers not only depends on the design but also, on the effective operating load. The variable losses depend on the effective operating load on the transformer. The maximum efficiency of the transformer occurs at a condition when the constant loss is equal to variable loss. For distribution transformers, the core loss is 15 to 20% of full load copper loss. Hence, the maximum efficiency of the distribution transformers occurs at a loading between 40 – 60%. For power transformers, the core loss is 25 to 30% of full load copper loss. Hence, the maximum efficiency of the power transformers occurs at a loading between 40 – 60%.



All the electrical parameters required evaluating percentage loading & losses of Transformers were recorded for old building transformers.

No load and full load losses of the transformer are obtained from standards to calculate the transformer losses as follows.

Note: Total loss = No load loss at Full load loss*(% Loading/2)

The efficiency of the transformers not only depends on the design but also, on the effective operating load. The variable losses depend on the effective operating load on the transformer.

Maximum Transformer load is 91% noted during power quality analysis. There is possibility of overloading in future. Transformer efficiency decreases as transformer winding losses increases at such >90% loading.

The university must plan to enhance transformer rating by addition of one more transformer.

Maximum demand is less than contract demand, no penalty charges were observed during last one year.



Total Energy Consumption

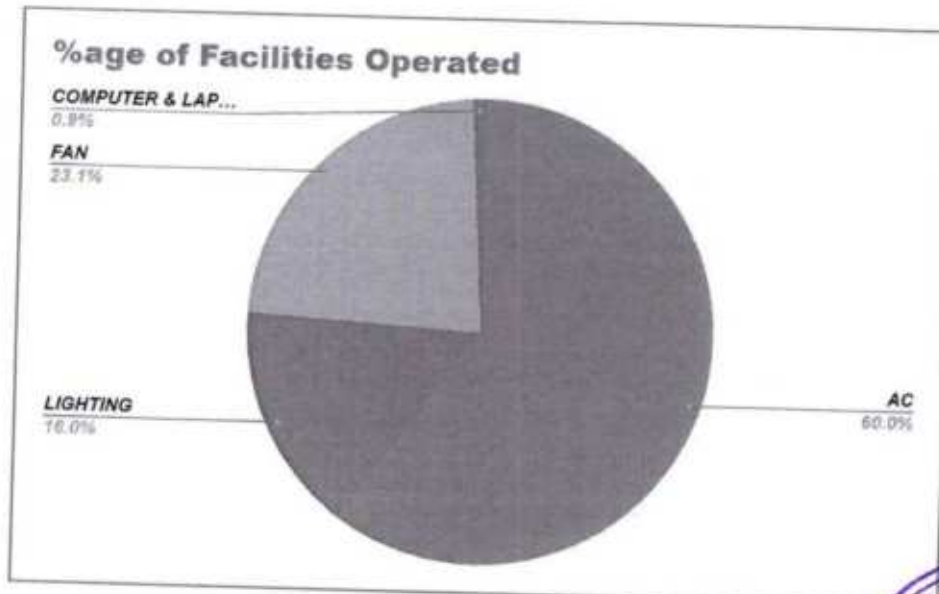
The University has facilities of Air Conditioning, Lighting system, Fans, Lifts and Fire Fighting System in the Block A, Block B, Block C, Block D, Block E, Block F, Block G, Block H, and Hostels of the University.

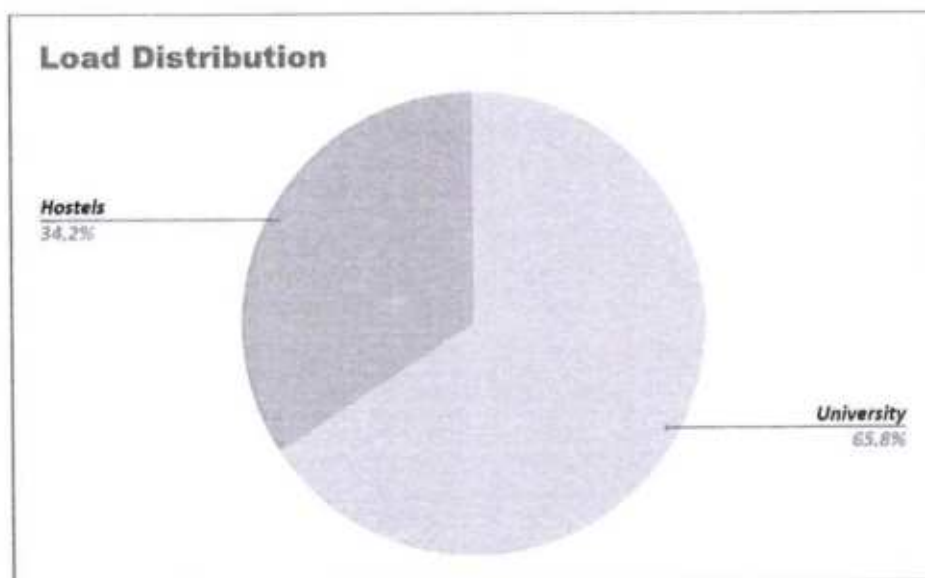
Electrical Equipment List in the University

S. No.	Equipment Name	Power	Qty
1	Ceiling Fan	65W	2080
2	Tube Light	20W	2621
3	2" x2" LED Light	36W	232
4	9" x8" LED Light	9W	560
5	LED Round White	12W	1131
		15W	
		18W	
		20W	
		30W	
6	LED Street Light	20W	41
		36W	
		100W	
7	Air conditioner	1.5T	170
		1.8T	
		2.2T	
		4.0T	
8	UPS	5KVA	8
		10KVA	
		25KVA	
		50KVA	
9	Water Motor Pump Mono block	2HP	5

Distribution of Load in the University

Load (KW) Distribution in the University				
Facility Operated	University	Hostels	Total	%age
AC	272	123.7	395.7	59.95
Lighting	63.9	42	105.9	16.04
Fan	92.7	59.8	152.5	23.10
Computer & Laptop	6	0	6	0.91
Total	434.6	225.5	660.1	100.00
%age	65.84	34.16		





Air Conditioner System

The Institute has installed 170 Nos. Window, Split and Cassette AC for human comfort.

S. No.	Quantity		
	Split	Window	Cassette
1.5 Ton AC	86	-	-
1.8 Ton AC	25	-	-
2.2 Ton AC	52	-	-
4.0 Ton AC	09	-	-
Total ACs	170		

The analysis was done to identify the measures that could be undertaken to reduce the energy consumption. The following parameter has studied in each unit.

- Air flow rate
- Air flow cross section area
- Return dry bulb temperature.
- Return wet bulb temperature.
- Power consumption
- Supply dry bulb temperature.
- Supply wet bulb temperature.



Parameters	Units	Split ACs					
		Classro om	Classro om	Classro om	Classr oom	Classro om	Classro om
Location							
Design Capacity	TR	2.2	2.2	2.2	2.2	2.2	2.2
Total Area	m ²	0.108	0.108	0.108	0.108	0.108	0.108
Measured avg. Velocity	m/s	4.3	4.2	2.9	2.2	2.9	4.6
Calculated Flow	m ³ /hr	1671.8	1633.0	1127.5	855.4	1127.5	1788.5
Supply Air Dry Bulb Temp.	C ⁰	26	26	25	24	25	23
Supply Air Wet Bulb Temp.	C ⁰	20	21	17	16	18	19
Enthalpy supply air	KCal/Kg	13.7	14.5	11.4	10.7	12.1	12.9
Return Air Dry Bulb Temp.	C ⁰	27	29	28	26	28	29
Return Air Wet Bulb Temp.	C ⁰	23	25	22	23	23	23
Enthalpy return air	KCal/Kg	16.27	17.21	15.36	16.27	16.26	15.36
Density of Air	Kg/M ³	1.225	1.225	1.225	1.225	1.225	1.225
Calculated Capacity	TR	1.76	1.79	1.82	1.94	1.90	1.79
Power Consumption	KW	3.02	3.1	3	3.1	3.1	3.2
KW/TR		1.715	1.729	1.646	1.595	1.635	1.788
EER		6.997	6.939	7.290	7.525	7.337	6.711
COP		2.049	2.032	2.135	2.203	2.149	1.965

Observation: AC can be replaced with five-star AC, AC is used for human comfort in Classrooms and office area. AC used in office areas are in two- and three-star rating.

Recommendations Replace old AC with five-star rating AC. Consider first phase to replace 9 AC.

- Cost Benefit Analysis of 3-star AC to 5-star AC

Parameters	Units	Classrooms		
Location		Classrooms	Classrooms	Classrooms
Design Capacity	TR	1.5	1.5	1.5
Total Area	m ²	0.085	0.085	0.085
Measured avg. Velocity	m/s	2	1.9	2.2
Calculated Flow	m ³ /hr	612.0	581.4	673.2
Supply Air Dry Bulb Temp.	C ⁰	26	23	28
Supply Air Wet Bulb Temp.	C ⁰	18	17	19
Enthalpy supply air	KCal/Kg	12.1	11.4	
Return Air Dry Bulb Temp.	C ⁰	29	27	



Return Air Wet Bulb Temp.	C ⁰	24	24	25
Enthalpy return air	KCal/Kg	17.21	17.3	18.18
Density of Air	Kg/M ³	1.225	1.225	1.225
Calculated Capacity	TR	1.27	1.39	1.45
Power Consumption	KW	2.1	2.2	2.25
KW/TR		1.658	1.578	1.548
EER		7.239	7.605	7.752
COP		2.120	2.227	2.270
Proposed				
Design Power of AC	kW	1.5	1.5	1.5
Present power consumption of AC	kW	2.1	2.2	2.25
Expected saving	%	28	28	28
Reduction in power consumption	kW	0.588	0.616	0.63
Running hours of AC fan	Hr/day	18	18	18
Running days of AC fan per annum	Days/Year	250	250	250
Cost of electrical energy	INR/KWh	7.15	7.15	7.15
Energy Saving/yr.	kWh	2646	2772	2835
Monetary saving per year	INR	18918.9	19819.8	20270.3
Investment	INR	35,000	35,000	35,000
Payback period	month	22.20	21.19	20.72



Water Pumps

Kalinga University has supply from Municipal water to meet the requirement for usage in University, Hostel and Washrooms. All the pumps are running as per the requirement. The detailed operating parameters of these pumps were measured to analyses the performance and it is given below.

The following parameters have been measured / recorded to assess the performance of pumps:

- Suction pressure
- Discharge pressure
- Power consumption
- Flow rate
- Performance Analysis of Water Pumps

Water Pumps						
Description	UOM	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5
Design						
Make		Crompton	Crompton	Crompton	Crompton	Crompton
Model		B99576751P 119030001	B99576751P 1119030002	B99576751P 1119030010	B99576751P 1119030030	B99576751P 1119030031
Capacity	m ³ /hr	50	50	50	50	50
Head	M	20	20	20	20	20
Power	KW	1.5	1.5	1.5	1.5	1.5
Operating Parameter						
Suction head	m	10	10	10	10	10
Discharge head	m	28	28	28	28	28
Total head	m	18	18	18	18	18
Flow rate	m ³ /hr	46.76	46.76	46.76	46.76	46.76
Power consumption	kW	1.36	1.46	1.60	1.25	1.25
Combined efficiency	%	51%	61%	55%	65%	65%
Pump Efficiency (η Motor=91%)	%	59%	67%	63%	70%	70%

- Pump Performance found Satisfactory



Lighting System

The University has already implemented energy efficient measures in lighting areas at different places. All conventional lamps are replaced by LED Lamps.

Blocks	LED Consumption (Kwh)	%age
Block A	8.22	7.62
Block B	7.22	6.69
Block C	11.89	11.02
Block D	12.97	12.02
Block E	12.93	11.98
Block F	11.30	10.47
Block G	11.40	10.57
Block H	10.90	10.10
Hostel - Boy	8.93	8.28
Hostel - Girl	7.09	6.57
Outer Area	5.04	4.67
Total Consumption (KWH)	107.89	

Observations

- It is recommended to install occupancy sensors ex. restroom, offices, lobby, staircases, panel room etc.
- University has opted for the latest LED technology for lighting.
- Lux was found satisfactory in many places but in some places, it is different from standard. It can be maintained as per university requirement.

Recommended value of illumination given as per National Building Code of India, 2005 clause 4.1.3, 4.1.3.2, 4.3.2 and 4.3.2.1

- Details of measured LUX in University

S.NO.	LOCATION NAME	MIN LUX	MAX LUX	Recommendation
1	Ground Floor	121	126	100-200
3	DG Room	150	170	100-200
4	Classrooms	310	450	300
5	Lecture rooms (including Demonstration areas)	310	450	300
6	Reading rooms	250	450	300-500

7	Laboratories	530	670	500-750
8	Corridors	150	170	150
9	Libraries	210	295	300
10	Moot court	245	450	300-500
11	Stage area	125	325	300
12	Canteen	80	120	100
13	Staff Room	155	185	150

Computer and Other Power Devices

University is using approximately 1200 nos. of computer and other power electronic devices.

An average desktop computer uses between 60 and 300 watts. It is very difficult to know exactly how much computers use on average because there are so many different hardware configurations. We estimate that an average modern desktop PC will use approximately 100 watts of power per day approximately 4-6 hrs. working per day.

Total consumption of electricity for 1200 computers per day = 120 KWH= 2400 KWH per month

Considering 250 days of working power consumption = $250 \times 110 = 30000$ KWH

To save energy, turn off the computer when it is not being used or enable power saving features such as hibernate, standby or sleep mode. Power saving modes will allow you to turn on a computer quickly when you need to use it. Sleep mode typically uses only 1-5 watts of power and can be set to turn on automatically after a set time of inactivity.



DG Performance

Two DG installed of ratings – 2 X 250 KVA, DGs were running for power cuts. No major power cuts were observed. Total diesel consumed = 22094 Liters.

Observation -

- Logbooks for DG were not maintained by the University. It is recommended to maintain a proper logbook for DG sets. This will help them to evaluate the specific power generation i.e kWh/litre of DG sets on a periodic basis. Sample Log Sheet for DG performance monitoring is shown in below table

Date	Time Start	Time Stop	Running Hours	Power Generated (Kwh)	Fuel Tank			Specific Power Consumption
					Initial Dip (mm)	Final Dip (mm)	Diesel Consumed (Ltr)	(Kwh/ltr)



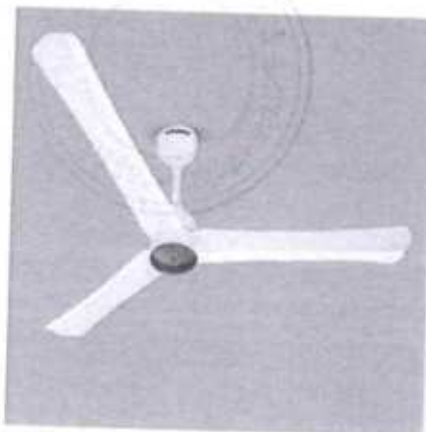
Fans

KALINGA UNIVERSITY has installed many fans for the comfort of the employees and students. The fans are regular fans consuming 70 watts each. The auditors recommend the use of Energy efficient BLDC Fans which consume less power.

The fans are regular fans consuming 70 watts each. The auditors recommend the use of Energy efficient BLDC Fans which consume less power.

- Saving Calculation of Ceiling Fans

Parameter	Unit of Measurement	Existing	Proposed
Ceiling Fan Type		Induction Motor	Brushless DC Motor
No of Fans	Nos	2080	2080
Power Consumption	Watts	65	25
Hours of Operation per year	Hours	1600	1600
Energy Consumed Annually	kWh/Fan	104	40
Saving in Energy	kWh/Fan		64
For 2080 fans	kWh		133120
Saving in Rs	Rs		13,31,200/-
Investment	Rs		6240000
Payback	Years		4.6



Product Features

- Small yet powerful BLDC motor for high air delivery
- Metallic finish Blades
- Wide blades for high air delivery
- Enjoy unmatched convenience with smart and elegant remote control
- Easy Speed Control Using Smart Remote
- Consistent Performance Even At Low Voltage and Power Fluctuations
- 3-Years Of On-site Warranty
- Save Up to ₹ 1,500 per year



General Tips for Energy Conservation in Different Utilities



- Minimize maximum demand by tripping loads through a demand controller.
- Use standby electric generation equipment for on-peak high load periods.
- Correct power factor to at least 0.99 under rated load conditions.
- Provide proper ventilation
- For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved.
- Check for under-voltage and overvoltage conditions.
- Use smooth, well-rounded air inlet cones for fan air intakes.
- Avoid poor flow distribution at the fan inlet.
- Minimize fan inlet and outlet obstructions.
- Clean screens, filters, and fan blades regularly.
- Clean screens and filters regularly.

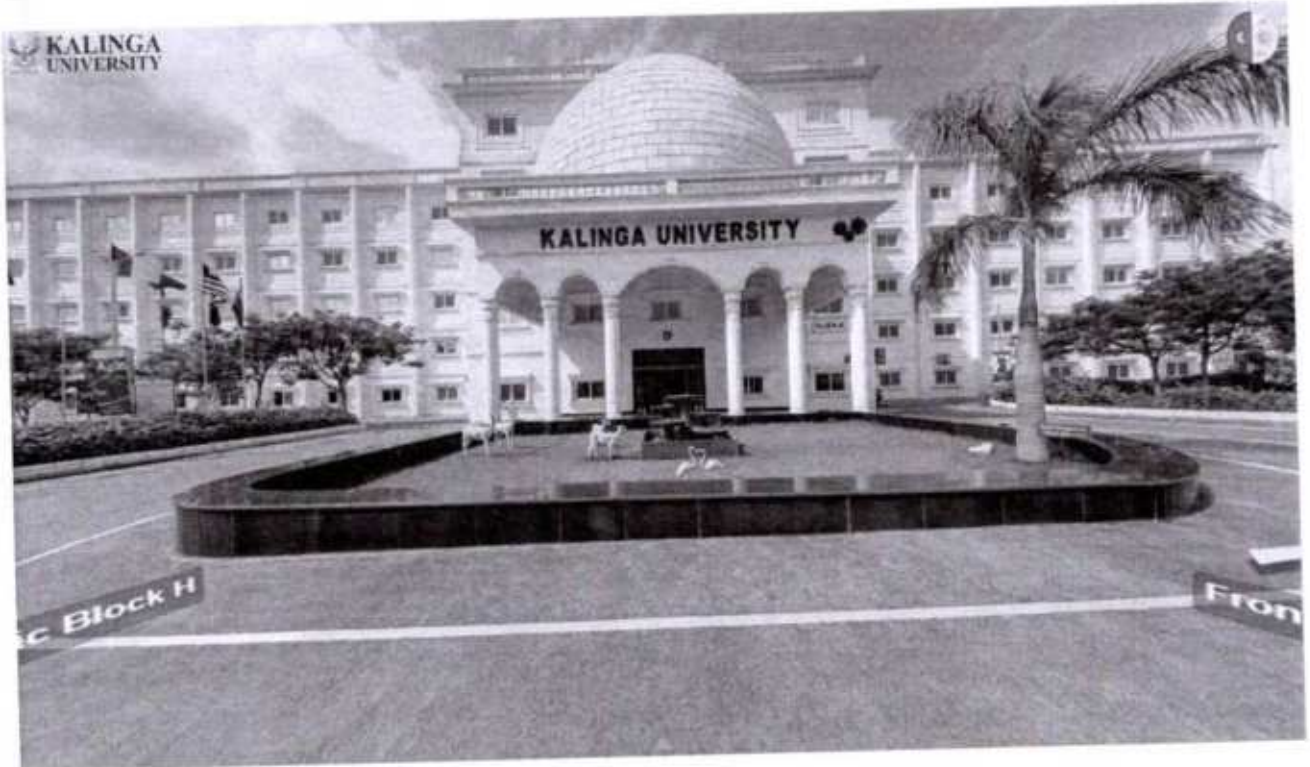


- Minimize blower speed.
- Use low-slip or no-slip belts.
- Operate pumping near the best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of smaller units.
- Increase the chilled water temperature set point if possible.
- Use the lowest temperature condenser water available that the chiller can handle.
- Reducing condensing temperature by 5.5°C, results in a 20 - 25% decrease in compressor power consumption.
- Tune up the HVAC control system.
- Consider installing a Plant automation system (BAS) or energy management system (EMS) or restoring an out-of-service one.
- Balance the system to minimize flows and reduce blower/fan/pump power requirements.
- Reduce excessive illumination levels to standard levels using switching, de-lamping, etc. (Know the electrical effects before doing de-lamping.)
- Aggressively control lighting with clock timers, delay timers, photocells, and/or occupancy sensors.
- Consider painting the walls a lighter colour and using less lighting fixtures or lower wattages.
- Use task lighting and reduce background illumination.
- Use waste heat to generate steam/hot water/power an absorption chiller or preheat process or utility feeds.
- Use jacket and head cooling water for process needs
- Clean air filters regularly
- Seal exterior cracks/openings/gaps with caulk, gasketing, weather stripping, etc.
- Consider new thermal doors, thermal windows, roofing insulation, etc.
- Install windbreaks near exterior doors.



SAMARTH™
GROUP

KALINGA UNIVERSITY



Kotni, Near Mantralaya, Naya Raipur - 492101
(Chhattisgarh) India.

Audit Date – 22nd February, 2023

Audit Conducted by:

SAMARTH™
GROUP

M/S SAMARTH MANAGEMENT PRIVATE LIMITED

212, BHERA ENCLAVE, PASCHIM VIHAR, DELHI – 11008



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LIST OF ABBREVIATIONS

1.	NAAC	National Assessment and Accreditation Council
2.	SMPL	Samarth Management Private Limited
3.	BMW	Biomedical Waste
4.	CTE	Consent to Establish
5.	CTO	Consent to Operate
6.	LOR	List of Requirements
7.	NABET	National Accreditation Board for Education and Training
8.	RWH	Rain water Harvesting
9.	STP	Sewage Treatment Plant
10.	L	Liters
11.	KLD	Kiloliter per Day
12.	Kg	Kilogram
13.	LED	Light-emitting diode
14.	PVC	Photovoltaic cell



CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Environmental audit is systematic and objective assessments of the environmental status and performance of facilities, processes, and/or operations. It is a valuable management tool which can be used to identify and assess environmental problems, and initiate corrective actions which ensure legal compliance and internal management policies and practices. Environmental audits can also be used to assess the quality of the existing environmental management systems, and to foster additional initiatives to improve the environmental performance. International Chambers of Commerce (ICC) has defined Environmental Auditing as

"A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of safeguarding the environment and natural resources in its operations/projects."

This Environment Audit aims to assess all the attributes of the environmental paradigm & natural resources which are likely to be impacted from different activities of the University. Samarth Management Private Limited (*hereafter termed as SMPL*) have been appointed by the Kalinga University to ensure the University's environmental performances are in-alliance with enviro-legal compliance set up by the Government.

This audit is prepared based on the legal compliances applicable to the University and environmental mitigation measures that have been undertaken by the University to reduce the environmental impacts. The detailed approach and methodology of this report is explained in Chapter 2 while this Chapter (1), provides the overview of the University along with the Audit objectives and scope.

1.2 OVERVIEW OF UNIVERSITY

Kalinga University, Raipur has emerged as a centre of excellence of higher education in Central India. Strategically located in the Smart City of New Raipur, this University has started carving a niche for itself in the education domain and is rising as a shining star on the horizon of quality education.

About Raipur – Raipur is the Capital of Chhattisgarh and New Raipur is the New Capital of Chhattisgarh in the making. New Raipur is the fourth planned city of India with wide roads and miles of greenery and is pollution free. It is the first Integrated and Smart City of the country. A cosmopolitan city which is also the hub of higher education hosts IIM, IIT, IIIT, National Law University, CIPET, NIT and AIIMS. In addition it also hosts most National and International brands of Food and Retail Outlets.



Establishment - Established in 2013, this university has been able to win the confidence of over 7000 students. Meritorious students from all over the country and various foreign countries namely Afghanistan, Bangladesh, Nepal, Nigeria, South Korea and Uganda have chosen this University for their education and career.

Schools of Excellence - A centre for Doctoral research programmes in various fields. Currently the University is serving the student community through various UG and PG programs namely Engineering, Law, Pharmacy, Arts & Humanities, Science, Commerce & Management, Biotechnology, Information Technology, Library Science, Fashion Design & Interior Design.

Academics and Faculty - All schools are headed by senior professors having excellent academic credentials and experience of teaching, publications and research. They are ably supported by the well qualified faculty members who come from top educational institutions and the Industry. Students also get an opportunity to learn from a distinguished panel of experts drawn from various industries, who regularly come for guest lectures.

Infrastructure – Kalinga boasts of World Class Infrastructure and student facilities with student centric approach. Highest attention is paid to hands on learning approach and students are encouraged to come up with innovative ideas for projects and practical's. The University has more than 75 laboratories and workshops, all well equipped with the latest, state of the art apparatus and tools. Special emphasis is given to the development of communication skills through the language lab. More than 1200 computers are available for the use of the students.

The Library has a collection of over 79,000+ books and also offers Digital content through membership of DELNET, National Digital Library and NPTEL. Various magazines and journals are available for the use of the faculty and students.

Infrastructure consists of Student Hostel facilities, Green Acres, Canteen, Food Mess, Gymnasium, Fully Wi-Fi Campus, ATM, Mini Market, Student hangout Areas, Sports Complex, Re-creation Halls with Indoor Games and Music and recreation activities.

Industry Orientation and Leadership - Industry interaction is an integral part of the curriculum and Industrial visits, internships on live projects and mentoring by the Industry leaders are regular features. The University has developed excellent connections with the top Industries of the region by taking memberships of leading industrial associations like Confederation of Indian Industries, PHD Chamber of Commerce and Industry, Federation of Indian Chamber of Commerce and Industry, Indian Importers Chamber of Commerce and Industry. The University has an active chapter of Young Indians in which students get an opportunity to interact extensively with the Industry leaders and attend various corporate seminars and events.



Life Changing Experience - Kalinga is a Life Changing experience where the stress is on over all development of students. NCC, NSS and Various other clubs and societies offer opportunities to students to showcase their talent and learn under the guidance of experts. Music, dance and martial arts trainers are available for the students. Coaches of different games and sports like Cricket, Football, Basketball, Volleyball and athletics are also available for sharpening the talent of the students.

1.3 CHRONOLOGY OF ENVIRONMENTAL PERMISSION

This section explains the historical background of the university in terms of the clearances that it has obtained from different authorities as per the national norms, related with environment clearance, consent to establish (CTE), and consent to operate (CTO). The series of the clearances obtained by the University at different times as presented below in **Table 1:**

Table 1: Brief History

S. No.	DESCRIPTION
1.	Research oriented, student centric university attracting students from all parts of India and over 22 foreign countries.
2.	8th Private University in the country approved under Section 12B by UGC.
3.	The best Private University in Central India Award by ASSOCHAM in 2020.
4.	44th Rank in top Universities in the country as per survey done by outlook-icare in 2019.
5.	30th Rank in top universities in the country established after the year 2000 as per survey done by India Today in 2018.
6.	Management Department Ranked as 7th Best in the country as per survey by Competition Success Review in 2018.



7.	Engineering Department Ranked as 3rd Best in the country as per survey by Competition Success Review in 2019.
8.	State of the art Library with over 80,000 books and E access to various journals and databases including DELNET, NPTEL, NDL, J-Gate (Social Science), J-Gate (Science and Technology), INSPEC Database of Elsevier & Web of Science.
9.	Free of cost Coaching classes for Competitive exams and IT skills in Collaboration with Bosch, NIIT, and BT for all students.
10.	Free of Cost Hobby classes for Self defense and Martial arts , Instrumental and Vocal Music for hostel students.
11.	Central Instrumentation Facility with world class Scientific apparatus and research databases.
12.	Innovation and Incubation Cell to support startups and entrepreneurship of students.
13.	Accredited by NAAC with B+ grade.
14.	Listed in Rank Band 101-150 in University category in NIRF Ranking 2022 as well as 2023.
15.	"Free of cost" Value Added courses available for all students.
16.	Unique policy of acquiring "Extra Credits" for Various Co-curricular & academic activities.



17.	Mentoring of all students by dedicated faculty members.
18.	Extra classes for slow learners.
19.	Regular field visits, guest lectures, case studies, role plays, mock sessions etc.
20.	Soft skills classes for all students.
21.	Activities, internship & placement opportunities for all students.

1.4 AUDIT OBJECTIVES

This audit focuses on the effective management of environment, health and safety within the University premises both during construction and operation phases along with legal compliances associated with the university. The objectives of this auditing are as follows:

- To assess the performance of implementation of environmental safeguards,
- To identify shortfalls and intimate the proponent regarding action required for improved & effective obedience of environmental conditions as stipulated in Environmental Clearance, Consent to Establish Certificate and statutory approvals / permissions.

1.5 ABOUT THE AUDITORS

M/s SAMARTH MANAGEMENT PRIVATE LIMITED (SMPL) is an Environmental Consulting Organization working in the Environmental field since 2004. The organization is having a team of Environment Experts with wide knowledge in the subject. SMPL is providing services for various sectors such as

- Preparing Environment Impact Assessment (for Building & Construction Projects, Small and big manufacturing units, Hospitals, Educational Institutions, Hotels etc.)
- Samarth Management Private Limited has prepared Environmental Audit reports for various institutes and organizations.

- Team involved in this auditing and report preparation is given below

Name

Designation



Ms. Palak Ahuja
Mr. Sagar Mahour

Auditor
Auditor

1.6 REPORT STRUCTURE

This audit report has been divided in to the following chapters:

Chapter 1: Introduction briefs on project background, project status, audit objectives.

Chapter 2: Approach & Methodology briefs the methodology and approach followed to conduct Environment Audit

Chapter 3: Data Collection and Analysis explains the norms applicable to the University and management measures undertaken by it.

Chapter 4 Conclusion elucidates the findings of the audit report and area for improvements

1.7 DISCLAIMER

SMPL Environment Audit Team has prepared this report based on input data submitted by the representatives of the University and the best judgment capacity of the expert team. It is further informed that the conclusions are arrived at following best estimates based on the provided information, and onsite observations to the extent possible.



CHAPTER 2: APPROACH AND METHODOLOGY

2.1 APPROACH & METHODOLOGY

The audit has been carried out in two stages. In the first stage, it includes the review of documents while involving the site inspection and report preparation. The general approach followed to prepare the audit report.

This report has been prepared based on the documents provided by the Kalinga University, and site inspection carried out by the SMPL team. Based on detailed scrutiny of documents and field observations on complied/partially complied /not complied/not assessed particulars, this report has been prepared.

SMPL team reviewed the previous reports, documents, and listed out the required information / documents to prepare this audit report. The checklist was prepared and was shared with the client to collect them during the site inspections. The audit was carried out as per compliance obligation applicable to the University. There are certain rules and notification that the university shall comply with either in the construction or in operation phases as explained below in Table 2.

Table 2: Applicable Rules and Notifications to University

S. No.	Act/Rule Notification	Related NOC/Clearance/Annual Returns	Concerned Department
1.	Environment Protection Rule 1986,	Submission of Environmental Statement (Form-5).	State Pollution Control Board
2.	Water prevention and Control of pollution act 1974.	1. Consent to Establish 2. Consent to Operate	State Pollution Control Board
3.	Air prevention and control of pollution act 1981		
4.	Hazardous & Other Wastes (Management and Tran-boundary Movement) Rules, 2016.	1. Hazardous Waste Authorization 2. Hazardous Waste Return (Form 4) 3. Manifest- Form 10.	State Pollution Control Board
		3. Maintain a record of hazardous	



		and other wastes in Form 3.	
5.	E-Waste (Management) Rules, 2016.	1. Form 3 (Annual returns) and 2. Form 6 (Manifest)	State Pollution Control Board
		3. Form-2: Maintain records of E- waste generated	
6.	Biomedical Waste Management Rules 2016.	1. BMW Authorization 2. Annual Return (Form 4)	State Pollution Control Board
7.	Municipal Solid Waste Management Rules 2018		Municipal Corporation



CHAPTER 3: DATA COLLECTION AND ANALYSIS

This audit has been carried out based on norms/rules/ laws applicable to the University and the actions undertaken by the University to combat the impacts on environmental components. The activities undertaken by the University along with the aspects and impacts are given below:

Table 3: Environment Impact/Aspects

S. No	Activities	Aspects	Impacts
1.	Water usage-domestic use, drinking purposes, etc.	Water consumption: almost 350KLD which is fulfilled by the Municipal.	Depletion of water sources.
2.	Use of diesel generator (DG) sets.	• Air Emission • Waste generation: spent oil • Noise nuisances • Leakages	• Increase the pollutant into the air. • Spent oil is a hazardous waste. • Increase in noise level. • Adverse impacts on the soil.
3.	Canteen Operation-produces the solid wastes.	Production of solid wastes;	• Soil contamination • Groundwater contamination • Health issues
4.	Use of medicine and first aid services-Medical waste	Biomedical waste generation	Health issues from the waste if not disposed of properly.
5.	Use of electronic equipments and E waste (TVs, computer monitors, printers, fan, scanners, keyboards, mouse, cables, circuit boards, lamps, clocks, flashlight, calculators, phones, answering	E-waste generation	Depletion of the resources



	<i>machines)-</i>		
6.	Planting around the premises of University.	Generation of green waste.	• Safety issues • Increase in greenery
7.	Electricity Usage: Lightening/appliances/ office electrical equipment.	Energy consumption in the University:	• Depletion of resources. • Increase the pollution level.
8.	Vehicular Movement & Access	Traffic and transportation in the University	• Release of dust from un-surfaced roads. • Increase in noise level. • Increased localized traffic movements and congestion in the parking area.
9.	Printed material: flyers, newspapers, posters, others	• Paper use • Printing - o Internally – electricity use - o Externally: transportation - Energy usage	• Raw materials (paper) – unsustainable forestry, habitat loss, biodiversity, air pollution. • Contribution to climate change: air pollution. • Contribution to climate change: land degradation.

3.1 DATA COLLECTION

In order to audit the legal compliances, all the required documents as per the norms and standards applicable for construction/expansion of the University are listed and collected. Similarly, the existing environmental conditions were examined through the site observations.



3.2 DATA ANALYSIS

3.2.1 Document Analysis

- As per the Environment Protection Rule 1986, the University is supposed to submit the Environmental Statement in the prescribed Form V. The University is regularly submitting the Statement to the State Pollution Control Board.
- The University has the CTE for site area 33.98 acres and it is validated. CTO was granted after completion of the construction.
- The University is having Hazardous Waste Authorization and maintaining the records of Manifest (Form 10). Also, the University is filing annual returns of hazardous waste. The records show that the University provides its hazardous waste to the vendor within 90 days of the generation of waste. Sub Rule (5) under Rule 6 of **Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2016** mentions that every occupier authorized under these rules, shall maintain a record of hazardous and other wastes managed by him. The University is maintaining the records of the same.
- As per **Bio-Medical Waste (Management and Handling) Rules, 2016**, The University shall maintain and update on day to day basis the bio-medical waste management register in terms of category and color coding as specified in Schedule I. It is observed that the University is maintaining the record of day to day basis the bio-medical waste management registers.
- The University is submitting a compliance report to NAAC as mentioned in the EIA notification 2006.
- In terms of Fire NOC, the University is having fire NOC for the buildings, a fire frightening plan has been prepared by the University.

3.2.2 Monitoring Report

The University is conducting quarterly monitoring of STP outlets, stack emission, and DG noise from ISO certified laboratories.

- For STP outlets, the parameters such as pH, total suspended solid, chemical oxygen demand (COD), biological oxygen demand (BOD), oil and grease are tested. The recent monitoring carried out, shows that the parameters are within the limit as per CPCB norms.
- The University is regularly monitoring the DG stack emission and noise. The monitoring results show that the emission from the DG sets are within the limit and so the noise.



3.3 MANAGEMENT MEASURE

In the above **Table 3**, the aspect and impact matrix of the University is given. The University is following different management measures to reduce the possible impacts. The overview of the same is given in Figure 3 while the detailed measures taken for each component are explained in **Table 4**.

Table 4: Management Measures

S. No	Aspects	Impacts	Management Measures
1.	Water consumption	Depletion of water sources.	• Water Recycling: The University is having the STP of capacity 3 X 40 KLD, 2 X 30 KLD = 180 KLD The treated water is used for flushing, landscape irrigation, and dust suppression. The treated water is tested each time before its use internally while quarterly monitoring is carried out from accredited laboratories. • Use of a low flow tap. • Rain water Harvesting Pits are available in the University.



2.	DG sets Operations • Air Emission • Waste generation: spent oil • Noise nuisances • Leakages	• Increase the pollutant into the air. • Spent oil is a hazardous waste. • Increase in noise level. • Adverse impacts on the soil.	• Almost 18.36 acres is under the landscaping and the University is planning to plant almost 1000 trees (as of today). This landscaping acts as a carbon sink. • The DG sets are provided with stack height as per the government notification for the DG sets i.e. 35 meters. Also, DG set is within the enclosure to reduce the noise nuisances. • The DG set is used only during emergencies. • The spent oil generated from the DG sets is given to the waste management authorities. • Regular monitoring of DG sets. • Use of low Sulphur content diesel (BS6).
3.	Production of biodegradable solid wastes	• Soil contamination • Groundwater contamination • Health issues	The University is having the Organic Waste Converter and biodegradable wastes are converted into the compost which is further used as manure in the landscape area.
4.	Biomedical waste generation	Health issues from the waste if not disposed of properly.	Management as per Bio-medical Waste Management Rule 2016.
5.	E-waste generation	Depletion of the resources	The University has an agreement with Adatte E- Waste Management Private Limited, New Delhi for E-Waste disposal.
6.	Energy consumption in the University:	• Depletion of resources. • Increase the pollution level.	Adoption of Energy efficient measures. Such as LED light, light sensor lights.



7.	- Paper use - Printing - Internally – electricity use - Externally: transportation - Energy usage	- Raw materials (paper) – unsustainable forestry, habitat loss, Biodiversity, and air pollution. - Contribution to climate change: air pollution. - Contribution to climate change: land Degradation.	The University is having a paperless office policy and has discarded the use of paper cups.

3.4 SEWAGE TREATMENT PLANT

The wastewater is generated from campus from the following areas:

1. Canteen
2. Restaurants
3. Hostels
4. Offices
5. Generator room

There are five STPs installed in the campus at various locations. The details are provided in table 5

Table 4: STP and their location with capacity and operational time.

S.No	STP capacity (KL)	Location	Operation status
1	40	Pacific Hostel	Operation hours 8-10 hrs
2	30	Brahmaputra Hostel	Operation hours 8-10 hrs
3	30	Indus Hostel	Operation hours 8-10 hrs
4	40	Canteen	Operation hours 8-10 hrs
5	40	Administrative Block	Operation hours 8-10 hrs

The STPs are maintained by the university staff. These STPs were installed during 2020.

Treatment Capacity:

The wastewater treatment plant is designed to treat 30,000 Liters/Day to 1 Lakh Liters/Day Sewage generated from the University..

The treated effluent is used for gardening, horticulture, and flush water in toilets.

As per the site visit, we found that there are 6 buildings-

1. Admin Building



2. Pharmacy Building
3. Old Boys Hostel
4. Girls Hostel
5. International Boys Hostel
6. New Boys hostel.

Admin Building and Pharmacy Building Sewage treatment plants can be common as there are no distances between them. There will be separate Sewage treatment plants for the other four buildings. As per the people's strength we have designed plants of different capacities for different buildings.

For Admin building and under construction pharmacy building we recommend a plant of 100 KLD.

DESIGN BASIS

Treatment Capacity:

The wastewater treatment plant is designed to treat 30,000 Liters/Day to 1 Lakh Liters/Day Sewage generated from the unit.

The treated effluent will be used for gardening, horticulture and flush water in toilets.

As per the site visit, there are 6 buildings-

1. Admin Building
2. Pharmacy Building
3. Old Boys Hostel
4. Girls Hostel
5. International Boys Hostel
6. New Boys hostel.

Admin Building and Pharmacy Building Sewage treatment plants can be common as there are no distances between them. There will be separate Sewage treatment plants for the other four buildings. As per the people's strength we have designed plants of different capacities for different buildings.





3.5 DETAILS OF TREES AND PLANTS IN CAMPUS

S.No.	AREA	LOCAL NAME	BOTANICAL NAME	NUMBERS
1	Finger Garden	Paper Flower	Bougainvillea Glabra	480
2		Chhatim Tree	Alstonia Scholaris	5
3		Gulmohar	Delonix Regia	14
4		Badam, Almond	Terminalia Catappa	7
5		Palm	Syagrus Romanzoffiana	15
6		Shami Plant (Sonapatti)	Bauhinia Racemosa	4
7		Cape Honeysuckle	Tecoma Capensis	6
8		Canna	Canna Indica	29



9		Morning Glory	Ipomoea Carnea	3
10	Basketball Area (Inside)	Badam, Almond	Terminalia Catappa	2
11		Gulmohar	Delonix Regia	11
12		Kaner	Nerium Oleander	1
13		Chandni Plant	Tabernaemontana Divaricata	2
14		Paper Flower	Bougainvillea Glabra	9
15	Basketball Area (Outside)	Kadam	Neolamarckia Cadamba	6
16		Palm	Syagrus Romanzoffiana	6
17		Gulmohar	Delonix Regia	5
18		Badam, Almond	Terminalia Catappa	5
19		Yellow Bells	Tecoma Stans	23
20		Yellow Trumpetbush	Tecoma Trumpet Vine	88
21		4 O'clock	Mirabilis Jalapa	16
22		10 O'clock Plant	Portulaca Grandiflora	30
23	Gol Chowk Area	Paper Flower	Bougainvillea Glabra	51
24		Red Leaf Plant	Acalypha	25
25		Cape Honeysuckle	Tecoma Capensis	5
26		Gudhal	Hibiscus Rosa	2

			Sinensis	
27		Morning Glory	Ipomoea Carnea	3
28		Palm	Syagrus Romanzoffiana	6
29		10 O'clock Plant	Portulaca Grandiflora	172
30	Parking Area	Kadam	Neolamarckia Cadamba	3
31		Ashoka Plant	Saraca Asoca	3
32		Gulmohar	Delonix Regia	5
33		Chhatim Tree	Alstonia Scholaris	3
34		Paper Flower	Bougainvillea Glabra	468
35	Mini Market Area	Gulmohar	Delonix Regia	13
36		Kadam	Neolamarckia Cadamba	4
37	Pond Area	Kaner	Cascabela Thevetia	1
38		Babul Plant	Vachellia Nilotica	16
39		Canna	Canna Indica	4
40		Aak	Calotropis Procera	2
41		Peepal Plant	Ficus Religiosa	1
42		Chhatim Tree	Alstonia Scholaris	39
43		Khajur	Date Palm	256
44		Mango	Mangifera Indica	16
45		Kadam	Neolamarckia	4



			Cadamba	
46		Madhavi Latha	Hiptage Benghalensis	5
47		Cape Honeysuckle	Tecoma Capensis	5
48		Gulmohar	Delonix Regia	14
49		Cape Honeysuckle	Tecoma Capensis	5
50		Paper Flower	Bougainvillea Glabra	476
51		Shami Plant (Sonapatti)	Bauhinia Racemosa	3
52	Main Building Area	Gulmohar	Delonix Regia	36
53		Shami Plant (Sonapatti)	Bauhinia Racemosa	1
54		Bamboo	Bambusa Vulgaris	48
55		Badam, Almond	Terminalia Catappa	6
56		Chhatim Tree	Alstonia Scholaris	3
57		Palm	Syagrus Romanzoffiana	26
58		Bamboo Palm	Areca Palm Tree	30
59		Gulmohar	Delonix Regia	39
60		Petunia	Petunia	8
61	Girls Hostel Area	Cape Honeysuckle	Tecoma Capensis	29
62		Gulmohar	Delonix Regia	



63		Bamboo Palm	Areca Palm Tree	35
64		Palm	Syagrus Romanzoffiana	8
65		10 O'clock Plant	Portulaca Grandiflora	33
66	New Pharmacy Building	Kadam	Neolamarckia Cadamba	28
67		Cape Honeysuckle	Tecoma Capensis	8
68		Petunia	Petunia	8
69	Boy International Hostel	Gulmohar	Delonix Regia	58
70		Palm	Syagrus Romanzoffiana	6
71		Amaltas	Cassia Fistula	12
72		Madhavi Latha	Hiptage Benghalensis	8
73		Bamboo Palm	Areca Palm Tree	34
74	General Boys Hostel	Bamboo Palm	Areca Palm Tree	15
75		Gulmohar	Delonix Regia	79
76		Paper Flower	Bougainvillea Glabra	58
77		10 O'clock Plant	Portulaca Grandiflora	97
78		Palm	Syagrus Romanzoffiana	18
79	Botanical Garden	Gulmohar	Delonix Regia	76 Approx.



80		Adhusa, Vasaka	Adhatoda Vasica	24
81		Ashoka	Saraca Asoca	1
82		Physic Nut, Biodiesel Plant	Jatropha Curcas	2
83		Lipstick Tree	Bixa Orellana	2
84		Cowplant, Periploca Of The Woods, Gurmar	Gymnema Sylvestre	1
85		Basil, Tulsi	Ocimum Sanctum	10
86		Madar	Calotropis Procera	1
87		Origano	Origanum Vulgare	1
88		Frangipani, Champa	Plumeria Alba	4
89		Shatavari	Asparagus Racemosus	2
90		Parijat, Night Flowering Jasmine	Nyctanthes Arbor-Tristis	4
91		Water Hyssop, Herb Of Grace	Bacopa Monnieri	3
92		Aloe Vera	Aloe Vera	18
93		Air Plant, Cathedral Bells, Life Plant	Bryophyllum Pinnatum	23
94		Babul	Acacia Nilotica	4
95		Banana, Kela	Musa × Paradisiaca	1



96		Hadjod And Pirandai	Cissus Quadrangularis	4
97		Bottlebrushes	Callistemon	1
98		Chinese Chastetree	Vitex Negundo	3
99		Neem	Azadirachta Indica	2
100		Peepal	Ficus Religiosa	2
101		Curry Tree	Murraya Koenigii	1
102		Sago Palm	Cycas Revoluta	14
103		Guduchi, And Giloya,	Tinospora Cordifolia	3
104		Asian Pigeonwings, Bluebellvine, Blue Pea, Butterfly Pea.	Clitoria Ternatea	2
107		Rhoeo Discolor, Moses-In-The-Cradle	Tradescantia Spathacea	2
108		Lemon	Citrus Limon	1
109		Lemon Grass	Cymbopogon	1
110		Cactus	Mammillaria	1
111		Pudina	Mintha	17
112		Asthma-Plant	Euphorbia Hirta	1
113		Jungle Geranium, Flame Of The Woods Or	Ixora Coccinea	3

		Jungle Flame		
114		Henna Tree, The Mignonette Tree	Lawsonia Inermis	2
115		Queen Palm	Syagrus Romanzoffiana	9
116		Bird Of Paradise Flower	Strelitzia Reginae	2
117		Ti Plant	Cordyline Fruticosa	9
119	Old Boys Hostel	Malabar Madhu Malati	Combretum Malabaricum	12
120		Palm	Syagrus Romanzoffiana	2
121		Gulmohar	Delonix Regia	5
122		Badam, Almond	Terminalia Catappa	5
123	Butterfly Garden	Paper Flower	Bougainvillea Glabra	159 Approx.
124		Gudhal	Hibiscus Rosa Sinensis	1
125		Gulmohar	Delonix Regia	14
126		Shami Plant (Sonapatti)	Bauhinia Racemosa	2
127		Badam, Almond	Terminalia Catappa	5
128		Palm	Syagrus Romanzoffiana	2
129	Horse Garden	Badam, Almond	Terminalia Catappa	
130		Shami Plant	Bauhinia Racemosa	3



		(Sonapatti)		
131		Palm	Syagrus Romanzoffiana	17
132		Cape Honeysuckle	Tecoma Capensis	6
133		Ticoma	Tecoma Stans	15 Approx.
135	Small Canteen Area	Petunia	Petunia	89 Approx.
136		Ticoma	Tecoma Stans	14 Approx.
137		Gulmohar	Delonix Regia	1
138		Badam, Almond	Terminalia Catappa	1
139		Chhatim Tree	Alstonia Scholaris	3
140		Shami Plant (Sonapatti)	Bauhinia Racemosa	29 Approx.

3.6 RAINWATER HARVESTING

Conserving and preserving water is a key issue that has been addressed by the University in the form of Rain water harvesting. The campus has been practicing rainwater mechanism in a site area of 33.98 acres approx. where there are 31 rain water harvesting pits all over campus. This mechanism ensures an increase in the water table index. The details of the rainwater harvesting system have been designed by a certified architect and have been implemented throughout the campus.

Table 5: Average yearly rainfall data of Chhattisgarh

	Avg. Temperature °C (°F)		Min. Temperature °C (°F)		Max. Temperature °C (°F)		Precipitation / Rainfall mm (in)		Humidity (%)	Rainy days (d)
January	13.5 °C	(56.4) °F	7.6 °C	(45.6) °F	20.1 °C	(68.2) °F	23	0	66%	3
February	17 °C	(62.6) °F	10.5 °C	(50.9) °F	23.8 °C	(74.8) °F	31	-1	59%	1
March	22.8 °C	(73) °F	15.3 °C	(59.6) °F	30.2 °C	(86.3) °F	20	0	45%	2
April	29.4 °C	(85) °F	21.2 °C	(70.1) °F	37 °C	(98.6) °F	13	0	27%	1
May	33.1 °C	(91.6) °F	25.6 °C	(78.1) °F	40 °C	(104) °F	19	0	30%	5
June	33.4 °C	(92.1) °F	28 °C	(82.4) °F	38.7 °C	(101.6) °F	71	2	45%	8
July	30.2 °C	(86.4) °F	26.9 °C	(80.4) °F	34.1 °C	(93.4) °F	197	-7	69%	12

August	29 °C	(84.2) °F	26 °C	(78.8) °F	32.6 °C	(90.7) °F	180	-7	75%	13
September	28.2 °C	(82.7) °F	24.1 °C	(75.4) °F	32.7 °C	(90.9) °F	90	-3	69%	7
October	25.8 °C	(78.4) °F	19.3 °C	(66.8) °F	32.4 °C	(90.4) °F	14	0	52%	1
November	20.8 °C	(69.4) °F	14.3 °C	(57.7) °F	27.8 °C	(82) °F	5	0	52%	1
December	15.5 °C	(59.9) °F	9.2 °C	(48.6) °F	22.4 °C	(72.3) °F	7	0	60%	0

Dimension of Rain Water Harvesting Pits and Desilting Pits as appended below: -

Water Harvesting Pits

- a. Depth - 3 Mtr
- a. Diameter - 3 Mtr
- b. Volume - $3 \times 3 \times 670$ (average rainfall in mm) $\times 8 = 3216$ Liters/pit $\times 31$ Nos pits
Total=99696 Liters

Desilting Pits

- a. Depth - 03 Mtr.
- a. Area - 3×3 Mtr



3.7 WATER MANAGEMENT

The university has installed groundwater extraction systems inside the campus to meet water demand. The groundwater is pumped to overhead tanks and passed through RO. Filtered water is supplied for drinking purposes. Raw water is utilized for laundry, washing and bathing purposes. Cooking water supplied is of drinking quality.

The tank capacity at various locations is provided in Table 1

Table 6: Water storage quantity in Campus

S. No.	Block	Quantity
1.	Main Building	40,000 ltr
2.	Academic Block	20,000 ltr
3.	Indus Hostel	50,000 ltr
4.	Bhramputra Hostel	40,000 ltr
5.	Everest Hostel	20,000 ltr

The water requirement as per NBC 2016 is provided in Table. This quantity is at a higher estimate. The water consumption is around 75% of the estimated quantity. The staffing pattern for the university is 600, out of which 200 are administrative, 400 teaching and 200 working staff. There are two restaurants with seating capacity of 10 indoors and 30 outdoors. The campus also houses canteens. There are 3500 non-resident students who travel from their place of residence to the campus by bus and personal transport. The annual holiday for students has been estimated to be around 75 days spread over two to three months along with leave with respect to medical and personal reasons.

Table 7: Water demand as per NBC for Kalinga University

S.No	Establishment	Number	Persons	NBC standard	Quantity
1.	Hostels	4	1200	135	1,62,000
2.	Offices	45	200	45	27,000



3.	Restaurant	2	10 (indoors) 30 (outdoors)	70	1,400 4,200
4.	Non-resident students		3500	45	1,57,500
5.	Total requirement				3,52,100
6.	Say				350 KLD

The supply is also obtained from tankers of 4 KL capacity. This water is utilized for drinking purposes. The approximate distribution of water is provided in table 8

Table 8: Number of tankers utilized by Hostels

S.No	Establishment	Number of tankers
1.	Brahmaputra	210
2.	Girls hostel	18
3.	Gole chowk	18
4.	Tree/Garden	76
5.	Sports Ground	22
6.	Makhana	13
	Total	325

The total tankers received in a month are an average of 640-650 KL. It translates to around 80-90 tankers per day. This would then indicate a volume of 80-90 KLD. This indicates that the tankers cater to 25%-30% of the total water demand.

The main storage inside the campus is at gole chowk of 35 KL. The underground tank at Brahmaputra hostel is of 15 KL capacity.



The wastewater generated is therefore, $350 \text{ KL} \times 80\% = 280 \text{ KL}$

The groundwater sampling reveals the following results.

Sampling was also undertaken from the artificial pond created by the university authorities. The pond has a 200 KL capacity.

The following type of waste is being generated in the university campus and quantity is calculated based on average of certain items received and the waste material sold out to vendors during last years: -

Solid

The university campus has the capacity to house the following population:

1. Students – 1200 (residents)
2. Teaching staff - 600
3. Non-teaching staff – 400
4. Students – 2800 (day engagement)

The solid waste generated from the campus in 2022-23 has been estimated based on the following (Assuming 0.3 kg/per capita daily solid waste generation):

The solid waste is collected through bins (blue and green). Blue bins are for dry waste, while the green bins are for wet wastes.

Fallen leaves, flowers and other organic materials are collected through manual sweeping and transported to vermicomposting plants.

The university also generates plastic wastes depending on the usage. However, considering that around 48,000 TPA of plastic waste is generated in the state with a population of 32,941,966 in 2021. The average plastic waste per capita comes around 1.45 kg per capita annually, which translates to 0.4 gm per capita daily.





The inert and other solid wastes are collected and stored before being discarded to authorized agencies on a regular basis.

The university is steadily moving towards achieving zero plastic thought. The university encourages segregation and has placed several blue and green bins across the campus site.

The sources of solid wastes are as follows:

1. Hostel Canteen – cut fruits and vegetables, eggshells, peels, skins, meat leftovers, etc.
2. General campus – crunchies packet, plastic water bottles, packaging, used and worn out fabric and clothes, used paper, cardboards, stationery items, etc.
3. Fallen leaves, flowers, dried stems, road, and kerb side dusts, etc.

There is solid waste generated from laboratories and offices.



CHAPTER 4: CONCLUSION

It has been observed that the University is following the applicable norms/laws and undertaking the management measures to reduce emission to the air, waste generation, water consumptions, and measures to conserve energy, and water. Following conclusions are made based on the documents received from the University and site observations.

- The University is submitting environment Statement, and compliance reports as per the applicable norms. It is having an agreement with authorized vendors for the waste management and maintaining the records of the waste.
- The University has installed various measures for the environmental conservation such as STP, RWH pits, low flow taps, organic waste converter etc. Almost 18.36 acres of the area is under the green cover of the University. The green coverage is well maintained and the compost from the OWC is used in it.
- The regular monitoring of STP water, DG stack and DG noise is carried out by the University.
- The safety, precautionary sign boards are placed at the different locations to alert the students and staff.

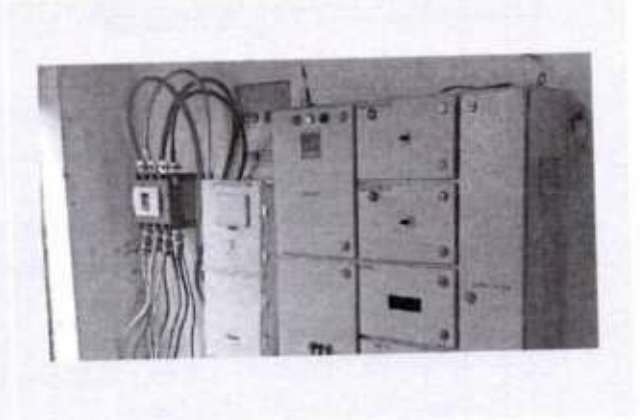
4.1 AREA OF IMPROVEMENTS

- Specific Environment Management Plan to be prepared by the University and shall establish the environment Management Cell with the proper responsibilities.
- It is suggested to the University to maintain the records of waste generated by them in the Forms as prescribed in the waste management rule.
- The University is having a provision for the solar PVC, however, it is recommended to increase the solar power plan. Also, installation and maintenance of water meters at the suitable places to measure the quantity of water used in various processes is also recommended.
- The University shall conduct the water audit annually. Water auditing is a systematic & scientific examination of water accounts of the University. It is a tool to overcome shortage, leakage and losses of water in the University.
- The used paper (if any) can be sent to an external unit for recycling. The recycled paper can be used in the University in the form of calendar, diaries, files/folders etc.



PHOTOGRAPHS





INITIATIVES TAKEN BY THE KALINGA UNIVERSITY TO SAVE ENVIRONMENT

Plastic Free Campus

Universities can generate enormous amounts of plastic waste, which is toxic to people and the environment, and never goes away.

Kalinga University is a Plastic Free Campus. We aim to measurably reduce plastic waste and pollution in our campus and the world around us. To achieve this we have undertaken following steps:

- Kalinga University has banned use of single-use plastics in canteens, cafes, Mini Market complex in the university premises and hostels, etc.
- In regular intervals, we carry out awareness drives and sensitisation workshops on the harmful impacts of single-use plastics.
- Encourage all students to avoid bringing non-bio-degradable plastic items to the University.
- We encourage students to sensitize their respective households about the harmful effects of plastics and make their households also 'plastic-free'.
- We have installed necessary alternative facilities like water units to avoid the use of plastic water bottles, and encourage the use of alternative solutions like cloth bags, paper bags, etc, instead of plastic bottles, bags, cover, and other goods on campus.



ENVIRONMENTAL PARAMETERS QUALITY MONITORING ANALYSIS

The ambient air samples were collected from two locations inside the campus. These were analyzed as per NAAQS parameters. The university also ensures that there is no open burning of solid waste.

TEST REPORT

AMBIENT AIR QUALITY REPORT		
Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil	
Method of test : IS: 5182	Sampling Details	
Test required: As per work order	Sample Monitored	: Ambient Air Quality
Sample Collected By:- CES Representative	Date of Sampling	: 01.04.2022 to 02.04.2022
Instrument used: Eco Tech FDS	Date of Receipt	: 02.04.2022
Atmospheric condition : Clear	Period of testing	: 02.04.2022 to 08.04.2022
Page : 1 of 1	Duration of sampling	: 24 hrs



AMBIENT AIR QUALITY RESULTS

S. No.	Parameters	NAAQ Standards (industrial area)	Pollutant Concentration	
			Near Main Gate	Near Girls Hostel
1	Wind direction		SE	SE
2	Wind speed Km/h		13	13
3	Relative Humidity %		31	31
4	Ambient Temp. (°C)		39	39
	Parameters		Pollutant Concentration	
1	Particulate matter (size less than 10µm) or PM ₁₀ (µg/m³)–Part-23-2006	100	57.22	61.30
2	Particulate matter (size less than 2.5µm) or PM _{2.5} (µg/m³)–Part-24	60	30.16	30.44
3	Sulphur Di-Oxide (SO ₂) (µg/m³) – Part-2	80	9.20	12.35
4	Oxide of Nitrogen (NO ₂) (µg/m³)- Part-6	80	15.30	19.24
5	Carbon monoxide (CO) mg/m³ Part-10 By Indicator tube method	04	<1.00	<1.00



NAAQ- National Ambient Air Quality Standards CPCB Notification 18th Nov. 2009

The Results relate only to the sample tested/Sampled

Note:-The report will not be valid for legal cases, if Prior permission is not taken from CES.

TEST REPORT

Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil	
Qty : 1 No. x 1 litre	Date of Collection	: 02.04.2022
Method of test : APHA 23 rd edition	Date of Receipt	: 02.04.2022
Packing :- Plastic bottle	Period of testing	: 02.04.2022 to 08.04.2022
Sample Condition at receipt: packed	Method of sampling	: IS:3025
Sample Discipline: Chemical Testing Sub Group: Surface Water	Sample tested as received	: OK
Sample Collected By:- CES Representative	Page no.	: 1 of 1



S. No	Test Parameters	Unit	Method No.	Result Obtained Pond Water
1	pH	-	4500 H+B	7.41
2	Conductivity	μmhos/cm	2510 B	1272.00
3	Turbidity	NTU	2130 B	0.70
4	Total Solid	mg/lit	2540 B	743.00
5	Total Dissolved Solid	mg/lit	2540 C	683.00
6	Total suspended solid	mg/lit	2540 D	60.00
7	Total Alkalinity	mg/lit	2320 B	144.00
8	Total Hardness as CaCO ₃	mg/lit	2340 C	258.00
9	Calcium as Ca	mg/lit	3500 B	57.72
10	Magnesium as Mg	mg/lit	3500 B	27.70
11	Sulphates as SO ₄	mg/lit	4500- SO ₄ E	48.93



12	Chlorides as Cl	mg/lit	4500-Cl ⁻ B	61.98
13	Iron as Fe	mg/lit	3500- Fe B	<0.05
14	Nitrate as NO ₃	mg/lit	4500-NO ₃ B	20.83
15	Sodium as Na	mg/lit	3500- Na B	1.50
16	Potassium as K	mg/lit	3500- K B	<1.00
17	Fluoride as F	mg/lit	4500- F D	<0.10
18	Acidity	mg/lit	2310 B	18.00

The Results relate only to the sample tested/Sampled

Note:-The report will not be valid for legal cases, if Prior permission is not taken from CES.

TEST REPORT

Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil
---	---



Qty : 1 No. x 1 litre	Date of Collection	: 02.04.2022
Method of test : APHA 23 rd edition	Date of Receipt	: 02.04.2022
Packing :- Plastic bottle	Period of testing	: 02.04.2022 to 08.04.2022
Sample Condition at receipt: packed	Method of sampling	: IS:3025
Sample Discipline: Chemical Testing Sub Group: Ground Water	Sample tested as received	: OK
Sample Collected By:- CES Representative	Page no.	: 1 of 1

S. No	Test Parameters	Unit	Method No.	Requirement as per IS-10500-2012		Result Obtained Handpump within University Campus
				Desirable Limit	Permissible limit	
1	pH	-	4500 H+B	6.5-8.5	No relaxation	7.27
2	Conductivity	µmhos/cm	2510 B	-	-	910.40
3	Turbidity	NTU	2130 B	1	5	0.80
4	Total Solid	mg/lit	2540 B	-	-	498.00
5	Total Dissolved Solid	mg/lit	2540 C	500	2000	456.00



6	Total suspended solid	mg/lit	2540 D	-	-	42.00
7	Total Alkalinity	mg/lit	2320 B	200	600	132.00
8	Total Hardness as CaCO ₃	mg/lit	2340 C	200	600	168.00
9	Calcium as Ca	mg/lit	3500 B	75	200	56.11
10	Magnesium as Mg	mg/lit	3500 B	30	100	6.80
11	Sulphates as SO ₄	mg/lit	4500- SO ₄ E	200	400	31.91
12	Chlorides as Cl	mg/lit	4500-Cl ⁻ B	250	1000	29.99
13	Iron as Fe	mg/lit	3500- Fe B	0.30	1	<0.05
14	Nitrate as NO ₃	mg/lit	4500-NO ₃ B	45	No relaxation	14.00
15	Sodium as Na	mg/lit	3500- Na B	-	-	12.33
16	Potassium as K	mg/lit	3500- K B	-	-	<1.00
17	Fluoride as F	mg/lit	4500- F D	1.0	1.5	<0.10
18	Acidity	mg/lit	2310 B	-	-	8.00

The Results relate only to the sample tested/Sampled



Note:-The report will not be valid for legal cases, if Prior permission is not taken from CES.

TEST REPORT

Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil	
Qty : 1 No. x 2 litre	Date of Collection	: 02.04.2022
Method of test : APHA 23rd edition	Date of Receipt	: 02.04.2022
Packing :- Plastic bottle	Period of testing	: 02.04.2022 to 08.04.2022
Sample Condition at receipt: Packed	Method of sampling	: IS:3025
Sample Discipline: Chemical Testing Sub Group: Waste Water	Sample tested as received	: OK
Sample Collected By:- CES Representative	Page no.	: 1 of 1

S. No.	Test Parameters	Unit	Method No.	Permissible limit	Result Obtained STP Outlet
1	pH	-	4500 H+B	6.5-9.0	7.36
2	Total Solid	mg/lit	2540 B	2200	788.00



3	Total Dissolved Solid	mg/lit	2540 C	2100	724.00
4	Total Suspended Solid	mg/lit	2540 D	100	64.00
5	COD	mg/lit	5220 B	250	90.00
6	BOD (3 day 27 degree)	mg/lit	IS/3025/P-44	30	8.00
7	Oil & Grease	mg/lit	5520 B	10	3.00

The Results relate only to the sample tested/Sampled

Note:-The report will not be valid for legal cases, if Prior permission is not taken from CES.



TEST REPORT

Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil	
Qty : 1 No. x 2 litre	Date of Collection	: 02.04.2022
Method of test : APHA 23rd edition	Date of Receipt	: 02.04.2022
Packing :- Plastic bottle	Period of testing	: 02.04.2022 to 08.04.2022
Sample Condition at receipt: Packed	Method of sampling	: IS:3025
Sample Discipline: Chemical Testing Sub Group: Waste Water	Sample tested as received	: OK
Sample Collected By:- CES Representative	Page no.	: 1 of 1

S. No.	Test Parameters	Unit	Method No.	Result Obtained STP Inlet
1	pH	-	4500 H+B	7.75
2	Total Solid	mg/lit	2540 B	850.00
3	Total Dissolved Solid	mg/lit	2540 C	670.00



4	Total Suspended Solid	mg/lit	2540 D	80.00
5	COD	mg/lit	5220 B	130.00
6	BOD (3 day 27 degree)	mg/lit	IS/3025/P-44	14.00
7	Oil & Grease	mg/lit	5520 B	5.00

The Results relate only to the sample tested/Sampled

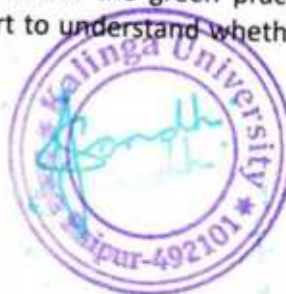
Note: -The report will not be valid for legal cases, if Prior permission is not taken from CES.



SUMMARY

Environment Audit is one of the important tools to check the balance of natural resources and its judicious use. Environment auditing is the process of identifying and determining whether institutional practices are eco-friendly and sustainable. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area.

Kalinga University has conducted a "Environment Audit" in the academic year 2022-2023. The main objective to carry out an Environment audit is to check the green practices followed by Kalinga University and to conduct a well-defined audit report to understand whether Kalinga University is on the track of sustainable development.



CONCLUSION

From the environment audit following are the conclusions, which can be taken for improvement in the campus.

All departments generate paper waste. Especially academic buildings. Using both sides of paper for printing and writing is good practice and use the other side of used paper for rough work.
Rainwater is collected from the rooftop to recharge the groundwater level table.

E- waste is segregated, handled and disposed properly in an eco-friendly manner.
Wear Mask Signages are provided in the facility.

Reducing the use of one-time use plastic bottles, cups, folders, pens, bouquets, decorative items will be useful to solve the problem of plastic pollution to some extent.



RECOMMENDATIONS

Following are some of the key recommendations for improving campus environment:

- Install a water meter to record water usage in the University premises.
- The solid waste should be reused or recycled at maximum possible places.
- An environmental policy document has to be prepared with all the recommendations and current practice carried by Kalinga University.
- Waste management agreements with authorized recyclers shall be regularly renewed.
- Seminars shall be arranged to spread awareness for Environment Safety amongst students
- A frequent visit should be conducted to ensure that the generated waste is measured, monitored and recorded regularly and information should be made available to administration.

----- END OF DOCUMENT -----



NAAC Environmental Parameters Review Report (EPRR)
Kalinga University, Raipur, Chhattisgarh

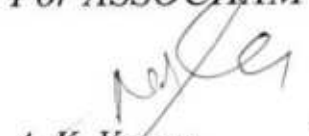
This is to certify that
ASSOCHAM
has carried out the following for

Kalinga University, Raipur

1. *Energy Audit*
2. *Environmental Audit*
3. *Water Audit*

The ensuing reports have been prepared as per the NAAC guidelines for Criteria 7 (7.1.2 to 7.1.6). The reports have been prepared as per primary visits and documents obtained from the client.

For ASSOCHAM


A. K. Verma
Accredited Energy Auditor
AEA-0194

**Director, Akhildeep Management and
Energy Consultant Pvt. Ltd.**





Rinaki Dasgupta
Environmental Auditor
ASSOCHAM

July 2021-22

THE ASSOCIATED CHAMBERS OF COMMERCE AND INDUSTRY OF INDIA

(CIN : U91990DL1920PLC008223)

ASSOCHAM Corporate Office : 4th Floor, YMCA Cultural Centre and Library Building, 1, Jai Singh Road, New Delhi-110001
Tel. : +91-11-46550555 (Hunting line) • Fax : +91-11-23347008/09 • E-mail : assocham@nic.in • Website : www.assochem.org

ENERGY AUDIT OF KALINGA UNIVERSITY RAIPUR

FY 2021-22

**BY
AKHILDEEP
MANAGEMENT &
ENERGY CONSULTANT
Pvt. Ltd. Raipur**

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EXECUTIVE SUMMERY

SN	Decription of work/ under progress	Old qty availabl e (Qty)	Replace by (Qty.)	Saving in kWh	Rat e/ KW H	Total savings (Rs)	Inverst ment (Rs)	PB
1	Replacement of 750 watt old conventional fan unit by 50 watt energy ef icient	1883	1883	1080	10	20,33,640	56,49,000	33 Month
2	Replacement of old window/ split AC by EESL make star inverter type air conditioner	20	20	1771	10	3,50,650/	6,33,600	22 Month
3	Replacement of old water coolers with ef icient water cooler (30% saving)	10	10	900	10	90000	200000	26 Month s
4	Conventional transformer with energy ef icient transformer	-	-	-	-	-	30% Saving	36 Month s

KEY OBSERVATIONS

- (1) The Audit report has been prepared based on the data available at Kalinga University Raipur.
- (2) The Power factor of Electrical system is being maintained pretty well as per standard.
- (3) The Lighting fixtures used in the whole premises of Kalinga University are Energy efficient.
- (4) 300 KW solar Power Plant is being maintained nicely this system is further to be provided with battery backup so that solar power can be used in nights also.
- (5) The existing ceiling fans should be gradually replaced by Energy efficient BLDC fans in Phased manner according to the availability of Budget preferably on exchange basis.
- (6) The street Light are being switched on & off manually. It is recommended to install a photo electric timer for automatic switch on & off.
- (7) The Old air conditioner are to be replaced with star rated efficient inverter type air conditioner in Phased manner.

ANNUAL ELECTRICITY BILL ANALYSIS

*Conducted as Health Check-up &
in the Interest of Improved Efficiency*
taking Present Power Factor is of Lag type.

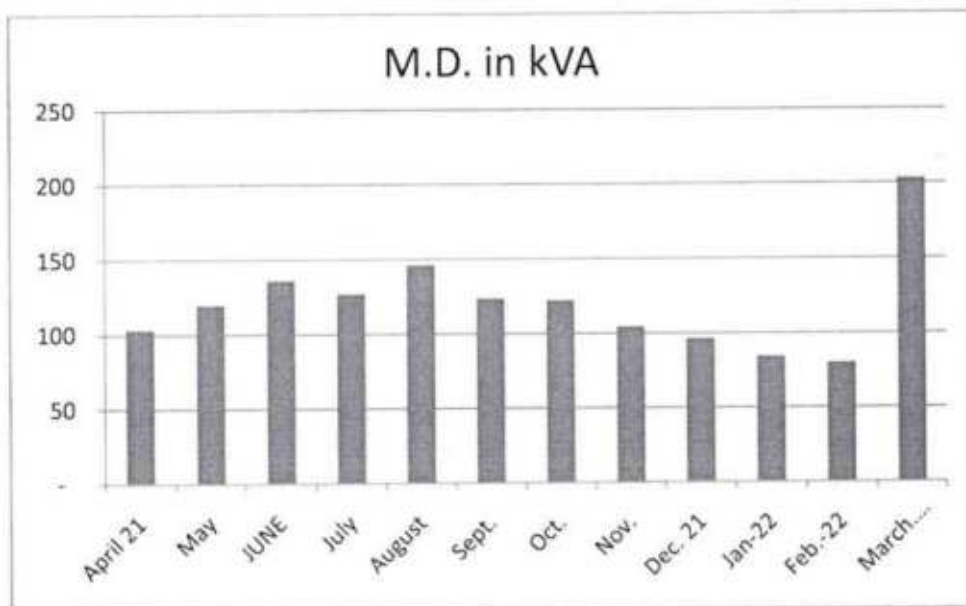
The H.T. Consumer I.D. No. 1021740

KALINGA University, Nava Raipur C.G.

Tariff Category HT – 3 11 kV, with SOLAR; Gen. Purpose

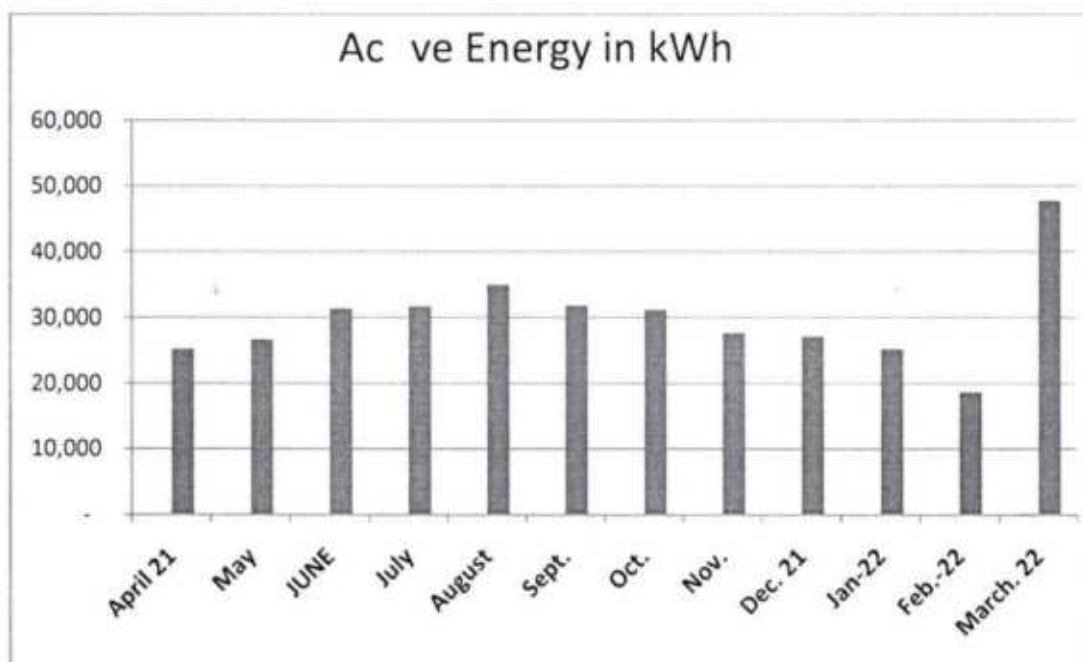
Max. Demand in kVA

Month	Max. Demand in kVA
April 21	103
May	120
JUNE	137
July	127
August	146
Sept.	124
Oct.	123
Nov.	105
Dec. 21	97
Jan-22	84
Feb.-22	80
March. 22	203



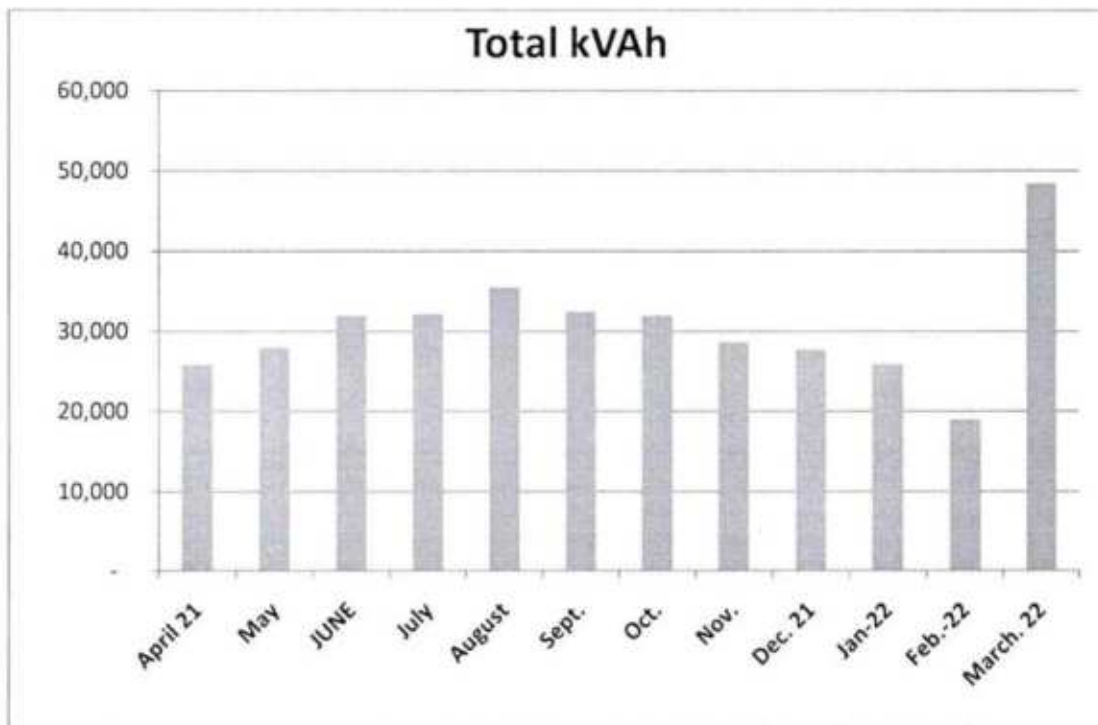
Monthly Active Energy Quantity in kWh.

Month	kWh
April 21	25,263
May	26,750
JUNE	31,419
July	31,754
August	35,060
Sept.	31,868
Oct.	31,251
Nov.	27,734
Dec. 21	27,141
Jan-22	25,227
Feb.-22	18,705
March. 22	47,781



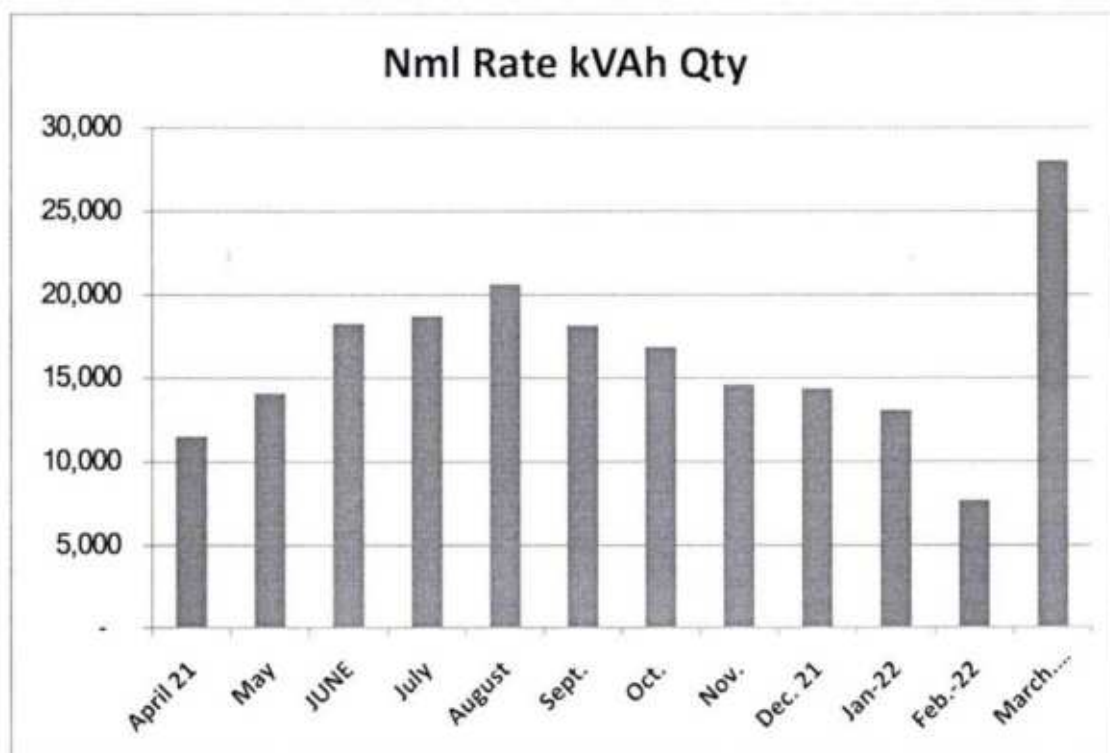
Monthly Active Energy Quantity in kVAh.

Month	Total kVAh
April 21	25,859
May	28,000
JUNE	31,958
July	32,191
August	35,490
Sept.	32,474
Oct.	31,986
Nov.	28,710
Dec. 21	27,786
Jan-22	25,928
Feb.-22	19,032
March. 22	48,508



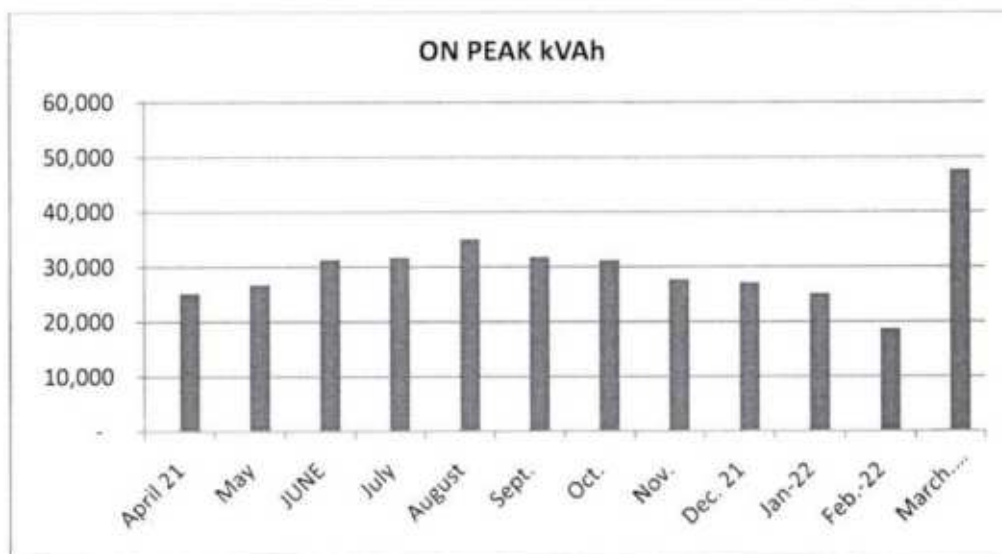
Normal Daytime Rate Qty. of kVAh.

Month	Nml Rate kVAh Qty
April 21	11,544
May	14,100
JUNE	18,289
July	18,722
August	20,621
Sept.	18,173
Oct.	16,865
Nov.	14,611
Dec. 21	14,382
Jan-22	13,100
Feb.-22	7,707
March. 22	28,048
Total	1,96,161
Maximum	28,048
minimum	7,707
Ann. Avg.	16,346.8



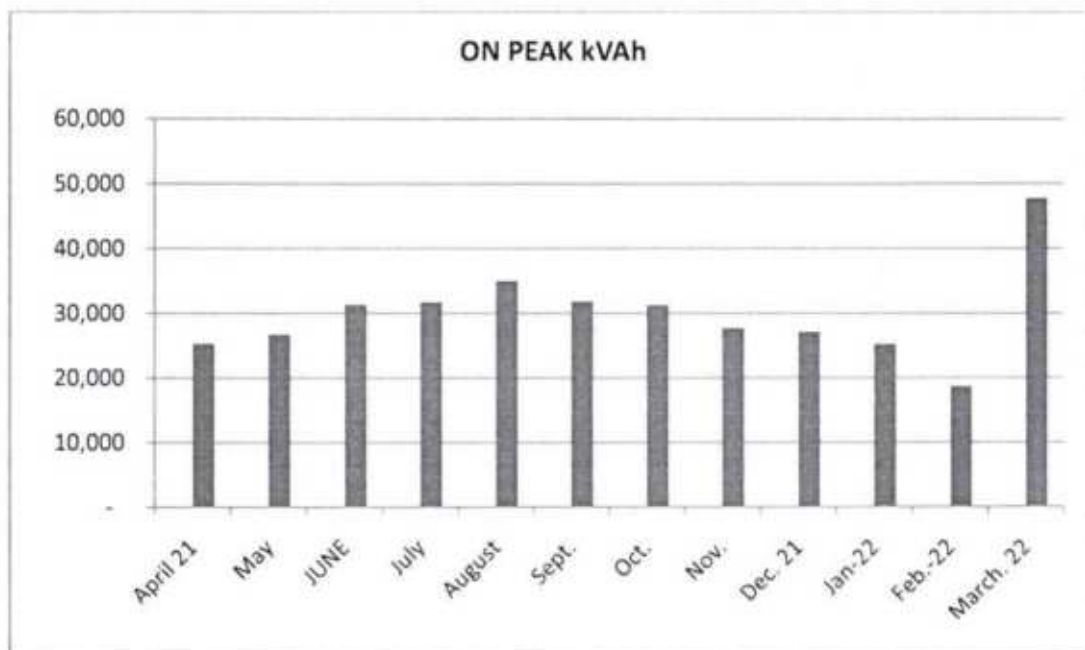
ON PEAK time (Evening 6pm to 11 pm) Rate Qty. of kVAh.

Month	ON PEAK kVAh
April 21	6,669
May	6,500
JUNE	6,398
July	6,255
August	7,169
Sept.	7,053
Oct.	7,475
Nov.	6,728
Dec. 21	6,441
Jan-22	6,393
Feb.-22	6,189
March. 22	10,023



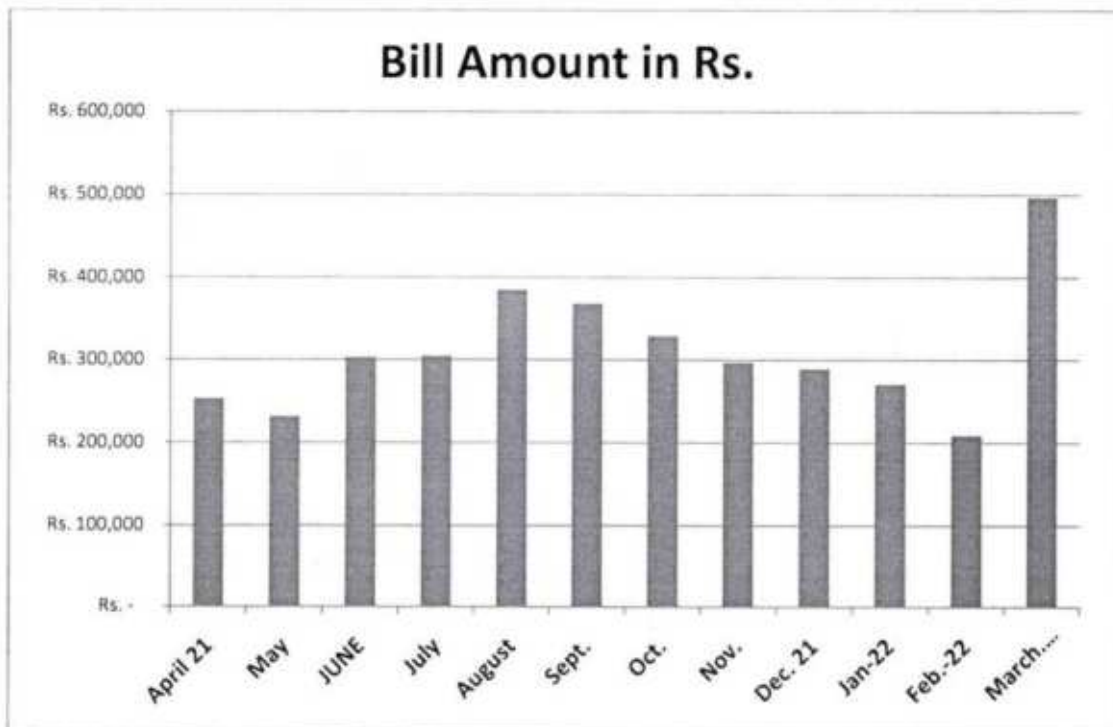
off peak (11 pm to 5 am; MIDNIGHT) time Rate Qty. of kVAh.

Month	off peak kVAh
April 21	7,646
May	7,400
JUNE	7,271
July	7,214
August	7,700
Sept.	7,248
Oct.	7,646
Nov.	7,371
Dec. 21	6,963
Jan-22	6,435
Feb.-22	5,136
March. 22	10,437



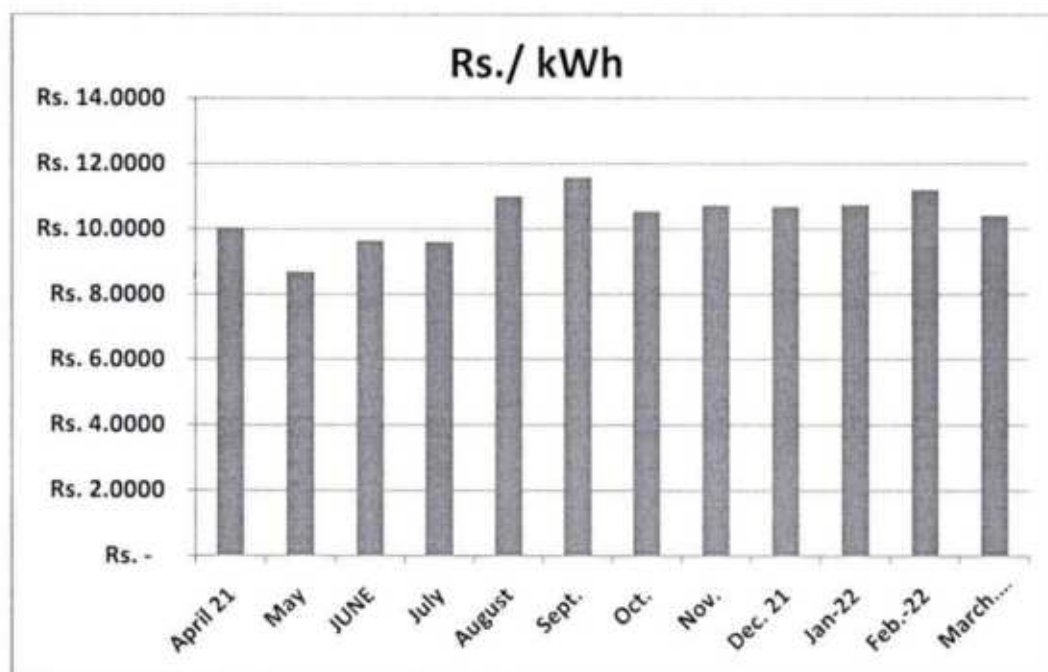
Monthly Bill Amount in Rs.

Month	Bill Amount in Rs.
April 21	Rs. 2,53,570
May	Rs. 2,32,650
JUNE	Rs. 3,03,244
July	Rs. 3,05,107
August	Rs. 3,85,881
Sept.	Rs. 3,69,061
Oct.	Rs. 3,29,360
Nov.	Rs. 2,97,178
Dec. 21	Rs. 2,89,617
Jan-22	Rs. 2,70,935
Feb.-22	Rs. 2,09,373
Bill of Feb. 22 is on assumed qty.	
March. 22	Rs. 4,97,044
Annual Total	Rs. 37,43,020
Maximum	Rs. 4,97,044
minimum	Rs. 2,09,373
Ann. Avg.	Rs. 3,11,918



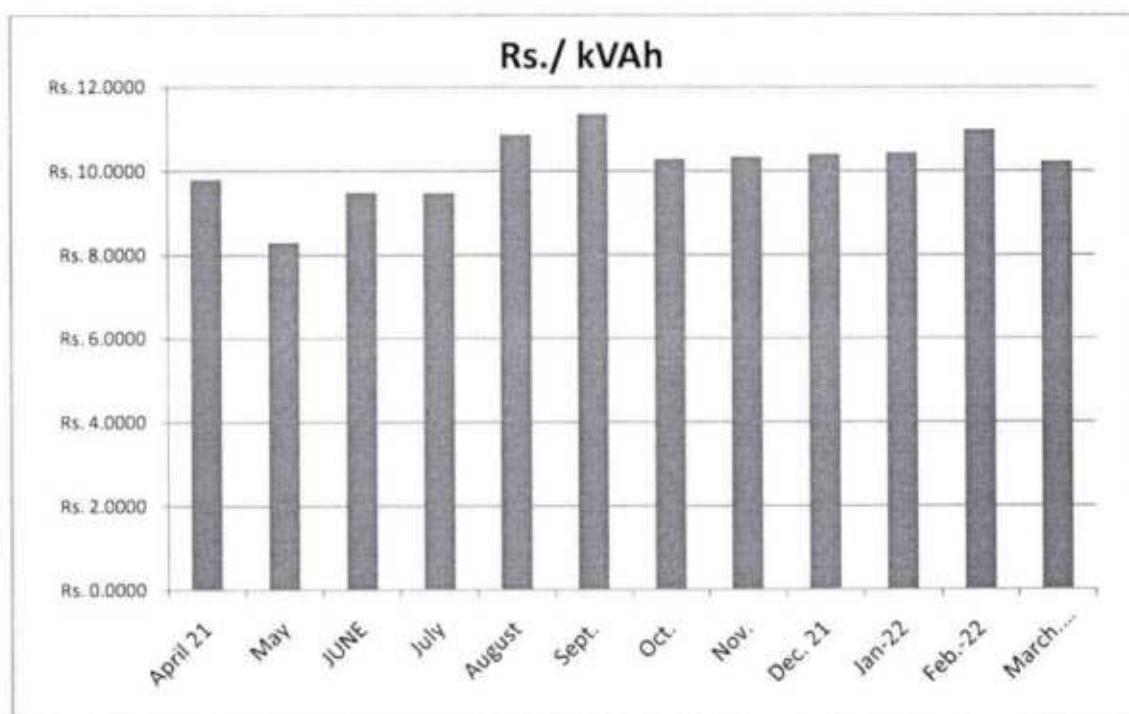
Avg. Rate of Active Energy in Rs. per kWh.

Month	Rs./ kWh
April 21	Rs. 10.0372
May	Rs. 8.6972
JUNE	Rs. 9.6516
July	Rs. 9.6086
August	Rs. 11.0065
Sept.	Rs. 11.5811
Oct.	Rs. 10.5392
Nov.	Rs. 10.7155
Dec. 21	Rs. 10.6708
Jan-22	Rs. 10.7399
Feb.-22	Rs. 11.1934
March. 22	Rs. 10.4025
Maximum	Rs. 11.5811
minimum	Rs. 8.6972
Ann. Avg.	Rs. 10.3987



Avg. Rate of Apparent Energy in Rs. per / kVAh

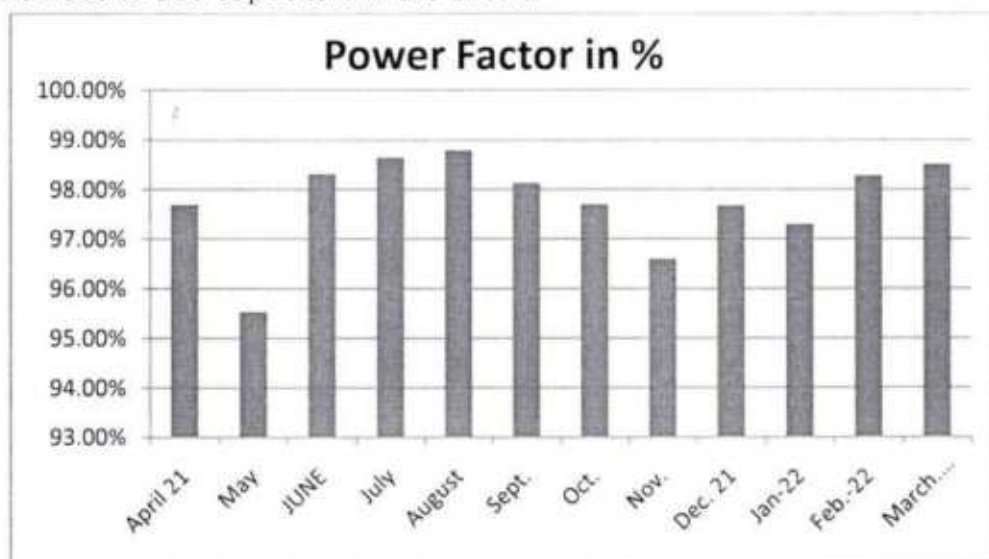
Month	Rs./ kVAh
April 21	Rs. 9.8059
May	Rs. 8.3089
JUNE	Rs. 9.4890
July	Rs. 9.4780
August	Rs. 10.8730
Sept.	Rs. 11.3650
Oct.	Rs. 10.2970
Nov.	Rs. 10.3510
Dec. 21	Rs. 10.4231
Jan-22	Rs. 10.4495
Feb.-22	Rs. 11.0011
March. 22	Rs. 10.2466
Maximum	Rs. 11.3650
minimum	Rs. 8.3089
Ann. Avg.	Rs. 10.1734



POWER FACTOR in %.

Month	Power Factor in %
April 21	97.70%
May	95.54%
JUNE	98.31%
July	98.64%
August	98.79%
Sept.	98.13%
Oct.	97.70%
Nov.	96.60%
Dec. 21	97.68%
Jan-22	97.30%
Feb.-22	98.28%
March. 22	98.50%
Total/ Annual	97.83%
Maximum	98.79%
minimum	95.54%

We find that the MONTHLY Average POWER FACTOR is very Good, and there is no need to add capacitors in the circuit.



- The period of the bills is of COVID time, hence may not be taken as a normal time.
- I find that average monthly power factor is pretty good. We congratulate the team. There is no need to add capacitors; because Annual Power Factor of 97.83% is very Good.
- There may be future plans of adding machinery, so again there is no need to reduce Contract Demand from 300 kVA; because in March 22; the Maximum Demand (M.D.) is 203 kVA.
- Though if we consider this as an non-covid time; then we may consider to have C.D. as 200 kVA, then for 10 months the power demand quantity is better; again as the size of Total campus is pretty large; there may be near future expansion plans, which is again a dynamic situation; then reducing C.D. by 100 kVA to new value of 200 kVA may save about Rs. 3.50 lakhs annually. This has a rare & a very minor risk of Power over-use financial penalty, along with pro-rata penalty on (energy, VCA, Duty etc).if there is a 15 minute meter time over-use, the bill with penal amount will be larger. But, this should be a part of Detailed Energy Audit.
- There are 3 Boys Hostels and 1 Girls Hostel, and all these 4 Hostels are having quite a useful Solar Panels; and the L.T. Electricity Bills are quite insignificant, because these hostels have lots of Solar Panels.
- The H.T. Bill for the Kalinga University, for the month of February 22 is missing, we have used assumed quantity of Energy DATA.

GLOSARY OF WORDS

MD	-	Medium Demand
BD	-	Billing Demand
CD	-	Contract Demand
COP	-	Coef icient of performance
DG	-	Diesel Generator
ECG	-	Energy Conservation Measures
FTL	-	Fluorescent Tube Light
LT	-	Low Tension
HT	-	High Tensions
kV	-	Kilo volt
kVA	-	Kilo volt Ampere
kVAH	-	Kilo volt Ampere Hour
kWh	-	Kilo Watt Hour
LED	-	Light Emitting Diode
SEC	-	Speci ic Energy consumption
SLD	-	Single line diagram
TR	-	Tons of Refrigeration

ENERGY AUDIT MEASURES

Immediate measures

- (1) Minimize exfiltration of conditioned air and infiltration of unconditioned air through leaky windows & doors by incorporating effective means of weather stripping. Auto door closers to be provided in Air conditioned rooms.
- (2) The temperature & human comfort with best energy saving should be set between 24° to 25° C.
- (3) Periodic cleaning of lighting fixtures specially at open spaces to maintain utilization factor & illumination level.
- (4) It is suggested NOT to pump the water supply during peak hours to save the cost of energy. It is because the utility service (CSPDCL) charges higher tariff during peak hours.
- (5) The temperature of water cooler should be >20°C for energy saving. Also from 10PM to 8AM, the water coolers should be switched off specially in winter & rainy season.
- (6) The lighting fixtures fitted on high mast are to be relocated in such a way that the lighting is better utilized.

Medium Term Measures

- (1) Installation of occupancy sensors in office room and retiring room at to switch OFF & ON the light/fan depending on occupancy.
- (2) The energy meter / Sub meter should be installed at every feeder to create awareness & control use of energy.
- (3) Soft starters should be installed for pump houses.

Long Term Measures

- (1) Provide dedicated lighting transformer for light circuit instead of feeding through power transformer. This will enable the dimming circuit to activate whenever needed.
- (2) Gradual replacement of conventional water coolers which are ghost consumers units with energy efficient water coolers. Energy efficient water coolers save 30% energy consumption.
- (3) Gradual replacement in phased manner the conventional transfer unit with energy efficient transformer.
- (4) The ceiling fans may further be replaced by replaced by more efficient 1200 mm sweep 35w BLDC (Brush less Direct Current) motor. It works an AC supply and converts AC to DC. It operates through remote in different speed.

Energy Audit Team

The following team was involved in the auditing of Kalinga University in April. 2022 for carrying out measurement, collection of data and field study.

S.N.	Name	Qualification	Experience	Contact
1.	Mr. A.K. Verma	Accredited Energy Auditor (AEA-0194), Director of Akhildeep Management & Energy Consultant Pvt. Ltd. Raipur	38 yrs.	9009347799
2.	Mr. Jitendra Rathod	Certified Energy Auditor (EA-2189)	38 yrs.	9893759981
3.	Mr. Deepak Jain	Certified Energy Auditor (EA-11607)	17 yrs.	7987701760

ABOUT M/S AKHILDEEP MANAGEMENT & ENERGY CONSULTANT PVT LTD

Akhildeep Management & Energy Consultant specialise in solving energy efficiency challenges' in today's highly demanding environments. We help companies to improve their energy efficiency by reviewing and modernizing process and introducing automation to system and devices. We have more than 20 satisfied customers in Energy Auditing and Consulting almost from all industry sectors across India. Based on our expertise and industry standards, we customize and scale our solutions for the needs of any company or community.

Akhildeep Management & Energy Consultant was establish in 2014 with a vision to serve the industry and deliver best solutions for Energy Conservation and Management of International standards. We possess sufficient Infrastructure and a Team of Management and Technical professional having vast diversified industrial experience of Consultancy & Training in Manufacturing and Service Industry. Some of them are lead auditors from Bureau of Energy Efficiency (B.E.E.) Government of India.

We have empanelment, arrangements and tie – ups with various National & International Energy Agencies & Certification Bodies / Registrars.

Equipments List From 01-04-2021 to 31-03-2022			
S.No.	Equipment Name	Power	Quantity
1	Cealing Fan		142
2	Tubelight	(20watt)	759
3	2"×2" Led Light	(36watt)	22pcs
4	Coolers		47pcs
5	Led Light 9"×8"		383pcs
6	Intercom		55pcs
7	Washing Machine	7KG	8pcs
		8.5KG	(1pcs)
8	AC	1.5ton	(28pcs)
		1.8ton	(11pcs)
		1ton	(04pcs)
		2.2ton	(10pcs)
		2ton	(02pcs)
		4ton	(2pcs)
9	Led Round White	15wa	(131pcs)
		12wa	(138pcs)
		18wa	(188pcs)
		20wa	(10pcs)
		30wa	(46pcs)
10	Led 3 in 1 Colour Light	12wa	(20pcs)
11	Led Street Light	20wa	(01pcs)
		36wa	(30pcs)
		100wa	(10pcs)
12	Led Bulb		46pcs
13	UPS	5KVA	(04pcs)
		50KVA	(02pcs)
		25KVA	(01pcs)
		10KVA	(01pcs)
14	Computer System UPS		40pcs
15	Water Motor Pump	5HP	(02pcs) (Mono Block)
		3HP	(02pcs) (Mono Block)
		2HP	(01pcs) (Mono Block)

		5HP	(03pcs) (Open wall)
16	Solar Street Light		24Pcs

Electrical Equipment List 2021-22				
S.NO.	Equipment Name	Power	Qty 2020-21	Remarks
1	Ceiling Fan	65W	1883	
2	Tube Light	20W	2621	
3	2"×2" LED Light	36W	232	
4	9"×8" LED Light	9W	560	
5	LED Round White	12W	1131	
		15W		
		18W		
		20W		
		30W		
6	LED Street Light	20W	41	
		36W		
		100W		
7	Air conditioner	1.5T	170	
		1.8T		
		2.2T		
		4.0T		
8	UPS	5KVA	8	
		10KVA		
		25KVA		
		50KVA		
9	Water Motor Pump Mono block	2HP	5	

		3HP		
		5HP		
10	Solar Street Light	-	24	

SUBSTATION TRANSFORMER DETAILS KALINGA UNIVERSITY RAIPUR

S.NO.	Rated Specification	TR1
1	KVA	300
2	HV VOLTAGE	11000
3	LV VOLTAGE	433
4	AMP HV	15.75
5	AMP LV	416.37
6	MAKE	Power Star
7	DATE OF INSTALLATION	2015
8	VECT GROUP	Dyn11

**TABLE SHOWING STANDARD NO LOAD/LOAD LOSSES IN
TRANSFORMER**

Rating	No load Loss (W)	Load Loss (W)
100	320	1950
160	455	2800
250	640	4450
500	900	6450
600	1260	9300
1000	1800	13300
1600	2600	19800
2000	3200	21000
3150	4600	28000
5000	6500	31000
6300	7700	45000
10000	11000	63000
12500	13000	77000
20000	18000	107000
31500	25000	150000
40000	30000	180000

Transformer load analysis :

Transformer losses consist of two parts:

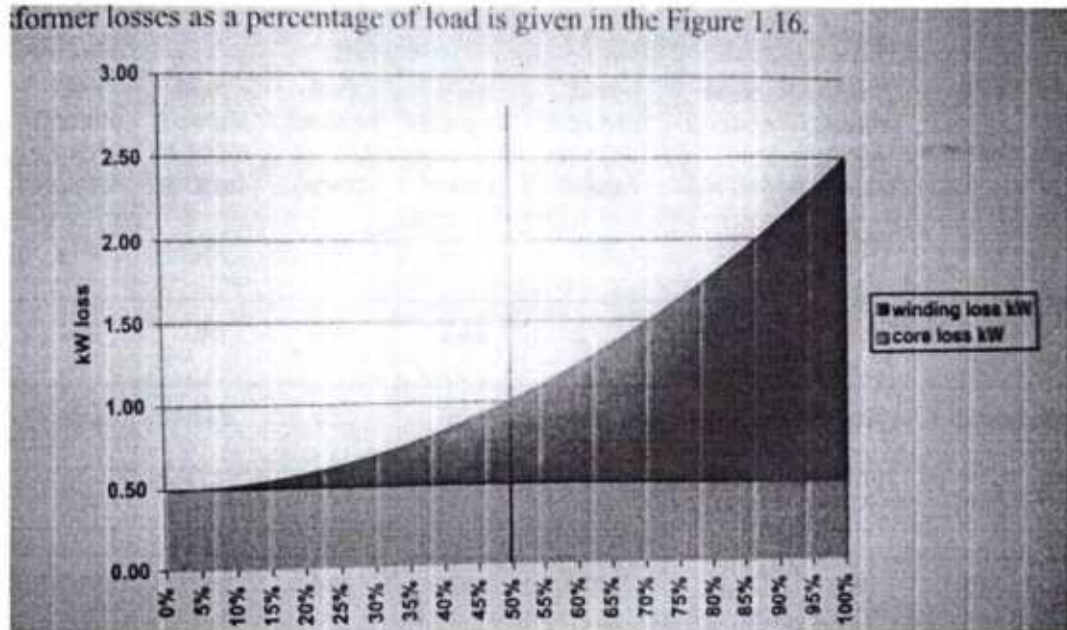
1. No-load loss (also called core loss) is the power consumed to sustain the magnetic field in the transformer's steel core. Core loss occurs whenever the transformer is energized; core loss does not vary with load. Core losses are caused by two factors: hysteresis and eddy current losses. Hysteresis loss is that energy lost by reversing the magnetic field in the core as the magnetizing AC rises and falls and reverses direction. Eddy current loss is a result of induced currents circulating in the core.
2. Load loss (also called copper loss) is associated with full-load current flow in the primary and secondary windings of a transformer due to the ohmic resistance of the windings. Copper loss varies with the square of the load current. ($P = I^2 R$). Transformer losses as a percentage of load is given in the figure.
3. For a given transformer, the manufacturer can supply values for no-load loss, $P_{\text{no-load}}$, and loss, P_{LOAD} . The total transformer loss, P_{TOTAL} , at any load level can then be calculated from:
4. $P_{\text{TOTAL}} = P_{\text{NO-LOAD}} + (\% \text{ LOAD}/100)^2 \times P_{\text{LOAD}}$
5. Where transformer's loading is known, the actual transformer's loss at given load can be computed as:

ENERGY EFFICIENT TRANSFORMER (STAR RATED)

Most energy loss in dry-type transformer occurs through heat or vibration from the core. The new high-efficiency transformer minimize these loss. The conventional transformer is made up of a silicon alloyed iron (grain oriented) core. The iron loss of any transformer depends on the type of core used in the transformer. However the latest technology is to use amorphous material – a metallic glass alloy for the core. The expected reduction in core loss over conventional (Si Fe core) transformers is roughly around 70% which is quite significant. By using an amorphous core – with unique physical and magnetic properties – these new types of transformers have increased efficiency even at low loads – 98.5% efficiency at 35% load.

Electrical distribution transformers made with amorphous metal cores provide excellent opportunity to conserve energy right from the installation. Though these transformers are a little costlier than conventional iron core transformers, the overall benefit towards energy savings will compensate for the higher initial investment.

former losses as a percentage of load is given in the Figure 1.16.



TOTAL TRANSFORMER LOSSES AT 50% AND 100% LOADING

	1 star		2 star		3star		4 star		5 star	
Rating kVA	Max Losses at 50% (watts)	Max Losses at 100% (watts)	Max Losses at 50% (watts)	Max Losses at 100% (watts)	Max Losses at 50% (watts)	Max Losses at 100% (watts)	Max Losses at 50% (watts)	Max Losses at 100% (watts)	Max Losses at 50% (watts)	Max Losses at 100% (watts)
16	200	555	165	520	150	480	135	440	120	400
25	190	785	235	740	210	695	190	653	175	595
63	490	1415	430	1335	380	1250	340	1140	300	1050
100	700	2020	610	1910	520	1800	475	1650	435	1500
160	1000	2800	880	2550	770	2200	670	1950	570	1700
200	1130	3300	1010	300	890	2700	780	2300	670	2100

Advantages of 20 w LED Tube

Comparison Between Conventional fluorescent tube & 20 w LED Tube

S.No.	Conventional 40 w l Tube	20 w LED Tube Energy
1	It Contains Mercury hence unsafe for environment	20 w LED tubes are mercury free environment friendly
2	Fl tube are expensive to dim	It has full dimming facilities
3	It was multi directional lighting which means some light is lost and illuminates unnecessary place also	It has direction a light which means illumination is at required place
4	It does not work well with occupancy sensor and other controls and burns faster	It works well with occupancy sensor & other controls
5	It's efficiency is less	LED tube are 30% more efficient
6	It is flickering issues hence quality of illuminations inferior	It does not flicks but gives constant high
7	Average life is 30,000 burning hours	Average life is 50,000 burning hours

Ceiling fan specification

(1)	Types of motor	Induction
(2)	Blade Material	Steel metal (MS)
(3)	Rated RPM	330
(4)	Actual RPM	332
(5)	Power Consumption	50 W
(6)	CMM (Air Delivery)	210 cubic meter per min.
(7)	Body Weight	750 grams
(8)	Sweep	1200 MM
(9)	Winding Material Gauge	Copper wire 32 SWG
(10)	Bearing Type	Open Bearing
(11)	Rated voltage	230 v
(12)	Blade Thickness	0.60MM
(13)	Air cutting noise	Moderate
(14)	Humming Noise	Moderate

BLDC FAN

BLDC fans are (Brushless Direct Current) Motor. IT works an normal 220 Volt Single Phase AC supply. It contains a converting direct from AC to DC Because of Brushless DC, It is more ef icient than recent 50 watt energy fans. It has following features.

- (1) Power consumption as full speed – 28 watt
- (2) Reduces power consumption by 65% than commercial fans.
- (3) Runs smoothly or wide voltage range of 110v – 285v.
- (4) Runs 3 times longer an inverter than ordinary fans.
- (5) Zero heating of motor result in increase fan life.
- (6) Better output performances or RPM or air delivery speed.
- (7) Smart remote controller.
- (8) It has sleep mode & timer mode.

**Comparison between conventional ceiling fan &
EESL make energy efficient fan**

S.No.	Parameters	Conventional fan	EESL fan
1	Wattage	75W	50W
2	Units Consumed per day per hour 12 hrs usage	0.9 kWh	0.6 kWh
3	Unit consumed per month per fan	27Kw	18Kw
4	Unit consumed per year per fan	324	216

Money saved per year per fan@ 10 per kwh	Rs/-1080
Total no. Of fans replaced	1883 fan
Total saving in Energy	Rs/- 20,33,640/-
Money saved	
Investment made for purchase of fan	
@ of Rs/- 1500 per fan	Rs/- 56,49,000/-
Payback period	33 MONTHS

COMPARISON OF DIFFERENT STAR RATED AIR CONDITIONERS

S.No.	Type	0.75T	1T	1.5T	2T
1	1 Star non inverter type	627	843	1246	1648
2	2 Star non inverter type	596	800	1184	1626
3	3 Star non inverter type	542	747	1104	1448
4	4 Star inverter type	464	645	945	1293
5	5 Star inverter type	450	554	840	1113

Comparison Between Inverter BEE split AC & Non Inverter conventional AC

S.No.	INVERTER AC 1.5T 5 STAR	CONVENTIONAL NON INVERTER
1	These are variable speed/variable air circulation and there of quite different from regular Air condition	These are fixed speed & fixed tonnage AC
2	Inverter AC can adjust Their speed depending upon heat load of room	These AC can not do so
3	It saves 30 to 40% power and Highly energy efficient	It consumes power and is much less efficient
4	No voltage fluctuation	It has fluctuation
5	It gives constant cooling of the room by adjusting the speed/air circulation	It can not do so

**Energy/Cost saving with replacement by energy efficient 5 star
inverter AC**

Energy saving per AC per year	1771kWh
Saving in Rs. for 20 AC per year	35420 kWh
Saving in Rupees @ Rs. 10	Rs 3,50,650
Total investment @ Rs 32000 for 2AC	Rs/-6,33,600/-
Payback period	22 Months

SUBMERSIBLE PUMP

This is a device coupled with a completely air tight sealed motor to the pump in entire assembly is submersed within the liquid to be pushed. These pump are mainly use to prevent cavitations of the pump. t. he advantage of submersible pumps are:

- (1) This pump does not need priming
- (2) This pumps are very ef icient
- (3) The pressure of water drives the water into pump hence conserves lot of energy
- (4) This pump can handle solids as well as liquid
- (5) This pump are quite in water
- (6) The pumps in power house are 1.5kW/2HP and are running with full load. Since these pumps are only 1.5 kW hence no much saving potential can be derived.

SN	LOCATION	CAPACITY	QTY.	RUNNING	TYPE OF PUMP
1	Kalinga University Premisis	2 HP	1	YES	Mono block
		3 HP	2	YES	Mono block
		5 HP	1	YES	Mono block
		5 HP	3	YES	Open well

It is recommended to use the soft starters in place of DOL starters due to following reasons.

- Smooth starting.
- More starting torque
- Less mechanical stress
- Improved power factor
- Lower maximum demand
- Less mechanical maintenance

UNINTERRUPTIBLE POWER SUPPLY

An uninterruptible Power Supply (UPS) is a device that has an alternate source of energy, typically a battery backup that can provide power when the primary power source is temporarily disabled. The switchover item must be small enough to not cause a disruption in the operation of the loads.

The components of a UPS are converter (AC to DC), battery, inverter (DC to AC), Monitor and control hardware/software.

There are two types UPS architectures namely line interactive (Off Line) and ON Line. Simple OFF Line UPS system, connect the load directly to the input AC line voltage deviates beyond preset limits by means of an auto-transformer based Automatic Voltage Regulator. In case of significant utility voltage dips or outage these system transfer the UPS to battery operation.

Due to its direct connection to input AC power, OFF lines types, including Line interactive systems offer higher efficiency when compared to an Online UPS. But, unstable grid environment, with frequent power interruptions nor outages, might cause these system to suffer frequent transfer to battery operation. Thus, exposing the critical load to possible failures due to unsmooth or unsuccessful transfer, or to battery failure, because of numerous battery discharges, which decrease drastically battery life time.

An online UPS system, frequently called Double conversion system, first converts the AC input voltage to stabilized DC, which is then converted back to AC, to feed continuously the critical load, with pure stabilized sinusoidal output, coming either from the input line via AC/DC converter, or from batteries in case of power failure.

Energy efficiency of a UPS is the difference between the amount of energy that goes into a UPS versus the amount of useful energy that comes out of the UPS and actually powers loads. In all UPS systems, some energy is lost as heat when it passes through the internal components of the UPS (including transformers, rectifiers, and inverters).

SOFT STARTER

When starting, AC Induction motor develops more torque than is required at full speed. This stress is transferred to the mechanical transmission system resulting in excessive wear and premature failure of chains, belts, gears, mechanical seals, etc. Additionally, rapid acceleration also has a massive impact on electricity supply charges with high inrush currents drawing = 600% of the normal run current.

The use of Star Delta only provides a partial solution to the problem. Should the motors slow down during the transition period, the high peaks can be repeated and can even exceed direct on line current.

Soft starter provides a reliable and economical solution to these problems by delivering a controlled release of power to the motor, thereby providing smooth, step less acceleration and deceleration. Motor life will be extended as damage to windings and bearings is reduced.

Soft start & soft stop is built into 3 phase units, providing controlled starting and stopping with a selection of ramp times and current limit settings to suit all applications.

Advantage of soft starter

- Les mechanical stress
- Improved power factor
- Lower maximum demand

GENERATOR (250 KVA * 2) Available for Emergency Supply

Generator Size (kW)	1/4 Load (gal/hr)	1/2 Load (gal/hr)	3/4 Load (gal/hr)	Full Load (gal/hr)
20	0.6	0.9	1.3	1.6
30	1.3	1.8	2.4	2.9
40	1.6	2.3	3.2	4.0
60	1.8	2.9	3.8	4.8
75	2.4	3.4	4.6	6.1
100	2.6	4.1	5.8	7.4
125	3.1	5.0	7.1	9.1
135	3.3	5.4	7.6	9.8
150	3.6	5.9	8.4	10.9
175	4.1	6.8	9.7	12.7
200	4.7	7.7	11.0	14.4
230	5.3	8.8	12.5	16.6
250	5.7	9.5	13.6	18.0
300	6.8	11.3	16.1	21.5
350	7.9	13.1	18.7	25.1
400	8.9	14.9	21.3	28.6
500	11.0	18.5	26.4	35.7
600	13.2	22.0	31.5	42.8
750	16.3	27.4	39.3	53.4
1000	21.6	36.4	52.1	71.1

Solar Energy system

As The cost of solar energy

Reduced in recent year with major improvement in technical efficiencies, the solar is seen viable source of alternate energy, solar panels are widely use in south India as the solar intensity is very high.

How solar panel work (step by step)

- (1) The silicon photo-voltaic cells absorb the energy of sun and convert it to D.C. Electricity.
- (2) The solar inverter converts DC electricity from solar modules to AC Electricity which is used by most home applications.
- (3) AC Electricity flows through home powering electrical devices.
- (4) Excess Electricity produced by solar panels to feed to electric grid through net metering.

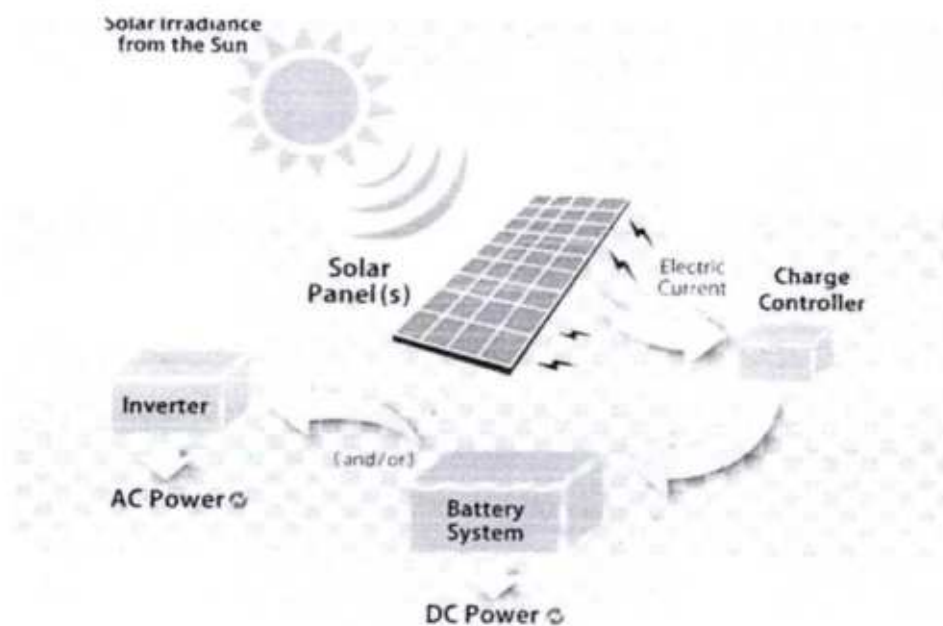
Advantage of solar energy

- (1) Solar power is pollution free and causes no greenhouse gases to be emitted after installation.
- (2) Reduced dependence on foreign oil and fossil fuels.
- (3) Renewable clean power that is available everyday. Even cloudy days produce some power.
- (4) Virtually no maintenance for solar panel and their useful life is 30 years.

- (5) Excess power can be sold back to power company.
- (6) Ability to live grid free if enough power is generated.
- (7) Can be installed anywhere in field to the building on roof or a ground.
- (8) Safer than traditional electric current.
- (9) Tax incentives are granted by Govt.
- (10) Using solar power reduces the electricity bills from utilities.

Disadvantage

- (1) High initial cost.
- (2) No solar power at night so there is a need of battery bank.
- (3) Lower product in winter & cloudy days.

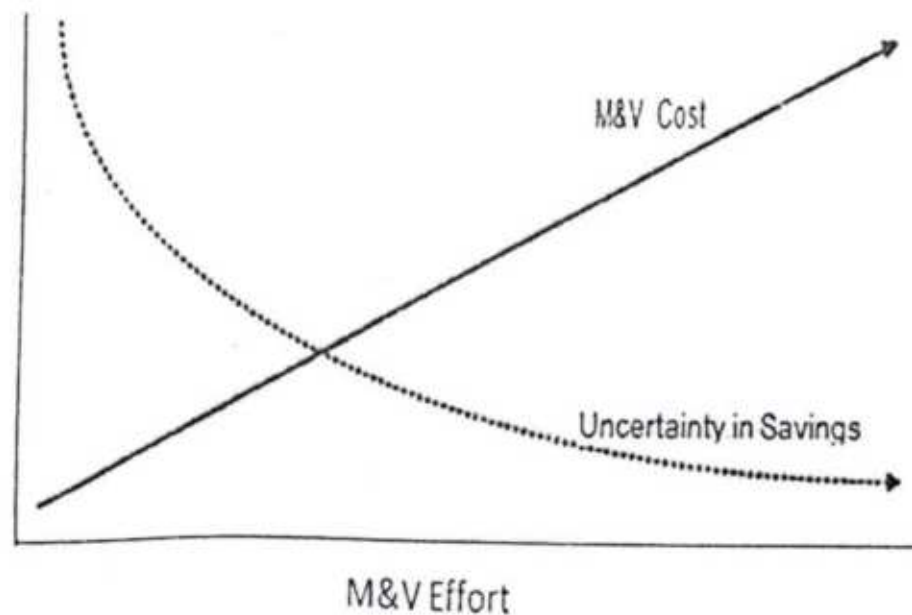


ENERGY METERING SYSTEM

It is possible to establish The existing energy consumption of an organization through energy audit however this only produces a picture of past energy consumption in order to keep control of subsequent energy consumption it is necessary to initiate a monitoring program through installation of energy meters in every feeder. To achieve an improvement in energy performance a targeting program in which targets are sets must accompany the monitoring process.

Energy monitoring and targeting (M&T) is primarily a management technique that uses a energy information as a basis to eliminate waste reduce and control current level of energy in existing operation system. It is base of the principle "You can't manage what you don't measure"_is essentially combines the principals of energy use of statistics.

By using M & T the utilities such as fuel steam compressed air water and electricity are managed as controllable resources. It can only monitoring and targeting can save 5 to 15% of energy.



GENERAL TIPS FOR ENERGY CONSERVATION

➤ ELECTRICITY

- Schedule your operation to maintain a high load factor.
- Minimize maximum demand bt tripping loads through a demand controller
- Use stand by electric generation equipment for on-peak high load periods.
- Set transformer taps to optimum settings.
- Shut off unnecessary computers, printers, and copiers at night.

➤ MOTORS

- Properly size to the load for optimum ef iciency.
- (High ef iciency motors offer of 4-5% higher ef iciency than standard motors)
- Provide proper ventilation.
- For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved.
- Check for under-voltage conditions.
- Balance the tree-phase power supplies.
- An imbalanced voltage can reduce 3-5% in motor input power.
- Demand ef iciency restoration after motor rewinding.

➤ **DRIVES**

- Use variable-speed drives for large variable loads.
- Use high-efficiency gear sets.
- Use precision alignment.
- Check belt tension regularly.
- Eliminate variable – pitch pulleys.
- Use flat belts as alternative to v-belts.
- Use synthetic lubricants for large gearboxes.
- Eliminate eddy current couplings.
- Shut then off when not needed.

➤ **FANS**

- Use smooth, well-rounded air inlet cones for fan air intakes.
- Avoid poor flow distribution at the fan inlet.
- Minimize fan inlet and outlet obstructions.
- Clean screens, filters, and fan blades regularly.
- Use aerofoil-shaped fan blades.
- Minimize fan speeds.
- Use low-slip or flat belts.
- Check belt tension regularly.
- Eliminate variable pitch pulleys.
- Use Variable speed drives for large variable fan loads.

- Use energy-efficient motors for continuous or near-continuous operation.
- Eliminate leaks in ductwork.
- Minimize bends in ductwork.
- Turn fans off when not needed.

➤ **BLOWERS**

- Use smooth, well-rounded air inlet ducts or cones for air intakes.
- Minimize blower inlet and outlet obstructions.
- Clean screens and filters regularly.
- Minimize blower speed.
- Use low-slip or no-slip belts.
- Check belt tension regularly.
- Eliminate variable speed drives for large variable blower loads.
- Use variable speed drives for large variable blower loads.
- Use energy-efficient motors for continuous or near-continuous operation.
- Eliminate ductwork leaks.
- Turn blowers off when they are not needed.

➤ **PUMPS**

- Operate pumping near best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of smaller units.
- Stop running both pumps-add an auto-start for an on-line spare or add a booster pump in the problem area.
- Use booster pumps for small loads requiring higher pressure.
- Increase fluid temperature differentials to reduce pumping rates.
- Repair seals and packing to minimize water waste.
- Balance the system to minimize losses and reduce pump power requirements.
- Use siphon effect to advantage : don't waste pumping head with a free-fall (gravity) return.

➤ CHILLERS

- Increase the chilled water temperature set point if possible.
- Use the lowest temperature condenser water available that the chiller can handle.
- Reducing condensing temperature by 5.5°C, result in a 20 – 25% decrease in compressor power consumption.
- Increase the evaporator temperature.
- 5.5°C increase in evaporator temperature reduces compressor power consumption by 20 – 25%.
- Clean heat exchangers when fouled.
- 1 mm scale build-up on condenser tubes can increase energy consumption by 40%.
- Optimize condenser water flow rate refrigerated water flow rate.
- Use water-cooled rather than air-cooled chiller condenser.
- Use energy-efficient motors for continuous or near-continuous operation.
- Specify appropriate fouling factors for condensers.
- Do not overcharge oil.
- Install a control system to coordinate multiple chillers.
- Study part-load characteristics and cycling costs to determine the most-efficient mode for operating multiple chillers.
- Run the chillers with the lowest operating costs to serve base load.
- Avoid over-sizing-match the connected load.
- Establish a chiller efficiently-maintenance program as a part of your continuous energy management program.

➤ **HVAC (Heating / Ventilation / Air conditioning)**

- Tune up the HVAC control system.
- Consider installing a building automation system (BAS) or energy management system (EMS) or restoring an out-of-service one.
- Balance the system to minimize leaks and reduce blower/fan/pump power requirements.
- Eliminate or reduce reheat whenever possible.
- Use appropriate HVAC thermostat setback.
- Use building thermal lag to minimize HVAC equipment operating time.
- In winter during unoccupied periods, allow temperatures to fall as low as possible without freezing water lines or damaging stored materials.
- In summer during unoccupied periods, allow temperatures to rise as high as possible without damaging stored materials.
- Improved control and utilization of outside air.
- Use air-to-air heat exchangers to reduce energy requirements for heating and cooling of outside air.
- Reduce HVAC system operating hours (e.g. – night, weekend.)
- Optimize ventilation.

- Ventilate only when necessary. To allow some areas to be shut down when unoccupied, install dedicated HVAC systems on continuous loads (e.g. – computer rooms.)
- Provide dedicated outside air supply to kitchens, cleaning rooms, combustions equipment, etc. To avoid excessive exhausting of conditional air.
- Use evaporative cooling in dry climates.
- Clean HVAC unit coils periodically and comb mashed ins.
- Upgrade filter banks to reduce pressure drop and thus lower fan power requirements.
- Check HVAC filters on a schedule (at least monthly) and clean/change if appropriate.
- Check pneumatic controls air compressor for proper operation, cycling, and maintenance.
- Isolated air conditioned loading dock areas and cool storage areas using high-speed doors or clear PVC strip curtains.
- Install ceiling fans to minimize thermal stratification in high-bay areas.
- Relocate air diffusers to optimum heights in areas with high ceilings.
- Consider reducing ceiling heights.
- Eliminate obstructions in front of radiators, baseboard heaters, etc.

- Check reflectors on infrared heat for cleanliness and proper beam direction.
- Use professionally-designed industrial ventilation hoods for dust and vapor control.
- Use local infrared heat for personnel rather than heating the entire area.
- Use spot cooling and heating (e.g. - - use ceiling fans for personal rather than cooling the entire area).
- Purchase only high-efficiency models for HVAC units.
- Put HVAC window units on timer control.
- Don't oversize cooling units. (oversize units will "short cycle" when results in poor humidity control).
- Install multi-fuelling capability and run with the cheapest fuel available at the time.
- Consider dedicated make-up air for exhaust hoods. (Why exhaust the air conditioning or heat if you don't need to?).
- Minimize HVAC fan speeds.
- Consider desiccant drying of outside air to reduce cooling requirements in humid climates.
- Seal leaky HVAC ductwork.
- Seal all leaks around coils.

- Repair loose or damaged flexible connections (including those under air handling units).
- Eliminate simultaneous heating and cooling during seasonal transition periods.
- Zone HVAC air and water system to minimize energy use.
- Inspect, clean, lubricate, and adjust damper blades and linkages.
- Establish an HVAC efficiency-maintenance program. Start with an energy audit and follow-up, then make an HVAC efficiency-maintenance program a part of your continuous energy management program.
- Online condenser cleaning system should be installed at chiller. This will keep the condenser tubes clean and will maintain the approach within range.

➤ **LIGHTING**

- Reduce excessive illumination levels to standard levels using switching, de-lamping, Etc. (know the electrical before doing de-lamping).
- Aggressively control lighting with clock timers, delay timers, photocells, and/or occupancy sensors.

- Install efficient alternative to incandescent lighting, mercury vapor lighting, etc. Efficiency (lumens/watt) of various technologies range from best to worst approximately as follows: low pressure sodium, high pressure sodium, metal halide, fluorescent, mercury vapor, incandescent.
- Select ballasts and lamps carefully with high power factor and long-term efficiency in mind.
- Upgrade obsolete fluorescent system to compact fluorescents and electronics ballasts.
- Consider lowering the fixtures to enable using less of them.
- Consider skylighting, skylights, etc.
- Consider painting the walls a lighter colour and using less lighting fixtures or lower wattages.
- Use task lighting and reduce background illumination.
- Re-evaluate exterior lighting strategy, type, and control, Control it aggressively.
- Change exit signs from incandescent to LED.

➤ **DG SETS**

- Optimize loading.
- Use waste heat to generate steam/hot water/power an absorption chiller or preheat process or utility feeds.
- Use jacket and head cooling water for process needs.
- Clean air filters regularly.
- Insulate exhaust pipes to reduce DG set room temperature.
- Use cheaper heavy fuel oil for capacities than 1MW.

➤ **BUILDINGS**

- Seal exterior cracks/opening/gaps with caulk, weather stripping, etc.
Consider new thermal doors, thermal windows, roofing insulation, etc.
- Install wind breaks near exterior doors.
- Replace single-pane glass with insulating glass.
- Consider covering some window and skylight areas with insulated wall panels inside the building.
- If visibility is not required but light is required, consider, replacing exterior windows with insulated glass block.
- Consider tinted glass, reflective glass, coating, awnings, overhangs, draperies, blinds, and shades for sunlit exterior windows.
- Use landscaping to advantage.

- Add vestibules or revolving doors to primary exterior personal doors.
- Consider automatic doors, air curtains, strip door, etc. At high-traffic passages between conditioned and non-conditioned spaces. Use self-closing doors if possible.
- Use immediate doors on stairways and vertical passages to minimize building stack effect.
- Use dock seals at shipping and receiving doors.
- Bring cleaning personnel in during the working day or as soon after as possible to minimize lighting and HVAC costs.

➤ WATER & WASTEWATER

- Recycle water, particularly for uses with less-critical quality requirements.
- Recycle water especially if sewer costs are based on water consumption.
- Balance closed systems to minimize losses and reduce pump power requirements.
- Eliminate once-through cooling with water.
- Use the at least expensive type of water that will satisfy the requirement.

- Fix water leaks.
- Text for underground water leaks. (It's easy to do over a holiday shutdown).
- Check water over low pipes for proper operating level.
- Automate blow down to minimize it.
- Provide proper tools for wash down – especially self-closing nozzles.
- Install efficient irrigation.
- Reduce flows at water sampling stations.
- Eliminate continuous overflow at water tanks.
- Promptly repair leaking toilets and faucets.
- Use water restrictors on faucets, shower, etc.
- Use self-closing types faucets in restrooms.
- Use the lowest possible hot water temperature.
- Do not use a heating system hot water boiler to provide service hot water during the cooling season - - install a smaller, more-efficient system for the cooling season service hot water.
- If water must be heated electrically, consider accumulation in a large insulated storage tanks to minimize heating at on-peak electric rates.
- Use multiple, distributed, small water heaters to minimize thermal losses in large piping system.
- Use freeze protection valves rather than manual of lines.

- Consider leased and mobile water treatment system, especially for deionized water.
- Seal sumps to prevent seepage inward from necessitating extra sump pump operation.
- Install pre-treatment to reduce TOC and BOD surchargers.
- Verify the water meter reading. (you'd be amazed how long a meter reading can be estimated after the meter breaks or the meter pit fills with water.)
- Verify the sewer flows if the sewer bills on them.

➤ MISCELLANEOUS

- Meter and unmetered utilities. Know what is normal efficient use. Track down causes of deviations.
- Shut down spare, idling, or unneeded equipment.
- Make sure that all of the utilities to redundant areas are turned off - - including utilities like compressed air and cooling water.
- Install automatic control to efficiently coordinate multiple air compressors, chillers, cooling tower cells, boilers, etc.
- Renegotiate utilities contracts to reflect current loads and variations.
- Consider buying utilities contracts to reflect current loads and variations.
- Leased space often has low-bid inefficient equipment. Consider upgrades of your lease will continue for several more years.
- Adjust fluid temperature within acceptable limits to minimize underestimate heat transfer in no long pipelines.
- Minimize use of flow bypasses and minimize bypass flow rate.
- Provide restriction orifices in purges (nitrogen, steam, etc.).
- Eliminate unnecessary flow measurement orifices.
- Consider alternatives to high-pressure drops across valves.
- Turn off winter heat tracing that is on in summer.

Minutes of the Quarterly Meeting of the National Council on Medical Devices and Diagnostics on 4th August via Hybrid Mode

Mr Vineet Gupta, Chairman extended a warm welcome to all council members and facilitated introductions. Chairman is very keen on issues related to business continuity. Furthermore, he directed the secretariat to develop a mechanism for effectively tracking policy initiatives.

Mr Dinesh Arora, Co-chair, welcome the members of the council and highlighted the importance of smaller groups directing their attention towards the council's agenda.

Discussions and Action Points:

- Council agenda will focus on the continuity of Business rules to come out which should be implementable with the ease of doing business.
- The Department of Pharmaceuticals is actively engaged in developing the PLI scheme and enhancing India's brand image. We have requested the Department of Pharmaceuticals to initiate technical advocacy in this domain, which presents a promising area for our concentrated efforts.
- Draft on Regulatory Pathway for Refurbishment to be shared with the members of the council for inputs and comments - OEM & Non OEM that also to be brought under regulatory control. Because this mainly focused on safety and efficacy of the patient
- Technical & Financial support to be provided for Indian Manufacturer to get CE & FDA approval.
- Exemption from Legal Metrology, QCO & CRO - ASSOCHAM to submit the representation to NITI Aayog addressing to Mr. Suman Bery, NITI Aayog & CC to Dr Vinod Paul. Following this, a comprehensive discussion involving all stakeholders can be organized.

NAAC Environmental Parameters Review Report (EPRR)
Kalinga University, Raipur, Chhattisgarh

This is to certify that
ASSOCHAM
has carried out the following for

Kalinga University, Raipur

1. Energy Audit
2. Environmental Audit
3. Water Audit

The ensuing reports have been prepared as per the NAAC guidelines for Criteria 7 (7.1.2 to 7.1.6). The reports have been prepared as per primary visits and documents obtained from the client.

For ASSOCHAM


A. K. Verma
Accredited Energy Auditor
AEA-0194

Director, Akhildeep Management and
Energy Consultant Pvt. Ltd.




Rinaki Dasgupta
Environmental Auditor
ASSOCHAM

July 2021-22

THE ASSOCIATED CHAMBERS OF COMMERCE AND INDUSTRY OF INDIA

(CIN : U91990DL1920PLC008223)

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NAAC Environmental Parameters Review Report (EPRR)

Kalinga University, Raipur, Chhattisgarh

Kalinga University
Raipur, Chhattisgarh

Energy Audit | Environmental Audit | Water Audit

2021-22



Regn. No. EA-11607



Certificate No. 6232

National Productivity Council
(National Certifying Agency)

PROVISIONAL CERTIFICATE

*This is to certify that Mr. / Ms.Deepak Kumar Jain.....
son / daughter of Mr.....S. Kumar Jain.....
has passed the National Certification Examination for Energy Auditors held in October - 2011, conducted on
behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.*

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

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

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India

Date : 1st February, 2012

Controller of Examination

NAAC Environmental Parameters Review Report (EPRR)

Kalinga University, Kotni, Raipur, Chhattisgarh

2021-22

1.0 Background

The NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL (NAAC) conducts assessment and accreditation of Higher Educational Institutions (HEI) such as colleges, universities, or other recognised institutions to derive an understanding of the 'Quality Status' of the institution. NAAC evaluates the institutions for its conformance to the standards of quality in terms of its performance related to the educational processes and outcomes, curriculum coverage, teaching-learning processes, faculty, research, infrastructure, learning resources, organisation, governance, financial wellbeing and student services.

Kalinga University, Raipur has retained ASSOCHAM Councils on Environment and Climate Change for conducting a NAAC review with focus on Criteria VII pertaining to Environmental parameters. The ensuing report covers the various points and provides an overview of the various initiatives as part of NAAC requirements for the year 2021-22.

2.0 About ASSOCHAM

The Associated Chambers of Commerce & Industry of India (ASSOCHAM) is the country's oldest apex chamber, initiated its endeavour of value creation for the industry in 1920. It brings in actionable insights to strengthen the Indian ecosystem, leveraging its network of more than 4,50,000 members. With a strong presence in states, and key cities globally, ASSOCHAM also has more than 400 associations, federations, and regional chambers in its fold.

ASSOCHAM with its principles of SEED: sustainability, empowerment, entrepreneurship, and digitisation serve as a bridge between the industry and government on policy and regulatory, ease of business and cross cutting sectoral issues.

The GEM green building certification is an indigenous systematic evidence-based rating system for built environment including commercial and residential complexes. It is designed on the principles of NBC, ECBC and selected CPWD guidelines. It is recognized in several states for availing incentives and subsidies for FAR and other existing benefits. GEM is at par with all other green certification programme.

The councils for Environment & Climate Change and Water were formed keeping in mind the importance and a greater need to engage members on the core principles of sustainable development, circular economy, and SDGs.

The councils have been involved in engaging stakeholders and members for policy interventions, addressing their business concerns for better productivity and profitability. The councils have a vision for being the leading strategic, knowledge and solutions platform for members and stakeholders for achieving 5Ps.

3.0 About Kalinga University

Kalinga University is located at Naya Raipur, Chhattisgarh that spreads over 35 acres of lush green campus enveloped with serene beauty. As a proactive University concerned with the conservation of the environment, we generate awareness and promote environmental care at both individual and community level. We aim to create a pervasive atmosphere on environmental issues by engaging faculty, students and the general public.



Photo 1: Kalinga University

The Kalinga university is situated in village Kotni, 35 km from Raipur city.

Kalinga University, Raipur is a NAAC accredited University with Grade B+ and the Only Private University in Chhattisgarh ranked in Top 101-150 Universities in NIRF Ranking 2022 and has emerged as a centre of excellence of higher education in Central India. Strategically located in the Smart City of New Raipur, this University has started carving a niche for itself in the education domain and is rising as a shining star on the horizon of quality education.

Establishment - Established in 2013, this university has been able to win the confidence of over 8000 students. Meritorious students from all over the country and 23+ foreign countries have chosen this University for their education and career.

Schools of Excellence - A centre for Doctoral research programmes in various fields. Currently the University is serving the student community through various UG and PG programs namely Engineering, Law, Pharmacy, Arts & Humanities, Science, Commerce & Management, Biotechnology, Information Technology, Library Science, Fashion Design & Interior Design.

Academics and Faculty - All schools are headed by senior professors having excellent academic credentials and experience of teaching, publications and research. They are ably supported by the well qualified faculty members who come from top educational institutions and the industry. Students also get an opportunity to learn from a distinguished panel of experts drawn from various industries, who regularly come for guest lectures.

Infrastructure – Kalinga boasts of World Class Infrastructure and student facilities with student centric approach. Highest attention is paid to hands on learning approach and students are encouraged to come up with innovative ideas for projects and practical's. The University has more than 75 laboratories and workshops, all well equipped with the latest, state of the art apparatus and tools. Special emphasis is given to the development of communication skills through the language lab. More than 1200 computers are available for the use of the students.

The library has a collection of over 79,000+ books and also offers Digital content through membership of DELNET, National Digital Library and NPTEL. Various magazines and journals are available for the use of the faculty and students.

Infrastructure consists of Student Hostel facilities, Green Acres, Canteen, Food Mess, Gymnasium, Fully Wi-Fi Campus, ATM, Mini Market, Student hangout Areas, Sports Complex, Re-creation Halls with Indoor Games and Music and recreation activities.

Industry Orientation and Leadership - Industry interaction is an integral part of the curriculum and Industrial visits, internships on live projects and mentoring by the industry leaders are regular features. The University has developed excellent connections with the top Industries of the region by taking memberships of leading industrial associations like ASSOCHAM, Confederation of Indian Industries, PHD Chamber of Commerce and Industry, Federation of Indian Chamber of Commerce and Industry, Indian Importers Chamber of Commerce and Industry. The University has an active chapter of Young Indians in which students get an opportunity to interact extensively with the industry leaders and attend various corporate seminars and events.

Life Changing Experience - Kalinga is a Life Changing experience where the stress is on over all development of students. NCC, NSS and Various other clubs and societies offer opportunities to students to showcase their talent and learn under the guidance of experts. Music, dance and martial arts trainers are available for the students. Coaches of different games and sports like Cricket, Football, Basketball, Volleyball and athletics are also available for sharpening the talent of the students.

Highlights of Kalinga University

1	Research oriented, student centric university attracting students from all parts of India and over 22 foreign countries.
2	8th Private University in the country approved under Section 12B by UGC.
3	The best Private University in Central India Award by ASSOCHAM in 2020.
4	44th Rank in top Universities in the country as per survey done by outlook-icare in 2019.
5	30th Rank in top universities in the country established after the year 2000 as per survey done by India Today in 2018.
6	Management Department Ranked as 7th Best in the country as per survey by Competition Success Review in 2018.
7	Engineering Department Ranked as 3rd Best in the country as per survey by Competition Success Review in 2019.
8	State of the art Library with over 80,000 books and E access to various journals and databases including DELNET, NPTEL, NDL, J-Gate (Social Science), J-Gate (Science and Technology), INSPEC Database of Elsevier & Web of Science.
9	Free of cost Coaching classes for Competitive exams and IT skills in Collaboration with Bosch, NIIT, and BT for all students.
10	Free of Cost Hobby classes for Self defence and Martial arts , Instrumental and Vocal Music for hostel students.
11	Central Instrumentation Facility with world class Scientific apparatus and research databases.
12	Innovation and Incubation Cell to support startups and entrepreneurship of students.
13	Accredited by NAAC with B+ grade.
14	Listed in Rank Band 150-200 in University category in NIRF Ranking 2021.
15	"Free of cost" Value Added courses available for all students.
16	Unique policy of acquiring "Extra Credits" for Various Co-curricular & academic activities.
17	Mentoring of all students by dedicated faculty members.

18	Extra classes for slow learners.
19	Regular field visits, guest lectures, case studies, role plays, mock sessions etc.
20	Soft skills classes for all students.
21	Activities, internship & placement opportunities for all students.

4.0 Background

Environmental issues are important for wellbeing of people and surroundings. They are increasingly impacting several walks of life and institutions. Proper addressing of environment concerns ensures that the bottom line and future prospects of companies and institutions.

They can present both opportunities and risk and can have important implications for strategy, competitiveness, risk management, stakeholder relations and business resilience.

The ICAI in its publication states that an understanding of how environmental issues impact stakeholders and understanding stakeholder's expectations about environmental issues can contribute valuable insights for the identification of strategic opportunities and corporate risks. Positive stakeholder relations build trust, increasingly essential for competitiveness and resilience.

Environment audit is one such tool which provides the owners and stakeholders a 360-degree view of the present status of physical environment in any location. It includes various components such as air management, water conservation, wastewater management, solid waste management, landscaping, and plantation aspects.

The aim is to assess how well environmental organisation, management and equipment are performing with the aim of contributing to safeguard the environment by facilitating management control of environmental practices and assessing compliance with organisational policies, which would include meeting regulatory requirement.

5.0 Audit Phases

The various phases of audit are

1. Pre-audit
2. Audit
3. Post-audit

The pre-audit consists of

1. Objectives
2. Scope

3. Audit Criteria
4. Audit team
5. Audit plan
6. Facility
7. Review

The audit phases consist of

1. Opening meeting
2. Physical visit and inspection
3. Records and documents review
4. Interviews
5. Initial review of findings
6. Closing

The post-audit phase consists of

1. Final evaluations
2. Preliminary report
3. Management approval
4. Final report

Audit Follow up and actions taken.

The ensuing report is based on the above guidelines.

5.1 Part A: Pre-audit

1. Objectives
The objective is to undertake an environmental assessment and report the findings through an audit report as per NAAC criteria 7.0.
2. Scope
The scope of the audit is the physical boundaries of Kalinga University situated at village: Kotni, Raipur in the state of Chhattisgarh.
3. Audit Criteria
The audit criteria for the purpose of this environmental audit is the guidelines of environment audit by ICAI.
4. Audit Team
The audit team is responsible for the physical inspection and documentation of the audit. The team consists of Chairman along with Member Secretary with members from all departments of university.

5. Audit Plan

The audit plan consists of opening meetings, physical inspection, interviews, document collection and verification, reporting and documentation.

5.2 Part B: Audit

The audit phases consist of

1. Opening meeting

An opening meeting was held on 26th July, 2022 with the registrar and other team members from the environment committee.

2. Physical visit and inspection

The audit team conducted physical visit to different departments inside the campus along with members from the environment committee of the university under the guidance of member secretary.

3. Records and documents review

The audit team inspected several documents during the audit. Some of these are

- a. Water register
- b. List of trees
- c. Waste logs
- d. Solar power bills
- e. STP documents
- f. MoUs with multiple agencies on waste.

4. Interviews

The interviews were conducted with administration, accounts, academics and randomly selected students and members of staff for their views on the environment. The team also interviewed the member secretary of the environment committee to obtain an overview of the environmental practices and actions of the university.

5. Initial review of findings

The findings were recorded, reviewed and shared with the management through the environment committee of Kalinga university.

6. Closing

A closing meeting was held with the member secretary and select members of the environment committee.

5.3 Part C: Post Audit

The post-audit phase consists of

1. Final evaluations
The final evaluations were initiated post receipt of the preliminary findings of the audit from the management.
2. Preliminary report
The preliminary report was shared with the management for their review and approval.
3. Management approval
The management accorded acceptance of the preliminary report.
4. Final report
The final report was prepared post obtaining the remarks and observations from the Kalinga management and environment committee.

6.0 Audit Observations and Findings

Solar Power

Kalinga University has set up Solar Panels generating 300 KW (200 KW + 100 KW) of electricity, which is directly linked to the grid. Apart from the above, the university has 24 solar street lightings.

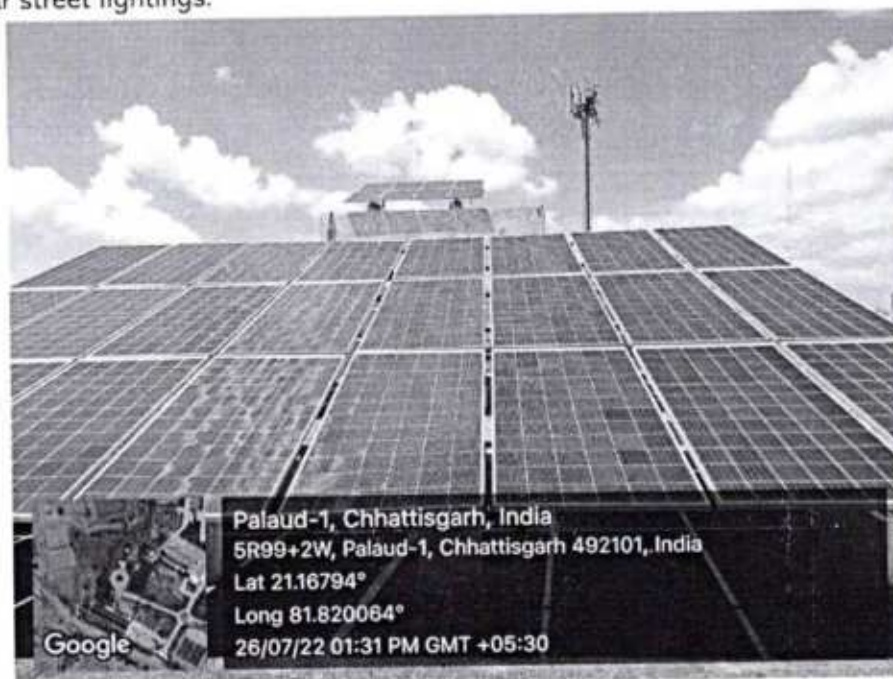


Photo 2: Solar panel at Kalinga University

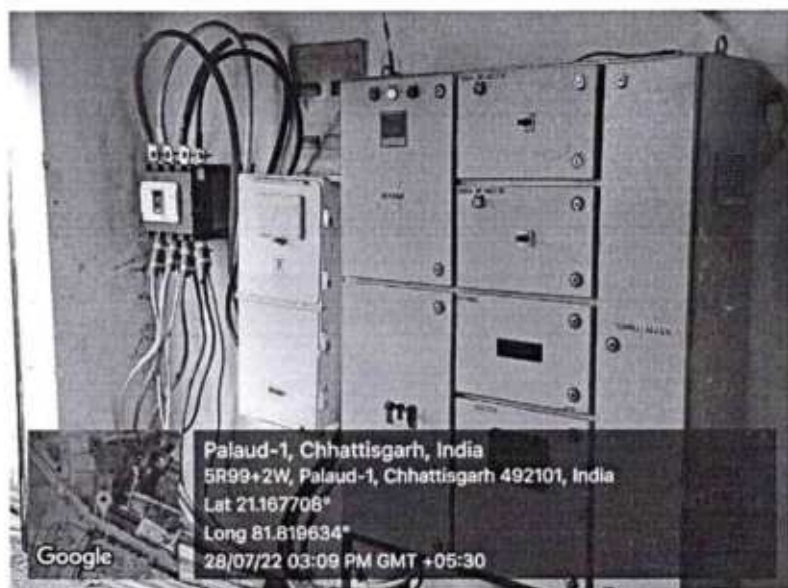


Photo 3: Solar Panel

Air

The ambient air samples were collected from two locations inside the campus. These were analyzed as per NAAQS parameters. The results are provided in Annexure-10. The university also ensures that there is no open burning of solid waste.

DG sets

There are three generators in use – 1 x 125, 2 x 45 KVA. They are as per CPCB guidelines.



Photo 4: DG sets

Water

The university has installed groundwater extraction systems inside the campus to meet water demand. The groundwater is pumped to overhead tanks and passed through RO. Filtered water is supplied for drinking purposes. Raw water is utilized for laundry, washing and bathing purposes. Cooking water supplied is of drinking quality.

The tank capacity at various locations is provided in Table 1

Table 1: water storage quantity in Campus

S.No	Block	Quantity
1.	Main Building	40,000 ltr
2.	Academic Block	20,000 ltr
3.	Indus Hostel	50,000 ltr
4.	Bhramputra Hostel	40,000 ltr
5.	Everest Hostel	20,000 ltr

The water requirement as per NBC 2016 is provided in Table. This quantity is at a higher estimate. The water consumption is around 75% of the estimated quantity. The staffing pattern for the university is 600, out of which 200 are administrative, 400 teaching and 200 working staff. There are two restaurants with seating capacity of 10 indoors and 30 outdoors. The campus also houses canteens. There are 3500 non-resident students who ply from their place of residence to the campus by bus and personal transport. The annual holiday for students has been estimated to be around 75 days spread over two to three months along with leave with respect to medical and personal reasons.

Table 2: Water demand as per NBC for Kalinga University

S.No	Establishment	Number	Persons	NBC standard	Quantity
1.	Hostels	4	1200	135	1,62,000
2.	Offices	45	200	45	27,000
3.	Restaurant	2	10 (indoors) 30 (outdoors)	70	1,400 4,200
4.	Non-resident students		3500	45	1,57,500
5.	Total requirement				3,52,100
6.	Say				350 KLD

The supply is also obtained from tankers of 4 KL capacity. This water is utilized for drinking purposes. The approximate distribution of water is provided in table 3.

Table 3: Number of tankers utilized by Hostels

S.No	Establishment	Number of tankers
1.	Brahmaputra	210
2.	Girl's hostel	18

3.	Gole chowk	18
4.	Tree/Garden	76
5.	Sports Ground	22
6.	Makhana	13
	Total	325

The total tankers received in a month are an average of 640-650 KL. It translates to around 80-90 tankers per day. This would then indicate volume of 80-90 KLD. This indicates that the tankers cater to 25%-30% of the total water demand.

The main storage inside the campus is at gole chowk of 35 KL. The underground tank at Brahmaputra hostel is of 15 KL capacity.

The wastewater generated is therefore, 350 KL x 80% = 280 KL

The groundwater sampling reveals the following results.

Sampling was also undertaken from the artificial pond created by the university authorities. The pond is 200 KL capacity.

The analytical result from the pond is provided in table.

The university also employs water conservation measures such as rainwater harvesting.

The rainwater harvesting estimation is provided in Table.

RAINWATER HARVESTING PIT CALCULATIONS

KALINGA UNIVERSITY, RAIPUR

PARAMETERS / DATAS / CALCULATIONS:

1.0	Areas	
	Total Area in Acre	33.98
a)	Site Area in m ²	137512.74
b)	Terrace / Roof Area (approx.)	65,000.00 Sq.m
c)	Paved / Pavement / Road/Sub Soil Drainage	136423.65 Sq.m
d)	Green Area / Loose Area	20626.91 Sq.m
2.0	Co-efficient and factors adopted	
a)	Harvesting efficiency factors for terrace and roof tops	0.9
b)	Harvesting efficiency factors for roads and paved surface/SSD	0.7
c)	Harvesting efficiency factor for Green/ soft soil	0.2
3.0	Rain Fall	
a)	Annual average rainfall considered (<i>as per CGWB – CENTRAL GROUND WATER BOARD Ministry of Water Resources, Government of India,</i>	1401.00 mm
4.0	Co-efficient for calculations of capacity for collection wells for Harvesting	
a)	Rain Fall intensity (<i>assumed as per rainydays</i>)	35 mm/hr
b)	Retention time for capacity of recharge tank	30 min
c)	Net runoff for which holding is required for infiltration	17.5 mm

5.0 Calculation for Rainwater Harvesting System

a)	Total Annual run up available	
	Terrace / Roof Area (approx.)	27381.70 Cu.Mtr
	Paved / Pavement / Road/Sub Soil Drainage	133790.67
		Cu.Mtr
	Green Area / Loose Area	5779.66 Cu.Mtr
	TOTAL	166952.03
		Cu.Mtr

CALCULATIONS:

1.0	Roof / Terrace	
i)	Average runoff co-efficient for terrace	0.9
ii)	Terrace / Roof Area	21716.00 Sq.m
iii)	Rain fall intensity	35 mm/hr
iv)	Infiltration well capacity design period	30 min
v)	Net runoff for which holding is required for infiltration	17.5 mm
vi)	Required approx. theoretical volume of infiltration wells (Total Area x Coefficient x Net Runoff)	342.03 Cu.Mtr
2.0	Road / Paved / Pavement Area	
i)	Average runoff co-efficient for terrace	0.7
ii)	Road / Paved / Pavement Area	136423.65 Sq.m
iii)	Rain fall intensity	35 mm/hr
iv)	Infiltration well capacity design period	30 min
v)	Net runoff for which holding is required for infiltration	17.5 mm
vi)	Required approx. theoretical volume of infiltration wells (Total Area x Coefficient x Net Runoff)	1671.19 Cu.Mtr
3.0	Green / Loose Area	
i)	Average runoff co-efficient for terrace	0.2
ii)	Green / Loose Area	20626.91 Sq.m
iii)	Rain fall intensity	35 mm/hr
iv)	Infiltration well capacity design period	30 min
v)	Net runoff for which holding is required for infiltration	17.5 mm
vi)	Required approx. theoretical volume of infiltration wells (Total Area x Coefficient x Net Runoff)	72.19 Cu.Mtr

Total Volume of Infiltration 2085.41 Cu.Mtr

Capacity of Single Desilting Chamber:

L	W	D	
5.0 M	5.0 M	2.0 M	50.00
			Cu.Mtr
			Say 50.00
			Cu.Mtr

Capacity of Single Circular Pit:

Dia Effect. Depth

3.0 M	3.0 M		21.20
			Cu.Mtr
		Say	21.20
			Cu.Mtr
Total volume of 1 set of Desilting Chamber + Pit			71.20
			Cu.Mtr
Thus, number of Pits required			= 31.4 Nos.
			Say 31 Nos.

Water Treatment

There are seven ROs installed inside the campus. Geotagged photos are provided. Three points per building are provided for purified water supply to residents.

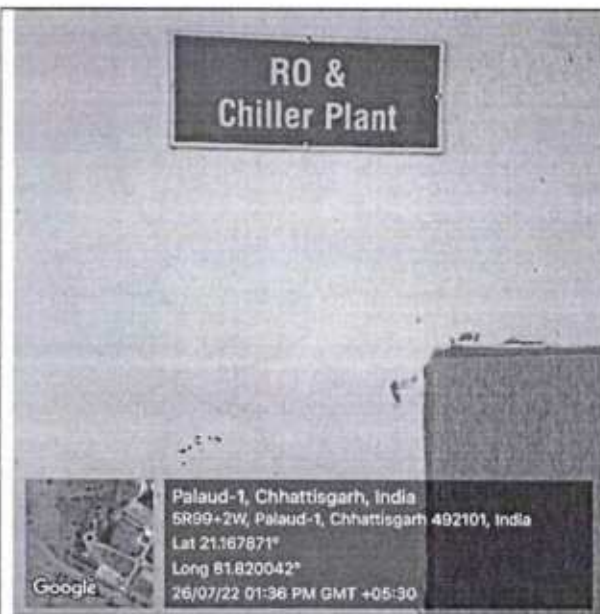


Figure 5: RO systems



Figure 6: RO distribution system within campus.

Wastewater

The wastewater is generated from campus from the following areas:

1. Canteen
2. Restaurants
3. Hostels
4. Offices
5. Generator room

There are five STPs installed in the campus at various locations. The details are provided in table 4

Table 4: STP and their location with capacity and operational time.

S.No	STP capacity (KL)	Location	Operation status
1	40	Pacific Hostel	Operation hours 8-10 hrs
2	30	Brahmaputra Hostel	Operation hours 8-10 hrs
3	30	Indus Hostel	Operation hours 8-10 hrs
4	40	Canteen	Operation hours 8-10 hrs
5	40	Administrative Block	Operation hours 8-10 hrs

The STPs are maintained by the university staff. These STPs were installed during 2020.
Treatment Capacity:

The wastewater treatment plant is designed to treat 30,000 Liters/Day to 1 Lakh Liters/Day Sewage generated from Unit.

The treated effluent will be used for gardening, horticulture, and flush water in toilets.

As per the site visit yesterday, we found that there are 6 buildings-

1. Admin Building
2. Pharmacy Building
3. Old Boys Hostel
4. Girls Hostel
5. International Boys Hostel
6. New Boys hostel.

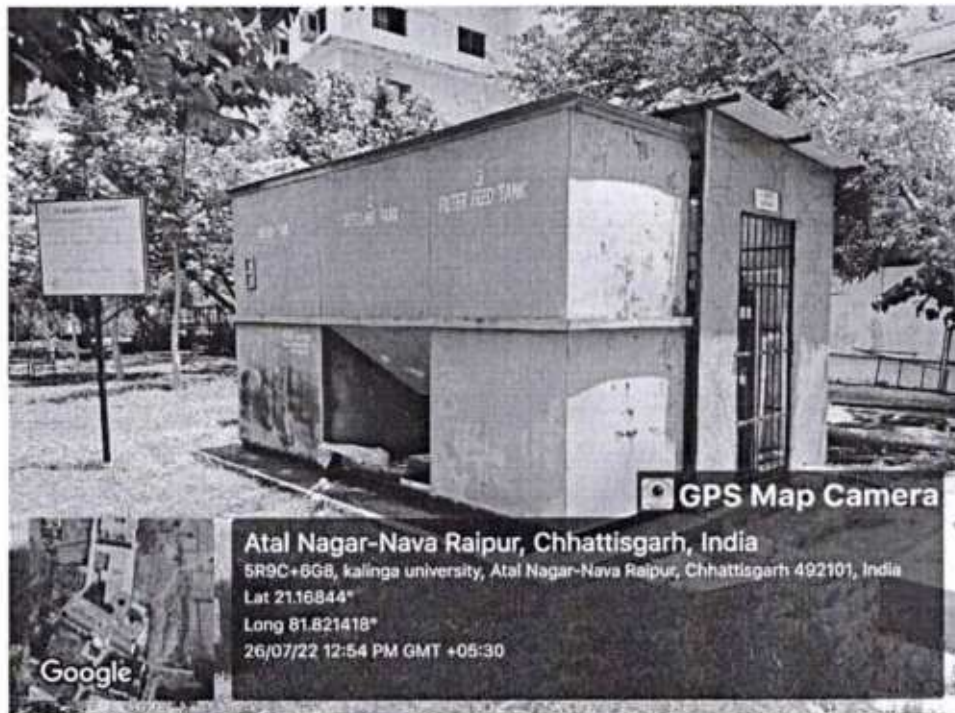
Admin Building and Pharmacy Building Sewage treatment plant can be common as there are no distances between them. There will be separate Sewage treatment plants for other four buildings. As per the people strength we have designed plants of different capacities for different buildings.

For Admin building and under construction pharmacy building we recommend plant of 100 KLD.

DESIGN BASIS

Treatment Capacity:

The wastewater treatment plant is designed to treat 30,000 Liters/Day to 1 Lakh Liters/Day Sewage generated from unit.



The treated effluent will be used for gardening, horticulture and flush water in toilets.

As per the site visit, there are 6 buildings-

1. Admin Building
2. Pharmacy Building
3. Old Boys Hostel
4. Girls Hostel
5. International Boys Hostel
6. New Boys hostel.

Admin Building and Pharmacy Building Sewage treatment plant can be common as there are no distances between them. There will be separate Sewage treatment plants for other four buildings. As per the people strength we have designed plants of different capacities for different buildings.

For Admin building and under construction pharmacy building a plant of 100 KLD was recommended

The technical specifications of 100 KLD Plant is provided in Annexure.

The results of the influent and effluent are provided in table.

Solid Waste

The university campus has the capacity to house the following population:

1. Students – 1200 (residents)
2. Teaching staff - 600
3. Non-teaching staff – 400
4. Students – 2800 (day engagement)

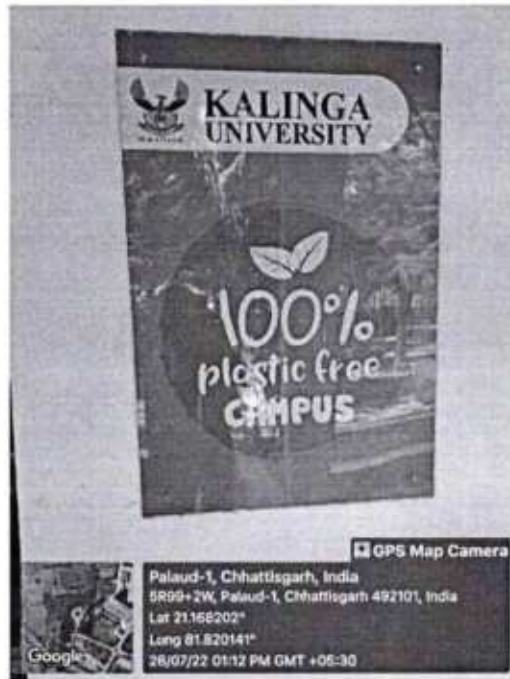
The solid waste generated from the campus in 2021-22 has been estimated based on the following (Assuming 0.3 kg/per capita daily solid waste generation):

The solid waste is collected through bins (blue and green). Blue bins are for dry waste, while the green bins are for wet wastes.



Fallen leaves, flowers and other organic materials are collected through manual sweeping and transported to vermicomposting plant.

The university also generates plastic wastes depending on the usage. However, considering that around 48,000 TPA of plastic waste is generated in the state with a population of 32,941,966 in 2021. The average plastic waste per capita comes around 1.45 kg per capita annually, which translates to 0.4 gm per capita daily.



The inert and other solid wastes are collected and stored before being discarded to authorised agencies on regular basis.

The university is steadily moving towards achieving zero plastic thought. The university encourages segregation and has placed several blue and green bins across the campus site.



The sources of solid wastes are as follows:

1. Hostel Canteen – cut fruits and vegetables, eggshells, peels, skins, meat leftovers, etc.
2. General campus – crunchies packet, plastic water bottles, packaging, used and worn out fabric and clothes, used paper, cardboards, stationery items, etc.
3. Fallen leaves, flowers, dried stems, road, and kerb side dusts, etc.

There are solid waste generations from laboratories and offices.

Food waste

The food waste is generated from various locations:

1. Hostel canteens
2. Offices
3. Small campus stalls
4. Restaurant

These are collected in boxes and sent for composting. There is also visit by municipal authorities daily for picking up garbage and municipal waste.





E- waste

The university has several sources of e-waste such as from laboratories, hostels, and offices. Some of the equipments which are deemed fit for upscaling and re-furbishing are completed in these two aspects and donated for primary school use in nearby villages.

University is committed to practicing sustainable development and the management of E-waste is an important aspect of the sustainability goal. E-waste is collected and

segregated in reusable and non-usable items. The life of electronic equipment is extended by appropriate upkeep and minor repairs carried out by University's own technical experts. Flip flops, memory chips, motherboard, compact discs, cartridges etc generated by electronic equipments such as Computers, Radio, TV, Phones, Printers, Fax and Photocopy machines are recycled properly. Instead of buying a new machine buyback option is taken for technology upgradation.

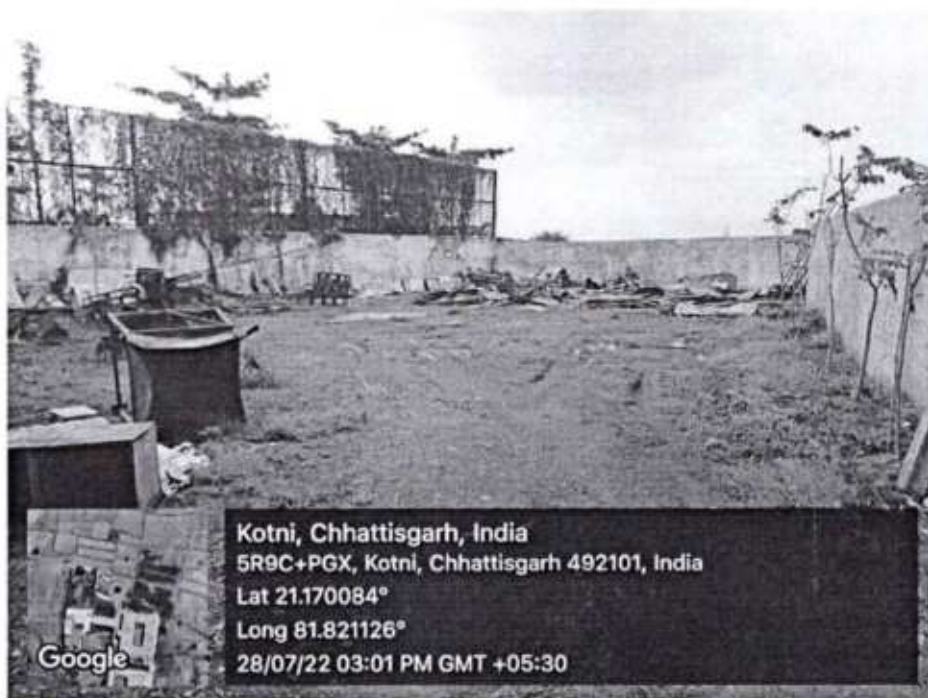
The e-waste generated from hardware which cannot be reused or recycled is being disposed off centrally through authorized vendors. Kalinga University has MoU with Adatte E- Waste Management Private Limited, New Delhi for E-Waste disposal.

Biomedical waste

The biomedical wastes are generated from the campus, especially from laboratories and hostels. However, the quantity is small.

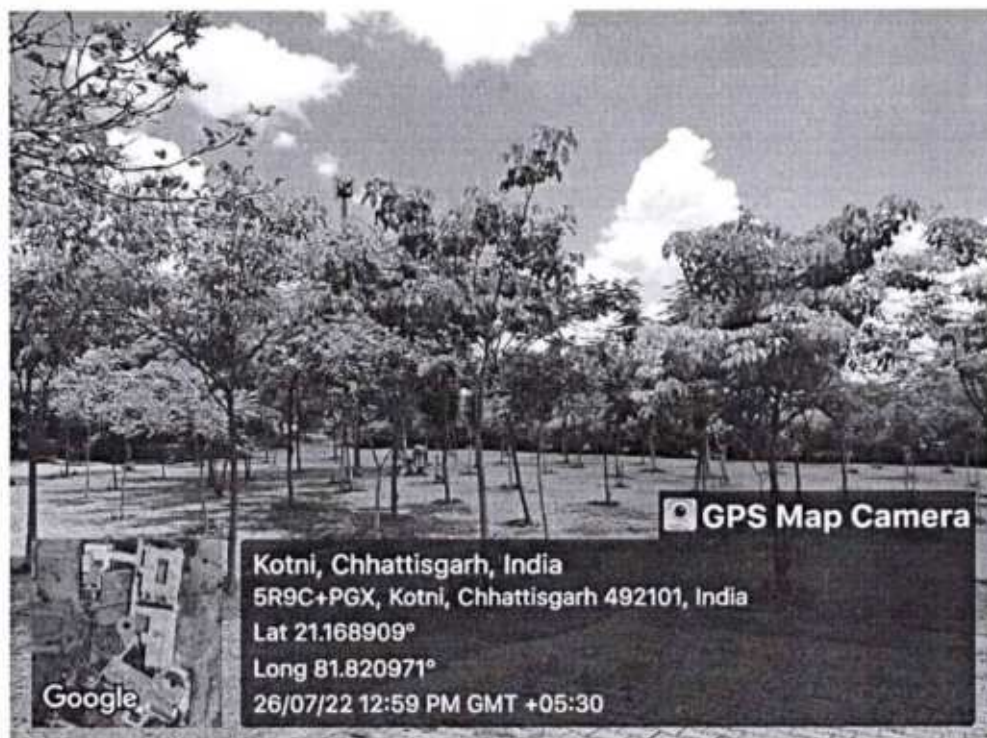
Hazardous waste

The university generates hazardous waste from laboratories. A very small proportion of the hazardous waste is also generated from hostels and offices, especially used cells and batteries.



Green Campus

The university has a small green house, which is utilized for cultivation of smaller plants. The campus has ample green spaces and has undertaken plantations wherever feasible. Kalinga University believes that a clean, green and pollution free environment provides a pristine backdrop for an effective learning experience.



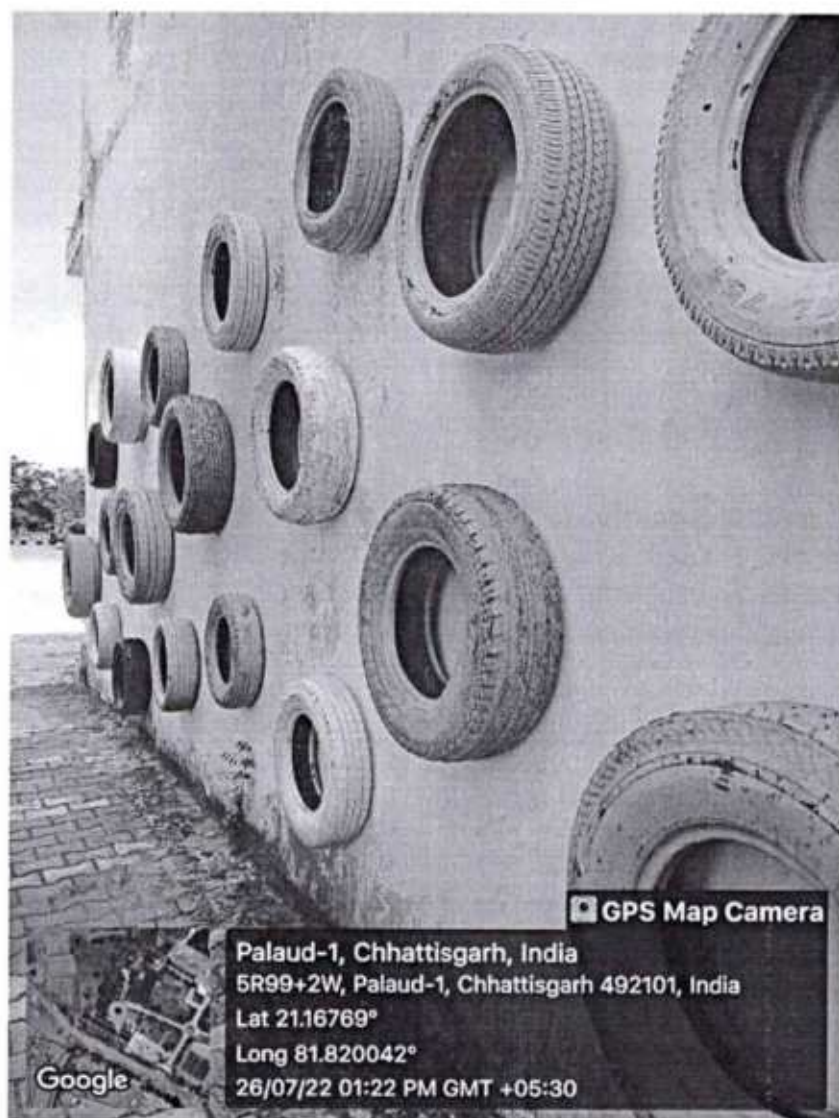
They have therefore resolved to provide a Green Campus. They have taken up environmental initiatives by creating a green environment in and around the campus. This is done by planting 1000's of plants and trees and ensuring a regular upkeep of the same. Another initiative taken up by the University is that the treated and re-cycled wastewater is utilised for these plants and trees.

The University has a Green House, Rainwater Harvesting System, Medicinal Plants Garden and Botanical Garden.



During the visit of prominent guests as a memento, they are presented with a potted plant and a tree is also planted by them in the University campus with a plaque plate/name plate stating their details.

The students have also put in creatives around the campus with used materials. These look attractive and demonstrate that waste is a resource if taken as one.



Green Cover

Kalinga university has taken several initiatives for maintaining a healthy green cover throughout the campus.

There are several green spaces inside the campus. These serve both as lungs for the campus as well as creating hubs for biodiversity to thrive. The open parks are also availed for student activities and cultural engagements.

GREEN AREA AT KALINGA UNIVERSITY CAMPUS

S.NO	PARTICULARS	AREA	
		SQUARE METER	SQUARE FEET
A1/A2	HORSE GARDEN	2461	26476.5
A3	PORCH GARDEN	140	1506
A4	KHO KHO GARDEN	1596	17170
A5	CIRCLE GARDEN	94.98	1021
A6	KAHAUDI GARDEN	1595	17159
A7	OLD BOYS HOSTEL GARDEN	1015	10919
A8	BOTANICAL GARDEN	1980	21301
A9	MINI CANTEN GARDEN	352.8	3796
A10	ELEPHANT FOUNTAIN GARDEN	29.4	316.3
A11	MAIN CANTEN GARDEN	847.3	9115.59
A12	GIRLS HOSTEL	595	6401.24
A13	INTERNATIONAL BOYS HOSTEL	304.7	3278.08
A14	NEW BOYS HOSTEL	3680	8071.28
A15	SPORTS GROUND (16 Acre)	64782.86	696960
GRAND TOTAL AREA		79474.04	855013.511
GRAND TOTAL AREA IN ACRES =18.36 ACRES			
PREPARED BY : DEPARTMENT OF CIVIL ENGINEERING , NAYA RAIPUR C.G.			

List of Plant Species in the Campus Area Wise

S.No.	Area	Local Name	Botanical Name	Numbers
1	Finger Garden	Paper Flower	<i>Bougainvillea glabra</i>	427
2		Chhatim Tree	<i>Alstonia scholaris</i>	3
3		Gulmohar	<i>Denolix regia</i>	10
4		Badam, Almond	<i>Termalaria catappa</i>	5
5		Palm	<i>Syagrus romanzoffiana</i>	13
6		Shami Plant (Sonapatti)	<i>Bauhinia racemosa</i>	2
7		Cape honeysuckle	<i>Tecoma capensis</i>	5
8		Canna	<i>Canna indica</i>	25
9		Morning glory	<i>Ipomoea carnea</i>	2
10	Basket Ball area (Inside)	Badam, Almond	<i>Termalaria catappa</i>	1
11		Gulmohar	<i>Denolix regia</i>	11
12		Kaner	<i>Nerium oleander</i>	1
13		chandani plant	<i>Tabernaemontana divaricata</i>	2
14		Paper Flower	<i>Bougainvillea glabra</i>	6
15	Basket Ball area (Outside)	Kadam	<i>Neolamarckia cadamba</i>	3
16		Palm	<i>Syagrus romanzoffiana</i>	6
17		Gulmohar	<i>Denolix regia</i>	7
18		Badam, Almond	<i>Termalaria catappa</i>	5
19			<i>Tecoma stans</i>	19
20			<i>Tecoma trumpet vine</i>	80
21		4 o'clock	<i>Mirabilis jalapa</i>	15
22		10 o'clock plant	<i>Portulaca grandiflora</i>	30
23	Gol chowk area	Paper Flower	<i>Bougainvillea glabra</i>	40
24		Red leaf plant	<i>Acalypha</i>	22
25		Cape honeysuckle	<i>Tecoma capensis</i>	5
26		Gudhal	<i>Hibiscus rosa sinesis</i>	2
27		Morning glory	<i>Ipomoea carnea</i>	2

28		Palm	<i>Syagrus romanzoffiana</i>	6
29		10 o'clock plant	<i>Portulaca grandiflora</i>	162
30	Parking area	Kadam	<i>Neolamarckia cadamba</i>	3
31		Ashoka plant	<i>Saraca asoca</i>	3
32		Gulmohar	<i>Denolix regia</i>	7
33		Chhatim Tree	<i>Alstonia scholaris</i>	3
34		Paper Flower	<i>Bougainvillea glabra</i>	438
35	Mini Market area	Gulmohar	<i>Denolix regia</i>	10
36		Kadam	<i>Neolamarckia cadamba</i>	3
37	Pond Area	Kaner	<i>Cascabela thevetia</i>	1
38		Babul Plant	<i>Vachellia nilotica</i>	15
39		Canna	<i>Canna indica</i>	5
40		Aak	<i>Calatropis procera</i>	2
41		Peepal Plant	<i>Ficus religiosa</i>	1
42		Chhatim Tree	<i>Alstonia scholaris</i>	36
43		Khajur	<i>Date palm</i>	226
44		Mango	<i>Mangifera indica</i>	11
45		Kadam	<i>Neolamarckia cadamba</i>	4
46		Madhavalata	<i>Hiptage benghalensis</i>	5
47		Cape honeysuckle	<i>Tecoma capensis</i>	5
48		Gulmohar	<i>Denolix regia</i>	10
49		Cape honeysuckle	<i>Tecoma capensis</i>	5
50		Paper Flower	<i>Bougainvillea glabra</i>	456
51		Shami Plant (Sonapatti)	<i>Bauhinia racemosa</i>	2
52	Main Building area	Gulmohar	<i>Denolix regia</i>	36
53		Shami Plant (Sonapatti)	<i>Bauhinia racemosa</i>	1
54		Bamboo	<i>Bambusa vulgaris</i>	42
55		Badam, Almond	<i>Termalaria catappa</i>	5
56		Chhatim Tree	<i>Alstonia scholaris</i>	2
57		Palm	<i>Syagrus romanzoffiana</i>	21
58		Bamboo palm	<i>areca palm tree</i>	28
59		Gulmohar	<i>Denolix regia</i>	36
60		Pitunia		8

61	Girls Hostel area	Cape honeysuckle	<i>Tecoma capensis</i>	28
62		Gulmohar	<i>Denolix regia</i>	2
63		Bamboo palm	<i>areca palm tree</i>	29
64		Palm	<i>Syagrus romanzoffiana</i>	8
65		10 o'clock plant	<i>Portulaca grandiflora</i>	30
66	New Pharmacy Building	Kadam	<i>Neolamarckia cadamba</i>	24
67		Cape honeysuckle	<i>Tecoma capensis</i>	8
68		Pitunia		8
69	Boy International Hostel	Gulmohar	<i>Denolix regia</i>	50
70		Palm	<i>Syagrus romanzoffiana</i>	6
71		Amaltas	<i>Cassia fistula</i>	12
72		Madhaviyata	<i>Hiptage benghalensis</i>	8
73		Bamboo palm	<i>areca palm tree</i>	29
74	General Boys Hostel	Bamboo palm	<i>areca palm tree</i>	12
75		Gulmohar	<i>Denolix regia</i>	75
76		Paper Flower	<i>Bougainvillea glabra</i>	55
77		10 o'clock plant	<i>Portulaca grandiflora</i>	84
78		Palm	<i>Syagrus romanzoffiana</i>	16
79	Botanical Garden	Gulmohar	<i>Denolix regia</i>	68 aprx
80		Adhusa, Vasaka	<i>Adhatoda vasica</i>	20
81		Ashoka	<i>Saraca asoca</i>	1
82				
83		physic nut, biodesiel plant	<i>Jatropha curcas</i>	2
84				
85		lipstick tree	<i>Bixa orellana</i>	2
86		cowplant, Periploca of the woods, <i>gurmar</i>	<i>Gymnema sylvestre</i>	1
87		Basil, Tulsi	<i>Ocimum sanctum</i>	10
88		Madar	<i>Calotropis procera</i>	1
89		Origano	<i>Origanum vulgare</i>	1
90		frangipani, Champa	<i>Plumeria alba</i>	3

91	Satavar	<i>Asparagus racemosus</i>	2
92	parijat, night flowering jasmine	<i>Nyctanthes arbor-tristis</i>	3
93	water hyssop, herb of grace	<i>Bacopa monnieri</i>	3
94	Aloe vera	<i>Aloe vera</i>	17
95	air plant, cathedral bells, life plant	<i>Bryophyllum pinnatum</i>	17
96	Babul	<i>Acacia nilotica</i>	4
97	Banana, kela	<i>Musa × paradisiaca</i>	1
98	hadjod and pirandai	<i>Cissus quadrangularis</i>	2
99	Bottlebrushes	<i>Callistemon</i>	1
100	Chinese chastetree	<i>Vitex negundo</i>	2
101	Neem	<i>Azadiracta indica</i>	1
102	Peepal	<i>Ficus religiosa</i>	1
103	Curry tree	<i>Murraya koenigii</i>	1
104	Sago palm	<i>Cycas revoluta</i>	9
105	gaduchi, and giloya,	<i>Tinospora cordifolia</i>	3
106	Asian pigeonwings, bluebellvine, blue pea, butterfly pea.	<i>Clitoria ternatea</i>	2
107	Rheo discolor, Moses-in-the-cradle	<i>Tradescantia spathacea</i>	2
108	Lemon	<i>Citrus limon</i>	1
109	Lemon grass	<i>Cymbopogon</i>	1
110	Cactus	<i>Mammillaria</i>	1
111	Pudina	<i>Mintha</i>	15
112	asthma-plant	<i>Euphorbia hirta</i>	1
113	Jungle geranium, flame of the woods or jungle flame	<i>Ixora coccinea</i>	3
114	henna tree, the mignonette tree	<i>Lawsonia inermis</i>	2
115	queen palm	<i>Syagrus romanzoffiana</i>	7
116	Bird of paradise flower	<i>Strelitzia reginae</i>	2
117	Ti Plant	<i>Cordyline fruticosa</i>	8

118	Old Boys Hostel			
119		Malabar Madhu Malati	<i>Combretum malabaricum</i>	9
120		Palm	<i>Syagrus romanzoffiana</i>	2
121		Gulmohar	<i>Denolix regia</i>	5
122		Badam, Almond	<i>Termalaria catappa</i>	5
	Butterfly garden			
123		Paper Flower	<i>Bougainvillea glabra</i>	150 apx
124		Gudhal	<i>Hibiscus rosa sinesis</i>	1
125		Gulmohar	<i>Denolix regia</i>	14
126		Shami Plant (Sonapatti)	<i>Bauhinia racemosa</i>	2
127		Badam, Almond	<i>Termalaria catappa</i>	5
128		Palm	<i>Syagrus romanzoffiana</i>	2
	Horse Garden			
129		Badam, Almond	<i>Termalaria catappa</i>	7
130		Shami Plant (Sonapatti)	<i>Bauhinia racemosa</i>	3
131		Palm	<i>Syagrus romanzoffiana</i>	12
132		Cape honeysuckle	<i>Tecoma capensis</i>	6
133		Ticoma	<i>Tecoma stans</i>	12 aprx
134	Small Canteen Area			
135			<i>Petunia</i>	80 apx
136		Ticoma	<i>Tecoma stans</i>	12 aprx
137		Gulmohar	<i>Denolix regia</i>	1
138		Badam, Almond	<i>Termalaria catappa</i>	1
139		Chhatim Tree	<i>Alstonia scholaris</i>	3
140		Shami Plant (Sonapatti)	<i>Bauhinia racemosa</i>	26 apx

Annexure-2
Solar Wheeling

Annexure-3
Sensor based Lighting

Annexure-4
LED lights

Annexure-5
Borewells

Annexure-6
Tanks and Bunds

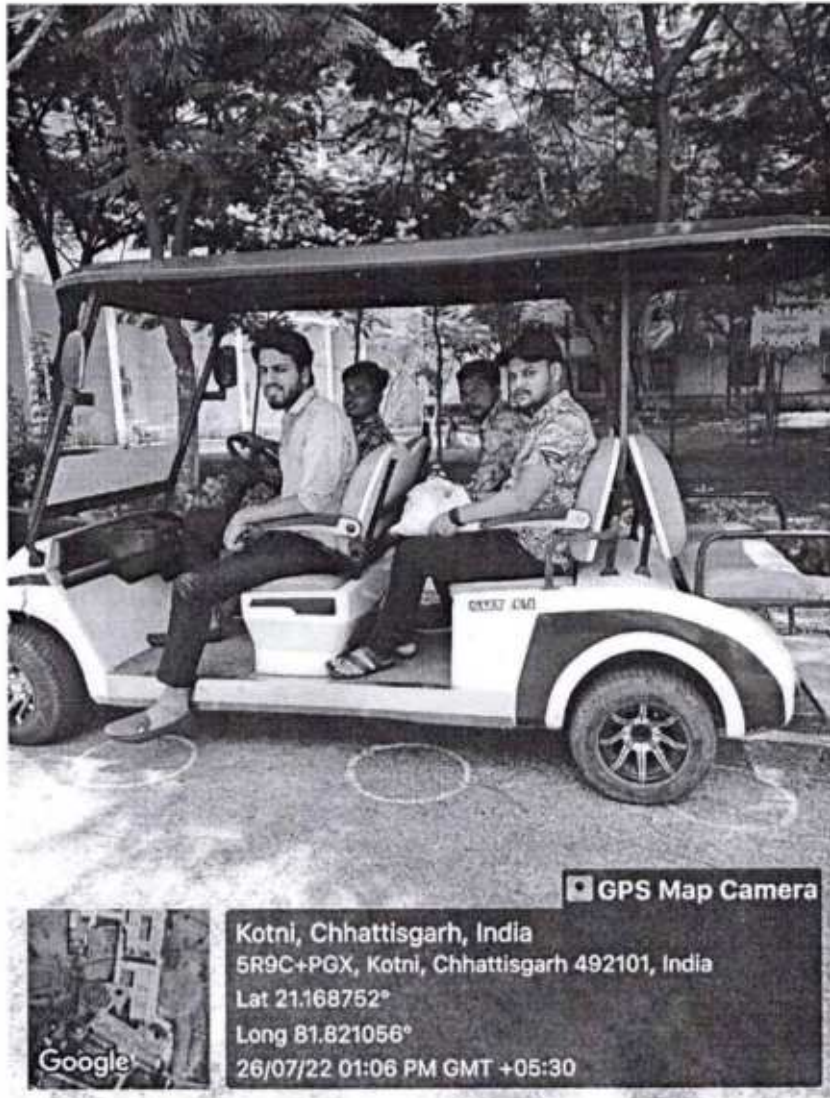
Annexure-7
Water Bodies

Annexure-8
Transportation within Campus

The university has a vehicle parking system inside the campus. Only very selected vehicles are allowed to ply. Staff, students, and visitors must park their vehicles at designated places.

The university has deployed golf carts and battery-operated rickshaws inside the campus for movement. Moreover, the campus has beautiful pathways for pedestrian movements.





GPS Map Camera

Kotni, Chhattisgarh, India
5R9C+PGX, Kotni, Chhattisgarh 492101, India
Lat 21.168752°
Long 81.821056°
26/07/22 01:06 PM GMT +05:30

Google

Annexure-9
Energy Audit Report

Annexure-10

Environmental Parameters Quality Monitoring Analysis

TEST REPORT

AMBIENT AIR QUALITY REPORT		
Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil	
Method of test : IS: 5182	Sampling Details	
Test required: As per work order	Sample Monitored	: Ambient Air Quality
Sample Collected By:- CES Representative	Date of Sampling	: 01.04.2022 to 02.04.2022
Instrument used: Eco Tech FDS	Date of Receipt	: 02.04.2022
Atmospheric condition : Clear	Period of testing	: 02.04.2022 to 08.04.2022
Page : 1 of 1	Duration of sampling	: 24 hrs

AMBIENT AIR QUALITY RESULTS				
S. No.	Parameters	NAAQ Standards (Industrial area)	Pollutant Concentration	
			Near Main Gate	Near Girls Hostel
1	Wind direction		SE	SE
2	Wind speed Km/h		13	13
3	Relative Humidity %		31	31
4	Ambient Temp. (°C)		39	39
	Parameters		Pollutant Concentration	
1	Particulate matter (size less than 10µm) or PM ₁₀ (µg/m ³)–Part-23-2006	100	57.22	61.30
2	Particulate matter (size less than 2.5µm) or PM _{2.5} (µg/m ³)–Part-24	60	30.16	30.44
3	Sulphur Di-Oxide (SO ₂) (µg/m ³) – Part-2	80	9.20	12.35

4	Oxide of Nitrogen (NO ₂) (µg/m ³)- Part-6	80	15.30	19.24
5	Carbon monoxide (CO) mg/m ³ Part- 10 By Indicator tube method	04	<1.00	<1.00

NAAQ- National Ambient Air Quality Standards CPCB Notification 18th Nov. 2009

The Results relate only to the sample tested/Sampled

Note:-The report will not valid for legal case, if Prior permission not taken from CES.

TEST REPORT

Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil	
Qty : 1 No. x 1 litre	Date of Collection	: 02.04.2022
Method of test : APHA 23 rd edition	Date of Receipt	: 02.04.2022
Packing :- Plastic bottle	Period of testing	: 02.04.2022 to 08.04.2022
Sample Condition at receipt: packed	Method of sampling	: IS:3025
Sample Discipline: Chemical Testing Sub Group: Surface Water	Sample tested as received	: OK
Sample Collected By:- CES Representative	Page no.	: 1 of 1

S. No	Test Parameters	Unit	Method No.	Result Obtained Pond Water
1	pH	-	4500 H+B	7.41
2	Conductivity	μmhos/cm	2510 B	1272.00
3	Turbidity	NTU	2130 B	0.70
4	Total Solid	mg/lit	2540 B	743.00
5	Total Dissolved Solid	mg/lit	2540 C	683.00
6	Total suspended solid	mg/lit	2540 D	60.00
7	Total Alkalinity	mg/lit	2320 B	144.00
8	Total Hardness as CaCO ₃	mg/lit	2340 C	258.00
9	Calcium as Ca	mg/lit	3500 B	57.72
10	Magnesium as Mg	mg/lit	3500 B	27.70
11	Sulphates as SO ₄	mg/lit	4500- SO ₄ E	48.93
12	Chlorides as Cl	mg/lit	4500-Cl ⁻ B	61.98
13	Iron as Fe	mg/lit	3500- Fe B	<0.05
14	Nitrate as NO ₃	mg/lit	4500-NO ₃ B	20.83
15	Sodium as Na	mg/lit	3500- Na B	1.50

16	Potassium as K	mg/lit	3500- K B	<1.00
17	Fluoride as F	mg/lit	4500- F D	<0.10
18	Acidity	mg/lit	2310 B	18.00

The Results relate only to the sample tested/Sampled

Note:-The report will not valid for legal case, if Prior permission not taken from CES.

TEST REPORT

Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil	
Qty : 1 No. x 1 litre	Date of Collection	: 02.04.2022
Method of test : APHA 23 rd edition	Date of Receipt	: 02.04.2022
Packing :- Plastic bottle	Period of testing	: 02.04.2022 to 08.04.2022
Sample Condition at receipt: packed	Method of sampling	: IS:3025
Sample Discipline: Chemical Testing Sub Group: Ground Water	Sample tested as received	: OK
Sample Collected By:- CES Representative	Page no.	: 1 of 1

S. No	Test Parameters	Unit	Method No.	Requirement as per IS-10500-2012		Result Obtained Handpump within University Campus
				Desirable Limit	Permissible limit	
1	pH	-	4500 H+B	6.5-8.5	No relaxation	7.27
2	Conductivity	µmhos/cm	2510 B	-	-	910.40
3	Turbidity	NTU	2130 B	1	5	0.80
4	Total Solid	mg/lit	2540 B	-	-	498.00
5	Total Dissolved Solid	mg/lit	2540 C	500	2000	456.00
6	Total suspended solid	mg/lit	2540 D	-	-	42.00
7	Total Alkalinity	mg/lit	2320 B	200	600	132.00
8	Total Hardness as CaCO ₃	mg/lit	2340 C	200	600	168.00
9	Calcium as Ca	mg/lit	3500 B	75	200	56.11
10	Magnesium as Mg	mg/lit	3500 B	30	100	6.80
11	Sulphates as SO ₄	mg/lit	4500- SO ₄ E	200	400	31.91
12	Chlorides as Cl	mg/lit	4500-Cl ⁻ B	250	1000	29.99
13	Iron as Fe	mg/lit	3500- Fe B	0.30	1	<0.05

14	Nitrate as NO ₃	mg/lit	4500-NO ₃ B	45	No relaxation	14.00
15	Sodium as Na	mg/lit	3500- Na B	-	-	12.33
16	Potassium as K	mg/lit	3500- K B	-	-	<1.00
17	Fluoride as F	mg/lit	4500- F D	1.0	1.5	<0.10
18	Acidity	mg/lit	2310 B	-	-	8.00

The Results relate only to the sample tested/Sampled

Note:-The report will not valid for legal case, if Prior permission not taken from CES.

TEST REPORT

Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil	
Qty : 1 No. x 2 litre	Date of Collection	: 02.04.2022
Method of test : APHA 23 rd edition	Date of Receipt	: 02.04.2022
Packing :- Plastic bottle	Period of testing	: 02.04.2022 to 08.04.2022
Sample Condition at receipt: Packed	Method of sampling	: IS:3025
Sample Discipline: Chemical Testing Sub Group: Waste Water	Sample tested as received	: OK
Sample Collected By:- CES Representative	Page no.	: 1 of 1

S. No.	Test Parameters	Unit	Method No.	Permissible limit	Result Obtained STP Outlet
1	pH	-	4500 H+B	6.5-9.0	7.36
2	Total Solid	mg/lit	2540 B	2200	788.00
3	Total Dissolved Solid	mg/lit	2540 C	2100	724.00
4	Total Suspended Solid	mg/lit	2540 D	100	64.00
5	COD	mg/lit	5220 B	250	90.00
6	BOD (3 day 27degree)	mg/lit	IS/3025/P-44	30	8.00
7	Oil & Grease	mg/lit	5520 B	10	3.00

The Results relate only to the sample tested/Sampled

Note:-The report will not valid for legal case, if Prior permission not taken from CES.

TEST REPORT

Name & Address of the Customer To, M/s Kalinga University Address: Raipur, Chhattisgarh	Test Report No.: CES/LAB/22-23/ Issue Date: 08.04.2022 Client Ref: Nil Date : Nil	
Qty : 1 No. x 2 litre	Date of Collection	: 02.04.2022
Method of test : APHA 23 rd edition	Date of Receipt	: 02.04.2022
Packing :- Plastic bottle	Period of testing	: 02.04.2022 to 08.04.2022
Sample Condition at receipt: Packed	Method of sampling	: IS:3025
Sample Discipline: Chemical Testing Sub Group: Waste Water	Sample tested as received	: OK
Sample Collected By:- CES Representative	Page no.	: 1 of 1

S. No.	Test Parameters	Unit	Method No.	Result Obtained STP Inlet
1	pH	-	4500 H+B	7.75
2	Total Solid	mg/lit	2540 B	850.00
3	Total Dissolved Solid	mg/lit	2540 C	670.00
4	Total Suspended Solid	mg/lit	2540 D	80.00
5	COD	mg/lit	5220 B	130.00
6	BOD (3 day 27degree)	mg/lit	IS/3025/P-44	14.00
7	Oil & Grease	mg/lit	5520 B	5.00

The Results relate only to the sample tested/Sampled

Note: -The report will not valid for legal case, if Prior permission not taken from CES.

NAAC Environmental Parameters Review Report (EPRR)
Kalinga University, Raipur, Chhattisgarh

This is to certify that
ASSOCHAM
has carried out the following for

Kalinga University, Raipur

1. Energy Audit
2. Environmental Audit
3. Water Audit

The ensuing reports have been prepared as per the NAAC guidelines for Criteria 7 (7.1.2 to 7.1.6). The reports have been prepared as per primary visits and documents obtained from the client.

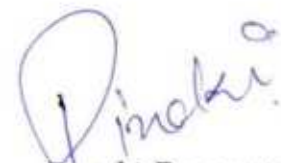
For ASSOCHAM


A. K. Verma

**Accredited Energy Auditor
AEA-0194**

**Director, Akhildeep Management and
Energy Consultant Pvt. Ltd.**





**Pinaki Dasgupta
Environmental Auditor
ASSOCHAM**

July 2020-21

THE ASSOCIATED CHAMBERS OF COMMERCE AND INDUSTRY OF INDIA

(CIN : U91990DL1920PLC008223)

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ENERGY AUDIT OF KALINGA UNIVERSITY RAIPUR

FY 2020-21

**BY
AKHILDEEP
MANAGEMENT &
ENERGY CONSULTANT
Pvt. Ltd. Raipur**

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GLOSARY OF WORDS

MD	-	Medium Demand
BD	-	Billing Demand
CD	-	Contract Demand
COP	-	Conf icient of performance
DG	-	Diesel Generator
ECG	-	Energy Conservation Measures
FTL	-	Fluorescent Tube Light
LT	-	Low Tension
HT	-	High Tensions
kV	-	Kilo volt
kVA	-	Kilo volt Ampere
kVAH	-	Kilo volt Ampere Hour
kWh	-	Kilo Watt Hour
LED	-	Light Emitting Diode
SEC	-	Speci ic Energy consumption
SLD	-	Single line diagram
TR	-	Tons of Refrigeration

EXECUTIVE SUMMERY

SN	Decription of work/ under progress	Old qty availa ble (Qty)	Replace by (Qty.)	Saving in kHW	Rate/ KWH	Total savings (Rs)	Inverst ment (Rs)	PB
1	Replacement of 75 watt old conventional fan unit by 50 watt energy ef icient	1741	1741	108	10/-	18,80,280	52,23000	33 Month
2	Replacement of old window/ split AC by EESL make star inverter type air conditioner	30	30	1771	10	5,31,300	9,60,000	22 Month
3	Replacement of old water coolers with ef icient water cooler (30% saving)	10	10	900	10	90000	200000	26 Months
4	Conventional transformer with energy ef icient transformer	-	-	-	-	-	30% Saving	36 Months

KEY OBSERVATIONS

- (1) The Audit report has been prepared based on the data available at Kalinga University Rapur.
- (2) The Power factor of Electrical system is being maintained pretty well as per standard.
- (3) The Lighting fixtures used in the whole premises of Kalinga University are Energy efficient.
- (4) 300 KW solar Power Plant is being maintained nicely this system is further to be provided with battery backup so that solar power can be used in nights also.
- (5) The existing ceiling fans should be gradually replaced by Energy efficient BLDC fans in Phased manner according to the availability of Budget preferably on exchange basis.
- (6) The street Light are being switched on & off manually. It is recommended to install a photo electric timer for automatic switch on & off.
- (7) The Old air conditioner are to be replaced with star rated efficient inverter type air conditioner in Phased manner.

ENERGY AUDIT MEASURES

Immediate measures

- (8) Minimize exfiltration of conditioned air and infiltration of unconditioned air through leaky windows & doors by incorporating effective means of weather stripping. Auto door closers to be provided in Air conditioned rooms.
- (9) The temperature & human comfort with best energy saving should be set between 24° to 25° C.
- (10) Periodic cleaning of lighting fixtures specially at open spaces to maintain utilization factor & illumination level.
- (11) It is suggested NOT to pump the water supply during peak hours to save the cost of energy. It is because the utility service (CSPDCL) charges higher tariff during peak hours.
- (12) The temperature of water cooler should be >20°C for energy saving. Also from 10PM to 8AM, the water coolers should be switched off specially in winter & rainy season.
- (13) The lighting fixtures fitted on high mast are to be relocated in such a way that the lighting is better utilized.

Medium Term Measures

- (1) Installation of occupancy sensors in office room and retiring room at to switch OFF & ON the light/fan depending on occupancy.
- (2) The energy meter / Sub meter should be installed at every feeder to create awareness & control use of energy.
- (3) Soft starters should be installed for pump houses.

Long Term Measures

- (1) Provide dedicated lighting transformer for light circuit instead of feeding through power transformer. This will enable the dimming circuit to activate whenever needed.
- (2) Gradual replacement of conventional water coolers which are ghost consumers units with energy efficient water coolers. Energy efficient water coolers save 30% energy consumption.
- (3) Gradual replacement in phased manner the conventional transfer unit with energy efficient transformer.
- (4) The ceiling fans may further be replaced by replaced by more efficient 1200 mm sweep 35w BLDC (Brush less Direct Current) motor. It works on AC supply and converts AC to DC. It operates through remote in different speed.

Energy Audit Team

The following team was involved in the auditing of Kalinga University in March. 2021 for carrying out measurement, collection of data and field study.

S.N.	Name	Qualification	Experience	Contact
1.	Mr. A.K. Verma	Accredited Energy Auditor (AEA-0194), Director of Akhildeep Management & Energy Consultant Pvt. Ltd. Raipur	38 yrs.	9009347799
2.	Mr. Jitendra Rathod	Certified Energy Auditor (EA-2189)	38 yrs.	9893759981
3.	Mr. Deepak Jain	Certified Energy Auditor (EA-11607)	17 yrs.	7987701760

ABOUT M/S AKHILDEEP MANAGEMENT & ENERGY CONSULTANT PVT LTD

Akhildeep Management & Energy Consultant specialise in solving energy efficiency challenges' in today's highly demanding environments. We help companies to improve their energy efficiency by reviewing and modernizing process and introducing automation to system and devices. We have more than 200 satisfied customers in Energy Auditing and Consulting almost from all industry sectors across India. Based on our expertise and industry standards, we customize and scale our solutions for the needs of any company or community.

Akhildeep Management & Energy Consultant was establish in 2014 with a vision to serve the industry and deliver best solutions for Energy Conservation and Management of International standards. We possess sufficient Infrastructure and a Team of Management and Technical professional having vast diversified industrial experience of Consultancy & Training in Manufacturing and Service Industry. Some of them are lead auditors from Bureau of Energy Efficiency (B.E.E.) Government of India.

We have empanelment, arrangements and tie – ups with various National & International Energy Agencies & Certification Bodies / Registrars.

Electrical Equipment List 2020-21				
S.NO.	Equipment Name	Power	Qty 2020-21	Remarks
1	Ceiling Fan	65W	1741	
2	Tube Light	20W	1862	
3	2"×2" LED Light	36W	210	
4	9"×8" LED Light	9W	177	
5	LED Round White	12W	618	
		15W		
		18W		
		20W		
		30W		
6	Air conditioner	1.5T	113	
		2.0T		

SUBSTATION TRANSFORMER DETAILS KALINGA UNIVERSITY RAIPUR

S.NO.	Rated Specification	TR1
1	KVA	300
2	HV VOLTAGE	11000
3	LV VOLTAGE	433
4	AMP HV	15.75
5	AMP LV	416.37
6	MAKE	Power Star
7	DATE OF INSTALLATION	2015
8	VECT GROUP	Dyn11

**TABLE SHOWING STANDARD NO LOAD/LOAD LOSSES IN
TRANSFORMER**

Rating	No load Loss (W)	Load Loss (W)
100	320	1950
160	455	2800
250	640	4450
500	900	6450
600	1260	9300
1000	1800	13300
1600	2600	19800
2000	3200	21000
3150	4600	28000
5000	6500	31000
6300	7700	45000
10000	11000	63000
12500	13000	77000
20000	18000	107000
31500	25000	150000
40000	30000	180000

Transformer load analysis :

Transformer losses consist of two parts:

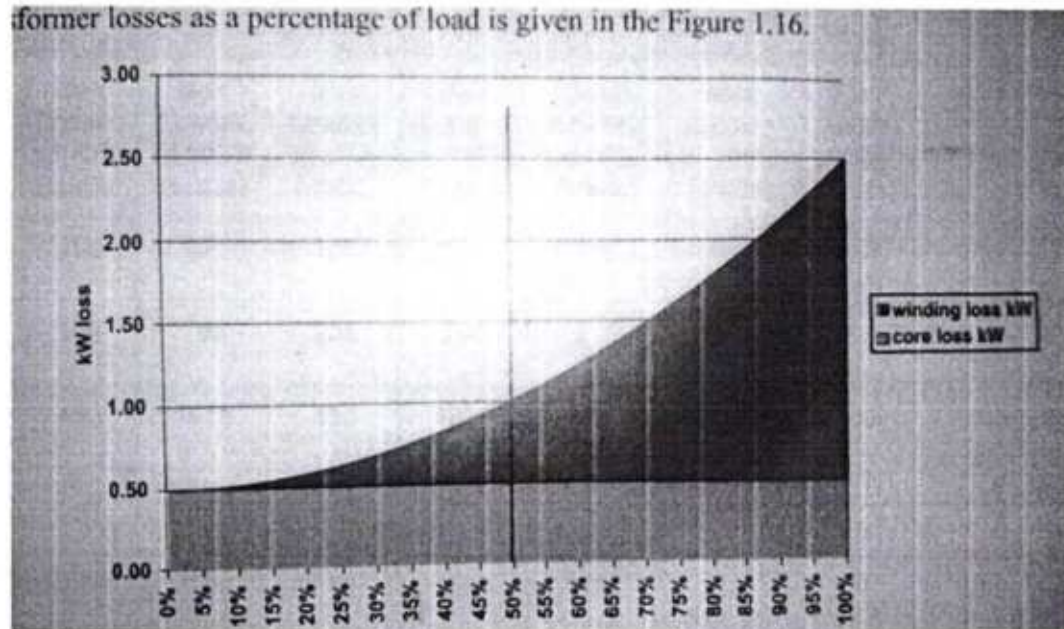
1. No-load loss (also called core loss) is the power consumed to sustain the magnetic field in the transformer's steel core. Core loss occurs whenever the transformer is energized; core loss does not vary with load. Core losses are caused by two factors: hysteresis and eddy current losses. Hysteresis loss is that energy lost by reversing the magnetic field in the core as the magnetizing AC rises and falls and reverses direction. Eddy current loss is a result of induced currents circulating in the core.
2. Load loss (also called copper loss) is associated with full-load current flow in the primary and secondary windings of a transformer due to the ohmic resistance of the windings. Copper loss varies with the square of the load current. ($P = I^2 R$). Transformer losses as a percentage of load is given in the figure.
3. For a given transformer, the manufacturer can supply values for no-load loss, $P_{\text{no-load}}$, and loss, P_{LOAD} . The total transformer loss, P_{TOTAL} , at any load level can then be calculated from:
4. $P_{\text{TOTAL}} = P_{\text{NO-LOAD}} + (\% \text{ LOAD}/100)^2 \times P_{\text{LOAD}}$
5. Where transformer's loading is known, the actual transformer's loss at given load can be computed as:

ENERGY EFFICIENT TRANSFORMER (STAR RATED)

Most energy loss in dry-type transformer occurs through heat or vibration from the core. The new high-efficiency transformer minimize these loss. The conventional transformer is made up of a silicon alloyed iron (grain oriented) core. The iron loss of any transformer depends on the type of core used in the transformer. However the latest technology is to use amorphous material – a metallic glass alloy for the core. The expected reduction in core loss over conventional (Si Fe core) transformers is roughly around 70% which is quite significant. By using an amorphous core – with unique physical and magnetic properties – these new types of transformers have increased efficiency even at low loads – 98.5% efficiency at 35% load.

Electrical distribution transformers made with amorphous metal cores provide excellent opportunity to conserve energy right from the installation. Though these transformers are a little costlier than conventional iron core transformers, the overall benefit towards energy savings will compensate for the higher initial investment.

former losses as a percentage of load is given in the Figure 1.16.



TOTAL TRANSFORMER LOSSES AT 50% AND 100% LOADING

Rating kVA	1 star		2 star		3 star		4 star		5 star	
	Max Losses at 50% (watts)	Max Losses at 100% (watts)	Max Losses at 50% (watts)	Max Losses at 100% (watts)	Max Losses at 50% (watts)	Max Losses at 100% (watts)	Max Losses at 50% (watts)	Max Losses at 100% (watts)	Max Losses at 50% (watts)	Max Losses at 100% (watts)
16	200	555	165	520	150	480	135	440	120	400
25	190	785	235	740	210	695	190	653	175	595
63	490	1415	430	1335	380	1250	340	1140	300	1050
100	700	2020	610	1910	520	1800	475	1650	435	1500
160	1000	2800	880	2550	770	2200	670	1950	570	1700
200	1130	3300	1010	300	890	2700	780	2300	670	2100

Advantages of 20 w LED Tube

Comparison Between Conventional fluorescent tube & 20 w LED Tube

S.No.	Conventional 40 w Tube	20 w LED Tube Energy
1	It Contains Mercury hence unsafe for environment	20 w LED tubes are mercury free environment friendly
2	Fl tube are expensive to dim	It has full dimming facilities
3	It was multi directional lighting which means some light is lost and illuminates unnecessary place also	It has directional light which means illumination is at required place
4	It does not work well with occupancy sensor and other controls and burns faster	It works well with occupancy sensor & other controls
5	It's efficiency is less	LED tube are 30% more efficient
6	It is flickering issues hence quality of illumination is inferior	It does not flicker but gives constant high
7	Average life is 30,000 burning hours	Average life is 50,000 burning hours

Ceiling fan specification

(1)	Types of motor	Induction
(2)	Blade Material	Steel metal (MS)
(3)	Rated RPM	330
(4)	Actual RPM	332
(5)	Power Consumption	50 W
(6)	CMM (Air Delivery)	210 cubic meter per min.
(7)	Body Weight	750 grams
(8)	Sweep	1200 MM
(9)	Winding Material Gauge	Copper wire 32 SWG
(10)	Bearing Type	Open Bearing
(11)	Rated voltage	230 v
(12)	Blade Thickness	0.60MM
(13)	Air cutting noise	Moderate
(14)	Humming Noise	Moderate

BLDC FAN

BLDC fans are (Brushless Direct Current) Motor. IT works an normal 220 Volt Single Phase AC supply. It contains a converting direct from AC to DC Because of Brushless DC, It is more ef icient than recent 50 watt energy fans. It has following features.

- (1) Power consumption as full speed – 28 watt
- (2) Reduces power consumption by 65% than commercial fans.
- (3) Runs smoothly or wide voltage range of 110v – 285v.
- (4) Runs 3 times longer an inverter than ordinary fans.
- (5) Zero heating of motor result in increase fan life.
- (6) Better output performances or RPM or air delivery speed.
- (7) Smart remote controller.
- (8) It has sleep mode & timer mode.

**Comparison between conventional ceiling fan &
EESL make energy efficient fan**

S.No.	Parameters	Conventional fan	EESL fan
1	Wattage	75W	50W
2	Units Consumed per day per hour 12 hrs usage	0.9 kWh	0.6 kWh
3	Unit consumed per month per fan	27Kw	18Kw
4	Unit consumed per year per fan	324	216

Money saved per year per fan@ 10 per kwh	Rs/-1080
Total no. Of fans replaced	1741 fan
Total saving in Energy	Rs/- 18,80,280
Money saved	
Investment made for purchase of fan	
@ of Rs/- 3000 per fan	Rs/- 52,23,000
Payback period	33 MONTHS

COMPARISON OF DIFFERENT STAR RATED AIR CONDITIONERS

S.No.	Type	0.75T	1T	1.5T	2T
1	1 Star non inverter type	627	843	1246	1648
2	2 Star non inverter type	596	800	1184	1626
3	3 Star non inverter type	542	747	1104	1448
4	4 Star inverter type	464	645	945	1293
5	5 Star inverter type	450	554	840	1113

Comparison Between Inverter BEE split AC & Non Inverter conventional AC

S.No.	INVERTER AC 1.5T 5 STAR	CONVENTIONAL NON INVERTER
1	These are variable speed/variable air circulation and there of quite different from regular Air condition	These are fixed speed & fixed tonnage AC
2	Inverter AC can adjust Their speed depending upon heat load of room	These AC can not do so
3	It saves 30 to 40% power and Highly energy efficient	It consumes power and is much less efficient
4	No voltage fluctuation	It has fluctuation
5	It gives constant cooling of the room by adjusting the speed/air circulation	It can not do so

**Energy/Cost saving with replacement by energy efficient 5 star
inverter AC**

Energy saving per AC per year	1771kWh
Saving in kWh for 30 AC per year @ Rs. 10 kWh	53130 kWh
Saving in Rupees	Rs 5,31,300
Total investment @ Rs 32000 for 2AC	Rs/-960000
Payback period	22 Months

SUBMERSIBLE PUMP

This is a device coupled with a completely air tight sealed motor to the pump in entire assembly is submersed within the liquid to be pushed. These pump are mainly use to prevent cavitations of the pump. t. he advantage of submersible pumps are:

- (1) This pump does not need priming
- (2) This pumps are very ef icient
- (3) The pressure of water drives the water into pump hence conserves lot of energy
- (4) This pump can handle solids as well as liquid
- (5) This pump are quite in water
- (6) The pumps in power house are 1.5kW/2HP and are running with full load. Since these pumps are only 1.5 kW hence no much saving potential can be derived.

SN	LOCATION	CAPACITY	QTY.	RUNNING	TYPE OF PUMP
1	Kalinga University Premisis	2 HP	1	YES	Mono block
		3 HP	2	YES	Mono block
		5 HP	1	YES	Mono block
		5 HP	3	YES	Open well

It is recommended to use the soft starters in place of DOL starters due to following reasons.

- Smooth starting.
- More starting torque
- Less mechanical stress
- Improved power factor
- Lower maximum demand
- Less mechanical maintenance

UNINTERRUPTIBLE POWER SUPPLY

An uninterruptible Power Supply (UPS) is a device that has an alternate source of energy, typically a battery backup that can provide power when the primary power source is temporarily disabled. The switchover item must be small enough to not cause a disruption in the operation of the loads.

The components of a UPS are converter (AC to DC), battery, inverter (DC to AC), Monitor and control hardware/software.

There are two types UPS architectures namely line interactive (Off Line) and ON Line. Simple OFF Line UPS system, connect the load directly to the input AC line voltage deviates beyond preset limits by means of an auto-transformer based Automatic Voltage Regulator. In case of significant utility voltage dips or outage these system transfer the UPS to battery operation.

Due to its direct connection to input AC power, OFF lines types, including Line interactive systems offer higher efficiency when compared to an Online UPS. But, unstable grid environment, with frequent power interruptions nor outages, might cause these system to suffer frequent transfer to battery operation. Thus, exporting the critical load to possible failures due to unsmooth or unsuccessful transfer, or to battery failure, because of numerous battery discharges, which decrease drastically battery life time.

An online UPS system, frequently called Double conversion system, first converts the AC input voltage to stabilized DC, which is then converted back to AC, to feed continuously the critical load, with pure stabilized sinusoidal output, coming either from the input line via AC/DC converter, or from batteries in case of power failure.

Energy efficiency of a UPS is the difference between the amount of energy that goes into a UPS versus the amount of useful energy that comes out of the UPS and actually powers loads. In all UPS systems, some energy is lost as heat when it passes through the internal components of the UPS (including transformers, rectifiers, and inverters).

SOFT STARTER

When starting, AC Induction motor develops more torque than is required at full speed. This stress is transferred to the mechanical transmission system resulting in excessive wear and premature failure of chains, belts, gears, mechanical seals, etc. Additionally, rapid acceleration also has a massive impact on electricity supply charges with high inrush currents drawing = 600% of the normal run current.

The use of Star Delta only provides a partial solution to the problem. Should the motors slow down during the transition period, the high peaks can be repeated and can even exceed direct on line current.

Soft starter provides a reliable and economical solution to these problems by delivering a controlled release of power to the motor, thereby providing smooth, step less acceleration and deceleration. Motor life will be extended as damage to windings and bearings is reduced.

Soft start & soft stop is built into 3 phase units, providing controlled starting and stopping with a selection of ramp times and current limit settings to suit all applications.

Advantage of soft starter

- Les mechanical stress
- Improved power factor
- Lower maximum demand

GENERATOR (250 KVA * 2) Available for Emergency Supply

Generator Size (kW)	1/4 Load (gal/hr)	1/2 Load (gal/hr)	3/4 Load (gal/hr)	Full Load (gal/hr)
20	0.6	0.9	1.3	1.6
30	1.3	1.8	2.4	2.9
40	1.6	2.3	3.2	4.0
60	1.8	2.9	3.8	4.8
75	2.4	3.4	4.6	6.1
100	2.6	4.1	5.8	7.4
125	3.1	5.0	7.1	9.1
135	3.3	5.4	7.6	9.8
150	3.6	5.9	8.4	10.9
175	4.1	6.8	9.7	12.7
200	4.7	7.7	11.0	14.4
230	5.3	8.8	12.5	16.6
250	5.7	9.5	13.6	18.0
300	6.8	11.3	16.1	21.5
350	7.9	13.1	18.7	25.1
400	8.9	14.9	21.3	28.6
500	11.0	18.5	26.4	35.7
600	13.2	22.0	31.5	42.8
750	16.3	27.4	39.3	53.4
1000	21.6	36.4	52.1	71.1



Solar Energy system

As The cost of solar energy

Reduced in recent year with major improvement in technical efficiencies, the solar is seen viable source of alternate energy, solar panels are widely use in south India as the solar intensity is very high.

How solar panel work (step by step)

- (1) The silicon photo-voltaic cells absorb the energy of sun and convert it to D.C. Electricity.
- (2) The solar inverter converts DC electricity from solar modules to AC Electricity which is used by most home applications.
- (3) AC Electricity flows through home powering electrical devices.
- (4) Excess Electricity produced by solar panels is fed to electric grid through net metering.

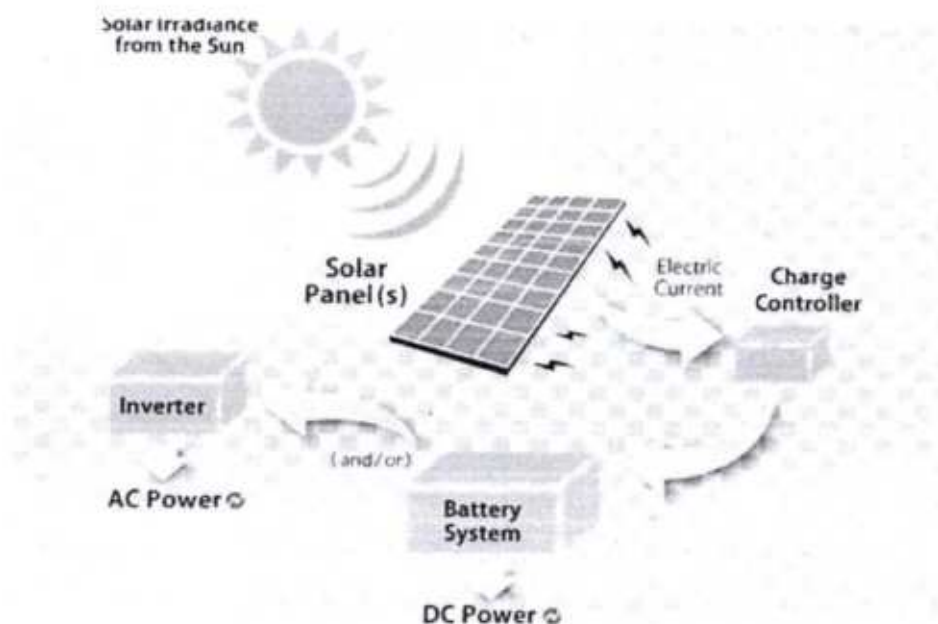
Advantage of solar energy

- (1) Solar power is pollution free and causes no green house gases to be emitted after installation.
- (2) Reduced dependence on foreign oil and fossil fuels.
- (3) Renewable clean power that is available everyday Even cloudy day produce some power.
- (4) Virtually no maintenance for solar panel and their useful life is 30 years.

- (5) Excess power can be sold back to power company.
- (6) Ability to live grid free if enough power is generated.
- (7) Can be installed anywhere in field to the building on roof or a ground.
- (8) Safer than traditional electric current.
- (9) Tax incentives are granted by Govt.
- (10) Using solar power reduces the electricity bills from utilities.

Disadvantage

- (1) High initial cost.
- (2) No solar power at night so there is a need of battery bank.
- (3) Lower product in winter & cloudy days.

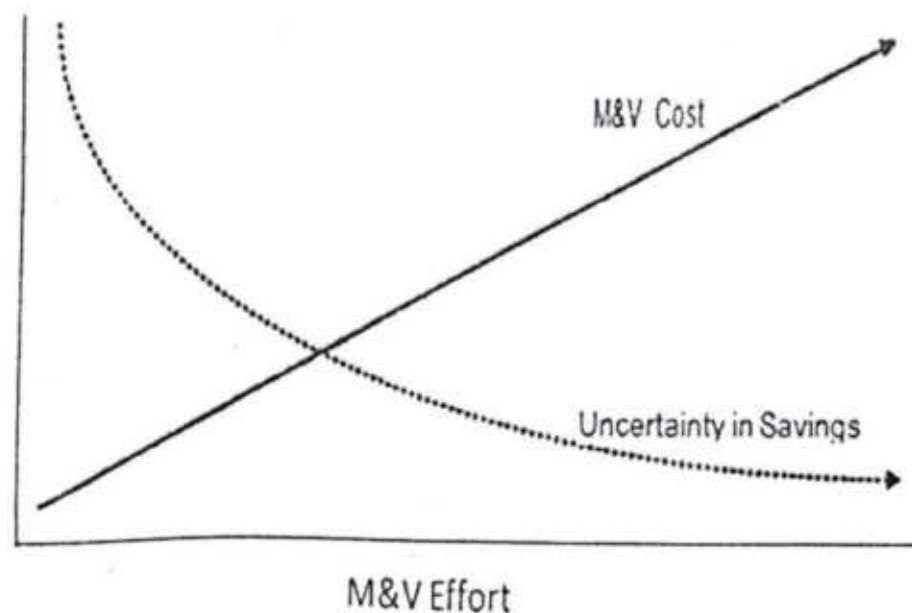


ENERGY METERING SYSTEM

It is possible to establish the existing energy consumption of an organization through energy audit however this only produces a picture of past energy consumption in order to keep control of subsequent energy consumption it is necessary to initiate a monitoring program through installation of energy meters in every feeder. To achieve an improvement in energy performance a targeting program in which targets are set must accompany the monitoring process.

Energy monitoring and targeting (M&T) is primarily a management technique that uses energy information as a basis to eliminate waste, reduce and control current level of energy in existing operation system. It is based on the principle "You can't manage what you don't measure" is essentially combines the principals of energy use of statistics.

By using M & T the utilities such as fuel steam compressed air water and electricity are managed as controllable resources. It can only monitoring and targeting can save 5 to 15% of energy.



GENERAL TIPS FOR ENERGY CONSERVATION

➤ ELECTRICITY

- Schedule your operation to maintain a high load factor.
- Minimize maximum demand bt tripping loads through a demand controller
- Use stand by electric generation equipment for on-peak high load periods.
- Set transformer taps to optimum settings.
- Shut off unnecessary computers, printers, and copiers at night.

➤ MOTORS

- Properly size to the load for optimum ef iciency.
- (High ef iciency motors offer of 4-5% higher ef iciency than standard motors)
- Provide proper ventilation.
- For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved.
- Check for under-voltage conditions.
- Balance the tree-phase power supplies.
- An imbalanced voltage can reduce 3-5% in motor input power.
- Demand ef iciency restoration after motor rewinding.

➤ **DRIVES**

- Use variable-speed drives for large variable loads.
- Use high-efficiency gear sets.
- Use precision alignment.
- Check belt tension regularly.
- Eliminate variable – pitch pulleys.
- Use flat belts as alternative to v-belts.
- Use synthetic lubricants for large gearboxes.
- Eliminate eddy current couplings.
- Shut then off when not needed.

➤ **FANS**

- Use smooth, well-rounded air inlet cones for fan air intakes.
- Avoid poor flow distribution at the fan inlet.
- Minimize fan inlet and outlet obstructions.
- Clean screens, filters, and fan blades regularly.
- Use aerofoil-shaped fan blades.
- Minimize fan speeds.
- Use low-slip or flat belts.
- Check belt tension regularly.
- Eliminate variable pitch pulleys.
- Use Variable speed drives for large variable fan loads.

- Use energy-efficient motors for continuous or near-continuous operation.
- Eliminate leaks in ductwork.
- Minimize bends in ductwork.
- Turn fans off when not needed.

➤ **BLOWERS**

- Use smooth, well-rounded air inlet ducts or cones for air intakes.
- Minimize blower inlet and outlet obstructions.
- Clean screens and filters regularly.
- Minimize blower speed.
- Use low-slip or no-slip belts.
- Check belt tension regularly.
- Eliminate variable speed drives for large variable blower loads.
- Use variable speed drives for large variable blower loads.
- Use energy-efficient motors for continuous or near-continuous operation.
- Eliminate ductwork leaks.
- Turn blowers off when they are not needed.

➤ **PUMPS**

- Operate pumping near best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of smaller units.
- Stop running both pumps-add an auto-start for an on-line spare or add a booster pump in the problem area.
- Use booster pumps for small loads requiring higher pressure.
- Increase fluid temperature differentials to reduce pumping rates.
- Repair seals and packing to minimize water waste.
- Balance the system to minimize flows and reduce pump power requirements.
- Use siphon effect to advantage : don't waste pumping head with a free-fall (gravity) return.

➤ CHILLERS

- Increase the chilled water temperature set point if possible.
- Use the lowest temperature condenser water available that the chiller can handle.
- Reducing condensing temperature by 5.5°C, result in a 20 – 25% decrease in compressor power consumption.
- Increase the evaporator temperature.
- 5.5°C increase in evaporator temperature reduces compressor power consumption by 20 – 25%.
- Clean heat exchangers when fouled.
- 1 mm scale build-up on condenser tubes can increase energy consumption by 40%.
- Optimize condenser water flow rate refrigerated water flow rate.
- Use water-cooled rather than air-cooled chiller condenser.
- Use energy-efficient motors for continuous or near-continuous operation.
- Specify appropriate fouling factors for condensers.
- Do not overcharge oil.
- Install a control system to coordinate multiple chillers.
- Study part-load characteristics and cycling costs to determine the most-efficient mode for operating multiple chillers.
- Run the chillers with the lowest operating costs to serve base load.
- Avoid over-sizing-match the connected load.
- Establish a chiller efficiently-maintenance program as part of your continuous energy management program.

➤ HVAC (Heating / Ventilation / Air conditioning)

- Tune up th HVAC control system.
- Consider installing a building automation system (BAS) or energy management system (EMS) or restoring an out-of-service one.
- Balance the system to minimize lows and reduce blower/fan/pump power requirements.
- Eliminate or reduce reheat whenever possible.
- Use appropriate HVAC thermostat setback.
- Use building thermal lag to minimize HVAC equipment operating time.
- In winter during unoccupied periods, allow temperatures to fails as low as possible without freezing water lines or damaging stored materials.
- In summer during unoccupied periods, allow temperatures to rise as high as possible without damaging stored materials.
- Improved control and utilization of outside air.
- Use air-to-air heat exchangers to reduce energy requirements for heating and cooling of outside air.
- Reduce HVAC system operating hours (e.g. – night, weekend.)
- Optimize ventilation.

- Ventilate only when necessary. To allow some areas to be shut down when unoccupied, install dedicated HVAC systems on continuous loads (e.g. – computer rooms.)
- Provide dedicated outside air supply to kitchens, cleaning rooms, combustions equipment, etc. To avoid excessive exhausting of conditional air.
- Use evaporative cooling in dry climates.
- Clean HVAC unit coils periodically and comb mashed ins.
- Upgrade filter banks to reduce pressure drop and thus lower fan power requirements.
- Check HVAC filters on a schedule (at least monthly) and clean/change if appropriate.
- Check pneumatic controls air compressor for proper operation, cycling, and maintenance.
- Isolated air conditioned loading dock areas and cool storage areas using high-speed doors or clear PVC strip curtains.
- Install ceiling fans to minimize thermal stratification in high-bay areas.
- Relocate air diffusers to optimum heights in areas with high ceilings.
- Consider reducing ceiling heights.
- Eliminate obstructions in front of radiators, baseboard heaters, etc.

- Check reflectors on infrared heat for cleanliness and proper beam direction.
- Use professionally-designed industrial ventilation hoods for dust and vapor control.
- Use local infrared heat for personnel rather than heating the entire area.
- Use spot cooling and heating (e.g. - - use ceiling fans for personal rather than cooling the entire area).
- Purchase only high-efficiency models for HVAC units.
- Put HVAC window units on timer control.
- Don't oversize cooling units. (oversize units will "short cycle" when results in poor humidity control).
- Install multi-fuelling capability and run with the cheapest fuel available at the time.
- Consider dedicated make-up air for exhaust hoods. (Why exhaust the air conditioning or heat if you don't need to?).
- Minimize HVAC fan speeds.
- Consider desiccant drying of outside air to reduce cooling requirements in humid climates.
- Seal leaky HVAC ductwork.
- Seal all leaks around coils.

- Repair loose or damaged flexible connections (including those under air handling units).
- Eliminate simultaneous heating and cooling during seasonal transition periods.
- Zone HVAC air and water system to minimize energy use.
- Inspect, clean, lubricate, and adjust damper blades and linkages.
- Establish an HVAC efficiency-maintenance program. Start with an energy audit and follow-up, then make an HVAC efficiency-maintenance program a part of your continuous energy management program.
- Online condenser cleaning system should be installed at chiller. This will keep the condenser tubes clean and will maintain the approach within range.

➤ LIGHTING

- Reduce excessive illumination levels to standard levels using switching, de-lamping. Etc. (know the electrical before doing de-lamping).
- Aggressively control lighting with clock timers, delay timers, photocells, and/or occupancy sensors.

- Install efficient alternative to incandescent lighting, mercury vapor lighting, etc. Efficiency (lumens/watt) of various technologies range from best to worst approximately as follows: low pressure sodium, high pressure sodium, metal halide, fluorescent, mercury vapor, incandescent.
- Select ballasts and lamps carefully with high power factor and long-term efficiency in mind.
- Upgrade obsolete fluorescent system to compact fluorescents and electronics ballasts.
- Consider lowering the fixtures to enable using less of them.
- Consider skylighting, skylights, etc.
- Consider painting the walls a lighter colour and using less lighting fixtures or lower wattages.
- Use task lighting and reduce background illumination.
- Re-evaluate exterior lighting strategy, type, and control, Control it aggressively.
- Change exit signs from incandescent to LED.

➤ **DG SETS**

- Optimize loading.
- Use waste heat to generate steam/hot water/power an absorption chiller or preheat process or utility feeds.
- Use jacket and head cooling water for process needs.
- Clean air filters regularly.
- Insulate exhaust pipes to reduce DG set room temperature.
- Use cheaper heavy fuel oil for capacities than 1MW.

➤ **BUILDINGS**

- Seal exterior cracks/opening/gaps with caulk, weather stripping, etc.
Consider new thermal doors, thermal windows, roofing insulation, etc.
- Install wind breaks near exterior doors.
- Replace single-pane glass with insulating glass.
- Consider covering some window and skylight areas with insulated wall panels inside the building.
- If visibility is not required but light is required, consider, replacing exterior windows with insulated glass block.
- Consider tinted glass, reflective glass, coating, awnings, overhangs, draperies, blinds, and shades for sunlit exterior windows.
- Use landscaping to advantage.

- Add vestibules or revolving doors to primary exterior personal doors.
- Consider automatic doors, air curtains, strip door, etc. At high-traffic passages between conditioned and non-conditioned spaces. Use self-closing doors if possible.
- Use immediate doors on stairways and vertical passages to minimize building stack effect.
- Use dock seals at shipping and receiving doors.
- Bring cleaning personal in during the working day or as soon after as possible to minimize lighting and HVAC costs.

➤ WATER & WASTEWATER

- Recycle water, particularly for uses with less-critical quality requirements.
- Recycle water especially if sewer costs are based on water consumption.
- Balance closed systems to minimize flows and reduce pump power requirements.
- Eliminate once-through cooling with water.
- Use the at least expensive type of water that will satisfy the requirement.

- Fix water leaks.
- Text for underground water leaks. (It's easy to do over a holiday shutdown).
- Check water over low pipes for proper operating level.
- Automate blow down to minimize it.
- Provide proper tools for wash down – especially self-closing nozzles.
- Install efficient irrigation.
- Reduce flows at water sampling stations.
- Eliminate continuous overflow at water tanks.
- Promptly repair leaking toilets and faucets.
- Use water restrictors on faucets, shower, etc.
- Use self-closing types faucets in restrooms.
- Use the lowest possible hot water temperature.
- Do not use a heating system hot water boiler to provide service hot water during the cooling season - - install a smaller, more-efficient system for the cooling season service hot water.
- If water must be heated electrically, consider accumulation in a large insulated storage tanks to minimize heating at on-peak electric rates.
- Use multiple, distributed, small water heaters to minimize thermal losses in large piping system.
- Use freeze protection valves rather than manual of lines.

- Consider leased and mobile water treatment system, especially for deionizer water.
- Seal sumps to prevent seepage inward from necessitating extra sump pump operation.
- Install pre-treatment to reduce TOC and BOD surchargers.
- Verify the water meter reading. (you'd be amazed how long a meter reading can be estimated after the meter breaks or the meter pit fills with water.)
- Verify the sewer flows if the sewer bills on them.

➤ MISCELLANEOUS

- Meter and unmetered utilities. Know what is normal efficient use. Track down causes of deviations.
- Shut down spare, idling, or unneeded equipment.
- Make sure that all of the utilities to redundant areas are turned off - - including utilities like compressed air and cooling water.
- Install automatic control to efficiently coordinate multiple air compressors, chillers, cooling tower cells, boilers, etc.
- Renegotiate utilities contracts to reflect current loads and variations.
- Consider buying utilities contracts to reflect current loads and variations.
- Leased space often has low-bid inefficient equipment. Consider upgrades of your lease will continue for several more years.
- Adjust fluid temperature within acceptable limits to minimize underestimate heat transfer in no long pipelines.
- Minimize use of flow bypasses and minimize bypass flow rate.
- Provide restriction orifices in purges (nitrogen, steam, etc.).
- Eliminate unnecessary flow measurement orifices.
- Consider alternatives to high-pressure drops across valves.
- Turn off winter heat tracing that is on in summer.

NAAC Environmental Parameters Review Report (EPRR)
Kalinga University, Raipur, Chhattisgarh

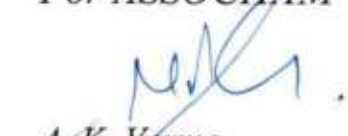
This is to certify that
ASSOCHAM
has carried out the following for

Kalinga University, Raipur

1. Energy Audit
2. Environmental Audit
3. Water Audit

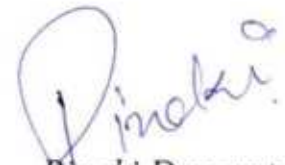
The ensuing reports have been prepared as per the NAAC guidelines for Criteria 7 (7.1.2 to 7.1.6). The reports have been prepared as per primary visits and documents obtained from the client.

For ASSOCHAM


A. K. Verma
Accredited Energy Auditor
AEA-0194

Director, Akhildeep Management and
Energy Consultant Pvt. Ltd.




Pinaki Dasgupta
Environmental Auditor
ASSOCHAM

July 2020-21

THE ASSOCIATED CHAMBERS OF COMMERCE AND INDUSTRY OF INDIA

(CIN : U91990DL1920PLC008223)

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NAAC Environmental Parameters Review Report (EPRR)

Kalinga University, Raipur, Chhattisgarh

Kalinga University
Raipur, Chhattisgarh

Energy Audit | Environmental Audit | Water Audit

2020-21



Regn. No. EA-11607

Certificate No. 6232



National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Ms.*Deepak Kumar Jain*.....
son / daughter of Mr.*S. Kumar Jain*.....
has passed the National Certification Examination for Energy Auditors held in October - 2011, conducted on
behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as *Certified Energy Manager* as well as *Certified Energy Auditor*.

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

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India

Date : 1st February, 2012

P. Shenoi

Controller of Examination

Kalinga University, Raipur, Chhattisgarh
Criteria 7 (7.1.2 to 7.1.6)
Environmental Consciousness and Sustainability
2020-21

4.1 Summary of points

The following is the summary with respect to criteria 7 under Environmental Consciousness and Sustainability section as per SSR.

Section	Criteria	Max Points	Points obtained
7.1.2	The Institution has facilities for alternate sources of energy and energy conservation measures	5	4
7.1.3	Describe the facilities in the Institution for the management of the following types of degradable and non-degradable waste	4	3
7.1.4	Water conservation facilities available in the Institution	4	4
7.1.5	Green campus initiatives	4	3
7.1.6	Quality audits on environment and energy are regularly undertaken by the institution	5	3
	Total	22	17

4.2 Outcome Table

The following table provide the preliminary assessments with reference to the NAAC requirements.

Environmental Consciousness and Sustainability				
7.1.2	The Institution has facilities for alternate sources of energy and energy conservation measures			
	Attribute	Marks	Evidence	Remarks
A	Solar Energy	1	Rooftop solar has been implemented. 24 Nos. solar streetlights are installed. Geotagged Photographs are attached. A brief writeup for Solar is provided in Annexure-1: Energy Management	The solar power is utilised for the university's lighting load requirements.
B	Biogas Plant	0	The university would implement this in future depending on feasibility.	
C	Wheeling to the Grid	1	The university has a power purchase agreement (2020) with state electricity supply agency.	

Environmental Consciousness and Sustainability				
7.1.2	The Institution has facilities for alternate sources of energy and energy conservation measures			
	Attribute	Marks	Evidence	Remarks
			The agreement is covered under Annexure-2	
D	Sensor-based Energy Conservation	1	The university has installed sensor-based energy devices within campus at selected locations. Bill attached.	The university is currently exploring viable options for installing more sensor-based devices.
E	Use of LED Bulb/ power efficient equipment	1	The university has installed LED Bulb/ power efficient equipments in the campus including street lighting systems. Refer Annexure-3	The lights in classrooms, workshops, canteens, offices are LED
	Total estimated marks	4/5		

7.1.3	Describe the facilities in the Institution for the management of the following types of degradable and non-degradable waste (within a maximum of 500 words)			
	Attribute	Marks	Evidence	Remarks
A	Solid waste management	1	Geotagged Photographs are attached for vermicomposting. Write up of the solid waste management system is provided as Annexure-4	The university has installed green (for wet waste) and blue bins (for dry waste)
B	Liquid waste management	1	University has several decentralised STPs. Write up of the liquid waste management system is provided as Annexure-4	The treated water is utilised for landscaping. $40 \text{ KLD} \times 3.30 \times 2 = 180 \text{ KLD}$
C	Biomedical waste management	0	The biomedical waste management is generated from various laboratories. Details are provided as Annexure-5	
D	E-waste management	1	The e-waste management report is provided as Annexure-5	There is a separate room for e-waste
E	Waste recycling system	1	For solid waste recycling stream, vermicomposting is in practice. For liquid waste management, treated water from STP is utilised in irrigation. There are 05 STPs on-site.	The university also employs adequate staff for collection of garbage from hostels on a daily basis.

7.1.3	Describe the facilities in the Institution for the management of the following types of degradable and non-degradable waste (within a maximum of 500 words)			
	Attribute	Marks	Evidence	Remarks
F	Hazardous chemicals and radioactive waste management	0	The university follow relevant safety principles for management of hazardous chemicals and their disposal in laboratories as well as other relevant departments.	University intends to strengthen the communication through display of MSDS and safety posters.
	Total marks	4/4		
7.1.4	Water conservation facilities available in the Institution			
A	Rainwater harvesting	1	The university have installed rainwater harvesting system inside the campus.	The university will strengthen initiatives on rainwater management.
B	Borewell/ Open well recharge	1	The university has installed bore wells (07) for withdrawing groundwater. Geotagged photos are provided as supporting documents. Refer Annexure-7	The university obtains it water supply from groundwater
C	Construction of tanks and bunds	1	The university has installed tanks for water storages	Adequate storage facility exists. (20 KL on each building, additional 30KL tank, 60 KL Brahmaputra).
D	Wastewater recycling	1	The STP serves as evidence for recycling of wastewater. The plumbing drawing is attached for reference. Covered under Annexure-4: Liquid waste management.	The annual load for the
E	Maintenance of water bodies and distribution systems in the campus		The campus regularly maintains a water body (2000 KLD) on-site, which manages run-off. Covered under Annexure-4	
	Total marks	4/4		

7.1.5	Green campus initiatives			
7.1.5.1	The institutional initiatives for greening the campus are as follows:			
A	Restricted entry of automobiles	1	The university has parking facilities at various places. There is a circular restricting free movement of vehicles.	

B	Use of Bicycles/ Battery powered vehicles	1	The university have battery powered vehicles and e-rickshaw for ferrying passengers within the campus. These are battery powered vehicles operating within the campus for students, faculties and support staff. Covered under Annexure-5	The university intends to deploy more e-rickshaws. E- loader -01 E-rickshaw -03 Golf carts - 04
C	Pedestrian friendly pathways	1	The university has ample pedestrian pathways within the campus for hassle free human movement.	
D	Ban on use of plastic	0	The university encourages minimal use of plastics inside the campus.	
E	Landscaping with trees and plants	1	The geotagged photographs of existing landscape are attached.	List of trees are provided in Environmental audit report
	Total estimated marks	3/4		

7.1.6	Quality audits on environment and energy are regularly undertaken by the institution (5)			
A	Green Audit	0	The university would undertake the same in the next cycle.	
B	Energy Audit	1	Third party report is attached as a compliance	
C	Environment Audit	1	A third-party report is attached as a compliance.	
D	Clean and Green Campus recognitions/ awards	0	The university would initiate the GEM green building certification	
E	Beyond the campus environmental provisional activities	1	The university has adopted five villages. The university has created safe and secured bathing places for women at ponds. Computers have been provided to primary students. Primary health camps are regularly conducted.	Villages names are as follows: Kotni Kohera Palod Tandul Dhamani

	Total estimated marks	3/5		
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7.1.7: Refer Annexure-9

1. Built environment with ramps/lifts for easy access to classrooms.
2. Disabled-friendly washrooms
3. Signage including tactile path, lights, display boards and signposts
4. Assistive technology and facilities for persons with disabilities (Divyangjan) accessible website, screen-reading software, mechanized equipment
5. Provision for enquiry and information: Human assistance, reader, scribe, softcopies of reading material, screen reading

List of Annexures

1. Energy Conservation
2. Solid Waste Management
3. Liquid waste Management
4. Water Conservation Measures
5. Green Campus Initiatives
6. Vehicle pooling
7. Efficient water fixtures
8. Local construction materials
9. Conformity under NAAC Sub-section 7.1.7
10. E- waste management,
11. Biomedical waste management
12. Hazardous chemical management
13. Energy Audit
14. Social Initiatives - Beyond the Campus

Kalinga University, Raipur
ENVIRONMENTAL AUDIT CHECKLIST- AS FULFILLMENT TOWARDS NAAC CRITERIA 7.0
2020-21

Introduction

The year 2020 saw unprecedented events in terms of a pandemic which was global in scale. The Covid-19 went on to affect everyone with millions of deaths worldwide. The disease affected health and education sectors severely. Schools, colleges, and universities were forced to shut down for very long duration, looking at uncertainties.

The Government of India declared a nationwide lockdown on the 25th of March 2020. In addition to above, several universities were converted to shelters and isolation wards to accommodate and treat the growing cases above with easing the burden on state's health infrastructure.

Kalinga university, Raipur, had more than 200 overseas students at the time of lockdown in the campus. There were also few Indian students from outside the state who were at the campus. There were around 30 girl students. The university acting swiftly took cognizance of the lockdown guidelines issued by the administration and commenced preparation for the immediate relief of the students in a humane manner.

The university allocated human and humanitarian resources for these students who were unable to travel to their home.

The load on environmental services went down by 80% during the lockdown. However, the economics remained same or marginally increased due to several additional services within the campus.

The residents were segregated as per safety protocol to minimize the probability of any infection. The university had a mutual agreement with Sadhbhavna Hospital, which is situated at 3 km from the campus site.

University dedicated one hostel each for female and male students. The university allocated supporting staff for residents and attending to the needs of the students.

The STPs of the hostels were kept operational. The treated water was discharged for irrigation purpose through manual operation from the final tank.

Three meals plus snacks were served to the students by trained staff with adequate PPEs. All procurement were monitored regularly including food items and raw materials.

Staff were ensured that they follow COVID guidelines, and any medical waste was securely, and safely kept in separate coloured polythene bags for disposal at later stage.

The university also installed an incinerator for burning the plastic and bio medical wastes in a temporary manner during the COVID period.

The hard biomedical waste was transported to the hospital where it was discarded as per the extant biomedical waste rules.

During lockdown, DG sets were kept operational as there was frequent power cuts. This was essential to ensure that the residents and staff were not faced with any emergency during their duties. Health checks up camps were organised regularly within the campus and all visitors were screened and tested on daily basis.

The university ensured that solid waste management was undertaken regularly to avoid any direct and indirect health effects and impacts. The organic fraction was composted, while the non-degradable items were properly maintained in safe bags for disposal at a later date to the municipal authorities.

The university commenced its normal operation steadily post 10th of April, 2021 ensuring all safety and health protocols in vogue were strictly followed by everyone visiting or staying in the campus.

Solar panels were attended to and maintained by staff to ensure that the generation is optimal.

Safe and clean water supply to the residents and support staff were ensured round the clock, through the operation of RO systems at the hostel and administrative buildings. The rest of the systems were also put under checks and maintenance for their operational efficiency.

Dedicated staff was deployed for checking over health and environment inside the campus. The team oversaw the health of DG sets, condition of STPs, condition of rainwater harvesting structures, health of RO systems, solar panels among others.

Therefore, a checklist-based approach has been adopted for framing the environmental audit report for the year 2020-21. The checklist assists in understanding the impacts of the university in terms of several environmental resources.

Environmental Factors Potentially Affected

The environmental factors checked below were potentially affected by this project, involving at least one impact that are classified into four impact categories namely:

1. Potentially Significant Impact,
2. Less than significant impact with mitigation,
3. less than significant impact and
4. No impact

along with observation as indicated by the checklist on the following pages. The different colour codes signify various types of impacts observed in the project.

Environmental impacts summary

	Aesthetics		Agriculture Resources		Air Quality
	Biological Resources		Cultural Resources		Geology /Soils
	Hazards & Hazardous Materials		Hydrology / Water Quality		Land Use / Planning
	Mineral Resources		Noise		Population / Housing
	Public Services		Recreation		Transportation/Traffic
	Utilities / Service Systems		Mandatory Findings of Significance		

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	Observations
I. AESTHETICS -- the project:					
a) Have a substantial adverse effect on a scenic vista?					The project has resulted in positive aesthetics
b) Substantially damage scenic					The project is a

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	Observations
resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?					well-designed infrastructure university building
c) Substantially degrade the existing visual character or quality of the site and its surroundings?					The university has created an external green area
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?					The project uses external lightings only during evenings
II. AGRICULTURE RESOURCES: the project:					
a) Convert Prime land, to non-agricultural use?					The land is classified as education use plot
b) Conflict with existing zoning for agricultural use,					The area is notified by New Raipur Development Authority as educational use
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?					
III. AIR QUALITY -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations- the project:					
a) Conflict with or obstruct implementation of the applicable air quality plan?					Regular monitoring is being carried out
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?					The NAAQS is being complied with
c) Result in a cumulatively considerable net increase of any					The university has employed 3-

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	Observations
criteria pollutant for which the project region is non-attainment under an applicable national or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?					star ACs. The DG sets are as per CPCB standards. Energy audits are carried out.
d) Expose sensitive receptors to substantial pollutant concentrations?					The university has created several green spaces as well as water bodies.
e) Create objectionable odors affecting a substantial number of people?					The university does not practice any operation involving odorous substances. The STPs are operational. They are being monitored for any obnoxious odours.

IV. BIOLOGICAL RESOURCES -- the project:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations,					The university has retained plantations already at the site as well as planted several trees inside and outside the campus.
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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans,					

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
policies, regulations					
c) Have a substantial adverse effect Water Act (including, but not limited to, filling, hydrological interruption, or other means?					University has RWH pits. The management has resolved to improve and enhance the groundwater recharge capacity.
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?					
e) Conflict with any local policies or ordinances protecting biological resources,					The university has also adopted ponds nearby.
V. CULTURAL RESOURCES -- the project:					
a) Cause a substantial adverse change in the significance of a historical resource					
b) Cause a substantial adverse change in the significance of an archaeological resource					
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?					
d) Disturb any human remains, including those interred outside of formal cemeteries?					
VI. GEOLOGY AND SOILS -- the project:					
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:					
	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
i) Rupture of a known earthquake					

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
fault, as delineated on the most recent Earthquake Fault Zoning Map issued by the various competent authorities in NOIDA for the area or based on other substantial evidence of a known fault?					
ii) Strong seismic ground shaking?					
iii) Seismic-related ground failure, including liquefaction?					
iv) Landslides?					
b) Result in substantial soil erosion or the loss of topsoil?					Only for paved and building areas
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?					
d) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?					
VII. HAZARDS AND HAZARDOUS MATERIALS -the project:					
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?					
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?					
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?					
d) Be located on a site which is included on a list of hazardous					

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
materials sites and, as a result, would it create a significant hazard to the public or the environment?					
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?					
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?					
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?					
h) Expose people or structures to a significant risk of loss, injury or death involving fires, chemical spills					
VIII. HYDROLOGY AND WATER QUALITY -- the project:					
a) Meet or violate any water quality standards or waste discharge requirements?					
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?					The main source of water for university is groundwater. Therefore, proper water conservation measures are required for water security.
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in					

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
substantial erosion or siltation on- or off-site?					
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?					
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?					
f) Otherwise substantially degrade water quality?					Domestic wastewater
g) A flood hazard area					
h) Place within a flood hazard area structure which would impede or redirect flood flows?					
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?					
j) Inundation by seiche, tsunami, or mudflow?					
IX. LAND USE AND PLANNING - the project:					
a) Physically divide an established community?					
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?					
c) Conflict with any applicable					

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
habitat conservation plan or natural community conservation plan?					
X. MINERAL RESOURCES -- the project:					
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?					
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?					
XI. NOISE --- Would the project result in:					
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?					DG sets have noise enclosures. Floor wise noise levels are kept within prescribed standards. Regular maintenance is carried out for ensuring machine noises are kept in check
b) Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?					Only during construction
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?					As the DGs operate as per CPCB standards, their noise levels in surrounding are kept in check
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?					
e) For a project located within an airport land use plan or, where					

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?					
XII. POPULATION AND HOUSING -- Would the project:					
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?					The university has provided education to more than 3000 students per year and employment to more than 200 personnel directly and another 300 indirectly
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?					
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?					
XIII. PUBLIC SERVICES					
a) the project results in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:					
Fire protection?					3-4 km
Police protection?					4 km
Schools?					2 km
Parks?					Within campus

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
Other public facilities?					Within campus
XIV. RECREATION --					
a) The project increases the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?					
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?					
XV. TRANSPORTATION/TRAFFIC -- the project:					
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?					The marginal traffic increment is due to the influx of students, staff, and visitors.
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?					
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks?					
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?					
e) Result in inadequate emergency access?					
f) Result in inadequate parking capacity?					

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g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?					
XVI. UTILITIES AND SERVICE SYSTEMS --- the project:					
a) Exceed wastewater treatment requirements of the applicable Water Quality Control Board?					
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?					
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?					
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?					
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project(s) projected demand in addition to the provider(s) existing commitments?					
f) Be served by a landfill with sufficient permitted capacity to accommodate the project(s) solid waste disposal needs?					
g) Comply with state, and local statutes and regulations related to solid waste?					

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	Observations
XVII. MANDATORY FINDINGS OF SIGNIFICANCE --					
a) The project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of history or prehistory?					The project is not situated in any eco-sensitive zone
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?					The university is expanding steadily. Therefore, it has to be conscious of the natural resources conservation.
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?					The university has deployed solar power plants.

On the basis of this Environment Audit Checklist matrix evaluation:

It can be concluded that Kalinga University, Raipur DOES NOT have ANY IRREVERSIBLE IMPACTS on the environment, however some impacts which are mitigable occur due to operational requirements. Appropriate mitigation measures would be implemented, and an Environment Management Plan shall be prepared to avoid/ reduce these impacts.

ON LETTER HEAD

To Whom It may Concern

This undertaking is in response to the EIA and EMP requirements.

Kalinga University, Raipur is committed to environmental conservation and ensuring occupational health and safety for its workforce at its highest level.

The university's operation in Raipur does not come under the purview of the country's environmental impact assessment criteria. However, the university has undertaken an EIA based on checklist methods for all possible impact and categorizing the same.

An Environmental Management Plan is in progress which would provide us guidance during future construction and operations. The document is dynamic and is intended to be continuously modified and updated as new challenges are faced and solutions emerge.

The university further initiates all preventive and protective measures possible for ensuring a safe workplace and ensures minimal environmental impacts.

For Kalinga University, Raipur

Authorised Signatory

Energy Audit Certificate by Auditing Agency

ENERGY AUDIT SERVICES

1116, Sector - 17, Faridabad - 121002

Tel: (0129)-2282132, 2284125; M : 09811229516, 09811627972

Email : <rbsinhaeas@gmail.com>

Ref: EAS/ 212

Dated: 20th June, 2020

Certificate

This is to certify that we have carried out the assignment for Energy Audit for KALINGA UNIVERSITY (Managed by Bhagwan Shri Balasai Educational & Charitable Soceity) , situated at Village- Kotni, Naya Raipur in the state of Chhattisgarh for the year 2019-20.

We have observed that they have successfully undertaken several effective steps for Energy Efficiency.

100 KW Capacity Solar Plant has already been installed to use Solar Power in place of Grid Power.

Split Type, Energy Efficient AC Units (with Star rating), have also been provided.

Power Factor is very well maintained.

Most of the areas, Old Lighting has been replaced by Energy Efficient LED Lighting.

It may please be concluded that Energy is being managed efficiently.


(Ram Biranjan Sinha)
Accredited Energy Auditor (AEA 0067)
Energy Audit Services – Faridabad

Accreditation Registration no AEA-0067 Dated 26th Feb 2013
By Bureau of Energy Efficiency, Ministry of Power, New Delhi

(20)



ENERGY AUDIT SERVICES

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