ENERGY AUDIT OF KALINGA UNIVERSITY RAIPUR

FY 2020-21

BY
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INDEX

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 Unviersity Rapur.

(2) The Power factor of Electrical system is being maintained pretty well as per standard.

(3) The Lighting ixtures used in the whole premises of Kalinga University are Energy ef icient.

(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 ef icient 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 ef icient inverter type air conditioner in Phased manner.

ENERGY AUDIT MEASURES

Immediate measures

(8) Minimize ex iltration of conditioned air and in iltration of uncodditioned air through leaky windows & doors by incorporating effective mean 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 ixtures 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 cast 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 of specially in winter & rainy season.

(13) The lighting ixtures itted on high mast are to be relocated in such a way that the lighting in better utilized.

Medium Term Measures

(1) Installation of occupancy sensors in of ice room and retiring room at to switch OFF & ON the ligh/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 ef icient water coolers. Energy ef icient water coolers save 30% energy consumption.

(3) Gradual replacement in phased manner the conventional transfer unit with energy ef icient transformer.

(4) The ceiling fans may further be replaced by replaced by more ef icient 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 March. 2021 for crying out measurement, collection of data and ield study.

S.N.	Name	Quali ication	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	Certi ied Energy Auditor (EA-2189)	38 yrs.	9893759981
3.	Mr. Deepak Jain	Certi ied 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 ef iciency by reviewing and modernizing process and introducing automation to system and devices. We have more than 200 satis ied 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 suf icient Infrastructure and a Team of Management and Technical professional having vast diversi ied industrial experience of Consultancy & Training in Manufacturing and Service Industry. Some of them are lead auditors from Bureau of Energy Ef iciency (B.E.E.) Government of India.

We have empanelment, arrangements and tie – ups with various National & International Energy Agencies & Certi ication 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 Speci ication	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:

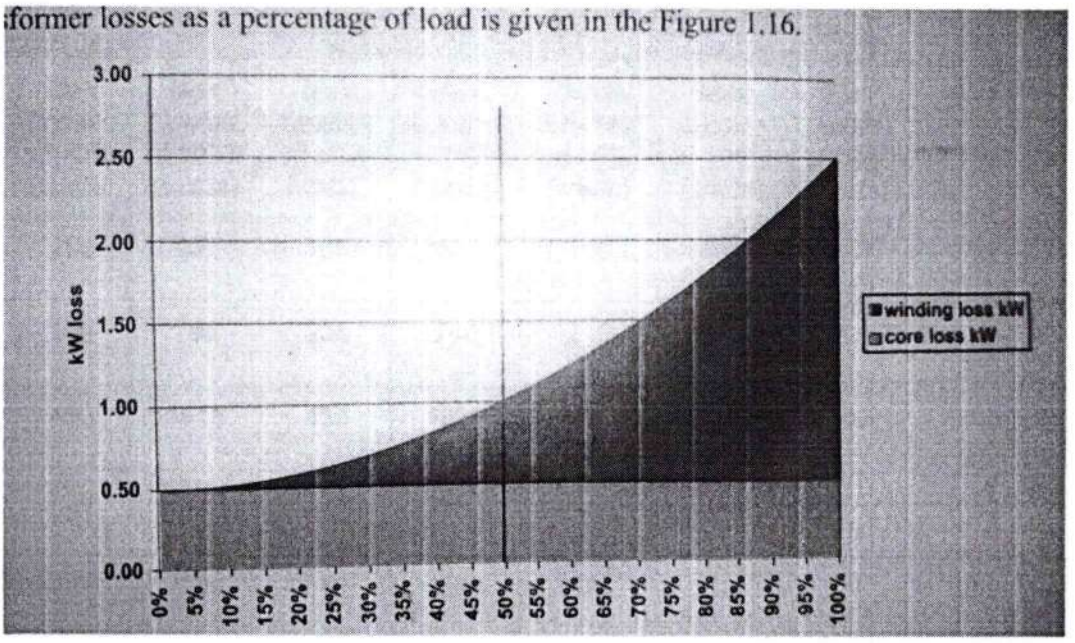
1. No-load loss (also called core loss) is the power consumed to sustain the magnetic field in the transformer's street core. Core loss occurs whenever the transformer is energized; core loss does not vary with load. Core losses are caused by two factors: hysteresis and eddy current losses. Hysteresis loss is that energy lost by reversing the magnetic ield in the core as the magnetizing AC rise 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 low 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=I2R). Transformer losses as a percentage of load is given in the igure.
3. For a given transformer, the manufacturer can supply values for no-load loss, Pno-load, and loss, P LOAD. The total transformer loss, PTOTAL, at any load level can then be calculated from:
4. P TOTAL = P NO-LOAD = (% LOAD/100)^2 X P LOAD
5. Where transformer's loading is known, the actual transformers 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-ef iciency transformer minimize these loss. The conventional transformer is made up of a silicon alloyed iron (grian 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 is core loss over conventional (Si Fe core) transformers is roughed around 70% which is quite signi icant. By using an amorphous core – with unique physical and magnetic properties – these new types of transformers have increased ef iciency even at low loads – 98.5% ef iciency at 35% load.

Electrical distribution transformers made with amorphous metal cores provide excellent opportunity to converse energy right form the installation. Though these transformers are a little costlier than conventional iron core transformers, the overall bene it 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		3 star		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 luorescent tube ijit & 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	FI 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 directiona 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 ef icient
6	It is lickering issues hence quality of illuminationis inferior	It does not licks but gives contract high
7	Average life is 30,000 burning hours	Average life is 50,000 burning hours

Ceiling fan speci ication

(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 ef icient 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 DIFFRENT 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 Invertor BEE split AC & Non Inverter conventional AC

S.No.	INVERTER AC 1.5T 5 STAR	COVENTIONAL NON INVERTER
1	These are variable speed/variable air circulation and there of quite different from regular Air condition	These are ixed speed & ix 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 enrgy ef icient	It consumes power and is much less ef icient
4	No voltage luctuation	It has luctutation
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 ef icient 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 signi icant utility voltage deeps 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 off higher ef iciency 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, irst converts th 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 ef iciency 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 is passes through the internal components of the UPS (including transformers, recti iers, 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, ets, 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 ef iciencies, 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 an 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 lows through home powering electrical devices.

(4) Excess Electricity produced by solar panels to fed to electric grid through net metering.

Advantage of sloar energy

(1) Solar power is pollution free and causes no green house gases to be emitted after installation.

(2) Reduced dependence a 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 fee if enough power is generated.

(7) Can be installed anywhere in ield to the building on roof or a ground.

(8) Safer than traditional electric current.

(9) Tax incentives are granted by Govt.

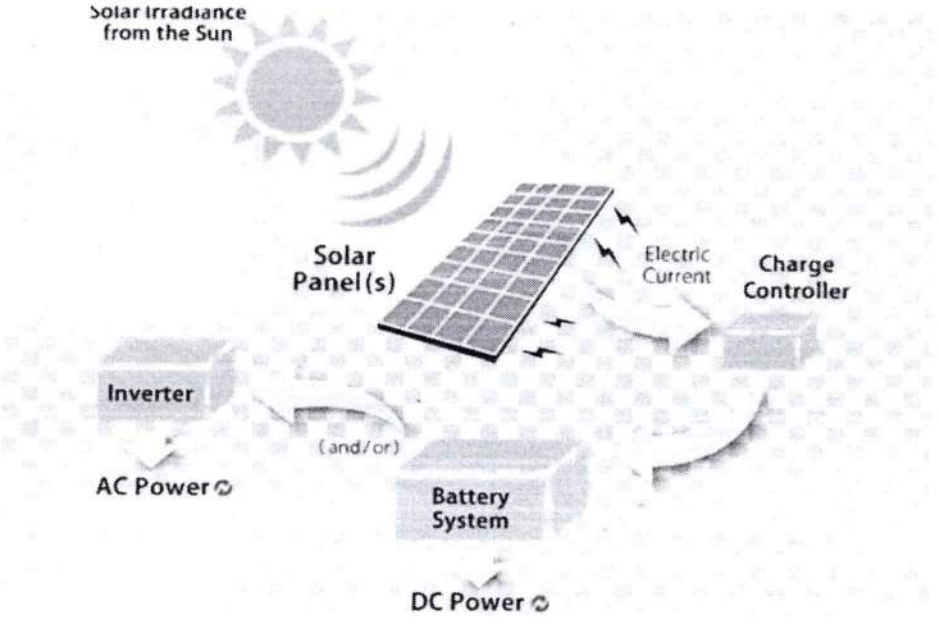
(10) Using solar power reduces the electricity bills from utilities.

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.

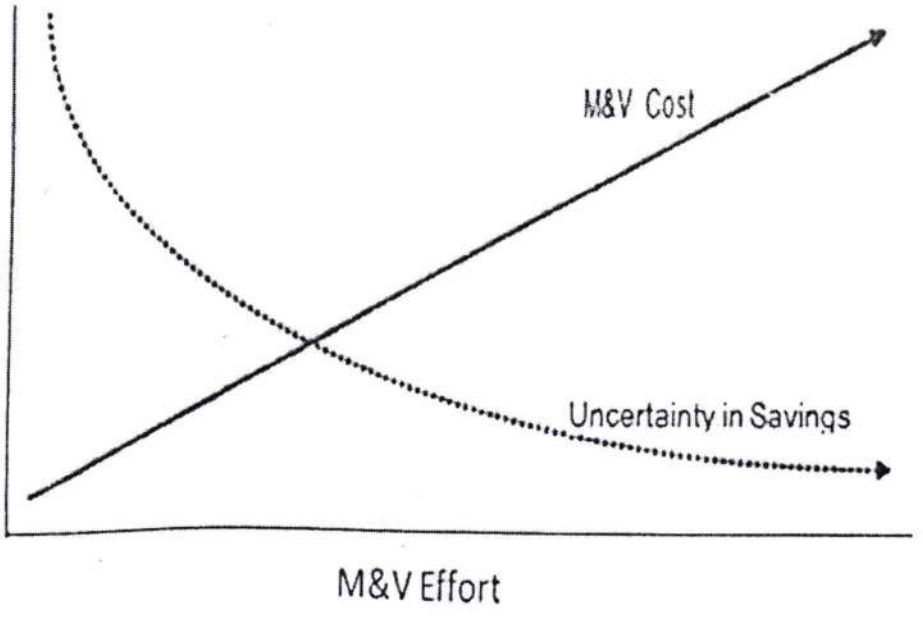


ENERGY METERING SYSTEM

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-ef iciency gear sets.
- Use precision alignment.
- Check belt tension regularly.
- Eliminate variable – pitch pulleys.
- Use lat belts as alternative to v-bells.
- 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 low distribution at the fan inlet.
- Minimize fan inlet and outlet obstructions.
- Clean screens, ilters, and fan blades regularly.
- Use aero il-shaped fan blades.
- Minimize fan speeds.
- Use low-slip or lat belts.
- Check belt tension regularly.
- Eliminate variable pitch pulleys.
- Use Variable speed drives for large variable fan loads.

- Use energy-ef icient 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 ilters 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 dries for large variable blower loads.
- Use energy-ef icient motors for continuous or near-continuous operation.
- Eliminate ductwork leaks.
- Turn blowers off when they are not needed.

➢ PUMPS

- Operate pumping near best ef iciency 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 luid temperature differentials to reduce pumping rates.
- Repair seals and packing to minimize water waste.
- Balance the system to minimize lows 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 ser 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 bt 20 – 25%.
- Clean heat exchangers when folded.
- 1 mm scale build-up on condenser tubes can increase energy consumption by 40%.
- Optimize condenser water low rate refrigerated water low rate.
- Use water-cooled rather than air-cooled chiller condenser.
- Use energy-ef icient 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-ef icient 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 ef iciently-maintenance program a 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 dedicate 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 ilter banks to reduce pressure drop and thus lower fan power requirements.
- Check HVAC ilters on a schedule (al 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 scari ication 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 re lectors 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 then 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-ef iciency 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.
- Seat leaky HVAC ductwork.
- Seal all leaks around coils.

- Repair loose or damaged lexible 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 ef iciency-maintenance program. Start with an energy audit and follow-up, then make an HVAC ef iciency-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/pr occupancy sensors.

- Install ef icient alternative to incandescent lighting, mercury vapor lighting, etc. Ef iciency (lumens/watt) or various technologies range from best to worst approximately as follows: low pressure sodium, high pressure sodium, metal halide, luorescent, mercury vapor, incandescent.
- Select ballasts and lamps carefully with high power factor and long-term ef iciency in mind.
- Upgrade obsolete luorescent system to compact luorescents and electronics ballasts.
- Consider lowering the ixtures to enable using less of them.
- Consider they lighting, skylights, etc.
- Consider painting the walls a lighter colour and using less lighting ixtures or lower wattages.
- Use task lighting and reduce background illumination.
- Re-evaluate exterior lighting strategy, type, and control, Control it aggressively.
- Changer 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 ilters 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, roo ing 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, re lective glass, coating, awnings, over change, 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-traf ic 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 & WASTERWATER**

- 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 lows 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 ef icient irrigation.
- Reduce lows at water sampling stations.
- Eliminate continuous over low 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, mor-ef icient 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 ills with water.)
- Verify the sewer lows if the sewer bills on them.

➢ MISCELLANEOUS

- Mater ant unmetered utilities. Know what is normal ef icient 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 ef iciently coordinate multiple air compressors, chillers, cooling tower cells, boilers, etc.
- Renegotiate utilities contracts to re lect current loads and variations.
- Consider buying utilities contracts to re lect current loads and variations.
- Leased space often has low-bid inef icient equipment. Consider upgrades of your lease will continue for several more years.
- Adjust luid temperature within acceptable limits to minimize underestimate heat transfer in no long pipelines.
- Minimize use of low bypasses and minimize bypass low rate.
- Provide restriction ori ices in purges (nitrogen, steam, etc.).
- Eliminate unnecessary low measurement ori ices.
- Consider alternatives to high-pressure drops across valves.
- Turn off winter heat tracing that is on in summer.

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ASSO/NAAC/EEA-041/2021

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

ASSOCHAM NEW DELHI

A. K. Verma
Accredited Energy Auditor
AEA-0194
Director, Akhildeep Management and Energy Consultant Pvt. Ltd.

Pinaki Dasgupta
Environmental Auditor
ASSOCHAM

July 2020-21

ASSOCHAM
Ideate Innovate Impact

NAAC Environmental Parameters Review Report (EPRR)

Kalinga University, Raipur, Chhattisgarh

Kalinga University

Raipur, Chhattisgarh

Energy Audit | Environmental Audit | Water Audit

2020-21

THE ASSOCIATED CHAMBERS OF COMMERCE AND INDUSTRY OF INDIA

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. Dhanadhayalan

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 KLD x 3, 30 x 2 = 180 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		

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, soft copies 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 safety 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 odourous 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.

	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?					

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact	observations
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