24th National Award for Excellence in Energy Management 2023

Confederation of Indian Industry

24th National Award

For

Excellence in Energy Management

FY-2022-23

Presenting by

- Puspahash Mohanty (AGM OS&E)
- Saurabh kumar (Manager OS&E)

GMR Kamalanga Energy Ltd

CONTENTS

VALUES & BELIEFS

Humility

We value intellectual modesty and detest false pride and arrogance

Teamwork and relationships

Going beyond the individual, encouraging boundary less behaviour

Learning & Inner Excellence

We cherish the life long commitment to deepen our self awareness, explore, experiment and improve our potential

Financial Prudence - Frugality

We spend wisely and judiciously

Entrepreneurship

We seek opportunities - they are everywhere

Deliver the promise

We value a deep sense of responsibility and self discipline, to meet and surpass commitments made

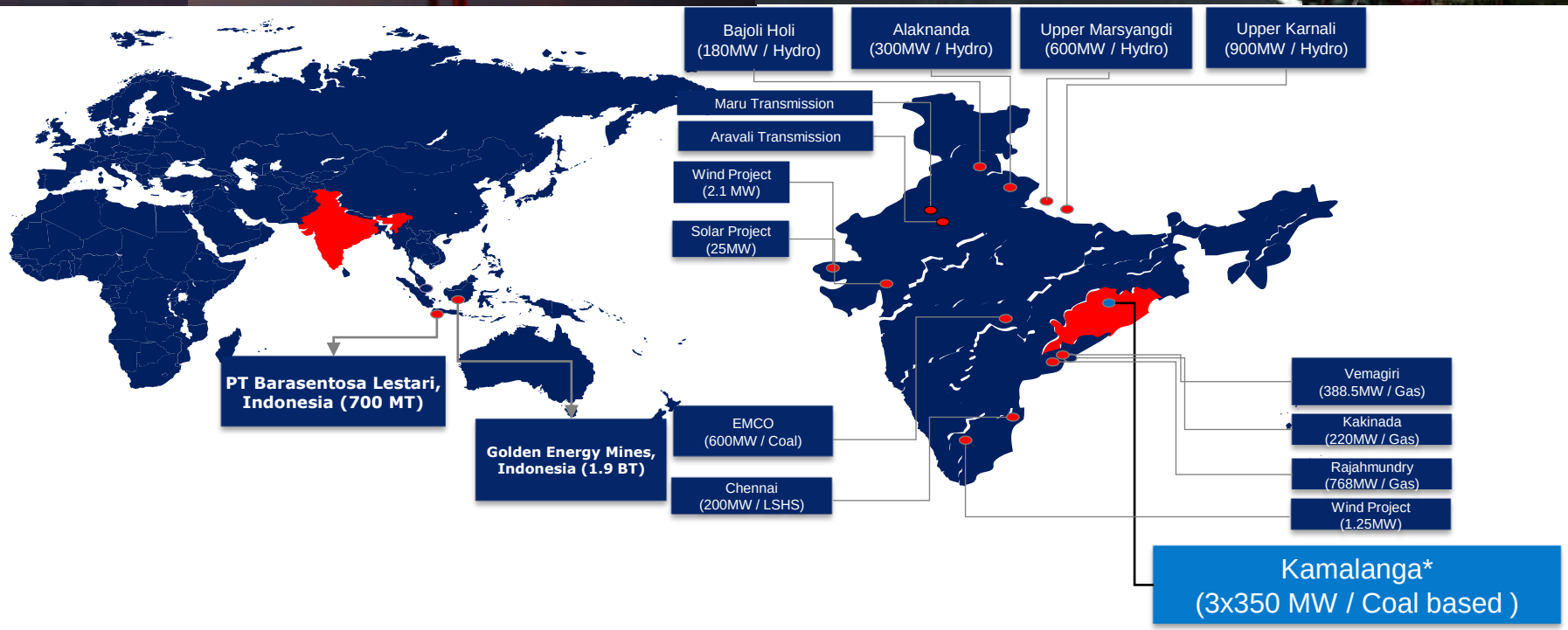
Social responsibility

Anticipating and meeting relevant and emerging needs of society

Vision

"GMR Group will be an institution in perpetuity that will build entrepreneurial organizations, making a difference to society through creation of value."

1. GMR AT A GLANCE



- **GMR Kamalanga Energy Limited** is a wholly owned subsidiary of GMR Energy LTD and is a step down subsidiary of GMR Power & Urban Infra Limited (**GPUIL**).
- **Products/Businesses of organization** : Electricity Generation
- **Capacity :** 1050 MW - (3x350 MW)
- **Operational since:** April 2013.

FSA

GKEL is having FSA with MCL

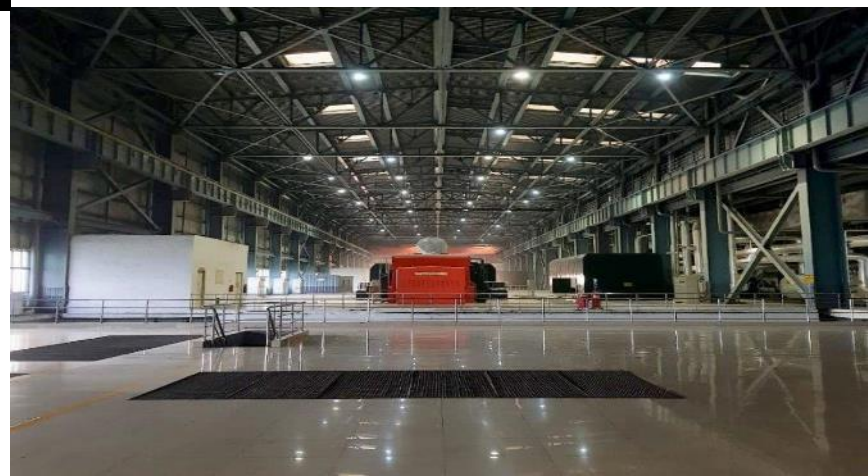
- FSA LINKAGE - 2.14 Million MT
- SAKTI LINKAGE - 1.50 Million MT
- WATER SOURCE – 20 Cusec - BRAMHANI RIVER

Plant Facility

- BOILER – HARBIN
- TURBINE – Donfang Turbine company
- GENERATOR - Donfang Electric company
- BFP - Turbine – Donfang Turbine company

PPA

- DISCOM BIHAR PPA - 260 MW – 25 Years
- DISCOM HARYANA PPA - 310 MW -25 years
- DISCOM GRIDCO PPA – 246 MW – 25 years
- DISCOM TANGEDCO PPA – 102.56 MW – 5 years
- BALANCE POWER - 65 MW



2. ENERGY MANAGEMENT POLICY AND CERTIFICATES

GMR KAMALANGA ENERGY LIMITED

VILLAGE KAMALANGA, DISTRICT DHENKANAL, STATE: ODISHA – 759 121, INDIA.

Bureau Veritas Certification Holding SAS – UK Branch certifies that the Management System of the above organization has been audited and found to be in accordance with the requirements of the Management System standards detailed below.

Standard

ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018

Scope of certification

GENERATION OF ELECTRICITY IN COAL BASED THERMAL POWER STATION OF 3 X 350 MW

Original cycle start date: 14 May 2020
Expiry date of previous cycle: Not Applicable
Certification Audit date: 18 February 2020
Certification cycle start date: 14 May 2020
Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: 13 May 2023
Certificate No. IND.20.3087/EMU Version : 1 Revision date: 14 May 2020

Signed on behalf of BVCH SAS – UK Branch
Jagdheesh N. MANIAN
Head – CERTIFICATION, South Asia
Commodities, Industry & Facilities Division

Certification body address: 5th Floor, 66 Prescot Street, London, E1 8HG, United Kingdom
Local office: Bureau Veritas (India) Private Limited (Certification Business): 72 Business Park, Mahakali Caves Road, MIDC Cross Road "C", Andheri (East), Mumbai – 400 093, India

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization.
To check this certificate validity please call + 91 22 6274 2666.

National Accreditation Board for Testing and Calibration Laboratories
(A Constituent Board of Quality Council of India)

CERTIFICATE OF ACCREDITATION

GMR KAMALANGA ENERGY LIMITED CHEMICAL LABORATORY

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

P.O. KAMALANGA, P.S. BIRUDHAN, DHENKANAL, ODISHA, INDIA

in the field of

TESTING

Certificate Number: TC-5266
Issue Date: 29/05/2019 Valid Until: 28/05/2021

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.
(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

GMR KAMALANGA ENERGY LIMITED

VILLAGE KAMALANGA, DISTRICT DHENKANAL, STATE: ODISHA – 759 121, INDIA.

Bureau Veritas Certification Holding SAS – UK Branch certifies that the Management System of the above organization has been audited and found to be in accordance with the requirements of the Management System Standard detailed below.

Standard

ISO 55001:2014

Scope of certification

GENERATION OF ELECTRICITY IN COAL BASED THERMAL POWER STATION OF 3 X 350 MW

Original cycle start date: 08 August 2022
Expiry date of previous cycle: Not Applicable
Certification Audit date: 31 May 2022
Certification cycle start date: 08 August 2022
Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: 07 August 2025
Certificate No. IND.22.19/AU Version: 1 Revision date: 08 August 2022

Signed on behalf of BVCH SAS UK Branch
Jagdheesh N. MANIAN
Director – CERTIFICATION, South Asia
Commodities, Industry & Facilities Division

National Productivity Council

Certificate

This is to certify that GMR Kamalanga Energy Ltd., Dhenkanal is awarded 'उत्कृष्ट' (Utkrisht) Category under 5S Certification Scheme of National Productivity Council.

NATIONAL PRODUCTIVITY COUNCIL

Group Head IT & E-Training

Certificate No.:
Issue date:
Certificate Expiry date:

Bureau Veritas Certification

GMR KAMALANGA ENERGY LIMITED

VILLAGE: KAMALANGA, CITY - DHENKANAL, POSTAL CODE – 759 121, ODISHA, INDIA.

Bureau Veritas Certification Holding SAS – UK Branch certifies that the Management System of the above Organisation has been audited and found to be in accordance with the requirements of the Management System Standard detailed below.

Standard

ISO 50001:2018

Scope of certification

GENERATION OF ELECTRICITY IN COAL BASED THERMAL POWER PLANT OF 3X350 MW

Original cycle start date: 20 May 2020
Expiry date of previous cycle: 19 May 2023
Recertification Audit date: 22 April 2023
Recertification cycle start date: 06 June 2023

Subject to the continued satisfactory operation of the Organisation's Management System, this certificate is valid until: 19 May 2026

Certificate No. IND.23.7548/EN/U Version: 1 Issue date: 06 June 2023

For certificate authenticity, click here https://certcheck.ukas.com/

ISO 50001 IN043635

Signed on behalf of BVCH SAS UK Branch
Jagdheesh N. MANIAN
Director – CERTIFICATION, South Asia
Commodities, Industry & Facilities Division

Certification body address: 5th Floor, 66 Prescot Street, London, E1 8HG, United Kingdom

Local office: Bureau Veritas (India) Private Limited (Certification Business): 72 Business Park, Mahakali Caves Road, MIDC Cross Road "C", Andheri (East), Mumbai – 400 093, India

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation.
To check this certificate validity please call + 91 22 6274 2666.

GMR Kamalanga Energy Limited

Energy Management Policy
(ISO 50001:2018)

GMR Kamalanga Energy Limited is committed to establish, implement and maintain Energy Management system to build world class capabilities in every aspect of its business operations. To achieve this GKEL is committed to:

- Adopt energy efficient and clean technologies in process design, maintain and operate the plant so as to make it a more efficient power utility among similar & comparable capacity power plants.
- Minimize the losses and Continual improvement upon the energy performance.
- Comply with related standards, legal and other requirements which relate to energy use, consumption and efficiency.
- Ensure availability of information and necessary resources to achieve energy management objectives and targets.
- Establish effective frame work and communicate responsibilities, authorities and obligations in order to facilitate effective energy management.
- Carryout regular energy audits to identify areas for improvements and proactively exercise controls in purchase of energy efficient products and services for new or modified projects for improvement in energy performance.

Date: 1-Aug-19

Ramesh R Pai
COO & Plant Head
GMR Kamalanga Energy Limited

To Adopt Energy efficient and clean technology

To Minimize the losses

To Comply legal and other requirements

To allocate resource

To frame Roles and responsibility

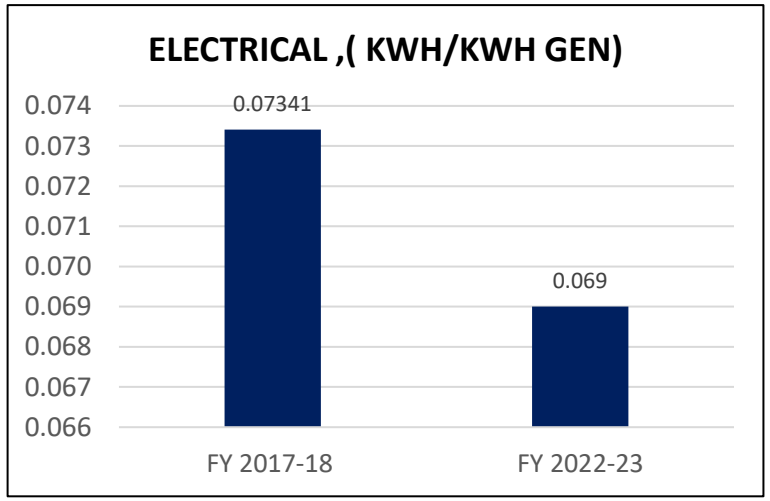
To purchase energy efficient product and Regular Energy audit

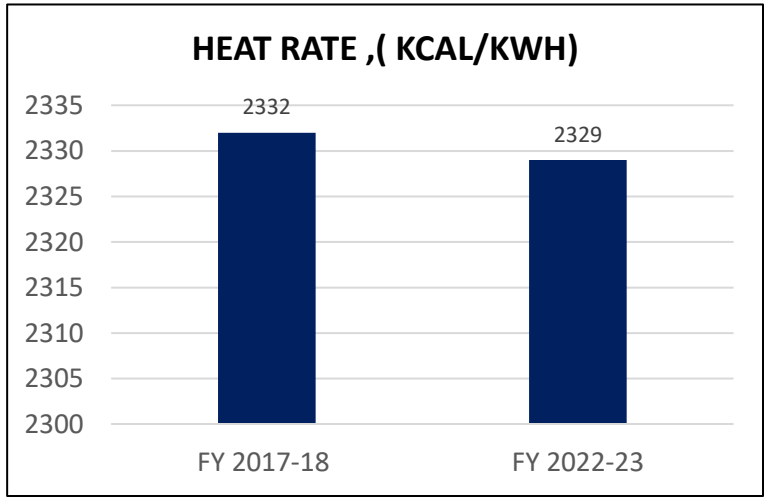
3. ENERGY CONSUMPTION OVERVIEW FY 2022-23

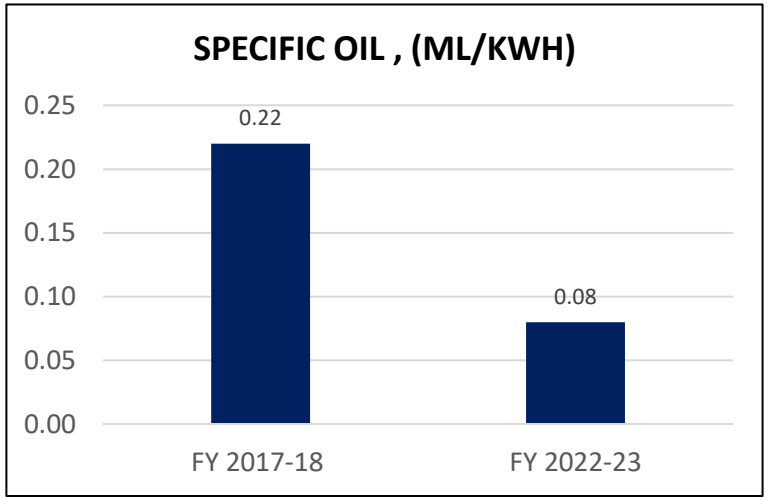
Annual Generation	: 7080.74 MU
PLF	: 76.98 %
Availability	: 89.89 %
Gross Heat Rate	: 2329 kcal/kwh
Auxiliary Power	: 6.90 %
UHR (UNIT 1/2/3)	: 2328/2326/2332 Kcal/kwh
BOILER EFFICIENCY	: 87.25/86.85/86.87 %
DM Water consumption	: 0.14 %
Raw Water Consumption	: 2.12 M3/ MWh generation
Specific Oil Consumption	: 0.08 ml/ KWh generation

4. SPECIFIC ENERGY CONSUMPTION LAST 3 YEARS

Financial Year	Specific energy consumption			Improvement in specific consumption w.r.t base line		
	Electrical	Thermal		Electrical	Thermal	Oil
	Kwh/kwh gen	Heat rate (kcal/kwh)	Specific oil (ml/Kwh)	(%)	(%)	(%)
FY 2017-18	0.07341	2332	0.220	Baseline Year		
FY 2020-21	0.0668	2323	0.097	9.0	0.4	55.9
FY 2021-22	0.0674	2318	0.082	8.2	0.6	62.7
FY 2022-23	0.069	2329	0.080	6.0	0.1	63.6



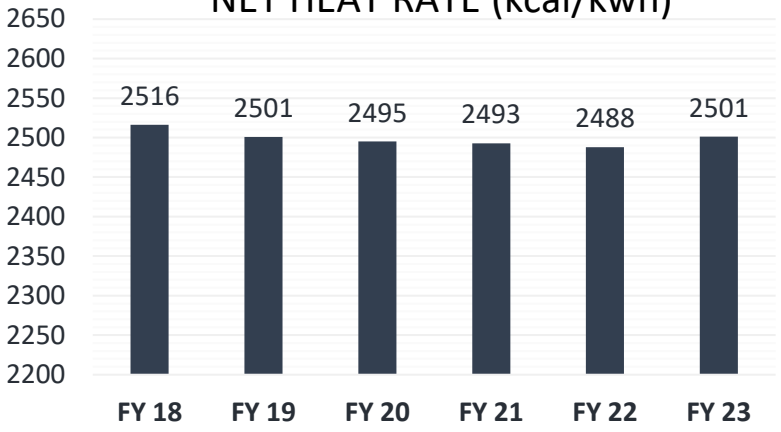




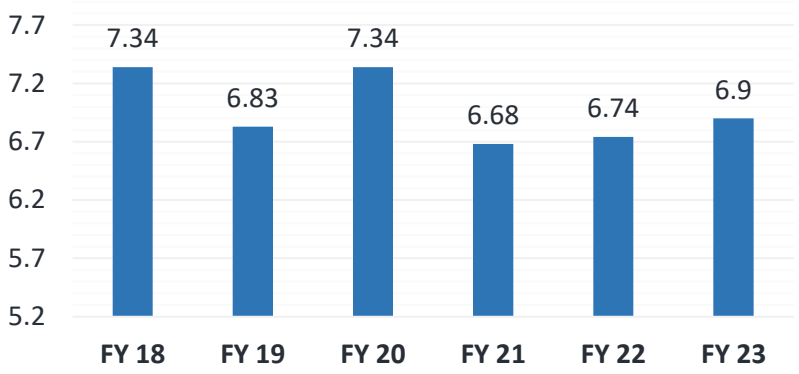
5. BENCHMARKING OF KPI

5.1 Internal Benchmarking

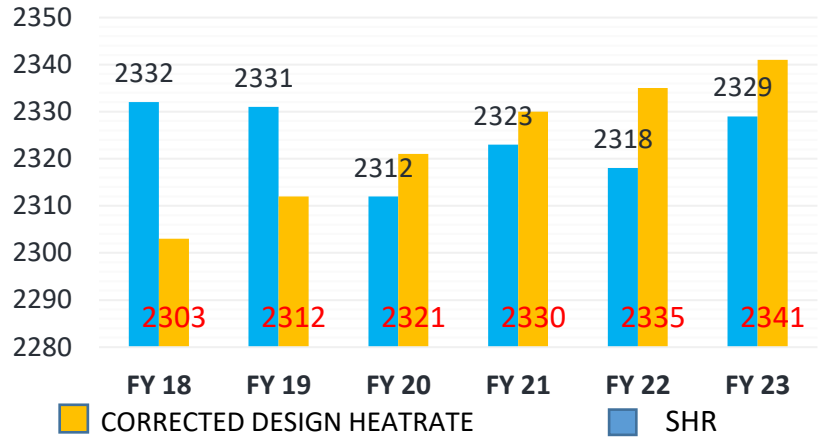
NET HEAT RATE (kcal/kwh)



APC (%)

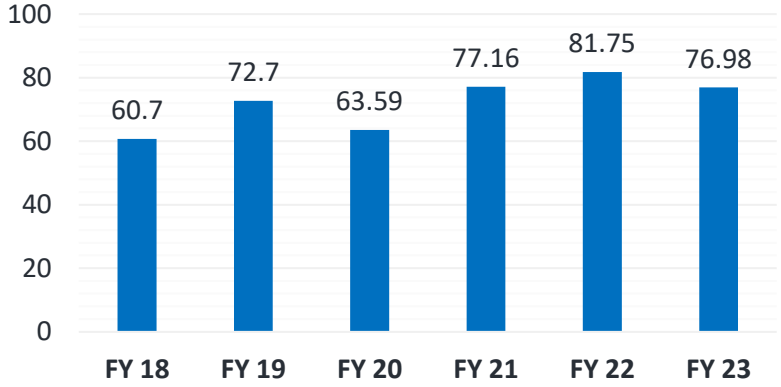


HEAT RATE (kcal/kwh)

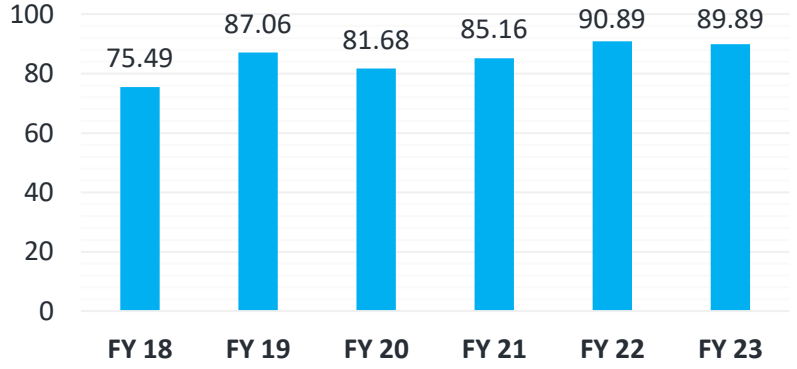


SOC (ml/kwh)

PLF (%)



AVAILABILITY (%)

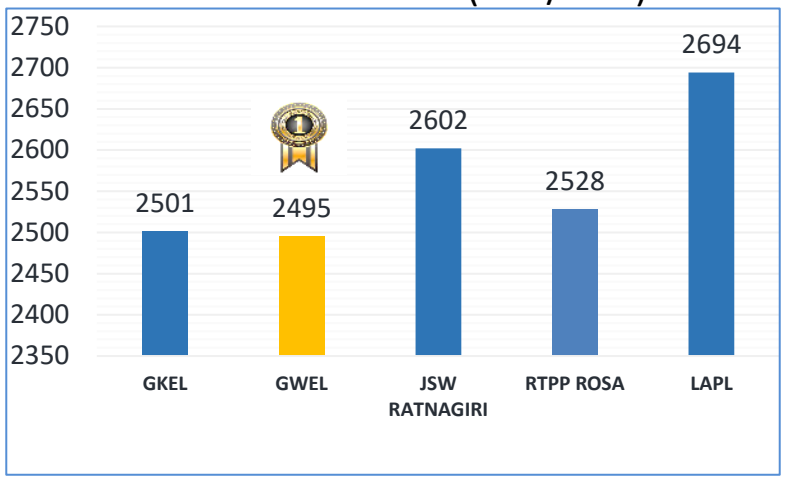


NOTE: Heat rate in comparing with corrected design heat rate with aging (as per OEM curve). Increase in heat rate is due to drop in HP and IP turbine efficiency & Boiler efficiency . Boiler eff. Drop due to drop in APH Heat transfer / efficiency which is addressed during overhauling.

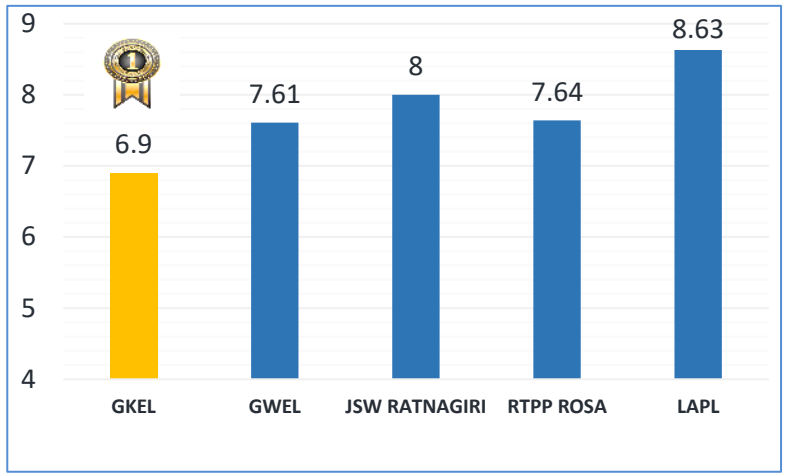
5. BENCHMARKING OF KPI

5.2 External Benchmarking

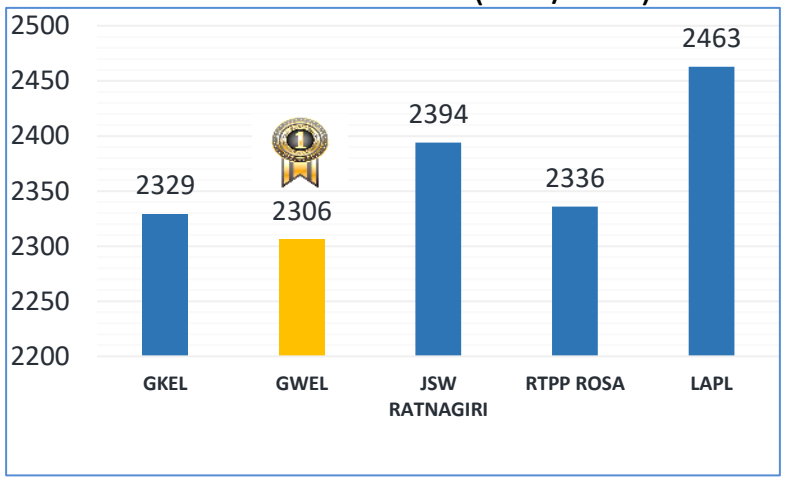
NET HEAT RATE (kcal/kwh)



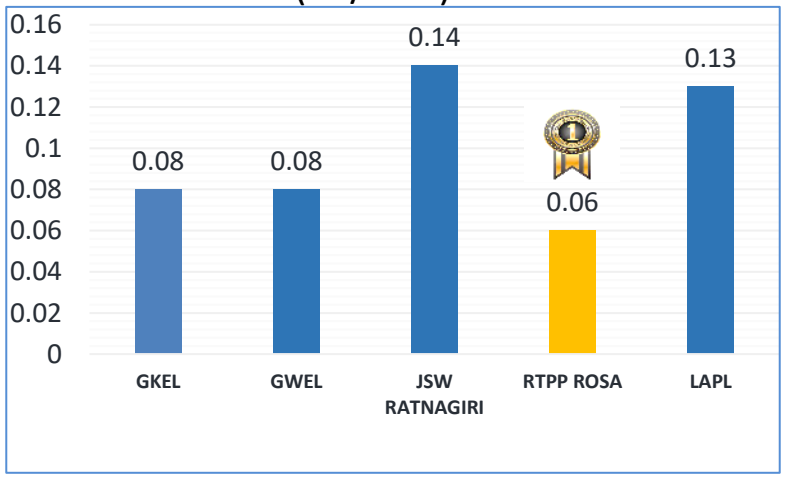
APC (%)



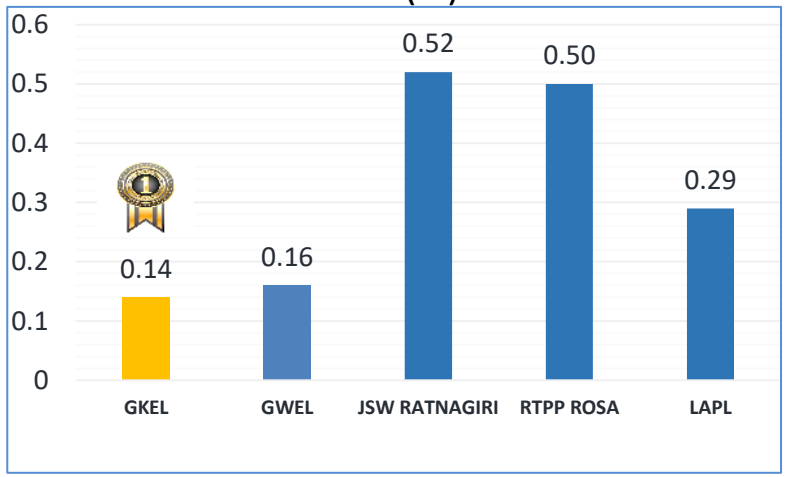
HEAT RATE (kcal/kwh)



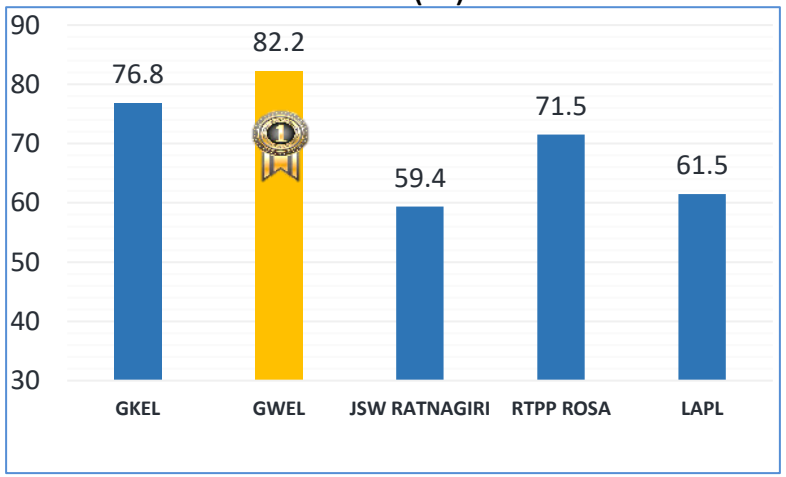
SOC (ml/kwh)



DM water (%)



PLF (%)



GKEL is equipped with TDBFP so benchmarking done with Net heat rate.

5. BENCHMARKING OF KPI

5.3 Road Map to create benchmarking

FUTURE TARGET FOR APC:

- GKEL presently achieved 5.83 % APC at full load against 7.55% design & normative APC 6.25% .
- GKEL aims to achieve day APC by 5.75 % & and annual average 6.5 % by FY 2024.

FUTURE TARGET FOR HEAT RATE:

- GKEL presently achieved 2305 kcal/kwh Heat rate at full load against 2223 design.
- GKEL aims to achieve 2300 Kcal/kwh by 2024.

PLANNING	EXECUTION	MONITORING	MOTIVATION
1.External and internal benchmarking	1.Prioritization of project	1.Deviation analysis	1.Reward and regnition in business level and group level
2.Set Energy objective and target	2.Implementation of action plan	RCA for each deviation	2.Workshop for energy conservation idea
3.Identification of EC project	3.Adopt best practices of sector	2.Monitoring CAPA through digital ATR	3.Appreciation in forum
4.Budget allocation for EC project	4.Training and awareness	3.Project effectiveness stuy	
5.Establishment of better monitoring system	5.Strengthening green suppy chain	Sustenance	
6.Action plan development	6.EC action beyond boundary		

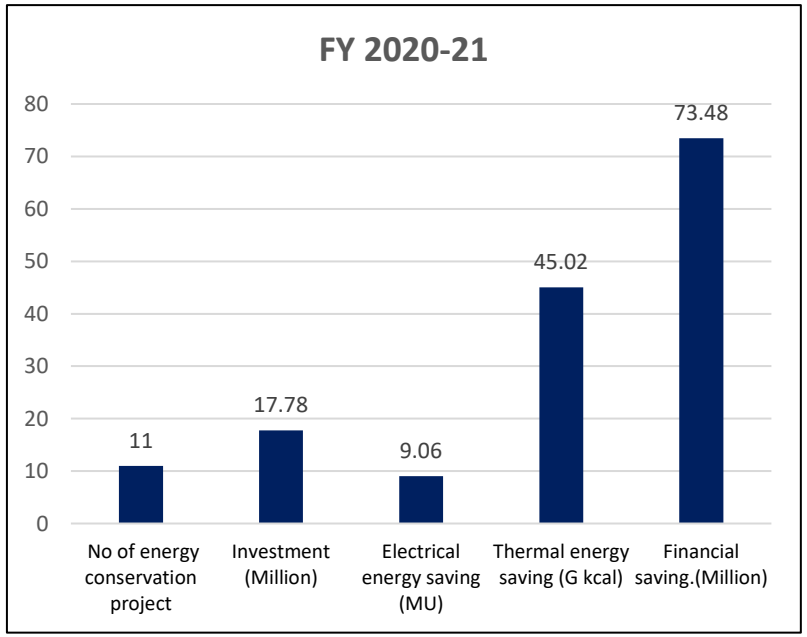
5.4 WAY FORWARD PLAN FOR ENERGY CONSERVATION

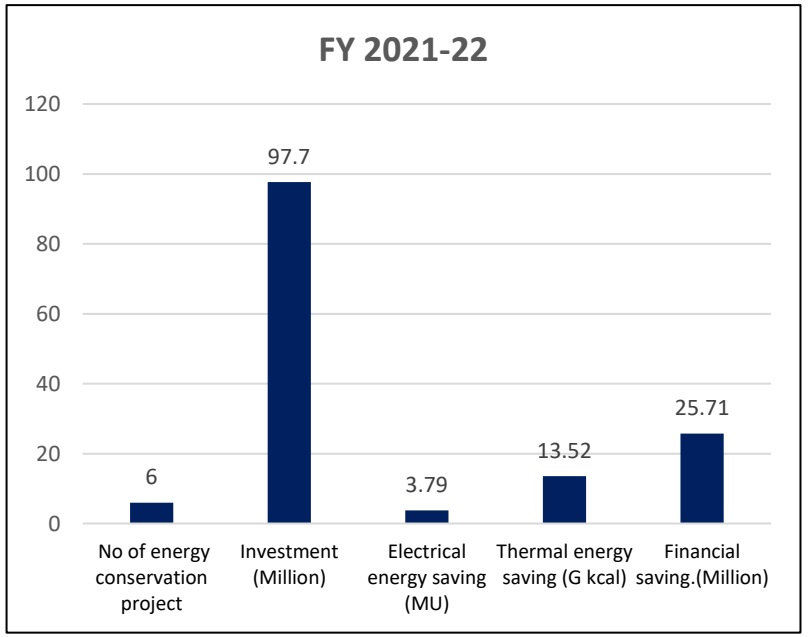
SL No.	Description of energy conservation measures	Investment (Rs in Million)	Annual Electrical Saving (Million kWh)	Annual Thermal Saving (Million Kcal)
1	IFC installation in compressor air network	5.5	1.0366	0
2	CHP instrument air header interconnection	0.2	0.18	0
3	Optimize coal mill seal air fan power (VFD installation)	3	1.093005	0
4	VFD In Compressor air network	1	0.2847	0
5	Install the Latest Generation Classifier for coal mill	18	0	2012
6	Increase in DFG&WFG loss due to (APH performance) unit 3 and unit 2	0	0	25969
7	Optimize power Consumption of BFP pump by maintenance / replace of RC valve	0.5	0	800
8	Single condenser pump operation in chiller circuit phase –I	0	0.12	0
9	Reduce generation pressure of BTG compressors	0	0.10	0
10	Replace Heatless Desiccant Air Dryers with HOC Dryers/ Refreezant dryer	2.6	0.35	0
11	Install level based auto zero drain valves for compressed air receivers	0.3	0.04	0
12	Automatic Star -delta-star starters for Belt Conveyors	3.4	0.23	0
Total		**34.5**	**3.43**	**28781**

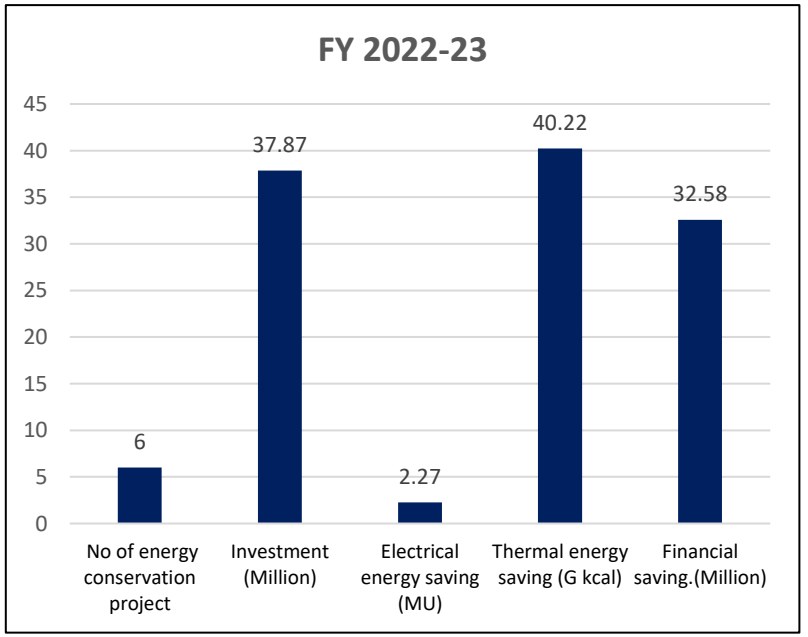
- **Flexible operation** : GKEL tested unit operation at 40% Loading Factor for assessment of Operational constraints , Reliability , Heat rate & APC degradation .GKEL is further exploring for external assement with BHEL for Operational Challenges , Performance degradation and mitigation plan.

6.ENERGY CONSERVATION PROJECT LAST 3 YEARS

Financial Year	No of energy conservation project	Investment (Million)	Electrical energy saving (MU)	Thermal energy saving (G kcal)	Financial saving. (Million)
FY 2020-21	11	17.78	9.06	45.02	73.48
FY 2021-22	6	97.7	3.79	13.52	25.71
FY 2022-23	6	37.87	2.27	40.22	32.58



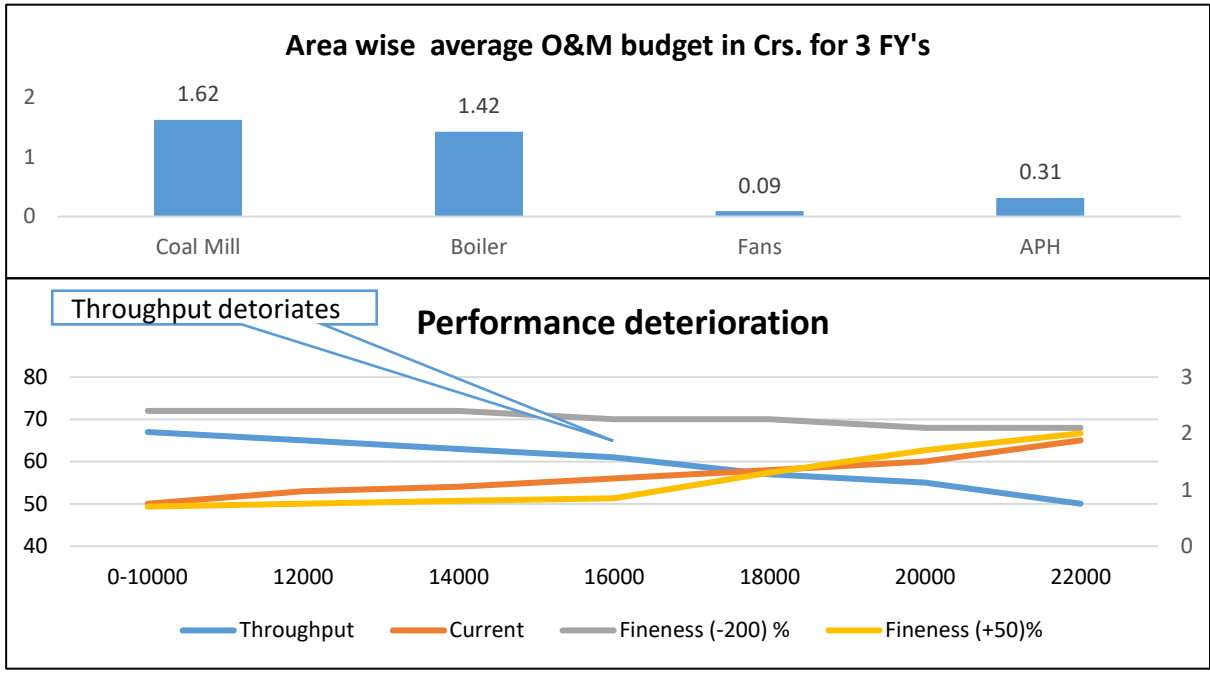




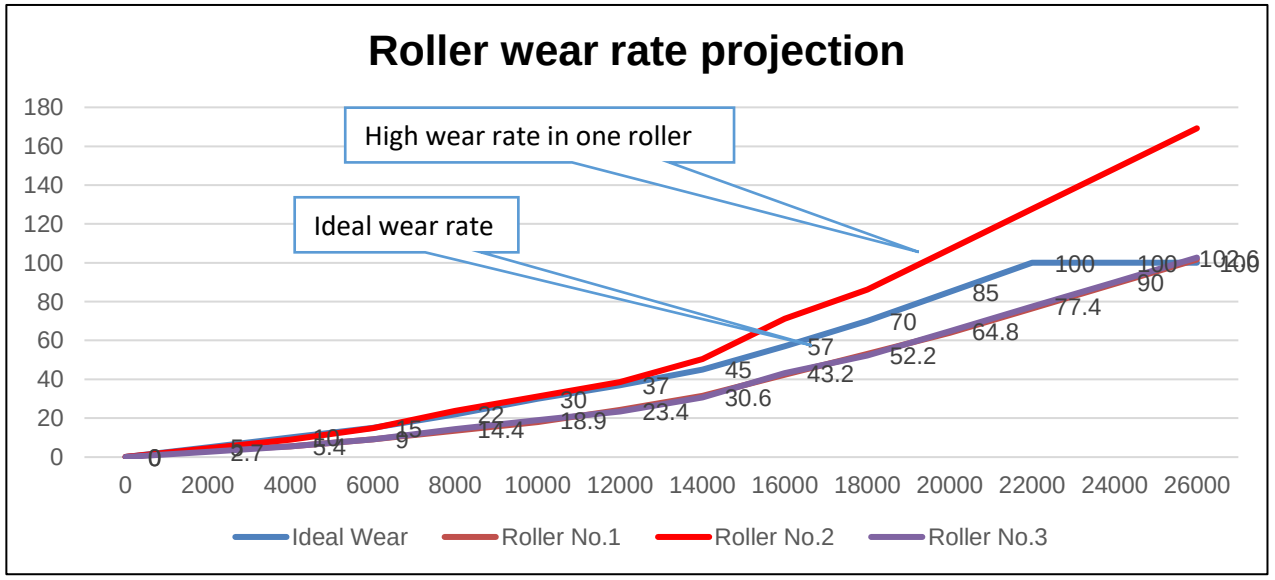
❑ **Identification of Problem-** R&M cost of coal mill contributes 47 % which is mostly due to the roller & track replacement. OEM guaranteed life of roller is 23000 RH but at 18000 RH ,performance parameter starts deteriorating .Due to high R&M cost , delayed replacement @ OEM recommended RH result in deterioration in energy performance of plant

- Increase in APC due to 5 coal mill operation against 4 mill (Design)
- Increases in Super heater & reheater Spray flow
- Increase in Fan Power due 5 mill operation

From the preliminary analysis it is found that after 18000 running hrs. their was a significant reduction in mill though put and fineness that forced for 5 mill operation.



❑ **Identification of Opportunity :-**



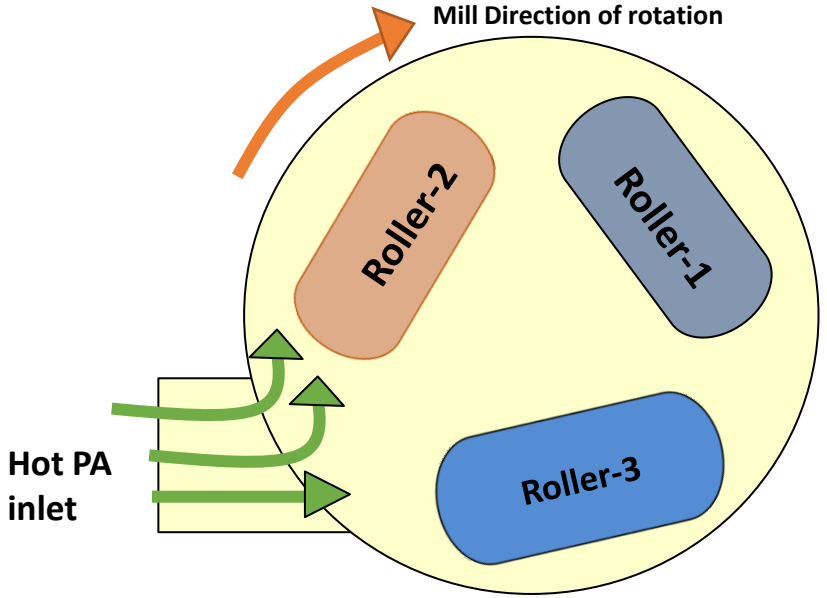
- It is observed from wear pattern at 23000 hrs., wear rate of one roller is 127 mm where allowable limit is 100 mm.
- Though two no's of rollers are below the limit value of 100 mm, there is an opportunity to increase the roller usable life if the wear rate of third roller can be controlled.
- From the above analysis, with predicted wear rate, the life of the roller can be extended up to 26000hrs.
- Further root cause of higher wear rate of one particular roller explored.

❑ **Analysis Outcome :-** With fishbone analysis for identification of possible factor and validation it was concluded that reason for more wear rate is - **Hot PA air directly impact towards roller no.2 along the direction of the rotation of the mill.**

❑ **Risk analysis :-**

Exploring the possible solution

Particular	Possible solution #1	Possible solution #2
Proposed solution	• Fixing of diverter plate near hot PA inlet duct.	• Swapping of rollers
Risk factor analysed	• It may disturb the vortex phenomena and affect on mill throughput • Air erosion phenomena may be developed on other area.	• Swapping may cause uneven load on grinding table and loading frame.
Implementation possibility	• Need approval from designer/OEM • Detail CFD study to be carried out to confirm vortex flow uniformity	• Close monitoring of different operating parameters after roller swapping for any abnormality
Time for implementation	• 8 -12 months	• 3 -4 days (outage of particular mill)



❑ **Action Plan:-**

To eliminate this risk further SMP has been modified as first swapping will be done at 10000 running hours and further swapping will be done at 5000 running hours to maintain wear pattern.

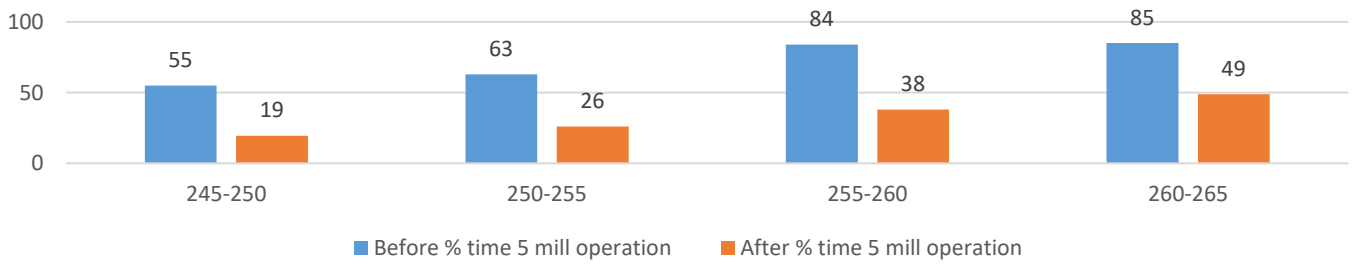
❑ Implementation :-

On pilot trail basis we have changed in 3 Nos. coal mill as shown in table.

Mills	Current Roller Running after swapping	OEM Guaranteed RHS	Over utilisation RH against guaranteed RH	Roller swapping
2A	29109	23000	6109	Done
2E	26793	23000	3793	Done
3F	27475	23000	4475	Done

- After swapping of roller, considering further wear rate, it is projected that it can be used up to 30000 running hours.
- It is proven in Coal mill 2A,2E & 3F in which running hours already exceed 26000 hrs.
- With the successful implementation and results same process modification is adopted in all the coal mills.

5th Mill Operation % @ Different coal flow range (TPH)



❑ Saving :-

- Reduction in 5th Mill Operation by 2686 hrs. which is directly contributes to APC saving of 2.08 Mu's. There will be net benefit of 2,40,66,000/-(for 18 coal mills@7000 extra running. And has potential to reduce O&M cost by 9%

Why Process Innovation

Innovation originates from need. Innovation needs 360 degree process interaction understanding, an out of box thinking and a positive force to shift from status co. The Change in process is an unique approach and beyond OEM which was implemented with risk analysis.

Knowledge Sharing

Knowledge sharing done with sister concern and group level CIP competition.

Adaptability

Solution is quite adaptable for hydraulic loaded bowl mill and it is a no cost solution with no adverse impact.

Economic Feasibility

No cost incurred for swapping except outage of the mill for 3-4 days. It generates huge cost benefit.

Control

The solution needs good SMP to maximize the benefit.

8. RENEWBLE ENERGY PROJECT

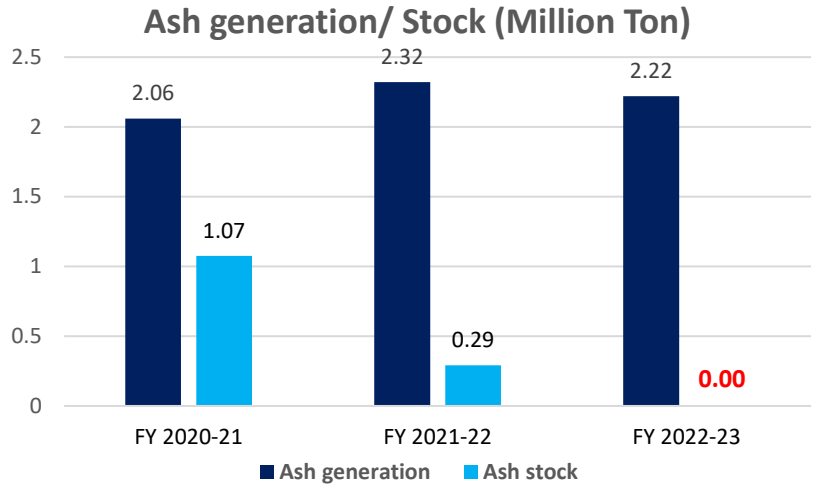
SL no.	Projects implemented	Capacity	Type of energy	(Generation Million KWh)
01	Wind operated Turbo ventilator installed (188 nos.) on TG Building and hydrogen builing.	250 Kwh	Wind	1.44
02	Security hub power supply from solar panel.	129 watt	Solar	0.001

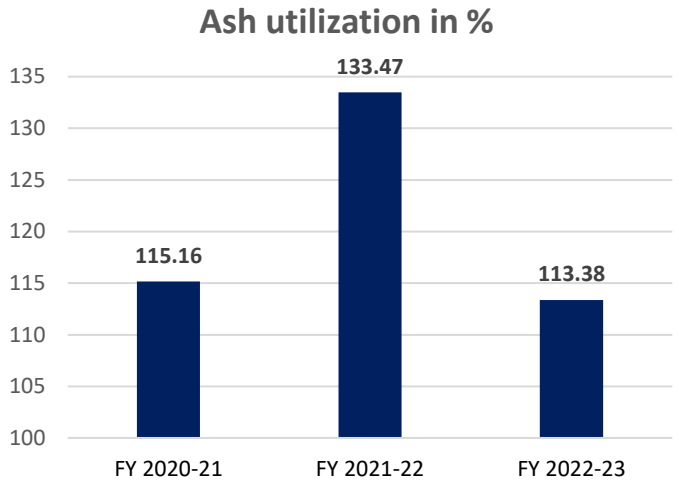
Turbo ventilators

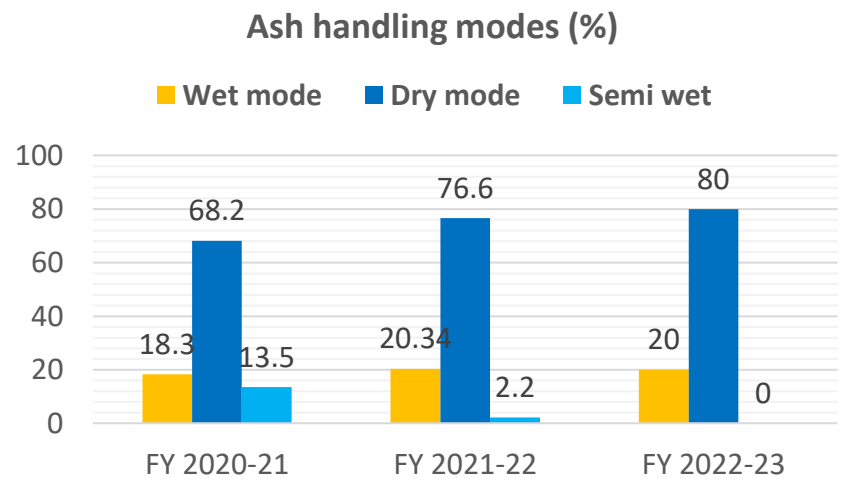
Solar panel at security post & Solar Traffic light

With corporate initiative (Under Project Abhijit- Energy 2.2), we are planning to install 25 MW solar power in 121 Acre land).

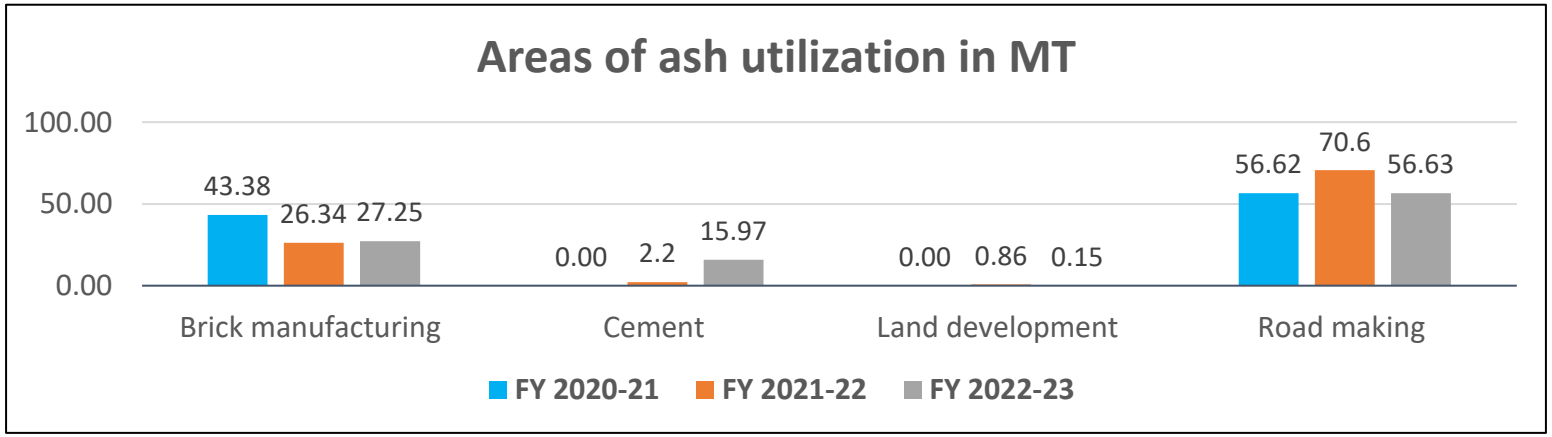
9.1 ENVIRNOMENT MANGEMENT - ASH UTILIZATION







0% legacy Ash stock



Modes of Ash Conveying

- Dry Ash conveying System with storage Silos
- Bottom Ash slurry conveying system with hydrobin water decanted system make it semi dry condition
- HCSD systems and ash pond with Ash water recovery System

9.2 ENVIRNOMENT MANGEMENT - ASH UTILIZATION

01

In house Bricks/blocks making unit – products is being sold to other and also used in-house for repairing & construction work of Township.

02

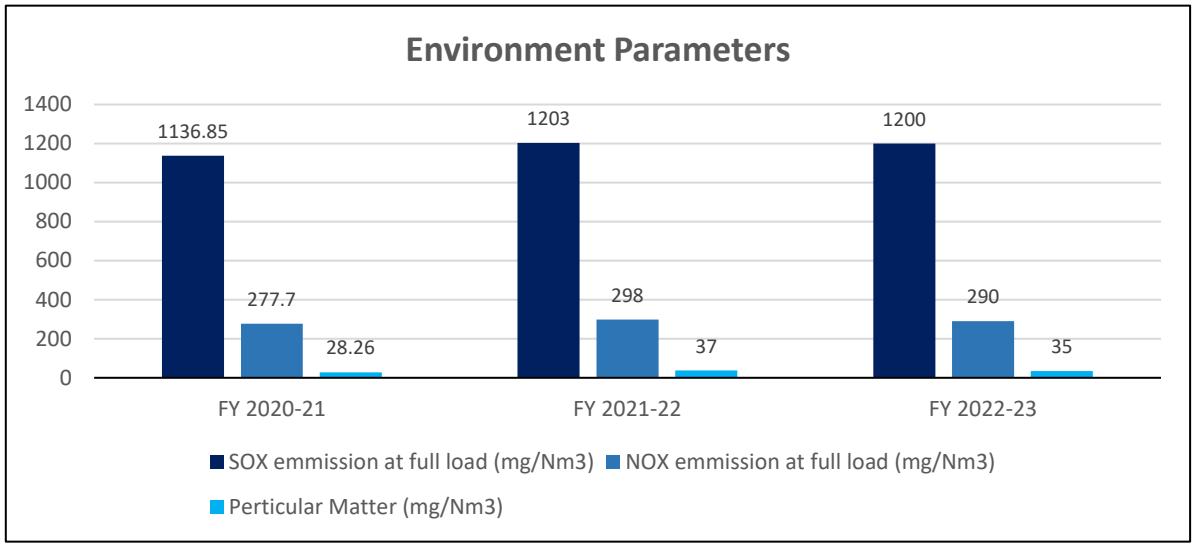
Supply to NH Authority for road construction project through trucks and bulk discharge through rakes

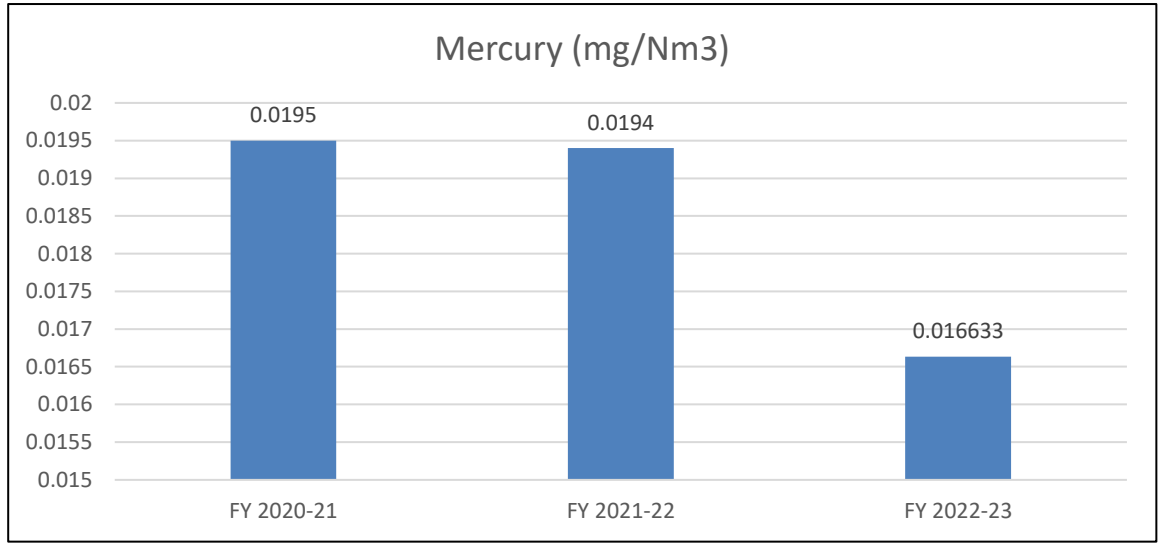
03

Supply to bricks/block and cement manufacturing unit by bulkers

- GKEL achieved the milestone and place itself as first plant in East cost railway division in terms of ash transportation first 100/200 rakes by rail mode.

9.3 ENVIRNOMENT MANGEMENT – EMMISSION





Best Practices for Emission control

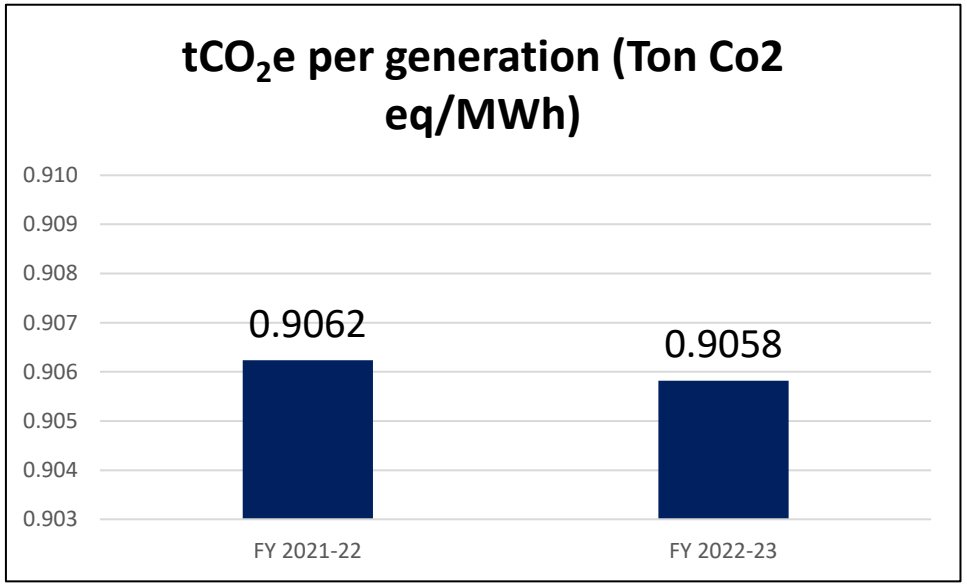
- Low NOx Burner and Over fire damper operation.
- Periodic checking of SADC for combustion control.
- Improvement in Fineness of coal particle
- Periodic replacement of Bag filters to control PM.
- Oxygen optimization for NOx control.
- Periodic monitoring of stack parameters.
- Daily ESP field healthiness monitoring.
- Online CEMS/ CEQMS is installed and data transmission to SPCB and CPCB
- Daily review of emission by EHS team

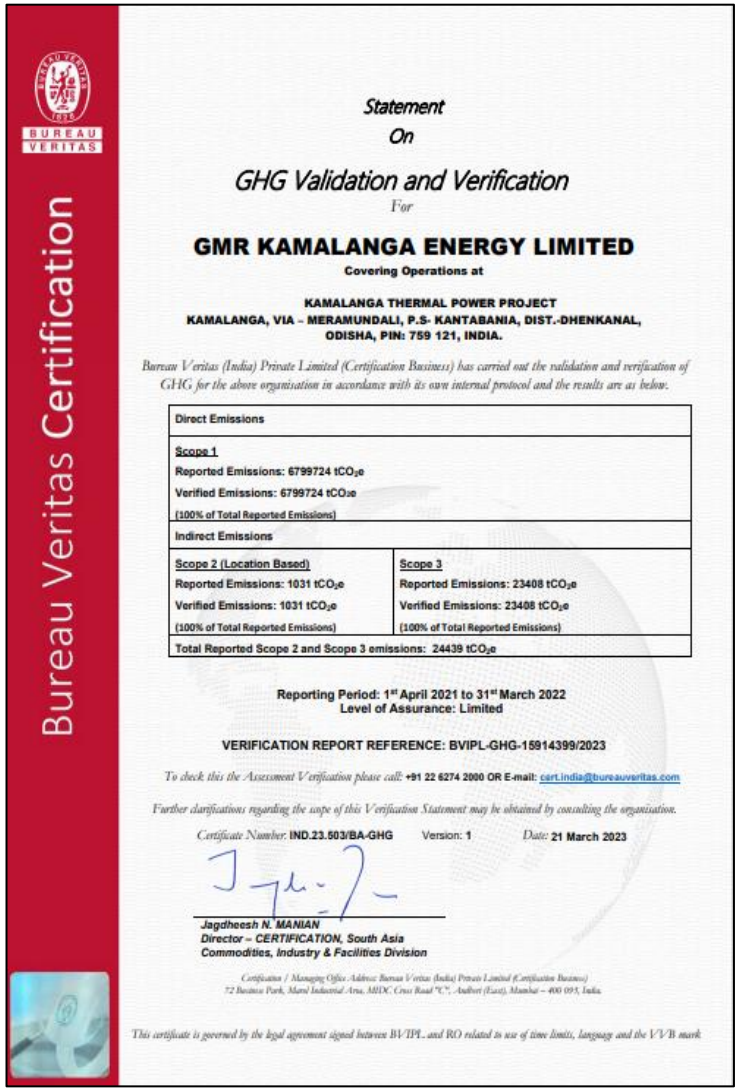
FGD installation is process and it will be commissioned by Dec -2025 as per MOEF direction.

Domestic bidding for Class-B in under Progress.

9.3 INFORMATION ON GHG INVENTORIZATION AND PUBLIC DISCLOSURE

GHG EMISSIONS (tCO_2e)				
Financial Year	Scope 1 Emission	Scope 2 Emission	Scope 3 Emission	Total Emission
FY 2021-22	6799724	1031	23408	6824163
FY 2022-23	6386602	925	26364	6413892





Bureau Veritas Certification

Statement
On
GHG Validation and Verification
For

GMR KAMALANGA ENERGY LIMITED
Covering Operations at

KAMALANGA THERMAL POWER PROJECT
KAMALANGA, VIA – MERAMUNDALI, P.S- KANTABANIA, DIST.-DHENKANAL, ODISHA, PIN: 759 121, INDIA.

Bureau Veritas (India) Private Limited (Certification Business) has carried out the validation and verification of GHG for the above organisation in accordance with its own internal protocol and the results are as below.

Direct Emissions	
Scope 1 Reported Emissions: 6799724 tCO_2e Verified Emissions: 6799724 tCO_2e (100% of Total Reported Emissions)	
Indirect Emissions	
Scope 2 (Location Based) Reported Emissions: 1031 tCO_2e Verified Emissions: 1031 tCO_2e (100% of Total Reported Emissions)	Scope 3 Reported Emissions: 23408 tCO_2e Verified Emissions: 23408 tCO_2e (100% of Total Reported Emissions)
Total Reported Scope 2 and Scope 3 emissions: 24439 tCO_2e	

Reporting Period: 1st April 2021 to 31st March 2022
Level of Assurance: Limited

VERIFICATION REPORT REFERENCE: BVIPL-GHG-15914399/2023

To check this the Assessment Verification please call: +91 22 6274 2000 OR E-mail: cert.india@bureauveritas.com

Further clarifications regarding the scope of this Verification Statement may be obtained by consulting the organisation.

Certificate Number: IND.23.503/BA-GHG Version: 1 *Date:* 21 March 2023

Jagdheesh N. MANIAN
Director – CERTIFICATION, South Asia
Commodities, Industry & Facilities Division

Certification / Managing Office Address: Bureau Veritas (India) Private Limited (Certification Business) 72 Business Park, Mami Industrial Area, MIDC Cross Road "C", Andheri (East), Mumbai – 400 093, India.

This certificate is governed by the legal agreement signed between BVIPL and RO related to use of time limits, language and the VVB mark

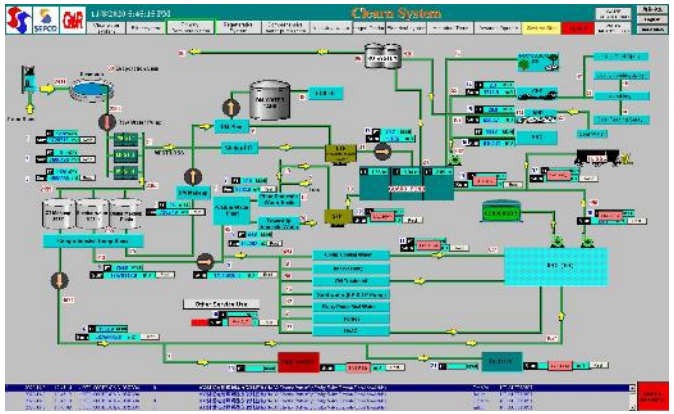
Use of Lower Emission Source of Energy

We are committed to reduce our overall GHG emissions from our operations in all scope.

<u>Action plan</u>

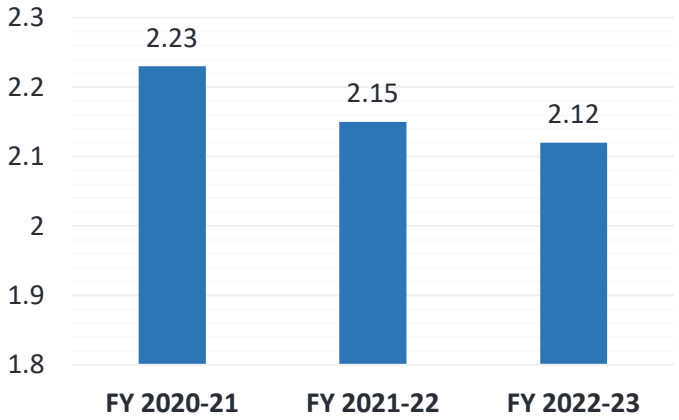
1. Reduction of Heat rate and APC , GCV gap.
2. Reduction of import power by reducing forced outage
3. Ash transport in rail mode (15% ash utilization by rail mode)

9.4 ENVIRNOMENT MANGEMENT -WATER

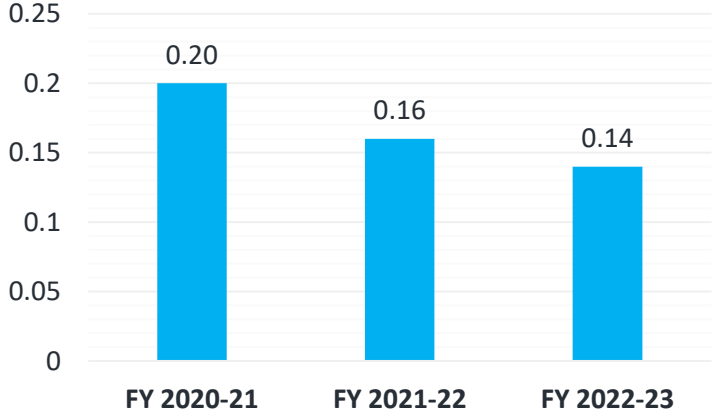


Water SCADA for Online Monitoring

Rain water Harvesting



RAW water(m3/MWh



DM WATER

Best Practices for reducing water load

- Replacement of drift eliminator .
- Water SCADA implementation .
- Rain water Harvesting by Rain water pump.
- Reuse of MFST blowdown
- Boiler refractory material modification
- Plant-wide storm water drains connected to Rain water harvesting pond.

Best Practices for waste water utilization

ETP and STP for treating the water and used in

- Makeup to bottom ash handling system.
- Make up to Fire fighting storage tank.
- Truck wheel washing spray system.
- Ash Conditioning during loading .
- Boiler seal trough charging.
- Floor and road cleaning.
- Coal yard sprinkling
- DS system in CHP.
- Horticulture.

9.4 ENVIRNOMENT MANGEMENT –WATER CONSERVATION OTHERS PROJECTS

- Relocation of underground utility pipes to over ground to reduce underground water leakages.
- Reuse of MFST blow down water back in to the system
- Installation of automatic level transmitters in all utility water tanks inside the plant and associates living area.
- Utilization of Guard pond Waste water instead of service water in Boiler , ESP area floor cleaning, DFDS System, Coal pre wetting system, and fog cannon .
- Utilization of township STP waste water for gardening purpose after treatment.

DFDS SYSTEM IN CHP

FOG Cannon

TRUCK WHEEL WASHING SYSTEM

WAGON SPRINKLING SYSTEM

11. BEST PRACTICE –NON ENERGY EFFICIENCY

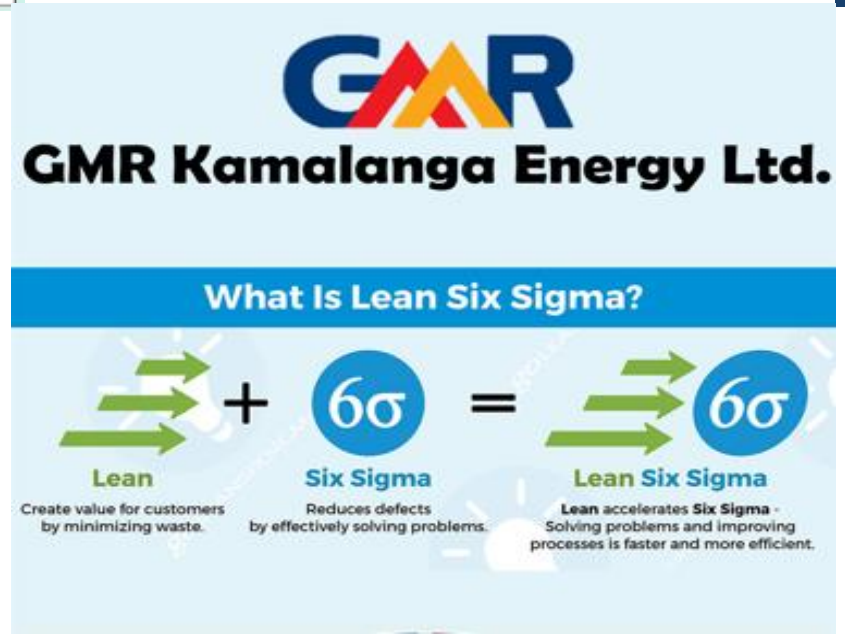
SIX SIGMA PROJECT

- Generation loss minimization by repeated failure analysis
- Life enhancement of frequently failing components
- CHP belt loading factor improvement
- Bottom ash quantity reduction
- Heat rate improvement
- Non-moving spare inventory reduction

RELIBILITY ENGINEERING

ABIRAL–A reliability improvement program with CFT approach and methodology includes

1. Repeated failure analysis
2. Critical spare management
3. Identification of process bottleneck.
4. RCA trough Six sigma approach.



USE OF DIGITAL PLATFORM

- Smart plant implementation for coal management , ash management and visitor management
- Compliance management, EHS management, Management Review & Sustainability reporting.
- SARATI portal for internal audits .
- Idea Factory for registration of individual idea
- SIP digitalization for change management
- ATR digitalization for tracking of CAPA.

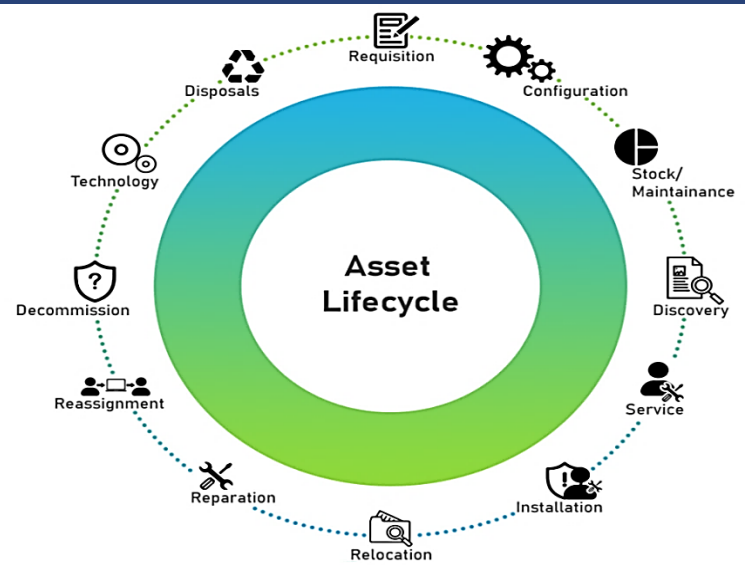
11. BEST PRACTICE –NON ENERGY EFFICIENCY

AFFORESTATION

1. GKEL has fulfilled statutory requirement by effective plantation in 335 Acres
2. Plantation of 3.96 Lakh sampling
3. Mass plantation in plant premises
4. Seedlings distribution to community
5. Planation in community.
6. 35 Acres landscape development
7. 2 Acres of organic farming

CSR

1. Farming & Livestock
2. Skill Training
3. Micro Enterprise Development
4. Support to Old People
5. Free Eye Check-Up Camp
6. Telemedicine support, Fogging
7. Mobile Medical Unit , Blood Donation



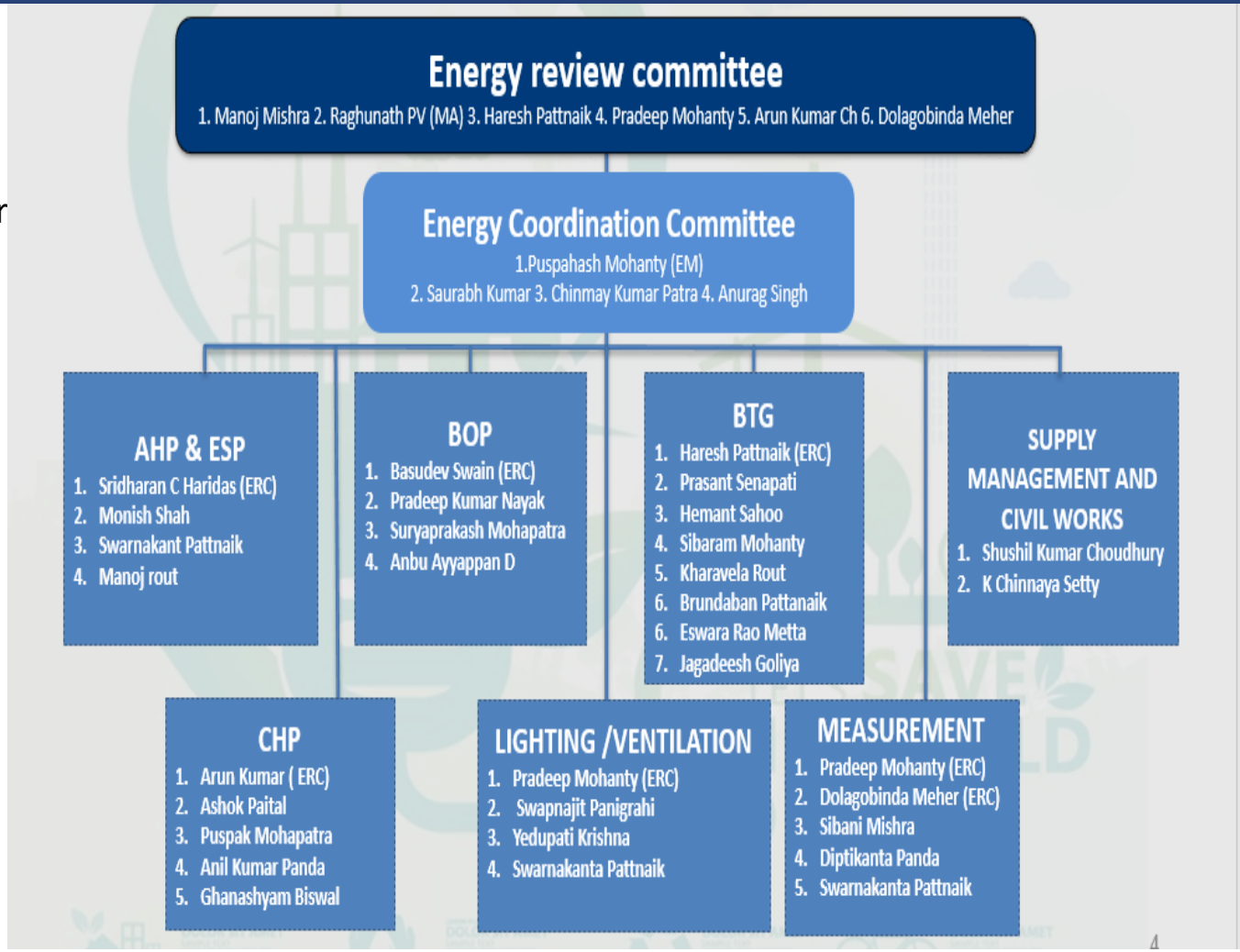
ASSET MANAGEMENT

1. SAP based maintenance
2. Preservation methodology
3. Min max process
4. Condition monitoring
5. Regulatory compliance
6. Waste management
7. Certification of ISO 55001

12. ENERGY MANGEMENT SYSTEM

12.1 ENERGY MANGEMENT CELL

- **Energy review committee** : For overall review & support
- **Energy management Cell** : For Monitoring and developing
- **Zonal members** : For field level execution .
- **No of zones** : 6 zones better targeting and monitor
- **Involvement** - : 31 Nos of employees associated.
- **Competency**- : 7 BEE Certified energy auditors
- **Review** : Energy review chaired by plant head



Objective of EMC to

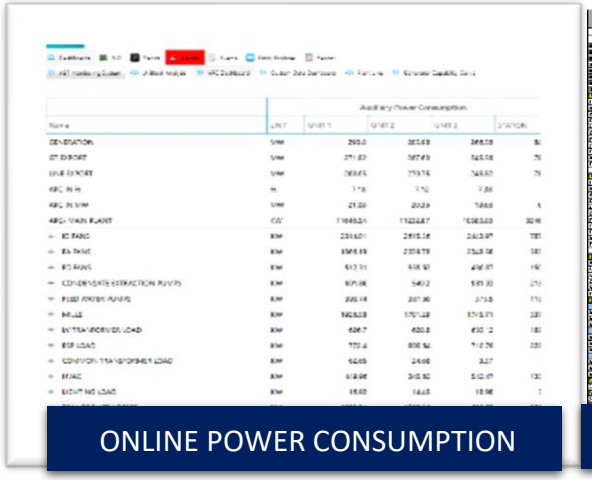
- Monitoring of specific energy consumption area wise.
- Deviation analysis of SEU and objective
- Sustenance Action planning and monitoring
- Improvement action planning and cost benefit analysis
- Awareness. And Training
- Establish ISO 50001 standard for process strengthening

Statutory Compliance:

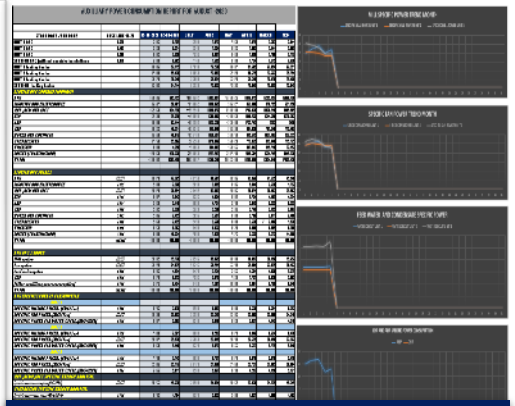
GKEL is bagged 6364 Escerts under PAT cycle-V.

12. ENERGY MANGEMENT SYSTEM
12.2 ENERGY MONITORING AND MEASUREMENT

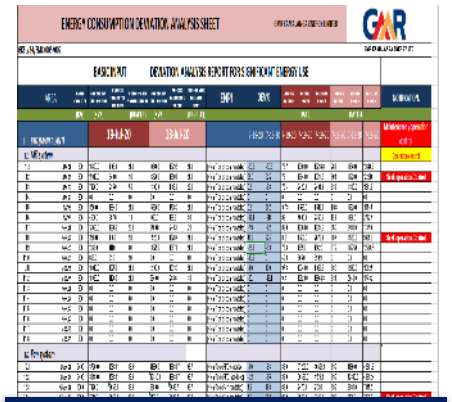
ELECTRICAL ENERGY MONITORING



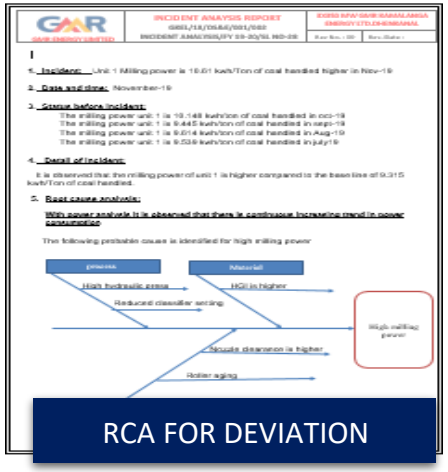
ONLINE POWER CONSUMPTION



AREA WISE SP ENERGY ANALYSIS

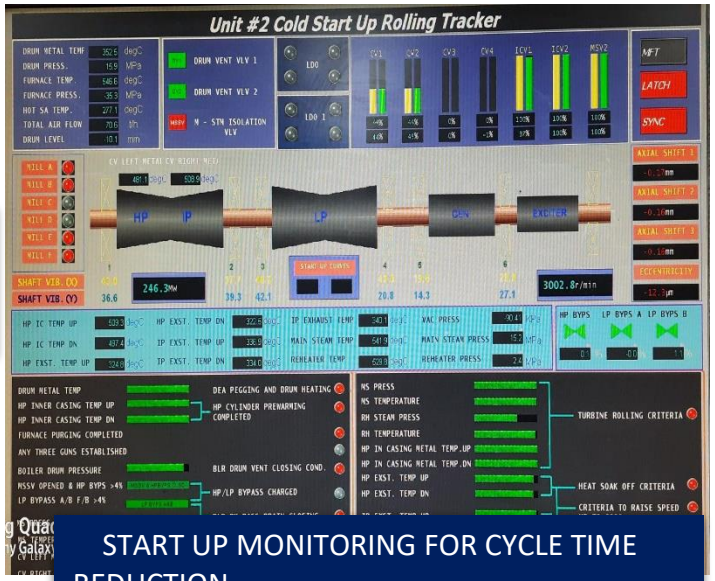


SEU DEVIATION ANALYSIS

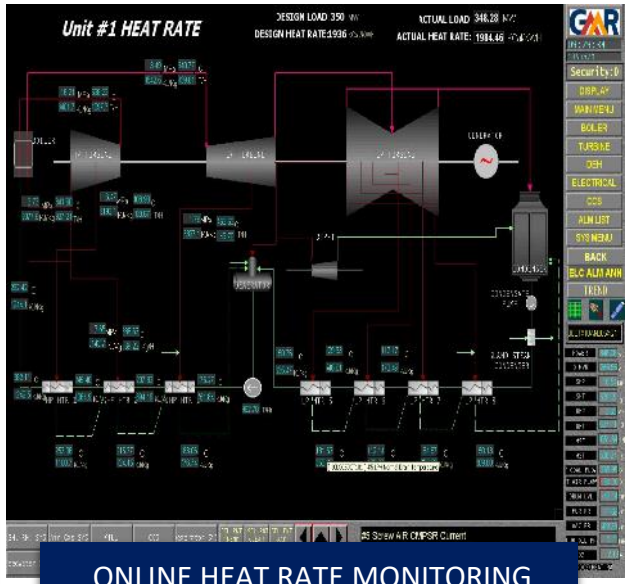


RCA FOR DEVIATION

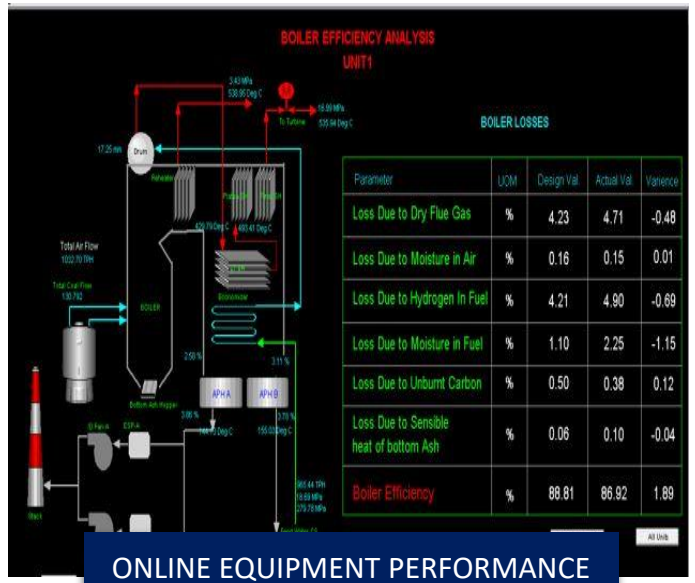
THERMAL ENERGY MONITORING



START UP MONITORING FOR CYCLE TIME REDUCTION



ONLINE HEAT RATE MONITORING

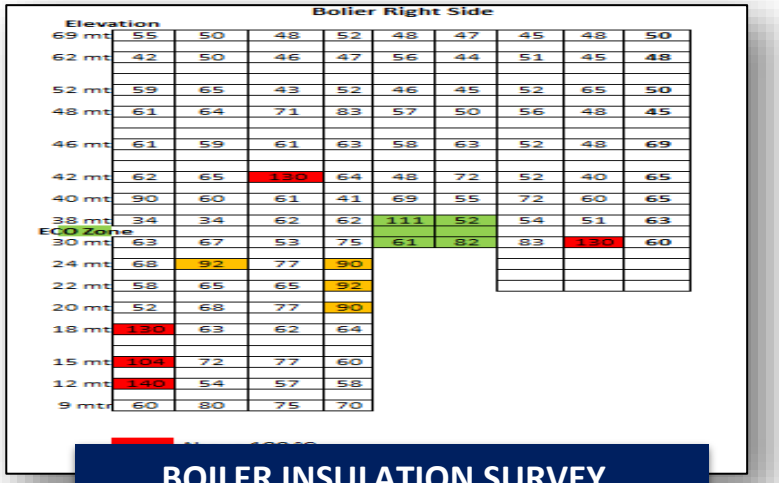


Parameter	UOM	Design Val	Actual Val	Variance
Loss Due to Dry Flue Gas	%	4.23	4.71	-0.48
Loss Due to Moisture in Air	%	0.16	0.15	0.01
Loss Due to Hydrogen In Fuel	%	4.21	4.90	-0.69
Loss Due to Moisture in Fuel	%	1.10	2.25	-1.15
Loss Due to Unburnt Carbon	%	0.50	0.38	0.12
Loss Due to Sensible heat of bottom Ash	%	0.06	0.10	-0.04
Boiler Efficiency	%	88.81	86.92	1.89

ONLINE EQUIPMENT PERFORMANCE

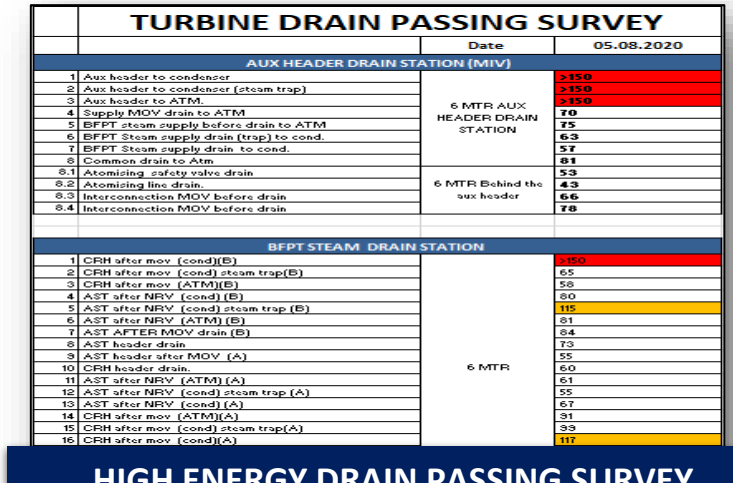
12. ENERGY MANGEMENT SYSTEM
12.3 WORKMEN INVOLVEMENT THROUGH SGA

1. Half yearly Boiler and turbine insulation temperature survey.
2. Furnace pressurization test for air in-leakage identification.
3. PA duct pressurization test for air in- leakage identification.
4. Monthly high energy Drain passing survey.
5. Instrument and service air leakage survey
6. Furnace velocity mapping.
7. Compressor FAD testing.
8. Illumination study.
9. Ventilation system audit


Bolier Right Side

Elevation									
69 mt	55	50	48	52	48	47	45	48	50
62 mt	42	50	46	47	56	44	51	45	48
52 mt	59	65	43	52	46	45	52	65	50
48 mt	61	64	71	83	57	50	56	48	45
46 mt	61	59	61	63	58	63	52	48	69
42 mt	62	65	130	64	48	72	52	40	65
40 mt	90	60	61	41	69	55	72	60	65
38 mt	34	34	62	62	111	52	54	51	63
ECO Zone									
30 mt	63	67	53	75	61	82	83	130	60
24 mt	68	92	77	90					
22 mt	58	65	65	92					
20 mt	52	68	77	90					
18 mt	130	63	62	64					
15 mt	104	72	77	60					
12 mt	140	54	57	58					
9 mt	60	80	75	70					

BOILER INSULATION SURVEY .

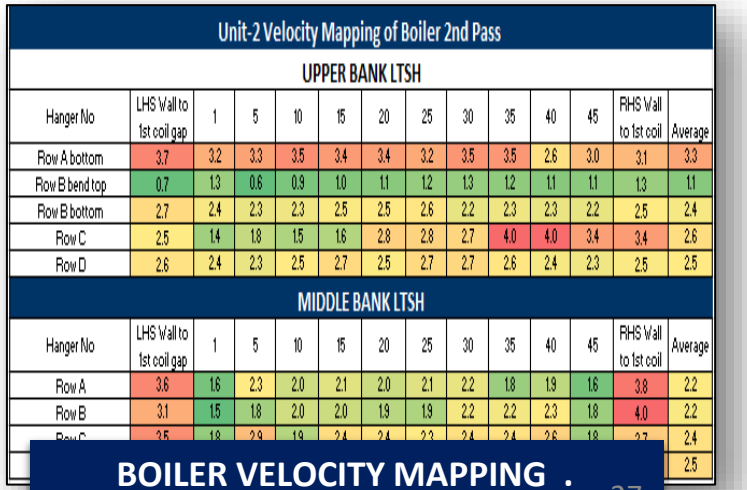

TURBINE DRAIN PASSING SURVEY

Date 05.08.2020

	AUX HEADER DRAIN STATION (MIV)		
1	Aux header to condenser	6 MTR AUX HEADER DRAIN STATION	>150
2	Aux header to condenser (steam trap)		>150
3	Aux header to ATM.		>150
4	Supply MOV drain to ATM		70
5	BFPT steam supply before drain to ATM		75
6	BFPT Steam supply drain (trap) to cond.		63
7	BFPT Steam supply drain to cond.		57
8	Common drain to Atm		81
8.1	Atomising safety valve drain	6 MTR Behind the aux header	53
8.2	Atomising line drain.		43
8.3	Interconnection MOV before drain		66
8.4	Interconnection MOV before drain		78

	BFPT STEAM DRAIN STATION		
1	CRH after mov (cond)(B)	6 MTR	>150
2	CRH after mov (cond) steam trap(B)		65
3	CRH after mov (ATM)(B)		58
4	AST after NRV (cond) (B)		80
5	AST after NRV (cond) steam trap (B)		115
6	AST after NRV (ATM) (B)		81
7	AST AFTER MOV drain (B)		84
8	AST header drain		73
9	AST header after MOV (A)		55
10	CRH header drain.		60
11	AST after NRV (ATM) (A)		61
12	AST after NRV (cond) steam trap (A)		55
13	AST after NRV (cond) (A)		67
14	CRH after mov (ATM)(A)		91
15	CRH after mov (cond) steam trap(A)		33
16	CRH after mov (cond)(A)		117

HIGH ENERGY DRAIN PASSING SURVEY .


Unit-2 Velocity Mapping of Boiler 2nd Pass

UPPER BANK LTSH

Hanger No	LHS Wall to 1st coil gap	1	5	10	15	20	25	30	35	40	45	RHS Wall to 1st coil	Average
Row A bottom	3.7	3.2	3.3	3.5	3.4	3.4	3.2	3.5	3.5	2.6	3.0	3.1	3.3
Row B bend top	0.7	1.3	0.6	0.9	1.0	1.1	1.2	1.3	1.2	1.1	1.1	1.3	1.1
Row B bottom	2.7	2.4	2.3	2.3	2.5	2.5	2.6	2.2	2.3	2.3	2.2	2.5	2.4
Row C	2.5	1.4	1.8	1.5	1.6	2.8	2.8	2.7	4.0	4.0	3.4	3.4	2.6
Row D	2.6	2.4	2.3	2.5	2.7	2.5	2.7	2.7	2.6	2.4	2.3	2.5	2.5

MIDDLE BANK LTSH

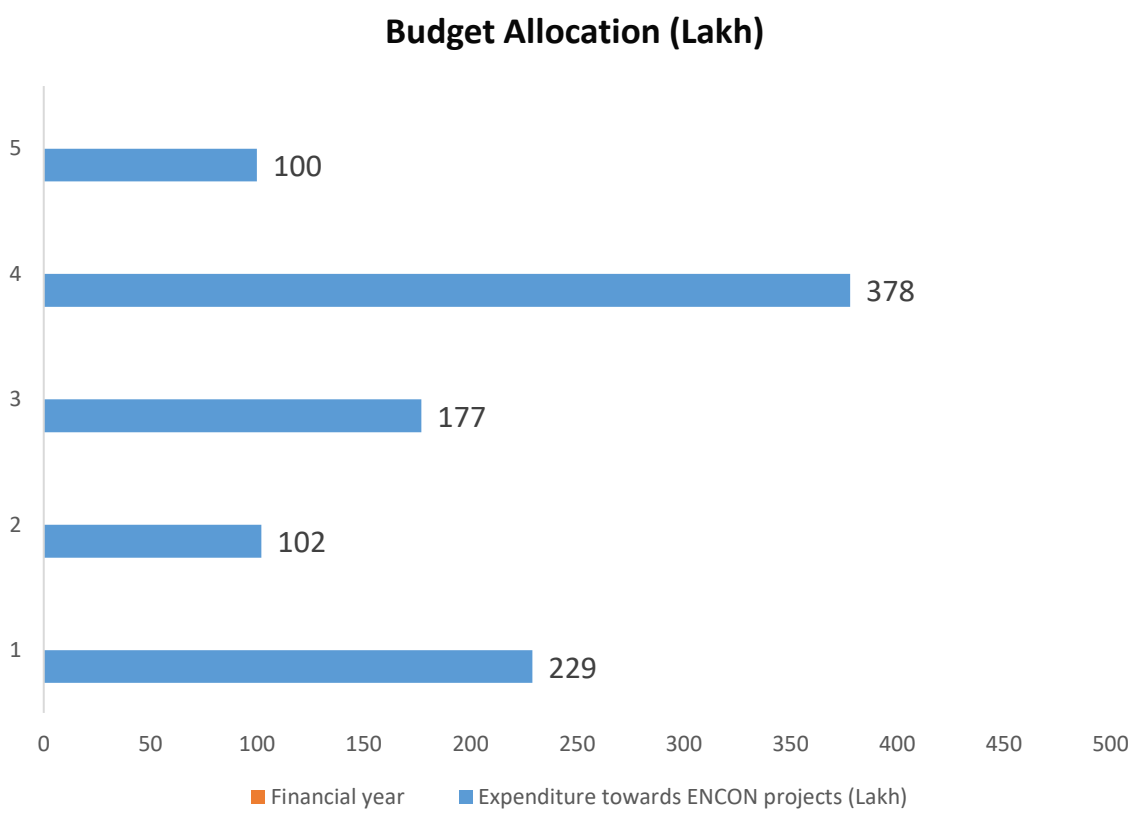
Hanger No	LHS Wall to 1st coil gap	1	5	10	15	20	25	30	35	40	45	RHS Wall to 1st coil	Average
Row A	3.6	1.6	2.3	2.0	2.1	2.0	2.1	2.2	1.8	1.9	1.6	3.8	2.2
Row B	3.1	1.5	1.8	2.0	2.0	1.9	1.9	2.2	2.2	2.3	1.8	4.0	2.2
Row C	2.5	1.9	2.9	1.9	2.4	2.4	2.3	2.4	2.4	2.6	1.8	2.7	2.4
													2.5

BOILER VELOCITY MAPPING .

13. BUDGET ALLOCATION

SL No.	Expenditure towards ENCON projects (Lakh)	Financial year
1	229	FY-19
2	102	FY-20
3	177	FY -21
4	378	FY -22
5	100	FY-23

Budget allocation w.r.t turn over = 0.05%



14.AWARD AND ACCOLADES

2018-19

State Energy conservation award

ICC Environment award -19

Kalinga safety award

Community initiative award

2019-20

CII national Energy award-20

CII –ER ENCON Award

ICC Env excellence Award

Pollution control Award

2020-21

CII national Energy award-21

CII National award for most innovative environment project-21

State Pollution control excellence award-21

2021-22

CII national Energy award-22

CII National award for most Leaders

15. LEARNING FROM CII & OTHERS

GKEL participated in CII National level award for energy management for last three years and awarded as excellent energy management unit & Leader Which turns to be great motivational factor for work force towards energy conservation. It helped the organization in following aspects.

- Adoption of best practices in energy conservation
- Adoption of best practice in environment aspects
- KPI benchmarking
- Motivations towards energy efficiency
- National level recognition.
- Employee engagement towards energy conservation

THANK YOU

We have rights to use national recourses but have no rights to waste it. Save energy save environment

Confederation of Indian Industry