CII-National Award for Excellence in Energy Management - 2022

Hindalco Industries Limited, Renukoot

Team Members :

Deena Jaiswal (Asst. Gen. Manager)

Himanshu Ranjan (Asst. Gen Manager)

Ravi Tiwari (Sr. Manager)

Introduction of Company -

- A Flagship Company of Aditya Birla Group
- Established in 1962 with “Kaiser Technology’’
- A pioneer Non-ferrous Metals Powerhouse– : Industry leader in both segments of Aluminium and Copper
- Renukoot Operations include:
  - Alumina Refinery, Co-generation Unit, Smelter Plant
  - Fabrication (Down Stream Production) & Captive Power Plant (35 km away)
- Commenced its operations with initial capacity of 20,000 TPA metal and 40,000 TPA alumina.
- Emerged as the largest integrated aluminium manufacturing company in India.
- Globally 12th largest aluminium and alumina producer.
- Has been, strategically, a healthy mix of Organic and Inorganic Growth.
- Capacity Enhancement through modernization of the plants, upgrading the processes and incorporating energy efficient latest technologies.

Vision & Mission

Vision :

To be a Premium Metals Major, Global in size and reach, Excelling in everything we do, and creating value for its stack holders.

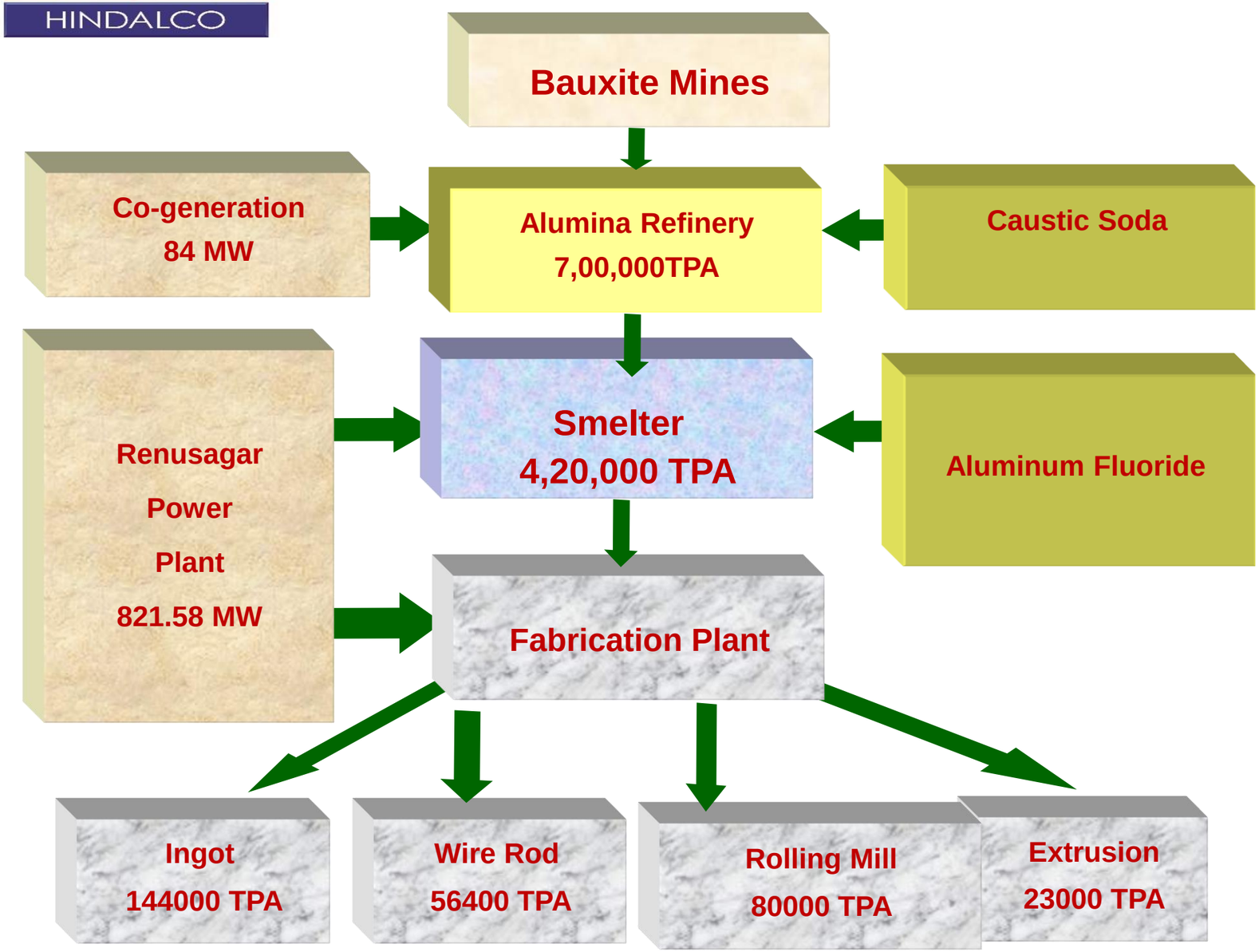
Mission :

To relentlessly pursue the creation of superior shareholder value by exceeding customer expectations profitably, unleashing employee potential and being a responsible corporate citizen adhering to our values.

"Values" - We value

- **Integrity : Honesty in Every Action**
- **Commitment : Deliver On The Promise**
- **Passion : Energized action**
- **Seamlessness : Boundary less in letter and spirit**
- **Speed : One step ahead always**

Capacities Overview & Salient Features of Hindalco Pot Lines



POT Line	Start up	Total No. of pots	Design DC Current (KA)	Prod. capacity (MT/day)
1	1962 + FY'06 +FY'07	166 + 2 + 6	50	63.01
2	1965	176	55	73.97
3	1967	176	55	73.97
4	1974+FY'08+FY'10	190 +10+6	60	87.67
5	1981 +FY'08 +FY'11	190 +10+6	60	87.67
6	FY'91+FY'08	190 +10	63.2	90.41
7	FY'96 +FY'08	190+10	63.2	90.41
8	FY'98 +FY'08	190+10	63.2	93.15
9	FY'02+FY'05	190+9	65	93.15
10	FY'03 +FY'04	190 +10	65	93.15
11	FY'03 + FY'08	200 + 2	65	98.63
	Total (11 Lines)	2138 Pots	60.41 (avg)	945.21

HIL's Energy Policy Focuses on…

- Reduction of specific energy consumption in all operations and activities.
- Adopt energy efficient technologies /equipment for all new projects.
- Replace old equipment and technologies with latest energy efficient technologies / equipment continually.
- Ensure control over energy consumption by periodic Management Reviews.

Honest Adherence to Policy's Themes

ADITYA BIRLA

HINDALCO MANAGEMENT FRAMEWORK
excellence by design

ENERGY AND CARBON POLICY

We, at Hindalco Industries Limited, operating across the value chain in non-ferrous metals, understand that energy consumption and carbon emission are two most important issues that currently concern the country and the planet. We shall take responsible actions within the company for prudent and efficient use of energy sources to achieve continual improvement in our energy and carbon performance.

To achieve this and in consonance with the organization's purpose, we shall:

- Meet legal compliance and other requirements related to energy and carbon across all our operating units.
- Raise awareness on the responsible use of energy resources at all levels of our operations and encourage efficient utilization of such resources with focus on reducing the energy and carbon intensity of our operations.
- Ensure the availability of information and necessary resources to achieve objectives and targets on Energy & Carbon.
- Allocate sufficient resources such as organizational structure, technology and finance for implementation of the policy and for regular monitoring of performance.
- Support design activities that consider energy & carbon performance improvement.
- Explore and utilize renewable energy, waste heat and clean fuel wherever techno-economically feasible across our operations.
- Adopt economically viable new/efficient clean technologies and best practices for improving energy efficiency and for emitting less carbon.
- Continually improve energy performance and carbon management in our units by adopting nationally/internationally accepted management systems, including setting and reviewing targets and monitoring, measuring and reporting their progress.
- Support the procurement of energy efficient products and services that impact energy & carbon performance.
- Work in partnership with regulatory services authorities, relevant suppliers, contractors and all stakeholders, as applicable, to understand and initiate improvement projects.
- Measure, monitor and report direct and indirect energy usage and carbon emission in accordance with internationally recognized protocols and set up systems for comparison and benchmarking across our units and operations.

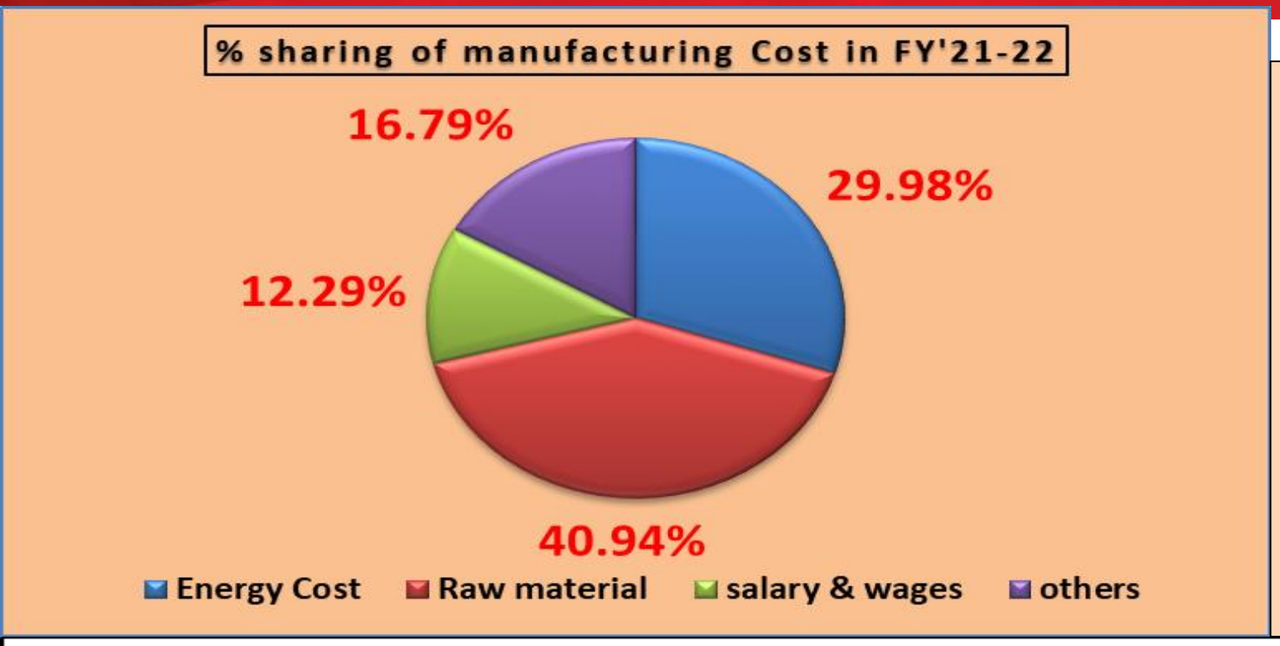
This policy shall be made available to all employees, suppliers, customers, community, other stakeholders, as appropriate and shall be reviewed every 3 years for its suitability and updated as necessary.

SATISH PAI
MANAGING DIRECTOR

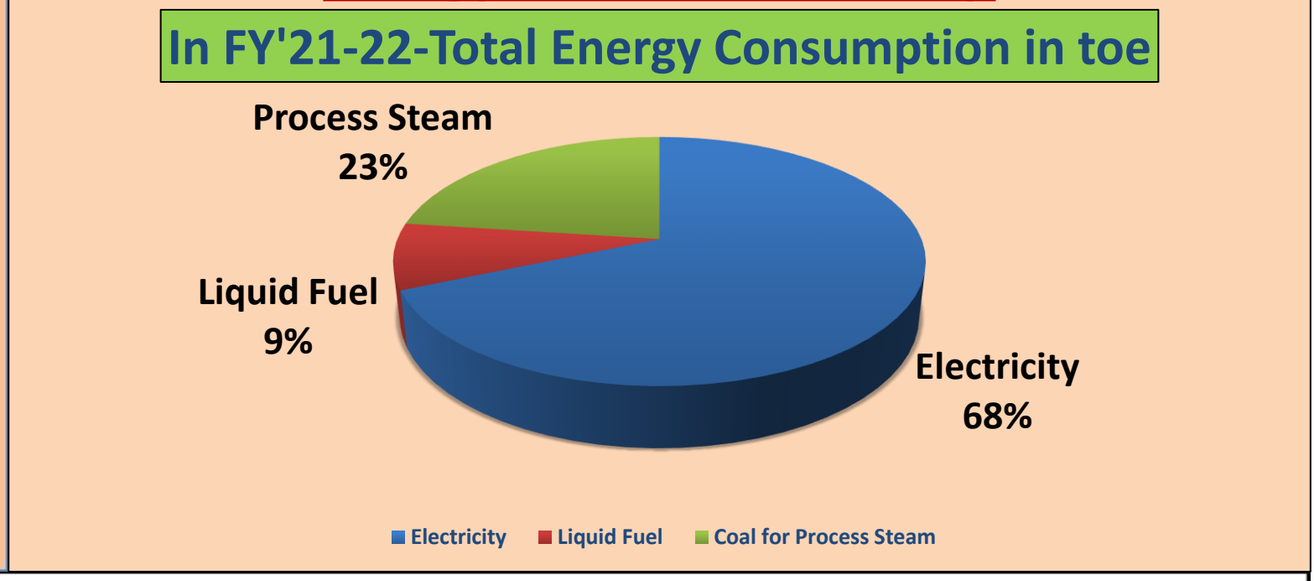
Date : 30 June 2020

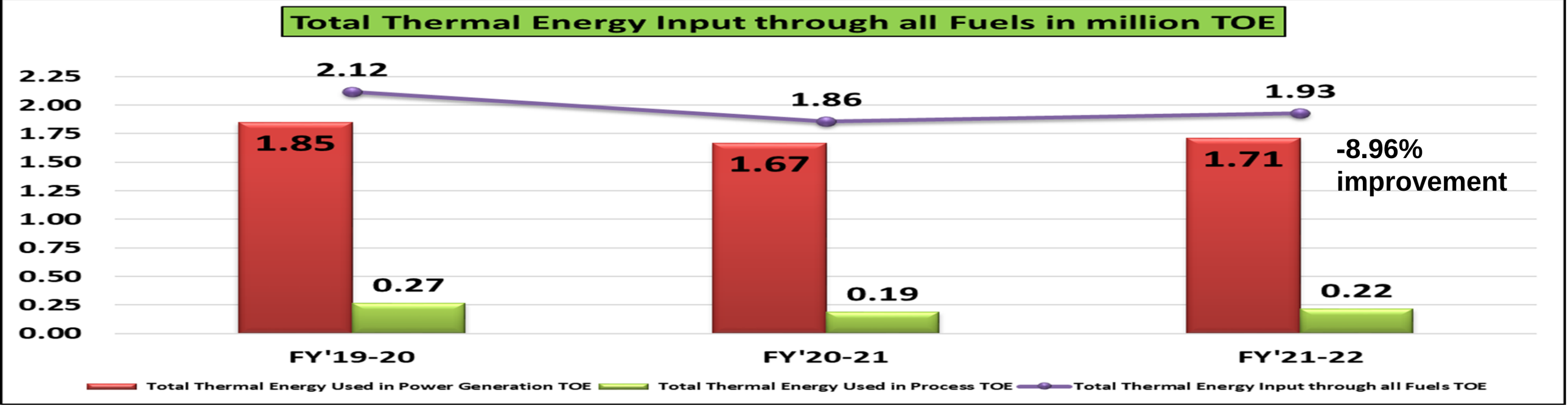
HINDALCO INDUSTRIES LIMITED

Al. Manufacturing Cost : An energy Intensive Process (FY'21-22)

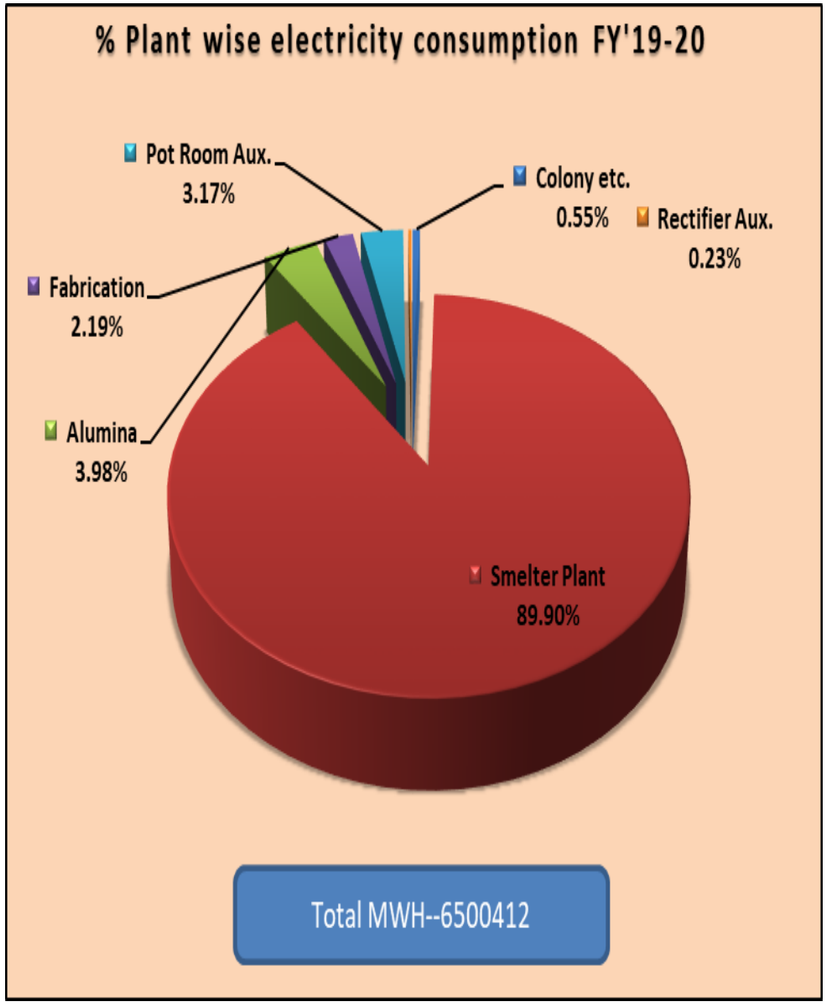


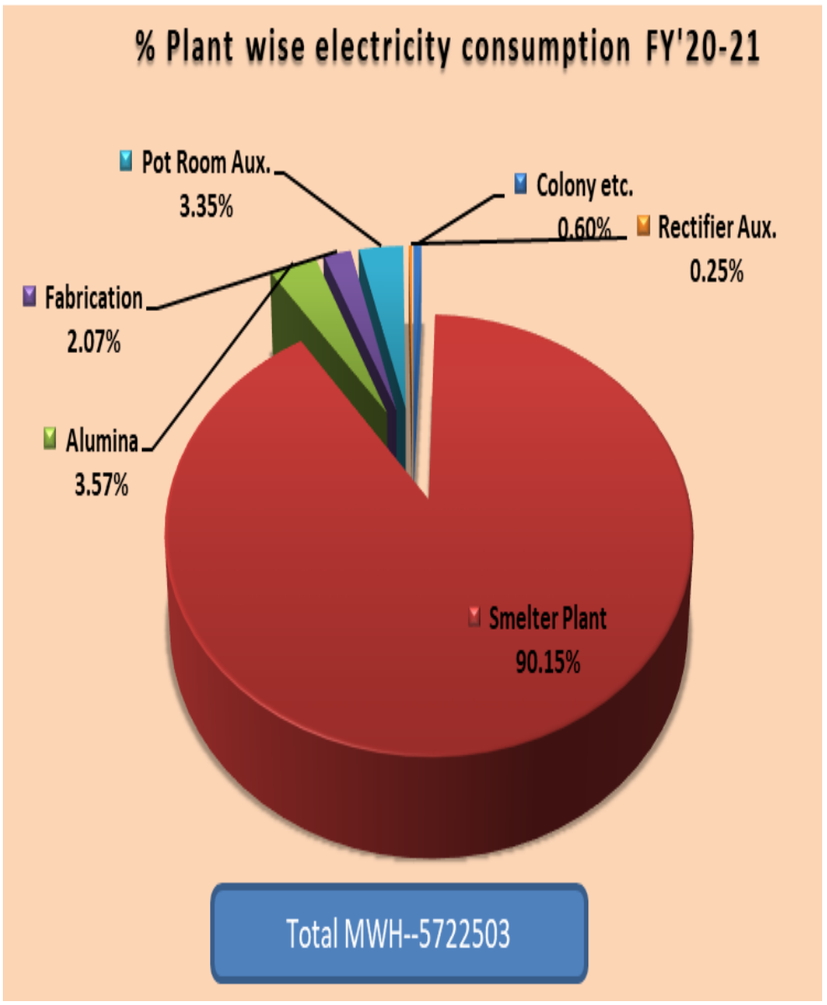
Energy wise cost break up

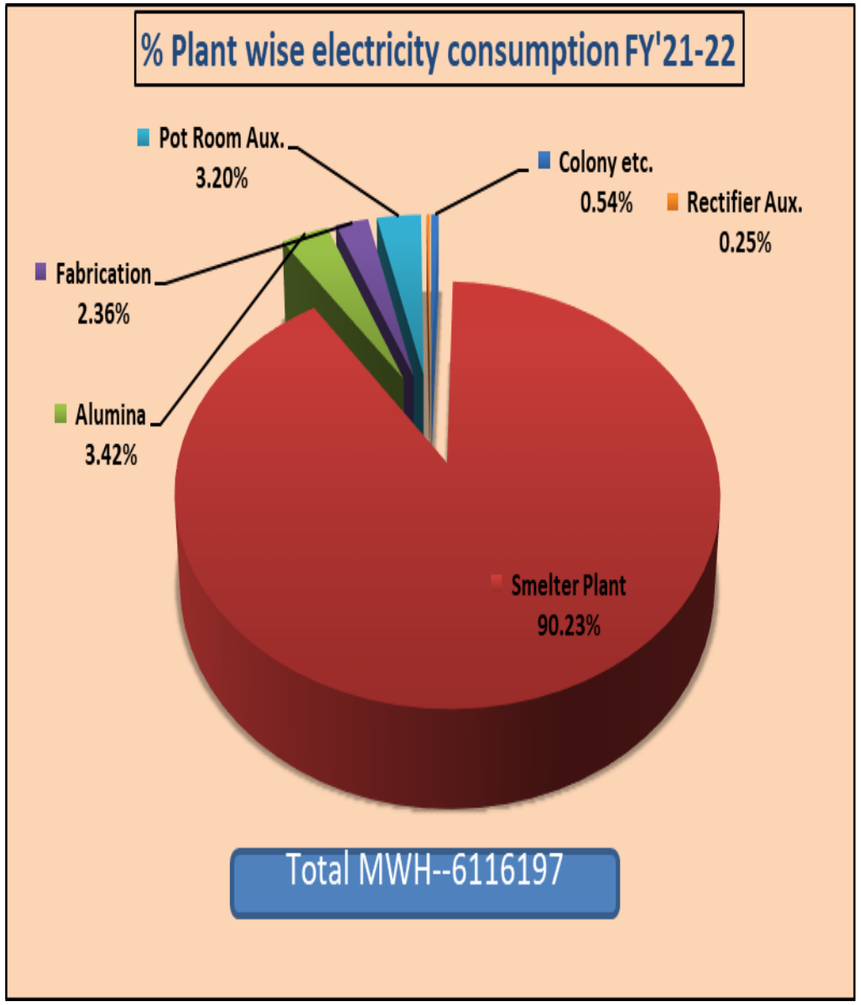




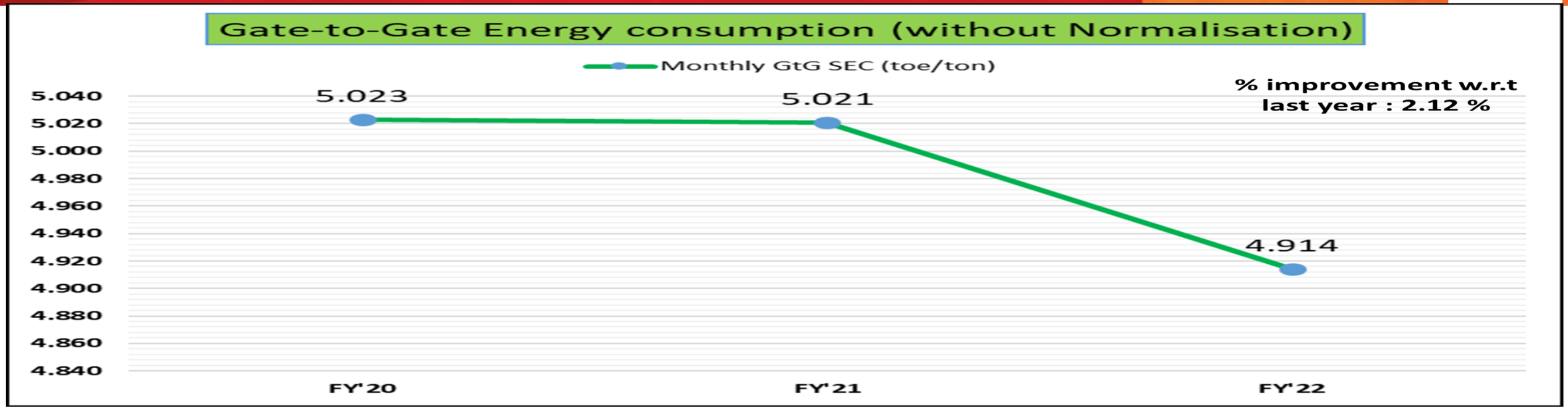
Total Electrical Energy and it's distribution (FY'20-22)

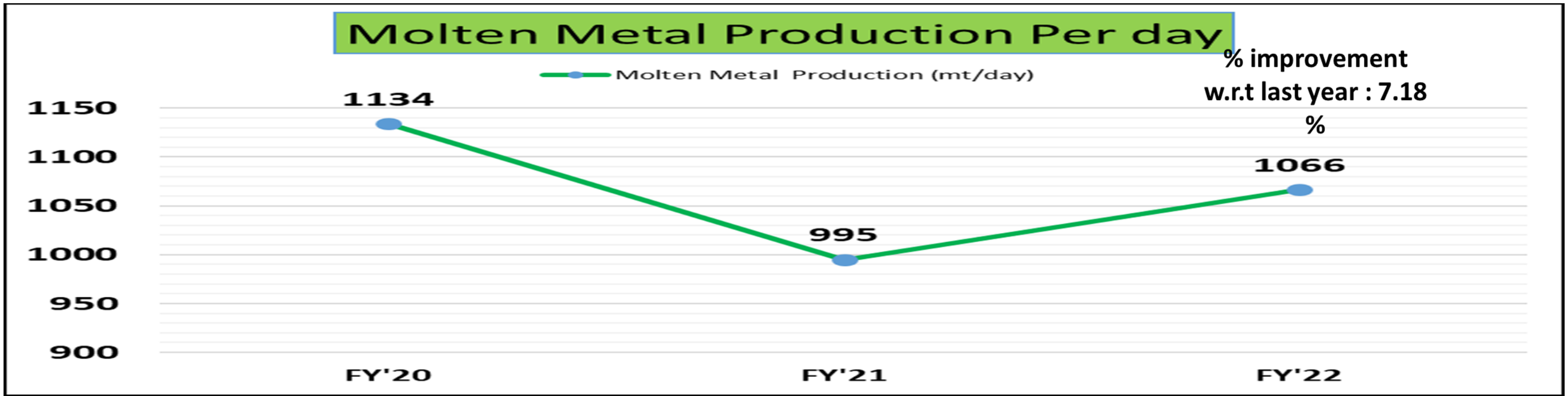






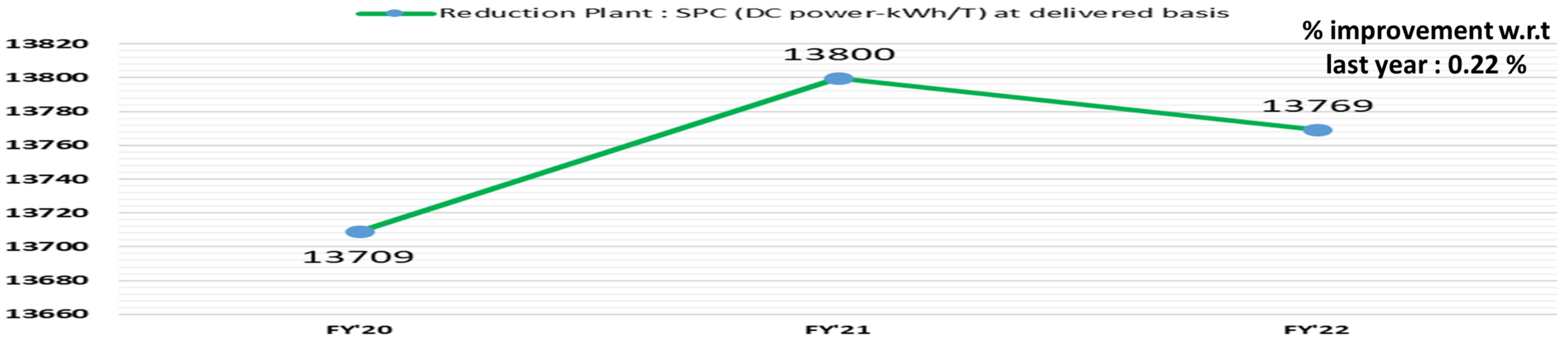
Trend : Raw Energy Consumption @ GtG basis



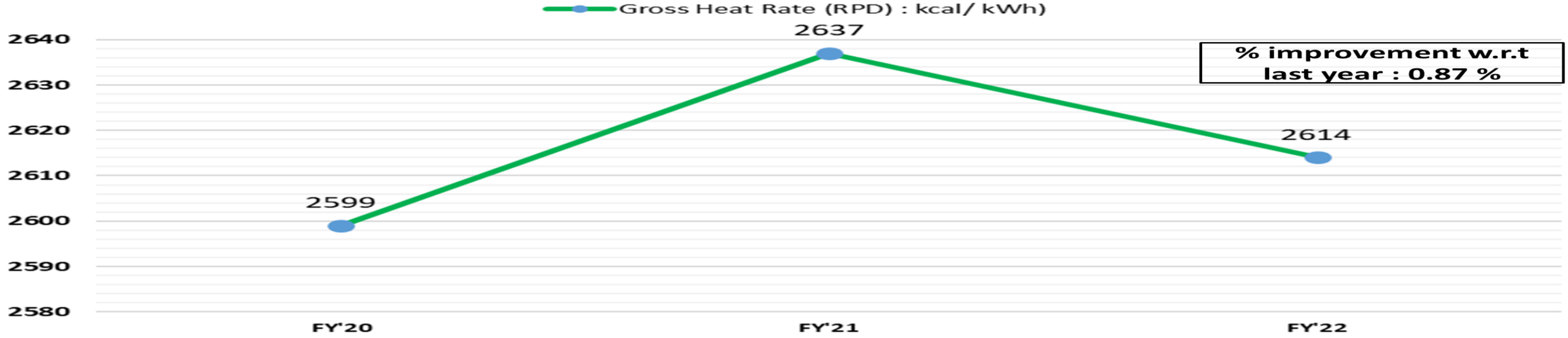


Trend : Raw Energy Consumption @ GtG basis

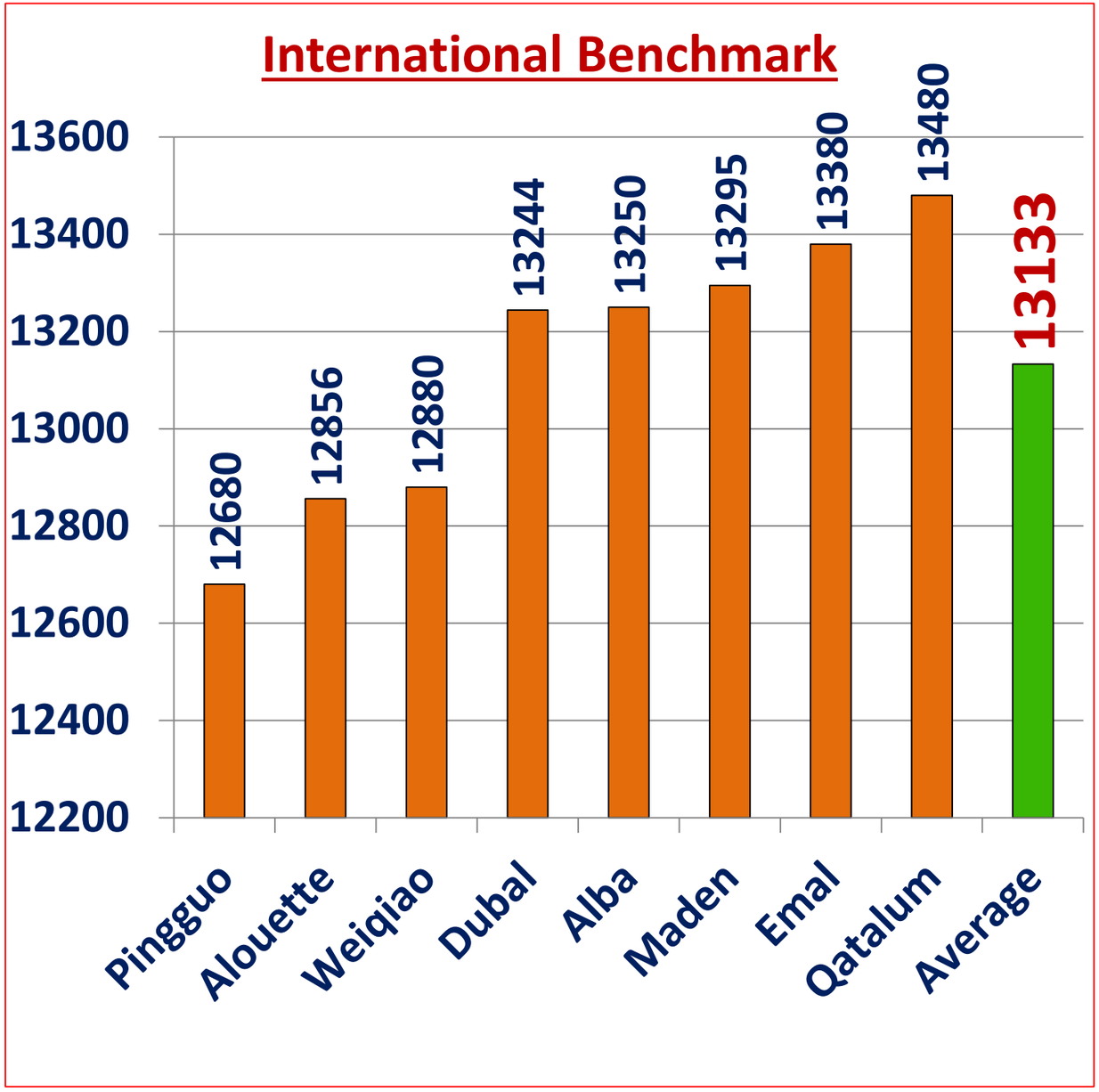
Reduction Plant Specific DC Power

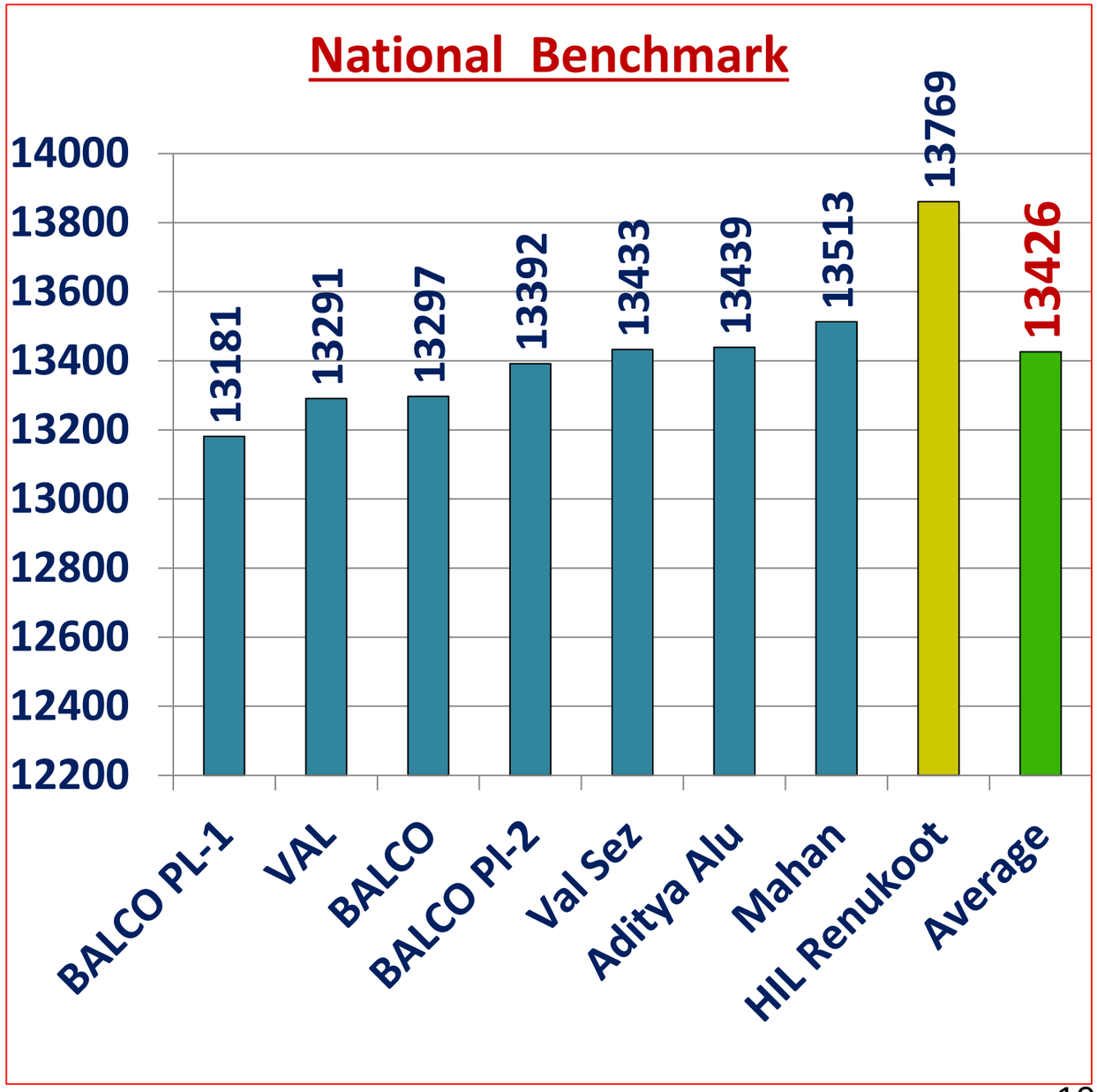


Gross Heat rate (RPD)

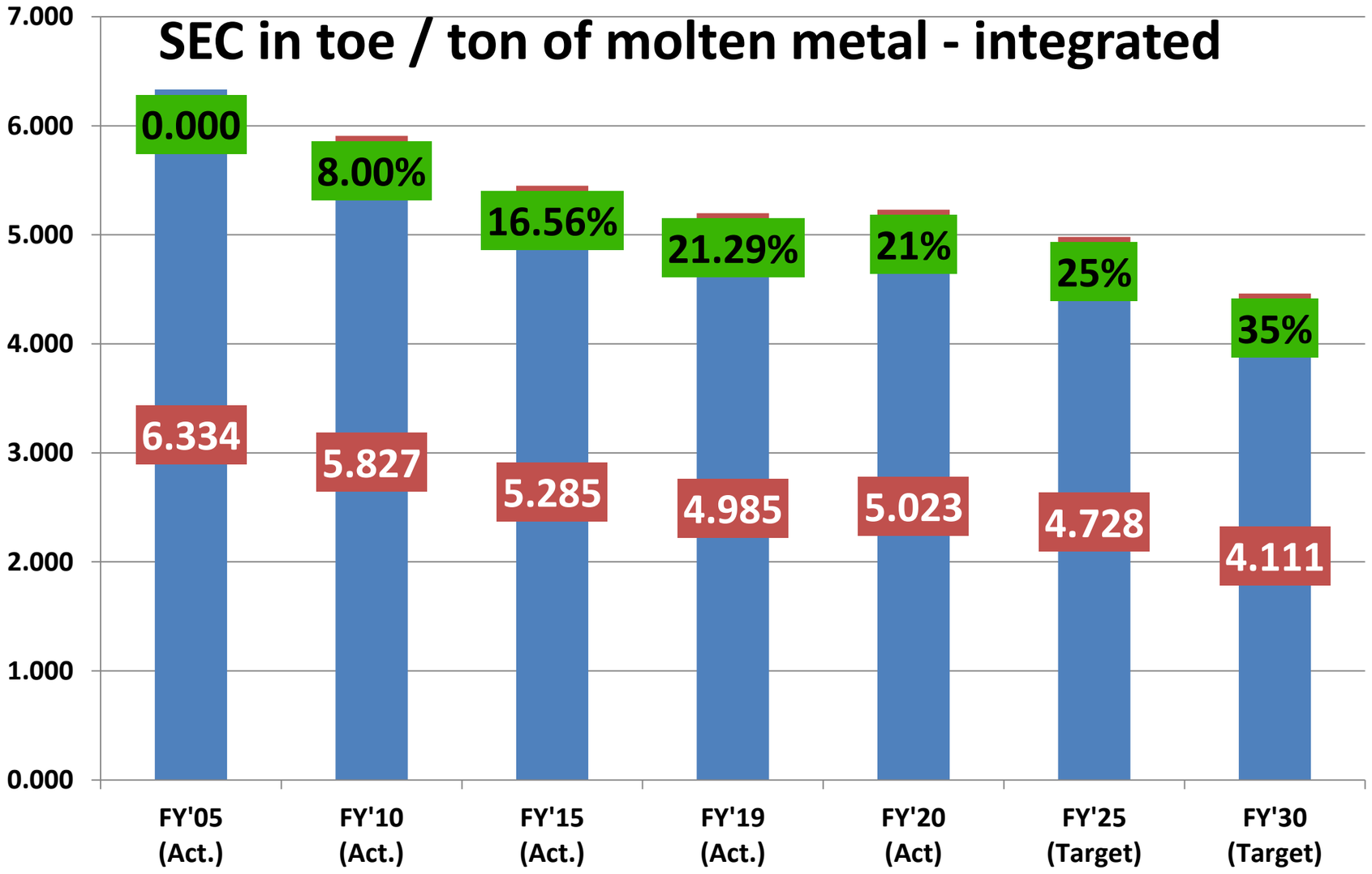


National and International bench marking of DC power





Road map : Specific Energy consumption trend and target @ integrated basis



- Achieved 21.29 % reduction till FY'19
- Projects Identified to reach 25 % reduction
- More ideas being generated for remaining 10 %

Long Term Objective : 35% reduction from FY'05 (base line) to FY'30

Road map :Projection of DCKWH/T w.r.t. improvement initiatives

Ongoing Power Reduction Projects:

By Implementation of Solid Bus bar SPC will reduce : 158 kWh / Mt of Metal

By Implementation of Stepped Stub SPC will reduce : 100 kWh / Mt of Metal

Total impact on SPC savings will be : 258 kWh / Mt of Metal

With the implementation of above projects, SPC will be 13613 kWh / Mt of Metal

New initiatives & Trials for Energy reduction:

- **Trial to use 50% graphitic cathode blocks – 10mV /pot reduction in pot voltage -- (Potential saving 30 DC kWh /T)**
- **Use of Ultra Low Resistivity Collector Bars having low Carbon content – (Potential saving 60 DC kWh /T)**

Encon Projects- Renukoot

Energy Conservation Measurs (ECMs) at Hindalo Industries Limited, Renukoot, Uttar Pradesh (ALM0009UP)							
Sr. No.	Brief Description of Energy Conservation Measures	Saving Potential, Lakh kWh p.a	Saving Potential, fuel in Tonne	Saving Potential, TOE p.a.	Saving Potential, INR Lakh p.a.	Investment, INR. Lakh	Payback Period, Month
A	**Short Term (up to 12 Months)**						
A.1	Switch off Transfomers with No load/Low loading at Fabrication plant to reduce no load losses	0.96	0.00	22.85	2.87	NIL	Immediate
A.2	Operate VFD in PID with I/L bag filter pressure and 100% damper opening of 2nd fan and saving potential by minimising pressure drop across damper in identified DSS ID Fans	2.88	0.00	68.65	8.63	NIL	Immediate
A.3	Optimise performance of caster furnace with mimimum heat losses by following SOP	0.00	133.35	153.35	40.00	5.00	1.50
A.4	Use Transvector Nozzle to improve efficiency of air compressors and reduced load	0.94	0.00	22.41	2.82	0.50	2.13
A.5	Reduce compressor room temperature at Centech North of Cogen and IR#3 &5 of Carbon plan	3.01	0.00	71.87	9.04	2.00	2.66
A.6	Improve effectivness of Cooling Tower at Fabrication remelt shop CT	3.01	0.00	71.78	9.03	2.00	2.66
A.7	Use active refrigerant agent for compressor oil in air conditioner units	1.50	0.00	35.79	4.50	1.00	2.67
A.8	Reduce pressure drop by removal of after cooler of IR-03 of Carbon Plant	1.45	0.00	34.64	4.36	1.00	2.75
A.9	Improve pumping system efficiency by trimming of impeller for north pump and resizing of discharge pipe line in DM Plant of Cogen-1	0.53	0.00	12.60	1.58	0.50	3.79
A.10	Use of fuel additive to reduction unburnt carbon in FA &BA at Boiler 3 & 4	0.00	17,157.41	19,731.02	686.30	321.42	5.62
A.11	Improve effectivness of Cooling Tower at Fabrication DAVY cold mill CT	0.65	0.00	15.60	1.96	1.00	6.12
A.12	Improve effectivness of Cooling Tower at Alumina ICT (Cell No#6)	4.71	0.00	112.35	14.13	8.00	6.80
A.13	Improve effectivness of Cooling Tower at Alumina New Compressor House (New Cooling Tower)	4.64	0.00	110.79	13.93	10.00	8.61
A.14	Installation of IGBT based rectifier and monitoring temperature at Induction Furnace	4.63	0.00	110.42	13.88	10.00	8.64
A.15	Improve insulation at Boiler Unit-03	0.00	58.18	66.91	2.33	1.82	9.40
A.16	Replacement of Domestic Water Pump No.4 and 5 in water treatment plant	3.30	0.00	78.85	9.91	8.00	9.68
A.17	Overhauling of heat exchangers for 6 nos. compressors as identified in carbon plant, Alumina-(CF1-CF3- CF4) to improve effectiveness	23.42	0.00	558.77	70.26	60.00	10.25
A.18	Improve ID fan efficiency at Bake oven plant#5	1.78	0.00	42.56	5.35	5.00	11.21
	Sub Total (A)	**57.42**	**17,348.94**	**21,321.22**	**900.87**	**437.24**	**5.82**
B	**Mid Term (12 to 24 month)**						
B.1	Install Static Voltage Generate on transformers at Alumina plant to reduce no load transformer losses	1.39	0.00	33.09	4.16	4.92	14.18
B.2	Replacement of reciprocating compressor no#10,11,12 and 14 at Alumina plant	10.00	0.00	238.60	30.00	60.00	24.00
	Sub Total (B)	**11.39**	**0.00**	**271.69**	**34.16**	**64.92**	**22.80**
C	**Long Term (more than 24 months)**						
C.1	Installation of VFD at DSS ID Fan#8B and Fan#10C in reduction plant-2	31.44	0.00	750.24	94.33	200.00	25.44
C.2	Install 1000 KWp Solar PV Rooftop Power Plant	16.47	0.00	392.95	77.60	300.00	38.60
C.3	Improve rectifier efficiency for load reduction	391.70	0.00	9,345.86	1,175.09	5,864.14	59.88
	Sub Total (C)	**439.61**	**0.00**	**10,489.04**	**1,347.01**	**6,364.14**	**56.70**
	Grand total	**508.41**	**17,348.94**	**32,081.94**	**2,282.05**	**6,866.30**	**36.11**

Encon Projects Renusagar CPP

Energy Conservation Measurs (ECMs) at Hindalo Industries Limited, Renusagar, Uttar Pradesh (ALM0009UP)							
Sr. No.	Brief Description of Energy Conservation Measures	Saving Potential, Lakh kWh p.a	Saving Potential, fuel in Tonne	Saving Potential, TOE p.a.	Saving Potential, INR Lakh p.a.	Investment, INR. Lakh	Payback Period, Month
A	**Short Term (up to 12 Months)**						
A.1	Optimise voltage at lighting transformer	1.65	0.00	37.88	4.94	Nil	Immediate
A.2	Use Transvector Nozzle at centrifugal compressors	3.76	0.00	86.43	11.27	2.00	2.13
A.3	Use MaxR100 additive for Compressor Oil in Air Conditioner units	1.50	0.00	34.50	4.50	1.00	2.67
A.4	Overhauling of heat exchangers for 3 nos. centrifugal compressors as identified for poor effectiveness	14.26	0.00	327.89	42.77	27.00	7.58
A.5	Overhauling of TG#3 and TG#4 for THR improvement	0.00	23,325.21	9,330.08	933.01	500.00	6.43
A.6	Use dynamic classifier in coal mill and online montoring of carbon in FA	0.00	5,727.84	2,291.14	171.84	500.00	34.92
A.7	Implement compressesed air management system for centrifugal compressors	32.00	0.00	736.00	96.00	60.00	7.50
A.8	Improve insulation of boilers and steam network	0.00	494.20	197.68	19.77	14.51	8.81
A.9	Optimise efficiency of BCW pumps(4A,5B, 9B and 10B) by trimmimg of impeller or replace with required flow and head for operation	9.59	0.00	220.47	31.95	21.01	7.89
	Sub Total (A)	**62.75**	**29,547.25**	**13,262.06**	**1,316.04**	**1,125.52**	**10.26**
B	**Mid Term (12 to 24 month)**						
B.1	Optimese efficiency of ACW pump no. 3B, 8A and 8B by trimmimg or replacing with required flow and head	2.76	0.00	63.57	8.29	9.99	14.46
B.2	Optimise ID Fan efficiency by operating VFD in PID loop and proper maintenance	7.35	0.00	169.01	22.04	30.00	16.33
B.3	Overhauling of Vapour Absorption Mechanism (VAM) - 2 for performance improvement	0.00	1,025.64	410.26	41.03	60.00	17.55
B.4	Install harmonics filter for 10 nos. Transformers having Current THD more than 10%	1.74	0.00	40.03	5.22	9.94	22.83
B.5	Install harmonics filter for 8 nos. motors with Currnet THD more than 10%	7.67	0.00	176.43	23.01	43.78	22.83
	Sub Total (B)	**19.52**	**1,025.64**	**859.30**	**99.60**	**153.71**	**18.52**
C	**Long Term (more than 24 months)**						
C.1	Install 1000 KWp Solar PV Rooftop Power Plant	77.60	0.00	1,784.74	77.60	300.00	38.60
	Sub Total (C)	**77.60**	**0.00**	**1,784.74**	**77.60**	**300.00**	**46.39**
	Grand total	**159.87**	**30,572.89**	**15,906.10**	**1,493.23**	**1,579.24**	**12.69**

Energy Saving Project Implemented in FY 2019-2022

Summary of last three years Project :

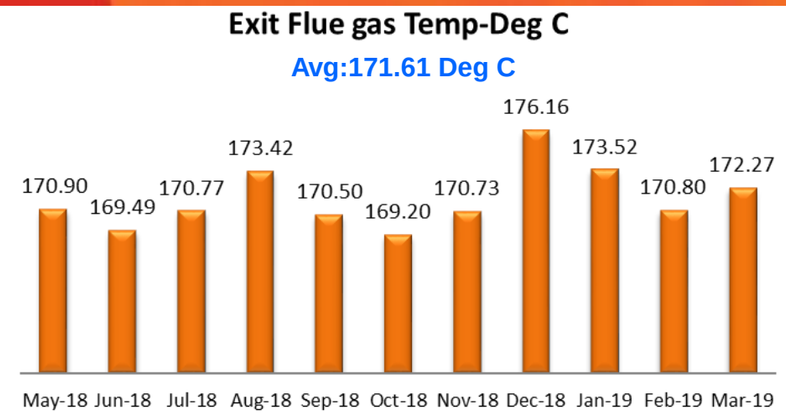
S.N	Year	No. of Energy saving Project	Investment (INR million)	Electrical Saving (in million kWH)	Thermal Saving (in million Kcal)	Saving (INR Million)	Impact on SEC
1	FY'19-20	38	286.02	338.32	196923.77	253.88	
2	FY'20-21	26	404.27	608.75	133723.40	298.31	-0.04%
3	FY'21-22	28	1592.8	1058.53	770453.42	935.70	-2.13%
	Total	92	2283.09	2005.60	1101100.60	1487.89	

Innovative Projects

Project Title : Efficiency & Reliability improvement of 80 TPH Pulverized Fuel Boiler#1

Problem / Concept Description:

Average Boiler exit flue gas temperature was on higher side. Varying from **170-175 Deg C**



Improvement Activity

Alignment of furnace water wall tubes to arrest air ingress in furnace.

Increasing the heating surface area of TAPH by **65 Sq M** & Economizer by **66 Sq M**

Total Heating surface

Before: 3585 Sq M, After: 3716 Sq M

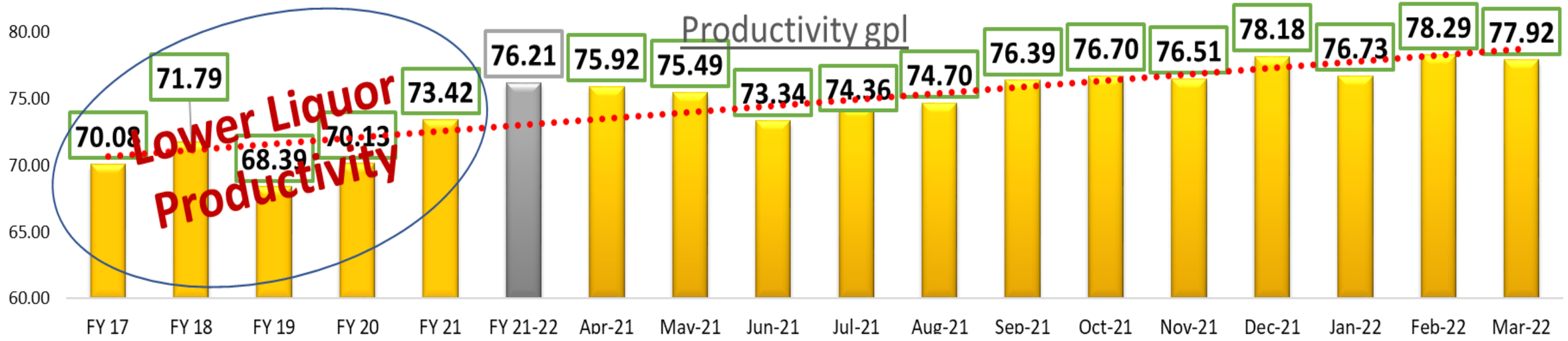
Value / Financial Benefits

Parameters	UOM	Assumption	Actual
Steam Generation	TPH	86	86
Flue gas temperature at ESP Inlet	Deg C	150	158
Boiler Efficiency	%	83.77	84.86
Improvement in Efficiency	%	1.25	1.09*
Yearly saving (3044 MT Coal/Yr, @ Rs 3712/MT for 340 days)	Lac Rs/Year	-	113.00
Project Cost	Cr	2.72	2.11

* Flue gas temperature reduced by 13.85 Deg C.

Also 40 KW saving in power achieved due to reduced loading of ID fan after arresting air ingress in furnace

Project Title : Enhancement In Precipitation Liquor Productivity Through Process Re-engineering and Robust Process Control of Renukoot Refinery



Impact on Energy Consumption –
Steam Consumption has reduced from 2.9 to 2.609 MT / MT of Alumina.
Power consumption reduced from 348.2 to 308.1 kWh / MT

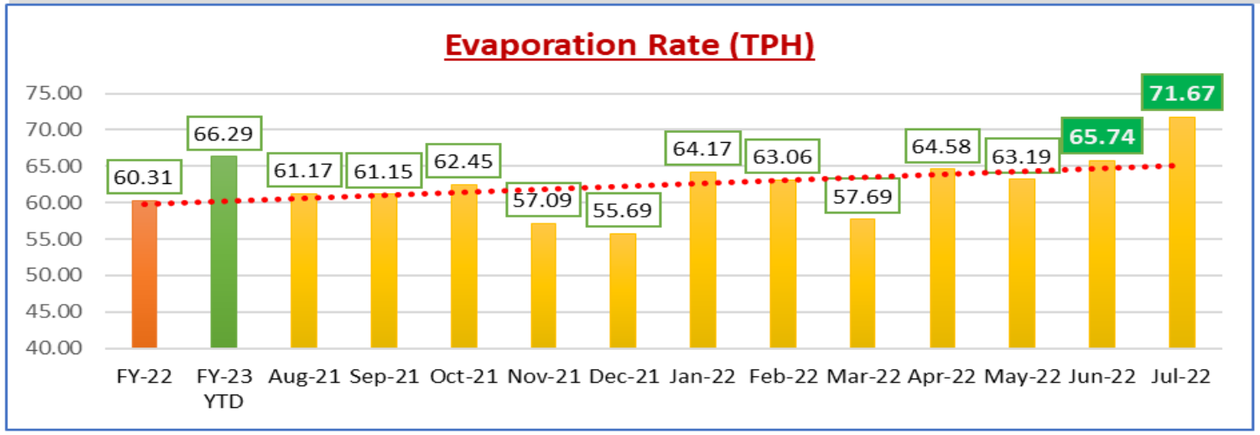
Action Taken to Increase Liquor Productivity:

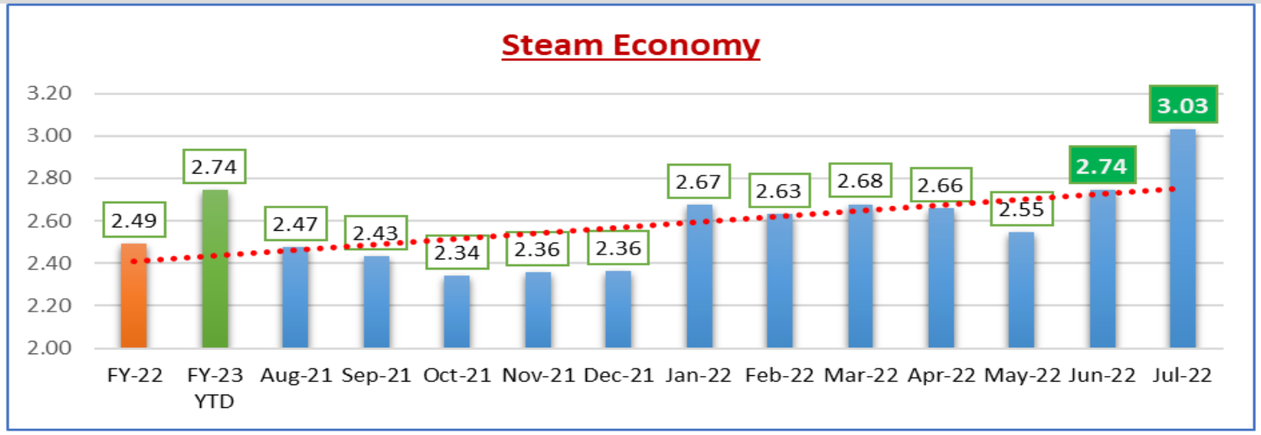
- Increase in PGL alumina super saturation
- Improvement in maintaining agglomeration fill temperature
- Optimization of agglomeration efficiency with seed charge control
- Increase in super saturation of process slurry through effective utilization of ISC
- Optimization of residence time of process slurry in circuit

Annual Saving of Steam, Power and Fixed Cost due to increase in Liquor Productivity – 25.1 Crores per annum

Project Title : Improvement of Evap III Unit Steam Economy

Project Title : Improvement of Evap III Unit Steam Economy

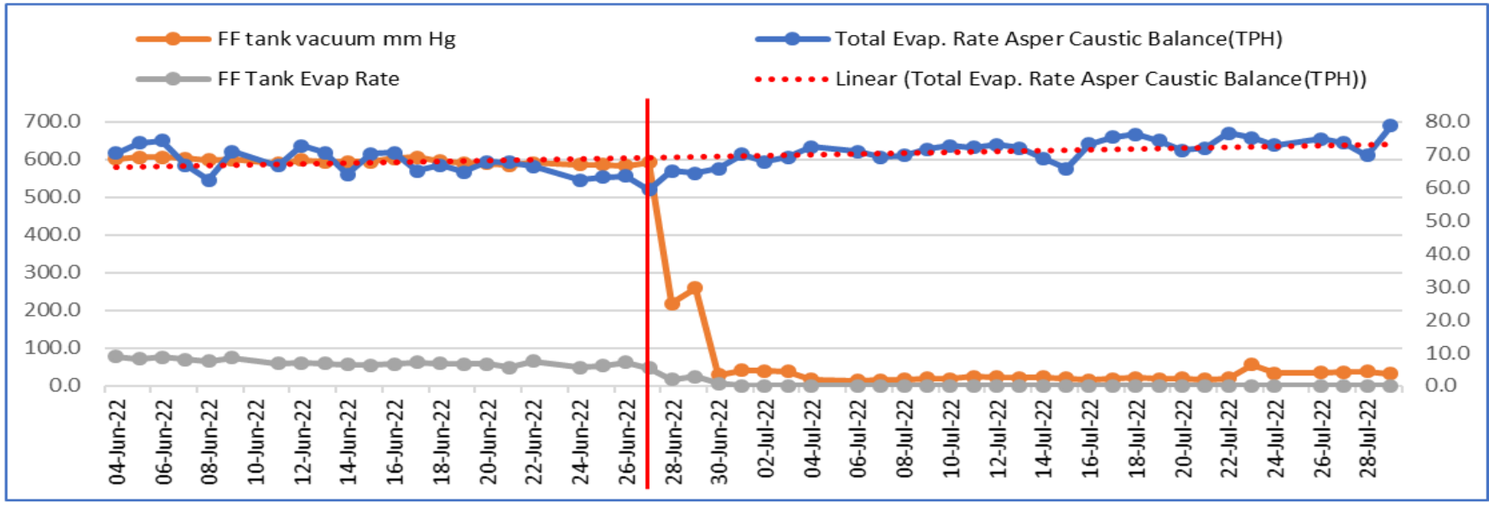




Evap Rate Improvement : 65 tph to 72 tph
Steam economy Enhancement: 2.5 T/T to 3.0 T/T

Action Taken to Improve Steam Economy :

- Optimization of Evaporation Feed flow with Vacuum : Experiment done by varying feed flow with vacuum, evap. feed flow of 315 m3/hr has given maximum possible Evap rate at 610 mm Hg vacuum pressure
- Utilization of Feed Flash vapor enthalpy as evaporation feed: Operation philosophy changed from traditional to innovative way by by-passing Feed Flash and feeding high temperature Spent liquor to evaporation circuit, reduced steam consumption.



Impact on Energy Consumption : Steam saved at the rate of 2.0 tph equivalent to 0.04 T/T. Cost saving of 4.44 Cr. Per annum

Renewable Energy sources

Utilization of Renewable Energy sources – Installation of 3.0 MW Solar Power

Year	Technology (electrical)	Type of Energy	Onsite/Off site	Installed Capacity (MW)	Generation (million kWh)	% of overall electrical
2019-20						
2020-21						
2021-22	Electrical	Renewable	Onsite	3.0	4.29	0.4 %

Investment made – 11.1 Crore

RPO Obligation - No

Solar & Wind Energy Installed in Group (Metal Business) – 100 MW

Share % of Plant – 3 %

Waste utilization and its Management

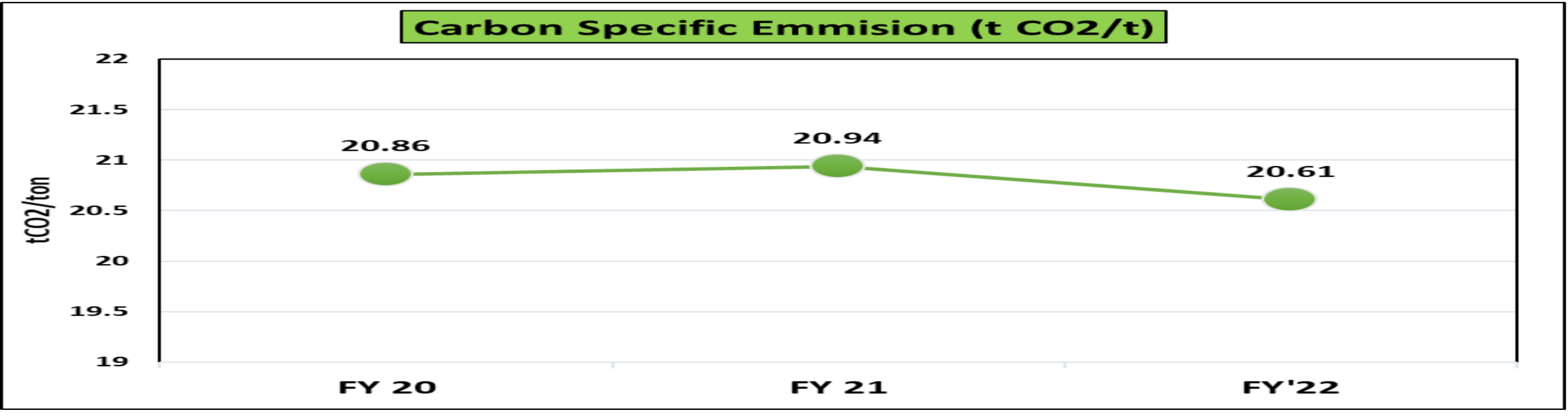
Sr No	Year	Type of Waste	Quantity (MT)	GCV (kCal/Kg)	Waste as Percentage of Total Fuel
1	FY 2019-20	Shot Blasting Dust	1496.46	5500	0.03%
2	FY 2020-21	Shot Blasting Dust	906.32	5700	0.02%
3	FY 2021-22	Shot Blasting Dust	833.66	5600	0.02%

Waste Utilization Process/System

We are using shot blasting dust of Rodding shop in our Boiler. These dust are being blended in Coal yard and then fed into Boiler as a fuel.

GHG Inventorisation

- Information on GHG Inventorisation and public disclosure– Its consolidated data reported in sustainability report of Hindalco
- Scope of Emission – I and II
- Short term Target and action Plan for CO2 emission reduction – We have target to reduce Specific emission by 0.38 % from the level of FY 2020-21 by implementing all 38 nos Encon Project
- Initiative on carbon capture and other reduction Measures –It is already in process to Exploring the Vendor



Teamwork ,Employee Involvement & Monitoring

Monitoring & review System

- Daily review through Standing committee meeting Chaired by COO
- Daily performance review meeting Chaired by Plant heads
- Monthly Energy review meeting Chaired by Plant heads
- Monthly Energy webinar @ metal business level
- MPR Chaired by COO
- MBR Chaired by MD

Employee Involvement-

Projects completed through kaizen in FY'22 :

- No. of implemented project : 624 nos
- No. of Employee participation : 2523
- Investment : 19.89 million Rs
- Expected saving : 293.22 million Rs

Awareness on Energy Conservation & Efficiency :

Activities performed :

- Display of Energy Conservation Banners in the Plant & Township.
- Sharing of Energy Saving Tips through Communication Mail to all employees
- Distribution of Energy Conservation Awareness Pamphlets in Plant & Township
- Energy Pledge by employees & School Children
- Distribution of Energy Saving Cap to School children
- Vriksha Ropan (Plant Implantation) by Employees
- Flag March by School Children in Township
- Nukkad Natak on Energy Conservation by School Children.
- On-line Energy Quiz competition for Employees
- On-line Slogan Competition for Employees
- On-line Quiz Competition for Housewives
- Display of energy saving tips and Video on LED screen in the Plant & Canteen.
- Painting Competition for School Children.
- Suggestion Mela for Employees on Energy Conservation
- Announcement and display of Banner on Energy Conservation through vehicle in Colony.

Implementation of ISO 50001:2018 :

- **ISO 50001: 2018 Certification—**
  - ✓ ISO 50001:2018- Certified by DNV-GL in 2019
  - ✓ ISO 50001:2018- Recertified by LRQA in 2022
- **% Investment of Energy saving Project on Total turnover of the company in FY'21-22--- 1.53 %**

(Annual Sales Turn Over-103960 & Energy Capex -1592.8)

Learning from CII Energy award or any other award program :

- Motivation & recognition.
- Platform for show casing our Energy Excellence.
- Create competitive culture in the plant & business.
- Create Energy Conservation Awareness in the plant & Society.
- Interaction with different plant's participants
- Learning of new developments / initiatives implemented in different plants.
- Interaction with Technology supplier for new developments.

Mandatory Energy Audit & PAT status

PAT Cycle # 1 :

S#	Base line SEC (toe/ Ton of Al)	Target SEC (toe/ Ton of Al)	Required Reduction in %	Achieved SEC	Achieved Reduction in %	E-certificate claimed & issued
1	5.858	5.512	5.91%	5.374	8.26 %	53664

PAT Cycle # 2 :

S#	Base line SEC (toe/ Ton of Al)	Target SEC (toe/ Ton of Al)	Required Reduction in %	Achieved SEC	Achieved Reduction in %	E-certificate claimed
1	5.2212	5.0436	3.40%	4.8752	6.63 %	70835

PAT Cycle # 3 :

S#	Base line SEC (toe/ Ton of Al)	Target SEC (toe/ Ton of Al)	Required Reduction in %	Target Year	Assessment Year	Required MTOE reduction
1	4.951	4.7282	4.50%	FY2022-25	FY'2024-25	93765

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Description	Duration	Conducted by	Report submitted to BEE
MEA # 1	10th Nov'14 to 24th Nov'14	CTES Team	05th Sep'15
MEA # 2	2nd May'18 to 21st May'18	Mott MacDonald	10th Oct'18
MEA # 3	20th Jul'21 to 31st Jul'21	Mott MacDonald	1st Nov'21

Reward & Recognition:

FY 2019 – 20

✓ Platinum Award – SEEM – National Energy Management Award

✓ Excellent Energy Efficient Unit – CII

FY 2020 – 21

✓ PAT Cycle 2 Best Achiever award by Ministry of Power UP State
✓ 3rd Prize – on-line Energy Conservation Award by UPNEDA

FY 2021 – 22

✓ Platinum Award – SEEM – National Energy Management Award

✓ 1st Prize in State Level Energy Conservation Award

Thank You

Contact Person

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