Confederation of Indian Industry

25TH NATIONAL AWARD FOR EXCELLENCE IN ENERGY MANAGEMENT 2024

NALCO – Smelter & Power Complex, Angul

MR. AMLAN KISHORE LENKA
MR. DEBASHIS MISHRA

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NALCO

Aluminum Smelter & Power complex

About us

A NAVRATNA CPSE under Ministry of Mines with Govt. of India holding 51.28 % equity

- **Established in 7th January, 1981**
- **4,60,000 TPA Capacity - state of art smelting Technology**
- **A group 'A' CPSE having integrated and diversified operations in mining, metal and power sectors**
- **NALCO's business footprints are present in more than 15 countries**

Foreign Exchange

- **The Company is the 2nd highest net foreign exchange earning CPSE in the country for FY 2019-20 and has been bestowed upon with the SCOPE award of Excellence in institutional category & CSR meritorious award from the President of India.**

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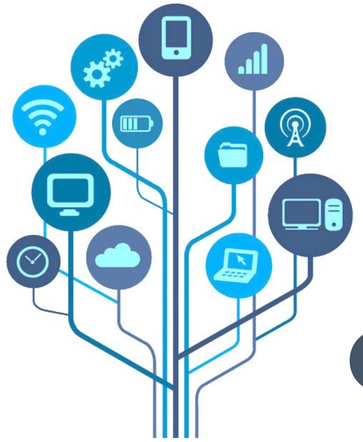

Our Technology

AP 18 Technology

- **180 KA Prebake Cell Technology**
- **The captive thermal power plant having a generation capacity of 1200 MW (10X120MW) provides entire electric power requirement of smelter.**
- **Operating at a 94.50 % of current Efficiency of smelter**

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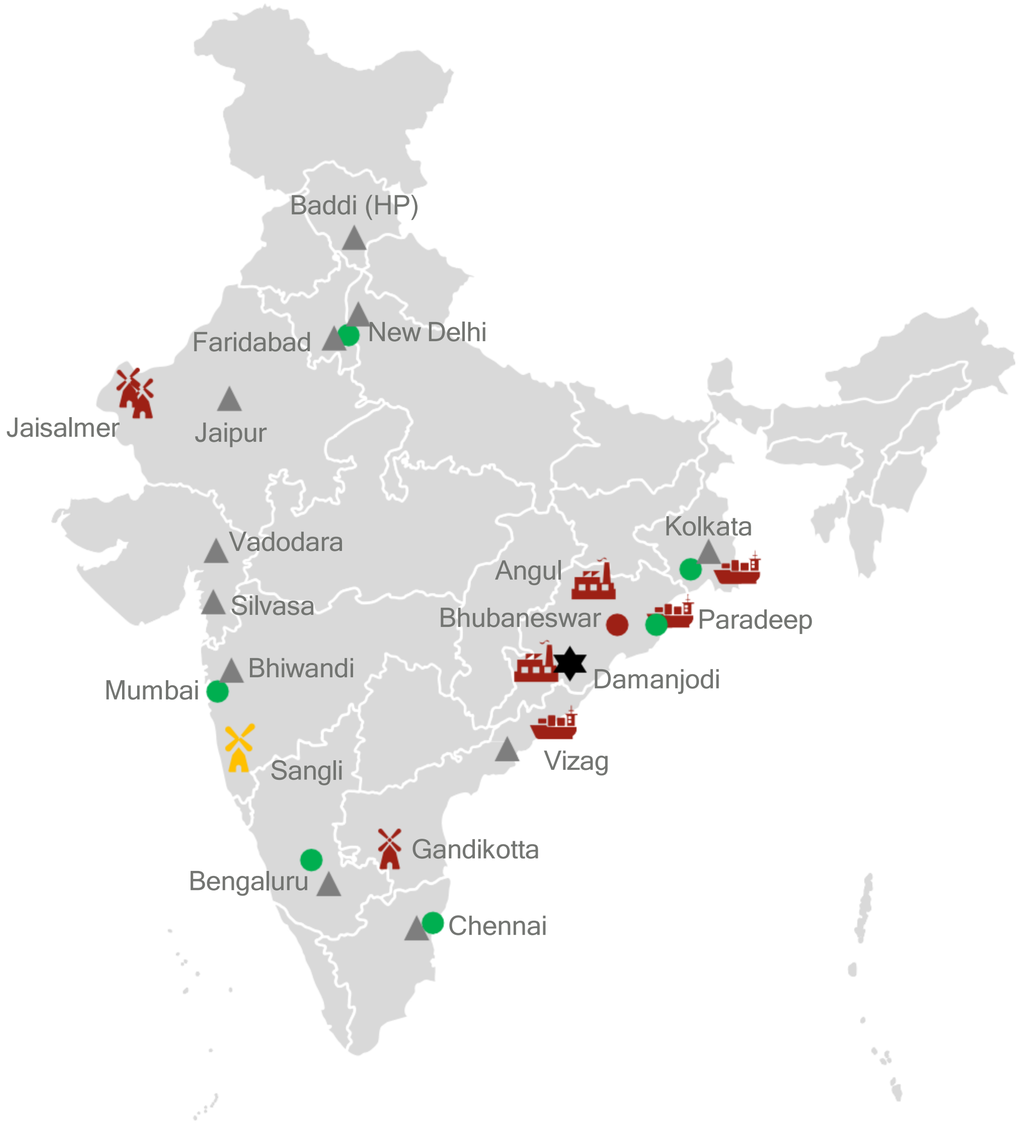
Our Products

- Standard Ingots
- Mechanized Sow ingots
- T-Ingots
- Wire Rods
- Billets
- Cast Strips
- Cold Rolled Coils & Sheets

INDIAN PRESENCE



- Registered Office
- Regional Offices - 6
- Production Centers - 2
- Ports - 3
- Bauxite Mines - 1
- Stockyards - 11
- Wind Power-3
- Wind Power under construction -1

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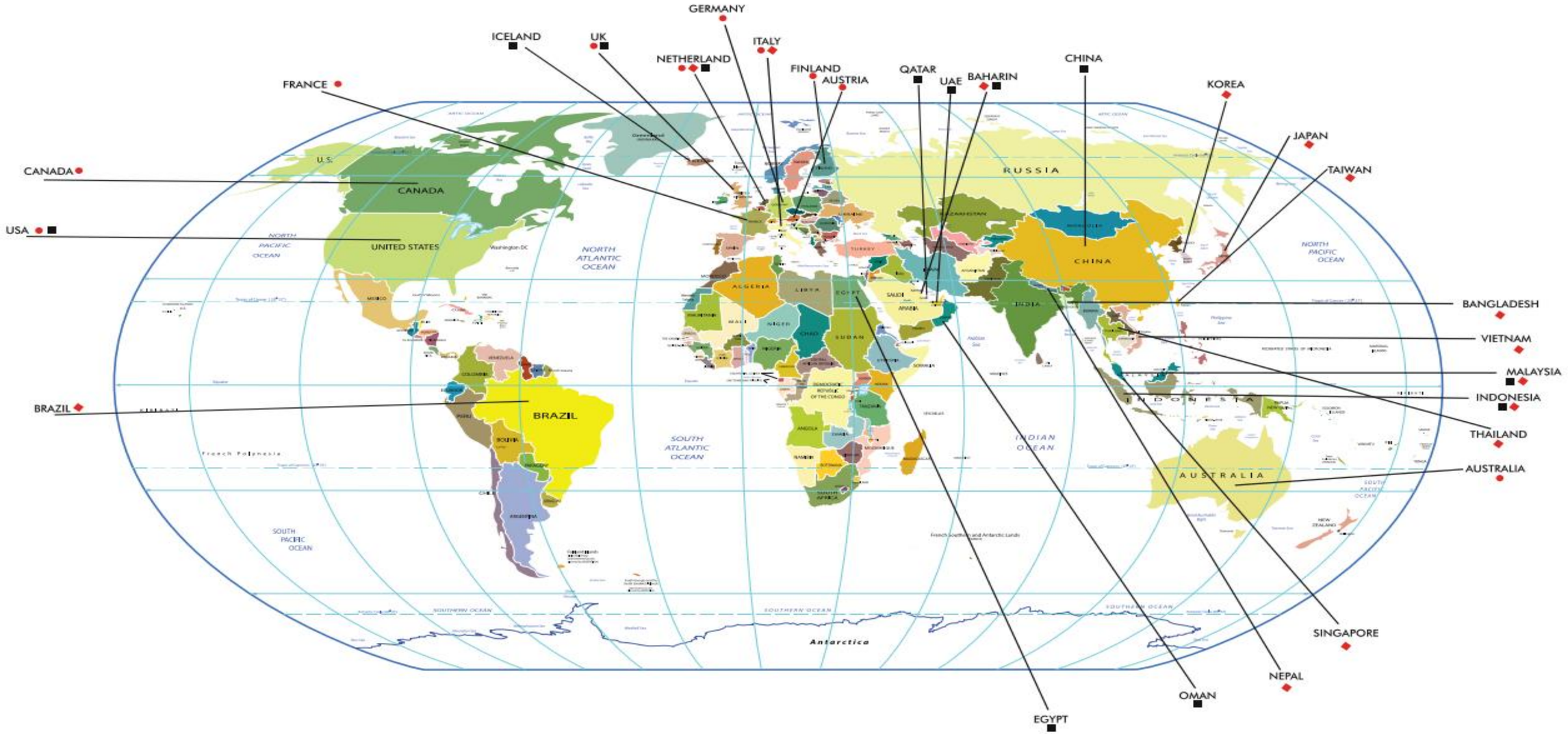
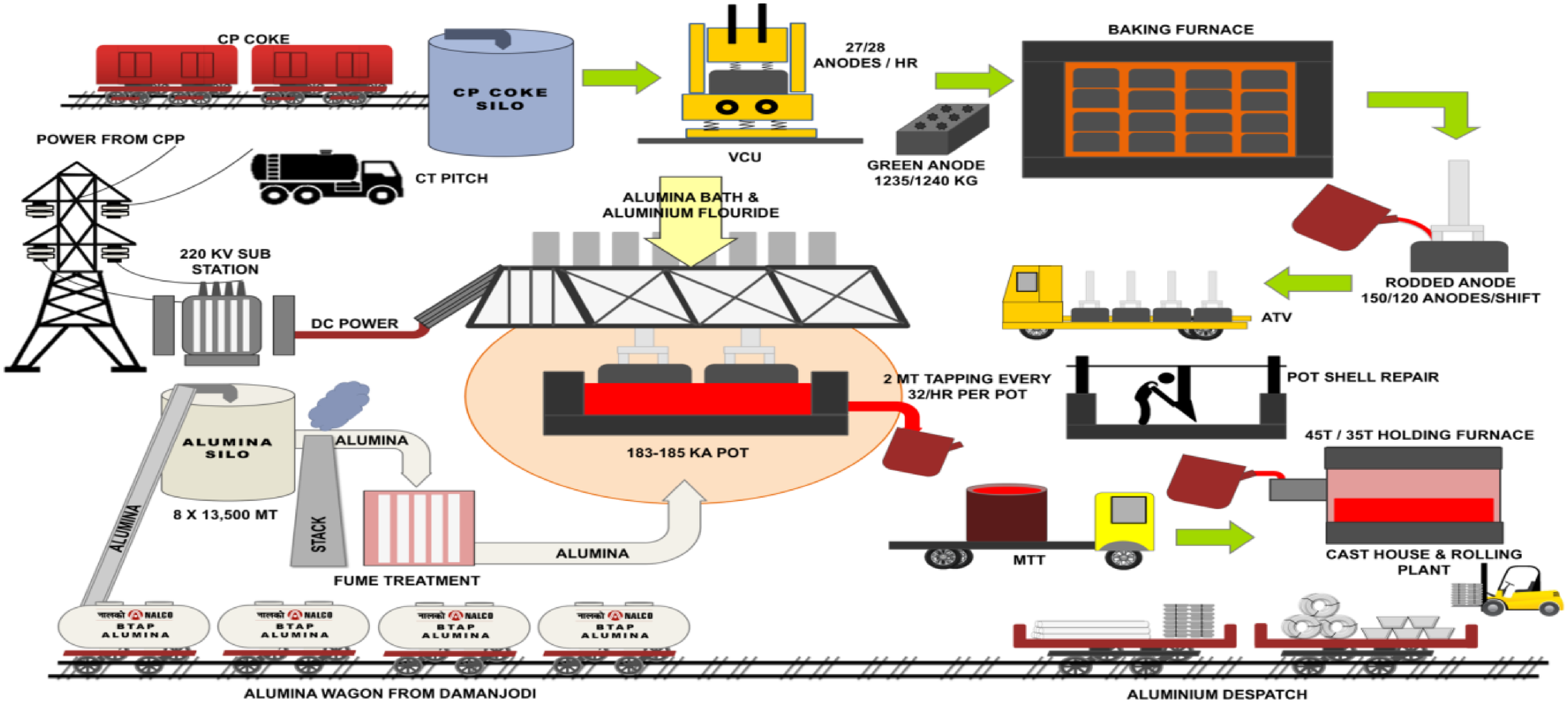
GLOBAL REACH



HOW ALUMINIUM IS MADE



CP COKE + CT PITCH + RECYCLED BUTT → GREEN ANODE → BAKED ANODE → RODDED ANODE → ANODE IN ELECTROLYTIC POT → ELECTROLYSIS OF ALUMINA WITH DC POWER FROM 220 KV MOLTEN ALUMINIUM → HOT METAL TO CAST HOUSE & ROLLING PLANT → FINISHED PRODUCTS LIKE INGOTS, SOW & TEE INGOTS, WIRE RODS, BILLETS, ROLLED COILS & SHEETS → DISPATCH TO CUSTOMER AS PER MARKETING ORDER

Vision, Mission and Core Values

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VISION

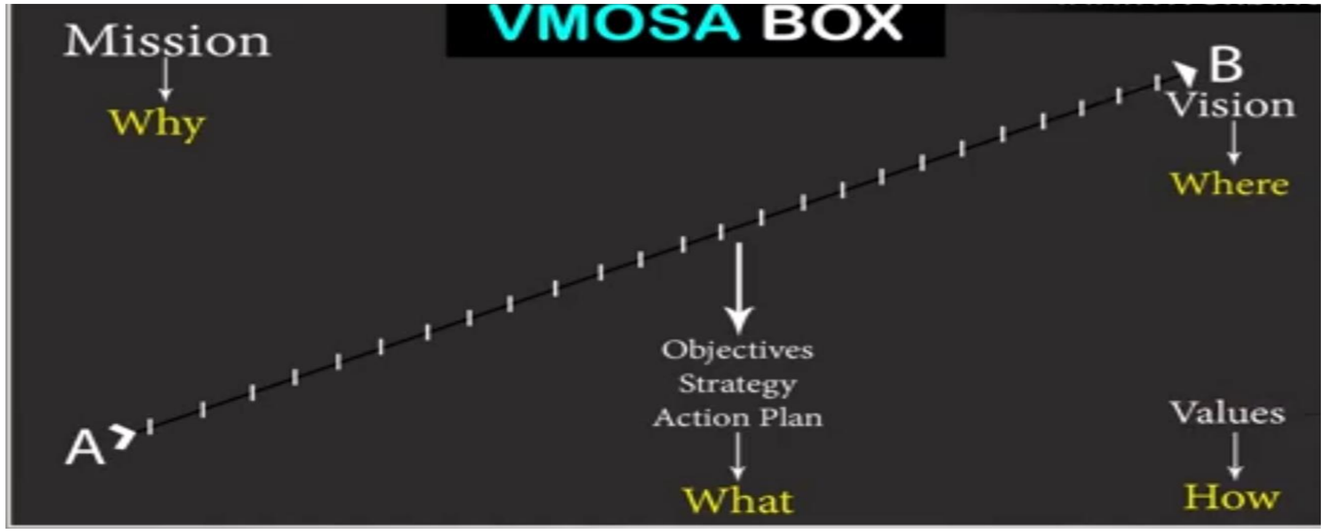
To be a Premier and Integrated company
in the Aluminium value chain
with strategic presence in Mining both
domestic & global,
Metals and Energy sectors

MISSION

To sustainably grow multi-fold in
Mining, Alumina and Aluminium business
along with select diversification in
Minerals, Metals and Energy sectors,
while continuously improving
on efficiency and business practices thus
enhancing value for all stakeholders

Core Values

- **B**enefitting Stakeholders
- **E**xcellence and Quality
- **S**ustainability
- **T**rust & Integrity



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Our Energy Vision

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National Aluminium Company Limited

CIN : L27203OR1981GOI000920

ENERGY POLICY

Enhancing Energy Performance, comprehensively optimizing Energy Use, Energy Consumption and Energy Efficiency, is a major imperative for an Energy Intensive industry like ours. In recognition of this, we focus on improvement of Energy Performance in all areas of operations with thrust on planning Energy Objectives based on the enshrined Guiding Principles.

Guiding Principles :

- **To endeavor for reduction in Specific Consumption of Energy in all forms and in all areas of Operations.**
- **To ensure availability of information and necessary resources for achieving Objectives and Targets.**
- **To comply with all applicable legal, regulatory and other requirements related to energy use, consumption and efficiency.**
- **To espouse Energy Efficient Technology encompassing procurement of Energy Efficient products & services and design for Energy Performance improvement.**
- **To carry out Energy audits and Energy reviews, at planned intervals, to improve energy performance.**

Commitment

We affirm our commitment to continually improve our Energy Performance and strive for achieving the objectives and targets.

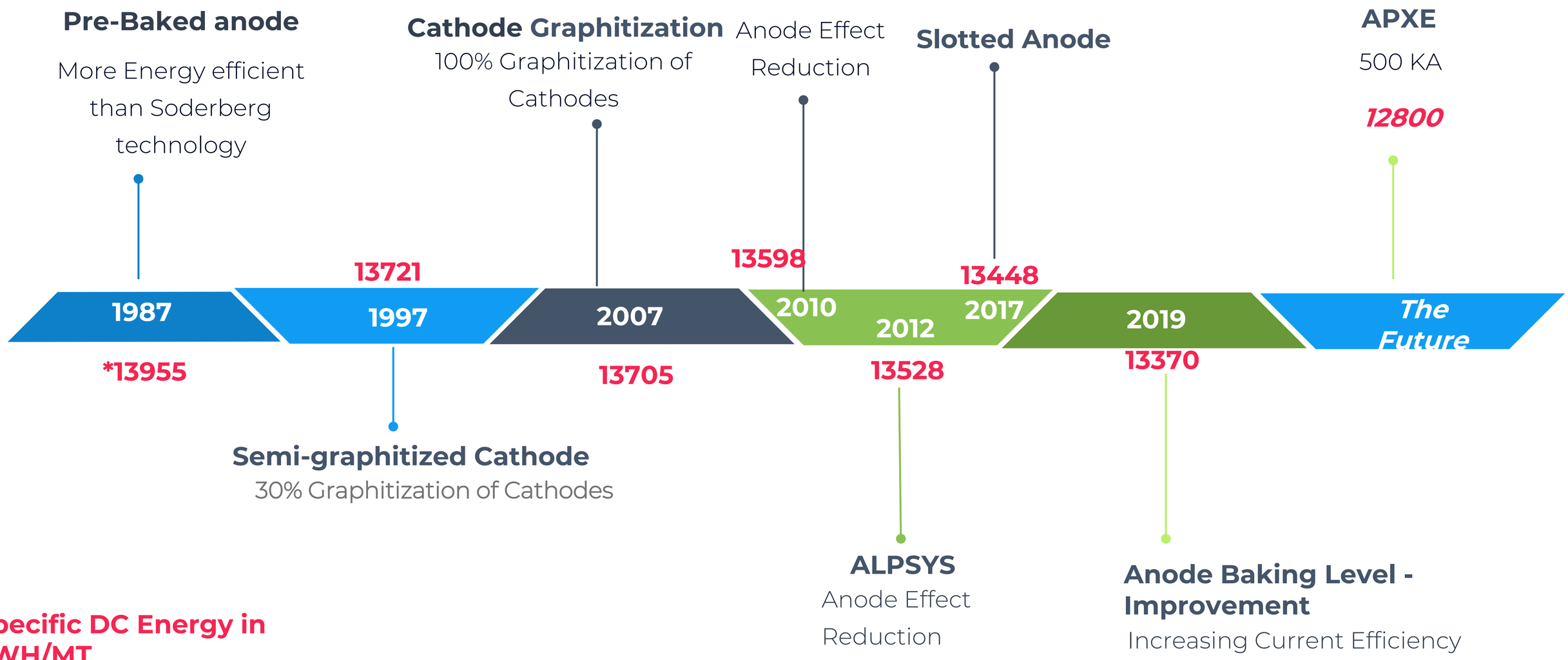
Bhubaneswar
Effective Date 30.09.2020

[Sridhar Patra]
Chairman-cum-Managing Director

Achievement (2021-22)

DC Energy : 13446.8 kWH/MT of HM

Our Energy Efficiency Journey



***Specific DC Energy in KWH/MT**

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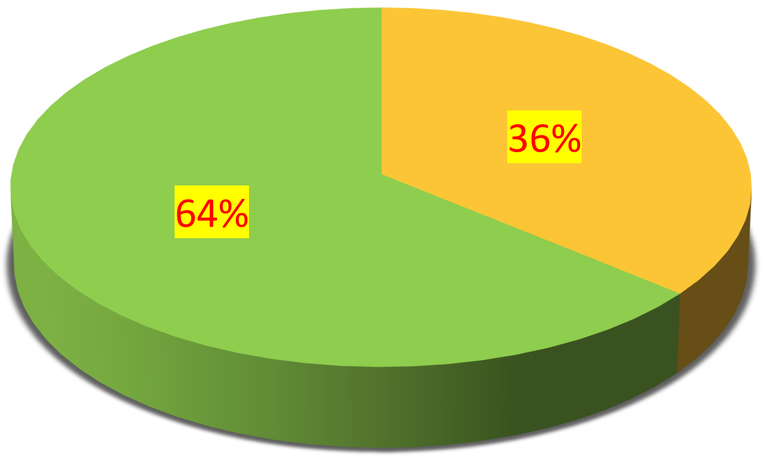
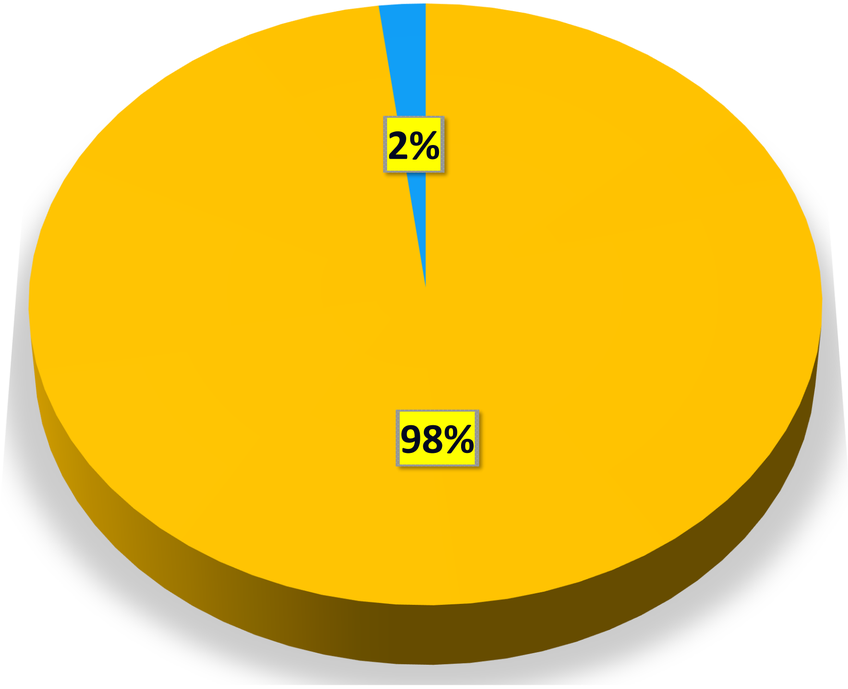
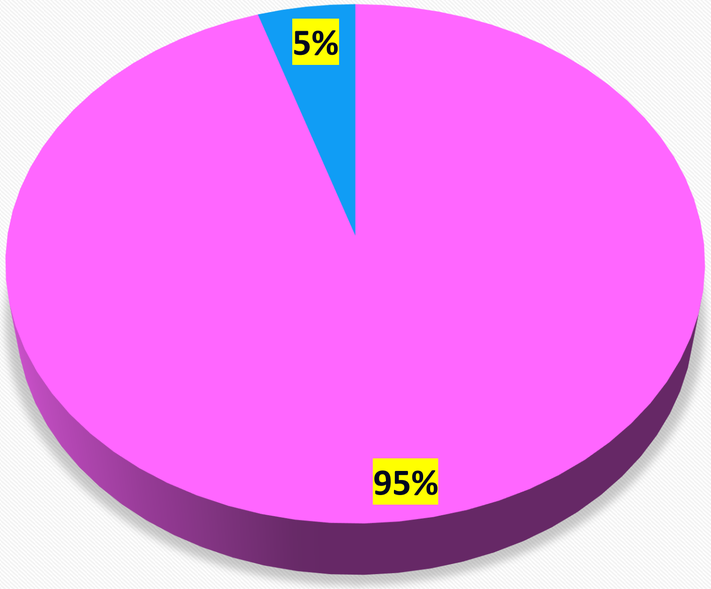
COST BREAK UP



% ENERGY CONSUMPTION



% DC AND AC ENERGY CONSUMPTION



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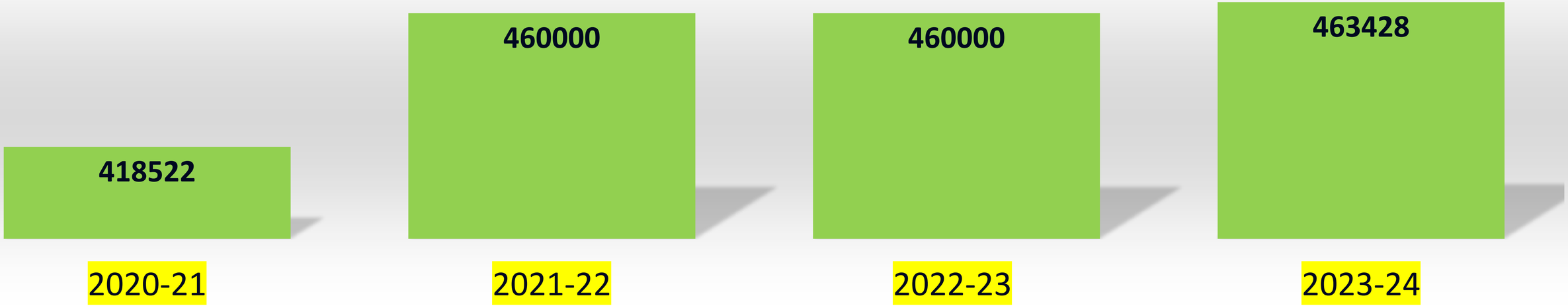
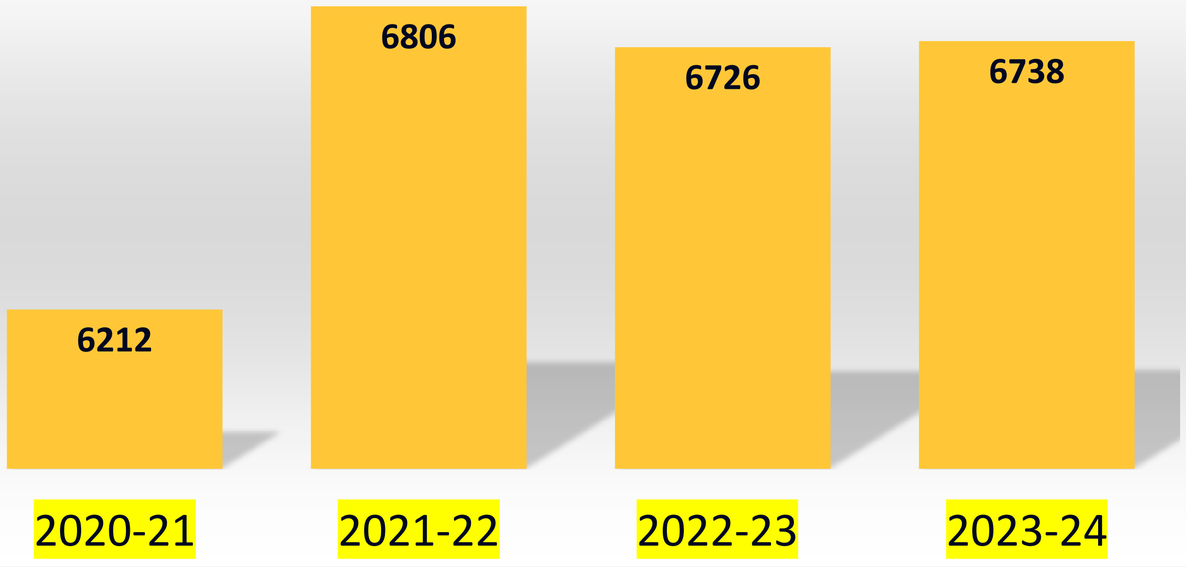
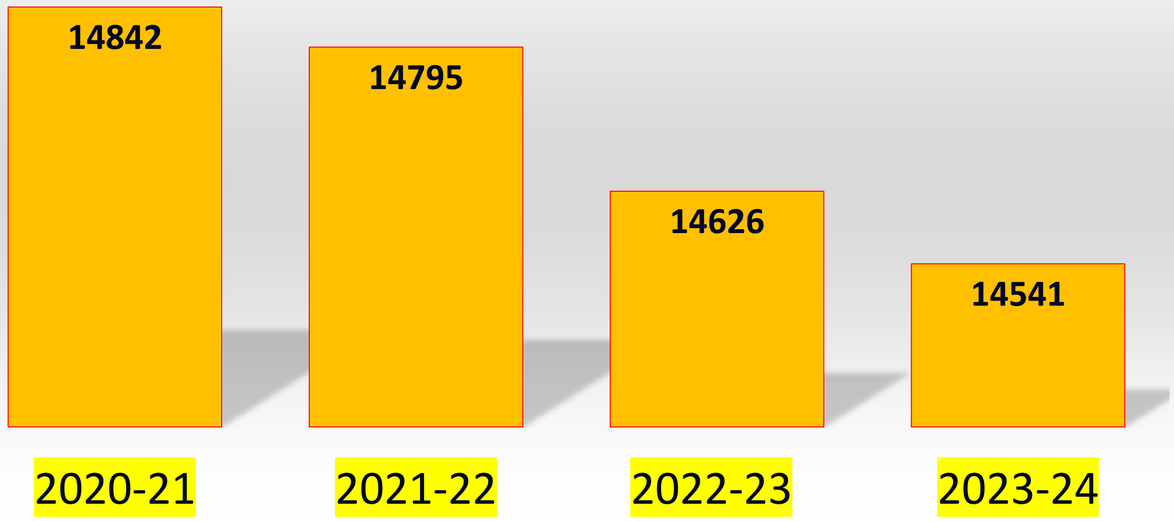
CAST METAL (in Metric Tonne)



Total AC Energy Consumption (in Million Unit)



specific AC Electrical Energy in kWh/MT of Production



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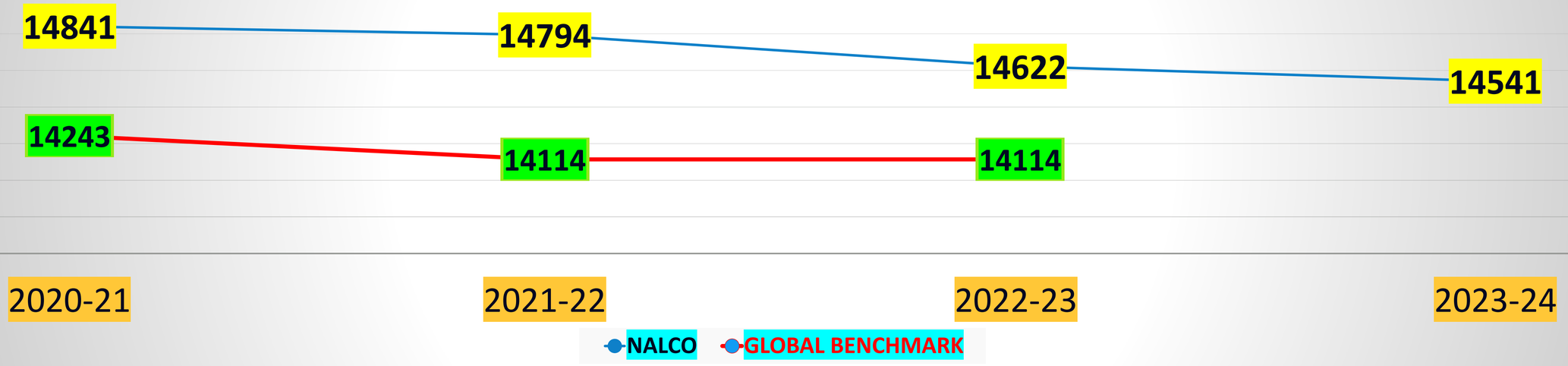
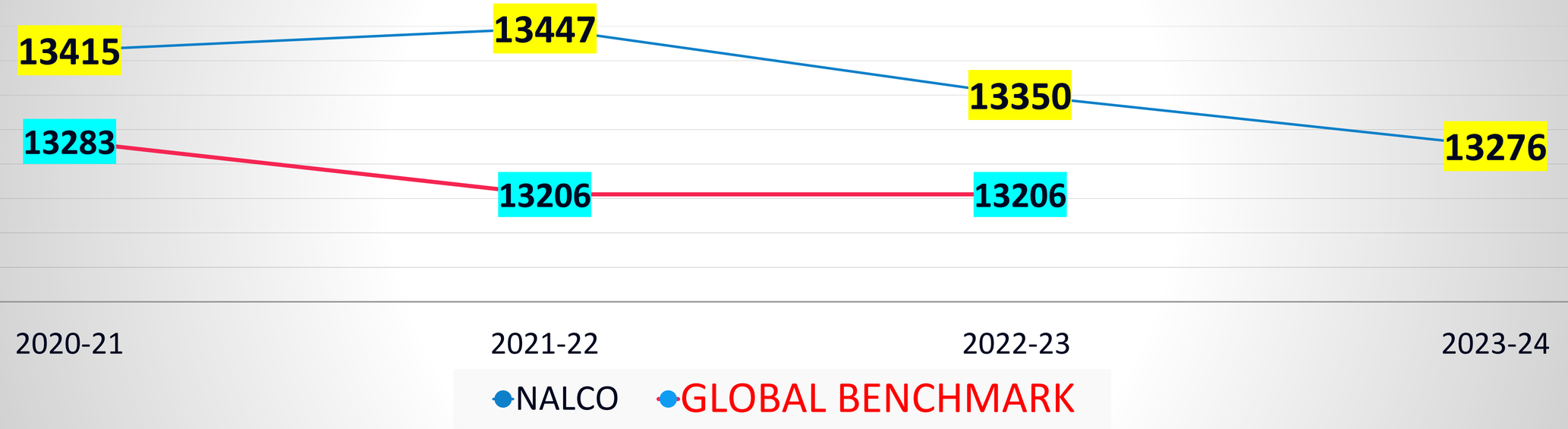
NALCO VS GLOBAL BENCHMARK IN SP AC ENERGY CONSUMPTION IN kWh/Metric Tonne



NALCO VS GLOBAL BENCHMARK IN SP DC ENERGY CONSUMPTION IN kWh/Metric Tonne



SOURCE : International Aluminium Institute (IAI)

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Major Energy Saving projects implemented in Smelter Plant

Year	Name of the Energy savings Projects	Investment (INR millions)	Electrical Savings (kWh)	Thermal savings (million kcal)	Total Savings (INR million)	Payback period (in months)
2022-23	Replacement of electrically heated desiccant dryers by refrigerated air dryer	2.38	3057240	0	9.5	3.01
2023-24	Replacement of Screw and reciprocating Compressor by Energy Efficient Centrifugal Compressor (2 nos)	17.4	2200000	0	7.48	2.32
2023-24	Replacement of Hot well Pumps of Cooling Tower-I(EE) by energy efficient pumps along with VFD panel that reduced the Electrical Energy Consumption by 2407680 KWH per annum.	1.8	221760	0	0.69	2.6
2023-24	Graphitization of electrolytic cells	35	2360000		82.5	0.5

Innovative Projects implemented

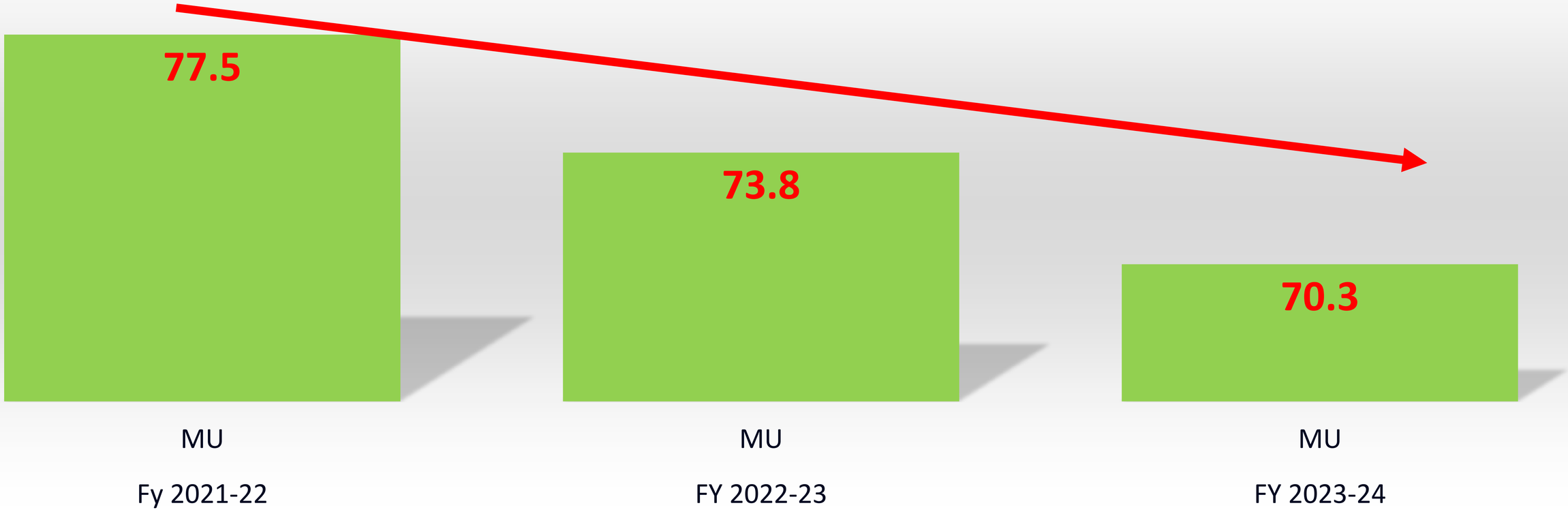
Sl No	Name of the Project	Brief Description of Project	Why Project is important	COST BENEFITS
1	Stoppage of Colling Tunnel Pumps during Local Testing of return conveyor in GAP 1	Two cooing tower pumps, two cooling tunnel pumps, both steam Extraction fans and both cooling tower fans are in line during plant running. After PM activities wagon Trollies are required to be checked. To check Wagon trollies return conveyor needs to be run. But without starting all pumps return conveyor cannot run in auto. During wagon trolley checking cooling water is not required. Since cooling water is not required, steam extraction fans and cooling tower fans are also not required to run	2-3 % of Energy consumption reduction YoY	17496 kwh saving per year
2	Replacement of 02 nos of desiccant dryers by 02 nos refrigerated air dryers at new compressor house.	The compressed air network in new compressor house was modified, so that compressed air of IR compressors is diverted to 02 nos refrigerated dryers and one Gaso make energy intensive desiccant dryer is kept as standby	Potential for energy reduction by approx. 30 % YoY	752400 kwh
3	Proposed Floating Solar Power Plant installation of capacity > 10 MW	Installation of solar power plant over holding pool sump approx.	Towards achieving net zero	Carbon neutral

BRIEF DESCRIPTION ABOUT THE PROJECT

Sl No	Name of the Project	Brief Description of Project	Why Project is important	COST BENEFITS
1	Reduction of Sp.D.C.Eenrgy consumption in FY 2022-23 by Process improvement	Nalco smelter was following low voltage pot operation till FY2023-24. Sp.D.C.Energy consumption achieved in 2022-23 was 13350 kWH/MT. But from the year 2023 onwards, smelter has adopted the methodology to increase %Current Efficiency by keeping required voltage in the pots for reducing Sp.D.C.Energy consumption. By following this methodology, smelter has achieved lowest Sp.D.C.Energy consumption with increased metal production. Reduction of Sp.D.C.Eenrgy consumption was also possible by optimizing pot parameters like KA , ACD optimization.	All potlines adopted the principle of raising %Current Efficiency for reducing Sp.D.C.Energy consumption.	Sp.D.C.Energy consumption in FY: 2023-24 i.e.13276 kWH/MT of Hot Metal, which is the lowest consumption since inception of Nalco smelter plant
2	Graphitisation of Potline Cathodes	Graphitisation of cathode reduces the Voltage /per operation thereby facilitating Low Energy Operation.	By using Graphitized electrode it was observed we are saving 55 KWH/MT of Hot metal.	Energy Reduction to the the tune of 55kwh/MT of Hot Metal.

SIGNIFANCT ACHIEVEMENT IN COMPRESSED AIR SYSTEM

Reduction in Electrical Energy consumption in compressed air system



1. REPLACEMENT OF ONE RECIPROCATING COMPRESSOR BY CENTRIFUGAL COMPRESSOR
2. REPLACEMENT OF ONE SCREW COMPRESSOR BY CENTRIFUGAL COMPRESSOR
3. REPLACEMENT OF 3 DESCICANT DRYERS BY 4 NOS OF REFRIGERANT DRYERS

Innovation 1 : close to 100 % Graphitization of Pots

- **Till date converted 1035pots to graphitized and plan is in place to convert all pots into graphitized cathode**
- **Helped in reducing Specific DC Energy consumption to the tune of 55 kWh/MT and increase the amperage of operation by another 5 KA**
- **Close to 100% of the entire Pot line has been graphitized**

Innovation : 100 % Graphitization of Pots

COMPARISION OF GRAPHITIZED CATHODE AND SEMI-GRAPHITE CATHODE		
PARAMETERS	**GRAPHITIZED**	**SEMI-GRAPHITE**
Cathode Resistance	1.50 μΩ	2.00 μΩ
Pot Voltage	Low	High
Bath Temperature	Low	High
Amperage of Operation-KA	High	Low
Productivity	High	Low
Current Efficiency	High	Low
Sp DC Energy-Kwh/MT	Low	High

- **Two desiccant type driers #9 & #10 were replaced with more energy efficient refrigerant type driers.**
- **Annual electrical energy saved was about 25,92,960 kwh**
- **Dryness of compressed air has improved dramatically.**

Innovation 2 : 100 % Replacement of desiccant driers with energy efficient refrigerant driers

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Utilisation of Renewable Energy sources

Source	Financial Year	Installed capacity (in MW)	Generation (in Million kWh)
SOLAR	2020- 21	0.8	0.52
SOLAR	2021- 22	0.8	0.73
SOLAR	2022- 23	0.8	0.703
WIND	2020- 21	198.4	285
WIND	2021- 22	198.4	320
WIND	2022- 23	198.4	292.56
WIND	2023-24	198.4	324
TOTAL RENEWABLE INSTALLATION IN MW	**199**		
TOTAL THERMAL INSTALLATION	**1200 MW**		
% RENEBLE GENERATION	**17 %**		

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GHG Inventorisation and Public Disclosure in Sustainability Report in Web Hosting

GreenHouse Gas Emissions

Fuel	Unit	GHG Emissions 2019-20	GHG Emissions 2020-21	GHG Emissions 2021-22
HFO (Scope 1)	tCO2e	6,19,874	6,13,674	6,31,201
LDO (Scope 1)	tCO2e	12,294	13,626	11,873
Coal (Scope 1)	tCO2e	93,25,614	96,12,147	88,08,272
Diesel (Scope 1)	tCO2e	20,428	23,052	21,671
LPG (Scope 1)	tCO2e	58	38	46
Electricity from Grid (Scope 2)	tCO2e	2,52,418	31,217	11,32,426
Emission from PFC (Scope 1)	tCO2e	87,902	94,166	98,484
Process carbon Emission from electrolysis in pots (Scope 1)	tCO2e	6,38,005	6,39,641	7,14,760
Process carbon Emission from anode baking (Scope 1)	tCO2e	60,707	59,315	55,725
Total Scope 1+ Scope 2 GHG Emissions	tCO2e	1,10,17,300	1,10,86,876	1,14,74,458

*GHG emissions are estimated based on actual usage of fuels and electricity, IPCC emission factors, CEA grid emission factor, actual production figures and Aluminium sector GHG workbook

National Aluminium Company Limited

Business Responsibility and Sustainability Report

6. Provide details of greenhouse gas emissions (Scope 1 and Scope 2 emissions) & its intensity, in the following format:

Parameter	Unit	GHG Emissions FY 2022-23	GHG Emissions FY 2021-22
Total Scope 1 emissions	$MTCO_2$ Equivalent	1,01,99,426	1,03,42,032
Total Scope 2 emissions	$MTCO_2$ Equivalent	9,86,969	11,32,426
Total Scope 1 and Scope 2 emissions per rupee of turnover	$MTCO_2$ Eq./ ₹	0.000079	0.000082

Note: Emission factor from central Electricity Authority, CO_2 baseline Database version 18 and IPCC Guidelines for National Greenhouse Gas Inventories has been referred to calculate GHG emissions. For estimating GHG emissions from Smelter Process, Aluminium Sector GHG workbook is used.

Net Zero Approach

Activity Timelines

Short Term (1-2 Years)

- ENCON Schemes
- Implementation of Slotted Anode in Electrolysis.
- Replacement of 2 Nos of reciprocating compressors by centrifugal compressor.
- Renewable Energy

Medium Term (2-5 Years)

- ENCON Schemes
- Replacement of HFO with Low sulphur Heavy Stock (LSHS) fuel.
- Tree Plantation
- Renewable Energy (10 MW solar Energy from roof top and floating)
- Carbon Capture, Utilisation and Storage (CCUS)

Long Term (5-10 Years)

- Implementation of Advance Technology for Electrolysis Energy Reduction AP XE and AP 2XN CELLS.
- Implementation of Digitisation Industry 4.0 in Smelter.
- Switch to Natural Gas
- Tree Plantation
- Carbon Capture, Utilisation and Storage (CCUS)
- Renewable Energy

Natural (>10 Years) **Investment Cycle**

- Grey to green hydrogen
- Tree Plantation
- CCUS
- Renewable Energy

Envisaged Emission Mitigation Pathway

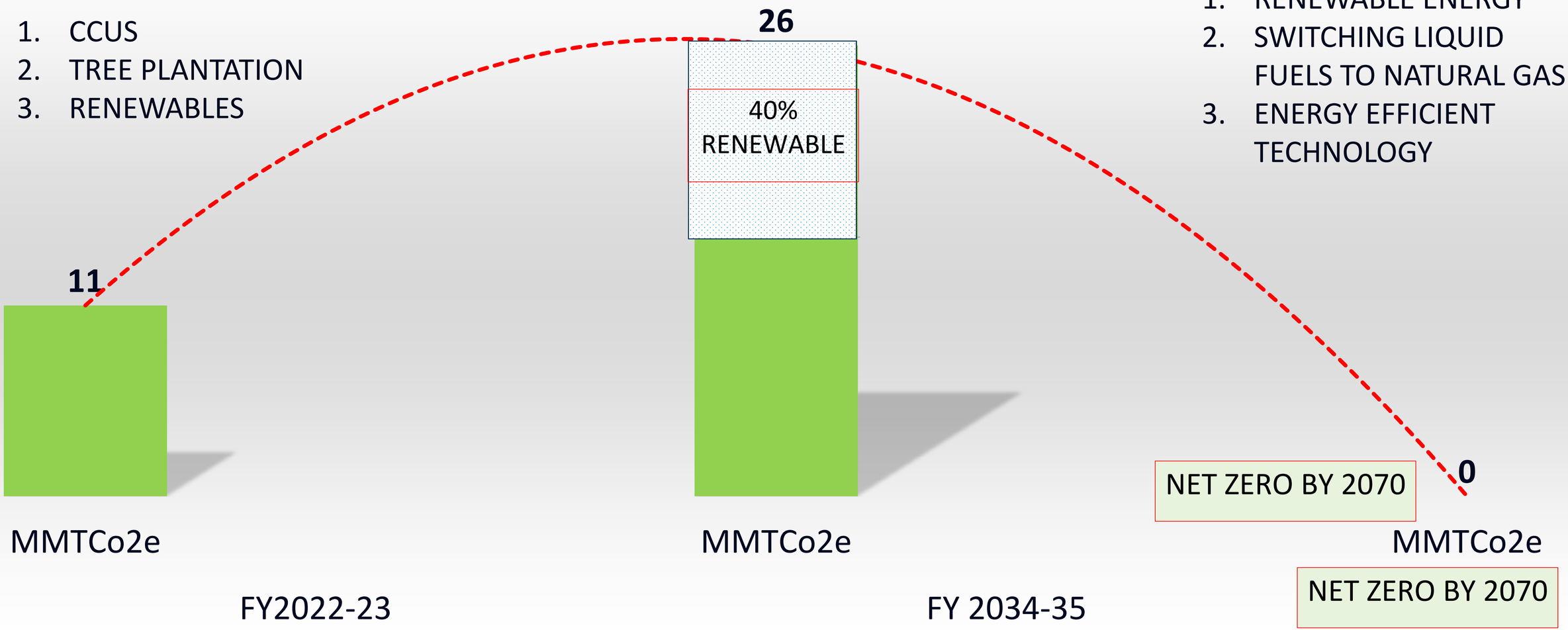
GHG Emission (due to Proposed expansion)

OFFSET EFFORTS

1. CCUS
2. TREE PLANTATION
3. RENEWABLES

MITIGATION PATHWAY

1. RENEWABLE ENERGY
2. SWITCHING LIQUID FUELS TO NATURAL GAS
3. ENERGY EFFICIENT TECHNOLOGY



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Total no. of plants planted - 17. 55 Lakhs
Actual no. of plants survived - 11.52 Lakhs
Average survival % age - 65.65%

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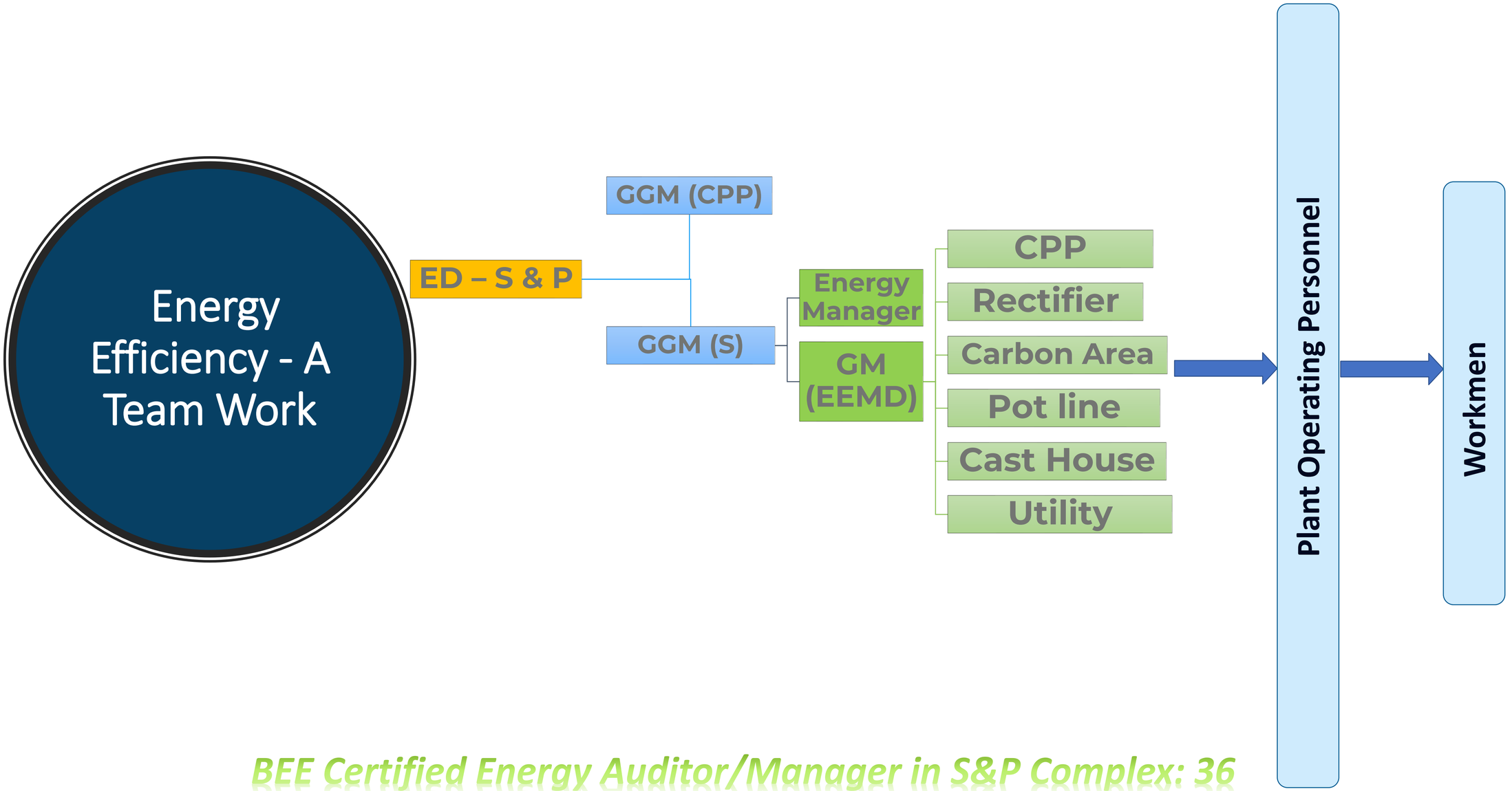

BEE Certified Energy Auditor/Manager in S&P Complex: 36

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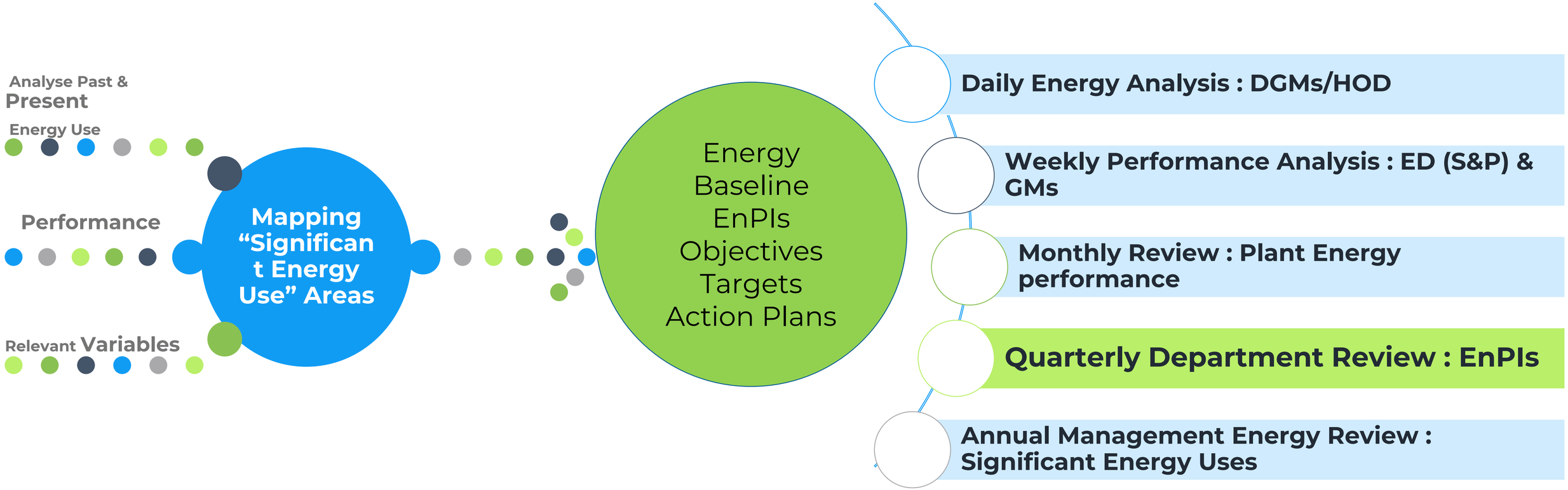
Energy Planning & Review



Energy Performance Indicators (EnPIs) set at Department level : 22

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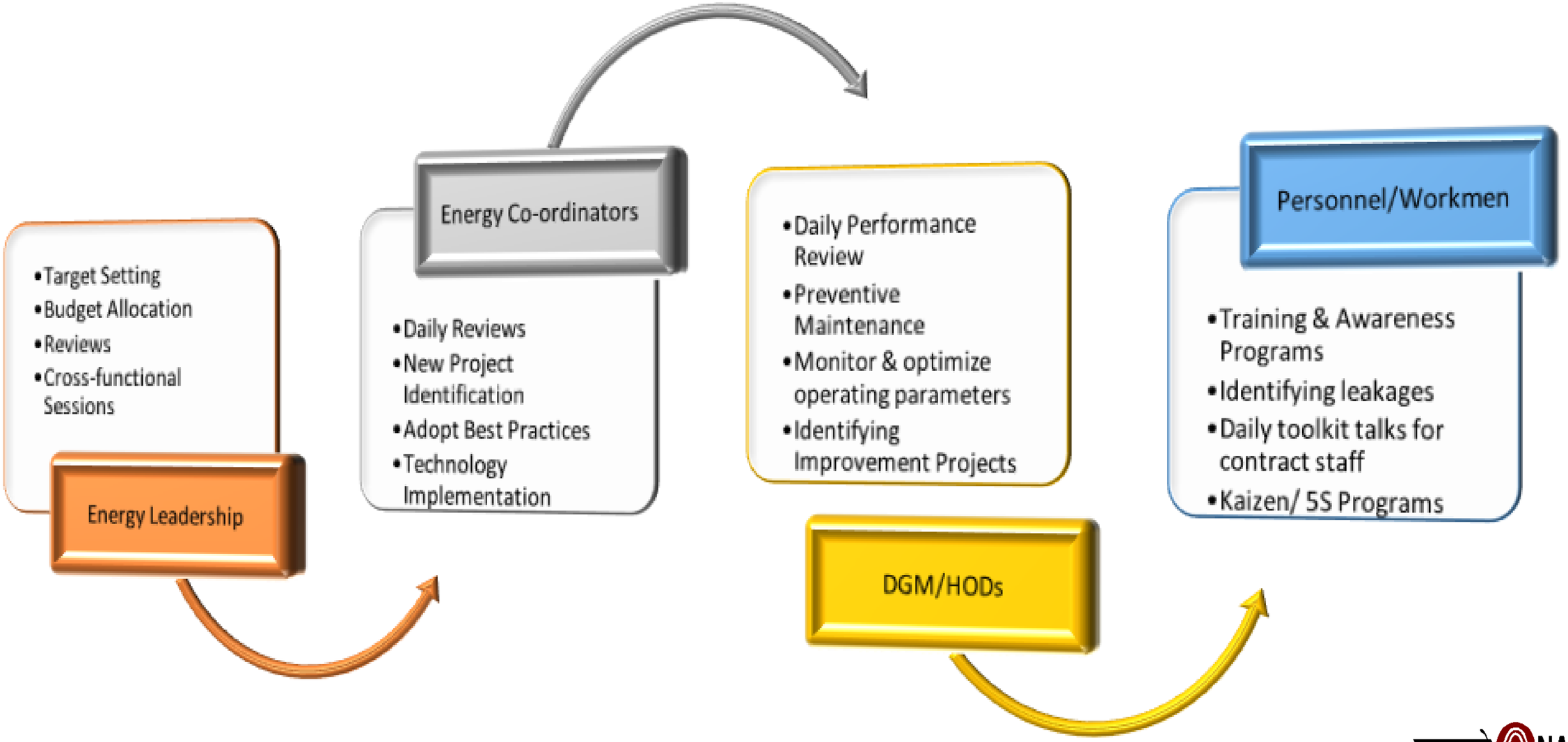
Energy Review - Mechanism



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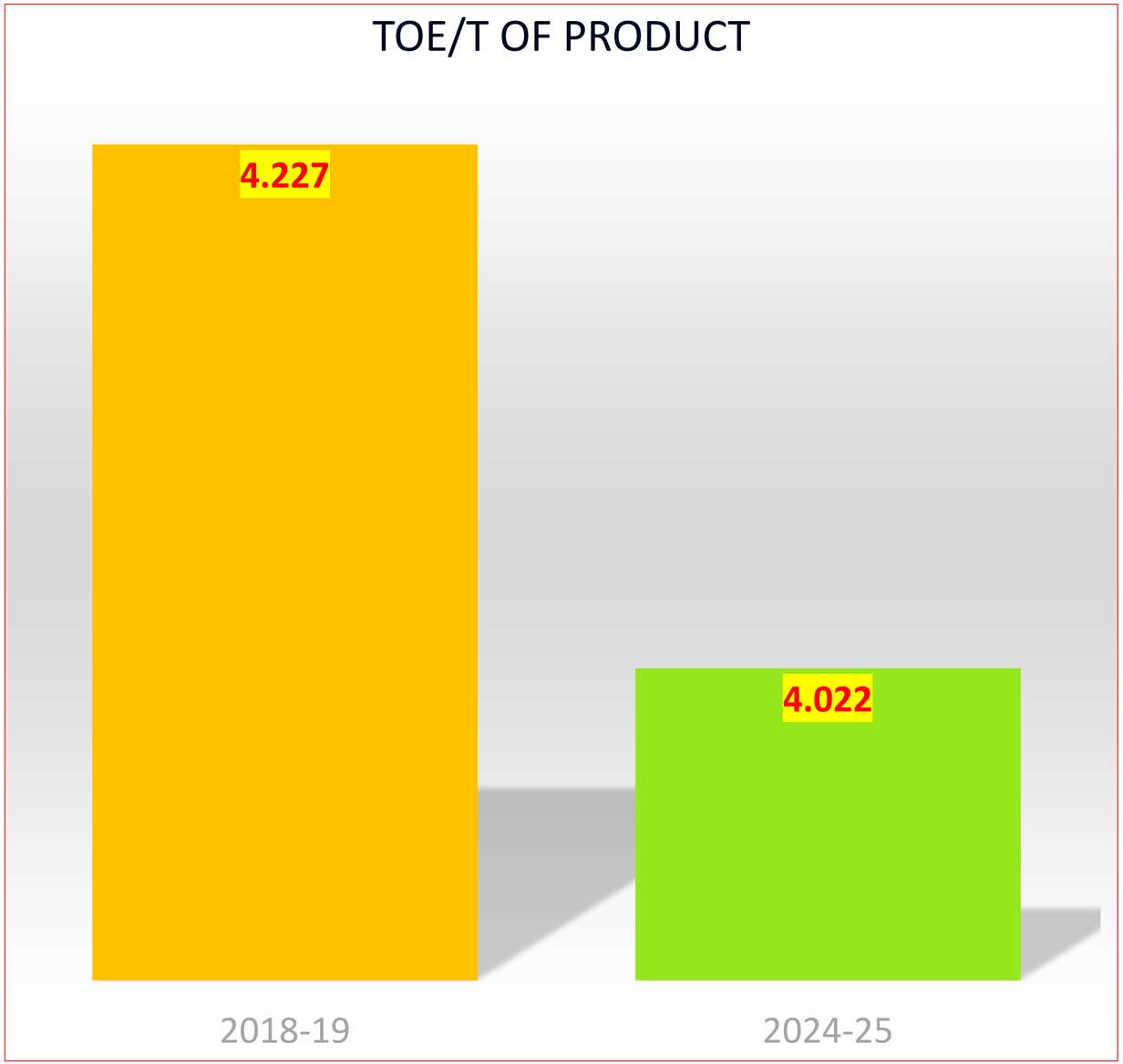
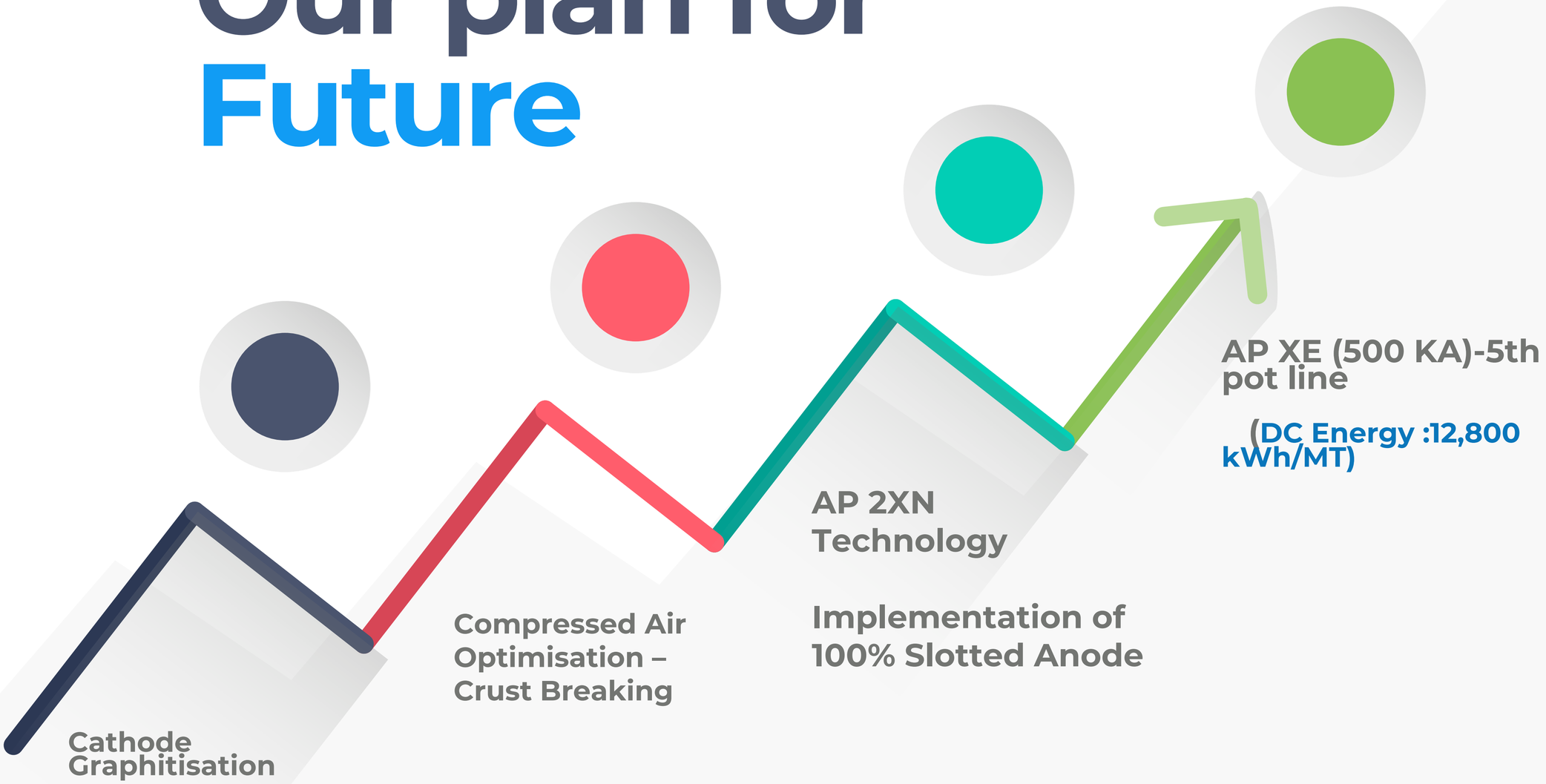
PAT TARGET 2024-25 : NALCO,S&P Complex ,Angul



FY 2024-25 : PAT 7 TARGET	
REDUCTION (TOE/T OF PRODUCT)	**0.205**
REDUCTION TARGET	**4.85%**

PAT 1 TARGET AND PAT 2 TARGET
ACHIEVED COMFORTABLY

Our plan for Future



THANK YOU