


# Hindalco Industries Limited
# Unit – Birla Copper
# Dahej

**Team Members –**

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# About Birla Copper - Overview

- One of the world's largest custom smelters at a single location
- Captive Jetty (Dahej Harbor & Infrastructure Ltd, a wholly owned subsidiary)
- State-of-art copper facility comprises a world-class copper smelter producing
- Major products of Birla copper are Cathode, and Copper Casting rod.

## Capacity spectrum

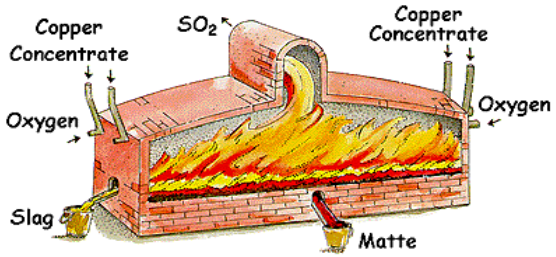
5 LPTA
Copper Smelter & Refinery

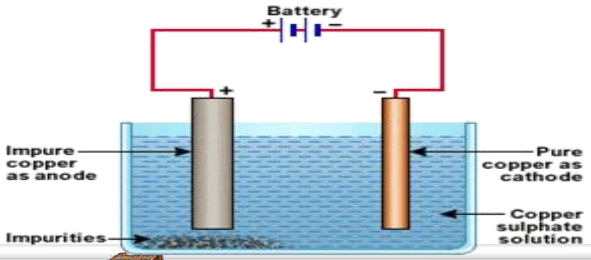
135 MW
Co-Generation Power Plant

12 TPA Gold, 105 TPA Silver
Precious Metals

# Manufacturing Process

**Cu % :**
**27 to 28%**

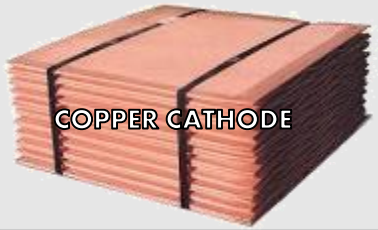



**Cu % :**
**99.99%**


**SMELTING**
4.28 Lac TPA (@31% Cu)


**REFINING**
5.0 Lac TPA




**HOT ROLLING**
3.64 Lac TPA


**Sulphur**

**Sulphur Acid Plant**

**Sulphuric Acid**

**Anode Slime**

**BYPRODUCTS**

**Precious Metals Refinery**

**Gold**

**Silver**

# Technology / Specification on Major Sections

| Major Equipment | Quantity ( nos. ) | Unit | Capacity | OEM / Technology |
|---|---|---|---|---|
| Copper Smelters | 2 | KTPA | 400 | Mitsubishi & Outotech ( Metso ) |
| Sulphuric Acid Plant | 2 | MT/day | 4650 | Outokumpu & MECS |
| Refineries ( Cathode ) | 2 | KTPA | 500 | Glencore |
| Copper Casting Rod | 2 | KTPA | 364 | Southwire & SMS ( Contirod ) |
| Co-generation Power Plant | 2 | MW | 135 | TKIL & LMZ |
| Oxygen plant | 5 | TPD | 1960 | Linde & Airliquide |
| Water treatment (DM water, Soft water etc.) | 2 | M3/day | 47,580 | Thermax & Ion Exchange |
| Effluent treatment plant | 2 | MT/day | 4500 | Outukumpu |

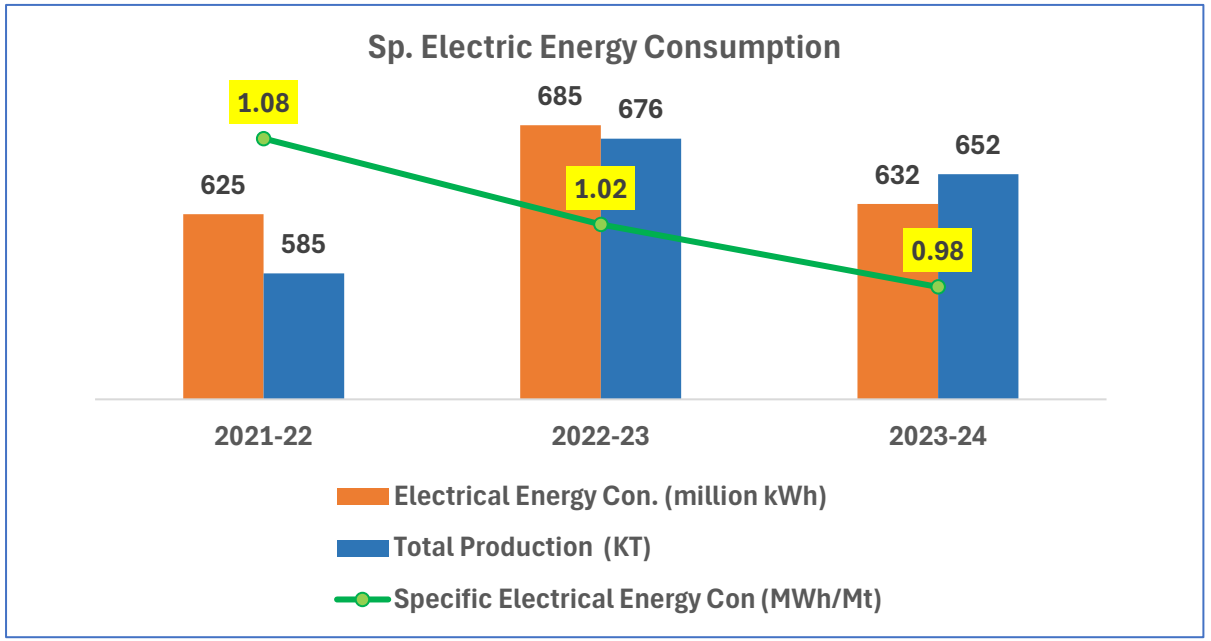
# Production Data of FY 2021-24

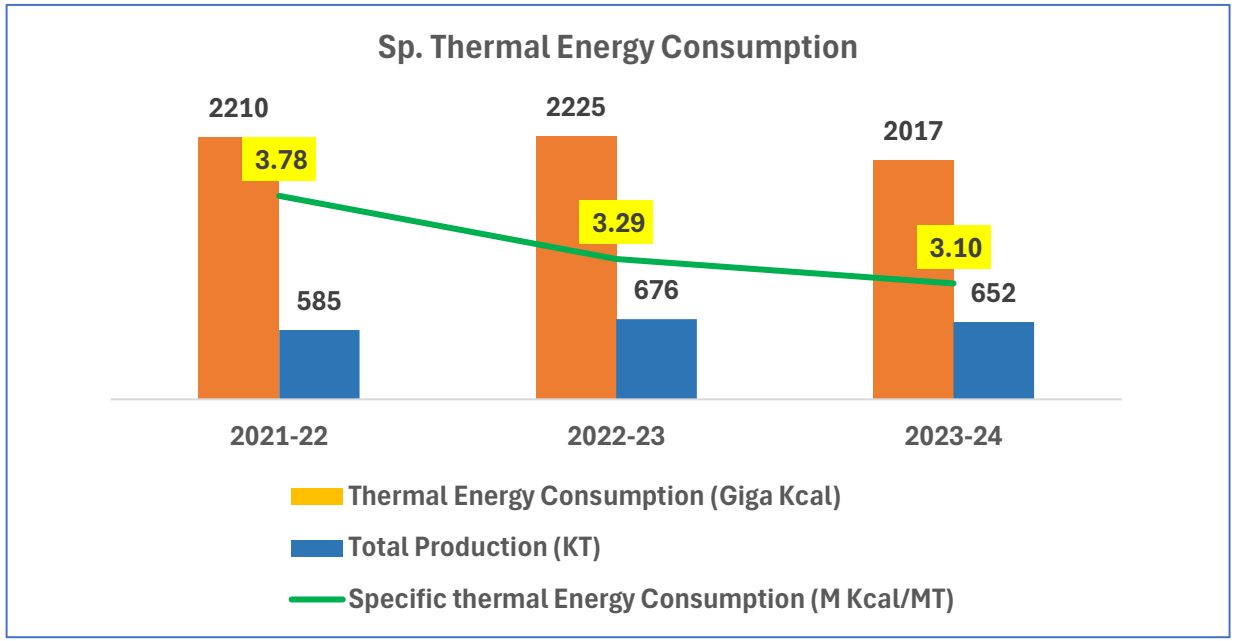
| Parameters | Year | Name of Product | Unit of Production | Production Quantity |
|---|---|---|---|---|
| Major Product | 2021-22 | Cathode | KTPA | 359 |
| Major Product | 2022-23 | Cathode | KTPA | 407 |
| Major Product | 2023-24 | Cathode | KTPA | 368 |
| Product | 2021-22 | Copper Casting Rod | KTPA | 225 |
| Product | 2022-23 | Copper Casting Rod | KTPA | 268 |
| Product | 2023-24 | Copper Casting Rod | KTPA | 283 |

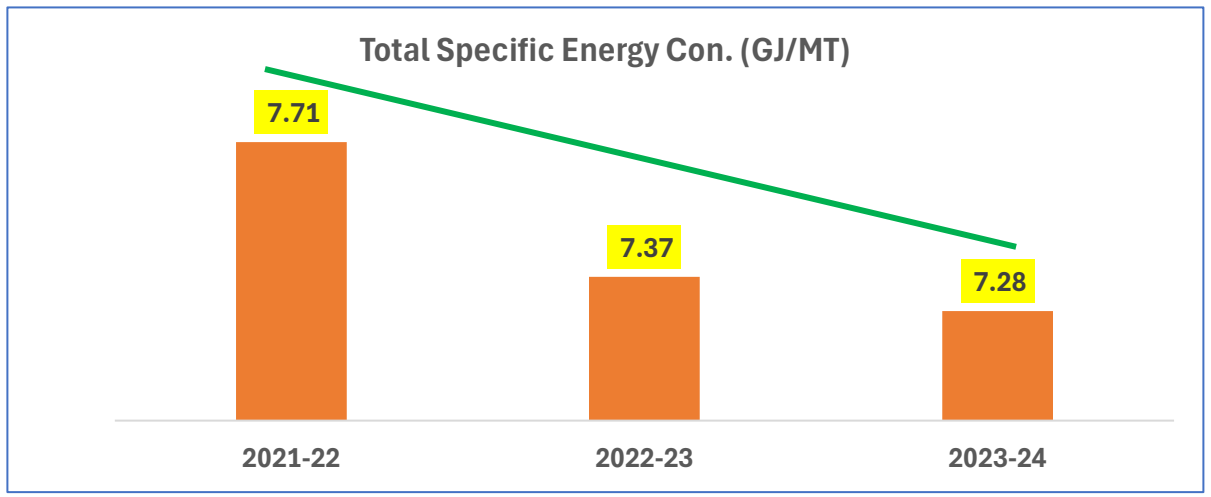
# Energy Consumption Data of FY 2021-24

| Parameters | Unit of Production | FY 2021-22 | FY 2022-23 | FY 2023-24 |
|---|---|---|---|---|
| Annual Electrical Energy Consumption | Million KWH | 625 | 685 | 632 |
| Annual Thermal Energy Consumption (Including coal used in power) | Giga kcal | 2210 | 2225 | 2017 |
| Specific Electrical Energy Consumption | MWh/MT | 1.07 | 1.01 | 0.97 |
| Specific Thermal Energy Consumption (Including coal used in power) | M kcal/MT | 3.78 | 3.29 | 3.10 |
| Total Specific Energy Consumption (Excluding coal used in power) | GJ/MT | 7.71 | 7.37 | 7.28 |

# Overall Energy and SEC




* Total Sp. energy excludes thermal energy of coal used in power.

* Specific thermal energy includes coal used in power.

- Specific electric & thermal energy consumption is gradually decreasing year on year.
- Overall reduction in specific energy consumption is 6% from FY 22 to FY 24.
- Annual electric and thermal energy was up in FY 23 due to increase in production.

# National & Global Benchmark

## NATIONAL BENCHMARK

| | |
|---|---|
| Name of the Company | HINDALCO - BIRLA COPPER |
| Location of Unit | DAHEJ |
| Total SEC (FY 22) | 7.71 GJ / MT |

Source – Annual Report of Hindalco FY 22

## GLOBAL BENCHMARK

| | |
|---|---|
| Name of the Company | Aurubis |
| Location of Unit | Germany |
| Total SEC (FY 22) | 7.58 GJ / MT |

Source – Annual Report of Aurubis FY 22

# Energy Saving Projects - Overall

| Year | No. of energy Saving Projects | Investment ( INR Million ) | Electrical Energy Saving (Million kWh) | Total Saving (INR Million) |
|---|---|---|---|---|
| FY 2020-21 | 16 | 86 | 3.47 | 29.6 |
| FY 2021-22 | 9 | 53.2 | 3.16 | 19.3 |
| FY 2022-23 | 14 | 112 | 5.24 | 48.4 |

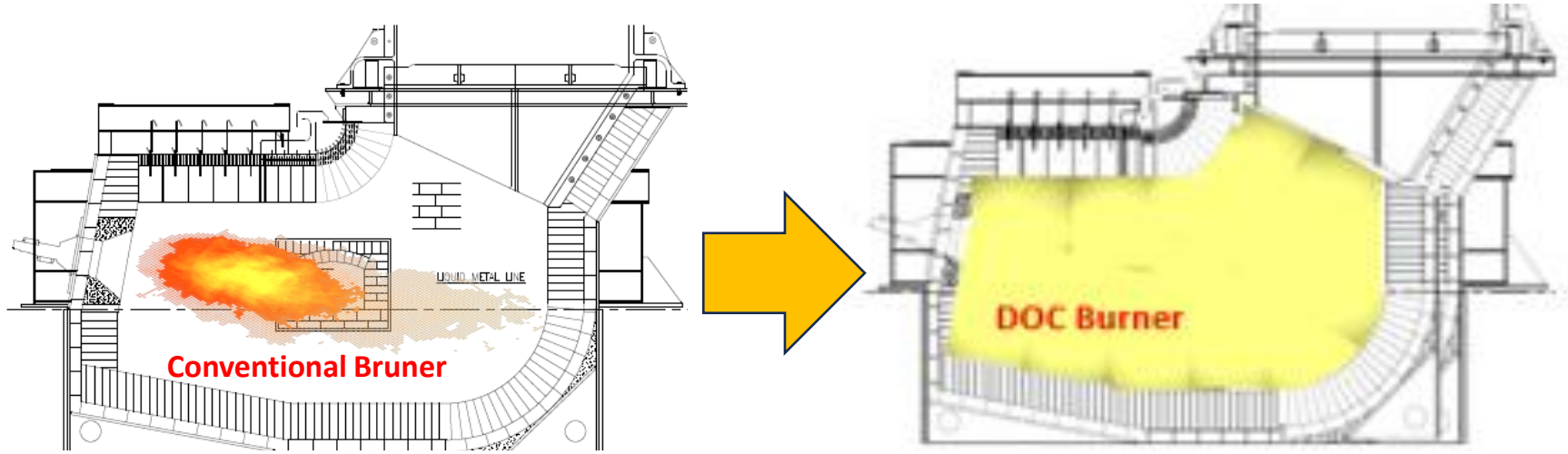
# Major Energy Saving Projects of FY 2021-24

| Year | Name of energy Saving Projects | Investment (INR Million) | Electrical Saving (Million kWh) | Thermal Saving (Million Kcal) | Total Saving (INR Million) | Payback Period (In months) |
|---|---|---|---|---|---|---|
| FY 2021-22 | Oxygen Plant upgradation - Cold box major work along with perlite power charging. | 30 | 6.17 | - | 61 | 5.9 |
| FY 2022-23 | Upgradation of cell house flexible bus bar, Insulator to minimize cell house bus bar (mV drop) power loss | 15.65 | 0.45 | - | 52.08 | 4 |
| FY 2023-24 | DOC burner installed for uniform and effective heat supply and operation parameters optimized for effective melting. | 30 | - | 4334.6 | 84 | 4 |

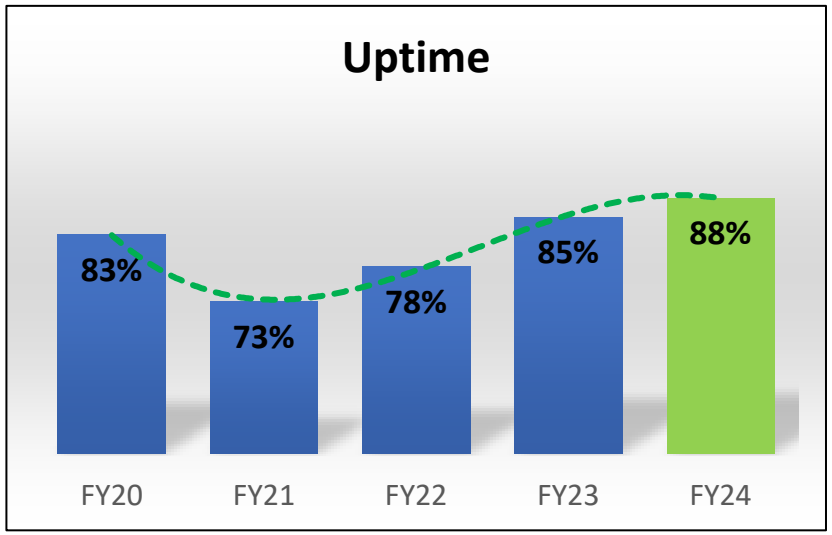
# Innovative Project 1 , Category ‘C’.

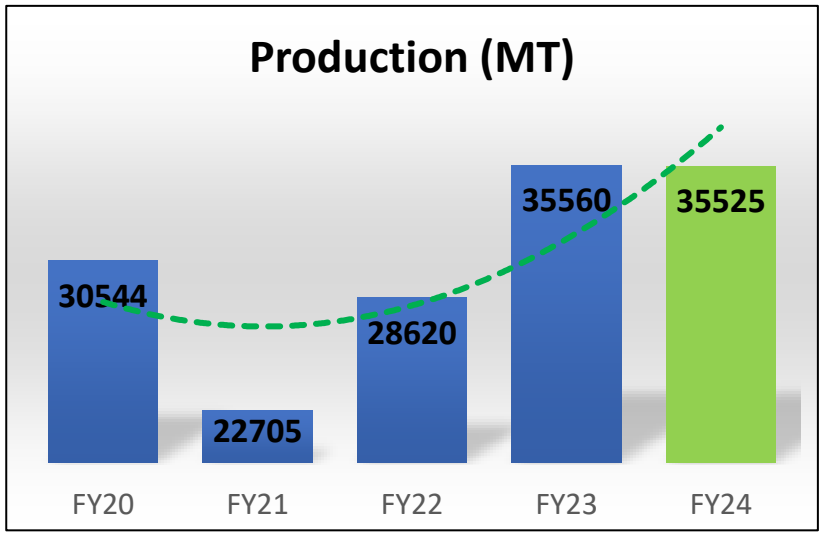
| | |
|---|---|
| **Name of the Project** | **DOC burner installed for uniform and effective heat supply and operation parameters optimized for effective melting** |
| **Brief description on why innovative** | With this project FO emission completely eliminated with 27% carbon footprint reduction. Production also increased by 7000 MT. Refractory life doubled compared to previous |
| **Trigger for implementing the project** | 1)Lower refractory life & lower melting rate of SMF.<br>2)Bottom build-up of SMF<br>3)Improper Combustion of fuel – leads to black smoke in SMF<br>4)High fuel consumption in SMF<br>5)Improper suction – The higher volume of flue gas to achieve req combustion.<br>6)Frequent damage of AF mouth refractory. |
| **Replication Potential** | Replicated in 6 nos. Anode Furnace<br>Replicable at Global Level |
| **How and What Impact Created.** | 1) Reduction in energy consumption of 273555 kwh/annum.<br>2) FO emission eliminated with 27% carbon footprint reduction.<br>3) Production increased by 7000 MT.<br>**Cost Benefit** – Total Investment – Rs. 300 Lakhs.<br>Annual Saving - Rs. 840 Lakhs. |

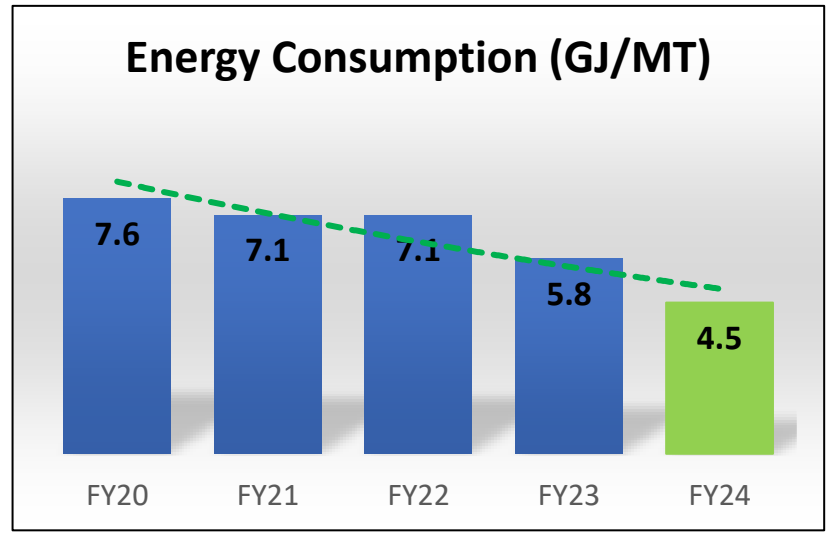
# Project -01, Dilute Oxygen Combustion (DOC)




- Flameless oxygen-enriched combustion burner for heating
- Low-cost way to convert burners from Air-fuel to Oxy-fuel systems
- Environment friendly



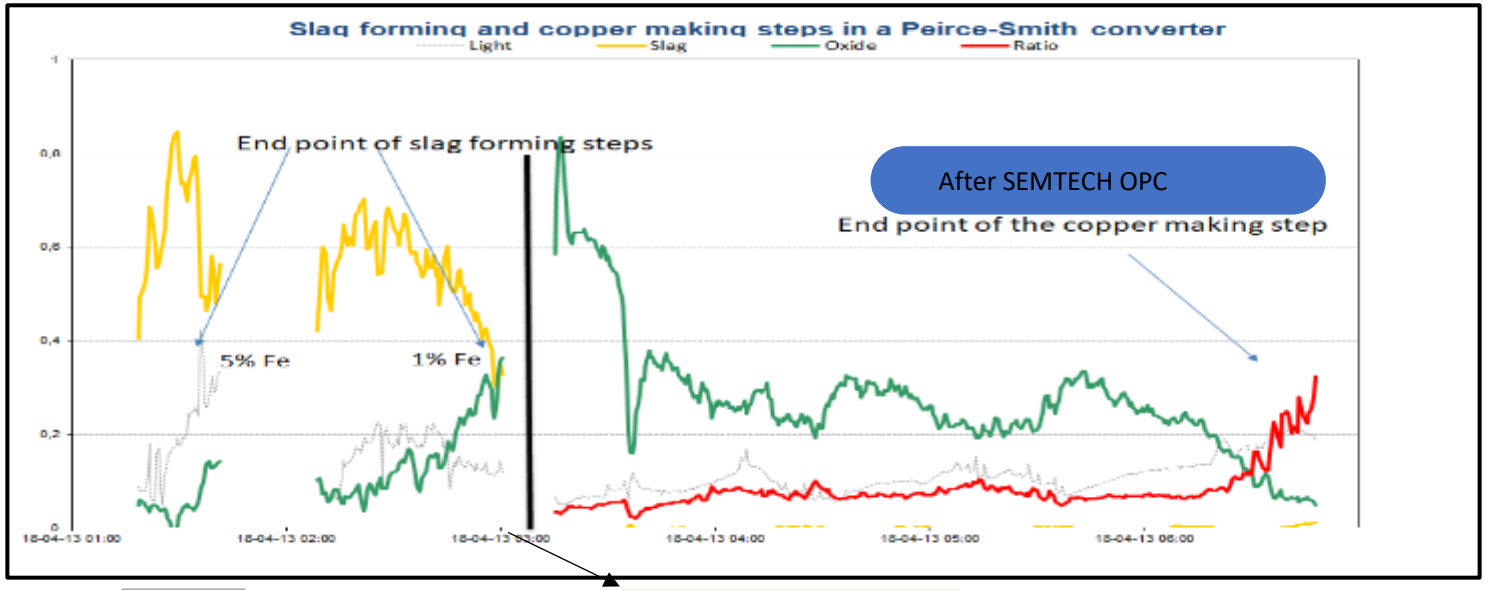



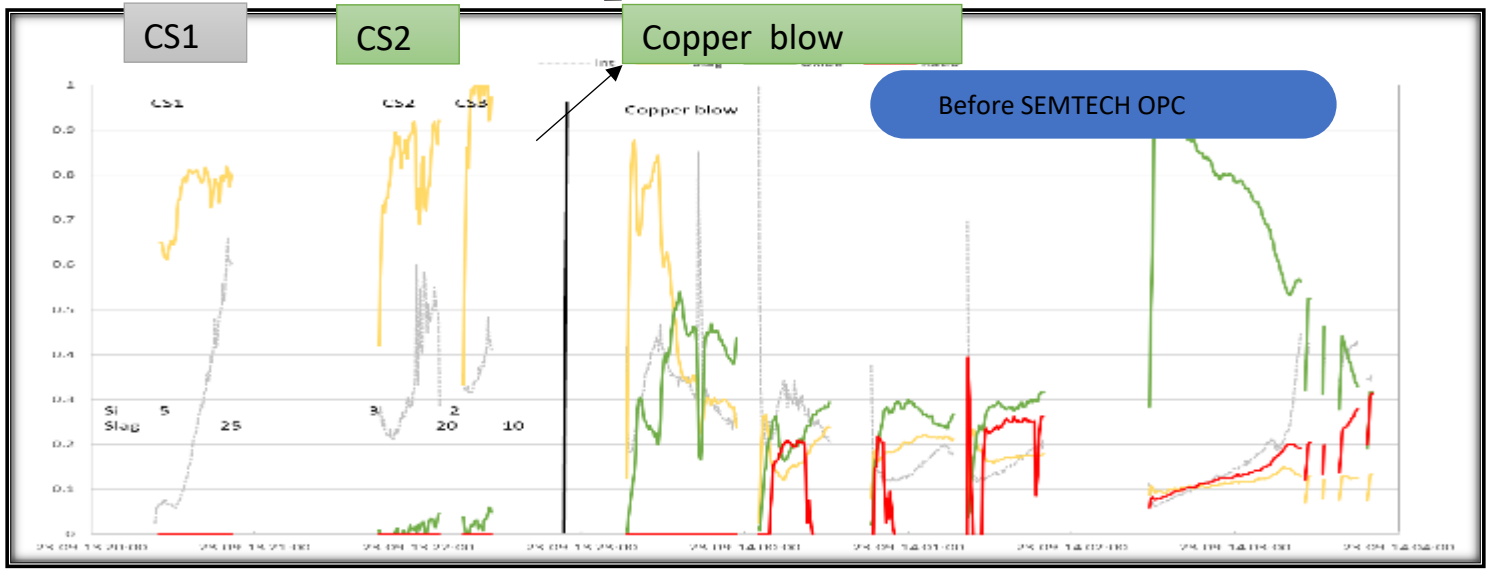



# Innovative Project 2 , Category ‘B’.

| | |
|---|---|
| **Name of the Project** | **Operational Efficiency Improvement by Digitalizing PS Converter process using OPC System** |
| **Brief description on why innovative** | Traditionally, determining process endpoints in metallurgical Converter operations relies on manual observation and empirical knowledge. By leveraging digitalization techniques, such as spectrum analysis of flame signals, the accuracy and precision of endpoint determination is significantly improved. |
| **Trigger for implementing the project** | • No online process insight.<br>• The operator observes the process through flame behavior, color, dust color, punch rod samples, spitting samples. |
| **Replication Potential** | It can be replicable at Global Level. |
| **How and What Impact Created.** | 1) Quality - no premature slag formation resulting blister quality improvement ( 4% increase in blister quality after implementation )<br>2) Process - Avg. cold dobing increased from 39 MT/blow to 49 MT/blow. Copper loss in converter slag is less than 5%.<br>3) Cost - additional liquidation of revert @ 5132 MT helped in releasing 200 Cr working capital & saving of 20 Cr recurring interest till June’2024. |

# Project -02, Digitalizing PS Converter process using OPC System

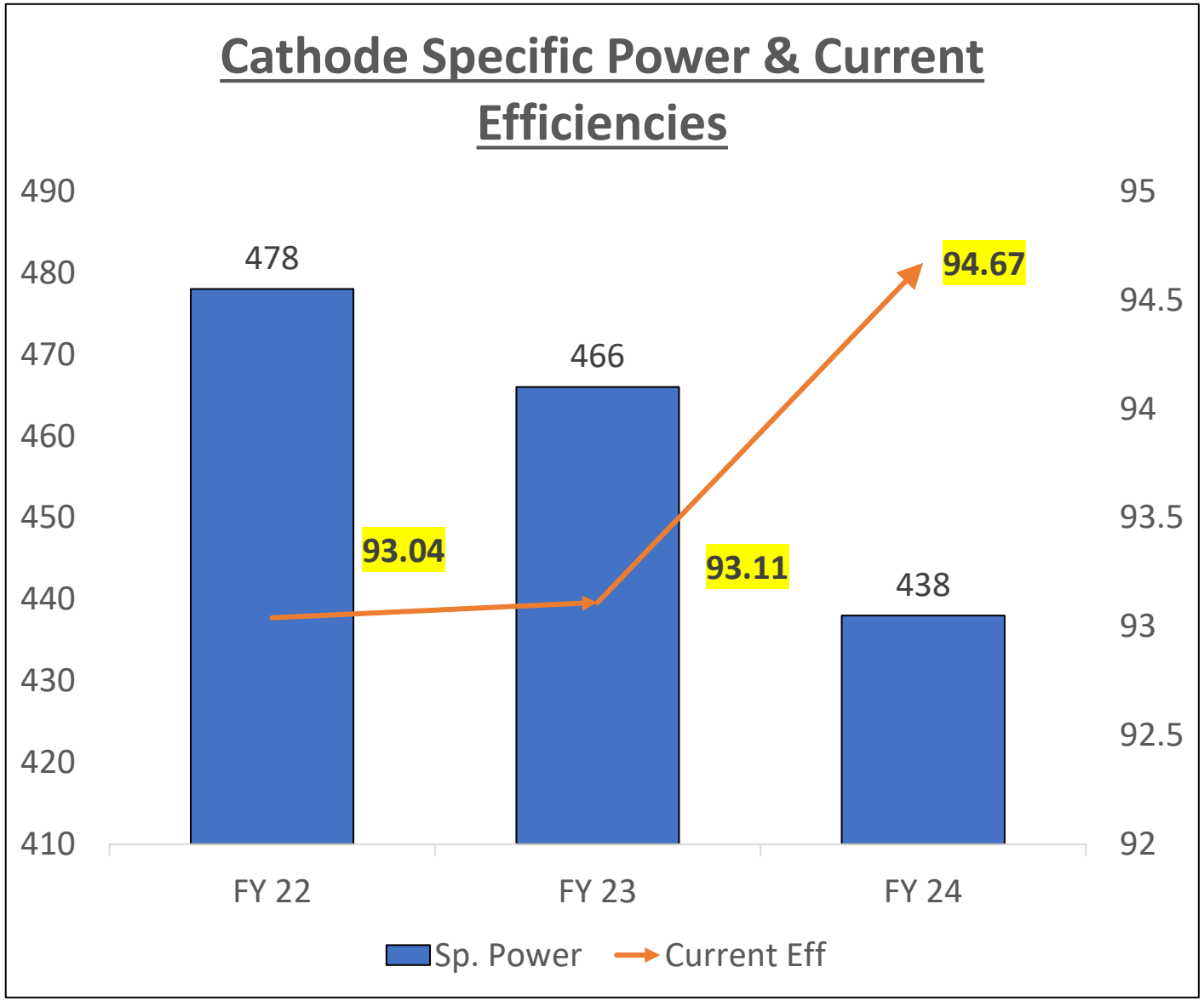


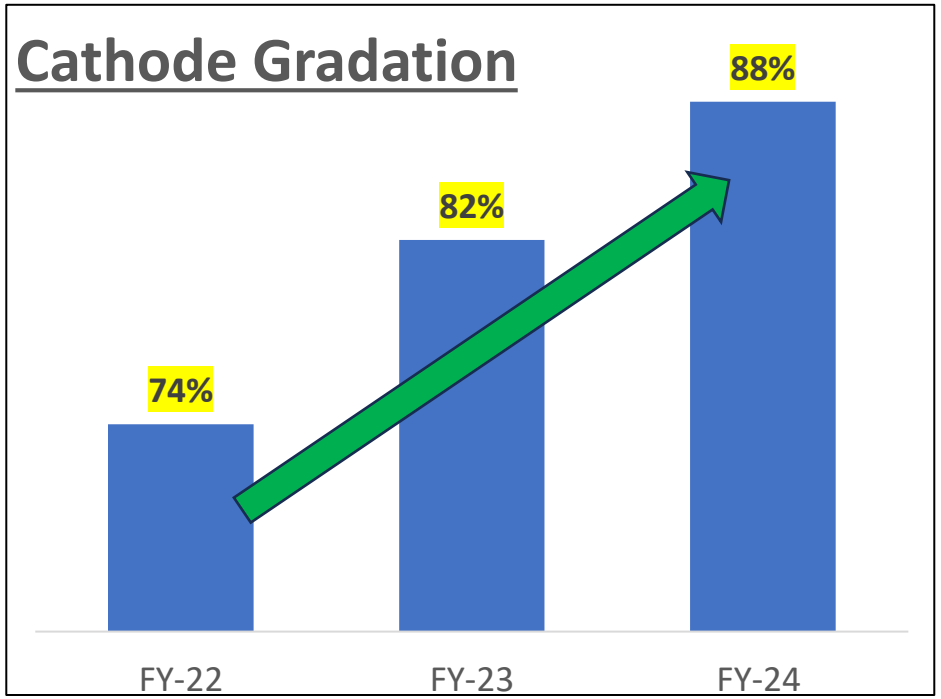



# Innovative Project 3 , Category ‘D’.

| | |
|---|---|
| **Name of the Project** | **Replacement of the Mother Blank at Refinery to Improve Cathode Quality and Enhance Current Efficiency** |
| **Brief description on why innovative** | This project introduces an innovative approach to refining processes by focusing on the replacement of the "Mother Blank" — a critical component used in the production of cathodes. The innovation lies in the advanced materials and design enhancements incorporated into the new Mother Blank. These improvements are expected to significantly elevate cathode quality and increase current efficiency in the electrolysis process. |
| **Trigger for implementing the project** | 1) Persistent issues with cathode quality affecting overall production efficiency.<br>2) Observed decline in current efficiency due to wear and tear of the existing Mother Blanks.<br>3) New technology that promise significant improvements in performance. |
| **Replication Potential** | Scalability and Versatility of technology at various refineries & electrolysis process. |
| **How and What Impact Created** | 1) Improved cathode gradation ( GB + PG ) grade from 74% in FY 22 to 88% after project implementation.<br>2) Improved current efficiency from 90% in FY 22 to 94% in FY 24 (Optimum – 97%).<br>3) Reduction in Sp. Power consumption from 478 kwh/MT in FY 22 to 416 kwh/MT in FY24.<br>4) Reduced maintenance costs and improved overall productivity. |

# Project -03, Improved Current Efficiencies increased Cathode Quality




# Renewable Energy Sources - Onsite

| Year | Source ( Solar, Wind etc. ) | Installed Capacity ( In MW ) | Total Generation ( million kWh ) | Total Consumption ( million kWh ) | Share % w.r.t to overall energy consumption |
|---|---|---|---|---|---|
| FY21 – 22 | Waste heat recovery | 10.5 | 42.09 | 692.6 | 6.1 |
| FY 22 – 23 | Waste heat recovery | | 43.42 | 749.08 | 5.8 |
| FY 23 - 24 | Waste heat (10.5 MW) & Roof top Solar (0.11 MW) | 10.61 | 39.28 | 690.9 | 5.7* |
| FY 24 – 25 (On going) | Rooftop & Floating solar | 11.25 | 40.09 | 768.2 | - |

- From FY 2023-24 , Birla Copper started drawing power from offsite-wind solar hybrid plant.
- And, due to shutdown of smelter 3, waste heat recovery is in downward trend.

# Renewable Energy Sources – Off site

| Year | Source (Solar, Wind etc.) | Installed Capacity (In MW) | Total Generation (million kWh ) | Total Consumption (million kWh) | Share % w.r.t to overall energy consumption |
|---|---|---|---|---|---|
| FY 21 - 22 | - | - | - | - | - |
| FY 22 - 23 | - | - | - | - | - |
| FY 23 - 24 | Wind Solar Hybrid ( PPA Mode ) | 20 | 72 | 690.9 | 10.4 |
| FY 24 – 25 (On going) | Wind Solar Hybrid ( PPA Mode ) | 30.5 | 154 | 768.2 | 20.04 |

# Renewable Energy Sources – Overall

| Particular's | Unit | Values (FY 24) |
|---|---|---|
| Total Requirement of plant | MW | 79 |
| Plant Generation + GEB | MW | 65 |
| Total RE + WHR Share ( Onsite & Offsite ) | MW | 14* |
| % of RE w.r.t total consumption | % | 17.7 |
| RPO Obligation ( FY 2016 ) | % | 9 |

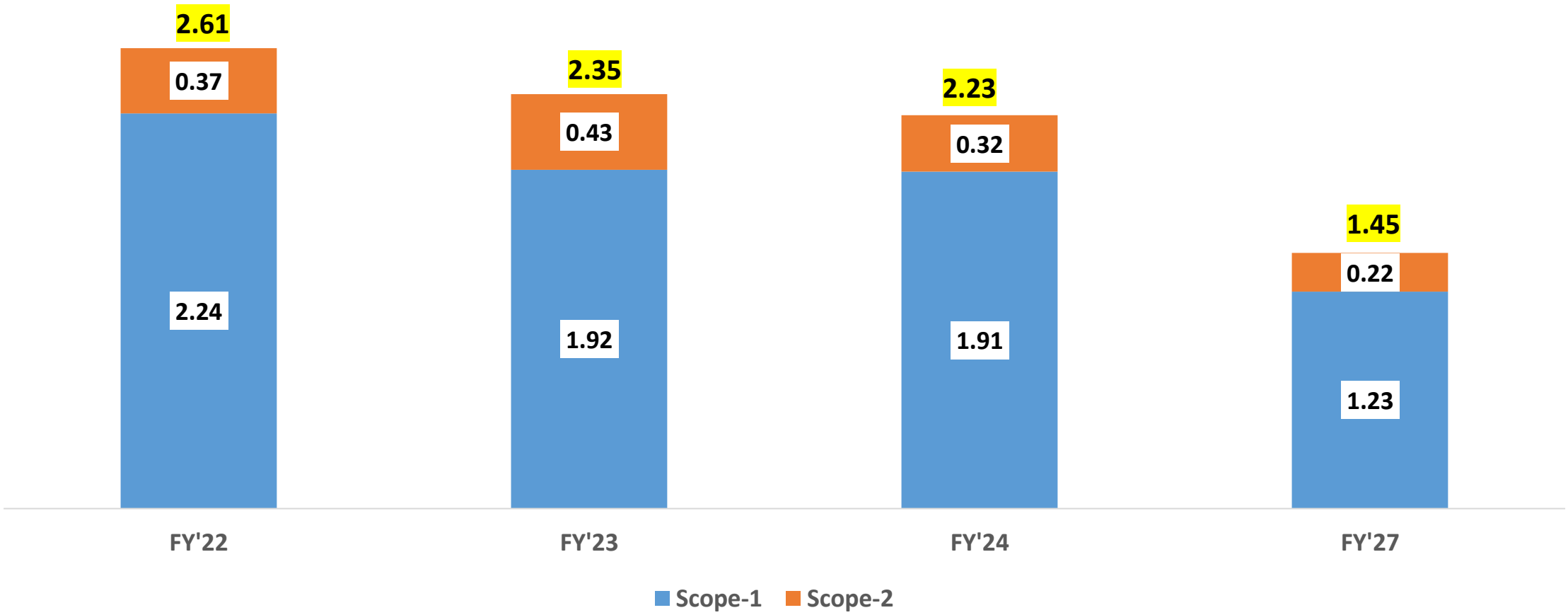
* It includes Waste heat recovery , On site Rooftop and Offsite hybrid (On going projects Excluded)

# GHG Inventorisation

| Parameters | | FY 2021 - 22 | FY 2022 - 23 | FY 2023 - 24 |
|---|---|---|---|---|
| Scope 1 Emission (direct emission from fuels used) | t CO2/Equivalent Product | 2.24 | 1.92 | 1.91 |
| Scope 2 Emission (indirect emission from grid electricity) | t CO2/Equivalent Product | 0.38 | 0.43 | 0.32 |
| Scope 3 Emission (employee commuting, business travel, purchased goods) | t CO2/Equivalent Product | - | - | - |
| **Total Emission** | **t CO2/Equivalent Product** | **2.61** | **2.41** | **2.23** |

# Carbon Footprint – Continuously down trend year on year

**$CO_2$ emission reduced by 15% from FY'22 to FY'24 and further 35% emission will be reduced by FY'27.**



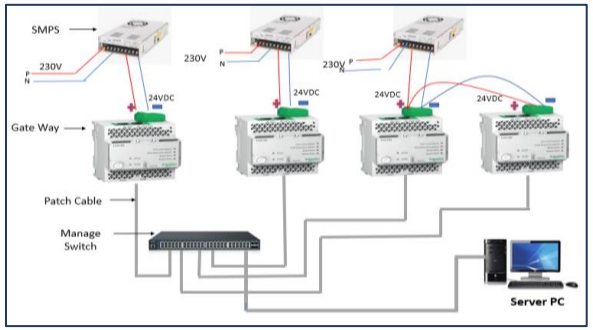

*** All fig in t $CO_2$/t CU**

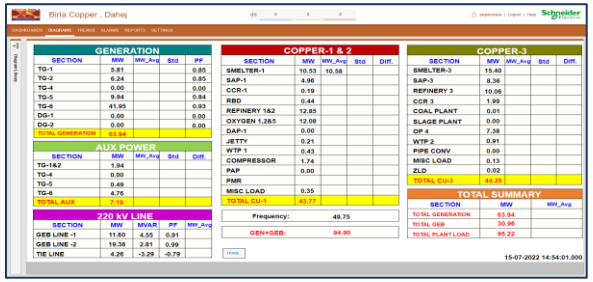
# GHG Inventorisation

| Short Term Goals | Long Term Goals | Action Plan |
|---|---|---|
| 1) 35 % carbon footprint reduction by FY 2026-27 against FY 24.<br>2) Increase % of RE power capacity w.r.t total demand.<br>3) Biomass blending with coal in own generation.<br>4) Biodiesel blending in all heavy equipment's used in plant. | 1) Net zero Carbon footprint till year 2050. | 1) 100 % RE power.<br>2) Replacement of carbon-based fuel to cleaner fuel.<br>3) Replacement of fuel-based vehicle to Electric vehicle.<br>4) Focus on efficiency improvement.<br>5) Digital internation for improving process efficiency.<br>6) Recycling of scrap & improving the quality of refractory bricks. |

# EMS System for Electrical Energy

| EMS | Description |
|---|---|
| Enterprise Level Energy Monitoring System | In Birla copper, we have enterprise level EMS system for –<br>• Efficient energy Mapping for monitoring & Control across plant.<br>• Direct connectivity with ERP for Sp. Energy monitoring & Control<br>• Equipment performance monitoring and efficiency control<br>• Fast Response & Extended view for multiuser<br>Till now, Total 104 Nos Old Meter replaced (out of 433 Meters) & 20 Nos Gateway replaced.<br>• Complete Software Upgradation done (10,000 Tags)<br>• All Meters connectivity with new system established<br>• Report Generation started from new system. |
| Challenges faced and Upgradation done during Implementation | **Challenges** – 1) Interoperability 2) Complexity of analytics<br><br>**Upgradation** – 1) Efficient energy Mapping for monitoring & Control across plant.<br>2) Direct connectivity with ERP for Sp. Energy monitoring & Control.<br>3) Automatic Report Generation. |



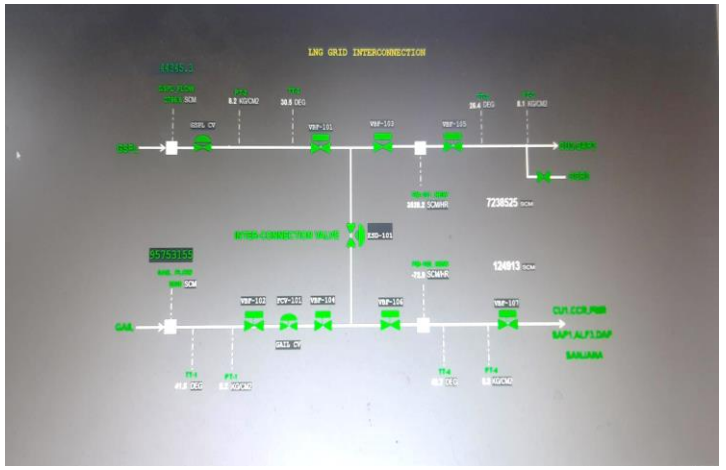



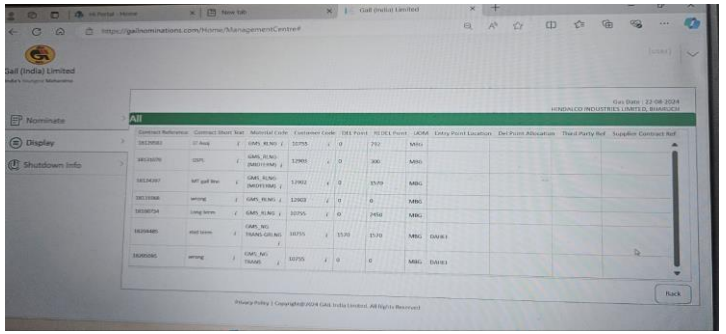


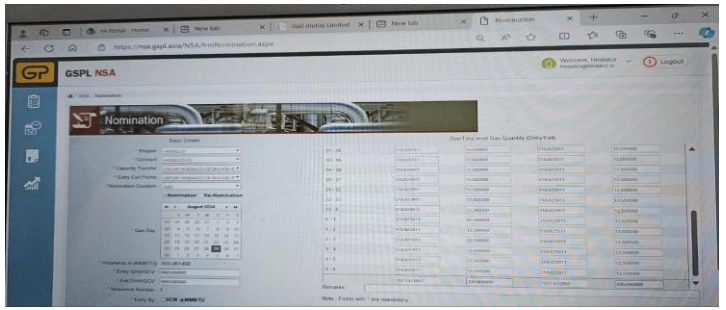
Trends available for all individual meter and parameter for different time scales.

# EMS System for Thermal Energy

| EMS | Description |
|---|---|
| Enterprise Level Energy Monitoring System | In Birla copper, we have Two RLNG line(Gail and GSPL) each line two skid for smooth plant operation.<br>Daily nomination of gas consumption given by plant before 11:00 in Birla copper portal(BCKM).<br>And nomination submitted in Gail and GSPL site before 16:00 as per requirement.<br>Continue flow and Pr. measurement in online DCS system. Daily joint ticket reporting of consumption pattern.<br>Leakage alarm system installed in both LNG skid.<br>Daily reporting of gas composition on next day.<br>Advance monthly planning done for gas contract booking.<br>FO tank level and pump Pr. showing in DCS. |
| Challenges faced and Upgradation done during Implementation | **Challenges** – Complexity in nomination vs consumption pattern.<br><br>**Upgradation** – 1) Efficient energy Mapping for monitoring & Control across plant.<br>2) Direct connectivity with ERP for Sp. Energy monitoring & Control. |





# EMS System & other requirements

| Particulars | Yes / No & Details |
|---|---|
| Is your plant ISO 50001 certified? | Yes |
| Is your plant GreenCo certified? | No |
| Is LCA Conducted? | No ( Initiation from Oct 24 ) |
| Learnings from previous CII energy award or any other award program | 1) Networking Opportunities.<br>2) Exposure to new ideas and technologies.<br>3) Adoption of latest technology.<br>4) Engagement with different perspective.<br>5) Inspiration.<br>6) Understanding educational context. |

# NET ZERO Commitment

| Particulars | Details |
|---|---|
| Net Zero Target year by organization | 2050 |
| Roadmap for achieving the target | 1) Focus on efficiency improvement<br>2) Digital internation for improving process efficiency.<br>3) Focus on increasing renewable power.<br>4) Replacement of carbon-based fuel to cleaner fuel.<br>5) Replacement of fuel-based vehicle to Electric vehicle.<br>6) Recycling of scrap & improving the quality of refractory bricks. |
| Net Zero Action plan | 1) Laying of 440KV transmission line for 100% renewable power.<br>2) Conversion of all FO based fuel to LNG based fuel followed by replacement of LNG with a cleaner fuel.<br>3) Installation of EV charging station.<br>4) Use of Bio-diesel and Bio-CNG in HEMM. |
| Voluntary Initiatives / Commitments | 1) Roof top solar installation.<br>2) Floating Solar installation.<br>3) Waste hear recovery.<br>4) Bio-diesel and Bio-CNG use. |

# Awards / Achievements / Acknowledgement

| Award Title / Category | Acknowledge by |
|---|---|
| Best Captive Thermal Power plant | CEE (Council of Enviro Excellence) - 2022 |
| Renewable Integration & Co-generation plant of the year | CEE (Council of Enviro Excellence) 3rd National Energy Efficient Award - 2023 |
| Sustainable performance best energy efficient unit CPP Coal 50 to 135 MW category. | |
| Front runner awards for sustainability | Frost and Sullivan - 2023 |
| Great Unit to work | Hindalco : Reprism |
| Gold Award for NAMC | International Research Institute of Manufacturing |
| Operation & Environment Excellence (50-135 MW category) | CEE (Council of Enviro Excellence) - 2023 |
| Safety First Award | Hindalco |

Hindalco Industries Limited
Unit: Birla Copper, Dahej

We Manufacture Materials that Make the World

GREENER - STRONGER - SMARTER

# Thanks

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