# CII National Award

## Excellence in Energy Management 2023

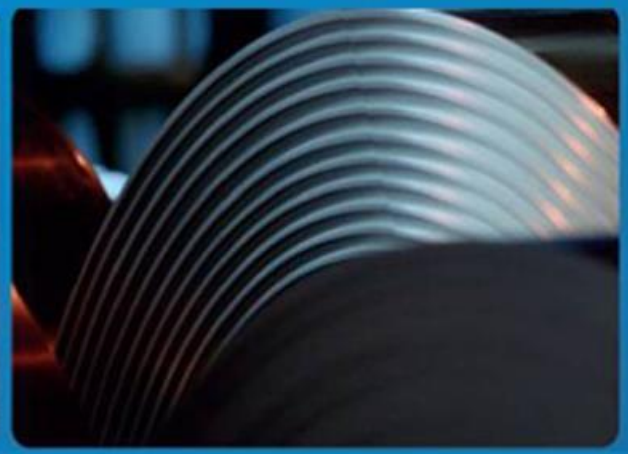
TATA STEEL
WeAlsoMakeTomorrow

TATA

## Tata Steel, Jamshedpur


*Mr. Nitin Lodha,* *Sr. Manager*
*Mr. Vipul Gupta,* *Sr. Manager*
*Mr. Sameeran Pani,* *Sr. Manager*
*Ms. Saziya Ahasan* *Manager*

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# Abstract from CEO & MD

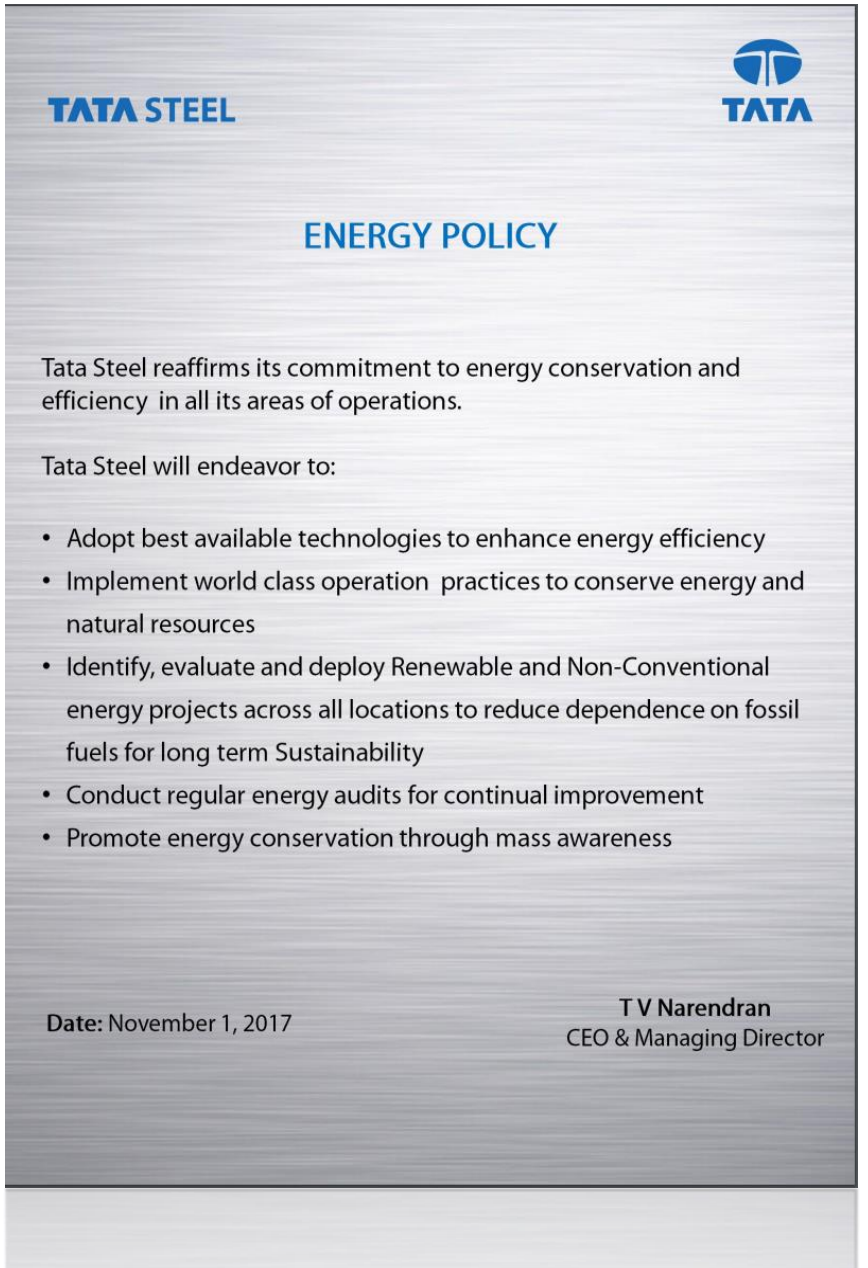
"Most Respected and Valuable Steel Company Globally" : **Strategy 2030**

Future ready Tata Steel - Structurally, Culturally and Financially Scale, Synergy and Simplification:

- **35-40 MTPA** Capacity in India
- 4 Clusters (Mining, Downstream, Utilities & Infrastructure and Long Products)
- Simplification of processes

(One IT, One Procurement, One Supply Chain etc.)

**Mr. T V Narendran**
**CEO & MD, TSL**



TATA STEEL

TATA

ENERGY POLICY

Tata Steel reaffirms its commitment to energy conservation and efficiency in all its areas of operations.

Tata Steel will endeavor to:

- Adopt best available technologies to enhance energy efficiency
- Implement world class operation practices to conserve energy and natural resources
- Identify, evaluate and deploy Renewable and Non-Conventional energy projects across all locations to reduce dependence on fossil fuels for long term Sustainability
- Conduct regular energy audits for continual improvement
- Promote energy conservation through mass awareness

**Date:** November 1, 2017

**T V Narendran**
CEO & Managing Director

TATA STEEL

TATA

# Focused on creating sustainable value

TATA STEEL






# Customer Segment and Geographic Presence

## Executive Summary

Tata Steel with its **Values Stronger Than Steel** is an Indian multinational steel making company. It is a market leader through its pioneering efforts in various industrial aspects. Along with its century old value heritage, it is now all geared up for developing a better future with various technological advancements and continuous improvement approach redefining its new tag line – **We Also Make Tomorrow.**

## Catering to Diverse Customer Segments


Automobile


Agriculture

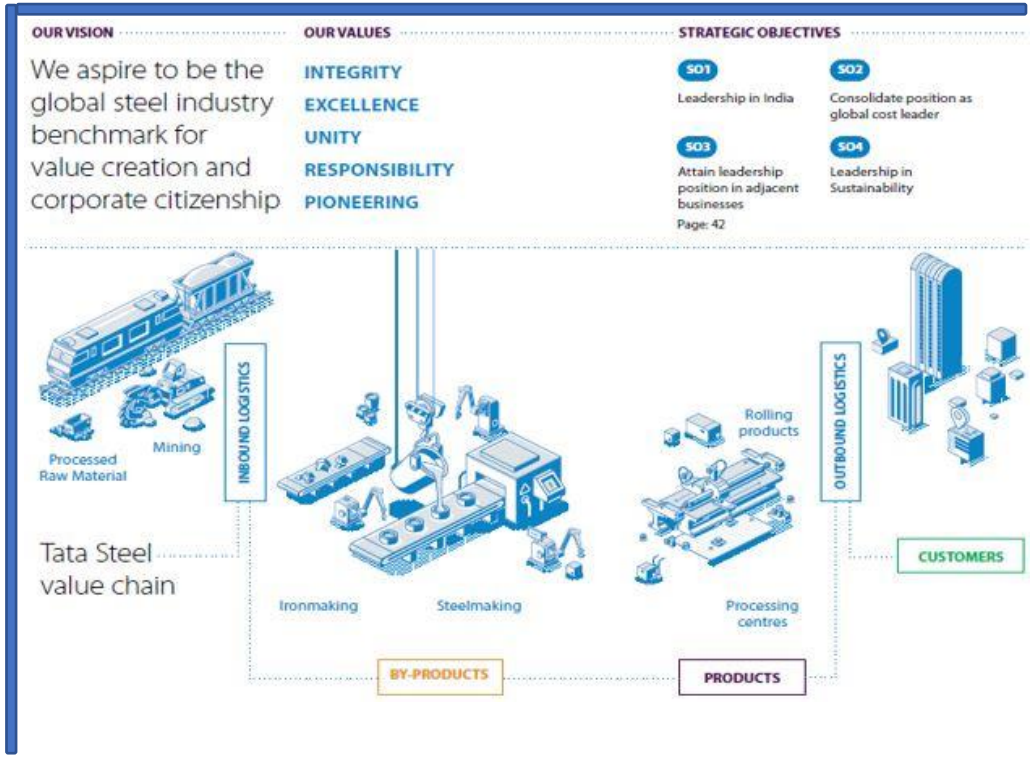

Material Handling


Engineering


Energy & Power


Construction


Consumer Goods




## Our footprint

**(TATA STEEL LIMITED)**

We are primarily involved in the business of mining, steelmaking and providing downstream value-added products and solutions. Our operational footprint has been indicated on the map.

**DOWNSTREAM OPERATIONS**

Tubes Manufacturing and Agrico
1 Jamshedpur

Wires Manufacturing
1 Jamshedpur 2 Tarapur
3 Pithampur 4 Indore

Bearings Manufacturing
5 Kharagpur

**RAW MATERIAL LOCATIONS**

Iron Ore Mines and Quarries
6 Noamundi 7 Joda East
8 Katamati 9 Khondbond

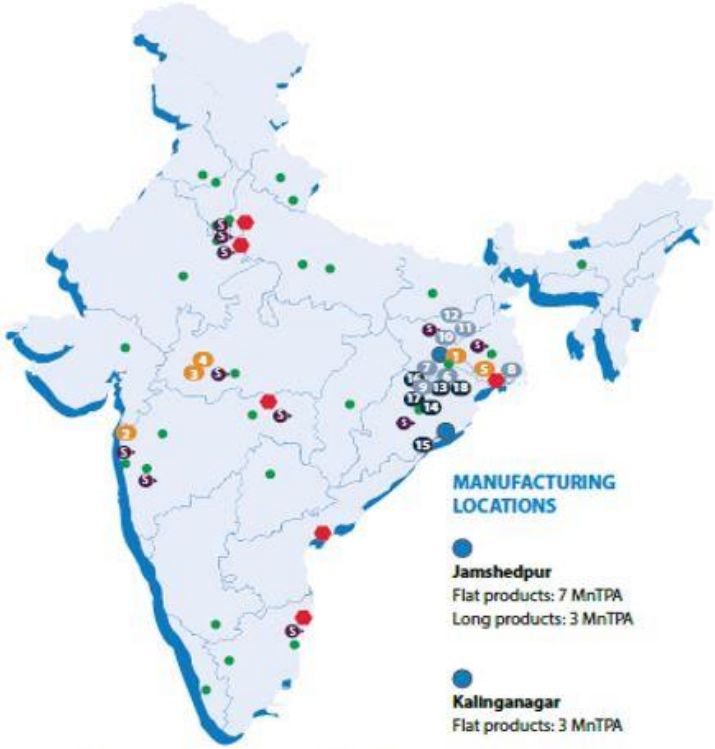
Opencast Coal Mines
10 West Bokaro

Underground Coal Mines
11 Jamadoba Group 12 Sijua Group

**RAW MATERIALS REVENUE STREAM (Ferro Alloys and Minerals)**

Ferro Alloys Plants
13 Joda 14 Bamnipal 15 Gopalpur

Manganese Mines
16 Joda West 17 Bamebari
18 Tiringpahar




6
Zonal Hubs
Delhi, Faridabad, Nagpur, Kolkata, Chennai and Vijayawada

38
Steel Processing Centres
SPCs across 11 locations (Jamshedpur, Kalinganagar, Chennai, Kolkata, Faridabad, Manesar, Pune, Mumbai, Indore, Delhi and Nagpur)

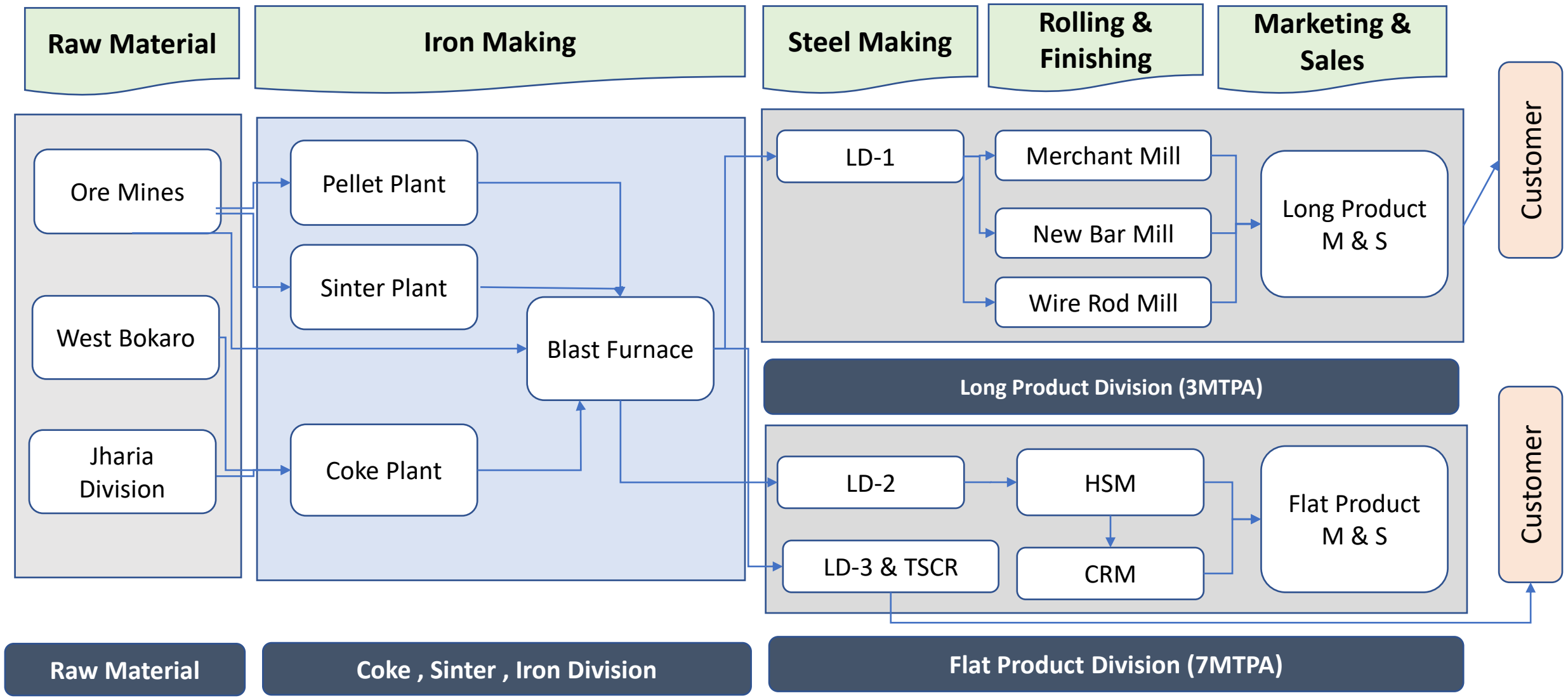
27
Sales Offices

18
Stockyards

262
Distributors

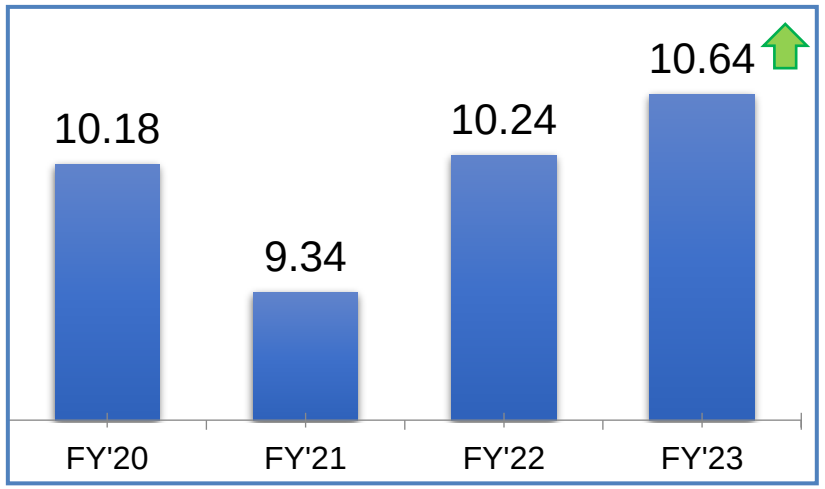
14,688
Dealers

# Process Flow Diagram of Tata Steel Jamshedpur

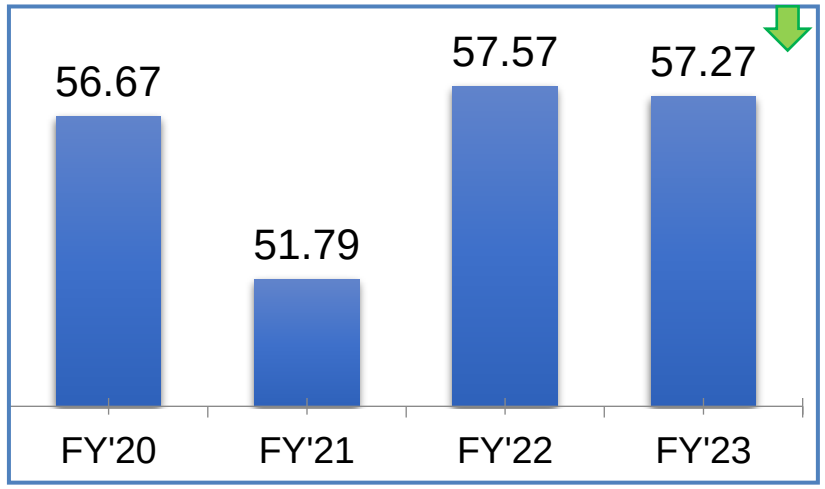


# Production & Energy Scenario in Tata Steel

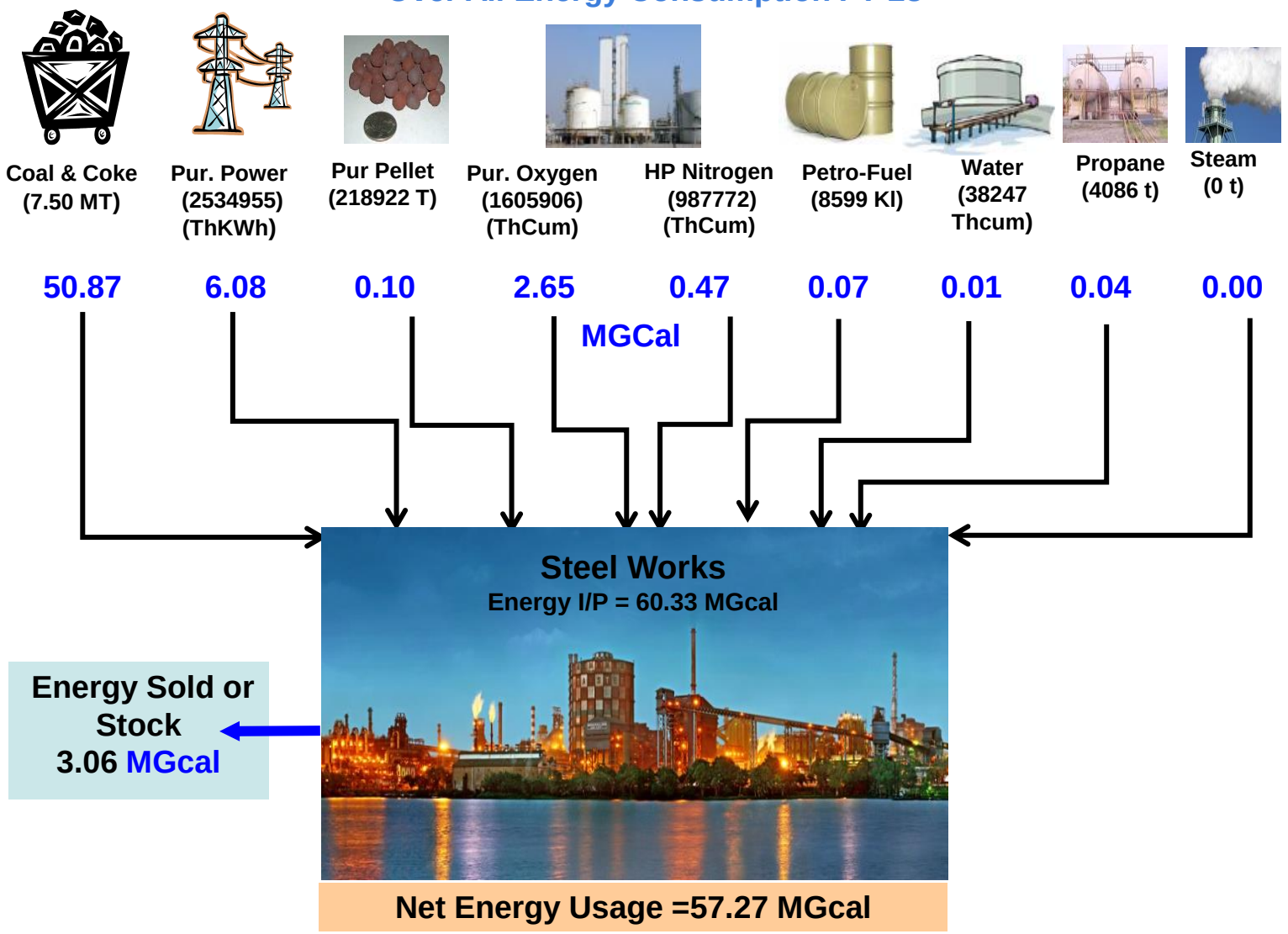
- Production Data (Crude Steel Production MT)




- Over All Energy Consumption (MGcal)

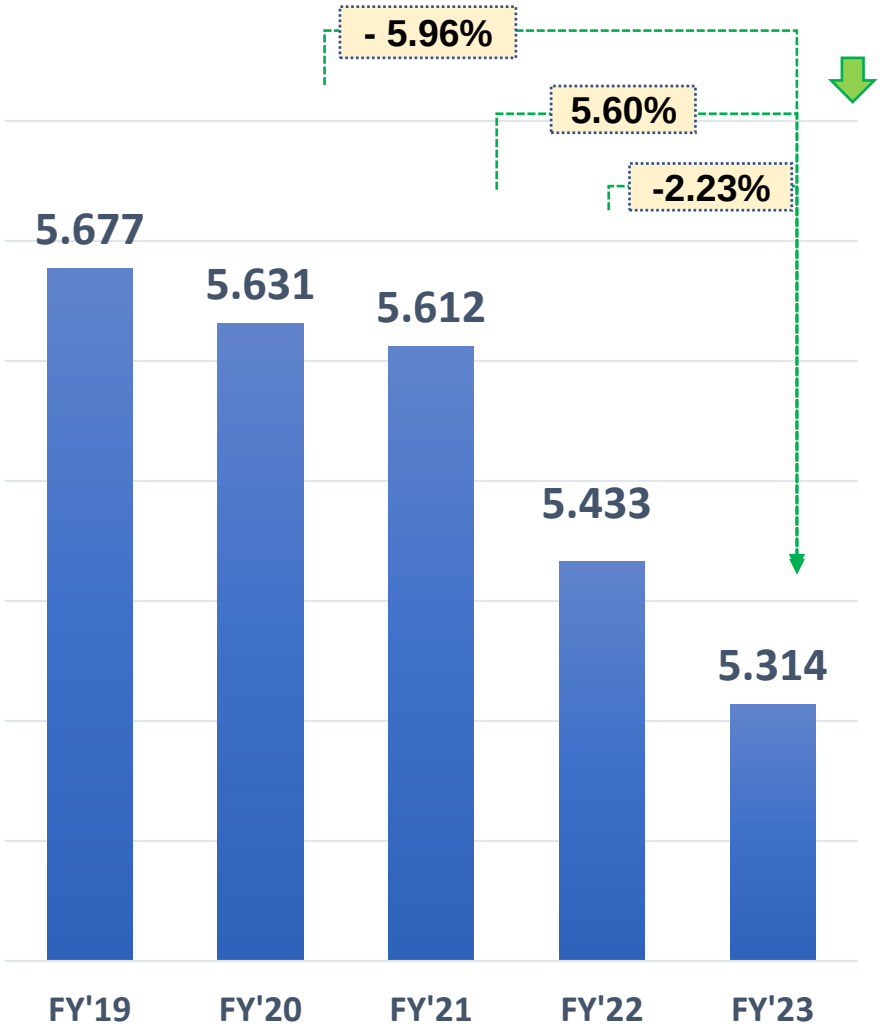



- Over All Energy Consumption FY-23



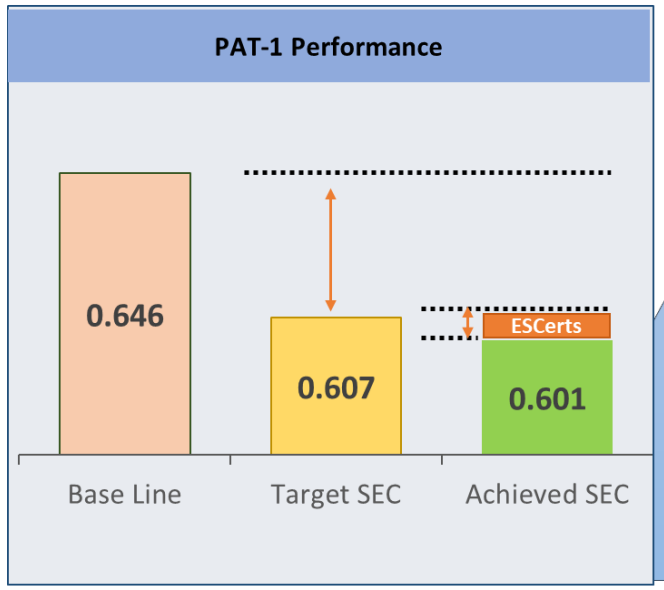

MT: Million Ton ; M Gcal: Million Giga calorie

# Specific Energy Consumption (SEC Gcal/Tcs)




| Items | Unit | FY'23 | Previous Best | Year |
|---|---|---|---|---|
| Specific Energy Consumption | Gcal/tcs | 5.314 | 5.433 | FY-22 |
| Highest LD Gas Recovery | $KNm^3/hr$ | 105 | 90 | FY-22 |
| Highest Power Generation | MW | 277 | 275 | FY-22 |
| Blast Furnace Fuel Rate | Kg/thm | 526 | 533 | FY-18 |
| CRM Fuel Rate | Gcal/t | 0.134 | 0.190 | FY-19 |
| TSCR Fuel Rate | Gcal/t | 0.156 | 0.157 | FY-22 |

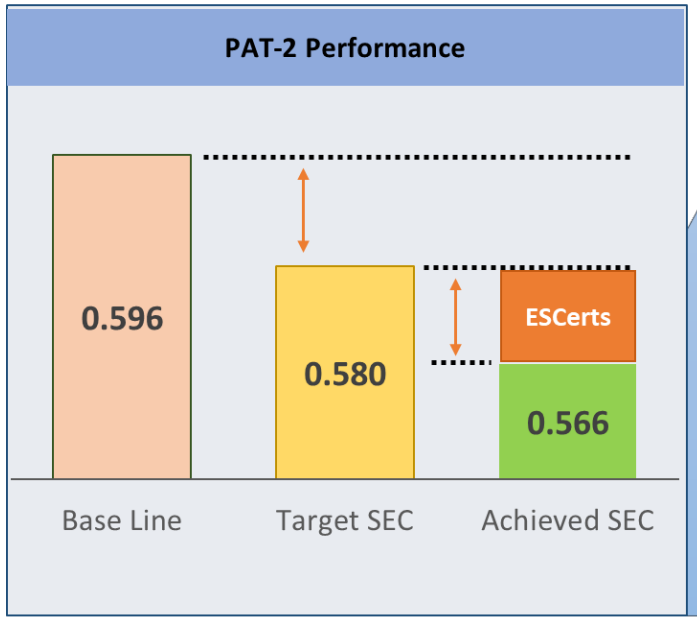
# PAT CYCLE 1 & 2 Performance




| | |
|---|---|
| Base line SEC | 0.646 TOE / Ton |
| Base Line Production | 57,41,167 Ton |
| Target SEC (2014-15) | 0.607 TOE / Ton |
| Achieved SEC (2014-15) | 0.601 TOE / Ton |
| Energy Saving Achieved | 30463.16 TOE |
| Issuance of Energy Savings Certificates (ESCerts) | **41,910 Nos.** |

## PAT CYCLE -1

## PAT CYCLE -2

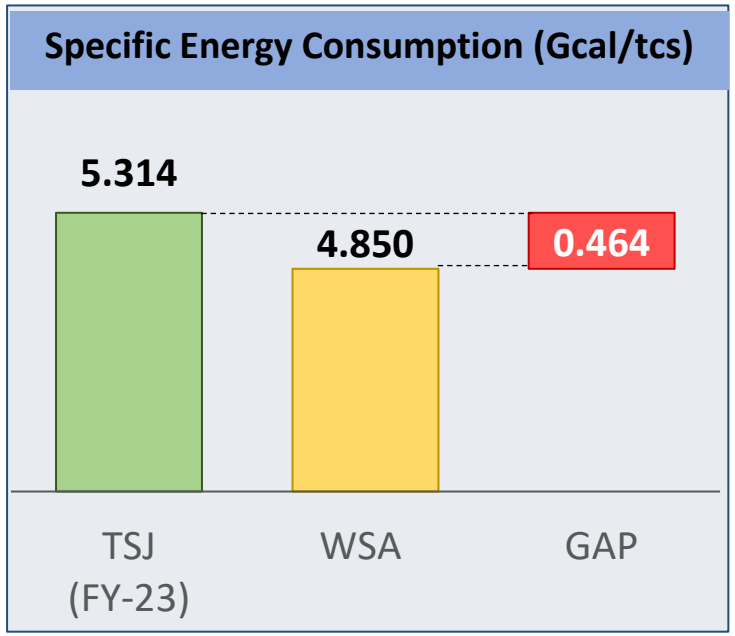



| | |
|---|---|
| Base line SEC (2014-15) | 0.5960 TOE/ Ton |
| Base Line Production (2014-15 ) | 93,32,344 Ton |
| Target SEC (2018-19) | 0.5802 TOE/ Ton |
| Achieved SEC (2018-19) | 0.5663 TOE/Ton |
| Energy Saving Achieved | 1,29,863 TOE |
| Issuance of Energy Savings Certificates (ESCerts) | **1,29,863 Nos.** |

# Specific Energy Consumption of a WSA Reference Plant

Steel Industry is an energy intensive sector. Energy intensity of BF/BOF steel production routes is between of 4.3 to 5.1 Gcal/tcs.

**WSA's Reference Plant :** Values for the Reference Plant are developed on basis of energy use data collected from 60 sites around the world over a period of 5 years. Reference values of processes are determined as the top 20% of the analyzed plants.




**Comparison of stage-wise energy consumption (unit in Gcal/tcs)**

| Area | Ref. Plant | TSJ-FY'23 | GAP |
|---|---|---|---|
| Coke Making | 0.216 | 0.428 | -0.212 |
| Sinter Making | 0.390 | 0.498 | -0.107 |
| Pellet Making | 0.182 | 0.216 | -0.033 |
| Blast Furnaces | 2.913 | 3.036 | -0.124 |
| Steel Making | 0.124 | 0.191 | -0.067 |
| Rolling & Finishing* | 0.703 | 0.455 | 0.248 |
| Boiler & Power Houses | 0.151 | 0.158 | -0.007 |
| Auxiliaries & Losses | 0.170 | 0.199 | -0.029 |
| Purchased Coke | - - | 0.133 | -0.133 |
| **Total** | **4.850** | **5.314** | **-0.464** |

* ***WSA Mills*** *consist of HSM, Bar Mill, WRM, Plate Mill & Section Mill.*
***TSJ Mills*** *consists of HSM, Bar Mill, WRM, Merchant Mill, CRM & TSCR.*

*Information source: Energy Use in the Steel Industry – published by WSA in 2013*

# Reasons for difference between WSA Reference Plant & TSJ Energy Intensity

**Reason for Performance Difference**

- Raw Material Gap
- Structural Gaps
- Technological Gaps
- Efficiency Gaps

## Raw Material Gap

| | WSA | TSJ |
|---|---|---|
| • HM to CS Ratio (%) | 0.917 | 1.029 |
| • Coal Ash (%) | 8.00 | 10.52 |
| • Coke Ash (%) | 10.40 | 14.10 |
| • HM Silicon (%) | 0.30 | 0.65 |
| • Coal Cv (Gcal/t) | 7.68 | 6.86 |
| • Coal VM (%) | 27 | 24 |
| • Scrap Rate (Kg/tcs) | 113 | 49 |

## Structural Gap

- No TSCR at WSA Ref. Plant.
- No Merchant Mill at WSA Plant.
- No CRM at WSA Plant.
- No Section Mill at TSJ.
- No Plate Mill at TSJ.
- No Auxiliaries units such as Lime Plant, Shops at WSA Ref. Plant.
- Lower purchased power heat rate at WSA Ref. Plant.

## Technology Gap

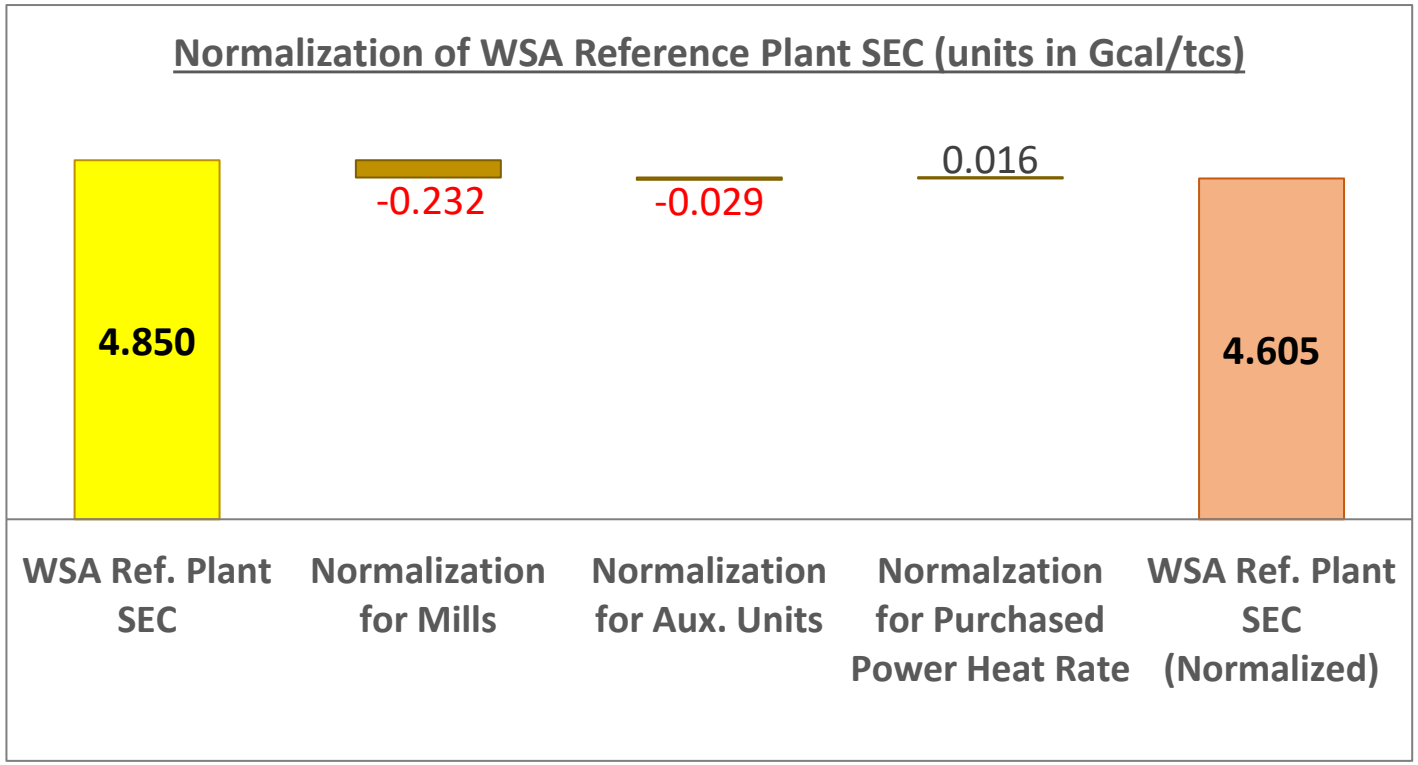
- Benzol Recovery
- COG sensible heat recovery.
- Heat Recovery from Sinter cooler
- Heat recovery from BF Slag
- Heat recovery from LD Slag
- LD Gas sensible heat recovery
- Recovery of waste energy at Mills

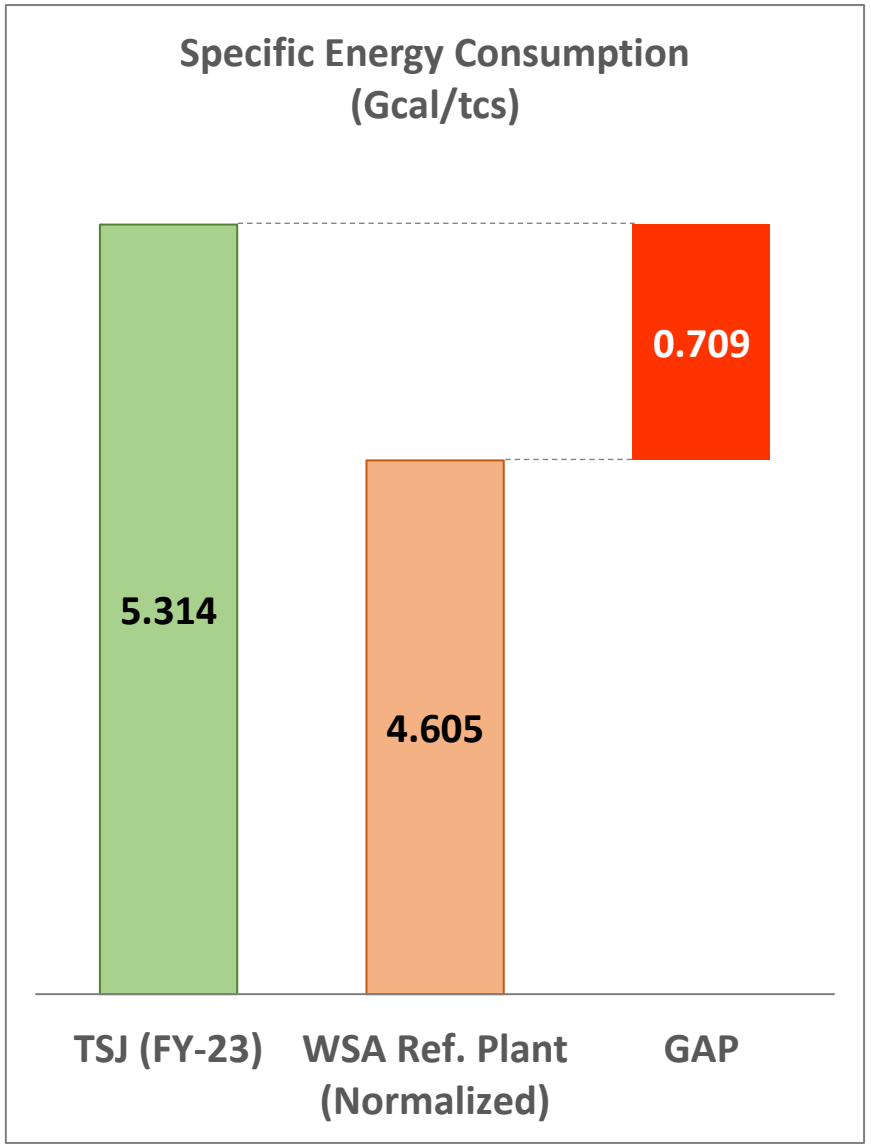
## Efficiency Gap

| | WSA | TSJ |
|---|---|---|
| • Gross Coke Yield (%) | 78.9 | 74.5 |
| • Tar Yield (Kg/tdc) | 40 | 36 |
| • COG Yield ($Nm^3$/tdc) | 456 | 428 |
| • LDG Yield ($Nm^3$/tcs) | 113 | 87 |

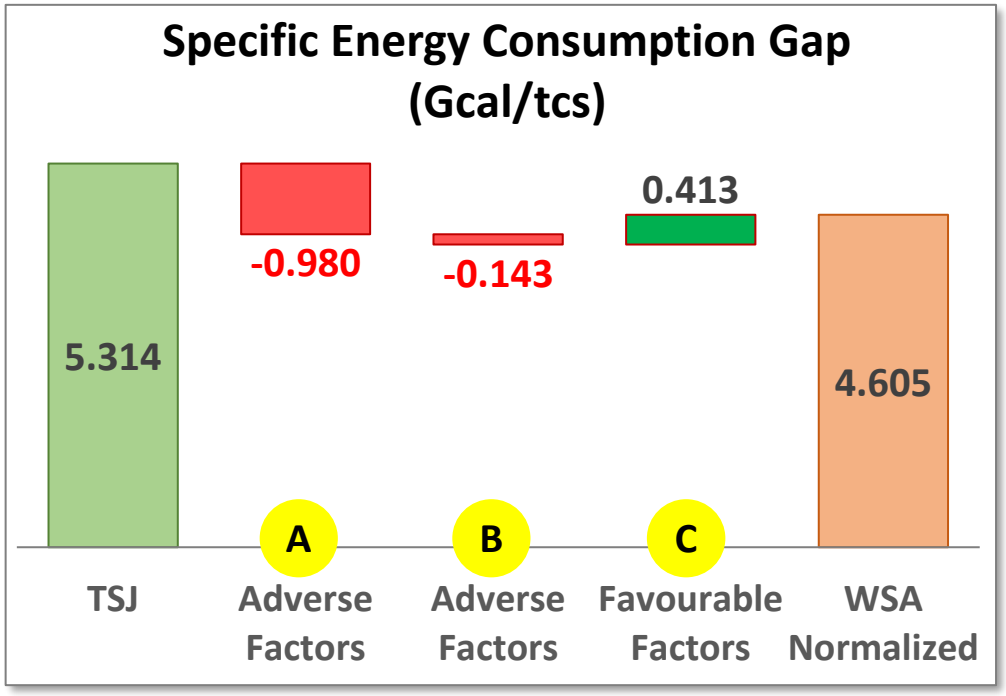
- Fuel & Power Rate-CP,SP,PP,BF,LD
- TRT & CDQ Power Recovery.
- Process Steam Consumption
- Steam & Power Generation Eff.

# Normalization of WSA Reference Plant SCE



# Factors Impacting TSJ-SEC when compared to WSA Reference Plant SEC




| A | Factors Adversely Impacting SEC | |
|---|---|---|
| • | **Recovery** of Benzole, Coal Tar, LD Gas, Steam & Power | -0.360 |
| • | **Utility Consumption** at Coke Plant, BFs, LDs & HSM | -0.285 |
| • | **Fuel Rate** at Coke Plant, Sinter Plant, Pellet Plant LDs & HSM | -0.157 |
| • | **Efficiency** of Steam & Power Generation | -0.076 |
| • | **Yield** of Coke & CO Gas | -0.074 |
| • | **Power rate** at Coke Plant & Pellet Plant | -0.026 |
| | **Total** | **-0.980** |

| B | Factors Adversely Impacting SEC | |
|---|---|---|
| • | Use of purchased coke | -0.133 |
| • | Use of purchased pellet | -0.010 |
| | **Total** | **-0.143** |

| C | Factors Favourably Impacting SEC | |
|---|---|---|
| • | **Recovery** of BF Gas | 0.179 |
| • | **Fuel Rate** at BFs. NBM, WRM | 0.116 |
| • | **Power Rate** at BFs, LDs, NBM, WRM & HSM | 0.053 |
| • | **Utility Consumption** at Coke Plant, Sinter Plant, BFs, LDs & WRM | 0.065 |
| | **Total** | **0.413** |

# Project List (FY-24, On Going)

| S.No. | Details of energy efficiency improvement measure | Investment Rs.(Cr.) | Verified Savings in Rs(Cr.) | Verified Savings – Energy (TOE) | Fuel |
|---|---|---|---|---|---|
| 1 | *Operate with high BF slag alumina in blast furnace to reduce slag rate and coke rate* | Nil | 50.0 | 8860 | Coke |
| 2 | *Hearth Layer height reduction at SP4* | Nil | 12.7 | 7040 | Coke Breeze |
| 3 | *Process improvement through waste heat utilization at SP3* | 30 | 28 | 4530 | Coke Breeze |
| 4 | *Installation of Micro turbines at PH#3,4,5* | 8.5 | 4.5 | 1074 | Electricity |
| 5 | *LD Gas injection in TSCR* | 0.94 | 14.0 | 1354 | Coal Tar |
| 6 | *Reduce LDO consumption at PH6* | 0.4 | 1.0 | 168 | LDO |
| | | | **110.2** | **23,026** | |

# EE Project List (FY-23)

| S.No. | Details of energy efficiency improvement measure | Investment Rs.(Cr.) | Verified Savings in Rs(Cr.) | Verified Savings – Energy (TOE) | Fuel |
|---|---|---|---|---|---|
| 1 | *Reduction in BF solid fuel rate through visualization of furnace burden top profile* | Nil | 27.8 | 4430 | Coke |
| 2 | *Nut coke coating to increase its reactivity and reduce coke rate* | Nil | 17.6 | 1772 | Coke |
| 3 | *Screening efficiency improvement at RMBB1 to reduce superfine in output coke breeze.* | Nil | 8.1 | 3622 | Coke Breeze |
| 4 | *Hot air annealing hood at SP1 through utilization sinter cooler waste heat* | Nil | 8.1 | 3915 | Coke Breeze |
| 5 | *ASRF charging (3rd Agglomerates) at C Blast Furnace for reduction in coke breeze* | Nil | 37.7 | 3541 | Coke |
| 6 | *CO Gas prediction model* | Nil | 1.1 | 137 | LDO |
| 7 | *Installation of rooftop solar panels* | Nil | 0.3 | 878 | Electricity |
| 8 | *Improvement of LD Gas Recovery form LD1* | Nil | 2.6 | 2461 | LD Gas |
| 9 | *Steam driven booster at BPP* | Nil | 2.5 | 372 | Electricity |
| 10 | *Enhancement in power generation from 25 to 30 MW* | Nil | 4.1 | 670 | Electricity |
| 11 | *Reduction of fuel consumption in Tunnel Furnace of LD3 TSCR through Heat Optimisation model* | Nil | 3 | 1324 | Mix Gas |
| | | | **112.3** | **23,122** | |

# INNOVATION CASES

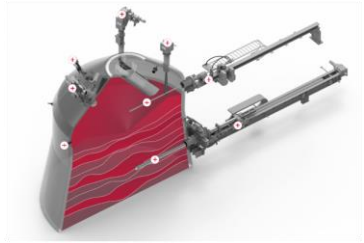
# 1. Thermal Hawk (1/2)

### #Process Events inside Furnace

1. Raw Material Charging
2. Raw Material Distribution
3. Central Gas Flow


Optimum performance required for minimum fuel consumption

### #Existing Solutions across the electromagnetic and sound wave spectrum



1. Contact Type Measurement
2. Limited Coverage
3. Multiple Equipment
4. Frequent Maintenance

Existing measurement solutions are incapable of grabbing all events at blast furnace top

### #Innovation

## Thermal Hawk

1st of its kind in the world

**Team Structure**

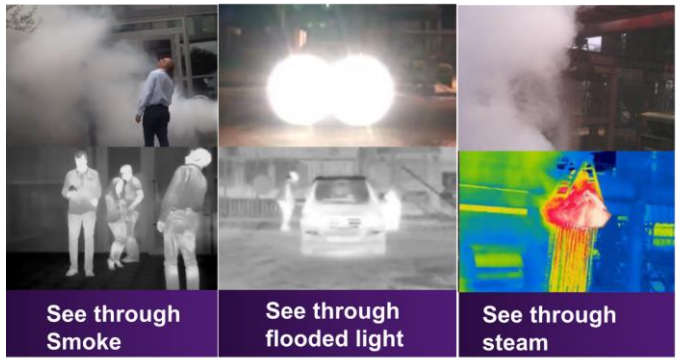
| | |
|---|---|
| R&D | 4 |
| Operations | 4 |
| Mechanical | 3 |
| Electrical | 4 |
| Design | 3 |
| One IT | 3 |
| Purchase | 2 |

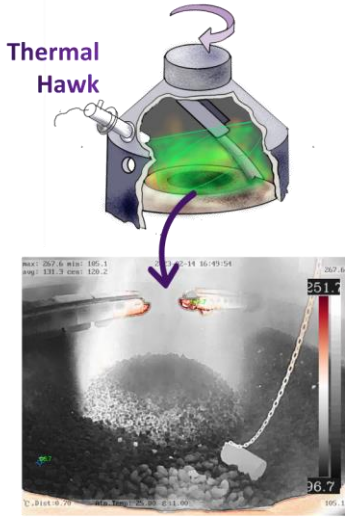
A unique integrated probe comprising

1. Microbolometer Sensor
2. Custom designed dual purging system
3. Smart data processing algorithm to grab events

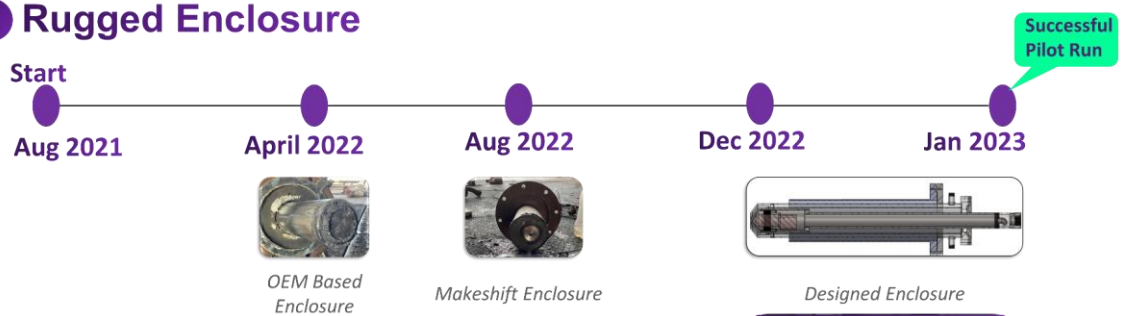
2 Patents filed

## 1 Microbolometer Based Vision




## 2 Rugged Enclosure



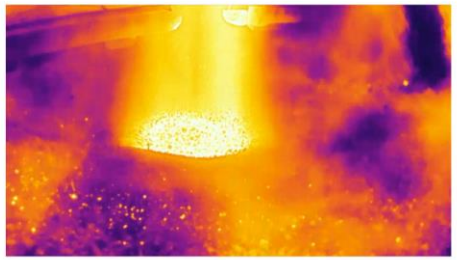

- 4 Plant Trials
- 3 Microbolometers Tested
- 4 Iterations in Design of cooling and Purging systems

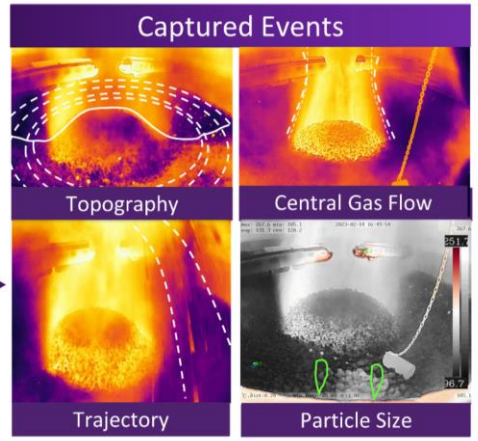

# These features enable capture of events in hostile environment.

# 1. Thermal Hawk (2/2)

## 3 Smart Algorithm

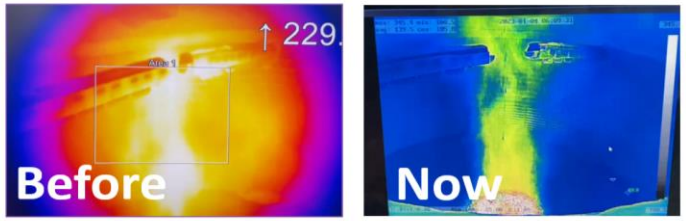
**#A computer application developed to capture real-time process events**






## Results Achieved

**#Raw Material Distribution Tuned**




**Elimination of Centre Coke Scattering Due to Mechanical Above Burden Probe**

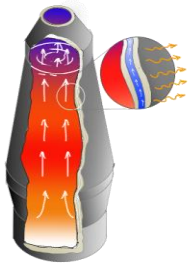
**Best-Ever Fuel Rate**
**Best-Ever Production**

- **11%** Drop in Fuel Rate
- **₹ 90+** Crores/ annum
- **24/7** Availability

**a** Quick Tuning of Raw Material Distribution by capturing top events

**b** Furnace Stability

Improved Central Flow of gases and reduced heat losses through walls

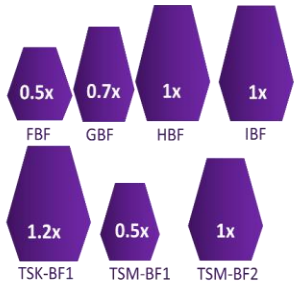


**Reduced Fuel Rates** 2%

## Value Proposition

# Scaling Impact across bigger blast furnace units of Tata Steel

X




**Metallurgical Coke** carbon based fuel **67583** tons/year

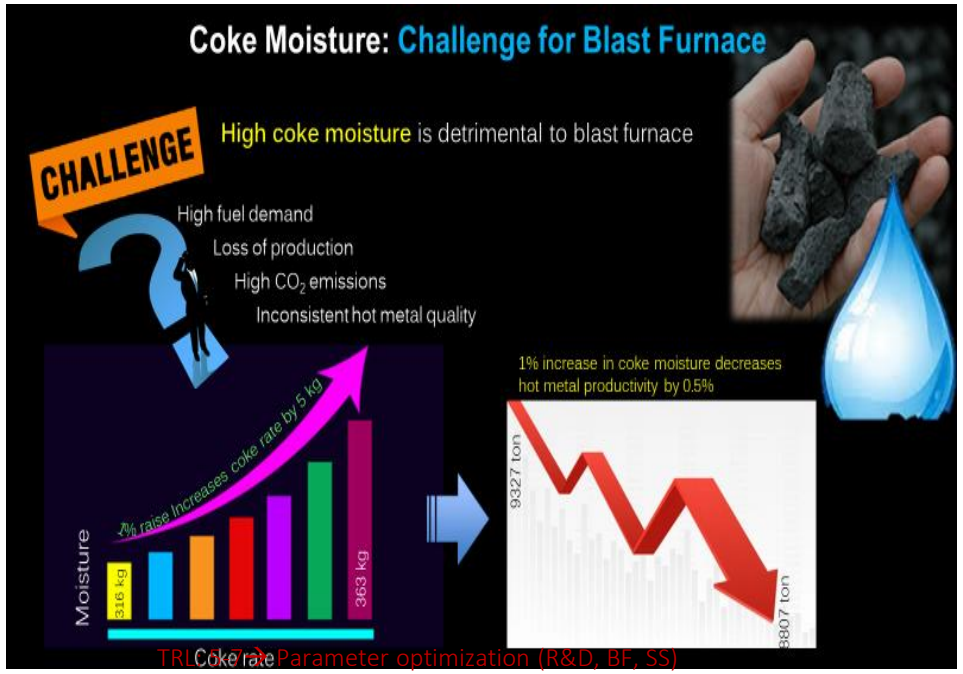
**Carbon Credits 40$/ton of $CO_2$**

**0.2** MTPA

*MTPA : Million Tonnes Per Annum

**₹ 220** Crore/annum

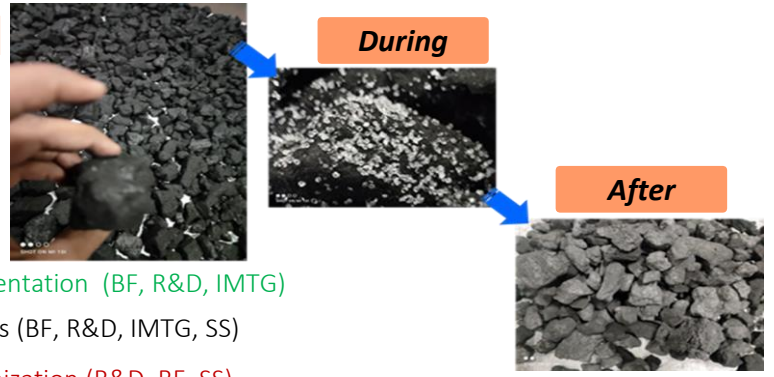
# 2. Use of Super Absorbent Polymer to Reduce Coke Moisture consumption (1/2)




TRL: 7→ Parameter optimization (R&D, BF, SS)

- Coke moisture plays a negative role in blast furnace. High coke moisture leads to higher coke rate in the blast furnace, throttled hot metal production, and high $CO_2$ emissions.
- Problem is significant in monsoon period (Coke moisture goes 7.5%-10%). However, conventional methods are least effective in moisture separation.
- Reduce the coke moisture by 3% with the help of powdered polymer spray.
- Separation of spent polymer along with coke fines.

## Approach




TRL: 10→ Implementation (BF, R&D, IMTG)

TRL: 7-9→ Plant trials (BF, R&D, IMTG, SS)

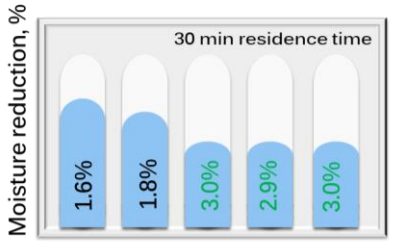
TRL: 5-7→ Parameter optimization (R&D, BF, SS)

TRL: 3-5→ Feasibility for coke (R&D)

TRL: 1-2→Effectiveness of polymer (R&D)

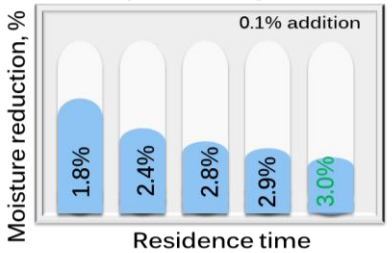
## Key Enablers

- Polymer can absorb and retain the water in it.
- It has high absorption capacity (~500 times).
- Non sticky and easily separable from coke.




## Challenges in Implementation

- ❖Handling of high volumes (5 tons/day).
- ❖ Precise addition of polymer (0.1%).
- ❖Optimum size distribution (<1 mm).
- ❖Homogeneous distribution of polymer on coke
- ❖Efficient separation of used polymer.



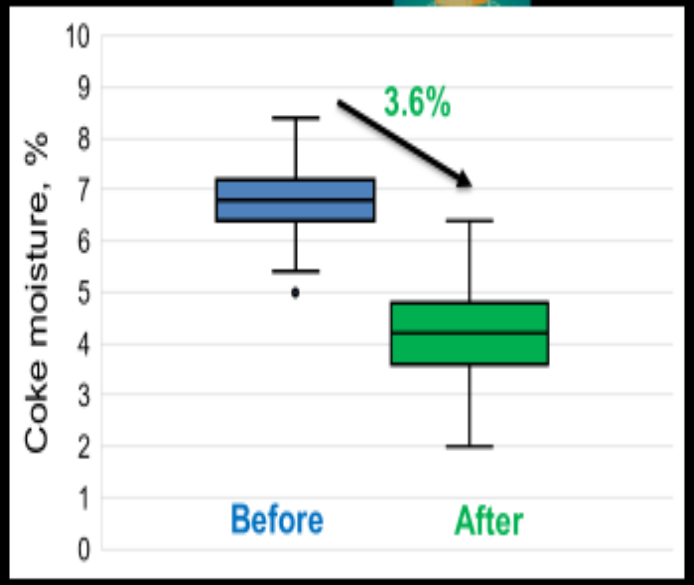

## Implementation

- ➢Innovative spray system developed in-house.
- ➢Implemented at H-BF on centre coke.
- ➢Horizontal deployment at H-BF & G-BF on gross coke.
- ➢ deployed at TSK and TSM

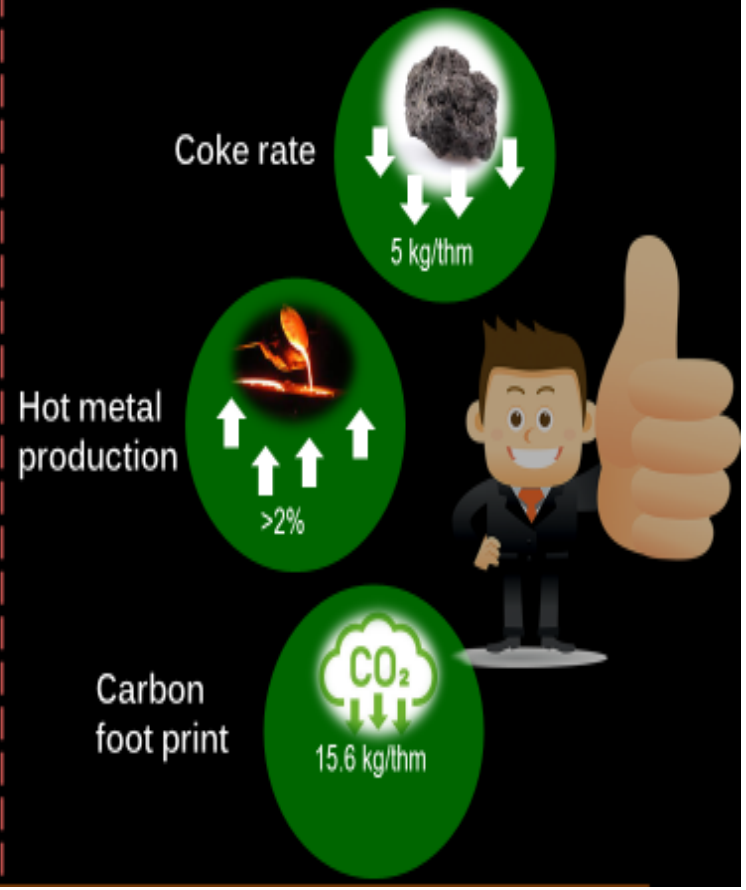
# 2. Use of Super Absorbent Polymer to Reduce Coke Moisture consumption (2/2)

## Outcome

### Benefits




- Successful in reducing the coke moisture considerably.
- On an average, coke moisture reduced by 2.7%-3.6%.
- No impact on down stream processes.





***Innovation***

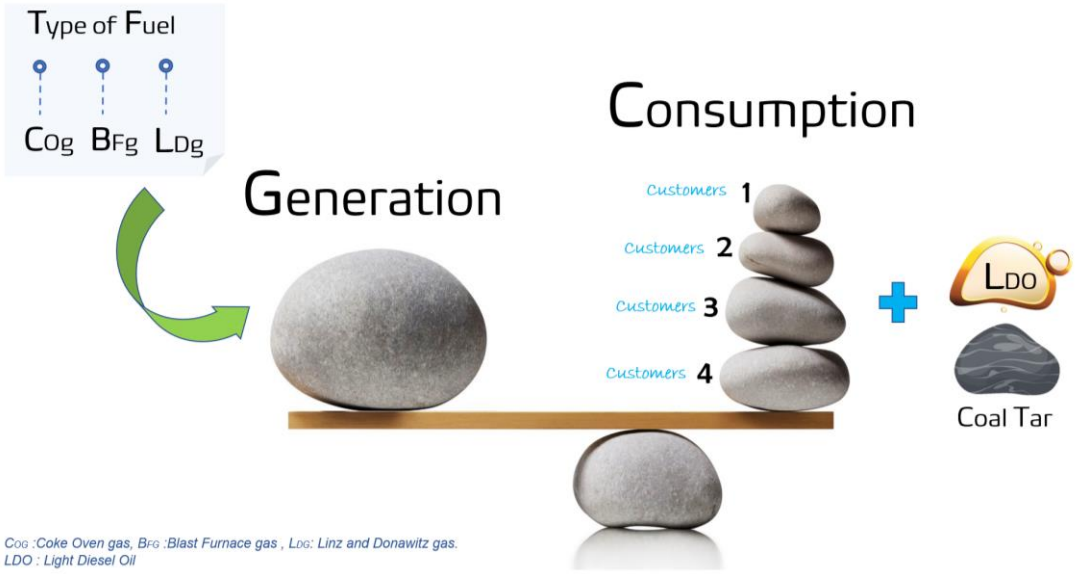
- Polymer can absorb and retain water in its structure.
- No impact on the downstream.
- First in steel industry.

First in Industry

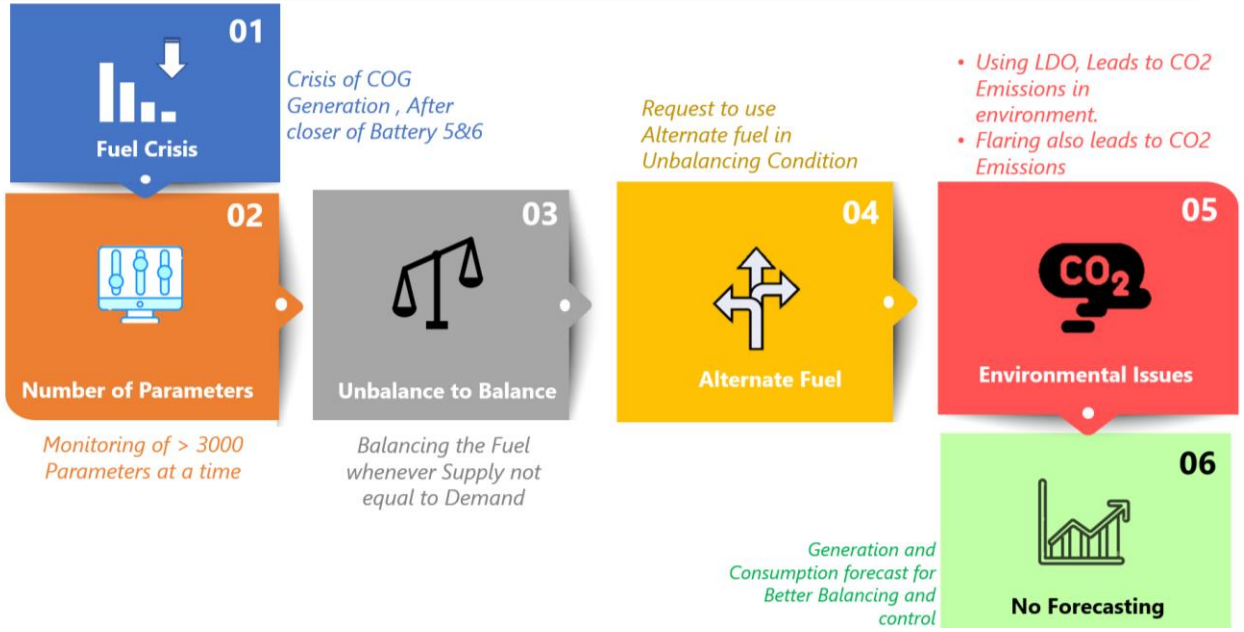
Antidote for moisture!!

Green Technology

# 3. Predictive modelling project for CO Gas Generation (1/3)

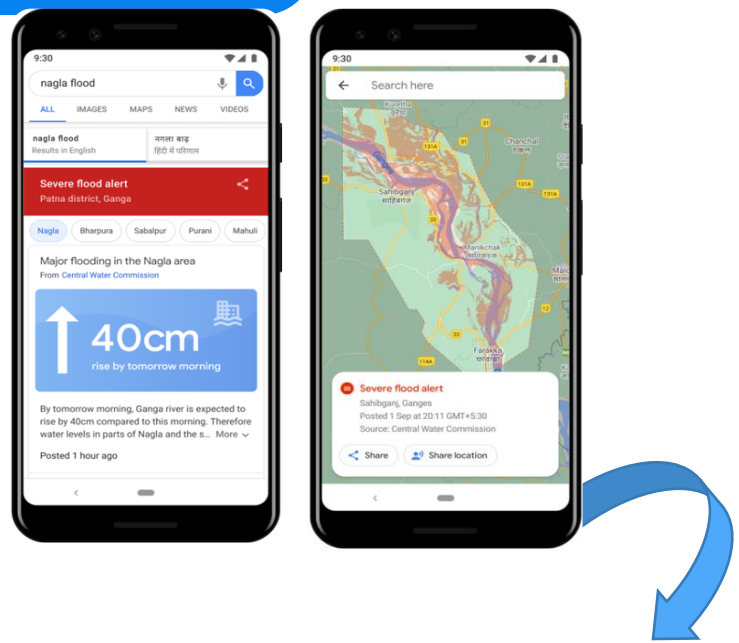



| | Case-1 Supply = Demand (Normal) | Case-2 Supply < Demand (Low) | Case-3 Supply > Demand (High) |
|---|---|---|---|
| 1 CO Gas Generation | ✓ | ↓ | ↑ |
| 2 COG Supply to Power Houses | ✓ | ↓ | ✓ |
| 3 COG Supply to Heating Process | ✓ | ↓ | ✓ |
| 4 Alternate Fuel | ✗ | ↑ LDO | ✗ |
| 5 Flaring of CO Gas | ✗ | ✗ | ↑ Flaring |

# Inspiration

Weather forecast system




# Solution

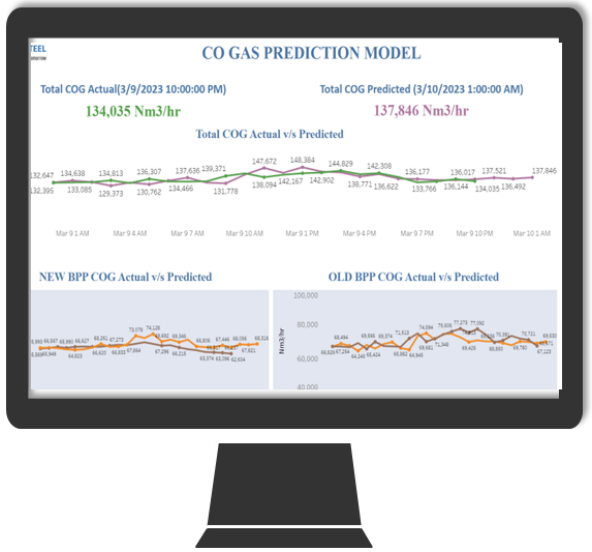


- *CO Gas Generation can be monitored through Prediction model at Control Room*
- *Proactive decision can be taken by the operator at Energy Management Centre Control Room for balancing of Fuels.*
- *Crisis of COG can be Managed with Another Fuel (BF & LD) leads to Reduction of LDO.*
- *Access COG can be Supplied to another Process for Reduction in Flaring.*

*Project URL*

https://bizanalytics.tatasteel.co.in/#/views/COGPredict_WithOracle/COGPredictionModel?:iid=1

# 3. Predictive modelling project for CO Gas Generation (3/3)




1st time

**Prediction of CO Gas Generation in steel Plant**

**Reduction in Oven top flaring**

Real time Demand Supply **Balancing**

Mathematical Model to Predict Metallurgical Outcome — Level-2 IT Model

*Nippon Steel Technical Report*

NIPPON STEEL TECHNICAL REPORT No. 100 JULY 2011

*Technical Report*

UDC 535 . 5 : 662 . 741

## Characterization of Gas Generation during Coking Reaction and Continuous Monitoring of COG Using Gas Monitoring System

Masayuki NISHIFUJI* Yuji FUJIOKA
Koji SAITO Yuji ISHIHARAGUCHI
Makoto UEKI

**Abstract**

*A gas monitoring system applying the infrared absorption method has been developed for continuous monitoring of gas generation during the coking process of coal. The developed system made it possible to continuously monitor coking reactions in a wide temperature range up to 1000 ℃, and thus, to follow pyrolysis of the coal in real*

*Hyundai Steel Coke Plant New Technology Report*

Mr. Marcel Schulz (author)[1], Mr. Klaus-Peter Paul Leuchtmann (co-author)[2], Mr. Jin Hyung Chung (co-author)[3], Mr. Yong Mook Kang (co-author)[4]

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Figure 1: Hyundai Steel Industrial Complex – near Dangjin / South Korea

The plant was built in three phases. Phase 1 and Phase 2 consists of 4 (four) batteries with 60 ovens each, means 240 ovens in total and one Gas Refinery Plant. The coke plant is split into two operational blocks. Each block has two batteries, a common coal bun

*Chinese Control Confrence*

Proceedings of the 32nd Chinese Control Conference
July 26-28, 2013, Xi'an, China

## The Prediction for the finished carbonization time

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E-mail: dongrlnpu@shnu.deu.cn,tany@shnu.edu.cn

**Abstract:** Finished carbonization time (FCT) is an important index in coke production of coking industry. A method to predict FCT based on the related variables such as the temperature and the change rate of the temperature in the waste gas piping is proposed in this paper. In this method, the predictive model to describe the relation between the FCT and the waste gas temperature as well as its corresponding change rate is constructed by using neural network. Then, the FCT can be predicted based on the predictive model. Finally, the method is used in a coke oven in a steel company in real time. The obtained prediction results show the validation of the method.

**Key Words:** Finished carbonization time; Waste gas temperature; Coking, Neural networks; Prediction

### 1 Introduction

Coking process consumes energy heavily in iron and steel enterprise, in the total consumed energy of coking plant. It is reported that almost 70 percent of the gas in a coking plant is

nonlinear dynamic model to predict FCT of a coke oven. In this paper, a method of FCT prediction is proposed based on neural networks. As neural network is an efficient tool to build nonlinear predictive models [6]. Hence, in the proposed method, FCT is considered to have relations with waste gas temperature (WGT) and its corresponding change

TATA STEEL
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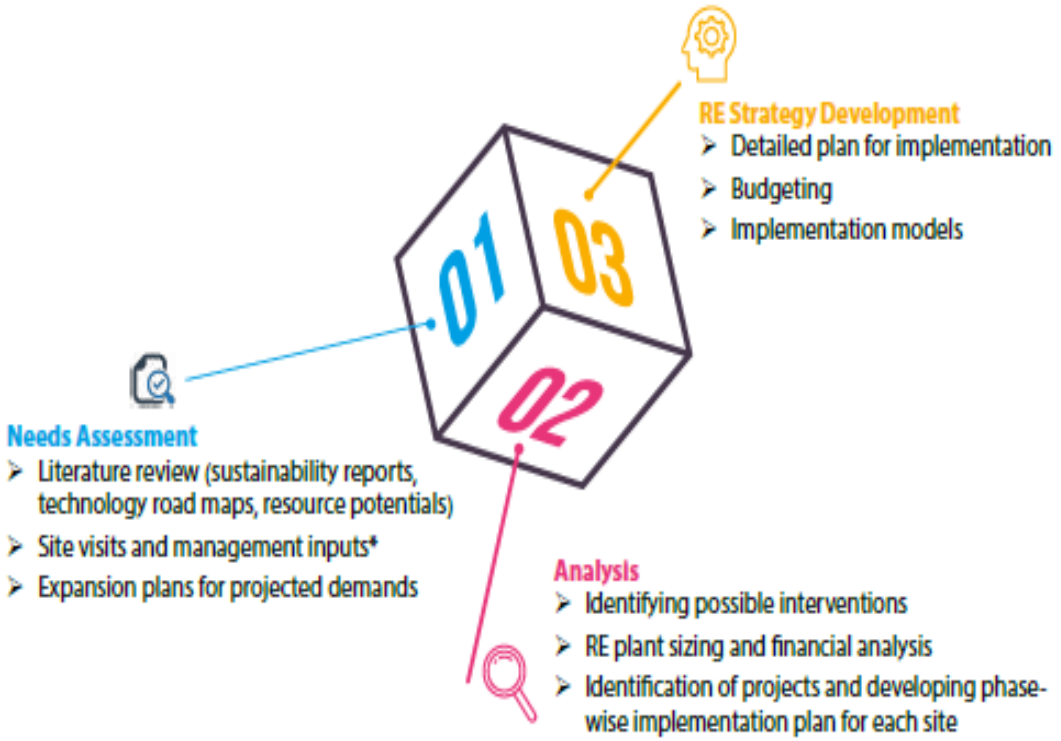
Confederation of Indian Industry

# SOLAR UPDATE

# Utilisation of Renewable Energy sources

- Tata Steel collaborates with Tata Power to set up 41MW grid connected solar projects in Jharkhand and Odisha.
- This project would generate an average of 32 MUs of energy per year. Tata Steel and Tata Power sign a Power Purchase Agreement (PPA) for 25 years.
- The projects will be a mix of rooftops, floating, and ground mounted solar panels.
- Four rooftop (6.57 MWp) are commissioned, Floating (10.8 MWp) and Ground Mounted (2 MWp) are under construction.
- Tata Power will develop Photo Voltaic (PV) capacities for Tata Steel at Jamshedpur (21.97MWp) and Kalinganagar (19.22MWp).

- **RPO obligation for TSL**
  - **Solar - 1%**
  - **Non Solar – 3%**

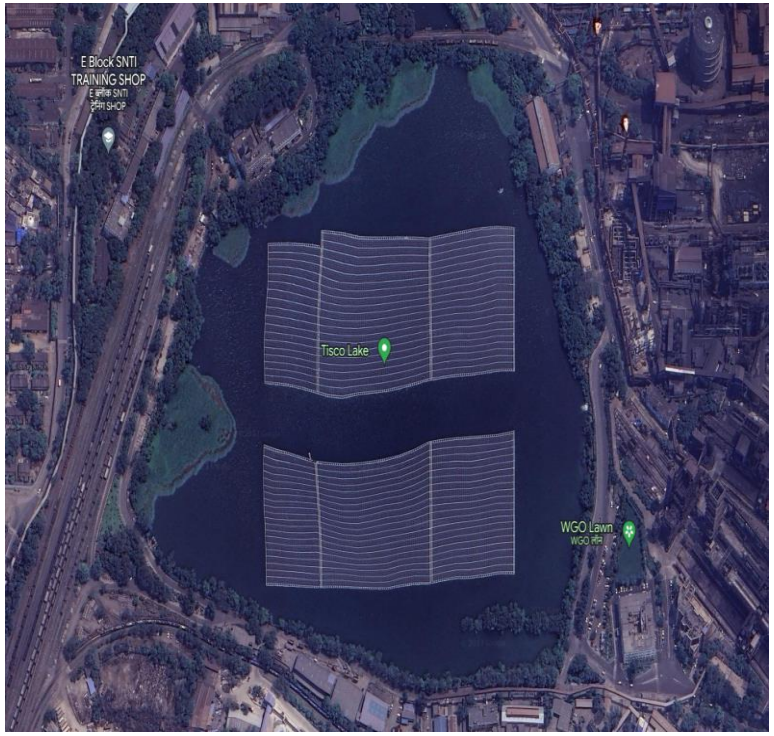



*The project came to light as a result of the synergy between three Tata group companies - Tata Steel, Tata Power Solar and Tata Power Trading Company.*
*Read more at:*
*https://economictimes.indiatimes.com/industry/indl-goods/svs/steel/tata-steel-commissions-solar-power-plant-at-noamundi-iron-ore-mines/articleshow/59528509.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst*

# Utilisation of Renewable Energy sources

Installation of roof top, floating and ground mounted solar panels across TSJ works to generate renewable power

Roof Top Solar




Floating Solar

Ground Mounted Solar

# Pursing sustainability through multiple pathways

## Net Zero by 2045


*Note : CCU – Carbon Capture & Utilisation, EAF – Electric Arc Furnace, TSE – Tata Steel Europe*

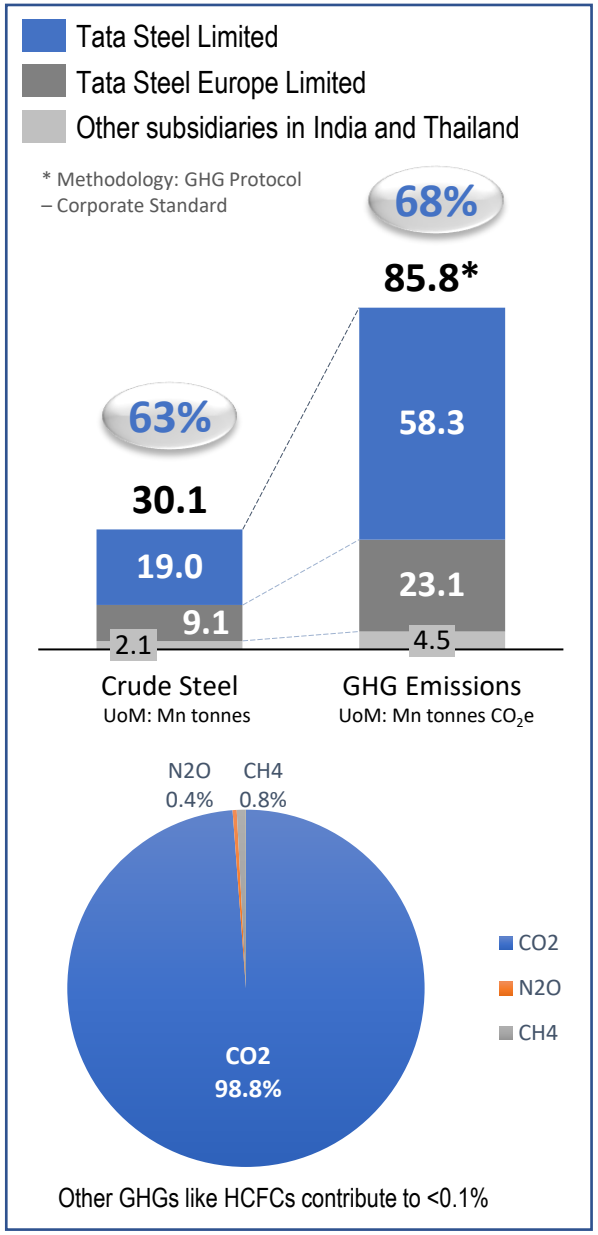
### Hydrogen injection in blast Furnace


### CO2 Capture

### Scrap bundling

# GHG Emissions Accounting – Steelmaking sites under Tata Steel Group

## GHG emissions Profile




| Tata Steel Jamshedpur – **CO2 emission intensity ($tCO_2$/tcs) | | | |
|---|---|---|---|
| Year | Scope 1 | Scope 2 | Scope 3 |
| 2022-23 | 2.24 | 0.08 | -0.12 |
| 2021-22 | 2.34 | 0.08 | -0.16 |
| 2020-21 | 2.30 | 0.08 | -0.09 |
| 2019-20 | 2.28 | 0.09 | -0.09 |

Note:
1) Scope-2 is based on default Global Emission factor of Electricity @ 0.504 $tCO_2$/MWh.
2) For the purpose of absolute emissions reporting, we also publish GHG Protocol based results with Location-based and Market-based Scope 2 emission factor for imported electricity.
3) Scope 3 emissions include slag credits.
4) Scope 1 emissions reported include Scope 1.1 emissions too.
5) All figures are based on $CO_2$ only (rest six gases contribute to < 1.5%).
6) **Methodology: worldsteel CO2 calculation User Guide v11 (Excel template v25).

**Short-term (by 2025)** - carbon pricing embedded in governance

- Enhance scrap in steel making; Steel Recycling Business
- Maximize waste heat recovery and use of by-product gases
- Improve quality of Raw Material (Iron ore & Coking coal) and
- Increase share of renewable energy

**Medium-term (till 2030)**

- Capacity addition using Scrap-Electric Arc Furnace route
- Switch to cleaner fuel like Natural Gas
- Upscaling pilots of Carbon Capture & Utilization and $H_2$ based steelmaking

**Long-term (2030-2050)**

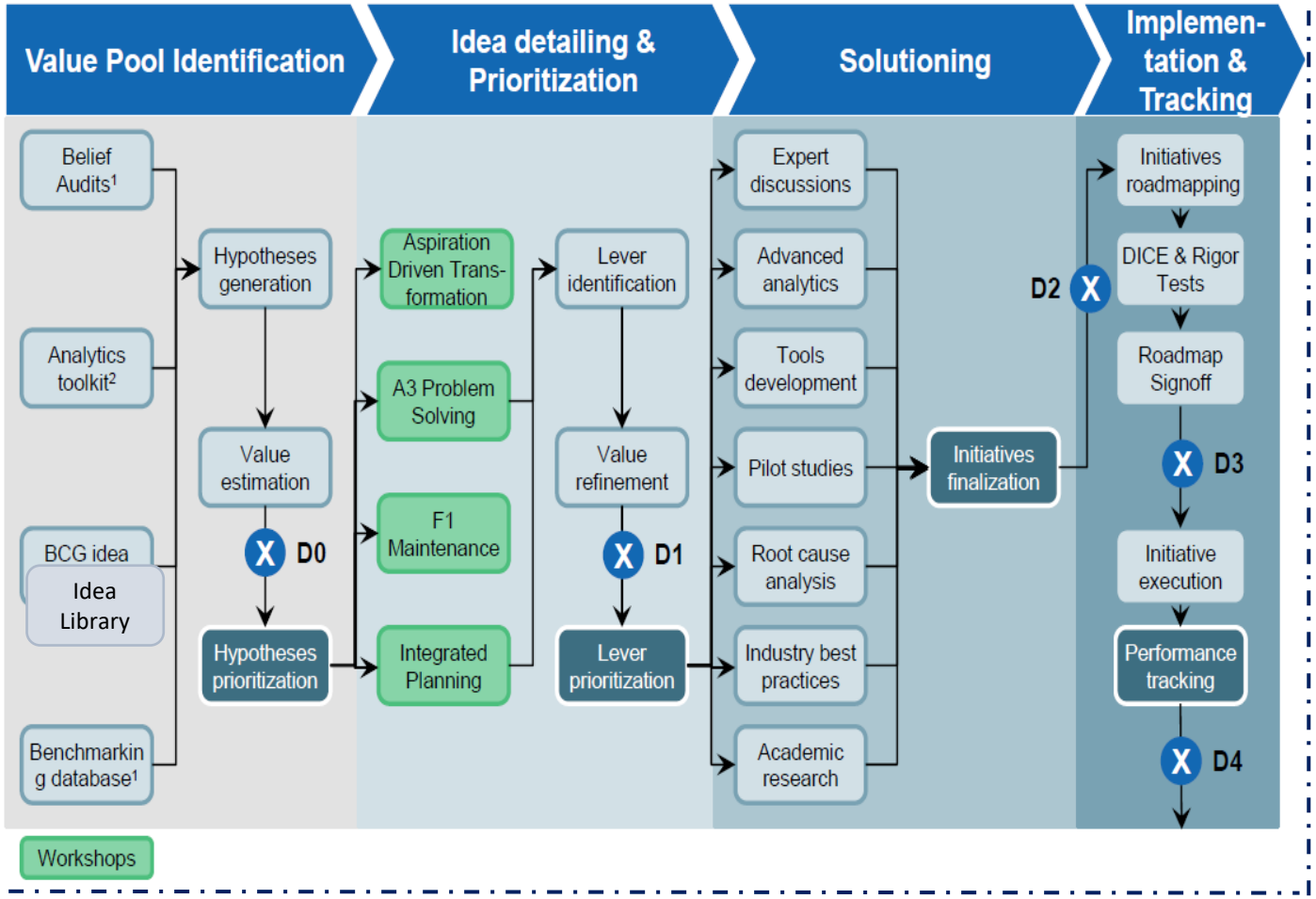
- Deployment of decarbonization technologies
  - HIsarna
  - CCU
  - $H_2$ use across value chain
- R&D on advanced materials

**Net Zero by 2045 (Tata Group)**

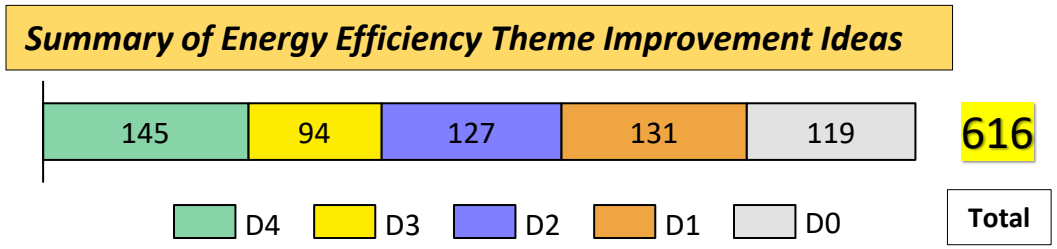
### Initiatives on Carbon capture, other reduction measures

- 5 TPD CCU Pilot Plant was commissioned in FY22 at LD1, Jamshedpur Works to capture $CO_2$ from B.F.Gas.
- Trial continuous injection of Coal Bed Methane, Hydrogen, Charcoal in Blast Furnace, Jamshedpur Works.

# Program Management – Idea Development Stages





# Financial Mechanism Taken For Implementation of EE Projects


**Depending upon the *nature of expenditure* and *expected financial benefits*, different funds sourcing routes are opted**

## Capital Expenditure

| Minor Capital ( MCRC) | |
|---|---|
| < 1 Cr. | IRR > 30% |

BU-PRG
Business Unit Peer Review Group

| Corporate Sustainability Corpus | |
|---|---|
| < 5 Cr. | KPI – $CO_2$ reduction |

| Peer Review Group (PRG) | |
|---|---|
| > 5 Cr. | Capital Expenditure Committee (CEC) |

## Revenue Expenditure

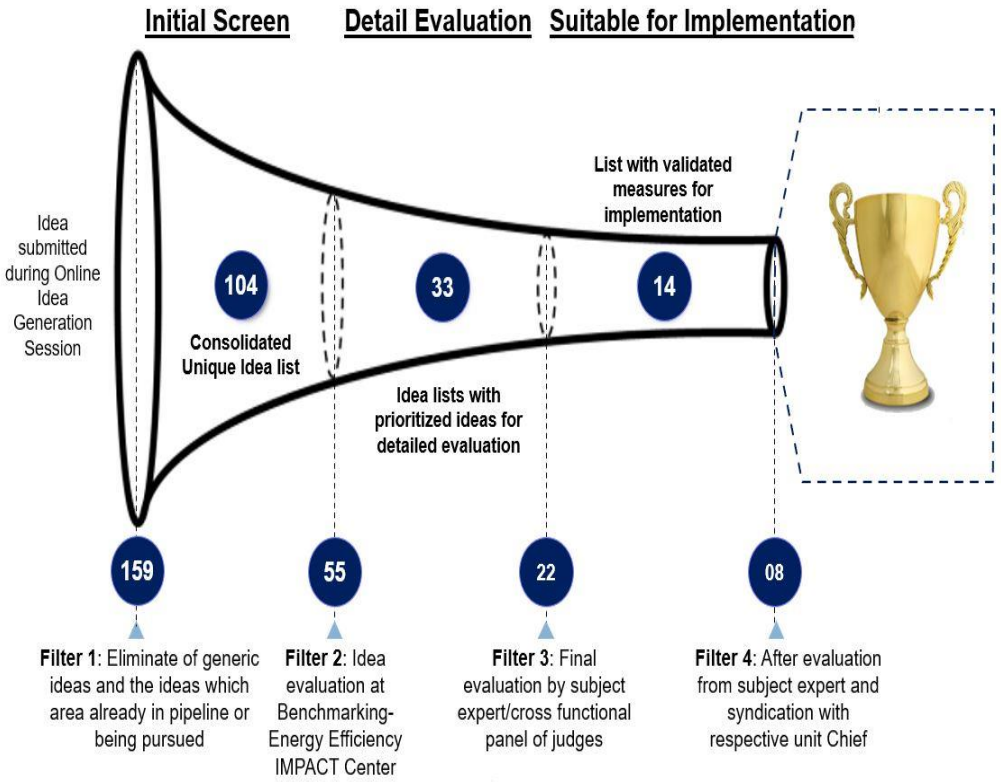
| Special Budget (above allotted dept FY budget) | |
|---|---|
| < 1 Cr. | Special Corpus for EE Improvement projects by VP Approval |

**Allotted budget for improvement projects**

- Corporate Sustainability Corpus – 5 Cr
- Minor Capital Shikhar Corpus – 40 Cr
- Capital Expenditure - 50 Cr

# Idea Generation Campaign for Energy Conservation

An Idea generation campaign ***"SANRAKSHAN"*** was launched in first week of Dec'22 across ***Tata Steel India*** focussing on spreading awareness and enhancing sensitization regarding energy conservation, commemorating National Energy Conservation Day.




**Energy Efficiency – Generate More, Consume Less!**




# Energy Awareness training program

Energy related session by Experts across the world speakers for reduction the Specific energy in steel sector

**Ideation for Reduce Specific energy consumption**
*cross functional teams Brainstorming*

**Shared Knowledge Among contractor employees**

**KSS on Energy Policy**


**Assessment Council, Technology TT GOI**

# “Sustainability Champion” World Steel 2023

# GLIMPSE OF AWARDS for TATA STEEL






# Thank You..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