



UK Government



Bureau of
Energy Efficiency
Ministry of Power, Government of India

ASPIRE PROGRAMME

Accelerating Smart Power &
Renewable Energy in India



SUMMARY REPORT

Sectoral Workshop on

BEST PRACTICES IN ENERGY EFFICIENCY IN IRON & STEEL SECTOR

A Path for Decarbonisation

19 April 2023

Hosted by:

Godawari Power & Ispat Limited, Raipur

Hotel Babylon Capital, Raipur, Chhattisgarh





CONTENT

Background	5
Inaugural Session	7
Technical Session I	9
Perform, Achieve, And Trade Scheme For The Iron & Steel Sector	
Technical Session II	10
Sharing Of Best Practices By Indian Iron & Steel Units	
Technical Session III	12
Standards & Decarbonisation Technologies For Iron & Steel Sector – By International & UK Technology & Solutions Providers	
Technical Session IV –	14
Best Practices by Indian Iron & Steel Industry & Case Studies on Low Carbon & Digital Technologies by Indian Technology Suppliers	
Concluding Session	16
Feedback from the Participants	17
Way Ahead	18
Gallery	19
Annexure	21
Attendance Sheet 1	

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ABBREVIATIONS

Abbreviations	Acronyms
ABC	After Burning Chamber
AI	Artificial Intelligence
APBS-CDRMax	Amine Promoted Buffer Salts
ASPIRE	Accelerating Smart Power and Renewable Energy in India
BEE	Bureau of Energy Efficiency
BF	Blast Furnace
BFP	Boiler Feed Pump
BOF	Basic Oxygen Furnace
BSP	Bhilai Steel Plant
CB	Coal Based
COO	Chief Operating Officer
CPP	Captive Power Plant
CRM	Cold Rolling Mill
CSR	Corporate Social Responsibility
DCs	Designated Consumers
DRI	Direct Reduced Iron
EAF	Electric Arc Furnace
EE	Energy Efficiency
ESP	Electrostatic Precipitator
FCDO	Foreign Commonwealth and Development Office
FeCr	Ferrochrome
GESI	Gender Equality Social Inclusion
GHG	Greenhouse gases
HAPL	Hot Annealed Pickled Line
HPL	Hot Pickled Line
HSM	Hot Strip Mill
ID	Induced Draft
IDEEKSHA	Industrial Decarbonisation and Energy Efficiency Knowledge Exchange Platform
IE3	International Efficiency Class 3
IEE	Industrial Energy Efficiency
IEED	Industrial Energy Efficiency and Decarbonisation
IoT	Internet of Things

Abbreviations	Acronyms
JSL	Jindal Stainless Limited
KEP	Knowledge Exchange Platform
LD	Linz Donawiz
LED	Light Emitting Diode
LRF	Ladle Refining Furnace
M3	Meter cube
MCW	Main Cooling Water
MTOE	Million Tonnes of Oil Equivalent
MVA	Mega Volt Ampere
MW	Mega Watt
NM3	Normal Cubic Meter
NMEEE	National Mission on Enhanced Energy Efficiency
PAT	Perform Achieve and Trade
PCB	Polychlorinated Biphenyl
R&D	Research and Development
RE	Renewable Energy
RPM	Revolutions per minute
RTD	Resistance Temperature Detector
SAIL	Steel Authority of India Limited
SEEM	Society of Energy Engineers & Managers
SMS	Steel Melting Shop
SUSTAIN	Strategic University Steel Technology and Innovation Network
TMT	Thermo - Mechanically Treated
TOE	Tonne of Oil Equivalent
TPD	Tons Per Day
VFD	Variable Frequency Drive
VRM	Vertical Roller Mill

BACKGROUND

India has emerged as a significant player in the global steel industry, holding the second position in both production and consumption. The country's crude steel production is expected to grow from approximately **120 million tonnes (MT)** in 2022 to around 200 million tonnes by 2030 and an estimated **580 million tonnes** by 2050. Furthermore, per capita steel consumption is anticipated to increase more than fourfold from **77 Kg** in 2022 to approximately **320 Kg** per person by 2050. The iron and steel sector is a crucial segment of India's economy, contributing **~2%** to the country's Gross Domestic Product, **~23%** to Gross Value Additions in 2022, and employing **~2.5 million** people. However, the sector is also the highest emitter of greenhouse gases in India, accounting for **~30%** of all industrial emissions. Therefore, it is essential to decarbonize the industry to transition India to a low-carbon economy and to limit global temperature below **1.5°C**. To overcome this challenge, several leading iron and steel companies in India have announced initiatives to reduce Greenhouse Gases' (GHG) emissions and decarbonize the sector. A total of **204** Designated Consumers (DCs) are notified under the Perform Achieve and Trade (PAT) scheme of the Bureau of Energy Efficiency (BEE) whereas total active DCs are including **197** active DCs until PAT Cycle VII. These Iron & Steel plants offer an **energy-saving potential of ~4.5 MT million tonne of oil equivalent (MTOE)** and a decarbonisation potential of **~18.6 MTCO₂e**.

The Indian steel industry is committed to minimizing the impact of its operations on global climate change and reducing its carbon footprint. India's commitment to achieving Net Zero emissions by **2070** is akin to not just walking the talk on the climate crisis but running the talk.

UK's Iron & Steel sector offers some key technologies, solutions, and best practices in the areas of:

- Advanced blast furnace technologies including improved furnace and re-heating furnace performance & optimization, electric-arc furnace, etc.
- Improved process control & automation
- Ultra-high-power transformers
- Technology for scrap densification for shredding
- Fuel switching (including in coking plant) - biomass, hydrogen, and electrification

The strengths and capabilities of UK Iron & Steel sector can be leveraged to facilitate a rapid transition of the Indian Iron & Steel sectors' journey to net-zero.

In view of the above, a one-day **sectoral workshop** was organised in Raipur, Chhattisgarh (India) on **19th April 2023** under Accelerating Smart Power and Renewable Energy in India (ASPIRE) Programme. The workshop was jointly organised by FCDO and the BEE with the support of Godawari Power & Ispat Ltd. (GPIL), Raipur. The theme of the workshop was - "**Best Practices in Energy Efficiency & Decarbonisation in Iron & Steel Sector**". During the workshop, the stakeholders deliberated on best practices, technologies, and policy interventions required to accelerate the decarbonisation of the Iron & Steel sector. In the workshop, some key organisations from the UK presented various leading best practices and technologies adopted in the UK.

Objective of the Workshop



Apprise stakeholders about IDEEKSHA platform and its key functionalities.



Apprise stakeholders on the impact of the PAT scheme and IEED measures in the Iron & Steel sector.



Share best practices/ technologies for enhancing IEED and identify learnings from the UK experience.



Identification of new emerging IEED technologies available globally including from the UK.

Highlights



110+
participants from
India and UK



4
Technical
Sessions



Active participation from the central and state government agencies, industrial organisations, and technology providers from India and the UK



Active participation from
15+
women including
3 women
speakers

INAUGURAL SESSION



(L – R) Mr. Abhishek Agrawal, Mr. Balawant Joshi, Mr. Vivek Agrawal, Ms. Sanyukta Das Gupta, Mr. Sunil K. Khandare, Mr. Anurag Singh Sirola & Mr. K. K. Chakarvarti

Speakers



Mr. Sunil K. Khandare
Director,
BEE



Ms. Sanyukta Das Gupta
Senior Adviser,
Smart Power, British High
Commission, Delhi



Mr. Abhishek Agrawal
Executive Director,
HIRA Group



Mr. Vivek Agrawal
COO,
Godawari Power
& Ispat Ltd. (GPIL)



Mr. K. K. Chakarvarti
Senior Advisor,
IDEEKSHA, ASPIRE Team



Mr. Balawant Joshi
MD, Idam Infra,
ASPIRE Team



Mr. Anurag Singh Sirola
Manager,
KPMG

Key Takeaways

- Steel sector in India contributes ~**12%** of the country's GHG emissions and this is set to increase ~**3.5x** to **837 MT** in next **30** years. Thus, it is critical to decarbonise the Iron & Steel sector in India.
- A knowledge exchange platform titled "IDEEKSHA (Industrial Decarbonisation and Energy Efficiency Knowledge Sharing) Platform" has been developed under the ASPIRE Programme in collaboration with BEE.
- Key focus areas for decarbonizing the Iron & Steel sector include:
 - ✓ Installation of Renewable Energy (RE) projects
 - ✓ Carbon capture technology application to achieve net-zero
 - ✓ Transforming waste carbon & residues into new links in a circular value chain
 - ✓ Sustainable refractory solution with controlled emissions
 - ✓ Energy Efficiency (EE) optimisation through the reduction in process fluctuations
 - ✓ GPIL has reduced its CO₂ emissions intensity from 3.1 T/tcs in 2005 to 2.64 T/tcs in 2020 (12% reduction). GPIL aims to achieve further reduction to 2.4 T/tcs by 2030.
 - ✓ Initiatives implemented by GPIL to achieve mentioned target include gradual adoption of clean technologies, improving raw material quality, enhancing fuel efficiency, creating carbon sinks, process improvement, providing energy efficiency training, minimizing waste and loss, and pursuing ISO-50001 certification for improved energy efficiency.

TECHNICAL SESSION I

Perform, Achieve, and Trade Scheme for the Iron & Steel Sector

Speakers



Mr. Sunil K. Khandare
Director, BEE



Mr. Himanshu Choudhary
Sector Expert, BEE

Key Takeaways

- Perform, Achieve, and Trade (PAT) scheme is a flagship scheme of BEE under the National Mission on Enhanced Energy Efficiency (NMEEE).
- PAT Scheme enables energy intensive industries to reduce energy consumption through regulations and market based trading of excess energy savings.
- PAT Cycles I-III (2012-2020) resulted in energy savings of **~24 MTOE** and emission reduction of **~106 MTCO₂e** across 13 large energy-intensive industrial sectors.
- Global DRI production reached 106 MT in 2022, with India leading in coal-based DRI production at 39 MT, accounting for 33% of total steel production worldwide.
- Iron & Steel Sector has 204 notified Designated Consumers (DCs), with 197 currently active as of PAT Cycle VII (2022-23 to 2024-25).
- BEE is establishing an Advanced Industrial Technology Development Centre (AITDC) at the National Power Training Institute (NPTI) in Badarpur to showcase **13** non-working models from 5 different sectors and provide training opportunities.
- Two selected technologies in the Iron & Steel sector: Waste Heat Recovery through Sinter Plant and Oxy-fuel burners.
- BEE and IIT-Roorkee collaborate on optimising rotary kiln performance in a sponge iron plant, aiming to maximise metallisation using natural gas or syngas as a reductant.
- BEE focuses on R&D to develop low-carbon steel-making processes and adopts best practices from the Iron & Steel industry to improve energy efficiency in thermal and electrical processes.

TECHNICAL SESSION II

Sharing of Best Practices by Indian Iron & Steel Units

Speakers



Mr. Vivek Agrawal
COO, Godawari Power
& Ispat Ltd.



Ms. Tripti Verma
Asst. Manager, Bhilai Steel Plant
(BSP), SAIL



Mr. Jyoti Ranjan Tripathy
Sr. Manager, JSL

Key Takeaways

- Godawari Power & Ispat Ltd.'s (GPIL) **'ARTIST'** initiative focuses on energy conservation in steel production through:
 - ✓ **Awareness:** Raising awareness can save 4-5% energy.
 - ✓ **Raw materials:** Developing technology to convert hot iron pellets to DRI through the Coal-based (CB) route.
 - ✓ **Technology:** Establishing energy-efficient technology, utilizing hot pellets for DRI making and CB DRI in furnaces.
 - ✓ **Innovations:** Improving efficiency, optimizing processes, and combustion.
 - ✓ **Specific consumption:** Comparing performance with benchmarks to reduce consumption.
 - ✓ **Top-driven approach:** Commitment from the top to drive energy management culture.
- GPIL recommends following measures for achieving industrial decarbonisation:
 - ✓ Carbon capture for sale, storage, or use in manufacturing building materials.
 - ✓ Utilising syngas from coal gasification for electricity generation or high-quality reducing gas for DRI production.
 - ✓ Solar power and green hydrogen-based steel production for self-reliance and decarbonisation.
 - ✓ Adoption of energy-efficient technologies, energy recovery, and operational practices.
 - ✓ Steel recycling for energy savings, reduced mining, and lower GHG emissions.

- **Bhilai Steel Plant (BSP) under SAIL** has implemented various energy-efficient technologies to reduce energy consumption and carbon footprint, including:
 - ✓ **Coke Dry Cooling Plant with Back Pressure Turbo Generator:** Recovers waste heat to generate electricity during coke making.
 - ✓ **Coal Chemical Department with Claus process:** The Claus process is used for the desulphurisation of Coke Oven gas to ensure the gas emitted during the coke-making process is clean and impurity free.
 - ✓ **Top Pressure Recovery Turbine:** A 14 MW capacity top pressure recovery turbine has been installed in one of India's biggest Blast Furnaces BFs (BF-8) of 8000 Tons Per Day (TPD) capacity with torpedo ladle facility for hot metal transfer.
 - ✓ **Waste Heat Recovery System in BF stoves:** The waste heat recovery system installed in the BF stoves of the new BF-8 is designed to recover the heat generated during the iron-making process. The recovered heat is then used to preheat the air, thereby reducing the energy required for the process.
 - ✓ **Sinter cooler heat recovery system and curtain flame burners:** Recover heat from the sintering process to preheat the air and reduce energy consumption.
 - ✓ **Basic Oxygen Furnaces (BOFs) equipped with Linz Donawitz (LD) gas holders:** The BOFs are equipped with wet type LD gas holder with a storage capacity of 24000 Nm³ and dry type LD gas holder with a storage capacity of 80000 NM³. This ensures the efficient storage and use of the LD gas produced during the steelmaking process.
 - ✓ **Continuous bloom, billet, and slab casters with hot charging facility:** Reduces energy required for reheating steel.
 - ✓ **Walking Beam Furnaces and fully automated efficient mills:** Optimises energy consumption.
 - ✓ **By-product gas-fired twin shaft regenerative kilns:** Efficient use of by-product gas.
 - ✓ **By-product gas-fired efficient boilers and Turbogenerators:** Generates steam and electricity by utilizing by-product gas.

- BSL has implemented a hazardous waste management system and built a **36,000 m³** secured landfill for asbestos and tar sludge disposal. Additionally, they established a national facility to decontaminate **3400 tons** of transformer oil containing Polychlorinated Biphenyl (PCB), mainly from BSP, to reduce and eliminate PCBs in India, with a focus on the power sector.

- **Jindal Stainless Limited (JSL)** has taken significant steps toward energy conservation by implementing several projects, resulting in significant energy savings and significant reduction in GHG emissions. Some of the projects include:
 - ✓ Direct addition of Liquid Ferrochrome (FeCr) to the Electric Arc Furnace (EAF) at the Steel Melting Shop (SMS).
 - ✓ Waste Heat Recovery from Submerged Arc Furnaces and Annealing Furnaces
 - ✓ Installation of Variable Frequency Drives (VFDs) for Fume Extraction system Induced Draft (ID) Fans in SMS.
 - ✓ Modification of Electrode regulation system to reduce specific power consumption at EAF in SMS.
 - ✓ Decrease in Ladle Refining Furnace (LRF) Power consumption by Minimal purging in lead heats of longer sequences in SMS.
 - ✓ Increase the capacity of the transformer used in the DRI furnace to **120 MVA** in SMS.
 - ✓ Coal Mills Optimisation in Captive Power Plants (CPP).
 - ✓ Black coil pickling in Hot Pickled Line (HPL) in place of Hot Annealed Pickled Line (HAPL).
 - ✓ Energy saving through compressed air networking in Cold Rolling Mill (CRM).

As a result of the above and several other initiatives, JSL has claims to save **30,500 TOE** energy, resulting in reduction of **93,043 tCO₂** in GHG emissions.

TECHNICAL SESSION III

Standards & Decarbonisation Technologies For Iron & Steel Sector – By International & UK Technology & Solutions Providers

Speakers



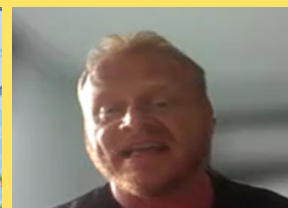
Mr. Shiva Kumar

Director (Policy & Regulation),
ResponsibleSteel



Mr. Niraj Singh

Sales Manager,
Carbon Clean



Dr. Richard Curry

SUSTAIN Programme
Manager, Swansea
University – Sustain Steel



Mr. David Boyd

Chief Commercial
Officer, CarbonRE



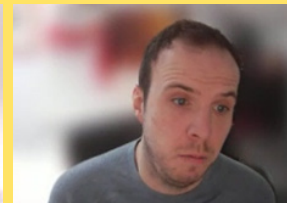
Ms. Selin Murat

Head of Commercial
Partnerships, Carbon8



Mr. Patricio Burdiles

Senior Project Manager,
Department of Engineering,
University of Cambridge



Mr. Aaron Lucid

Development and
Partnership Manager
Carbon Upcycling

Key Takeaways

- The **ResponsibleSteel™ International Standard V2.0** promotes sustainable, low-carbon steel production, reducing greenhouse gas emissions throughout the supply chain. Compliance with Version 2.0 showcases integrity, encourages responsible practices, and recognizes industry leaders committed to a sustainable future.
- **Carbon Clean's CDRMax™ process** captures carbon dioxide from industrial flue gases, meeting strict environmental criteria at a low cost. CDRMax™ can be used with source gases that contain CO₂ concentration between **3% to 25%** by volume. The process produces carbon dioxide with purities ranging from **95% to 99%**, which can be sold, reused, or sequestered, enabling efficient carbon capture.

- The **SUSTAIN project**, led by Swansea University, drives innovation in science and engineering research for carbon-neutral steel supply chains in the UK. By leveraging cutting-edge technologies and collaboration, SUSTAIN aims to transform the industry with sustainable economic growth.
- **Carbon8's** artificial intelligence and machine learning platform known as "**Delta Zero Cement**" harnesses existing industrial data to produce sophisticated modeling of energy-intensive processes and optimise fuel use, resulting in reductions in specific heat consumption, with lower operating costs and lower emissions
- **Carbon8 technology** converts carbon and residues into valuable streams, permanently capturing and utilising CO₂ with TRL 9 technology through a closed-loop system.
- The **University of Cambridge** proposes modifying **Electric Arc Furnaces' flux** composition to produce cementitious slags without affecting steel processing. These slags can substitute cement in concrete, generating new revenue streams and reducing GHG emissions.
- **Carbon Upcycling** transforms low-reactivity materials into SCMs (Supplementary Cementitious Materials) that surpass the minimum standards for use in concrete, thus tackling two massive problems:
 - Unmanageable amounts of industrial CO₂
 - Landfills of industrial by-products and natural minerals

TECHNICAL SESSION IV

Best Practices by Indian Iron & Steel Industry & Case Studies on Low Carbon & Digital Technologies by Indian Technology Suppliers

Speakers



Mr. Kapil Jat

Senior Engineer, Jaideep Ispat & Alloys Pvt. Ltd.



Mr. Baljeet Singh

Associate Vice President, Aarti Steel Ltd.



Mr. Moolchand Jain

National President, Society of Energy Engineers & Managers



Mr. Baljeet Singh

CEO, AKXA Tech Pvt. Ltd.



Mr. Jaidhish Passary

Director, Passary minerals



Mr. Rajiv Shukla

Executive Director, Idam Infra (ASPIRE Team)

Key Takeaways

- **Jaideep Ispat & Alloys Pvt. Ltd.** has implemented several innovative energy conservation projects, resulting in significant cost savings and reduced environmental impact. These projects include:
 - ✓ Conversion of a diesel-powered chain excavator to an electric-driven one with a **100%** electrification ratio. This project has resulted in savings of **466,650 kWh** per annum.
 - ✓ Changes in the building design structure, where a large part of the roof was covered with glass to act as a reflector for the entire building. This has eliminated the need for LED lighting in the daytime, resulting in savings of **41,000 kWh** per annum, which equates to Rs. **225,000 per annum**.

- ✓ Development of a visual indication system based on voltage and instantaneous power drawn. This system was made in-house and installed, resulting in savings of INR **1.2 Mn.**
- ✓ Implementation of an induction furnace power controller to reduce specific power consumption, resulting in annual savings of INR **7.75 Mn.**
- Aarti Steel Ltd. highlighted the following best practices for Energy Efficiency in the Iron and Steel Sector:
 - ✓ Replacement of Old Oversized Pumps with New Pumps.
 - ✓ Installation of Variable Frequency Drive (VFD) on Boiler Feed Pump (BFP) and Main Cooling Water (MCW) in Power Plant.
 - ✓ Discontinuation of Water injection in the After Burning Chamber (ABC) of the DRI Kiln.
 - ✓ Dust injection in ABC of DRI Kiln.
 - ✓ Replacement of Old compressors with VFD-driven Compressors.
- **Dr. Moolchand Jain** highlighted the following best practices:
 - ✓ **Best Practices in DRI section** includes- implementation of temperature shield kiln coat, installation of an iron ore wet screening plant, segregation of injection coal size, using 100% imported coal for both feed and injection, utilizing high-grade pellets, etc.
 - **Best Practices in Steel Melting Shops** includes replacement of electrical energy with chemical energy
 - **Best Practices in Captive Power Plant** include installation of retrofit energy efficient ESP controllers, installation of sonic horn soot blower, installation of an online continuous tube cleaning system in the condenser etc.
 - **Best Practices in Rolling Mill** include direct hot billet rolling, conversion of single strand to double strand rolling, thermo-mechanical treatment, etc.
- **AKXA Tech Pvt. Ltd.** provides advanced plant optimisation solutions and data analytics tools. Their software leverages historical data for valuable insights, enabling informed decisions and enhancing asset utilization and productivity.
- **Passary Minerals** highlighted sustainable refractory solutions as an environmentally-friendly alternative in the industry, offering controlled emissions and promoting sustainability.

CONCLUDING SESSION



(L-R) Mr. Vivek Agrawal, Mr. Sunil K. Khandare & Mr. Moolchand Jain

Key Takeaways

- Enhancing energy efficiency and decarbonisation of industries, particularly Iron & Steel, is vital for India's sustainable energy transition towards net-zero.
- The ASPIRE programme facilitates collaboration with global technology suppliers, including those from the UK, to support large energy-intensive industries in adopting low-carbon technologies and solutions.
- The University of Cambridge's innovative solution for zero emissions in Electric Arc Furnaces (EAFs), combined with Carbon Clean's CCUs technology and CarbonRE's AI & ML platform, holds immense potential for increased energy efficiency and reduced carbon emissions in the Iron & Steel industry.
- Stakeholders in the Indian sector have shown interest in these technologies. However, to accelerate the deployment of these low-carbon technologies, programmatic interventions are needed to facilitate technology transfer.
- The workshop successfully explored innovative measures implemented by Indian Iron & Steel manufacturers and identified new-age technologies and solutions necessary to accelerate decarbonisation in the sector.

FEEDBACK FROM THE PARTICIPANTS

- Around **92%** of the participants were more than satisfied with the outcomes of the workshop (*provided a 7+ rating on a scale of 10*).
- ~**100%** of the participants found the quality and content of the delivery more than satisfactory (*provided a 7+ rating on a scale of 10*).
- The technical session IV - **Best Practices by Indian Iron & Steel Industry & Case Studies on Low Carbon & Digital Technologies by Indian Technology Suppliers** was highly appreciated by the participants.
- Many participants recommended similar sectoral workshops for the Iron & Steel sector.
- Participants expressed their keen interest in acquiring further information about the Industrial Energy Efficiency (IEE) and decarbonisation technologies offered by the UK
 - ✓ Waste heat recovery and utilisation output
 - ✓ Energy, data management, and reporting
 - ✓ Recycling technology and process
 - ✓ Advanced electrolysis technology and process
- ~**15% women participation** in most of the participating organisations.
- Participating organizations have implemented several initiatives to promote Gender Equality and Social Inclusion (GESI), including:
 - ✓ Ensuring equal opportunities for all genders in tasks and support to achieve established targets. This involves addressing gender biases in recruitment, performance evaluations, and promotions.
 - ✓ Promoting women's participation in sports and games to foster physical fitness, leadership abilities, and confidence.
 - ✓ Undertaking Corporate Social Responsibility (CSR) activities to enhance educational opportunities for marginalized communities, with a specific focus on girls and women.

“

“Conducting workshops like this shows a strong commitment to caring for the environment”

- **Mr. Bharat Kumar Mahajan**,
Energy Manager
JSW Ispat Special Products Ltd.

”

“

“The event offered an insightful platform for sharing best practices and emerging technologies”

- **Mr. Jayakumar Nair**
Managing Director
Sustenergy Foundation

”

WAY AHEAD



Group photograph of Participants

The Sectoral Workshop received a positive response, with extensive participation from BEE officials, prominent Indian Iron & Steel industries, and technology providers from India and the UK. The workshop served as a platform for national and international organizations to exchange best practices and technologies for improving Industrial Energy Efficiency and Decarbonisation (IEED) measures in the Indian Iron & Steel sector. Notably, the workshop actively promoted Gender Equality and Social Inclusion (GESI) by involving stakeholders from marginalized groups in large energy-intensive industries. The workshop is expected to have a tangible and long-lasting impact in the field. To maintain the momentum, the upcoming tasks include:

- Provide handholding support to large energy-intensive industries including from the Iron & Steel sector in identifying technologies & solutions, technology suppliers, and financing avenues for enhanced adoption of IEED interventions.
- Plan and organise online seminar / B2B meetings with Iron & Steel industry stakeholders in close collaboration with technology suppliers such as Carbon Clean, CarbonRE, Carbon8, etc. from the UK.
- Create more discussion forums to facilitate the exchange of knowledge and information that will aid in the formulation of policies.

GALLERY





For more information please contact:

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ANNEXURE

Attendance Sheet

S. No	Name	Designation	Organisation
1	Mr. Omprakash Malviya	Chief General Manager - Technical	Jaideep Ispat and Alloys Pvt Ltd.
2	Mr. Kapil Jat	General Manager - OE	Jaideep Ispat and Alloys Pvt Ltd.
3	Mr. Dinesh Bharti	Chief General Manager	Jaideep Ispat and Alloys Pvt Ltd.
4	Mr. Vishal Vashishtha	Asst. General Manager	Nalwa Steel And Power Limited,
5	Mr. Srinivasa Rao Boosa	Asst. General Manager	Nalwa Steel and Power Limited
6	Mr. Sarobindu Mohanta	AEA	ESCO Energy Management & Service,
7	Mr. Nukesh Kumar Verma	AGM (Operation/Process)	Hira Power and Steels Ltd.
8	Mr. Sukhbir Singh	D.G.M	Jindal Stainless Limited, KNIC, Odisha
9	Mr. Siddharth Kumar	A.G.M	Jindal Stainless Limited, KNIC, Odisha
10	Mr. Jyoti Ranjan Tripathy	Sr. Manager	Jindal Stainless Limited, KNIC, Odisha
11	Mr. Prashant Kumar Dash	Manager	Jindal Stainless Limited, KNIC, Odisha
12	Mr. Dileep Busigonda	Executive	Jindal Stainless Limited, KNIC, Odisha
13	Ms. Tripti Verma	Asstt. Manager	Energy Management Department, Bhilai Steel Plant
14	Mr. E. Venkateswara Rao	Manager (Process)	JANKI CORP LTD
15	Mr. Md. Mustaq	Deputy Mgr.	JSW ISPAT SPL. PROD. LTD
16	Mr. Veer Singh	Sr. Engr.	JSW ISPAT SPL. PROD. LTD
17	Mr. Om Prakash Khard	Sr. Manager	JSW ISPAT SPL. PROD. LTD
18	Mr. Bharat Mahajan	Manager	JSW ISPAT SPL. PROD. LTD
19	Mr. Nitin Thombre	Manager	JSW ISPAT SPL. PROD. LTD
20	Mr. Sujit Kumar Acharya	Manager (Electrical)	Vishal Metallics (P) Ltd.
21	Dr. Moolchand Jain	National President	Society of Energy Engineers & Managers (SEEM)
22	Mr. RPS Kushwaha	CEM	MCJ Energy Engineers Pvt. Ltd.
23	Mr. Raj Gaurav Bhonsle	Energy Engineer	MCJ Energy Engineers Pvt. Ltd.
24	Mr. Manoj Kumar Shah	Head CMO & WRM	Sarda Energy & Minerals Limited
25	Mr. Umakant Upadhyay	AGM	Sarda Energy & Minerals Limited
26	Dr. Raghuraj K Rao	MD	AKXA Tech Pvt. Ltd. Works
27	Mr. Sanjeev Jain	Advisor, CREDA	Chhattisgarh State Renewable Energy Development Agency (CREDA)
28	Mr. Nihar Ranjan Sahu	Project Coordinator, CREDA	Chhattisgarh State Renewable Energy Development Agency (CREDA)
29	Mr. Ravindra Kumar Singh	Sr. GM	Super Smelters Ltd.
30	Mr. Abhishek Barachhiha	Manager – Operation	Jagdamba Power, Ph -II, Siltara, Raipur
31	Mr. Avinash Sahu	Sr. Engineer – Electrical	Jagdamba Power, Ph -II, Siltara, Raipur

S. No	Name	Designation	Organisation
32	Mr. Dilip Kumar Mishra	AVP – Gasifier & Oxygen Plant	Godawari Power & Ispat Ltd., Ph-1, Siltara, Raipur
33	Mr. Mithilesh Singh	DGM - Operation	Godawari Power & Ispat Ltd., Ph-1, Siltara, Raipur
34	Mr. Rajesh Kumar	Manager - Electrical	Godawari Power & Ispat, Aaridongri Mines
35	Mr. PD Mishra	Manager – Electrical	Godawari Power & Ispat, Aaridongri Mines
36	Mr. Tunak Sil	DGM – SMS/Electrical	Godawari Power & Ispat Ltd., Ph-1, Siltara, Raipur
37	Mr. R.K.Trivedi	GM – Electrical & Engineering	RR Ispat, Raipur
38	Mr. Amit Kumar	AGM	RR Ispat, Raipur - Galvanization
39	Mr. Dilip Bhattalwar	Gen Manager (Project)	SAIL, Mul Road Chandrapur, Maharashtra
40	Mr. Ashok Pundir	Vice President	Shreeyam Power & Steel Industries Ltd.
41	Mr. Ravi Yadav	AGM	Shreeyam Power & Steel Industries Ltd.
42	Mr. Ramnaresh Choubey	Asst Manager (Energy audit)	Vandana Global Limited Works: Phase-II, Siltara Industrial Growth Center
43	Mr. Sumit Singh	Sr. Engineer (Energy audit)	Vandana Global Limited Works: Phase-II, Siltara Industrial Growth Center
44	Dr. Priyanka Pachauri	Project Coordinator	CREDA
45	Ms. Neena Raicha	Sr. Consultant Architect – Building Cell	CREDA
46	Ms. Preeti Gupta	Sr. Consultant Engineer – Building Cell	CREDA
47	Ms. Amardeep Gandhi	Sr. Consultant Engineer – Building Cell	CREDA
48	Mr. Sreekanth P K	Lead Energy Assessor	Industry Energy Assessment Cell (IEAC), IIT Bombay
49	Mr. NS Nehra	AVP	Godawari Power & Ispat Ltd., Ph-1, Siltara, Raipur
50	Mr. Sunil K Rai	GM	Godawari Power & Ispat Ltd., Ph-1, Siltara, Raipur
51	Mr. Nilabh Thakur	Assistant Manager	Godawari Power & Ispat Ltd., Ph-1, Siltara, Raipur
52	Mr. S.B. Jana	Associate Head DRP	Sunflag Iron & Steel Co. Ltd.
53	Mr. H. S. Singh	Associate Head MBF	Sunflag Iron & Steel Co. Ltd.
54	Mr. M. S. Chawla	Section Head A&E and Energy Manager	Sunflag Iron & Steel Co. Ltd.
55	Mr.R Jayakumar	VICE PRESIDENT	SOCIETY OF ENERGY ENGINEERS AND MANAGERS (SEEM)
56	Mr. G Krishnakumar	CHIEF OPERATING OFFICER	SOCIETY OF ENERGY ENGINEERS AND MANAGERS (SEEM)
57	Mr. S.K. Khandare	Director, BEE	Bureau of Energy Efficiency
58	Mr. K.K. Chakarvarti	Sr. Advisor	Knowledge Exchange Platform
59	Mr. Balwant Joshi	Managing Director	Idam Infra
60	Mr. Rajiv Shukla	Executive Director	Idam Infra

S. No	Name	Designation	Organisation
61	Ms. Dhaarna Rawat	Analyst	Idam Infra
62	Ms. Sanyukta Das Gupta	Smart Power Advisory	British High Commission, New Delhi
63	Mr. Anurag Singh Sirola	Manager	KPMG
64	Mr. Himanshu Choudhary	Sector Expert	BEE
65	Mr. Vivek Agarwal	COO	Godawari Power & Ispat Limited
66	Mr. Abhishek Agrawal	Executive Director	HIRA Group
67	Mr. M. Sudhakar	GM-System improvement	Godawari Power & Ispat Limited
68	Mr. Bhushan Patil*	International Funder Associate	Carbon Trust, ASPIRE Team
69	Mr. Niraj Singh*	Sales Manager	Carbon Clean
70	Mr. Sandeep Nanda	Energy Manager	Nava Limited, Dhenkanal, Odisha
71	Mr. Rajat Kanti Sahoo	Manager-Ele (FAP)	Nava Limited, Dhenkanal, Odisha
72	Mr. Deepti Ranjan Pradhan	Engr-MM (FAP)	Nava Limited, Dhenkanal, Odisha
73	Mr. Deepesh Goyal	AGM-Marketing	Vandana Global Ltd.
74	Mr. Aashish Kumar Gupta	Asst. Mgr- Solar & E.A.	Vandana Global Ltd.
75	Mr. Mahveer Jain	Founder & Director	E- Efficiency Management Consultancy Private Ltd.
76	Ms. Jisha Suresh*		S6 ME2, Department of Mechanical Engineering, SCMS School of Engineering and Technology
77	Ms. Teres Antu*		S4 ME, Department of Mechanical Engineering, SCMS School of Engineering and Technology
78	Mr. C Vijayakumar	Senior Fellow	The Energy and Resources Institute
79	Mr. V C Vishwakarma	Director	Allied Energy services
80	Mr. H.G.Rao	GM-DRP	JNIL, Raipur
81	Mr. D. Tiwari	GM-Inst	JNIL, Raipur
82	Mr. Alok Thakur		Steel Mint
83	Mr. Jai Prakash Sahu		Steel Mint
84	Mr. R D Gupta	VP	GPIL
85	Mr. Swarup Biswas	GM	GIPL
86	Mr. C S Verma	GM	HIRA
87	Mr. R K Maheshwari	DGM	GPIL
88	Mr. Pranay Agrawal	Director	GPIL
89	Mr. Prakash S.	Director	Sea change
90	Mr. Amit Das	AFM	GPIL
91	Mr. Vineet Singh	CFO	APPL
92	Mr. A. G. Sharma	Director	Stelex Industries
93	Mr. Mayank Tiwari		GPIL
94	Mr. Ishan		GPIL
95	Mr. Ritesh Chandrawash		GPIL

S. No	Name	Designation	Organisation
96	Mr. Poonam Sahu		GPIL
97	Mr. Prashant Dahiya		GPIL
98	Mr. Indrajit	Director	SAIL
99	Mr. David Boyd*	Chief Commercial Officer	CarbonRE
100	Dr Richard Curry*	SUSTAIN Programme Manager	Swansea University, Sustain Steel
101	Mr Patricio Burdiles*	Senior Project Manager, Department of Engineering	University of Cambridge
102	Ms. Selin Murat*	Head of Commercial Partnerships	Carbon8
103	Mr. Aaron Lucid*	Development and Partnership Manager	Carbon Upcycling
104	Mr. Baljeet Singh*	Associate Vice President	Aarti Steels Ltd
105	Ms. Piyali Sengupta*	Asst. Prof	Indian Institute of Social Welfare and Business Management (IISWBM)
106	Mr. Harsh Jape*		Ministry of Steel
107	Mr. P. K. Thakur*	Chief General Manager	Simplex Engineering & Foundry Works Pvt. Ltd.
108	Ms. Subhechha Ghosh*	Student	Indian Institute of Social Welfare and Business Management (IISWBM)
109	Ms. Shabina Khanam*	Associate Professor	IIT Roorkee
110	Ms. Ria Mitra Thakur*	Student	Indian Institute of Social Welfare and Business Management (IISWBM)
111	Ms. Sreejoni Bhattacharjee*	Student	Indian Institute of Social Welfare and Business Management (IISWBM)
112	Dr Binoy Krishna Choudhury*	Professor	Indian Institute of Social Welfare and Business Management (IISWBM)
113	Mr. ACR Das*		
114	Mr. Vivek Negi*	Joint Director	BEE
115	Mr. Sudhanshu Singh*	Project Engineer	BEE
116	Mr. Parth Vachhani*	Project Associate	The Energy and Resources Institute (TERI)
117	Mr. Anand Kumar Singh*	Research Associate	The Energy and Resources Institute (TERI)
118	Mr. Ratna Deep Gupta*	Vice President	Godawari Power & Ispat Limited

**Attended Virtually*