Steel SCENARIO

A JOURNAL ON FERROUS AND ALLIED SECTORS

August 2023

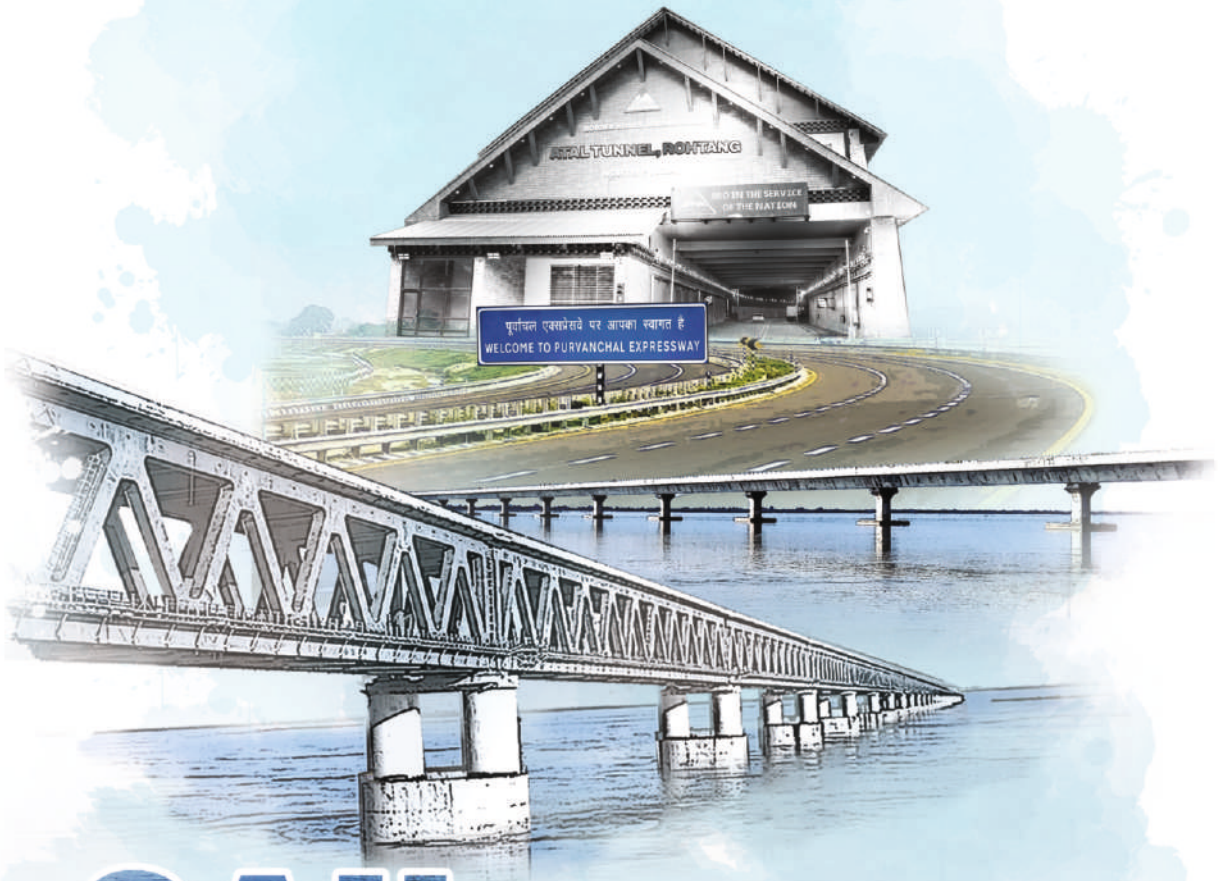
Azadi Ka Amrit Mahotsav

G20 भारत 2023 INDIA

सेल SAIL

Strengthening Infrastructure. Steering Progress.

SAIL, a Maharatna Public Sector Undertaking, is the steel backbone of India for decades.
SAIL steel remains the most preferred choice of the nation.



SAIL THE STEELMAKER OF ATMANIRBHAR BHARAT

स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED

There's a little bit of SAIL in everybody's life

India's first AI based steel chatbot - SAIL SARATHI, your assistant to SAIL steel.
For more details, visit www.sail.co.in or scan the QR code

www.facebook.com/SAILsteelofficial http://www.twitter.com/SAILsteel http://www.instagram.com/steelauthority

August 2023

CONTENTS

STEEL SCENARIO VOL 33/M 01

SECTION: EDITORIAL

Have the steelmakers reached the make-or-break moment? 2

SECTION : ARTICLE

India Net Zero Steel Demand Outlook Report 3

Effect of H_2 on Blast Furnace Ironmaking: A Review 6

ArcelorMittal: Green Steel for Europe, Blast Furnaces for India 16

Two PhD Students pave the way for the Future of the Blast Furnace 18

Assessment of Shaft Gas Injection Technology for Blast Furnace Ironmaking
By **JING LI, SHIBO KUANG, RUIPING ZOU and AIBING YU**
ARC Research Hub for Computational Particle Technology, Department of Chemical Engineering, Monash University, Melbourne 21

SECTION : REPORT

BNI - Business & Beyond 2023 31

SECTION : DATA BANK

Steel Market Price 32

Steel SCENARIO

Registration No. 53085 / 92

Founder Chief Editor
Late Dr. Monoj Chatterjee

Editor & Publisher
Sakuntala Chatterjee Chanda

Content & Marketing Executive
Joyanta Mani

Accounts & Admin
Gobinda Roy

Design & Layout
SERC

Representative in Bangladesh
Rifat Mahmood
+88-01911394324
serc.events@gmail.com

Spark Economy Research Centre
46CD, Binodini Bhavan, Sammillani Park, East Rajapur, Santoshpur, Kolkata - 700075
Email: info@steelscenario.com / editor@steelscenario.com | Web: www.serc.org.in

ATTENTION SUBSCRIBERS
Any complain of non-receipt of journal should reach 'Steel Scenario' office at Kolkata latest within a month of publication.
- Publisher

Printed and Published by Ms. Sakuntala C. Chanda on behalf of Spark Economy Research Centre at SERC.

Sakuntala, Editor & Publisher

Have the steelmakers reached the make-or-break moment?

Steel producers face a thorny investment dilemma: refurbish the coal-fired blast furnaces that have been the industry standard thus far or invest in new less emissions-intensive technology. Globally, 71 % of coal-fired blast furnaces need major refurbishment by 2030. The rest by 2040. Meanwhile, like all manufacturers, steel producers are facing regulatory and societal pressures to decarbonise their operations and manufacture steel without the use of fossil fuels. Iron and steel production accounts for 7% of carbon emissions worldwide. Manufacturers burn heavily polluting coal in blast furnaces in the process of turning iron into steel. Electric-arc furnaces, which use electricity to generate heat, offer a low-carbon alternative to blast furnaces. It is found that 43% of planned steelmaking capacity globally will rely on electric-arc furnaces, up from 33 % last year. Many major steelmakers have identified direct reduced iron (DRI) as a pathway to significantly reduce GHG emissions. DRI utilizes natural gas—and hydrogen as an even lower emission alternative—to directly reduce iron ore without the need for melting.

Much of the world's existing steelmaking infrastructure is fast becoming obsolete: Replacing heavy-polluting coal-fired blast furnaces with low-emission EAF technology fuelled by electricity offers the industry a chance to clean up its act. But will investors buy into the promise of sustainable green steel when the market for this premium product is still in its early stages?

The key challenges facing future blast furnace operations are therefore:

- Reducing CapEx and OpEx significantly to generate a sustainable ROCE throughout the economic cycle.
- Reducing effective CO_2 emissions to a point even below that determined from chemical thermodynamics of the conventional coke-based process.

Innovation is another factor driving many aspects of the energy transition and steelmaking is no exception. New solutions are being developed to ease the steel industry's transition to a more sustainable future. First, coal is a commodity with a global price tag, whereas the price for electricity to power EAFs is set regionally, which changes the business case significantly. Decarbonising the global steel industry will need more scrap steel recycling and a switch in primary production from coal-consuming blast furnaces to DRI processes using green hydrogen. This will require a plentiful supply of both green hydrogen and iron ore that is suitable for DRI processes. A faster-than-expected transition from blast furnaces to DRI-based steelmaking will clearly have implications for long-term metallurgical coal demand. The fundamental environmental challenge for the blast furnace is the use of carbon as a chemical reductant. This presents a hard thermodynamic limit, below which further carbon reduction is not possible without a significant process change.

> **"It is estimated that emissions reduction of 111 million tonnes from the business-as-usual scenario can be achieved in the sector by implementing CCU in 30% of total production."**

Policy support will help steel producers to stay competitive in the market while they pursue decarbonisation. The transition to decarbonised steel will come at a price. Installing decarbonisation technologies requires significant investment, as does the infrastructure for the renewable energy systems that will power them. Carbon capture, utilisation and storage (CCUS), particularly for the BF-BOF process in which substituting coal is difficult, must be used. Therefore, the option is to upscale the implementation of CCUS, which is being tried out by big players like Tata Steel (India) Ltd, JSW Steel and SAIL in their manufacturing plants. It is estimated that emissions reduction of 111 million tonnes from the business-as-usual scenario can be achieved in the sector by implementing CCU in 30% of total production. In this case, emissions in the BF-BOF route would go down from 414.37 million tonnes in the business-as-usual scenario to 290.06 million tonnes in 2030. The iron and steel industry is an emission-intensive sector and it is possible to bring down carbon dioxide (CO_2) emissions from our iron and steel sector drastically by 2030, while more than doubling India's output of steel. We can emit even less than what we do today. But this will need planning, technology and adequate funds. The bottom line is that it is possible to bend the CO_2 curve even for a sector like iron and steel. Countries like India can develop while drastically reducing their GHG emissions. But, will the developed countries accept the imperative of climate justice and provide the funds for the technology transformation necessary for a future-ready industry?

S.Chanda

Sakuntala Chanda