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NIPPON STEEL

Nippon Steel's Green Transformation (GX) Initiatives

NET ZERO

NIPPON STEEL Green Transformation initiative

March 13, 2025

Nippon Steel Corporation

Nippon Steel's Mission in Addressing Climate Change

Our Mission

Nippon Steel Corporation Group will pursue world-leading technologies and manufacturing capabilities, and contribute to society by providing excellent products and services.

Response to Climate Change

Reduce CO_2 emissions in the steelmaking process

Contribute to CO_2 emissions reduction in society
(CO_2 emissions reduction during steel processing and usage)

Ensure a sustainable supply of essential materials to build the social infrastructure while achieving continuous corporate value growth

Secure economic viability

Realize a carbon-neutral steelmaking process by 2050

Expand products that contribute to CO_2 emission reductions in society

Create economic value through CO_2emission reductions

Provision of GX Steel*

Provision of GX Solutions

Contribute to the customer's CO_2 reductions

2050 Realize a carbon neutral society

* GX Steel: Defined as "Green Steel for Green Transformation Development" as stated in the summary of the Study Group on Green Steel for GX Promotion, organized by the Ministry of Economy, Trade and Industry (METI) in January 2025.

Achieve Carbon Neutrality with Initiatives to Pursue the Twin Goals of Technology Development and Market Creation

Technology development to implementation

- 2030

Around 2040

High-grade steel production in large-scale EAFs

Production of direct reduced iron using hydrogen (shaft furnace, etc.)

Hydrogen Reduction in BFs

Committed to be the global pioneer in full-scale implementation technology and subsequent commercial deployment

Creation of GX Steel Market

Crystallizing the value of CO_2 reduction through data visualization and standardization

Foster the social environment to bear the cost of CO_2 reduction

Working together with society towards market creation

2030: 30% reduction in CO_2 emissions

2050: Carbon neutrality

Overview of Today's Presentation

Nippon Steel's CO_2 Reduction Scenario		2030: 30% reduction 2050: Carbon neutrality	P6 - 13
Technology development to implementation — **Multi-pathway approach**	No readily available decarbonization technologies in steelmaking exists; unlike renewable energy and nuclear power to transition the power sector	**Multi-pathway approach through the development and implementation of breakthrough technologies**	P14 - 36
Technology development to implementation — **Secure decarbonized energy and raw materials**	Huge quantities of cost-effective hydrogen and decarbonized energy is required for carbon-neutral steel production process.	**Policy measures are necessary for social infrastructure development** **[1] Hydrogen and decarbonized energy** **[2] CCUS**	P37 - 46
GX Steel market creation — **Adoption and standardization of GX Steel**	Rules must be established to ensure proper evaluation of marketing GX Steel and valuing CO_2 reduction.	**International standardization based on the mass balance approach is required.**	P47 - 52
GX Steel market creation — **Predictability of capex recovery**	A social framework is necessary to recover rising cost, including large-scale investments.	**Predictability of investment recovery is crucial.** **[1] Government support** **[2] Creating the GX Steel market**	P53 - 61
Nippon Steel Group's initiatives for CO_2 reduction			P62 - 66
Advocacy to society and Stance			P67 - 75

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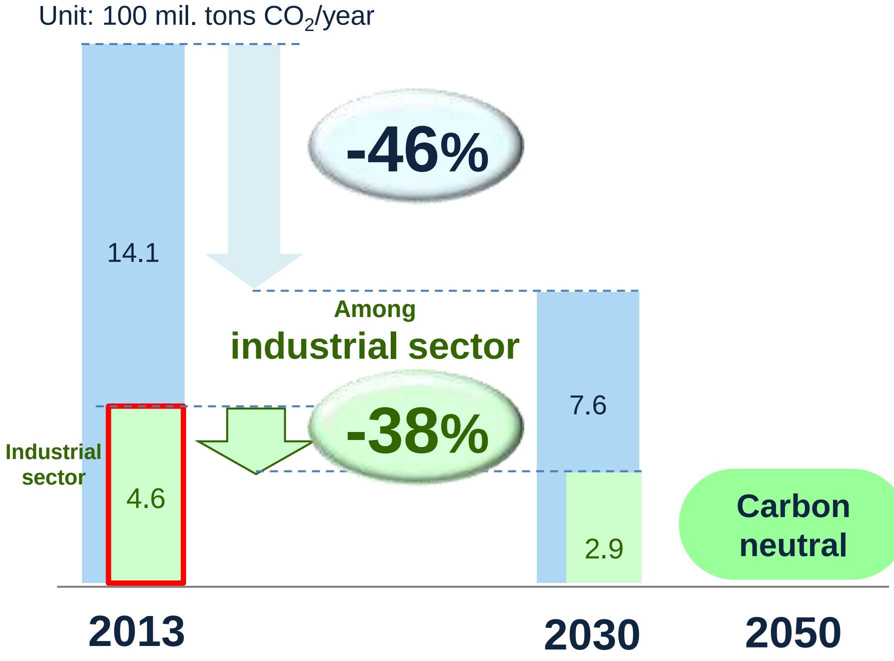
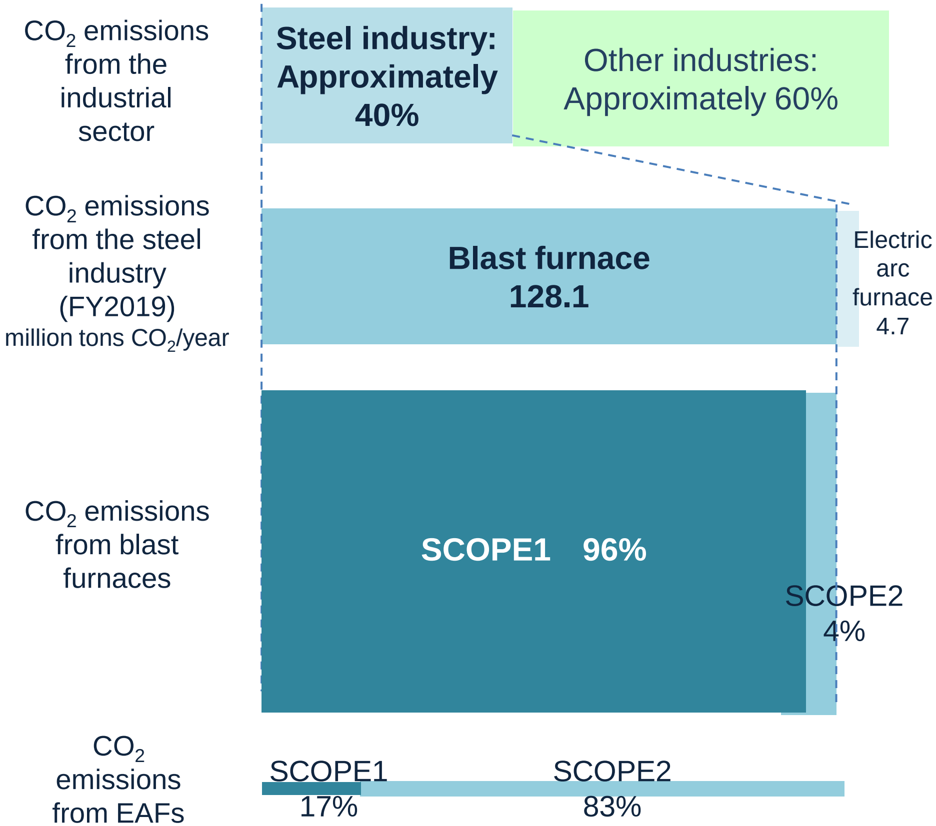
1. Nippon Steel's CO_2 Emission Reduction Scenario

Reduction of CO_2 Emissions from Blast Furnaces: A Key Challenge in Achieving Japan's Emission Reduction Targets

Achieving Japan's 2030 Nationally Determined Contributions (NDC) requires a significant reduction in Scope 1 emissions from blast furnaces, which accounts for a substantial portion of the country's CO_2 emissions.

Japan's 2030 Emission Reduction Targets under **the Law Concerning the Promotion of Measures to Cope with Global Warming**





These calculations are based on estimates by the Japan Iron and Steel Federation.

Iron Ore Requires Reduction

Iron exists in its oxidized form as iron ore in nature. Removal of oxygen from iron ore (reduction) is necessary for steel production.

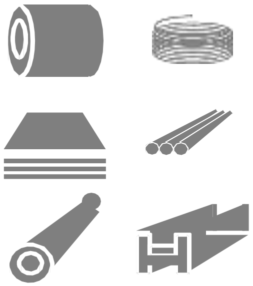
Chemical reaction of carbon (coal) and oxygen produces CO_2 emissions.

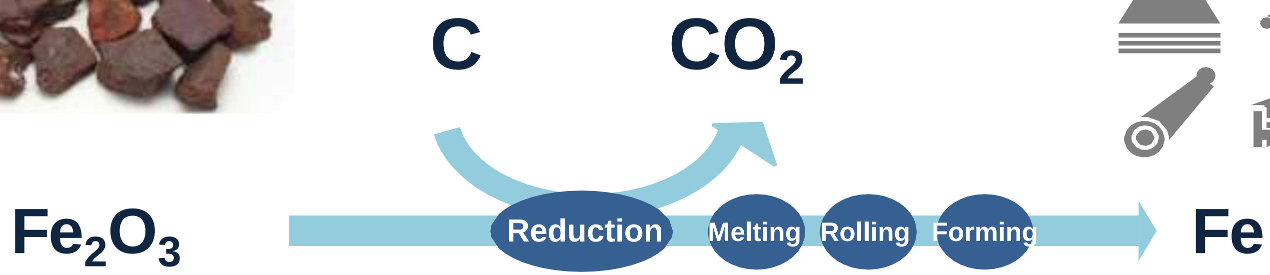
Iron ore exists naturally as oxidized iron compounds (e.g., Fe_2O_3),

Oxygen (O) is removed (reduced) from iron (Fe) using carbon (C) or other elements with high affinity to combine with oxygen.

Steel is produced.

Approximately 2 tons of CO_2 are produced for every 1 ton of iron produced.

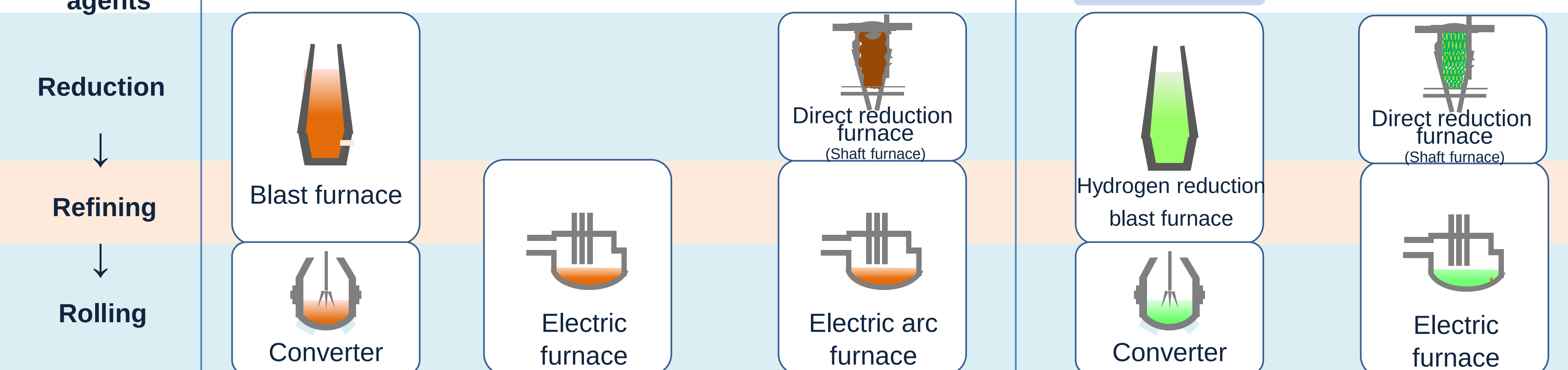




Various Steel Production Processes

Iron ore reduction-based processes vs. scrap melting-based recycling processes

	Existing Processes			Processes Under Development	
	In operation at Nippon Steel		In operation at AM/NS India	Under development by Nippon Steel	
	Blast furnace + converter route	EAF route	**Direct reduction + EAF route**	**Blast furnace + converter route**	**Direct reduction + EAF route**
	Blast furnace -> Converter	**EAF scrap melting**	**Natural gas direct reduction -> EAF**	**Hydrogen reduction blast furnace -> Converter + CCUS***	**Hydrogen direct reduction -> EAF**
CO_2 emission intensity t-CO_2/t-steel	Approximately 2	Approximately 0.3-0.7 Scrap melting after reduction, resulting in low CO_2 emissions	Approximately 1.6	Carbon neutral	Carbon neutral
Raw material	Iron ore	Scrap	High-grade iron ore	Iron ore	Iron ore, Scrap
Reducing agents	Coal		Natural gas	Coal, **H2**	**H2**



*CCUS = Carbon Capture, Utilization and Storage

Constraints of the "Hydrogen Direct Reduction + EAF"

Although "EAF Scrap Melting" and "Hydrogen Direct Reduction + EAF" processes have superior decarbonization potential, a complete and full transition from current production process is unfeasible due to quantitative and qualitative constraints

Constraints of direct reduction

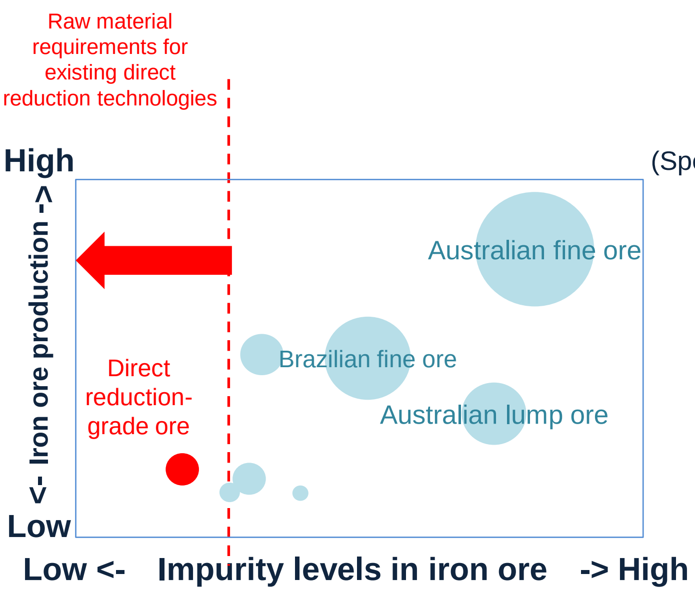
Constraints of EAF scrap melting

Quantitative constraints

Qualitative constraints

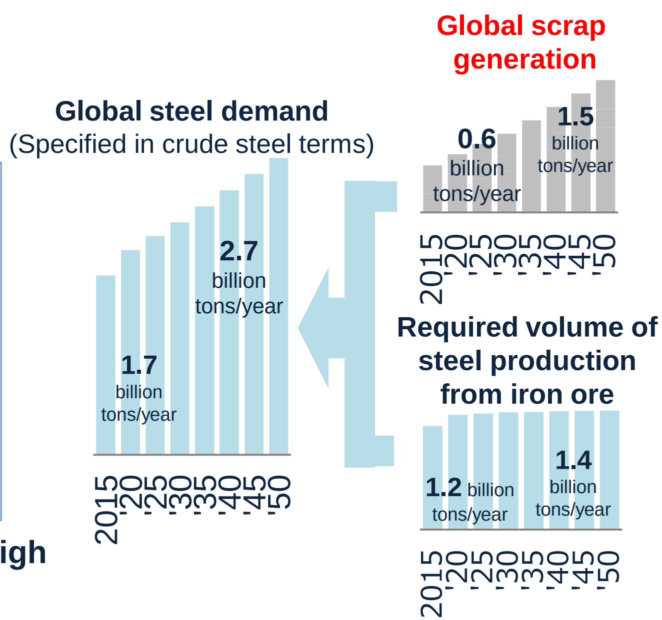
Resource availability of high-grade iron ore

Production of direct reduced iron requires rare high-grade iron ore which accounts for only 5–10% of the world's iron ore resources.



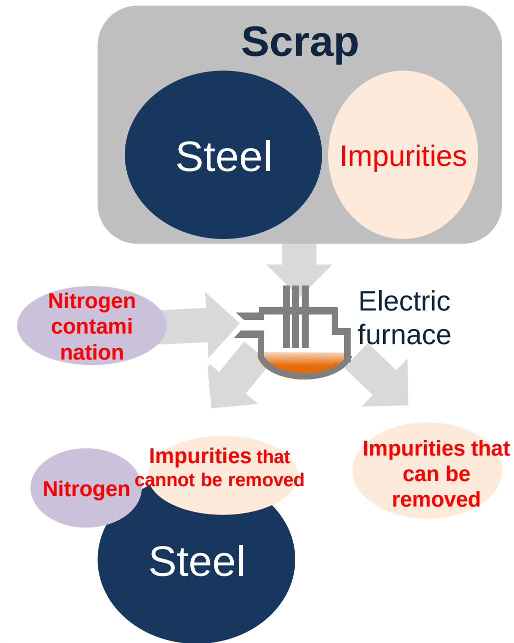
Limited availability of scrap

Despite increasing scrap metal availability, iron ore reduction still remains necessary to meet global steel demand.



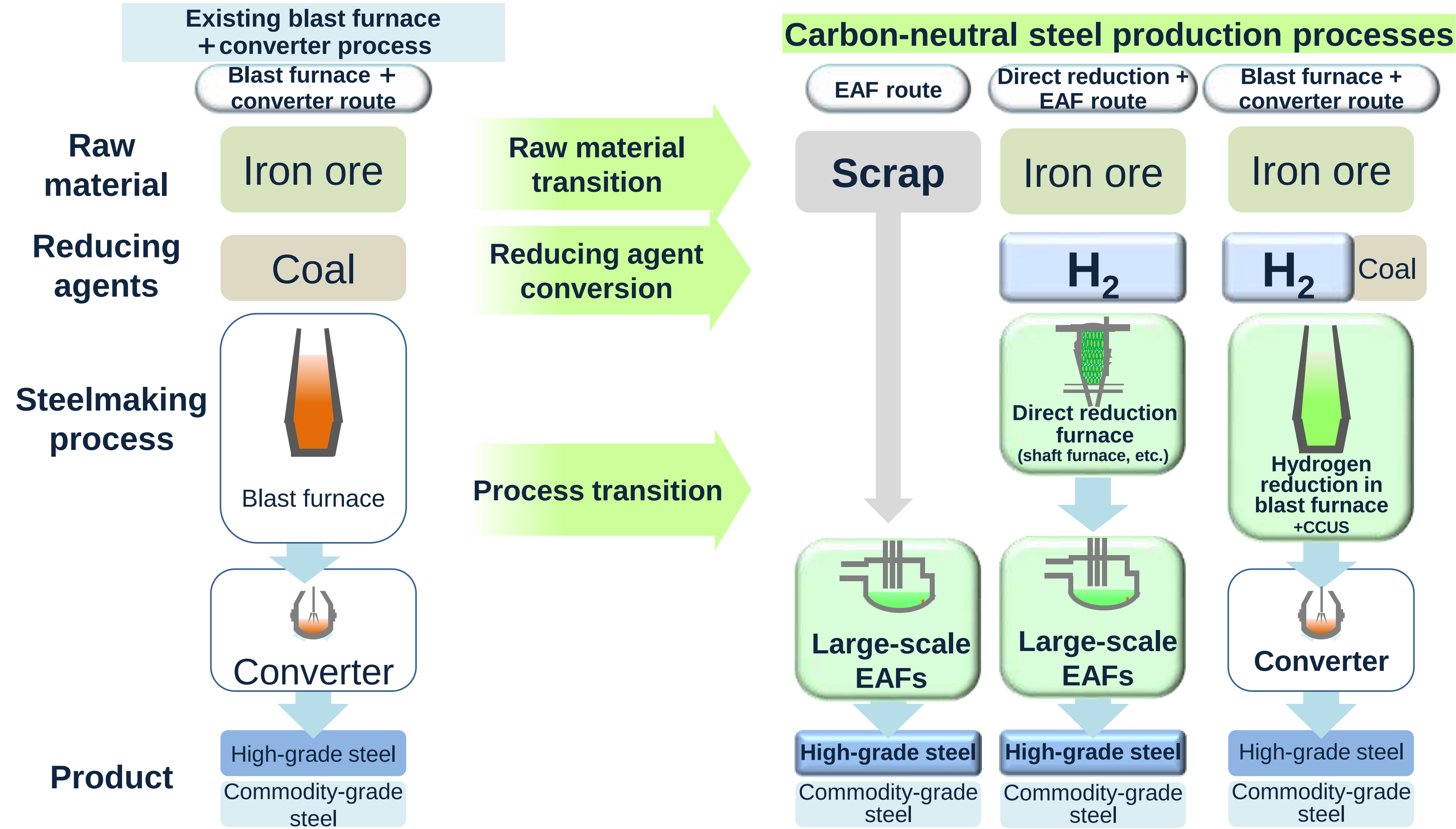
Impurities in steel scrap

Impurities present in scrap and nitrogen contamination during electric arc furnace (EAF) melting make it difficult to produce high-grade steel in EAFs.



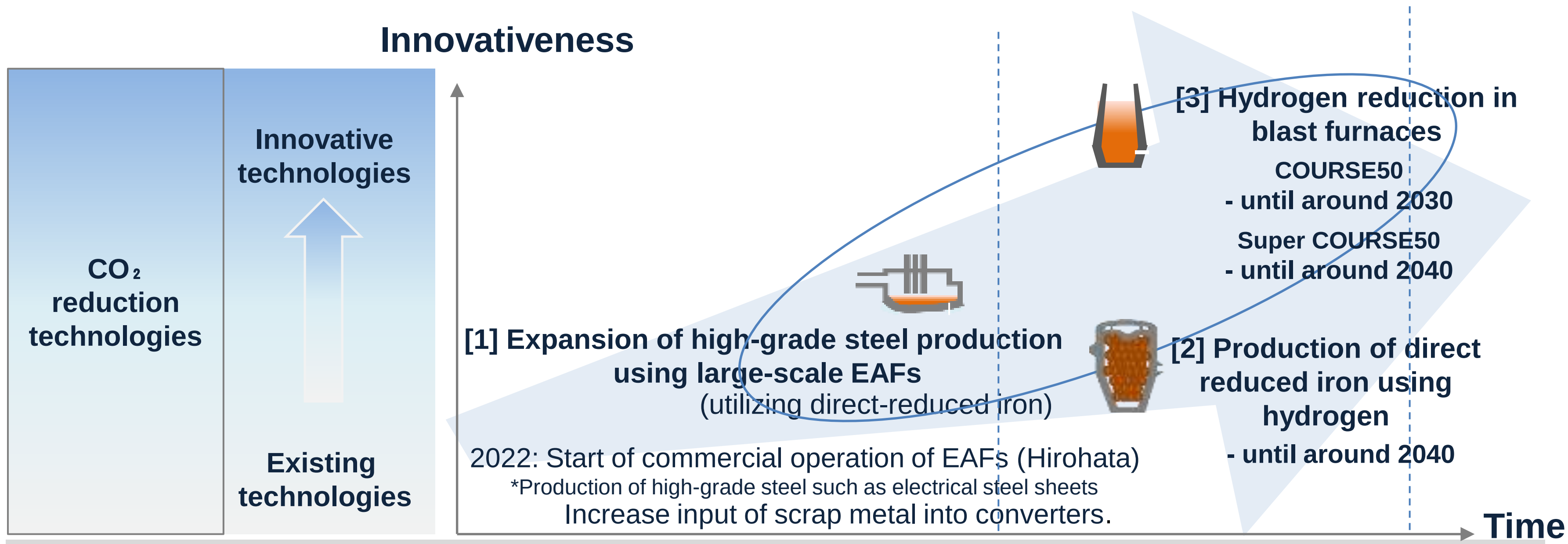
Nippon Steel's Carbon-Neutral Steel Production Processes

Necessary to pursue a multi-pathway that combines "hydrogen reduction in blast furnace ＋ CCUS" and "hydrogen direct reduction ＋EAFs"



Reduction and Transition of CO_2 Emissions from Blast Furnaces

The primary transition path will be from blast furnaces to EAFs up to 2030.
From 2030 to 2050, we will pursue full-scale implementation of GX technologies for iron ore reduction, including hydrogen reduction in blast furnaces and production of direct reduced iron using hydrogen.



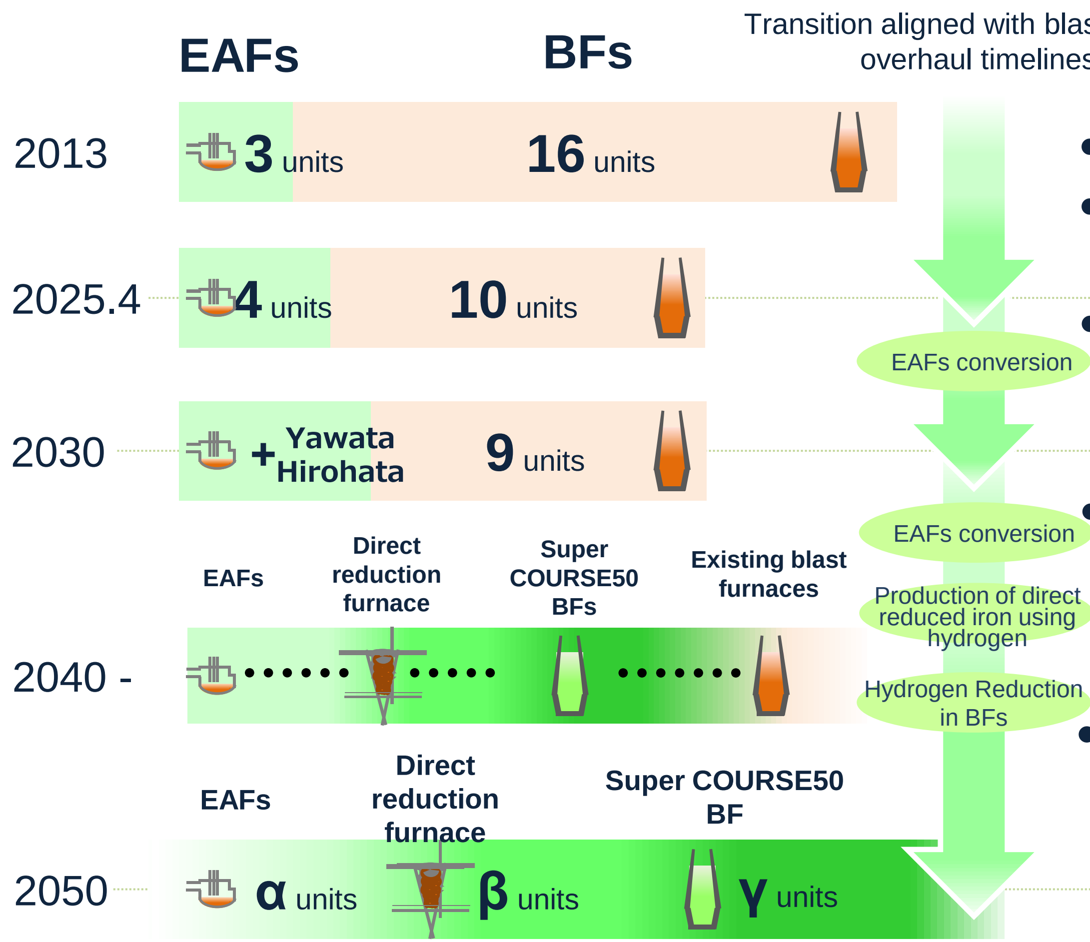
CO_2 emissions reduction target and vision
*Nippon Steel's CO_2 emissions: 102 million tons/year (2013 baseline)

2030
▼30%
(compared to 2013 baseline)

2050
Carbon neutral

Carbon Neutral Transition of Existing Blast Furnaces

The existing domestic blast furnaces will be transitioned to (a) EAFs, (b) direct reduction furnaces and/or (c) Super COURSE50 blast furnaces by 2050. Carbon neutrality will be achieved through the optimal combination of these technologies



- **Decommissioning BFs**
  (Kimitsu No.1, Kokura No.1, Wakayama No.1, Kure No.1,2, Kashima No.1)
- **October 2022**
  New No.1 EAF at Hirohata Area, Setouchi Works
- **-2030**
  BF conversion to electric arc furnaces (nos. of units are TBD) at Yawata Area, Kyushu Works.
  New No.2 EAF installed at Hirohata Area, Setouchi Works
- **Up to 2040**
  Technological readiness for full-scale implementation of Super-COURSE50 hydrogen reduction in blast furnaces and production of direct reduced iron using hydrogen
- **-2050**
  Transition ALL blast furnaces to either EAFs, direct reducing furnaces, and/or Super-COURSE50 blast furnaces

2. Development and Implementation of Emission Reduction Technologies

(1) Technology Development to Implementation, Multi-pathway approach

[1]
Roadmap

Carbon Neutral Vision 2050 Roadmap

present | 2030 | 2050

High-grade steel production in large-scale EAFs

2022
Hirohata No.1 EAF starts commercial operation

Accumulate knowledge of high-grade steelmaking using EAF

2023
Start in-depth study for EAF conversion

- 2030
Hirohata No.2 EAF starts operation

Under construction

2024
Complete installation of experimental EAF
(of 10 t/ch)
at Hasaki R&D Center and start experimental tests

- 2030
Yawata and Shunan EAFs starts operation

Production of direct reduced iron using hydrogen

Hydreams

Integrated technology development of both large-scale EAFs and reduced iron production for use in EAFs at Hasaki R&D Center

Under construction

2025
Install experimental reduction furnace at Hasaki R&D Center, commence test operations

2027
In-depth research into scaling up

by around 2040
Establish implementation technology

Implementation

Electric melting furnace

- 2030
Establish implementation technology

Hydrogen reduction in blast furnaces

2008 -
Start COURSE50 development

Under construction of hydrogen injection facility

2026
Test commences at Kimitsu #2 BF

- 2030
COURSE50 implementation

2022
Start Super COURSE50 testing at the Kimitsu test furnace

Scale-up testing

by around 2040
Establishing full-scale implementation technology for Super COURSE50

Implementation

Reduction in CO_2 emissions confirmed

2022	2023	2024
-23%	33%	-43%

CO_2 emission reduction by 50% or more

CCS

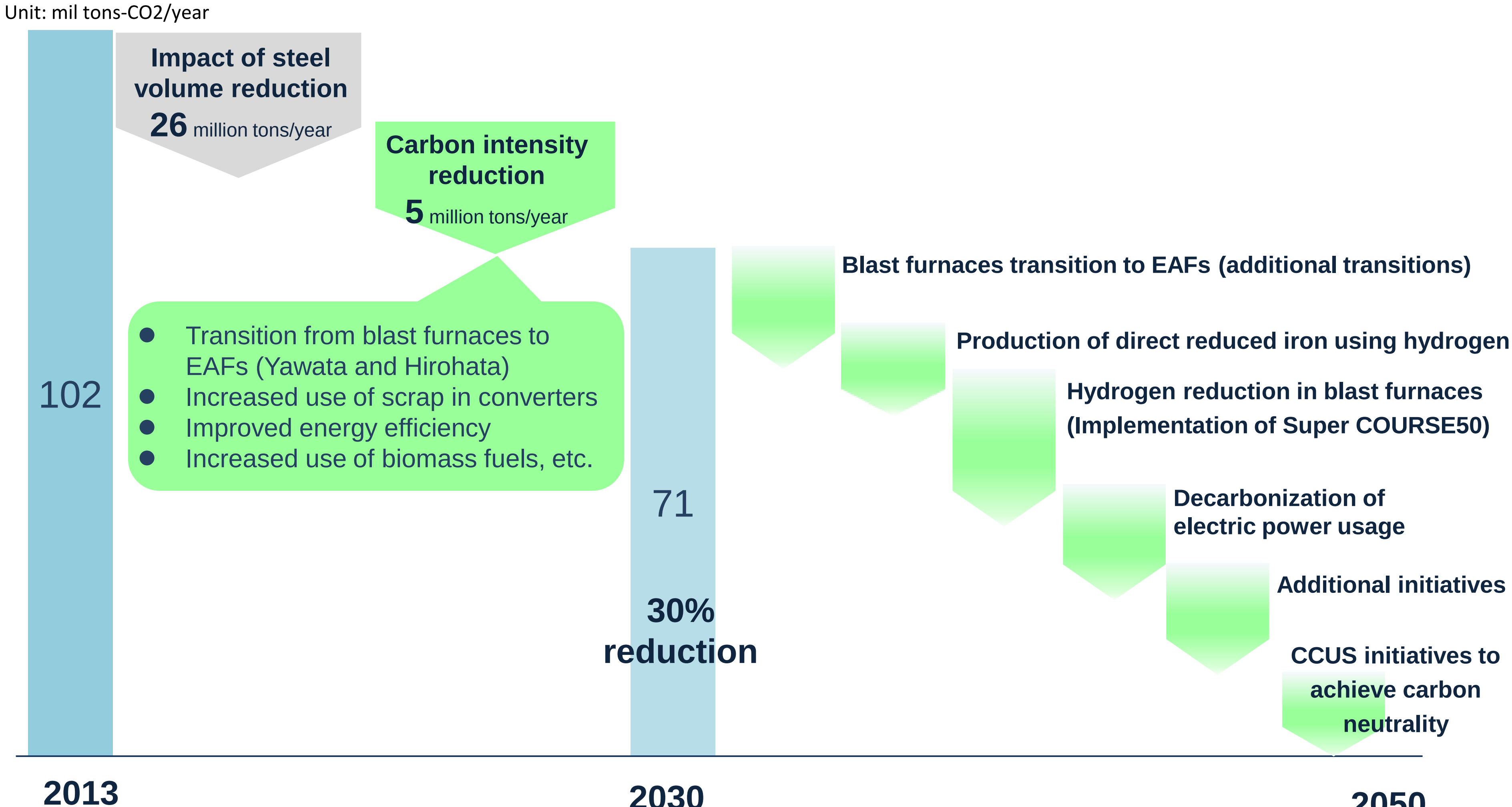
Engineering design work for advanced CCS projects

30% Reduction

Fully Achieve Carbon Neutral Production Process

Technology Implementation Roadmap to Achieve Carbon Neutrality by 2050

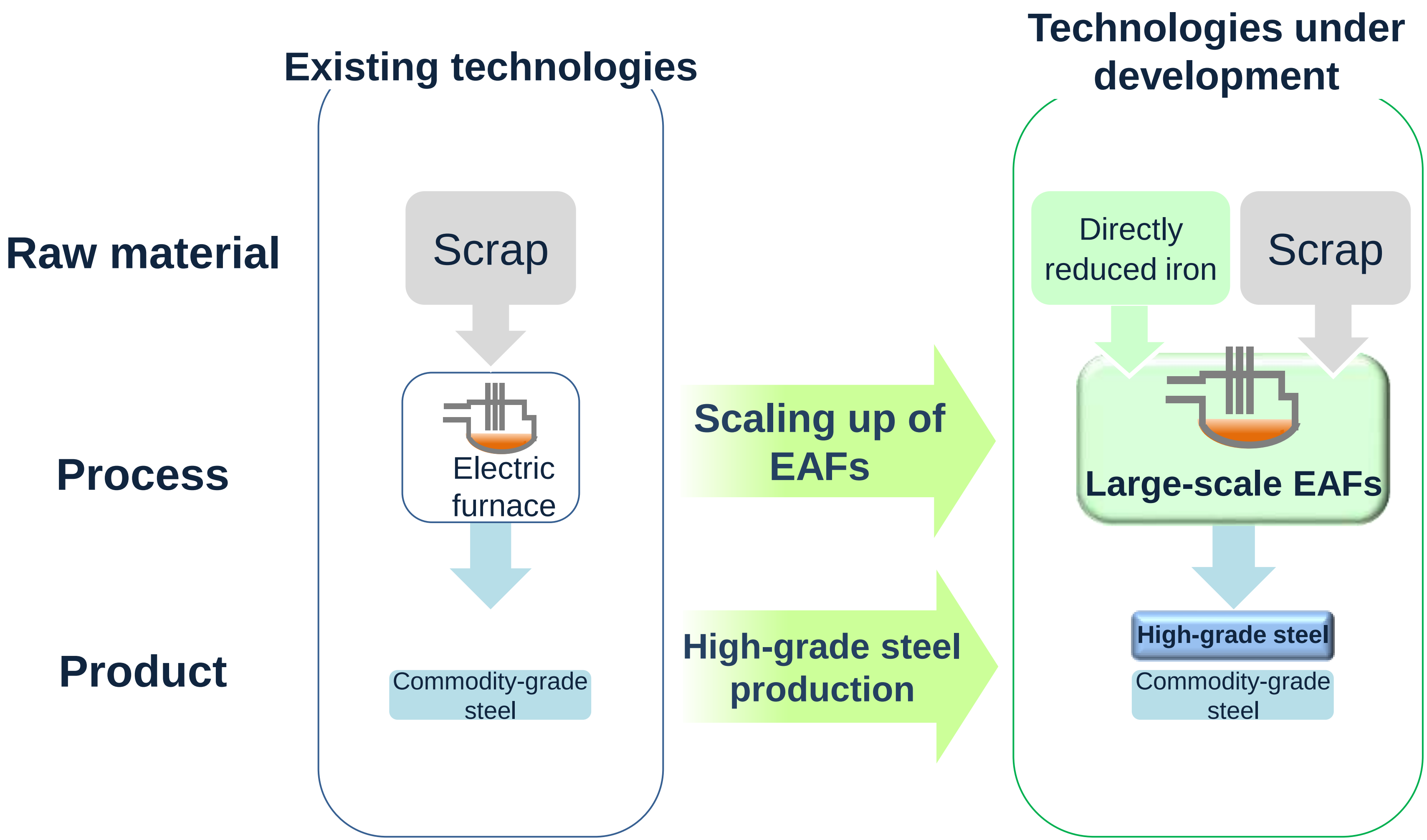
Steadily advancing towards full implementation of the multi-pathway CO_2 reduction technologies to achieve 30% reduction by 2030 and carbon neutrality by 2050.



[2]
High-grade steel production in large-scale EAFs

Technology Overview of High-Grade Steel Production in Large-Scale EAFs

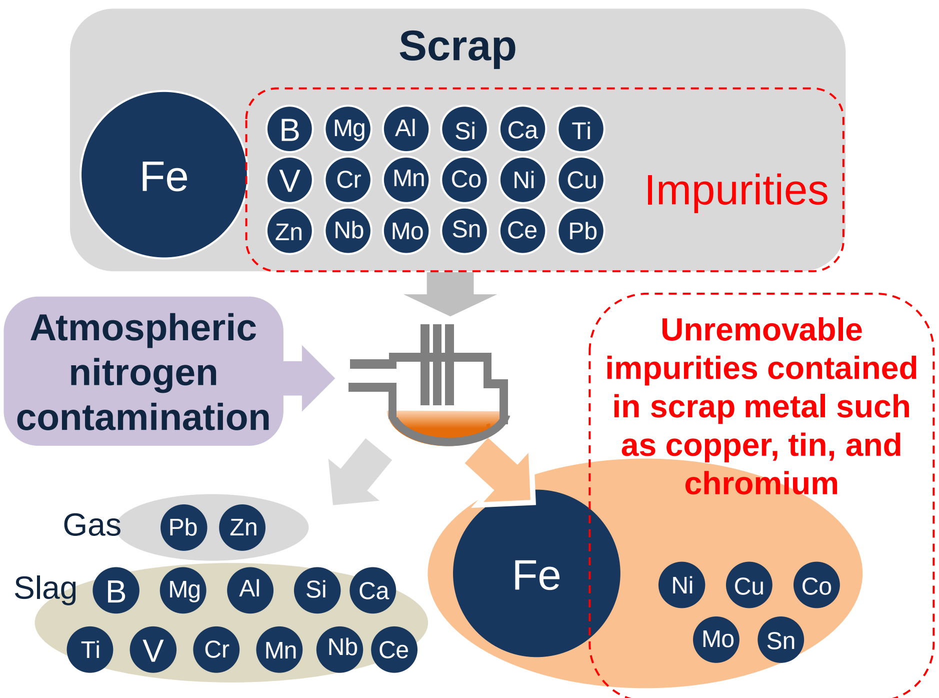
Development of electric arc furnace technology with productivity and steel quality on par with blast furnace + converter process



Challenges of High-Grade Steel Production in Large-Scale EAFs

Quality challenges

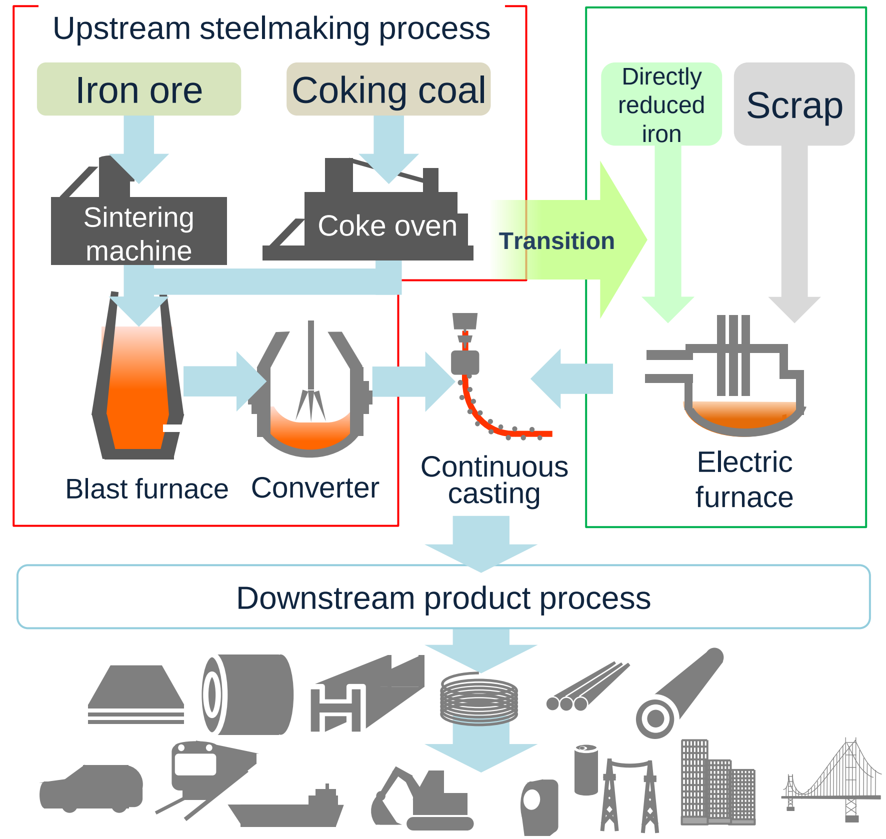
Difficulty in manufacturing high-grade steel with advanced processability and functionality



Current EAF technology is far inferior compared to BF + converter method for chemistry control, such as alloy composition control and impurity removal

Productivity challenges

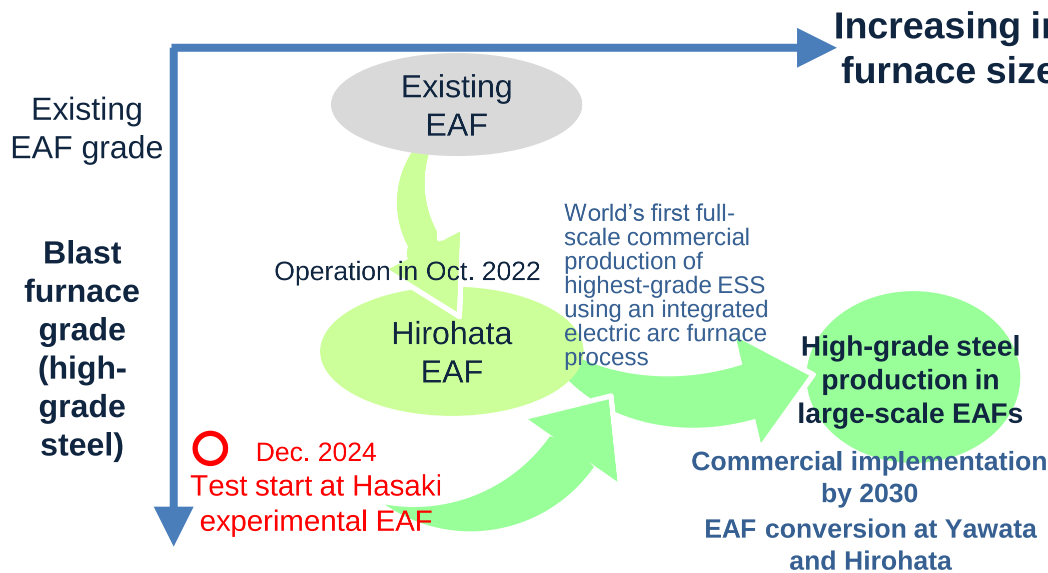
EAFs must achieve significantly higher productivity to replace blast furnaces, requiring large-scale EAF deployment.



Utilize the same downstream process and facility as is to provide high-grade steel to customers

Progress of Technology Development of High-Grade Steel Production in Large-Scale EAFs

World's first ever commercial production of high-grade electrical steel sheets (ESS) at Hirohata EAF. Development continues and testing commenced at the experimental EAF



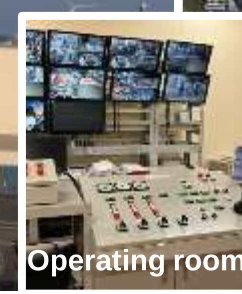
Green Innovation (GI) Fund eligible Project

Tests commenced at experimental EAF to deepen and expand technological advances

- Installation completed for experimental EAF (10 -ton/ch scale) at Hasaki R&D Center, a GI Fund project
- Commenced development and verification of high-efficiency dephosphorization and denitrification technologies in 2025

-> Onboard these new technologies into large-scale EAFs for commercial implementation


Experimental EAF building


Operating room


Inside EAF building

GI (Green Innovation) Fund : A government fund to provide continuous support to companies and others committed to ambitious goals to achieve carbon neutrality by 2050, from R&D and demonstration to social implementation, for a period of 10 years.

Assessment of the first Hirohata EAF completed, paving the way for the construction of a second unit.

The newly installed EAF at Setouchi Works, Hirohata Area, commenced operation in October 2022, marking the world's first production of high-grade electrical steel sheets using an electric arc furnace as well as high-grade thin sheet production.

Construct second EAF unit by 2030.

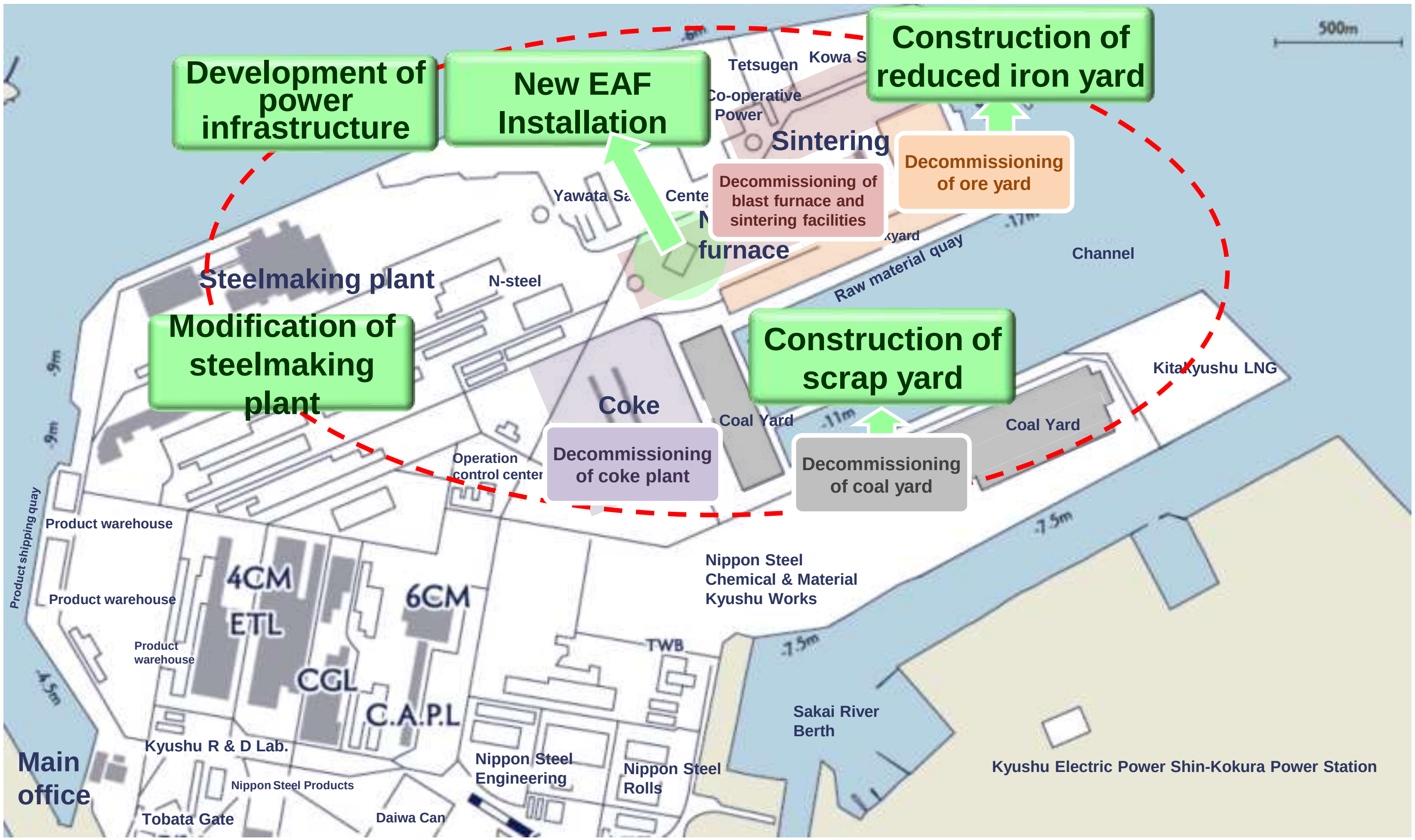

Electric furnace in Hirohata Area

EAF Conversion at Yawata Area, Kyushu Works

A mega project to transform and revitalize the birthplace of modern steelmaking.

Project's investment will redevelop <u>approximately 50%</u> of the total area of the Yawata Area.

Total land area of Yawata Area: Approximately 7 million m^2 (equivalent to around 150 Tokyo Domes)



Comprehensive Strategy for Steel Scrap and HBI & Pig Iron

Expansion of large-scale EAFs to significantly increase demand for steel scrap

Nippon Steel Group to adopt a comprehensive strategy for procurement, utilization, inventory management, and logistics of raw materials in order to optimize procurement and material blending on a Group-wide basis.

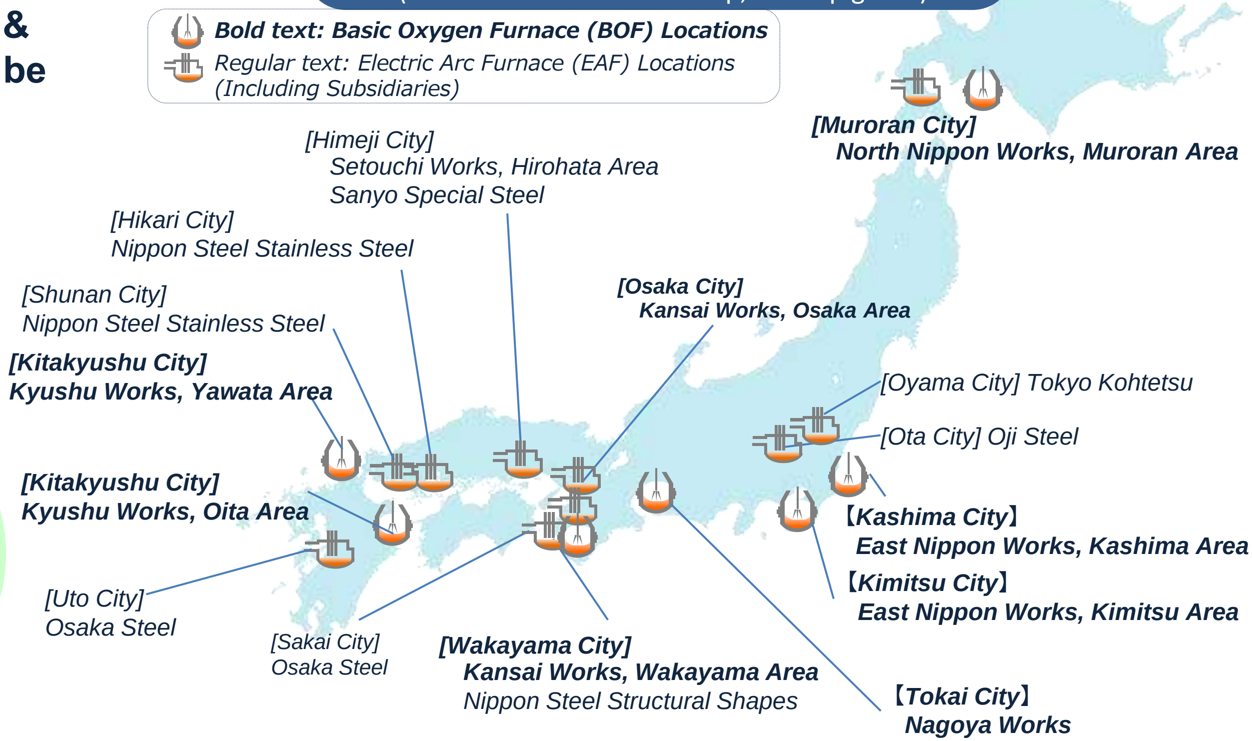
A dedicated division in charge of this strategy called "Steel Scrap, HBI & Pig Iron General Planning Div." to be established in April 2025

Usage
Establishment of usage criteria based on technical and quality considerations

Procurement
Buildout of a supplier network
Customer recycling scrap
Upgrade lower-grade scrap to higher-grade scrap

Logistics
Buildout of intermediate sites and satellite yards
Optimization of logistics across entire company

Nippon Steel Group EAF locations
(i.e. sites that use steel scrap, HBI & pig iron)

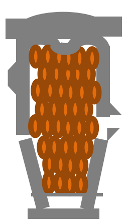


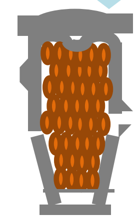
[3]
Production of Direct Reduced Iron Using Hydrogen

Overview of Technology for Producing Direct Reduced Iron Using Hydrogen

Technology development of (a) conversion of reducing agents from natural gas to hydrogen and (b) utilizing low-grade iron ore currently unsuitable for direct reduction

	Existing technologies		Technologies Under Development
Raw material	High-grade iron ore → Pellet	**[Raw material transition]** **Utilization of low-grade ore**	**Low-grade iron ore** → Pellet
Reducing agents	Natural gas	**[Reducing agent conversion]** **Transition from natural gas to hydrogen**	**Heated hydrogen**
Process	Direct reduction furnace (Shaft furnace) → CO_2		Direct reduction furnace (Shaft furnace) → H_2O
	Directly reduced iron (Solid form)		Directly reduced iron (Solid form)

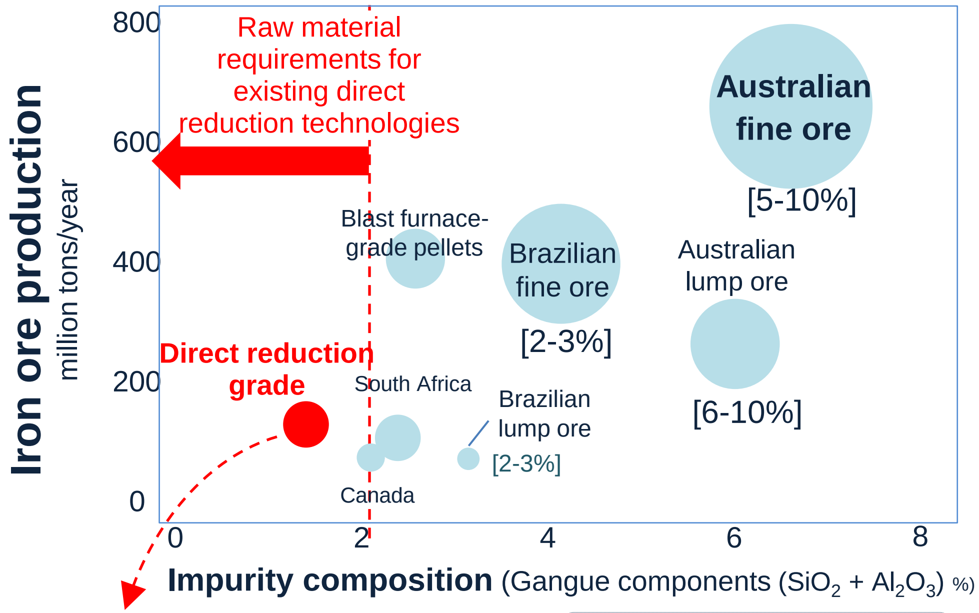




Challenges in Technology for Producing Direct Reduced Iron Using Hydrogen [1]

Raw material challenges

High-grade iron ore suitable for direct reduced iron production is a scarce resource that constitutes less than 10% of the global iron ore supply



Geographically concentrated in certain regions such as Northern Europe and North America.

Bubble size: Export volume
[ ]: Crystal water content

Source: Created by Nippon Steel based on CRU/AME data (2018 production/export volumes)

Productivity challenges

Using low-grade iron ore poses significant obstacles to productivity, stable operation, and the quality of reduced iron.

[Challenges in using Australian Fine Ore to make Direct Reduced Iron]

[1] <u>High crystalline water content</u> (5-10%)
⇒Risk of pellet **explosion** during production
⇒**Low-strength pellets**

[2] <u>High slag content</u> (approx. 5× higher than standard)
⇒ Deterioration in the quality of reduced iron (DRI/HBI*)
Issues include: **Low melting efficiency**, **reduced reactivity**, increased **powdering**, and excessive **slag volume**

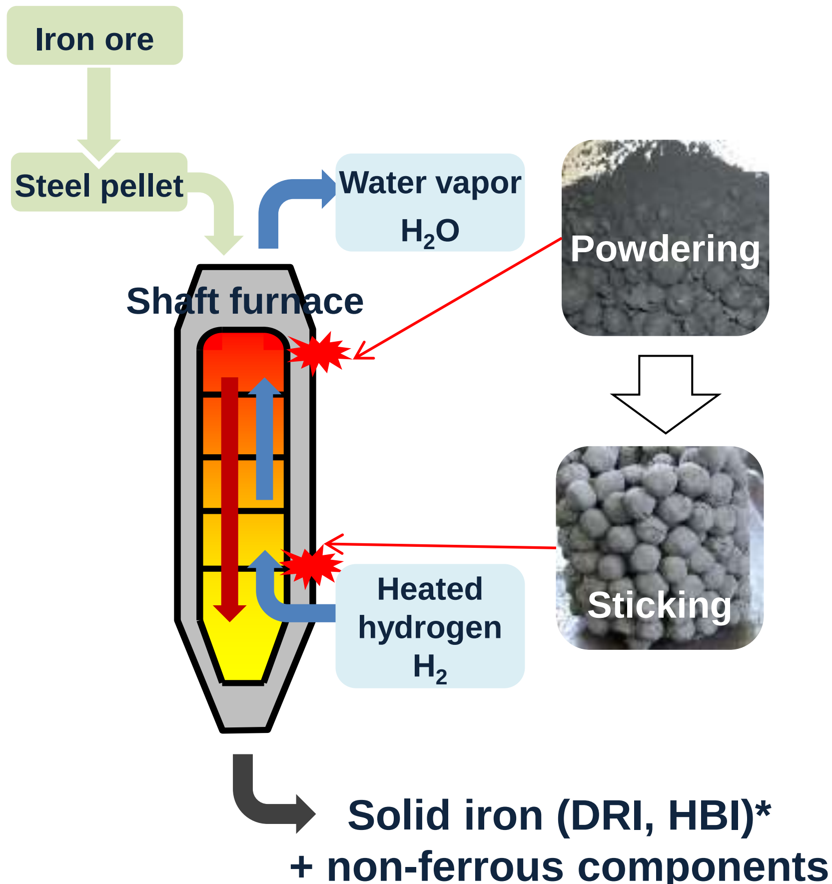
[3] <u>High phosphorus content</u>

*DRI = Direct Reduced Iron
HBI = Hot Briquetted Iron

Challenges in Technology for Producing Direct Reduced Iron Using Hydrogen [2]

Hydrogen-specific challenges

Hydrogen reduction is an endothermic reaction, requiring thermal compensation, which exacerbates the powdering and sticking of iron ore.



*DRI = Direct Reduced Iron
HBI = Hot Briquetted Iron

Thermal compensation

Natural gas reduction is an exothermic reaction, **whereas hydrogen reduction is endothermic, requiring thermal compensation** for the absorbed heat.

Ensuring operational safety is critical.

Powdering and sticking

Changes in furnace temperature patterns exacerbate iron ore powdering.
Issues that are likely to occur are: disruption of reducing gas flow and sticking of the produced materials inside the shaft furnace.

Only high-grade iron ore can be used, which is resistant to powdering and sticking, but scarcity is an issue.

Progress of Technology Development for Producing Direct Reduced Iron Using Hydrogen [1]

Nippon Steel has been conducting tests to accumulate technical expertise using a bench-scale shaft furnace installed at Futtsu's RE Center since 2010

- **Testing commences using natural gas injection**

  Development of fundamental technologies for utilizing low-grade iron ore
  - Mitigation of reduction degradation and sticking
  - Thermal compensation technologies, etc.

- **Hydrogen injection testing initiated in 2019**

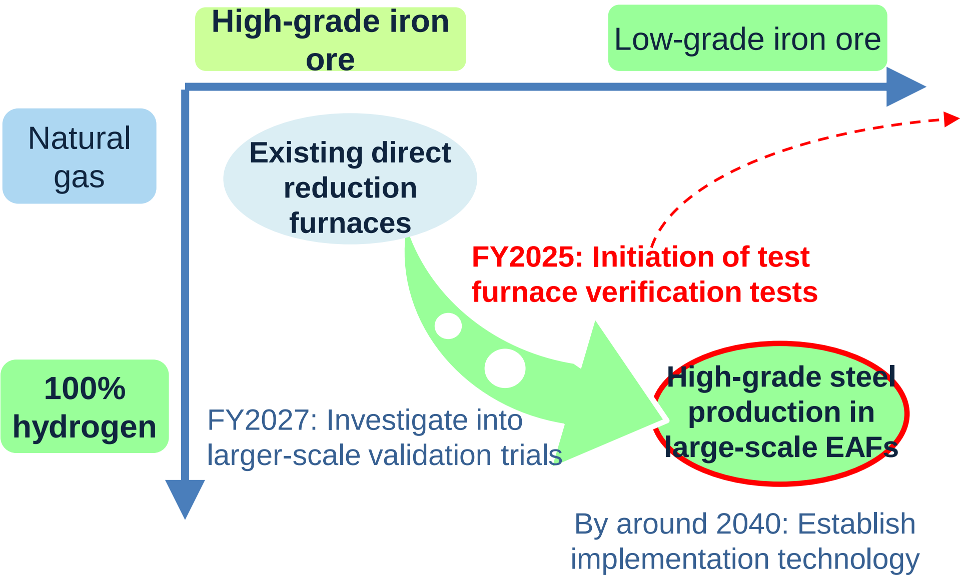
- Endothermic reaction of hydrogen reduction leads to a wider low-temperature zone.
- Low temperature zone (a) triggers powdering triggered due to low-temperature reduction and (b) stimulates sticking (clustering) ⇒ Leading to production instability.

- **Advanced technologies to mitigate powdering and sticking are under development.**

GI fund eligible project

Progress of Technology Development for Producing Direct Reduced Iron Using Hydrogen [2]

A larger-scale test shaft furnace is under construction at Hasaki R&D Center, with test operations scheduled to begin in FY2025. Aiming to establish an industrial-scale hydrogen-based DRI production technology by around 2040.



Larger-scale trials set to commence in FY2025.

GI Fund project

Production capacity: 1t/h

Site dimensions: Approximately 80 m × 200 m

Height: Approximately 60 m

Reference (full-scale industrial plant): Approximately 100-150 m

Full process evaluation (reduction -> cooling -> molding) to be conducted on process flow, equipment and system configuration similar to a commercial plant.

Proceeding to Acquire Mining Interest into High-Grade Iron Ore Mine Suitable for Direct Reduced Iron Production

Invested in the feasibility study for the development and operation of Kami Mine in Eastern Canada, which is expected to have abundant high-grade ore reserves

In June 2025, a joint venture agreement will be signed to establish Kami General Partnership (GP) and commence the feasibility study for the development and operation of a new mining area.

- Equity stake: Nippon Steel 30%, Sojitz 19%, Champion Iron (CI) 51%
- Investment amount: CND $150 Million (Approx. ¥16.2 Billion)

Overview of Kami iron ore mine

Open-pit iron ore mine in Eastern Canada, with abundant reserves of scarce **DR-grade iron ore**

- Located where stable hydroelectric power is available
- Production Volume : Approx. 9 MT/y
- Resource Reserves : Approx. 600 MT (Open-pit iron ore mine)
- Mine Life: Approx. 25 years
- Fe Ratio : 67.5% or more

High-grade iron ore with low gangue content (such as alumina and silica) **suitable for direct reduced iron production.**

[4]
Hydrogen injection into BFs

Overview and Challenges of Hydrogen Reduction in Blast Furnace Technology

Reduce CO_2 emissions by over 50% by converting BF reducing agent from coking coal to hydrogen. Carbon neutrality achieved with the combined use of CCUS.

Existing technologies

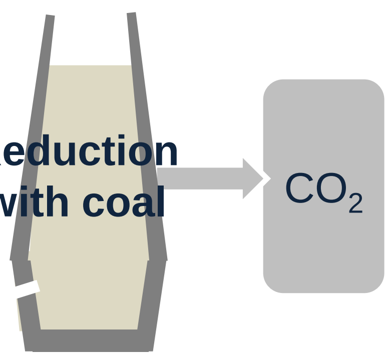
Raw material

Iron ore

Reducing agents

Coal

Process



Blast furnace

[Reducing agent conversion]
Reduction using hydrogen

Thermal challenges

Hydrogen reduction is an endothermic reaction which leads to a drop in furnace temperature, which causes:

(1) Reaction to be interrupted/ discontinuous; and
(2) Insufficient melting of iron

Hydrogen-specific challenges

Handling of heated hydrogen

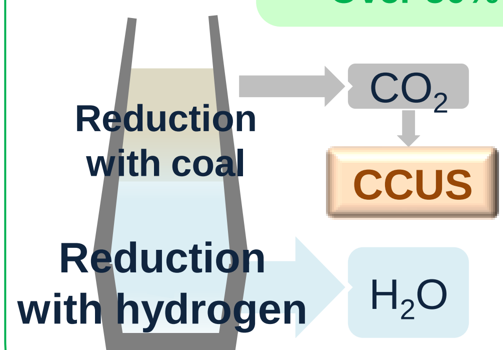
Technologies Under Development

Iron ore

Coal

Heated hydrogen

CO_2 reduction: Over 50%



Blast furnace

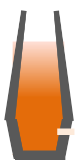
CCUS = Carbon Capture, Utilization and Storage

Decarbonization that Leverages the Strengths of Blast Furnace Process (Large-scale Integrated Steelworks)

Blast furnace method is **currently the only existing large-scale integrated steelmaking process capable of mass-producing high-grade steel products from iron ore.**

Developing the hydrogen reduction technology for blast furnaces enables decarbonization while leveraging this characteristic

Blast furnace + converter process

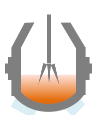


Blast furnace

<u>Average size of Nippon Steel's blast furnaces</u>:

Approximately 4,900 m^3 per unit

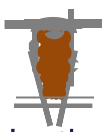
≒ 4 million tons per year per unit (capacity)



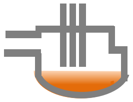
Converter

<u>Average size of Nippon Steel's converters</u>:
Approximately 280 tons per charge
≒ 4 million tons per year per unit (capacity)

Existing DR furnace + EAF process



Direct reduction furnace
(Shaft furnace)



Electric furnace

<u>Average size of EAFs</u>＜
100 ton per charge
≒0.7 million tons per year per unit (capacity)

Advantages and Potential of Development of Technology for Hydrogen Reduction in Blast Furnaces

Nippon Steel's technological advantages for hydrogen reduction in blast furnaces

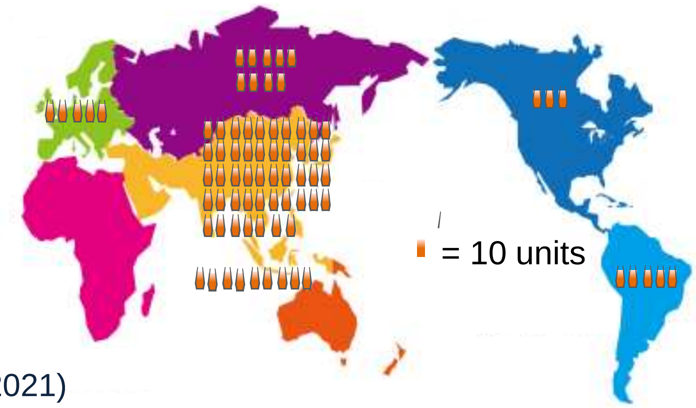
- **Leading the world** in research and development of hydrogen reduction in test blast furnaces since 2016
- Leveraging **Nippon Steel's comprehensive expertise** to drive the technology development:
  - World-class BF operational technology gained through decades of practical experience
  - Advanced analytical technology, including blast furnace mathematical modeling accumulated at research divisions
  - Cutting-edge equipment technology, such as hydrogen heating system

Potential for global CO_2 reduction using hydrogen reduction in blast furnaces

- **Very significant global CO_2 reduction potential** by successfully deploying hydrogen reduction technology for blast furnaces.

Over 70% of global steel production uses the blast furnace process.
Approximately 800 blast furnaces exist worldwide.

CO_2 emissions from the blast furnace process account for **about 8% of total global** CO_2 emissions.



- Global CO_2 emissions: Approx. 33.2 billion tons (2021)
- Estimated CO_2 emissions from blast furnaces: Approx. 2.8 billion tons
  = Global blast furnace crude steel production (2021): Approx. 1.4 billion tons/year × CO_2 emissions per ton of blast furnace-based steel production: Approx. 2 tons

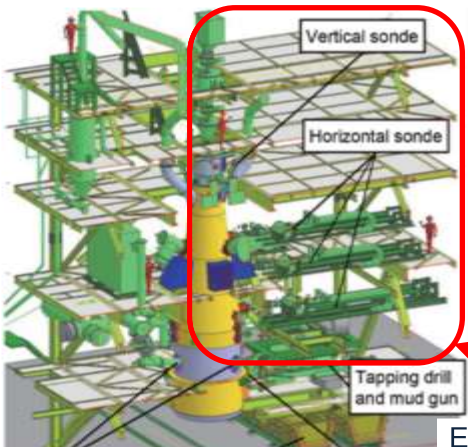
Progress of Technology Development of Hydrogen Reduction in Blast Furnaces” [1]

Green Innovation (GI) Fund project

Development of hydrogen reduction technology in blast furnace using a tandem approach (“a spiral-up approach”) that integrates mathematical modeling and validation using small-scale test blast furnaces

Operational evaluation and analysis

Test blast furnace
(12m³)



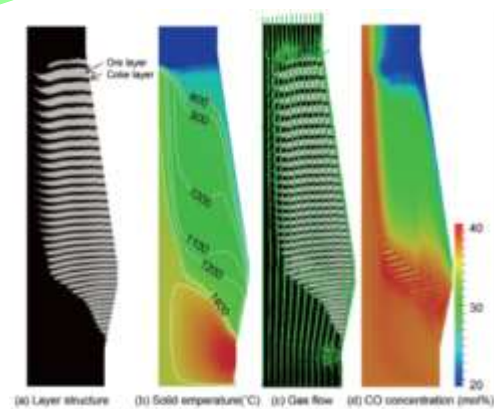
Operational design

Installation of a test furnace at the Kimitsu Area of East Nippon Works in 2016 and commencement of trials.

Equipped with advanced measurement points not available in commercial furnaces

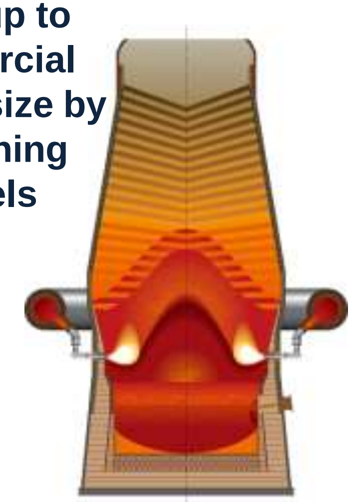
Detailed post-operation dismantling investigation possible after approximately one month of test operations

Process analysis technology
Blast furnace mathematical model



Commercial-scale blast furnaces
(2,000 – 5,000m³)

Scale up to commercial furnace size by fine-tuning models

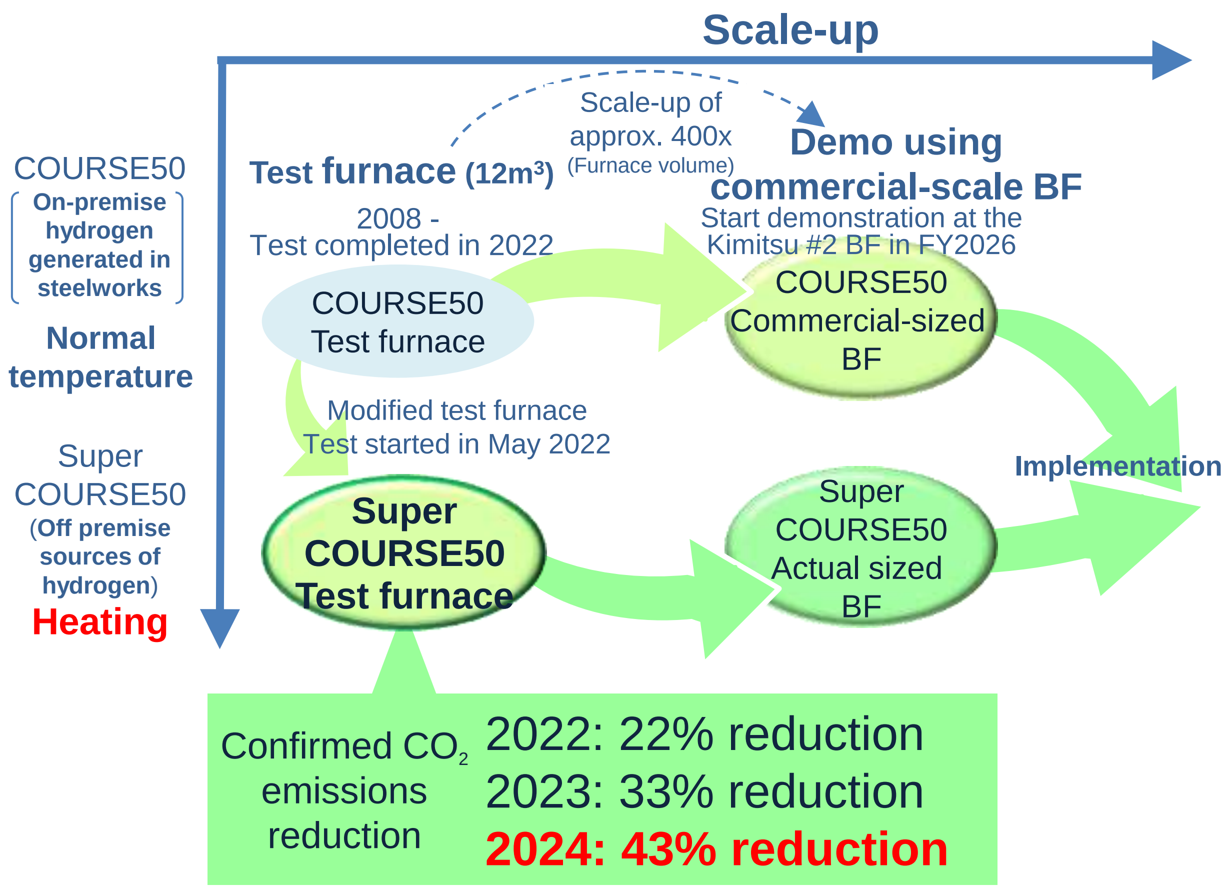


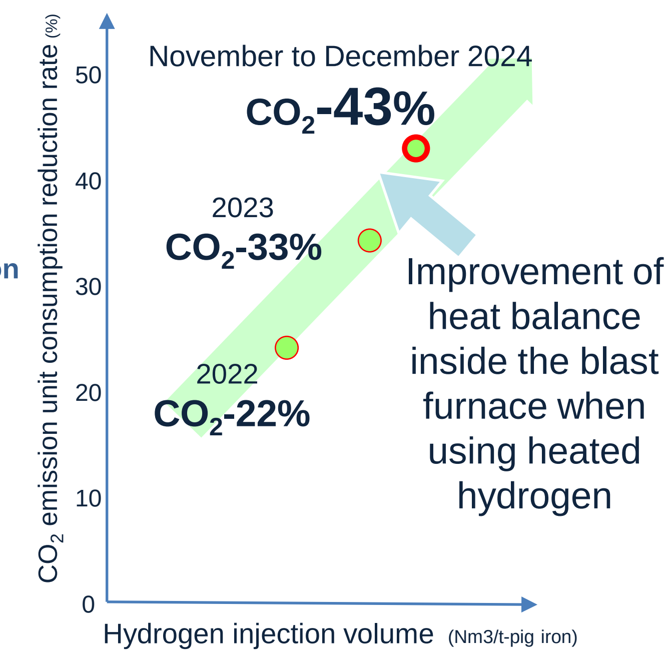
Progress of Technology Development of Hydrogen Reduction in Blast Furnaces” [2]

Green Innovation (GI) Fund project

First-in-world achievement of <u>43% CO_2 emissions reduction</u> successfully demonstrated in test blast furnace

Continue to develop scale-up technologies and over-50% CO_2 reduction technologies to accelerate towards full-scale implementation in large-scale blast furnaces





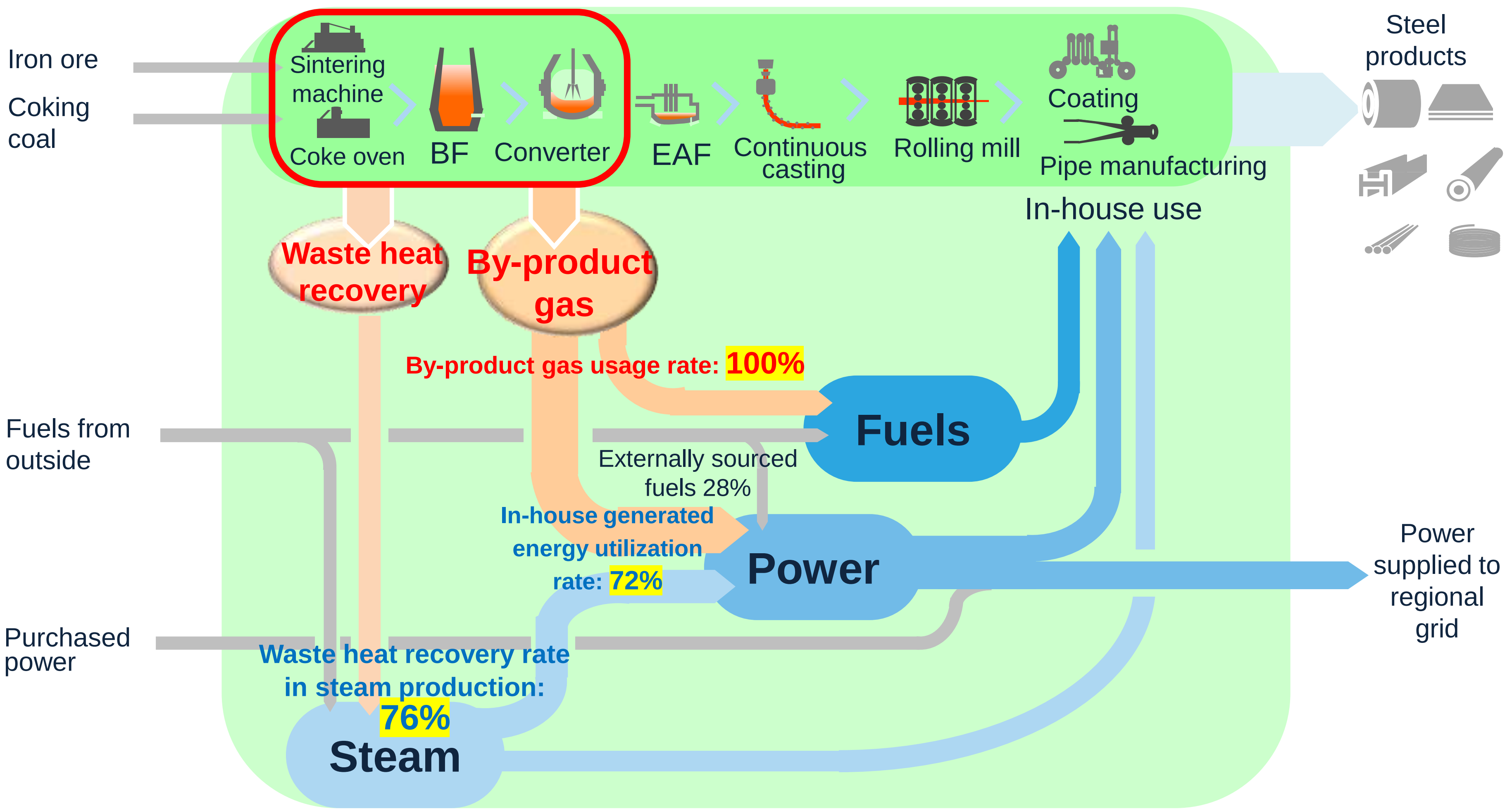
2. Development and Implementation of Emission Reduction Technologies in Society

(2) Secure Decarbonized Energy and Raw Materials and Infrastructure Development

[1]
Decarbonized Energy and Raw Materials

Stable and Cost-Effective Power Supply from In-house Power Plants (Current Status)

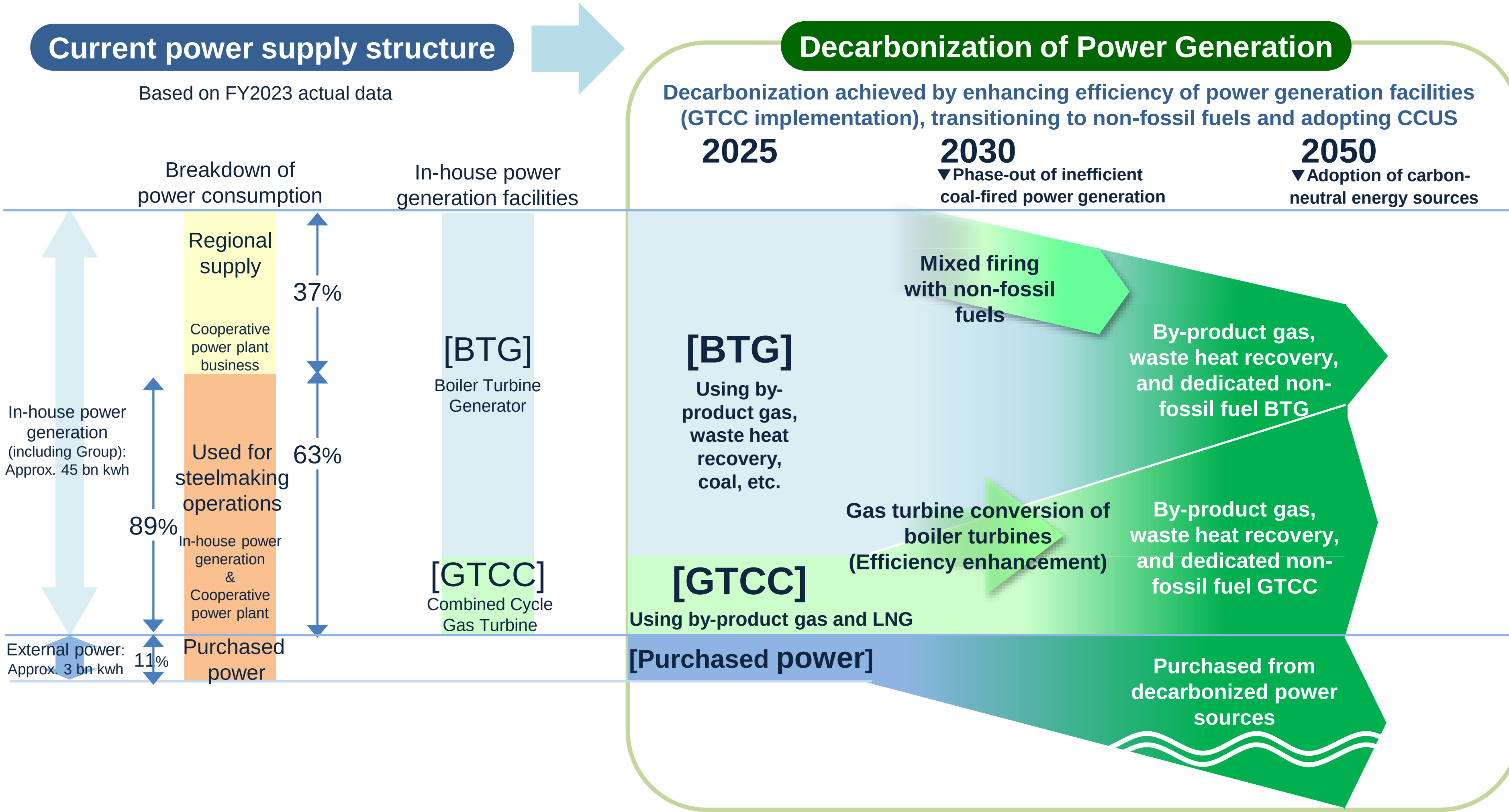
By-product gases and exhaust heat generated in coke ovens and BF operations are **recovered and efficiently utilized as fuel for in-house power plants (some sold to regional power grid) and reheating furnaces to minimize energy waste**



Operating results in FY2022

Decarbonization of Power Generation

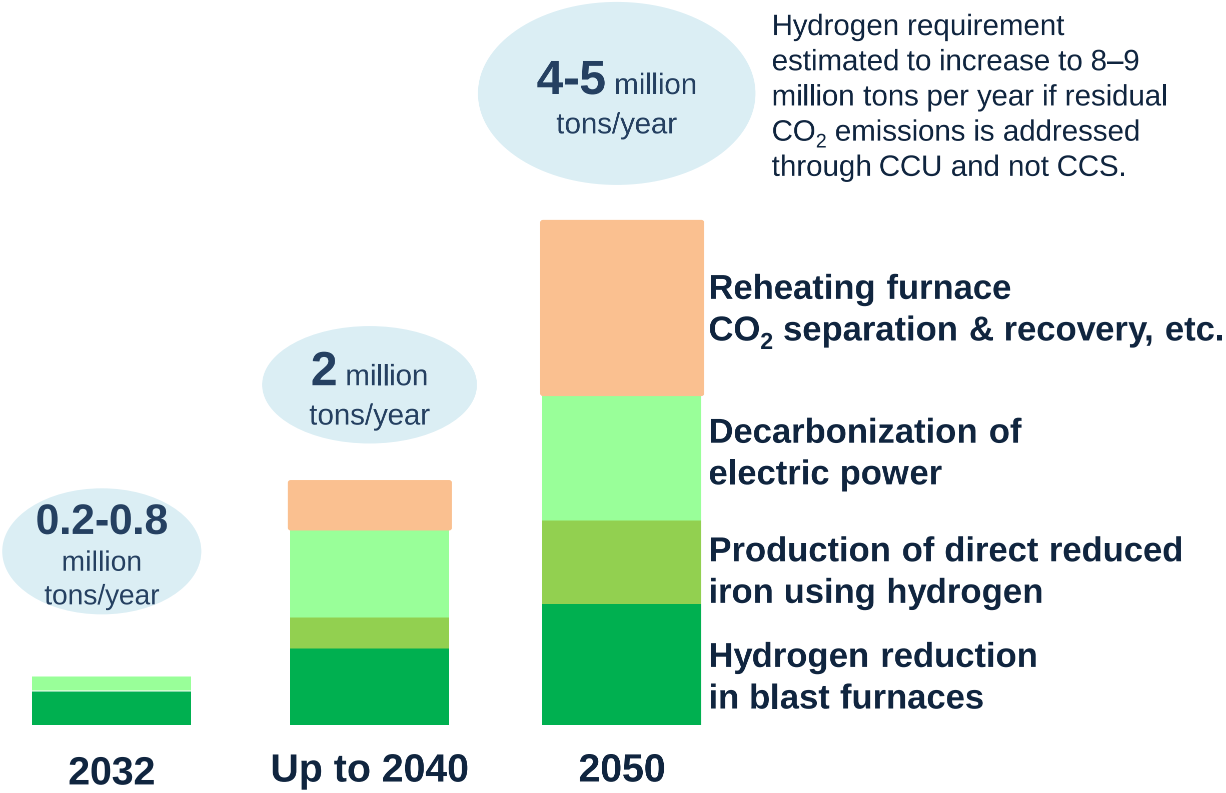
Pursuing **fuel conversion, efficiency improvements of in-house power generation facilities and the transition to non-fossil fuels** such as hydrogen, ammonia, and biomass as well as efforts to **decarbonize purchased power** in order to drive CO_2 reduction towards 2050.



Stable and bulk supply of hydrogen needed to transition to a decarbonized process

Nippon Steel alone requires several million tons of hydrogen annually for the carbon-neutral steelmaking processes of hydrogen reduction in BFs, hydrogen DRI production and decarbonization of power generation

Hydrogen use by application and projected demand (macro assumptions)



Hydrogen use by application and required amount by the steel industry
(Reproduced from the October 2022 Hydrogen Policy Sub-committee, METI)

(Reference)
Hydrogen parity cost
in steelmaking*
*Hydrogen cost to make it equivalent to or lower than the current cost.

(Current carbon reduction method)
13.8 yen/Nm^3-H_2

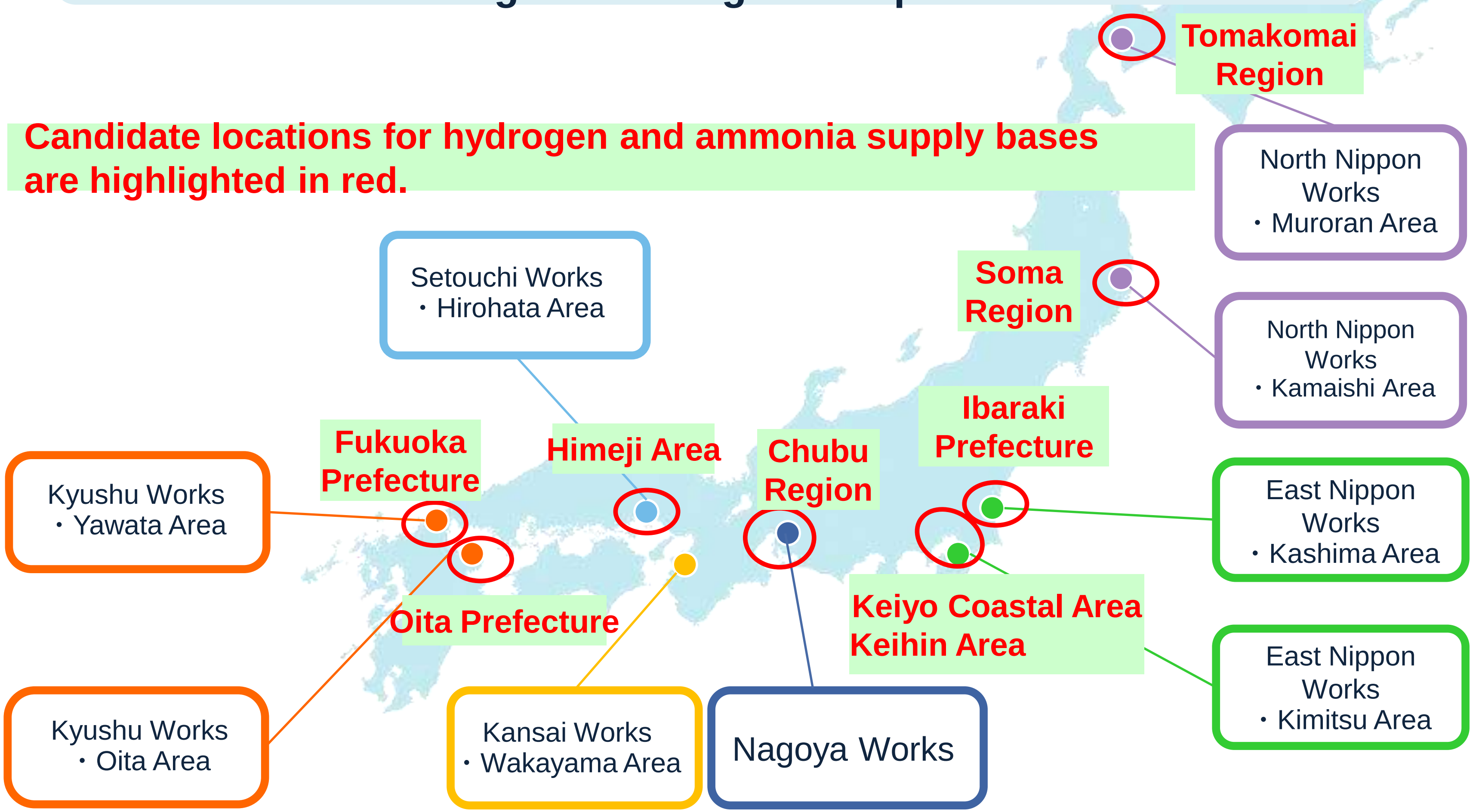
Assumption
Exchange rate: 140 JPY/USD
PCI coal price: 240 USD/ton

Nippon Steel's Manufacturing Sites and Proposed Hydrogen Supply Base Locations in Japan

Hydrogen demand expected to increase from 2030 and reach full-volume requirement after 2040

Critical need to establish hydrogen supply bases in various regions throughout Japan

Candidate locations for hydrogen and ammonia supply bases are highlighted in red.



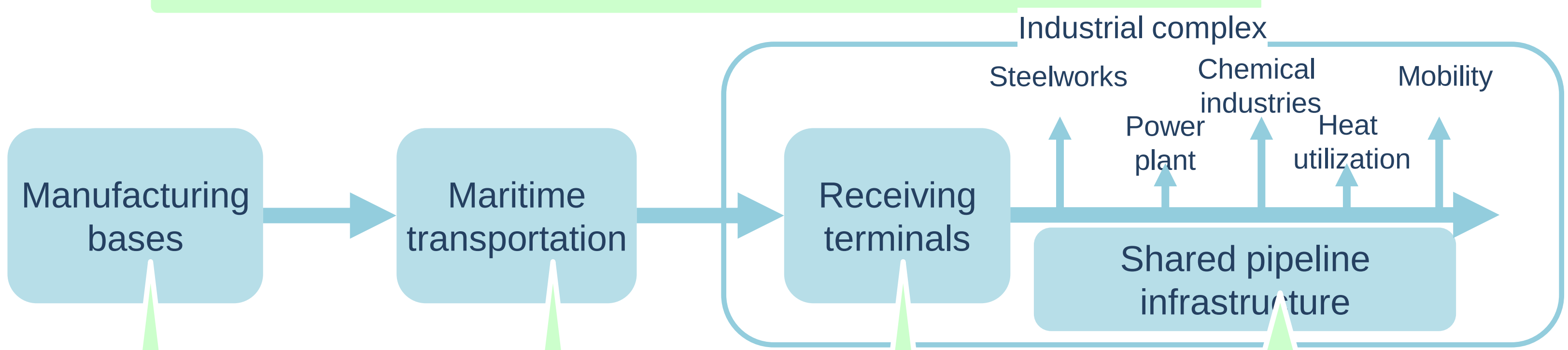
Challenges in Securing Cost-Effective and Stable Supplies of Hydrogen and Ammonia

- **The Hydrogen Society Promotion Law was enacted in FY2024, and the framework for government support is being deliberated, such as "price difference-based support" and "infrastructure development support" covering a 15-year support period from start of supply. However, the hydrogen production cost is extremely higher than fossil fuels, requiring substantial cost reductions.**
- Additionally, **large-scale hydrogen production, transportation, and storage** technologies are still under development.

Nippon Steel is actively collaborating with government agencies, local municipalities, and hydrogen supply-related companies to address the challenges in securing a stable and cost-effective hydrogen supply.

Common issues across sectors ・・・・・・・・・・・・・・・ **Reducing the full-cycle cost from hydrogen production to supply**

Hydrogen-specific challenges



Developing large-scale hydrogen manufacturing capacity to ensure a stable supply capacity

Establishing a safe maritime transportation network for large-scale hydrogen shipments

Constructing safe, large-scale hydrogen storage facilities

Developing supply infrastructure for hydrogen-using sites

Ammonia-specific challenges ・・・・・ **Securing large-scale cracking capacity**

[2]
Promotion of CCS and Blue Carbon Initiatives

Participation in Advanced CCS Projects

Nippon Steel is participating in three collaboration projects under JOGMEC's Engineering Design Work for Advanced CCS Projects

- Three projects were officially selected in August–September 2024 for Engineering Design Work for Advanced CCS Projects under JOGMEC's (Japan Organization for Metals and Energy Security) FY2024 public submission of proposals.
- Latter-stage feasibility studies focusing on the overall design of the CCS value chain and the preparation for evaluation of storage potential(*) to be carried out in FY2024.

	Participating companies	Project characteristics
Tohoku Region West Coast CCS	Itochu Corporation Nippon Steel Taiheiyo Cement Corporation Mitsubishi Heavy Industries, Ltd. Itochu Oil Exploration Co., Ltd. INPEX Corporation Taisei Corporation	➢ Transportation of liquefied CO_2 via ships and pipelines ➢ Offshore storage in deep saline aquifers in Sea of Japan, Tohoku region
Metropolitan Area CCS	INPEX Corporation Nippon Steel Kanto Natural Gas Development Co., Ltd.	➢ Pipeline transportation ➢ Offshore storage in deep saline aquifers in Tokyo Bay area
Oceania CCS	Mitsubishi Corporation Nippon Steel ExxonMobil Asia Pacific Pte.Ltd. Mitsubishi Chemical Corporation Mitsubishi Corporation Clean Energy Corporation	➢ Collection and liquefaction of CO_2 emissions from multiple industries in the Ise Bay/Chubu region ➢ Transport and storage in depleted offshore oil and gas fields or deep saline aquifers in the Oceania region

* The CO_2 storage potential of each planned storage site is continuously examined as part of this advanced CCS project.

Marine Forest Restoration Using Steel Slag – Seaweed Bed Regeneration Project

Coastal rocky shore denudation (Sea desertification)

The reduction in the influx of nutrients (such as **iron**) that previously flowed from rivers, **caused by deforestation, river management (dam construction, embankment protection)**, and other human activities, **has contributed to the depletion of seagrass beds**.

Utilization of steelmaking byproducts (slag) to supply iron to the ocean, promoting the restoration of seaweed beds for CO_2 absorption and fixation (blue carbon).

Offline testing

Experimental studies and field trials

Model analysis

Large experimental water tank (Sea lab)

Degraded coastal area

Deployment of Vivary® units

Seaweed bed restoration

Since 2004, seaweed bed restoration trials have been conducted at 56 locations across Japan.

Restoration and recovery of seaweed beds have been successfully observed in numerous marine regions.

Search for conditions to maximize the effect of promoting seaweed beds

The ongoing collection of fundamental data, including fluctuations in iron concentration and sustained seaweed growth, aims to enhance the effectiveness of marine reforestation efforts and further substantiate blue carbon benefits.

J-Blue Credit® Certification acquired

- The CO_2 absorbed by seaweed beds has been calculated.
- Certified for J-Blue Credit® by the Japan Blue Economy Association, an organization authorized by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).

2. Creation of GX Steel Market

[1]
Initiatives for the Promotion and Standardization of GX Steel

NS Carbolex: Our Brand Name of GX Steel

NSCarbolex®
Innovative action for sustainability

Nippon Steel + Carbon dioxide less + X

Nippon Steel provides steel that contributes to CO_2 emissions reduction and supports a sustainable future.

NSCarbolex® Neutral

Making ourselves CN

Low-CO_2 steel by allocating CO_2 emissions reduction from the steel manufacturing process.

contributing to emissions reductions across the supply chain up to the customer.

NSCarbolex® Solution

Contributing to society and customer's CN

Nippon Steel's high-performance products and solution technologies contribute to reducing CO_2 emissions across society.

- Reducing CO_2 emissions in customers' manufacturing processes
- Reducing CO_2 emissions during product usage in society
- Contribution to energy transition in society

This two-pronged value proposition aims to support the global competitiveness of our customers (approx. 6,000 domestic customers)

Adoption Cases of GX Steel

NSCarbolex® Neutral

Increasing cases of adopting GX Steel for mass production and sustained use

Automotive

Nissan Motor Co., Ltd. has adopted NSCarbolex® Neutral for its **mass-production vehicles**.

*Announced on February 7, 2025, via Nissan Motor Newsroom.
According to Nissan: "The share of green steel in the total steel sheet used for vehicles produced in Japan is expected to **increase approximately fivefold** in FY2025 compared to FY2023."

Civil engineering/ Public works

The Kyushu Regional Development Bureau of MLIT has adopted NSCarbolex® Neutral for the Fukuoka Route 201 Shin-Asakura Bridge construction project (February 2024).

One of the technical proposal themes for the project was the "realization of carbon neutrality."
Yokogawa Bridge Corp. won the bid by proposing "the use of Green Steel."

Construction

Nippon Steel Kowa Real Estate Co., Ltd. and Toyota Housing Corporation have adopted NSCarbolex® Neutral for the steel structure of (tentative name) LOGIFRONT Nagoya Minato logistics facility.

Shipbuilding

Yamanaka Shipbuilding Co., Ltd. has adopted NSCarbolex® Neutral for coastal vessel steel materials, **with plans to expand its use to all future vessels**.

Furniture

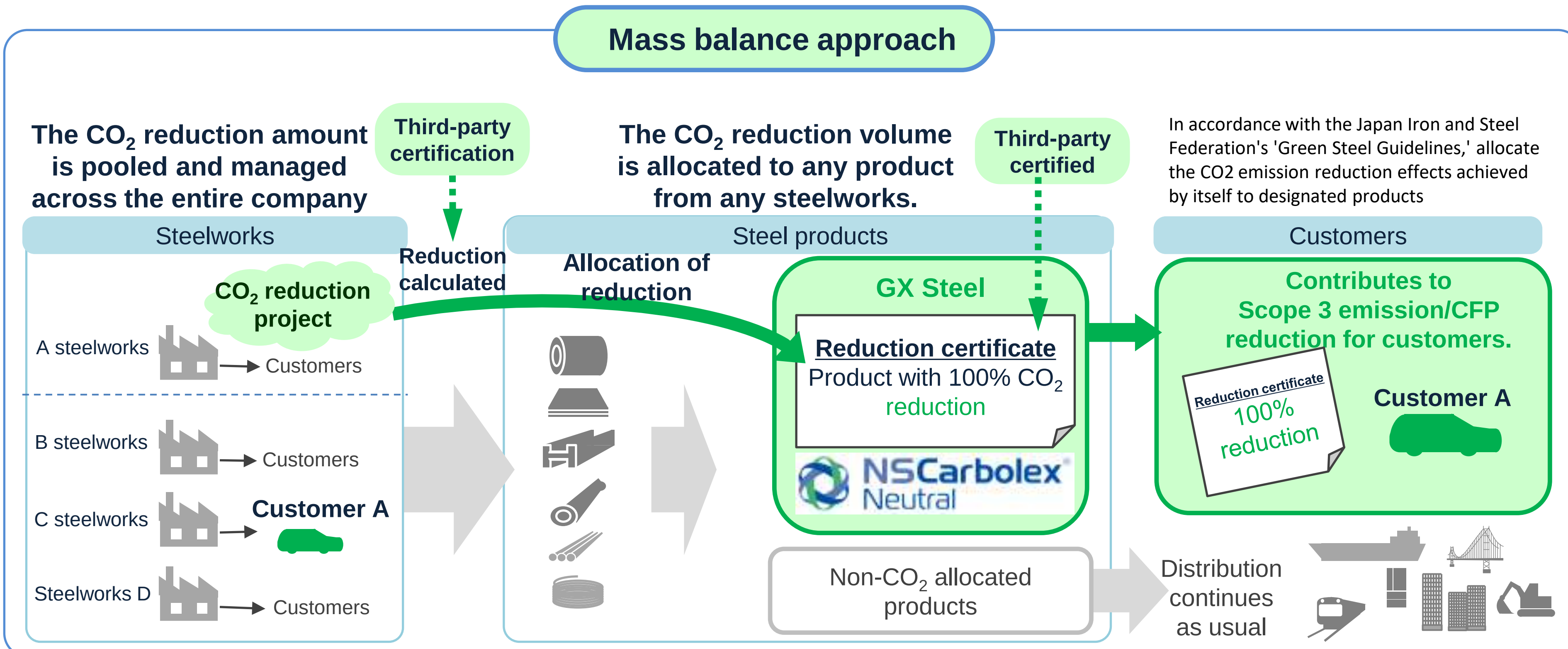
Nippon Steel has reached an agreement with Okamura Corporation on collaboration to achieve carbon neutrality through the provision of NSCarbolex® Neutral/Solution (November 12, 2024).

The Necessity of the Mass Balance Approach for Steel During the Transition Period

GX transition must proceed in a phased manner, **considering economic rationality and the timing of blast furnace relining**

High-grade steel products required by customers can only be made at specific steelwork, **making it difficult to easily switch to other steelworks**

The "mass balance approach" is the only scheme that satisfies both the investment rationale for steel manufacturers while swiftly responding to customer's need for GX Steel during the transition period.



Steady Progress Towards International Standardization of GX Steel

worldsteel (World Steel Association) issued Guideline Ver. 1 based on the Japan Iron and Steel Federation's Green Steel Guidelines in November 2024

Global standard including other industries

Steel industry

Domestic

Japan Iron and Steel Federation

Green Steel Guidelines

Deliberations based on Japan Iron and Steel Federation Guidelines

Feedback

World

World Steel Association

worldsteel guidelines for GHG Chain of custody approaches in the steel industry ver.1

Share

Feedback

Rules based on unit of product as the main concept

ISO 14067
International Carbon Footprint Standard

ISO 13662
Chain of custody

Rules on a per-company basis

GHG Protocol

Initiatives for Corporate Emission Reduction Targets

SBTi
(Science Based Targets Initiative)

NIPPON STEEL

Active Participation and Leadership

Defines a method (**mass balance approach**) for **allocating certified GHG reduction volumes to products from reduction projects that have additionality** and are implemented by steelmakers themselves.

The guideline was introduced at **COP29 in November 2024** by Clare Broadbent, head of worldsteel's Sustainability Division, hosted by the Japan Iron and Steel Federation.

(left: Ms. Clare Broadbent)

[2]
Ensure Predictability of Investment Recovery

Massive Investments and High Opex of Decarbonization

R&D

CAPEX

Massive investment required to achieve carbon neutrality through the world's pioneering development and implementation of breakthrough technologies.

[1] Enormous research and development costs for technology development
Promoting the development of various carbon-neutral technologies, including breakthrough technologies supported by the Green Innovation Fund, as well as proprietary technologies.

[2] Enormous equipment investment for commercial implementation
Investments for the implementation of breakthrough technologies after establishing their feasibility, as well as in decarbonization of electric power and CCUS.

OPEX

Compared to conventional processes, operational costs will also increase.

The high cost burden of decarbonized raw materials and decarbonized energy will further add to the overall expenditures.

CAPEX = Capital Expenditure
OPEX = Operating Expense

CAPEX estimate for commercial implementation

Image of investment size

Equipment investment for carbon neutrality

- **Introduction of breakthrough technologies**
- **Decarbonization of electric power**
- **Measures to increase scrap utilization**
- Other

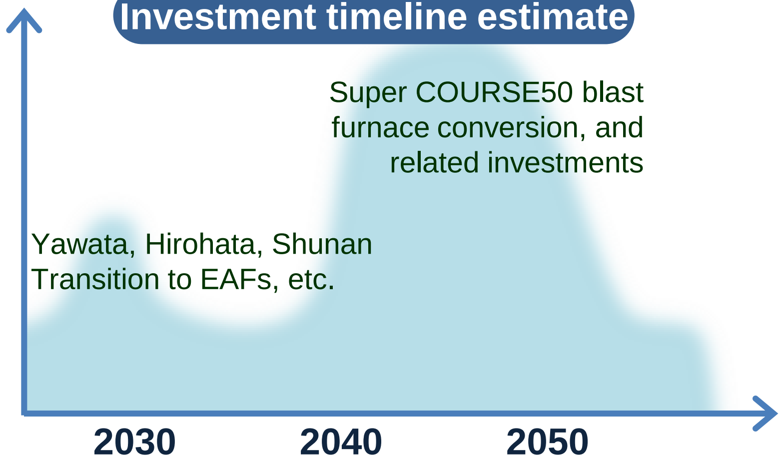
Estimated cost per unit for the introduction of breakthrough technologies

(Unit: ¥100 million)

5,000 10,000

Technology	Estimated cost
High-grade steel production in large-scale EAFs	**Substitution of existing blast furnaces with EAFs**
Production of direct reduced iron using hydrogen	**New installation of shaft furnace and allied equipment**
Hydrogen reduction in blast furnaces	**Conversion of existing blast furnaces to Super COURSE50 blast furnaces**
	Installation of CO_2 recovery equipment

Investment timeline estimate



Increase in material and labor costs
Finalization of plans for implementing breakthrough technologies

CAPEX for commercial implementation is **expected to exceed** the initially estimated range (**JPY 4–5 trillion***).

* Total investment amount excluding subsidies

Investment decisions will only be made when feasible outlook on investment recovery can be made. Improving economic viability through policy support and monetization of CO_2 reduction value in the GX Steel market will be required.

OPEX

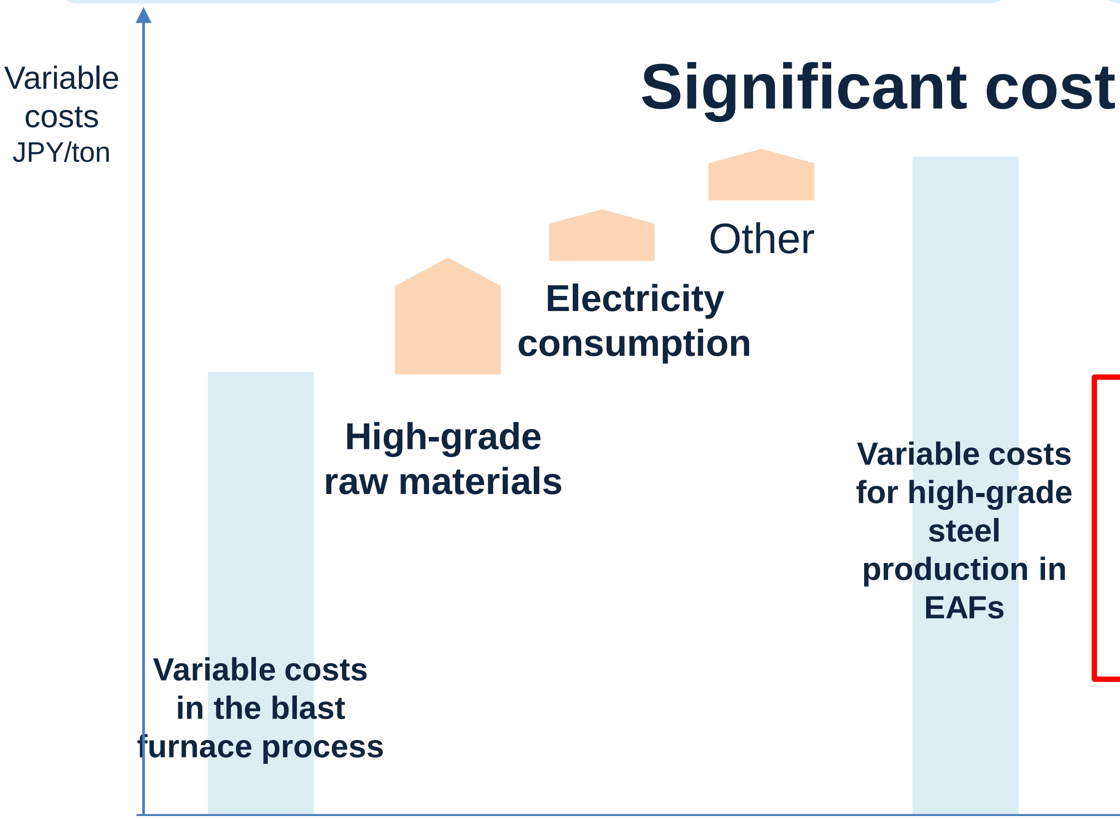
(Example) Significance of Transition from Blast Furnace Process to EAFs and Associated Cost Increases

Blast furnace process

- Capable of utilizing diverse raw materials
- Optimized energy efficiency through cost-effective utilization of by-product gases

Innovative EAFs

- Requires high-grade raw material input
- Requires new power procurement



The GX transformation requires significant investment and an increase in operational costs.

Key to Ensuring predictability of GX Investment Recovery

The formation of a sound GX Steel market, where the value of CO_2 reduction is properly compensated, is the greatest challenge in ensuring predictability of GX investment recovery.

Monetizing the "CO_2 reduction value" in GX Steel pricing

- To ensure the viability of GX investments as a business, the increasing costs of GX Steel must be **recouped through appropriate compensation**.
- **The price of GX Steel needs to be raised** to an appropriate level that reflects its "CO_2 reduction value."
- A well-structured system must be established where the cost of **CO_2 reduction is recognized as a CO_2 reduction value, with the financial burden shared across the entire value chain and, ultimately, society as a whole**.

Visualization of CO_2 reduction value

- For customers, it is essential to achieve "**visualization of GX value**" to accurately reflect the "environmental value of emissions reduction " in the products that use GX Steel.

Incentive mechanisms to promote GX Steel adoption

- Although GX Steel includes the CO_2 reduction value, its fundamental functional properties remain unchanged from conventional steel.
- During the transition period, where both conventional steel and GX Steel coexist, an effective and impactful **incentive mechanism** must be established to **encourage customers to shift towards GX Steel**.

Environmental Value (CO_2 Reduction) Monetization – Toward Creating the "GX Steel" Market

Proposal of comprehensive public-private measures for creating the GX Steel market at the Study Group on Green Steel for Green Transformation (GX) , organized by the Ministry of Economy, Trade and Industry (METI)

Collaboration among experts, the steel industry, and demand-side industries to examine the necessity of GX in the steel industry, the necessity of quantifying GX value, and the necessity of ensuring consistency with international discussions. (Scheduled to be held five times from October 2024 to January 2025)

Based on the Summary of the 5th Study Group on Green Steel for GX Promotion by METI in January 2025

Concept of support for Green Steel for GX and low CFP steel

Green Steel for GX

Steel products that have a significant environmentally favorable impact due to additional direct emission mitigation actions on a company-by-company basis, and that experience a significant price increase compared to general products when the costs associated with these actions are included.

→ **Eligible for market expansion policies**, such as priority procurement by the government (e.g., Green Procurement Law) and other support measures for purchasing (incorporate into the subsidy criteria)

* Combined with measures to further reduce costs.

Low CFP* steel

* Carbon Footprint of Products

→ Expand demand by encouraging customers to consider CFP

Comprehensive public-private measures

- **Promoting GX value and reflecting it in international standards**
- **Enhancing the utilization of CFPs for steel products**
- **Providing support to the demand side**
- **Providing support to the supply side**

The creation of a GX product market was positioned as a key element of the GX strategy in the government's 'GX2040 Vision' (Cabinet approved in February 2025)

Finalized Framework for Early-stage Demand Creation Measures for GX Steel

The Study Group on Green Steel for GX, organized by METI, has classified GX Steel as a key target for demand-side support.

Progress has been made for preferential procurement and purchase support for GX Steel by the government.

Revision of the Act on Promoting Green Procurement
(The revision was approved by the Cabinet on January 28, 2025)

The Basic Policy of the Act on Promoting Green Procurement has been revised to prioritize the procurement of products utilizing Green Steel in accordance with the Japan Iron and Steel Federation Green Steel Guidelines.

Additional CEV subsidy* measures for vehicles using GX Steel
(Announced by METI on January 27, 2025)

A new measure has been introduced to increase subsidies by up to ¥50,000 to stimulate demand for steel to promote GX, including steel produced via innovative EAFs. This measure is scheduled for implementation starting in FY2025.

*CEV subsidy is designed to promote the introduction of clean energy vehicles.
A government program that supports the adoption of clean energy vehicles such as EVs, PHEVs, and FCVs. It also facilitates the development of essential charging and hydrogen refueling infrastructure necessary for their widespread use.

Drive GX investments to advance decarbonization of the steelmaking process, which will enable stable supplies of GX Steel to customers and contribute to customer’s Scope 3 emissions reduction.

Summary of Achievements to Date

Steady progress has been made in the development of three breakthrough technologies, alongside active engagement in policy and regulatory proposals to the government and industry, as well as broader outreach activities to society.

Technology development	**Development plan and testing**	Establishment of hydrogen reduction technology in the test blast furnace (43% reduction in CO_2 emissions achieved) Completion of an experimental EAF at Hasaki R&D Center and commencement of testing	
	Government support	Green Innovation (GI) Fund Funding for Hydrogen Utilization in the Steelmaking Process increased from 193.5 billion JPY to 449.9 billion JPY.	**Budgeting completed**
Infrastructure development	**Energy infrastructure development**	Safe use of nuclear and other energy sources for the 7th Strategic Energy Plan	**Committee recommendations under discussion**
		Hydrogen & ammonia: Revision of the Basic Hydrogen Strategy, Hydrogen Society Promotion Law	**Bill passed**
		CCS: JOGMEC/Advanced CCS support Program	**Project participation**
Standardization	**International standardization**	Publication of worldsteel Guidelines Ver.1 (November 2024)	**Guideline issued**
		Engagement for revision of ISO, GHG protocol, etc.	**Implementing and preparing**
Predictability of investment recovery	**Gov't support for capital expenditures**	One-third of the investment costs are covered by the government through the utilization of GX transition bonds.	**Instituted**
	Gov't support for operating costs	Establishment of a strategic materials and production base tax system (Green Steel)	**Instituted**
	Environmental value (CO_2 reduction) monetization	GX Product Market Study Group (METI) GX 2040 Vision and Sector-Specific Investment Strategy (Japanese Government) Study Group on Green Steel for GX (METI) → Formation of the GX Steel market Creation of early-stage demand through the Act on Promoting Green Purchasing and CEV subsidies	**GX market creation under discussion**

Further Challenges for the Creation of the GX Steel Market

1. Further demand creation in public procurement

Institutionalization of GX Steel adoption in the public civil engineering work sector

*In discussions on the civil engineering work sector under the Act on Promoting Green Procurement, GX Steel is currently classified as a 'further consideration item' (long list).

2. Further expansion of procurement by private companies

Further expansion of proactive dialogue with customers

Introduction of "phased regulatory measures" to facilitate GX Steel market creation
(Refer to the government's Sector-Specific Investment Strategy .)

3. Engagement from investors and financial institutions with their investees and borrowers

Engagement of investors with steel consumers in their investment portfolios, engagement of financial institutions with steel-consuming borrowers on financed emissions engagement

4. Engagement to formulate international standardization and industry-specific standards

Engagement to establish rules in GHG Protocol, SBTi, and other influential standards so that align with customer's and steel industry's needs for their emission reductions efforts.

Engagement to formulate emission reduction rules tailored to each industry sector

4. Efforts toward CO_2 Reduction within the Group

Nippon Steel Group CO_2 Emissions Map

The reduction of CO_2 emissions from Nippon Steel parent company is the highest priority, **as it accounts for 92% of the company's consolidated emissions and 82% of the group's total emissions, including equity method affiliates.**

Approx. **90** million tons/year

Domestic: Approx. 80 million tons/year

Overseas: Approx. 10 million

Consolidated basis — Approx. 80 million tons/year

Domestic consolidated: 78 million tons/year

Engineering business: *0.1 million tons/year

Chemicals & materials business: *0.6 million tons/year

System solutions business: *0.0 million tons/year

*Including overseas group companies and equity method affiliates

Nippon Steel Corp. Non-consolidated: 72.5 million tons/year

Domestic EAFs
2.2 million tons/year
Nippon Steel Stainless Steel Corporation, Sanyo Special Steel Group, etc.

Other subsidiaries
2.4 million tons/year
Cement, logistics, etc.

Overseas consolidated: 2 million tons/year

Integrated iron and steel works
1.1 million tons/year
OVAKO
Standard Steel, etc.

Other subsidiaries
1.1 thousand tons/year
LATINUSA, Krosaki Harima India base, etc.

Equity method — Approximately 10 million tons/year

Domestic equity-method affiliates: 2 million tons/year

Domestic EAFs
0.5 million tons/year
Kyoei Steel Ltd., Topy Industries Limited, etc.

Other related companies
1.0 million tons/year
Maritime shipping, coke, etc.

Raw material
0.8 million tons/year
NS United Kaiun Kaisha, Ltd., Nippon Denko Co., Ltd.

Overseas equity method affiliates: 8 million tons/year

Integrated iron and steel works
6.8 million tons/year
AM/NS India Usiminas

Other related companies
0.8 million tons/year
AM/NS Calvert, NSBS, JCAPCPL, etc.

Raw material
0.2 million tons/year
Australian mines, NIBRASCO

Methodology for aggregation

- SCOPE1+2
- FY2022 performance
- CO_2 emissions were aggregated from the parent company, consolidated subsidiaries, and major equity-method affiliates with significant emissions.
- Emissions from equity-method affiliates were calculated based on ownership share.

CO_2 Reduction Targets of Global Upstream Production Group Companies

	Company	Region	Crude steel production capacity (million tons/year)	Blast furnace (Unit)	Electric Furnace (Unit)	DRI (Unit)	Nippon Steel Equity stake	CO_2 emission: Emissions (million tons/year)	CO_2 reduction targets: Consolidated basis (parent company + subsidiaries) Mid-term targets	Consolidated basis (parent company + subsidiaries) Long-term targets	Equity method affiliate Mid-term targets	Equity method affiliate Long-term targets
[1] Domestic parent company + subsidiary	NIPPON STEEL		41	11	4			72.5	Group target 2013→2030 -30%	Group target 2050 Carbon neutral		
	Subsidiary *1		5		11			2.2				
[3] Equity method affiliates *2			1		10			0.5				
Non-upstream companies					-			5				
Domestic			**47**	11	25			**80**				
[2] Overseas subsidiaries	OVAKO	EU	1.3		3			0.2	2015→2030 -80%	2015→2040 -90% *3		
	STANDARD STEEL	United States	0.2		1			0.1				
	SSMI	India	0.2		1			0.2	2016→2030 -40%	2050 Carbon neutral		
	GSteelGJS	Thailand	3.5		3			0.6				
[3] Equity method affiliate	AM/NS INDIA	India	9.6	1	6	5	40%	6.1			2021→2030 Unit consumption -20%	
	USIMINAS	Brazil	4.4	3			12%	0.7			2019→2030 Unit consumption -15%	
Non-upstream companies						-		2				
Overseas			**19**	4	14	5		**10**				
Global			**66**	15	33	6		**90**				

*1 Nippon Steel Stainless Steel Corporation, Nippon Steel Structural Shapes Corporation, Sanyo Special Steel Group, Osaka Steel Co., Ltd., Tokyo Kohtetsu Co., Ltd., Oji Steel Co., Ltd.

*2 Godo Steel, Ltd., Topy Industries Limited, Mitsubishi Steel Muroran Inc.

*3 Carbon neutrality achieved through the Carbon Offset Program for 2022.

Group’s Governance Policy on Carbon Neutrality

Leveraging Nippon Steel Corporation’s resources and expertise gained from domestic R&D and operational activities to advance carbon neutrality initiatives at domestic and overseas upstream companies

[1] Domestic consolidation (parent company + subsidiaries)	● Establish group-wide targets that includes the parent company and consolidated subsidiaries. ● Each company formulates individual emission reduction plans to achieve these targets.
[2] Overseas subsidiaries	● Targets set individually for each country and/or company in recognition of different conditions between country and region and varying national reduction targets and transition strategies
[3] Equity method affiliate (Domestic and overseas)	● Collaborate with JV partners to support target setting and carbon neutrality initiatives for each company.

Initiatives Across the Entire Supply Chain (Scope 3)

Collaboration with raw material suppliers on decarbonization solutions

- Memoranda of understanding signed for joint research on high-grade iron ore and direct reduced iron with Vale, Rio Tinto, and Anglo American.

VALE RioTinto AngloAmerican

Reduction of CO_2 emission through logistics optimization

- Maintaining a high modal shift rate of 97% and working to reduce CO_2 emission by raising efficiency in logistics, such as by use of larger vessels.
- Introduction of the lithium-ion battery-equipped hybrid cargo vessel “Utashima” by NS United Kaiun.


Lithium-ion battery-equipped hybrid cargo vessel “Utashima”

- ➢ Evaluating primary data disclosure for Category 1 (Purchased Goods and Services) and Category 4 (Upstream Transportation and Distribution), which are major contributors to Scope 3 emissions. Conducting hearings with suppliers and logistics departments.
- ➢ Establishing actual primary data calculations and considering introducing a target for CO_2 reduction.

5. Advocacy to society and Stance

Advocacy to society to ensure the predictability of GX investment recovery

Nippon Steel's initiatives

Policy incorporation

Advocacy for GX policies

A Japanese-style policy package that integrates climate change measures with maintenance and enhancement of international industrial competitiveness.

- Advocacy at METI's Industrial Structure Council and MOE's Central Environment Council for the expansion of the GI Fund and the **importance of comprehensive and continuous support across all stages**, from R&D for decarbonization to equipment implementation and operational cost increases.

Policy incorporation:

- Expansion of Green Innovation Activities (GI) Fund
- Subsidization of one-third of investment costs using GX transition bonds.
- Establishment of a strategic materials and production base tax system

Development of mechanisms for the proper market evaluation of GX products

- Proposal activities at the GX League's "Working Group on Adding Value to Green Products"

Policy incorporation:

- Recognition of "verified reduction volume" as the green value of products and services

- Presentations at METI's Research Group on Green Steel for GX Promotion, highlighting the necessity of regulatory frameworks, support mechanisms, and standardization of "verified reduction volume" for market formation.

Policy incorporation:

- Rule-making for GX product market development, prioritization of GX Steel procurement, and government purchasing support.

Advocacy for Energy Policy Reform

- At the Strategic Policy Committee of the Advisory Committee for Natural Resources and Energy, the necessity of a structural shift in energy supply was advocated, including **not only renewable energy but also the proactive promotion of nuclear power**. Additionally, the importance of **stable and cost-effective supplies of green hydrogen and green electricity, as well as the social implementation of CCUS**, was emphasized.

Policy incorporation:

- 7th Strategic Energy Plan

Request for Cooperation and Collaboration From You

Encourage customers to purchase GX Steel

It is crucial that the entire supply chain shares responsibility for environmental value, as this is a key factor in ensuring the business feasibility of GX investments.

To contribute to Scope 3 reductions in customer industries, we aim to collaborate with these industries to establish industry standards and promote the procurement of GX Steel.

Establish the specifics of market mechanisms

Policies for quantification, purchase subsidies, and green procurement to generate early-stage demand, as outlined in the government's GX strategy, are already implemented. With continued investment in innovative EAFs, a substantial increase in GX production is expected. We need to establish a healthy and sizeable GX Steel market that aligns with these advancements, it is essential to establish concrete market mechanisms, including the "phased introduction of regulations".

The understanding and support from customers, consumers, and society at large is necessary to drive these efforts forward. To foster this momentum, leveraging the influence of a wide range of stakeholders is also needed.

< Reference Document >

Nippon Steel's Stance on Carbon Neutrality Given Its Mission, Corporate Philosophy, and Changing Business Environment, etc.

- The Nippon Steel Group is committed to continuously pursue world-leading technology and manufacturing excellence, contributing to social progress by providing superior products and services.
- Steel is a fundamental material essential to all industries and infrastructure development. As the global population grows and economies expand, the demand for steel will remain indispensable to society. Nippon Steel's mission is to contribute to sustainable societal development by providing comprehensive solutions, not only through steel as a material but also through its processing and application technologies, which serve as the foundation of modern life and economic progress.
- Significant transformations in society and industry is leading to more sophisticated need in steel product performance and properties, especially regarding environmental and social considerations. In particular, climate change response has become a critical global challenge. Nippon Steel is determined to maintain its position as a global leader in the steel industry by fully embracing the challenge of developing and implementing new CO_2 reduction technologies, thereby driving the transition to a decarbonized society, which has become a new standard of industrial competition. Furthermore, leveraging our technological expertise and product capabilities, we will contribute to the realization of carbon neutrality on a societal level by providing high-performance products and solution technologies.
- By balancing our mission to supply steel products essential for social development with the imperative to address climate change, we aim to achieve business sustainability, growth, and long-term development, striving toward the goal of achieving carbon neutrality by 2050.

NIPPON STEEL

The Prerequisites Needed to Comprehensively Address Climate Change from a Business Standpoint and Contribute to Societal Development

- Maintaining and advancing steelmaking processes that include reduction processes is unavoidable and necessary to meet demand for essential steel products required for societal development, as relying solely on scrap-based processes—which have inherent supply limitations—will be insufficient. We seek societal understanding of this necessity.

- Securing a stable supply of decarbonized energy and reducing agents, at internationally competitive cost, is of critical importance for the stable production of GX Steel and the establishment of a socially acceptable cost structure.
  We will advocate for the necessary business environment and infrastructure development to support these requirements.

- Japanese steel products are not mere commodities but rather a highly integrated manufacturing system optimized for diverse quality requirements (realization of customized high-value-added solutions) for individual customers and fine-tuned manufacturing processes. Based on this premise, we will seek societal understanding of a realistic transition to decarbonized steel manufacturing processes.

- Calling for the establishment of environmental evaluation rules that allow customers to benefit from the procurement of GX Steel, ensuring that the final products they manufacture are valued accordingly.
  Nippon Steel will take a leading role in shaping these rules.

- The transition to decarbonized steelmaking processes requires massive investment and entails higher operational costs compared to conventional processes. As a result, GX Steel will be more expensive than traditional products. We seek understanding from customers and society at large on the burden-sharing of this environmental premium.
  We advocate for the establishment of the GX product market by fostering understanding of the GX supply chain innovation, where all stakeholders must commit to realizing the transition to decarbonized steelmaking process.

Nippon Steel's Policy Position

Based on the previously stated "Nippon Steel's Stance on Carbon Neutrality Given Its Mission, Corporate Philosophy, and Changing Business Environment, etc." and "Pursuit of a Foundational Environment Where Carbon Neutrality Efforts Enhance Business Sustainability and Corporate Value," we will actively advance carbon neutrality initiatives in accordance with the following policy position.

1. Stance on the government's GX policy

- Achieving carbon neutrality requires the bold introduction of policies and systems based on a national strategy.
- To realize these policies, we emphasize the necessity of a Japan-specific policy package that integrates climate change measures with the maintenance and enhancement of international industrial competitiveness. Strong and continuous support across all stages of decarbonization transition process, as well as support for increased costs related to hydrogen, electricity, and raw material operations, is advocated. Various proposals are made regarding Japan's climate change measures and energy policies in line with the Paris Agreement. We also pursue active leadership in promoting initiatives.

2. Stance on energy policy

- Achieving carbon neutrality in the steel industry requires the expansion of decarbonized power sources and fuels, ensuring a stable and cost-effective supply, and establishing a functional CCS implementation environment.
- For decarbonized power sources, in addition to renewable energy, the maximum utilization of nuclear power is essential to ensure a stable and cost-effective supply, considering the S+3E perspective. Expanding the stable and cost-effective supply of hydrogen and ammonia is also crucial.

S+3E : Safety, Energy Security, Economic Efficiency, and Environment

- Nippon Steel will continue to actively engage with the government and relevant institutions to establish policies and systems necessary to achieve these objectives, ensure their effective implementation, and facilitate the development of required infrastructure.

3. Stance of carbon pricing

- The government's commitment to large-scale, long-term, and multi-year support, along with the phased introduction of carbon pricing mechanisms, is a crucial approach for simultaneously achieving economic growth and decarbonization.
- The growth-oriented carbon pricing concept, as outlined in GX Vision 2040, is designed to evaluate and encourage early transitions to carbon neutrality and to support businesses competing in the international market. We fully endorse this initiative.
- For high-emission industries that currently lack technological options for full decarbonization, the most rational pathway toward 2050 carbon neutrality is to drive the development of innovative technologies that expand available solutions. We will also advocate for effective and feasible regulatory frameworks by the Japanese government to support this transition.

4. Stance on the creation of the GX product market

- For the high-GHG emitting basic material industries to continuously pursue bold decarbonization investments and increased use of recycled materials on the path to carbon neutrality, it is essential to visualize the emission reduction efforts of upstream companies as a value-add (environmental value) across the entire value chain. A GX product market must be created and expanded, where downstream companies and consumers recognize and actively evaluate these environmental values, leading to appropriate pricing mechanisms that fairly reflect the environmental premium.

- To ensure that corporate efforts in GX contribute to global carbon neutrality through emission reductions across the product lifecycle, it is critical to establish a market that favors products and services with such environmental value. A collaborative effort between the public and private sectors is necessary to ensure that “actual amount of reduction(s)” is properly assessed and recognized.

- The creation of a GX product market requires commitment and financial contributions from demand-side entities. In addition to establishing rules for quantifying environmental value, Nippon Steel will actively engage with the government to advocate for the promotion of GX product procurement by private enterprises, the development of incentive programs—including government procurement support, and the implementation of green procurement in infrastructure projects by public institutions. Furthermore, we will push for the phased introduction of regulations to support the growth of the GX product market. At the same time, we will emphasize to society the importance of deepening understanding of the GX product market and fostering a shift toward GX-oriented behaviors.

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