Initiatives to Address Climate Change

Basic Policy

Climate change is a critical business concern for the JFE Group that is directly linked to business continuity and the enhancement of corporate value over the medium to long term. Our steel business, which emits at least 99% of the Group's total greenhouse gas (GHG) emissions, has been developing various technologies for saving energy and reducing these emissions. We have applied these technologies to steel manufacturing processes to enable production with low levels of GHG emission intensity.

Furthermore, the JFE Group has developed and maintains a variety of products and technologies that contribute to reducing GHG emissions, including high-performance steel materials that save energy when customers use them, as well as renewable energy power generation. We will continue to develop and promote the widespread use of these processes and products. We consider this an opportunity to apply the technologies we have fostered across the globe and at the same time contribute to tackling climate change.

Following its endorsement of the TCFD recommendations, the JFE Group has used scenario analysis to identify climate-related risks and opportunities and to formulate strategies based on them. Building on these efforts, we now incorporate our response to climate change in our management strategies while seeking to align our efforts with international frameworks, including the ISSB climate-related disclosure standards.

Furthermore, aiming to be a leader in the development of carbon-neutral technologies, the JFE Group has formulated the JFE Group Environmental Vision for 2050, with the goal of achieving carbon neutrality by 2050. We will actively work to reduce GHG emissions and contribute to GHG reductions.

At the same time, the business environment surrounding climate change remains highly uncertain. In executing investments related to Green Transformation (GX), we will make and implement decisions after comprehensively taking into account the development status of individual technologies, the availability of energy infrastructure such as electricity and hydrogen, the maturity of markets for GX products, and trends in government support measures and system design, after carefully assessing economic rationality.

JFE Group Environmental Vision for 2050

The JFE Group intends to strengthen sustainability through solutions that address global climate change issues while restructuring its business in response to changes in the environment surrounding the steel business.

In 2021, we formulated the JFE Group Environmental Vision for 2050 toward achieving carbon neutrality by that year.

Under this vision, we will systematically address climate change, building on our climate-related efforts in line with the TCFD recommendations and aligning our approach with international climate-related disclosure frameworks. In the steel business, we set a target of reducing GHG emissions by 18% from FY2013 levels by the end of FY2024. In addition, we have announced targets for our steel business of reducing GHG emissions by FY2027 by 24% and by FY2030 by 30% or more, compared to FY2013. In FY2024, we achieved a 23% reduction, exceeding our initial target.

To explore all possibilities for realizing carbon neutrality in 2050, we will take on the challenge of developing ultra-innovative technologies such as carbon-recycling blast furnaces developed with our proprietary technology while also adopting a multitrack approach for pursuing other technologies. In our engineering business, we will widen our contribution to the reduction of GHG in society as a whole by expanding and advancing renewable power generation and carbon-recycling technologies. In our steel business, we contribute by supplying high-performance steel products and through other initiatives. Furthermore, we will apply Group strengths to accelerate the commercialization of our offshore wind-power business.

The development of process technologies that minimize GHG emissions while enabling the mass production of high-quality, high-performance steel products is essential for the sustainable development of society. Efforts for achieving carbon neutrality will inevitably entail substantial costs for research and development and renewed facilities. We believe it will be necessary to consider how society will bear these costs and what support can be provided by the government and other sources.

Given the ambitious target of achieving carbon neutrality by 2050, we hope to lead the way in establishing the necessary decarbonization technologies at the earliest possible stage, based on developing a decarbonization infrastructure and realizing a global equal footing.

JFE Group Environmental Vision for 2050

- **Climate change is a critical business concern for JFE, and we are aiming to achieve carbon neutrality by 2050.**
- **We will accelerate our research and development of new technologies and pursue ultra-innovative technologies.**
- **We will seek business opportunities that allow us to enhance corporate value by contributing to GHG emissions reduction across society**
- **The principles of TCFD will be reflected in our business strategies and systematically deployed.**

Target of Reducing GHG Emissions in FY2027 (Eighth Medium-term Business Plan Initiatives)
- Reduce steel-business GHG emissions in FY2027 by 24%, compared to FY2013 (steel business)

Target of Reducing GHG Emissions in FY2030
- Reduce steel-business GHG emissions in FY2030 by 30% or more, compared to FY2013 (steel business)

Initiatives for Carbon Neutrality by 2050

❶ Reduce steel-business GHG emissions
- Pursue ultra-innovative technology for carbon-recycling blast furnaces and CCU
- Develop hydrogen-based ironmaking direct reduction technology
- Leverage top-class electric arc furnace technology for high-quality, high-performance steel manufacturing and for high efficiency, ensure early implementation, etc.
- Develop transitional technologies for carbon neutrality, including increased use of steel scrap in converters, energy savings, and low-carbon energy transformations

❷ Expand contributions to GHG emissions reduction in society
- Engineering business: Expand and develop renewable energy power generation and carbon-recycling technologies (targets for contributing to GHG emissions reductions of 13.5 million tonnes in FY2027, 20 million tonnes in FY2030, and 30 million tonnes in FY2035)
- Steel business: Develop and market eco-products and eco-solutions
- Trading business: Increase trading in biomass fuels, steel scrap, etc., and strengthen business in supply chain management for eco-products

❸ Offshore wind-power generation business (Groupwide effort to accelerate commercialization of the offshore wind-power business)
- Engineering business: Manufacture monopiles and other seabed-fixed structures for offshore wind-power generation
- Steel business: Produce large, heavy plates using the No. 7 continuous casting machine in the Kurashiki district of the West Japan Works
- Trading business: Carry out supply chain management for steel materials and processed products.
- Shipbuilding business: Manufacture offshore wind power generation floating structures and construct work vessels
- Groupwide: Operation and maintenance (O&M) making maximum use of Group resources

Notes:
1. Carbon-recycling blast furnace: A technology that converts CO_2 from the blast furnace into methane, which is then used as reducing material in the blast furnace
2. CCU: Carbon dioxide capture and utilization
3. Transitional technologies: Technologies that advance the transition to carbon neutrality

› **Progress under JFE Vision 2035 and the Eighth Medium-term Business Plan** (P. 24)
› **JFE Group Environmental Vision for 2050, Presentation Material** (https://www.jfe-holdings.co.jp/en/common/pdf/investor/climate/2021-210525-release01.pdf)
› **JFE Group Environmental Management Strategy, Presentation Material**
(https://www.jfe-holdings.co.jp/en/common/pdf/investor/climate/environmental-management-strategy250529-01.pdf)

JFE Group's Strategy for Addressing Climate Change Issues

The JFE Group organizes climate change-related risks and opportunities and reflects them in its management strategies. In the Eighth Medium-term Business Plan (FY2025–FY2027), the Group positions this as a key management issue and is pursuing related initiatives. In addition, based on the JFE Group Environmental Vision for 2050 toward achieving carbon neutrality by 2050 and JFE Vision 2035, we have incorporated initiatives aimed at becoming a leader in carbon-neutral technology development into our business strategies. These strategies are formulated in light of the risks and opportunities identified through impact assessments based on scenario analysis and are also used for decision-making. Furthermore, we communicate our climate change initiatives through various disclosure channels and briefings to further strengthen relationships of trust with our stakeholders.

For related materials, please refer to:

› **Identification and Assessment of Risks and Opportunities (TCFD Scenario Analysis)** (P. 113)

› **JFE Group Environmental Vision for 2050, Presentation Material**
(https://www.jfe-holdings.co.jp/en/common/pdf/investor/climate/environmental-management-strategy250529-01.pdf)

› **JFE Group Long-term Vision "JFE Vision 2035," Eighth Medium-term Business Plan (FY2025–FY2027)**
(https://www.jfe-holdings.co.jp/uploads/2024-chuuki250508-01e.pdf)

› **JFE Group Environmental Management Strategy, Presentation**
(https://www.jfe-holdings.co.jp/en/common/pdf/investor/climate/environmental-management-strategy250529-01.pdf)

Initiatives for Achieving Carbon Neutrality in the Steel Business

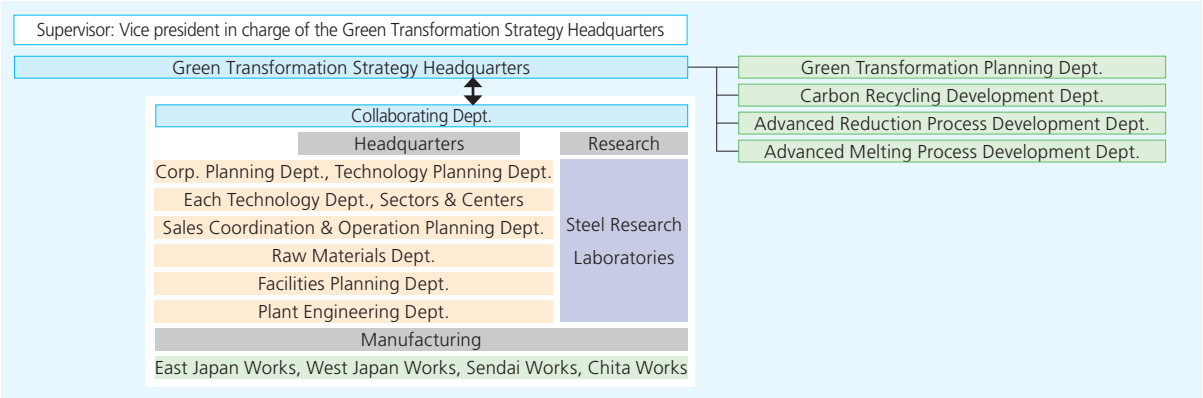
Promotion Structure

At JFE Steel, the Green Transformation Strategy Headquarters was established to formulate and promote a Companywide strategy to realize GX. The office is comprised of the Green Transformation Planning Department*[1] and departments responsible for developing technologies, specifically the Carbon Recycling Development Department, the Advanced Reduction Process Development Department, and the Advanced Melting Process Development Department. The Green Transformation Strategy Headquarters steers various GX-related initiatives, and important decisions are deliberated on and made by the Group Management Strategy Committee and the Board of Directors. Under this structure, JFE Steel will conduct and manage carbon-neutral technology development and investment as well as address issues such as market development for expanding sales of GX steel JGreeX™*[2] and strengthening cooperation with government authorities.

*1 In April 2026, the Green Energy Infrastructures Development Department was merged into the Green Transformation Planning Department, consolidating responsibility for external collaboration with government authorities and companies in industrial complexes to support a more integrated implementation of the GX strategy.

› ***2 Initiatives to Develop the GX Steel Market through GX Steel, JGreeX™** (P. 60)

JFE Steel's Management Structure to Promote Carbon Neutrality



Approach to Balancing Environmental Initiatives and Economic Rationality in the Steel Business

The market for GX steel*[1] (green steel) has potential demand of approximately 500 million tonnes by 2050,*[2] and demand-side needs for GX products are expected to grow in the future. The Japanese government has also set a target of capturing a domestic and international market for high-quality GX steel of approximately 3 million tonnes or more per year for automobiles, construction, public works, shipbuilding, industrial machinery, and other applications in the early 2030s.*[2] Competitors in Japan and overseas are also pursuing technological development and investment for producing GX steel.

In this context, JFE Steel is pursuing the development of ultra-innovative technologies, including carbon-recycling blast furnaces, hydrogen-based direct reduction, and highly efficient, large-scale electric arc furnaces by utilizing the Green Innovation Fund Project with the aim of leading the way in achieving carbon neutrality in the steel industry. We believe the use of electric arc furnaces is the only available means during the transition phase. We will strengthen collaboration with the government to secure CAPEX support and tax incentives so that we can quickly convert to the innovative electric arc furnace process. In April 2025, after securing a subsidy under the government's Energy and Manufacturing Process Conversion Support Program for Industries in a Hard-to-Abate Sector, we formally decided, ahead of other companies, to introduce an innovative, highly efficient, large-scale electric arc furnace to replace the No. 2 blast furnace at the West Japan Works (Kurashiki district), scheduled for refurbishment in FY2027. In the field of electric arc furnace steel as well, enhancing the technological capabilities underpinning our competitiveness, including process technologies and product and composition patents, and supplying high-quality, high-performance steel products that were difficult to manufacture with existing electric arc furnaces, are essential for maintaining and enhancing our standing as a world-leading steel company. JFE Steel aims to build a domestic production and a technology base for low-carbon, high-quality, high-performance steel products and to secure the top share in the domestic GX steel market.

On the other hand, demand for GX steel is still at an early stage. To ensure the predictability of recovering GX investments, JFE Steel will propose and help implement public-private measures to create a GX steel market, such as the visualization of environmental value as well as preferential procurement and purchase support.

› ***1 Initiatives to Develop the GX Steel Market through GX Steel, JGreeX™** (P. 60)

› ***2 Public-Private Investment Roadmap for "Key Products and Technologies" in 17 Strategic Fields (Japanese only)**
(https://www.cas.go.jp/jp/seisaku/nipponseichosenryaku/pdf/rm2026.pdf)

Steel Business Initiatives for Achieving GHG Emissions Reduction Targets

The JFE Group has adopted a multi-pronged approach to achieve carbon neutrality by 2050, including the development of ultra-innovative technologies. We have set a target in the steel business for reducing GHG emissions by 24% by FY2027 and by at least 30% by FY2030, compared to FY2013. We regard the period through 2030 as a transition phase, during which we will steadfastly implement plans to achieve our GHG reduction targets, mainly by expanding the application of low-carbon technologies focused on "reducing," while accelerating research and development of ultra-innovative technologies in preparation for the innovation phase after 2030. In the innovation phase, we will advance initiatives for the wise use of resources, including the commercialization of carbon-recycling blast furnaces that leverage our proprietary carbon-recycling technology and direct reduction steelmaking, as well as the expansion of CCU applications. Furthermore, we will undertake CO_2 sequestration through CCS to create a carbon-neutral society together with local communities and industrial complexes. We will achieve carbon neutrality through initiatives under these three themes.

Roadmap to Carbon Neutrality

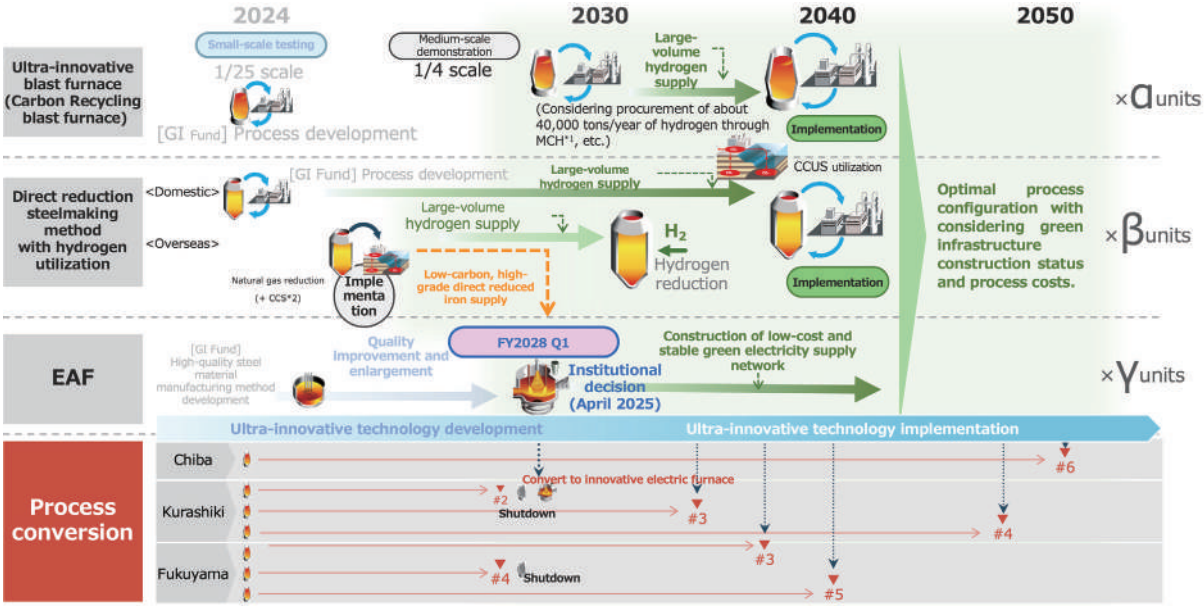
In May 2025, the JFE Group formulated the Eighth Medium-term Business Plan (FY2025–FY2027) to drive growth strategies and announced its GHG reduction plan through FY2030 at the JFE Group Environmental Management Strategy Briefing held that same month. In the steel business, we have set a new target of a 24% reduction by FY2027 as an interim milestone on a linear path toward a reduction of at least 30% by FY2030 (both compared to FY2013). Furthermore, we formulated our long-term vision, JFE Vision 2035, expressing our aspirations for the future. JFE Vision 2035 incorporates into our business strategies the policy of becoming a leader in carbon-neutral technology development, and we are advancing phased and strategic initiatives to achieve carbon neutrality in our steel business by 2050.

Major GX investments expected to contribute significantly to achieving the FY2030 target, such as the Kurashiki innovative electric arc furnace and investments in the use of direct-reduced iron in a blast furnace, have for the most part already been formally approved. Meanwhile, toward achieving carbon neutrality by 2050, we are working on research and development of

innovative low-carbon technologies while utilizing public support such as the Green Innovation Fund. Targeted for completion around 2035, these efforts are intended to establish ultra-innovative technologies, such as the use of hydrogen in carbon-recycling blast furnaces and direct reduction, as well as methods for producing high-quality, high-performance products using electric arc furnaces, which fundamentally reimagine conventional manufacturing processes.

The state of energy infrastructure will be a crucial factor in addition to progress in the development of ultra-innovative technologies for achieving carbon neutrality. Just as essential will be our response to external changes, such as the development of hydrogen supply networks and securing a stable supply of decarbonized electric power. Furthermore, market demand for GX steel and the rising environmental awareness of customers will also be key indicators for decisions on the transformation of the steelmaking process. We will pursue this transformation at the optimal time by comprehensively taking these factors into account.

Roadmap to Carbon Neutrality in 2050



*1 MCH (Methyl Cyclol Hexane) A type of hydrogen carrier, a liquid made by adding hydrogen to toluene

*2 CCS (Carbon dioxide Capture and Storage)

› Source: May 29, 2025 JFE Group Environmental Management Strategy Presentation Materials
(https://www.jfe-holdings.co.jp/en/common/pdf/investor/climate/environmental-management-strategy250529-01.pdf)

JFE Group's Strategy and Alignment with the Paris Agreement

The Technology Roadmap for Transition Finance in the Iron and Steel Sector, published by the Japanese Ministry of Economy, Trade, and Industry (METI), is consistent with Japan's emissions reduction targets based on and therefore aligned with the Paris Agreement. The roadmap sets out a pathway to achieve carbon neutrality by accelerating decarbonization through the introduction of innovative technologies starting in the 2040s, assuming the development of a hydrogen supply infrastructure and CCUS.

In 2022, the JFE Group issued transition bonds through a public offering. During the evaluation process for this issuance, a third party certified that the Group's initiatives aligned with METI's roadmap. The Group therefore considers its initiatives to be aligned with the Paris Agreement.

› METI: Technology Roadmap for Transition Finance in the Iron and Steel Sector (Japanese only)
(https://www.meti.go.jp/policy/energy_environment/global_warming/transition/transition_roadmap2025_ironandsteel_j.pdf)

› METI: Transition Finance Case Study (https://www.meti.go.jp/policy/energy_environment/global_warming/transition/transition_finance_case_study_jfehd_eng.pdf)

Metrics and Targets (Plans and Results for GHG Emissions Reduction in the Steel Business)

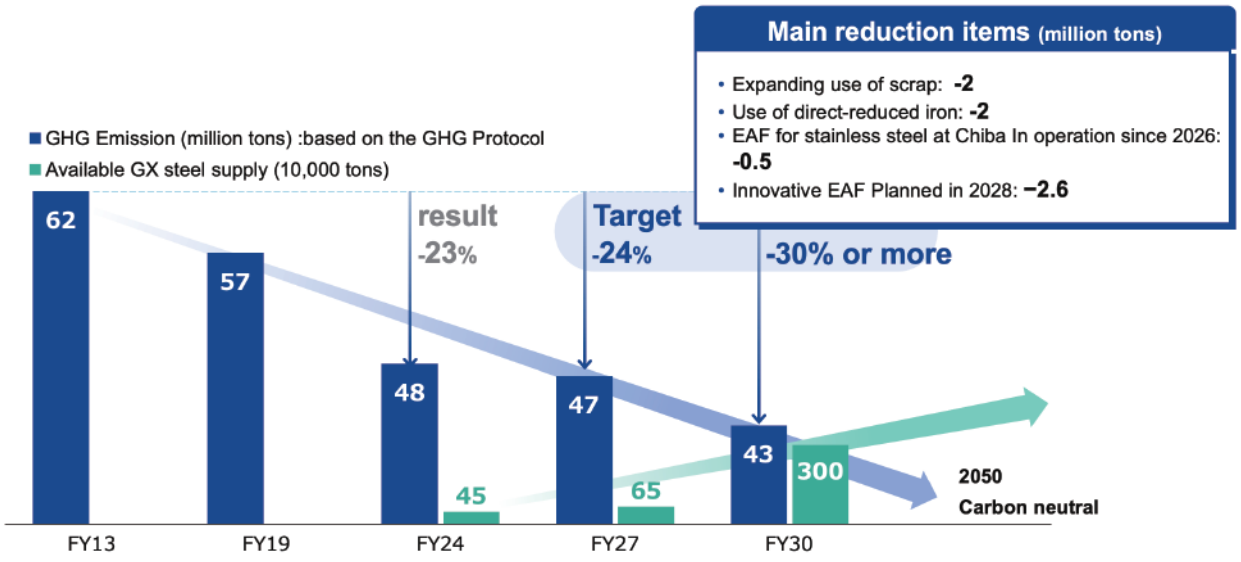
GHG Emissions Reduction in the Domestic Steel Business

The JFE Group has set a target in the steel business for reducing GHG emissions by 24% by FY2027 and by at least 30% by FY2030, compared to FY2013. To achieve these goals, JFE Steel began constructing an innovative electric arc furnace in the Kurashiki district of the West Japan Works in October 2025, scheduled to start operating in FY2028. Once this innovative electric arc furnace is operational, we will build a system for the mass supply of GX steel, JGreeX™* and steadily reduce GHG emissions. In addition, in April 2026 we started operating an electric arc furnace for stainless steel production in the Chiba district of the East Japan Works. By uniting all Group companies in Japan and overseas to incorporate efforts to address climate change into our business strategies, the Group will systematically reduce GHG emissions by reflecting the TCFD's principles in its management strategies.

In addition to reducing GHG emissions, JFE Steel has also set a target of expanding the supply capacity of JGreeX™ to 3 million tonnes per year to contribute to the decarbonization of society as a whole.

› *Initiatives to Develop the GX Steel Market through GX steel, JGreeX™ (P. 60)

Domestic Steel Business: GHG Emissions Reduction Plan



Alignment with the Japan Iron and Steel Federation's Plan

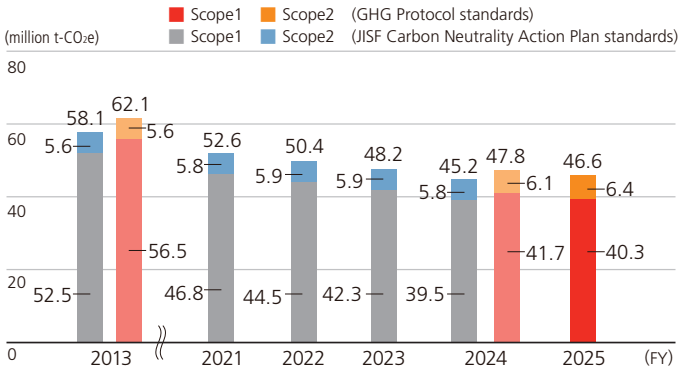
As a member of the Japan Iron and Steel Federation (JISF), JFE Steel is working to achieve the targets of the federation's Carbon Neutrality Action Plan. This plan sets a target of a 30% reduction in energy-derived CO_2 emissions in FY2030, compared to FY2013, and JFE Steel is aggressively pursuing this goal.

In addition, JISF formulated and announced the Long-term Vision for Climate Change Mitigation, which looks ahead to 2030 and beyond, in 2018, which is intended to realize zero-carbon steel. JFE Steel played a key role in formulating this vision. Furthermore, in 2021, the JISF announced the Basic Policy of the Japan Steel Industry on 2050 Carbon Neutrality, sought by the Japanese government, declaring that the Japanese iron and steel industry will boldly take on the challenge of realizing zero-carbon steel.

The JFE Group has declared its intention to reduce GHG emissions in the steel business by at least 30% in FY2030, compared to FY2013, and to achieve carbon neutrality by 2050.

Domestic Steel Business: Actual GHG Emissions

JFE Steel's GHG Emissions Trends

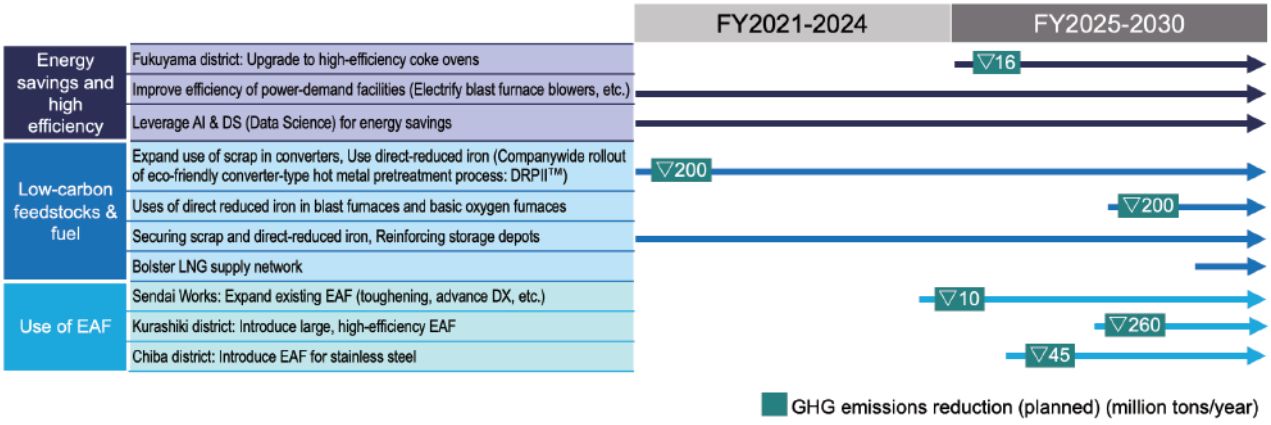


Note: For FY2021–FY2024, CO_2 emissions are calculated in accordance with the JISF Carbon Neutrality Action Plan standards. From FY2024 onward, emissions are calculated in accordance with the GHG Protocol standards.

For quantitative data for the JFE Group's GHG emissions, please refer to:
› **Environmental Data** (P. 273)

Initiatives for Achieving the FY2030 GHG Emissions Reduction Target

To achieve the steel business target of reducing GHG emissions by at least 30% from FY2013 levels by FY2030, we have defined the period up to 2030 as a transition phase and are pursuing initiatives based on three pillars: energy saving and higher efficiency, use of low-carbon raw materials and fuels, and the application of electric arc furnace technology. By FY2024, we had authorized investments of approximately 0.4 trillion yen for reducing GHG emissions, which we were implementing. Major investment projects that will contribute to achieving the FY2030 reduction target, such as the innovative electric arc furnace project in the Kurashiki district of the West Japan Works and the expanded use of direct-reduced iron and scrap in the Chiba district of the East Japan Works, have for the most part already been formally approved. In addition, under the Eighth Medium-term Business Plan, we are steadily executing GHG reduction investments to achieve the reduction targets for FY2027 and FY2030 through the cumulative effects of each initiative. We will continue to authorize and execute the necessary financing and investments while developing and deploying ultra-innovative technologies to achieve carbon neutrality by 2050.



Initiatives in Existing Processes

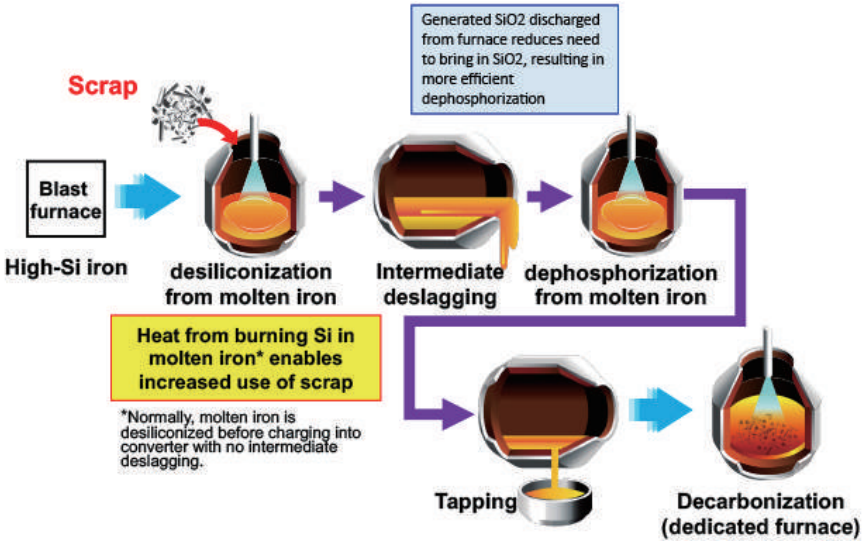
Increased Use of Scrap Iron in Steelmaking

JFE Steel introduced the Double-slag Refining Process (DRP™), an eco-friendly converter-type molten-iron pretreatment process, at all of its sites in 2021, thereby increasing the amount of scrap iron to be used in converters and reducing GHG emissions.

DRP makes full use of silicon in molten iron as a heat source, thereby increasing the amount of scrap iron to be used in converters. It allows for the reduction of the molten-iron blending ratio (molten iron vs. scrap charged into the converter) to 82%, down from 90% through conventional methods.

The Company introduced this process in all of its steelmaking facilities, and the increased use of scrap iron in converters enabled us to reduce annual GHG emissions by approximately 1.34 million tonnes in FY2024. We will continue to develop technologies to further expand the use of scrap.

Eco-Friendly Converter-Type Molten Iron Pretreatment Process DRP™: Double-Slag Refining Process



Use of HBI in Blast Furnaces

JFE Steel is expanding the use of direct-reduced iron in the form of hot briquetted iron (HBI) in blast furnaces. Direct-reduced iron is an iron source produced by removing part of the oxygen from iron ore in advance. It contributes to reducing coke consumption and CO_2 emissions by reducing the need for reduction reactions inside the blast furnace. JFE Steel formally approved a GX investment of approximately 6 billion yen to utilize direct-reduced iron in the No. 6 blast furnace in the Chiba district of the East Japan Works, with support from the FY2024 Subsidy for the Energy Conservation Investment Promotion and Demand Structure Transformation Support Project. We are continuing to promote the Middle East direct-reduced iron project while developing and implementing technologies for its use in blast furnaces, mainly in the Chiba district of the East Japan Works. Using direct-reduced iron while maintaining the blast furnace process's strength in producing high-quality steel products will reduce GHG emissions by making effective use of existing facilities and contribute to achieving our emission reduction targets.

Electric Arc Furnace Process Technology Development

JFE Steel is developing and implementing innovative electric arc furnace process technology. The electric arc furnace process uses steel scrap and direct-reduced iron as its main raw materials to manufacture steel products, and can substantially reduce CO_2 emissions compared to the blast furnace-converter method. Further reductions in GHG emissions are expected through the expanded use of hydrogen-reduced iron and decarbonized electricity.

However, the performance of conventional electric arc furnace processes in manufacturing high-quality, high-performance steel products has been constrained due to the effects of impurities derived from scrap, known as tramp elements, and productivity challenges. We have been developing high-quality, highly efficient melting technologies and technologies to mitigate the effects of impurities through development efforts using a pilot electric arc furnace under the Green Innovation Fund Project and at our research laboratories. In 2025, we completed verification of the elemental technologies using the pilot electric arc furnace in the Chiba district and identified a clear path toward establishing the technologies required to

manufacture high-quality steel products. We have now moved on to the engineering stage for implementation of the innovative electric arc furnace.

Building on these achievements, JFE Steel is advancing an innovative electric arc furnace project in the Kurashiki district of the West Japan Works. This project will introduce a highly efficient, large-scale electric arc furnace with an annual capacity of about two million tonnes of steel. Combining our proprietary technologies with innovative process technologies will enable the mass production of high-quality, high-performance steel products such as electrical steel sheets and high-tensile steel sheets, which have been difficult to manufacture with conventional electric arc furnaces. The furnace will also use up to 50% direct-reduced iron and is expected to reduce CO_2 emissions by approximately 2.6 million tonnes per year.

The innovative electric arc furnace in the Kurashiki district is being constructed as a core project for achieving the FY2030 GHG emissions reduction target. In addition to the furnace itself, the project includes related infrastructure, including energy supply facilities for electricity, LNG, and other sources required for the process conversion and port facilities to accommodate the expanded use of direct-reduced iron and scrap. We are making steady progress on the detailed planning and engineering to bring the furnace into operation. Going forward, we will strive to become a main player in the high-quality GX steel market by establishing a stable supply system for high-quality GX steel while substantially reducing CO_2 emissions.

Expansion of Electric Arc Furnace Production Capacity at the Sendai Works

JFE Steel increased electric arc furnace production capacity at the Sendai Works by approximately 140,000 tonnes per year in FY2024 by reinforcing the furnace, applying DX and other measures, and expanding cargo handling capacity. This is expected to result in a reduction of about 0.10 million tonnes of GHG emissions per year.

Operation of the Electric Arc Furnace for Stainless Steel Production at the East Japan Works, Chiba District

JFE Steel began operating a new electric arc furnace at the No. 4 steelmaking shop at the East Japan Works (Chiba district) in April 2026. The shop produces stainless steel, mainly using molten iron from blast furnaces and scrap generated in-house as raw materials. The introduction of the new electric arc furnace has established a system that uses scrap more effectively. The electric arc furnace allows the facility to replace some of the molten iron from blast furnaces with scrap, thereby reducing CO_2 emissions in the steelmaking process. Scrap melting capacity is now up to approximately six times the previous level, and we expect to reduce GHG emissions by a maximum of about 450,000 tonnes per year. Furthermore, we are promoting resource circulation and strengthening business competitiveness by adjusting the raw material mix through greater use of scrap and improving operational efficiency.

Equipment Overview

Capital investment	Approx. 18 billion yen
Start of operation	April 29, 2026
Scrap melting capacity	Approx. 300 kilotonnes/year
GHG emissions reduction effect	Up to approx. 450 kilotonnes/year



Exterior of the electric arc furnace at the No. 4 steelmaking shop in the Chiba district

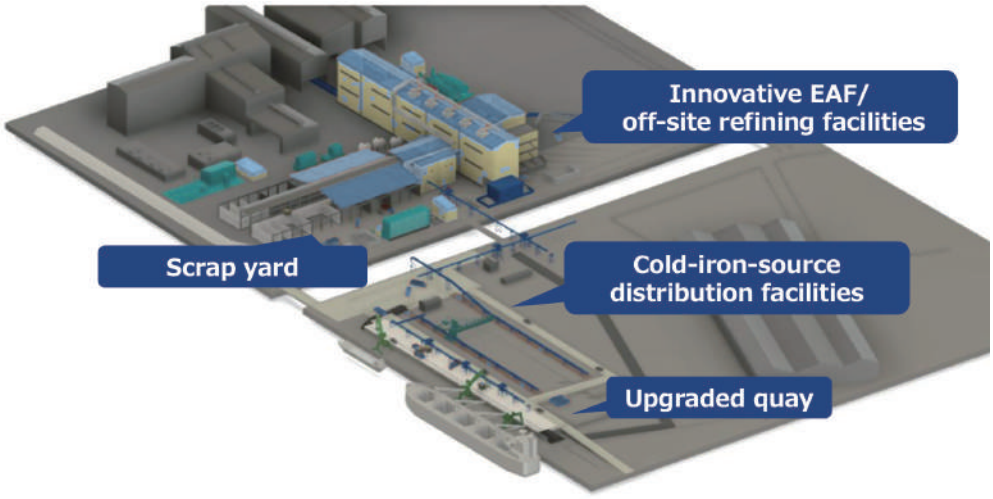
Introduction of an Innovative Electric Arc Furnace at the West Japan Works, Kurashiki District

In April 2025, JFE Steel formally decided to convert the No. 2 blast furnace at the West Japan Works (Kurashiki district), scheduled for refurbishment in FY2027, into an innovative electric arc furnace. We then proceeded with the removal of existing facilities and started foundation pile-driving work in late October 2025. This innovative electric arc furnace will be one of the largest in the world. With it, we aim to establish, ahead of our competitors, a mass supply system for high-quality, high-performance steel products that cannot be produced using conventional large-scale electric arc furnaces, and secure the top share in the domestic GX steel market. This project will convert part of the blast furnace process to the electric arc furnace process and is positioned as a core project among the GHG reduction investments authorized through FY2024. The innovative electric arc furnace is world-class equipment that combines a high-efficiency, large-scale electric arc furnace with our proprietary technologies for manufacturing high-quality steel. It will enable the mass supply of high-quality, high-performance steel products such as electrical steel sheets and high-tensile steel sheets, which are difficult to manufacture with conventional electric arc furnaces.

The innovative electric arc furnace will have an annual capacity of about two million tonnes of steel and is planned to use up to 50% direct-reduced iron. It will produce high-quality steel products and reduce CO_2 emissions through an integrated electric arc furnace process using scrap and direct-reduced iron and is expected to reduce GHG emissions by approximately 2.6 million tonnes per year.

We are also formulating plans for this project on the basis of government support. In addition to constructing the furnace itself, we are also developing related infrastructure, such as energy supply facilities for electricity, LNG, and other sources and port facilities to accommodate the expanded use of direct-reduced iron and scrap. Going forward, we aim to become a major player in the high-quality GX steel market by building a stable supply system for high-quality GX steel and substantially reducing GHG emissions.

Conceptual image of the innovative electric arc furnace and related facilities in the Kurashiki district



Equipment Overview

Investment scale	329.4 billion yen (with government support capped at 104.5 billion yen)
Investment details	Innovative electric arc furnace, secondary refining equipment, cold iron logistics facilities, wharf development, power grid reinforcement, etc.
Production capacity	Approx. 2 million tonnes/year
Start of production	First quarter of FY2028
GHG emissions reduction effect	Approx. 2.6 million tonnes/year

Notes:

*The Company's share of the cost will be financed with support from the debt guarantee program of the GX Acceleration Agency and other arrangements.

*The Company entered into Japan's first transition loan agreement under this program (March 2026).

Planned construction site of the innovative electric arc furnace and related facilities in the Kurashiki district



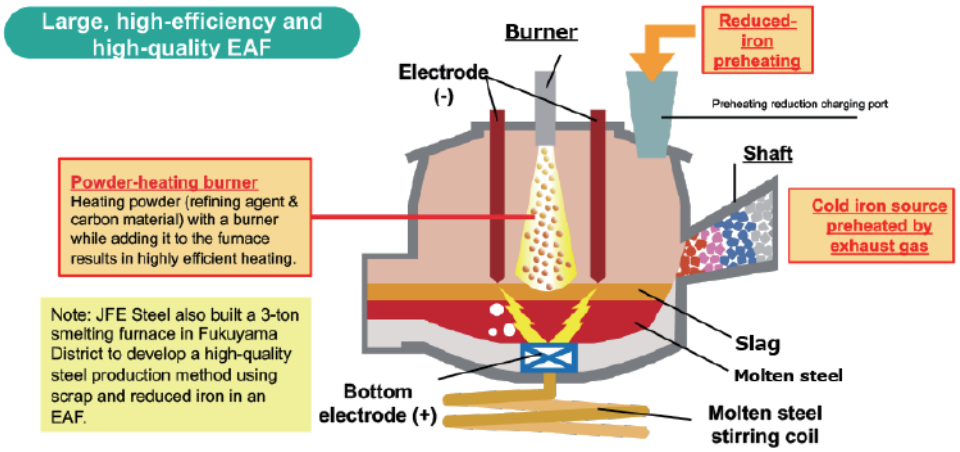
Demonstration Tests for Developing Manufacturing Methods for High-Quality Steel Products

With support from NEDO's Green Innovation Fund (GI Fund) Project, we are developing a process that reduces the electric arc furnace's melting power consumption and also enables high-speed melting of cold iron sources (scrap and direct-reduced iron). We will verify the following during demonstration tests.

- Optimal methods for preheating and feeding direct-reduced iron
- Methods for using heating burners
- Optimal methods for molten steel stirring

In the FY2025 stage-gate review, the progress and results of development were evaluated, and NEDO approved the project's continuation. Moreover, we will continue to pursue development toward the practical application of technologies for manufacturing high-quality steel products.

Research and Development for Electric Arc Furnaces



Feasibility Study on New Venture Business to Secure Direct-Reduced Iron Supply

In the transition phase up to 2030, we expect a shortage in domestic scrap supply. The use of direct-reduced iron is considered an effective way to supplement this in the production of high-quality steel using electric arc furnaces and in the reduction of GHG emissions from blast furnaces.

JFE Steel is conducting detailed feasibility studies with EMSTEEL, the largest steel producer in the UAE, and ITOCHU Corporation to establish a supply chain of direct-reduced iron with low carbon emissions. After the business scheme is finalized, we will begin producing direct-reduced iron (approximately 2.5 million tonnes per year) under a joint venture to be established in the UAE. As the largest off-taker, we will secure a long-term and stable supply of direct-reduced iron, mainly for the innovative electric arc furnace at the West Japan Works (Kurashiki district).

- Overview of EMSTEEL
  Company name: EMSTEEL
  Representative: HE Engineer Saeed Ghumran Al Remeithi (Group CEO)
  Business: Steel

The memorandum exchange ceremony held in Abu Dhabi, United Arab Emirates, in the presence of then Prime Minister Fumio Kishida (July 17, 2023)





Initiatives to Develop the GX Steel Market through GX Steel JGreeX™

Name origin: JFE + Green + GX
We invited the relevant departments to propose names and selected this one from the suggestions because it clearly represents a GX steel product provided by JFE Steel.
Logo design:
The logo combines the letter X with an arrow to express our intention to move forward toward carbon neutrality.

The steel industry is a hard-to-abate sector that emits significant amounts of CO_2 from its manufacturing processes. At present, it is difficult to substantially reduce GHG emissions immediately using the blast furnace process or provide a stable, large-scale supply of zero-emission steel products. Nevertheless, customer demand for such steel products is rising.

The Japan Iron and Steel Federation (JISF) has set out the GX steel concept in its GX Steel Guidelines*[1] for achieving a carbon-neutral society. Under this concept, GHG emission reductions generated through reduction projects with additionality are allocated to selected steel products. The guidelines define GX steel as "steel products that have a significant environmentally favorable impact due to additional direct emission mitigation actions (Scope 1) 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." The Study Group on Green Steel for Green Transformation of the Ministry of Economy, Trade and Industry clearly states that the government will focus on policies such as government priority procurement by the government and other support measures to support the purchase of these steel products, classified as "Green Steel for GX."*[2] JFE Steel has started supplying GX steel JGreeX™ based on these guidelines to meet decarbonization needs in the supply chain. The GHG emission reductions and product emission intensity of JGreeX™ have received third-party certification from Nippon Kaiji Kyokai (ClassNK), which certified approximately 1.34 million tonnes of GHG emission reductions for FY2024. JFE Steel strongly emphasizes transparency in the methods for calculating reductions and allocating environmental value, and it is working to enhance reliability through third-party certification. In addition, it recognizes that the sound development of the GX steel market requires that the methods for calculating GHG emissions and reductions, as well as for attributing environmental value, are aligned with international rules such as the GHG Protocol and ISO standards. JFE Steel is actively engaged in these efforts.

Alongside these efforts to enhance transparency, JFE Steel is working to create and expand the GX steel market. In FY2025, the adoption of JGreeX™ expanded across a wide range of fields, including automobiles, shipbuilding, construction, and industrial machinery, and sales volume also increased. JFE Steel believes that support through policies such as subsidies and public procurement is important for further expanding the GX steel market, and it is actively engaging in dialogue with government authorities as well as customers. For details on these initiatives related to international rulemaking and policy proposals, please refer to Policy Engagement (P. 89).

The GX steel market is still developing, and one key challenge is to create a market that appropriately recognizes the environmental value generated through the capital investment and additional operating costs required for decarbonization. Implementing ultra-innovative technologies for the innovative electric arc furnace requires an enormous investment, and its deployment depends on customers choosing GX steel as well as a society-wide mechanism for recognizing its value, including the development of international rules and policy support.

> *1 Japan Iron and Steel Federation: GX Steel Guidelines
(https://www.jisf.or.jp/business/ondanka/kouken/greensteel/documents/GXSteelGuidelinev4.1_translation_May2026.pdf)

> *2 METI: Report by the Study Group on Green Steel for Green Transformation (https://www.meti.go.jp/english/press/2025/0123_001.html)

Overview of JGreeX™ Adoption



Overview of JGreeX™ Supply

Supply start	First half of FY2023
Supply capacity	Approx. 500 kilotonnes (FY2025 onward)
Target products	All steel products produced by JFE Steel
Certification body	Nippon Kaiji Kyokai (ClassNK)

JGreeX™ Sales Performance (September 2024 Onward)

Application Field	Details	Timing	URL
Construction	High-strength bolts for construction	March 2025	https://www.jfe-steel.co.jp/release/2025/03/250326.html (Japanese only)
	Overhead crane	July 2025	https://www.jfe-steel.co.jp/en/release/2025/07/250707.html
Shipbuilding	General cargo ship	June 2025	https://www.jfe-steel.co.jp/en/release/2025/06/250612.html
	Gutt ship	December 2025	https://www.jfe-steel.co.jp/release/2025/12/251202-2.html (Japanese only)
Plant	Large industrial transformer	February 2025	https://www.jfe-steel.co.jp/release/2025/02/250203.html (Japanese only)
Industrial machinery	Motor surface mounters	September 2024	https://www.jfe-steel.co.jp/en/release/2024/09/240903.html
Steel pipe	Sales to steel pipe and tube trading companies	January 2025	https://www.jfe-steel.co.jp/en/release/2025/01/250129.html
Steel sheets and steel pipes	Memorandum of understanding (MOU) with manufacturer	September 2024	https://www.jfe-steel.co.jp/en/release/2024/09/240924.html
Automotive	Automotive components	April 2025	https://www.jfe-steel.co.jp/en/release/2025/04/250424-2.html
		November 2025	https://www.jfe-steel.co.jp/release/2025/11/251111.html (Japanese only)
		January 2026	https://www.jfe-steel.co.jp/en/release/2026/01/260129.html

Initiatives for Achieving Carbon Neutrality by 2050

We are engaged in a multi-pronged approach to developing ultra-innovative technologies, such as carbon-recycling blast furnaces (CR blast furnaces), hydrogen steelmaking (direct reduction), and the electric arc furnace process (high-efficiency, large-scale electric arc furnaces), to achieve carbon neutrality by 2050, as announced in the JFE Group Environmental Vision for 2050. We are particularly focused on a technology that combines a CR blast furnace and CCU, which allows us to efficiently mass-produce high-grade steel and reuse CO_2 in the blast furnace. Measures such as converting surplus CO_2 into basic chemicals, including methanol, and storing it underground (CCS) can help achieve net zero emissions.

Demonstration Tests for NEDO Project (GREINS) for Hydrogen Utilization in Iron and Steelmaking Processes

JFE Steel formed a consortium with Nippon Steel Corporation, Kobe Steel, Ltd., and the Japan Research and Development Center for Metals and was jointly commissioned by the New Energy and Industrial Technology Development Organization (NEDO) to undertake the Green Innovation Fund Project (GREINS) for Hydrogen Utilization in Iron and Steelmaking Processes, and is working toward achieving carbon neutrality by 2050.

In order to further advance the development of ultra-innovative technologies to achieve carbon neutrality by 2050, JFE Steel has decided to construct all the necessary facilities for the demonstration tests for the project centrally in the East Japan Works (Chiba district) to increase the efficiency of the development effort. We will work together with consortium members to accelerate the development of ultra-innovative technologies.

Details of the Planned Demonstration Tests

- Carbon-recycling pilot blast furnace (150 m^3)
  Started construction in 2023, began demonstration tests in May 2025 to complete demonstration tests by FY2026.
- Direct reduction compact bench pilot furnace
  Started construction in 2023, began demonstration tests in December 2024 to complete demonstration tests by FY2026.
- Pilot electric arc furnace (10 t pilot furnace)
  Started construction in 2023, began demonstration tests in February 2025, completed demonstration tests at the end of FY2025, passed the stage gate review in June 2026, and received NEDO approval to continue the project.

Details for each are as follows.

Carbon-Recycling Blast Furnaces

Technical Features of a CR Blast Furnace

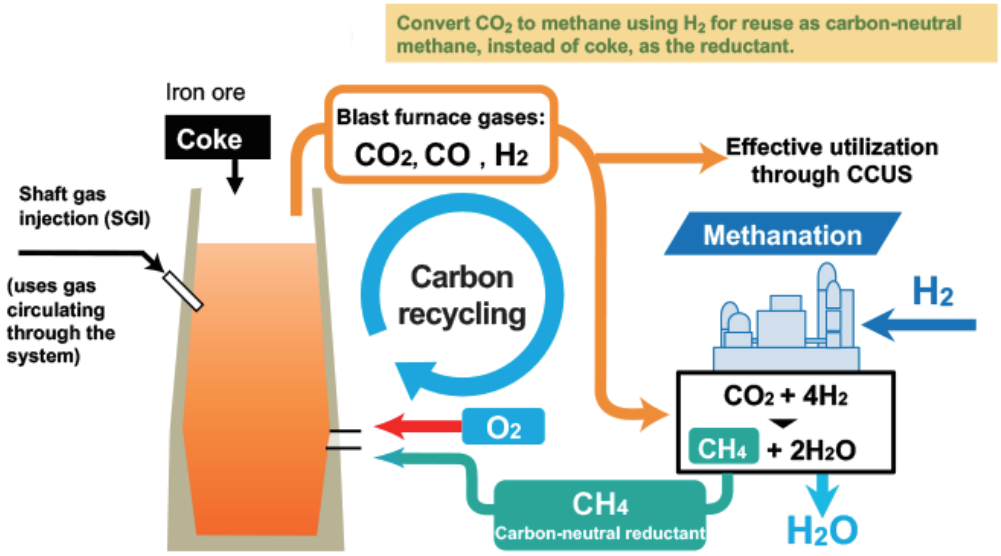
The CR blast furnace incorporates an ultra-innovative technology that converts CO_2 in the furnace exhaust gas into carbon-neutral methane through methanation, which is then reused as reducing material in the furnace. The technology, together with other measures, is expected to reduce CO_2 emissions by 50% compared to conventional blast furnaces and to ultimately help achieve carbon neutrality by leveraging CCU/CCUS. The thermal efficiency of the process can be further enhanced by replacing the air blown into the blast furnace with pure oxygen, allowing the energy used to heat the nitrogen in the air to then be used to heat methane. In addition, the lack of nitrogen facilitates the separation of CO_2, so the equipment necessary to separate CO_2 for methanation can be more compact and efficient and CCUS can be carried out efficiently.

Overview of the Demonstration Tests

We are developing a process for converting the CO_2 produced in the blast furnace into methane using hydrogen, allowing the carbon to be repeatedly used in the furnace as a reducing agent and thus reducing CO_2 emissions. We will verify the following during demonstration tests.

- Methods for blowing a large volume of methane along with oxygen into the furnace
- Applications for the heating burner that uses the circulation gas
- Methods for linking the operations of the furnace and the methanation facility that converts CO_2 from the blast furnace gases to methane

Overview of Carbon-Recycling Direct Furnaces



Development of Direct Hydrogen Reduction Technology (Carbon-Recycling Direct Reduction Process)

Hydrogen reduction ironmaking technology is another steelmaking process that the JFE Group is working on to achieve carbon neutrality. With this technology, the natural gas currently used in direct reduction ironmaking is replaced by 100% hydrogen to eliminate CO_2 emissions when iron ore is reduced.

Technology for Processing Raw Materials

Currently, the only raw material that can be used for direct reduction ironmaking is high-grade iron ore. Its production volume, however, is limited, and we expect it will become even more difficult to obtain in the future if direct reduction ironmaking were to expand worldwide.

To address this, JFE and one of its iron ore suppliers, BHP, are collaborating in the development of a new raw material processing technology for low- and medium-grade ores, which are currently used as raw materials for blast furnaces due to their large production volume. We are hoping that this new technology will allow us to use low- and medium-grade ores as raw materials for direct reduction ironmaking, thus expanding the raw material sourcing for direct reduction ironmaking.

Technology for Pre-Heating Raw Materials, Technology for Heating Hydrogen Gas

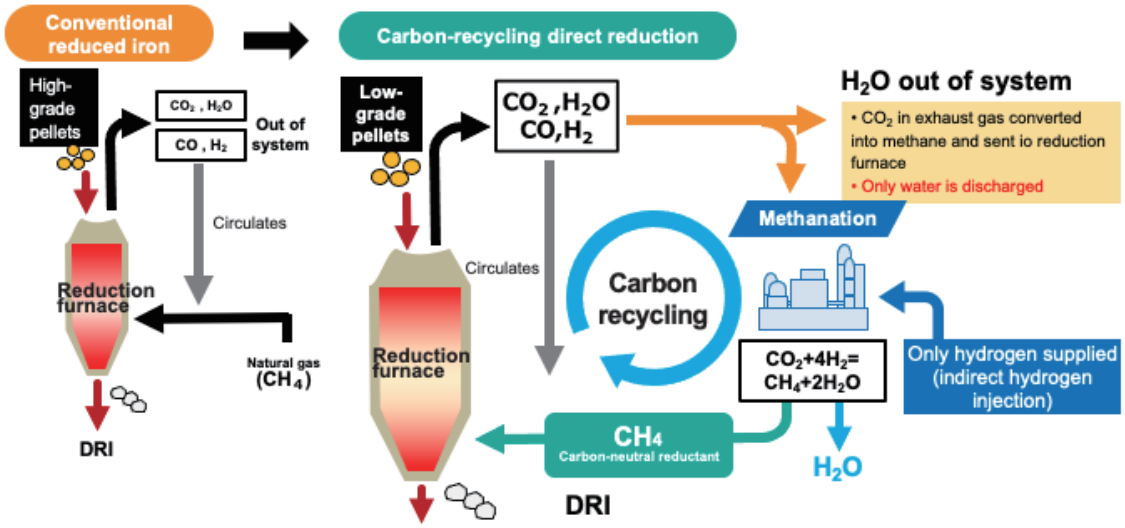
One challenge of hydrogen reduction is that the reduction of iron ore by hydrogen is an endothermic reaction, which means that heat must be applied externally for the reaction to proceed. A sufficient reduction reaction may not take place if there is not enough heat. Thus, technologies for heating raw materials and hydrogen gas must be developed.

Overview of the Demonstration Tests

We are developing a process whereby the CO_2 produced in the direct-reduction furnace is converted into methane through methanation with hydrogen, allowing the carbon to be repeatedly used in the furnace as a reducing agent and enabling repeated carbon recycling while reducing CO_2 emissions. We will verify the following during demonstration tests.

- Optimal methods for recycling CO_2 through methanation
- Methods for using low-grade ores

Carbon-Recycling Direct Reduction Process



Progress in Trial Production of Direct-Reduced Iron Using Green Hydrogen

Under NEDO's Green Innovation Fund Project "Hydrogen Utilization in Iron and Steelmaking Processes," we successfully produced direct-reduced iron using green hydrogen*1 on a trial basis for the first time in Japan*2 under the theme "Development of Direct Hydrogen Reduction Technology for Reducing Low-Grade Iron Ore Using Only Hydrogen / Development of Direct Hydrogen Reduction Technology."

This trial production used green hydrogen supplied from hydrogen production facilities constructed under NEDO's Development of Technologies for Realizing a Hydrogen Society*3, together with the direct hydrogen reduction test facilities constructed under the project. This was made possible through coordinated efforts to develop green hydrogen production and utilization technologies.*4

We will continue to advance the development of direct hydrogen reduction technology and work toward its deployment.

Direct-reduced iron produced on a trial basis using green hydrogen*4



*1 As of July 2026, according to NEDO research.

*2 Hydrogen produced by electrolyzing water using renewable energy, without emitting CO_2 during the production process.

› ***3 NEDO Development of Technologies for Realizing a Hydrogen Society: "Development of Power-to-Gas System Technology Aimed at Building a CO_2-Free Hydrogen Society" (Japanese only)** (https://www.nedo.go.jp/content/100950549.pdf)

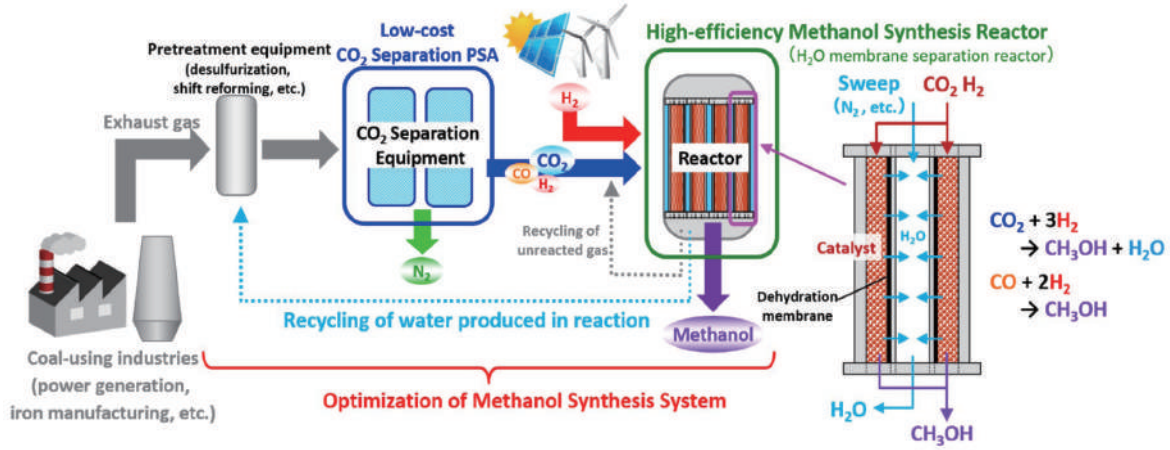
› ***4 Japan's First Successful Trial Production of Direct-Reduced Iron Using Green Hydrogen (Japanese only)** (https://www.jfe-steel.co.jp/release/2026/07/260731.html)

CCUS Initiatives

Development of an Optimal System for Methanol Synthesis Using CO_2

JFE Steel is working on the Optimum System for Methanol Synthesis Using CO_2, an R&D project, in collaboration with the Research Institute of Innovative Technology for the Earth (RITE) (see figure). On-site construction of a test facility commenced in FY2022 in the Fukuyama district of the West Japan Works, with operations scheduled to start in FY2023 and actual gas demonstration tests to be completed by the end of FY2026. The project focuses on establishing an optimal overall methanol synthetic system, mainly by developing technologies for low-cost CO_2 separation and high-efficiency methanol synthesis. The ultimate goal is to combine this new system with carbon-recycling blast furnaces and other ironmaking processes to achieve a large-scale CCU process. These results were obtained through R&D commissioned by NEDO (JPNP16002).

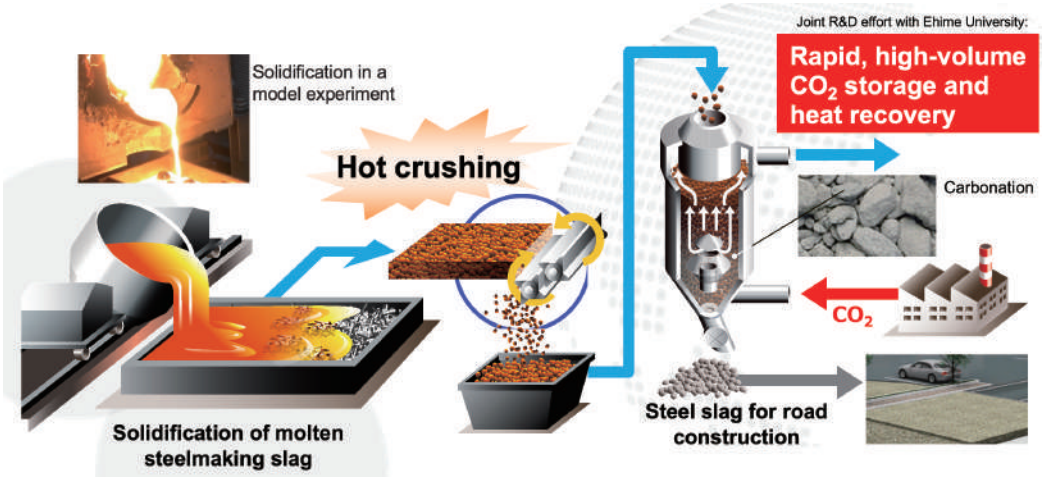
Methanol Synthesis Flow Using CO_2



Innovative CO_2 Sequestration Technology through Quick, Large-Quantity Carbonation of Steel Slag

JFE Steel is also collaborating with Ehime University to promote the NEDO project: Innovative CO_2 Sequestration Technology through Quick, Large-quantity Carbonation of Steel Slag. We have already confirmed the process principle, constructed facilities for demonstration testing toward practical application in the Chiba district of the East Japan Works, and commenced tests in FY2025. Through this research and development, we will sequester the CO_2 generated from ironmaking processes, such as carbon-recycling blast furnaces, and from nearby thermal power plants in slag, while at the same time verifying technologies for recovering sensible heat from high-temperature slag and converting the steel slag to roadbed materials and other products.

Quick, Large-Quantity Carbonation Flow of Steel Slag

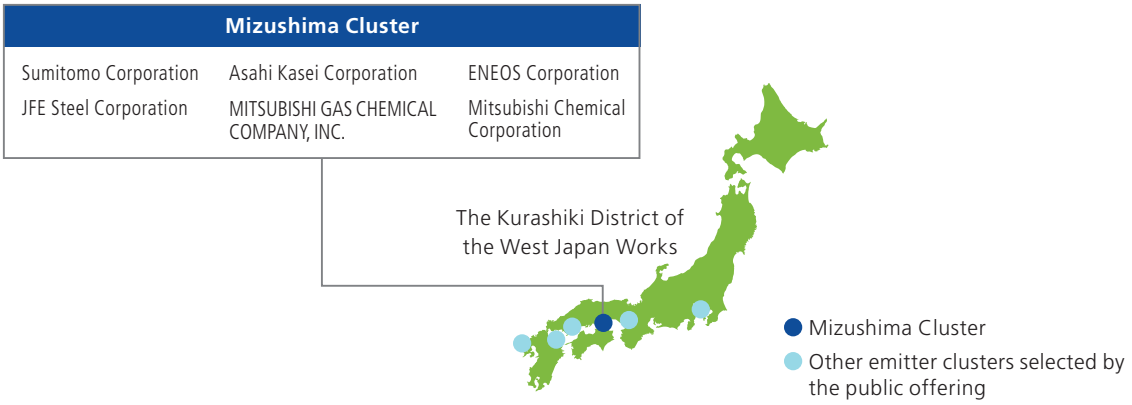


*This technological development is being carried out as a project commissioned by the New Energy and Industrial Technology Development Organization (NEDO) under its public solicitation for "Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation/Development of Technologies for CO_2 Reduction and Utilization."

Studies Toward Realizing CCS

In its public offering for FY2026, concerning "Design Work for Separation, Capture, Liquefaction, Temporary Storage, and Shipping Facilities for Ship-Based Advanced CCS Projects" the Japan Organization for Metals and Energy Security (JOGMEC) selected the "Mizushima Cluster" (for the Kurashiki district of the West Japan Works), in which JFE Steel participates. Through collaboration with CO_2 emitters located in the Mizushima Industrial Complex, we are promoting studies aimed at realizing CCS. In addition, we are continuing to conduct our own study in the Fukuyama district of the West Japan Works and the Chiba district of the East Japan Works. In FY2025, we examined the facility configurations and operating policies required in each district for separation and capture, liquefaction, utility supply, and other functions. We will advance studies and preparations for project implementation, on the assumption that government support will be secured.

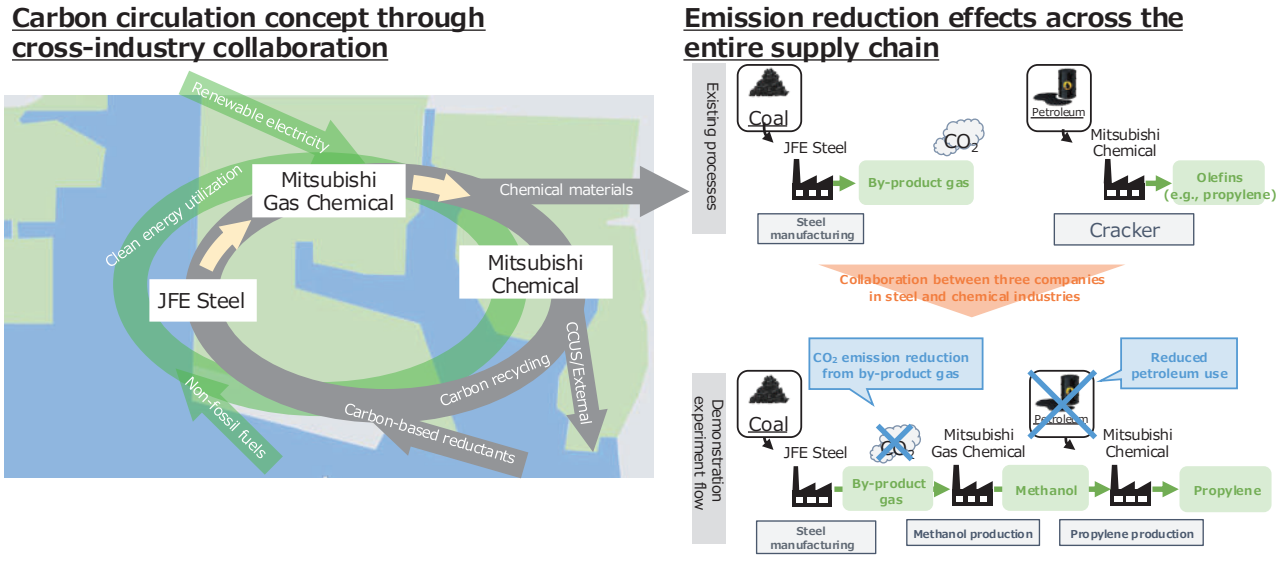
Consideration at Mizushima Cluster



Initiatives for Inter-Company Collaboration at the Mizushima Complex

JFE Steel Corporation, Mitsubishi Gas Chemical Company, Inc. (Mitsubishi Gas Chemical), and Mitsubishi Chemical Corporation (Mitsubishi Chemical) have signed a memorandum of understanding concerning a demonstration project at the Mizushima Complex (Kurashiki City, Okayama Prefecture). The project converts steelmaking by-product gas into methanol and then into propylene, a raw material for plastics. A new initiative within the Mizushima Complex promotes collaboration among hard-to-abate sectors (industries where GHG emissions are difficult to reduce). By utilizing CO_2 contained in byproduct gases from steel manufacturing processes to produce valuable chemicals, the project provides a model for collaborative CO_2 utilization, with the aim of launching the demonstration in FY2026. Looking ahead, the initiative intends to develop into a conceptual framework for carbon recycling through the collaboration of the steel and chemical industries. This approach is expected to reduce GHG emissions compared to traditional fossil resource-based methods for chemical production.

Inter-Company Collaboration at the Mizushima Complex



List of Related Initiatives

Reduce CO_2 Emissions at JFE Steel		
Carbon neutrality	Key initiatives	**JFE Group Environmental Management Strategy, Presentation Material** (https://www.jfe-holdings.co.jp/en/common/pdf/investor/climate/environmental-management-strategy250529-01.pdf)
	Demonstration tests	**JFE Steel Challenge to Achieve Carbon Neutrality through Green Transformation** (https://www.jfe-steel.co.jp/en/movie/#movie-Corporate)
Carbon-recycling blast furnace	Carbon-recycling blast furnace technology	**JFE Group Environmental Management Strategy, Presentation Material: Progress in the Development of CR Blast Furnaces** (https://www.jfe-holdings.co.jp/en/common/pdf/investor/climate/environmental-management-strategy250529-01.pdf)
		Challenge Zero: Challenge for development of super-innovative technologies focusing on Carbon-recycling Blast Furnace+CCU (https://www.challenge-zero.jp/en/casestudy/812)
	CCU/CCUS	**Challenge Zero: Technology of CO_2 utilization** (https://www.challenge-zero.jp/en/casestudy/391)
New technology to process raw materials for hydrogen direct reduction ironmaking	Development of technology for hydrogen direct reduction	**JFE Group Environmental Management Strategy, Presentation Material: Progress in the Development of the Direct Hydrogen Reduction Method** (https://www.jfe-holdings.co.jp/en/common/pdf/investor/climate/environmental-management-strategy250529-01.pdf)
	Collaboration with a material supplier	**JFE Steel and BHP to address decarbonization in steelmaking process** (https://www.jfe-steel.co.jp/en/release/2021/210210.html)
Expanded use of scrap and direct-reduced iron	Eco-friendly converter-type molten iron pretreatment process DRP™	**Increased Use of Scrap Iron in Steelmaking Process to Reduce CO_2 Emissions** (https://www.jfe-steel.co.jp/en/release/2022/220621.html)
		Feasibility Study on Building a Supply Chain of Direct-Reduced Iron with Low Carbon Emissions (https://www.jfe-steel.co.jp/en/release/2022/220901.html)
	Feasibility study on new venture business to secure direct-reduced iron supply	**Collaboration to Establish a Supply Chain of Ferrous Raw Material with Low Carbon Emissions** (https://www.jfe-steel.co.jp/en/release/2023/230718.html)
	Development of electric arc furnace process technology	**JFE Steel Carbon Neutrality Strategy Briefing: Large, High-efficiency EAFs** (https://www.jfe-steel.co.jp/en/company/pdf/carbon-neutral-strategy_231108_1.pdf)
	Adoption of electric arc furnace process	**Start of Operation and Completion Ceremony for the Electric Arc Furnace at the No. 4 Steelmaking Shop, East Japan Works (Chiba district) (Japanese only)** (https://www.jfe-steel.co.jp/release/2026/04/260430.html)
		JFE Steel to Introduce Advanced, High-Efficiency, Large-Scale Electric Arc Furnace in Japan (https://www.jfe-steel.co.jp/en/release/2025/04/250410.html)
CO_2 utilization and storage technology	CO_2 utilization technology	**Novel Processes for Manufacturing Valuable Materials Using Coal-Derived CO_2 Selected for NEDO Projects** (https://www.jfe-steel.co.jp/en/release/2021/211015.html)
	Testing for practical use	**JFE Steel Moves Ahead with Testing CO_2-utilization Technologies Aimed at Achieving Carbon Neutrality** (https://www.jfe-steel.co.jp/en/release/2022/220620-2.html)
		JFE Steel, Mitsubishi Gas Chemical, and Mitsubishi Chemical Collaborate to Develop a Carbon Recycling Supply Chain at Mizushima Complex (https://www.jfe-steel.co.jp/en/release/2025/03/250324.html)
	Establish CCS value chain	**Contract Signed with JOGMEC for Design Work Related to Ship-Based Advanced CCS Project Aiming to establish one of Japan's largest CCS hubs at the Mizushima Industrial Complex** (https://www.jfe-steel.co.jp/en/release/2026/08/260824.html)
		The Chugoku Electric Power and Nippon Gas Line Participate in the Joint Evaluation to Establish a CCS Value Chain Originated from Japan for the CCS Project in Malaysia (https://www.jfe-steel.co.jp/en/release/2024/02/240226.html)

Introduction of Internal Carbon Pricing (ICP)

Since the steel industry is one of the hard-to-abate sectors, the introduction of GHG reduction technologies is essential for achieving carbon neutrality. As a leader in development of carbon-neutral technologies, JFE Steel aims to achieve carbon neutrality by 2050 through the development and implementation of these technologies.

Stakeholders, including investors and ESG rating agencies, have recently shown more interest in how companies incorporate the risks and opportunities associated with the future introduction of carbon pricing and the transition to a decarbonized society into their management decisions. JFE Steel uses ICP as a reference indicator when reflecting in its management decisions the carbon value created by decarbonization technologies and the carbon cost burden that may arise in the future.

At JFE Steel, GX investments fall into two broad categories: (1) Ongoing investment in GHG emission reductions using existing technologies, and (2) Investment in the development and implementation of innovative GHG reduction technologies such as innovative electric arc furnaces and CCS. These two categories differ significantly in investment scale, payback period, and assumptions about the future business environment. JFE Steel uses different internal carbon prices (ICPs) suited to the characteristics of each category to appropriately evaluate both the carbon cost burden that may arise in the short to medium term and the long-term carbon value in pursuit of achieving carbon neutrality by 2050.

For investments in GHG emission reductions using existing technologies under (1), JFE Steel uses the GX-ETS price (the average of the upper and lower limit prices for FY2026: 3.0 thousand yen/t-CO_2*[1]) to reflect the carbon cost burden expected under the current regulatory environment. In this way, the carbon cost burden that may arise in the future are taken into account in the economic evaluation of energy-saving and other investments.

On the other hand, for additional GX investments, such as the development and implementation of innovative GHG reduction technologies under (2), the cost burden and investment scale associated with technological development are significant, and the payback period is long, making it difficult to adequately evaluate their future value based on current carbon prices alone. JFE Steel therefore uses the 2030 carbon price published by the IEA (US$140/t-$CO_2$*[2]) as a reference indicator of the future carbon value required to realize a net-zero society by 2050.

However, these ICPs are flexibly reviewed when making investment decisions, taking into account the outlook for future profitability and risks, including the transition to a decarbonized society, the demand environment for GX steel*[3], and government support for GX investment. JFE Steel uses ICP as a reference indicator to visualize the cost impact of the future introduction of carbon pricing and the carbon value created by decarbonization, and to reflect these factors in business feasibility assessments and investment prioritization.

JFE Steel will build on its use of ICP in management decisions to advance the deployment of GHG reduction technologies with the aim of achieving carbon neutrality by 2050.

› *1 Ministry of Economy, Trade and Industry: Reference Upper Limit Transaction Price and Adjustment Reference Transaction Price for FY2026 (1.7–4.3 thousand yen/t-CO_2) (Japanese only)
(https://www.meti.go.jp/shingikai/sankoshin/sangyo_gijutsu/emissions_trading/pdf/20251219_2.pdf)

› *2 IEA Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach (2023 Update)
(https://iea.blob.core.windows.net/assets/8ad619b9-17aa-473d-8a2f-4b90846f5c19/NetZeroRoadmap_AGlobalPathwaytoKeepthe1.5CGoalinReach-2023Update.pdf)

› *3 Initiatives to Develop the GX Steel Market through GX Steel, JGreeX™ (P. 60)

Initiatives for Greater Contribution to Reducing GHG in Society as a Whole

The JFE Group is promoting a variety of initiatives to reduce GHG, such as offshore wind power generation projects and initiatives in renewable energy-related fields, with a focus on its engineering business. In addition, in fields where demand is growing for eco-products such as electrical steel sheets and ultra-high-tensile steel sheets, we are collaborating with Group companies and others to maximize overall effectiveness.

Initiatives in the Engineering Business Contributing to GHG Reduction

Demand is expected to rise for power generation plants using renewable energy sources that do not emit carbon. Through the engineering business, the JFE Group is handling the design, procurement, construction, and operation of renewable energy generation plants, including biomass*1, geothermal*2, solar*3, and onshore wind power*4. We are also working to increase the amount of power generated at waste treatment facilities in order to promote recycling and the effective use of resources.

Furthermore, we are actively engaged in the retailing of electricity, which uses this renewable energy as the main power source, supporting the establishment and operation of new regional electricity companies*5 that focus on local production and consumption of energy using renewable sources, and expanding the Multisite Energy Total Service (JFE-METS)*6, which optimizes energy use for multiple sites within the same corporate group through centralized management.

As initiatives for carbon neutrality, we are developing technologies to safely and efficiently transport large amounts of hydrogen, ammonia, and CO_2, and working on demonstrating a process that separates and collects CO_2 for reuse from the exhaust gas of waste treatment facilities.

Initiatives for material recycling include recycling waste plastics by directing unsorted post-use plastics to either material recycling or chemical recycling, depending on their properties*7; bottle-to-bottle (BtoB)*8, an effort to recycle collected PET bottles into raw material for new bottles; and recycling solar panels that are discarded due to age-related deterioration.

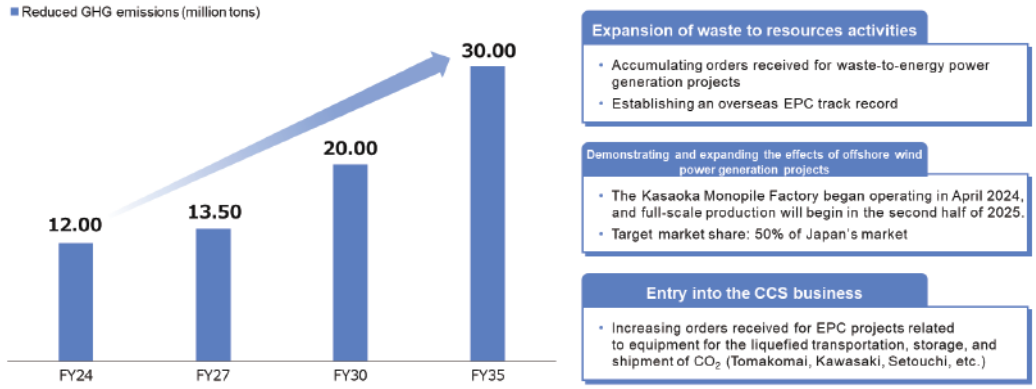
- ***1 Biomass Power Generation Business (Japanese only)** (https://www.jfe-eng.co.jp/products/electric-power/electric07.html)
- ***2 Geothermal Power Generation Systems** (https://www.jfe-eng.co.jp/en/products/power-generation/plant01.html)
- ***3 Solar Power Generation Business (Japanese only)** (https://www.jfe-eng.co.jp/products/electric-power/electric05.html)
  Solar Power Generation, JFE Technos (Japanese only) (https://www.jfe-technos.co.jp/products/solar/)
- ***4 Onshore Wind Power Generation Business (Japanese only)** (https://www.jfe-eng.co.jp/products/electric-power/electric06.html)
- ***5 Support for New Regional Electricity Projects** (P. 72)
- ***6 JFE-METS (Japanese only)** (https://www.jfe-eng.co.jp/products/electric-power/electric04.html)
- ***7 Waste plastic recycling: Promoting Plastic Recycling** (P. 129)
- ***8 Bottle-to-bottle: Horizontal Recycling of PET Bottles** (P. 131)

Metrics and Targets (Plans and Results for Contribution to GHG Reduction in the Engineering Business)

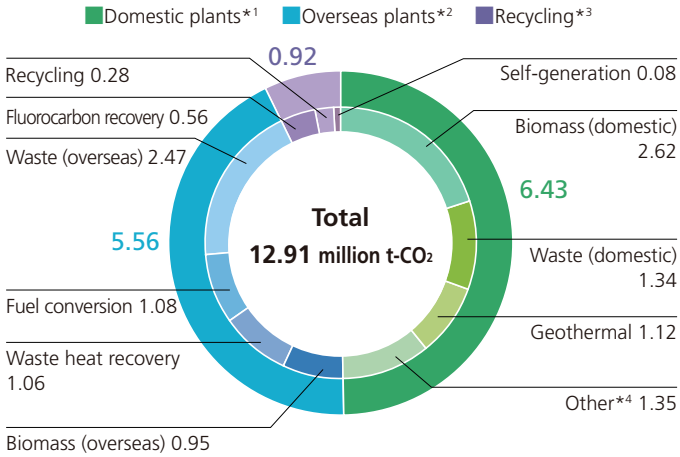
JFE Engineering contributes to GHG emissions reductions in society as a whole through its business operations, such as expanding renewable energy generation and constructing and operating plastic and food recycling plants. In FY2025, the Company contributed to reducing 12.91 million tonnes of GHG emissions (a 7.5% increase compared to FY2024) across society. JFE Engineering will further expand its business and aims to contribute to GHG emissions reductions of 13.5 million tonnes in FY2027, 20 million tonnes in FY2030, and 30 million tonnes in FY2035.

With regard to JFE Engineering's GHG emissions, we set a KPI of reducing CO_2 emissions at our plants and offices by 40% in FY2025 compared to FY2013. Since FY2021, we have introduced on-site solar power PPAs and zero-emission electricity plans at the Yokohama head office and low-emission electricity at the Tsu Works. We consequently achieved a 79.5% reduction in FY2025 compared to FY2013. At the same time, we are promoting energy-saving activities at our plants and offices. We will continue to steadfastly conduct business in ways that are environmentally sound, including expanding the use of renewable energy.

Engineering Business GHG Reduction Contribution Plan



JFE Engineering's Equivalent Contribution to GHG Reduction (FY2025)



*1 Data cover: JFE Engineering
*2 Data cover: JFE Engineering and Standardkessel Baumgarte GmbH (SBG), a German subsidiary of JFE Engineering Corporation
*3 Data cover: J&T Recycling Corporation and JFE Urban Recycle Corporation
*4 Others: Digestion gas, solar, wind, waste heat recovery, fuel conversion, energy service, biomass silos, and logistics products

For quantitative data for the JFE Engineering Group's GHG emissions, please refer to:
› **Environmental Data** (P. 273)

EN JFE Engineering's Commitment through Its Business

Under its corporate purpose to "Create, Care, Connect. The Foundations of Life—Just For the Earth," JFE Engineering is seeking to expand its contributions to GHG reductions, focusing on the key fields of waste to resource*1 and carbon neutrality*2.

As part of JFE Engineering's climate change initiatives, the following are examples of carbon neutral business activities. Food recycling and biogas power generation, as well as waste-to-energy power generation, are initiatives for the circular economy and carbon neutrality.

*1 Primarily promotes waste-to-energy power generation and recycling (food, plastics), etc.
*2 Primarily promotes renewable energy power generation and hydrogen/ammonia and CCUS, etc.

› Recycling Food Waste (P. 133)
› Construction and Operation of Waste-to-Energy Plants Overseas (Thermal Recovery) (P. 132)

EN The Energy Forest Project (Demonstration Project for Creating Stable and Effective Supply Systems of Woody Biomass Fuel)

The town of Yuni in Hokkaido and JFE Engineering are jointly carrying out an Energy Forest Project, which will continue until the end of FY2027. This project, named the JFE Forest NEXTGATE Project and drawn up by JFE Engineering, was selected by NEDO, a national research and development agency, for inclusion in the FY2023 Demonstration Project on Development of New Fuel Sources Such as Fast-growing Trees on August 3, 2023. JFE Engineering is specifically engaged in pioneering research for creating a large "energy forest," involving the silviculture of trees that grow well and fast in a subarctic climate (clean larch and Sakhalin willow) on land owned by the town of Yuni.

The town of Yuni is seeking to nullify GHG emissions by 2050 under the Yuni Zero Carbon City declaration. JFE Engineering is working with the town to contribute to carbon neutrality and prevent global warming, thereby fulfilling its corporate purpose, "Create, Care, Connect. The Foundations of Life—Just For the Earth."



› The Town of Yuni and JFE Engineering Enter into an Agreement Concerning the Energy Forest Demonstration Project (Japanese only)
(https://www.jfe-eng.co.jp/news/2024/20240520.html)

EN Aqua Connect Namie Corporation's Hydroelectric Power Generation Business at the Ukedogawa Hydro Power Plant

Aqua Connect Namie Corporation, a company established through the joint investment by JFE Engineering, The Tokyo Electric Generation Co., Ltd., and the Ukedogawa Land Improvement District (the town of Namie in the district of Futaba, Fukushima Prefecture), has been operating the Ukedogawa Hydro Power Station since May 2024. The station, which marks JFE Engineering's first venture into hydroelectric power generation, takes advantage of the agricultural water supplied by the Ogaki Dam to the ward of Odaka in the city of Minamisoma and to the towns of Namie and Futaba in the district of Futaba.

The Ukedogawa Hydro Power Station, with its waterwheel and power generator located at the foot of the Ogaki Dam, generates power by using the energy produced by the difference in water levels. All the power generated at this station is sold through the Feed-in Tariff System. Aqua Connect Namie Corporation is committed to operating the station safely and stably while supporting farmers in the Ukedogawa area. The company will thereby contribute to carbon neutrality and a sustainable future.



Celebrating the completed construction of the Ukedogawa Hydro Power Station



Water turbine for power generation

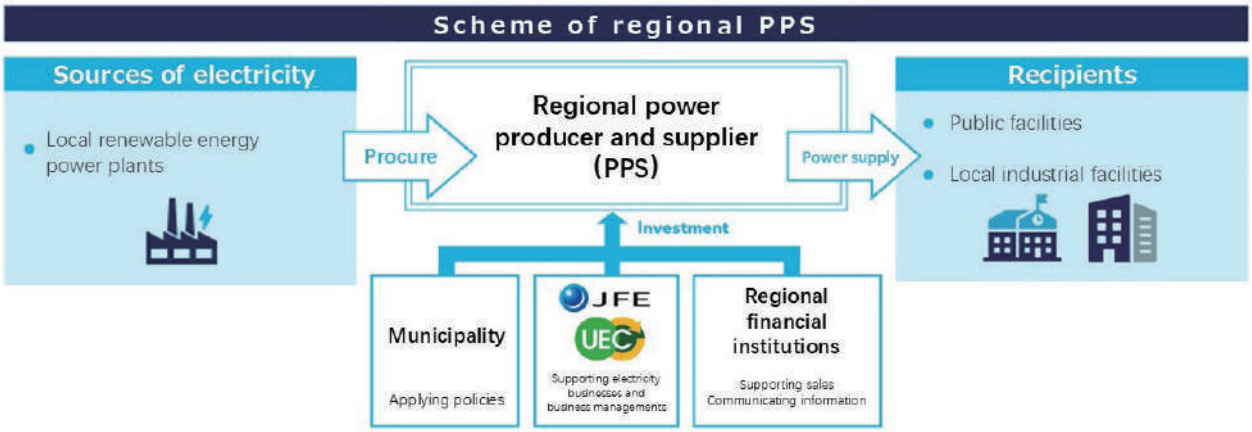
> **Aqua Connect Namie Corporation Launches Power Generation Business at the Ukedogawa Hydro Power Station (Japanese only)**
(https://www.jfe-eng.co.jp/news/2024/20240521.html)

EN Support for New Regional Electricity Projects

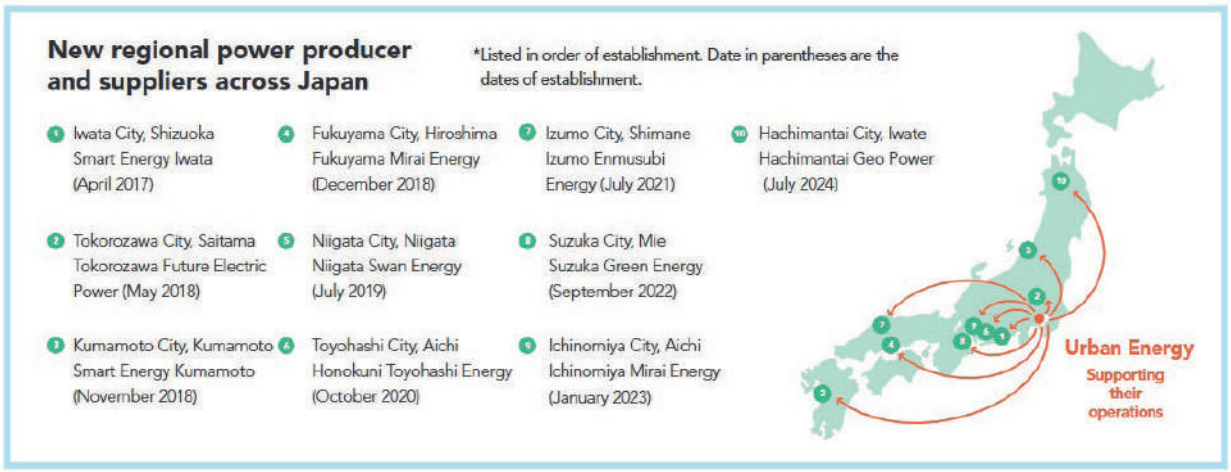
JFE Engineering is creating mechanisms for effectively using regional renewable energy sources such as wind and geothermal power and supplying electricity to local public facilities from renewable energy plants constructed by JFE Engineering, including waste-to-energy plants. These efforts support local production and consumption of energy.

Urban Energy Corporation (UEC), a subsidiary of JFE Engineering, provides consistent support for new regional electricity projects, from establishment to operation, with the goal of achieving regional decarbonization and stabilizing energy costs. Drawing on its extensive experience and expertise cultivated in the retail power business, UEC ensures stable and efficient operations, thereby contributing to the creation of sustainable communities.

New Regional Electricity Scheme Diagram



Record of Support for New Regional Electricity Projects



EN Development of SAF Synthesis Process

In collaboration with the University of Toyama, JFE Engineering is developing a catalytic process for synthesizing sustainable aviation fuel (SAF*[1]), which is expected to contribute to decarbonizing the aviation sector.

The process uses Fischer-Tropsch (FT) synthesis*[2] to produce SAF from synthesis gas composed of carbon monoxide and hydrogen. JFE Engineering has enhanced the SAF synthesis performance of a catalyst developed by Professor Noritatsu Tsubaki of the School of Engineering, University of Toyama*[3], [4]. The new catalyst achieves high performance with a yield*[5] of at least 50% for liquid hydrocarbons suitable for SAF production, and it is expected to enable a highly productive SAF synthesis process.

With conventional FT synthesis catalysts, the hydrocarbons produced must be converted into the carbon number range suitable for SAF through hydrocracking*[6]. When losses during this hydrocracking process are taken into account, the SAF yield typically remains at around 25%. In contrast, FT synthesis using the new catalyst eliminates the need for hydrocracking plants, which require significant capital investment, as well as additional hydrogen input. As a result, equipment costs can be significantly reduced while enabling SAF production with at least twice the yield of conventional processes using FT synthesis alone.

Currently, both in Japan and overseas, the primary feedstock for SAF production is used cooking oil. However, due to limited edible oil supply, feedstocks are expected to diversify to include biomass and waste materials such as municipal solid waste. Over the longer term, synthetic fuels produced by reacting carbon dioxide captured from power plants and factories with hydrogen derived from renewable energy sources are expected to play an important role*[7]. FT synthesis is essential for producing SAF from these feedstocks, and the new catalyst can be applied in such processes.

Together with the University of Toyama, JFE Engineering will continue to advance SAF synthesis processes utilizing this catalyst and hopes to contribute to the decarbonization of the aviation sector through the wider adoption of SAF.

*1 Sustainable aviation fuel. Various production pathways are being studied, including HEFA using used cooking oil, ATJ using bioethanol, and FT synthesis using gasified waste and other feedstocks.

*2 A catalytic process that produces petroleum substitute fuels such as synthetic diesel, as well as basic chemicals including alcohols and olefins, from synthesis gas composed of carbon monoxide and hydrogen.

*3 Source: "Integrated tuneable synthesis of liquid fuels via Fischer-Tropsch technology," Jie Li, Yingluo He, Li Tan, Peipei Zhang, Xiaobo Peng, Anjaneyulu Oruganti, Guohui Yang, Hideki Abe, Ye Wang, Noritatsu Tsubaki, Nature Catalysis, Vol. 1, 787–793, 2018

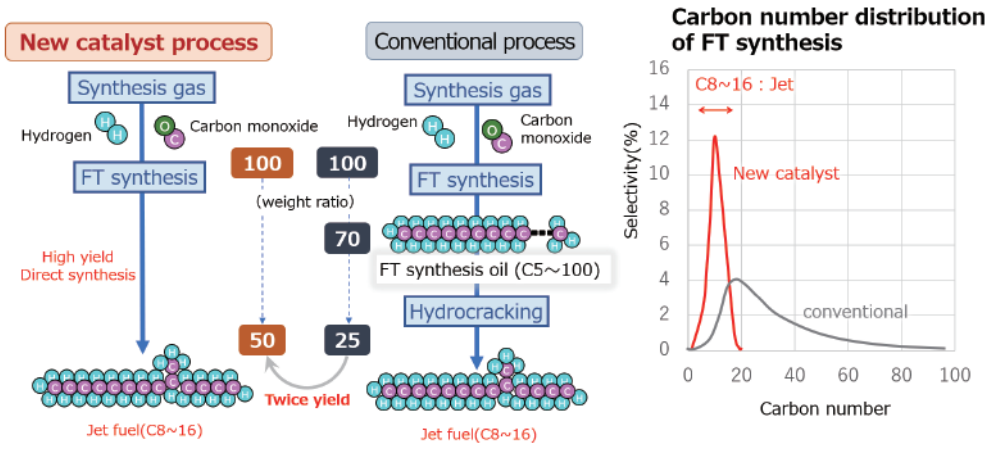
*4 Source: "Clever chemistry offers new source of jet fuel," Nature, Vol. 561, 286, 2018 (editorial)

*5 The proportion of carbon in the feed gas converted into the desired hydrocarbons (in this development, liquid hydrocarbons with carbon numbers from C8 to C16). It is an indicator that describes catalyst performance.

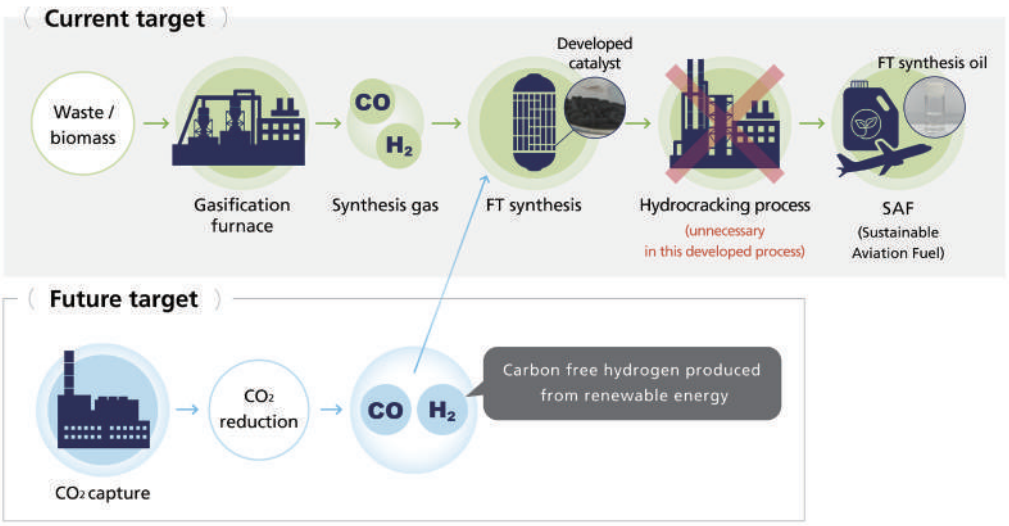
*6 A process in which hydrogen is added using a zeolite catalyst to break the chain structure of solid hydrocarbons (wax) with carbon numbers of 20 or higher into liquid hydrocarbons with smaller carbon numbers.

› *7 Source: Advisory Committee for Natural Resources and Energy, Basic Policy Subcommittee (61st meeting) materials (Japanese only)
(https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/2024/061/061_006.pdf)

Novel Catalyst Process



Process for Producing SAF via FT Synthesis



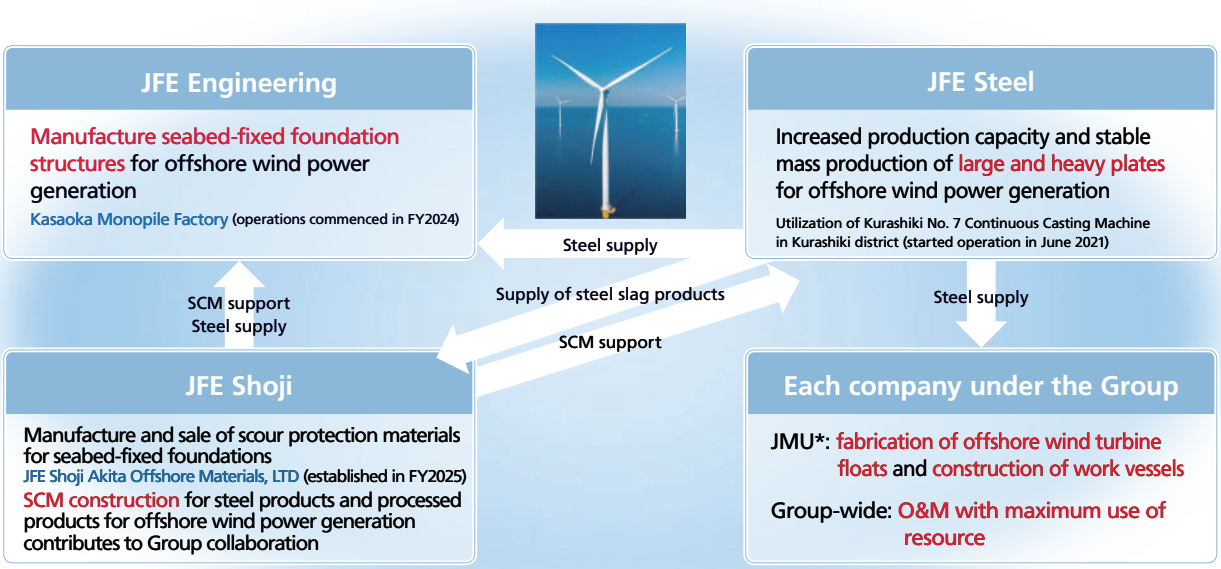
Offshore Wind Power Business Initiative

The JFE Group has positioned its offshore wind power business as a key initiative. With engineering as the core business, the Group is leveraging its diverse businesses to create synergies and deliver new added value. Specifically, we are commercializing the manufacture of offshore wind power generation foundations (monopiles, jackets) as well as O&M* services, establishing an integrated supply chain covering materials, foundation manufacturing, and O&M. We will continue to take advantage of the comprehensive strengths of the Group to commercialize this business, thereby significantly contributing to the JFE Group's efforts to achieve carbon neutrality and make progress toward the government's goal of realizing carbon neutrality.

*Operation and maintenance. Applies repair and diagnostic technologies.

Commercialization of Offshore Wind Power Business

- By commercializing our manufacturing of foundation structures (monopiles), we will become the forerunner in the business of offshore wind-power generation and establish a supply chain across the entire Group, including foundation manufacturing and O&M.
- We will strive to expand business in the field of renewable energy by leveraging the JFE Group's collective strengths (synergies), with JFE Engineering as the main player.



*Japan Marin United Corporation (equity method affiliate)

Technologies of Group Companies

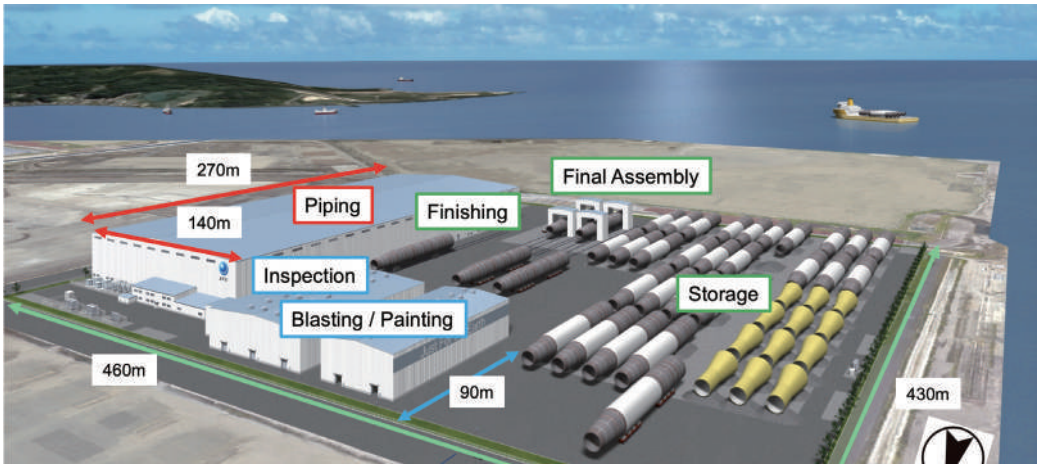
Category	Company	Details
Foundation structures	JFE Engineering	Seabed foundations (monopiles, jackets, etc.)
	Japan Marine United	Floating foundations (semi-submersible)
	JFE Steel	High-quality, large and heavy steel plates, high-strength steel (reduced using HBL series steel plates)
	JFE Shoji	Manufacture and sale of scour protection materials for seabed-fixed foundations
Construction	Japan Marine United	SEP vessels (self-elevating platform)
	JFE Engineering	JFE-RAPID (cable laying method)
		Battery systems for power storage
	GECOSS	Stands for large steel structures
	JFE Steel	Natural stone substitute materials (use of steel slags)
O&M (operation and maintenance)	JFE Engineering	Technologies for remote monitoring and operation
	JFE Advantech	Vibration measurement equipment and systems, sea monitoring tools (water quality, sea conditions)
	Japan Marine United	Offshore support vessels (work vessels)
	JFE Plant Engineering	Wind turbine maintenance (diagnosis and repair)
	JFE Technos	Technologies and expertise in planning, constructing, and maintaining onshore turbines
	JFE Techno-Research	Equipment evaluation and analysis for corrosion, fatigue, vibration, etc., diagnosis of remaining service life, strength and durability testing and evaluation techniques for large structures
Supply chain	JFE Shoji	Contribution to optimizing offshore wind power generation project execution

EN Japan's Only Monopile Manufacturing Base

JFE Engineering completed the Kasaoka Monopile Factory in Kasaoka, Okayama Prefecture and commenced operations in April 2024. Monopiles are the foundational structural components for offshore wind power generation and are extremely large steel structures, approximately 10 m in diameter, 100 mm thick, and 100 m long. This is the only monopile plant in Japan. To maximize production efficiency, the plant combines extensive grounds and a quay for direct shipment, state-of-the-art equipment such as large-diameter bending machines and welding machines for extra-thick plates, and efficient manufacturing processes based on experience in manufacturing large steel structures at the Tsu Works. In December 2025, JFE Engineering received an order to manufacture monopiles in Japan for the Offshore Wind Power Project Off Oga City, Katagami City, and Akita City, Akita Prefecture, and in February 2026, it began producing monopiles for this project. In addition, a corporate solar power PPA service was launched in June 2026 at the Kasaoka Monopile Factory, which is now manufacturing monopiles using electricity derived from renewable energy. At full capacity, the plant is expected to produce up to 100,000 tonnes annually and significantly contribute to the establishment of a domestic supply chain in the offshore wind power sector and to the realization of carbon neutrality.

Overview of the Kasaoka Monopile Factory

Construction site	Kasaoka City, Okayama Prefecture (JFE Steel West Japan Works Fukuyama area)	Investment amount	Approximately 40 billion yen* (plant building, mechanical equipment, quay reinforcement) *Includes the facility reinforcement cost of the Tsu Works.
Construction start	June 2022	Site area	Approximately 20 ha (includes storage area)
Operation start	April 2024	Production capacity	Approximately 80,000–100,000 tonnes per year (Approx. 50 sets)
Length of shipping quay	200 m (quay total length: 400 m)	Quay depth	–11 m



Layout of the Kasaoka Monopile Factory


Overall view of the Kasaoka Monopile Factory


Monopiles for offshore wind power foundations

EN Initiatives to Enter the Floating Foundation Manufacturing Business

In addition to manufacturing monopiles, which are bottom-fixed foundation structures for offshore wind power generation, JFE Engineering applied for and was selected to receive funding under the Ministry of Economy, Trade and Industry's FY2025 GX Supply Chain Construction Support Program III (Floating and Other Offshore Wind Power Generation Equipment) (the "Subsidy") in order to enter the floating foundation manufacturing business, which is expected to expand in the future.

With this Subsidy, JFE Engineering will make timely capital investments at the Tsu Works (Tsu City, Mie Prefecture) in light of market conditions to establish the capacity to mass-produce at least 24 floating foundations per year.

The Tsu Works has one of the largest marine docks in Japan and an extensive outdoor yard, as well as proven expertise and technical capabilities cultivated over half a century of manufacturing bridges and steel structures. JFE Engineering will leverage these strengths to lead Japan's offshore wind power industry as a manufacturer capable of producing a wide range of floating foundation designs and help accelerate the realization of a carbon-neutral society.



Project area (Tsu Works)

EN Offshore Wind Power Generation, a Foray into O&M through a Remote Integrated Management System

For more than 25 years since 1996, JFE Engineering has been involved in EPC for onshore wind power stations (131 generators at 25 sites) in addition to equipment supply and associated maintenance services. The company will fully leverage its deep, extensive expertise in onshore wind power generation as well as technologies owned by other JFE Group companies to grow and advance its O&M services for offshore wind power plants.

In October 2023, JFE Engineering launched a 20-year O&M contract for offshore wind power facilities (three generators with the maximum output of 7,495 kW) off the coast of Nyuzen in Toyama Prefecture. These facilities were built under Japan's first offshore wind energy project in a general sea area. Under this contract, JFE Engineering is using an integrated management system to remotely monitor an offshore wind power project for the first time. JFE Engineering will steadily build up its track record off the coast of Nyuzen while continuing to advance its own technologies and expertise.

In addition, the company jointly developed with the Institute of Science Tokyo the world's first technology for detecting anomalies in wind turbine blades by combining sound and video analysis. The technology enables blade inspections while wind turbines remain in operation, helping reduce inspection costs and achieve stable operation through the early detection of anomalies.



Nyuzen offshore wind power station (photo by VENTI JAPAN, Inc.)

› **World's First! Development of Anomaly Detection Technology for Wind Turbine Blades Using Sound and Video: Joint Development with the Institute of Science Tokyo Significantly Reduces the Risk of Wind Turbine Blade Failure (Japanese only)** (https://www.jfe-eng.co.jp/news/2026/20260108.html)

EN Demonstration Research on Cost Reduction for Floating Offshore Wind Power Generation

JFE Engineering, as a member of a consortium*1, jointly proposed the Southern Akita Floating Offshore Wind Demonstration Project Aimed at Overseas Expansion via Cost Reductions in response to NEDO's call for proposals under the Green Innovation Fund*2 Project/Cost Reductions for Offshore Wind Power Generation/Floating Offshore Wind Power Demonstration Project (Phase 2), and the proposal was selected.

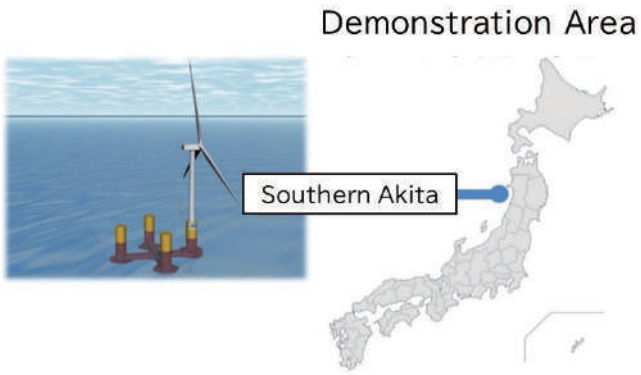
The project aims to establish a technology to commercialize floating offshore wind power generation at an internationally competitive cost level to support wider deployment in the future. The consortium plans to install two wind turbines, each with an output of over 15 MW, approximately 25 km off the coast of southern Akita Prefecture in waters about 400 m deep, with a demonstration operation scheduled to begin in October 2029. The project period will span July 2024 to March 2031.

*1 Consortium members: Marubeni Offshore Wind Development Corporation; Tohoku Electric Power Co., Inc.; Akita Floating Offshore Wind LLC; Japan Marine United Corporation; TOA CORPORATION; TOKYO SEIKO ROPE MFG. CO., LTD.; Kanden Plant Corporation; JFE Engineering Corporation; and NAKANIHON AIR Co., Ltd.

*2 A fund established by NEDO under the Ministry of Economy, Trade and Industry to support companies committed to ambitious goals toward achieving carbon neutrality by 2050, providing continuous support for research, development, demonstration, and social implementation for up to ten years.

Project Overview (Planned)

Project name	Southern Akita Floating Offshore Wind Demonstration Project Aimed at Overseas Expansion via Cost Reductions
Demonstration site	Southern coast of Akita Prefecture (approx. 25 km offshore, water depth approx. 400 m)
Turbine output	Over 15 MW
Number of turbines	2
Floating type	Semi-submersible
Project period	July 2024–March 2031



ST Developed Steel Plates with a Maximum Thickness of 130 mm for Use in Foundations for Wind Power Generation, Performance Evaluation by the Ministry of Economy, Trade and Industry Completed

JFE Steel has developed steel plates with a maximum thickness of 130mm, which are suitable for use in foundations for wind power generation (e.g. monopiles, jackets and wind turbine towers). Performance evaluations have been completed at the Ministry of Economy, Trade and Industry (METI)*1. This allows steel plates exceeding 100 mm in thickness to be used in domestic offshore wind power projects.

In recent years, the size of wind turbines used for wind power generation has increased. In particular, offshore wind power generation will increasingly rely on turbines with a generating capacity of over 10 MW per unit. Conversely, the use of steel plates exceeding a thickness of 100mm for foundations has not been permitted in Japan's wind power generation. Consequently, there has been a strong demand for the development of thicker steel plates for these large-scale turbines.

To meet these needs, we have developed steel plates with a maximum thickness of 130 mm. These plates are as strong as JIS SM520, which is used in foundations of wind power generation. This newly developed steel plate is also included in the J-TerraPlate™ large and heavy steel plate line-up for wind power generation*2. It can significantly contribute to the introduction of large-size wind turbines by reducing welding labor and other costs. We have already received enquiries from several operators regarding its use in domestic offshore wind power projects and are currently holding discussions.

> ***1 Website of the Ministry of Economy, Trade and Industry: Notification of performance evaluation of JFE Steel Corporation's rolled steel for welded structures for wind power generation equipment support structures, JFESM520BTMC/W and JFESM520CTMC/W (Japanese only)** (https://www.meti.go.jp/policy/safety_security/industrial_safety/oshirase/2025/12/20251205.html)

> ***2 JFE Steel's J-TerraPlate™, Large and Heavy Steel Plate, Chosen for Wind Power Project (August 3, 2023)** (https://www.jfe-steel.co.jp/en/release/2023/230803-1.html)

SH Manufacture and Sale of Scour Prevention Materials for Offshore Wind Power Generation

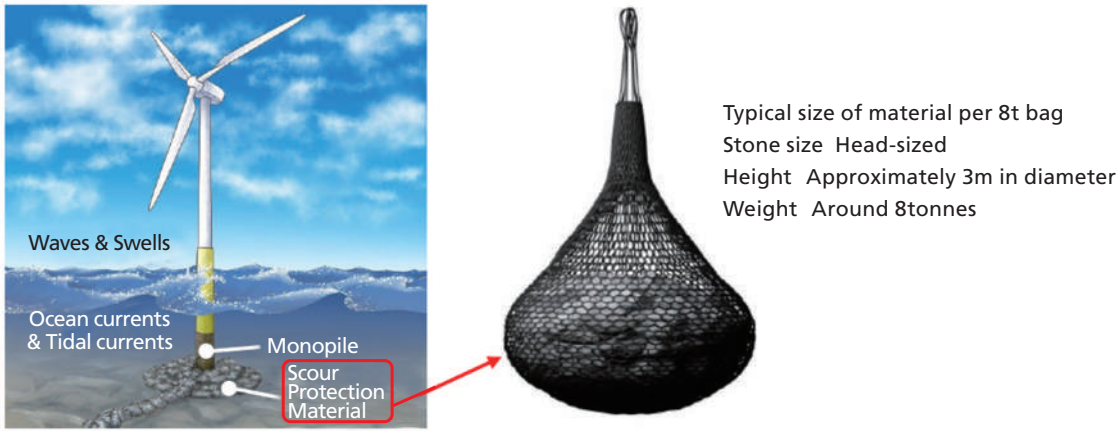
JFE Shoji established JFE Shoji Akita Offshore Materials, LTD. (JAOM), a joint venture with quarry operators, construction companies, and financial institutions in Oga City, Akita Prefecture, to manufacture and sell scour prevention materials for offshore wind power generation projects.

When monopiles are driven into the seabed for these projects, scour forms around the monopile due to waves and tidal currents, causing turbines to tilt. JAOM will base itself in Akita, where offshore wind power is expanding, to manufacture and stockpile scour prevention materials made from local natural stone and artificial stone* produced by JFE Steel, on a just-in-time basis within construction schedules.

Furthermore, the company will also pursue businesses through the expanded use of steel slag products and stone products for purposes such as forming fishing reefs and seaweed beds toward restoring the marine environment and mitigating global warming. JAOM hopes to contribute through this business to the development of Japan's offshore wind power industry and the realization of carbon neutrality and a sustainable society.

*Artificial stone manufactured by mixing steelmaking slag, a byproduct of the steelmaking process, with ground granulated blast furnace slag (a raw material for blast furnace cement) and water, then hydrating and solidifying. This artificial stone, produced by JFE Steel under the brand name Frontier Rock™, contains a high level of iron and has excellent properties for algae adhesion.

Conceptual Diagram of Scour Protection Material



SH Building a Supply Chain for the Offshore Wind Power Generation Industry

Carbon neutrality initiatives are expanding worldwide to address concerns over climate change. To achieve carbon neutrality by 2050, Japan approved the Seventh Strategic Energy Plan at a cabinet meeting in 2025, which sets targets for FY2040: a 73% reduction in greenhouse gas emissions, renewable energy accounting for 40–50% of the electricity mix, and wind power accounting for around 4–8% compared to 1.1% in FY2023.

As for offshore wind power generation, the industry is planning projects that will achieve 10 GW capacity by 2030 and 30–45 GW by 2040. Steadfast efforts are also being made to adopt a large number of internationally competitive technologies, such as the adoption of a demonstration project for a floating offshore wind power generation system under the Green Innovation Fund.

JFE Shoji is collaborating with a local enterprise that manufactures the windmill foundations in Taiwan, which is leading in the offshore wind power generation market, and has been making progress in regard to the supply chain of steel materials for foundation structures. Looking ahead, the company will capitalize on the knowledge it has acquired and contribute to the realization of carbon neutrality by establishing a supply chain that supports the domestic production of goods and the local economy while also meeting customer demand in the offshore wind power generation industry in Japan.

Eco-Products and Eco-Solutions Contributing to GHG Reduction

We provide a wide range of eco-products and eco-solutions for reducing GHG by efficiently using resources and optimizing energy use through environmentally sound technological innovations.

In addition, JFE Steel operates JFE Resolus™, a business that provides solutions to customers by leveraging its own technologies and operational improvement expertise with the aim of growing together with its customers.

ST Expanding the Supply of Steel Plates for Ammonia Tanks to Support the Energy Transition

Cumulative orders for JFE Steel's low-temperature steel plates for liquefied ammonia tanks on ships have now reached 50,000 tonnes, with the company ranking among the industry leaders in orders for these products.

Global efforts to realize a decarbonized society are advancing. Ammonia, which does not emit CO_2 when burned, offers great potential under Japan's Green Growth Strategy as a fuel for thermal power stations and ships. The use of ammonia requires the urgent establishment of a supply chain, driving increasing demand for ammonia storage tanks.

Ammonia is liquefied when it is stored and transported by sea, and liquid ammonia poses a risk of causing stress corrosion cracking in the steel plates of storage tanks. To address this risk, in 2020, JFE Steel began manufacturing ammonia-grade low-temperature steel*1 that complies with the IMO IGC Code*2 and is certified by Nippon Kaiji Kyokai (ClassNK).

JFE Steel offers a range of low-temperature steel for ammonia service, manufactured using its proprietary TMCP*3 technology to suit diverse applications and specifications*4. It has also established a manufacturing system at the plate mills in the three districts of Kurashiki, Fukuyama, and Keihin to meet increasing demand in the shipbuilding sector and further expand sales, including in new fields such as energy.

*1 As specified in Parts K and N of the ClassNK Rules for the Survey and Construction of Steel Ships (KL24B-440U, KL27-440U, KL33-440U, and KL37M-440U), fine-grained steel with an actual yield point of 440 N/mm² or less must be

*2 International Maritime Organization International Gas Carrier Code (International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk)

*3 Thermo Mechanical Control Process. A manufacturing method that precisely controls the temperature and reduction ratio at each stage from slab heating through rolling and cooling to ensure the required material properties of the steel. It helps reduce variation in yield strength while maintaining the specified strength.

*4 Such as specifications for high heat input welding and PWHT (post weld heat treatment)



LPG and ammonia carrier

ST Development of Maintenance Technology for Ammonia Infrastructure to Support a Decarbonized Society

JFE Steel formed a consortium with IHI Corporation, Nippon Kaiji Kyokai (ClassNK), Tohoku University, and the Institute of Science Tokyo, and the consortium was selected by NEDO to participate in the Feasibility Study Program on Energy and New Environmental Technology. The consortium will promote the development of Stress Corrosion Cracking (SCC)*1 Probability Evaluation Tools for Fuel Ammonia Storage Tank and Transportation Equipment (the "Research"). The consortium's proposal to carry out the project was approved in May 2025, and an outsourcing agreement was recently concluded with NEDO.

Global efforts to realize a decarbonized society are accelerating. Ammonia, which does not emit CO_2 when burned, offers great potential under Japan's Green Growth Strategy as a low-impact fuel for thermal power stations and ships. Accordingly, the safe and rational operation of fuel ammonia storage tanks and transportation facilities is critical. However, because liquefied ammonia for storage and transportation poses SCC risks to steel surfaces, inspection and maintenance based on rational and practical risk assessments are required. Initially, the consortium will conduct a detailed study of the SCC mechanism involved in steel cracking due to the combined effects of mechanical stress and corrosion caused by liquid ammonia and use the findings to develop a prototype program to assess the likelihood of SCC simply and accurately. After the research is completed, the consortium will gather and incorporate feedback from a broad range of stakeholders on the prototype program to promote the practical adoption of risk-based maintenance*2 for fuel ammonia tank and transportation facilities, thereby helping to expand the use of fuel ammonia.

*1 Stress Corrosion Cracking: Crack formation in metal materials subjected to tensile stress in a corrosive environment

*2 Prioritizes inspection, repair, replacement, etc., based on risk assessments focused on high-risk areas, ensuring that overall risk remains within acceptable limits.

> **NEDO Feasibility Study Program** (https://www.nedo.go.jp/english/activities/activities_ZZJP_100100.html)

> **JFE Steel Launches Facility to Test Steel Materials for Liquid Ammonia Tanks** (https://www.jfe-steel.co.jp/en/release/2023/231116.html)

ST Development of High-Performance Sour Line Pipes to Support the Energy Transition

JFE Steel has developed steel material for sour line pipes*1 used to transport natural gas containing higher-than-usual concentrations of hydrogen sulfide. In recognition of this achievement, JFE Steel received the Minister of Economy, Trade and Industry Award at the 10th Monozukuri Nippon Grand Award, following its receipt of the FY2024 Okochi Memorial Production Prize.

Natural gas is an energy source that emits less CO_2 when burned, compared to coal or oil, and is regarded as an important energy source during the transition to a carbon-neutral society. At the same time, transporting natural gas containing high concentrations of hydrogen sulfide requires a high level of safety and reliability.

To minimize sulfide stress cracking*2 (SSC) and hydrogen-induced cracking*3 (HIC) in environments with high hydrogen sulfide, JFE Steel developed a surface hardness control technology, a technology for inspecting hardness across the entire surface, and a center segregation control technology. These technologies enable the stable supply of steel material for sour line pipes with a high level of safety and reliability.

Furthermore, by enhancing steel performance, these technologies achieve high durability while avoiding excessive use of alloying elements, thereby extending infrastructure service life and conserving resources.

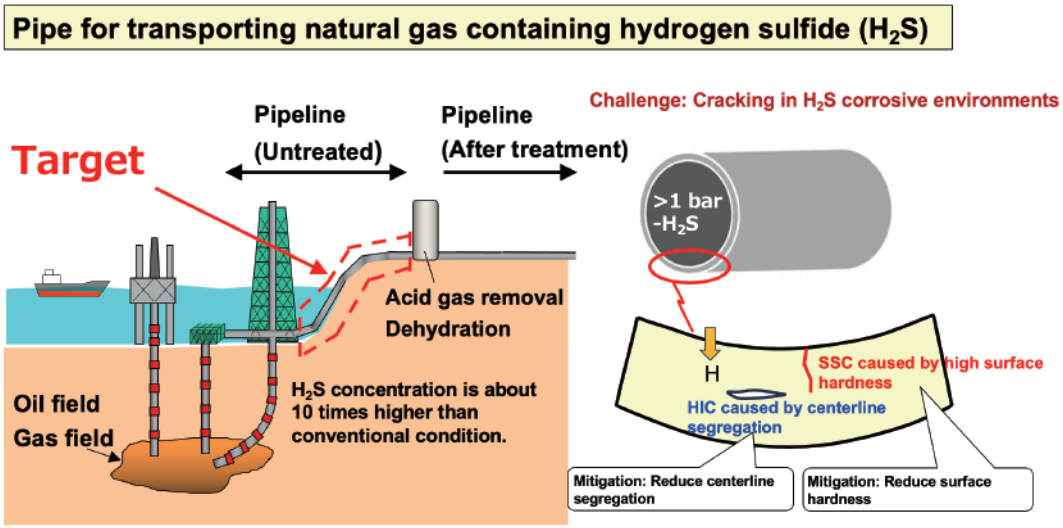
Going forward, JFE Steel will continue to contribute to the stable supply of low-carbon energy and advance the energy transition by supplying high-performance, high-quality line pipes while working to realize a sustainable society.

*1 Pipes used to transport sour gas, which is natural gas containing hydrogen sulfide.

*2 A phenomenon in which hydrogen enters into steel in a sour gas environment, degrading the steel and creating cracking when stress is applied. Higher hydrogen sulfide concentrations and applied stress increase the likelihood of cracking.

*3 A phenomenon in which hydrogen that has entered steel accumulates at inclusions such as MnS, causing cracks that propagate through areas hardened by center segregation.

Overview of a Sour Line Pipe



› **JFE Steel Receives the Minister of Economy, Trade and Industry Award at the 10th Monozukuri Nippon Grand Award: Development of Sour-Resistant Line Pipe Meeting Extremely Stringent Specifications by Reducing Center Segregation and Surface Hardness (Japanese only)** (https://www.jfe-steel.co.jp/release/2026/03/260316.html)

ST Energy-Saving Initiatives through the Development of a Radiant Tube Burner with High Thermal Efficiency and Long Service Life

Radiant tube burners are used to heat steel sheets in continuous hot-dip galvanizing and continuous-annealing lines to adjust mechanical properties such as tensile strength and elongation. Unlike direct heating burners, radiant tube burners burn fuel and air inside a metal tube, resulting in radiant heat from the tube that can be used to heat steel sheets. Since this design can help maintain the surface quality of steel sheets, JFE Steel uses the burner extensively in annealing furnaces. However, because combustion in the radiant tube burners takes place in a relatively narrow space, the tube can reach high temperatures, making deformation of the tube in the furnace a challenge. At the same time, radiant tube burners are also required to deliver high energy efficiency, so JFE Steel has worked to develop a radiant tube burner that combines long service life with energy savings.

The new radiant tube burner (see figure) uses a tube and an internal support structure designed to resist deformation in the furnace. As a result, deformation, the key indicator for burner replacement, has been limited to about one-sixth the conventional level, and service life is expected to be extended substantially. In addition, we developed technology to control the recirculating flow around the burner in accordance with the tube geometry, a gear-shaped heat transfer promoter, and a high-efficiency heat exchanger, enabling the burner to reduce fuel consumption per unit weight of steel sheet by 4.9%.

The developed radiant tube burner, which both extends service life and saves energy, is already in operation in the annealing furnaces of JFE Steel's steelworks, and JFE Steel plans to deploy it more widely in the future. In addition, JFE Steel leverages its own technologies and operational improvement expertise to offer customer solutions, including this technology, through JFE Resolus™, with the aim of growing together with its customers.

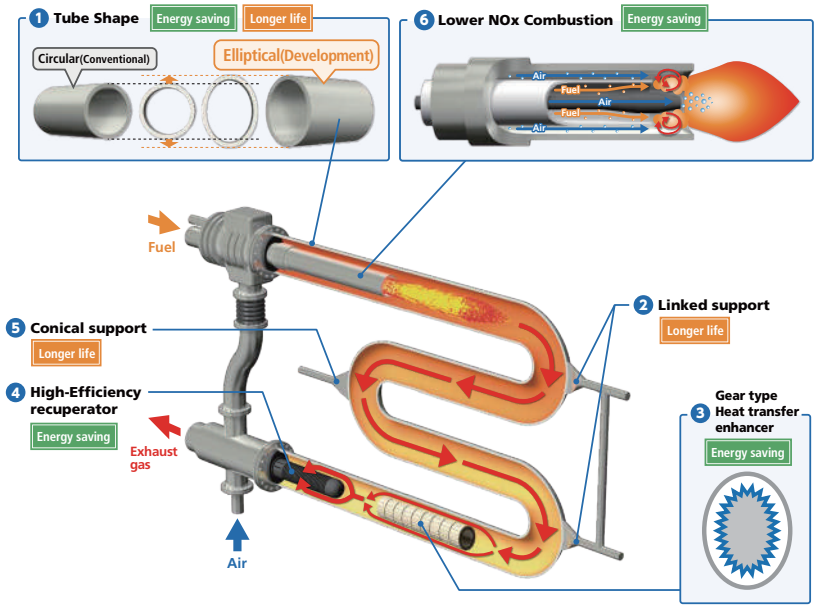
For its achievement in "Energy-Saving Initiatives through the Development of a Radiant Tube Burner with High Thermal Efficiency and Long Service Life," JFE Steel received the Minister of Economy, Trade and Industry Award, the top honor in the Energy Conservation Case Category of the FY2025 Energy Conservation Grand Prize. The Energy Conservation Grand Prize recognizes outstanding energy-saving initiatives implemented by businesses and at business sites that serve as models for others, as well as products and business models with excellent energy-saving performance. It aims to contribute to building an energy-saving society by raising awareness throughout Japan and encouraging the wider adoption of energy-saving products. The Energy Conservation Case Category covers activities that save electricity and energy at companies, factories, business sites, and other facilities. This technology also received the Excellent Presentation Award at the FY2025 Energy Conservation Grand Prize regional presentation event, which also served as the second-stage screening, as well as the FY2023 Technology Award from the Heat Transfer Society of Japan.

JFE Steel will continue to contribute to the realization of a sustainable society by further developing and commercializing energy-saving technologies.

Technologies Developed for the High-Performance Radiant Tube Burner

Key Technologies

High performance radiant tube burner



Six Key Technologies Enabling This System

Technology	Benefit	
	Energy saving	Longer life
❶Elliptical tube	Increased Radiating Surface Area	Reduced Tube Deformation
❷Linked support	—	Reduced Support Deformation
❸Gear type Heat transfer enhancer	Improved Heat Transfer Efficiency	—
❹High-Efficiency recuperator	Improved Waste Heat Recovery Efficiency,	—
❺Conical support	—	Reduced Support Deformation
❻Lower NOx Combustion	Reduced NOx Emissions through Recirculation Control	—

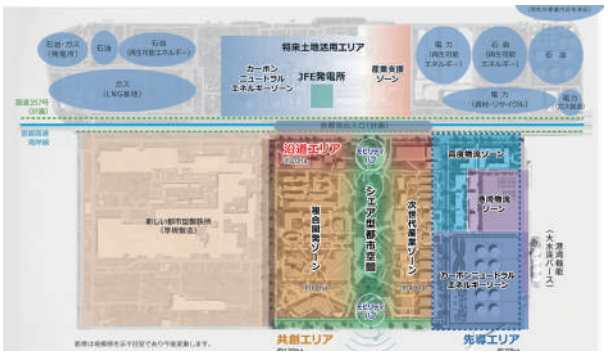
- **JFE Steel Receives the Minister of Economy, Trade and Industry Award in the Energy Conservation Case Category of the FY2025 Energy Conservation Grand Prize: Energy-Saving Initiatives through the Development of a Radiant Tube Burner with High Thermal Efficiency and Long Service Life (Japanese only)** (https://www.jfe-steel.co.jp/release/2025/12/251217-2.html)
- **JFE Steel Uses Digital Twin to Rapidly Develop Innovative Radiant Tube Burner that Achieves Extended Service Life, Fewer NOx Emissions, and Energy Savings** (https://www.jfe-steel.co.jp/en/release/2024/06/240619.html)
- **Solution Business: High Cost Performance Radiant Tube Burner** (https://www.jfe-steel.co.jp/en/products/solution/data-science/28-radiant-tube-burner.html)

Initiatives for Achieving Carbon Neutrality in the Keihin Waterfront Areas

JFE Holdings has released OHGISHIMA 2050, the JFE Group's conceptual plan for the reuse of land currently occupied by JFE Steel's East Japan Works (Keihin district), following the suspension of blast furnace operations and other upstream processes there, and in accordance with Kawasaki City's land use policy. The concept is to create fields of innovation and enterprise that will address the complex challenges involved in the pursuit of carbon neutrality. Through implementation of its OHGISHIMA 2050 plan, the JFE Group aims to convert the land for use on projects that will offer significant public benefit and help address some of the key challenges Japan faces. By attracting new industries and creating jobs that will benefit the country over the next 100 years, the JFE Group hopes to contribute to the sustainable development of local communities and society as a whole.



Rendering of the Ohgishima district, as envisioned in 2050



Land use zoning in Ohgishima

Initiatives for Developing a Hydrogen Supply Hub in the Carbon-Neutral Energy Zone

The Lead Area of the Ohgishima district has been designated as a Carbon-neutral Energy Zone, where hydrogen supply facilities will be deployed. Dramatically improved access to these facilities will support carbon neutrality and innovation across the entire district. The location has been selected as the construction site for a liquefied hydrogen receiving terminal as part of the "Commercial demonstration of Liquefied Hydrogen Supply Chain" under the Green Innovation Fund Project of NEDO, being undertaken by Japan Suiso Energy, Ltd. (JSE). A land lease agreement between JFE Steel and JSE was concluded in July 2024, the transfer of the land commenced in April 2025, and construction of the hydrogen receiving terminal began in May 2025. Preparations are steadily underway toward starting commercial demonstration operations in FY2028.

The hydrogen to be supplied in the future to Ohgishima will be used to generate green electricity at JFE's in-house power plant, which will in turn be supplied to ongoing factory operations. Surplus power will also be supplied to JSE in the leading area, advanced logistics operators, and a data center in the northern part of Ohgishima that is under consideration for joint commercialization with Mitsubishi Corporation. In addition, we also envision using hydrogen as a green fuel in the reheating furnaces of the plate mill.

Starting with Ohgishima, the JFE Group plans to play a role in building a stable, economical supply chain for hydrogen and other decarbonized fuels and to contribute to realizing carbon neutrality throughout society, including in the Keihin waterfront area.



Rendering of the hydrogen base (courtesy of Japan Suiso Energy Ltd.)



Construction at the hydrogen base (photo taken in June 2026)

Initiatives for Developing a Next-Generation Frozen and Refrigerated Logistics Hub in the Advanced Logistics Zone

On August 5, 2026, JFE Steel and GLP Japan Inc. ("GLP Japan") signed a sale and purchase agreement for approximately 18 ha of land in the Lead Area of the Ohgishima district, which will serve as the site for a large-scale, multifunctional logistics complex, focused on frozen and refrigerated storage. On the same day, JFE Holdings, JFE Steel, GLP Japan, and the City of Kawasaki signed a partnership agreement to develop an advanced logistics hub.

GLP Japan plans to develop, in phases, a group of large-scale multifunctional logistics facilities consisting of up to 11 buildings with a total floor area of approximately 370,000 m² and a frozen and refrigerated storage capacity of about 550,000 tonnes. The project aims to help address challenges facing the frozen and refrigerated logistics industry, such as aging facilities and insufficient storage capacity, while also helping to ensure a stable food supply in the Tokyo metropolitan area and strengthening cold-chain capabilities. A portion of the logistics complex is scheduled to begin operations by July 2030.

The JFE Group, GLP Japan, and the City of Kawasaki will work to enhance logistics capabilities by promoting GX and DX. They will seek to reduce environmental impact while improving logistics efficiency by conducting demonstrations and deploying technologies and initiatives such as hydrogen-powered mobility, autonomous trucks, logistics facility automation, collaborative transportation and delivery, and a modal shift leveraging the Port of Kawasaki. They will also work to strengthen the hub's capabilities as a transport base for emergency supplies during major disasters to enhance its role as part of the social infrastructure.



Rendering of the completed advanced logistics complex
(courtesy of GLP Japan Inc.)

Development of Research Facilities to Accelerate the Practical Application of Climate Tech*[1] in the Northern Part of the Minamiwatarida North District

JFE Steel and Hulic Co., Ltd. are jointly developing approximately 5.6 ha in the northern part of the Minamiwatarida North district to establish a scale-up hub envisioned by the City of Kawasaki for the practical application of climate technologies. Construction began on Research Building B in December 2025 and Research Building A in March 2026 ahead of the planned opening of the district in January 2028. The Steel Research Laboratory will occupy Research Building A, strengthening JFE Steel's R&D capabilities in areas such as GX and DX to address social challenges and contribute to greater industrial competitiveness and a sustainable society through materials technologies.

In its R&D, the laboratory will leverage data from manufacturing sites, simulation technologies, and AI to develop technologies that improve quality, ensure stable operations, increase productivity, and reduce environmental impact. The facility will also include a co-creation space designed to facilitate interaction and co-creation with companies, universities, and local stakeholders toward establishing an "open R&D hub" that accelerates the practical application of research outcomes.

Furthermore, the facility incorporates features for reducing environmental impact from the construction stage, including the use of GX steel, JGreeX™*[2] and ARCHITETSUT™*[3], a hybrid structure combining steel and wood.

Under the concept of "a one-of-a-kind industrial hub that changes the world through materials," Hulic and the JFE Group aim to create an R&D hub that generates and deploys innovations through co-creation.

*1 A general term for technologies and services designed to reduce carbon dioxide emissions and support adaptation to climate change.
*2 A proprietary JFE Steel product and registered trademark of JFE Steel in Japan. GHG emission reductions generated through JFE Steel's emission reduction technologies are allocated to designated steel products, significantly reducing the GHG emissions attributed to those products from the steelmaking process.
*3 A proprietary environmental brand and registered trademark of JFE Steel in Japan for environmentally friendly buildings combining steel frames with high seismic resistance and wood that enhances aesthetics and indoor environments.



Rendering of Research Building A



Rendering of the co-creation space



Note: The project outline and rendering reflect current plans and are subject to change. The surrounding buildings shown in the rendering are based on a city model from Vexcel Imaging US, Inc.

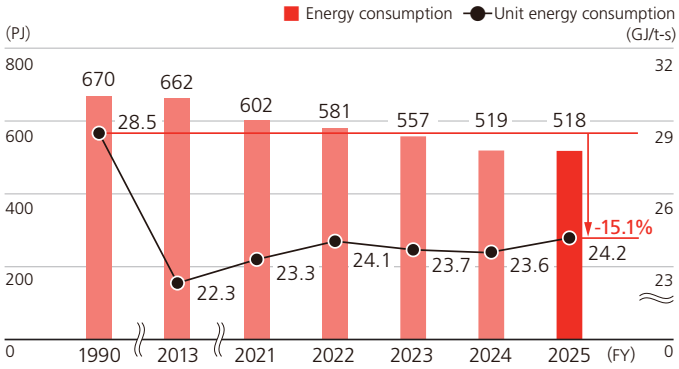
Initiatives to Reduce Energy Consumption

Reducing energy consumption is a core initiative of our response to climate change. The JFE Group is working to improve energy efficiency in our business activities and reduce GHG emissions by introducing renewable energy and optimizing facilities.

Initiatives in the Steel Business

In addition to introducing high-efficiency facilities, we have been working to reduce energy consumption in the steelmaking process by actively applying digital solutions (DS) and IoT technologies. These initiatives improve production efficiency and optimize energy use, representing important steps toward building a sustainable manufacturing framework. Going forward, we will continue pursuing technological innovation and on-site improvement to further enhance energy efficiency.

Energy Consumption and Unit Energy Consumption of JFE Steel



Note: FY2013 figure includes data for the Sendai Works of JFE Bars & Shapes Corporation.

ST Fuel and Power Operation Guidance System for Steelworks

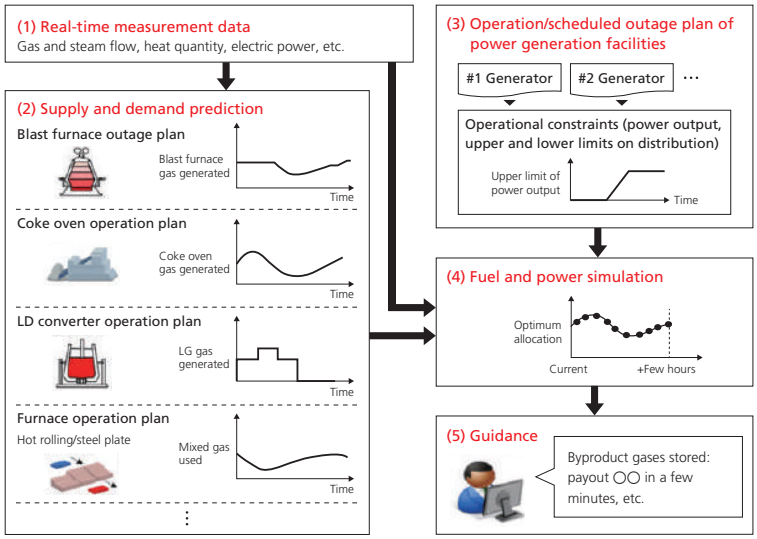
JFE Steel developed a fuel and power operation guidance system for steelworks and succeeded in saving energy and reducing CO_2 as well as fuel and power costs by optimizing the fuel, steam, and electric power used in the steelmaking process.

Previously, operators determined various factors such as the distribution of byproduct gas to each process, amount of fuel (heavy oil, city gas, etc.) and electricity to purchase, and the amount of byproduct gas stored, taking into account energy demand and supply (amount generated and used) as well as the operating conditions of power generation facilities, to minimize cost and energy loss. However, it was difficult to use this method to accurately estimate the change in energy demand and supply. The guidance system developed by JFE Steel uses voluminous real-time measurement data (1) obtained through a cyber physical system (CPS)* and the precise production plans of each factory to predict future demand and supply with high accuracy (2), and by taking into account information such as in-house power generation capacity (3), fuel and power simulation allows for the calculation of the optimal operating conditions with the lowest possible purchases from external sources (4), and the results are fed back to guide the operator (5).

The system's development was awarded the Academic Award (Technical Division) of the 2022 Japan Institute of Energy Award. JFE Steel established the JFE Digital Transformation Center (JDXC™) to promote CPS within the manufacturing process and other digital transformation initiatives to achieve innovative production improvements as well as stable operations. We remain committed to realizing a sustainable society by adopting digital transformation to address the various issues identified at production sites.

*A system that brings together a vast amount of sensor information about physical space as big data in cyberspace and generates value by feeding back in real time the results analyzed by various measures for application in the physical space.

Guidance System Overview



› **JFE Steel receives Academic Award (Technical Division) of the 2022 Japan Institute of Energy Award (Japanese only)**
(https://www.jfe-steel.co.jp/release/2023/03/230301.html)

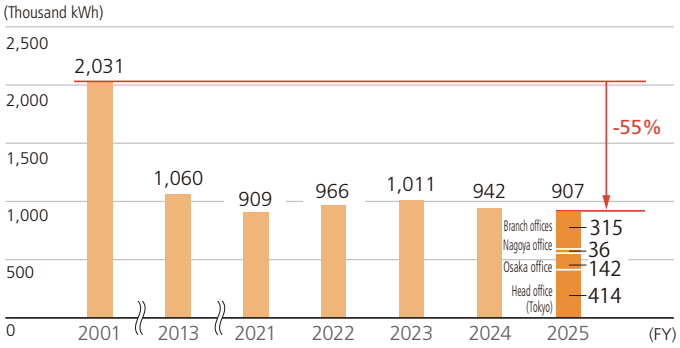
Initiatives in the Trading Business

Under the environmental policy revised in 2025, JFE Shoji is continuously implementing initiatives to reduce paper and electricity consumption and strictly manage waste separation as part of its energy reduction efforts.

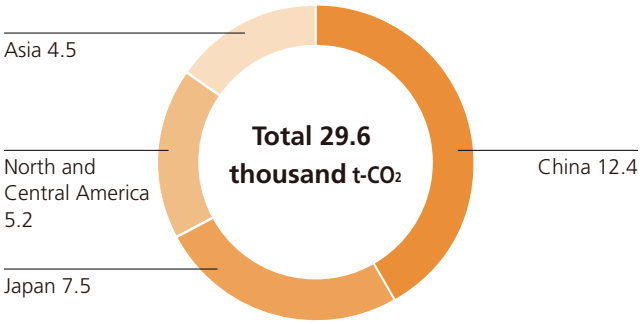
In terms of reducing paper consumption, the company continues to use recycled paper and we ensure that documents are printed in N-up layout using both sides of the paper. We are also promoting paperless meetings through the use of large monitors and web conferencing systems. Consequently, the amount of paper used per employee is decreasing. As for electricity consumption, JFE Shoji is reducing its environmental impact through measures such as replacing fluorescent lights with LEDs, introducing motion-sensor lighting and energy-saving equipment, implementing leave-on-time days, and improving operational efficiencies through robotic process automation (RPA).

Furthermore, the company has set a new goal for its domestic operating companies to reduce CO_2 emissions by installing solar panels and purchasing electricity derived from renewable energy sources. In FY2025, in addition to a decline in emission factors, the domestic operating companies acquired non-fossil certificates through the full-scale operation of off-site PPAs and procured electricity derived from renewable energy, reducing CO_2 emissions by 36.6% compared to FY2019.

Electric Power Consumption by JFE Shoji



GHG Emissions of the JFE Shoji Group



Data cover: JFE Shoji and 59 affiliates in Japan and overseas

For quantitative data for the JFE Shoji Group's GHG emissions, please refer to:

› **Environmental Data** (P. 273)