Environment: Executive Summary

The JFE Group strives to maintain its businesses in harmony with the environment for the prosperity of society. We have positioned climate change as a key management concern in our pursuit of becoming the top runner in carbon neutrality technology development by 2035 toward achieving carbon neutrality by 2050. To this end, we are reducing greenhouse gas emissions in the steel business and expanding our contribution to reducing greenhouse gas emissions in society as a whole, centered on the engineering business. We have identified climate change, transition to a circular economy, and biodiversity conservation and nature positive as key issues under our Eighth Medium-term Business Plan (FY2025–FY2027), and the entire Group is working in concert to address global environmental concerns.

The JFE Group systematically addresses climate change by incorporating the principles of international frameworks into its management strategies, including the climate-related disclosure standards of the International Sustainability Standards Board (ISSB). In the steel business, we have created a roadmap for achieving carbon neutrality by 2050 and are working to reduce greenhouse gas (GHG) emissions toward short-, medium-, and long-term targets. GHG emission reductions in the steel business are progressing according to plan, and our efforts toward achieving the Eighth Medium-term Business Plan target of a 24% reduction by FY2027 compared to FY2013 and a reduction of 30% or more by FY2030 include introducing innovative electric arc furnaces and using direct reduced iron. We are also pursuing the parallel development of ultra-innovative technologies, including a carbon-recycling blast furnace, with the aim of establishing these technologies by around 2035. Their implementation, however, depends on their economic viability. Moreover, the shift to steelmaking processes that achieve carbon neutrality entails enormous costs, making it indispensable to create markets for GX products with environmental value and gain support from the government and others. As part of these efforts, we allocate the reductions created by our emission-reduction technologies to selected steel products and supply them as GX Steel "JGreeX™" while promoting their use across a wide range of fields, including automotive, shipbuilding, and industrial machinery. To support investment, we applied for a program of the Ministry of Economy, Trade and Industry and secured support for the introduction of an innovative electric arc furnace at the Kurashiki district of the West Japan Works. In the engineering business, we are working to expand our contributions to reducing GHG emissions in society by constructing renewable energy power generation facilities, including offshore wind power generation. In FY2025, we achieved our target of contributing to a 12.5 million tonne reduction in GHG emissions in society, and we are expanding initiatives for achieving reductions of 20 million tonnes in FY2030 and 30 million tonnes in FY2035.

The transition to a circular economy is also positioned as a key theme, and we are coordinating our steel, engineering, and trading businesses and value chain to expand the use of recycled resources, improve the efficiency of waste resource utilization, and convert waste into resources.

We are promoting initiatives for biodiversity conservation and nature positive, assessing the dependencies and impacts between our business activities and natural capital, and advancing disclosures in line with the TNFD. These efforts mainly include monitoring and conservation activities around production sites and initiatives to improve the marine environment by using steel slag products. In regard to the blast furnace site and other facilities suspended in FY2023 at JFE Steel's East Japan Works (Keihin district), we are focusing on converting the land for public and highly public-interest use, contributing to the sustainable development of local communities and society by establishing new industries and creating jobs for the next 100 years.

Targets and Results for Environment-Related Material Issues of Corporate Management

› **FY2025 KPI Results and FY2026 KPIs** (P. 19)

Key Initiatives

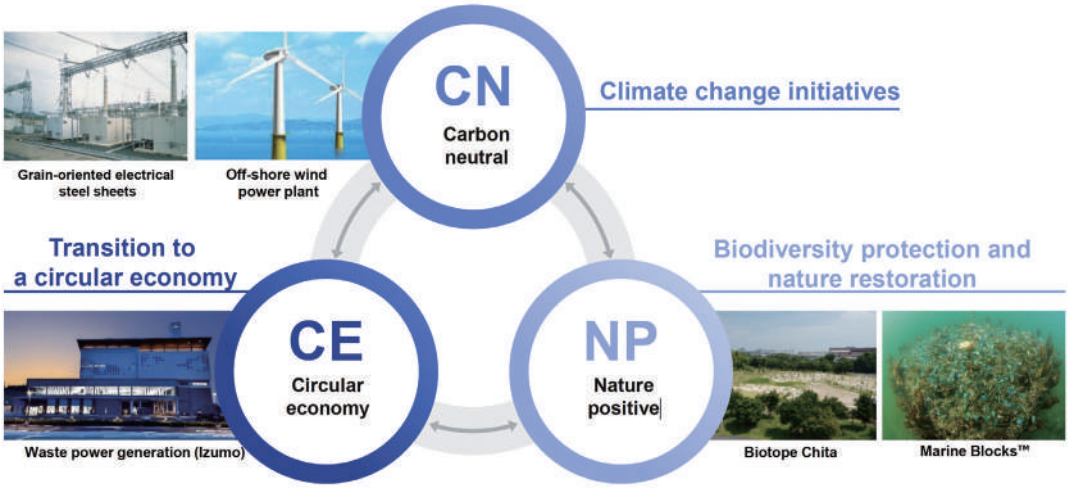
- Environmental Management Initiatives (P. 45)
- Initiatives to Address Climate Change (P. 49)
- Policy Engagement Initiatives (P. 89)
- Identification and Assessment of Risks and Opportunities (TCFD Scenario Analysis) (P. 113)
- Initiatives to Transition to a Circular Economy (P. 126)
- Biodiversity Conservation and Nature Positive (P. 154)
- Environmental Management Activities (P. 180)

Environmental Management

Basic Policy

JFE Group companies are developing innovative technologies and international cooperation for the protection of the global environment by operating in harmony with the global environment, as well as protecting it, in accordance with the Group's environmental philosophy and policy.

Under the Eighth Medium-term Business Plan, we have positioned initiatives to address climate change, transitioning to a circular economy, and biodiversity conservation and nature positive as key issues. Since these issues are interconnected, we will address them in an integrated manner, taking into account both trade-offs and synergies. The JFE Group also views environmental issues as key management concerns that lead to new value creation and opportunities for sustainable growth beyond reducing risks. We aim to simultaneously resolve social issues and enhance corporate value by providing products and services that help reduce environmental impact, developing markets for products with environmental value, including GX steel, and expanding the use of circular resources. In advancing these initiatives, we will make appropriate investment decisions with emphasis on ensuring capital efficiency and economic viability based on the business environment and technological trends. At the same time, we will strive to provide highly transparent disclosure of environmental information and strengthen relationships of trust through constructive dialogue with stakeholders.



Based on the Ministry of the Environment's "State of the Environment, the Economy, and Society and Direction of Environmental Policies" (January 2023)

Environmental Philosophy

The JFE Group puts top priority on protecting and enhancing the global environment to maintain its business in harmony with the environment and ultimately for the prosperity of society as a whole.

Environmental Strategies

1. Reduce the environmental impact of all businesses
2. Contribute through technologies and products
3. Contribute through businesses for resource conservation and energy efficiency
4. Communicate with society
5. Facilitate international cooperation

Policy on Environment-related Information Disclosure

Environment-related risks and opportunities may have a significant impact on corporate finances and business activities over the medium to long term. The JFE Group has worked to enhance disclosure on environmental issues, including climate change, by disclosing climate-related information based on the TCFD recommendations and endorsing the recommendations of the Taskforce on Nature-related Financial Disclosures (TNFD). Through disclosure aligned with these international disclosure frameworks, the Group seeks to enhance the transparency and reliability of its initiatives for stakeholders, including investors, customers, employees, and local communities.

In addition, the International Sustainability Standards Board (ISSB), established by the IFRS Foundation*, has built on the work of the TCFD and developed international standards for sustainability-related financial disclosures. In Japan, the Sustainability Standards Board of Japan (SSBJ) has formulated disclosure standards based on the ISSB standards, which were published in March 2025. The JFE Group is preparing to apply the standards from the fiscal year ending March 2028. Going forward, the JFE Group will continue to enhance its environment-related disclosure while ensuring alignment with international disclosure standards.

*A private, non-profit organization responsible for developing International Financial Reporting Standards (IFRS)

In May 2019, JFE Holdings announced its endorsement of the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), and in March 2025, it announced its endorsement of the recommendations of the Taskforce on Nature-related Financial Disclosures (TNFD).

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

TNFD Taskforce on Nature-related Financial Disclosures

For the TCFD Content Index, please refer to the following.

› **Guidelines Content Index** (P. 310)

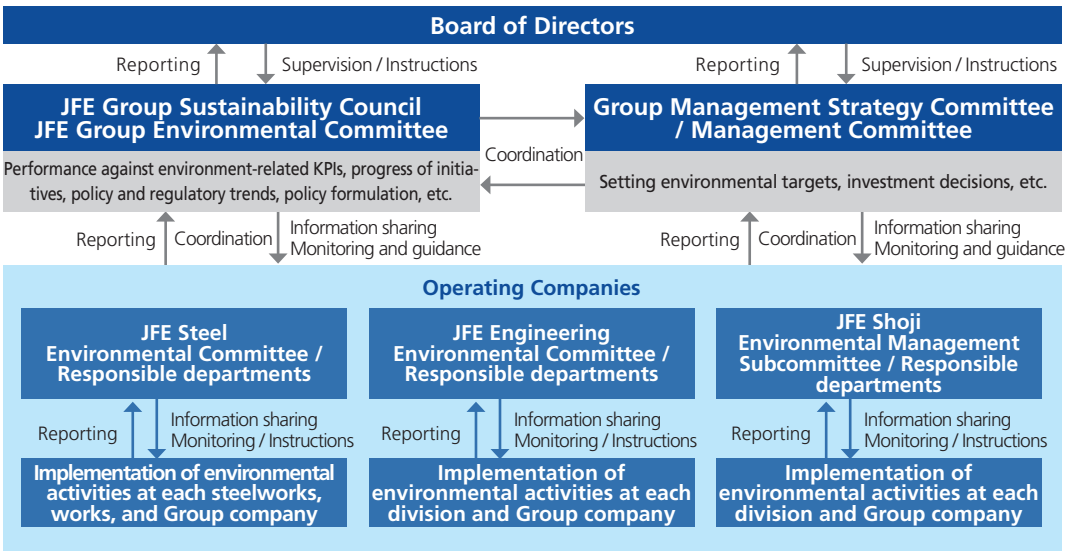
Governance

The JFE Group Environmental Committee, chaired by the president of JFE Holdings and operating under the JFE Group Sustainability Council, advances the Group's response to environmental issues. The Group Management Strategy Committee and Management Committee serve as forums for discussing and deliberating material environmental issues from a strategic perspective and, as appropriate, set targets for environmental issues, including climate change, and make decisions on environment-related investments. The JFE Group Environmental Committee serves as a forum for sharing and managing information on performance against environmental KPIs, progress on initiatives, policy trends in Japan and overseas, and changes in the business environment. It meets twice a year to improve the Group's overall environmental performance and strengthen its response to environmental issues. These matters are reported to the Board of Directors at least twice a year, and the Board fulfills its supervisory function through these discussions.

Furthermore, each JFE Group operating company and other Group company has also established specialized environmental committees and promotes environmental management activities tailored to their business characteristics, thus creating an integrated Groupwide environmental management framework.

For further details, please refer to:
- **System for Promoting Sustainability** (P. 10)
- **Progress under JFE Vision 2035 and the Eighth Medium-term Business Plan** (P. 24)
- **JFE Group Environmental Vision for 2050** (P. 49)

Environment-related Governance Structure



Examples of Environmental Items Reported to or Decided by the Board of Directors

- Reports on KPI targets and performance for material items (environment)
- Information disclosure consistent with TCFD recommendations (scenario analysis, financial impact, and other information)
- Formulation of the JFE Group Environmental Vision for 2050
- Use of climate-related metrics to determine executive remuneration
- Formulation of GHG emissions reduction targets and contribution targets under the Eighth Medium-term Business Plan
- Decision-making on capital investment for GHG emissions reduction (including the introduction of innovative electric arc furnaces)
- Status of initiatives to prepare for the SSBJ standards
- Status of initiatives for environment-related disclosure through CDP and other channels
- Status of initiatives for the transition to a circular economy, biodiversity conservation, and nature positive

Risk Management

JFE Holdings is responsible for comprehensive risk management in accordance with its Basic Policy for Building Internal Control Systems.

Environment-related risks and opportunities are identified, assessed, and reviewed on an ongoing basis at the corporate level, using methods such as scenario analysis for material issues, including climate change. The results of these analyses are appropriately reported in accordance with the aforementioned governance framework. Key factors affecting business are selected, and detailed analysis of their impacts is used in formulating business strategies, including medium-term business plans.

In addition, each operating company works to identify and reduce risks through environmental management systems, routine environmental management activities, and training. This information is compiled by JFE Holdings, thereby establishing an integrated environmental risk management framework across the JFE Group.

› **Environmental Management Activities** (P. 180)

Monitoring Method for Risks

The JFE Group continuously monitors environment-related risks and opportunities through the JFE Group Environmental Committee, Group Management Strategy Committee, and Management Committee. Monitoring methods include scenario analysis, progress management for various KPIs, and tracking changes in the business environment and regulatory trends to periodically assess changes in risks and opportunities. These monitoring results are used to review response policies and measures as necessary to reduce risks and maximize opportunities. Particularly important matters are promptly reported to management under the governance framework and reflected in management decisions. In addition, the JFE Group Environmental Committee consolidates information related to risks, strengthens management systems, and strives to reduce the frequency and impact of risks. Moreover, the JFE Group promotes initiatives to maximize climate-related opportunities. These initiatives are reported to and overseen by the Board of Directors at least twice a year.

Each operating company also continuously implements improvement measures for issues identified through environmental management activities and verifies their effectiveness, thereby strengthening its ability to address environmental risks.

Countermeasures Based on Monitoring

1. Groupwide deliberations
2. Monitoring penetration of policies within the Group
3. Information sharing and horizontal communication regarding responses to issues and problems

› **System for Promoting Sustainability** (P. 10)
› **Risk Management** (P. 269)
› **Environmental Management Activities** (P. 180)

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

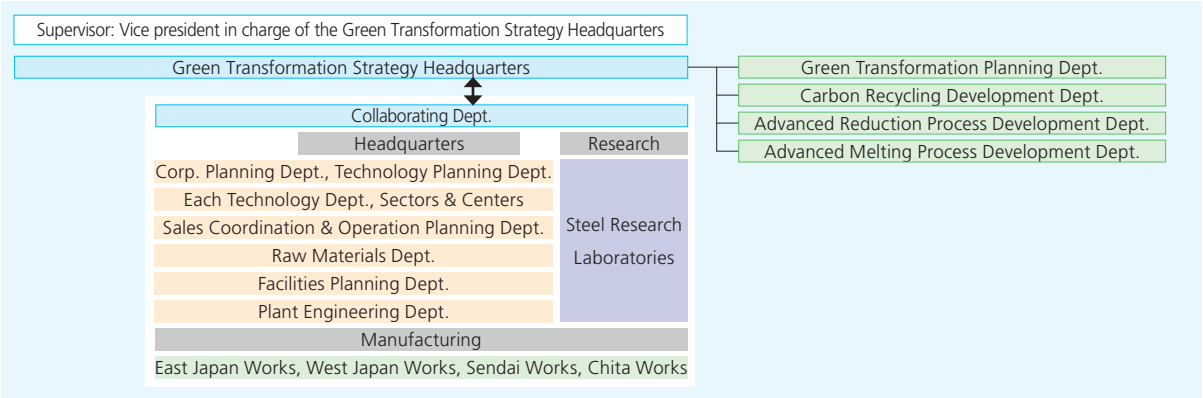
Promotion Structure

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

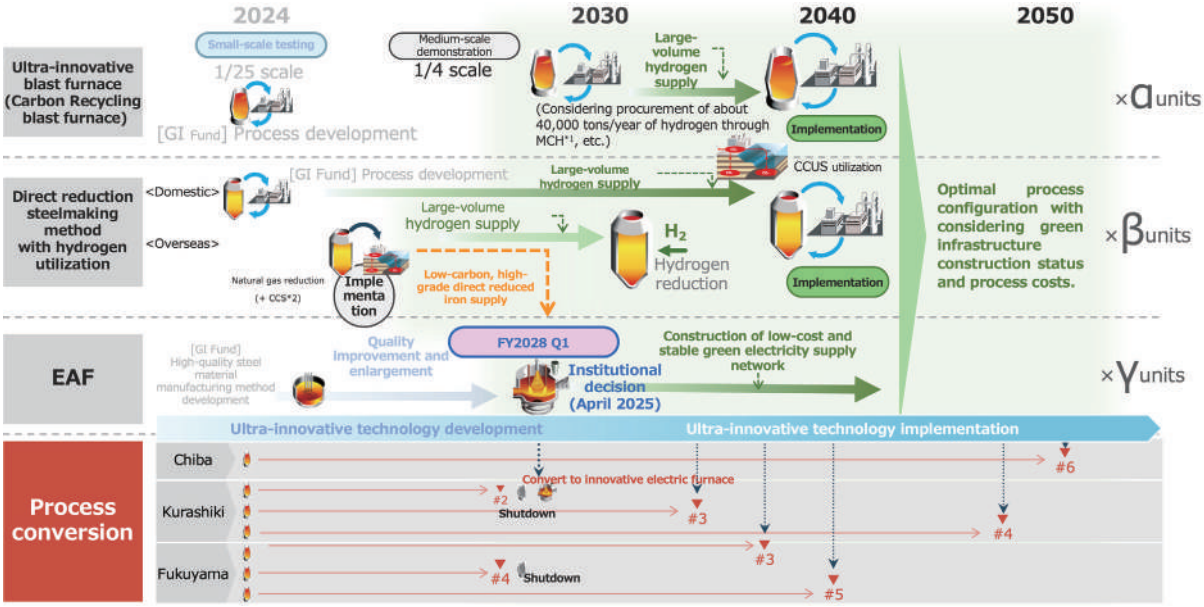
In May 2025, the JFE Group formulated the Eighth Medium-term Business Plan (FY2025–FY2027) to drive growth strategies and announced its GHG reduction plan through FY2030 at the JFE Group Environmental Management Strategy Briefing held that same month. In the steel business, we have set a new target of 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)

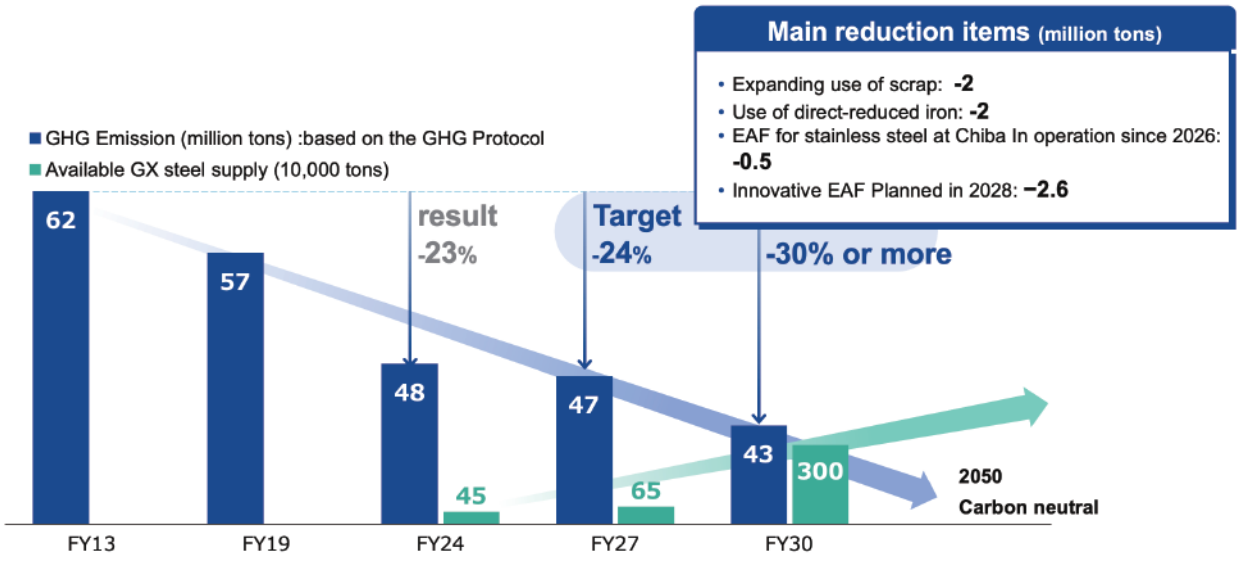
GHG Emissions Reduction in the Domestic Steel Business

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

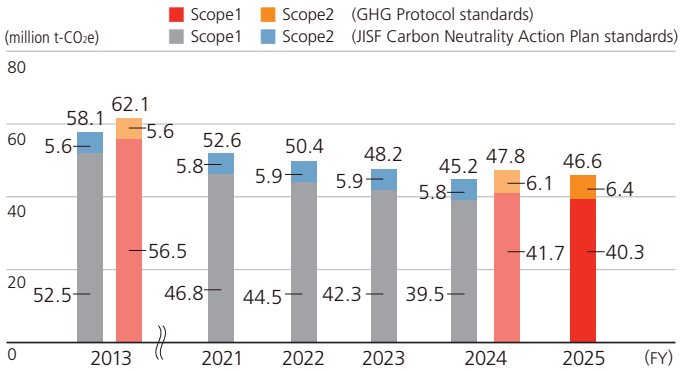
As a member of the Japan Iron and Steel Federation (JISF), JFE Steel is working to achieve the targets of the federation's Carbon Neutrality Action Plan. This plan sets a target of a 30% reduction in energy-derived CO_2 emissions in FY2030, compared to FY2013, and JFE Steel is aggressively pursuing this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

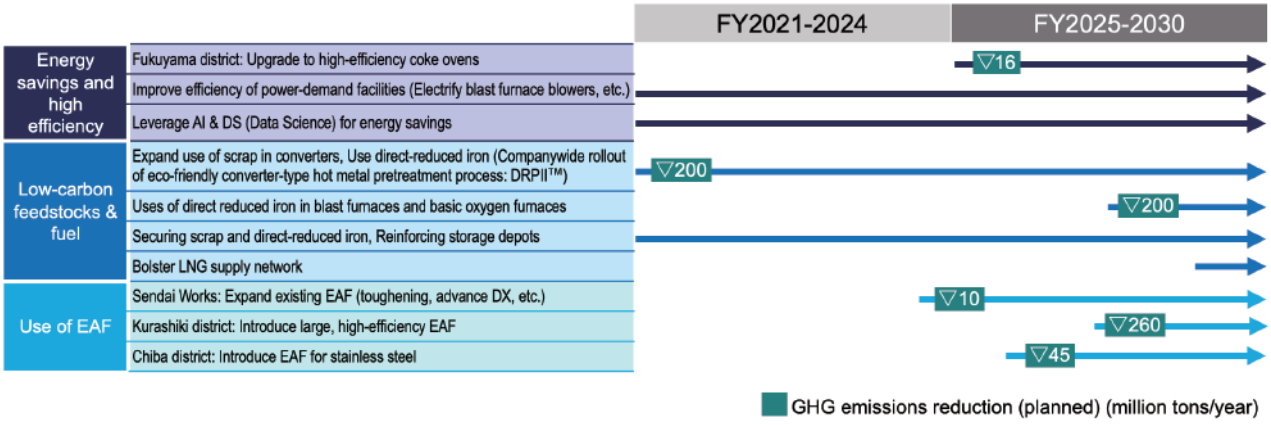


Note: For FY2021–FY2024, CO_2 emissions are calculated in accordance with the JISF Carbon Neutrality Action Plan standards. From FY2024 onward, emissions are calculated in accordance with the GHG Protocol standards.

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

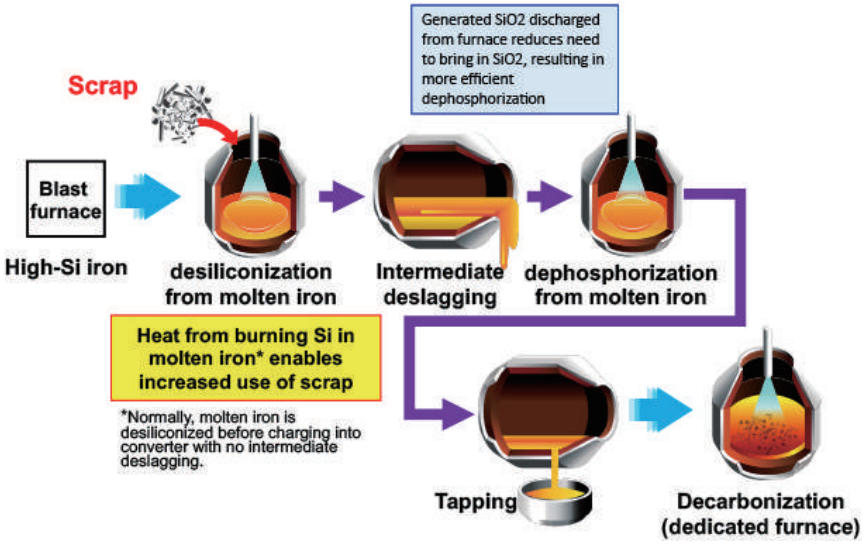
Increased Use of Scrap Iron in Steelmaking

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

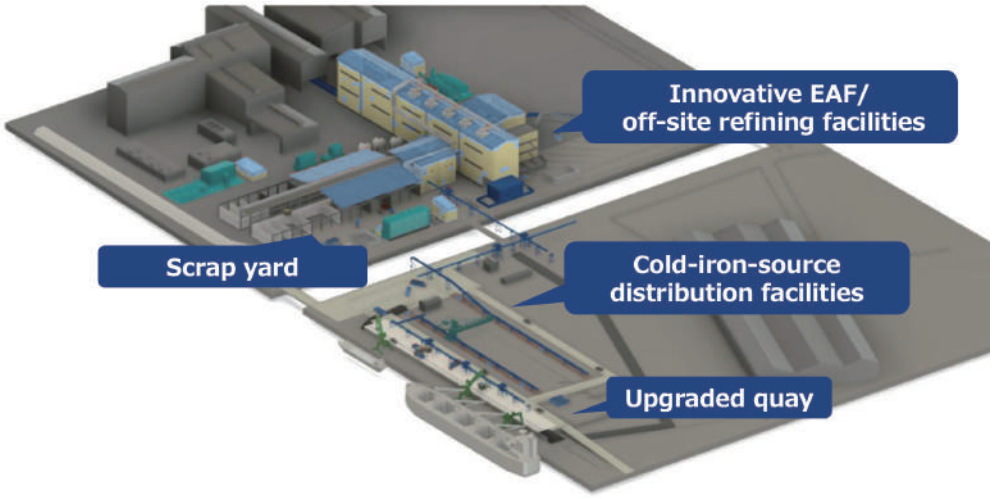
Introduction of an Innovative Electric Arc Furnace at the West Japan Works, Kurashiki District

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



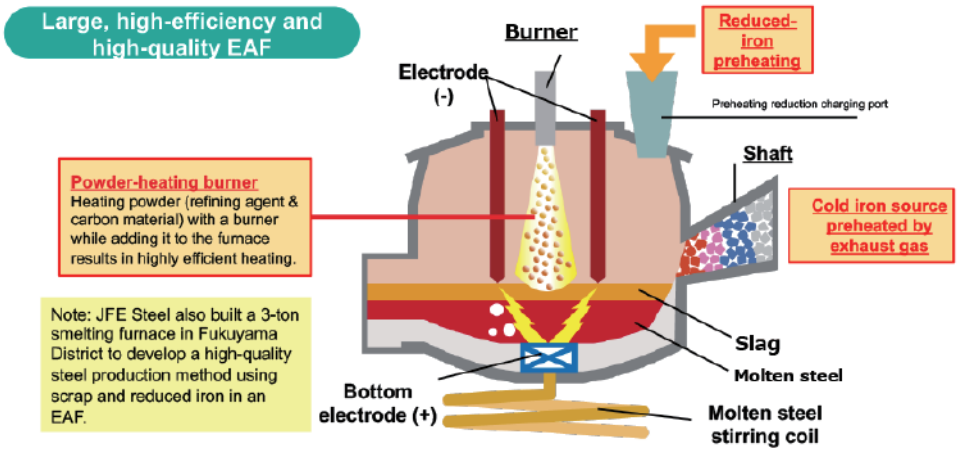
Demonstration Tests for Developing Manufacturing Methods for High-Quality Steel Products

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

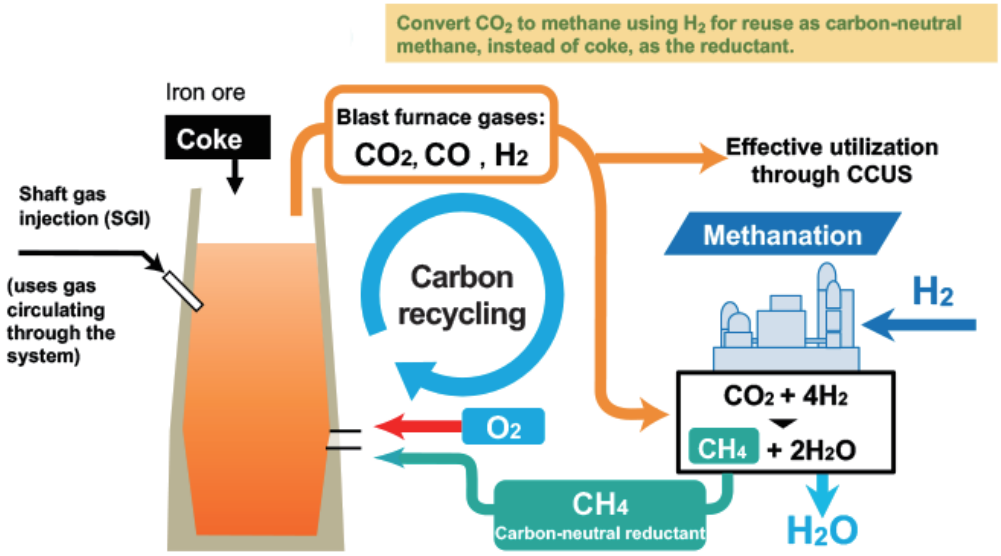
The CR blast furnace incorporates an ultra-innovative technology that converts CO_2 in the furnace exhaust gas into carbon-neutral methane through methanation, which is then reused as reducing material in the furnace. The technology, together with other measures, is expected to reduce CO_2 emissions 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

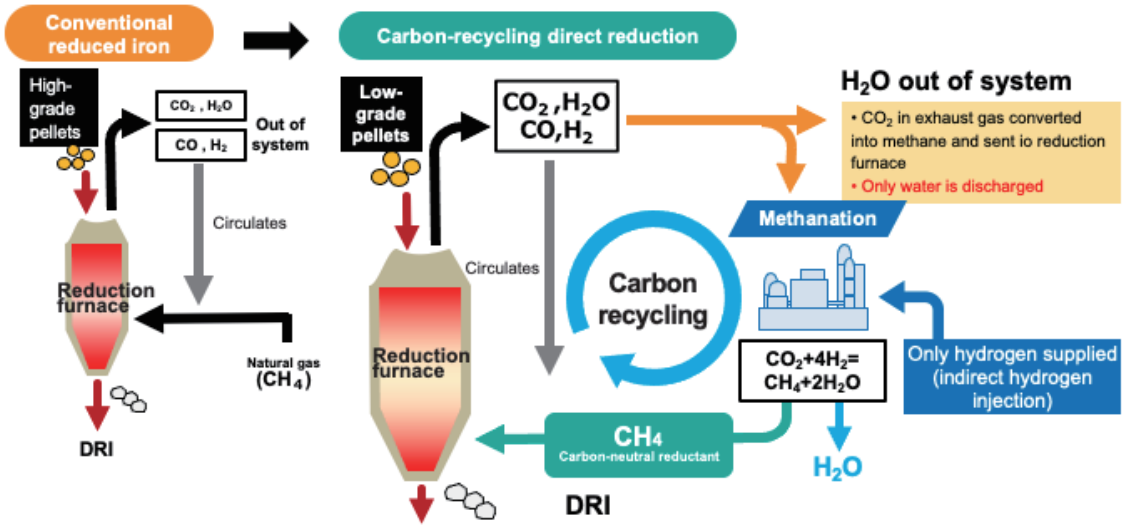
One challenge of hydrogen reduction is that the reduction of iron ore by hydrogen is an endothermic reaction, which means that heat must be applied externally for the reaction to proceed. A sufficient reduction reaction may not take place if there is not enough heat. Thus, technologies for heating raw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

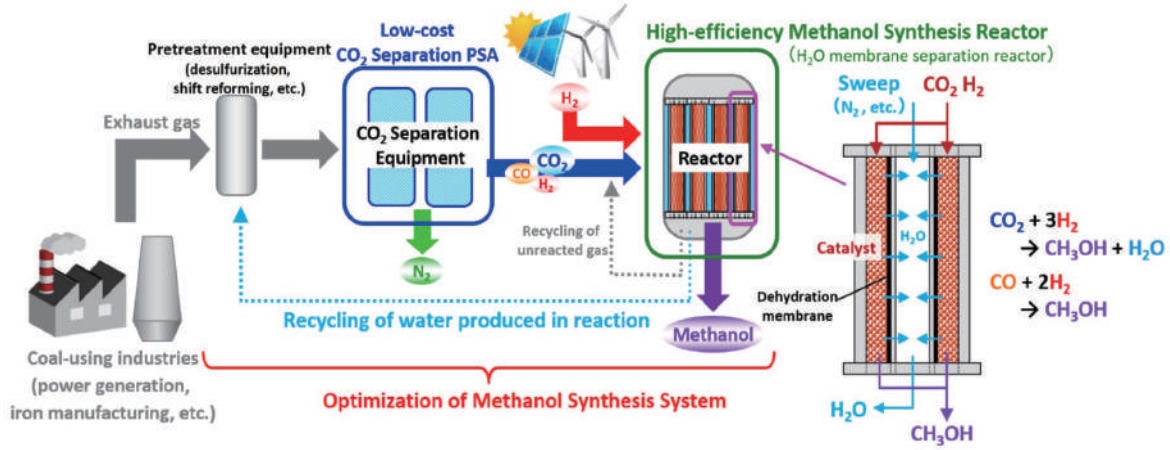
› ***4 Japan's First Successful Trial Production of Direct-Reduced Iron Using Green Hydrogen (Japanese only)** (https://www.jfe-steel.co.jp/release/2026/07/260731.html)

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).

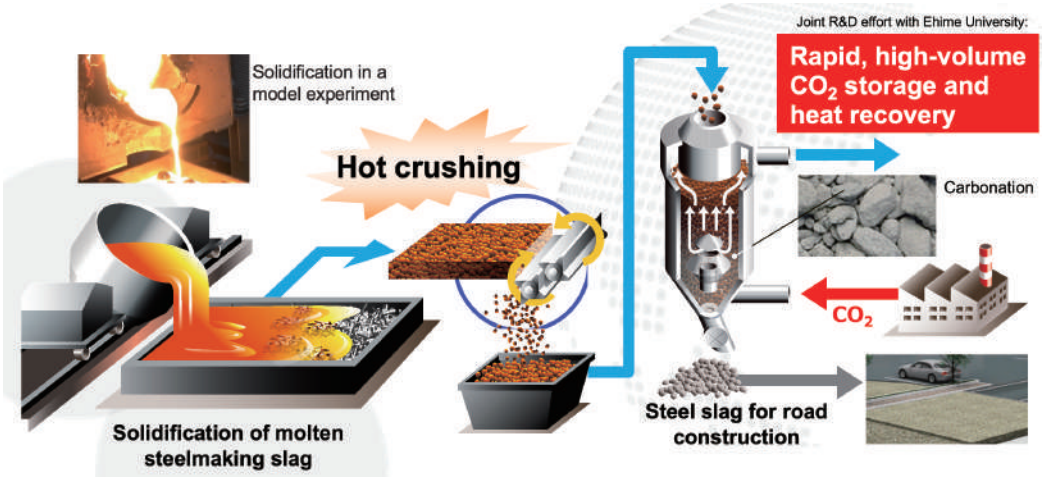
Methanol Synthesis Flow Using CO_2



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

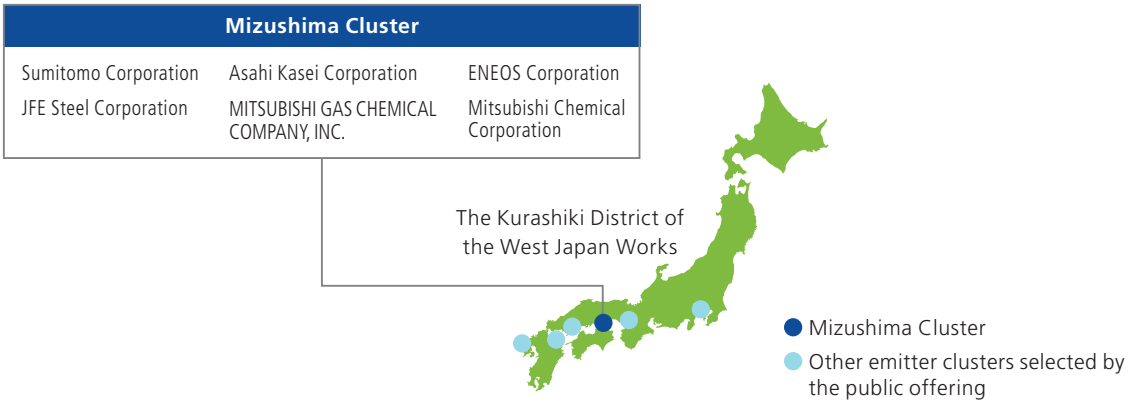


*This technological development is being carried out as a project commissioned by the New Energy and Industrial Technology Development Organization (NEDO) under its public solicitation for "Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation/Development of Technologies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

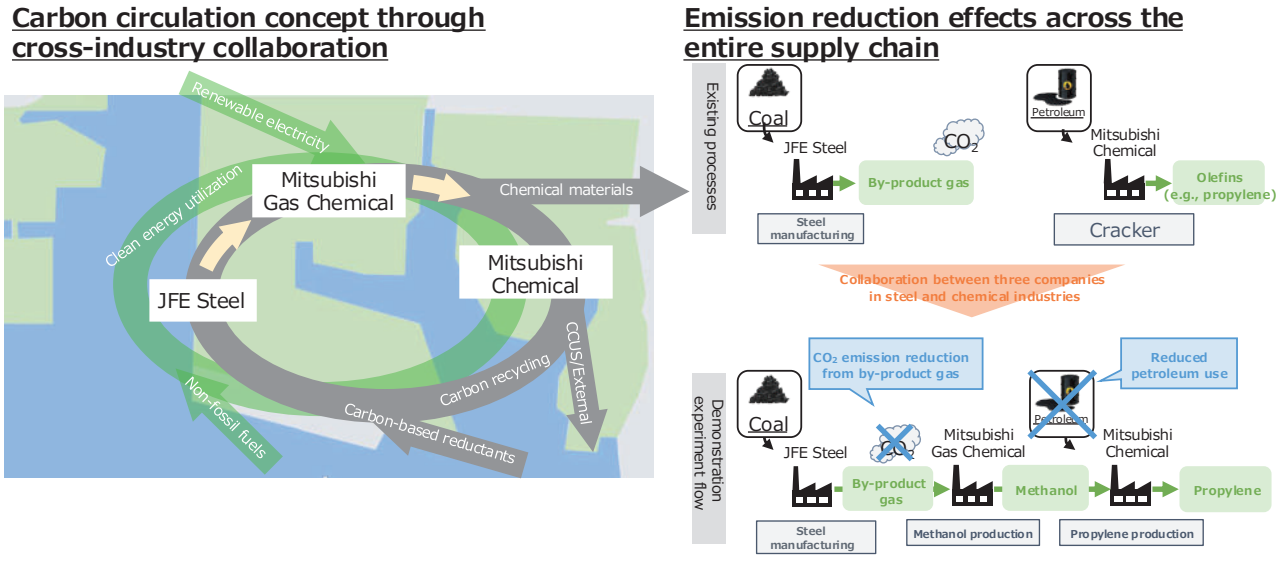
Consideration at Mizushima Cluster



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.

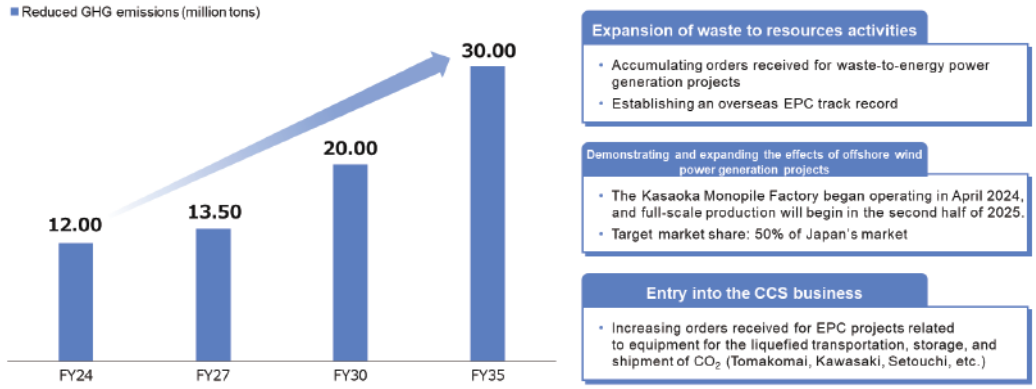
- ***1 Biomass Power Generation Business (Japanese only)** (https://www.jfe-eng.co.jp/products/electric-power/electric07.html)
- ***2 Geothermal Power Generation Systems** (https://www.jfe-eng.co.jp/en/products/power-generation/plant01.html)
- ***3 Solar Power Generation Business (Japanese only)** (https://www.jfe-eng.co.jp/products/electric-power/electric05.html)
  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)

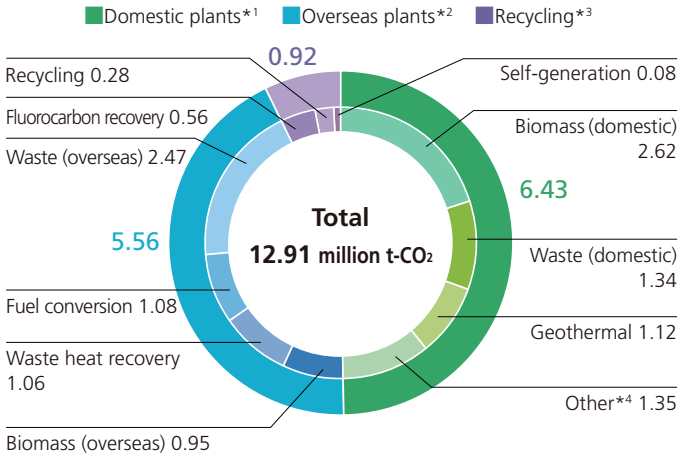
JFE Engineering contributes to GHG emissions reductions in society as a whole through its business operations, such as expanding renewable energy generation and constructing and operating plastic and food recycling plants. In FY2025, the Company contributed to reducing 12.91 million tonnes of GHG emissions (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

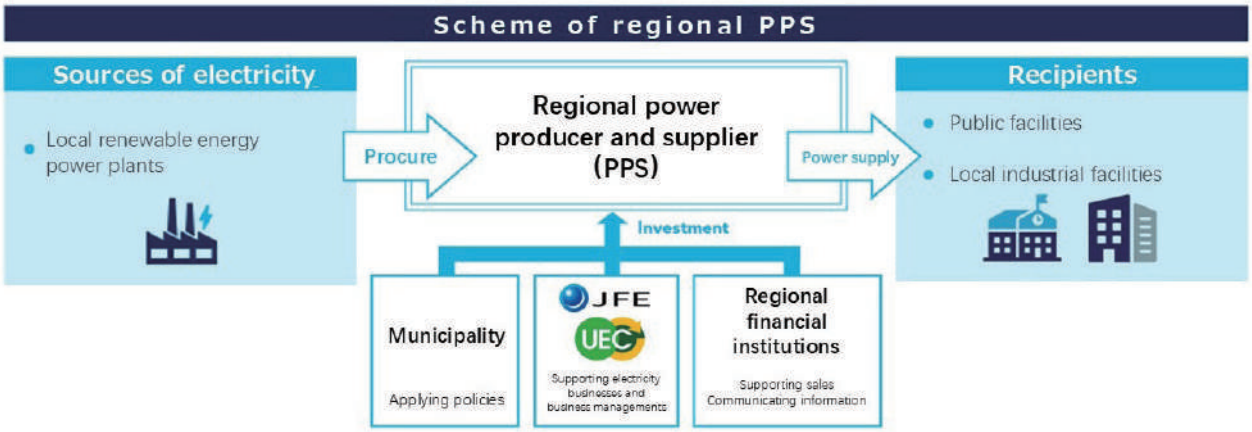
> **Aqua Connect Namie Corporation Launches Power Generation Business at the Ukedogawa Hydro Power Station (Japanese only)**
(https://www.jfe-eng.co.jp/news/2024/20240521.html)

EN Support for New Regional Electricity Projects

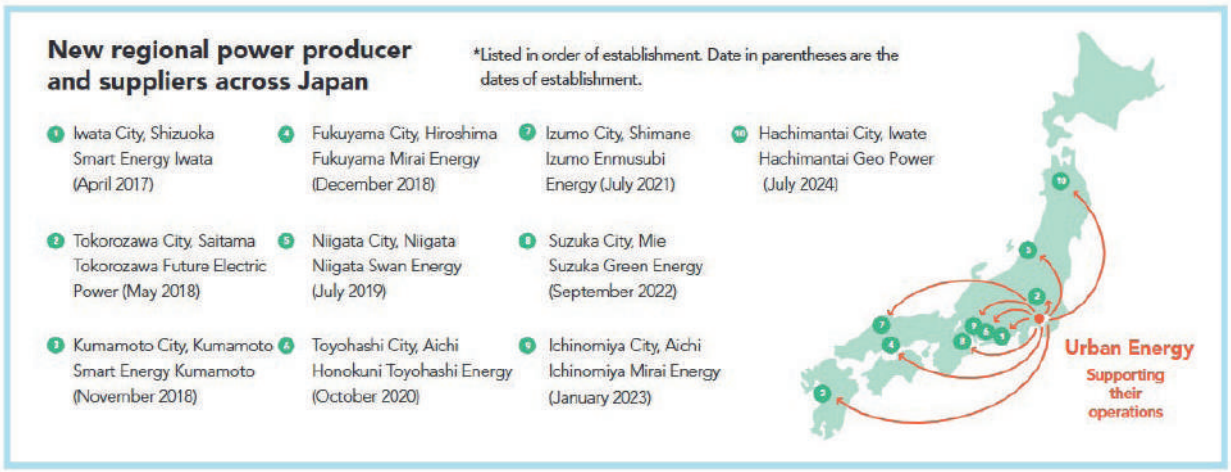
JFE Engineering is creating mechanisms for effectively using regional renewable energy sources such as wind and geothermal power and supplying electricity to local public facilities from renewable energy plants constructed by JFE Engineering, including waste-to-energy plants. These efforts support local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

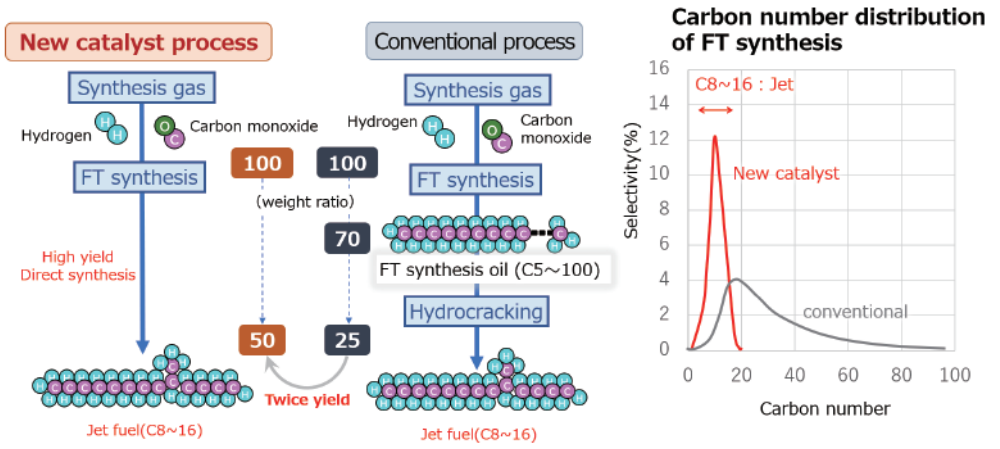
*4 Source: "Clever chemistry offers new source of jet fuel," Nature, Vol. 561, 286, 2018 (editorial)

*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.

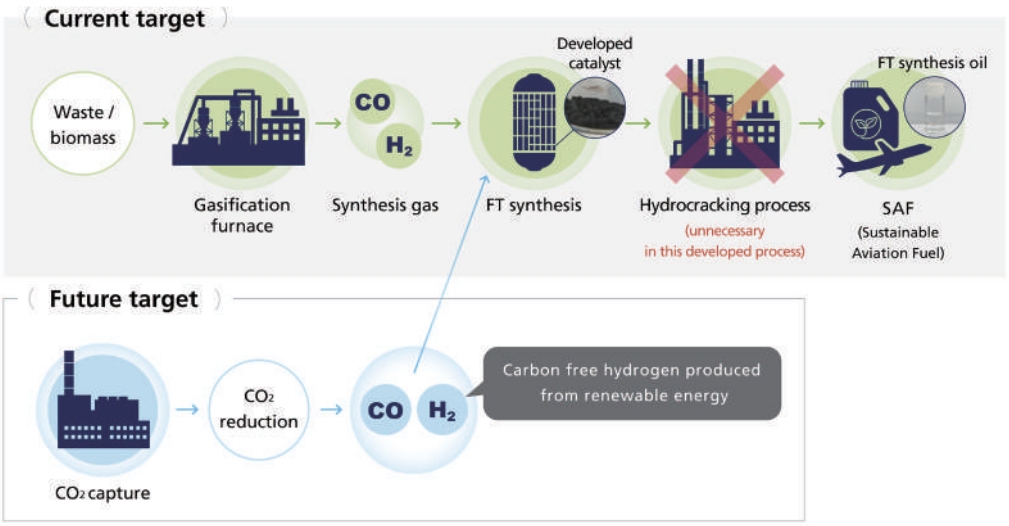
*6 A process in which hydrogen is added using a zeolite catalyst to break the chain structure of solid hydrocarbons (wax) with carbon numbers of 20 or higher into liquid hydrocarbons with smaller carbon numbers.

› *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



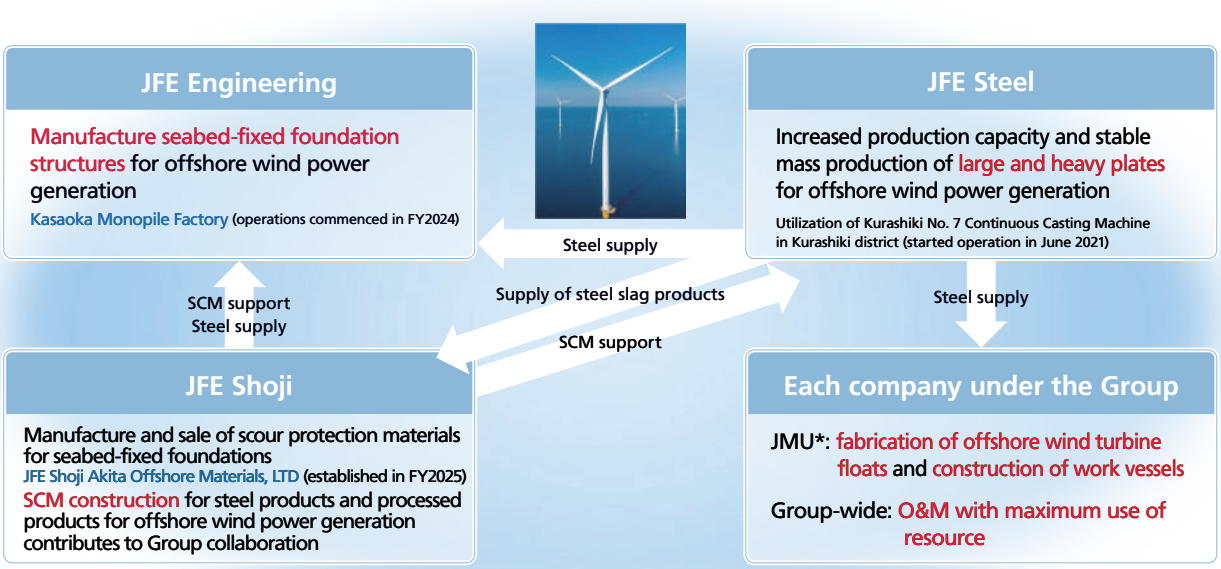
Offshore Wind Power Business Initiative

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

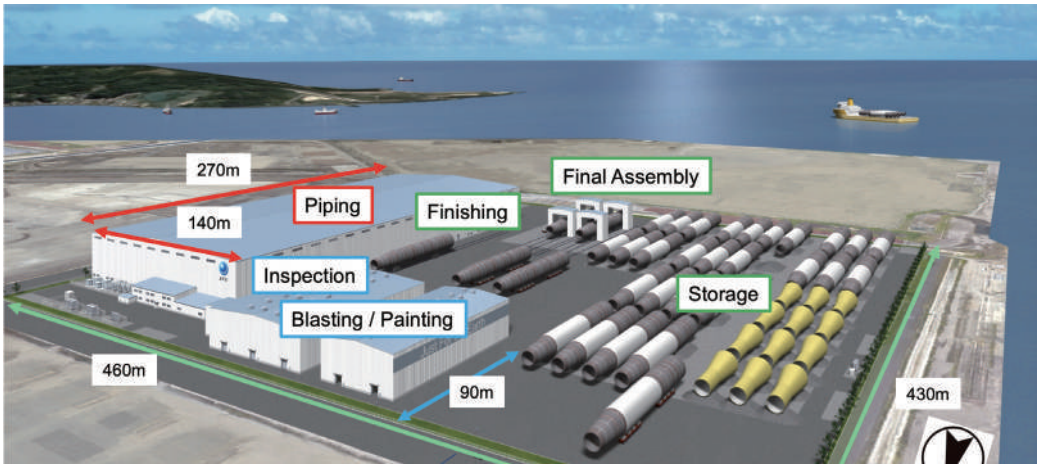
Category	Company	Details
Foundation structures	JFE Engineering	Seabed foundations (monopiles, jackets, etc.)
	Japan Marine United	Floating foundations (semi-submersible)
	JFE Steel	High-quality, large and heavy steel plates, high-strength steel (reduced using HBL series steel plates)
	JFE Shoji	Manufacture 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.

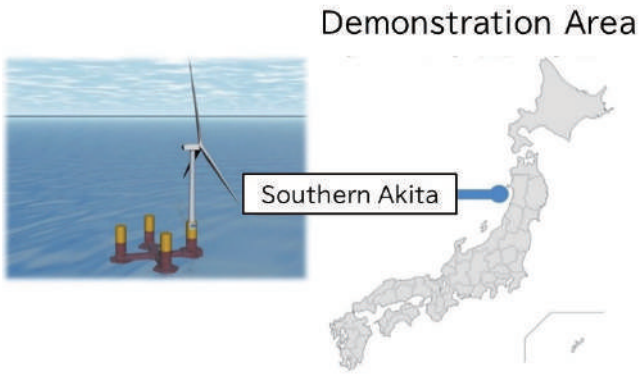
The project aims to establish a technology to commercialize floating offshore wind power generation at an internationally competitive cost level to support wider deployment in the future. The consortium plans to install two wind turbines, each with an output of over 15 MW, approximately 25 km off the 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

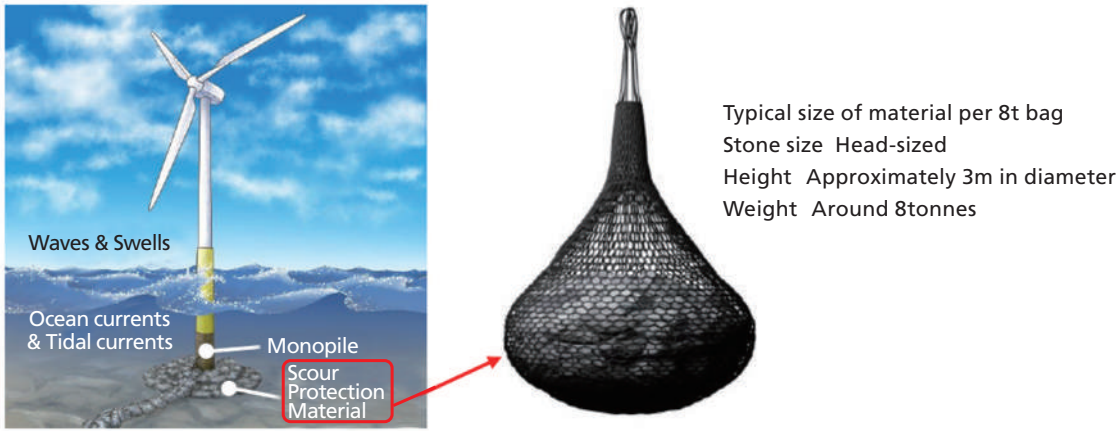
JFE Shoji established JFE Shoji Akita Offshore Materials, LTD. (JAOM), a joint venture with quarry operators, construction companies, and financial institutions in Oga City, Akita Prefecture, to manufacture and sell scour prevention materials for offshore wind power generation projects.

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.

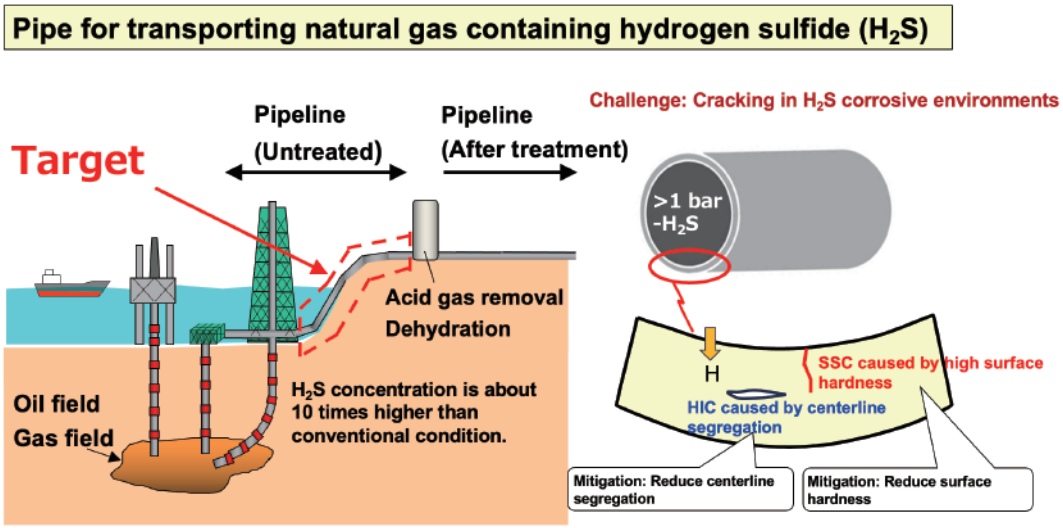
Going forward, JFE Steel will continue to contribute to the stable supply of low-carbon energy and advance the energy transition by supplying high-performance, high-quality line pipes while working to realize a sustainable society.

*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.

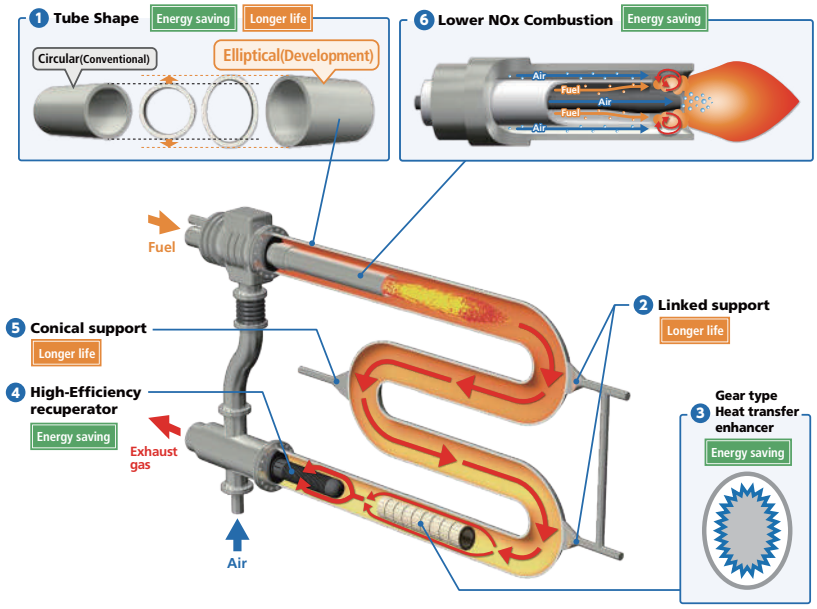
For its achievement in "Energy-Saving Initiatives through the Development of a Radiant Tube Burner with High Thermal Efficiency and Long Service Life," JFE Steel received the Minister of Economy, Trade and Industry Award, the top honor in the Energy Conservation Case Category of the FY2025 Energy Conservation 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	—

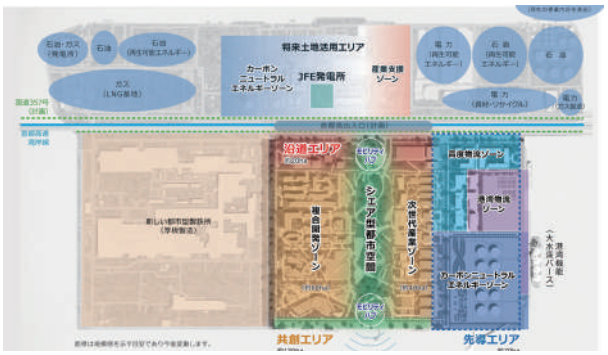
- **JFE Steel Receives the Minister of Economy, Trade and Industry Award in the Energy Conservation Case Category of the FY2025 Energy Conservation Grand Prize: Energy-Saving Initiatives through the Development of a Radiant Tube Burner with High Thermal Efficiency and Long Service Life (Japanese only)** (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.

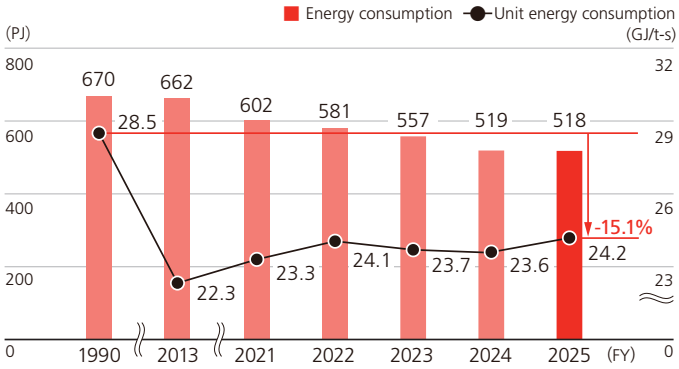
Initiatives to Reduce Energy Consumption

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

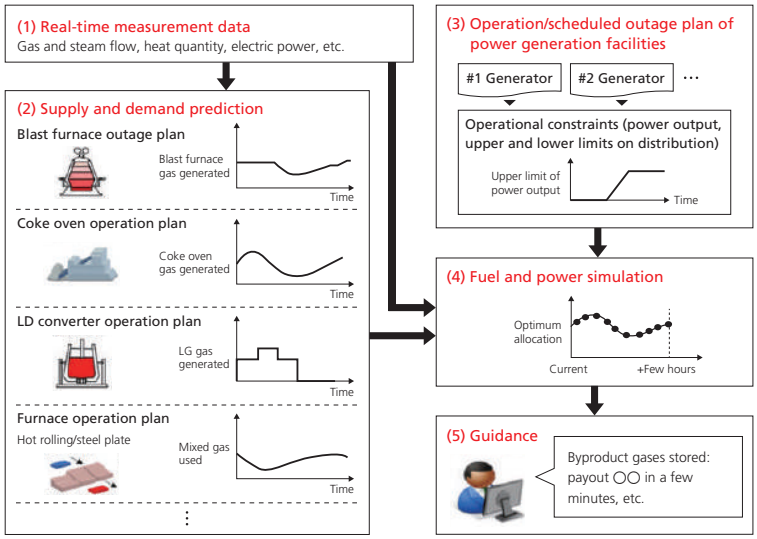
JFE Steel developed a fuel and power operation guidance system for steelworks and succeeded in saving energy and reducing CO_2 as well as fuel and power costs by optimizing the fuel, steam, and electric power used in the steelmaking process.

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)

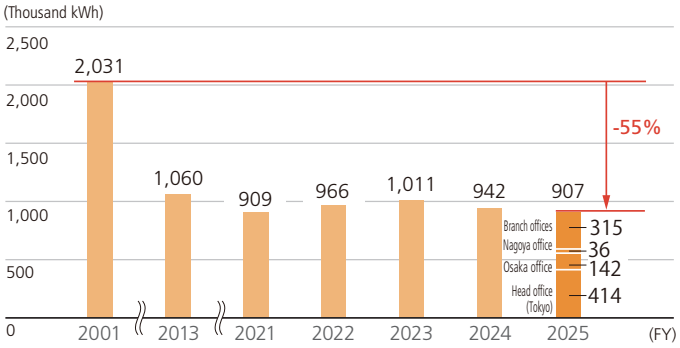
Initiatives in the Trading Business

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.

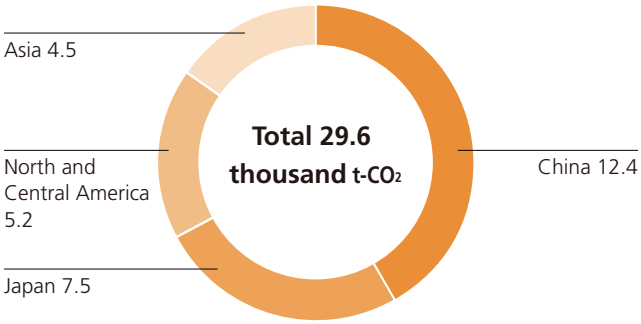
In terms of reducing paper consumption, the company continues to use recycled paper and we ensure that documents are printed in N-up layout using both sides of the paper. We are also promoting paperless meetings through the use of large monitors and web conferencing systems. Consequently, the amount 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)

Policy Engagement

Basic Approach to Policy Engagement on Climate Change Issues

The JFE Group has identified climate change as a top priority and formulated both the JFE Group Environmental Vision for 2050 to achieve carbon neutrality by 2050 and its long-term JFE Vision 2035. To realize these aspirations, JFE Steel is focusing on the early implementation of ultra-innovative technologies and expanding the supply of GX steel JGreeX™. However, long-term technology development, investment in the construction of large-scale decarbonization infrastructure, and ensuring investment predictability by creating demand for GX steel and other Green Transformation (GX) products require bold and powerful industrial policies from the government as well as collaboration with society, including stakeholders. We therefore actively recommend policies through the Company and related organizations and disclose the results of our lobbying activities.

In particular, JFE Steel not only seeks to enhance corporate value but also contributes to the realization of carbon neutrality, which in turn will contribute to sustainable development worldwide. Accordingly, the Company makes recommendations regarding Japan's climate change policies as well as GX and energy policies, taking into account the Paris Agreement, and proactively engages in and contributes to activities through industry associations.

In addition, each Group company participating in industry associations and initiatives regularly reviews the Group's thinking, direction, stance, and influence and puts forward its views or reviews its participation if there are differences with the stance of industry associations and other organizations. Matters requiring key decisions are discussed by the Group Management Strategy Committee and then submitted to the Board of Directors for deliberation and decision.

Stance on Major Policies

The JFE Group views government GX as a key framework for realizing a sustainable society. We support the GX2040 Vision and are developing our business activities and environmental strategies in alignment with the directions of these policies. Our stance on GX policies and specific initiatives are described below.

GX Policies

The government's GX2040 Vision presents long-term directions and policy guidelines to enhance investment predictability for GX as a national strategy toward achieving both a decarbonized society and industrial development.

In the steel business, bold and powerful government support is required for long-term technology development, increased operating costs associated with process transitions, and infrastructure development to meet higher electricity demand.

Also essential are support systems for building hydrogen and ammonia supply chains as decarbonized fuel infrastructure, promoting CCUS, and creating markets that properly value GX products, such as GX steel. We will strive Companywide and through industry associations to recommend policies and promote public understanding to ensure the directions set forth in this vision are advanced as concrete policies.

Energy Policy

The principle of "S+3E" in the government's 7th Strategic Energy Plan stands for safety as a major premise, energy security as the highest priority, and improvement of economic efficiency and compatibility with the environment, in concert with policies calling for the transition of renewable energy into a mainstay power source and for maximizing the use of nuclear power.

The reduction of byproduct gas previously used as an energy source will significantly boost electricity demand in the steel business's decarbonization efforts, particularly in process transitions at integrated blast furnace steelworks. Therefore, the stable, medium- to long-term supply of decarbonized power, realization of internationally competitive industrial electricity prices, and the development and rebuilding of transmission infrastructure will be essential. The construction of hydrogen and ammonia supply chains as decarbonized fuel infrastructure is also necessary. We will work Companywide and through industry associations to recommend policies and promote public understanding to ensure that concrete policies are advanced in line with this plan.

Carbon Pricing

Under the government's growth-oriented carbon pricing scheme, the government has decided to launch the emissions trading system (GX-ETS) in FY2026 and introduce a fossil fuel surcharge system in FY2028. Under this policy package, the three pillars are the issuance of GX Economic Transition Bonds, the introduction of carbon pricing, and the use of new financing methods, and the government is committed to large-scale support for technology development and capital investment for decarbonization. We support this policy that encourages taking on the challenge of developing innovative technologies for carbon neutrality.

We will make the necessary policy recommendations as a company or through industry associations based on this scheme to help ensure the introduction of effective systems for developing and implementing innovative technologies in the Japanese steel industry while maintaining and enhancing international competitiveness. In addition, we believe that ensuring investment predictability for GX requires that both the introduction of carbon pricing and policies to create markets for GX products proceed in tandem.

Creation of GX Product Markets

GX products arising from the transition to decarbonized processes (products with reduced GHG emissions over their life cycle through decarbonization investments) typically carry higher costs, so it is unlikely that demand will spontaneously emerge through market forces alone. It is essential to create a market environment that recognizes GX value throughout society and mechanisms that ensure that GX value is recognized throughout the supply chain. To create such demand, the public and private sectors must jointly advance specific initiatives such as visualizing GX value and active procurement of GX products and services.

For the steel industry in particular, from the perspective of ensuring the necessary investment predictability for decarbonization, the actual emission reductions from the steelmakers' own efforts must be understood and recognized as GX value (visualizing GX value), which in turn will depend upon promoting understanding and creating transparent and reliable communication guidelines. It is also important to promote mechanisms that recognize the procurement of GX products and the use of public procurement (active procurement of GX products and services). JFE Steel is recommending policies and raising public awareness to ensure the advance of concrete initiatives by both the public and private sectors to expand GX product markets while also actively participating in rule and standard-setting efforts in domestic and international industry associations and global initiatives.

Initiatives to Materialize Demand Creation Measures

The March 2024 Interim Summary of the Study Group on GX Product Markets for Demand Creation Contributing to Industrial Competitiveness Enhancement and Emission Reduction*1 and the January 2025 Consolidated Summary of the Study Group on Green Steel for Green Transformation*2 clarify the government's policy direction of providing priority support for and using products that incorporate the costs of decarbonization investment, such as GX steel*3.

Specifically, beginning in FY2025, these policies were reflected in the criteria for products subject to preferential procurement under the Act on Promoting Green Procurement and in the criteria for additional subsidies to promote the introduction of clean energy vehicles. From FY2026, in addition to conducting pilot public works projects using GX steel, the government has introduced policies to support the formation of the GX steel market in sectors with substantial demand. These include the Ministry of the Environment's support program for new ZEB construction using low-carbon building materials, and the Ministry of Land, Infrastructure, Transport and Tourism and the Ministry of the Environment's support program for the introduction of zero-emission and other vessels.

In addition, as a result of activities in the Rules Working Group of the GX League in which JFE Steel participated, a framework for the GX Acceleration Declaration*4 was launched, whereby companies voluntarily declare their procurement of GX products and the content of their declarations is disclosed and evaluated. Based on this initiative, JFE Steel has declared its procurement of GX products and is actively promoting the creation of private sector demand as well.

> ***1 METI: Interim Summary of the Study Group on GX Product Markets for Demand Creation Contributing to Industrial Competitiveness Enhancement and Emission Reduction (Japanese only)** (https://www.meti.go.jp/shingikai/energy_environment/gx_product/20240326_report.html)

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

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

***4 GX Acceleration Declaration**

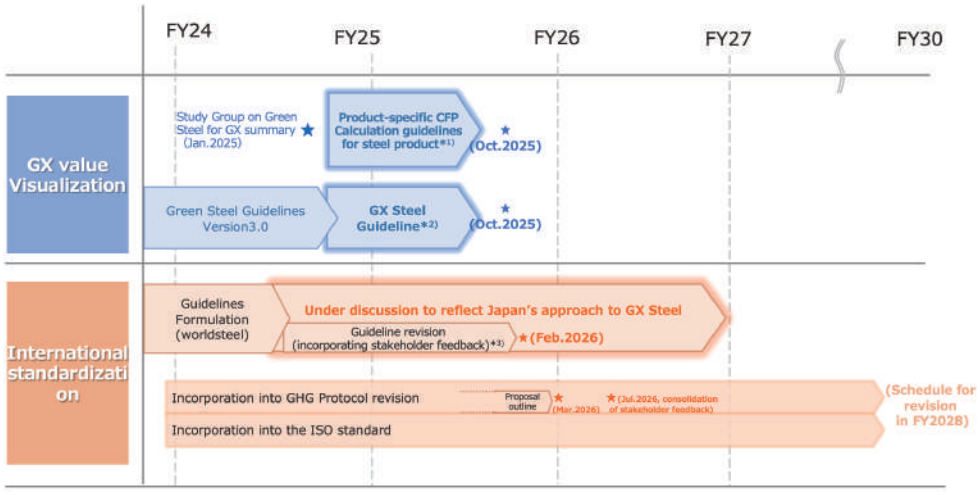
> **METI: GX Acceleration Declaration Framework Newly Launched as Effort to Encourage Companies Proactively Engaging in Creation of a Market for GX** (https://www.meti.go.jp/english/press/2024/1206_001.html)

> **JFE Steel GX Acceleration Declaration (Japanese only)** (https://www.jfe-steel.co.jp/release/2024/12/241220-3.html)

Initiatives for Setting Rules and Standards in Japan and Overseas

In October 2025, the Japan Iron and Steel Federation (JISF) took the lead globally by formulating and publishing Guidelines for Calculating Product Carbon Footprint for Steel Products*1 and GX Steel Guidelines*2 that reflect the value of GHG emission reductions. At the World Steel Association, guidelines on steel products using the Chain of Custody*3 approaches were also revised incorporating third-party feedback and published based on the JISF guidelines. In March 2026, the Institute of Life Cycle Assessment, Japan, also formulated guidelines for actual GHG emission reductions*4. Guidelines for Calculating the Carbon Footprint of Non-Fossil-Powered Steel*5 have been formulated, although these products do not qualify as GX steel. JFE Steel actively participates in and promotes rulemaking in these industry organizations.

In addition, the development of standards is also progressing at international organizations such as the International Organization for Standardization (ISO) and the GHG Protocol, and JFE Steel is involved either on its own behalf or through industry associations.



> ***1 Guidelines for Product-Specific CFP Calculation for Steel Products (Japanese only)**
(https://www.jisf.or.jp/business/ondanka/kouken/greensteel/documents/steelcfpguideline_final.pdf)

> ***2 Japan Iron and Steel Federation: GX Steel Guidelines (formerly Guidelines on Green Steel) (Japanese only)**
(https://www.jisf.or.jp/business/ondanka/kouken/greensteel/documents/GXSteelGuideline_v4.1.pdf)

> ***3 A framework for tracking and recording how products and raw materials move and are managed through the supply chain. World Steel Association: GHG accounting using chain of custody approaches** (https://worldsteel.org/climate-action/chain-of-custody/)

> ***4 Guidelines for Actual Greenhouse Gas Emission Reductions by the Institute of Life Cycle Assessment, Japan (Japanese only)**
(https://www.ilcaj.org/assets/doc/kenkyukai/02/guideline.pdf)

> ***5 Guidelines for Calculating the Carbon Footprint of Non-Fossil-Powered Steel (Japanese only)**
(https://www.jisf.or.jp/business/ondanka/kouken/greensteel/documents/Non-FossilPoweredSteelGuidelinev1.1.pdf)

Lobbying Activities and Outcomes

The JFE Group is contributing to the realization of a carbon-neutral society by advancing the development of ultra-innovative technologies and the transformation of the steelmaking process. At the same time, it is actively engaging in policy formation to enhance the sustainability of society as a whole. In particular, we aim to accelerate decarbonization while maintaining industrial competitiveness through constructive lobbying efforts that reflect the realities of the industry regarding national strategies such as GX and energy policies and by ensuring their inclusion in institutional design.

Specific outcomes of these activities include the incorporation of the Group's recommendations into policies such as the GX2040 Vision and the 7th Strategic Energy Plan, as well as the receipt of government support such as subsidies for capital investment and research and development supporting the social implementation of innovative technologies. We also regard these initiatives as part of our social responsibility that extends beyond corporate boundaries, contributing to the building of a sustainable future.

Public Policy Engagement and Outcomes

The role of companies in realizing a sustainable society goes beyond business activities alone. As a member of the industrial sector, the JFE Group is actively involved in policy formation that contributes to the construction of a decarbonized society and actively engages in policy advocacy to promote effective institutional design.

Study Group on Green Steel for GX

At the 3rd meeting of the Study Group on Green Steel for GX, hosted by the Ministry of Economy, Trade and Industry in November 2024, Hiroyuki Tezuka, Fellow of JFE Steel, spoke about the necessity of green steel, the status of formulating green steel guidelines in Japan and the World Steel Association, and policy advocacy activities at COP29 and other forums. He also introduced the status of rulemaking for the dissemination of green steel and emphasized the importance of assigning environmental value to emission reductions during the carbon-neutral transition period.

As a result of these proposals, the summary of the Study Group clarified the definition of "Green Steel for GX" and confirmed the government's policy to prioritize measures such as preferential procurement and purchasing support for steel products that reflect the value of emission reductions in the steelmaking process.

> **3rd Meeting of the Study Group on Green Steel for Green Transformation (November 25, 2024) (Japanese only)**
(https://www.meti.go.jp/shingikai/mono_info_service/green_steel/pdf/003_04_00.pdf)

Expert Working Group on Carbon Pricing toward GX

At the first meeting of the Expert Working Group on Carbon Pricing toward GX held in September 2024, Hiroyuki Tezuka, Fellow of JFE Steel, expressed his views on the design of GX-ETS reflecting the realities of the steel industry. He explained the industry's characteristics, including its high marginal abatement costs and the need for long-term technology development, and emphasized the need to maintain international competitiveness and the importance of creating a market for GX products.

Based on this working group's review of the issues, the detailed design of GX-ETS reflects the importance of taking sector characteristics into account in system design and avoiding excessive burdens during the transition period. In addition, system design to encourage GX investment and consideration of medium- to long-term investment funding were identified as factors to be considered in allocating emission allowances. The steel industry's positions are thus reflected in the direction of system design.

› **Explanation Materials by The Japan Iron and Steel Federation — Expert Working Group on Carbon Pricing toward GX (1st Meeting) (Japanese only)** (https://www.cas.go.jp/jp/seisaku/gx_jikkou_kaigi/carbon_pricing_wg/dai1/siryou4.pdf)

56th Meeting of the Advisory Committee for Natural Resources and Energy's Strategic Policy Subcommittee

The 56th Meeting of the Advisory Committee for Natural Resources and Energy's Strategic Policy Subcommittee was held on June 6, 2024 toward formulating Japan's 7th Strategic Energy Plan. At this meeting, JFE Holdings' President Kitano gave a presentation entitled Energy Policy to Help JFE Steel Achieve Decarbonization, during which he recommended policies to promote the use of GX steel products and energy policies to reduce uncertainty in the business environment related to GX.

The president announced a plan to make an investment decision during FY2024, assuming government support, on the process conversion to an innovative electric arc furnace under consideration at the Kurashiki district of the West Japan Works of JFE Steel, and expressed the intention to build a mass production system for high-quality, high-function GX steel products that could not be produced with conventional electric arc furnaces. He also emphasized that policies to promote the use of GX steel products are indispensable for Japanese manufacturing to enhance its international competitiveness in this area, in addition to measures supporting capital investment and operating costs. Challenges include the development and reconstruction of transmission infrastructure, establishing a stable supply system for decarbonized power sources, and developing a supply infrastructure for non-fossil fuels such as hydrogen and ammonia. He called for the government to proactively deploy policies and promote decarbonization as a national GX strategy to seize this opportunity to revitalize the Japanese economy.

These recommendations were confirmed to have influenced policy formulation, as the aforementioned GX2040 Vision and the 7th Strategic Energy Plan, both approved by the Cabinet in February 2025, explicitly stated the necessity of securing electricity supply capacity and strengthening power grids (including intra-regional trunk systems), developing supply infrastructure for non-fossil fuels, and promoting policies for introducing decarbonization technologies.

› **Agency for Natural Resources and Energy: 56th Meeting of the Advisory Committee for Natural Resources and Energy's Strategic Policy Subcommittee (Japanese only)** (https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/2024/056/)

The 8th GX Implementation Council

In February 2023, the cabinet approved the Basic Policy for the Realization of GX to simultaneously achieve three goals through GX: decarbonization, stable energy supply, and economic growth. In July of the same year, the cabinet also approved the Strategy for Promoting Structural Transition based on Decarbonization (GX Promotion Strategy). The growth-oriented Carbon Pricing (CP) Concept is the decarbonization initiative based on this strategy and is currently being actively pursued toward its realization and implementation.

At the 8th GX Implementation Council, held in November 2023, JFE Steel's President Kitano (then-Chairman of the Japan Iron and Steel Federation) explained the efforts being made by the Japanese steel industry to achieve carbon neutrality, and he called for long-term government support measures comparable to the support provided by the governments in Europe, the U.S., and China for the huge research and development and capital investment costs. He also expressed the need for long-term government support for converting to innovative processes and dealing with the increase in operational costs for non-fossil fuels, electricity, and other sources, as well as actions for stimulating demand for GX steel materials with high environmental value through, for example, public procurement, measures to ensure the international competitiveness of industrial electricity prices, and support for building new infrastructure, including a hydrogen supply chain and a CCS scheme.

These recommendations were reflected in the GX2040 Vision, approved by the cabinet in February 2025, in the form of visualizing GX value and active procurement of GX products and services, and they were positioned as concrete policies encouraging the formation of GX markets. The vision also clearly stated that measures to promote GX investment will be advanced for hard-to-abate, high-emission industries such as steel, including conversion to innovative electric arc furnaces and introduction of steelmaking processes utilizing hydrogen.

› **Cabinet Secretariat: the 8th GX Implementation Council (Japanese only)** (https://www.cas.go.jp/jp/seisaku/gx_jikkou_kaigi/dai8/index.html)

Overview of Government Support

Efforts to achieve carbon neutrality require both the research and development of innovative technologies and large-scale capital investment, which are beyond the capacity of companies to pursue on their own. The JFE Group is actively using policy support frameworks established under Japan's GX initiatives to accelerate decarbonization.

Adoption under the Energy and Manufacturing Process Conversion Support Program for Industries in a Hard-to-Abate Sector

Realizing a carbon-neutral society in Japan while also reviving economic growth will depend upon reliably linking research and development outcomes to domestic capital investment. In particular, the practical application of decarbonization technologies in the steel industry requires massive investment accompanied by process conversion, without prospects for increased revenue through higher production volumes. For this reason, we have repeatedly emphasized the extreme difficulty for private companies to make such investment decisions on their own.

In light of this, the government established the Energy and Manufacturing Process Conversion Support Program for Hard-to-Abate Sectors Industries to subsidize a portion of the capital investment required for fuel conversion in in-house power generation facilities and the conversion of manufacturing processes that meet requirements such as CO_2 reduction effects, in industries such as steel, chemicals, paper and pulp, and cement. This program uses GX transition bonds and aims to support both the practical realization of carbon neutrality and the strengthening of industrial competitiveness.

In addition, the tax credit for promoting domestic production in strategic sectors was introduced to promote domestic production in strategically important industries, including GX. The system is intended to enhance industrial competitiveness by providing tax credits to support fields such as GX steel, where initial investment as well as production and sales costs are high.
In regard to the innovative electric arc furnace (high-efficiency, large-scale electric arc furnace) that we had been considering for introduction at the Kurashiki district of the West Japan Works during the transition period toward carbon neutrality, our project was selected under the process conversion support program on December 20, 2024, and we formally decided to introduce the furnace following the subsidy grant decision on April 9, 2025. In addition to the innovative electric arc furnace, new installations will include secondary refining equipment, cold iron source logistics facilities, wharf development, and power receiving and distribution facilities. The total investment will amount to 329.4 billion yen, with government support capped at 104.5 billion yen. We plan to commence production in the first quarter of FY2028 and will promptly advance construction of the innovative electric arc furnace. Furthermore, we will enhance our supply capacity for GX steel and strive to achieve both emission reductions and business growth by also using the support of the tax credit for promoting domestic production in strategic sectors.

Adoption Status for the Green Innovation Fund Projects

The JFE Group is fully leveraging the New Energy and Industrial Technology Development Organization (NEDO)'s Green Innovation Fund project, and we are conducting research and development in collaboration with other companies in the industry toward realizing carbon neutrality. JFE Steel is working on a NEDO project called Utilizing Hydrogen in Steelmaking Processes (GREINS), while JFE Engineering is focusing on carbon neutrality in the material cycles and waste management sector as well as on lowering the cost of offshore wind power generation.

Utilizing Hydrogen in Steelmaking Processes (GREINS)

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 to undertake the Utilizing Hydrogen in Steelmaking Processes (GREINS) project to achieve progress toward carbon neutrality by 2050. The four companies involved are receiving a total of approximately 439.2 billion yen of financial support.

> **Green Innovation Fund Project "Hydrogen Utilization in Iron and Steelmaking Processes": Research and Development and Social Implementation Plan (March 10, 2026) (Japanese only)** (https://www.meti.go.jp/policy/energy_environment/global_warming/gifund/gif_05_randd_3r.pdf)

Carbon-Recycling Pilot Blast Furnaces

By developing low-carbon technologies using externally sourced hydrogen and CO_2 contained in blast furnace exhaust gas and combining these technologies with other low-carbon techniques, such as using biomass and direct-reduced iron as raw materials, we will demonstrate technologies that achieve a reduction of 50% or more in CO_2 emissions from the blast furnace steelmaking process by 2030 through the use of medium-scale test blast furnaces, which are at least one-fifth the size of a full-scale furnace. JFE Steel is in charge of developing carbon recycling blast furnace operation technology and elemental technology as well as overall process evaluation and review, and in May 2025, a small-scale test blast furnace was fired up, and testing is ongoing.

- Project scale: Approx. 285.3 billion yen*1, Financial support scale: Approx. 238.6 billion yen*2 (total for the four companies)

*1 Project scale based on the level of financial support and subsidy rate.
*2 This includes incentives and is subject to change depending on project progress and other factors at each stage gate.

Direct Hydrogen Reduction Compact Bench Pilot Furnace

In the area of developing direct hydrogen reduction technology, we intend to demonstrate a technology for directly reducing low-grade iron ore with hydrogen in medium-scale direct reduction furnaces, which are at least one-fifth the size of a full-size furnace, to achieve a reduction in CO_2 emissions of 50% or more, compared to the current blast furnace method, by 2030. JFE Steel is in charge of examining operational fluctuations and wide-ranging methanation reaction characteristics using the new bench pilot furnace, investigating gas composition that suppresses reduction pulverization and clustering while achieving a high reduction rate, evaluating the microstructure using high-precision equipment, determining gas composition, the gangue content of direct-reduced iron and carbon addition levels, and optimizing shape and forming. The bench pilot furnace, with a production capacity of 15 kg/h, began operation in December 2024 and continues to undergo testing. The tests have successfully produced direct-reduced iron continuously from low-grade pellets using 100% hydrogen. Furthermore, from June to July 2026, hydrogen-reduction testing using green hydrogen was conducted in the bench pilot furnace, successfully producing about one tonne of direct-reduced iron for the first time in Japan. The tests also demonstrated that direct-reduced iron could be stably produced through the consistent reduction of low-grade pellets using green hydrogen.

- Project scale: Approx. 136.9 billion yen*1, Financial support scale: Approx. 114.1 billion yen*2 (total amount for the three companies)

*1 Project scale based on the level of financial support and subsidy rate.
*2 This includes incentives and is subject to change depending on project progress and other factors at each stage gate.

- **NEDO: A new research focus under the Green Innovation Fund Project: Hydrogen Utilization in Iron and Steelmaking Processes (Japanese only)** (https://www.nedo.go.jp/news/press/AA5_101738.html)
- **NEDO: Hydrogen Utilization in Iron and Steelmaking Processes** (https://green-innovation.nedo.go.jp/en/project/utilization-hydrogen-steelmaking/)
- **Consortium of the Green Innovation Fund Project: Utilizing Hydrogen in the Steelmaking Process** (https://www.greins.jp/en/)
- **Japan's First Successful Production of Direct-Reduced Iron Using Green Hydrogen (Japanese only)** (https://www.jfe-steel.co.jp/release/2026/07/260731.html)

Pilot Electric Arc Furnaces

In a project for developing impurity removal technology for electric arc furnaces using direct-reduced iron, demonstrations of a large-scale integrated electric arc furnace process (processing capacity of approximately 300 tonnes) will be conducted by 2030 to verify its control of the concentration of impurities (components affecting the product) to the same level as standard blast furnace methods (phosphorus 150 ppm, nitrogen 40 ppm or less), toward the goal of manufacturing high-grade steel suitable for car body panels and other components with the hydrogen-based direct-reduced iron made from low-grade iron ore. JFE Steel is in charge of evaluating and examining the new heat sources and cold iron source preheating using a small-scale test electric arc furnace with a capacity of 10 tonnes and developing technologies for dephosphorization and denitrification of molten steel using a secondary refining furnace with a capacity of 3 tonnes. The small-scale pilot electric arc furnace began operation in February 2025. Development progress and results were evaluated in the FY2025 stage-gate review, and NEDO approved the project's continuation. We will continue development toward the practical application of technology for manufacturing high-quality steel.

- Project scale: Approx. 40.4 billion yen*1, Financial support scale: Approx. 30.6 billion yen*2 (total for the four companies)

*1 Project scale is calculated based on the level of financial support and subsidy rate.
*2 This includes incentives and is subject to change depending on project progress and other factors at each stage gate.

Carbon Neutrality in the Material Cycles and Waste Management Sector

A project titled "Achieving Carbon Neutrality in Waste and Resource Circulation" is underway as part of the Green Innovation Fund project administered by the New Energy and Industrial Technology Development Organization (NEDO). According to NEDO, this project is intended to minimize atmospheric emissions of carbon dioxide, methane, and other gases from waste incineration and landfill disposal, and to stably and efficiently recover carbon from waste to achieve net zero GHG emissions. It also involves development and demonstration for realizing a carbon-neutral carbon circulation system that circulates and supplies biomass-derived carbon as an industrial resource, with the goal of creating a model for social implementation.

JFE Engineering was selected for NEDO's Green Innovation Fund Project, "Achieving Carbon Neutrality in Waste and Resource Circulation," for which proposals were invited in February 2024, and it is conducting small-scale furnace demonstration testing as a commissioned project.

For details on this project, please refer to:
- **Development of a Waste Chemical Recycling Technology through the Use of the Green Innovation Fund** (P. 135)

Efforts to Lower the Cost of Offshore Wind Power Generation

A project titled "Cost Reductions for Offshore Wind Power Generation" is underway as part of the Green Innovation Fund project administered by NEDO. According to NEDO, the aim is to achieve early cost reductions, primarily in floating offshore wind power generation, and to promote wider introduction, drawing on knowledge gained from this project and previous demonstration initiatives.

Through the consortium in which it participates, JFE Engineering jointly proposed and was selected for NEDO's Green Innovation Fund Project/Cost Reductions for Offshore Wind Power Generation/Floating Offshore Wind Power Demonstration Project (Phase 2) under the theme "Southern Akita Floating Offshore Wind Demonstration Project Aimed at Overseas Expansion via Cost Reductions."

For further details, please refer to:
› **Demonstration Research on Cost Reduction for Floating Offshore Wind Power Generation** (P. 78)

Funding Methods through Green/Transition Finance

JFE Holdings has established the Green/Transition Finance Framework and issued transition bonds through a public offering in 2022. It was the first Japanese manufacturer to be selected as a model case under METI's Transition Finance Model Projects in FY2021. Achieving carbon neutrality will require significant, long-term investments in capital and R&D. JFE Holdings will continue to leverage transition financing and diversify its funding methods.

Formulated the Technology Roadmap for Transition Finance in the Iron and Steel Sector

The technology roadmap for Transition Finance toward decarbonization in the iron and steel sector, published by the Japanese Ministry of Economy, Trade, and Industry (METI), outlines a path for accelerating decarbonization and achieving carbon neutrality by introducing innovative technologies from the 2040s onward, assuming that social infrastructure such as hydrogen supply and CCUS is in place. In the process of drawing up this roadmap, JFE Steel's Fellow, Hiroyuki Tezuka, Chairman of the Japan Iron and Steel Federation's Energy Technology Committee, participated as a specialist in the task force formulating the roadmap. The roadmap is aligned with Japan's nationally determined contribution (NDC) based on the Paris Agreement and is therefore aligned with the agreement.

Green/Transition Finance Framework

The JFE Group developed this framework based on the "Green Bond Principles 2021" of the International Capital Market Association (ICMA), the "Green Loan Principles 2023" of the Loan Market Association (LMA), the Asia Pacific Loan Market Association (APLMA), the Loan Syndication & Trading Association (LSTA), the "Green Bond Guidelines (2022)," the "Green Loan Guidelines (2022)" of the Ministry of the Environment, the "Climate Transition Finance Handbook 2023" of the ICMA, and the "Basic Guidelines on Climate Transition Finance (May 2021)" of the Financial Services Agency, the Ministry of Economy, Trade and Industry, and the Ministry of the Environment. Since our initiatives have been certified by a third-party organization as being aligned with METI's roadmap, they are also aligned with the Paris Agreement.

› **METI: Technology Roadmap for Transition Finance in the Iron and Steel Sector**
(https://www.meti.go.jp/english/policy/energy_environment/transition_finance/index.html)

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

› **Green/Transition Finance Framework (Japanese only)**
(https://www.jfe-holdings.co.jp/common/pdf/sustainability/environment/climate/Framework_for_Green_and_Transition_Finance.pdf)

› **Transition Finance Report—Funds Raised, Allocated, and Their Impact (Japanese only)**
(https://www.jfe-holdings.co.jp/common/pdf/sustainability/environment/climate/impact_report_2024.pdf)

Participation in External Initiatives

The JFE Group is taking responsible action toward realizing a sustainable society in response to global environmental issues such as climate change. As part of this effort, we are actively participating in major domestic and international initiatives, enhancing our ability to respond to climate change through the sharing of knowledge and collaboration. The following are the main initiatives in which we participate.

Engagement with the GX Acceleration Agency

The GX Acceleration Agency is a certified corporation established with approval granted in April 2024 by the Ministry of Economy, Trade and Industry, as stipulated in the Act on Promoting a Smooth Transition to a Decarbonized Growth-oriented Economic Structure. To help realize GX investment of over 150 trillion yen over the next 10 years, the GX Acceleration Agency is responsible for financial support, including debt guarantees, operating a carbon emissions trading system, and collecting fossil fuel surcharges.

JFE Holdings supported the purpose of establishing the GX Acceleration Agency and invested in the GX Acceleration Agency at the time of its establishment. The JFE Group also actively contributes to the advancement of GX in Japan through dialogue with the agency and use of its various programs.

In 2026, JFE Holdings entered into a transition loan agreement backed by the GX Acceleration Agency's debt guarantee program for investment in the innovative electric arc furnace (high-efficiency, large-scale electric arc furnace) to be introduced at JFE Steel's West Japan Works (Kurashiki district). The GX Acceleration Agency chose to support the project with the expectation it would both significantly reduce GHG emissions and strengthen industrial competitiveness through the stable supply of high-quality, high-performance steel products.

- **GX Acceleration Agency** (https://www.gxa.go.jp/en/)
- **JFE Holdings and Mizuho Bank Enter into Transition Loan Agreement Utilizing the GX Acceleration Agency's Debt Guarantee Program (Japanese only)** (https://www.jfe-holdings.co.jp/uploads/260323.pdf)

Participation in the GX Future Consortium and GX Future League

The GX Future Consortium,*1 for which the GX Acceleration Agency serves as secretariat, is a public-private partnership platform that integrates and builds on the activities of the TCFD Consortium, which promoted enhanced climate-related disclosures, and the GX League, which advanced the creation of GX product markets and related rulemaking. The GX Future League has also been established as a forum for putting these efforts into practice, bringing together companies, local governments, financial institutions, research institutions, and other organizations to develop GX-related rules and create markets.

JFE Holdings, JFE Steel, JFE Engineering, and JFE Bars & Shapes participate in the GX Future Consortium and GX Future League because they consider these initiatives' objectives to be aligned with the JFE Group's policies for addressing climate change and advancing GX.

JFE Holdings has endorsed the recommendations of the final TCFD report and participated in the TCFD Consortium, taking part in discussions for enhancing climate-related financial disclosures. The TCFD Consortium developed guidance on climate-related financial disclosures and a guidebook on transition plans to encourage appropriate corporate disclosure and constructive dialogue with investors and financial institutions. JFE Holdings has applied the knowledge gained through these activities to enhance its climate-related disclosures, including analysis of the risks and opportunities climate change presents for its business, scenario analysis, and disclosure of its transition plan.

JFE Steel also actively participated in GX League working group activities and contributed to rulemaking for the creation and expansion of the market for GX products. JFE Steel participated in the Working Group for Adding Value to Green Products, where concepts and methods for appropriately assessing the value of emission reductions created through decarbonization investment were discussed. In 2023, the working group compiled "How to Add Value to Green Products."*2 The concepts presented in the document were subsequently used in discussions on creating GX product markets and contributed to developing the concept of "Reduced Emissions of Product."

Furthermore, based on discussions held by the GX Product Social Implementation Promotion Working Group, a framework for the GX Acceleration Declaration*3 was established in 2024 to encourage companies to proactively procure and use GX products and services. JFE Steel has also made the declaration*4 and is pursuing initiatives to form GX product markets and generate demand.

Going forward, while carrying forward the knowledge and achievements developed through the TCFD Consortium and GX League, the JFE Group will actively participate through the GX Future Consortium and GX Future League in enhancing climate-related disclosures; forming GX product markets; visualizing GX value; developing rules for creating demand and social implementation; and establishing mechanisms through which emission-reduction efforts are recognized by financial markets. Through these activities, the Group will contribute to realizing a decarbonized society and strengthening industrial competitiveness.

- ***1 GX Future Consortium** (https://gx-future-consortium.go.jp/en/)
- ***2 GX League Working Group Deliverables (Japanese only)** (https://gx-league.go.jp/action/wg/)
- ***3 METI: GX Acceleration Declaration Framework Newly Launched as Effort to Encourage Companies Proactively Engaging in Creation of a Market for GX** (https://www.meti.go.jp/english/press/2024/1206_001.html)
- ***4 JFE Steel GX Acceleration Declaration (Japanese only)** (https://www.jfe-steel.co.jp/release/2024/12/241220-3.html)

United Nations Global Compact

The JFE Group has signed the United Nations Global Compact, the world's largest sustainability initiative advocated by the United Nations, and has declared its support. We are committed to complying with and implementing the Ten Principles of the Global Compact and promoting the SDGs in order to realize a sustainable society. The JFE Group is also a member of the Global Compact Network Japan, the local network of the Global Compact. Having identified "Contribute to resolving climate change issues" as a material issue, the JFE Group is working to reduce GHG emissions. We also draw on the decarbonization initiatives of other participating companies to further advance efforts to reduce GHG emissions across the JFE Group and society as a whole.

SPEED Research Group

The SPEED (Special Project on Eco-innovation and Eco-business for Sustainable Development) Research Group contributes to the development of eco-innovations and eco-businesses through industry-academia-government collaboration and international cooperation. JFE Holdings participates in this research group and is involved in activities such as information sharing and opinion exchange with government, universities, research institutions, and companies.

EN Japan Climate Leaders' Partnership (JCLP)

JFE Engineering is a member of the Japan Climate Leaders' Partnership (JCLP). Established in 2009, the JCLP is a coalition of Japanese corporations that encourage the industrial community to fully recognize the urgency of climate change and take more decisive action to create a sustainable, decarbonized society. Companies fulfill their corporate responsibility by demonstrating leadership in the transition to a decarbonized society. The Company is participating in the Decarbonization Consortium, JCLP's platform for encouraging information sharing and collaboration between companies, and is actively engaged in creating opportunities to learn from companies, at the frontline of decarbonization efforts, and collaborating with other companies to create new solutions.

Japan's Steel Industry Initiatives

Japan Iron and Steel Federation (JISF) Initiatives

Long-term Vision for Climate Change Mitigation

JFE Steel is proactively engaged in a variety of activities as a member of the Japan Iron and Steel Federation (JISF). The JISF has been focusing on achieving the goals for 2020 under its Commitment to a Low Carbon Society (renamed the Carbon Neutrality Action Plan in FY2021). Furthermore, in November 2018, the JISF formulated and published its Long-term Vision for Climate Change Mitigation for 2030 and beyond, with JFE Steel playing a central role in its development. This document lays out the industry's challenge for realizing zero-carbon steel and explains the pathway for achieving the 2°C scenario for steelmaking and the necessity of ultra-innovative technologies to achieve the 1.5°C scenario. Also, on February 15, 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 accept the challenge of realizing zero-carbon steel.

› **Alignment with the JISF's Long-term Vision for Climate Change Mitigation policies** (P. 115)

JISF's Carbon Neutrality Action Plan

In February 2021, the JISF declared that the Japanese steel industry will boldly take on the challenge of realizing carbon neutrality. The Plan on Commitment to a Low Carbon Society was amended and renamed as the Carbon Neutrality Action Plan, and the Phase II target (2030 target) was revised. In the Eco Process of the plan, an ambitious 2030 target was set taking into account new perspectives such as the expansion of the use of cold iron sources as well as the maximum introduction of best available techniques (BATs) based on energy efficiency already among the highest in the world.

Regarding Eco Products, which is intended to reduce GHG emissions at the product use stage, high-performance steel is expected to play a particularly major role in the promotion of offshore wind power and electrification of automobiles, which are among the 14 fields of the government's Green Growth Strategy. Accordingly, in addition to the conventional quantitative evaluation of the five types of high-performance steel, the Japanese initiative will accelerate practical global warming measures from a global perspective by making these contributions visible. As for Eco Solutions, the JISF will develop a system for appropriately introducing technology to transfer and spread the production process for decarbonized steel in the Asian regions, where steel production is expected to expand.

Furthermore, regarding Innovative Technology Development, the JISF will take on the challenges of technologies such as direct hydrogen reduction and high-performance steel production using electric arc furnaces under the Green Innovation Fund, in addition to COURSE 50 and ferro-coke.

Overview of the Carbon Neutrality Action Plan

Eco Process

Cut energy-related CO_2 emissions (total volume) in FY2030 by 30% compared to the FY2013 level by adopting BATs to promote energy conservation, using waste plastics, adopting innovative technologies that are currently under development and scheduled to be in use around 2030, and using raw fuel with less CO_2 emissions.

Eco Product

Contribute to CO_2 emissions reduction by domestically and internationally supplying high-performance steel. This steel will reduce CO_2 emissions when used in the final product. The reduction potential in 2030 is estimated to be approximately 42 million t-CO_2 for the five steel products that have been quantitatively evaluated for their contribution to reducing emissions.

Eco Solution

Contribute to reducing CO_2 emissions worldwide by transferring and spreading the Japanese steel industry's advanced energy-saving technologies and facilities to the world's steel industry. Estimated contribution on CO_2 emissions reduction is 80 million t-CO_2 in 2030.

Innovative Technology Development

Contribute to carbon neutrality by boldly developing technologies in the following four areas.

- Hydrogen reduction technology using in-house hydrogen
- Low-carbon technology using CO_2 contained in externally sourced hydrogen or blast furnace exhaust gas
- Direct hydrogen reduction technology
- Impurity removal technology for electric furnace using direct reduced iron

Assessment of the FY2024 Carbon Neutrality Action Plan (Phase II) Results (JISF)

Total volume of energy-related CO_2 emissions in FY2024 was 144.23 million tonnes, a decrease of 50.24 million tonnes, or 25.8%, compared to FY2013. The achievement rate of the FY2030 target (to reduce by 30% from FY2013) has reached 86.1%. Energy-related CO_2 emissions and energy consumption are both declining, given continued energy saving efforts.

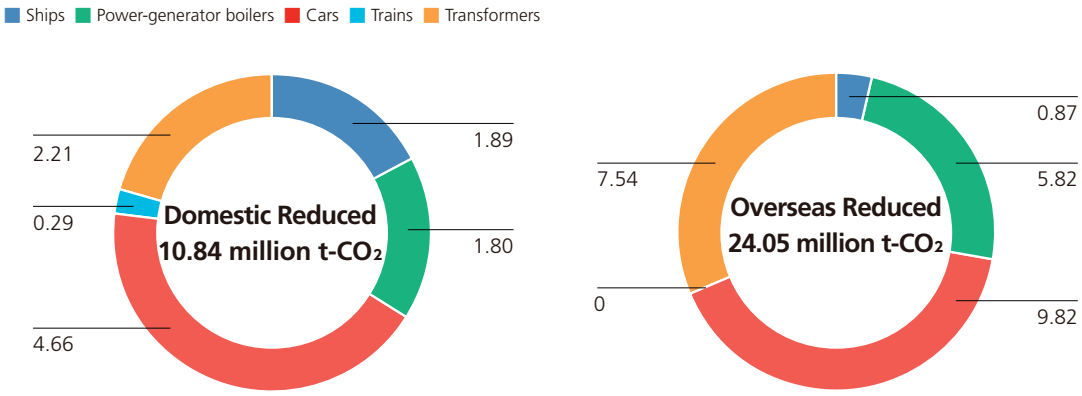
While the energy efficiency of the Japanese steel industry is among the highest in the world, vigorous efforts are made to promote greater energy savings by having businesses engaged in this effort draw upon subsidies to promote investment in saving energy and other actions.

Reduced CO_2 Emissions through High-Performance Steel Materials (Effects of Eco-Products)

The Japan Iron and Steel Federation (JISF) estimates the CO_2 emissions reduction impact of using high-performance steel materials. It is estimated that the use of five major high-performance steel materials in cars, transformers, ships, power generation boilers, and trains in Japan and overseas* (FY2024 production: 3.22 million tonnes, 4.1% of crude steel production) helped reduce CO_2 emissions by 34.89 million tonnes (10.84 million tonnes in Japan, 24.05 million tonnes overseas) in FY2024.

*Calculations made by the Institute of Energy Economics, Japan. The five materials are steel sheets for automobiles, grain-oriented electrical steel sheets, thick steel sheets for shipbuilding, steel tubes for boilers, and stainless steel sheets. FY1990 is the reference point for domestic reduction figures, with FY2003 as the reference point for the overseas reduction figures for automobiles and ships, FY1998 for steel pipes for boilers, and FY1996 for electrical steel sheets.

CO_2 Reduction Resulting from the Use of Five High-Performance Steel Materials in Japan and Overseas (FY2024)



Related Links

- **The Japan Iron and Steel Federation (JISF): Climate Change Policy page** (https://www.jisf.or.jp/en/activity/climate/index.html)
- **The Japan Iron and Steel Federation (JISF): LCA of Steel Products page** (https://www.jisf.or.jp/en/activity/lca/index.html)
- **The Japan Iron and Steel Federation (JISF): Publication of ISO 20915** (https://www.jisf.or.jp/en/activity/lca/iso/index.html)
- **The Japan Iron and Steel Federation (JISF): Publication of JIS Q 20915** (https://www.jisf.or.jp/en/activity/lca/iso/index.html)
- **The Japan EPD Program by SuMPO** (https://ecoleaf-label.jp/en/)

Industry-Academia Collaboration Initiatives

The JFE Group is actively engaged in joint research and collaboration with universities to strengthen scientific and practical responses to climate change. We are incorporating the latest knowledge and technologies through partnerships with academic institutions and advancing efforts toward realizing a sustainable society. Below are some of the main initiatives we are pursuing in collaboration with universities.

The University of Tokyo and 16 Organizations Announce Launch of Joint Research Initiative to Achieve a Carbon-Neutral Society Establishment of the Social Collaboration Program "Materials for Future Energy Infrastructure Trust (MEIT)"

JFE Steel, JFE Engineering, the University of Tokyo, IHI Plant Services Corporation, INPEX CORPORATION, ENEOS Xplora Inc., Kanadevia Corporation, Kawasaki Heavy Industries, Ltd., Kobe Steel, Ltd., JERA Co., Inc., TOKYO GAS NETWORK Co., Ltd., Namura Shipbuilding Co., Ltd., NIPPON STEEL ENGINEERING CO., LTD., NIPPON STEEL PIPELINE & ENGINEERING CO., LTD., NIPPON STEEL CORPORATION, Nippon Kaiji Kyokai (ClassNK), and Mitsubishi Heavy Industries, Ltd. have jointly established the Social Collaboration Program*, Materials for Future Energy Infrastructure Trust (MEIT), to scientifically elucidate and standardize the material reliability of energy infrastructure that supports a carbon-neutral society. The joint research commenced on May 1, 2025. JFE Steel, Kobe Steel, Ltd., NIPPON STEEL CORPORATION, and Nippon Kaiji Kyokai serve as the managing institutions for this program.

The purpose of the program is to evaluate the reliability of materials used in energy infrastructure and storage systems for decarbonized energy carriers such as liquefied hydrogen and ammonia, as well as in liquefied and high-pressure CO_2 in carbon capture and storage (CCS) projects. Through these efforts, the initiative seeks to accelerate the development of energy infrastructure for a carbon-neutral society, meet domestic demand, and strengthen international competitiveness.

*A collaborative research framework between the University of Tokyo and companies as well as other organizations on research topics of high public interest, operated with joint research expenses borne by the companies under contractual agreements with the university. This program facilitates interdisciplinary collaboration among researchers and the formation of research teams to address comprehensive societal challenges, thereby overcoming the limitations of conventional one-on-one collaborations between researchers and companies.

Overview of the Social Collaboration Program

As society transitions to carbon neutrality, energy infrastructure is shifting significantly from fossil fuels to new systems based on hydrogen and ammonia. This includes liquefied hydrogen tanks, liquefied ammonia tanks, liquefied CO_2 tanks, and high-pressure CO_2 pipelines for CCS, all of which require material reliability evaluations to ensure long-term safety and economic viability. The program will establish material selection criteria, post-weld heat treatment omission standards, and fracture prevention criteria to optimize infrastructure construction costs and promote international standardization that contributes to a sustainable energy society.

Program Name: Social Collaboration Program "Materials for Future Energy Infrastructure Trust (MEIT)"
Period: May 1, 2025–April 30, 2030
Joint Research Topics:

- Development of fracture evaluation technologies and standards for large-scale liquid ammonia tanks (stress corrosion cracking prevention and omission of post-weld heat treatment)
- Development of fracture evaluation technologies and standards for large-scale liquid CO_2 tanks (omission of post-weld heat treatment)
- Establishment of rapid ductile fracture prevention standards for high-pressure CO_2 pipelines in CCS projects
- Enhancement of reliability and evaluation technologies for next-generation materials (cost-effective stainless steel and low-nickel steel) for large-scale liquid hydrogen tanks

Collaborating Faculty: School of Engineering, University of Tokyo

› The University of Tokyo and 16 Organizations Announce Launch of Joint Research Initiative to Achieve a Carbon-Neutral Society Establishment of the Social Collaboration Program "Materials for Future Energy Infrastructure Trust (MEIT)"
(https://www.jfe-steel.co.jp/en/release/2025/05/250519.html)

ST JFE Steel and Tohoku University's Collaborative Research Laboratory for Green Steel

In February 2022, JFE Steel and Tohoku University jointly established the Collaborative Research Laboratory for Green Steel within the university's Graduate School of Engineering to research eco-friendly steel materials and production methods for the carbon-neutral era. The Collaborative Research Laboratory is managed under a cross-divisional system and develops collaborations across a wide range of fields, including the development of steelmaking processes and materials. This will facilitate a multifaceted approach to resolving issues related to low-carbon steelmaking processes and discovering innovative development themes from new perspectives. Furthermore, we will dispatch young researchers to nurture highly specialized human resources who will lead the next generation of the steelmaking industry.



Collaborative Research Wing, Materials Development, Graduate School of Engineering, Tohoku University

› JFE Steel and Tohoku Univ. Establish Collaborative Research Lab for Green Steel
(https://www.jfe-steel.co.jp/en/release/2022/220203.html)

EN JFE Engineering Carbon Neutrality Collaborative Research Center Established at the Institute of Science Tokyo

JFE Engineering and the Institute of Science Tokyo*1 opened the JFE Engineering Carbon Neutrality Collaborative Research Center (CRC) at the Institute's Laboratory for Zero-Carbon Energy under the former Tokyo Institute of Technology (currently the Institute of Science Tokyo) on July 1, 2022. The purpose of the CRC is to promote new technologies for realizing a carbon-neutral society. The two parties are comprehensively and jointly working on technical developments in carbon neutrality, transcending the boundaries of a typical individual joint research framework in a multilayered approach to generate innovation across the wide range of fields required for realizing a carbon-neutral society.

The CRC will promote the development of new technologies to help realize a carbon-neutral society by combining JFE Engineering's engineering technologies related to plant and infrastructure construction in the fields of energy and the environment with the Institute of Science Tokyo's advanced academic knowledge across a wide range of areas. The CRC will also continue collaborating with a variety of organizations through Science Tokyo GXI*2, a Ministry of Education, Culture, Sports, Science and Technology project for industry-academia collaboration led by the Institute of Science Tokyo.

*1 Tokyo Institute of Technology and Tokyo Medical and Dental University were integrated in October 2024.
*2 Intended to promote research activities that will initiate a Green Transformation (GX) society, strengthen startups, and substantiate industry-society collaboration.



Laboratory for Zero-Carbon Energy, Institute of Integrated Research
(Ookayama North Building 1)

› **JFE Engineering and Tokyo Institute of Technology establish JFE Engineering Carbon Neutrality Collaborative Research Center (Japanese only)** (https://www.jfe-eng.co.jp/news/2022/20220629.html)

Global Scale Initiatives

Global Actions to Address Global Warming

ISO 14404 is an international standard proposed by the Japan Iron and Steel Federation (JISF) to the International Organization for Standardization (ISO) as a methodology for the globally unified calculation of CO_2 emissions and intensity from iron and steel production, to ultimately assess the energy efficiency of steelworks. The Japanese steel industry is addressing global warming through international public-private collaborations, including ISO 14404-based assessment of steelworks in developing countries and recommending specific technologies best suited to India and ASEAN countries. It is continuing this effort together with the Ministry of Economy, Trade and Industry (METI) in order to enhance ISO 14404 so it can be applied to steel manufacturing facilities with more complex structures.

JFE Steel is also addressing global warming by participating in international activities, such as the Japan-India Public and Private Collaborative Meeting, the Japan-ASEAN Steel Initiative, and the Japan-China Steel Industries Exchange. In addition, JFE Steel is a member of the World Steel Association's Climate Action Data Collection Programme, which uses ISO 14404 as the standard for measurement and calculation.

WSA Climate Action Data Collection Programme Certification



› **worldsteel Climate Action Data Collection Programme** (https://worldsteel.org/climate-action/climate-action-data-collection/data-providers/)

Efforts to Assess the Environmental Impact of the Excellent Recyclability of Steel Products

Accurately evaluating the environmental impact of products requires assessment and quantification of impact over their entire life cycles, from raw resource mining to material production, product manufacture, use, and final disposal. Life cycle assessment (LCA) is one evaluation method.

After final products such as automobiles and buildings finish their mission in society, all of their steel components can be recycled and reused. Closed-loop recycling is an excellent characteristic of steel materials. From the perspective of LCA, steel can be viewed as having an extremely low environmental impact compared to other materials.

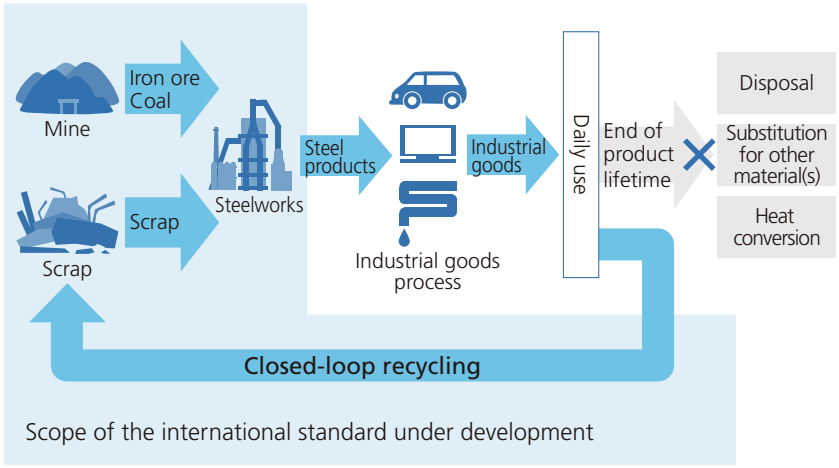
JFE Steel played a major role in the development of ISO 20915 (Life Cycle Inventory Calculation Methodology for Steel Products) and JIS Q 20915 (Life Cycle Inventory Calculation Methodology for Steel Products), initiatives led by the Japan Iron and Steel Federation (JISF) that take into account the impact of recycling and provide life cycle inventory (LCI) calculation methods specific to steel products.

In addition, 14 Japanese steelmakers using blast furnaces or electric arc furnaces joined forces to calculate the Japanese average for LCI of different steel products. Calculations based on their FY2022 operational data were also published.

JFE Steel acquired SuMPO EPD certification for 36 product types under the SuMPO Environmental Label Program under the Sustainable Management Promotion Organization (SuMPO). These cover three types of steel sheets for cans, nine flat steel products, nine construction steel products, three types of steel plates (steel plates for marine structures and wind power, shipbuilding steel plates, and UOE pipes), four steel pipe products, and eight bar and wire rod products. We will continue to make use of SuMPO EPD labels to help customers protect the environment and strengthen communications with them.

› **Value of Steel** (P. 4)

Life Cycle of Steel Materials



› **Action by the steel industry: LCI data collection** (https://www.jisf.or.jp/en/activity/lca/data/index.html)

Japan-Korea Green Steel Joint Seminar

The 3rd Japan-Korea Green Steel Joint Seminar was held in Seoul, South Korea, on December 9, 2025, jointly organized by the Japan Iron and Steel Federation and the Korea Iron and Steel Association. The seminar was attended by representatives from both countries, including Masaaki Izumiyama, Chairman of the Global Environment Committee, the Japan Iron and Steel Federation (Nippon Steel Corporation), and Lee Kyung-ho, Vice Chairman of the Korea Iron and Steel Association, as well as guests of honor, including Manabu Nabeshima, Director of the Metals Division of the Ministry of Economy, Trade and Industry of Japan, and Song Young-sang, Director of the Steel and Ceramics Division and Steel Team Leader, Office of Industrial Policy, Ministry of Trade, Industry and Energy of the Republic of Korea. A total of 65 participants, mainly from government organizations, steel companies, and academia in both Japan and South Korea, exchanged opinions on wide-ranging topics related to carbon neutrality in the steel industry.

Public and Private Collaborative Meeting between Indian and Japanese Iron and Steel Industry

The Japan Iron and Steel Federation has held the Public and Private Collaborative Meeting between Indian and Japanese Iron and Steel Industry annually since 2011 with support from the Ministry of Economy, Trade and Industry, and JFE Steel attends this meeting every year. The purpose of this meeting is to apply the technology and experience of Japan's steel industry, which boasts world-leading energy efficiency, to recommend policies on energy conservation and environmental protection to the Indian steel industry and promote the transfer of energy-saving and environmental protection technologies from Japan.

The FY2025 meeting was held in Tokyo on January 20, 2026, with support from the Economic Research Institute for ASEAN and East Asia (ERIA), as in the previous fiscal year. It was moderated by Hiroyuki Tezuka, Secretary of the International Environmental Strategy Committee of the Japan Iron and Steel Federation and Fellow of JFE Steel. Participants included Nobuyuki Matsumoto, Director of the Metal Technology Office, Metals Division, Ministry of Economy, Trade and Industry of Japan; Vinod Kumar Tripathi, Joint Secretary of the Ministry of Steel of India; and Nuki Agya Utama, Director of Energy Policy and Head of the Asia Zero Emission Center at ERIA. About 40 participants, mainly from government organizations and steel companies in both Japan and India, engaged in lively discussions on topics related to carbon neutrality in the steel industry of both countries. JFE Steel will continue to play a major role in this meeting and contribute to CO_2 reduction in India by transferring Japanese energy-saving technologies.

ASEAN-Japan Steel Initiative

In May 2014, the Japan Iron and Steel Federation and the ASEAN Iron and Steel Council (AISC) signed a memorandum of understanding to promote regional collaboration in the areas of the environment, standardization, and trade. The ASEAN-Japan Steel Initiative (AJSI) was launched as a public-private environmental effort to strengthen cooperation in environmental and energy saving efforts in ASEAN countries. As part of its activities, the initiative developed a Technologies Customized List (electric arc furnaces) as well as a Technologies Customized List (blast furnaces), which include energy-saving, environmental protection, and recycling technologies for electric arc furnaces and blast furnaces suitable for the ASEAN steel industry.

On June 2, 2026, as part of the ASEAN-Japan Steel Initiative (AJSI), a webinar was held jointly with the Economic Research Institute for ASEAN and East Asia (ERIA). Participants included Nobuyuki Matsumoto, Director of the Metal Technology Office, Metals Division, Ministry of Economy, Trade and Industry of Japan; Dr. Nuki Agya Utama of ERIA; and Hiroyuki Tezuka, Chairman of the Energy Technology Committee of the Japan Iron and Steel Federation and Fellow of JFE Steel.

At the seminar, participants from Japan and ASEAN countries discussed GX steel as well as policy and technological initiatives toward carbon neutrality.

Japan-China Steel Industry Environmental Protection and Energy Conservation Technology Conference

This conference has been held since 2005, based on the memorandum of understanding that was signed at the Japan-China Steel Industry Environmental Protection and Energy Conservation Technology Conference, held in Beijing in July 2005 with the participation of top executives from both countries' steel industries. The purpose of the conference is to raise the level of environmental conservation and energy saving in both countries through information exchanges between technical experts from steel manufacturers in Japan and China. The importance of this conference has been growing as it helps to promote not only sound development of the steel industry in both countries but also the effective use of resources and environmental conservation.

The FY2024 event was held in Wuhan, China, in March 2025, with roughly 80 participants from both countries' steel industries. Representatives from both sides presented the status of actions toward carbon neutrality, energy conservation, CO_2 reduction, and environmental protection, and actively exchanged information and opinions on topics of shared interest in both countries' steel industries, such as green steel. JFE Steel will continue to participate in this conference to contribute to global carbon neutrality, energy saving, environmental action, and the sustainable development of the steel industry.

Lecture Events

The JFE Group delivers lectures at various events to increase awareness of our efforts to combat climate change.

Major Lectures Held in Japan

- Lecture: "JFE Steel's Initiatives and Challenges toward Carbon Neutrality—JFE Steel GX Process Transformation Roadmap" at a lecture event held in conjunction with the Ordinary General Meeting of the Japan Mechanical Design Industries Association
  Date: June 11, 2026
  Lecturer: Hiroyuki Tezuka (Fellow, JFE Steel Corporation)

- Lecture: "Latest Technology in Energy and Environment in the Steel Industry and Measures against Global Warming" in the Institute of Science Tokyo's Advanced Course in Science and Technology in Energy and Environment
  Date: December 17, 2025
  Lecturer: Ikuhiro Sumi (Principal, Green Transformation Strategy Department, JFE Steel Corporation)

- Lecture: "The Path to Decarbonization of Steel — Green Steel Contributing to the Green Transition" at the Kyoto University Graduate School of Management Energy Industry Seminar, "Strategies, Prospects, and Challenges toward a Carbon-Neutral Society"
  Date: November 27, 2024
  Lecturer: Ikuhiro Sumi (Leader, Global Environment Team, Green Transformation Strategy, JFE Steel Corporation)

- Lecture: "Carbon Neutrality Initiatives" at the Bingo Urban Roundtable Lecture Meeting
  Date: October 31, 2024
  Lecturer: Hiroyuki Tezuka (Fellow, JFE Steel Corporation)

- Lecture: "JFE Steel's Initiatives for Achieving Carbon Neutrality and the Challenges" at the APAC Financial Institutions Summit 2024 — Banking
  Date: October 2, 2024
  Lecturer: Hiroyuki Tezuka (Fellow, JFE Steel Corporation)

Major Lectures Held Overseas

The JFE Group provides lectures at various events to raise awareness overseas of our efforts to address climate change.

- Lecture: "Japan's Domestic Policies of Carbon Reduced Steel Trading Market" at the COP30 Korea Pavilion side event "Global Policies and Leadership for Creating a Premium Market for Carbon-Reduced Steel"
  Date: November 17, 2025
  Lecturer: Hiroyuki Tezuka (Fellow, JFE Steel Corporation)

- Lecture: "Technology roadmap for Iron and Steel Industry, Transition pathways" at the COP30 Japan Pavilion Keidanren/IEEJ/GISPRI event "Green Transformation — Balancing Economic Growth, Energy Security, and Decarbonization"
  Date: November 19, 2025
  Lecturer: Hiroyuki Tezuka (Fellow, JFE Steel Corporation)

- Lecture: "Japan's Strategy for GX Steel Market Development" at "The Good, the Bad and thEUgly: The Need for Harmonisation of Standards," a worldsteel event at the Standards Pavilion
  Date: November 18, 2025
  Lecturer: Hiroyuki Tezuka (Fellow, JFE Steel Corporation)

Evaluation of Alignment with Major Organizations

The JFE Group participates in various industry and economic organizations with the aims of realizing a sustainable society and enhancing corporate value. Through these affiliations, we pursue policy recommendations, share information, and address industry-wide challenges while fulfilling the social responsibilities associated with the business activities of our operating companies. The evaluation of alignment between the policies of major organizations in which the JFE Group participates and JFE's stance is presented below along with the results.

Summary of Evaluation Results

We evaluated the consistency of the main recommendations and activities published by each organization with our aforementioned views and stance. As a result, we confirmed that the policies, stances, and policy recommendations clarified by each organization are aligned with our own views and stance. Going forward, we will continue to encourage constructive dialogue and exchanges of opinions with these organizations to ensure that our views and stance are reflected in the activities conducted by the organizations we belong to as members.

Organization / Policy	GX Policies	Energy Policy	Carbon Pricing	Creation of GX Product Markets
The Japan Iron and Steel Federation	Aligned	Aligned	Aligned	Aligned
World Steel Association	Aligned	Aligned	Aligned	Aligned
Keidanren (Japan Business Federation)	Aligned	Aligned	Aligned	Aligned

The Japan Iron and Steel Federation

Purpose: To promote the sound production, distribution, consumption, and trade of steel, thereby contributing to the development of the Japanese economy and the improvement of people's livelihoods.
Participation of JFE Group Officers: Chairman, Masayuki Hirose, Representative Director, President and CEO of JFE Steel Corporation

Item	Result	Basis / Reference URL, etc.
GX Policies	Aligned	In 2021, the Federation announced the Basic Policy of the Japan steel industry on 2050 Carbon Neutrality, in which it declared its agreement with the ambitious national policy of achieving carbon neutrality in 2050 and its own bold commitment to take on the challenge of realizing carbon neutrality in the steel industry. It has also requested the establishment of a national strategy for decarbonization, financial support to commercialize and implement the results of technology development, fostering public understanding that achieving decarbonization will involve significant costs, and building mechanisms for sharing such costs across society. **› Basic Policy of the Japan steel industry on 2050 Carbon Neutrality aimed by the Japanese government (Feb. 2021)** (https://www.jisf.or.jp/en/activity/climate/documents/CN2050_eng_201210215.pdf)
Energy Policy	Aligned	In its comments on the draft 7th Strategic Energy Plan, the federation recognized it as a realistic plan that squarely addresses changes in the energy situation while maintaining the S+3E perspective, and that reemphasizes the importance of stable supply and economic efficiency. It also valued the fact that resource-poor Japan will have a number of options, including renewable energy, nuclear power, and decarbonized thermal power, moving away from the conventional binary view of renewables versus nuclear. It has also stated that the integration of energy policy and industrial policy is an extremely important perspective in advancing GX, and that specific policies are needed to promote decarbonization on the premise of strengthening industrial competitiveness and ensuring inexpensive and stable energy supply. **› Comments on the Draft 7th Strategic Energy Plan (Japanese only)** (https://www.jisf.or.jp/news/topics/documents/7jienekian-ikenr.pdf)
Carbon Pricing	Aligned	In its comments on the draft GX2040 Vision, the Federation valued the Growth-oriented Carbon Pricing Concept for clearly indicating the timing of introduction and the basic framework of emission trading schemes and other systems. It stated that designing the GX-ETS system requires appropriately reflecting differences in timelines and marginal abatement costs for decarbonization by sector and designing a system that supports GX promotion in the Japanese steel industry while sustaining domestic production capacity and maintaining and strengthening international competitiveness. In addition to introducing carbon pricing, the federation has also underlined the urgency of creating a GX product market to ensure investment predictability for GX. **› Comments on the Draft GX2040 Vision (Japanese only)** (https://www.jisf.or.jp/news/topics/documents/GX2040visionan-ikenr2.pdf) **› Explanation Materials by The Japan Iron and Steel Federation — Working Group on Carbon Pricing toward GX (1st Meeting) (Japanese only)** (https://www.cas.go.jp/jp/seisaku/gx_jikkou_kaigi/carbon_pricing_wg/dai1/siryou4.pdf)
Creation of GX Product Markets	Aligned	The federation considers the creation of a GX market essential for increasing the predictability of decarbonization investments. In its comments on the draft GX2040 Vision, it valued the extensive descriptions regarding GX market creation, particularly the implementation of initiatives such as visualization of GX value, public procurement, and private procurement. It has also expressed that the government's proactive initiatives, including the creation of initial demand, are extremely important for GX market creation, that clear policy directions for steadily expanding market size are required, and that more concrete measures such as regulatory and institutional measures for procurement are necessary to enhance the predictability of investment recovery and that the government should present a more specific roadmap. **› Comments on the Draft GX2040 Vision (Japanese only)** (https://www.jisf.or.jp/news/topics/documents/GX2040visionan-ikenr2.pdf)

World Steel Association

Purpose: To promote sustainability, safety, technological innovation, and human resource development in the steel industry and contribute to the overall development of the industry through international collaboration and the provision of information

Participation of JFE Group Officers: Member of the Executive Committee — Masayuki Hirose, Representative Director, President and CEO of JFE Steel Corporation.

Item	Result	Basis / Reference URL, etc.
GX Policies	Aligned	In its policy paper "Climate change and production of iron and steel," worldsteel expressed its full support for the goals of the Paris Agreement and declared that it would realize industrial and social transformation by reducing CO_2 emissions from steel production. **› Climate change and production of iron and steel (Nov. 2025)** (https://worldsteel.org/wp-content/uploads/Policy-Paper-climate-change-and-the-production-of-steel.pdf)
Energy Policy	Aligned	The same policy paper recommended the utilization of low-carbon energy, such as renewable energy, nuclear power, and fossil fuels with mitigation technologies such as CCS as a technological option for the steel industry's climate change measures. **› Climate change and production of iron and steel (Nov. 2025)** (https://worldsteel.org/wp-content/uploads/Policy-Paper-climate-change-and-the-production-of-steel.pdf)
Carbon Pricing	Aligned	The policy paper states that strong demand-side signals and clear policies are essential for deploying low-emission technologies and discusses market creation, including public procurement schemes, alongside effective carbon pricing, aligning with JFE's stance that both should be advanced in tandem. **› Climate change and production of iron and steel (Nov. 2025)** (https://worldsteel.org/wp-content/uploads/Policy-Paper-climate-change-and-the-production-of-steel.pdf)
Creation of GX Product Markets	Aligned	The policy paper also noted that steel products using low-carbon technologies will be more expensive than conventional products and therefore require policy support to compete in the market. It also pointed to rising demand from customer companies for low-carbon steel products. To meet this demand, worldsteel proposed a method for allocating each steelmaker's GHG emission reduction value to specific products (chain of custody, or CoC) and published principles and guidelines to enhance transparency and clarity regarding the application of this method. **› Principles "Chain of custody approaches in the steel sector"** (https://worldsteel.org/wp-content/uploads/worldsteel-chain-of-custody-principles.pdf) **› worldsteel guidelines for GHG chain of custody approaches in the steel industry** (https://worldsteel.org/wp-content/uploads/worldsteel-chain-of-custody-guidelines_Version-1.2_Feb2026_FINAL-1.pdf)

Keidanren (Japan Business Federation)

Purpose: To draw out the vitality of companies, individuals supporting companies, and local communities as a comprehensive economic organization, thereby contributing to the autonomous development of the Japanese economy and the improvement of people's livelihoods.

Participation of JFE Group Officers: Chairman of the Tax System Committee — Yoshihisa Kitano, Representative Director, President and CEO of JFE Holdings, Inc.

Item	Result	Basis / Reference URL, etc.
GX Policies	Aligned	In its 2022 publication "Toward Green Transformation (GX)," Keidanren expressed the view that to realize carbon neutrality by 2050, Japan as a whole must create a "virtuous cycle of the economy and environment" and promote Green Transformation (GX), representing the transformation of the entire economic and social system. It also recommended that the government formulate a GX Policy Package as a grand design for GX. **› Toward Green Transformation (GX) (May 2022)** (https://www.keidanren.or.jp/en/policy/2022/043_point.pdf)
Energy Policy	Aligned	In its 2024 proposal "Recommendations for Revising the Strategic Energy Plan," Keidanren stated that ensuring safety is the fundamental premise, and that the principles of (a) energy security and stable supply, (b) economic efficiency, and (c) environmental compatibility (S+3E) must be upheld. It emphasized the need to pursue an optimal mix of diverse energy sources suited to Japan's characteristics, to further expand the introduction of renewable energy that meets the three requirements of low cost, stable supply, and business discipline, and to maximize the use of nuclear and atomic energy. **› Recommendations for Revising the Strategic Energy Plan (Oct. 2024) (Japanese only)** (https://www.keidanren.or.jp/policy/2024/071_honbun.pdf)
Carbon Pricing	Aligned	In its comments on the public consultation for the "Basic Policy for the Realization of GX," Keidanren evaluated the government's growth-oriented carbon pricing concept as a key step for achieving more than 150 trillion yen in public and private GX investment while reducing and curbing emissions. It also requested that, while fully considering technological developments and the opinions of the business community, specific system design should proceed in a way that contributes to maintaining and strengthening industrial competitiveness. **› Comments on the Public Consultation for the Basic Policy for the Realization of GX (Jan. 2023) (Japanese only)** (https://www.keidanren.or.jp/policy/2023/004.html)
Creation of GX Product Markets	Aligned	In its comments on the public consultation for the GX2040 Vision (Draft), Keidanren stated that creating a GX market is indispensable for enhancing the predictability of GX investment. It proposed that, in addition to measures such as visualization of GX value and demand-stimulating initiatives, a specific roadmap should be formulated that specifies the timing of introducing various regulatory and institutional measures. It also emphasized that the cost increases associated with the production of GX products should be reliably reflected in product prices, and that consumers who purchase such products should accept these cost increases so that they can be fairly and equitably distributed across society as a whole. **› Comments on the Public Consultation for the GX2040 Vision (Draft) (Jan. 2025) (Japanese only)** (https://www.keidanren.or.jp/policy/2025/010.html)

Identification and Assessment of Risks and Opportunities (TCFD Scenario Analysis)

Initiatives

The JFE Group intends to achieve carbon neutrality by 2050 and regards climate change as a key management issue. To understand the impact of climate change on its business activities and finances, it leverages the scenario analysis in line with the TCFD recommendations to identify and assess climate change-related risks and opportunities. The Group aims to strengthen business resilience to climate change and achieve sustainable growth by incorporating the results of these analyses in its management strategies and business plans.

For details on governance and risk management based on the TCFD recommendations, please refer to Environmental Management, and for details on strategy, metrics, and targets, please refer to Initiatives to Address Climate Change Issues.

› **Environmental Management** (P. 45)
› **Initiatives to Address Climate Change** (P. 49)

Timeline of Milestones Related to Climate Change Developments and JFE's Key Initiatives

1997 Kyoto Protocol adopted at COP3 in Kyoto
2008 JISF's Voluntary Action Plan launched
2013 JISF's Commitment to a Low Carbon Society launched
2015 Paris Agreement adopted at COP21
2017 TCFD published the final report of its recommendations
2018 JISF announced the Long-term Vision for Climate Change Mitigation, Zero Carbon Steel
2019 JFE Group announced its endorsement for the final report of the TCFD recommendations
JFE Group published a scenario analysis in line with the TCFD recommendations
2020 Keidanren launched the Challenge Zero initiative
Ministry of Economy, Trade and Industry published a list entitled Companies Taking on the Zero-Emission Challenge
JFE Group published its targets in its medium- to long-term vision (target for 2030 and achieving carbon neutrality by 2050)
Prime Minister Suga declared Japan will achieve carbon neutrality by 2050
2021 JISF announced the Basic Policy of the Japan Steel Industry on 2050 Carbon Neutrality Aimed by the Japanese Government
JFE Group published its roadmap for achieving carbon neutrality in 2050 in the JFE Group Environmental Vision for 2050
Japanese government formulated the Green Growth Strategy Through Achieving Carbon Neutrality in 2050
2022 JFE Group announced that the CO_2 emissions reduction target for FY2030 for JFE Steel has been revised upward to 30% or more compared to FY2013
JISF published the "Evaluation of the Phase I Target (FY2020 Target)" and Phase II target (FY2030 target) of reducing the total volume of energy-related CO_2 emissions by 30% compared to FY2013 in its Activities to Combat Global Warming—Report of JISF's Carbon Neutrality Action Plan (Commitment to a Low Carbon Society) (March 2022)
2023 The Act Concerning the Promotion of a Smooth Transition to a Decarbonized Economic Structure (GX Promotion Act) was enacted
2024 JFE Steel announced its GX Acceleration Declaration
2025 Japanese government published GX2040 Vision
JFE Group announced its long-term vision JFE Vision 2035 and the Eighth Medium-term Business Plan (FY2025–FY2027)

The JFE Group publishes information on specific initiatives through the following website.
› **Challenge Zero** (https://www.challenge-zero.jp/en/member/34)

- **Zero-Emission Challenge (Japanese only)** (https://www.meti.go.jp/policy/energy_environment/global_warming/zero-emission_challenge/index_zeroemi.html)
- **GX Future Consortium: About the GX Acceleration Declaration** (https://gx-future-consortium.go.jp/gx-declaration/)
- **GX Future Consortium: List of Companies Making the GX Acceleration Declaration** (https://gx-future-consortium.go.jp/gxdec-list/)

Scenario Analysis

Tools and Methods

Scenario analysis is used to portray an accurate understanding of climate-related risks and opportunities and assess implications for the current business strategy, thereby enabling an organization to establish strategies that reflect the results of the assessment. As our business could be significantly affected by climate change, we have created both a 1.5°C scenario and a 4°C scenario. In setting the 1.5°C scenario, we also took into account the 2°C / below 2°C scenarios*1.

All scenarios are based on those developed by the International Energy Agency (IEA). Analysis was conducted under the assumption that major emitting countries implement uniform carbon pricing to increase the feasibility of achieving the 1.5°C target.

Our goal under the long-term scenario analysis is to achieve carbon neutrality by 2050. We conducted risk assessments that take into account the 1.5°C scenario (IPCC 1.5°C Special Report) in steelmaking and the necessity of ultra-innovative technology to achieve the Shared Socioeconomic Pathways (SSP) for carbon neutrality by 2050.

Selected Scenario		1.5°C Scenario	4°C Scenario
Reference Scenario	Transition Risks	Transition scenarios developed by the IEA • IPCC Special Report on Global Warming of 1.5°C*2 • NZE2050	Transition scenarios developed by the IEA • Stated Policies Scenario (STEPS)*3 • Reference Technology Scenario (RTS)*4
	Physical Risk	Climate change projection scenario developed by the Intergovernmental Panel on Climate Change (IPCC) • Representative Concentration Pathways (RCP) Scenario*5 • Shared Socioeconomic Pathways (SSP)*6	
How Society will Look		Dynamic policies will be adopted and technical innovations will progress to limit the average temperature rise by the end of this century to below 1.5°C and realize sustainable development. Assume a society in which our business is affected by social changes accompanying transition to a decarbonized society. • Worldwide/industry-wide uniform carbon pricing*7 • Increase in the ratio of sales of electric vehicles to overall vehicle sales	Despite new policies implemented in each country based on approaches under the Paris Agreement, the average temperature will rise by about 4°C by the end of this century. Assume a society in which our business is affected by temperature rise and other climate change. • Increase in the occurrence of flooding • Sea level rise

*1 The Sustainable Development Scenario (SDS) and the 2°C Scenario (2DS) are used for the 2°C / below 2°C scenarios.
*2 Source: IEA's Net Zero by 2050 — A Roadmap for the Global Energy Sector
*3 Source: IEA's World Energy Outlook 2024
*4 Source: IEA's Energy Technology Perspectives 2017
*5 Source: IPCC Fifth Assessment Report
*6 Source: IPCC Sixth Assessment Report
*7 When carbon pricing varies by country, a gap opens in international competitiveness between industries in countries with strict GHG regulations and those in countries with less strict regulations. This results in carbon leakage, where production and investment shrink in stricter countries (reducing GHG emissions) while expanding in more lenient countries (increasing GHG emissions). Accordingly, it is assumed that carbon pricing will be introduced in developed countries and some developing countries.

Scope of Business and Period for Analysis

This analysis covers the following businesses: the steel business by JFE Steel, the engineering business by JFE Engineering, the trading business by JFE Shoji, and businesses carried out by some of the other Group companies. The period covered is up to 2050.

Alignment with the JISF's Long-term Vision for Climate Change Mitigation

The Japan Iron and Steel Federation (JISF) has been working toward its Commitment to a Low Carbon Society, and Phase I of this initiative ended in FY2020. From FY2021, the effort was rebranded as the Carbon Neutrality Action Plan, and the Phase II target (FY2030 target) was revised. In November 2018, the JISF also formulated and published the Long-term Vision for Climate Change Mitigation for 2030 and beyond. JFE Steel played a central role in the formulation of this long-term vision. The vision represents the industry's challenge toward realizing zero-carbon steel and lays out the prospect of achieving the 2°C scenario for steelmaking and necessity of ultra-innovative technologies to achieve the 1.5°C scenario. Furthermore, on February 15, 2021, the JISF announced the "Basic Policy of the Japan Steel Industry on 2050 Carbon Neutrality Aimed by the Japanese Government," which declares that the Japanese iron and steel industry will boldly accept the challenge of realizing zero-carbon steel.

The JFE Group's scenario analysis is intended to ensure resiliency in our Group's business strategy during the intermediate stages of these long-term challenges.

Process to Identify Key Factors that Impact the Business

STEP 1: Examine the entire value chain from a holistic perspective and sort out factors that impact the businesses under analysis
(For more information on risks and opportunities in the value chain, please refer to: › JFE Group Value Chain (P. 28)

STEP 2: Examine all factors at an overview level and identify key factors by taking into account the level of impact and stakeholder expectations and concerns

	1.5°C Scenario	4°C Scenario
Impact on Procurement		❺ Unstable raw materials procurement due to increased occurrence of climatic hazards
Impact on Direct Operation	❶ Decarbonization of iron and steelmaking process ❷ Increased needs for effective utilization of steel scrap	❻ Damage to production bases and offices caused by climatic hazards
Impact on Product and Service Demand	❸ Change in demand for automotive steel, etc. ❹ Increase in demand for solutions to enhance decarbonization	❼ National resilience



Axis for identifying key factors: • Level of impact (possibility of risks and opportunities arising × Level of impact if manifested)
• Expectations and concerns of stakeholders

Results of Scenario Analysis

Climate change is a critical business concern for the JFE Group from the perspective of business continuity. Our steel business, which emits at least 99% of the Group's total GHG emissions, has been developing and applying energy-saving and CO_2 emissions reduction technologies to the steelmaking process to address decarbonization risks. At the same time, given rising demand for effective use of steel scrap, we are working to convert the steelmaking process from blast furnaces to electric arc furnaces and secure cold iron sources. Going forward, we will continue to develop processes to further reduce environmental impact, and by globally deploying our diverse technologies, we will view our response to climate change as an opportunity and contribute to addressing related issues.

The JFE Group has developed and maintains a variety of eco-friendly products and technologies, including high-performance steel materials that contribute to energy savings when used by customers, as well as renewable energy power generation, thereby responding to the growing demand for decarbonization solutions. Going forward, with automobiles expected to become increasingly lighter and more electrified, we will further enhance the performance of JFE's high tensile strength steel sheets and electrical steel sheets to meet the changing demand for automotive steel and contribute to the realization of a low-carbon society.

It is also important to prepare for physical risks such as unstable raw material procurement due to frequent meteorological disasters and the damage they cause. The JFE Group is strengthening its resilience to address these risks.

At the same time, we will continue to develop and disseminate the necessary technologies for achieving the long-term goal of the Paris Agreement of keeping the global average temperature increase well below 2°C compared to pre-industrial levels and limiting it to 1.5°C. We will also contribute to national resilience by supplying and constructing steel for social infrastructure in preparation for the anticipated intensification of meteorological disasters.

Analysis Results

	Societal Changes	Opportunities / Risks		Expectations and Concerns of Stakeholders toward the JFE Group	Strategies and Initiatives	Financial Impact (2030–2035 assumptions)*1	
						Item	Amount / scale
1.5/C Scenario Key Factor ❶ **Decarbonization in steel production processes**	Increasing societal demands for decarbonization of steel production processes	Introduction of ultra innovative technologies for drastic decarbonization	Opportunities	JFE leading the supply of high-environmental value steel through the introduction of ultra innovative technologies such as EAF	• Implementation of conventional low-carbon technologies • Introduction of large-scale EAF capable of producing high-quality steel • Utilization of low-carbon direct-reduced iron • Development and implementation of ultra-innovative technologies • Studies of feasibility to commercialize CCUS • Expansion of JGreeX™ supply capacity • Lobbying to create demand for steel with environmental value • Collaboration with other companies in the Japan Iron and Steel Federation to promote steel with environmental value	Increase in sales of steel with added environmental value	Up to +¥150 billion per year
			Transition risk	Increase in investment to introduce ultra innovative technologies such as EAF	• Reinforcement of the earnings base • Secure funding for investments and technology development • Lobbying for government support • Expansion of JGreeX™ sales	Amount of GX-related investment for 2025–2035	Approx. –¥0.6 trillion
		Implementation of carbon pricing	Transition risk	• Increased financial burden due to the purchase of emission allowances and an increased burden of compliance require-ments due to strengthened regulation • Decline in sales volume to Europe	• Ensuring full compliance with environmental regulations • Establishment of reliable carbon-neutral technologies • Policy engagement toward achieving carbon neutrality	Increased costs burdens resulting from the introduction of systems such as GX-ETS*2 and EU-CBAM, and a decline in sales to Europe	Up to about –¥10 billion per year
1.5/C Scenario Key Factor ❷ **Increase in demand for the effective utilization of steel scrap**	Increased attention on EAF process for low CO_2 emissions	Higher competition and prices for cold iron sources (scrap/direct-reduced iron)	Transition risk	Increase in the cost of purchasing cold iron sources	• Collaboration with customers and users for scrap collection • Establishment of technologies for use of low-grade and difficult-to-use scrap • Participation in direct-reduced iron projects • Expansion of scrap handling volume • Reduction of manufacturing costs • Passing higher costs onto steel sales prices	Increase in purchase cost for cold iron sources	Up to about ¥30 billion per year
		Stronger demand for electric power due to shift from BF-BOF process to EAF process	Transition risk	Increase in electric power used when manufacturing steel (increase in power used, decrease in byproduct gases)	• Reduction of manufacturing costs • Passing higher costs onto steel sales prices • Lobbying related to prices and stable supply of electric power	Increase in manufacturing costs due to process transition (equivalent to the output of approx. 0.5 nuclear reactors)	Up to about ¥50 billion per year
1.5/C Scenario Key Factor ❸ **Change in demand for steel for automotive use**	Change in demand for automobiles	Changes in product sales mix due to EV production	Opportunities	Increase in sales volume of electrical steel as material for EV motors	• Expansion of production facilities for electrical steel sheets • Establishment of a global processing and distribution system for electrical steel sheets	Increase in sales of electrical steel sheets	Tripling of production capacity for top-grade non-oriented electrical steel sheets for EV main drive motors (compared to FY2024)
			Opportunities	Increase in sales volume of high-strength steel to improve vehicle crash safety	• Increase in production capacity for ultra-high-strength steel sheets	Increase in sales due to expanded orders for ultra-high-strength steel sheets	New CGL capacity for manufacturing ultra-high-strength automotive steel sheets +360,000 tonnes
			Transition risk	Decrease in steel sales volume due to decline in internal combustion engines and shift to other materials through use of multi-materials	• Develop high-performance products	Decrease in sales of conventional automotive steel sheets	Small impact
1.5/C Scenario Key Factor ❹ **Increase in demand for solutions promoting decarbonization**	Transition to decarbonized society	Expansion of business opportunities in decarbonization and solutions business	Opportunities	Expansion of renewable energy-related business	• Expansion of integrated construction and operation businesses for renewable energy plants (offshore wind, geothermal, solar, etc.) • Development and application of CCUS solutions and commercialization of technologies related to green hydrogen and ammonia	Increase in segment profit in the engineering business's CN-related fields	Approx. ¥31 billion/year
			Opportunities	Expansion of the waste-to-resource-related business	• Expansion of integrated construction and operation businesses for plants that thoroughly utilize waste (waste-to-energy power generation, recycling, etc.)	Increase in segment profit in the engineering business's WtR-related fields	Approx. ¥37 billion/year
			Opportunities	Expansion of low-carbon business (ecosolutions) as cutting-edge energy conservation technologies developed and commercialized in Japan are offered to emerging countries	• Support for low-carbon steel manufacturing technology	Increase in sales in the overseas solutions business	Tens of billions of yen
4°C Scenario Key Factor ❺ **Unstable procurement of raw materials due to increased frequency of climate disasters**	Intensifying climate disasters alongside global warming	Instability in raw material procurement	Physical risk	• Reduction in sales due to decreases in production • Increase in raw material costs	• Alternative procurement, diversification of raw material sources, and stockpiling • Acquisition of raw material interests	Decrease in sales of steel due to depletion of raw material inventories	Approx. –¥30 billion per year per 1% decrease in annual sales volume
4°C Scenario Key Factor ❻ **Damages to business bases due to climate disaster**	Intensifying climate disasters alongside global warming	Occurrence of typhoon, heavy rain, and drought damage at manufacturing sites	Physical risk	Reduction in sales due to decreases in production	• Implementation of flood and drought countermeasures at manufacturing sites	Negative impact of flooding and drought on production and sales	No impact due to countermeasures in place
4°C Scenario Key Factor ❼ **Resilience to physical risks**	Intensifying climate disasters alongside global warming	Strengthening of infrastructure and disaster countermeasures	Opportunities	Contributing to improved resilience and longevity of infrastructure	• Strengthening of businesses to meet needs for improving resilience and longevity of domestic and international infrastructure • Increase in sales of infrastructure-related steel products	Increase in segment profit in infrastructure field of the engineering business	Further increase from around ¥12 billion/year under a 1.5°C scenario

*1 Financial impact is solely an estimated figure based on scenario analysis and does not represent actual business performance.

*2 The GX-ETS figure is calculated based on the assumption that 1% of emissions were not met.

Overview of Assessment of Identified Risks and Opportunities and JFE Group's Focus

Timeframe: **Short term (2027)** ⇒until 2027 **Medium term (2035)** ⇒until 2035, **Long term (2050)** ⇒until 2050 (final)

FOCUS Key Factor (1) Decarbonization of Iron and Steelmaking Process

Implementation of innovative technologies to realize large-scale decarbonization

Supply steel materials with high environmental value through implementation of innovative technologies such as electric arc furnaces Opportunity

Short term (2027) **Medium term (2035)**

JFE Steel has actively sought to improve efficiency and decarbonize the iron and steelmaking processes by developing energy-saving technologies and has established process technologies boasting the world's top energy efficiency. Taking advantage of the increasing public demand for decarbonized iron and steelmaking processes, we have the capacity to supply steel products with high environmental value, manufactured by deploying the low-carbon technologies we have developed across our steelworks.

The global drive toward decarbonization is intensifying, and with rising demand to reduce GHG emissions across entire supply chains, interest is rapidly growing for low-GHG emission steel products, particularly in industries such as automotive. In the IEA's Net Zero by 2050 Scenario, the share of steel production using the electric arc furnace method is projected to increase to 37% by 2030 and 53% by 2050. Going forward, demand is expected to expand for steel products made with the electric arc furnace method, which has lower GHG emissions.

During this transition, JFE Steel will introduce innovative electric arc furnaces capable of producing high-performance, high-quality steel materials that could previously only be manufactured using the blast furnace process. In addition, we will cut overall GHG emissions from the steelmaking process by using direct-reduced iron with low carbon emissions.

Since the first half of FY2023, we have been supplying JGreeX™, a brand of GX steel products that significantly reduces GHG emissions in the steelmaking process compared to conventional products. Since it is not immediately possible to achieve zero GHG emissions, we allocate the reductions created by our emission-reduction technologies to selected steel products by applying the mass balance approach and supply them as steel products with environmental value. Going forward, we will contribute to the decarbonization of society by expanding our capacity to supply JGreeX™. To broaden public recognition of these efforts, we are actively lobbying to stimulate demand for steel products with environmental value, while promoting adoption in collaboration with other JISF member companies.

Long term (2050)

Over the long term, to achieve carbon neutrality by 2050, as stated in the JFE Group Environmental Vision for 2050, we are pursuing the development of carbon-recycling blast furnaces (CR blast furnaces), utilization of hydrogen through the direct hydrogen reduction method, and manufacturing methods for high-quality steel using the electric arc furnace method. In particular, the technology that combines a CR blast furnace with CCU is an ultra-innovative technology for achieving net zero CO_2 emissions by drastically reducing CO_2 emissions from the blast furnace process, enabling efficient mass production of high-grade steel and allowing the reuse of CO_2 in the blast furnace. As for the CO_2 that cannot be fully reused in the blast furnace, we are also studying the practical application of carbon capture, utilization, and storage (CCUS) technologies to pursue further reduction potential.

Increased investment burden for electric arc furnaces and ultra-innovative technologies Transition Risk

Short term (2027) Medium term (2035)

The introduction of electric arc furnaces and ultra-innovative technologies carries the risk of increased investment burden to achieve carbon neutrality. At JFE Steel, decisions on the necessary capital investments to achieve the FY2030 GHG reduction target are nearly complete, with about 0.4 trillion yen in GHG reduction investments decided between FY2021 and FY2024. In addition, we estimate that about 0.6 trillion yen of investments will be required by 2035.

Sustaining these large-scale investments will require that we strengthen our revenue base and secure funds for investment and technology development. JFE Steel is promoting research and development using external funds such as the Green Innovation Fund while also lobbying to obtain government support.

In addition, through the expanded sales of JGreeX™, a GX steel product that significantly reduces GHG emissions, we will encourage the market penetration of environmentally valuable products and achieve profitability while protecting the environment. With these initiatives, we will pursue sustainable growth toward realizing a decarbonized society and securing long-term competitiveness.

Long term (2050)

Although the measures to be taken under the 2°C / below 2°C and 1.5°C scenarios will not significantly differ, we must consider scale and scope. In the case of the 1.5°C scenario, it will be necessary to further accelerate the development and implementation of decarbonization technologies, which will require even greater research and development and capital investment expenditures. In addition, the development of infrastructure to stably supply inexpensive, abundant green hydrogen and electric power will be a prerequisite. In addressing these issues, it will be necessary for society as a whole to consider how to share the costs and for the government to formulate long-term strategies for the supply of green hydrogen and electric power, in collaboration with society.

Financial burden will increase due to carbon pricing, and emission reduction targets will be more aggressive and stricter due to environmental changes Transition Risk

Short term (2027) Medium term (2035) Long term (2050)

Countries around the world are introducing and strengthening carbon-pricing and GHG emission reduction systems. In Japan, an emissions trading system (GX-ETS) based on the GX Promotion Act has been launched, creating a regulatory environment in which companies may need to procure emissions allowances depending on their progress toward emission reduction targets. In Europe, the Carbon Border Adjustment Mechanism (CBAM) is now being fully implemented, entailing additional costs based on the carbon emissions associated with imported products.

There is a risk that countries and regions may expand the scope of carbon pricing, increase prices, and further tighten emission reduction targets. These developments could affect steel product manufacturing costs and business earnings. In particular, as policies and regulations in each country are expected to be continually revised toward achieving carbon neutrality by 2050, the JFE Group continuously monitors regulatory trends and changes in market conditions in Japan and overseas.

On the other hand, stronger systems and regulations may help establish mechanisms for appropriately recognizing the market value of low-carbon products such as GX Steel. JFE Steel is actively participating in rule and standard-setting efforts related to carbon pricing systems and GX product markets in Japan and overseas while promoting policy engagement to create markets and generate demand for GX Steel.

Beyond regulatory compliance, the Company is building a business foundation capable of addressing future tightening of emission reduction targets and stronger carbon pricing. It is doing this by continuing to reduce emissions through the introduction of energy-saving and high-efficiency technologies and by advancing the development and implementation of ultra-innovative technologies, including innovative electric arc furnaces and CCUS.

FOCUS Key Factor (2) Increased Need for Effective Utilization of Steel Scrap

Cost of purchasing cold iron sources (scrap/direct-reduced iron) will increase Transition risk

Short term (2027) Medium term (2035) Long term (2050)

The electric arc furnace method, which has low CO_2 emissions, is attracting increasing global attention, and countries are introducing electric furnace facilities. At the JFE Group, in addition to maximizing the use of existing electric arc furnaces, we have decided to introduce an electric arc furnace at the East Japan Works (Chiba District) and an innovative electric arc furnace at the West Japan Works (Kurashiki District). Going forward, demand is expected to increase even further for cold iron sources such as scrap and direct-reduced iron, raising concerns about the risk of higher costs for procuring the cold iron sources needed to maintain steel quality and ensure stable production. We are responding by strengthening collaboration with customers and users in scrap collection to ensure a stable supply of high-grade scrap. We are also advancing research and development to establish technologies for using low-grade and difficult-to-use scrap, to expand the amount of scrap handled and promote the effective use of resources.

In addition, we are taking part in a Middle East direct-reduced iron project to ensure stable procurement of direct-reduced iron. Through these activities, we are reducing procurement risks for cold iron sources while lowering manufacturing costs.

Furthermore, based on the market evaluation of steel products with high environmental value, we are seeking to sustainably operate our business by appropriately passing these costs on to steel prices.

Power demand will increase due to converting from blast furnace process to electric arc furnace process Transition risk

Short term (2027) Medium term (2035) Long term (2050)

Converting from blast furnaces to electric arc furnaces requires large amounts of electric power. In addition to the power needed to melt cold iron sources in electric arc furnaces, power will also be needed to make up for the heat sources previously supplied through byproduct gases generated in blast furnaces and other facilities, which had been used in reheating furnaces and elsewhere within steelworks. Since this increase in power demand involves the risk of higher manufacturing costs, we are working to reduce manufacturing costs at JFE Steel through more efficient processes and technological innovation. Furthermore, based on the market evaluation of steel products with high environmental value, we are seeking to sustainably operate our business by appropriately passing these costs on to sales prices. In addition, stable operation of the electric arc furnace process requires a large and stable supply of power at competitive prices. To this end, we are lobbying the government for stable power supply and pricing and recommending policies for institutional development and reinforcing infrastructure.

FOCUS Key Factor (3) Change in Demand for Automotive Steel

Changes in the product mix due to EV production and other factors

Sales volume of electrical steel sheets for EV motors will increase Opportunity

Short term (2027) Medium term (2035) Long term (2050)

The widening adoption of electric vehicles is expected to change the composition of steel demand. In addition to the expansion of demand for electrical steel sheets for motors, the product mix of steel is diversifying to encompass high-tensile-strength steel for reducing vehicle body weight to offset the additional weight of batteries and stronger frames to protect batteries. At the JFE Group, we view this change as an opportunity and are bolstering our ability to respond. First, as part of strengthening manufacturing capacity for electrical steel sheets, we are proceeding with construction to triple our production capacity of non-grain-oriented electrical steel sheets at the West Japan Works (Kurashiki District) compared to current levels. In addition, we are building a global processing and distribution system for electrical steel sheets to respond to the worldwide expansion of the EV market.

Sales volume of high-strength steel sheets will increase due to improved collision safety Opportunity

Short term (2027) Medium term (2035) Long term (2050)

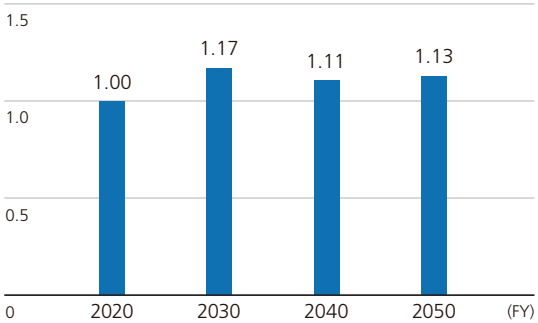
To achieve both weight reduction and collision safety performance, we have decided to construct and are proceeding with construction of a new continuous hot-dip galvanizing line (CGL) at the West Japan Works (Fukuyama District) to expand production capacity for ultra-high-tensile-strength steel sheets. On the product development front, in addition to the commercialization of 1.5 GPa-grade cold-rolled steel sheets, we have developed a multi-material structure that maximizes the performance of steel by incorporating a small amount of resin. This structure sandwiches a highly ductile, strongly adhesive resin between a main component made of ultra-high strength steel and a thin steel plate component, thereby achieving further weight reduction and improved collision safety in automotive body frame components.

Steel sales volume will decrease due to material substitution in multi-material design Transition risk

Short term (2027) Medium term (2035) Long term (2050)

Shifting to materials such as aluminum and carbon fiber reinforced plastics (CFRP) to reduce vehicle weight poses potential risk. These materials have higher manufacturing costs than steel and generate more CO_2 emissions over their life cycle. In the 1.5°C scenario, which assumes the introduction of carbon pricing, the price gap between steel and these materials could further widen. As a result, while the use of multi-material designs is expected to progress to some extent in luxury vehicles, adoption by mass-market vehicles is likely to remain limited. Even if all panel components, such as the doors of luxury vehicles, were replaced with aluminum, the resulting weight reduction would affect only about 5% of the total body materials across both luxury and mass-market vehicles. Taking into account the anticipated increase in automobile production volume, the impact on steel demand for vehicle bodies is expected to remain limited.

Estimated World Demand for Automotive Special Steel



Vertical axis: Steel demand (comparison by year with the year 2020 as 1.00)
Source: Estimated by JFE Holdings based on the reports from METI's Strategic Commission for the New Era of Automobiles

FOCUS Key Factor (4) Increase in Demand for Solutions to Enhance Decarbonization

Increase in demand for decarbonization solution businesses

Expansion of renewable energy-related business Opportunity

Short term (2027) Medium term (2035) Long term (2050)

Demand is expected to continue rising for power generation plants using renewable energy that does not emit carbon. In the engineering business, we are expanding operations through the integrated provision of engineering, procurement, construction, and operation and maintenance (EPC and O&M*[1]) for renewable energy plants, including biomass power generation*[2], geothermal power generation*[3], solar power generation*[4], and wind power generation.

The Japanese government has positioned offshore wind power generation as a pillar of its Green Growth Strategy for realizing carbon neutrality by 2050. In this context, efforts are being promoted on a Groupwide basis, led by JFE Engineering in the manufacture of seabed-fixed foundation structures such as monopiles. We also built Japan's first monopile foundation manufacturing plant, which began operation in April 2024*[5]. The steel business supplies large, heavy plates, and the trading business develops supply chain management, including the provision of information on Taiwan and potential demand regions such as East and Southeast Asia.

In addition to renewable energy, we are focusing on developing and implementing carbon capture, utilization, and storage (CCUS) solutions, as well as commercializing green hydrogen and ammonia-related technologies. Strengthening these initiatives for next-generation technologies will accelerate the delivery of solutions for realizing a decarbonized society and open up business opportunities with high environmental value.

› ***1 The JFE Engineering Corporation's biomass power generation (Japanese only)** (https://www.jfe-eng.co.jp/products/power/ele07.html)

*2 Engineering, procurement, and construction (EPC) and operation and maintenance (O&M) business

› ***3 The JFE Engineering Corporation's geothermal power generation plant** (https://www.jfe-eng.co.jp/en/products/power/gene01.html)

› ***4 The JFE Engineering's solar power generation (Japanese only)** (https://www.jfe-eng.co.jp/products/power/ele05.html)
The JFE Technos Corporation's solar power generation (Japanese only) (https://www.jfe-technos.co.jp/products/solar/)

› ***5 Completion of Japan's first manufacturing base of fixed-bottom foundation (monopile) for offshore wind turbines** (https://www.jfe-eng.co.jp/en/news/2024/20240401.html)

Expansion of waste-to-resource-related business Opportunity

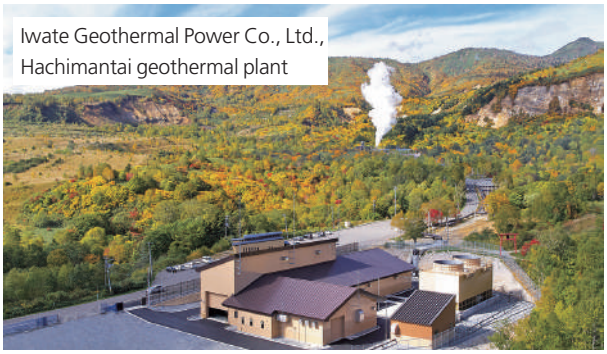
Short term (2027) Medium term (2035) Long term (2050)

From the perspective of resource circulation and effective use, efforts are also underway at waste treatment facilities to increase power generation from waste-derived sources. The engineering business is focusing on fully automated operation*[6] of waste incinerators, which makes it possible to increase power generation. In addition, we are actively engaged in the electricity retail business*[7], which uses renewable energy as the main power source, and supporting the establishment and operation of new regional electricity retail companies*[8], focused on local production and consumption of energy using renewable energy.

JFE Engineering is going beyond conventional energy optimization site by site to develop a Multisite Energy Total Service (JFE-METS)*[9] that optimizes energy by collectively managing multiple sites. This service achieves overall energy savings and reductions in CO_2 by analyzing actual energy consumption at multiple sites, deploying, operating, and optimizing energy-related facilities at each site, and enabling energy interchange, including at remote sites.



Waste-to-energy power generation plant



Iwate Geothermal Power Co., Ltd., Hachimantai geothermal plant

Geothermal power generation plant

› ***6 JFE Engineering's BRA-ING (Japanese only)** (https://www.jfe-eng.co.jp/news/2020/20200727.html)
› ***7 Urban Energy Corporation's electricity retail business (Japanese only)** (https://u-energy.jp/service/retail.html)
› ***8 Urban Energy Corporation's regional electric power support business, targeting local governments (Japanese only)** (https://u-energy.jp/support/)
Regional Electricity Retail Support (P. 72)
› ***9 JFE Engineering's "Multisite Energy Total Service (JFE-METS)" (Japanese only)** (https://www.jfe-eng.co.jp/products/electric-power/electric04.html)

Expansion of low-carbon businesses (eco-solutions) Opportunity

Short term (2027) **Medium term (2035)** **Long term (2050)**

There is ample room in the steel industry for disseminating energy-saving steel technologies (eco-solutions) in countries such as China, which accounts for about 50% of global crude steel production, as well as in India and ASEAN countries, where further economic growth and expanded production are expected. Internationally transferring and deploying advanced energy-saving technologies already in use in Japan is expected to yield a potential reduction of more than 400 million tonnes of CO_2 worldwide in FY2030, of which Japan's contribution is projected to be approximately 80 million tonnes of CO_2.

JFE Steel has launched JFE Resolus™, a solution business that applies the accumulated manufacturing and operational technologies from steelmaking to address issues faced by a wide range of industries beyond the steel industry. As the business environment and marketplace undergo significant change, we are further enhancing our own manufacturing technologies while providing the JFE Group's technologies and know-how under the JFE Resolus™ brand, working in concert with customers to achieve sustainable growth.

› **JFE Steel's Solution Business** (https://www.jfe-steel.co.jp/en/products/solution/)

FOCUS Key Factor (5) Unstable Raw Material Procurement due to Increased Occurrence of Climatic Hazards

Unstable material procurement Physical risk

Short term (2027) **Medium term (2035)** **Long term (2050)**

JFE Steel is taking multiple precautions against the risk of instability in the procurement of steelmaking raw materials associated with climate change. In Australia, a source of our major raw materials, the frequency of cyclones is expected to increase in the future, and our ability to supply steel products could be impacted if production and shipping operations are suspended for an extended period, resulting in a depletion of our raw material inventories. To address this risk, we are strengthening alternative procurement channels and diversifying raw material sources. Specifically, we are gaining flexibility by conducting spot procurement from Chinese port inventories, increasing procurement from nearby sources such as Indonesia, and using multiple loading ports in Australia. We are also mitigating risks of supply interruptions by stockpiling raw materials at Philippine Sinter Corporation, a Group company, and using external yards. In addition, in FY2025, JFE Steel acquired a 10% interest in the Blackwater coal mine owned by Australian steelmaking coal supplier Whitehaven Coal Limited. This is a key means for securing the stable procurement of high-quality raw materials amid increasing difficulty in developing or expanding new steelmaking coal projects.

As the decarbonization of steelmaking processes is expected to foster the diversification of required raw materials, we will continue developing and diversifying procurement sources for those materials with due consideration for climate change risks.

FOCUS Key Factor (6) Damage to Production Bases and Offices Caused by Climatic Hazards

Damage to manufacturing bases from typhoons, heavy rain, and drought Physical risk

Short term (2027) **Medium term (2035)** **Long term (2050)**

We are taking action to minimize damage with the assumption that typhoons and heavy rains will become stronger and that the incidents of disasters comparable to the torrential rain in Western Japan in 2018 will rise. JFE Steel has already implemented flood and drought countermeasures at production sites to minimize the impact of climate-related hazards, and at this point, no significant impacts are anticipated.

Specifically, we have invested approximately 6.5 billion yen in flood disaster prevention at steelworks and completed upgrades to drainage facilities and other precautions. In addition, we have invested approximately 3.5 billion yen in drought countermeasures and introduced seawater desalination equipment at several steelworks. Since the drought disaster of 1994, no severe comparable events have occurred, and we are confident that existing countermeasures are sufficient to maintain stable operations even if their frequency increases.

Furthermore, since all of our steelworks are located along the coast, inundation risks from rising sea levels must also be taken into account. However, the anticipated sea level rise of about 20–30 cm by around 2050 (70 cm by 2100 at the extreme impact of climate change) is not at the scale at which storm surge inundation would occur. Going forward, we will continue to analyze the status of climate-related hazards and strengthen required countermeasures.

FOCUS Key Factor (7) Resilience to Physical Risks

Expansion of business opportunities for infrastructure strengthening and disaster prevention and mitigation measures

Opportunity

Short term (2027) Medium term (2035) Long term (2050)

The JFE Group takes seriously the increased frequency and severity of recent climatic hazards in Japan and overseas. Having one's daily life put in danger is a huge risk. It is our mission to contribute to national resilience and disaster prevention and mitigation measures to maintain vital infrastructure that is essential to daily life and economic activities.

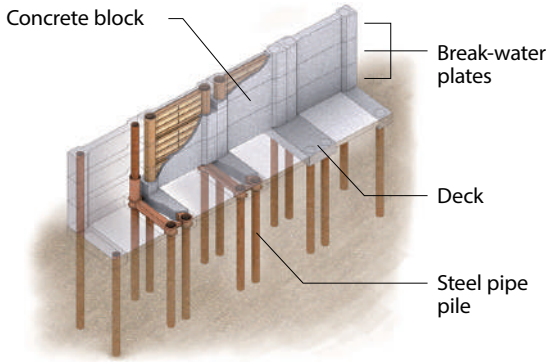
The JFE Group is able to draw upon its collective strengths to contribute in many ways—for example, by protecting key structures from earthquakes using structural steel such as high-strength H-shaped steel and steel pipe piles as well as steel sheet piles, reinforcing embankments that are prone to bursting, and providing disaster prevention products such as hybrid tide embankments and permeable steel slit dams. Our engineering business can also handle a wide range of infrastructure construction projects, including bridges, gas, water and sewage, and pipelines.

JFE Group Products that Contribute to Climate Change Adaptation

- Hybrid Tide Embankments

Hybrid tide embankments are made of steel and concrete. Because of their hybrid structure, they require shorter construction time and less space.

Concrete blocks for hybrid tide embankments are precast at a JFE Group factory, while steel pipe piles for foundations are installed at the construction site, thereby reducing the time required for on-site construction by about 60%. This arrangement does not require large amounts of materials, equipment, or workers on site, so it does not interfere with other construction work. Furthermore, compared to a conventional embankment structure, the land area occupied by the embankment can be reduced by about 80%, saving considerable space.



Cross section



Hybrid tide embankments

› **JFE Engineering: Hybrid Tide Embankments (Japanese only)** (https://www.jfe-eng.co.jp/products/bridge/steel-structure03.html)

Permeable Steel Slit Dams

A permeable steel slit dam is a steel pipe structure installed in a river to trap debris flows. Made of strong steel pipes to withstand the impact of driftwood and huge debris, it has large openings to let water and sediment to pass through, which prevents the water level from rising upstream during floods and also ensuring that debris does not flow downstream. Since it does not block the flow of water, unlike a dam, it can be shaped to the slope of a riverbed to protect the ecosystem. The JFE Group is working to expand the use of permeable steel slit dams by reducing installation costs and shortening the construction period through structural innovations.



Permeable steel slit dams

› **J Slit Dam – JFE Metal Products Corporation** (https://jfe-kenzai.co.jp/en/products/j-slit-dam/)

Terre Armée Method

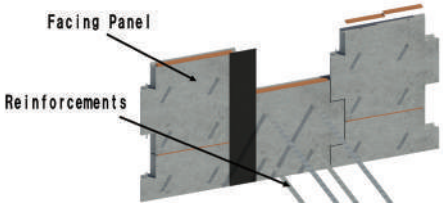
The Terre Armée method involves reinforced soil wall construction in which layers of steel reinforcements are laid within an embankment to create a vertically strong structure with excellent earthquake resistance. The robust yet flexible structure formed by interaction between the embankment and the reinforcements helps suppress sediment-related disasters from increasingly severe natural hazards (heavy rainfall and major earthquakes) and supports the maintenance of critical lifelines.

JFE Shoji Terre One Corporation, a subsidiary of JFE Shoji, will continue to contribute to building disaster-resistant roads and communities by promoting the Terre Armée method and expanding sales of other products that contribute to disaster prevention and mitigation and strengthen national resilience.





Exterior view of a Terre Armée structure



Internal structure of the Terre Armée method

› **JFE Shoji Terre One Corporation: Terre Armée Method (Japanese only)** (https://www.terrearmee.com/terrearmee/)

Links to Information about the JFE Group Environmental Vision for 2050 and Climate Change Scenario Analysis

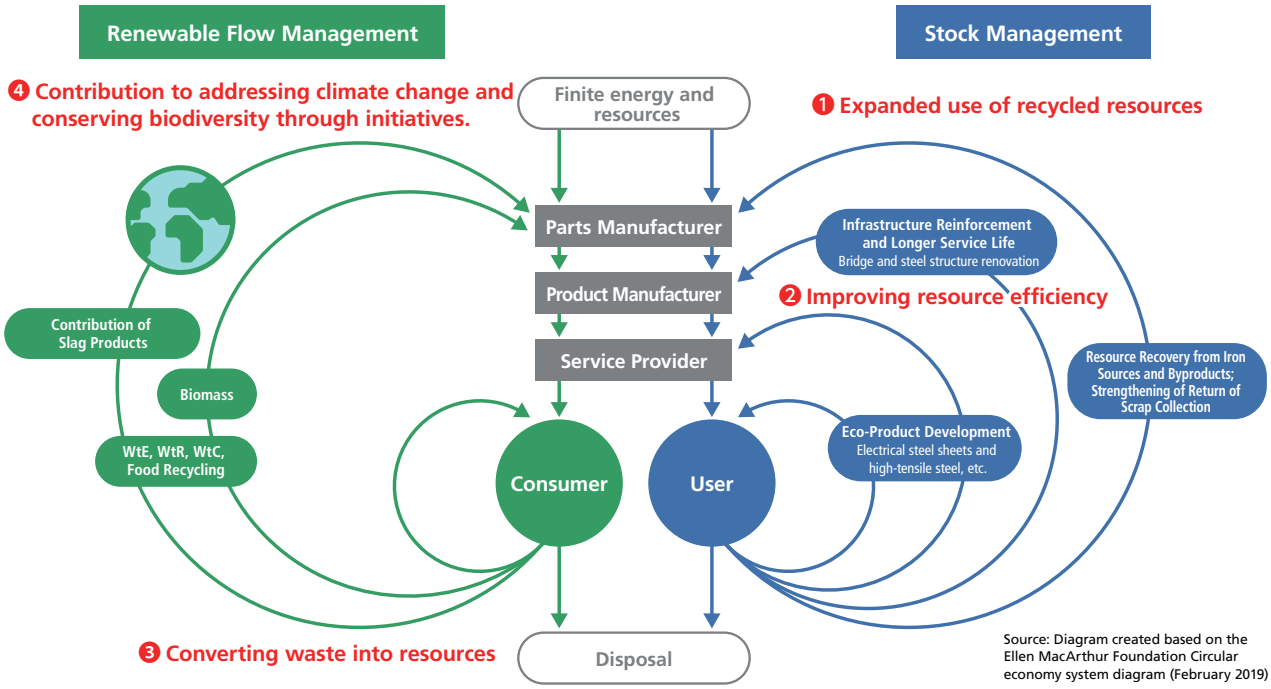
› **Commitment to a Low Carbon Society: Policy Engagement** (P. 89)
› **Targets and Results Related to Climate Change: FY2025 KPI Results and FY2026 KPIs** (P. 19)
› **Initiatives on Climate Change: Initiatives to Address Climate Change** (P. 49)

Initiatives to Transition to a Circular Economy

Basic Policy

The JFE Group views transition to a circular economy as indispensable for realizing a sustainable society, and we are taking action to shift the overall economic system of society from a conventional linear economy to a circular economy. In these efforts, we are using digital technologies and collaborating with government, municipalities, and customers throughout the value chain, extending beyond the Group's framework. We will focus on reducing resource use, improving resource-use efficiency, and reducing waste while also strengthening our activities from three perspectives: converting byproducts and waste into resources, developing eco-product/eco-solution technologies with high resource efficiency, and expanding the use and sales of recycled resources. These activities will also contribute to addressing environmental issues such as climate change and biodiversity conservation.

Circular Economy Concept and Initiatives



Source: Diagram created based on the Ellen MacArthur Foundation Circular economy system diagram (February 2019)

Iron is easily recovered, highly recyclable, and can be infinitely recycled as raw material for the same steel products. The JFE Group is also recovering and using steel scrap as well as developing initiatives for transitioning to a circular economy.

Our steel business is promoting the use of recycled resources by effectively using byproduct resources such as dust, sludge, and slag generated in the steelmaking process and using waste plastics as blast furnace raw materials. We are also improving resource efficiency by providing high-quality, high-performance steel products.

Our engineering business is delivering solutions for resource circulation by constructing plant and infrastructure facilities such as biomass fuel plants for food waste and sewage sludge, and waste-to-energy plants, as well as operating and managing these facilities on consignment. In addition, we are promoting a circular economy through recycling businesses for PET bottles and plastics, and energy supply businesses.

Our trading business is procuring environmentally sound materials such as biomass fuel by drawing upon our supply chain management network.

In addition, all of the JFE Group's major production sites in Japan, comprising seven JFE Steel sites and three JFE Engineering sites, have established water management plans and monitor water intake and discharge volumes and recycling volumes in order to manage water resources and reduce environmental impact. Since the steelmaking process consumes large volumes of fresh water for cooling and cleaning products and facilities, the efficient use of water resources, taking into account the impact on water sources and surrounding stakeholders, is a key issue. In response, we are reducing water intake by building systems to purify and recycle used water as much as possible at steelworks. We are also raising employee awareness of water conservation and continuously minimizing environmental impact through reduced and more efficient water use.

Furthermore, we place priority on maintaining a safe and sanitary water environment in the areas surrounding our manufacturing sites, implementing measures to protect water quality to have the least possible impact on local water resources, and actively preserving the living environment of local residents.

For details on the recycling businesses of JFE Steel and JFE Engineering, please see:

› **List of JFE Group Recycling Businesses in Japan** (https://www.jfe-holdings.co.jp/en/common/pdf/sustainability/environment/resource/resource01.pdf)

Endorsing and Participating in External Initiatives

To accelerate the transition to a circular economy, JFE Holdings participates in the Japan Partnership for Circular Economy (J4CE), established by the Ministry of the Environment, the Ministry of Economy, Trade and Industry, and the Japan Business Federation. J4CE is a public-private platform through which companies, industry associations, municipalities, government agencies, and other organizations collaborate to foster understanding of the circular economy, share best practices, and promote collaboration among businesses.

Within the JFE Group, J&T Recycling Corporation, a member of the JFE Engineering Group, also participates in J4CE and is advancing initiatives to promote a circular economy, drawing on its expertise in waste treatment and resource circulation. Through its participation in J4CE, the JFE Group will apply its knowledge of domestic and international policy and technology trends and best practices related to resource circulation, communicate its recycling and resource-circulation initiatives, and contribute to building a recycling-oriented society through collaboration with diverse stakeholders.



› **Japan Partnership for Circular Economy** (https://j4ce.env.go.jp/en)

JFE Group Strategy for Transition to a Circular Economy

To accelerate the transition to a circular economy, we believe it is important to establish mechanisms that optimize resource circulation across society by linking arterial industries that supply materials and products with venous industries responsible for collection and recycling. This will require not only collaboration among companies but also the development of rules, infrastructure, and market conditions involving government agencies and municipalities. The JFE Group will advance initiatives to enhance resource circulation through dialogue and collaboration with relevant stakeholders.

The JFE Group also views the circular economy as more than merely an effort to reduce waste and use resources efficiently; it represents a growth opportunity for creating new value from recycled materials and circular resources. Expanding the use of recycled resources and enhancing their functionality will increase the environmental and GX value generated through resource circulation while contributing to the creation of sustainable materials and product markets.

In addition, amid rising geopolitical risks and growing demand for critical minerals, resource circulation is becoming increasingly important not only for addressing environmental issues but also from the perspective of economic security. By effectively using recycled resources and developing resource-circulation networks, the JFE Group will contribute to reducing dependence on natural resources and securing stable supplies of resources, thereby supporting the development of resilient social infrastructure.

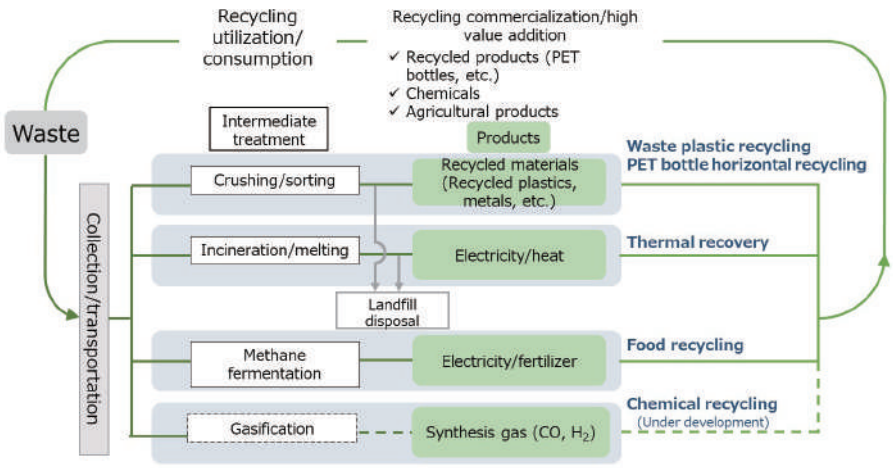
Conversion of Byproducts and Waste into Resources

The JFE Group incorporates the circular economy concept into its business activities to ensure the responsible use of limited resources, reduce environmental impact, and realize a sustainable society. In particular, we are reusing byproducts and waste as new resources as ways to circulate resources and minimize waste.

EN Building a Recycling Value Chain

As one of Japan's leading companies capable of providing one-stop solutions from the collection and transportation of waste to the intermediate treatment and recycling of recovered products, JFE Engineering is striving to establish a recycling value chain, including collaboration with partner companies and municipalities.

Recycling Value Chain



We are engaged in waste-plastic recycling, horizontal recycling of PET bottles, thermal recovery, food recycling, and chemical recycling.

We also support new regional power companies that locally produce and consume energy derived from waste, including electricity generated from waste-to-energy facilities and biogas power generation through food recycling (P. 72). For JFE Engineering, this is an important initiative for the circular economy as well as carbon neutrality.

EN Promoting Plastic Recycling

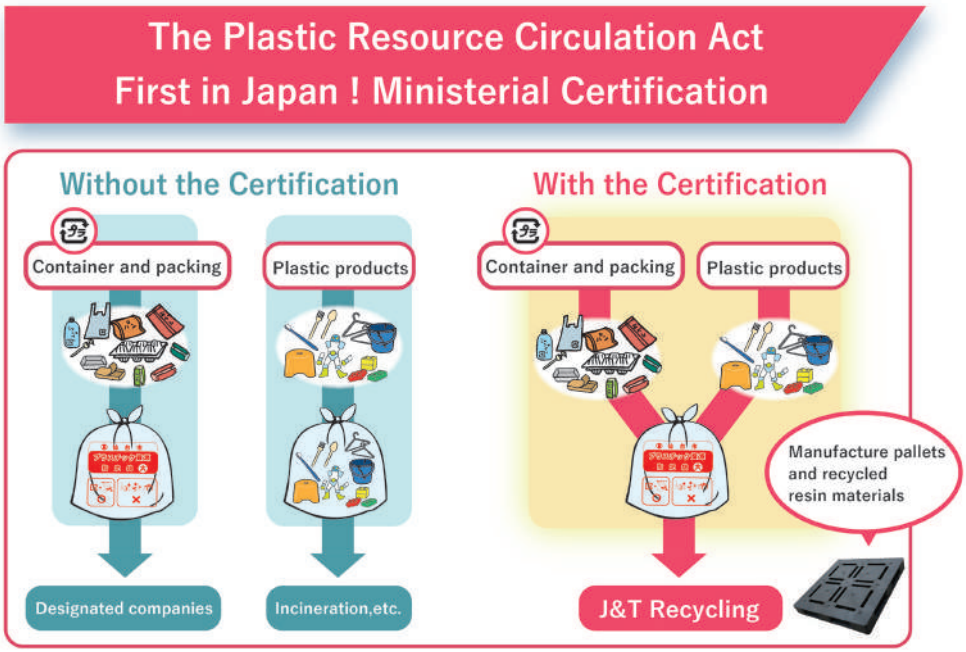
J&T Recycling Corporation joined the recycling plan formulated by Sendai City under the Plastic Resource Circulation Act in September 2022 and, for the first time in Japan, obtained certification from both the Minister of the Environment and the Minister of Economy, Trade and Industry. Following this, in April 2023, the company launched the integrated collection of plastic products. In Sendai, product plastics that had previously been incinerated can now be collected with plastic containers and packaging for more efficient recycling.

In July 2023, J&T Recycling Corporation and the JR East Group jointly established J Circular System Corporation in Kawasaki, Kanagawa Prefecture to promote plastic recycling in Japan. This facility, one of the largest in Japan, can process 200 tonnes of used plastics per day and is set up to handle the entire process, from sorting to recycling into new products. The plant began full-scale operation in April 2025 and can directly accept unsorted used plastics collected by municipalities and businesses. This makes it possible to recycle used plastics that had previously been incinerated because they were difficult to sort. The collected used plastics are subjected to advanced sorting and, depending on their characteristics, are recycled through material recycling or chemical recycling in collaboration with nearby recycling businesses, thereby enhancing resource circulation.

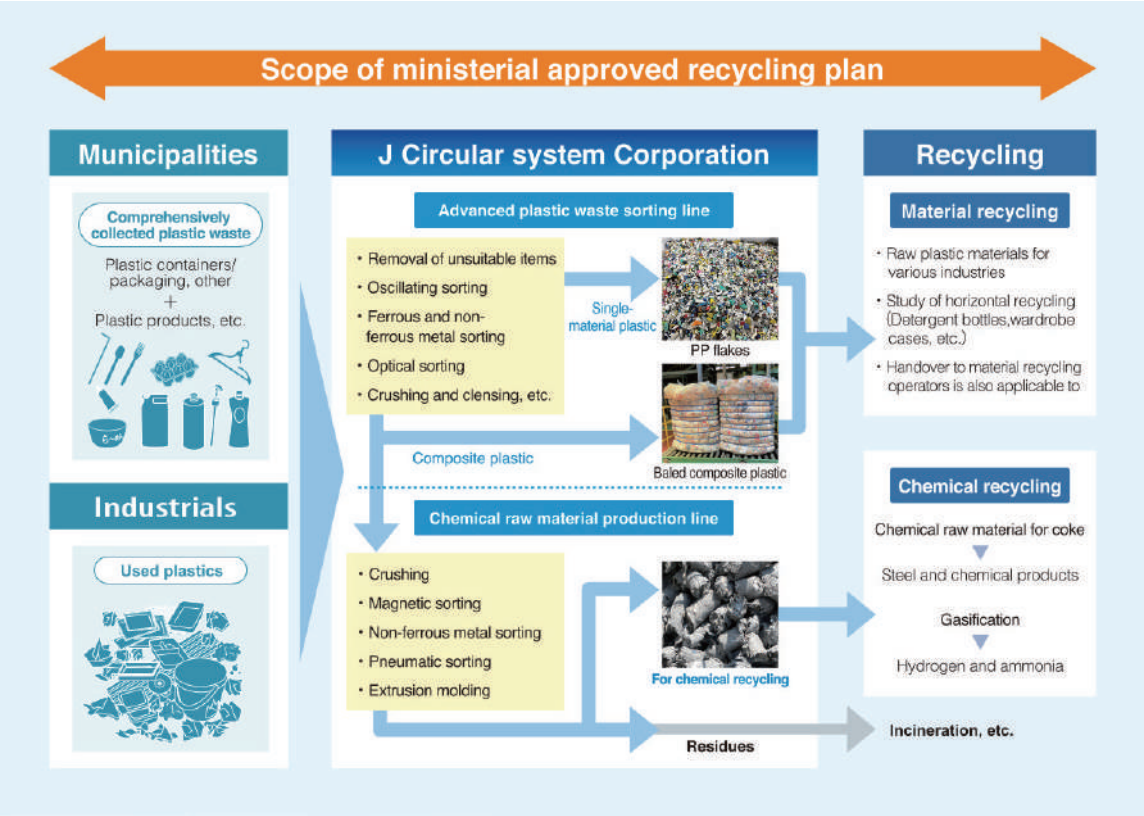
At present, recycling plans formulated under the Plastic Resource Circulation Act by Kawasaki City, Fujisawa City, Yokosuka City, and Ota Ward have received ministerial certification, and this is the first case in Japan where certification has been obtained through the collaboration of multiple municipalities and recycling businesses. With this certification, a large portion of the used plastics separated and collected as household waste from municipalities and citizens can now be recycled at this facility.

With its unprecedented recycling system, J Circular Systems aspires to become a forerunner in advanced plastic resource circulation and in promoting decarbonization while contributing to the realization of a sustainable, recycling-oriented society.

Ministerial Certification of the Recycling Plan in Sendai City



Scope of Municipal Recycling Plans Related to J Circular Systems





J Circular Systems Kawasaki Super Sorting Center

- **Japan's First! J&T Recycling Corporation Participates in Sendai City's Plastic Waste Recycling Project**
  (https://www.jt-kankyo.co.jp/en/topics/2022/10/20221003.html)
- **Full-Scale Operation Begins at J Circular Systems, One of Japan's Largest Plastic Recycling Facilities, Recycling Used Plastics from Residents of Three Municipalities in the Tokyo Metropolitan Area (Japanese only)**
  (https://www.jfe-eng.co.jp/news/2025/20250313.html)

EN Horizontal Recycling of PET Bottles

Kyoei J&T Recycling Corporation*1, a subsidiary of J&T Recycling Corporation, launched its flake manufacturing plant in October 2021 and completed its pellet production line in April 2022 to begin full-scale commercial operation. Its bottle-to-bottle (B-to-B) technology facilitates repeated recycling (closed-loop/horizontal recycling) an unlimited number of times, achieving a 63% reduction in CO_2 compared to the production of PET bottles from crude oil (calculated by Mitsubishi UFJ Research and Consulting Co., Ltd.), and was included as an example*2 of addressing resource and environmental constraints in the White Paper on Manufacturing Industries (Monozukuri) 2010, published by the Ministry of Economy, Trade and Industry.

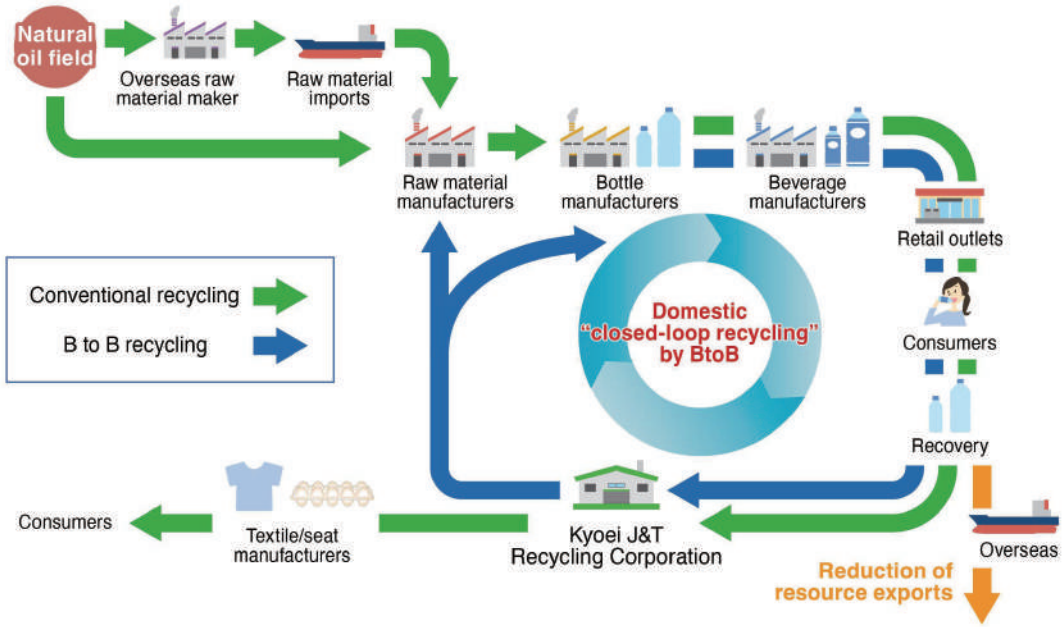
Beverage manufacturers and retailers are pursuing a variety of ways to boost the recycling rate of PET bottles (B-to-B). In response to these needs, the B-to-B business of Kyoei J&T Recycling significantly contributes to realizing a circular economy and reducing CO_2 emissions by curbing the use of natural resources.

*1 A joint venture of J&T Recycling Corporation and Kyoei Sangyo Co., Ltd.
*2 By Kyoei Sangyo Co., Ltd.



Exterior of the West Japan PET Bottle MR Center

Horizontal Recycling Flow of PET Bottles



> **Kyoei J&T Recycling Corporation's West Japan PET Bottle MR Center Begins Full Commercial Operations**
(https://www.jt-kankyo.co.jp/en/topics/2022/04/20220421.html)

> **Establishment of Joint Venture between J&T Recycling Corporation and Kyoei Sangyo Co., Ltd. — Construction of Japan's Largest PET Bottle Recycling Resin Plant Contributing to the Shift to B-to-B (Japanese only)**
(https://www.jfe-eng.co.jp/news/2020/20200507.html)

EN Construction and Operation of Waste-to-Energy Plants Overseas (Thermal Recovery)

JFE Engineering and the Thuan Thanh Environment Joint Stock Company*1 (TT) jointly established T&J Green Energy Company Limited (T&J) to conduct a waste-to-energy business in Bac Ninh Province, Vietnam.

After the establishment of T&J, JFE Engineering was responsible for plant design, construction, and operation, while TT handled the obtaining of permits and approvals, securing the plant site, collecting and transporting waste for incineration, and treating incineration ash. The waste-to-energy plant incinerates 500 tonnes per day of municipal and industrial waste and has a power output of 11.6 MW. Electricity generated, excluding power consumed on site, is sold to Vietnam Electricity Corporation under the feed-in tariff (FIT) system.

Funding for the construction and operation of the T&J plant was provided through the equipment subsidy program under the Japanese government's Joint Crediting Mechanism (JCM), together with loans from the International Finance Corporation (IFC) of the World Bank Group and the Finland–IFC Blended Finance for Climate Program.*2

This financing package was based on recognizing the project's proper waste treatment and an expected reduction of approximately 600,000 tonnes of GHG emissions over 15 years. The project was implemented in cooperation between the governments of Vietnam and Japan. Both companies plan to use this project as a starting point for launching similar efforts.

Drawing from the JFE Engineering Group's experience in the construction and operation of waste treatment plants, we will continue to contribute to the realization of a resource-recycling society by promoting business planning, construction, and operation in this field in Japan and overseas.

*1 A major recycling company in Vietnam is comprehensively engaged in waste incineration and other recycling businesses.
*2 Refinanced by a local bank at present.



Waste-to-energy facility in Bac Ninh Province, Vietnam

EN Recycling Food Waste

J&T Recycling Corporation aims to create locally produced and locally consumed resource-circulation systems and operates food recycling power generation businesses* at six locations nationwide.

Recycling rates tend to decline further downstream in food distribution. One reason is that food waste generated by downstream industries often contains foreign materials such as containers, disposable chopsticks, and toothpicks. The food-recycling systems promoted by J&T Recycling can process food waste containing such materials, which was previously considered difficult to recycle, thereby helping to raise the recycling rate of the industry as a whole.

The basic treatment flow is common to each plant: food waste is converted into methane through microbial action, and the resulting biogas is used as fuel to generate electricity with gas engines. We have used this system to establish two recycling loops, one for electricity and one for agriculture.

The electricity recycling loop returns electricity generated from food waste to waste generators. Under a power purchase agreement between waste generators and Urban Energy Corporation (UEC), JFE Engineering's electricity-retailing subsidiary, waste generators receive renewable energy equivalent to the electricity generated from their food waste. They can also use Soudenwari™, a service that provides a discount on electricity charges equivalent to the electricity generated based on the volume of waste accepted.

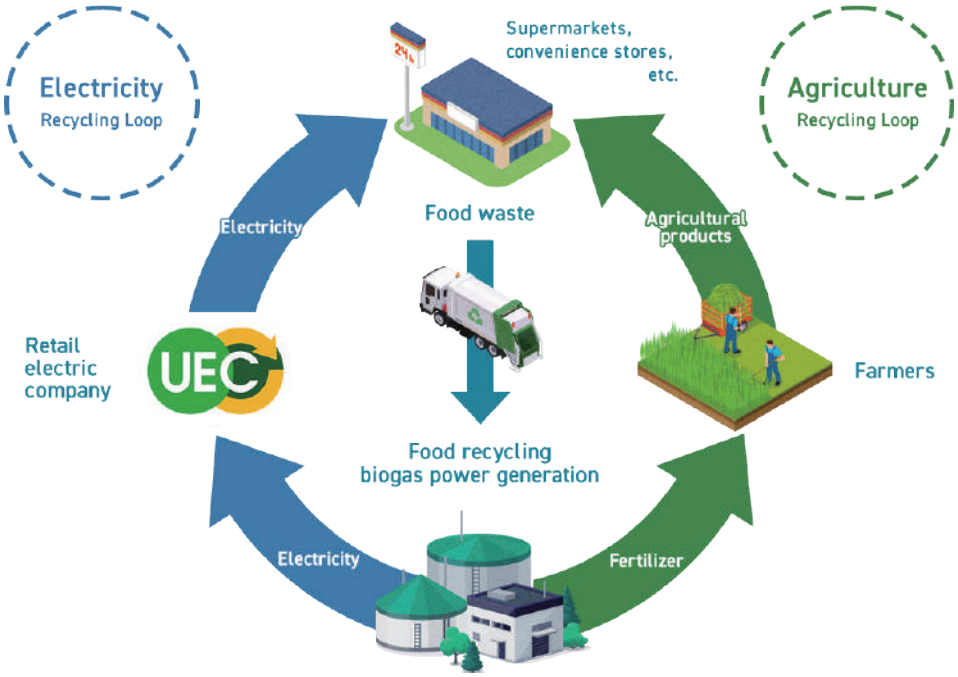
In the agricultural recycling loop, farmers use the residue generated during fermentation as fertilizer, and the crops grown with that fertilizer are in turn used by the waste generators. Food waste generated by those businesses is subsequently treated again by J&T Recycling, completing the cycle.

J&T Recycling aims to realize a Regional Circular and Ecological Sphere by promoting a double recycling loop that combines the electricity recycling and the agricultural recycling loops.

The JFE Engineering Group will continue to work with local communities to promote improved food recycling rates and local production and consumption of renewable energy, contributing to the realization of a recycling-based society.

› ***Food recycling business of the J&T Recycling Group** (https://www.jt-kankyo.co.jp/en/business/#sec03)

Double Recycling Loop: Creating Renewable Energy and Fertilizer from Food Waste





Food recycling power generation plant (J Bio Food Recycling)

EN Development of a Waste Chemical Recycling Technology (C-PhoeniX Process™) through the Use of the Green Innovation Fund

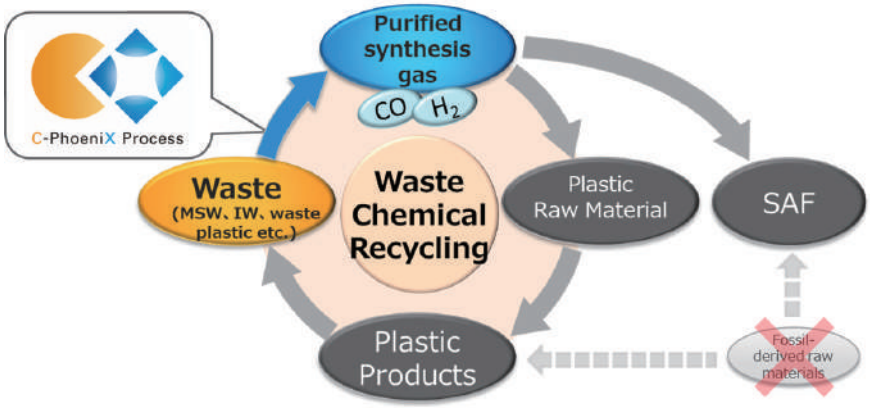
In February 2024, JFE Engineering was selected as an implementing organization for NEDO's Green Innovation Fund Project, "Achieving Carbon Neutrality in the Waste and Resource Circulation Sector."*1 Following more than two decades of trial and error, JFE Engineering established a technology to gasify a wide range of waste, including municipal waste. The company has the world's only long-term operational record for this technology. It is currently developing a new gasification technology, C-PhoeniX Process™ (or CX Process™), to further improve the technology toward achieving carbon neutrality. The C-PhoeniX Process™, based on the company's accumulated technological expertise, maintains the ability to process waste reliably while enhancing its capability to stably produce high-quality, purified synthesis gases, consisting primarily of hydrogen and carbon monoxide, from a wide range of waste materials. Once established, this technology will be applicable to the waste-to-chemical (WtC) process, enabling many types of waste to be recycled for different purposes, including the production of plastic, sustainable aviation fuel (SAF), and hydrogen.

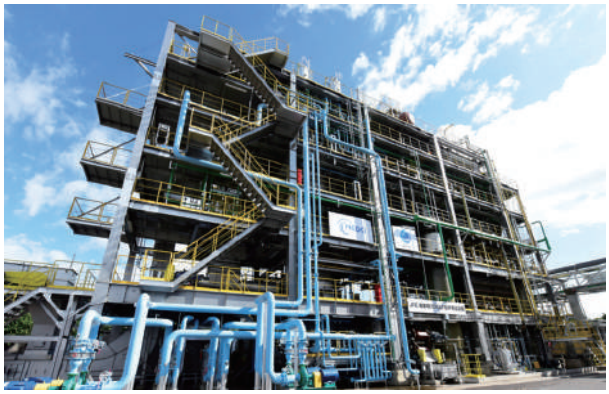
Under this Green Innovation Fund project, demonstration testing using a small-scale furnace (20 tonnes/day) began in December 2025,*2 and steady progress has been made with the new gasification technology. Building on the results of this demonstration, we plan to conduct a large-scale demonstration combining technology for producing purified synthesis gas from waste with technology for producing high-value-added chemicals from the gas. With government support, we will further accelerate development and social implementation of the entire WtC process in addition to the C-PhoeniX Process™. JFE Engineering aims to complete the development by FY2030 and deploy it in Japan as well as overseas, thereby contributing to the achievement of carbon neutrality by 2050.

› ***1 NEDO launches its Green Innovation Fund Projects to Achieve Carbon Neutrality in the Waste and Resource Circulation (Japanese only)** (https://www.nedo.go.jp/news/press/AA5_101724.html)

› ***2 Demonstration Testing Begins to Convert Waste into Chemical Feedstock Using an Innovative Gasification and Reforming Process** (https://green-innovation.nedo.go.jp/en/article/resource-circulation/)

Overview of Waste Chemical Recycling





Small-scale demonstration facility

› **Developing the Advanced Waste-to-Chemical Gasification Process, the "C-PhoeniX Process™" Towards Practical Use in Society** (https://www.jfe-eng.co.jp/en/news/2024/20240207.html)

ST Utilization of Byproducts Generated in the Steelmaking Process (Dust, Sludge, Slag)

JFE Steel carefully controls the generation and emission of iron and steelmaking slag (a co-product), iron dust from blast furnaces and converters, sludge from water treatment facilities, and other co-products by setting targets to improve recycling rates. Dust and sludge with high iron content are recycled as raw materials for steelmaking. Iron and steelmaking slag is effectively recycled for reuse in cement and other construction materials. The company is also promoting its use as environment recovery material such as Marine Stone™, which works effectively as a base for the adhesion of organisms and for improving the marine environment. As a result of these efforts, it achieved a 99.6% recycling rate for dust, sludge, and slag in FY2025, fulfilling the target of at least 99%, and it remains committed to consistently achieving the target.

For more quantitative data related to co-products, please refer to:
› **Environmental Data** (P. 273)

Contribution of Steel Slag Products

Many steel slag products are designated as specified procurement items (products that contribute to the reduction of environmental impact) for public works under the Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Act on Promoting Green Procurement), which came into force in 2001 to protect the natural environment.

To realize a circular economy, JFE Steel has set a target under the Eighth Medium-term Business Plan (FY2025–FY2027) for using a cumulative total of 320,000 tonnes of steel slag products for marine applications, in order to contribute further to the conservation of natural resources (sand and stone). We will further expand this effort. Actual usage was 78,000 tonnes in FY2025.

● Calcia Improvement Material

Calcia improvement material is a slag product that uses converter-type steelmaking slag as raw material and is manufactured by controlling the composition and adjusting particle size. Dredged soil mixed with calcia improvement material is called calcia improved soil, which is stronger than the original weak dredged soil and is therefore able to prevent dredged soil from dissipating into the surrounding area and having a negative environmental impact when placed in water. As a construction material for infrastructure development, it can be applied to landfill materials and other uses, enabling the effective use of dredged soil. Calcia improved soil has been used as material for a mid-section submerged breakwater*1 (Shin Honmoku Pier, Port of Yokohama), backfill material for earthquake-resistant quay walls (Fukuyama Port Minooki district quay wall construction project), and soil for bank protection (Tokyo new landfill site development project).

Calcia-improved soil can also be used for creating shallow waters and tidal flats and backfilling deep excavated holes, as a technology that can restore marine environments.*2

*1 An embankment built under the water surface on the inside of a perimeter wall to divide the land into sections for reclamation.

› ***2 Biodiversity Conservation and Nature Positive** (P. 154)

Calcia Improvement Material and Calcia Improved Soil





Example of calcia improvement soil application (landfill material)

Steel Slag Hydrated Matrix

Steel slag hydrated matrix is a slag product that can be used as a substitute for concrete but uses ground granulated blast furnace slag instead of cement, and steelmaking slag instead of natural gravel and sand aggregate, as its ingredients. It effectively uses steel slag and does not rely on natural aggregate, thereby reducing environmental impact, and uses less cement, in turn reducing CO_2 emissions.

There are many examples of blocks and artificial stones made from steel slag hydrated matrix being used as a substitute for concrete blocks and natural stones in harbor works, apart from the expected application for scour-prevention at the growing number of offshore wind-power stations to be constructed in the near future. In addition, we are conducting on-site monitoring in the Katsunan Central Zone of Chiba Port with the help of a local fishing association and have confirmed benefits for biodiversity.



Block made from Steel Slag Hydrated Matrix (wave-dissipating and foot protection block)

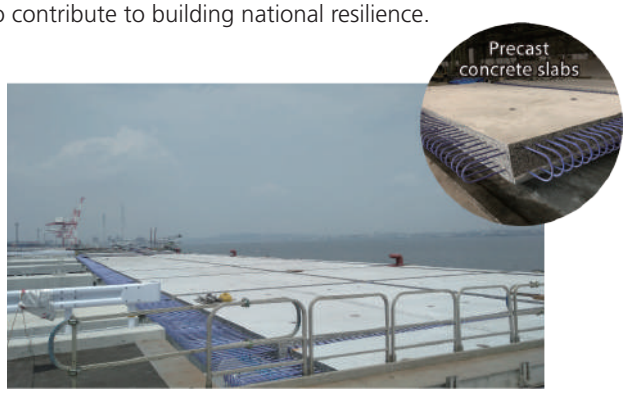


Artificial stones made from steel slag hydrated matrix

Precast Concrete Products Mixed with Blast Furnace Slag Fine Aggregate

Blast furnace slag fine aggregate, which hardens like cement, can be used in concrete. This type of concrete exhibits significantly higher durability under harsh conditions such as applications in sewers and exposure to anti-freeze agents. Its effectiveness in reducing environmental impact is widely understood, although there has recently been growing interest in its practical applications for concrete constructions that require higher durability.

As one of the deliverables for the Japanese government's Strategic Innovation Promotion Program, the Japan Society of Civil Engineers published a draft guideline in March 2019 on the application of blast furnace slag fine aggregate to precast concrete products, and its application now includes precast concrete slabs installed in highways and piers. With the application of blast furnace slag fine aggregate in concrete, the durability of precast products is expected to be greater and their quality more consistent, allowing them to contribute to building national resilience.



Precast concrete slabs mixed with blast furnace slag fine aggregate installed in piers

Granulated Blast Furnace Slag

Granulated blast furnace slag, when ground to a fine powder and used to replace part of ordinary Portland cement, reduces the amount of limestone, crushed stone, and sand used, saves energy, and can also reduce CO_2 generated in cement production. For example, blast furnace cement made by replacing 45% of ordinary Portland cement with granulated blast furnace slag reduces CO_2 emissions per tonne of cement produced by 42%. In FY2025, JFE Steel supplied approximately 5.72 million tonnes of granulated blast furnace slag to cement production, equivalent to a reduction of about 4.05 million tonnes of CO_2 emissions.

CO_2 Emissions for Producing 1 Tonne of Cement (Unit: kg- CO_2/tonne)

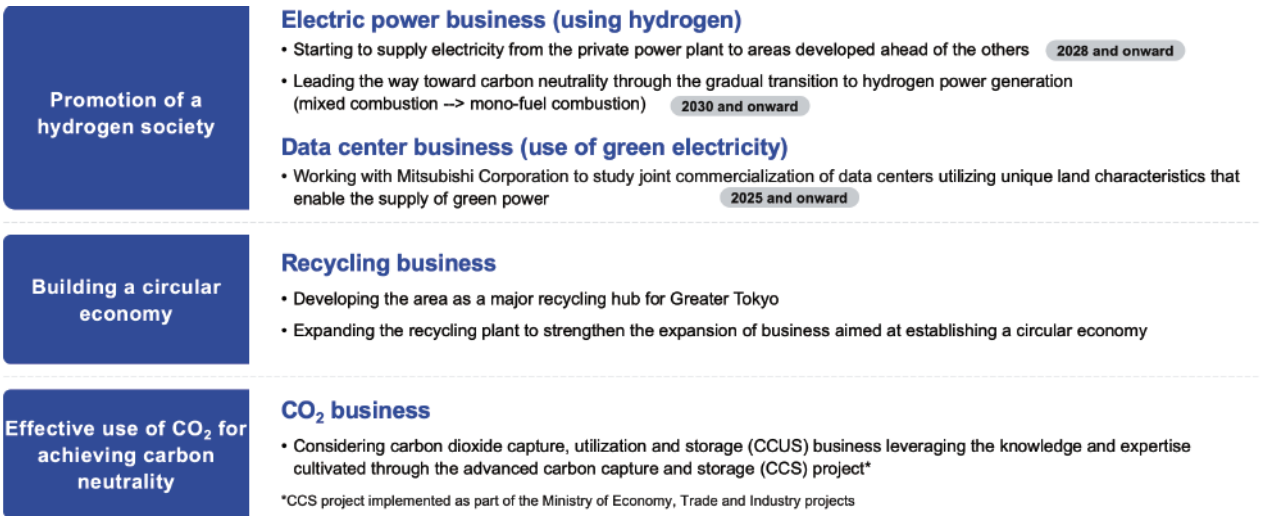
CO_2 Emissions Source	Ordinary Portland Cement	Blast Furnace Slag Cement
Limestone	476	270
Electricity/energy	283	170
Total	759	440

Source: Data published by the Japan Cement Association in 2022, and "Environmental Materials" published by the Nippon Slag Association

Initiatives for Realizing a Circular Economy in the Keihin Waterfront Area

Taking advantage of its proximity to Tokyo, the Mizue district is collaborating with Kawasaki City in expansion and development to create a major recycling hub for the metropolitan area. J&T Recycling Corporation, a group company of JFE Engineering, partnered with JR East and others to establish J Circular System Corporation in a pioneering project to construct the J Circular Systems Kawasaki Super Sorting Center as one of the largest plastic recycling facilities in Japan. Full-scale operations commenced in April 2025. Going forward, we will continue to promote businesses toward realizing a circular economy through the expansion and development of the recycling area.

Keihin District Land Business Utilization (from Materials of the Eighth Medium-term Business Plan)



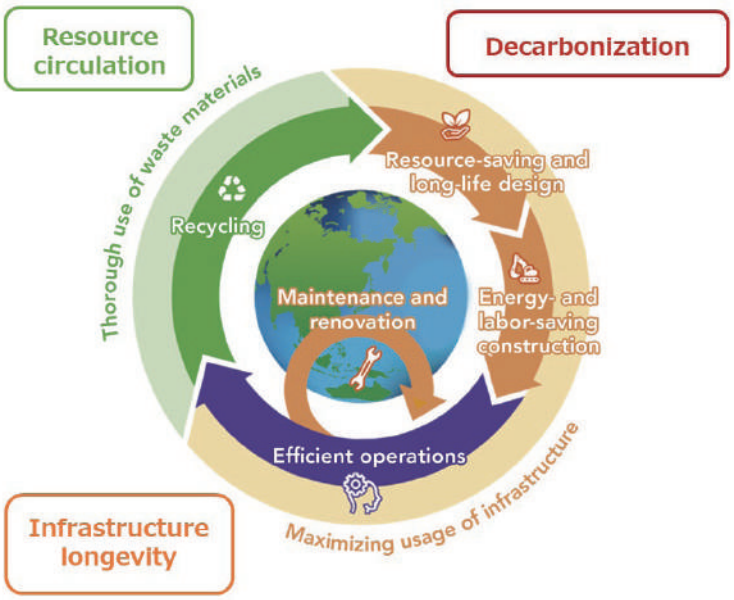
Development of Resource-Efficient Eco-Products and Eco-Solutions

The JFE Group is developing and providing resource-efficient products and services to support the realization of a circular economy. We are deploying eco-products designed from the perspective of the entire life cycle and eco-solutions that create circular value to reduce environmental impact and effectively use resources.

EN Infrastructure Reinforcement and Longer Service Life

JFE Engineering is leveraging its diverse business portfolio to promote multifaceted efforts for transitioning to a circular economy. In the infrastructure field, we are helping to realize a sustainable society through projects that maximize the useful life of infrastructure through resource-saving and long-life design, energy- and labor-saving construction, and efficient operation through maintenance and renovation.

JFE Engineering Circular Economy



Toward Realizing Bridges with Longer Service Life

Japan's stock of social infrastructure is expected to age rapidly in the coming years. At the same time, declining birth rates, an aging society, and population decline are reducing the available labor force, making it increasingly difficult to secure engineers for infrastructure maintenance. To address this, JFE Engineering is working to lessen the burden of maintenance by using highly durable materials to construct bridges with longer service life.

Technology Allowing for Bridges with Longer Service Life

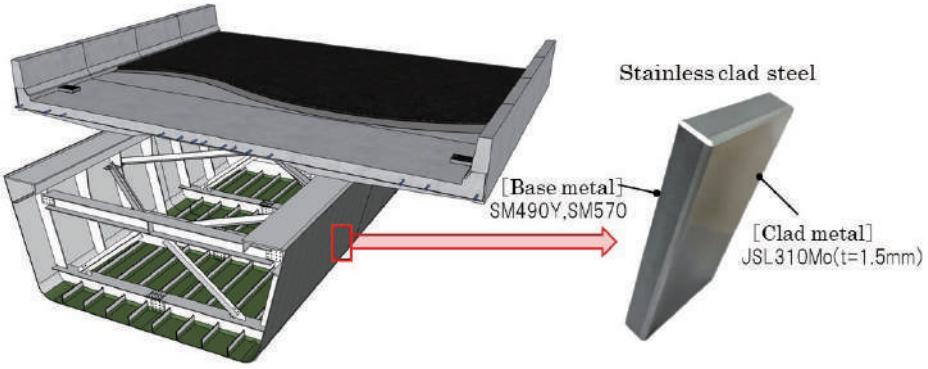
Conventional steel bridges suppress corrosion by using coatings such as paint that must be periodically reapplied. Using highly durable materials that do not need to be coated eliminates the need for reapplications, significantly reducing maintenance tasks associated with ordering, design, construction, and management. Moreover, these bridges demonstrate superior cost savings over a 100-year life cycle compared to painted bridges. We have thus pioneered the use of stainless clad steel for constructing a road bridge.

Stainless clad steel is a steel plate with a two-layer structure, combining ordinary steel (carbon steel) and stainless steel. Stainless steel is placed on the outer surface, which is susceptible to salt damage, while painted carbon steel (base material) is used on the inner surface, which is less susceptible to corrosion. A stainless clad steel bridge is more economical than bridges made entirely of stainless steel and more durable than those made entirely of carbon steel, thereby combining economy and durability.

The clad steel selected for this project uses JSL310Mo, a stainless steel with extremely high corrosion resistance, to extend service life. This seawater-resistant stainless steel was uniquely developed by JFE Steel as a material for clad steel, and JFE Engineering is a pioneer in fabrication and construction technology for steel structures using clad steel. This one-of-a-kind long-life bridge was possible through the combined strengths of the entire JFE Group.

The bridge is currently under construction as part of the replacement work for the Tedori River Bridge on the Hokuriku Expressway, commissioned by Central Nippon Expressway Company Limited.

Bridge Using Stainless Clad Steel



ST Contributing to Extending the Service Life of Steel Structures through FLExB™ Welding, Which Improves Fatigue Resistance

A new welding method developed by JFE Steel to improve the fatigue resistance of steel structures, FLExB™ Welding*1, has been adopted for the first time in the National Route 8 Miyukibashi Bridge Superstructure Widening Project of the Kinki Regional Development Bureau, being constructed by Komaihaltec Inc. FLExB™ Welding is registered with the Ministry of Land, Infrastructure, Transport and Tourism's New Technology Information System (NETIS) (CB-230007-A).

Steel structures used over long periods require lower maintenance and renewal costs as they age. Bridges in particular are repeatedly subjected to traffic loads from automobiles and other vehicles, creating a risk of fatigue damage in the form of fatigue cracks at welded joints. To address this issue, JFE Steel developed a new welding method that improves resistance to fatigue damage at welded joints in bridges and other steel structures. Applying the method to wrap-around welds, such as those on the short sides of gusset plates (reinforcing steel plates), where fatigue cracks tend to occur, improves durability against fatigue damage and contributes to extending structural service life.

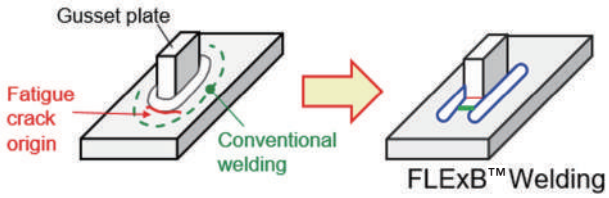
In this project, FLExB™ Welding was applied to gusset plates for lateral bracing*2, where improved fatigue strength is required in steel bridges. This eliminates post-welding surface-treatment processes that were conventionally required to improve fatigue strength and also contributes to lower construction costs.

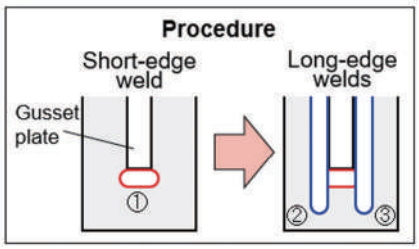
*1 Abbreviation for "fatigue life extended bead welding," a welding method designed to improve resistance to fatigue damage.

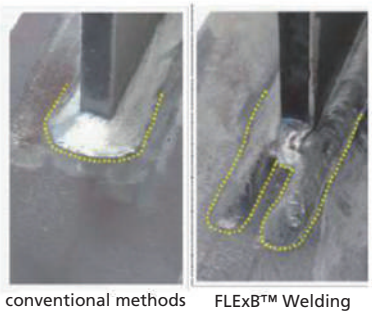
› **FLExB™ Welding Improves Fatigue Resistance of Steel Structures** (https://www.jfe-steel.co.jp/en/products/solution/plates/01-flexb.html)

› **Development of New "FLExB Welding" Method to Improve Fatigue Resistance of Steel Structures (Japanese only)** (https://www.jfe-steel.co.jp/release/2023/07/230724.html)

*2 A member arranged in a horizontal plane to connect main girders or main trusses and primarily resist lateral loads.







conventional methods FLExB™ Welding

ST Electrical Steel Sheets Contributing to Improved Resource-Use Efficiency

Electrical steel sheets* are popularly used as core materials for electrical equipment such as motors and transformers and therefore play a key role in determining their performance. JFE Steel contributes to global energy conservation and consequently to reducing CO_2 emissions by supplying high-performance electrical steel sheets.

*Electrical steel sheets are obtained by adding silicon to iron and are widely used as iron core materials in equipment such as motors and transformers.

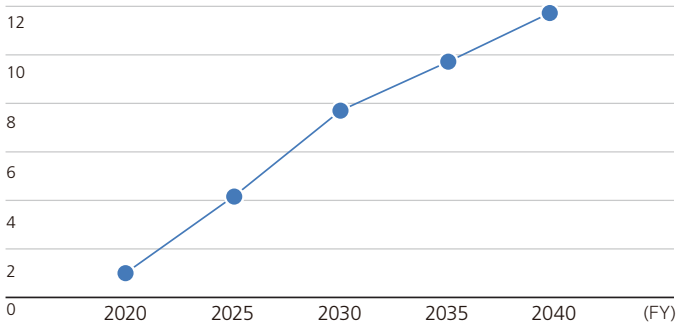
Expansion of Domestic Production Capacity for Non-Oriented Electrical Steel Sheets to Support an Electrified Society

Transitioning to a carbon-neutral society requires a major transformation of the social structure, from fossil-fuel-based energy to primarily carbon-free sources. Highly efficient motors, constructed from high-performance, non-oriented electrical steel sheets, will be essential for transitioning to a society in which mobility depends on electric vehicles (xEVs) and zero-emission electricity is the primary source of energy.

JFE Steel's high-grade non-oriented electrical steel sheets contribute to higher performance xEV drive motors through the improved efficiency of excellent low-iron-loss magnetic properties and reduced size made possible by high magnetic flux density. Recognizing the value of these characteristics has led many automobile manufacturers to incorporate these materials into their products, and demand for high-grade non-oriented electrical steel sheets is projected to expand going forward. To keep pace with this demand, Phase I expansion work to increase capacity for electrical steel sheet production at the West Japan Works (Kurashiki district) was completed as planned in July 2024, and line production began in September. The start-up of this facility has approximately doubled JFE Steel's production capacity for high-grade non-oriented electrical steel sheets (NO).

Demand for high-grade non-oriented electrical steel sheets essential for xEV drive motors is expected to increase further. Phase II expansion work is now underway. This plan is projected to triple production capacity for top-grade non-oriented electrical steel sheets for main xEV motors by FY2026 compared to pre-Phase I levels.

Demand for High-Grade Non-Oriented Electrical Steel Sheets (Calculated by JFE, 2020 results = 1.0)



Expansion of Grain-Oriented Electrical Steel Sheet Production Capacity in India to Improve Resource Efficiency by Supporting High-Efficiency Transformers

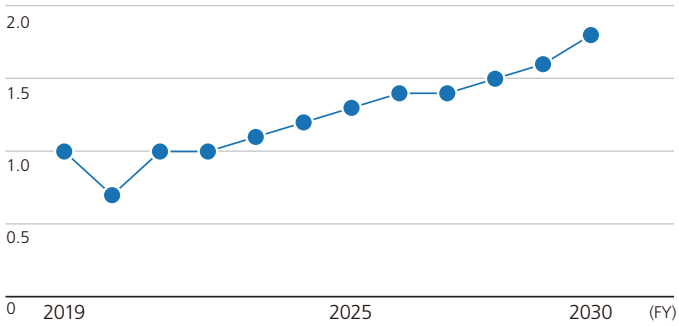
The global demand for grain-oriented electrical steel sheets in transformers is expected to increase due to continuously growing demand for electric power and the expanding adoption of renewable energy. The demand for these steel sheets, particularly in India, is expected to increase to 1.8 times the 2019 level in 2030.

JFE Steel and its strategic alliance partner in India, JSW Steel Limited (JSW), have therefore decided to substantially expand the production capacity of JSW JFE Electrical Steel Private Limited (J2ES Vijayanagar), established in 2023 as a 50:50 joint venture for the manufacture and sale of grain-oriented electrical steel sheets, and JSW JFE Electrical Steel Nashik Private Limited (formerly thyssenkrupp Electrical Steel India Private Limited; J2ES Nashik).

In this expansion plan, we will double the manufacturing capacity of the J2ES Vijayanagar site from the initial plan to 100,000 tonnes per year and increase the current manufacturing capacity of the J2ES Nashik site fivefold, from 50,000 tonnes per year to 250,000 tonnes per year. The manufacturing capacity of the J2ES Vijayanagar site and the J2ES Nashik site will be significantly increased to a total of 350,000 tonnes per year. In India, which has the largest population in the world, the

demand for GOES is rapidly increasing due to rising power demand linked to economic growth, expansion of renewable energy use, improvements in transformer efficiency, and an increase in the number of data centers. The market is expected to expand substantially. The J2ES Vijayanagar site is scheduled to start full production during FY2027, as planned. The expansion of the J2ES Nashik site will be carried out gradually starting in FY2028, with completion expected in FY2030. Through this manufacturing capacity expansion, we will secure a dominant position as the number one GOES supplier in India.

Demand for Grain-Oriented Electrical Steel Sheets in India
(Calculated by JFE, 2019 results = 1.0)



Resource-Efficient Si-Gradient Magnetic Material Contributing to Energy Savings in Electrical Equipment

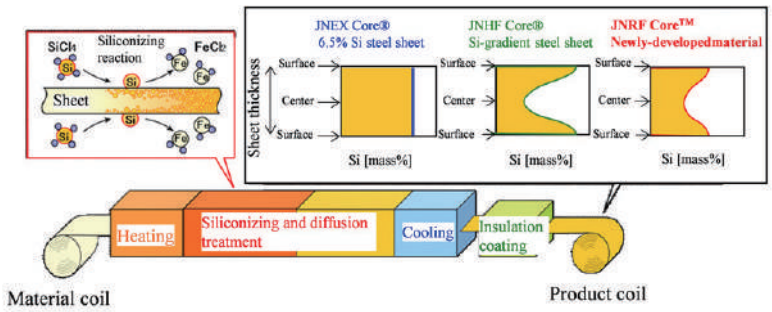
The recent trend toward increasing driving frequency due to the downsizing of electrical equipment has intensified the need to reduce iron loss* in the high-frequency range for electrical steel sheets, widely used as iron core material for electrical equipment such as motors and transformers. Meeting this demand depends upon increasing the concentration of silicon (Si), an element that strengthens electrical resistance. However, increasing concentration also causes magnetic flux density to decrease at the same time.

To overcome this, JFE Steel developed JNHF™, JNSF™, and JNRF™ using its proprietary chemical vapor deposition (CVD) continuous siliconizing process technology for controlling Si concentration distribution. These steel sheets offer low iron loss and high magnetic flux density in the high-frequency range, significantly contributing to higher efficiency and downsizing of electrical equipment. They are used as core materials for solar power reactors and high-speed motors.

In recognition of the positive social impact of this development, we received the 2022 Award for Science and Technology from the Minister of Education, Culture, Sports, Science and Technology under the development category of the science and technology field. JFE Steel will continue to contribute to improving electrical equipment by raising efficiency, reducing size, and saving energy by providing high-performance, high-grade electrical steel sheets.

*The loss of energy, primarily as heat, that occurs when the iron core is excited by an alternating current. The lower the iron loss, the higher the efficiency of electrical equipment.

CVD Continuous Siliconizing Process and Si Concentration Distribution Control



› Received the 2022 Award for Science and Technology from the Minister of Education, Culture, Sports, Science and Technology for the science and technology field (development category). (Japanese only)
(https://www.jfe-steel.co.jp/release/2022/04/220408.html)

SH Further Expanding the Global Supply Chain for the Electrical Steel Sheets Business

As global demand for electricity continues to grow, reducing power losses at each stage is essential for cutting CO_2 emissions. Motors used in power plants, factories, homes, and other settings account for 40% to 50% of global electricity consumption, while in Japan motors used in residential, commercial, and industrial applications account for approximately 55% of annual electricity consumption. It is estimated that improving motor efficiency in Japan by 1% would produce energy savings equivalent to the output of one large 1,000 MW-class power plant, making higher motor efficiency an important initiative for reducing CO_2 emissions.

JFE Shoji has established a global supply chain for electrical steel sheets used as core materials in motors and transformers. In addition to trading the materials, it has set up a system for adding value through processing tailored to customer needs. Most recently, it established a new motor-core processing base in Serbia to serve the energy-conscious European market, and the plant has begun operations. JFE Shoji's mission is to meet customer needs through its global supply chain, and it will continue contributing to reductions in CO_2 emissions by strengthening its supply network.



Exterior of the Electrical Steel Sheet Processing Plant in Serbia

ST Powder-Core Technology Contributing to Thinner, Lighter Motors with Complex Shapes and Improved Recyclability

In a joint project with JFE Techno-Research Corporation and ARMIS CORPORATION, a venture company launched by Shizuoka University, JFE Steel designed and prototyped a motor using Denjirou™, the company's insulated pure-iron powder, and demonstrated the feasibility of producing motors 48% thinner and 40% lighter than conventional models while maintaining the same output.

Demand continues to rise for smaller but higher-performing electric motors for industrial equipment and vehicles. Axial-gap motors, which are thinner than general radial-gap motors, can deliver high power (Figure 1). Unlike radial-gap motors, however, axial-gap motors pose a significant manufacturing challenge by requiring a three-dimensional magnetic core that cannot easily be made by laminating electrical steel sheets. In contrast, powder cores formed by pressing insulation-coated magnetic powder possess uniform three-dimensional magnetic properties, can accommodate complex shapes, and provide flexibility in design. Furthermore, because these cores are easily crushed, copper wire can be readily separated and recovered from motors, improving recyclability. Efforts are underway to remanufacture crushed powder cores by reforming them for reuse. JFE Steel has developed and launched the insulation-coated pure iron powder Denjirou™ for powder cores. In this project, an axial gap motor incorporating powder cores made with Denjirou™ was designed, prototyped, and evaluated for performance (Figure 2). The results showed a 48% reduction in height and a 40% reduction in weight, compared to conventional motors, at equal or greater efficiency (Table, Figure 3). Based on these results, JFE Steel and JFE Techno-Research Corporation have begun supporting customer design of components using powder cores while also supplying large powder compacts for machining and prototype powder cores processed into designed shapes to promote the use of powder cores for motors.

Going forward, JFE Steel will continue to develop products that meet customer needs while also encouraging technical exchanges, such as proposing the application of technologies and supporting prototype evaluation. These efforts will expand the supply of eco-products that contribute to a circular society and help realize a sustainable society.

Figure 1: Types of motors

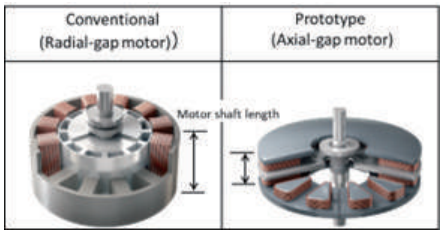
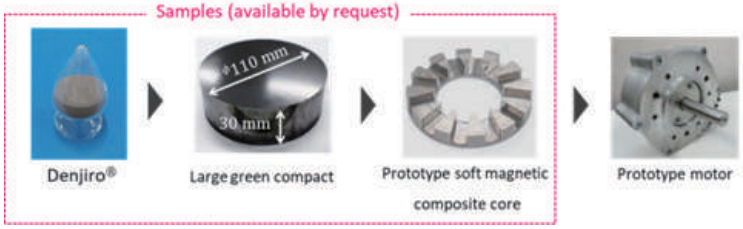


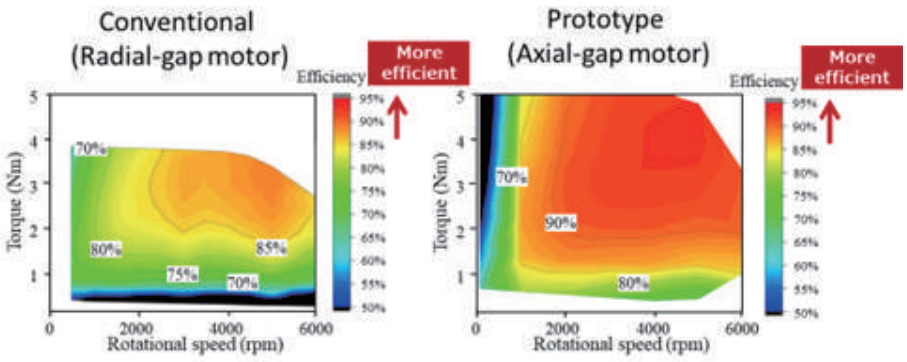
Figure 2: From powder to prototypes



Conventional vs. Prototype Motor (Test Results)

	Conventional (Radial-gap motor)		Prototype (Axial-gap motor)
Motor shaft length (mm)	90		110
Core weight (g)	1270	Thinner, Lighter	760
Core diameter (mm)	62		32
Max. efficiency (%)	89		93
Max. torque (Nm)	3.7		5.4

Figure 3: Efficiency of conventional vs. prototype motor



› **JFE Steel's New Insulated Pure-iron Powder for Soft Magnetic Composites Enables Prototype Axial-gap Motor to be Slimmed Down by 48%** (https://www.jfe-steel.co.jp/en/release/2024/01/240116.html)

ST High-Tensile-Strength Steel Sheets (HITEN) for Automobiles, Contributing to Improved Resource Efficiency through Vehicle Weight Reduction

Applying high-tensile-strength steel sheets (HITEN) to automobile components helps reduce weight while maintaining crash safety performance. JFE Steel contributes to improved fuel efficiency and ultimately reducing CO_2 emissions by supplying customers with ultra-high-tensile-strength steel sheets that meet the need for lighter car bodies. In addition to developing and producing these steel sheets for automobiles, JFE Steel develops application technologies. These include techniques for applying body design and forming or assembly technologies, which have been systematized to offer comprehensive solutions as JESOLVA™ (JFE Excellent SOLution for Vehicle Application), JFE Steel's unique suite of application technologies for automotive steel sheets. To provide these solutions, JFE Steel is actively promoting early vendor involvement (EVI) activities, in which it collaborates with customers from the early stages of automobile development. By improving car body performance and reducing weight, JFE Steel is contributing to the development of next-generation automobiles and the realization of a sustainable society.

Expansion of Ultra-High-Tensile-Strength Steel Sheet Supply Capacity Supporting Wider Adoption of Lightweight, High-Strength Vehicle Bodies (Construction of a Hot-Dip Galvanizing Line at West Japan Works (Fukuyama District))

The automotive industry is producing lighter and stronger car bodies to meet increasingly stringent environmental regulations and collision safety standards around the world, and demand is expected to grow for ultra-high-tensile sheets* with excellent processability. JFE Steel has therefore decided to construct a new hot-dip galvanizing line (CGL) at the West Japan Works (Fukuyama district), with an annual production capacity of 360,000 tonnes. The investment will total approximately 70 billion yen, with operations scheduled to commence in October 2028. The new line will enable JFE Steel to increase its production capacity for such sheets, including its JEFORMA™ series, to meet growing demand in the foreseeable future and respond to subsequent needs for even higher strength and functionality.

*High-tensile-strength steel sheets with a tensile strength of ≥980 MPa (megapascals)

Development of Application Technologies (Press Forming Methods for Ultra-High-Tensile-Strength Steel Sheets) Contributing to Lightweight, High-Strength Vehicle Bodies

While contributing to vehicle weight reduction, ultra-high tensile steel sheets are susceptible to press wrinkles, die damage, and shape variation, and all these issues are more likely to occur with thinner, stronger steel sheets, a factor that has inhibited the wider application of ultra-high tensile steel sheets.

Ultra-high-tensile-strength steel sheets exhibit greater springback after forming than ordinary steel sheets, and mass-produced materials also tend to show greater variation in strength. The Stress Reverse Forming™ Method is designed to reduce variation in the scale of springback (or variation in dimensional accuracies), which increases as ultra-high tensile steel sheets have higher levels of strength. This method uses the Bauschinger Effect, or the mechanical phenomenon in which deformation stress in steel sheets decreases immediately after the direction of the deformation is reversed. The Wall Bending and Restrike Method provides a solution for reducing springback by applying stress that counteracts the stress causing springback, particularly through the optimization of the shape formed in the preceding press-forming stage. These methods are expected to contribute to the stable production of press-formed parts even when material strength varies.

When ultra-high-tensile-strength steel sheets are press-formed into curved component shapes, it is necessary to address both press wrinkles that form in curved areas during forming and springback, in which the material tends to return toward its original shape after forming. The inflow control method reduces wrinkles, particularly those occurring in flange areas, by optimizing material inflow across multiple press-forming processes.

In addition to providing materials, JFE Steel actively promotes early vendor involvement (EVI) activities, in which it collaborates with customers from the early stages of automobile development to offer solutions that enable customers to develop products and improve product performance. The company has developed and systematized a range of application technologies as JESOLVA™ (JFE Excellent SOLution for Vehicle Application), which is JFE Steel's unique suite of application technologies for automotive steel sheets, to offer comprehensive solutions. Going forward, JFE Steel will continue to support the expanded application of ultra-high-tensile-strength steel sheets in automotive components, improve vehicle-body performance, and reduce weight, thereby contributing to the realization of a sustainable society.

Welding Technologies for HITEN Supporting Improved Resource Efficiency (Ultra-High-Tensile-Strength Steel Sheet Welding Stabilization Technologies: "Intelligent Spot Welding Technology" and "LME Crack Suppression Welding Technology"*1)

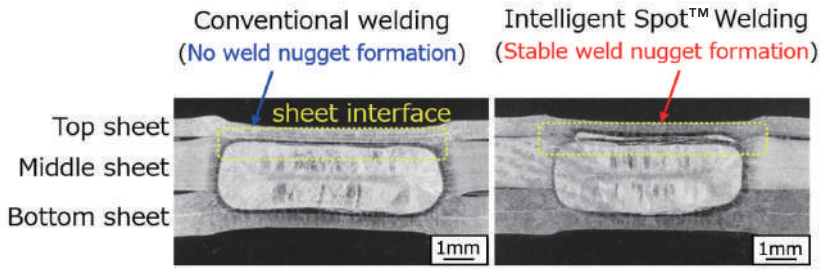
Spot welding technologies for automotive steel sheets developed by JFE Steel have now been adopted for components supplied to a Japanese automaker. JFE Steel provides a wide range of materials and application technologies to meet the increasingly advanced requirements of next-generation vehicle-body design.

Spot welding requires stable weld quality despite increasingly complex combinations of steel sheets, and customers have sought technologies that enable the use of more challenging sheet combinations and the wider use of HITEN. Through collaboration with customers, the following technologies have been adopted for vehicles for the Japanese market and production has begun. Intelligent Spot Welding Technology forms stable weld nuggets in stacks of three or more sheets with a large sheet-thickness ratio.*2 Conventionally, heat generation tended to concentrate on the thick-sheet side, making it difficult to form a sufficient weld between the thick and thin sheets. Two-stage control of the current pattern and electrode force stabilizes weld quality.

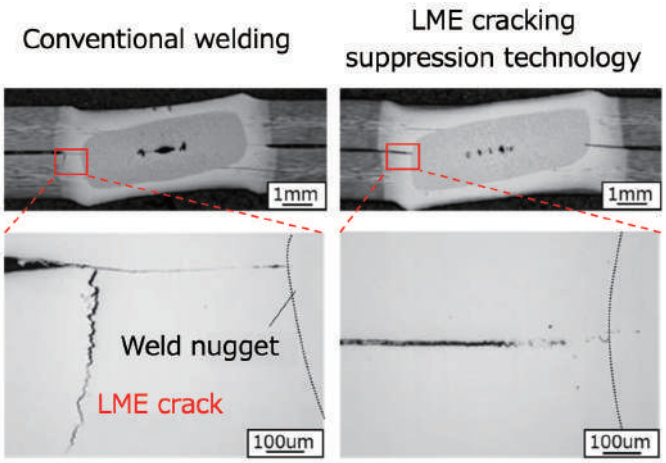
LME Crack Suppression Welding Technology suppresses LME cracking that can occur when welding high-strength coated steel sheets. JFE Steel developed a welding process that promotes cooling and solidification of the coating, thereby improving the stability of weld quality in ultra-high-tensile-strength steel sheets. Alongside the application of this technology, JFE Steel's ultra-high-tensile-strength steel sheets have begun to be adopted in domestically produced vehicle models. Application technologies, including Intelligent Spot Welding Technology and LME Crack Suppression Welding Technology, have been organized under the JESOLVA™ brand to provide comprehensive solutions.

*1 Abbreviation for "liquid metal embrittlement."
*2 Total sheet thickness divided by the thickness of the thinnest sheet. A larger value makes welding of the thin sheet less stable.

Intelligent Spot™ Welding



LME cracking suppression technology



Highly Formable HITEN "JEFORMA™" Contributing to Improved Resource Efficiency and Reduced CO_2 Emissions

JFE Steel has developed a 980 MPa-class highly formable galvannealed (GA) high-tensile-strength steel sheet with unprecedented formability and collision-energy absorption characteristics, contributing to vehicle weight reduction and improved crash safety.

In the automotive industry, demand for GA high-tensile-strength steel sheets is increasing to reduce vehicle weight for improved energy efficiency and lower CO_2 emissions during driving, while improving corrosion resistance to extend vehicle service life. However, as strength increases, these steel sheets tend to lose formability and to fracture in collisions, creating a need for improved press formability and sufficient collision-energy absorption.

To address these issues, JFE Steel developed a surface-control technology that utilizes silicon (Si), which is effective in improving steel-sheet ductility, by controlling the atmosphere inside the CGL furnace to retain Si as oxides within the steel sheet. In addition, JFE Steel achieved both high formability and excellent collision-energy absorption performance by applying proprietary heating and cooling heat-pattern control in the CGL annealing process.

The newly developed steel uses resources more efficiently by reducing vehicle weight and lowers CO_2 emissions by decreasing energy consumption during driving. Its excellent corrosion resistance also extends vehicle service life, reducing environmental impact across the entire life cycle. Expanded application is also expected in energy-absorbing components and components around batteries for electrified vehicles.

JFE Steel is expanding the JEFORMA™ series of highly formable high-tensile-strength steel sheets incorporating this technology while developing and proposing application technologies tailored to customer needs. Through these initiatives, we will realize lighter, higher-performance, safer, and longer-lasting automobiles and at the same time support the development of a circular society and the achievement of a carbon-neutral society.

This technology received the 72nd Okochi Memorial Technology Prize (FY2025) in recognition of its originality and contribution to industry.

> **Received the 72nd Okochi Memorial Technology Prize—Development of Highly Formable, High-Strength Galvannealed Steel Sheet Contributing to Automobile Weight Reduction— (Japanese only)** (https://www.jfe-steel.co.jp/release/2026/02/260218.html)

Cold-Press Forming Technology for Integrated Auto-Frame Component to Improve Resource Efficiency

As a component integration solution using ultra-high-tensile-strength steel sheets and cold-press forming, JFE Steel has developed a technology for reducing the number of components in automobile body structures, targeting the rear member*1.

Automakers have recently focused on, from the standpoint of improving productivity and reducing manufacturing costs, large-scale component integration technologies such as giga casting, which uses aluminum casting technology, and medium-scale integration technologies such as hot stamping, which involves heating steel prior to press forming and simultaneously cooling and quenching in the die to achieve both formability and component strength. This technology falls into the same category of component integration technologies.

Component integration by cold-pressing presents challenges in formability. However, by utilizing JESOLVA™, JFE Steel's unique systematized solution technology for automotive steel sheets, we have made it possible to form large components using ultra-high-tensile-strength steel sheets in grades up to 1,470 MPa. Furthermore, to integrate components with different strengths, we applied Tailor Welded Blank (TWB)*2 and our proprietary Cold Patchwork Method*3, enabling designs with strength variations within a single component. The result is a reduced number of components, even for small-scale integrations, thereby increasing productivity and reducing the cost of auto-frame production.

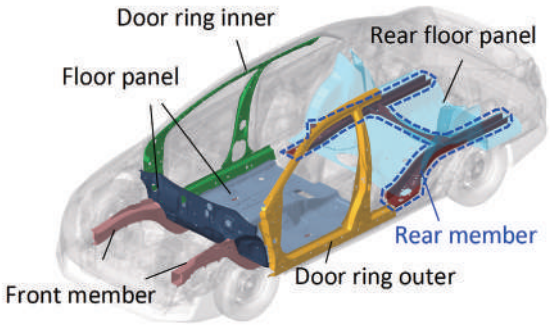
Challenges arise as integrated components become larger, such as higher logistics costs and greater burdens on end users when damage requires extensive repairs. Limiting integration to appropriate ranges using this technology ensures portability and reduces repair burdens.

The rear member is a large part that protects the body from rear collisions and is composed of 11 spot-welded components. With this technology, the number of components can be reduced to as few as three while maintaining rear collision performance, thereby improving productivity and reducing costs in automobile body manufacturing.

As part of these initiatives, JFE Steel exhibited for the first time at Automotive Engineering Exposition 2026 YOKOHAMA and Automotive Engineering Exposition 2026 NAGOYA. These comprehensive exhibitions feature cutting-edge mobility technologies, and JFE Steel primarily showcased products and technologies related to vehicle-body manufacturing.

*1 A structural component that supports a vehicle's rear suspension and drivetrain and connects them to the body
*2 A processing technology that uses laser welding to join steel sheets of different thicknesses and strengths into a single sheet
*3 A technology for stacking and spot-welding together steel sheets for simultaneous press forming

Cold-press integration target and rear member



Prototype rear member



ST Certification under the SuMPO Environmental Label Program SuMPO EPD

JFE Steel acquired SuMPO EPD certification for 36 product types under the SuMPO Environmental Label Program operated by the Sustainable Management Promotion Organization (SuMPO). These certifications cover three types of steel sheets for cans, nine flat steel products, nine construction steel products, three types of steel plates, four steel pipe products, and eight bar and wire rod products.

Environmental Product Declarations (EPDs) quantify environmental information for each product using the LCA (life cycle assessment) methodology under ISO 14044, and only product information that has passed third-party verification in accordance with ISO 14025 is disclosed as valid information on the EPD program website.

SuMPO EPD is an environmental label for quantitatively disclosing the environmental impact of products and services throughout their life cycle, from raw material procurement to disposal and recycling in accordance with ISO 14025:2006 (environmental labels and declarations, Type III Environmental Declarations, Principles and Procedures). The environmental impact of our products is presented as data to increase transparency. The disclosure of environmental impact data with fairness and reliability assured by third-party review and verification enables customers to quantitatively and objectively evaluate the environmental impact of the products they use.

Going forward, JFE Steel will actively promote the acquisition and publication of SuMPO EPD for its products.

› **SuMPO Environmental Labeling Program** (https://ecoleaf-label.jp/en/)

Expansion of the Use and Sales of Recycled Resources

The JFE Group is actively promoting the use of recycled resources to help realize a circular economy and is expanding its market application through products and services that leverage these materials. By combining resource efficiency with waste reduction, we contribute to reducing environmental impact and achieving sustainable growth.

SH Initiatives to Strengthen the Handling of Environmentally Beneficial Products

Our trading business has strengthened the handling of environmentally beneficial products by setting KPIs for the handling volume of fuels for biomass power plants and steel scrap. In FY2025, as part of expanding our lineup of environmentally beneficial products, we began handling aluminum and recycled zinc. We will continue advancing efforts toward realizing a circular economy.

Expanding Business in Biomass Fuels

JFE Shoji imports palm kernel shells (PKS) from Malaysia and Indonesia. We also source wood pellets from Southeast Asian countries to supply biomass fuel to power plants in Japan.

PKS and wood pellets are made from materials such as byproducts and wood residues generated during palm oil production and wood processing. Using these as fuel reduces waste and promotes effective resource use. These initiatives also contribute to realizing a circular economy. Using these as fuel reduces waste and promotes effective resource use. These initiatives also contribute to realizing a circular economy.

Since these biomass fuels absorb CO_2 during their growth process, they are regarded as carbon-neutral fuels, offsetting the CO_2 emitted when burned. Furthermore, replanting and recultivating the trees and crops used as raw materials after harvesting supports the development of a sustainable supply chain.

To promote carbon neutrality in power-generation fuels, JFE Shoji is also developing and supplying alternative biomass fuels toward reducing environmental impact and advancing the energy transition.



PKS



Wood pellets

Expansion of Scrap Trading to Support the Development of a Recycling-Oriented Society

JFE Shoji engages in a recycling business for steel and aluminum scrap. Demand for steel scrap is particularly expected to grow in Japan and overseas as the global community advances toward carbon neutrality. JFE Shoji will contribute to building a recycling-oriented society by increasing scrap recycling across the globe.

ST Initiatives to Expand Scrap Collection and Use

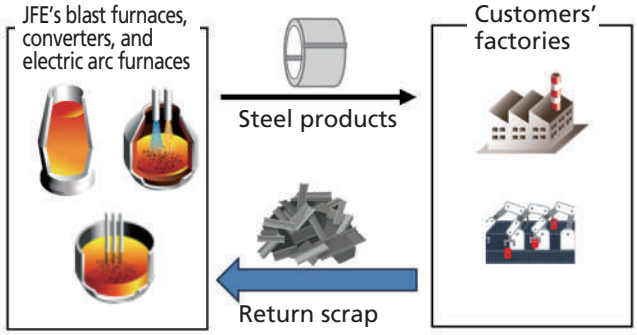
Steel is highly recyclable because it can be separated and collected using magnetic force. Its recycling rate of 93.7% is extremely high compared to other materials. In addition, many of the additive elements (alloys) contained in recovered steel scrap can be separated and removed during refining through gasification or oxidation, meaning that recycling is less likely to result in a decline in quality. This characteristic allows for closed-loop recycling, in which steel can be reborn repeatedly as high-quality, high-functionality products. This helps reduce consumption of newly extracted natural resources, emissions of environmentally harmful substances, and waste, thereby significantly contributing to reducing environmental impact across the entire life cycle.

Closed-Loop Recycling Concept



Source: The Japan Iron and Steel Federation

JFE Steel uses steel scrap as raw material in blast furnaces, converters, and electric arc furnaces. We have traditionally collected and used "return scrap," a term for scrap generated during production that is sold back by customers and Group factories. Under the Eighth Medium-term Business Plan, we have set a KPI for the expansion of this volume with associated action plans. For FY2026, we expect to achieve our target of increasing the volume of collected and used return scrap to 2.5 times the average during the Seventh Medium-term Business Plan period. By expanding the collection and use of scrap toward the realization of a circular society, we will also contribute to addressing climate change.



Resource Recovery and Recycling Targets and Results

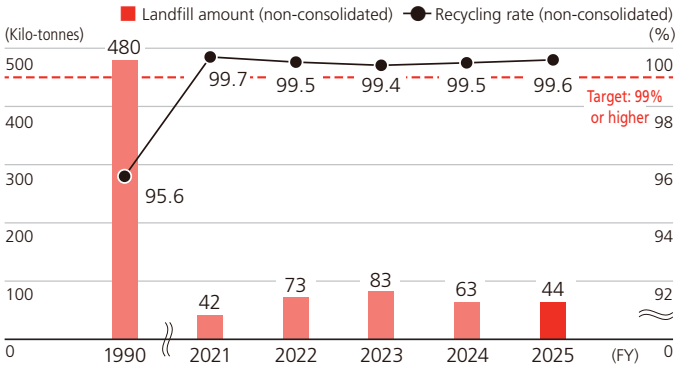
Recognizing that the efficient use of resources is a key environmental issue for the manufacturing industry, the JFE Group sets and manages progress against ambitious targets tailored to the respective business characteristics of Group companies. We will continue to pursue the following targets and advance initiatives that contribute to the transition to a circular economy.

The responsible use of water resources is also an important environmental concern for the manufacturing industry. Since the steel business consumes large volumes of water, we set ambitious targets for water recycling rates, manage progress, and strive to reduce water usage.

Targets and Results for FY2025 and Targets for FY2026

Operating Company	FY2025 Targets	FY2025 Results and Initiatives	FY2026 Targets
JFE Steel	Recycling rate of co-products: 99% or higher	Resource recovery rate: 99.6%	Continue efforts to prevent and reduce the generation of dust and sludge and recycle co-products, to maintain the recycling rate of co-products at 99% or higher
	Maintain efficient use of water Recirculated water usage rate: 90% or higher	Recirculated usage rate: 92.2%	Continue the water resource recycling effort to reduce water usage and maintain the recirculated usage rate at 90% or higher
JFE Engineering	Recycling rate at construction sites • Recycling rate of rubble: 99.5% or higher • Recycling rate of sludge: 95.0% or higher • Recycling rate of industrial waste: 85.0% or higher	Recycling rate at construction sites • Recycling rate of rubble: 97.7% • Recycling rate of sludge: 99.4% • Recycling rate of industrial waste: 66.8%	Recycling rate at construction sites • Recycling rate of rubble: 99.5% or higher • Recycling rate of sludge: 95.0% or higher • Recycling rate of industrial waste: 85.0% or higher
	Recycling rate of office recyclable waste (Yokohama head office): 98.0% or higher	Recycling rate of office recyclable waste (Yokohama head office): 98.9%	Recycling rate of office recyclable waste (Yokohama head office): 98.0% or higher
JFE Shoji	Global recycling of steel scrap • Scrap trade volume exceeds FY2020 level by 10%	From FY2020: –3% Overseas sales increased, but domestic sales decreased partly due to lower crude steel production, and the target was not achieved	Global recycling of steel scrap: +10% from FY2020 Strengthen domestic and overseas procurement networks and expand sales to JFE Group and domestic and overseas customers

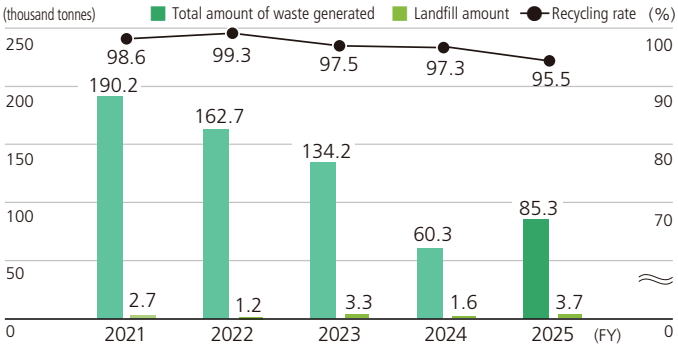
JFE Steel Landfill of Co-Products and Recycling Rates



		1990	2021	2022	2023	2024	2025	
Group companies*	Amount released	—	504	593	583	640	620	(Kilo-tonnes)
	Landfill amount	—	52	94	97	83	50	(Kilo-tonnes)

*Twenty-two JFE Steel consolidated subsidiaries in Japan

JFE Engineering Waste Generated at Construction Sites



For more quantitative data on industrial waste generated at the manufacturing plants, please refer to:

› **Environmental Data** (P. 273)

Efficient Use of Water Resources

The JFE Group recognizes water resources as important natural capital that supports its business activities. At the same time, issues surrounding water resources are becoming increasingly serious around the world due to such factors as advancing climate change, population growth, and expanding industrial activity, and companies are expected to use water resources sustainably.

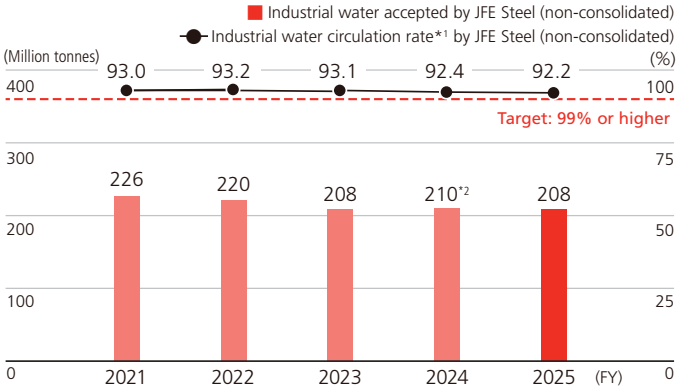
The JFE Group works to use water resources efficiently and conserve local water environments by reducing water intake in its business activities, promoting water recirculation, and appropriately managing water quality. We will also contribute to realizing a sustainable society while appropriately managing water-related risks and opportunities, taking into account their relationship with the transition to a circular economy and our efforts for conserving biodiversity and nature positivity.

Furthermore, we will continue to promote water-resource management tailored to the characteristics of each business, use water more efficiently, and reduce environmental impact, working toward the sustainable use of water resources.

ST Setting Targets for Water Recirculation and Implementing Them in the Steel Business

All of JFE Steel's seven production sites in Japan have developed water management plans and monitored water usage in seeking to increase the recirculation rate of water in order to reduce the volume of water intake and drainage and efficiently use water resources. The target water recycling rate at JFE Steel, which uses a large volume of water for cooling and other processes, is 90% or more, which is extremely high considering the amount evaporated when water is used. We are striving to improve the recycling rate by adopting purification processes such as biological and chemical wastewater treatments, and we have been successfully achieving the target. Our recycling rate of industrial water in FY2025 maintained a high level of 92.2%.

JFE Steel Industrial Water Accepted and Circulated



JFE Steel

Total amount	3,207	3,242	3,053	2,748*2	2,672	(Million tonnes)
Industrial water accepted	226	220	208	210	208	(Million tonnes)

Group companies*3

Total amount	235	233	207	226	218	(Million tonnes)
Industrial water accepted	19	18	16	16	17	(Million tonnes)

*1 Industrial water circulation rate (%) = (Total amount used – industrial water accepted) / total amount used × 100
*2 Figures have been revised retroactively
*3 Scope: Twenty-two JFE Steel consolidated subsidiaries in Japan

EN Efficient Use of Water Resources in the Engineering Business

JFE Engineering and each Group company strive to use water efficiently at their business sites.

For more on quantitative data related to water, please refer to:
› Environmental Data (P. 273)

Biodiversity Conservation and Nature Positive

Basic Policy

Recognizing that natural capital and biodiversity are foundational for realizing a sustainable society, the JFE Group conducts business as a member of the international community in harmony with nature. We particularly recognize biodiversity conservation as a key challenge and assess the ecological impacts associated with our business activities while working to minimize those impacts. We are also engaged in activities that contribute to biodiversity conservation and nature positive at our own production sites, construction sites, and their surrounding areas, and at suppliers, including monitoring ecosystems and carrying out conservation activities at steelworks, our key facilities, and in their surrounding areas. We are actively contributing beyond our business operations through initiatives that include the development of steel slag products that restore marine environments, joint research with local governments, and the provision of environmental education opportunities for local communities. Taking into account the interrelationships among environmental issues, such as biodiversity conservation, climate change mitigation, and resource circulation, we are pursuing initiatives such as obtaining J Blue Credit™ certification for marine environment restoration using steel slag products and reducing CO_2 emissions during resource extraction by using recycled materials.

Our core steelmaking business uses large quantities of fresh water for cooling and cleansing products and facilities. For this reason, the efficient use of water resources with due consideration to the source of the water and stakeholders in the area is a key challenge. While we have always implemented countermeasures against meteorological disasters such as droughts and floods at our manufacturing sites in Japan, we are further reinforcing them in anticipation of the increased frequency and severity of weather events associated with climate change by securing alternative means and raising the height of embankments. We also seek to identify water-related risks throughout our business sites and supply chain in Japan and overseas, such as the risk of drought at the source of water intake and pollution at the point of discharge. In areas under water stress, we will respond appropriately through dialogue with stakeholders.

Basic Approach

The JFE Group has established a basic policy to promote initiatives for biodiversity conservation and nature positive.

Guided by our corporate philosophy of contributing to society with the world's most innovative technology, the JFE Group recognizes biodiversity conservation and nature positive as essential for realizing a sustainable society and has established the following policies to guide its activities:

- Deepen recognition that our business activities depend on and impact biodiversity and natural capital and promote activities to mitigate risks.
- Promote the development of processes, products, and technologies that contribute to biodiversity conservation and nature positive.
- Collaborate with stakeholders such as local communities and supply chains and promote biodiversity conservation and nature positive efforts through diverse approaches, including integration with carbon neutrality and the circular economy.
- Foster awareness of biodiversity through employees' proactive initiatives and educational activities.
- Disclose initiatives for biodiversity conservation and nature positive and broadly share them with society

Endorsing and Participating in External Initiatives

As a member of the Keidanren Committee on Nature Conservation, the JFE Group endorses the Declaration of Biodiversity by Keidanren and Action Policy and actively engages in the conservation of nature and biodiversity.

The JFE Group is registered on the Ministry of the Environment's Nature Positive Economy Promotion Platform (NPE Platform) as an NPE Partner.

JFE Holdings has also joined the 30by30 Alliance for Biodiversity, launched by the Ministry of the Environment, business associations, nature conservation groups, and other organizations. This alliance is committed to effectively protecting at least 30% of Japan's land and sea as healthy ecosystems toward the nature positive goal of halting and reversing biodiversity loss by 2030. JFE will contribute to the conservation of biodiversity by carrying out various activities, including the conservation of its biotopes.

For further details on external initiatives, please refer to:

- **Declaration of Biodiversity by Keidanren and Action Policy (Revised Edition)** (https://www.keidanren.or.jp/en/policy/2018/084.html)
- **Nature Positive Economy Promotion Platform, Ministry of the Environment (Japanese only)** (https://policies.env.go.jp/nature/biodiversity/npeplatform/index.html)
- **Ministry of the Environment's 30by30 Alliance** (https://www.env.go.jp/nature/biodiversity/OECM.html)

In addition, JFE Holdings has endorsed the disclosure recommendations published by the Taskforce on Nature-related Financial Disclosures (TNFD), joined the TNFD Forum, and registered as a TNFD Adopter. Going forward, we will appropriately disclose information about the impacts of our business activities on the natural environment and biodiversity in line with the TNFD framework.

- **Taskforce on Nature-related Financial Disclosures (TNFD)** (https://tnfd.global/)

JFE Group Strategy for Biodiversity Conservation and Nature Positive

Evaluation of the Relationship between Business Activities and Natural Capital (Evaluation in Line with the LEAP Approach)

As a holding company, JFE Holdings is responsible for the JFE Group's comprehensive risk management under the Basic Policy for Building Internal Control Systems. Regarding initiatives for biodiversity conservation and nature positive, each operating company identifies priority areas, assesses dependencies and impacts, and evaluates risks and opportunities in line with the LEAP approach recommended by the TNFD, and the results, including priorities for action, are reflected in the Group's strategy.

The Group is conducting evaluations for future disclosures in line with the LEAP approach and organizing its initiatives and analysis results. In FY2023, we conducted a trial evaluation focusing on the steel business. In FY2024, we expanded the scope within the steel business for a more detailed examination and also evaluated the engineering business.

Process

Locate

Locating the interface with nature

Steel business: identified the location information of major manufacturing sites and mines supplying raw materials such as iron ore and coking coal and assessed the state of natural capital in the surrounding areas.
Engineering business: identified the location information of major construction sites in FY2025 and assessed the state of natural capital in the surrounding areas.
Both evaluations referred to TNFD-recommended tools such as IBAT and Resource Watch.

Evaluate

Evaluating dependencies and impacts

We applied ENCORE and other TNFD-recommended tools to identify and evaluate the dependencies and impacts of our steel and engineering businesses on important natural capital.

Assess

Assessing nature-related risks and opportunities

Based on the findings from the evaluation of the dependencies and impacts, we identified and assessed nature-related risks and opportunities for our steel and engineering businesses.

Prepare

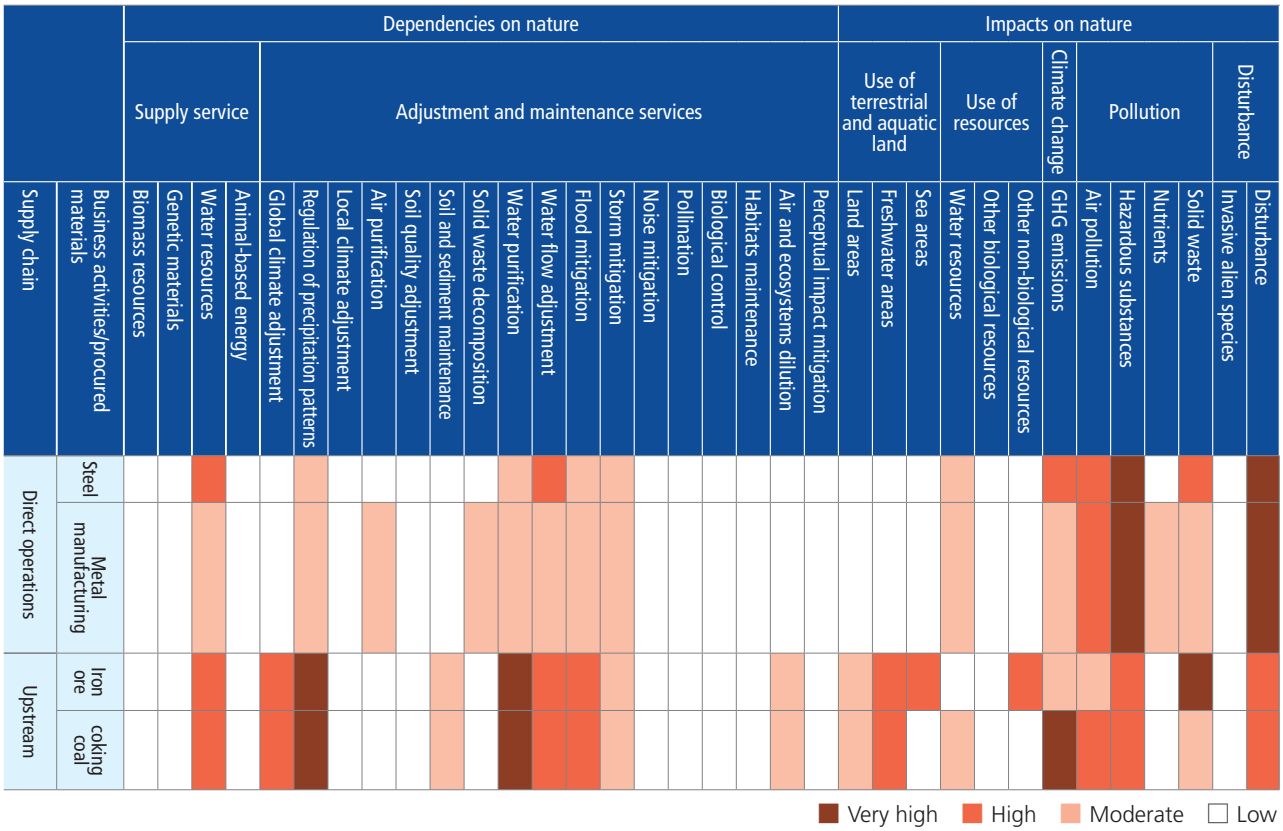
Preparing to respond and report

We have been preparing to respond to the assessed risks and opportunities.

Steel Business

Specific Categories of Findings on the Dependencies and Impacts on Nature (Evaluate)

Regarding the dependencies and impacts of our steel business on nature, we reviewed the findings under the categories of manufacturing at our production sites and procurement from our upstream supply chain at iron ore and coking coal mining sites. Our procurement and manufacturing operations depend on natural resources, particularly related to water supply, the control of water volume, and climate adjustments. Meanwhile, our manufacturing operations impact nature through GHG emissions and pollution. The iron ore and coking coal mining conducted upstream in our supply chain also affect nature through land use, water resource use, GHG emissions, and pollution.



Assessment of Leading Manufacturing Sites (Locate)

Our assessment of major manufacturing sites, in line with the five criteria* defined by the TNFD for priority areas, found that there are areas of high conservation significance, including key biodiversity areas (KBAs), in the surrounding regions. We also conducted similar assessments for production sites of JFE Steel's domestic Group companies, evaluated the surrounding natural environment, and confirmed the results.

Manufacturing Site	Conservation Significance		Ecosystem Integrity	Degradation in Ecosystem Integrity	Water-Related Physical Risks		
	Protected Areas/KBA	STARs	Biodiversity Intactness Index	Pressures on Biodiversity	Baseline Water Stress	Riverine Flood Risk	Coastal Flood Risk
East Japan Works, Chiba	Located in proximity	1	1	5	3	2	3
East Japan Works, Keihin	Not located in proximity	1	1	5	3	2	3
West Japan Works, Kurashiki	Located in proximity	1	1	5	2	2	3
West Japan Works, Fukuyama	Located in proximity	1	2	5	2	2	3
Chita Works	Located in proximity	1	1	5	3	2	3
Sendai Works	Located in proximity	1	1	5	2	2	3

Very high ■ High ■ Moderate □ Low

In addition, the JFE Shoji Group conducted similar assessments at 48 processing sites operated by 38 companies (24 sites at 18 companies in Japan and 24 sites at 20 companies overseas). In Japan, six sites were found to be adjacent to protected areas or KBAs of high conservation significance. Overseas, sites in eight countries were found to face water risks, and in one country, a site was identified as being adjacent to indigenous peoples or local communities. These sites have been recognized as priorities for future evaluation and responses.

*Assessment based on the five criteria was performed using the following indicators and tools.

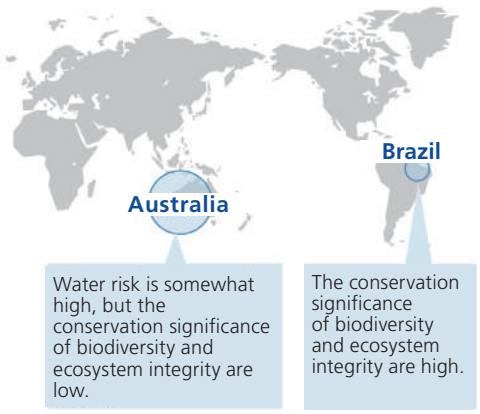
- Conservation significance: Assessed with IBAT, the proximity (within a 5-km radius) to areas of conservation significance, for example, protected areas and KBAs
- Ecosystem integrity: Assessed based on the Biodiversity Intactness Index provided by Natural History Museum
- Rapid degradation in ecosystem integrity: Assessed based on the Pressures on Biodiversity indicator provided by WWF Biodiversity Risk Filter to measure the degree of influence on nature
- Water-related physical risks: Assessed based on the Baseline Water Stress, Riverine Flood Risk, and Coastal Flood Risk indicators through the use of Aqueduct

Assessment of Raw Material Suppliers (Locate)

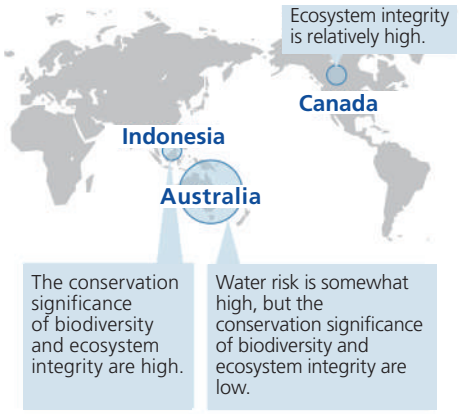
We located the interfaces of our major iron ore and coking coal suppliers in natural settings and assessed the state of nature at those sites (procurement volume of roughly 70%; 8 iron ore mines and 14 coking coal mines). Iron ore is procured from countries including Australia and Brazil. The assessment revealed that procurement mines in Australia are exposed to high water stress, making responses to water-related risks important. Although procurement volumes are relatively small, some mines in Brazil were found to be located near areas of conservation significance.

Our coking coal suppliers are mining in Australia, Canada, and Indonesia. The assessment revealed that procurement mines in Australia face relatively low levels of various risks. On the other hand, some mines in Canada and Indonesia were found to be located in regions with high ecosystem integrity.

Iron Ore (Supplier Countries and Procurement Ratios)



Coking Coal (Supplier Countries and Procurement Ratios)



Reviewing Nature-Related Risks and Opportunities (Assess and Prepare)

Following the above evaluation of dependencies and impacts, we organized the currently assumed nature-related risks and opportunities. The risks, some of which are recognized in our climate change scenario analysis, include physical risks that could materialize due to a water shortage or natural disasters and potentially trigger a decrease in production at our manufacturing sites or a lack of procurement from suppliers. Additionally, transition risks may arise if regulations concerning protected areas and pollution are tightened. On the other hand, opportunities were identified in the form of increased demand and development potential for environmentally friendly products, processes, and technologies, as well as environmental materials that contribute to resource circulation.

Meanwhile, we confirmed that JFE Steel's major iron ore and coking coal suppliers have conducted assessments concerning water resources and ecosystems and have publicly disclosed how to respond to their detected risks. We will continue to monitor the status of their response efforts as part of our supply chain management. We will also encourage more of our suppliers to adopt and observe the JFE Steel Procurement Guidelines.

As for our own material risks and opportunities, we will maintain the current measures in place and, while enhancing our assessment, we will keep a close watch on whether additional measures are necessary.

Nature-Related Risks and Opportunities in Direct Operations

	Category		Item	Impact	Magnitude	Likelihood	Time Frame	Response
Direct operations	Physical risk	Acute	Intensification of extreme weather	Suspension of operations due to infrastructure damage caused by the increased frequency and severity of natural disasters	Large	Low	Medium term	**Reinforcement of drainage facilities at steelworks and plants** •Facilities reinforced to prevent water pollution during heavy rainfall (expansion of treatment, water gates, raised manholes, etc.) •Facilities reinforced to prevent site flooding (forced drainage systems, pump trucks, raised critical equipment, etc.) •Damage mitigation through the use of weather information for torrential rains, typhoons, storm surges, etc. (minimizing damage by preemptively shutting down equipment when risks are anticipated)
		Chronic	Water shortages and ecosystem degradation	Suspension of operations due to ecosystem degradation, such as water depletion	Large	Low	Long term	**Reduced water intake and discharge by recycling water** •Formulate water management plans and monitor and manage water usage (set targets for water usage and recycling rate and track actuals monthly) •Reduce water intake and discharge by increasing recycling rates (install coagulation-sedimentation, filtration, and biological treatment to promote recycling) •Conduct water stress assessments (using Aqueduct for objective evaluation)
			Impact on surrounding ecosystems	Impacts on ecosystems through bioaccumulation and other processes when chemical substances flow into rivers, seas, and other water bodies	Medium	Low	Long term	**Wastewater treatment under strict voluntary management standards** •Implement thorough purification to reduce environmental impacts when discharging water used in the steelmaking process into public water bodies •Conclude agreements with local governments that enact stricter discharge standards than those mandated by the Water Pollution Prevention Act, and implement water quality improvement initiatives with stricter voluntary management standards to consistently meet those agreements •Conduct environmental audits (annually by the audit department, covering measurement results, responses to incidents, and the handling of complaints)

	Category		Item	Impact	Magnitude	Likelihood	Time Frame	Response
Direct operations	Transition risk	Policies and regulations	Stricter regulations toward nature positive	Increased compliance costs from tighter regulations on water use and pollution affecting ecosystems around business sites (terrestrial and aquatic)	Medium	Low	Long term	**Implementation of the following measures with the goal of Zero Major Environmental and Disaster Accidents** •Implement thorough purification to reduce environmental impacts when discharging water used in the steelmaking process into public water bodies •Conclude agreements with local governments that enact stricter discharge standards than those mandated by the Water Pollution Prevention Act, and implement water quality improvement initiatives with stricter voluntary management standards to consistently meet those agreements •Conduct environmental audits (annually by the audit department, covering measurement results, responses to incidents, and the handling of complaints) •Install NOx and SOx control equipment (e.g., low-NOx burners, exhaust gas treatment facilities) •Use dust dispersion simulations to design effective countermeasures for neighboring areas (identify sources, strategic placement of windbreak walls and nets) •Continuously monitor major emission sources of soot, dust, NOx, and SOx, and detect and remedy abnormal signs at an early stage •Periodically conduct on-site environmental audits of domestic and overseas Group companies (every 3–5 years, depending on environmental impacts and management practices) •Periodically exchange information with local residents (explain environmental measures at steelworks and regularly gather resident feedback)
		Reputation	Occurrence of accidents affecting surrounding ecosystems	Financial penalties from litigation or damage claims, increased response costs, and reduced sales due to loss of trust resulting from adverse impacts on ecosystems around business sites (terrestrial and aquatic) through water use, pollution, and other causes.	Medium	Low	Long term	
	Opportunity	Services and markets	Ecosystem restoration and environmental load reduction through steel and slag products	Increased demand for products contributing to nature positivity and reducing environmental load	Medium	High	Short term	**Expansion of supply of products that contribute to biodiversity, nature positivity, and environmental load reduction, and collaboration with municipalities and other companies** •Expand supply of eco-products such as high-tensile steel sheets and electrical steel sheets •Manufacture steel sheets free of environmentally harmful substances such as hexavalent chromium •Contribute to marine environment improvement, shallow-water habitat and tidal flat creation, and coral reef restoration through steel slag products •Joint public-private research project with Yokohama City for "Creating Abundant Seas" •Agreement with Chiba Prefecture on a demonstration project for blue carbon creation at the Hota Fishing Port •Obtained Nature Symbiosis Site certification for a seaweed bed created off Shinto, Iwakuni City, Yamaguchi Prefecture, in collaboration with Koujiro Fisheries Cooperative, the National Institute of Technology, Ube College, and Iwakuni City •Promote biodiversity verification of steel slag products through collaboration with the venture company Innoqua Inc.
		Products and services	Growing demand for resource-circulating products	Higher sales by expanding lineup of resource-circulating products	Medium	High	Medium term	**Expand lineup of environmental products supporting resource circulation** •Expand targeted products at JFE Shoji and strengthen distribution and logistics

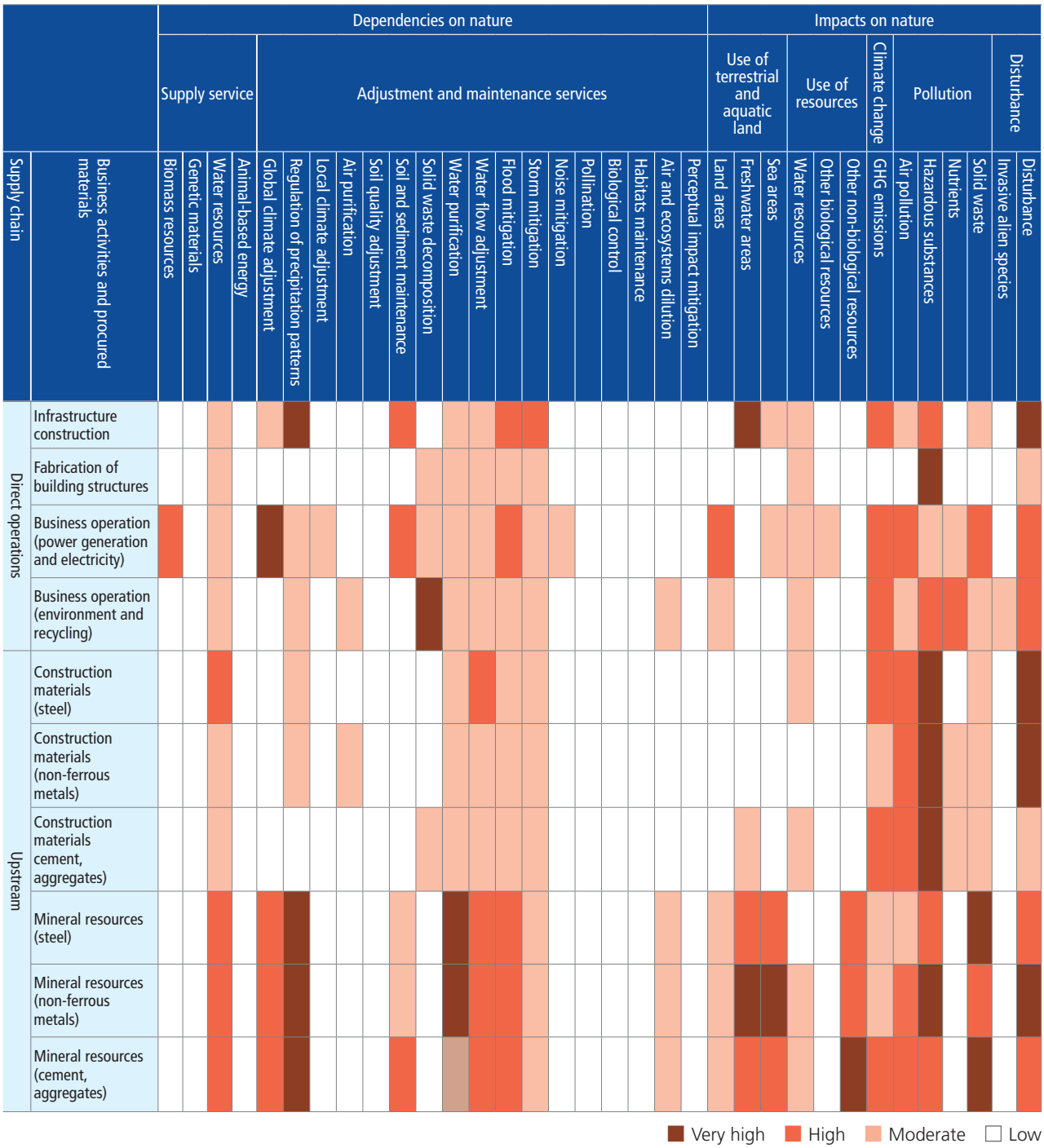
	Category		Item	Impact	Magnitude	Likelihood	Time Frame	Response
Upstream	Opportunity	Resource efficiency	Switch to environmentally conscious manufacturing systems	Reduced manufacturing costs through higher productivity and avoidance of fines and penalties by reducing the environmental impacts associated with waste treatment through waste reduction	Medium	High	Short term	**Effective use of co-products (dust, sludge, and slag) and byproduct gases generated in the steelmaking process** • Reuse iron-rich dust from blast furnaces and converters and water-treatment sludge as steelmaking raw materials • Effectively use steel slag as cement and civil engineering materials and promote its use as environmental restoration material, including Marine Stone™, which serves effectively as a base for organism attachment and as a material for improving marine environments • Recover byproduct gases generated in the steelmaking process and use them as fuel for reheating furnaces on rolling lines and for in-house power generation facilities
		Nature preservation and restoration	Biodiversity conservation at factories	Enhanced reputation among stakeholders, including local residents, by promoting initiatives on Company premises in response to growing public interest in nature and biodiversity conservation	Small	Medium	Medium term	**Biodiversity conservation initiatives on Company premises, mainly at the Chita Works** • Reproduction and conservation of the ecosystem of the Chita Peninsula, Aichi Prefecture, at Biotope Chita • Biotope Chita certified as a Nature Symbiosis Site • Chita Works certified as an Aichi Biodiversity Company • Transplanting of rare plants within planned construction areas
	Physical risk	Acute	Intensification of extreme weather	Instability of raw material procurement and increased procurement costs due to increased frequency and severity of natural disasters	Medium	Low	Medium term	**Response policy** • Diversification of procurement sources • Sharing and promoting the JFE Steel Procurement Guidelines • Monitoring suppliers' ESG-related activities **Specific measures currently implemented** • Ongoing diversification of procurement sources • Confirming proximity to critical ecosystems and the availability of water-risk response programs at each major supplier site
		Chronic	Water shortages and ecosystem degradation	Instability of raw material procurement and increased procurement costs due to ecosystem degradation such as depletion of water resources	Medium	Low	Long term	
	Transition risk	Policies and regulations	Strengthening of mining regulations	Increased procurement costs due to decline in new mine development caused by expansion of protected areas	Medium	Low	Long term	
				Increased procurement costs due to tighter regulations on environmental impacts such as pollution and water use during mining	Medium	Low	Long term	
		Reputation	Serious impacts at procurement mines	Reputational decline from sourcing at mines that seriously impact critical natural areas or local communities due to deforestation or pollution, and reduced procurement volumes due to mine shutdowns from serious impacts	Medium	Low	Long term	
		Markets	Demand for sustainable procurement	Increased compliance costs from demands by customers and investors for sustainability in raw material procurement	Low	Medium	Medium term	

Engineering Business

Specific Categories of Findings on the Dependencies and Impacts on Nature (Evaluate)

Regarding the dependencies and impacts of our engineering business on nature, we reviewed the findings under infrastructure construction and business operation categories at our sites and procurement from our upstream supply chain at iron ore and coking coal mining sites. Our procurement and infrastructure construction operations depend on the benefits provided by nature, particularly climate regulation. Meanwhile, our infrastructure construction operations impact nature through pollution and other factors. The iron ore and coking coal mining conducted upstream in our supply chain also affect nature through land use, water resource use, GHG emissions, and pollution.

Following this evaluation, we proceeded with assessments focused on infrastructure construction and upstream procurement, which have significant dependencies and impacts as well as business scale.

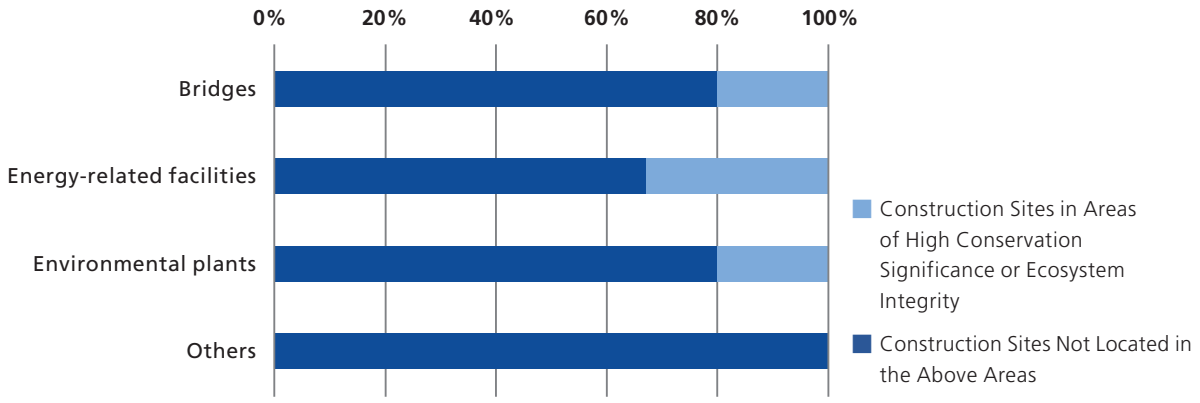


Assessment of Construction Sites (Locate)

We identified the locations of domestic construction sites of at least a certain size in 2025 and evaluated them based on the five criteria defined by the TNFD for priority areas. The evaluation found that some construction sites are in areas of high conservation significance or ecosystem integrity. Other criteria, such as water stress, were generally evaluated as low.

Roughly 20% of the construction sites are in areas of high conservation significance or ecosystem integrity, and when viewed by business type, many are energy-related facilities. At all construction sites, we confirmed that environmental assessments are conducted in advance regarding impacts on surrounding ecosystems and that additional measures are taken during construction to reduce ecosystem impacts.

Ratio of Construction Sites in Areas of High Conservation Significance or Ecosystem Integrity



Reviewing Nature-Related Risks and Opportunities (Assess and Prepare)

Following the above evaluation of dependencies and impacts, we organized the currently assumed nature-related risks and opportunities. The risks, some of which are recognized in our climate change scenario analysis, include physical risks that could materialize due to a water shortage or natural disaster and potentially trigger a decrease in production at our manufacturing sites or insufficient procurement from suppliers, apart from transition risks that might occur if regulations concerning protected areas and pollution are tightened.

Nature-Related Risks in Direct Operations

	Category		Item	Impact	Magnitude	Likelihood	Time Frame	Response
Direct operations	Physical risk	Acute	Intensification of extreme weather	Suspension of construction work and increased construction costs due to increased frequency and severity of natural disasters	Medium	Medium	Medium term	• Adoption of construction methods requiring less on-site work and development of new construction technologies • Enhance project management by using weather forecasting systems • Reduce CO_2 emissions from fuel consumption by using commercial power instead of generators
		Chronic	Water shortages and ecosystem degradation	Suspension of construction work and increased construction costs due to ecosystem degradation such as depletion of water resources	Medium	Medium	Long term	• Promote water recycling, adopt construction methods with low water use, and develop methods that account for water shortages
	Transition risk	Policies and regulations	Stricter regulations toward nature positive	Decline in new construction demand and increased compliance costs due to stricter land use regulations toward 30by30	Medium	High	Medium term	• Properly conduct construction in protected areas based on regulations and in line with the requirements of laws, municipalities, and other customers
				Increased compliance costs due to stricter regulations and monitoring requirements on environmental impacts such as pollution and ecosystem disruption during construction	Medium	Medium	Long term	• Optimize environmental assessment compliance costs by leveraging lessons learned from past construction projects • Develop efficient environmental management methods using digital technologies
		Markets and technologies	Delay in technologies addressing ecosystem considerations	Increased costs for developing and implementing technologies that contribute to nature positive and resource circulation, and loss of opportunities due to delays in response	Medium	Medium	Medium term	• Develop technologies for sorting and recycling plastics and promote new recycling businesses in collaboration with municipalities and private companies in plastic-related industries
		Reputation	Impact on surrounding ecosystems	Reputational decline due to adverse impacts on terrestrial and marine ecosystems caused by land use change, pollution, and disruption during construction	Medium	Medium	Medium term	• Plan and implement construction in line with environmental assessment results to reduce ecosystem impact risks • Reduce ecosystem impact risks through environmentally conscious initiatives during construction • Plan and implement construction based on engagement with local communities

Nature-Related Opportunities in Direct Operations

	Category		Item	Impact	Magnitude	Likelihood	Time Frame	Response
Direct operations	Opportunity	Services, markets	Efficient use of construction materials	Increased demand for repair work to extend infrastructure lifespans	Large	High	Short term	• Shorten construction periods, adopt methods requiring less on-site work, and develop new construction technologies to reduce impacts on infrastructure users
			Expansion of orders for environmental facilities	Increased demand and order opportunities for environmental facility construction such as for waste-to-energy plants	Medium	High	Short term	• Design improvements to enhance performance of existing products, develop new customers • Development of new products
			Development and implementation of ecosystem-friendly technologies	Increased demand and order opportunities through construction technologies with low environmental impact	Medium	Medium	Medium term	• Adoption of construction methods requiring less on-site work and development of new construction technologies
			Expansion of orders through national resilience measures	Expansion of order opportunities through national resilience measures to address intensifying natural disasters	Large	High	Short term	• Propose designs to customers that anticipate early restoration after disasters • Strengthen orders for seismic reinforcement and seismic isolation work on existing structures

Nature-Related Risks and Opportunities in Upstream and Downstream

	Category		Item	Impact	Magnitude	Likelihood	Time Frame	Response
Upstream	Physical risk	Acute	Intensification of extreme weather	Instability of raw material procurement and increased procurement costs due to increased frequency and severity of extreme weather events	Medium	Medium	Long term	• Consider the use of GX steel depending on construction project requirements • Require suppliers to implement GHG reduction initiatives through procurement guidelines • Develop construction technologies that reduce the use of materials with unstable procurement risks • Reduce procurement instability risks by developing new suppliers
		Chronic	Water shortages and ecosystem degradation	Instability of raw material procurement and increased procurement costs due to ecosystem degradation such as depletion of water resources	Medium	Medium	Long term	• Reduce procurement instability risks by developing new suppliers • Develop construction technologies that reduce the use of materials with unstable procurement risks • Require suppliers to reduce and effectively use resources (water, energy, raw materials, etc.) through procurement guidelines • Require suppliers to implement biodiversity conservation and sustainable use initiatives through procurement guidelines
	Transition risk	Policies and regulations	Stricter regulations on raw materials	Increased compliance and procurement costs due to stricter regulations toward nature positive in raw material mining and requirements for sustainability certification	Medium	Medium	Long term	• Reduce procurement instability risks by developing new suppliers • Develop construction technologies that reduce the use of materials with unstable procurement risks • Require suppliers to reduce and effectively use resources (water, energy, raw materials, etc.) through procurement guidelines
	Opportunity	Resource	Efficient use of construction materials	Reduction of natural impacts and cost savings in procurement through efficient use of construction materials, leading to reduced procurement volumes	Medium	Medium	Short term	• Implement environmentally conscious designs that require fewer materials • Further promote the use of recycled materials • Adoption of construction methods requiring less on-site work and development of new construction technologies
Downstream	Transition risk	Policies and regulations	Expansion of responsibility scope for impacts on nature after construction	Increased monitoring costs and reputational decline due to construction of facilities with significant natural impacts during operation (expansion of responsibility scope)	Medium	Medium	Long term	• Plan and design facilities from a life cycle perspective to reduce environmental impact risks

Measures to Address Impacts and Risks in Areas of High Conservation Significance or Ecosystem Integrity

The evaluation of construction sites in FY2025 confirmed the presence of sites in areas of high conservation significance or ecosystem integrity. Actions were taken at construction sites in these areas to avoid and mitigate impacts on ecosystems, as shown below.

Examples of Measures Implemented at Construction Sites in Areas of High Conservation Significance or Ecosystem Integrity

Example: Construction of an environmental plant in Prefecture A

The site was confirmed to be adjacent to a protected area and to have high ecosystem integrity, and the following actions were taken during construction.

- Temporary drainage ditches and earth dikes were installed around the perimeter of the work area to prevent turbid water from flowing off the construction site
- An environmentally sound dust suppressant was applied to the soil surface, and mist was sprayed to prevent dust from soil stockpiled for long periods
- Low-noise, low-vibration hybrid excavation machinery was used wherever possible to reduce noise and vibration

Example: Construction of an energy-related facility in Prefecture B

The site was confirmed to be adjacent to a protected area and to have high ecosystem integrity, and the following actions were taken during construction.

- Important plant species identified within the development area before construction were transplanted outside the area prior to the start of work
- All excavated soil was reused for embankment work within the construction site so that it would not need to be transported off-site
- Embankments and slopes were promptly compacted and protected to prevent dust dispersion and soil runoff

Metrics and Targets

We monitor environmental performance and set targets, and many of these metrics are aligned with the TNFD framework. For the TNFD disclosure metrics that are not yet subject to monitoring and target setting, we will prepare for future data collection.

ST JFE Steel EN JFE Engineering SH JFE Shoji

Items Monitored	Target Operating Company	Metrics	Correspondence to TNFD Metrics (Global Core and Additional)	Performance
Water resources	ST EN SH	Water intake	A3.0	P.282
	ST EN	Water discharge	C2.1	P.282
	ST	Water recycling volume	A3.2	P.282
Pollution	ST EN	Hazardous substance emissions (PRTR)	C2.4	P.279
	ST EN	Hazardous substance emissions (COD)	C2.1	P.278
	ST	Hazardous substance emissions (SOx/NOx)	C2.4	P.278
Resource circulation	ST EN	Resource input volume	—	P.280
	ST EN	Co-products/waste emissions	C2.2	P.280
Use of resources	ST	Water intake and consumption from water-stressed areas	C3.0	No intake from water-stressed areas (Japan)
Risk	ST EN SH	Fines due to negative impacts on nature	C7.2	0 yen (Japan)
Opportunity	ST EN	Beautification/greening expenses at production sites	C7.3	Approx. 0.6 billion yen (Japan)

Items with Set Targets	Target Operating Company	Metrics	Correspondence to TNFD Metrics (Global Core and Additional)	Performance
Reduction of chemical substance emissions	ST	Reduction of chemical substance emissions	C2.4	P.278
Resource use	ST	Recycling of co-products	A2.1	P.280
	EN	Recycling rate at construction sites	A2.1	P.281
	EN	Recycling rate of office recyclable waste	A2.1	P.281
	SH	Expand product lineup, contributing to resource circulation	C7.4	Initiative starting in FY2025
Effective use of water resources	ST	Efficient use of water resources	A3.0	P.282

Nature-Related Management Metrics

As part of overall risk management, we identify, analyze, and evaluate water risks based on past incidents of droughts and floods affecting the JFE Group's businesses, forecast data from the Japan Meteorological Agency, and the results of our scenario analysis. In particular, we consider as key risks the damages to business sites and disruption of the supply chain caused by restrictions on water intake due to droughts or increasing severity of meteorological disasters. In response, we are further reinforcing measures such as using recycled water, securing alternative means, and strengthening drainage facilities.

ST Water Risk Assessment and Measures

JFE Steel identifies and evaluates water-related risks based on past incidents of damage caused by droughts and floods, forecast data from the Japan Meteorological Agency, and results of scenario analysis. We conduct a further evaluation of water risks around each manufacturing site from different perspectives by also using the World Resources Institute (WRI)'s Aqueduct, a mapping tool for evaluating overall water risks from droughts and floods in each region around the world. According to the WRI's assessment in June 2024, water risks at JFE's main steelworks and production sites are not designated at a high level or above, but there will be risks of water shortages and flooding due to weather conditions in the future (2030s and 2040s). JFE Steel identifies manufacturing sites under such weather risks and takes measures such as business continuity planning.

ST Raised Effluent Standards to Reduce Water Resource Pollution Risks in Iron and Steelmaking Processes

JFE Steel strives to reduce its environmental impact on waterways by thoroughly purifying water used in iron and steelmaking processes before releasing it into public waterways or sewers. The company has concluded agreements with the administrative entity in each area that set out more rigorous effluent standards, compared to those stipulated under the Water Pollution Prevention Act. It also established a strict voluntary control standard to improve water quality. For FY2025, COD*, the water quality index for wastewater, was 2.3 tonnes per day.

*Chemical Oxygen Demand (COD) is an indicator for water pollution in seas, oceans, lakes, and ponds. It represents the amount of oxygen (mg/l) consumed when pollutants present in water, such as organic matter, are oxidized.

EN Proper Management in Accordance with the Water Pollution Prevention Act and Sewerage Act

Wastewater from the JFE Engineering Yokohama head office, Tsurumi works, Tsu works, and the Kasaoka Monopile Factory is released into public waterways or sewer systems. Nitrogen, phosphorus, and COD in the wastewater are measured on a regular basis and effectively managed in accordance with the Water Pollution Prevention Act and Sewerage Act.

For more on quantitative data related to water, please refer to:
> Environmental Data (P. 273)

Main Initiatives for Biodiversity Conservation and Nature Positive

The JFE Group endorses and participates in the Challenge Zero initiative jointly sponsored by Keidanren and the Japanese government. We are also collaborating with Yokohama City on a project that uses steel slag products to improve the marine environment while also undertaking efforts for biodiversity conservation and nature positive.

> **Challenge Zero** (https://www.challenge-zero.jp/en/member/37)

ST Complete Chromate-Free Hot-Dip Galvanized Steel Sheets

Chromate treatment using hexavalent chromium (Cr^{6+}), an environmentally hazardous substance, has been employed to improve the corrosion resistance of hot-dip galvanized steel sheets, mainly used in the electrical and building materials sectors. We developed steel sheets that deliver performance equal to or greater than that of chromated steel sheets without using hexavalent chromium, and by having customers evaluate the stable performance of these products, we achieved complete chromate-free hot-dip galvanized steel sheets in 2020.

ST Contributing to Biodiversity and the Creation of an Attractive Seaside Town by Utilizing Steel Slag Products (Partnership Agreement with Yokohama City)

Silty sediment (sludge containing large amounts of organic matter) piles up on the seabed along the seaside frontage of Yamashita Park in Yokohama City, Kanagawa Prefecture, and significantly deteriorates water quality in summer. As a result, the ocean's ability to function as a spawning ground or environment for nurturing organisms has been lost.

In a joint research project with Yokohama City, JFE Steel is restoring the intrinsic ability of the waters to purify seawater with the help of marine organisms by using steel slag products to create rocky habitats that provide attachment surfaces for marine organisms and assist in improving the marine environment. Immediately after the experiment began, we observed an increase in the presence of marine organisms such as starfish and sea cucumbers around the area, and the populations continued to grow. Moreover, we estimated that 8,400 kl of seawater (equivalent to seventeen 25-meter swimming pools) is filtered per day by filter-feeding marine creatures such as bivalves and sea squirts. We also estimated their impact on the removal of COD and the reduction of CO_2 in comparison to results obtained through water purification at sewage treatment plants.

This public-private initiative to improve the marine environment has earned public recognition, with Yokohama City and JFE Steel jointly receiving the FY2021 Environmental Award of the Japan Society of Civil Engineers*1. In 2022, JFE Steel also received the Minister of Land, Infrastructure, Transport and Tourism Award at the 5th EcoPro Awards*2, sponsored by the Sustainable Management Promotion Organization (SuMPO). Following these awards, a commemorative sign displaying the results was installed near the balcony facing the waters in front of Yamashita Park so that more people can learn about the initiative.

These results are also used to raise environmental awareness among local communities through numerous exhibitions and events, including Hamatora FES*3 and Tokyo Bay Dai-Kanshasai*4.

*1 The Japan Society of Civil Engineers Award is a prestigious award with a history of over 90 years. The Environmental Award (Group-2) is given to an innovative project that has contributed to any combination of environmental preservation, improvement, and creation activities by developing or operating civil engineering technologies or systems.

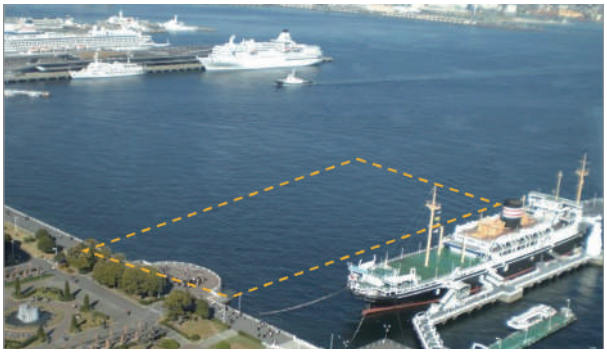
*2 The award is given to goods, services, technologies, solutions, or business models with specific and outstanding eco-friendly attributes that are widely recognized by businesses, consumers, investors, and market players in the Japanese market.

*3 Hamatora FES is the short name for the Yokohama Triathlon Festival. This is one of Japan's largest triathlon (swim, bike, and run) festivals, bringing together a variety of booths for triathlon, other sports, official event merchandise, food and beverages, and environmental PR. Organized by the World Triathlon Championship Series Yokohama Organizing Committee.

*4 A public-private partnership event in which citizens, companies, and organizations, as well as the national and local governments, work together to restore Tokyo Bay and promote co-existence with nature. Organized by the Tokyo Bay Dai-Kanshasai Executive Committee and the Tokyo Bay Renaissance Public-Private Partnership Forum.

> **FY2021 Environmental Award of the Japan Society of Civil Engineers** (https://www.jsce-int.org/node/780)

> **The 5th Eco Pro Award (Japanese only)** (https://sumpo.or.jp/seminar/awards/5th_eco-pro_award_results.html)



The dotted line indicates the area in which slag products are being used at Yokohama Bay (photo taken by Yokohama City)



Colony of sea squirts on Frontier Rock™



Signboard commemorating the partnership project (installed in September 2023)



Hamatora FES (May 2026)

ST Agreement Concluded on the Demonstration Project for Blue Carbon Creation at the Hota Fishing Port

In March 2025, JFE Steel entered into a collaboration agreement with Chiba Prefecture, the Hota Fishery Cooperative Association in Kyonan Town, and Kyonan Town for a demonstration project to restore seaweed beds.

In Chiba Prefecture, shallow coastal areas host many rocky reefs and tidal flats with widespread seaweed and seagrass beds. Recently, however, the destruction of seaweed beds has been spreading in the Uchibo coastal area. Although there are several theories about why this is happening in Chiba's coastal waters, the main causes are thought to be rising seawater temperatures and damage caused by herbivorous fish. The demonstration project began in April 2025 and is scheduled to continue through March 2028. Steel slag products (artificial stone) rich in iron, which is essential for seaweed growth, are wrapped with seed strings containing seaweed seedlings and placed in the sea. To confirm the effects of seawater temperature and herbivorous fish, which are considered causes of the destruction of seaweed beds, seaweed growth will be monitored under varying conditions, including seaweed species and water depth.

This demonstration project is intended to create blue carbon* and improve fishery productivity by enhancing the marine environment.

*Blue carbon refers to CO_2 sequestered by growing seaweed and other marine vegetation.



From left: Ms. Yoko Inoue, Director General, Environmental and Community Affairs Department, Chiba Prefecture; Mr. Eiji Katayama, General Manager, Slag Business Planning Division, JFE Steel Corporation; Mr. Harukazu Shiraishi, Mayor of Kyonan Town; Mr. Shigeo Murai, Representative Director and President, Hota Fishery Cooperative Association

Commemorative photo with participants (April 2025)

ST Advancing Biodiversity Verification of Steel Slag Products in Collaboration with Venture Businesses

JFE Steel keeps a water tank containing the coral-covered steel slag products Frontier Rock™ and Marine Block™ in the exhibition area at the reception of the head office, offering visitors the opportunity to watch coral and tropical fish while learning about our initiative to preserve the ecosystem using steel slag products. We also intend to conduct experiments inside the tank. Innoqua Inc.*1 is providing technical support for the exhibition, which has been featured by several newspapers and TV programs as an example of business collaboration in the field of the environment. JFE Steel also participates in the Setouchi Nagisa Forum*2, a seaweed-bed and tidal-flat restoration project established by Innoqua, and collaborates on marine environmental conservation in the Seto Inland Sea region using steel slag products.

*1 A venture company engaged in the development of systems for managing and nurturing corals and fish by combining its aquarist know-how with IoT and AI.

*2 Participating members include companies, universities, municipalities, and fisheries cooperatives located along the Seto Inland Sea. The project aims to conserve biodiversity and revitalize local economies through regional collaboration, beginning with the restoration of seaweed beds and tidal flats



Healthy coral attached to and steadily growing on Frontier Rock™ installed in the tank

ST The Biotope Chita Initiative to Reproduce and Conserve the Local Ecosystem

To commemorate the 80th anniversary of its opening in 2023, the JFE Steel Chita Works established and developed Biotope Chita within the plant premises to recreate and conserve the Chita Peninsula's ecosystem. Of the approximately 2 ha of site area, 1 ha had already been developed as a green belt in 2013. We are creating habitats at Biotope Chita for living organisms and conducting community-based events in collaboration with the local area.



Biotope Chita overview



Rice planting event

ST The Chita Works Certified as an Outstanding Aichi Biodiversity Company

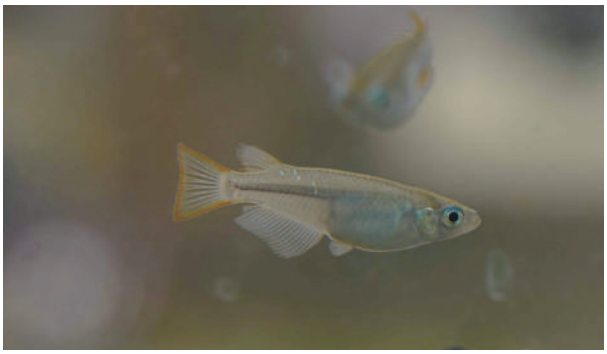
In November 2025, our Chita Works was certified as an Outstanding Aichi Biodiversity Company under the Aichi Biodiversity Company Certification Program launched by Aichi Prefecture and based on the Aichi Biodiversity Strategy 2030. The program is intended to encourage more businesses in the prefecture to play a pivotal role in preserving local biodiversity by certifying those that have implemented outstanding initiatives to do so.

We have used Biotope Chita at the Chita Works since FY2022 to create green spaces that attract the chestnut tiger butterfly, a species that migrates more than 2,000 kilometers across Japan, and we have partnered with municipalities in the Chita Peninsula of Aichi Prefecture to exchange information on butterfly arrivals. We are also engaged in conservation activities for native species such as the Japanese rice fish (Oryzias latipes) and Japanese honeybee (Apis cerana japonica). We have further strengthened our initiatives since FY2024 by undertaking ex-situ conservation of wetland plants.

Certified
Aichi Biodiversity Company



Chestnut tiger butterfly



Japanese rice fish

ST Biotope Chita Certified as a Nature Symbiosis Site

Biotope Chita, the biodiversity conservation base of the Chita Works, was certified as a Nature Symbiosis Site by the Ministry of the Environment, the Ministry of Agriculture, Forestry and Fisheries, and the Ministry of Land, Infrastructure, Transport and Tourism.

A Nature Symbiosis Site is an area that promotes biodiversity conservation through private initiatives and other efforts. The system was launched in 2023 and codified into law in 2025 under the Act on Promoting Activities to Enhance Regional Biodiversity. This legislation expanded the scope of certification to include areas where initiatives are undertaken to conserve or create natural environments for the future. In 2025, a portion of Biotope Chita (0.66 ha) was certified as a Nature Symbiosis Site as part of the Chita Peninsula Greenbelt*1. The newly certified area covers 0.8 ha developed in 2023. The area was independently certified as a "creation type" Nature Symbiosis Site in recognition of efforts to create a natural environment in which native plants and animals can live and grow.

*1 The Chita Peninsula Greenbelt (76.33 ha) is a forest belt in the coastal industrial area of the Chita Peninsula. In 2011, efforts began under the Inochi wo Tsunagu Project, a wide-area collaboration focused on biodiversity. Activities include improving the quality of green spaces, creating pathways for species to move freely between green spaces, and creating habitats for living organisms.

自然共生サイト認定
30by30

ST Initiatives for Blue Carbon Using Steel Slag Products and Acquisition of J Blue Credit™

In recent years, research on blue carbon (carbon absorbed and stored by living organisms in the ocean) has been advancing. We are also creating seaweed beds using steel slag products and measuring the total carbon absorption of these beds.

JFE Steel has been promoting the research while creating a seaweed bed using steel slag products and measuring the amount of carbon captured by the entire bed. The company has been collaborating with Koujiro Fisheries Cooperative (Iwakuni City, Yamaguchi) and the National Institute of Technology, Ube College (Ube City, Yamaguchi) on a project to create a seaweed bed and ecosystem using recycled materials in areas around Shinto, Iwakuni City, since FY2012. The initiative involves creating a seaweed bed with rich biodiversity using Marine Stone™, a grain-size-adjusted steel slag, and other steel slag products, and measuring CO_2 absorption of the created beds. Iwakuni City joined the project in FY2023. The cumulative amount of CO_2 absorbed and stored from 2018 to 2023, which totaled 81.4 tonnes, received J Blue Credit™ certification by the Japan Blue Economy Association. This was the first certification ever given to a three-party joint project by the Fisheries Cooperative, academia, and private business. The seaweed bed created through the project had the co-benefits of offering a gathering place for a diverse range of fish species. Additionally, the sea area is used for education and research.

In recognition of this initiative, the project partners and JFE Steel jointly received the Ministry of Agriculture, Forestry and Fisheries Prize at the 32nd Global Environment Award*1 in 2024 and the WAVE Award at the Blue Infrastructure Award*2 in 2025.

JFE Steel is also participating in the Creating Tidal Flats Using Recycled Resources in the Inner Harbor of Fukuyama Port project with Hiroshima University, The Chugoku Electric Power Co., Inc., and Fukuyama City, Hiroshima Prefecture. The project calculates the amount of carbon absorbed by microalgae growing on the tidal flats. The calculated carbon absorption of 17.6 t-CO_2 from February 2023 to January 2024 received J Blue Credit™ certification from the Japan Blue Economy Association. Going forward, JFE Steel will continue to contribute to creating multifaceted environmental value, including CO_2 absorption, water purification, and enhanced biodiversity, by expanding the applications of steel slag products.

*1 The Global Environment Award recognizes environmental preservation and related efforts that will help establish a circular society for a "harmonic coexistence between industrial development and the environment of the Earth."

*2 Established to help ensure that valuable waterfront spaces in ports are passed on to future generations in an even richer state and contribute to the expansion of blue infrastructure aimed at achieving carbon neutrality.

› The 32nd Global Environment Award (Japanese only) (https://www.sankei-award.jp/eco/jusyou/)

› Selection of Award-Winning Initiatives for the 3rd National Sea Restoration and Blue Infrastructure Awards (Japanese only) (https://www.wave.or.jp/doc/2026/doc/2025_blueinfra_shou.pdf)



School of rockfish gathered around the steel slag seaweed bed



Excellent place for education and research
(photo from the National Institute of Technology, Ube College)



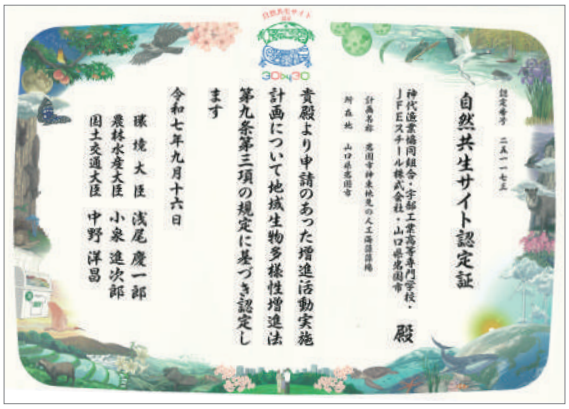
Blue Infrastructure Awards ceremony

From left: Atsushi Kurata, Director, Agriculture, Forestry and Fisheries Department, Iwakuni City; Kenji Sugimoto, Professor, National Institute of Technology, Ube College; Hiroshi Fujimoto, Representative Director and President, Koujiro Fisheries Cooperative; and Kentaro Iwai, Slag Planning Department, JFE Steel Corporation

ST Restoring Marine Ecosystems Using Steel Slag Products and Certification as a Nature Symbiosis Site by the Ministry of the Environment

Marine Stone™ is a grain-size-adjusted steel slag that controls the generation of hydrogen sulfide from silty sediment in enclosed coastal seas and improves the environment in which organisms can live. Its effectiveness in improving marine environments is widely recognized, and the joint project with Hiroshima University has received external commendations. The project to create a seaweed bed and ecosystem using recycled materials in areas around Shinto, Iwakuni City, was certified as a Nature Symbiosis Site by the Ministry of the Environment, the Ministry of Land, Infrastructure, Transport and Tourism and by the Ministry of Agriculture, Forestry and Fisheries. The Nature Symbiosis Site scheme certifies areas where biodiversity is conserved through private initiatives and other efforts, as part of measures to achieve the Ministry of the Environment's 30by30 target, which aims to effectively conserve at least 30% of land and sea as healthy ecosystems by 2030. The project was recognized for enhancing biodiversity, generating blue carbon, and utilizing the created seaweed beds as sites for environmental awareness, education, and research, leading to our first certification in an actual sea area.

Meanwhile, Frontier Rock™, an artificial stone made from a steel slag hydrated matrix, has also demonstrated excellent performance as a base for seaweed beds and fishing reefs. A submerged bank built on the seabed off the coast of Minami-Izu Town, Shizuoka Prefecture, has become a gathering place for large perennial seaweeds as well as useful fishery resources such as lobsters and a wide variety of fish.



Nature Symbiosis Site Certificate



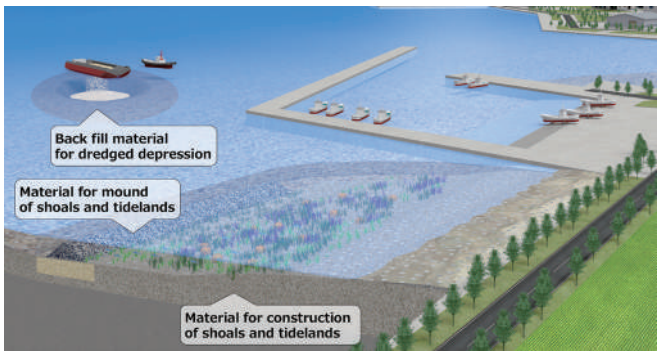
School of fish attracted to the submerged bank made of Frontier Rock™

ST Calcia Improvement Material

Calcia improvement material is a slag product that uses converter-type steelmaking slag as raw material and is manufactured by controlling composition and adjusting particle size. Dredged soil mixed with calcia improvement material is called calcia-improved soil.

Calcia-improved soil can also be used for creating shallow waters, tidal flats, and embankment material and as back fill material for deep excavation pits left by marine sand extraction. It contributes to improving the marine environment. To date, it has been used as the main embankment material for creating a shallow area (incidental facilities at the sediment disposal site, Tokuyama-Kudamatsu Port). In the Seto Inland Sea, studies are also underway to explore its use as backfill for deep excavation pits to restore former marine sand extraction sites.

› **Contribution of Steel Slag Products** (P. 136)



Application of Calcia-Improved Soil for Marine Environmental Improvement

ST Environmental Conservation and Nature Positive Designated as a Priority Area under the Policy on Social Contribution

In 2026, JFE Steel established the JFE Steel Policy on Social Contribution Activities. In promoting social contribution activities, it designated environmental conservation and nature positive as one of its priority areas, closely aligned with its business strategy. In addition to providing products, technologies, and services that contribute to these areas, JFE Steel will also undertake activities to advance environmental conservation and nature positive beyond its business operations.

EN Initiatives in the Engineering Business for the Preservation of the Natural Environment and Biodiversity

In engineering projects, at waterfronts, in mountainous areas, and in large-scale construction efforts, customers and related organizations often conduct preliminary surveys in advance, depending on the importance of conserving the surrounding environment, and various environmental protection conditions may be imposed on the work, including measures for protecting living organisms.

JFE Engineering respects the proposed conditions and thoughtfully considers biodiversity conservation by keeping the impact of construction work at a minimum. For example, it may propose a construction method that minimizes the impact of noise or drainage pollution. For its works, the status of biodiversity on its premises and in surrounding areas is checked, and necessary measures are taken to ensure preservation.

The JFE Engineering Group also undertakes initiatives that contribute to conserving the natural environment and biodiversity, including the construction of sewage treatment plants that help improve water quality in developing countries (P. 174), as well as initiatives that help address marine plastic pollution,* such as plastic recycling (P. 129), horizontal recycling of PET bottles (P. 131), and the construction and operation of waste-to-energy plants in developing countries (P. 132).

*JFE Engineering Group initiatives that contribute to addressing marine plastic pollution include the construction and operation of waste-to-energy plants in developing countries and are in alignment with the Ministry of the Environment's National Action Plan for Marine Plastic Litter, formulated in 2019. Furthermore, J&T Recycling Corporation, a group company of JFE Engineering, supports the activities of the Japan Clean Ocean Material Alliance (CLOMA), which was established to support activities that address the problem of marine plastic litter. As a member of CLOMA, the company is recycling PET bottles and plastics.

EN Completion of the Largest Sewage Treatment Plant in Hanoi, Vietnam —Contributing to the Improvement of Water Quality in Public Water Areas in Hanoi

JFE Engineering Corporation, in a joint venture with Tsukishima JFE Aqua Solution Co., Ltd., has completed the construction of the largest sewage treatment plant in Hanoi, the Yen Xa Wastewater Treatment Plant, for which the joint venture was awarded the contract by the City of Hanoi, Vietnam. The two companies were responsible for the detailed design and construction of the project. The work was completed in May 2025, and the completion ceremony was held in grand fashion on August 19.

In Vietnam, rapid urbanization accompanying accelerated economic growth has led to severe water pollution of rivers caused by domestic wastewater, and the development of sewage treatment facilities has become a pressing priority. Although the government has set a target of 100% sewerage coverage by 2050, the sewage treatment rate in urban areas remains low at around 20%.

This project consisted of constructing a sewage treatment facility designed to support a national objective. The plant is equipped with nitrogen and phosphorus removal technologies, has a daily treatment capacity of 270,000 m^3, and serves around one million people. Construction began in 2019 and, despite the impact of the COVID-19 pandemic, continued steadily, with completion achieved approximately six years later.

The project was financed by a yen loan provided by the Japan International Cooperation Agency (JICA). The facility incorporates Japanese technologies, including rapid filtration for water treatment and pipe jacking with electromagnetic detection for construction, thereby realizing the export of high-quality infrastructure.

Going forward, JFE Engineering will continue to contribute to the improvement of living environments overseas and to the realization of a sustainable society as a leading company in the field of water and sewage treatment plants, by providing Japanese technologies as well as our accumulated expertise and experience.

Project Overview

Client	City of Hanoi, Vietnam
Site location	Thanh Tri District, Hanoi
Scope	Construction of a new wastewater treatment plant
Contract amount	Approx. 12.0 billion yen (JFE Engineering share)
Completion	May 2025



Scene from the completion ceremony

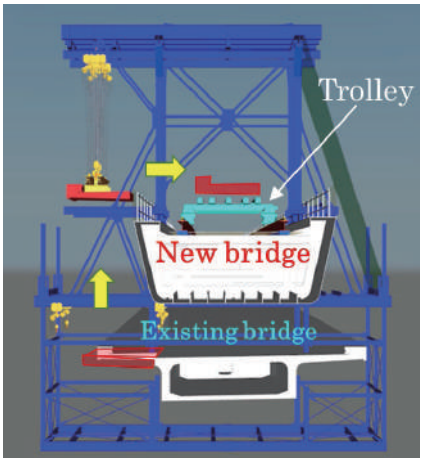

Panoramic View of the Yen Xa Wastewater Treatment Plant

EN Biodiversity Conservation in the Reconstruction of the Tedori River Bridge

The reconstruction of the Tedori River Bridge is described under the heading "Toward Realizing Longer Service Life Bridges" in the Initiatives to Transition to a Circular Economy section of this Sustainability Report 2026. The project is characterized not only by the use of stainless clad steel but also by the adoption of a special reconstruction method necessitated by local site constraints. The bridge is located at the mouth of the Tedori River, and the sandy beach beneath the girders is inhabited by the Iso-komori spider (Lycosa ishikariana) and the Little Tern, both listed as endangered species (Category II). We therefore developed a reconstruction method that avoids bringing heavy machinery onto the sandy beach to protect these rare species.

The construction method begins by assembling the new bridge on top of the existing one before its removal and then installing a removal frame on the new bridge. Using this frame, the girders are cut in mid-air, lifted onto the new girders, placed on transport vehicles, and carried out of the bridge area. This reconstruction method was developed by JFE Engineering, combining multiple techniques derived from similar experiences in urban expressway reconstruction and widening projects and applied to the site after full-scale construction trials.

› Toward Realizing Longer Service Life Bridges (P. 139)



Schematic of the girder removal procedure



Removal frame



On-site construction status
(removal of existing girders in mid-air using a removal frame)

EN JFE Engineering: Biotope for Children's Learning Experience

JFE Engineering has conducted some renovation work at the JFE Dragonfly Path in the Tsurumi Works, and since 2009 it has been inviting local residents and children to learn about the ecosystem at a biotope, Dragonfly Pond, located along this path.

The JFE Dragonfly Path Fan Club, a group mainly composed of neighborhood residents, has organized a research event that involved capturing dragonflies to help children learn about dragonfly ecology and the local natural environment.

We are also a founding member of the How Far Do Dragonflies Fly Forum, which aims to improve the quality of green spaces in the Keihin coastal area and contribute to biodiversity. The forum brings together companies, residents, governments, and experts and conducts research activities such as capture, tagging, and release of dragonflies that fly in 20 green spaces and biotopes scattered throughout the Keihin coastal area and inland areas to track their movements. The JFE Dragonfly Path also serves as a research site.

These activities were certified in 2024 by the Ministry of the Environment as a Nature Symbiosis Site under the designation "Yokohama/Keihin Forest."



Dragonfly Pond serving as a biotope

EN Participation in Kanagawa Prefecture's Reforestation Partner Program

In March 2023, the JFE Engineering Group's J&T Recycling Corporation expressed its support for the Kanagawa Reforestation 50 Year Plan and signed a memorandum of understanding with Kanagawa Prefecture on the Reforestation Partner Program, an initiative launched by the prefecture.

The company's intent is to use the program as part of its environmental protection and harmony activities while supporting the prefecture's vision. Under the partnership, the company's employees volunteer to help thin trees and take part in other efforts for conserving forests, a valuable source of water for future generations.

The Reforestation Partner Program grants naming rights to participants for parts of the prefecture-owned forests, one of which is now called the J&T Kankyo Miracle Forest (with the word "miracle" expressed in kanji, meaning the "future is coming"). J&T Recycling Corporation is constantly enhancing its ESG initiatives to improve the environment.



New employees pruned trees in a volunteer activity



J&T Kankyo Miracle Forest



Valuation report on CO_2 absorption by the forest

For details about the Reforestation Partner Program, please refer to:

› **Website for Kanagawa Prefecture (Japanese only)** (https://www.pref.kanagawa.jp/docs/pb5/partner.html)

EN Participation in Beach Cleanup Activities with Sea Turtle Network Mie

In 2017, the Governor of Mie Prefecture, the chair of Sea Turtle Network Mie, and the head of JFE Engineering's Tsu Works signed Mie Prefecture's first Mie Biodiversity Partnership Agreement to protect wildlife and raise awareness. Since then, JFE Engineering has supported the initiative by providing 5,000 awareness-raising leaflets each year and participating in beach cleanups.



Leaflet (front)



Leaflet (back)

● Beach Cleanup (Primarily Conservation Activities for Loggerhead Sea Turtles*)

Because April through August is the breeding season for the Kentish plover, the official bird of Mie Prefecture, large-scale beach cleanups during this period could cause parent birds to abandon their nests, thereby disrupting breeding. We therefore conduct beach cleanups several times between September and March along the coast, from around the Tsu Works to Yokkaichi.



Beach cleanup

*The loggerhead sea turtle is listed as Threatened IB (Endangered, EN) on the Ministry of the Environment Red List. According to the Sea Turtle Conservation Handbook (2006) by the Ministry's Nature Conservation Bureau, juvenile loggerhead turtles hatched on Japanese beaches use the Kuroshio Current to cross the Pacific, with many reaching waters off the Baja California peninsula. After maturing there, the turtles cross the Pacific again toward the coast of Japan and lay eggs on beaches. Conserving loggerhead turtles in Japan, an important nesting area, therefore also contributes to protecting populations across their trans-Pacific habitat.

EN Marine Environmental Conservation through Participation in Refresh Setouchi (Kasaoka City Coastal Cleanup Campaign)

JFE Engineering participates in the Kasaoka City Coastal Cleanup Campaign under Refresh Setouchi, organized by the Setouchi Umi-no-Michi Network Promotion Council, which comprises municipalities and other organizations along the Seto Inland Sea, thereby promoting co-existence with local communities and conservation of the natural environment. This ongoing activity has been primarily led by the Chugoku Branch. Participation increased following the establishment of the Kasaoka Monopile Factory, and the initiative has now expanded across departments.

Kasaoka City has a rich natural environment with extensive tidal flats and shallow coastal waters and is an important habitat for the tri-spine horseshoe crab, a species listed as Endangered Category I and regarded as a living fossil.

The horseshoe crab's habitat is shrinking year by year due to such factors as coastal reclamation, and marine litter washed ashore can affect spawning grounds and larval habitat. In light of these conditions, cleanup activities not only help to beautify the coast but also help to conserve valuable ecosystems, including horseshoe crab habitats.

JFE Engineering also supports conservation in collaboration with the community by participating in the Kasaoka City Horseshoe Crab Environmental Support Group, an initiative that promotes nature conservation with the horseshoe crab as its symbol.

JFE Engineering is engaged in businesses closely connected to the marine environment, including the manufacture of offshore wind power equipment such as monopiles as well as port and marine structures such as jackets, caissons, and cranes.

Because our business is closely related to the marine environment, we regard conducting business activities in harmony with this environment as a key management concern. We will continue to contribute to marine environmental conservation and the maintenance of biodiversity through collaboration with local communities.



Beach cleanup

Initiatives for Realizing Nature Positive in the Keihin Waterfront Area

The shared urban space under OHGISHIMA2050 is envisioned as a green, future-oriented venue for demonstration and interaction of advanced technologies supporting DX and GX. In collaboration with Kawasaki City, we are exploring the creation of a nature-positive urban space that fosters biodiversity.

As part of land use initiatives in the Keihin area, we are considering the promotion of CCUS projects by leveraging the expertise and know-how cultivated in advanced CCS projects, contributing to ecosystem conservation through businesses that support carbon neutrality. Land use conversion in the Keihin area involves dismantling large idle facilities such as steelmaking shops and coke plants. Through the recycling of scrap, concrete, and other materials, we are working to reduce environmental impact. At Ohgishima, we have continued operations as a steelworks rich in greenery, conducting extensive greening initiatives to create a people- and environment-friendly site. In land use conversion as well, we will aim to realize an urban environment that takes biodiversity and resource circulation into consideration.



Shared urban space (concept)

Environmental Management Activities

Environmental Management System

The JFE Group companies work to prevent environmental risks and continuously improve environmental performance through their environmental management systems. As part of these efforts, they promote ISO 14001 certification, the international standard for environmental management systems, with the aim of strengthening voluntary and ongoing environmental activities. In accordance with the requirements of ISO 14001, each registered organization reviews its environmental policy, compliance with legal requirements, achievement of targets for the previous fiscal year, and activity results. Each organization then formulates environmental targets and action plans for each fiscal year and communicates them throughout the organization.

Progress toward achieving environmental targets is periodically reported and reviewed, while implementation status and results are confirmed through internal audits and other means as necessary.

Annual activity results are evaluated through management reviews to confirm effectiveness, while issues and opportunities for improvement are reflected in the environmental targets and action plans for the following fiscal year to drive continuous improvement.

All production sites of JFE Steel and JFE Engineering, as well as JFE Shoji's major offices in Japan and overseas, have been certified, encompassing 64% of the 44,303 employees at the 82 companies covered in this report and 42% of all sites. In FY2025, there were no major violations of environmental laws or regulations by any of these companies (air, water, soil, etc.) that resulted in a fine or other penalty. Total fines and penalties were 0 yen.

For quantitative data related to ISO 14001 for each business, please refer to:

› **List of ISO 14001-certified companies** (https://www.jfe-holdings.co.jp/en/common/pdf/sustainability/environment/env_manage/iso14001.pdf)

ST Environmental Committee and Environment Management Committees Provide Appropriate Management Supervision

JFE Steel maintains Environment Management Departments at its head office and in each business office, as well as an Environmental Committee under the Sustainability Council, which is chaired by the president, and Environment Management Committees in each local office. In addition, the Management Committee deliberates and sets materialities and KPIs, including those related to the environment, and evaluates performance.

› **FY2025 KPI Results and FY2026 KPIs** (P. 19)

EN Environmental Committee Oversees Environmental Management

JFE Engineering maintains an Environment Management Department at each of its major locations, including production sites and branch offices as well as all divisions in charge of products. The Environmental Committee, chaired by the president, oversees environmental management for the entire company. Under its Environmental Management System, JFE Engineering works to minimize environmental impact at production sites, branch offices and construction sites and contribute to environmental protection through all products and services. The major strategies for FY2026 are (1) promote environmental contribution through products for mitigating global warming and climate change, (2) promote environmental protection, effective energy conservation, and resource recycling in business activities, and (3) ensure thorough compliance with environmental laws and regulations. These strategies are incorporated into related operations and implemented accordingly.

SH Expand ISO 14001 Certification Acquisition Coverage

JFE Shoji obtained ISO 14001 certification for its head office, Osaka branch, and Nagoya branch in 2000 and later expanded the scope of certification to all domestic offices. JFE Shoji also applies the same environmental management system to its domestic group companies, promoting the same environmental management activities and striving for the same certification. Overseas coil centers are also working to obtain ISO 14001 certification.

Environmental Audit

In addition to the regular internal and external audits at ISO 14001-certified sites, the audit and environment departments at each operating company's head office conduct independent environmental audits at their production sites once a year.

ST Conduct Detailed Audits

Once a year, JFE Steel's Audit Department and the Environment, Disaster Prevention and Recycling Department conduct an environmental audit at each operational site. JFE Steel categorizes Group companies based on the result of risk assessment taking into account their equipment and other factors, and it conducts detailed audits every one to five years using checklists.

In FY2025, we conducted audits of 20 Group company sites.



Document audit at a domestic Group company



On-site audit at a domestic Group company

EN Conduct Audits to Confirm Compliance with Environmental Laws and Regulations

JFE Engineering places top priority on complying with environmental laws and regulations.

For JFE Engineering's production sites in Japan (Tsurumi, Tsu, and Kasaoka), the Safety and Environment Department conducts environmental law compliance audits as well as internal audits of the environmental management system. In addition, the department annually audits about 50 locations selected from construction sites in Japan and Group companies to confirm compliance with environmental laws and regulations. Furthermore, at JFE Engineering, internal audits are conducted at approximately 70 locations annually (including about 30 construction sites and plant operation sites) to evaluate the effectiveness of initiatives for improving environmental performance and take remedial action. Annual environmental inspections to confirm compliance with environmental laws are conducted for each construction project by the responsible departments, and self-checks of legal compliance are carried out every year at production sites (Tsurumi, Tsu, and Kasaoka).

SH Conduct Internal Audits and Environmental Audits

The JFE Shoji Group conducts internal environmental audits once a year for its ISO 14001-certified group companies, and environmental audits are conducted once every three years for non-certified group companies to confirm on-site compliance with laws and regulations. In FY2025, we conducted internal audits of all 54 ISO-certified organizations and environmental audits of 12 non-certified companies.

For quantitative data related to environmental audits, please refer to:
› **Environmental Data** (P. 273)

Environmental Education

The JFE Group actively provides education to foster a corporate culture of environmental protection. Education at operating companies includes training for new recruits and newly promoted employees as well as specific environmental-protection training by position and job.

For groupwide environmental training, we hold an annual Review Session on Environment-Related Laws and Regulations, to which lawyers specialized in environment-related laws and regulations are invited to give lectures on the latest information related to the enactment and revision of these laws, as well as associated violations and court decisions. Employees from wide-ranging departments, including the environment, disaster prevention, legal affairs, general affairs, and manufacturing departments of the operating companies and their group companies, who are involved in environment-related activities, attend these annual sessions as the basis for planning their activities, such as educating employees and raising awareness of environmental laws and regulations across the Group.

ST Promote Acquisition of Pollution-Control Manager Qualifications

JFE Steel encourages employees to obtain qualifications as pollution-control managers, and it implements a training program for environmental managers at Group companies. JFE Steel also provided employees with training to ensure compliance with environmental laws, disseminated information about regulatory revisions at its Environmental Liaison Committee meetings for Group companies, and organized brush-up training in waste management skills for on-site personnel.

EN Provide General Environmental Education

JFE Engineering educates all employees, including those at its group companies, about environmental issues to increase their understanding of the company's policies and initiatives. To ensure proper environmental management at production and construction sites, training is often tailored to specific employee operations, helping to enhance their capabilities. In FY2025, we improved the video materials distributed for environmental law education to make the content easier to understand.

SH Provide General Environmental Training and Specialized Training for Internal Auditors

JFE Shoji provides all employees with general environmental training in compliance with ISO 14001 and specialized training for internal audit staff. All employees within the scope of certification receive a pocket-size ISO Employee Card to carry with them so they can check the details of ISO 14001 activities at any time. In addition, each company performs a self-check using its own extensive checklist to ensure understanding and rigorous compliance with environmental laws. Also, JFE Shoji provides environmental training to new executives and information about revised laws and regulations to environmental management personnel.

Environmental Impact Reduction Initiatives

The JFE Group regards co-existence and mutual prosperity with local communities, the global environment, and society at large as a critical managerial challenge in terms of business continuity. It strives to control air and water pollutant emissions and aggressively invests in environmental protection. Related internal controls and education are steadily being strengthened as well. Also, the transfer and widespread application of proprietary technologies, mainly in developing countries, contribute to pollution prevention on a global scale.

For quantitative data related to reducing environmental impact, please refer to:
› Environmental Data (P. 273)

Controlling Air Emissions

ST Initiatives to Further Reduce SOx and NOx Emissions

JFE Steel is installing low-nitrogen oxides (NOx) burners in reheat furnaces, switching to low-sulfur fuels and deploying desulfurization and denitration devices in sintering plants, all major sources of sulfur oxides (SOx) and NOx emissions. It has concluded agreements with local administrations that stipulate conditions that are stricter than the total volume restrictions required by the Air Pollution Control Law. The company is continuing to further control emissions at a level that is less than the amount set forth in the agreement. In addition, the company suppresses dust dispersion through measures that include enhancing on-site cleaning, installing sprinklers and windbreak fences in raw material yards, and improving the performance of dust collectors.

EN Appropriate Management in Place to Restrict SOx and NOx Emissions

To ensure compliance with the Air Pollution Control Law and relevant local regulations, JFE Engineering properly manages facilities that emit soot and smoke at its Yokohama head office, Tsurumi works, and Tsu works, so NOx and SOx emissions from those facilities are maintained at a level sufficiently lower than the total annual volume restriction (NOx: 18,000 Nm^3, SOx: 100 Nm^3).

Environmental protection efforts are underway at construction sites and plant operation sites through the exclusive use of construction machinery and on-site vehicles in compliance with the Automotive NOx and PM Law and the Act on Regulation, Etc. of Emissions From Non-road Special Motor Vehicles (Off-Road Vehicle Law).

In addition, we strive to prevent leakage at the Yokohama head office, Tsu works, and Kasaoka Monopile Factory and at temporary locations such as construction sites by inspecting equipment using fluorocarbons and ensuring proper disposal in accordance with the Fluorocarbons Emission Control Act.

Management of Chemical Substances and Emission Control

ST Initiatives to Reduce VOC Emissions

JFE Steel lowers its environmental impact by voluntarily reducing the chemical substances it releases. Release and transfer amounts of substances subject to Japan's Law concerning Pollutant Release and Transfer Register (PRTR Law) are reported in accordance with the law.

The Japan Iron and Steel Federation formulated a voluntary action plan to reduce VOC emissions by 30% from FY2000 levels by FY2010. As part of this action plan, JFE Steel set a target for reducing emissions to 1,078 tonnes or less. As a result of our initiatives, we achieved a significant reduction that exceeded the 30% reduction target in FY2010 and have been consistently cutting VOC emissions by more than 50%, with reductions exceeding 60% since FY2020. Going forward, we will continue to maintain emissions at 1,078 tonnes or less and take the necessary steps to prevent any increase.

Emissions of benzene and dichloromethane are kept at low levels. We will continue to set targets for the two substances and maintain low emissions levels.

EN Management of Chemical Substances in Accordance with the PRTR Law

Major chemical substances subject to the PRTR Law for the JFE Engineering works in Tsurumi, Tsu, and Kasaoka include organic solvents such as xylene used for painting products, and manganese and its compounds generated during welding. We report the release and transfer amounts of these substances in accordance with the law.

PCB Waste Management at JFE

Polychlorinated biphenyl (PCB) waste is properly stored and managed at the JFE Group's facilities. High-concentration PCB waste has been treated under the guidelines set by the Japan Environmental Storage & Safety Corporation (JESCO), and the treatment is almost complete. Low-concentration PCB waste is being treated under contracts with certified detoxification contractors. The Yokohama Eco Clean Plant of J&T Recycling Corporation treats insulating oil contaminated with slight amounts of PCB, helping to reduce pollutants both in and outside the JFE Group.

Environmental Accounting

Basic Policy

The JFE Group is saving energy and reducing its environmental impacts by making its production facilities increasingly efficient and introducing more environmentally friendly equipment. Any equipment or facilities related to energy conservation and environmental protection are categorized as environmental investment, while all activities related to environmental protection and impact reduction are categorized as environmental expenses.

Through these environmental investments and expenses, we are working to lower unit-based CO_2 emissions to prevent global warming and to reduce final-disposal waste by maintaining a high recycling rate to effectively use natural resources. We are also striving to reduce emissions of pollutants into the water and air, which contributes to environmental protection and ensures thorough compliance with statutory regulations concerning exhaust gas emissions and discharged water.

For quantitative data related to environmental accounting, please refer to:
› **Environmental Data** (P. 273)

Related Links

› **Material Flow** (P. 273)
› **JFE Steel: Environmental Initiatives (Japanese only)** (https://www.jfe-steel.co.jp/research/environment.html)
› **JFE Engineering: 360° JFE Engineering—Protecting Natural Environments** (https://www.jfe-eng.co.jp/en/360_jfe_engineering/#env)
› **JFE Shoji: Environment Management Activities** (https://www.jfe-shoji.co.jp/en/sustainability/environment/)