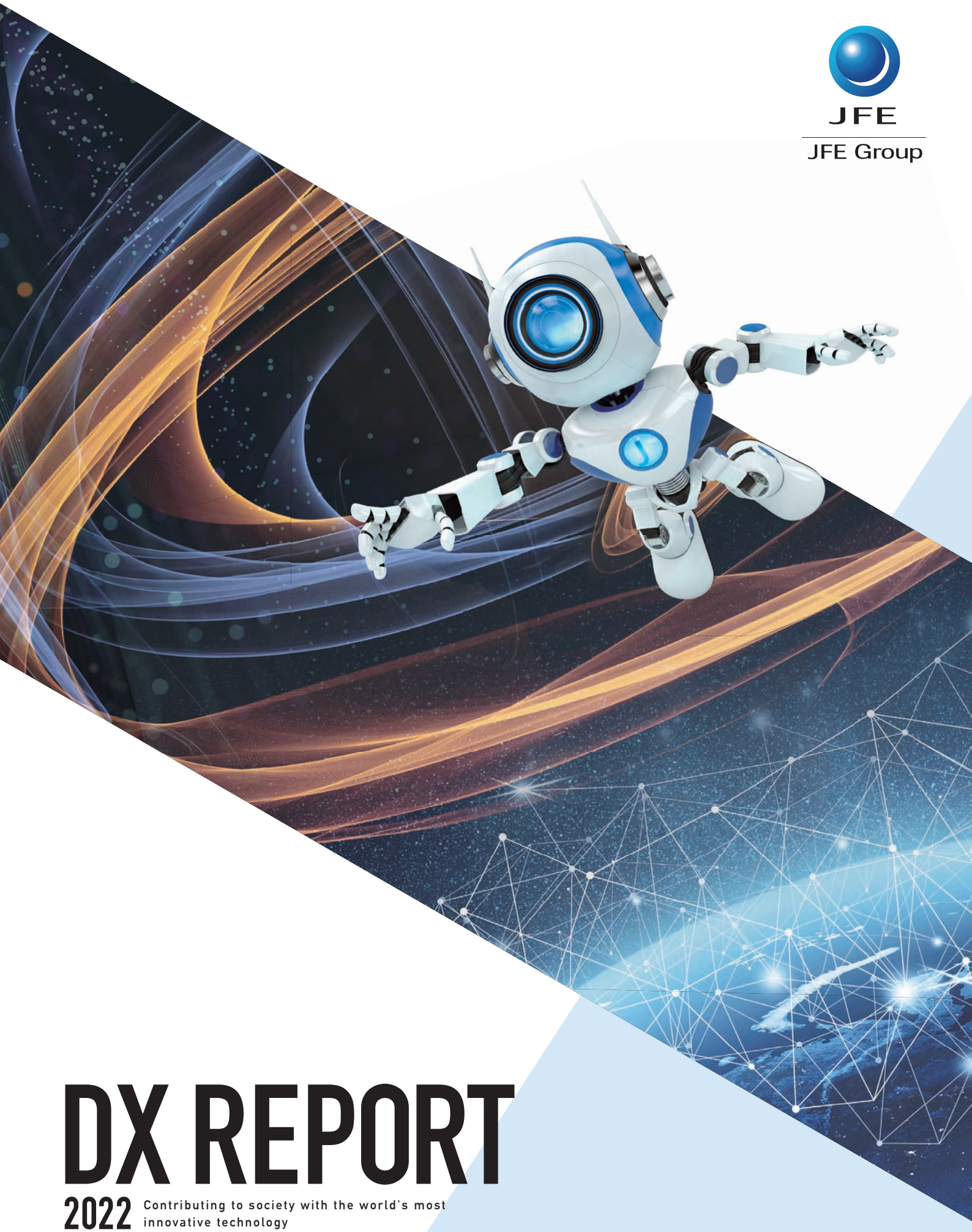
JFE

JFE Group



DX REPORT

2022 Contributing to society with the world's most innovative technology

CONTENTS

Providing new added value externally

— Transformation of existing businesses, creation of new businesses, and innovation of groundbreaking improvements in productivity

Our digital transformation (DX) strategy in the Seventh Medium-term Business Plan is one of the most important strategies that will determine the outcome of our largest transformation since our founding. The data, know-how and technologies that the Group has accumulated over the years are a source of value creation, precious assets that cannot be imitated by other companies. By combining these DX initiatives, we aim to further improve productivity and strength competitiveness, and also focus efforts on the transformation of existing businesses and the creation of new businesses to become able to steadily provide new added value to the world. Each operating company is pursuing specific initiatives aligned with the unique features of its business, and based on this, we are constantly discussing and sharing information related to Group strategies, primarily among each company's officers, working diligently to enhance common measures across the Group and create synergies.

Meanwhile, it is becoming increasingly important to address cyberattacks and the risk of information leaks. It is therefore vital that we strengthen security and governance while advancing our DX strategy.

JFE Group's DX Strategy

Initiatives under the Seventh Medium-term Business Plan (FY2021–24)

- Aggressive DX to lead to improve earnings power, realize growth strategy and advance business model
- DX investments: ¥120 billion over four years
  →Fiscal 2021 results
  Over 30% of investments selected

Strategy for Each Business

JFE Steel

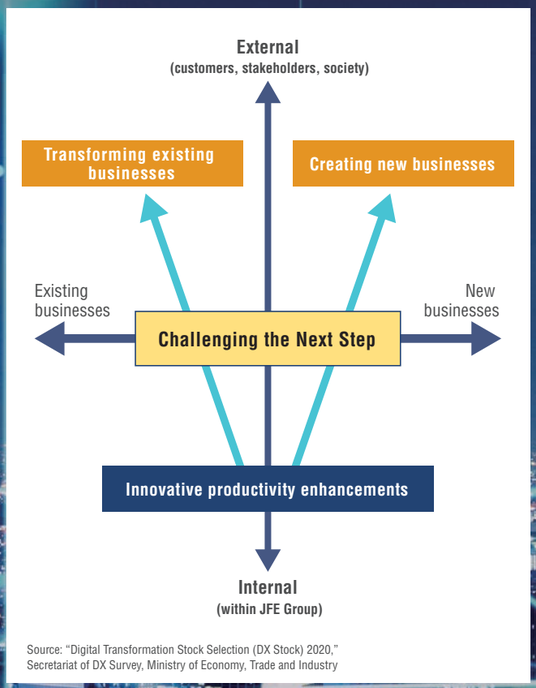
Establish competitive advantage through advanced use of data

JFE Engineering

Promote DX in a variety of areas to achieve a green society and increase sustainable corporate value

JFE Shoji

Create value through transforming services for customers using digital technologies



Source: "Digital Transformation Stock Selection (DX Stock) 2020," Secretariat of DX Survey, Ministry of Economy, Trade and Industry

Using diverse businesses to provide new added value

Having diverse businesses organized around a steel business is one of the JFE Group's unique features.

The Group's strength lies in having these diverse businesses, and being able to create synergies through cooperation across these businesses to provide new added value. Here we will introduce some examples that lead to providing new added value.

Group collaboration × Synergy

Offshore wind power generation

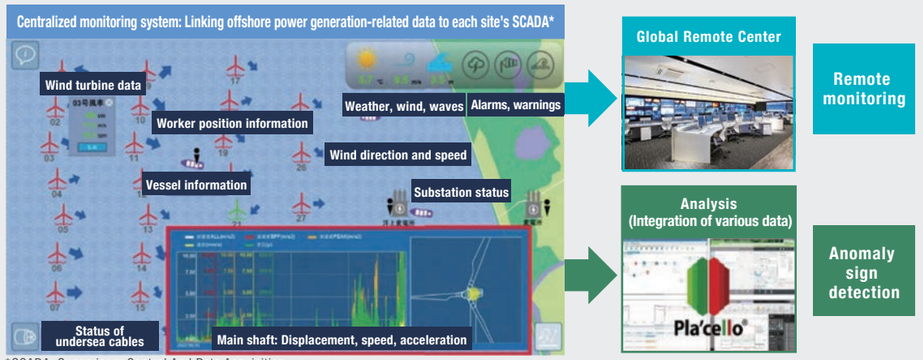
The JFE Group aims to enter the field of offshore wind power generation operation and management (O&M).

For more than 25 years, since 1996, JFE Engineering has been engaged in engineering, procurement, and construction (EPC) for onshore wind farms with businesses ranging from providing equipment to maintenance. Because offshore wind power generation facilities are difficult to access unlike onshore facilities, it is more important for the stable operation using our extensive experience and knowledge to constantly monitor the status of equipment and to respond quickly and appropriately when signs of problems are detected.

JFE Engineering has the experience gained through remote monitoring of 87 (as of November 2022) waste incineration and other facilities in Japan and overseas using big data analysis technologies to detect signs of abnormalities. JFE Steel also has the technologies and knowledge acquired through the operation and maintenance of steelworks that operate uninterrupted 24 hours a day using big data analysis. With the aim of applying these experiences and the Group's data analysis technologies to the field of offshore wind power generation, we are conducting analysis and verification tests for abnormality detection using data related to things like vibration, strain and corrosion at the Horonobe wind power station in Hokkaido operated by JFE Engineering.

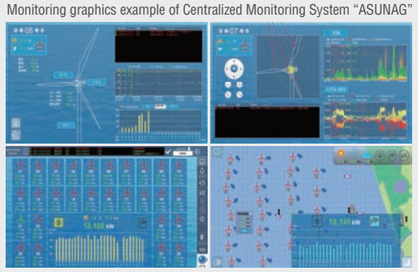
In addition to wind turbines, we are developing the ASUNAG centralized monitoring system that enables flexible, centralized management of various information related to things including cables, substations, weather, and ships.

Conceptual image of the ASUNAG centralized monitoring system

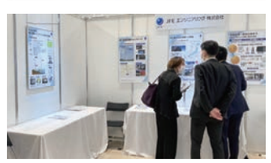


*SCADA: Supervisory Control And Data Acquisition

Monitoring graphics example of Centralized Monitoring System "ASUNAG"



https://www.jfe-eng.co.jp/products/life/owp03.html
(in Japanese only)



Exhibition booth at "Global Offshore Wind Summit – Japan 2022" held in Akita City in November 2022

Trading business × Business transformation and creation

Centralized management system for plant information and video images

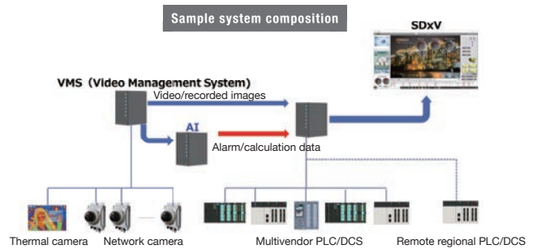
JFE Shoji Electronics' DX products and services

With the aim of "transforming businesses and creating new value," JFE Shoji Electronics Corporation has begun offering the SDxV remote monitoring system that enables the centralized management of plant information (temperature, pressure, etc.) and images from surveillance cameras in steelworks. This system makes it possible not only to visualize equipment and plant sites from a monitoring room, but also to use artificial intelligence (AI) for the effective collection of information to detect abnormalities and for predictive maintenance.

System overview

- Integrates optic, thermal camera images with SCADA (supervisory control and data acquisition) which is able to manage and monitor various data (such as control status, operating info) comprehensively, in order to display all those images and data on a single screen for centralized management
- Realized integrated visualization, centralized monitoring and remote control of events that occur in the plant

Sample system composition



System features

- View various plant information, live images, and recorded images from surveillance cameras simultaneously
- Display current and past sensor data, AI analysis information, and recorded simultaneously for comparison and inspection
- Operate remotely while confirming onsite images from remote locations
- Design customized monitoring screen based on customers' request

Example of usage in steelworks

Order received: JFE Steel West Japan Works Kurashiki district and East Japan Works Chiba district

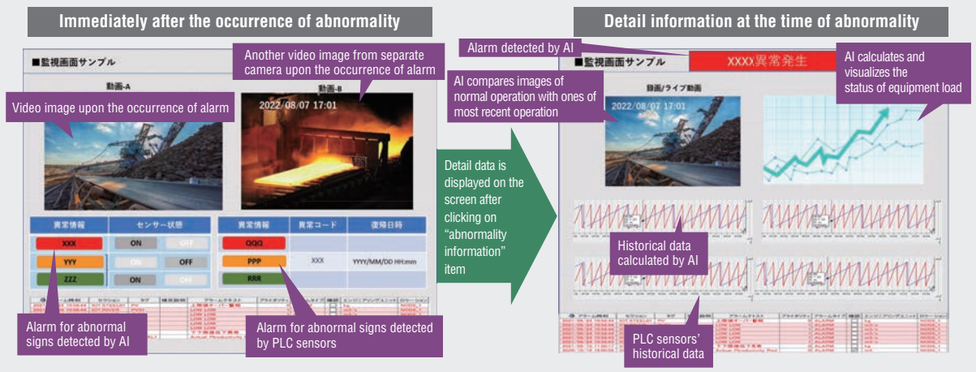
Locations of cameras and sensors

Materials yard, continuous casting, hot rolling, coke, sintering, steelmaking, product quay, etc.

Easy comparison between "current" and "past" situation of manufacturing site.
AI analysis based on live, recorded video footage and collected sensor data to detect abnormalities and predictive maintenance

Overall monitoring in steelworks

Operation screen display of SDxV at the time of abnormality



Groupwide and multilayered promotion

Initiatives to secure and train human resources for DX promotion

Securing and training human resources is the key to our initiatives to promote DX.

The JFE Group is working to secure and train human resources who understand various businesses and are able to promote DX across the Group and at a wide range of levels. Here, we will introduce the main initiatives at each operating company.

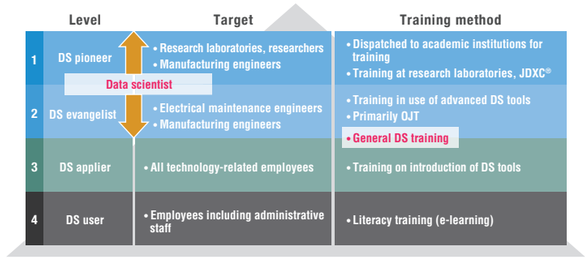
Steel Business

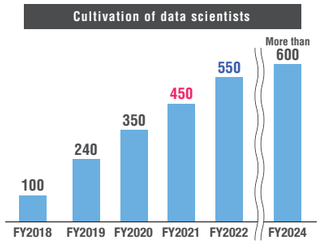
JFE Steel is introducing various training programs based on the fact that training human resources and cultivating a corporate culture are important as the driving force behind DX promotion.

"Advanced use of data," a pillar of JFE's DX, requires the training of internal human resources with a thorough knowledge of actual operations and manufacturing processes, and we are therefore retraining at various levels of proficiency to cultivate internal data scientists. In addition to training specialist human resources, through activities including low-code citizen development in operational departments we are working to cultivate a corporate culture that proactively uses digital technologies to improve operations and create new value. Going forward, we will expand DX fundamental training with the aim of instilling our DX vision and raising the level of DX literacy companywide.

Training data scientists

For DX promotion, we are building easier-to-use environments and frameworks for utilizing data science to cultivate data scientists internally and encourage their activities, allowing many employees to take part in our DX promotion.





- Launched level-specific training programs companywide in FY2018
- **More than 80%** of data scientists working on DS operational issues

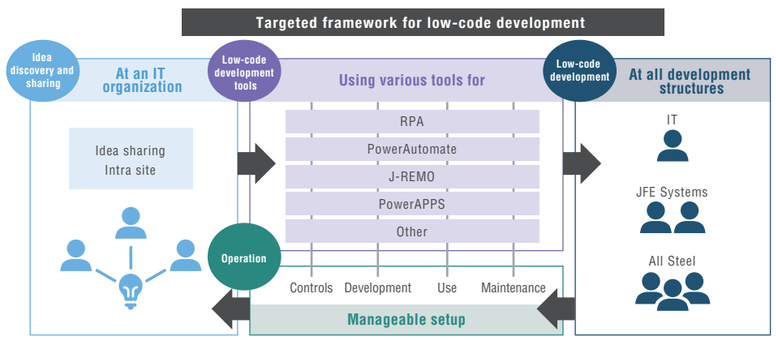
Training completed for 450 persons as of end-FY2021, and will increase to more than 600 by end-FY2024.

Strengthening low-code development structure

Low-code development, including citizen development, to strengthen problem-solving approach and achieve and jointly (competitively) create business value

JFE Steel is building a structure for low-code development that includes citizen development. This is being organized primarily by the IT Innovation Leading Department, which shares ideas for operational labor savings with operational departments and works to achieve those ideas with various tools and an optimal development structure. All successful results are managed by the administrative department and ideas that are achieved are shared across the organization, leading to further innovation.

In particular, we believe that citizen development, with a problem-solving approach using digital technologies and the experience of repeated agile and quick PDCA cycles, cultivates a mindset and raises the level of DX literacy that are needed to promote DX companywide. Broadening participation beyond IT departments to include operating department staff deepens the level of DX promotion across the company. (Further details are included under the Steel Business on page 8.)



Citizen development
Application development by operational division staff rather than IT specialist staff

Low-code development
Method and support tools for swift application development without writing sophisticated code

Engineering Business

Training for highly-skilled engineers and raising overall IT literacy

JFE Engineering established a DX Headquarters in April 2022 to consolidate its DX related human resource, which it defines as: (1) DX promotion staff who are able to transform existing businesses and create new businesses; (2) IT engineers who develop and operate digital platforms (cloud platforms, data analysis, systems and application development, etc.); and (3) control engineers who implement control systems and collect data from construction sites and plants.

DX promotion staff, who have a high level of interest in digital technology and are familiar with business operations, use things like open innovation to enhance technological strengths and business sense. The company is actively hiring mid-career IT engineers as core DX resource who are skillful at cutting-edge digital technologies and data analysis, and roughly 80% of those engineers are mid-career hires.

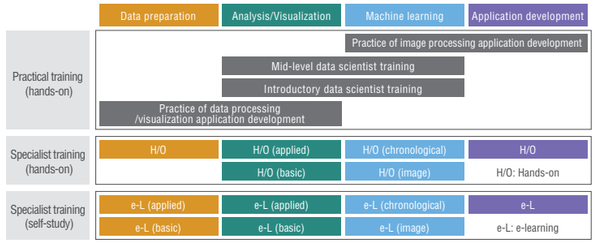
DX promotion also includes proactive activities to raise the overall IT literacy. The number of users of the Pla'cello® data analytics platform has surpassed 1,800, and more than 1,000 people on a cumulative basis have taken classes from the Data Scientist Training program (an educational program comprising 17 classes over 120 hours).

The company also has an internal AI/IoT Technical Group, with 265 members, to raise the overall level of information and communications technology (ICT) capabilities and train experts. In addition to raising the skill levels of both beginners and mid-level staff, they are striving to strengthen the company's OT-related* ICT. (Further details on transforming the corporate culture and Pla'cello® initiatives are included under the Engineering Business on page 12.)

* OT: Operational Technology

Data Scientist Training Program

- Training in individual tools (self-study and hands-on): 13 courses
- Implementation training using multiple tools in near-real cases (hands-on): 4 courses



AI/IoT Technical Group

Data Utilization Working Group
- AI in general

OT-Related Working Group
- DCS* linkage, IoT data collection, cloud utilization, application development

Smart Workplace Working Group
- Robotics, drones, AR/VR

Smart Operations Working Group
- Teams, Sharepoint, Power Automate, Excel

Case Study Working Group
- Internal and external case studies using AI and ICT

*DCS: Distributed Control System

Trading Business

Raising level of DX-related knowledge and motivation for transformation

As part of DX promotion activities, JFE Shoji is conducting training including basic DX training (e-learning) and position-specific training by using outside specialists to raise the level of companywide DX-related knowledge and motivation for transformation.

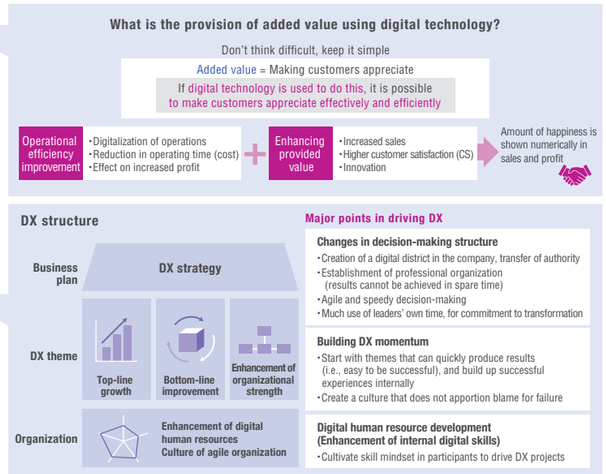
Going forward, the company intends to continue training while expanding its scope and increasing the number of programs.

❶ DX e-learning (Nov–Dec 2021)
- Purpose: Basic DX training
- Participants: Career position – General managers (approx. 1,100 people)
- Content: Explanation of the basics of DX, approx. 2 hours

❷ DX survey (Nov–Dec 2021)
- Purpose: Identify operational departments' DX needs
- Participants: Career position – General managers (approx. 1,100 people)
- Content: Survey of DX needs by business category DX workshops consider materialization, based on survey results

❸ DX seminar for officers (August 2022)
- Purpose: Cultivation of DX mindset for officers
- Participants: Executive officers – President (29 people)
- Content: Explanation of the basics of DX, approx. 1.5 hours

❹ DX training for new managers (August 2022)
- Purpose: Cultivation of DX mindset
- Participants: Newly appointed managers (mid-30s; 45 people)
- Content: Explanation of the basics of DX (main points of ❸ above; approx. 45 minutes)



Steel Business

(JFE Steel Corporation)

JFE Steel's DX strategy is to accelerate the building of a foundation for transformation of existing businesses, innovation of groundbreaking improvements in productivity, and creation of new businesses, to establish a competitive position that makes maximum use of the abundant data it has accumulated over the years.

The company is integrating its IT platforms beginning with steelworks' system upgrades, to build a platform that is able to make full use of its accumulated expertise and data together with image and sensor data obtained using the latest technologies. In addition, increased productivity, improved labor productivity, and higher yields are also being achieved through initiatives including the introduction of cyber-physical systems (CPS), remote operations, and automation in all steelmaking processes.

The company is also strengthening initiatives that will lead to the creation of a culture that will be a foundation for retraining and DX to train key people who will use data assets and information and communications technology (ICT), to cultivate the human resources who will be the driving force behind DX.

DX Strategy

The main pillars of JFE Steel's DX are the introduction of technologies like the Internet of things (IoT), artificial intelligence (AI), and data science (DS) for gaining a competitive advantage by proactively utilizing data (= data-driven). Our accumulated expertise in high-grade steel manufacturing, responses to aging equipment, and data related to predictive management are the sources of our competitiveness, as we make the advanced use of data—one of JFE Steel's important strategies.

JFE Steel's major initiatives under the Seventh Medium-term Business Plan

Use "digital" technologies to strengthen the manufacturing base and execute new growth strategies

JFE Steel's vision for DX promotion

Gain competitive advantage through the proactive utilization of data (= data-driven)

With a long history of manufacturing, JFE is a storehouse of data. Our accumulated expertise in high-grade steel manufacturing, responses to aging equipment, and data related to predictive management are the sources of our competitiveness. Advanced use of data is JFE Steel's strategic theme.

Three pillars of DX promotion

1 Execute IT structural reforms
Upgrade systems at steelworks
Realize a flexible, change-tolerant IT structure

2 Raise our level of data use
Promote business reforms and the latest advancements in IT
Actively utilize data science and AI

3 Reinforce our IT risk management
Enhance security and standardized controls
Enhance the security environment for IT

Maximize value

Synergistic effects

Operational and R&D data assets

Decisive IT restructuring

JFE Steel is pursuing "IT restructuring" to build an open platform that achieves an "IT structure that is highly flexible in response to change" and integrate and switch from antiquated legacy systems as one of the pillars supporting its DX promotion.

The company is making progress in its IT restructuring with the completion in 2022 of making its **head office mission-critical system** 1 and **Sendai system** 2 **as the first manufacturing center** with an open platform. Along with introducing open platforms at other steelworks and manufacturing centers to have companywide open platforms during the period covered by the Eighth Medium-term Business Plan, it is pursuing DX in new platforms at the head office and Sendai district, which are already open platform, with the aim of increasing corporate value.

	Head office	Steelworks					
		Kurashiki	Fukuyama	Chiba	Keihin	Sendai	Chita
Open platform project	Sales, manufacturing, logistics (Marketing / Logistics)	System updates at steelworks: Manufacturing management, operational management					
Upgrade completed in FY2021		Upgrades scheduled for completion during period covered by 8th Medium-term Business Plan					
Open platform project	Business management	Open platform project: General administration				Upgrade completed in 2022	
Upgrade completed in FY2021		Upgrades scheduled for completion during period covered by 8th Medium-term Business Plan					

Open structure process : Restructuring and migration : ERP installation

1 Migration of head office mission-critical systems to open platform completed

The migration of all head office mission-critical systems to an open platform was completed in November 2021. Going forward, we will pursue a project to transform business processes in mission-critical operational areas. In the area of human resources, we are working to strengthen our human resource management capabilities by upgrading systems in the pursuit of D&I* and enhanced employee engagement, centralizing management of human resource data to achieve optimal allocation and training of human resources, and expanding the sharing of human resource information. In materials purchasing, we aim to upgrade operations to shift to value creation operations, use category management to reduce costs and automate small projects to increase operational efficiency, and strengthen supply chain management using external solutions that have become accessible with an open platform.

■ News release (in Japanese only)

Migration of head office mission-critical systems to open platform completed
—Transforming structure of IT platform as foundation for DX promotion—
https://www.jfe-steel.co.jp/release/2022/03/220315.html

*D&I: Diversity and inclusion

2 Migration of first manufacturing center mission-critical system to open platform completed

The migration of the mission-critical system at the Sendai Works to an open platform, as the first manufacturing center to migrate, was completed in October 2022. With this migration, we will promote DX in a cutting-edge system environment, strengthen our manufacturing foundation, and work to reduce CO_2 emissions by at least 30% by fiscal 2030.

■ News release (in Japanese only)

Migration of first manufacturing center mission-critical system to open platform completed
—DX promotion at Sendai Works—
https://www.jfe-steel.co.jp/release/2022/11/221107.html

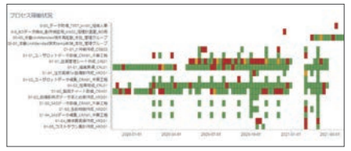
DX human resource development

Strengthening low-code development structure

JFE Steel is working to increase developer motivation and share ideas companywide through a variety of initiatives including the commencement of citizen development for robotic process automation (RPA) from fiscal 2020 and citizen development using Power Platform from fiscal 2022. The emphasis in processes for improvement is on visualizing operations and reviewing unnecessary operations, which will lead to the elimination of operational black boxes and improve operational efficiency in a real way. By monitoring logs after operations are completed, the administrative department will conduct surveys and interviews for programs that do not work or have many errors, and follow the situation for continuous improvement.

Low-code development process, follow-up structure and tools

Concept creation	• In addition to operational improvement, confirm meaning and vision for citizen development as a cornerstone of DX promotion • Top message: Using DX to improve labor productivity				
Process	Orientation	Business improvement	Coding	Release	Operation
Content	• Citizen development fundamentals • Explanation of rules • Basic training in tools	• Organize and review own business processes • Consider ideas to improve own business processes • Select development tools	• Coding • User testing and improvement (repeated)	• Check for compliance with rules • Involve supervisor • Share developed product	• Operational monitoring (remove programs that do not work, follow programs with many errors) • Continuous improvement
Support structure and tools	• Academy • Training held by the administrative department	• Business counseling • Development tool proposals	• Q&A support	• Pre-deployment inspection	• Monitoring of operational logs
		• Community of citizen developers • Website for idea discovery and sharing • Presentations of smart work styles			
Enhance motivation	• Encourage heads of departments with few citizen developers • Create system of giving badges to citizen developers by level				



Automated collection and monitoring of program operational status

Badges according to certification level

Citizen development: Application development by operational division staff rather than IT specialist staff
Low-code development: Method and support tools for swift application development without writing sophisticated code

■ Results

No. of employees who have completed the UiPath Academy	292	No. of operations with RPA introduced (citizen development) (Creation time: 1,801 hours/month)	238	No. of employees who have attended low-code development briefing (of whom, 222 are in trials)	280	No. of applications in full-scale operation using Power Platform	104

Achieved FY2022 target at end-September!

JFE VOICE!

Case study

Shizuka Sakurada
Sendai Products Design & Quality Control Sec.
Products Design & Quality Control Dept.

App to manage progress in addressing quality non-conformity

Application that automatically sends confirmation email to related people on designated day after quality non-conformity form is received

When the Sendai Products Design & Quality Control Sec. receives a quality non-conformity form from a plant, I create a list, request the persons involved to address non-conformity, and consolidate it. I used to manage this process by sending emails and talking directly to the related people to ensure that there were no delays in addressing the issues. Recently, I heard that with low-code development, we can automate the current management operations, so I decided to give it a try. Using Power Automate, I created an automatic transmission email app in a short period of time. For the base portion, I used one that had been created by an IT department employee, and was able to develop the app relatively smoothly.

I enjoyed putting together the pieces that were available, and felt a sense of accomplishment when the app worked. I hope that people will give it a try, even if they do not have any experience. I believe you will be able to realize great results.

Initiatives to develop DX human resources —DS tools and apps—

All employees can upgrade and enhance the latest DS tools on their own personal computers at any time. Instructors are invited from vendors and manufacturers to conduct on-the-job training (OJT) based on themes from the participants' workplace, and the number of cases of successful implementation is steadily increasing.

dotData (NEC)	DS analytical and modeling tools for intermediate to advanced users No. of users: 600, No. of projects implemented: 30, No. in preparation: 70
SPSS (IBM)	DS analytical and modeling tools for intermediate users No. of users: 1,000, No. of projects implemented: 430, No. in preparation: 60
Visual Inspection (IBM)	Image recognition AI tools for beginning to intermediate users No. of users: 270, No. of projects implemented: 2, No. in preparation: 8
AnyLogic (AnyLogic)	Simulation modeling tools for intermediate to advanced users (logistics, etc.) No. of users: 30, No. of projects implemented:10

Raising our level of data use

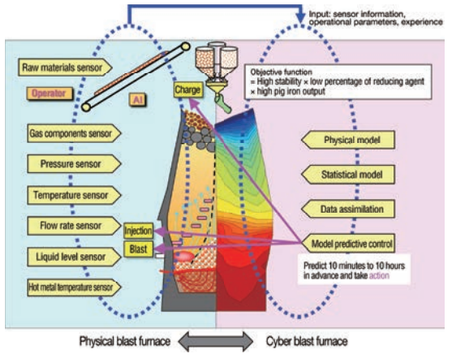
Using cyber-physical systems (CPS) to automate blast furnace operations

In the past, blast furnace operations have relied on the experience and intuition of skilled operators, but in recent years a declining birthrate and work style reforms have created a need for high efficiency to raise productivity, while at the same time reducing CO_2 emissions requires stable operations with low percentage of reducing agent. We have therefore built a system that uses process models in a virtual space to predict the temperature of hot metal eight to 12 hours into the future with high accuracy and automatically takes the most appropriate action to achieve highly efficient, stable operations through process automation. In addition, gas channeling prediction technology using information from several thousand sensors, a new furnace heat index to predict furnace cooling problems, estimates of slag liquid surface levels, and other features are used to detect abnormalities quickly for automated blast furnace operations in a normal state.

This has made it possible to digitalize the sophisticated expertise that had previously been in the form of "craftsmanship," and is a revolutionary way to pass on operations technologies indefinitely and use stable operations to contribute to work style reforms.

By rolling out this system companywide, we will increase labor productivity and reduce CO_2 emissions through stable operations with low percentage of reducing agent.

We will also work to incorporate these initiatives in all processes, as a further step toward the achievement of JFE Steel's aim of intelligent steelworks that learns by itself to autonomously carry out optimal automated operations.

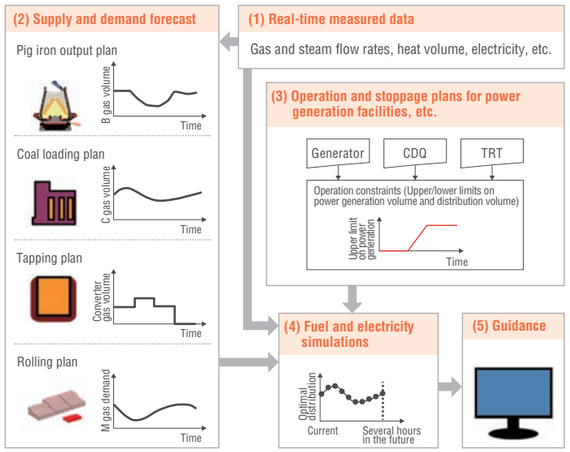


Introducing fuel and electricity use guidance system at steelworks

To conserve energy, reduce CO_2 emissions, and minimize costs in the use of fuel and electricity at steelworks in Japan, JFE Steel has developed and begun using a guidance system to support operators in their work.

This guidance system is based on the CPS concept, and uses huge amounts of measured data (1) and detailed production plans at each plant to calculate supply and demand forecasts, to predict the supply and demand situation from the present into the future with a high degree of precision (2). Then, taking into consideration the operational constraints, special features, and contract information of things like the power generation facilities within the steelworks (3), the optimal operational conditions for the minimal purchasing amount are determined through a fuel and electricity simulation (4), and that result is used as guidance (5).

Introducing this system makes it possible to optimize the amount of city gas and electricity purchased. We can operate much more efficiently than in the past and achieve reductions in energy use, CO_2 emissions, and fuel and electricity costs.



Start of verification testing for automated truck transport system

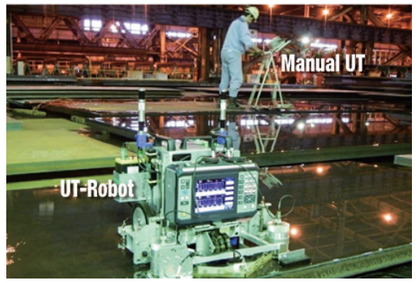
In February 2023, JFE Steel and IHI Corporation began verification testing of an automated transport system using a retrofitted existing vehicle for transport within a facility at the East Japan Works (Keihin district).

JFE Steel has been jointly developing automation technologies for transport vehicles within plant premises with IHI since fiscal 2019, to address a shortage of truck drivers and improve the work environment, and has completed development for basic automation functions related to driving, turning, and stopping. To verify their development results in a real-world environment, the two companies began transport testing in February 2023 using a tractor-trailer loaded with 100 tons of actual cargo along part of a transport route (roughly three kilometers) within the East Japan Works' Keihin district.

Various signs have been set up at intersections and pedestrian crossings, and the testing is to verify appropriate traffic control methods using these signs and signal controls to inform nearby vehicles and pedestrians of the approach of the automated transport vehicle. This is intended to achieve safer transport, and also to increase acceptance of automated vehicles driving on roads within the premises. The configuration of the sensors to detect objects around the vehicle, including the number and positioning, is also being studied, and we aim to complete verification testing along the entire route during fiscal 2023.

Self-driving transport vehicle

Using robots to increase labor productivity



JFE Steel is emphasizing the use of remote operations and automation robots to achieve the increase in labor productivity of at least 20% called for in the Medium-term Business Plan.

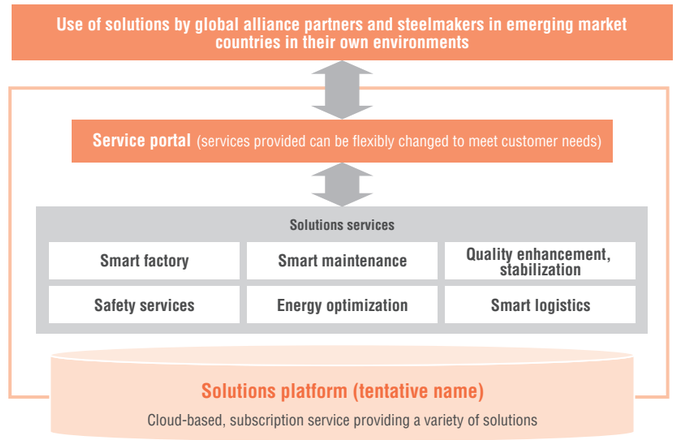
We are introducing robots in various locations to automate manual operations including the processing and transport of steel products at steelworks. This automation is being carried out through a combination of using cameras for object recognition, automation control algorithms, and off-the-shelf robots.

The aim is to promote the introduction of robots for tasks that can be automated, for further increases in labor productivity.

Autonomous Ultrasonic Testing Robots (UT-Robots) have been introduced at the steel plate plant in the East Japan Works' Keihin district. Going forward we plan to roll them out to the Kurashiki and Fukuyama districts as well.

External service sales platform to support development of solutions business

We are developing a platform to serve as a foundation supporting the solutions business being pursued by the Global Business Development Division. The platform will use JFE's accumulated data to provide solutions to customers who conclude subscription contracts for the service. The service is built around a "service portal" that takes into account customer convenience, with a secure connection to customers' systems allowing it to be used as a cloud-based service anywhere in the world. We are currently building the platform to provide various solutions services to customers in Japan and overseas.



Engineering Business

(JFE Engineering Corporation)

By promoting digital transformation (DX), *"Tsu-ku-ru," "Ni-na-u,"* and *"Tsu-na-gu"** the foundations of life for achieving SDGs — *Just For the Earth*

JFE Engineering has taken up the challenge of achieving SDGs (Sustainable Development Goals) through planning, designing, building, and operating infrastructure supporting people's daily lives and industry. DX is necessary for our company to continue to be a front-runner in the engineering industry while further accelerating those initiatives.

DX is transforming all operations, and there are no products or services unrelated to DX. We are promoting DX in all areas by securing and training DX-related human resources and proactively investing toward the realization of a green society (GX) and the sustainable enhancement of corporate value (SX).

* *"Tsu-ku-ru," "Ni-na-u,"* and *"Tsu-na-gu"* are Japanese words whose meanings for us are the following:
Tsu-ku-ru: Construction of plants.
Ni-na-u: Operating, maintaining, and managing business.
Tsu-na-gu: Handing over a beautiful planet to the next generations, good communication between our customers and us, throughout JFE, and construction of data networks, three elements essential for achieving SDGs.

The Seventh Medium-term Business Plan designates four priority areas: waste to resource; combined utility; infrastructure; and carbon neutral, and a policy for business expansion. We believe that digital transformation is essential for the achievement of this policy, and have positioned DX as an initiative to support all business areas.

Waste to resource
- Solidifying the profit base of the Waste to Energy plant business in Japan
- Investing in and expanding the recycling business* nationwide
  * Food, plastic, thermal recycling

Combined utility service
- Transforming to a combined utility service business model that covers everything including operation of highly efficient facilities contributing to energy conservation and decarbonization

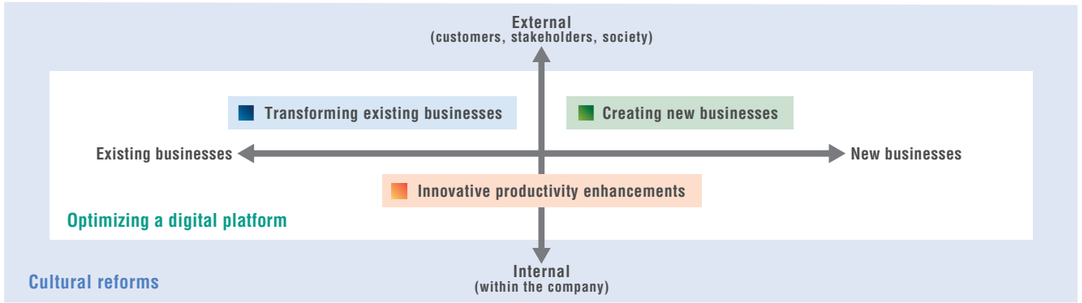
Carbon neutral
- Focusing on renewable energy businesses (offshore wind power/geothermal power)
- Developing and commercializing carbon-recycling technologies

Infrastructure
- Contributing to resilient and long-lasting infrastructure utilizing new technology →Investing in new products, materials, and processes

DX Accelerating achievement of SDGs with DX

To accelerate these initiatives, we established a new DX Headquarters in fiscal 2022. The DX Headquarters is promoting DX in the three key areas of "innovative productivity enhancements," "transforming existing businesses," and "creating new businesses." The organization is made up of IT engineers engaged in using cloud platforms and data analysis, engineers who gather data from plants and other worksites and implement AI on edge devices, and human resources for DX promotion who work together with business divisions to resolve various internal and external issues.

Both "cultural reforms" including developing human resources and "optimizing a digital platform" on which anyone can perform data analysis are also very important for the efficient promotion of DX. From the next section, we will introduce initiatives in the areas of "cultural reforms" and "optimizing a digital platform" and individual cases in the three key areas of DX promotion.



Cultural reforms

Companywide "DX Day!" event held to build momentum for DX promotion

JFE Engineering held a "DX Day!" event at the Yokohama Head Office (in Tsurumi) on November 24, 2022, to build momentum for its DX promotion. The event used a hybrid in-person and online format to make it easier for branch employees and employees of group companies from outside the Tokyo and Tsurumi area to participate.

The event featured a variety of content that will contribute to DX promotion, including a live demonstration of a robot that can walk on four legs, a poster session introducing companywide DX initiatives, an "ideathon"* led by mid-career and younger employees, and presentations by outside lecturers. Participants gave positive feedback for the next event, with comments including "The content was better than I expected," "DX information shared at the event seems very useful," and "I felt the company's enthusiasm for DX promotion."

We will hold "DX Day!" again in the future as a place for gathering and sharing DX information to transform the "organizational culture" and "mindset" required for DX promotion.

* Ideathon: A combination of the terms "idea" and "marathon," with groups competing to come up with ideas, refine them, and produce results within a designated time.

The "Neighbors' DX" session led by mid-career hires used "graphic facilitation" sharing illustrations of the speaker's comments.

An exhibition-style format using posters of initiatives at various departments. Everybody, including the president, listened to the explanations with great interest.

Diverse people including group company employees held an "ideathon" to drive innovation.

Demonstration of a robot that walks on four legs. It is expected to be used for surveys and inspections within plants and in dangerous areas.

Optimizing a digital platform

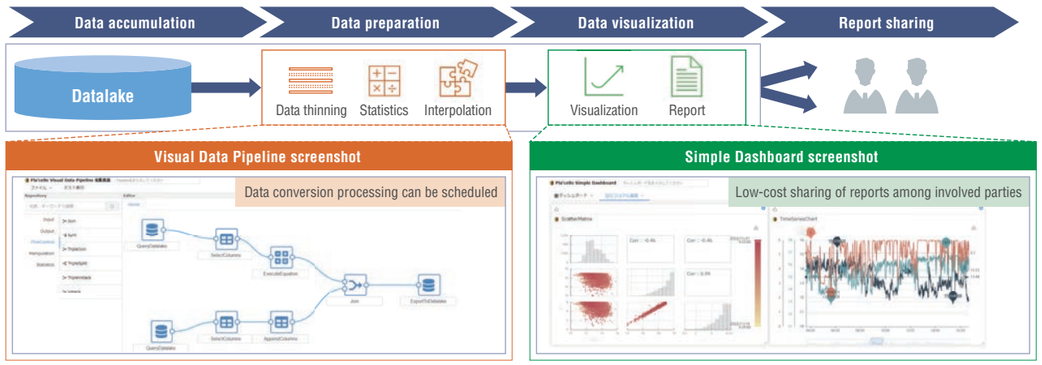
Ongoing evolution of the internally developed Pla'cello® data analytics platform

Use of the Pla'cello® data analytics platform, which was released internally in 2018, is spreading throughout the company as a tool which makes it easy for anyone to analyze a variety of data collected from plants. The platform uses a process of data accumulation, data preparation, and data visualization of plant data which makes it possible for users to develop their own systems in a graphical user interface (GUI) environment. This ease of use has accelerated its popularity, and today, four years since the initial launch, it has been used by more than 1,800 people internally for more than 100 DX projects.

The development of Pla'cello® was initially outsourced, but later switched to in-house production. This has enabled us to respond flexibly to specification changes and to reduce development costs and time. The following two recently released applications also incorporate agile development methods and are developed completely in-house.

*Visual Data Pipeline, which enables data preparation to be performed via GUI
*Simple Dashboard, which visualizes data and shares with many people

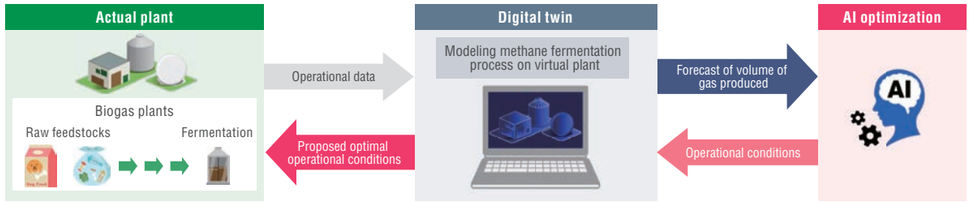
Going forward, we plan to look beyond plant time-series data and incorporate IT data like internal accounting systems. We will make maximum use of Pla'cello® to accelerate the company's DX Promotion.



Transforming existing businesses

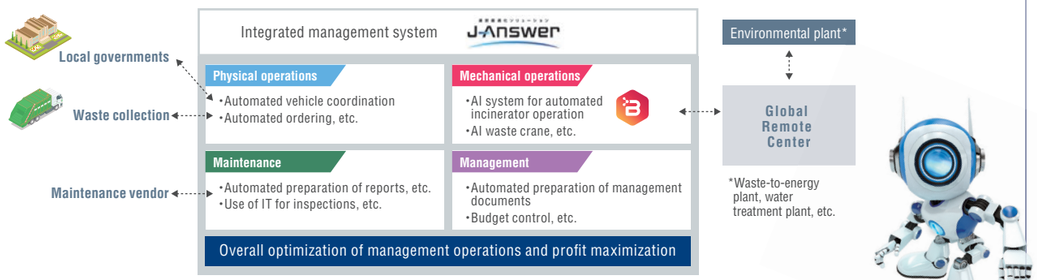
Optimizing plant operations using digital twin

JFE Engineering is using a digital twin to make plant operation more efficient. Biogas plants use food waste as raw feedstocks to produce methane gas through fermentation by micro-organisms and generate electric power with gas engines. Because a wide variety of food waste is used, it is important to know the concentration of the substrate and the micro-organisms in the fermentation tank in detail to maintain stable operation. We developed a digital twin with "data assimilation" technology, which integrates the physical model of the anaerobic digestion reactor with real operational big data. This makes it possible to know the details of the real fermentation tank and to operate the virtual fermentation tank accurately. AI-optimized operational conditions using a digital twin realizes stable and efficient operations.



"J-Answer" environmental plant integrated management system

Waste-to-energy (WtE) plants used to be operated manually by skilled operators who relied on their experience and expertise because the condition of the waste used as fuel changes in a variety of ways. JFE Engineering has developed BRA-ING, which aims for fully unmanned operations using AI that is a combination of image analysis of the combustion condition and machine learning from manual operations by skilled operators. As of the end of fiscal 2022, BRA-ING has been rolled out to 12 facilities. In addition to incinerator operations, the company has developed and is rolling out the "J-Answer" plant integrated management system in order to share and analyze data of plant operations and maintenance. We will continue to optimize overall plant management and operations by developing new systems using AI technologies, with the aim of further unmanned operation of WtE plants.



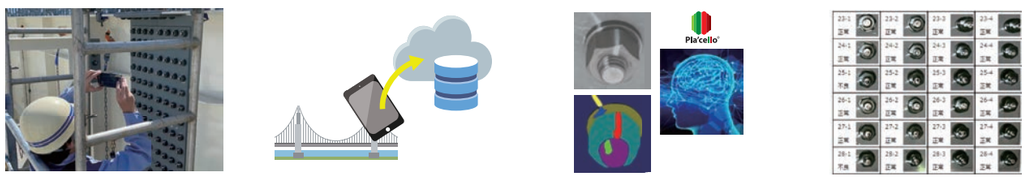
Innovative productivity enhancements

Bolt tightness inspection system using AI image recognition technology

Steel bridges are constructed by connecting 10-meter-long segments with high-strength bolts. Normally, several hundred of these bolts are installed in a bridge, and visual inspection and recording the results requires a huge amount of manpower. JFE Engineering has therefore developed a bolt inspection system that uses AI to reduce the time required for the inspection and recording operations. We could achieve a 50% time reduction using this system. Inspection can be performed with one smartphone. By uploading images of installed bolts taken with its camera to the cloud, AI determines the bolts' tightness status and returns them to the smartphone. We will continue to raise construction efficiency using AI going forward.

Operational time reduced by 50%!

Bolts' tightness status photographed with a smartphone → Bolt images stored in the cloud → AI determines bolts' tightness status and records the result → Inspection results produced as an official report



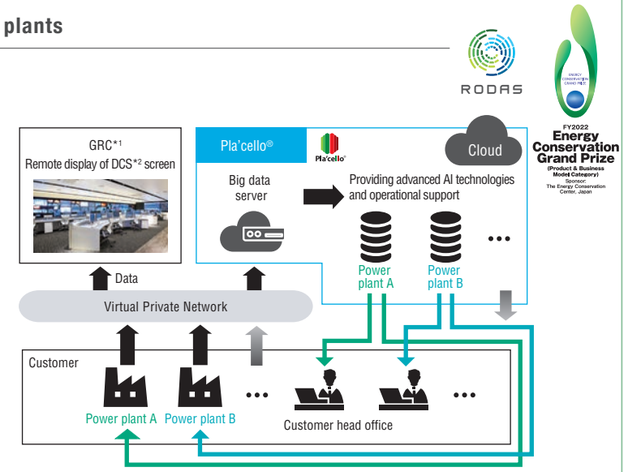
Creating new businesses

"RODAS" DX service package for boiler power plants

JFE Engineering is doing optimization and labor saving in plant operation using its Global Remote Center and Pla'cello® proprietary data analytics platform. We received an order from the erex group for the RODAS DX service package, which was developed for biomass power plants using big data. The system is installed in three locations: erex's headquarters and its Buzen and Nakagusuku biomass power plants.

The services provided this time are data collection and utilization service, visualization and analytics tools and remote support. Going forward, JFE Engineering will expand the RODAS service menu to simplify managing and analyzing huge amounts of plant operation data, while also creating greater data linkage across sites. We will provide solutions to better meet plant operators' needs with RODAS package.

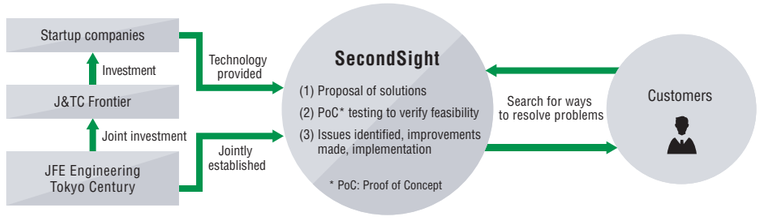
FY2022 Energy Conservation Grand Prize
Minister of Economy, Trade and Industry Award
Product & Business Model Category
The Energy Conservation Center, Japan



*1 GRC: Global Remote Center *2 DCS: Distributed Control System

Establishing new company to provide diagnostic solutions integrating latest technologies

In June 2022, JFE Engineering and Tokyo Century Corporation jointly established the operating company SecondSight Inc. to provide diagnostic solutions that integrate startup technologies. SecondSight was set up to provide one-stop diagnostic solutions from consulting to implementation, integrating AI sensing technologies that replace the five human senses, including image, sound, and smell recognition, from among many startups in which JFE Engineering and Tokyo Century invest via J&TC Frontier. As a "bridge" between startups and customers, SecondSight will promote diagnostic innovation.



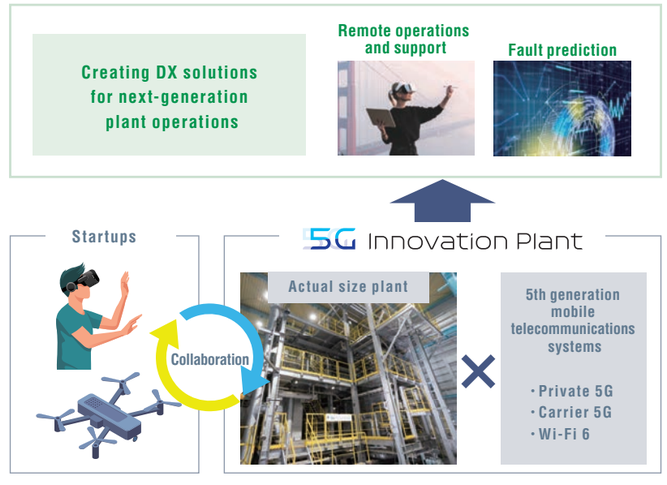
Launching "5G Innovation Plant" digital solution verification facility for plants

This verification facility was established on March 30, 2022, and commenced operations in June, to accelerate the creation of digital solutions for plants together with startups and others that possess the latest digital technologies.

The facility is an actual-size plant with high-speed wireless equipment including Private 5G, a mobile carrier's (NTT DOCOMO) 5G, and Wi-Fi 6 installed. The facility has received many inquiries since commencing operations, and is carrying out a wide range of verification testing (remote operations and support, fault prediction, safety and security, etc.).

We will continue to utilize this facility as a place for open collaborative creation of new value and digital solutions.

MCPC Award 2022
Encouragement Prize, Services and Solutions Division
Mobile Computing Promotion Consortium



Trading Business

(JFE Shoji Corporation)

Under the Seventh Medium-term Business Plan, the JFE Shoji Group is pursuing a DX strategy that looks ahead 10 years. During fiscal 2021, we carried out companywide e-learning and a survey to teach employees the basics about DX. During fiscal 2022, we held a DX seminar for officers, position-specific training for mid-level employees, and a cross-organizational DX workshop to disseminate an awareness of DX promotion throughout the entire organization and to materialize DX seeds and themes.

Anticipating the future changes in the JFE Shoji Group's business environment, we will continue to transform our services and to enhance our value for various stakeholders aiming for "X" (transformation) with "D" (digital technologies) while drawing our future vision.

Examples of DX initiatives

Promotion theme	Digitalization of existing operations		Creation of new businesses using digital technologies
	Increased internal efficiency	Review of customer contact points	
Specific initiatives	■ **RPA promotion** ・Initiatives launched from FY2018 ・Identified operations in all departments and sections ・Labor savings: Approx. 56,000 hours/year (545 robots) at the end of FY2021	■ **OCR implementation** ・Labor saving: Average of approximately 1,000 hours/year ・Workload reduction by receiving electronic data through Excel, etc., in cooperation with customers ・Further improvement of efficiency by linkage between OCR and RPA	■ **DX workshop** ・Discussion by four teams of selected participants ・Issues identified and measures considered ・Future forecasts using digital technologies ■ **DX seminar for officers, position-specific training**

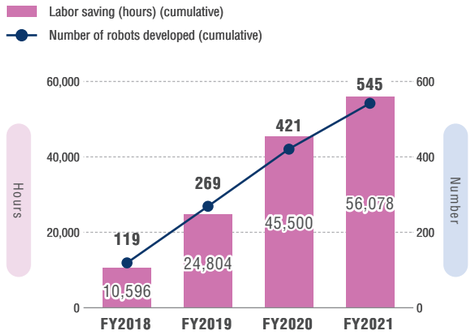
01 Initiatives to increase operational efficiency using digital technologies
JFE Shoji's RPA and OCR initiatives

The development of robots for Robotics Process Automation (RPA) began in fiscal 2018, and the companywide identification of needs was completed by the end of fiscal 2021, with 545 robots developed in total and labor saving reached approximately 56,000 hours/year.

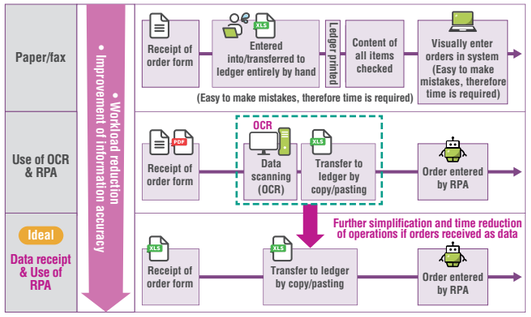
In addition, the adoption of AI-OCR* has been proceeding on track to digitalize handwritten documents (cumulatively 109 business forms had been digitalized as of the end of September 2022). This initiative realized approximately 1,000 hours/year of labor saving. Furthermore, we have been working to receive data in Excel or other formats from customers instead of handwritten documents. Successful cases of the linkage between OCR and RPA robots will be steadily increased in the pursuit of further improvement of efficiency.

* OCR: Optical Character Recognition/Reader

Number of robots developed (FY2018 through FY2021)



Pursuit of further improvement of efficiency with electronic data receipt instead of OCR



02 Initiatives to transform and create businesses
JFE Shoji's DX workshop

DX workshop is organized primarily by the internal DX propulsion working group (DX-WG). Aiming to realize "transformation of existing businesses" and "creation of new businesses using digital technologies," representatives selected from various divisions focused on cross-division discussions.

Team discussion

DX workshop overview (session period: June - September in 2022)

Objective	- Discuss DX proposals across divisions - Formulate plans and goals to realize JFE Shoji vision
Members	- Representatives from sales departments and group companies: 15 people - DX-WG: 5 people - Consulting firm: 4 people
Method	- 7 programs in total provided by outside consultants with extensive experience supporting DX implementation

Made up of four teams, with each team discussing the DX that JFE Shoji wants to achieve

DX workshop program content

	A. Understanding assumptions and defining what we want to be		B. Organization of issues		C. Formulate specific measures		D. Drafting of execution steps
Consideration step	#1 Organization of business assumptions (internal)	#2 Organization of business assumptions (external) and definition of what we want to be	#3 Identification of issues	#4 Reorganization of what we should be and priority issues	#5 Formulate specific measures	#6 Prioritization of measures, formulation of plan going forward	#7 Summary of consideration
Things to be considered	a. Understanding our company's business b. Organizing value our company provides	a. Understanding strengths of competitors b. Insights into future of customers and market c. Definition of what we want to be	a. Understanding gaps between what we want to be and what we are now b. Issues from elemental analysis of gaps	a. Classification of issues b. Recognition of importance and commonality of issues	a. Propose measures b. Consider effect of measures c. Evaluate difficulty of measures	a. Solution survey b. Solution prioritization	a. Definition of steps toward realization b. Organization of remaining points
Envisioned output	a. List of JFE Shoji's strengths b. Value provided by supply chain	a. List of strengths of competitors b. Pest analysis results, future insight results c. What we want to be	a. List of issues b. Customer journey map	a. Issue classification map b. Correlation between what we want to be and issues	a. List of ideas for measures b. List of effects of each measure c. Feasibility map	a. List of solutions b. Priority map	a. Realization roadmap b. Final report
Method of use	Supply chain analysis	Pest analysis, future insights	Customer journey	Issue mapping	Ideation	Evaluation mapping	—

03 Cross-organization initiative
JFE Shoji's "new work-style consideration"

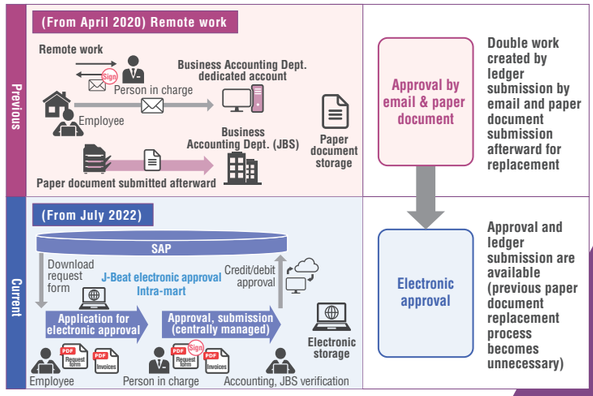
Triggered by the COVID-19 pandemic, JFE Shoji has embarked on "new work-style consideration" based on cross-organization cooperation among divisions.

Working groups have been established on the four themes of contracts, payment and collection, reimbursement of payments, and general applications. We are working to review operations and increase efficiency to address diverse work styles.

New work-style consideration (overview)

Aim	Create frameworks and system that are compatible with diverse work styles	
Coverage	Contracts, payment and collection, reimbursement of payments, and general applications	
Content	•Departmental collaboration for continuous implementation initiated from FY2021 •Cooperation across Finance & Corporate Accounting, Business Accounting, Steel Business Planning & Coordination, Business Planning & Coordination, Legal, Credit, Public Relations, and General Administration departments	
Measures	(1) Contracts	Commenced companywide use of DocuSign (from May 2022)
	(2) Payment and collection	•Electronic approval of application forms completed (July 2022) •Commenced interface development between SAP (in use from April 2023)
	(3) Reimbursement of payments	Preparing for use launch (October 2023)
	(4) General applications	•Legal, Public Relations, Steel Business Planning & Coordination (in use from February 2023) •Finance & Corporate Accounting, Business Accounting, Credit, Business Planning & Coordination (in use from April 2023) •General Administration (requirements being confirmed)

(Example) Electronic approval of payment operations (from July 2022)

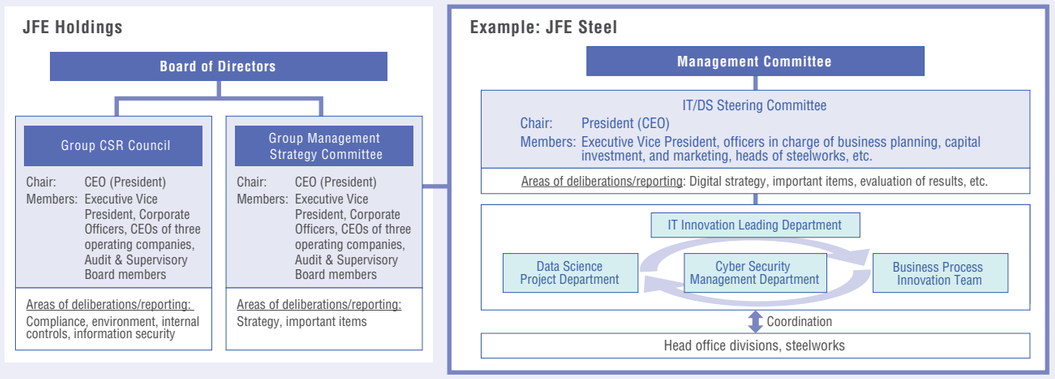


Security Management

Digital governance

■ JFE Group digital governance framework

Group digital governance structure is embedded in the corporate governance framework.



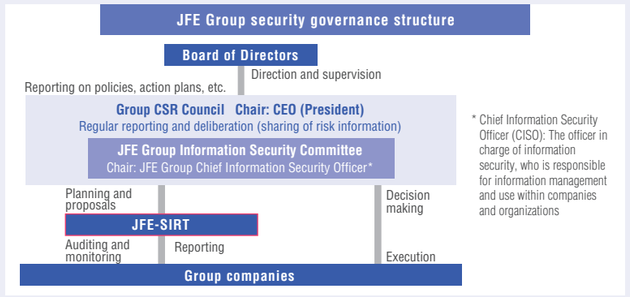
Security management

■ JFE Group security management structure

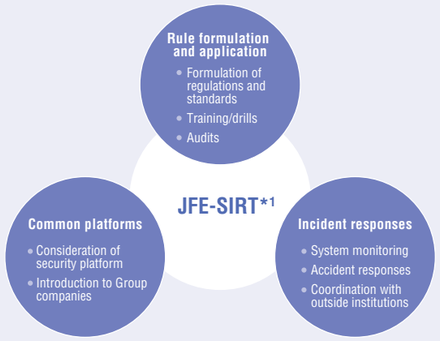
In line with the Declaration of Cybersecurity Management, we are strengthening our management-led cybersecurity countermeasures, primarily at JFE-SIRT, in response to increasingly serious and sophisticated cyberthreats.

Declaration of Cybersecurity Management

1. Recognize cybersecurity as a management issue
2. Determine management policies and declare intentions
3. Build internal and external systems and implement security measures
4. Encourage widespread use of cybersafe products, systems, and services
5. Help build safe and secure ecosystems

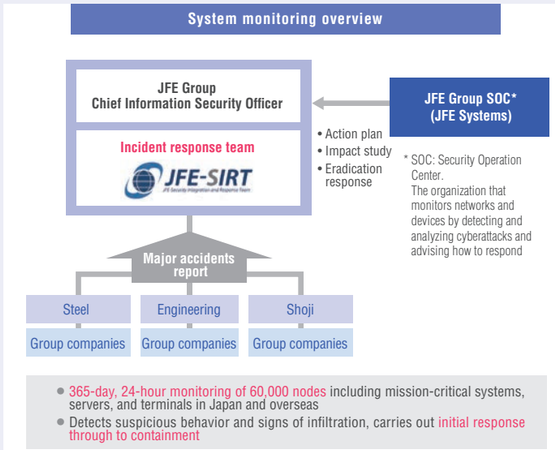


■ Cybersecurity monitoring initiatives



*1 JFE-SIRT: A CSIRT*2 responsible for responding to incidents of information security, as well as planning, proposing, and promoting Groupwide measures, auditing Group companies, and reviewing security policy

*2 CSIRT: Computer Security Incident Response Team. A general term for a group that responds to internal computer security-related incidents



JFE Group Declaration of Cybersecurity Management

1 Recognize cybersecurity as a management issue

The JFE Group recognizes cyber-related risk as a key management priority. We shall enhance our own understanding of the latest cybersecurity developments and actively engage in management by positioning cybersecurity spending as an investment that is critical to DX promotion.

In facing the risks associated with digitalization, management recognizes the importance of strengthening cybersecurity across the entire supply chain, and will exercise leadership as it implements measures under its responsibility. Members of management shall chair cybersecurity-related committees at JFE Holdings and its three operating companies, promote constructive discussions, validate various measures, and allocate appropriate resources to whatever measures deemed necessary.

2 Determine management policies and declare intentions

The JFE Group shall determine management policies and draft a business continuity plan (BCP) aimed at quick recovery in the event of a cybersecurity incident, emphasizing not only identification and defense, but also detection, response, and recovery.

Every year, the JFE Group shall lay out a cybersecurity action plan for the Group, reflecting a review of risk identification, defense mechanisms, and guidelines for responding to an information security incident. Also, the JFE Group shall strengthen incident response capabilities through regular drills and prepare the BCP. Furthermore, the JFE Group shall periodically conduct cybersecurity audits on JFE Group companies. Through these efforts, the JFE Group aims to steadily raise the level of the overall Group.

Management shall take the lead in declaring companies' intentions to internal and external stakeholders, and make every effort to voluntarily disclose recognized risks and measures to deal with them, in corporate reporting.

3 Build internal and external systems and implement security measures

The JFE Group shall establish internal systems mainly through JFE-SIRT, ensure sufficient resources including budgets and personnel, and take necessary human, technical, and physical measures.

Using various internal and external human resources development programs, the JFE Group shall cultivate the skills of high-level, professional staff with detailed knowledge of cybersecurity and shall work with external specialists to leverage the benefits of sharing know-how. The JFE Group shall strive to educate and motivate employees at every level in all divisions at each company under the JFE Group umbrella through in-house training and drills, as well as participation in cross-industry exercises.

The JFE Group shall strive to address the entire supply chain, including overseas, using cybersecurity guidelines and frameworks, cooperating with government activities to support cybersecurity measures, and monitoring cybersecurity measures at subcontractors and other parties.

4 Encourage widespread use of cybersafe products, systems, and services

The JFE Group shall manage cybersecurity across the full spectrum of corporate activity, including development, design, production, and supply of products, systems, and services.

5 Help build safe and secure ecosystems

The JFE Group shall collaborate with relevant government agencies, organizations, industry associations, and other bodies to actively share information, engage in dialogue, and build human networks, both in Japan and internationally. The JFE Group shall contribute to reinforcement of cybersecurity throughout global society by raising awareness of measures taken on the basis of such information.

Revised January 2023

JFE Group

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