

JFE Steel

## Leveraging Our Manufacturing Power to Open Up New Horizons

Under the Sixth Medium-term Business Plan, JFE Steel will make capital investments totaling 850 billion yen over three years, an increase over the previous plan. By establishing leading-edge facilities through renovation and new production processes, the company aims to increase production efficiency, reinforce cost competitiveness and realize the stable production of products with high added value. Maximized manufacturing capabilities will enable JFE Steel to triumph against global competition and ensure a solid earnings base for the future.

West Japan Works (Fukuyama)  
Continuous casting machine



JFE Engineering

## Increase revenue sources by developing operating business

The Global Remote Center (GRC) offers 24-hour remote surveillance for plants constructed by JFE Engineering. Operating conditions of the plants around the world are monitored from Yokohama Head Office and from a branch of the GRC in Manila. Our experienced staff supports to ensure operational safety. The system provides a variety of services, including AI and Big Data diagnoses to prevent accidents, prompt support for troubleshooting. GRC serves as an operating business control center to contribute to the increase of earnings.

JFE Shoji Trade

## Workforce diversity as a driving force

We are now pursuing regional strategies under a four-region structure comprising Japan (main focus), China, the Americas and ASEAN, emphasizing cooperation between Japan and each other region. Employees are cooperating with each other on a global scale to pioneer new businesses by leveraging our global network spanning 19 countries as well as our workforce diversity, the true driving force behind this strategy.



Japan Marine United

## Reinforcing competitive strengths through superior technologies

Japan Marine United satisfies customer needs by applying superior research and development, technological and manufacturing capabilities to build the finest ships and other marine products noted for energy-savings and environmentally friendly performance. Japan Marine United continues to contribute to industry and society as a whole as it strives to become a world-top-class shipbuilding company.

Ariake Shipyard  
(Nagasaki, Tamana-gun, Kumamoto Prefecture)

## Meeting Challenges throughout JFE's History

### Kawasaki Steel Corporation

1896  
Kawasaki Dockyard Company, Ltd. established (later renamed Kawasaki Heavy Industries, Ltd.)

1950  
Steel division of Kawasaki Heavy Industries spun off as independent organization Kawasaki Steel Corporation established

### Nippon Kokan K.K. (NKK)

1912  
Nippon Kokan K.K. established

1916  
Yokohama Shipyard launched (later renamed Asano Shipyard Co., Ltd.)

1940  
NKK acquires and absorbs Tsurumi Steelmaking and Shipbuilding Company (formerly Asano Shipyard)

2001

Merger announced

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

2012

2013

2014

2015

2016

2017



Presidents of both companies agree to merger (2001)  
JFE Holdings established

### Established JFE Holdings

- JFE Holdings operating companies established
  - JFE Steel Corporation
  - JFE Engineering Corporation
  - JFE Urban Development Corporation (merged into JFE Steel in 2011)
  - Kawasaki Microelectronics, Inc. (sold to MegaChips Corporation in 2012)
  - JFE R&D Corporation (consolidated with JFE Steel in 2009)

Universal Shipbuilding Corporation becomes subsidiary (stock acquired from Hitachi Zosen Corporation and JFE Engineering)



Strategic collaboration agreement concluded with JSW Steel (2009)



Basic agreement on merger reached (2012)



Waste-fueled power plant constructed in United Kingdom



Groundbreaking ceremony (2017)

Strategic collaboration agreement concluded in India with JSW Steel Ltd. (capital participation and technical cooperation agreement concluded in 2010)

Japan Marine United Corporation established as equity-method affiliate through merger of Universal Shipbuilding Corporation and IHI Marine United Inc.

German engineering company Standardkessel Power Systems Holding GmbH acquired

NUCOR-JFE STEEL MEXICO established to manufacture and sell automotive steel sheets

Guangzhou JFE Steel Sheet Co., Ltd. established to manufacture and sell automotive steel sheets



Merger conclusion ceremony held (2003)

JFE Steel Galvanizing (Thailand) Ltd. established to manufacture and sell automotive steel sheets



Manufacturing line established for automotive steel sheets

JFE Steel subsidiary JFE Shoji Trade turned into operating company of JFE Holdings

PT. JFE STEEL GALVANIZING INDONESIA established to manufacture and sell automotive steel sheets

U.S. pipe distributor Kelly Pipe Co., LLC acquired



Kelly Pipe (U.S.)

Al Gharbia Pipe Company established in United Arab Emirates to manufacture and sell large-diameter welded pipes for energy companies

Took a stake in an integrated steelworks project (FHS) initiated by Formosa Plastics Group, and entered into agreements, including the licensing of technologies.



First blast furnace for FHS (2017)

Zinc-coated plating and colored sheets operations for construction materials launched in Myanmar



Groundbreaking ceremony (2018)

## Growing together with Japanese industry

The predecessors of the JFE Group, the former NKK (Nippon Kokan) and Kawasaki Steel Corporation, were major privately established steel manufacturers. Both companies grew together with Japanese industry through their steelmaking and shipbuilding (NKK) businesses as well as engineering services that applied steel-processing and combustion-control technologies from these businesses.

## Making a fresh start as JFE

The Japanese steel industry peaked in the 1960s when the country entered a phase of rapid economic growth after World War II. Thereafter, the global oil shocks and the collapse of Japan's bubble economy led to a period of change. Reorganization took hold in many industries from the 1990s, including steel users such as the automotive industry, suppliers of raw materials including iron ore, and steel manufacturers worldwide. Intense competition among steel companies intensified and plummeting prices significantly reduced the competitive strength of Japanese steelmakers. NKK and Kawasaki Steel Corporation, seeking to ensure their long-term viability in this difficult environment, decided to merge as JFE Holdings in 2002.

## Successful evolution

The new JFE substantially increased earnings thanks to the beneficial effects of facilities consolidation and rising global demand for steel materials, especially due to China's rapid economic development. After the fall of Lehman Brothers in 2008, however, the company encountered a contracting steel market due to overproduction in China and violent fluctuations in the costs of raw materials. JFE pursued stronger earnings and more sustainable growth by reorganizing its business portfolio, upgrading manufacturing capabilities in Japan and accelerating global development.

## Sixth Medium-term Business Plan

JFE launched its Sixth Medium-term Business Plan in April 2018, setting out its corporate strategies from fiscal 2018 to 2020. Seeing opportunities in trends such as structural changes in the automotive and environmental energy fields and the rapid development of digital technologies, JFE is now pursuing new technologies to satisfy new needs. As it works to reinforce manufacturing capabilities in Japan and increase earnings overseas, JFE looks forward to enhancing its corporate value and contributing to more sustainable societies over the medium to long term.

# Steel, Material for a New Future

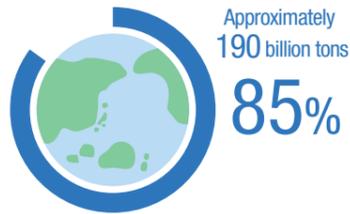
Since there are rich reserves of iron ore, there is little risk of depletion. It can also be mass produced at low cost. Steel has an extremely low impact on the environment at the manufacturing stage when compared to other materials, and has an excellent recyclability. These factors enable high function and quality at reasonable prices, making it an essential and fundamental material for a civilized society. There is no other material that possesses all of these features.

## Steel, a sustainable material

### Rich iron ore reserves

An incredible 85% (190 billion tons) of the Earth's metal resources are iron ore. Although the supply is not inexhaustible, there is little risk of depletion when compared to other resources, ensuring a stable supply.

#### Recoverable reserves of iron ore on the Earth



Source: Mineral Commodity Summaries (2016)

### Mass production at low cost

Steel is a material with rich reserves and a long history of development. It can be mass produced at low cost and supplied stably. It can also provide various functions at a reasonable price.

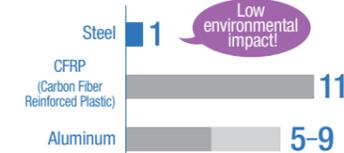


Created by JFE Holdings with documents from Mizuho Bank Industry Research Division and economic forecasts by Fuji Keizai Co., Ltd.

### Extremely low environmental impact at the manufacturing stage when compared to other materials

Steel has extremely low environmental impact at the manufacturing stage when compared to other materials. For example, the GHG (greenhouse gasses) emission of steel at the manufacturing stage\*1 is 1/5 to 1/9 of that of aluminum, and approximately 1/11 of that of carbon fiber.

#### GHG emissions at manufacturing stage\*2



Source: Steel Recycling Institute  
\*1 From mining raw materials to factory shipment  
\*2 Comparisons with other materials' GHG emissions per unit weight, with steel as 1

### Excellent recyclability

Iron can be separated by magnets and is a material that can be recycled easily. After final product made of steel ends its life, steel scrap returns to the steelmaking process to be reborn as various products over and over again, with no change in its intrinsic quality (closed-loop recycling).

#### Recycle ratio per item (%)

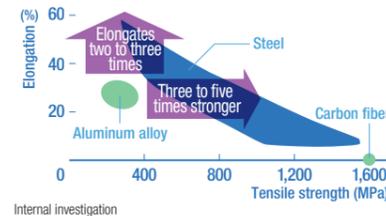


Source: Japan Steel Can Recycling Association

### Potential for evolution

Steel is processed into such as rods and sheets, its strength can be increased up to 40 times as its original. Steel can be elongated two to three times more than aluminum at the same strength, and is three to five times stronger at the same extended rate, making it the optimal material for the world-class structures of the times, such as Tokyo Skytree. Steel can be stronger by heating until it turns red and swiftly cooling. Just this method alone has the potential to create features we have never seen before. Steel has been developed alongside society. Emerging needs of society will open up the future of steel, and the evolution of steel will contribute to a productive future.

#### Comparison of strength and elongation between steel, aluminum and carbon fiber



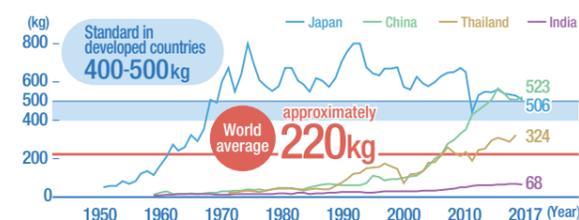
Internal investigation

## Global demand for steel continues to grow

### The potential to grow on a global level

The long-term global demand for steel is expected to keep growing alongside the economic development of emerging countries. The annual consumption of steel per capita in developed countries is approximately 400 to 500 kg. This level has been roughly unchanged, but as the world average currently stands at 220 kg per capita, there is still an underlying potential for growth.

#### Trends in annual steel consumption per capita by country (kg per capita, year)



Source: World Steel Association

Steel is easily processed and its properties can be changed flexibly by adjusting composition and through heat processing. Many functions and uses can be developed from steel and create new value that meets the needs of society and customers, enabling steel to endlessly contribute to various industries and lifestyles. The global demand for steel will continue to increase alongside the economic growth of emerging countries.

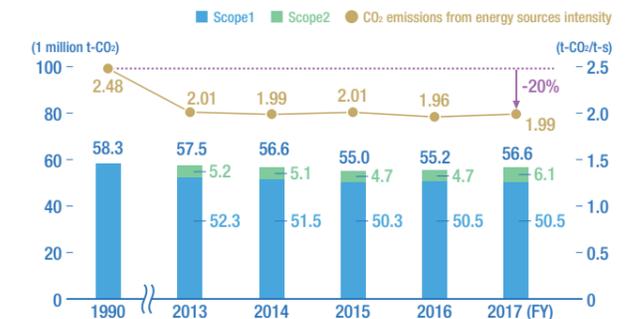
## Energy-saving and CO<sub>2</sub> reduction initiatives

### Efforts toward becoming a steel manufacturer with low environmental impact (responding to climate change risks)

Japanese steel industry including JFE Steel has actively been working over the years on technological development and environmental conservation measures. As a result, Japan has the best energy-saving and CO<sub>2</sub> emission reduction technologies in the world, and JFE Steel applies these technologies to properly control environmental risks. Furthermore, we see these technologies as a competitive advantage and hope to expand them all over the world to attain sustainable growth.

On the other hand, coal must be used as a reducing agent to remove oxygen from iron ore, not as a fuel, when mass producing steel under the current process. There is no substitute for this method, meaning emission of CO<sub>2</sub> is inevitable. This is why we have positioned the mitigation of environmental impact as the most important management issue in ensuring sustainability of our business. JFE Steel applies world-class technologies for innovative steelmaking processes and contribute to resolve global environmental issues such as climate change.

#### CO<sub>2</sub> emissions from energy sources and CO<sub>2</sub> emission intensity of JFE Steel



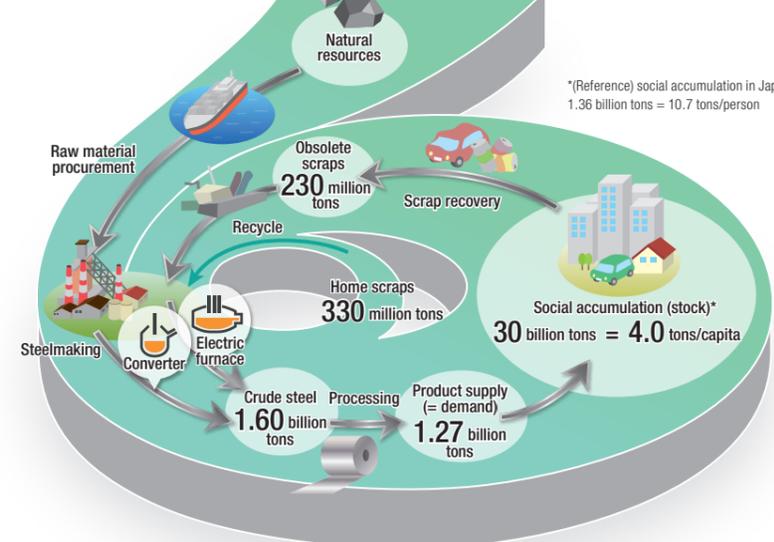
## Sustainability of steel from its lifecycle

### Steel contributes to world's sustainable growth with its low environmental impact in production, use and recycling

Steel can be recycled over and over again even after a final product made of steel ends its life. Steel products manufactured from natural resources (iron ore and coal) in integrated process are essential to meet the increasing demand associated the world's growing population and social stock due to the economic development of emerging countries. As a Japanese steel manufacturer that can produce steel with the lowest

environmental impact in the world, JFE Steel continues improving energy efficiency (Eco-Processes), spreads our superior processing technologies globally (Eco-Solutions) and supplies environmentally-friendly products (Eco-Products), toward realizing a sustainable society.

#### The world's steel cycle (2015)



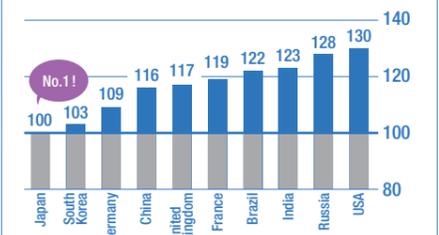
\* (Reference) social accumulation in Japan 1.36 billion tons = 10.7 tons/person

Source: Japan Steel Can Recycling Association and Bureau of International Recycling AISBL (Some contents on losses and breakdowns of scraps have been omitted)

### Japan's steel industry keeps the top energy efficiency in the world

Japan's steel industry (integrated mill) produces steel with the lowest environmental impact when compared to other major steel-producing countries in the world as a result of its longstanding efforts towards environmental conservation, including developing and spreading the use of energy-saving technologies.

#### The world's quotient, with Japan as 100 (2015)



Source: Research Institute of Innovative Technology for the Earth (RITE)

Input

Business growth drivers

Business model

Output into market

Outcome

Management resources accumulated over time

Intellectual capital

World-class technologies that have been developed and accumulated in long-term relationships with our customers

• Domestic patent publications (FY2017) **1,178** patents (entire Group)

\*Total patents published in Japan and patents published under PCT, designated to be transferred to Japan

• R&D expenses (FY2017) **34.7** billion yen (Group consolidated)

Manufacturing capital

Two major, consolidated and highly efficient steelworks and bases for production and process engineering across the globe

• Consolidated crude steel production (FY2017) **30.06** million tons (consolidated JFE Steel)

• Manufacturing bases (as of April 2018) **108** bases in **22** countries and regions (entire Group)

Natural capital

Realizing a recycling-oriented society and reduction of negative environmental impact through leading-edge, energy-saving and resource conservation technologies

• Energy consumption intensity (FY2017) Comparison with FY1990 **21** % reduction (22.6 GJ/t)

• Recycling of water resources (FY2017) **93.5** % (steelmaking process)

Social and other related capital

Relationships of trust established over many years with our customers and stakeholders

• Number of customers (delivery destinations) (FY2017) Approximately **24,000** customers

\*Total of JFE Steel, JFE Engineering and JFE Shoji Trade (FY2017)

Human capital

Diverse human resources with abundant experience and a high levels of knowledge and expertise that support our wide range of operations

• Number of employees (as of the end of March 2018) **61,234** persons (Group consolidated)

• Annual training hours (FY2017) **1.38** million hours a year  
(total of operating companies: 67 hours a year per employee)

Financial capital

A sound financial base that enables further investment for growth

• Equity capital ratio (as of the end of March 2018) **43.6** %

• Net assets (as of the end of March 2018) **2,006.5** billion yen

Business development with the Group as one

Engineering Business

In addition to the urban environment and steel structure sectors, we also focus on renewable energy and resource recycling solutions to support a sustainable society.

▶ P.45

Steel Business

We possess two major integrated steelworks in Japan along with global manufacturing and processing bases, which allow us to incorporate world-class technologies to supply products with the high-added value that meets our customers' evolving requirements.

▶ P.39

Trading Business

Supplying steel products with added value globally, this business operates in a broad range of sectors, including food and electronics, as well as handling iron and steel raw materials.

▶ P.51

Shipbuilding Business (Equity-method affiliate)

Building a wide range of vessels, this business possesses advanced technologies and one of the strongest construction capabilities in Japan.

▶ P.55

Building a foundation for sustainable growth

(ESG Initiatives)

▶ P.57

Creating new value by providing solutions that meet the needs of society in general, and also of our customers

Improving medium- to long-term corporate value



Steel sheets for automobiles



Bridges and steel for bridges



Steel sheets for tableware and kitchenware



Urban environmental plants



Biomass power generation facilities



Very large crude oil carrier (VLCC)

Making efforts to resolve social issues

Using our operations to make progress possible in diverse industries and lifestyles

- Realizing comfortable lifestyles through supply of automobiles, ships, and household appliances with advanced functions
- Constructing a strong infrastructure through development in the civil engineering and construction fields
- Ensuring a stable energy supply and spreading the use of renewable energy toward a sustainable society
- Developing and supplying environmentally friendly products and promoting resource recycling
- Creating jobs and enhancing job satisfaction

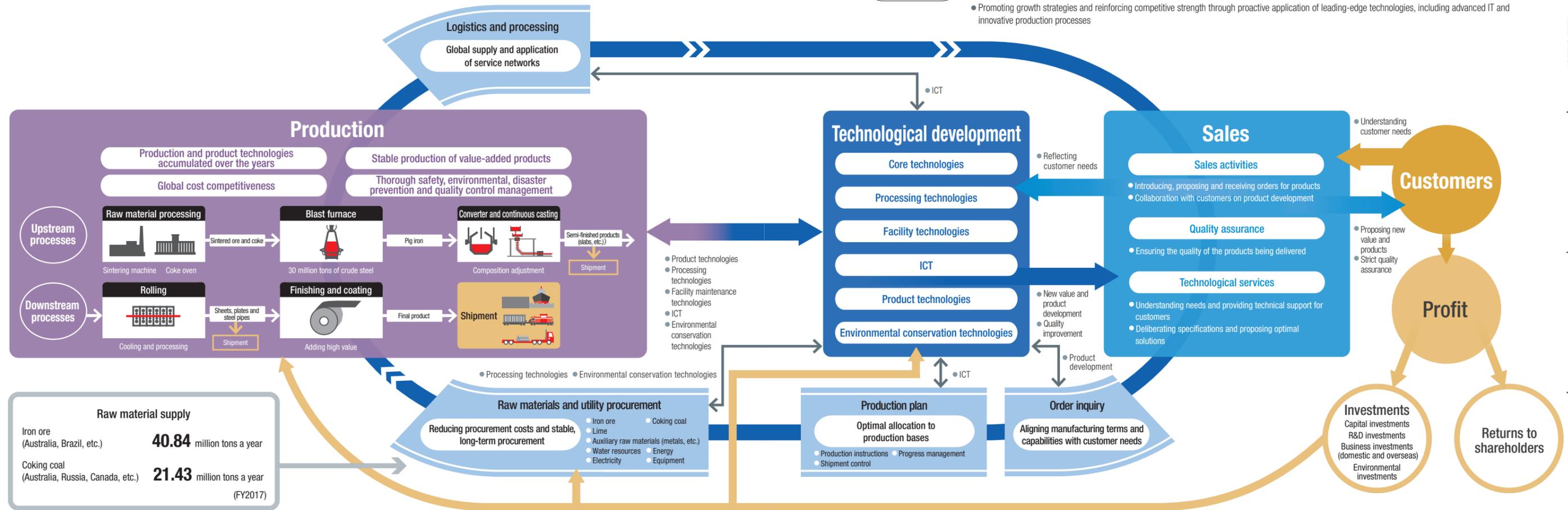
Securing profits from sustainable growth

Returning the economic value created through business operations into investments and to shareholders

- Sustainable cash flow growth
- Investment for further growth
- Return of profit to shareholders  
Dividend payout ratio of approximately 30%

## A business model that creates a JFE brand associated with high-added value

The competitive advantages of our steel and trading businesses have three fundamental sources: (1) **leading-edge technological development capabilities mobilized by customer needs**, (2) **production capabilities constantly developed and enhanced at production sites**, and (3) **sales capabilities underpinned by firm relationships of trust with customers** established over years by JFE Steel and JFE Shoji Trade. We have created new value tailored to customer needs and provided optimized solutions based on these three factors. Our competitive advantages are treasured assets created through many years of effort. They are also the driving force behind our sustainable growth and cannot easily be matched by other companies.



The source of competitive advantages that reinforce our business model

Two major, integrated steelworks with excellent competitive strength

Production



The primary source of our competitive strength in the steel business are two major steelworks located in east and west Japan, both with world-class production scale. Consolidating manufacturing bases reduces fixed costs and enables highly-efficient production. West Japan Works can produce 20 million tons of steel materials annually and, by international standards, is among the best in terms of cost, product lineup and technological capabilities. Leading production and product technologies, intellectual property, expertise and other strengths accumulated over many years in service provide the company with a unique source of competitive strength.

Initiatives and investments for reinforcement

- Major renovation of facilities to reinforce manufacturing capabilities, along with strategic capital investment and development of innovative production processes
- Application of advanced IT and development of diverse human resources so that skills and technologies are effectively handed down, and dramatic increases in productivity can be realized
- Investment for overseas growth to expand global production systems using technologies and skills constantly developed and enhanced at domestic steelworks
- Stable procurement of raw materials and cost reduction utilizing technologies for low-cost raw materials and networks, including JFE Shoji Trade

The source of competitive advantages that reinforce our business model

Ability to respond to customer needs and a stable customer base

Sales



We have established relationships of trust through two-way communications with many customers during our long years in business. We have created new value by closely communicating with customers to accurately meet their evolving requirements and through other activities, including cooperation from the initial development stage which helps us to contribute to the resolution of customer issues. As a result, we have created a solid customer base that cannot be easily or quickly built by other companies and, at the same time, gained global competitive strength (non-price competition).

Initiatives and investment for reinforcement

- Consolidating product development and sales as well as understanding the needs of customers in an appropriate way and in a timely manner through close communication with them
- EVI (Early Vendor Involvement): Fine-tuning technologies with customers from the initial stage of new product development, to create the finest products possible with the available technologies
- Accurately responding to customer expectations and creating a global network that can deliver products and services in a timely manner

Business models that support society and create the future

The main focus of the engineering business is infrastructure construction that supports people's lives and society, providing products and services based on the Group's comprehensive strengths and advanced technologies. As long as people in the world long for more comfortable and abundant lives, there will never be an end to our mission.

We will provide optimal solutions for society and strive to realize a sustainable society to "create" and continue to "Ni-na-u\*" the foundations for life.

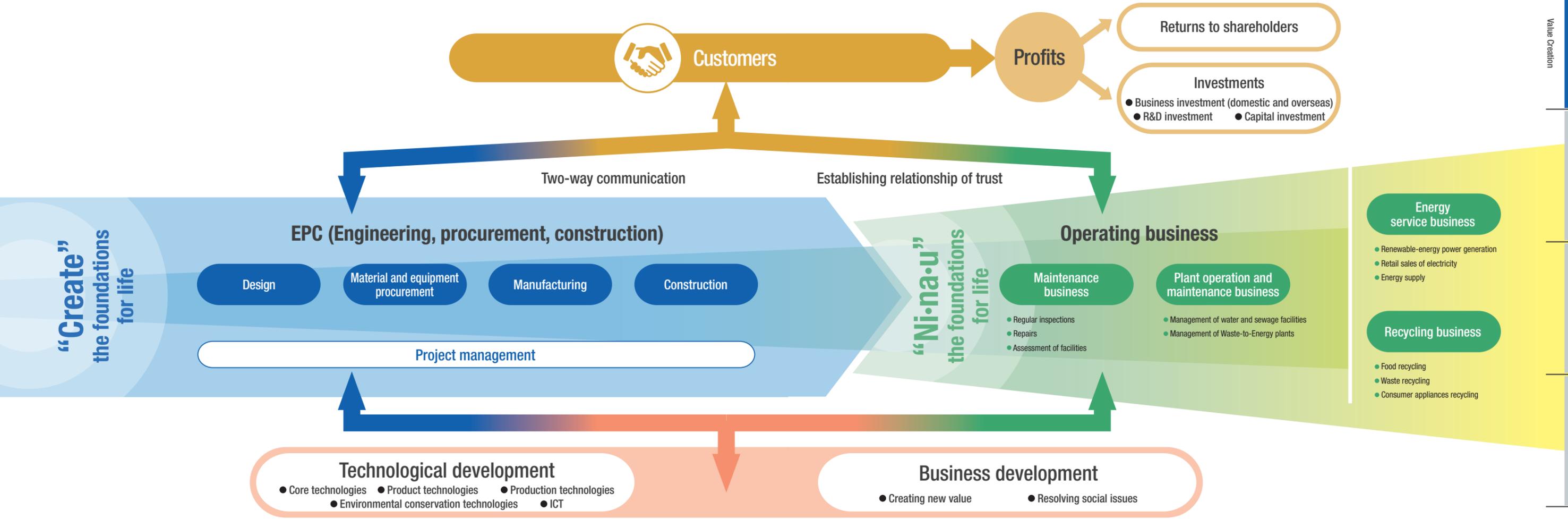
\*"Ni-na-u" is a Japanese word meaning supporting and remaining responsible. We aim to provide solutions with our engineering and manufacturing know-how.

The source of competitive advantages that reinforce our business model **Advanced core technologies and diverse product technological capabilities** Technological development



We have conducted business in diverse fields such as energy, environment and bridges, taking advantage of our advanced technological capabilities, which combine and take to a new level the processing and assembly technologies based on our shipbuilding business, and the material and combustion technologies based on our steel business. We especially possess many technologies that support society, including those for the creation of next-generation energy and solutions for environmental issues. We will make every possible effort to plan, design and promote new business models and develop new technologies based on these technologies.

- Initiatives and investments for reinforcement
- Enhancing existing products with a focus on the energy and environment fields, along with developing new products that meet the needs
  - Accelerating the creation and expansion of new businesses by consolidating existing businesses toward a recycling-oriented and sustainable society
  - Continued investment and reinforcement of human resources to accelerate the enhancement of products and services, including through application of AI and IoT



The source of competitive advantages that reinforce our business model **Proven track record and project execution capabilities enabled by diverse human resources** Engineering, procurement and construction



We have constructed many high-performance, high-quality facilities that meet customer needs in fields such as energy, environment and bridges, from design to completion. Furthermore, we possess Japan's largest steel structure manufacturing plant and other production bases, allowing us to provide high-quality products at low cost. We also have built global engineering structure in overseas bases, centered in Asia, to further reinforce our competitive strength.

- Initiatives and investments for reinforcement
- Enhancing quality and productivity through active application of advanced IT at construction and manufacturing sites
  - A global engineering structure that enables the supply of optimal products for each country
  - Further enhancement of project management systems to ensure projects are thoroughly implemented and earnings is secured

The source of competitive advantages that reinforce our business model **Business management capabilities with strengths in manufacturing expertise** Business management



We have nurtured our expertise in operation and maintenance over the years at environmental and water and sewage plants, and conduct various projects collaborating with public and private sectors in the civil service field. Our plants undertake recycling and renewable energy generation businesses for a recycle-oriented and sustainable society. We will strive to further expand our operating business, including public and private sector collaborations and energy service operations, applying our strengths in manufacturing and management expertise.

- Initiatives and investments for reinforcement
- Active investment toward expanding operating business, such as public and private sector collaborations in the civil service field, energy services, and recycling
  - Establishing a system that provides management solutions with remote monitoring of various plants using AI and IoT
  - Active business investment, including collaborations with local overseas partners, to enhance our overseas business