“ KOBELCO ESG DAY ”

KOBELCO Group Initiatives in the Engineering Business

September 27,2023
Kobe Steel, Ltd.

KOBELCO

1. Engineering Business Overview

2. Position of the Engineering Business

3. Initiatives in the Low-carbon Steelmaking Field

4. Initiatives in the Sewage and Waste Treatment Fields

Engineering Business Overview

KOBELCO Group Net Sales/Ordinary Profit Forecast

Machinery-related Business

- Net sales: 847.0 billion yen
- Ordinary profit: 43.0 billion yen

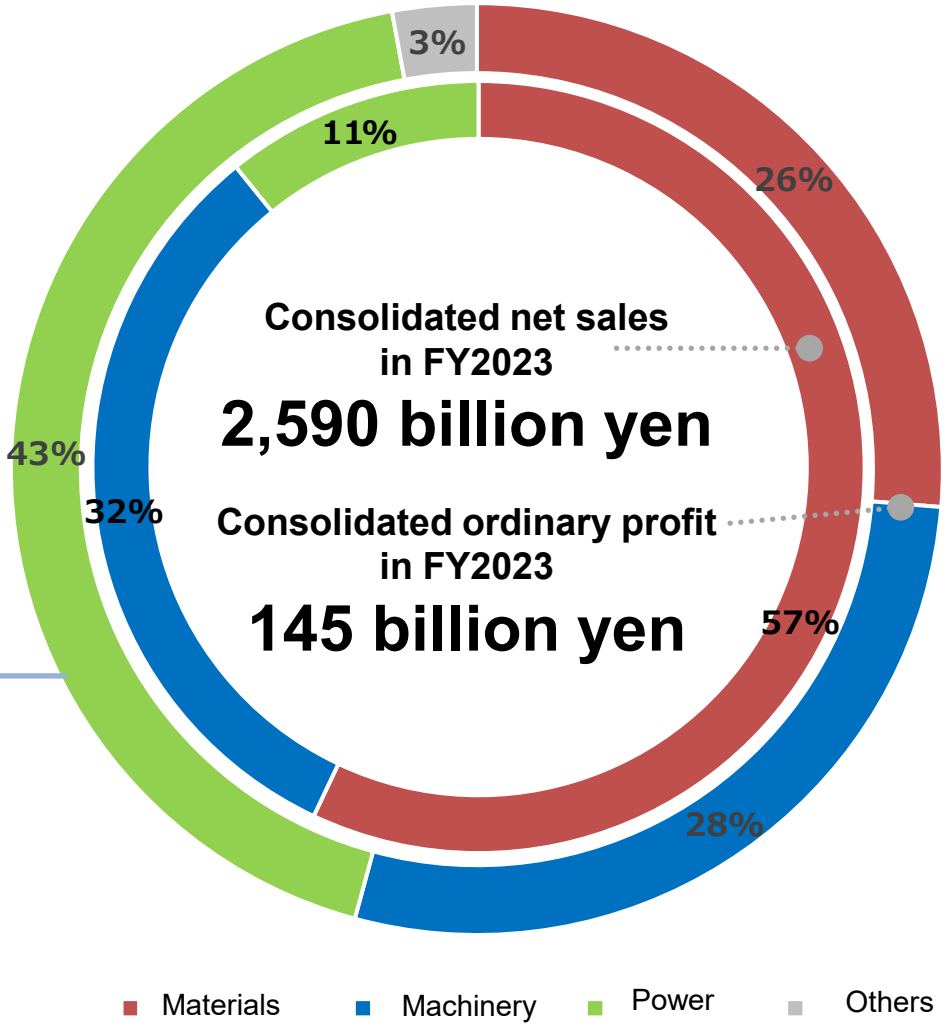
・Machinery
・**Engineering**
・Construction machinery

Engineering Segment

Net sales
170.0 billion yen (approx. 6% of total)

Ordinary profit
8 billion yen (approx. 5% of total)

Structured around the Kobelco's Engineering Business Division, Kobelco Eco-Solutions Co., Ltd. and KOBELCO E&M Co., Ltd. (Plant Division)



Main Business Areas within the Engineering Segment

Engineering Business Division

■ **MIDREX® process** (low-carbon steelmaking solutions)
- Eighty percent of the world's direct reduced iron (DRI) production (natural gas-based DRI), over 90 units delivered

■ **New transportation systems**
- Delivered 6 out of 8 domestic lines

■ **Nuclear power, earthquake reconstruction, etc.**
- Contributing to earthquake reconstruction by fusing Engineering Business Division's nuclear power-related technologies and KES's waste treatment technologies.

Plant Division, KOBELCO E&M Co., Ltd.

■ **Comprehensive engineering**

Petrochemicals, general chemicals, resin, synthetic rubber, fine chemicals, LNG-related plants, etc.

Kobelco Eco-Solutions (KES)

■ **Water treatment-related business**
- Top 3 in Japan by sewage treatment plant orders received

■ **Waste treatment-related business**
- Leading manufacturer of fluidized-bed gasification and melting furnaces with the highest energy recovery rate in Japan
- A wood biomass power generation business with one of the most days in operation in Japan

■ **Medical and fine chemical machinery business**
- Leading manufacturer of glass-lined equipment

■ **Hydrogen business (HHOG)**
- Top share in the small- and medium-sized hydrogen generator market

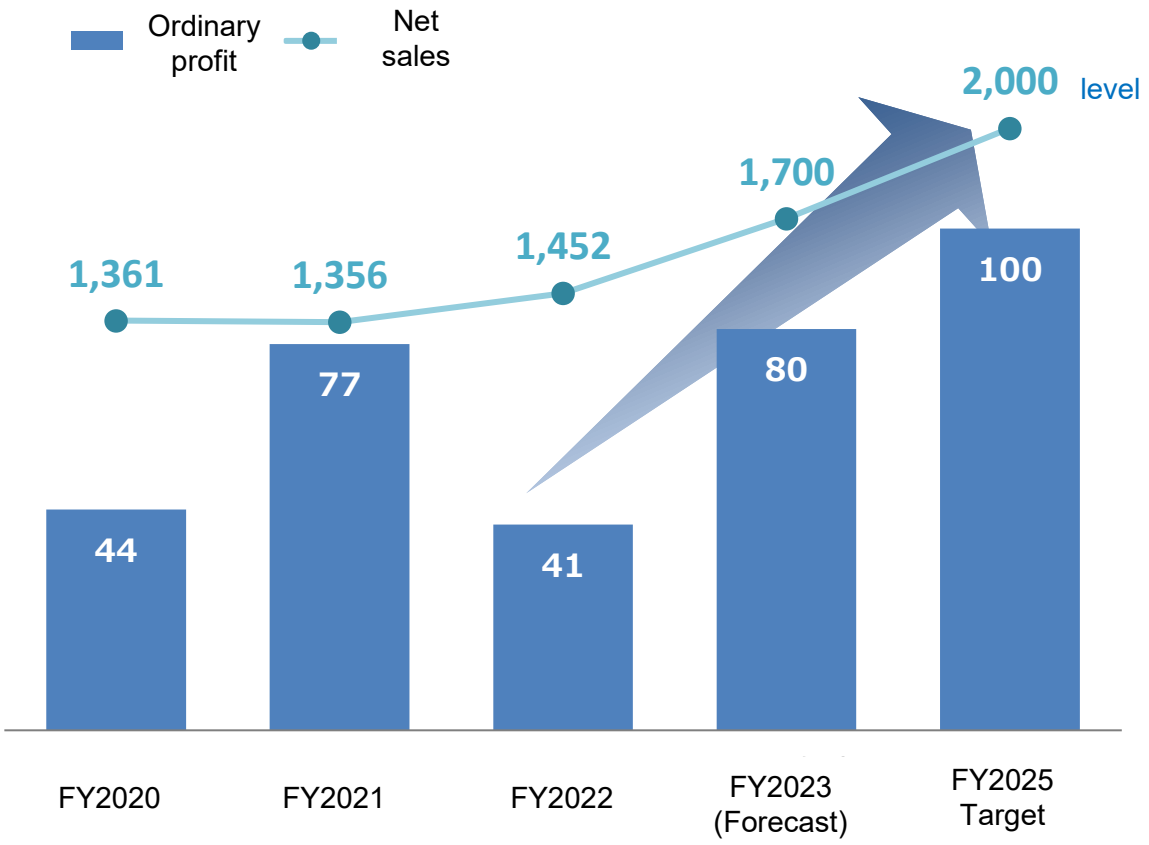
Engineering Business Overview

KOBELCO

We aim to maximize earnings by leveraging our numerous environmental contribution activities and collective strengths, with a focus on the low-carbon (CO_2 reduction), environment, and energy fields.

Changes in the Balance of Net Sales and Ordinary Profit in the Engineering Segment

(Unit: 100 million yen)



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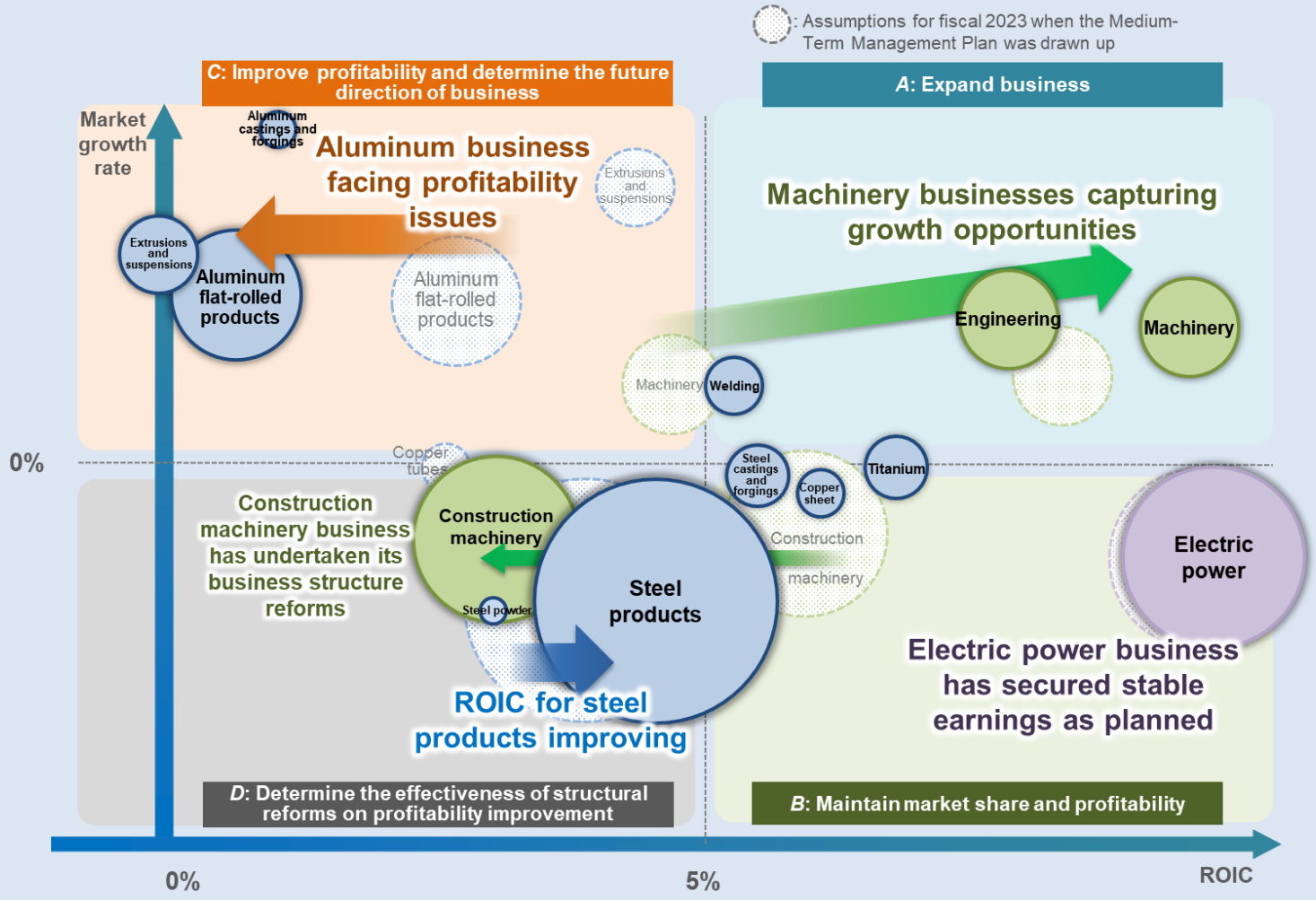
Engineering Business / Position in the Business Portfolio

The engineering business shows promise in contributing to the environment and society through technologies, products, and services that reduce CO_2 emissions and mitigate environmental impact.



*Source: Material presented at the mid-term management plan progress briefing held on May 18, 2023.

Position of the Engineering Business

Five Key Measures for Establishing a Stable Earnings Base

1. Strengthening the earnings base of the steel business
2. Smooth startup and stable operation of new electric power projects
3. Strategic investment in the materials businesses leading to earnings contribution
4. Restructuring unprofitable businesses
5. **Stabilizing earnings in the machinery businesses and responding to growing markets**
   - ■ **Enhancing environmental contribution lineup and strengthening of collaboration in Group**
   - ■ Reforming earnings structure of the construction machinery business

Maximize Profit through Environmental Contribution Offerings

(1) Expand MIDREX® business

(2) Demonstrate collective Group strengths through collaboration with the steel and electric power businesses as well as Kobelco Eco-Solutions

Stabilization of earnings

- **Initiatives in the low-carbon steelmaking field**

  Receipt of orders for the world's first commercial MIDREX H2™ and MIDREX Flex™ plants

- **Initiatives in the sewage and waste treatment fields**

  Solid orders for large-scale projects in sewage sludge fuel conversion (a biomass resource) and multiple large-scale renovation projects in the waste treatment-related business

Responses to growing markets

- Capturing demand in growing markets via our multiple environmental contribution activities

Solid orders and steady progress in MIDREX and Kobelco Eco-Solutions' environmental contribution activities

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Initiatives in the Low-carbon Steelmaking Field

What is the MIDREX® Process?

A direct reduced ironmaking process developed by our wholly owned U.S. subsidiary Midrex Technologies, Inc.

(1) Manufacturing process	The process produces direct reduced iron **(DRI)**, a raw material for steel, by direct reduction of iron ore using hydrogen or (hydrogen-rich) reducing gas made by reforming **natural gas**.
(2) CO_2 reduction	20 to 40 percent reduction (comparison between “reduced iron and electric furnaces” and “blast furnaces and converters” in the case of MIDREX NG™)
(3) Extensive track record	80 percent*1 of the world’s reduced iron production and more than 90 units delivered (*1 natural gas-based DRI)

MIDREX® Plant

DRI

HBI*2

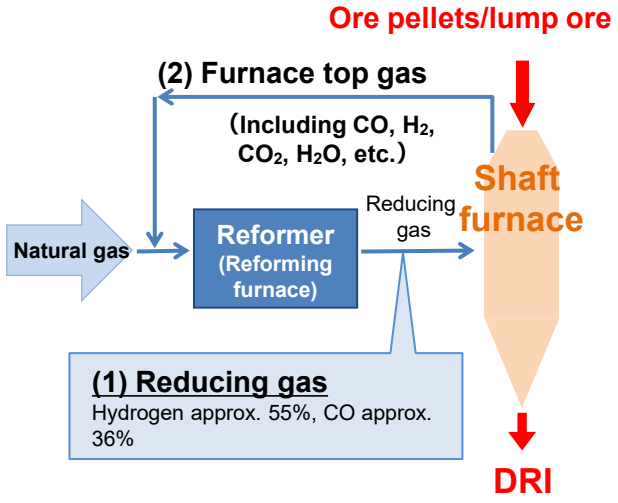
*2 HBI：Hot Briquetted Iron. For marine transportation.

Initiatives in the Low-carbon Steelmaking Field

KOBELCO

Flexibly compatible with regions where carbon-free hydrogen will be introduced in the future, and also provides an optimal solution for the transition period

MIDREX NG™

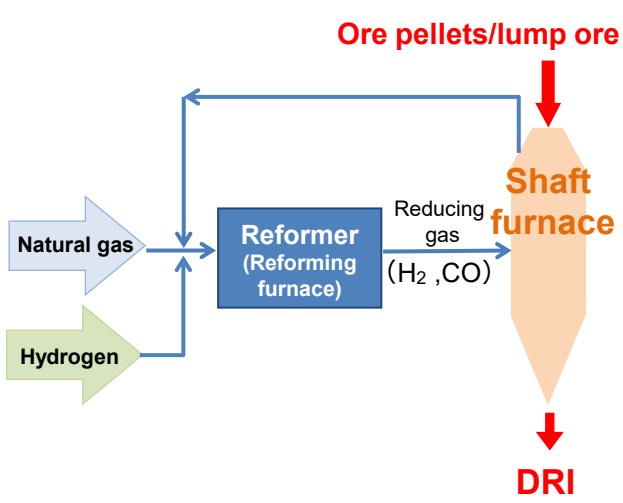


- **Commercial track record with reducing gas with a hydrogen concentration of over 70%**

Key points of DRI production with low CO_2 emissions

(1) Use of hydrogen-rich reducing gas
(2) Effective use of furnace top exhaust gas (CO_2 separation is not required and the gas can be reused as a reforming material and fuel gas)

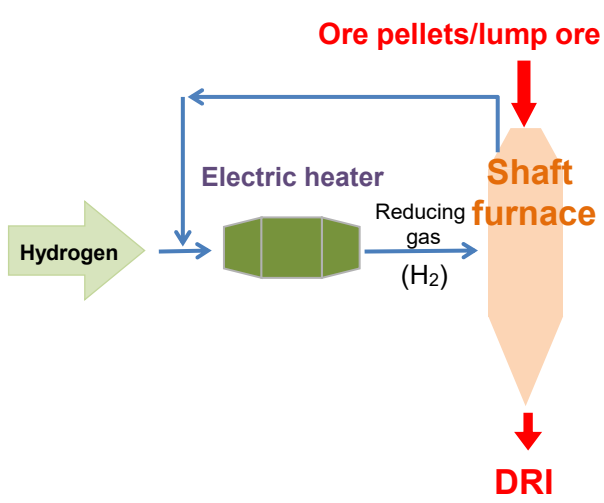
MIDREX Flex™



- **Flexible replacement of natural gas with hydrogen in the range of 0% to 100%**

Order received for Thyssenkrupp (Germany)
Annual production capacity: 2.5 million tons

MIDREX H2™



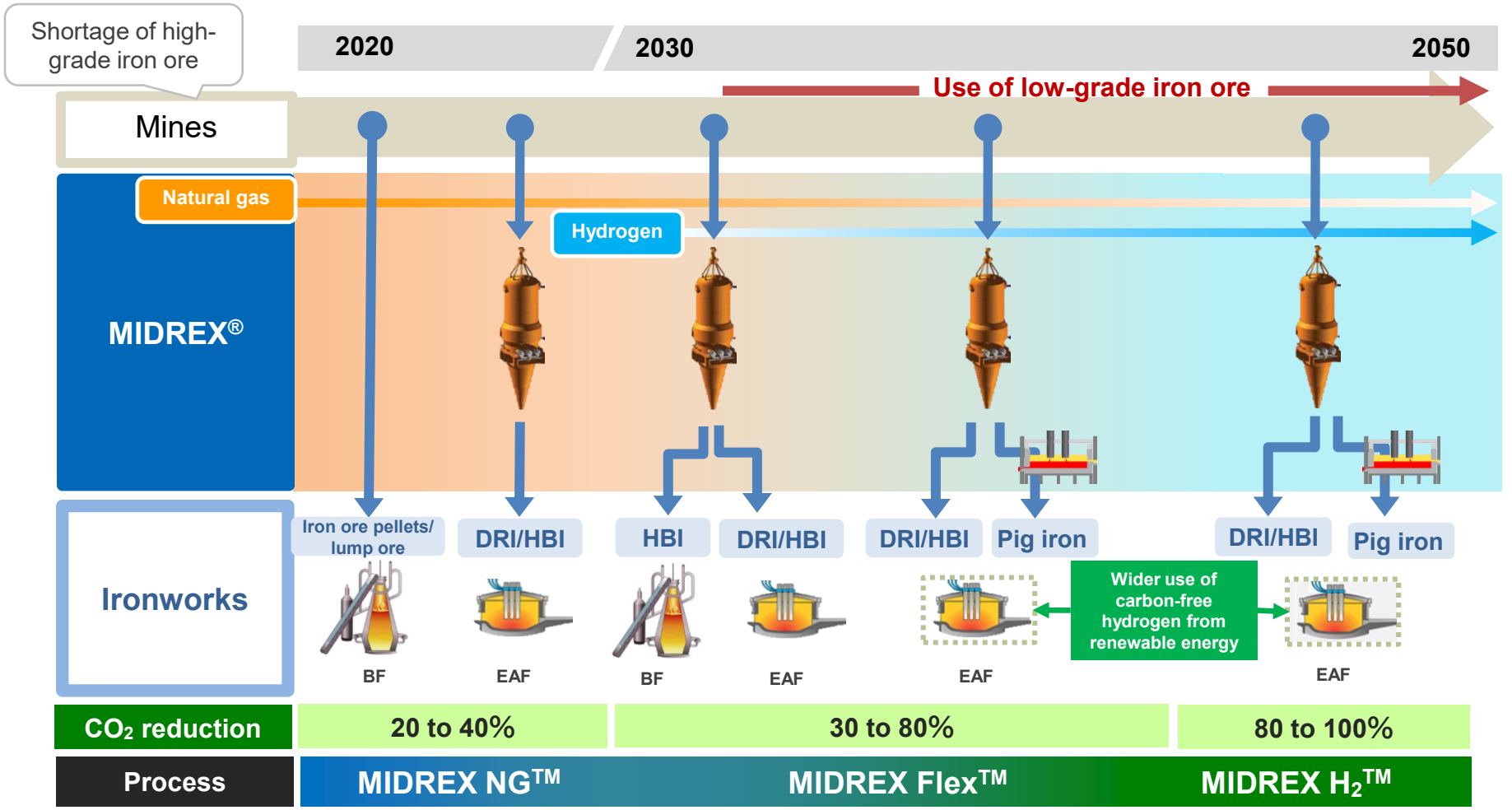
- **Use 100% hydrogen as a reducing gas**
- **Use electric heaters instead of reformers**

Order received for H2 Green Steel (Sweden)
Annual production capacity: 2.1 million tons

Initiatives in the Low-carbon Steelmaking Field

KOBELCO

Capable of providing CO_2 reduction solutions at any stage from short- to long-term to achieve carbon neutrality



*1 The amount of CO2 reduction may change depending on the situation of installed equipment, raw materials used, etc.
*2 DRI: Direct Reduced Iron *3 HBI: Hot Briquetted Iron

Initiatives in the Low-carbon Steelmaking Field

Feasibility study of low-CO2 Iron Metallics Project in Oman

Kobe Steel and Mitsui & Co. will jointly conduct the feasibility study of production and sale of HBI (low-CO2 iron metallics) using MIDREX® process.

Kobe Steel **Mitsui & Co.**

(1) MoU on comprehensive cooperation for the low-CO2 Iron Metallics Project

OPAZ*1, an Omani authority that oversees special economic zones in Oman

(2) Land Reservation Agreement on Special Economic Zone Authority at Duqm

Port of Duqm Company S.A.O.C., an Omani entity that undertakes port development and management of Special Economic Zone Authority at Duqm (SEZAD)

We have made good progress in establishing cooperative framework with local stakeholders through these agreements that enable us to secure land for business in special economic zones at Duqm in Oman and secure natural gas production quota.

*1 Official name: Public Authority for Special Economic Zones and Free Zones

Feasibility study of low-CO2 Iron Metallics Project in Oman

Oman

- Oman is rich in natural gas.
- Under Oman Vision 2040, the country promotes its key policy focused on the supply of renewable energy and green hydrogen.

→ **Ideal location for low-CO2 iron metallics business with a view to promoting green steel production.**

×

MIDREX® Process

- MIDREX® Process bridges the transition from natural gas to hydrogen direct reduction ironmaking.

→ **Optimal ironmaking process for green steel production in the future, applicable to the transition period**

The plan is to produce 5 million tons of DRI per year through the MIDREX® process. Kobe Steel and Mitsui & Co. will accelerate the feasibility study of a low-CO2 iron metallics business in Oman.

We will contribute to the decarbonization of the entire steel industry in Japan and overseas by supplying low-CO2 iron source (HBI).

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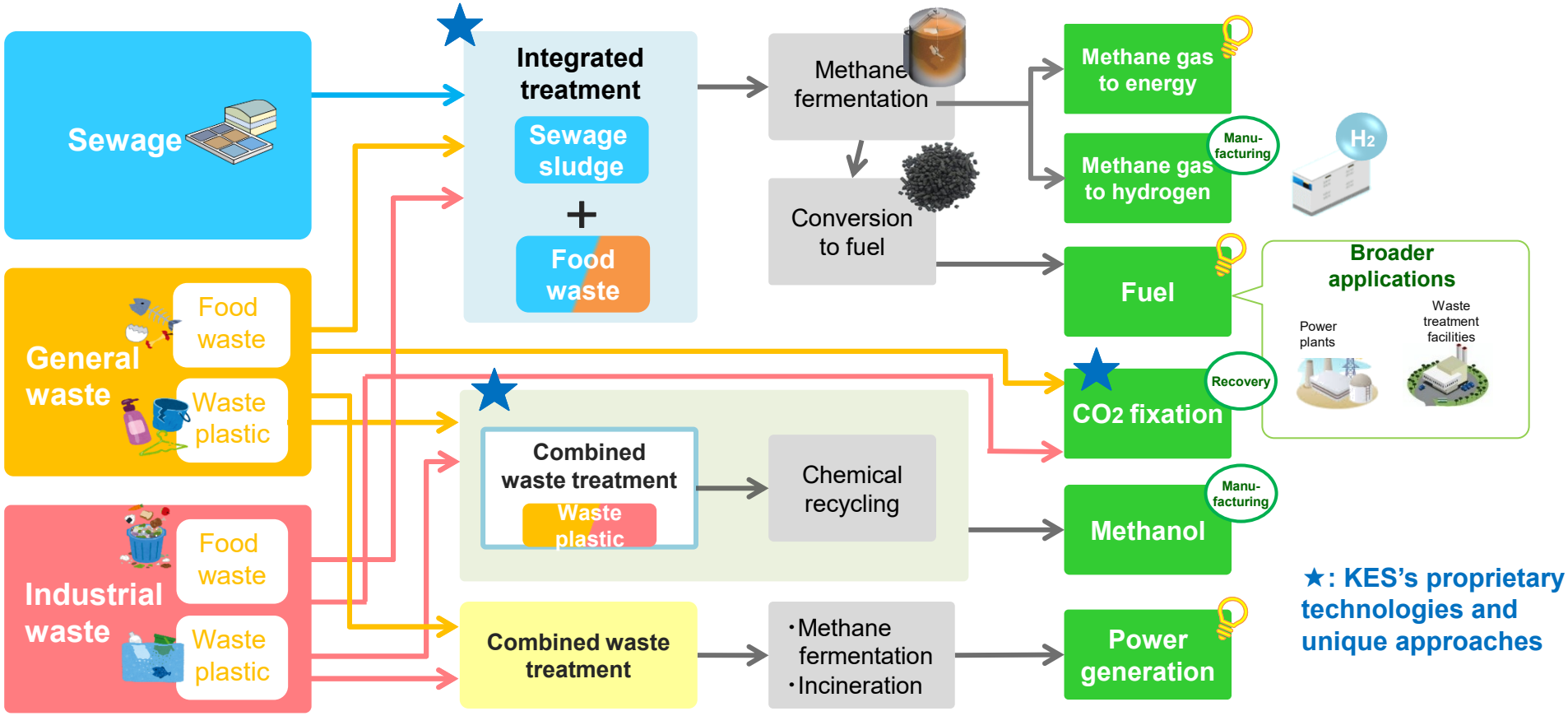
4. Initiatives in the Sewage and Waste Treatment Fields

Initiatives in the Sewage and Waste Treatment Fields
～Optimal solutions for the region to achieve carbon neutrality～

KOBELCO

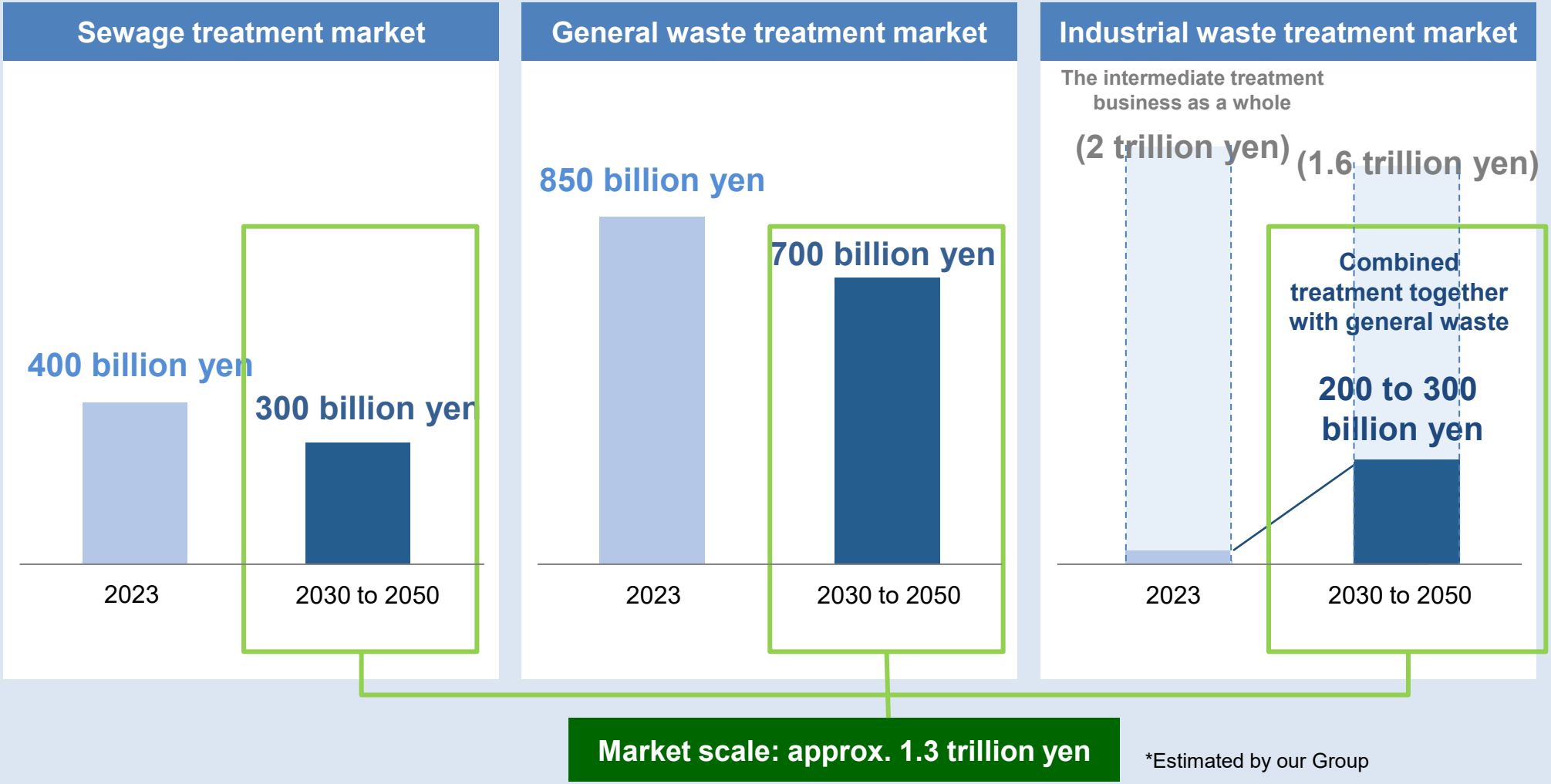
Treatment that transcends the boundaries of the sewage and waste treatment fields, expansion of applications for the materials produced, and creation of synergies through new technologies



Actual amount of CO_2 emissions reduced by KES in FY2022:
approx. 200,000 tons of CO_2 reduced during the year
(Power generation: approx. 440,000 MWh/year)

Future trends in the sewage and waste markets (estimation)

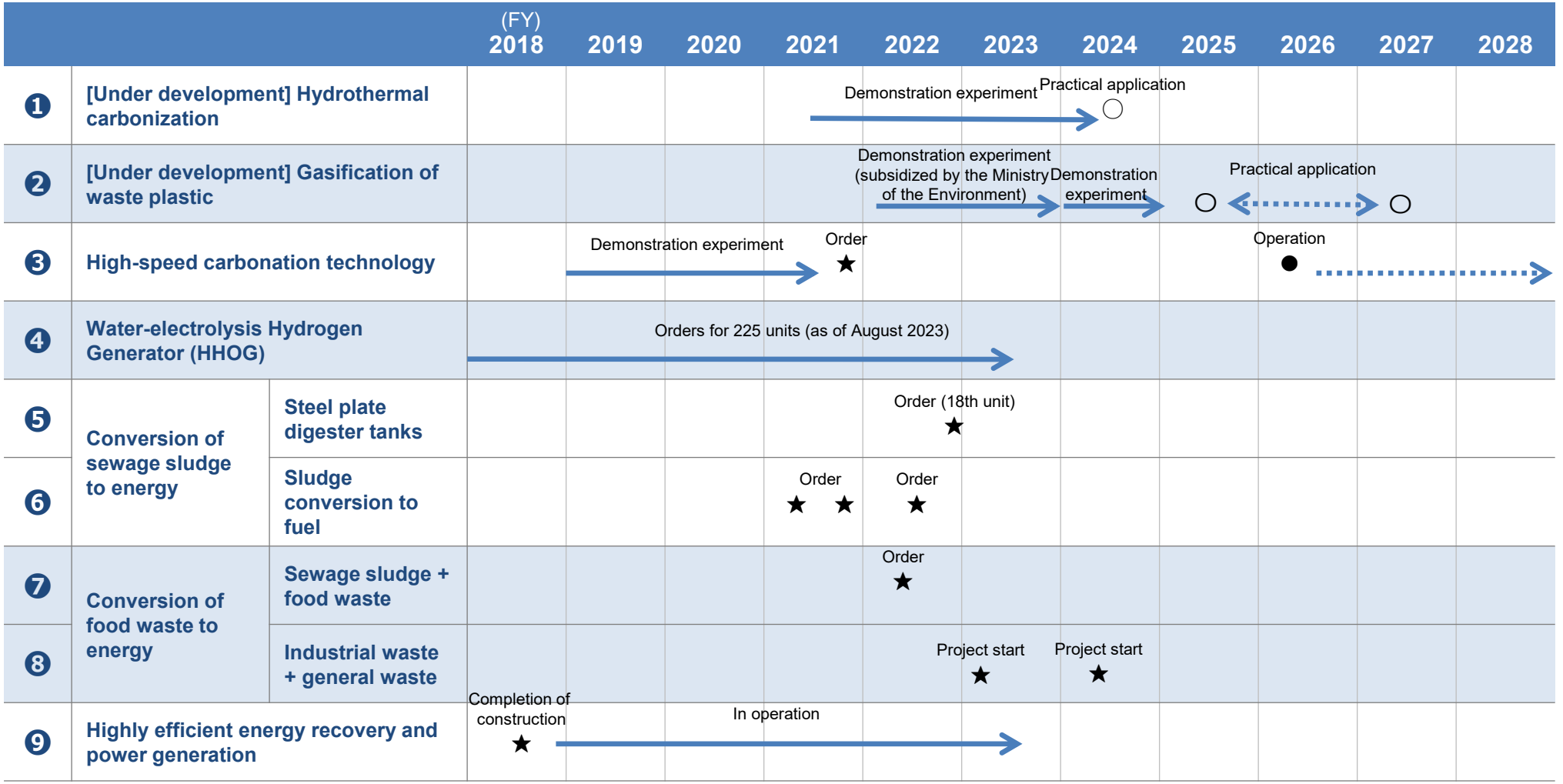
While the conventional market (sewage / general waste) will shrink due to population decline and other factors, the market for cross-boundary treatment (e.g., combined treatment of industrial waste) will expand.



*Estimated by our Group

Initiatives in the Sewage and Waste Treatment Fields ～Initiatives to achieve carbon neutrality～

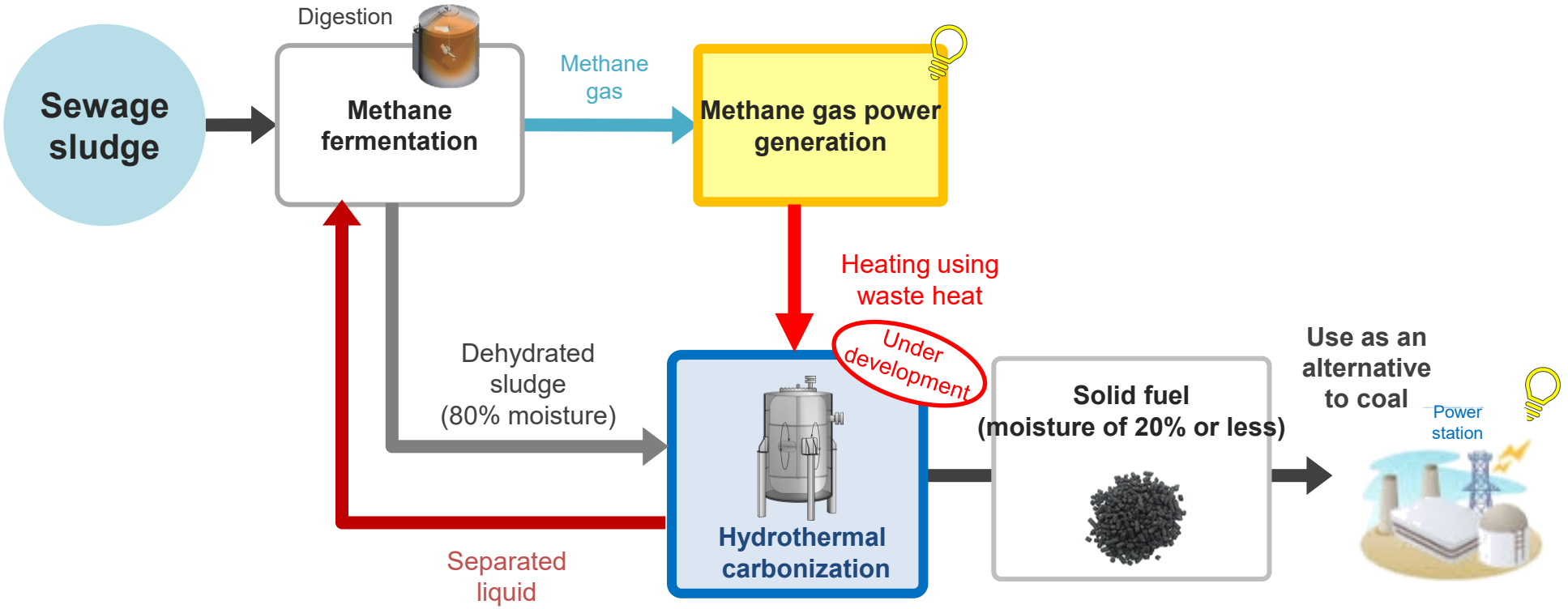
Project Schedule



Hydrothermal carbonization technology [Under development]

(1) Conversion of sewage sludge to energy (fuel conversion under development)

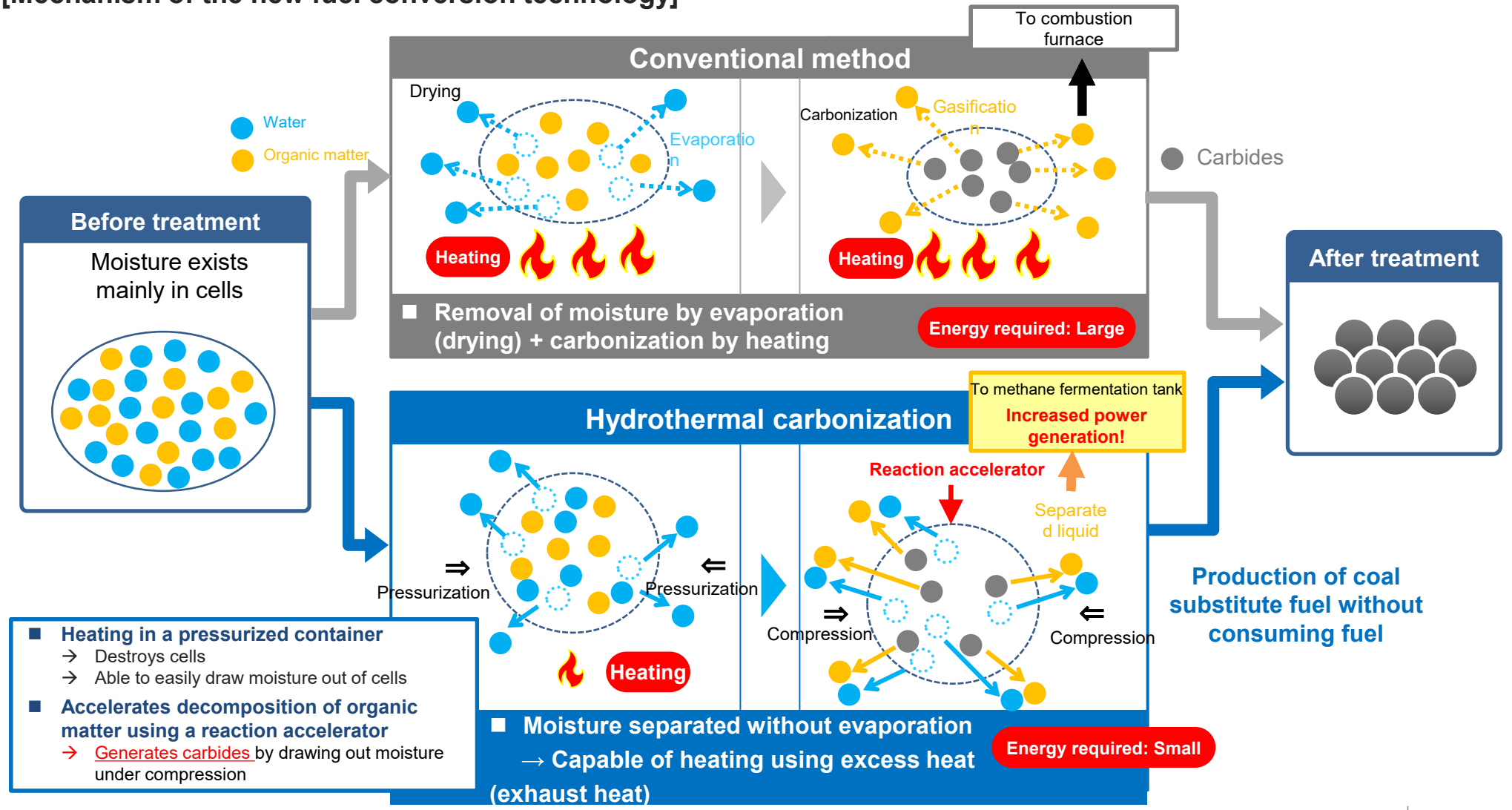
New fuel conversion technologies that will contribute to achieving carbon-neutral sewage treatment are under development.



Initiatives in the Sewage and Waste Treatment Fields ～Initiatives to achieve carbon neutrality～

(1) Conversion of sewage sludge to energy (fuel conversion under development)

[Mechanism of the new fuel conversion technology]

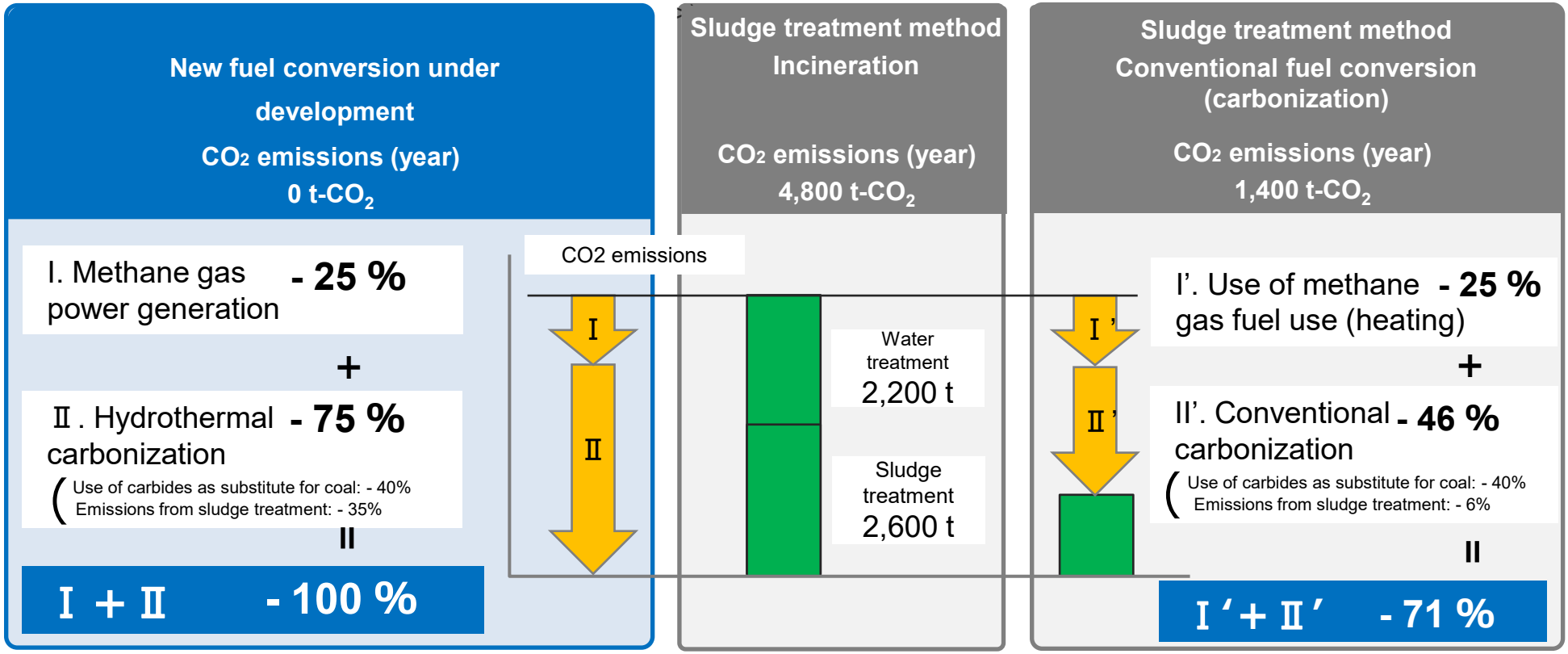


Initiatives in the Sewage and Waste Treatment Fields ～Initiatives to achieve carbon neutrality～

(1) Conversion of sewage sludge to energy (fuel conversion under development)

[Trial calculations of CO_2 emissions from sewage treatment]

(Assumed scale: Medium-scale treatment plant < Daily average water treated: 50,000 m^3)



Carbon neutrality is achievable.

*KES trial calculations based on the Manual for Global Warming Countermeasures in Sewerage Systems, released by the Ministry of the Environment and Ministry of Land, Infrastructure, Transport and Tourism, and Sewage Sludge Energy Conversion Technology Guidelines - FY2017 Ver., released by the Ministry of Land, Infrastructure, Transport and Tourism. (The electricity emission coefficient is based on the estimated value for FY2030.)

Waste plastic gasification technology [Under development]

(2) Waste plastic gasification technology

Demonstration project for the gasification and methanol conversion of waste plastics

Ministry of the Environment: Subsidies for carbon dioxide emission control projects under the Demonstration Project for a Plastic Resource Circulation System toward a Decarbonized Society

[Conventional issues]

Miscellaneous waste plastics that are difficult to recycle (industrial waste, construction waste, marine plastic, etc.) are incinerated, and then thermally recovered or disposed of in a landfill.

[Countermeasure technologies]

Gasification breaks down the waste to the molecular level and generates gas suitable for synthesizing methanol, a key chemical product.

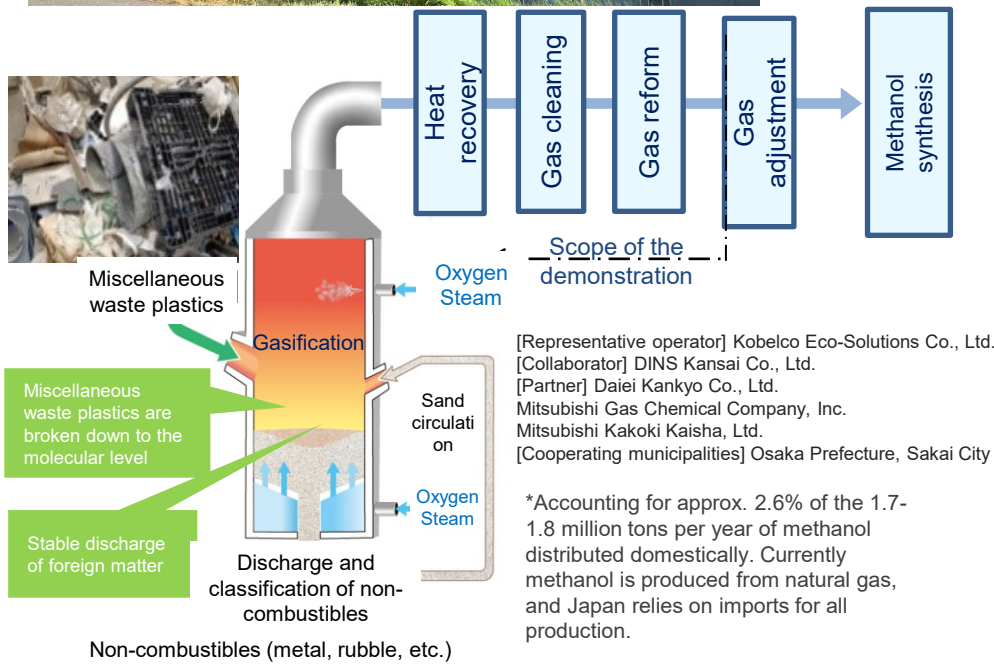
● CO_2 reduction effects

If this technology is used to process 200 tons of waste plastic per day and produce 45,000 tons* of methanol per year, it could reduce **approx. 100,000 t-CO_2 per year** of CO_2 emissions in comparison to conventional methanol production + waste plastic incineration.

(KES trial calculations)

- **Application of KES's fluidized-bed gasification furnace technology**

  Delivery to 21 locations for municipal waste treatment facilities, all of which are still in operation



[Representative operator] Kobelco Eco-Solutions Co., Ltd.
[Collaborator] DINS Kansai Co., Ltd.
[Partner] Daiei Kankyo Co., Ltd.
Mitsubishi Gas Chemical Company, Inc.
Mitsubishi Kakoki Kaisha, Ltd.
[Cooperating municipalities] Osaka Prefecture, Sakai City

*Accounting for approx. 2.6% of the 1.7-1.8 million tons per year of methanol distributed domestically. Currently methanol is produced from natural gas, and Japan relies on imports for all production.

High-speed carbonation technology

Initiatives in the Sewage and Waste Treatment Fields ～Initiatives to achieve carbon neutrality～

(3) High-speed carbonation technology

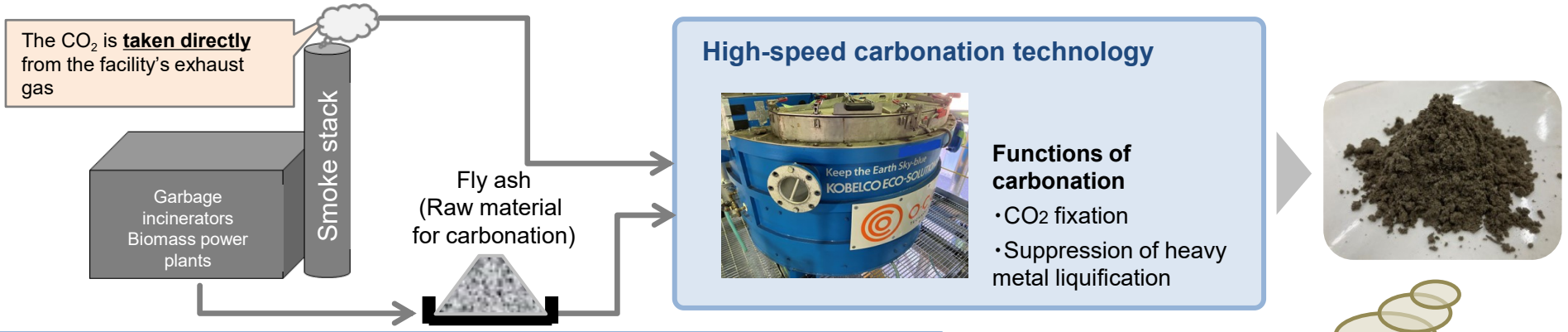
CO_2 reduction from exhaust gases released into the atmosphere

⇒ Development of **high-speed carbonation technology** to fix the CO_2 in exhaust gas in fly ash generated by garbage incinerators, biomass power plants, etc.

CO_2 fixation, which used to take up to several months, takes place in **only a few minutes to a few dozen minutes**.

● **CO_2 reduction effects**

Fixation of **10 to 60 kg of CO_2 per ton** of fly ash generated from facilities. Can be installed in both new and existing facilities.



Advantages of carbonation

- Reduction of chemical costs due to suppressing liquidation of heavy metals, etc.
- Reduction of the amount of final disposal by reducing the agents added
  *Significant reduction in both disposal and transportation costs
  *Contribution to reducing CO_2 emissions from agents
- Fixation of CO_2 in final disposal sites through landfill disposal of carbonated materials

Expected applications

To establish technology to granulate carbonated ash for use as aggregate, roadbed material, asphalt mixture, etc.

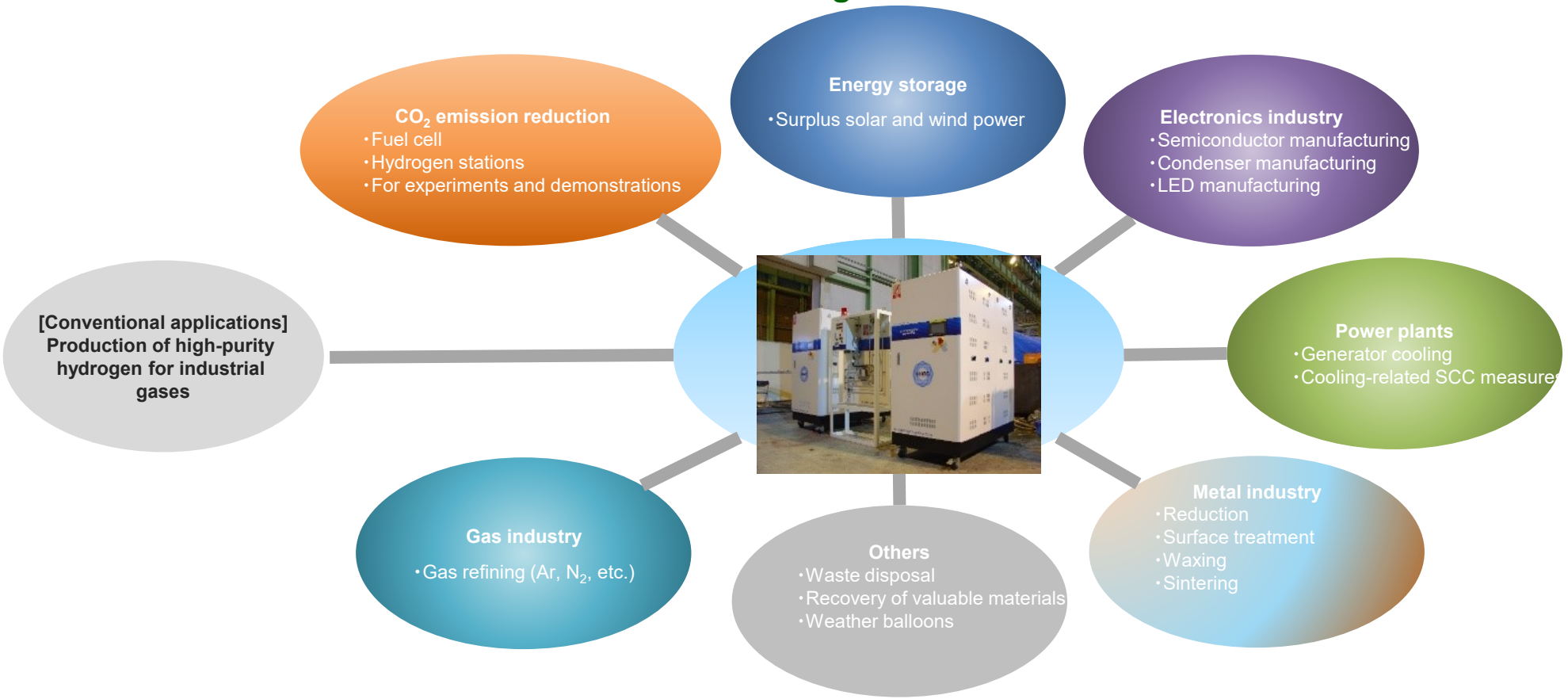
Granulated ash

Water-electrolysis Hydrogen Generator (HHOG)

(4) Water-electrolysis Hydrogen Generator: HHOG

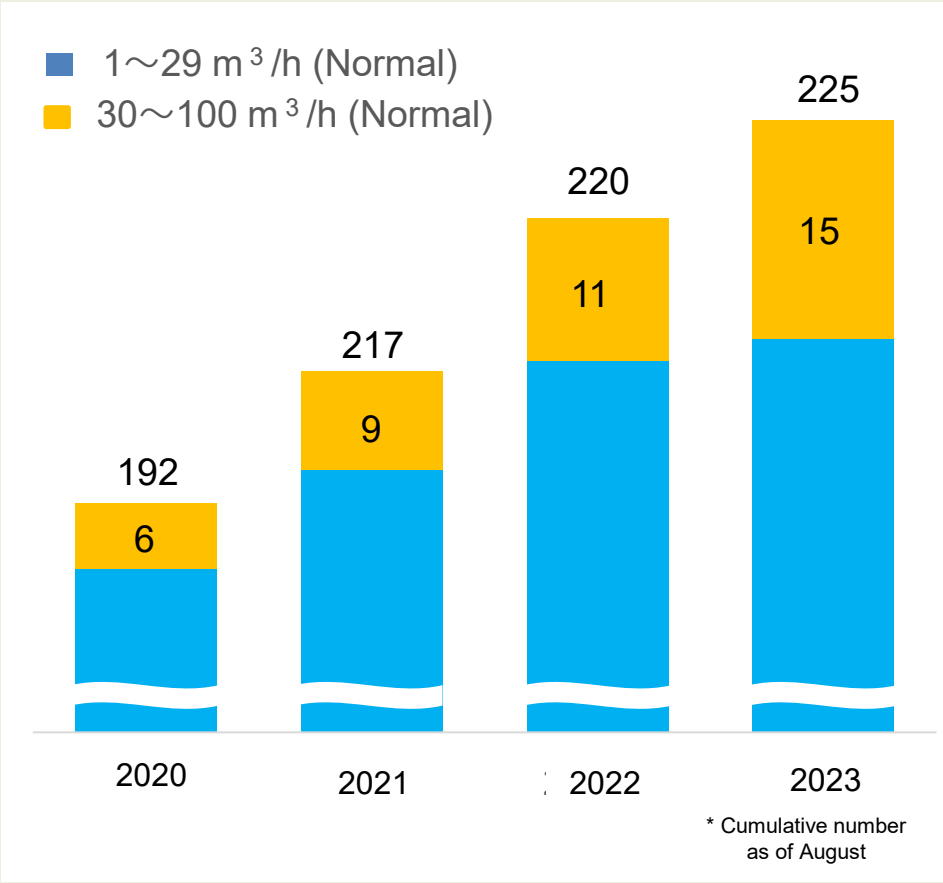
HHOG (**H**igh-purity **H**ydrogen **O**xygen **G**enerator): Green hydrogen can be supplied via water-electrolysis using renewable energy.

In recent years, the need is expanding for large capacity models and applications such as green hydrogen production to reduce CO_2 emissions and hydrogen production for energy storage.



(4) Water-electrolysis Hydrogen Generator: HHOG

Best track record in Japan in terms of the number of green hydrogen generators ordered (over 225 orders received)*As of August 2023



[Recent Major Orders Received]

●FY2022
Central Technical Research Laboratory of ENEOS Corp.
(For demonstration of synthetic fuel production)
80 Nm³/h
Iwatani Corp.
(For hydrogen boilers)
100 Nm³/h

●FY2023
Taiyo Nippon Sanso Corp.
(For semiconductor manufacturers)
100 Nm³/h × 2 units
SPARX Green Energy & Technology Corp.
(For demonstration of hydrogen supply chain)
100 Nm³/h × 2 units

Case introduction

Conversion of sewage sludge to energy

(1) Utilization in methane gas power generation using steel plate digester tanks

(2) Utilization of sludge fuel for power generation by converting sludge into fuel

Initiatives in the Sewage and Waste Treatment Fields ～Case Study～

KOBELCO

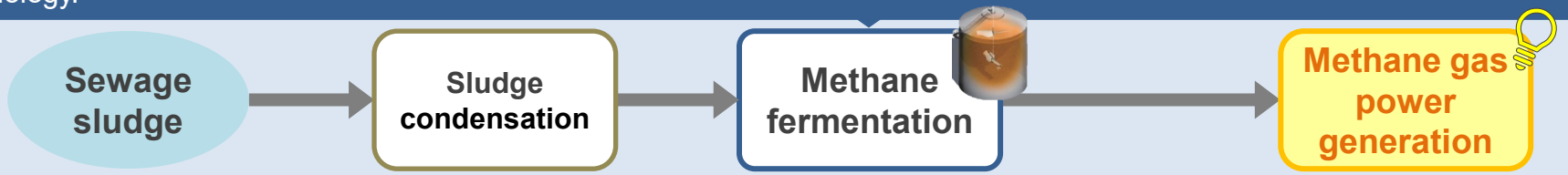
(5) Conversion of sewage sludge to energy (Steel plate digester tanks)

Reduction in greenhouse gas emissions by producing methane gas from sewage sludge and **using it to generate power**

Steel plate digester tanks

- **Construction time and costs can be reduced to roughly half** those of conventional concrete digester tanks.
- Power consumption is reduced by the use of impeller-type agitators. **This results in significant energy savings**.
- **Appropriate digestion reactions are maintained** by operation support functions, such as visualization of operation status using sensors as well as KES's proprietary sediment reduction technology.


Steel plate digester tanks



Sludge digestion facility

■ KES-led Group received order for **Digestion Gas Power Generation Project at Sendai Municipal Minamigamo Sewage Treatment Center** *Amount for the entire joint venture

(Construction contract concluded in March 2023; contract amount (excluding tax): 5,515.5 million yen)

→ Construction of a new high-concentration digestion and digestion gas power generation facility at **one of the largest sewage treatment plants in the Tohoku region**

Power generated: 9,840 MWh/y (equivalent to the consumption of approx. 3,000 average households)

CO_2 reduction: approx. 3,360 t-CO_2/y *Figures published by the City of Sendai

(According to the Manual for Global Warming Countermeasures in Sewerage Systems, released by the Minis Ministry of Land, Infrastructure, Transport and Tourism, large-scale sewage treatment plants (100,000 m^3 per day) emit 8,864 tons of CO_2 per year).

Acquired **the top share of the domestic market** for steel plate digester tanks for sewage sludge with 18 orders received.

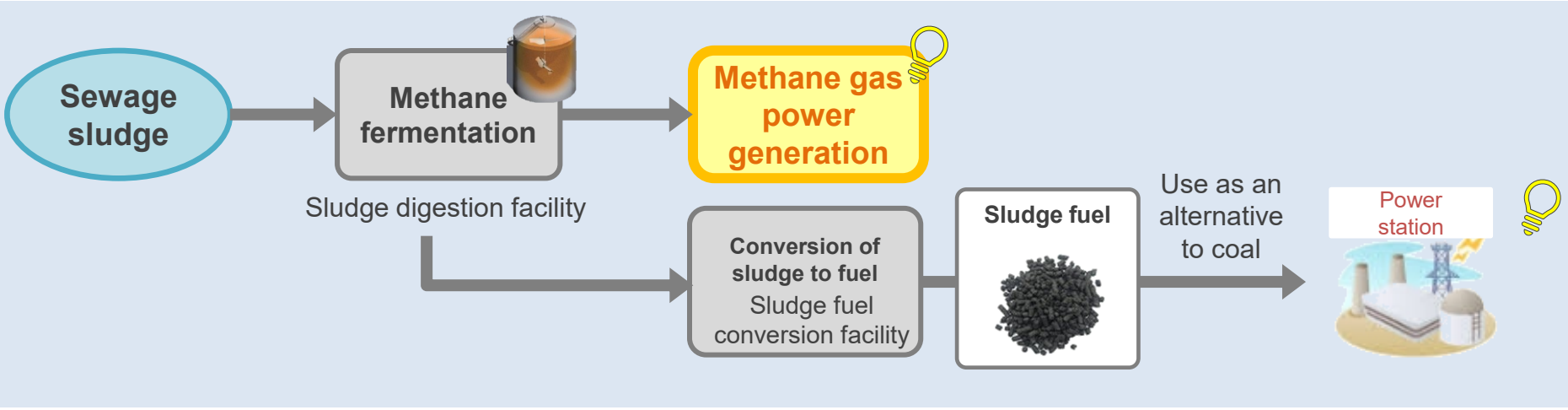

Projected illustration of the Minamigamo Sewage Treatment Center

Initiatives in the Sewage and Waste Treatment Fields ～Case Study～

(6) Conversion of sewage sludge to energy (Conversion of sludge to fuel)

■ **Reduction in greenhouse gas emissions by** producing methane gas from sewage sludge and **using it as fuel for power generation**

→ The sludge fuel produced is being promoted as an alternative to coal in power plants.



■ **Project to reconstruct sludge treatment facility at Hyogo East Basin Sewage Sludge Wide-area Treatment Plant**
- Construction contract concluded in October 2021; contract amount (including tax): 48.015 billion yen. Order received by KES-led Group.
- **One of the largest sewage sludge treatment facilities in Japan** *Amount for the entire joint venture

■ **Fukuchiyama City sludge treatment reconstruction project and construction to improve facilities to make effective use of sludge** (The following two projects do not include methane gas power generation)
- Construction contract concluded in January 2022; contract amount (including tax): 5.5 billion yen *Amount for the entire joint venture

■ **Construction of sewage sludge fuel conversion facility at Lake Biwa Konan-Chubu Treatment Center**
- Construction contract concluded in October 2022; contract amount (including tax): 10.12 billion yen *Amount for the entire joint venture

Conversion of food waste to energy

(1) Utilization in methane gas power generation using [sewage sludge + food waste]

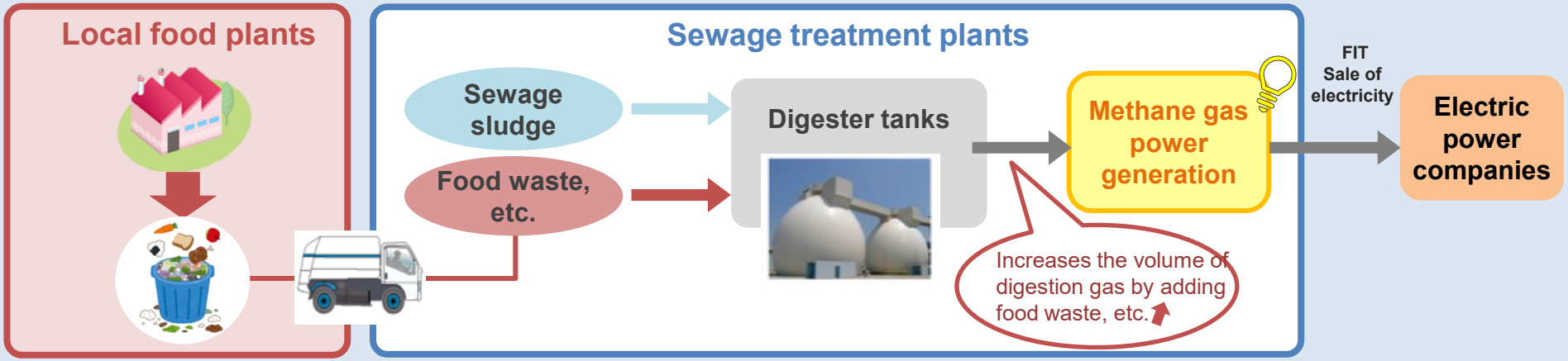
(2) Utilization in fuel for power generation using [industrial waste + general waste]

Initiatives in the Sewage and Waste Treatment Fields ～Case Study～

(7) Conversion of food waste to energy (sewage sludge + food waste)

● **The first company in Japan to obtain permission to operate an industrial waste treatment business within a sewage treatment plant**

- **Converts waste into energy utilizing the existing infrastructure**
- **Facility to produce biomass energy for local consumption**



■ Received an order from Kobe City for a **project to renovate sludge treatment facilities at the Higashinada sewage treatment plant**

(Basic contract concluded in November 2022; construction contract amount (including tax): 4.576 billion yen; maintenance and management contract: 6.26199 billion yen)

*Amount for the entire joint venture

- Renovation of sewage treatment facilities for approx. 10 years, and maintenance and management services for 20 years

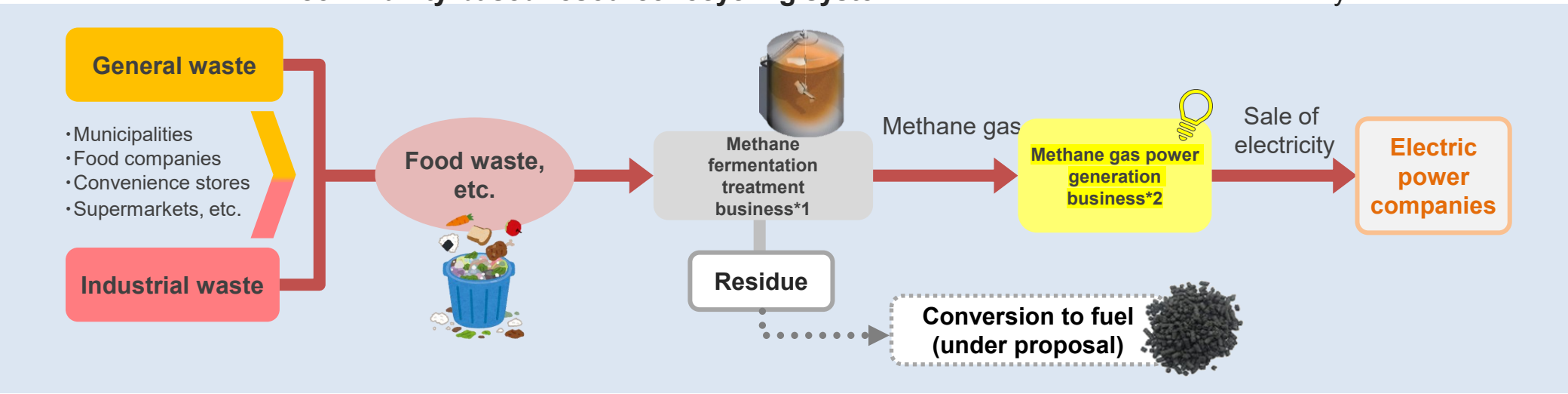
***Contributes to increased power generation and reduced CO_2 emissions** by increasing the amount of gas generated by approx. 10% by adding food waste, etc. to the approximately 12,000 m^3/day of digestion gas generated from sewage water.

Power generated: 8,500 MWh/y or more (equivalent to the consumption of approx. 2,400 average households), CO_2 reduction: approx. 3,000 t-CO_2/y or more

Initiatives in the Sewage and Waste Treatment Fields ～Case Study～

(8) Conversion of food waste to energy (industrial waste + general waste)

■ **Gas power generation from food waste, etc. that transcends the boundaries** between general waste and industrial waste
Promotion of a **community-based resource recycling system** that contributes to carbon neutrality



■ **Entered the business by jointly establishing SPC with other companies**

***1: Kobec Co., Ltd.** (Methane gas power generation is overseen by Kobe Kankyo Create.)
Investment ratio: Kobe Kankyo Create Co., Ltd. 83.7%
Kobelco Eco-Solutions 16.3%
Power generation scale: 1,000 kW
Annual power generation: approx. 5,000 MWh/y
(equivalent to the consumption of approx. 1,500 average households)
Scheduled start of project: June 2024
Project location: Kobe City, Hyogo Prefecture

***2: Re-enermie Co., Ltd.** (Methane fermentation process is overseen by Daiei Kankyo.)
Investment ratio: Daiei Kankyo Co., Ltd 65%
Kobelco Eco-Solutions 35%
Power generation scale: 1,980 kW
Annual power generation: approx. 10,000 MWh/y
(equivalent to the consumption of approx. 3,000 average households)
Start of project: April 2023
Project location: Iga City, Mie Prefecture

Other initiatives

- Initiatives relating to highly efficient energy recovery and power generation

- Sewage sludge fuel conversion ~ hydrogen production and supply initiatives

Initiatives in the Sewage and Waste Treatment Fields ～Case Study～

(9) Highly efficient energy recovery and power generation

■Hatsukaichi Energy Clean Center [Completed in March 2019]

Consists of an energy recovery-type waste treatment facility (75 tons/day × 2 furnaces) and an bulky waste treatment facility (10 tons/day)

〈Feature (1)〉

■Adoption of fluidized-bed gasification and combustion furnaces

■Stable treatment of a broad range of wastes

(This facility targets residue generated at facilities that process general combustible waste, dehydrated sludge from human waste, and bulky waste.)

〈Feature (2)〉

■High-temperature, high-pressure boilers and turbines

■Adoption of boiler steam conditions of 6 MPa × 450°C enabling the most efficient power generation in Japan

〈Feature (3)〉

■Hot water is recovered from turbine exhaust heat to supply heat to the adjacent Hiroshima Gas Hatsukaichi Plant.

Achievement of highly efficient power generation with a world-class high energy recovery rate

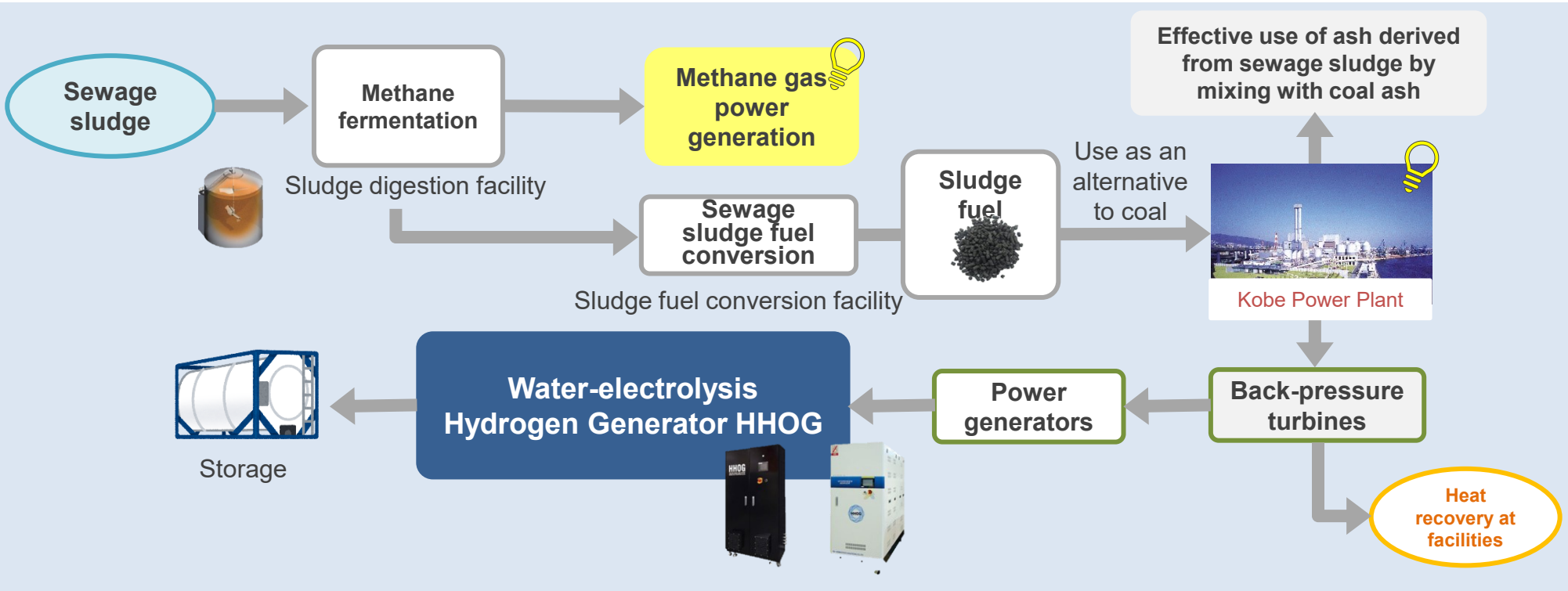
Won the Chairman's Award of the Japan Society of Industrial Machinery Manufacturers at the 48th Excellent Environmental Equipment Awards

Initiatives in the Sewage and Waste Treatment Fields ～Case Study～

Kobelco Eco-Solutions × Power

(10) Sewage sludge fuel conversion ~ hydrogen production and supply initiatives

Kobelco collaborates at the Kobe Power Plant
on a project to co-fire biomass fuel derived from sewage sludge and utilize the extracted steam.



We aim to achieve carbon neutrality by 2050 by generating synergies across the entire Kobelco Group.

Group Corporate Philosophy

KOBELCO's View of the Future

Our view of a society and future to be attained as we carry out KOBELCO's mission

We envision a world in which people, now and in the future, can fulfill their hopes and dreams while enjoying safe, secure, and prosperous lives.

KOBELCO's Mission

Our mission and the social significance of the KOBELCO Group that we must fulfill

Our mission is to provide solutions to the needs of society, by making the best use of the talents of our employees and our technologies.

Core Values of KOBELCO

The commitments of the KOBELCO Group to society and the values shared by the entire KOBELCO Group

1. We provide technologies, products and services that win the trust and confidence of our customers we serve and the society in which we live.
2. We value, and support the growth of, each employee on an individual basis, while creating a cooperative and harmonious environment.
3. Through continuous and innovative changes, we create new values for the society of which we are a member.

Six Pledges of KOBELCO

Code of Conduct for all Group employees to follow to fulfill the Core Values of KOBELCO and the Quality Charter

1. Uphold the Highest Sense of Ethics and Professionalism
2. Contribute to the Society by Providing Superior Products and Services **Quality Charter**
3. Establish a Comfortable but Challenging Work Environment
4. Live in Harmony with the Local Community
5. Contribute to a Sustainable Environment
6. Respect Each Stakeholder

Cautionary Statement

- Certain statements in this presentation contain forward-looking statements concerning forecasts, assertions, prospects, intentions and strategies. The decisions and assumptions leading to these statements are based on information currently available to Kobe Steel. Due to possible changes in decisions and assumptions, future business operation, and internal and external conditions, actual results may differ materially from the projected forward-looking statements. Kobe Steel is not obligated to revise the forward-looking contents of this presentation.

- Uncertain and variable factors include, but are not limited to:
  - Changes in economic outlook, demand and market conditions
  - Political situation and trade and other regulations
  - Changes in currency exchange rates
  - Availability and market conditions of raw materials
  - Products and services of competing companies, pricing policy, alliances, and business development including M&As
  - Strategy changes of alliance partners

KOBELCO