



Medium-term Management Plan (FY2023–2026)

May 12, 2023

Section 1

**Review of the Previous
Medium-term Management Plan**



Section 2

Long-term Vision



Section 3

Medium-term Management Plan



Appendix

Section 1



Review of the Previous Medium-term Management Plan

Basic policies	Results	Issues
<p>Fortifying the business foundation</p> <p>Restructuring the business foundation to increase core earning capability</p>	<ul style="list-style-type: none"> • Enhancement of manufacturing functions <ul style="list-style-type: none"> - Starting operations at the Muroran Factory in April 2019. - Orders received for several large-scale industrial dryers in FY2022. • Strengthening joint efforts Groupwide <ul style="list-style-type: none"> - Transition to a holding company structure in 2023 • Advancing workstyle reforms <ul style="list-style-type: none"> - Adopting work from home and a free-address system at the head office. - Revision of the childcare leave program. 	<ul style="list-style-type: none"> • Enhancing competitive strengths in the Industrial Business • Further cost cutting for manufacturing functions • Sustainability initiatives <ul style="list-style-type: none"> - Promoting diversity (Securing board director diversity, female manager ratio, etc.) - Investments in human capital, addressing climate change • Promoting digital transformation (DX) to improve business efficiency and productivity
<p>Promoting a growth strategy</p> <p>Expanding business domains and reforming business models from long-term perspective</p>	<ul style="list-style-type: none"> • Expanding the energy and environmental businesses <ul style="list-style-type: none"> - Merger with JFE Engineering Corporation's domestic water engineering business (planned for October 1, 2023) - Strong orders for next-generation sewage sludge incineration systems and waste liquid and solid waste treatment systems - Receipt of large-scale EPC orders for lithium-ion secondary battery manufacture equipment • Strengthening the aftersales service business <ul style="list-style-type: none"> - Grew life cycle businesses. - Acquired a sewage treatment plant operations management firm. • Expanding overseas businesses <ul style="list-style-type: none"> - Strong orders at European subsidiary - Received orders for sewage treatment machinery in China and Vietnam. 	<ul style="list-style-type: none"> • Receiving orders for energy-creating dewatering incineration systems (development is complete) • Developing lithium-ion batteries, enhancing overseas sales • Implementing AI and IoT technologies in the aftersales service business • Overseas business expansion <ul style="list-style-type: none"> - Rebuilding business development in Southeast Asia - Stalled new sewage sludge treatment projects in China due to COVID-19 lockdowns

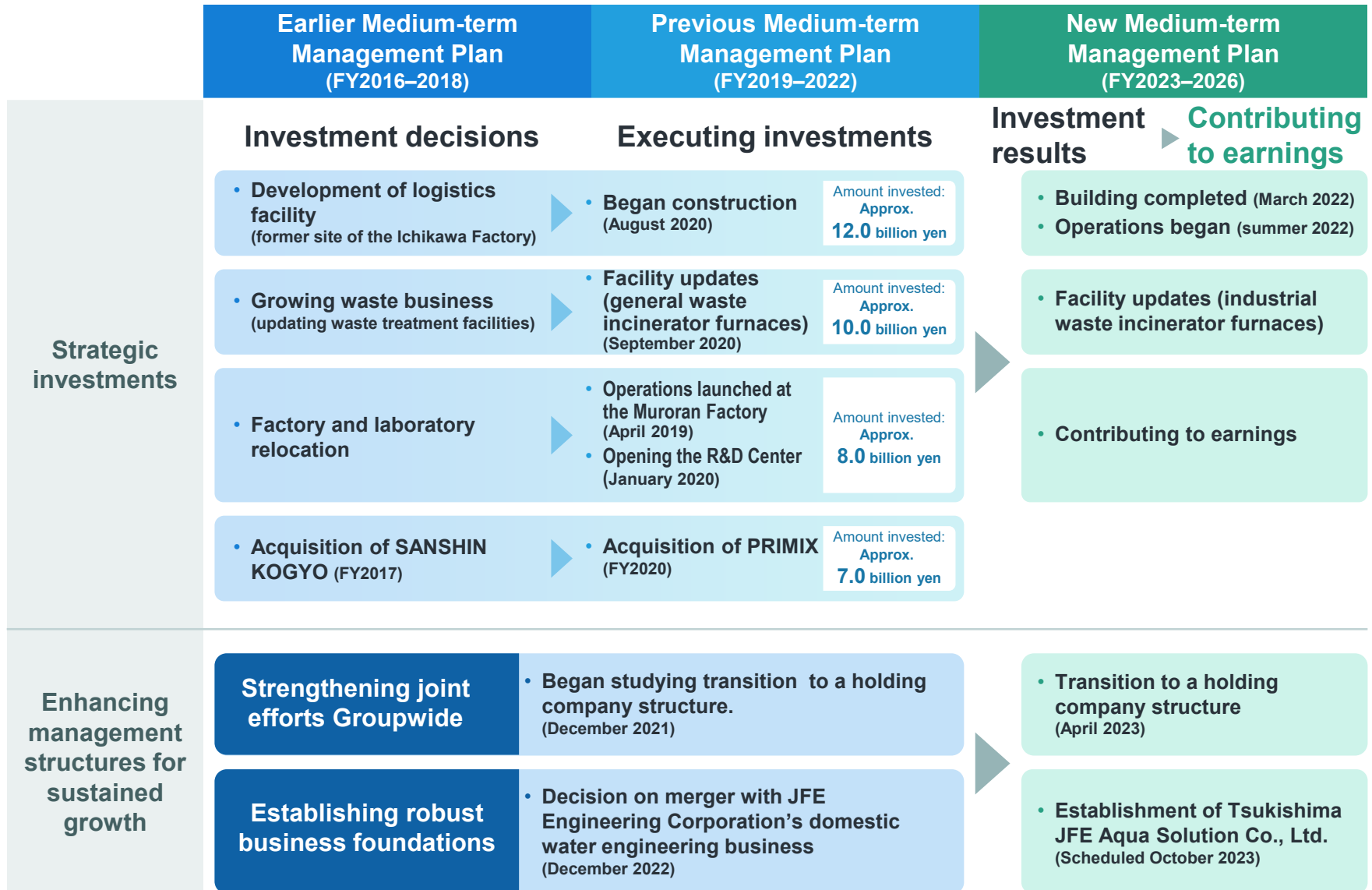
Review of the Previous Medium-term Management Plan: Financial Results

- In the first year of the Medium-term Management Plan (FY2019), while the company achieved all numerical targets except for net sales, orders received were down due to COVID-19.
- While net sales were down in FY2020, they began to recover in accordance with a recovery in orders received.
- Originally scheduled to end in FY2021, the Medium-term Management Plan was extended by one year, with the transition to the holding company structure in April 2023.

(Unit: 100 million yen)	Targets*	FY2019	FY2020	FY2021	FY2022
Orders received	-	815	950	1,186	1,060
Net sales	1,100	1,003	906	931	978
EBITDA	-	97	85	83	82
Operating profit	80	81	57	57	50
Operating profit margin	7.3%	8.0%	6.3%	6.1%	5.1%
Ordinary profit	83	85	61	65	57
Profit attributable to owners of parent	54	57	10	82	42
ROE	7% or higher	8.5%	1.4%	10.9%	5.2%

- When the plan was announced, the figures of FY2021 were set for as the targets of the plan, since the plan was originally scheduled to end in FY2021.

Review of the Previous Medium-term Management Plan: Strategic Investments



Section 2



Long-term Vision

Purpose

Building a Better Tomorrow with Environmental Technologies

Group Corporate Policy

1. To make contribution to the society, the company will dedicate to the industry development and environmental protection by making advantage of its leading-edge technology.
1. Primarily targeting satisfaction of market demand, the company will provide best products and services possible to customers.
1. While adhering to originality and vitality-based sustainable development, the company is proud to be a profitable enterprise that deserves the loyalty of its staff.

Long-term Vision (2030)

Realizing a comfortable, sustainable society while contributing to lives and culture











Medium-term Management Plan (FY2023–2026)

Basic policies

1. Promoting sustainability management
2. Enhancing business domains and strengthening the Group's earning capabilities
3. Improving capital efficiency and enhancing returns to shareholders

Long-term Vision (2030)

Realizing a comfortable, sustainable society while contributing to lives and culture

Materiality issues	Priority measures	Most important KPIs
I Contributing to a decarbonized society	<ol style="list-style-type: none"> 1. Expanding the deployment and use of waste-to-energy incineration systems 2. Generating energy from sewer sludge 3. Technological and GX initiatives accompanying efforts to promote EVs 4. Reducing greenhouse gas emissions (reducing Scope 1 and 2 emissions) 	<ul style="list-style-type: none"> • Receiving orders for corresponding projects • Reducing greenhouse gas emissions • Scope 1 and 2: Establish roadmap for reduction of greenhouse gas emissions • Scope 3: Calculate and disclose by 2026  
II Sustainable use of resources	<ol style="list-style-type: none"> 1. Enhancing R&D in environmental businesses 2. Advancing technologies for environmental protection 3. Recovering valuable materials 4. Boosting orders received for overseas industrial infrastructures 	<ul style="list-style-type: none"> • Receiving corresponding orders • R&D expenses that contribute to a decarbonized society: 30% or more (as percentage of Group R&D expenses) • Increasing orders received for waste treatment facilities overseas 
III Contributing to a comfortable, sustainable society	<ol style="list-style-type: none"> 1. Boosting orders received for comprehensive water and sewer facilities, promoting DX in maintenance and management, enhancing the capacity to respond to natural disasters 2. Contributing to water safety and water infrastructure promotion and development efforts overseas 	<ul style="list-style-type: none"> • Increasing orders received for comprehensive contracting projects and overseas water infrastructures • DX adoption and promoting its use at remote monitoring centers • Participation in community contribution activities   
IV Attractive, rewarding working environments	<ol style="list-style-type: none"> 1. Promoting respect for human rights, diversity, and inclusivity 2. Hiring and developing diverse human resources 3. Promoting occupational health and safety and health management 4. Resolving labor and human rights issues along the supply chain 	<ul style="list-style-type: none"> • Ratio of women managers: 6% or more • Utilization ratio of men childcare leave programs: 100% • Zero serious workplace accidents • Supplier CSR surveys  
V Developing a governance structure to realize sustainability management	<ol style="list-style-type: none"> 1. Establishing and promoting a Sustainability Committee 2. Appointing Directors and Corporate Auditors from diverse backgrounds 3. Addressing climate change risks 4. Securing and utilizing intellectual property 	<ul style="list-style-type: none"> • Numbers of meetings of various committees • Ratio of women on board of directors: 15% or more • Business continuity management, Groupwide deployment of business continuity planning • Percentage of patent applications contributing to a decarbonized society: 30% or more (cumulative total during period covered by the Medium-term Management Plan)  

Promoting more efficient Group management and more advanced governance after transitioning to a holding company structure on April 1, 2023
 The holding company concentrates on Group strategies and corporate management, while operating companies are tasked with accelerating decision-making.



Corporate management of the Group, formulating Group strategies

Governance oversight

Supporting operating companies

Creating comfortable water environments

Segment 1 Water Environmental Business

- Manufacture, construction, operations management, and maintenance of water and sewer facilities

Subsegment 1-1 Water infrastructures

EPC, machinery and equipment

- Tsukishima Aqua Solution Co., Ltd. (Tsukishima JFE Aqua Solution Co., Ltd. from October [planned])

Subsegment 1-2 Life cycle businesses

Operations management, maintenance, business operation

- Tsukishima Technology Maintenance Service Co., Ltd.
- Related subsidiaries and SPCs

Realizing more prosperous and comfortable lives and communities

Segment 2 Industrial Business

- Manufacture, construction, and maintenance of industrial machinery
- Waste treatment business

Subsegment 2-1 Industrial infrastructures

- Tsukishima Kikai Co., Ltd.
- PRIMIX Corporation
- BOKELA GmbH (Germany)
- TSK Engineering (Thailand) Co., Ltd., etc.

Subsegment 2-2 Environment

- Tsukishima Kankyo Engineering Ltd.
- SANSHIN KOGYO Co., Ltd.
- DAIDO CHEMICAL ENGINEERING CORP.
- SUN ECO THERMAL Co., Ltd.

Segment 3

Other businesses

- Real estate management, leasing (logistics facilities, etc.)



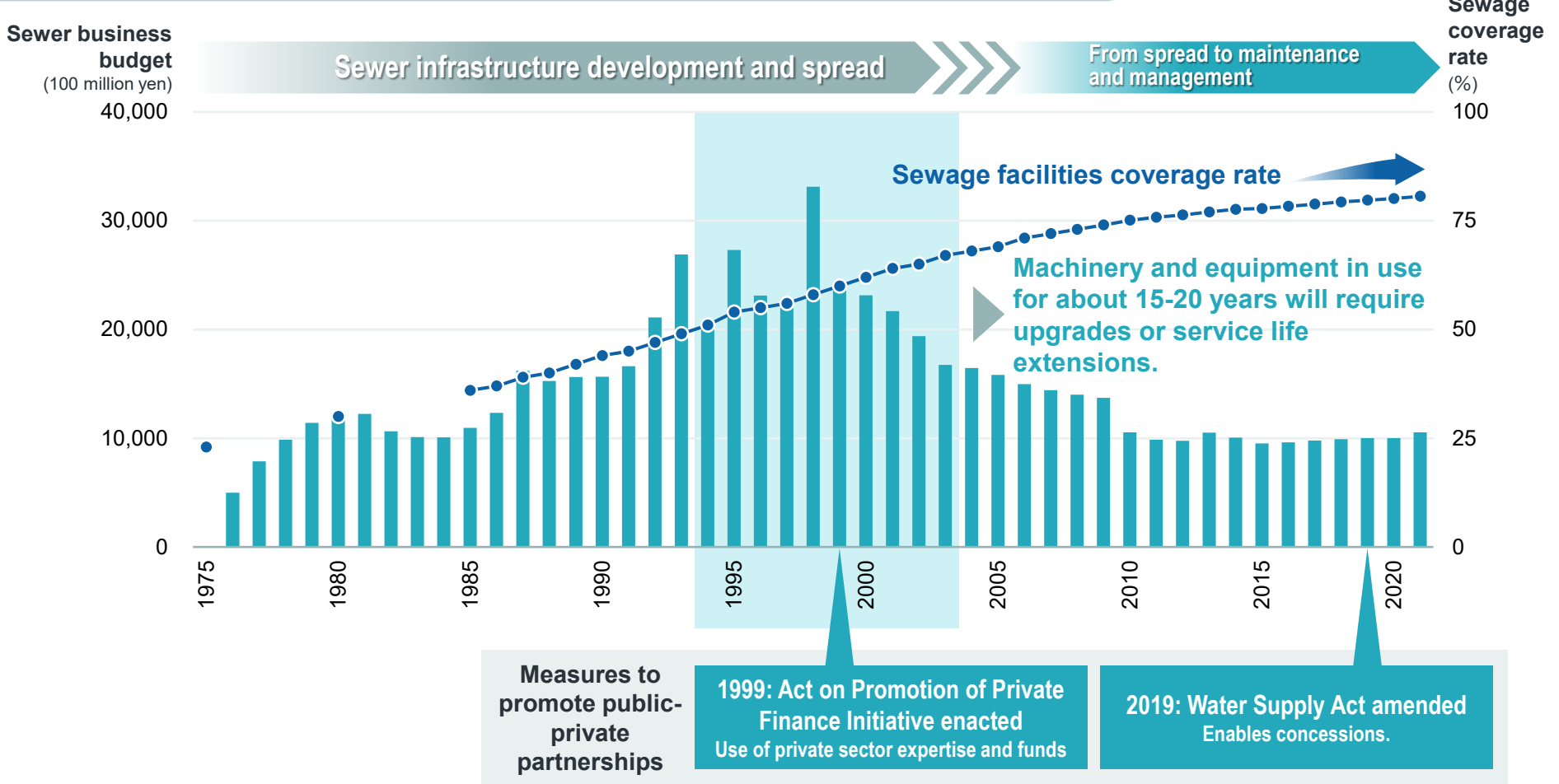
Logistics facility

- Printing and binding drawings and documents

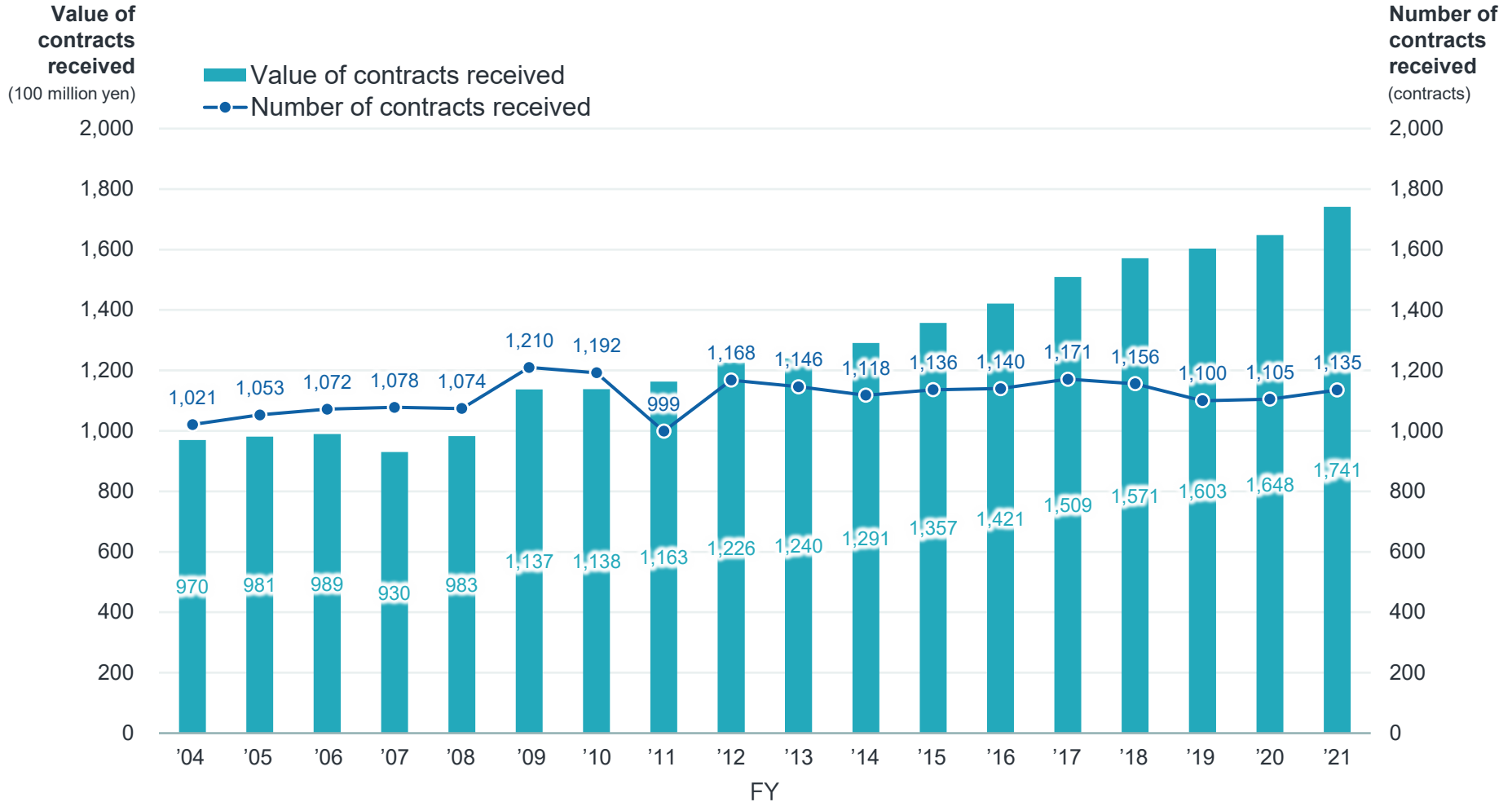
	Water Environmental Business	Industrial Business
Social issues	<ul style="list-style-type: none"> • Accelerating efforts to achieve carbon neutrality and a decarbonized society <ul style="list-style-type: none"> - Promoting the use of solar power, wind power, and other renewables - Promoting the use of next-generation energy (e.g., ammonia, hydrogen, SAF) • Progress of digital technologies (AI, IoT) • Growing risks of climate change • Progress on electrification of mobility • Geopolitical risks (Ukraine invasion, US-China trade frictions) 	
Domestic	<ul style="list-style-type: none"> • Aging water infrastructures • Fiscal difficulties at local governments, shortage of technicians • Enhancing resilience from natural disasters 	<ul style="list-style-type: none"> • Strengthening semiconductor and battery industries • Human resource shortfalls at factories and plants
Overseas	<ul style="list-style-type: none"> • Emerging markets Growing water use and demand for wastewater treatment as populations expand and ways of life change 	<ul style="list-style-type: none"> • Emerging markets <ul style="list-style-type: none"> - Growing populations and incomes, industrialization - Growing demand for petrochemical products - Higher levels of waste generated
The role of the Tsukishima Holdings Group	<p>Providing technologies and services to contribute to a decarbonized society and a circular economy</p>	

The useful life of machinery and equipment is about 15-20 years. Although this has been extended through maintenance and other means, the time is approaching to upgrade machinery and equipment built from the late 1990s through the early 2000s.

Trends in sewer business budget and sewage facilities coverage rate

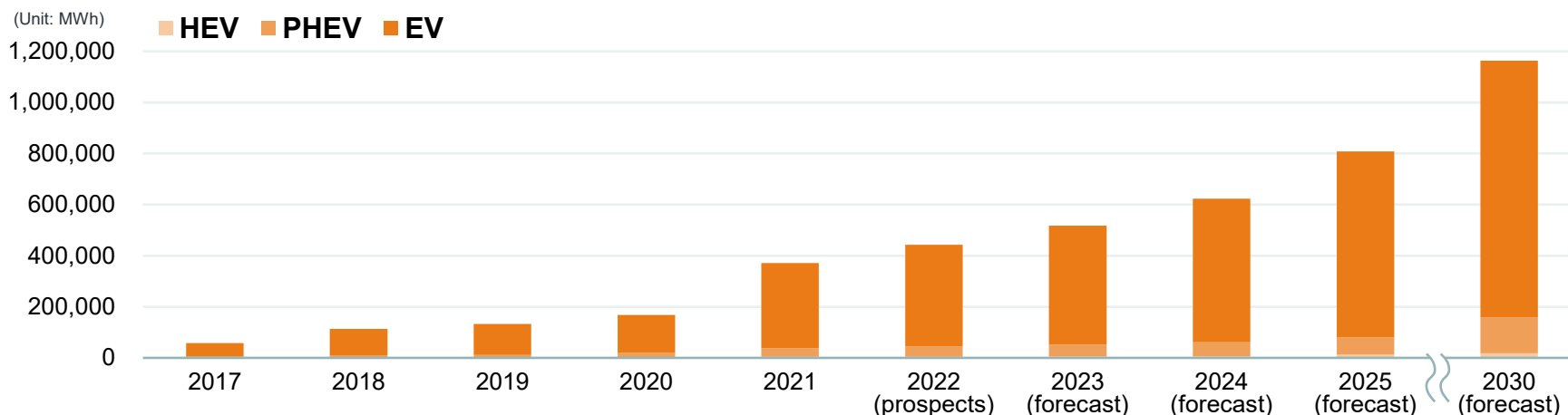


- The value of private sector maintenance and management contracts received is trending up.
- We have a wealth of contracting experience in water and sewer facilities



(Source: Japan Sewage Treatment Facility Management Association data, modified by Tsukishima Holdings)

Global automotive lithium-ion battery market



Category	2017	2018	2019	2020	2021	2022 (prospects)	2023 (forecast)	2024 (forecast)	2025 (forecast)	2030 (forecast)
HEV	808	1,058	1,964	2,824	4,751	4,899	5,791	7,339	12,428	18,661
YoY change	130.2%	130.9%	185.7%	143.8%	168.2%	103.1%	118.2%	126.7%	169.3%	150.2%
PHEV	6,043	9,582	9,305	17,082	32,265	40,897	46,951	54,185	68,790	140,139
YoY change	113.9%	158.6%	97.1%	183.6%	188.9%	126.8%	114.8%	115.4%	127.0%	203.7%
EV	50,588	102,578	121,844	148,135	334,130	397,297	464,480	561,536	726,896	1,004,241
YoY change	124.2%	202.8%	118.8%	121.6%	225.6%	118.9%	116.9%	120.9%	129.4%	138.2%
Total	57,440	113,218	133,113	168,041	371,146	443,093	517,222	623,060	808,114	1,163,040
YoY change	123.1%	197.1%	117.6%	126.2%	220.9%	119.4%	116.7%	120.5%	129.7%	143.9%

Notes:

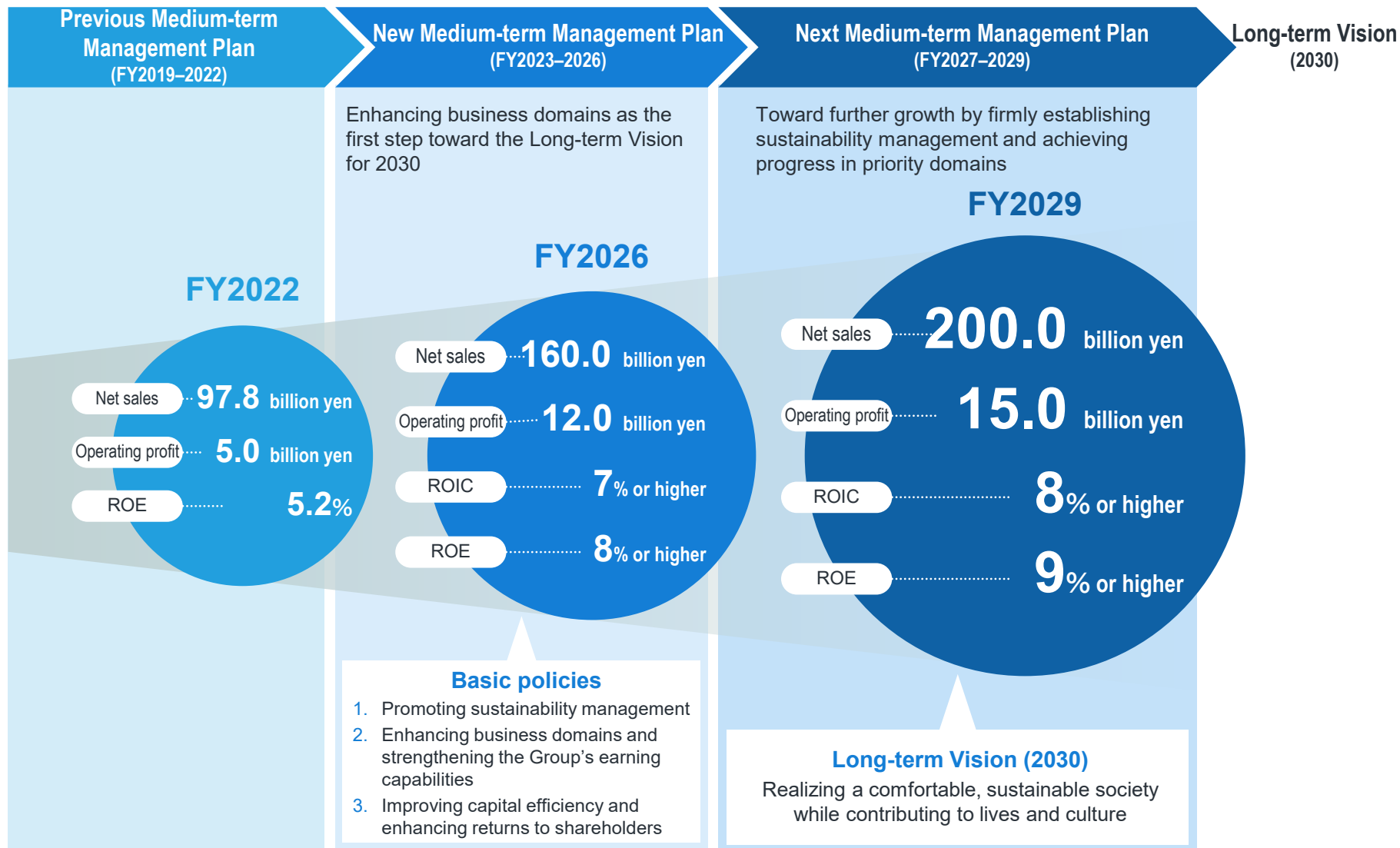
1. Figures for 2022 are projections; figures for 2023 and later are forecasts. YoY change for 2030 is relative to 2025.
2. Figures shown are battery capacities of lithium-ion batteries used in mild hybrid (SSV, 12 V, 48 V MHEV), hybrid (HEV), plug-in hybrid (PHEV), and electric (EV) passenger and commercial vehicles. These figures were calculated based on automaker shipments through 2021 and automaker production in 2022 and later.
3. Totals and percentages may differ due to rounding.

Source: Yano Research Institute Ltd., "Market-based forecasts: Global automotive lithium-ion battery market size trends and forecasts by xEV type" (July 28, 2022)

Section 3



Medium-term Management Plan



1

Promoting sustainability management

- Contributing to a decarbonized society through businesses
- Developing rewarding workplace environments and systems, promoting diversity and inclusion, and enhancing human resource development
- Further enhancements in governance

2

Enhancing business domains and strengthening the Group's earning capabilities

Water Environmental Business

- Generating synergies with JFE Engineering Corporation (domestic water engineering business)
- Enhancing energy creation businesses (sludge to fuel, digestion gas power generation)
- Enhancing PPP initiatives

Industrial Business

- Enhancing competitive strengths in fine particle manufacture technologies in the battery business and other fields
- Decarbonization technology initiatives (technologies for ammonia recovery and use)

Common to both businesses

- Shifting business domains toward environmental businesses to contribute to a decarbonized society and to high added value (priority area) domains such as public-private partnerships, where strong growth is anticipated
- Improving earning capabilities through enhancements of Group corporate management and strategic functions

3

Improving capital efficiency and enhancing returns to shareholders

- Adding return on invested capital (ROIC) as a key performance indicator (KPI) and setting ROIC and ROE figures in financial targets
Improving PBR(Price-Book-Value) ratio by improving capital efficiency and promoting corporate value management based on a keen sense of capital costs
- Formulating capital allocation plans and optimizing allocation to investments and shareholder returns
Continuing to reduce cross-shareholdings with a cumulative sales target of 3–5 billion yen in cross-shareholdings over four years to levels not exceeding 20% of consolidated net assets
- Actively providing returns to shareholders with a targeted total return ratio of 50% or more and a dividend return ratio of 40% or more
Controlling equity capital through continual increases in dividends and dynamic purchase of treasury shares

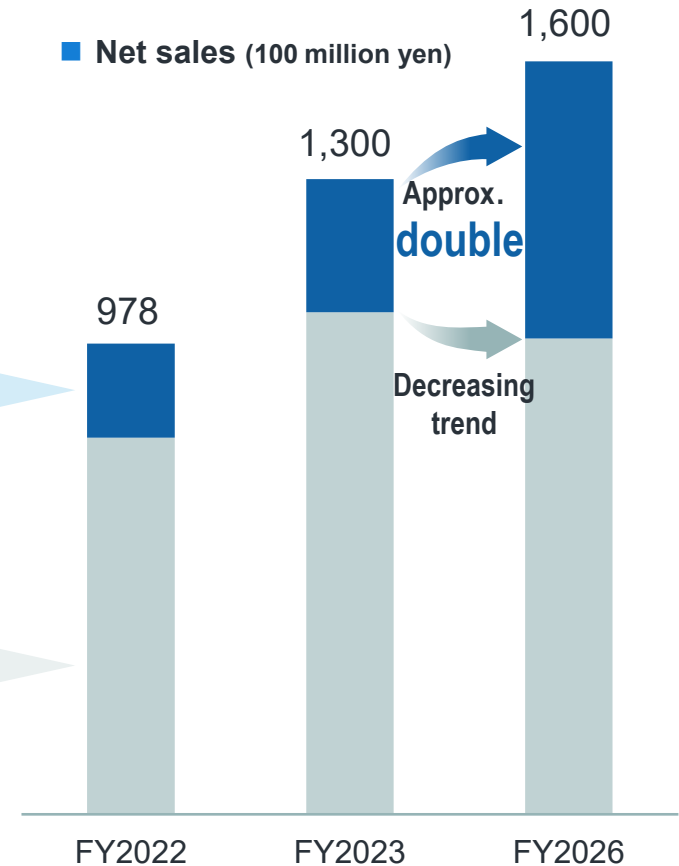
Through strategic investments, shifting focus area toward priority business domains, including environmental businesses such as energy creation and decarbonization technology businesses that contribute to a decarbonized society; public-private partnerships which have strong growth potential; and areas that hold the promise of high added value.

Priority domains

- Water Environmental Business**
 - Public-private partnerships (PFI, DBO)
 - Energy creation businesses (sludge to fuel, digestion gas power generation)
- Industrial Business**
 - Fine particle manufacture technologies (batteries)
 - Decarbonization technologies (ammonia use)

Existing domains

- Water Environmental Business**
 - We anticipate the EPC business of selling machinery and plant equipment (one-time sales) to shift gradually to public-private partnerships (e.g., 20-year PFIs).
- Industrial Business**
 - We anticipate contraction in existing businesses, such as steelmaking and foodstuffs, and a shift toward new fields with growth potential and high added value, such as fine particles and decarbonization technologies.



Priority measures in the Water Environmental Business

Generating synergies with JFE Engineering Corporation
Developing and securing public-private partnerships

Business environment

- Fiscal difficulties at local governments, shortage of technical staff
- Time to update aged machinery
- Demand related to efforts to reduce greenhouse gas emissions
- Intensification of competition for contract award

Measures (strategic investments)

- Generating synergies with JFE Engineering Corporation
- Enhancing energy creation businesses
- Enhancing public-private partnerships

Proposing public-private partnerships to apply private sector expertise in response to demands to update aging facilities
Further enhancing energy creation businesses (sludge to fuel, digestion gas power generation) to reduce greenhouse gas emissions
⇒ **Increasing orders received by public-private partnerships**

Net sales

Priority domains

- Machinery, plant equipment, and operations management in public-private partnerships (PFIs, DBOs)
- Sludge to fuel and digestion gas power generation businesses, etc.

Existing domains

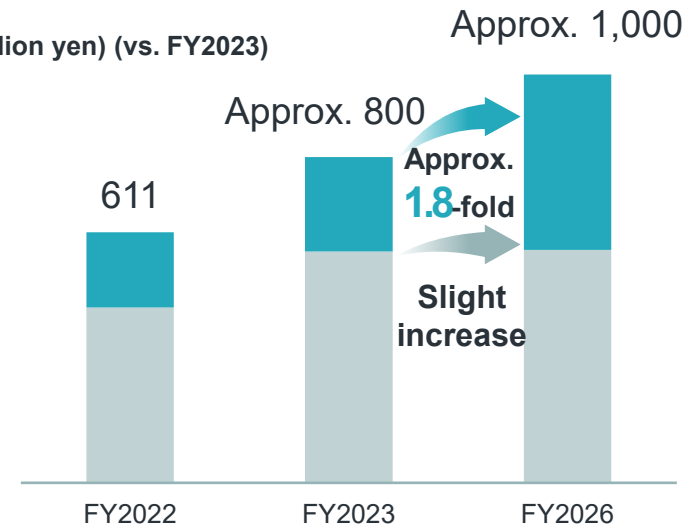
- Machinery, plant equipment (one-time sales)
- Repairs and operations management

Increase: PFI and DBO businesses, plus those of JFE Engineering Corporation

Increase: Repairs and operations management of JFE Engineering Corporation projects
Decrease: Shift from one-time sales of machinery and plant equipment to public-private partnerships

⇒ **These effects will offset each other, resulting in a modest net increase.**

■ FY2026 net sales targets (100 million yen) (vs. FY2023)



Water Environmental Business: Generating Synergies from Merger with JFE Engineering Corporation

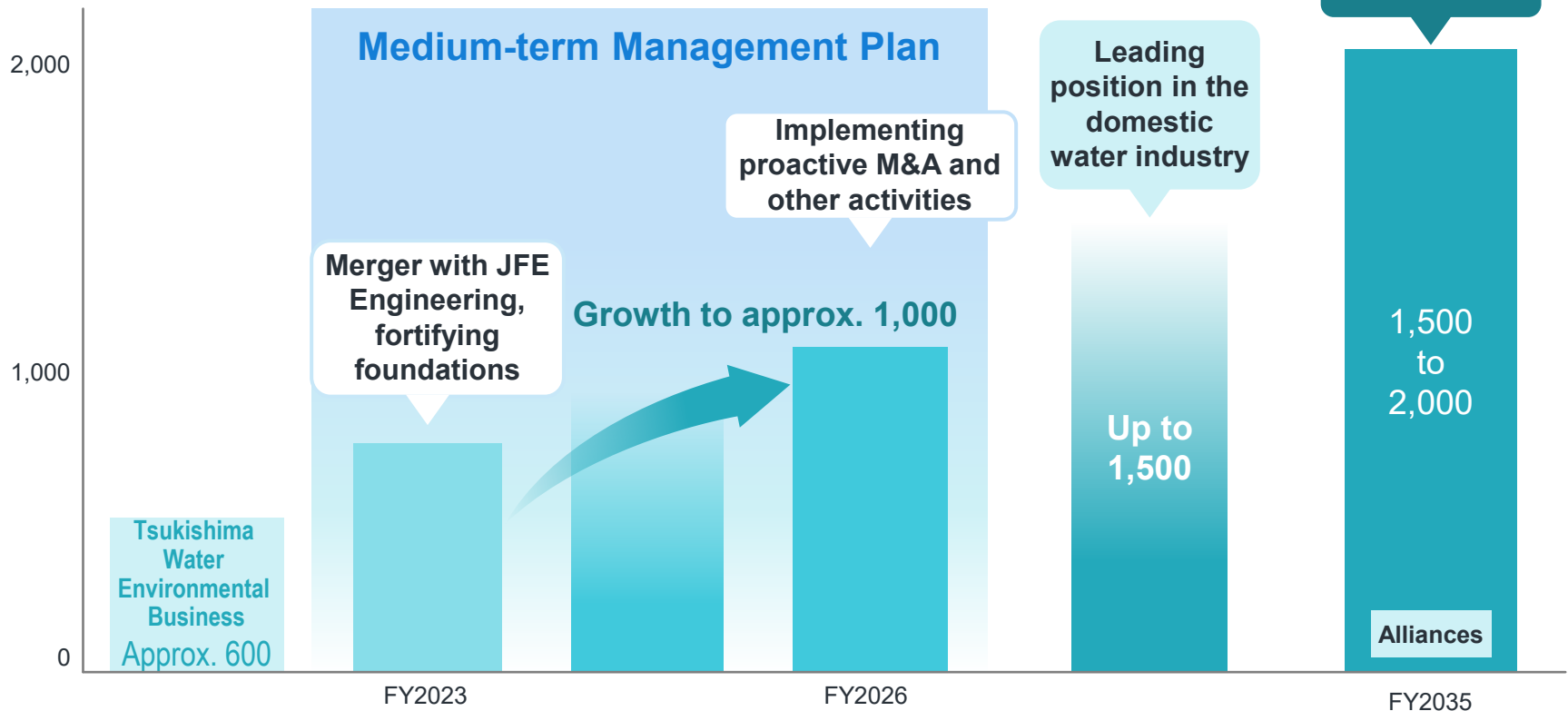
Merger of domestic water engineering businesses

Aim

A leading company in the domestic water industry

- Growing technological resources and channels
- Growing decarbonization technologies
- Enhancing public-private partnership (PPP) initiatives
- Generating synergies through merger

Water Environmental Business net sales (100 million yen)



Priority measures in the Industrial Business

Enhancing competitive strengths in fine particle manufacturing technologies, enhancing aftersales services (machine parts and repairs)
Decarbonization technology initiatives

Business environment	Measures (strategic investments)
<ul style="list-style-type: none"> Shift of mass-production plants and machinery for petrochemical and other industries to emerging countries' markets Demand for renovations of aging facilities, high value added products, and waste treatment plants in domestic markets Demand related to efforts to reduce greenhouse gas emissions 	<ul style="list-style-type: none"> Enhancing competitive strengths in fine particle manufacture technologies in the battery business and other fields Enhancing aftersales services (machine parts and repairs) Decarbonization technology initiatives <p>Focusing on machinery and processes for the manufacture of high value added fine particles and related products Strengthening the aftersales service business, which involves high profit margins Actively tackling next-generation energy fields (e.g., ammonia use)</p>

Net sales

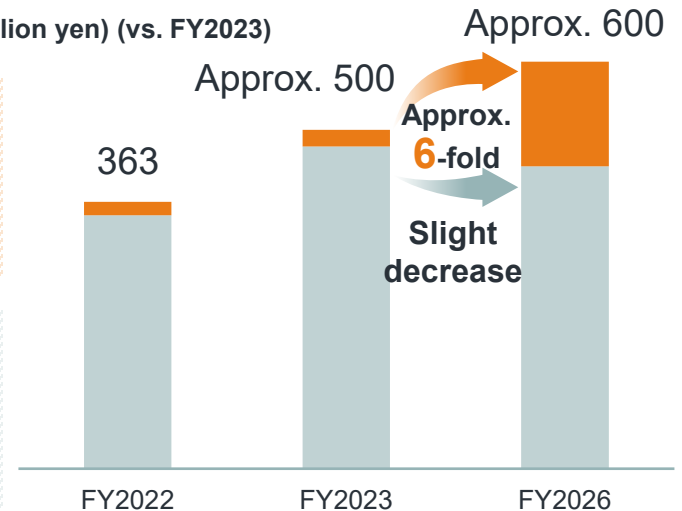
FY2026 net sales targets (100 million yen) (vs. FY2023)

Priority domains
<ul style="list-style-type: none"> Machinery, plant equipment (batteries, fine particles) Decarbonization technologies (ammonia recovery and use)

Increase: Enhancements in batteries, fine particles, and other high value added domains

Existing domains
<ul style="list-style-type: none"> Machinery, plant equipment (e.g., chemicals) Solid and liquid waste treatment

Slight decrease of net sales due to shift toward priority domains



Tsukishima Kikai's Battery Business

The market for automotive lithium-ion batteries is projected to grow at an annual rate of more than 20%. For manufacturing processes of cathode active materials, which significantly impact battery performance, delivering major equipment based on core technologies, including crystallization, filtration, and drying.

Precursor manufacturing process

Focusing on crystallization, which plays the key role in the precursor manufacturing process


Growing business domains in the cathode material manufacturing process by achieving differentiation in the core process of crystallization



Vortex flow crystallizer

- Capable of continuous manufacturing with uniform granular distributions
- Requires only about half the space of a (batch) mixer

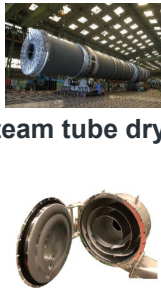
Crystallization



Horizontal belt filter

- Efficient particle washing and filtration


Washing, filtration



Steam tube dryer

Clean flash dryer

Drying



Classification

Precursors

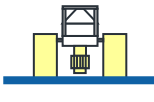
Active material manufacturing process

Raw materials (precursor) (lithium)



Powder handling system

Raw material management



Weighing and mixing

Weighing and mixing

Baking




Horizontal belt filter

Washing, filtration



Steam tube dryer

Drying



Classification

Classification

Cathode active materials

(Unit: 100 million yen)	FY2022 results	FY2023 plan	FY2026 targets	FY2022 – FY2026
Net sales	978	1,300	1,600	CAGR: 13.1%
EBITDA	82	107	152	CAGR: 16.7%
Operating profit	50	70	120	CAGR: 24.4%
Operating profit margin	5.1%	5.4%	7.5%	+2.4 points
Profit attributable to owners of parent	42	44	70	CAGR: 13.5%
ROIC	3.3%	4% or higher	7% or higher	+3.7 pts or more
ROE	5.2%	5% or higher	8% or higher	+2.8 pts or more

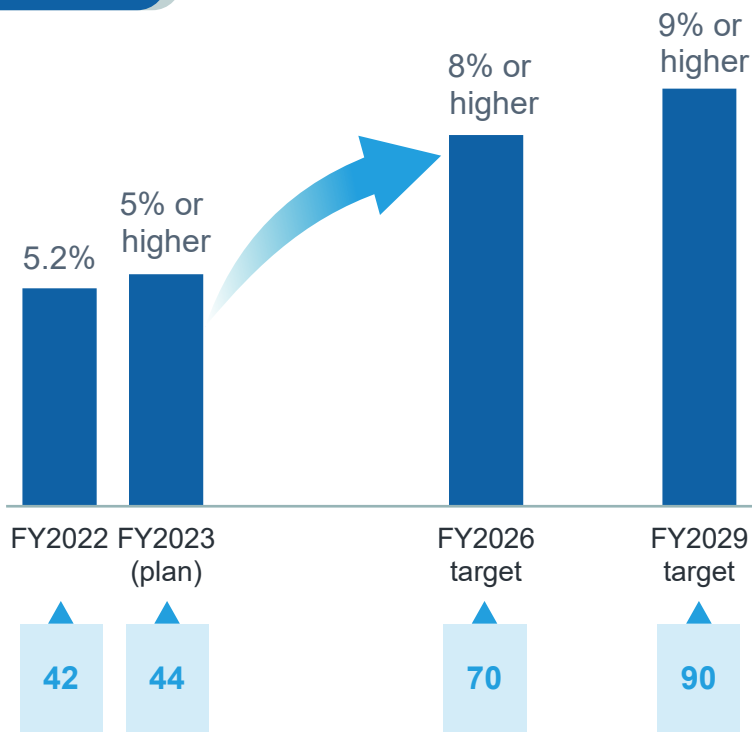
Segment Financial Targets

(Unit: 100 million yen)

		FY2022 results	FY2023 plan	FY2026 targets	FY2022 – FY2026
Water Environmental Business	Net sales	611	800	1,000	CAGR: 13.1%
	Operating profit	34	50	63	CAGR: 16.9%
	Operating profit margin	5.5%	6.3%	6.3%	+0.8 points
Industrial Business	Net sales	363	485	585	CAGR: 12.7%
	Operating profit	19	20	52	CAGR: 28.2%
	Operating profit margin	5.3%	4.1%	8.9%	+3.6 points
Others	Net sales	4	15	15	-
	Operating profit	-3	0	5	-

Seeking to improve ROE continually based on implementation of capital policies keenly aware of improving capital efficiency.

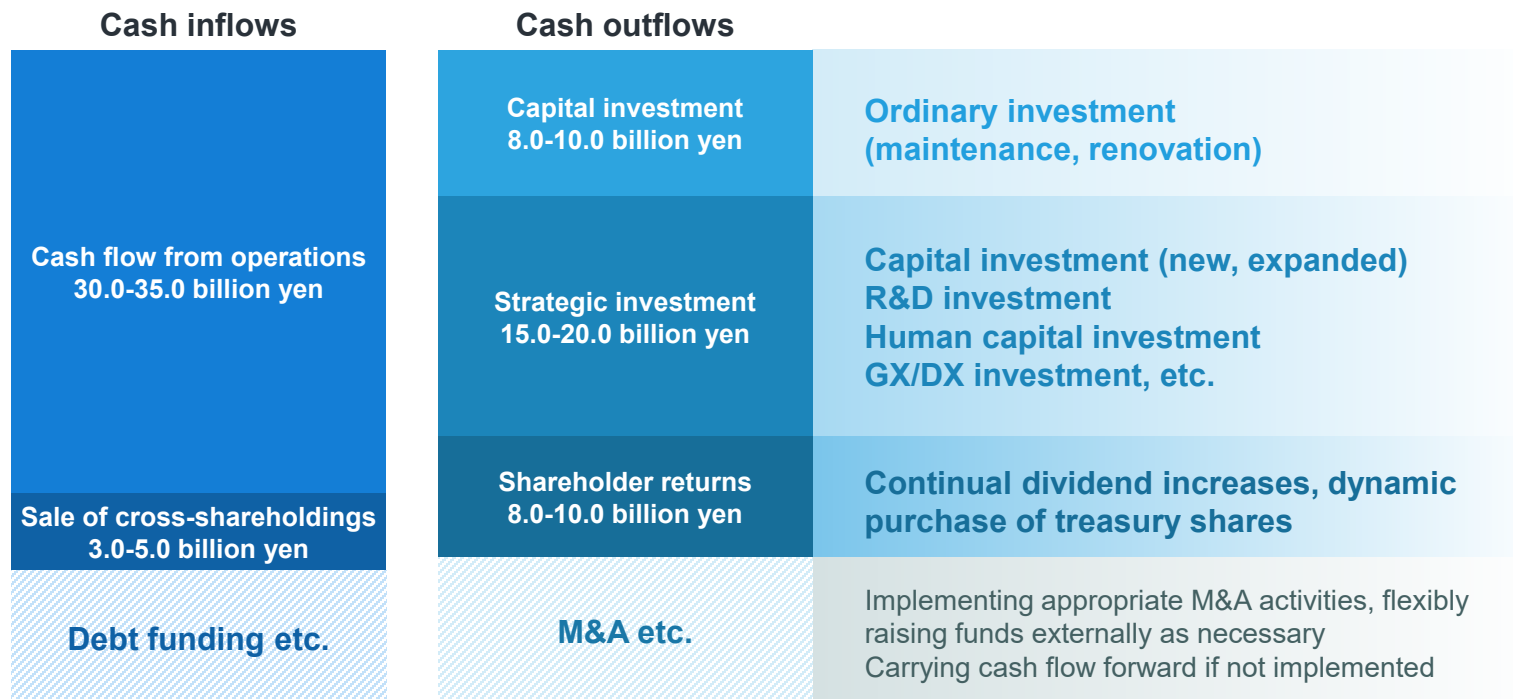
ROE trend



Business portfolio reforms	Strengthening and expanding priority domains by proactively revising the business portfolio based on an awareness of capital costs and capital returns
Enhancing earning capabilities	Labor savings and business efficiency improvements through DX promotion, cost cutting by reducing expenses and sales costs
Sale of cross-shareholdings	Continually reducing cross-shareholdings for a lighter asset base
Enhancing returns to shareholders	Controlling equity capital at an appropriate level through continual dividend increases and timely, appropriate, and dynamic purchase of treasury shares
Reducing capital costs	Establishing an optimal capital structure by enhancing disclosure of ESG and other information, active dialogue with shareholders and investors, effective use of interest-bearing debt, and controlling equity capital

Increasing PBR through continual improvements in ROE

- Generating 33.0-40.0 billion yen through capital efficiency improvement, a keen awareness of capital costs, and utilization of operating cash flows and funds from sale of cross-shareholdings. The funds raised will be optimally allocated to investments in growth and shareholder returns.
- Utilizing interest-bearing debt as necessary for M&A activities and other investments. Review of financial discipline

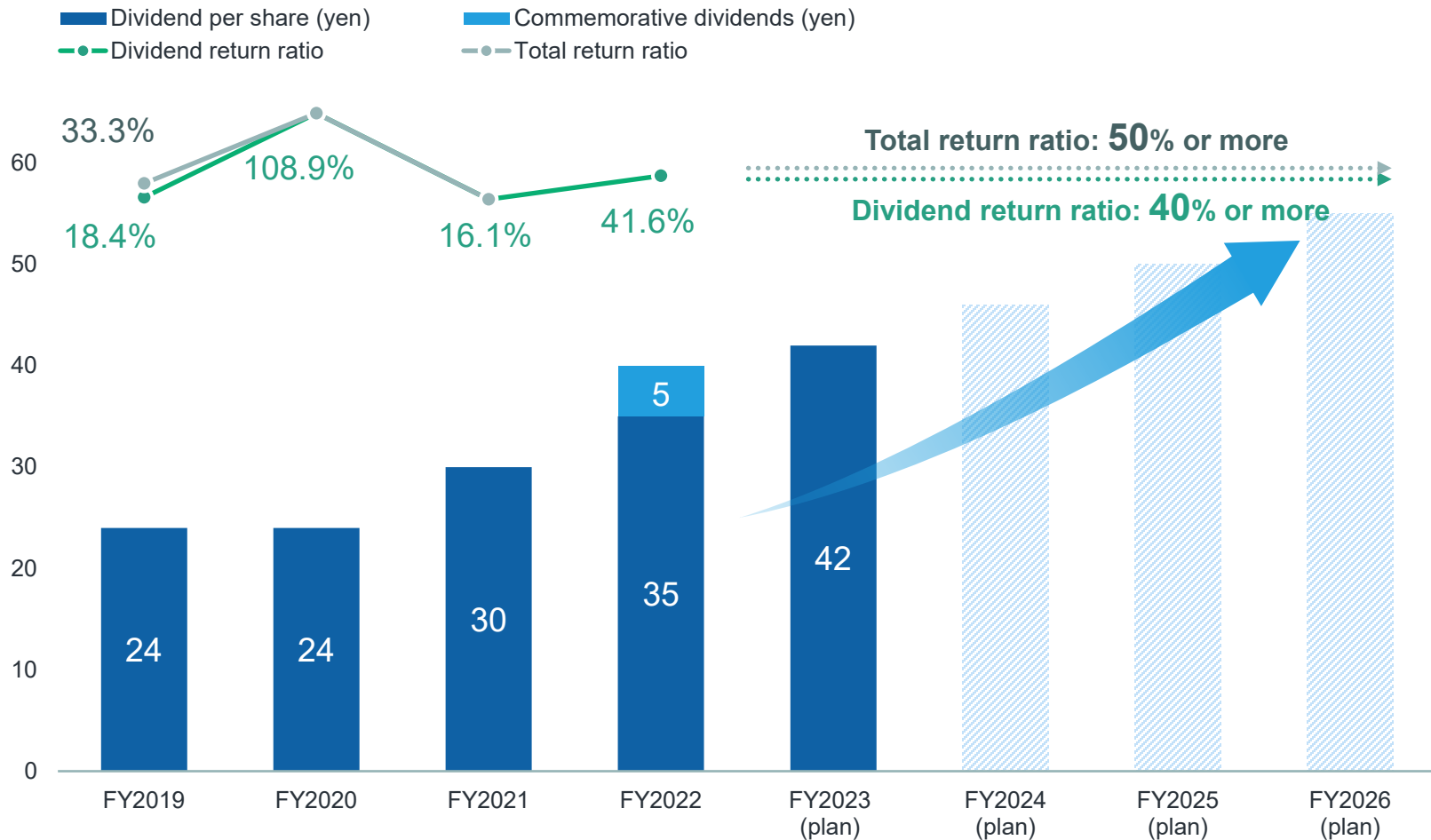


Review of financial discipline

	New Medium-term Management Plan	Previous Medium-term Management Plan
Equity own capital ratio	Approx. 40-50%	Approx. 50%
D/E ratio	0.8 or lower	0.5 or lower
Cash on hand	Securing twice monthly turnover (unchanged)	Securing twice monthly turnover

Policy on Shareholder Returns (Enhancing Returns to Shareholders)

- Implementing steady increases in dividends and timely and appropriate purchase of treasury shares, targeting returns to shareholders with a total return ratio of 50% or more and a dividend return ratio of 40% or more (vs. targeting a total return ratio of 30-50% for the previous Medium-term Management Plan).



* In FY2020, the dividend return ratio and the total return ratio both stood at 108.9% due to impairment losses for PRIMIX Corporation. The figures would have been about 30% based on profit excluding impairment losses.

* The dividend return ratio and the total return ratio were identical in FY2020 through FY2022.

Materiality	Priority measures	Most important KPIs
I Contributing to a decarbonized society	<ol style="list-style-type: none"> Expanding the deployment and use of waste-to-energy incineration systems Generating energy from sewer sludge Technological and GX initiatives accompanying efforts to promote EVs Reducing greenhouse gas emissions (reducing Scope 1 and 2 emissions) 	<ul style="list-style-type: none"> Sales ratio of businesses that contribute to a decarbonized society <ul style="list-style-type: none"> Water Environment Business ▶ 20% or more Industrial Business ▶ 20% or more
II Sustainable use of resources	<ol style="list-style-type: none"> Enhancing R&D in environmental businesses Advancing technologies for environmental protection Recovering valuable materials Boosting orders received for overseas industrial infrastructures 	<ul style="list-style-type: none"> Scope 1 and 2 Establish roadmap for reduction of greenhouse gas emissions Scope 3 Calculate and disclose by 2026
III Contributing to a comfortable and sustainable society	<ol style="list-style-type: none"> Boosting orders received for comprehensive water and sewer facilities, promoting DX in maintenance and management, enhancing the capacity to respond to natural disasters Contributing to water safety and water infrastructure promotion and development efforts overseas 	<ul style="list-style-type: none"> R&D expenses that contribute to a decarbonized society ▶ 30% or more
IV Attractive, rewarding working environments	<ol style="list-style-type: none"> Promoting respect for human rights, diversity, and inclusivity Hiring and developing diverse human resources Promoting occupational health and safety and health management Resolving labor and human rights issues along the supply chain 	<ul style="list-style-type: none"> Promoting respect for diversity <ul style="list-style-type: none"> Ratio of women managers ▶ 6% or more Utilization ratio of men childcare leave programs ▶ 100% Ratio of women on board of directors ▶ 15% or more
V Developing a governance structure to realize sustainability management	<ol style="list-style-type: none"> Establishing and promoting a Sustainability Committee Appointing Directors and Corporate Auditors from diverse backgrounds Addressing climate change risks Securing and utilizing intellectual property 	

Appendix



Water infrastructures

Design, manufacture, and construction of machinery and plant equipment

- A leading track record in the treatment of sludge from water purification plants and sewage treatment plants, building Tsukishima's reputation as a trusted brand for sludge treatment (dehydration, drying, incineration)
- The capacity to design and build most key equipment in-house
- Also engaging in water and sewer plant and machinery businesses overseas

Equipment



Sludge dehydrator (water purification)



Sludge dehydrator (sewage)

Plants



Next-generation sewage sludge incineration system



Sewage sludge to fuel conversion system

Life cycle businesses Affiliates: Tsukishima Technology Maintenance Service Co., Ltd., SPCs

Operations management of water and sewage treatment facilities (operation, maintenance)

- Single-year, multiyear operation and maintenance (103 plants and facilities)
- Facility repairs, supply of parts and chemicals



Operations room at sewage treatment plant



Facility maintenance

A long-term main-contracting business model (up to 20 years) based on our public-private partnership (PPP) technologies and operations management expertise

- PFI/DBO businesses: Bundling construction and long-term maintenance and management of facilities (sewage sludge to fuel conversion business, water purification and sewage treatment business, etc.)
- Comprehensive main-contracting (bulk contracting of operations management, repairs, purchase of power and chemicals, etc. for 3–5 years)
- Sewer digestion gas power generation business using the feed-in tariff (FIT) system



Digestion gas power generation business

Industrial infrastructures

Undertaken by Tsukishima Kikai Co., Ltd., PRIMIX Corporation, BOKELA GmbH, TSK Engineering (Thailand) Co., Ltd., etc.

Plants and equipment used in the fields of chemicals, energy, foodstuffs, and steelmaking.

Plants

A track record centered on chemicals and foodstuffs in Japan and overseas (mainly in Thailand and other Asian markets)

Environmental and energy fields: Active in the fields of exhaust gas treatment equipment and lithium-ion secondary batteries

Equipment

Offering a diverse range of machinery, including dryers, filters, mixers, and centrifugal separators, in Japan and worldwide



Large-scale overseas plant (Malaysia)



Steam tube dryer (large-scale industrial dryer)



Horizontal belt filter (filter for resin and battery materials)

Environment

Undertaken by Tsukishima Kankyo Engineering Ltd., SANSHIN KOGYO Co., Ltd., SUN ECO THERMAL Co., Ltd., and DAIDO CHEMICAL ENGINEERING CORP.

Waste liquid and solid waste incineration facilities

- Waste liquid combustion systems: Approx. 70% market share in Japan, also expanded overseas
- Solid waste treatment: Track record including one of Japan's largest facilities
- Also active in acid recovery equipment for chlorine, fluorine, etc.



Waste liquid combustion system



Solid waste treatment facility

Plants, equipment, and construction in the environmental field

Equipment

Waste acid recovery equipment, mist separators, packing, etc.



Packing

Construction

Construction and repair work on waste incinerator furnaces and other plants



Waste incinerator furnace plant construction

General and industrial waste treatment business

- Waste treatment and power generation using waste heat
- Solar power



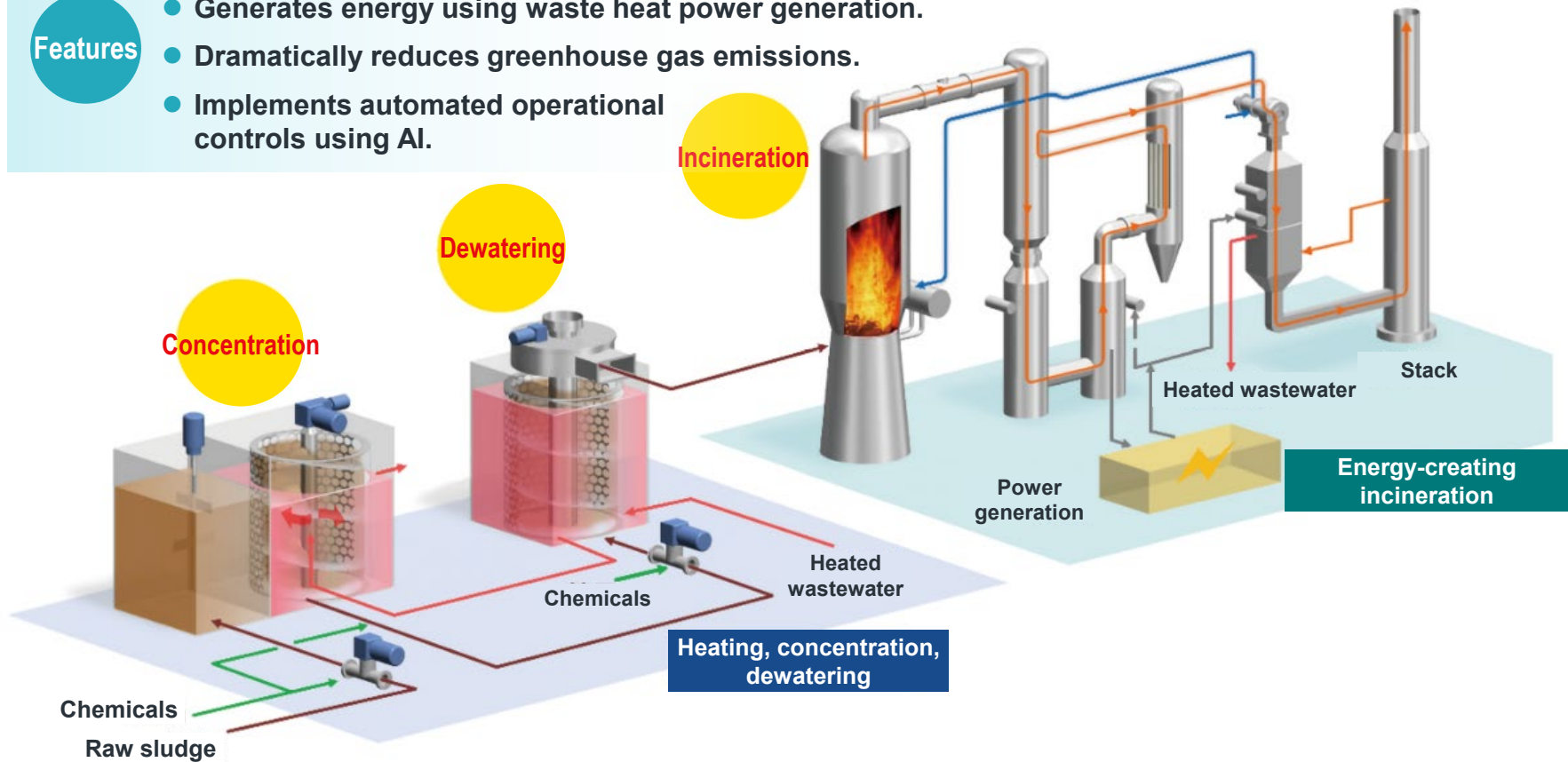
Waste treatment facility

Energy-creating dewatering incineration systems

We have developed the revolutionary **energy-creating dewatering incineration systems** that build on energy-efficient next-generation sludge incineration systems to contribute to a decarbonized society by transforming sewage sludge incinerators from net consumers of energy to energy creators.

Features

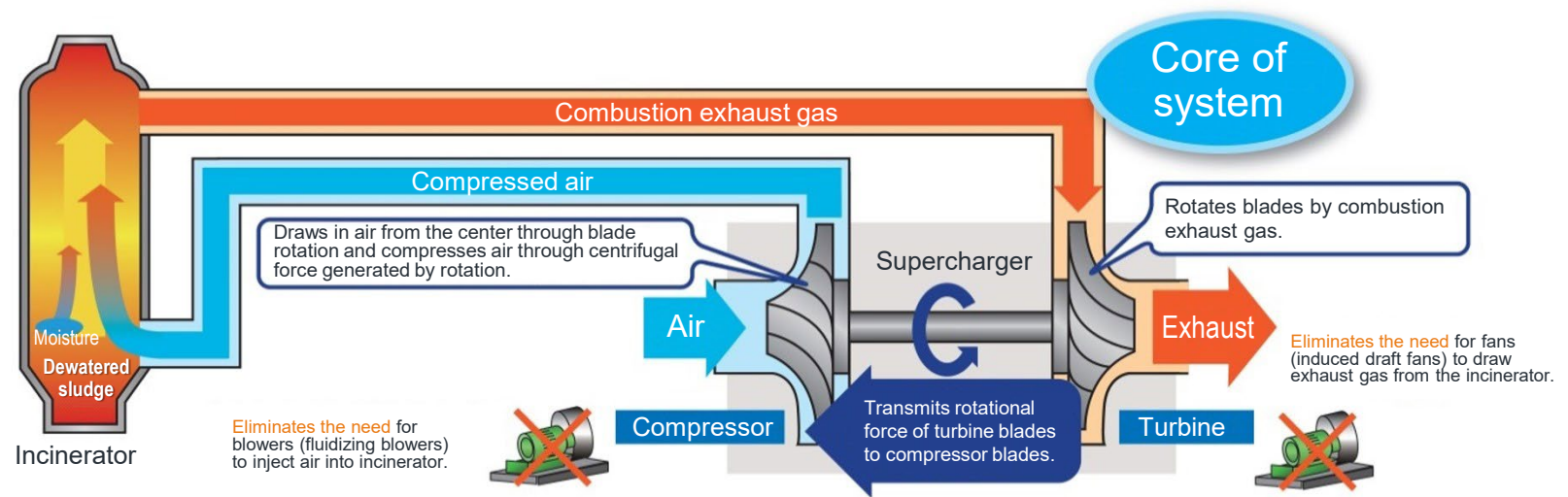
- Eliminates need for auxiliary fuel.
- Generates energy using waste heat power generation.
- Dramatically reduces greenhouse gas emissions.
- Implements automated operational controls using AI.



Next-generation sludge incineration systems

Consume 40–60% less power
 The lack of energy-intensive blowers reduces power consumption dramatically.

Cut GHGs by more than 50%
 Incineration under pressure dramatically reduces N₂O emissions.



High environmental performance recognized and awarded the Minister of Economy, Trade and Industry Prize and the Minister of Land, Infrastructure, Transport and Tourism Top Prize



Minister of Economy, Trade and Industry Prize
 41st Outstanding Environmental Equipment Awards of the Japan Society of Industrial Machinery Manufacturers



Minister of Land, Infrastructure, Transport and Tourism Top Prize
 17th Infrastructure Technology Development Awards of the Japan Institute of Country-ology and Engineering and Coastal Development Institute of Technology

Sewage sludge to fuel conversion systems

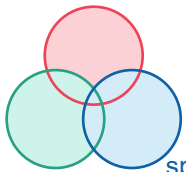
Low-temperature carbonization systems (for medium- to large-scale sewage treatment plants)

Systems to produce coal alternative fuel from sewage sludge

Feature 1 Low-temperature carbonization technology

High calorific value

Low odor



Low spontaneous ignitability

Low-temperature carbonization at 250-350 °C enables higher fuel value than conventional high-temperature carbonization.

Feature 2 Stable long-term business

Stable supplies of sewage sludge from public sewer systems generate stable biomass resources suited for use in long-term business.

Weather-dependent



Solar

Wind

Stable resource



Sewage sludge

Stable long-term 20-year business



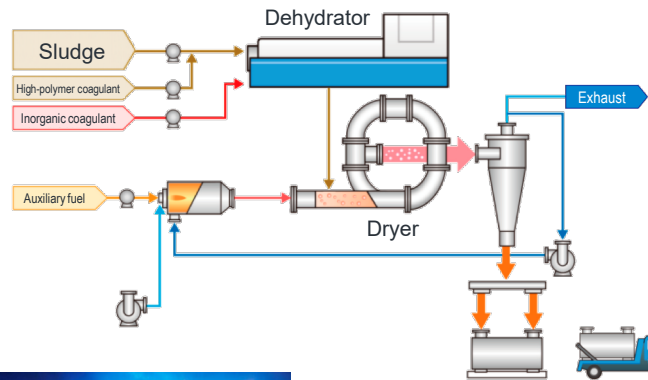
Low-temperature carbonization system

Dehydration and drying systems (for small- to medium-scale sewage treatment plants)

Low-cost sludge treatment systems capable of putting sewage sludge to a diverse range of effective uses

Feature Suitable for a diverse range of effective uses

Water content of dried sludge can be adjusted by changing the dryer's hot air temperature; suitable for diverse applications such as fuel and fertilizer



Dehydration and drying system



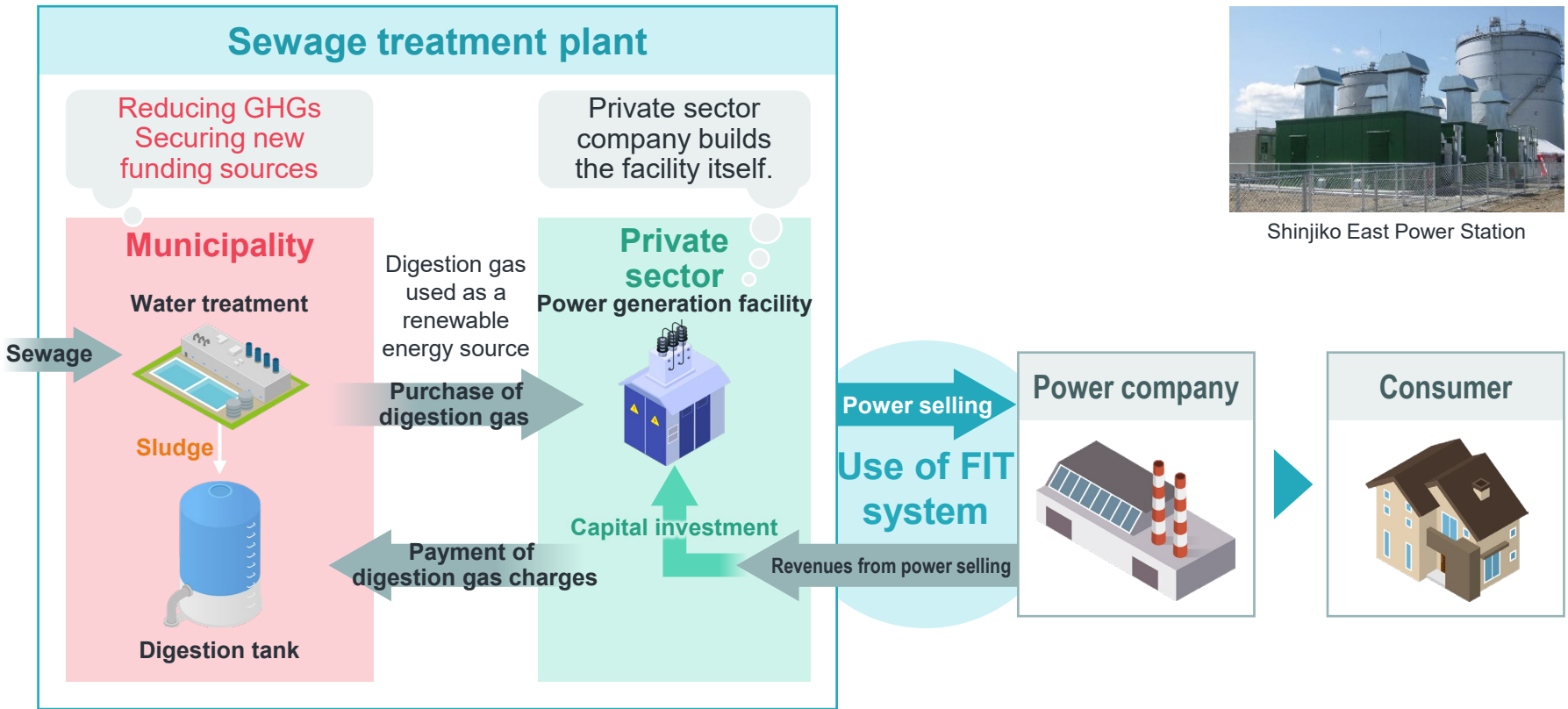
Fuel



Fertilizer

Digestion gas power generation business using the feed-in tariff (FIT) system (private sector facility building and operation)

- In this business, a private sector company invests in the biogas power generation and selling power business on the site of a municipal sewage treatment plant.
- We hold the leading market share for private sector facility building and operation projects (26 projects).



Shinjiko East Power Station

The feed-in tariff (FIT) system is intended mainly to promote use of renewable energy as part of efforts to counter global warming, secure energy resources, and prevent global pollution.

Issues in operation monitoring and inspection of water and sewer facilities

Need to improve operation efficiency and save labor and to pass along operation management know-how in light of low birth rates, aging populations, and retirement of skilled operators

Efforts toward solutions through DX promotion

Centralized monitoring centers

Using centralized monitoring centers to monitor multiple sites simultaneously



Use of AI

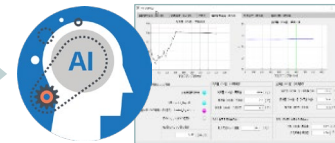
Using AI to optimize operations

Applications

- **Optimizing the operation of sludge dehydrators**
Using image analysis to optimize chemical injection rates
- **Stable incinerator operation**
Minimizing GHGs
Maximizing waste heat power generation



Incinerator



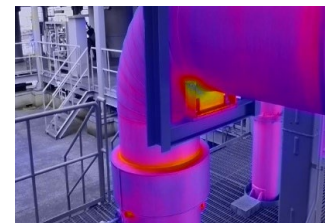
Optimized operation using AI

Use of various tools

Site inspections using smart glasses (more efficient work on site)



Image analysis using drones



Providing environmental technologies and solutions based on our expertise in thermal technologies

Tsukishima Kankyo Engineering Ltd

Solid treatment Liquid treatment Waste gas treatment

