

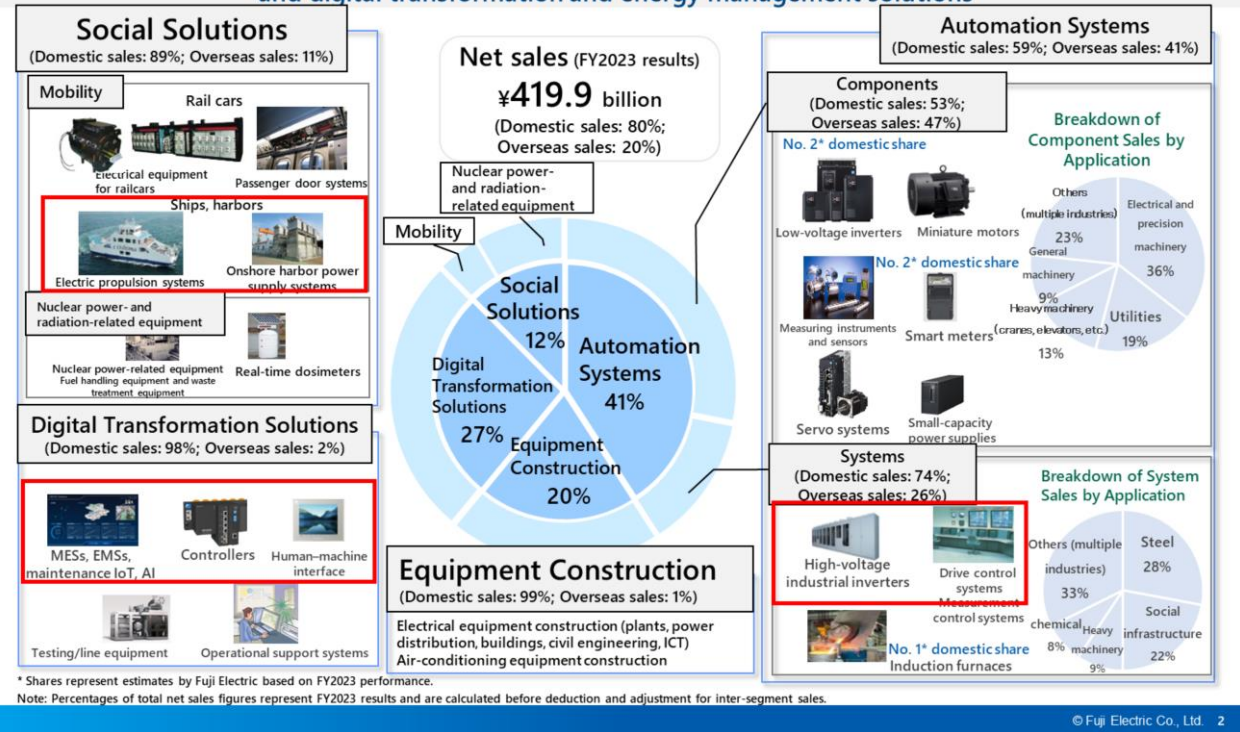
Industry Business Group  
Research and Development looking toward FY2026

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I'm Kentaro Toyama in charge of Development Division in Industry Business Group. I will explain our R&D looking towards FY2026.

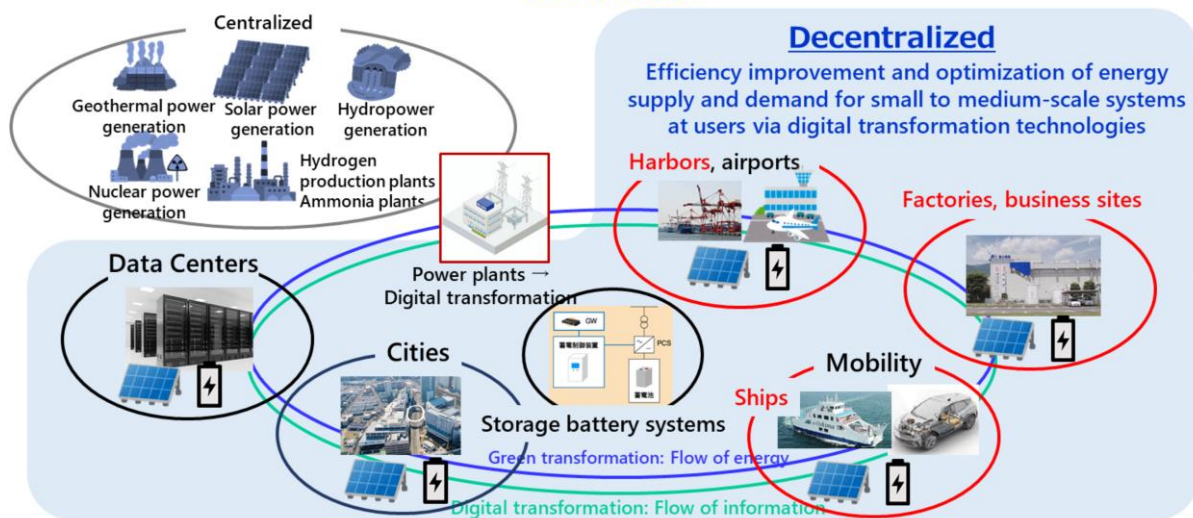
## Contributions to decarbonization through components, systems, and digital transformation and energy management solutions



At the Industry Business Group, we contribute to decarbonization through our components and system products, as well as our digital transformation and energy management solutions. Whereas the Energy Business Group focuses on power generation and stable energy supply, our focus is on reducing customer energy consumption and carbon emissions.

We are engaging business in Social Solutions, Digital Transformation Solutions, and Automation Solutions. Typical examples of Social Solutions include mobility-related systems used in ships and harbors. Digital Transformation Solutions are used in smart factories and other applications. We also contribute to plant decarbonization through the supply of systems such as industrial and high-voltage inverters.

Need for decarbonization of both centralized and decentralized power supplies in order to achieve green transformation



- Rapid electrification of ships and harbors amid carbon neutrality initiatives
- Accelerated production process decarbonization initiatives (electrification, fuel conversion) in plant system field
- Increased need for automation and process reforms at factories and business sites due to workforce contraction and digital transformation trend

Here we look at the operating environment and business opportunities.

A key point is the development of decentralized energy systems. There is marked shift towards the decentralization of energy supply for harbors, airports, factories, business sites, and mobility applications such as ships, and one of the issues facing the Industry Business Group is the need to tap energy demand in each of these areas.

A key development in harbors and ships is the creation of carbon neutral ports. Related initiatives are gaining momentum alongside electrification. A key theme for factories is the decarbonization of production processes, and we aim to differentiate our plant system business through support for production of high-quality products, as well as decarbonization solutions such as electrification and fuel conversion in the steel and other industries.

One major issue affecting factories and business sites is the decline in the working population, which we aim to address by promoting digitalization and meeting the need for labor-saving solutions such as automation and process reform.

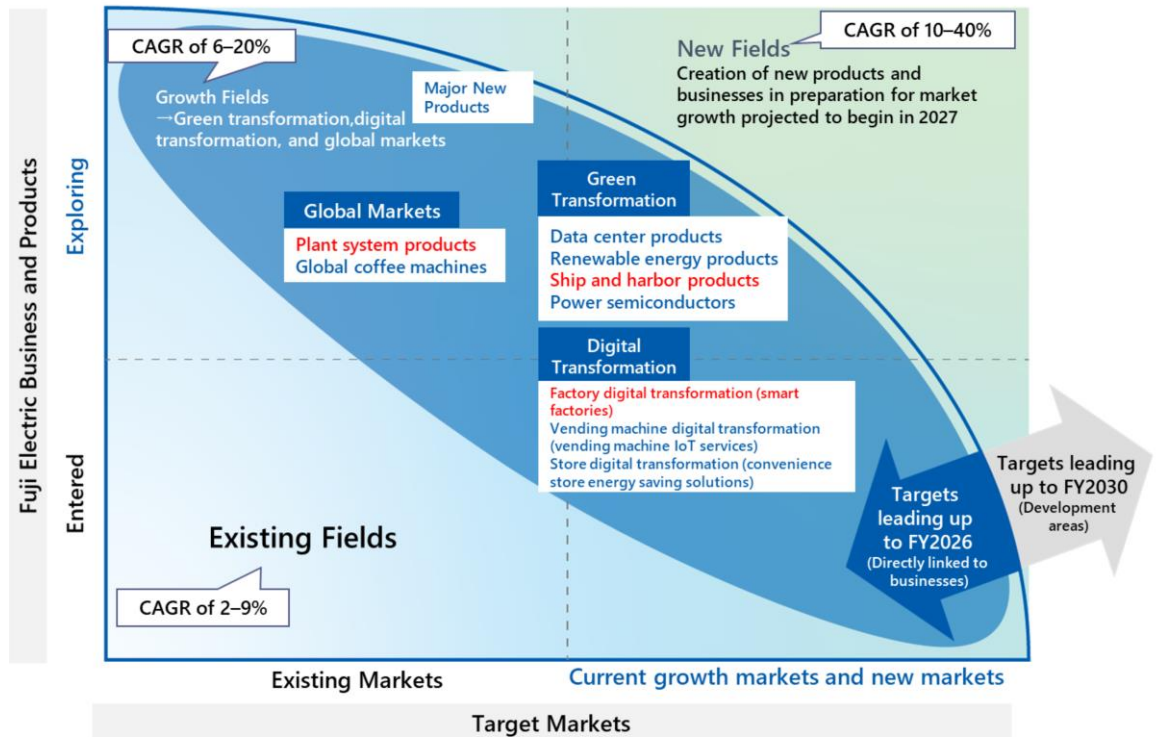
Business		Market Outlook and Technical Requirements (FY2024–2026)		
Automation Systems	Plant systems	Market Outlook	<ul style="list-style-type: none"> <li>Accelerated production process decarbonization initiatives (electrification, fuel conversion)</li> <li>Firm investment in steel and nonferrous metal plants, oil, ceramics, harbor cranes, and other fields</li> </ul>	
		Technical Requirements	<ul style="list-style-type: none"> <li>Space saving via increased stack capacity and optimized equipment compositions</li> <li>High stack output through refined cooling structures</li> </ul>	
Social Solutions	Ships, harbors	Market Outlook	<ul style="list-style-type: none"> <li>Popularization of low-emissions and emissions-free ships following institution of new greenhouse gas emissions regulations</li> <li>Accelerated efforts to create carbon-neutral ships</li> </ul>	
		Technical Requirements	<ul style="list-style-type: none"> <li>More compact and space-efficient electricity conversion equipment</li> <li>Synchronized connection to and disconnection from onboard generators</li> <li>Selectable voltage and frequency functions to ensure stable power supply</li> </ul>	
Digital Transformation Solutions	Smart factories	Market Outlook	<ul style="list-style-type: none"> <li>Increased need for automation and process reforms due to workforce contraction and digital transformation trend</li> </ul>	
		Technical Requirements	<ul style="list-style-type: none"> <li>Factory production process monitoring made possible using digital transformation technologies</li> <li>Improvement of production efficiency and increases to energy efficiency aimed at reducing CO<sub>2</sub> emissions</li> </ul>	

In the process automation business, there is a growing need for decarbonization and electrification of the production processes. With investment holding firm in areas such as steel, non-ferrous metal, oil, ceramics, and harbor cranes, our focus is on electrification, energy conversion, and fuel conversion.

Our strategy is to achieve higher output by increasing stack capacity, reducing equipment footprints, and enhancing cooling structures.

In the ships & harbors business, we are working on ways to reduce carbon emissions to help make carbon neutral ports a reality, and progress is being made on the electrification of both ships and harbors. There is a need for systems that supply stable power synchronized with onboard power generation, and for power conversion equipment with smaller footprints.

For smart factories, there is a growing need for digitalization to respond to the decline in the working population. This requires the use of digital technologies to simultaneously optimize production processes, raise productivity, and lower carbon dependency, while maximizing energy efficiency.



I will now introduce our key themes. Of the three categories of existing fields, growth fields, and new fields, our focus today will be on the growth fields. Within that context, we will look at products in global markets, green transformation, and digital transformation.

Offering systems capable of contributing to decarbonization and labor saving at plants  
 • Reduction of power losses and CO<sub>2</sub> emissions via industrial drives



Information in Today's Presentation

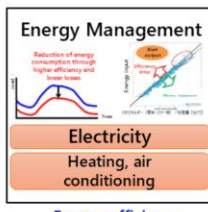


Premium efficiency motors



FRENIC-GS industrial drive

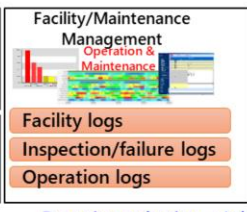
Industry-leading performance, functionality, and safety



Energy Management

Reduction of energy consumption through higher efficiency and load losses  
 Electricity  
 Heating, air conditioning

Energy efficiency improvement → CO<sub>2</sub> emissions reductions



Facility/Maintenance Management

Operation & Maintenance  
 Facility logs  
 Inspection/failure logs  
 Operation logs

Downtime reduction → Labor savings  
 Comprehensive traceability management → Safety and security



MICREX-ViewW FOCUS Evolution

The first item from the growth field is plant systems. Within this category, there is a sharp rise in the need for decarbonization and labor-saving solutions.

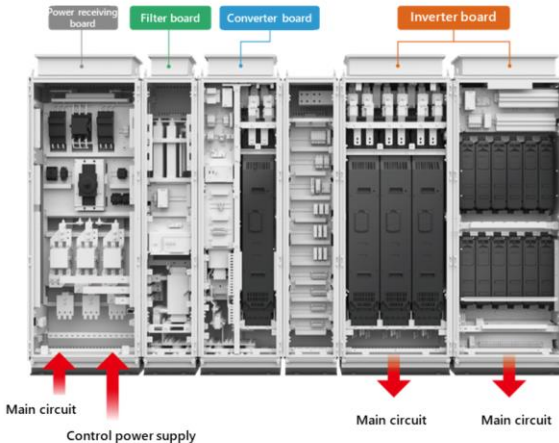
Reducing power loss for industrial drives is a focal area for product development, as it helps lower CO<sub>2</sub> emissions.

Our systems are used in many types of plant, including steel, pulp & paper, film, cement, cranes, equipment manufacturing, and ships. We supply products such as motors, drive systems, energy management equipment, equipment maintenance services, and visualization systems. Today we will look at industrial drives.

## Industrial drive featuring industry-leading performance, functionality, and safety

### Features and Strengths of FRENIC-GS

- Slim stack design reducing space requirements
- Multi-drive structure with DC distribution to increase capacity and allowing for easy maintenance
- Capacity for large data transmissions contributing to digitalization of monitoring, etc.



### Applicable Fields

- Plant systems (steel, paper, pulp, cement, cranes, etc.)

### Customer Needs

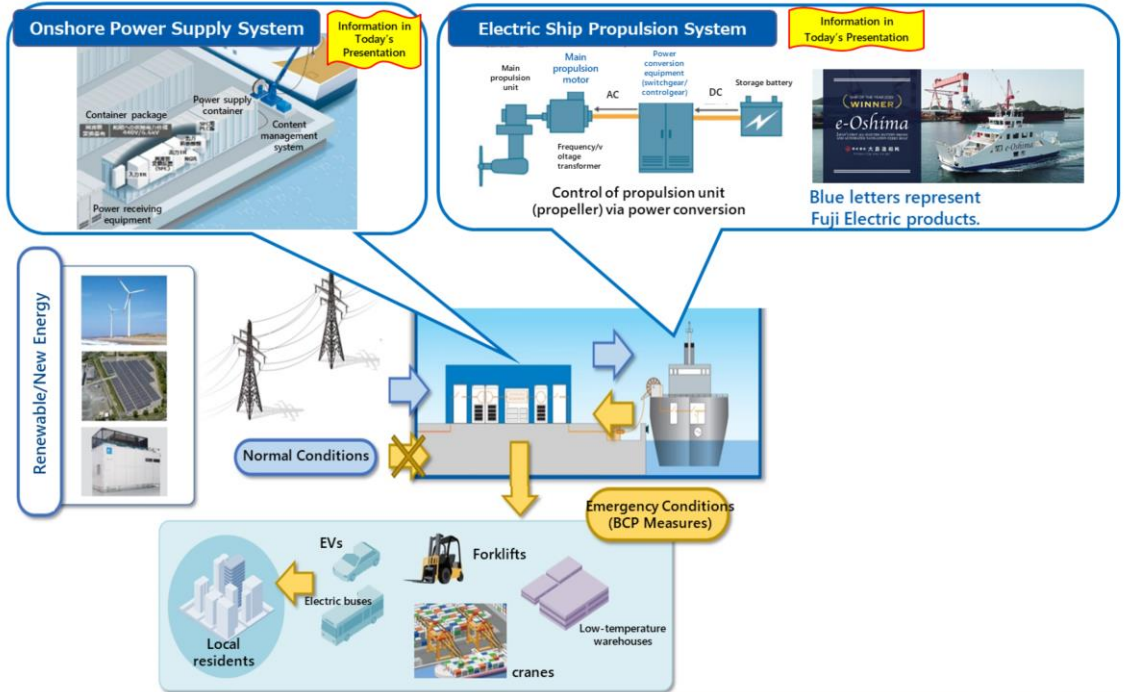
- Productivity improvement
- Safety and security
- CO<sub>2</sub> reduction

FRENIC-GS, within Plant System Products, is an industrial drive with industry-leading performance, functionality, and safety. It has a slim stack design that drastically reduces space requirements.

It features a multi-drive structure with DC distribution and high capacity. In addition, there is a need for making plant systems easier to maintain, and we therefore prioritize the ease of repair and replacement in the event of failure (minimizing the mean time to repair, MTTR).

The optimization of energy and data flows is also crucial, and the volume of transmittable data is expanding. We increased transmitted data volume to meet demand arising from labor-saving and digitalization processes, such as status monitoring. The main applicable field is plant systems, and the customer needs met are for improved productivity, safety and security, and decarbonization.

## Provision of electrified ship and harbor systems to help create carbon-neutral ports



The next item within the growth fields we will look at is Ship and Harbor Solutions. We are working on the electrification of harbors and ships to contribute to decarbonization and the realization of carbon-neutral ports.

Our onshore power supply systems have been adopted for use in harbors. These supply power from onshore sources to ships anchored at port without the need to run generators onboard, thereby reducing CO2 emissions. Similarly, increasing number of ships are installing our electric ship propulsion system, which also helps lower CO2 emissions by utilizing storage batteries, power conversion equipment, and motors to propel ships forward.

In addition to the onshore power supply systems and the electric ship propulsion systems, the ship and harbor solutions business is working on development of two-way clean energy usage, including the use of renewable energy and the supply of electric power from ship batteries to shore in times of emergency.



## Onshore power supply system contributing to reduced CO<sub>2</sub> emissions at harbors

### Features and Strengths of Onshore Power Supply System

- Ability to use up to eight 1.25 MVA units simultaneously (max. capacity of 10 MVA)
- In-container storage allowing for shortened lead time prior to start of operation
- Lower labor requirements for connecting cables and increased safety



Container package



Capable management system delivered to Kobe City (operation commenced in April 2024)

### Applicable Fields

- Onshore power supply system

### Customer Needs

- Shortened installation times
- Lower labor requirements for connecting cables between ships and onshore equipment and increased safety

At first, we will look at the onshore power supply system. This supplies energy from shore to ship when at anchor, and helps reduce CO<sub>2</sub> emissions. Capacity is 1.25MVA, which can be scaled up to 10MVA through parallel connections, providing compatibility with a wide range of ship size.

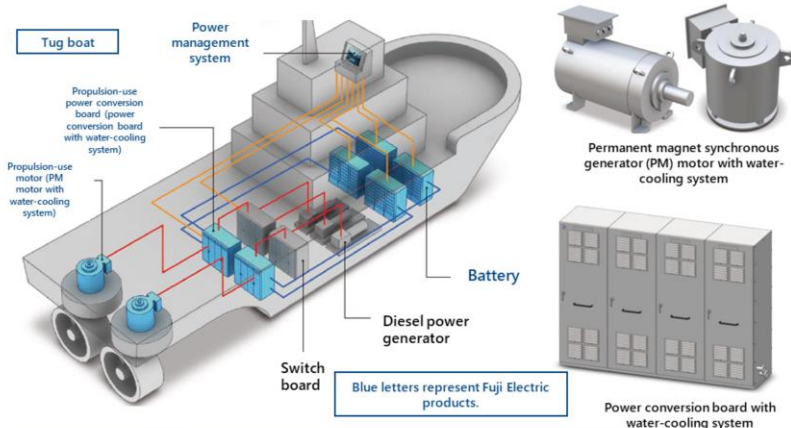
The system fits into a shipping container, which significantly reduces the time required until the start of operations. The container in which the system is enclosed need simply be installed in the harbor. For certain larger ships, the high-power requirements made the handling of heavy duty cables an issue. We therefore developed a cable management system that reduces labor requirements when connecting the cable to supply power from the container.

The main application is harbor decarbonization through onshore power supply. The main customer needs to be met are shorter equipment installation times, and lower labor requirements/improved safety when connecting cables from ship to shore.

Propulsion system coupled with battery contributing to reduced CO<sub>2</sub> emissions from small vessels

## Features and Strengths of Electric Ship Propulsion System

- Unparalleled compact design allowing for installation in small vessels with limited space (PM motor with water-cooling system)
- Compatible with flushing with clean water, no need for dedicated flushing water; water-cooling system reducing need for onboard air conditioning (power conversion board with water-cooling system)



## Applicable Fields

- Electric ship propulsion systems

## Customer Needs

- Emissions-free ships
- Compact equipment
- Low levels of noise and vibrations

This slide covers our electric ship propulsion system.

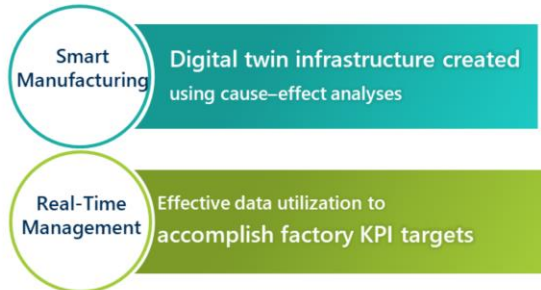
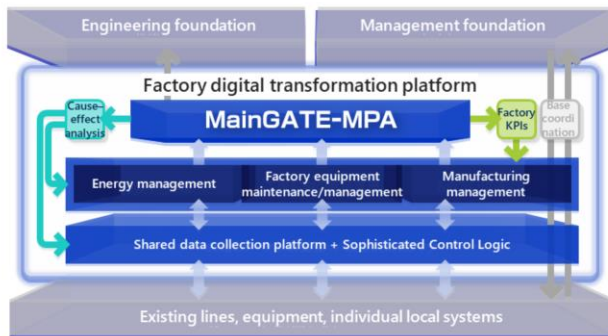
This is a propulsion system combined with a storage battery to help reduce CO<sub>2</sub> emissions from small ships.

We have successfully designed a small-footprint system that can be installed in ships with limited space by using water-cooled permanent magnet motors. We are also working to lower the size of the conversion equipment by using water cooling, reduce the use of air-conditioning equipment within the ship, and promote electrification. The main application is electric ship propulsion. The main customer needs to be met are for decarbonization and emission-free ships, more compact equipment, and lower levels of vibration and noise.

## Factory digital transformation for achieving real-time management and smart manufacturing

### Factory Digital Transformation (Comprehensive MES/MOM Diagnosis)

MES: Manufacturing execution system  
MOM: Manufacturing operations management



Cross-area consolidation of various manufacturing data using Fuji Electric's MainGATE-MPA comprehensive analysis platform

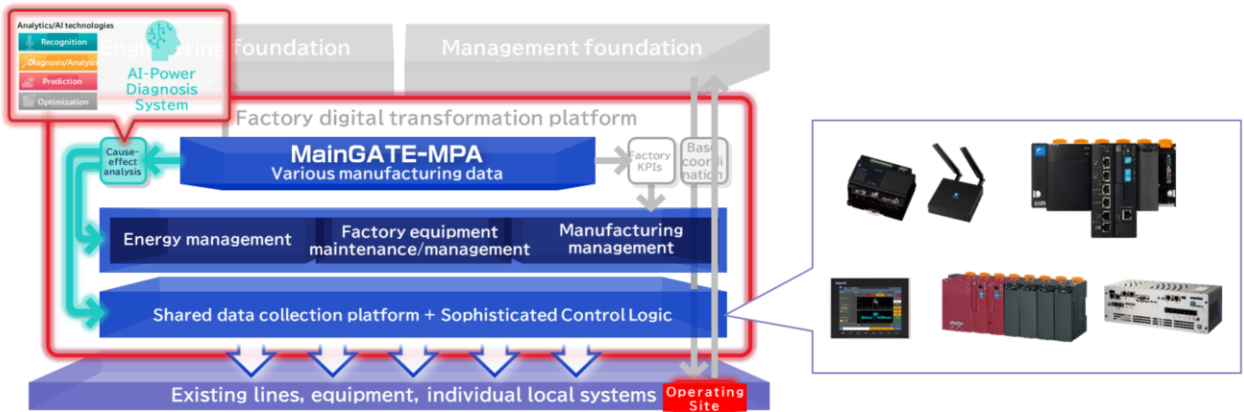
The third item we will talk about is the global smart factory.

Amid growing demand for digital transformation at various types of factory, it is increasingly important to provide both smart manufacturing and real-time management. Our goals are to build a digital twin environment in the smart manufacturing space, and help clients meet KPIs with real-time management. We are combining manufacturing execution systems and manufacturing operations management to respond to customer needs.

Proposing visualization and resolution offerings of production line issues utilizing data collection and AI-powered data analysis by IoT equipment

## Features and Strengths of Factory Digital Transformation Platform

- Combination of extensive sensor array and IoT equipment to collect actual site data
- Highly convincing resolution measures proposed using analytics and AI technologies
- Cooperation with inverters and other energy-saving equipment to optimize productivity and CO<sub>2</sub> emissions levels



In the area of factory digital transformation platforms, we conduct AI-powered data analysis on data collected from our IoT devices and sensors.

Our focus is on visualizing the issues that arise in production lines, and providing solutions to them. Our strengths are in the collection of real site data through our extensive line up of IoT devices and sensors, and the provision of attractive solutions that combine analytics and AI (analysis and optimization technologies). We also provide optimization services by interfacing with energy-saving inverters and other equipment to simultaneously raise productivity while lowering carbon emissions.

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