

# Power Electronics Systems Energy / Industry

The Power Electronics Systems Energy segment, which contributes to the stable supply and optimization of energy, and the Power Electronics Systems Energy segment, which realizes automation and energy saving at factories, operate their businesses under shared policies as Fuji Electric's power electronics systems business. Based on these shared policies, we seek to create competitive components through synergies with our core power semiconductor and power electronics technologies; reinforce systems operations by combining engineering services, optimal control technologies, and IoT technologies; and expand overseas operations.

## Priority Measures for Fiscal 2019

### Creation of Competitive Components

Fuji Electric will accelerate the development of transformers, switchgears and controlgears, and others to create competitive global products.

Another focus of development is differentiated products equipped with next-generation SiC power semiconductors that contribute to the realization of more efficient and compact equipment. In this area, we are moving ahead with the development of traction converters for railcars.

### Expansion of Overseas Businesses by Leveraging Systems

Fuji Electric is stepping up development of high-value-added systems that combine standardized product and system bundles with engineering services and IoT technologies.

Acting in accordance with our basic principle of local production and consumption, we will ramp up local design in China and other parts of Asia, move ahead with the construction of switchgear and controlgear system factories at Fuji Electric Manufacturing (Thailand) Co., Ltd., and establish engineering centers. At the same time, we will look to expand overseas operations through partner strategies with affiliates and with companies acquired through M&A activities.

### China

We will pursue collaboration with Shanghai Electric Group Co., Ltd., to promote sales of control systems that support stable operation at material factories. At the same time, we will work together with Dalian Bingshan Group Co., Ltd., to expand sales of energy management systems for contributing to energy saving and optimization at beverage factories.

### Southeast Asia

Transmission and distribution systems and comprehensive electrical equipment supply operations will be fortified through launches of new products while the sales channels of Fuji CAC Joint Stock Company are used to expand sales of control systems for cement factories.

### India

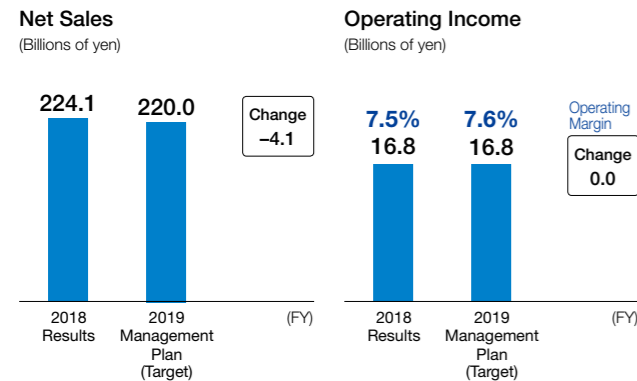
In addition to leveraging the sales channels of Fuji Gemco Private Limited to grow sales of steel plant control systems, we will also seek to expand our power supply operations through the newly acquired Consul Neowatt Power Solutions Pvt Ltd. This company's technologies, manufacturing capabilities, and sales channels will be used to bolster local production and consumption systems in India in order to grow our operations in this market.



# Power Electronics Systems Energy

Expand overseas businesses by leveraging proposal bundles for electrical equipment

Executive Officer  
Corporate General Manager,  
Power Electronics Systems Energy Business Group  
**Masahiro Morimoto**



## Awareness of Market Needs

We are seeing continuing renewal investments in the manufacturing industry in Japan due to aged equipment such as substation equipment acquired in the 1970s and 1980s, while a shortage of equipment management engineers among customers is stimulating requirements for equipment orders and efficiency of management. Moreover, with a view to improving energy saving throughout factories and reducing CO<sub>2</sub> emissions from the perspective of growing environmental awareness and restricting energy costs, demand is increasing not only for the introduction of products with a high level of power conversion efficiency, but also for the visualization and optimization of energy throughout factories leveraging energy management systems (EMS).

In the Southeast Asia and Middle East regions, which are experiencing remarkable economic growth, demand for substation equipment and switchgear and controlgear for factories and buildings to stabilize power supplies is increasing amid growing investment in industrial and social infrastructure and demand for electricity.

## Strengths of the Power Electronics Systems Energy Segment

The strength of the Power Electronics Systems Energy segment lies in its wide range of products and systems, from instruments that prepare electricity such as transformers and switchboards to instruments that protect equipment from lightning and instantaneous voltage drops, such as uninterruptible power systems and EMS. Moreover, in addition to the expertise on energy saving at Fuji Electric's factories, we possess an extensive delivery track record and engineering experience. At the same time, we are experts in the operation of various factories and facilities, and are able to provide maintenance services that suit user conditions, including the products and systems that underpin power stabilization and optimization in line with customer specifications. In these ways, the ability to offer comprehensive proposal bundles, from a diverse array of products and systems up to and including maintenance services, is this segment's strength.

## Priority Measures for Fiscal 2019

We will expand our transmission and distribution systems business and comprehensive electrical equipment business overseas through Asian manufacturing and engineering and capabilities in proposal bundles cultivated in Japan.

### Strengthen systems for Asian manufacturing and engineering

We will construct switchgear and controlgear system factories at Fuji Electric Manufacturing (Thailand) Co., Ltd. (FMT), and build a new engineering center in order to consolidate engineering staff, who had previously been dispersed. Through coordination between the engineering center and the technological sales force at sales companies in Thailand, Indonesia, Vietnam, the Philippines, and Singapore, we will expand sales proposals that are custom-tailored to the needs of customers.

### Expand the transmission and distribution business by introducing new global products

We will introduce new, price-competitive transformers and switchgear products. In Southeast Asia we will expand our business targeting the electricity and materials fields that combines substation equipment with switchgear and controlgear. Meanwhile, in the Middle East, we will concentrate our efforts on capturing demand for renewals and services among existing substation equipment customers by bolstering sales proposals for equipment malfunction prevention, and lifespan diagnosis services via coordination with local service companies.

### Expand the comprehensive electrical equipment business for factories and facilities

Since fiscal 2018 we have strengthened our systems and are growing comprehensive electrical equipment orders for data centers and semiconductor factories centered on Japan. Going forward, we will continue to expand the comprehensive electrical equipment business in Japan and Southeast Asia where we anticipate robust capital expenditure in those industries. The key to strengthening competitiveness is short delivery times and low costs. In order to realize this, we will further promote the standardization of our core products, namely switchgear and controlgear. At the same time, we will begin local production in order to improve our lineup of products that conform to overseas standards.

### Expand sales of ED&C components business targeting the power distribution market

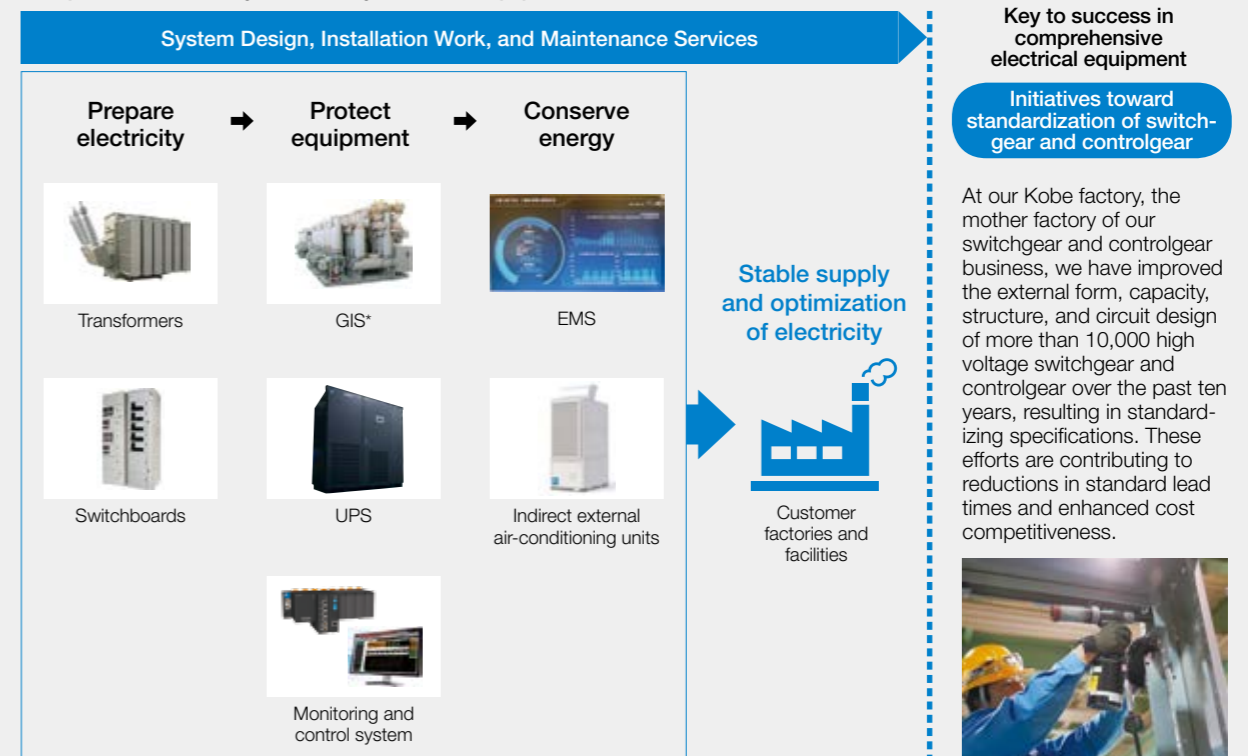
We will expand sales on the back of Tokyo 2020 Olympic and Paralympic Games-related investment by strengthening nomination activities in the power distribution market for buildings and general contractors.

## Close-Up

# Contributing to the stable supply and optimization of electricity through the comprehensive electrical equipment business for factories and facilities

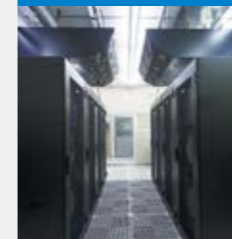
Fuji Electric contributes to the stable supply and optimization of electricity by performing everything up to and including design, installation work, and maintenance services for electrical equipment at factories and facilities.

## Comprehensive Factory and Facility Electrical Equipment Business Model



\*Gas-insulated switchgears

### Case Study 1 Data Center of a Foreign Company (Japan)



#### Realizing early facility construction and energy saving through a wealth of expertise and products

Amid progress in the shift to cloud-based information systems and in anticipation of the expansion of the information and communication technology (ICT) market, foreign data center businesses are increasingly establishing a presence in Japan. Although foreign customers expect shortened construction periods, a shortage of their own engineers at their Japanese bases and lack of progress in procuring materials became an issue.

Fuji Electric shortened the construction period

by comprehensively undertaking everything from design of the entire facility up to its construction, combining power distribution equipment, UPSs, emergency power generation equipment, and other equipment to enable a stable power supply. Furthermore, on the operational front, we supported energy saving by providing monitoring and control systems that facilitate the visualization of energy, air-conditioning equipment that utilizes outside air, and UPSs with industry-leading levels of efficiency. We have gained recognition for our track record in Japan and we are now seeing an increase in inquiries overseas, principally in Southeast Asia.

### Case Study 2 Oil Tank Factory (Japan)



#### Realizing energy saving and reliable operations through factory diagnosis and maintenance services

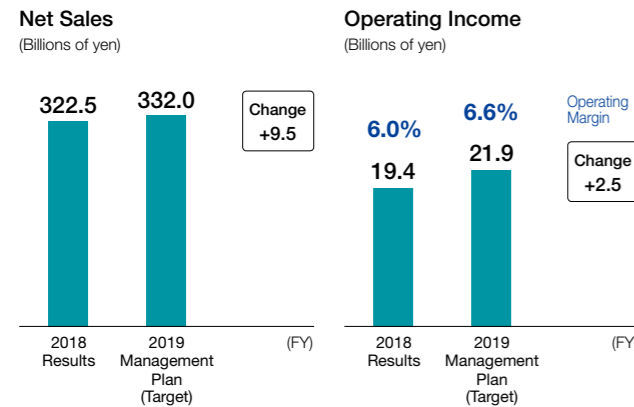
A lack of engineers to implement energy saving throughout the factory was an issue for the customer when renewing their production facilities. We implemented a facility diagnosis by checking the deterioration of all electrical equipment, such as substation equipment, including equipment manufactured by other

companies, high voltage motors, inverters inside switchgears and controlgears, and circuit breakers while clarifying recommendations on the timing of the renewal of such equipment. We were awarded a contract that entails everything from replacing existing products with Fuji Electric ones to 24 hours a day, 365 days a year maintenance services, and have thereby contributed to higher than ever energy-saving effects and operational reliability.

## Power Electronics Systems Industry

Expand the systems business through promotion of an overseas partnership strategy

Executive Officer  
Corporate General Manager,  
Power Electronics Systems Industry Business Group  
**Hiroshi Tetsutani**



### Awareness of Market Needs

In the industrial field in Japan, a shortage of labor is stimulating an increase in demand for automation and reducing labor requirements. In addition, initiatives are being stepped up toward heightening competitiveness through production reforms such as the visualization of equipment operating conditions as well as the prediction of equipment defects and analysis of the reasons for such defects. Moreover, renewal and energy-saving investments are continuing due to aged production equipment in the materials field.

In China, we anticipate investment in energy saving driven by environmental measures, and investment in automation and labor saving on the back of a shortage of labor. Meanwhile, we anticipate new and renewal investment in the materials field in Southeast Asia and India.

In the transportation field, such as ships and railroads, making equipment lighter and more compact while reducing environmental impacts is becoming a global issue.

### Strengths of the Power Electronics Systems Industry Segment

The Power Electronics Systems Industry segment provides a wide range of products—combining drive equipment, measuring instruments, control equipment, and the Internet of Things (IoT) that facilitate the automation of production equipment and labor saving—to a broad spectrum of customers, from those in the materials field to the assembly field. In particular, the segment's greatest strength is its ability to be the first to introduce to the market competitive power electronics products equipped with our own power semiconductors, the key devices for facilitating energy saving. The extensive lineup of our core product of inverters that are suitable for all industries and a variety of applications is the segment's forte while motion systems combining servo systems and controllers that boast industry-leading levels of control performance have a considerable delivery track record in machine tools, packaging machinery, and other areas. As for steel and cement plants, our drive control

systems, monitoring control systems, and other systems have an extensive delivery track record, enabling us to have a deep understanding of the production processes of customer plants. By combining these differentiated products with production floor expertise we are able to establish ideal plants and systems that address the issues of customers.

### Priority Measures for Fiscal 2019

We will expand the systems business in China and elsewhere in Asia through M&A activities and a partnership strategy with cooperative companies while setting the business targeting ships to a growth trajectory.

#### Expansion of the systems business

In China, we will expand a system that facilitates production optimization and energy saving by leveraging Dalian Fuji Bingshan's air-conditioning heating and cooling technologies and equipment and its sales channels while combining inverters, measuring instruments, control equipment, and energy management systems to target beverage plants. Moreover, we will expand sales of drive control systems and monitoring control systems for the materials field by utilizing Shanghai Electric's sales channels. In Southeast Asia, we will leverage the engineering and sales channels of Fuji CAC of Vietnam to promote sales of control systems for cement plants, while in India, we will increase sales of control systems for steel plants centered on Fuji Gemco.

In Japan, we will continue to focus our efforts on capturing renewal demand for aged equipment in the materials field while promoting sales of semiconductor production equipment through the introduction of new servo system products. In addition, we will expand the systems business by providing data collection equipment and analysis and support services utilizing IoT for process assembly such as for automobiles.

#### Expanding ship exhaust gas cleaning systems operations

Fuji Electric will expand its ship exhaust gas cleaning systems operations, business negotiations for which are increasing due to environmental regulations. We will bolster production capabilities and reinforce engineering systems while promoting productivity increases and cost reduction through the introduction of automation equipment. Additionally, we will respond to customer needs by developing large-sized products, with a goal of launching them in fiscal 2019.

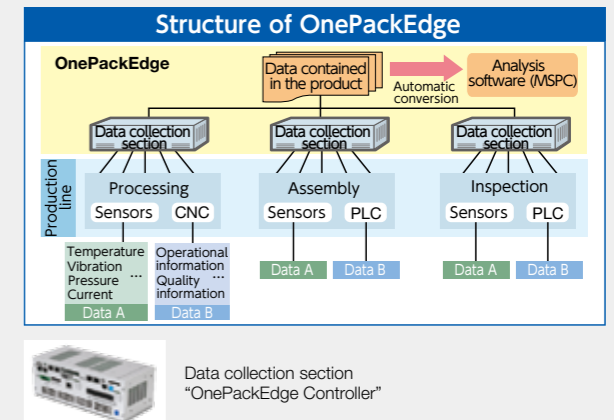
### Close-Up

## Facilitating productivity and quality enhancements through data collection and analysis of production equipment

Utilization of IoT in order to improve operations and enhance productivity on production floors has been increasing in recent years.

"OnePackEdge," comprising data collection sections and analysis software, supports analysis of the factors of equipment abnormalities and defects by collecting together data including information on temperature, vibration and operation, and quality from production floor sensors and controllers.

We contribute to the early resolution of issues facing customers by providing data collection and analysis in one package.



#### Case Study Automotive Manufacturer (Japan)



#### Significantly shortening data collection and factor identification time

As data management was conducted departmentally on the customer's production floors, data collection factor identification took a considerable amount of time when problems occurred.

By adopting "OnePackEdge," the amount of time required to collect and aggregate data on the motor rotation speed and current of processing equipment, screw-tightening pressure

on assembly equipment, breakdown history, and other issues at the customer's engine factory was drastically reduced. Furthermore, Fuji Electric's proprietary software makes it possible to predict and prevent abnormality occurrences. Therefore, we are contributing to the customer's operational efficiency improvement and quality enhancement.

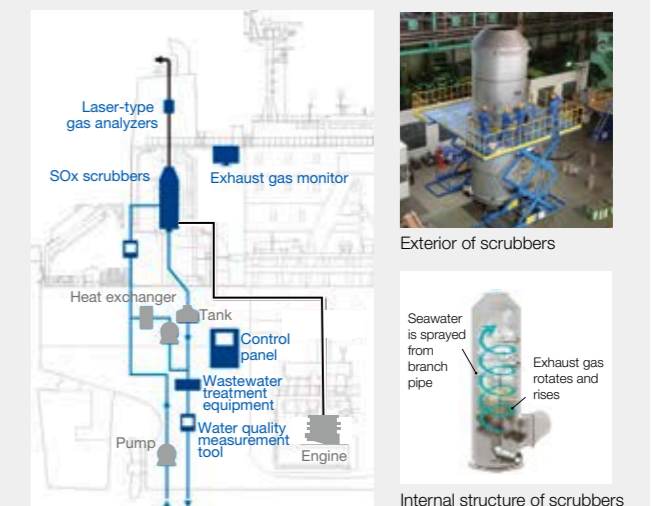
## Contributing to the resolution of the environmental problems of ships

The International Maritime Organization will strengthen regulations on sulfur oxide (SOx), a pollutant, in oceans throughout the world from 2020. The running costs of expensive low-sulfur fuels that conform to these regulations has become an issue.

Fuji Electric offers ship exhaust gas cleaning systems that enable the continued use of current fuel. We provide SOx scrubbers that reduce sulfur oxide in exhaust gas by mixing sea water with exhaust gas to create a chemical reaction, and a combination of gas analyzers that measure the constituent concentration of SOx scrubbers and exhaust gas in real time as well as inverters and controllers for managing a feed pump that draws seawater in an optimal manner.

In these ways, Fuji Electric's ship exhaust gas cleaning systems are helping customers to adhere to air pollution regulations.

#### System structure (Fuji Electric provides blue areas)



#### Case Study Shipbuilder (Japan)



#### Limiting required loading space through the world's smallest scrubbers

The customer was planning to equip medium-sized new ships with SOx scrubbers in order to conform to regulations but securing cargo space had become an issue.

Fuji Electric's scrubbers are the world's first scrubbers for ships to adopt cyclone technology in their internal structure. By securing the retention time of exhaust gas inside scrubbers, we have heightened the cleaning effect of scrubbers

on SOx, and realized the world's smallest scrubbers, at 50% of the volume of those of other companies, thereby contributing to a reduction of the loading space required for scrubbers on customer ships. We are creating new business as a result of our compact-sized scrubbers, which are suitable for both new and existing ships and make placement easy to consider, and providing optimal systems.