

# Feature 1: Contributing Solutions for Global Energy Issues

## 1 Stable Supply of Clean Energy and Efficient Energy Use

The environment surrounding energy is currently undergoing changes, both in Japan and throughout the world.

In Japan, following the introduction of the feed-in tariff fixed purchase price system aimed at popularizing and promoting renewable energy, mega solar power generation are now being built throughout the country, and the introduction of a large number of high-efficiency thermal power plants is being considered, with the aims of securing a stable supply of electricity and reducing environmental impact. The introduction of smart energy systems that use energy intelligently in order to utilize limited resources as efficiently as possible, is garnering a lot of attention.

Overseas, emerging countries are facing power shortages and must improve the quality of their electricity. In these countries, efforts are underway to build new power plants, as well as to bring facilities online that will stabilize electricity and help save energy.

Fuji Electric possesses a wealth of products and experience, starting with clean energy generation and smart projects that achieve effective energy use, and through our businesses we will continue to contribute to solving energy issues throughout the world.

### Fuji Electric's Clean Energy and Smart Conversion Businesses

#### Clean Energy

Helping Provide a Stable Supply of Electricity around the World with High-Efficiency, Low Environmental Impact, Highly-Reliable Power Plants

##### Thermal Power Generation Facilities

###### Special Features

- High efficiency power generation facilities such as ultra-supercritical pressure and GTCC power generation\* equipment

###### Track record

- Supplied over 366 generators to electricity companies and independent power producers (IPPs) (122 supplied to Japan)
  - Ultra supercritical pressure power generation equipment (Electric Power Development Co., Ltd. Isogo Thermal Power Plant)
  - GTCC power generation equipment (Okinawa Electric Power Company, Incorporated Yoshinoura Thermal Power Plant)

##### Fuel Cells

###### Special Features

- Highly efficient power generation equipment with low energy loss based on electro-chemical reaction

###### Track record

- Supplied fuel cell solutions for 48 customers' needs (41 in Japan and 5 in Germany)
  - Use of by-product gas from a steel refinery (hydrogen) (Kitakyushu Hydrogen Town)
  - Use of sewer gas (Yamagata Purification Center)
  - World's first demonstration trial for fire prevention using low-oxygen concentration air held in Germany

#### Renewable Energy

##### Geothermal Power Generation Facilities

[Case Example P. 29](#)

###### Special Features

- Anticorrosion technologies to protect facilities from corrosion and wear
- Remote maintenance support system
- Coverage of all sizes from large to small capacity systems

###### Track record

- Supplied 67 generators (5 in Japan), including the world's largest capacity system
- 40% share of the global market for the past 10 years

##### Hydropower generation equipment

###### Special Features

- Low-head hydropower generation technology
- Coverage of all sizes from large to small capacity systems

###### Track record

- 689 generators supplied to electric power companies (414 in Japan)

##### Solar / Wind Power Generation Systems

[Case Example P. 27](#)

###### Special Features

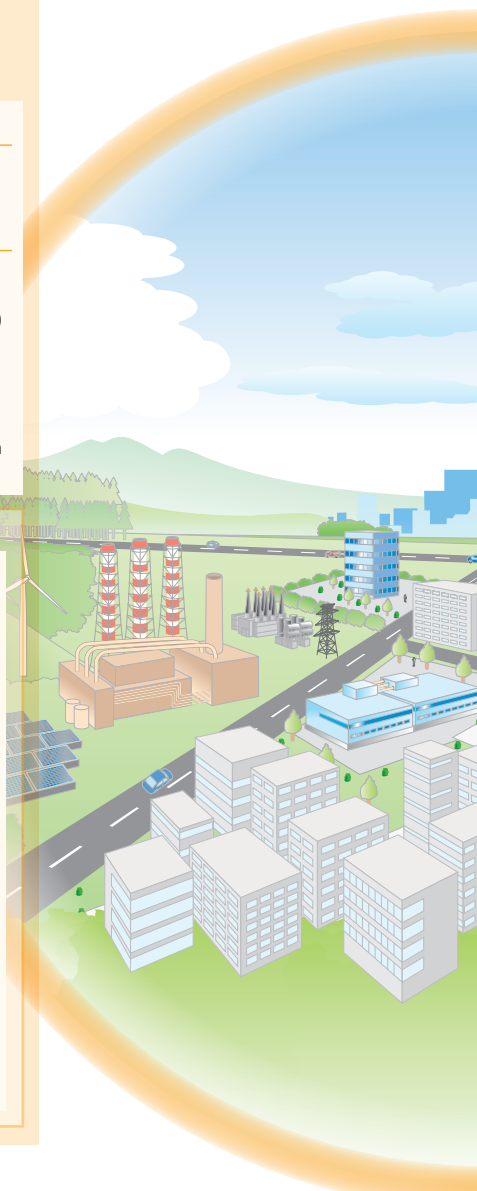
- Technical expertise and experience to undertake contracts for entire systems
- Highly efficient power conditioners for converting generated electricity to alternating current for efficient transmission
- Power system stabilizers for controlling the load on electrical systems

###### Track record

- Miyama Joint Power Station Miyama Takayanagi No. 1 / No. 2 power station (total 4 MW)
- Idemitsu Kosan Co., Ltd. Moji Power Plant (2.9 MW)
- Okinawa Electric Power Company, Incorporated Ogimi wind power plant (4 MW)
- Fuji Green Power Co., Ltd. Nishime wind power plant (1.9 MW)

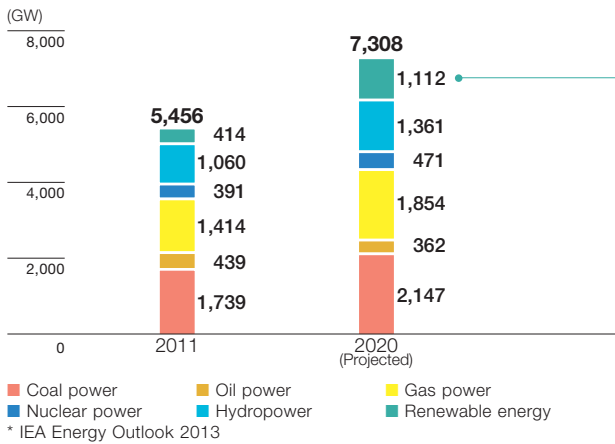
others

\* Gas turbine combined cycle power generation

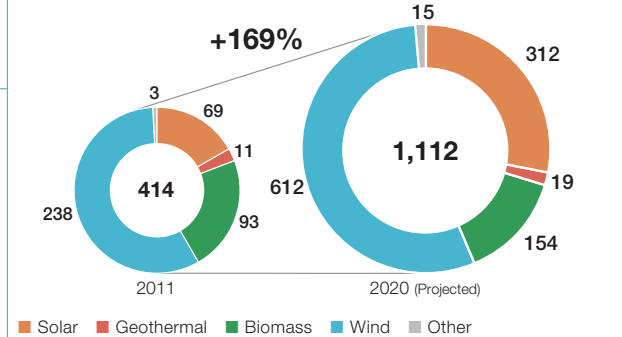


## Changes in the Energy Environment

### Global Power Generation Capacity



### Expand Introduction of Renewable Energy



## Adoption of Smart Energy Systems

Contributing to Efficient Energy Use by Offering Total Solutions, from the Energy Supply Side to the Demand Side

### Special Features

We offer a wide variety of products and technologies to provide total packages tailored to customers' needs. Our offerings include distributed power sources, energy management systems that enable precise energy control, power stabilization equipment, and energy-saving devices that reduce environmental impact.

#### Smart Community Micro Grid

Optimizing energy supply for countries, local governments, and communities

Case Example P. 28

#### Track record and case examples

- Smart communities (Kita Kyushu, Kamaishi, Aizuwakamatsu)
- Microgrids for remote islands (Kingdom of Tonga, six islands in Kyushu, and three islands in Okinawa)
- Microgrids for ports, and agricultural and fishing villages (Minamata)
- others



#### Smart Industrial Parks

Reduce amount of energy use and stabilize power supply for the industrial park

Case Example P. 30

#### Track record and case examples

- Indonesia (Surabaya Industrial Park, Suryacipta City of Industry)
- Thailand (Prachinburi Industrial Park)
- Malaysia (Iskandar Industrial Park)
- Saudi Arabia (Modon Industrial Park)
- others

#### Smart Factories, Stores, Buildings

Reducing the energy usage and environmental impact of factories and stores

#### Track record and case examples

- Fuji Electric Mie Factory and Yamanashi Factory
- AEON Mall Yahata Higashi
- Familymart (Kitakyushu)
- others



## Feature 1: Contributing Solutions for Global Energy Issues

### Initiatives in Japan

Japan has an energy self-sufficiency rate of 4%. Partly to increase this ratio, in 2012 Japanese government implemented a feed-in tariff fixed purchase price system aimed at popularizing and promoting renewable energy. Since then, a total of 1,110 mega solar power generation representing 2.1 million kW of power have come online, and there are plans to build another 7,700 projects, with a total of 35 million kW in power generating capacity.\* In addition, promoting the use of renewable energy and effective utilization of limited resources, the government and private-sector companies are working together on demonstration projects in order to create smart energy systems for communities and facilities alike.

Fuji Electric is helping to make energy cleaner and smarter by supporting the introduction of mega solar power generation and participating in smart community demonstration projects taking place in many areas.

\* Source: Ministry of Economy, Trade and Industry (As of March 31, 2014)

#### Case Example

Idemitsu Kosan Co., Ltd. Moji Power Plant

#### Clean Energy

### Supporting High Efficiency and Long-Term, Stable Operation in Mega Solar Power Generation

In addition to its core business areas including fuel oil and petrochemicals, Idemitsu Kosan Co., Ltd. is also focusing its efforts in the renewable energy sector, which has a low environmental impact. The introduction of the feed-in tariff fixed purchase price system presented an opportunity for the company to enter the solar power generation business, and its Moji Power Plant and Himeji Power Station are currently generating power. Efficient power generation and stable operation over the long time span of at least 20 years are important in the solar power generation business.

Fuji Electric was selected as the sole EPC\* contractor for the construction of the Moji Power Plant, which came online in November 2013, and completed the work under a tight deadline. With the construction complete, we are also providing ongoing services. Power conditioners manufactured by Fuji Electric are the heart of the mega solar power generation. Our power conditioners featuring industry-leading high efficiencies helped increase the overall power generation efficiency.

Moreover, in addition to our local service platform, we supplied a remote monitoring system to the customer's head office in Tokyo, allowing the company to check the power station's operating status as a part of our effort to support the long-term, stable operation of the solar power generation.

\* Contracting the full range of operations, from engineering to production and procurement of equipment, installation, and testing



Idemitsu Kosan Moji Power Plant



Power conditioners in an outdoor container at the Moji Power Plant

#### Voice

### A Message from a Customer

**Hideaki Mimaki**  
Deputy Manager of the Renewable and  
New Energy Department  
Idemitsu Kosan Co., Ltd.

After performing a careful analysis to make sure that we didn't lose hours of sunlight due to connecting buildings, Fuji Electric handled everything, from engineering to construction, in just six months. I took a tour of the power conditioner production line, and was impressed by the high quality. Going forward, I hope that Fuji Electric will provide ongoing service for many years and support the plant's stable operation.

## Case Example

## Kitakyushu Smart Community

## Adoption of Smart Energy Systems

## Optimizing Energy Supply and Demand across the Entire Community

Kitakyushu City in Fukuoka Prefecture is one of the four areas selected from throughout Japan by the Ministry of Economy, Trade and Industry for smart community pilot projects. As one of the companies managing the project, Fuji Electric introduced facilities starting in fiscal 2010, and started a variety of testing from fiscal 2012.

The defining feature of the smart community is the Cluster Energy Management System (CEMS). It optimally manages distributed power sources, including solar power generation, wind power generation, and electric power storage systems, and provides the total control needed to efficiently produce and use electricity.

We are introducing proprietary management systems, control instruments and smart meters as energy management systems (EMS) for electricity users in the community, including factories, hospitals, convenience stores, and condominium buildings. In addition to visualizing and reducing energy usage, we were the first in Japan to trial a demand

response system in which users link with a cluster energy management system (CEMS) to efficiently use the community's overall energy. One example is dynamic pricing, in which the cost of electricity changes according to the supply and demand predictions based on local weather forecasts. Furthermore, as emergency energy reserves to be used during natural disasters and other times of emergency, we are building an electricity storage system using Fuji Electric's fuel cells and other equipment.

As we await the completion of the trial at the end of fiscal 2014, we are working to commercialize the achievements and knowledge gained through the project.

In May 2014, the International Smart Grid Action Network (ISGAN), the smart grid-related implementation body of the International Energy Agency (IEA), gave the ISGAN AWARD 2014 to excellent performing projects around the world. The Kitakyushu Smart Community Project was the only project in Asia ranked in the Top 10.



Cluster Energy Management System (CEMS)

### Column A Smart Meter Essential for the Efficient Use of Energy

Smart meters are set to become key components in realizing effective energy use. Smart meters are equipped with communication functionality to allow the supply side (power companies, etc.) and the user side (commercial facilities, factories, homes, etc.) to share information about electricity use in real time.

In 2011, Fuji Electric and General Electric Company of the U.S. established a joint venture called GE Fuji Meter Co., Ltd. The company has built up a reputation for product quality by providing smart meters to the smart community pilot project in Kitakyushu City. GE Fuji Meter is working to reduce costs and boost its supply capacity, including building a new automated production line to respond to the increase in demand.



## Feature 1: Contributing Solutions for Global Energy Issues

# Initiatives in Indonesia and Other Parts of Asia

In Indonesia, demand for electricity continues to increase as the country's economy expands and its population grows. There are a number of energy-related challenges to be overcome, including power outages and voltage drops due to shortage of power generation capacity, insufficient excess capacity in transmission and distribution equipment, as well as an inadequate power grid. In response, the government of Indonesia has established a long-term policy of bolstering energy supply and diversifying energy sources, as well as working to stabilize the quality of electricity.

Fuji Electric is helping to improve the electric power situation in Indonesia, leveraging its track record as the leading manufacturer of geothermal power stations and the know-how in energy management that it has accumulated in Japan.

### Case Example

### Indonesia Geothermal Power Station

#### Clean Energy

## Supporting Energy Demand in Indonesia with Geothermal Power



Wayang Windu Geothermal Power Station (Indonesia)

The Indonesian government is promoting an energy diversification policy in response to the increase in demand for electric power accompanying the country's rapid economic growth as well as to protect the environment. As a part of this policy, the government has set a target of increasing the amount of geothermal power produced to 9,500 MW by the year 2025.

Currently, the total generating capacity of the geothermal power stations planned or installed in Indonesia is approximately 1,400 MW, and roughly one-half (662 MW) is supplied by Fuji Electric. In fiscal 2013, we received an order to build the Unit 5 (35 MW) at the Kamojang geothermal power station, and we are now in the process of manufacturing the facility with the aim of bringing it online in July 2015.

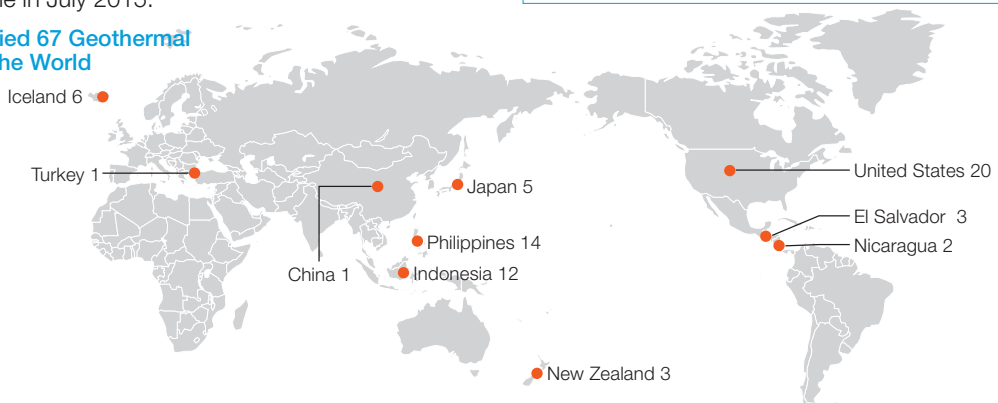
Due to the fact that corrosive geothermal steam is used in geothermal power generation, corrosion, wear, impurity deposits, and other unique issues must be dealt with. Fuji Electric has strong technological capabilities and engineering know-how in steam turbines accumulated over 50 years, as well as corrosion-resistant technologies based on its wealth of experience with geothermal power. These have enabled us to offer highly-reliable and long-lasting geothermal power facilities. Also, with an Operation Support Center capable of checking the operating status of geothermal power stations around the world, we are able to monitor plants' operating status, including steam volume and power generation capacity as well as predict the future status of equipment, make maintenance suggestions, and offer other types of support.

Going forward, we will continue our activities aimed at receiving orders for new geothermal power stations, and contribute to Indonesia's effort to diversify its energy mix to support its economy.

#### Fuji Electric — A Leading Geothermal Power Plant Manufacturer

Fuji Electric is one of the three Japanese manufacturers that account for approximately 70% of the world's geothermal power generating capacity. We have the top share of the global market, accounting for roughly 40% of the geothermal power delivered over the past 10 years.

#### Fuji Electric has Supplied 67 Geothermal Power Plants around the World



**Case Example** **Suryacipta City of Industry**

**Adoption of Smart Energy Systems**

**Stable Supply of Energy to an Industrial Park**

Poor power quality in electric power infrastructure, such as power outage and voltage dip, cause major damage to factories. Securing a stable supply and improving the quality of electric power are therefore priority issues for the development of industrial parks.

Fuji Electric and several other Japanese companies have been contracted to work on the smart community pilot project at an industrial park on the island of Java in Indonesia. The project is being jointly conducted by NEDO\* and Indonesia's Ministry of Energy and Mineral Resources. Preparations are underway for the start of the pilot project in June 2015.

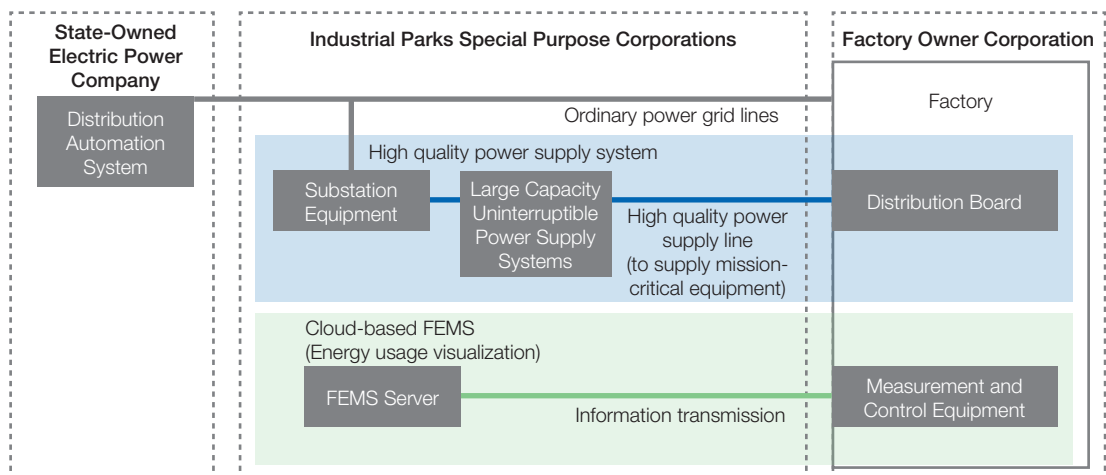
Fuji Electric is responsible for the distribution automation system, which will quickly and automatically restore electricity in the event of a power outage, the high-quality electricity supply system, which uses large capacity uninterruptible power supply systems to protect important equipment from any trouble such as power outages or

instantaneous voltage drops, and a cloud-computing based factory energy management system (FEMS), which visualizes factory energy usage, helping to save energy and reduce costs. We will leverage the technologies and knowledge that we have cultivated in Japan, including through the pilot project in Kitakyushu City, to contribute to the growth of Indonesia's economy and to the reduction of its carbon emissions.

Securing a stable supply of electric power is a common issue at industrial parks in emerging countries throughout Asia and the world. Through this pilot project, we will develop technologies and systems that will allow us to meet such needs in a broader context. Using these systems, we will propose ways to ensure stable supplies of electric power and save energy for industrial parks on a case-by-case basis, according to actual local conditions.

\* New Energy and Industrial Technology Development Organization

**Systems Managed by Fuji Electric**



Suryacipta City of Industry Entrance



Industrial park substation



Large capacity uninterruptible power supply system

## Feature 2: Our New Business in Food and Beverage Distribution

# 2

### Contributing to the Safety and Security of Food with Heating and Cooling Technologies

With the aging society and the falling birthrate, the environment surrounding Japanese agriculture is changing, and there is a growing awareness of food safety and security. As new needs emerge in the food and beverage distribution market, new services and business formats are also appearing in response.

Using its strengths in electric and cooling technologies, we are working to expand its business scope in food and beverage distribution from stores to production areas, food processing, storage and transportation, and yet further into the transportation and delivery sector which connects all of these areas. This is all part of our aim to provide safety and security, freshness, and flavor.

#### Food and Beverage Distribution Market

##### Production areas



Distribution

##### Food processing



Distribution

##### Storage and transportation



Distribution

##### Stores



#### Solutions provided by Fuji Electric

##### Crop Production Facilities

We are building plant factories to increase the reliability of production areas and boost work efficiency.



##### Energy Management

We make the energy used by food processing plants visible and provide energy savings.



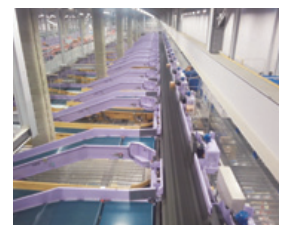
##### Warehouses for refrigerated and frozen foods

We support distribution systems with our cooling technology and our experience and expertise in warehouse design and installation.



##### Distribution System

We build distribution systems including warehouse management and automated cargo sorting with our IT-integrated system controls.



##### Smart Stores

We create energy-saving stores leveraging our electric and cooling technologies. Examples include store EMS\* and energy-saving showcases.



\* Energy Management System

#### Refrigerated storage container

The D-BOX mobile refrigerated storage container enables refrigerated distribution management.



Case Example

Food and Beverage Distribution

New Business

### Safely and Reliably Delivering Fresh Food with Comprehensive Constant-Temperature Distribution Management

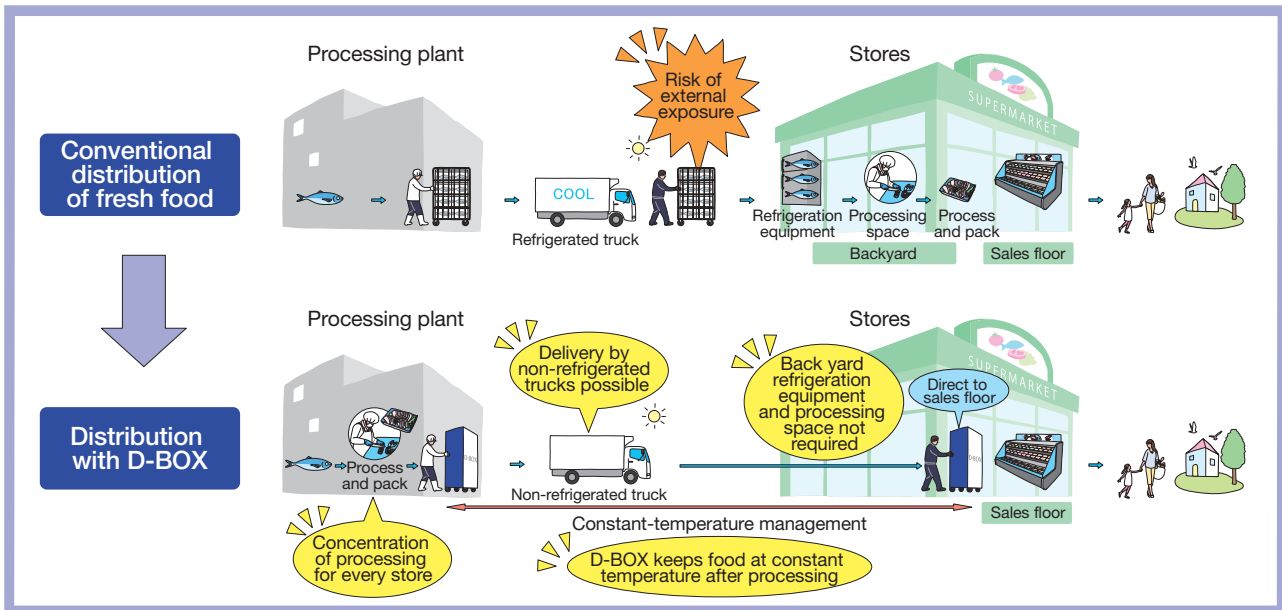
In order to maintain the quality of fresh foods such as meat, agricultural products and seafood, it is important to keep foods at a constant temperature throughout the food distribution process, from the production areas to the stores and ultimately to the sales areas.

The D-BOX, a mobile refrigerated storage container developed by Fuji Electric, uses a built-in refrigerator and the ultimate insulation capabilities to keep food at a constant temperature throughout the food distribution chain. D-BOX keeps foods fresh by minimizing the risk of contact with outside air, and features a system to track the temperature history inside the container to verify if the temperature has been controlled appropriately. This temperature history is centrally managed via cloud computing, allowing customers to use this service in their marketing strategies.

D-BOX enables fresh foods to be processed in bulk at processing plants before being transported directly to sales areas at a constant low temperature. This enables stores to save the equipment and personnel costs associated with preparation, as well as to increase the floor space for sales. With this constant temperature distribution management system, Fuji Electric will continue to contribute to people's lives by increasing the safety and reliability of fresh foods.



\* D-BOX. Three temperature settings include chilled (about 5°C), frozen (about -18°C), and room temperature



#### A Message from a Product Planner



**Yoko Horiuchi**  
 Manager of the Global Food Promotion Department  
 Distribution System Division  
 Food and Beverage Distribution Business Group

D-BOX maintains temperatures correctly and includes a traceability function to track the temperature inside the container as well as to log the opening and closing of the container door. These innovations enable the D-BOX to contribute not only to enhanced food safety and security, but also to society in a number of other ways. These include reducing energy consumption by changing the food processing and distribution process, alleviating the shortage of truck drivers by consolidating delivery, and reducing food and material waste loss.

The D-BOX is a tool that will improve logistics in the food and beverage distribution sector, and I am confident that a wide range of customers in sectors including retail, wholesale, and logistics, will make good use of it.