

# Research and Development

Combining its core technologies in power semiconductors and power electronics with instrumentation and control systems, Fuji Electric is focusing R&D on products and systems that effectively provide and use electricity and thermal energy.

## R&D Policies

- ▶ Expand and strengthen core technologies of power semiconductors and power electronics
- ▶ Accelerate new product development through technology synergies between thermal, machinery, and control systems
- ▶ Promote open innovation



## Major Initiatives in Fiscal 2014

### Power and Social Infrastructure

#### Spray Type Condensers for Axial-Flow Exhaust Geothermal Steam Turbines

Fuji Electric has created the world's first example of using a spray type condenser in the method for flowing turbine exhaust gas axially to connect it with a condenser. This enables plant buildings to be made lower, which is suitable for construction of a geothermal power plant in areas where scenery is a factor, such as Japanese national parks and other areas.



The Maibarara Geothermal Power Plant in the Philippines uses steam turbines, condensers, and other equipment supplied by Fuji Electric

#### Smart Community Verification Projects in Kitakyushu and Keihanna Science City

Fuji Electric participated in both of these projects from 2010 through to their final year in fiscal 2014.

The projects verified the construction of energy management systems in the regions and peak shifting and peak cutting of electricity demand. The technologies and expertise cultivated through the projects will be used in the development of new smart communities.



Kitakyushu pilot project

### Industrial Infrastructure

#### Exhaust Gas Cleaning Equipment for Ships

Fuji Electric has created the world's most compact sulfur oxide (SOx) cleaning equipment for ships, achieving a 50% reduction in size compared to its previous model. The equipment complies with stronger ship fuel exhaust gas regulations that came into force in 2015.



#### Integrated Cloud Services Supporting Facility Life-Cycle Management

Fuji Electric has developed a system that integrates functions such as support for energy management and energy-saving, operational monitoring, and preservation support services for factories, buildings, facilities, and so forth. The various types of information are managed in an integrated way in a cloud computing environment. We provide overall optimization from the perspectives of smart system adoption, safety and security, and management throughout the entire lifecycle of a facility, from its introduction to operation and replacement.

### Power Electronics

#### World's First Large-Capacity Mega Solar Power Conditioning Sub-Systems Utilizing All-SiC Modules

Utilizing an All-SiC module, Fuji Electric has realized power conditioning sub-systems with a 98.8% conversion efficiency, one of the highest in the industry, while reducing the installation footprint by 20% compared with its previous models. This development will contribute to highly efficient power generation at mega solar facilities.



This product was awarded the highest award at the 64th Japan Electrical Manufacturer's Association awards held by the Japan Electrical Manufacturers' Association (JEMA).

#### FRENIC-VG (Stack-Type) Large-Capacity Inverter Utilizing a SiC Hybrid Module

Fuji Electric has developed an inverter utilizing a SiC hybrid module to reduce switching losses in the power conversion circuit by 28% compared to its previous models and increase capacity to 450 kW while retaining the same dimensions of a single 315 kW model. The new inverter will enable customers to save both energy and space at their facilities.



## Electronic Devices

### All-SiC Modules

The All-SiC module has a 45% smaller footprint than a Si-IGBT model of the same rating and uses a new type of package to reduce switching losses by approximately 50%. Fuji Electric is using it for the first time in the world in a mega solar power conditioning sub-system to achieve highly efficient energy conversion.



### Automotive Pressure Sensors

Fuji Electric has developed a pressure sensor that maintains high accuracy under the harsh automotive environmental conditions to help optimize engine control. The sensors will be installed in engines that comply with the EURO 6 exhaust gas regulations in Europe and contribute to fuel efficiency improvements and cleaner exhaust gas.



## Food and Beverage Distribution

### Vending Machines with DC Power Vend Mechanism

Fuji Electric has improved the functionality of beverage vending machines for cans and PET bottles, such as new DC vend mechanism, and has also achieved energy savings. Moreover, by fitting them with back-up power source, the machines can continue to supply beverages when in a power outage, for example during a disaster.



### Twistar – A Vending Machine for China and Asia

With four types of the easily replaceable selling modules, and three selectable temperature settings (strong/weak refrigeration or at ambient temperature), this newly developed vending machine is globally adaptable and able to sell a wide range of products including beverages, food, and merchandise. It can also be used in “unattended stores” during nighttime hours and so forth.



## New Technology

### Anti-Corrosion Technology for Geothermal Turbines

To enhance the erosion resistance (fluid abrasion) of turbine blades in thermal and geothermal power generators, Fuji Electric developed extra-deep laser-hardening reformulation technologies that have doubled the life of the blades.

## Voice

## Message from a Developer



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### Small- and Medium-Scale Monitoring and Control System **MICREX-VieW XX**

The MICREX-VieW XX conducts status monitoring and control of factory production lines and power plants, contributing to plant energy savings as well as operational safety and security.

The most important factor in developing this product was using a common platform applicable to all industrial fields: namely, pursuit of performance improvement, flexibility of system scale and configuration, and cost competitiveness. Another factor was considering the needs and wishes of the many customers who are long-time users of our control systems by ensuring compatibility with their previous user interfaces while also improving operability. We made multiple visits to customers' sites, and sales divisions, technology divisions, and factories worked in concert to identify the true needs behind customers' requests, carrying out repeated proposal activities including demonstrations. We also worked to expand functions that would enable us to make effective use of customers' existing application assets while upgrading their systems in stages, which really demonstrated our careful attention to their needs.

Looking ahead, we will leverage the Company's expertise and combined capabilities to increase customer satisfaction even further by improving on the high performance and reliability of our systems.



A single unit achieves process automation for controlling temperature and pressure, as well as factory automation for dealing with process and assembly control