# Creating New Customer Value and Resolving Social Issues Through Our Innovation in Energy and Environment Technology

**NAKAYAMA, Kazuya**
Corporate General Manager, Corporate R&D Headquarters, Fuji Electric Co., Ltd.

Fuji Electric has been implementing research and development to create new customer value and resolve social issues based on our Management Policies to contribute to the creation of a responsible and sustainable society through our innovation in energy and environment technology. In addition to developing new products in line with our business strategy and creating products that will expand our global business, we are also strengthening our search for research themes and product planning to respond to major changes in the market environment, such as the advent of carbon neutrality and DX (digital transformation).

In order to achieve the 2023 Medium-Term Management Plan and growth strategies beyond, we have been concentrating resources on the development of products and technologies to achieve electrification in the mobility field, including automobiles, railroads, and ships, as well as to resolve environmental issues and other global challenges. Below, I will introduce our key efforts in FY2021 for each segment of business.

In the power electronics energy segment, for the expanding electricity balancing market, we have developed the "PVI1400CJ-3/2600" PCS (2,600 kVA) for large-capacity storage batteries, which has the world's smallest size. Using Fuji Electric's proprietary power semiconductors, it achieves a high conversion efficiency of 98.2%. Using a high voltage DC input has reduced the cable losses between the battery and the PCS.

In the power electronics industry segment, we have been developing systems that combine IoT with our distinctive components, such as inverters, servos, control equipment, and measuring equipment, on the basis of power electronics as core technology. These systems serve to create value, for instance, providing automation systems, improving productivity, and saving energy in all of the industries. In control equipment, we have developed the "SPH5000EC," a new CPU module for the MICREX-SX Series of programmable controllers, for use in packaging machines, printing machines, semiconductor manufacturing equipment, and other machinery and equipment. Using EtherCAT open network facilitates the building of high-speed, high-precision motion systems in combination with servo and other devices. In measuring instruments, we have developed the FCX-AIV Series of pressure transmitters for the process automation market, including petrochemical plants. It has acquired the functional safety standard IEC 61508 (SIL2) and can be used for emergency stop functions of control systems that require high reliability.

In the semiconductor segment, we have been developing products that contribute to low power dissipation (higher efficiency), compactness, and high reliability of power electronics equipment. As for industrial modules, we have developed a 3.3-kV All-SiC module for power conversion equipment used in railcars. It integrates 2nd-generation SiC trench gate MOSFET chips and has reduced power dissipation. Combined with a newly developed low inductance package, it contributes to improved efficiency and size reduction of equipment. In addition, we have developed automotive power modules for electric vehicles and hybrid electric vehicles. They use RC-IGBT chips that have been reduced in power dissipation, a cooler with high heat dissipation efficiency, and a lead frame package that reduces internal wiring inductance. The modules accomplish twice the power density of previous products and contributes to the size and weight reduction of electrified vehicles.

In the power generation segment, we are developing geothermal, solar, biomass, and other power generation systems to help achieve a decarbonized society and create resilient power infrastructure. With regard to geothermal power generation, a market that is expected to expand further toward achieving carbon neutrality, the Rantau Dedap geothermal power plant (49.2 MW × 2 units) in Indonesia has started commercial operation. We developed and put to practical use the world's first "double-flush multi-pressure combined system" to maximize power output.

In the food distribution segment, we have been developing vending machines to promote improved convenience and to save labor and energy. We have developed "Frozen Station," a frozen food vending machine, for restaurants and retail stores, which use a wide range of methods to serve their products. The product storage structure has been devised to achieve the industry's top class product capacity.

Next, I will introduce efforts in common fundamental and advanced technologies. We have developed an analytics and AI technology that automatically ana-

lyzes factors in reducing the efficiency of energy plants using a combination of cause-and-effect analysis and machine learning. As for power electronics technology, we have been developing technology to substitute SF6 gas, which has a high global warming potential, for use in gas insulated switchgear (GIS). With regard to heating and cooling technology, we have developed the industry's first compressor-less high-efficiency ejector cooling technology to effectively use factory waste heat. Unused low-temperature waste heat generated in production process can be utilized to efficiently generate cool water.

In this way, Fuji Electric refines its real-world technology and enhances its digital technology to create new value for customers and solve social and environmental issues. We will innovate energy and environment technology through the sophisticated synergy and integration of these technologies to contribute to the creation of a responsible and sustainable society.

Fuji Electric

*Innovating Energy Technology*