Power Generation

Renewable Energy and New Energy
Solution Services

Working towards the realization of a decarbonized society has become a global trend. In Japan, the Sixth Basic Energy Plan was approved by the Cabinet in October 2021. Efforts to expand the use of renewable energy are accelerating, with the goal of reducing greenhouse gases emissions by 46% by 2030 and achieving carbon neutrality in 2050. In the field of solar power generation, projects with corporate power purchase agreements (PPA) is drawing attention. The Ministry of Economy, Trade and Industry's efforts to promote geothermal power generation aim to "reduce lead times by up to 2 years and double the number of geothermal power plants nationwide by 2030." Attention has been placed on expanding the introduction of renewable energy in harmony with local communities. Fuji Electric continues to accelerate its efforts to make a social contribution in the fields of renewable energy and distributed power sources.

Renewable Energy and New Energy

In the field of geothermal power generation, for which we have the largest market share in the industry, we are continuously promoting our power generation equipment and system backed by our extensive track record as we target Japan and promising regions in Asia, Africa, Iceland, New Zealand, and the United States. In FY2021, a geothermal power plant delivered to PT Supreme Energy Rantau Dedap started commercial operation in December 2021, which we constructed on an engineering procurement and construction (EPC) project (turn-key project) basis, jointly with PT Rekayasa Industri in Indonesia. We have also received an order for the Tauhara Geothermal Power Station in New Zealand, the world's largest single unit capacity geothermal power plant, and we are on track to complete the project in FY2023. In Japan, we will expand sales of power generation equipment for small-scale heat sources as distributed power sources, and in other countries, we will strengthen relationships with local companies and supply chains to improve our presence in the market.

In the fields of solar and wind power generation, we are promoting the expansion of solar and wind power generation equipment, supported by our track record of successful deliveries, as well as our technological superiority in contributing to the stabilization and peak shift of electric power using high-efficiency power conditioning systems equipped with power semiconductors and storage batteries. In FY2021, we received an order from a local government for a solar power plant for a microgrid including power purchase agreement (PPA), creating a foothold for the change from large EPC projects to small and medium EPC projects. We also have steadily received orders for substation equipment for wind power plants, as well as an order for a storage battery system for the effective use of renewable energy power. In FY2022, we will further promote the transformation of the business form for solar power generation from a large-scale EPC projects to a small- and medium-scale EPC projects for microgrid and private consumption PPAs. In the field of wind power generation, by taking advantage of its strength in power system analysis technology, Fuji Electric will work to further promote our substation equipment while also assuming onshore small and medium EPC projects.

Solutions Service

In the field of maintenance and replacement, in the current trend toward carbon neutrality, there is a demand for solutions that enable changing the fuel type of existing power generation facilities and changing the operation in accordance with changes in the power source configuration. We have been developing various diagnostic and repair technologies in addition to replacement technologies to improve efficiency and operational flexibility. In generator stator diagnosis, we have developed one of the industry's thinnest inspection robots to enable diagnosis without having to pull out the rotor, thereby contributing to a shorter outage period. In turbine repair, we are promoting onshore and on-site implementation by applying ASTM standard* alternative materials and to complete repair services on site overseas.

In the field of nuclear power, we are continuously contributing to safe resumption of operation, decommissioning, and radioactive waste treatment for nuclear power plants by utilizing our proprietary technology, which focuses on remote handling, radiation measure-

ment, and waste treatment (remote cutting, advanced solidification, etc.). In FY2021, as an effort to minimize the amount of radioactive waste generated, we developed a system for recycling waste cables and a decontamination system for small-diameter piping. We have also started to develop a multi-nuclide analysis technology to meet the requirements for rapid and accurate quantitative measurement of radioactivity.

Fuji Electric is promoting efforts to realize a society based on continuous economic and environmental recycling by supplying highly efficient and environmentally friendly clean energy and providing services to monitor, maintain and manage a safe and secure energy supply.

* ASTM standards: Standards by American Society for Testing and Materials, currently established by ASTM International

Renewable Energy and New Energy

1 Start of the Commercial Operation of the Kanda Biomass Power Plant, Kanda Biomass Energy K.K.

Fuji Electric has delivered the main equipment for power generation (steam turbine, generator, auxiliary equipment, etc.) through Sumitomo Heavy Industries, Ltd. to the Kanda Biomass Power Plant (approximately 75 MW) of Kanda Biomass Energy K.K.

This plant is an environmentally friendly power generation facility that reduces CO_2 emissions by using wood biomass (palm kernel shells and wood pellets), a renewable energy source. The plant commenced commercial operation in June 2021.

Its steam turbine, which requires high reliability and high efficiency, is a single casing reheat turbine. It uses an air-cooled brushless exciter generator with an extensive operational track record. We optimized the facility layout to reduce the building area.

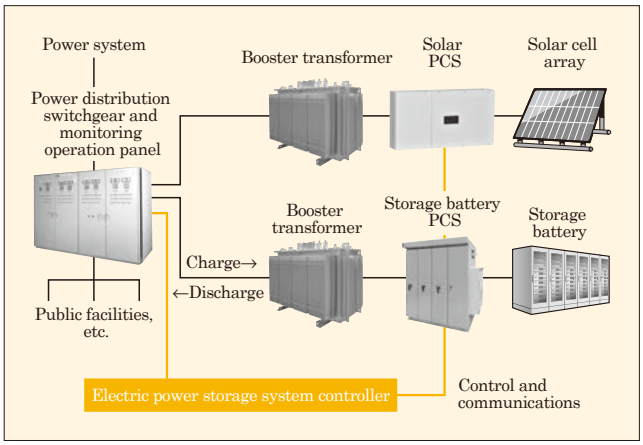
Fig.1 General view of 75-MW biomass power plant

2 Solar Power Station with Storage Batteries for Regional Microgrid

With the aim of realizing a decarbonized society, efforts to turn renewable energy into a major power source are accelerating, and one method is to introduce renewable energy using regional microgrids. Since it is important to coexist with the local community and secure the most suitable land for power generation, local governments are promoting these efforts by taking the initiative in building local consensus.

Fuji Electric has been working on a solar power generation business for local governments since FY2021. For this initiative, we received an order for turnkey contract (EPC) of a solar power station with storage batteries that is to be a major element of the regional microgrid and have started construction. An electric power storage system (ESS) using lithium-ion batteries is colocated to continue supplying electric power even in the event of a disaster. We thus help promote the local production for local consumption of electric power and raise the self-sufficiency rate of renewable energy of the local municipality.

Fig.2 System configuration example



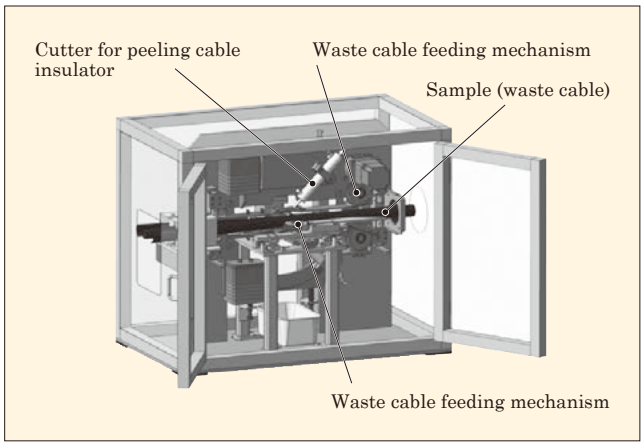
Solution Services

1 Efforts to Recycle Waste Cables Generated in the Decommissioning of Nuclear Power Plants

The decommissioning of nuclear power plants generates approximately 2,000 km of waste cable per plant, and the disposal is said to be costly. Fuji Electric, in cooperation with Fuji Furukawa Engineering & Construction Co., Ltd., is developing an automatic system to separate waste cables into insulator and conductor. Most of the radioactive contamination on waste cables is on the insulator surface. This system aims to automate the identification of contaminants, separation of contaminated insulator, extraction of conductor, measurement of radiation amount, and determination of contamination level. Since non-contaminated wires can be recovered as clearance material*, waste costs can be saved by reducing the amount of radioactive waste, and resources can be recovered and reused. This contributes to safe and efficient decommissioning.

* Clearance material: Material that has very low levels of radioactivity and do not need to be treated as radioactive waste.

Fig.3 Automatic cable insulator separating system (under development)

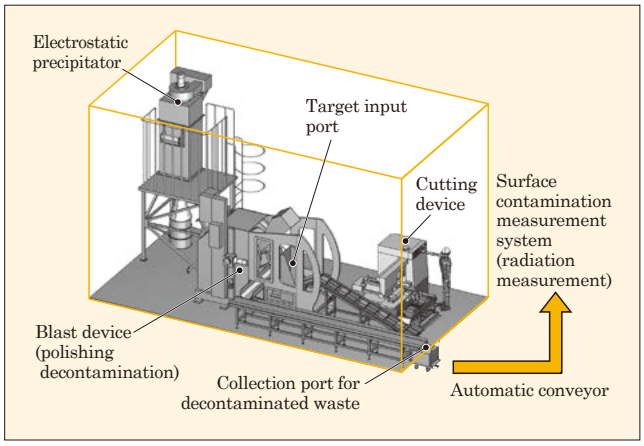


2 Decontamination System for Small Diameter Tubes

Safe and efficient decommissioning of nuclear power plants is important not only for operators but also for local communities and citizens. The dismantling of heat exchangers, which are the core equipment of nuclear power plants, is said to produce approximately 100 tons of waste heat exchanger tubes per nuclear power plant. However, due to the current high cost of processing, all of these tubes are assumed to be radioactive waste rather than clearance material*. Fuji Electric, in cooperation with Fuji Furukawa Engineering & Construction Co., Ltd., has developed a process to automatically cut heat exchanger tubes in round slices, decontaminate them, and measure their radiation. We then built an automatic processing system and are evaluating it in cooperation with the Tokyo Institute of Technology. Using this method, we aim to allow the heat exchanger tubes to be treated as clearance material while reducing the costs for decontamination and measurement.

* Clearance material: Material that has very low levels of radioactivity and do not need to be treated as radioactive waste.

Fig.4 System overview



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Innovating Energy Technology