

Power Generation

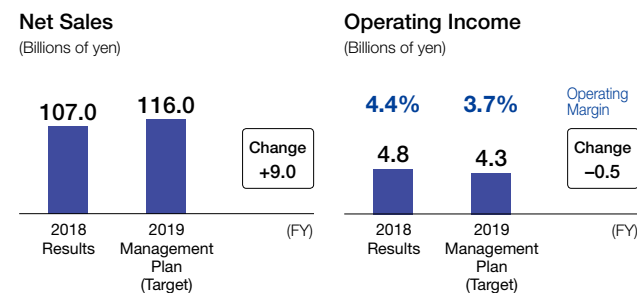
Fully leverage cultivated power plant strengths to shift to renewable energy and after-sales businesses

Executive Officer
Corporate General Manager,
Power Generation Business Group
Tadao Horie



Business Areas

- Renewable and new energy**
Geothermal power, hydro power, solar power, wind power, fuel cells
- Thermal power**
- Nuclear power-related equipment**



Awareness of Market Needs

Since the adoption of the Paris Agreement, an international framework for combating climate change, there has been a strong global push to realize a low-carbon society. This push has stimulated structural reforms in thermal power businesses in Japan and overseas.

Against this backdrop, it can be expected that use of renewable energy that does not emit greenhouse gases will spread. At the same time, demand is growing on a global scale for the improvement of generation efficiency through replacements of and upgrades to aging generation facilities.

Furthermore, decommissioning has been decided or is being considered with regard to several nuclear power plants in Japan. This situation is expected to drive the growth of the decommissioning system market going forward.

Strengths of the Power Generation Segment

The Power Generation Segment boasts a diverse lineup of products encompassing thermal power, geothermal power, hydro power, solar power, and wind power generation equipment; nuclear power-related equipment; and fuel cells. We also have an extensive track record of delivering such power generation facilities to a wide range of power generation business operators through engineering, procurement, and construction (EPC) and other arrangements.

Fuji Electric has more than half a century of experience in the thermal and hydro power fields, and we have maintained the top global share of deliveries of geothermal power generation equipment since 2000. In addition, we have participated in

numerous solar power EPC projects as the number of such projects grew rapidly following the introduction of feed-in tariff schemes. In nuclear power-related equipment, we have developed a track record with regard to fuel transport and radioactive waste material treatment facilities.

The plant engineering experience and the insight and expertise gained through this experience are valuable assets of the Power Generation segment.

Priority Measures for Fiscal 2019

The Power Generation segment has begun overhauling its previous business structure, which was centered on thermal power generation. By fully leveraging its cultivated power plant strengths, Fuji Electric is shifting its business portfolio toward renewable energy and after-sales businesses.

Expand renewable energy orders

Fuji Electric aims to expand renewable energy orders through the provision of high-value-added solutions. In the wind and solar power fields, we will contribute to stable electricity quality and energy supplies by making excellent use of the various technologies related to control and electricity storage. Meanwhile, in the geothermal power field, we are bolstering our lineup of binary geothermal power offerings that make use of the heat emitted from existing facilities as we seek to help quickly bring geothermal power plants on stream.

Expand after-sales businesses

In its after-sales businesses, Fuji Electric is shifting its focus from inspections and repairs to proposal-based services. In the thermal and geothermal power field, we boast extensive insight and experience as a power generation equipment manufacturer that is knowledgeable in everything from structures to materials. Leveraging this foundation as well as the technologies of the specialized after-sales service company acquired in the United States in fiscal 2015, we aim to expand orders for onsite and quick delivery after-sales services to improve power generation efficiency and to extend equipment lifespans. As for hydro power, our efforts will be focused on responding to the robust replacement demand by contributing to customers' businesses and to reductions in environmental impacts through such means as improving efficiency and mitigating oil leak risks.

Reinforce and expand decommissioning system operations

Centered on fuel transport and radioactive waste material treatment facilities, areas where it has a developed track record, Fuji Electric is taking steps to reinforce and expand its domestic decommissioning system operations. Looking specifically at radioactive waste material treatment facilities, we are enhancing our proposal capabilities with the aim of spreading application of the SIAL® cutting-edge solidification technology, which has a track record overseas.

Close-Up

Contributing to expanded use of renewable energy through binary geothermal power

Since delivering the first geothermal power generation facility to be put to practical application in Japan in 1960, Fuji Electric has proceeded to supply 82 geothermal power turbines around the world with a combined generation capacity of 3.2 GW. Principal examples of Fuji Electric-supplied facilities include one of the world's largest flash-cycle*1 turbines as well as one of Japan's largest binary*2 turbines.

Demand for binary generation technologies is rising above the demand for flash-cycle technologies as binary technologies allow for power generation to be performed using hot water or low-temperature steam, thus bringing the potential to expand the scope of geothermal power generation businesses.

Fuji Electric is advancing the development of equipment that realizes high-efficiency generation using smaller heat sources. We also package geothermal systems as decentralized power sources in bundles tailored to provide the ideal response to customer needs in order to reduce the amount of expenses and time required for installation. In addition, we develop portable systems to enable equipment to be more easily reused in case a heat source is depleted.

In this manner, we are committed to contributing to the spread of renewable energy by providing these solutions for heightening the profitability of customers' power generation operations.

*1 A generation method in which geothermal steam directly turns turbines
*2 A generation method in which low-temperature steam or hot water is used to heat and evaporate organic mediums with low boiling points so that the resulting steam can turn turbines



Nga Awa Purua Geothermal Power Station (140 MW generation capacity, New Zealand)



Takigami Binary Geothermal Power Station of Idemitsu Oita Geothermal Co., Ltd. (5.05 MW generation capacity, Oita Prefecture, Japan)

Upgrading hydro power generation facilities to contribute to higher efficiency and reliability and lower costs

Fuji Electric has been involved in the hydro power field longer than any other area of power generation. Over our many years of involvement in this field, we have delivered 431 hydro power generation facilities to power companies and private generation business operators in Japan with a combined generation capacity of 4.8 GW.

Hydro power has continued to support the economic growth of Japan as a reliable, low-cost base load power supply. As existing hydro power facilities age, demand is growing for scrap and build*1 projects.

For example, we installed a turbine designed using state-of-the-art 3D flow analysis technologies at the Akiha No. 1 Power Station and were thereby able to boost this facility's generation capacity from 45.3 MW to 47.2 MW.

One strength of Fuji Electric in this field is its turbine output adjustment technologies. Previously, it has been common for output adjustment to be performed using hydraulic servos for turbines with medium to large output capacities and electric servos for small-capacity turbines. However, Fuji Electric is leading the industry as it was among the earliest to realize the practical application of hybrid servo systems that maintain the cost benefits of electric servos while being applicable to a wider range of turbines.

The upgrade at the Akiha No. 1 Power Station enabled us to refine this system while employing a proprietary design*2 that utilizes backup facilities under normal operating conditions in addition to during main equipment failures. This design realizes the same level of performance as a conventional system with less than half the equipment.

The reduction in the number of parts not only increased the reliability and ease of maintenance of the system, but also contributed to significantly lower initial and running costs.

*1 Projects in which aged, inefficient facilities are decommissioned and replaced with new facilities to improve efficiency
*2 Joint patent held with Electric Power Development Co., Ltd.



Akiha No. 1 Power Station of Electric Power Development Co., Ltd. (47.2 MW, Shizuoka Prefecture, Japan)



Hybrid servo system