Operating Environment

Over the medium to long term, in the power generation field demand related to renewable energy is likely to grow due to measures to counter global warming and increasingly stringent environmental regulations, while that for generation using fossil fuels is expected to slow or fall.

The main business in this domain—natural gas and coal-fired thermal power generation facilities and nuclear power generation facilities—will continue to represent major sources of power.

Therefore, demand for maintenance services for our main business remains robust. On the other hand, we expect demand for newly constructed power plants to stagnate—particularly for coal-fired thermal generation. Competition for orders is likely to heat up as a result.

In wind power and other types of renewable energy, demand is forecast to continue growing. Going forward, needs in this area will include increased generation efficiency and lower unit generating costs. We also expect the need for supply and demand adjustment systems and electricity storage systems to grow. In order to stabilize sources of electric power.

At the same time, future prospects in the oil and gas field are subject to the protracted curtailment of investment as the price of crude oil falls. Nevertheless, we anticipate a resurgence in demand for compressors as the market recovers. Given the globally robust aircraft market, we believe the market for aero engines will continue to deliver solid growth.

Directions for Fiscal 2017 and Focus Strategies for the Medium to Long Term

We expect the operating environment to remain challenging in fiscal 2017. Even so, we plan to meet our sales and profit targets, thanks to growth in the service business and steady progress on the construction of large-scale domestic thermal power plants for which we have already received orders. Also, as we move forward toward the new business plan that will commence in fiscal 2018, we will seek to bolster profitability by accelerating PMI at MHPS and augmenting competitiveness through turbomachinery synergies, building a solid financial and technological foundation.

Over the medium to long term, we expect the composition of power generation sources to change and become more diverse in response to needs to lower environmental impact and move toward a low-carbon society. Responding accordingly to customer demands in these respects, it will become increasingly important for us to develop more sophisticated generation technologies and provide optimal solutions for the efficient use of energy.

In thermal power generation facilities, we have taken the lead and are moving enthusiastically forward in the gas turbine combined cycle (OTC) arena by accelerating the development of a 1450°C-class next-generation gas turbine that realizes one of the world's highest levels of efficiency. In coal-fired generation, we are proceeding with the construction of integrated coal gasification combined cycle (IGCC) facilities that offer increased generation efficiency and reduced CO2 emissions.

In nuclear power generation systems, we are concentrating on providing support for the restart of a pressurized water reactor (PWR) that conforms to Japan's new standards, which are some of the world's highest. At the same time, we are stepping up collaboration with the AREVA Group of France, working in the nuclear fuel cycle process field and engaging in new overseas projects.

Offshore wind power generation facilities are a focal area in the renewable energy field. In this category, we are working with MVOW of Denmark. We plan to launch a cutting-edge 9.5MW turbine and expand the North American, Asian, and other markets. To respond to the increase in demand for supply and demand adjustment, which is caused by growth in renewable energy generation, we will provide systems that leverage our aero-derivative gas turbines—with their rapid startup capabilities—as well as demand for facilities to store electricity.

From the perspective of energy-efficient operation, we propose solutions that utilize Internet of Things (IoT) and artificial intelligence (AI) technologies. Specifically, we will begin offering the MHPS-TOMONTM digital solution service for optimizing facility operation and maintenance, as well as the ENER/G CLOUD Service, which realizes energy-efficient operations at factories and other facilities.

We will also seek to maximize synergies from consolidating our turbomachinery technologies, centered on gas turbines. In compressors, we intend to secure orders for petrochemical plants, which has typically been an area of strength for MHI. We will also seek to combine these offerings with gas turbines to provide new compressor trains, increasing their introduction into the upstream oil and gas market. In aero engines, we aim to expand the business of maintaining engines that are currently in operation, as well as developing next-generation engines.
Addressing Social Issues

An Energy Portfolio that Contributes to the Realization of a Low-Carbon Society

Social Issues
Since the second half of the 20th century, global warming has been driving changes in the climate: atmospheric and ocean temperatures have been rising, increasing ocean levels and reducing the amount of polar ice. The Intergovernmental Panel on Climate Change (IPCC) surmises that rising concentrations of CO₂ and other greenhouse gases are highly likely to be a major cause. Worst-case scenarios predict that average global air temperatures will rise by around 4°C by the year 2050, presenting the serious risk of climate change across the entire world. Global efforts to counter this situation by realizing a low-carbon society, such as by adopting the Paris Accord, are growing. As electric power generation has a particularly large effect on CO₂ emissions, renewable energy use is forecast to grow substantially over the medium to long term.

Forecast of Global Changes in Average Global Surface Air Temperatures

Source: Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report

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MHI Group’s Solutions

MHI Group provides some of the world’s most efficient thermal power plants. We also have an extensive menu of power generation offerings in the area of renewable energy, including offshore wind turbines and geothermal generation systems. Through combined systems that incorporate AQCS and SOFC*, we can contribute to a reduction in greenhouse gases, meeting needs in regions around the world.

Looking first at our thermal power plants, which boast some of the highest efficiencies in the world, as one aspect of our activities as a world leader in high-efficiency gas turbine combined cycle (IGCC) systems, at our demonstration facility in the Takasago cycle (GTCC) systems, we are working on the development of dual benefit of making effective use of resources and helping to protect the environment. Combining an IGCC system with our AQCS curtails the environmental impact of coal-fired generation, optimizing facilities for the regions where they will be used. By commercializing SOFCs as a next-generation technology, from fiscal 2017 MHI Group will begin launching hybrid units combining SOFCs and micro gas turbines. SOFCs reform natural gas and LNS into hydrogen and carbon monoxide, reacting with the oxygen in the air to generate power directly. As the heat produced in this process can also be used effectively, energy efficiency is extremely high, leading to expectations for future use in distributed or concentrated power sources.

Energy Portfolio that Contributes to the Realization of a Low-Carbon Society

In this domain, we are leveraging leading-edge IoT and AI technologies to respond to diverse customer needs. For thermal power plant customers, in March 2017, MHPS began providing MHPS-TOMONI™, which optimizes operational and maintenance costs of thermal power generation facilities and enhances their environmental performance. Leveraging big data analysis and AI technology derived from the innovative technologies and specialized knowledge we have cultivated in thermal generation over decades, in-house QM know-how, total plant knowledge, and customer partnerships, MHPS-TOMONI™ is a comprehensive package of digital solutions developed for the power industry.

Also, in April 2017, we began providing the ENERGY CLOUD® Service for customers that use large amounts of energy. ENERGY CLOUD® is a general term for the energy solution service based on MHI Group’s industry-leading technological strength and experience in power generation facilities and related businesses, as well as comprehensive analysis from the Group’s own diversified plant operation expertise, configured with our unique ENERGY CLOUD® Brain AI technology. Data is measured through our newly developed facility operation monitoring system, and analysis is performed using this AI technology. The data and analysis enable energy demand to be forecast to a high level of accuracy—higher than 90%. By performing this forecasting and ascertaining facility operational status, the system helps improve energy procurement and production efficiency. ENERGY CLOUD® can also be configured into an energy management system (EMS) that uses a network connection and operates over multiple business sites. We have begun considering an overseas rollout in line with needs in various regions. We anticipate that this could become a ¥100.0 billion business.

Solutions Combining IoT and AI Technologies, as Well as the Knowledge Cultivated Over Many Years

ENERGY CLOUD® Service Scheme

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R&D Case Study

Development of Elemental Technologies for 1,650°C-Class Next-Generation Gas Turbines

MHI has developed high-efficiency gas turbine combined cycle (IGCC) systems for many years. We are now working on the development of elemental technologies, including the gas turbines with a turbine inlet temperature in the 1,650°C class and a next-generation air cooling system, in the aim of achieving combined thermal efficiency of more than 64%, exceeding that of new machines offered by our competitors. Specifically, we are developing technologies to predict the risk of combustion instability and flashback (backfire) associated with higher turbine inlet temperatures, as well as prediction technology for turbine blade heat transfer coefficient distribution to minimize the rise in cooling air temperature, leading to increased generation efficiency. In the aim of gaining the top share of the market for gas turbines larger than 300MW, the main manufacturing technologies, we are accelerating development with a view to market launch in fiscal 2019.