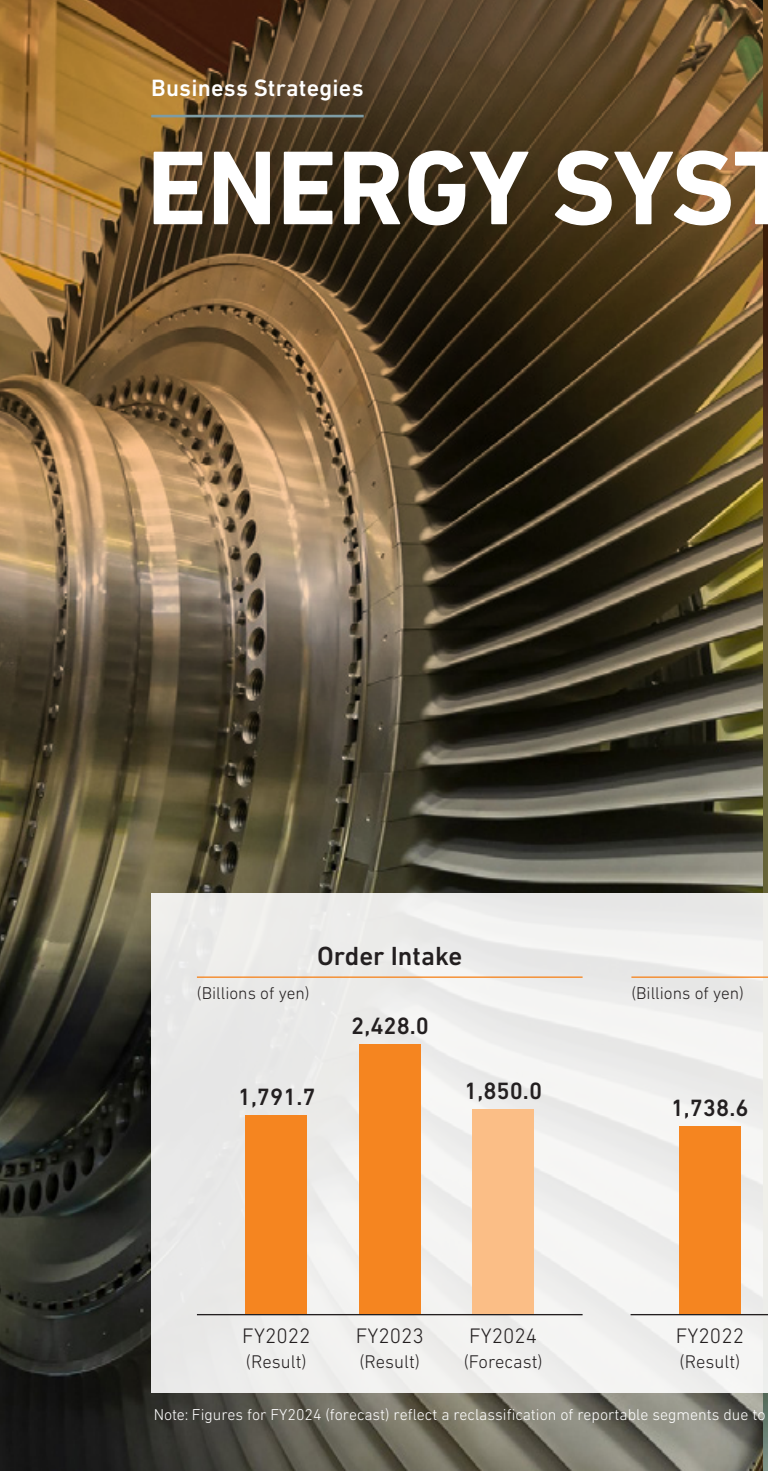
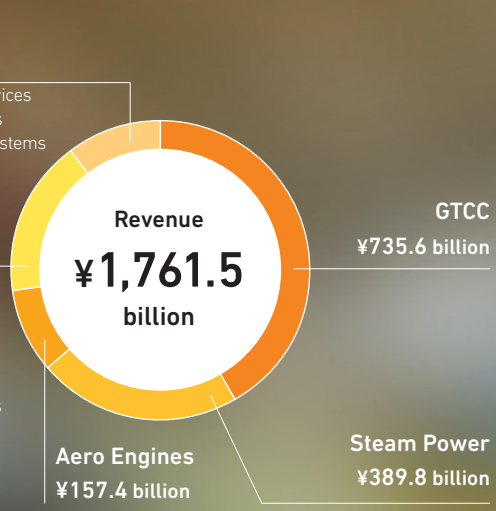
ENERGY SYSTEMS





Note: Figures for FY2024 (forecast) reflect a reclassification of reportable segments due to a reorganization, including the establishment of the new GX Solutions segment on April 1, 2024.

Overview of FY2023

Consolidated order intake totaled ¥2,428.0 billion, up from the previous year, mainly due to an increase in orders for GTCC systems, for which we maintain the top share of the booming global market, as well as higher orders for nuclear power systems in response to the restart of existing plants.

Revenue amounted to ¥1,761.5 billion, up year on year, mainly due to increased sales of aero engines and nuclear power systems. Profit from business activities was ¥141.5 billion, surpassing the previous year's figure, mainly owing to increases in earnings from GTCC systems and steam power systems, as well as stable earnings from nuclear power systems.

Takasago Hydrogen Park

Takahama Nuclear Power Station
(The Kansai Electric Power Co., Inc.)

Business Environment and Key Strategies in the Medium to Long Term

Business Environment

The movement towards decarbonization is accelerating, centered on Europe and the United States, among rising interest in achieving Carbon Neutrality and energy security.

The European Union is seeing a wider reevaluation of nuclear power and natural gas, with a decision to include nuclear power and natural gas in the EU Taxonomy[1], which defines sustainable economic activities.

In Japan, the cabinet approved the Basic Policy on Green Transformation in February 2023. The policy clearly lays out the country's direction on both responding to climate change and ensuring a stable supply of energy, mainly by promoting action on decarbonization, such as thorough energy conservation and switching to decarbonized sources of electricity that help to increase the country's energy self-sufficiency, such as nuclear power and hydrogen. MHI Group is actively promoting an Energy Transition grounded in reality through a wide range of solutions including gas & steam power systems, such as high-efficiency gas turbines, hydrogen-firing gas turbines, and biomass boilers, as well as nuclear power systems.

1 EU Taxonomy: A set of criteria established as part of the European Union's sustainable finance strategy, defining standards for "sustainable economic activities"

Business Status

Gas & Steam Power Business

Gas turbines saw a steady buildup of orders received from Japan, the U.S., Brazil, Uzbekistan, Singapore, and elsewhere backed by firm demand for gas-fired thermal power, which has a lower environmental impact than coal-fired thermal power. The Company's gas turbines are highly regarded for offering the world's highest level of efficiency and output capacity and maintained the world's top market share in FY2023 for the second consecutive year. This is due to the high product reliability of the J-series gas turbine, which has a cumulative operating time of more than 2 million hours, and the future extensibility such as installation of CO_2 capture equipment and conversion to hydrogen-firing.

At the GTCC demonstration facility (rated output: 566,000 kW) in Takasago Hydrogen Park, we successfully conducted demonstration tests using the latest JAC gas turbine with a turbine inlet temperature of 1,650˚C. The tests, conducted at both partial and full loads, utilized a mixed fuel containing 30% hydrogen blended with city gas. Moving forward, we will make full use of Takasago Hydrogen Park, which enables integrated demonstration tests, from hydrogen production to storage and utilization (power generation). In the process, we will establish hydrogen-fired gas turbine technology to help realize a future carbon-neutral society.

The focus of the steam power business is shifting to a service-centered model in response to the shrinking new-build market. As the need for stable electricity supply and decarbonization differs from region to region, we propose solutions tailored to local conditions. As part of this effort, we signed a memorandum of understanding to study the use of biomass and ammonia fuels at existing thermal power plants. We are also promoting CO_2 emissions reduction in our service business by making proposals for maintenance and suggesting innovations to increase efficiency, for example.

Nuclear Power Business

In the nuclear power business, we are working with electric utilities to restart existing light water reactor plants, installing severe accident management facilities (Specialized Security Facilities), and preparing for completion of a fuel cycle facility's construction. In FY2023, we completed the installation of key equipment for such facilities at Kansai Electric Power's Takahama Nuclear Power Station (Unit 1 and Unit 2) and restarted operations, thus contributing to stable and low-cost supply of electric power through the stable operation of 12 PWR[2] plants. Recently, based on our track record in restarting PWR plants and installing Specialized Security Facilities, we

have received a number of requests from BWR[3] electric utilities for support in regard to restarting BWR plants and installing Specialized Security Facilities. In addition, with a view to contributing to the realization of Carbon Neutrality and stable energy supply, we have been working with four PWR electric utilities[4] on joint development and design of the Advanced Light Water Reactor SRZ-1200, which will achieve the world's highest standards of safety, aiming for practical implementation in the mid-2030s. The basic design for the standard plant has been largely completed. Once a specific construction site is determined, we will proceed with basic and detailed designs of individual plants, with the aim of achieving early commercialization.

Furthermore, to enable us to respond to diversifying social needs in the future, we are proceeding with development of technologies including small light water reactors as distributed power sources, high temperature gas-cooled reactors that can contribute to large-scale stable hydrogen production, and fast reactors that contribute to a reduction in the volume and toxicity of radioactive waste. With government assistance, we are aiming for practical implementation of these technologies around 2040. In FY2023, MHI was selected as the core company for design and development of a demonstration fast reactor and a high temperature gas-cooled demonstration reactor, both promoted by the Japanese government.

2 PWR: Pressurized water reactor
3 BWR: Boiling water reactor
4 Hokkaido Electric Power, Kansai Electric Power, Shikoku Electric Power, and Kyushu Electric Power

FOCUS

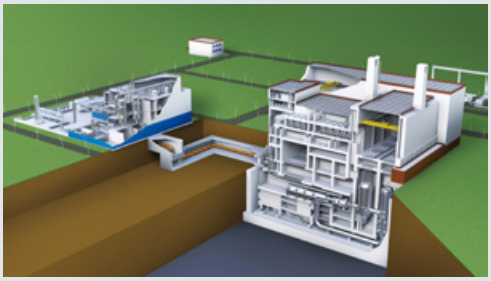
Selection as core company for development of a demonstration fast reactor and a demonstration high-temperature gas-cooled reactor

Nuclear power is carbon-free and provides a large-scale, stable power supply, making it an essential baseload power source from the perspective of energy security. Therefore, we believe that utilizing nuclear power in the future is essential.

In this context, MHI was selected as the core company for the design and development of a demonstration fast reactor and a demonstration high-temperature gas-cooled reactor, both promoted by the Japanese government.

Fast reactors are extremely important for Japan, which has limited natural resources, because their inclusion produces a fuel cycle that enables such resources to be used more efficiently. Furthermore, they make it possible to reduce the volume and toxicity of high-level radioactive waste. As the core company in fast reactor development, we will steadily proceed with the aim of building a domestic demonstration reactor by around 2040.

Sodium-cooled tank-based fast reactor
(includes research results from projects commissioned by the Ministry of Economy, Trade and Industry)



Hydrogen terminal utilizing a high-temperature gas-cooled reactor (artist's rendering)

High-temperature gas-cooled reactors are capable of utilizing nuclear heat at ultrahigh temperatures exceeding 900°C. By using nuclear energy as a carbon-free, high-temperature heat source for large-scale and stable hydrogen production, they can contribute to the decarbonization of steel and other industrial sectors. As the core company in high-temperature gas-cooled reactor development, we aim to build a demonstration reactor by around 2040. To this end, we will engage in design and development in collaboration with the Japan Atomic Energy Agency (JAEA).

Aero Engines/Compressors/Marine Machinery

Aero engines saw growth in demand for new builds and maintenance as air travel demand returns to a growth trajectory following the relaxation of travel restrictions. To keep pace with the expected growth in MRO[5] demand, we completed expansion work on our aero engine maintenance plant in Komaki, Aichi Prefecture. We are also proceeding with expansion of our Nagasaki Plant, aiming to integrate production of combustors and achieve further productivity gains. The second phase of that expansion is scheduled for completion in 2024, with operations beginning in stages thereafter.

In compressors, we will actively respond to demand for use in decarbonization-oriented ethylene, ammonia, and LNG plants, mainly in North America and the Middle East, backed by our strong track record in supplying compressors for oil and gas and petrochemical plants. In addition, we will proceed with product development to address new needs related to CCS and hydrogen.

In the marine machinery sector, we are managing our business by maintaining and increasing our market share in the newbuilding market and expanding our after-sales business. In response to the introduction of energy efficiency regulations for vessels in service and the International Maritime Organization's adoption of an accelerated zero greenhouse gas (GHG) emissions target, we promote solutions for the energy-saving systems market and the fuel conversion retrofitting market to meet growing demand for reducing CO_2 and other GHG emissions.

5 MRO: Maintenance, repair, and overhaul

FOCUS

Expansion of aero engine combustor manufacturing plant to meet rising demand

Mitsubishi Heavy Industries Aero Engines, Ltd. (MHIAEL), which handles the manufacturing, maintenance, and repair of aero engines, has completed the second phase of the construction of its Nagasaki Plant. This expansion strengthens its production capacity to meet growing demand for engine components for short- and medium-haul passenger aircraft. In addition to expanding production capacity, MHIAEL will enhance its manufacturing technology and strengthen cost competitiveness by introducing Japan's first thermal-barrier coating system for mass production of aircraft-related components.

MHIAEL Nagasaki Plant

The first phase of the plant, which manufactures combustors for the PW1100G-JM engine (installed on the Airbus A320neo), began operations in November 2020 and has since been gradually expanding its production scale. With this second phase of investment, we expanded the production area to approximately 11,000 m^2, doubling its original size. In addition, we plan to integrate certain manufacturing processes that are currently outsourced to overseas manufacturers, thereby achieving full in-house production of combustors. At the same time, we will enhance our facilities in preparation for a significant increase in production in the future.

The MHIAEL Nagasaki Plant is an aircraft-related facility specializing in the production of combustors, a critical component of aero engines. Its production line can handle fully integrated operations, from receipt of raw materials for combustor parts to machining and assembly. To efficiently manufacture highly complex aero engine components, it has introduced advanced automation and labor-saving technologies, including cutting-edge machine tools and automated conveyance and tool-changing systems.

MHIAEL will continue enhancing its technical capabilities and reliability in the development, manufacture, and after-sales service of aero engines while expanding its production capacity, thereby fostering the development of the aircraft industry in Japan and contributing to "carbon neutrality of the skies."