Power for a Brighter Future

Company Profile
The energy market today continues to expand globally in line with the growth of emerging economies. Meanwhile, heightened awareness toward the earth’s environment has resulted in demands of unprecedented strength calling for simultaneous resolution of energy and environmental issues.

Based on our corporate vision “Thermal-Power and Environmental Technologies Open the Door to a Brighter Future for Our Planet,” Mitsubishi Hitachi Power Systems, Ltd. (MHPS) provides products and solutions backed up by an in-depth understanding of our customers’ needs and our comprehensive long-term support and proven reliability through world-class thermal-power generation and environmental technologies that we have built up over many years.

As a global-leading company in thermal-power and environmental technologies, we handle from technology development to the provision of products, systems and solutions that will contribute to enriched lifestyles for people around the world and the creation of a safe and secure global environment.
Creating a New Field with Power Generation Technology for the Future

Mitsubishi Hitachi Power Systems, Ltd. (MHPS) began with the merging of the thermal power generation divisions of Mitsubishi Heavy Industries, Ltd. and Hitachi, Ltd. in February 2014. Since our establishment, we have strived to build synergy between the two companies, and in addition to advancing our technical ability to develop reliable high quality products, improving our comprehensive engineering ability that is capable of handling projects in various regions around the world, and strengthening our thorough sales operations and service abilities, we also seek to advance global business expansion.

The needs of our clients as well as society are constantly changing. In addition to the development of the world’s most efficient power generation equipment, MHPS proposes solutions for the improvement of operating thermal power generators using the latest digital technology, and provides new values through our challenge to innovate power generation technology.

As a leading global company in the field of thermal power generation systems and environmental technology, we will continue to meet the expectations of our clients and evolve so that we may contribute to the future of a sustainable society.
Total Solutions from Development and Design to Construction and Service

MHPS can handle the entire production process from the development, design, manufacturing, construction and commissioning to after-sales service of core equipment for thermal power plants using our own unique technology. For thermal power plants requiring sophisticated technologies and reliability, we are active in operating EPC* business that covers the entire plant and are contributing to the supply of power in a stable manner that is kind to the environment in different regions of the world.

*EPC: Engineering, Procurement, Construction
State-of-the-Art Power Plants Rated Highly the World Over

MHPS supplies a variety of power plants in accordance with application and scale. These plants have been rated highly for their outstanding reliability, operability and ease of maintenance, in particular, and we now have an extensive proven record around the world.

GTCC
Highly Efficient Energy through Combined Cycle Power Generation

Gas Turbine Combined Cycle (GTCC) power plants utilize fossil fuels to deliver the cleanest and most efficient power generation. In addition to power generation with a gas turbine, the system also combines a steam turbine to create power through the use of waste heat to ensure excellent power generation efficiency.

Plants employing MHPS’ state-of-the-art J-series gas turbines have a 20% higher power generation efficiency than conventional coal-fired thermal power generation systems and achieve the world’s highest level of efficiency at 63% or more. In addition, this enables CO2 emissions to be reduced by around 50%.

Conventional
Highly Efficient Operation Using Coal, Oil and Natural Gas

Conventional boiler- and turbine-driven power plants use a variety of resources such as coal, oil and natural gas as fuel and there is global demand for these facilities.

MHPS has an extensive record in high-efficiency ultra-supercritical pressure boilers with an output of over 1,000MW. We also have unique technology that enables the efficient burning of lignite (low-grade coal), deemed difficult due to its high water content. On top of this, we lead the world in technology to keep the gas emitted from thermal power plants clean and are contributing to both the effective utilization of fossil fuels and preservation of the global environment with our high-efficiency thermal-power and environmental technologies.

IGCC
High-Efficiency, Clean Next-Generation Power Generation System Based on Coal Gasification

The integrated coal gasification combined cycle (IGCC) system is a next-generation thermal power system with significantly enhanced power generation efficiency and environmental performance due to its combination with coal gasification and the gas turbine combined cycle (GTCC) system. Large-type IGCC systems can improve power generation efficiency by approximately 20% and reduce CO2 compared with conventional coal-fired thermal power systems.

MHPS retains two types of coal gasification technology, namely, air-blown and oxygen-blown technologies, and leads the world in terms of technological capability. In line with expectations that the need for the IGCC system will increase further owing to its ability to both effectively utilize coal resources and protect the environment, this system has thus been gaining attention around the world.

Geothermal
Utilizing Natural Energy with Cutting-Edge Power Generation Technology

Geothermal power generation refers to a system of creating high-efficiency, clean power by extracting heat energy from the ground in its natural state.

MHPS was the first in the world to apply a combined system that consists of a two-phase flow transportation system and a double flash cycle, which has become the global standard in geothermal power generation. Our geothermal power generation system continues to be installed globally and we have achieved the world’s top delivery record.
Challenging the World’s Highest Efficiency

Gas turbines, the core in Gas Turbine Combined Cycle (GTCC) power plants, incorporate a number of critical leading-edge technologies. MHPS has worked on the development of gas turbines for many years and has integrated the latest advances in aerodynamics, cooling design and material technologies to create a variety of products that realize high efficiency and high reliability. The state-of-the-art J-series gas turbines have consistently led the world including achieving the world’s largest capacity and highest efficiency with a turbine inlet temperature of 1,600°C.

Responding to Diverse Needs with Gas Turbines Ranging from 40MW to 490MW

MHPS has a wide range of gas turbines from the 40MW class to the 490MW class in order to meet diverse needs around the world. We have delivered over 800 gas turbines to more than 30 countries worldwide to date and are contributing to a highly efficient, clean energy supply in different parts of the world.

Gas Turbine Combined Cycle Power Plant for Verification Tests

MHPS has a power plant for verification testing at the Takasago Works (Takasago City, Hyogo Prefecture), a site for gas turbine development, and is conducting test operation of the latest equipment there. The operational data is quickly fed back into R&D and design divisions, which makes it possible to conduct highly reliable and efficient research and development into gas turbines.
In Pursuit of Performance and Reliability

Driven by independent technology amassed over many years, MHPS develops technology for developing higher performance blades, long Integral Shroud Blades (ISBs) and higher temperatures, including material development. As a result, we have achieved outstanding levels of performance and reliability in our steam turbines. In addition, we provide high-quality products in a timely manner by making effective use of our global production sites. We have delivered over 2,500 steam turbines to 70 countries worldwide.

Contributing to Power Supply Worldwide for More Than a Century

MHPS manufactures and delivers a wide range of steam turbines that can meet diverse needs from small single-cylinder turbines for in-house power generation to large nuclear turbines.

In particular, MHPS can handle up to turbines over 1,000MW for both 50Hz and 60Hz users and for both fossil fuel use and nuclear use. In addition, we have the ability to provide economical and reliable turbines by leveraging our global sites to ensure the ultimate in design and production depending on application and conditions.

Installation of World's Largest High Speed Balance (HSB)

Hitachi Works has installed cutting-edge equipment to test high-speed rotation of the steam turbine, generator and rotor. The equipment is the largest of its kind in the world and can even test steam turbines with 70-inch blades.
MHPS supplies boilers that boast world-leading quality and performance around the globe based on stable quality built up over many years and state-of-the-art technological development.

Amid rising demand for coal-fired thermal power generation, we boast power generation efficiency at a world-class level and have a proven record in ultra-supercritical pressure thermal power facilities.

Of all the fossil fuels, coal is exceptionally economical with extremely stable supply and is used widely as a core energy source. However, since properties differ for each type of coal, there is demand for a high-performance boiler that can deal with the respective varieties of coal. MHPS has leveraged its unique technology to develop combustion technology for bituminous coal and subbituminous coal as well as lignite and anthracite. The combustion technology helps realize environmentally friendly power generation with a minimal amount of nitrogen oxides (NOx), soot and dust and exceptional efficiency.

In addition, we provide high-quality, reasonably priced products by leveraging our global production sites.

MHPS has a combustion test facility that features the world’s largest capacity of 4 tons of coal combustion per hour. The facility was built to achieve more advanced combustion technologies, the core factor in boilers, particularly in terms of lower emissions of nitrogen oxides (NOx), less unburnt combustibles and lower excess air ratio. The facility can accommodate a wide variety of fuels, including bituminous coal, subbituminous coal, lignite, anthracite, biomass, petroleum coke and residual oil. By significantly improving combustion evaluation capability, we are pushing ahead with the development of boilers that contribute to further reducing fuel costs, thereby enhancing availability and easing environmental impacts.
Toward Cleaner Gas Emissions

Environment-related equipment is indispensable to power generation plants as global environmental awareness rises, and Japan’s environmental technology realizing a global-leading level of purification has been gaining a great deal of attention worldwide. As a pioneer in flue gas treatment technology, MHPS has spent more than half a century developing and manufacturing Flue Gas Desulfurization (FGD) plants and Selective Catalyst Reduction (SCR) plants as a pioneer in flue gas treatment technology. We are one of only a few manufacturers worldwide able to provide integrated flue gas treatment systems on the back of the state-of-the-art technology we have accumulated over this period.

MHPS has a proven record with the supply of over 1,400 SCR systems for the removal of nitrogen oxides (NOx), over 300 FGD systems for the removal of sulfur dioxide (SO2) and 3,200 electrostatic precipitators (ESP) for the removal of soot and dust.

Conscious of the increasing speed in trends to strengthen emission regulations around the world, we will strive to continue contributing to a reduction in environmental load by making effective use of our unique technologies.

As a Leading Global Company with Experience Supplying Over 4,900 Units

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Air Quality Control System (AQCS)

AQCS is a system to clean gas emitted from thermal power plants by combining an SCR system for the removal of NOx, an electrostatic precipitator (ESP) for the removal of soot and dust and an FGD system for the removal of SO2. It is also possible to efficiently treat gas emissions for the different types of coal. In addition to power generation plants using coal and heavy oil, it is also possible to handle chemical and other types of plants.
MHPS has supplied over 1,000 turbine generators worldwide to date. Our product reliability has been rated highly based on operating results. We currently supply turbine generators that employ a variety of cooling systems, including an air cooling system, a hydrogen cooling system and a water and hydrogen cooling system as well as special generators such as short circuit generators designed to exactly meet a wide range of needs. In addition, we provide solutions for the entire product lifecycle, including service and maintenance.

Fuel Cells

Key Technology toward the Realization of a Low-Carbon Society

New power generation systems with high efficiency and low CO₂ emissions are required to realize a highly sustainable, low-carbon society.

In 2017, MHPS launched a new pressurized hybrid power generation system that integrates solid oxide fuel cells (SOFC) with micro gas turbines (MGT). The hybrid system is expected to be in high demand from a wide range of industries as an attractive choice for distributed or cogeneration power systems that function to improve both energy and environmental problems.

SOFC possesses many advantageous characteristics such as high-efficiency power generation, potential use with a large variety of fuels, and outstanding durability. Due to these advantages, we expect that SOFC will be used in the future for a wide range of power generation systems, from small- to medium-scale cogeneration units for distributed electrical power systems to replacements for large-scale centralized power units for commercial thermal power plants. MHPS will continue to develop various integrated hybrid power generation systems, and contribute to energy production suitable for a sustainable, low-carbon society.

Control Systems

Key Devices Supporting the Era of the IoT

Control systems supporting power generation plants are core equipment requiring exceptional reliability and operating efficiency. We provide optimal control systems aimed at maximizing plant performance by leveraging our extensive experience and know-how in a high number of power generation plants.

In addition, the importance of control systems is increasing as we head toward the era of the IoT, driving the need to realize both openness and high security. MHPS has developed a control system compliant with functional safety standards. This system has been positioned as a key device for the ICT platform supporting the era of the IoT and we will contribute to maximizing customers’ management value in the operation of power generation plants through the provision and analysis of big data related to electric power.

*1 IoT: Internet of Things
*2 Functional safety standards refer to standards that comply with international standards (IEC61508-2010) related to functional safety.
MHPS contributes to availability improvement of the power plant and maximization of customers’ asset value by providing a long-term maintenance agreement covering all aspects of maintenance for a specified period, reducing the risk associated with plant operation and maintenance, shortening the period of regular inspections and performing upgrades.

Proposing Service Tailored to Meet Diverse Customer Needs

MHPS contributes to availability improvement of the power plant and maximization of customers’ asset value by providing a long-term maintenance agreement covering all aspects of maintenance for a specified period, reducing the risk associated with plant operation and maintenance, shortening the period of regular inspections and performing upgrades.

Remote Monitoring Center (RMC)

A Remote Monitoring Center has been established in respective areas of the world and MHPS experts in operations and maintenance monitor operating conditions under a 24-hour system. The system entails warning and detection of anomalies as well as diagnosis of performance loss based on operating data that is constantly updated. Customers are at all times provided optimum advice depending on the situation, which helps prevent trouble and maximize the plant’s operating rate.
MHPS’ products have been rated highly, particularly on account of their reliability, ease of maintenance and economical attributes, and have received a great deal of support from users in various countries and regions of the world in addition to Japan. Some of our product delivery results over the years are outlined herein.

Delivery Results

Gas Turbine Combined Cycle Power Plants (GTCC)

Conventional (Boiler & Turbine) Power Plants

Environmental Plants

Geothermal Power Plants
**Mitsubishi Heavy Industries, Ltd.**

1884: Mitsubishi Heavy Industries established (Lease of Government-Owned Nagasaki Shipyard)

1908: Completed first steam turbine [0.5MW]

1963: Developed world's highest efficiency 1000°C class G-series gas turbine

1984: Completed world's highest efficiency and largest Gas Turbine Combined Cycle (STGC) power plant

1990: Completed world's first double flash cycle geothermal power plant

1997: Developed world's highest efficiency 1500°C class G-series gas turbine

1998: Developed world's highest efficiency 1600°C class J-series gas turbine

2011: Started commercial operation of an Integrated coal Gasification Combined Cycle (IGCC) power plant

2013: Completed ultra-supercritical pressure coal-fired conventional power plant

2014: Completed Gas Turbine Combined Cycle (STGC) power plant

2016: Completed supercritical pressure coal-fired conventional power plant

**Hitachi, Ltd.**

1910: Hitachi founded

1933: Developed world's highest efficiency first steam turbine

1966: Completed first gas turbine

1984: Completed conventional power plant

1990: Developed world's highest efficiency 1000°C class G-series gas turbine

1998: Developed world's highest efficiency 1500°C class G-series gas turbine

2000: Developed world's highest efficiency 1600°C class J-series gas turbine

2007: Developed world's highest efficiency 1700°C class J-series gas turbine

2012: Developed world's highest efficiency 1800°C class J-series gas turbine

**Corporate Overview**

- **Company Name**: Mitsubishi Hitachi Power Systems, Ltd.
- **Establishment**: February 1, 2014
- **Head Office**: 3-1 Minatomirai 3-chome, Nishi-ku, Yokohama, Kanagawa, 220-8401, Japan
- **Representative**: President and CEO Kenji Ando
- **Capital**: 100 billion yen
- **Stockholders**: Mitsubishi Heavy Industries, Ltd. (65%) / Hitachi, Ltd. (35%)
- **Employees**: Consolidated 19,574 / Non-Consolidated 10,903 (As of October 2017)
- **Works in Japan**: Hitachi / Yokohama / Takasago / Kure / Nagasaki
- **Offices in Japan**: Hokkaido / Tohoku / Tokyo / Hokuriku / Chubu / Kansai / Chugoku / Shikoku / Kyushu
- **Number of Main Group Companies**: 65 companies (including 8 companies in Japan)

**Corporate Organization**

(As of November, 2017)

- **Board of Directors**
- **President and CEO**
- **Statutory Auditors**
- **Statutory Auditors’ Office**
- **Research & Development Center**
- **PWPS Operations Department**
- **Indian Power System Joint Venture Operations Department**
- **Quality Management Division**
- **PM Management Division**
- **Digital Innovation Division**
- **Global Strategic Planning Headquarters**
- **Management & Administration Division**
- **Global Strategic Planning Headquarters**
- **Business Headquarters**
- **Procurement & Sourcing Division**
- **Turbomachinery Headquarters**
- **Steam Turbine Technology & Production Integration Division**
- **Gas Turbine Technology & Products Integration Division**
- **Turbine Global Products Integration Division**
- **Engineering Headquarters**
- **Power Systems Project Management Division**
- **Plant Engineering Division**
- **Plant Construction Division**
- **Boiler Technology Integration Division**
- **Boiler Products Integration Division**
- **Power Systems Service Headquarters**
- **Air Quality Control Systems Technology Division**
- **Fuel Cell Business Department**
- **Hitachi Works**
- **Yokohama Works**
- **Takasago Works**
- **Kure Works**
- **Nagasaki Works**