COMPANY PROFILE

Mitsubishi Power, Ltd.
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MOVE THE WORLD FORWARD
MITSUBISHI HEAVY INDUSTRIES GROUP
The global energy sector is rapidly changing. Around the world, there are initiatives to ramp up decarbonization of power systems, develop new digital technologies and significantly transform the energy mix. Through it all, Mitsubishi Power has brought to market solutions that are reliable, efficient and economical, while also achieving high environmental performance.

As a company, we are committed to addressing the various needs of our customers, by designing equipment to handle various types of fuel, maintaining output flexibility as more renewables enter the market, and optimizing operations and maintenance through deep technologies such as AI and IoT. At the same time, we continue to accelerate our global efforts to help provide reliable, accessible and affordable electricity for all.

Mitsubishi Power is creating a future that works for people and the planet by developing innovative power generation technology and solutions to enable the decarbonization of energy and deliver reliable power everywhere.

President and CEO
Ken Kawai
State-of-the-Art Power Plants that Help Supply Electricity to the World

Mitsubishi Power 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, which has resulted in an extensive proven record around the world.

**GTCC**
Highly Efficient Energy via Combined Cycle Power Generation

Gas Turbine Combined Cycle (GTCC) power plants utilize fossil fuels to deliver the cleanest and most efficient power generation possible. In addition to the power generated by a gas turbine, the system also incorporates a steam turbine to utilize exhaust heat in achieving optimal power-generation efficiency. Plants employing Mitsubishi Power’s state-of-the-art J-series gas turbines have about 30% higher power generation efficiency than conventional plants employing Mitsubishi Power’s state-of-the-art J-series gas turbines.

**Steam Power**
Several Types of Fuel Are Applicable to High Efficiency Power Generation Plant

Steam power plants generate electricity utilizing not only fossil fuels but also a variety of other types including biomass, by-product gas, and oil pitch to generate electricity. Mitsubishi Power has an extensive record in terms of high-efficiency ultra-supercritical pressure boilers and steam turbines with an output of over 1,000 MW. Mitsubishi Power also have developed unique technologies that enable the efficient burning of lignite (low-grade coal), which is generally difficult to use due to its high water content, and leads the world in technologies for clean emissions in steam power plants.

**IGCC**
Highly Efficient, Clean Power Utilization Based on Coal Gasification

The integrated coal Gasification Combined Cycle (IGCC) system is a next-generation power generation system with significantly enhanced power generation efficiency and environmental performance due to its combination of coal gasification via a gasifier with a Gas Turbine Combined Cycle (GTCC) system. Large IGCC systems can improve power generation efficiency by approximately 10-15% and reduce CO₂ compared to conventional coal-fired thermal power systems.

**Geothermal**
Utilizing Natural Energy with Cutting-Edge Power Generation Technologies

Geothermal power generation refers to a system of generating high-efficiency, clean power by extracting heat energy from the ground in its natural state. Mitsubishi Power 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 now been applied to geothermal power generation worldwide. Our geothermal power generation systems have achieved the world’s top delivery record.

**Products**

Gas Turbines
Steam Turbines
Boilers
Environmental Equipment
Generators
Control Systems

We have a wide range of gas turbines to respond to diverse needs, including everything from turbines in the 30-MW class to turbines in the 645-MW class. Up until now, we have delivered more than 1,100 units in over 50 countries, including aero-derivative gas turbines, gas turbines for power-generation, and gas turbines for industrial use. We manufacture and deliver a wide variety of steam turbines, including everything from small single-cylinder turbines for industrial use to large turbines for nuclear power. Of these, the large turbines can handle any combination of power (thermal power / nuclear power) and frequency (50 Hz / 60 Hz), and have the capability of handling over 1,000 MW.

We have unique combustion technologies for handling diverse types of fuel, including coal, heavy oil, biomass, natural gas, and other fuel gas. In addition, we have boiler technologies that can handle high steam temperatures of over 560°C, which makes it possible to achieve high efficiency.

Our environmental equipment helps to clean up air pollutants emitted by thermal power plants, thereby reducing the environmental burden. Our extensive results in this field include over 1,400 SCR systems for removing NOx (sulfur dioxide), over 300 ESP systems for removing SO2 (sulfur dioxide), and over 3,000 ESP (electrostatic precipitators) for removing soot and dust.

We provide highly efficient turbine generators that employ a range of cooling systems, such as air cooling, hydrogen cooling, and water cooling generators. In addition, we provide special generators that include synchronous condensers intended to achieve power-system stabilization as well as short-circuit generators for laboratories and institutes.

We deliver control systems that offer optimal reliability and operational rates, and that are designed to bring out the full potential of machinery. In conjunction, we provide responsive service solutions related to long-term maintenance support, linkage with AI and the cloud, functional safety, and cyber security.
Mitsubishi Power develops cutting-edge gas turbines by incorporating the latest advances in aerodynamics, cooling design, and material technologies. Our state-of-the-art JAC gas turbine have achieved a turbine-inlet temperature of 1,650°C and a power generation efficiency of 64% or more. We have a power plant for verification tests at Takasago Works (in Takasago City, Hyogo Prefecture), and we completed new facility (T-Point 2) for long-term validation of JAC gas turbine in 2020. We provide highly efficient, highly reliable products that are backed by many years of operational experience.

Reducing CO₂ with the World’s Leading Level of Efficiency

Large Gas Turbines

Mitsubishi Power is working on the development of power-generation technologies for handling new types of fuels that reduce CO₂ emissions. Hydrogen has gained popularity as a fuel that does not emit CO₂ when burned. Mitsubishi Power has successfully tested a large-scale turbine that uses a 30% hydrogen fuel mix. The test results confirmed that by using Mitsubishi Power’s proprietary burner, which was newly developed to burn hydrogen, stable combustion can be attained even when hydrogen is mixed with natural gas. We will accelerate the development of hydrogen-fueled gas turbines to achieve 100% hydrogen power generation.

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Total Solutions that Include Product / Technology

Mitsubishi Power provides Engineering, Procurement, and Construction (EPC) as “turn-key” solutions for customers.

Mitsubishi Power is one of the few contractors capable of delivering self-developed products, accompanied with fully integrated EPC* solutions. Mitsubishi Power is able to manage complex, large-scale projects within a vastly integrated organization, in which all activities are conducted in a consistent and harmonized manner with a continuous flow of information and a standardized quality control and project management system. Mitsubishi Power continues to be dedicated in contributing to the stable supply of electric power and the reduction of environmental impact all around the world.

* EPC: Engineering, Procurement, Construction

Development Design Manufacturing

Service Commissioning Construction

Providing Optimal Service According to the Plant Life Cycle

To ensure a stable power supply in line with constantly changing market needs and environmental requirements, we provide a wide range of services, optimized to accommodate customer needs, at every stage of the plant life cycle. In addition, throughout the entire life cycle, we provide operational support and a full range of maintenance and repair services, ensuring full utilization of cutting-edge ICT (information and communications technology), preventive equipment maintenance, human resource development, rapid recovery support, and long term service agreements (LTSA), to meet the diverse needs of our global customer base.

Service Lineups Suitable for Each Life Cycle Stage

- Performance and operability improvement
  - Performance improvement
  - Output improvement
  - Environmental equipment enhancement and improvement
- Life extension
  - Large-scale retro-fitting
  - Installation of gas turbines at conventional (steam) power plants (repowering)

Long term service agreements (LTSA)
Preventive maintenance, training, and operational support

Digital Solutions, Applying the Latest AI and IoT Technologies

Mitsubishi Power provides digital solutions for a wide range of plants, including those used for grid-level power generation and industrial applications. Mitsubishi Power’s digital solutions can be customized to work with customers’ existing platforms, thus contributing to O&M optimization as well as improvements in plant performance and operability.
Mitsubishi Power’s 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. Some of our product delivery results over the years are outlined here.

### Delivery Results

#### Gas Turbine Combined Cycle (GTCC) / Gas Turbine Power Plants

1. Tohoku Electric Power Co., Inc.
   - Nira-Sendai Thermal Power Station Unit 3 (Japan)
   - 180 MW
   - 2015 / 2016

2. Okinawa Electric Power Co., Inc.
   - Nikgata Thermal Power Station Group 5 (Japan)
   - 109 MW
   - 2011

3. JERA Co., Inc.
   - Kamaishi Thermal Power Station Unit 2 (Japan)
   - 3,420 MW
   - 2009 / 2016

4. JERA Co., Inc.
   - Niigata Thermal Power Station Unit 5 (Japan)
   - 109 MW
   - 2011

5. JERA Co., Inc.
   - Tohoku Electric Power Co., Inc.
   - 980 MW
   - 2015 / 2016

#### Steam Power Plants

6. JERA Co., Inc.
   - Hitachi Thermal Power Station Unit 1, 2 (Japan)
   - 2,000 MW
   - 2003 / 2013

7. ENEA Wytwarzanie S.A.
   - Mazowiech Thermal Power Plant Unit 1 (Poland)
   - 1,375 MW
   - 2017

8. Mitsubishi Electric Co., Ltd.
   - Buckeye Power Plant (Germany)
   - 670 MW
   - 2012

9. CapitaPower Corporation / TransAlta Corporation
   - Genesee Power Generating Station Phase 3 (Canada)
   - 495 MW
   - 2005

10. NIPPON STEEL CORPORATION
    - Tairokuran Works (Japan)
    - 670 MW
    - 2012

11. ENEA Wytwarzanie S.A.
    - Ostrzegawacze Power Station (Poland)
    - 1,075 MW
    - 2017

12. Vattenfall
    - Paiton III Thermal Power Plant (Indonesia)
    - 866 MW
    - 2012

#### Environmental Plants

13. JERA Co., Inc.
    - Tohoku Electric Power Co., Inc.
    - 980 MW
    - 2015 / 2016

14. Mitsubishi Electric Co., Ltd.
    - Kamaishi Thermal Power Station Unit 2 (Japan)
    - 3,420 MW
    - 2009 / 2016

15. Mitsubishi Electric Co., Ltd.
    - Naka Thermal Power Station Group 5 (Japan)
    - 109 MW
    - 2011

16. JERA Co., Inc.
    - Tohoku Electric Power Co., Inc.
    - 980 MW
    - 2015 / 2016

#### Flue Gas Desulfurization (FGD)

17. JERA Co., Inc.
    - Hitachi Thermal Power Station Unit 1 (Japan)
    - 1,000 MW
    - 2011

18. Mitsubishi Electric Co., Ltd.
    - Naka Thermal Power Station Group 5 (Japan)
    - 109 MW
    - 2011

19. JERA Co., Inc.
    - Tohoku Electric Power Co., Inc.
    - 980 MW
    - 2015 / 2016

20. Mitsubishi Electric Co., Ltd.
    - Kamaishi Thermal Power Station Unit 2 (Japan)
    - 3,420 MW
    - 2009 / 2016

21. ENEA Wytwarzanie S.A.
    - Mazowiech Thermal Power Plant Unit 1 (Poland)
    - 1,375 MW
    - 2017

#### Geothermal Power Plants

22. JERA Co., Inc.
    - Tohoku Electric Power Co., Inc.
    - 980 MW
    - 2015 / 2016

23. Electric Power Development Co., Ltd.
    - Kamaishi Thermal Power Station Unit 1 (Japan)
    - 1,000 MW
    - 2000

24. Mitsubishi Electric Co., Ltd.
    - Naka Thermal Power Station Group 5 (Japan)
    - 109 MW
    - 2011

25. JERA Co., Inc.
    - Tohoku Electric Power Co., Inc.
    - 980 MW
    - 2015 / 2016

    - Kamaishi Thermal Power Station Unit 1 (Japan)
    - 1,000 MW
    - 2000

27. Mitsubishi Electric Co., Ltd.
    - Naka Thermal Power Station Group 5 (Japan)
    - 109 MW
    - 2011

28. JERA Co., Inc.
    - Tohoku Electric Power Co., Inc.
    - 980 MW
    - 2015 / 2016

29. Electric Power Development Co., Ltd.
    - Kamaishi Thermal Power Station Unit 1 (Japan)
    - 1,000 MW
    - 2000

30. Mitsubishi Electric Co., Ltd.
    - Naka Thermal Power Station Group 5 (Japan)
    - 109 MW
    - 2011

2a. Client
2b. Plant (country)
2c. Generating power
2d. Start Up
Mitsubishi Heavy Industries, Ltd.

1850

Completed first steam turbine (10.5 MW)

1883

Establishment

1908

Completed first gas turbine

1937

Completed conventional power plant: Shikoku Thermal Power Station (4 units, 433 MW)

1949

Completed world’s highest efficiency and Largest Gas Turbine Combined Cycle (IGCC) power plant: Mitsubishi Heavy Industries Power Station Group 2, Tohoku Electric Power Co., Inc. (3.204 MW)

1977

Completed world’s first double-flash cycle geothermal power plant: Yatsugatake Electric Power Co., Ltd. (50 MW Class)

1987

Completed world’s highest efficiency 1,000°C class B-series gas turbine

1985

Developed world’s highest efficiency and largest Gas Turbine Combined Cycle (GTCC) power plant: Hirono IGCC Power G.K. (540 MW)

1992

Received an order for a global state-of-the-art gas turbine: Developed world’s highest efficiency J-series gas turbine

1993

Completed world’s highest efficiency 1,500°C class G-series gas turbine

1997

Completed world’s highest efficiency 1,600°C class J-series gas turbine

1998

Developed world’s highest efficiency 1,500°C class J-series gas turbine

2000

Developed world’s highest efficiency 1,500°C class J-series gas turbine

2010

Completed commercial operation of first H-25 series gas turbine

2016

Developed small-scale solid oxide fuel cells (SOFC) and Micro Gas Turbine Hybrid Power Generation System

2020

Renamed Mitsubishi Power, Ltd.