

COMPANY PROFILE



Mitsubishi Power, Ltd.

3-1, Minatomirai 3-chome, Nishi-ku, Yokohama,
Kanagawa, 220-8401, Japan
TEL 81-45-200-6100 FAX 81-45-200-7989
power.mhi.com



Top Message

Creating a future that works for people and the planet by developing innovative power generation technology and solutions

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



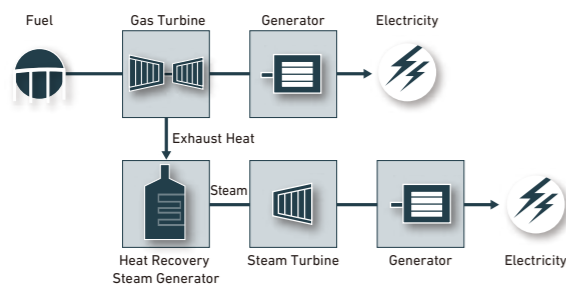
State-of-the-Art Power Plants that Help Supply Electricity to the World

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

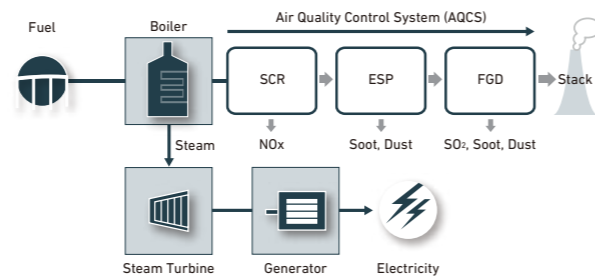
Gas Turbine Combined Cycle (GTCC) power plants utilize fossil fuels to deliver the cleanest and most efficient power generation possible. In addition to the power generated by a gas turbine, the system also incorporates a steam turbine to utilize exhaust heat in achieving optimal power-generation efficiency. Plants employing Mitsubishi Power's state-of-the-art J-series gas turbines have about 30% higher power generation efficiency than conventional coal-fired thermal power generation systems, and have the potential of achieving the world's highest level of efficiency at 64% or more. In addition, GTCC power plants enable CO₂ emissions to be reduced by around 50%.



Gas Turbine Combined Cycle Power Plants (GTCC)

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

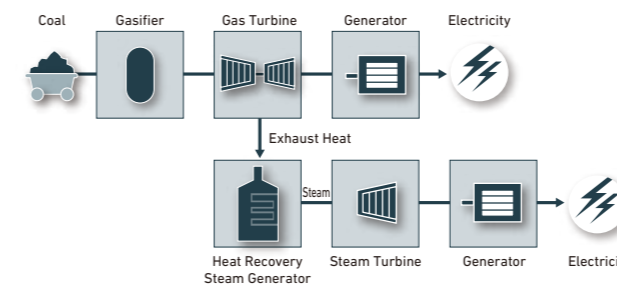
Steam power plants generate electricity utilizing not only fossil fuels but also a variety of other types including biomass, by-product gas, and oil pitch to generate electricity. Mitsubishi Power has an extensive record in terms of high-efficiency ultra-supercritical pressure boilers and steam turbines 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.



Steam Power Plants

IGCC Highly Efficient, Clean Power Utilization Based on Coal Gasification

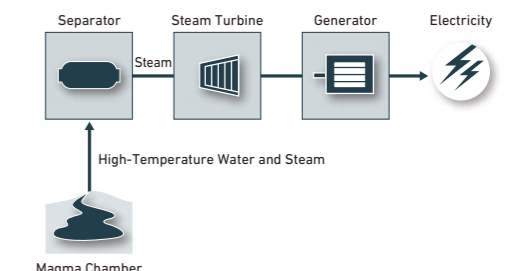
The Integrated coal Gasification Combined Cycle (IGCC) system is a next-generation power generation system with significantly enhanced power generation efficiency and environmental performance due to its combination of coal gasification via a gasifier with a Gas Turbine Combined Cycle (GTCC) system. Large IGCC systems can improve power generation efficiency by approximately 10-15% and reduce CO₂ compared to conventional coal-fired thermal power systems. Mitsubishi Power has two types of coal gasification technologies—namely, air-blown and oxygen-blown—and leads the world in terms of technological capability.



Integrated coal Gasification Combined Cycle Power Plants (IGCC)

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.



Geothermal Power Plants

Products

Gas Turbines



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 560-MW class. Up until now, we have delivered more than 1,500 units in over 50 countries, including aero-derivative gas turbines, gas turbines for power-generation, and gas turbines for industrial use.

Steam Turbines



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.

Boilers



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 600°C, which makes it possible to achieve high efficiency.

Environmental Equipment



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 NO_x (nitrogen oxides), 300 FGD systems for removing SO₂ (sulfur dioxide), and over 3,200 ESP (electrostatic precipitators) for removing soot and dust.

Generators



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.

Control Systems



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's Technological Development: Toward a Future of Brighter and Safer Energy

Reducing CO₂ with the World's Leading Level of Efficiency

Large Gas Turbines

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.



To advance toward a future of brighter and safer energy, Mitsubishi Power is developing power generation technologies that simultaneously achieve a stable supply of power, economic efficiency, and a reduced environmental burden, including CO₂ emissions. In addition to further increasing the efficiency of our world-leading large-capacity power generation, we are actively working on responding to the increasing need for distributed power generation as well as handling new fuels that impose little environmental burden.

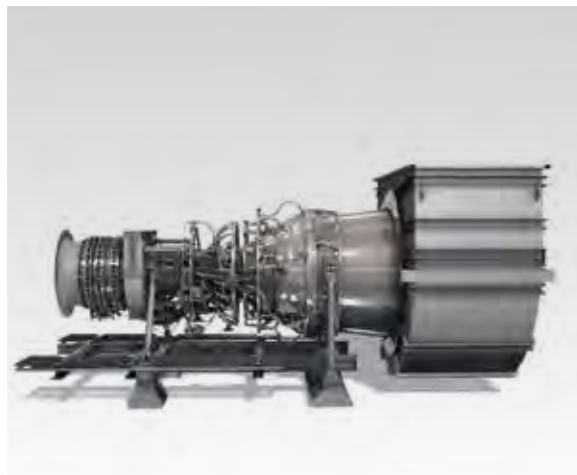
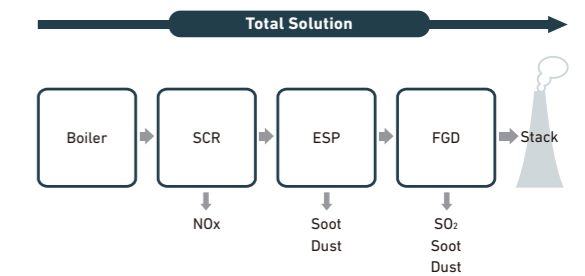
The World's No.1 Share of the Flue Gas Desulfurization (FGD) Market

Air Quality Control Systems (AQCS)

An Air Quality Control System (AQCS) is a system for cleaning up gas emitted by thermal power plants through the combination of a selective catalyst reduction (SCR) system for removing NO_x, an electrostatic precipitator (ESP) for removing soot and dust, and a flue gas desulfurization (FGD) system for removing SO₂. Mitsubishi Power has the world's No.1 share of the FGD market, and we have utilized our technologies to jointly develop an FGD system for ships with Mitsubishi Shipbuilding.



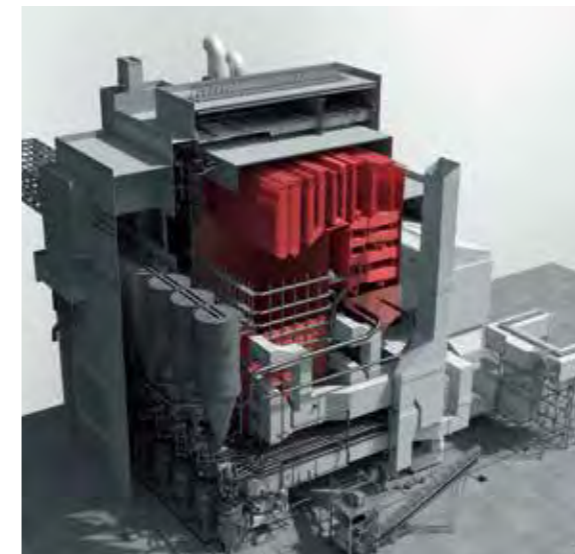
Hirono Thermal Power Station (Japan), JERA Co., Inc.



Backing Up Renewable Energy

Aero-Derivative Gas Turbines

PW Power Systems, Mitsubishi Power group company, is developing and selling aero-derivative gas turbines to which aircraft jet-engine technologies have been applied to enable a rapid startup time of five minutes or less. These turbines boast outstanding energy-saving performance and load-following capability, are environmentally friendly, and are regarded as an important auxiliary power source for renewable energy, for which the power-generation amount is easily affected by the weather. In addition, due to the durability and refined modular design of our aero-derivative gas turbines, they make it possible to shorten the construction period and achieve mobile power generation (container-type systems and barge power generation), for which they are attracting attention as a maintenance-free power source suitable for emergency situations, natural disasters, etc.



Reducing Coal-Derived CO₂ Emissions

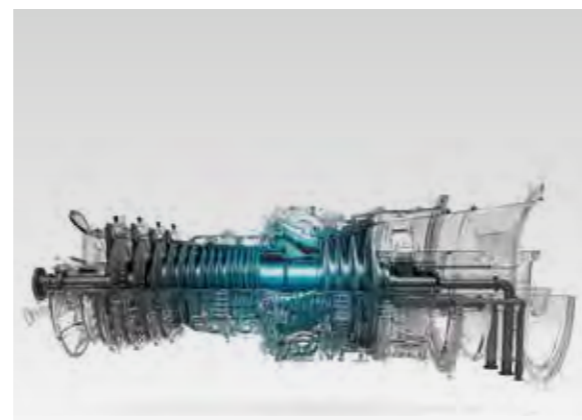
Biomass-Fired / Multi-Fuel Boilers

Mitsubishi Power has developed combustion technologies that allow the use of biomass fuels in coal fired boilers, and now have numbers of operating references. We enable the utilization of biomass fuel as a carbon-neutral solution to reduce coal-derived CO₂ emissions from coal-fired steam power plants. By applying our combustion technologies to newly developed plants, or by retrofitting existing coal-fired boilers, we enable our clients to use biomass fuel as either a primary or complementary, or blended source.

Next-Generation Power Generation that Does Not Emit CO₂

Hydrogen Gas Turbines

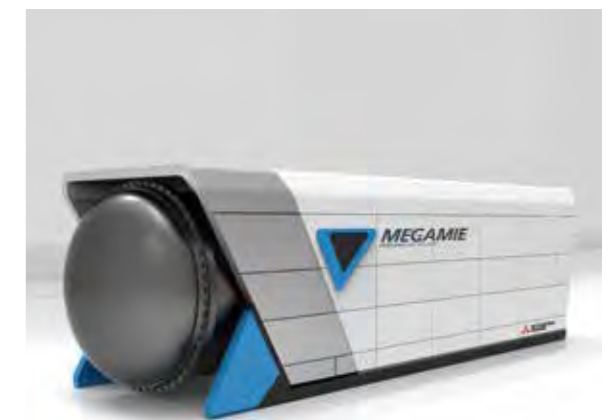
Mitsubishi Power is working on the development of power-generation technologies for handling new types of fuels that reduce CO₂ emissions. Hydrogen has gained popularity as a fuel that does not emit CO₂ when burned. Mitsubishi Power has successfully tested a large-scale turbine that uses a 30% hydrogen 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.



Clean, Distributed Power Generation

Fuel Cells (SOFC)

In 2017, Mitsubishi Power launched a new pressurized hybrid power generation system that integrates solid oxide fuel cells (SOFC) with micro gas turbines (MGT) as an effective distributed power generation / cogeneration system option. The system boasts a total efficiency of over 70%, reduces CO₂ emissions compared to conventional cogeneration systems by approximately half, and is expected to be used for a wide range of applications, including private power generation for buildings, hospitals, and plants.



Total Solutions that Include Product / Technology Development, Design, Construction, and Service

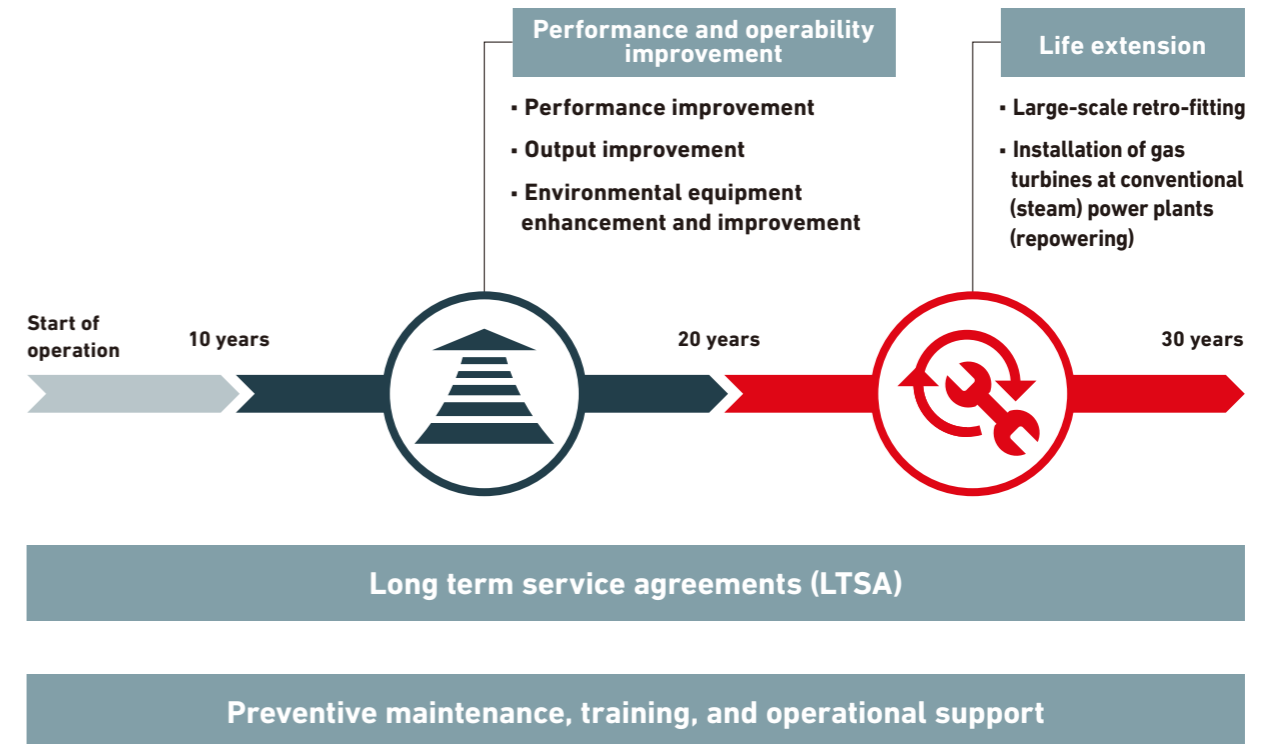


Providing Optimal Service According to the Plant Life Cycle

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



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



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.

Delivery Results

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.

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



- 1** a. Tohoku Electric Power Co., Inc.
b. Shin-Sendai Thermal Power Station Unit 3 (Japan)
c. 980 MW
d. 2015 / 2016

- 2** a. Tohoku Electric Power Co., Inc.
b. Niigata Thermal Power Station Group 5 (Japan)
c. 109 MW
d. 2011

- 3** a. JERA Co., Inc.
b. Kawasaki Thermal Power Station Group 1, 2 (Japan)
c. 3,420 MW
d. 2009 / 2016

- 4** a. The Kansai Electric Power Company, Incorporated
b. Sakaiko Thermal Power Station Units 1-5 (Japan)
c. 2,000 MW
d. 2009 / 2010

- 5** a. Gulf JP NS Company, Limited
b. Nong Saeng Power Plant (Thailand)
c. 1,600 MW
d. 2014

- 6** a. Sonelgaz
b. Algeria
c. 1,350 MW (FT8MP x 54)
d. 2011 / 2014 / 2015 / 2017

a. Client b. Plant (country)
c. Generating power d. Start Up



Environmental Plants



Selective Catalyst Reduction (SCR)

- 7** a. JERA Co., Inc.
b. Joetsu Thermal Power Station Units 1-1 / 1-2 (Japan)
c. 1,190 MW
d. 2012 / 2013

- 8** a. Xcel Energy
b. Allen S. King Generating Station (U.S.A.)
c. 598 MW
d. 2007

Flue Gas Desulfurization (FGD)

- 9** a. JERA Co., Inc.
b. Hitachinaka Thermal Power Station Unit 2 (Japan)
c. 1,000 MW
d. 2013

- 10** a. Electric Power Development Co., Ltd.
b. Tachibanawan Power Station Unit 1 (Japan)
c. 1,050 MW
d. 2000

a. Client b. Plant (country)
c. Generating power d. Start Up



Steam Power Plants



- 11** a. JERA Co., Inc.
b. Hitachinaka Thermal Power Station Units 1, 2 (Japan)
c. 2,000 MW
d. Bituminous coal / Subbituminous coal
e. 2003 / 2013

- 12** a. ENEA Wytwarzanie S.A.
b. Kozenice Thermal Power Plant Unit 11 (Poland)
c. 1,075 MW
d. Bituminous coal / Subbituminous coal
e. 2017

- 13** a. Vattenfall
b. Boxberg Power Plant (Germany)
c. 670 MW
d. Lignite
e. 2012

- 14** a. Capital Power Corporation / TransAlta Corporation
b. Genesee Power Generating Station Phase 3 (Canada)
c. 495 MW
d. Bituminous coal
e. 2005

- 15** a. PT Paiton Energy
b. Paiton III Thermal Power Plant (Indonesia)
c. 866 MW
d. Subbituminous coal
e. 2012

- 16** a. NIPPON STEEL CORPORATION
b. Oita Works (Japan)
c. 330 MW
d. Coal, by-product gas
e. 2002

a. Client b. Plant (country)
c. Generating power d. Fuel
e. Start Up



Geothermal Power Plants



- 17** a. Reykjavik Energy
b. Hellisheidi Geothermal Power Plant (Iceland)
c. 250 MW
d. 2006-2011

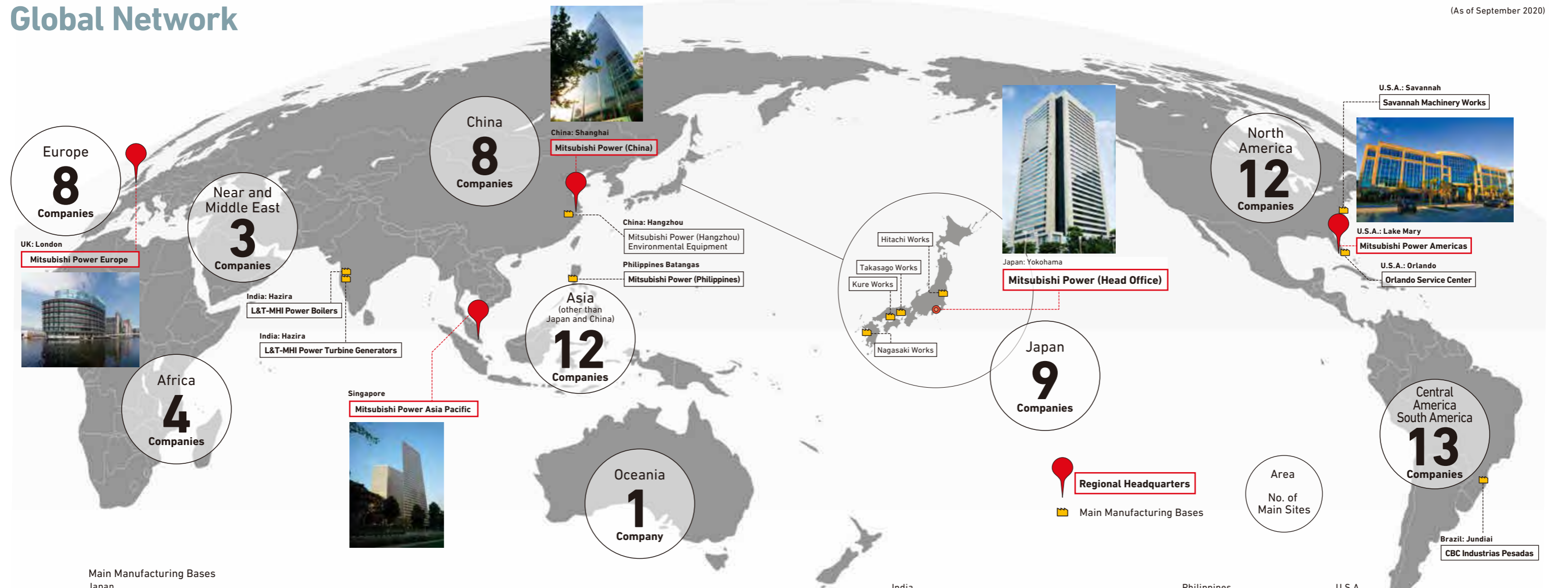
- 18** a. Kyushu Electric Power Co., Inc.
b. Hatchobaru Power Plant Units 1, 2 (Japan)
c. 110 MW
d. 1977 / 1990

- 19** a. Kenya Electricity Generating Company Limited
b. Olkaria II Power Station (Kenya)
c. 105 MW
d. 2003 / 2010

- 20** a. Instituto Costarricense de Electricidad
b. Miravalles III Power Station (Costa Rica)
c. 27 MW
d. 2000

a. Client b. Plant (country)
c. Generating power d. Start Up





Main Manufacturing Bases Japan



Nagasaki Works



Kure Works



Takasago Works



Hitachi Works

India



L&T-MHI Power Boilers



L&T-MHI Power Turbine Generators

Philippines



Mitsubishi Power (Philippines)

U.S.A.



Savannah Machinery Works

Mitsubishi Power, Ltd.

Works	Overseas Offices
Hitachi Works	Moscow Representative Office (Russia)
Takasago Works	Basra Branch (Iraq)
Kure Works	Middle East and North Africa (MENA) Branch (U.A.E.)
Nagasaki Works	Kuwait Branch
	Doha Branch (Qatar)
	Taipei Branch (Taiwan)

Group Companies

Japan
Mitsubishi Power Precision Casting Co., Ltd.
Mitsubishi Power Environmental Solutions, Ltd.
Mitsubishi Power Industries Co., Ltd.
MHI Power Engineering Co., Ltd.
Mitsubishi Power Inspection Technologies, Ltd.
MHI Power Control Systems Co., Ltd.
Mitsubishi Power Maintenance Service, Co., Ltd.
CECYLLS Co., Ltd.

Group Companies

Europe, Near and Middle East, Africa

UK
Mitsubishi Power Europe, Ltd.

Belgium
PW Power Systems Europe SPRL

Germany
Mitsubishi Power Europe GmbH
Meeraner Dampfkesselbau GmbH
Babcock Fertigungszentrum GmbH

Italy
ATLA S.r.l.

Romania
MHI Power Romania SRL

Russia
PW Power Systems CIS LLC

Algeria
PWPS Algeria LLC

Egypt
MHI Power Egypt, LLC.

Saudi Arabia
Mitsubishi Power Saudi Arabia, Co.

U.A.E.
MHI Power Middle East, L.L.C.
MHI Power Middle East for Manufacturing Parts and Machinery, LLC

South Africa
MHI Power ZAF (Pty) Ltd.
Mitsubishi Power Africa (Pty) Ltd.

Asia, Oceania

India
Mitsubishi Power India Private Limited
L&T-MHI Power Boilers Private Ltd.
L&T-MHI Power Turbine Generators Private Ltd.

Singapore
Mitsubishi Power Asia Pacific Pte. Ltd.

Thailand
Mitsubishi Power (Thailand) Ltd.
EGAT Diamond Service Co., Ltd.

Indonesia
PT. Mitsubishi Power Indonesia
P.T. Power Systems Service Indonesia

Philippines
Mitsubishi Power (Philippines) Inc.
MHI Power (Philippines) Plant Services Corporation
MHI Power Technical Services Corporation

China
Mitsubishi Power (China) Co., Ltd.

Mitsubishi Heavy Industries Dongfang Gas Turbine (Guangzhou) Co., Ltd.
MHI Power Jieneng (Qingdao) Steam Turbine Co., Limited
Mitsubishi Power Gas Turbine Engineering Technology (Nanjing) Co., Ltd.
MHI Power Dalian Electricity Equipment Co., Ltd.
Mitsubishi Power (Hangzhou) Environmental Equipment Co., Ltd.
MHI Power Dongfang Boiler Co., Ltd.
PW Power Systems (Beijing) Management and Consulting Ltd.

Korea
MH Power Systems Korea, Ltd.

Australia
Mitsubishi Power Australia Pty. Ltd.

North America, Central America, South America

U.S.A.
Mitsubishi Power Americas, Inc.

MHI Power Florida LLC
Mechanical Dynamics & Analysis LLC
Power Generation Services, Inc.
Mohawk Labor Services, LLC
PW Power Systems LLC
PW Power Systems International LLC
Energy Services LLC
Wood Group Pratt & Whitney Industrial Turbine Services, LLC
Oriden LLC
Advatech, LLC

Canada
Mitsubishi Power Canada, Ltd.

Mexico
Mitsubishi Power de Mexico, S.A. de C.V.
MHI Power de Mexico, S.A. de C.V.
Mechanical Dynamics & Analysis de Mexico, S.A. de C.V.

Puerto Rico
MHI Power Puerto Rico, LLC.

Barbados
MD&A International Incorporated

Venezuela
MHI Power de Venezuela, C.A.

Colombia
MHI Power Colombia S.A.S.

Ecuador
MHI Power Ecuador CIA. LTDA.


Brazil
MHI Power America Latina EIRELI
CBC Industrias Pesadas S.A.

Chile
MHI Power Chile SpA

Argentina
MHI Power Argentina S.R.L.
PW Power Systems Argentina S.R.L.

History and Development

1850 Mitsubishi Heavy Industries, Ltd.



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

1900 Yataro Iwasaki (Photo by The Mitsubishi Archives)

1908 Completed first steam turbine [0.5 MW]

1950

1963 Completed first gas turbine (Chiba Plant, Asahi Glass Co., Ltd. [12 MW])

1980 Completed conventional power plant (Hartha Thermal Power Station, Iraq [200 MW x 4 units])

1984 Completed world's highest efficiency and largest Gas Turbine Combined Cycle (GTCC) power plant (Higashi Niigata Thermal Power Station Group 3, Tohoku Electric Power Co., Inc. [1,090 MW])

1988 Completed first H-25 series gas turbine (Tokuyama Refinery, Idemitsu Kosan Co., Ltd. [25 MW class])

1990 Completed world's first double flash cycle geothermal power plant (Hatchobaru Power Plant Unit 2, Kyushu Electric Power Co., Inc. [55 MW])

1997 Developed world's highest efficiency 1,500°C class G-series gas turbine [330 MW]

2000 Completed ultra-supercritical pressure coal-fired conventional power plant (Tachibanawan Power Station Unit 2, Electric Power Development Co., Ltd. [1,050 MW 600 / 610°C])

2010 Started commercial operation of first H-100 series gas turbine (Shin Oita Power Station Group 1, Kyushu Electric Power Co., Inc. [115 MW x 6 units])

2011 Developed world's highest efficiency 1,600°C class J-series gas turbine
Started commercial operation at demonstration unit at power plant [389 MW]

2013 Started commercial operation of an Integrated coal Gasification Combined Cycle (IGCC) power plant (Nakoso Power Plant Unit 10, Joban Joint Power Co., Ltd. [250 MW])

2014 February: Established Mitsubishi Hitachi Power Systems, Ltd. following integration of thermal-power generation systems businesses of Mitsubishi Heavy Industries, Ltd. and Hitachi, Ltd.
October: Merged with Babcock-Hitachi K.K.

2016 December: Launched JAC-series Gas Turbines

Received an order for a global state-of-the-art Integrated coal Gasification Combined Cycle (IGCC) power plant (Nakoso IGCC Power GK [540 MW]) (Hirono IGCC Power GK [540 MW])

2017 August: Launched solid oxide fuel cells (SOFC) and Micro Gas Turbines Hybrid Power Generation System

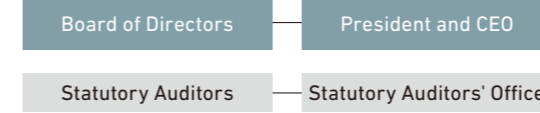
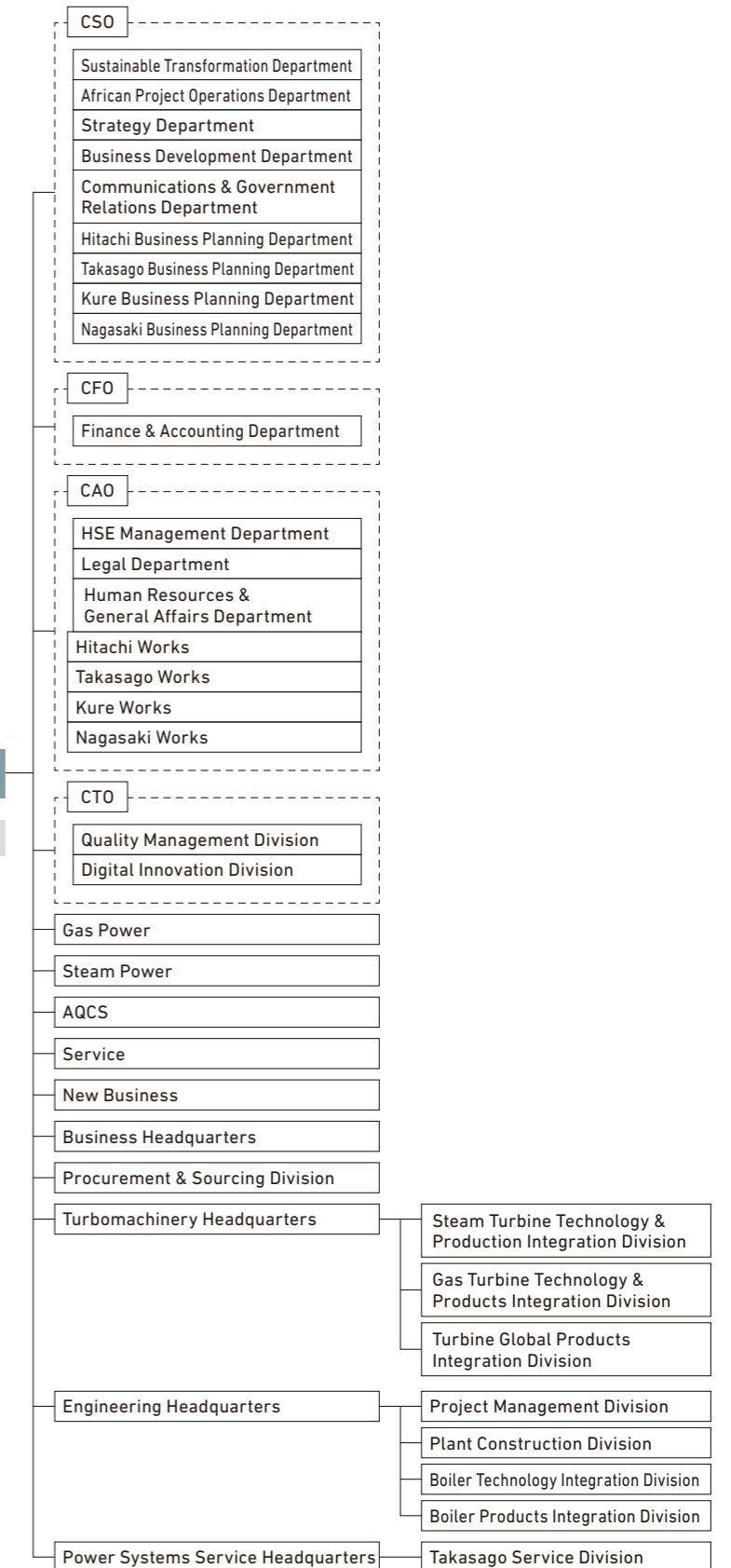
2020 July: Commissioned and started commercial operations of T-Point 2 combined cycle power plant validation facility

September: Renamed Mitsubishi Power, Ltd.

Corporate Overview

- Company Name Mitsubishi Power, Ltd.
- Establishment September 1, 2020
- Head Office Address 3-1 Minatomirai 3-chome, Nishi-ku, Yokohama, Kanagawa, 220-8401, Japan
- Representative President and CEO Ken Kawai
- Capital 100 billion yen
- Stockholders Mitsubishi Heavy Industries, Ltd. (100%)
- Number of Employees Consolidated: 18,356 / Non-consolidated: 9,589 (As of April 2020)
- Works in Japan Hitachi / Takasago / Kure / Nagasaki
- Offices in Japan Hokkaido / Tohoku / Hokuriku / Chubu / Kansai / Chugoku / Shikoku / Kyushu
- Number of Main Group Companies 69 companies (including 8 companies in Japan)

Corporate Organization (As of October 2020)



CSO : Chief Strategy Officer
 CFO : Chief Financial Officer
 CAO : Chief Administrative Officer
 CTO : Chief Technology Officer