Power Systems Domain Business Plan

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Mitsubishi Heavy Industries, LTD

Contents

1-1. Overview (Domain Reorganization)

The former Energy & Environment domain was renamed as the Power Systems domain. The aero engine and compressor businesses were transferred to the Power Systems domain in order to achieve greater synergies in the turbo machinery business as a whole.

【Until March 2017】

Energy & Environment

- Thermal Power
- Nuclear Power
- Renewable Energy
- Chemical Plants

Commercial Aviation & Transportation Systems

- Commercial / Cruise Ships
- Land Transportation Systems
- Commercial Aircraft
- MRJ
- Aero Engines

Integrated Defense & Space Systems

- Defense Systems
- Space Systems

Machinery, Equipment & Infrastructure

- Compressors
- Metals Machinery
- Material Handling Equipment
- Turbochargers
- Engines
- Air-conditioning & Refrigeration
- Machinery & Equipment

【From April 2017】

Power Systems

- Thermal Power
- Compressors
- Aero Engines
- Nuclear Power
- Renewable Energy

Industry & Infrastructure

- Metals Machinery
- Material Handling Equipment
- Turbochargers
- Engines
- Air-conditioning & Refrigeration
- Machinery & Equipment
- Commercial / Cruise Ships
- Land Transportation Systems
- Chemical Plants

Aircraft, Defense & Space

- Commercial Aircraft
- MRJ
- Defense Systems
- Space Systems

Business	Group company
Thermal Power	Mitsubishi Hitachi Power Systems, Ltd.
Thermal Power (Aero-derivative Gas Turbine)	PW Power Systems, Inc.
Compressors	Mitsubishi Heavy Industries Compressor Corp.
Aero Engines	Mitsubishi Heavy Industries Aero Engines, Ltd.
Offshore Wind Turbines	MHI Vestas Offshore Wind A/S（MVOW）
Marine Machinery	Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd.
Organic Rankine Cycle Systems	Turboden S.p.A.

1-1. Overview (Net Sales by Main Businesses)

Marine Machinery

MET Turbochargers

Thermal Power

- GTCC
- Coal-fired Thermal Systems
  IGCC
- Aero-derivative Gas Turbines
- Environmental Plants
- Organic Rankine Cycle Systems

Gas Turbine

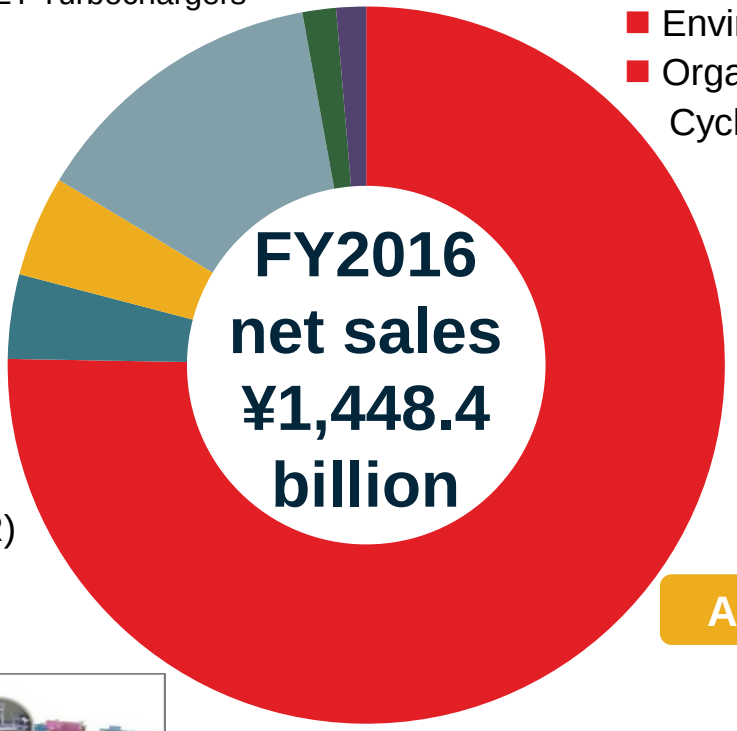
IGCC

Renewable Energy

- Wind Turbines

* As an equity-method affiliate, MVOW's sales are not included in the graph.

- Pumps

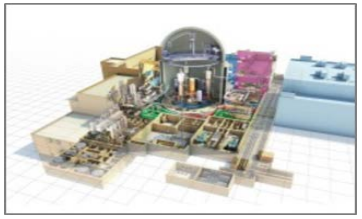


Compressors

Nuclear Power

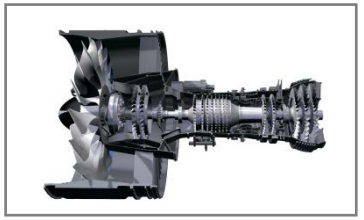
- Pressurized Water Reactors (PWR)
- ATMEA1
- Nuclear Fuel Cycle

Pressurized Water Reactors



ATMEA1

Aero Engines



GTCC : Gas Turbine Combined Cycle, IGCC : Integrated coal Gasification Combined Cycle

1-2. FY2016 Major Projects and Orders Received

＜Europe＞
Offshore wind turbines
Order from Germany for 56 units of V164-8.0MW

＜Japan＞
Orders for IGCC power plants for Nakoso and Hirono power stations

＜USA＞
Orders for M-501J-Series gas turbines（GTCC)

＜CIS＞
Order for natural gas-fired GTCC power plant in Uzbekistan

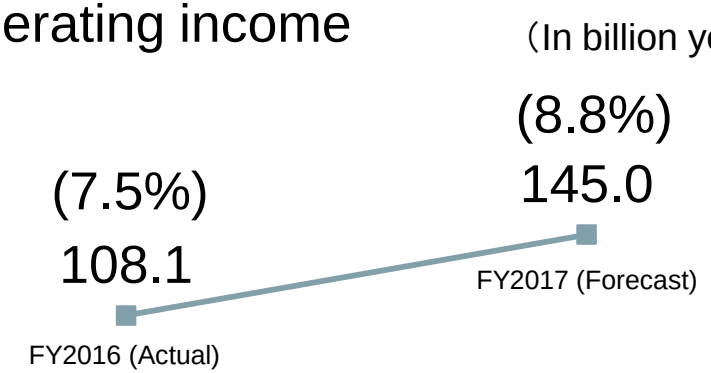
＜S.E. Asia＞
Order for GTCC Power Generation Systems in Indonesia

＜USA＞
PW4000, V2500 and Trent engine parts (aero engines)

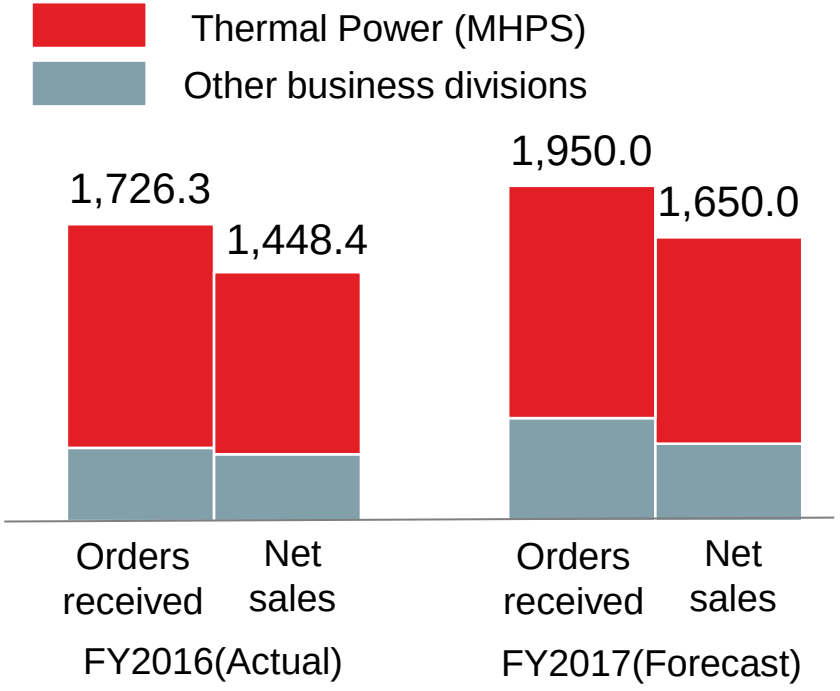
CIS: Commonwealth of Independent States　GTCC: Gas Turbine Combine Cycle　IGCC: Integrated coal Gasification Combined Cycle

2-1. FY2016 Summary & FY2017 Outlook

Operating income



Orders received / Net sales



FY2016 Summary and Issues

- **Orders received**
  Deceleration and deferment of overseas orders for thermal power systems
- **Net sales**
  Longer delivery periods for domestic coal-fired plants
- **Operating income**
  Target set above 10% went unachieved due to imbalance between business scale and total assets / fixed costs caused by sales decrease and delayed PMI

FY2017 Outlook

- **Orders received**
  Expansion in orders for nuclear power, aero engines, compressors, etc.
- **Net sales**
  Increased progress on coal-fired power plant projects currently underway
- **Operating income**
  Increase from sales growth and lower fixed costs and expenditures

MHPS : Mitsubishi Hitachi Power Systems, Ltd.

Seek to ensure significant and continuous growth

Core businesses

New fields

Business foundation

Social/ Customer Change and Business Direction

Global Strategies

Individual Business Strategies

- -Thermal Power
- -Compressors
- -Aero Engines
- -Nuclear Power
- -Renewable Energy

Turbomachinery Synergies

IoT / AI Energy Solutions

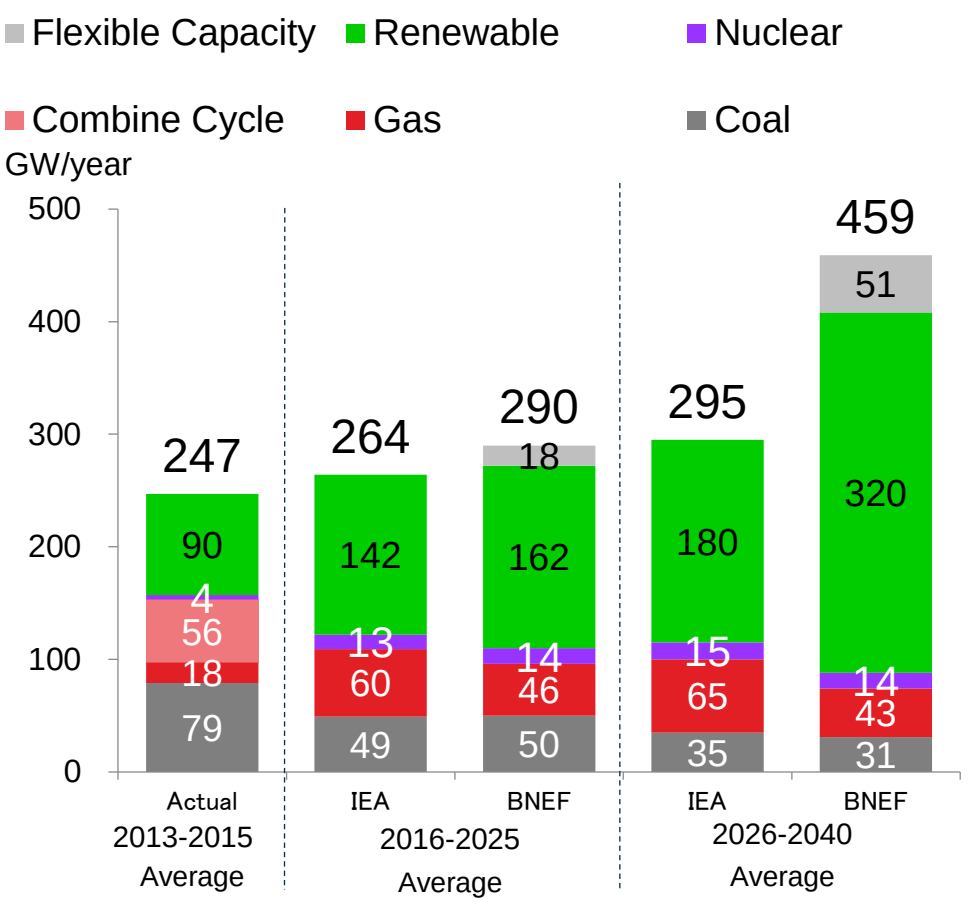
Reorganization, Financial Strategies

IoT : Internet of Things AI : Artificial Intelligence

2-2. (2) Social / Customer Change and Business Direction

Global outlook for new power generation facilities

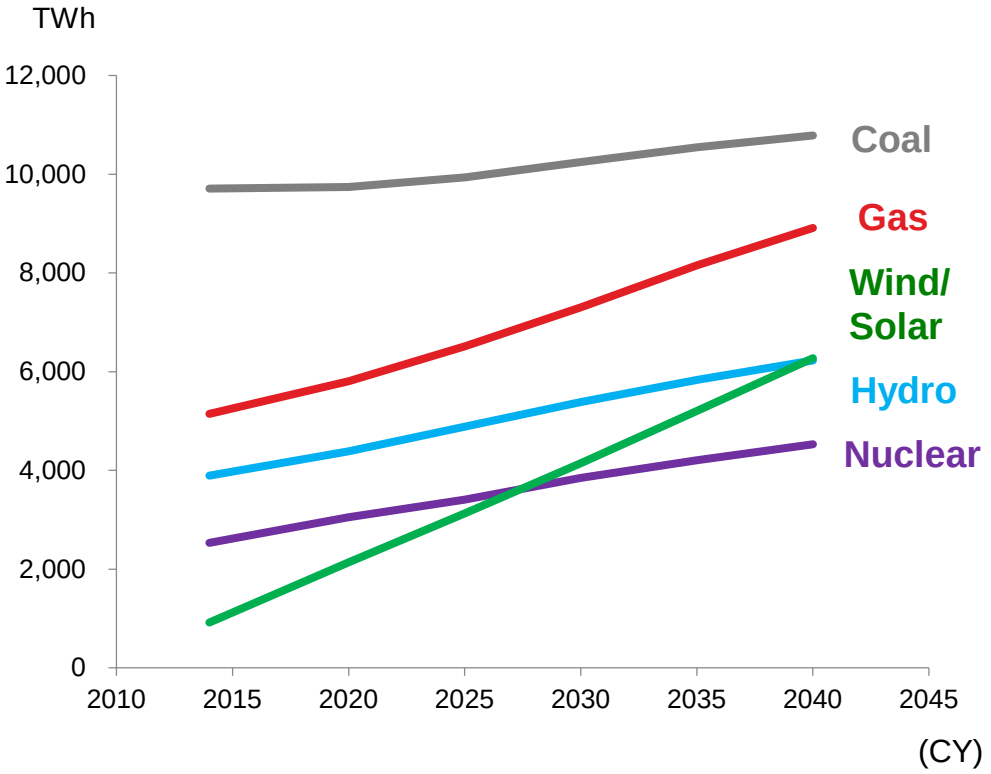
- Medium/long-term growth in renewable energy



IEA : International Energy Agency (WEO2016)
BNEF : Bloomberg New Energy Finance (2016)

Global outlook for power generation volume

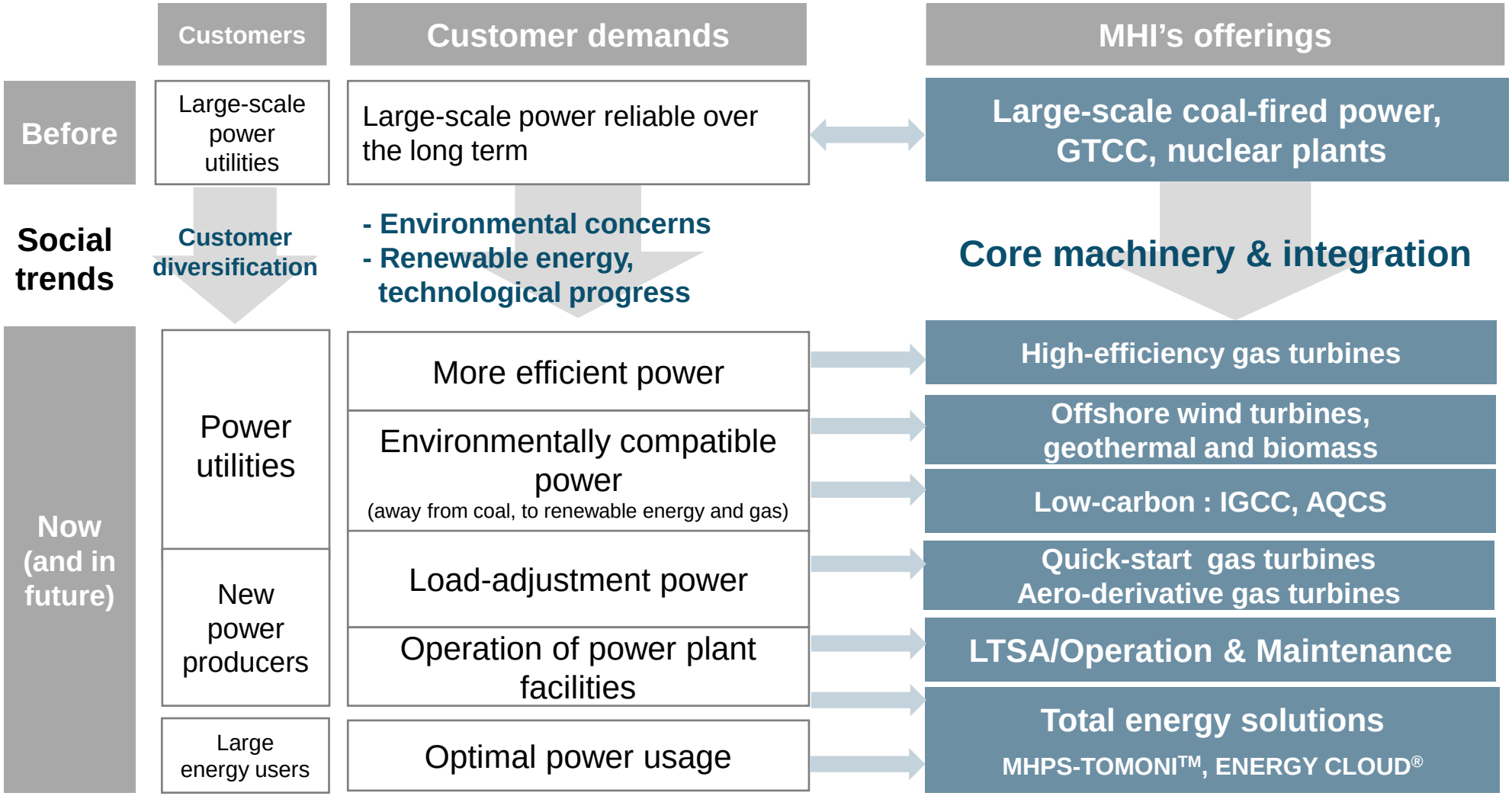
- Marked increase in renewable energy and gas-fired power plants
- Volume increase from coal to be minimal, but constituting a large percentage of total output



Reference : International Energy Agency (WEO2016)

2-2. (2) Social / Customer Change and Business Direction

Social evolution engendered by MHI products in response to changes sought by society and customers



GTCC : Gas Turbine Combined Cycle , IGCC : Integrated coal Gasification Combined Cycle
AQCS : Air Quality Control System, LTSA : Long Term Service Agreement

2-2. (3) Global Strategies

Scale of FY2016 orders received Future direction of business scale

Europe:
Expansion in renewable energy

Offshore wind turbines:
Market share expansion through launch of large-scale models (8MW and larger)

Middle East & Africa:
Next growing markets

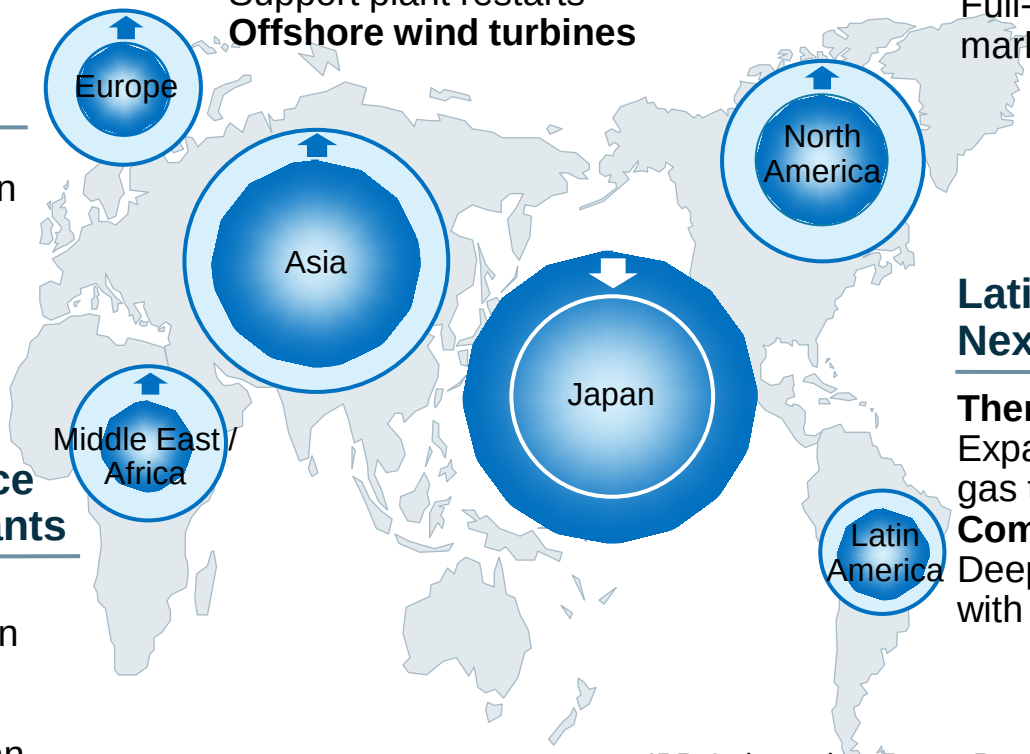
Thermal power:
Project formulation through yen loans and use of ECA finance
Compressors:
Shared factory with MHPS in Saudi Arabia

Asia:
Actively use loans/finance for coal-fired thermal plants

Thermal power:
Project formulation through yen loans and use of ECA finance
Offshore wind turbines:
Seeking opportunities in Taiwan

Japan:
Our main market, seeking all opportunities

Thermal power:
Gas-fired replacement / biomass project enhancement
Nuclear power:
Support plant restarts
Offshore wind turbines



North America:
Expansion of turbo machinery business

Thermal power:
Proactive participation in IPP development
Compressors:
Full-scale entry into Oil & Gas market

Latin America:
Next growing market

Thermal power:
Expand sales of next-generation gas turbines
Compressors:
Deepen collaboration with local partners

IPP: Independent Power Producer, ECA: Export Credit Agency

Turbomachinery Synergies

Market	MCO	×	MHPS	=	**Oil & gas market**
Technology	MHIAEL	×	MHPS	=	**Next-generation flexible gas turbines**
Manufacturing, Supply chain	MCO-I	×	MHPS -AMER	=	**Shared factories**
Customer value	TOMONI	×	ENERGY CLOUD®	=	**Integrated energy value chain services**

MCO : Mitsubishi Heavy Industries Compressor Corp.
MHPS : Mitsubishi Hitachi Power Systems, Ltd.
MHIAEL : Mitsubishi Heavy Industries Aero Engines, Ltd.

MCO-I :Mitsubishi Heavy Industries Compressor International Corp. (USA)
MHPS-AMER : Mitsubishi Hitachi Power Systems Americas, Inc.
TOMONI : MHPS-TOMONI™

Turbomachinery Synergies: Market

Aims

- "One stop solution" service for the oil & gas market
- Creation of appealing products through integration

Action

- Expand sales of compressor trains for LNG combining MCO's compressors and MHPS's gas turbines for the oil & gas market

MCO

Compressor

×

MHPS

Gas turbine for driving

=

Oil & Gas market
LNG compressor train driven by high-performance gas turbine

MCO : Mitsubishi Heavy Industries Compressor Corp. MHPS : Mitsubishi Hitachi Power Systems, Ltd.

2-2. (4) Turbomachinery Synergies

Turbomachinery Synergies: Technology

Aims

- Sharing of technologies and resources
- Development of next-generation turbomachinery products

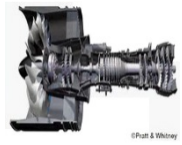
Action

- Integrate gas turbine and aero engine technologies
- Improve technological competitiveness and products

Industrial gas turbines (MHPS)

Industrial gas turbine technologies

Aero engine technologies



Demonstration technologies

3D printers

CMC

Aero-derivative gas turbines (PWPS)

Aero engines (MHIAEL)

MHIAEL

Quick drive and lightweight technologies

×

MHPS

High-efficiency gas turbine technologies

=

Next-generation flexible gas turbines

PWPS : PW Power Systems, Inc. MHIAEL : Mitsubishi Heavy Industries Aero Engines, Ltd.

CMC : Ceramic Matrix Composites

2-2. (4) Turbomachinery Synergies

Turbomachinery Synergies: Manufacturing, Supply chain

Aims

- Higher productivity through optimal use of factories
- Formation of appropriate supply chains for procurement

Action

- Shared factories（USA）
- Formation of appropriate supply chain

MCO-I (USA)

Houston Works

×

MHPS-AMER (USA)

Savannah / St. Louis Works

=

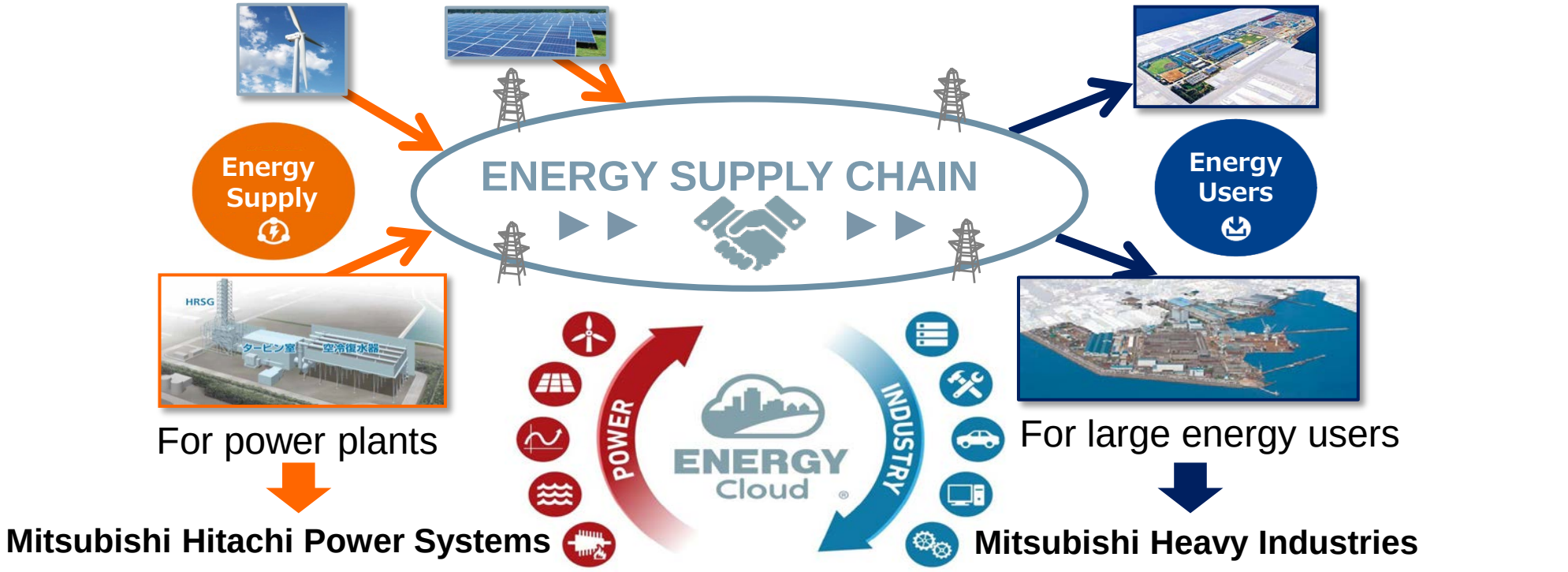
Higher productivity through factory sharing

Formation of optimal supply chain

MCO-I :Mitsubishi Heavy Industries Compressor International Corp. (USA)　MHPS-AMER : Mitsubishi Hitachi Power Systems Americas, Inc.

2-2. (4) Turbomachinery Synergies

Turbomachinery Synergies: Customer value



Mitsubishi Hitachi Power Systems

MHPS-TOMONI™ *1

- Flexible operation
- Performance improvement
- O&M optimization

Mitsubishi Heavy Industries

ENERGY CLOUD® *2

- Administration support, O&M support
- Energy management, Optimization
- Failure detection, Improved reliability

(O&M: operation and maintenance, EMS: Energy Management System)

*1 MHPS-TOMONI ™ is a trademark of Mitsubishi Hitachi Power Systems Ltd.
*2 ENERGY CLOUD® and related logomarks are registered trademarks of Mitsubishi Heavy Industries, Ltd. In Japan.

ENERGY CLOUD® Service

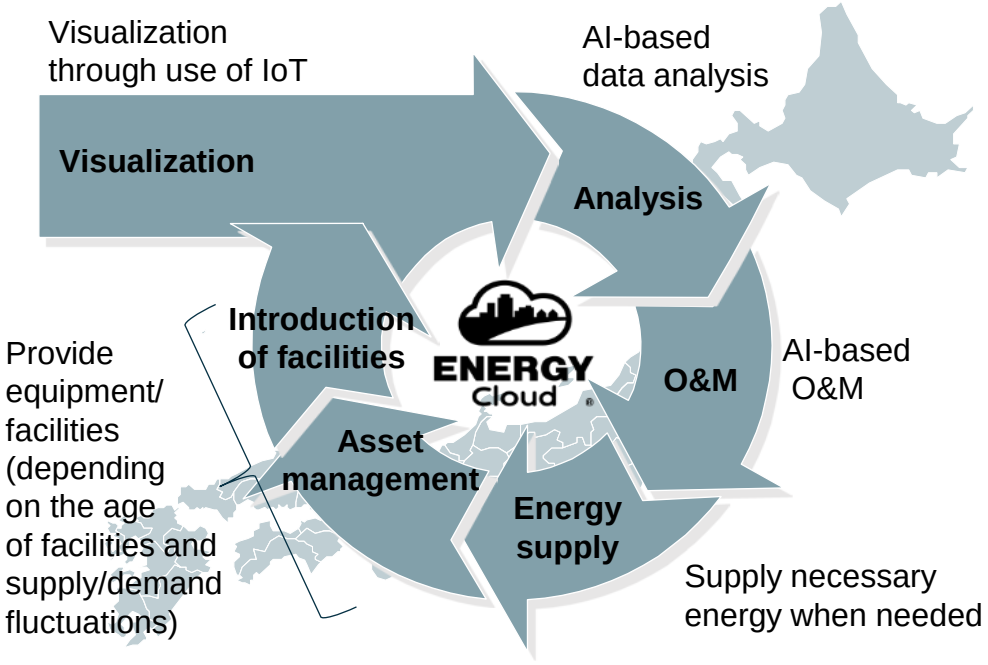
Developed based on factory operation expertise cultivated through diversified product operations, technological strength, and experience in power generation facilities and related businesses

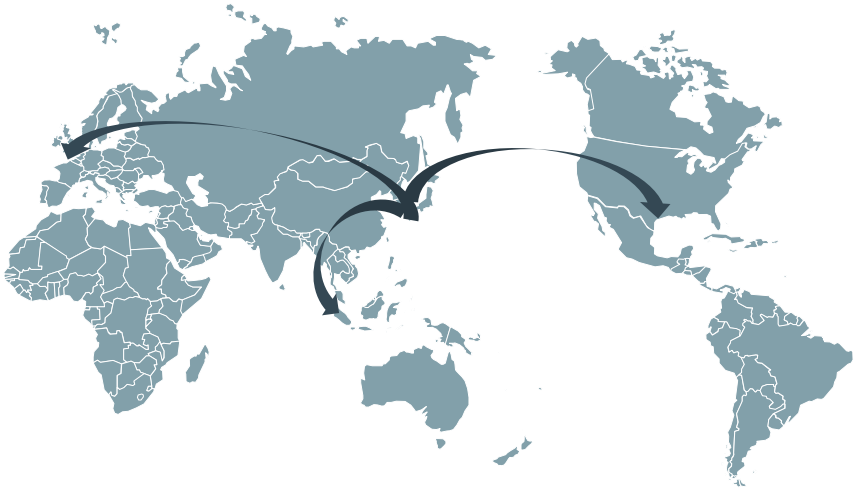
ENERGY CLOUD® Service launched on April 1, 2017

- One-stop services ranging from AI-based data analysis to solutions
- Technology and service demonstrations underway at MHI Group's domestic factories

Aiming for ¥100 billion business scale

- Assess how to successfully launch business operations overseas
- Consider how to optimize services to meet local needs





2-2. (6) Reorganization

- Reduced domestic production (result of increased overseas production)
- Widely dispersed and superannuated domestic production facilities

Improvement measures

- Consolidation and reorganization of bases
  ⇒ Reduce fixed and variable costs
- Invest in facilities utilizing IoT / AI
- Develop (more advanced, multi-skilled) human resources
- Enhance land and facilities value through asset management

Productivity enhancement target: ≧30%

Core domestic bases

Gas Turbines (Takasago)

Compressors (Hiroshima)

Steam Turbines (Hitachi)

Industrial Thermal Power (Nagasaki)

Nuclear Power (Kobe*)

* The Kobe district employs a companywide shared factory arrangement

2-2. (7) Financial Strategies

Issue

Securing “resources for growth”
⇒Seek expansion in new businesses and business areas

Mission

Formation of robust financial structure
⇒Strengthen ability to generate cash flow and earning capacity*

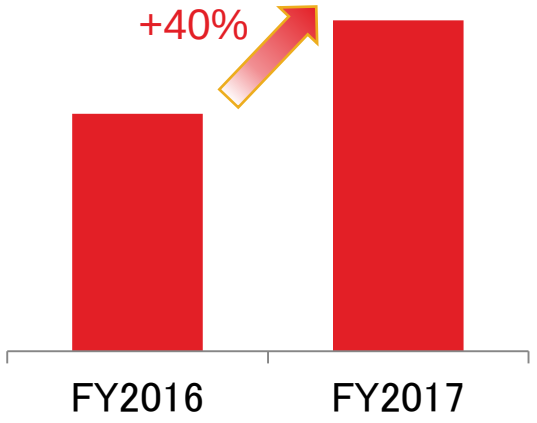
Measures

Immediate action

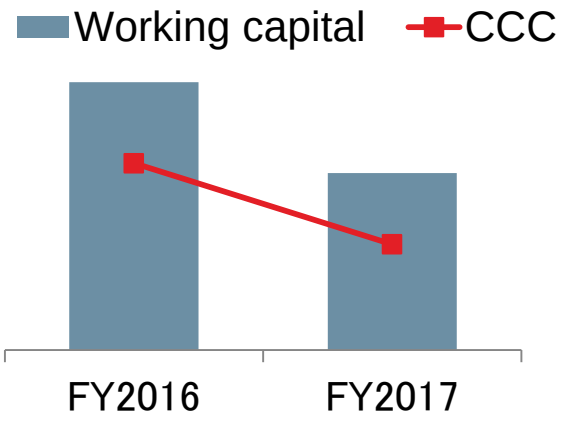
- Curb unnecessary cash outlays
  - Reduce and optimize fixed costs
  - Reduce inventory
- Enhance production efficiency
  - Consolidate and reorganize production bases
  - Reduce lead time (improve CCC)
- Strengthen project cash flow management

Reap benefits in FY2017

Ordinary free cash flow



Improve efficiency by reducing working capital by 30% even amid sales expansion



*Excludes extraordinary factors (South Africa project, AREVA investment)

CCC: Cash Conversion Cycle

3-1. Thermal Power (1/7)

MHPS business environment and overview of FY2016

- Sluggish growth in business scale due to market saturation and intensified competition
- Earning capacity eroded from delayed reduction of fixed costs in line with business scale

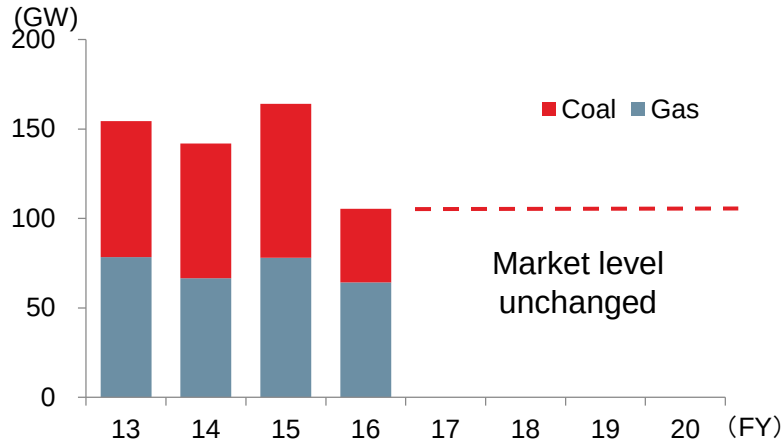
Issues

- Stagnation of new thermal plant market
- Increasing demand for environmental load reduction
- Intensified competition
- Eroded earning capacity

Measures

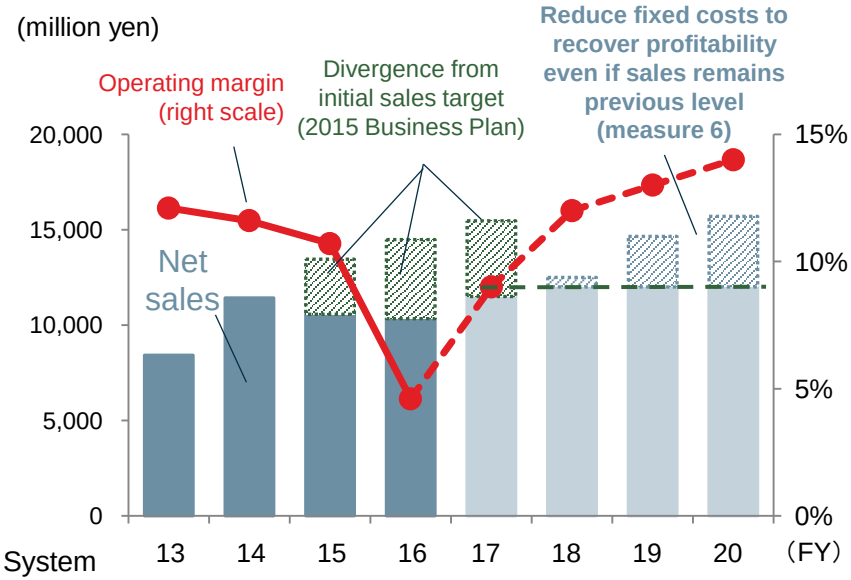
1. Strengthen service business using IoT and AI	All areas
2. Strengthen information gathering for overseas markets and ability to formulate projects	All areas
3. Bring forward the launch of high-performance gas turbine models	GTCC
4. Initiatives toward low-carbon society (IGCC/AQCS)	Coal-fired plants
5. Reduce costs of ongoing projects	Coal-fired plants
6. Reduce fixed costs in line with business scale	All areas

Scale of market for new thermal power plants



Source: FY2013-2016(actual) McCoy Power Report FY2017-2020 MHI forecasts

MHPS sales and operating income



IGCC : Integrated coal Gasification Combined Cycle Power Plants, AQCS : Air Quality Control System

3-1. Thermal Power (2/7)

Measure 1: Strengthen service business for thermal power plants through use of IoT / AI. Form win-win relationships with customers through improved performance and flexible operations

All areas

Provide unprecedented value together with the customer

MHPS's core businesses

Services tailored to customers, prioritizing the customer's interests first

High-quality products

Partnership with customers

Innovative technologies

In-house O&M knowhow

Total plant knowledge

O&M monitoring

O&M Optimization

O&M support

Performance Improvement

Advanced O&M

Flexible Operation

Automated autonomous operation

Efficiency optimization (group management level)

Remote operation

Longer intervals between inspections

- Early detection, automated warnings for malfunctions/anomalies and recovery measures
- Operating life extension measures, placing orders for spare parts

Performance improvement and optimization (equipment and plant levels)

Shorter schedule for regular inspections

Higher operating ratios

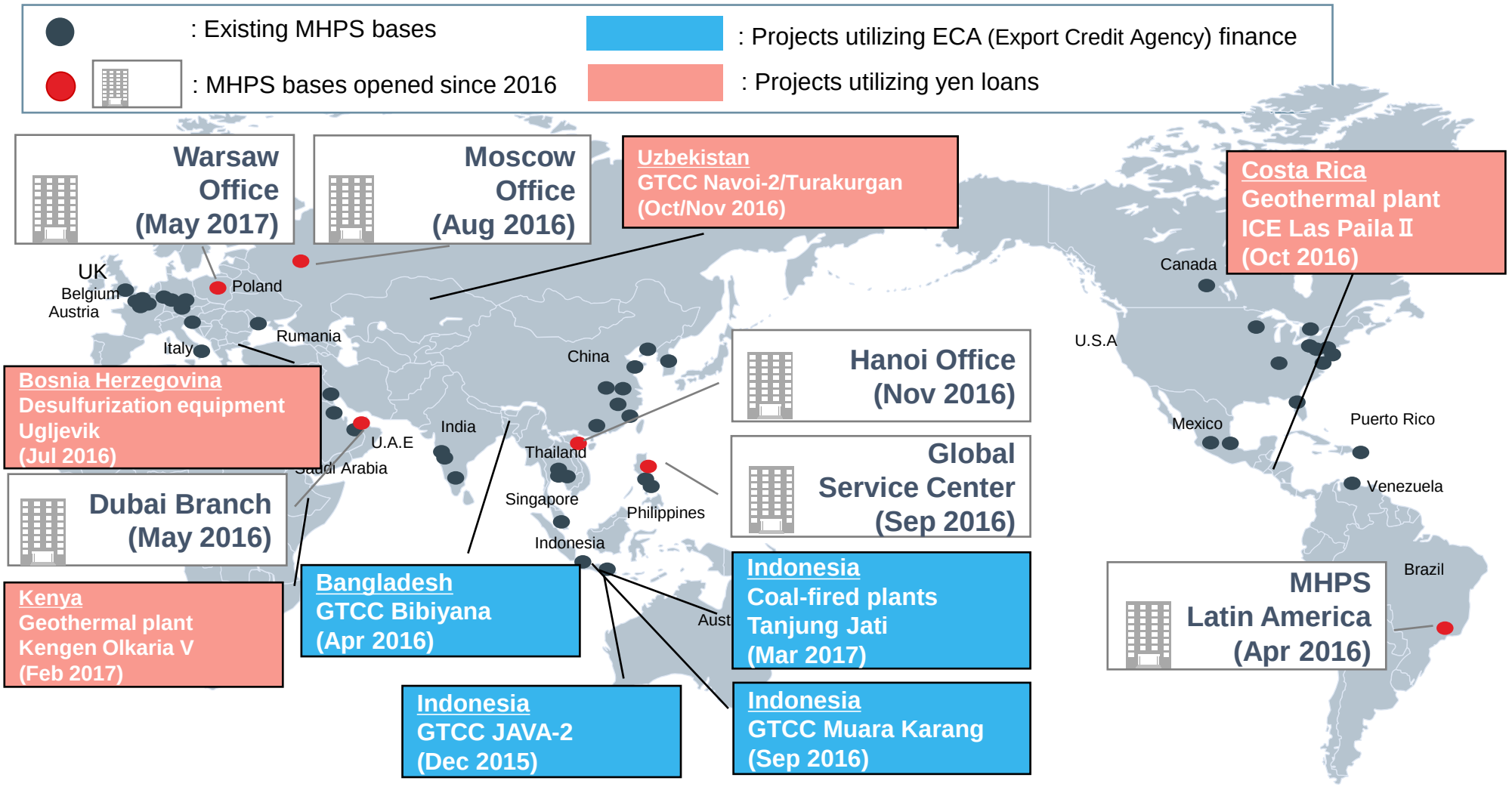
Promote preventive maintenance, Short-term peak operation, Eco operation, recommend replacement parts during regular maintenance

Data gathering & evaluation (digitalization)

3-1. Thermal Power (3/7)

Measure 2: Strengthen information gathering for overseas markets and ability to formulate new projects
Expand project formulation capability overseas through opening bases in new markets through active use of yen loans and ECA finance

All areas



3-1. Thermal Power (4/7)

Measure 3: Bring forward the launch of high-performance gas turbine models Compared to competitors, secure superiority in performance in main market (above 300MW)

GTCC

Business environment

Amid overall stagnant market, market for gas turbines above-300MW is expanding. Becoming main market.

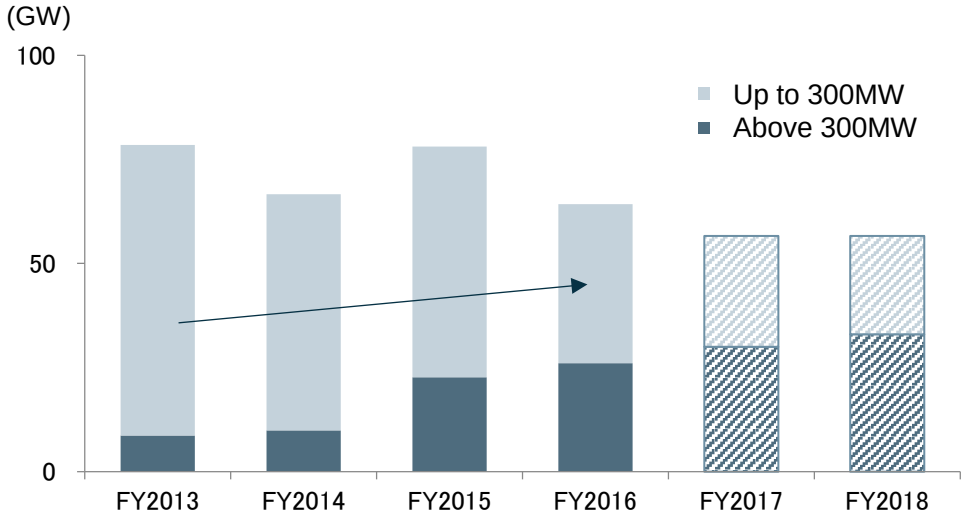
Issue

In the above-300MW market (first developed by MHI), competitors have launched their latest models.

Measures

- Bring forward the launch of 1650℃-class next-generation gas turbines outperforming others' systems to 2019, i.e. 1.5 years ahead of initial schedule.
- Commence business discussion with customers immediately.
- Get top share of the above-300MW market

【Gas turbine market scale】



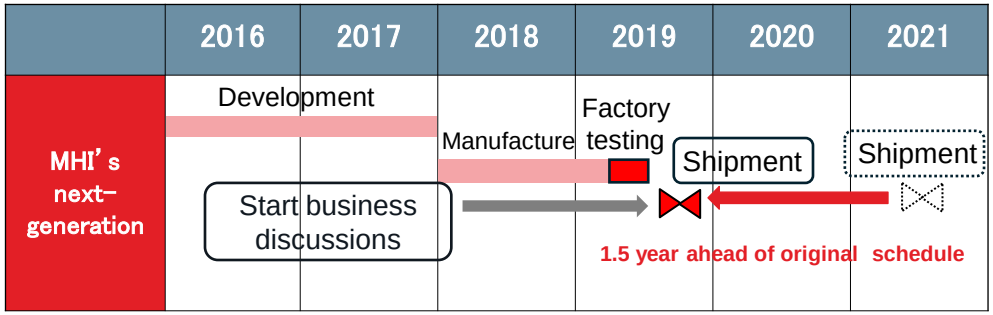
Source: FY2013-2016(actual) McCoy Power Report FY2017-2018 MHI forecasts

【Combined thermal efficiency (LHV)】

Competitors' latest models	MHI's next-generation
Above 63%	Above 64%

【Launch timetable】

(FY)



3-1. Thermal Power (5/7)

Measure 4: Initiatives toward a low-carbon society / IGCC, AQCS

Coal-fired plants

Active promotion of IGCC: Market penetration overseas, applying world's leading technologies, cultivated in Japan

Joban Joint Power Co., Ltd. Nakoso

Demonstrator operation: 2007-
Commercial operation: 2013-

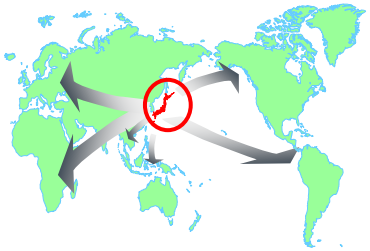
- Accumulate operation and maintenance expertise through long-term operations
  (current record holder for longest operation of IGCC)

Nakoso / Hirono IGCC projects (2020 and beyond)

- Strengthen cost competitiveness based on repeat and high-volume merit of domestic large-scale systems

Market penetration overseas

- Target markets in coal-producing countries, where needs for coal-fired plants are robust, stress contribution to environmental footprint reduction



Global expansion of AQCS

Coal-fired boilers	Denitrification equipment	GGH	Electrostatic precipitators	Desulfurization equipment	GGH

- Reduce environmental footprints of coal-fired plants through completion of full AQCS lineup
- Provide coal-fired power plants incorporating state-of-the-art environmental equipment
  - Promote environmental plants in China to deal with PM2.5 (high-performance soot removal systems and electrostatic precipitators)
  - Promote coal-fired thermal power plants in Southeast Asia and India with environmental systems suited to those regions

IGCC: Integrated coal Gasification Combined Cycle Power Plants AQCS: Air Quality Control System GGH: Gas-Gas Heater

3-1. Thermal Power (6/7)

Measure 5: Reduce costs of ongoing projects Improve profitability through swift and orderly implementation

Coal-fired plants

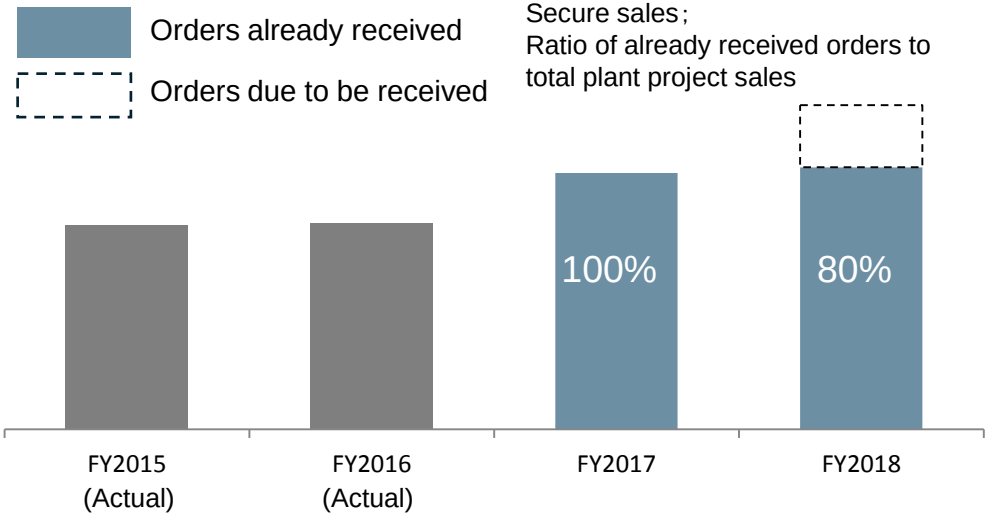
【World's foremost capability in power plant EPC】

Building on the numerous coal-fired power plant projects currently underway, **make use of proven EPC expertise**

EPC execution capability, project management experience + **Abundant work volume, optimal lead time to work commencement**

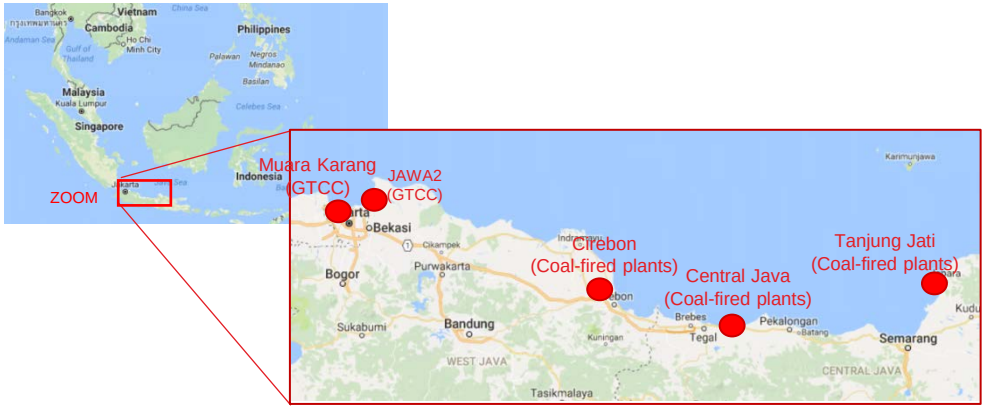
→ **Pursue optimal QCD, improve profitability**

Ratios of Coal-fired Power Plant orders already received



Execute 5 consecutive projects in Indonesia (example)

- Using the same platform, perform efficient project management of 5 projects being simultaneously executed in FY2017-FY2019
- For the 5 projects together, undertake bulk transport and loading, procurement, horizontal VE development, and common parts utilization



EPC: Engineering Procurement and Construction QCD: Quality, Cost, Delivery VE: Value Engineering

3-1. Thermal Power (7/7)

Measure 6: Reduce fix costs in line with business scale

Improve productivity, strengthen competitiveness and enhance earning capacity through consolidation of production bases for each product

All areas

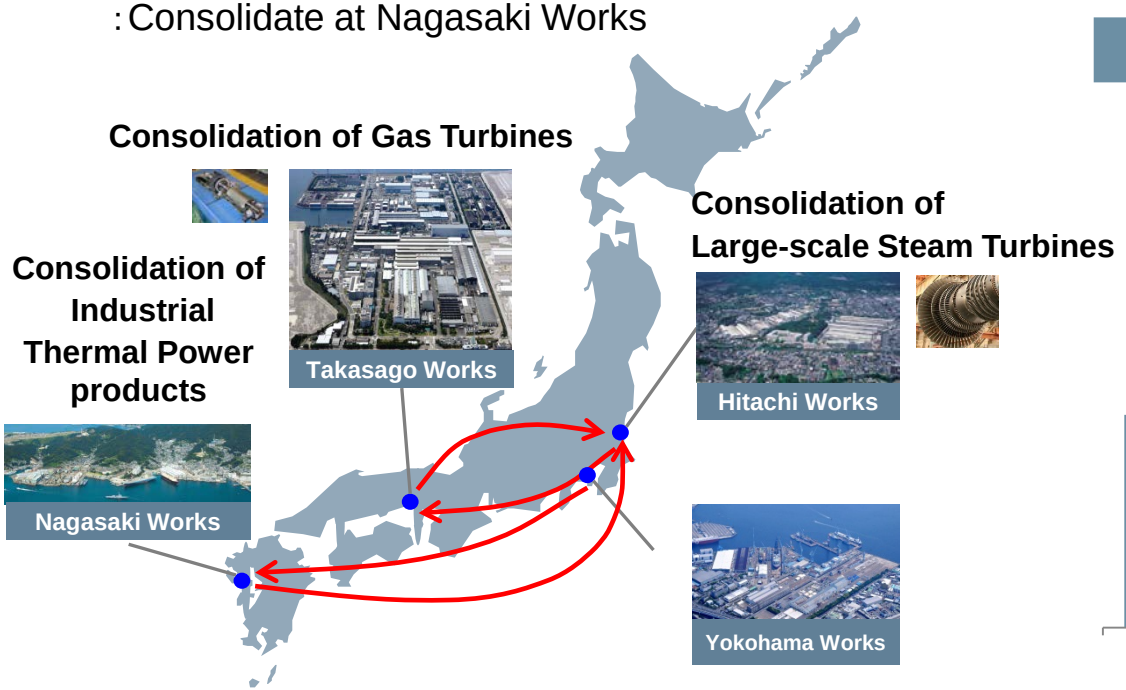
・Gas Turbines
：Consolidate at Takasago Works*1

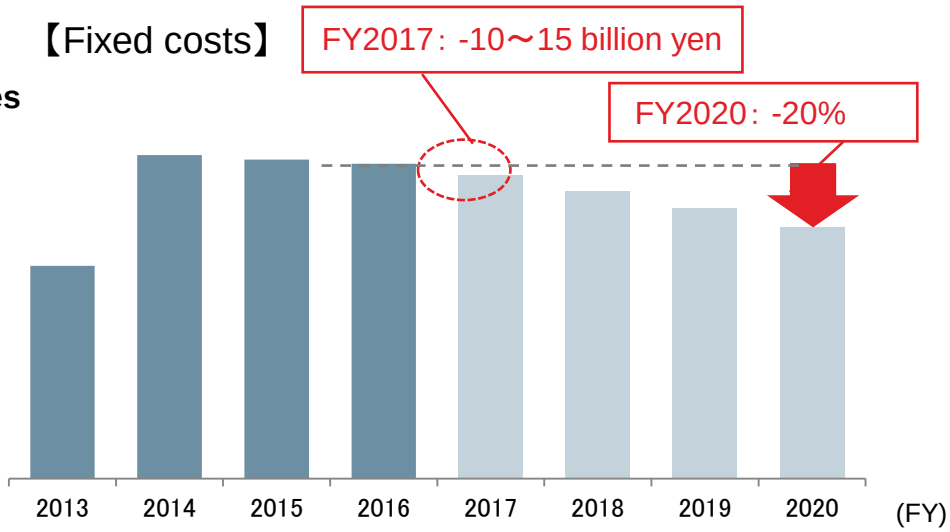
・Large-scale Steam Turbines, Nuclear Turbines and Hydraulic Turbines
：Consolidate at Hitachi Works*2

・Industrial Steam Turbines and Boilers
：Consolidate at Nagasaki Works

Achieve the following through consolidation of production lines and factors for each product
1. Higher productivity
2. Promotion of effective use of assets
3. Streamlining of supply chain

Fixed costs: -10～15billion yen
Variable costs: -20 billion yen
(within FY2017)



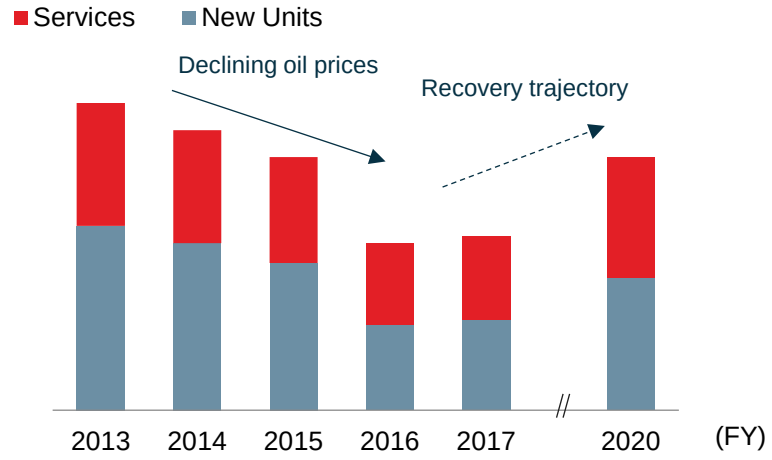


*1 For the time being, production of small/medium gas turbine rotors and high-temperature components will remain at the Hitachi Works until a final evaluation is made of market conditions and cost effectiveness.
*2 In future, nuclear turbines will be consolidated at the Hitachi Works when market conditions and other factors warrant this.

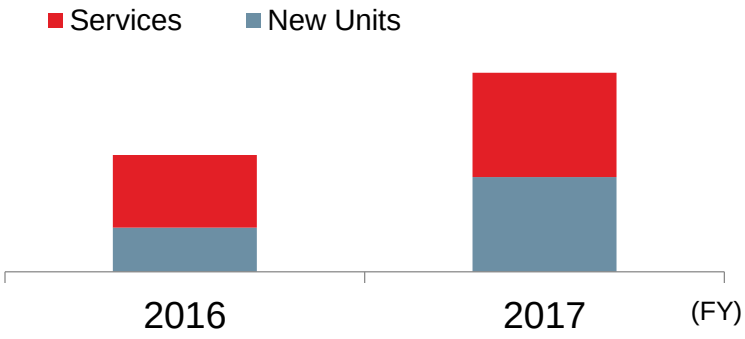
3-2. Compressors

Business environment	As oil prices stabilize, demand for new plants will show signs of gentle recovery starting in late 2017
Strategies	• Strengthen both domestic and overseas business foundations and raise profitability in order to successfully compete globally • Strengthen service business offerings
Issue	• Intensifying competition between companies in a oligopolistic market
Measures	• Expand sales of compressor trains in the oil & gas field through combined offerings with MHPS gas turbines • Increase market share in petrochemicals, a market in which we have several strengths. • Expand service business ・Strengthen alliances with system-oriented companies ・Improve local response capabilities at overseas service facilities (USA, Saudi Arabia, Brazil, Russia) ・Share resources with gas turbine facilities

Market scale of compressor business



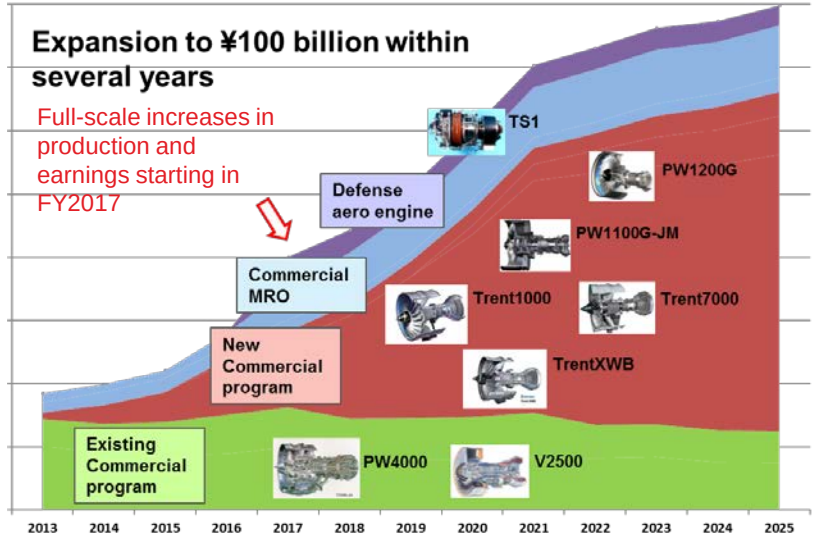
Business scale (by orders received)



3-3. Aero Engines

Business environment	• Growing market sustained by robust aircraft demand • Business will expand sharply when delivery of new aircraft ramps up
Strategies	• Increased involvement in engine design and expansion of assembly/overhaul businesses • Improve competitiveness by boosting production tie-ups with operational partners
Issues	• Long-term business model requiring long time period in which to reap investment returns • Responding to sharp production increases
Measures	• Optimize program mix (recovery period / investment period) • Enhance SCM through use of IoT / AI and transform into smart factory (promote as model factory for entire company) • Strengthen business portfolio through expansion of engine assembly and overhaul businesses (V2500 overhaul, assembly and test of MRJ engines) • Enhance collaboration with engine OEMs (Pratt & Whitney, Rolls-Royce)

Business scale



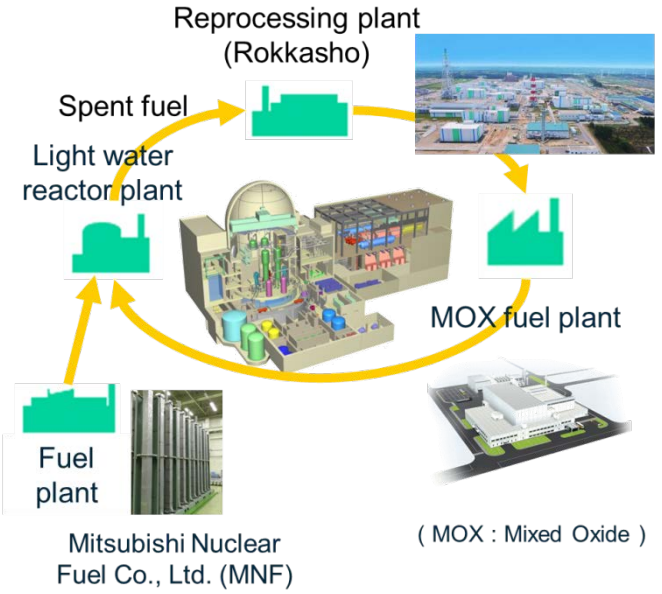
V2500 engine repair business

SCM : Supply Chain Management MRJ : Mitsubishi Regional Jet MRO: Maintenance, Repair and Overhaul

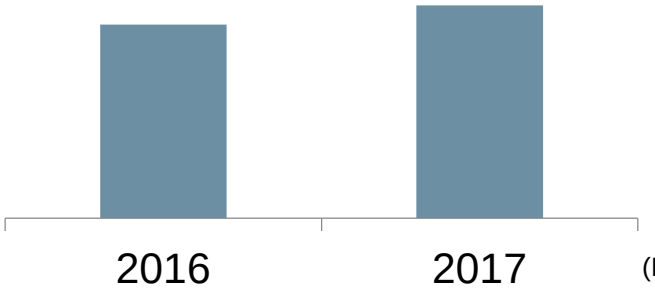
3-4. Nuclear Power (1/2)

Business environment	• Important base-load power supply source within the domestic energy mix • Global expansion of nuclear power generation
Strategies	• Contribute to nuclear plant restarts in Japan, and nuclear fuel cycle process • Promote plant projects overseas with reinforced risk management
Issues	• Strengthening of product competitiveness (collaboration with AREVA, etc.) • Transfer of technology/skills over the long-term, optimization of resources
Measures	• Support nuclear plant restarts in Japan • Promote Sinop project (ATMEA1) in Turkey (strengthen overseas business risk management) • Encourage nuclear fuel cycle process (support of safety enhancement measures, etc.) • Support stabilization of Fukushima Daiichi Nuclear Plant (development of remote-controlled robots, etc.) • Strengthen collaboration through investment in AREVA

Responding to all processes in nuclear energy cycle

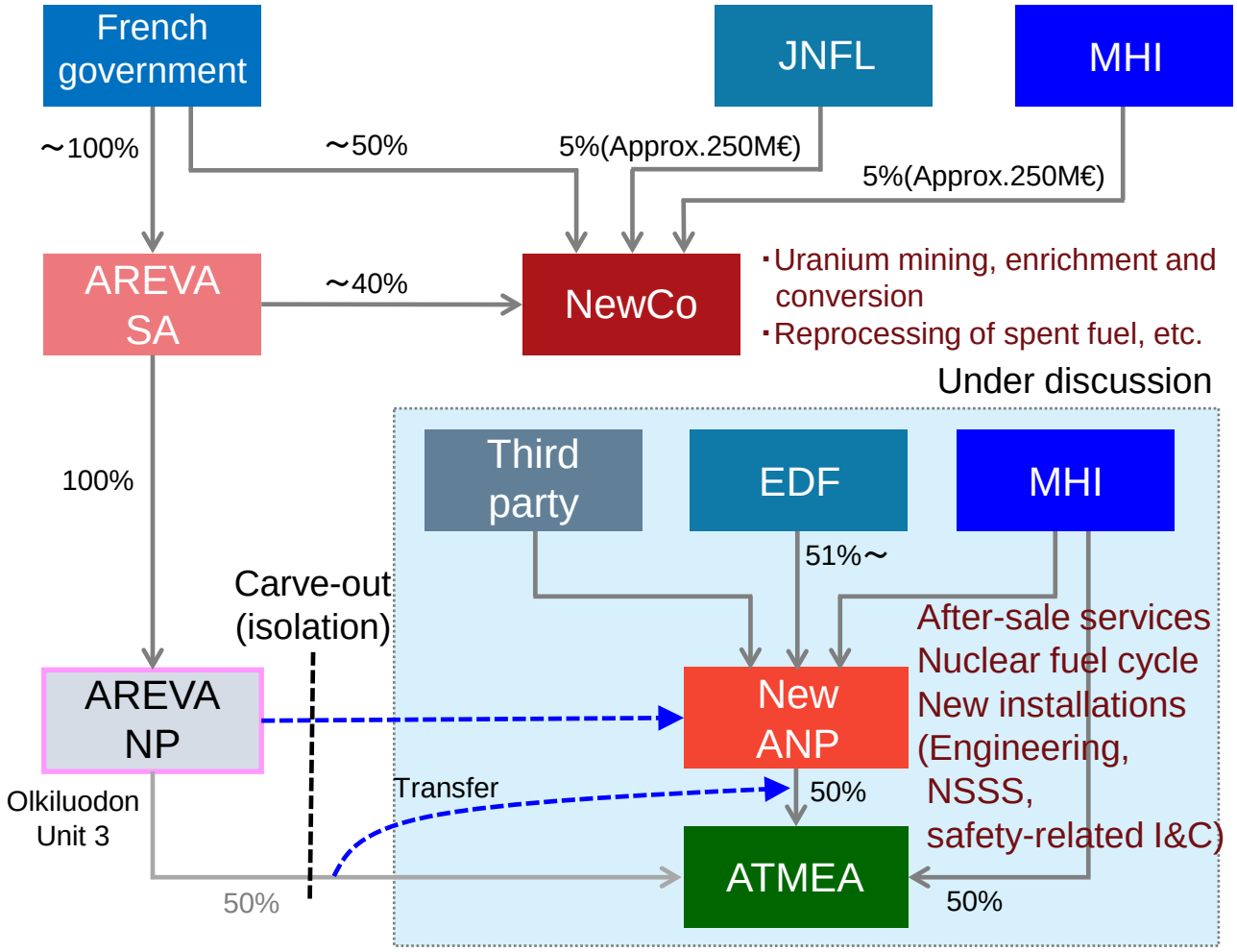


Business scale (by net sales)



3-4. Nuclear Power (2/2) Investments relating to AREVA

- Investment into stable earnings businesses after separation from existing risks
- Creation and expansion of business opportunities through strengthening of strategic relationships with EDF and New AREVA



Purpose of investment into NewCo

- Reinforce collaboration with global leader (AREVA) in field of nuclear fuel cycle

Strengthen MHI's response capability to reactor decommissioning and fuel cycle

Purposes of investment into New ANP

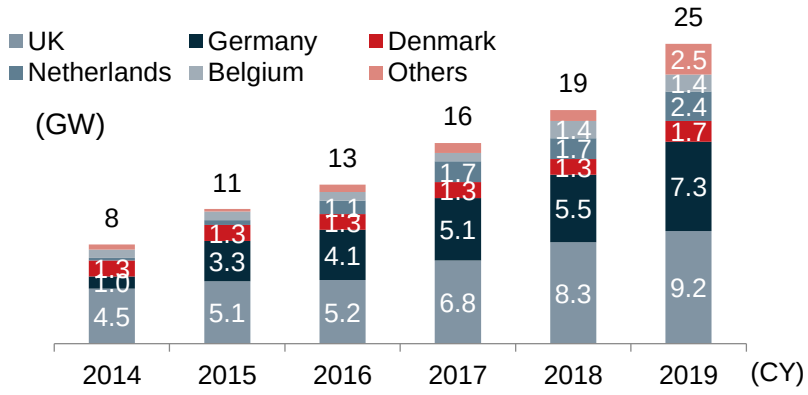
- Increase business opportunities, including ATMEA, through expanded collaboration with EDF
- Achieve stable profitability at New ANP
  -- After-sale services and fuel cycle
  -- Reactor-related engineering business (no EPC risk)

EDF: Électricité de France,
JNFL: Japan Nuclear Fuel Limited,
NSSS: Nuclear Steam Supply System
I&C: Instrumentation & Control

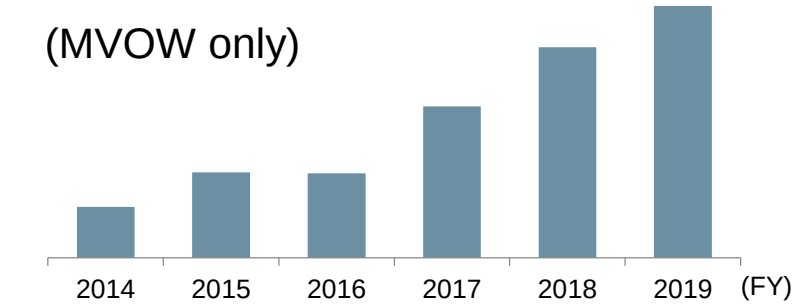
3-5. Renewable Energy (Offshore Wind Power)

Business environment	• Significant increase of renewable energy in Europe • Remarkable downward trend of wind energy costs
Strategies	Expand and stabilize the business by establishing mass production as planned
Issues	Boosting technological and economic strength, achieving a dominant position in the market
Measures	• Launching improved high-rated 9.0MW/9.5MW model, to meet needs for large-scale turbines (above 8MW) (in December 2016, 24 hour power generation recorded from 9 MW prototype in Østerild) • Keeping high availability of existing fleets through preventive maintenance • Penetration into new markets (U.S, Taiwan and Japan)

European offshore wind power market



Business scale (by net sales)



Goal of Power Systems Domain

We aim to MOVE THE WORLD FORWARD by becoming the top company globally for energy solutions and turbomachinery

Create new value for customers through core machinery and integration

Gas Turbines

Nuclear Reactors

Steam Turbines

Core Machinery

High-temperature, high-precision, high-quality machinery products

&

Integration

Total engineering solutions with complex systems

Offshore Wind Turbines

Gasifier

Compressors

AQCS

Aero Engines

AQCS: Air Quality Control System

We focus on making a positive impact on people's lives around the world to deliver environmentally friendly and safe products

MOVE THE WORLD FORWARD

MITSUBISHI
HEAVY
INDUSTRIES
GROUP