Power Systems Business Plan

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June 5, 2018

Mitsubishi Heavy Industries, LTD



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 - "POWER & ENERGY SOLUTION PROVIDER"

1-1. FY 2017 Sales Overview





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1-2. FY2017 Major Projects



Highly Efficient Gas Turbines

Thailand Received order of Advanced GTCC



Poland Received order of Advanced GTCC



GTCC: Gas Turbine Combine Cycle SOFC: Solid-Oxide Fuel Cell MGT: Micro Gas Turbine

Environmentally Friendly Technologies

Serbia

Received order of world's largest flue gas desulfurization (FGD) system



Fuel-Efficient Aircraft Engines

Next-generation aircraft engine for MRJ

Mitsubishi Heavy Industries Aero Engines assembles first unit



Zero Emission Power

Japan

Received first order of a SOFC-MGT hybrid system for industrial-use distributed power



Germany

Received order for 31 units of V164-8.0MW offshore wind turbines (Order received by MVOW)



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2-1. Review of 2015 Medium-Term Business Plan



Challenges in FY2015 Medium-Term Business Plan

- Orders received & Net sales: Rapid market change in power business
- Operating income: Imbalance between business scale and fixed costs

Achievements of 2015 Medium-Term Business Plan

- Launch of power & energy solution business
- Creating synergies among turbo machinery businesses
- Improved financial foundation (reduced working capital, shortened CCC)

Opportunities

- New business development by power & energy solutions coexisting with growing renewable energy
- Efforts of synergies among turbo machinery businesses
- Continue to pursue PMI activities while steadily executing the many projects on hand.





2-2. 2018 Medium-Term Business Plan (1/2)





2-2. 2018 Medium-Term Business Plan (2/2)



Initiatives for Achieving Earnings Targets			
Gas/Coal/ Geothermal Power	 Efficient execution and profit improvement for order backlog Expand services business Improvement work for existing facilities (e.g. reduce carbon emissions, higher efficiency) Digitalization, -Optimize O&M, etc. Reorganization of domestic & overseas bases through PMI 		
Nuclear Power	 Promote and ensure safety of construction and compliance with new domestic regulatory requirements. Carry out various maintenance works after restart Support completion of nuclear fuel cycle process facilities Support stabilization of Fukushima Nuclear Power Plant Strengthen risk management for overseas projects 		
Aero Engines	 Expand business volume in response to robust commercial aircraft demand Promote the engine overhaul and repair business 		
Renewable Energy (MVOW, Pumps, etc.)	 Strengthen competitiveness in response to the expansion of the offshore wind turbine market 		
Others (Compressors, Turbomachinery Synergies, Power & Energy Solution Business, etc.)	 Increase orders for new compressors and services in preparation of an upturn in the oil & gas market Promote synergies within a broad range of MHI group turbo machinery technologies Develop unique businesses within the Power & Energy Solution Business function 		



Note: Impact of IFRS conversion is negligible.

2-3. Turbomachinery Synergies





MHPS: Mitsubishi Hitachi Power Systems, Ltd.

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Comprehensive Management System Utilizing Al/IoT



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EMS: Energy Management System *2 ENERGY CLOUD® and related logomarks are registered trademarks of Mitsubishi Heavy Industries, Ltd. In Japan.

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3-1. MHI FUTURE STREAM





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Why?	Provide stable clean energy solutions for a sustainable society	
What ?	Provide decarbonizing solutions (low carbon / zero emissions)	
How ?	Focus strategy around 3E+S in the future (2030s, 2040s, and 2050s)	3E+S
Who?	MHI Power Systems can provide advanced technologies & integrate multiple solutions	Energy Security Environ- mental Protection
C. A. Land		

MHI as a "POWER & ENERGY SOLUTIONS PROVIDER" of the future

3-3. Challenges of Expanding Renewable Energy Use(1/2)



While wider use of renewable energy is essential, <u>a stable backup power</u> supply is also indispensible

Australia: Wide-reaching power outage results in suspension of major resource operations and disruptions to public transportation.

• In September 2016, a severe storm hit the state of South Australia and <u>a large power outage occurred</u> (wind power-generated electric power, which accounts for about half of the state's electricity supply, was cut off and lines from neighboring states were also interrupted).



3-3. Challenges of Expanding Renewable Energy Use (2/2) — time constraints, uneven regional distribution







High volume power-consuming areas that are distant from renewable energy fields require stable sources of power of a fixed scale



Regional

3-4. Power Systems Strategies Toward a Carbon-Free Society (1/2)

Challenges of Paris Agreement, Capping Climate Change at less than +2°C



(Reference: IEA World Energy Outlook 2017)

3-4. Power Systems Strategies Toward a Carbon-Free Society (2/2) 🚣 MITSUBISHE

Regional initiatives to Achieve Paris Agreement \rightarrow Combination of Renewable Energy and Low-Carbon Power Supply (gas/nuclear energy)



3-5. Future Energy Infrastructure (1/3)





3-5. Future Energy Infrastructure (2/3)



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3-5. Future Energy Infrastructure (3/3)





3-6. Solutions for Achieving "+2°C Scenario" for Climate Change (1/3)









GT: Gas Turbine CC: Combined Cycle

3-6. Solutions for Achieving "+2°C Scenario" for Climate Change (3/3)





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- 4-5. Mitsubishi Heavy Industries Marine Machinery & Equipment (MET Turbochargers)
- 4-6. Mitsubishi Vestas Offshore Wind (Offshore Wind Turbine)

5. Power Systems – Mission Statement: "POWER & ENERGY SOLUTION PROVIDER"

4-1. Mitsubishi Hitachi Power Systems





4-1. Mitsubishi Hitachi Power Systems



Respond to changes in the circumstances by expanding the business sphere and by adapting the new business structure



ESCO: Energy Service Company

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4-1. Mitsubishi Hitachi Power Systems Digital Solution





4-1. Mitsubishi Hitachi Power Systems Expansion of Solution Service





4-1. Mitsubishi Hitachi Power Systems Nuclear Turbine, Generator, Reactor Pressure Vessel (1/2)





Japanese market

[Strengthen expansion of after-sales services]

- Support plant restarts
- Increase reliability (extend lifespan, improve performance) (20~22% power supply configuration by 2030)

Overseas market

[Approach regions seeing expansion in demand]

- Supply turbines to countries where demand is growing (China, India, etc.)
- Respond to rebuilding demand in developed countries

PWR: Pressurized Water Reactors BWR: Boiling Water Reactors RPV: Reactor Pressure Vessel ST: Steam Turbine Gen.: Generator

4-1. Mitsubishi Hitachi Power Systems Nuclear Turbine, Generator, Reactor Pressure Vessel (2/2)



RPV: Reactor Pressure Vessel ST: Steam Turbine Gen.: Generator

4-1. Mitsubishi Hitachi Power Systems Restructuring of Coal Power Systems Business

Promote structural shift to increase added value and to be ready for scale-down of coal-fired power systems business from 2021 Study the 2018 Medium-Term Business Plan to implement necessary initiatives



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4-2. Nuclear Energy Systems (1/2)





4-2. Nuclear Energy Systems (2/2)



2018 Medium-Term Business Plan (FY2018-FY2020)

Make steady progress of maintaining and enhancing skilled nuclear technology in preparation for coming carbon –free society



- Promote initiatives for conforming to new regulations
- (severe accident management facilities, etc.)
- ·Develop large-scale renewal projects
- Support successful completion of construction of nuclear fuel cycle facilities



Medium to Long Term Business Outlook (CY2021-2030s)

Pursuing new business sphere

- Make efforts for new plants, including Sinop project in Turkey
- Prepare for removal of fuel debris from Fukushima Daiichi Nuclear Plant
- Contribute to intermediate storage facilities for spent fuel
- Commitment to decommissioning projects into full scale activities
- Promote R &D for fast reactor and fusion technology
- Promote strategic maintenance planning for 60 years operation (continual attention to safety, improve reliability)
- Deepen collaboration between Japan and France









Credit © ITER Organization, http://www.iter.org/

4-3. Mitsubishi Heavy Industries Compressor (Compressor)



(FY)

(FY)

4-4. Mitsubishi Heavy Industries Aero Engines (Aero Engines) 📩 MITSUBISH



[development & design]

P&W: Pratt & Whitney RR: Rolls-Royce GTF: Geared Turbo Fan

4-5. Mitsubishi Heavy Industries Marine Machinery & Equipment (MET Turbochargers)



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(FY)

2020

For power

generation and

mechanical

For lowspeed marine engines

drive engines



Power

Generation Offshore

Marine (auxiliary)

4-6. MHI Vestas Offshore Wind (Offshore Wind Turbine)



2025 (CY)

(FY)

Circumstances	 Growing renewable energy becomes a prominent resource of electricity European market continuing to grow, and US, Taiwan, and Japan markets are expected to be emerging (around 4~6GW/year) The second largest share of offshore wind turbine market (cumulative market share) 	
Challenges	 Respond to market growth and strengthen competitiveness Further improve economic performance Adjust for the variable renewable energy 	Offshore Wind Turbine Market (Survey by research institutes) •U. K. •Germany •European countries •U.S.A. •Korea • Taiwan • Japar (GW) 44 47 44 47 44 47 44
	 Respond to market growth by strengthening mass-production systems 	2018 2019 2020 2021 2022 2023 2024 2025 (C Net sales (MVOW)
Solutions	 Introduce the world's largest turbine, output 9.5MW, to the market (install in 2019) 	
	 Add on higher value by combining with flexible power sources (e.g. small GT) 	
		2015 2016 2017 2018 // 2020 2021 2022 (F
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Power Systems - Mission Statement : Toward Realizing a Sustainable Society





MHPS Digital Solutions

POWER & ENERGY SOLUTION PROVIDER

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MOVE THE WORLD FORW>RD

