

# **Medium-Term Business Plan “FY2019 MTBP” (FY2019 - FY2021) Energy System & Plant Engineering Company**




October 2, 2019

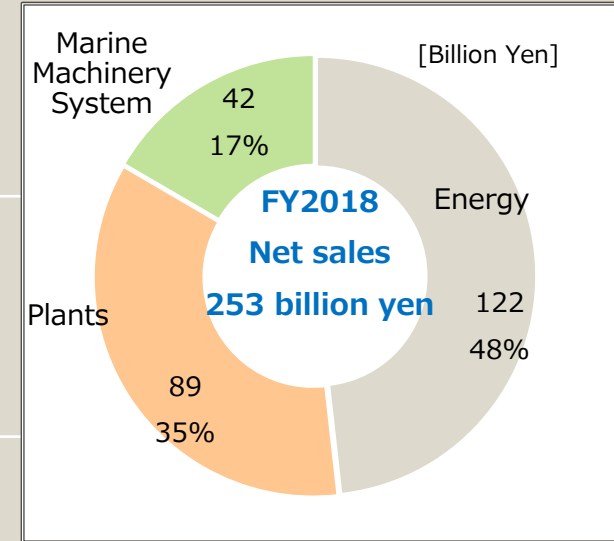
**Kawasaki Heavy Industries, Ltd.**

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# Overview of Energy System & Plant Engineering Company

Business	Product/Market	Main Models
  	Energy System	<ul style="list-style-type: none"> <li>• CCPP*(Combined Cycle Power Plant)</li> <li>• Industrial gas turbines</li> <li>• Gas engines for power generation</li> <li>• Aerodynamic machines</li> <li>• Steam turbines</li> <li>• Distributed energy systems</li> <li>• Hydrogen power generation facilities</li> </ul>
	Boiler Plants	<ul style="list-style-type: none"> <li>• Thermal power boilers (U-KACC*, Internal Circulation Fluidized Bed Boiler)</li> <li>• Exhaust heat boilers (HRSG*, cement exhaust heat, waste incineration waste heat)</li> <li>• FLNG*, FPSO*, marine boilers for offshore power generation</li> </ul>
	Low-temperature plants	<ul style="list-style-type: none"> <li>• LNG tanks/unloading bases</li> <li>• Hydrogen storage tanks/unloading bases</li> <li>• Hydrogen production/liquefaction facilities</li> </ul>
Plants	Industrial machinery plants	<ul style="list-style-type: none"> <li>• Industrial plants (cement, ferronickel)</li> <li>• Chemical plants (GTG*, fertilizer plants)</li> <li>• Materials handling plants (conveyors, stackers/reclaimers)</li> <li>• Shield tunneling machines</li> <li>• Ash handling plants</li> <li>• Crusher plants</li> </ul>
	Environmental plants	<ul style="list-style-type: none"> <li>• Waste incineration plants (including O&amp;M*)</li> </ul>
Marine Machinery System	Marine Machinery System	<ul style="list-style-type: none"> <li>• Naval Machinery</li> <li>• Marine reciprocating engines</li> <li>• Marine Propulsion System</li> </ul> 



# Business Strategy of Energy System & Plant Engineering Company

## Business Environment

- Shift from fuel and exhaust gas with high environmental impact to **CO<sub>2</sub>-free and low environmental impact**
- Power generation system trends shift from concentrated/large-scale to **distributed/medium-to small-scale**
- **Networking** between power generation facilities is progressing

## Our strengths

- Products with market competitiveness from **differentiation**
- **Engineering power** cultivated domestically and overseas
- **Brand power** in small- and medium-sized fields, specific regions, and **niche fields** for special applications

## Issues

- Responding to increased demand for LNG-fired power generation, transitioning to hydrogen fuel, and recovering unused energy
- Responding to needs for local production/local consumption and small- and medium-sized power generation systems
- Strengthening maintenance and after-sales service businesses

Global warming countermeasures under the Paris Agreement  
Greenhouse gas reduction

Japan's target: Reduce GHG emissions for FY2030 by 26% from FY2013 levels



Gas demand: 1.4 times in 2040  
(Compared to 2017)  
Hydrogen demand: 9.8 times in 2050  
(Compared to 2015)

Source: IEA World Energy Outlook 2018, Hydrogen Council



# Business Strategy of Energy System & Plant Engineering Company

## Overall policy (2019-2021)

### 1. Company management policy

Demonstrate our strengths by adapting existing technologies and products to the market.

⇒ Bring “strong” products into new markets. Expand shares in “strong” markets.

Enter new markets by creating new technologies, functions, and added value.

⇒ Hydrogen-related products, gas reforming-related products, CCPP-related products, next-generation marine equipment and systems

### 2. Items to be handled during the MTBP to address issues of priority throughout the company

#### **Improve profitability/improve free cash flow**

- Expand sales of CO<sub>2</sub>-free and low-environmental impact products (CCPP, gas turbines, gas engines, etc.)
- Secure orders for existing plants/facilities up for renewal through proposal-based marketing
- Strengthen maintenance and after-sales service
- Improve FCF through expansion of after-sales service and acquisition of advance payments

#### **Business model innovation**

- Construction of hydrogen supply chain (make, transport, store, use)
- Shift EPC\* management power for plant businesses to hydrogen and energy businesses

#### **Strengthen project risk management**

- Select appropriate contract formats
- Strengthen risk management for projects already underway

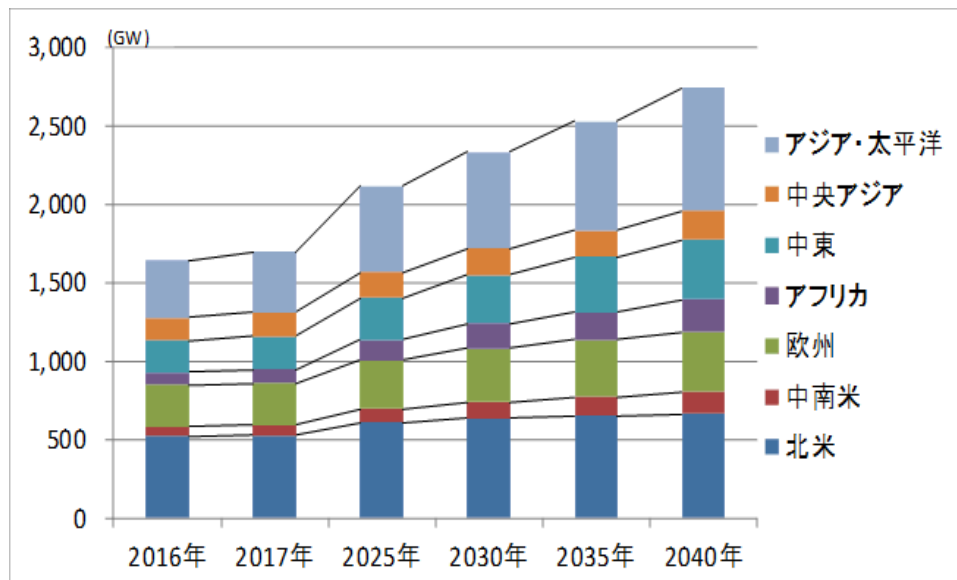
# Business Strategies by Product/Market (Energy)

## Energy

### Market Environment

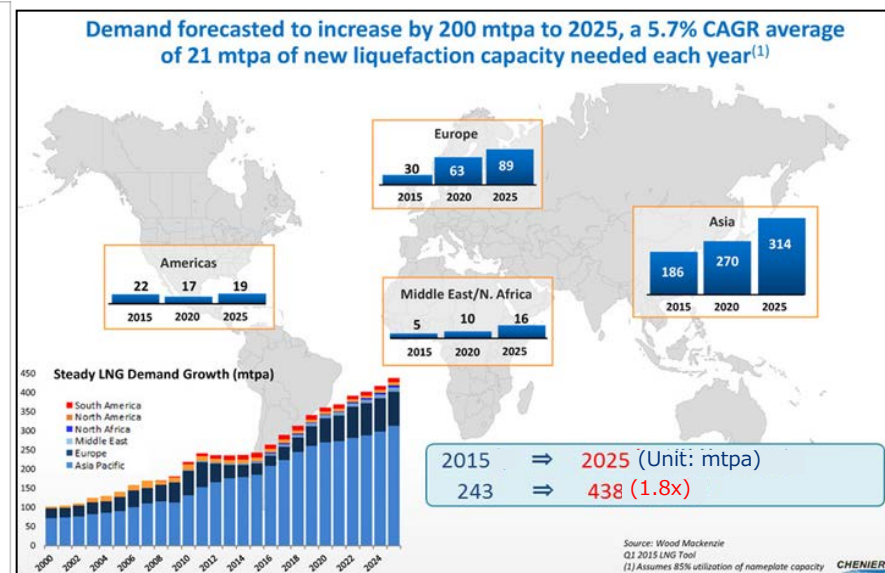
- Continued expansion of power generation capacity due to global economic growth
  - Shifts to CO<sub>2</sub>-free and low environmental impact
- Solid increase in gas-fired thermal power and growth in renewable energy  
 Increasing demand for power sources for load adjustment to supplement renewable energy  
 Expansion of hydrogen utilization

[Gas power generation capacity forecast]



Source: World Energy Outlook 2018

[LNG demand forecast]



# Business Strategies by Product/Market (Energy)

## Measure

Business stage: growth

Role during MTBP: improving profitability

[Energy]

**The main player of small and medium energy systems throughout the world**

- (1) Promoting overseas expansion
- (2) Strengthening sales expansion of CCPP
- (3) Strengthening core hardware competitiveness

[Hydrogen/LNG]

**A leading company in the hydrogen supply chain**

- (1) Responding to energy shift from LNG to hydrogen
- (2) Promoting efforts toward demonstrating commercial uses of hydrogen

FY2018 sales ¥122 billion → FY2021 sales ¥194 billion

Energy

# Business Strategies by Product/Market (Energy)

## [Energy initiatives]

### (1) Promoting overseas expansion

- Strengthen sales power, engineering power, and service systems
- Flexibly respond to customer demands for thermoelectric (combined cogeneration, gas turbine/gas engine hybrid proposals, etc.)

→ Industrial gas turbines: Boasting a high market share in the industrial gas turbine (small- and medium-sized) field in Indonesia, Malaysia, and Germany; expand sales further by expanding overseas bases.

→ Gas engines for power generation: Develop sales by utilizing industrial gas turbine bases and past performance.

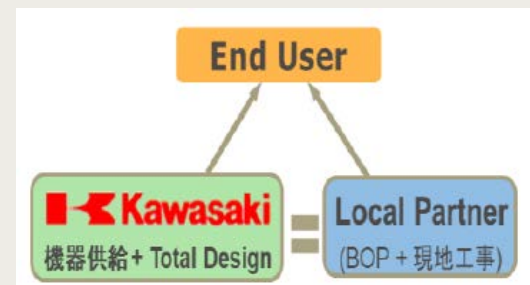
### (2) Strengthening sales expansion of CCGP

- Form CCGP overseas promotion project team, strengthen overseas sales system

→ Make direct proposals for our “equipment + TOTAL design” by cooperating with local partners

### (3) Strengthening core hardware competitiveness

- Improve the efficiency of various equipment, handle power sources for adjustment, hydrogen fuels, etc.

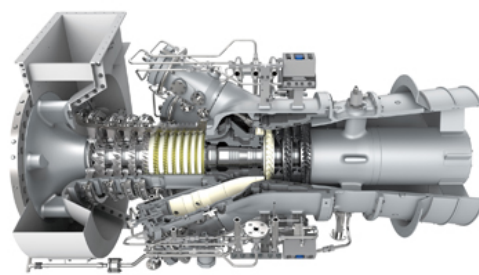


## Essential products



L30A CCGP

A Combined Cycle Power Plant including a 30MW-class high-efficiency gas turbine (L30A) developed in-house and produced domestically



Industrial gas turbine (M5A)



Gas engine for power generation



# Business Strategies by Product/Market (Energy)

[Hydrogen/LNG initiatives]

## (1) Responding to energy shift from LNG to hydrogen

- Applying cryogenic storage and transport technology cultivated with LNG to hydrogen businesses
- Developing combined use of LNG and hydrogen (hydrogen mixed gas turbines, LNG reformed hydrogen production)

## (2) Promoting efforts toward demonstrating commercial uses of hydrogen

- Hydrogen pilot demonstrations (Kobe, Australia) completed in FY2020
- Promote product development toward commercialization of hydrogen pilot chain  
E.g., Hydrogen liquefaction system (5t/d hydrogen liquefier 3,000 hours endurance test underway)  
Increasing size of hydrogen storage tanks (2,500 m<sup>3</sup> tank under construction at Kobe unloading base)  
Hydrogen production equipment (under construction at Australian loading base)
- Establish presence by participating in hydrogen business feasibility studies

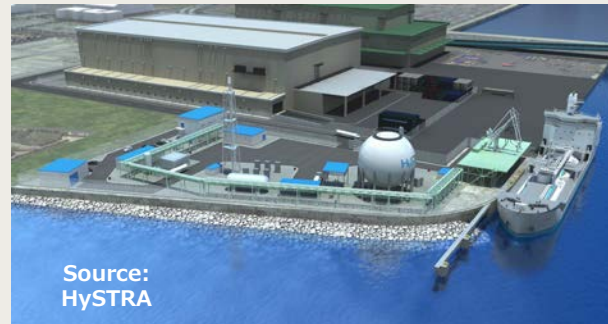
### Development products



Hydrogen liquefier



Hydrogen storage tanks



Source:  
HySTRA

Hydrogen unloading base

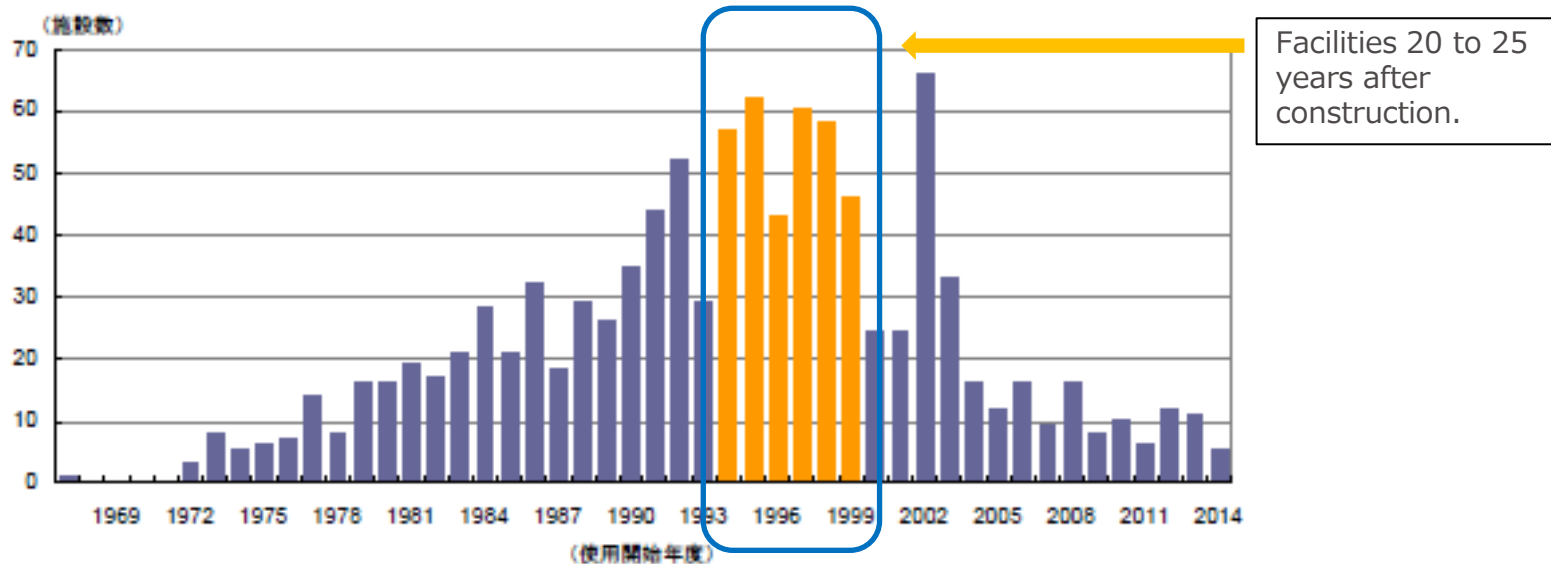
# Business Strategies by Product/Market (Plants)

## Market Environment

### Plants

- Domestic demand for rebuilding, lifespan extension, and repair due to aging, and infrastructure demand due to urban development, are continuing
- Overseas, growing demand for plant construction due to increasing environmental awareness and effective use of natural gas

[Changes in the number of facilities by year in which use started for domestic waste incineration plants]



Source: Japan Waste Management Consultant Association

# Business Strategies by Product/Market (Plants)

## Plants

### Measure

Business stage: stable/recovery

Role during MTBP: securing stable revenue

### A plant engineering company with core hardware

- Secure demand for rebuilding and lifespan extension of waste incineration plants and secure base loads through operation & maintenance
- Expand sales of waste incineration plants in the Chinese market through Chinese joint ventures
- Expand sales of chemical plants in response to growing demand for gas reforming
- Strengthen sales of products with high competitiveness and added value

FY2018 sales ¥89 billion → FY2021 sales ¥113 billion

### Essential products



Waste incineration plants



GTG plants

# Business Strategies by Product/Market (Plants)

## [Secure orders of waste incineration plants]

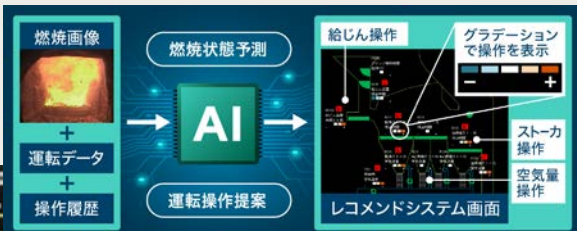
Prioritize the allocation of management resources to waste incineration plants which are expected to be continuously updated throughout the MTBP.

Orders increased in the Chinese market in line with investment expansion of Conch Venture\* (parent company of the Chinese joint venture)

\* Joint ventures Orders received in China: 26 facilities in total, 11,100 t/d waste processed

## (Our strengths)

- Highly efficient power generation technology
- Operation monitoring/support systems using AI
- Improved safety and less labor by using robots



## [Expanding sales of chemical plants in response to growing demand for gas reforming]

- Completed the world's largest GTG plant in June 2019
  - \* The world's only plant that produces 600,000 tons of high-quality gasoline per year using natural gas as a raw material
- Sales expansion to Turkmenistan and neighboring countries

## [Strengthening sales of products with high competitiveness and added value]

- **Materials handling plants**
  - ⇒ Yard machines
- **Shield tunneling machines**
  - ⇒ Long distance/high depth (high water pressure)/shields that can handle hard rock
- **Ash handling plants**
  - ⇒ Dry bottom ash handling system



Materials handling plants



Shield tunneling machines

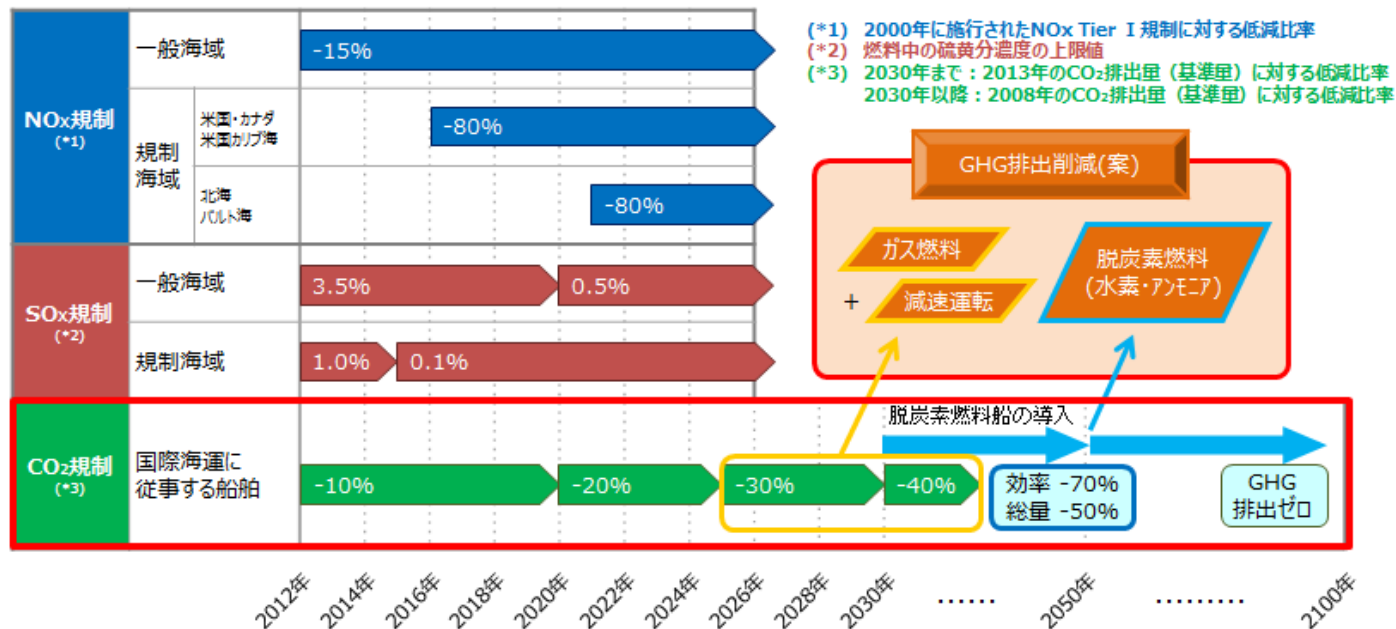
# Business Strategies by Product/Market (Marine Machinery System)

## Marine Machinery System

### Market Environment

- **Gas-fueled ships are spreading** due to the recovery of the shipping and new shipbuilding markets and further tightening of environmental regulations
- **In the future, demand for decarbonized fuel ships will increase** due to increased GHG\* emission reductions
- **Needs for autonomy in ship operations and maneuvering are increasing** for the purpose of improving safety, combating de-skilling, and improving efficiency in ship operations

[Types and application of environmental regulations]



# Business Strategies by Product/Market (Marine Machinery System)

## Marine Machinery System

### Measure

Business stage: business innovation

Role during MTBP: improving profitability

**A pioneer who constantly nurtures competitive products with new technologies in changing business environments**

- (1) Technological development and commercialization of next-generation marine equipment and systems
  - Concentrating on gas-fueled engines, strengthening the competitiveness of Marine Propulsion System
  - Developing and commercializing control systems for hybrid propulsion systems
- (2) Future product development and proposals
  - Proposing of autonomous propulsion systems utilizing basic ICT/IoT technology

FY2018 sales ¥42 billion → FY2021 ¥48 billion

### Gas-fueled engines

Kawasaki-MAN B&W 7S60ME-C10.5-LGIP



Image of ship for installation (LPG fuel-propelled ship)

### System/package sales

System/package sales through combinations of core hardware (propulsion units, etc.) and propulsion systems

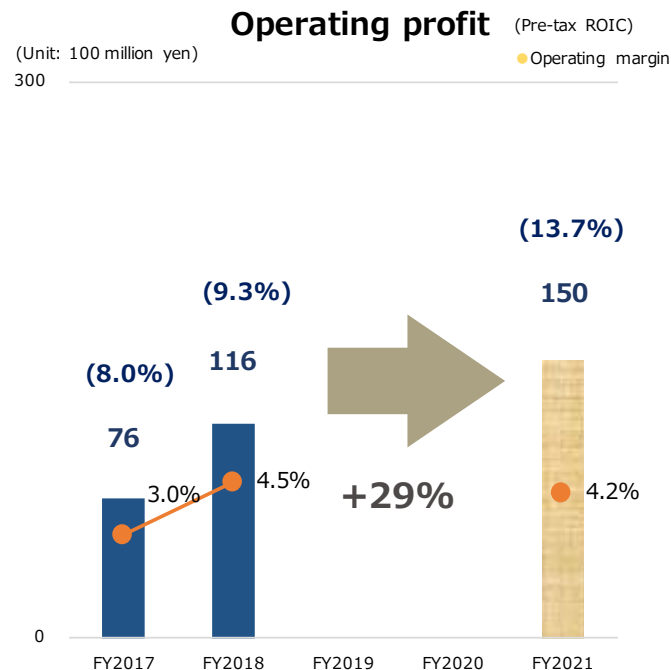
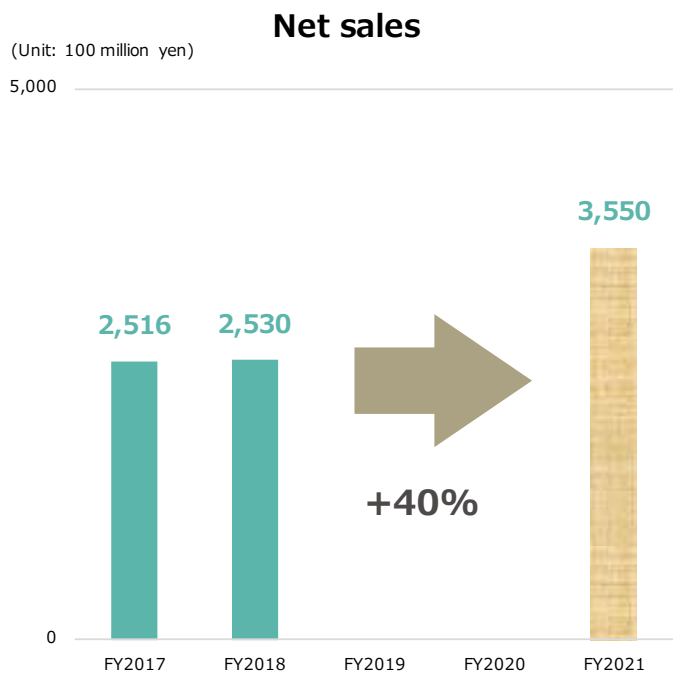


Rexpeller E-Series



KICS : Kawasaki Integrated Control System

# FY2019 MTBP Quantitative Goals



## [Energy]

- Expand sales through CCPP sales expansion
- Reduce domestic gas engine power plant projects
- Increase after-sales service

## [Marine Machinery System]

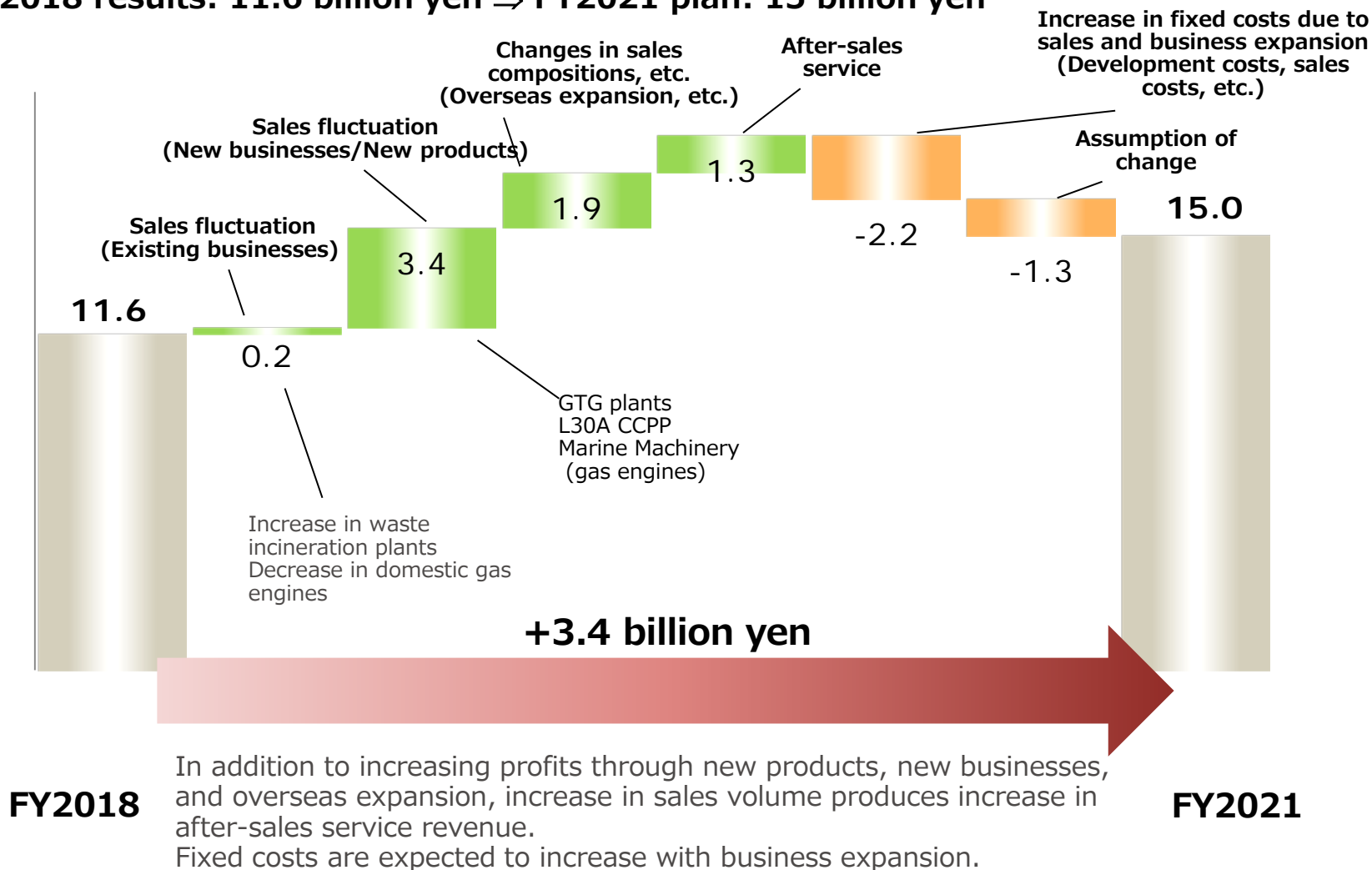
- Increase from securing demand for conversion to gas-fueled engines

## [Plants]

- Increase due to demand for renewing waste incineration plants
- Increase due to orders for overseas chemical plants

# Measures for Improving Operating Income

- FY2018 results: 11.6 billion yen ⇒ FY2021 plan: 15 billion yen





# Long-Term Direction Until FY2030

## — Growth strategy and business model innovation for 2030

### Concentrating management resources in hydrogen-related business

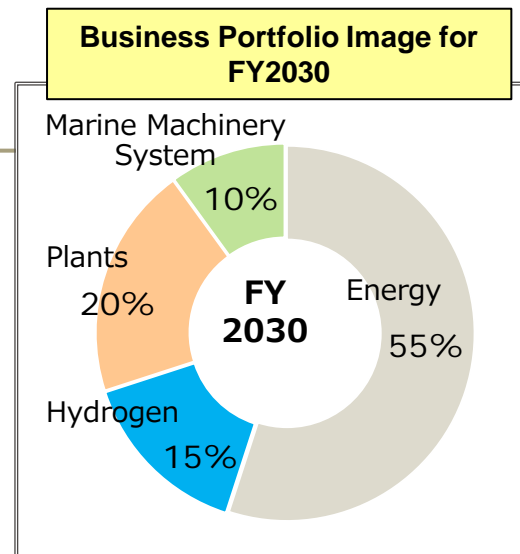
- **Provide key hardware at each stage of the hydrogen chain**

Make:	Gas-reforming hydrogen production, electrolytic hydrogen production, hydrogen liquefaction system
Transport and store:	Liquefied hydrogen tanks, loading systems
Use:	Energy products such as hydrogen gas turbines

- **Shift personnel from plant businesses to energy business (hydrogen)**

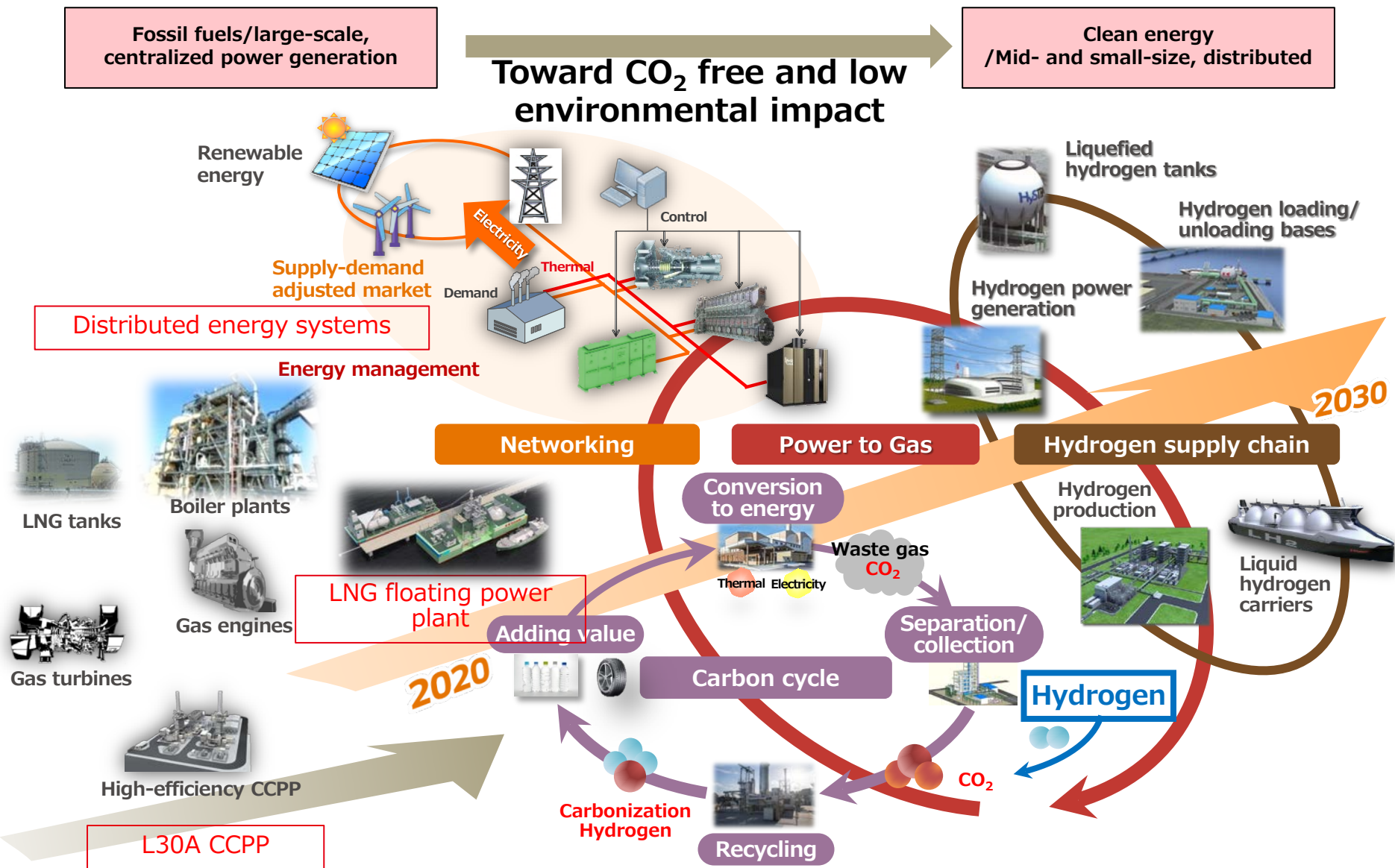
### Promoting decarbonization and saving labor

- **Expand sales by using core hardware, such as gas turbines and gas engines, in the market trending toward decarbonization**  
(L30A CCPP overseas expansion, launch of LNG floating power plant, providing distributed energy systems)
- **Build up a strong position as system integrator of marine machinery**  
(Autonomous propulsion systems, hybrid propulsion systems, electrification packages)



# Long-Term Direction Until FY2030

— Growth strategy and business model innovation for 2030



世界の人々の豊かな生活と地球環境の未来に貢献する

“Global Kawasaki”

# [Explanation of Acronyms]

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**CCPP:** Combined Cycle Power Plant

**U-KACC:** Upgrade Kawasaki Advanced Clean Combustion (Nonflammable petroleum residue fired boiler)

**HRSB:** Heat Recovery Steam Generator

**FLNG:** Floating Liquefied Natural Gas

**FPSO:** Floating Production, Storage and Off-loading system

**GTG:** Gas To Gasoline plant (a plant that synthesizes gasoline from methanol, which itself has been synthesized from natural gas)

**O&M:** Operation and Maintenance

**EPC:** Engineering, Procurement and Construction

**Conch Venture** (a company listed in the Hong Kong market)

\*The parent company of the Chinese joint venture, Wuhu Conch Venture Enterprise Limited, is a subsidiary company founded by Conch Venture.

**GHG :** Green House Gas