

Resources, Energy & Environment Business Area Briefing

IHI

May 17, 2019

IHI Corporation

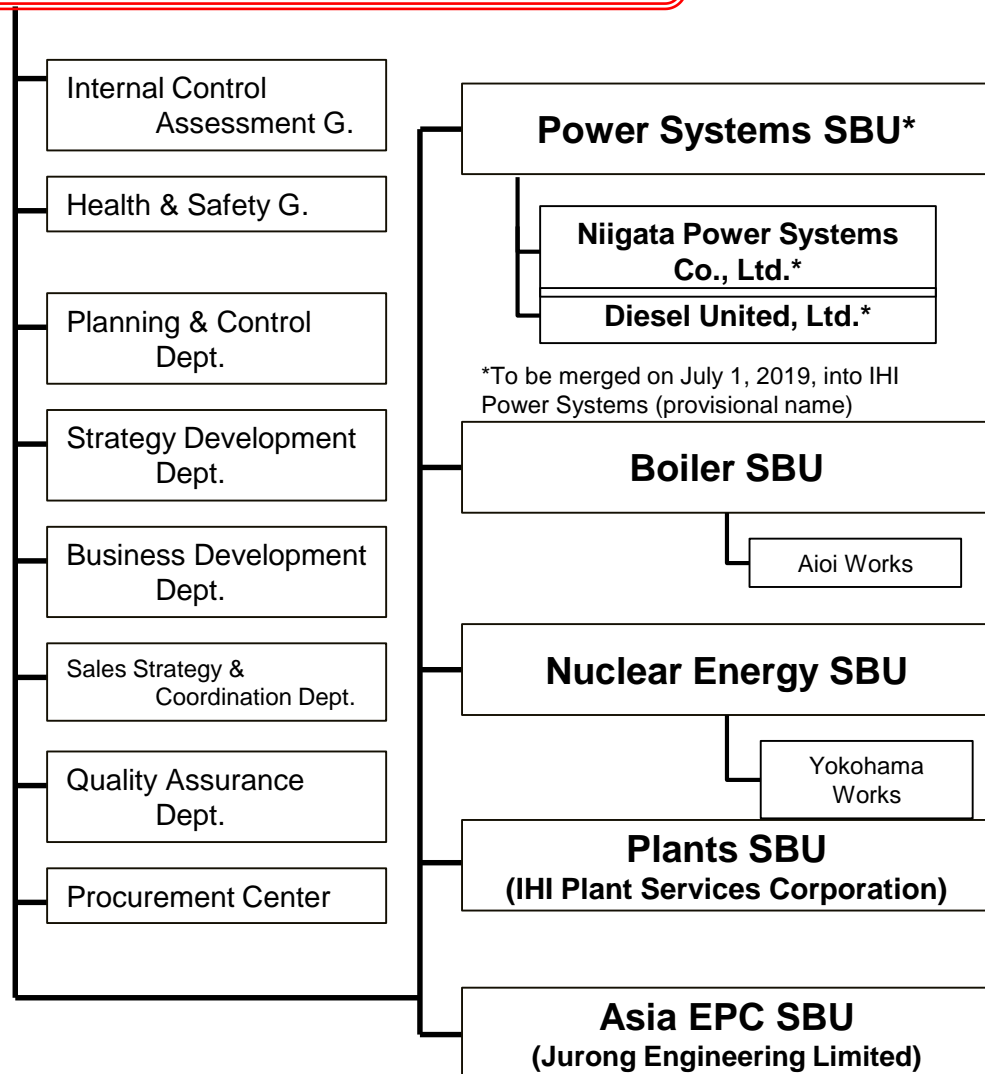
Hiroshi Ide, Managing Executive Officer and President of
Resources, Energy & Environment Business Area

Contents

1. Resources, Energy & Environment Business Area Outline.....	3
2. Management Policies based on Group Management Policies 2019.....	5
3. Individual Business Strategies.....	12
Core Businesses	13
Lowering Carbon Dioxide Emissions for a Recycling Society.....	17

1. Resources, Energy & Environment Business Area Outline

Resources, Energy & Environment Business Area



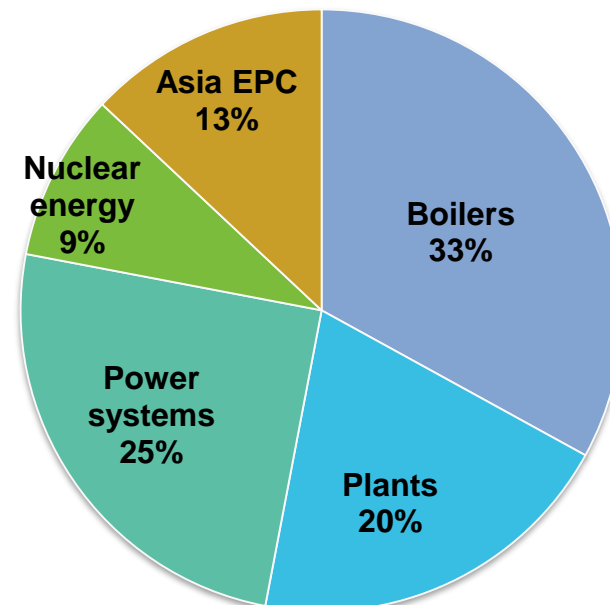
Hiroshi Ide: Executive officer and president of business area

Yoshinori Komiya: Executive office and vice president of business area

Kouji Takeda: Executive officer and vice president of business area and president of IHI Plant Services Corporation



FY2018 Segment Sales (¥377.0 billion)



2. Management Policies Based on Group Management Policies 2019

(1) Direction

Contribute to carbon-free and recycling societies by providing optimal integrated solutions for each region and customer

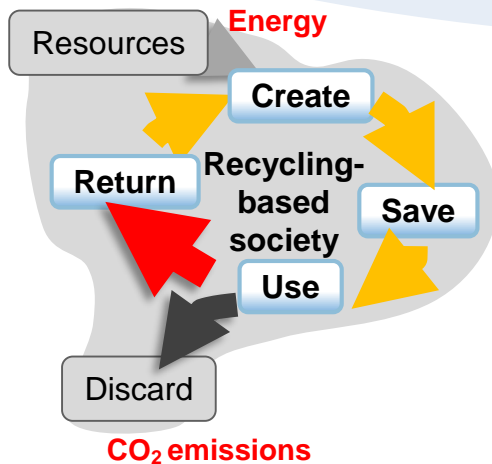
Environment

Assess and lower carbon dioxide emissions in framework of life cycle and recycling-based society

Renewable resources
Create new resources in carbon-free and recycling societies

Renewable energy usage
Pursue regional and industry decentralization and renewable energy-based society

Depleted resources usage
Minimize life cycle carbon dioxide emissions



Carbon dioxide emissions reduction approaches

1. Lower emission rates

Higher performance and efficiency, fuel conversion, and renewable resource usage, etc.

2. Use less energy

Energy conservation and management, etc.

3. Increase absorption and usage

Resources creation and chemicals conversion, absorption, and storage, etc.

Halve carbon dioxide emissions of domestic and overseas customers by 2035

Solutions proposals

Use existing technologies

Develop new technologies

Collaborate with other companies

Addressing social issues

While energy 4D+E* megatrends initiatives are accelerating to combat climate change, lower environmental impact and cut carbon dioxide emissions

* Decarbonization, Decentralization, Digitization, Deregulation, and Electrification

(2) Focuses over three years

Strengthen business foundations

Reinforce core technologies and enhance customer value in lifecycles

- Fully employ such strengths as ultra-super critical pressure, biomass incineration, and fuel handling technologies
- From the perspective of globalizing the cycle value chain, supply plant systems and services that cater to diversifying social needs, notably for high efficiency, distribution, fuel diversification, and renewables stabilization, to create new energy businesses
- Conceive and materialize with partners the development of infrastructure that encompasses industrial estate development that incorporates the energy businesses created, distributed energy supply businesses, and other elements

Build a robust operational structure

Create a lean and flexible organization by reforming business structure

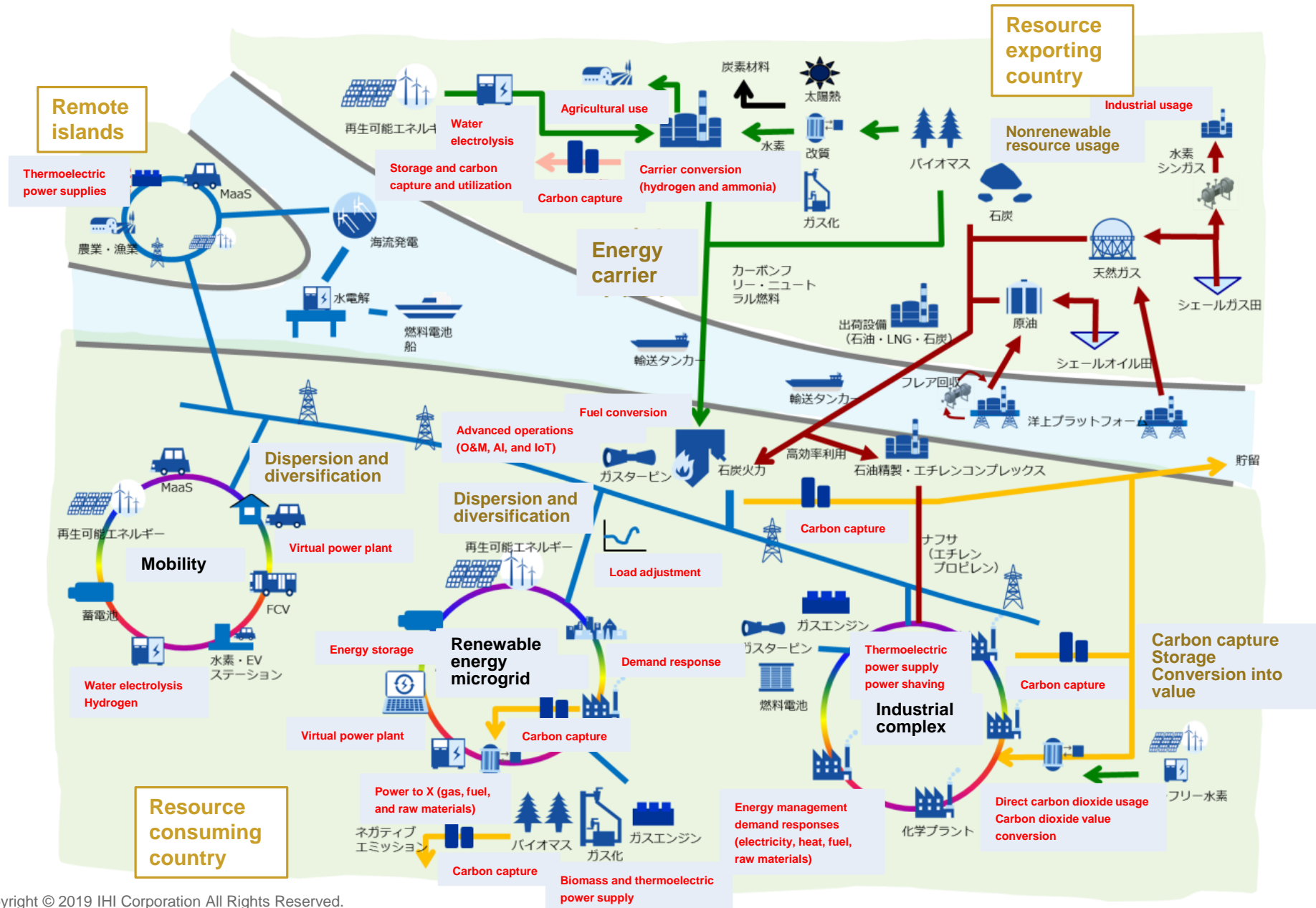
- Digitize to establish shared business platforms and optimally allocate resources across the Group to drive business structure reforms, to build a robust business management structure that is efficient with lean and flexible business operations

Accelerate preparations for tomorrow

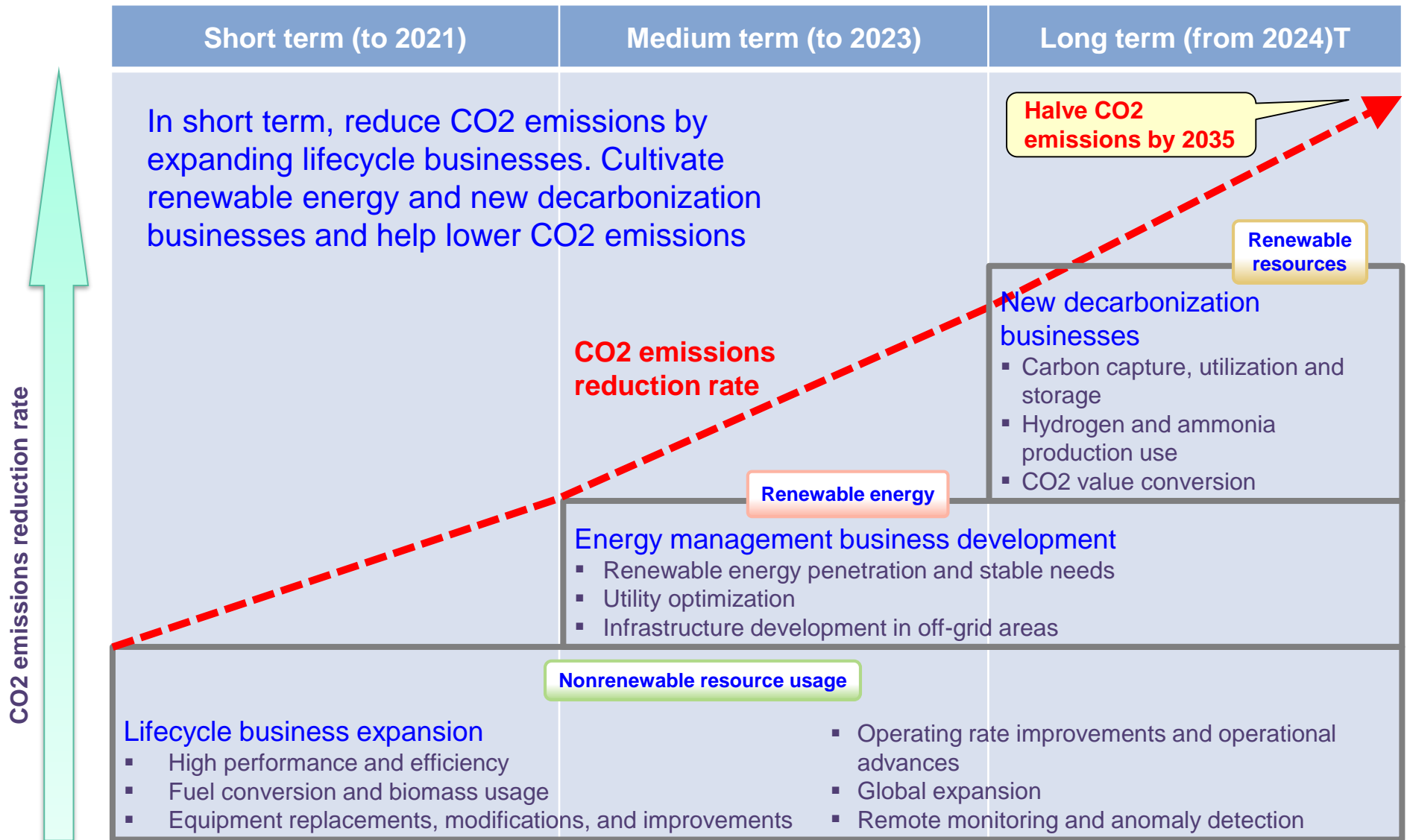
Create new value for carbon-free and recycling societies

- Develop diverse technologies that help reduce carbon dioxide emissions while exploring an effective business model and formulating a technology portfolio that is pivotal for tomorrow's businesses

(3) Value chain encompassing carbon-free and recycling societies



(4) Medium- and long-term roadmap under business strategies



(5) Direction: Focuses in three areas

Nonrenewable resource usage

Reinforce lifecycle business to lower carbon dioxide emissions and increase customer value

- **Identify customers' intrinsic needs** and provide solutions
- Develop lifecycle business through **high performance and efficiency**
- Engage in advanced **digitally based (monitoring and Digital Twin)** operations and management
- Expand scope of business from business to industrial use and cater to diverse needs
- **Enhance globalization** by bolstering collaboration with overseas business sites

Renewable energy

Cut carbon dioxide emissions by harnessing renewables and managing energy

- Stabilize renewable energy and formulate comprehensive proposals that encompass everything from supply through demand
- **Optimally manage energy operations** in on-grid areas

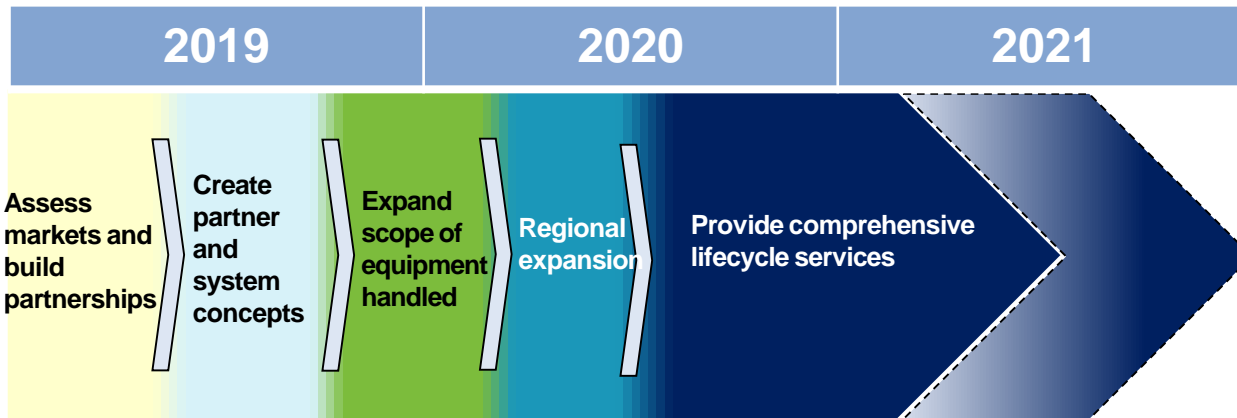
Renewable resources

Develop technologies for carbon-free and recycling societies and cultivate new businesses

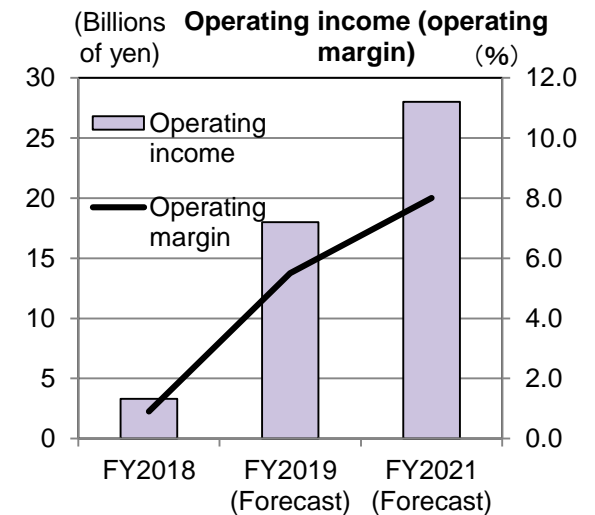
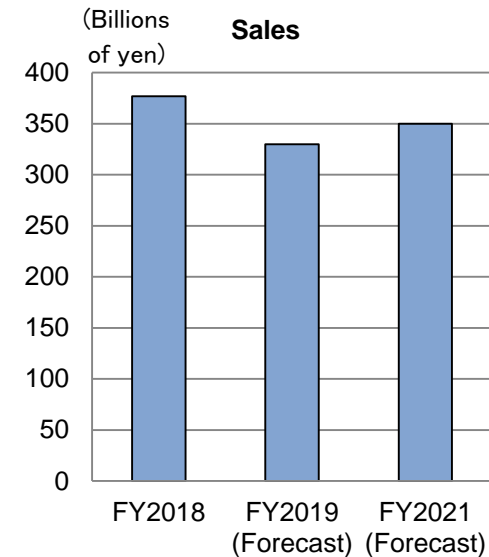
- Develop technologies for **hydrogen production, ammonia, and methanation usage**
- Use biomass and develop business for fuel diversification

(6) Three-year roadmap

Expand life cycle businesses and enhance customer value



Boilers	<ul style="list-style-type: none"> Reinforce overseas services
Power systems	<ul style="list-style-type: none"> Cultivate overseas marine engine services businesses Cultivate small distributed power and services businesses
Plants	<ul style="list-style-type: none"> Reinforce domestic services businesses
Nuclear energy	<ul style="list-style-type: none"> Run business based on government nuclear energy policies
Asia EPC	<ul style="list-style-type: none"> Expand oil and gas and existing power plant businesses Enter emerging markets



3. Individual Business Strategies

Core Businesses



Push ahead with robust maintenance inspections and drive efficiency to lower carbon dioxide emissions

Transition to lifecycle business

Involve ourselves closely in customer operations and switch to a comprehensive proposal-based model from the perspectives of utilization rates, operational costs, and initial investments

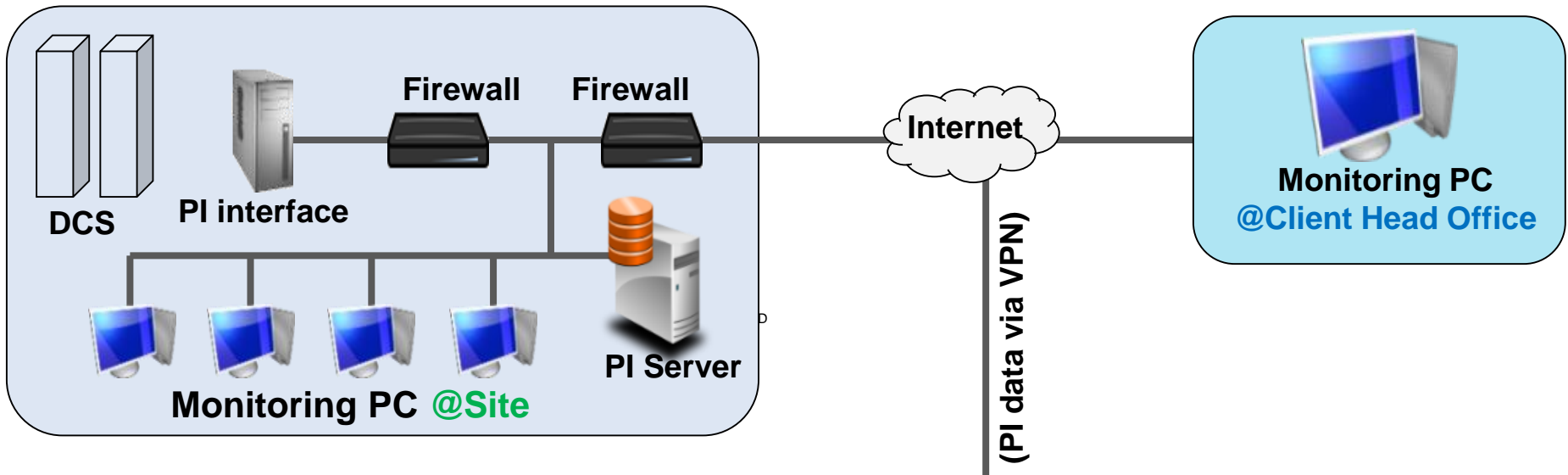
Japanese market: Endeavor to enhance customer value

- Undertake initiatives to shorten processes and lift operational rates
- Propose business conversion flows to customers extending from running facilities to maintenance, upgrades, and engineering (also take same approach overseas)

Overseas markets: Endeavor to enhance value and expand business

- For existing thermal power stations, drive advances and ensure high efficiency, centered in Southeast Asia, North Africa, and the Middle East
- Step up strategic collaborations with IHI global network entities Jurong Engineering Limited in construction, Steinmüller Engineering GmbH in engineering, PT. Cilegon Fabricators in manufacturing, and IHI POWER SYSTEM MALAYSIA SDN. BHD. (maintenance) to create overall value for the supply chain
- Collaborate with domestic power companies to undertake operations and optimize plants overall, including by increasing operational rates

Remote monitoring business in Malaysia



**Monitoring PC
@IPSM in KL**

**Remote monitoring
technologies at IHI
POWER SYSTEM
MALAYSIA SDN.
BHD.**

Bolster core technologies and improve customer value in lifecycles

Marine-use power systems: Expand market share, centered on tugboats in this core business, and strengthen technological capabilities

- Step up marketing activities and use overseas sites to expand our global market share
- Ultimately develop technologies that cater to automation and electrification

Land-use power systems: Priority investment area for expansion; identify markets and differentiate with technology

- Collaborate with customers to supply optimal energy infrastructures in off-grid areas
- Develop high-performance engines
- Cater to diversifying needs by strengthening product lineup

Lifecycle services: Establish integrated structure to handle everything from project creation to sales

- Involve ourselves in customer operations and apply remote monitoring technologies and supply parts to optimize operations, thereby expanding operations and maintenance businesses in emerging nations
- Cultivate long-term agreements to stabilize operations and help enhance customer value

Lowering Carbon Dioxide Emissions for a Recycling Society

(1) Methanation

(2) Compact Reactor

(3) Global Ammonia Network

(4) Palm Business

(1) Methanation

Developing a demonstration equipment for a new methanation technology that recycles carbon dioxide and contributes to a recycling society

IHI has jointly researched methanation technologies with the Institute of Chemical and Engineering Sciences (ICES) of Singapore's National Agency for Science, Technology And Research since 2011. Methanation entails processes to cause reactions with carbon dioxide emissions from power plants and factories with hydrogen to create methane as a useful energy source.

We developed a proprietary catalyst that delivers outstanding reaction efficiency and durability. We completed a methanation demonstration equipment employing the catalyst, installing it at ICES.

Methane from methanation can be fed through existing pipelines to power stations for fuel or for use as City Gas. We will help materialize a recycling society by leveraging promising carbon dioxide conversion technologies.

Text from IHI press release
issued on May 13, 2019



Demonstration device incorporating methanation technology installed at ICES



Demonstration device completion ceremony

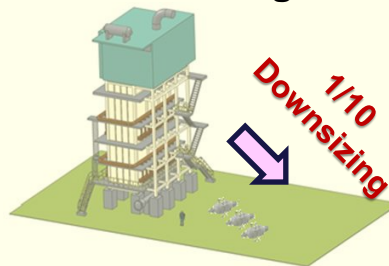
(2) Compact Reactor

We developed a compact reactor that is just one-tenth the size of conventional counterparts, lowering carbon dioxide emissions from high fuel efficiency and materializing a very eco-friendly business solution

Carbon dioxide emission reductions

- Carbon dioxide emissions around 10% lower owing to high fuel efficiency
- Clearing domestic and overseas benchmark values

Downsizing



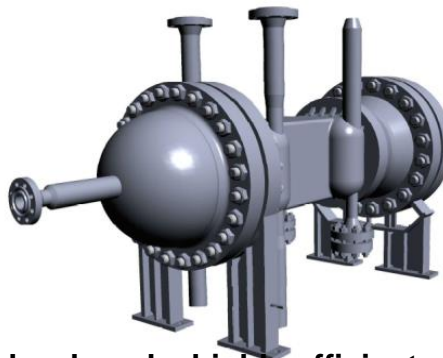
- One-tenth size of conventional models

Modular construction method



- Lowering local construction risks

Compact reactor



- We developed a highly efficient reactor employing advanced microreaction engineering
- Thermal transfer and reaction performances are around 10-fold better

Flexibility

- Eventually apply to an array of chemical processes
- For local production and consumption of maritime resources and shale oil and gas

Maintenance

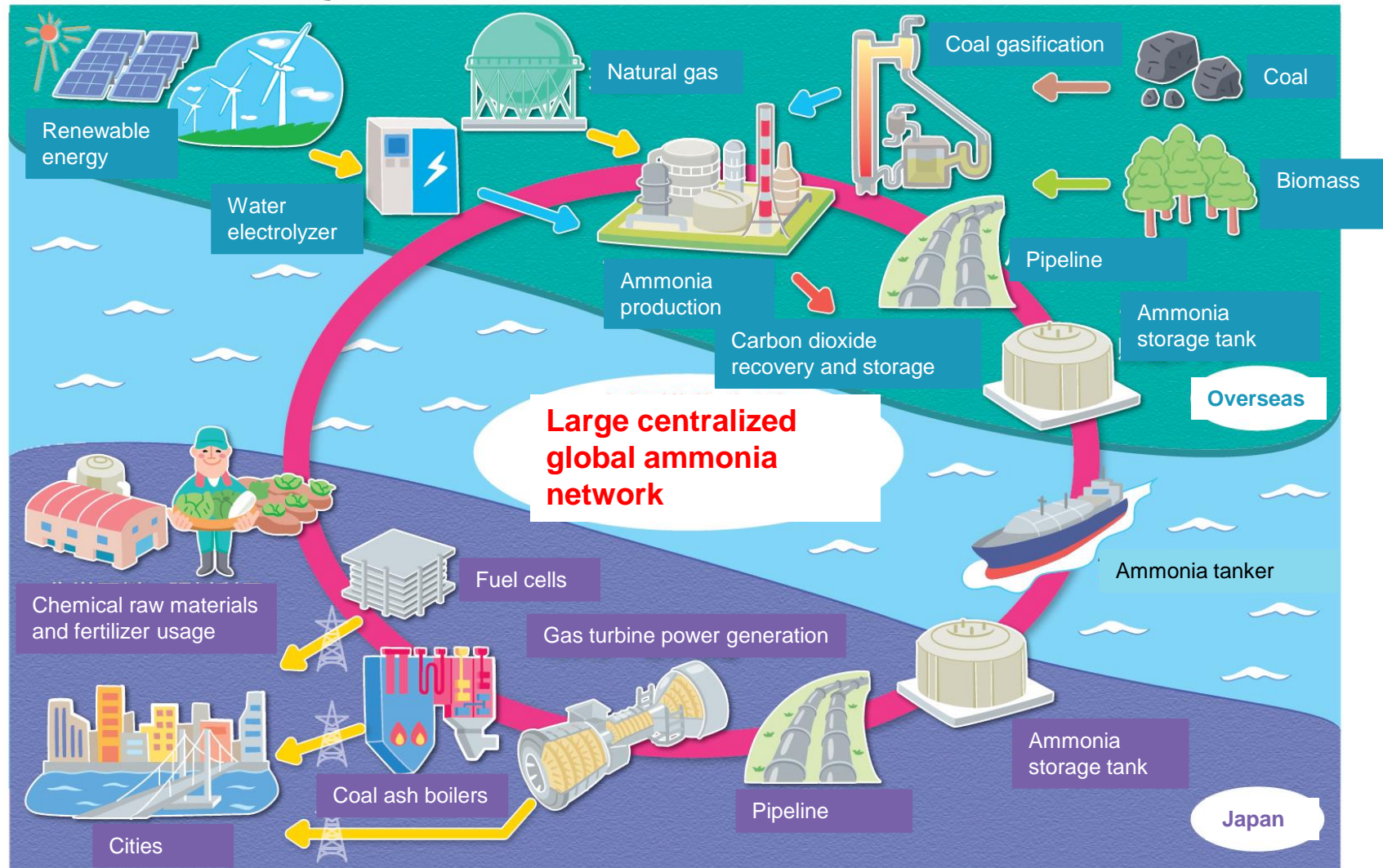
- Developed catalyst with advanced structure and slashed catalyst replacement times by one to three weeks
- Shortened maintenance shutdown periods and improved operational efficiencies

(3) Global Ammonia Network

Constructing a carbon-free energy supply chain with ammonia, which is easy to transport and store

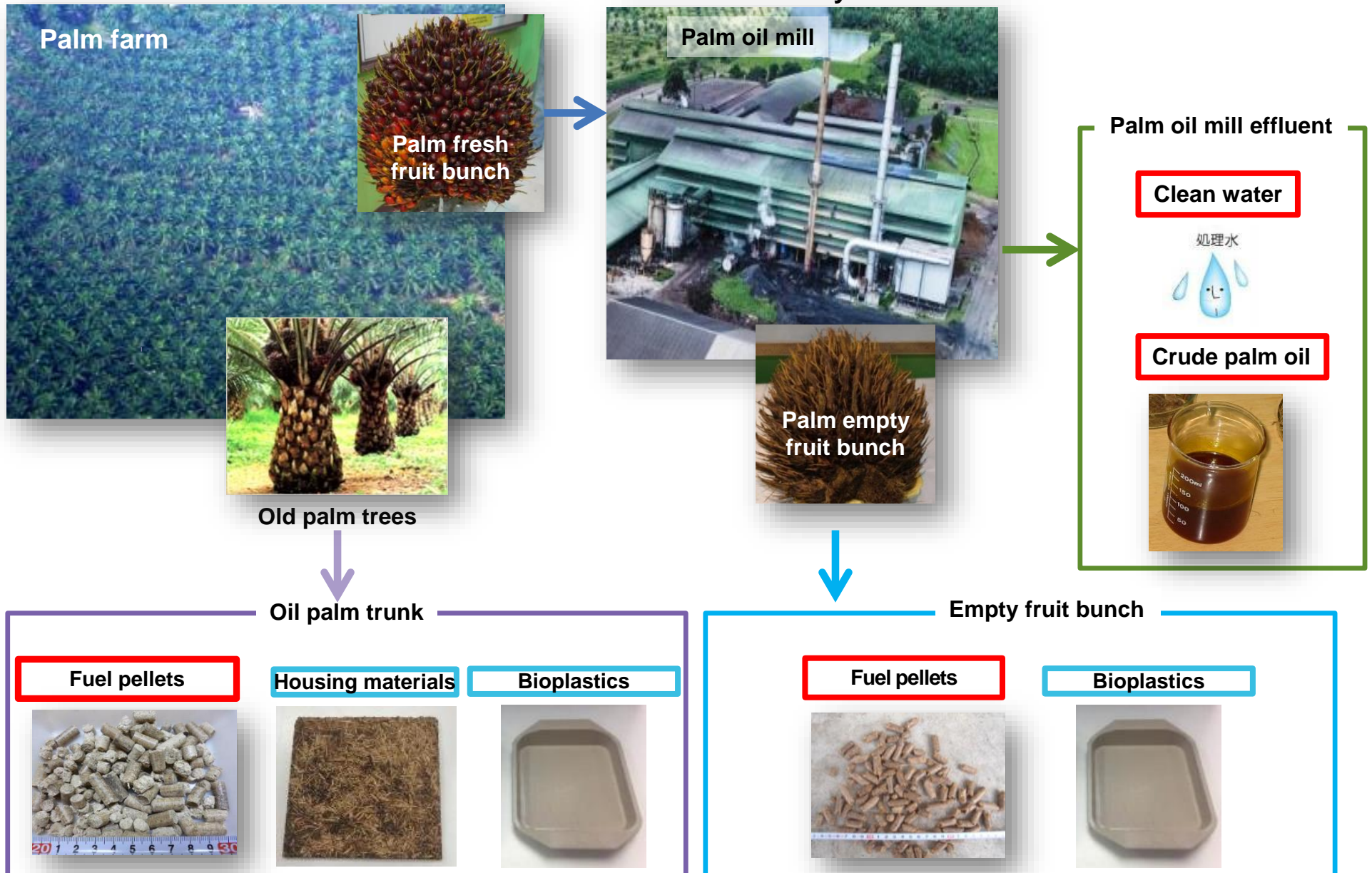
Advantages of ammonia

- Easy to liquefy, store, and transport
- Accessible through existing manufacturing and transportation infrastructures
- Directly usable as a fuel



(4) Palm Business

Leverage IHI's technology to resolve issues in world's largest vegetable oil industry and contribute to social sustainability





Forward-looking figures shown in this material with respect to IHI's performance outlooks and other matters are based on management's assumptions and beliefs in light of the information currently available to it, and therefore contain risks and uncertainties. Consequently, you should not place undue reliance on these performance outlooks in making judgments. IHI cautions you that actual results could differ materially from those discussed in these performance outlooks due to a number of important factors. These important factors include political environments in areas in which IHI operates, general economic conditions, and the yen exchange rate including its rate against the US dollar.