

Industrial Systems & General-Purpose Machinery Business Area Briefing

IHI

May 17, 2019

IHI Corporation

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1. Industrial Systems & General-Purpose Machinery Business Area Outline

1. Industrial Systems & General-Purpose Machinery Business Area Outline

Key product lines

Making things

Heat treatment and surface engineering



Vacuum heat treatment furnaces



PVD/PACVD coating equipment

Rotating machinery



Process gas turbo compressors



General-purpose turbo compressors

Moving people

Vehicular turbochargers



Turbochargers

Parking



Elevator parking



Underground parking (Super Square Parking System)

Moving things

Transport machinery



Continuous unloaders



Jib climbing cranes

Logistics and machinery



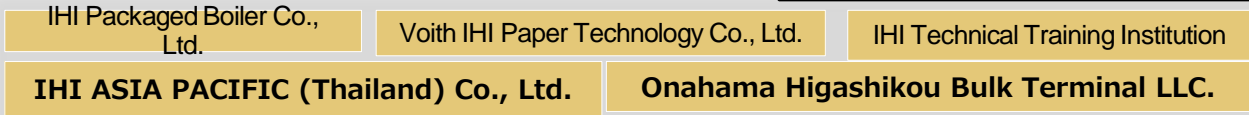
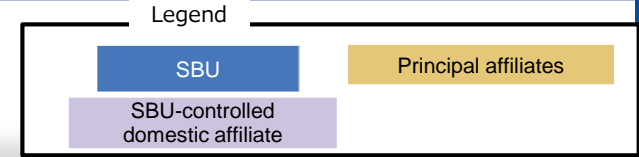
Air-suspended conveyors for large panels



Automated storage/retrieval systems

1. Industrial Systems & General-Purpose Machinery Business Area Outline

Industrial Systems & General-Purpose Machinery Business Area



Directly controlled businesses

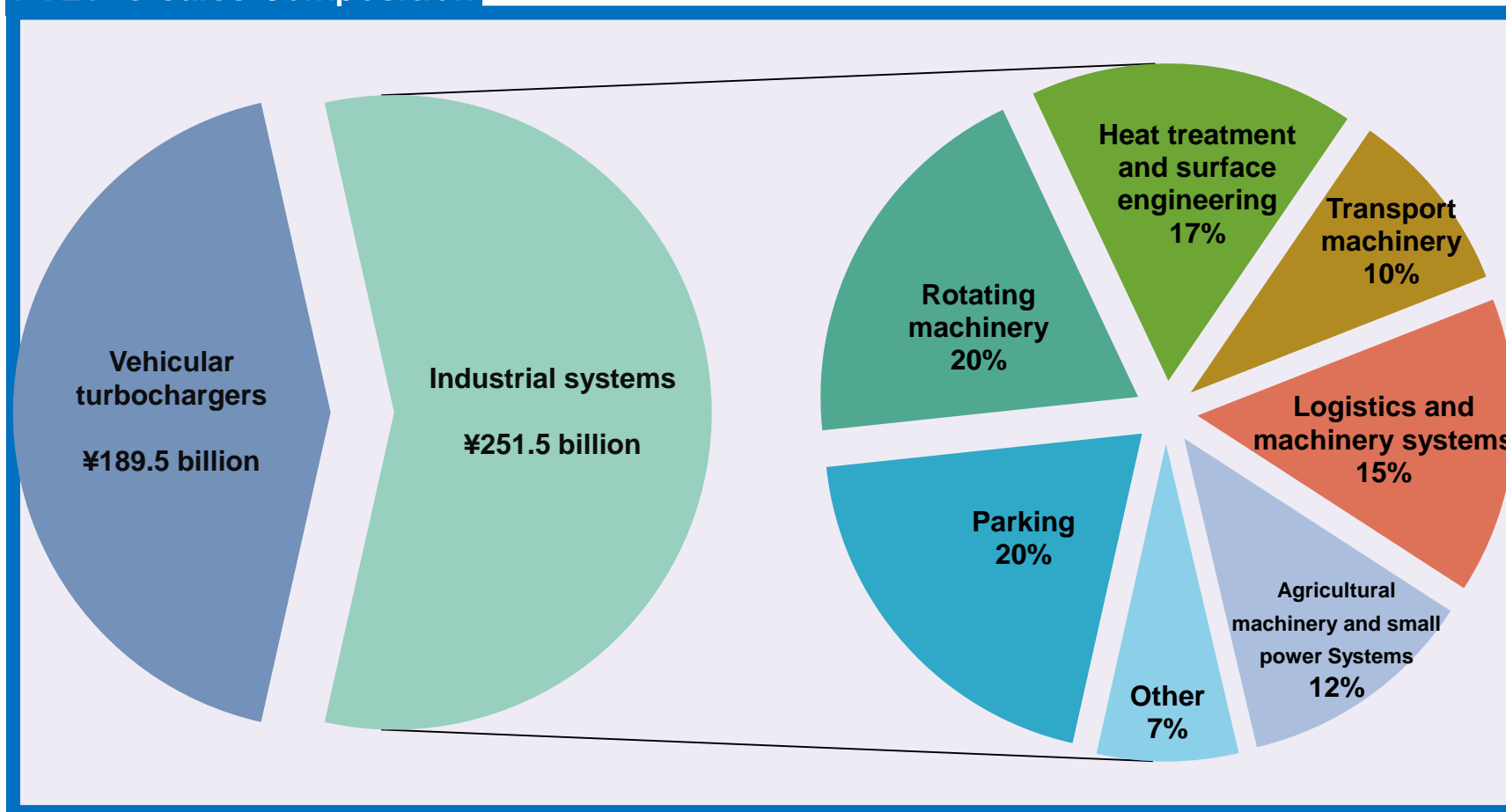
Business overview Main affiliates

Vehicular turbochargers	Supplying turbochargers for automotive engines	IHI Turbo CloverTurbo Co., Ltd.
Parking	Designing, manufacturing, constructing, and maintaining mechanical and automated parking systems	IHI Transport Machinery Co., Ltd.
Rotating machinery	Developing, designing, and manufacturing compressors, separators, and other rotating machinery	IHI Rotating Machinery Engineering Co., Ltd.
Heat treatment and surface engineering	Supplying and processing heat and surface treatment equipment for tools, automobile parts, and industrial machinery components	IHI Machinery and Furnace Co., Ltd. IHI Hauzer Techno Coating B.V. IHI Ionbond AG
Logistics and machinery systems	Designing and and supplying frozen and refrigerated automatic warehouse facilities, automated warehouses for hazardous goods, and storage and transport facilities	IHI Logistics & Machinery Corporation
Agricultural machinery and small power systems	Providing grass cutters and lawn maintenance machinery and agricultural machinery	IHI Agri-Tech Corporation
Transport machinery	Supplying jib climbing cranes for building construction and port unloaders	IHI Transport Machinery Co., Ltd.

1. Industrial Systems & General-Purpose Machinery Business Area Outline

- FY2018 results

FY2018 sales composition



Industrial systems

Overseas sales: 27.8%
After-sales services: 43%

2. Management Policies Based on Group Management Policies 2019

Direction

Contribute to industrial infrastructure progress by thoroughly optimizing operational lifecycles with customers

Optimize the people, energy, and assets of society and customers

Human resources

Process Automation and Personnel Saving

Assets

Optimize facilities utilization and balance sheets

Energy

Use electrical, thermal, water, and other energy efficiently

Prerequisites for maximizing efficiency

1. Enhance throughput and reduce costs by conserving labor and optimizing manufacturing and distribution processes

2. Reduce environmental impact and electricity costs by improving the efficiency of electrical, thermal, and other energy sources

3. Eliminate traffic accidents by providing a safe, secure, and convenient mobility infrastructure while helping lower environmental impact, eliminating mobility issues, and pioneering CASE* initiatives

Build new industrial infrastructure that optimizes operational lifecycles

Seek to create new industrial systems that comprehensively streamline customers' human resources, energy, and assets

Addressing social issues

- Energy storage and consumption efficiency, progress in industrial and technology innovation infrastructure, overcrowding and urban traffic congestion, rising carbon dioxide emissions, pollution, and aging populations in developed nations
- Compatibility with CASE* in automotive industry, digital transformations in the industrial machinery sector, structural changes across in logistics sector, and urban development progress

Focuses Over Three Years

Strengthen business foundations

Strengthen lifecycle businesses to boost customer value and accelerate global development

- Leverage strong ties with customers from providing industrial machinery products and services to enhance the value of customer operations by accelerating efforts to deliver more sophisticated after-service
- Starting with Southeast Asia, undertake earnest global efforts to bolster after-service capabilities

Build a robust operational structure

Undertake groupwide structural reforms to create a lean and flexible structure

- Push ahead with reforms to shift away from individual business management toward Group management that makes customers the top priority
- Specifically, transition to a lean and flexible organization that generates customer value by integrating responses to customers within the Group while strengthening customer relationship management capabilities

Accelerate preparations for tomorrow

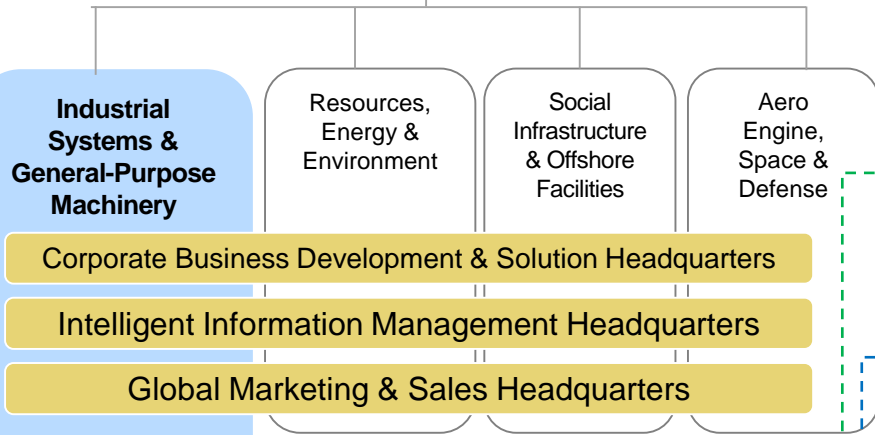
Develop a new business model to drive industrial infrastructure progress

- Connect real and digital spaces for customers and society in manufacturing, logistics, mobility, and other industrial machinery fields, thereby accelerating the creation of new industrial systems that streamline overall efficiency for customers' human resources, energy, and assets

2. Business Area Management Policies

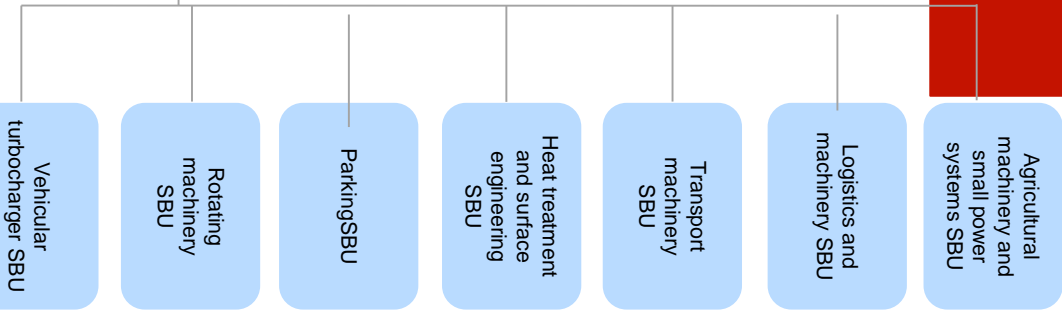
Structure

IHI



Main roles of key units

- | | |
|-----------------------------|--|
| Quality Assurance | <ul style="list-style-type: none"> Enhance continuous improvement of quality and coordinate quality assurance in business areas Undertake environmental activities for business areas overall |
| Planning and Control | <ul style="list-style-type: none"> Plan and deploy business area management policies Formulate and deploy business area visions and strategies and manage risks |
| Strategy Development | <ul style="list-style-type: none"> Build and reinforce lifecycle business earnings platforms, and strengthen internal and external collaboration (Lifecycle Business Development Group) Improve Global business expansion primarily in lifecycle business, centered on Southeast Asia (Global Business Development Group) Drive industrial systems advances through digital transformation (Digital Transformation Group) Optimize, standardize, and modernize business area value chain processes (Business Process Transformation Group) |



3. Industrial Systems & General-Purpose Machinery Business Area Strategies

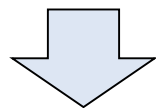
Enhance customer value and accelerate global development by reinforcing lifecycle businesses

Reinforce lifecycle businesses

1. Strengthen business fundamentals through after-sales businesses
2. Develop new products, services and create new business models offering higher customer value leveraged by the expertise from after-sales businesses = a cycle of value increasing across product and business lifecycles

Parking business

Strengths: Market-leading maintenance network (Realizing customers' operation safely and efficiently)



Increasing unit number managed
Securing service expertise

Expand maintenance operations through business transfers	
2016	KYC Machine Industry Co., Ltd.
2017	Nabco Door, Ltd.
2018	Orient Industries, Ltd.



Acquiring new knowledge

- Developing new elevator parking systems (Time saving, Noiseless)
- Experiment: Car-sharing services for residents
- Collaborating in joint research with universities in automated driving and parking
- Providing IoT platform services
Cultivating SST Business (Security Sharing Technology)



3. Business Area Strategies

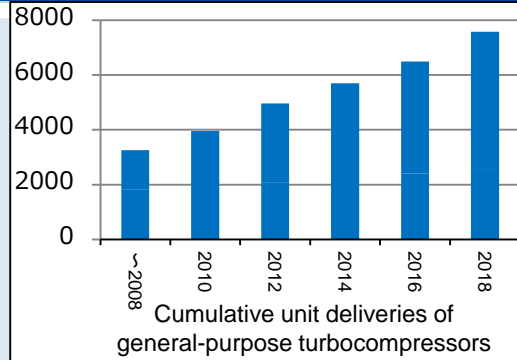
Reinforce lifecycle businesses



Enhance customer value and accelerate global development by reinforcing lifecycle businesses

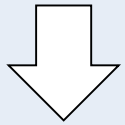
Rotating machinery

Strengths
Robust delivery record
Customer-centric service network



Customer Center

Wide channels for diverse customers



Through advanced service-business processes leveraged by the ICT tools

Building more close ties with customers

- Secure Customers' Information and knowledge

Deploy information that starts at frontlines

Design Dept.

Develop more valuable new products and services

Bolster products' lineup

Retrofit Business

Process line engineering Dept.

Incorporate related businesses

Air supply services

Total plant engineering

Manufacturing Dept. and back-office units

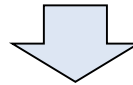
Realize specific new service options

Demand-follow group control system

Further reinforce relationships



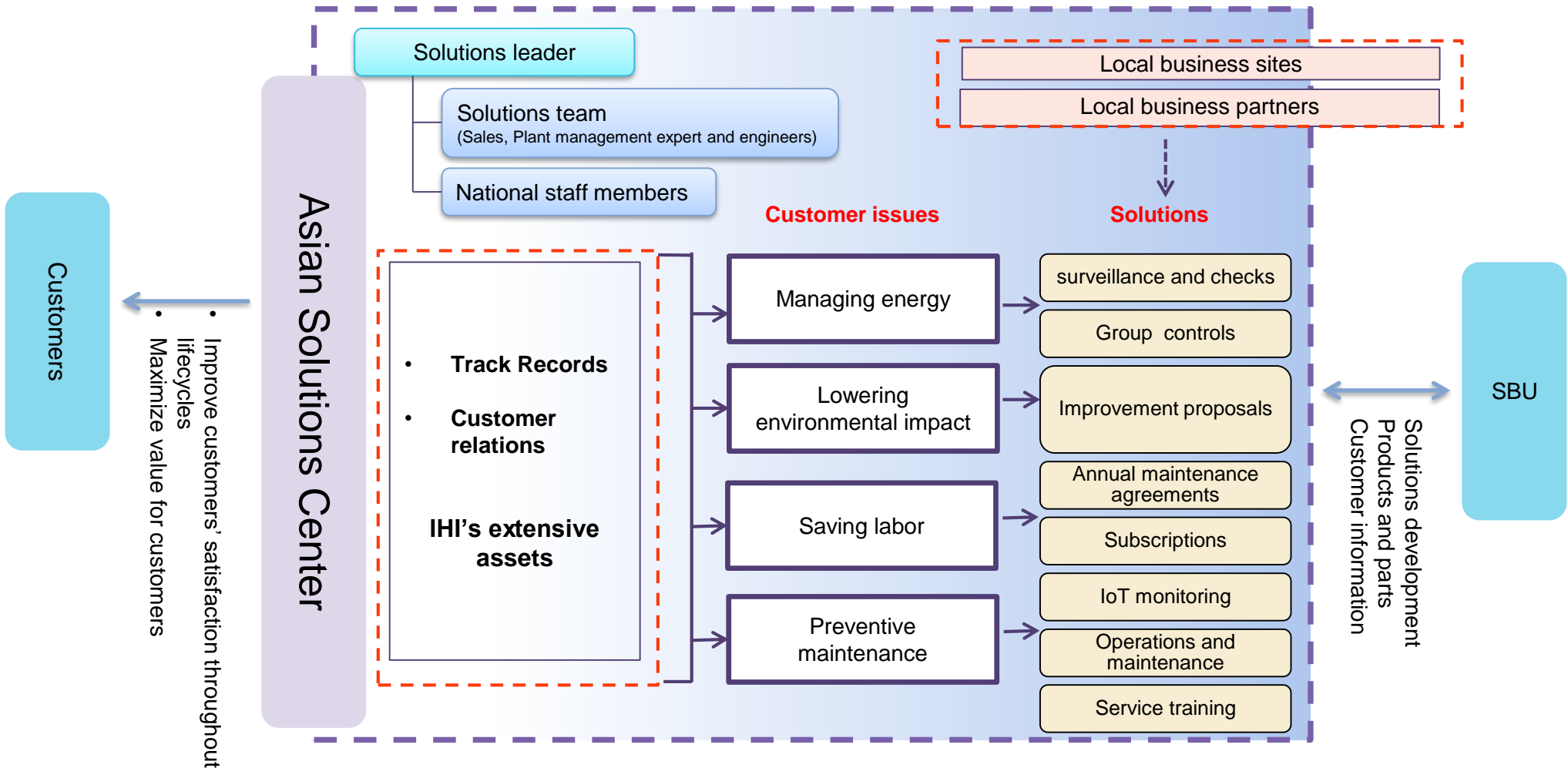
Further enhance strengths and establish competitive edge



Transition to lifecycle business model originated by Frontlines' information

Enhance customer value and accelerate global development by reinforcing lifecycle businesses

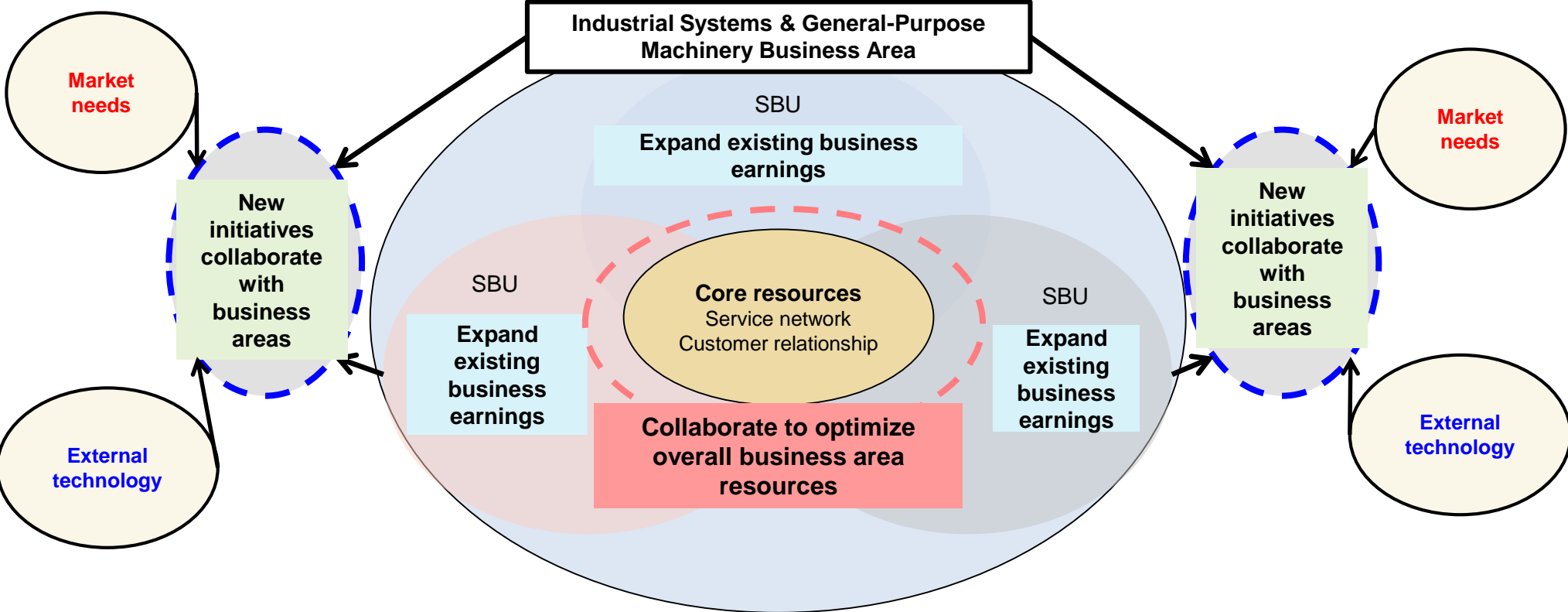
Increasing the value of customer operations and delivering advanced after-sales services by leveraging solid customer ties



Establishing Asia Solutions Center at IHI ASIA PACIFIC (Thailand) Co., Ltd., which has solid track record, to expand advanced services throughout Southeast Asia from Thai hub

Undertake Group management-based reforms to create a lean and flexible structure

Create framework to deliver high added value throughout customer lifecycles

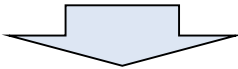


Lean and flexible structure

1. **Integrated responses across SBUs** in line with customer issues
2. **Structure to respond swiftly** to emerging issues and cater to new business models
3. **Optimization** of Group functions, sites, and resources

Undertake Group management-based reforms to create a lean and flexible structure

Business area's portfolio management under Group Management Policies 2016	
Logistics system and industrial machinery business integration (2016)	Compact construction machinery business transfer (2016)
Turkey: Establishment of general-purpose compressor manufacturing and sales joint venture (2016)	
Agricultural machinery and small power systems business reorganization (2017)	Disaster prevention business transfer (2017)
Rotating machinery business integration (2017)	Ship machinery business transfer (2017)
China: Establishment of mechanical parking facilities joint venture (2018)	Small power systems business transfer (2018)



Manage portfolio even under Group Management Policies 2019

- Extend involvement to SBU's business portfolios
- Reorganization keeping with the transformation to lifecycle business changes



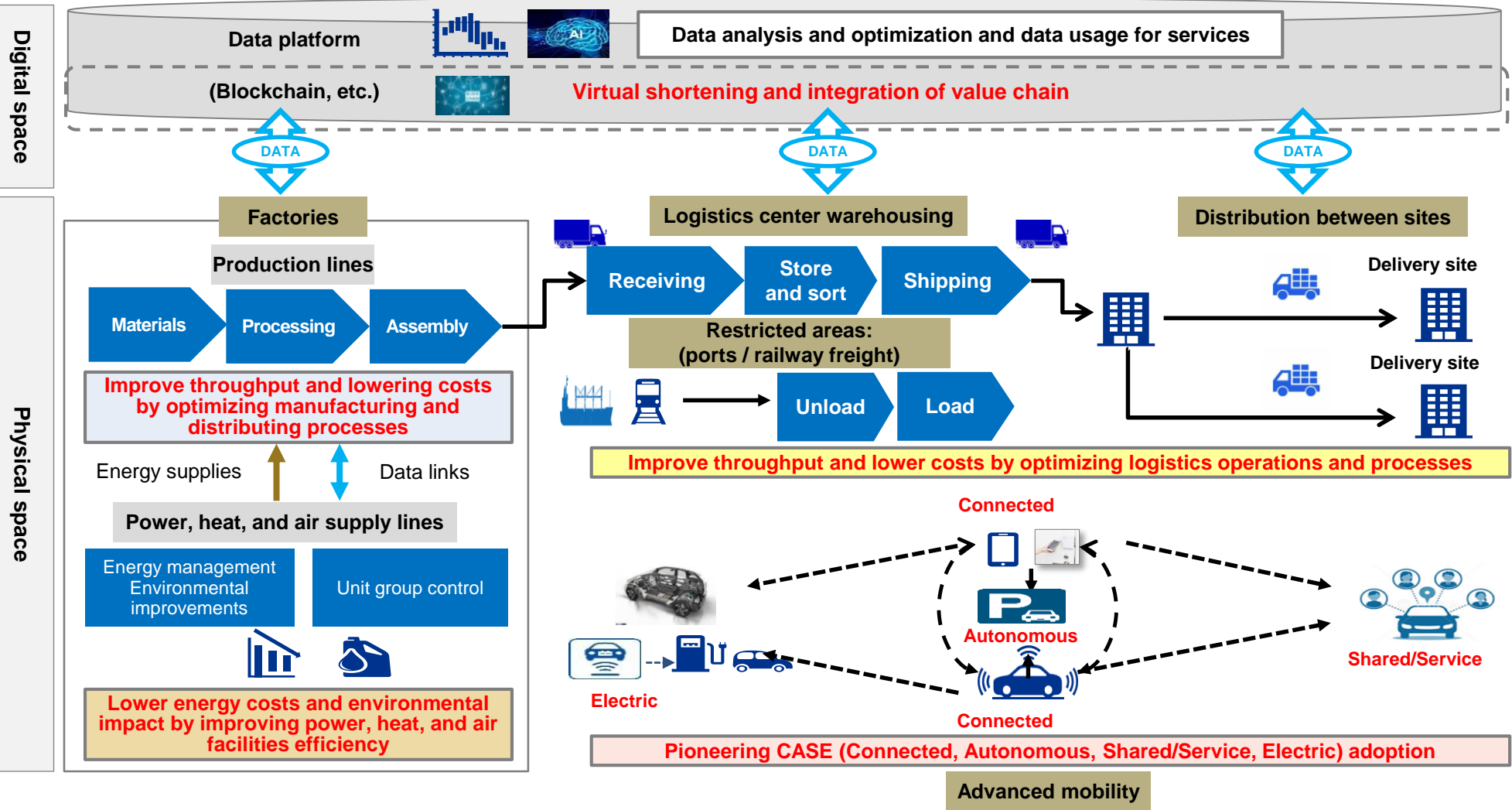
**Accelerate business area
"Concentration and Selection"**

3. Business Area Strategies

Develop new business model



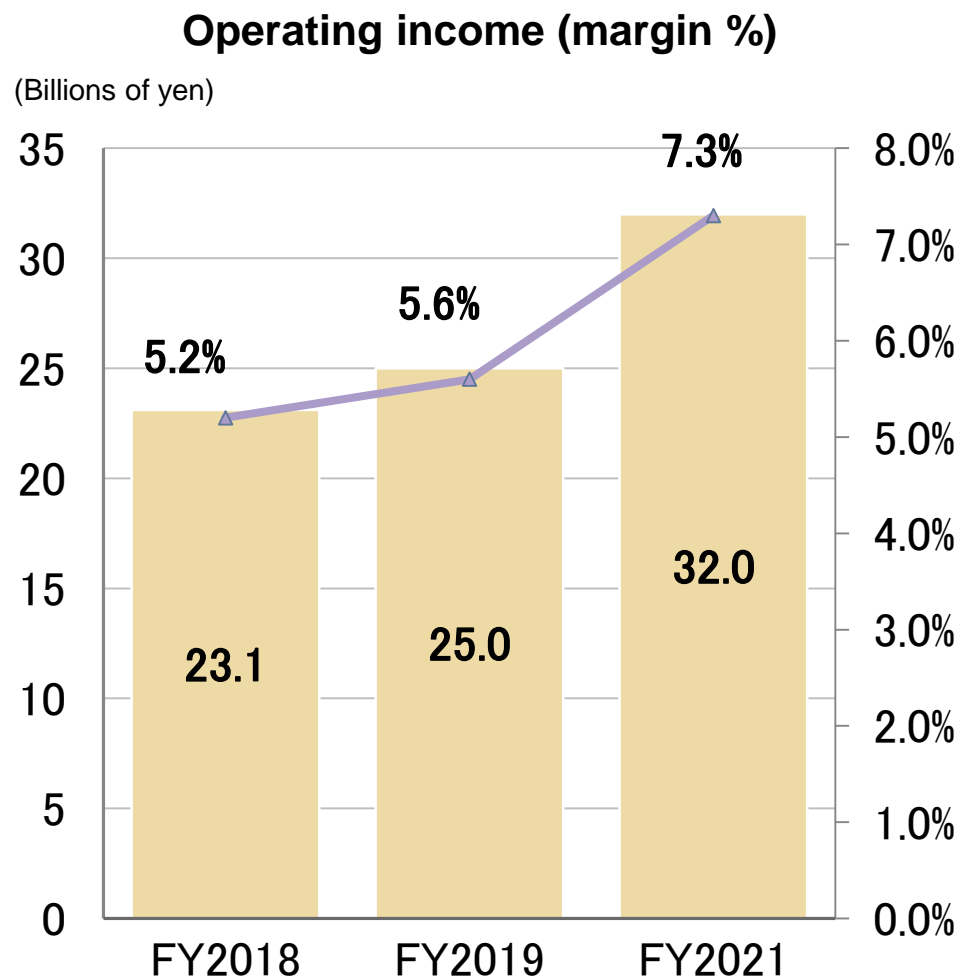
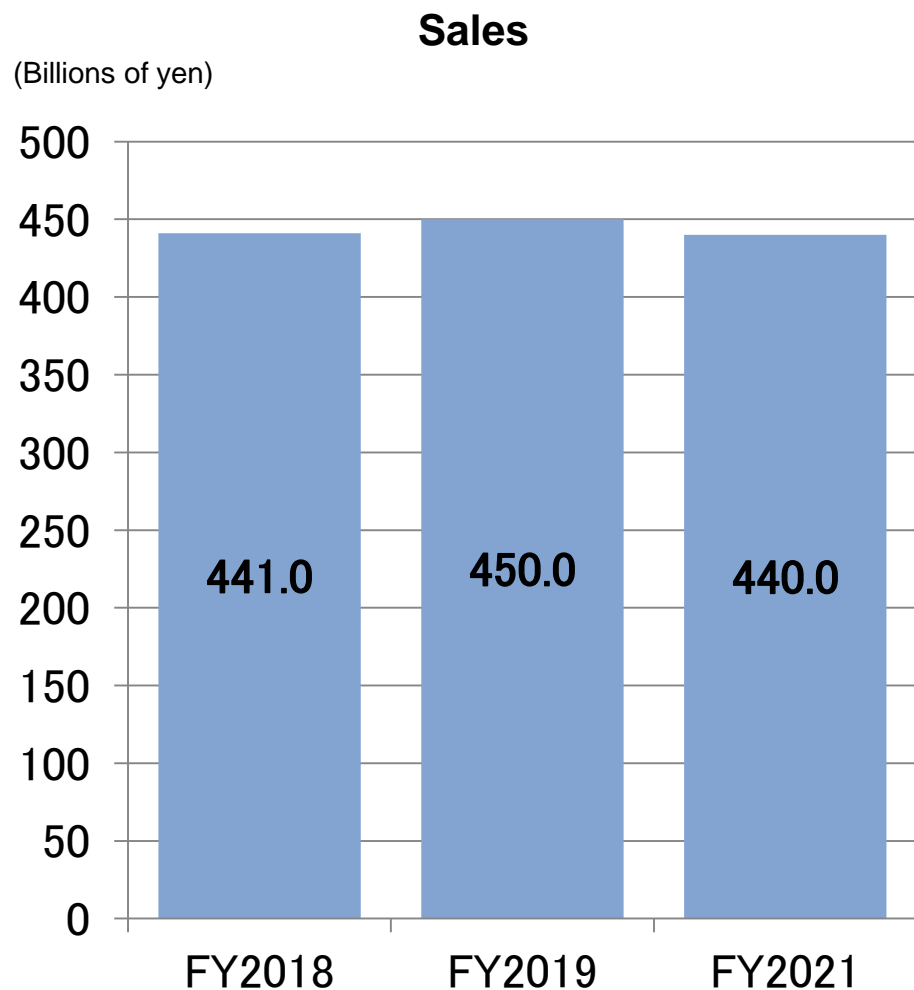
Accelerate preparations for the future



We will cultivate a diverse businesses to resolve customer challenges, such as by virtually shortening and integrating value chains by effectively linking physical and digital spaces

4. Industrial Systems & General-Purpose Machinery Business Area Business Plans **IHI**

- FY2018 results, FY2019 forecasts, and FY2021 targets



Industrial Systems

Aiming to boost after services contribution from 43% of sales in FY2018, to 50% in FY2021

Vehicular Turbocharger Business Strategies

IHI

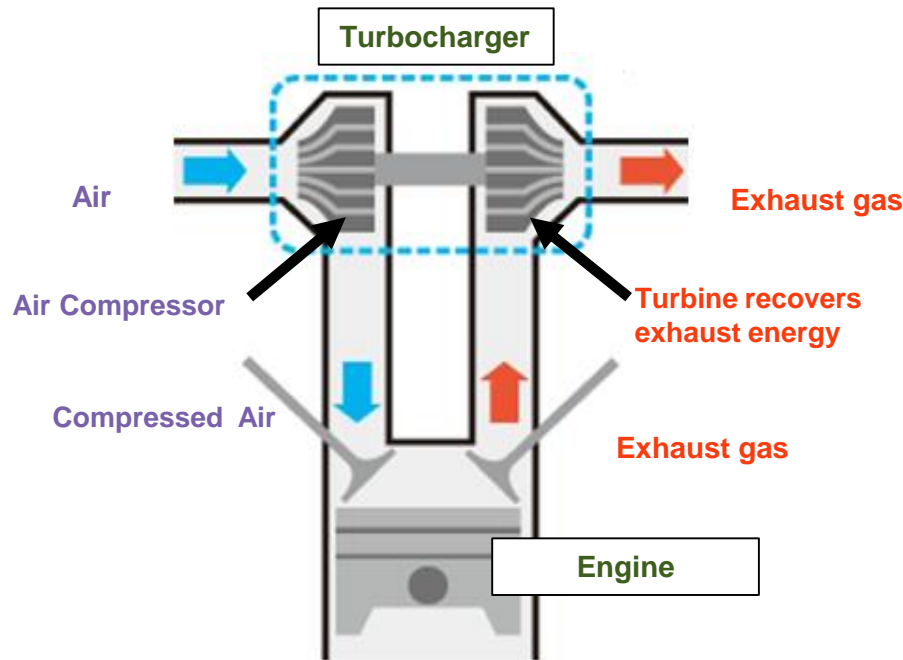
IHI Corporation

Yoshinori Kawasaki, Managing Executive Officer, Vice President of
Industrial Systems & General-Purpose Machinery Business Area
General Manager of Vehicular Turbocharger Business Unit

Role of Turbocharger

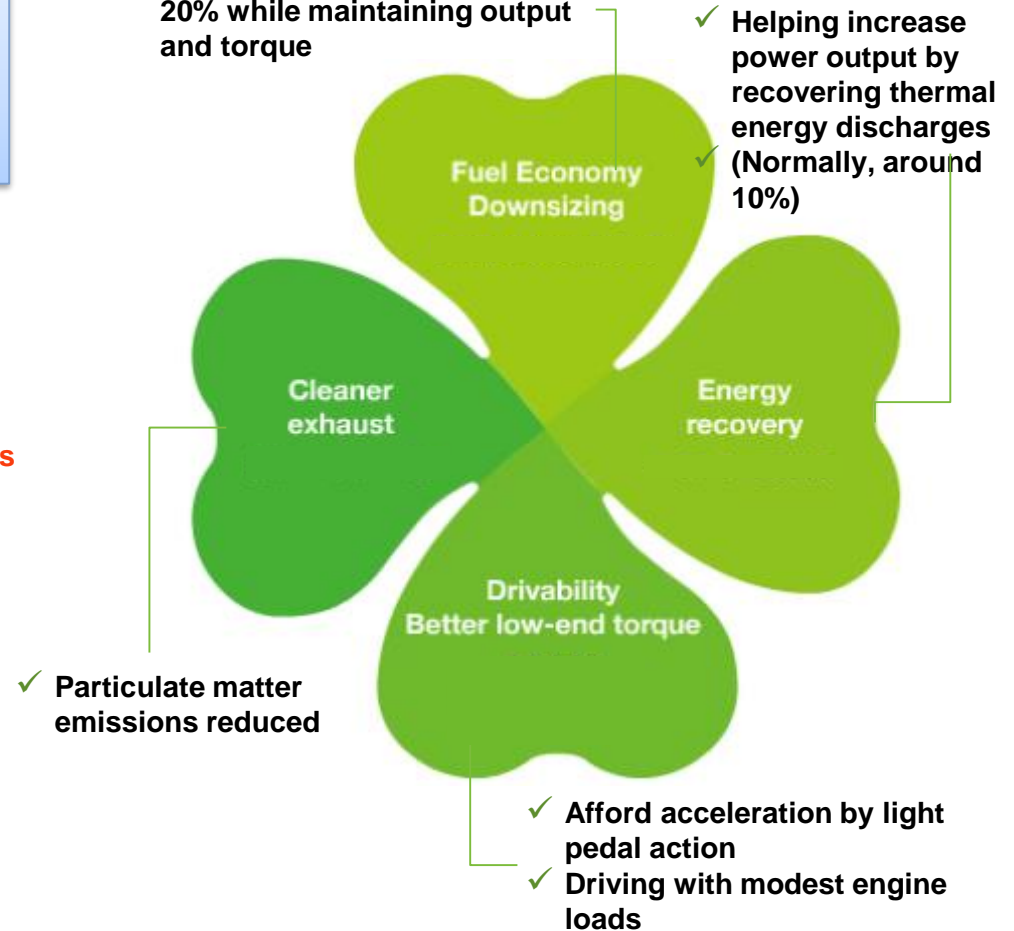
Usage

- ✓ Helping to boost power, fuel saving and purify exhaust gases by delivering highly pressurized air to the engine
- ✓ Essential devices for diesel engines
- ✓ To lower fuel consumption, increasingly used by downsizing gasoline engines



Benefits

- ✓ Improve fuel efficiency around 20% while maintaining output and torque
- ✓ Helping increase power output by recovering thermal energy discharges (Normally, around 10%)



Turbochargers are eco-friendly devices that deliver low fuel consumption and low environmental impact

1. Overview of IHI's Turbochargers

Product lineup

Engine displacement

Turbocharger size

Gasoline vehicles employing IHI turbochargers

Diesel vehicles employing IHI turbochargers

Large commercial vehicles



Passenger cars



Light commercial vehicles



Construction and agricultural machinery

Compact cars



1. Overview of IHI's Turbochargers

Global development of turbocharger business



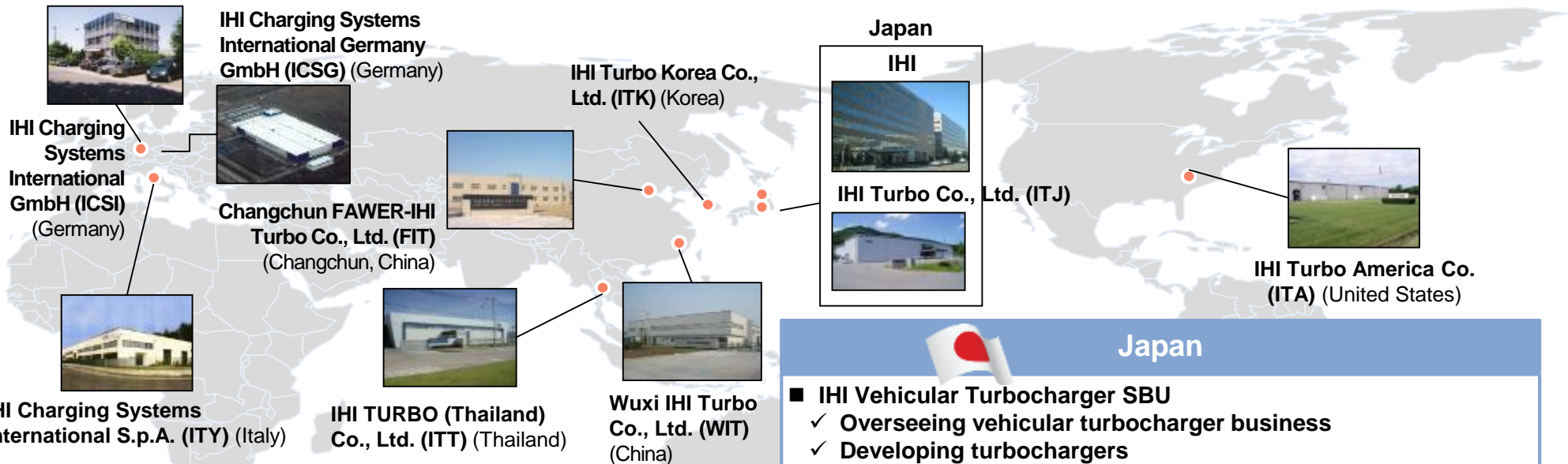
Europe

- ICSI/ICSG/ITY
 - ✓ Developing products
 - ✓ Making and selling parts and components for Europe and regions



North America

- ITA
 - ✓ Making and selling turbochargers
 - ✓ Developing, making, and selling superchargers



China

- FIT/WIT
 - ✓ Making and selling turbochargers for local market



Korea

- ITK
 - ✓ Selling turbochargers for local market



Japan

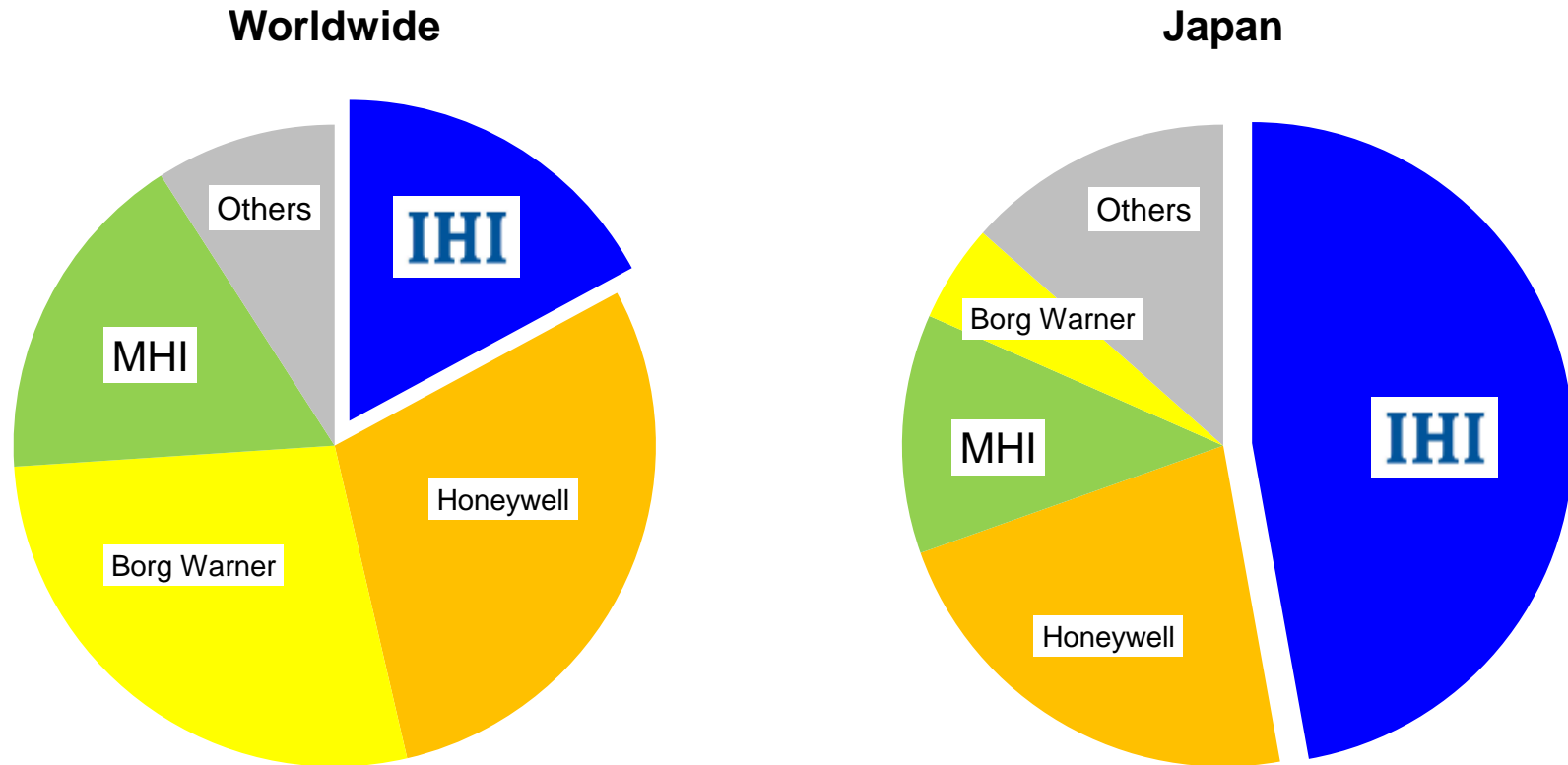
- IHI Vehicular Turbocharger SBU
 - ✓ Overseeing vehicular turbocharger business
 - ✓ Developing turbochargers
 - ✓ Making and selling turbochargers for Japanese market
- ITJ
 - ✓ Making turbochargers and parts for Japan and regions



Thailand

- ITT
 - ✓ Making and selling turbochargers for Southeast Asian market
 - ✓ Making components and turbochargers for regions

Competitive environment



1. IHI's global market share is around 20%
2. IHI accounts for around 50% of the Japanese market
3. Two leading auto parts manufacturers have also entered the market, but their shares remain low

Customer base

Passenger vehicles (Japanese automakers)



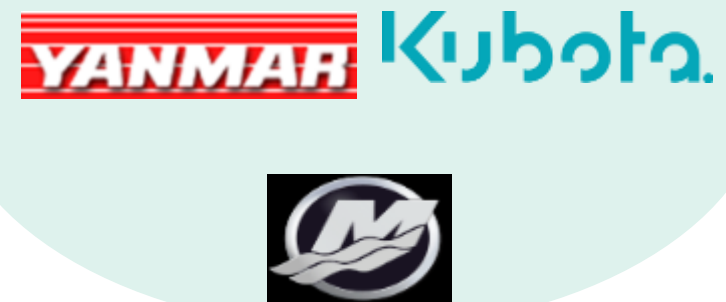
Passenger vehicles (overseas automakers)



Commercial vehicles



Agricultural and construction machinery and small boats



1. Overview of IHI's Turbochargers

Key customers

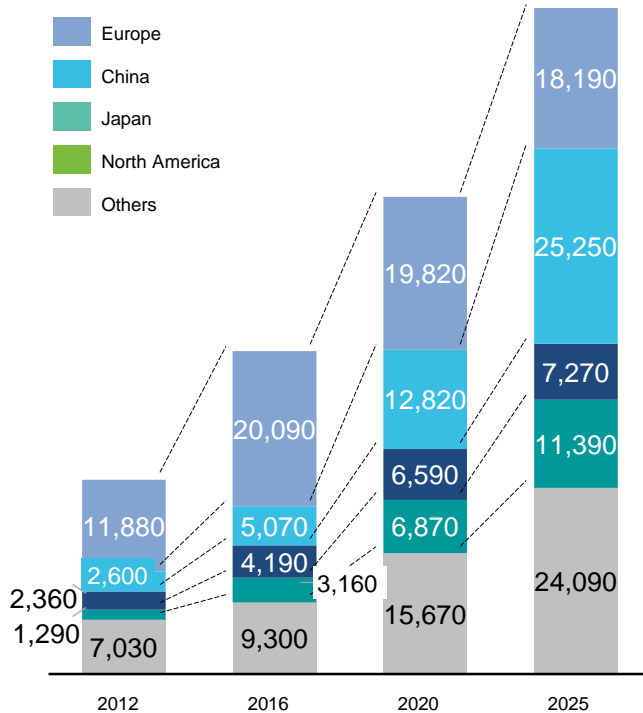
Customers	Main models		
 Volkswagen  Audi			
 Mercedes-Benz			
 TOYOTA			
 HONDA			
ISUZU			

2. Vehicular Turbocharger Business Market Climate

Regional market outlooks

Unit sales of vehicular turbochargers by region

Thousands of units



Average annual growth rates

	2012-2016	2016-2020	2020-2025
Europe	+14%	+0%	-2%
China	+18%	+26%	+15%
Japan	+15%	+12%	+2%
North America	+25%	+21%	+11%
Other	+7%	+14%	+9%

Growth outlook beyond 2025

	Given market maturity and a transition to electric vehicles amid tighter regulations, the existing vehicular turbocharger market should shrink
	Growth in unit sales of new cars should stop, with unit sales of new vehicle turbochargers languishing
	New car sales should decrease, while there should also be a shift to electric vehicles, shrinking the the existing vehicular turbocharger market
	Having lagged demand in Japan and Europe, existing vehicular turbocharger demand should remain strong for gasoline engine
	New markets to grow

1. North American and Chinese markets should expand by fiscal 2025

2. After FY2025, the switch to electric vehicles should gradually progress, primarily in mature markets

Sources: Fuji Chimera Research Institute, Inc., and interviews with experts from KPMG and Takaki Nakanishi of Nakanishi Research Institute

Market analysis

1. Overall automotive market

The market should continue to expand through 2030. The proportion of powertrains solely employing internal combustion engines should trend down overall. Full hybrid penetration should rise, with demand soaring for 48-volt mild hybrid vehicles

2. Gasoline engine turbochargers

Stronger fuel efficiency (carbon dioxide emissions) regulations in each country have driven efficiencies through engine turbocharging, with turbocharger installation rates rising in China and North America. More than 90% of 48-volt mild hybrid models should be equipped with turbochargers, and demand should keep rising

3. Diesel engine turbochargers

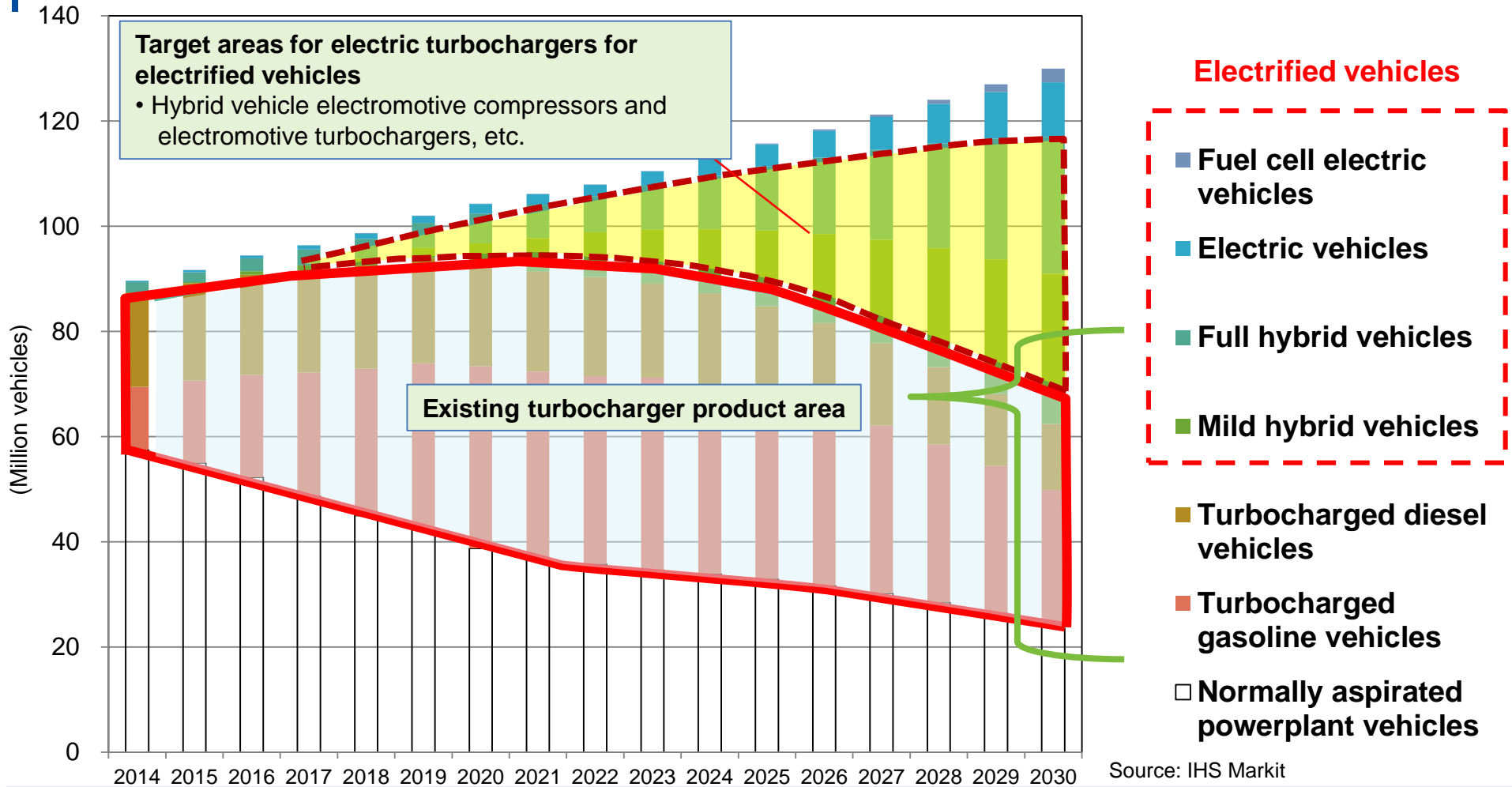
Demand is unlikely to rise because of the costs incurred in complying with increasingly tighter environmental regulations in developed and emerging nations

4. Markets in which turbocharger demand should continue to grow are:

- (1) Gasoline passenger cars in China
- (2) Gasoline passenger cars in North America
- (3) Gasoline passenger cars in Asia

2. Vehicular Turbocharger Business Market Climate

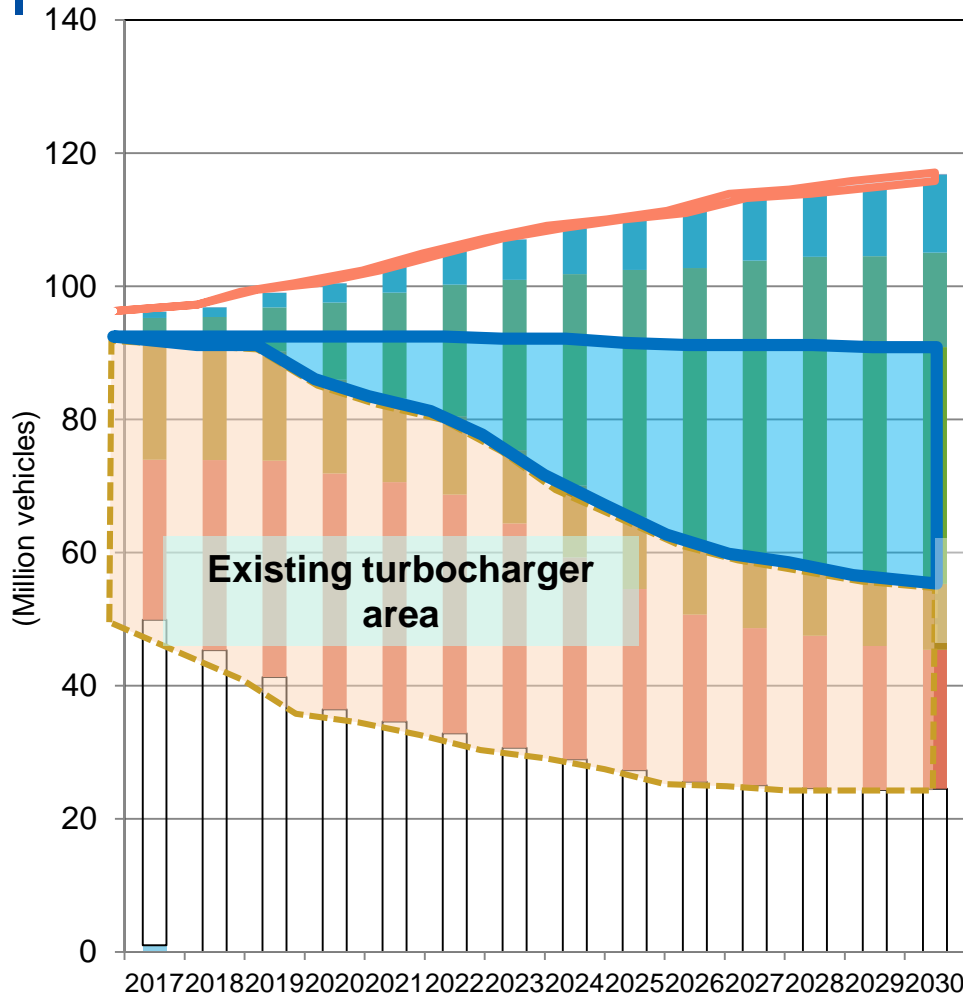
Long-term powertrain forecasts and new product areas (existing turbochargers)



1. Demand for existing turbochargers should peak in 2025 and continue through 2030
2. Accelerate development of new products in line with growing numbers of hybrid, electrical, and other electrified vehicles thereafter

2. Vehicular Turbocharger Business Market Climate

Long-term powertrain forecasts and new product areas (electrified vehicle products and IHI's efforts)



Fuel cell vehicle turbochargers

Electromotive turbochargers for FCV



Mild hybrid vehicle turbochargers

REC4 electromotive compressors (48V)



REF Series electric-assist turbochargers (48V/high-voltage)



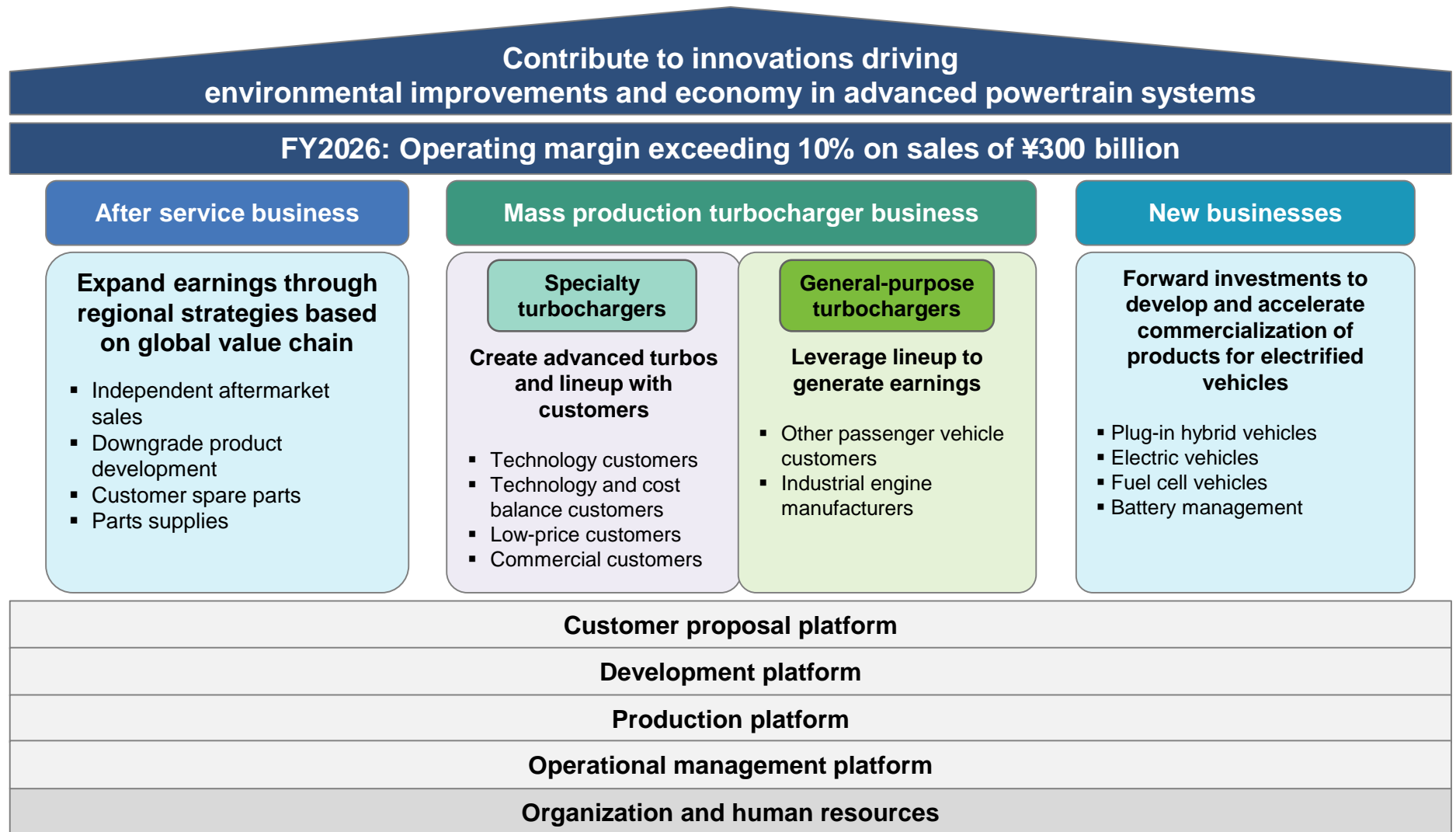
Source: IHS Markit

1. Supplying electromotive compressors and electric-assist turbochargers for mild hybrid electric vehicles, for which demand is expected to spread in Europe and China
2. Developing next-generation oil-free electromotive turbochargers for supplying air in fuel cell vehicles launched in 2018, catering to full-fledged penetration from 2030

3. Vehicular Turbocharger Business Strategies

Vehicular Turbocharger SBU Goals

Transform business from focusing on new turbos supply to centering to the aftermarket for the automotive and industrial machinery market, and establish a highly profitable, world-class business



Priorities

1. Step up order taking in key markets

- (1) Reinforce efforts to secure orders in China and North America (orders confirmed for major North American project: second plant under construction at IHI Turbo America Co)
- (2) Strengthen efforts to generate orders in Europe (orders confirmed for medium-scale project)

2. Launch new models

- (1) Start rolling out RHS series
- (2) Developing higher-performance RHZ model, and will swiftly commercialize

3. Strengthen procurement

Reinforce centralized purchasing and global supply chain to accelerate cost reductions

4. Set up global production structure (from “local production for local consumption” to global production approach)

Collaborate at each site to build an optimal production structure for global customer project

5. Expand after service business

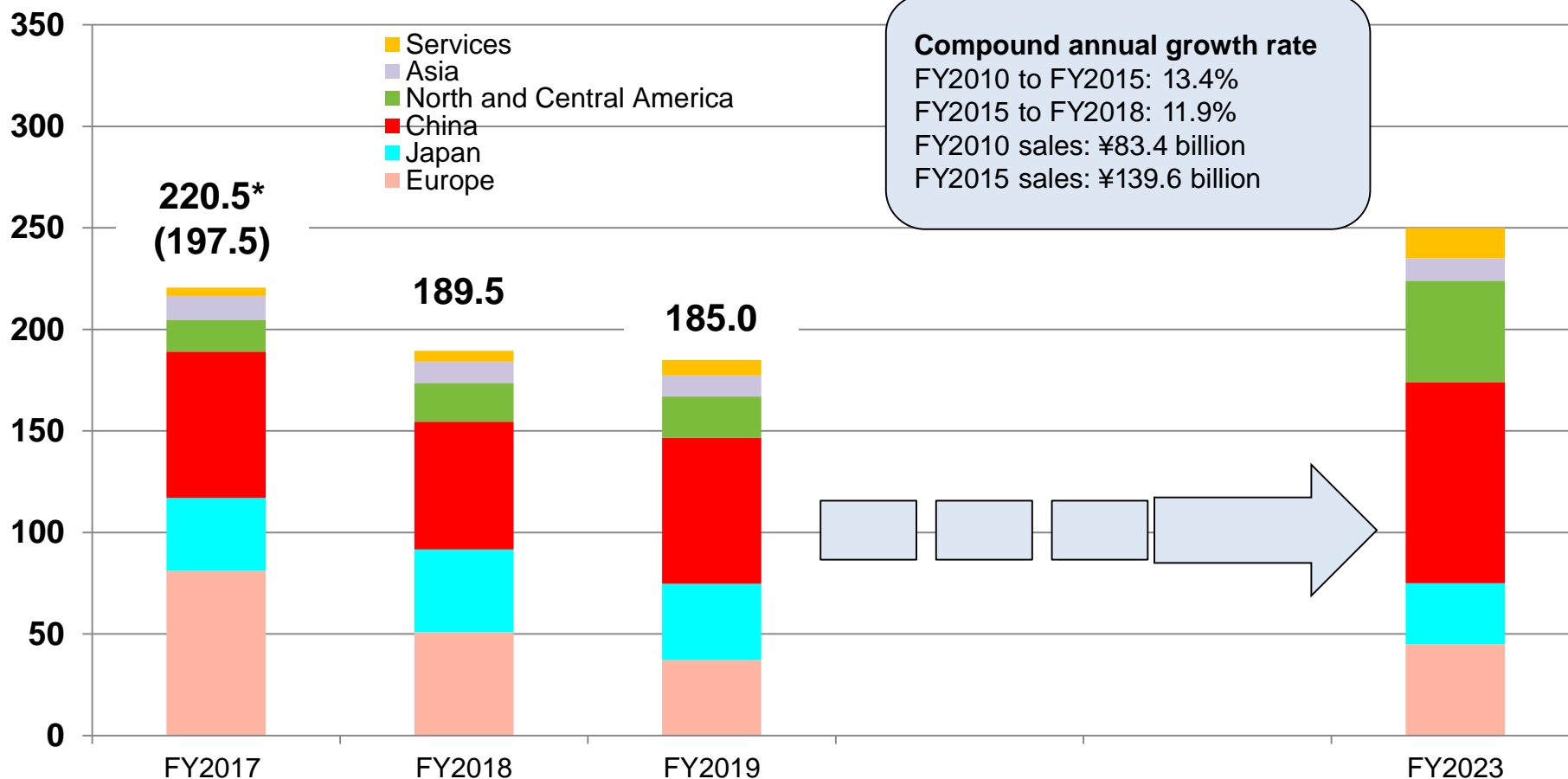
- (1) Reinforce regional activities by increasing one region (CloverTurbo) to three (Asia, Europe, and Americas)
- (2) Set up dedicated organization – personnel in each region

6. Develop products for new business areas (to cater to electrification)

- (1) E-compressors and electronic automatic transmissions to encompass premium and standard class models
- (2) Start shipping electric turbochargers for fuel cell vehicles

4. Consolidated Sales

(Billions of yen)



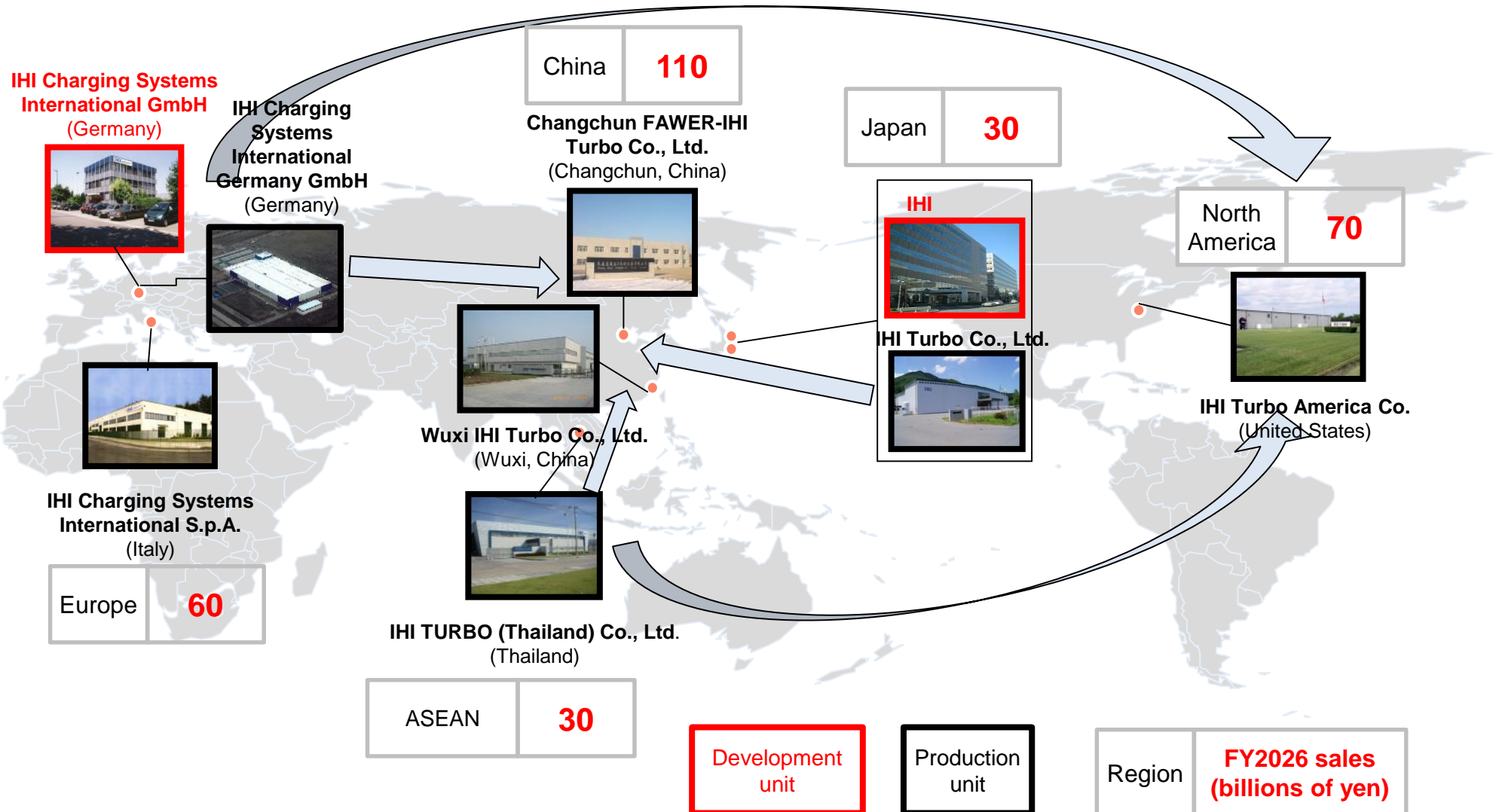
*FY2017 figure included impact of accounting period unification

Order strategy

- Reinforced European order structure in FY2018
- Strengthened after service structure, shifting from one region to three region structure in FY2018
- Launch new models for gasoline engine vehicles

5. Global Project

1. Develop in Japan and Europe
2. Establish a lean and flexible global production structure
3. Basic approach to be of final assembly in each region and optimal global supply of key parts





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.