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# Introducing Vehicular Turbocharger Business

November 17, 2014

IHI Corporation  
Vehicular Turbocharger Operations

Executive officer, President of Vehicular Turbocharger Operations  
Hiromu Furukawa

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# Outline of Turbocharger Business



## A favorable market climate

- Stricter environmental regulations in many regions have focused attention on turbochargers as eco-friendly devices
- Global turbocharger installations are set to surge

## IHI's competitive strengths

- Broad customer base and line-up
- Global production footprint
- Powerful Group technology platform

## Expanding sales and profitability

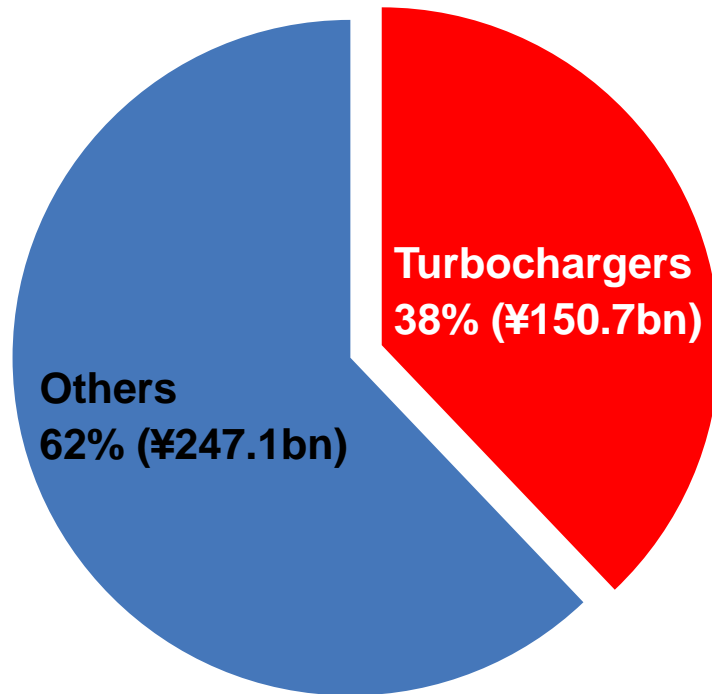
- Securing stable sales and earnings from expanding, high-volume market
- Boosting sales and margins by prioritizing high-value-added offerings

# Turbocharger Business Overview



## Industrial Systems and General-Purpose Machinery Sales

FY2013



## Turbocharger Business Overview

- **Division Name:** Vehicular Turbocharger Operations
- **Representative:** Hiromu Furukawa, General manager and Executive Officer
- **Products:** Vehicular turbochargers
- **Number of employees:** 2,755 (on consolidated basis)

### Subsidiaries

Entity Name	Acronym	Location
IHI Turbo Co., Ltd.	ITJ	Japan
IHI Charging Systems International GmbH	ICSI	Germany
IHI Charging Systems International Germany GmbH	ICSG	Germany
IHI Charging Systems International S.p.A.	ITY	Italy
IHI Turbo America Co	ITA	U.S.A.
IHI TURBO (THAILAND) CO.,LTD.	ITT	Thailand
Wuxi IHI Turbo Co., Ltd.	WIT	China
Changchun FAWER-IHI Turbo Co., Ltd.	FIT	China
IHI Turbo Korea Co., Ltd	ITK	Korea
Clover Turbo., Ltd.	CTJ	Japan
Hyundai WIA IHI Turbo Co., Ltd. (49% owned by IHI)	HWIT	Korea

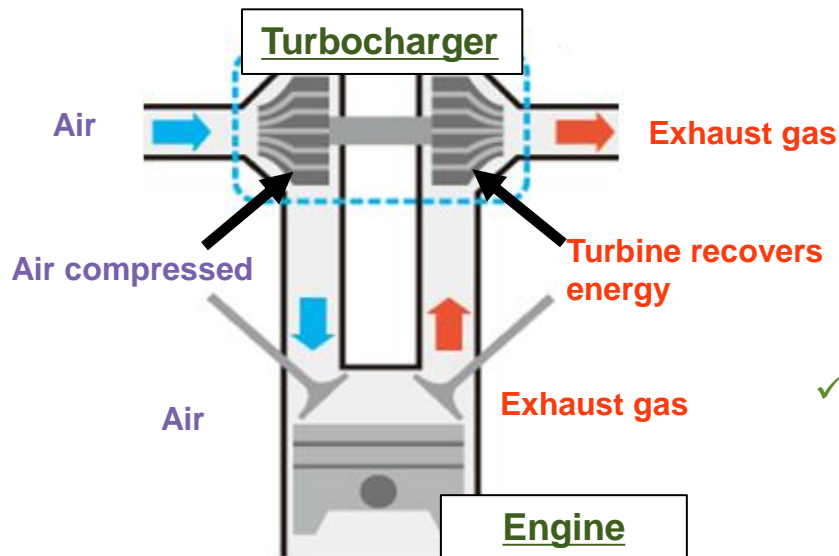
➤ **Turbochargers are vital for the Industrial Systems and General-Purpose Machinery business, representing nearly 40% of segment sales**

# Turbocharger Functions



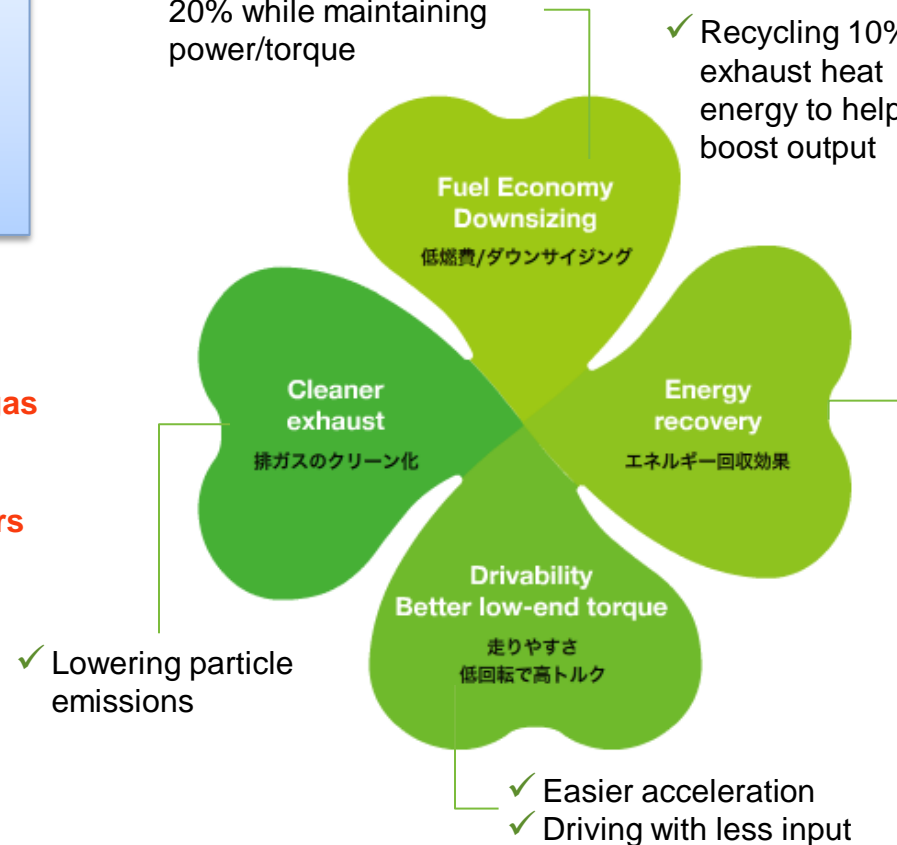
## MECHANISM

- ✓ Improving engine performance, conserving fuel, and purifying exhausts by delivering air at high pressures to engines
- ✓ Essential for diesel engines
- ✓ Installations rising in increasingly downsized gasoline engines to enhance fuel efficiency



## BENEFITS

- ✓ Improving mileage by 20% while maintaining power/torque
- ✓ Recycling 10% of exhaust heat energy to help boost output

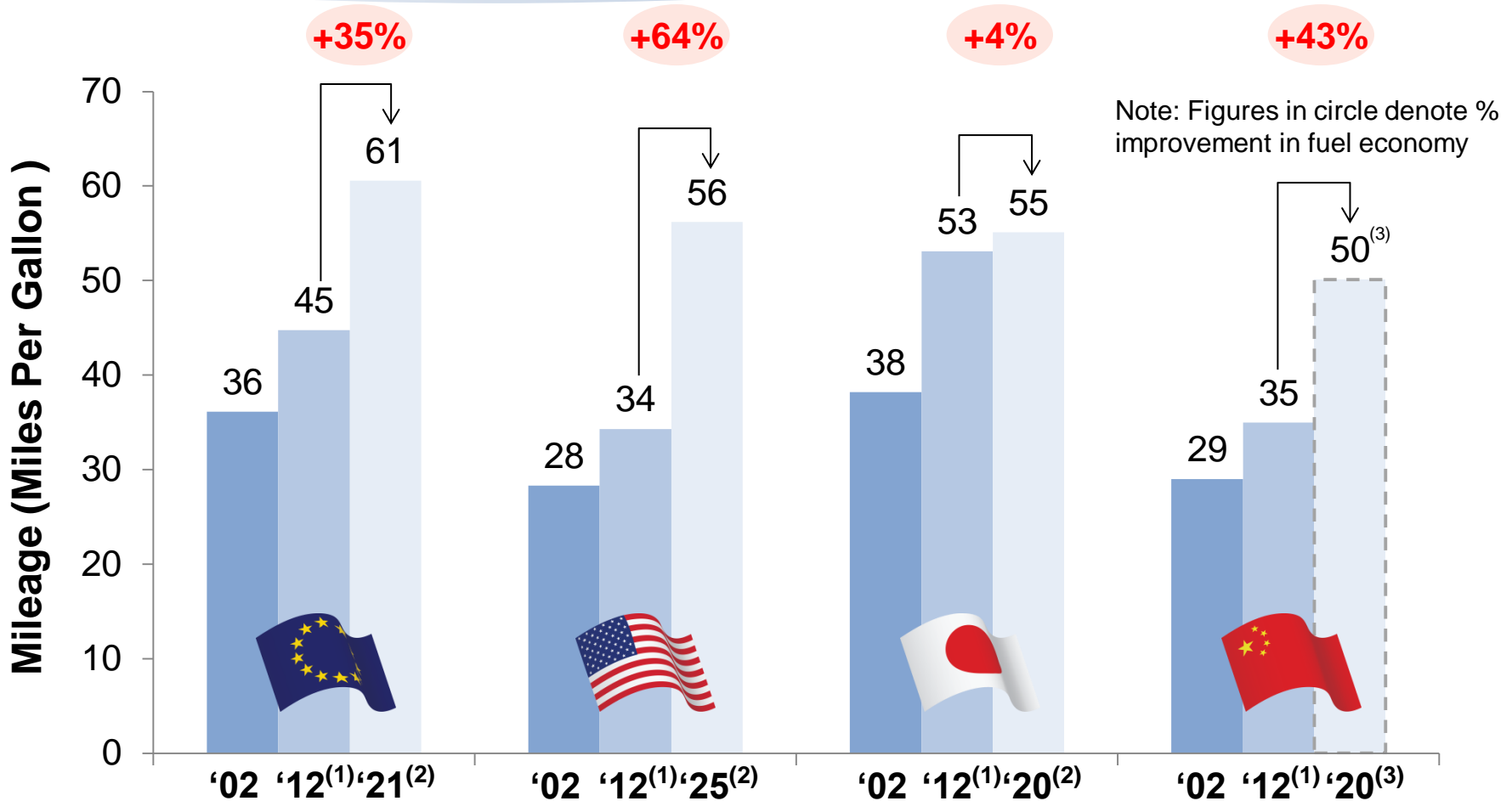


**Turbocharger is eco-friendly device which supports various vehicle types to realize fuel economy**



# Market Climate

# Fuel Economy Standard Indices



**Implementation of stricter fuel economy standards in many regions is favorable for the turbocharger market**

Source: The International Council on Clean Transportation

(1) Initial target enforcement year

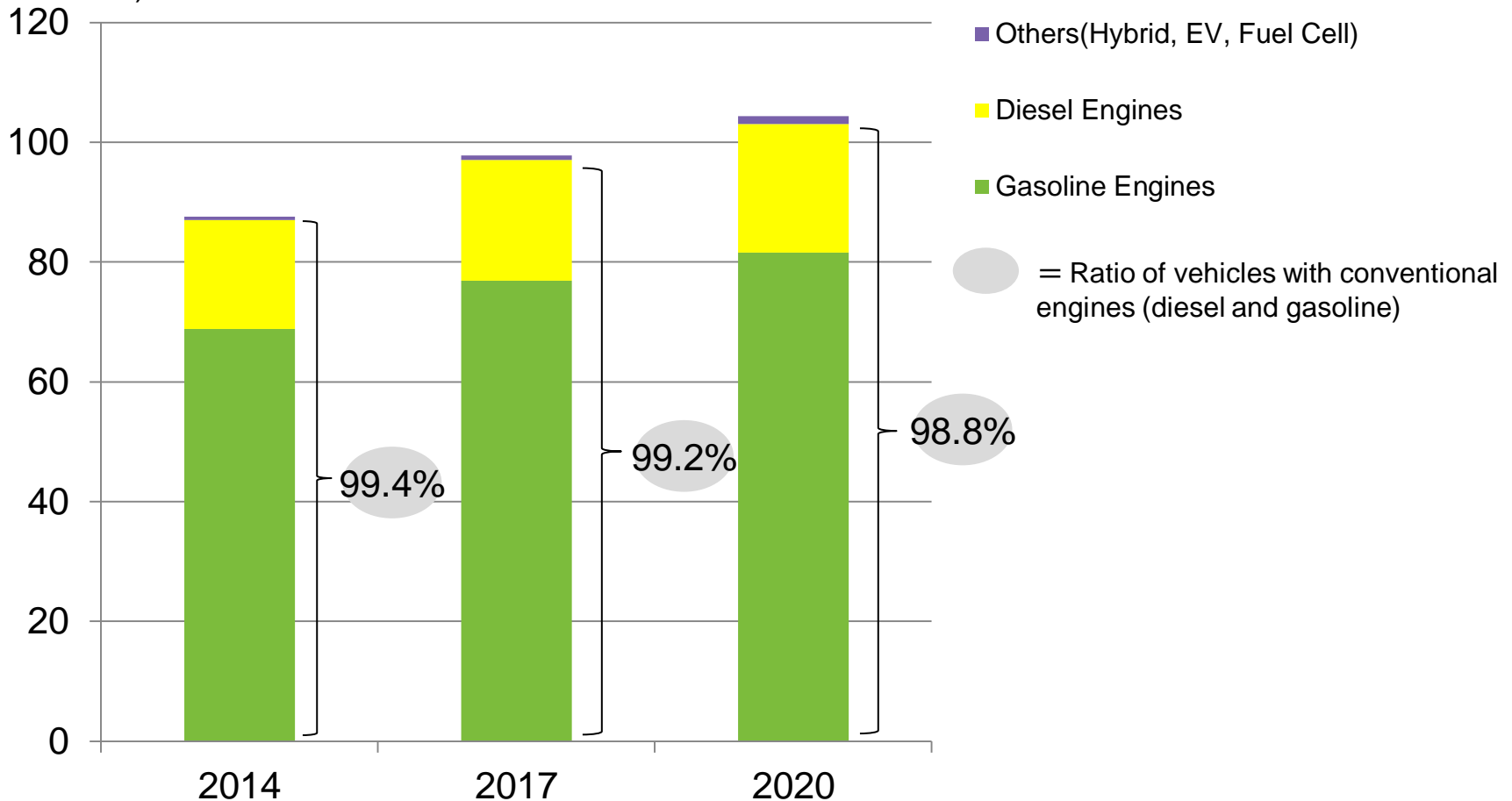
(2) Year for achieving target

(3) Proposed target figure

# Global Automobile Market Prospects



(Million Units)



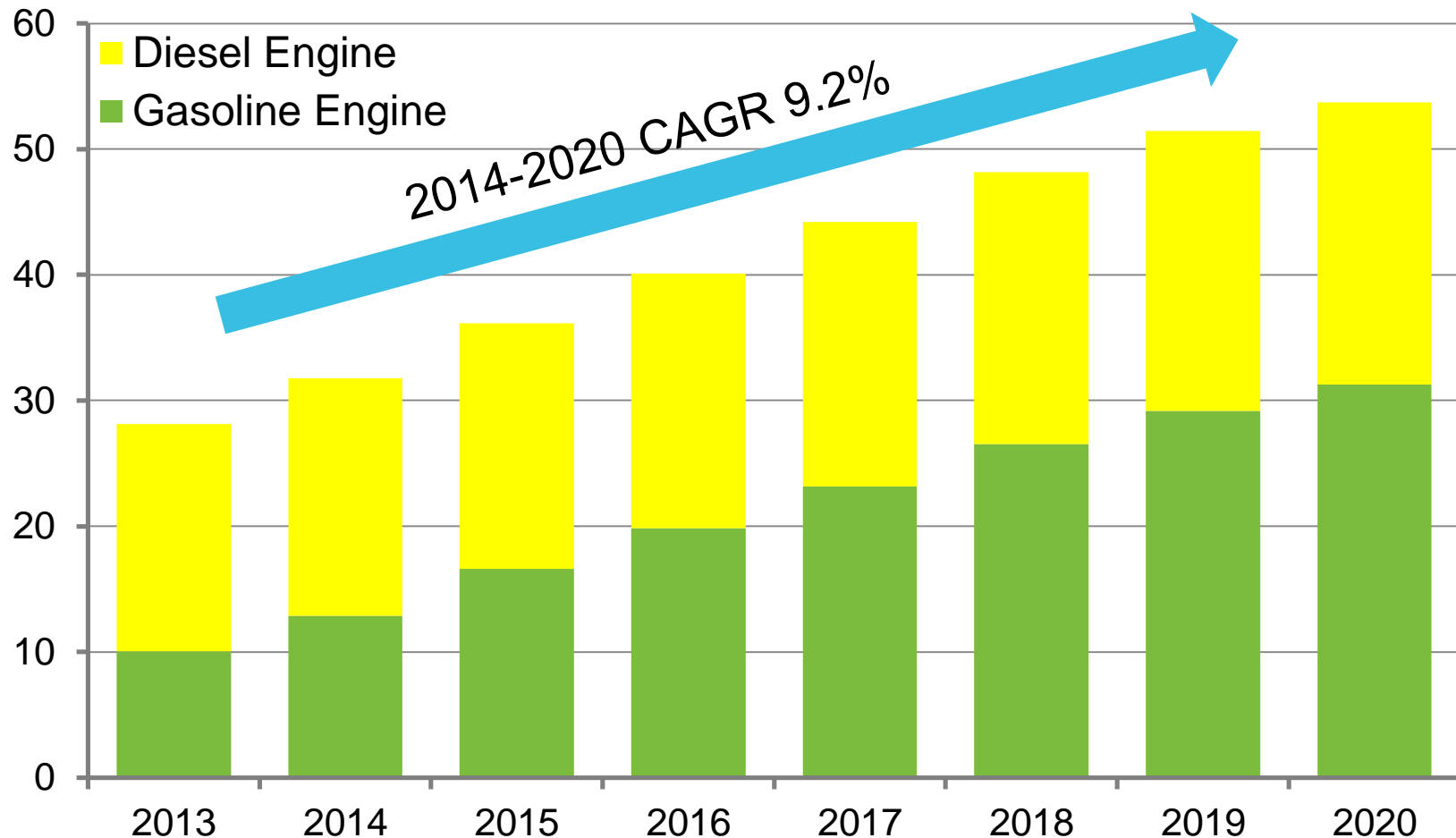
**Statistics predict that conventional engines will remain mainstream for the time being**

Source: Third Party Research

# Global Turbocharger Market Prospects



(Million Units)



**Annual installations of turbochargers should exceed 50 million units by 2020**

Source: Third Party Research





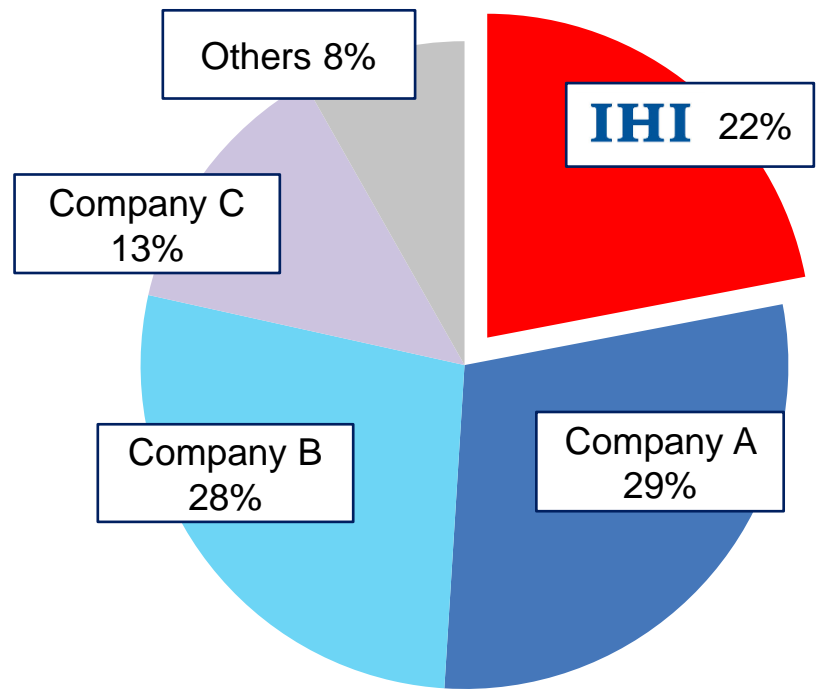


# Introducing IHI's Turbocharger Business

# Our Global Turbocharger Market Position



## GLOBAL MARKET SHARE (FY2013)



**IHI is one of major players with a global market share exceeding 20%**

Source: Third Party Research, IHI

# Our Customers



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## Passenger Vehicles (Japanese brands)

**TOYOTA**    **DAIHATSU**  
**HONDA**    **SUZUKI**  
**NISSAN**  
**SUBARU**    **MAZDA**  
**MITSUBISHI**

## Passenger Vehicles (Overseas brands)

**V W**    **Audi**    **Daimler**  
**Ferrari**    **B M W**    **FIAT**  
**Hyundai**    **K I A**  
**Chrysler**

## Commercial Vehicles

**ISUZU**    **HINO**  
**UD Trucks**

## Agricultural and Construction Machinery and Small Vessels






**YANMAR**    **Kubota**  
**Mercury**

**IHI has been acquired good reputations from world wide customers**

# Models Employing IHI Turbochargers



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	Models	Features/Advantages
Passenger Vehicles (Overseas Brands)	 Volkswagen Golf	<ul style="list-style-type: none"><li>■ Distributing in China and North America through collaboration with European customers</li></ul>
Passenger Vehicles (Japanese Brands)	 Suzuki Wagon R	<ul style="list-style-type: none"><li>■ Contributing to improve fuel economy for light motor vehicles</li></ul>
	 Isuzu D-MAX	<ul style="list-style-type: none"><li>■ Offering optimum turbochargers for pickup trucks</li></ul>
Commercial Vehicles	 Isuzu ELF	<ul style="list-style-type: none"><li>■ Satisfying high efficient, high reliable, regulation fulfillment and high performance altogether</li></ul>
Agricultural and Construction Machinery and Small Vessels	 Kubota V2403	<ul style="list-style-type: none"><li>■ Offering simple and high performance turbochargers</li></ul>

# Japan Advanced Technology Platform



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## IHI Turbocharger Sector

### R&D Technology Center in Yokohama

- ✓ Expanding center for overall R&D activities
  - Deploying equipment for performance tests and for durability tests under high-pressure and high-temperature circumstance
  - Using engine bench and analytical technologies to develop turbochargers
- ✓ Collaborating with Corporate Research & Development
  - New product development through collaboration with Corporate Research and Development



## IHI Turbo Co., Ltd.

### Production facilities in Kiso and Tatsuno, Nagano Prefecture

- ✓ Leveraging sophisticated technologies to manufacture compressor impellers and other key components
- ✓ Developing production automation process and new manufacturing techniques such as balance modification technologies and other production method

# A Global Footprint



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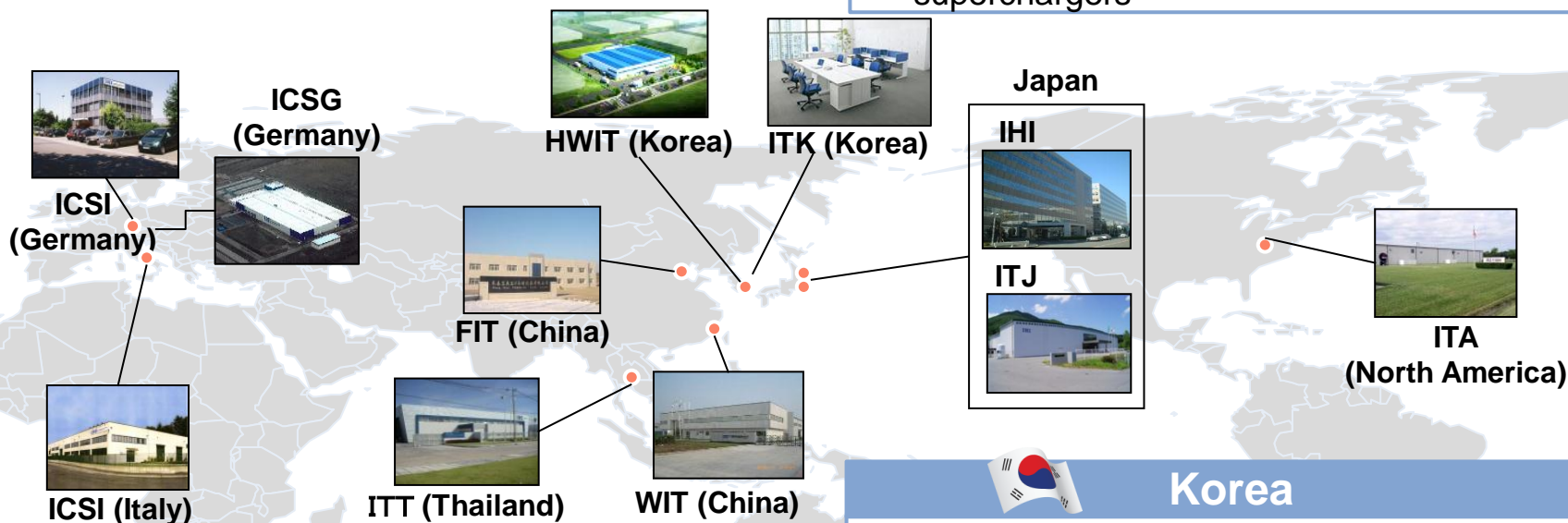
## Europe

- ICSI/ICSG/ITY
- ✓ R&D in Europe
- ✓ Manufacturing and sales for Europe



## North America

- ITA
- ✓ Manufacturing and sales for North America
- ✓ R&D, manufacturing, and sales for superchargers



## Korea

- ITK/HWIT
- ✓ Manufacturing and sales for Korea



## China

- FIT/WIT
- ✓ Manufacturing and sales for China



## Thailand

- ITT
- ✓ Manufacturing and sales for Southeast Asia

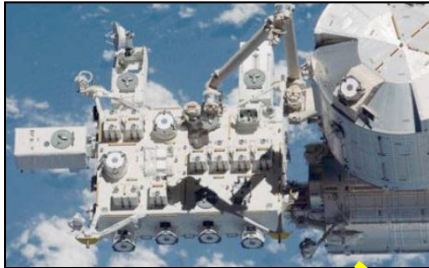


# Group Technological Platform



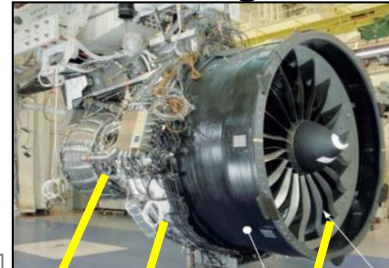
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## Space Station



• Tribology

## Aero Engines



• Turbine blade  
(Performance & reliability)

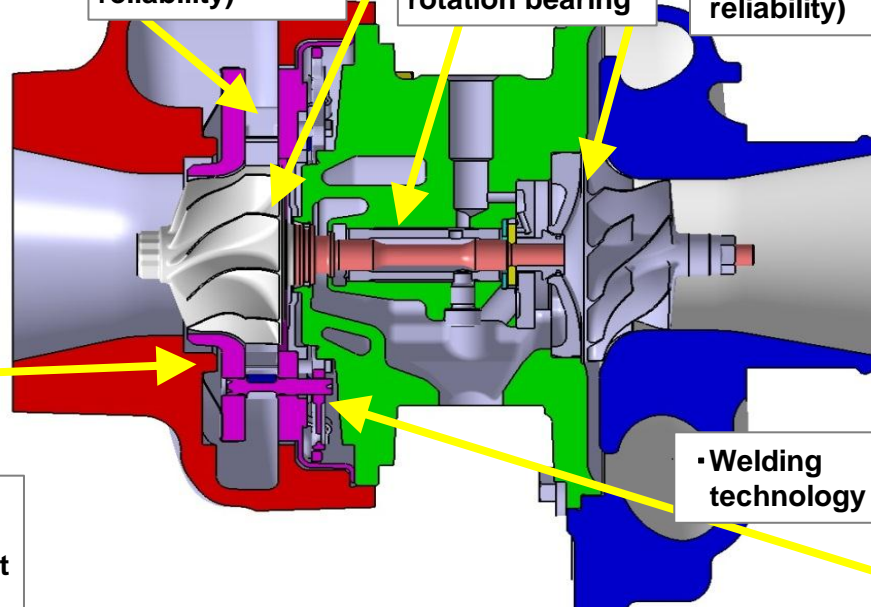
• High-speed  
rotation bearing

• Compressor  
(Performance & reliability)

## Boiler



• Thermal fluid analysis  
• Durability analysis  
• Corrosive environment  
evaluation



• Welding  
technology

## Other Group shared Technological Platform

- New materials development
- Mechanism analysis
- Mechatronics
- Fracture mechanics
- Lifetime prediction
- Noise/Vibration
- Materials mechanics
- Production technology

## Vessels



- The mobilization of overall technological capability in IHI group
- High synergies with aero engines business for high-speed rotation technology



# Global R&D Capacity



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## Europe

### Matching market needs Developing commercial production know-how

- Securing high-value-added technologies from an advanced market
- Harnessing new technologies for European market vital for commercial production and global deployment
- Relationships with high-end European customers drives proposals and development to meet market and customer needs



## Japan

### Developing fundamental and advanced technologies and new products

- Corporate Research and Development consolidates IHI's platform technologies
- Developing advanced, high-value-added products by drawing on Group's shared technology platform
- Long-term relationships with Japanese customers drives proposals and development to meet market and customer needs
- Driving creation and deployment of global production structure

**Achieving to enhance turbocharger as high value-added product by promoting technology innovations in both Europe and Japan market**

# High Value-Added Technology Development



Technologies	Power Train			
	Gasoline	Diesel	Hybrid	Fuel Cell
1. Mixed Flow Turbine	○	○	—	—
2. Titanium Aluminum Turbine	○	○	—	—
3. Ball Bearing	○	○	—	—
4. VGS Turbo	○	○	—	—
5. Two-Stage Supercharger	—	○	—	—
6. Electrical Assist Turbo	○	○	○	—
7. Electrical Compressor	○	○	○	—
8. Fuel Cell Vehicle Turbocharger	—	—	—	○

Note: 「○」 represents to aim technology applied for each power train

## R&D Target

- Improving turbocharger performance to meet further advancement for downsized gasoline engine and diesel engine
- Further Improving mileage for hybrid vehicles
- Developing turbochargers for next-generation fuel cell vehicles

# Our High Technology Product

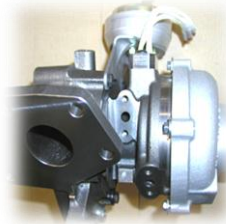


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## TECHNOLOGY

## KEY FEATURES

### Electrical Assist Turbo



- **Contributes to improve system and fuel efficiencies with the combination of turbocharger and motor**

### Electrical Compressor



- **Enables turbocharging with the use of motor only (does not require exhaust gas)**
- **Contributes to improve fuel efficiency with securing installation flexibility by combining with turbochargers**

### Fuel Cell Vehicle Turbocharger



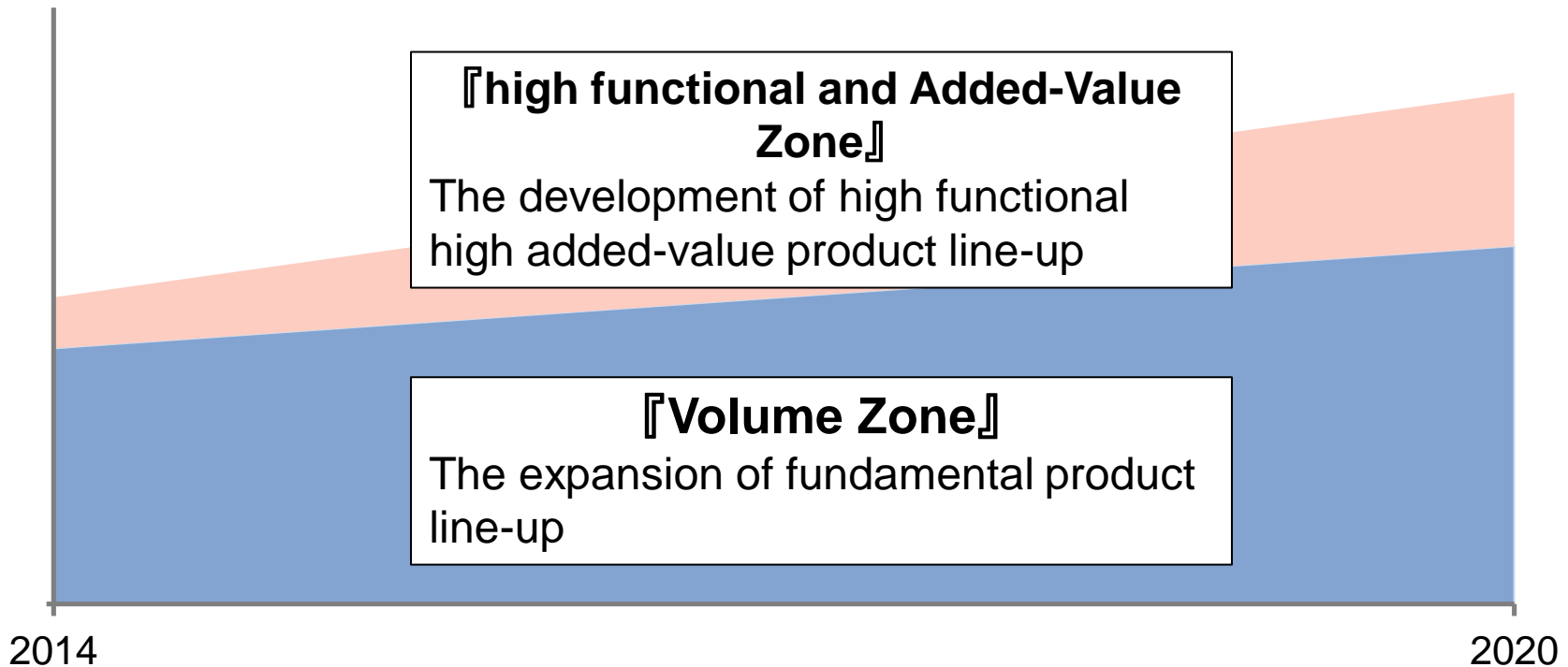
- **Contributes to improve power generation efficiencies with optimum turbocharger to supply fuel cell batteries with clean air**



# Business Strategy



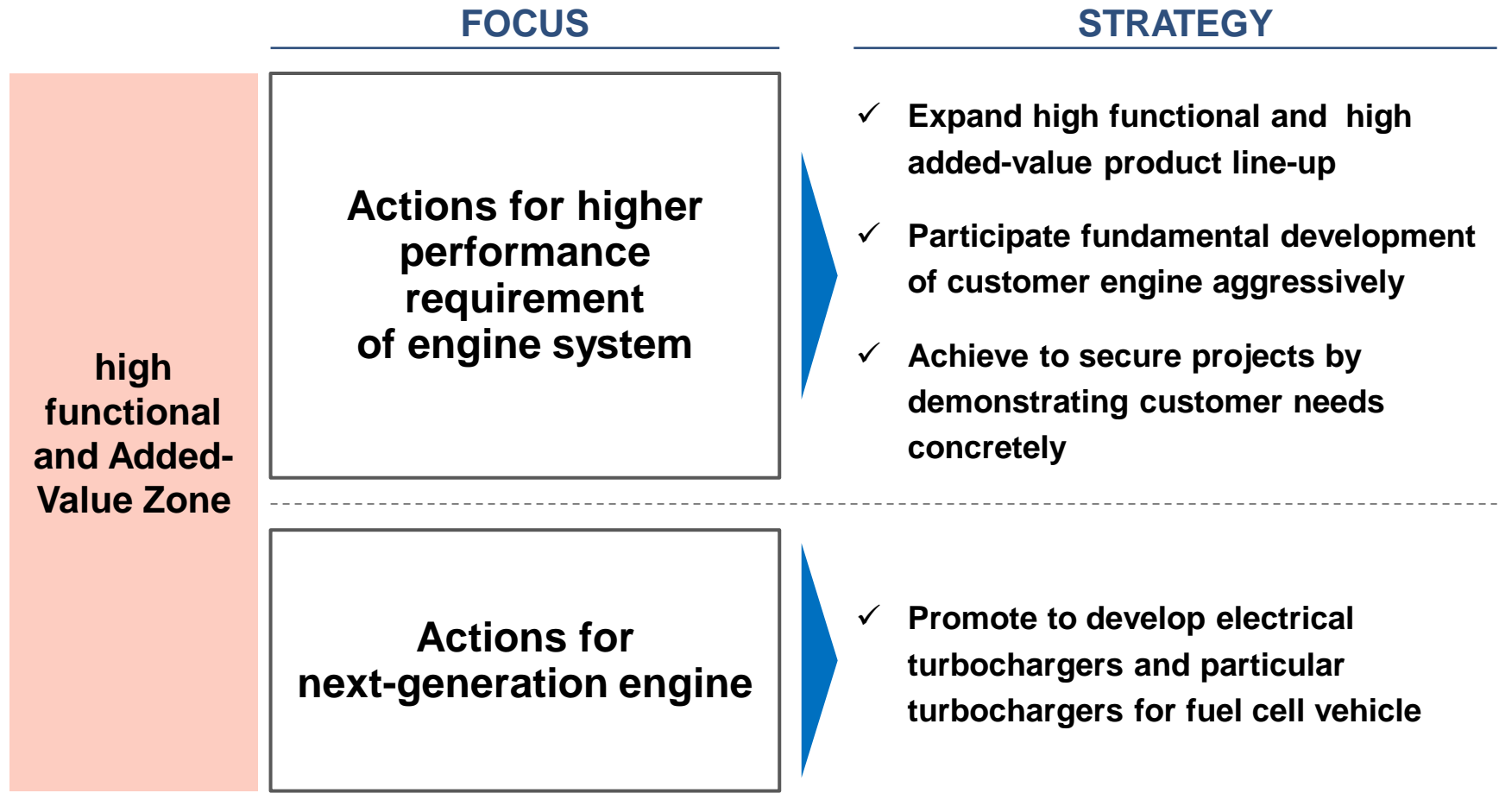
## TURBOCHARGER PRODUCT CATEGORY SALES (IMAGE)



- **Improve profitability by boosting sales from high added-value turbochargers**
- **Secure sales volume by capturing demands for fundamental product line-up steadily**



# Business Strategy Overview



# Business Strategy Overview (cont'd)



## FOCUS

## STRATEGY

**Volume  
Zone**

**Actions for gasoline  
turbocharger demands  
in growing market**

- ✓ Penetrate market with IHI's high technology/reputable brand name
- ✓ Acquire new customers by leveraging many track records in advance market
- ✓ Contribute to expand turbo vehicle sales in North America and China by Japanese and European customers

**Actions for diesel  
turbochargers in  
emerging markets**

- ✓ Penetrate market by leveraging the relationship with Japanese and European customers that increase productions and sales rapidly in emerging Asian market with utilizing IHI's global network

# Regional Highlights



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## Europe

- ✓ Started supplying to high-end European customer



## China

- ✓ Received order from European customer for gasoline engine turbocharger project



## Thailand

- ✓ Received order from Japanese customer for pick-up truck project



## North America

- ✓ Received order from European customer for a gasoline engine turbocharger project
- ✓ Launched commercial production of superchargers for North American customer



## Japan

- ✓ Received orders from several customers for turbochargers for downsizing gasoline engines



## Korea

- ✓ Received order from Korean customer for gasoline engine turbocharger project





# Profitability Expansion Strategy

## R&D

- ✓ **Group-wide R&D propulsion**
  - Strengthen group R&D operations
  - Strengthen further capability to meet customer request
- ✓ **Invest to strengthen product development**
  - Boost experimentation and evaluation capabilities

## Manufacturing

- ✓ **Heighten manufacturing techniques**
  - Improve productive efficiency while securing group common quality standards
- ✓ **Strengthen global procurement function**
  - Optimize procurement costs
- ✓ **Optimum global manufacturing facilities**
  - Streamline facilities operations and capital investments

## Sales activity

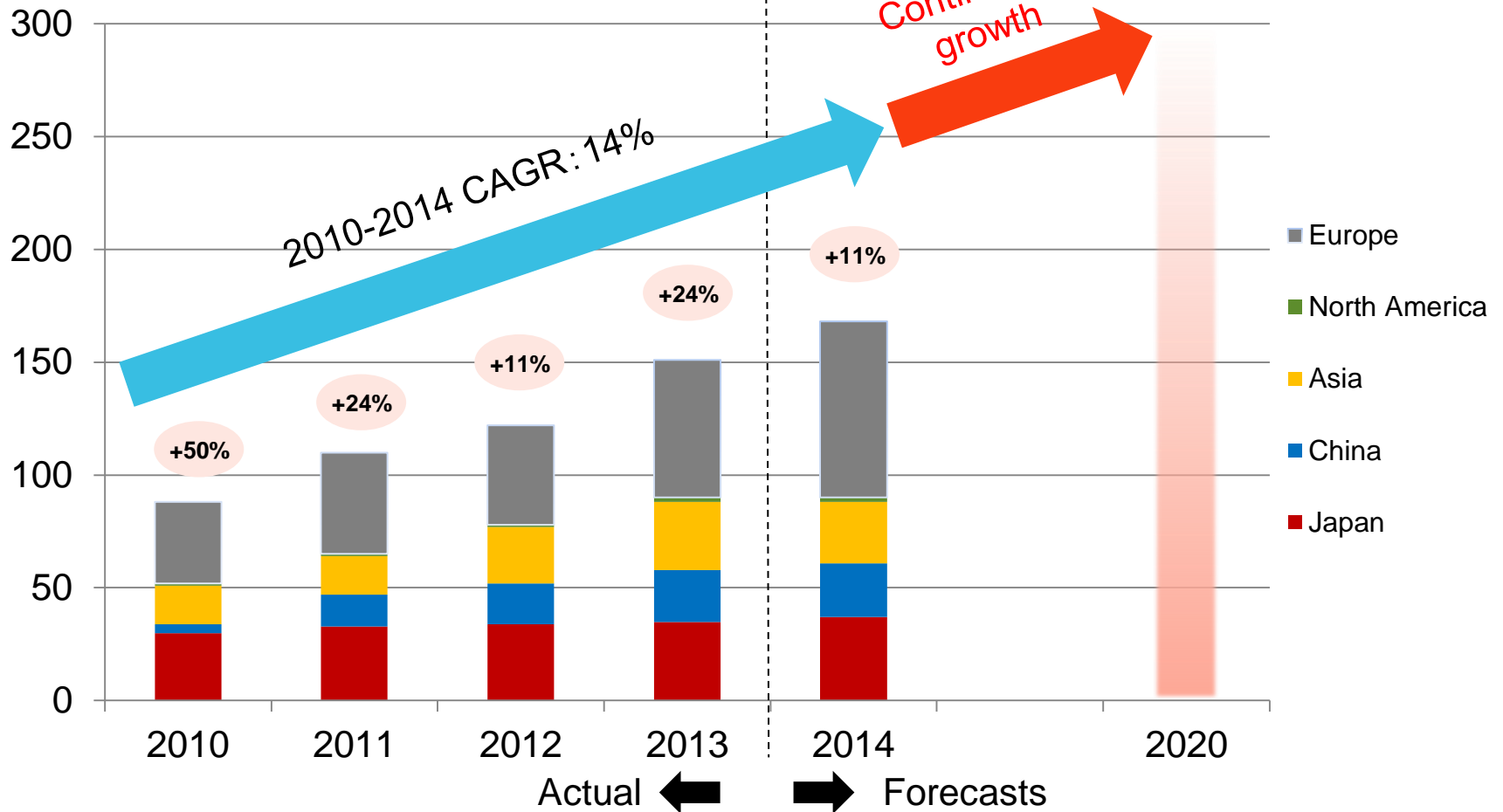
- ✓ **Increase orders of high-performance, value-added products**
  - Improve overall profitability by increasing high-margin product orders
- ✓ **Strengthen after-market business**
  - Established after-market subsidiary

**Realize to boost the profitability by implementing aggressive strategies throughout all turbocharger business activities**

# Consolidated Sales Outlook



(Billions of Yen)

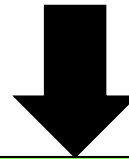


- Accumulated sales record has broken through over 50 million units
- Targeting continuous annual sales growth of more than 10%

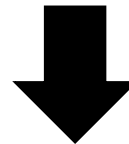
# Summary



- **Continuous expanding market**
- **R&D competence and global production capability**
- **The accomplishment of business strategy**



**Continuous growth with achieving sales scale expansion and profitability improvement steadily**



**Contributing to improve IHI market value**



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