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Changes for the Better

Factory Automation Systems Business Strategy Briefing
～ Overview of FA Systems Business and Growth Strategy ～

Yoshikazu Miyata
Executive Officer and Group President
Factory Automation Systems

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Mitsubishi Electric Corporation

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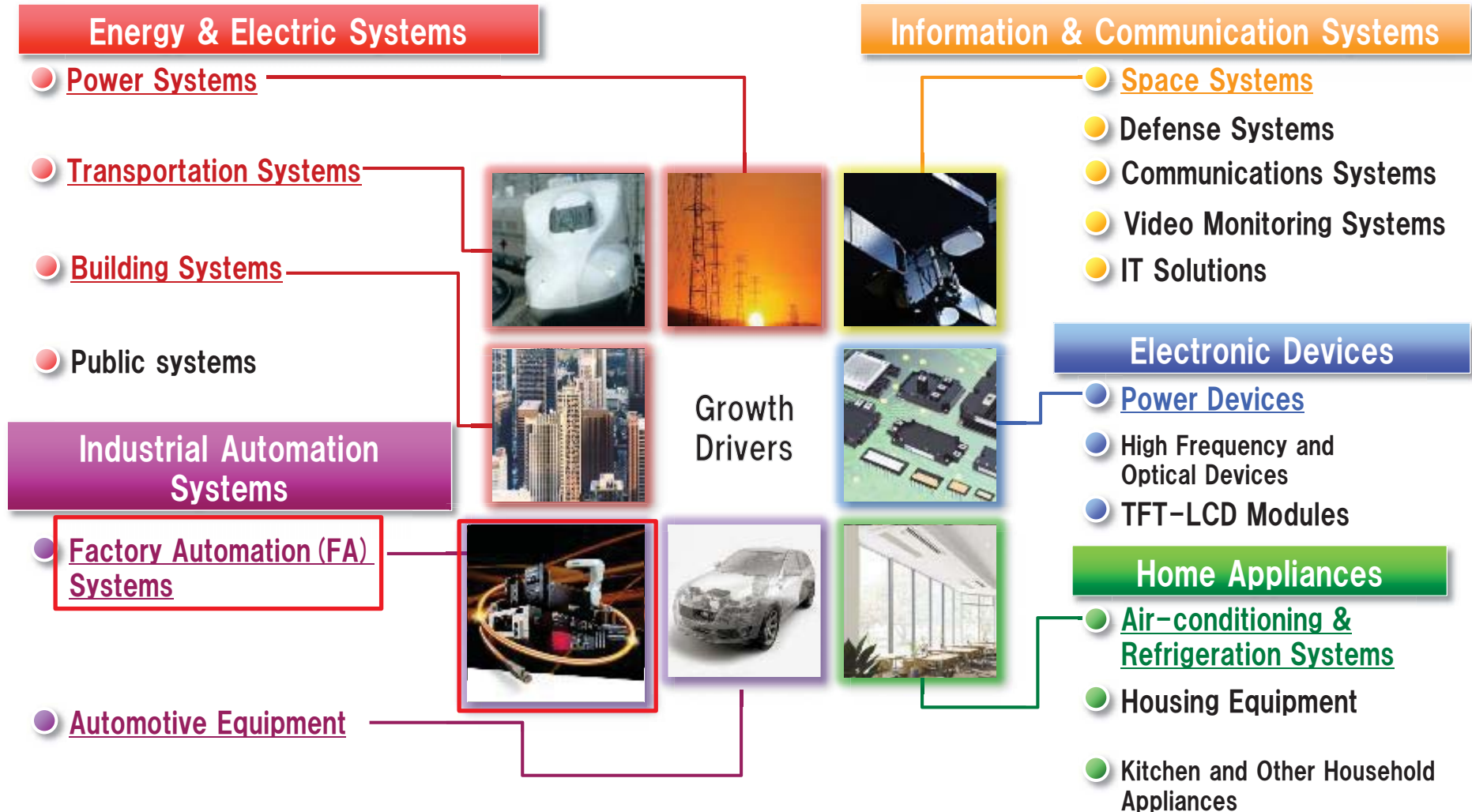
1. Business Overview

2. Growth Strategy

- e-F@ctory
- AI Utilization
- Product Strategy
- Regional Strategy

3. Mid-term Business Target

One of the Growth-driving Businesses

Energy & Electric Systems
- **Power Systems**
- **Transportation Systems**
- **Building Systems**
- Public systems

Industrial Automation Systems
- **Factory Automation (FA) Systems**
- **Automotive Equipment**

Information & Communication Systems
- **Space Systems**
- Defense Systems
- Communications Systems
- Video Monitoring Systems
- IT Solutions

Electronic Devices
- **Power Devices**
- High Frequency and Optical Devices
- TFT-LCD Modules

Home Appliances
- **Air-conditioning & Refrigeration Systems**
- Housing Equipment
- Kitchen and Other Household Appliances

Growth Drivers

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Comprehensive FA Manufacturer Offering a Wide Range of Products, Services and Solutions
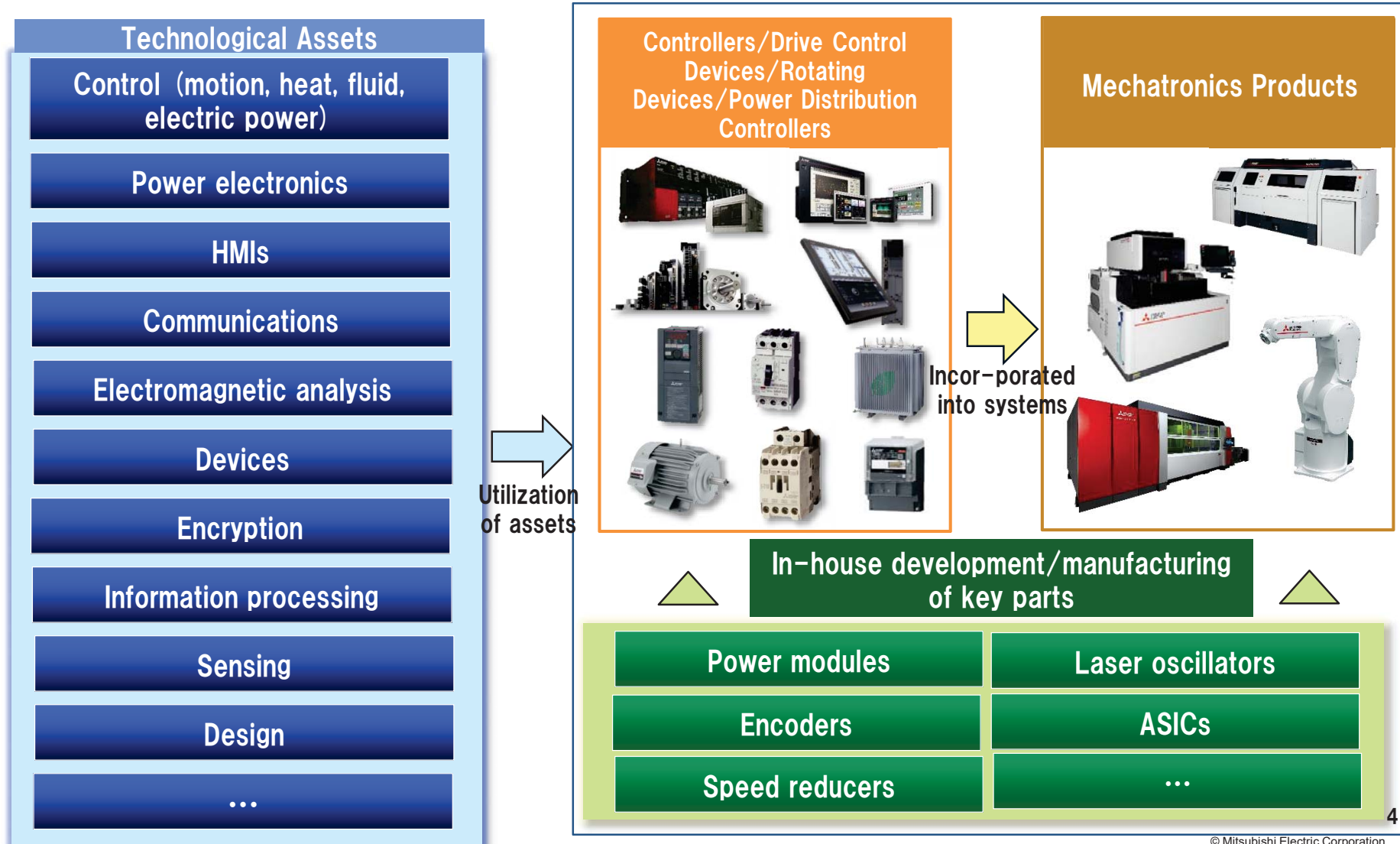
Controllers
- Programmable Controllers
- HMIs*1

Drive Control Devices
- AC Servos
- Inverters
- CNCs*2

Mechatronics Products
- Electrical-discharge Machines
- Laser-processing Machines
- Robots

Rotating Devices
- Three-phase Motors, Geared Motors, Industrial Fans

Power Distribution Controllers
- Circuit Breakers, Energy-saving Devices, Electromagnetic Switchgear, Transformers

*1 HMIs: Human-Machine Interfaces   *2 CNCs: Computerized Numerical Controllers

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Creating Value by Utilizing Technological Assets

Technological Assets

- Control（motion, heat, fluid, electric power）
- Power electronics
- HMIs
- Communications
- Electromagnetic analysis
- Devices
- Encryption
- Information processing
- Sensing
- Design
- …

Utilization of assets →

Controllers/Drive Control Devices/Rotating Devices/Power Distribution Controllers

Incor-porated into systems →

Mechatronics Products

In-house development/manufacturing of key parts

Power modules	Laser oscillators
Encoders	ASICs
Speed reducers	…

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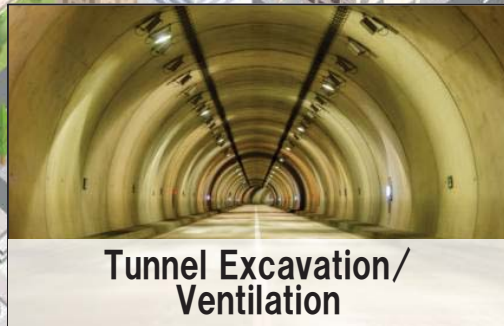Contributing to Improving Customer Product Competitiveness, and Facilitating Automation and Adoption of IoT*[1] at Production Sites

Liquid-crystal／Organic EL

Smartphones

Semiconductors

Automobiles／Automotive Components
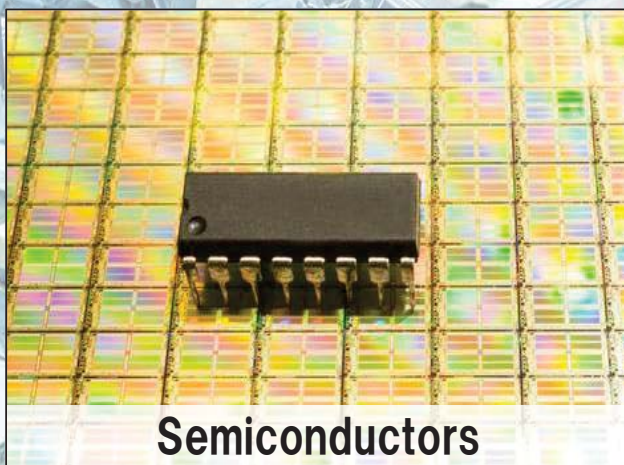
＊1 Internet of Things

Widely Used Outside of Production Sites as Well

Logistics/Transportation

Power Distribution Facilities

Building Air-conditioning

Waste Processing Plants

Tunnel Excavation/ Ventilation

Ports & Harbors/Shipping

<Production Volume of Major Products>

AC Servos
370,000 units/month

Programmable Controllers (CPUs)
150,000 units/month

Inverters
200,000 units/month

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New Record Sales Expected Thanks to Strong Capex Demand

（JPY Billion）

Overseas ratio

Europe and US

Other Asian regions＊

China, South Korea, Taiwan

Japan

	FY12	FY13	FY14	FY15	FY16	FY17 Forecast
Overseas ratio	35%	42%	47%	47%	49%	52%

600

300

0

Accelerated shift towards automation and IoT

Cultivation of new fields/markets

Increased market share
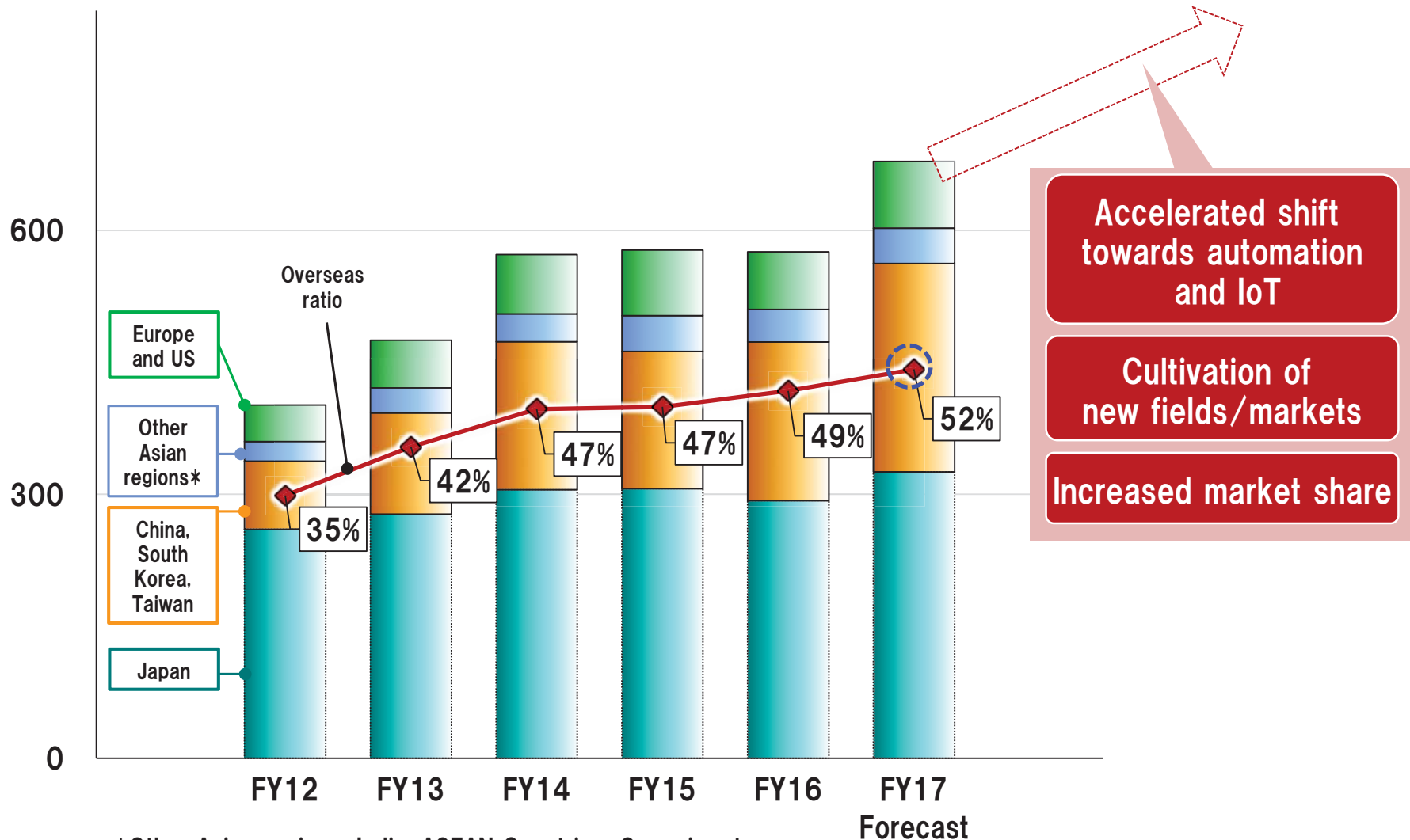
＊Other Asian regions: India, ASEAN Countries, Oceania, etc.

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Sales Expanded in All Regions, Driven by China, South Korea and Taiwan

（JPY Billion）

450

Japan

China,
South
Korea,
Taiwan

Other
Asian
regions

Europe
and
US

123%
year-
on-
year

Apr-Dec/16

Apr-Dec/17

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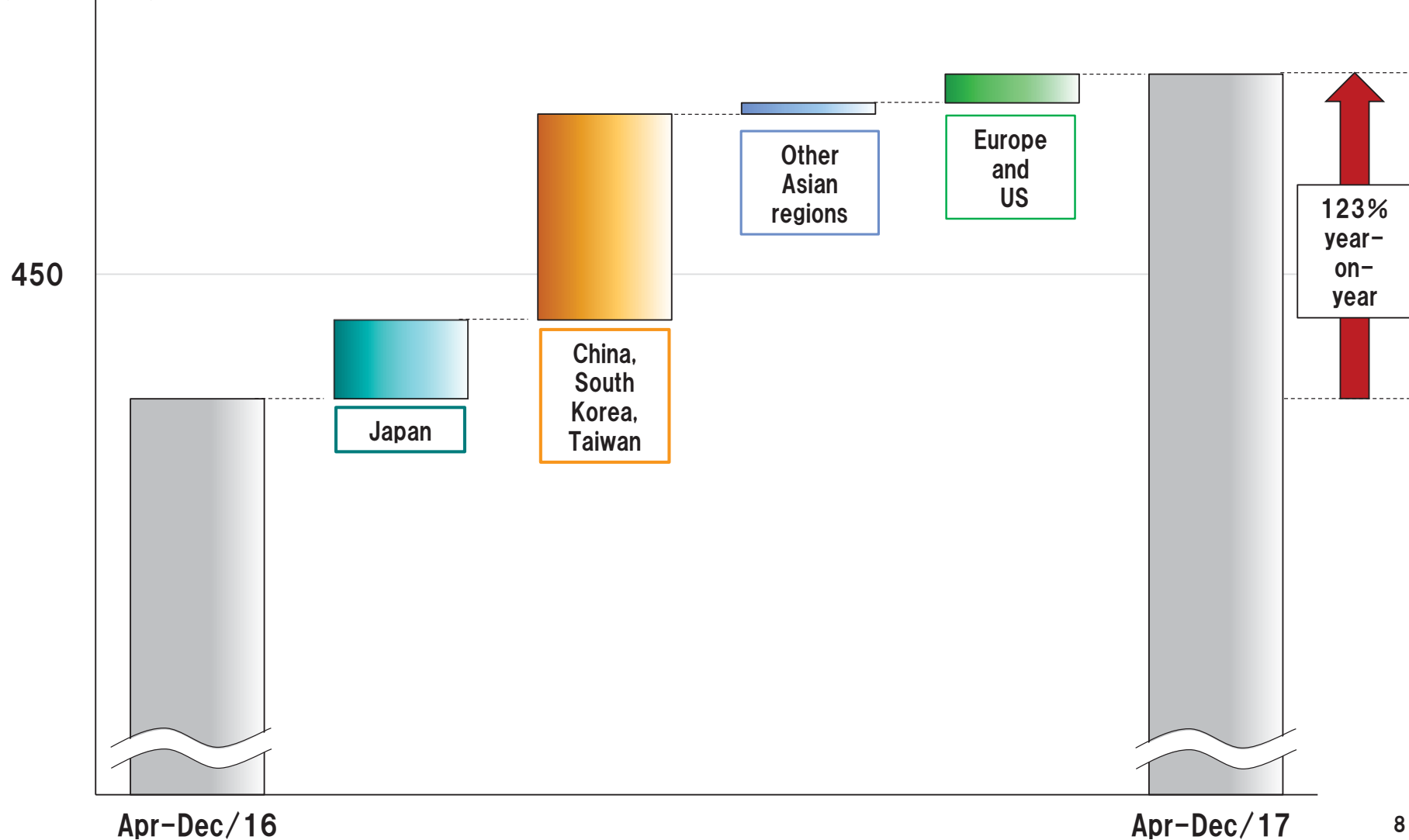
Sales Expanded in All Product Categories, Driven by Drive Control Devices

（JPY Billion）
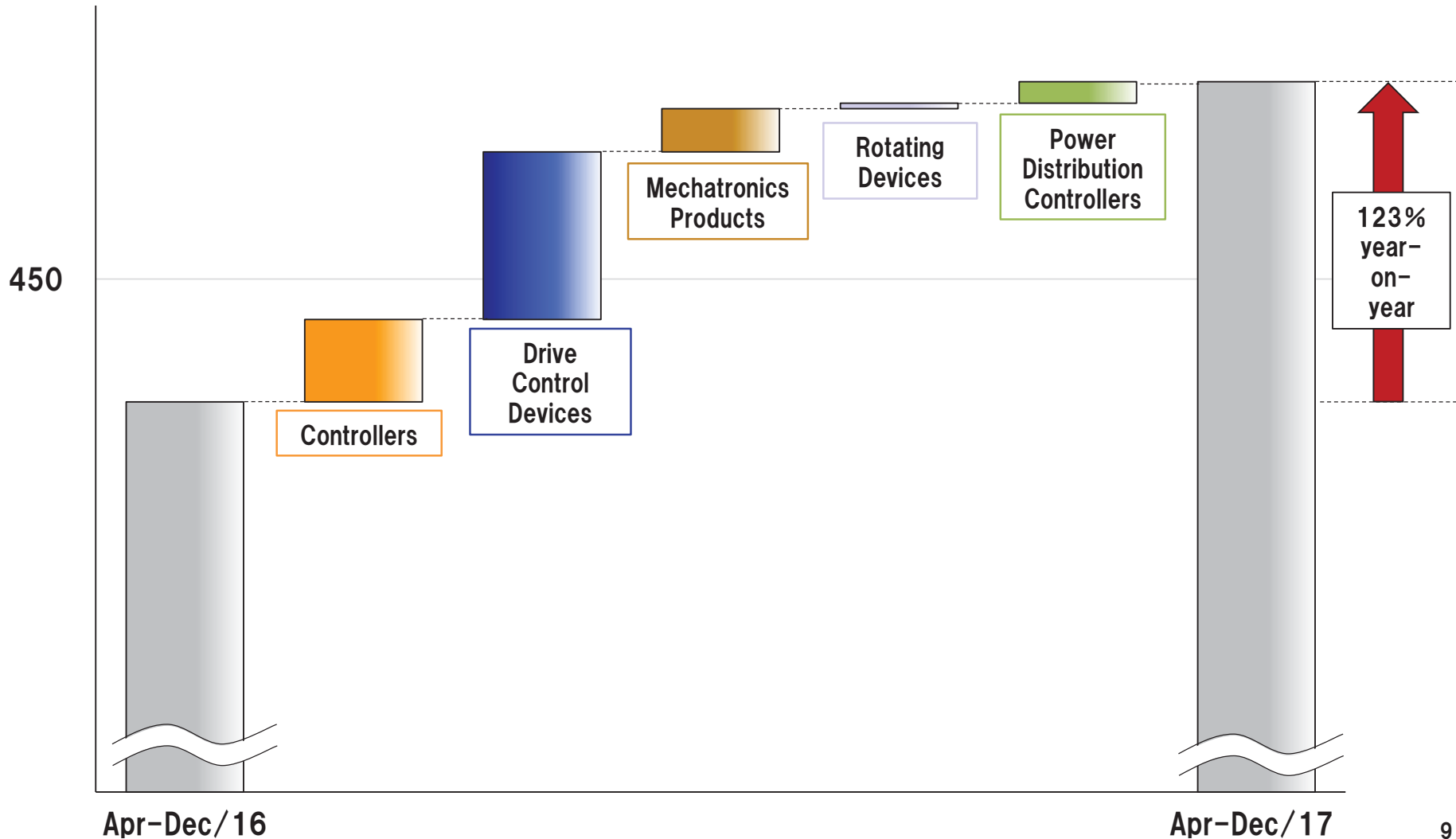
450

Controllers

Drive Control Devices

Mechatronics Products

Rotating Devices

Power Distribution Controllers

123% year-on-year

Apr-Dec/16

Apr-Dec/17
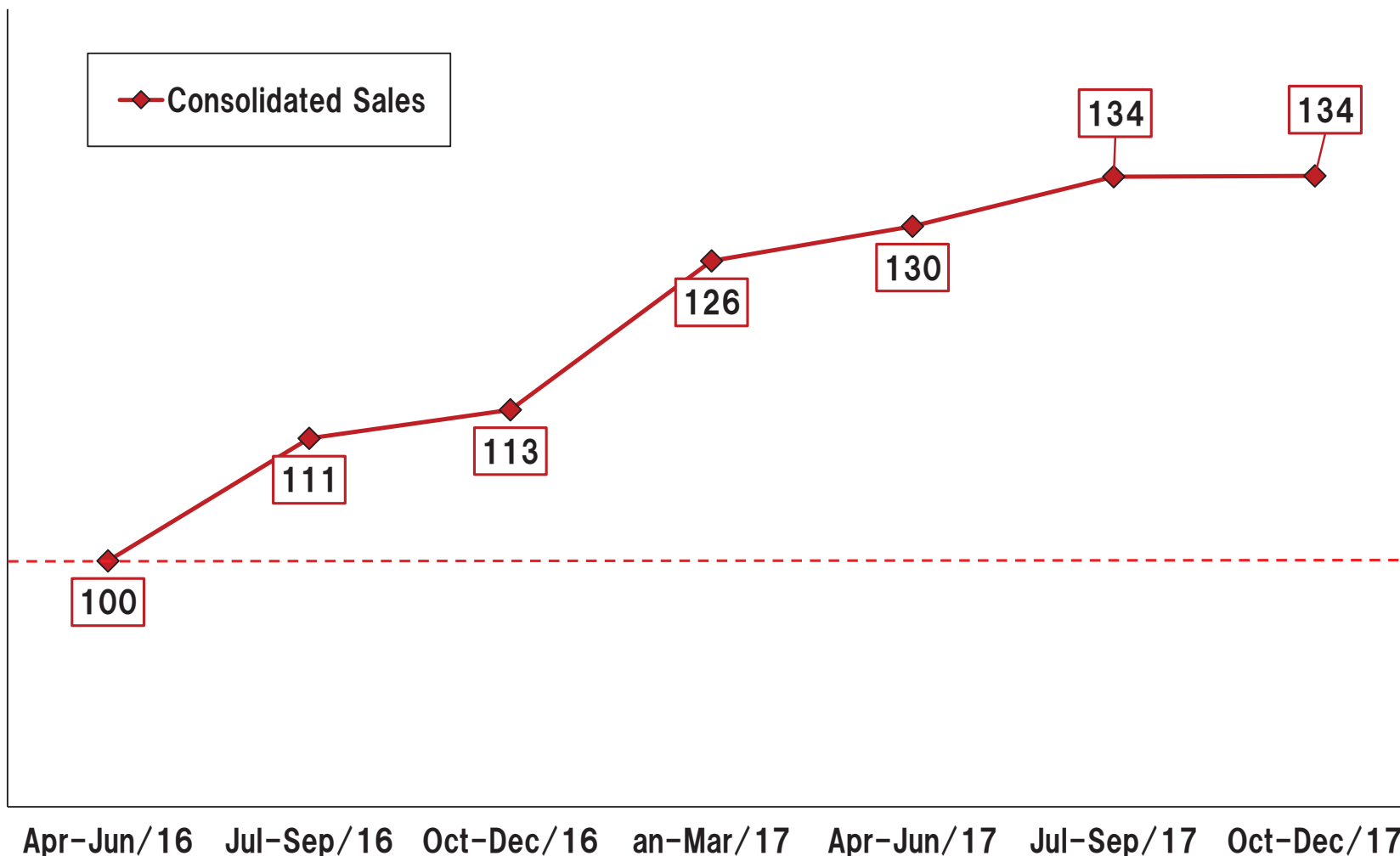
Production in Overseas Consumption Areas Expanded as Well as in Japan

Mitsubishi Electric Low-Voltage Equipment（Xiamen）Co., Ltd.

Second factory became operational（Mar 17）
Second factory to be expanded（Oct 18）

Mitsubishi Electric Automation Manufacturing（Changshu）Co., Ltd.

Mitsubishi Electric Dalian Industrial Products Co., Ltd.

Mitsubishi Electric India Pvt. Ltd.

Mother Factories

China（Changshu）

China（Dalian）

China（Xiamen）

India（Pune）

Thailand（Bangkok）

Vietnam（Ho Chi Ming）

Nagoya Works

Mitsubishi Electric Automation（Thailand）Co., Ltd.

Oriental Electric Industry Co., Vietnam Ltd.

Fukuyama Works

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Maximizing Comprehensive Strengths and Overseas Hubs

Corporate Research and Development Group's Research Centers

Information Technology R&D Center (Kamakura City)

Industrial Design Center (Kamakura City)

Advanced Technology R&D Center (Amagasaki City)

Mitsubishi Electric Research Laboratories (US)

Mitsubishi Electric R&D Center Europe (France/UK)

Germany (Dusseldorf)

China (Dalian)

China (Changshu)

India (Pune)

San Jose

Chicago

Boston

FA Development Center No.2 completed (July 2017)

Nagoya Works

European FA Development Center

North American FA Development Centers

China FA Development Centers

India FA Development Center

Fukuyama Works

Functions of Overseas Hubs

- US & Europe: R&D of cutting-edge technologies
- China: Improvement in competitiveness of locally made products
- India: Locally-tailored development activities

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Extensive Sales/Service Network Covering 94 Countries Worldwide

Business Sites Added in FY17

- Mexico Queretaro FA Center（17/5）
- Mexico Monterrey FA Center（17/5）

Overseas Service Functions

- Product training
- Response to technical inquiries
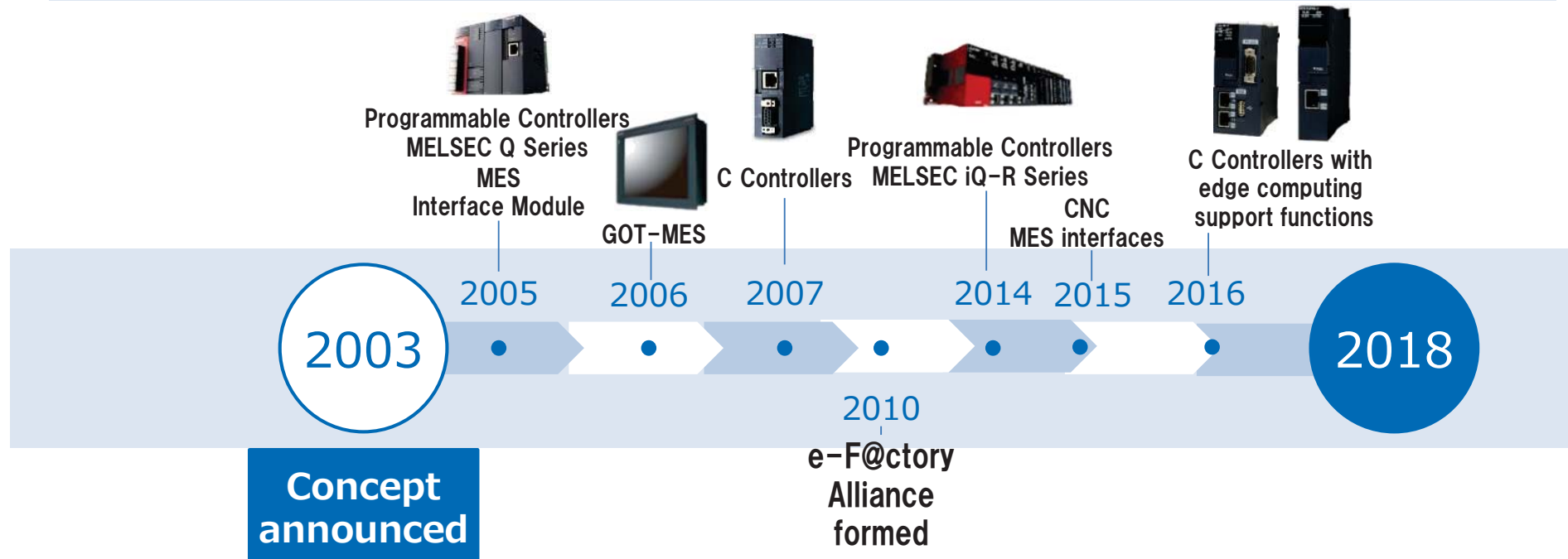- Supply of parts for repairs and service

Concept Advocated Since 2003

FA-IT Integrated Solution

e-F@ctory

Proposing solutions for manufacturing that stays one step ahead by reducing total cost of development, production and maintenance through the utilization of FA and IT technologies

Programmable Controllers
MELSEC Q Series
MES
Interface Module

GOT-MES

C Controllers

Programmable Controllers
MELSEC iQ-R Series

CNC
MES interfaces

C Controllers with
edge computing
support functions

2005   2006   2007   2014   2015   2016

2003   **2018**

2010
e-F@ctory
Alliance
formed

**Concept
announced**

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Expertise Accumulated Inside/Outside of the Company, and Alliances with a Wide Variety of Partners

Track Record of Introducing to MELCO Production Lines and Customers' Model Lines

Over 7,700 cases

Examples of introducing various applications

Changshu Innovation Center for Green & Intelligent Manufacturing (China)

2013
Nagoya Works substrate mounting line

2017
Mitsubishi Electric Automation Manufacturing (Changshu) Co., Ltd. servo motor assembly line

2018
Power Distribution Systems Center vacuum interrupters (VI) and vacuum circuit breakers (VCB) factory

Mitsubishi Electric Corporation production lines

Wide Variety of Partners

e-F@ctory Alliance

Approx. **610** participating companies[1]
■ Software partners (approx. **150**)
■ SI partners (approx. **310**)
■ Equipment partners (approx. **150**)

CLPA

Approx. **3,300** participating companies[1]
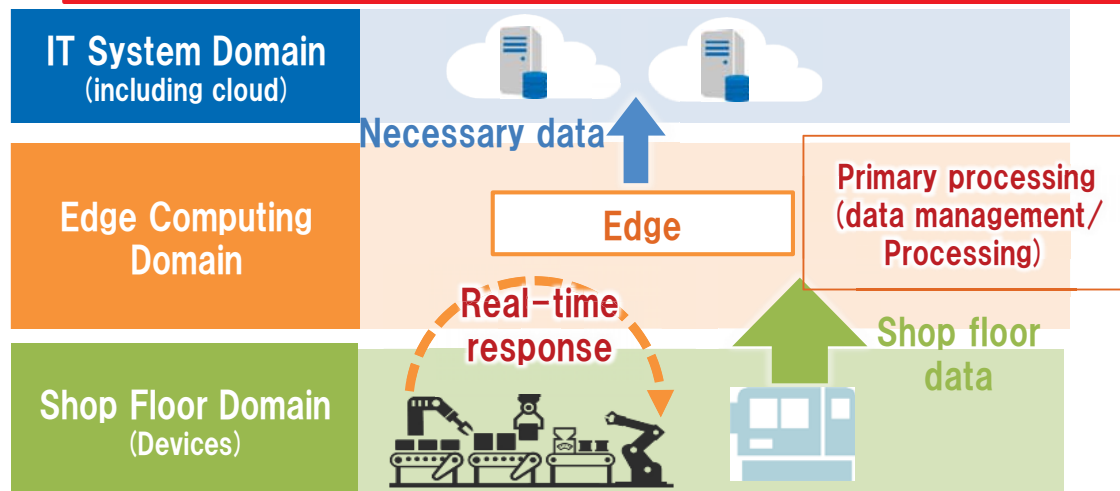Approx. **1,800** connectable products[1]

CC-Link Partner Association[2]

[1] No. of partner companies and connectable products as of March 2018.
[2] Organization promoting industrial network, CC-Link 15

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Edge Computing – The Key to Using IoT

IT System Domain (including cloud)

Edge Computing Domain

Shop Floor Domain (Devices)

Necessary data

Edge

Real-time response

Primary processing (data management/ Processing)

Shop floor data

Primary processing of shop floor data
Feedback made close to shop floor

① Simultaneous operationsimproved
② Security ensured
③ Communication volume reduced

Reference: Ministry of Economy, Trade and Industry/Commerce and Information Policy Bureau/Information Economy Subcommittee/Industrial Structure Council's
"Working Group on Distribution Strategy (First Session)"

Open Software Platform for Edge Computing Domain

EDGECROSS

Edgecross is an open software platform for the edge computing domain, which originated in Japan. It was created by Edgecross Consortium members, who interact outside the boundaries of corporations and industries with the aim of achieving FA-IT collaboration.
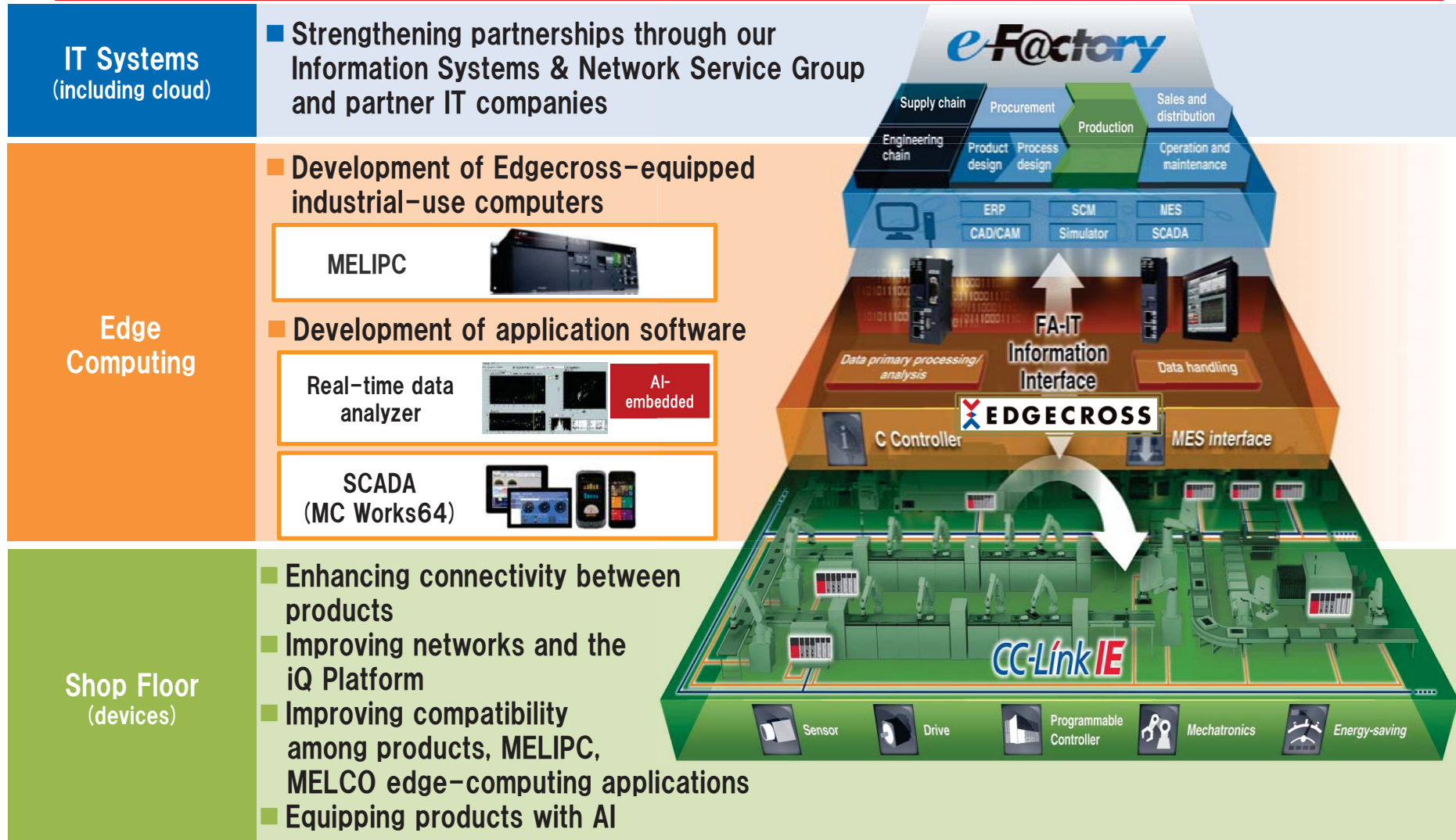
■ Operates on any industrial-use computer regardless of manufacturer
■ All data on shop floor collected
■ Real-time diagnosis and feedback

■ Modeling shop floor
■ Seamless connectivity between FA and IT systems
■ Utilizing wide variety of applications in the edge computing domain

Source: Edgecross Consortium

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Enhance Solution Proposal Capability through Utilization of Edgecross

IT Systems (including cloud)

- Strengthening partnerships through our Information Systems & Network Service Group and partner IT companies

Edge Computing

- Development of Edgecross-equipped industrial-use computers

  MELIPC

- Development of application software

  Real-time data analyzer — AI-embedded

  SCADA (MC Works64)

Shop Floor (devices)

- Enhancing connectivity between products
- Improving networks and the iQ Platform
- Improving compatibility among products, MELIPC, MELCO edge-computing applications
- Equipping products with AI

Mitsubishi Electric Service Solution That Takes Advantage of IoT
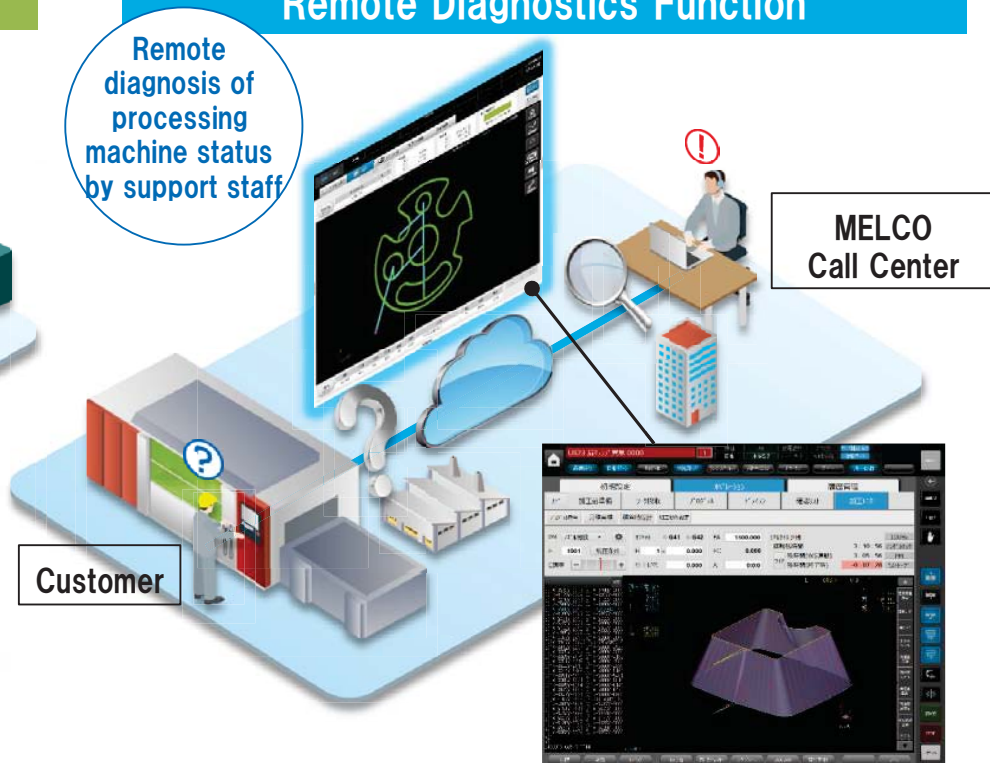
iQ Care Remote4U

Production/Maintenance Support Service for Electrical-discharge/Laser Sheet Metal Processing Machines Offered through IoT Utilization

Dashboard Function

Visualization of operational/maintenance status

Customer's office

Shop floor

Remote Diagnostics Function

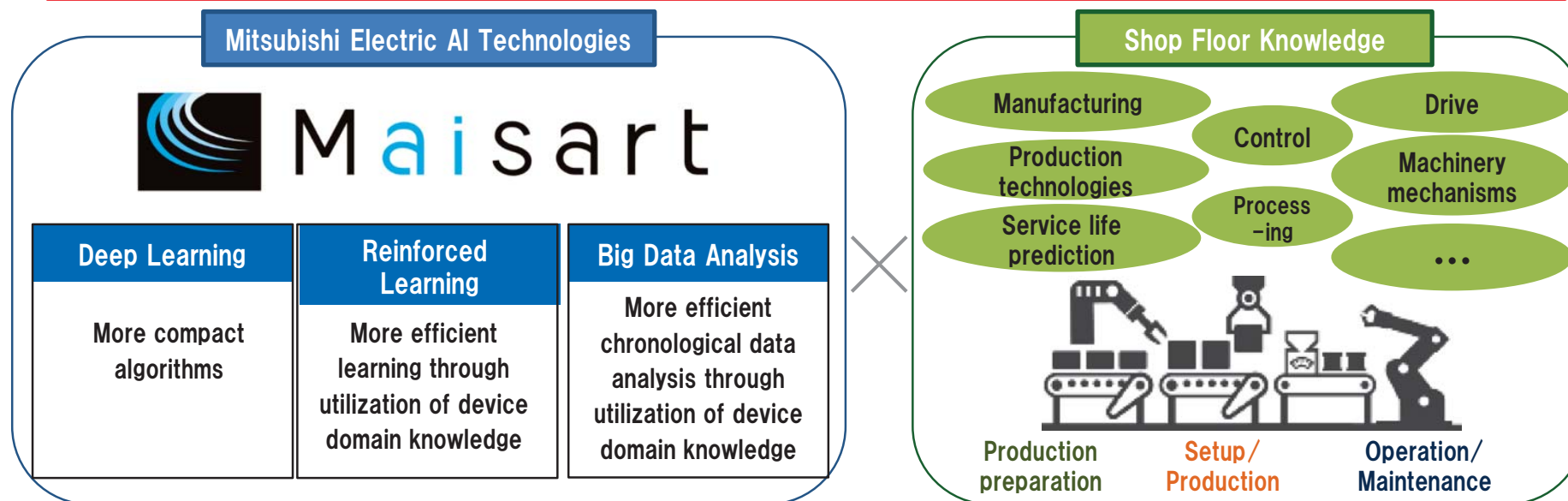Remote diagnosis of processing machine status by support staff

MELCO Call Center

Customer

Service launched in Japan (April 2016)
Total applicable machines: 600 units

Service to be introduced overseas beginning FY18

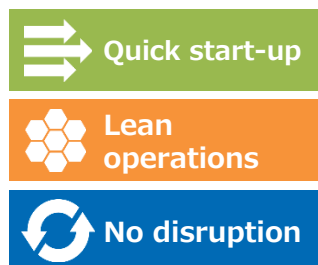Create "Smart Factories" Utilizing Mitsubishi Electric
AI Technologies and Shop Floor Knowledge

Mitsubishi Electric AI Technologies

Maisart

Deep Learning	Reinforced Learning	Big Data Analysis
More compact algorithms	More efficient learning through utilization of device domain knowledge	More efficient chronological data analysis through utilization of device domain knowledge

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Shop Floor Knowledge

Manufacturing   Drive
Control
Production technologies   Machinery mechanisms
Process -ing
Service life prediction   ...

Production preparation   Setup/ Production   Operation/ Maintenance

Applied to 7 models in FY18

◆**Advantages of AI embedded Systems**

Quick start-up — Reduces start-up time: Set-up time for facilities and production lines

Lean operations — Improves yields/utilization rates by analyzing test results and operational status

No disruption — Advises optimal maintenance timing by predicting possible equipment breakdown

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Enhance Product Lineups and Connectivity between Products

Product Development Policies

Controllers	■ Enhance lineups of programmable controllers, MELIPC and HMIs ■ Improve engineering environment in pursuit of user-friendliness
Drive Control Devices	■ AC Servos: Develop next series and improve basic performance ■ CNCs: Enhance functions by utilizing cutting-edge technologies and improving operability ■ Inverters: Enhance the range of large-capacity products
Mechatronics Products	■ Electrical-discharge machines: Enhance product appeal in the area of high-precision processing ■ Laser-processing machines: Enhance product appeal in the fiber area ■ Robots: Develop robots capable of working with humans in pursuit of user-friendliness
Rotating Devices	■ Three-phase motors: Strengthen ability to meet overseas regulations for high-efficiency operation
Power Distribution Controllers	■ Circuit breakers/Electromagnetic switchgear: Enhance product lineups for overseas markets ■ Transformers: Enhance product appeal through improved efficiency

- MELIPC links
- Enhanced iQ Platform
- Connectivity between products
- Enhanced networks
- Improved safety functions
- Maisart-equipped
- ・・・

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Reinforce Business Networks for the Base-load Market

◆ **East Japan FA Solution Center (tentatively named) to be opened (July 2018, Akihabara)**
Exhibit products/solutions, Users' school, User application testing

◆ **New division dedicated to solution business established (April 2017, approximately 150 staff members)**
1. Solutions Business Division
2. Dedicated sales teams (7 locations throughout Japan)

◆ **Strengthen partnerships with sales partners/customers**

1. Equipment Distributors Association
   (celebrating 50th anniversary in FY18)
   ① Equipment distributors: approx. 200 companies
   ② Equipment dealers: approx. 400 companies

2. 「RyoBankai」(celebrating 50th anniversary in FY19)
   Switchboard/Control panel manufacturers:
   approx. 500 companies

3. FATEC Club
   User members: approx. 16,000

4. Mitsubishi Electric FA Product Information Site
   Registered users: approx. 300,000

\<Exterior/User school (illustrative purpose only\>

\<Equipment Distributors Association nationwide meeting\>

Enhance Resources for Sales, Development, Production and Services in China as the Priority Overseas Market

◆ **Establish our position in IoT market using Chinese government's guideline "Made in China 2025" as a spring board**

1. Participate in government-sponsored seminars as a lecturer
2. Establish relationships with relevant government sectors

<e-F@ctory seminar>

◆ **Expand e-F@ctory usage in government projects**
ITEI* Intelligent Production Model Line constructed
（November 2017）
　*ITEI：Instrumentation Technology and Economy Institute

<ITEI Model Line>　　<China International Industry Fair>

◆ **Strengthen local network to understand trend towards automation and IoT**

1. Substantial increase in number of staff for sales, production, design and service

2. Increase number of e-F@ctory staff at sales companies

3. Reinforce sales bases for focus segments
(e.g., government's investment promotion regions)

4. Increase number of models manufactured in the consumption areas and expand locally procured materials

⟹ **Approx. 2,600（up 400 from FY17）**

⟹ **Approx. 50（2x from FY17）**

⟹ **FY18: 4 locations（Hefei and others）**

⟹ **FY18: Robots**

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Korea/Taiwan – Maintain/Expand top-class share by winning projects in key segments
ASEAN – Strengthen business networks in anticipation of local company growth and additional investment by Japanese companies

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South Korea/Taiwan

◆ **Expand e-F@ctory partnerships**

1. South Korea/Taiwan
   e-F@ctory Alliance formed (March 2018)

2. Taiwan
   ① MOU concluded with Taiwan Ministry of Economic Affairs for promotion of IoT (June 2017)
   ② e-F@ctory demonstration model exhibited at IoT experimental exhibition held in Taichung City

◆ **Key segments**
Smartphones, LCDs/OLEDs, Semiconductors, Lithium-ion batteries, machine tools

Partner Target No.
South Korea: 70 companies
Taiwan: 70 companies

<e-F@ctory Alliance formed>

ASEAN

◆ **Strengthen business networks**

Reinforce business networks utilizing comprehensive sales company, and expand and improve local sales network

◆ **Key segments**

Automobiles/Automotive components (including local Japanese affiliate companies), food processing and instrumentation

<MOU concluded with Taiwan Ministry of Economic Affairs>

2. Growth Strategy: Regional Strategies (India, Europe and Americas)

India – Strengthen Business Networks in Anticipation of Economic Growth and Sophistication of Manufacturing

Europe and Americas – Improve Position by Gaining Market Share in Key Segments/Regions

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India

◆ **Strengthen business networks**

1. Expand sales network to north and central regions (e.g., Rajasthan)
2. Examination of setting up of new production base (see p.25)

◆ **Key segments**

Automobiles, food processing, pharmaceuticals, machine tools, and instrumentation

◆ **Contribute to advancements in manufacturing through "Made in India" movement**

Active participation in government-sponsored events (e.g., attract foreign investment)

<Mitsubishi Electric booth visited by Prime Minster Narendra Modi>

Europe and Americas

◆ **IoT and AI technology R&D**

1. European FA Development Center: participate in Industrie4.0-related working group
2. North American FA Development Centers: Utilize new San Jose Center

→ **Collect Industrie4.0-related information and develop relevant technologies**

→ **Research technological trends in AI, AR, etc.**

◆ **Enhance development activities to meet local needs in Europe and US**

Europe: Foods, automobiles and instrumentation; Americas: Automobiles, air-conditioning and sanitation

◆ **Key regions**

Europe: Southern Europe, central and eastern Europe and Turkey; Americas: US Midwest and Mexico

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> **Strengthen Production Network and Establish Stable Supply Network to Achieve Mid-term Business Target**

◆ **Increase production capacity**

1. Increase AC servos production → **March 2018** **480,000 units/month** （170% compared to FY16）

2. Increase Programmable Controllers production → **June 2018** **190,000 units/month** （160% compared to FY16）

3. Increase robots production → **June 2018** **Production started in China（Changshu）**

◆ **Procurement of parts and materials, and securing the workforce（labor）**

1. Strengthen relationships with key suppliers in cooperation with procurement divisions across the company and diversify suppliers of parts and materials
2. Aggressively promote recruitment and improve employee satisfaction（e.g., upgrade welfare facilities）

◆ **Reinforce production network to achieve mid-term business targets**

| Japan	Overseas
Nagoya Works: Strengthen production network 1. Consider purchasing site for factory in Chubu region（FY18） 2. Construction of new factory building/office block（FY19-）	Strengthen production network in consumption areas 1. Expand production bases in Changshu and Dalian areas in China 2. Consider establishing new production base（India）

◆ **Establish Stable Supply Network**

Improve and extend inventories of key parts and products → **Reinforce BCP measures/Learn to manage sharp fluctuations in demand**
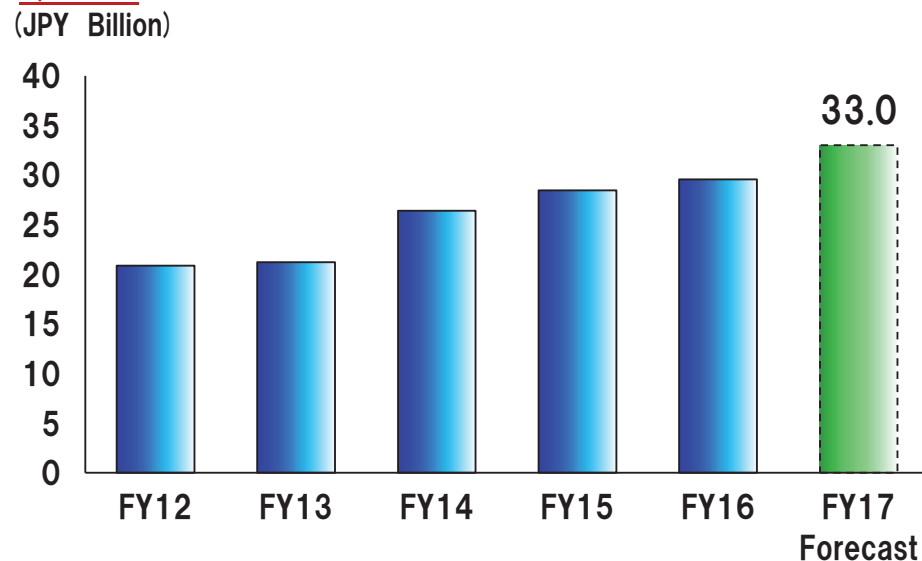
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Continuous Injection of Resources to Enhance Business Competitiveness

◆ Capital Investment

（JPY Billion）

◆R&D

（JPY Billion）
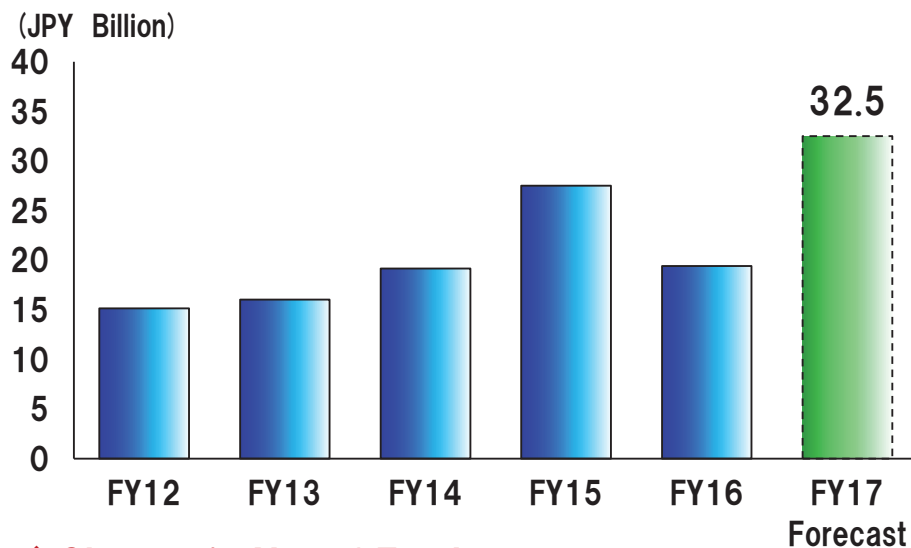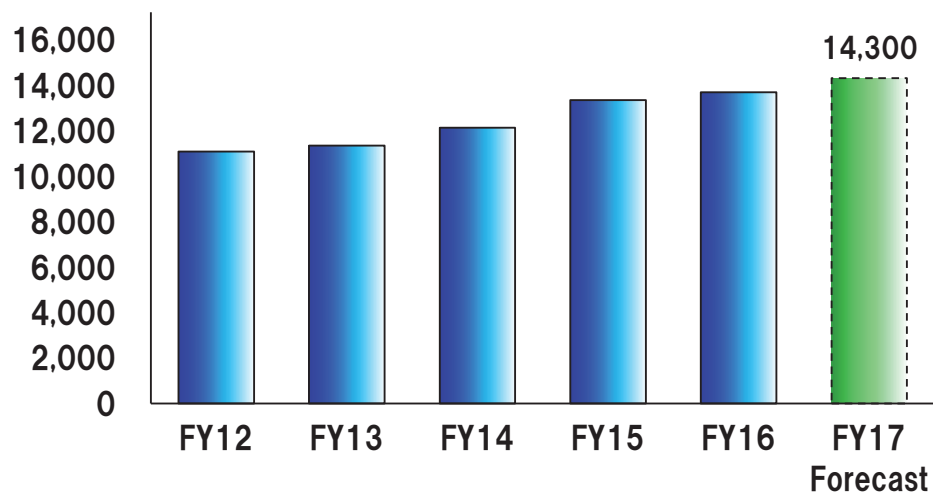

◆Change in No. of Employees

Capital investment	Increase production capacity and accelerate updating of factories
R&D	e-F@ctory, edge computing-related products, Networks, next series
Employees	Sales, production, design, quality assurance, and service staff

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2. Growth Strategy: M&As

① Complement Product Groups, Technological Fields, Etc.
② Ensure Sales/Service Networks, and ③ Obtain New Clientele

◆Major M&As carried out in past five years（including joint capital investments）

| Strengthening of Technological Prowess		
Country	Case	Aim
Japan	Making AnyWire Corporation a subsidiary	Strengthen sensor network
US	Acquisition of a stake in ICONICS	Expand SCADA product lineup
Germany	Acquisition of KH-Automation	Enhance solution proposal capability
Japan	Acquisition of assets of Dura Systems Corporation	Enhance product development capability in edge computing
Japan	Takeover of part of business of NIPPON DENNO Co., Ltd.	Enhance product development capability in edge computing

Expansion of Sales Networks		
Country	Case	Aim
India	Acquisition of MESSUNG	Expand sales channels and enhance product development function
Turkey	Acquisition of GTS	Expand Turkish business
Thailand	Acquisition of F.A.TECH	Enhance sales function
Japan/ Asia	Making SETSUYO ASTEC Corporation a subsidiary	Enhance sales network and expand business in ASEAN/Taiwanese markets
Russia	Takeover of ETS	Enhance business network

Strengthened technical prowess: 11 cases in total

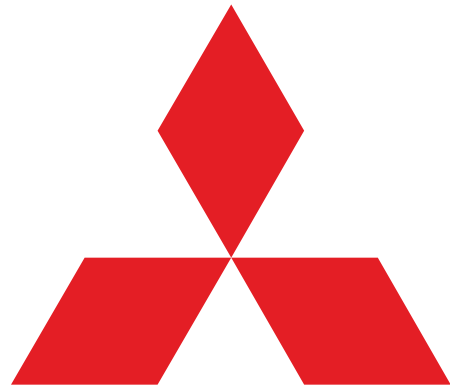**Expanded sales channels: 8 cases in total**

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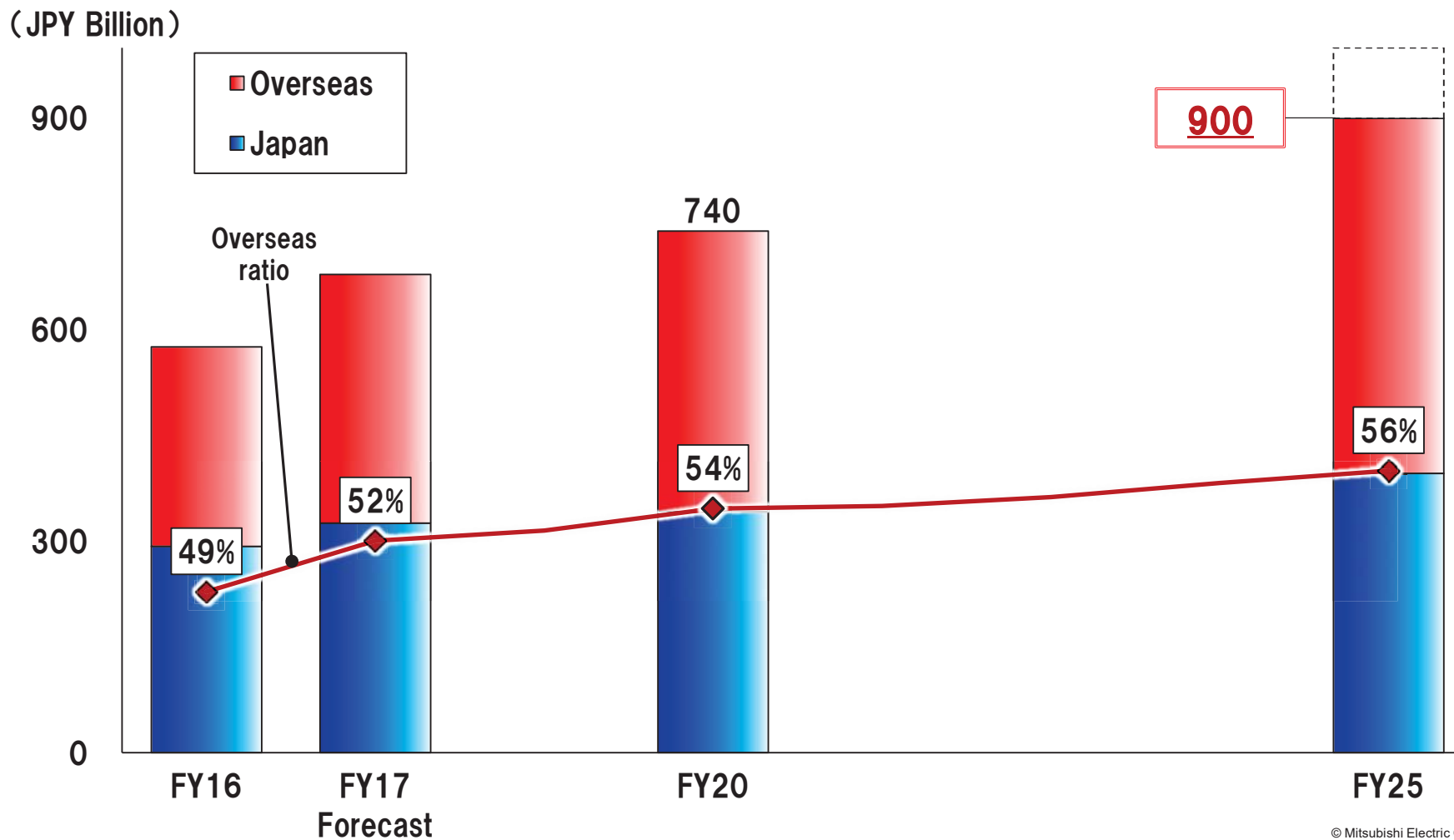
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Cautionary Statements

The expectation of operating results herein and any associated statement to be made orally with respect to the Company's current plans, estimates, strategies and beliefs, and any other statements that are not historical facts are forward-looking statements. Words such as "expects," "anticipates," "plans," "believes," "scheduled," "estimated," "targeted," along with any variations of these words and similar expressions are intended to identify forward-looking statements that include but are not limited to projections of revenues, earnings, performance and production. While the statements herein are based on certain assumptions and premises that the Company trusts and considers to be reasonable under the circumstances to the date of announcement, you are requested to kindly take note that actual operating results are subject to change due to any of the factors as contemplated hereunder and/or any additional factor unforeseeable as of the date of this announcement.

Such factors materially affecting the expectations expressed herein shall include but are not limited to the following. As such, additional factors may arise at any given time.

1. Any change in worldwide economic and social conditions, as well as laws, regulations, taxation and other legislation
2. Changes in foreign currency exchange rates, especially yen/dollar rates
3. Changes in stock markets, especially in Japan
4. Changes in balance of supply and demand of products that may affect prices and volume, as well as material procurement conditions
5. Changes in the ability to fund raising, especially in Japan
6. Uncertainties relating to patents, licenses and other intellectual property, including disputes involving patent infringement
7. New environmental regulations or the arising of environmental issues
8. Defects in products or services
9. Litigation and legal proceedings brought and contemplated against the Company or its subsidiaries and affiliates that may adversely affect operations or finances
10. Technological change, the development of products using new technology, manufacturing and time-to-market
11. Business restructuring
12. Incidents related to information security
13. Occurrence of large-scale disasters including earthquakes, typhoons, tsunami, fires and others
14. Social or political upheaval caused by terrorism, war, pandemic by new strains of influenza and other diseases, or other factors

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