Power Electronics Systems
Business Strategies

May 25, 2017
Fuji Electric Co., Ltd.
Power Electronics Systems
Business Group
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■ Review of FY2016

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  • Specific Initiatives

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Review of FY2016
Review of FY2016 - Social Engineering Systems

- Establishment of domestic operating foundations
  - Top domestic share for smart meters
  - Development of production system with production capacity of 3 million units
  - Strong growth in social information business

- Challenges
  - Growth of overseas operations
  - Expansion of energy management field operations

* Figures for net sales and operating income are the sums of figures for the social engineering systems business and the social information business.
* Figures for FY2015 and FY2016 are prior to the segment reorganization conducted in FY2017. ©2017 Fuji Electric Co., Ltd. All rights reserved.
Review of FY2016 - Industrial Infrastructure

- **Expansion of domestic operations**
  - Steady incorporation of domestic replacement demand
    Substations, etc.
  - New business launches
    Distribution, datacenters

- **Challenges**
  - Expansion of overseas system operations
  - Reinforcement of industrial plant operations
    Enhancement of system component equipment (measuring, control)

* Figures for FY2015 and FY2016 are prior to the segment reorganization conducted in FY2017. ©2017 Fuji Electric Co., Ltd. All rights reserved.
Review of FY2016 - Power Electronics

- **Establishment of foundations for business expansion**
  - Growth of domestic share for major components
    - Low-voltage inverters, servos, industrial motors, UPSs
  - Expansion of overseas operations
    - Establishment of overseas foundations through M&A activities

- **Challenges**
  - Creation of greatly differentiated components
    - Adoption of competitive SiC power semiconductors
      (Power supplies, electrical equipment for railcars, inverters, servos)
  - Transformation of earnings structure
    - Standalone components
      → Expansion of motion FA systems

* Figures for FY2015 and FY2016 are prior to the segment reorganization conducted in FY2017.
Review of FY2016 - Overall

* Figures for FY2015 and FY2016 are prior to the segment reorganization conducted in FY2017.

- **Establishment of operating foundations**
  - Expansion of domestic operations
  - Reorganization and reinforcement of development and mother bases
  - Acquisition of overseas operating foundations through M&A activities

- **Challenges**
  - Growth of overseas system operations
  - Reinforcement of plant systems

Fully exercise comprehensive strengths of Fuji Electric
Individual reinforcement of business segments → Success in domestic market
Conversely, separate component and plant operations → Challenges faced in exercising comprehensive strengths of Fuji Electric

* Share information is from FY2016 and is based on Fuji Electric’s figures.
Vision for Power Electronics Systems Business

Target net sales of ¥650.0 billion and operating margin of more than 7% in FY2023

Exercise Fuji Electric's comprehensive strength comprised of social engineering systems, industrial infrastructure, and power electronics

- Steady growth of domestic sales
- Overseas expansion of EMS operations
- Expansion of IDC operations
- New M&A activities (¥30.0 billion)
- Proactive R&D
- Overseas expansion of plant systems (M&As)
- New businesses (EVs, distribution, etc.)
Vision for Power Electronics Systems Business

Energy Solutions

Contribute to consistent supply, optimization, and stabilization of energy

- Expand EMS operations with smart meters as core (commence overseas expansion in 2017)
- Grow competitive substation system and industrial power supply operations
- Bolster IDC operations centered on differentiated products (SiC-UPSs)

Industry Solutions

Contribute to improved productivity and energy savings with FA and monitoring

- Employ differentiated products (SiC inverters, servos) in FA systems and then IoT equipment
- Grow overseas operations for competitive steel and chemical plants (M&A activities)
- Deploy differentiated products (SiC railway inverters, doors) in Japan and overseas
- Expand new businesses (EVs, distribution, plant factories)
M&A activities advanced in China, other parts of Asia, and North America since FY2014
Acquisition of sales channels and engineering and production bases

(Billion yen)

FY2014 FY2015 FY2016 FY2017 FY2018

North America
China
Asia

FTU: Fuji Tusco Co., Ltd. F SMBE: Fuji SMBE Pte. Ltd.
F Gemco: Fuji Gemco Private Limited F CAC: Fuji CAC Joint Stock Company
F SEMEC: Fuji SEMEC Inc.
Changes in Structure and Segments
Power Electronics Systems
Fuji Electric’s Comprehensive Strengths

- Creation of competitive power electronics components with power semiconductors at their core
- Expansion of overseas operations with systems combining sensor and control technologies

Social infrastructure (power, telecommunications)
- Transformers
- GISs
- PCSs
- UPSs
- Smart meters
- Inverters
- Servos
- Motors
- Scrubbers
- Switchgears and controlgears
- Linear doors

Energy Solutions
- Substation equipment
- Energy Solutions
- Industry Solutions

IoT
- Creation of competitive power electronics components with power semiconductors at their core
- Expansion of overseas operations with systems combining sensor and control technologies

Industry Solutions
- Industrial (materials, assembly)
- Distribution, logistics

Energy Solutions
- Energy Solutions
- Industry Solutions

IoT
- Creation of competitive power electronics components with power semiconductors at their core
- Expansion of overseas operations with systems combining sensor and control technologies

Industry Solutions
- Industrial (materials, assembly)
- Distribution, logistics

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Power Electronics Systems Organizational Structure

Power Electronics Systems Business Group

Energy Solutions
- Energy Management Division
- Transmission & Distribution Systems Division
- Power Supply Systems Division

Industry Solutions
- Factory Automation Systems Division
- Process Automation Systems Division
- Environment Solution Systems Division
- Transportation Systems Division

Cross-Business Organizations
- Development Division
- Engineering Division
- Production Division
- After Sales Service Division
- Business Management Division
  Asia Pacific Business Strategy Office

Business expansion
- Business responsibility
- Product planning
- New business development
- M&A activity execution and effective utilization

Business linking (including with other segments)
- New product creation
- System standardization
- Optimal global supply chain development
- Lifecycle business expansion
- Domestic and overseas business expansion

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## Cross-Business Organizations Linking All Businesses

### Power Electronics Systems

#### Energy Solutions
- Energy management
- Substation systems
- Power supply systems
- ED&C components

#### Industry Solutions
- Factory automation
- Process automation
- Environmental and social solutions
- Installation, social information

### Development
- Create competitive power electronics components with power semiconductors at their core
- Develop systems that combine sensors and control equipment with power electronics

### Engineering
- Utilize monitoring techniques to reduce costs and shorten lead times
- Standardize systems and expand utilization of packages

### Production
- Increase value and productivity by expanding in-house production
- Spread automation through standardization and in-house production (introduce IoT into factories)

### Services
- Grow sales through close relationships with customers and enhanced on-site proposal capabilities
- Consolidate component service operations to increase sales
Development System

- Create competitive components (power electronics equipment, measuring equipment, control equipment)
- Develop competitive power electronics systems by incorporating IoT and engineering

Development Division

Power Electronics Components Development Center

- Inverters, servo amps, EVs
  (Development of products for railways and overseas)
- UPSs, PCSs, railway equipment, EV power supplies
- Industrial motors, servo motors, Dedicated motors for railways/EVs

Create differentiated products employing power semiconductors (SiC)

Suzuka Power Electronics Components Development Center

Control and Instrumentation Technology Development Center

- PLCs, DCSs, HMI, NW
- Sensors, measurement systems

Develop IoT products to enhance systems

Tokyo Control and Instrumentation Technology Development Center
+Corporate R&D Headquarters
### Development Roadmap - Power Electronics

- **Created differentiated SiC-equipped components**

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<td>DC-UPSs</td>
<td>System compatibility</td>
<td>Large-capacity UPSs</td>
<td>Expansion of capacity series, measures in focus areas</td>
<td>IDCs</td>
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<th>PA,FA</th>
<th>PA</th>
<th>FA</th>
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<td>System compatibility</td>
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<tr>
<td>Environmental resistant inverters</td>
<td>Expansion of capacity series</td>
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<td>Servos</td>
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<th>Shinkansen propulsion systems</th>
<th>Conventional line train propulsion systems</th>
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<tr>
<td></td>
<td></td>
<td>Compatibility with use overseas</td>
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<td>EV systems</td>
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* PA: Process automation, FA: Factory automation

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## Development Roadmap - Systems Equipment

### Monitoring (sensors) and linkage (systems) → IoT development

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<td>Energy center packages</td>
<td>Steam flow meters</td>
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<td>Power supply systems</td>
<td>IDC diagnosis packages</td>
<td>IDC operation packages</td>
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<td>Industry Solutions</td>
<td>FA controllers</td>
<td>PA controllers</td>
<td>High-performance controllers</td>
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<tr>
<td>PA, FA</td>
<td>Robotic sensors</td>
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<tr>
<td>Environment</td>
<td>Laser gas analyzers</td>
<td>Robotic sensors</td>
<td>Production support controllers</td>
<td></td>
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</tr>
</tbody>
</table>

* Scheduled launch

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## Engineering

- **Strengthen plant systems**
  - Competitive components → Enhancement of systems → Overseas expansion of systems operations

<table>
<thead>
<tr>
<th>System packages</th>
<th>Energy supply equipment (energy)</th>
<th>IDCs (power supplies)</th>
<th>Assembly line equipment (FA)</th>
<th>Steel plants (PA)</th>
<th>Cement plants (PA)</th>
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<tr>
<td>HMIs</td>
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<td>Controllers</td>
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<tr>
<td>Measuring equipment</td>
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<tr>
<td>Power Electronics components (SiC)</td>
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Engineering
- System Standardization & Package Development

- Expand package development utilizing switchgears and controlgears as key products
- Promote sales of packages (software and hardware) overseas
- Standardize equipment containing switchgears and controlgears, reduce costs, and expand usage of Fuji Electric products

1. Monitoring
   Costs, sales channels, manufacturing

2. Creation and implementation of business reinforcement plans
   Business strategies, development plans
   Standardization, cost reduction, manufacturing (base) strategies

3. Expansion of product lineups
   Standardized, low-cost switchgears and controlgears;
   IEC standard-compliant switchgears and controlgears
   Standardization of equipment containing switchgears and controlgears

4. Overseas expansion
   Increased coordination with FCAC by FSMBE, FMT, and FTU

Utilize continuous flow processing encompassing everything from sheet metal and coating to assembly tests
Production - Reinforcement of Mother Bases

- Reorganization and consolidation of models manufactured at Kobe and Suzuka factories (completed in FY2016)
  → Expansion of in-house production, standardization, and automation (introduction of IoT into factories)

Kobe Factory (Systems)

Model factory for producing complete systems and pursuing increased speed
- Use of continuous flow processing
  Engineering, design, procurement, testing, and witness inspection / shipping
  One stop operation spanning order receipt to shipping
- Mixed production of switchgears and controlgears

Suzuka Factory (Components)

Model factory for creating new products and pursuing productivity improvements
- Creation of high-value-added components
- Pursuit of high levels of productivity and reduced costs
  Automation, production technologies, and manufacturing technologies
  In-house manufacturing for core technologies

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Production
- Local Production and Consumption System

- Expand operations in Asia through acquired companies (manufacturing + engineering)
- Identify benefits of local production and consumption system

- Fuji Electric France (FY1995)
- Fuji Electric (Zhuhai) (FY2005)
- Fuji Electric Dalian (FY2005)
- Wuxi Fuji Electric (FY1998)
- F Gemco (FY2016)
- Shanghai Electric JV (FY2014)
- F CAC (FY2016)
- M&A Fuji Electric Dalian (FY2005)
- Fuji Electric Manufacturing (Thailand) (FY2010)
- F SMBE (FY2014)
- F SEtU (FY2013)

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Services - Plant Systems

- Expand domestic service businesses and provide lifecycle support to customers
  - Form close relationships with customers and expand sales in downstream areas
  - Enhance facility maintenance proposal capabilities and step up efforts to incorporate replacement demand

- Develop foundations for expanding operations in Asia (UPSs, transformers, VCBs)

Service Sales Forecasts (Billion yen)

- Cross-selling activities
  Propose measuring equipment inspection to power supply customers and otherwise encourage customers to utilize other models

- Sales activities during maintenance inspections
  Propose function improvements, upgrades, and parts purchases

- Collaboration with sales distributors
  Make proposals to customers together with sales distributors

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Services—Components

- Integrate consultation venues for all components (consolidate technical service centers) and improve customer service
- Accelerate efforts centered on technical service centers to grow sales and encourage customers to switch to Fuji Electric

**Technical service center**
(commenced operation in October 2016)

10,000 consultations per month
- Improved customer service
- Strengthened marketing capabilities from analyzing technical consultations
- Sequentially expansion of models handled

Response rates: 72% prior to establishment
→ 97% after establishment

*LV-INV : Low Voltage Inverters*
Realize optimal energy management and operation with competitive components and systems.

Field equipment
- Cogeneration systems
- Exhaust gas steam boilers
- Heat pumps

Heat management equipment
- Substation equipment
- Storage batteries
- Solar cells

Energy supply equipment
- Fuel cells

Comprehensive facility management
- HMIs
- IoT platforms

Energy center solutions
- SCADAs
- EMSs

Sensors
- Switchgears and controlgears
  - FITSA-Σ
  - MICREX-SX

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Initiative Examples - Power Supply Systems

- Differentiate operations with competitive components for realizing stable and highly efficient electricity supply and optimal air conditioning
  - Development of system packages for IDCs
  - Introduction of SiC-equipped platform products (module UPSs, DC-UPSs)

Field equipment
- From power companies

Datacenter
- Electricity receipt
- C-GIS
- Server block
- Indirect outside air cooling system

IoT platforms
- HMIs
  - UPS control via the Internet
  - Monitoring systems
- M2M platforms
  - Internet communications (UPSs)
  - PLCs
  - SNMP cards

Controllers
- Switchgears and controlgears
  - MONITOUCH

Measuring equipment
- Wireless temperature and humidity measurers
- Electricity use measurement units
- Access management
- Surveillance cameras

Power electronics equipment (SiC)
- Substations
- In-house generation facilities
- UPSs
- DC-UPSs
- Server racks
- Anti-vibration equipment
- Air conditioning
- Fire extinguishing equipment

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Initiative Examples - Factory and Process Automation

- Expand overseas operations with competitive systems packaged with competitive components

Field equipment

- Assembly equipment (Japan, overseas)
- Steel plants (Japan, overseas)
- Cement plants (Overseas)

HMIs

- MONITOUCH

Controllers

- FITSA
- MICREX-SX

Measuring equipment

- Sensors
- Motors
- UPSs
- Inverters

IoT platforms

- SCADA
- HCIs, DBs
- Localization Package development

Engineering

- OnePack

Switchgears and controlgears

- Power electronics equipment (SiC)

Assembly equipment

- FCAC (Vietnam, Indonesia)
- FGemco (India, Vietnam)
- Localization Package development

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Initiative Examples—New Businesses

- Utilize Company technologies to create and provide new value in response to customer needs
- Develop foundations for new businesses

### Distribution
- Acquire ongoing orders from newly approached customers
- Promote transportation solutions
- Deploy IT equipment monitoring know-how (China, home delivery, etc.)
- Expand in-house production

(Photograph provided by Fives Intralogistics K.K.)

- Ultra low-temperature freezer (-55°C)
- Low-temperature distribution center

### Plant Factories
- Improve earnings capacity by deploying EPC product packages and IoT services
- Acquire expertise through product and technology verification

- Measuring equipment, sensors
- Cultivation condition management capable even offsite

- Total facility environment control system
- Substation equipment
- Skylight, side window
- Curtain (shade, insulation)
- Circulation fan, mist cooling system

### Automotive Power Electronics
- Create unrivaled automotive products by utilizing power device and power electronics technologies

- Power device technologies (RC-IGBT, SiC)
- Power supply circuit control technologies
- Motor drive control technologies

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FY2017 Management Plan
Business Policies

1. Establish foundations for new power electronics systems organization
2. Create competitive components
3. Enhance systems using competitive components
4. Expand overseas operations by leveraging systems
5. Develop human resources

FY2017 Establish solid foundations for new power electronics systems organization
FY2018~ Expand power electronics systems business overseas

*FY2023 Achieve targets*
1. Create competitive components
   ・Strengthen components by consolidating development systems and reinforcing mother factories

2. Enhance systems using competitive components
   ・Utilize system monitoring techniques to reduce costs and shorten lead times
   ・Reduce total costs by standardizing systems and developing packages

3. Expand overseas operations by leveraging systems
   ・Expand operations in Asia and North America through acquired companies (FSMBE, FTU, FCAC, and FGemco in Asia, FSEMEC in North America)

4. Grow service businesses
   ・Provide customers with lifecycle support from frontline staff

5. Develop human resources
   ・Reform attitudes
Business Plan

Amount of Orders Received (Billion yen)

- Industry Solutions
  - FY2016 Results: 294.1
  - FY2017 Management Plan: 310.4
  - Change: +16.3

- Energy Solutions
  - FY2016 Results: 232.1
  - FY2017 Management Plan: 218.1
  - Change: -14.0

Net Sales (Billion yen)

- Industry Solutions
  - FY2016 Results: 286.0
  - FY2017 Management Plan: 294.7
  - Change: +8.7

- Energy Solutions
  - FY2016 Results: 218.7
  - FY2017 Management Plan: 219.3
  - Change: +0.6

Net Sales in Japan / Overseas (Billion yen)

- Industry Solutions
  - FY2016 Results: 98.4
  - FY2017 Management Plan: 105.7
  - Change: +7.3

- Energy Solutions
  - FY2016 Results: 406.4
  - FY2017 Management Plan: 408.4
  - Change: +2.0

Operating Income / Operating Margin (Billion yen)

- Industry Solutions
  - FY2016 Results: 13.9
  - FY2017 Management Plan: 15.9
  - Change: +2.0

- Energy Solutions
  - FY2016 Results: 13.7
  - FY2017 Management Plan: 14.0
  - Change: +0.3

*Figures for FY2016 have been restated to reflect organizational restructuring conducted in FY2017.
Priority Measures - Expansion of Overseas Operations

- Expand systems operations in Asia and railway and power supply operations in North America
- Exercise benefits of M&A activities on a global scale

**Europe**
- Industry Solutions: Coordinate inverters and servos

**Asia**
- Energy Solutions: Expand operations of FSMBE and FTU
- Industry Solutions: Develop operations of FGemco and FCAC

**China**
- Energy Solutions: Expand IDC operations
- Industry Solutions: Develop operations of joint venture with Shanghai Electric and shift to FA and motion fields

**Americas**
- Energy Solutions: Expand UPS operations
- Industry Solutions: Develop railway operations and business of FSEMEC
## Business Plan - Energy Solutions

### Net Sales by Subsegment
(Percentage Change, Billion yen)

<table>
<thead>
<tr>
<th>Subsegment</th>
<th>FY2016 Results</th>
<th>FY2017 Management Plan</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED&amp;C components</td>
<td>71.3</td>
<td>74.6</td>
<td>+3.3</td>
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<tr>
<td>Power supply systems</td>
<td>59.5</td>
<td>59.9</td>
<td>+0.4</td>
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<tr>
<td>Transmission and distribution</td>
<td>64.6</td>
<td>61.8</td>
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<tr>
<td>systems</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Energy management</td>
<td>34.2</td>
<td>34.2</td>
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<tr>
<td>Elimination</td>
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### Net Sales in Japan / Overseas
(Percentage Change, Billion yen)

<table>
<thead>
<tr>
<th>Region</th>
<th>FY2016 Results</th>
<th>FY2017 Management Plan</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>164.5</td>
<td>159.3</td>
<td>-5.2</td>
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<tr>
<td>Overseas</td>
<td>54.2</td>
<td>60.1</td>
<td>+5.9</td>
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</table>

### Operating Income / Operating Margin
(Percentage Change, Billion yen)

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<tr>
<th>FY2016 Results</th>
<th>FY2017 Management Plan</th>
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<tbody>
<tr>
<td>13.7</td>
<td>14.0</td>
<td>+0.3</td>
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Priority Measures - Energy Solutions

Energy management
- Introduce next-generation smart meters
- Commence overseas development of EMS operations

Transmission and distribution systems
- Incorporate domestic replacement demand
- Enhance manufacturing and engineering capabilities in Asia

Power supply systems
- Reinforce data center business
- Introduce differentiated products (SiC-UPS) into domestic and overseas markets

ED&C components
- Capture domestic construction demand
### Net Sales by Subsegment (Billion yen)

<table>
<thead>
<tr>
<th>Subsegment</th>
<th>FY2016 Results</th>
<th>FY2017 Management Plan</th>
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<tbody>
<tr>
<td>IT Solutions</td>
<td>58.1</td>
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<tr>
<td>Equipment Construction</td>
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<td>Environmental and social solutions</td>
<td>53.6</td>
<td>59.1</td>
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<tr>
<td>Process automation</td>
<td>39.2</td>
<td>44.8</td>
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<td>Factory automation</td>
<td>87.7</td>
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<tr>
<td>Elimination</td>
<td>-20.9</td>
<td>-23.0</td>
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### Net Sales in Japan / Overseas (Billion yen)

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<th>Region</th>
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<tr>
<td>Japan</td>
<td>241.8</td>
<td>249.1</td>
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<tr>
<td>Overseas</td>
<td>44.2</td>
<td>45.6</td>
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### Operating Income / Operating Margin (Billion yen)

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<th>FY2016 Results</th>
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<tr>
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<td>13.9</td>
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<tr>
<td>Overseas</td>
<td>4.9%</td>
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Priority Measures - Industry Solutions

Factory automation
- Expand factory automation systems business (Automotive fields in China and Japan)

Process automation
- Capture domestic replacement demand
- Leverage engineering subsidiaries (Vietnam and India) to reinforce overseas operations

Environmental and social solutions
- Expand sales to the logistics industry
- Accelerate development of new transportation systems
Capital Investment / Research and Development

**Capital Investment (Billion yen)**

<table>
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<th>Industry Solutions</th>
<th>Energy Solutions</th>
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<td>FY2016 Results</td>
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<td>FY2017 Management Plan</td>
<td>4.8</td>
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<td>Change</td>
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**Research and Development (Billion yen)**

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<th>Industry Solutions</th>
<th>Energy Solutions</th>
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<tr>
<td>FY2017 Management Plan</td>
<td>9.9</td>
</tr>
<tr>
<td>Change</td>
<td>+0.5</td>
</tr>
</tbody>
</table>

Energy Solutions
- Electricity distribution and storage systems

Industry Solutions
- SiC-equipped power electronics devices
- FA systems and motion and servo equipment
- Field equipment and systems compatible with IoT

* R&D expenditure figures above represent expenditures that have been allocated to segments based on theme and may therefore differ from figures contained in consolidated financial reports.

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