Fuji Electric
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Electronic Devices Business Strategies

May 25, 2017

Fuji Electric Co., Ltd.
Electronic Devices Business Group

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Business Overview

Electronic Devices Business Overview

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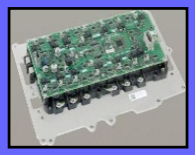
Businesses	Major products	Application	Production bases
Semi-conductors	Power semiconductors  	Inverters UPS PCS Air conditioners Automobiles Power supplies	【Front-end processes】 ▪Fuji Electric Matsumoto Factory ▪Fuji Electric Yamanashi Factory ▪Fuji Electric Tsugaru Semiconductor Co., Ltd. ▪Fuji Electric (Malaysia) Sdn. Bhd. 【Back-end processes】 ▪Fuji Electric Power Semiconductor Co., Ltd. ▪Fuji Electric (Shenzhen) Co .,Ltd. ▪Fuji Electric Philippines, Inc. ▪Fuji Electric (Malaysia) Sdn. Bhd.
	Photoconductors 	Copiers Printers	▪Fuji Electric (Shenzhen) Co .,Ltd.
Magnetic disks	Aluminum substrate magnetic disks Glass substrate magnetic disks 	HDD	▪Fuji Electric (Malaysia) Sdn. Bhd.

* UPS：Uninterruptible power system

* PCS：Power conditioning sub-systems

Power Semiconductors Business Overview

※% of total sales is FY2016.
Ratio of ( ) is including photoconductors and chip foundries.

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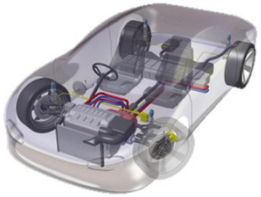
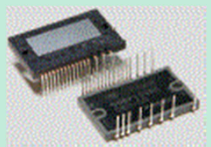
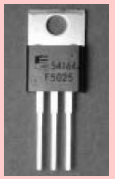
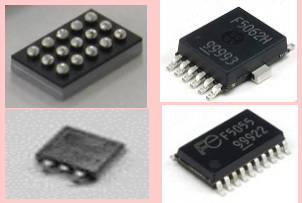
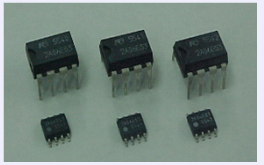
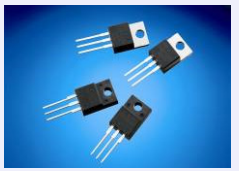
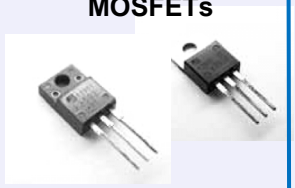
	Industrial field (% of total sales: 52% (47%))	Automotive field (% of total sales: 32% (29%))	Consumer field and others (% of total sales:16% (24%))
Application	Inverters, NC machine tools, elevators, UPS, PCS (wind/solar power generation), air conditioners, etc.  Inverters  NC machine tools  PCS	HEV motor controls, Engine controls, transmission controls, brake controls, steering controls, etc.,  Automobiles	Industrial equipment, communication equipment, servers, PCs, flat-screen TVs, video game consoles , copiers, printers, etc.  Servers  Flat-screen TVs
Products	**Modules** IGBT modules    SiC modules  RB-IGBT* modules 	Automotive IGBT IPMs  Pressure sensors  Igniters  Power ICs 	**Discrete products** Power supply control ICs  Diodes  Photoconductors  MOSFETs 
Features	Unique devices that greatly improve power conversion efficiency (**SiC, RB-IGBT***) and packaging technologies that realize high reliability	Small, light-weight, and high-reliable devices critical for driving, turning, and stopping created by utilizing unique technologies (**direct water cooling technology, single chip power IC technology**)	High-voltage, low-loss **power supply IC and SJ-MOS* technologies** that respond to ever stricter energy saving standards for power supplies

* RB-IGBT: Reverse Blocking IGBT SJ-MOS: Super Junction MOSFET

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Review of FY2016

Review of FY2016

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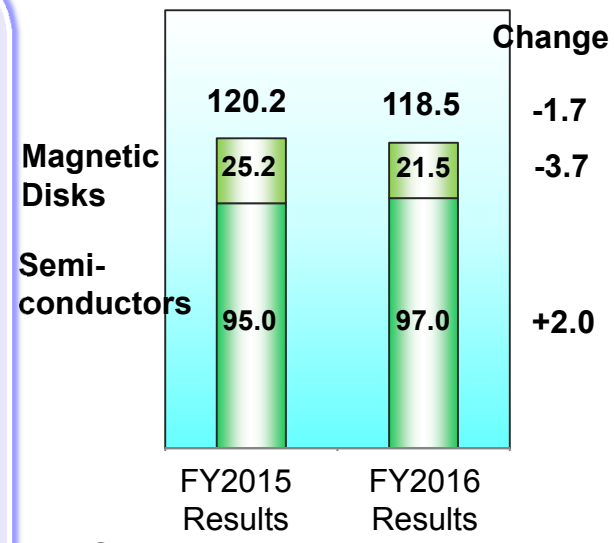
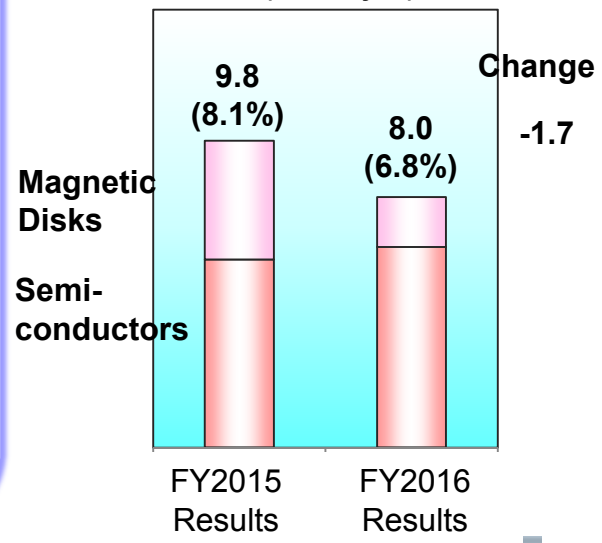
- **Overall**
  - Experienced YoY decreases in sales and income as semiconductor sales were unable to compensate for the impacts of lower demand for magnetic disks
- **Semiconductors**
  - Achieved YoY increases in sales and income centered on products for the industrial and consumer fields
  - Commenced integrated operation increasing flexibility in areas spanning from R&D to sales (completed consolidation of sales, R&D, and manufacturing divisions)
  - Step up efforts to have our proposed specifications for automotive IGBT modules accepted
  - Promoted local design, production, and consumption
- **Magnetic Disks**
  - Minimized impacts of customer structure reforms implemented in response to market condition downturns
  - Compensated for declines in magnetic disk sales with substrate sales
  - Advanced development of new products together with customers

Net Sales by Subsegment (Billion yen)



Operating Income / Income Margin
(Billion yen)



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FY2017 Management Plan

FY2017 Business Policies

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◆Secure income through business operation methods that minimize the impacts of market fluctuations

◆Solidify industry position with world-leading technologies and products

【Semiconductors】

●Accelerate development of new products, bolster 8-inch wafer production capacity, and invest in production equipment for new products to achieve targets of FY2018 Medium-Term Management

【Magnetic Disks】

●Secure stable sales volumes and maintain profitability amidst contraction of HDD market

Electronic Devices Business Plan

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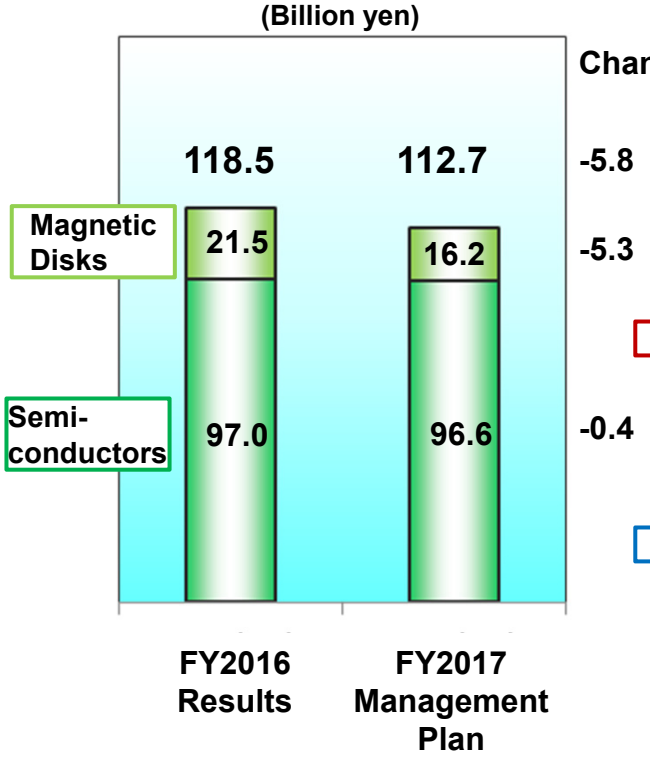
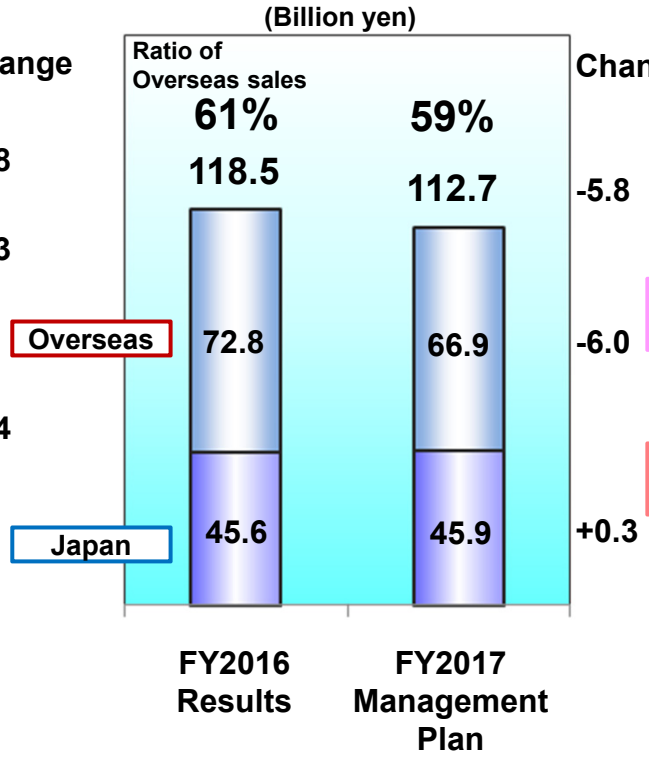
- Advance measures of medium-term management plan and develop highly profitable structure for period beyond plan
- Expand sales by advancing new technology and product development as planned
- Compensate for decline in magnetic disk sales and income with semiconductor sales and income

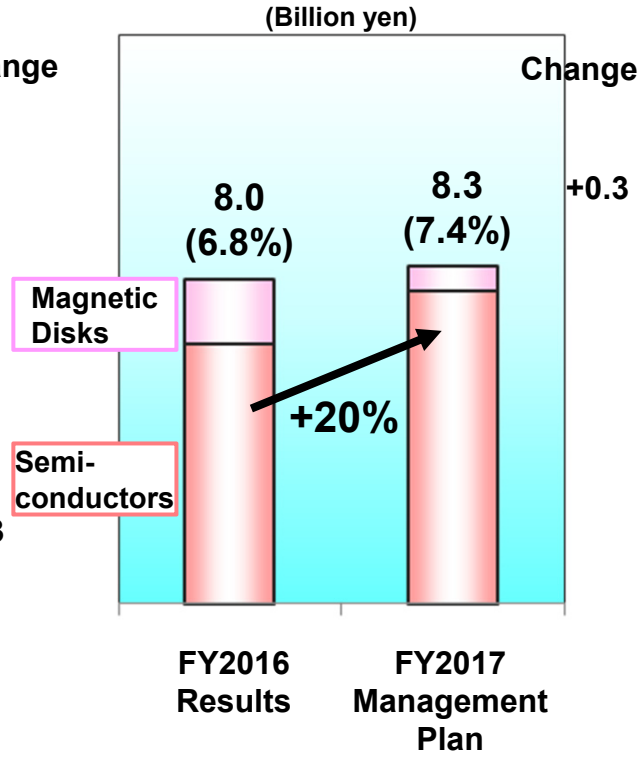
Net Sales by Business



Net Sales in Japan / Overseas



Operating Income / Operating Margin



Semiconductors

Market Trends—Semiconductor Market Forecasts (Market Segments Targeted by Fuji Electric)

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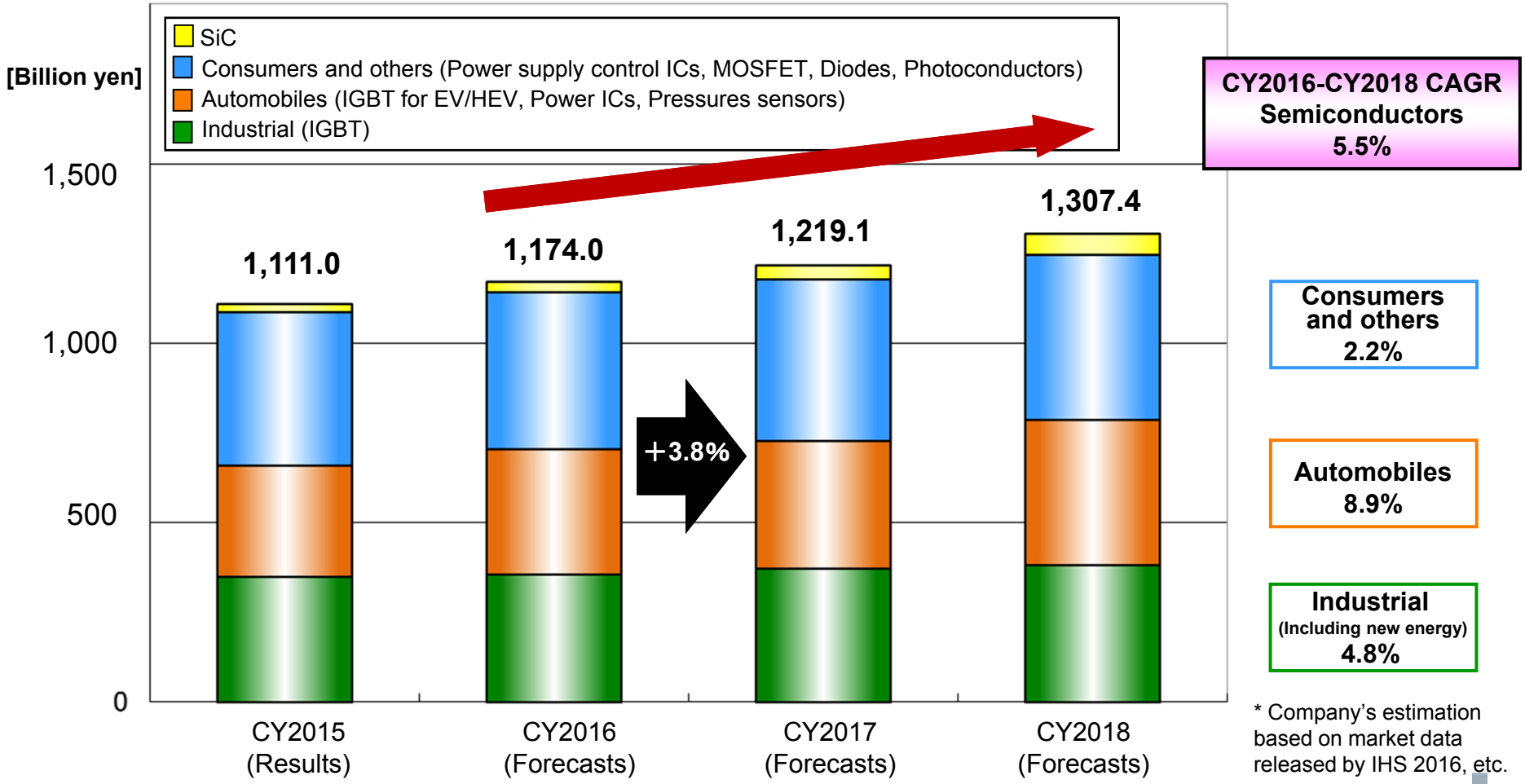
- **Rapid spread of EVs and electrical equipment in automotive market**
- **Expansion of industrial markets (overseas new energy and energy saving markets)**



* Company's estimation based on market data released by IHS 2016, etc.

Semiconductors—Business Plan

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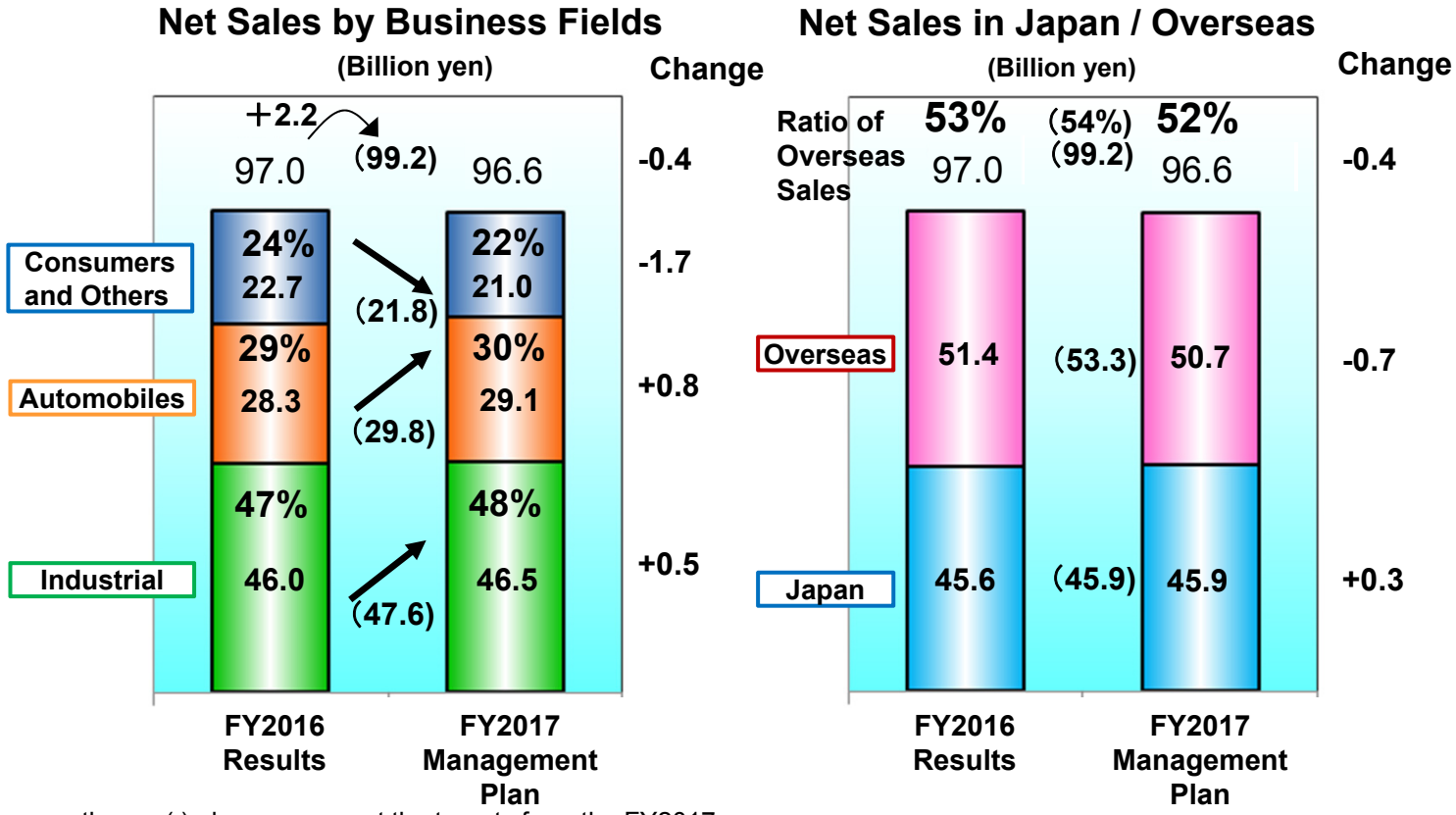
- **Expand series of 7th-generation IGBTs to increase sales in industrial fields**
- **Develop products for and work to have our proposed specifications accepted in automotive market to fuel future growth**
- **Transition to business operation methods emphasizing income in the consumer field**
- **Improve productivity and reduce costs**



Note: Figures in parentheses ( ) above represent the targets from the FY2017 management plan after being recalculated based on the exchange rates at March 31, 2017.

Semiconductors—Priority Measures

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- **Advance full-fledged development of 7th-generation IGBT modules**
  - Promote sales in strong-performing fields of NC machine tools, robots, air conditioners, etc.
- **Accelerate development of products for increasing automotive field sales**
  - Achieve sales double FY2016 levels in FY2023 by growing sales of IGBT modules for EVs
- **Bolster development efforts for increasing SiC sales**
  - Accelerate development efforts to expand product lineup and create next-generation successors (with improved performance) to increase the portion of semiconductor sales accounted for SiC products in the future
- **Increase production capacity**
  - Front-end: Bolster 8-inch wafer production capacity at Matsumoto Factory and Yamanashi Factory (+40% YoY)
  - Back-end: Prepare to commence production of automotive modules in Japan

    Double air conditioner IPM and sensor production capacity and production levels (YoY) in Philippines (overseas operations)

Automotive Field Business Plan and Module Performance Improvement

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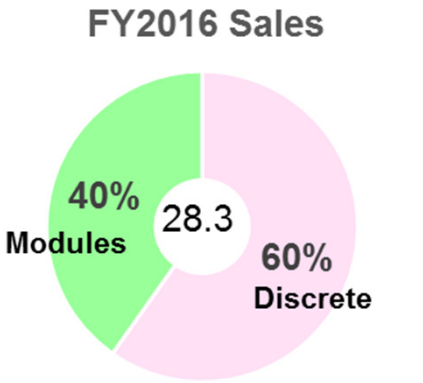
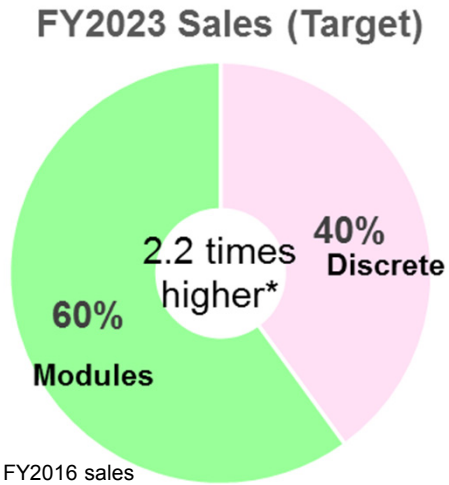
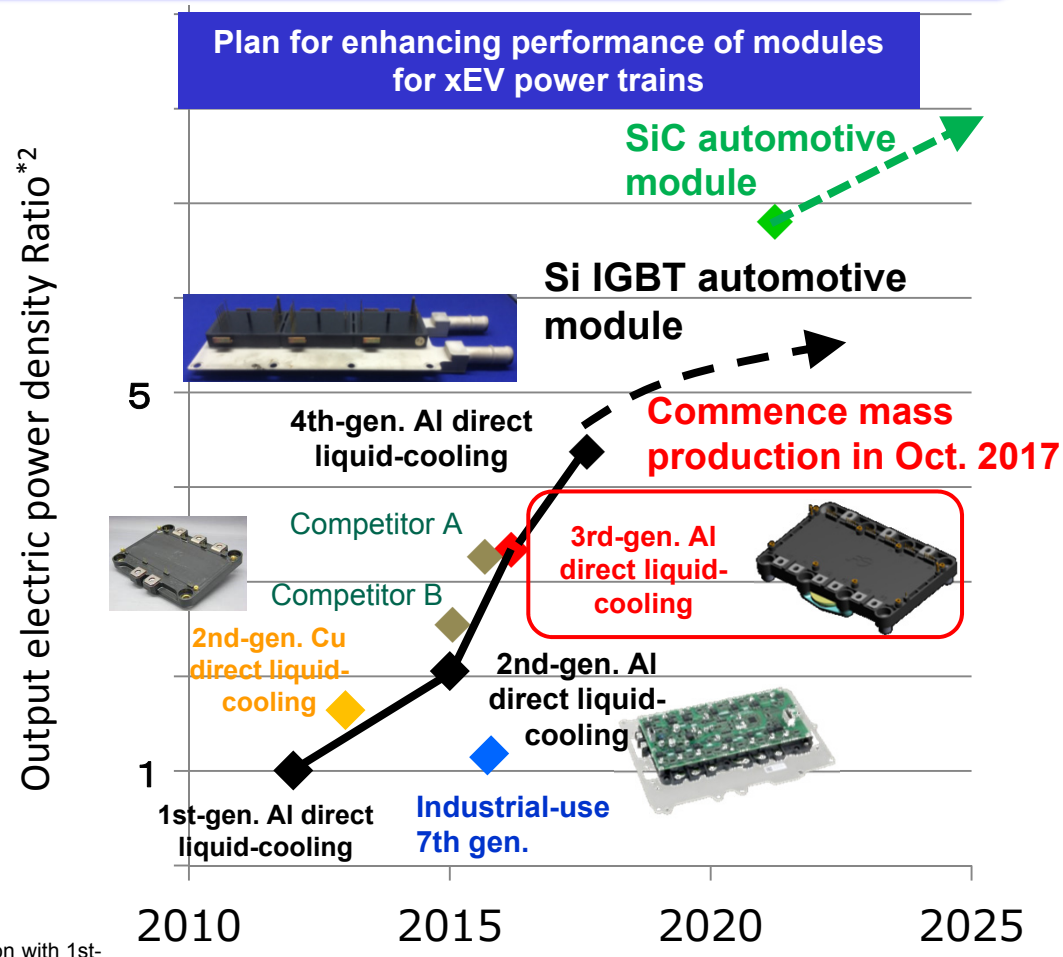
- **Increase sales of high-value-added module products**
- **Utilize cutting-edge chip, package, and cooling technologies to realize top levels of output electric power density**







*1. In comparison to FY2016 sales
*2. Output electric power density ratio: Output electric power density of each generation with 1st-generation AI direct liquid-cooling indexed to 1
Output electric power density (kVA/L) = Maximum power output (kVA) ÷ Module volume (L)

Redoubling of Development Efforts for Increasing SiC Sales

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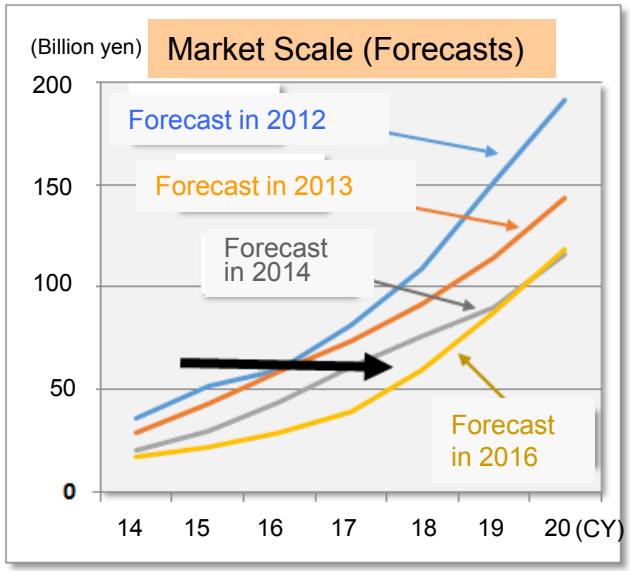
- **Step up product development utilizing results of R&D ventures conducted to date**
- **Accelerate development of trench MOSFET technologies to achieve world-leading performance**

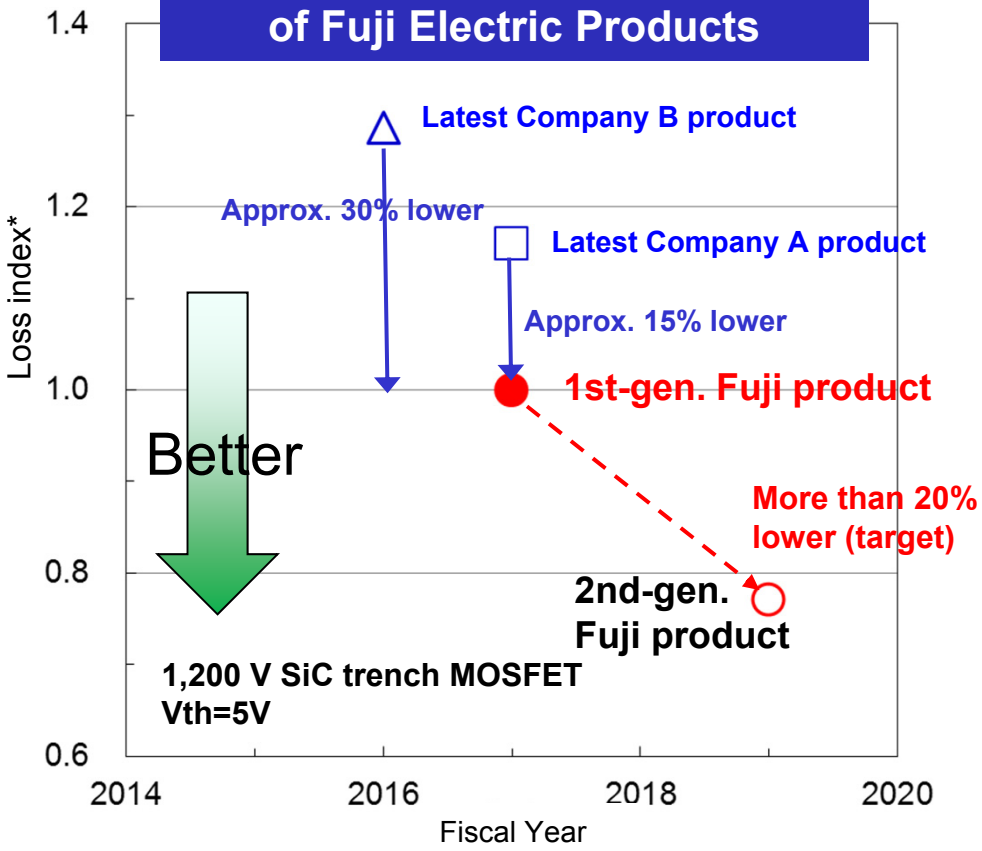
SiC Market Trends



Reasons for delays in SiC market expansion

- **High costs of SiC wafers**
- **Frequent quality deficiencies of SiC wafers**
- **Slow expansion of sales volumes**

Performance and Market Positon of Fuji Electric Products



* Per unit area on-resistance (mΩcm2) under gate drive conditions recommended by each company with Fuji Electric's 1st-generation trench MOSFET indexed to 1

* Source for market trend data: IHS, 2016

Plans for Production Capacity Expansion

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Front-end processes

Increase ratio of large-diameter wafer fabrication and improve productivity

Japan (Matsumoto)

- Increase 8-inch wafer production capacity (3,000 wafers → 5,000 wafers)
- Move to full-fledged mass production as SiC device production base

Japan (Yamanashi)

- Increase 8-inch wafer production capacity (9,000 wafers → 12,000 wafers)
- Expand range of automotive application IGBT series manufactured
- Commence production of 7th-generation IGBTs

Japan (Tsugaru)

- Increase ratio of power semiconductor production (50% → 80%)
- Expand range of IGBT (FWD), power IC, and MOS series manufactured
- Transfer production of products for automotive applications

Malaysia

- Expand range of 6th-generation IGBT series manufactured

Back-end processes

Expand range of models produced overseas

Japan (3 bases)

- Bolster facilities for producing automotive IGBT modules
- Manufacture products for domestic customers
- Function as mother bases

Philippines

- Double air conditioner IPM production capacity
- Bolster production capacity of products for power supplies and pressure sensors for automotive applications

China (Shenzhen)

- Expand range of IGBT module models manufactured

(Currently planning to manufacture industrial-use IPMs)

Malaysia

- Expand range of IGBT module models manufactured

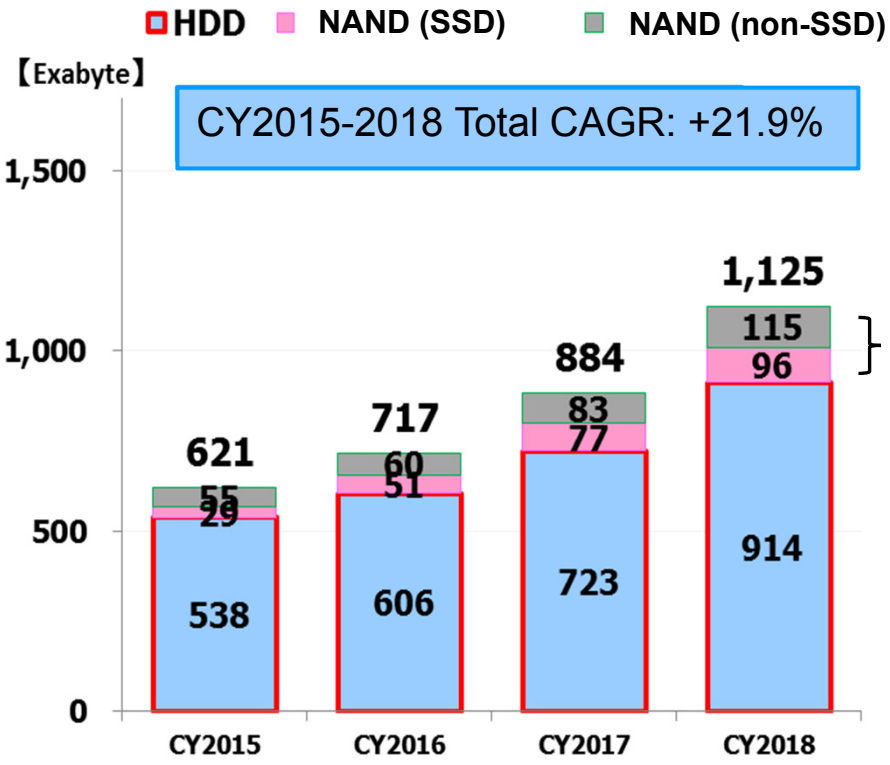
(Currently planning to manufacture large-capacity modules)

Magnetic Disks

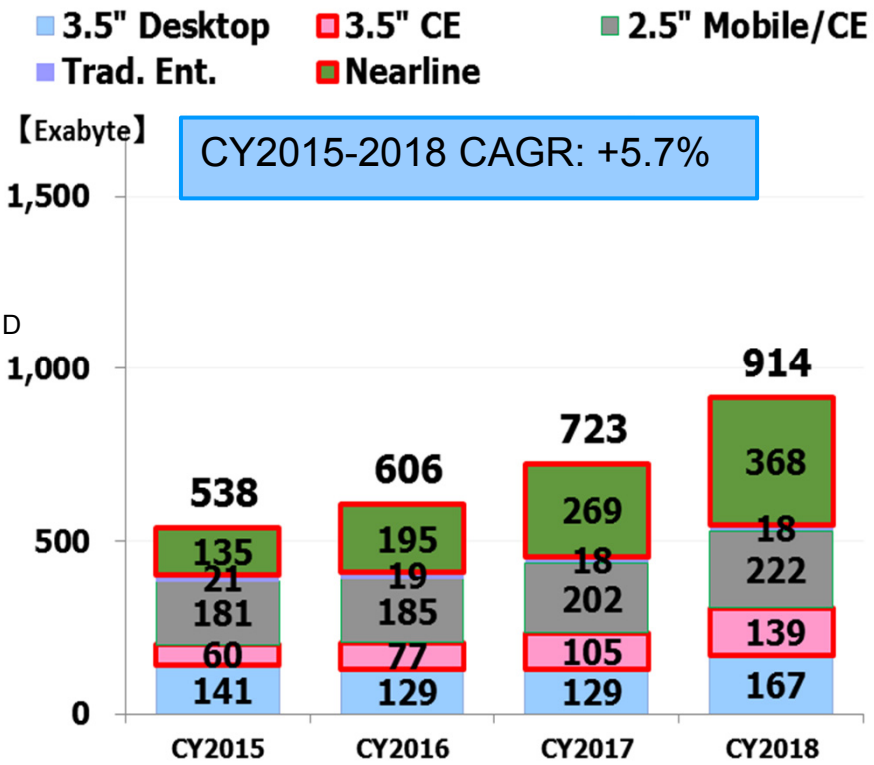
Total Shipped Data Volumes

- **Overall data volume to continue to increase, HDD expected to cover majority of data demand**
- **Large growth in data volume from nearline models for cloud servers and CE models for surveillance cameras in HDD field**

Data shipment volumes as HDD, SSD and NAND Memory



HDD Data Shipment Volumes



Source : Trend Focus, Feb 2017
CE= Consumer Electronics, Trad. Ent.= Traditional Enterprise

Magnetic Disks—Market Trends

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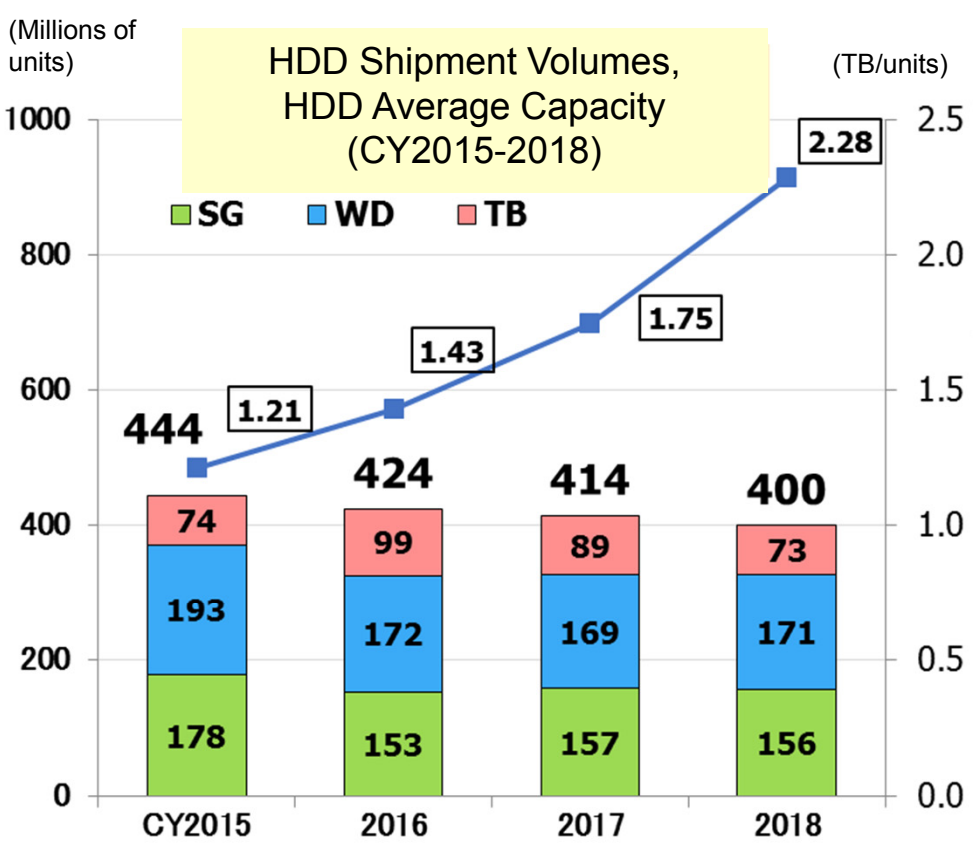
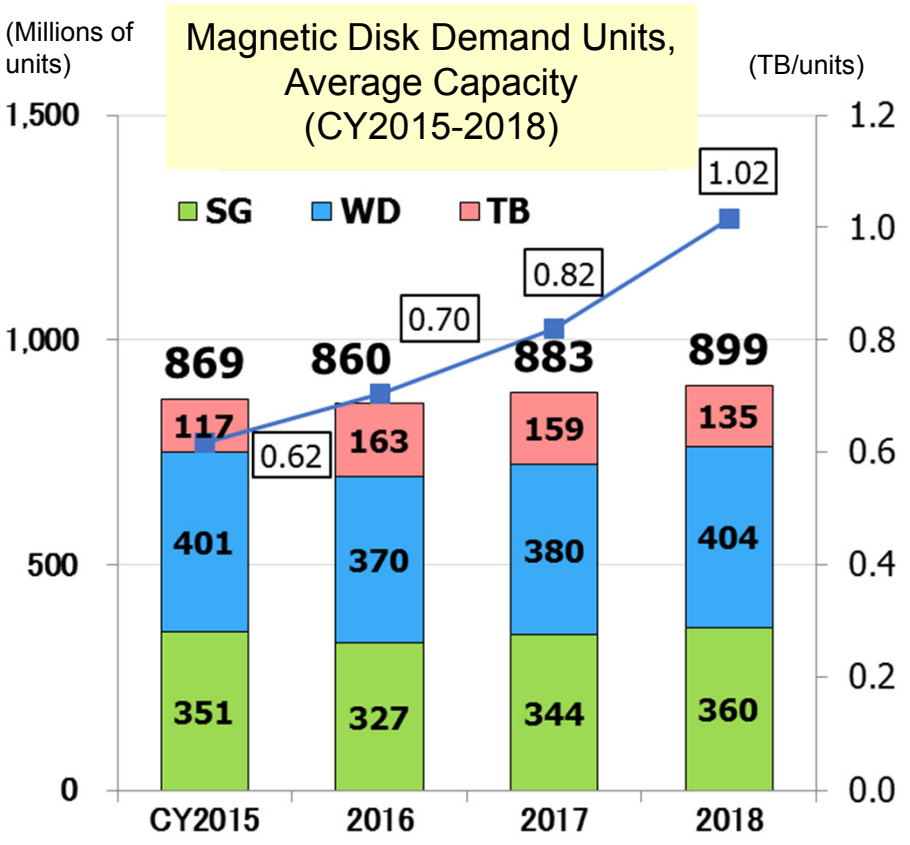
- **Lower HDD shipment volumes, but higher average capacity per unit**
- **Recovery of magnetic disk demand anticipated in conjunction with increase in HDD capacity**





※Trend Focus, Feb 2017 and Company's estimation

Magnetic Disks—Business Plan

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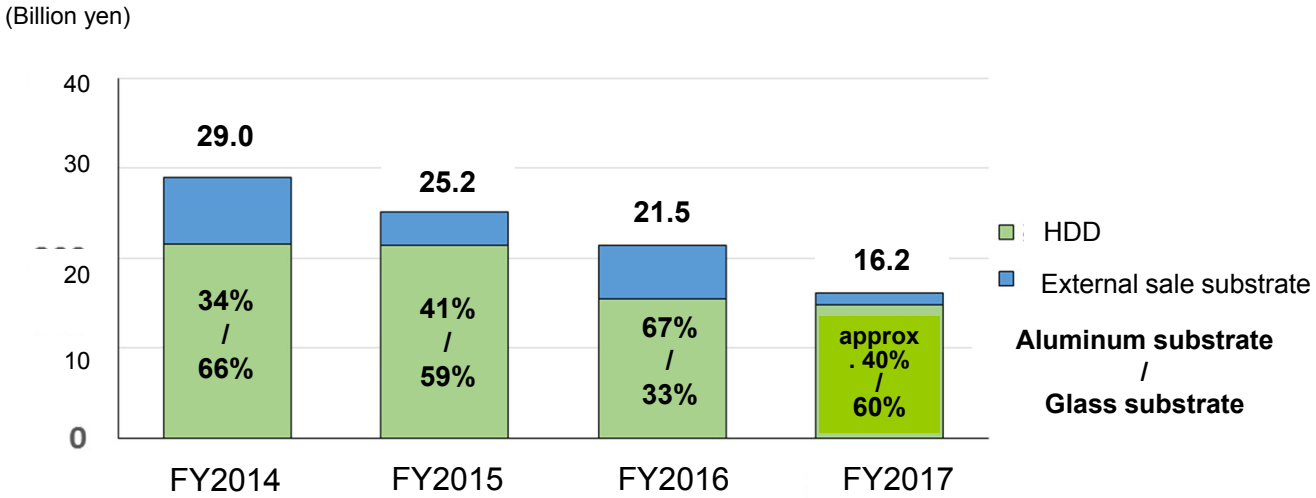
- **Reinforce constitution to secure income as sales decrease**



- Priority Measures
  - ◆Secure sales and income
    - ➢ Secure sales through new products
    - ➢ Increase cost competitiveness by reducing costs
  - ◆Advance R&D
    - ➢ Promote joint-development with customers

Capital Investment / Research and Development

Capital Investment / Research and Development

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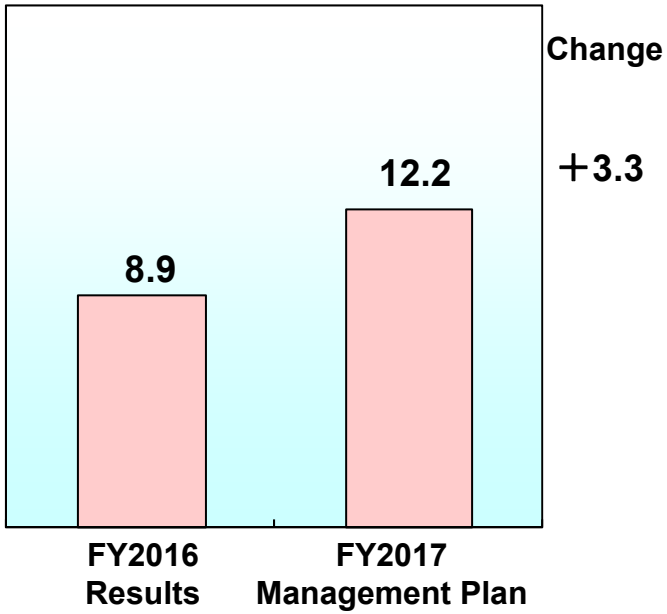
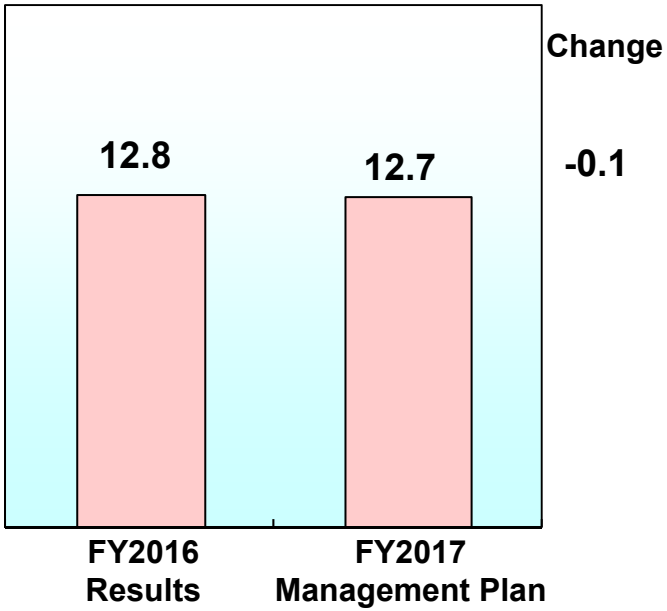
Capital Investment (Billion yen)



- Equipment for new products
  - 7th-generation IGBTs, SiC devices
- Rationalization and production capacity increases
  - Front-end: Expansion of 8-inch wafer production
  - Back-end: Automotive modules
    Doubling of air conditioner IPM production

Research and Development (Billion yen)



- SiC devices and modules
- Automotive devices and modules
- Development of 7th-generation IGBT products

* 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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