

FY2017 1st Half Results

(from April 1, 2017 to September 30, 2017)

November 2, 2017



NGK INSULATORS, LTD.



President
Taku Oshima

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This is a translation of materials used for the analyst meeting held in Tokyo, Japan on November 2, 2017

This document contains forward-looking statements that are based on management's expectations, estimates, projection and assumptions that were available and reasonable at the time of release. Actual future results and trends may differ materially from those in the forecasts due to a variety of factors.

Agenda

Summary of financial results for FY2017 1st Half

(Ended September 30, 2017)

Forecast for FY2017

(Ending March 31, 2018)

Segment Information

Capital Expenditures & Depreciation Costs

Medium-term Plan (New products / R&D / Financial / ROIC)

Financial Condition

	(¥Bil.)	FY2016 1 st half	April announcement	FY2017 1 st half	FX	Growth ratio
Net Sales		194.3	205.0	219.8	+5.4	+13%
Operating Income		34.3	33.0	35.9	+0.8	+5%
Ordinary Income		32.4	31.5	34.2		+6%
Profit Attributable to Owners of Parent		21.7	20.0	19.8		-9%
Exchange Rate	USD	¥106	(¥105)	¥111		+¥5
	EUR	¥119	(¥115)	¥127		+¥8

Year on year, Sales and Operating/Ordinary Income increased, while Profit decreased

- Power Production system reduced to decrease deficit for both insulators and NAS® batteries.
- Ceramics Sales increased for automotive-related products due to higher truck sales in the Chinese market and an increase in sensor usage caused by tighter emissions regulations.
Profits decreased as a result of the increase in development costs, startup costs, etc.
- Electronics Both sales and profits increased for ceramic components for semiconductor manufacturing equipment due to increased demand against the background of robust 3D-NAND related investments.
- Extraordinary losses An impairment loss of ¥2.5 billion and a provision for loss related to competition law of ¥1.1 billion.

Forecasts for FY 2017

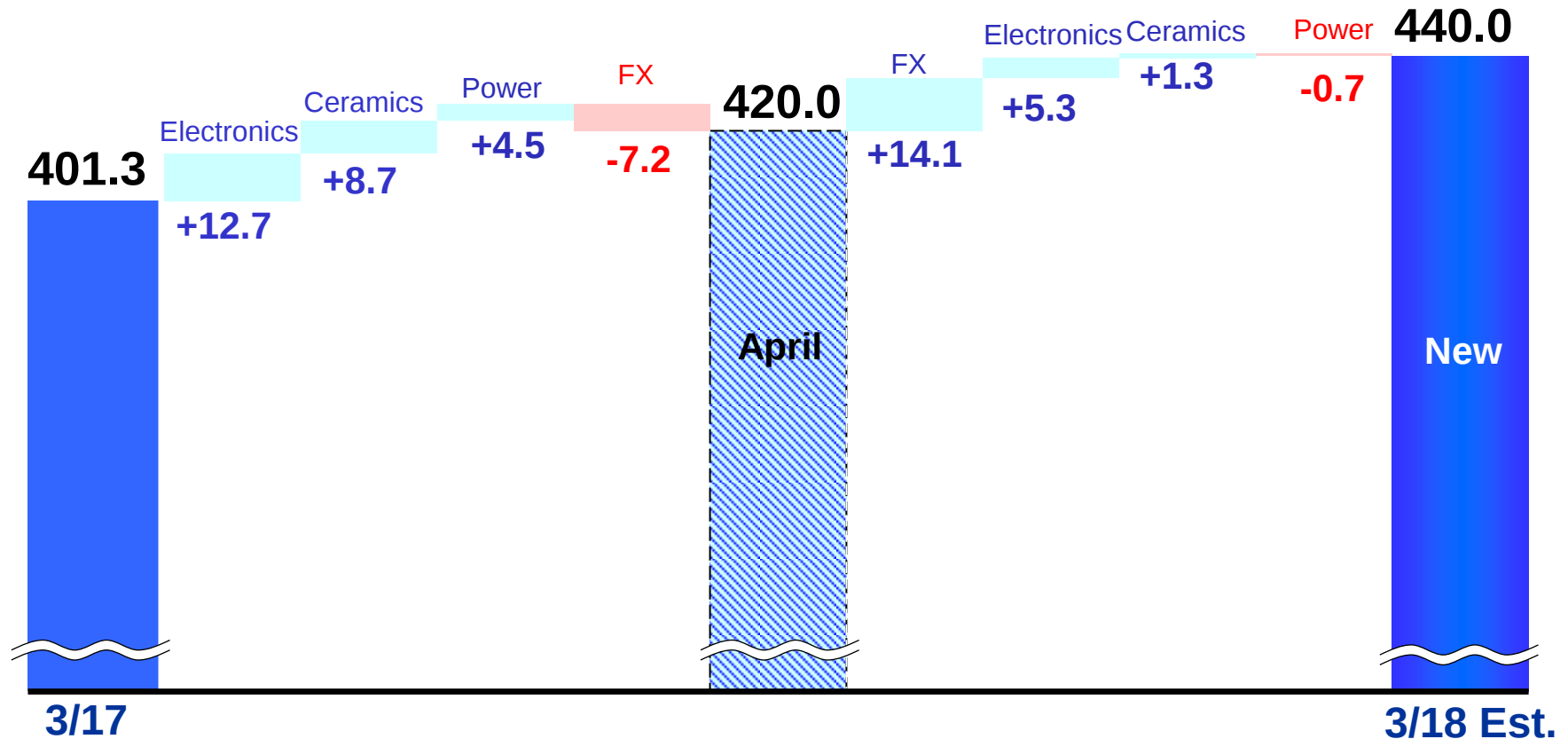
	(¥ Bil.)	FY2016	FY2017		Growth ratio	
			April announcement		FX	
Net Sales		401.3	420.0	440.0	+6.9	+10%
Operating Income		63.2	67.0	70.0	+0.8	+11%
Ordinary Income		64.6	68.0	70.0		+8%
Profit Attributable to Owners of Parent		36.4	45.0	46.0		+26%
Exchange Rate	USD	¥109	(¥105)	¥111	+¥2	
	EUR	¥119	(¥115)	¥126	+¥7	

Higher sales and income forecasts
compared with the same period last year

- Power Insulators are expected to see a surplus due to an increase in overseas projects and cost reductions, while NAS® batteries will decrease deficit.
- Ceramics Demand increased for automotive-related products due to increased sensors usage, in addition to higher sales of trucks in the Chinese market.
Lower income is expected as a result of increases in temporary costs for development, depreciation, startups, etc.
- Electronics Both sales and income are forecast to increase due to strong demand for ceramic components for semiconductor manufacturing equipment and increased demand for wafer products.

Change Analysis: Sales

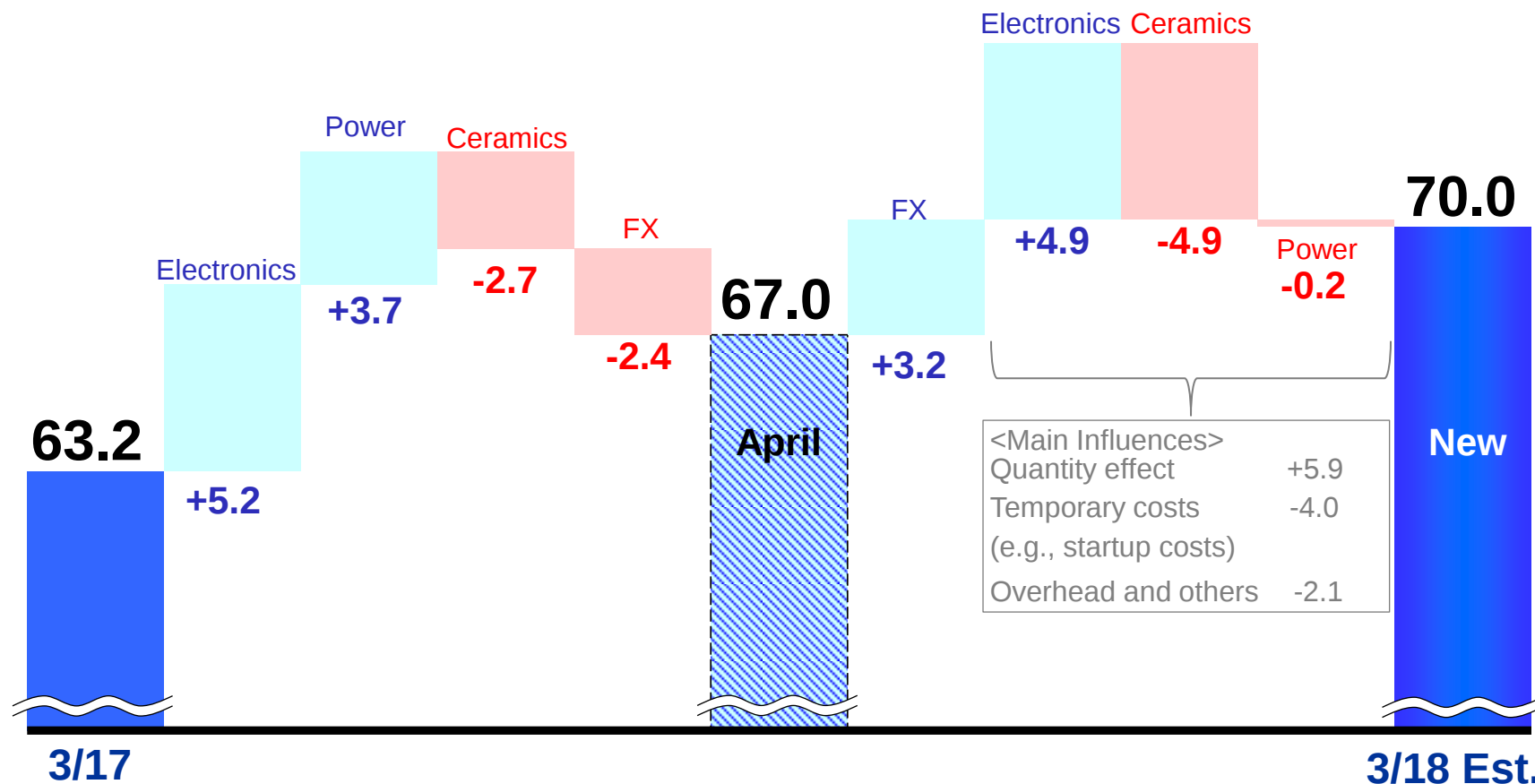
(¥ Bil.)



FX Rate 3/17
¥109/USD
¥119/EUR

April(3/18 Est.)
¥105/USD
¥115/EUR

New(3/18 Est.)
¥111/USD
¥126/EUR

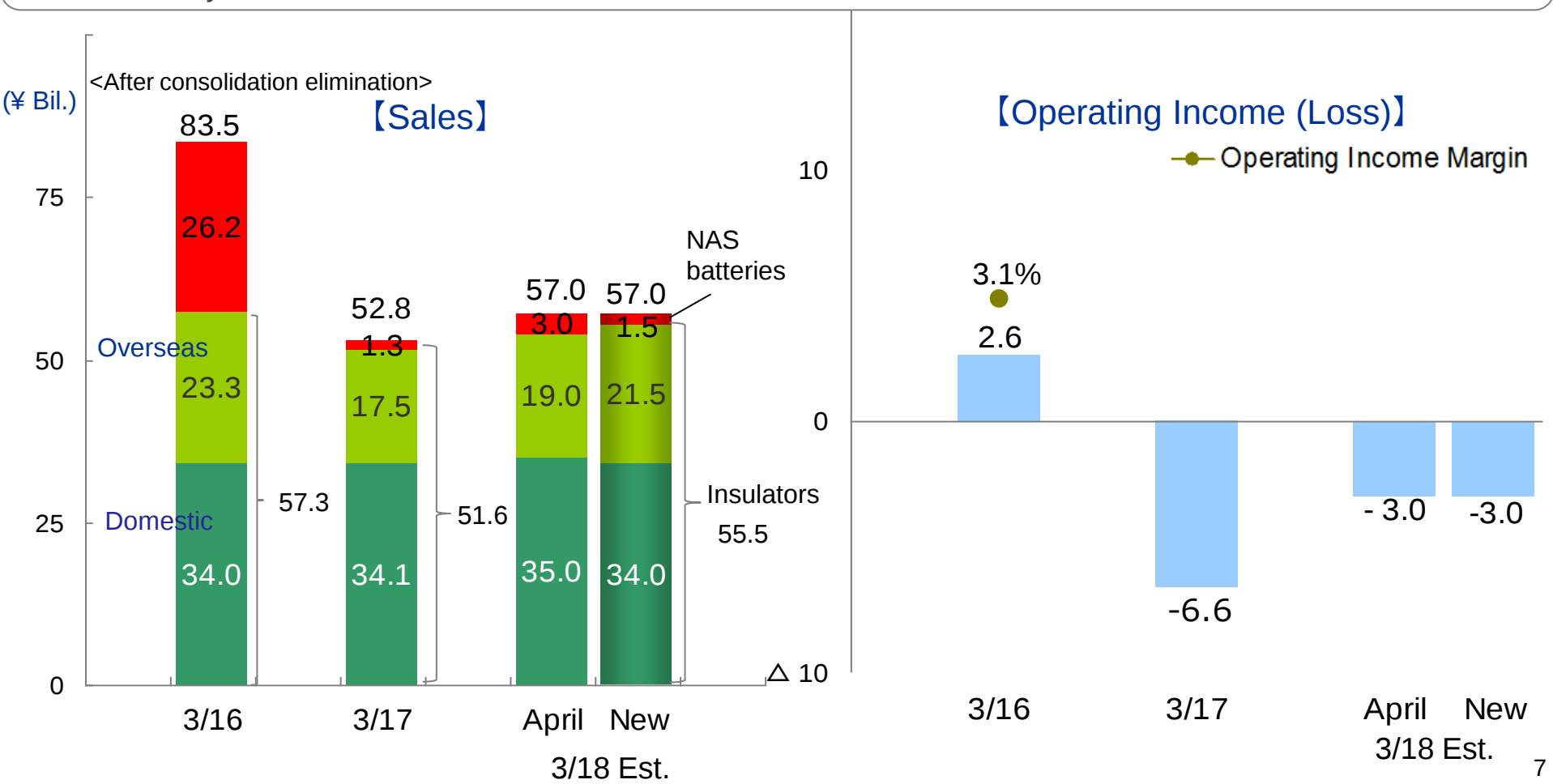


FX Rate 3/17
¥109/USD
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April(3/18 Est.)
¥105/USD
¥115/EUR

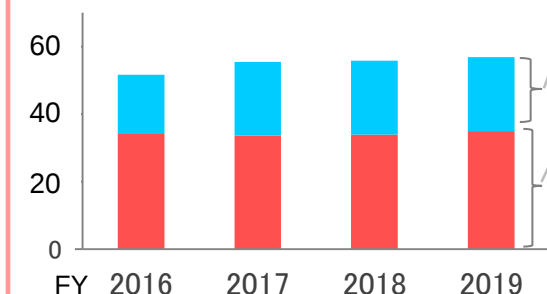
New(3/18 Est.)
¥111/USD
¥126/EUR

- Insulators
 - While replacement demand is forecast to increase in Japan in the medium-term, demand for power distribution products is expected to decrease, as electric power companies are currently reducing budgets in anticipation of the separation of electric power generation and distribution in 2020.
 - Overseas demand is forecast to increase with the large-scale projects in Asia.
 - Aim to become surplus in FY2017 by reducing fixed costs through downsizing the production system.
- NAS
 - Sluggish due to the decrease in domestic projects. Aim to reduce loss with the minimum production system.



■ Insulators Domestic and overseas replacement demand will be flat.

(¥ Bil.)



Overseas: Focus on receiving orders for large-scale power transmission line projects in priority markets (Asia and the Middle East).

Since demand is sluggish in North America, **proceed with business restructuring.**

Business restructuring cost (¥1.1 bil) was recorded under non-operating expenses.

Japan: Replacement demand will begin in earnest in 2020 and after (separation of electric power generation and distribution).

Reduce fixed costs to strengthen competitiveness by downsizing overseas businesses and domestic production systems(*), etc.

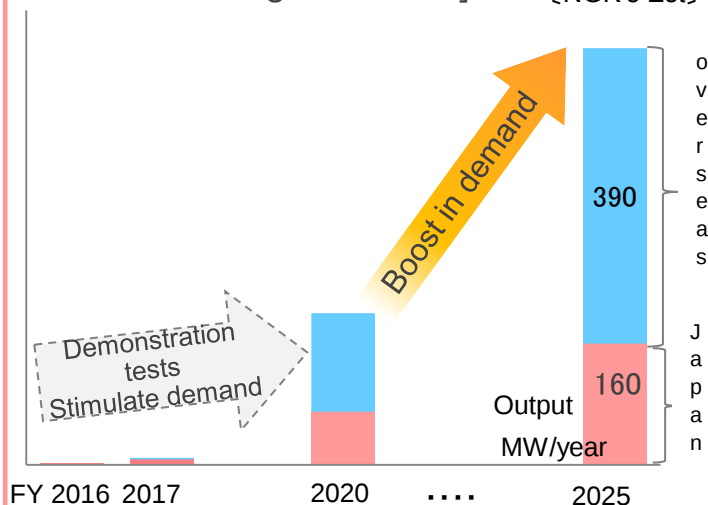
(*)Komaki Plant: Change from 2 shifts to one from FY2017

Chita Plant: Scheduled to change from 2 shifts to one in next fiscal year and after

■ NAS® Batteries While it will take time for the development of full-scale demand, the potential needs are high.

[Global market scale for long-life storage batteries]

[NGK's Est]



[Overseas]

Middle East: Plans for the large-scale introduction of solar power generation as an alternative to thermal power generation

(To improve finance by reducing crude oil usage)

Europe: Considers introducing NAS batteries in markets for adjustment due to the increase in surplus renewable energies

→ Strive for realization through demonstrations in the Middle East and Europe

[Japan]

Hokkaido: Realized a project to install systems storage batteries for the introduction of wind power generation and started publicly soliciting wind power generators

Storage battery size

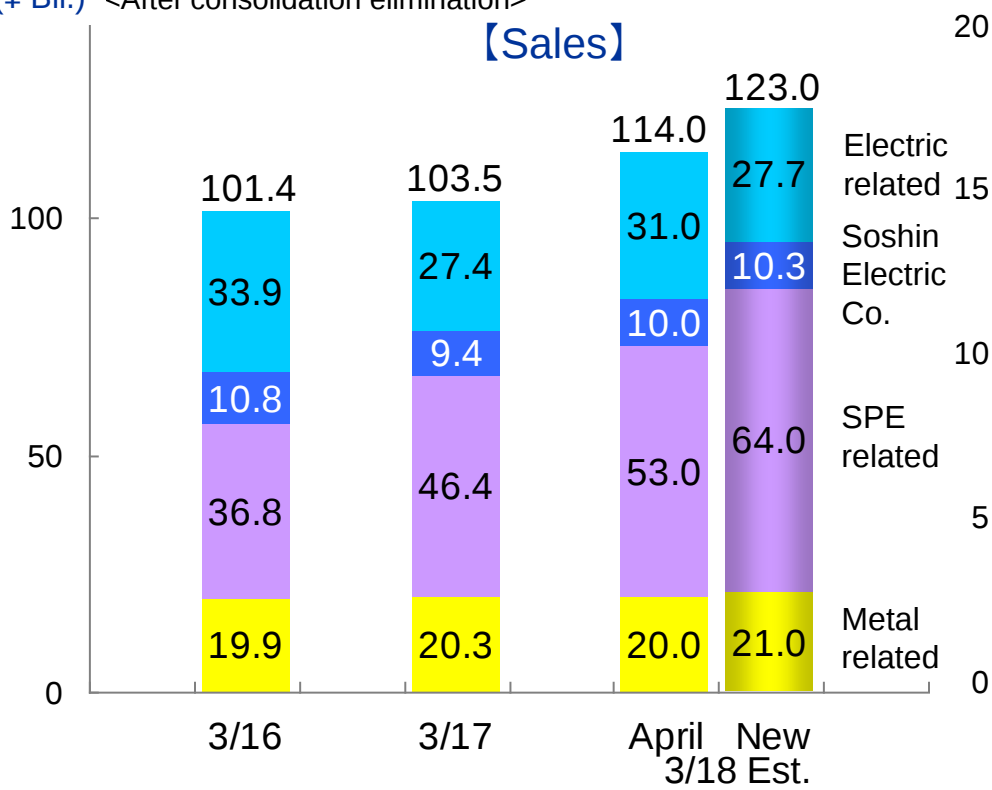
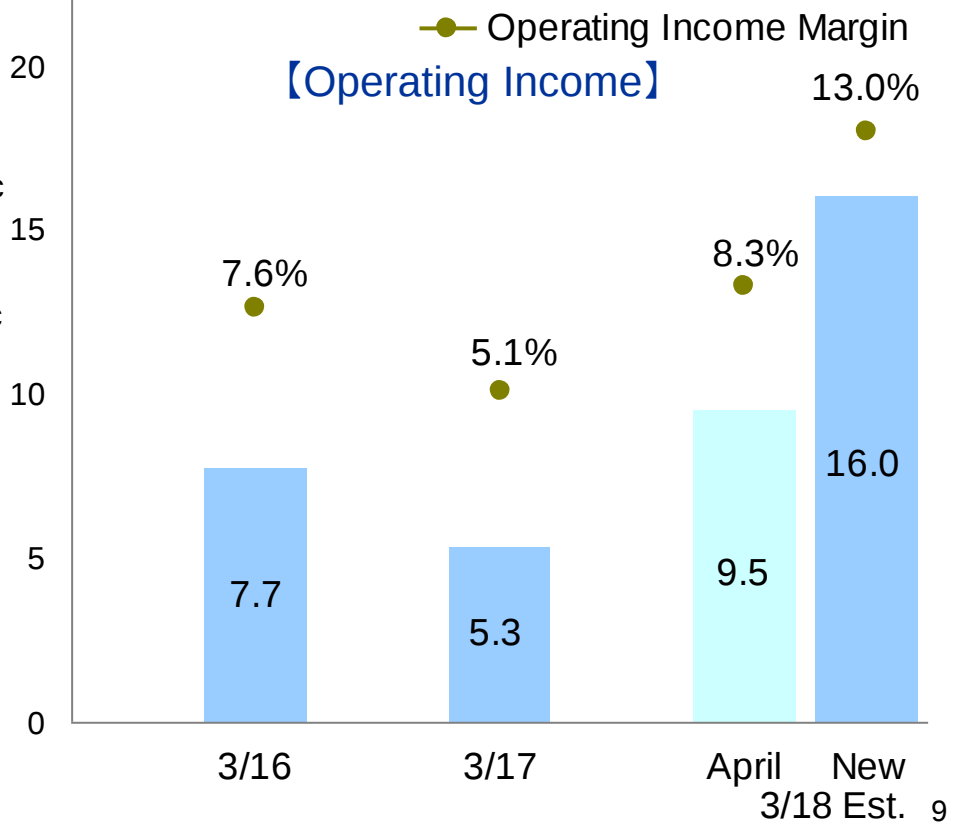
Stage I 90MW (to be installed by around FY2022)

Stage II 60MW

→ Aim to capture the order

- Ceramic for Semiconductor Manufacturing Equipment (SPE-related products)
 - Substantial increases in both sales and profits are expected as semiconductor manufacturers are likely to expand 3D-NAND and DRAM related investments against the backdrop of the increased demand for semiconductors
 - Continue reinforcing production capacity in response to the increasing demand.
- Electronics Components
 - Package products are forecast to see deteriorated earnings because investment in mobile phone base stations is restrained in China in anticipation of 5G investment starting in earnest in 2019 and after. Aim to improve profits by reducing the costs of the existing products and consolidating plants.
 - Demand has steadily grown for composite wafers, together with an expansion in the high-performance filter market following increases in the speed and capacity of mobile communication.
- Metal Related Products
 - Higher sales and income are forecast with the current demand expected to remain strong mainly for the Chinese market.

(¥ Bil.) <After consolidation elimination>

【Sales】

【Operating Income】


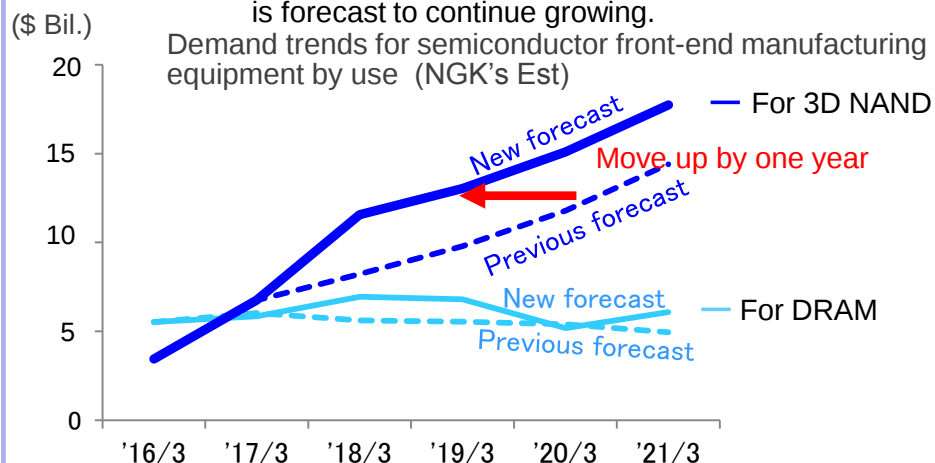
■ Ceramic Components for Semiconductor Manufacturing Equipment



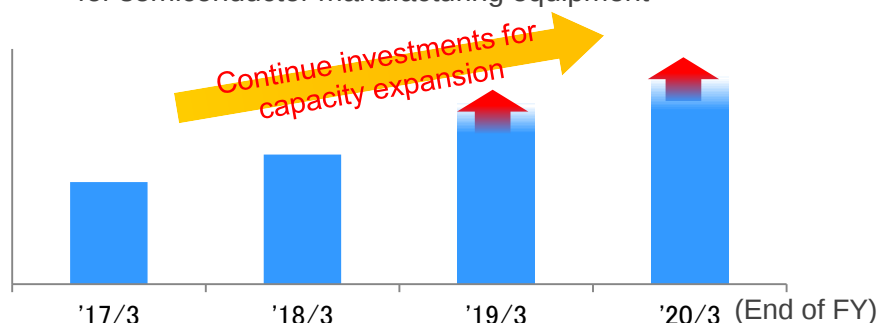
Investment related to 3D-NAND flash memories and DRAM is forecast to increase against the backdrop of brisk demand for mobile devices and memory devices including data servers.

Demand for semiconductor manufacturing equipment is forecast to continue growing.

Demand trends for semiconductor front-end manufacturing equipment by use (NGK's Est)



NGK Insulators' production capacity for ceramics products for semiconductor manufacturing equipment



< Establishment of a new production base in Tajimi City, Gifu Prefecture is decided >

Invest about ¥20 billion to further reinforce production capacity.

Production will start in April 2020.

[Press release on May 18]

■ Ceramic Package Business (Electronics Components)

Boost of injecting and promoting development of new products



Optical package

Demand is forecast to grow due to development of high-speed optical communication networks.
*Transition from 10G (Gbps) to 100G, 400G



DCB infrastructure

Aim to expand sales for use in power semiconductors with excellent reliability and heat conduction mainly for those installed in vehicles.

Strengthening the profitability of existing products



RF package



Quartz crystal package

Aim to improve profits by expanding sales of small quartz crystal and reducing costs.

Aim to expand business by strengthening the profitability of existing businesses and shifting to high-value products.

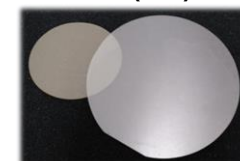
■ Wafer Products

(Electronics Components)

Bonded wafers for SAW filters

Demand is forecast to increase rapidly from the next term and after due to favorable reception by customers, in addition to the expansion of markets.

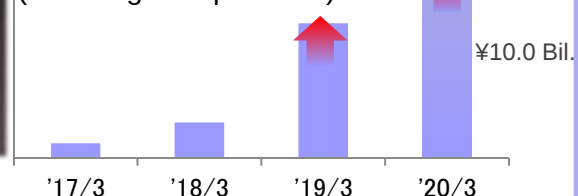
New product
Gallium nitride (GaN) wafer



Details are on page 17

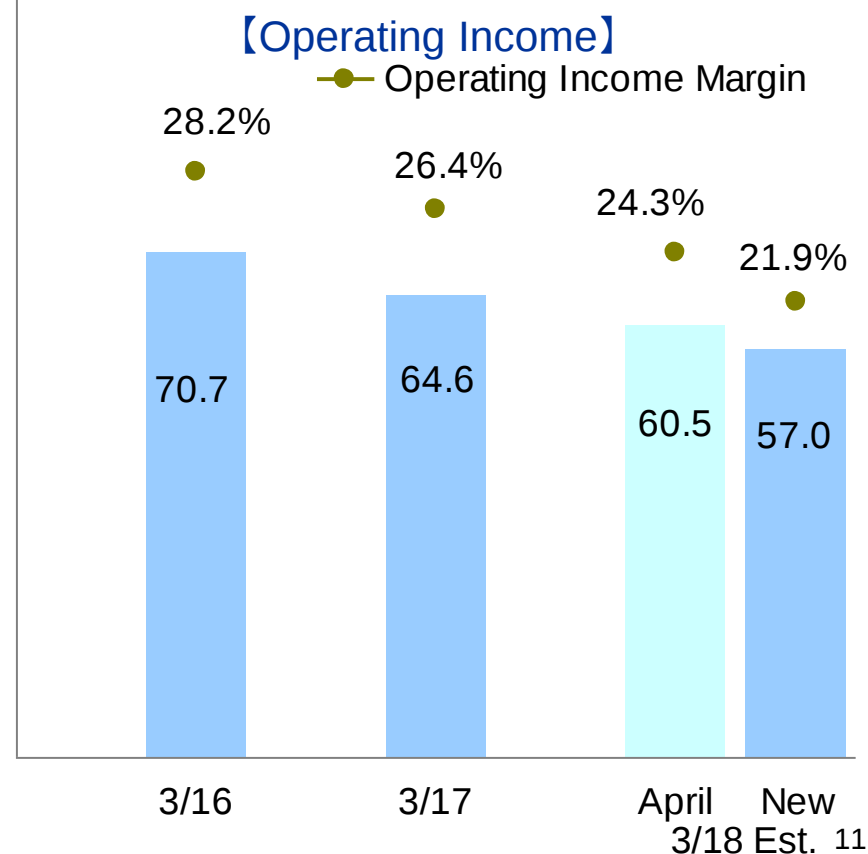
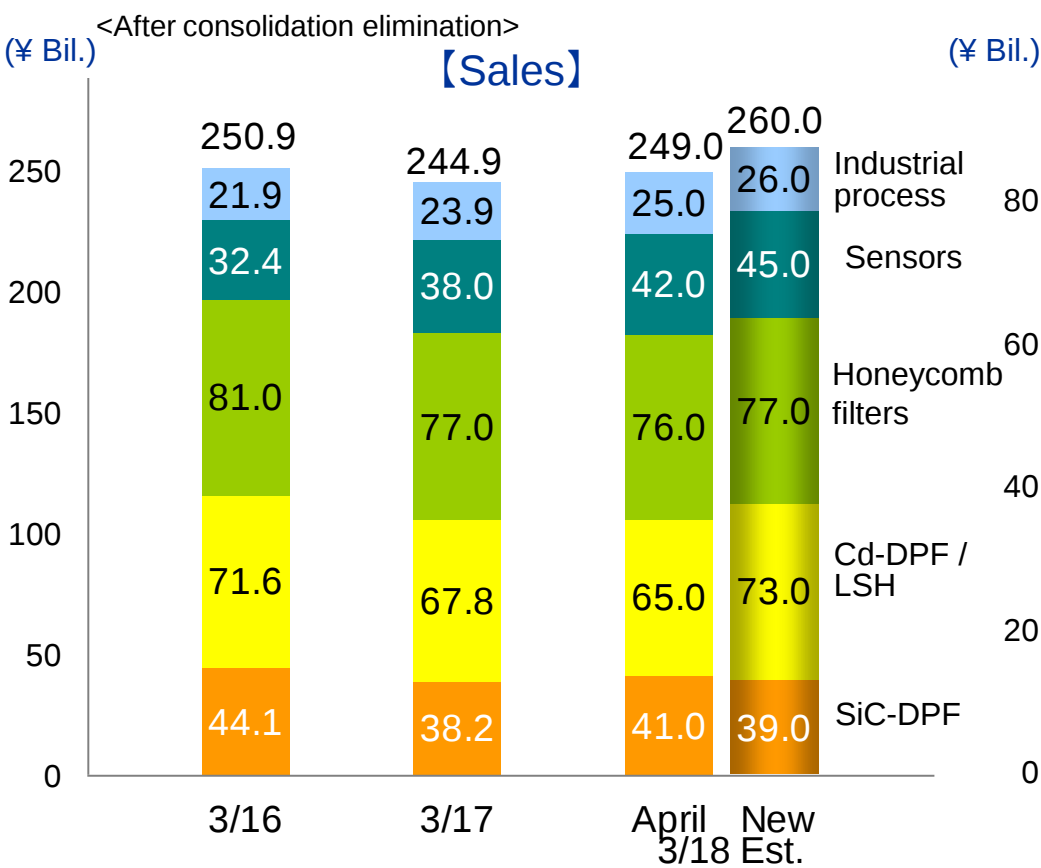


Sales forecast for wafer products (including new products)

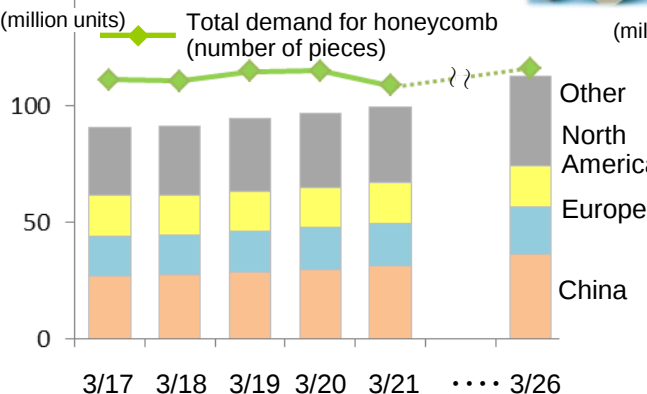


Work to reduce costs while strengthening production capacity in response to the increase in demand.

- **Automotive-related** : Sales increase due to the strong demand and the weaker yen. Lower income is expected as a result of increases in costs for startups.
- **Honeycomb** : Demand is flat. The number of global passenger car sales is almost same as expect.
- **LSH** : Demand has increased with the continued strong demand for trucks in North American markets.
- **SiC-DPF** : Demand is forecast to decrease due to the decrease of diesel passenger vehicle sales in European market, although the small and medium truck sales will increase in the Chinese market.
- **Sensors** : Demand is forecast to continue increasing due to the higher number of sensors used as a result of the tighter emission regulations.
- **Industrial processes** : Sales have increased mainly for heating equipment, as customers in Japan and China have continued making investments in lithium-ion batteries.

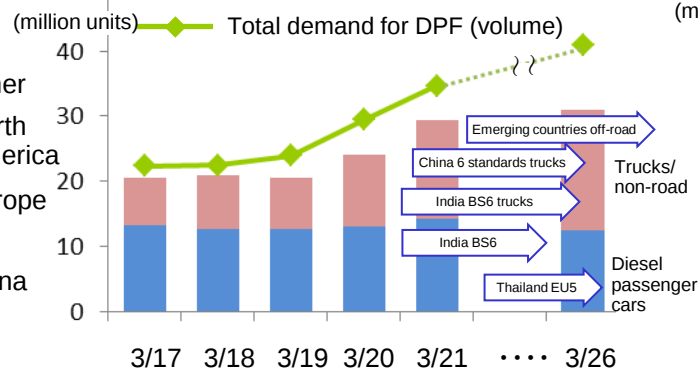


Passenger car sales volumes and total demand for honeycomb



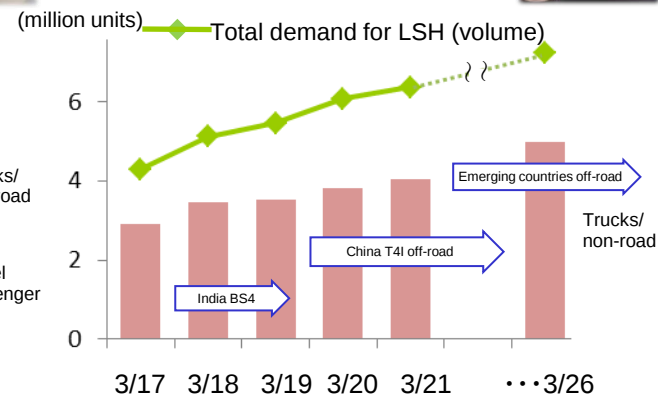
Due to the introduction of GPF, increased demand for honeycomb is smaller than the increase in the number of passenger car sales.

Number of vehicles equipped with DPF (passenger car conversion) and total demand for DPF (SiC, Cd, AT)



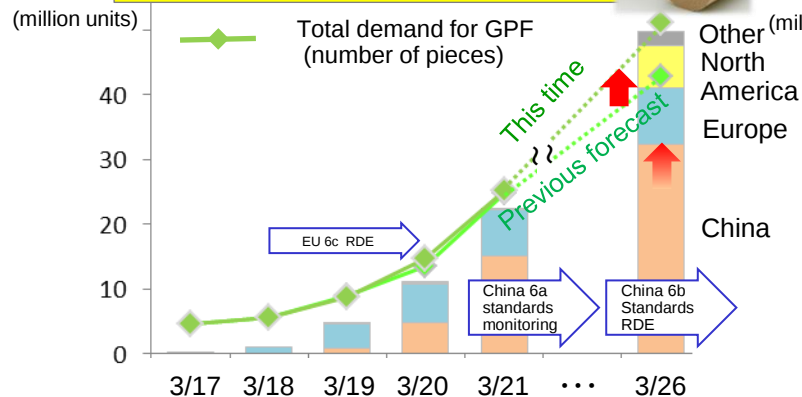
Tightening of regulations mainly in China, India, and other emerging countries will cause DPF demand to increase from FY2019.

Number of trucks and construction machinery requiring after-treatment and total demand for LSH



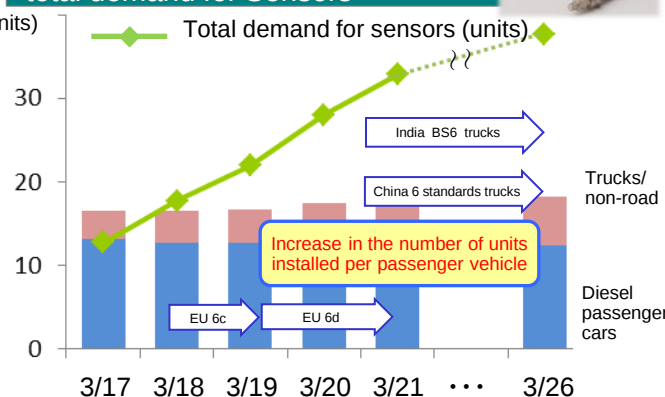
Increase in demand for LSH due to increased sales of trucks in the Chinese market and tightening regulations in India (FY2017).

Number of vehicles equipped with GPF and total demand for GPF



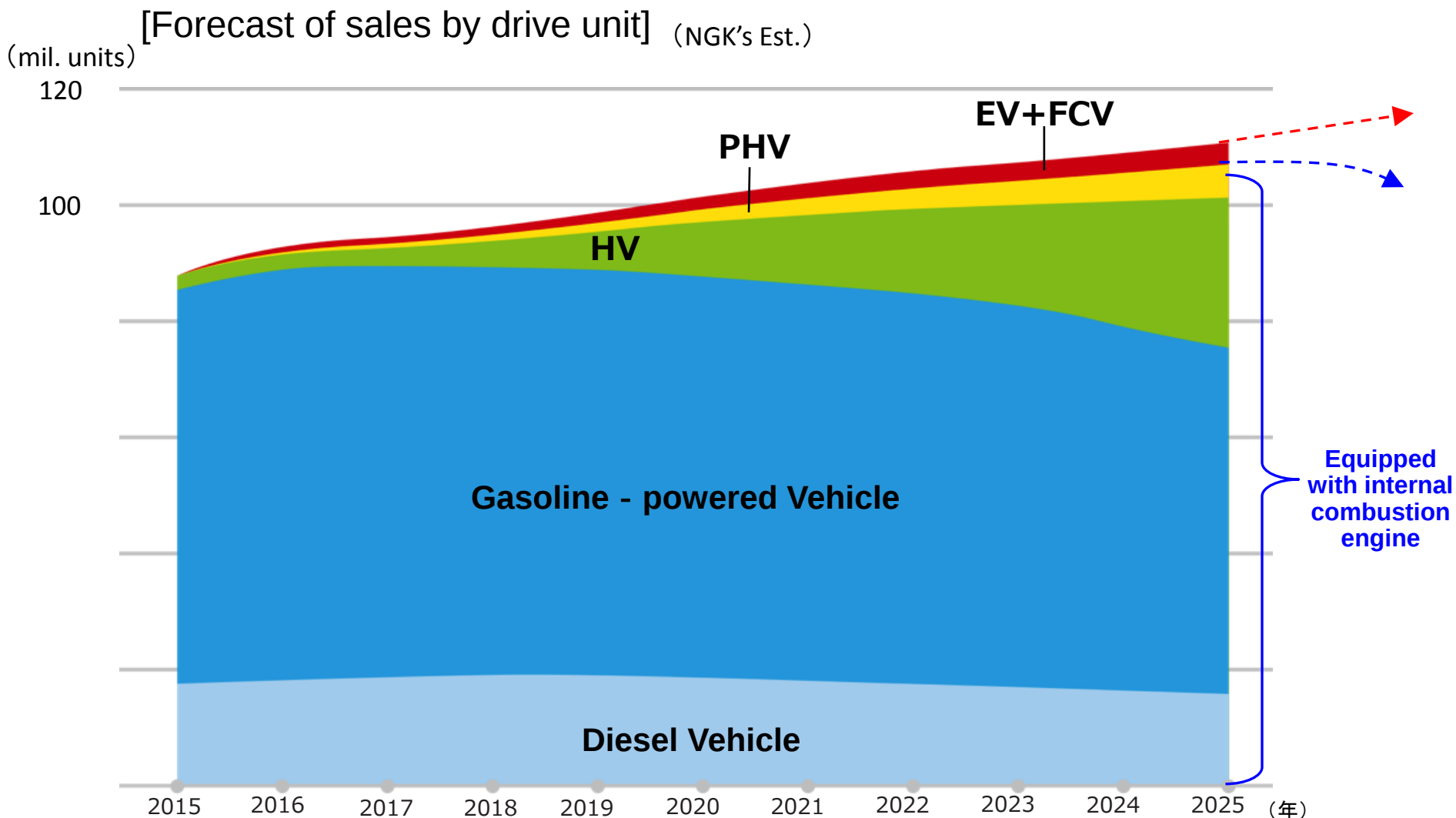
Increase in GPF demand due to the rapid increase in number of adopting manufacturers as a result of the start of RDE in Europe and the moving up of the schedule of 6a regulation in China.

Diesel engine vehicles requiring after-treatment and total demand for Sensors



Rapid increase in demand due to the increased number of installed sensors per diesel passenger vehicle (2→3 sensors) in preparation for the tightening of regulations in the Eurozone (Euro6d) in 2018 and after.

- On the assumption that the ratio of those with non-internal combustion engines is around 4-5% (about 4-5 million cars) of global passenger car sales in 2025, the internal combustion engine is forecast to increase until then.



Increase of capacity of **Sensors** (approx. ¥14.0 Bil.)



1st plant in Poland

Reinforce facilities for assembling Sensors
Production starts in **October 2019**

(press release on October 11)

Ishikawa Plant

Increase capacity of elements for Sensors.
Production starts in **January 2019**

Belgium ● ● Poland

2nd plant in Poland



Increase capacity of **SiC-DPF**
(approx. ¥22.0 Bil.)
Production starts in **April 2019**

Ishikawa

China

Nagoya

Thailand

Indonesia

Mexico

U.S.

Plant in China

1st plant



Increase capacity of **Honeycomb**

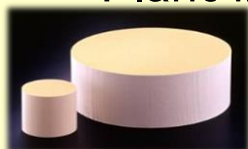
Mass production of **GPF**
(approx. ¥12.0 Bil.)
Production starts in **April 2018**

2nd plant



Mass production of **GPF**
(approx. ¥33.0 Bil.)
Production starts in **December 2019**
(press release on July 26)

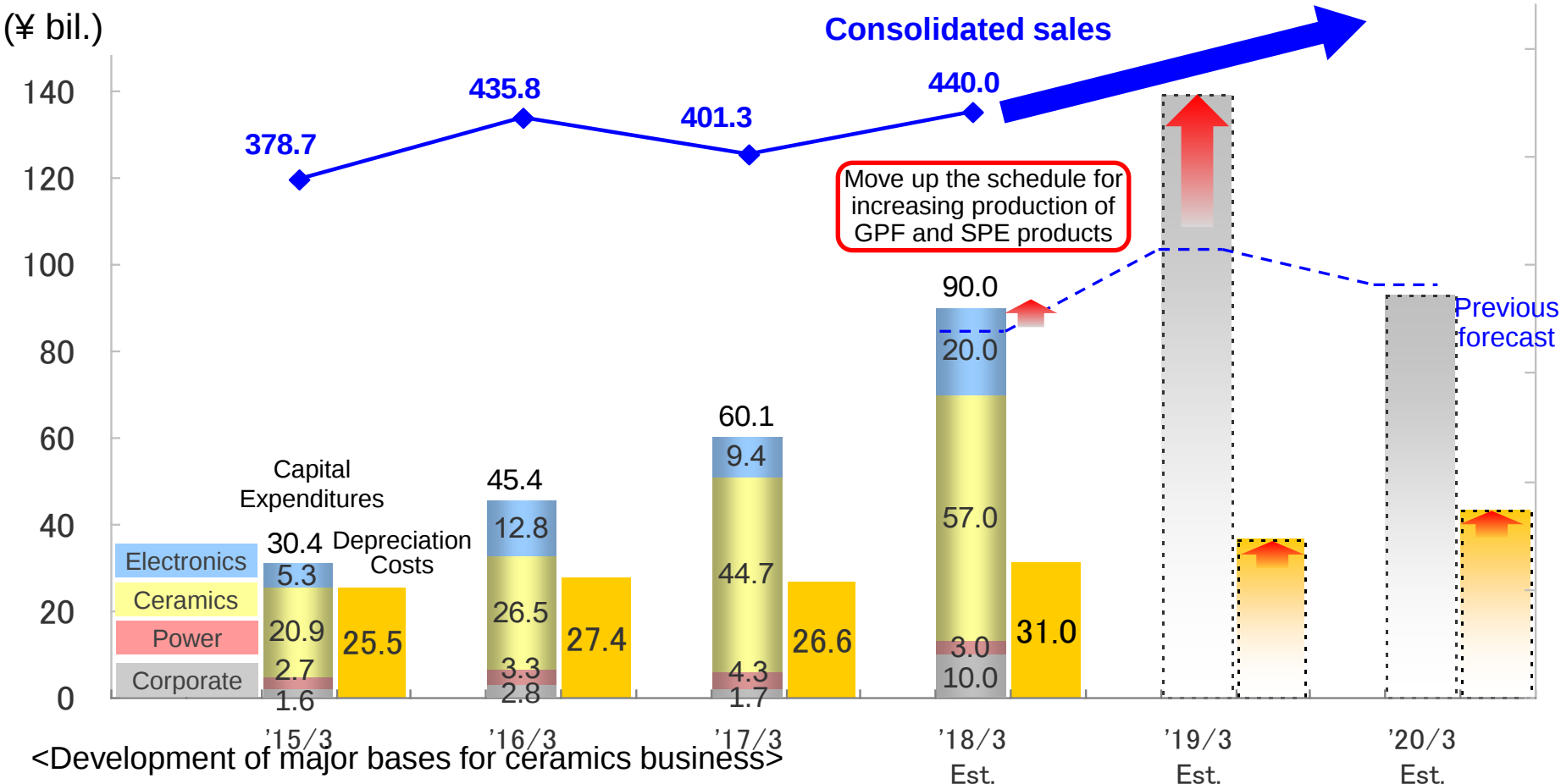
Plant in Thailand



Investment amount by 2020: approx. ¥50.0 Bil.
Honeycomb production starts in **April 2018**

In response to the increased GPF demand in China, establishment of **the 2nd plant in China** was decided (press release on July 26).

Also, increased production of Sensors in Ishikawa Plant and the 1st Plant in Poland was decided in response to tighter emission regulations in Europe (RDE regulations) and globally (press release on October 11).



Plant in Poland { 1st plant(GPF) : ¥7.0 Bil. Production starts in July, 2018
2nd plant(SiC-DPF) : ¥22.0 Bil. Production starts in April, 2019

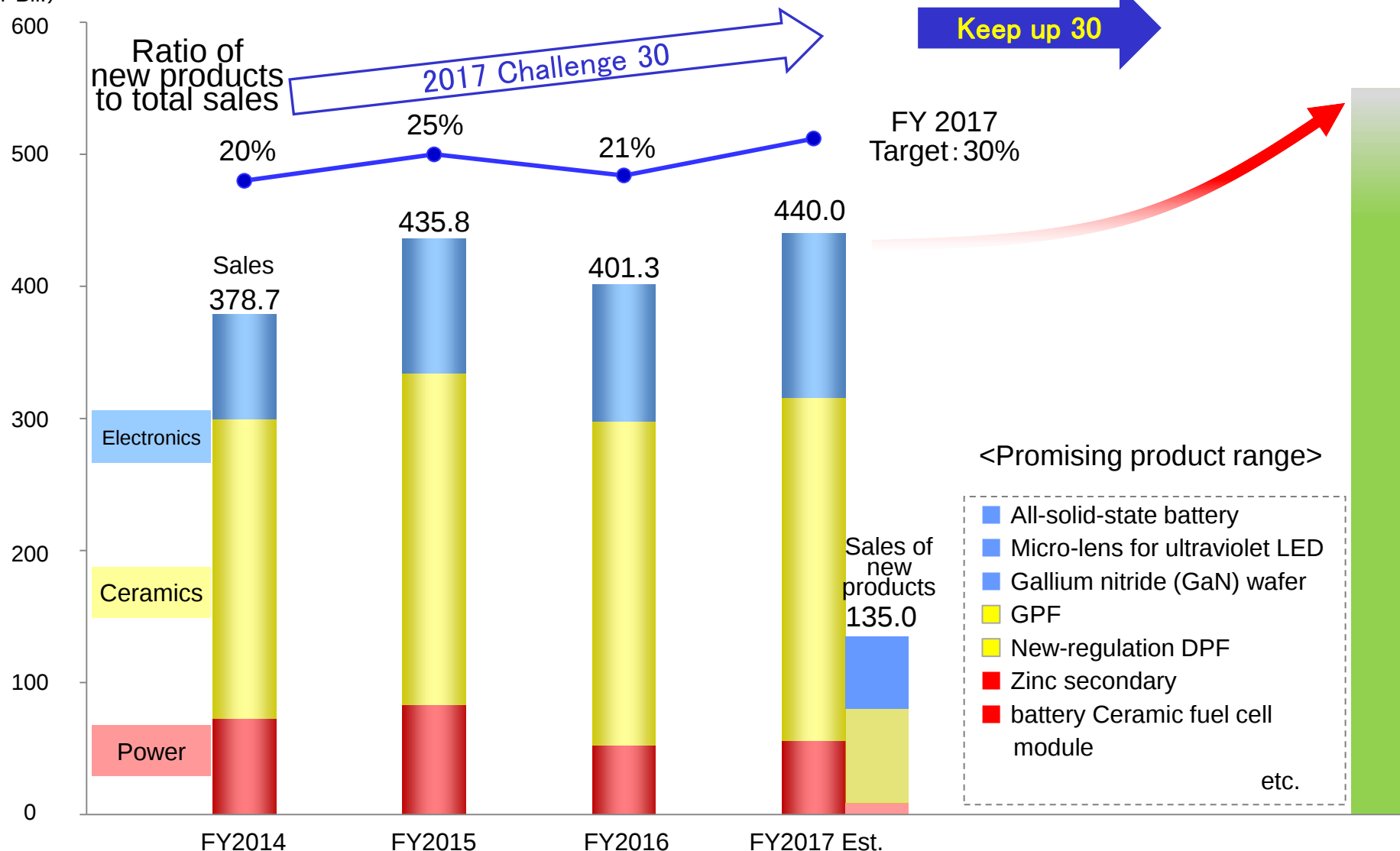
New manufacturing base in Thailand(Honeycomb, etc.) : ¥50.0 Bil. Honeycomb production starts in April, 2018
Range of products manufactured will expand in line with phased investments by 2020

Plant in China { 1st plant(Honeycomb/GPF) : ¥12.0 Bil. Production starts in April, 2018
2nd plant(GPF) : ¥33.0 Bil. Production starts in December, 2019

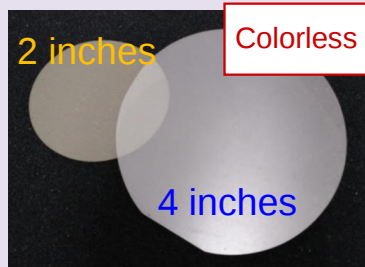
Increase capacity of Sensors: ¥14.0 Bil. { Ishikawa Plant Production starts in January, 2019
1st plant in Poland Production starts in October, 2019

Forecast to achieve target ratio of new products to total sales in FY2017
 Maintain ratio of new product to total sales of at least 30% from FY2017 by working towards the rapid commercialization of new products.

(¥ Bil.)



Gallium Nitride (GaN) Wafer



*Defect density
10⁴/sq.
cm or less

Micro-lens for Ultraviolet LED



Chip-type Secondary Battery



Remarks

- Achieved Low defect density* through entire wafer surface by the original liquid phase epitaxial growth technology
- Capable of realizing light source with ultra-high brightness (laser, LED)

- Available in complex shapes through a unique manufacturing process
- Highly transparent and durable for ultraviolet light

- Crystallographically-oriented ceramic positive plates (basic patents acquired)
- Very small thickness, high energy density, and high temperature operation

Applications

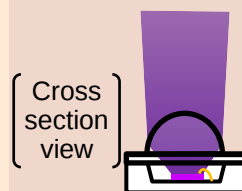
Business projector



Cinema projector



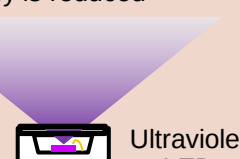
Ultraviolet LED with micro-lens (for sterilization)



A small lens that can reduce Ultraviolet light angle is necessary for effective sterilization.

Reference:

In the case of LED without lens Ultraviolet light is dispersed, hence sterilization efficiency is reduced



Ultraviolet LED

Head light (high beam)



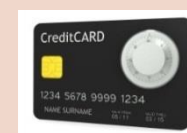
Stadium lighting



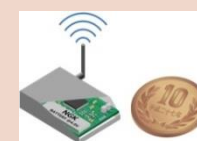
Wearable devices



Smart cards



IoT wireless modules



On-board power units



Progress

Pilot lines are being developed for all of them, aiming to start mass production in FY2018.

Stationary Module Batteries

- For zinc secondary batteries and battery ceramic fuel cell modules (solid-oxide fuel cell (SOFC) modules), field experiments, evaluation by customers, etc. are in progress as planned.

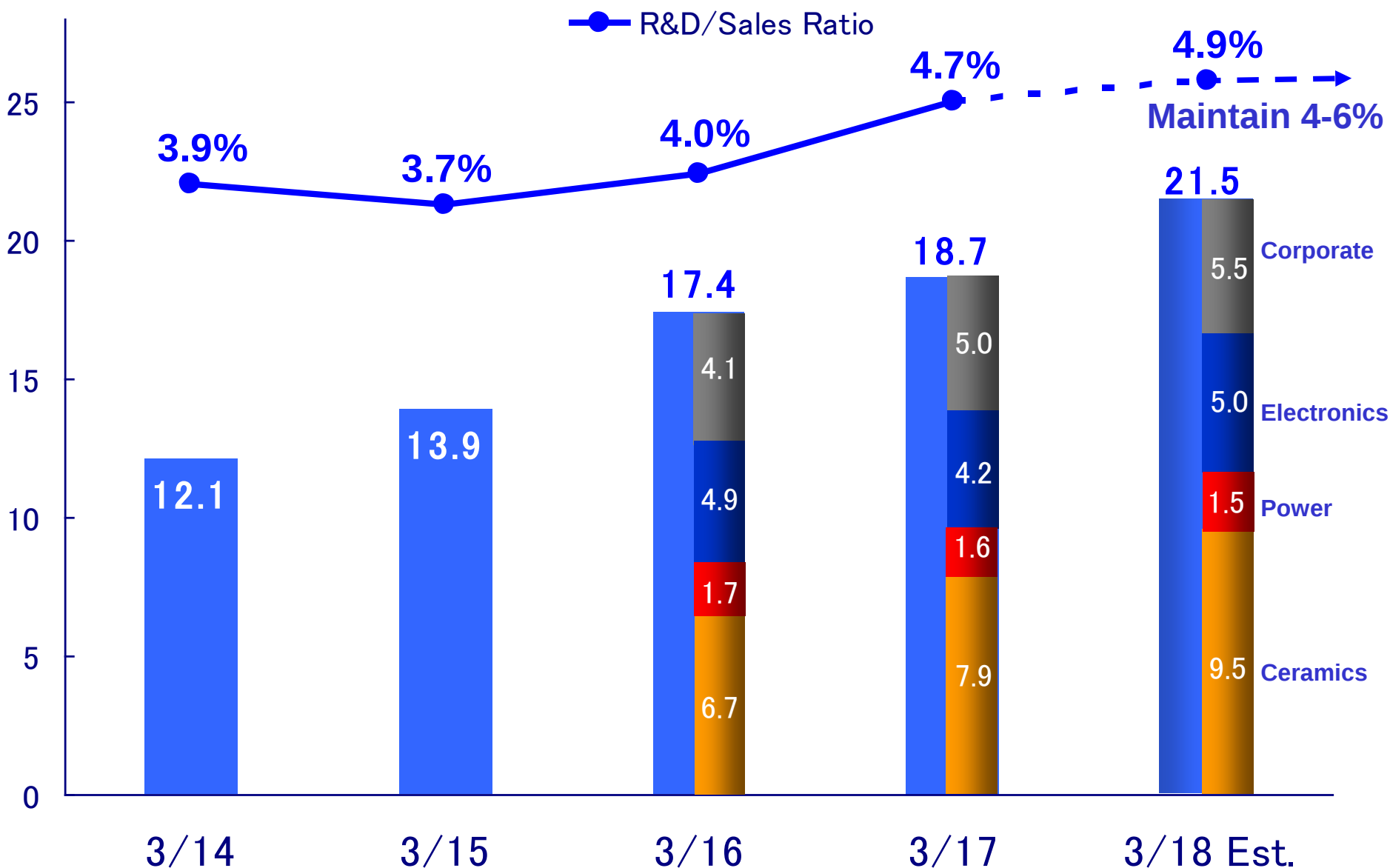
Zinc Secondary Battery

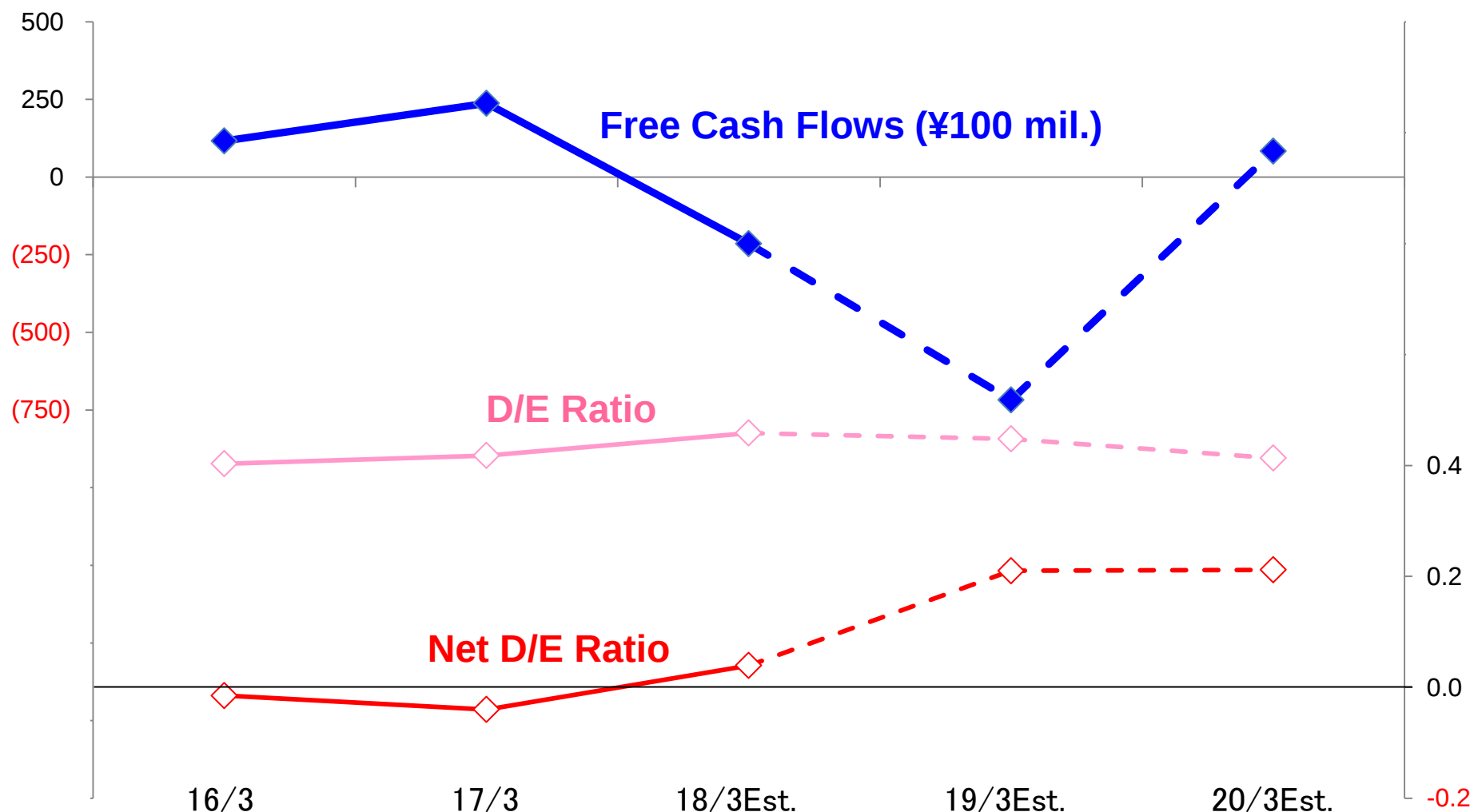


Ceramic Fuel Cell Module



(¥ Bil.)





- With capital expenditure preceding, interest-bearing liabilities will exceed outstanding funds for a while.
Free cash flow is forecast to turn positive in FY ending March 2020.
- Equity ratio of 50% or higher and DE ratio of about 0.4 will be maintained.

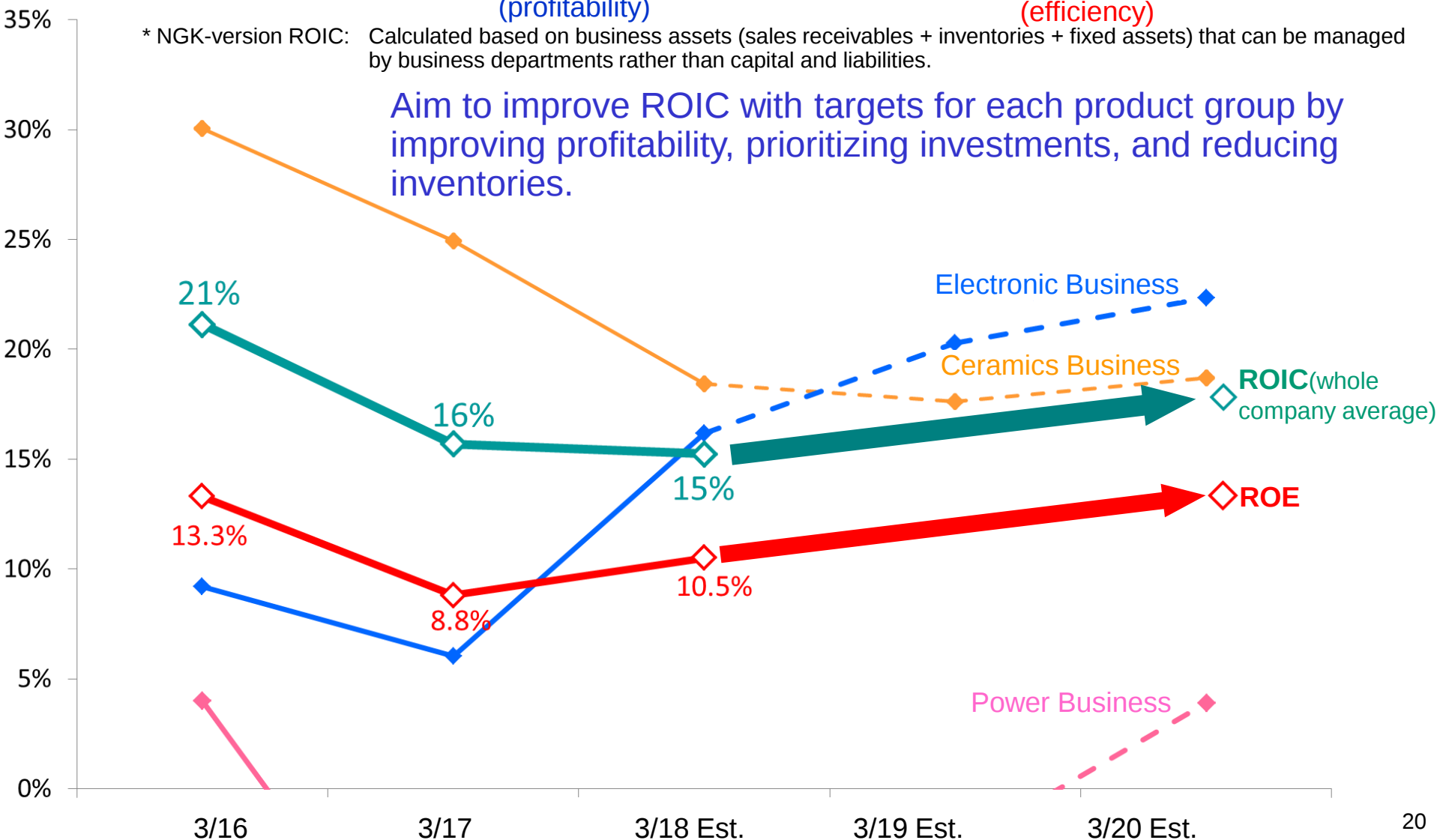
Return on Invested Capital (ROIC)

• Return on invested capital (NGK-version ROIC*) = $\frac{\text{Operating income}}{\text{Net sales}}$ × $\frac{\text{Net sales}}{\text{Business assets (sales receivables + inventories + fixed assets)*}}$

Return on turnover (profitability) Business assets turnover rate (efficiency)

* NGK-version ROIC: Calculated based on business assets (sales receivables + inventories + fixed assets) that can be managed by business departments rather than capital and liabilities.

Aim to improve ROIC with targets for each product group by improving profitability, prioritizing investments, and reducing inventories.

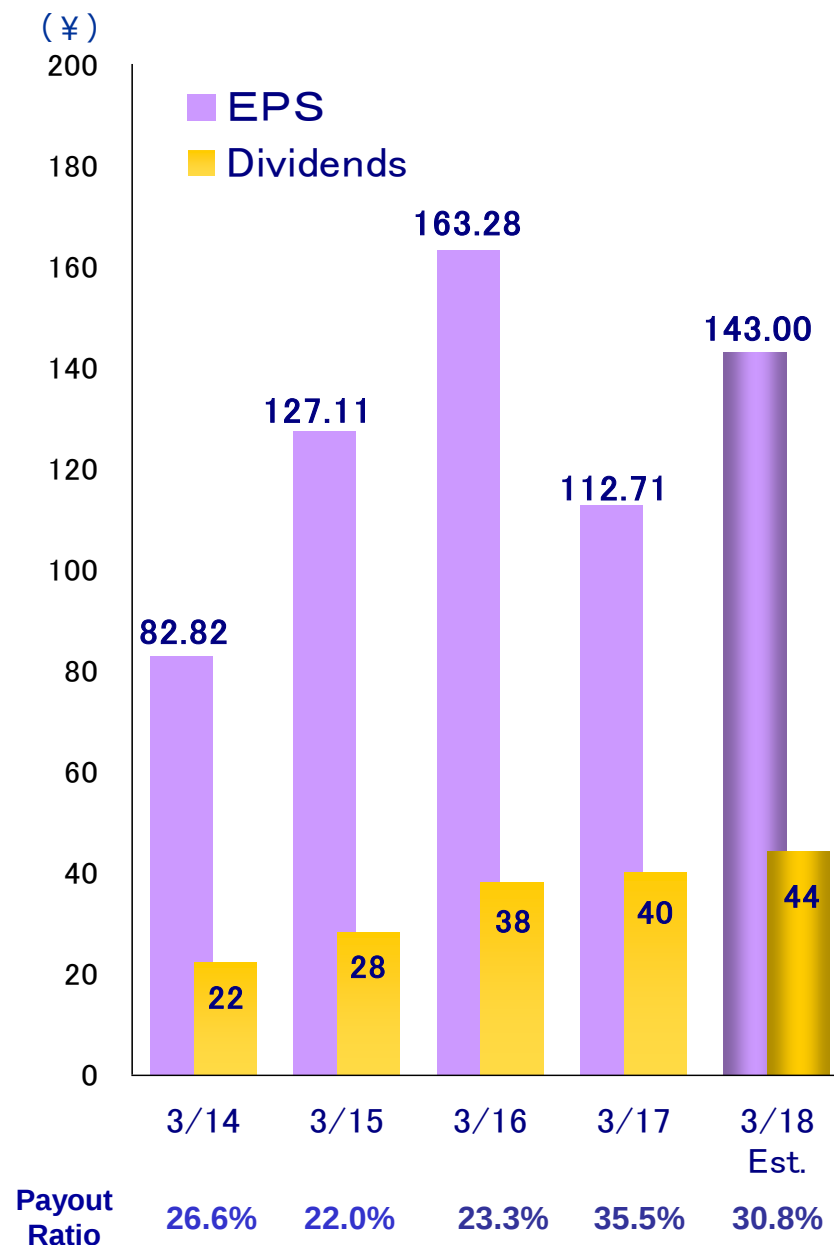
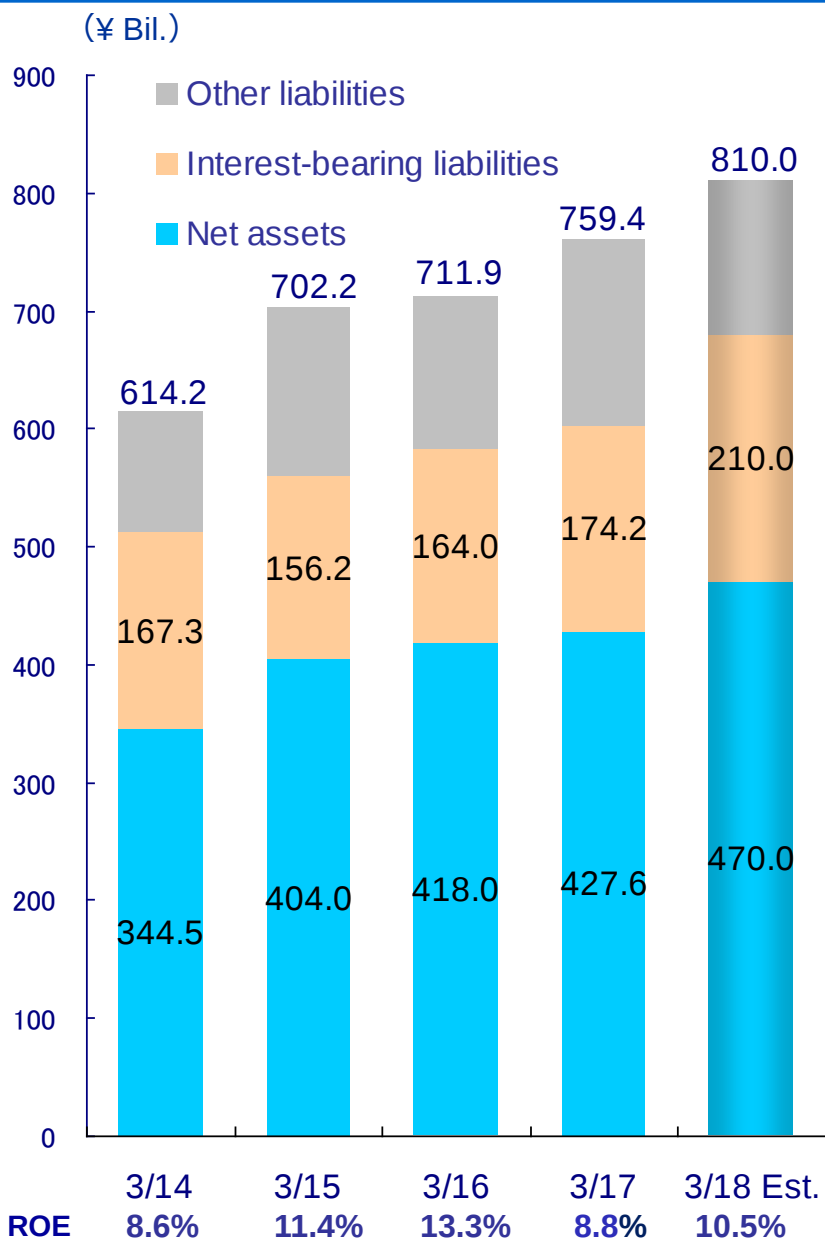


Summary of Cash Flows

(¥ Bil.)

	3/16	3/17	3/18 Est.
Operating Activities	59.4	80.2	45.0
Investing Activities	-47.8	-56.5	-68.0
Financing Activities	-0.4 New loans +16.8 Repayment -6.7	-13.0 New loans +30.1 Repayment -19.2 Treasury stock purchase -11.2	24.0 New loans + 44.0 Repayment -7.0
Effect of Exchange Rate Changes on Cash &Cash Equivalents	-3.9	-2.1	0.5
Net Change in Cash & Cash Equivalents	7.4	8.6	1.5
Cash & Cash Equivalents- at the End of Year	136.1	144.7	146.2

Total Assets & ROE / EPS & Dividends



Sales by Product (Annual)

<After Consolidation Elimination>

(¥ Bil.)

	3/15	3/16	3/17	3/18 Est.
Insulators	57.0	57.3	51.6	55.5
NAS	15.8	26.2	1.3	1.5
Power Business	72.8	83.5	52.8	57.0
Honeycomb filters	72.4	81.0	77.0	77.0
SiC-DPF	41.8	44.1	38.2	39.0
Cd-DPF / LSH	68.9	71.6	67.8	73.0
Sensors	24.0	32.4	38.0	45.0
Industrial Process	20.0	21.9	23.9	26.0
Ceramics Business	227.1	250.9	244.9	260.0
Metal related	21.5	19.9	20.3	21.0
SPE related	31.5	36.8	46.4	64.0
Electric Related	14.5	33.9	27.4	27.7
Soshin Electric Co.	11.3	10.8	9.4	10.3
Electronics Business	78.8	101.4	103.5	123.0
Total	378.7	435.8	401.3	440.0

Sales by Product (Semi Annual)

<After Consolidation Elimination>

(¥ Bil.)

	3/17		3/18 Est.	
	1 st Half	2 nd Half	1 st Half	2 nd Half
Insulators	26.0	25.5	26.9	28.6
NAS	0.4	0.9	0.4	1.1
Power Business	26.4	26.4	27.2	29.8
Honeycomb filters	39.0	38.0	38.5	38.5
SiC-DPF	19.4	18.8	20.4	18.6
Cd-DPF / LSH	33.1	34.7	37.6	35.4
Sensors	17.5	20.5	22.0	23.0
Industrial Process	10.3	13.6	12.6	13.4
Ceramics Business	119.3	125.6	131.0	129.0
Metal related	9.8	10.5	11.2	9.8
SPE related	20.5	25.9	31.7	32.3
Electric Related	13.7	13.6	13.5	14.2
Soshin Electric Co.	4.5	4.9	5.2	5.1
Electronics Business	48.6	54.9	61.5	61.5
Total	194.3	207.0	219.7	220.3

The purpose of this brief is information disclosure for better understanding of NGK Group's policies, projections and financial condition. This brief does not solicit buying and selling of NGK's shares.

The figures included in this brief, including the business performance targets and figures, are all projected data based on the information currently available to the NGK Group, and are subject to variable factors such as economic conditions, competitive environments and future demands.

Accordingly, please be advised that the actual results of business performance may differ substantially from the projections described here.



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