SHOWA DENKO

PROJECT 2020+

Evolving unique chemical company

2017 Financial Results

- Consolidated -

SHOWA DENKO K.K.

February 14, 2018

Toshiharu Kato, CFO
Director & Corporate Officer

Performance forecast and other statements pertaining to the future as contained in this presentation are based on the information available as of today and assumptions as of today regarding risk factors that could affect our future performance. Actual results may differ materially from the forecast due to a variety of risk factors, including, but not limited to, the economic conditions, costs of naphtha and other raw materials, demand for our products such as graphite electrodes and other commodities, market conditions, and foreign exchange rates. We undertake no obligation to update the forward-looking statements unless required by law.

Consolidated Companies

■ Consolidated subsidiaries: 62 (14 companies newly consolidated)

[Chemicals segment]
Showa Denko New Material (Zhuhai) Co., Ltd.
Shanghai Showa Highpolymer Trading Co., Ltd.
Showa Chemicals of America Inc.

[Inorganics segment]
SHOWA DENKO CARBON Holding GmbH
SHOWA DENKO CARBON Germany
SHOWA DENKO CARBON Products Germany
SHOWA DENKO CARBON Spain Holding
SHOWA DENKO CARBON Spain
SHOWA DENKO CARBON Malaysia
SHOWA DENKO CARBON Italy
SHOWA DENKO CARBON Austria
SHOWA DENKO CARBON Canada
SHOWA DENKO CARBON Shanghai
SHOWA DENKO CARBON Germany Treuhand

■ Equity method applied: 11 (1 company excluded)

[Electronics segment]
TS Opto Co., Ltd. (transfer of shares)

Selected Data

(Average)

	2016		2017		Increase/decrease	
		Oct.-Dec.		Oct.-Dec.		Oct.-Dec.
■Exchange rate: ¥/US$	108.8	109.3	112.2	113.0	Yen depreciated by ¥3.4/$	Yen depreciated by ¥3.7/$
■Domestic naphtha price: ¥/KL	32,800	34,100	40,400	44,600	7,600	10,500
■Aluminum						
LME price: US$/T	1,610	1,709	1,979	2,118	370	409
Domestic market*: K¥/T	227	238	276	291	49	53

Exchange rate at the end of December, 2016 ¥116.5/US$, at the end of December, 2017 ¥113.0/US$
⇒Yen appreciated by ¥3.5/US$

*Domestic market: data from Nikkei

Summary

(Unit: Billions of Yen)

	2016	2017	Increase/decrease
Net Sales	671.2	780.4	109.2
Operating Income	42.1	77.8	35.8
Non-operating income and expenses, net	-3.4	-13.9	-10.5
Interest/Dividends income and expenses	-1.6	-1.2	0.4
Equity in earnings of affiliates	4.3	-7.7	-12.0
Foreign exchange gains or losses	-1.7	-2.8	-1.1
Other	-4.4	-2.2	2.3
Ordinary Income	38.7	64.0	25.3
Extraordinary Profit	1.7	4.6	2.9
Extraordinary Loss	-22.8	-22.0	0.9
Income before income taxes	17.5	46.6	29.1
Income taxes	-3.7	-10.8	-7.1
Net income	13.8	35.8	21.9
Net income attributable to non-controlling interests	-1.5	-2.3	-0.8
Net income attributable to owners of the parent	12.3	33.5	21.2
Net income attributable to owners of the parent per share	¥86.27 (note1)	¥234.84	¥148.57
Term-end cash dividends per share	— (note2)	¥50 (planned)	—

(note 1) SDK consolidated every ten shares of its common stock into one share on July 1, 2016. The above-mentioned "per share" indicators are calculated on the assumption that the share consolidation had been carried out at the beginning of 2016.

(note 2) SDK resolved payment of dividends of Yen 30 per share based on the record date of May 11, 2017 at the extraordinary general meeting of shareholders held on June 27, 2017, and paid dividends on the next day.

Extraordinary Profit/Loss

(Unit: Billions of Yen)

	2016	2017	Increase/decrease
■Extraordinary Profit	1.7	4.6	2.9
●Gain on sales of fixed assets	0.8	0.9	0.1
●Gain on bargain purchase	0.7	3.1	2.4
●Other	0.1	0.6	0.4
■Extraordinary Loss	-22.8	-22.0	0.9
●Loss on sales and retirement of noncurrent assets	-4.1	-5.3	-1.3
●Impairment loss	-15.6	-7.2	8.4
●Provision of allowance for doubtful accounts	—	-2.6	-2.6
●Provision for business structure improvement	-0.7	-2.7	-1.9
●Provision for loss on guarantees	—	-2.6	-2.6
●Other	-2.4	-1.5	0.9
■Extraordinary Profit/Loss, Net	-21.2	-17.3	3.8

Consolidated Sales by Segment

(Unit: Billions of Yen)

	2016	2017	Increase/ decrease	
Petrochemicals	185.8	251.1	65.3	【Olefins】sales increased (price up due to naphtha price up) 【Organic chemicals】sales increased (vinyl acetate, ethyl acetate: shipment volumes up, market price up) Consolidation of SunAllomer Ltd. (2H, 2016)
Chemicals	134.5	148.8	14.2	【Basic chemicals】sales increased (AN: shipment volumes up, market price up chloroprene rubber: export steady, market price up) 【Electronic chemicals】sales increased (high purity gases for electronics: shipment volumes up) 【Functional chemicals】sales increased (shipment volumes for domestic automotive up) 【Industrial gases】sales slightly decreased
Electronics	120.5	123.1	2.6	【HDs】sales increased (shipment volumes up) 【Compound semiconductors】【Rare earths】sales increased (shipment volumes up) 【LIB materials】sales decreased (shipment volumes bound for China down)
Inorganics	50.9	73.4	22.6	【Ceramics】sales increased (shipment volumes for electronic materials up) 【Graphite electrodes】sales significantly increased (shipment volumes up, China market price up, consolidation of SHOWA DENKO CARBON Holding GmbH (4Q, 2017))
Aluminum	98.6	105.4	6.9	【High-purity foil for capacitors】sales increased (shipment volumes up) 【Aluminum specialty components】sales increased (shipment volumes of large-sized aluminum extrusions and aluminum cylinders for LBPs up) 【Aluminum cans】sales increased (Hanacans Joint Stock Company: shipment volumes up)
Others	128.7	133.6	4.9	【SHOKO Co., Ltd.】sales increased
Adjustments	-47.8	-55.1	-7.3	
Total	671.2	780.4	109.2	

(note) From 2017 SDK changed the segmentation (LIB materials was transferred from “Others” to “Electronics”) . Figures of 2016 are based on the new segmentation.

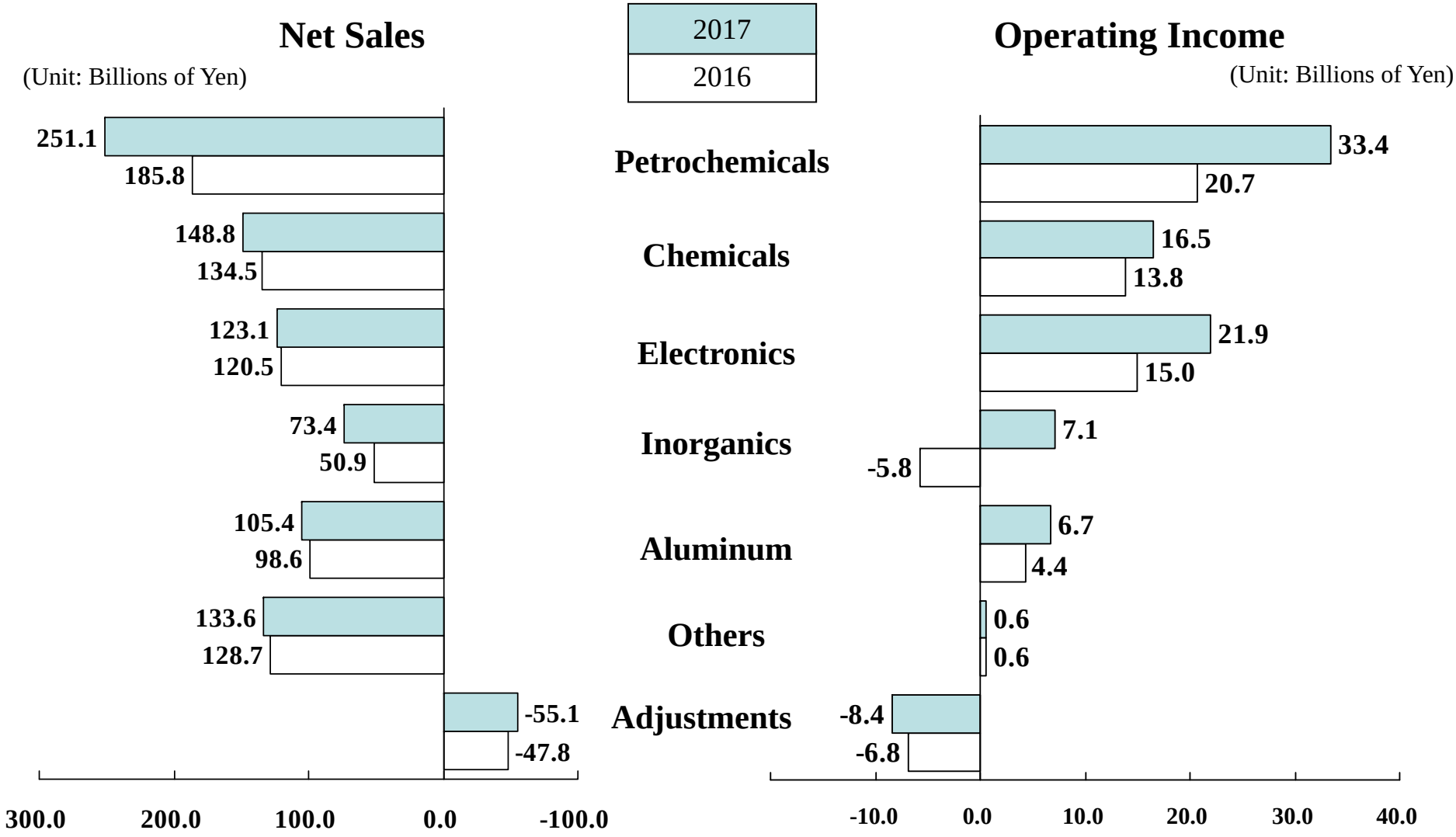
Consolidated Operating Income by Segment

(Unit: Billions of Yen)

	2016	2017	Increase/ decrease	
Petrochemicals	20.7	33.4	12.7	【Olefins】profit significantly increased (continuation of high operating rates, market price up) 【Organic chemicals】profit slightly increased Consolidation of SunAllomer Ltd. (2H, 2016)
Chemicals	13.8	16.5	2.7	【Basic chemicals】profit increased (AN: shipment volumes up, market price up, chloroprene rubber: export steady, market price up) 【Electronic chemicals】profit increased (high purity gases for electronics: shipment volumes up) 【Industrial gases】profit decreased (transportation cost up) 【Functional chemicals】profit decreased (raw material prices up) 【Power generating business】profit decreased (fuel price up)
Electronics	15.0	21.9	6.9	【HDs】profit increased (shipment volumes up, cost reduction) 【Compound semiconductors】profit increased (shipment volumes up) 【Rare earths】profit increased (shipment volumes up, improvement in the loss on reduction in the book value of inventories) 【LIB materials】profit decreased (shipment volumes bound for China down)
Inorganics	-5.8	7.1	12.8	【Ceramics】profit increased (shipment volumes for electronic materials up) 【Graphite electrodes】profit significantly increased (shipment volumes up, renovation of the hydropower facilities, China market price up, consolidation of SHOWA DENKO CARBON Holding GmbH (4Q, 2017))
Aluminum	4.4	6.7	2.3	【High-purity foil for capacitors】profit increased (shipment volumes up) 【Aluminum specialty components】profit increased (shipment volumes of large-sized aluminum extrusions and aluminum cylinders for LBPs up) 【Aluminum cans】profit increased (Hanacans Joint Stock Company: shipment volumes up)
Others	0.6	0.6	0	
Adjustments	-6.8	-8.4	-1.6	
Total	42.1	77.8	35.8	

(note) From 2017 SDK changed the segmentation (LIB materials was transferred from “Others” to “Electronics”) . Figures of 2016 are based on the new segmentation.

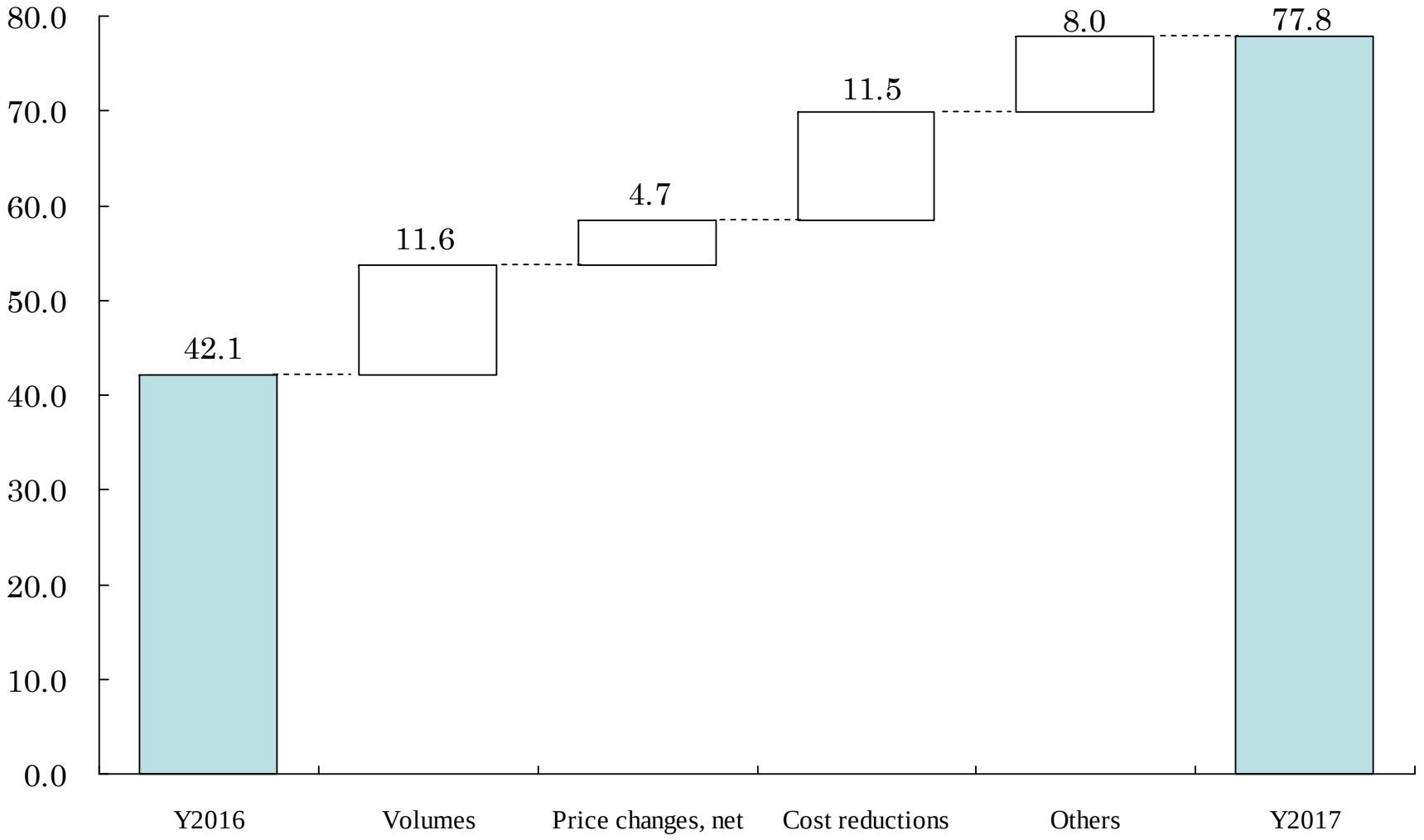
Sales and Operating Income by Segment



(note) From 2017 SDK changed the segmentation (LIB materials is transferred from "Others" to "Electronics") . Figures of 2016 are based on the new segmentation.

Operating Income Breakdown by Factor

(Unit: Billions of Yen)



Consolidated Balance Sheet

(Unit: Billions of Yen)

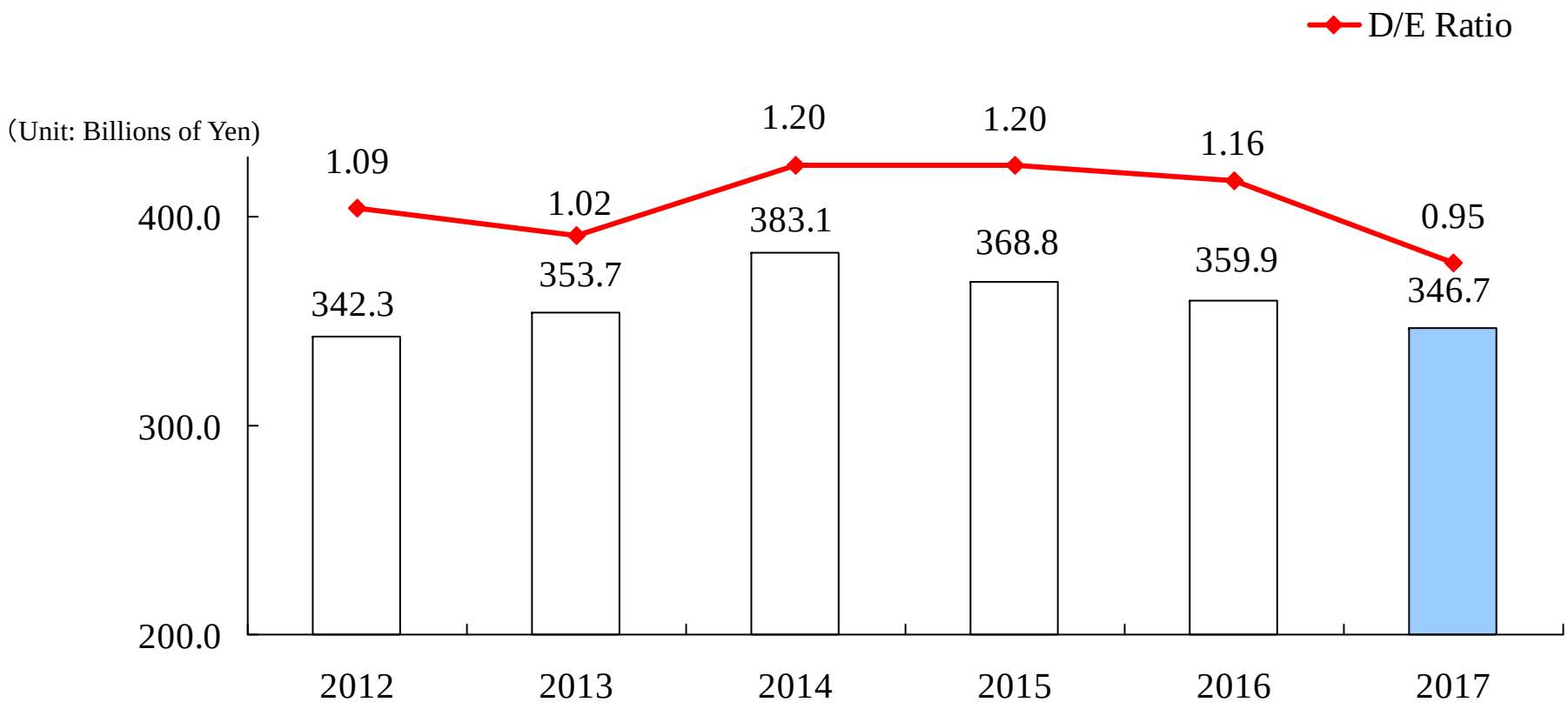
Assets	Dec. 31, 2016	Dec. 31, 2017	Increase/ decrease	Liabilities and Net Assets	Dec. 31, 2016	Dec. 31, 2017	Increase/ decrease
Cash and deposits	69.9	77.2	7.3	Notes and accounts payable	104.0	120.8	16.8
Notes and accounts receivable	143.8	176.0	32.2	Interest-bearing debt	359.9	346.7	-13.2
Inventories	91.3	114.9	23.6	Net defined benefit liability	21.9	19.0	-3.0
Other current assets	30.0	37.2	7.2	Other liabilities	135.6	173.3	37.7
Total Current Assets	335.1	405.3	70.3	Total Liabilities	621.5	659.7	38.3
Buildings and structures	77.4	85.5	8.1	Capital stock	140.6	140.6	0
Machinery and equipment	110.2	151.6	41.4	Capital surplus	62.0	61.7	-0.4
Land	242.8	245.1	2.2	Retained earnings	65.4	96.1	30.8
Other tangible fixed assets	56.7	23.7	-33.0	Treasury stock	-10.5	-10.5	-0
Total Tangible Fixed Assets	487.1	505.9	18.8	Total Shareholders' equity	257.5	287.9	30.4
Intangible Fixed Assets	11.7	12.4	0.7	Valuation difference on available-for-sale securities	4.5	16.5	12.0
Investments and other assets	98.8	101.1	2.3	Deferred gains or losses on hedges	0.3	3.8	3.5
incl. investment securities	75.0	89.2	14.2	Revaluation reserve for land	31.0	29.5	-1.5
				Foreign currency translation adjustment	14.2	15.5	1.2
				Remeasurements of defined benefit plans	-11.0	-4.7	6.3
				Total accumulated other comprehensive income	39.1	60.6	21.5
				Non-controlling interests	14.7	16.5	1.9
Total fixed assets	597.6	619.4	21.8	Total net assets	311.2	365.0	53.8
Total Assets	**932.7**	**1,024.7**	**92.0**	**Total Liabilities and Net Assets**	**932.7**	**1,024.7**	**92.0**

Total Assets
Interest-bearing Debt and D/E ratio

(Unit: Billions of Yen)

	Dec. 31, 2016	Dec. 31, 2017	Increase/ decrease
● Total assets	932.7	1,024.7	92.0
● Interest-bearing debt	359.9	346.7	-13.2
● Debt/Equity ratio	1.16 times	0.95 times	-0.21p
● Stockholders' Equity ratio	31.8%	34.0%	2.2p

Interest-bearing Debt



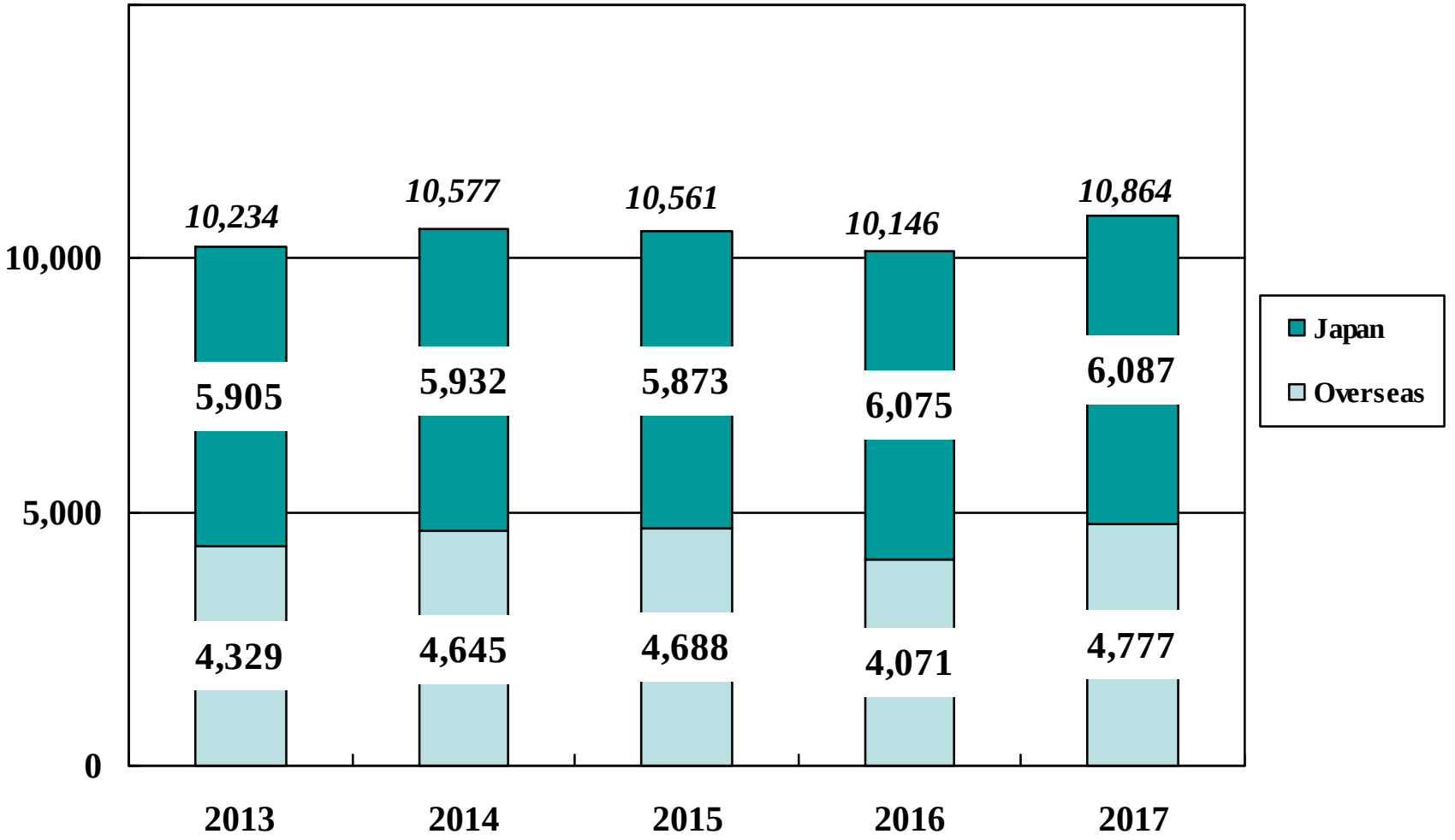
Equity ratio	29.2%	30.6%	29.7%	31.5%	31.8%	34.0%

Consolidated Cash Flows

(Unit: Billions of Yen)

	2016	2017	Increase/ decrease
●CF from Operating Activities	68.9	67.3	-1.7
●CF from Investing Activities	-53.8	-29.9	23.8
●Free CF	15.2	37.4	22.2
●CF from Financing Activities	-13.2	-18.4	-5.2
●Others	-0.4	1.6	2.0
Increase/decrease of cash and equivalents	1.6	20.6	19.1

Total number of employees and breakdown by location



Japan	57.7%	56.1%	55.6%	59.9%	56.0%
Overseas	42.3%	43.9%	44.4%	40.1%	44.0%

Capital expenditures/ Depreciation by Segment

(Unit: Billions of Yen)

	2016		2017		Increase/decrease	
	Capital expenditures	Depreciation	Capital expenditures	Depreciation	Capital expenditures	Depreciation
Petrochemicals	3.4	5.7	2.8	6.9	-0.6	1.1
Chemicals	12.9	7.4	9.6	8.5	-3.3	1.1
Electronics	7.6	12.9	11.2	9.6	3.6	-3.3
Inorganics	8.2	4.1	7.8	5.5	-0.4	1.4
Aluminum	5.2	5.7	8.0	5.4	2.8	-0.3
Others	1.9	3.0	1.8	2.7	-0.1	-0.3
Total	39.3	38.8	41.3	38.5	2.0	-0.3

(note) From 2017 SDK changed the segmentation (LIB materials was transferred from “Others” to “Electronics”) . Figures of 2016 are based on the new segmentation.

Selected Data 2017, 2018 Forecast (Consolidated)

(*Unit: Billions of Yen)

	2016	2017	2017-2016 Increase/ decrease	2018 Forecast	2018-2017 Increase/ decrease
●Exchange rate: ¥/US$	108.8	112.2	3.4	110.0	-2.2
¥/€		126.7		130.0	3.3
●Domestic naphtha price: ¥/KL	32,800	40,400	7,600	41,600	1,200
●Aluminum LME price: US$/T	1,610	1,979	370	2,250	271
●Interest-bearing debt*	359.9	346.7	-13.2	335.0	-11.7
●Interest/dividend income less interest expenses*	-1.6	-1.2	0.4	-1.6	-0.4
●R&D expenditures*	17.3	18.5	1.2	20.8	2.2
●Number of employees: people	10,146	10,864	718	10,874	10
●Total employment cost*	70.2	74.3	4.0	78.3	4.1

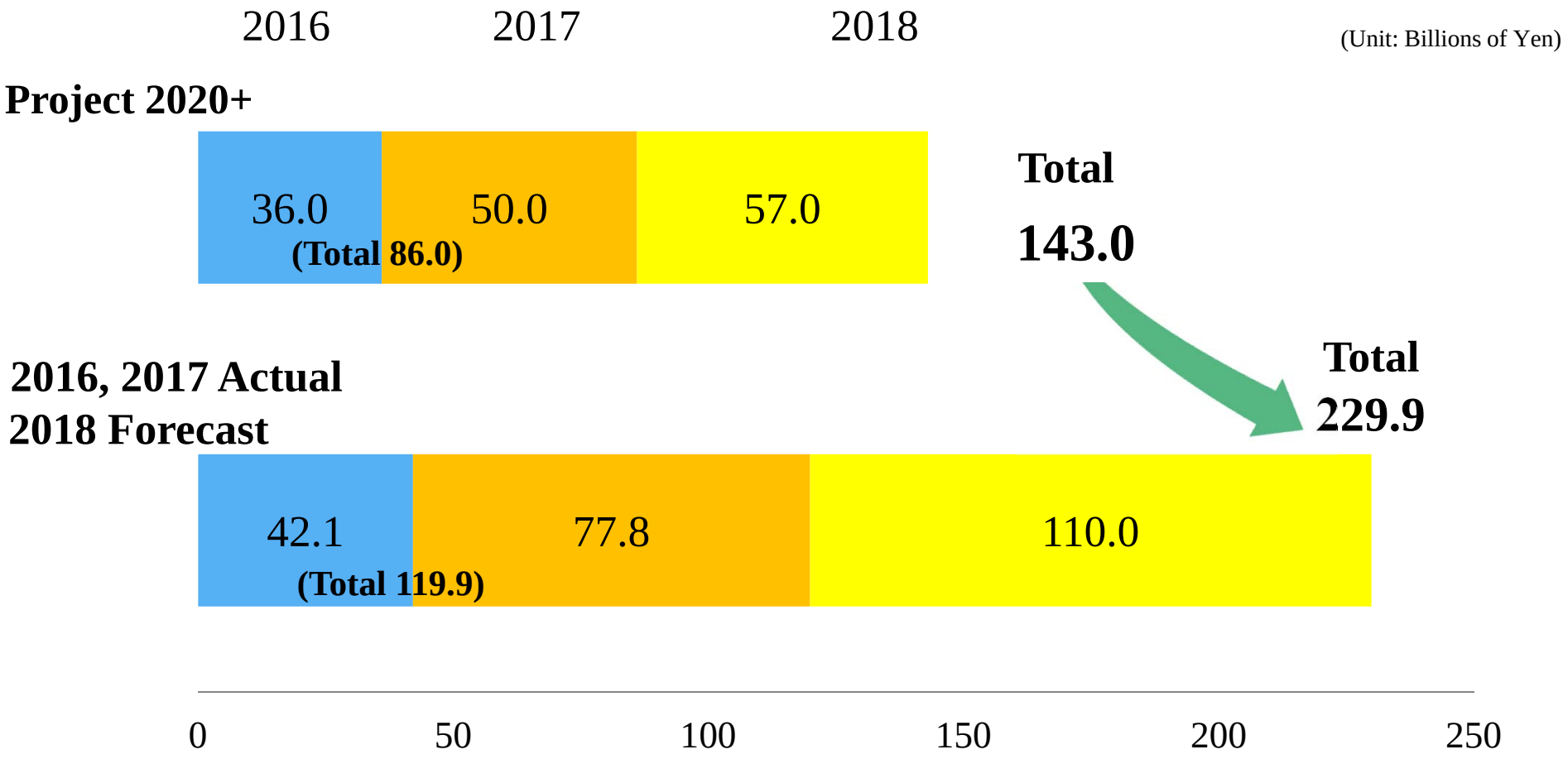
2018 Forecast (Consolidated)

(Unit: Billions of Yen except Cash dividends per Share and Net income per Share)

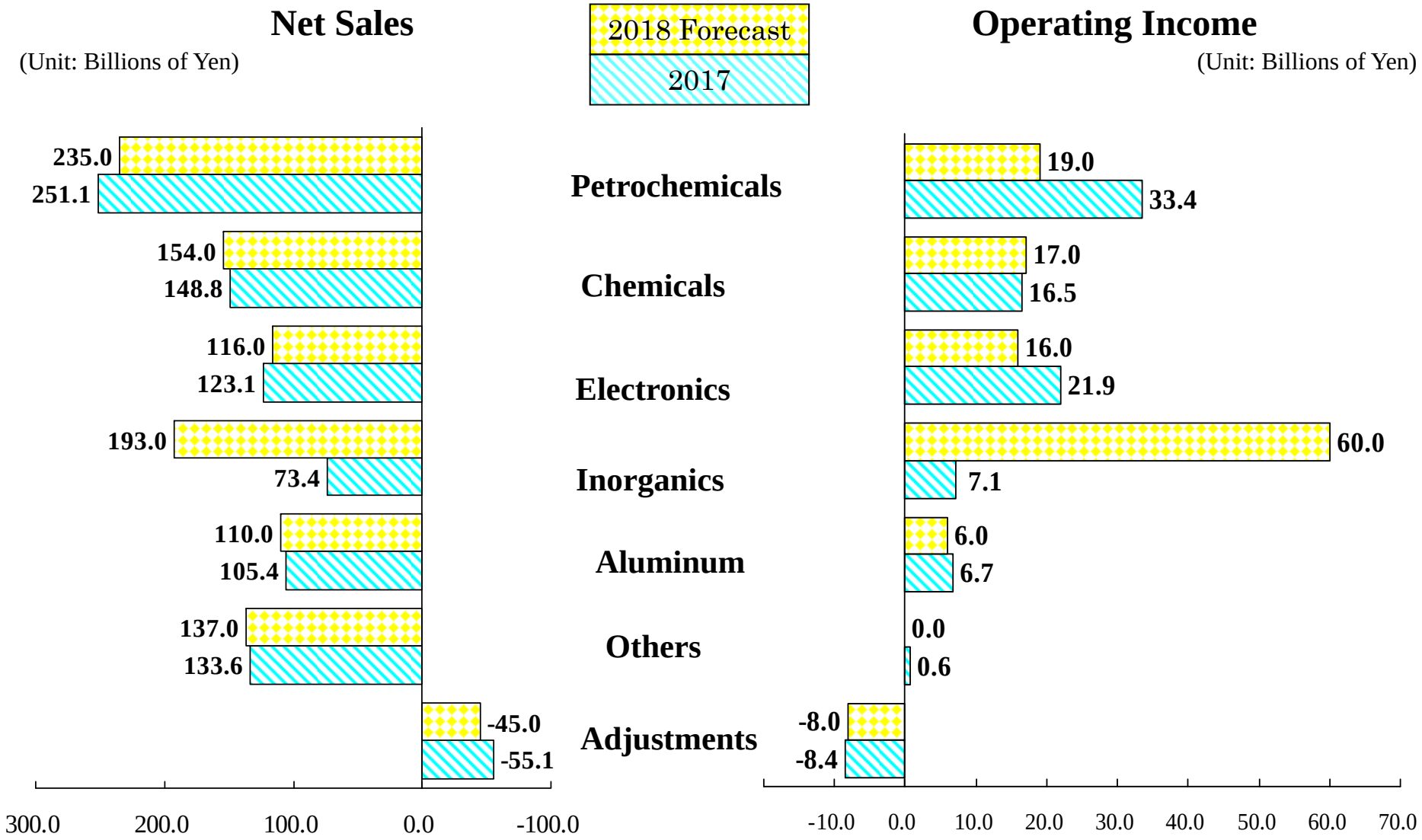
	2017	2018 Forecast	Increase/ decrease	2018 Forecast	
				1st Half	2nd Half
Net Sales	780.4	900.0	119.6	417.0	483.0
Operating Income	77.8	110.0	32.2	41.0	69.0
Non-operating income and expenses	-13.9	-4.0	9.9	-2.0	-2.0
Ordinary Income	64.0	106.0	42.0	39.0	67.0
Extraordinary Profit	-17.3	-12.0	5.3	-6.0	-6.0
Extraordinary Loss					
Net income attributable to owners of the parent	33.5	65.0	31.5	23.0	42.0
Net income attributable to owners of the parent per share	¥234.84	¥456.05	¥221.21		

Term-end cash dividends per share	¥50 (planned)	¥70	—

Progress in Cumulative Operating Income under Project 2020+



Sales and Operating Income
Forecast for 2018



Net Sales by Segment, 2018 Forecast (Consolidated)

(Unit: Billions of Yen)

	2017	2018 Forecast	Increase/ decrease	Comments	2018 Forecast	
					1st Half	2nd Half
Petro-chemicals	251.1	235.0	-16.1	Olefins, Organic chemicals: sales decrease expected (shipment volumes down due to shutdown maintenance, market price of C4 fraction down)	103.0	132.0
Chemicals	148.8	154.0	5.2	Electronic chemicals: sales increase expected (shipment volumes up) Functional chemicals: sales increase expected (shipment volumes up)	74.0	80.0
Electronics	123.1	116.0	-7.1	HDs: sales decrease expected (shipment volumes for 1st half down)	54.0	62.0
Inorganics	73.4	193.0	119.6	Ceramics: sales decrease expected (shipment volumes of alumina down) Graphite electrodes: sales increase expected (shipment volumes up, market price up, the effect of consolidation of SHOWA DENKO CARBON Holding GmbH expected for a full year)	88.0	105.0
Aluminum	105.4	110.0	4.6	Rolled products: sales increase expected (metal prices up, shipment volumes up) Aluminum specialty components: metal prices up Aluminum cans: sales increase expected (shipment volumes of Hanacans up)	53.0	57.0
Others	133.6	137.0	3.4		67.0	70.0
Adjustments	-55.1	-45.0	10.1		-22.0	-23.0
Total	780.4	900.0	119.6		417.0	483.0

Operating Income, 2018 Forecast (Consolidated)

(Unit: Billions of Yen)

	2017	2018 Forecast	Increase/ decrease	Comments	2018 Forecast	
					1st Half	2nd Half
Petro-chemicals	33.4	19.0	-14.4	Olefins, Organic chemicals: profit decrease expected (shutdown maintenance, market price of C4 fraction down)	4.0	15.0
Chemicals	16.5	17.0	0.5	Electronic chemicals: profit increase expected (shipment volumes up) Industrial gases: slight profit decrease expected Basic chemicals, Functional chemicals: profit will be maintained at the previous year's level	7.0	10.0
Electronics	21.9	16.0	-5.9	HDs: profit decrease expected (shipment volumes for 1st half down) LED, Rare earths: slight profit increase expected LIB materials: profit increase expected (shipment volumes up)	5.0	11.0
Inorganics	7.1	60.0	52.9	Ceramics: profit increase expected (shipment volumes for electronic materials up) Graphite electrodes: significant profit increase expected (shipment volumes up, market price up, the effect of consolidation of SHOWA DENKO CARBON Holding GmbH expected for a full year)	27.0	33.0
Aluminum	6.7	6.0	-0.7	Rolled products: profit will be maintained at the previous year's level Aluminum specialty components: slight profit decrease expected Aluminum cans: slight profit increase expected (Japan: profit decrease expected (metal prices up), Hanacans: profit increase expected (shipment volumes up))	2.5	3.5
Others	0.6	0	-0.6		-0.5	0.5
Adjustments	-8.4	-8.0	0.4		-4.0	-4.0
Total	77.8	110.0	32.2		41.0	69.0

Consolidated Cash Flows, 2018 Forecast

(Unit: Billions of Yen)

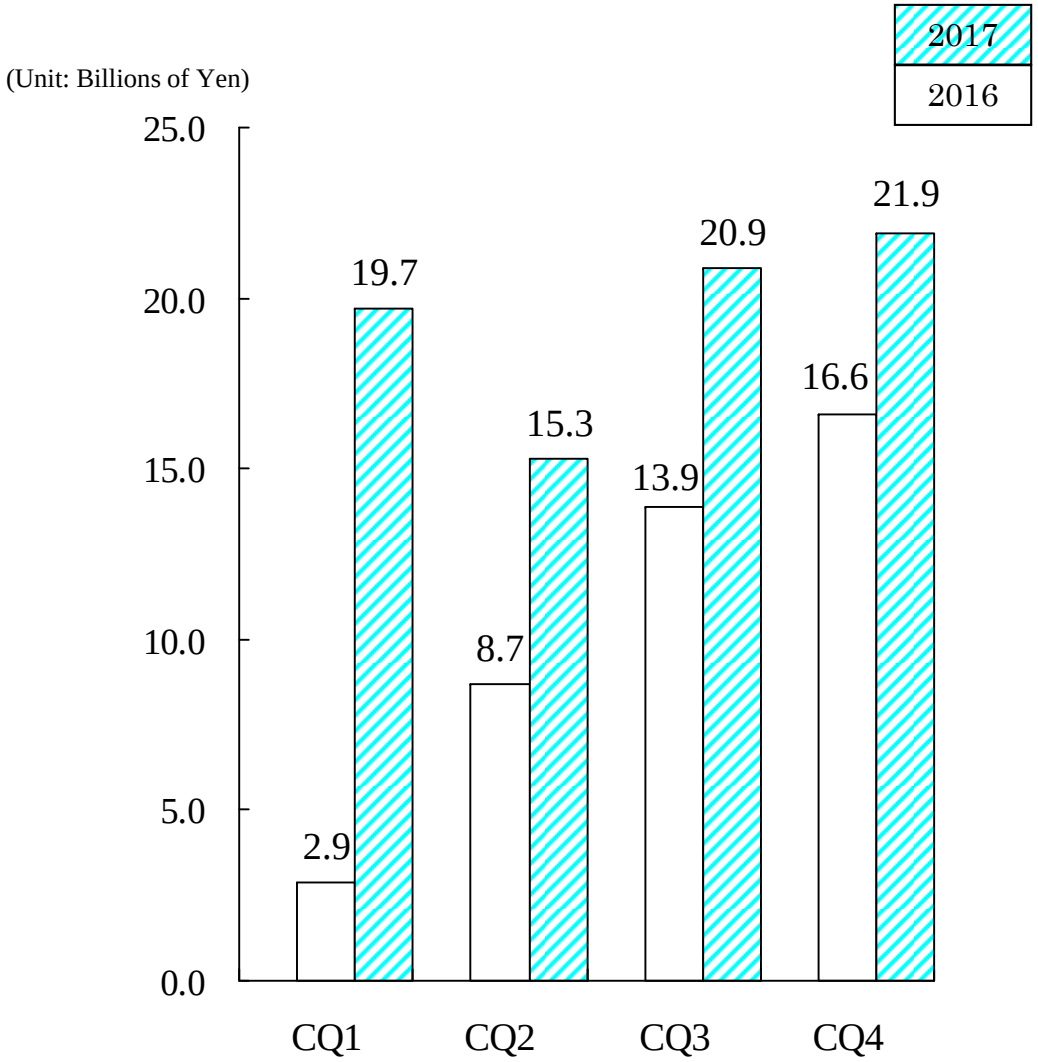
	2017	2018 Forecast	Increase/ decrease
●CF from Operating Activities	67.3	100.0	32.7
●CF from Investing Activities	-29.9	-70.0	-40.1
●Free CF	37.4	30.0	-7.4
●CF from Financing Activities	-18.4	-27.6	-9.2
●Others	1.6	-0.1	-1.7
Increase/decrease of cash and equivalents	20.6	2.3	-18.3

Capital expenditures/Depreciation by Segment
2018 Forecast

(Unit: Billions of Yen)

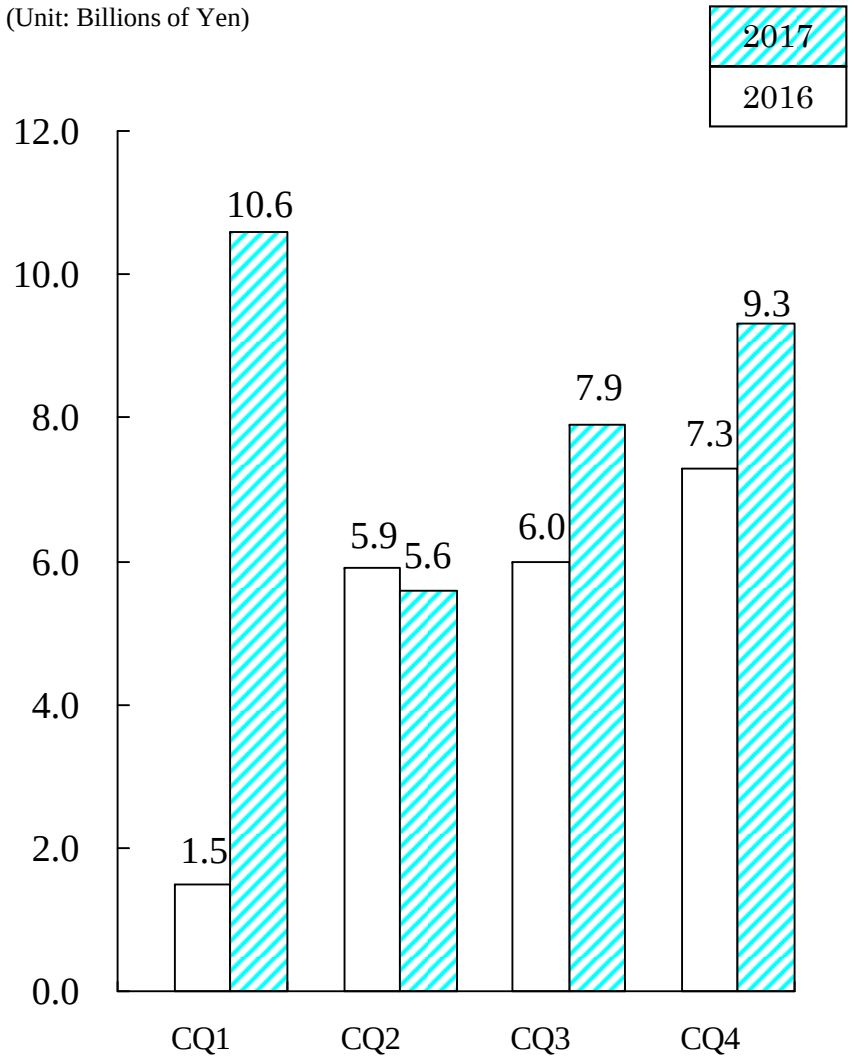
	2017		2018 Forecast		Increase/decrease	
	Capital expenditures	Depreciation	Capital expenditures	Depreciation	Capital expenditures	Depreciation
Petrochemicals	2.8	6.9	5.8	5.2	3.0	-1.7
Chemicals	9.6	8.5	10.9	9.0	1.3	0.5
Electronics	11.2	9.6	11.5	9.8	0.2	0.2
Inorganics	7.8	5.5	8.6	7.8	0.8	2.4
Aluminum	8.0	5.4	7.0	5.9	-1.0	0.5
Others	1.8	2.7	5.2	2.8	3.4	0.1
Total	41.3	38.5	49.0	40.4	7.8	2.0

(Reference) Quarterly Operating Income

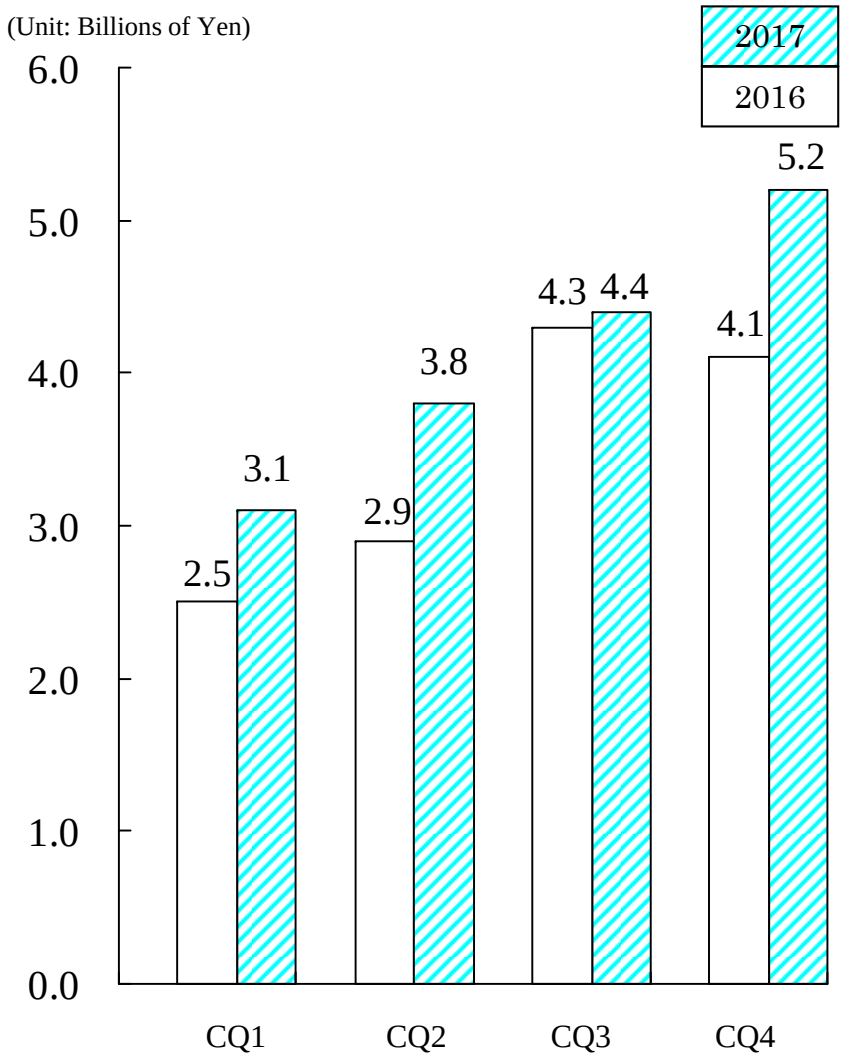


(Reference) Quarterly Operating Income by Segment

《Petrochemicals》



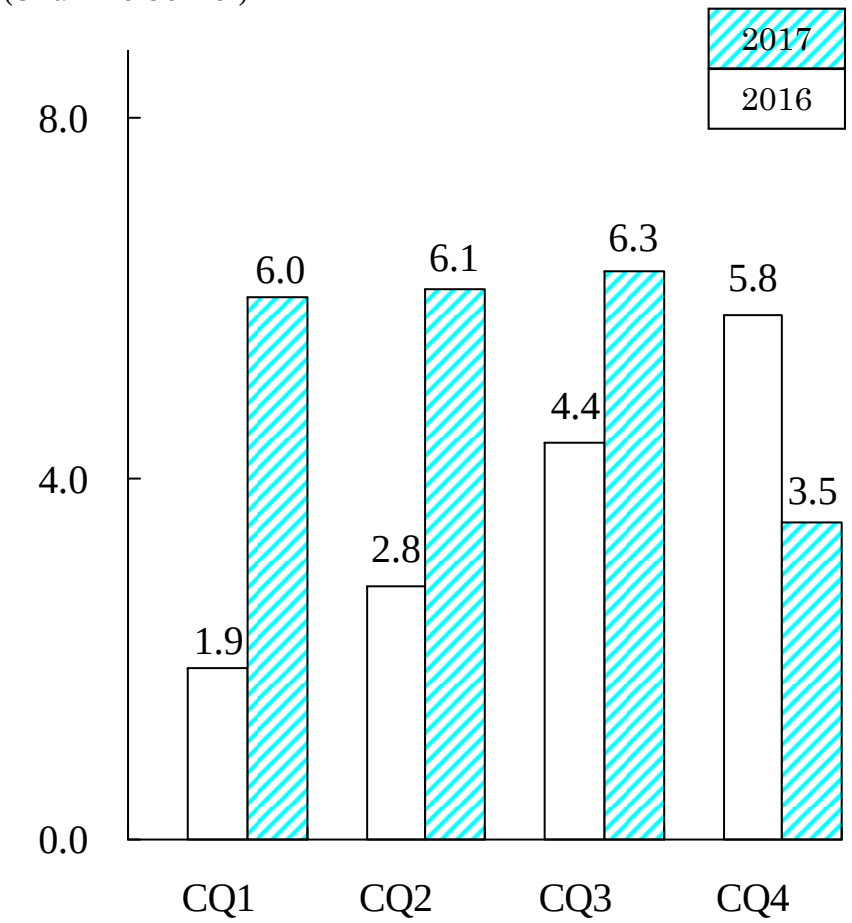
《Chemicals》



(Reference) Quarterly Operating Income by Segment

《Electronics》

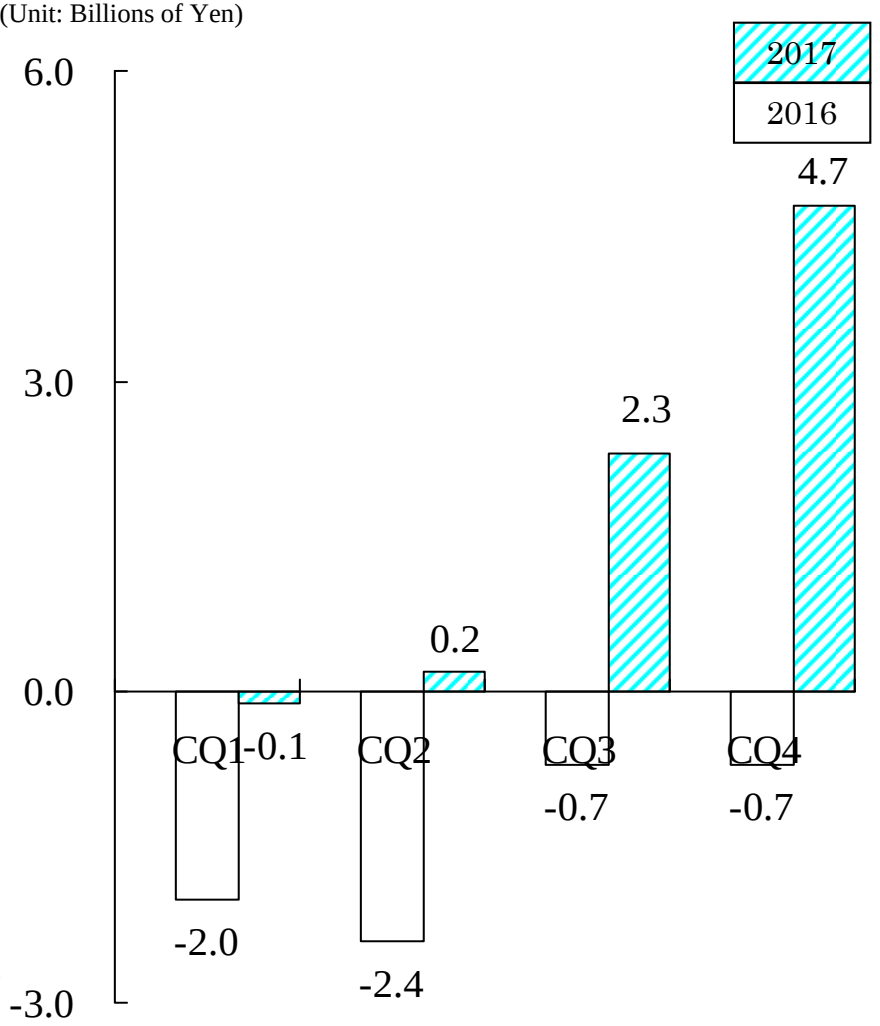
(Unit: Billions of Yen)



(note) From 2017 SDK changed the segmentation (LIB materials was transferred from "Others" to "Electronics") . Figures of 2016 are based on the new segmentation.

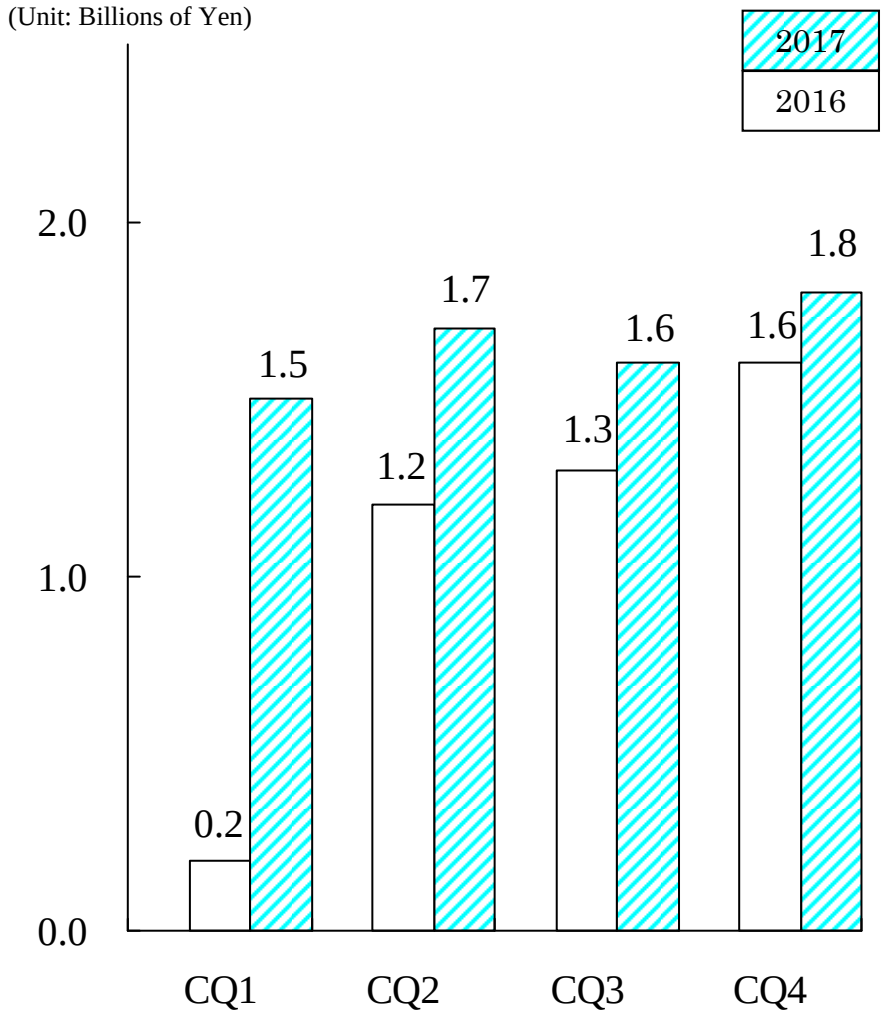
《Inorganics》

(Unit: Billions of Yen)

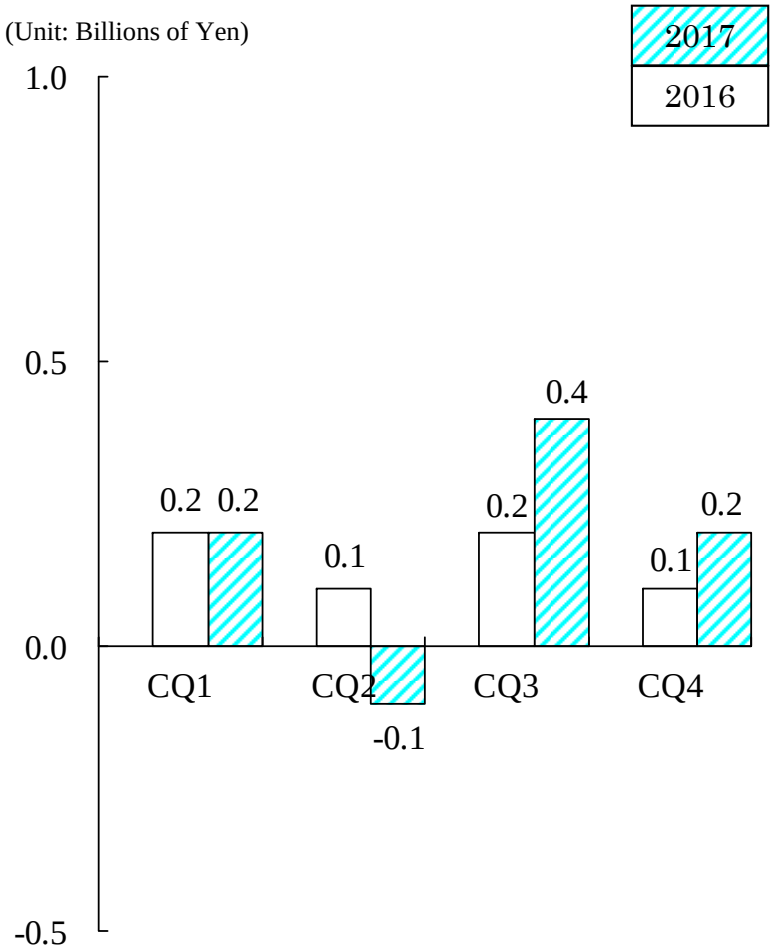


(Reference) Quarterly Operating Income by Segment

《Aluminum》



《Others》



(note) From 2017 SDK changed the segmentation (LIB materials was transferred from "Others" to "Electronics") . Figures of 2016 are based on the new segmentation.

Delay in announcement of 2016 financial results and other related documents

SDK once postponed announcement of its consolidated financial results for the year ended in December 2016, and finally announced them on April 25, 2017. This delay was caused by the occurrence of necessity to investigate details of transactions between BE International Corporation (BE, a subsidiary of Shoko Co., Ltd.) and its specific customer. Shoko Co., Ltd. (Shoko) is a consolidated subsidiary of SDK.

In order to examine the issue from professional and objective point of view, Shoko established the Special Examination Committee including outside experts. On April 17, 2017, Shoko disclosed the results of the examination reported by the Committee. In the report, the Special Examination Committee concluded that the subject of the relevant transactions had no substance, no one among officers/employees of Shoko or BE had the perception that the subject of transactions had no substance, those transactions were only circulation of funds, and there was no similar transaction at Shoko or its subsidiaries.

SDK accordingly amended accounting of those transactions as normal commercial transactions which were posted as sales, submitted its annual securities report for the 108th business term and amended prior-year annual securities reports to Kanto Local Finance Bureau on April 25, 2017. On the same day, SDK also disclosed 2016 financial statements and amended prior-year financial statements.

Under these circumstances, SDK could not report its business report and consolidated financial statements for the fiscal year ended in December 2016 to the 108th ordinary general meeting of shareholders held on March 30, 2017, which was based on the record date of December 31, 2016, and decided to abandon payment of year-end dividend to shareholders. However, SDK had an extraordinary general meeting of shareholders on June 27, 2017 based on the record date of May 11, 2017, submitted business report, consolidated financial statements, and other related documents for the fiscal year ended in December 2016, and paid dividend of ¥30 per share.

Shoko submitted the “Report on the Reform Plan” on June 26, 2017 and the “Report on the State of the Implementation of the Reform Plan” on December 27, 2017, both of which had been required by the Tokyo Stock Exchange, and reported the details of the issue and the results of the special examination. Shoko will implement its plan for improvement including establishment of procedure for M&A, revision of its rules on credit management, and strengthening of the organization responsible for internal control and inspection, as scheduled in the Report on the Reform Plan.

SDK will give full support to Shoko’s implementation of the Reform Plan, recognize strengthening of group-wide risk management function as an urgent task, and further strengthen internal control of the Showa Denko Group.

Topics

[General]

- **Received “2017 Top 100 Global Innovators” Award, 3 years in a row**

In January 2018, SDK received “The Clarivate Analytics 2017 Top 100 Global Innovators” award. Clarivate Analytics, formerly the Intellectual Property & Science business of Thomson Reuters, selected the top 100 global innovation-leading companies and organizations by utilizing strict and objective data compiled from its value-added patent citation database which is the world’s largest one in this category, its intellectual property intelligence platform, and the company’s original basis for evaluation. In the screening process of the award, Clarivate Analytics used scientific and objective methodology involving four main criteria of “patent volume,” “application-to-grant success,” “globalization” and “citation influence.” The Showa Denko Group has designated its intellectual property strategy as an important part of its overall business strategies. The Group will continue its intellectual property strategy through close integration with business and R&D strategies.

- **Incorporated into ESG indexes for investment**

In July 2017, SDK was incorporated into three ESG indexes for investment: “FTSE Blossom Japan Index” provided by FTSE International Limited and Frank Russel Company (FTSE Russell, a member of London Stock Exchange Group); and “MSCI Japan ESG Select Leaders Index” and “MSCI Japan Empowering Women Index” provided by MSCI Incorporated (MSCI). FTSE Russell and MSCI are world-famous index providers, and ESG stands for “environmental, social and governance.” Government Pension Investment Fund (GPIF) of Japan has adopted these three ESG indexes as benchmarks to conduct full-scale ESG conscious investment. FTSE Blossom Japan Index is designed to provide market participants with a tool to identify and measure the performance of Japanese companies that demonstrate strong environmental, social and governance (ESG) practices. MSCI Japan ESG Select Leaders Index is constructed using the MSCI Japan IMI Top 500 Index (parent index) and targets best ESG performers among issues included in the parent index. MSCI Japan Empowering Women Index evaluates companies promoting and maintaining gender diversity. In addition to these three ESG indexes, SDK has been included in the “Morningstar Socially Responsible Investment (SRI) Index,” which is provided by Morningstar Japan K.K., for four consecutive years and the “SNAM Sustainability Index,” which is provided by Sompo Japan Nipponkoa Asset Management Co., Ltd., for six consecutive years.

Topics

[General]

● Acquired Highest-Level BCM Rating from DBJ again

SDK has acquired the highest-level rating from Development Bank of Japan Inc. (DBJ) for its efforts concerning disaster prevention and business continuity management (BCM). SDK acquired this rating for the second time in a row, following its first acquisition in 2012. SDK received a loan from DBJ based on this rating in December 2017. DBJ evaluates firms' efforts to prepare disaster prevention plans and strengthen BCM, as a means for minimizing damage to business assets and for enabling business continuation and smooth rehabilitation. This time, SDK is awarded the highest-level BCM rating in recognition of various steps it has taken. These steps include continuous risk reduction through comprehensive risk evaluation each year, and preparation/renewal of business continuity plans considering characteristics of products and business. SDK has also been recognized for its close cooperation over many years with local governments in the area of disaster prevention. The Showa Denko Group will continue its efforts to establish a business system resistant to disaster at home and abroad, thereby contributing toward creating a society where affluence and sustainability are harmonized.

[Chemicals segment]

● Established a subsidiary to sell high-purity gases for electronics in the US

In July 2017, SDK established a wholly-owned subsidiary, "Showa Chemicals of America Inc." (SCA), in Austin, Texas, aiming to strengthen its sale of high-purity gases for electronics in the United States. American semiconductor manufacturers have 15-percent share of the global semiconductor production capacity. SDK established SCA in order to further expand its high-purity gas business in the US, strengthen relationship between SDK and major semiconductor manufacturers in the US, and gather information about state-of-the-art semiconductor-processing technologies. SCA will start sale of high-purity gases in 2018. SDK sells various high-purity gas products in many areas where manufacturers of semiconductors and display panels are located. SCA will function as the Showa Denko Group's base in the US to promote marketing, sale and distribution of high-purity gas products.

Topics

[Chemicals segment]

- **Decided to found new liquefied CO_2 gas plant in Oita Petrochemical Complex**

  In August 2017, Showa Denko Gas Products Co., Ltd. (SGP), a consolidated subsidiary of SDK, decided to found a new plant to produce liquefied carbon dioxide (CO_2) gas in Oita Petrochemical Complex. The new plant will have annual production capacity of 15,000 tons, and the foundation of it is scheduled to be completed by the end of 2018. The supply-demand situation for liquefied CO_2 gas and dry ice is expected to be even tighter in the future. To cope with this problem and maintain stable supply of liquefied CO_2 gas and dry ice to our customers in Kyusyu, Chugoku, and Shikoku regions, SDK and SGP decided to found the new plant. SDK and SGP plan to make the new plant utilize stable CO_2 gas sources in the chemical plant of the Complex.

- **Established fourth bulk molding compound plant in Asia**

  In September 2017, Showa Denko New Material (Zhuhai) Co., Ltd. (SDNZ), a consolidated subsidiary of SDK, had a ceremony for the completion of its new plant to produce thermosetting bulk molding compound (BMC) in Zhuhai, Guangdong Province, China. The Showa Denko Group formerly had BMC production bases at three locations, namely, in Japan, Shanghai and Thailand. The production base in Shanghai has been supplying BMC to customers mainly in East China, and has been operating at full capacity because sales of BMC in China have been rapidly increasing centering on the application for automobiles and home electrical appliances. The new plant of SDNZ will supply BMC to customers mainly in South China. SDK Group will make its BMC production system, which comprises four production bases located in Japan, Shanghai, Zhuhai and Thailand, ready to be operated at full capacity as soon as possible, and aggressively expand its functional chemicals business especially in China and ASEAN region where rapid growth of the market is expected.

Topics

[Electronics segment]

- **Started shipment of 2.5-inch 1 TB HD media, best in class**

In September 2017, SDK started shipment of 2.5-inch hard disk (HD) media with storage capacity of 1 terabyte (TB) per platter, which featured the world's highest storage capacity for this size available on the market[*1]. SDK's 2.5-inch 1 TB HD media, which use the ninth-generation perpendicular magnetic recording (PMR) technology, was adopted into Toshiba Electronic Devices & Storage Corporation's hard disk drive (HDD), "MQ04ABF100," for client. In December 2017, SDK also started shipment of 3.5-inch hard disk (HD) media for storage capacity of 1.5-1.8 terabyte (TB) per platter, which featured the world's highest storage capacity for this size available on the market[*2]. SDK's 3.5-inch 1.5-1.8 TB HD media, which use the ninth-generation perpendicular magnetic recording (PMR) technology, was adopted into Toshiba Electronic Devices & Storage Corporation's hard disk drive (HDD) for near-line storage, "MG07ACA Series," which was the world's first[*3] HDD to achieve total storage capacity of 14 TB with Conventional Magnetic Recording (CMR)[*4]. In 2005, SDK became the world's first to manufacture and sell PMR-technology-based HD media, and now is the largest independent supplier of HD media. SDK will continue to strengthen its HD media business in accordance with the company's motto of "Best in Class."

*1: As of September 25, 2017, according to our research

*2: As of December 20, 2017, according to our research

*3: As of December 8, 2017

*4: Conventional Magnetic Recording (CMR): CMR HDD uses PMR-technology-based HD media and realizes high-density data recording without using Shingled Magnetic Recording (SMR) technology.

Topics

[Electronics segment]

- **Expanded lineup of infrared LEDs for high-output uses**

In August 2017, SDK expanded its product lineup of infrared LED chips (IR-LEDs), which are mainly used as parts of photo-couplers for gate drivers in power semiconductor modules and parts of sensors for IoT-related devices. SDK's product lineup of IR-LEDs has three categories, namely, conventional LEDs made with Liquid Phase Epitaxy (LPE) method*1, transparent type LEDs and reflection type LEDs made with Metal Organic Chemical Vapor Deposition (MOCVD) method*2. This time, SDK upgraded its technology to manufacture reflection type LEDs, and successfully added "Double Junction Reflection Type LED" and "P-up Reflection Type LED*3" to its product lineup of IR-LEDs. Double Junction Reflection Type LED realizes output nearly twice as much as that of conventional reflection type LED. It is suitable for uses that require high output LEDs such as biometric sensors, surveillance or security cameras, virtual reality, and sensors for automotive equipment. P-up Reflection Type LED is a product which realizes the P-up polarity structure in Reflection Type LED, where N-up structure manufactured through LPE method is the main stream. SDK developed this P-up Reflection Type LED in order to respond to the requests from customers who desire to develop high-power modules which are compatible with circuit designs for conventional P-up non-reflection type LEDs, which are manufactured through LPE method. The market for IR-LEDs is expected to expand concurrently with the expansion of IoT-related device market. SDK will continue to expand its lineup of LED products, and respond to the needs of the market.

*1: LPE method: Liquid Phase Epitaxy method. Under this crystal growth method, solid phase crystal crystalizes and grows on a substrate dipped into the solution of the target material. Due to the rapid growth of crystal, this method easily realizes thick film.

*2: MOCVD method: Metal Organic Chemical Vapor Deposition method. Under this crystal growth method, an organometallic compound is vaporized, and crystal of the target material grows on a substrate in the gas. Through proper control of the flow of the gas containing vaporized organometallic compound, you can form homogenous thin crystal efficiently.

*3: P-up: An LED chip consists of P-side electrode and N-side electrode. "P-up" indicates an LED chip with P-side electrode on the top.

Topics

[Inorganics segment]

- **Completed acquisition of all shares in SGL GE, a graphite electrode production company**

  By late September 2017, SDK obtained approval from all required competition authorities for its acquisition of all shares in SGL GE Holding GmbH (SGL GE), a graphite electrode production company, from its parent company, SGL Carbon GmbH, which is a wholly owned subsidiary of SGL Carbon SE, a world carbon and graphite product manufacturer based in Germany. Effective on October 2, 2017, SDK completed acquisition of all shares in SGL GE and made it a wholly owned subsidiary of SDK. The acquired company's name was changed to "SHOWA DENKO CARBON Holding GmbH" as of the same date. Through the business integration of this time, SDK now has graphite electrode production bases in Europe and Southeast Asia, in addition to its existing bases in Japan, the US and China, and becomes the leading supplier in the global graphite electrode industry. SDK will strive to generate synergy as early as possible, pursue more cost effectiveness, and achieve further growth in a highly competitive market. On the other hand, effective on November 7, 2017, SDK completed transfer of former SGL GE's graphite electrode business in the US to Tokai Carbon Co., Ltd. This transfer was implemented in order to make the acquisition of former SGL GE in line with the condition given by the US competition authorities as a prerequisite to give approval to the acquisition.

- **Decided to sell all of the shares SDK holds in ICA**

  ICA, in which SDK holds a 20% stake, operates an alumina plant located in Tayan District, West Kalimantan, Indonesia. SDK discussed about the way to manage the plant of ICA in the future with ANTAM, which is the parent company of ICA. However, there was still a great difference between the shareholders' opinions on new terms and conditions to revive ICA. Thus SDK judged it is difficult for the two parties to reach an agreement on this matter in the future. In consideration of these circumstances, at the meeting of the Board of Directors held in July 2017, SDK decided to report, in its financial statements for the second quarter of 2017, a loss on investment to companies under the application of equity method (non-operating cost) with regard to ICA, and an extraordinary loss on the whole amount of SDK's surety obligations and long term loans to ICA at the end of June 2017. SDK also decided to sell all of the shares SDK now holds in ICA to ANTAM or a third party, and has been negotiating this issue with ANTAM. With regard to our ceramics business in the future, we will focus on high value-added products including heavy duty grinding materials, filler for electronic parts, and titanium oxides for ceramic capacitors.

Topics

[Aluminum segment]

- **Showa Aluminum Can decided to establish second production base in Vietnam**

In February 2017, Showa Aluminum Can Corporation (SAC), a consolidated subsidiary of SDK, decided to establish its second base in Vietnam to produce aluminum cans, aiming to expand its business in that country. This new production base is to be located in Quang Nam Province, which occupies the mid-portion of Vietnam. Quang Nam Province is contiguous with Da Nang City, the largest city in the mid-portion of Vietnam. Many Vietnamese and foreign beverage manufacturers have decided to establish, or already established their factories in Quang Nam Province. At the new factory, SAC will install a line that can produce 700 million can bodies a year. In addition, synchronizing with this installation, SAC will install an additional line to produce can ends in Hanacans' existing factory in the suburbs of Hanoi in northern Vietnam. Through the installation of these new lines, Hanacans' capacity to produce can bodies and can ends in Vietnam will be expanded to that for 2 billion cans a year by October 2018. Since its acquisition of Hanacans, a can manufacturer of Vietnam, in May 2014, SAC has been introducing its leading-edge production technologies and quality control system into Hanacans, successfully expanding Hanacans' sales in Vietnam. SAC will pursue further expansion of its aluminum can business in Vietnam through quickly and timely offer of products which meet needs of the market.

Topics

[Aluminum segment]

- **Established a new aluminum can JV in Thailand**

  SDK, Showa Aluminum Can Corporation (SAC), which is a consolidated subsidiary of SDK, and Carabao Group Public Company Limited (CBG), which is a beverage maker having second largest market share in the energy drink market of Thailand, established a joint corporation “Asia Can Manufacturing Company Limited” (ACM) to manufacture and sell aluminum cans in June 2017, and had a foundation stone-laying ceremony for its factory in July, 2017. ACM will have can production lines with a capacity to produce 1 billion can bodies per year. After the start-up of operations of the factory which is scheduled for October 2018, ACM will mainly manufacture aluminum cans for CBG’s beverages for export from Thailand. Hanacans Joint Stock Company of Vietnam will have priority rights to supply ACM with can ends. CBG aims to expand its overseas sales, centering on Southeast Asian countries, China and the United Kingdom. ACM will support CBG’s overseas operations through stable supply of high-quality aluminum cans manufactured by leading-edge technologies and quality management system built up by SAC over many years. ACM will be the Showa Denko Group’s second overseas can production base following Hanacans Joint Stock Company of Vietnam. The Showa Denko Group has been promoting aluminum can business expansion strategy that targets Southeast Asia, and will utilize ACM’s business development for the formation of its best marketing mix in Southeast Asia.

- **Expanded high-purity aluminum foil plant in China**

  SDK increased the capacity of Showa Denko Aluminum (Nantong) Co., Ltd. (SDAN) to produce high-purity aluminum foil, which is a major material for aluminum electrolytic capacitors, from 600 tons per month to 800 tons per month in November 2017. In China, backed by increasing demand for solar batteries and industrial machines for automation, and also backed by rapid electrification of cars, the market for high capacitance and high strength aluminum foil produced by SDAN has been rapidly expanding. Aluminum electrolytic capacitors are used in wide areas such as electric appliances, IT devices, electric vehicles, hybrid cars and equipment for power generation utilizing renewable energy sources. The demand for aluminum electrolytic capacitors is expected to increase especially in the fields of environment and energy.

Topics

[Others segment]

- **Decided to expand capacity for producing high-grade SiC epitaxial wafers**

SDK is now expanding its capacity for producing high-quality-grade silicon carbide (SiC) epitaxial wafers for power devices, which had already been marketed under the trade name of “High-Grade Epi” (HGE), from current 3,000 wafers per month to 5,000 wafers per month[*1] by April 2018. Moreover, in order to respond to a further increase in demand for HGE, SDK decided in January 2018 to re-expand that capacity. After the re-expansion work which is to be finished in September 2018, that capacity will be increased to 7,000 wafers per month. In HGE developed by SDK, the number of surface defects and basal plane dislocation (BPD)[*2], which is typical crystal defect, is controlled to be within 0.1/cm2. Since the launch in October 2015, HGE has been acclaimed by many device manufacturers at home and abroad, and adopted as a key component to produce SiC-MOSFET for practical use. SDK decided to re-expand its capacity to produce HGE because SDK’s facilities to produce HGE are operating at full capacity these days and we expect that our HGE production facility after the first re-expansion work will soon achieve full-capacity operation by the middle of 2018 due to the take-off of the market for SiC-MOSFET. The size of the market for SiC epitaxial wafers for power devices is expected to reach ¥20 billion in 2020[*3] as the early use of SiC power devices in vehicles is under consideration. SDK will continue meeting the need of the market for high-quality SiC epitaxial wafers, aiming to contribute to the improvement in energy efficiency of power devices.

*1: This number is based on a conversion into SiC epitaxial wafers for power devices having withstanding voltage of 1,200 V.

*2: Basal plane dislocation: Dislocation that occurs on a basal plane of a single crystal SiC.

*3: Estimated by SDK.

- **Acquired assets concerning SiC for power devices from Nippon Steel & Sumitomo Metal Group**

SDK acquired assets concerning Sublimation-recrystallization Method to manufacture silicon carbide (SiC) wafers from Nippon Steel & Sumitomo Metal Corporation and Nippon Steel & Sumikin Materials Co., Ltd. at the end of January 2018. Development of full-SiC-based power modules including MOSFET requires SiC wafers with fewer crystal defects and further cost reduction. This time, SDK aims to improve the quality of its SiC epitaxial wafers through the acquisition of SiC-wafer-related assets currently owned by Nippon Steel & Sumitomo Metal Group.

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