



# FY2018

## Progress of Business Strategy

May 17, 2019



**SUMITOMO METAL MINING CO., LTD.**

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# I. Summary



## Summary



Overview of FY2018 Business Performance  
and FY2019 Business Performance Forecast



2015 3-Year Plan Review



2018 3-Year Plan Progress of 3 Main Basic  
Strategies



Supplementary Materials

## 1. Review of FY2018

- Final year of 2015 3-Year Plan
  - Steadily achieved planned items of strategy
  - (1) More decline in grade of copper of overseas copper mines than expected
  - (2) Equipment trouble at Taganito HPAL
- Expected profit was greatly below forecast

### Main strategies implemented during 2015 3-Year Plan

#### Mineral Resources

Expansion of Cerro Verde Copper Mine  
Acquisition of additional interest in Morenci Copper Mine  
Acquisition of interest in Quebrada Blanca Copper Mine  
Participation in Côte Gold project  
Transfer of Pogo Gold Mine

#### Smelting & Refining

Complete 36kt production structure in Taganito HPAL  
Promotion of scandium and chromite recovery commercialization  
Achievement of electrolytic copper production of 450kt  
Complete 49kt nickel sulfate production structure in Harima  
Begin DFS of Pomalaa Project  
Starting demonstration tests of recycling of lithium-ion rechargeable batteries

#### Materials

Complete 4,550 tons/month production structure of battery materials  
Establishment of increased production structure of LT/LN  
Development of nickel oxide powder for use in fuel cell electrodes  
Stock purchase of Silicon carbide (SiC) development company  
Withdrawal from lead frame business

## 2. FY2019 Outlook

- World economy becoming more uncertain
  - Movements of the U.S. against China, Iran, and North Korea
  - Brexit
  - Consumption tax hike (Japan)
- Safety performance: Target (Less than 5 accidents)  
Safety communication of line and safety management based on the Three Realities Principle
- First year of 2018 3-Year Plan
  - Long-term declining trend in copper ore grade of overseas copper mines is inevitable
    - Efficiency improvement, cost reduction promotion
  - Enhancement and improvement of production capabilities and project management capability
    - Full achievement of production and sales plans
  - Proceeding with large-scale projects as planned
    - Strengthening cooperation with partners

## II. Overview of FY2018 Business Performance and FY2019 Business Performance Forecast



Summary



Overview of FY2018 Business Performance and FY2019 Business Performance Forecast



2015 3-Year Plan Review



2018 3-Year Plan Progress of 3 Main Basic Strategies



Supplementary Materials

# 1) Trend of Business Performance

Business performance and  
performance forecast

		Japanese standards [J-GAAP]					[IFRS]		
		2013	2014	2015	2016	2017	2017	2018	2019Forecast
Net Sales		8,305	9,213	8,554	7,861	9,335	9,297	9,122	8,680
Operating Income		754	1,258	597	764	1,102	—	—	—
Recurring Profit		1,144	1,742	-128	-16	1,249	—	—	—
Profit before tax		1,110	1,233	6	-60	1,058	1,083	894	740
Equity Method profit		298	239	-732	-860	114	123	-49	70
Segment Profit	Mineral Resources	691	538	-443	-536	560	580	365	290
	Smelting & Refining	291	813	253	333	515	478	409	390
	Materials	111	129	60	121	153	71	138	100
	Other	16	-1	-8	-1	2	-74	-20	-30
	Diff. Adjustment	35	263	10	67	19	28	2	-10
Net Income (Profit attributable to owners of parent)		803	911	-3	-185	916	902	668	640
Copper (\$/t)		7,104	6,554	5,215	5,154	6,444	6,444	6,341	6,300
Nickel (\$/lb)		6.51	7.62	4.71	4.56	5.06	5.06	5.85	6.00
Gold (\$/Toz)		1,327	1,248	1,150	1,258	1,285	1,285	1,263	1,275
Cobalt (\$/lb)		12.67	13.69	11.73	13.67	30.64	30,64	31.64	18.00
Exchange (¥/\$)		100.24	109.93	120.15	108.40	110.86	110.86	110.92	110.00

## 2) FY2018 Results & FY2019 Forecast

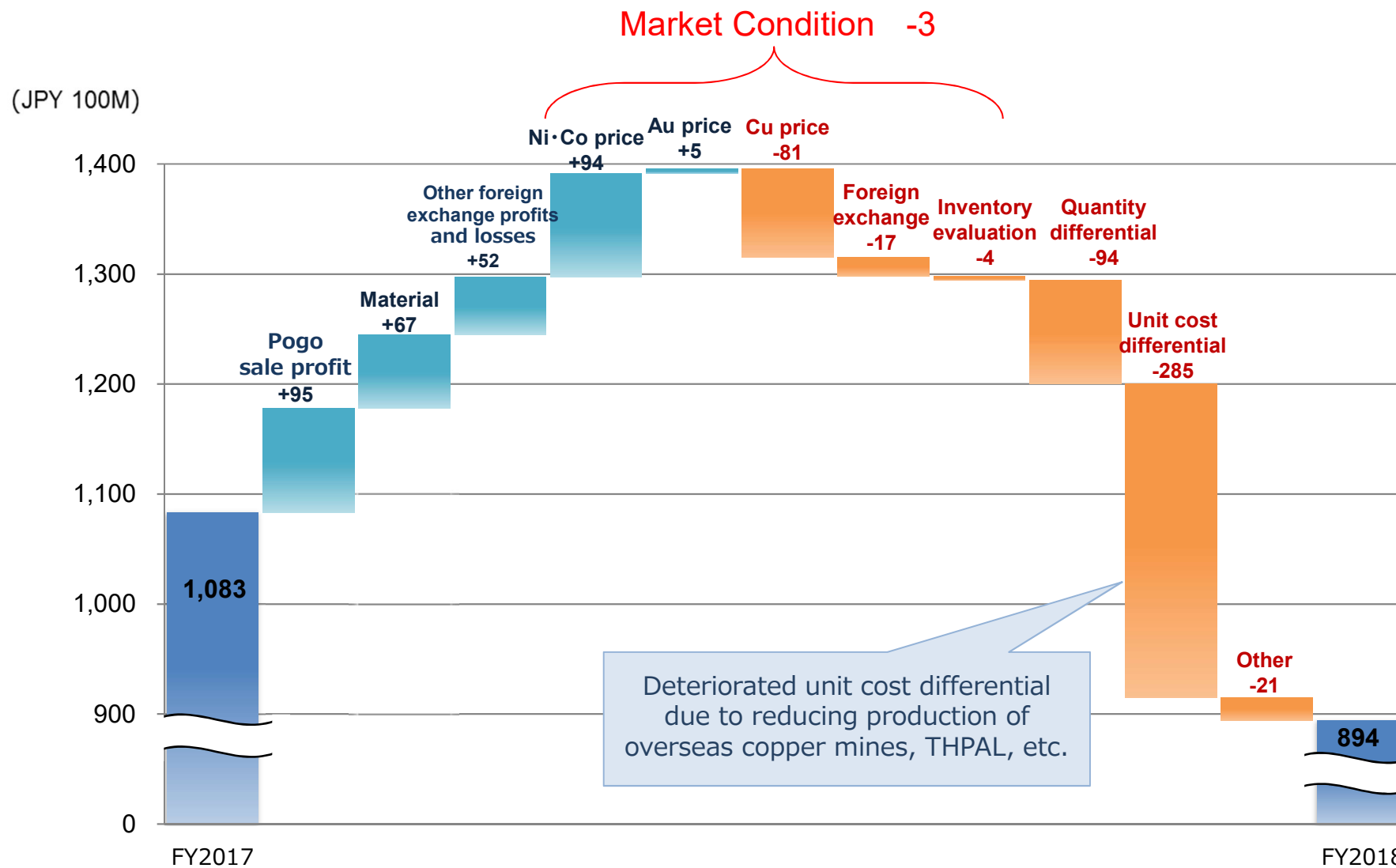
Business performance and  
performance forecast

		2018Result (A)	2017Result (B)	Difference (A) - (B)	2019forecast (C)	Difference (C) - (A)
Net Sales		9,122	9,297	-175	8,680	-442
Gross Operating Profit		1,266	1,490	-224	1,240	-26
Pretax Profit		894	1,083	-189	740	-154
Equity Method profit		-49	123	-172	70	+119
Segment Profit	Mineral Resources	365	580	-215	290	-75
	Smelting & Refining	409	478	-69	390	-19
	Materials	138	71	+67	100	-38
	Other	-20	-74	+54	-30	-10
	Diff. Adjustment	2	28	-26	-10	-12
Net Income (Profit attributable to owners of parent)		668	902	-234	640	-28
Copper (\$/t)		6,341	6,444	-103	6,300	-41
Nickel (\$/lb)		5.85	5.06	+0.79	6.00	+0.15
Gold (\$/Toz)		1,263	1,285	-22	1,275	+12
Cobalt (\$/lb)		31.64	30.64	+1.00	18.00	-13.64
Exchange (¥/\$)		110.92	110.86	+0.06	110.00	-0.92



### 3) Pretax Profit/Loss Analysis FY2018 Results vs FY2017 Results

Business performance and  
performance forecast

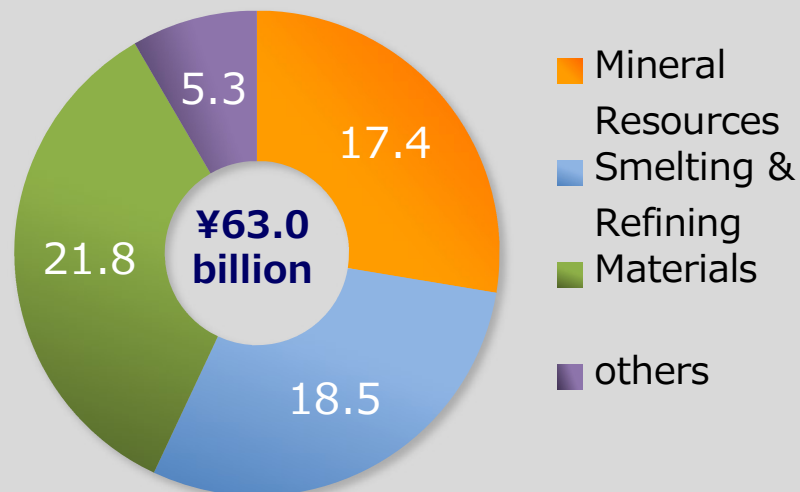


## 4) Capital investment

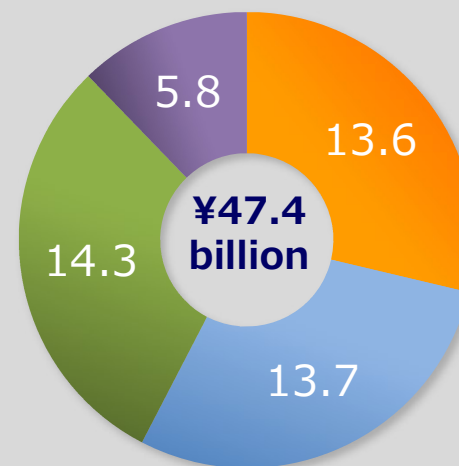
FY2018 Plan vs. Results

Business performance and  
performance forecast

FY2018 Plan (beginning)



FY2018 Results

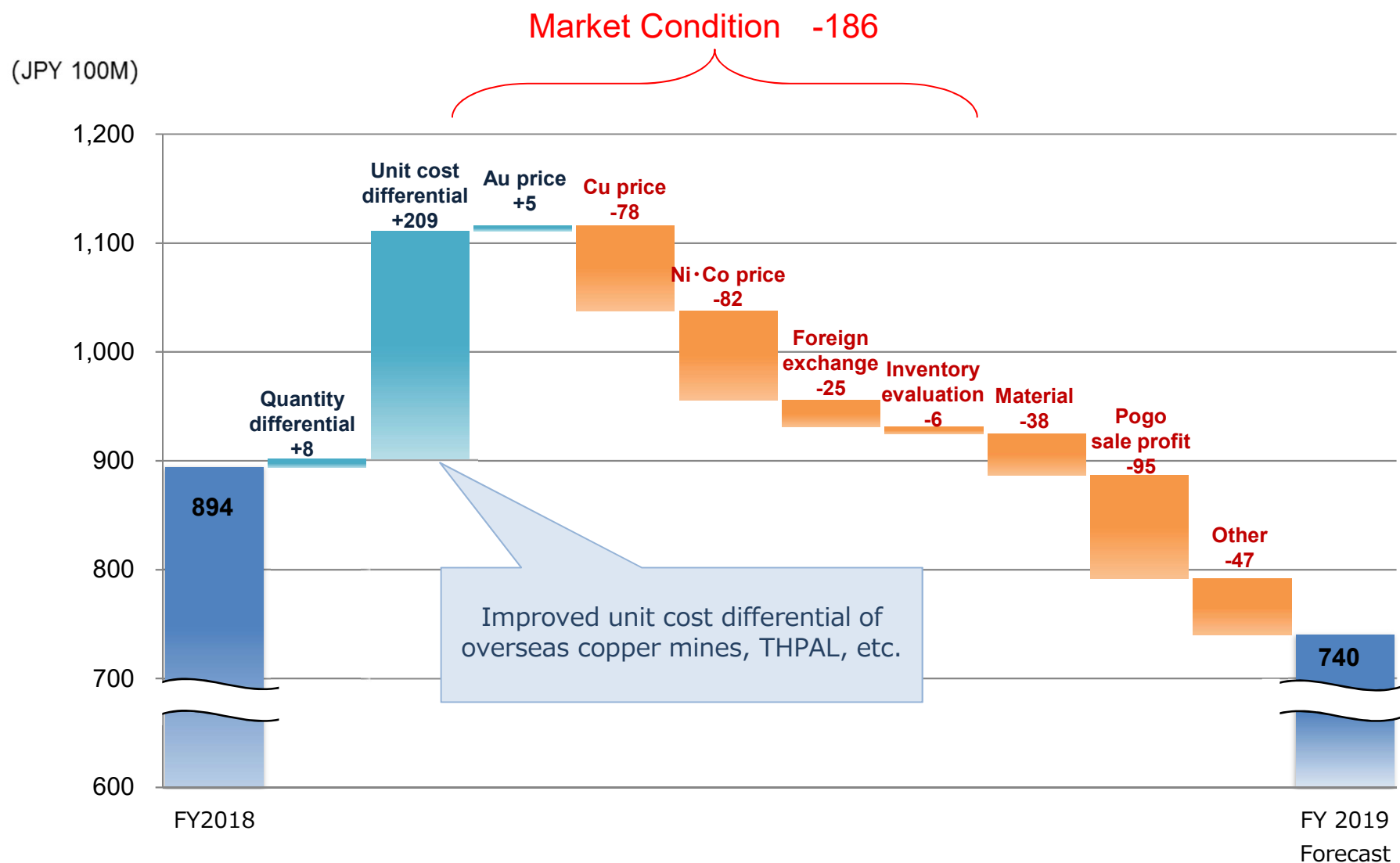


Minus 15.6 billion yen compared to initial plan due to deviation of acceptance inspection, etc.

Main projects (Figures in parentheses are the total amount of the plan):

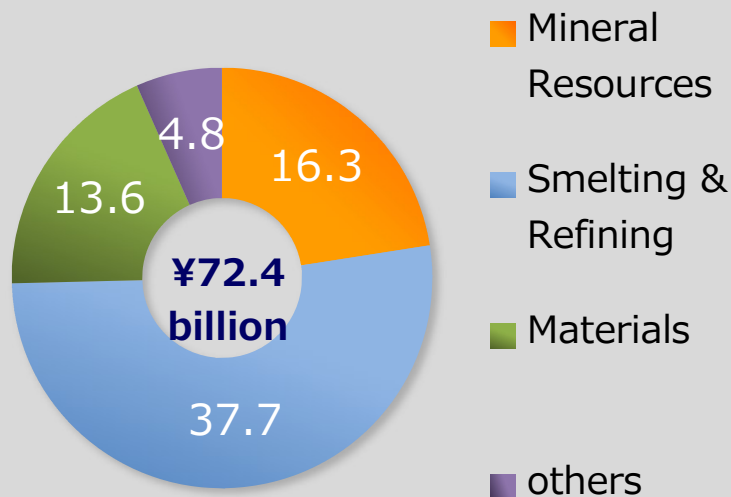
- |                                                |                                   |
|------------------------------------------------|-----------------------------------|
| • NCA production expansion                     | 7.8 billion yen (22 billion yen)  |
| • THPAL chromite recovery                      | 1.3 billion yen (3.5 billion yen) |
| • Lower ore body development in Hishikari Mine | 400 million yen (3.7 billion yen) |

## 5) Pretax Profit/Loss Analysis FY2019 Results vs FY2018 Forecast

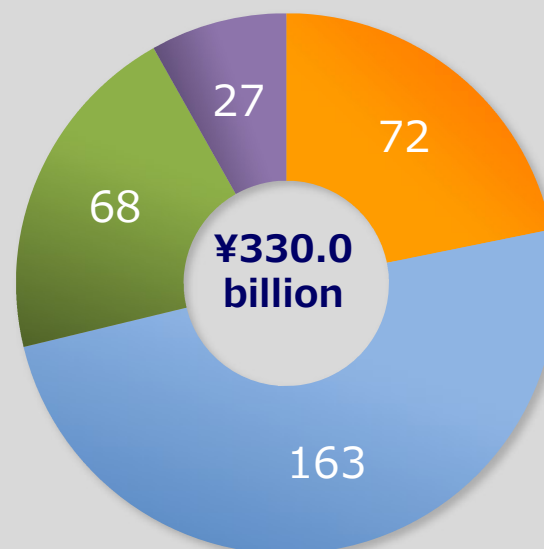


## 6) Capital investment FY2019 Plan vs. 2018 3-Year Plan, 3-Year Total

FY2019 Plan



2018 3-Year Plan,  
3-Year Total



Main projects of FY2019 Plan (Figures in parentheses are the total amount of the plan):

- Enhancement of ability to handle raw materials in Niihama Nickel Refinery  
2.4 billion yen (2.6 billion yen)
- NCA production expansion  
2.2 billion yen (22 billion yen)
- THPAL chromite recovery  
1.9 billion yen (3.5 billion yen)
- Lower ore body development in Hishikari Mine  
300 million yen (3.7 billion yen)

## 7) Initiatives regarding safety

### To achieve by FY2021

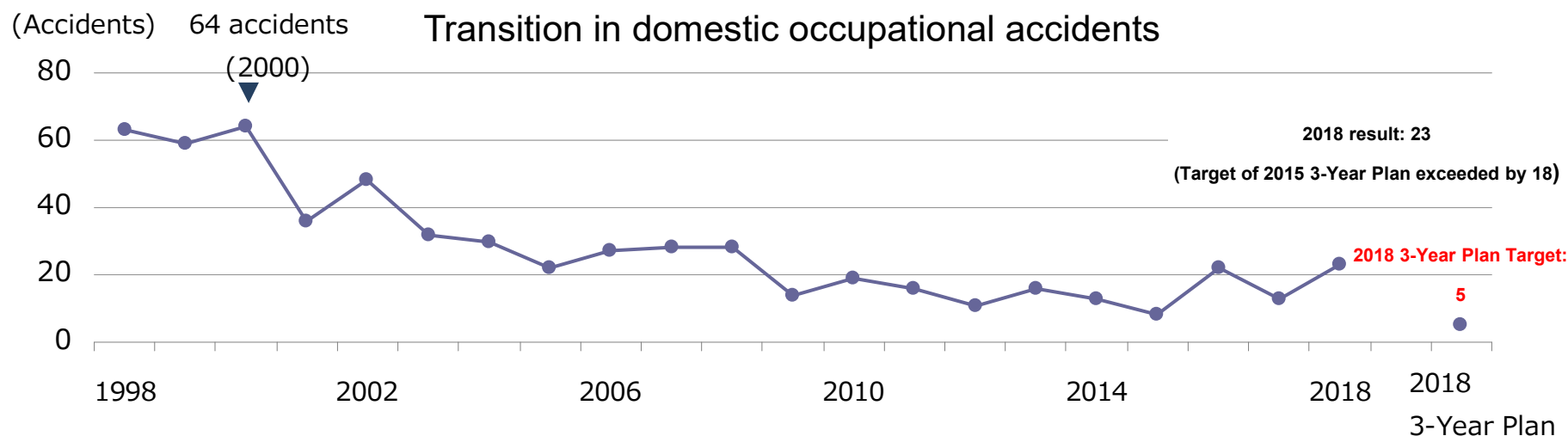
Workplace promoting activities while **clarifying issues for improvement to be focused on** and **practicing the PDCA cycle** in order to prevent serious accidents

Workplace where **top management and supervisors communicate with workers**, **grasp the actual condition of the site** and **improve facilities based on the Three Realities Principle**, and **conduct work in a procedure that fully takes safety into consideration naturally**.

### 2018 3-Year Plan Targets

Limit domestic work-related accidents to **5** or less

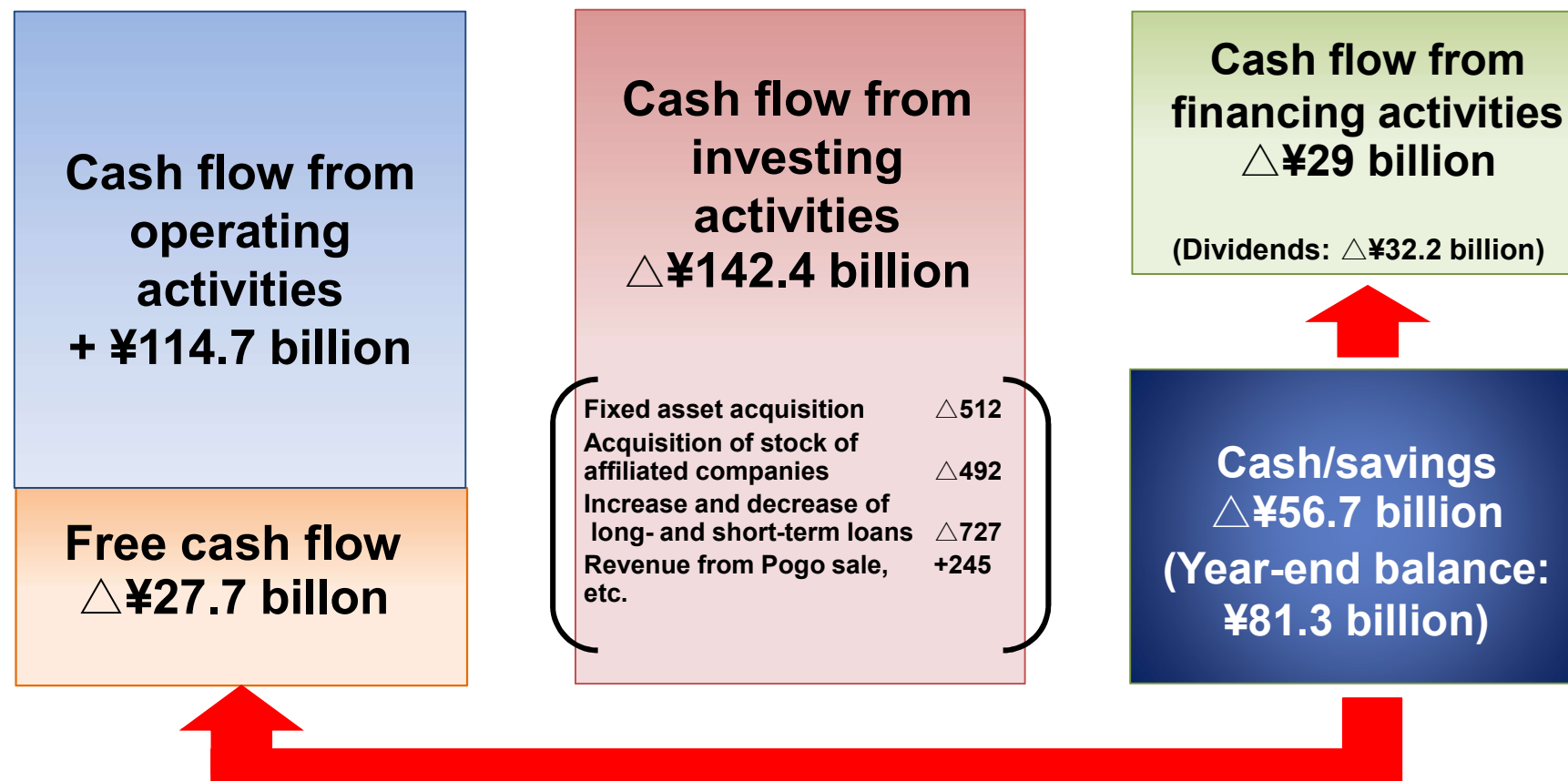
Limit overseas work-related accidents to **3** or less



## 8) Cash flow (FY2018 results)

Although sales CF has increased, FCF decreased by 27.7 billion yen due to active investment activities such as payment of consideration for the acquisition of QB interest.

Combined with financial cash flow such as dividend payments, reduction of cash and savings is 56.7 billion yen.



### Dividend forecast

#### FY2018

Intermediate dividend                      ¥51/share

Year-end dividend forecast              ¥22/share

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Annual dividend forecast                ¥73/share

(Annual dividend payout ratio: 30.0%)

#### FY2019

Intermediate dividend   ¥39/share

Year-end dividend forecast              ¥43/share

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Annual dividend forecast                ¥82/share

(Annual dividend payout ratio: 35.2%)

2018 3-Year Plan:  
Annual dividend payout  
ratio of more than 35%

## III. 2015 3-Year Plan Review



Summary



Overview of FY2018 Business Performance  
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2015 3-Year Plan Review



2018 3-Year Plan Progress of 3 Main Basic  
Strategies



Supplementary Materials



# 1) 2015 3-Year Plan: Progress and issues of priority items (1)



2015 3-Year Plan  
Review

		Project	FY2015	FY2016	FY2017	FY2018	FY2019 and after
Mineral Resources	Cu	Sierra Gorda Copper Mine	Start of commercial production	Operating capacity of 110,000 t		Start of debottlenecking	
	Cu	Morenci Copper Mine	Start of extended full production	Acquisition of additional interest (12%→25%)			
	Cu	Cerro Verde Copper Mine		Start of extended full production			
	Ni	Solomon			Withdrawal from project decided		
	Au	Côte		Acquisition of interest/FS start		FS complete	Start of production
Smelting & Refining	Ni	Taganito HPAL			36,000 t capacity		
	Ni	Pomalaa Project				DFS start	Investment decision
	Ni	Harima Refinery Nickel sulfate		Completion of 2nd line		49,000 t capacity	
Materials		Battery materials	NCA 1,850 t capacity		NCA 3,550 t capacity	NCA 4,550 t capacity	
		Crystal materials (LT/LN)	Increased production decision	300KP capacity		(400KP capacity)	

# 1) 2015 3-Year Plan: Progress and issues of priority items (2)



2015 3-Year Plan  
Review

## Mineral Resources

**Full production of  
Sierra Gorda  
Copper Mine**  
**Acquisition of  
new interests  
in gold mines**

### Sierra Gorda Copper Mine

Weak production and increase in cost

- ▶ Appreciated large amount of impairment loss
- ▶ Implementation of de-bottlenecking

- Expansion of Cerro Verde Copper Mine
- Acquisition of additional interest in Morenci Copper Mine
- Acquisition of interest in Quebrada Blanca Copper Mine
- Participation in Côté Gold project
- Transfer of Pogo Gold Mine

## Smelting & Refining

**Expansion of  
Taganito HPAL**  
**Development of growth strategy  
by peripheral technologies of  
HPAL**  
**Enhancement of copper  
smelting and refining business  
competitiveness**

### Taganito HPAL

Complete 36kt production structure

- ▶ Stabilization is an issue

- Promotion of scandium and chromite recovery commercialization
- Achievement of electrolytic copper production of 450kt
- Complete 49kt nickel sulfate production structure in Harima
- Begin DFS of Pomalaa Project
- Starting demonstration tests of recycling of lithium-ion rechargeable batteries

## Materials

**Profit contribution of  
production increase of  
battery materials and  
LT/LN**  
**Continuous creation of and  
transition to next-generation  
products**

Complete 4,550 tons/month production structure of battery materials

Increase of LT/LN (Partially suspended)

- ▶ No profit contribution due to sluggish demand

- Development of nickel oxide powder for use in fuel cell electrodes
- Stock purchase of Silicon carbide (SiC) development company
- Withdrawal from lead frame business

## Corporate Governance

**Increase of external directors, female directors, etc.**

## Responding to globalization

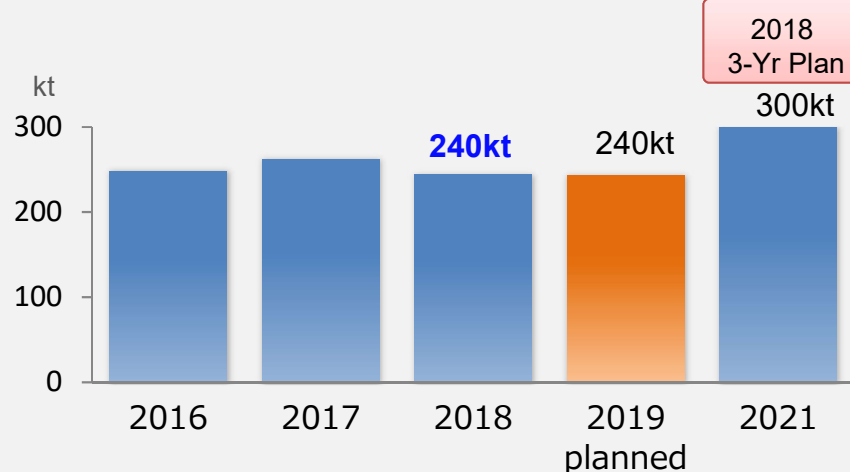
**Issuing integrated report**  
**Adoption of International Financial Reporting Standards (IFRS)**

## 2) 2015 3-Yr Plan Status of Achievement of Long-Term Vision

2015 3-Year Plan  
Review

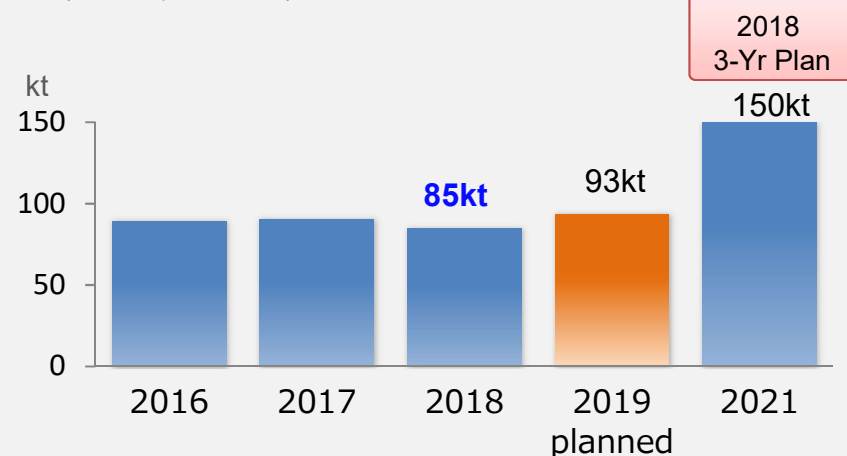
### Cu

(Production from interest in mine)



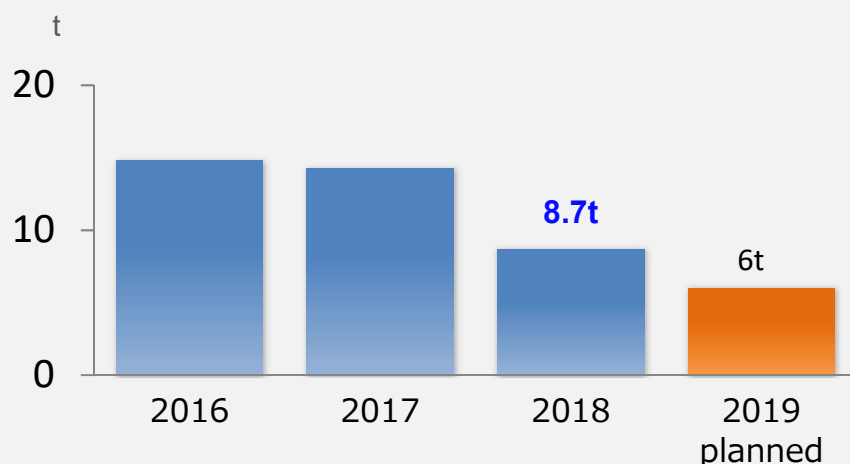
### Ni

(Annual production) \*2021 production means capacity



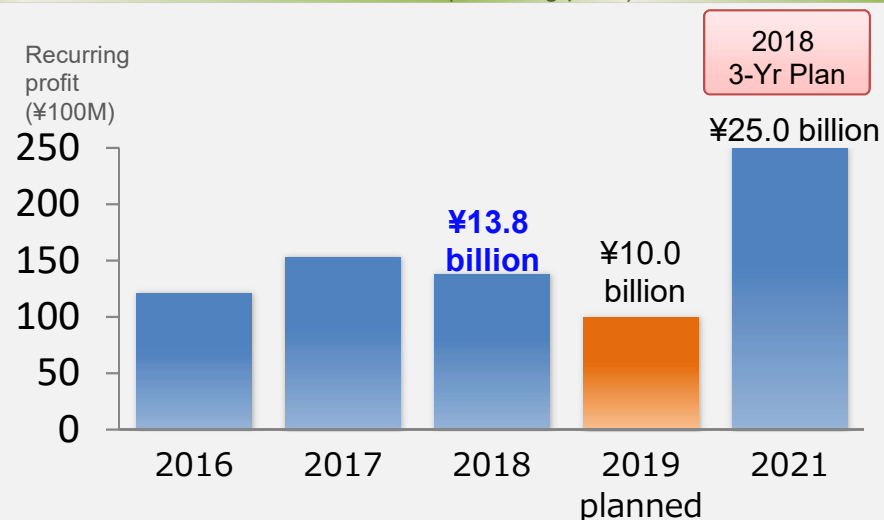
### Au

(production volume from interest)



### Materials business

(recurring profit)  
\*Recurring profit-based up to FY2017.  
Profit-before-tax based from FY2018



### 3) Trend of Business Performance

<IFRS>	2018 Result	2018 (2015 3-Yr Plan trial calculation)	Difference
Net Sales (¥100M)	9,122	10,600	-1,478
Profit before tax (¥100M)	894	1,700	-806
Equity Method profit (¥100M)	-49	270	-319
Net Income(¥100M)	668	1,200	-532
Copper (\$/t)	6,341	6,000	+341
Nickel (\$/lb)	5.85	7.0	-1.15
Gold (\$/Toz)	1,263	1,150	+113
Cobalt (\$/lb)	31.64	14.5	+17.14
Exchange (¥/\$)	110.92	120.0	-9.08

## 4) Pretax Profit/Loss Analysis (2015 3-Yr FY2018 Plan vs FY2018 Results)

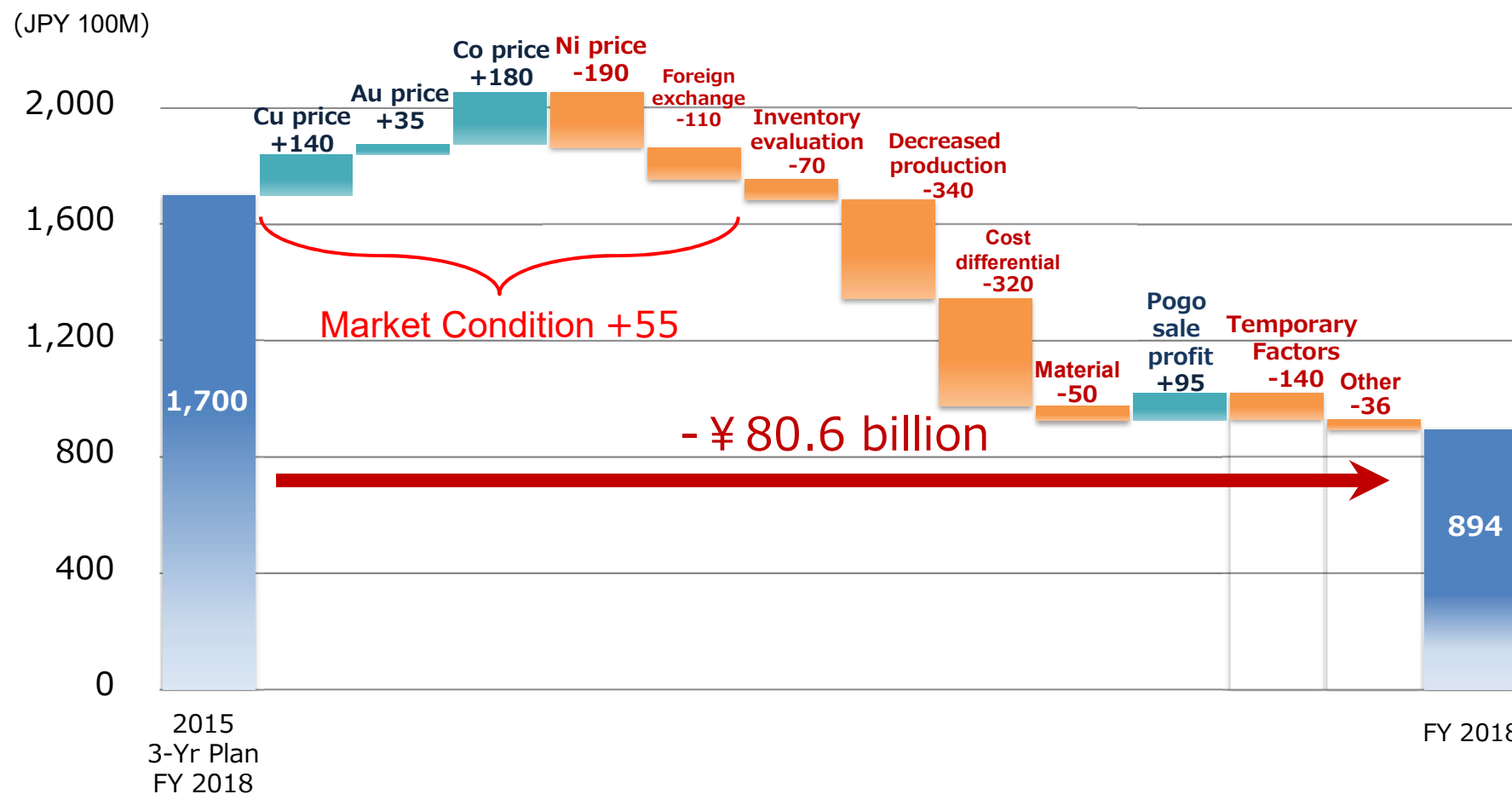


2015 3-Year Plan  
Review

Results for FY2018 are expected to be about ¥80 billion lower than 2015 3-yr plan

The main factors are reduced sales and deterioration in unit cost differential due to decreased production

(Mineral Resources: -490, Smelting & Refining: -170)



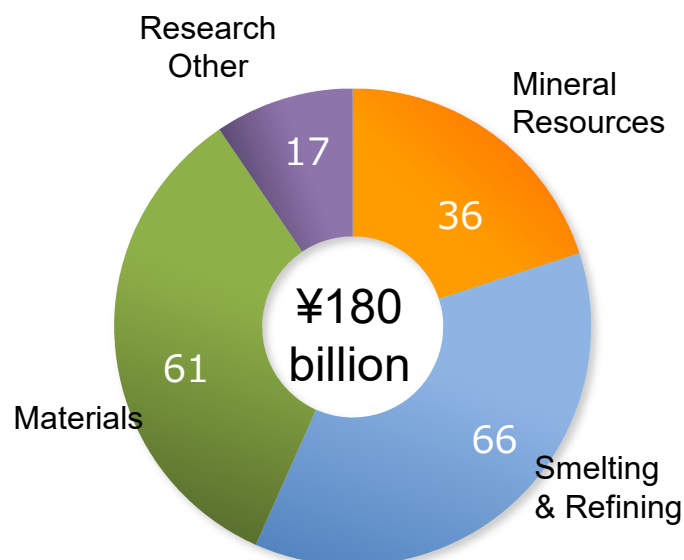
## 5) Investment Plans 2015 3-Yr Plan Cumulative Total vs Results Cumulative Total



2015 3-Year Plan  
Review

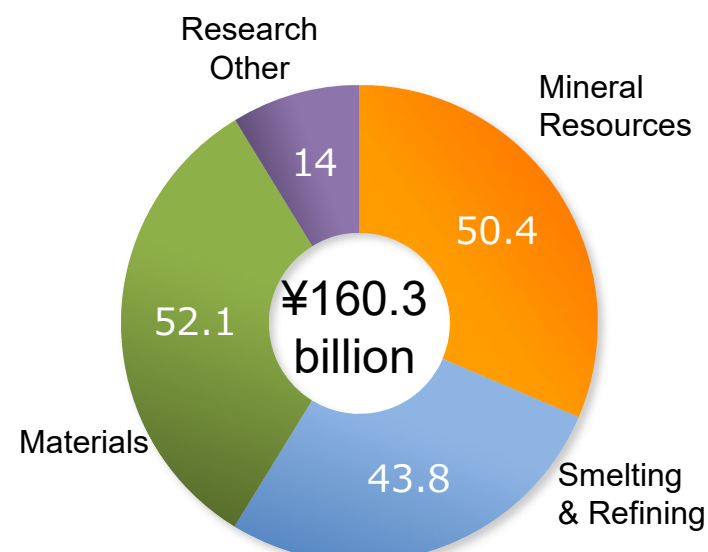
(JPY100M)

2015 3-Yr Plan  
(Total of 3 Years)



(JPY100M)

FY2016 - 2018 Cumulative Total



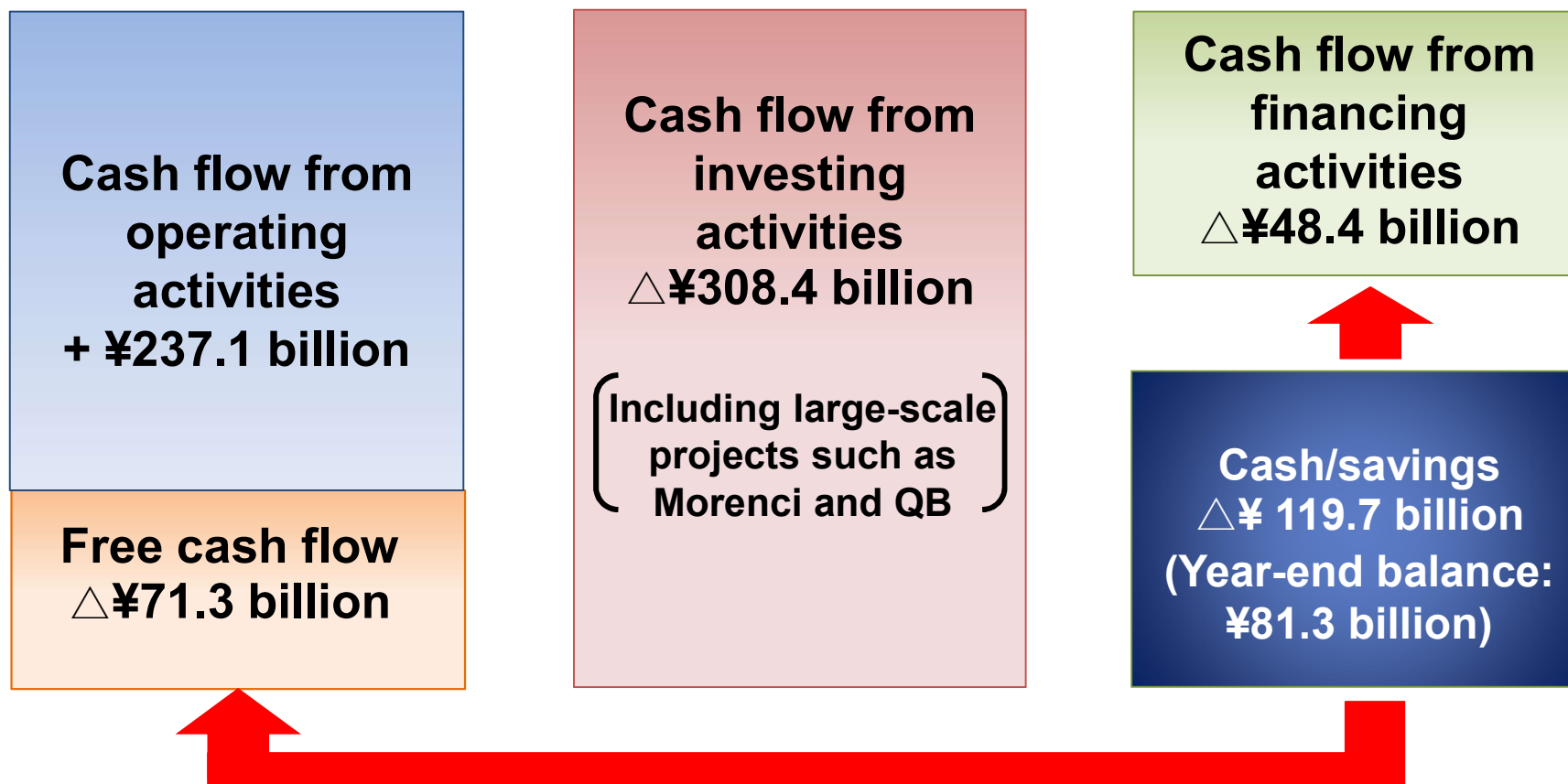
¥19.7 billion below plan in 3-yr cumulative total (FY2016-2018)

→ Mostly according to plan despite decrease from withdrawal from Solomon, lead frame business, etc., and acceptance inspection carry over to subsequent year

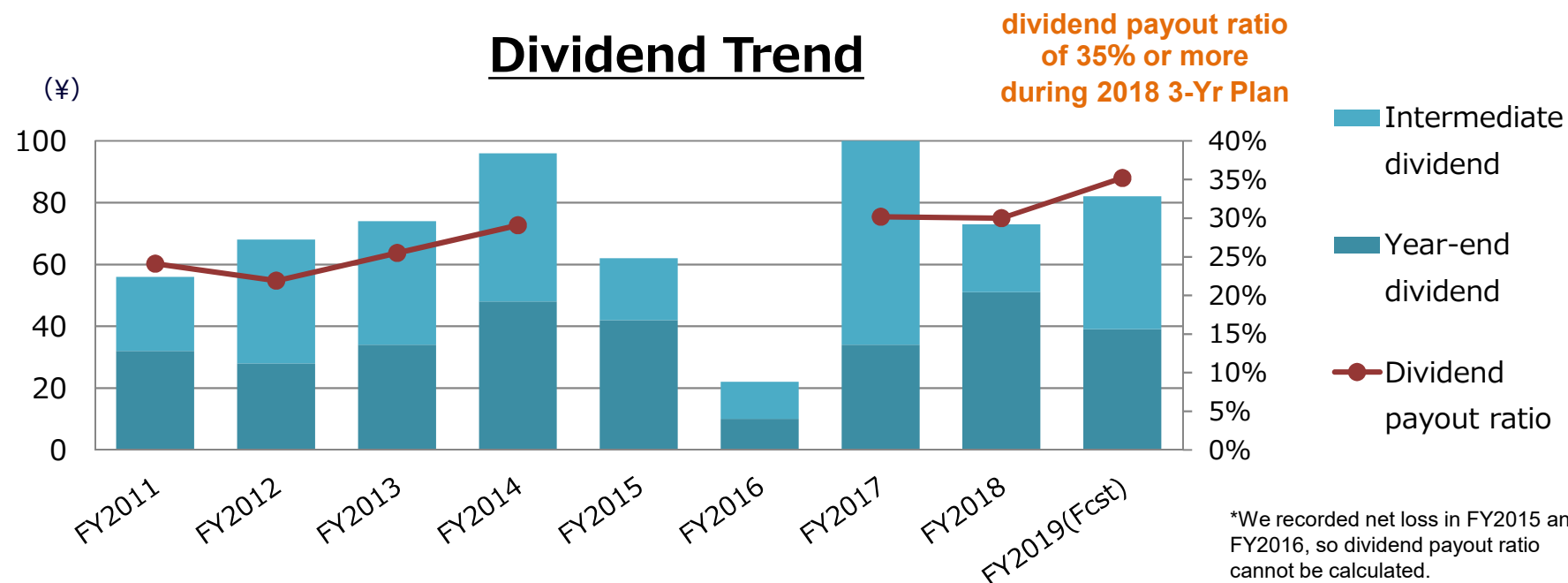
## 6) Cash flow (Result of 3 year total)

FCF decreased by 71.3 billion yen due to CF from investment that largely exceeds CF from operation, with large projects such as acquisition of additional interest in Morenci and acquisition of interest in Quebrada Blanca.

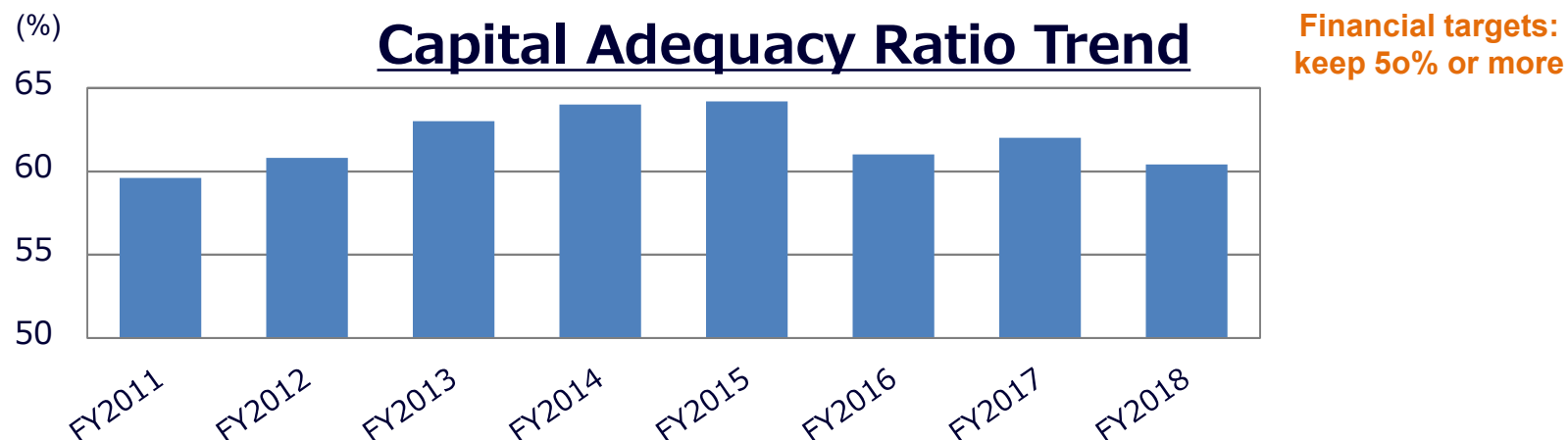
Coped by reduction of cash and savings of about 120 billion yen combined with CF from finance.



## 7) Trend of dividend and capital adequacy ratio



(Note) Due to stock consolidation (ratio 2:1) as of October 1, 2017, the dividend per share before that date is calculated and presented based on the standard after stock consolidation.





## IV. 2018 3-Year Plan Progress of 3 Main Basic Strategies



Summary



Overview of FY2018 Business Performance  
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2015 3-Year Plan Review



2018 3-Year Plan Progress of 3 Main Basic  
Strategies



Supplementary Materials

## (1) Quebrada Blanca 2 Project

Closing on March 30, 2019 (amount of money: Project 100% base)

Entry Fee	US\$800m
Capex	US\$170m
<hr/>	
Total	US\$970m

- Full-scale efforts to achieve “on budget, on schedule”
- Project Finance has been under discussion with potential lenders
- Expected to pay additional approximately US\$0.3 billion in 2019

### Project Outlook

Interest ratio: Teck 60%, SMM 25%, Sumitomo Corp. 5%, others 10%

Expected investment amount: US\$4,700M (Project 100% base)

Average production late: 240kt /year

Planned production start: 2021

Location: 165 km southeast of Iquique City, capital of Chile's Region I



## (2) Pomalaa Project (Indonesia)

With long-term vision production structure of nickel 150kt /year, it is regarded as the third HPAL plant following CBNC and THPAL in the Philippines.



Taganito HPAL (Philippines)

From April 2018: Started DFS (Definitive Feasibility Study)

Expect to complete DFS in FY2019 ➡ Decide on investment

### If decide to participate

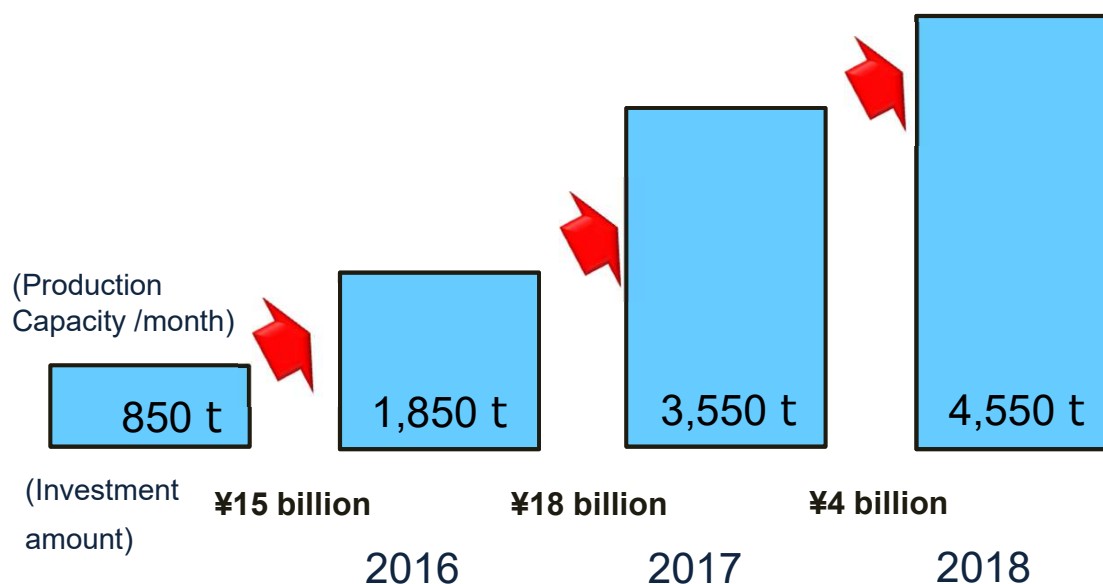


- Production: 40kt-Ni of mixed sulfides (roughly)
- Investment: Several billion US\$ (Project 100% base)
- Operation to start in the mid-2020s (target)

### (3) Battery materials (cathode material)

- Demand for secondary batteries for automobiles is expanding as electric vehicles become more popular
- Respond appropriately to the market and customer trends while continuing full production

#### Changes in cathode material (NCA) production ability expansion



Aim to establish 10,000 tons/month in total production structure of cathode materials (NCA, NMC, nickel hydroxide) during the term of 2024 3-Year Plan



## 2) Enhancement of 3 business collaborations focusing on cathode materials for batteries



### Securing raw materials for batteries (Expansion of self-procured Ni/Co resources)

New acquisition by promoting Pomalaa Project



Until the realization, respond by optimizing in-house product portfolio and stabilization of external procurement

Development of new recycling process of discarded LiB and operation of a pilot plant



Pyrometallurgical refining process: Collectively separate impurities of secondary batteries and recover as Ni/Co/Cu alloys



Hydrometallurgical refining process: dissolve and refine Ni/Co/Cu alloys and recover Cu/Ni/Co

Started operation of the pilot plant from March 2019



Design and construction of a new plant after 2021

### 3) Enhancement of corporate functions

## Challenges of Corporate Unit

#### Specific issues in SMM

- ✓ Passive attitude towards changes of external environment
- ✓ Securing and retaining human resources
- ✓ Less communication in workplace
- ✓ Decrease of cross-organizational free discussion

#### Change of environment and social trends

- ✓ Correspondence to CSR, SDGs and ESG is essential
- ✓ Progress of employees' diversity
- ✓ Request for a real "work-style reform"
- ✓ Emphasize long-term strategy for sustainable growth

Approach proactively / break a mannerism / develop an open and vibrant organizational climate

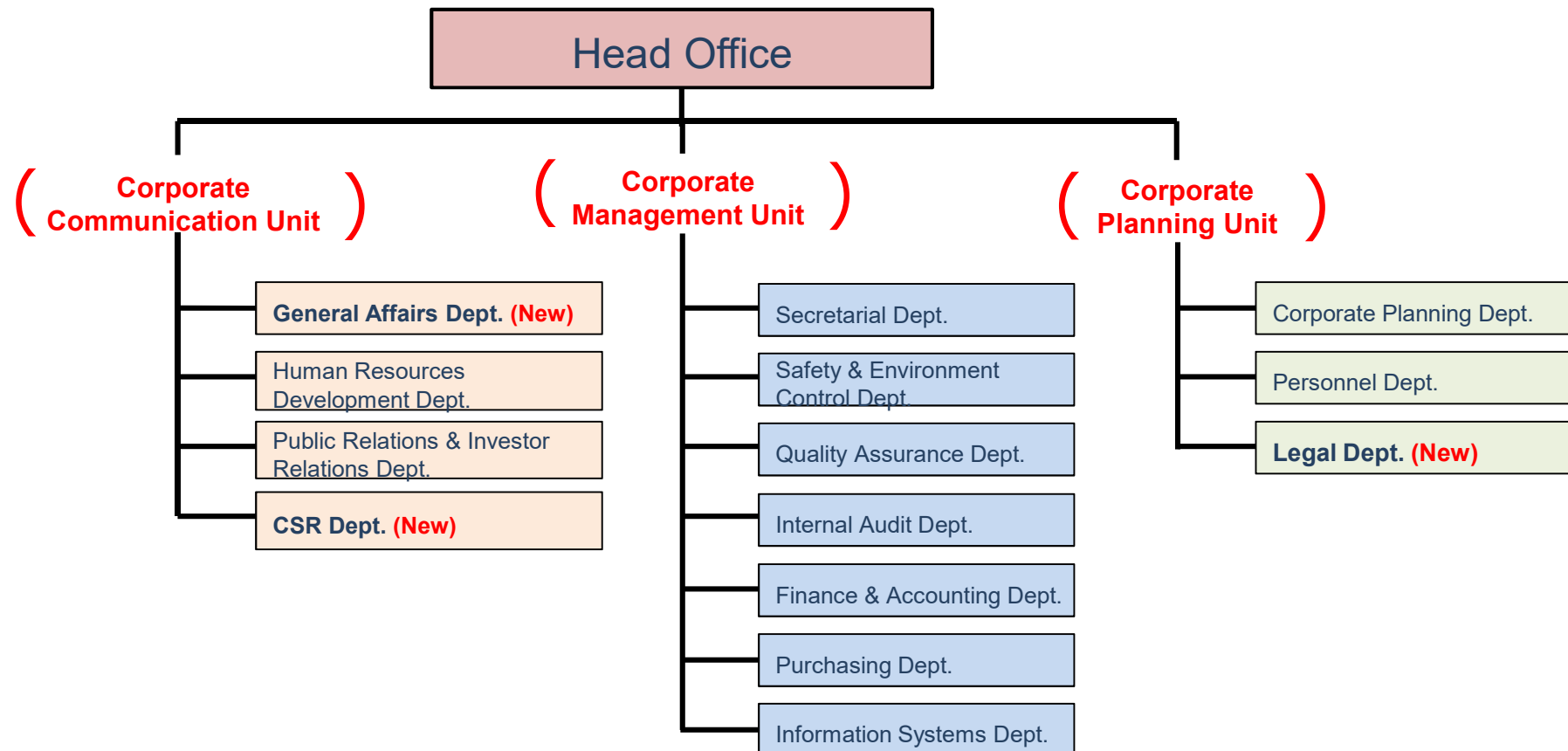
**Be More Proactive**

Improving sense of crisis, innovative mind and quickness by integrating corporate departments based on their function

### 3) Enhancement of corporate functions

#### Reorganization of Head Office departments focusing on functionality

While focusing on expertise, address common issues across units such as CSR, SDGs, and ESG in cooperation especially at Corporate Communication Unit





## V. Supplementary Materials



Summary



Overview of FY2018 Business Performance  
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2015 3-Year Plan Review



2018 3-Year Plan Progress of 3 Main Basic  
Strategies



Supplementary Materials



# 1) Our external environment

- ✓ **China's economic growth rate has decelerated, while tension due to trade friction between the U.S. and China continues**
- ✓ **Supply and demand of non-ferrous metals remain tight for the moment**
  - Resource prices have continues to rise in the medium term
- ✓ **Deterioration in the business environment surrounding resource development and smelting & refining operation**
  - Enhanced resource nationalism
  - Increased development difficulty such as mines that are in more remote locations, on higher altitudes, deeper, and which have lower grade ores
  - Strengthening of environmental regulations, acquisition of understanding of residents becoming more difficult
  - Increase of investment and running costs
- ✓ **Evolution, development and infrastructurization of digital technology**
  - Accelerating development of AI, IoT, 5G, VR technology
  - Application of CASE, robots, etc. in the real world
  - Expansion of places where “materials” can be utilized

## 2) Demand trends (copper/nickel)

### Copper

[ICSG Forecast May 2019]

(kt)

	2017	2018	2019 (forecast)
Production	23,498	24,111	24,780
Usage	23,759	24,510	24,969
Balance	-261	-399	-189

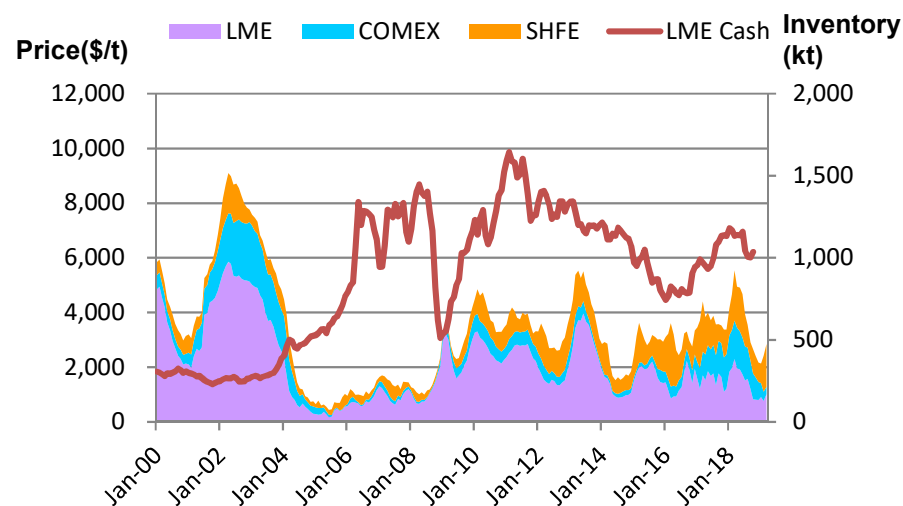
### Nickel

(kt)

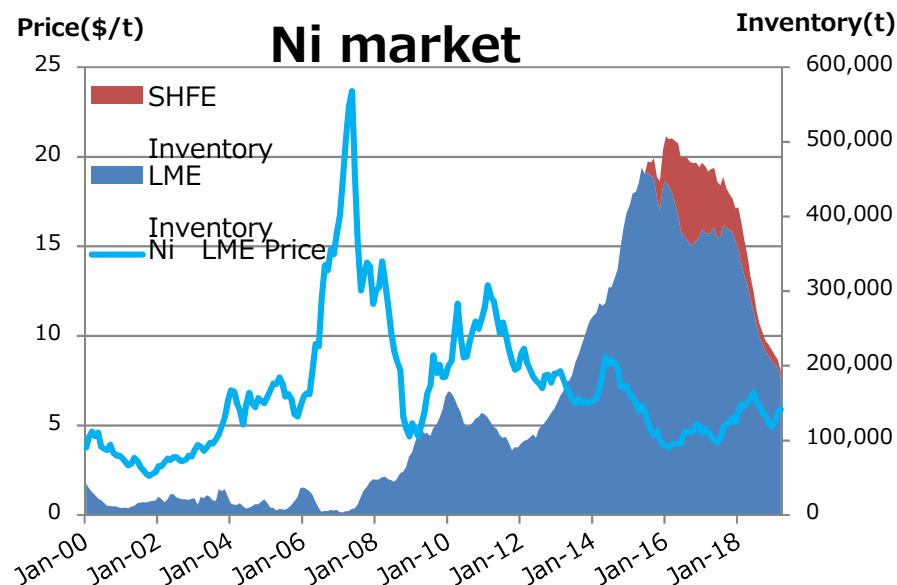
	INSG Forecast May 2019			SMM Forecast February 2019		
	2017	2018	2019 (forecast)	2017	2018	2019 (forecast)
Production	2,040	2,182	2,380	2,065	2,172	2,311
Usage	2,184	2,328	2,464	2,142	2,261	2,346
Balance	-114	-146	-84	-77	-90	-35

### 3) Non-ferrous Metals/Foreign Exchange

#### Copper market



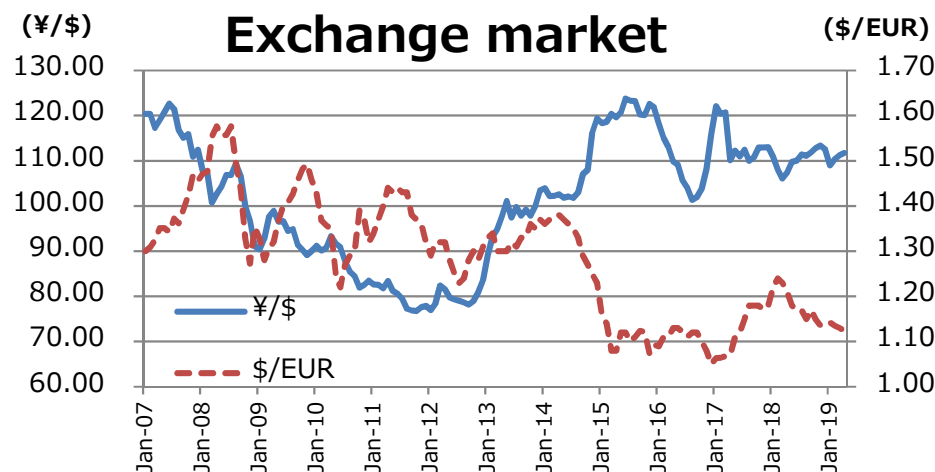
#### Ni market



#### Gold market



#### Exchange market



## 4) Overview of individual businesses

### Mineral Resources: (1) Copper (Morenci/Cerro Verde)

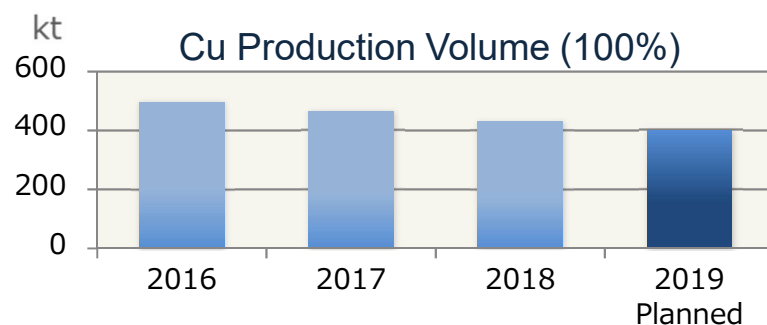
#### Morenci Copper Mine (Arizona, USA)

Equity  
interest  
ratio

FCX	72%
SMM	25%
Sumitomo Corp.	3%



• Production volume	FY2018	430 kt (result)
	FY2019	401 kt (planned)



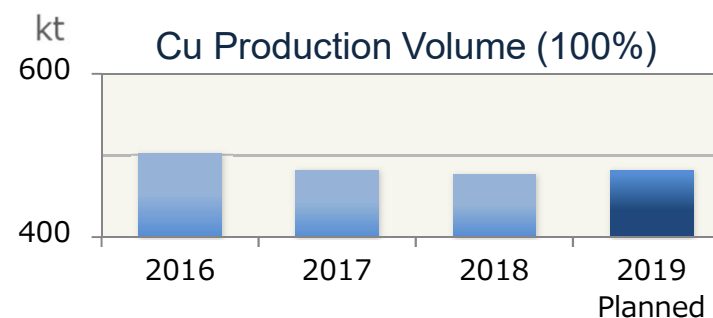
#### Cerro Verde Copper Mine (Peru)

Equity  
interest  
ratio

FCX	53.56%
SMM	16.80%
Sumitomo Corp.	4.20%
Other	25.44%



• Production volume	FY2018	476 kt (result)
	FY2019	482 kt (planned)



Continue stable production with a long-term operation plan

## 4) Overview of individual businesses

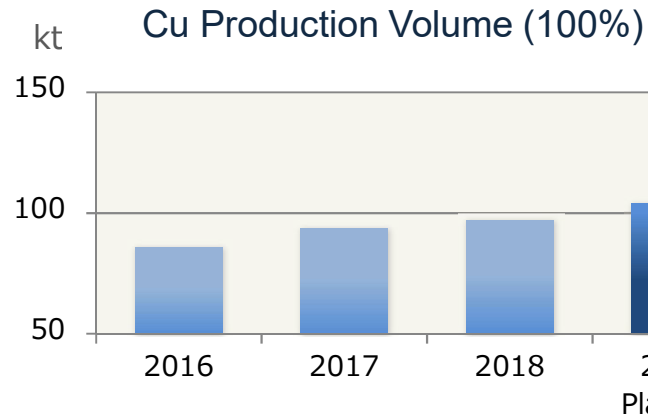
### Mineral Resources: (1) Copper (Sierra Gorda)

#### Sierra Gorda Copper Mine (Chile)

Equity interest ratio	KGHM	55.0%
	SMM	31.5%
	Sumitomo Corp.	13.5%



- Production volume  
FY2018 97 kt (result)  
FY2019 104 kt (planned)



- Both ore processing volume and copper production volume continue to be close to the level of full production
- Debottlenecking: increase current ore processing volume of 110 kt/day to 130 kt/day in 2020

Promote establishment of stable full operation and cost reduction through implementation of de-bottlenecking as planned, and improvement of operating ratio

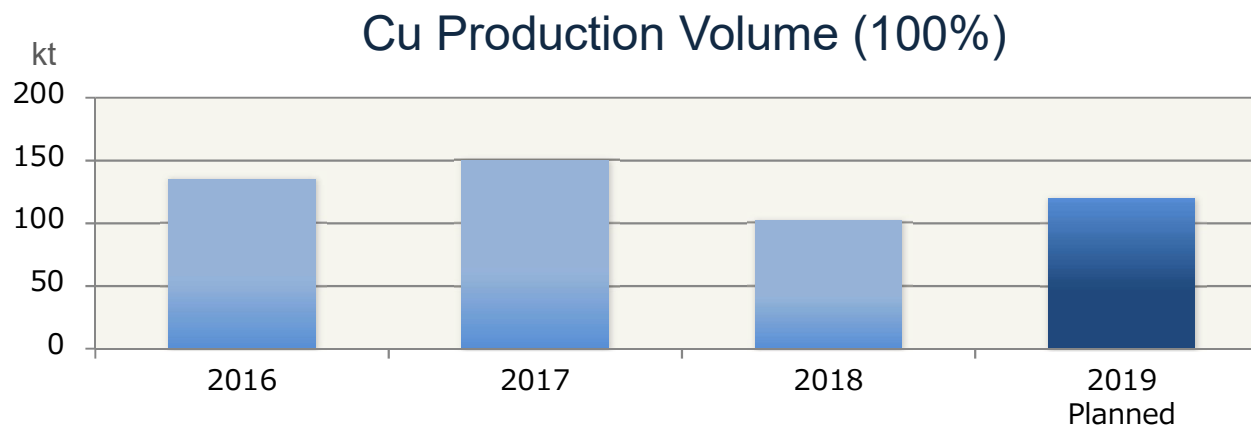
## 4) Overview of individual businesses

### Mineral Resources: (1) Copper (La Candelaria)

#### La Candelaria Copper Mine (Chile)

Equity interest ratio	Lundin	80%
	SMM	16%
	Sumitomo Corp.	4%

- Production volume  
FY2018 102 kt (result)  
FY2019 120 kt (planned)



Production volume expected to recover to FY2017 levels around 2020



## 4) Overview of individual businesses

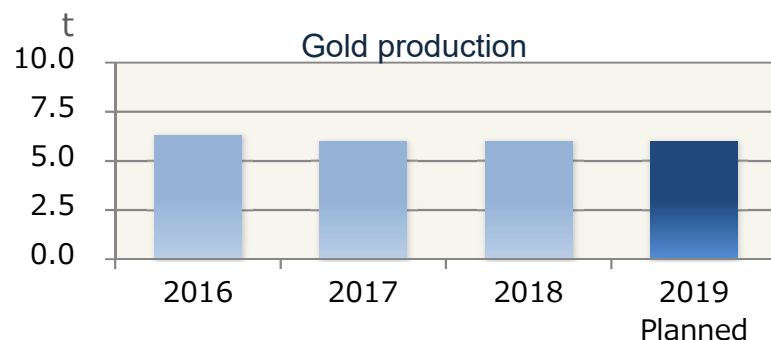
### Mineral Resources: (2) Gold (Hishikari / Côte)

#### Hishikari Mine (Kagoshima Prefecture, Japan)

Ownership SMM 100%



- Lower ore body development Continue with safety first
- End of 2018 Gold reserves 167t (JIS standards)
- Gold production FY2019 6.0t (planned)



#### Côte Gold Project (Canada)

Ownership IAMGOLD 64.75%  
SMM 27.75%  
Others 7.50%

- F/S completion in November 2018
- Detailed design in progress
- Production start target in 2021

FS Overview (from Press Release on November 1, 2018)

Location : Ontario, Canada  
CAPEX : US\$ 1,147M

	Base case
Reserves	203Mt
Contained gold (Avg. grade)	198t (0.98g/t)
NPV@5% (Au:US\$1,250/oz)	US\$ 795M

Continue stable operation at Hishikari Mine, and undertake proactive exploration towards extending mine life

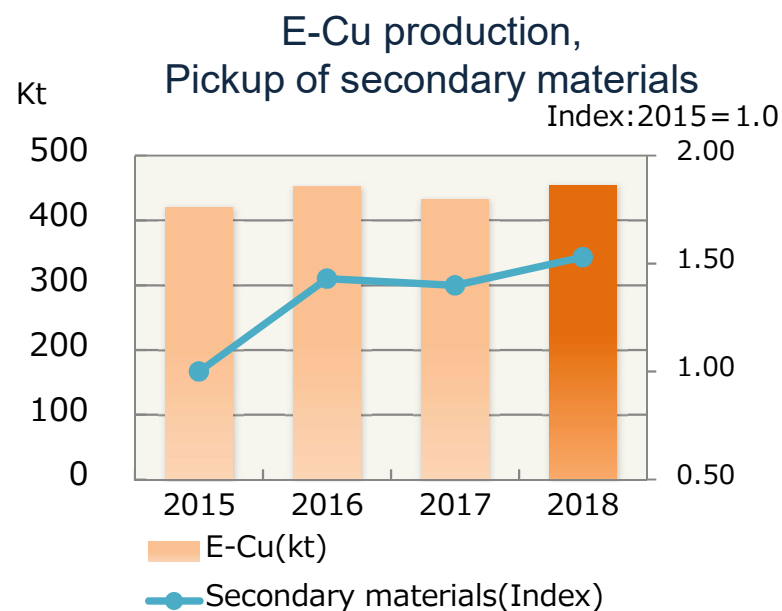
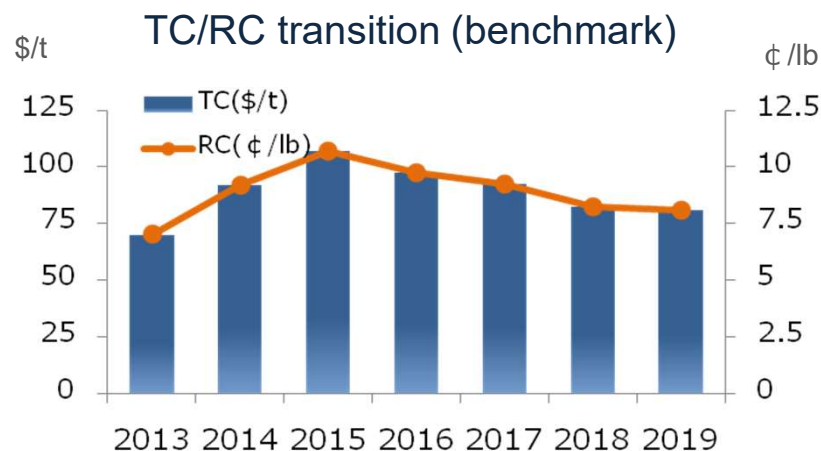
### Toyo Smelter & Refinery

#### Production volume

FY2018 454 kt (result)

FY2019 420 kt (planned)

Production volume is planned to decrease by 34kt compared to the previous year's result since periodic repair is scheduled for about one month from the end of October, etc.



Secure planned production volume by continuing stable operation



## 5) Overview of individual businesses

### Smelting & Refining: (2) Nickel smelting and refining

#### CBNC, THPAL, Niihama Nickel Refinery

Production volume (FY2018 result, FY2019 plan)

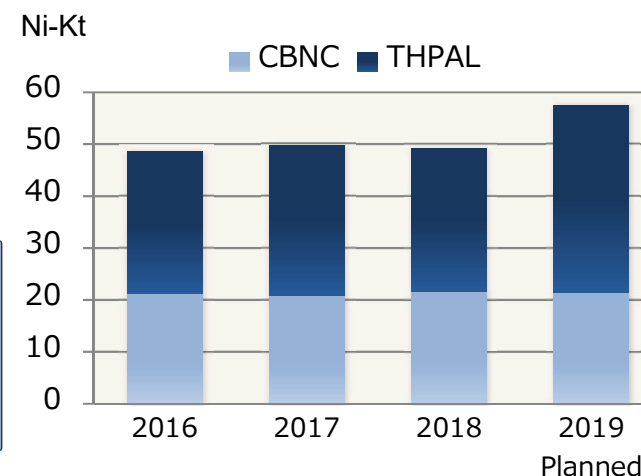
Unit Ni-kt	FY2018 result			FY2019 plan	Diff.
CBNC	1H R	10.6	21.7	21.5	△0.2
	2H R	11.1			
THPAL	1H R	12.9	27.4	36.0	8.6
	2H R	14.5			
Nickel Refinery	1H R	28.2	56.7	62.6	5.9
	2H R	28.5			

Many equipment-related problems occurred at THPAL in FY2018, mostly in the first half of the year, and production decreased at THPAL and Niihama Nickel Refinery.

THPAL: Strive to improve equipment operation rate by promoting daily preventive maintenance in addition to equipment inspection and improvement during regular operation interruptions



MS Production Volume



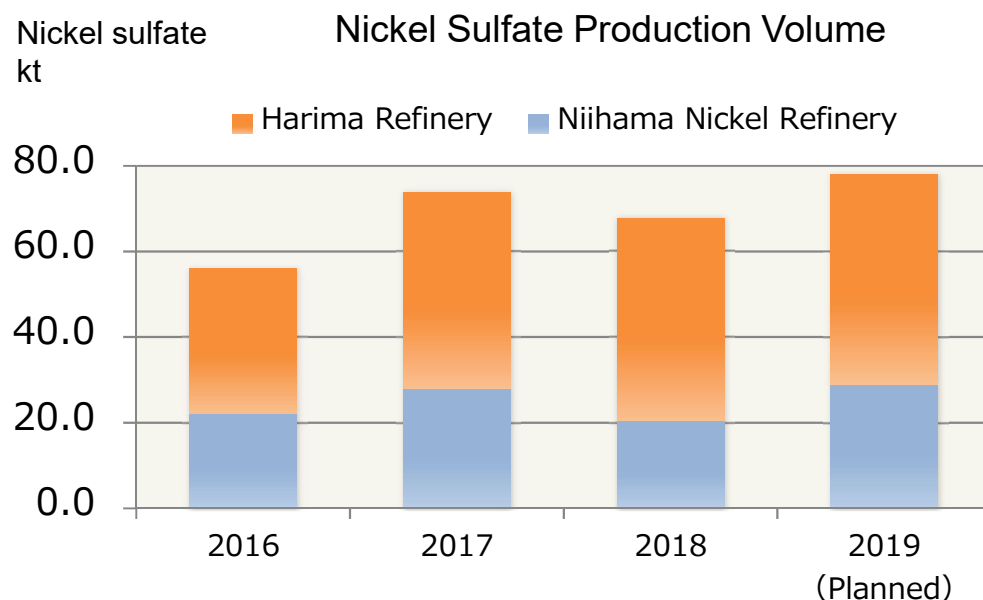
#### Maximizing byproduct recovery at HPAL

Scandium oxide: Commercial production started from January 2019

Chromite: Aim to start commercial production in 2020

## Niihama Nickel Refinery & Harima Refinery

- Result of FY2018 is 65 kt, not reaching the initial forecast (73 kt) due to production reduction of MS materials
- Recovery of THPAL operation rate is expected in FY2019, and full production is scheduled for both Niihama Nickel Refinery and Harima Refinery (Total production of two refineries: 78 kt)



In order to meet strong demand for battery material (cathode material), maximize production and shipping of nickel sulfate of both Niihama Nickel Refinery and Harima Refinery

## Hyuga Smelting Co., Ltd.

### Production volume

FY2018	12.9 kt (result)
FY2019	13.3 kt (planned)

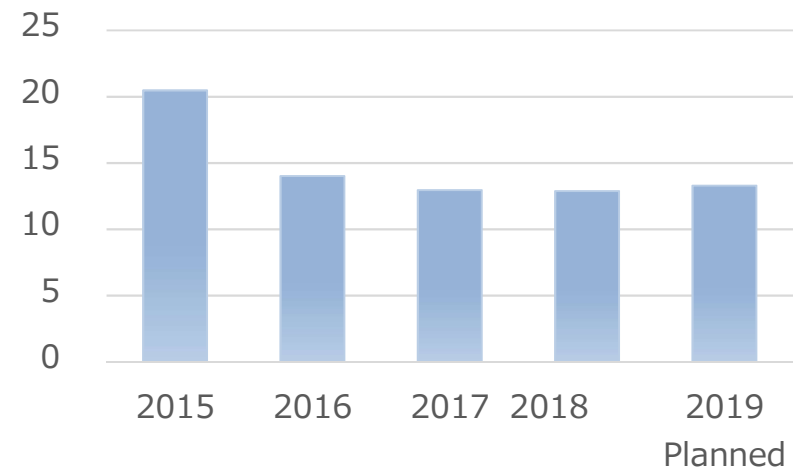


Maximize production volume under the structure of 2 kilns, 1 electric furnace setup

Strive for cost reduction through stable production and efficient operation, and secure profits

Ni-Kt

### Fe-Ni Production Volume



## 6) Overview of individual businesses - Materials – (1)

### Four key products in the battery materials/functional materials fields

#### Battery materials



Nickel hydroxide

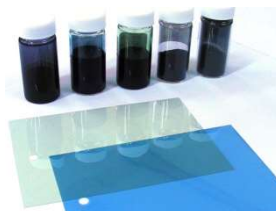


Lithium nickel oxide (NCA)

#### Powder materials



Thick film paste



Infrared shielding material



Magnetic materials



Thin-film material

#### Crystal materials

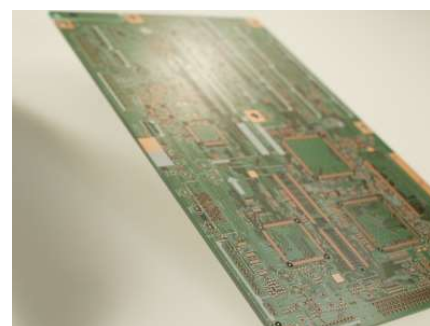


Lithium tantalate (LT)  
Lithium niobate (LN)



Optical isolators

#### Package materials



Printed wiring boards



Dual-plated circuit boards



## 6) Overview of individual businesses - Materials – (2)

**Battery materials** FY2018: Highest ever shipment of NCA due to electrification of automobiles

FY2019: Continued full operation to meet voracious demand

**Powder materials** FY2018: Robust for vehicle use, consumer use slumped in 2nd half due to rapid decline in Chinese market

FY2019: Fears over slowing for automobile and industrial machinery use for factors including trade friction between the USA and China

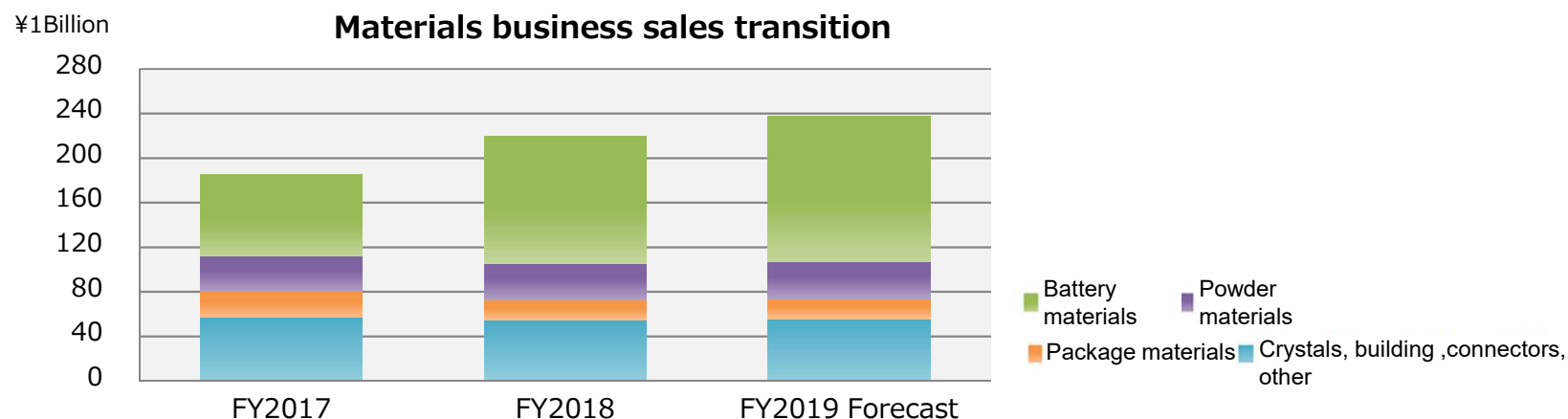
**Package materials** FY2018: Robust due to vigorous circuit board demand in Chinese market

FY2019: Concerns over slowing down for TV panels, but increased use for small/medium panels is expected

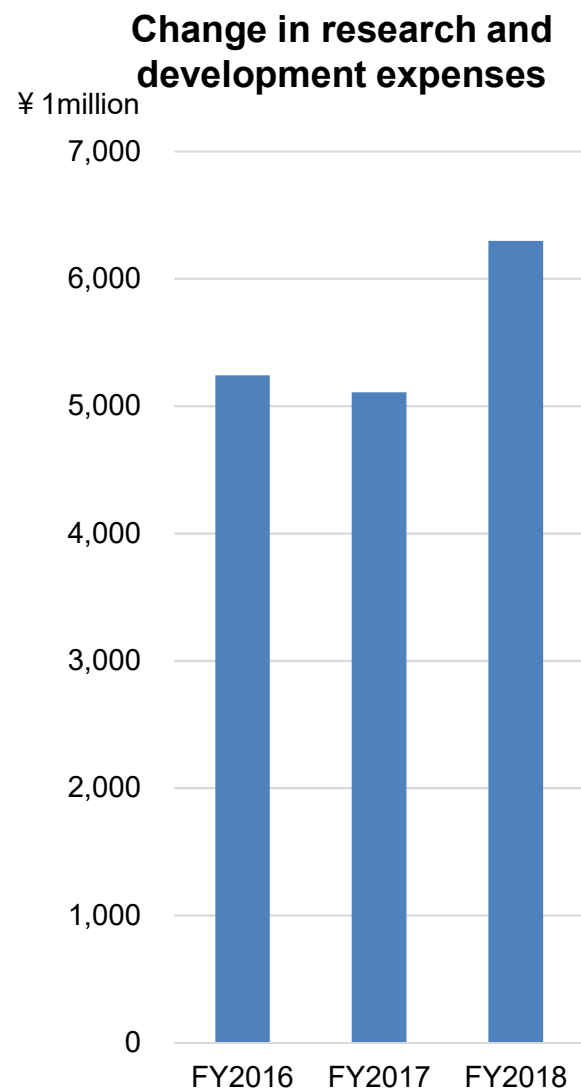
**Crystal materials** FY2018: Reduced production due to global sluggishness in smartphone market

FY2019: Continued slump in demand

(True recovery expected in 2020 with introduction and spread of 5G)



## 7) Research & Development



### Materials business (material development)

#### [Battery materials]

- Research & development of higher performance battery cathode materials
- Customizing for solid electrolyte

#### [Crystal materials]

- Cost reduction ahead of commodification  
Achievement of improved productivity through crystal lengthening and improved crystal growing/production yield, etc.
- Meeting new user needs  
Large bore LT crystal growth technology established, now in user work

### Smelting & Refining Business (process development)

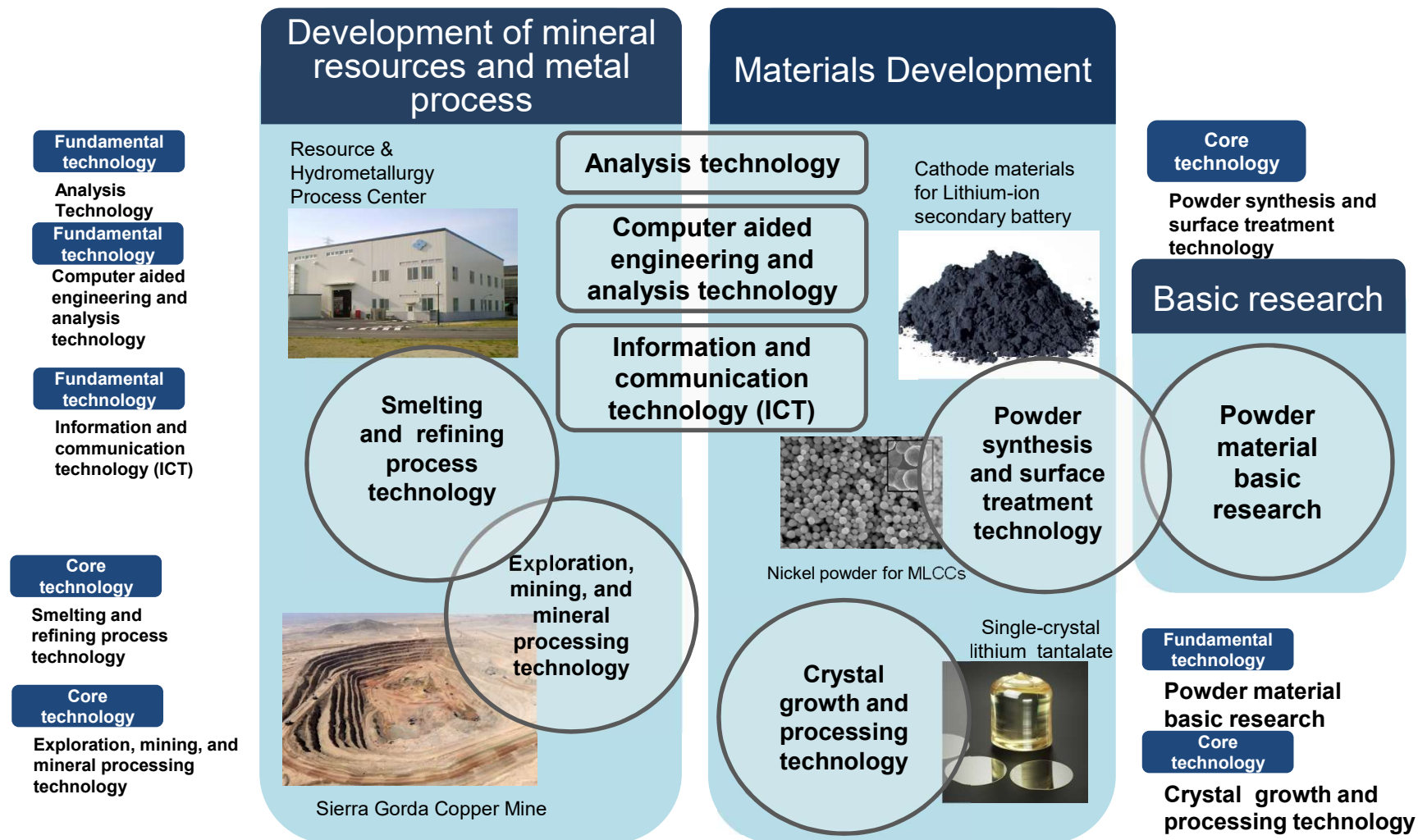
#### [Securing raw material for batteries (Ni/Co)]

- Internal low cost chemical product manufacturing process established specialized in battery raw material
- New process to enable new Ni/Co raw material utilization, and enhance ability to handle raw materials

#### [Lithium ion battery recycling]

- Develop cobalt recovery process which was the subject of recycling, transition to pilot test

# 7) Research & Development



Concentration on growth strategy fields, search for "seeds" of next-generation business

## 8) Sensitivity trial calculation

(JPY 100M)

Element	Degree of variation	FY2019 Pretax profit
Cu	±100\$/t	25
Ni	±10 ¢ /lb	18
Au	±10\$/toz	2
¥ / \$	±1¥/\$	10

Remark) ¥/\$ translation includes RC-related and Conversion rate of overseas consolidated / equity-method affiliate companies' profit.



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