

2nd Quarter of FY2012

Progress of Business Strategy

November 2012



SUMITOMO METAL MINING Co., Ltd.

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I . Trend in Business Performance and Asset Components



Taganito Project

SUMITOMO METAL MINING CO., LTD.

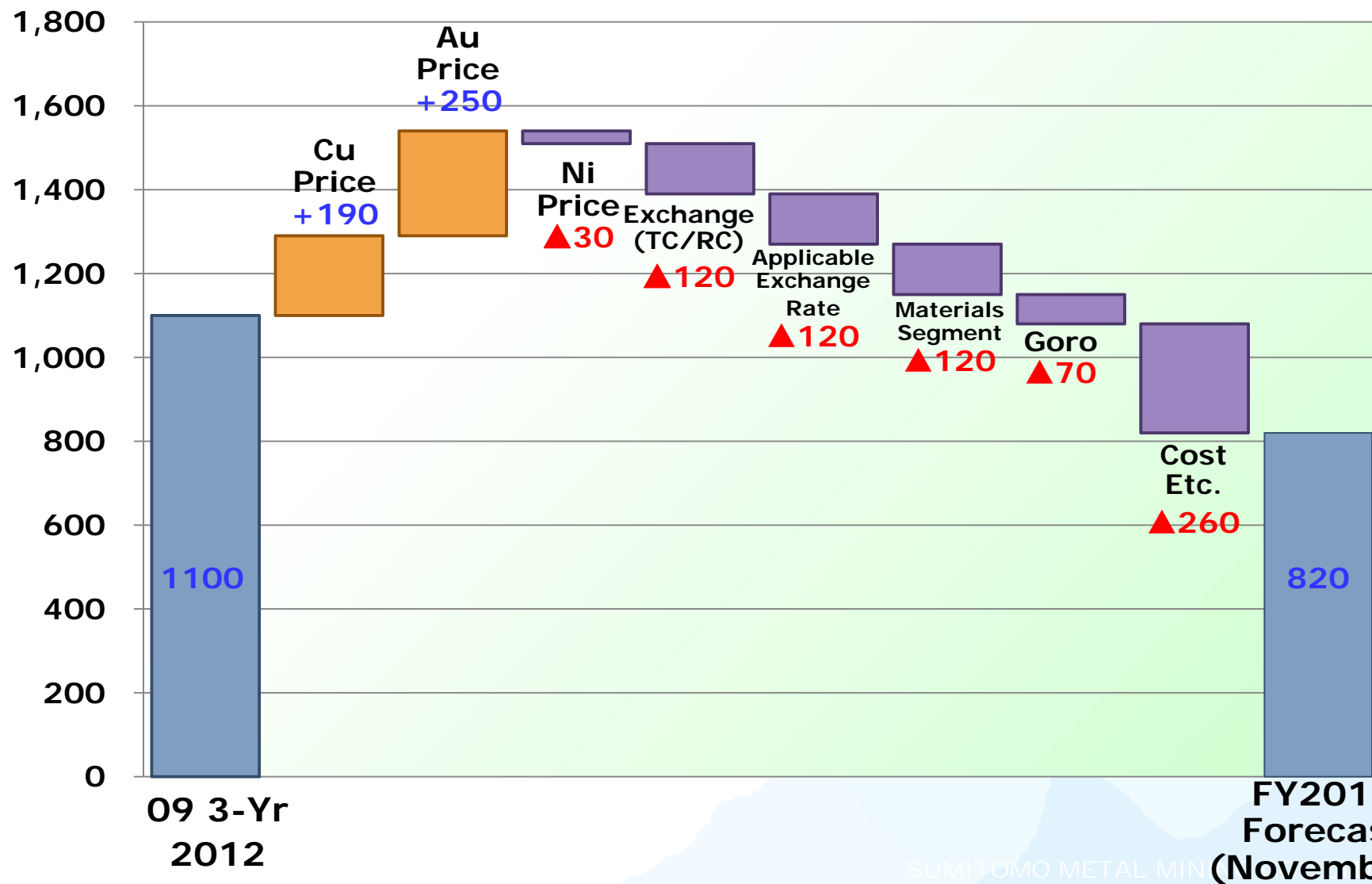
1) Consolidated Results and Forecast



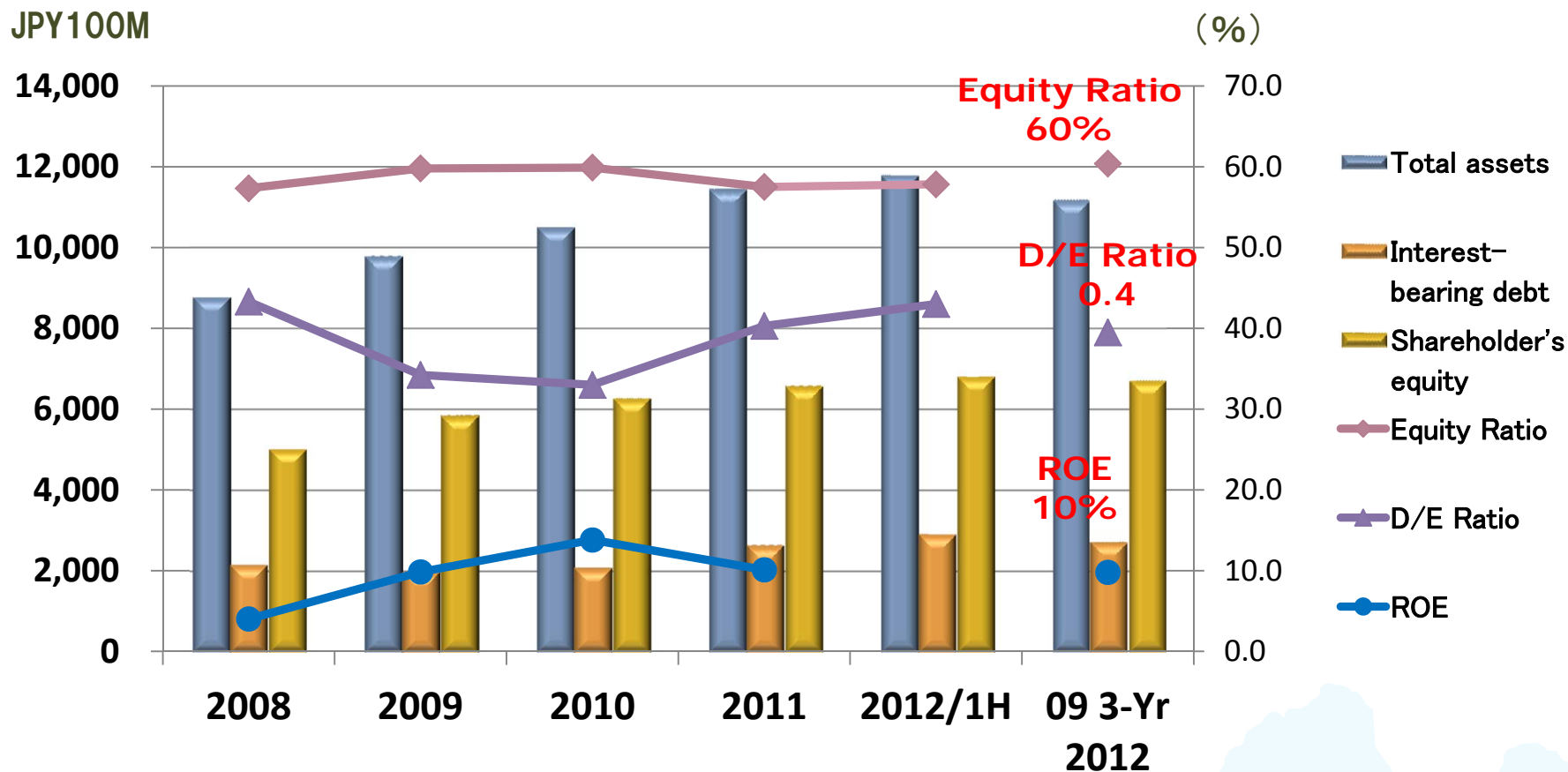
	2009	2010	2011	2012 Forecast	09 3-yr 2012
Consolidated recurring profit (JPY100M)	878	1,237	1,088	820	1,100
Overseas asset contribution to cons. RP (JPY100M)	461	763	749	540	550
Cu (\$/T)	6,101	8,140	8,485	7,646	6,000
Ni (\$/lb)	7.7	10.7	9.6	7.3	8.0
Au (\$/Toz)	1,023	1,294	1,646	1,666	1,000
Exchange (¥/\$)	92.9	85.7	79.1	78.7	90.0

2) Recurring profit Analysis (FY2012 forecast in November vs 09 3-Yr 2012)

JPY100M



3) Maintenance and utilization of sound finances



- Maintain Equity Ratio of 50% +
- Dividend payout ratio of 20% +

II . Progress of 2009 3-Yr Business Plan



Sierra Gorda (Chile) Pre-stripping

SUMITOMO METAL MINING CO., LTD.

1) Cu—Sierra Gorda Project

Mineral Resources

Location

Region 2, Republic of Chile
140 km northeast of
Antofagasta
Altitude: Approx. 1,700 m

Minable Volume

Approx. 1.3 billion tons
Mining life: 20 years

Development Cost

Initial investment
approx. \$2.9 billion
(Cu volume:
110 kt/year)



Starting from 2014,
additional investment
approx. \$800 million
(Cu volume:
220 kt/year)

Equity Interest Ratio

KGHM International 55%
SMM 31.5%
Sumitomo Corp. 13.5%
**Off-take right in copper concentrates:
SMM & SC 50%**

Off-take Right

Copper volume:
110 kt/year

Start of Operation

Scheduled for 2014








	Cu	Mo	Au
Contained metal volume	5,000 kt	300 kt	80 t
Grade	0.4%	0.025%	0.06 g/t



1) Cu—Sierra Gorda Project

Mineral
Resources

Development Schedule

	2011	2012	2013	2014	2015	2016	2017
Acquisition of required permits and approvals							
Construction							
Operations (110 ktpd)							
Expansion of operations to 190 kt							
Operations (190 ktpd)							

- Obtained an environmental permit in June 2011 and started construction in July 2011
- August 2011: Dispatched staff from SMM (currently 3 staffs)
- Progress of construction work:
 - Completed construction of housing, offices, and related support facilities (water supply, sewage treatment, etc.)
 - Construction of heavy equipment repair shops, power station, and land development for millsites is under way
 - Overall rate of construction progress as of the end of October 2012: 22%
- Started pre-stripping work in March 2012
 - Scheduled to be completed at the end of 2013

Development fund (initial investment + working capital: approx. \$3.1 billion in total), achieved fund procurement

- Equity amount—approx. \$800 million, project finance – total \$1 billion, parent company loan—approx. \$1.3 billion

1) Cu—Expansion of Existing Mines Morenci

Mineral Resources

Morenci Mine (North America) Expansion Project

Reinforcement Plan

	Current	2014
Mining output	635 kt/day	816 kt/day
Concentration capability	50 kt/day	115 kt/day
Production volume of copper	280 kt/year	400 kt/year

SMM + 14 kt



Schedule

- Complete FS in 2012 1Q
- Started initial construction work in FY2012
- Complete construction by the end of 2014 and launch full-scale operation in April
- Cost for the launch of operation: Up to \$1.6 billion

Current Status

- Received FS and review in progress
Official announcement to be made within the year

Equity Interest Ratio

FCX	85%
SMM	12%
Sumitomo Corp.	3%

1) Cu—Expansion of Existing Mines Cerro Verde

Mineral
Resources

Cerro Verde Mine (Peru) Expansion Project

Reinforcement Plan

	Current	2016
Mining output	320 kt/day	850 kt/day
Concentration capability	120 kt/day	360 kt/day
Production volume of copper	300 kt/year	500 kt/year



SMM + 34 kt

Schedule

- Complete the procedures for required permits and approvals by the end of 2012
- Start construction in 2013
- Full production by the end of 2015
- Aim to operate for 30 years
- Cost for the launch of operation: \$4.4 billion

Current Status

- Agreed on tax rate stabilization with the Peruvian government
For 2014 and after, tax rate will be fixed at 32%
- Finance proposal from FCX is scheduled

Equity Interest Ratio

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

1) Cu—Expansion of Existing Mines Northparkes

Mineral
Resources

Northparkes Mine (Australia) Expansion Project

Reinforcement Plan

	Current		2016
Concentration capability	5.8 mt/year	➔	Production of 30 mt/year is under consideration
Production volume of copper	38 kt/year		Production of 150 kt/year is under consideration



Background

SMM + 15 kt

STEP CHANGE PROJECT

August 2010 Announced a shift to the pre-FS stage

→ Planned the expansion of production scale by developing the bottom of three existing ore bodies and a new ore body

Schedule

- Aim for full-scale production from 2016

Current Status

- Pre-FS preparation under way

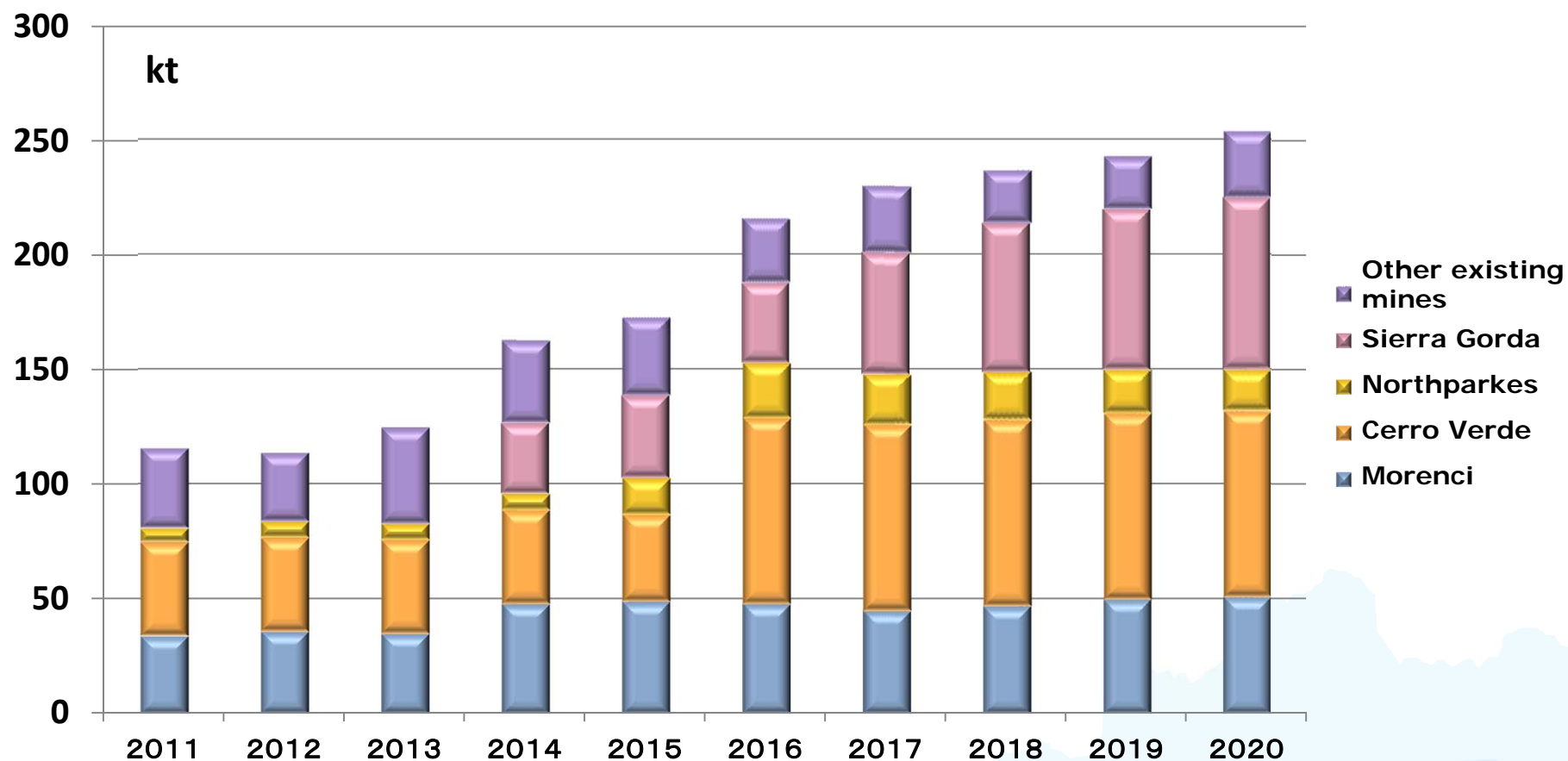
Equity Interest Ratio

Rio Tinto	80.0%
SMM	13.3%
Sumitomo Corp.	6.7%

1) Cu—Promotion of Interest Expansion Plan

Mineral Resources

SMM equity interest production



Going forward to long-term vision,
Cu equity interest production 300 kt/year

2) Ni—Taganito Project

Smelting &
Refining

Steady progress of the **2nd construction of world's most advanced HPAL plant** based on CBNC results

- ◆ Production capacity: Ni 30 kt/year, Co 2.6 kt/year
- ◆ Investment amount: US\$1.3 billion
- ◆ Investment ratio: SMM 62.5%, NAC 22.5%, MITSUI & CO., LTD. 15%
- ◆ Scheduled period for operation: 30 years

Construction to resume in
December 2011

Approx. 80% completed

Schedule

March 2010	Started construction work
October 2011	An assault incident occurred
December 2011	Safety measures were taken and construction was resumed
February 2012	Completed construction of housing
April 2012	Completed construction of office buildings
	Promoted measures to reinforce security system
	Installation of related equipment, such as piping and wiring, under way
2013	Completed construction work
	Commercial production to start around autumn



2) Ni—Promotion of 65 kt Electrolytic Nickel Production Operation

Smelting & Refining

Reinforce Electrolytic Ni Production Capacity at Niihama Nickel Refinery

- ◆ Capacity: 41 kt/year → 65 kt/year
- ◆ Investment amount: ¥14.0 billion
- ◆ Schedule

Schedule to be completed in 2013 1Q

Completed the launch of operations prior to the launch of HPAL operation at Taganito

Facility Reinforcement

Process Development/
Improvement

Operation in Conjunction
with Taganito



Status of progress

- CM process: Equipment expansion under way
- Electrolyzing process: Tank expansion, piping construction under way

Steady progress toward 100 kt/year
Ni production structure

2) Ni—Solomon Project

Mineral
Resources

Solomon Project

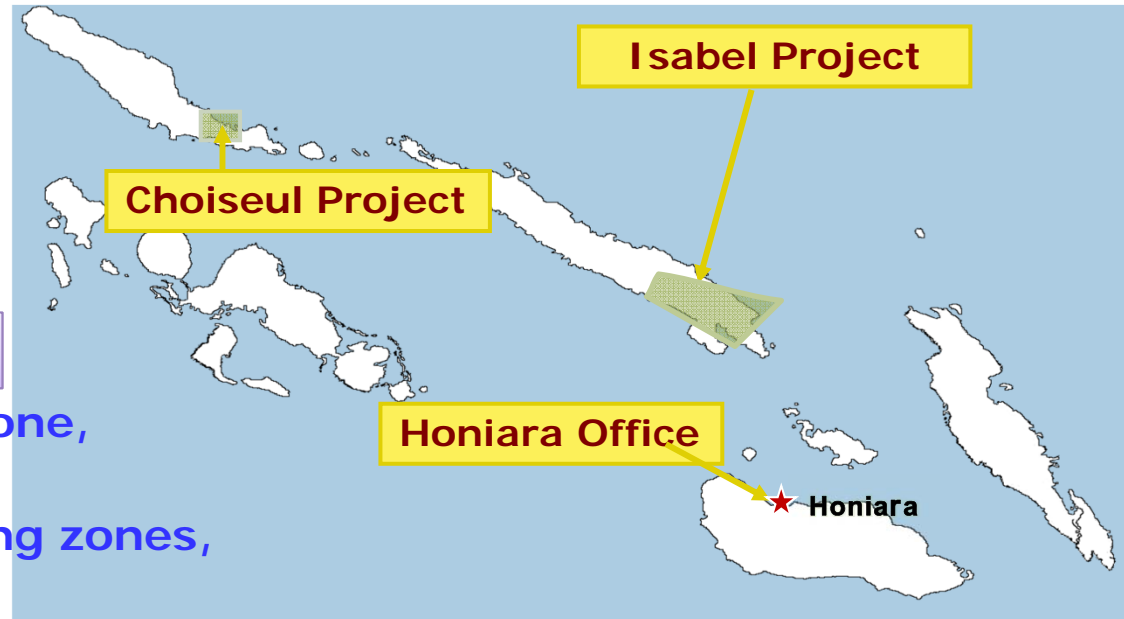
Target

Nickel oxide ores

Existing mining zones

Choiseul Island: 1 mining zone,
approx. 200 km²

Santa Isabel Island: 3 mining zones,
approx. 150 km²



Progress

In accordance with expiration of exploration rights,
preparation of mining rights application is under way

- Pre-FS and EIS (environmental impact study) were submitted and approved by the Solomon Ministry of Environment
- Submitted mining rights application to the Solomon Ministry of Mining
(Choiseul: Submitted in August, Isabel: Scheduled to be submitted targeting December)

2) Ni—Goro Project

Smelting &
Refining

June 2011 Dispatched four SMM staff, including executives

- **Support for fundamental solution on the issue of solvent extraction facilities**
- **Renovated damaged facilities**

November 2011 – Early March 2012

Started pilot operation of the entire process

- HPAL → SX (solvent extraction) → FBR (fluidized bed reactor)
- **Establishment of production system for finished product (nickel oxide) progressing as planned**



May 2012 **Water leak during sulfuric acid process**

→ **Production scheduled to resume from 2012 4Q**



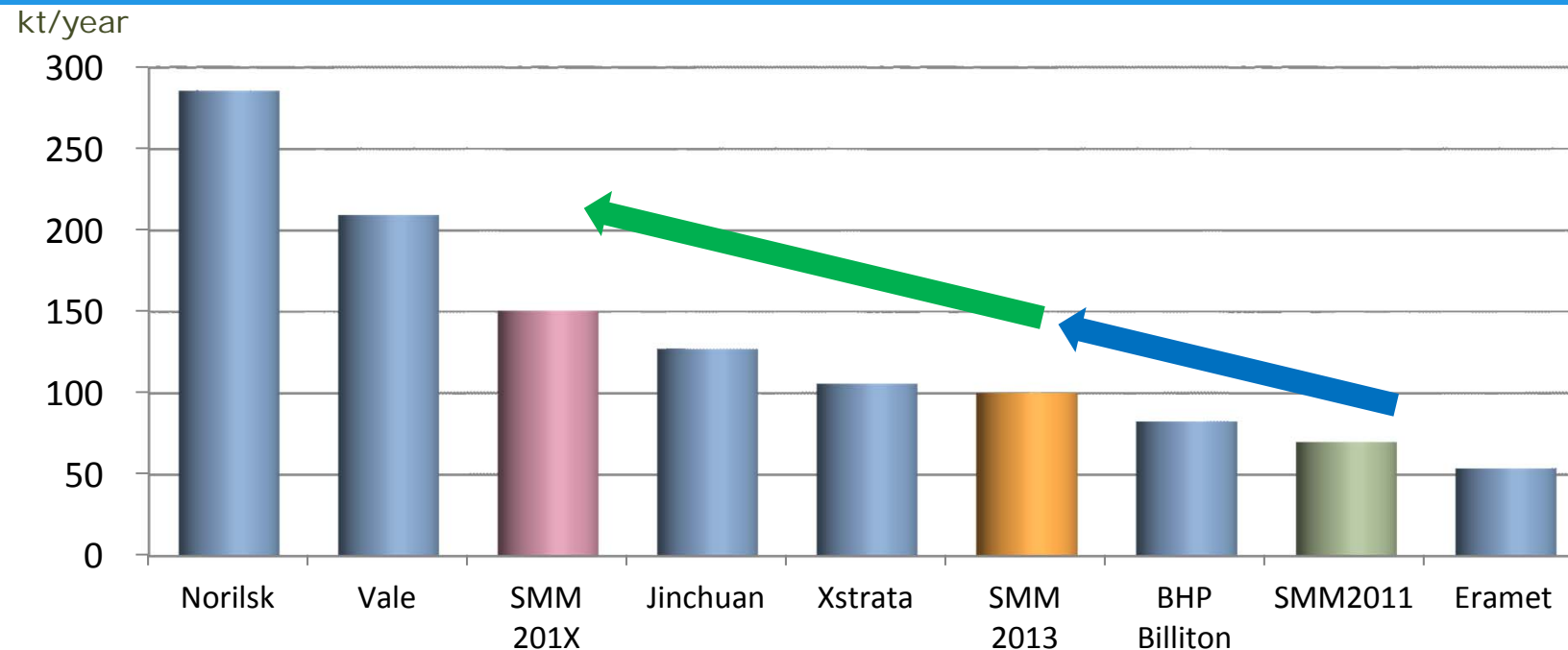
October 2012

Agreed not to undertake the expenses for facility repair and improvement (additional investment) at this stage

→ **Investment by SUMIC decreased from 21% to 14.5% (no longer an affiliated company accounted for using equity method since 2012 3Q)**

2) Ni—Boost Output of Nickel to 150 kt

Smelting & Refining



(kt)	2011	2013	201x
Electrolytic Ni	41	65	65
FeNi	22	22	22
Ni Chemical Products	7	13	13
Other			50
Total	70	100	150

3) Au—Maintenance and Expansion of Existing Mine Volume

Mineral Resources

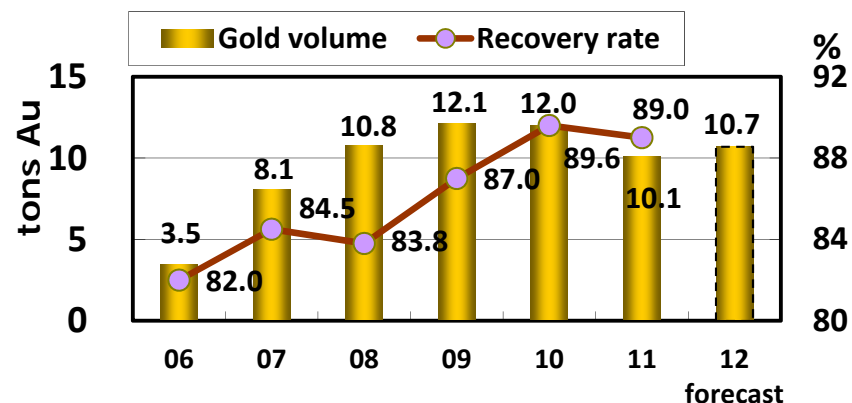
Pogo Mine

Production forecast for 2012: 10.7 tons

Reserves as of December 31, 2011: 155 tons

【Development of East Deep deposit】

- Confirmed new deposit in northeast area of Liese deposit currently being mined – East Deep – (gold volume 40 t)
- Excavate access tunnels
→ launch of mining operation system
- Actively continue the exploration of surrounding area



Hishikari Mine

Production forecast for FY2012: 7.5 tons

Reserves as of December 31, 2011: 150 tons

Maintaining reserves by carrying on the policy of “Explore as much as we mine”

【Development plan for lower ore body】

Confirmed quality mineral vein in the lower part of ore body being mined

- Installed hot spring drawdown equipment at 80ML above sea level
 - Total investment amount: approx. ¥3.2 billion
 - Start construction in November 2012
 - Scheduled to start mining from 2018
- Acquisition of new gold volume of approx. 30 tons is anticipated

3) Au—Stone Boy Project

Mineral Resources

Stone Boy Project

Ratio of Interest

SMM 95%
Sumitomo Corp. 5%

Target Minerals

Au, Sb, etc.

Current Status

Boring surveys began in 1991
(Pogo mine was discovered during
this project)

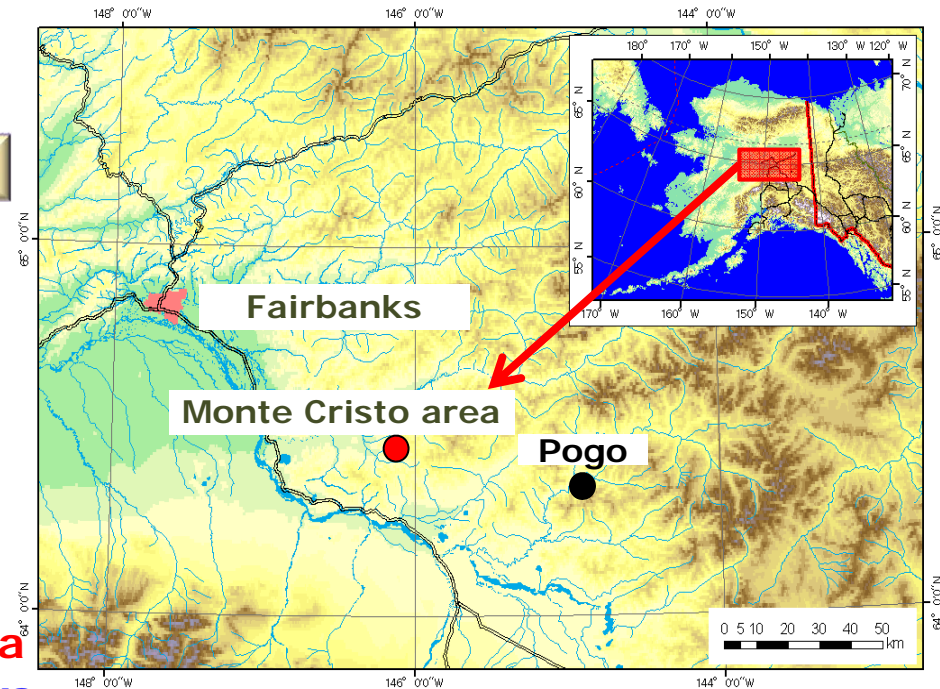
Naosi section in the Monte Cristo area
2008–2010: Conducted boring surveys

The existence of promising mineralization zones for Au, Ag and Sb was
confirmed within **27 of the 29 pits**

12 pits in 2011 and 43 pits in 2012 were explored

Concurrently, conducting a concentration experiment on the Naosi ore body

**A more extensive survey will be conducted to obtain
more accurate volume of minable reserves**



4) Procuring of Resources: Three Methods

Mineral Resources

1. Exploration by SMM

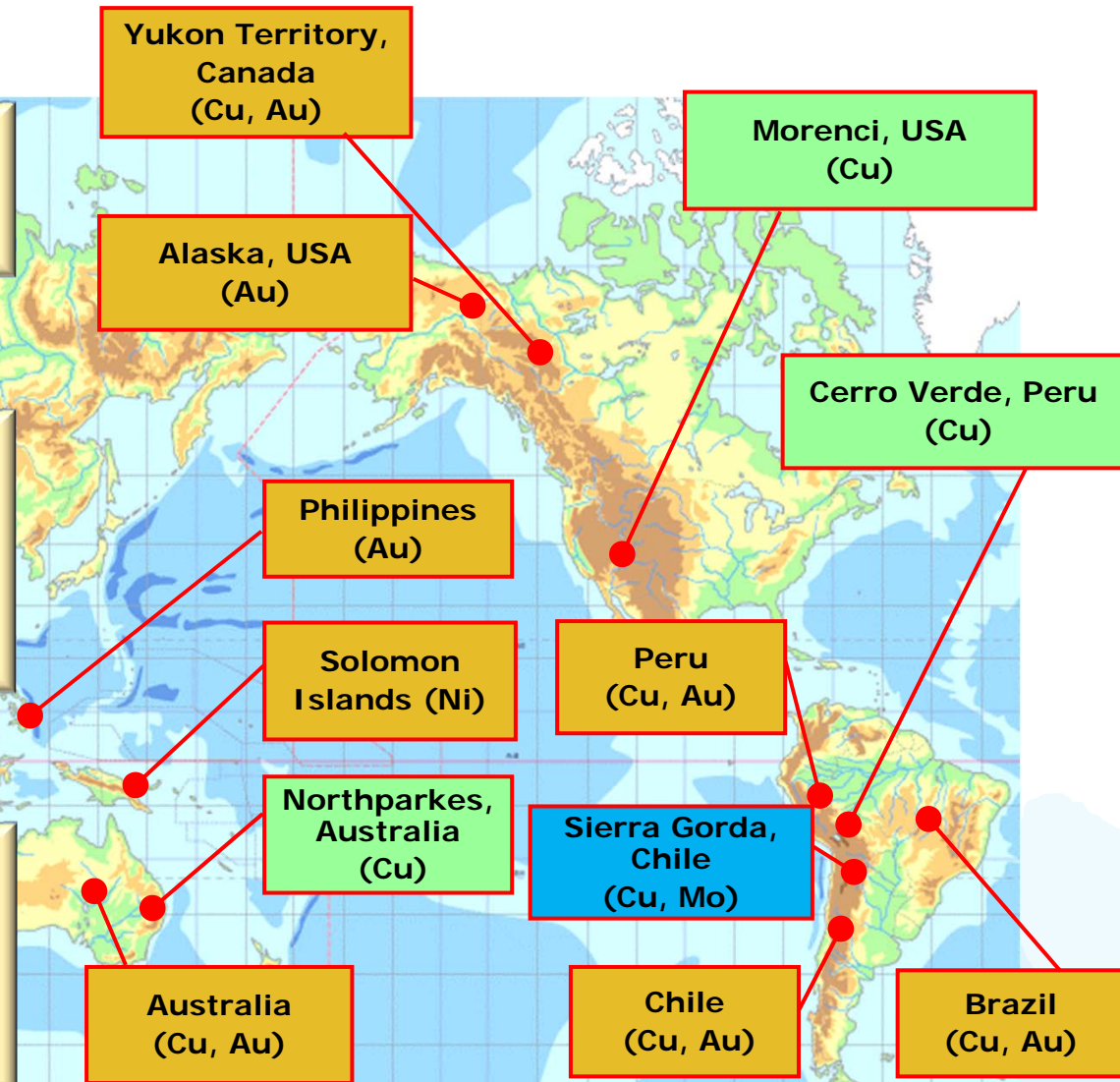
The majority of resources will be procurable by SMM
It takes considerable time to start mining operation

2. Participate in a mine development project

Relatively short-term operation is possible
Obtaining majority share is difficult
There are risks of competition with other companies and an increase in expenses

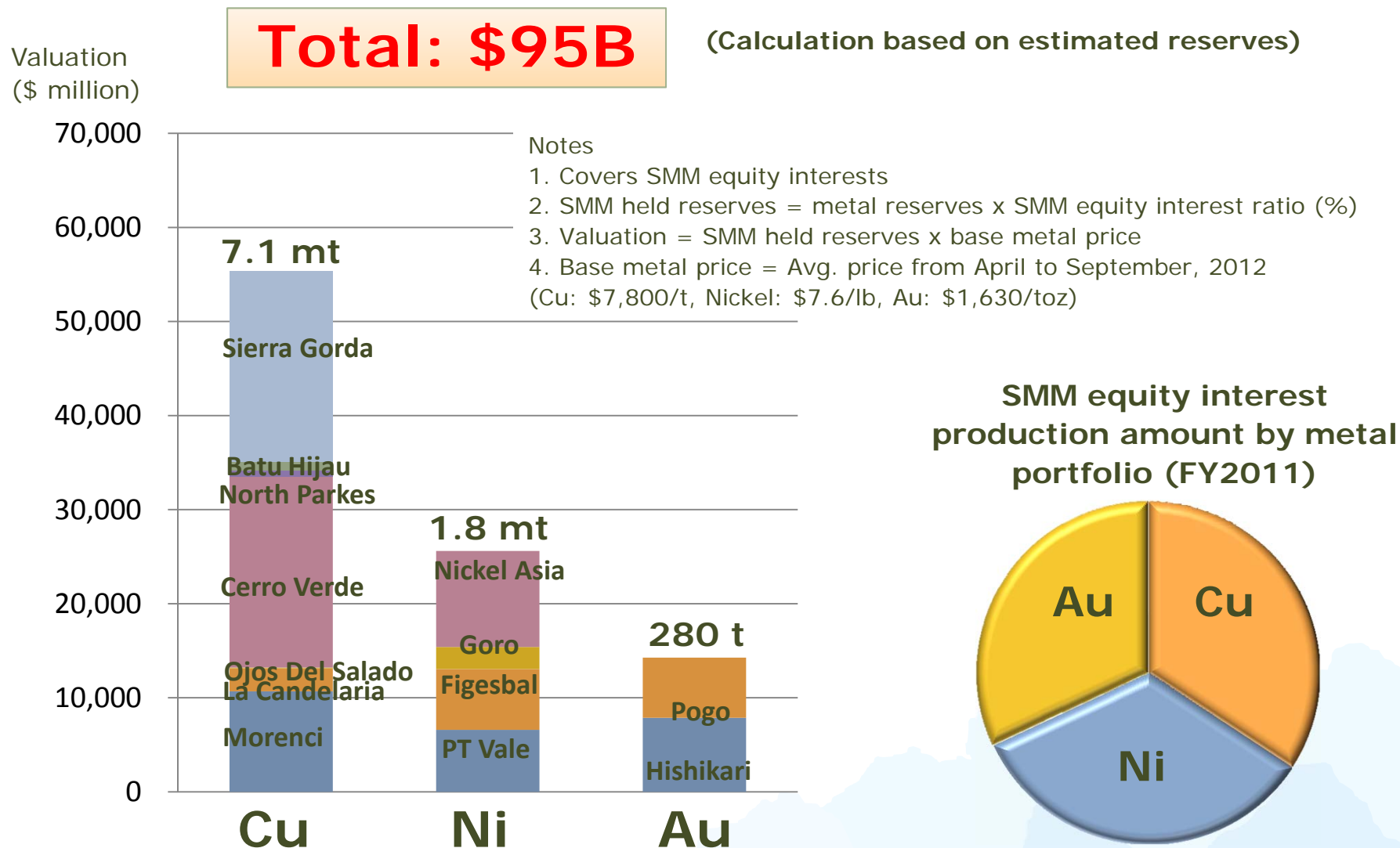
3. Increase production at existing mines

We can use partners' capabilities
There are not many large-scale projects in which we can increase production
It is difficult to increase the SMM equity interest ratio



4) Procuring of Resources: Mining Interest—Reserves

Mineral
Resources



5) Cu Operation Plan at SMM's Toyo Smelter

Smelting &
Refining

FY2012 Production Plan

Electrolytic copper: 436 kt/year
Stable high-load operation at
our new flash furnace
Progressively increased volume
of recycled raw materials



Current operations are
progressing smoothly

Planned production volume is
expected to be achieved

Measures to enhance competitiveness

Develop and improve an advanced
concentrate burner

Support expanded pickup and process
of secondary raw materials

Promote further cost reduction
measures

Improve operational environment



6) Establishment of a Smelting and Refining R&D Structure

Mineral Resources,
Smelting & Refining

Establish RHPC

(Resource/Hydrometallurgy Process Center)

Purpose

As a research laboratory befitting a major nonferrous metal producer, implement world-leading processing and facility technologies in the resource and refining field, which support the Smelting & Refining business

Concept

- Promote development focused on hydrometallurgical processes that defines the growth strategy
- Cross-sectionally gather and assign engineers from our research centers, plants, engineering works
- Operate facilities on a scale that allows acquisition of engineering data
- Utilize center for onsite learning

Schedule

Year 2014: Completion of RHPC to start operation with a 10-person system (on average)

Location

Within the Niihama Nickel Refinery

7) Reorganization and Integration of Materials Business

Materials



Thorough shift of the business structure to make our materials business an independent core business

Further concentration in growth fields
Efficient allocation of management resources
Acceleration of development of new products

July 1, 2012: Launch of "Materials Division"

October 1, 2012: Establishment of "Materials Development Center"

7) Integration of Lead Frame Business

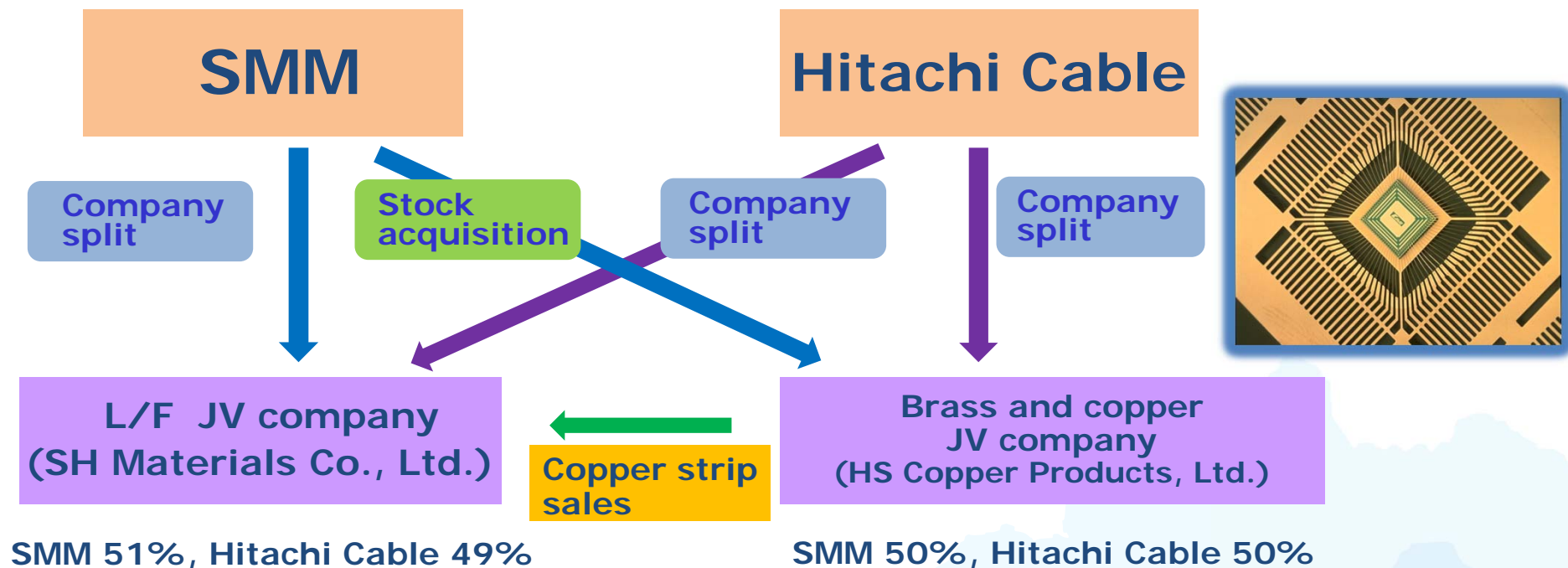
Materials

L/F Business growth strategy through alliance with Hitachi Cable, Ltd.

Entry into the power semiconductor field
Partnership with brass and copper manufacturers



Gain a firm position as No.1 in global L/F shares through establishment of a JV company



Integration scheduled for April 2013

7) Expansion of Battery Materials

Materials

Basic Strategy

1) Remain top supplier of cathode materials for TOYOTA vehicles

2) Enter into existing supply chain



Increase the capacity of nickel sulfate

Current capacity

25,000 tons/year



February 2014

45,000 tons/year

¥6.0 billion investment

Increase the precursor capacity

Current capacity

700 tons/month



March 2014

1,500 tons/month

¥2.0 billion investment

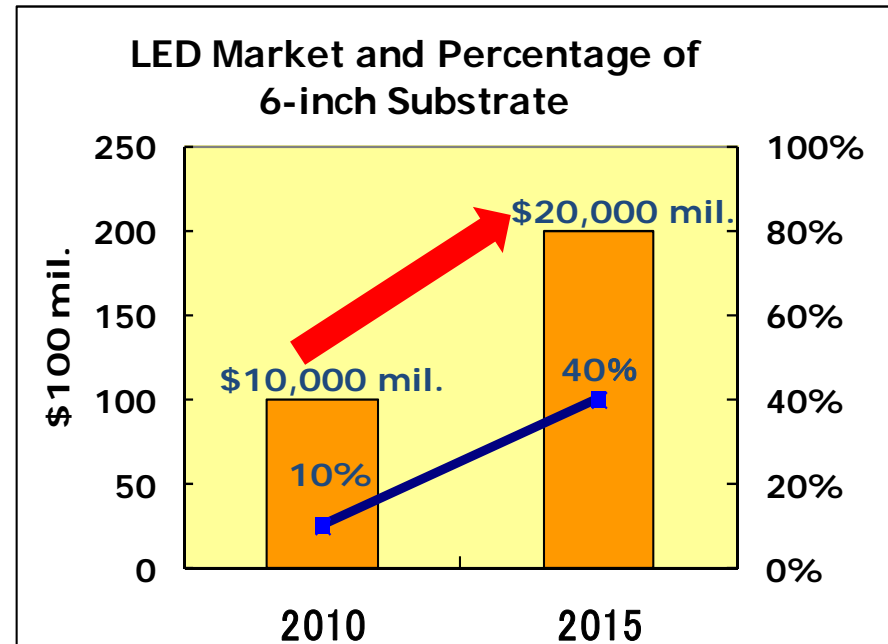
3) Establish a new recycling business model processing scrap containing raw materials for batteries

Develop a process that can collect all Ni/Co contained in used nickel hydroxide batteries Start operation in January 2013

7) Launch of Sapphire Substrates Materials

In line with the expanding demand for lighting LEDs, there is strong demand for large-scale substrates

- ◆ The mass-production technology of large crystalline sapphire substrates has been established
Cost reduction has been achieved by allowing two 6-inch diameter substrate bars to be pulled from a single ingot



The mass manufacturing of sapphire substrates is already under way at Okuchi Electronics Co., Ltd.

- ◆ 6-inch-diameter substrate production increase plan
 - Capital investment: ¥1.2 billion (including the investment already made)
 - September 2012: Complete construction of large-scale fabrication furnace
 - October 2012: Start shipment of mass-produced products, with two substrate bars pulled from a single ingot

8) Sales Integration in China

Smelting & Refining,
Materials

Establish SMM's distribution company in China

Sumitomo Metal Mining Management (Shanghai) Co., Ltd.

Start of operations: July 2012

Location: Shanghai

Content of business:

- Functions as a trading company for materials products and refined metals
- Support for administrative services provided by SMM's subsidiaries and affiliates in China
- Accumulation of knowledge about business in China
- Provision of information to SMM
- Nurturing of human resources through a trainee system

Target

- ◆ Expand sales in emerging markets, exploit good customers
- ◆ Collect and analyze information on our own and formulate our strategies for the Chinese market
- ◆ Make a business model that can be used to further expand business in other emerging markets

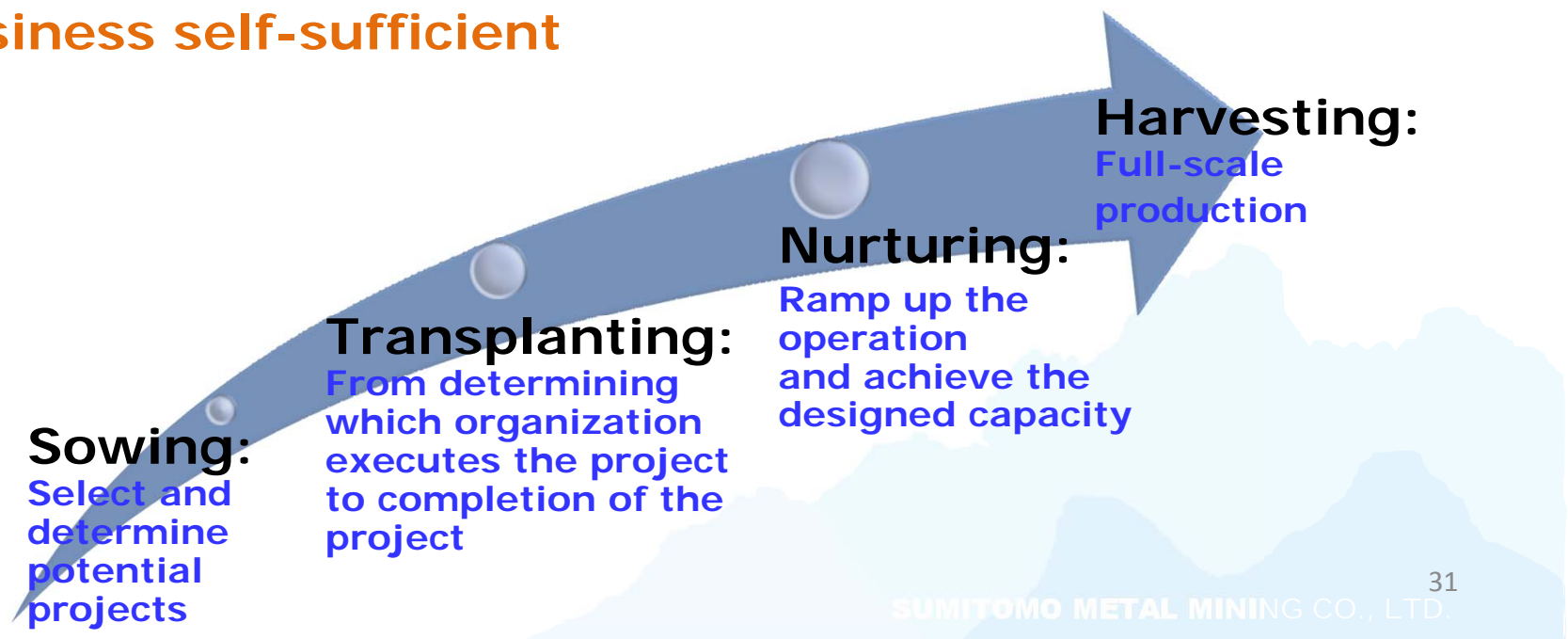
9) 3-Yr Business Plan—Promotion and Launch of Large-Scale Projects

Projects primarily in the Mineral Resources and Smelting & Refining segments
→ Launch and start full production according to the plan

	Project	2009 3-Yr Plan	2012 3-Yr Plan			2015 3-Yr Plan		
		2012	2013	2014	2015	2016	2017	2018
Mineral Resources	Sierra Gorda Project			1 st stage			2 nd stage	
	Cerro Verde Expansion					○		
	Morenci Expansion			○				
	Northparkes Expansion					○		
Smelting & Refining	Taganito		○					
	ENi 65 kt		○					
	Goro Project	○						
Cu equity interest production (Cu kt/year)		120	130	160	170	220	230	240
Ni production capacity (Ni kt/year)		70	100	100	100	100	100	150?

10) 3-Yr Business Plan—Steadily Sowing the Seeds of Future Business

- ◆ Prepare and oversee large-scale projects with a long-term vision
- ◆ Screen appropriate “sowing” projects from among the new large-scale candidate projects
- ◆ Continually monitor progress by project from “Transplanting” to “harvesting”
- **Sierra Gorda Stage 2: Laying the foundation for Cu-300 kt**
- **Specific measures to achieve Ni-150 kt/year**
- **Materials business: Specific measures to make the business self-sufficient**

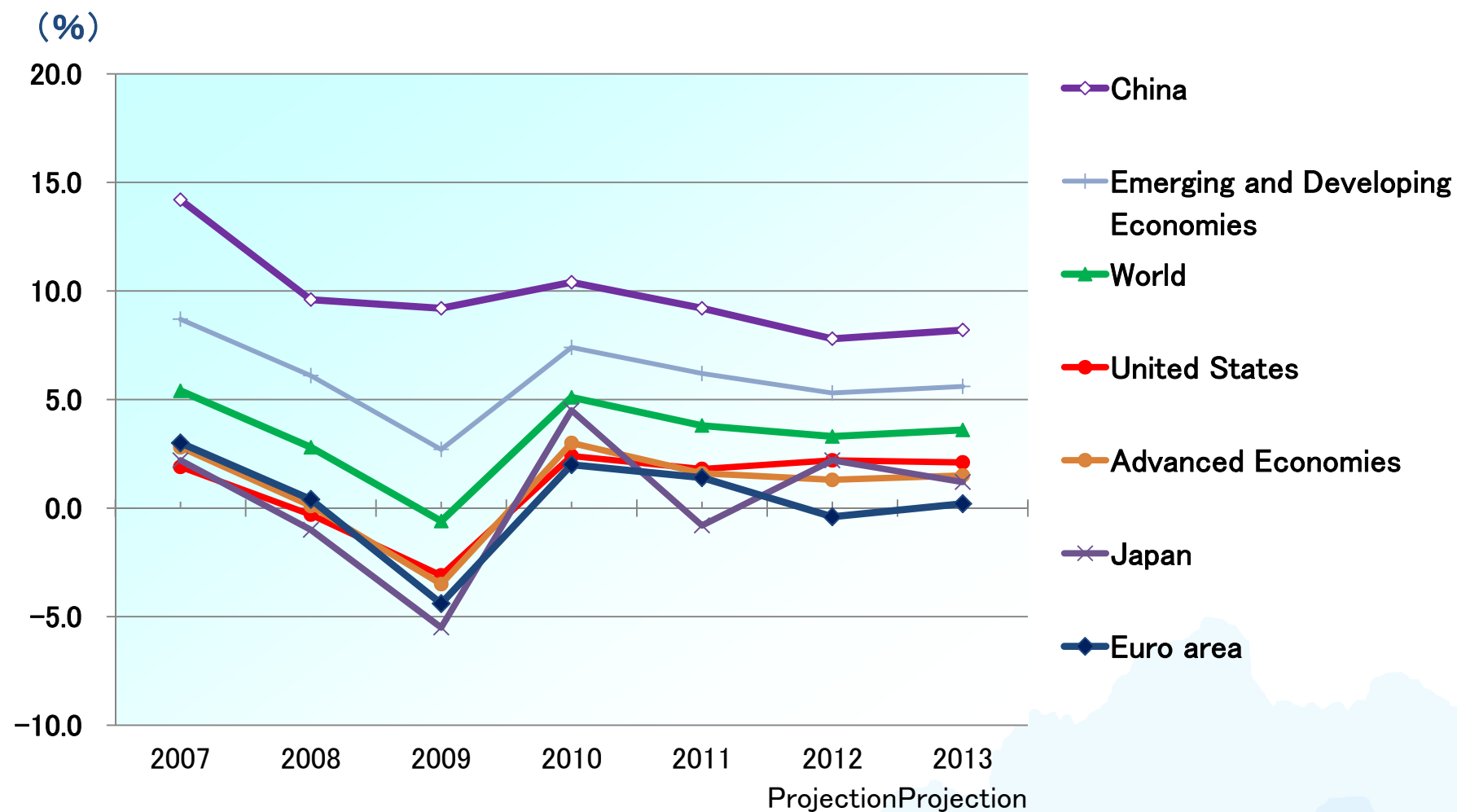


III. External Environment



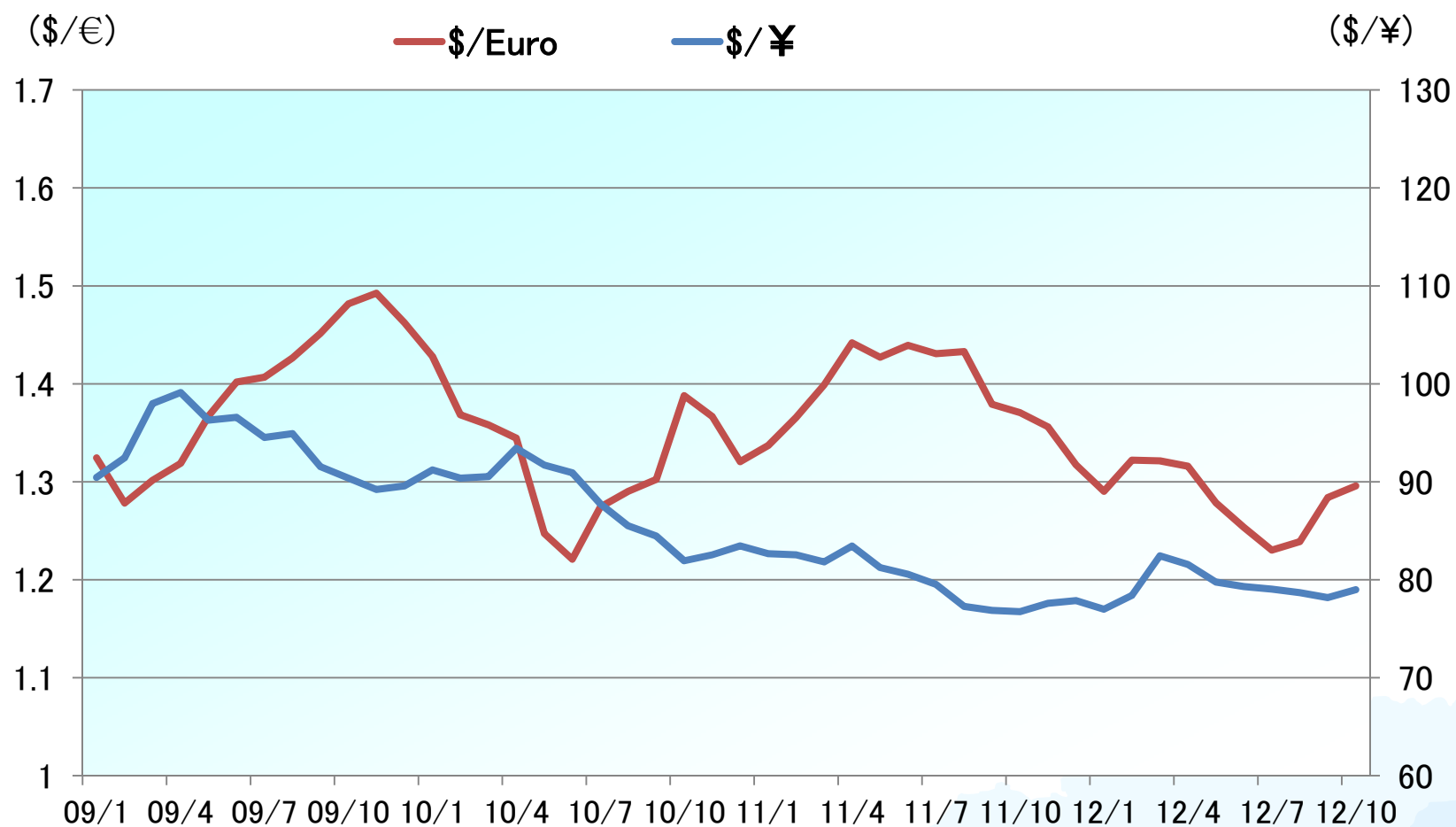
Sierra Gorda Project

1) GDP Outlook

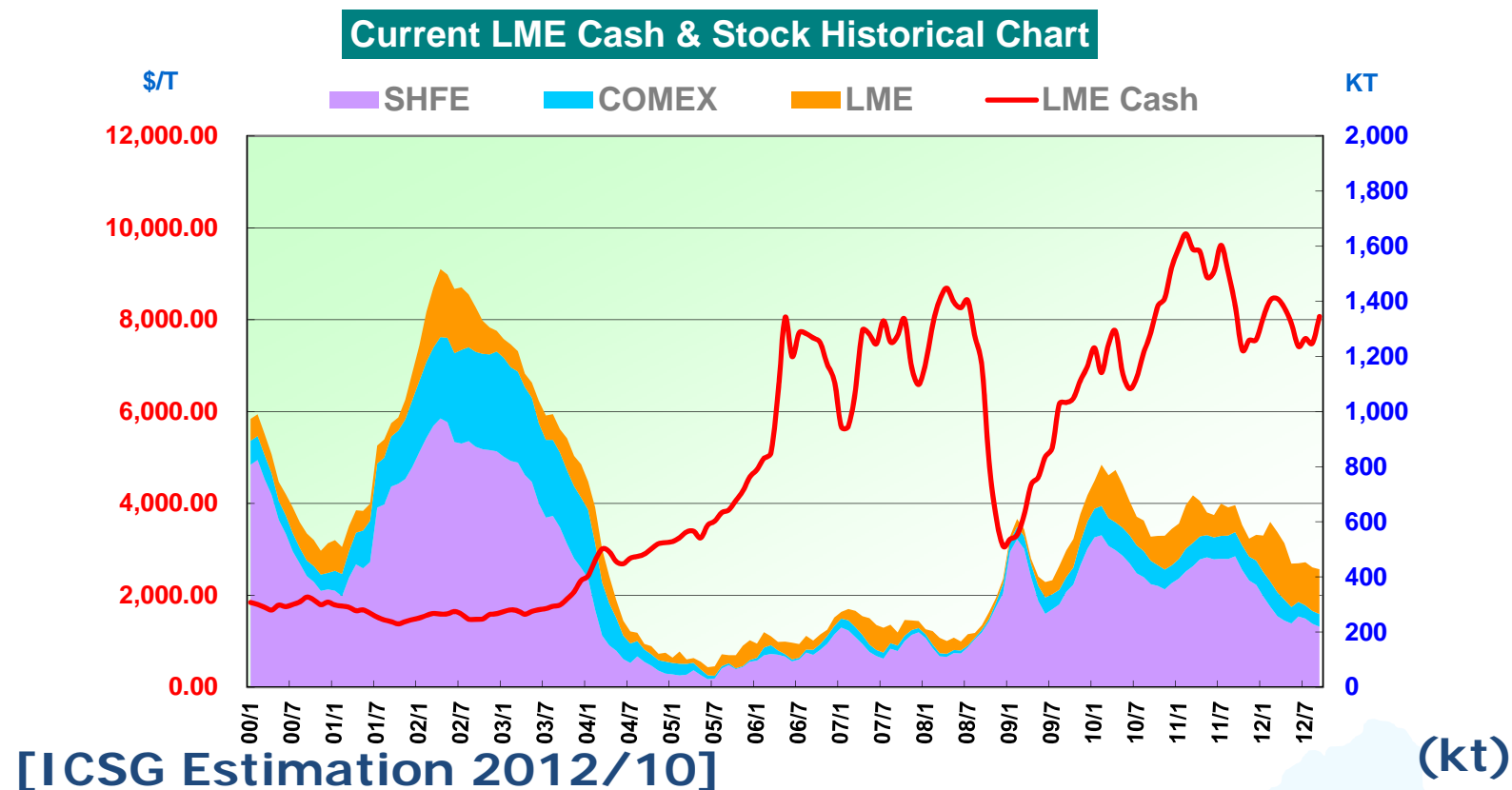


(IMF2012/Oct)

2) Foreign Exchange trend

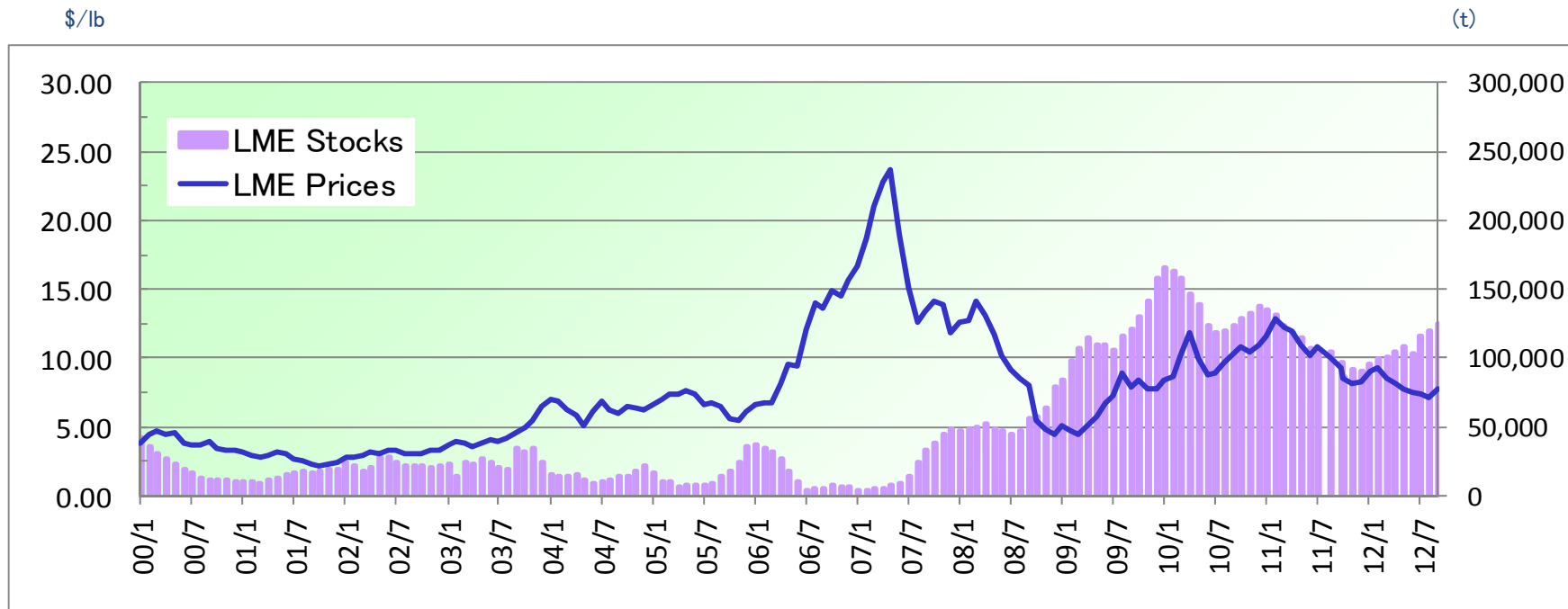


3) Copper – Price / Supply & Demand balance



	2011	2012	2013
Production	19,651	19,950	21,140
Usage	19,865	20,376	20,682
Balance	▲214	▲426	458

4) Nickel – Price / Supply & Demand balance



	INSG Estimation 2012/10(kt)			SMM Estimation 2012/10(kt)		
	2011	2012	2013	2011	2012	2013
Production	1,597	1,687	1,780	1,604	1,673	1,756
Usage	1,587	1,645	1,707	1,582	1,633	1,696
Balance	10	42	73	22	40	60

5) Au – Price



IV. Financial Highlights, Sensitivity and Information Materials



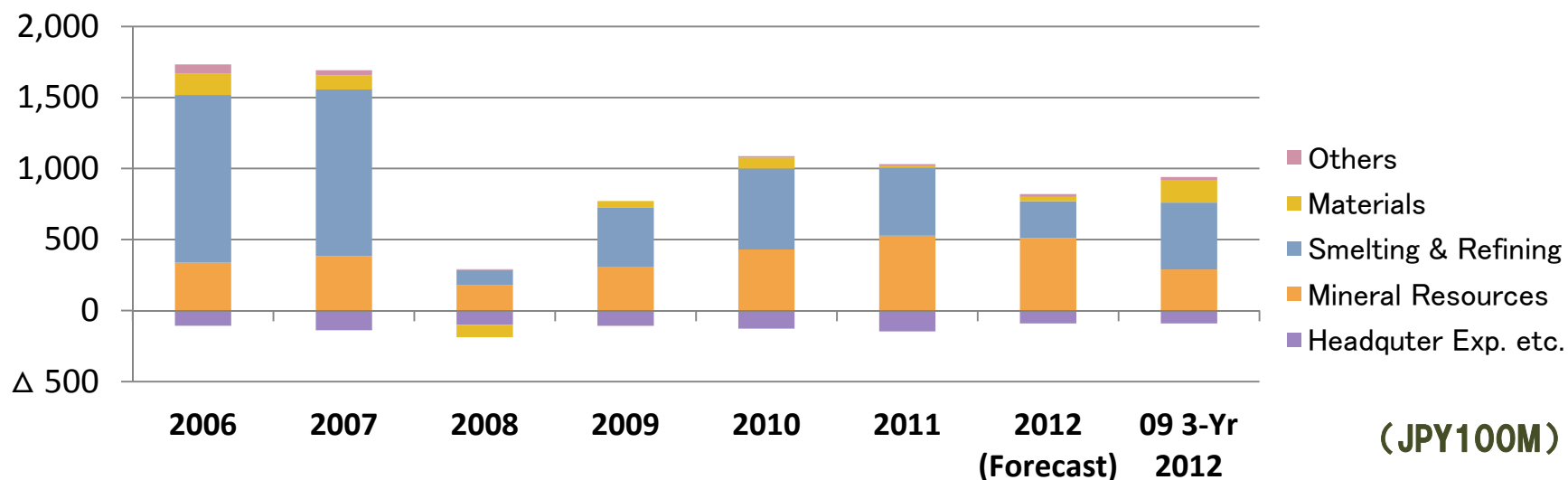
Taganito Project

1) Trends of financial summary

(JPY100M)

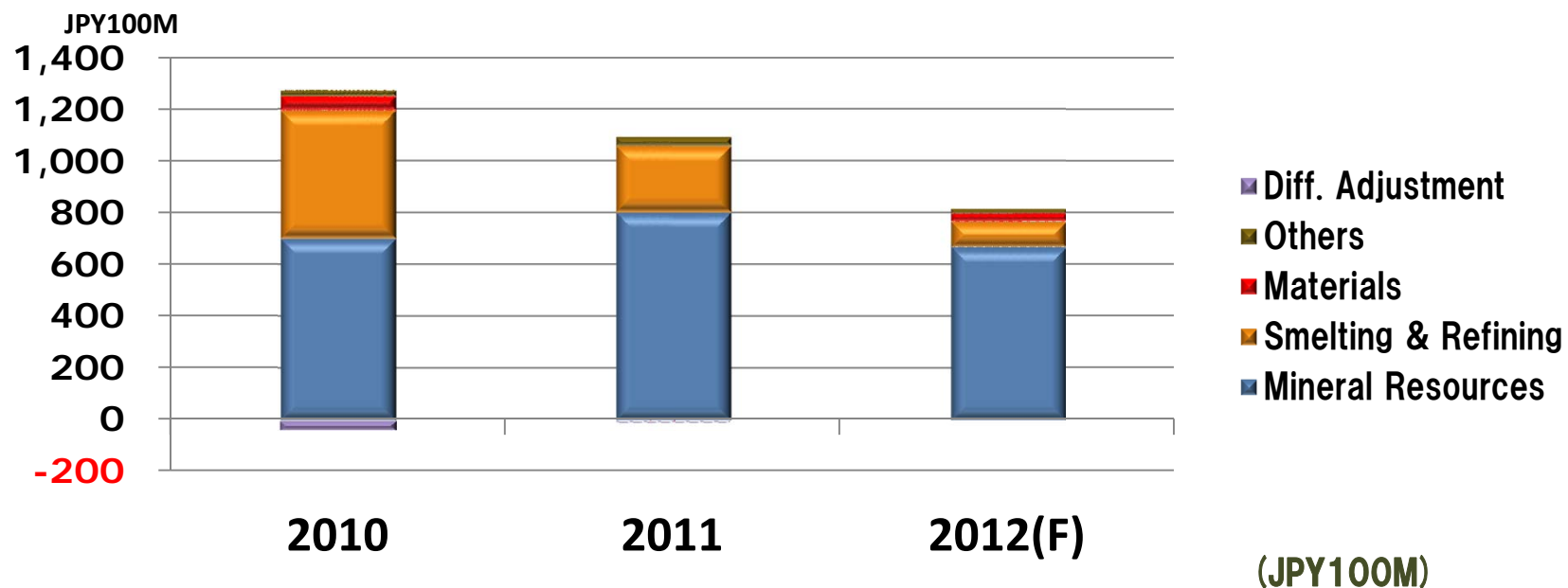
	2006	2007	2008	2009	2010	2011	2012 Forecast	09 3-Yr 2012
Net Sales	9,668	11,324	7,938	7,258	8,641	8,479	7,640	7,800
Operating Income	1,626	1,554	105	663	960	885	730	850
Recurring Profit	2,053	2,179	326	878	1,237	1,088	820	1,100
Equity Method profit	467	740	315	261	348	232	150	300
Net Income	1,261	1,378	220	540	840	652	580	700
ROA(%)	14.8	13.6	2.2	5.8	8.3	5.9	-	6
ROE(%)	29.0	25.4	4.0	9.9	13.8	10.1	-	10
Dividend Per Share(¥)	27.0	30.0	13.0	20.0	32.0	28.0	28.0	N/A
Copper (\$/t)	6,970	7,584	5,864	6,101	8,140	8,485	7,646	6,000
Nickel (\$/lb)	14.0	15.5	7.5	7.7	10.7	9.6	7.3	8.0
Gold (\$/Toz)	629	766	867	1,023	1,294	1,646	1,666	1,000
Zinc (\$/T)	3,579	2,986	1,560	1,934	2,187	2,101	1,854	2,000
Exchange(¥/\$)	117.0	114.4	100.7	92.9	85.7	79.1	78.7	90.0

2) Operating income by segment



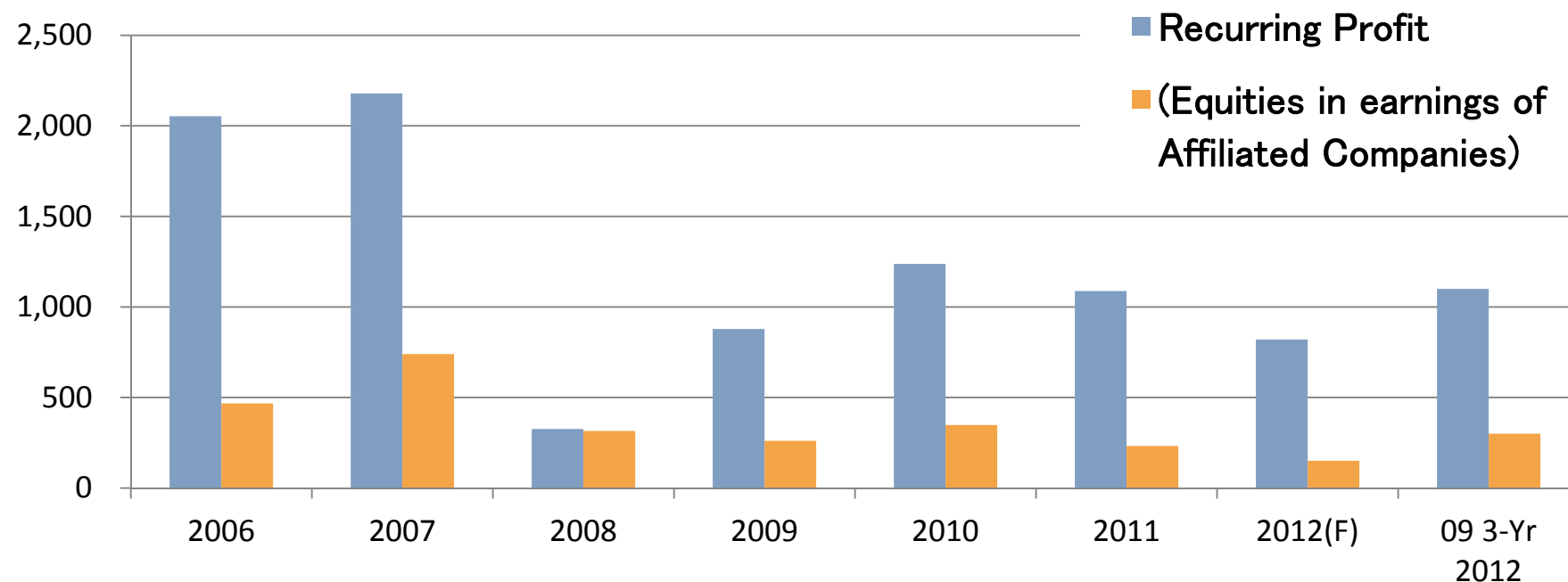
	2006	2007	2008	2009	2010	2011	2012 Forecast	09 3- Yr 2012
Mineral Resources	337	383	179	309	430	527	510	290
Smelting & Refining	1,181	1,174	107	417	569	480	260	470
Materials	152	98	▲87	45	78	10	30	150
Others	63	37	6	▲1	10	14	20	20
Headquarter Exp. etc.	▲107	▲138	▲100	▲107	▲127	▲146	▲90	▲80
Op. income Total	1,626	1,554	105	663	960	885	730	850

3) Contribution margin by segment



		2010	2011	2012予想
Contribution Margin	Mineral Resources	704	805	670
	Smelting & Refining	495	257	100
	Materials	54	▲3	30
	Others	23	34	20
Diff. Adjustment		▲39	▲5	0
Recurring Profit Total		1,237	1,088	820

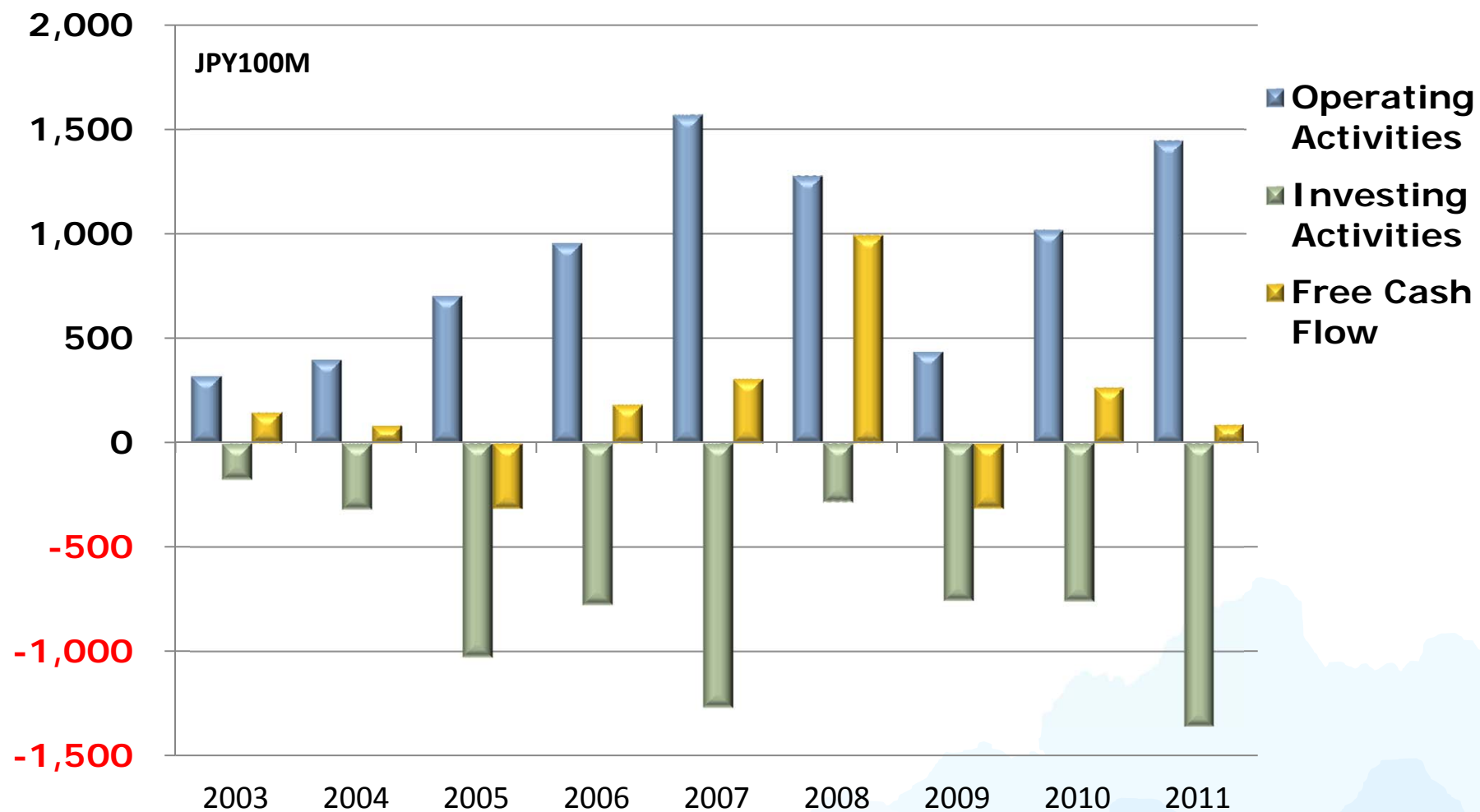
4) Earnings from Equity in affiliated Companies



(JPY100M)

	2006	2007	2008	2009	2010	2011	2012 Forecast	09 3-Yr 2012
Recurring Profit	2,053	2,179	326	879	1,238	1,088	820	1,100
(Equities in earnings of Affiliated Companies)	467	740	315	261	348	232	150	300

5) FCF



6) Sensitivity

(JPY100M/Year)

	Fluctuation	FY2012 Profit up/down
Cu	±100\$/t	5/10
Ni	±10¢ /lb	8/9
Au	±10\$/TOZ	4/4
¥/\$	±¥1/\$	11/11

(Remarks)

Operating income/Recurring profit

USD/JPY translation applied to RC-related only.

(Overseas profit effects excluded).

7) Glossary

Mineral resources and metals

1) Metal trading

London Metal Exchange (LME)

The LME specializes in trading of non-ferrous metals such as copper, nickel, aluminum, lead and zinc. The LME trading prices for metals are used as the international pricing benchmarks for sales of refined metal and purchases of refining ores.

TC/RC

Treatment Charge (TC) and Refining Charge (RC) are commonly used in the terms of purchase for copper concentrate or nickel ore for refining. They are amounts designed to cover refining costs. For example, copper concentrate contracts may define a purchase price based on the LME price at a certain date, minus the TC or RC being used at the time.

London fixing

Gold is not traded on the LME. Its price is determined for each transaction between market participants. The financial institutions in the London Bullion Market Association (LBMA) agree a standard price for gold based on these transactions and publish it on the morning and afternoon of each trading day. This “London fixing” price is the benchmark for trading in gold.

Pound (lb)

Part of the imperial system of measures, the pound is the standard unit of weight used in measuring and pricing base metals such as copper and nickel, and in TC/RC calculations. One pound is equal to 453.59 grams; an imperial ton equals 2,204.62lb.

Troy ounce (toz)

The troy ounce is the standard unit of weight for precious metals such as gold and silver. It equals approximately 31.1 grams. It is named after Troyes, a city in the Champagne region of central France that was the site of a major market in Europe in medieval times. Originally used as a unit of exchange for valuing goods in terms of gold or silver weights, the troy ounce is still used today in gold trading.

2) Metal refining

Smelting and refining

Refining processes extract valuable metals from ores or other raw materials. They fall into two basic types: hydrometallurgical (wet) and pyrometallurgical (dry). At SMM's Toyo facilities in Ehime Prefecture, the copper concentrate pre-processing undertaken at Saijo uses pyrometallurgical processes and the nickel refining at the Niihama site uses hydrometallurgical processes entirely. The term ‘smelting’ is used for the extraction of metal from ores using melting and heating (pyrometallurgy). The term ‘refining’ refers to any process that increases the grade or purity of a metal.

Pyrometallurgical refining

The precursor ore is melted at high temperature in a furnace, and refining techniques are applied to separate the metal in a molten state. Although large amounts of ore can be processed at one time, the equipment needs periodic maintenance for heat proofing.

Hydrometallurgical refining

The ore and impurities are dissolved in a solution, and chemical reactions are used to separate out the metal. This approach allows continuous and stable refining, but incurs additional costs due to the refining chemicals consumed.

3) Metal ores

Sulfide ores

These ores contain copper, nickel or other metals chemically bonded to sulfur. Since the application of heat breaks these bonds, releasing the sulfur, such ores are generally refined using pyrometallurgical techniques.

Oxide ores

These ores contain metals in oxidized forms. Unlike sulfide ores, oxides need much more energy to achieve melting. For this reason, the hydrometallurgical approach is generally used to refine these ores.

Copper concentrates

Used as raw materials in copper smelting, copper concentrates have a copper content of about 30% by weight. The remainder consists mostly of sulfur and iron. Copper concentrates are made mostly from sulfide ores. Ores extracted from overseas mines have a typical grade of about 1%. The ores are then “dressed” at the mine to increase the purity and produce concentrate. Most of the copper ores imported by SMM for smelting in Japan are concentrates.

Nickel oxide ores

Whilst the higher-grade sulfide ores are used predominantly in nickel refining, nickel oxide ores are more prevalent than nickel sulfides. The sulfide-oxide ratio in current nickel reserves is believed to be about 3:7. High refining costs and technical issues have limited use of oxide ores in nickel refining to date, but SMM has succeeded in refining nickel from low-grade oxide ores based on HPAL technology.

Mixed sulfide (MS) ores

CBNC produces a mixed nickel-cobalt sulfide intermediate containing about 60% nickel by weight. This is used as a raw material in electrolytic nickel production.

Matte

A matte is another term for metal sulfides. For raw material, electrolytic nickel production at SMM also uses a nickel matte (of about 75-80% purity) sourced from PT Inco.

Proprietary ore ratio

This ratio is the proportion by volume of ore procured from overseas mining interests relative to the overall volume of smelting ores used as raw materials. Typically, off-take rights are proportional to the equity interest in a mine. In the case of Cerro Verde, SMM has secured 50% off-take rights for the first ten years of production from 2006, based on a 21% equity interest.

7) Glossary

4) Nickel production process

Coral Bay Nickel Corporation (CBNC)

Based in the Philippines, this SMM subsidiary produces mixed nickel-cobalt sulfides using HPAL technology and exports the raw materials to the SMM Group's nickel refining facilities in Niihama, Ehime Prefecture.

High Pressure Acid Leach (HPAL)

HPAL technology enables the recovery of nickel from nickel oxide ores that traditionally were difficult to process. SMM was the first company in the world to apply it successfully on a commercial scale. The oxide ores are subjected to high temperature and pressure and reacted under stable conditions with sulfuric acid to produce a nickel-rich refining intermediate.

Matte Chlorine Leach Electrowinning (MCLE)

MCLE is the technology used in the manufacturing process at SMM's nickel refinery. The matte and mixed sulfide ores are dissolved in chlorine at high pressure to produce high-grade nickel using electrolysis. MCLE is competitive in cost terms, but poses significant operational challenges. Other than SMM, only two companies are producing nickel based on this kind of technology.

5) Main applications for metals

Copper

Copper is fabricated into wires, pipes and other forms. Besides power cables, copper is used widely in consumer applications such as wiring in vehicles or houses, and in air conditioning systems.

Electrolytic nickel

This form of nickel, which has a purity of at least 99.99%, is used in specialty steels, electronics materials and electroplating, among other applications. SMM is the only producer of electrolytic nickel in Japan.

Ferronickel

Ferronickel is an alloy containing nickel (about 20%) and iron. Its main use is in the manufacture of stainless steel, which is about 10% nickel by weight. Based in Hyuga, Miyazaki Prefecture, SMM Group firm Hyuga Smelting produces ferronickel.

Gold

Gold is in demand worldwide for investment and decorative purposes. Gold is widely used in Japanese industry within the electronics sector because of its high malleability and ductility.

Semiconductor and advanced materials

Copper-clad polyimide film (CCPF)

CCPF is a polyimide film that is coated using a copper base. It is used as a material for making COF substrates.

Chip-on-film (COF) substrates

COF substrates are electronic packaging materials used to make integrated circuits for LCD drivers. They connect these circuits to the LCD panel.

Lead frames (L/F)

Lead frames are electronic packaging materials used to form connections in semiconductor chips and printed circuit boards. They contain thin strips of a metal alloy containing mostly nickel or copper.

Secondary batteries

Secondary batteries are ones that can be recharged and used again. SMM supplies battery materials that are used in the anodes of nickel metal hydride batteries and lithium-ion rechargeable batteries, which supply power for hybrid vehicles or notebook computers, among other consumer applications.

Note

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