Sumitomo Metal Mining IR-Day 2020｜Battery Materials Business, Integrated Supply Chain of Mineral Resources, Smelting and Refining to Materials, Focusing on Recycling

This is a transcription of the contents of Sumitomo Metal Mining IR-Day 2020, a business briefing session held on December 21, 2020.

<Speaker>
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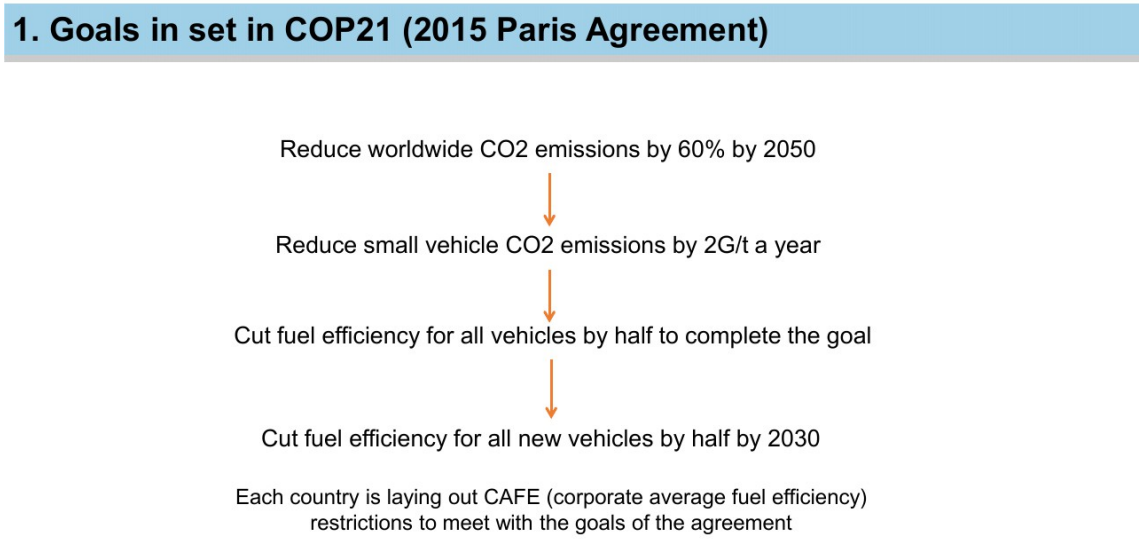
1. Goals in set in COP21 (2015 Paris Agreement)



Isao Abe (hereinafter, Abe): I'm Abe, General Manager of Battery Materials Division. Now, concerning the battery materials business, I would like to explain the "environmental restrictions and electrification in the automotive industry" and the "Sumitomo Metal Mining's battery materials business strategy".

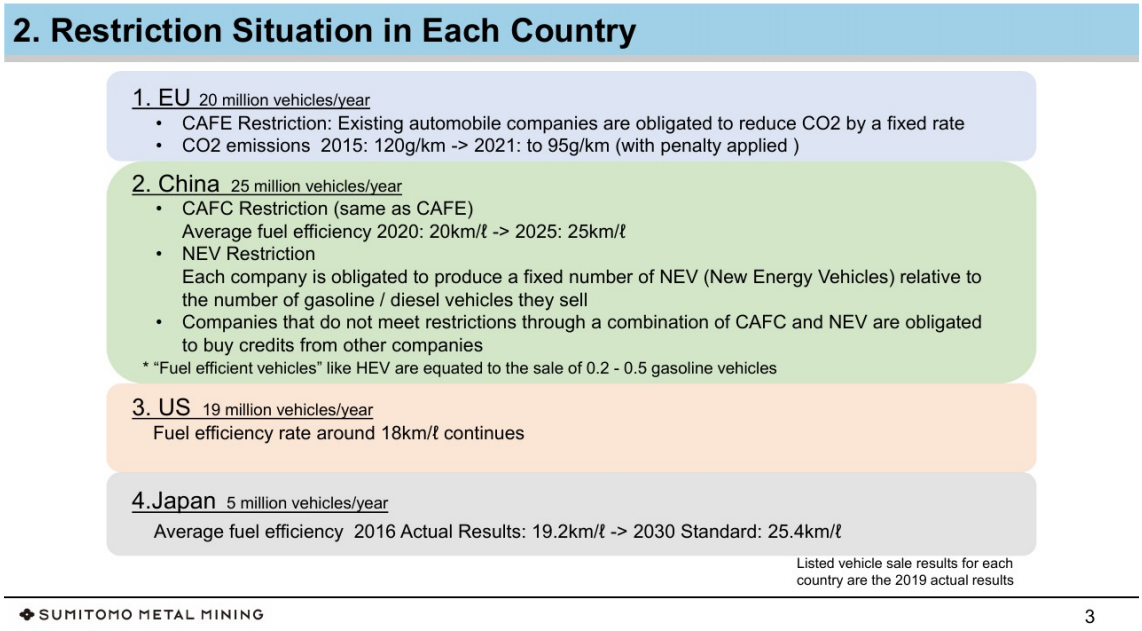
First, I will explain about environmental regulations for batteries. Currently, there are two main types of batteries: "automotive" and "civil use". Recently, however, demand for batteries has been increasing mainly for automobiles. First, I will explain the background of why batteries have grown so much in automotive materials.

The underlying background is the agreement at COP 21. COP 21 has a major goal of reducing global CO2 emissions by 60% by 2050. To achieve this goal, an international agreement has been reached to reduce CO2 emissions from small cars by 2 gigatonnes per year.

To achieve this, it is necessary to reduce the average fuel consumption of all vehicles by half. To achieve "Cut fuel efficiency for all vehicles by half to complete the goal" the target set at 2030 was to halve the average fuel efficiency of new vehicles by COP 21.

The current situation is that each company has established CAFE regulations to achieve the agreed targets.

2. Restriction Situation in Each Country



Next, it is the regulation from the latest in each country to around 2025. First, European CAFE regulations have been widely reported. About 20 million new cars are sold in Europe each year, and the CAFE regulations require European automakers to reduce CO2 emissions at a certain rate. In 2015, the amount of CO2 emitted per 1 kilometer of a car was 120 grams, but in 2021, efforts are being made to reduce this to 95 grams per 1 kilometer.

Fines are also involved behind this, forcing a system of fines that will result in huge fines of hundreds of billions of yen for some companies for sales in 2021. In 2015, against the backdrop of the so-called diesel fraud in Europe, the current situation in Europe is that to achieve this regulation, they steered away from diesel to EV, electric vehicles.

China is now the world's top seller of new cars, selling 25 million new cars a year. China has two regulations: CAFE regulation and NEV regulation.

The CAFE regulations call for "In 2025, increase the company's average fuel efficiency to 25 kilometers per liter." The NEV regulations require that a certain number of new energy vehicles,

called New Energy Vehicles, be produced and sold following the number of gasoline and diesel vehicles sold by each company.

If the sum of the CAFE regulation and the NEV regulation does not meet the regulation value, we are obliged to purchase credits from other companies, and many companies are obliged to purchase credits from other companies. The advantage of EV companies in China is that they contribute to these credit sales.

Under the leadership of Republican President Donald Trump, the United States is moving to withdraw from the Paris agreement, and only the United States is reversing global efforts to reduce CO2 emissions. Fuel consumption will continue to be 18 kilometers per liter, and no stricter regulations have been announced so far.

However, with the change of the president to the Democratic Party, it is expected that regulations on CO2 emissions in the United States will become stricter.

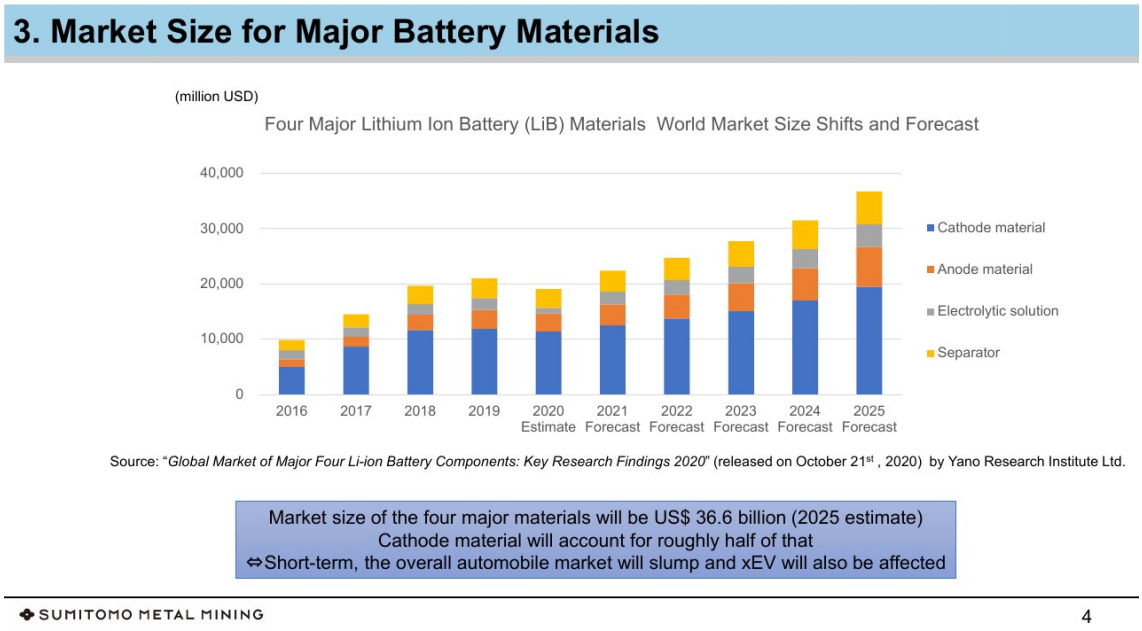
During the Republican era, Canada, the United States, and Mexico signed a law called the United States Mercantile Exchange (USMCA), which requires the use of U.S.-made parts. On the other hand, there is talk of increasing the ratio of batteries for cars made in the United States to be made in the United States by stopping the massive inflow of auto parts from Mexico into the United States.

In addition to environmental regulations, such regulations have emerged in the United States, and there is growing pressure to produce batteries in the United States. I think this is moving differently from Europe and China.

Finally, Japan. In Japan, 5 million new cars are sold every year. By country, Japan still boasts the world's 3rd largest sales of new cars and has set a target of increasing the average fuel economy in 2016 from 19.2 kilometers per liter to the 2030 level of 25.4 kilometers.

The other day, according to from the government, the Ministry of Economy, Trade, and Industry (METI) announcement, I guess someone leaked the information however, a policy to abolish gasoline-powered cars by the mid-2030s, meaning that all new car sales will be electric cars. In 2050, Prime Minister Kan announced that Japan would aim for a "carbon neutral" to reduce carbon emissions to 0. Japan, which may have been one step behind Europe and China, has started to reduce CO2 as a policy.

3. Market Size for Major Battery Materials

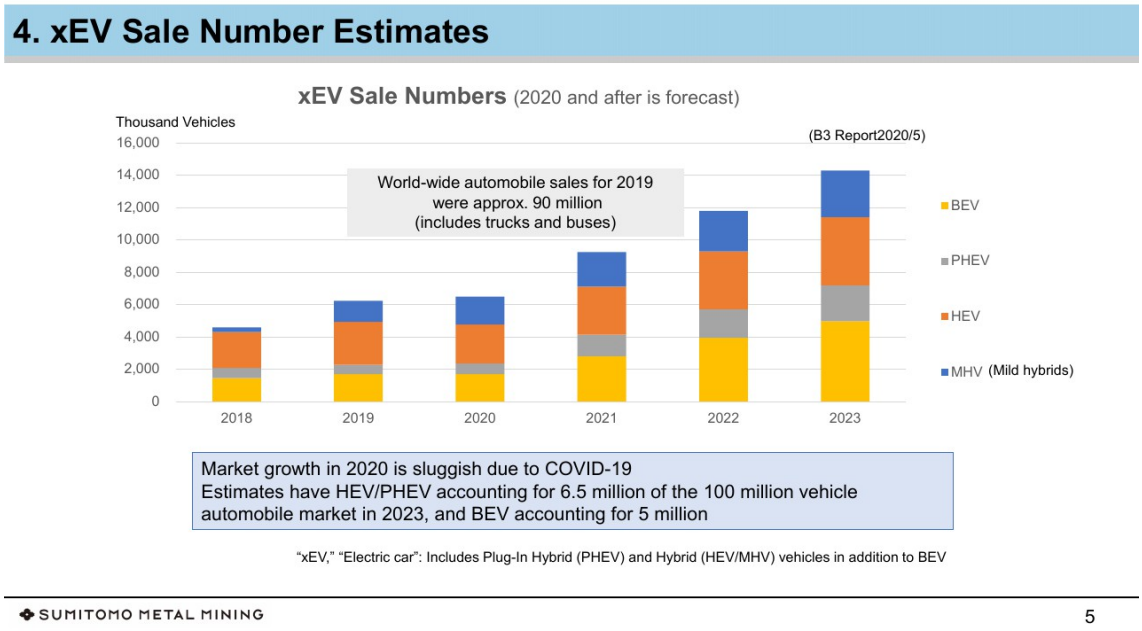


Next is the market size of the main components of batteries. Yano Economic Research Institute Co., Ltd. estimates the market size of major battery components. In the first half of 2020, in particular, the automobile market as a whole declined due to the impact of the COVID-19, and sales of parts and materials also declined.

Cathode materials account for half of the battery components, and further growth is expected in 2025. The global market is expected to grow significantly from the current ¥1.2 trillion to approximately ¥2 trillion.

Also, battery materials are especially strong in Japan. Us and Nichia Corporation, are very strong in cathode materials, Showa Denko Materials Corporation (Former Hitachi Chemical Co., Ltd.) is strong in anode materials, Mitsubishi Chemical Corporation is strong in electrolytes, and Asahi Kasei Corporation and Sumitomo Chemical are strong in separators.

4. xEV Sale Number Estimates



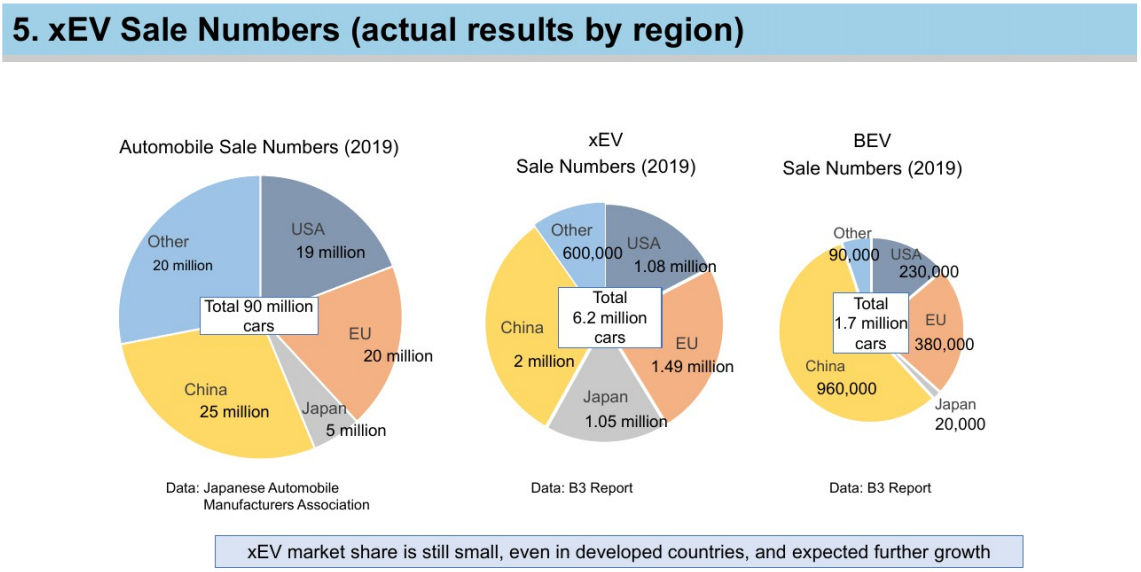
The following is our forecast for xEV sales. As you can see in the diagram, we call the four types of vehicles together xEV: mild hybrid, hybrid, plug-in hybrid, and pure electric vehicle. If you read the media reports that "gasoline vehicle ban" and "all-electric" the Japanese government's "total electrification" refers to the 4 xEVs.

In 2019, the total number of vehicles sold worldwide was 90 million, of which approximately 6 million were new xEVs. In 2019, xEVs accounted for 7% of total sales. While EVs are said to grow significantly, the market share is still small compared to gasoline cars.

The general view is that xEV is a market that has room to double in the next few years. Although the overall automobile market shrank significantly in 2020, EVs remained relatively strong and the level of BEV remained at the same level as the previous year.

I believe that one of the reasons why EV sales have not declined as much as overall car sales are because the EV customer base has returned to the market quickly, and EVs have been aggressively subsidized in Europe and China. At this point, I believe that government subsidies are a huge incentive for sales, especially for the spread of BEVs.

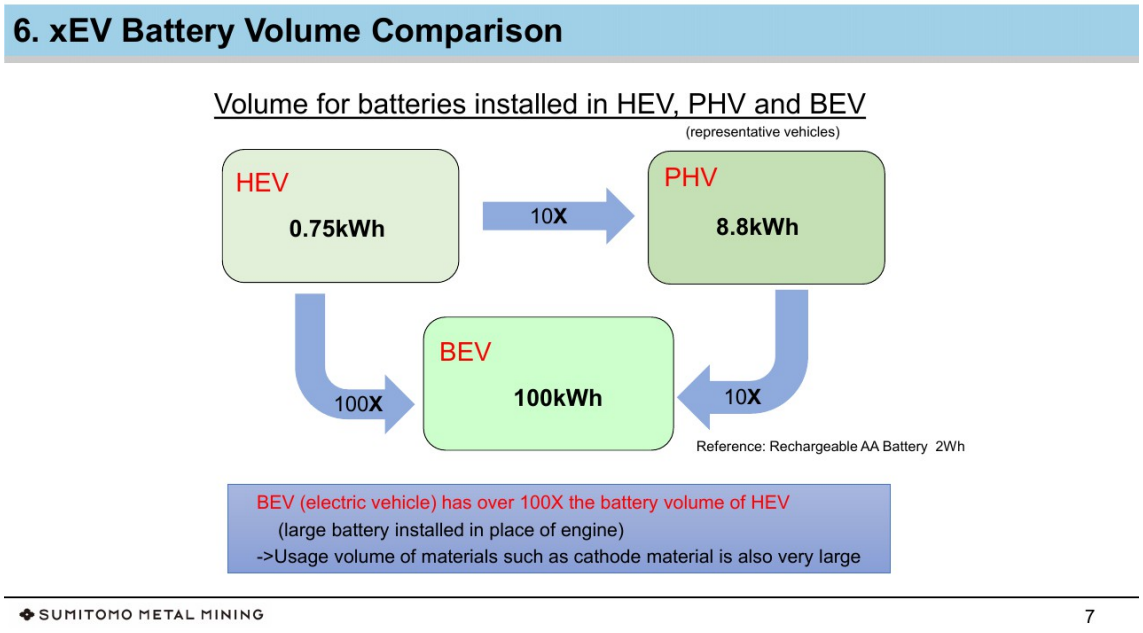
5. xEV Sale Numbers (actual results by region)



This is the number of cars sold by country. Since the data source is different between the leftmost and the two chart in right, it is not possible to make a pure comparison, but it is shown here as a reference. In the graph in the center, the number of electric cars in Japan is very large, because hybrid cars are selling very well in Japan.

In terms of pure electric vehicles, I think Japan is very small compared to China, Europe, and the United States. Also, concerning sales of xEV, the "Other" part, in other words, the sales volume is very low in countries other than the U.S., Europe, Japan, and China, so I think that we can see that countries other than those 4 are still far away.

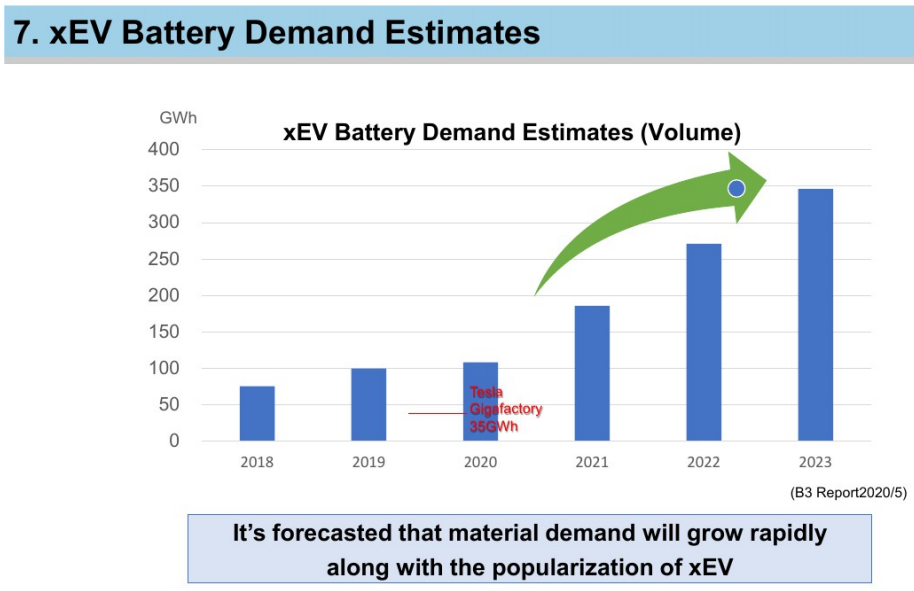
6. xEV Battery Volume Comparison



The next most significant impact on the battery materials business is shown in this diagram. What this means is the capacity of the battery in hybrid cars, plug-in hybrid cars, and pure EVs.

As you can see, 0.75 kilowatts for a hybrid, 8.8 kilowatts for a plug-in, and 100 kilowatts for a BEV, which is 10 times the capacity difference between a hybrid and a plug-in, and almost 100 times the capacity difference between a hybrid and an electric vehicle. The fact that the number of cathode materials loaded per vehicle increases at this rate indicates that electric vehicles use far more cathode materials than hybrids.

7. xEV Battery Demand Estimates



Demand for xEV batteries is expected. Demand for parts and materials is expected to grow rapidly with the spread of xEV. This is in 2020, and Tesla is 35 gigawatts, or 100 gigawatts globally, which means about 30% of the demand is for Tesla. As European automakers have announced, a variety of electric vehicles will be launched in the future, and we expect to see demand for such batteries in 2023.

1. Battery Materials Business Strategy

The following is an explanation of our battery materials business. Our advantages are that we have an integrated supply chain of mineral resources, smelting and refining, to materials, that we have been produce battery materials using metal powder technology since the 1990s, that we now have a specialized research laboratory, and that we can handle recycling using our research system and supply chain.

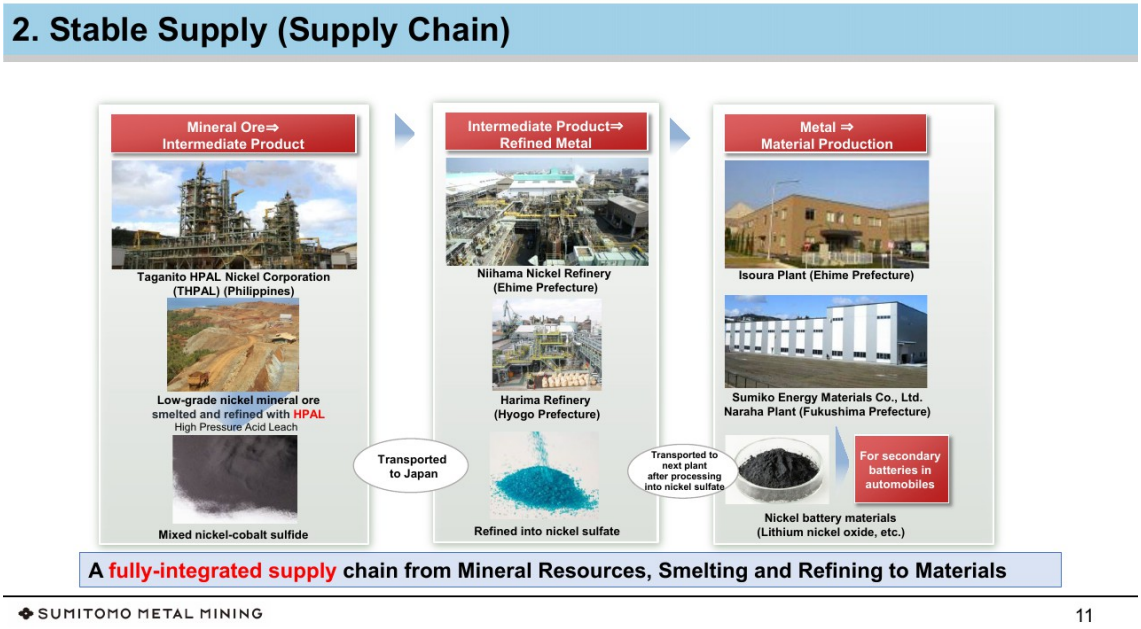
Current cathode materials are mainly nickel-based. The term lithium-ion battery and the solid-state battery may give you the impression that the amount of nickel is decreasing, unlike the conventional "nickel-hydrogen", but in fact, the main cathode material is nickel, which plays an important role in determining battery capacity.

As the Non-Ferrous MetalsDivision explained earlier, our company has been refining high-purity nickel for many years, and we believe that our greatest strength in nickel is our knowledge of various resources and technologies.

Also, automobile manufacturers, our customers, are in an advantageous position in R & D for the next generation because they are conducting development with a relatively long-term perspective.

Our Battery Research Laboratories is also conducting R & D on solid-state batteries as an evolution of existing nickel-based cathode materials.

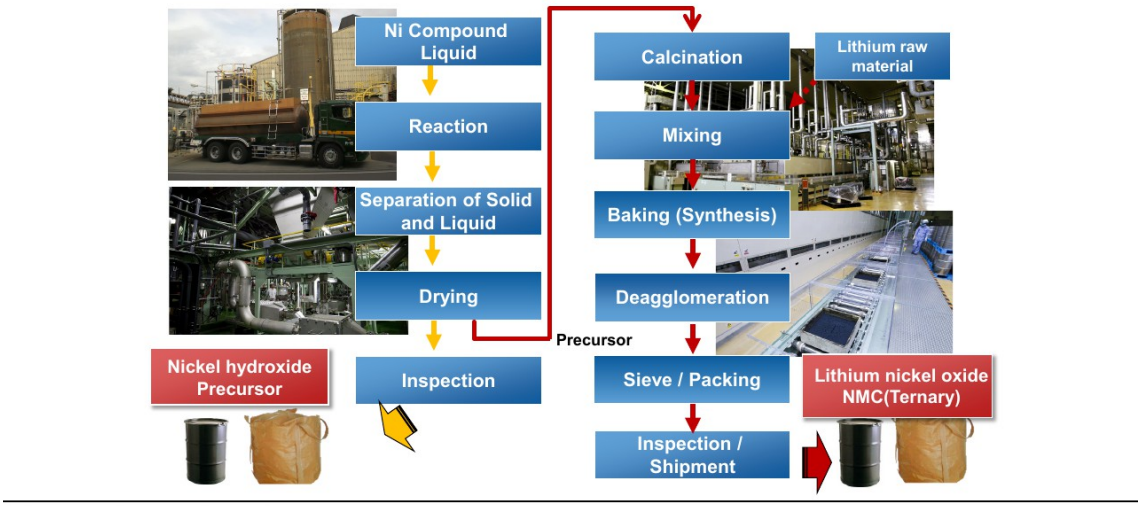
2. Stable Supply (Supply Chain)



Our company's supply chain starts with the acceptance of low-grade nickel ore from a Philippine mining company in which we have an equity stake and smelting it with HPAL technology at a Philippine smelter. As explained by the Non-Ferrous Metals Division earlier, we will bring the nickel-cobalt mixed sulfide produced by smelting in the Philippines to Japan and produce it in nickel sulfate, the main raw material for battery materials.

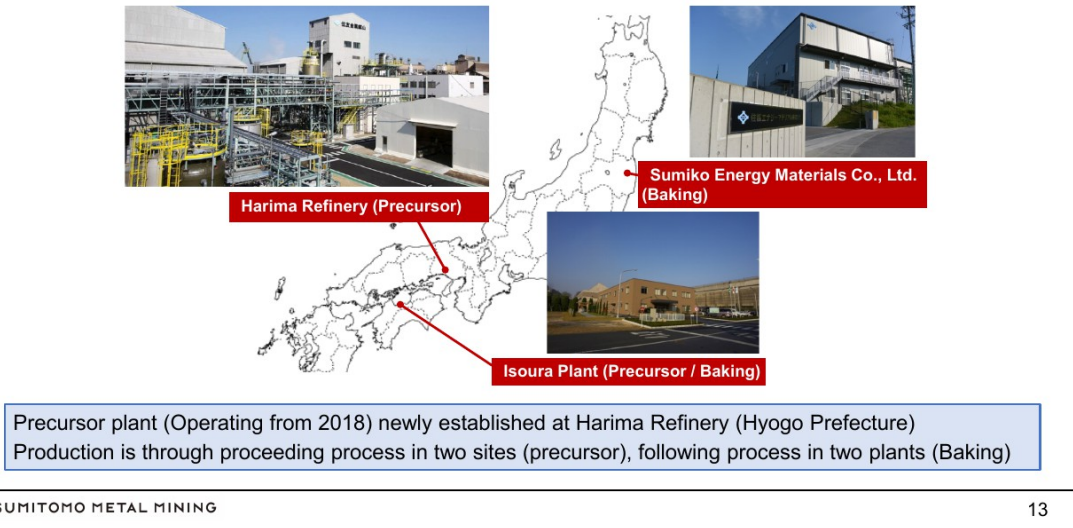
Our strength is that we have an integrated supply chain, from ore to metals and materials, by taking nickel sulfate to our Isoura Plant in Ehime Prefecture and selling it as a precursor and battery materials.

3. Battery Materials Business Fundamental Production Process



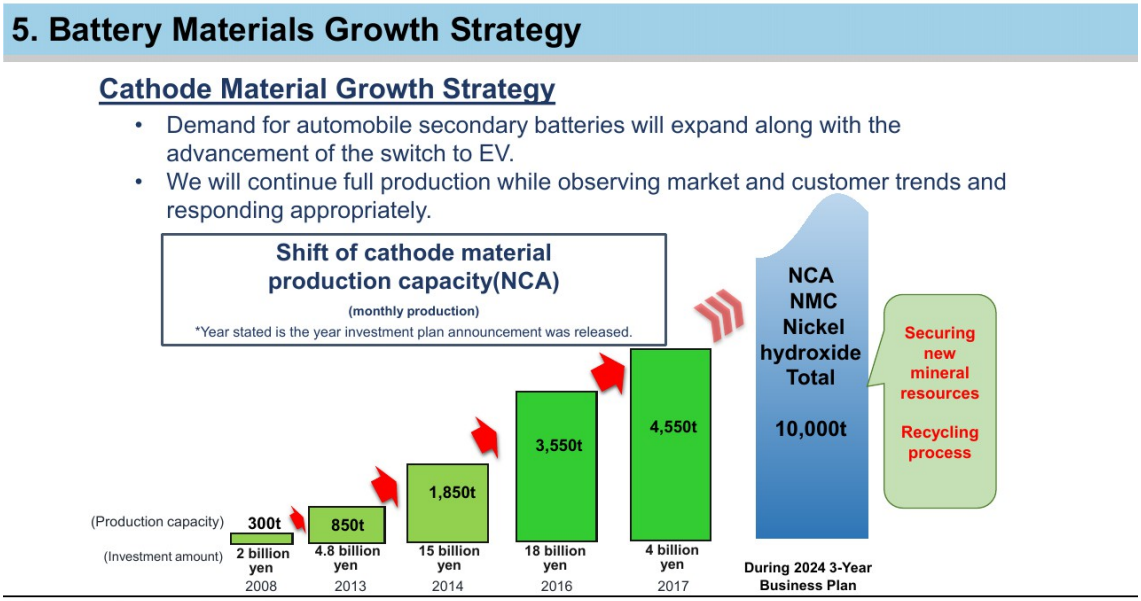
The basic process for producing battery materials. Nickel chemicals such as nickel sulfate are brought into the Isoura Plant, where they are reacted, solid-liquid separated and dried to produce nickel hydroxide precursors. This precursor is baked, mixed with lithium, fired, and ground to produce lithium nickelate or NMC ternary materials.

4. Cathode Material Production SIte



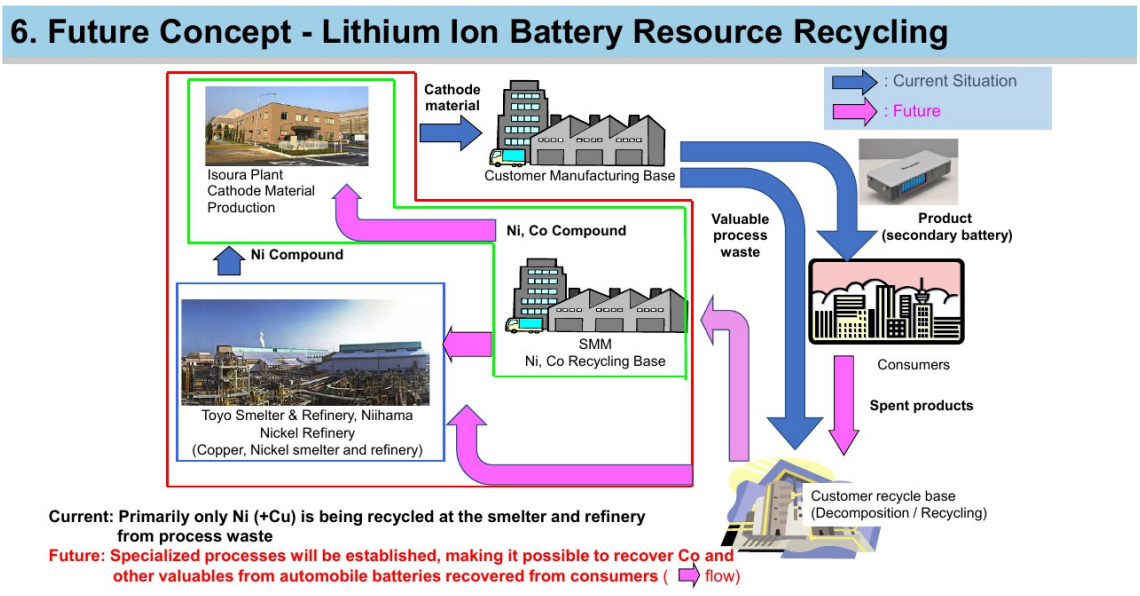
There are three major production bases for cathode materials in Japan: the Harima Refinery, which manufactures precursor materials; the Isoura Plant, in which precursor materials and the firing process are used; and the firing process; and the Sumiko Energy Materials in Narahamachi, Fukushima.

5. Battery Materials Growth Strategy



As for the growth strategy of battery materials, the demand for automotive secondary batteries for cathode materials has been increasing along with the development of EVs. In 2013, we decided to increase NCA production from 300 tonnes per month to 850 tonnes per month, and the production capacity has rapidly expanded to 15 times in 6 years. As we have explained, these measures have been taken to respond to the rapid growth of electric vehicles. We will continue to consider expanding production capacity over the medium term.

6. Future Concept - Lithium Ion Battery Resource Recycling

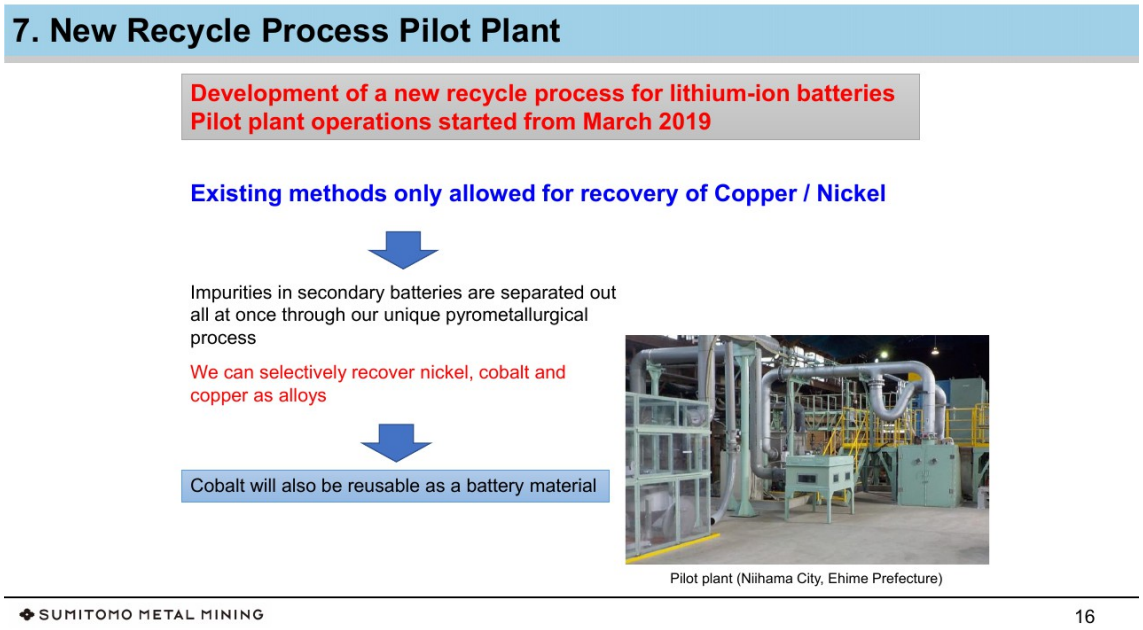


As a plan, we are also researching the recycling of automotive batteries. At present, most of the waste is generated in the production process, but in the future, we are anticipating an increase in

the disposal of electric vehicles, so we are studying a system that enables recycling from general consumers and recycling of resources.

Our company has a copper and nickel smelter and refinery in the vicinity of a battery materials plant in Ehime Prefecture and has the advantage of being able to recover advantageous metals using a variety of processes. As shown in this figure, we have begun recycling some nickel-metal hydride batteries for hybrids in cooperation with Toyota Motor Corporation and are now beginning to recycle some compounds such as lithium ions.

7. New Recycle Process Pilot Plant



Since conventional recycling plants cannot recover cobalt, we are currently developing a new recycling process that can recover cobalt. We are conducting research and development on a pilot plant that can recover not only copper and nickel but also cobalt, and that can comprehensively recover valuable metals from batteries. This concludes our explanation of the battery materials business.

Q & A 1: Construction of a new plant and solid-state batteries

Moderator: We received two questions. In the materials of the briefings held in November, it was mentioned that 'With the construction of a new plant in mind' but is there a possibility of construction outside Japan? If it is possible, please tell me the reason. As for the development of cathode materials for solid-state batteries, you mentioned the evolution of existing nickel-based materials. What are the specific requirements? Are there any elements different from the liquid?

Abe: First, let me answer the first question. We have announced that we are considering the construction of a new plant, and you asked us if we are considering the construction of a plant outside Japan. Of course, we are also considering it outside of Japan.

The biggest reason for this is, as I mentioned earlier, the USMCA in the United States, and countries in Europe, for example, are moving toward such an orientation politically. Therefore, I think that having a base overseas following that is one of the options. I'm on the candidate list to completely follow the policy.

The second question about cathode materials for solid-state batteries was how they differ from liquid-state. Electrolytic solution, in other words electrolyte, is different. In case of liquid-state, chemical reaction is that electrolytic solution and the cathode material react, but in case of solid-state, the solid electrolyte reacts with the cathode material. It is necessary to find a suitable cathode material for solid electrolyte, different from a liquid-state, in terms of surface treatment and other technologies, taking into account the differences in chemical reactions.

Q & A 2: Customer Expansion Initiatives

Moderator: "Do you have any plans to expand sales to customers other than your current customers? Do you have any plans to expand sales beyond your current customers? We have been asked this question.

Abe: You are talking about expanding sales to other customers, but at the moment, we are not considering expanding sales to other customers. There has been no change in our focus on expanding our business centered on Toyota Motor Corporation and Panasonic Corporation. Our basic stance at present is to maintain this focus even when we build a 10,000-tonnes monthly production system.

Q & A 3: Commercialization of solid-state batteries

Moderator: We received another question. Recently, it was announced that the expansion of the Battery Research Laboratories and the expansion of facilities will be completed in July 2022. I believe that you will also be involved in the development of cathode materials for solid-state batteries. What is your company's view on the timeline for the commercialization of solid-state batteries? Also, I understand that consumer use is ahead of automobile use. How will your company engage in each of these?

Abe: In 2022, we announced that we would expand the Battery Research Laboratories, focusing on solid-state R & D. From the viewpoint of cathode materials, the difficulty level of solid-state is not so high, but the difficulty level of the main solid electrolyte is extremely high.

We believe that there are various high barriers such as cost and manufacturing stability, so it will take 10 years to become common in automobiles.

As for whether the consumer use takes precedence, I think the consumer use takes precedence. We believe that solid oxide electrolytes handled by ceramic capacitor manufacturers, rather than sulfide electrolytes developed for automobiles, will be used in consumer applications that require extreme safety, such as wearables.

However, at this point, there is very little electricity that can be stored in this oxide-type, so I do not think there is any possibility that it will be used in automobiles.

Q & A 4: Competitive advantage in cathode materials and securing profit margin of battery materials

Moderator: I received some questions. 1st, based on the diffusion of iron phosphate in China and NCMA being developed in Korea, how do you evaluate the competitive advantage of cathode materials in the future for your company? Second, I believe that Tesla and other companies are accelerating their efforts to reduce battery costs. Would it be possible to post a high level of profit when the production capacity for battery materials reaches 10,000 tonnes? What can you think of as an effort to maintain profitability?

Abe: First of all, I would like to talk about our company's competitive edge in materials based on LFP and NCMA. LFP has an overwhelmingly lower capacity than our nickel-based materials. However, in terms of electric vehicle applications, LFP is also inexpensive, so I think it will be increasingly used in EVs such as city commuters.

We believe that LFP can be separated from our materials. As there are both LFP and high-nickel materials, we think that EVs as a whole will be segregated, so we do not think that there will be a big competition at this point.

NCMA is one of the varieties of high-nickel, and I think it's more or less the same as the NCA we make. For this reason, we are looking at how we can win in terms of performance and price, but for now, we feel that we are superior in terms of capacity and other aspects of performance. We believe that fierce competition will continue in terms of cost and performance.

The second issue is to reduce the cost of batteries themselves. In particular, how to secure a profit margin for battery materials, which have been targeted at a much lower price, is a very difficult issue for us.

In terms of product innovation and the use of advantageous raw materials, we have smelting technology, so we can use raw materials that are difficult for other producer to use as raw materials for batteries, for example, and we can make effective use of materials obtained through recycling, as mentioned earlier in the presentation. In this way, we hope to secure a profit margin.