

# **【Battery Materials Business】 Battery Materials Div.**

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**SUMITOMO METAL MINING**

# Briefing contents

**1**

**Environmental restrictions and  
electrification in automotive industry**

**2**

**SMM Battery Materials Business Strategy**

# 1. Goals in set in COP21 (2015 Paris Agreement)

Reduce worldwide CO2 emissions by 60% by 2050



Reduce small vehicle CO2 emissions by 2G/t a year



Cut fuel efficiency for all vehicles by half to complete the goal



Cut fuel efficiency for all new vehicles by half by 2030

Each country is laying out CAFE (corporate average fuel efficiency)  
restrictions to meet with the goals of the agreement

## 2. Restriction Situation in Each Country

### 1. EU 20 million vehicles/year

- CAFE Restriction: Existing automobile companies are obligated to reduce CO2 by a fixed rate
- CO2 emissions 2015: 120g/km -> 2021: to 95g/km (with penalty applied )

### 2. China 25 million vehicles/year

- CAFC Restriction (same as CAFE)  
Average fuel efficiency 2020: 20km/ℓ -> 2025: 25km/ℓ
- NEV Restriction  
Each company is obligated to produce a fixed number of NEV (New Energy Vehicles) relative to the number of gasoline / diesel vehicles they sell
- Companies that do not meet restrictions through a combination of CAFC and NEV are obligated to buy credits from other companies

\* "Fuel efficient vehicles" like HEV are equated to the sale of 0.2 - 0.5 gasoline vehicles

### 3. US 19 million vehicles/year

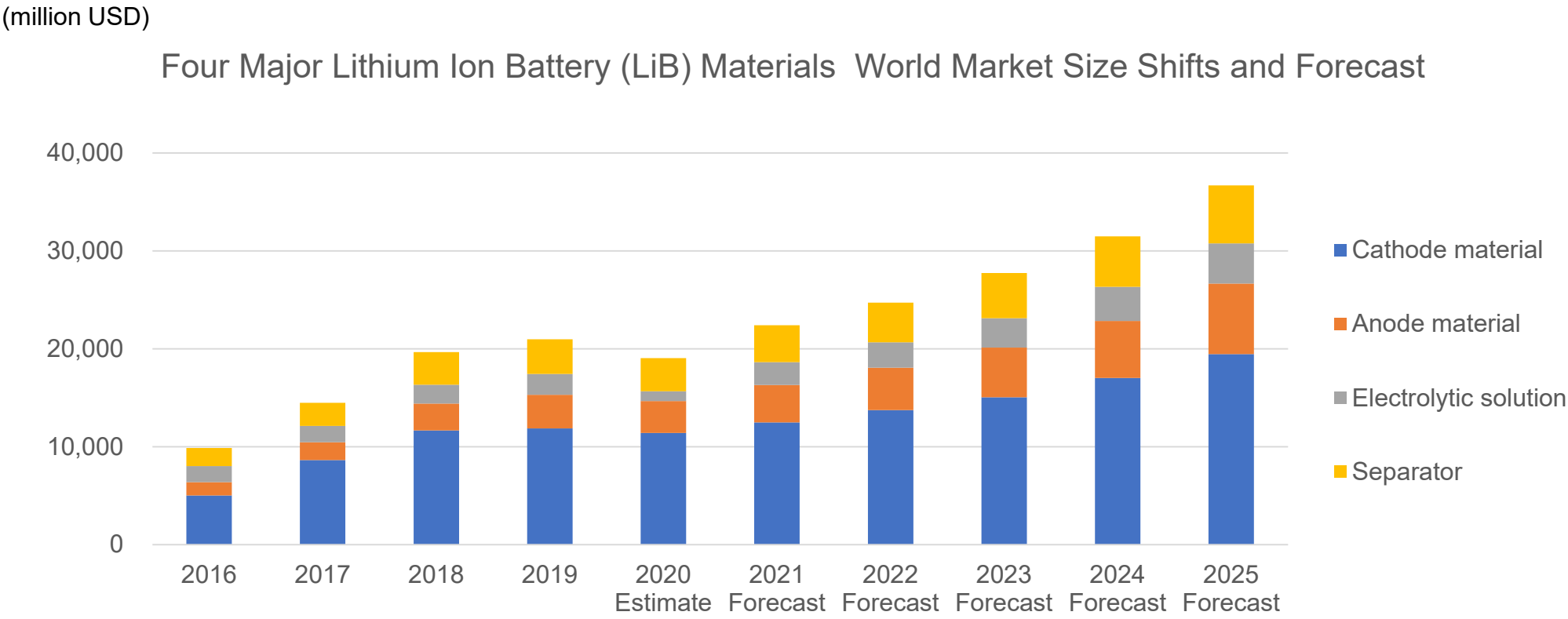
Fuel efficiency rate around 18km/ℓ continues

### 4. Japan 5 million vehicles/year

Average fuel efficiency 2016 Actual Results: 19.2km/ℓ -> 2030 Standard: 25.4km/ℓ

Listed vehicle sale results for each country are the 2019 actual results

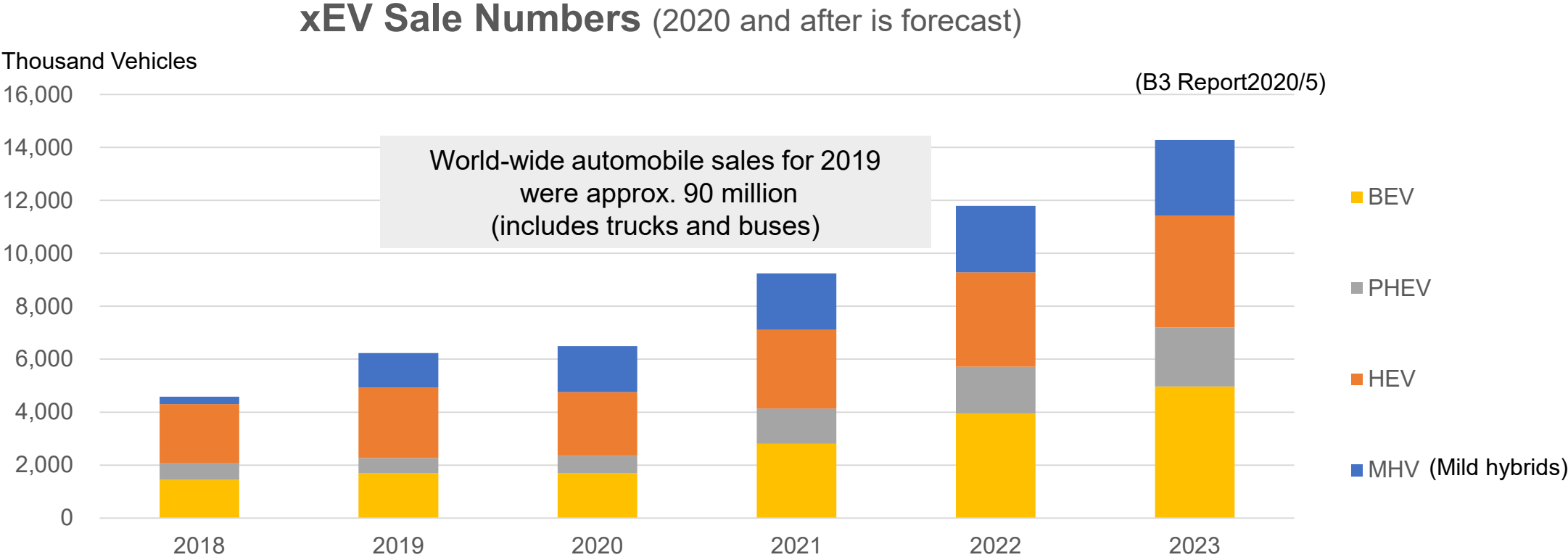
# 3. Market Size for Major Battery Materials



Source: “Global Market of Major Four Li-ion Battery Components: Key Research Findings 2020” (released on October 21<sup>st</sup> , 2020) by Yano Research Institute Ltd.

Market size of the four major materials will be US\$ 36.6 billion (2025 estimate)  
Cathode material will account for roughly half of that  
⇔ Short-term, the overall automobile market will slump and xEV will also be affected

# 4. xEV Sale Number Estimates

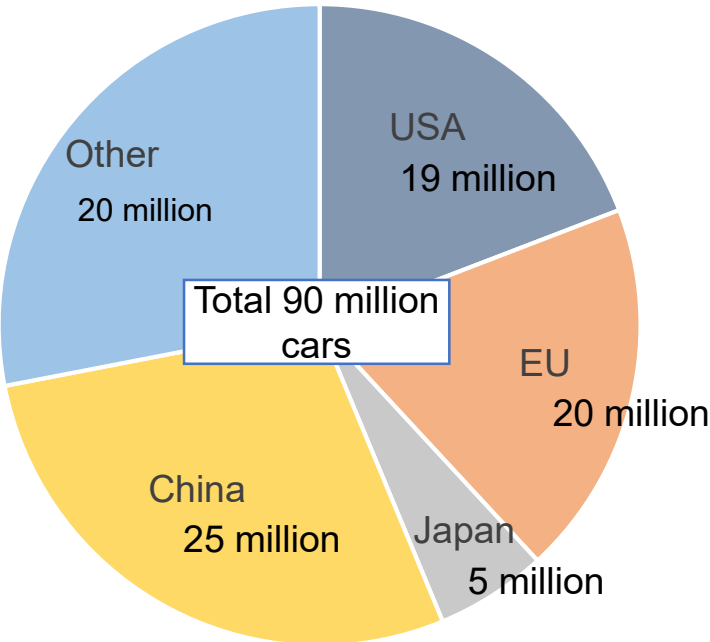


Market growth in 2020 is sluggish due to COVID-19  
Estimates have HEV/PHEV accounting for 6.5 million of the 100 million vehicle automobile market in 2023, and BEV accounting for 5 million

“xEV,” “Electric car”: Includes Plug-In Hybrid (PHEV) and Hybrid (HEV/MHV) vehicles in addition to BEV

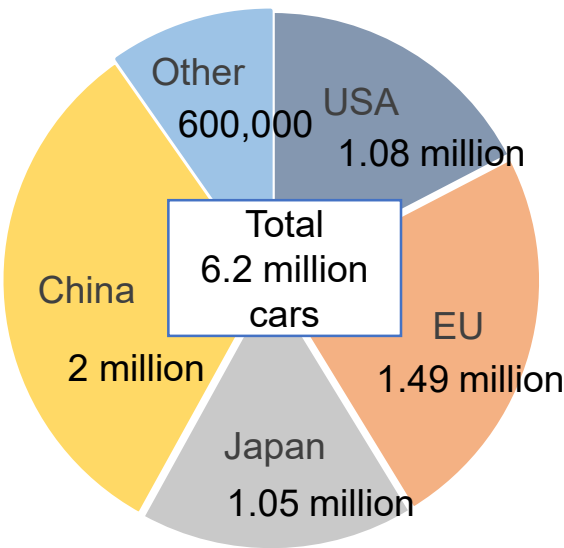
# 5. xEV Sale Numbers (actual results by region)

Automobile Sale Numbers (2019)



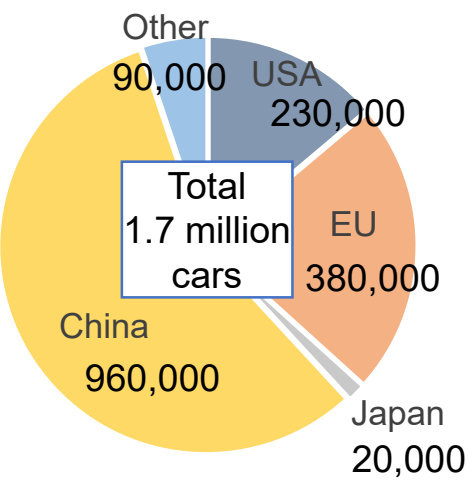
Data: Japanese Automobile Manufacturers Association

xEV Sale Numbers (2019)



Data: B3 Report

BEV Sale Numbers (2019)



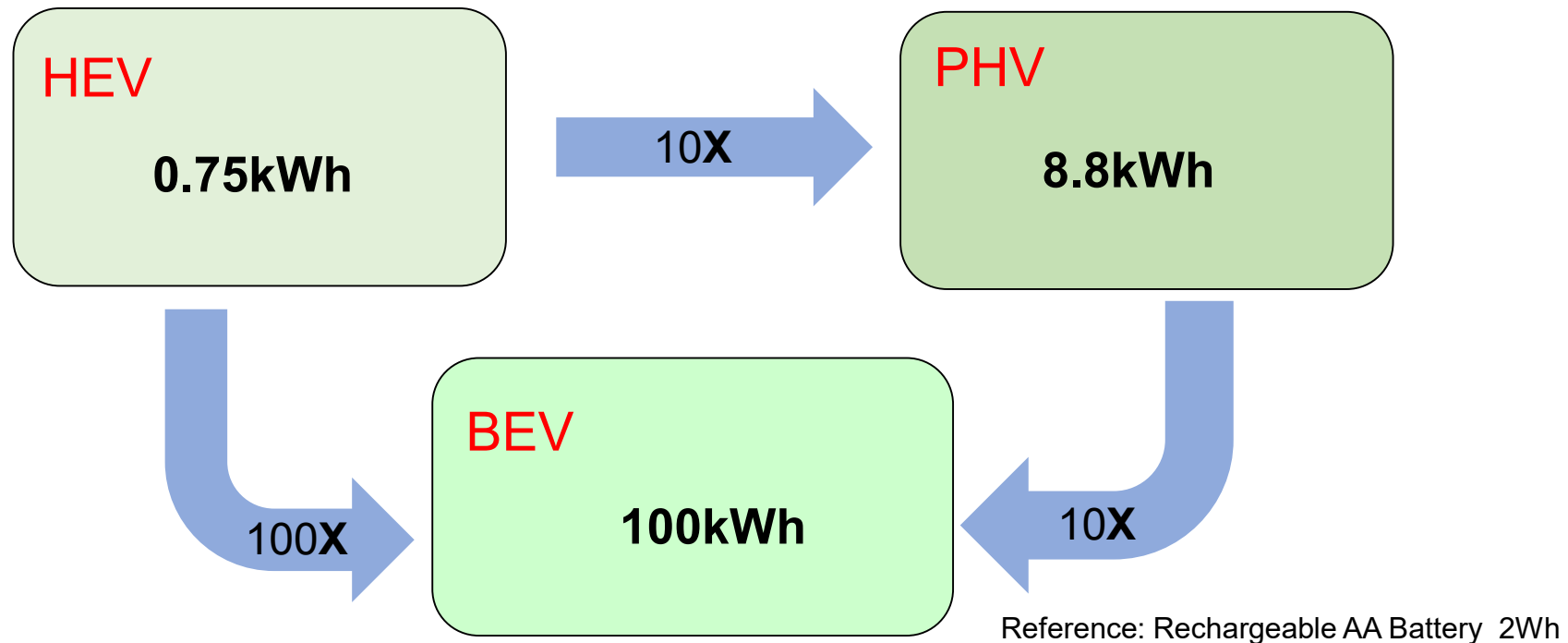
Data: B3 Report

xEV market share is still small, even in developed countries, and expected further growth

## 6. xEV Battery Volume Comparison

### Volume for batteries installed in HEV, PHV and BEV

(representative vehicles)



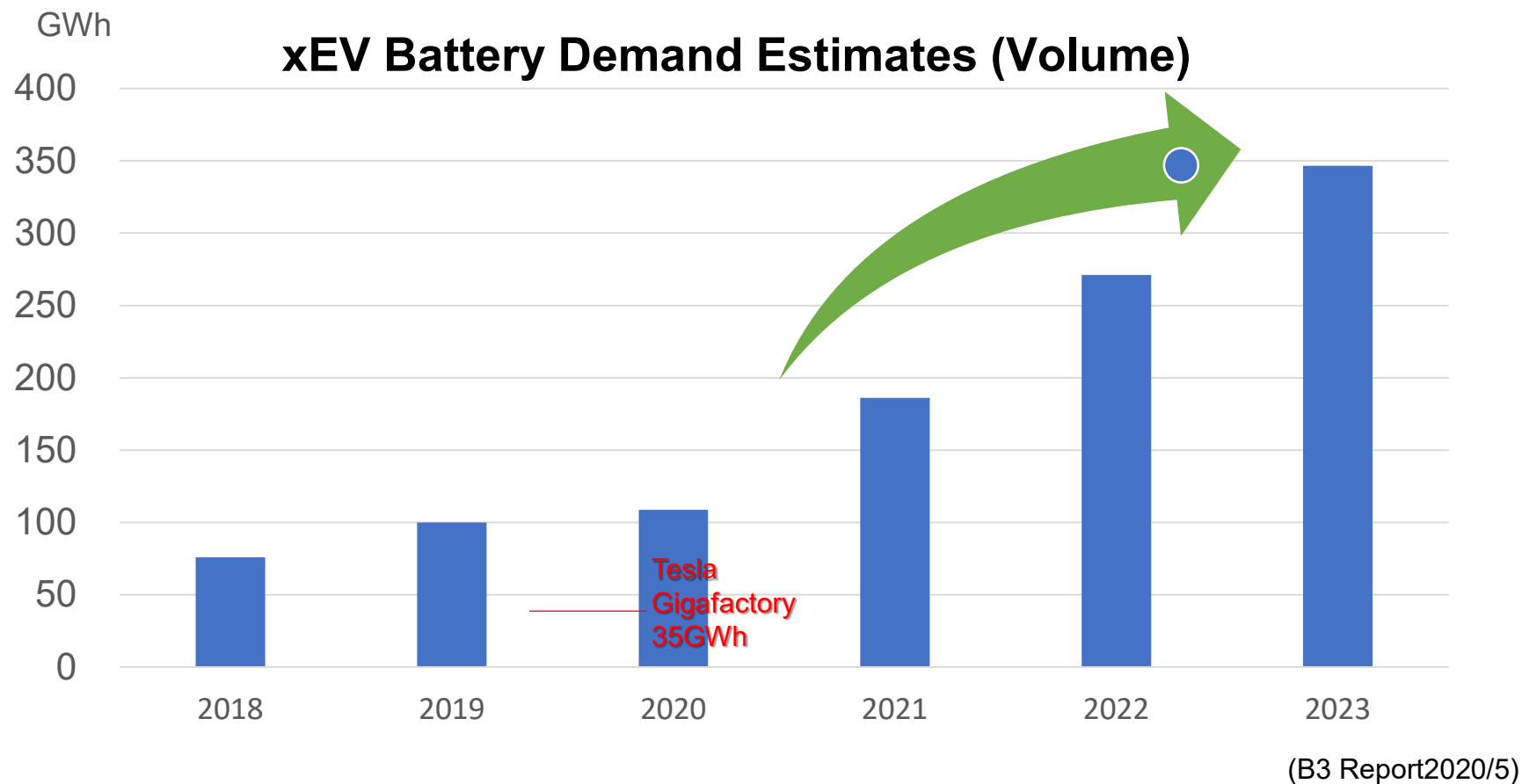
**BEV (electric vehicle) has over 100X the battery volume of HEV**

(large battery installed in place of engine)

-> Usage volume of materials such as cathode material is also very large



# 7. xEV Battery Demand Estimates



**It's forecasted that material demand will grow rapidly along with the popularization of xEV**

# Briefing contents

1

Automobile environmental restrictions  
and the push towards electric

2

**SMM Battery Materials Business Strategy**

# 1. Battery Materials Business Strategy

## 1. Stable Supply

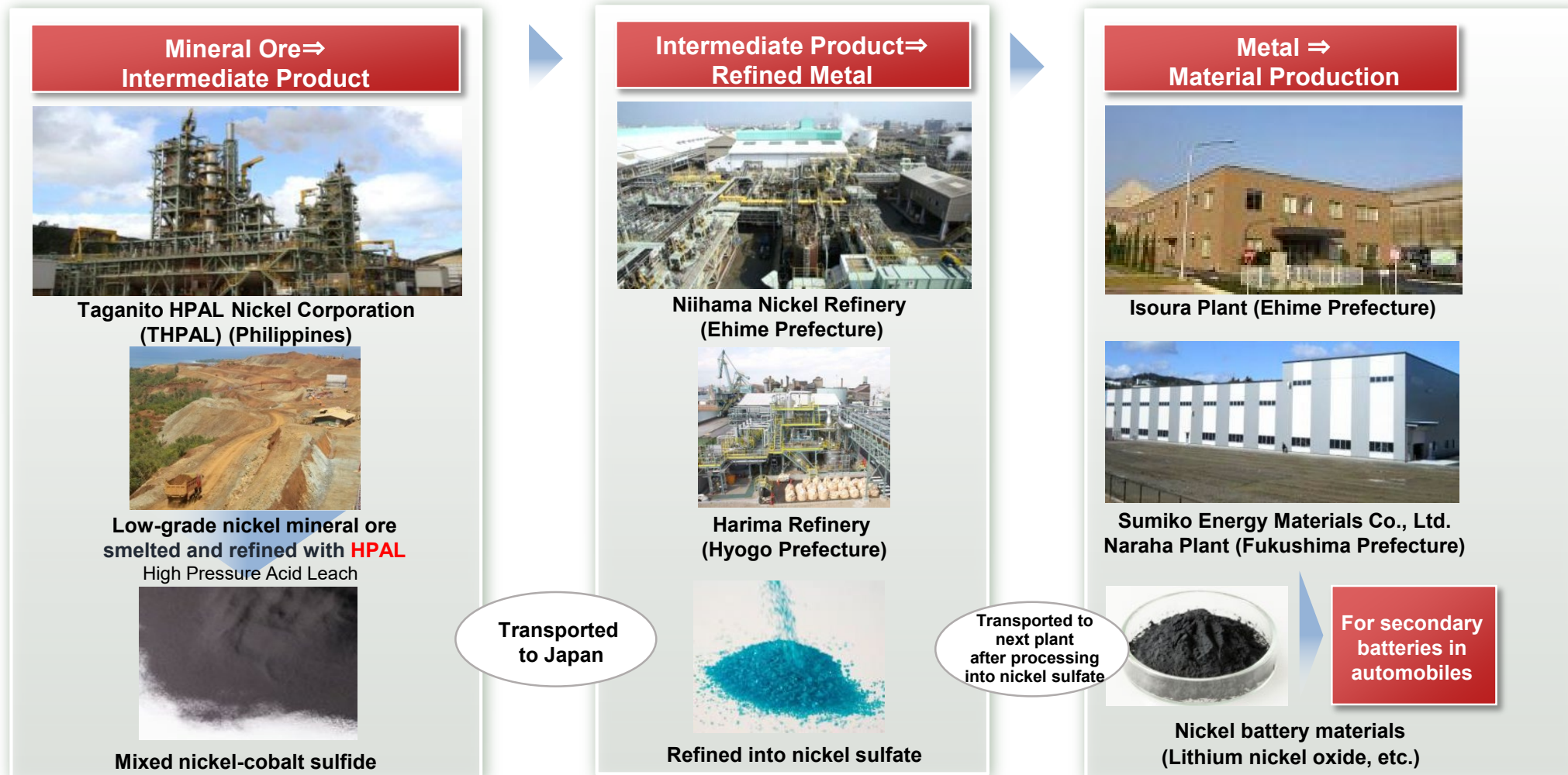
**Having a fully-integrated supply chain from Mineral Resources, Smelting & Refining to Materials**

## 2. Long-term Continuity

**Research laboratory specializing in the development of battery materials (Battery Research Laboratories: Niihama City, Ehime Prefecture)**

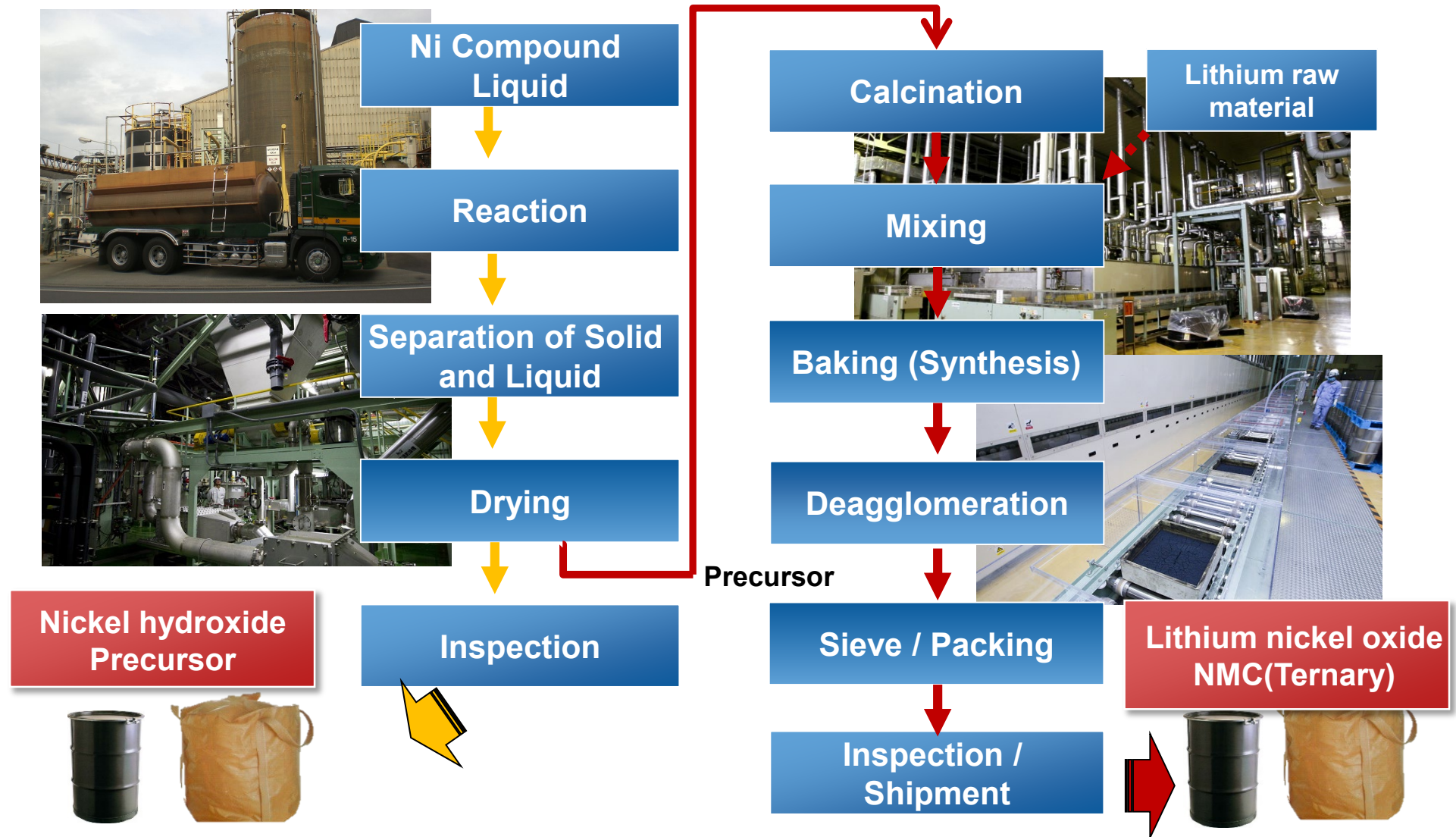
**Recycling of raw materials utilizing Smelting and Refining technology and processes**

## 2. Stable Supply (Supply Chain)



**A fully-integrated supply chain from Mineral Resources, Smelting and Refining to Materials**

# 3. Battery Materials Business Fundamental Production Process





## 4. Cathode Material Production Sites



**Harima Refinery (Precursor)**



**Sumiko Energy Materials Co., Ltd. (Baking)**



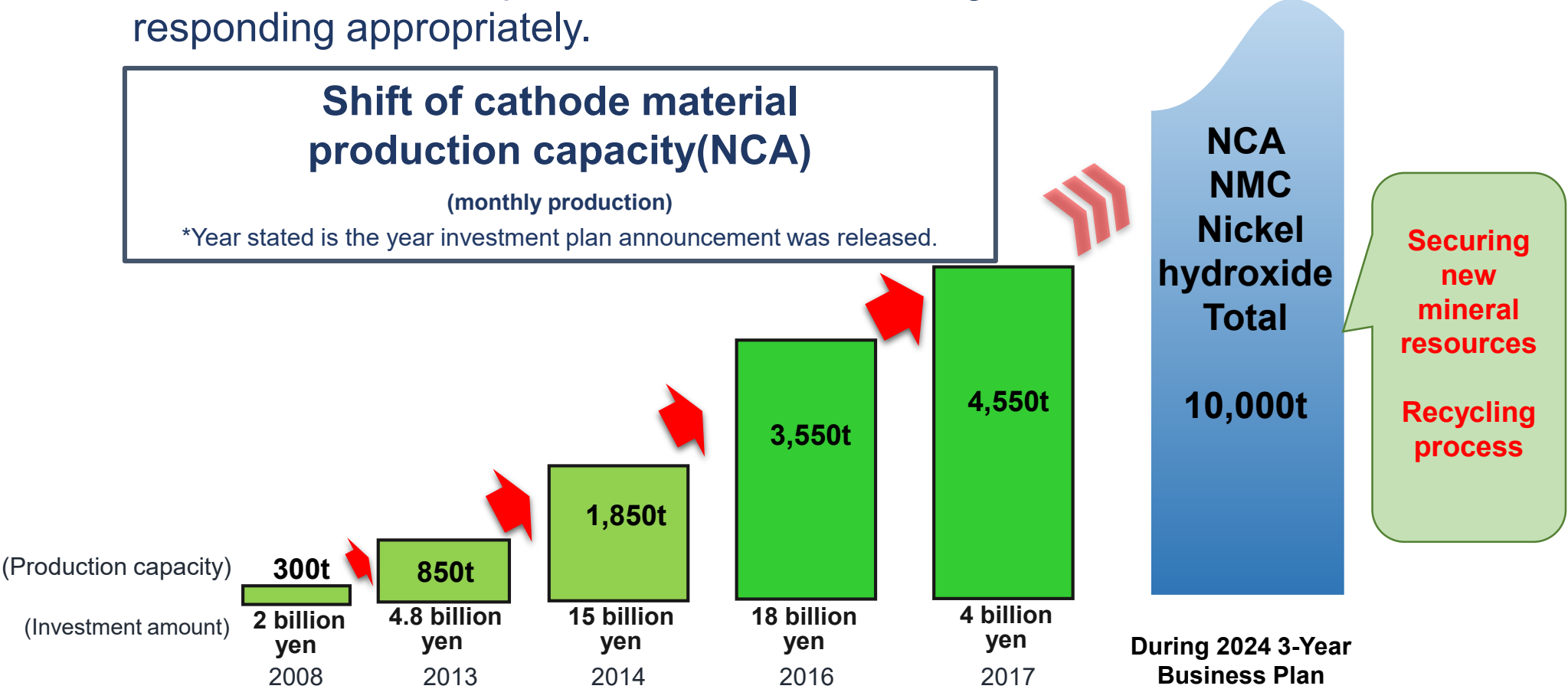
**Isoura Plant (Precursor / Baking)**

Precursor plant (Operating from 2018) newly established at Harima Refinery (Hyogo Prefecture)  
Production is through proceeding process in two sites (precursor), following process in two plants (Baking)

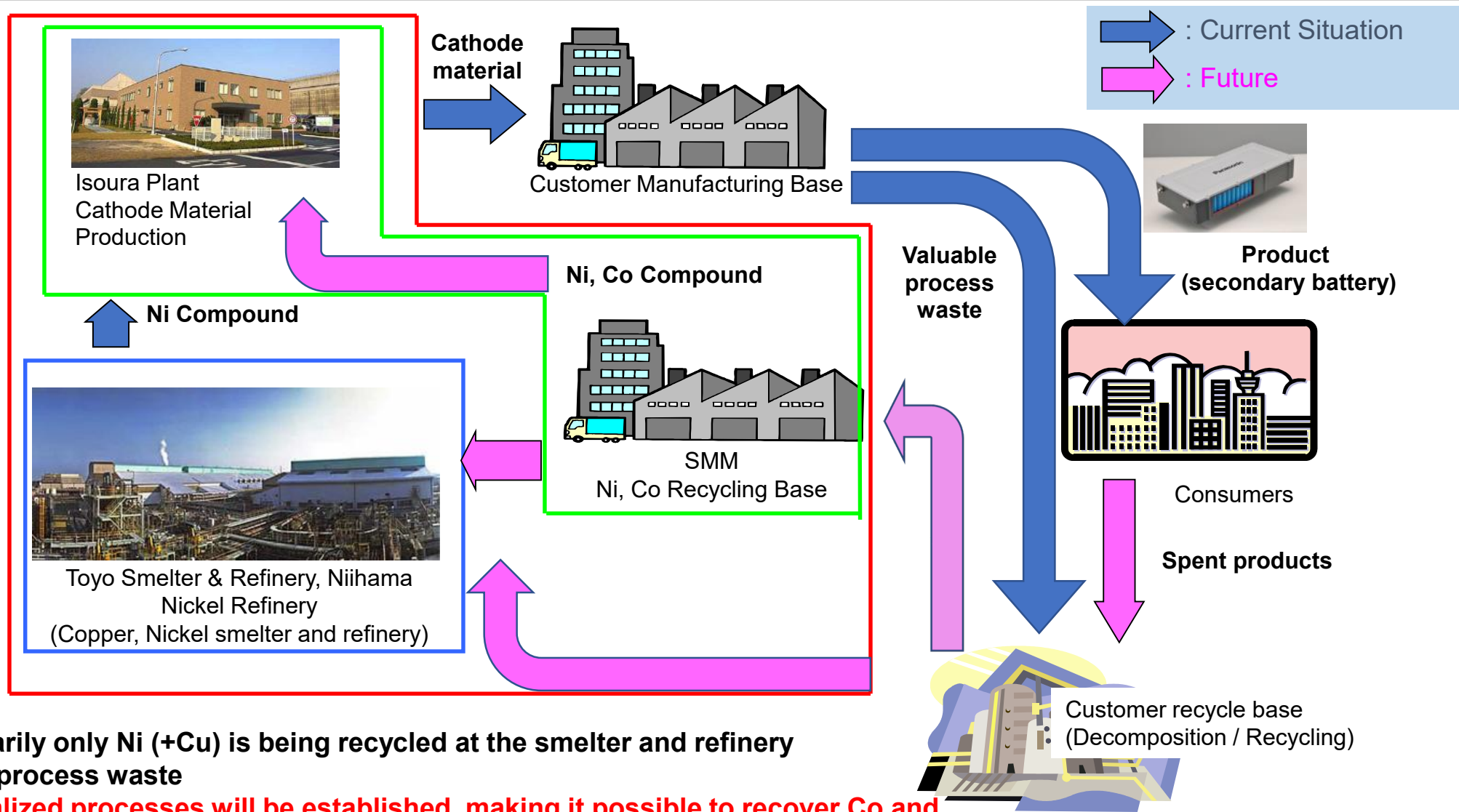
# 5. Battery Materials Growth Strategy

## Cathode Material Growth Strategy

- Demand for automobile secondary batteries will expand along with the advancement of the switch to EV.
- We will continue full production while observing market and customer trends and responding appropriately.



# 6. Future Concept - Lithium Ion Battery Resource Recycling



**Current:** Primarily only Ni (+Cu) is being recycled at the smelter and refinery from process waste

**Future:** Specialized processes will be established, making it possible to recover Co and other valuables from automobile batteries recovered from consumers ( → flow)



# 7. New Recycle Process Pilot Plant

**Development of a new recycle process for lithium-ion batteries**  
**Pilot plant operations started from March 2019**

**Existing methods only allowed for recovery of Copper / Nickel**



Impurities in secondary batteries are separated out all at once through our unique pyrometallurgical process

**We can selectively recover nickel, cobalt and copper as alloys**



**Cobalt will also be reusable as a battery material**



Pilot plant (Niihama City, Ehime Prefecture)

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