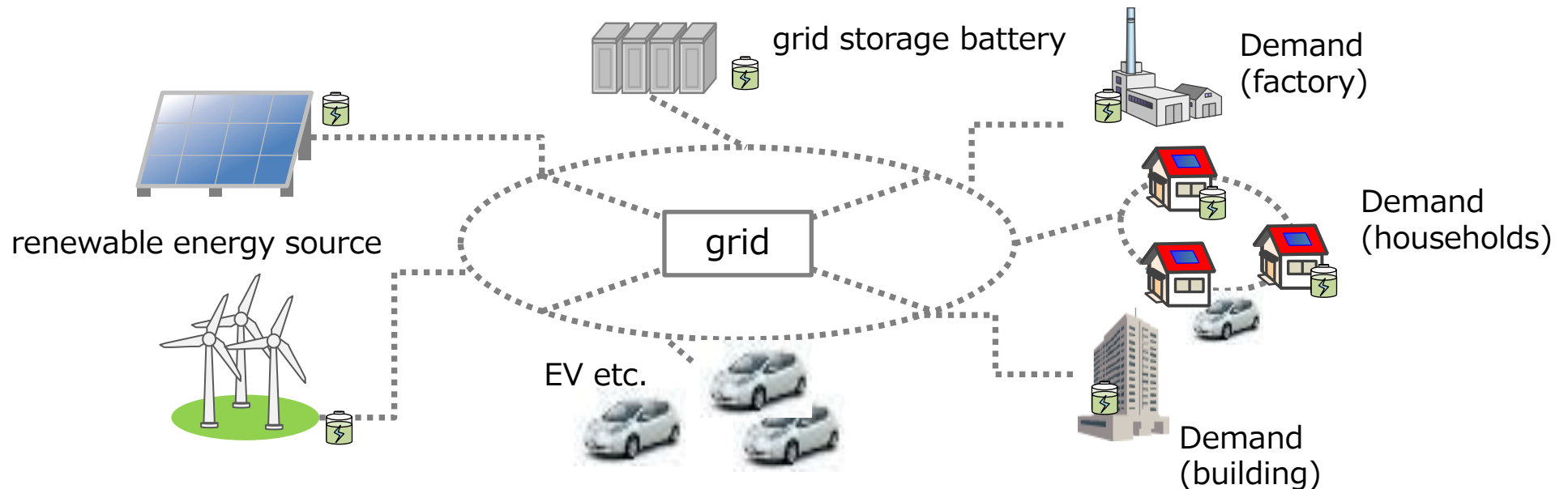


Battery Industry Strategy - Interim summary -

22 April 2022
Ministry of Economy, Trade and Industry

Importance of batteries

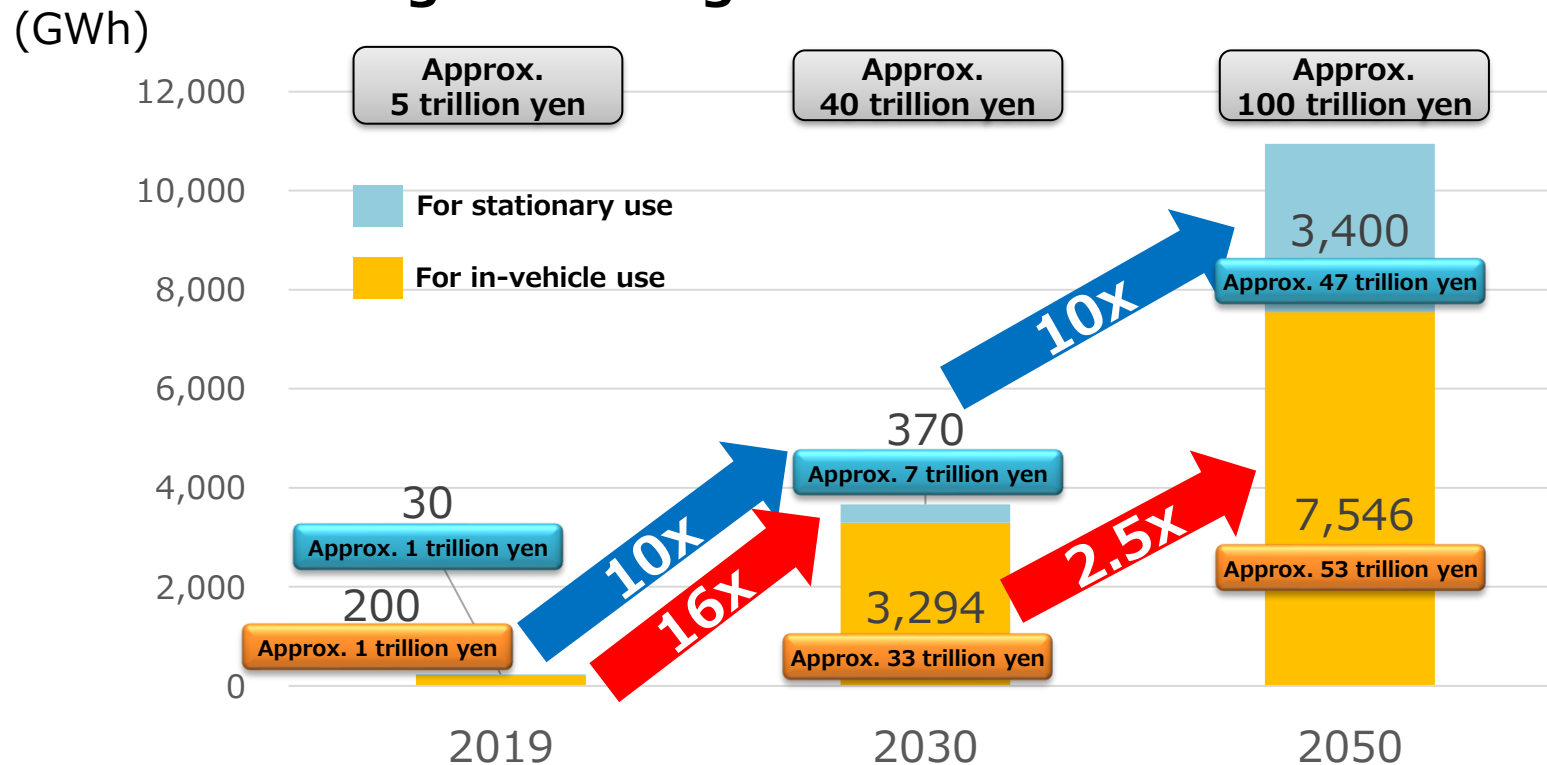
- Batteries are key to achieving carbon neutrality in 2050. In the electrification of vehicles and other forms of mobility, batteries are the most important technology.
- In addition, in order to make renewable energy the main source of power, it is essential to deploy batteries, which are used to adjust the supply and demand of electricity.
- They are a back-up power source for critical facilities such as 5G communication base stations and data centres, are used for various kinds of IT equipment. So they are an essential piece of infrastructure supporting the foundations of a digital society, and also important for strengthening resilience.
- Therefore, these are important goods on which people's lives and economic activities depend in an electrified and digital society.



Expansion of the battery market

- The battery market is expected to expand for both in-vehicle use and stationary use. For the time being, the market for in-vehicle is expanding rapidly in line with the expansion of the EV market. At present, the stationary battery market is about 1/10th the size of the vehicle-mounted market, but the market for stationary use is also expected to grow towards 2050.

Changes in the global market for batteries.



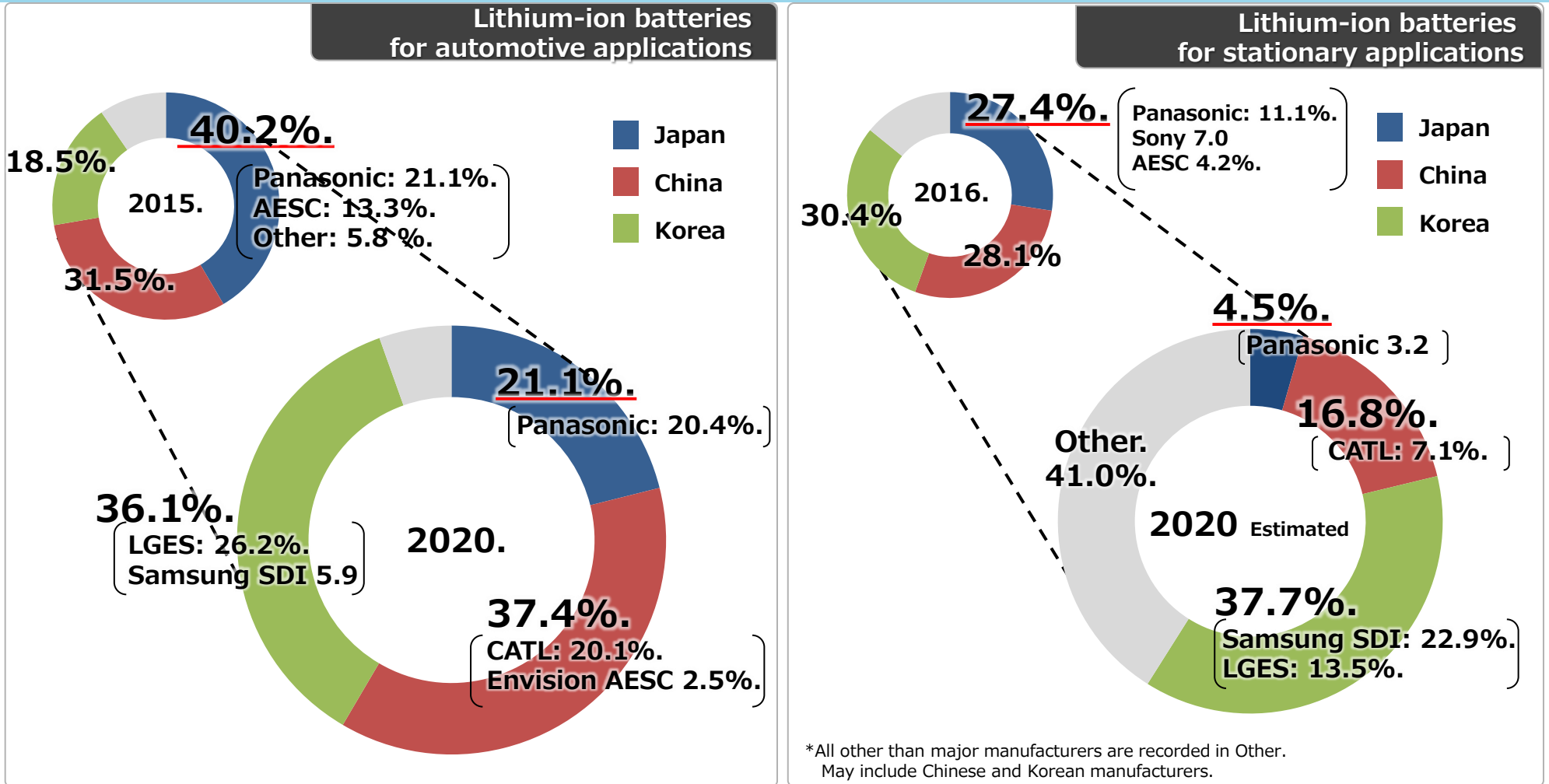
(Source: IRENA Global Renewables Outlook 2020 (Planned Energy Scenario)).

The economic scale is estimated based on the unit price of the vehicle pack (global) as 20 000/kWh in 2019 → 10 000/kWh in 2030 → 0.7/kWh in 2050.

The unit price for stationary applications is estimated as twice the unit price for vehicle-mounted applications.

Share trends by country and manufacturer

- Japanese companies secured the initial market with their technological superiority, but as the market expanded, Japanese manufacturers lost market share to Chinese and Korean manufacturers.

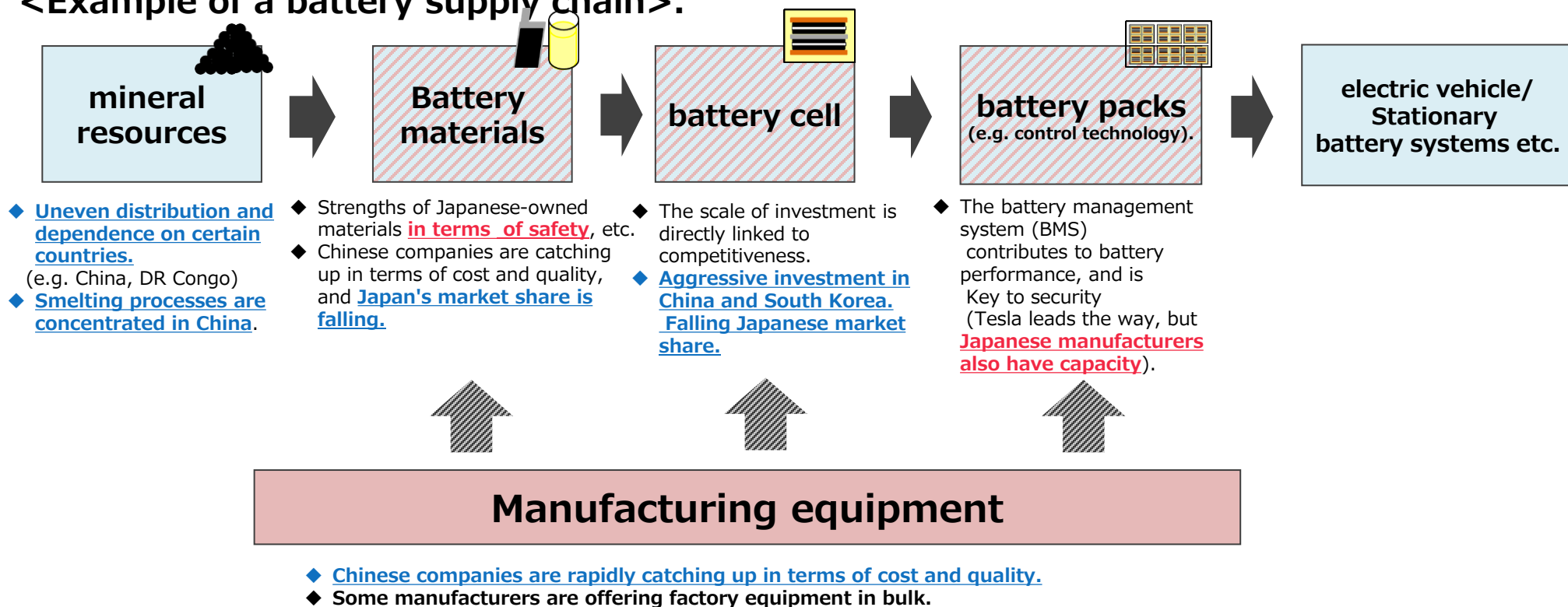


The battery supply chain

: Importance of securing the manufacturing base

- Risks exist in the supply chain of mineral resources and materials which support battery cell production as the supply chain may dependent on certain countries.
- In battery cells, Japan is also losing competitiveness and there is a risk of increasing dependence on foreign countries. It is necessary to maintain and strengthen the entire supply chain, including securing raw materials and securing manufacturing infrastructure for materials and cells.

<Example of a battery supply chain>.

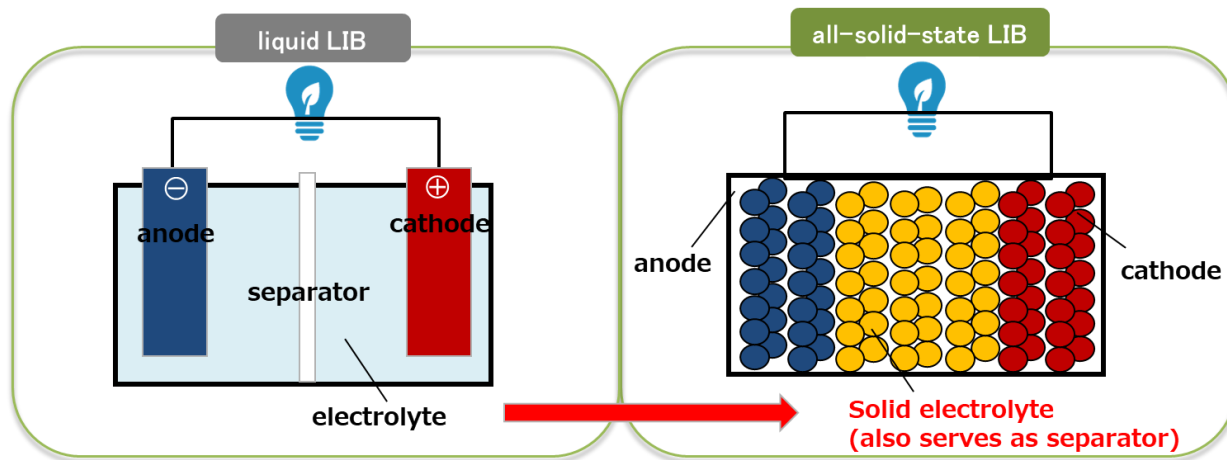


Technological evolution of batteries

: all-solid-state lithium-ion batteries

- For the time being, liquid lithium-ion batteries are the mainstream. On the other hand, all-solid-state lithium-ion batteries are expected to become the next-generation battery. There are various views, but there is a possibility that they will be introduced in the EV market from the late 2020s onwards.
- Japan has led R&D, but in recent years other countries have also strengthened their research, with China in particular catching up rapidly.

All-solid-state batteries are batteries in which the electrolyte is solid.



【Features of all-solid-state lithium-ion batteries. 】

- ✓ Improved safety by eliminating ignition and leaks caused by flammable electrolytes.
- ✓ Compared with liquid LiBs and all-solid-state batteries of the same volume, the range is approximately double.
- ✓ Rapid charging at high currents and shorter charging times (about 1/3 of liquid LiB).
- ✓ There are technical challenges regarding age-related deterioration (short life span).
- ✓ Establishing mass production technology is also an challenge.

Basic concept of the battery industry strategy

Reflections on previous policies

- Japan has developed a strategy of concentrated investment in the development of all-solid-state battery technology. However, there are still issues with all-solid-state batteries, and the market for liquid lithium-ion batteries (liquid LiBs) is expected to continue for the foreseeable future.
- On the other hand, with strong government support, Chinese and Korean companies have turned the tables on Japan in liquid LiBs. Competition for investment is intensifying in the public and private sectors worldwide, including in Europe and the US.
- If this trend continues, Japanese companies may become exhausted and withdraw from the market before all-solid-state batteries are put to practical use. Japan may be forced to rely on foreign suppliers for batteries.

Future directions.

1st Target

- Reviewing the existing strategy, Japan will not leave it solely to the private sector, but the Government will also support large-scale investment to strengthen the manufacturing infrastructure for liquid LiBs, including securing upstream resources, and establish a domestic manufacturing infrastructure.

2nd Target

- Strategic development of overseas operations to ensure a global presence, based on technology established in Japan, so that world-leading companies can maintain and strengthen their competitiveness.

3rd Target

- Accelerate technological development to lead the world in the commercialization of next-generation batteries, including all-solid-state batteries, and steadily capture the next-generation battery market.

Also, the environment will be improved by strengthening human resource development, increasing domestic demand, promoting reuse and recycling, expanding the supply of renewable electricity and reducing the burden of electricity costs.

Direction of the battery industry strategy.

1st Target

Establishment of a manufacturing base for liquid LiBs.

goal setting

2nd Target

Ensuring a global presence

goal setting

3rd Target

Capturing the next-generation battery market

goal setting

Technology and business

1. Policy package for further expansion of domestic base to achieve manufacturing targets

- Establishment of a domestic manufacturing base for batteries and materials
- Actions for the advancement of battery management systems (BMS)

2. Strategic formation of global alliances and global standards

- Securing financing for the global supply of batteries
- Promote the establishment of international rules and formulate global standards for safety
- Promotion of batteries for new applications and related services
- Overseas development of stationary battery systems featuring security and safety

3. Securing upstream resources

4. Development of next-generation technologies

market

5. Expansion of a domestic market

- Promoting an environment for the expansion of electric vehicles market
- Promotion of stationary batteries
- Measures to further ensure the safety and security of battery systems

environmental

6. Strengthening human resources development

7. Improving the domestic business environment

- Promoting reuse and recycling
- Expanding electricity supply from renewable energy sources and reducing the cost burden of electricity

Targets in the battery industry strategy.

1st Target.

Establishment of a manufacturing base for liquid LiBs.

Domestic manufacturing capacity targets

Establishment of a domestic manufacturing base of 150 GWh of batteries and materials by 2030 at the latest.

2nd Target.

Ensuring a global presence

Global manufacturing capacity targets

Japanese companies secure manufacturing capacity of 600 GWh* in the global market in 2030

* Estimated share of 20% even if the global market expands to 3000 GWh in 2030.

3rd Target.

Capturing the next-generation battery market

R&D capacity targets

Full-scale commercialization of all-solid-state batteries around 2030; Japan maintains and secures technology leader position even after 2030

Future measures (technology and business (i))

1. Policy package for further expansion of domestic base to achieve manufacturing targets

To establish a domestic manufacturing base of 150 GWh in 2030 in an internationally competitive manner, the following initiatives will be implemented.

- Establish a **domestic manufacturing base for batteries and materials**
 - **Strengthen investment in domestic manufacturing base for batteries and materials** through public-private partnerships
 - **Establish and strengthen advanced manufacturing technologies through DX and GX** to be internationally competitive
- **Actions to advance battery management systems (BMS).**

Future measures (technology and business (ii))

2. Strategic formation of global alliances and global standards

- Establishment of **domestic manufacturing base for batteries and materials** (reiterated)
- **Securing finance for the global supply of batteries**
Securing risk capital through markets in the private sector. Policy support on finance by JBIC, NEXI, NEDO, JIC, etc.
- **Promotion of the establishment of international rules and the formation of global standards for safety**
 - The study examines how Japan's carbon footprint is calculated and how risks in the supply chain are continuously assessed and reduced (due diligence). At the same time, harmonize with overseas systems while starting trial projects.
 - Consider measures such as standardization of battery safety and promotion of third-party testing and verification services.
- **Promotion of batteries for new applications and related services**
 - Various new applications for batteries (ships, trains, aircraft, agricultural machinery, etc.) and related services.
- **Overseas development of stationary battery systems featuring on security and safety.**

3. Upstream resources

Consider strengthening policy support for securing resources, including expanding JOGMEC's risk capital supply (e.g., equity investment), to enable active resource development to diversify raw material procurement.

4. Development of next-generation technologies

In the face of intensifying international competition in the development of next-generation batteries, including all-solid-state batteries, Japan promote research and development through industry-academia-government collaboration so that we can continue to lead internationally with our research and development capabilities, which is one of Japan's strengths.

- **Strengthen support for the development of next-generation battery technology**
- Strengthen R&D centres, including for next-generation batteries (also linked to human resource development)

5. Expansion of a domestic market

It is important to stimulate domestic demand for batteries in parallel with the strengthening of the supply side.

- **Environmental improvements for the promotion of electric vehicles**
Support for the purchase of electric vehicles and the development of charging stations.
- **Promotion of stationary battery systems**
Support for the introduction of stationary battery systems and other environmental improvements.
- **Measures to further ensure the safety and security of stationary battery systems.**
Ensuring safety and security with regard to stationary battery systems (especially for the grid).

Future measures (environmental improvement (i))

6. Strengthening human resources development

With a view to developing human resources throughout the country, but **first focusing on the Kansai area, where the battery industry is concentrated, and in order to develop human resources that meet local needs**, the following will be considered.

- ① **Establish a human resource development consortium comprising industry, government and educational institution.**
- ② **Establishment of an educational programme centred on the AIST Kansai Centre, which is a research and development base.**

Through these initiatives, the project aims to strengthen the training of researchers and technicians who are indispensable for research and the development of manufacturing technologies, and to secure and train personnel who will be active in the field, such as in operations, production and quality control, which will be required as the scale of battery plants expand.

7. Improving the domestic business environment

- **Promotion of recycling and reuse**

Examine measures to strengthen the collection of used batteries, revitalise the reused battery market and establish a recycling infrastructure and system. Also, necessary measures aiming to establish a domestic recycling system by 2030 are being discussed.

- **Efforts to ensure sustainability**

Investigate the calculation of carbon footprints, assessment and reduction of risks in the supply chain, promotion of reuse and recycling, and the data platform required for these. A trial initiative will be launched this year.

- **Expanding electricity supply from renewable energy sources and reducing the cost burden of electricity**

- **Review of relevant regulations (Fire protection Act)**