Challenges of Envision AESC towards carbon neutrality

June 24th, 2021

Envision AESC's History

Apr. 2007
Nissan and NEC jointly established AESC (Automotive Energy Supply Cooperation) to produce Lithium-ion batteries (LiB) for EV

Aug.2018
Nissan and Envision signed Purchase Agreement for AESC

Oct. 2010
AESC started mass production of battery for EV

Dec.2010
Nissan started to sell LEAF

Oct.2012
US battery plants started production

Dec.2012
UK battery plants started production

Jun. 2014
Nissan started to sell e-NV200

April 2019

Advanced Energy Solutions Cooperation

Management goal

Global leading AIoT (AI+IoT) battery company

Global growth

Competitive Products

10Yrs

EV Battery manufacturing experience

“0” Critical incidents

Global Leading

Over 100mil. cells installed in the world

Global EV: 550,000 (Dec 2020)

AESC Battery - ‘Zero Critical Incident’ in 10 yrs History of Competitive Battery production in the World

Envision AESC Profile

US Plant

- Tennessee, US
- Capacity: 3.0 GWh/yr

UK Plant

- Sunderland, UK
- Capacity: 1.9 GWh/yr

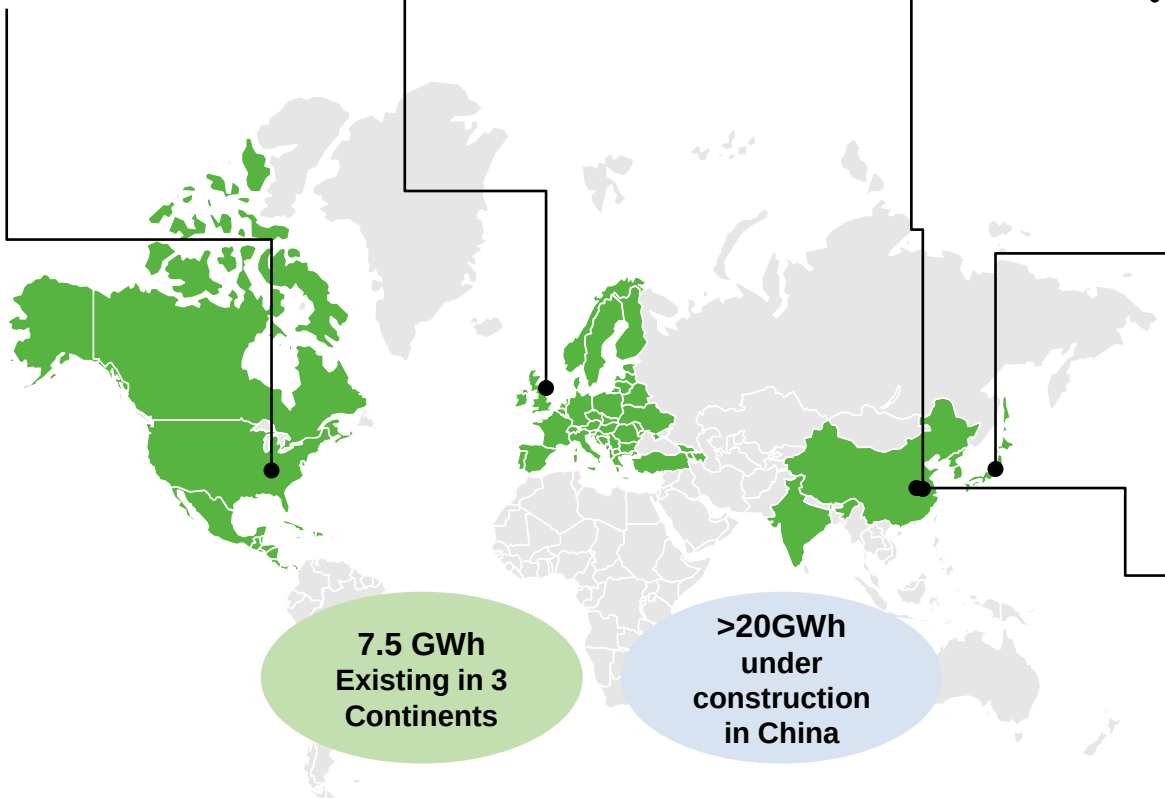
China R&D Centre

- Shanghai, China

Japan Global HQ, R&D Centre, and Plant

- Kanagawa, Japan
- Capacity: 2.6 GWh/yr

Under consideration of new plants in Japan, Europe, US



China Plant & Engineering Centre

- Wuxi, China
- Capacity >**20** GWh in phases
- #1A 3GWh（2021 Spring）

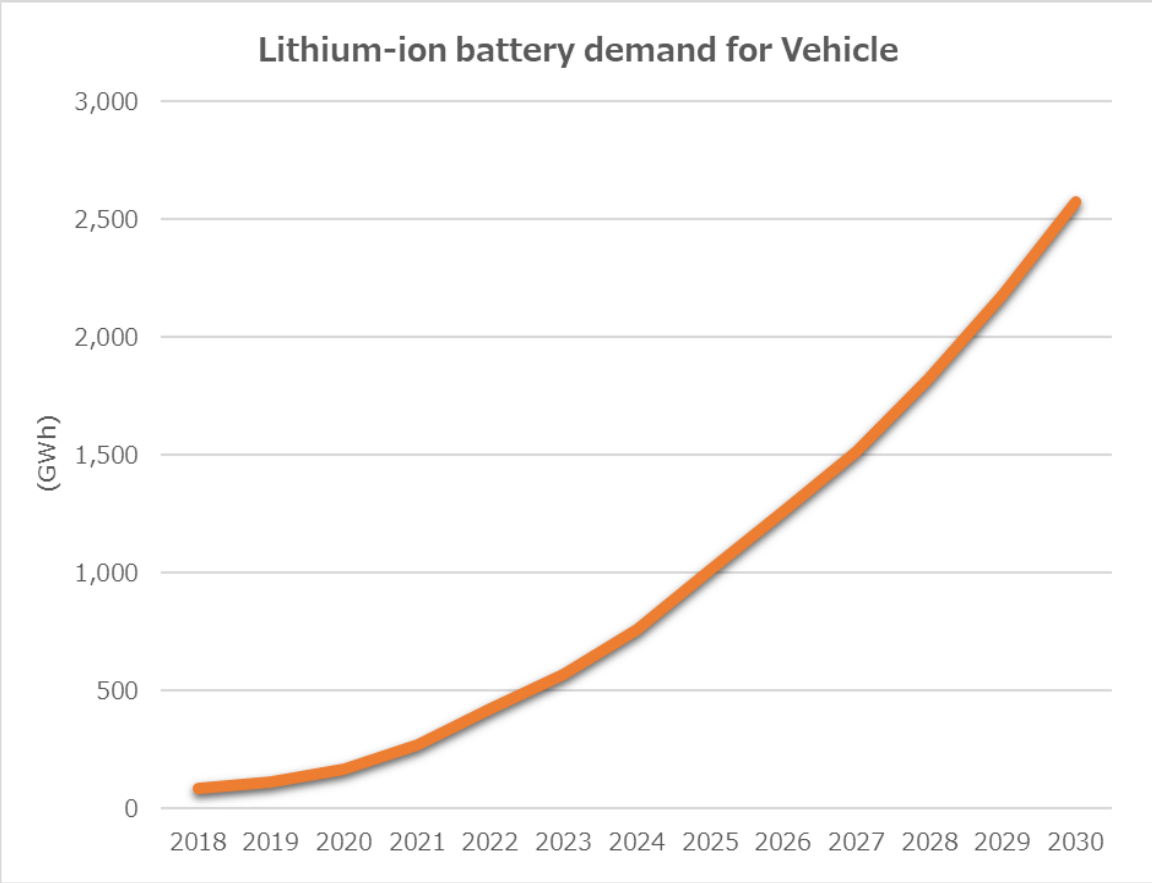
Global number of Employee 2,300

Battery maker challenge

Contribute to de-carbonization through electrification of mobility by providing leading-edge batteries sustainably.
Lithium-ion battery demand for vehicle will increase more than 10 times to 2,500GWh by 2030.

Our challenge

- Expand our production capability
- Leading-edge battery technologies
  - ✓ Higher energy density, Lower Cobalt
  - ✓ ASSB (All Solid State Battery)
- Sustainable supply chain
  - ✓ Sustainable supply chain creation (re-use, recycling)
- Carbon neutral production

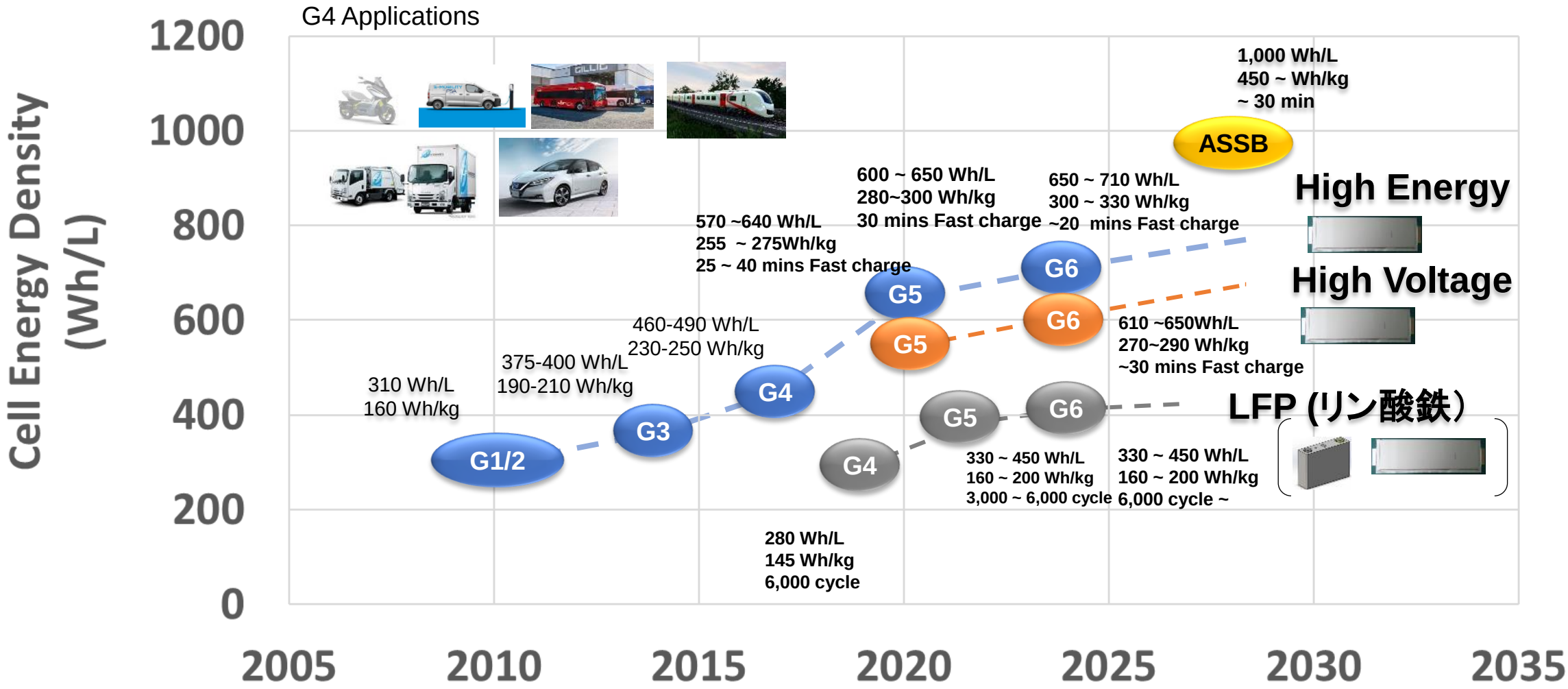


Source: Bloomberg

Leading-edge battery technologies

Envision AESC Technology Roadmap

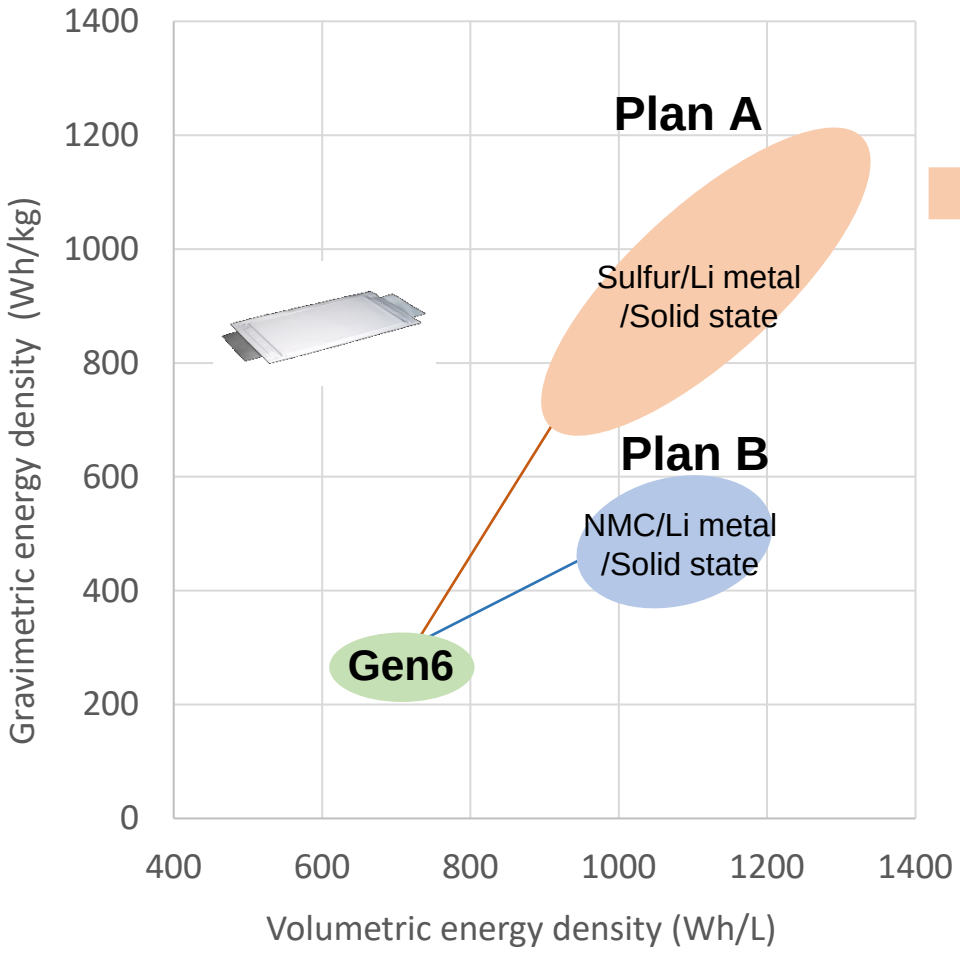
Multiple Technology Line-up will Support All Electrifications Demands Flexibly



Post Lithium-ion battery: Solid State Battery

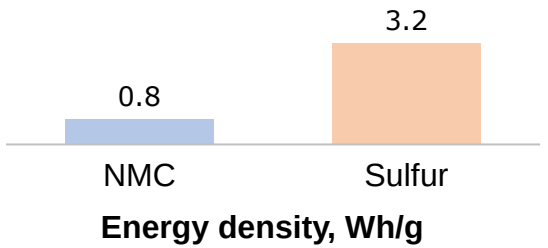
Envision AESC is aiming to achieve 1,000 [Wh/L]

Energy Density Target



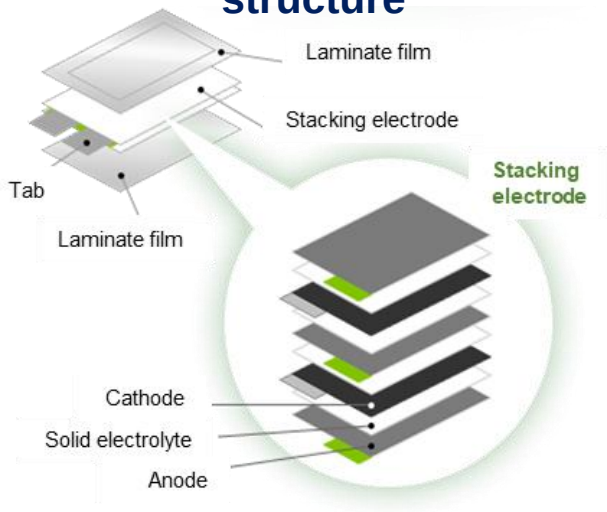
Advantage of New Technology

Advantage of Sulfur



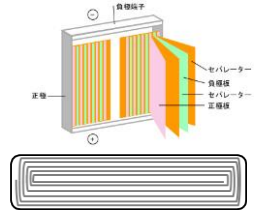
- Cathode energy density per kg is **200%** higher than NMC

Advantage of stacking structure



- Stacking is the best structure for solid electrolyte which prefers no bending
- Envision AESC has over 10 years experience of stacking technology

< Prismatic cell >



< Cylindrical cell >

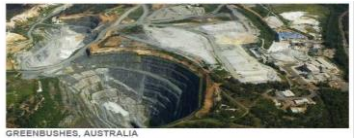
Sustainable supply chain

Lithium-ion Battery Supply Chain

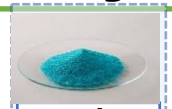
Ni mineral

Co mineral

Mn mineral



Lithium mineral



Ni Sulfate

Co Sulfate

Mn Sulfate

Precursor

Li2CO3 /LiOH

NCM Cathode

37%

Anode

5%

Separato

5%

Electrolyt

4%

Others

Module/ Pack

Battery Plant

EV OEM

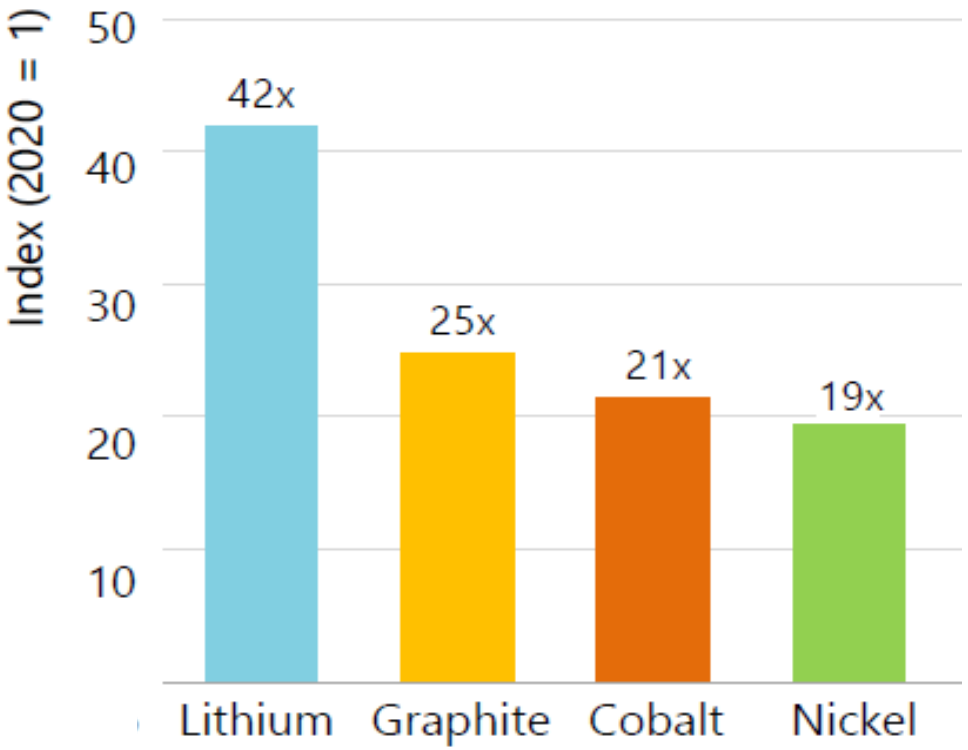
Recycle

Recycled metals to Precursor process

Necessity of battery recycling

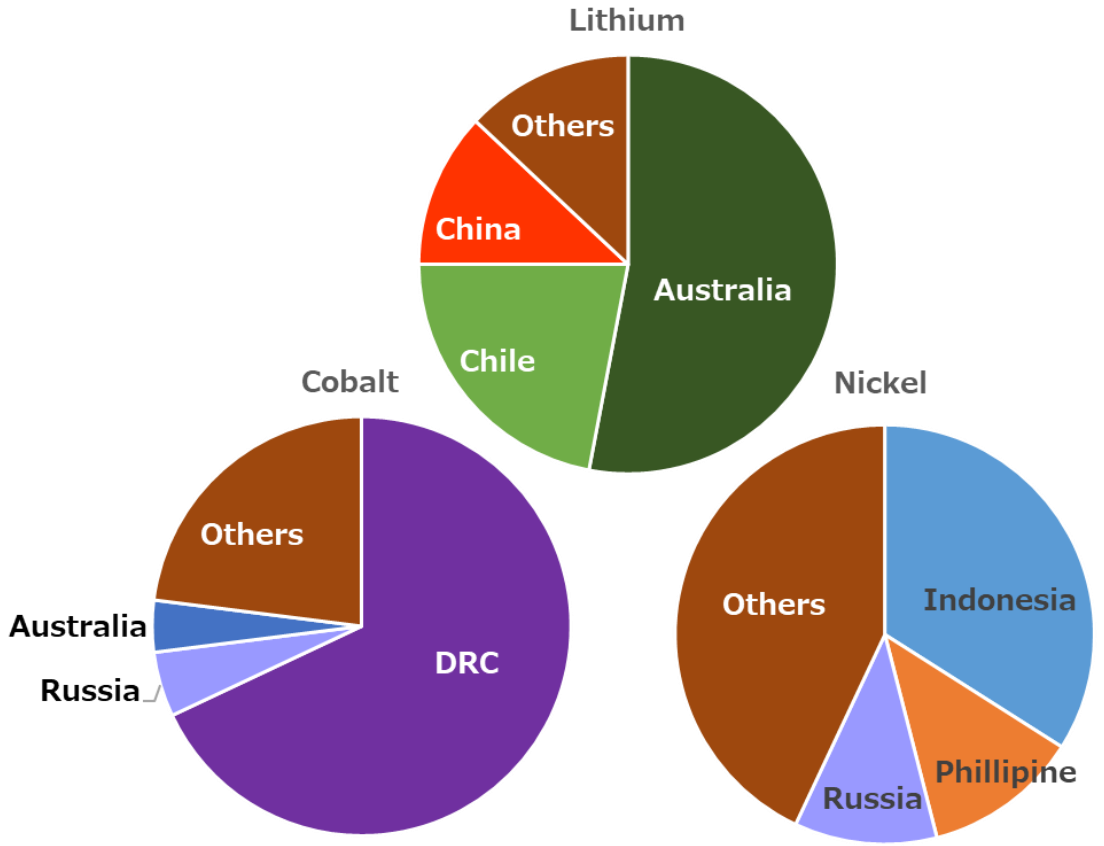
- **Demand of battery materials will extremely increase and their producing countries are very limited.**
- **One of the key approaches to solve the issue is battery recycling.**

Material demand in 2040 relative to 2020



* Based on IEA's sustainable development scenario (Net zero by 2070)

Share of top3 producing countries in 2019

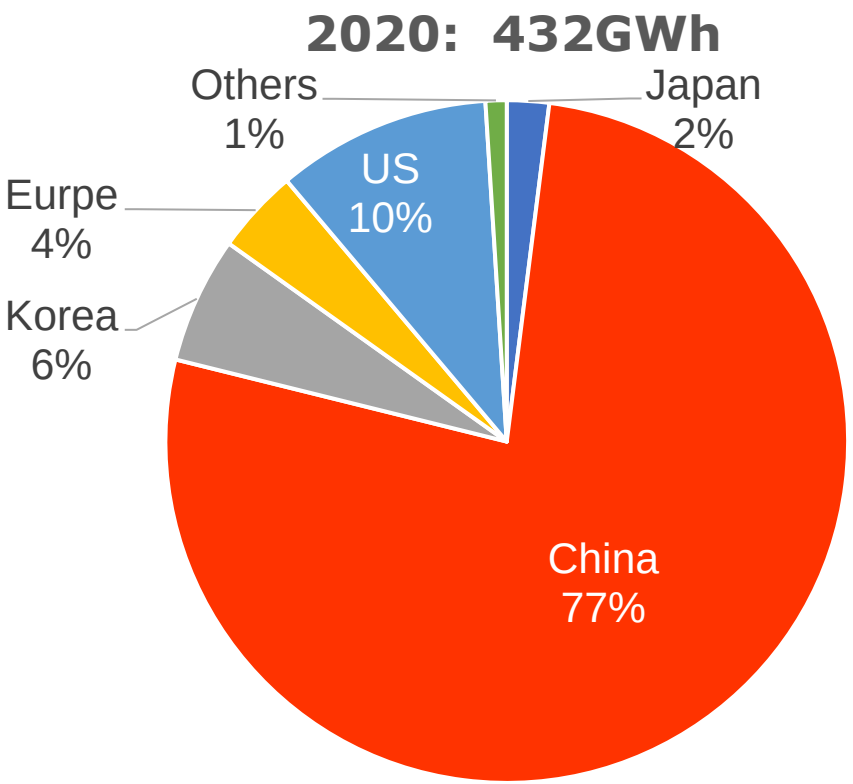


Source: IEA

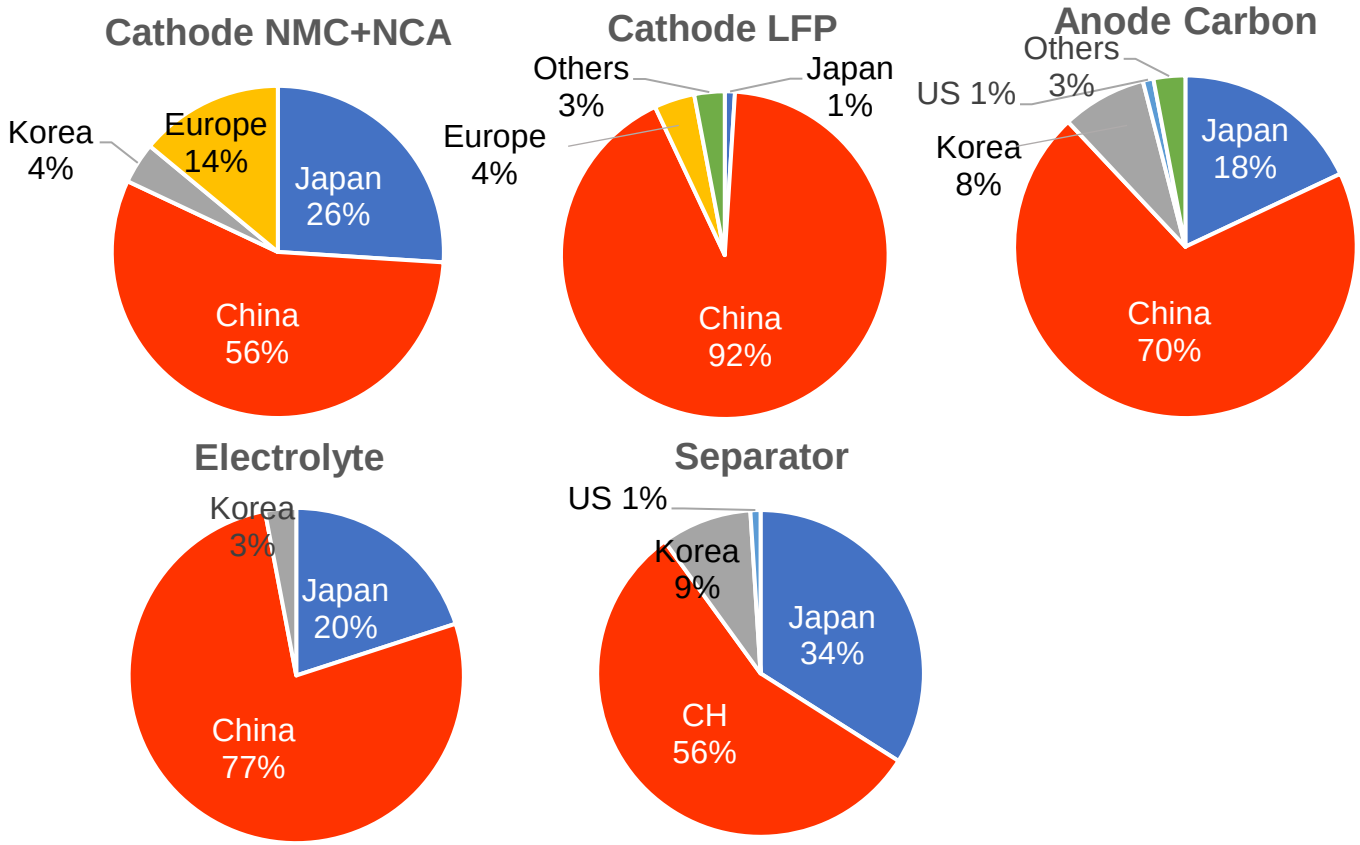
Status of lithium-ion battery supply chain

Necessary to expand production in Japan, Europe and US.

Lithium-ion battery production share by region



Battery materials production share by region



Contribution to circular economy

Promote battery life cycle management and contribute to circular economy.

Envision AESC

LiB Plants
US, UK, Japan, China

Key Materials
Cathode, Lithium, Cupper

Raw Material

Mine or Brine

Raw Materials
Nickel, Cobalt, Lithium

Recycle

Short Recycle Loop

LiB for xEV

For xEV

Long Recycle Loop

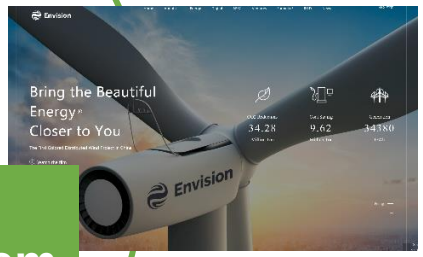
Reuse

LiB for ESS

“LiB of EoL”

V2G System Design
Bipolar Smart Charger
Pilot Project with TSO

Link to energy management system by advanced BMS



BASC (Battery Association for Supply Chain)

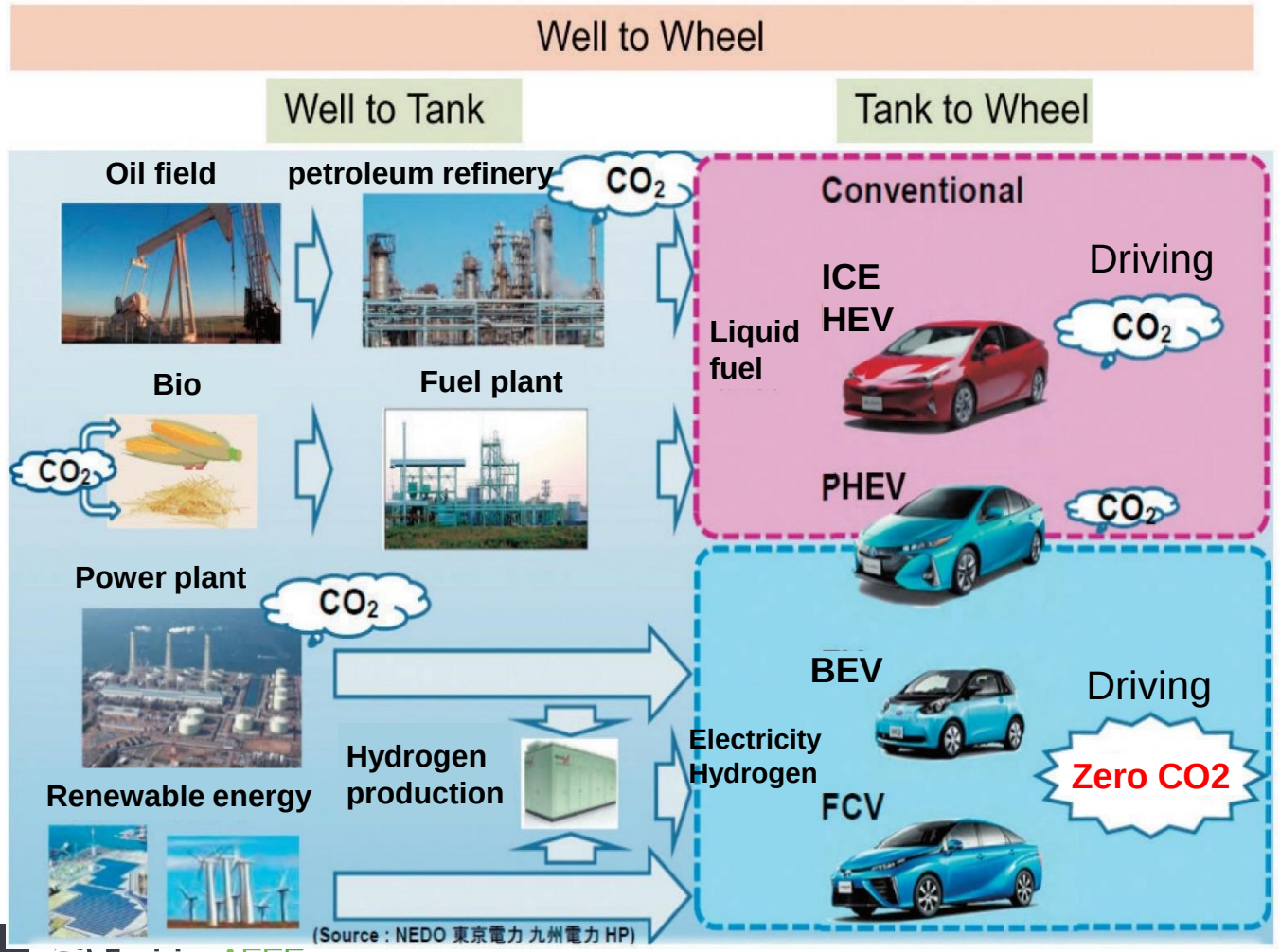
Envision AESC is the regular member of the BASC in Japan.

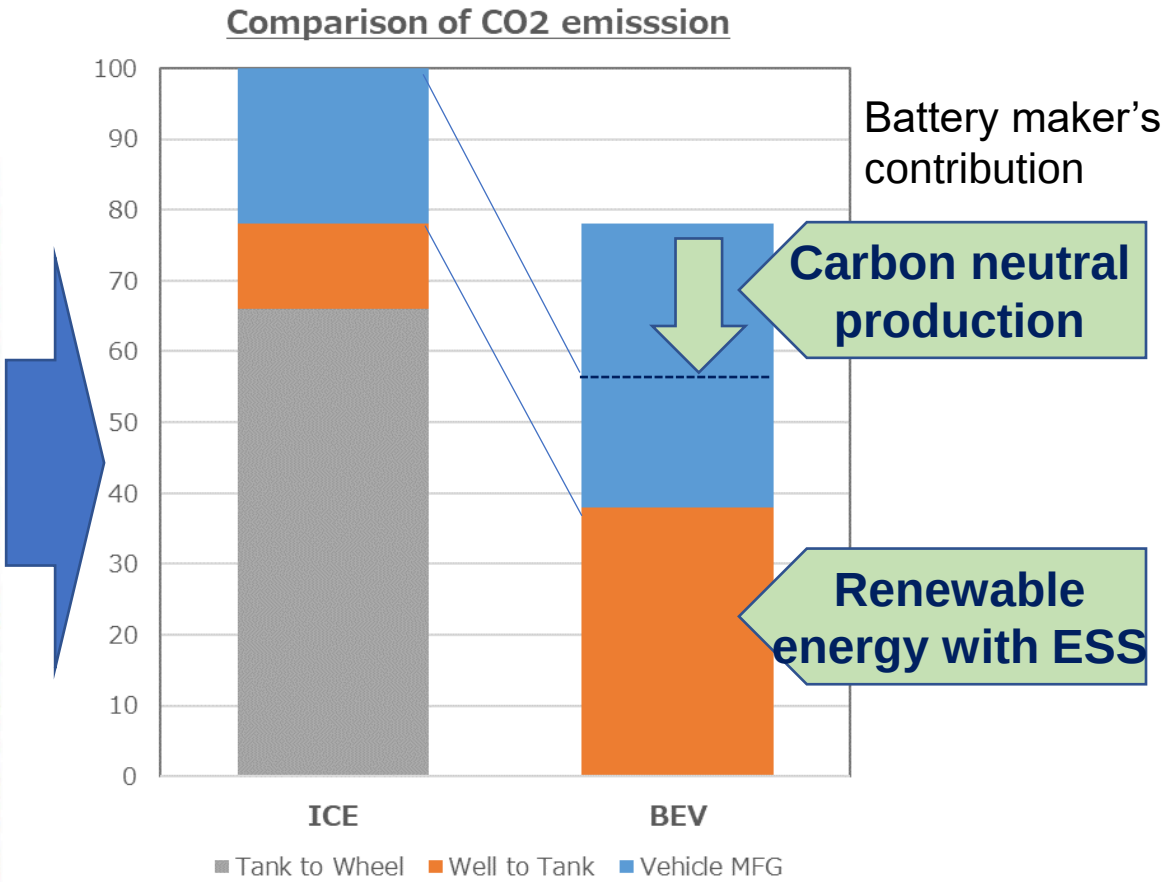
Carbon neutral production

Contribution to carbon neutral

Battery production is one of the key process to realize carbon neutral.

Battery can also contribute to promote renewable energy through ESS.





In case of CO2 emission of ICE is 100. Calculation of electricity is based on in Japan@2030. Renewable ratio is 22~24% . Nuclear is 20%

Source: Goldman sacks report

Expectations for international cooperation

Envision AESC expect for international cooperation in following categories.

- **Technology**
  Raw material recycling technology development.

- **Supply chain management**
  Battery material supply chain scheme establishment in Europe.
  Cathode / Anode material, Aluminum / Copper foil, Separator, Laminate film etc.

- **Regulation / Policy of battery business**
  Work with governments to establish regulations and policies for carbon neutrality
  EV promotion, Infrastructure(Battery charger etc.) , Life cycle management.

Envision AESC

To Solve the Challenges for a Sustainable Future.

Leading the De-Carbonization Revolution through AIoT Defined Battery Solutions.