

Batteries in the energy revolution

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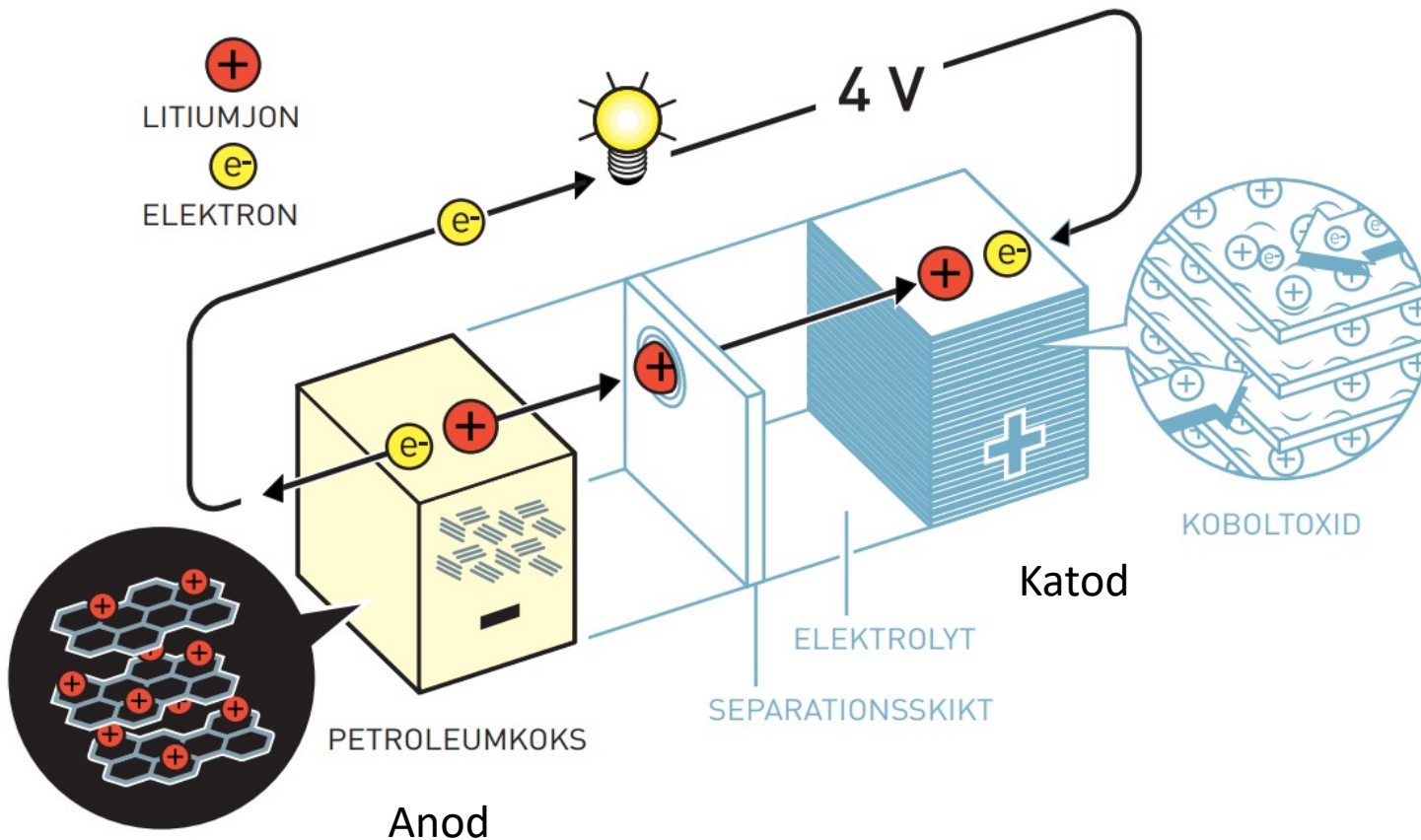
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Batteries – important concepts (Li-ion)



Cell

Anod, katod och elektrolyt
Aktivt och inaktivt material

Pack

Modul

BMS – battery management system

BMU – battery management unit (styrenhet +
algoritmer)

Kylsystem

Säkerhetssystem

Spänning (V)

Ström (A)

Kapacitet (Ah)

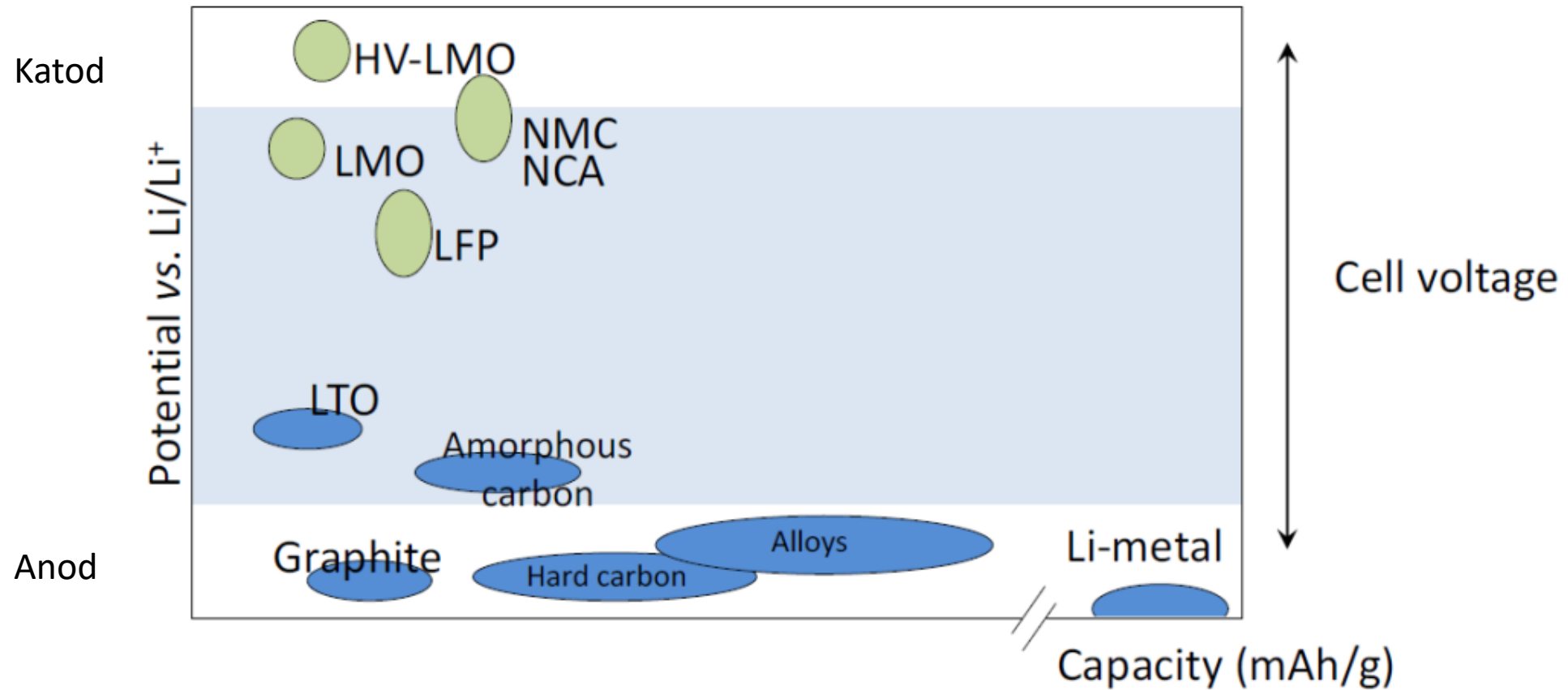
Energi (kWh)

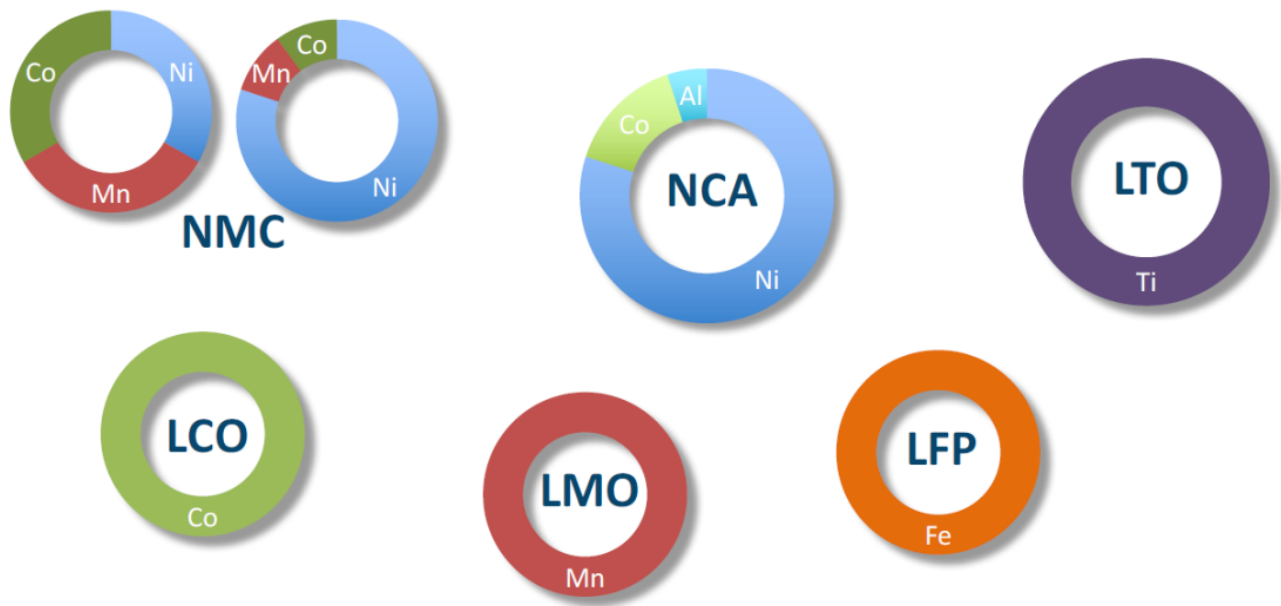
Effekt (kW)

State of Charge (SOC)

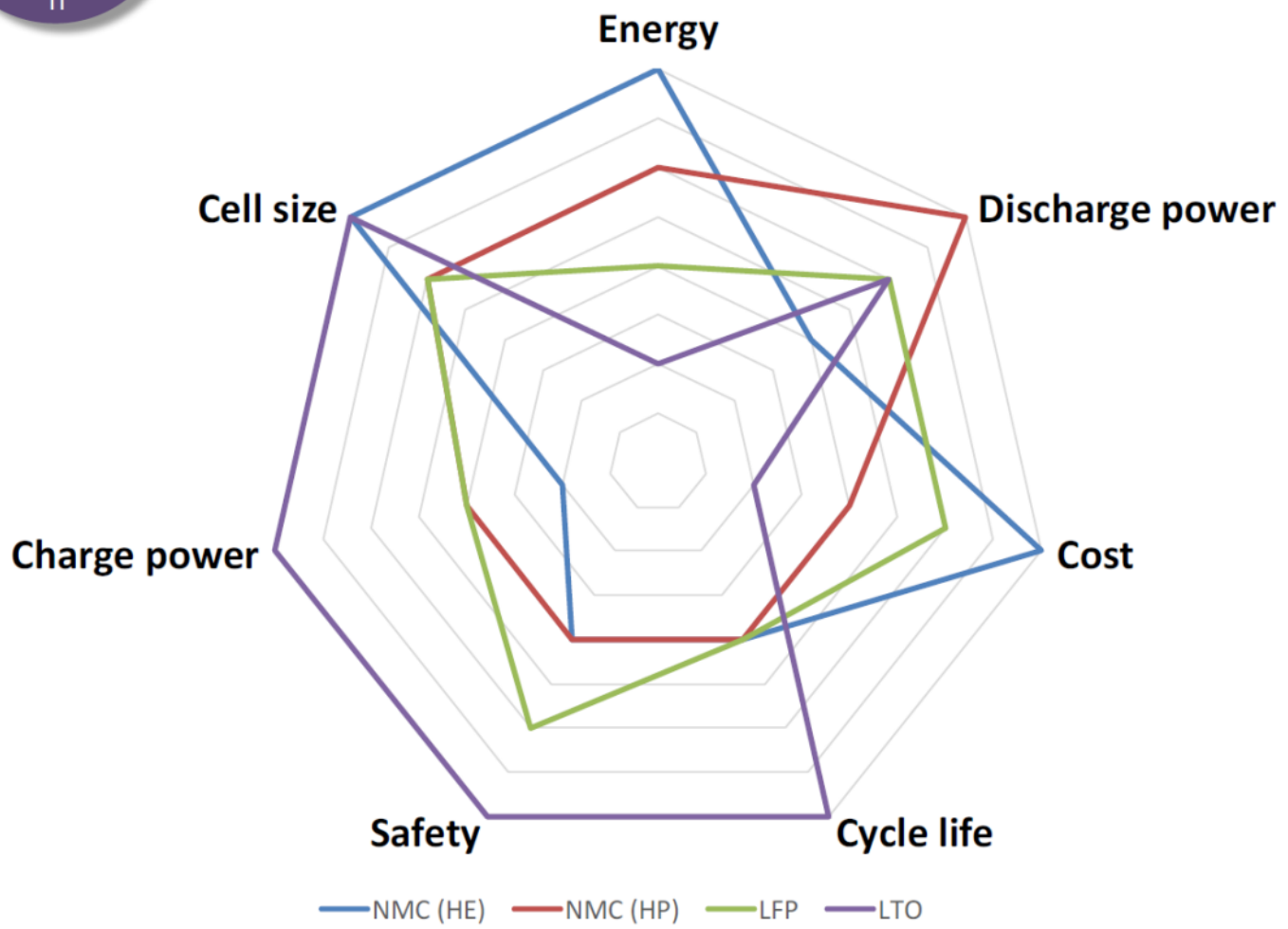
State of Health (SOH)

Anod- and catod materials





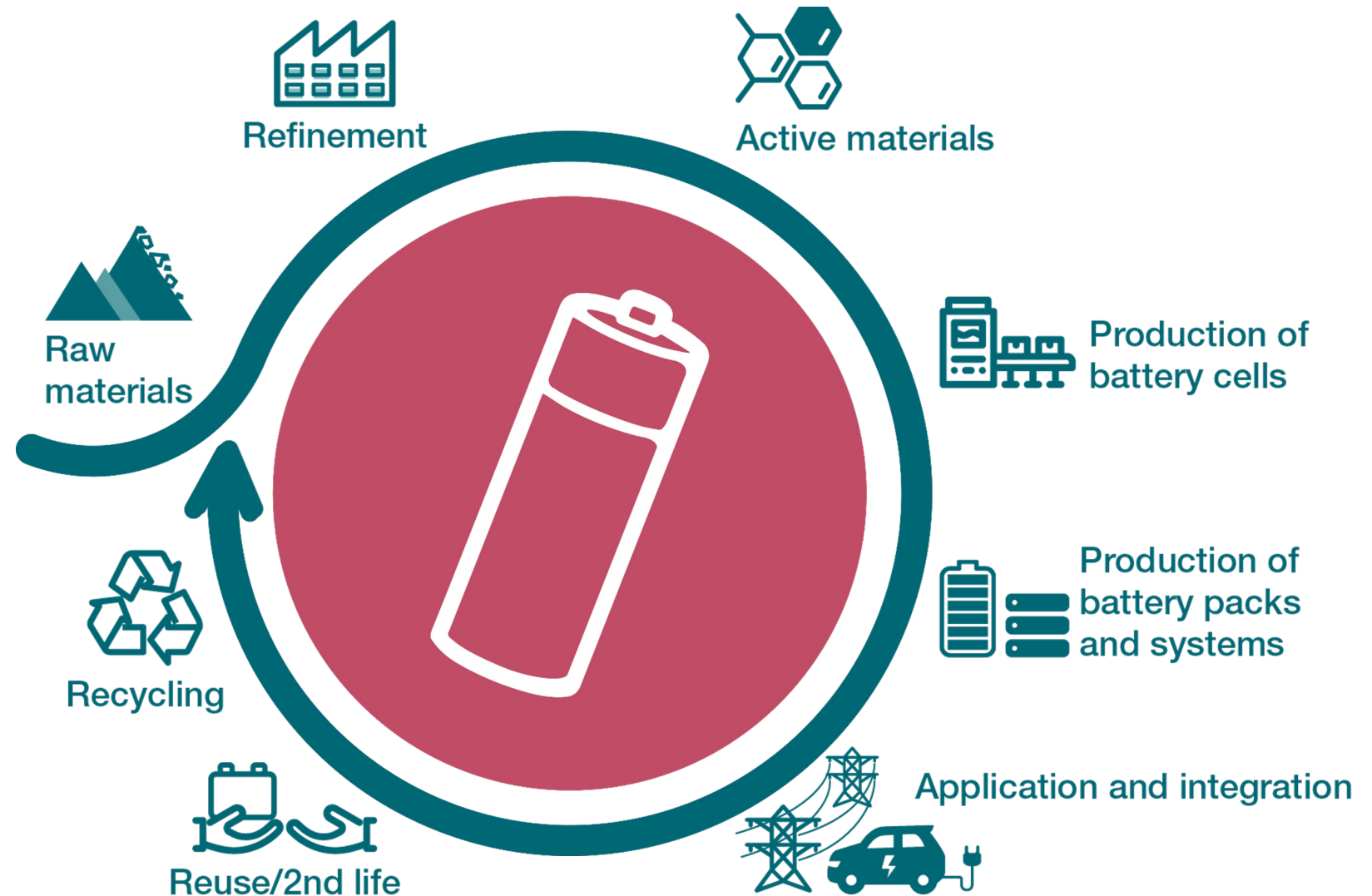
Hur delarna kombineras avgör → egenskaperna



What do we mean by a sustainable battery value chain?



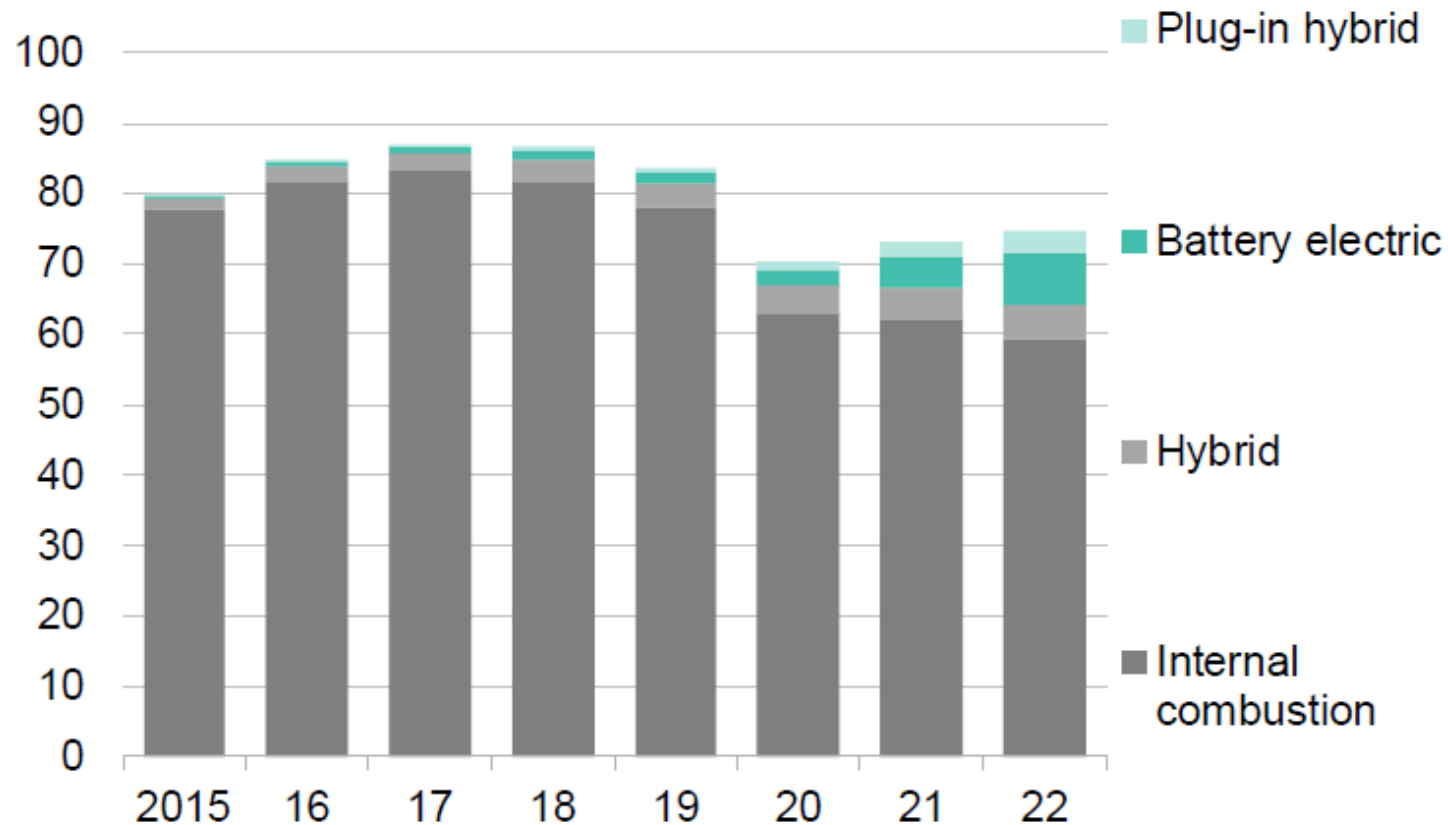
- Why batteries?
- Value chain perspective - added value and lower risk
- Environmental and climate, Social and Economic sustainability
- An ecosystem of actors where the weakest link slows down the other parts
- A sustainable value chain require incentives and time to accomplish. First incentives, then time.



Combustion vehicle sales have already peaked

Global passenger vehicle sales by drivetrain

Million vehicles



Source: BloombergNEF

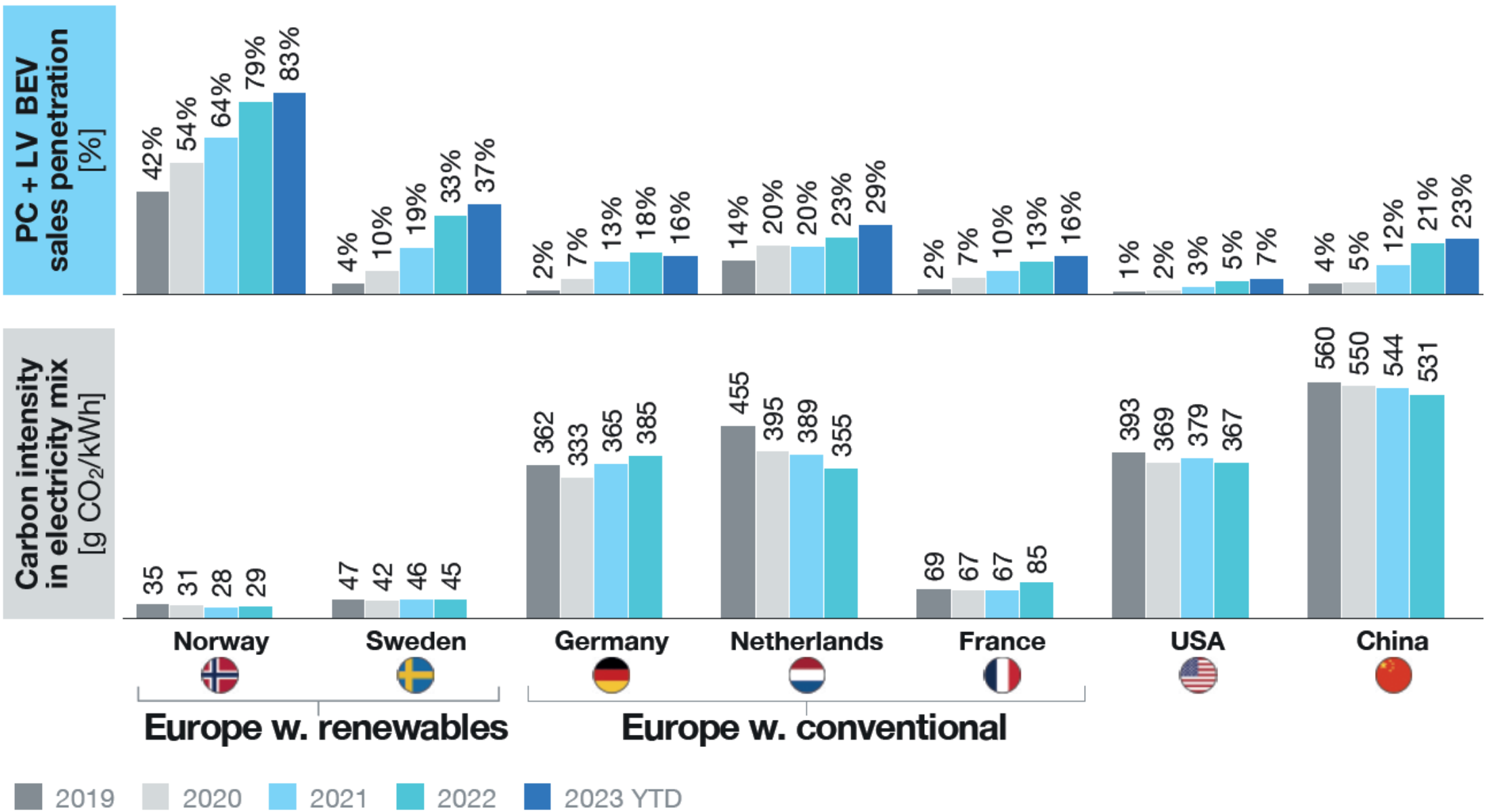
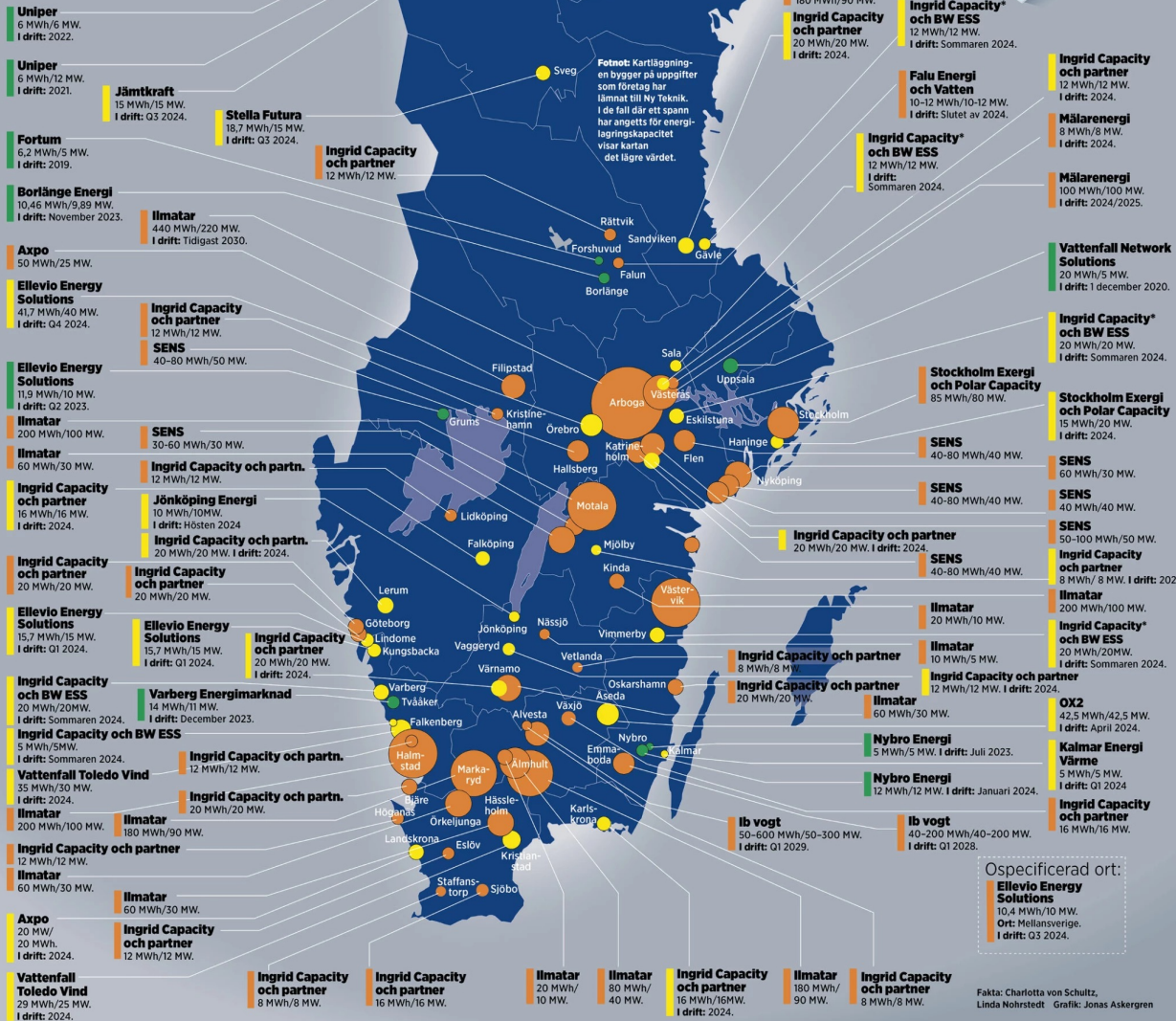
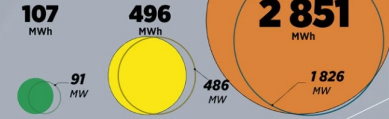


Figure 27: Electric vehicle sales penetration and carbon intensity of electricity mix in major EV markets; *Source: EV Volumes⁴⁸, Ember climate⁴⁹*

Svenska batteriparker

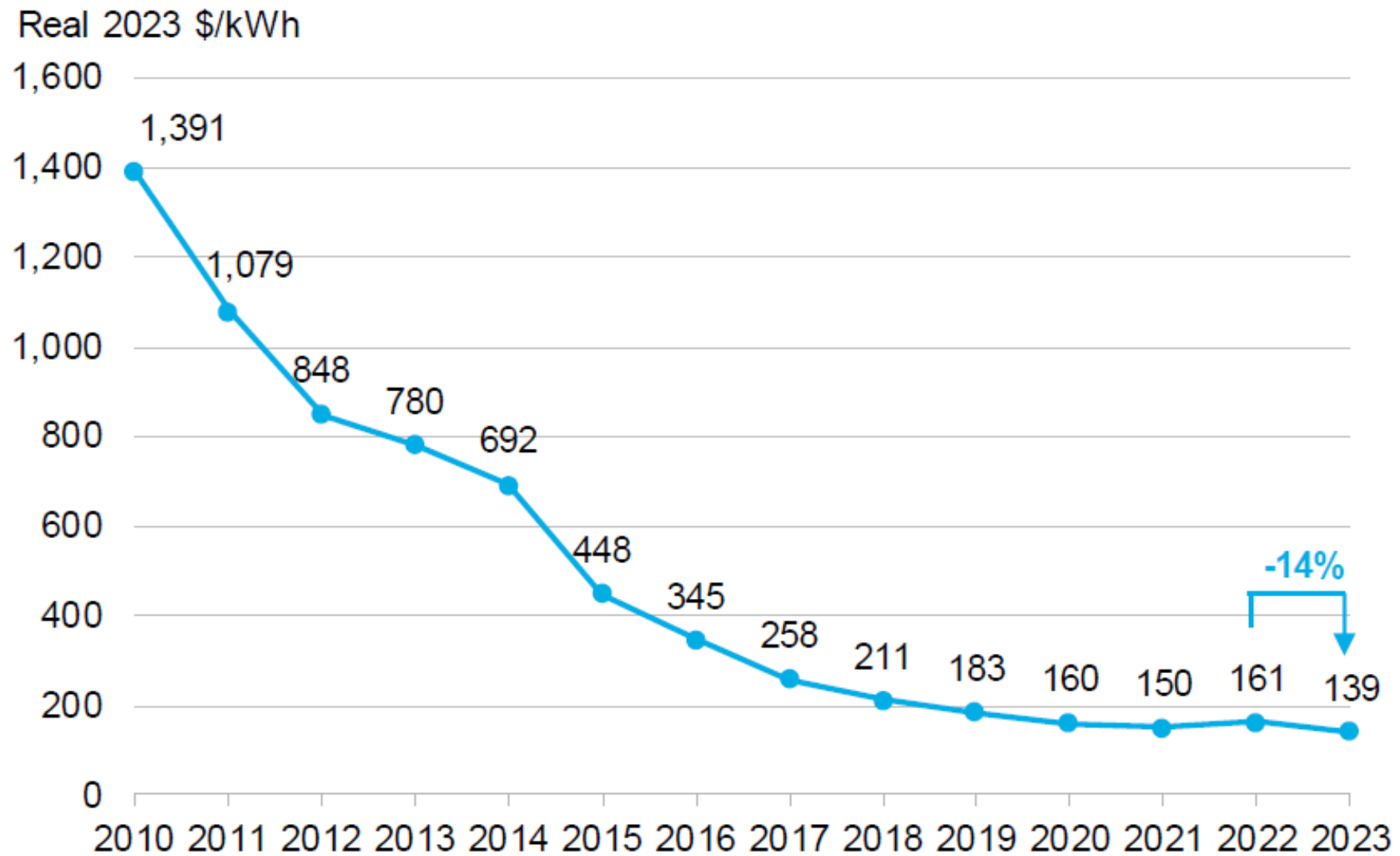
Total energilagringsskapacitet/total effekt

I drift Byggstartade Planerade



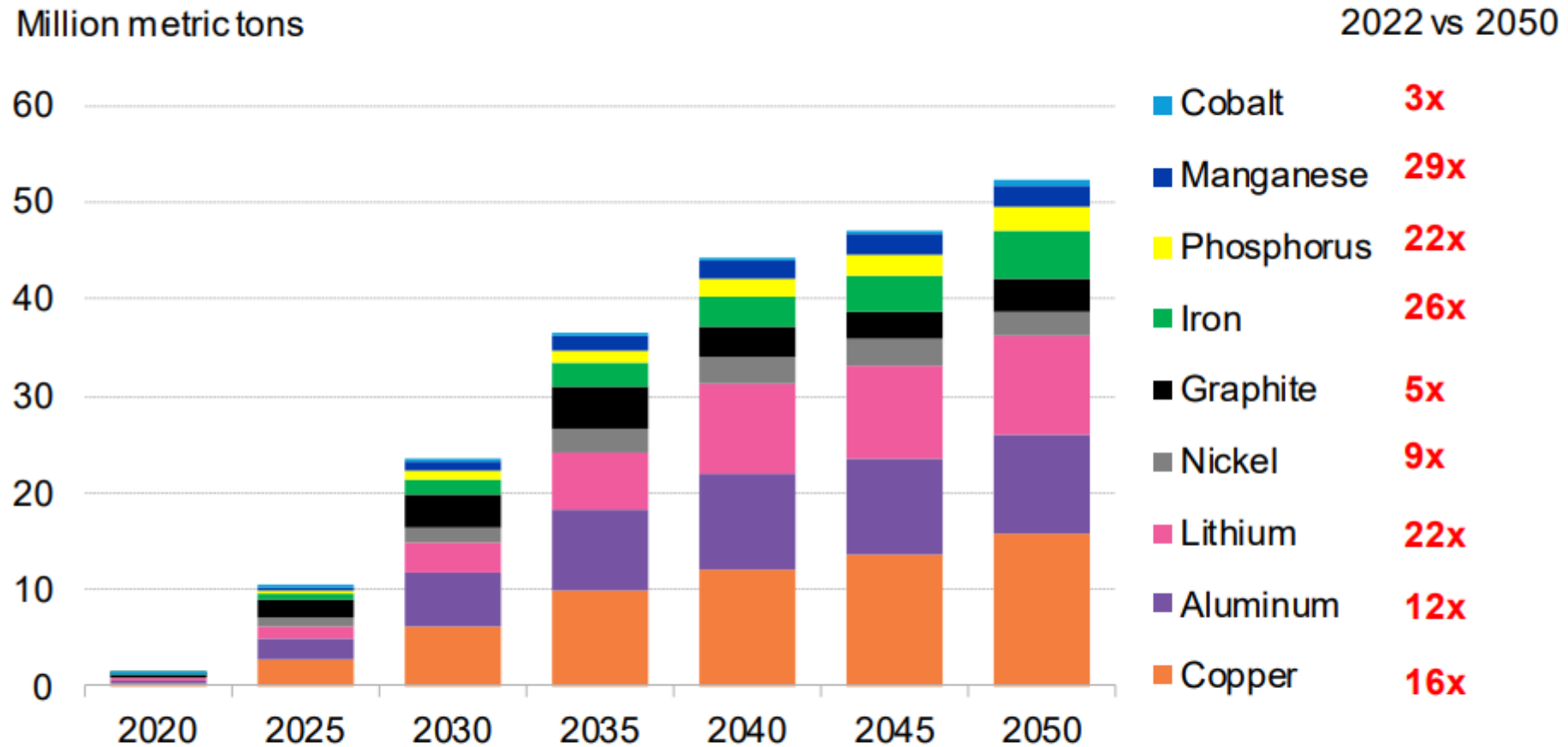
Fotnot: Kartläggningen bygger på uppgifter som företaget har lämnat till Ny Teknik. I de fall där ett spann har angivits för energilagringsskapacitet visar kartan det lägre värdet.

Volume-weighted average lithium-ion battery pack price



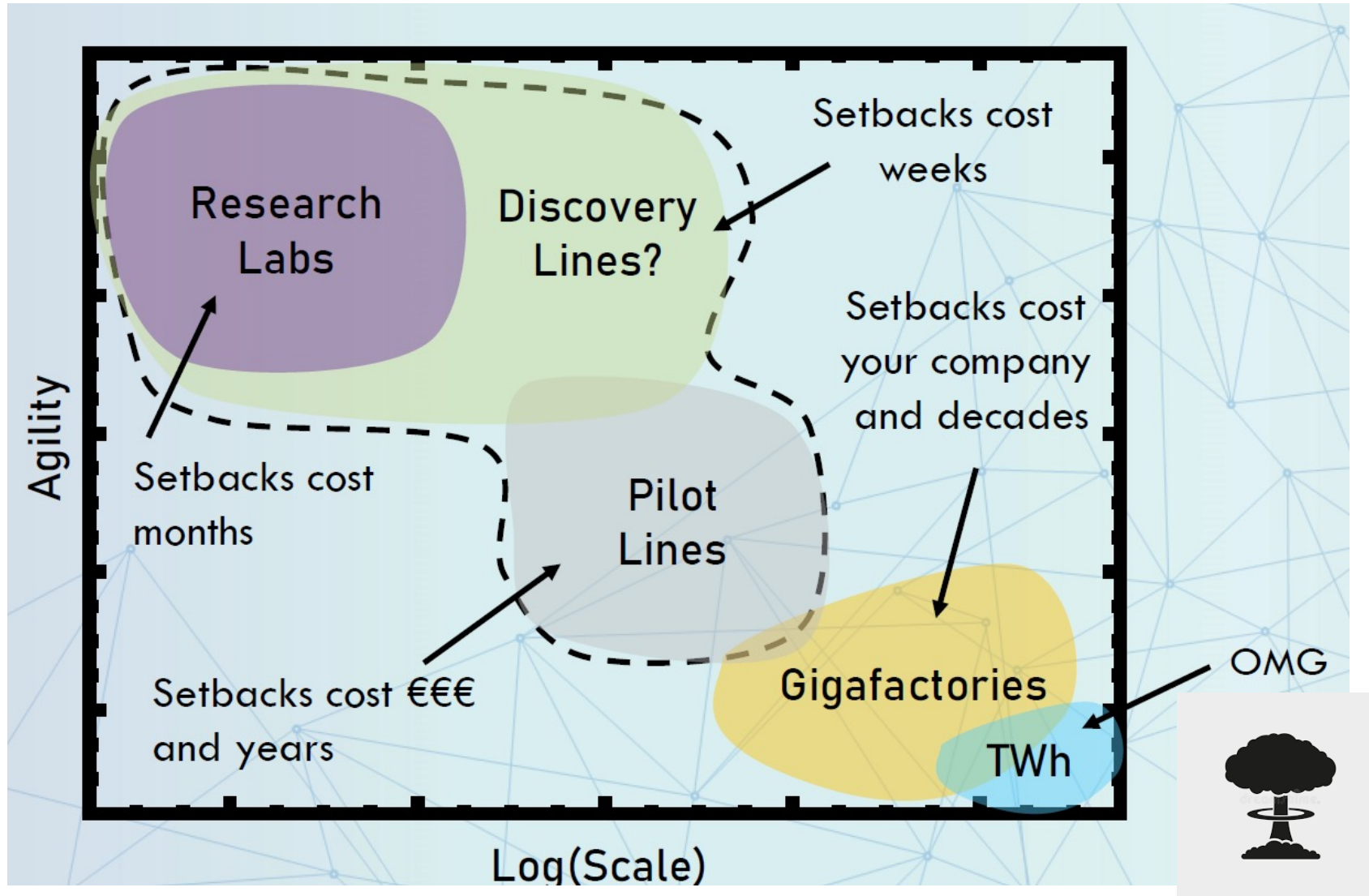
Source: BloombergNEF. Note: Historical figures have been adjusted to real 2023 dollars.

Figure 7: Annual metals demand from lithium-ion batteries under the Net Zero Scenario



Source: BloombergNEF. Note: Lithium is expressed in million metric tons lithium carbonate equivalent (LCE). Demand occurs at the mine mouth, one year before battery demand. Multiples between 2022 and 2050 are based on annual demand in the given year.

Necessity of incremental scaling



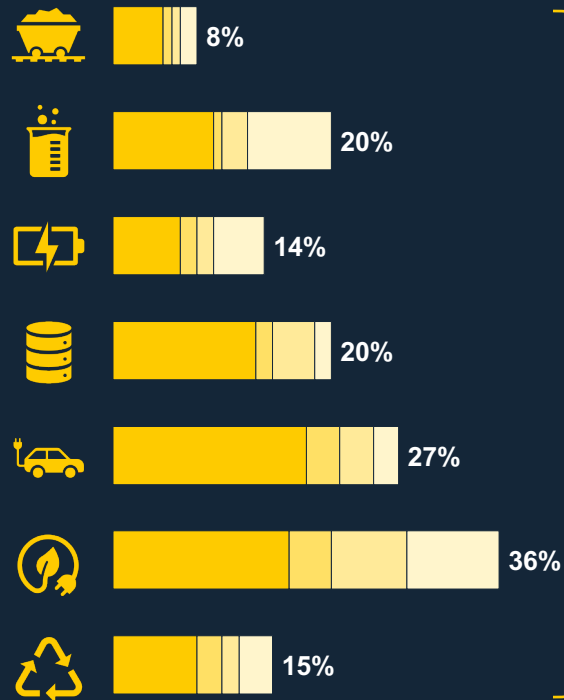


The industry builds on industrial legacies and engages companies of all sizes in the value chain

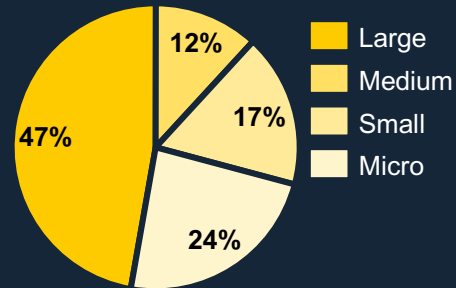
Swedish battery value chain – distribution & company size

Based on financial data of 127 companies

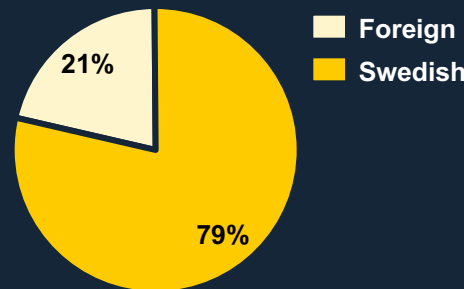
Number of companies in the value chain steps



Size distribution in the entire value chain



Company owner country



The Mobility Hub

Automotive legacy and home to two new battery gigafactories

23%
Of all companies in value chain



2

The Power System & R&D Hub

Power system legacy and strong private & public battery R&D scene

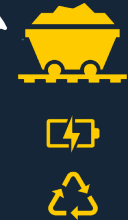
48%
Of all companies in value chain



1

The Process & Energy Hub

Strong mining legacy and home to Europe's first homegrown battery gigafactory



9%
Of all companies in value chain

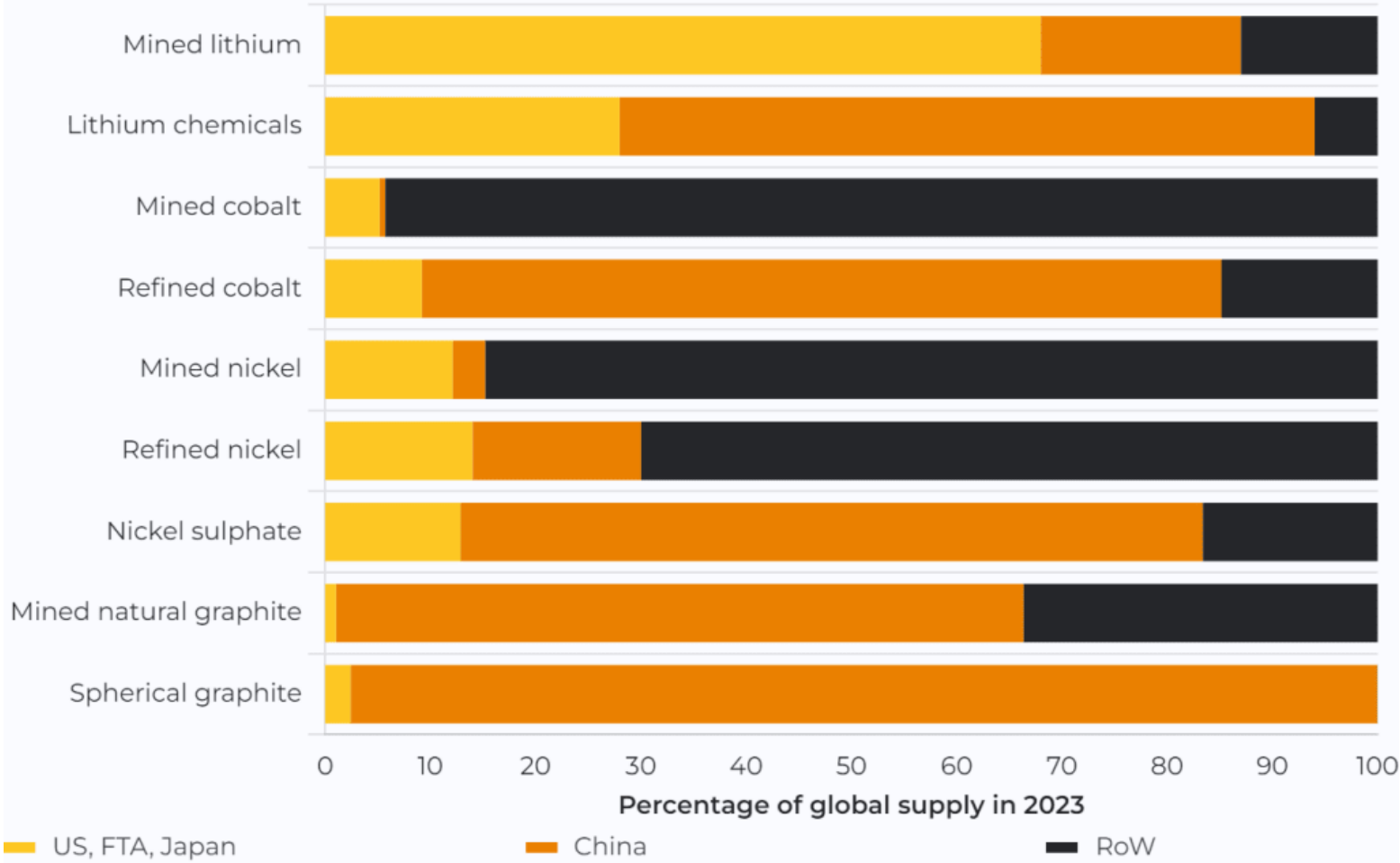
Note: Companies can be active in several value chain steps and regions – therefore, sum does not equal 100%

The map is illustrative, i.e. differences in exact location might apply



China dominates in the processing of critical minerals

The US, its FTA allies and Japan have some strength in lithium but have low shares of the market in other minerals

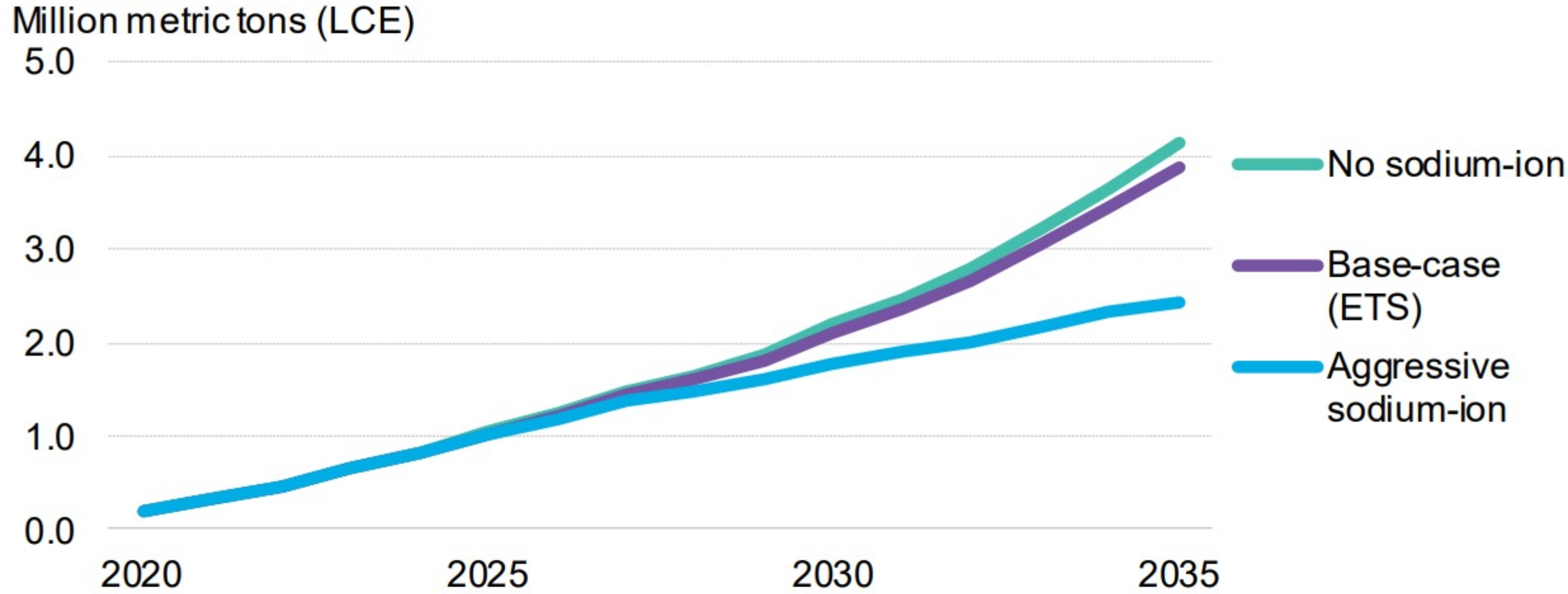


SOURCE: BENCHMARK MINERAL INTELLIGENCE

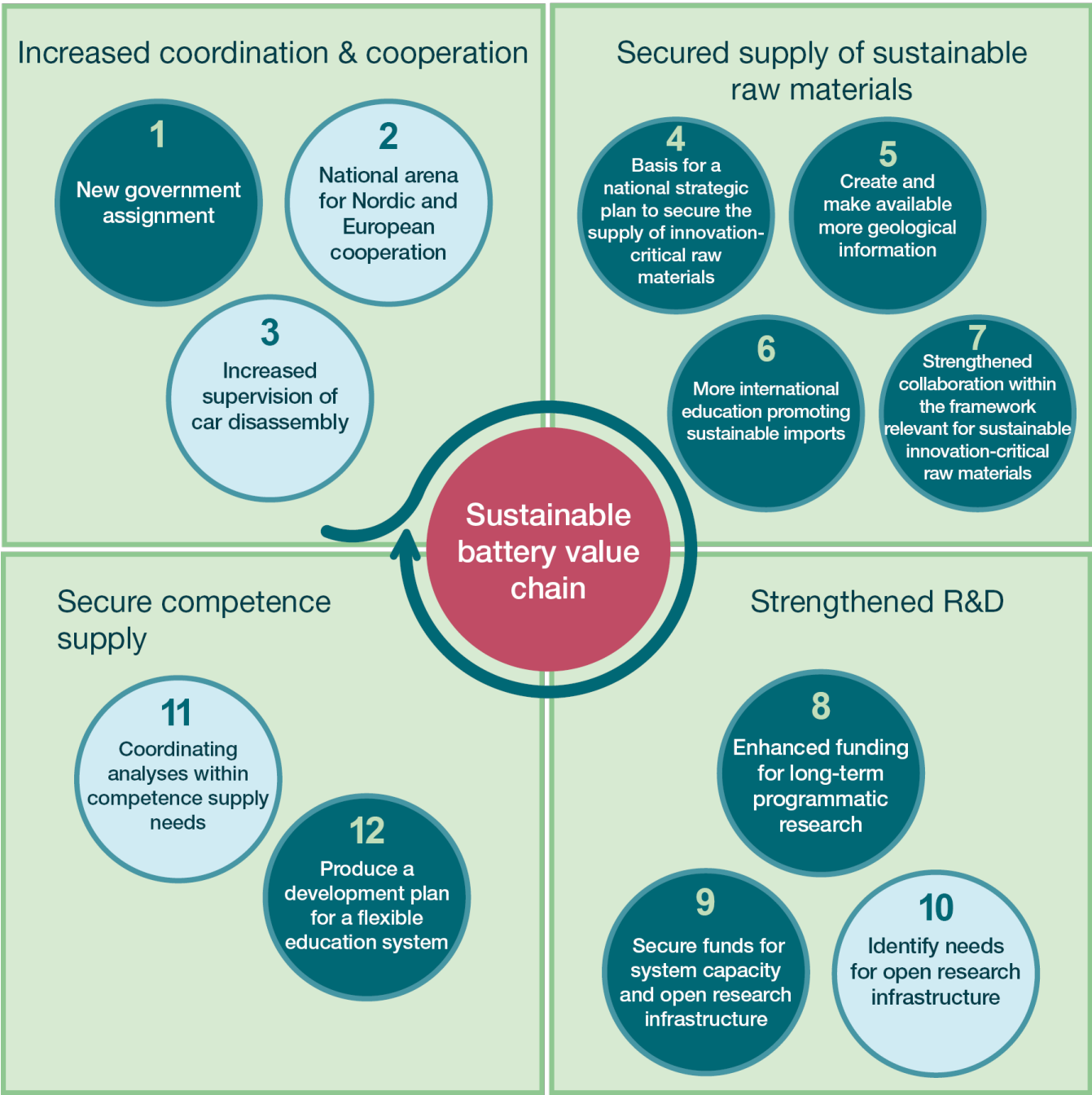
Next gen battery chemistry

- Na-ion, not Cu, less cumbersome, easier to transport, safer
- Solid-state Li-batteries, +energy +safety -manufacturing
The electrolyte: a ceramic or a polymer
Magnesium, Aluminum, Calcium, more electrons per ion, +energy -effect
- Zinc, Li-Sulphur, +energy –effect Metal-air (Zinc-air, Li-air) ???
- Organic concepts, water electrolyte ? –energy
- Flow batteries (Redox-flow) V or possibly Fe

Figure 14: Impact of sodium-ion battery uptake scenarios on lithium demand



Source: BloombergNEF. Note: LCE = lithium carbonate equivalent. ETS = Economic Transition Scenario.



Questions!

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