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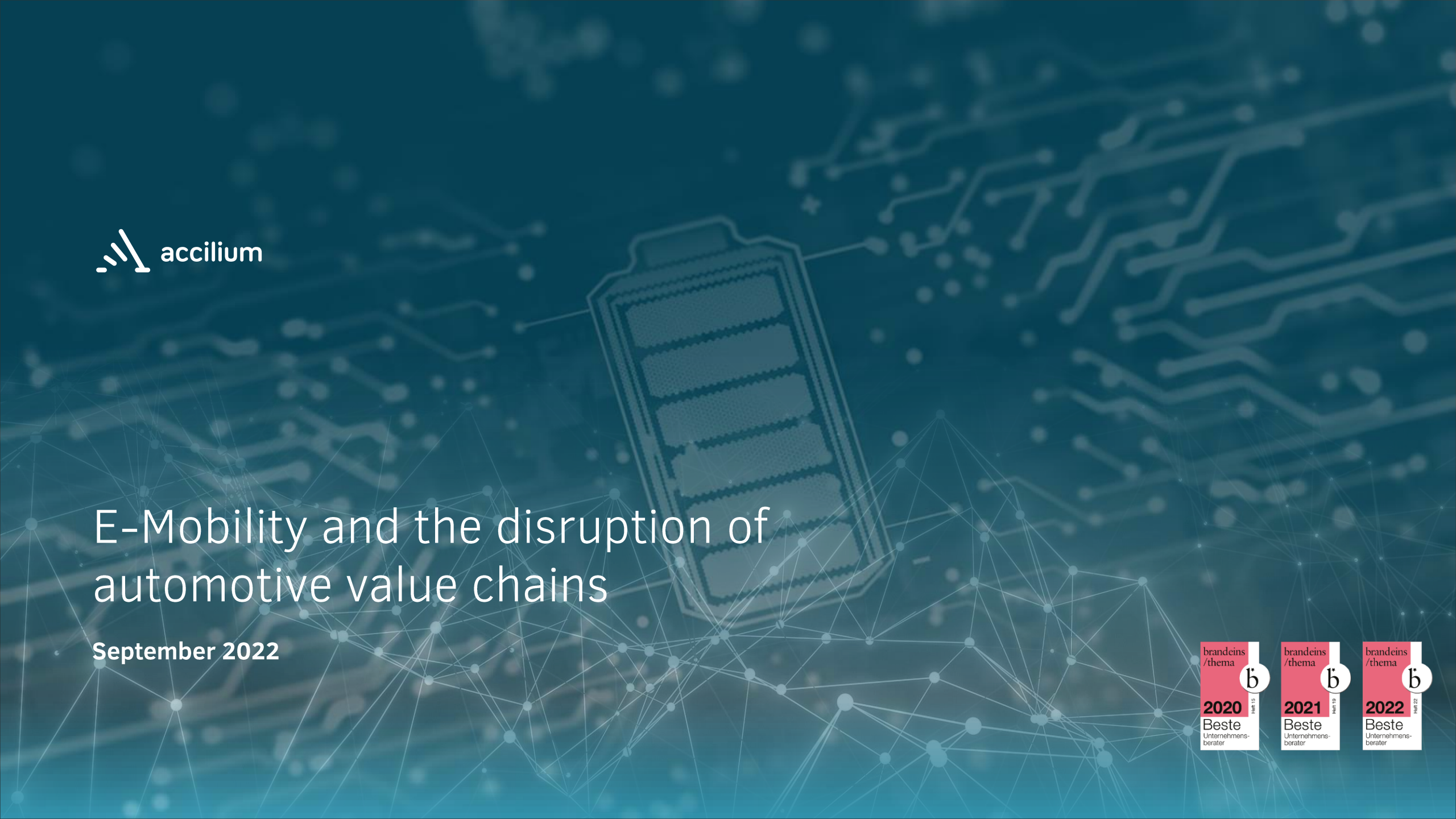
E-Mobility and the disruption of automotive value chains

September 2022



The advancing electrification requires automotive OEMs to rethink their current value chains

The End of Combustion Engines

The electrification of vehicles is gaining momentum further accelerated by the recent announcement that only zero emission vehicles sales will be permitted from 2035 onward in the EU.

This leads to drastic changes for automotive OEMs who have in the past built up their core competencies around the internal combustion engine and related engineering components.

Ban on new fossil-fuel cars from **2035**[1]

Rise and Value of Electric Vehicles

With both automotive OEMs and policy makers pushing the adoption of electric vehicles the number of global EVs is growing rapidly and it is expected that prices for EVs will reach a similar price level as those of ICEV no later than 2028.

It is crucial for OEMs to lock in a significant share of this value creation by shifting and building their competencies to those parts with the most promising value potential.

Price parity between EVs and ICEV reached by **2028**[3]

Value Chain Integration of OEMs

In EVs the battery makes up about 35% of the total vehicle costs. To lock in this value potential, OEMs need to reconsider their supply strategies and current value chains. A higher degree of vertical integration for batteries and battery cells will enable OEMs to build new competencies and to reduce their dependency on suppliers.

An integral part of a resilient OEM supply chain will be the development of a strong and partly localized supply network.

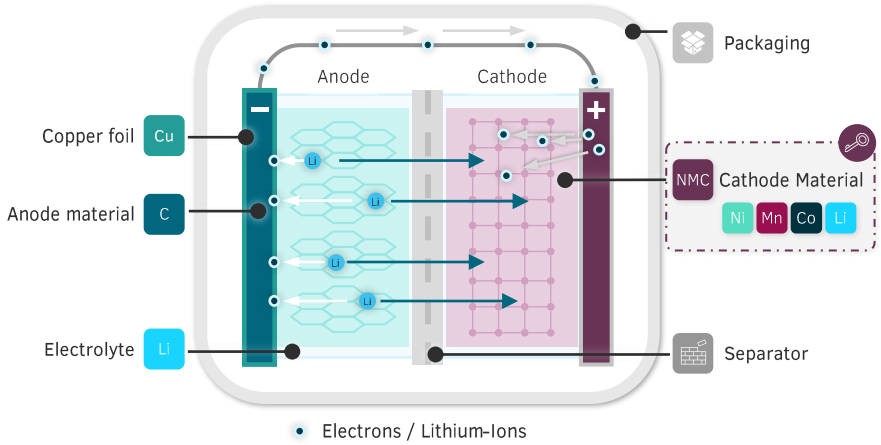
Battery accounts for up to **35% of total costs**[2]

With the approaching end of the combustion engine OEMs need to reconsider their current supply strategies and value chains. In this reducing supply dependencies and building up own battery cell production competencies become crucial factors for sustainable business success.

1 EU countries reach deal on climate laws after late-night talks | Reuters
2 Batterien für Elektroautos: Faktencheck und Handlungsbedarf | Fraunhofer
3 Hyperdrive Daily: The EV Price Gap Narrows | Bloomberg

Securing access to valuable raw materials becomes a critical success factor for automotive OEMs

Lithium-Ion Battery Design and Materials



The cathode accounts for up to 50% of the total battery costs due to its composition of high demand materials[1,2]

Leading Producers of Battery Raw Materials[3]

NMC Cathode Material

Nickel Ni
- **Indonesia 26%**
- Philippines 15%
- Russia 9%

Manganese Mn
- **South Africa 31%**
- Australia 18%
- Gabon 12%

Cobalt Co
- **DR Congo 72%**
- Australia 4%
- Cuba 4%

Lithium Li
- **Australia 63%**
- Chile 20%
- China 8%

The access to battery raw materials imposes a critical challenge to a robust battery supply chain. For OEMs it will be vital to enter strategic partnerships and invest in long-term supply contracts with key players in the up-stream market to secure battery raw material supply, especially considering the drastically increasing adoption of electric vehicles and the continuously rising demand for lithium-ion batteries.

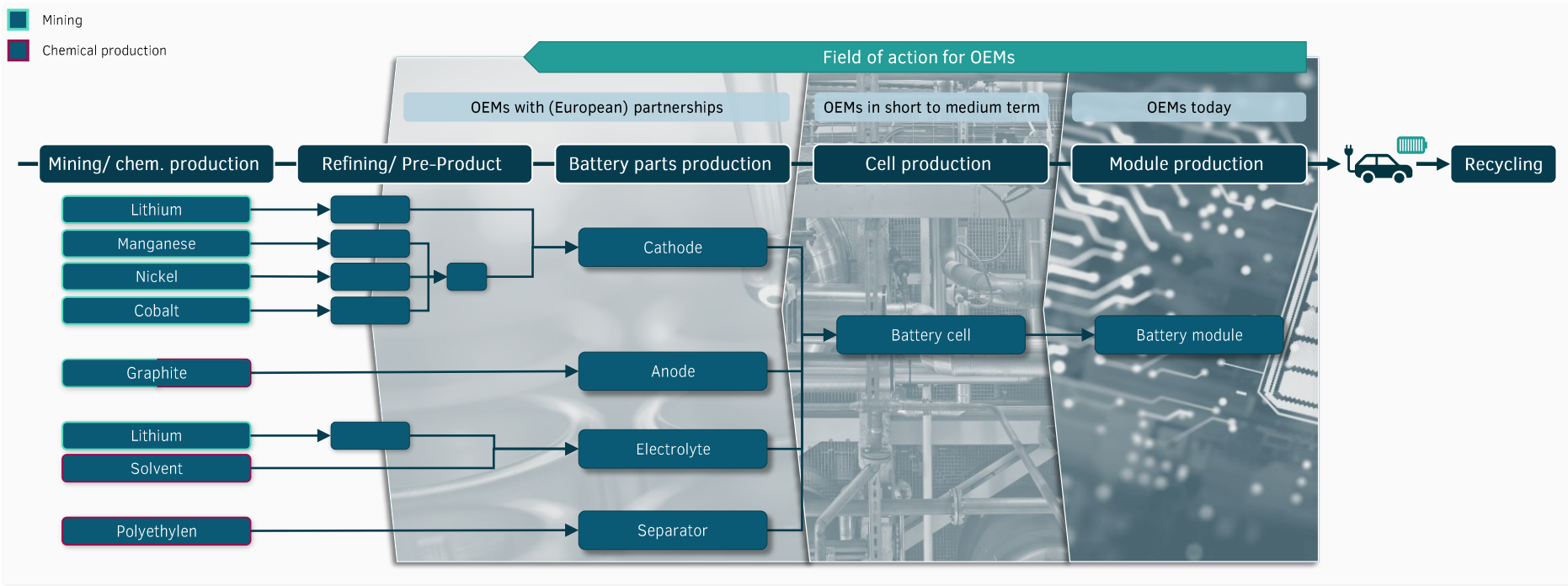
1 Breaking Down the Cost of an EV Battery Cell | Visual Capitalist
2 Battery Pack Prices Fall to an Average of $132/kWh, But Rising Commodity Prices Start to Bite | BloombergNEF
3 Rohstoffe für die E-Mobilität | BMZ

OEMs' vertical integration in battery cell production is increasing

OEM SUPPLY STRATEGIES

- Build diversified and less monopolistic ecosystem of supply partners to reduce dependency on battery cell producers
- Form strategic partnerships with leading cell manufacturers and mid-stream suppliers to profit from technologies and innovation
- Establish in-house battery cell production to build up necessary competencies to produce customized battery cells

The Value Chain of Battery Cell Production for OEMs



Especially large automotive OEMs will pursue a high degree of vertical integration for battery cell production in order to develop competencies to position the battery as differentiation feature of the vehicle [1] as well as to mitigate risks and manage critical points along the supply chain.

1 Carmakers Race to Control Next-Generation Battery Technology | The New York Times

Recycling represents an important step within sustainable battery cell value chains

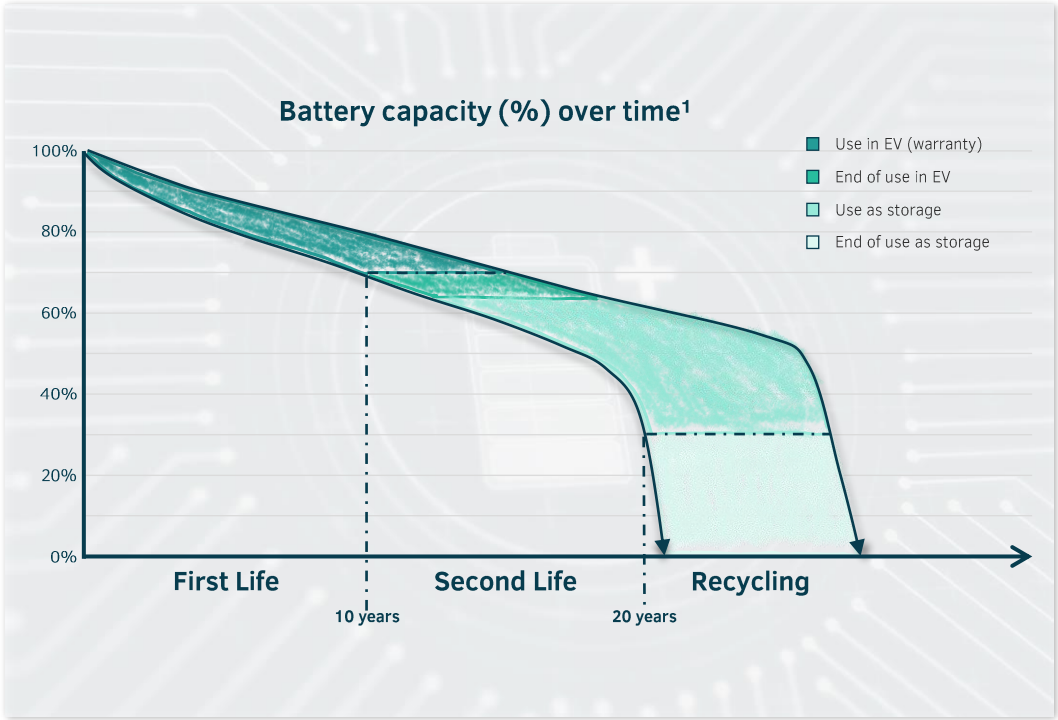
End of 1st battery life

Second Life

- 70-80% remaining capacity at the end of use in EVs (1,500 - 2,500 charging cycles)
- Use of remaining capacity as stationary energy storage (e.g. private household, charging stations)

Recycling

- Closed Loop Approach: Battery contains raw materials that can be used to manufacture new batteries
- Recycling efficiency can reach over 90%
- Recycling reduces CO^2 emissions by 70% compared to mining and processing newly extracted resources



RECYCLING RELEVANCE

- Increasing raw material demand as globally about 200 million EVs are expected by 2030[2]
- Increasing market for recycling as globally about 4 million EVs are expected to retire in 2030[2]
- Intensifying actions from governments towards battery production ecosystems and circular economy standards[3,4]

With the increasing volume of EVs, battery recycling rapidly gains relevance as an additional step in the battery cell value chain. Tapping into the potential of recycling, OEMs will be able to both reduce their dependency on the supply and price of primary resources as well as drastically reduce their carbon footprint.

1 Elektroauto: So funktioniert das Akku-Recycling | ADAC
2 Global EV Outlook 2022 | IEA
2 Global EV Outlook 2020 | IEA
3 Recycling von Lithium-Ionen-Batterien | Fraunhofer
4 Millions of electric car batteries will retire in the next decade | The Guardian

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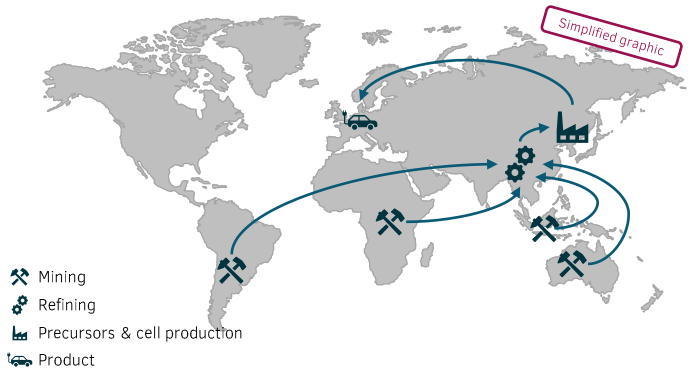
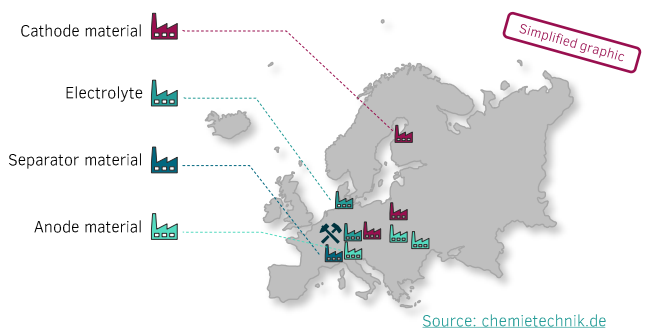
Shifting focus of the value chain towards a European battery ecosystem

Establishing the European Battery Cell Value Chain



Current focus | Asia

The top 10 global battery manufacturers for EVs are from Asia producing approx. 90% of car batteries[1]



Future focus | Europe

Shifting towards Europe reduces dependencies of OEMs on Asian suppliers while also limiting supply chain risks due to long transportation distances

EUROPE'S ADVANTAGE

- Proximity to retailers and end customers enables cost savings from shorter logistics and reduced supply risks
- Localization of the supply chain and its thereby increased transparency allows to meet rising demand for environmentally and ethically produced batteries
- Potential competitive advantage for European batteries by considering environmental, social and governance (ESG) factors
- Strong funding available through the European Union with the aim of building a strong and self-sufficient battery ecosystem

Europe as production location for battery cells is gaining traction due to a favorable combination of an immature market for EV batteries with substantial growth potential and strong political support to set up a domestic production[3]. This provides automotive OEMs with the opportunity to build a tightly linked battery supply chain network enabling them to serve end customers locally as well as to manifest leading standards for sustainably and ethically produced battery cells.

1 CATL Retains Top Position as World's Biggest EV Battery Maker | BNN Bloomberg
2 Batterien „made in Germany" – ein Beitrag zu nachhaltigem Wachstum und klimafreundlicher Mobilität | BMWK
3 European action plan to accelerate growth of battery value chain | Energy Storage News

Europe’s efforts within the Battery Supply Chain are fueled by economic and ecological drivers

Status Quo, Ambitions & Challenges of the European Union

China dominates the EV battery supply chain entirely downstream of mining

Europe closely ranks in second place behind China regarding EV car stock

Ambitions

Gain ground and foster the localization of a significant share of the battery supply chain in Europe

Meet European climate goals by reducing overall carbon footprint of EV production

Challenges

Acquire a sufficient and highly skilled workforce to establish leadership in the market

Secure supply of required material that comply with environmental, social and governance regulations

EUROPEAN BATTERY ALLIANCE (EBA)

EBA was established with the purpose of creating a competitive and sustainable battery cell manufacturing value chain in Europe

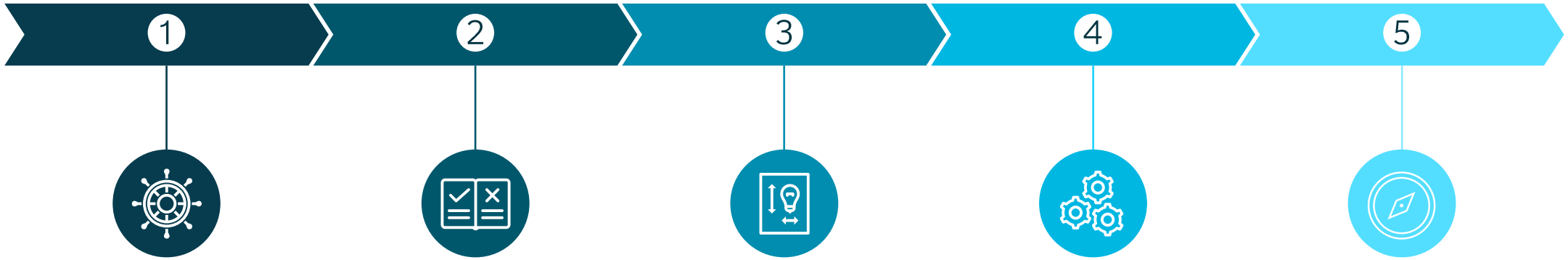
As of today, the EBA resulted in the development of 111 industrial battery projects across EU member states, with some 20 battery cells Gigafactories[1]

The goal is to meet demand for batteries independently for 69% of the demand in 2025 and 89% in 2030 creating a self-sufficient battery industry[1]

European policy makers need to act now to create conditions that will ensure the growth of a competitive battery value chain and value creation potential for European OEMs while also continuing to reduce its overall carbon footprint. Developing world-leading recycling technologies and capabilities to produce sustainable batteries may be at the core of the EU’s competitive advantage aiming towards a circular economy.

1 Q&A: The European Battery Alliance | European Commission

accilium's structured approach ensures a sustainable business transformation for automotive OEMs



PROJECT PHASE	Understand individual requirements in detail	Derive design principles for your organization	Define holistic organizational footprint	Elaborate operational framework	Execute location assessment
KEY DELIVERABLES	› (Strategic) framework parameters & organizational requirements are determined › Corporate functions in scope are identified and prioritized › Initial sizing of to-be organizational structure is conducted	› Influencing factors on global footprint of to-be organization are identified › Organizational design principles are derived and aligned with (strategic) framework parameters	› Activity-/responsibility split between Headquarter (HQ), Center of Excellence (CoE) and Global Business Center (GBS) is defined › Corporate functions are allocated to HQ, CoE and GBS	› Control model for to-be organization is set-up › Ramp-up scenarios are defined › Qualitative and quantitative factors for site assessments are elaborated	› Framework for location assessment is established › Location scenario planning is fulfilled › Suitable locations are short-listed

To encounter the challenges caused by an advancing electrification and to profit from European funding programs re-structuring established organizations and value chains becomes a critical success factor for OEMs. accilium provides a structured approach to guide OEMs towards a state-of-the-art battery cell value chain.

Let’s shape the transformation towards a sustainable European battery cell network!




Why you should act now

The **advancing electrification of powertrains** and thus the increasing value share of battery cells forces established OMEs to **reinvent their global value chain strategies**. In this light especially securing **access to required resources** and **coverage of technical know-how** become crucial factors.

A promising approach to encounter these challenges is **vertical integration of up-stream activities** along the entire battery cell value chain.

What is in for you

Establishing and re-structuring of organizations and value chain networks is a comprehensive venture, which requires a **clear vision and strategy accompanied by a structured execution**. Resulting globally streamlined corporate structures fit OEMs for upcoming challenges and ensure thereby sustainable business success.

OEM’s will benefit especially from an **increased security of supply** due to reduced dependencies from suppliers as well as from built-up **in-house technology excellence**.

accilium serves as a sparring partner and supports clients within business transformation projects through the entire process from strategy to execution.

Contact our automotive value chain experts for more insights

Jakob Mozyszek

Senior Manager
+43 676 7039832
jakob.mozyszek@accilium.com

Simone Plonka

Senior Associate
+49 173 673 6232
simone.plonka@accilium.com

accilium

CONTACT

office@accilium.com
+43 1 934 68 05

accilium.com

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