Deloitte.

The key role of battery costs in Automotive

How new players are disrupting the automotive industry

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Content

Introduction

How accelerated electrification is disrupting the automotive industry

Electrification is transforming the automotive industry, and battery technology is the beating heart

Electric vehicles are transforming the automotive industry

The automotive market is experiencing a transformative shift from the internal combustion engine (ICE) to alternative powertrains, especially electric vehicles (EVs) (see figure 1). We expect BEVs to account for a share of total new car registrations in 2030 of about 70% in Germany, about 30% in the US, and about 55% in China. This transition is based primarily on sustainability, efficacy, and performance, and is a response to the call for green energy and mobility. The EV battery is key to the move. This component essentially comprises the heart of the vehicle and is actually causing disruption throughout the automotive industry. As history has often shown, a disruption of this kind can have existential consequences for established players.

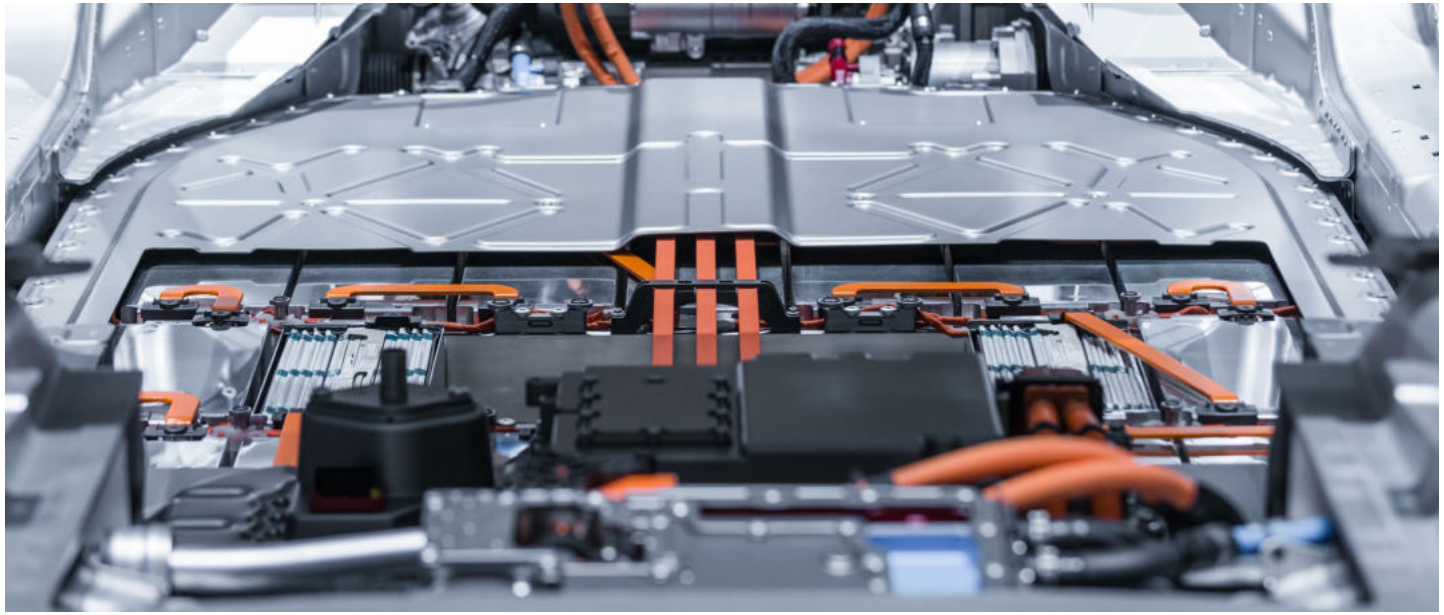
The EV battery – the heart of future vehicles

EV batteries venture far beyond their traditional counterparts in terms of technology and cost. Batteries account for around 40 percent of the vehicle's total cost[1], making them the most expensive component. They present complex challenges such as sourcing and processing of rare raw materials, new and complex production capabilities, and sustainability. Understanding, managing, and innovating in this space is therefore paramount for any significant player in the automotive industry.

New core competencies are needed to stay successful

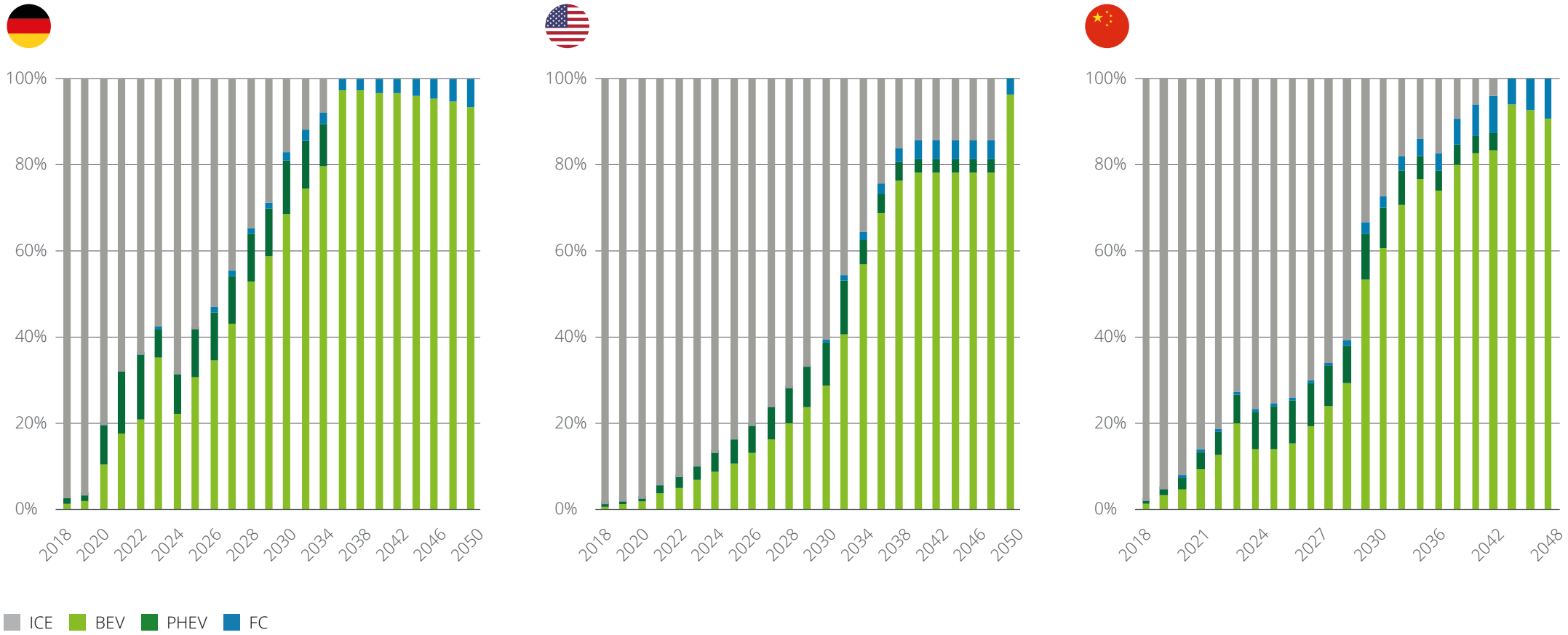
Traditional automakers perfected the way of developing and manufacturing internal combustion engines over a period of 100 years. This created an environment which was dominated by large established automakers.

Mastering the complex and resource-intensive development and production of ICE drivetrains was a difficult hurdle to overcome for new competitors for a long time. The transformation towards electric drivetrains is disrupting this historically grown ecosystem. Battery production, especially for EVs, presents a new landscape along with new challenges. It goes beyond merely a 'production' challenge – it's costly, highly scientific, and requires totally different, energy-intensive processes. To be successful it requires unique skills and a supply chain infrastructure that most traditional vehicle manufacturers are not equipped to handle – at least until recently.



[1] S&P Global Mobility Supply Chain & Technology (SCT) proprietary research, 2023

Fig. 1 – EV Ramp-up Forecast in German, US and Chinese Markets | Based on Deloitte EV Forecasting Model | As of March 2023



Source: Automotive pathway to net zero

Mastering cost-efficient battery production will be the key competency of the future | It will decide on success or failure

New players are leveraging their battery competencies

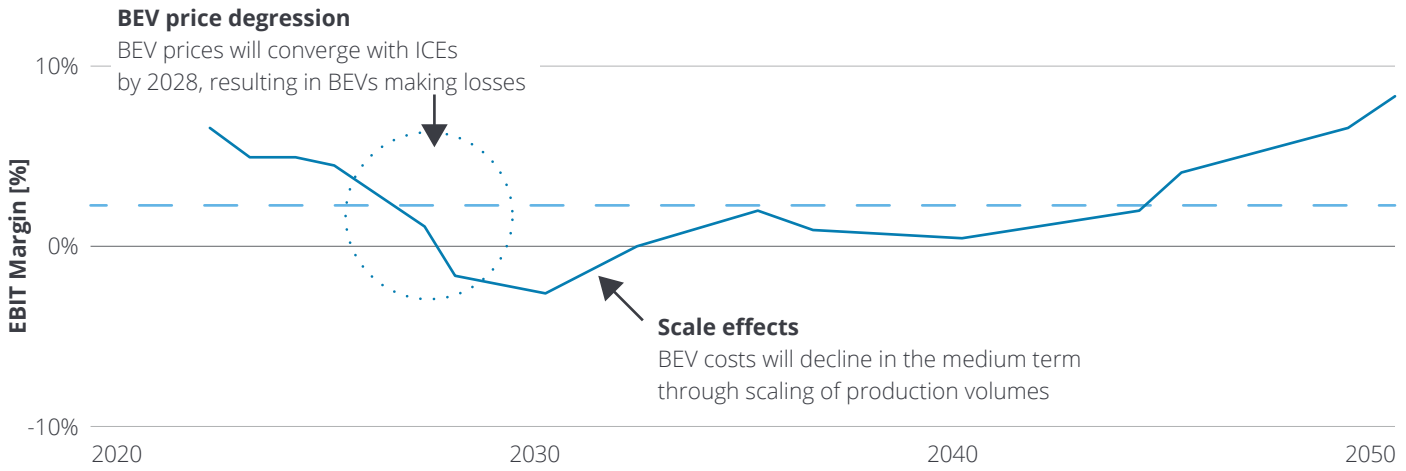
Most traditional players are currently struggling to meet the cost challenge of developing and manufacturing EVs in parallel to ICEs. Due to high investments and the current low profitability of EVs, most OEMs are facing sharply declining margins in the short term (see figure 2). They are just starting to get involved in the field of battery production (see figure 3) – and so far there are not enough production facilities in Europe to provide the industry with the cost-efficient batteries it needs. Meanwhile more and more new players purely focused on EVs are entering the automotive market.

The elimination of the ICE as a technological hurdle, combined with changing customer requirements has opened up the market, especially in Asia, to these new competitors.

Most of the new OEMs have a track record in the battery industry, focus entirely on EVs for the volume segments, and do not need to use legacy technology. Mastering battery technology as a core competency, operating in a highly mature battery industry at scale, and supported by clear government strategies and subsidies, these players are currently able to offer EVs with significantly higher cost efficiency than the existing players.

In so doing, new players have already gained notable market share in EVs in relevant Asian markets. Having successfully established themselves in their domestic markets, they are now looking to expand into other markets such as Europe and the US.

Fig. 2 – Profitability development of a model OEM shifting the product portfolio to EVs



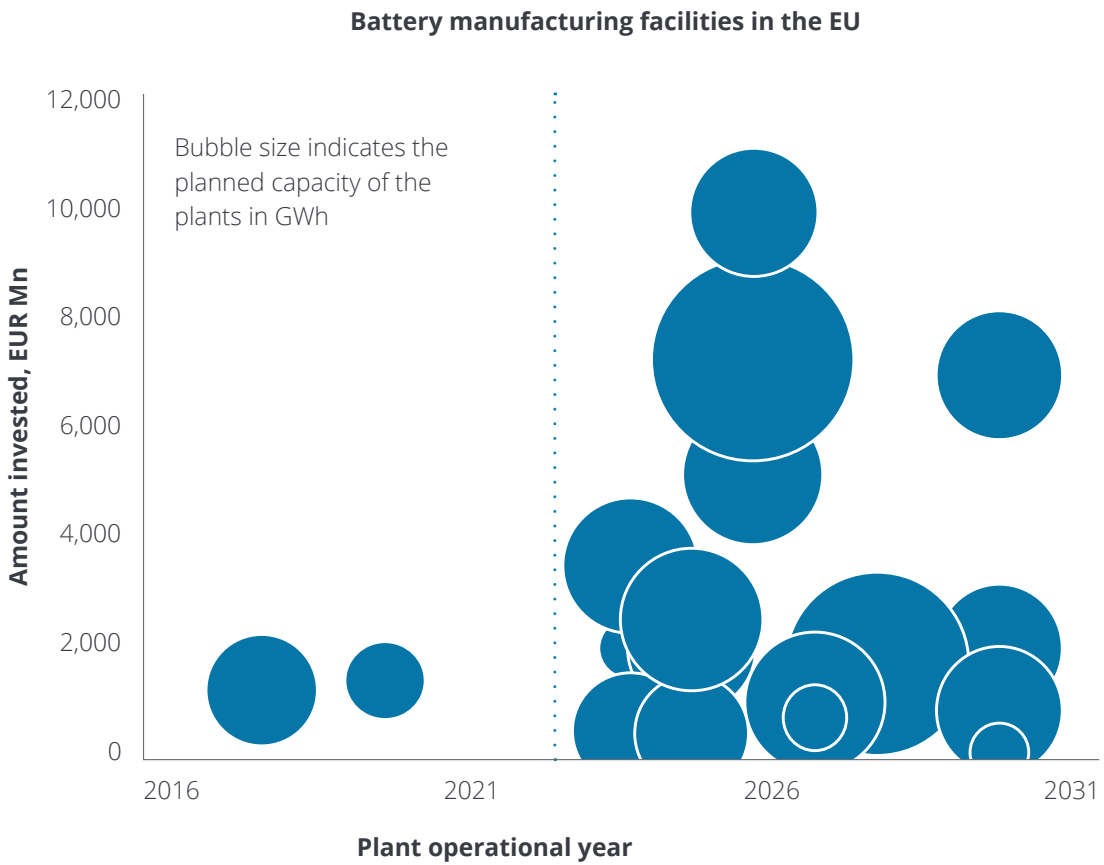
Source: Deloitte Pathway to net zero model

Mastering cost-efficient battery production will be the key competency of the future | It will decide on success or failure

EV transformation in Europe will unlikely meet governmental goals

The transformation towards EVs is still sluggish in Europe compared to China. A Deloitte forecast on the EV ramp-up in Germany indicates that the government targets of 15 million EVs in operation in 2030 will not be met. Taking recent market and price data into account, Deloitte forecasts about 11.7 million EVs in operation by 2030. The situation is similar or worse for most other European markets. In addition, the EBIT margin is likely to suffer due to the transformation (see figure 2), but will return to its original level and more over time. In fact, OEMs might face up to five years of negative EBIT if they are not properly equipped to tackle the twofold mission of decarbonization and profit generation.*

Fig. 3 – European Investment in battery production facilities



Source: Reuters

*) Automotive Pathway to net-zero | Deloitte Germany

Traditional car manufacturers are struggling to meet the demand for affordable EVs in the volume segments | Opportunities for new players to jump in

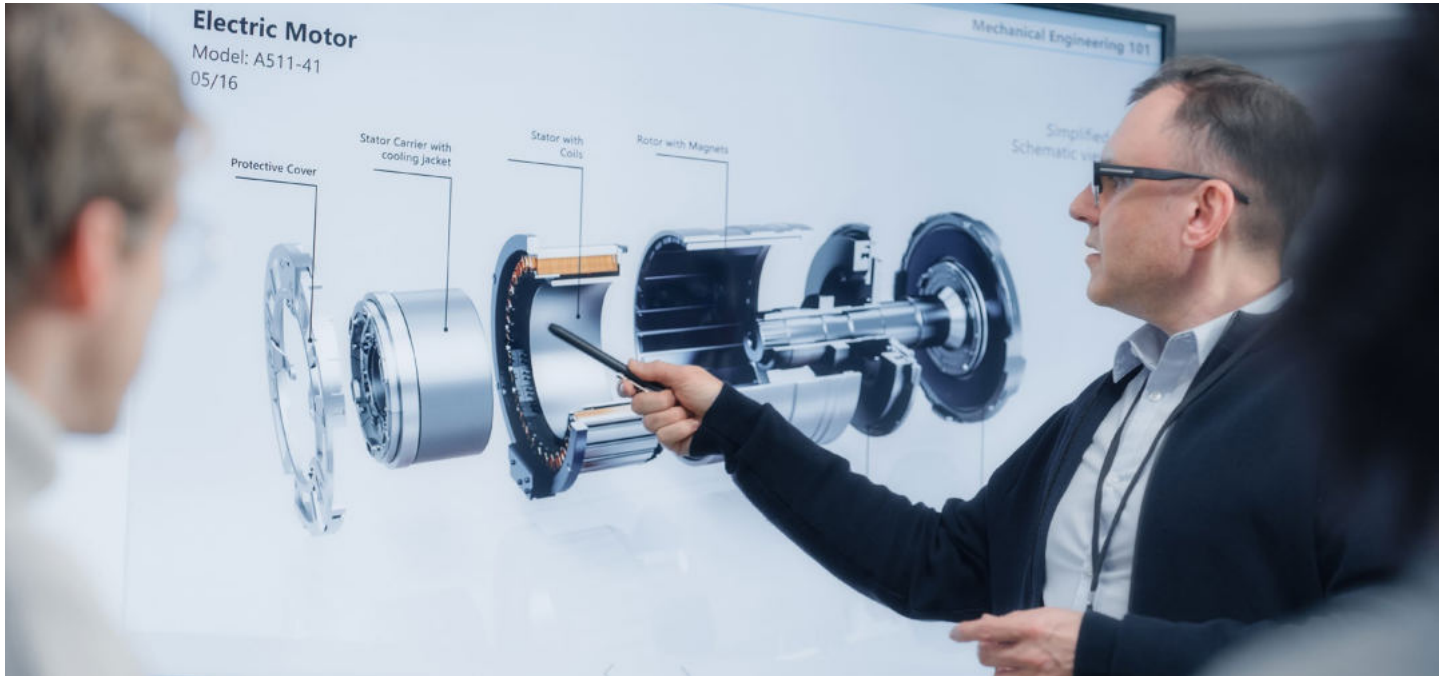
Traditional OEMs are struggling to adapt and scale the new battery technology

The large required investments in new technologies and the recent dependency on battery suppliers are resulting in higher vehicle sales prices compared to equivalent ICEs. Therefore most OEMs are focusing their recent EV portfolios on premium vehicles, where the negative impact of high battery costs is comparatively lower. Taking the current battery costs and planned ramp-up into account, we assume that cost parity between ICEs and EVs will be reached in 2028 to 2030 (compare figure 2).

Our TCO-based sales forecasting model shows that, especially in the volume-intense B and C segments, a rapid reduction in specific battery costs is necessary in order to accelerate the EV ramp-up in the coming years.

Demand for affordable EVs - new players to jump in

As they are currently unable to sufficiently meet the market demand for affordable EVs in the lower segments, traditional automakers are opening the door for their new counterparts from the East. Driven by lower battery and thus also sales prices, we assume that these players will also be able to capture a relevant market share of Evs, especially in the volume segments in Europe.



02

Deep Dive

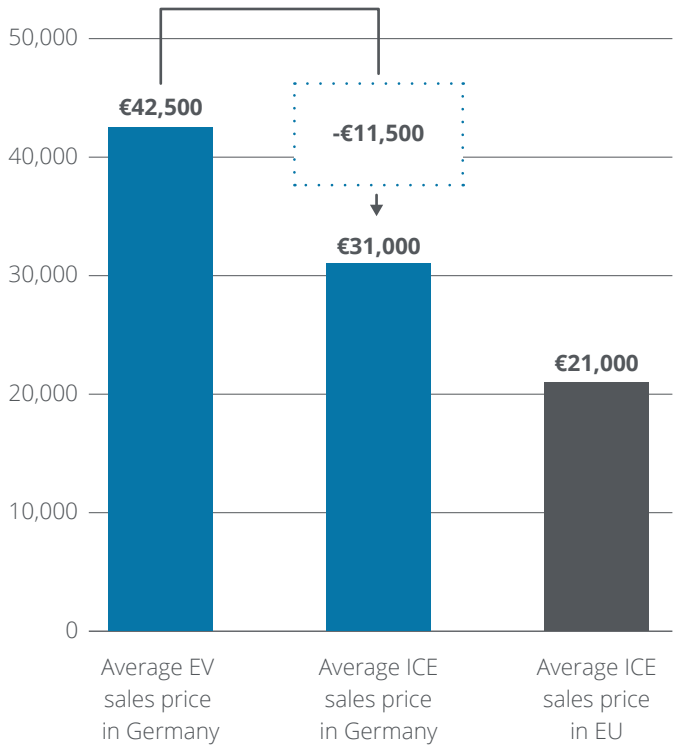
Simulation of battery price impact on EV sales in Germany

German EV sales still driven by high-price premium models

The average price of EVs sold is still significantly higher in Germany than the average price of ICEs sold. Cheap EV models in the lower vehicle segments are still barely available – slowing down the EV ramp-up in the market

Fig. 4 – Price comparison ICE BEV

Average prices of sold vehicles in 2022 ICE vs. BEV



Newly registered EVs were still €11,500 more expensive on average in 2022 than the average ICEs sold.

Currently, BEV sales in Germany primarily serve the upper vehicle segments (C, D and E). Compared to their ICE counterparts, EVs are still sold for notably higher prices, especially in the middle class. As a result, EVs are currently being purchased primarily by a small group of consumers (early adopters) who are less price-sensitive and more willing to pay extra costs.

To accelerate EV sales – in order to reach the target of 15 million EVs on Germany's roads in 2030 – it is necessary to attract the mass of price-conscious customers in the high-volume B and C vehicle segments to the EV market.

To achieve this, it is necessary to close the price gap of €11,500* by increasing the supply of electric vehicles in the smaller segments.

Forecast

Based on the development in the Chinese vehicle market we predict new integrated OEMs will be able to close this gap in Germany in the short term:

1. The Chinese market already has lower-priced vehicles in the segment that is still missing here.
2. New integrated OEMs have more price leeway/ advantage due to their lead in battery technology (see following analysis).
3. They are just about to place their first models in the volume segment in Europe.
4. We predict that new integrated OEMs will then increasingly take market share from traditional OEMs.

Source: Deloitte calculation of top vehicle sales based on ADAC and S&P Global Mobility data.

*) based on the average price EVs and ICEs were sold for in 2022

Deloitte assumptions | Battery cost advantages for highly integrated OEMs

Deloitte predicts significant battery cost advantages for highly integrated OEMs compared to traditional players. The cost advantages are due to scaled and settled processes, a stable raw material supply and internalized profits along the value chain.

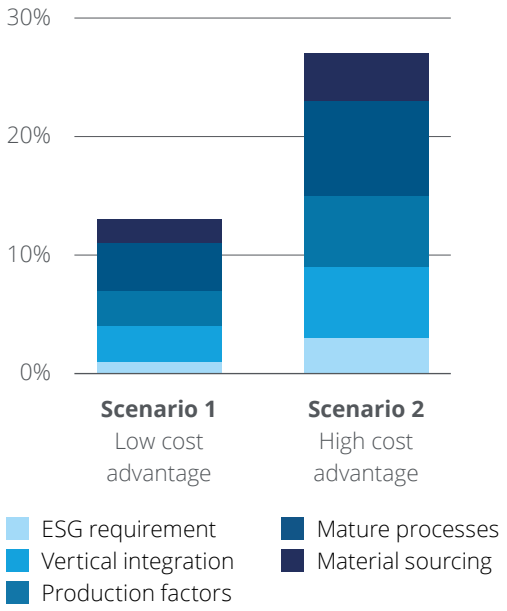
Legacy OEMs
- Raw materials procured at spot prices on global market
- Processing done in Europe
- Cell production and pack assembly in Europe
- Ramp-up with non-settled processes

vs.

New vertically integrated OEMs
- Fully vertically integrated, control over entire value chain
- Processing of raw materials in China
- Cell production and pack assembly in China
- Mature processes and high process efficiency

Battery cost advantage and development

Fig. 5 – Deloitte assumption on cost advantage leverage for vertically integrated OEMs



Source: Deloitte research based on expert interviews

Base scenario | No cost advantage
Battery price forecast for legacy OEMs

Equiv. €1,000 for standard* EV battery

Scenario 1 | Lower cost advantage
13% cost advantage for vertically integrated OEMs in 2023
In 2023 integrated manufacturers have a 13% cost advantage along the battery value chain; European OEMs can close the gap to 9% by 2030 and to 5% by 2040

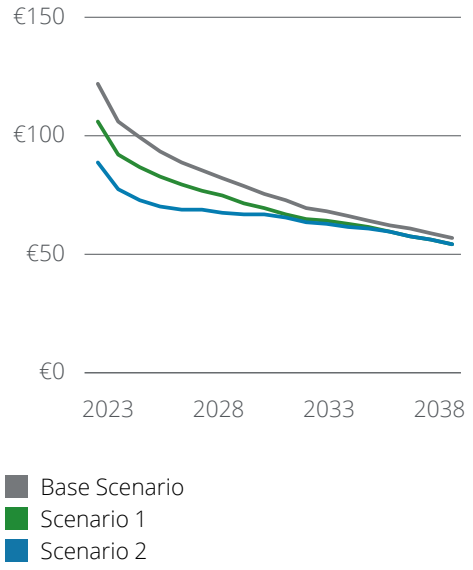
Equiv. €2,000 for standard* EV battery

Scenario 2 | Higher cost advantage
27% cost advantage for vertically integrated OEMs in 2023
In 2023 integrated manufacturers have a 27% cost advantage along the battery value chain; European OEMs can close the gap to 15% by 2030 and to 5% by 2040

In both scenarios European OEMs are able to close the cost gap down to 5% by scaling production and increasing process efficiency beyond China's recent industry benchmark.

* Standard Battery: 60 kWh

Fig. 6 – Battery cost development (in €/kWh)



Source: Deloitte forecast

EV market ramp-up in Germany | The self-defined climate targets will not be achieved

Based on our recent assumption, we will not reach our target of 15 million BEVs on the roads by 2030.
We can accelerate the EV ramp-up with more cost-efficient battery technology.

Fig. 7 – Cumulative market share of German BEV Fleet in 2030 by manufacturer origin (base scenario)

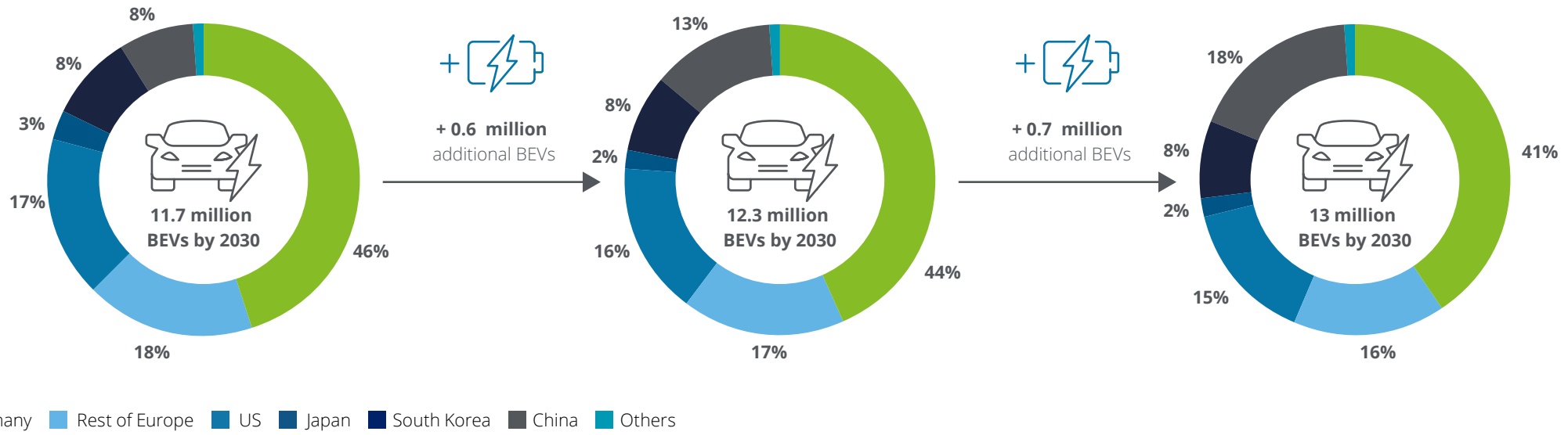
Base forecast
Based on recent market assumptions and the European battery price development forecast.

Fig. 8 – Cumulative market share of German BEV Fleet in 2030 by manufacturer origin (Scenario 1)

Scenario 1 | Low cost advantage
Based on the assumption of an equivalent to €1,000 cost advantage for a standard EV battery from a fully integrated OEM.

Fig. 9 – Cumulative market share of German BEV Fleet in 2030 by manufacturer origin (Scenario 2)

Scenario 2 | High cost advantage
Based on the assumption of an equivalent to €2,000 cost advantage for a standard EV battery from a fully integrated OEM.



Note throughout: Sum of the values in selected charts may not add to 100% due to rounding
Source: Deloitte forecast

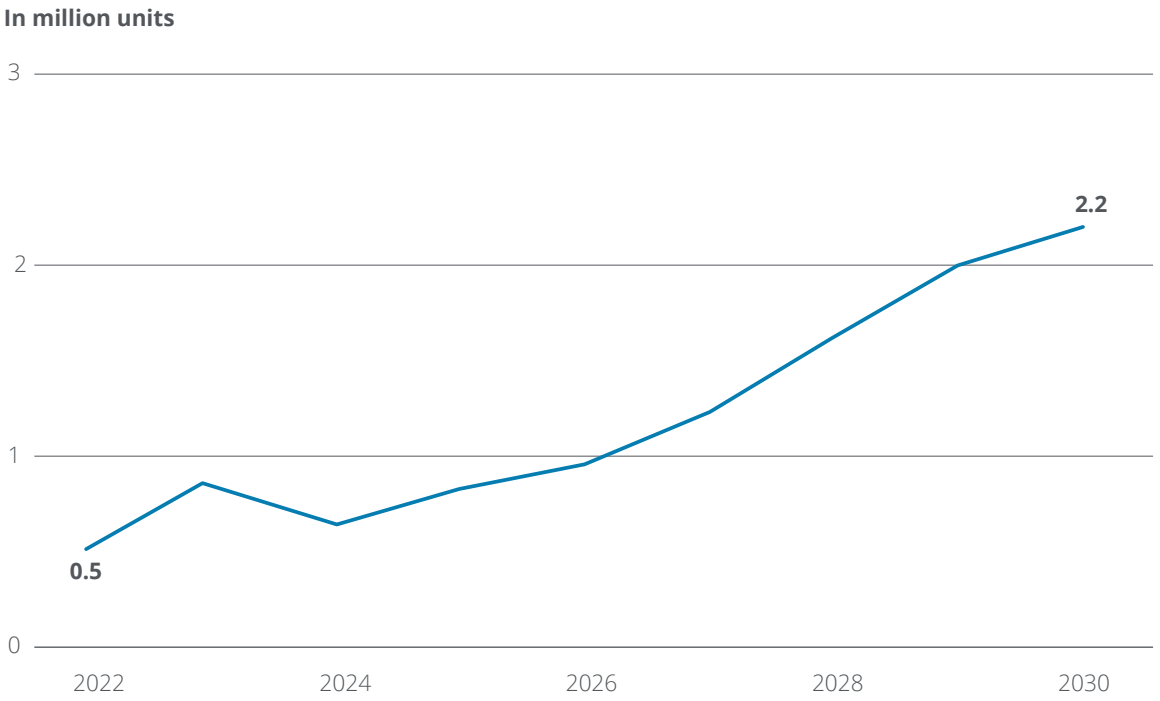
Different scenarios for the EV ramp-up in Germany show that the climate goals set by the government will most likely not be achieved. The simulated higher cost advantages result in higher EV sales, as they make electric vehicles more attractive to consumers. But as we assume the additional sales generated will be mainly attributable to new, fully integrated carmakers entering the European markets, Germany may need to rely on the imports from other regions in order to get closer to the defined climate and electrification targets. As shown above, especially Asian players may be able to increase their market shares until the end of the decade if they are able to maintain these cost advantages.

More Information

EV market ramp-up in Germany | Legacy OEMs losing their market share

European OEMs are losing their market share in the fast-growing EV market. This will be further exacerbated if the battery cost gap to the new fully integrated OEMs cannot be closed.

Fig. 10 – BEV sales in Germany



Source: Deloitte e-mobility forecasting model

Battery price advantages lead to higher EV sales, but not from legacy OEMs
While German car manufacturers were able to claim 47 Percent of the BEV market in 2022, we forecast a decline in their market share until 2030 due to increased competition from new entrants. Even though, there are significant investments being observed today in Germany, already integrated OEMs from other regions will enjoy an advantage in the next years.

As we expect the BEV market to grow significantly (see figure 10), German manufacturers would need to significantly increase their market shares in the BEV segment to retain their current position in the overall market. In 2022 they accounted for 62 percent of all passenger cars sold in the country.

In contrast, we forecast an opposite development and expect integrated OEMS from USA and Asia to grow their shares in the German BEV market - even without any battery cost advantages. Assuming the benefit is passed on to end customers and legacy OEMs cannot close this gap in the short term, almost one in five BEVs sold could come from integrated Chinese OEMs by 2030.

Conclusions from our Deep Dive

Traditional car manufacturers are struggling to meet the demand for affordable EVs in the volume segments | Opportunities for new players to jump in

An estimate based on our TCO-driven sales forecast predicts that applying a battery cost advantage of €1,000* in 2022 and passing this on to the end customer will lead to approximately 0.6 million additional EVs being sold in Germany by 2030. If the battery-driven cost advantage assumed is even higher (about €2,000*), a total of 13 million EVs (1.3 million more than the base forecast) are expected to be in operation on German roads by 2030.

Traditional OEMs will not be able to close the cost gap with new competitors in the short term. New integrated manufacturers are currently in a position to address the demand for affordable EVs, which is crucial to achieving government climate targets in the short term. However, it's equally important for legacy OEMs to stay competitive and seamlessly integrate battery technology into their core strategies.

The ability to develop and manufacture cost-optimized battery cells and modules will determine future competitiveness in a fundamentally changing automotive industry. And this is an impending threat not only in Europe, but even more so in the important Asian markets where the new OEMs have already taken over the leading role.

How to stay relevant in a disrupted industry

Between 2022 and 2030 the global demand for light passenger vehicle batteries is expected to increase from around 500 GWh to several thousands. We have recently observed that traditional automotive players are showing a growing interest and getting more involved in the battery value chain (see figure 3). This underlines the critical need – especially for traditional automakers – to invest, adapt, and pivot towards EV battery manufacturing – an investment that's not just about staying relevant, but that increasingly looks like a survival imperative.

But what steps can traditional automotive companies take to reinvent themselves and compete with the growing number of new integrated OEMs? In the following chapter, we will focus on the economics of battery manufacturing across regions, the rationale behind the dominance of integrated new players, and potential courses of action that will mean make or break for today's traditional automotive companies when it comes to EV batteries – 3 brief responses to 3 fundamental questions.

* For details see slides 10–12

Question 1

What are the main cost drivers for the batteries of today and tomorrow?

Raw materials and energy consumption improvement are the main cost drivers of EV batteries today

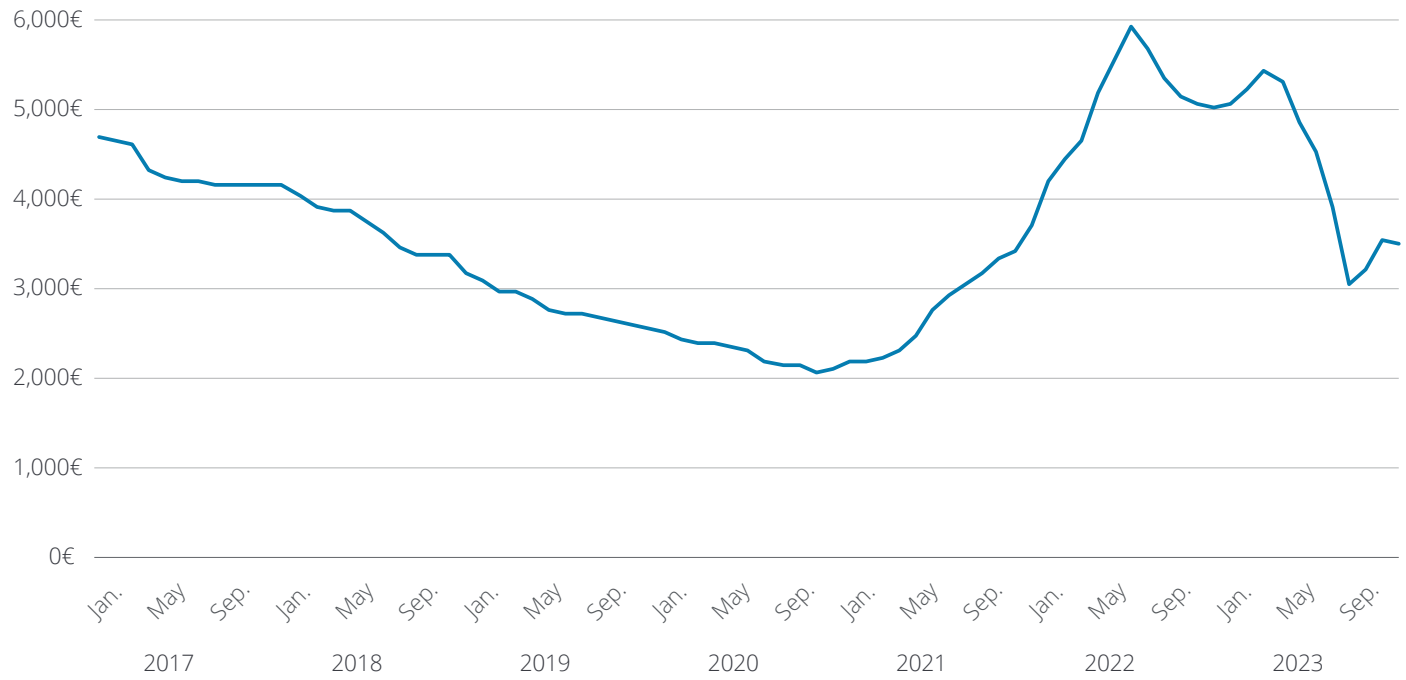
The cost of electric vehicle (EV) batteries is influenced by several key factors, each playing a significant role in shaping overall expenses. Understanding these drivers helps shed light on the challenges faced by manufacturers in making EVs more affordable and accessible to a wider market.

Raw materials

Among the most crucial factors affecting battery costs are the price and availability of raw materials, as EVs use six times the amount of rare minerals that conventional cars use. The volatility of raw material prices, particularly for lithium, which is a vital component of EV batteries, is a major factor in determining the overall battery costs (see figure 11).

Fluctuations in raw material costs, coupled with sourcing challenges, such as the case of cobalt from the Democratic Republic of Congo, bring financial and ESG challenges that directly impact battery manufacturing costs.

Fig. 11 – Development of raw material costs or a 60kWh LFP battery



Source: Morgan Stanley Research

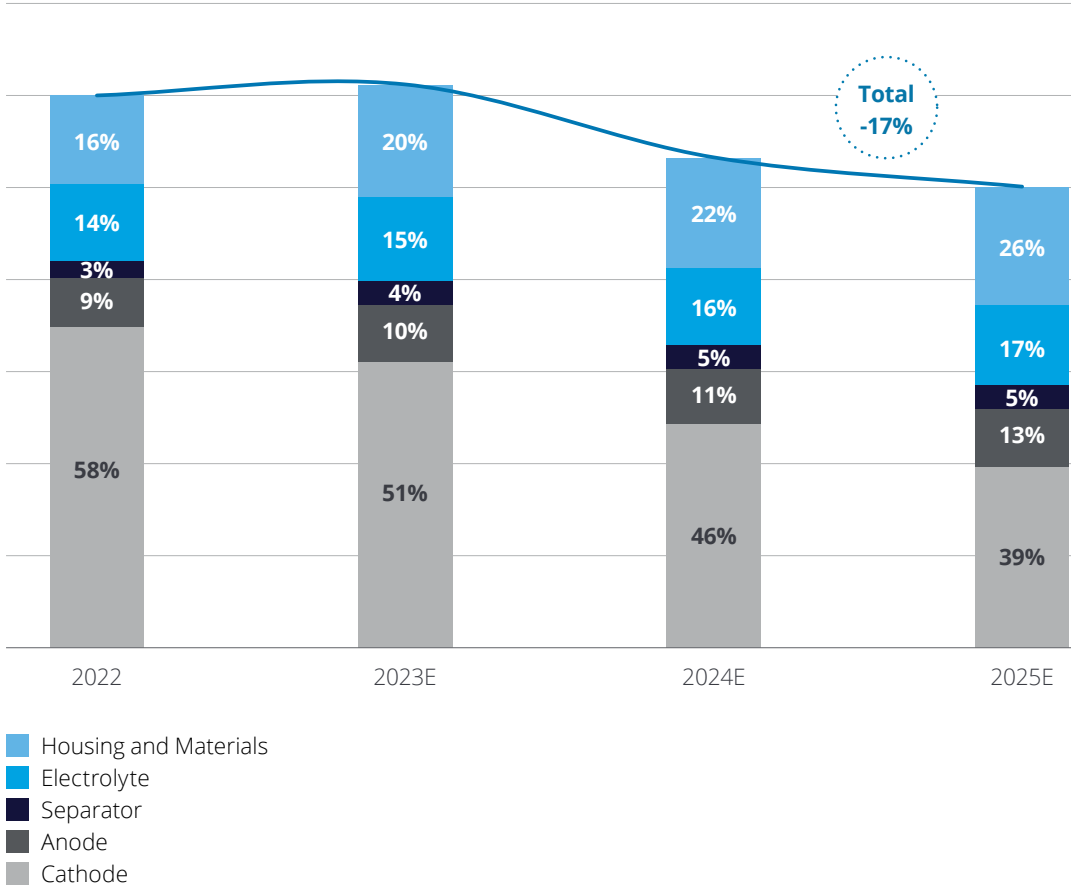
R&D and innovation

R&D activities are a significant driver of battery costs. Investing in innovative technologies, new materials, and improved manufacturing processes increases the overall cost of batteries. But likewise, new and more efficient chemistries can allow for better use of raw materials and a higher energy density, which drive demand up and have a positive effect on acceptance among consumers. The improvements can particularly reduce the costs for cathode production, which accounts for the largest share of material costs (see figure 12).

ESG requirements increase costs in the EU

The EU has committed to the targets it has set itself. The requirements for sustainability and the environmental compatibility of production mean that European batteries are "greener". However, these requirements mean that new integrated competitors have cost advantages. The requirements for product safety, waste management, recycling quotas and the like increase the hurdles for manufacturers in the EU.

Fig. 12 – Breaking down the cost of EV battery cell materials



Source: LFP, Source Analyst report from Everbright Securities

03 | Question 1 | What are the main cost drivers for the batteries of today and tomorrow?

Manufacturing process

One of the primary factors contributing to the energy intensity of EV battery production is the manufacturing process itself. Production involves several stages, including processing raw materials like lithium, cobalt, and nickel, which requires significant amounts of energy. Additionally, the subsequent steps of refining, cell production, and assembly entail energy-intensive operations such as chemical reactions, electrode coating, and cell formation. One third of the energy is used as process heat, the rest is electrical energy.

Production waste and recycling

Substantial amounts of production waste are generated, especially during the start-up of new production facilities, but also when production conditions change. Due to the complexity and the large number of production steps, this rejection rate increases. Even with a high efficiency rate of 99% for every production step, this results in up to 14% waste. Defective intermediate products have to be identified, which requires great effort and costs for quality control. An appropriately designed recycling structure is needed in order to keep the valuable materials in the material cycle and to comply with regulatory requirements. It is imperative that establishment of this structure be taken into account when investing in new production sites.

Public-private collaboration

Government policies, regulations, and incentives significantly influence battery costs. Subsidies, tax credits, and supportive regulations can help offset the initial cost and promote market growth, which has been the case for China and its strongly established industry. As many processes require very high scrap rates at the beginning, manufacturers can benefit greatly from the support of the authorities. But the level of market demand for EVs and competition among battery manufacturers also affect pricing. Higher demand and intense competition can drive costs down through innovation and efficiency improvements. And this ultimately affects the scale of operations and the cost advantages that come with it.

Question 2

How did players outside of Europe develop their advantage?

Long term strategic decisions, incentives and high demand have enabled a battery industry to operate at scale.

Who are the dominant players in the battery industry?

Chinese, Korean and Japanese players have become dominant figures in EV battery manufacturing and represent more than 90% of the global market (see figure 13). This position of advantage stems from a variety of factors, starting with an adaptation of lithium-ion batteries in the consumer electronics industries decades ago and accelerated by the fast-tracked widespread adoption of EVs.

These players have developed extensive know-how, built a significant network of production facilities, and pushed the development of modern technologies, and now find themselves in a highly demanding market at scale. Furthermore, they have not only succeeded in the manufacturing of batteries and battery cells, but have also positioned themselves as an integral part of the value chain.

Early investments and clear vision

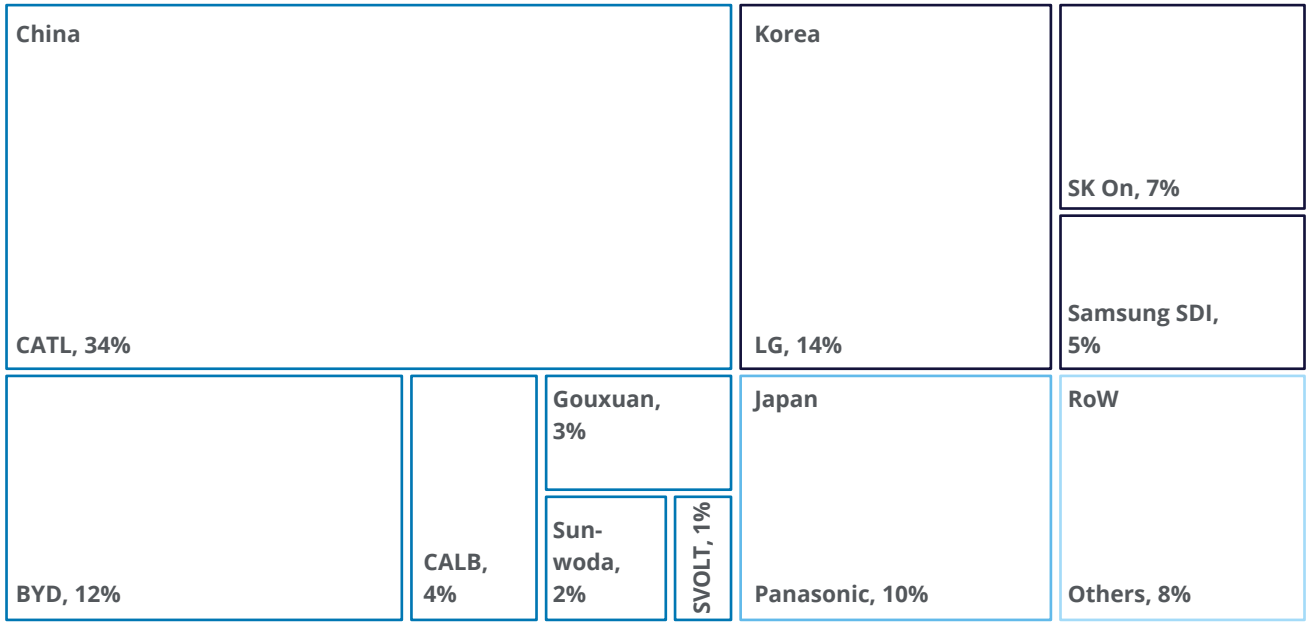
New integrated players made this reality by starting to invest heavily in securing raw materials, building capabilities and massive capacity in cell manufacturing a long time ago – way before European players realized the full potential behind EVs and their ability to disrupt the automotive industry.

The role of government strategy and regulations

The entire development of the EV industry and indirectly also battery production is based on a clear government vision - to dismantle the existing dominance of the traditional, ICE-focused automotive industry and the regulatory framework and subsidies based on it.

While battery production itself is not the direct focus of government subsidies, EV production is systematically pushed by government policies. Combined with incentives for the purchase of electric vehicles, it has created high demand – enabling an economy at scale along the battery value chain.

Fig. 13 – Battery manufacturing capacity by company and region



Source: Bloomberg

04 | Question 2 | How did players outside of Europe develop their advantage?

Production at scale

Owing to decades-long investment to set up an entire EV battery manufacturing value chain and continuous improvement of its efficiency, New integrated players are now in a position to meet the growing demand for batteries and have achieved the needed scales to do so in a profitable manner.

Setting up manufacturing lines for batteries requires an extensive ramp-up period and high scrap rates at the beginning. New integrated players are already in a steady state of production with stable, high-quality outcomes, supporting a significant cost advantage compared to those starting to build the first gigafactories.

Value chain integration

While EV batteries use six times the amount of rare minerals that conventional cars use, the access to these raw materials and the ability to create battery-grade ingredients through cost efficient processing are key factors for establishing a competitive battery industry.

Supported by a long-term government strategy, new integrated players in particular have integrated themselves strategically along the entire upstream and downstream value chain.

A high degree of vertical integration and leading technology for raw material processing enable significant cost advantages

Control of raw materials

While most needed rare minerals apart from graphite and (some) lithium are not mined locally in China, private and public new integrated players have secured access to these important raw materials through huge investments and acquisitions of mines around the globe. This has resulted in China's leading position when it comes to control over raw material deposits of the important battery components cobalt, nickel, lithium and graphite.

Today China already controls more than 40% of the available supply of cobalt – and given their huge investments in Indonesia, new integrated players will be the leading supplier of nickel from 2027 onwards.

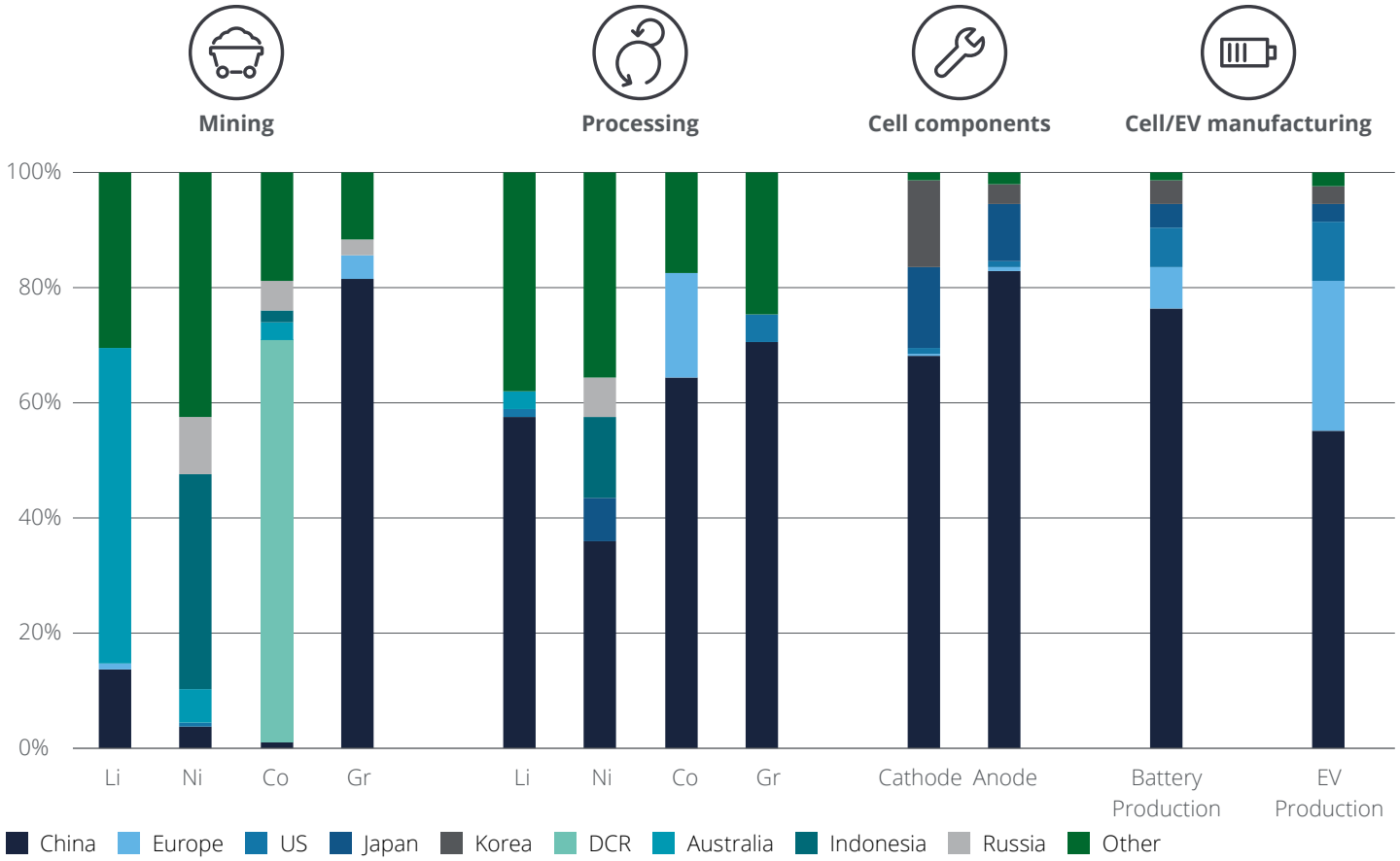
Leading processor of battery-grade minerals

In addition to controlling large shares of the upstream activities of required raw materials, New integrated players have leveraged their position as leading downstream processors for battery-grade minerals. Regarding the most required raw materials for EV batteries, China, in particular, accounts for more than 50% of processing capacity worldwide.

The processing of raw materials to create battery-grade supplies requires complex technical and process expertise, which is fundamentally different from the processes in the traditional automotive industry. This expertise and much of the associated intellectual property is currently found among New integradted Players.

Another key reason why New technology leading companies are leading the way in processing battery intermediates is the high energy requirements for the processes. Due to government subsidies for cheap energy combined with way less strict environmental regulations on emissions, sustainability and waste processing, these players are currently able to process raw materials at scale for lower costs than any other region in the world.

Fig. 14 – Geographical distribution of value-add along the battery value chain



Source: IEA – Global Electric Vehicle Outlook 2022

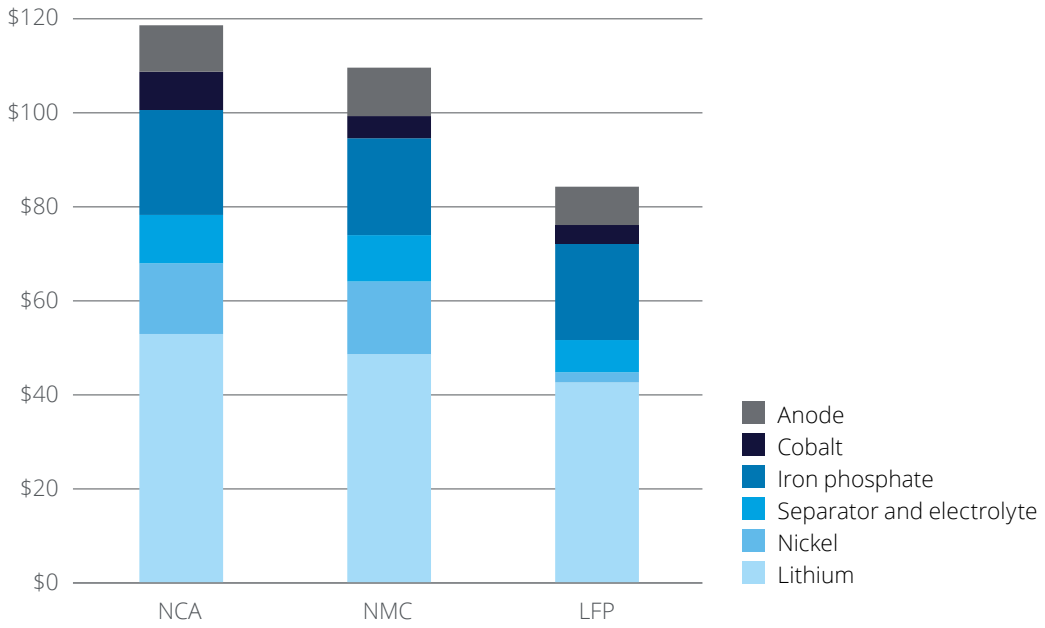
Accumulating various benefits along the value chain results in a notable cost advantage for EVs from integrated OEMs.

Battery technology

EV batteries with different cell chemistries vary in terms of performance and application. At the same time, the various cell types have differing raw material requirements and specific costs per kWh (see figure 15).

Traditional European, American and Asian OEMs and battery cell manufacturers are mainly focusing on "more powerful" NMC cells with a higher specific energy density. This was long considered a key factor for high ranges, which are a critical requirement of European customers. But these cells also bear higher specific costs than LFP battery cells.

Fig. 15 – Raw material costs for different cell chemistries



Source: BofA, Bloomberg

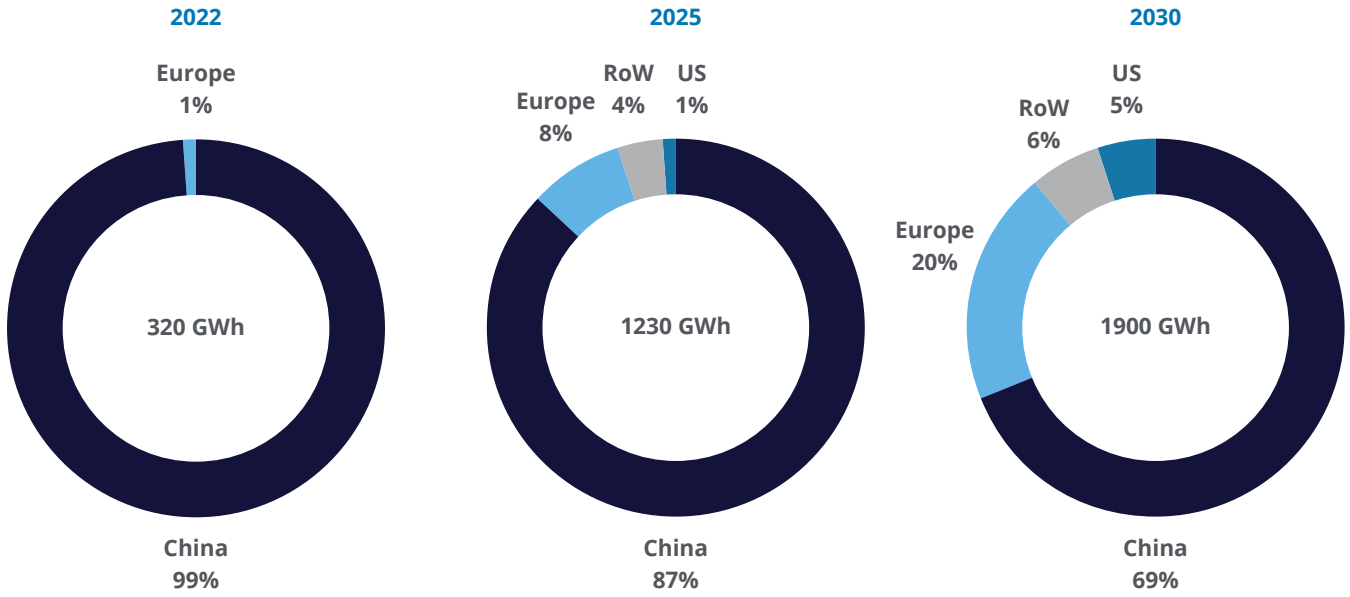
New OEMs focus on LFP cells for the volume market

While LFP cells offer a lower energy density, they are superior to their counterparts in terms of handling and safety. Due to their chemical composition, they are very robust and stable and pose fewer risks from overcharging and overheating.

The production of LFP cells has historically grown in China. A decade ago, electric public transport was mainly responsible for most of the demand for EV batteries. From the beginning, China relied almost exclusively on LFP technology in this area. LFP production has matured and scaled over the last decade, providing integrated OEMs with robust and cost-efficient battery cells for the volume market.

Today more and more OEMs, especially in Europe and the US, are following this blueprint of using LFP battery cells for their vehicles in the volume market. They are even more dependent on new leading suppliers to provide this battery technology (see figure 16).

Fig. 16 – Production capacity of LFP batteries in 2023, 2025 and 2030



Source: Frauenhofer ISI

04 | Question 2 | How did players outside of Europe develop their advantage?

China is currently dominating all major steps along the battery value chain and is fueling the EV industry with efficient battery cell production at scale.
But it is still difficult to quantify the cost advantage that new OEMs have in terms of battery technology. Cost structure, purchasing prices and internal billing costs are among the best-kept secrets in the automotive industry.

The investigations carried out and the findings from various expert interviews support our hypothesis that there is currently a noticeable cost advantage that highly integrated players can count on.

We assume the cost advantage of a comparable battery pack along the entire battery value chain adds up to 13–27%.
This advantage is due to lower raw material procurement prices, high efficiency in the processing of materials, government subsidies and, in particular, the elimination of margins at several points along the value chain. Beneficial production factors like cheap energy and skilled labor and the use of more favorable cell chemistries further support the competitive advantage of the new OEMs.

05

Question 3

How can traditional players close the gap?

Closing the gap: Enhancing traditional automotive competitiveness in the evolving EV landscape

In the pursuit of climate targets, the European automotive market faces a pressing need to escalate EV production, aligned with the EU green deal regulation, to secure a substantial market share. This is even more urgent given the emergence of new market entrants with cost-efficient battery technology. This imperative calls for strategic action across key realms:

Advancing cell and production technology

Cell and production technology have witnessed significant evolution and continue to progress. Dry coating techniques offer benefits such as heightened energy density and reduced production costs, which are pivotal for optimizing battery performance. Novel cell chemistries such as sodium-ion batteries have the potential to penetrate specific segments by year-end, yielding substantial cost reductions. Solid-state batteries hold great promise in terms of safety and energy density, and investing in their development may provide a competitive edge. Implementing cell-to-pack integration streamlines the manufacturing process, by reducing complexity and increasing overall efficiency.

Even established battery manufacturers have to invest great effort in researching the latest technologies. The market is very much on the move. This creates a great opportunity for the traditional manufacturers, who could succeed in becoming pioneers in a new technology.

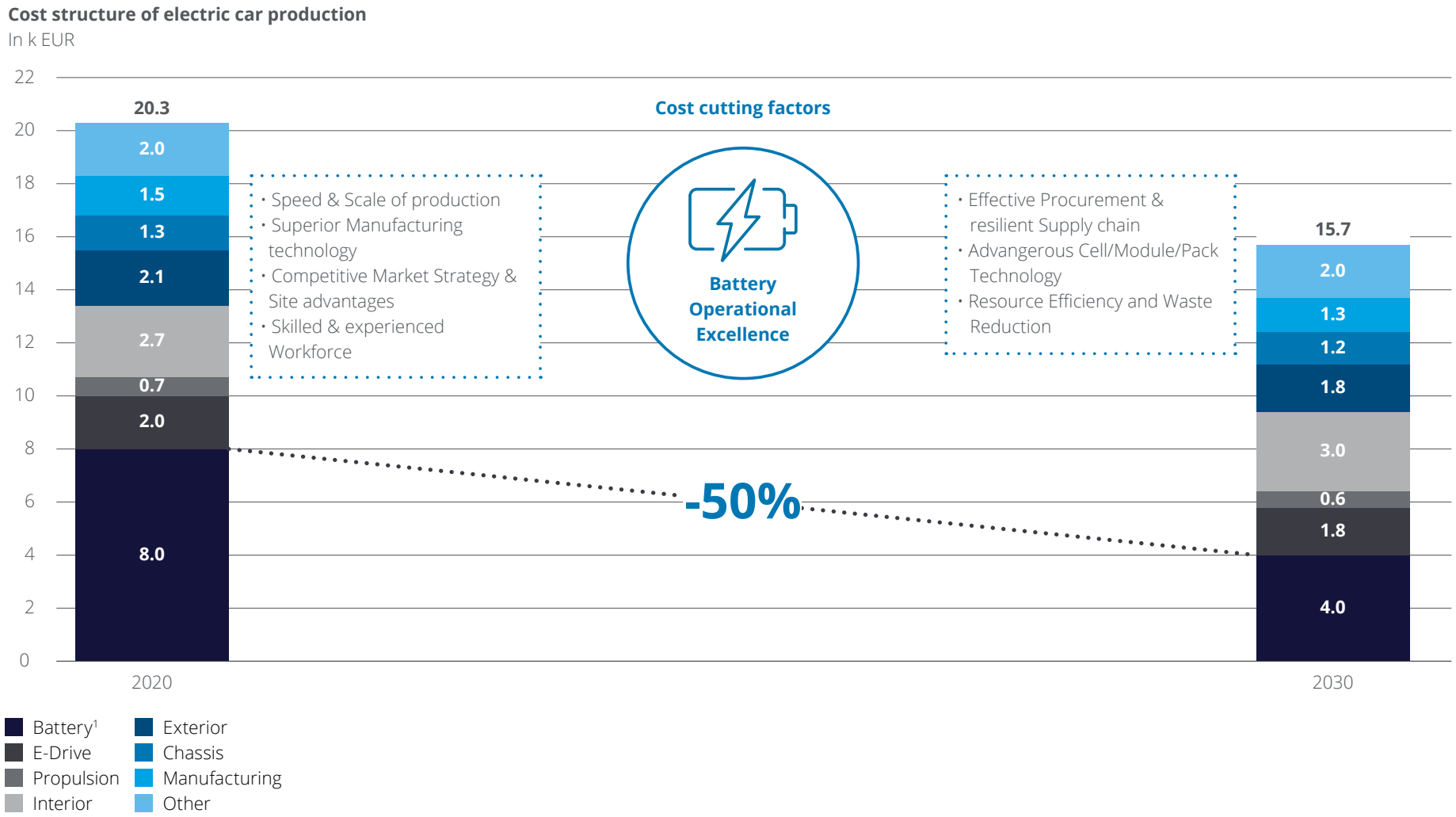
Navigating challenges and seizing opportunities

Analyzing the EV cost structure underscores the pivotal role of the battery, which constitutes around 40% of total costs. Despite projected cost reductions of 50% by 2030, the battery's significance as a hardware-related cost component remains. This future progression reveals both the challenges and the opportunities for automotive players. It accentuates the need for reliable and exclusive access to economical cell technology to mitigate high battery costs while affirming the open race to successful EV manufacturing. Embracing the relevant capabilities and cost-reduction strategies is paramount for securing prominent market positions.

Strategies for success: Innovation, collaboration, and regulation

Traditional players must strategically orchestrate multifaceted success strategies. Cultivating a conducive regulatory environment for domestic manufacturing, fostering investment in new technologies, and diversifying raw material processing levels the competitive landscape. Strategic partnerships, rather than solitary expertise development, prove advantageous, leveraging the intricate dynamics of the battery domain. These alliances fortify traditional manufacture's competitive stance in the EV sector.

Fig. 17 – Development of cost structures of EV production



[1] For a battery with 50 kWh, comparable to an average combustion engine

Source: König, Adrian; et al. (2021)

Strategic innovation: Navigating Chinese expertise and pioneering battery evolution

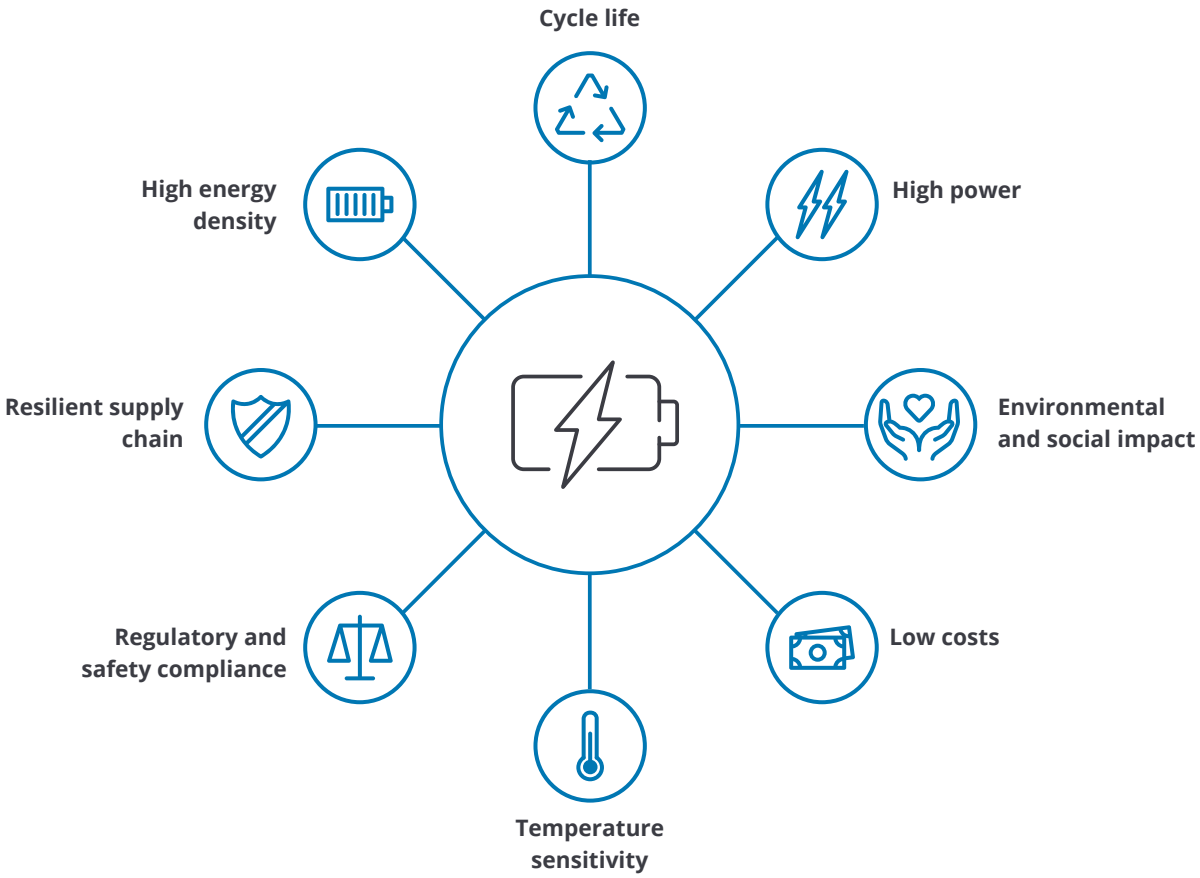
In the realm of existing technologies, the pragmatic approach may involve leveraging the expertise of alreday integrated counterparts. Given the strides they have made in certain technological domains, attempting to replicate their achievements from scratch could potentially result in misallocated investments. Instead, a strategic course of action could entail acquiring current technologies while dedicating considerable resources to research for the development of novel battery technologies and production methods. This two-pronged strategy aims to narrow the gap, in order to gradually catch up, and eventually, in an ideal scenario, vault ahead in the dynamic landscape of battery innovation.

Innovation and leading-edge technologies

Traditional players must adopt a multifaceted approach in navigating the evolving battery cell landscape and dynamic EV market. Striking a balance between energy density, power, safety, supply chain resilience, and cost is imperative. In addition, factors like cycle life, environmental impact, charging speed, temperature sensitivity, size, and weight demand consideration. To bridge the gap and compete effectively, Europe's battery industry must emphasize speed, scale, and innovation. This involves developing cutting-edge technologies, embracing adaptable operating models, and fostering a regulatory landscape that incentivizes domestic manufacturing. Collaborative partnerships leverage specialized skills, elevating Europe's capacity to master cost-cutting dynamics and achieve operational excellence in battery manufacturing.

We need to speed up our investments and have a clear plan in mind; companies and policymakers must act quickly and decisively. Our greatest opportunity to close the gap is to be at the forefront of new generations of battery technologies from the very beginning and then to produce more efficiently than the competitors.

Fig. 18 – Dimensions impacting battery technology



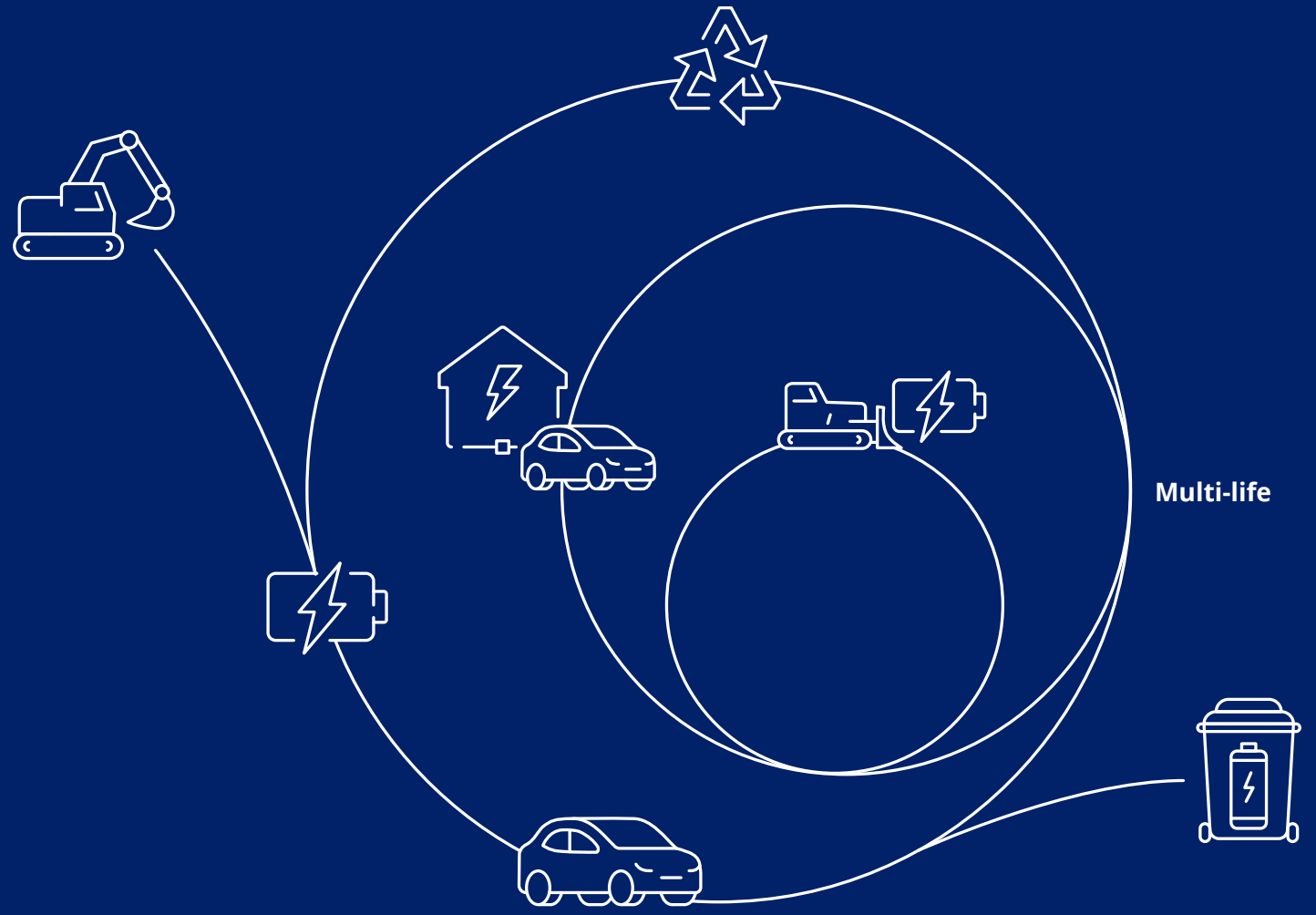
Source: Deloitte Research

Multi-life approach

The useful life of a battery in a BEV often ends as soon as the capacity of the battery, which decreases over the lifetime, has fallen below a certain level and is therefore unsuitable for use in a BEV. However, the battery is not defective at this point and can be used for the same purpose of storing energy in a different environment. This significantly extends its useful life and reduces the environmental impact. In addition, a multi-life design can reduce the cost of repurposing to such an extent that the additional revenue exceeds it. Due to the additional revenues along the lifecycle, the battery can be offered to the customer at a lower price in its first life.

The multi-life approach is just one example of how new business models can create opportunities to innovate beyond the production and supply chain to strengthen the competitiveness of legacy players. It is important to think outside the box, because linear thinking does not lead to a positive result.

Fig. 19 – Multi-Life approach cycleSource: Deloitte Research



Source: Deloitte Research

06

Conclusion and outlook

Six key takeaways for automotive players

Embracing a “too little too late” approach will not suffice in competing with the rising new integrated players.

In an increasingly competitive global landscape, the traditional automotive industry faces significant challenges as new integrated companies have taken a lead in technological advancements and market presence. If the traditional OEMs want to reduce their dependence on battery suppliers and at the same time ensure competitive prices for EVs, they must multiply their investments and efforts in battery technology today.

01

New and lasting players
The automotive industry has changed significantly with the emergence of new and lasting players. Traditional OEMs must take action to retain market share and stay competitive.

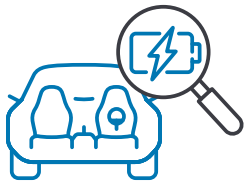
02

We must rely on trailblazers
In order to accelerate the EV ramp-up and fulfill ambitious climate targets, we are dependent on affordable EVs in the short term.

03

Immediate and decisive action
Immediate and decisive action is needed to catch up with integrated technology leading companies. Fast scaling of local battery production is imperative for survival.

04



Leveraging production efficiency
Transfer the knowledge and experience from car manufacturing to the battery industry to gain superior production efficiency.

05

Collaboration and partnerships
Collaboration and strategic partnerships along the supply chain are necessary in order to catch up as quickly as possible.

06

Government commitment
Clear government commitment and strategic subsidies are necessary to get through the transformation phase.

Management recommendation
Traditional manufacturers need to build on their experience and capabilities. Only if manufacturers manage to scale up quickly and transfer knowledge and experience in efficient production from other areas to battery manufacture will they have a chance to catch up with existing players and survive in the market consolidation phase.

However, this is only possible if manufacturers, politicians and as many players as possible along the supply chain act together and are prepared to make advanced investments for a long time. It must be clear to those involved that long-term strategic decisions and investments are important, because short-term profits do not lead to sustainable success.

07

Appendix

Report Design and Sources

The holistic view of battery production and its impacts on the automotive industry is fueled by global client work, expert interviews and forecasts from Deloitte proprietary EV simulation models

Methodology

We employed various research methodologies to conduct a comprehensive analysis in a very complex and dynamic environment. In addition to the insights from our global client work, the approach involved gathering primary data through expert interviews and further secondary research. We applied our proprietary EV forecasting model to ensure a robust and data-based understanding of the global EV market and to evaluate the impacts of battery cost developments. Our report reflects information and results as of July 2023.

07 | Appendix

Primary research

We conducted several expert interviews on a global scale, including China, Australia and Germany, allowing us to capture insights along the whole value chain of battery production. By engaging with professionals, industry experts, and relevant stakeholders, we obtained firsthand information that formed the foundation of our analysis.

Secondary research

We conducted extensive secondary research to complement our findings. This involved engaging teams in India, Germany, and China to analyze existing data, reports, studies, and relevant industry publications. By synthesizing information from a wide range of sources, we were able to validate and enhance our primary research findings and provide a more comprehensive analysis of the market.

EV sales forecasting model

Deloitte has developed a proprietary model based on total cost of ownership (TCO) to forecast the future distribution of vehicle sales across different drivetrain types. By feeding our model with relevant cost indications gathered during the research, we were able to simulate the impact of battery price developments on global sales.

Deloitte professional network

Based on the experiences of our colleagues worldwide working daily on countless projects in the automotive industry, the raw materials industry and the public sector, we have validated our assumptions and incorporated their views on the dynamics of the battery industry into our report.

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Audit & Assurance	Consulting	Financial Advisory	Risk Advisory	Tax & Legal
2,013	4,924	707	1,476	1,518

Study Team and Contacts

Harald Proff
Partner
Global Automotive Sector Lead
Tel: +49 211 87723184
hproff@deloitte.de

Nicolas Zauner
Senior Researcher
Automotive Sector Research
Tel: +49 151 14881664
nzauner@deloitte.de

Benedikt Schlueter
Manager
Supply Chain & Network Operations
Tel: +49 151 58075467
bschlueter@deloitte.de

Rolf Kunzler
Manager
Technology Transformation
Tel: +49 151 19175841
rkunzler@deloitte.de

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