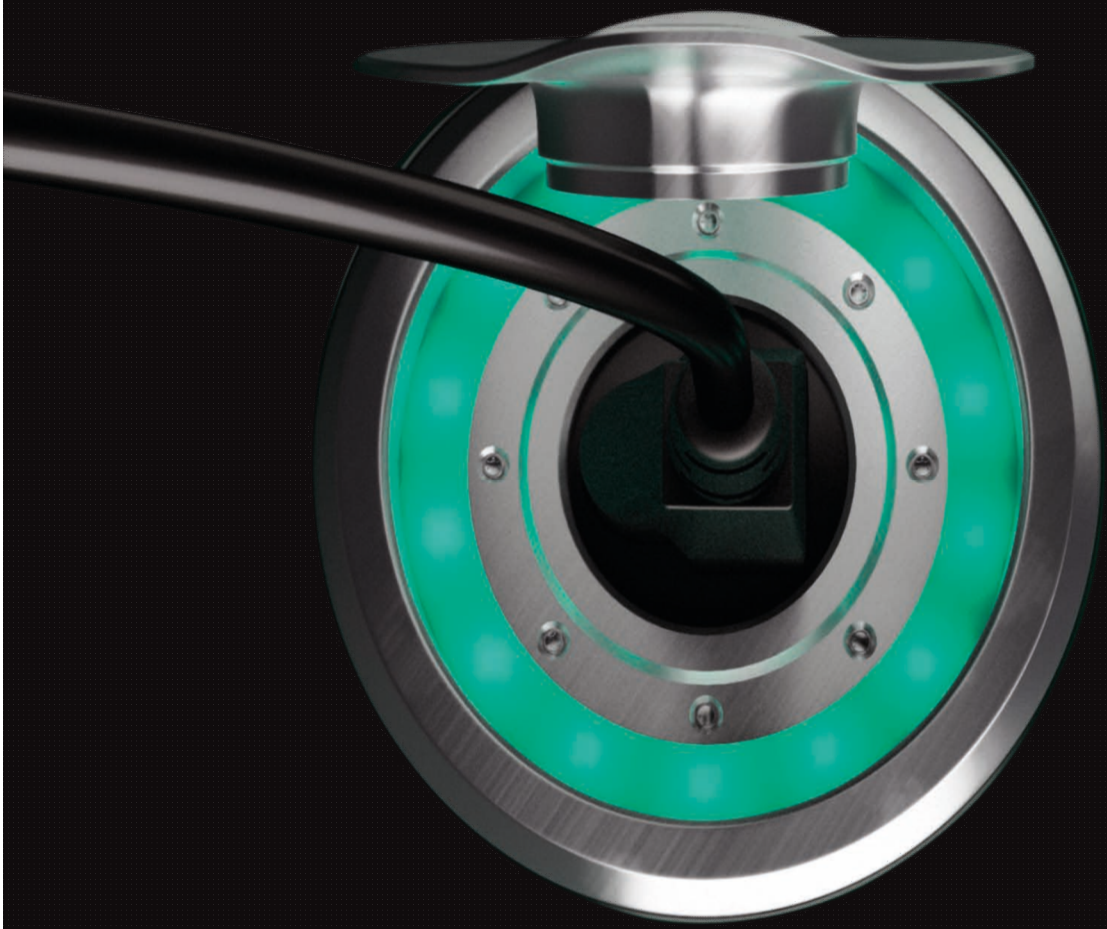
Deloitte.



New market. New entrants. New challenges.

Battery Electric Vehicles

Contents

Foreword

I am pleased to share with you this report on the growth of the electric vehicle market and the strategies required to succeed therein.

The last two years have seen a sea change in attitudes towards EVs. While 2017 was a landmark year for EVs, as global sales surpassed one million units for the first time, it is quite possible that in 2018 more than two million units were sold.

In response to the growing demand for EVs, automotive original equipment manufacturers are pursuing electric strategies with varying degrees of success. With competition fierce among themselves, the incumbent OEMs now face growing competition from lesser known Chinese OEMs and a staggering number of new entrants, including a mixture of startups, established tech companies and even brands from other industries.

It is our belief that as competition in the EV market grows, an 'expectation gap' is emerging between manufacturer capacity projections and demand from customers. With a substantial increase in the level of EV production expected over the next decade, the number of potential manufacturers appears genuinely unsustainable. If, as expected, supply significantly outstrips demand then something will have to give. Our expectation is that the market will find a way to normalise itself at the expense of the manufacturers.

We have identified five areas that will help determine a company's success: brand, customer experience, production strategy, talent and business model. Companies need to develop a strategy around each of these areas to remain competitive in an industry that is seeing a fundamental shift towards a new competitive landscape.

I hope you find this report insightful and thought-provoking and welcome your comments.

Mike Woodward
North West Europe Automotive Leader

Executive summary

After years of being viewed as a fringe technology, the battery electric vehicle market is finally nearing a tipping point. A number of factors including a positive change in customer perceptions, technological advancements and greater intervention from governments are combining to focus attention on BEV adoption.

Deloitte estimates that the market will reach a tipping point in 2022 – when the cost of ownership of a BEV is on par with its internal combustion engine counterparts. With cost of ownership no longer a barrier to purchase, BEVs will become a realistic, viable option for any new car buyer.

However, our simultaneous analysis of manufacturer capacity forecasts to 2030 suggests that there is a significant 'expectation gap' growing. In fact, the overall industry capacity forecast for 2030 is approximately 14 million units above our projections for consumer demand.

This expectation gap between capacity and demand has serious implications for the industry. To produce the capacity that is forecast, investment in R&D, tooling and talent is happening now. But while many original equipment manufacturers have clear production goals and investment strategies for their EV division, they cannot assume that they will achieve the same level of market share as their ICE business produces. Similarly, new entrants to the automotive market with a history of success in other industries cannot expect their existing approach to business to transfer seamlessly to the world of EVs.

Based on current forecasts, the number of EV manufacturers appears unsustainable. Indeed, it is not inconceivable that some incumbent OEMs will be out of business by 2030 or shortly thereafter. Those that survive may face significant changes to their existing business models, with the prospect of today's powerful OEMs acting as white label suppliers to other brands a real possibility.

Based on conversations with industry executives and the experience of working on multiple EV based projects, Deloitte has identified five areas that will be key to success in the EV market. The five areas that organisations can seek to find a competitive advantage are brand, customer experience, production strategy, talent and business model.

To be successful in the future OEMs will need to invest in and advance their EV business, implementing new business models and partnering with (or acquiring) companies that offer the right capabilities. This requires a focused long-term strategy based on identifying where or how OEMs want to differentiate their offering, and the technological capabilities required.

For startups or new entrants, a similar strategic approach is required. Areas of strength, such as agility, capital flexibility, independence and experience from other industries will be required to compete with incumbent OEMs and outperform other new entrants.

Deloitte estimates that the market will reach a tipping point in 2022 – when the cost of ownership of a BEV is on par with its internal combustion engine counterparts.

Growth of the electric vehicle market

The market for electric vehicles is reaching a tipping point

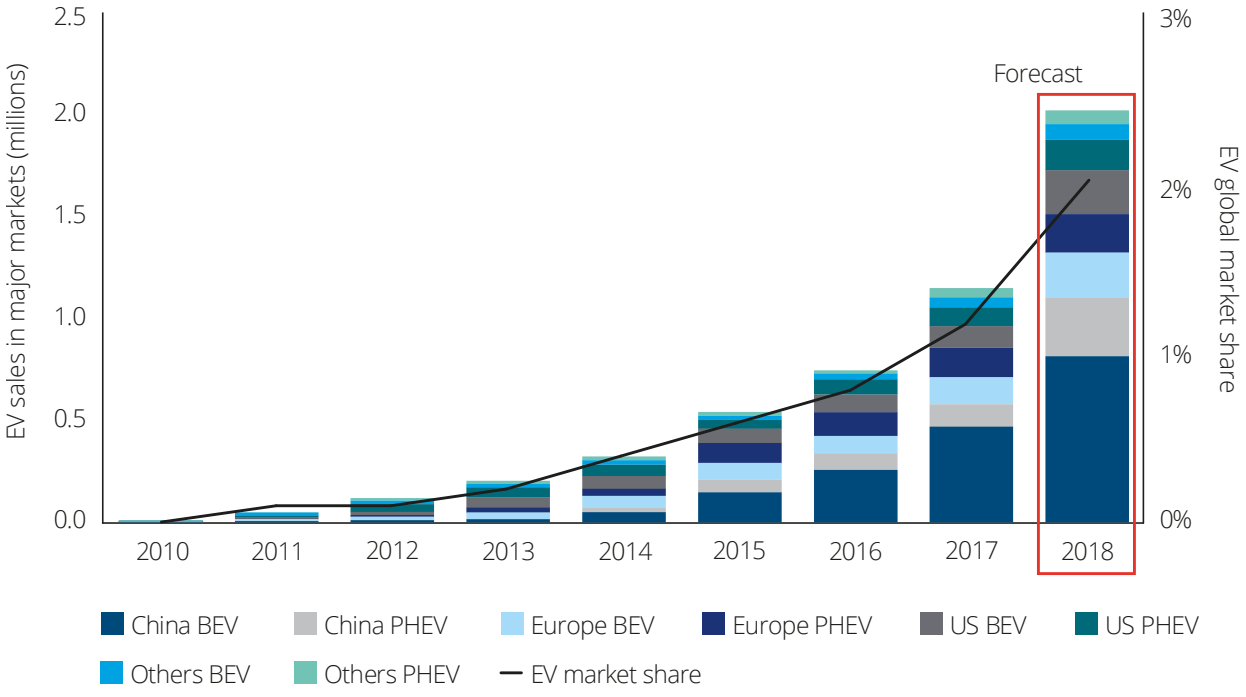
The last two years have been noteworthy ones for the automotive industry. Indeed, 2017 was a landmark year for electric vehicles (EVs) as global sales of battery electric vehicles (BEV) and plug-in hybrid vehicles (PHEV) surpassed one million units for the first time[1]. As a result, the EV market share moved above one per cent of global car sales (see Figure 1), and the EV vehicle parc has more than doubled since 2015, with BEVs accounting for up to two-thirds of global sales.

In the first half of 2018, EV sales reached 783,000 units worldwide, and were on track to pass two million units by the end of the year.

So far, policy and regulation has created an environment that has allowed the EV market to grow. Within this environment, Deloitte anticipate that growing demand from customers, supplemented by continued innovation and investment in technology from original equipment manufacturers (OEMs), will begin to accelerate EV deployment.

We estimate that the market will reach a tipping point in 2022 – when the cost of ownership of a BEV is on par with its internal combustion engine (ICE) counterparts. With cost of ownership no longer acting as a barrier to purchase, EVs will become a viable option for any new car buyer. As a result, their share of the total automotive market will begin to grow rapidly, reaching ten per cent by 2024.

Figure 1. EV annual passenger car and light duty vehicle sales in major regions

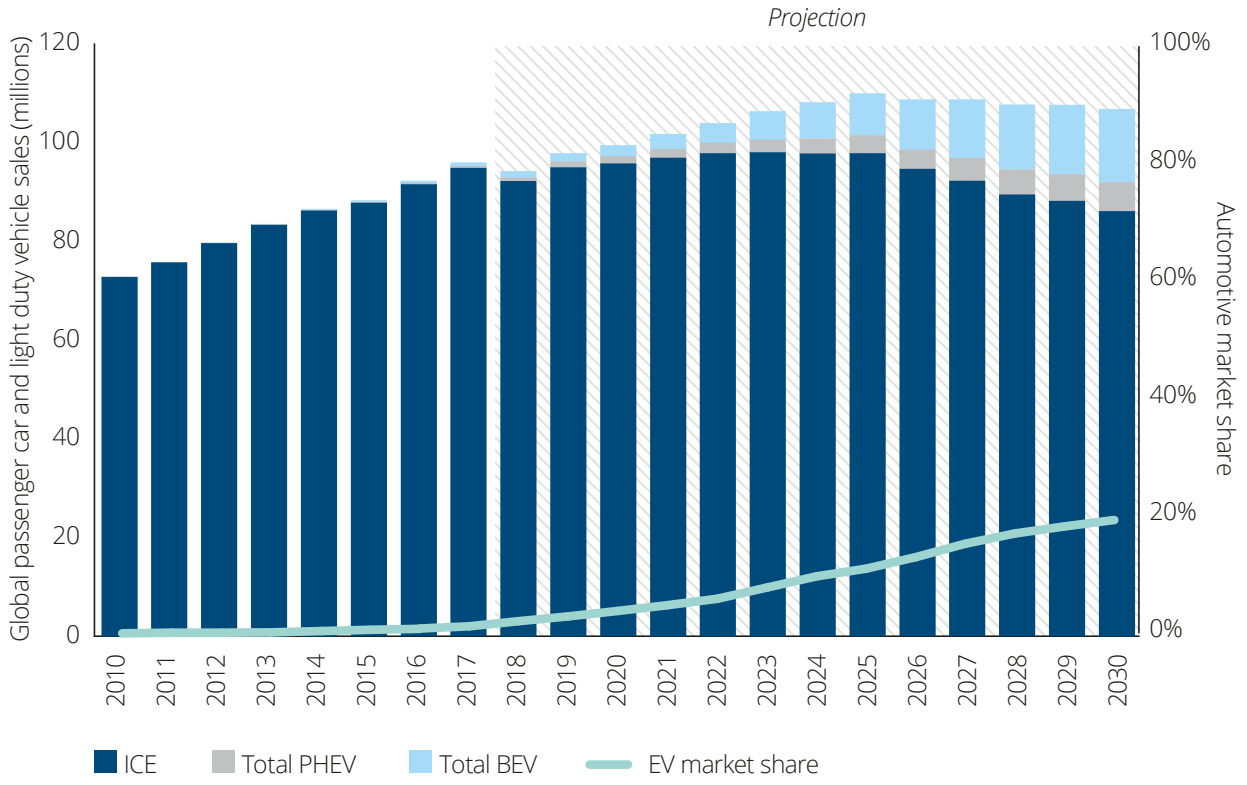


Source: International Energy Agency (IEA), IHS Markit

Sales are expected to continue to grow

Deloitte's latest outlook shows EV sales shifting from 2 million units in 2018, to 4 million in 2020, 12 million in 2025, before rising to 21 million in 2030 as the cost of manufacturing batteries falls significantly. BEVs are already starting to outperform PHEV sales globally, and it is expected that this trend will accelerate over time. BEVs are likely to account for about 70 per cent of total EVs in 2030. As EV sales grow, the penetration of ICE vehicles will start to decline with sales beginning to fall from 2024 onwards (see Figure 2).

Figure 2. Outlook for annual global passenger car and light duty vehicle sales



Source: IEA, IHS, Deloitte analysis

Two major factors driving the change

We see change in the EV market as being driven by two factors: policy and regulation, and customer demand.

Factor one – policy and regulation

Fuel economy and emissions targets, financial incentives and city access restrictions are the major policies and regulations helping to create an environment that encourages the growth of EV adoption.

Fuel economy and emissions standards

All major markets have fuel economy and emissions regulations in place[2]. To meet these mandated targets, the EV market will have to grow significantly. For example, for the EU fleet average CO_2 emission targets to be met, the PHEV and BEV market share will need to reach a combined 10 per cent by 2025 and 22 per cent in 2030, with BEVs accounting for more than half of it.

Approximately 20 major cities worldwide have announced plans to ban gasoline and diesel cars by 2030 or sooner.

Financial incentives

Financial incentives, including government subsidies, value-added tax (VAT) and vehicle registration tax exemptions, are the main policy mechanisms used to make EVs more appealing to both private and business customers[3]. These mechanisms have made EVs more affordable at a time when manufacturers struggle to compete on price.

City access restrictions

Approximately 20 major cities worldwide have announced plans to ban gasoline and diesel cars by 2030 or sooner[4]. In Europe, Paris intends to ban all gasoline and diesel vehicles from the city centre by 2030, and Copenhagen plans to ban diesel cars from 2019[5]. Central London and town centres across the UK will see zero emission zones (ZEZs) introduced from 2025, while Oxford has proposed banning all non-electric vehicles from its centre from 2020[6]. In Asia, Beijing has long had in place a number of road space rationing initiatives, including a number plate lottery that restricts the number of new cars registered. Beijing's number plate lottery now favours EVs, with over 60 per cent of number plates expected to be allocated to new EVs in 2019[7].

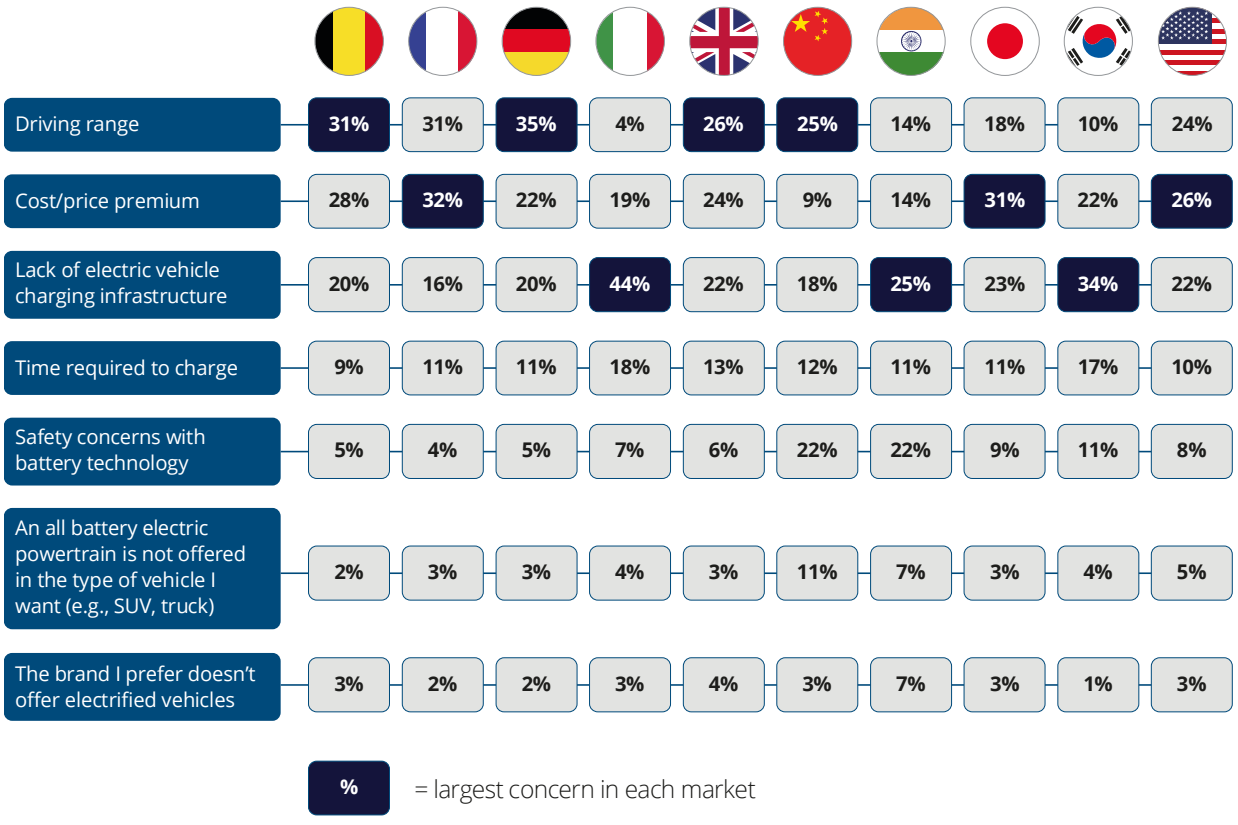
Factor two – customer demand

Despite governments pushing the adoption of EVs, there are still a number of barriers to overcome before the majority of customers are comfortable with the switch. Modern BEVs currently offer a wide range of benefits: performance, cutting-edge technology and connectivity, a quieter ride, lower running cost, full city access, unique exterior styling and increased interior space. However, as shown in Figure 3, many customers still express concern over the basics[8].

Figure 3 shows that the four most important customer concerns regarding BEVs are: driving range, cost premium, lack of infrastructure and time required to charge.

Understanding the technological progress being made across these areas, alongside evolving customer expectations, gives us an insight into when customers' anxieties will be eased.

Figure 3. Customer concerns regarding battery electric vehicles

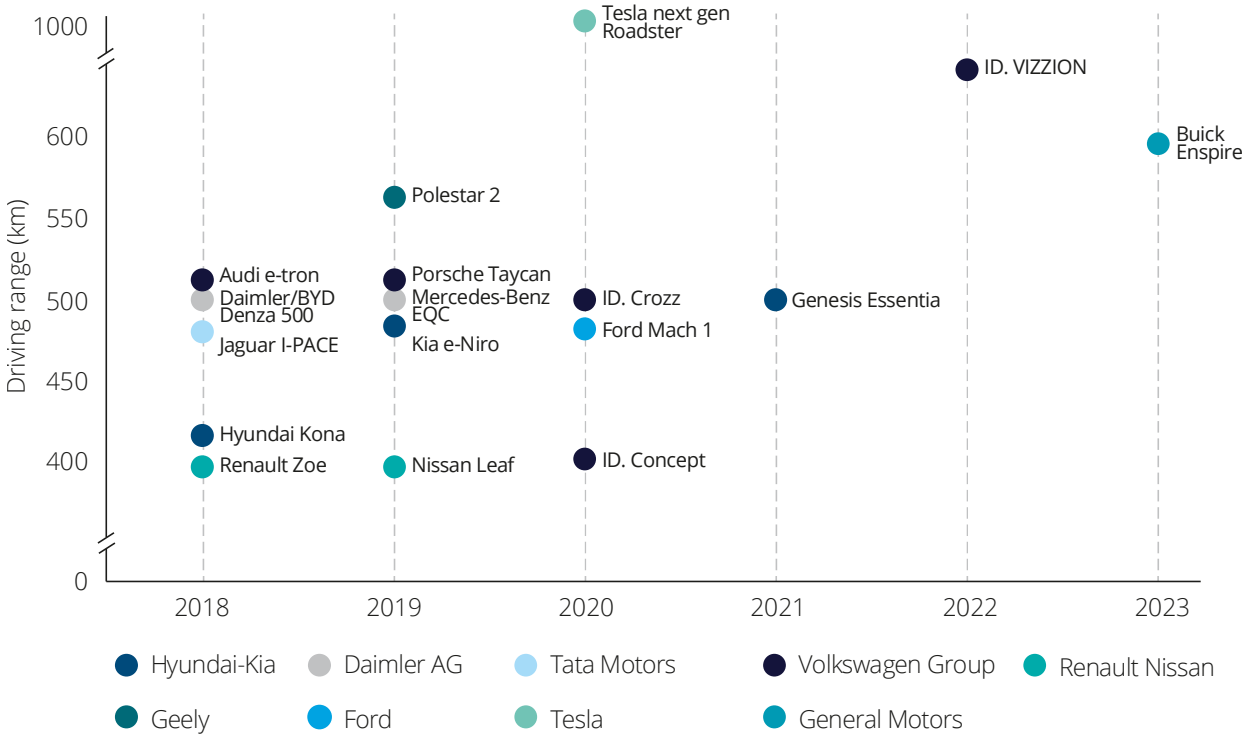


Source: Deloitte Global Automotive Consumer Survey 2018

Concern one – Driving range

As the next generation of BEVs are launched, we anticipate customer's 'range anxiety' will become history. This is because the planned new BEV models have a driving range more comparable to their ICE counterparts (Figure 4), and the estimated drive range of BEVs is only forecasted to increase over time.

Figure 4. Driving range of the next gen BEVs (NEDC cycle)



Source: OEM public announcements

Next generation BEV driving range explained:

- Optimisation of existing lithium-ion cell chemistries, as well as the introduction of new battery cell materials will result in incremental improvements in energy density, charge discharge and thermal performance
- Advances in battery management systems will contribute towards extending vehicle range while simultaneously improving safety and extending battery life
- Increase in energy density of battery assembly through the use of new materials, improved pack design and optimised cooling will improve vehicle range
- Incremental improvement in range will also be achieved through continued reduction of vehicle and battery pack mass.

Beyond 2023:

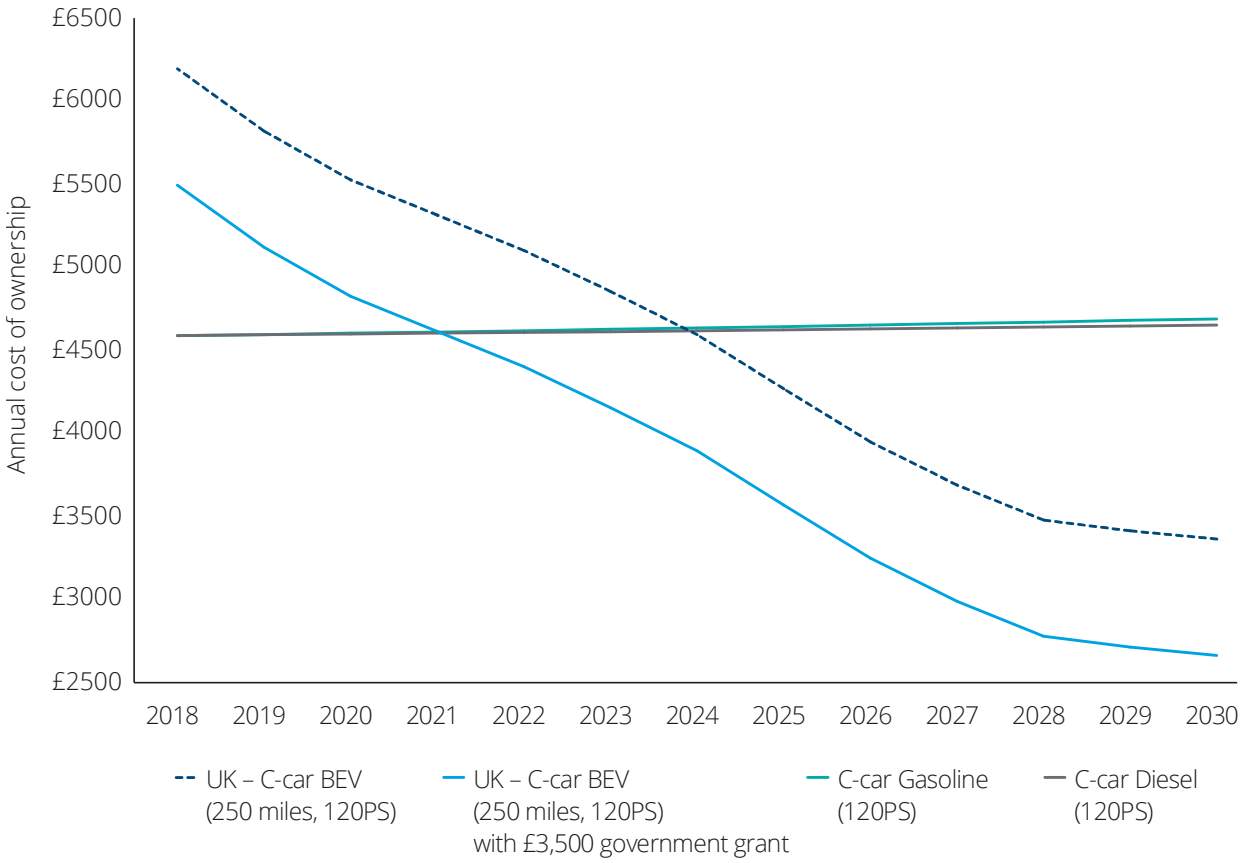
- New breakthrough concepts such as: lithium-air, alternative metal-ion chemistries, solid state technology and higher energy capacitors may also enable advancements in vehicle range within the next 8 to 10 years.

Concern two – Cost premium

If customers can overcome 'range anxiety' and concerns about charging time and infrastructure, economics will then play a dominant role in the adoption of EV technology, with the cost of ownership and the lifetime cost of a vehicle becoming key selling points.

Over time, the BEV cost will continue to decrease, driven by technology developments and economies of scale. For example, in the UK, the cost of ownership between ICE cars and their BEV counterparts (400km range), supported by a £3,500 incentive from the government and an increasingly favourable taxable benefit scheme, will converge year on year and intersect in 2021. If the current government incentive scheme is phased out, this will shift to 2024, as shown in Figure 5. A similar time frame is expected for markets within other developed economies.

Figure 5. Annual cost of ownership in UK



Source: DfT, TfL, AutoTrader, GoCompare, RAC, KwikFit, Deloitte analysis
Assumptions: cost of ownership is based on 5-year average for volume brand C-segment car, assuming 7,900 annual miles (average UK driver)

Concern three – Lack of EV charging infrastructure

Over time, concerns about the lack of an EV charging infrastructure will decrease for two reasons. First, the next generation BEVs have a greater range, which makes home and workplace charging more than sufficient for a customer's daily commute and second, reduced charging time enables the fast and ultra-fast charge stations to serve more BEVs.

While these factors will help reduce concerns, they will not eliminate them. Home charging is not always a viable solution for those vehicle owners with access to street parking only. Meanwhile, continued fast and ultra-fast charging can, under some circumstances, reduce the capacity of a battery. This raises the prospect of a reduction in the overall range of the vehicle over time.

Concern four – Time to charge

Benefiting from battery technology improvements, the time required to charge at fast charging stations is predicted to decrease substantially in the next ten years[9]. We estimate the time required to achieve an 80 per cent charge in a 60 kWh battery (equivalent to a range of 200 miles) will be reduced to just 30 minutes – the threshold that the majority of customers consider acceptable – by 2025.

The manufacturing landscape is also changing

With a number of factors such as policy, cost, drive time, battery technology and improving infrastructure combining to make BEV's more appealing, the market has responded positively. In the next section, we explore how the manufacturing landscape is changing to reflect the increasing demand for EVs and the growing capability of companies to produce them.

Benefiting from battery technology improvements, the time required to charge at fast charging stations is predicted to decrease substantially in the next ten years.

The supply side of the EV market

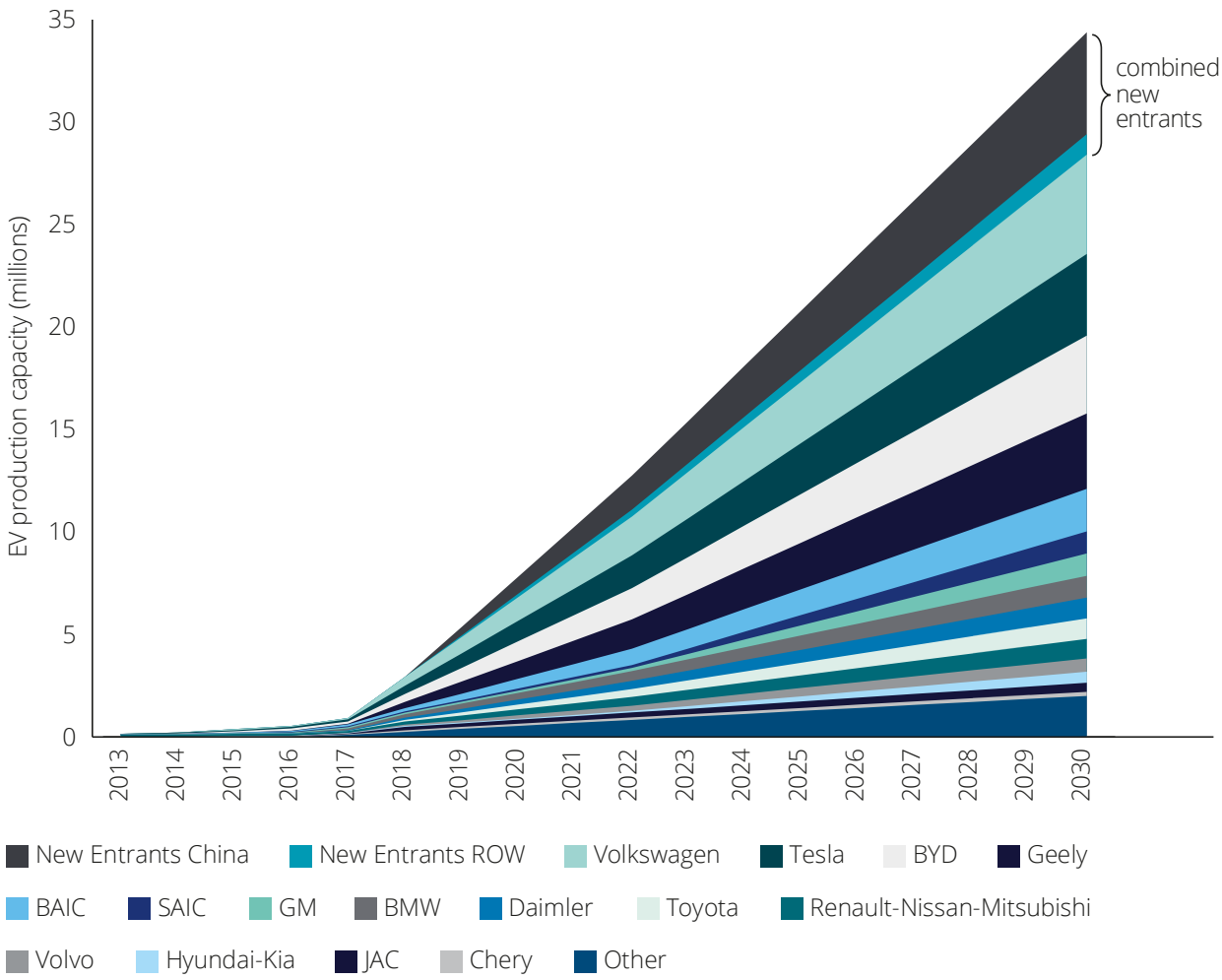
OEMs respond accordingly

Almost all of the major OEMs have announced their ambitious plans for the EV market. Using a combination of these company announcements, forecasts from industry groups and proprietary analysis, Deloitte has projected global production ambitions to 2030. According to our projections, EV car production, dominated by BEVs, will reach 35 million units in 2030, as shown in Figure 6.

New entrants also represent a substantial threat to the status quo. Their combined market share will be the largest in the world - with the majority coming from or operating in China

Forecasting capacity remains an important process for manufacturers. To meet capacity demands in 2030, organisations need to invest now in factories, tooling, design, innovation and talent. Getting these projections wrong, even at this early stage, could cost manufacturers significant amounts of money.

Figure 6. Electric vehicle production forecast of major OEMs and new entrants



Source: Deloitte analysis, IHS (2018), CAAM, IEA, wattev2buy, evobsession, Gasgoo AutoNews, Cleantechnica, SinaAuto, Xinhuanews, Yiche, ifeng

An expectation gap emerges

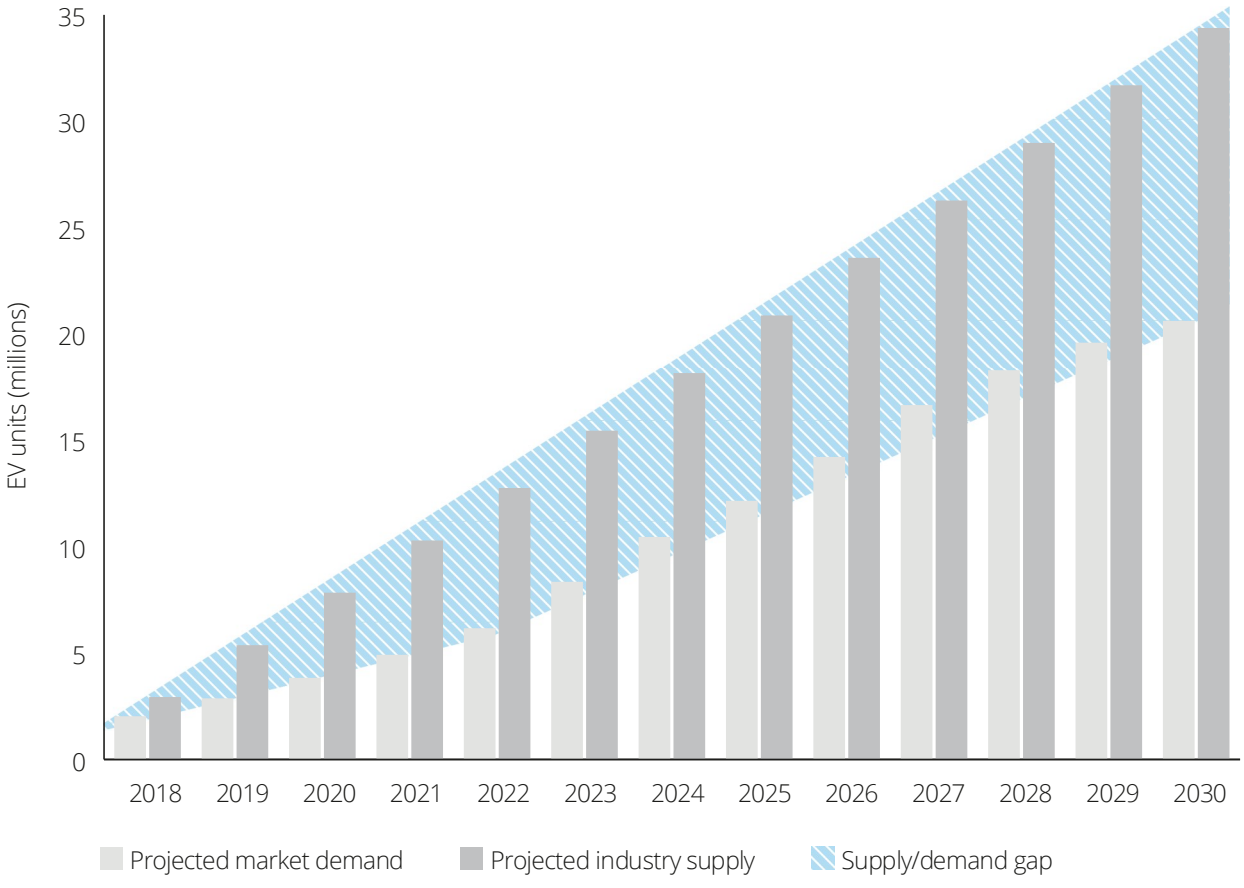
With many OEMs planning a significant increase in the level of EV production over the next decade, the number of potential manufacturers appears unsustainable. Based on our analysis, the overall industry capacity shown in Figure 6 is approximately 14 million units above the forecast consumer demand for EVs in 2030 as shown in Figure 2. The growing gap between demand and capacity is shown in Figure 7.

Given that today's projections are closely linked to investment, getting them wrong can have serious implications for the industry. Based on these figures, it is not inconceivable that some incumbent OEMs will be out of business beyond 2030, while it is highly likely that not all EV startups will survive.

Meanwhile, those organisations that survive will no doubt face major changes to their existing business models, with the prospect of today's powerful OEMs acting as white label suppliers to other brands now a real possibility.

To thrive in this rapidly changing market, OEMs will need to adjust their strategies and new entrants will have to overcome substantial barriers. In the next section, we will evaluate the five areas for success that have been identified as being key in the EV era: brand, customer experience, production strategy, talent and business model.

Figure 7. Electric vehicles: market demand vs industry supply



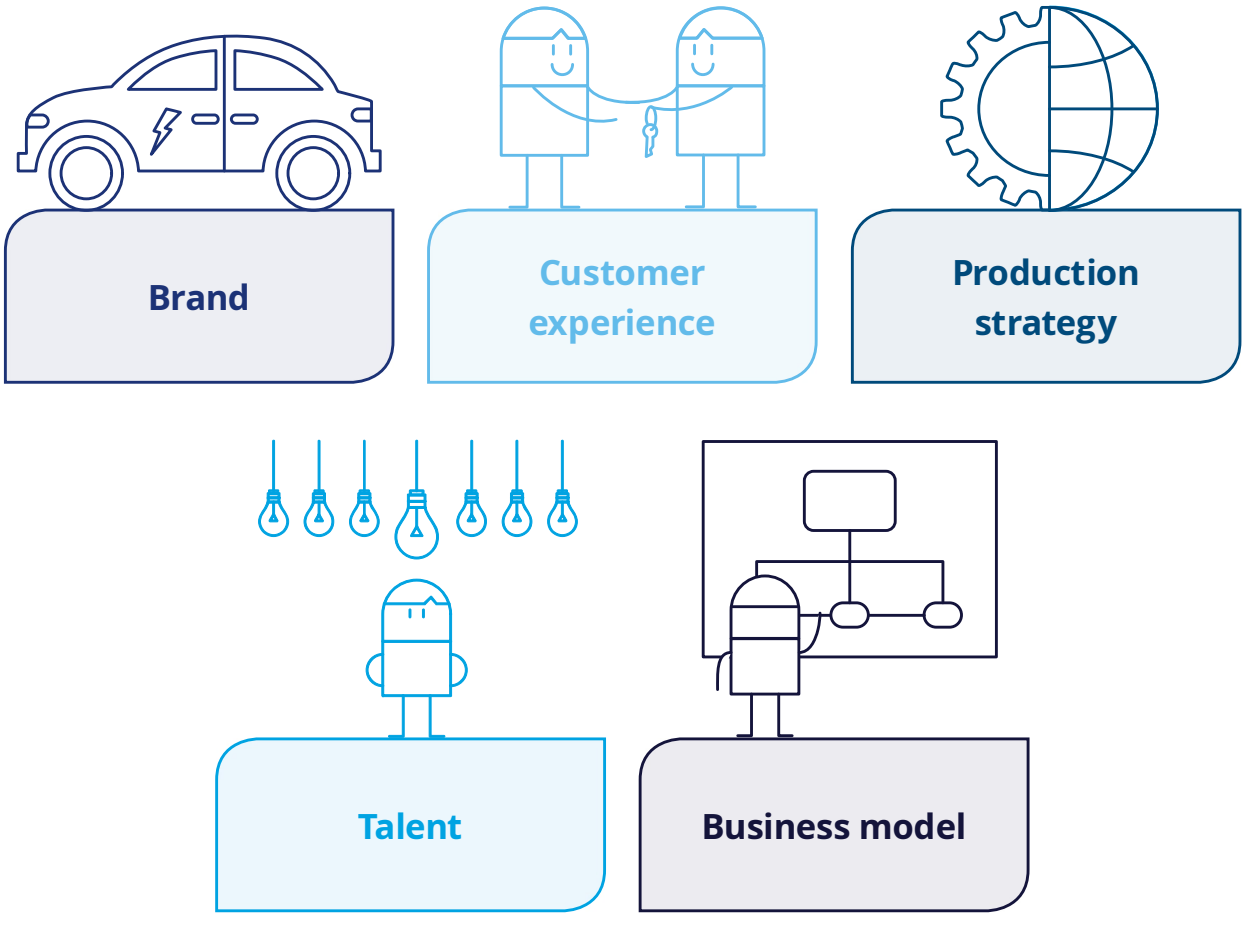
Source: Deloitte analysis

Implications for the industry

Traditional OEMs are preparing to launch a wide variety of EVs into the market to satisfy growing customer demand and meet their regulatory targets. However, they are facing unprecedented competition and disruptions from regionally advantaged OEMs and new entrants such as startups and non-automotive players.

While the ability to meet the demands of an evolving industry varies substantially on a company-by-company basis, there are some fundamental considerations for any organisation wishing to be successful in the EV market.

The ability of a company to achieve success based on the five areas we identified earlier – brand, customer experience, production strategy, talent and business model – varies depending on their current market position. In some areas, OEMs have considerable advantage over their new competitors, but in others having the agility of a new entrant can be beneficial.



Brand – Build a recognisable EV-dedicated brand

One of the greatest strengths an existing OEM has is their established customer base and the ability to access markets across the world. In addition, many OEMs have the advantage of having built trust among customers over a number of years.

Such advantages pose a major challenge to new entrants. Brands in the automotive market rely heavily on their personal safety credentials and this is not expected to change as EVs become more popular. Indeed, there is a substantial gap between OEMs that can boast excellent safety records and new entrants that have no history of car manufacturing.

However, relying on an existing brand name and reputation has its risks. Environmental sustainability is a key selling point for EVs, and OEMs without credible green credentials – especially those that have had negative press in the last few years over emissions testing – may want their EV products to be viewed separately from their core brands. OEMs aiming for success in the EV market will have to assess carefully the value of their existing brand in the context of the EV market. If their green credentials are not considered satisfactory, persevering with an existing brand strategy may end up being a waste of time, money and effort.

Understanding brand positioning is also key for new entrants. Some will be fortunate enough to have built up a strong brand image and reputation in other industries, putting the customer at ease and building trust quickly. For those lacking such credentials, focusing on the core selling points of EVs such as sustainability, technology innovation and safety will be key to building a successful brand.

Customer experience – Capitalise on aftersales credentials

Customer experience has been, and will continue to be, a key differentiator in the automotive market, whether during the sales process, the in-car driving experience or the aftersales market.

The competition between EV manufacturers to deliver the latest in car technology will likely follow the same patterns as found in ICE vehicles. However, an area that will be keenly fought over and offers a challenge unique to EVs is the aftermarket.

While BEVs are technologically simpler and need less frequent maintenance than ICE vehicles, the maintenance and repair infrastructure required is actually more complex, safety critical and expensive than for ICEs.

The complexity of servicing an EV creates an immediate barrier for new entrants, who have no experience or existing investment in servicing customers. One strategy for new entrants, who may not have the experience, capability or appetite to setup dealer agreements, could include partnering with existing third party mechanics or garages. However, even third party mechanics may struggle with the cost and complexities of servicing future EVs, leaving OEMs with large dealer networks at a clear advantage.

Production strategy – Build powerful battery partnerships in all production regions

While the manufacture of EVs requires fewer mechanical parts it does require a large number of new electric and electronic components, and a battery – the most expensive part of the vehicle. If an OEM does not produce its own battery cells, successful EV production will require strong and advantageous partnerships – particularly with battery cell manufacturers. Without these partnerships, OEMs (and likely most startups) will be forced to accept 'off-the-shelf' specifications for their vehicle batteries. This could impact critical elements of their EV design and performance and, ultimately, their market offering. At the same time Deloitte expects to see some new entrants moving from the battery industry into the EV business. These companies will have a significant advantage when it comes to battery production, but will face the opposite challenge of having to decide whether to invest in the manufacture and design of the vehicles' body and interior, or whether to accept an off-the-shelf solution.

Battery packs are challenging to transport, necessitating their production (and the prior cell production) close to vehicle assembly. However, today the bulk of cell production is located in Asia. As a result, OEMs will increasingly rely on Asian battery manufacturers and the establishment of advantageous and well negotiated supplier arrangements.

Battery packs also pose a challenge at the end of their life. Anyone looking to enter the EV market needs to consider the mandated costs of disposing, reusing or recycling batteries at the end of their life. While some organisations will be able to absorb the costs, the majority of manufacturers will have to consider creating further partnerships to give battery packs a 'second life'. A second life for an EV battery could include industrial on/off grid energy storage or grid services, domestic energy storage or remanufacturing.

For both OEMs and new entrants, the current battery cell production and end-of-life landscape mean that it is critical to form deep and strong relationships with battery cell suppliers as well as organisations that can assist with second life utilisation. Manufacturers that can afford to should consider bringing battery cell production closer to home. This means investing in local cell manufacturing or even creating in-house cell manufacturing capability and disposal, or second life utilisation. Although this will be costly, it will ultimately offer better integration with their vehicles and extend their power over the entire value chain.

The ability of a company to achieve success based on five areas – **brand, customer experience, production strategy, talent and business model** – varies depending on their current market position. In some areas, OEMs have considerable advantage over their new competitors, but in others having the agility of a new entrant can be beneficial.

Talent – Invest in expertise

The shift to EV manufacturing will require a substantial investment in talent from both OEMs and new entrants. In the race for talent, OEMs are struggling to maintain their existing advantages associated with the industry knowledge of their workforce as new entrants, and startups in particular, attempt to 'steal' top executives away from OEMs because of their experience.

Despite increased efficiencies resulting from automation, the manufacture of cars remains a labour intensive process. In Europe, the automotive sector currently employs 3.4 million people in high-skilled jobs – 11.3 per cent of the EU's manufacturing employment[10].

Despite the number of highly-skilled workers currently employed in the industry, the design and manufacture of EVs will require a substantial investment in new talent. Working with battery packs instead of ICEs requires OEMs to increase both the breadth and depth of knowledge within their pool of engineers. The shift to EVs means that multi-skilled engineers, who are as comfortable with chemistry as they are with electrical and mechanical engineering, are required. This is a challenge as multi-skilled engineers are scarce and as such, they generally demand higher wages. Building the workforce of the future becomes even more challenging for OEMs when the best and the brightest science, technology, engineering and mathematics (STEM) graduates are increasingly drawn to startups.

The level of investment in talent required depends on the extent to which manufacturers want to be responsible for the end-to-end production of their vehicles. While some new entrants may be happy to bypass this challenge by buying off-the-shelf solutions, OEMs looking to replicate the manufacturing processes of ICE vehicles, or OEMs and new entrants looking for more control over the design of their batteries, will have to invest in talent capable of either designing, building and integrating battery cells, or of working with partners to specify bespoke designs.

Business model – Build and expand the ecosystem

Evolving customer needs and wants are necessitating a shift away from traditional business models. Customers are increasingly seeking mobility solutions that offer greater flexibility, convenience and cost effectiveness than before, for example 'usership' over ownership. New entrants to the automotive market hold an advantage in this area over their traditionally less agile OEM rivals. Unencumbered by legacy dealership relationships and technology partnerships rooted in commercial deals, startups in the automotive market can build customer focused business models from the ground up.

Although new entrants might have an initial advantage in this area, innovative customer focused business models will be key to success in the EV market. There is an opportunity for both OEMs (if they can be more agile) and startups (if they can gain market credibility) to create an advantage by acknowledging specific customer 'pain points' and barriers to EV uptake and offering innovative solutions. For example, a new business model that is formed by a partnership or alliance between an EV auto player and a utility company could see custom electricity tariffs bundled into the purchase of an EV.

Considering how the automotive industry is changing, the shift to EVs affords everyone in the industry the opportunity to test and refine new ownership models that will be utilised in the future. Many customers that are currently buying EVs can be considered early adopters of technology. Using early adopters as a test market for future ownership models will provide valuable insight that can be used to inform the design and implementation of future business models.

Next steps

Many automotive manufacturers have already made significant progress in the EV market. Incumbent OEMs and new entrants are making important technological developments in areas such as driving range and charge time, improving efficiency and reducing the cost of production. As a result, previous barriers to purchase are being removed.

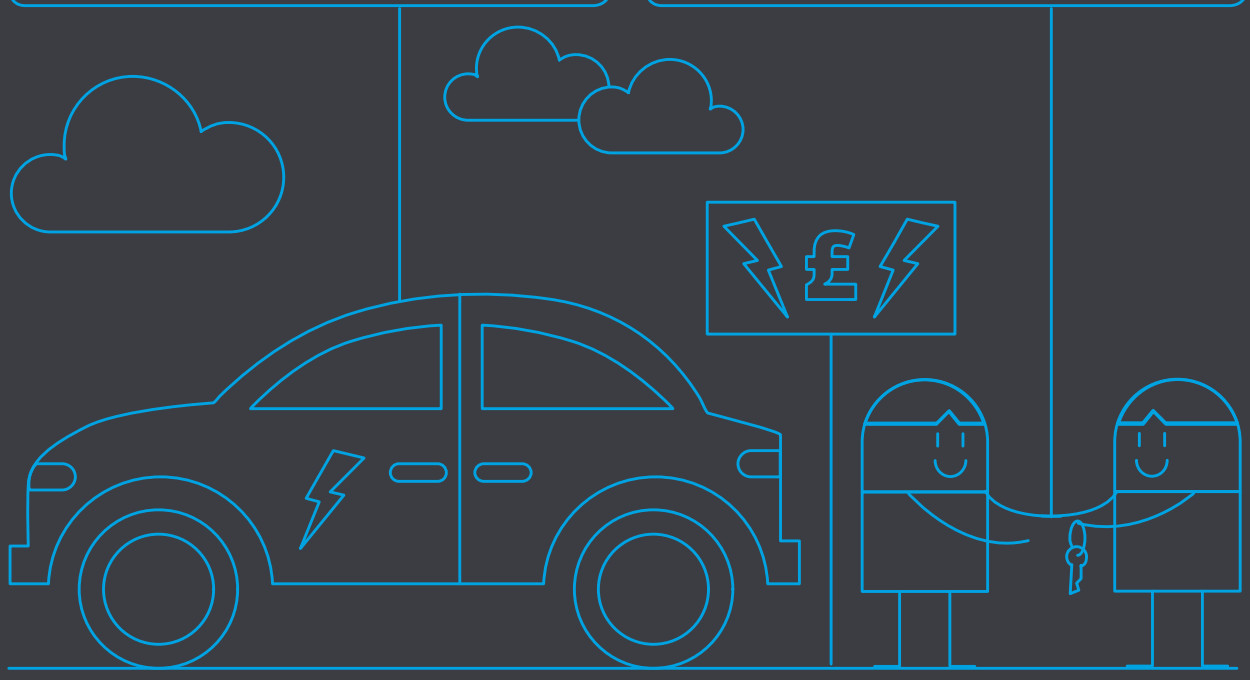
However, over the next decade, manufacturers will face substantial challenges. The expectation gap between projected capacity and projected customer demand creates a real threat to existing businesses. As a result, anyone with serious ambitions in the EV market must be looking carefully at the way they operate. At this stage, there are some key questions that business leaders should be asking:

Brand

- Do customers associate our brand with EVs? If not, do we have a strategy in place to build a recognisable EV brand?
- Is it in our best interests to use our (established) brand reputation and credentials to extend customer trust to our EV offering?
- If we do not have an existing customer base or auto credentials, how can we build trust and excitement with target customers?

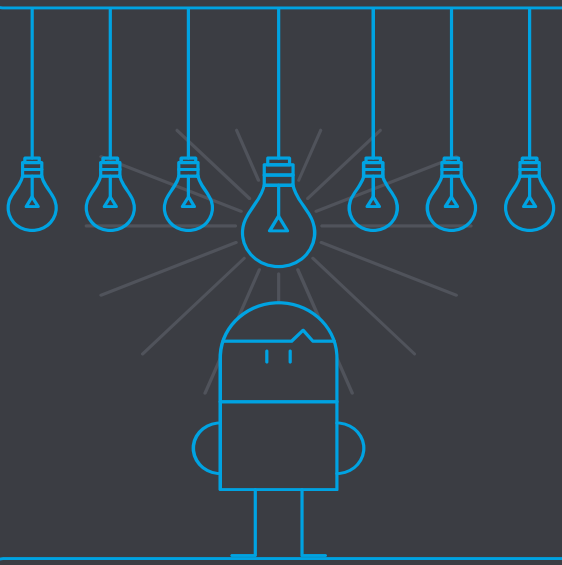
Customer experience

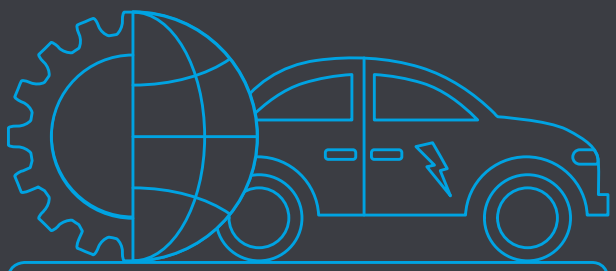
- What is the experience we want to create for our customers around EVs and how do we utilise existing expertise to deliver that?
- Can we use our existing after-sales assets and partnerships to serve customers (better than competitors)? If not, can our existing assets be adapted to our advantage, or do we need to get rid of them?
- If we do not have an established automotive customer base, what are the key purchase criteria for an EV customer?



Talent

- What skills will we need, what are our skill gaps and what is our plan to address them?
- What investment is required in talent and resourcing to support our production strategy?



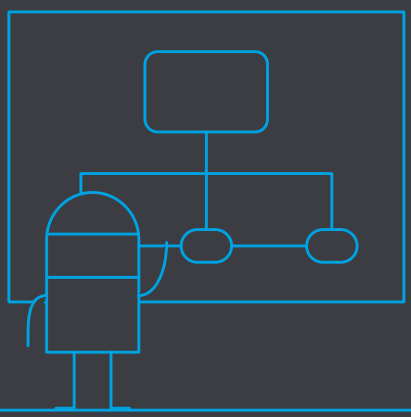


Production strategy

- What existing R&D capability and in-house technical expertise do we have to support our battery development needs? Is this sufficient to support our vehicle performance and design aspirations?
- If we do not have, or want to acquire, in-house battery capability, what existing battery supplier relationships do we have? Can we make these stronger to increase security of supply?
- What other parts of the supply chain do we want to integrate vertically (i.e. do on our own) and what are we prepared to outsource?
- Do we have a strategy in place, including partnerships or alliances where required, to access and compete in the Chinese market, and how does this differ from our strategy for other markets (if at all)?

Business model

- How quickly do we need to incentivise the movement from ICEs to EVs within our existing customer base?
- How will our EV strategy adapt to the changing mobility landscape?
- Can our organisation use EVs as a springboard towards success in other areas – including autonomous vehicles and shared ownership?
- Is our organisation set up to be able to innovate and develop services around EVs?
- What partnerships could support or complement our EV business models? In addition to manufacturing, what do we want to develop in-house?



We believe the key for all businesses is to ensure that their EV strategy is consistent across these five key areas. However, it also needs to align with their existing (if any) automotive business and their wider connected, autonomous, shared (CAS) strategy.

Both OEMs and new entrants face growing competition and there is not space for everyone. While keeping the customer satisfied remains critical to success, it is not sufficient on its own. To thrive in this market, manufacturers need to be realistic about their capabilities and gaps, and focus on building strategic partnerships or alliances as part of an integrated, innovative and agile approach to the changing automotive market.

Endnotes

1. IEA, Global EV Outlook 2018, May 2018, https://webstore.iea.org/global-ev-outlook-2018
2. ICCT, Light-Duty Vehicle Greenhouse Gas And Fuel Economy Standards, 2017, https://www.theicct.org/sites/default/files/publications/2017-Global-LDV-Standards-Update_ICCT-Report_23062017_vF.pdf
3. Harvey Jones, What's put the spark in Norway's electric car revolution?, July 2018, https://www.theguardian.com/money/2018/jul/02/norway-electric-cars-subsidies-fossil-fuel
Jack Perkowski, What China's Shifting Subsidies Could Mean For Its Electric Vehicle Industry, July 2018, https://www.forbes.com/sites/jackperkowski/2018/07/13/china-shifts-subsidies-for-electric-vehicles/#1b6b295d5703
4. Nils Zimmermann, Move is on to ban diesel cars from cities, February 2018, https://www.dw.com/en/move-is-on-to-ban-diesel-cars-from-cities/a-42747043
Agence France-Presse, China to ban production of petrol and diesel cars 'in the near future', September 2017, https://www.theguardian.com/world/2017/sep/11/china-to-ban-production-of-petrol-and-diesel-cars-in-the-near-future
5. Brian Love, Paris plans to banish all petrol and diesel vehicles from city centre by 2030, October 2017, https://www.independent.co.uk/environment/paris-petrol-diesel-car-ban-2030-gas-guzzlers-emissions-air-pollution-evs-france-a7996246.html
6. FleetNews, Mayor wants zero-emission zone in central London by 2025, June 2017, https://www.fleetnews.co.uk/news/environment/2017/06/21/mayor-wants-zero-emission-zone-in-central-london-by-2025
7. Wang Keju, Beijing limits new car plates, boosts new energy vehicles, December 2017, http://www.chinadaily.com.cn/a/201712/15/WS5a33819aa3108bc8c6734ecb.html
8. Deloitte Global Automotive Consumer Survey 2018, https://www2.deloitte.com/uk/en/pages/manufacturing/articles/automotive-consumer-study.html
9. Fred Lambert, A new 'electric highway' is going to connect Europe from Norway to Italy, November 2017, https://electrek.co/2017/11/13/electric-highway-connect-europe-from-norway-to-italy/
10. European Automobile Manufacturers Association, Employment trends in the EU auto industry, June 2018 https://www.acea.be/statistics/article/employment

Key contacts

Key contacts

Michael Woodward
North West Europe Automotive Leader, Deloitte
mwoodward@deloitte.co.uk
+44 20 7303 0884

Dr Jamie Hamilton
UK Automotive Strategy Lead, Deloitte
jamihamilton@deloitte.co.uk
+44 20 7303 0650

Report authors

Dr Hao Wu
Monitor Deloitte Automotive Strategy, Senior Consultant, Deloitte
haoxwu@deloitte.co.uk
+44 20 7007 9014

Geneviève Alberts
Monitor Deloitte Automotive Strategy, Senior Consultant, Deloitte
galberts@deloitte.co.uk
+44 20 7007 3336

Dr James Hooper
Deloitte Automotive, Senior Consultant, Deloitte
jmhooper@deloitte.co.uk
+44 20 7007 7235

Contributing author

Dr Bryn Walton
Insight Manager, Automotive and Industrial Products Deloitte
bcwalton@deloitte.co.uk
+44 20 7007 2352

Acknowledgements

The authors wish to thank Saskia Fullerton-Smith, Flora Stevenson, Nick Smith, Sarah Noble, Nathan Thompson and Wendy Calsen for their contributions to this article.

Notes

Deloitte.

Designed and produced by 368 at Deloitte. 17235