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The road ahead for e-mobility

How OEMs can win consumers and achieve
mass-market EV adoption



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Introduction and key messages

While electrification represents the biggest technological development in automotive power trains in decades, there is still significant uncertainty as to when large-scale adoption of electric vehicles (EVs) will occur. Our working definition of an EV is a light vehicle with an electric power train. The two most relevant segments of EVs – which are the focus of this report – are battery-powered electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).

There is currently a lack of systematic and fact-based investigation of e-mobility industry dynamics which is necessary to understand (i) what is still holding back the mass-market adoption of EVs and (ii) what is required to finally become mainstream.

One thing that is certain is that all car manufacturers have a stake in greater EV adoption, not least because governments are dialing up the pressure to make EVs a more significant share of the mobility landscape. Against this backdrop, this report provides fresh insights – derived from the latest McKinsey research (see Text Box 1) – into four central and pressing questions for the automotive industry at large:

1. What is the current level of mass-market readiness for EV adoption?
2. What are consumers' current perceptions regarding the purchase of EVs – and how have they developed since 2016?
3. How prepared are OEMs and their dealer outlets to sell EVs, and how can their readiness be improved?
4. How can OEMs contribute to rapid, large-scale EV adoption and improve their EV-related business case?

Text Box 1: McKinsey's e-mobility research

— Consumer preference:

launched a comprehensive consumer survey in 2019 in China, Germany, Norway, and the US of more than 12,000 consumers (for further details, see Text Box 2 on page 9).

— Sales performance:

carried out a mystery shopping study encompassing 42 visits to the outlets of eight OEMs across three countries (for further details, see Text Box 5 on page 24)

Our research and analyses yielded the following key insights that will be explained in more detail in this report:

1. EV sales are up, and OEMs are planning to release hundreds of new models. Market research shows EV sales approaching 2.3 million vehicles worldwide and a market penetration of 2.5 percent in 2019, while OEMs' EV model pipeline is fuller than ever before with around 400 new, battery-powered electric vehicle models to hit the market between 2020 and 2025
2. More consumers are considering EVs, but not as many are buying. Insights from our EV consumer survey show that consumers' consideration of EVs has increased on average by around 21 percent over the last three years, as consumers have recognized the numerous benefits of EVs. Still, significant EV-specific concerns persist – such as concerns regarding battery/charging, driving range, and higher costs compared to ICE vehicles – and prevent a large-scale consumer pull for EVs
3. There is considerable room for improvement in captivating consumers on EVs. The insights from our mystery shopping study – consolidated in 10 pragmatic recommendations – illustrate how OEMs can improve their sales approach to boost sales and build their EV business case by systematically assessing EV sales readiness
4. Five moments of truth represent make-or-break customer touch points. From our perspective, OEMs need to succeed at five key touchpoints or key consumer interactions, which will trigger a large fraction of consumers to adopt EVs.

1. The stage for EV mass-market adoption is set – almost

EVs have existed for more than a century, but large-scale production and marketing began only a few years ago. Despite this relatively short period of time, the outlook in terms of planned production to be considered, sales, market penetration, and industry dynamics is very positive.

1.1 Global EV sales are approaching a tipping point

EV sales totaled 2.08 million vehicles globally in 2018. After rapid growth between 2016 and 2018 (62 percent p.a.), sales have been increasing more slowly and hit 2.3 million in 2019 (Exhibit 1). However, this development should be considered in relation to the slowdown of the overall light-vehicle market (total light-vehicle market estimated to shrink 4.5 percent in 2019)¹, which, despite a slow down in sales, led to significant growth in EV market share in 2019. The EV market penetration steadily increased from 0.9 percent in 2016 to about 2.5 percent of the total light-vehicle market in 2019 (an increase of 39 percent CAGR p.a.). The fastest-growing market for EVs in 2019 is Europe.



annual growth in market penetration 2016-19

At the same time, there are multiple signs that demand in Europe will pick up even more strongly in 2020. Consumers in several countries are likely to make purchases not before 2020 when higher subsidies are expected (e.g., in Germany). In parallel, CO₂ regulations in the EU will come into effect in 2020, adding strong incentives (on top of existing ones) for OEMs to sell more EVs.

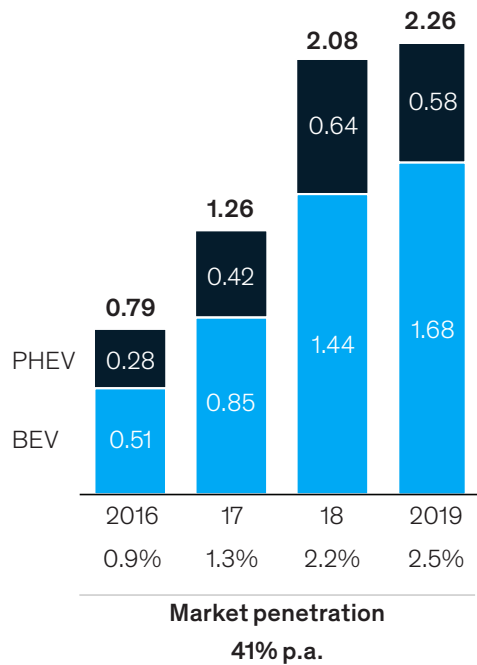
¹ Source: IHS Markit (sales forecast as of January 31, 2019), Light Vehicle Sales Forecast (January 31, 2019).

Exhibit 1

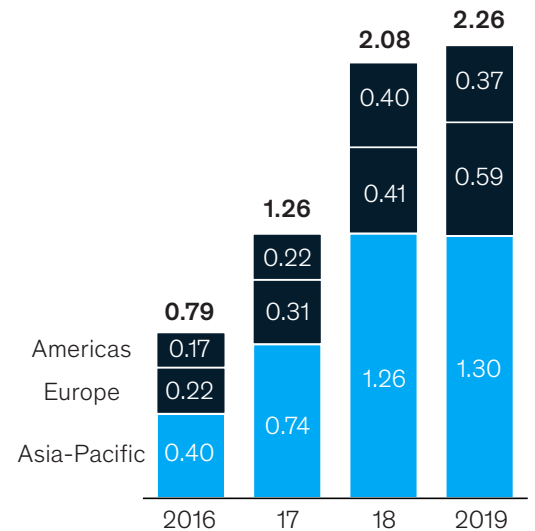
Global EV sales and market penetration are continuously growing

Global light electric vehicle sales, 2016-19, million units

By propulsion



By region



Source: EV-volumes.com; IHS Markit (sales forecast as of January 31, 2019), McKinsey

1.2 OEM EV model pipeline is stronger than ever before

With around 400 BEV models planned to enter the market by 2025, OEMs and new players have demonstrated their commitment to ramping up EV production and pushing new models into the market (Exhibit 2).

The fact that we see the EV model pipeline fuller than ever before across segments underlines a shift towards mass-market EVs. Enabled by advancing battery technology, larger vehicles with larger batteries and longer ranges are also expected to hit the

~400

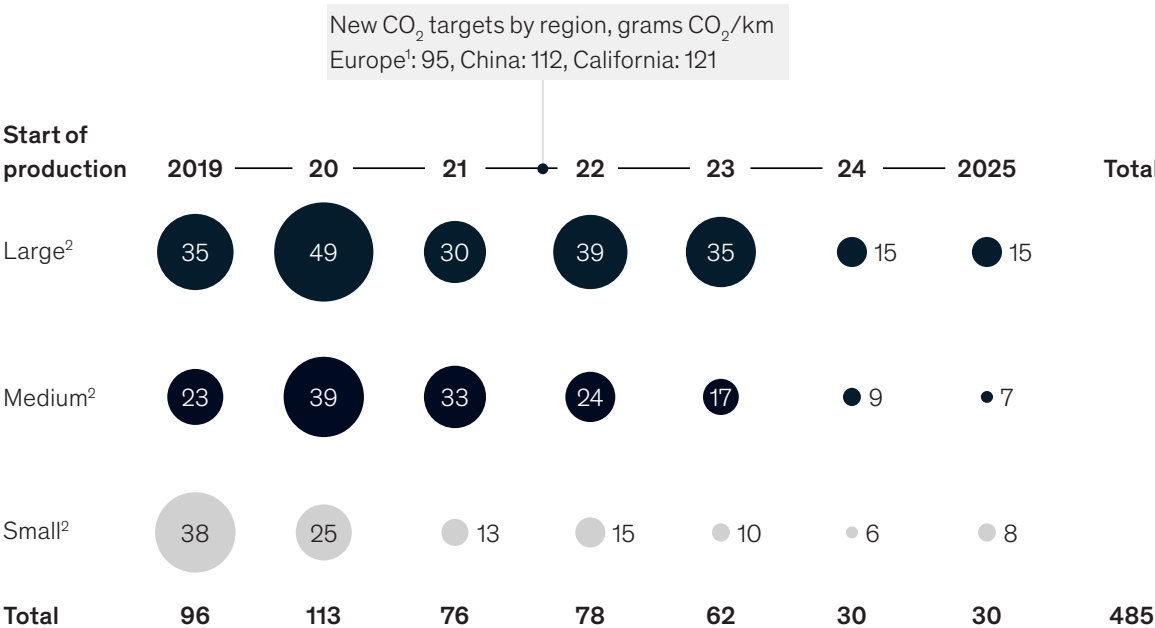
BEV models to be launched by 2020-25

market. While before 2017 most BEV models entering the market were small and medium-sized vehicles (e.g., Renault Zoe, Chery QQ, BMW i3, and Nissan Leaf), in 2018 we saw a significant increase in the number of market launches of large EV models (e.g., Jaguar I-Pace, NIO ES8, and Bjev EU5) by OEMs. The number of newly launched larger-footprint BEV models increased from only 7 out of 39 (18 percent) in 2017, to 23 out of 69 (33 percent) in 2018, and 35 out of 96 (36 percent) in 2019. Likewise, the model pipeline until 2025 (see also Exhibit 2) shows a significant increase in the number of BEV models across all major segments.

Exhibit 2

OEMs plan to launch around 400 new BEVs by 2025, with a strong focus on medium-sized and large vehicles

Number of BEV launches



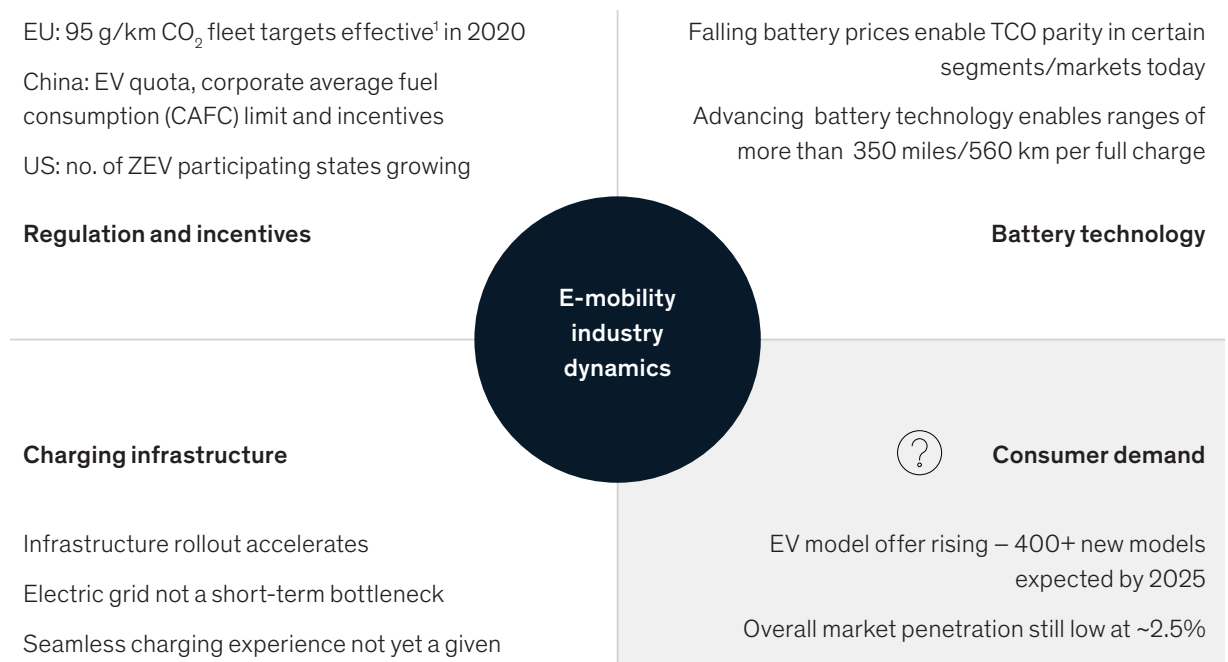
1 Phase in from 2020 for 95% of fleet
 2 Small = A/B segment, medium = C segment, large = D/E segment
 Source: IHS Markit (alternative propulsion forecast as of November 30, 2019)

1.3 Consumer demand for EVs going forward is the “last big unknown”

Three key dimensions of the EV industry are developing in ways that clearly support greater EV adoption: regulation and incentives, battery technology, and charging infrastructure. However, progress in the fourth key dimension, consumer demand for EVs, is still difficult to predict (Exhibit 3).

Exhibit 3

Consumer demand is the “last big unknown” within e-mobility industry dynamics



¹ In 2020, the 95g CO₂/km target only applies to 95% of the fleet
Source: McKinsey

Governments are tightening regulations and offering incentives to foster greater EV adoption

Governments worldwide are imposing increasingly stricter CO₂ regulations. In the EU, for example, a new set of fleet wide CO₂ targets will be phased in starting in 2020. OEMs need to fully comply with an industry wide emission target for CO₂ of 95 grams per km by 2021 to avert significant financial penalties. These mandates are putting additional pressure on OEMs to push EVs into the market. On the consumer side, governments are incentivizing EV adoption. The German federal government, for example, has recently announced its plan to increase its EV purchase price subsidy for BEVs from EUR 4,000 in 2019 to EUR 6,000, starting in 2020 and in effect until 2025.

Non-monetary incentives include an increasing number of cities planning to partially exempt EVs from their congestion reduction policies (i.e., restrictions on vehicles entering the city center). In China alone, on top of the current Tier-1 cities, 10 to 20 additional cities are expected to be under a congestion reduction plan by 2025. Similarly, an increasing number of US federal states (twelve states) have joined California's zero-emission vehicles (ZEV) program, which requires OEMs to sell a steadily increasing share of EVs to be allowed to continue to sell ICE vehicles.

Substantial technological progress has increased the mass-market compatibility of EVs

Several developments in technology are making EVs easier to own. First, decreasing battery prices and large shifts in the power train supply chain are enabling a further reduction in the EV vehicle price. Specifically, EVs in the A and B segment in Europe already have a lower TCO over three years than ICE vehicles. Second, falling battery prices make BEVs the least expensive power train option in terms of total cost of ownership (TCO) in certain segments and markets today. For example, the average list price (before subsidies) of the five least expensive, small BEVs on the Chinese market have decreased by 16 percent to about CNY 86,000 (approximately USD 12,300) over the last three years. Third, advancing battery technology has also led to increases in driving ranges that should make consumers increasingly more comfortable. Specifically, the current top BEV models on the market offer driving ranges of more than 350 miles (560 km) per full charge³.

Charging infrastructure has been further improved and expanded

Infrastructure rollout is accelerating as several players have started establishing dense charging networks across regions. In Europe, five large OEMs are building a fast-charger network of 400 stations by 2020 under a collaboration called Ionity. In the US, one OEM is investing USD 2 billion over a 10-year period ending in 2027 in both fast-charging stations along high-traffic corridors in 39 US federal states and in public chargers in 17 metropolitan areas. In China, the State Grid Corporation is building 120,000 public charging stations by 2020 and is currently accelerating plans in central and eastern China.

It is still largely unclear how many consumers will actually switch to EVs

Government, technology, and infrastructure developments are clearly conducive to EV proliferation, but consumer concerns about EVs seem to be a sticking point when it comes to large-scale adoption. Consumers commonly ask several critical questions about EV technology that describe their concerns:

- Will the battery capacity provide the driving range that I need?
- How will I charge my EV if I am unable to install a charging outlet at home?

³ EPA standard

- If I buy an EV today, will the technology be outdated tomorrow?
- How long do EV batteries last and provide their full capacity?
- How does the value of my EV depreciate over time?

Until these questions are convincingly answered, the EV stage will remain set but with a critical mass of potential EV drivers waiting in the wings. To lay the foundation for a potential breakthrough, the following chapter examines what OEMs can and should do to captivate consumers.

2. Understanding the preferences of consumers is key

The results of the McKinsey EV Consumer Survey 2019 (see Text Box 2) reveal an interesting mix: significant improvement in consumer consideration rates and user satisfaction of early adopters on the one hand and persistent concerns and lack of information of most vehicle consumers on the other. These key insights and several additional findings from the survey results show how understanding current consumer perspectives on EVs and the development of those perspectives over the past three years are key to improving the consumer EV sales experience and increasing EV sales.

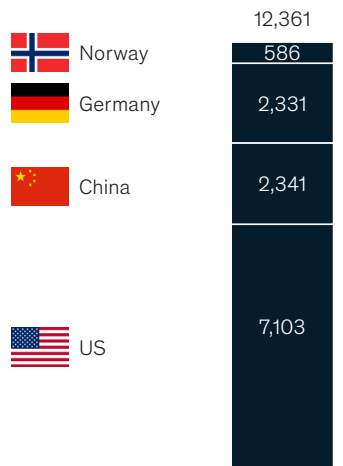
Text Box 2: the McKinsey EV Consumer Survey 2019

- Over **100** questions for general consumers and EV owners about their car usage habits, perceived benefits, and concerns about EVs, and preferences on the car-purchasing process and services
- **Four** key EV markets on **three** continents (Exhibit 4)
- Over **11,100** survey responses from consumers and more than **1,200** responses from EV owners (separate panel compiled by over-sampling EV owners without selection bias)
- **Comparison** to the McKinsey EV Consumer Survey 2016 to identify trends

Exhibit 4

4 key markets covered by the EV consumer survey

Survey responses per country



Source: McKinsey EV Consumer Survey 2019

2.1 EV consideration has increased, yet EV sales conversion remains low

Regarding consumer attitudes and behaviors related to the EV sales funnel, we have derived a clear range of insights from product awareness on one end to product purchase on the other (Exhibit 5).

Unchanged near-universal awareness. Almost all consumers know of the existence of EVs. Today's level of awareness is above 90 percent in all key markets and is largely unchanged since our 2016 survey. Consumer awareness in China is highest at 99 percent.

Moderate changes to familiarity and knowledge of technology/model availability. The share of consumers familiar with the “tech basics” of EVs is around 43-47 percent. Regionally, this ranges from 43 percent in the US to 74 percent in China. This represents a slight decline over the share reflected in our 2016 survey, but it does not necessarily suggest a drop in consumers' general EV-related knowledge. Many new models have hit the market in the last three years, and there were simply more technical details and different features for the customers to be familiar with in 2019 than there were in 2016.

Purchase consideration has strongly increased since 2016. Among those with a basic knowledge of EVs, there has been significant growth in the number that would consider purchasing one. While only 29 to 44 percent of consumers outside China reported a willingness to consider purchasing an EV in 2016, 36 to 51 percent in 2019 said they would, and this applies fairly equally to both PHEVs and BEVs. The regional difference is quite stark, with the lowest level of consideration observed among US consumers (though the three-year increase of about one-fourth is strongest here). Consumers in China are most likely to consider an EV purchase (80 percent of those with an understanding of EVs). For further details about the EV consumer in China and the US, see Text Box and Infographics 3 and 4 on page 15-17 and 21-23.

Completed purchases⁴ remain low. Overall, a very small percentage of consumers are present in the purchase stage of the EV sale funnel⁵. The biggest share of consumers represented in the purchase phase in 2019 was in Norway at 44 percent, up from 24 percent in 2016. All other regions show only a single-digit market share, with China being second at 5 percent. We are observing modest increases, but the percentage of car buyers choosing an EV (BEV or PHEV) remains in the single digits outside Norway.

Given these developments, what are the reasons behind the increase in EV consideration but the persistently low EV purchase rates?

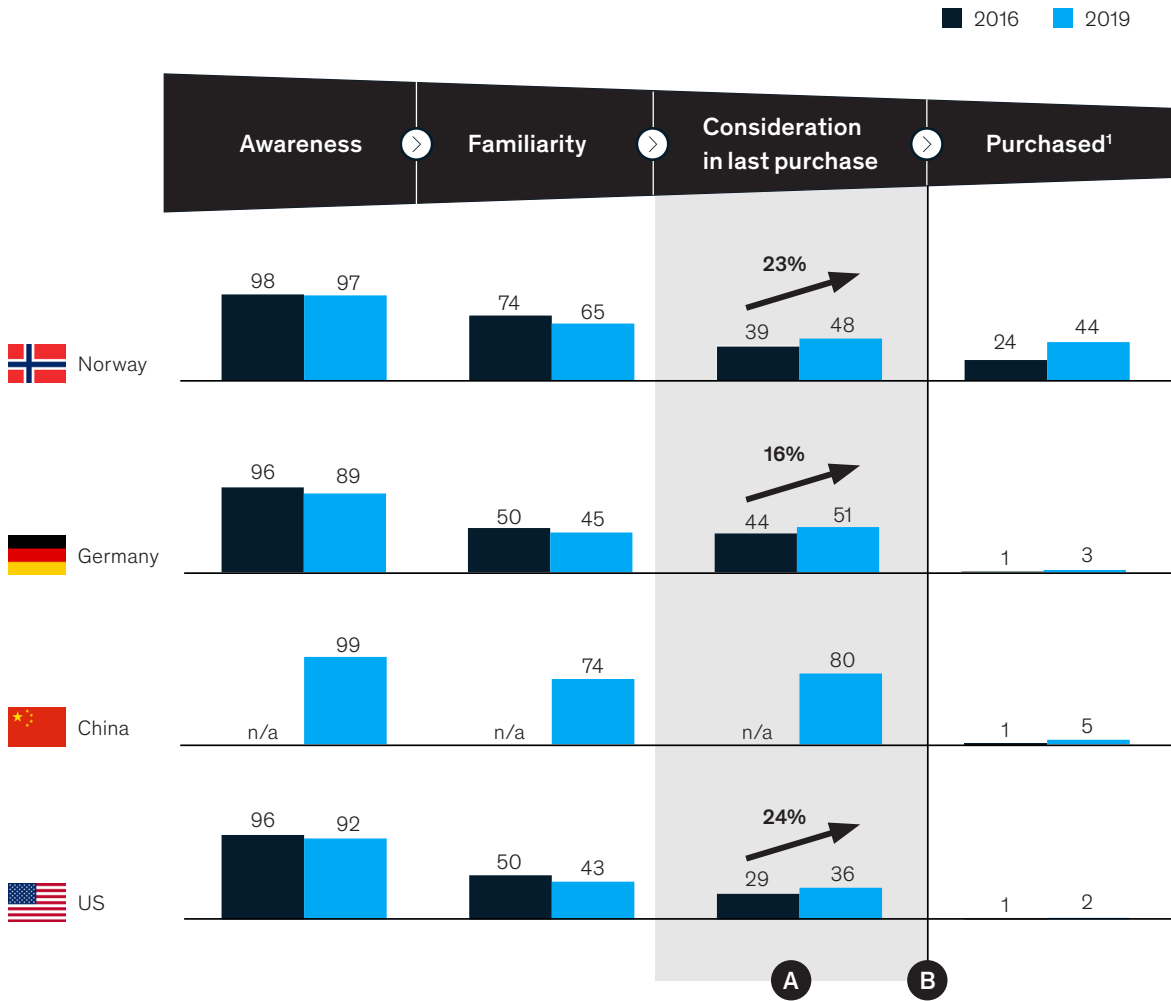
⁴ EV market share calculated using figures from Q1-Q3/2019

⁵ To yield insights into the perspective of current EV owners, we ran an additional sampling strategy to increase the number of EV owners in our sample. This over-sampling strategy is free of selection bias and has been analyzed separately from the representative sample of the population in the key markets

Exhibit 5

While an increasing share of consumers are considering EVs, conversion into actual EV purchases remains low

Percentage of consumers at each funnel stage for PHEVs and BEVs
(self-rated in survey; actual sales figures for “purchased”)



Key observations

- A** EV consideration up ~21% over the last 3 years (average of Norway, Germany, and China)
- B** Conversion into purchases remains low due to unresolved concerns

¹ Actual sales figures, market penetration of BEV/PHEV in percent
Source: McKinsey EV Consumer Survey 2016 and 2019; EV-volumes.com; IHS Markit (sales forecast as of November 30, 2019), McKinsey

2.2 Perceived benefits of EVs are still outweighed by perceived concerns

Increasing awareness of EV benefits explains increasing consideration

As more and more EV models hit the roads, more consumers are becoming aware of the benefits. Word of mouth is a powerful force, as more people know someone (or know someone who knows someone) who owns an EV.

Of all the perceived EV benefits, the driving experience stands out as the most popular – being included in about one-third of consumer responses (Exhibit 6). Consumers appreciate the almost-silent driving experience paired with high acceleration rates (high-end EVs accelerate from 0 to 100 km per hour (62 miles per hour) in less than three seconds).

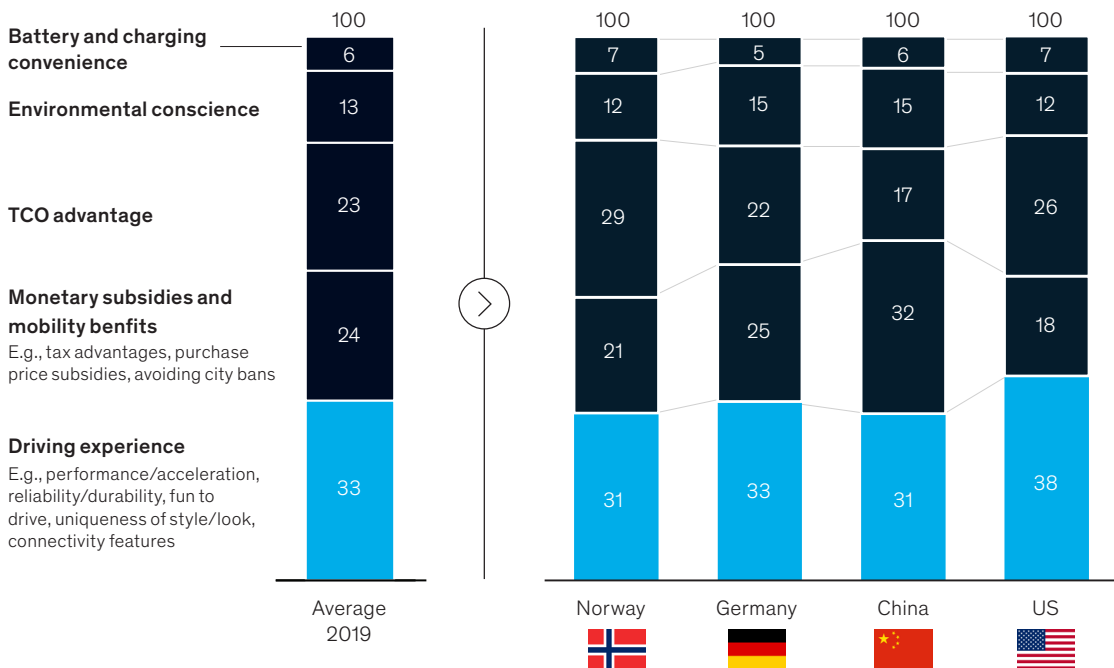
Exhibit 6

The EV driving experience stands out from the multiple benefits of EVs that consumers are aware of

A. Increasing consideration

Benefits perceived by consumers who considered EVs in their last purchase

Average of PHEV owner and BEV owner perspectives, N(PHEV)=2,616; N(BEV)=2,551; average share of responses per category, percent



Source: McKinsey EV Consumer Survey 2019

Another benefit perceived by a growing number of consumers relates to cost advantages. Specifically, about half of the benefits mentioned by consumers considering EVs relate to TCO or subsidies. The government provision of direct and indirect subsidies reaching up to 40 percent of the vehicle purchase price is reflected in consumers' stated perception. This benefit is most clearly articulated by consumers in China – a country where both local and federal governments are currently strongly incentivizing EVs (see Text Box and Infographics 3 on page 15).

Although the environmental advantage of EVs is frequently discussed in the media – BEVs have zero local emissions and up to 50 percent better lifecycle CO₂ footprints than ICE vehicles today – it is only the fourth most popular benefit for consumers.

The convenience of charging the EV battery at home is also listed among the benefits and – although mentioned by only 6 percent of consumers – contrasts with our observation that consumers mentioned several topics related to batteries and charging as concerns. Apparently, the fact that EVs are battery powered and need to be charged with specific chargers is a significant concern to many consumers who have yet to commit to purchasing an EV. However, some consumers already perceive it as a benefit (e.g., because it eliminates the need to stop at a gas station, as EVs can be charged at home).

The growing awareness of these benefits is the most reasonable explanation for the fact that, nowadays, more consumers than before reach the consideration phase of the EV purchase funnel.

Persistent concerns prevent many customers from purchasing an EV

Although the increasing awareness of the benefits is bringing consumers to the consideration stage of the EV purchase funnel, EV-related concerns appear to be a blockage in the funnel, keeping consumers in that stage and the purchase level consequently still low.

This holds especially true as concerns related to battery/charging have deepened over the last three years, such that battery/charging and driving range represent more than half of all concerns mentioned by consumers considering EVs (Exhibit 7). In detail, battery/charging issues make up 38 percent of all reported concerns, up from 13 percent in 2016. The anxiety around driving range discussed earlier persists, but it has remained stable over the last three years, at 16 percent.

This concern, however, is largely unfounded. Most consumers drive a much shorter distance per day than the total range allowed on a fully charged BEV. Modern EVs can deliver a “real world” driving range of 200 to 500 km, meaning that a fully charged battery can last for several days of average driving. For example, all models across segments on the German market in 2019 provide driving ranges of 200 km, and four out of 18 models provide driving ranges greater than 500 km.

Even if consumers drive long distances (e.g., while going on vacation), they take regular breaks that can be used to charge the vehicle using fast chargers. In Germany, for example, 74 percent of the respondents in a representative survey⁶ indicated that they take a break within the first four hours of driving.

6 TNS Emnid survey sent out in 2016 with results representing 1,000 car owners in Germany

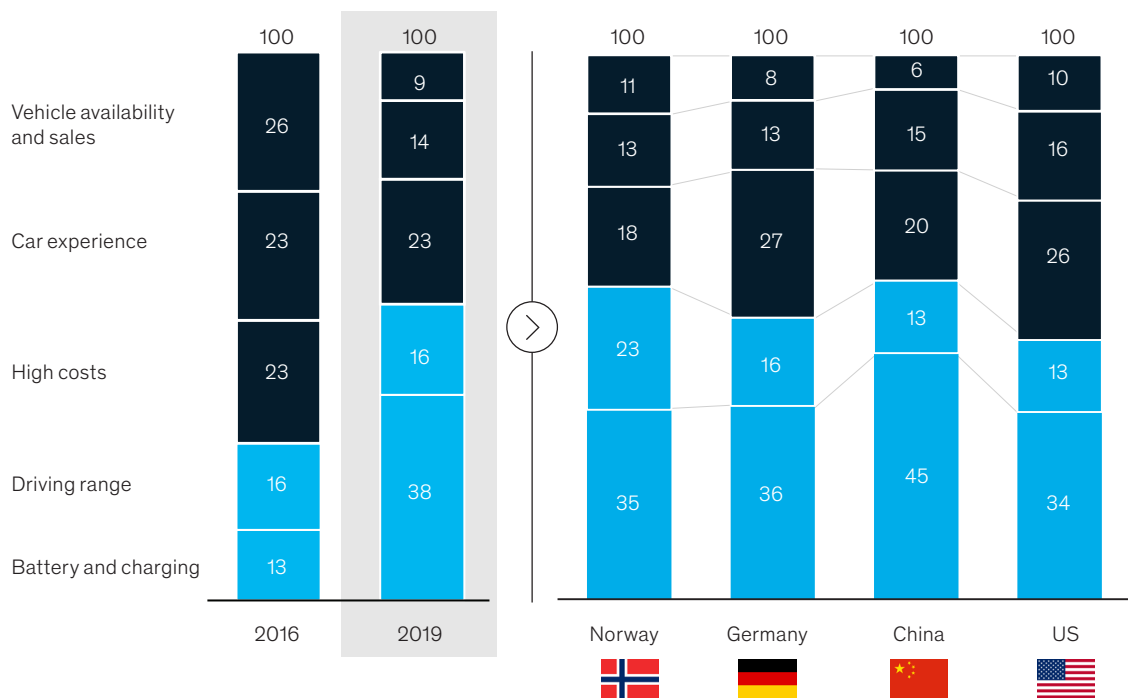
Exhibit 7

Concerns related to battery, charging, and driving range have grown over the last 3 years

B. Low conversion to purchase

Concerns perceived by consumers who considered EVs in their last purchase

Average of PHEV owner and BEV owner perspectives; N(PHEV)=2,616; N(BEV)=2,551; average share of responses per category, percent



Source : McKinsey EV Consumer Survey 2016 and 2019

Three years ago, vehicle availability was the most prominent concern; today, it is the least, dropping from 26 percent to only 9 percent. Meanwhile, the number of BEVs on the market has grown four fold, a reality that consumers have clearly observed. To capitalize on the momentum of consumers' increasing consideration of EVs, OEMs will need to address the persistent (and, in some cases, deepening) concerns that keep conversion rates low.

Text Box and Infographics 3: deep dive on consumer insights in China

EV consideration in China: high across the board and still rising

About 80 percent of consumers in China considered an EV when making their most recent vehicle purchase, and variation by age and region was relatively low, i.e., 67 to 85 percent (Exhibit 8). The share of consumers who considered an EV purchase was only slightly higher both in larger cities and among younger segments.

consider an EV when making their next vehicle purchase. The biggest jump from “last purchase” to “next purchase” is observed in the segment of Tier-2 city consumers age 45 and older, who represent an uptick in consideration of 11 percentage points (from 67 to 78 percent).

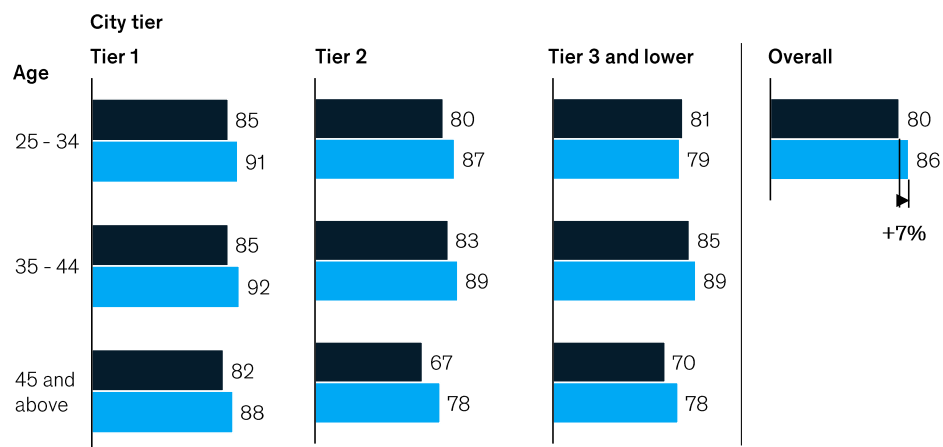
Looking ahead, across all city tiers and age segments, even larger shares of consumers expect to consider EVs, with an overall average of 86 percent of consumers stating that they will

Exhibit 8

Consideration of an electric vehicle is consistently high around 80%, and increasing further

Consideration of EVs consumers' last year and next car purchase¹

Percent of consumers, PHEVs and BEVs



¹ Last purchase, on average, 18 months ago; next purchase expected in, on average, 16 months
Source: McKinsey EV Consumer Survey 2019

EV penetration: slower growth rate and shift to mid-class vehicles

EV sales and market penetration in China have almost doubled from 2018 to the first half of 2019 (Exhibit 9), making China the fastest-growing market with the four key markets studied. In this timeframe, market penetration increased from 3.2 to 5.8 percent. However, given that governments in China are continuing to reduce the financial subsidies – purchase price subsidies have been decreasing every year since 2014 – EV sales will continue to increase, but most likely at a lower rate.

Most EV sales in China are still small vehicles in the A-class segment and below (e.g., the model BYD E5 in the A-class or model Baojun E100/E200 in the below-A-class segment).

Additional growth in 2019 has come mainly from vehicles in the A, B and C class. Furthermore, the share of entry level, below-A-class vehicles has decreased from 53 to 35 percent and is expected

to decrease further. A driving factor may be related to the reduction in monetary subsidies mentioned above, because they represent a bigger discount for smaller vehicles, given how large the subsidies are, relative to the lower purchase price.

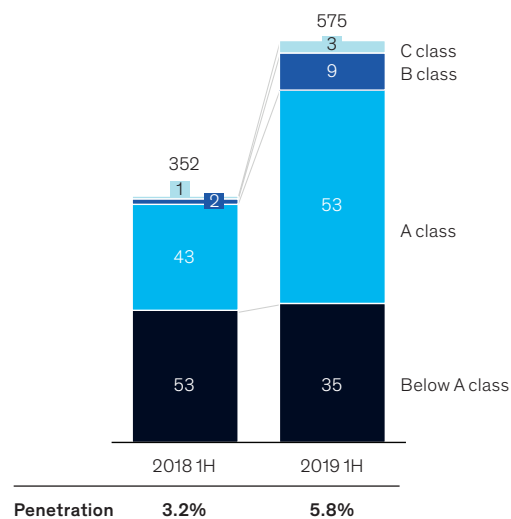
As both the federal and local governments are increasing non-monetary incentives, such as privileges for EVs in city centers, customers in other car segments are also switching for non-financial reasons. At the same time, foreign premium brands are introducing additional EVs to the market, which has so far been dominated by domestic manufacturers of small cars. However, it is still unclear whether the EV market growth in China is sustainable without significant financial incentives. Given the advanced stage and size of the EV market, the developments in China will provide early indications of developments of the EV mass market.

Exhibit 9

Market penetration has increased significantly due to growth from A- and B-class vehicles

Sales breakdown of EVs

PHEV and BEV sales in first half of each year in 1000 units, percent



Source: 2019 McKinsey China Auto Consumer Report; CPCA

The public charging network has grown rapidly

China has the largest installed base of charging equipment (mostly located in its eastern states with big cities). Still, insufficient availability of public chargers is the biggest concern among Chinese consumers, with 50 percent naming it among the top reasons why they would not consider purchasing a BEV. Closely related to this concern is the fact that 26 percent of consumers think BEVs should have driving ranges of more than 500 km per charge.

The federal government aims to have 500,000 public charging stations installed by the end of 2020. In the last few years, the number of installations grew rapidly at 84 percent p.a. and reached 487,000 by October 2019. However, the public charging service still face challenges: EV owners have sometimes

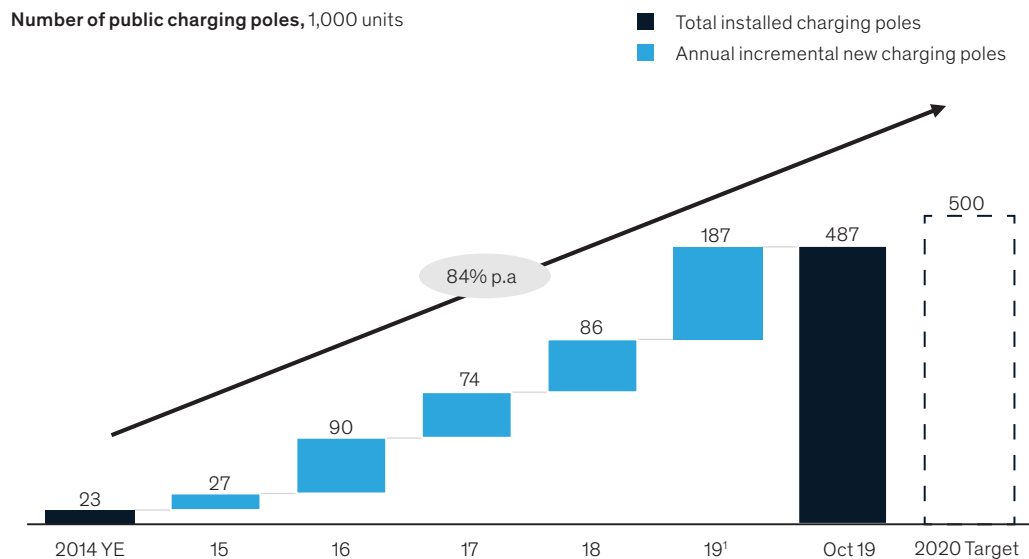
found public charging stations not working or blocked by other (ICE) vehicles. At the same time, charging infrastructure operators are concerned about a profit-losing utilization rate as low as 10%.

In addition, there is progress regarding the availability of semi-public and private charging stations. The New Energy Vehicle Development Masterplan 2021-2035 (draft) encourages the use of shared charging stations within gated residential communities as well as smart-charging facilities at commercial sites. In July 2019, the largest real estate developers in China partnered with the State Grid Corporation of China to drive smart charging service at their real estate properties.

Exhibit 10

The public charging network has grown rapidly during past few years

Number of public charging poles, 1,000 units



¹ Jan - Oct 2019
Source: EVCIPA (December 2018)

2.3 Today's BEV buyers are a lot different from ICE vehicle buyers

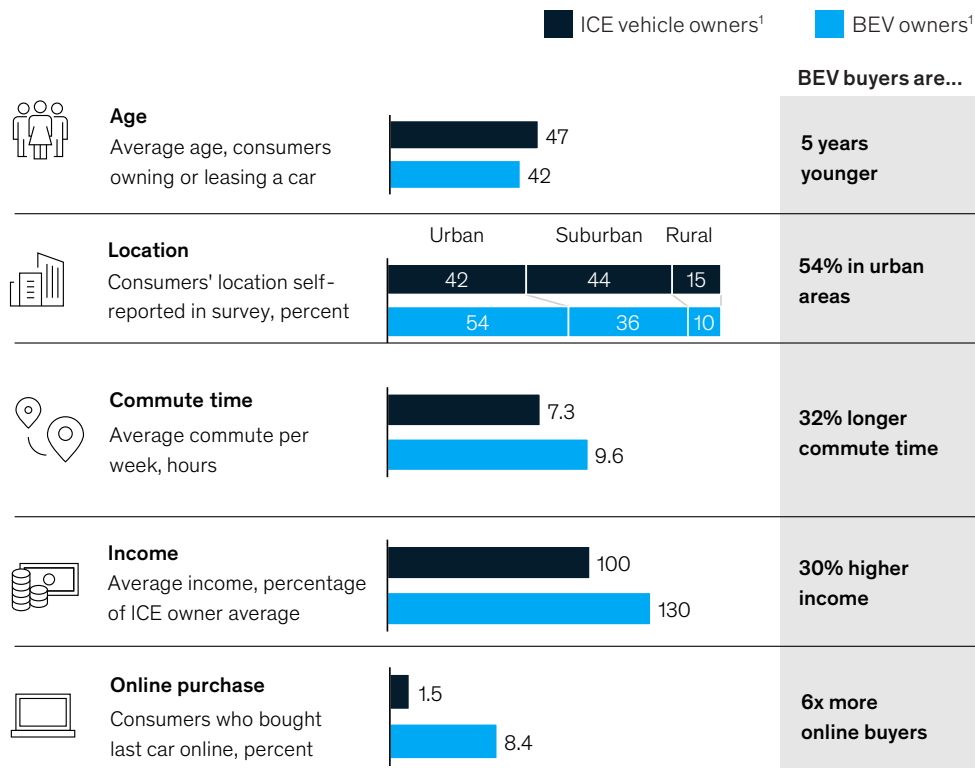
One key to boosting BEV adoption may be developing an understanding of the stark differences between today's BEV and ICE-vehicle buyers. Our research has shown key differences in several areas related to demographics, attitudes, and perceptions. BEV owners differ from their ICE vehicle-buying counterparts within the following five key demographic characteristics (Exhibit 11).

Specifically, BEV owners:

- Are on average five years younger
- Are more likely to live in urban areas
- Have a 32 percent longer commute time
- Earn 30 percent more
- Are six times more likely to have bought their last car online

Exhibit 11

5 key characteristics distinguish EV owners from ICE vehicle owners



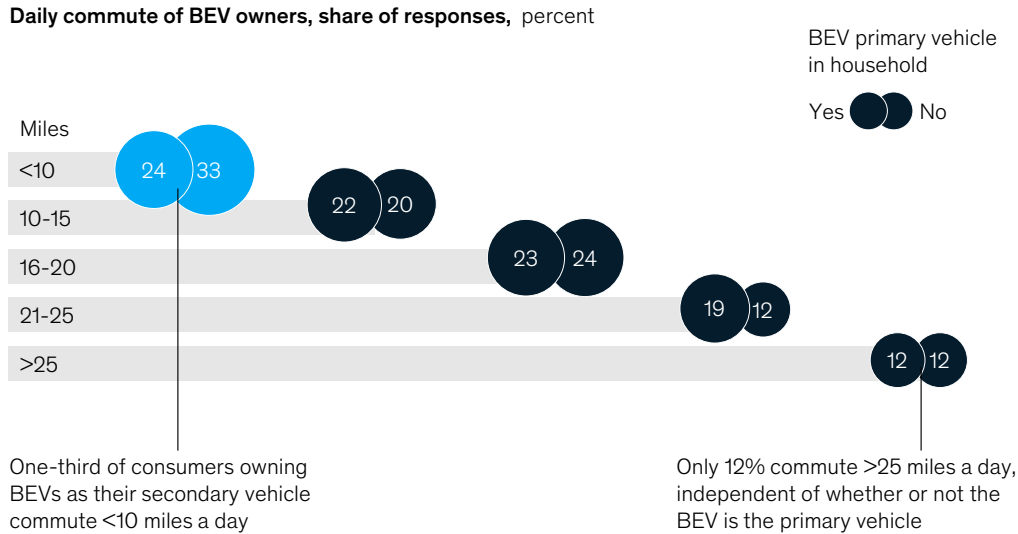
¹ Average of China, Germany, Norway, and the US
Source: McKinsey EV Consumer Survey 2019

The early adopters of BEVs appear to be a specific fraction of consumers who can be described as tech-savvy, urban consumers with above-average incomes, and who are much more accustomed to online shopping.

Current BEV owners have a broad range of commute times, but a significant share of them travel less than 10 miles per day: 24 percent of BEV owners for whom the BEV is the primary household vehicle and 33 percent for whom the BEV is not the primary vehicle (Exhibit 12). Only 12 percent of BEV owners have a daily commute of more than 25 miles.

Exhibit 12

Current BEV owners drive mostly short distances, no matter whether they use their BEV as a primary or secondary vehicle



Source: McKinsey EV Consumer Survey 2019

Looking at attitudes and perceptions, BEV owners describe the driving experience as the primary benefit of BEV ownership. Specifically, one third of all benefits perceived by BEV owners relate to the EV driving experience – up from one fifth three years ago. Revealingly, EV owners mention the appeal of the EV driving experience with the same frequency and experience as consumers in the EV consideration stage, suggesting that expectations become fulfilled once consumers buy and experience EVs.

Early adopters are also more likely to find ways to adapt to the new battery and charging technology, because they mention it slightly more often as a benefit (8 percent instead of 6 percent, Exhibit 13) and slightly less often as a concern (35 percent instead of 38 percent). However, battery-and charging-related concerns are still, by far, the most frequently mentioned concerns.

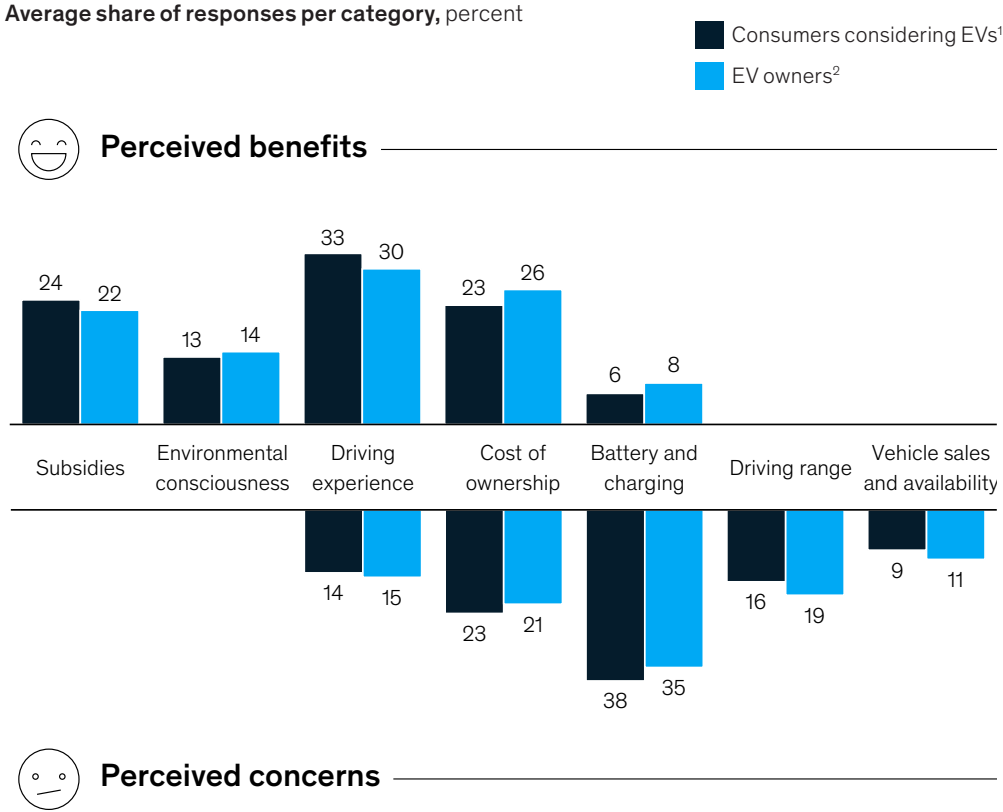
Given that EV performance is improving and exceeding consumer expectations – nine out of ten EV owners would consider purchasing an EV again – a key task for OEMs and their dealer outlets is to convince the average consumer of the benefits of EVs and to alleviate any remaining concerns about EVs. Today’s typical EV buyers live in cities and buy EVs because they only travel short distances, so range anxiety is not a key concern. Another motivating factor in their EV purchase – at least in some markets – is that larger cities are increasingly restricting ICE vehicles in city centers. To expand EV adoption beyond the urban, tech-savvy consumers who are easily accustomed to EVs, OEMs will need to adapt their sales approach so that it teaches and convinces other consumers who commute longer distances, are older or not as tech-savvy, or have significant concerns regarding whether an EV can actually fulfill their mobility needs.

91%

of EV owners would choose an EV again in their next purchase

Exhibit 13

Benefits and concerns perceived by EV considerers and EV owners



¹ Average of consumers considering BEVs and consumers considering PHEVs
² Average of BEV and PHEV owners
Source: McKinsey EV Consumer Survey 2019

Text Box and Infographics 4: deep dive on consumer insights in the US

EV consideration in the US: low on average but highly variable and growing

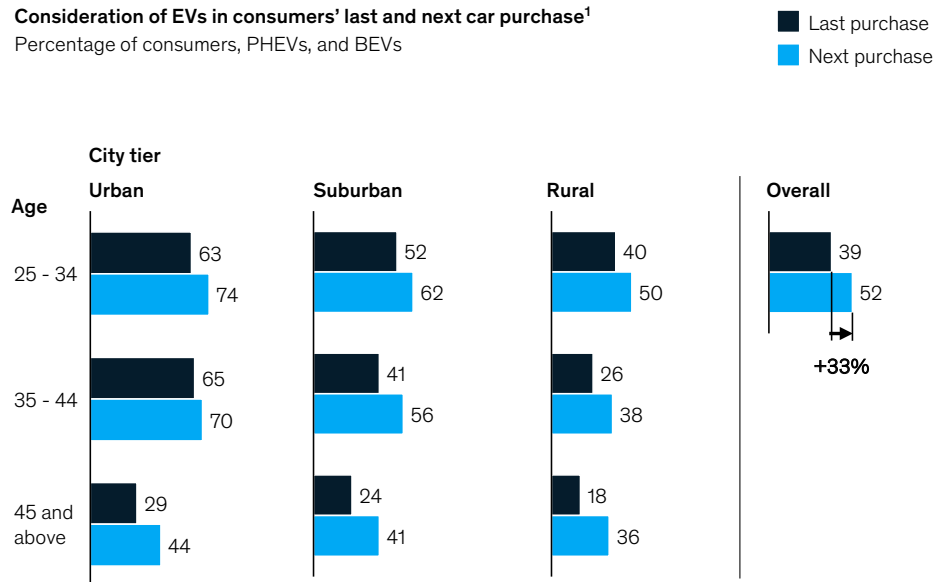
When making their most recent vehicle purchase, around 39 percent of consumers in the US considered an EV, the lowest rate among the four key markets in the study (Exhibit 14). This average, however, masks a large spread and significant differences across consumer groups. Specifically, younger consumers in urban areas are the most represented among those who considered an EV (approximately 65 percent), while older consumers in rural areas were least represented (18 percent).

Regarding their next vehicle purchase, now, 52 percent of US consumers expect they will consider an EV, which represents a 33 percent increase over the share who considered EVs in their most recent vehicle purchase. Overall, the increase can be observed across all consumer segments, city tiers, and age groups, but it is the segment that considered EV the least (older, rural consumers) who represents the biggest jump from “last car” to “next car” (a 100 percent increase). OEMs should gear their go-to-market approach to such consumers.

Exhibit 14

Consideration of an EV is consistently higher with younger, more urban populations

Consideration of EVs in consumers' last and next car purchase¹
Percentage of consumers, PHEVs, and BEVs



¹ Last purchase, on average, 19 months ago, next purchase expected in, on average, 19 months
Source: McKinsey EV Consumer Survey 2019

EV penetration: very low but growing

The total annual EV market size in the US is around 310,000 vehicles (2019, BEVs and PHEVs), which is slightly less than one-fourth of the annual Chinese market (about 1.2 million EVs). Market penetration of BEVs in the US rose to 1.3 percent in the first half of 2019 and is increasing steadily.

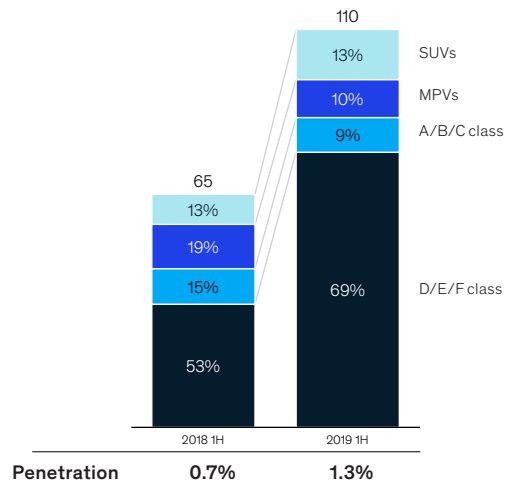
Growth comes mainly from large vehicles in the D/E/F class segments, which is in stark contrast to China's A- class and below-A- class segment growth. Specifically, 70 percent of all BEV sales in the US in the first half of 2019 were D-/E-/F- segment cars.

Exhibit 15

Sales breakdown of BEVs, first half of each year, 1,000 units

Growth in BEV sales mainly from large cars in the D/E/F class segment

US



Source: IHS Markit (sales forecast as of November 30, 2019)

Charging is a key concern – even in the state with the densest charging network

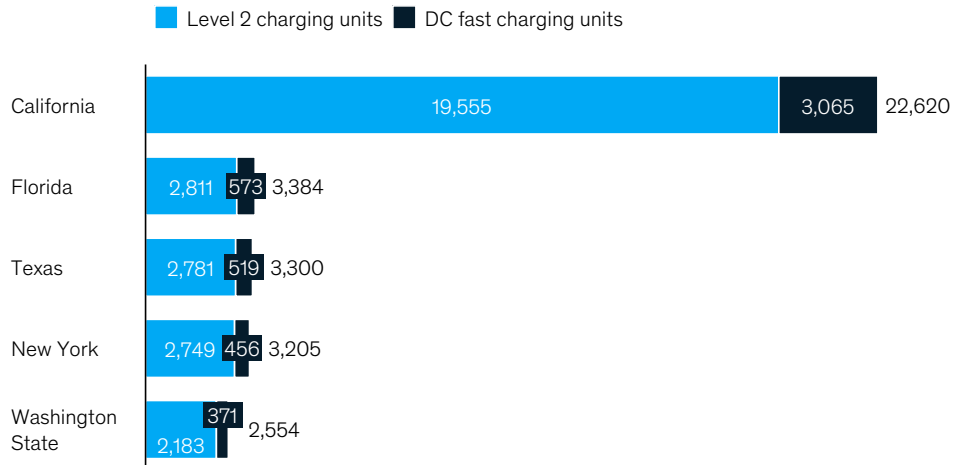
As in other regions, battery/charging and driving range are the most important concerns among US consumers (approximately 47 percent of consumer responses about their expressed concerns related to battery/charging and driving range). More specifically, the main concerns in the US are the speed of charging and the availability of public charging stations.

The distribution of the charging network in the US is very uneven. California, by far, has the most public charging poles of all states in the US. Even when accounting for size or population, the charging network in California is the densest. However, consumers in California are just as concerned about access to charging stations (around 20 percent) as the consumers in states with just a fraction of California's charging network.

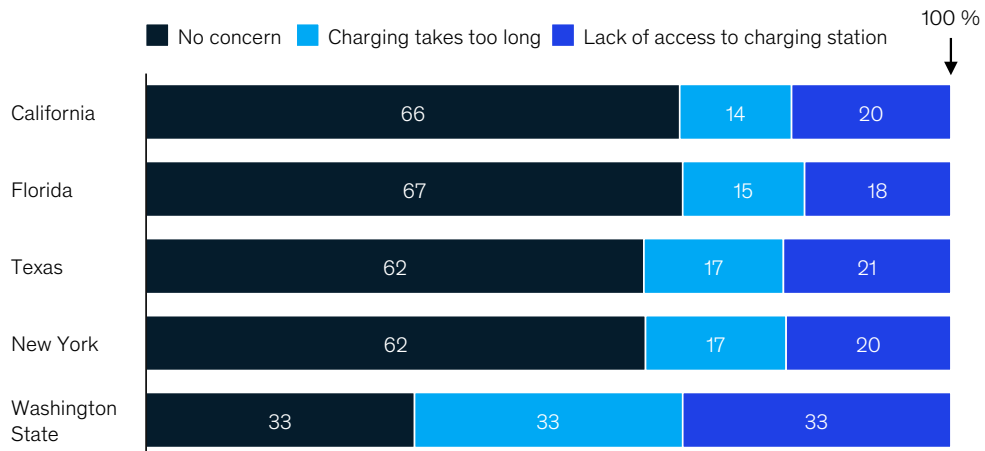
Exhibit 16

California has, by far, the densest charging network; yet consumers are no less concerned about ease of charging

EV charging units by state



EV charging concerns of consumers by state



Source: Elektrek Analysis (July 2019); McKinsey EV Consumer Survey 2019

3. Measuring consumer car-buying experiences sheds light on OEM EV sales readiness

As the results of the current EV Consumer Survey in Chapter 2 show, consumer attitudes about EVs have improved significantly since 2016. OEMs should thus make systematic efforts to affirm consumers' growing positive attitudes towards many aspects of EVs (such as the driving experience and subsidies), disprove their concerns that do not reflect reality (such as range anxiety), and solve pressing pragmatic problems (such as the availability of charging stations), which might differ regionally.

To help OEMs as well as their affiliated dealer outlets optimize EV sales readiness, we developed a six-dimensional measurement instrument (Exhibit 17) and conducted a mystery shopping exercise at the dealer outlets of some major OEMs to analyze their EV sales readiness in detail. The results pinpoint the areas where dealers can improve their sales process to align with their most successful competitors and positively impact the attitudes of EV customers (see Text Box 5).

Text Box 5: the McKinsey EV Mystery Shopping Survey 2019

This survey employed incognito store visits to assess the six measurable dimensions of the EV sales readiness framework. The survey approach comprised:

- **Eight** OEMs
- **42** store visits in **three** metropolitan areas in **three** key markets (Los Angeles, Düsseldorf/Cologne, Shanghai)
- **Six** EV sales readiness dimensions, including **29** subtopics assessed

The survey facilitated the detailed analysis of the EV sales readiness by country, by OEM, and by individual dealer. Examining sales readiness along the 29 subtopics guides the identification of opportunities for OEMs to improve.

3.1 Quantifying OEM EV sales readiness

We identified six key dimensions that characterize OEM readiness to sell EVs and to identify the critical assets in the sales process to boost their EV sales (Exhibit 17).

In-store experience. A superior in-store experience is essential for attracting undecided consumers to EV models and resolving their concerns. By designing a state-of-the-art in-store experience, OEMs and their dealer partners can showcase EVs in ways that both excite and reassure

Test-drives. Our insights about current EV owners and general consumers considering a purchase indicate that the experience of driving an EV can help seal the deal. By proactively marketing the EV driving experience and offering test-drives, dealers can help convince customers

Sales process. The way EVs are presented and explained to consumers is essential. A solid sales pitch should be crafted and delivered with the objective of convincing customers of the wide range of benefits of EVs and alleviating the pressing concerns that we identified in Chapter 2. Sales readiness is high if customers can be convinced that EVs are on equal footing with ICE vehicles on some dimensions and outperform ICE vehicles in other dimensions

TCO know-how. A detailed understanding of the true and holistic cost of EV ownership is an asset to OEMs. The ability to clearly communicate the TCO advantage of EVs is critical to winning consumers who care about the lifetime cost of car ownership

Battery know-how. The ability to provide clear answers to questions related to the EV battery, such as warranty and range, helps address a critical consumer concern. This includes, for example, the knowledge of what happens with the battery at the end of the warranty and then at the end of the battery's life – a question of concern for most consumers

Charging know-how. Though largely irrational, “range anxiety” is prevalent. OEMs should develop their capacity and capabilities to help consumers understand how charging works – including charger installation and usage – and provide individual, tailored advice to customers on how they can charge their vehicle, given their personal driving patterns.

Exhibit 17

We define 6 EV sales readiness dimensions to analyze to what extent dealers are addressing the prevalent consumer uncertainty preventing EV adoption

6 dimensions to quantify OEM EV sales readiness	Observed uncertainty among consumers (non-exhaustive)	
<p>In-store EV experience Design a state-of-the-art experience to showcase EVs and consult customers</p>	47% think new entrants, rather than incumbents, are leading the market	Innovative retail and flagship store experience drives consumer perception of EVs
<p>EV experience during a test drive Advertising the driving experience by proactively marketing test drives</p>	EVs are expensive and difficult to charge	EV driving experience with large potential to surprise and retain consumers (9 out of 10 would repurchase an EV)
<p>EV sales process Present EVs on equal footing with ICEs</p>	Black or white debate on EVs, e.g., expensive and eco-friendly	Wide range of EV benefits: high tech and performance, financially attractive, and eco-friendly
<p>TCO know-how Explain TCO differences based on individual use case of customer</p>	Batteries make EVs USD 5,000-10,000 more expensive than comparable ICE vehicles	14% lower TCO for A/B class EVs in the EU
<p>Battery know-how Provide answers to customers critical concerns about range and warranty</p>	Consumers concerned about battery lifetime and residual value	Many EVs come with a > 7 year warranty, and batteries may work longer than the vehicles lifetime
<p>Charging know-how Exhibit charging solutions in-store and consult customers on installation and usage</p>	>50% express charging/range as top concern	Some owners appreciate ease and convenience of charging

Source: McKinsey EV Consumer Survey 2019; McKinsey

3.2 There are striking differences in OEM EV sales readiness

The findings of our mystery shopping study highlight for OEMs and their dealers both the EV sales pitfalls and the opportunities on how to convince more consumers to buy EVs. In a cross-country comparison of OEM dealer outlets in Germany, China, and the US along the dimensions of EV sales readiness, Exhibit 18 illustrates these key insights. Exhibit 19 on page 30 further details the insights for selected subtopics.

The insights can be consolidated in the following 10 pragmatic recommendations of EV sales readiness.

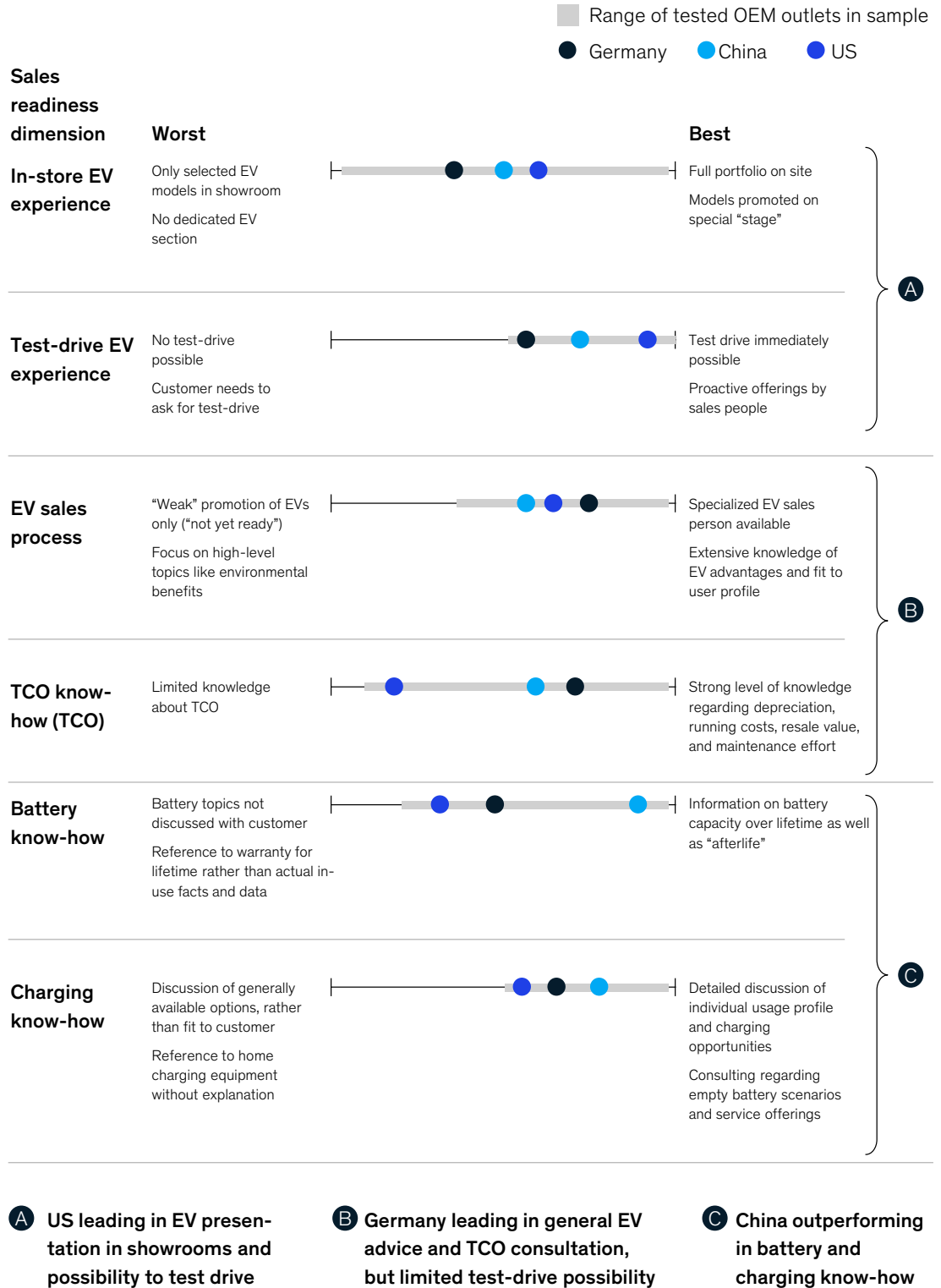
In-store EV experience

- I **Present the complete EV product portfolio in all stores.** While almost all outlets in China (11 out of 12) had some EV models on display in the showroom, only two stores had the whole product portfolio on display at the outlet (either inside or outside the showroom). In the US, most outlets (12 out of 15) had EV models available for inspection at the dealer site – e.g., parked outside the showroom – but the majority (10 out of 15) did not present the models in the showroom. As EVs move towards mainstream, customers will demand a variety of EV models to fit their different needs – this calls for OEMs to exhibit the complete portfolio of EVs.

- II **Elevate EVs to a “special stage” next to ICE vehicles.** For an optimal EV in-store experience, the complete models should be presented side by side with ICE vehicles in the showroom and especially promoted as a new technology, as many consumers are not familiar with these vehicles. We have often observed the opposite. Except for outlets in China, EVs were typically positioned in a corner of the showroom floor or not at all. In one case, the only EV that the sales staff could show was the private car of a member of the sales staff.

Exhibit 18

A cross-country comparison of sales readiness shows large differences in TCO and battery know-how



Source: McKinsey EV Mystery Shopping 2019

Test-drive EV experience

- III Make test-drives available.** While almost all outlets in all three regions, particularly in the US, offered EV test drives, there were stark differences in how quickly customers could embark on a test-drive. In Germany, some customers were only able to test-drive an EV after having it delivered from the headquarters of the vehicle manufacturer, requiring a significant amount of time and the transport of the test vehicle over hundreds of kilometers. Making test-drives immediately possible on-site to consumers without any barrier (ideally at no cost and with the ability to make short-notice appointments online, via telephone or in-store) is the reference point.
- IV Proactively advertise test-drives.** We observed stark differences in the way that dealers advertised test-drives. While almost all tested dealers in the US (14 out of 15) proactively offered test-drives that were immediately available, this was only the case for a third of dealers in Germany (five out of 15). Dealers who do not proactively offer test-drives or require consumers to wait for test-drives (to request them a long time in advance) will be less successful convincing consumers of the EV driving experience.

EV sales process

- V Develop knowledge of all EV benefits among sales staff.** We observed that many dealer outlets across regions could list only a single EV benefit, such as government subsidies or environmental advantage. Individually, these are important benefits, however each is only a small part of a wide spectrum of benefits. As we indicated in Chapter 2, consumers are attracted by a diverse set of benefits. For a good sales pitch, there should be sales staff with extensive knowledge about the available EVs, who can advise consumers on how EVs fit their needs and pitch the benefits that fit each customer. While several outlets in the observed regions had sales staff on duty who were able to deliver EV sales pitches as specialized and as tailored as their ICE vehicle pitches, this was not the case across the board. For example, sales staff at only 25 out of 42 dealers globally (60 percent) mentioned the technical benefits (e.g., fast acceleration) of EVs to customers.
- VI Inspire and demand professionalism and enthusiasm among the entire sales staff.** The knowledge and professionalism of sales staff varied significantly. While several dealer outlets of OEMs seem to do a good job in the EV sales process, we did observe very weak and uninspiring promotions, such as, “EVs are not ready yet” or “EVs do not fit your needs”, without asking the consumer about his or her driving behavior. A balanced discussion of all powertrain options with the customer was only possible at 23 out of 42 outlets (55 percent). OEMs should monitor both their own and third-party dealer performance to ensure consistent delivery of an optimal EV sales pitch.

TCO know-how

- VII Be prepared to explain maintenance costs and depreciation to consumers.** Dealers in China and Germany advised customers about the TCO advantage of EVs but were still lacking important

Exhibit 19

Drill-down analysis of EV sales readiness (excerpt): detailed analysis of subtopics covered by the mystery shopping indicates topics that need improvement

Score per country, average of all stores of all brands tested¹

0-4.9

5.0-7.9

8.0-10.0

EV sales readiness Dimension	Subtopics (selection)	China	Germany	US	Selected observations and explanation
In-store EV experience	EVs visible/presented in showroom	9.2	7.3	3.3	Dealers in US have EVs often only parked on-site but not in showroom
	Entire EV portfolio on site	1.7	0.7	8.0	
Test drive EV experience	EV test-drive proactively offered and immediately possible	7.5	3.3	9.3	Test drives in Germany often only possible by appointment
EV sales process	Highlighting of real benefits of EVs (instead of simply justifying common prejudices)	9.2	8.7	4.0	Dealers in US lag in pointing out benefits
	Mentioning of environmental benefits (e.g., less pollution, CO ₂ reduction, noise)	0.0	8.0	4.7	Environmental benefit less important factor
	Pointing out of special EV subsidies/offers	8.3	7.3	9.3	Subsidies are consistently used in sales pitch
TCO know-how	Knowledgeable about TCO (compared to an ICE)	10.0	9.3	1.3	Dealers in US don't know about depreciation and electricity costs
	Knowledgeable about vehicle depreciation after 1 year	0.0	4.7	2.0	Depreciation unknown to most dealers
	Explanation of charging costs	10.0	8.0	2.0	Dealers in US unable to explain TCO advantage
	Knowledgeable about maintenance schedule/effort (cost) compared to ICE	7.5	6.7	4.7	Many dealers in US stated that maintenance is identical (incorrect)
Battery know-how	Knowledgeable about lifetime of battery	9.2	5.3	4.7	Lack of know-how about battery lifetime and warranty outside China
	Knowledgeable about what happens after useful life of the battery	8.3	4.7	2.0	
Charging know-how	Information on public charging possibilities	10.0	7.3	8.0	Tips for chargers in local areas and references to charging apps given
	Information on real driving range under normal conditions	9.2	10.0	8.7	Dealers often explain both nominal and typical driving range
	Explanation of options in case of empty battery	3.3	4.7	5.3	Dealers consistently lack answers on what to do if battery is empty

¹ Scale from 0 = worst performance to 10 = best performance
Source: McKinsey EV Mystery Shopping 2019

knowledge about maintenance efforts, expected depreciation, and resale value⁷. Dealers need to improve their fact base to convincingly answer TCO- and maintenance-related questions and questions about the maintenance effort. The vague statements we observed like “EVs could be less expensive in maintenance costs” are neither sufficient nor convincing. Several dealers in our study were unable to offer any piece of advice in this area and thus further unsettled the consumer. In some instances, our test buyers were provided with incorrect information such as “the maintenance costs are the same [as for ICE vehicles]”.

Battery know-how

VIII Build Know-how among sales staff on battery lifetime and quality. Only dealers in China demonstrated solid knowledge about the topics of lifetime, capacity, and the “after-life” of batteries. Mystery shoppers in the US and Germany typically received only standard responses, such as, “the battery warranty is seven years.” To best alleviate consumer concerns, dealers need to answer consumer questions regarding the battery (including the different warranty options and diminishing capacity over the lifetime of the battery) thoroughly and individually.

Charging know-how

IX Educate consumers interactively on how to navigate charging in every-day usage. Beyond the basics of charging – such as public charging facilities, the different charging products for home, and the driving range under normal conditions – it is the tailored advice offered by sales staff that distinguished some dealer outlets from others. To excel, knowledgeable sales staff should guide the consumer through their new every day life with an EV, e.g., explaining how charging poles at home, at work, or during a shop visit can be utilized, given the specific situation of the individual customer.

X Respond to consumer range anxiety with tailored advice and solutions. Across regions, we observed most dealers falling back to standard responses to answer customer concerns about battery range and charging options. Sales staff at less than half of all outlets globally (19 out of 42) could answer questions about, e.g., what customers should do if the battery unexpectedly becomes flat. Clear guidance on what to do in such a situation paired with a superior service offering (e.g., provision of emergency power, etc.) is necessary to convince the customer. Moreover, dealers should provide consumers with a convenient option to obtain a replacement car for ultra-long drives when going on vacation (e.g., one free voucher per year).

Our observations suggest that decisive action is necessary. Both OEMs and dealers have several opportunities to improve the sales experience for consumers. A superior sales experience is critical to captivate consumers and facilitate their EV purchases.

⁷ Given the technological uncertainties of batteries, it is, of course, difficult today to forecast the residual value of EVs. Dealers could approach these uncertainties in scenarios (e.g., assuming a specific value of the battery after 100,000 miles driven).

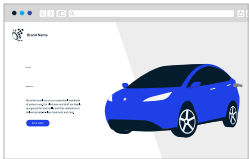
4. OEMs can boost EV adoption by improving the consumer experience

Based on expert and customer interviews, surveys, and proprietary analyses, we have identified five critical make-or-break touch points for gaining a new EV customer or holding on to an existing one (Exhibit 20): the digital moment of truth, the in-store moment of truth, the driving moment of truth, the charging moment of truth, and the service moment of truth. In this chapter, we discuss the actions to be taken by OEMs at each moment of truth in order to win customers.

Exhibit 20

To boost EV adoption, OEMs should focus on mastering five moments of truth

Digital
moment of truth



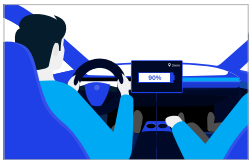
Create a superior online experience with tailored customer advice and omnichannel integration

In-store
moment of truth



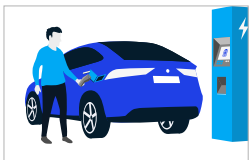
Design a modern store experience to optimally showcase EVs and provide comprehensive know-how

Driving
moment of truth



Lock in consumers on the EV driving experience via test drives and shared-mobility solutions

Charging
moment of truth



Offer a seamless private and public charging experience to address consumer concerns

Service
moment of truth



Provide state-of-the-art service with remote maintenance and world wide service excellence

Source: McKinsey

4.1 Create a superior online experience

Provide a superior Website experience, as most consumers (80 percent and rising) research online when considering a car purchase. The average car consumer spends 14 hours online and one hour offline before buying a vehicle⁸. Ease of experience is key in this moment, and it requires a personalized, modern online store setup. For example, premium OEM Websites often center on a car configurator as the main feature, with sophisticated configuration options yielding millions of possible choices⁹, yet little explanation of the future car experience is given to the customer. In contrast, rising EV-native companies often feature simple and intuitive car configurators with much fewer but easier-to-understand choices. For example, they might offer only three versions labelled “basic,” “standard,” “performance” for the whole engine and power train configuration and enable further customization possible after the car purchase, making choosing a car as easy as selecting a smartphone¹⁰. For each option, OEMs could interactively explain the envisioned use cases and how the car can be used in everyday life (e.g., detailing for each option how often the car needs to be charged per week for a typical consumer). By keeping the EV experience at the center and interactively showing how consumers can drive and charge their EVs, OEMs should use their online presence as an opportunity to focus on the potential benefits and mitigate potential concerns.

Establish an online store for EVs, as 50 percent of car consumers are comfortable with signing contract a online¹¹. Our research suggests that a superior online experience may be even more important to potential EV buyers. EV consumers are on average more tech-savvy with, e.g., 12 percent of BEV customers in the US having made the actual purchase transaction online. Just as important is the seamless integration of online channels with offline sales channels. Integration provides value to the customer as well as opportunities for OEMs to recover margins lost to dealers. Setting up showrooms in city centers or shopping malls complements online shops and provides customers with a low-hurdle opportunity to see the vehicle before purchasing it online. By linking online sales with offline marketing opportunities, OEMs can offer consumers a modern, convenient shopping experience that is cost efficient at the same time.

Develop competitive leasing models and offer EVs in mobility subscription services to adapt to changing consumer preferences. Since a higher share of current EV owners lease their vehicle than ICE vehicle owners (e.g., approximately 80 percent of BEVs in the US are leased), providing competitive leasing models to customers is imperative. Offering convenient leasing models with a mobility guarantee eases any residual uncertainty about the resale value and battery warranty among customers. At the same time, as mobility subscription services (i.e., car-sharing apps and ride-hailing apps) are becoming ubiquitous, OEMs should also partner with mobility service providers to feature EV models. Offering EVs in shared mobility services not only accesses a growing market but also provides the opportunity to convince consumers of the EV driving experience.

8 Data for average car purchase (ICE vehicles and EVs); source: McKinsey Center for Future Mobility

9 Multiplying all possible options for a top model of a large premium OEM yields more than one billion of possible combinations

10 Smart phone manufacturers have limited the choices to few basic choices, e.g., a choice between three colors and three different memory options but offer ample possibilities for (digital) customization via app stores

Source: McKinsey Auto Retail Survey

Offer digital advice and service apps to counter prevalent myths and enhance the customer experience.

Offering additional electronic services, such as specific apps that help customers to calibrate their driving behavior before buying an EV or manage their car (e.g., smart-charging apps to determine when to charge the EV) has become quite common. Several EV manufacturers even offer an “app store” and integrate the car seamlessly with customer mobile devices. Customizing the experience is an effective, cost-efficient approach to achieve the individualization and connectivity that customers demand. At the same time, it paves the way for a more continuous monetization that will become more common in the future mobility landscape. Given the trends towards smarter, more autonomous cars, customers will increasingly be willing to pay for features enabled by additional software that can be acquired after the initial car purchase. Future EV customers will want their digital life to extend from customer mobile devices to their car.

4.2 Design a modern store experience

Change from car sellers to trusted advisors who interactively address consumer concerns and provide advice using innovative methods. Customer concerns need to be fully and proactively addressed to turn EV consideration into EV purchases. Many dealers only provide standard answers rather than tailored, trusted advice. To excel in this regard, technological aids, such as personalized, tablet-based visualization of costs tailored to individual driving behavior or the in-store demonstration of wall chargers can be implemented. Answering questions before they are asked and anticipating and allaying fears before they arise is key. Given the increasing importance of online shopping, the role of sales staff at dealer outlets is augmented too. Rather than a focus on transactions with the aim of selling as many EVs as possible, dealer staff should assume the role of knowledgeable, trusted advisor to their customers. The in-store experience has the potential to win over customers or lose them forever.

Fully and prominently display the whole EV portfolio, as 70 percent of customers see the physical car experience as the main reason for their dealer visit¹². As consumers increasingly obtain information from the internet, the relevance of the physical car experience is elevated. Dealers should leverage this by centering the customer in-store experience on product representation (“showroom”) rather than the typical set up of large desks between just a few cars.

Address younger, urban, tech-savvy customers – the early adopters – through customized marketing and “experience stores” within cities/shopping centers. Because our findings show that current EV owners – the early adopters – mostly live in cities, OEMs should establish urban consumers first by providing a superior in-store experience in city center outlets and installing flagship stores in city centers. This customer segment will be easiest to convince, as they typically drive short distances (i.e., range anxiety less prevalent) and are more affected by EV-friendly regulations in cities that are being unveiled around the globe. Once this customer segment is convinced, they will help to spread the word about the benefits of EVs.

4.3 Lock in consumers on the EV driving experience

Move the test-drive experience from “hard to get” to “instantly available” with online booking tools.

Given the importance of regions on the EV driving experience and the observed hassles in arranging test drives in some regions, OEMs should focus on making the booking of test-drives in person and via Websites as easy as possible. Consumers should be able to book test-drives free of charge on short notice via the internet, telephone, or in-store.

¹² Source: McKinsey Auto Retail Survey

Advertise EV test-drives to all customers, rather than having customers ask for them. Test-drives should be offered proactively at dealer outlets and with minimal hurdles. Proactive marketing to promote EV technologies through special events, for example, can boost customer conviction among the average consumer, who – unlike young, tech-savvy individuals who are less wary of and more willing to adopt new technology – need guided introductions to new technologies.

Create other low-barrier, hands-on “EV experience” opportunities beyond test drives. Partnering with taxi companies, and shared mobility providers, such as car-sharing apps or ride-hailing platforms is another important method to pull customers into the EV experience. On average, 32 percent of consumers would pay extra for an EV when booking, and there is potential here to reach and influence consumers. Customers who become familiar with EVs in this way get a sense of the EV driving experience, including – in the case of car sharing – developing an understanding of how charging works.

4.4 Offer a seamless charging experience

Provide a seamless charging experience in the public, semi-public, and private space. Offering seamless private and public charging experiences to consumers addresses their two most critical concerns regarding EVs – battery/charging and driving range. A seamless charging experience requires that customers can easily find charging stations, use them without technical difficulties, and bill the costs transparently to a single customer account. Currently, as more charging providers enter the market, a main drawback is the lack of interoperability of existing services. For example, there are dozens of different smartphone apps from charging infrastructure providers available to pay for the charging that typically require a separate registration – making the customer experience cumbersome. Moreover, a critical customer concern in some regions is the charging costs – the primary concern regarding charging in Germany (Exhibit 21). Good cost transparency and reasonable prices at public charging poles – especially in the long run – are necessary to convince many consumers in these markets. Overall, consumers will only accept EVs in the long run if they can charge them easily, at a reasonable cost, and at any public charging pole close to them.

Increase density of (semi-)public charging networks. While currently many early adopters of EVs charge at home, future growth is only possible if consumers without the option of installing a charger at home can also easily charge their vehicle – e.g., while parked on the street. Making charging stations available when and where EV drivers need them by making them accessible, available, and easy to find is key as currently 43 percent of all charging instances of current BEV owners occur at public charging stations. To build dense charging networks, OEMs need to engage in partnerships with governments and infrastructure providers to install public charging stations and at the same time enable retailers, office locations, and managers of residential buildings to install charging stations as well.

















Increase the availability of fast chargers to counter the most critical consumer pain point. To manage consumer demands for fast charging – the primary concern in two out of the four markets we analyzed (i.e., in Norway and the US, Exhibit 21) – the provision of fast chargers seems critical. To enable consumers to take long, cross-country trips (e.g., driving for a vacation) with EVs, an expansion of the fast-charging network is key especially along highway routes. At the same time, by advertising a new “charging lifestyle” in which cars are charged for 30 minutes during a lunch break or a visit to a point of interest, a major pain point can be turned into an opportunity.








Provide smart charging, as 64 percent of BEV owners would like to or already participate in smart-charging services. Facilitating smart charging is desirable not only because customers demand it (to profit from lower electricity prices in off-peak times, among other reasons), but also because it provides a meaningful way to manage the charging habits of the growing number of EV owners to balance the stability of the electric grid.

Exhibit 21

EV owners are mostly unsatisfied with the speed of charging and availability of public chargers

Key concern points regarding EV charging per country

	1st concern	2nd concern	3rd concern
 Norway			
 US			
 Germany			
 China			

-  Speed of charging
-  Cost of charging
-  Chargers difficult to find
-  Availability of public chargers
-  Managing battery charge
-  Location of charging station
-  Breadth of public charger network

Source: McKinsey EV Consumer Survey 2019

4.5 Provide a state-of-the-art service experience

Car companies need to be customer centric, but about 70 percent of car customers do not perceive OEM as customer centric¹³. A step change in the after-sales service is required. In the context of EVs, OEMs can introduce a new level of customer-centric service offerings. OEMs may consider, for example, building a close-knit network of certified service providers in addition to their own outlets to quickly execute guaranteed services, such as battery changes or other critical battery services. In addition, they may provide recharging services in case of an empty battery or provide replacement vehicles for particularly long journeys (e.g., during a move or when going on vacation). With this model of service, customers are more likely to believe that car companies are looking out for them even after they have made the purchase and feel more comfortable switching to an EV as their primary vehicle.

Differentiate by offering continuous connectivity and digital maintenance planning, as 40 percent of consumers would switch car brands for better connectivity. Online management of cars has become a standard for several car brands and will continue to be an important sales criterion for many consumers. We have already established that EV consumers are tech-savvy, but this applies to more than vehicle research and purchase. They also demand state-of-the-art after-sales services that are always available and connect to their smartphones. This includes, in particular, the online management of all after-sale services and software updates via the internet. For example, an online account accessible via a smartphone app and online website could host all service-related information regarding the EV, including alerting the customer when a replacement of parts, such as the brakes, is necessary and offering the possibility to update the software online as new software versions or features become available.

OEMs and their dealer partners can take targeted measures to ensure that they master these five moments of truth – helping to build the case for EVs in the eyes of the customer. However, the relevance of each factor depends on the region and the car brand itself, thus requiring a balanced discussion for each OEM regarding what they should focus on.

¹³ Source: McKinsey Center for Future Mobility, *"The Future of Automotive Retail"*

Outlook

Sparked by increasing environmental awareness across the globe and consumer demand for cleaner cities, governments around the world are going to push even further for EV adoption. Many national governments and local municipalities alike have implemented a variety of “sticks” (restrictions and fees tied to ICE vehicles) and “carrots” (purchase subsidies and greater street access tied to EV vehicles) to foster greater EV adoption.

With all incentives implemented, EVs would be on a fast track towards widespread adoption. In fact, OEMs are planning to release an unprecedented number of EVs to market in the coming years – 400 new BEV models by 2025. The challenge now is to bring consumers more fully onboard. A small segment of tech-savvy consumers is already leading the adoption wave, but a more critical mass of consumers will have to become more comfortable with the idea that EVs can reliably and comfortably get them from Point A to Point B.

Getting started on improving OEM EV sales readiness

The conditions for a large-scale consumer pull for EVs have never been as positive as they are today. For widespread adoption to become a reality, though, consumers will need to be convinced, in greater numbers, of the upsides of EV ownership. It has become apparent from our research that consumers will only switch to EVs if they meet their needs. The good news for OEMs is that (i) objectively seen, the benefits of EVs clearly outweigh the concerns, and (ii) that OEMs are in the driver’s seat when it comes to pulling the additional levers necessary to convince consumers that EVs can work for them. In other words, OEMs in particular can make a decisive contribution to consumers understanding EV benefits – and that those benefits outweigh their concerns.

At the same time, OEMs should act quickly to shape the ecosystem and differentiate themselves early by understanding customer needs. OEMs who lead in customer centricity will be able to attract new customers. Furthermore, it could well be that those OEMs who provide a superior EV experience will be able to reestablish customers who have chosen and cultivate new long-term relationships, especially in the premium segments.

Assisted by the analytical toolkit we have developed (i.e., the EV consumer survey and the six EV sales readiness dimensions), OEMs have several opportunities – online, in the showroom, on the road, and in the repair shop – to educate and excite consumers about EVs and build their confidence in the idea that EVs are the reliable and affordable next wave of individual mobility. OEMs will want to assess their strengths, consider their options, and follow a smart approach to ensuring that the EVs they are bringing to market are purchased by a growing number of customers.

The advent of EVs marks the second turning point of the automotive industry

At the beginning of the 20th century, horse-drawn carriages were replaced by cars as the ubiquitous means of transportation in cities within just a few years – marking the first turning point of the automotive industry.

The advent of EVs marks the second turning point of the automotive industry and will be a critical milestone towards the future of the industry. This time, the disruption of conventional ICE vehicles by EVs will be strongest in cities.

OEMs should, therefore, focus on big cities with electric mobility. The OEMs that master the five moments of truth of electric mobility will also be the first ones to develop a profitable EV business model and gain a competitive edge.

While these technological developments bring numerous opportunities by themselves for OEMs, suppliers, and after-sales players to succeed in new markets, business models will also have to transform. Future key technological developments in the industry will be related to connected and autonomous car technologies; a shared vehicle ecosystem; and more connectivity among the vehicle, the driver, and his/her devices. OEMs that excel in EV technology will likely be in a better position to also shift gears and make the transition into these future business models.

The change from “vehicle as a product” to “mobility as a service” will bring new experiences to consumers and provide ample opportunities for automotive players across the value chain to transform their business models into subscription models and lifecycle monetization. In the decade ahead, OEMs will need to master both technological development and the transition to new business models to succeed.

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