



AUTOMOTIVE

Regulation and Electrification in Vehicle Sales Forecast Scenarios

How will forecasts reflect disruptive trends?

28 February 2017 | Tokyo, Japan

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**INDUSTRY
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- Scenario concept
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Preliminary questions

How are disruptive trends impacting your planning processes?

Which transparency and understanding of forecast/planning backgrounds do you require?

Which 'what if' questions do you need to answer?

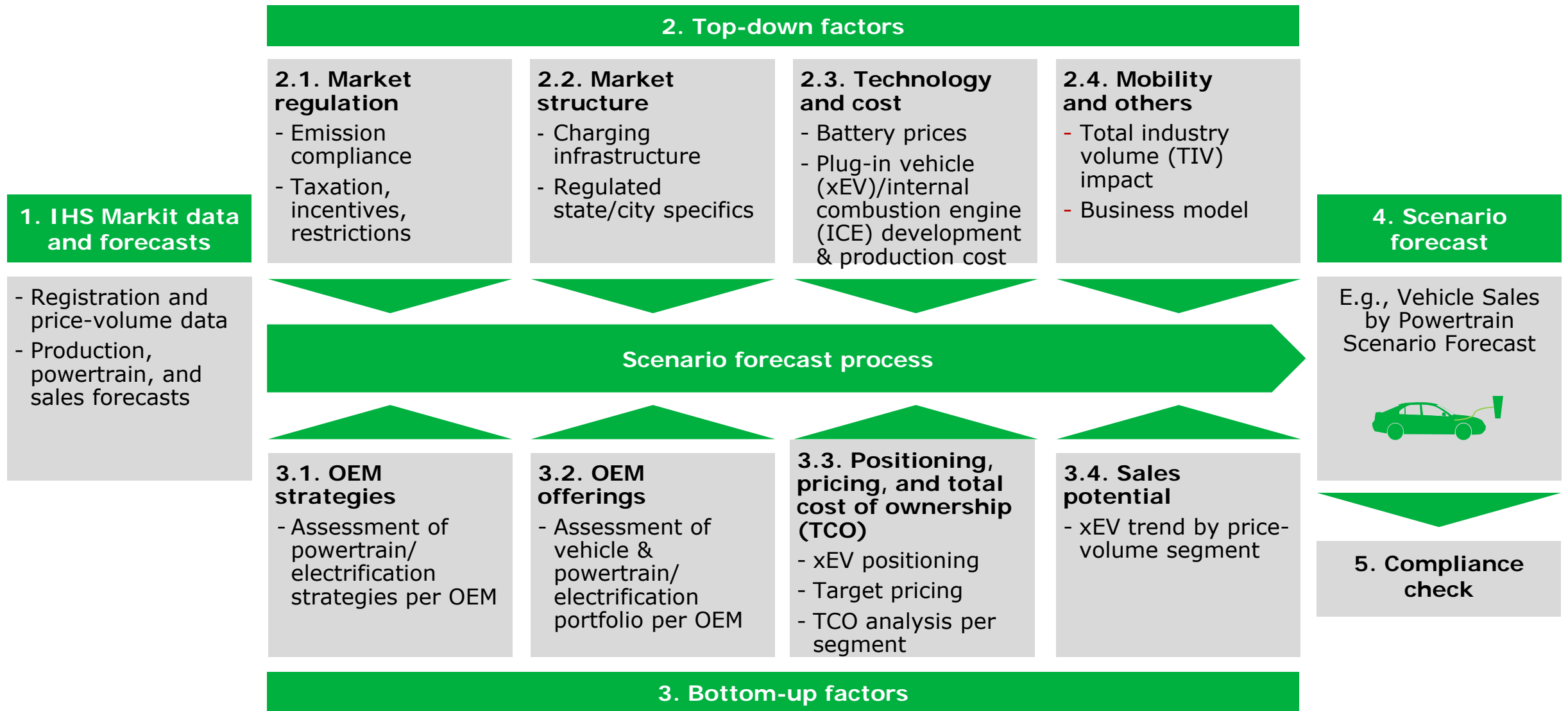
Do forecast backgrounds and scenarios give answers to these questions?

What are your current and future expectations regarding automotive information, forecasts, or supporting services?

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Scenario concept



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China—city restrictions are major forecast drivers



Two major types of city restrictions

License plate ban

- First introduced in Shanghai in 1986 to reduce carbon dioxide (CO₂) emissions and traffic in the city center
- Vehicles cannot enter the city center every day and are banned for one day of each week, depending on the number on their license plates
- Exception for neighborhood electric vehicles (NEVs) with special green license plates

Car quota system

- First introduced in Beijing in 2008 to reduce private vehicle volume and create safer, more livable cities with lower registration rates
- Works like a lottery and includes better chances for NEVs to get a license plate (e.g., gasoline license plate in Shanghai costs CNY90,000)
- Beijing already set a cap to have not more than 6 million registered vehicles in 2017 and 100,000 vehicles a year from 2018–20

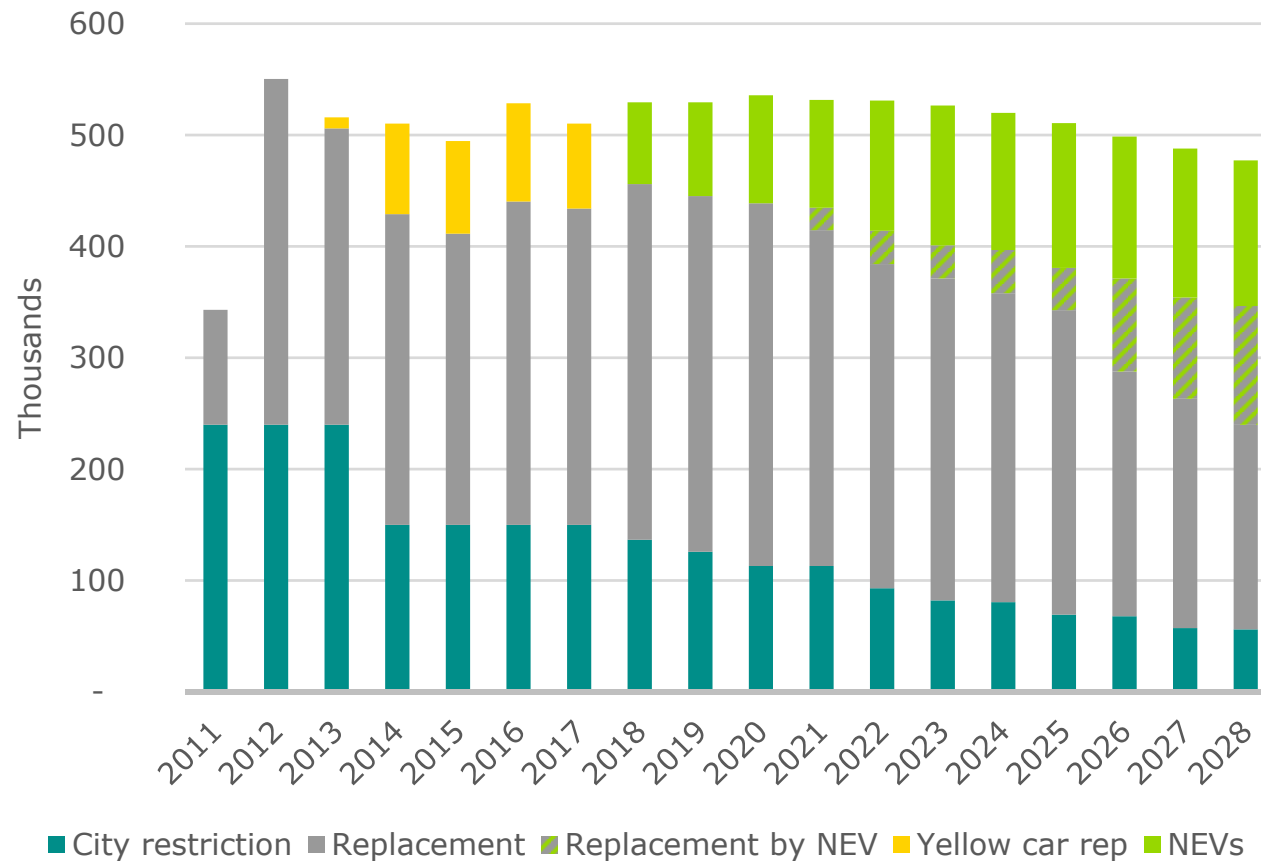
Top-30 potentially restricted cities

Restricted cities	Beijing	Shanghai
	Guangzhou	Shenzhen
	Hangzhou	Tianjin
Signs of city restrictions	Changsha	Shenyang
	Chongqing	Suzhou
	Nanjing	Taiyuan
	Ningbo	Zhengzhou
	Chengdu	Ürümqi
	Donguan	Wenzhou
Potential restrictions	Foshan	Wuhan
	Jiaxing	Wuxi
	Jinan	Xi'an
	Kunming	Xiamen
	Qingdao	Zhongshan
	Shijiazhuang	Zhuhai

China—NEV quotas will affect sales significantly



Beijing vehicle registrations by registration type, 2011–28



- Beijing introduced its license plate restriction scheme in 2011. The lottery-based system allowed 240,000 new plates to be issued each year. This limit was reduced to just 150,000 units in the beginning of 2014. IHS Markit assumes that this level will be maintained until the end of 2017 as the regulations have already been put in place.
- The main goal of the controls was to limit road congestion while expanding the Beijing metro system in parallel, increasing its size and coverage by a factor of three or four by 2020.
- In line with new national government guidance (September 2015), NEVs are no longer to be subject to licence plate or circulation restrictions.
- After 2020, NEVs will become common, so that they are assumed to be included in a separate cap (in line with assumptions on other restricted cities at that time).

China—infrastructure will support NEV convenience



Charging infrastructure development in China

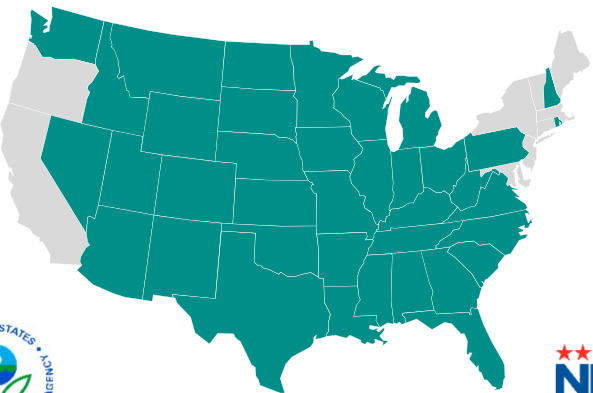


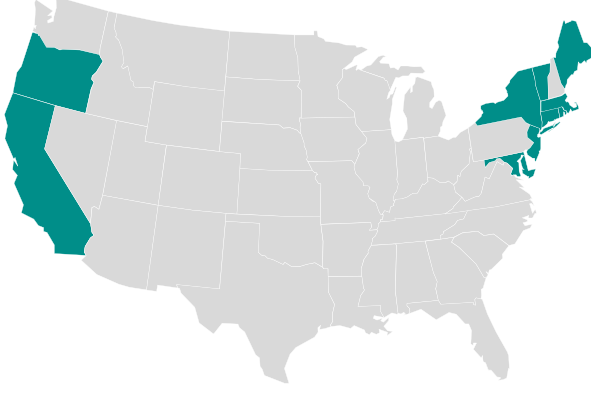
- Regional focus**
 - Main focus on East, North, and South China, including megacities Beijing, Shanghai, Guangzhou, and Qingdao
- Charging standard**
 - New Chinese charging standard from early 2016 supports both DC fast charging and level 2 charging
- Infrastructure development**
 - About 81,000 public charging stations and more than 50,000 private charging stations
 - USD600 million investment in 2016
- Ambitious target**
 - Government aims to build 12,000 charging stations, 4.8 million charging points by 2020
 - Investment of up to USD19 billion



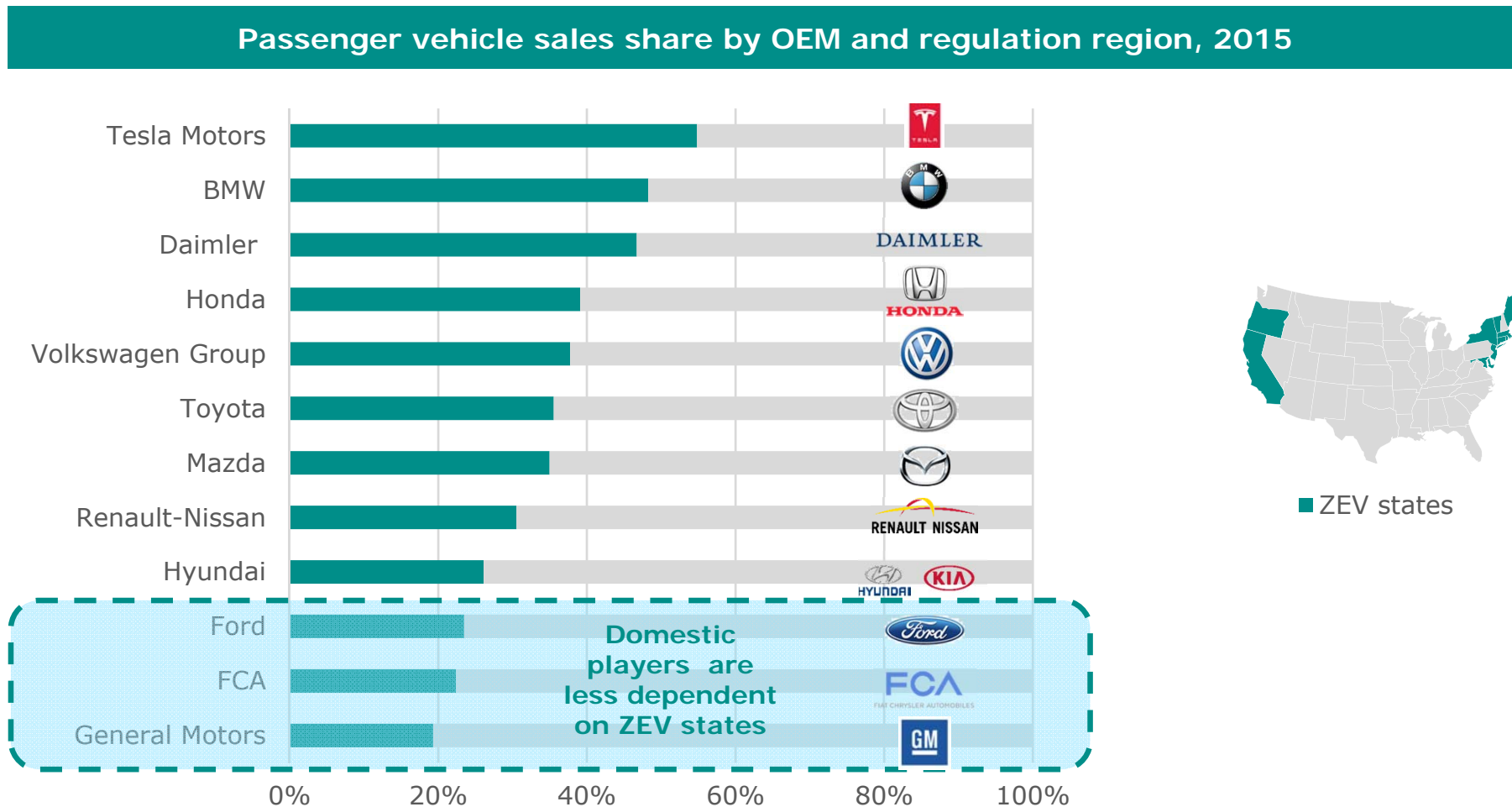
United States—a market differentiated by two regulations



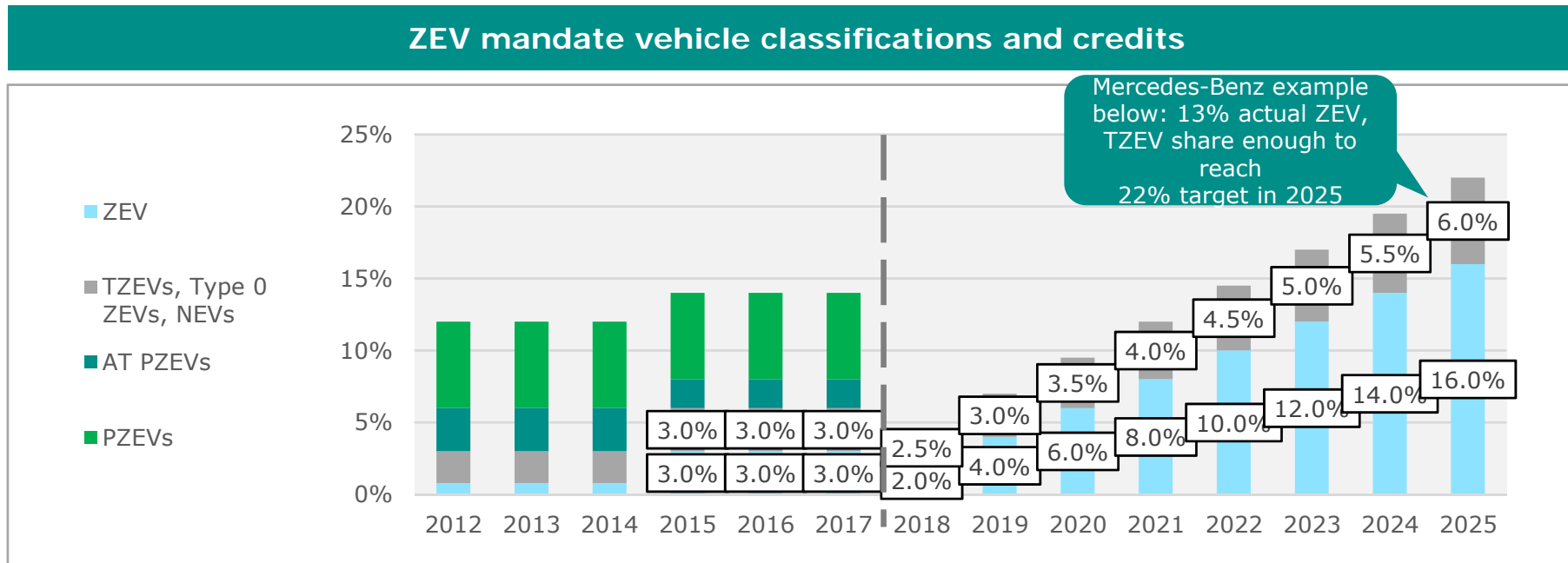
Section 177 of Clean Air Act allows states to choose from:

National regulations	or	California zero-emissions vehicle (ZEV) mandate
 <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;">   </div> <ul style="list-style-type: none"> The US Environmental Protection Agency (EPA) has established national greenhouse gas emission standards. National Highway Traffic Safety Administration (NHTSA) has established Corporate Average Fuel Economy standards. Parallel standards are combined in nationwide standards until 2025, mandatory for all states not using section 177. 	or	 <ul style="list-style-type: none"> California is allowed to set own (stricter) emission standards owing to special provisions in the Clean Air Act. ZEV mandate forces OEMs to sell increasing percentages of transitional ZEVs, i.e., battery electric vehicles (BEVs), fuel-cell electric vehicles (FCEVs), and plug-in hybrid electric vehicles (PHEVs) until 2025. As other states are not allowed to set own regulations, nine so-called Section 177 states have chosen to follow the ZEV mandate instead of national regulations.

United States—domestic OEMs are less dependent on ZEV states than European or Asian competitors











United States—ZEV states drive the powertrain electrification



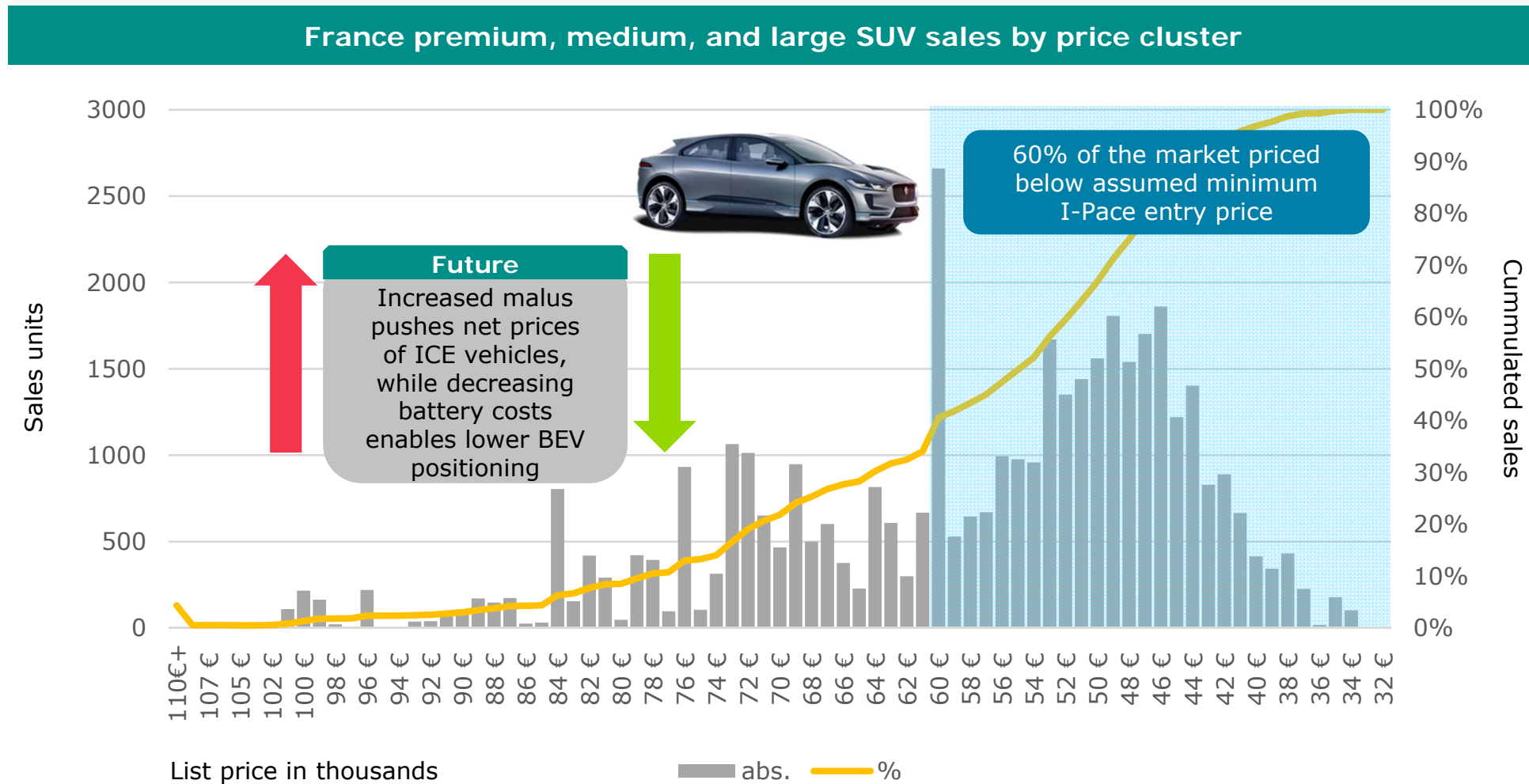
Example: Mercedes-Benz	2018	2019	2020	2021	2022	2023	2024	2025
Credits needed for 100,000 sales	4,500	7,000	9,500	12,000	14,500	17,000	19,500	22,000
 Mercedes-Benz GLC PHEV: 0.7 credits (20 miles range assumed)	Max. units: 3,570	4,290	5,000	5,710	6,430	7,140	7,860	8,570
 Mercedes-Benz EQ BEV: 3.6 credits (310 miles range assumed)	Min. units: 560	1,110	1,670	2,220	2,780	3,330	3,890	4,440

Europe—a common emission regulation, but different market frameworks

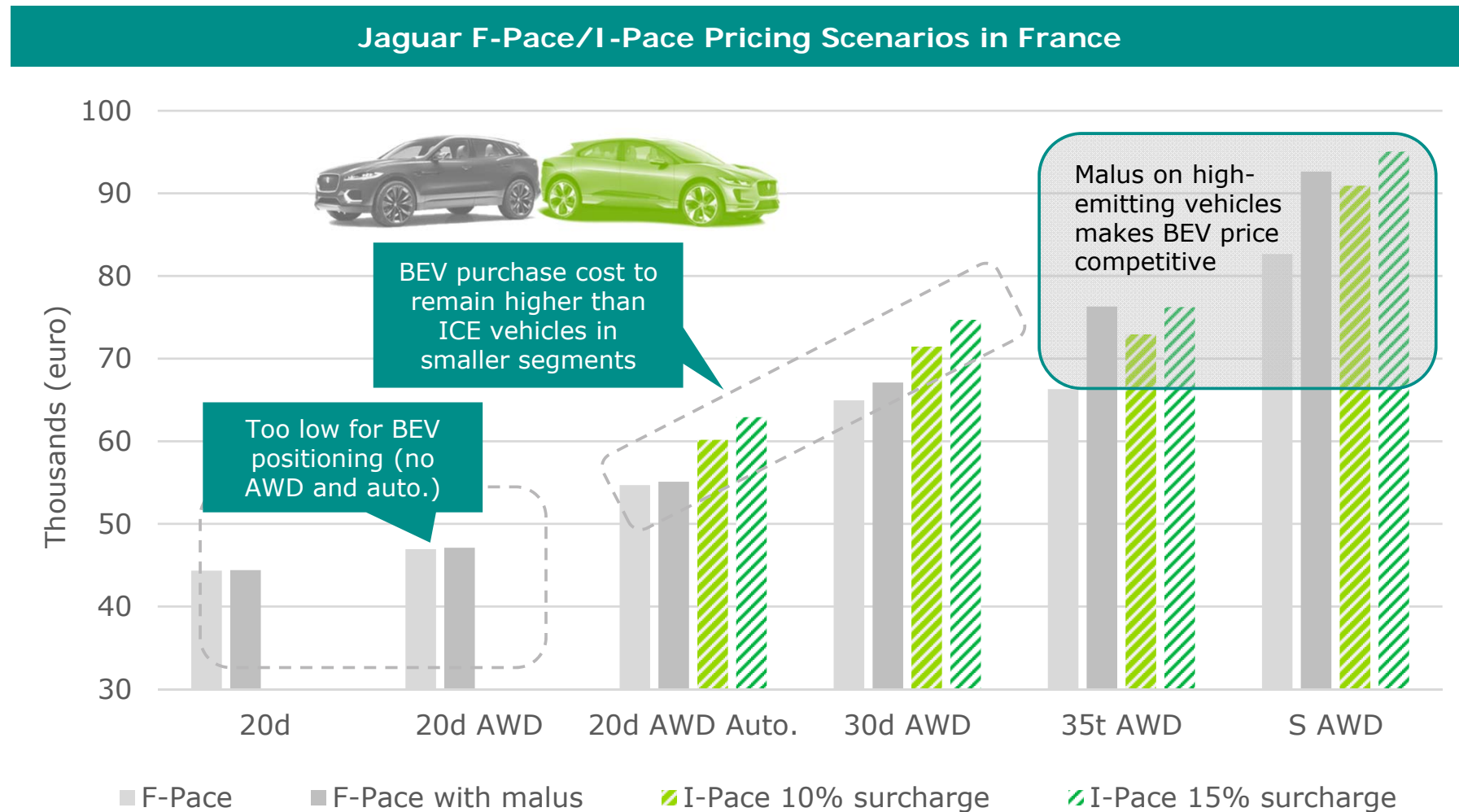


Forecast drivers		 France	 United Kingdom	 Spain	 Italy	 Germany
 Market frameworks	Incentives					
	Taxation					
	City restrictions					
	Infrastructure					
 TCO	Small segments					
	Larger segments					
 OEM offerings	Industry wide					

France—BEVs target limited market volumes owing to high price positioning



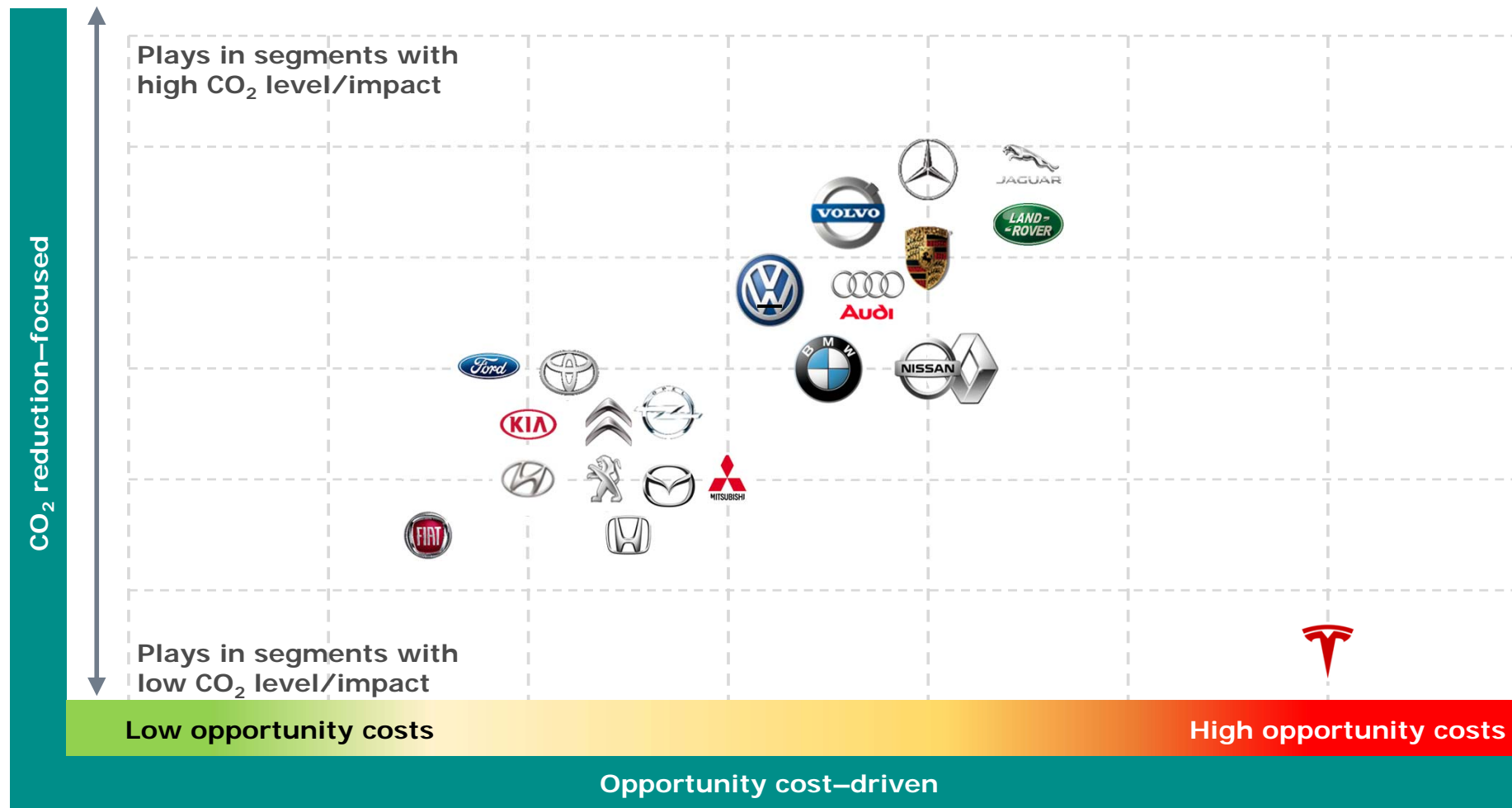
France—the malus system makes BEVs attractive at a high price positioning



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OEM strategies—OEMs react differently to the challenges of regulation and electrification



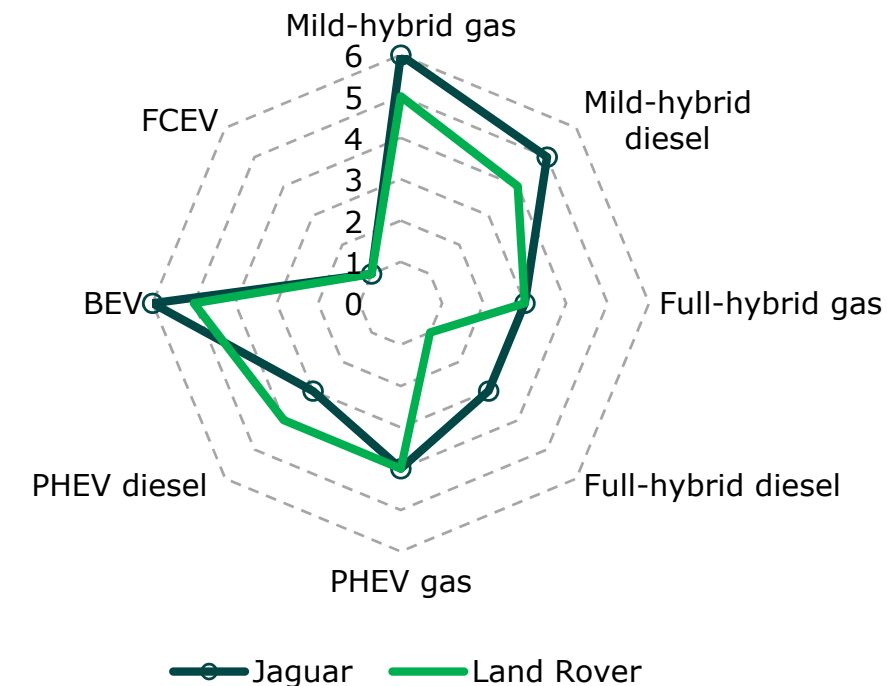
OEM strategies—Jaguar Land Rover (JLR) starts a BEV offensive



Current strategic steps

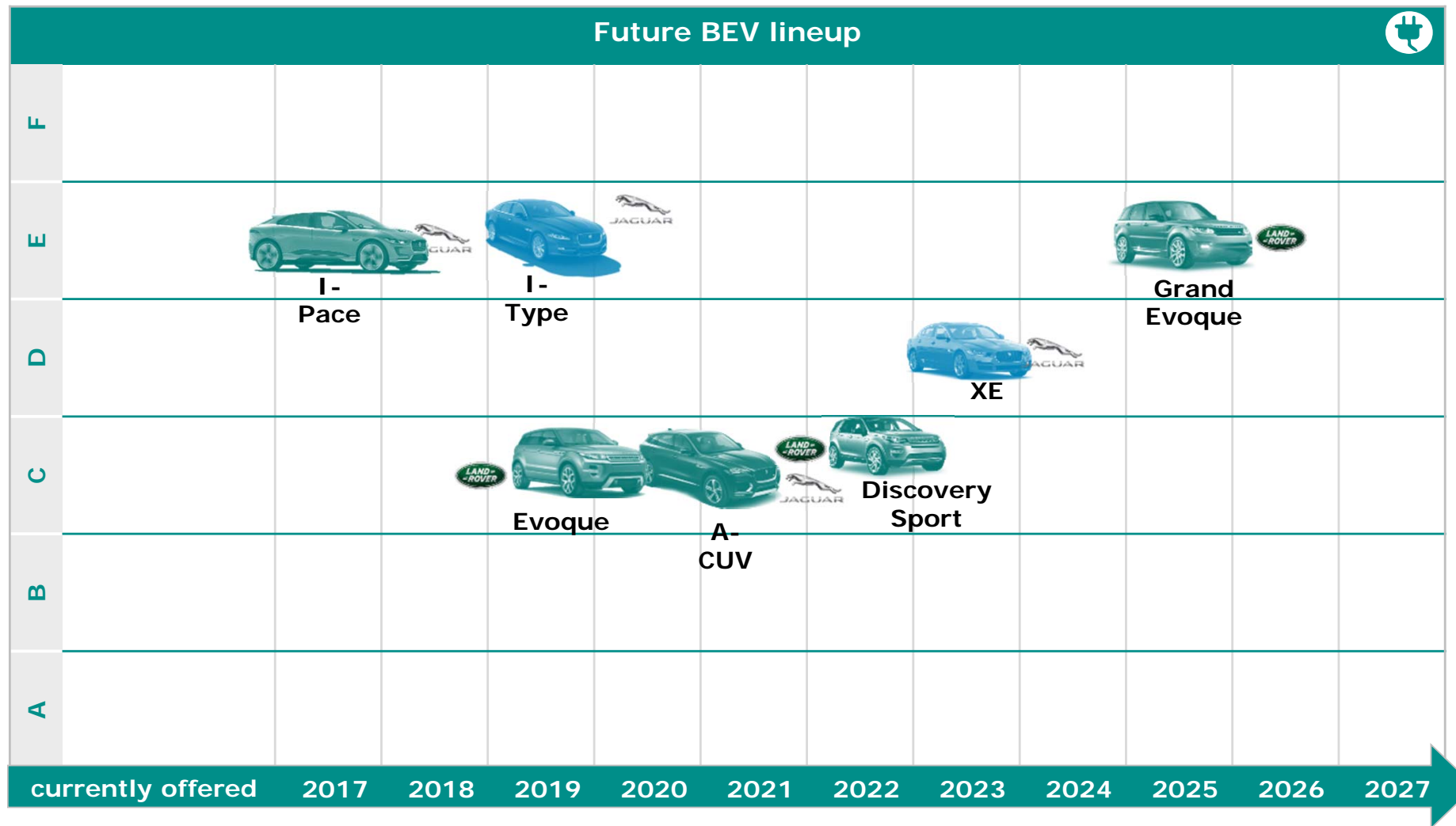
PHEV	<ul style="list-style-type: none"> PHEVs mostly use diesel engine. Land Rover, especially, will not use gasoline engine for its PHEVs.
BEV	<ul style="list-style-type: none"> Jaguar I-Pace is the first BEV in 2017. Luxury EV (I-Type) – Formula E engagement is to promote BEV. JLR rumored to open battery plant in cooperation with BMW and Ford
Mild hybrid electric vehicle (MHEV)	<ul style="list-style-type: none"> In 2026, MHEVs will dominate the market of JLR vehicles and will help the OEM to reach future compliance targets.
Ian Callum (Head of Design, Jaguar)	<p>"I'm clear in my mind that an electric Jaguar would be suitable for the brand. You have to move with the times."</p>

Alternative powertrain strategic relevance, 2026*



Category	1	2	3	4	5	6
% of total sales	0%	0- <1%	1- <5%	5- <10%	10- <20%	>20%

OEM strategies—JLR BEV lineup assumption



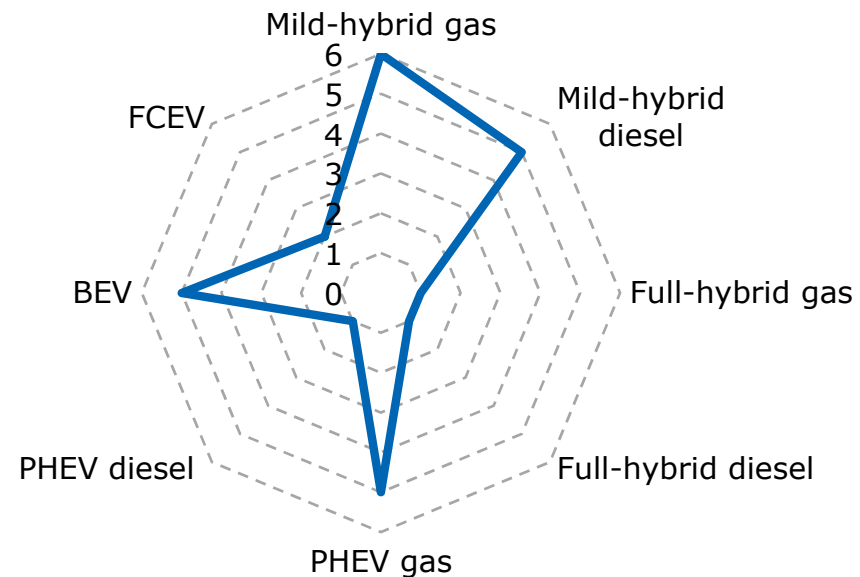


OEM strategies—BMW rolls out PHEVs, followed by BEVs, while mild-hybridization almost becomes a standard

Current strategic steps

<p>BMW i</p>	<ul style="list-style-type: none"> Portfolio expansion of the i brand focuses on technologies, rather than on BEVs. iNEXT is focusing on autonomous driving and connectivity.
<p>Performance</p>	<ul style="list-style-type: none"> PHEV rollout across most model ranges, starting from 2 Series to 7 Series, branded as iPerformance. BMW vehicles to be launched with BEV powertrain (MINI, X3, 3 Series).
<p>Fuel cell research</p>	<ul style="list-style-type: none"> Fuel cell research in cooperation with Toyota Limited production volumes only due to costs and infrastructure hurdles
<p>MHEV</p>	<ul style="list-style-type: none"> In 2026, MHEV will dominate the offerings of BMW vehicle.

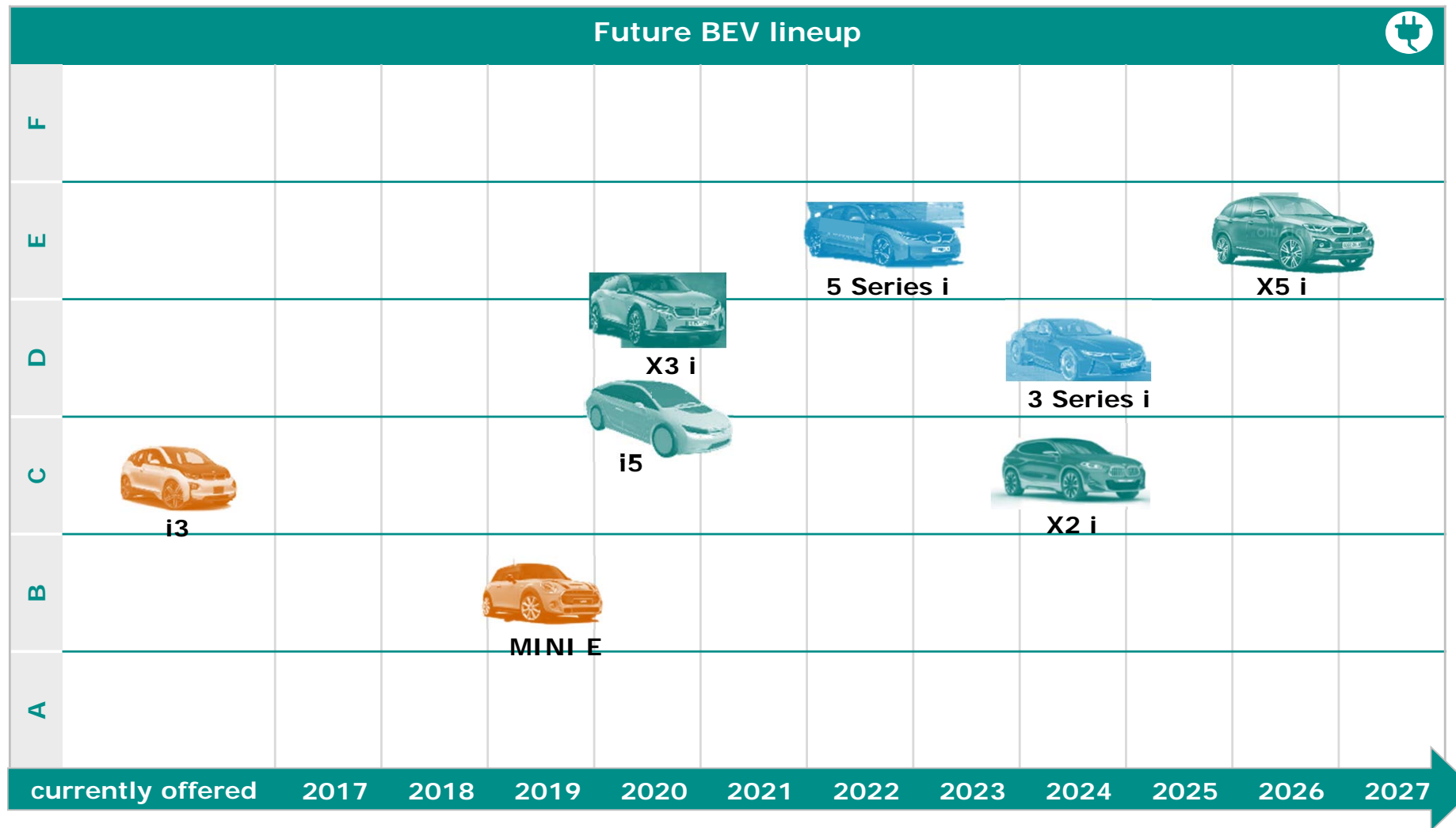
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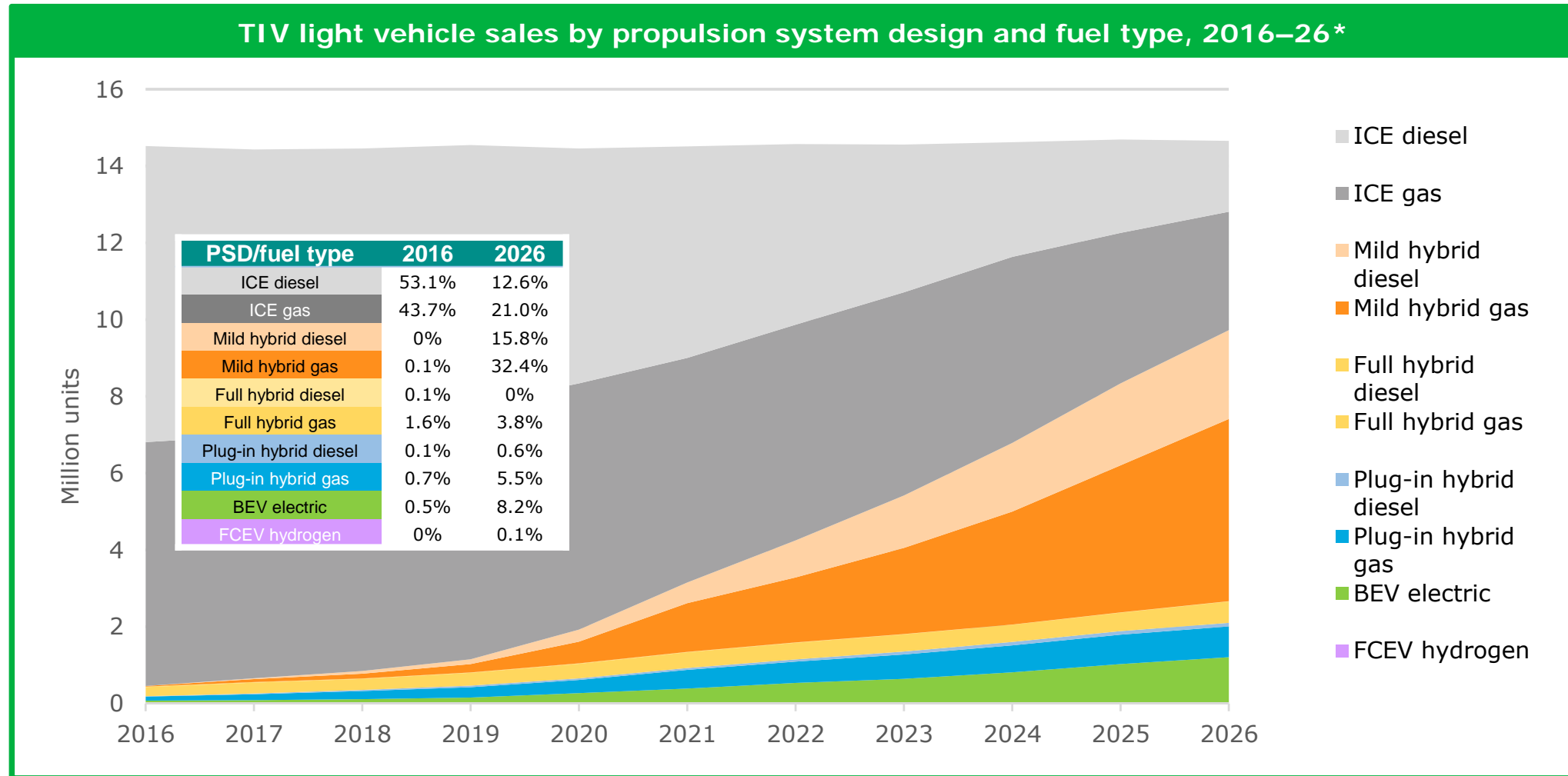
OEM strategies—BMW BEV lineup assumption



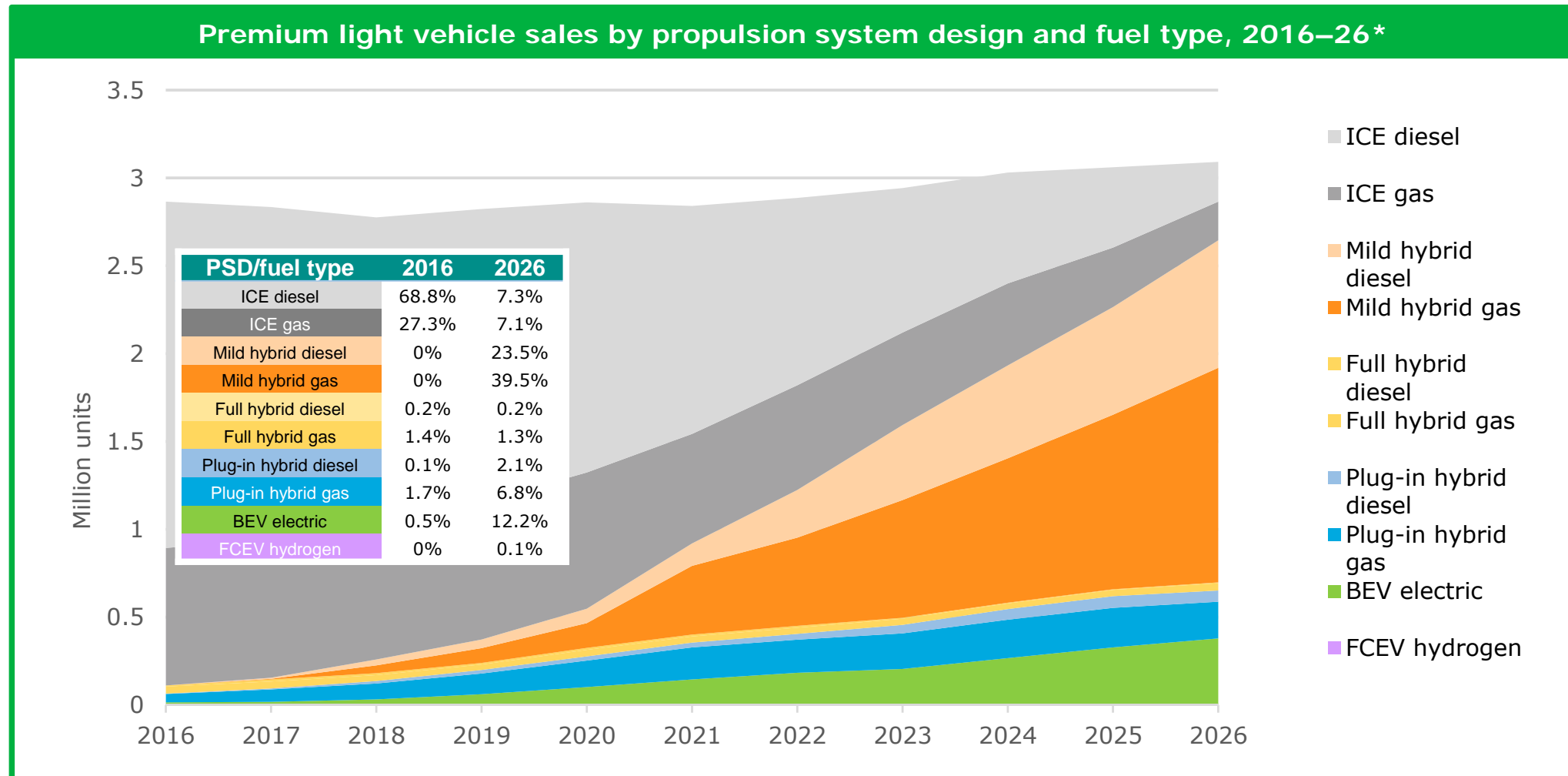
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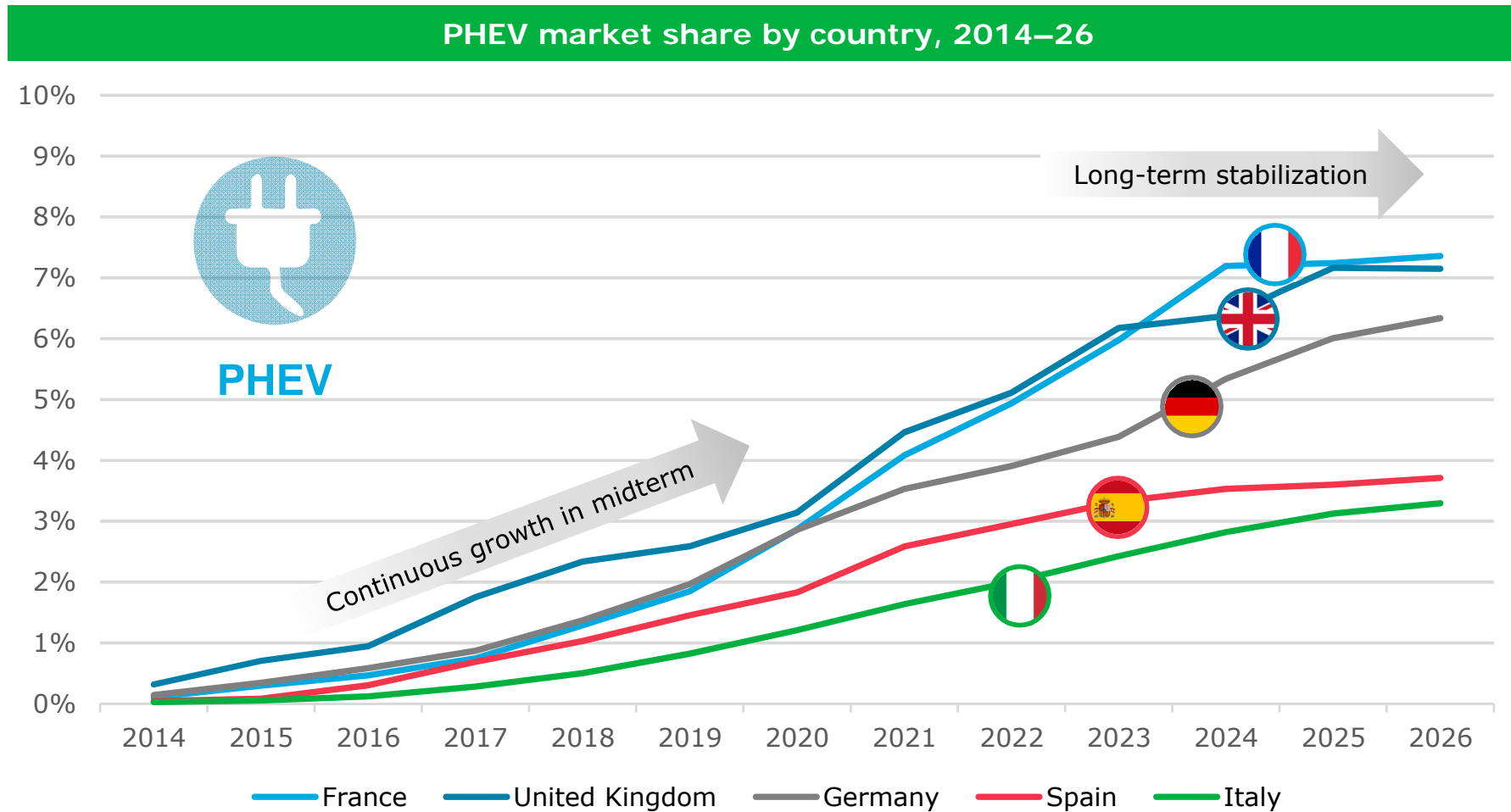
Electrification trends—EU28 emission regulations and OEM offerings lead to BEV & PHEV scenarios with >14% sales share



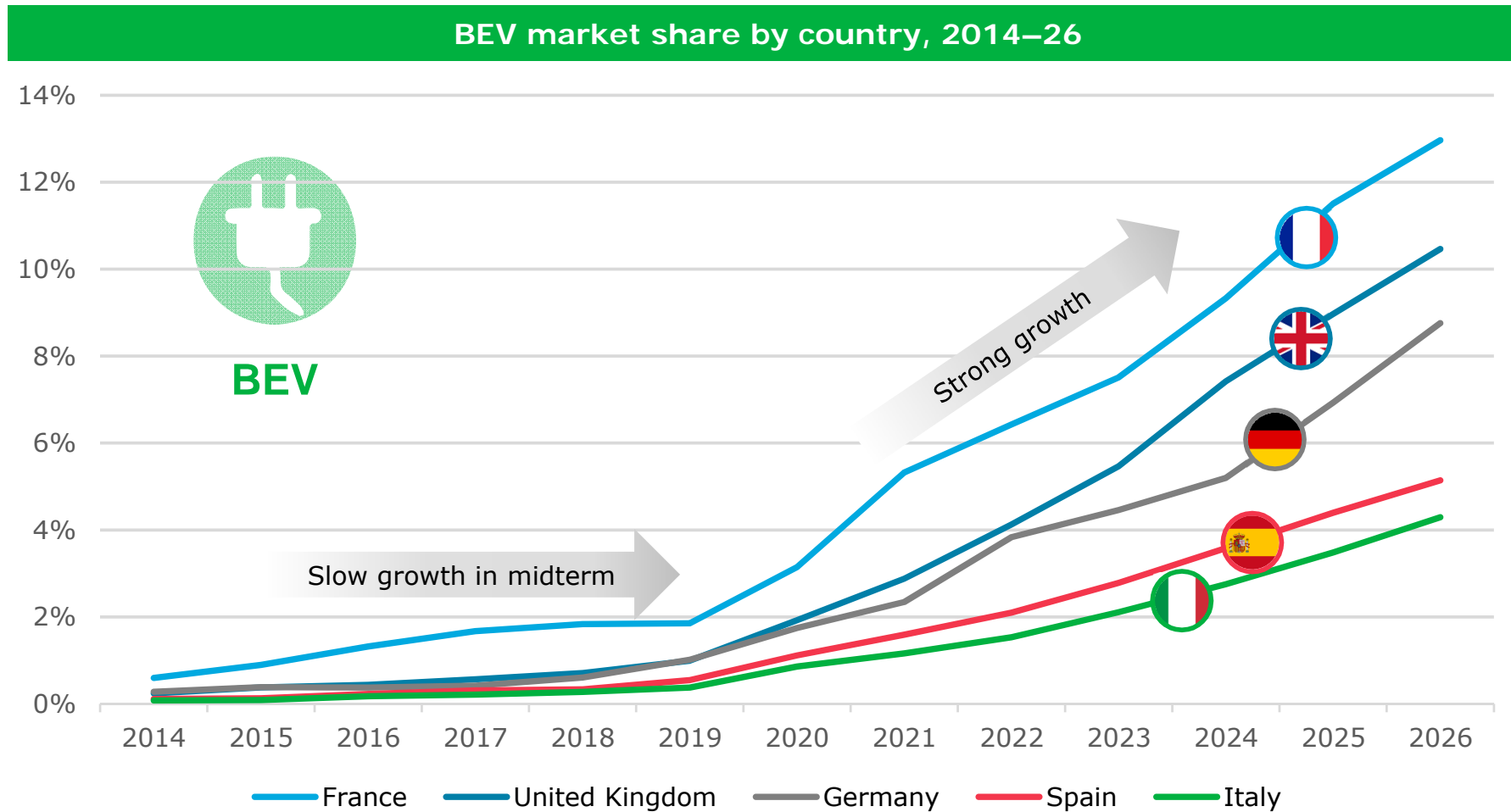
Electrification trends—BEV & PHEV scenarios reach >20% sales share in the European premium vehicle market



Electrification trends—market frameworks in United Kingdom and France support growth of PHEV sales



Electrification trends—significant growth of BEV sales is expected after 2019



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Summary

- **Markets require individual forecast approaches** including anticipations of future regulations.
- **OEM strategies and vehicle portfolios require individual assessments** including anticipations of future emission compliance.
- Powertrain electrification is in progress. Customer acceptance and speed of xEV penetration trend depend on the **closure of price and convenience gaps**.
- Overall, **the complexity of the forecast process increases significantly**, along with your questions regarding the **assumptions and their sensitivity regarding scenarios**. **We look forward to discuss them with you.**

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