# Challenges of the EVs in the European Markets

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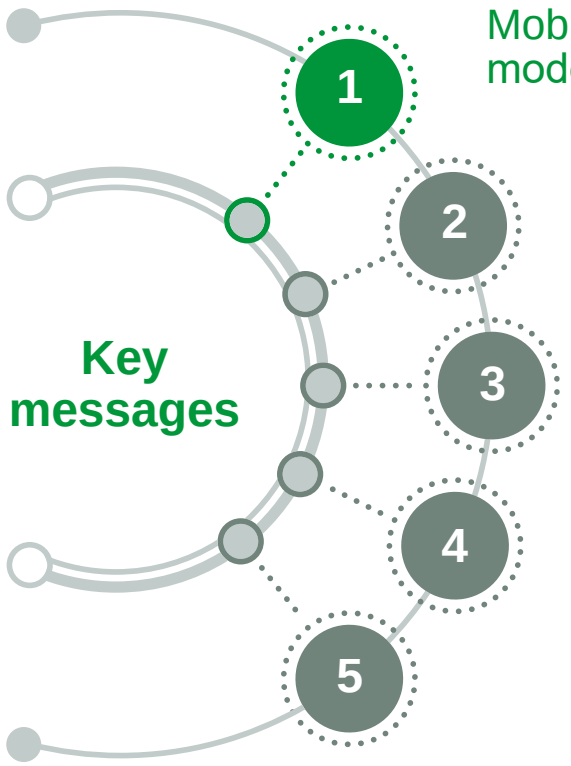
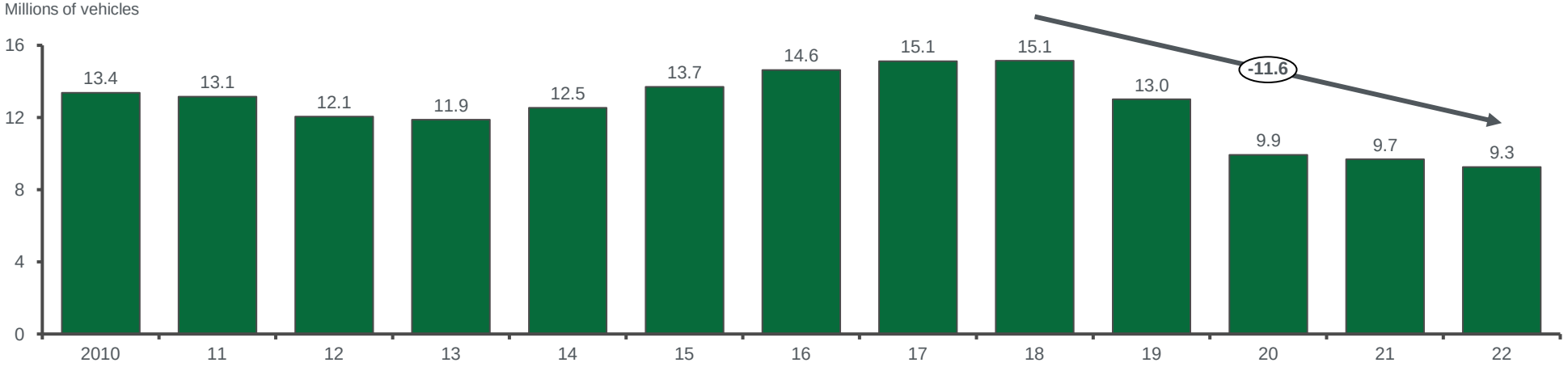
# The automotive industry is under a deep transformation with an uncertain future



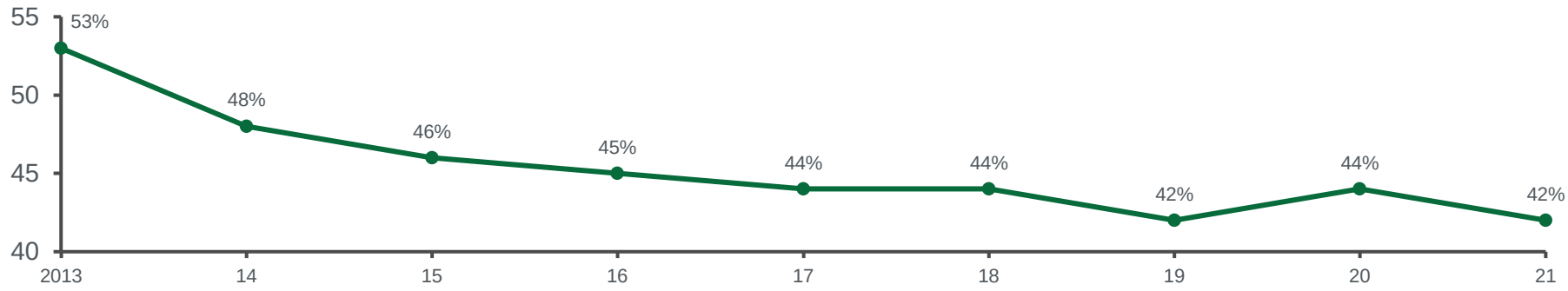

Mobility is shifting because of the evolution of the ownership model and the regulation pushing to the EVs, …

# New passenger car sales have been decreasing steadily in the last years across Europe

**New passenger car registrations in the European Union (2010-2022)**
Millions of vehicles




**Private registrations as a share of total EU passenger car market (2013-2021)**
%




Source: European Automobile Manufacturers' Association; JATO; L.E.K. research and analysis



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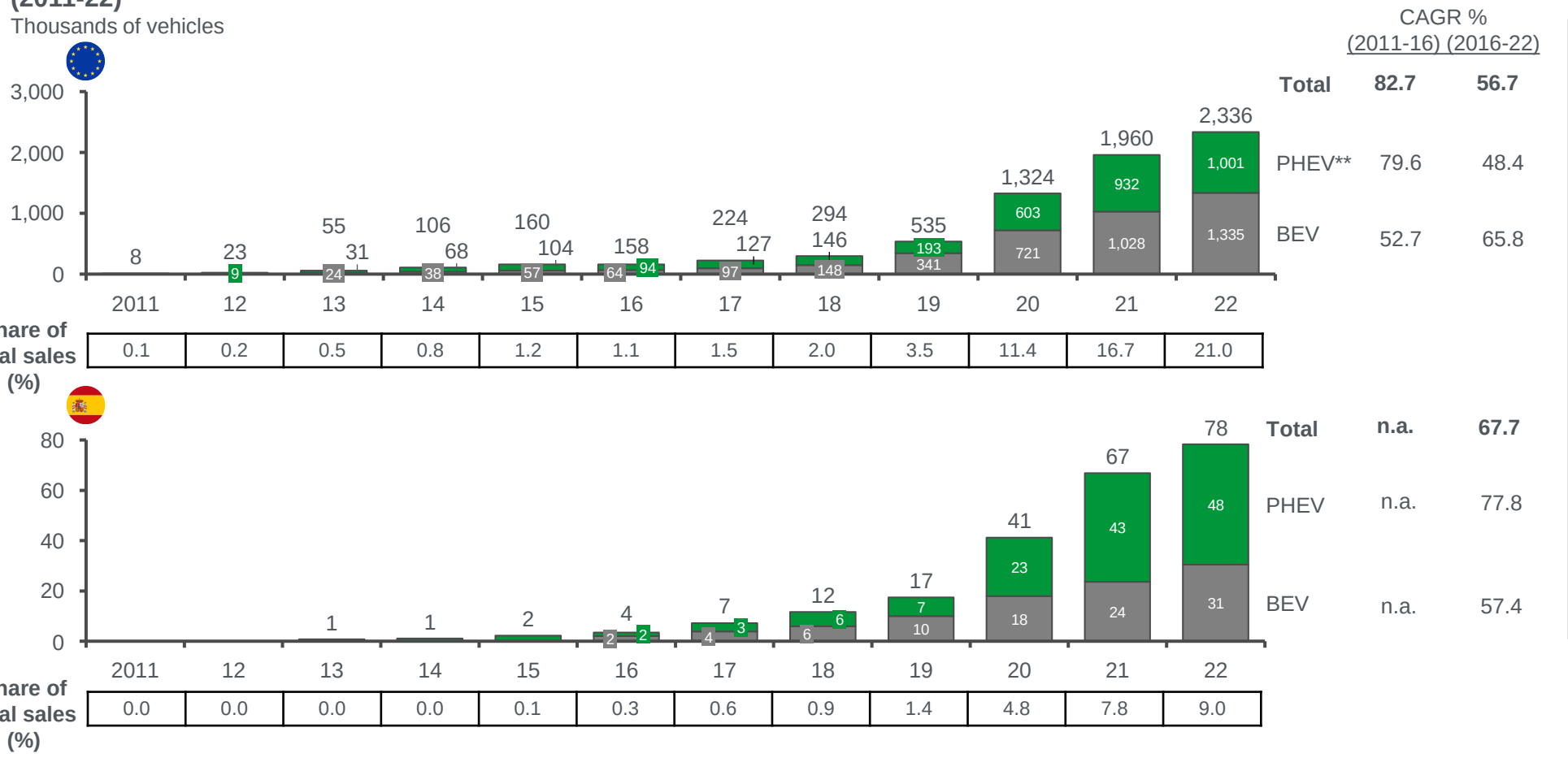
# At the same time, sales of EVs have been growing increasing the penetration of EVs over total new vehicle sales which represents c.21% in Europe

**Annual sales of EVs* by type (2011-22)**

Thousands of vehicles

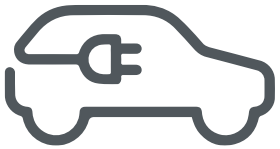



Note: *Includes only LV passenger vehicles, ** 2022 data based on realised data until November 2022, assuming sales in December are equal to the average of the previous months

Source: European Environmental Agency, ANFAC

# New regulation and financial incentives are playing a big part in contributing to adoption of EVs in Europe

## *Forms of government support for BEV adoption*



### *Vehicle mandates / bans*

- Countries are beginning to mandate that all new vehicle sales by 2035 are zero emission vehicles, functionally banning ICEV sales…
- … but the EU agreed to permit sales and registration of internal-combustion engine (ICE) models after the 2035 deadline — provided those vehicles operate only on carbon-neutral fuels, often generically referred to as ‘e-fuels’

### *Financial incentives*

- Many state governments also offer financial incentives
- These financial incentives lower the upfront cost of purchasing a BEV, helping BEV vehicles reach price parity with ICEVs earlier than they otherwise would

### *Secondary policies*

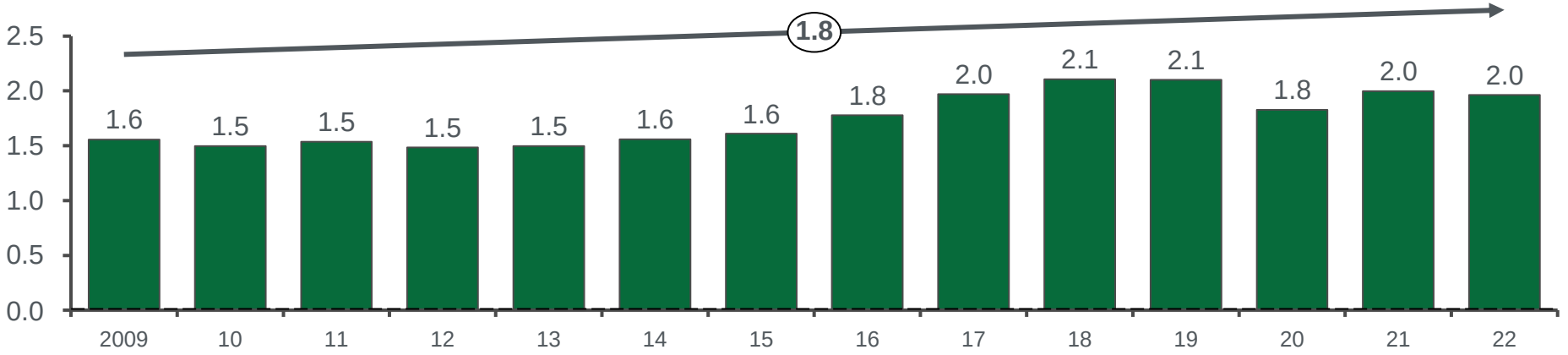
- Other government policies can also indirectly support BEV adoption
  - The EU’s 750 billion EUR stimulus package includes 20 billion euros to boost the sales of clean vehicles, and 1 million electric and hydrogen vehicle charging stations are to be installed by 2025

Source: L.E.K. research and analysis

# The introduction of new regulation is causing consumers to postpone their purchasing decisions making the car park older

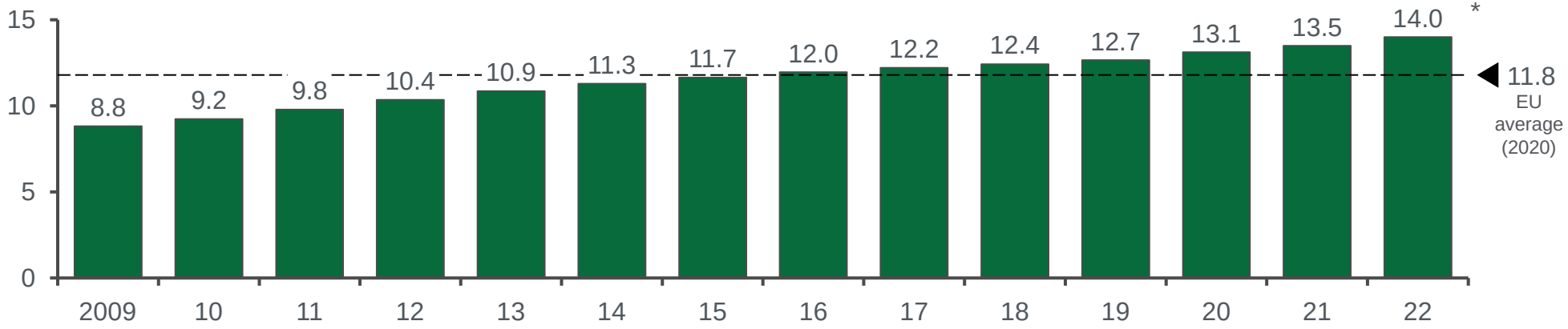
**Volume of used passenger car sold in Spain (2009-22)**

Millions of units




**Average age of the Spanish car parc (2009-22)**

Age (years)




Note: *Based on press the average age of the Spanish car fleet for 2022 is estimated around 14 years

Source: Statista; ACEA; L.E.K. research and analysis



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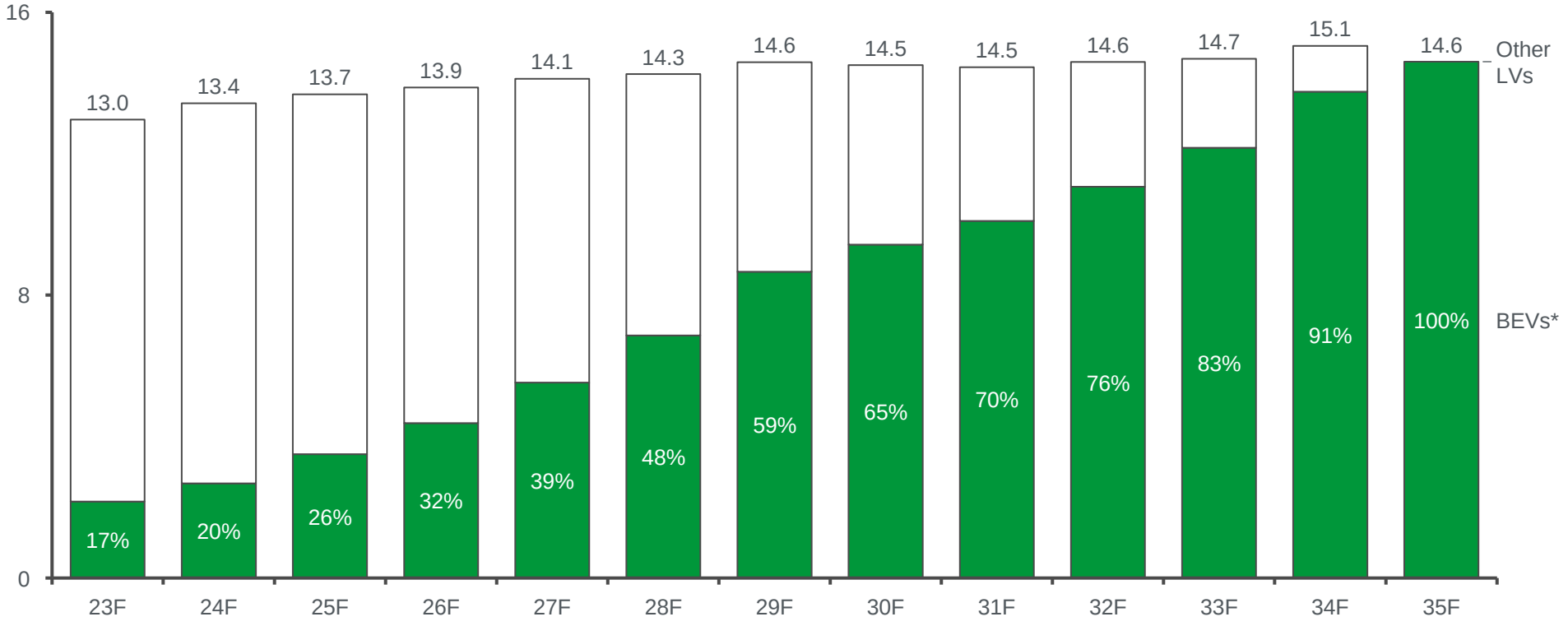
# EV regulation in Europe is driving exponential adoption, the question is whether the market will be able to absorb and accept it

*INDICATIVE*

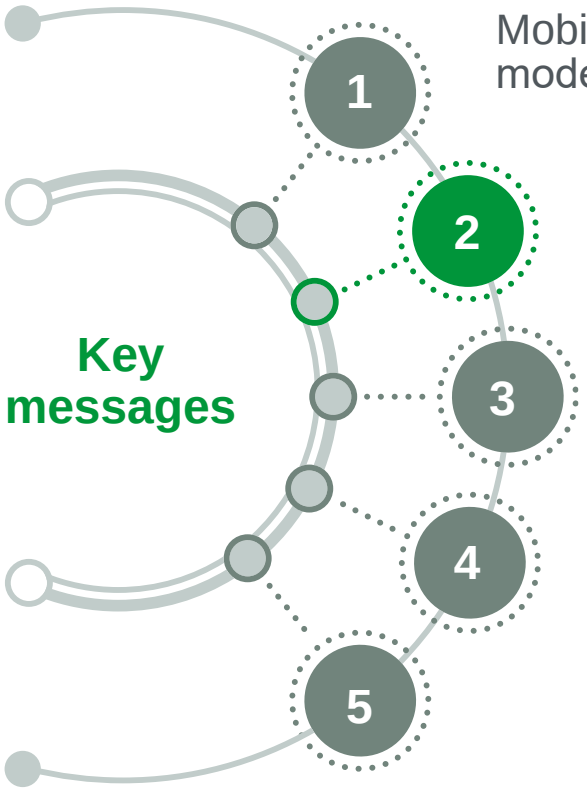
**Europe light vehicle sales by powertrain, with government mandates (2020-35F)**

Millions of vehicles, percent of sales




Source: L.E.K. research and analysis

# The automotive industry is under a deep transformation with an uncertain future

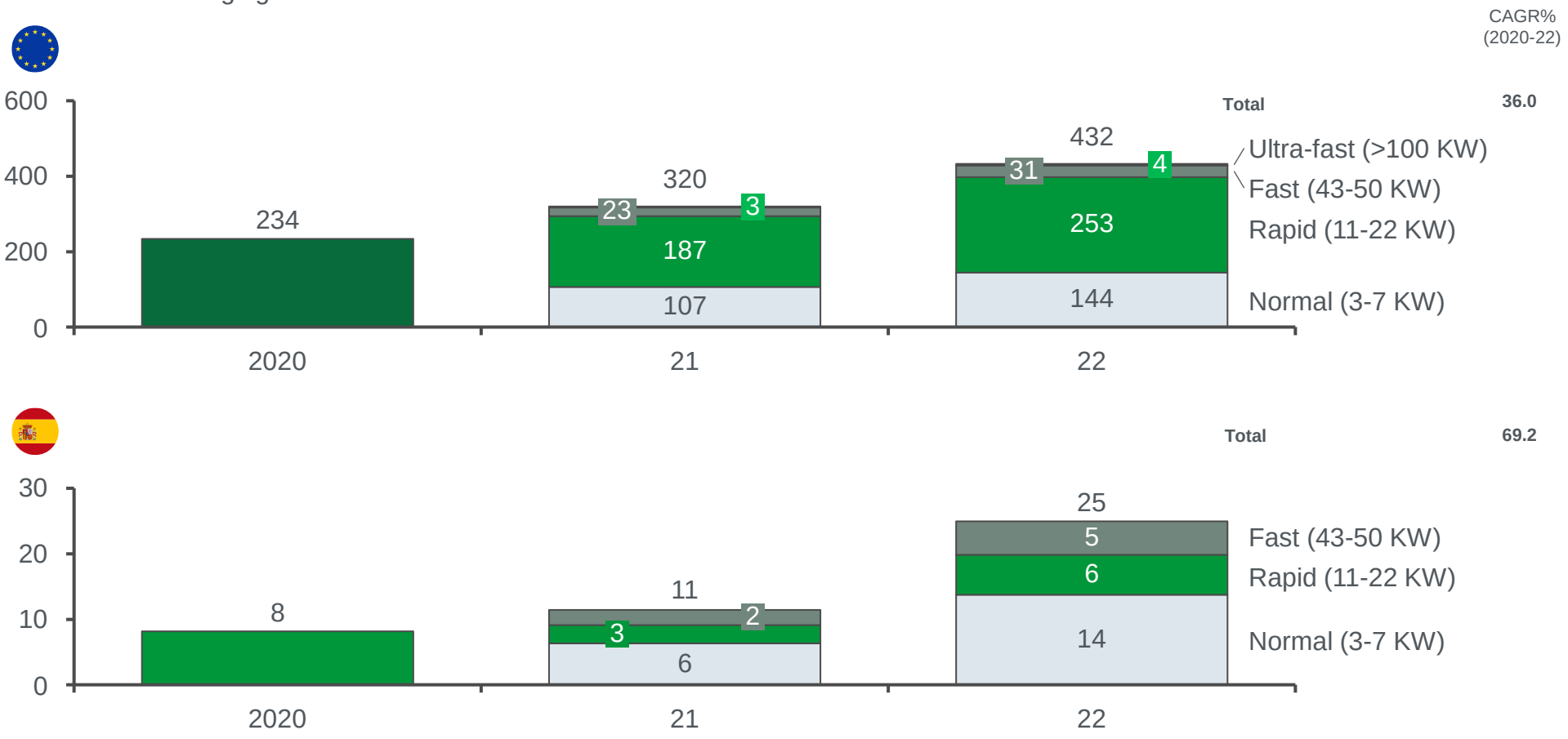



Mobility is shifting because of the evolution of the ownership model and the regulation pushing to the EVs, …

… but EV adoption is slow because of the lack of charging infrastructure and the cost of the vehicles

# Infrastructure of EV charging stations in Europe and Spain has seen solid growth since 2020, but is still largely integrated by slower chargers

**Total electric charging points installed (2020-2022*)**
Thousands of charging stations

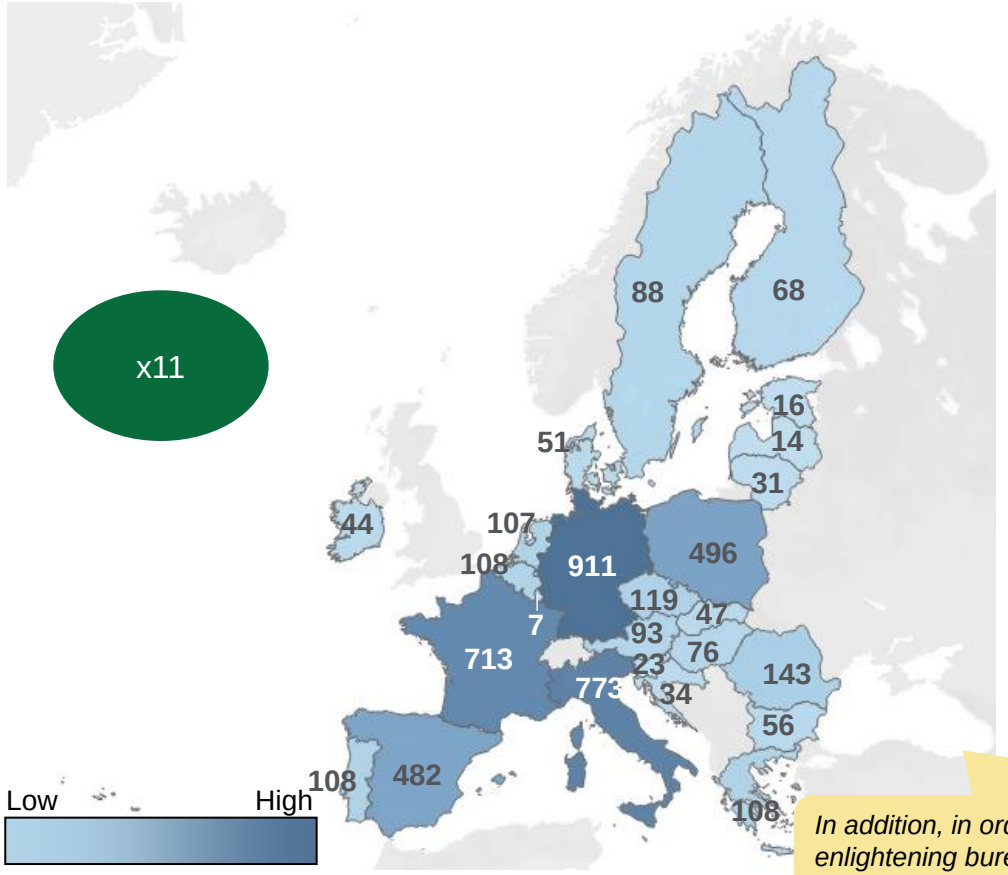



Notes: * Share of charger per type assumed using 2021 data for both 2021 and 2022
Source: EAFO, EV_Observatory, L.E.K. analysis;

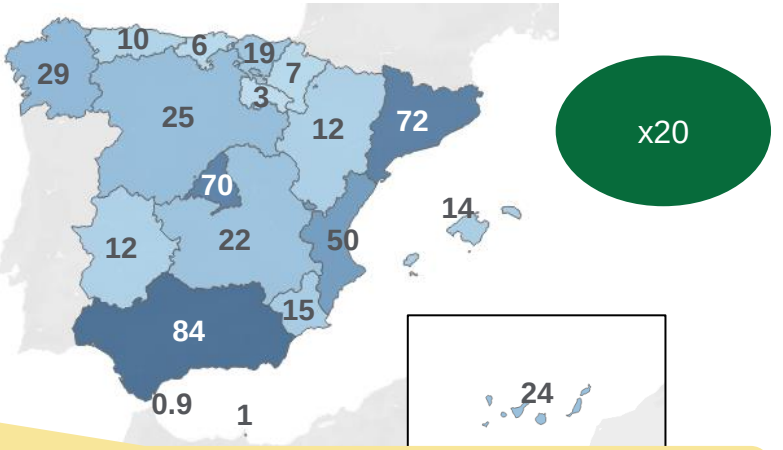
# As EV adoption grows, significant investment will be required in order to upgrade the public charging infrastructure to meet the EU target in 2035

**EV charging station opportunity (2035)**

Thousands of EV chargers




- European countries will have to invest heavily in their EV charging infrastructure in order to keep up with the growing adoption of EVs
- L.E.K. forecasts that EU countries will need to install c.4.7m EV chargers until 2035, c.480k in Spain only



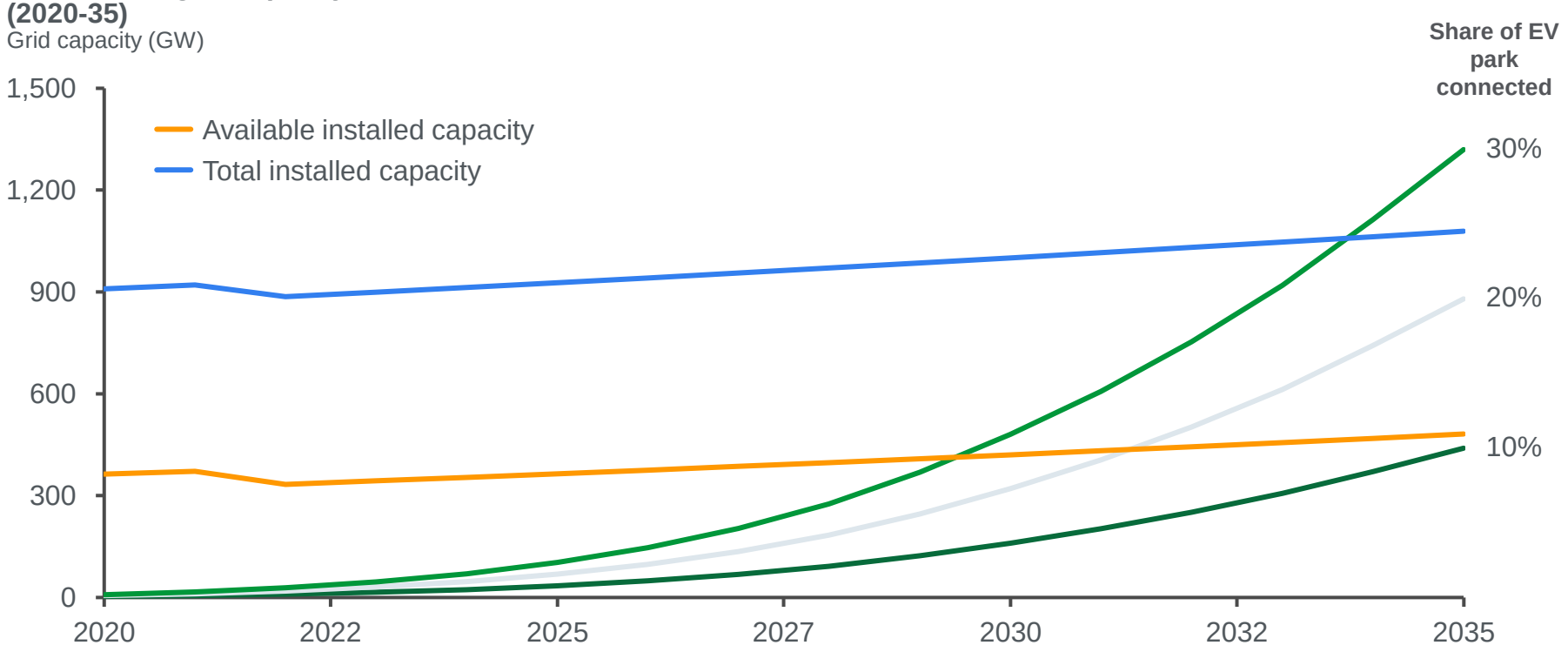

*In addition, in order to support infrastructure development, governments should work enlightening bureaucracy, as regulation and local permitting are issues most companies in charge of stations deployment are currently struggling with*

Source: EAFO, ANFAC, L.E.K. research and analysis

# Growth in the charger network and move towards faster chargers will test the capacity of European power grids

**EU installed grid capacity and estimated EV demand (2020-35)**

Grid capacity (GW)



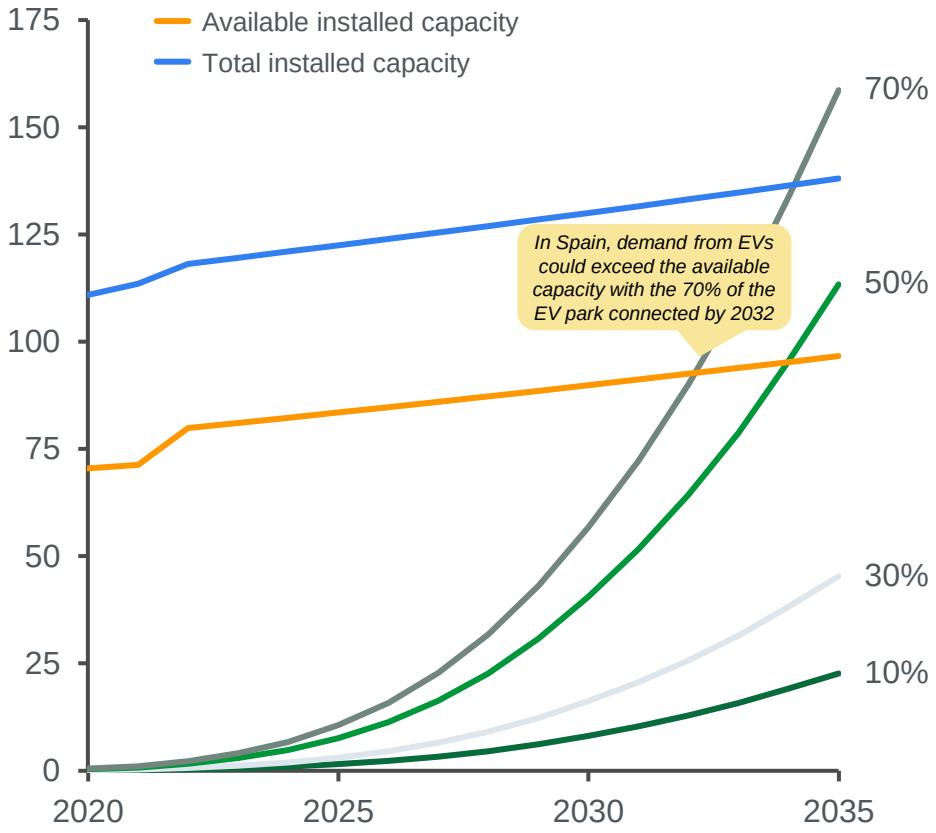

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Level I | 33 | 30 | 26 | 22 | 18 | 15 | 10 | EV chargers by type (%) |
| Level II | 58 | 55 | 49 | 45 | 39 | 36 | 30 | |
| Level III | 7 | 12 | 18 | 23 | 29 | 33 | 40 | |
| Level IV | 1 | 3 | 7 | 10 | 14 | 16 | 20 | |

Note: * The available installed capacity is the result of subtracting the maximum peak load from the total installed capacity

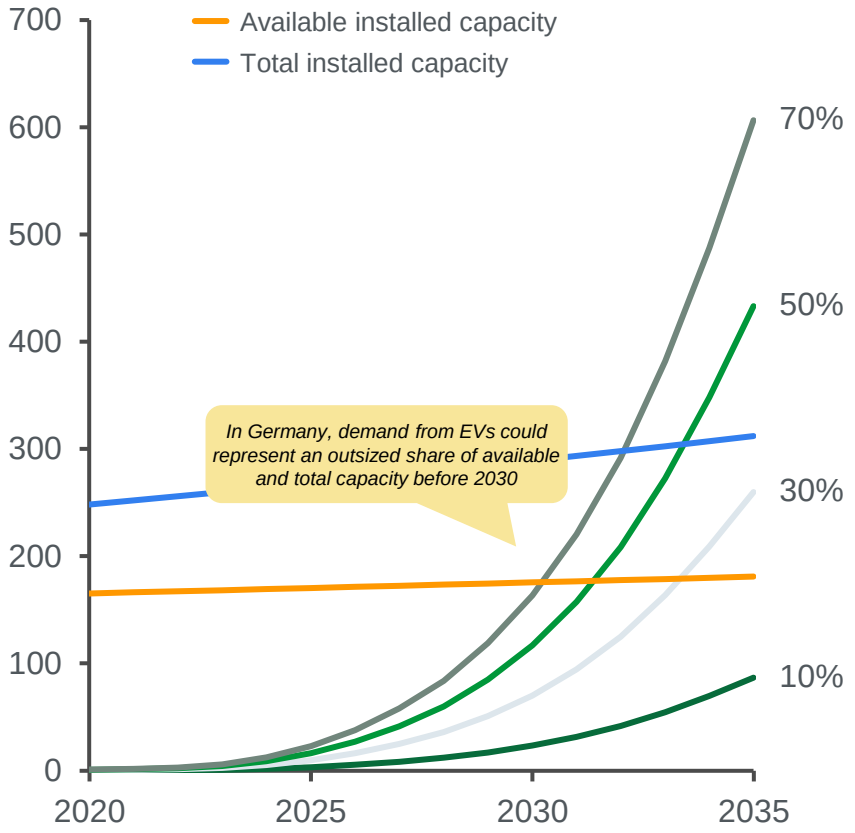
Source: IEA; L.E.K. research and analysis

# Most EU countries will require grid capacity upgrades before 2030 to respond to the increase from EV charging demand

**Spanish installed grid capacity and estimated EV demand (2020-35)**
Annual grid capacity (GW)




**German installed grid capacity and estimated EV demand (2020-35)**
Annual grid capacity (GW)




Source: IEA; Red Eléctrica Española official website; L.E.K. research and analysis



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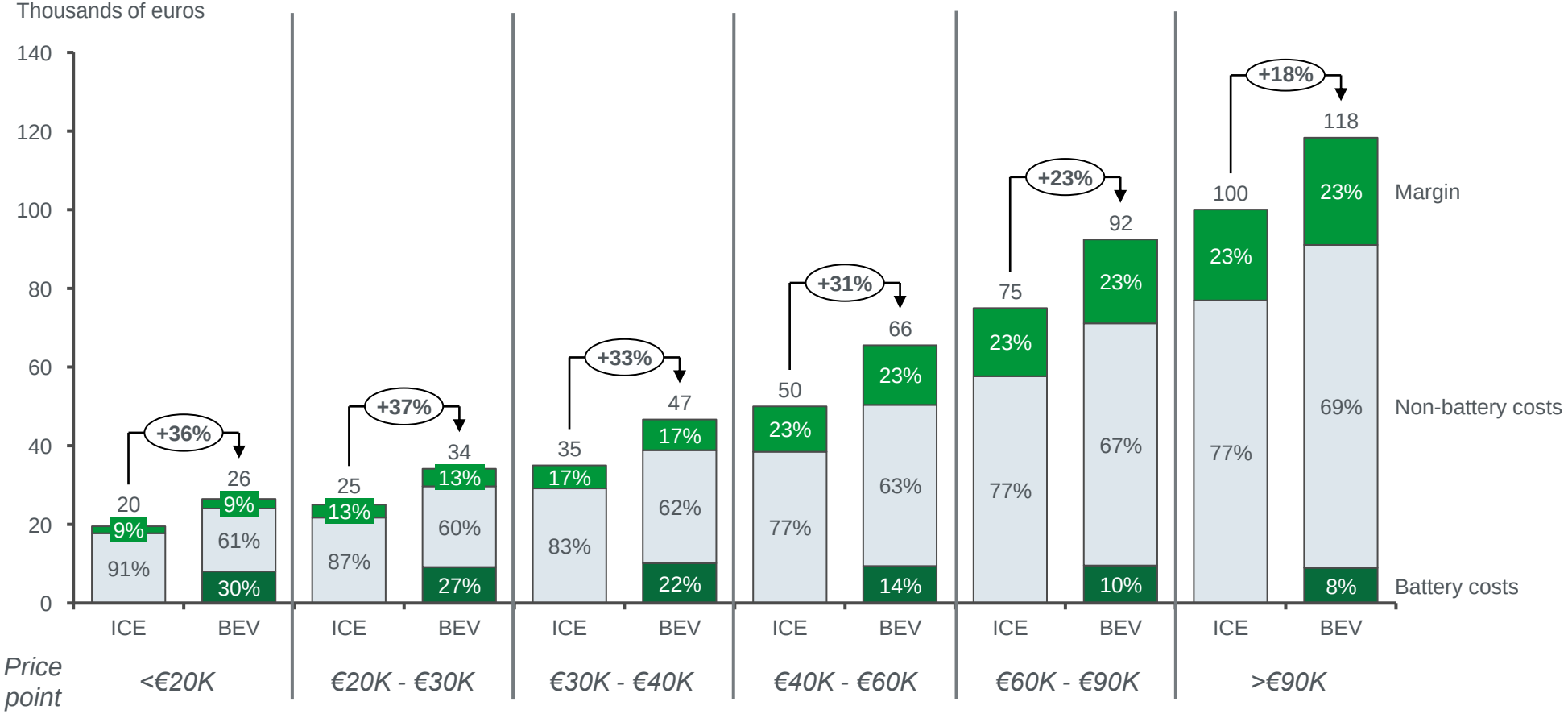
# The BEV purchase price premium for a comparable ICEV declines for more expensive vehicles as battery costs represent less of the overall price

**Upfront price* of comparable ICE and BEVs by price point (2022)**

Thousands of euros



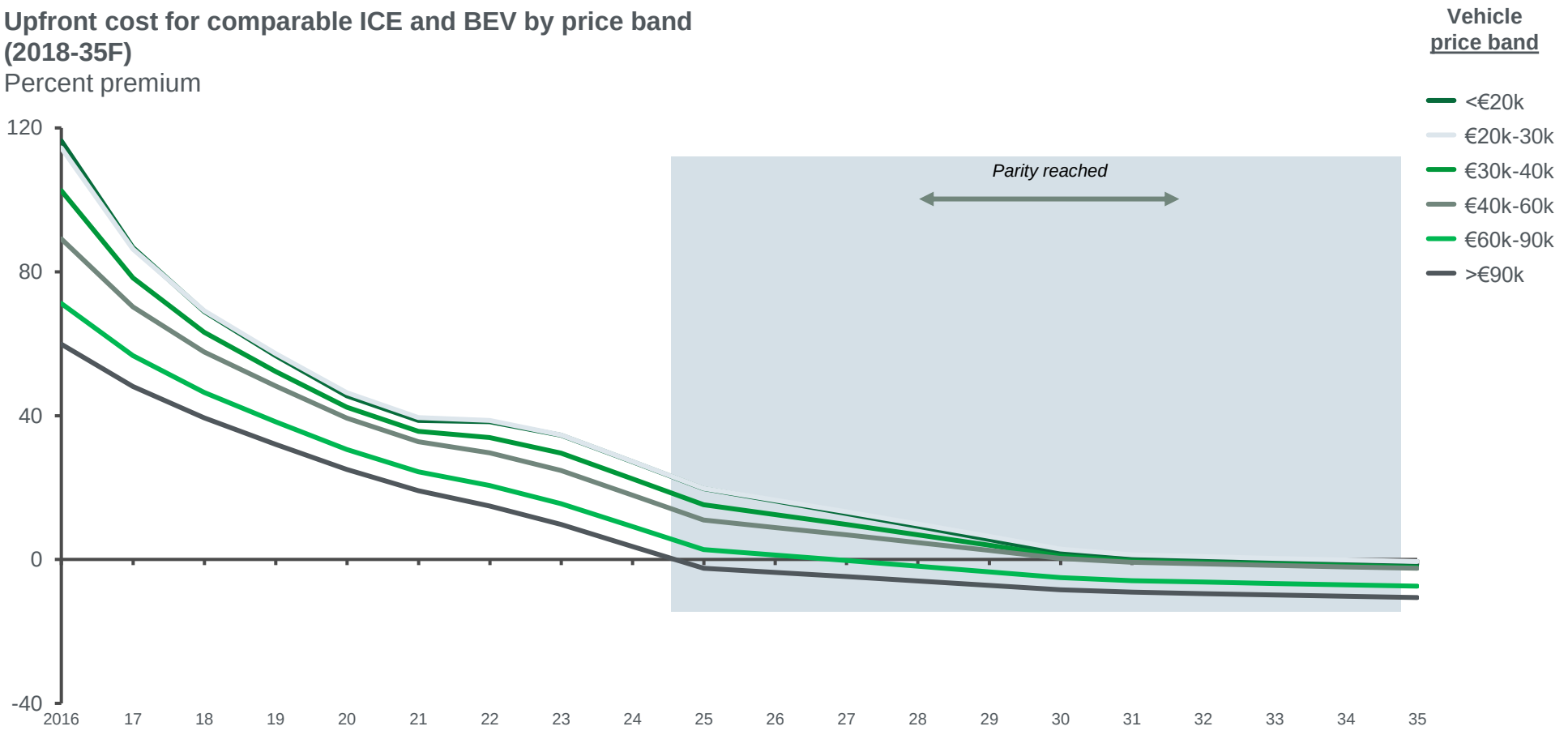

Note: * Excludes incentives and incremental home charging costs

Source: UBS, Credit Suisse, L.E.K. analysis

# Across price tiers, upfront cost for BEVs are expected to reach parity with ICEVs prices between 2025 and 2034

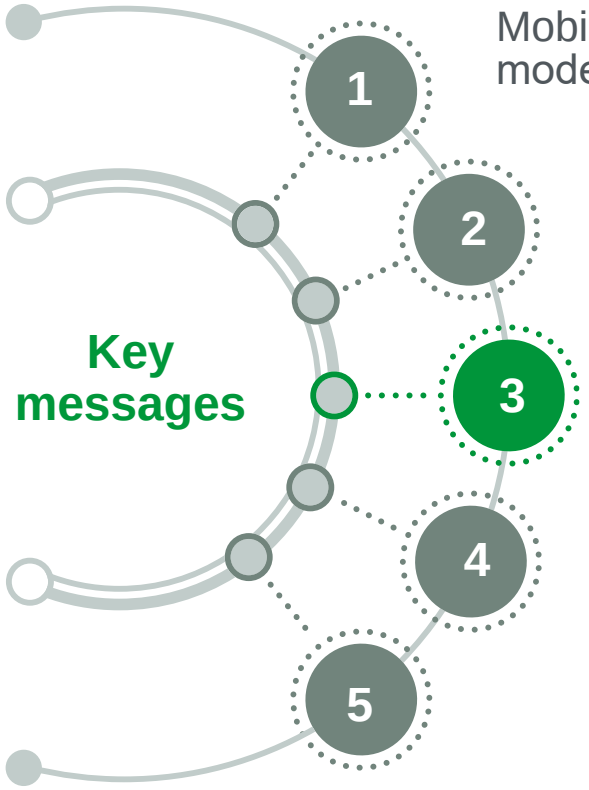
**Upfront cost for comparable ICE and BEV by price band (2018-35F)**

Percent premium




Source: L.E.K. research and analysis

# The automotive industry is under a deep transformation with an uncertain future




Mobility is shifting because of the evolution of the ownership model and the regulation pushing to the EVs, …

… but EV adoption is slow because of the lack of charging infrastructure and the cost of the vehicles

The volume segment seems to not be a priority for the European OEMs

# The combination of an insufficient public charger network, limited subsidies and restrictive regulation makes EVs an option for higher income population

Limited financial incentives makes adoption of new EVs difficult among medium and lower income households


## Insufficient public EV chargers

Insufficient public EV charging infrastructure makes EVs a viable option only for people with access to a private garage where they can charge their vehicle

## Restrictive regulation

Restrictive regulations of ICEVs limits the options for lower income households which may look at no ownership mobility alternatives

Source: L.E.K. research and analysis

# At the same time, the European OEMs are progressively abandoning volume segments to focus on more profitable premium vehicles, …

FT FINANCIAL TIMES

**VW to scrap dozens of models to focus on profitability**
**Apr, 2022**

Volkswagen, the pioneer of the "people's car" that epitomised the auto industry's obsession with expansion, will axe dozens of combustion engine models by the end of the decade and sell fewer cars overall to concentrate on producing more profitable, premium vehicles.

"We are [more focused] on quality and on margins, rather than on volume and market share." VW, he said, would reduce its line-up of petrol and diesel cars — which consists of at least 100 models across several brands — by 60 per cent in Europe over the next eight years.

VW's new strategy is a sign of profound changes in the wider auto sector, which for decades has attempted to increase profits by selling more cars each year, even if doing so required heavy discounting.

JALOPNIK

**VW Is Giving Up On People's Cars**
**Apr, 2022**

VW is doubling down on premium models offering higher profit margins than the cheap stuff. The Company is merely following what other car companies are doing as part of a broader industry trend; It's just that other car companies making this pivot don't literally have "people's car" as their name

CarExpert

**Volkswagen to focus on profits, slash ICE range**
**Apr, 2022**

More profitable vehicles, and fewer models with internal combustion engines: that's the plan for the Volkswagen Group over the next decade. This marks a turnaround from the era when the automaker actively chased volume in pursuit of being the world's largest automaker.

Source: L.E.K. research and analysis



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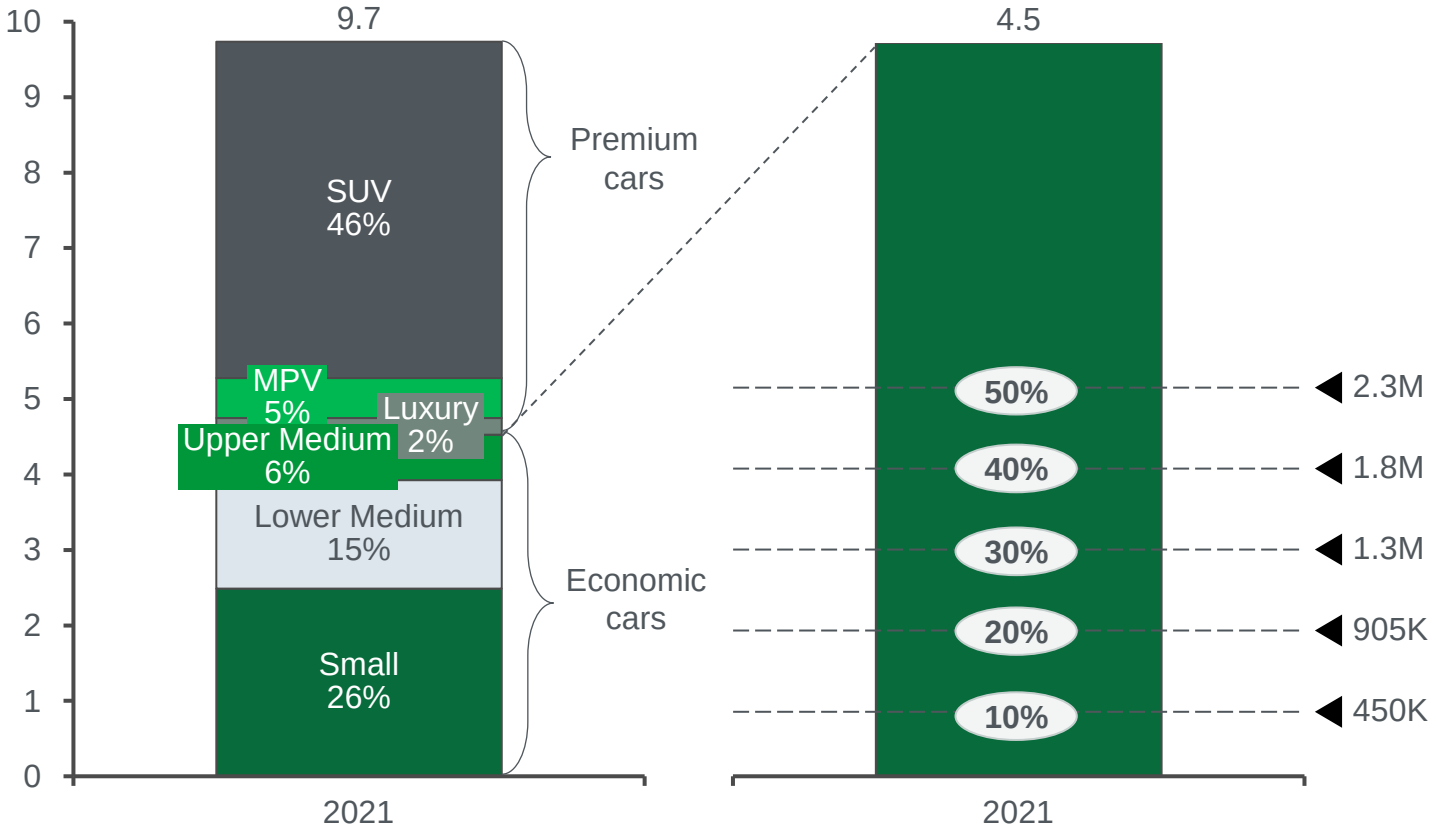
# … risking cutting off a proportion of drivers from mobility, …

**Passenger cars in the EU by segment (2021)**
Millions of vehicles, percent of sales




**Economic segment cars in the EU (2021)**
Millions of vehicles, percent of sales




Source: Statista; L.E.K. research and analysis



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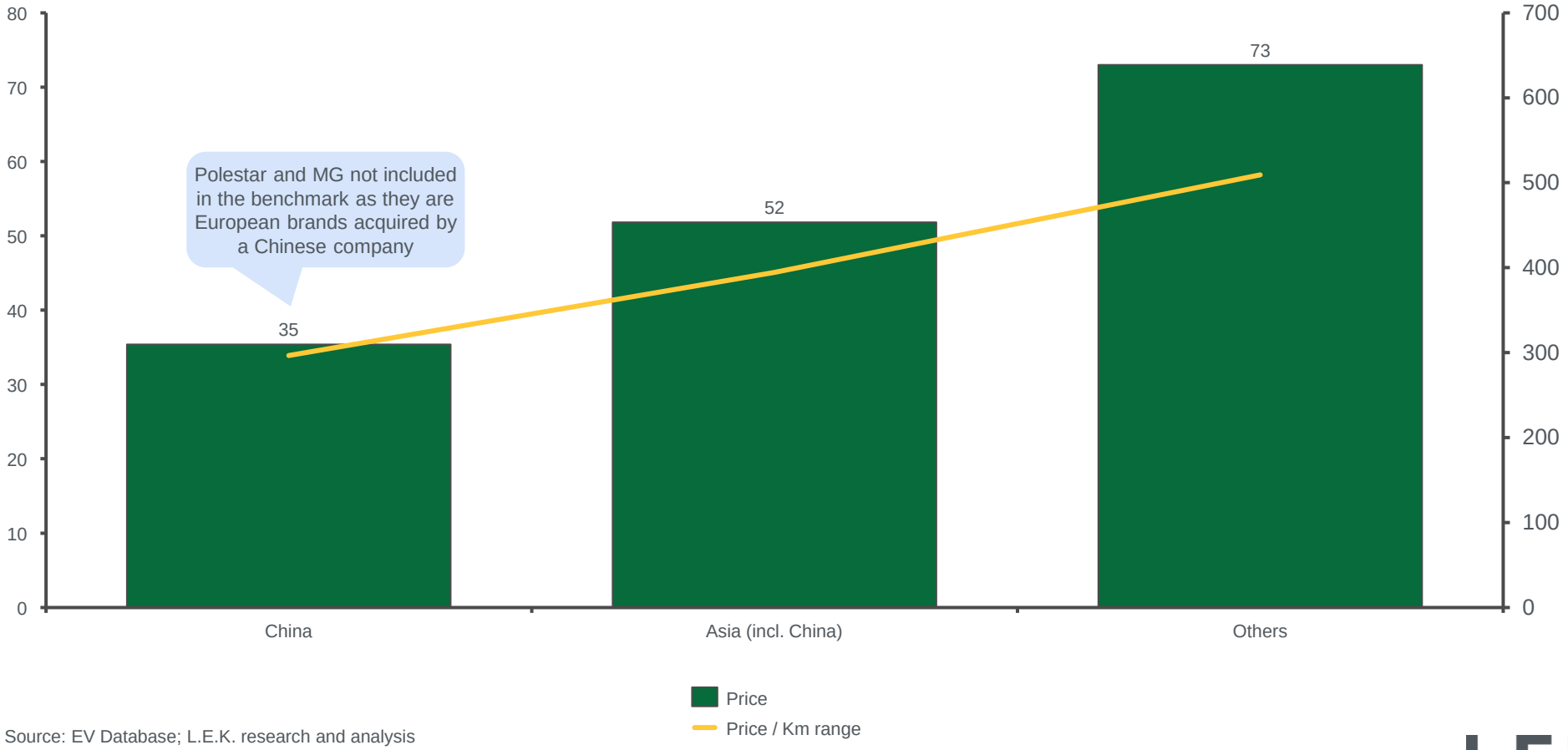
# … while Chinese OEMs are mainly focused in developing its European penetration strategy around a lower price point for similar capabilities

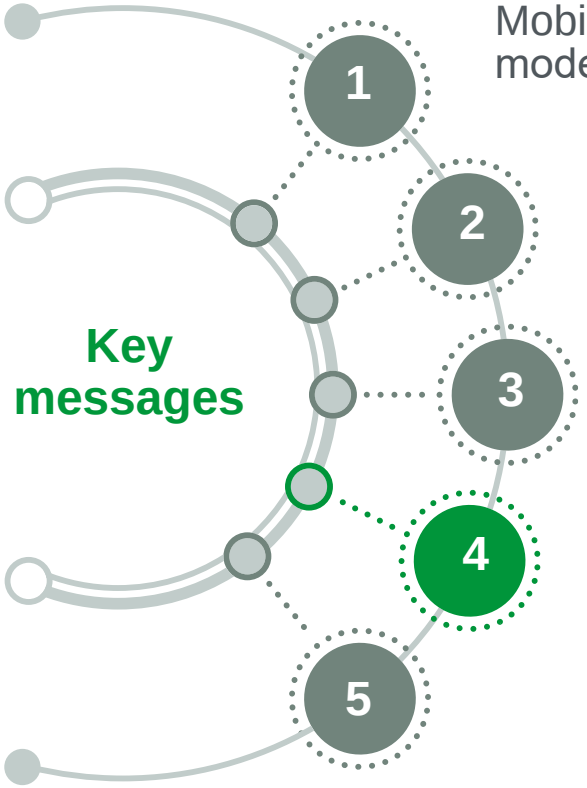
*NON-EXHAUSTIVE*

**Average EV price by OEM origin (Europe, 2022)**
Thousand Euro, Euro per Km




Source: EV Database; L.E.K. research and analysis

# The automotive industry is under a deep transformation with an uncertain future

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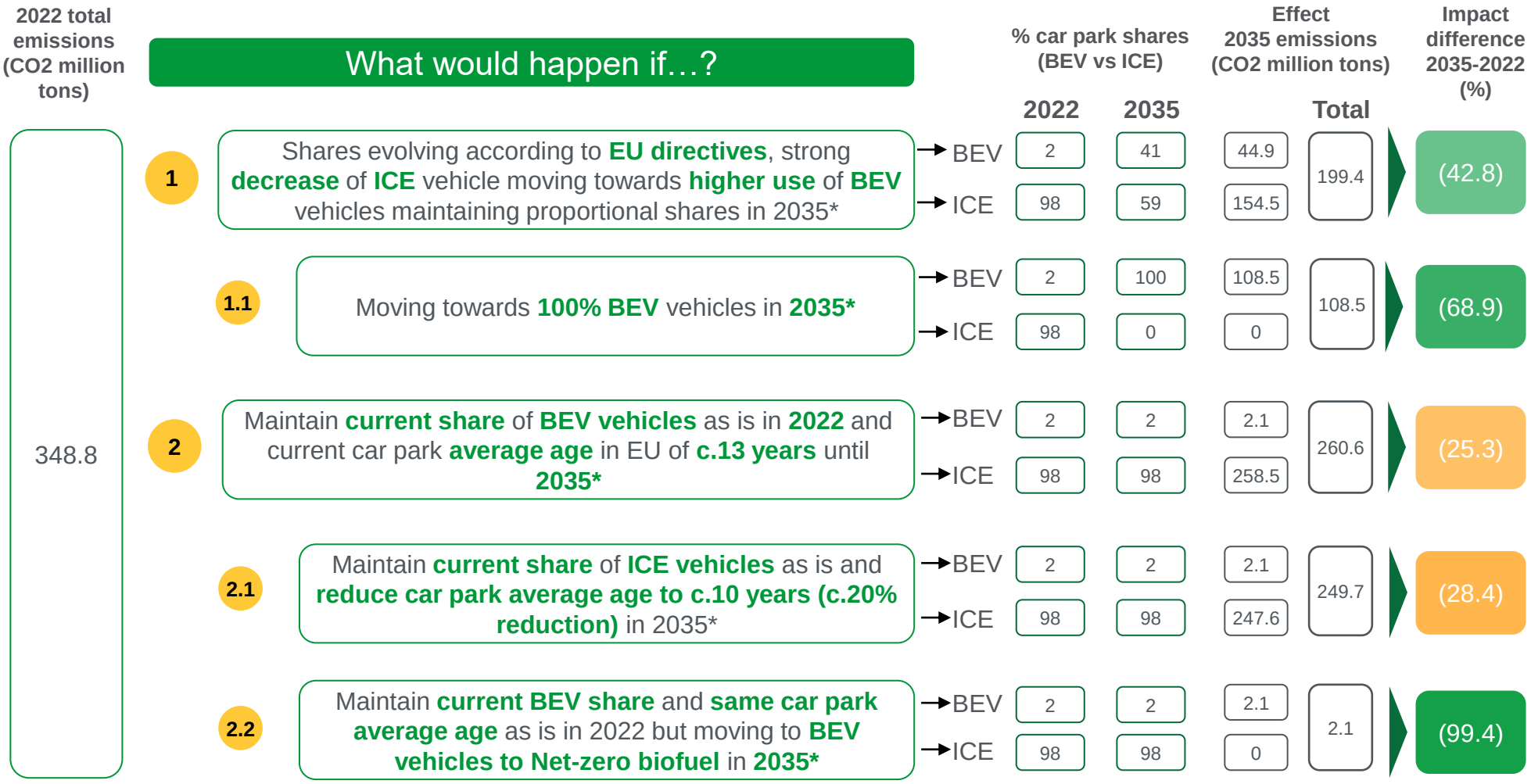
The volume segment seems to not be a priority for the European OEMs

To achieve the goal of emission reduction, a synergistic approach employing a diverse range of technologies can be employed

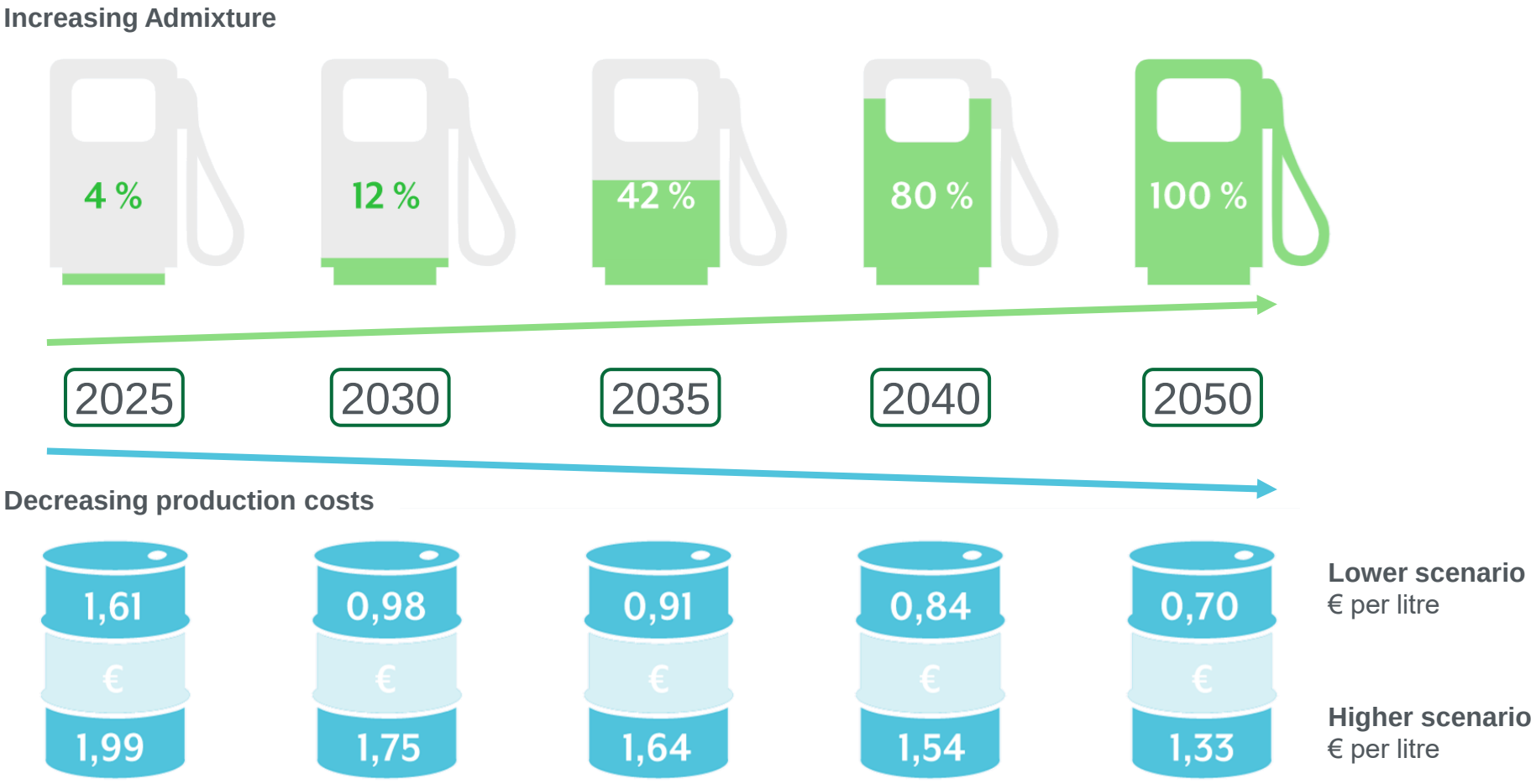
# Out of the future scenarios possible, the higher reduction of emissions occurs when efforts are focused in shifting ICE towards using biofuel/hydrogen




Source: L.E.K. research and analysis
Note: *Assuming BEV's emission to move from 350g to 200g C02/KWh in 2035 and 11.300km per car as Average yearly usage

Positive impact
Lower — Higher

# And moving towards to a 100% scenario is feasible?




Source: Prognos AG, Fraunhofer UMSICHT and DBFZ (2018): Status and perspectives of liquid energy sources in the Energy transition

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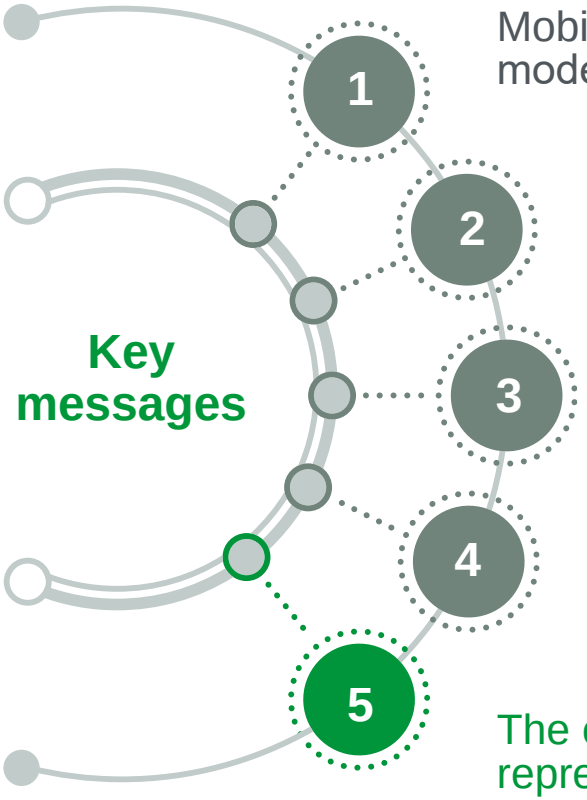


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To achieve the goal of emission reduction, a synergistic approach employing a diverse range of technologies can be employed

The combination of EVs, hydrogen and net-zero fuels may represent the future of the automotive

# The Electric Vehicles market can explore some alternatives in order to overcome these challenges and thrive as a viable option for the light vehicle mass market

## *Car manufacturers are in doubts with the future of BEV*

STELLANTIS

**The real challenge with electric cars is to make is to make it affordable**

"… The real challenge of the electric car is to make it affordable. We will need to make a lot of efforts to absorb the extra costs of the electric technology…"

- CEO, Stellantis

Volkswagen

**Electric car prices will not go down and those who used to bought cheap cars will have to use public transport**

"… Their production in Europe, as of today, will not be cost-effective compared to vehicles made in China…"

- Ex-brand strategy director, Volkswagen

TOYOTA

**Best way forward includes different powertrain technologies**

- Toyota chief executive Akio Toyoda claims that he is among the "silent majority" of those in the automotive industry questioning whether electric vehicles are the only way forward

mazda

**Longer-range EVs not expected to have a viable place in the future**

"… people are hoping for electric cars with 300 miles of range, but I do not see that as sustainable in the future …"

- CEO, Mazda

Source: L.E.K. research and analysis



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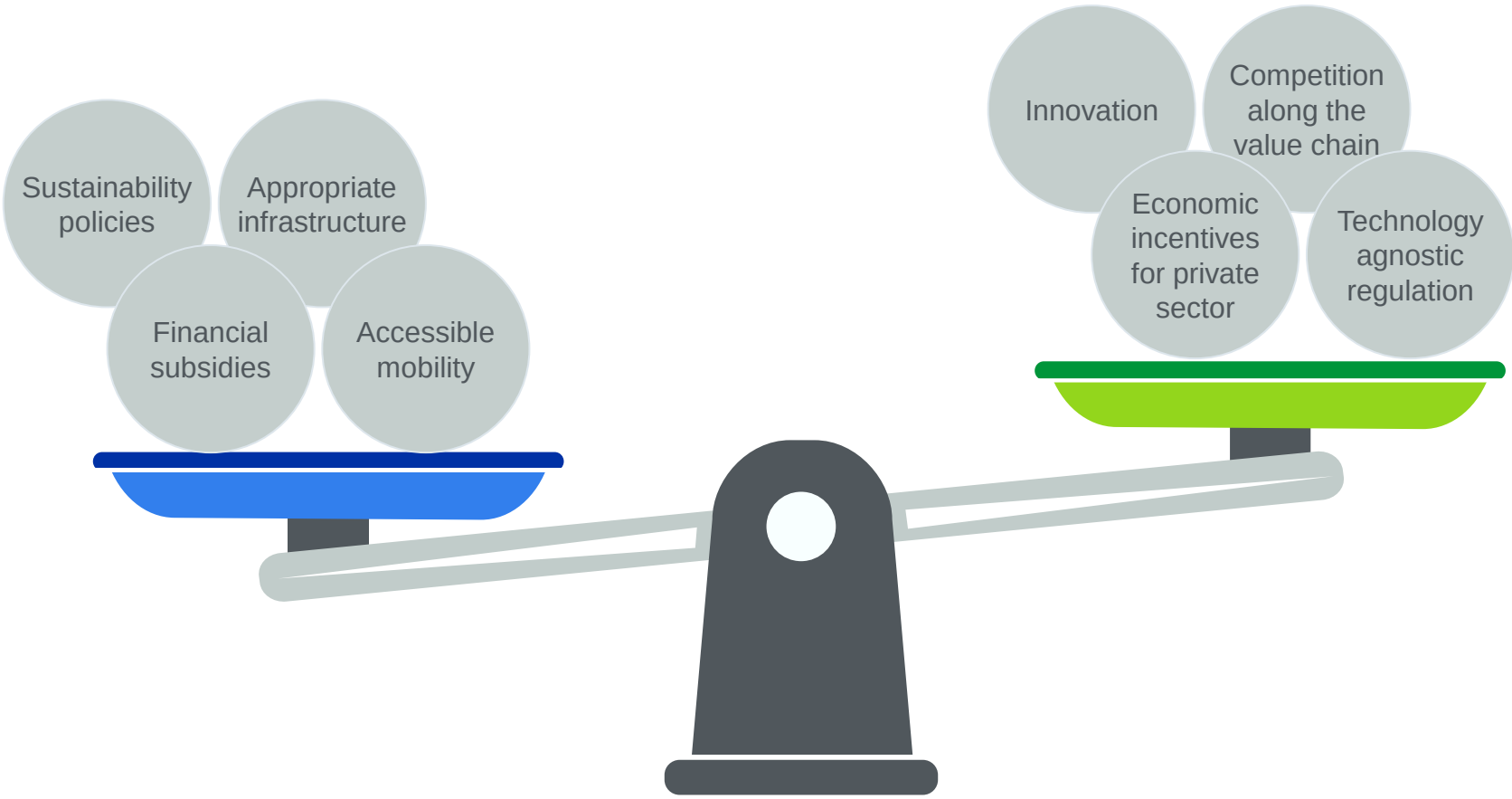
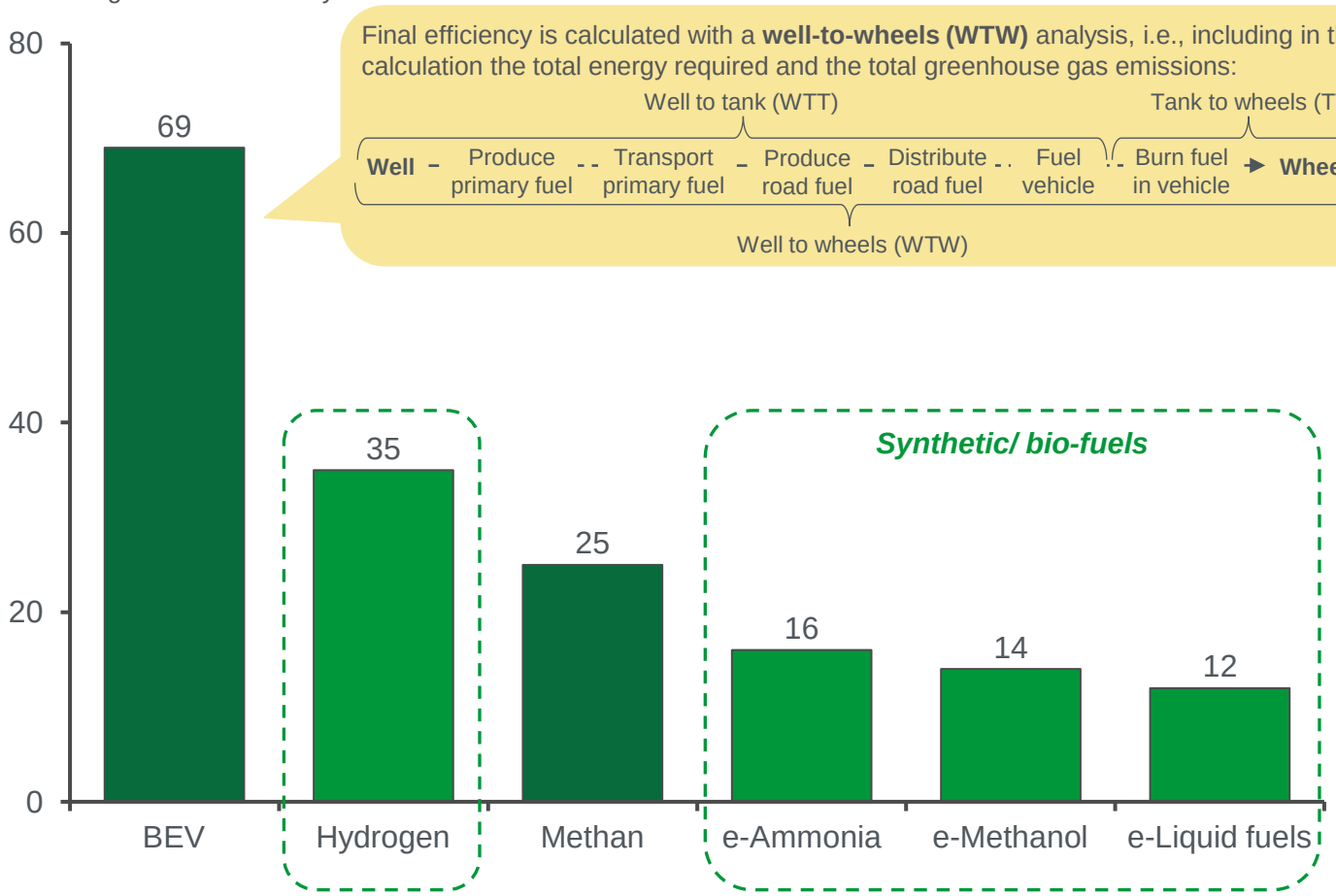
# Regulation must be balanced and open to technologies that facilitate affordable and sustainable mobility solutions while defending the competitiveness of the industry




Source: L.E.K. research and analysis

# Given the challenges faced by BEVs, alternative solutions such as hydrogen and net-zero bio-fuels may help reach emission reduction objectives

**E-fuels final efficiency in engines**
Percentage of total efficiency

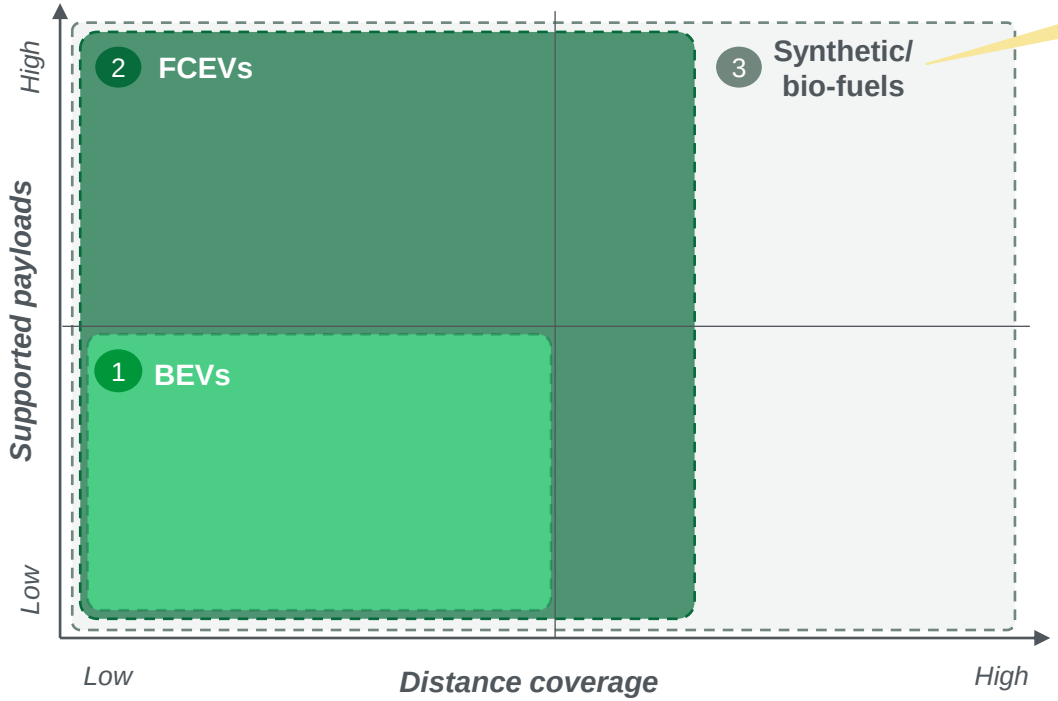



- There are “green” solutions, alternative to electric vehicles already on the market, including hydrogen and e-fuels
- Although to date they do not offer efficiency levels comparable to BEVs, they can

Source: Concawe Environmental Science for European Refining; European Commission; L.E.K. research and analysis

# A mix of technologies will represent the best solution for the future of automotive

**Engines positioning by supported payloads, distance coverage and efficiency**




For an efficient evolution, the hypothesis is that where there is the coverage of more than one technology, the technology with the higher level of efficiency prevails

**1 Battery electric vehicles**

- Not suitable for long distances or heavy payloads, BEVs will cover urban passenger travels as they represent the most efficient solution in this area

**2 Fuel cell electric vehicles**

- Not suitable for very long distances but able to support heavy payloads, FCEVs will cover public transportation as they represent the most efficient solution in this area

**3 Synthetic/ bio-fuels vehicle**

- Bio-fuels will be used for long journeys as they are the only green fuel able to guarantee large distance coverage
- Despite potentially covering all drive occasions, biofuels do not represent the most efficient solutions when compared to FCEVs and BEVs

The future of automotive will see the use of BEVs (or PHEVs with synthetic fuels) for urban travel, hydrogen in public transport and synthetic fuels (or eco-fuels) for long journeys

Key: Level of efficiency — Lower — Higher

Source: L.E.K. research and analysis



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