From boom to brake: is the e-mobility transition stalling?

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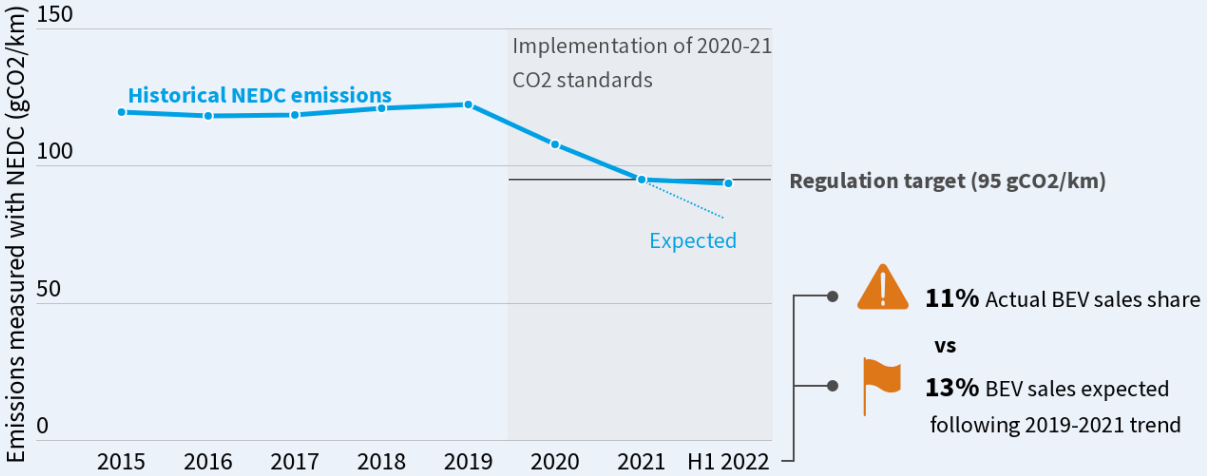
Executive Summary

After two consecutive years of CO2 emission drops - driven by the EU CO2 standards -, in the absence of a higher target, 2022 has seen both a stagnation of emission reductions and a slowdown of electric car sales. With little regulatory incentive for carmakers to scale up electric vehicle production over the coming decade, policy makers risk putting the brakes on Europe's emobility boom. Weak targets in the 2020s not only threaten the achievement of EU countries' climate goals, but also put at risk European industrial competitiveness, leaving the door open for Chinese carmakers to capture the mass market for BEVs.

Emissions stagnated as the car CO2 standards' stringency stopped increasing



Following 2019-2021 trend (dotted line), emissions are expected to decrease to 83 g/km (NEDC)

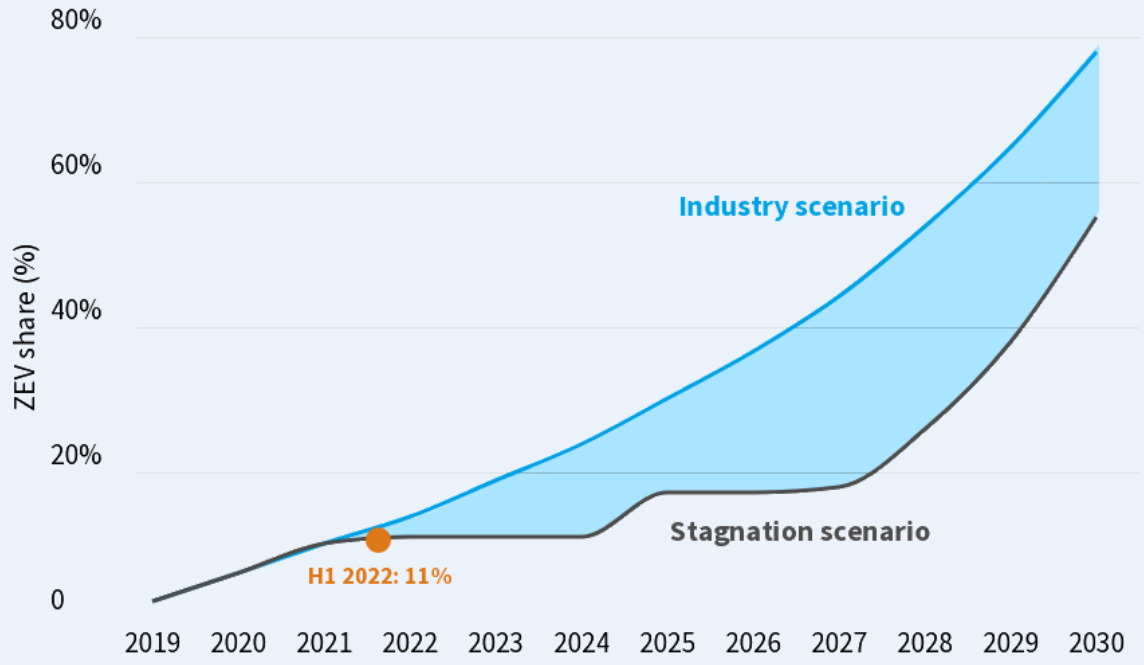
Source: T&E analysis of data in the European regulation scope from the European Environment Agency (2015-2021) and H1 2022 from Dataforce

The EV stagnation has started

After an unprecedented drop in CO2 emissions from new cars driven by the 2020/21 CO2 standards, CO2 emissions decreased by only 2% in H1 2022. The BEV market also slowed down, reaching 11% of the EU market. With EV sales growing in both China and the US, global supply chain disruptions cannot be said to be chiefly responsible. Even if the usual slump in start of the year sales is included, the BEV share should have been closer to 13%. Despite the stagnating BEV sales, all but VW are on track to meet their 2022 CO2 goal, underscoring the weakness of the current regulation.

Electric car sales are at a crossroad between two different pathways - industry trends based on carmaker promises vs. stagnation in response to weak regulation until 2030. Carmakers' own sales commitments would see BEVs making up 78% of the car market in 2030. But if carmakers do the minimum to meet their mandatory targets and prioritise sales of combustion engine vehicles - the

sales will be 55%. In case of EV sales stagnation, 20 million BEVs would not be sold compared to the industry scenarios. This would be responsible for an additional 135 MtCO2 over the decade, more than the yearly GHG equivalent emissions of the whole of the Czech Republic.



Zero emission vehicle sales face large uncertainties in the coming decade

A last chance to fix the regulation

As the revision of the car CO2 standards legislation nears the finishing line, policy makers will aim to find a final agreement by the end of the year. While the backing of the 2035 100% CO2 cut by both the Parliament and Council is crucial and welcome, unfortunately, amendments to increase the ambition of the targets were rejected, limiting possibilities for a faster transition and leaving the door open to carmakers to backtrack on previous commitments and prioritise ICE sales. Without strong supply-side policies though, the emobility transition in Europe is set to stall, threatening the achievement of the EU Green Deal goals. Even if targets will remain unambitious until 2030, some regulatory flexibilities - such as additional CO2 bonuses for EV sales - can still be fixed. These flexibilites would lead to a weakening between 5% and 8% of the targets between 2025 and 2029, and would be equivalent to 500,000-700,000 missing BEVs - that would otherwise have to be sold - annually. This is the climate cost of the flawed design of the regulation. The CO2 bonus - or "ZLEV benchmark" that gives credits to carmakers for sales of electric cars - is the largest contributor to this weakening. It would amount to a 3.7% weakening from 2025, equivalent to about 800,000 BEVs sold between 2025-30.

EV sales stagnation not without consequences

Stagnation of European electric car sales contrasts with trends in China or the US where incentives continue to fuel the EV boom. In Europe, carmakers are now failing to meet the growing consumer demand with longer waiting times than elsewhere and most car brands sold out. This stagnation is accompanied by Chinese carmaker entry in the EU market - reaching 5% of the BEV market already in H1 2022 - and a growing share of electric cars produced in China (2 BEVs out of 10). If Chinese carmakers continue on the current trend, their market penetration in Europe could reach between 9-18% of the BEV market in 2025. The failure of EU carmakers to scale up BEV supply could result in foreign automakers offering affordable models and capturing a large share of the mass market in Europe. If the EU is unable to efficiently regulate its own market, it risks losing its economic sovereignty in the automotive industry.

Stagnating BEV sales are also bad news for the climate - as the emission reduction slow down will make it difficult for member states to meet their climate targets - and consumers, who will not reap the benefit of cheaper EU EV models given the lack of economies of scale.

In this context, the EU must consider additional measures to accelerate BEV supply on top of the weak CO2 targets before 2030. Smart policies, including local content thresholds to mirror the US Inflation Reduction Act, are needed to guarantee a more resilient and socially acceptable pathway toward carbon neutrality. We need global markets, including China, for scale and competition. But Europe should not be naive and should put in place targeted industrial policy to capture parts of the BEV supply chains.

Key recommendations

For car CO2 trilogues:

- Lock-in the 100% CO2 reduction from all new cars by 2035
- Oppose any exemptions or credits for e-fuels in new cars
- Delete the Zero- and Low-Emission Vehicle (ZLEV) benchmark from 2025
- Support energy efficiency standards for future BEVs

Additional measures to spur BEV supply in 2020s:

- Electrify all new sales of corporate fleet vehicles by 2030
- Use EU funds and national measures to accelerate BEV production beyond minimum targets
- Integrate local content requirements on BEV, batteries and minerals into national EV support schemes
- Ensure minimum public charging network on all EU roads from 2025 (via AFIR) and mandate all buildings to pre-cable their garages by 2035 (via EPBD).

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Acronyms

AFIR	Alternative Fuel Infrastructure Regulation
BEV	Battery electric vehicle
EEA	Depending on the context, European Environment Agency or European Economic Area
EI	Eco-innovation
EPBD	Energy Performance of Buildings Directive
ESR	Effort Sharing Regulation
EV	Electric vehicle
HEV	Hybrid electric vehicle (without plug)
ICE	Internal combustion engines vehicle
NEDC	New European Drive Cycle
OEM	Original equipment manufacturer (carmaker)
PHEV	Plug-in hybrid electric vehicle
VW	Volkswagen Group
WLTP	Worldwide Harmonised Light Vehicle Test Procedure
ZEV	Zero emissions vehicle (battery electric vehicles and fuel cell electric vehicles)
ZLEV	Zero and low emissions vehicle (vehicles with emissions below 50 g/km)
%p	Percentage point

1. Introduction

Since their implementation in 2020, new EU car CO_2 emission standards have been the main regulatory driver for emission reductions from new cars in the EU by forcing carmakers to sell cleaner cars. In 2021, new car emissions dropped by 12% for the second year in a row and one out of ten cars sold in Europe[1] was electric[2].

In order to meet the European Green Deal's ambition of net zero CO_2 emissions by 2050, CO_2 emissions from passenger cars have to drop quickly, requiring all new cars to be zero emission by 2035 at the latest. Although the legislative process for the revision of the post-2021 car CO_2 emission standards is not yet finalised, it is encouraging that both the European Parliament and EU governments (in the Council) backed the European Commission's proposal to phase-out internal combustion engines vehicles (ICE) sales from 2035.

In order to reach this crucial target and secure the most efficient and socially acceptable pathway, early action and supply-side targets are required. Sales of zero emissions vehicles (ZEVs) will need to hit at least 67% in 2030 to be on the feasible path to 100% zero emission sales in 2035 [1]. This corresponds to a CO_2 reduction target of 80% in 2030 with at least a 30% CO_2 reduction from 2025 and 45% from 2027. This will drive the necessary early battery electric vehicles (BEVs) cost reductions to ensure mass market adoption and avoid potential supply chain bottlenecks that could result from industry waiting until the last moment to transition to 100% ZEV. Regrettably, both the Council and the Parliament rejected proposals for more ambitious CO_2 reduction targets, with both their final positions aligned with the 15% reduction in 2025 and 55% reduction in 2030 proposed by the European Commission. Inter-institutional trilogue negotiations started in September and are expected to result in a final law being agreed before the end of the year 2022.

Following successive years of impressive electric vehicle sales growth, evidence suggests that the absence of a higher target in 2022 is leading to stagnating emission reductions and a slow down in EV sales. This should be a wake up call to regulators, as an unambitious regulation not only threatens the achievement of the EU's and European countries' climate goals, but puts at risk the competitiveness of the EU automotive industry as Chinese carmakers move to fill the supply void and capture the market left by European players.

While not setting more ambitious targets in the 2020s is a missed opportunity, trilogues still represent a chance for policy makers to tighten up remaining regulatory loopholes and avoid any further weakening of the regulation. In the absence of higher targets however, more policies will be needed to provide the necessary incentives for industry to boost supply over the coming years.

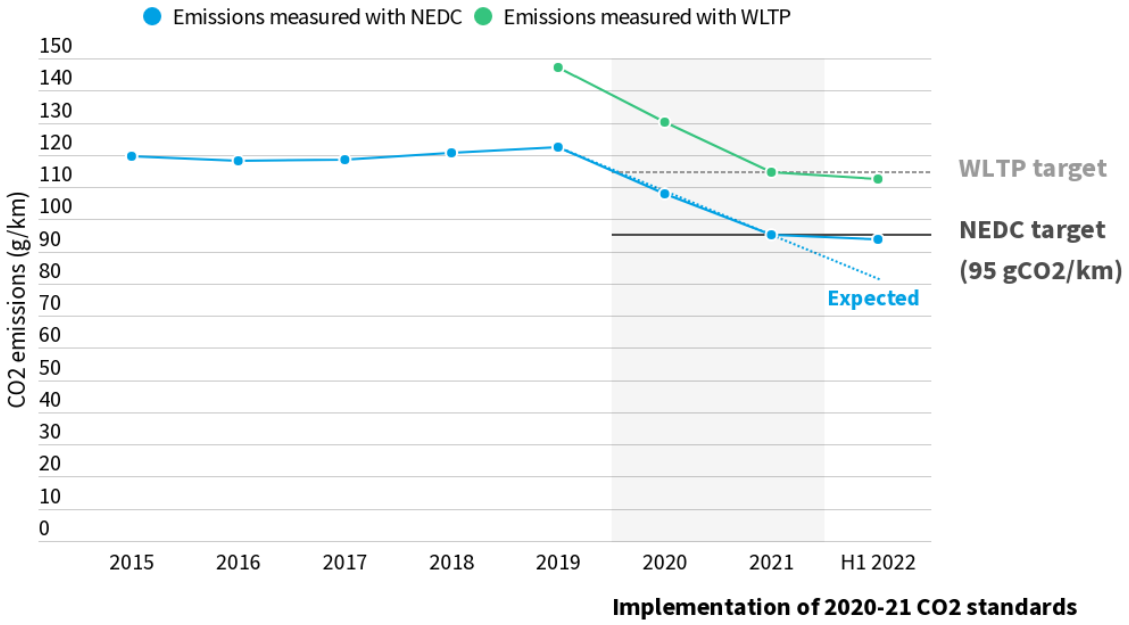
[1] Unless specified otherwise, "Europe" is used to refer to the scope of the European regulation that includes the whole European Economic Area.
[2] "Electric cars" refers to battery electric cars and does not include plug-in hybrid (PHEV) cars

Published on an annual basis, T&E's car CO_2 report tracks the compliance of carmakers (OEMs) with the regulation and analyses the impacts of current and future regulation on emissions reductions and ZEVs sales. The CO_2 emissions of new cars are analysed in section 2, and section 3 looks at plug-in vehicle sales during the first half of 2022. Section 4 analyses the possible trends of BEV sales in the rest of the decade and the implications of the CO_2 standard rules on BEV sales and broader industrial activities.

2. Car CO_2 emissions stagnate in 2022

2.1. CO_2 emissions trends

T&E acquired car registration data for the first half of 2022 from Dataforce in August 2022 and compared it with official emissions data provided by the European Environment Agency (EEA) until 2021. Figure 1 displays the trends of emissions measured both with the New European Drive Cycle (NEDC) and the Worldwide Harmonised Light Vehicle Test Procedure (WLTP)[3].



Following 2019-2021 trend (dotted line), emissions were expected to decrease to 83 g/km (NEDC) and 101 g/km (WLTP)
Source: T&E analysis of data in the European regulation scope from the European Environment Agency (2015-2021) and H1 2022 from Dataforce.

Figure 1: NEDC and WLTP emissions in the European Economic Area (EEA)

[3] The NEDC is the measurement standard used before 2021, emissions are reported with this standard by member states until the end of 2022. Progressively introduced from 2018, the WLTP has been used for regulatory purposes since 2021.

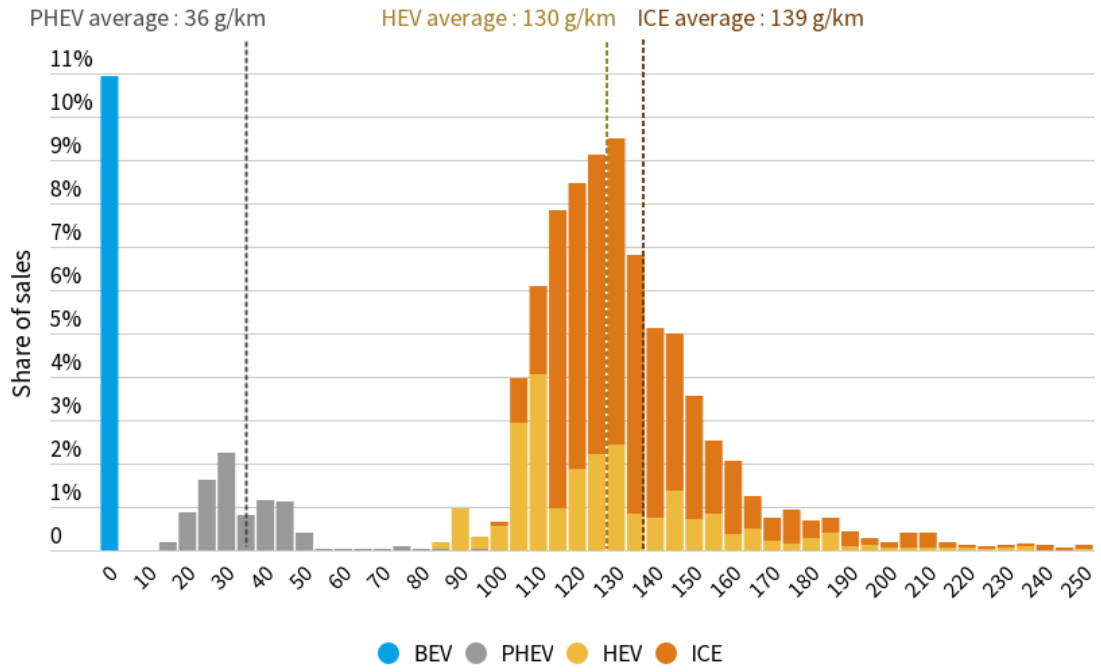
In the absence of new regulatory targets, emission reductions slowed down in H1 2022

The phase-in[4] of the 2020-2021 car CO_2 standards (including the 95g CO_2 fleetwide target, which applies to OEMs each year until the end of 2024) led to a 12% emissions reduction both in 2020 and 2021. But this declining trend slowed down in the first half of 2022 with just a 2% reduction compared to 2021. The average CO_2 emissions in Europe in this period settled at 112.2 g/km[5] compared to 114.7 g/km in 2021. If emissions had continued to follow the 2019-2021 downward trend, average emissions were expected to reach 100 g/km in 2022. This change of direction highlights a concerning trend: that without more ambitious regulatory targets, carmakers will not maintain the same level of commitment to emission reductions, especially in difficult periods[6].

2.2. Distribution of sales by powertrain and emissions

Compared to 2021, the average CO_2 emissions for each powertrain type has slightly reduced in H1 2022: ICE emissions decreased by about 0.8% (highlighting the technological limitations of improving ICE emission performance), hybrid electric vehicles (HEV) emissions by 1.6%, while plug-in hybrid vehicles (PHEVs) underwent a larger improvement with a 6.5% reduction in PHEV emissions. Figure 2 highlights the emission range of different powertrains. Most PHEVs range from 15 g/km to 80 g/km with an average at 36 g/km according to WLTP, but in reality have much higher real-world emissions[7]. Hybrid electric vehicles[8] (HEV) emissions range starts from 85 g/km with an average at 130 g/km and pure ICE vehicles have emissions starting from 100g/km with a 139 g/km average.

[4] 2020 was a phase-in year as the target only applied to the 95% least emitting new cars in a carmaker's fleet.
[5] Unless specified otherwise, emissions values used in this report are measured with WLTP.
[6] Lasting supply chain issues due to many factors (including Putin's war in Ukraine, Covid lockdowns, or semiconductor shortages) impacted carmakers' activities in the first half of 2022.
[7] ICCT reports that real-world values are 3-5 times higher than WLTP type-approval values. [2]
[8] In this report, HEV is used to qualify all plugless hybrids (full and mild hybrids).



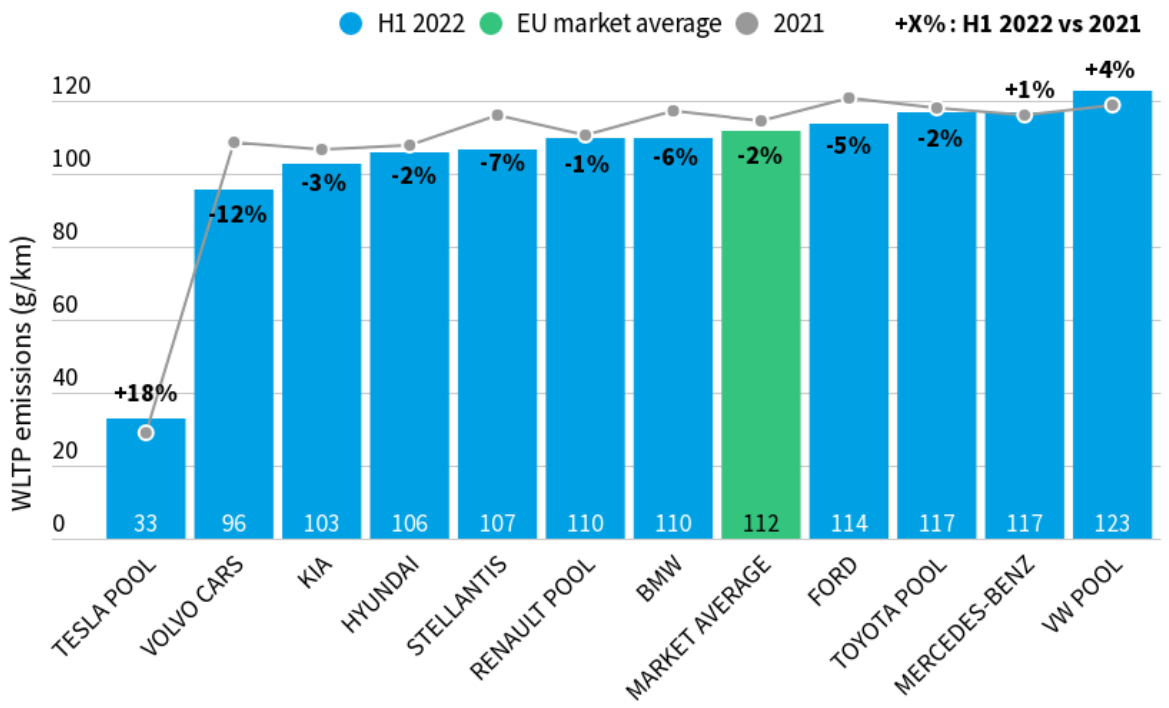
Scope: Registration data for the EU27 and Norway. Emissions measured with the WLTP.
Source: T&E analysis of passenger car registration data from the first half of 2022 from Dataforce.

Figure 2: Emission distribution by powertrain in H1 2022

2.3. Carmakers' CO_2 emissions

Most carmakers succeeded in reducing their emissions and those with the largest increase in BEV sales achieved the largest cut in emissions. Figure 3 displays the change in emissions for each carmaker pool[9] between 2021 and H1 2022. Among the leaders, Volvo Cars[10] cut its emissions by 12% as its BEV sales share increased from 5.9% in 2021 to 11.2% in H1 2022. However, their large share of PHEVs (40%) artificially decrease the carmaker's overall emissions. On the other hand, some carmakers increased their emissions. The increase of the Tesla pool is simply explained by a change in the balance of brands in the pool with a higher car sales share for Honda. But carmakers such as Volkswagen (VW pool) and Mercedes-Benz appear as laggards as their emissions increased compared to 2021. VW's BEV sales share decreased by 1 percentage point in H1 2022 while its ICEs were 1% more polluting.

[9] OEMs are allowed to form pools to jointly comply with CO_2 targets. In a pool, emissions across manufacturer groups included in it are averaged out. Manufacturers who don't sell enough electric cars can benefit through such collaborations (such as Honda in the Tesla pool). The list of pools currently declared can be found in Annex 6.1.
[10] In this report, Volvo Cars does not include Polestar.



Scope: Registration data for the EU27 and Norway.

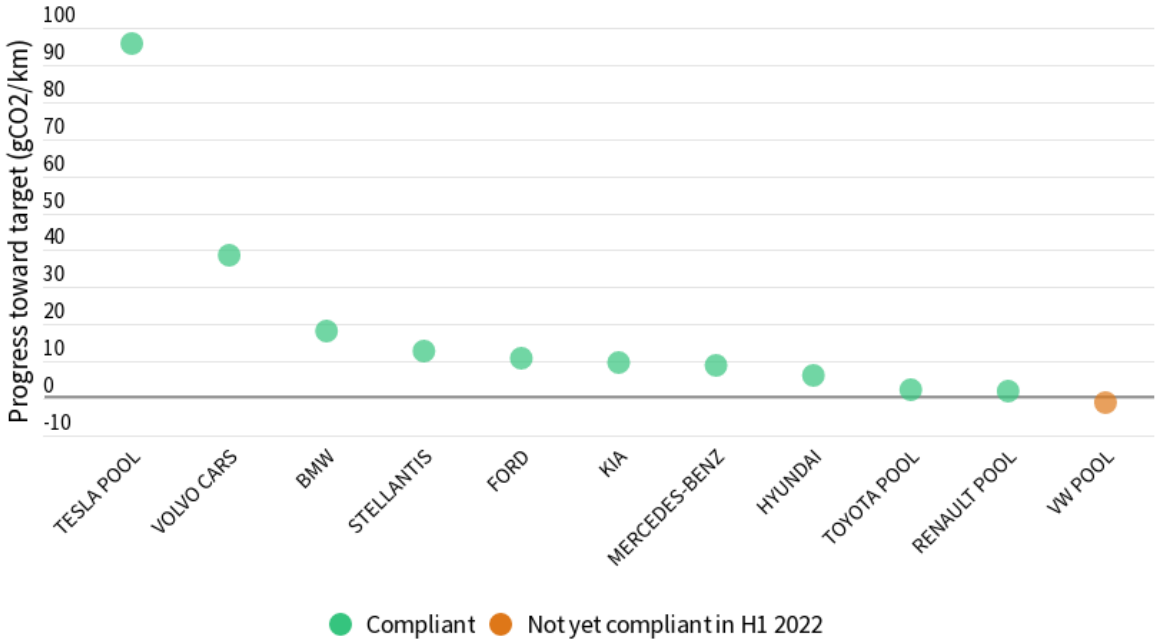
Source: T&E analysis of passenger car registration data from Dataforce (H1 2022) and the EEA (2021)

Figure 3: Average WLTP emissions by carmaker in H1 2022 compared to the whole year 2021

VW is the only carmaker pool not compliant with its regulatory targets in H1 2022

When assessing OEMs' compliance with the regulation, all carmaker pools except Volkswagen are already compliant with the 95 g/km target in the first half of 2022[11] . However, as the German group already announced having a full order book of BEVs for the rest of the year [3], and as they expect their own supply chain issues to ease [4], we can expect that it will meet its targets thanks to a BEV sales push in the second half of the year, as was done in the last two years. As the regulation stringency stopped increasing in 2022, all carmakers should meet their 2022 targets very easily.

[11] To define OEMs average mass used in the target calculation, the OEM average mass by powertrain from the EEA 2021 dataset is combined with the share of powertrain sales in H1 2022 from Dataforce

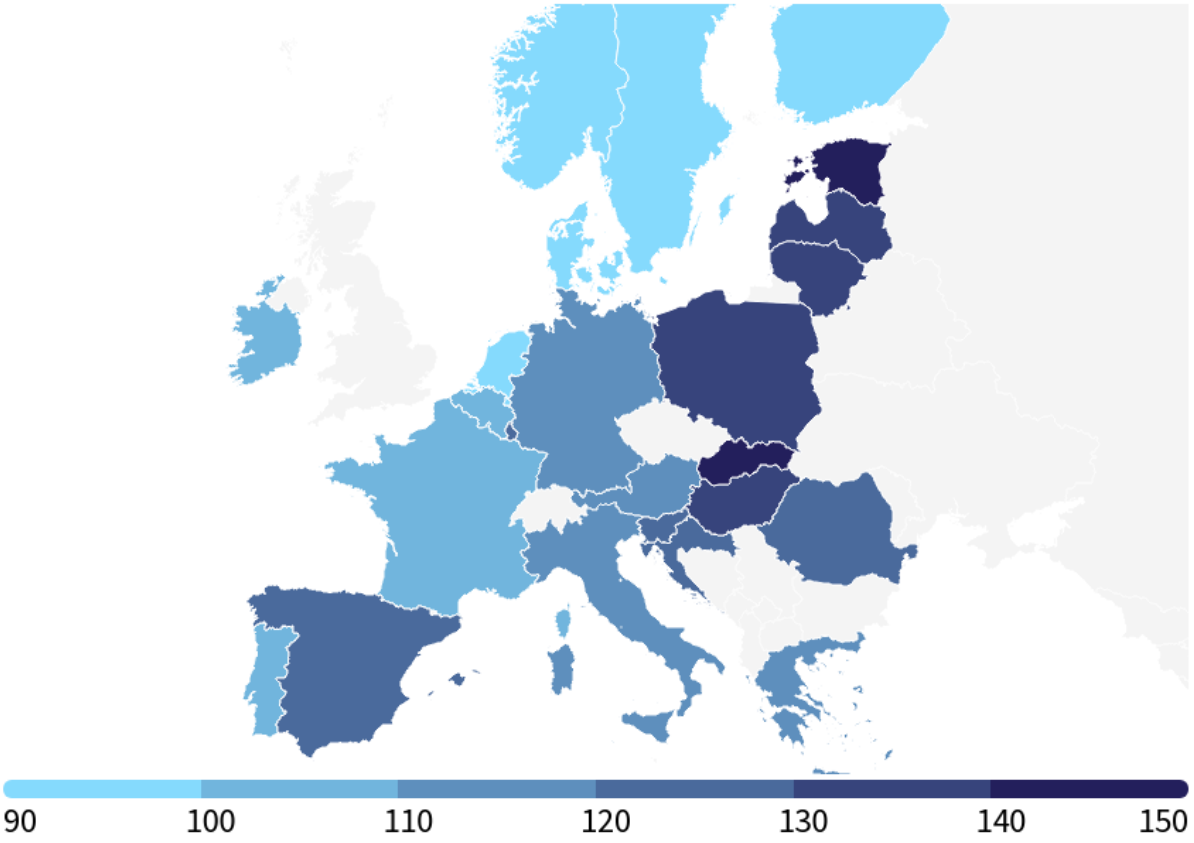


Scope: registration data for the EU27 and Norway in H1 2022.
Source: T&E analysis of passenger car registration data from the first half of 2022 from Dataforce.

Figure 4: Compliance of OEMs over the first half of 2022

2.4. CO_2 emissions per country

With new car CO_2 emissions ranging from 18.7 g/km in Norway to 157.5 g/km in Slovakia, European countries have performed very differently. The Northern country group (Norway with 18.7 g/km, Sweden with 76.6 g/km, Denmark with 91.5 g/km and Finland with 91.7 g/km) and the Netherlands (92.0 g/km) are still leading the way with emission averages already below 100 g/km due to their high shares of BEV sales (e.g. Norway with 79.1% and Sweden with 27.6%). On the other hand, countries with the highest emissions are located in Eastern Europe where the BEV share of sales is mostly still low. Slovakia with 156.5 g/km only has a 1.7% BEV sales share or Estonia with 141.8 g/km has 3.2% BEV sales share. Nevertheless, with a low number of cars sold, these countries have little effect on the EU average emission.



Scale: CO2 emissions measured with the WLTP (gCO2/km)

Source: T&E analysis of passenger car registration data from the first half of 2022 from Dataforce

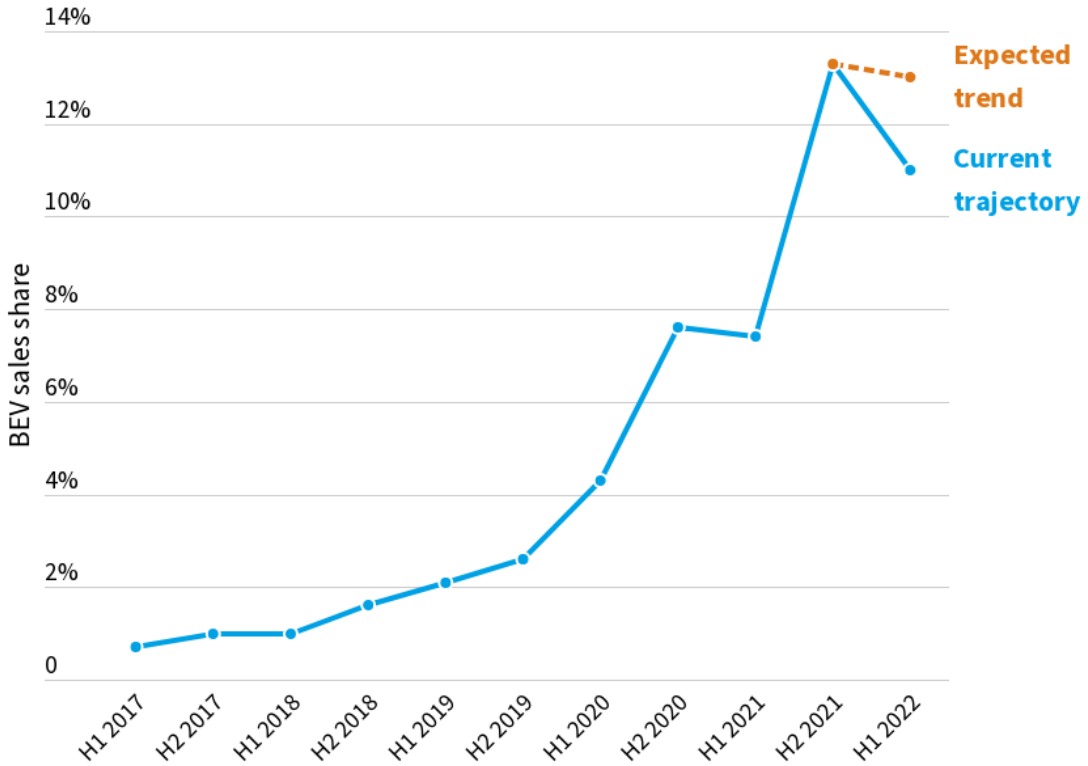
Figure 5: Average emissions by countries in H1 2022

3. Electric car sales stalled in the first half of 2022

3.1. BEV sales trend analysis

European BEV sales fell behind in the first half of 2022

Electric cars reached 11.1% of the European market in the first half of 2022. As shown in Figure 6, this is actually lower than the second half of 2021 (13.3%), but still slight progress compared to the 10.1% for the whole year 2021 (+0.9%p increase). As witnessed in H1 2021, a lower sales share in the start of 2022 was expected as carmakers tend to boost their BEV sales at the end of the year and end up with low inventories at the start of the following year after the Christmas production break. But the actual results are well below the expected trend. The BEV sales share increased by about 75% in both H1 2021 and H2 2021 compared to the preceding year. Following this trend, a 13% BEV sales share was expected in H1 2022. The current trajectory could be an outlier in a long term upward trend or the first evidence of a worrying trend of stagnation of EV sales in Europe, in the absence of stricter CO_2 targets after 2021. Although automotive supply chains were impacted by external factors (semiconductor and wire harness shortages, Chinese Covid shutdowns,...), the following sections show that this drop is mostly a problem in Europe, due to the weak regulation.



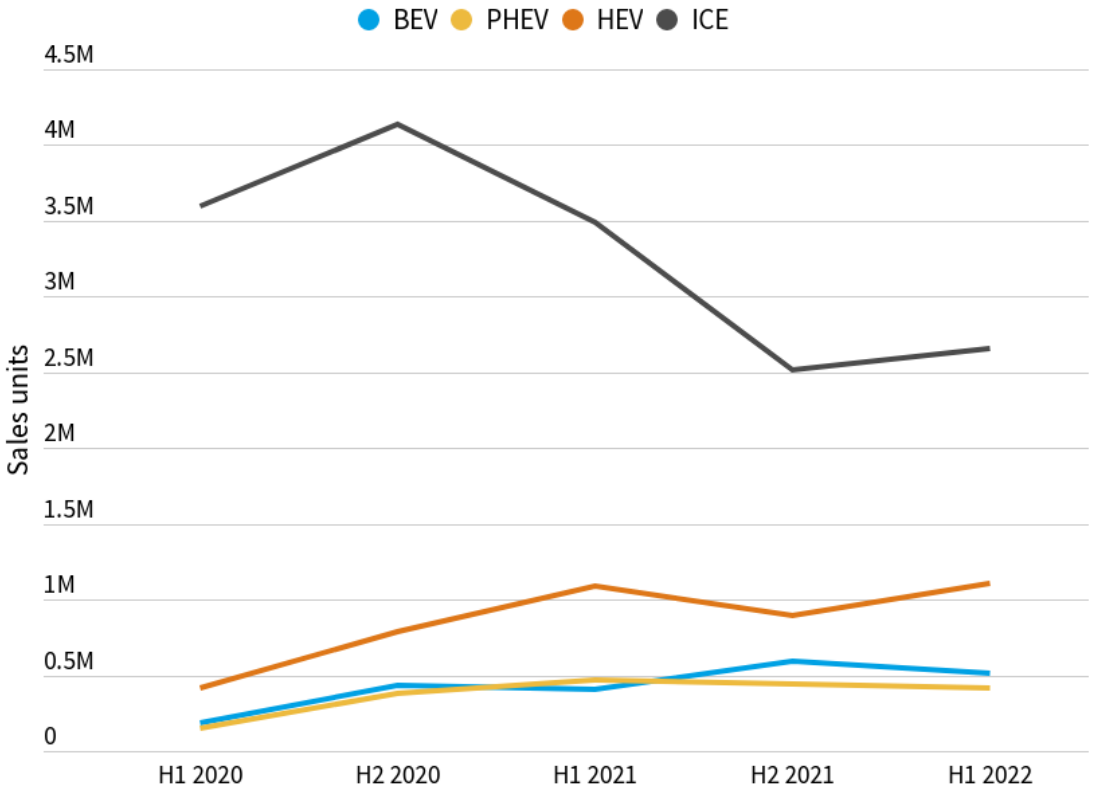
Scope: EEA registrations. The expected trend is based on the historic trend of +75% increase of the BEV sales share compared to H1 2021

Source: ACEA (2022) Quarterly AFV registrations

Figure 6: BEV share of sales in Europe

BEV volumes decreased while ICE and HEV sales rebounded

In terms of volumes, Figure 7 shows that electric cars sales decreased by 13% in the first half of 2022 compared to the second half of 2021, while HEV and ICE sales rebounded (23% and 5% respectively).



Scope: EEA registrations

Source: ACEA (2022) Quarterly AFV registrations

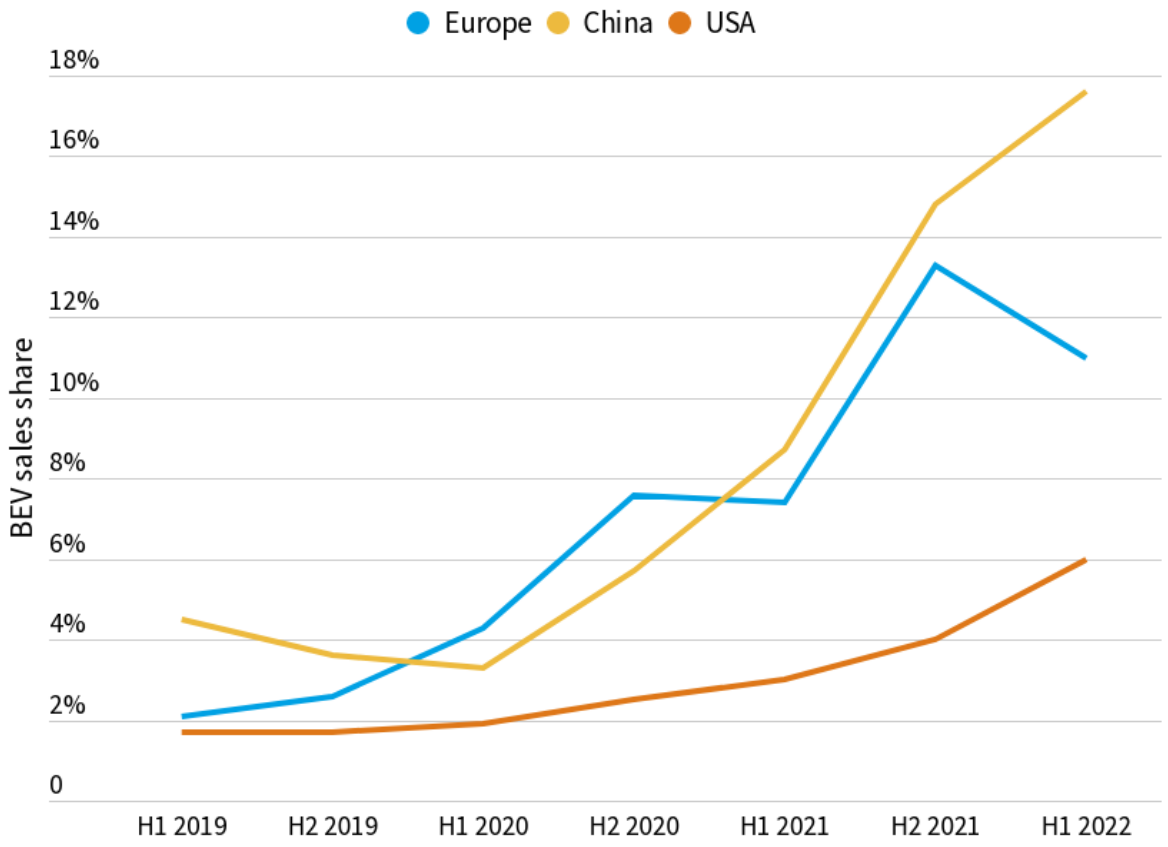
Figure 7: Sales unit by powertrain

Rising electric car sales in China and in the US contrasts with Europe's slowdown

From a global perspective, the BEV market slowdown in Europe in the absence of new CO_2 targets is in stark contrast with growth in other large markets. Thanks to more ambitious regulatory incentives[12], BEV sales continue to increase in China (3 percentage point increase of the BEV sales

[12] The main driver in China is the new energy vehicle (NEV) mandate. It requires OEMs to produce NEVs to meet credit requirements and meet their average fuel consumption requirements. Moreover, NEV models are exempted from Purchase Tax.
In the US, 46 states provide a wide range of EVs incentives including tax credits or fleet acquisition goals. 15 states adopted California's low-emission vehicle (LEV) and zero-emission vehicle (ZEV) standards requiring manufacturers to sell a certain number of ZEVs per year.

share in H1 2022 compared to the previous semester) and in the US (2%p increase). This shows that regulatory incentives and targets are a key driver in driving the supply, and cannot be explained by supply chain disruptions alone. Without more stringent CO_2 reduction targets over the coming years, Europe risks lagging behind its industrial rivals and conceding the lead in future-proof technology to other regions of the world.



Source: ACEA (2022) Quarterly AFV registrations for the European Economic Area, LMC Automotive Global Hybrid & Electric Vehicle Forecast (Q2 2022) for the USA and China

Figure 8: BEV sales share comparison between main global markets

3.2. BEV sales by country

Sweden is the EU country with the largest BEV sales share (27.6%) and its sales numbers are the third largest in the EU. Germany and France have the largest sales numbers but their domestic BEV sales share are closer to the EU average (13.5% for Germany and 12.1% for France). BEV sales are not just a Western EU phenomenon however, with some Eastern countries such as Romania (7.6%) starting to have significant BEV sales. Combined with smart national policies, this shows Eastern European consumers are ready to buy BEVs. Some southern countries, however, have been largely

unsuccessful in increasing their BEV sales, for instance Spain only reached 3.5% BEV in H1 2022 and Italy 3.6%. Figure 9 displays the BEV sales share by EU countries and compares it with the amount of BEV sold in this country to visualise the weight of a country in the EU BEV market.

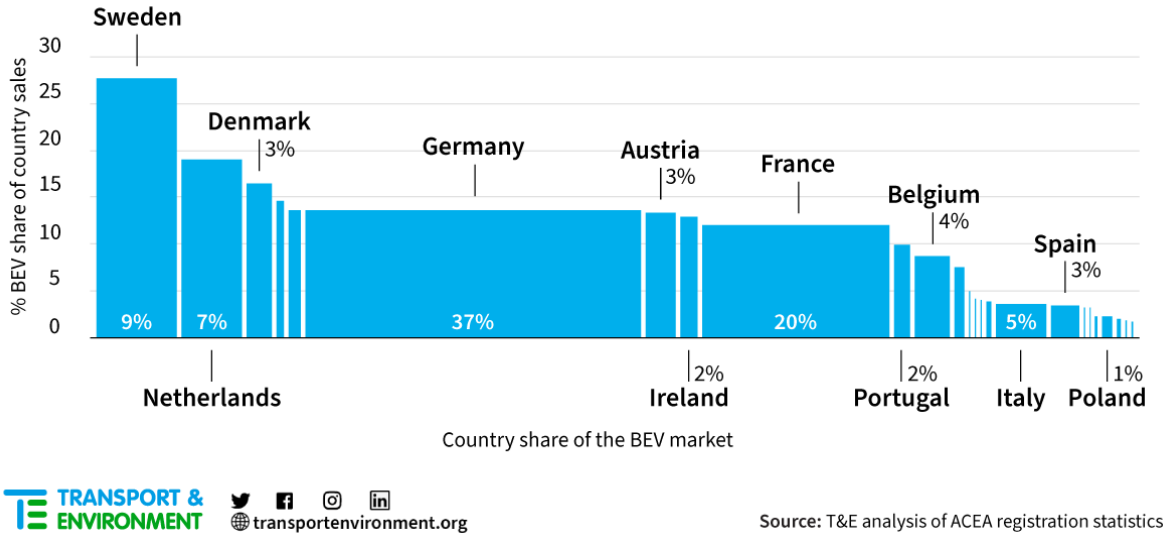
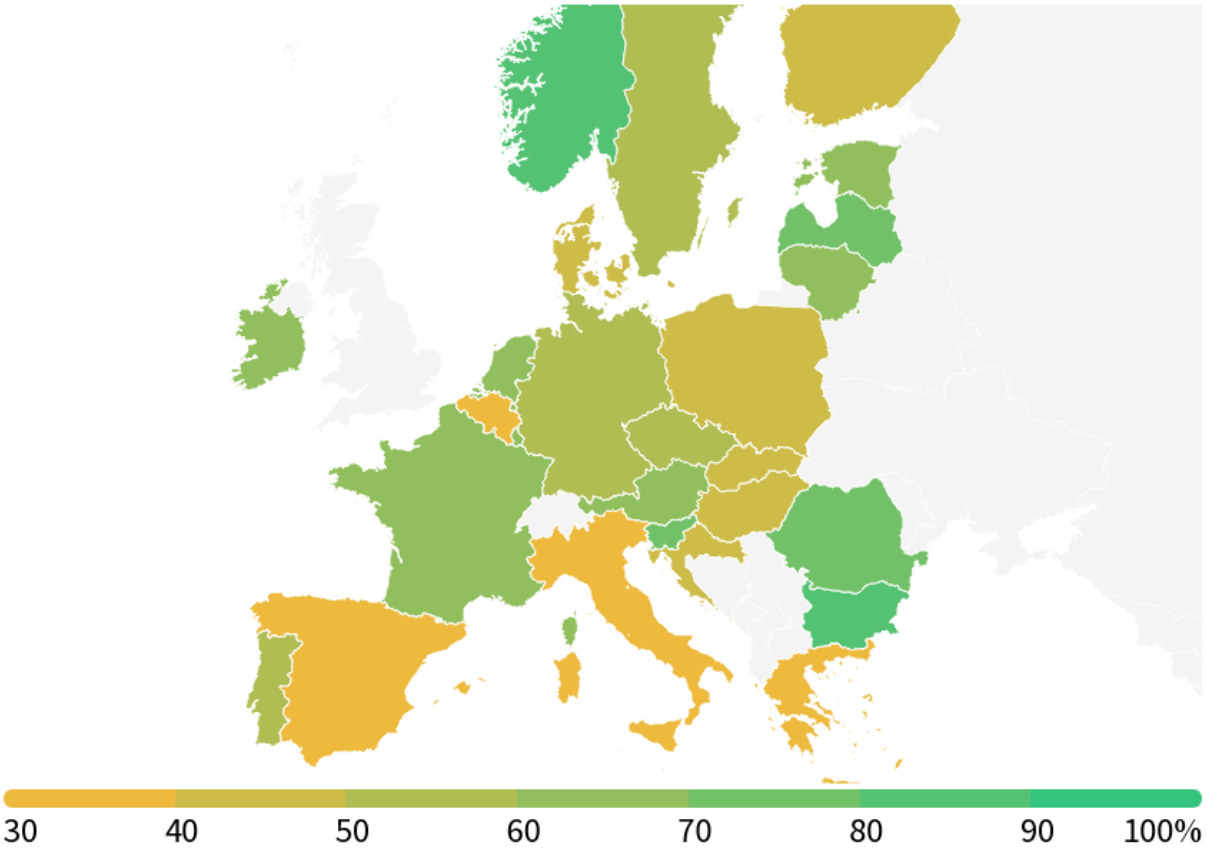


Figure 9: BEV share of sales by EU country in H1 2022

PHEVs are still a problem in many European countries

The previous figures hide some market imbalance, however, that occurs in specific EU countries, where the share of PHEVs is larger than BEVs in their sales mix. This is a problem because PHEVs are, in reality, not low emissions vehicles and cannot today be considered as low emission cars. T&E has shown that, when the EU regulation will be updated to reflect real-world use patterns of these cars in 2027, PHEV emissions would be closer to 100 g/km, significantly higher than the current 36 g/km average calculated with overly optimistic utility factors[13]. Figure 10 below shows the share of full electric vehicles (BEVs) among total plug-in vehicle (BEVs and PHEVs) sales. Countries with a low value suffer from a large imbalance where high sales of PHEVs are likely to be at the expense of fully electric vehicles sales. Moreover, high real world emissions mean that tax emissions are forgoing significant revenues until PHEVs real emissions are accounted for in 2027. This is the case for Greece, where BEVs are only 31% of plug-in sales, Belgium (36%), Spain (38%) and Italy (39%). On the other hand, eastern countries perform well as Bulgaria (89%), Slovenia (79%), Latvia (75%) and Romania (71%) are among the top 5, with the leading country being Norway (89%).

[13] The utility factor (UF) is the assumed share of electric driving done by PHEVs. It is used to calculate their CO_2 emissions as part of the WLTP. [5]



Scale: Share of BEV sales among plug-ins (BEV+PHEV) sales

Source: ACEA (2022) Quarterly AFV registrations and H1 2022 car registration from Dataforce

Figure 10: Share of BEV among plug-in vehicles per country

3.2. Two BEVs out of ten are produced in China

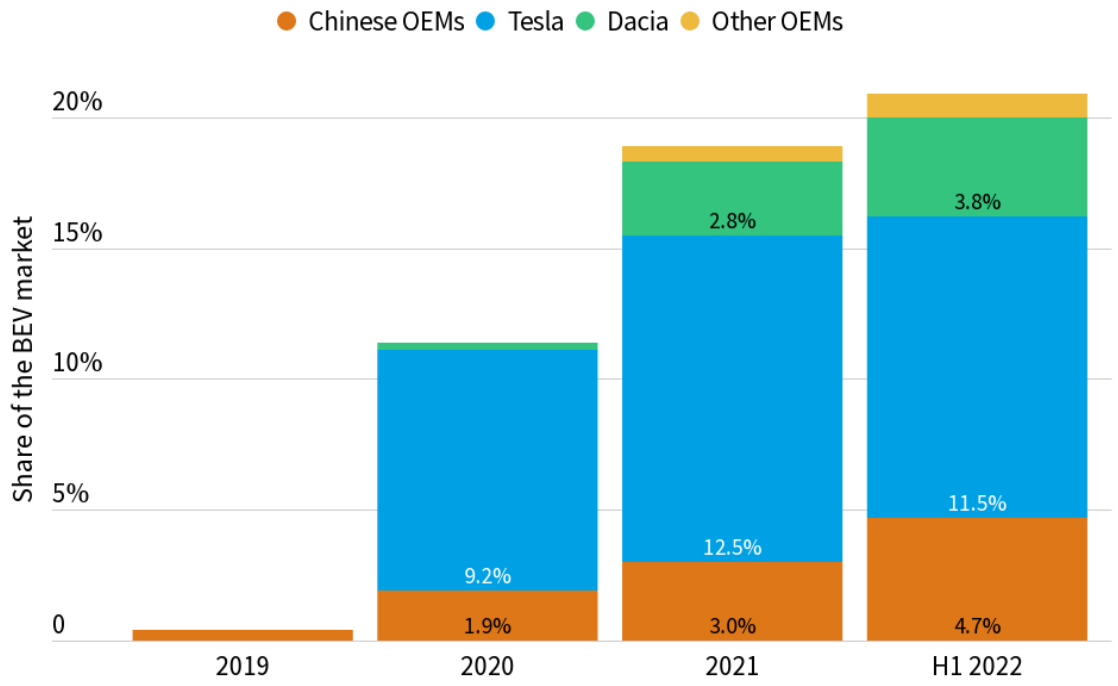
Over the last 3 years, both the share of electric cars sold in Europe by Chinese brands[14] and the share of European and American brand cars produced in China and exported to Europe increased. From about 0.4% of the European BEV market in 2019, Chinese brands approached 5% of the market in the first half of 2022. Chinese brands mostly targeted mature BEV markets, for instance:

- 12.5% of Norway's BEV sales came from Chinese OEMs, and
- 11.1% in Sweden,
- 7.6% in the UK,
- 5.8% in the Netherlands

[14] In this report, "Chinese brand" means a car brand owned by a Chinese group for which cars are produced in China. In addition to brands founded in China, both Polestar and MG are now Chinese brands as they were bought by Geely and SAIC respectively and they do not produce cars in Europe anymore.

This growing trend is anticipated to last, as many Chinese brands have plans to enter the EU market: BYD is about to enter Germany and Sweden with 3 electric models [6], Xpeng is taking aim at the Swedish and Dutch markets [7], whilst the NIO ET7 is about to be launched in 5 European countries [8]. Moreover, car rental company SIXT has already signed a long term contract with BYD to buy 100,000 BEVs by 2028 [9].

Furthermore, other carmakers such as Tesla, Dacia or BMW imported electric cars produced in China. All told, the total amount of BEVs made in China reached 21% of the European BEV market in H1 2022.



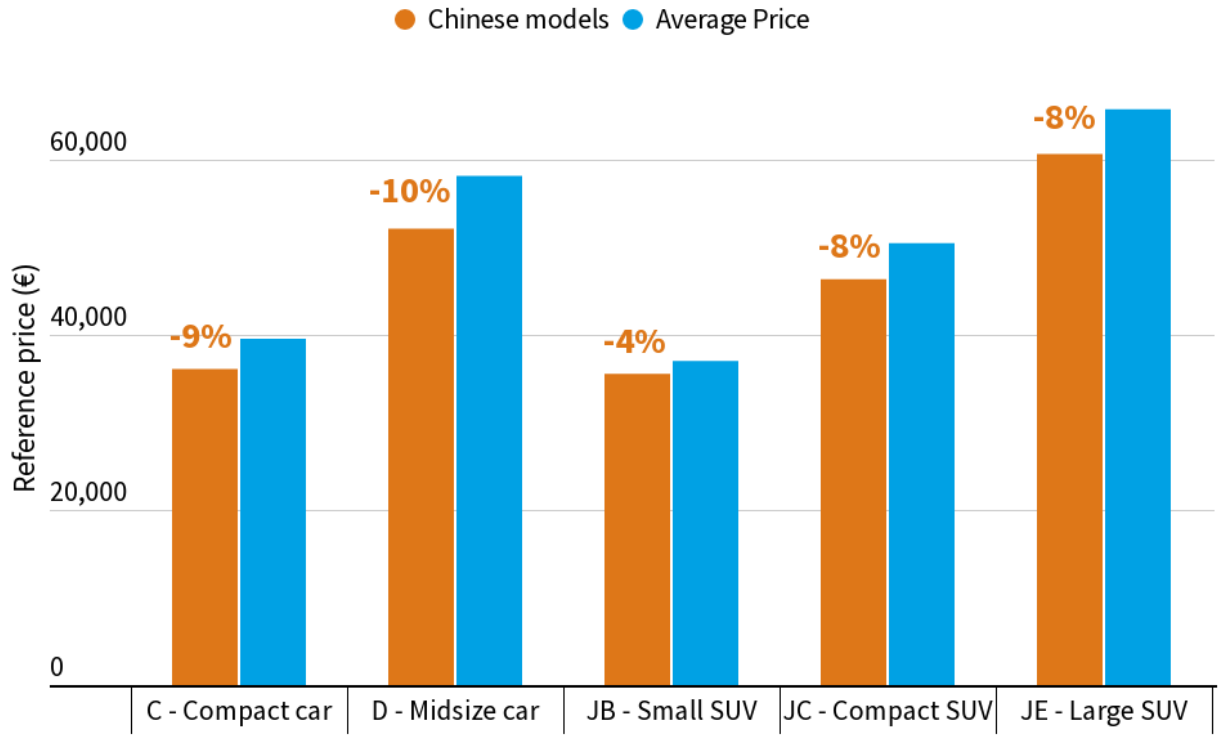
Scope: BEVs made in China sold in the European Economic Area.
Source: EEA data from 2019 to 2021, Dataforce in H1 2022

Figure 11: Made-in-China BEV sales share of the European electric car market

Chinese BEVs models appear to be more affordable

In addition to increasing their market share in the EU, Chinese OEMs are also coming with more affordable models. Using prices by model in the Netherlands reported by EV-Database[15] as a reference, we estimate that Chinese brands are 4-10% cheaper that the average[16] of each segment (see Figure 12).

[15] Starting price for the Netherland market (includes VAT and fees) reported by EV Database [10]
When a BEV model is available with different battery sizes, the average price is used.
[16] Average weighted by the sales number of each model in H1 2022.



Scope: BEV models sold in the European Economic Area in H1 2022.
Source: Reference price: starting price in the Netherlands from EV-Database or from other web sources. Weighted average based on sales volumes reported by Dataforce.

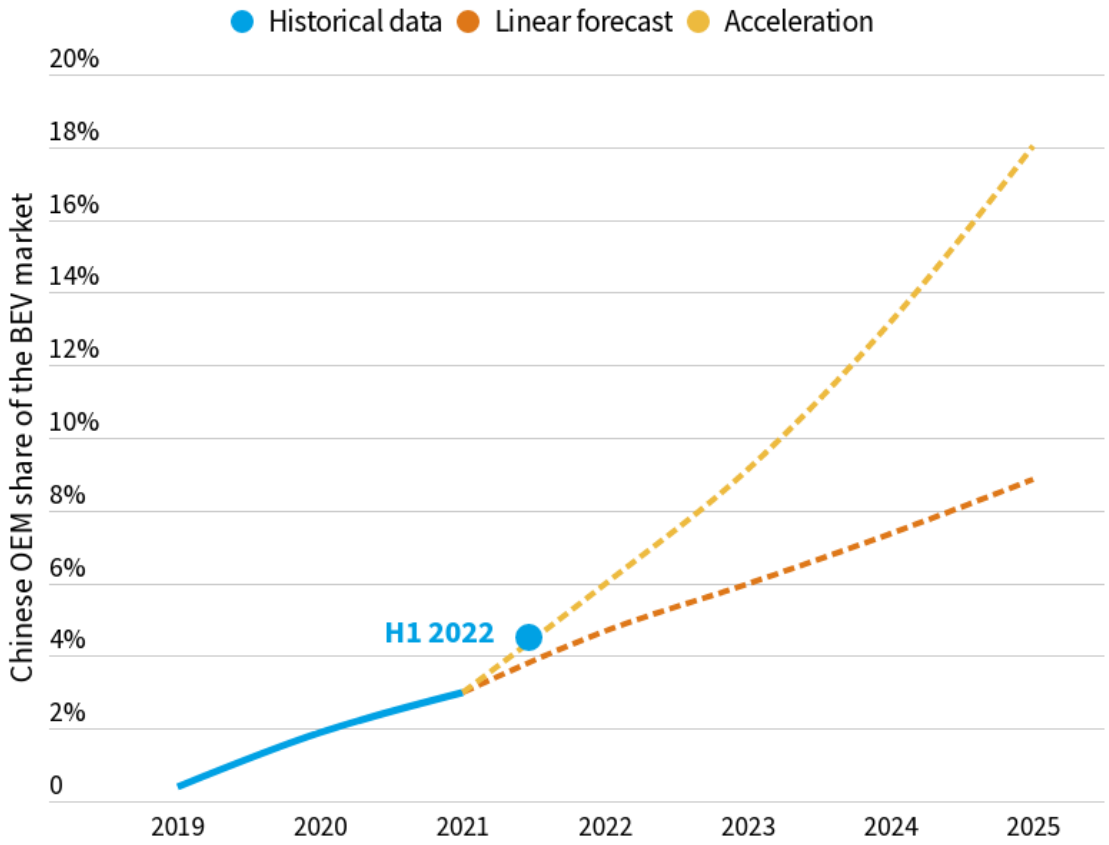
Figure 12: Made-in-China BEV sales share of the European electric car market

Chinese BEVs to capture the mass market?

With weak EU CO_2 targets in the 2020s, European OEMs can decide to limit BEV production and sales volumes in order to do the minimum to comply with the regulation. In such a scenario - with evidence already suggesting a stagnation compared to China and the US (see Figure 8) - EU carmakers will fail to meet growing domestic consumer demand, presenting a golden opportunity for Chinese OEMs to enter the mass market.

Under such a scenario, EU OEMs will fail to reach the levels of production needed to optimise economies of scale in order to bring down BEV costs to be able to compete with Chinese competitors. This means that EU carmakers will lose competitiveness in the EU market and will have to shift toward higher margin/low number vehicles to stay in good financial shape.

Based on the 2019-2021 historical trend and assuming that Chinese OEM share of the BEV market in H2 2022 is similar to the first half of the year (about 5%), we can expect that Chinese carmakers could reach at least 9% of the European BEV market by 2025. Nevertheless, as Chinese carmakers are expected to keep accelerating their growth in Europe, they could already reach 6% in the whole year 2022 (2 times their sales in 2021) and 18% by 2025, as shown in Figure 13.



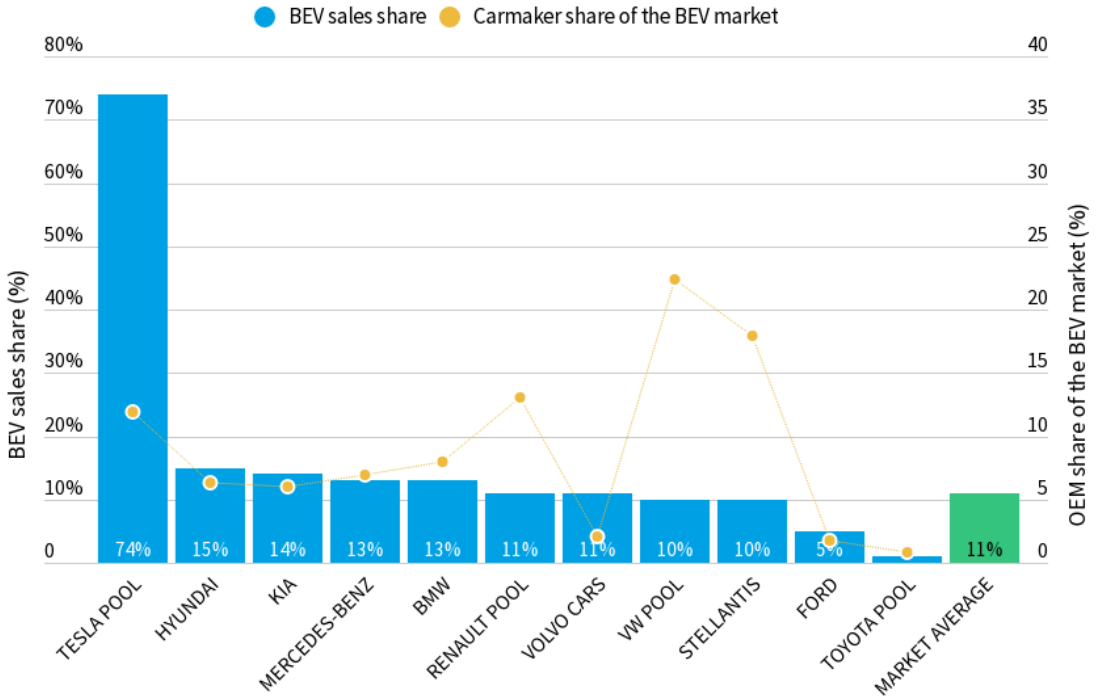
Scope: Passenger car registrations in the European Economic Area

Source: EEA registration data (2019-2021), Dataforce (H1 2022) and T&E estimates.

Figure 13: Chinese OEM share of the European BEV market

3.3. Carmakers' electric car sales

Although all carmakers have ramped up EV sales in the past 2 years, they still have diverse BEV strategies. Figure 14 shows the BEV share of each OEM's sales in H1 2022. Some carmakers such as Volvo Cars have made a big leap forward with a 5 percentage point (%p) increase of their BEV share, while others such as Renault - stagnated. Among the largest carmakers, Stellantis partly closed the gap with Volkswagen by increasing its BEV share by 3%p while Volkswagen BEV sales share decreased by 1%p.



Scope: Registration data for the EU27 and Norway.

Source: T&E analysis of passenger car registration data from the first half of 2022 from Dataforce.

Figure 14: Electric car sales share and volume by carmaker in H1 2022

BEV sales share forecast between 11.3% and 13.8% in 2022

Volkswagen is the only major carmaker pool that does not comply yet with its regulatory target with its H1 2022 sales. To comply, the German OEM will need to increase by about 0.5%p its sales share of both BEVs and PHEVs. If carmakers only increase sales based on what they need for compliance, the BEV sales will only reach 11.3% point in 2022, a significant slowing down of growth compared to the previous years. On the other hand, if all carmakers increase their BEV sales further, the data forecast provider LMC Automotive expects the BEV share to reach 13.8% in 2022[17].

INFO BOX: Regulation has always driven supply

Back in 2019, the automotive industry was complaining about the stringency of the 2020-2021 car CO_2 standards and most actors did not believe that carmakers would meet their targets. Volkswagen chief executive Herbert Diess warned investors of a €30 billion [11] penalty for the whole industry. We showed, however, that these targets could be met [12]. After a five fold increase of BEV sales between 2019 and 2021, the result was indeed different to industry's claims. In 2020,

[17] LMC Automotive's Global Hybrid & Electric Vehicle Forecast, Q2 2022 update, commercial vehicles excluded.

only VW and three niche manufacturers with a derogation (including Jaguar Land Rover) failed to meet their targets and the total amount of fines is estimated at just €570 million in total [13], not even 2% of the expected amount from the industry. In 2021, all major car makers met their targets. Since then, T&E accused the industry of "just crying wolf that they cannot meet the target" and predicted that most carmakers would meet their targets. Our predictions were proved right. Today, the situation is reversed, and forecasters are contemplating an EV growth that would match the rising demand from consumers. But, again, we believe that the industry is wrong, with the regulation most likely to limit the supply when targets are not stringent enough. We expect carmakers to do the minimum to meet their targets and benefit from high margins caused by the high EV prices - a consequence of the demand-supply imbalance.

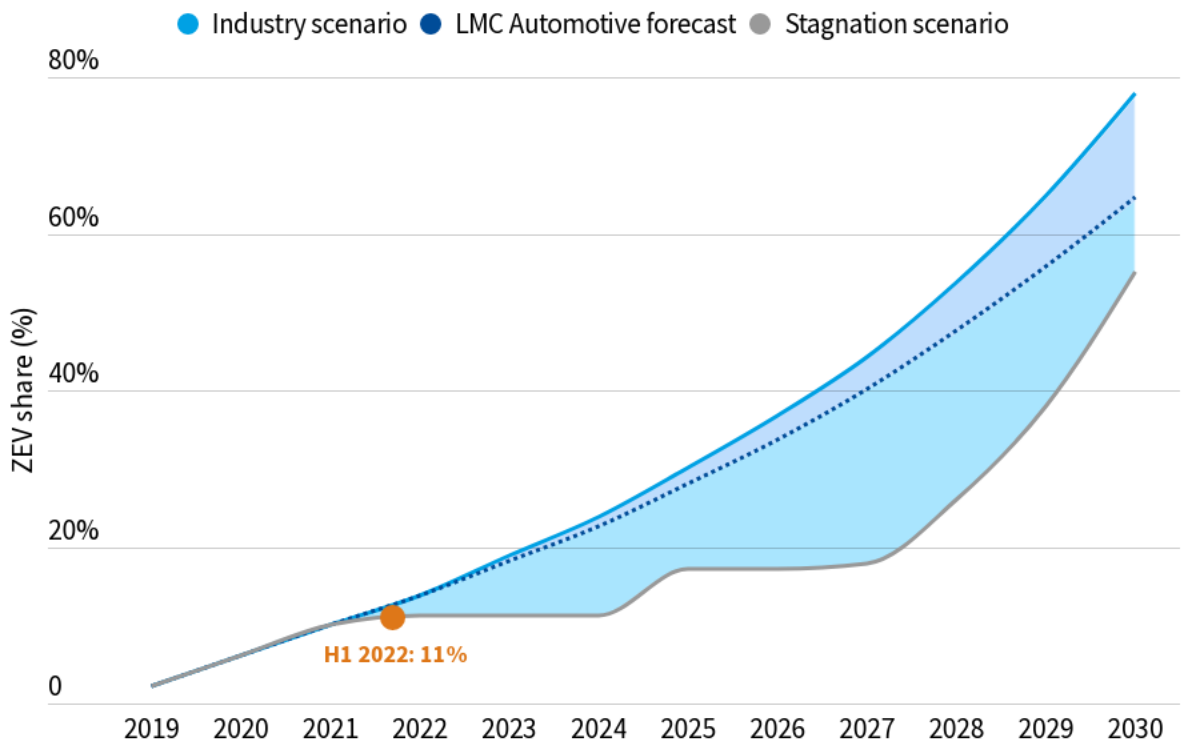
4. The emobility transition at risk of stalling

4.1. Electric car sales at a crossroad between different pathways

Projected BEV sales in 2030 given current dynamics

Given the electric cars sales drop in the first half of 2022 described in section 2 and 3, in the absence of new regulatory incentives, there is a risk of continued stagnation of EV sales over the rest of the decade. Figure 15 displays 3 possible scenarios:

- **Stagnation scenario**: With a regulation lacking stringency, carmakers have the opportunity to focus on their traditional products and sell the maximum of ICEs allowed by weak car CO_2 standards. This scenario is increasingly likely as car CO_2 targets are unlikely to be righted until 2030, with economic downturns, supply chain disruptions or other unexpected geopolitical events testing carmakers' voluntary will to accelerate. This would lead to a 17% ZEV share of sales in 2025 and 55% ZEV in 2030.
- **LMC Automotive forecast**: LMC Automotive provides a forecast based on stable macroeconomic trends and carmakers current production plans. In that case, the ZEV sales would reach 28% of the market in 2025 and 65% in 2030.
- **Industry scenario**: We modelled a scenario based on the assumption that all carmakers meet their public electrification commitments [14]. In this scenario, ZEV sales are projected to rise to 30% of the market in 2025, 44% in 2027 and 78% in 2030.



Scope: passenger car sales in the EEA

Source: T&E's plug-in vehicles sales forecast modelled from passenger car registration data from the first half of 2022 from Dataforce, LMC Automotive's Global Hybrid & Electric Vehicle Forecast (Q2 2022 update), and carmakers' sales targets.

Figure 15: Possible pathways for ZEV sales in the decade

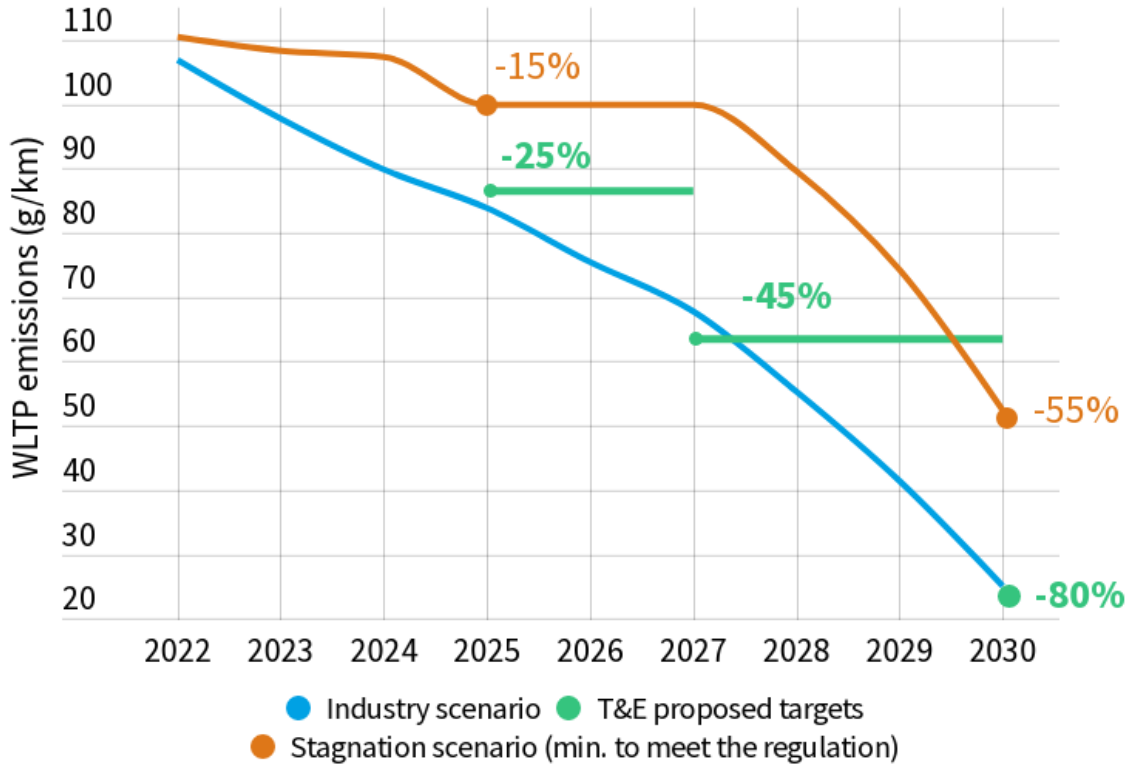
The market is on track for the stagnation scenario

Some industrial actors and forecasters keep an optimistic view on the transition. But in the absence of a regulatory push (as in China or the US), some major carmakers such as Volkswagen are having difficulties keeping their BEV production intact amid supply chain complications. The energy crisis in Europe, rising inflation and possible future economic recession can all have serious impacts on the ability and willingness of the industry to go beyond the minimum required by the regulation. In light of the uncertainty and recent geopolitical events, and lacking any new regulatory targets, a stagnation of BEV sales in the 2020s increasingly appears as the most likely outcome.

Emissions reductions forecast between -55% and -80% by 2030

In case of stagnation of electric sales, carmakers would be expected to reduce emissions in line with the -15% CO_2 target in 2025 and would start ramping up technology to reduce emissions again from around 2028 to meet the -55% step in 2030. On the other hand, in the industry scenario where carmakers would deliver on their promises, the average market emissions could be cut by 27% in 2025 already, 41% in 2027 and 78% in 2030 (hypotheses described in Annex 6.3). In this accelerated scenario, the European car fleet would emit about 40 $MtCO_2$ less than the stagnation scenario in 2030

alone. Consequently, the BEV stagnation scenario would be responsible for an additional 135 $MtCO_2$ over the decade, more than the yearly GHG equivalent emissions of the whole of Czech Republic.



Source: T&E modelling of carmakers emissions in the 2020s

Figure 16: Possible pathway for future emission reductions

A more ambitious regulation is required to avoid market stagnation

Since 2018, T&E has advocated for a -25% emissions reduction target in 2025, and called for an intermediate -45% target in 2027 and an ambitious 80% reduction in 2030. This scenario is feasible given it is close to carmakers' own commitments. However, in the votes to approve their respective positions on the revised regulation, both the Parliament and the Council failed to set these (or any) more ambitious targets than those proposed by the Commission (see orange line above).

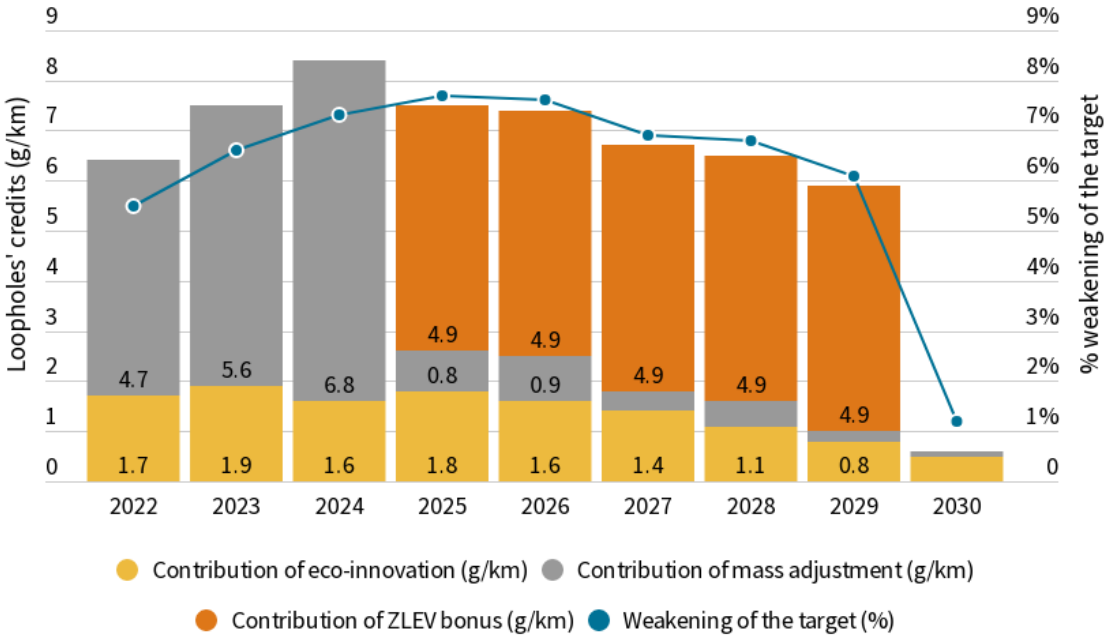
A stricter and more ambitious regulation is required to avoid carmakers diverting to the stagnation scenario. Although stronger CO_2 targets are now off the table, the trilogues - informal tripartite meetings between representatives of the Parliament, the Council and the Commission to find agreement on legislative proposals - could at least help fix some of the loopholes in the current regulation proposal, and therefore avoid a further weakening of the targets.

4.2. Regulatory flexibilities weaken carmakers targets even further

4.2.1. State of play

The car CO_2 standards are currently weakened by three main regulatory loopholes: the eco-innovation credits, the CO_2 target mass adjustment, and the zero and low emissions vehicle (ZLEV) bonus[18]. The ZLEV bonus is the largest contributor to this as it would directly lead to a 5% weakening of the CO_2 targets from 2025 in the industry scenario, and between 2.5% and 5% in the stagnation scenario (see section 4.2.2). The eco-innovation credits will be the second largest weakening from 2025[19].

To understand the order of magnitude of the weakening, we estimated the impact of these loopholes in terms of CO_2 credits (how much equivalent g/km these loopholes would remove from carmakers official emissions - primary y axis) and in terms of weakening of the regulatory targets (secondary y axis). In both the industry scenario (Figure 17) and the stagnation scenario (Figure 18), these loopholes lead to a weakening between 5% and 8% of the targets between 2025 and 2029 and would be equivalent to 500,000-700,000 missing BEVs annually.

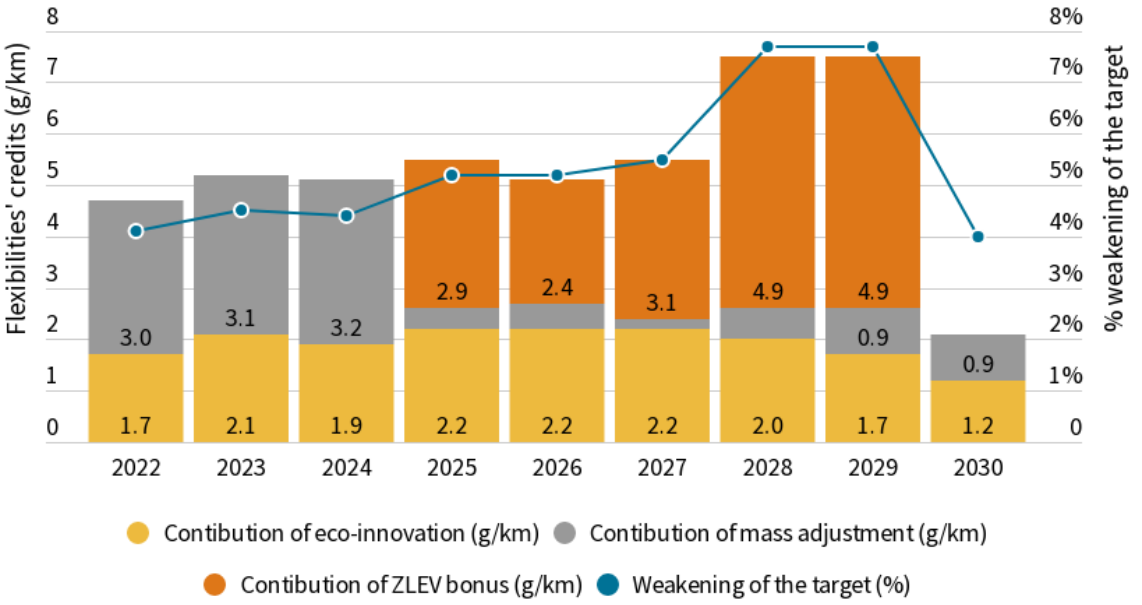


The secondary axis (% weakening of the target) is only applicable for the blue line

Source: T&E modelling of carmakers' compliance in the 2022-2030 period based on T&E sales forecast (industry scenario based on LMC Automotive forecast adjusted to take carmaker public sales targets into account).

Figure 17: Weakening of the targets from regulatory loopholes in the industry scenario

[18] A detailed overview of these regulatory flexibilities can be found in T&E's 2021 car CO_2 report [15]
[19] Based on eco-innovations available in 2021, we assume that carmakers would reach an average 3g/km EI credit for applicable cars (ICEs and HEVs) by 2025.



The secondary axis (% weakening of the target) is only applicable for the blue line

Source: T&E modelling of carmakers' compliance in the 2022-2030 period (minimum BEV sales to meet the regulation targets).

Figure 18: Weakening of the targets from regulatory loopholes in the stagnation scenario

4.2.2. ZLEV benchmark: a free lunch offered to carmakers

From 2025 on, a new incentive mechanism for ZLEVs is introduced, replacing the super-credit mechanism which is phased out after 2022 - the ZLEV benchmark. This crediting system allows a carmaker to relax its specific emissions target if its share of ZLEV sales exceeds the non-binding 15% benchmark from 2025 to 2029. Exceeding the ZLEV benchmark by one percentage point increases the manufacturer's CO_2 target (in g/km) by one percent, making it easier to comply with. Target weakening is capped at 5%, so carmakers benefit from the full bonus by selling at least 20% ZLEV.

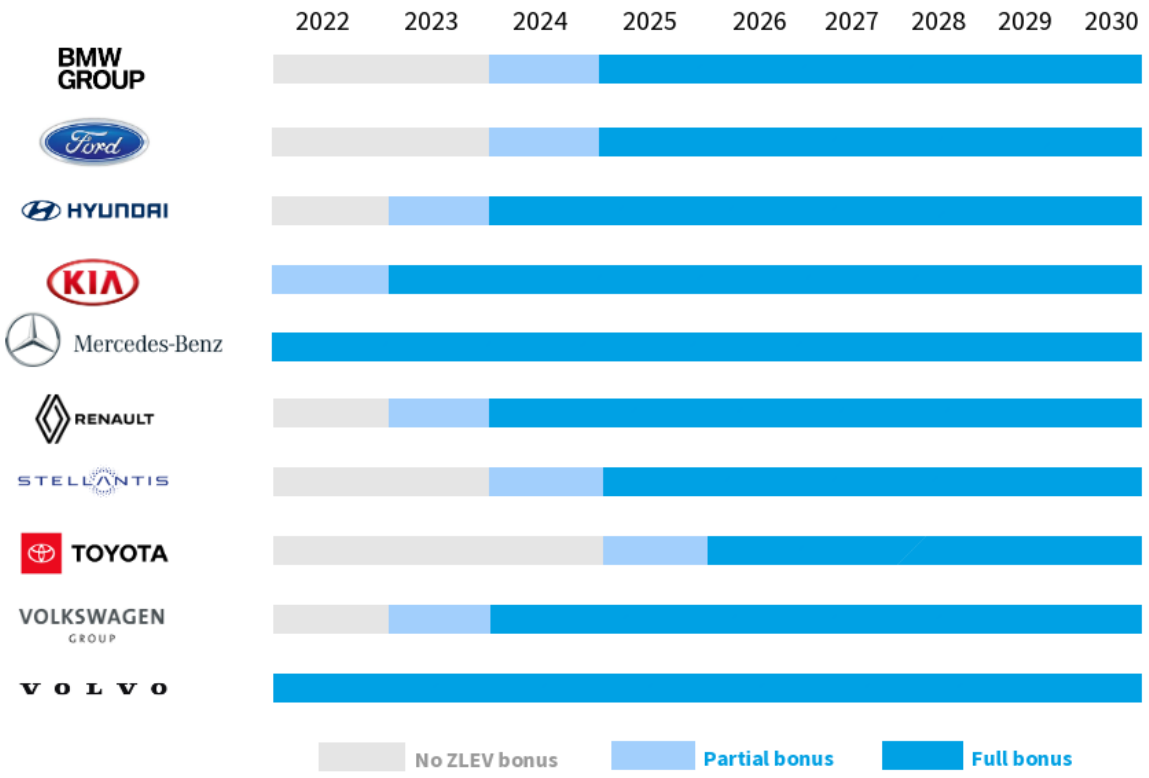
In all scenarios, the ZLEV bonus is expected to be a gift for carmakers and it will disincentive BEV sales instead of effectively promoting them (as the bonus was initially intended to do).

In the industry scenario, the ZLEV benchmark weakens the targets by 5% from 2025

The industry scenario shows that carmakers are committed to much higher ZLEV sales from 2025 than the maximum threshold for the ZLEV benchmark. The average ZLEV share[20] of the market is

[20] Market share of vehicles below 50g/km, mostly ZEVs as most PHEVs are not expected to be classified as ZLEV in 2025 as shown in Annex 6.2.

forecast to be above the 20% threshold limit as early as 2024 in the industry scenario thanks to the growing BEV sales. As shown in Figure 19, all major carmakers would benefit from the full ZLEV bonus in 2025 except Toyota that would still reach it in 2026. In this scenario, removing the ZLEV benchmark from the regulation would reduce the overall weakening of the target by 5%p from an average weakening of 7% between 2025 and 2029 to only 2%. The weakening of the target due to this ZLEV benchmark is equivalent to 2.4 million additional BEVs[21] being sold between 2025 and 2030 in the industry scenario. At the whole car fleet level, this weakening would be equivalent to a 18 $MtCO_2$[22] emitted between 2025 and 2030.



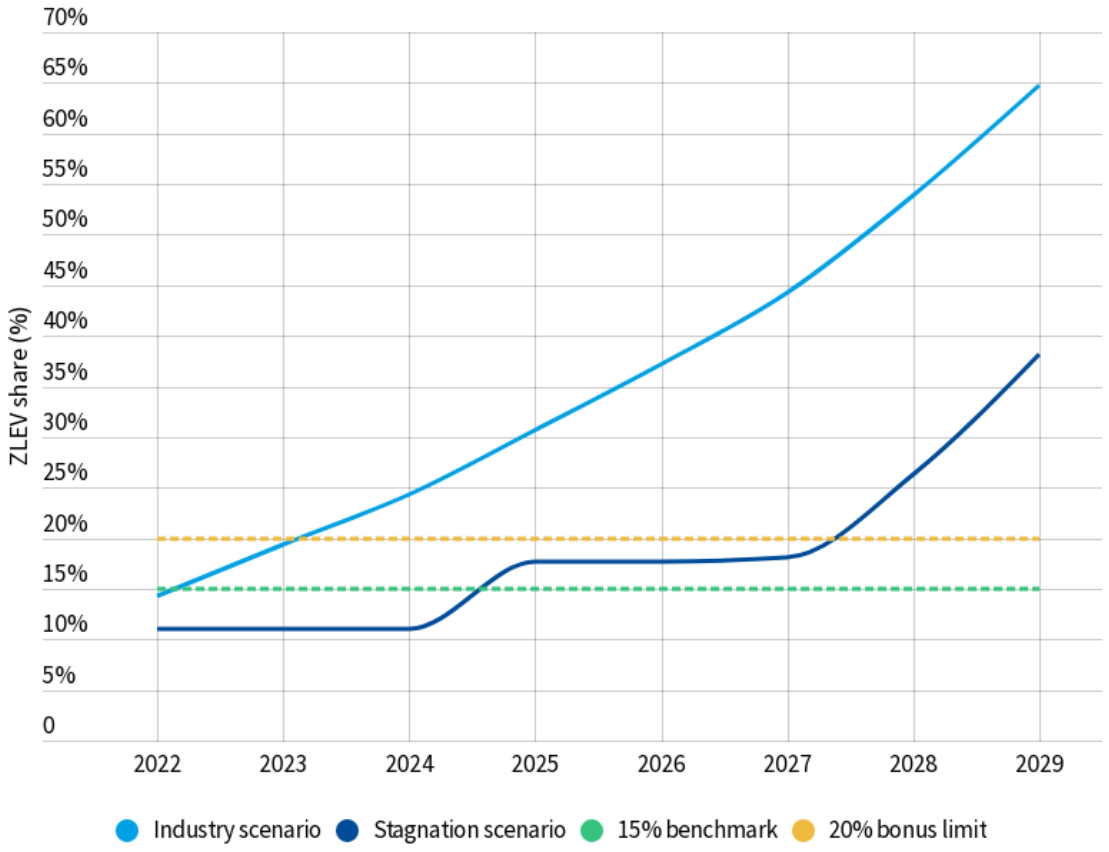
The period 2022-2024 was included for indicative purposes given no bonus can effectively be achieved over this period.
Scope: Forecast for the EU27 and Norway from 2022 to 2030.
Source: T&E's plug-in vehicles sales forecast modelled from passenger car registration data from the first half of 2022 from Dataforce, carmakers' sales targets, and LMC Automotive's Global Hybrid & Electric Vehicle Forecast (Q2 2022 update)

Figure 19: Expected years in which carmakers benefit from ZLEV bonuses in the industry scenario

[21] The equivalent number is calculated with the following methodology: BEV sales are increased so that average emissions decrease by the same amount as the weakening of the target due to the ZLEV benchmark.
[22] Based on T&E's fleet-wide emission modelling (EUTRM), the equivalent emissions are the cumulative difference between two compliance scenarios, with and without the ZLEV benchmark.

In the stagnation scenario, removing the ZLEV benchmark from 2025 would lead to the additional sales of 770,000 BEVs

In case of stagnation of the BEV market, the ZLEV benchmark would both disincentivise BEV sales and increase actual emissions. Figure 20 shows that carmakers would still benefit from a 2-3% average bonus between 2025 and 2027 in that case. The full bonus would be reached in 2028 when BEV sales would need to increase in anticipation of the 2030 regulation target. If carmakers do the minimum to comply with their targets, removing the ZLEV benchmark from 2025 would lead to the additional sales of 770,000 BEVs[23], with an average weakening of the target of 3.7% between 2025 and 2029.



Source: T&E's plug-in vehicles sales forecast modelled from passenger car registration data from the first half of 2022 from Dataforce, carmakers' sales targets, and LMC Automotive's Global Hybrid & Electric Vehicle Forecast (Q2 2022 update)

Figure 20: Projection of the market average ZLEV share

[23] If the ZLEV benchmark is removed, carmakers would need to increase their BEV sales from 2025 to 2027 in order to meet their targets.

4.2.3. Stronger eco-innovations cap needed to avoid further weakening

OEMs can claim credits, called eco-innovation credits, for fitting technology to the car that delivers emissions reductions on the road but not during the official test (such as LED headlamps that are not switched on during the test or during coasting). Eco-innovation credits are given based on theoretical calculations and lab measurements, but their actual use and contribution on the road is unknown. The eco-innovation savings are capped at 7 g/km but no OEM reached this cap yet as the highest contribution was Ford with 2.2 g/km in 2021.

With current technologies[24], the average amount of eco-innovation (EI) credits earned across all carmakers is not expected to exceed 2.2 g/km in the decade. The proposal of the Parliament to reduce the cap of these credits in line with emissions reduction targets (e.g. from 7 g/km in 2021 to 5 g/km in 2025 and 2 g/km in 2030) would not pose an additional challenge for carmakers compliance. This reduced cap would, however, avoid any further weakening of the regulatory targets if carmakers use new eco-innovation technologies in the coming years. For instance, the approval of eco-innovation credits for efficient mobile air-conditioning systems are about to be considered by an EU expert group. In their common position proposed in 2021 [16], carmaker lobby groups planned to propose the application of eco-innovations for low emissions vehicles. This could become an additional loophole in the regulation as it would basically imply that zero-emissions vehicles (ZEVs) would be counted with *negative* emissions, and therefore allow the sales of more combustion models.

Improving real-world electric range by using more efficient technologies is key to improving energy efficiency. But, as earning EI credits can enable carmakers to sell fewer ZEVs, this type of EI should not be included in the car CO_2 regulation as it would only further weaken the regulation (and thus disincentivise the sales of these ZEVs).

4.3. A ZEV sales stagnation is bad news for people, climate and EU economy

4.3.1 Consumers struggle to purchase clean models

OEMs failing to meet consumer demand

As shown in section 2.1 and 3.1, BEV sales underperformed in the first half of 2022 and CO_2 emissions stagnated. In the absence of new regulatory targets or policy incentives, this trend could become the new normal as carmakers could plan just the minimum ZEV sales needed to meet their targets. These reduced BEV production plans have already impacted BEV supply, which has repeatedly failed to meet the skyrocketing consumer demand over the past months. Car delivery to consumers has

[24] Currently, eco-innovations only apply to ICEs and HEVs. We assume here that the scope of EI credits is not increased with new technology such as coasting or efficient mobile air-conditioning systems.

been delayed and major carmakers have sold-out of their most popular electric models. For instance, Volkswagen was already sold out of some electric models for the whole year as soon as March 2022 [17], Mercedes-Benz was in the same situation in May 2022 [18], while Ford's CEO declared to be sold-out "for a couple of years" [19]. Carmakers could further divert from their own declared EV ambitions to suboptimal strategies as there will be no strong regulatory targets to guide their direction towards the BEVs that are in high demand.

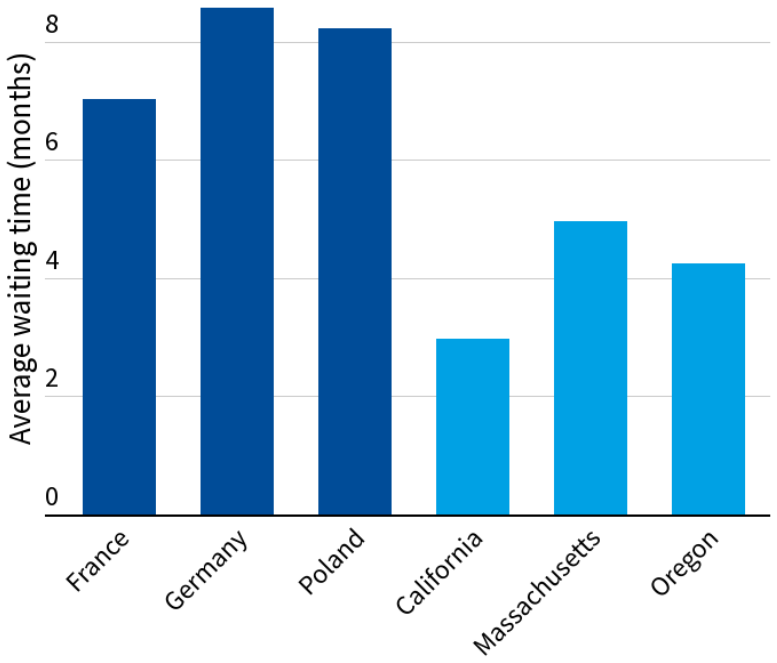
EV waiting times lengthen in Europe

T&E carried out a survey on BEV delivery waiting times in different EU countries and US states. From 600 answers from dealerships, we averaged waiting times by BEV models[25] in different countries and states. We assumed the average waiting time per country or state could be a rough indicator of waiting time trends across regions.

Based on the survey results, it appears that the average waiting time for a new BEV is longer in the selected European countries compared to the US states we selected with a ZEV mandate, as shown in Figure 21. Whereas we found an average waiting time of 7-9 months in the EU countries (France, Germany and Poland), this compared with only 3-5 month in the selected US states (California, Massachusetts and Oregon). Although these results would need to be validated with more significant data samples and correlation analyses, it clearly suggests that regulatory incentives could have a significant impact on delivery times. With average waiting times almost halved in US states with a ZEV mandate[26] compared to the selected EU countries, the US regulation appears to be driving supply more than in Europe. With global disruptions limiting BEV supply, carmakers prioritise sales in the jurisdictions with stricter regulations and de-prioritise deliveries in Europe, where regulatory incentives have tailed off.

[25] Models selected were the: VW ID.4, Audi e-tron, Nissan Leaf, Hyundai Kona, Hyundai Ioniq 5, Kia EV6, BMW iX, Mini Cooper SE

[26] For instance, California's ZEV mandate requires 14.5% ZEV in 2022. 15 states including Massachusetts and Oregon have similar rules based on California's regulation. [20]



Source: T&E estimates from a survey with 8 BEV models

Figure 21: Average BEV delivery waiting time

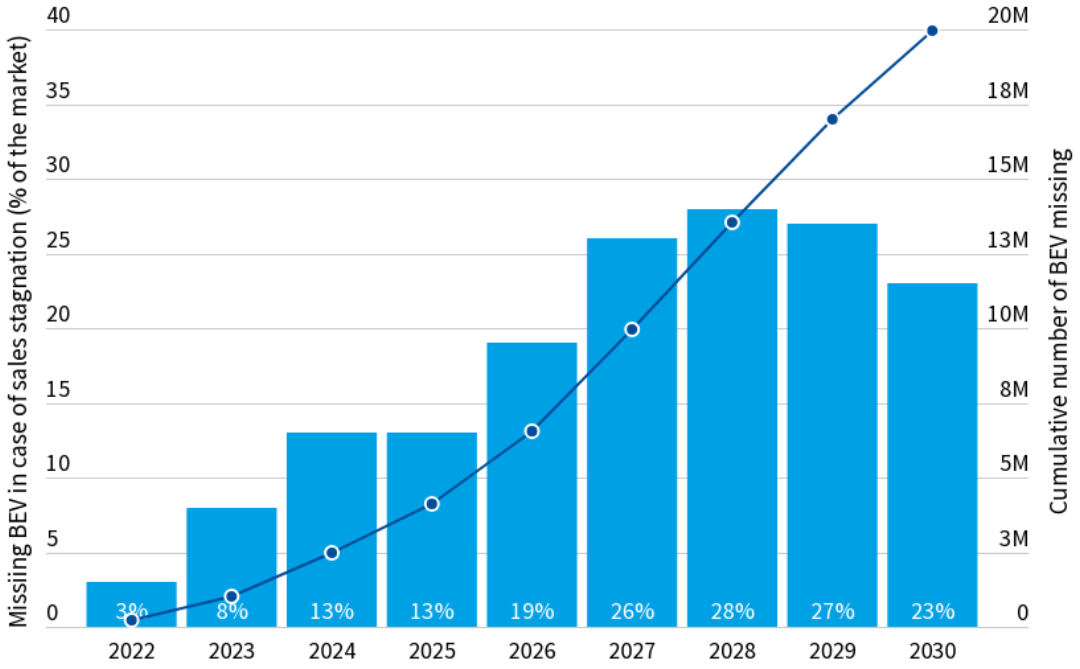
This is a bad news for EU drivers

A stagnation of ZEV sales in the 2020s means carmakers will not increase production volumes in line with demand and this will have three consequences. Firstly, the supply deficit will allow carmakers to maintain high BEV prices. Secondly, this will delay economies of scale, preventing carmakers from decreasing their production cost quickly and delaying sales of mass-market models at low costs. Thirdly, this will also delay the rate at which BEVs enter the used vehicle market, preventing accessibility for low-income drivers. These all mean higher priced BEVs at a time of runaway inflation and purchase power squeeze.

4.3.2 Stagnation is bad for the climate

20 million BEVs at risks in case of stagnation

Section 4.1 detailed two possible scenarios in the coming years: either carmakers do meet their voluntary commitments or they settle for the minimum required by the regulation with a stagnation of BEV sales from 2022 to 2024 and from 2025 to 2028. Figure 22 displays the difference of ZEV sales share between these scenarios: each year from 2022 to 2028, with the divergence growing up to a 28% difference. Cumulatively, this means 20 million ZEVs would not be sold - or would be missing - in the stagnation scenario compared to the industry potential.



Source: T&E modelling of carmakers' compliance in the 2021-2030 period based on T&E plug-in vehicles sales forecast (LMC Automotive forecast adjusted to take carmaker sales targets into account).

Figure 22: Missing ZEVs due to weak targets

This is a bad news for member states' climate targets

In the industry scenario where carmakers would approach an 80% reduction in emissions in new vehicle sales, emissions from the overall car fleet would only be reduced by about 20%[27] by 2030 compared to 2005 levels. In the scenario where BEV sales stagnate, the existing fleet emissions reduction would be limited to only 10%. To put this into context, according to the Effort Sharing Regulation (ESR), the EU has to reduce its emissions in the ESR sectors, which includes transport, by 40% by 2030 [21]. In this context, emissions from the existing fleet will remain a thorn in the side of EU member states' climate policies in the coming years, with countries needing to compete to attract the limited ZEV supply available. This could create inequalities between member states where the most mature markets will capture available ZEVs at the expense of others. Central and eastern countries could end-up with fewer levers to meet their own climate targets if they cannot benefit from a large supply of ZEVs.

[27] Based on T&E in-house transport emission model, EUTRM

4.3.3 Stagnation is bad for the economy

This is a bad news for carmakers financials

As shown in a financial analysis commissioned by T&E [22], the best available market data suggests that electric cars will have better profit margins in coming years, while ICEs are expected to suffer as their market share and pricing power shrink. The analysis finds that BEV business operating margins are expected to reach and surpass those of conventional cars in the next 5 years. This implies that quick BEV transition strategies in the 2020s would generate higher margins, triggering higher equity value for shareholders as well as better access to capital for companies. If they settle for a slower transition, OEMs risk both losing market share and missing out on potential value increase. Laggard carmakers risk being trapped in a downward spiral and losing investors' confidence.

This is a bad news for EU carmakers' competitiveness

As shown in section 3.2, Chinese OEMs are set to become a significant part of the EU BEV market (and at lower costs) and some carmakers such as Dacia have already started to outsource their BEV production. If EU carmakers produce only the minimum amount of BEVs as required by regulation, consumer demand will not be met and will present a golden opportunity for Chinese carmakers to enter the market en masse. Whilst this could favour BEV adoption for low-income drivers, this spells trouble for EU OEM competitiveness. EU carmakers need to produce electric cars early to secure their market share in the growing BEV market and get ahead of the foreign competition. Therefore, - unless regulators push EU carmakers to accelerate production in the next years via national and EU policy - Chinese brands will be well placed to take over the lower margin sales in each segment (a significant part of the mass market).

Facing this increased competition, EU carmakers could be inclined to delocalise their mass-market cars out of Europe in order to reach lower production costs and keep competitiveness, as we have already seen with Renault's Dacia in China. Carmakers suffering from loss of competitiveness could also be inclined to "optimise" their cost structure and cut jobs. This would be bad news for the EU automotive industry and jobs. Similarly, a failure to grow a domestic EU EV industry will also undermine the development of the EU's EV battery value chain and the wider jobs associated with it.

As other jurisdictions look to accelerate domestic EV production and boost industrial competitiveness in the coming years, for example the US government's recent Inflation Reduction Act, both the European Parliament and the Council failed to adopt more ambitious short term supply-side targets in the Car CO_2 regulation. In the absence of additional measures, and unless they meet their own voluntary production commitments, EU carmakers' competitiveness is increasingly at risk.

4.4. Recommendations

Recommendations for the current EU cars CO_2 review

A fast and ambitious transition to e-mobility will allow Europe to secure the leading electromobility supply chain and the future jobs that come with it. However, Europe's main supply-side regulation - the car CO_2 standards - risks slowing down the progress that the regulation itself has underpinned over the last few years. Weak CO_2 targets throughout the 2020s will not only undermine Europe's ability to cut CO_2 emissions in line with a credible pathway toward carbon neutrality, but risk jeopardising an industrial opportunity.

As the draft revised regulation enters inter-institutional negotiations (trilogues), policy makers will aim to find a final agreement by the end of the year. Unfortunately, amendments to increase the ambition of the targets were rejected, meaning possibilities to improve the text and ensure a faster transition will be limited. Nevertheless, based on the positions of the respective institutions, T&E recommends that policy makers involved in the discussions do the following:

- **Confirm the phase out of all combustion engine cars by 2035**. All three institutions backed the proposed 100% CO_2 reduction target in 2035 and it is crucial that this is confirmed in the final text. The target is crucial to give the certainty the car industry needs to invest in and ramp up production of electric vehicles, which will drive down prices for drivers.

- **Oppose any role for e-fuels for now and in the future.** Considerations in the Council text to allow e-fuels in engines for new cars sold from 2035 is a dead end and must be opposed. T&E has shown that running a petrol car on a blend of synthetic and conventional petrol would only reduce emissions by 5% for cars bought in 2030 [23]. Even if the car runs on 100% e-fuels meeting the EU's sustainability criteria, an average battery electric car bought in 2030 would still be 53% [24] cleaner than the petrol car running on e-fuel. E-fuels require 5 times more renewable energy than battery electric vehicles and would be prohibitively expensive to the vast majority of drivers. If such fuels ever become commercially available, they need to be prioritised for hard to decarbonise sectors such as aviation and shipping.

- **Support the Parliament's position to delete the ZLEV benchmark already from 2025**. Compared to the position of the Council, which supports phasing it out from 2030, removing the ZLEV benchmark from 2025 would reduce the overall weakening of the target by 5%p. This is significant and would be equivalent to 2.4 million BEVs sold between 2025-30 in the industry scenario.

- **Support a stricter cap on eco-innovation (EI) credits**. Although it should not be a negotiating priority, implementing the Parliament's position to progressively reduce EI credits down to 2 g/km in 2030 would not pose an additional challenge for carmakers compliance (who are not expected to claim more than 2.2g/km in the decade). However, this

reduced cap would avoid any further weakening of the regulatory targets if carmakers use new eco-innovation technologies in the coming years.

- **Support** the Parliament's amendment for the Commission to come forward with a legislative proposal to set **minimum energy efficiency thresholds for new zero-emission cars**, an important next step on the path to sustainable electromobility.

Recommendations for additional measures to spur BEV supply

Not increasing the interim CO_2 targets in the 2020s and 2030 is a missed opportunity for Europe and means that, unfortunately, the revised regulation won't do much in the short term to boost electric vehicle production. Therefore, more policies will be needed to provide the necessary incentives for industry.

- **Electrify all new sales of corporate fleet vehicles by 2030.** As part of its REPowerEU Communication, the Commission said it would consider a legislative initiative to increase the share of zero emission vehicles in public and corporate car fleets above a certain size. Similarly, the European Parliament has asked the Commission to bring such proposals no later than February 2023 in its amendments to the Cars CO_2 regulation. Fleets across the EU account for 20% of total light and heavy duty vehicles, but are responsible for half the emissions from road transport [25]. Crucially, fleets drive market demand through new registrations of company cars, and shape the wider EU car stock as these vehicles quickly reach the used car market - important to ensure equal access to EVs for lower income drivers. With the risk of ZEV stagnation outlined above, mandatory ZEV targets for fleets can provide an important demand side push. **T&E calls on the Commission to present a legislative proposal, no later than early 2023, to increase the share of zero-emission vehicles - to 100% by 2030 - in corporate vehicle fleets**.

- **Use EU funds to support automotive transition.** Transitioning from producing predominantly ICE cars to going 100% electric will mean fundamental and fast-moving changes to the automotive industry, its supply chains and the workers involved. With a lack of stricter standards in the 2020s, industrial measures should be used to accelerate the BEV supply and assure Europe's automotive competitiveness. To this end, the European Investment Bank (EIB), the European Bank for Reconstruction and Development (EBRD) and the new Social Climate Fund (SCF) facility should be considered to provide loans for companies in the automotive supply chain to retool factories, reskill workforces and adapt production lines on the condition they increase the BEV supply above the regulations. It will be equally important to prepare the future workforce for this transition and make sure they acquire the necessary skills for future industries, such as electronic engineering, electrochemistry and IT. This means vocational training and other technical education across Europe must be strengthened and reformed to align with e-mobility needs as soon as possible.

- **Integrate local content and environmental requirements into ZEV subsidy schemes.** With China and now the US adopting EV subsidies and policies that explicitly favour domestic production and material sourcing, the EU should consider applying electric-vehicle subsidies to cars built in the bloc. European governments should consider introducing, with support of the Commission:
    - BEV purchase support that is conditional on local content requirements, including EU vehicle and battery manufacturing, and sourcing of critical minerals either from Europe (e.g. recycling) or countries with high due diligence rules and transparency. The EU Battery Passport, expected to enter into force in 2025/6, should be extended to cover major markets such as the US, Canada, Japan and South Korea.
    - Additional environmental criteria for vehicles to support cleaner domestic processes, such as quotas for low carbon steel or minimum energy efficiency requirements.

  These should be added to the millions of euros currently being allocated to ZEVs, battery production and charging infrastructure. EU governments should be under no illusions about the changing dynamics of free trade and must be reactive in order to support EU industry, jobs and technology.

  Such policies can also be designed to support the uptake of ZEVs amongst low income groups. Where carmakers benefit from public subsidies to help support the scale up of green technology, governments should require a certain percentage - whether it be of electric cars, vans or charging points - to be made available to poorer households.

- **Provide sufficient charging infrastructure**
  Ubiquitous and seamless charging is crucial to enable uptake in emobility, so increasing penetration of electric cars should go hand in hand with more and better roll-out of charging points. The Alternative Fuel Infrastructure Regulation (AFIR) is still in negotiations, but the positions of the three institutions will guarantee a basic public infrastructure coverage across the EU. Key is to ensure that the entire TEN-T network is covered no later than 2025, and easy payment solutions including card payments are allowed on fast public chargers.

  While public charging infrastructure is important, most charging events are happening at peoples' homes, while they are at work or on errands. It is therefore of crucial importance that EU policy makers agree on an ambitious Energy Performance of Buildings Directive (EPBD) - the EU's only legislation dealing with private charging. Targets for charging infrastructure for new buildings and those that are undergoing renovation are important and already exist to a certain degree. What is lacking, and needs to be included into the EPBD, are targets for existing buildings to ensure both the residential and non-residential building stock is pre-cabled by 2035.

- **Ensure taxation plays an enabling role.** Taxation largely sits with national governments and is a powerful tool to incentivise ZEV sales. On the consumer side, vehicle purchase

subsidies should be replaced with bonus-malus CO_2 taxation with higher taxes on polluting vehicles supporting the adoption of battery electric cars. This is a fiscally sustainable way to support the growing sales of ZEVs while at the same time helping to shift the behaviour of consumers away from high CO_2 emitting models.

Where BEV sales exceed 10%, outright purchase subsidies become expensive and are no longer justified. These should be focused on low income households or as a tool to support electric cars where vehicle and battery production takes place in Europe, and key minerals are sourced locally (e.g. from recycling) or from countries with high due diligence standards.

Corporate fleets and company cars are the prime market to target with taxation or mandates. Member states should follow best practice amongst their peers and create tax incentives by vehicle emissions, for example the low benefit-in-kind tax in the UK for zero emission company cars, a phase-out of depreciation write-offs for corporate fleets in Belgium, and steadily increasing acquisition taxes on polluting cars as in France's bonus-malus system.

5. Conclusion

The first half of 2022 marks the first step of a concerning trend: the stagnation of CO_2 emission reductions and the slowdown of electric car sales. As we enter a potentially turbulent and uncertain economic period, carmakers' voluntary commitments and theoretical production plans risk being buried and replaced by suboptimal strategies.

The EU Parliament and Council missed a golden opportunity to propose an increase in ambition of the car CO_2 targets in the decade. This means that there will be no supply-driven targets to ensure carmakers stay on a cost optimal pathway toward a socially equitable zero emissions transport system. The stagnation in Europe contrasts with China, and more recently the US, that are succeeding in attracting BEV sales with regulatory incentives. The European industry is now at risk of losing competitiveness and it could fail to keep-up with major economies such as China. As the demand for zero emissions vehicles will not be met by European carmakers, Chinese brands also have the opportunity to enter the EU market in the coming decade. Facing increased competition and unable to meet the demand for low-cost electric cars, European carmakers might also shift toward high margin vehicles, letting Chinese brands reap the benefits of the lower margin vehicle mass market. If the EU is unable to efficiently regulate its own market, it risks losing its economic sovereignty in the automotive industry.

To face these challenges, the EU must design regulations and policies that are fit for purpose. Trilogue negotiations on the revised car CO_2 standards are the last chance to fix some of the largest regulatory loopholes. The ZLEV benchmark is currently the largest loophole and implementing the Parliament's proposal to remove it from 2025 will avoid a further 5% weakening of the regulatory

targets. The consideration of allowing certain combustion engines powered by e-fuels in the regulation will only divert resources toward an energy inefficient technology that is unlikely to be available at an affordable price for the average driver and that doesn't even reach the same emission reduction as ZEVs. Both the 2035 ICE phase-out and the already weak intermediate targets must not be weakened further.

The revised regulation won't do much in the short term to boost electric vehicle production due to low targets in the 2020s and will do nothing to protect EU industrial competitiveness. Therefore, additional policies will be needed to provide the necessary incentives for industry to continue to ramp up electric car production. With the risk of ZEV stagnation, mandatory ZEV targets for corporate fleets can provide an important demand side push and member states should follow best practices to create tax incentives according to vehicle emissions, with higher taxes on polluting vehicles. The EU also needs to promote smart industrial policies, such as providing loans for companies in the automotive supply chain to retool factories, reskill workforces and adapt production lines to secure EU industrial jobs. Policies should also consider how to ensure the EU maintains its competitiveness in the global market by boosting ZEV production within the EU, such as linking electric-vehicle subsidies to local content and production rules and strict environmental standards. All these measures will help reinforce the resilience and economic sovereignty of the EU industry while ensuring the EU benefits fully from a strong ZEV industrial ecosystem.

6. Annexes

6.1. Manufacturer pools

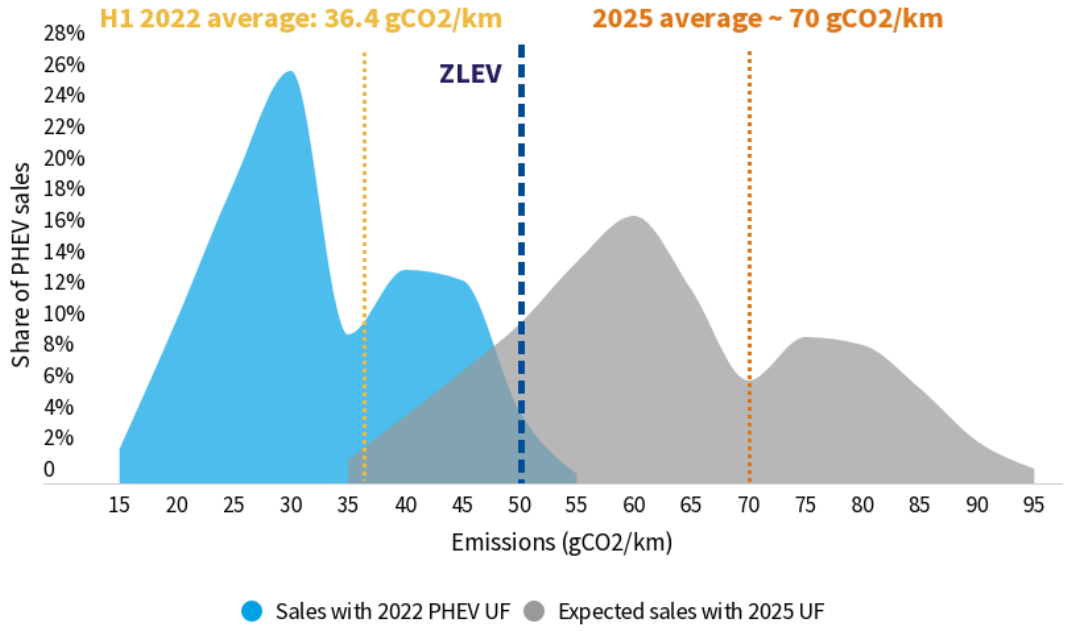
For this report, the definition of pools according to the European Commission, "M1 pooling list", version of 14h of July applies with open pool added from the declaration of intent (version of 7 June 2022). The Renault pool and Toyota pool are assumed to be maintained from 2021 as some brands would still not comply in H1 2022 without pooling.

The main brands or pools considered in this report are:

- **BMW**: BMW, Mini, Rolls-Royce
- **Ford**
- **Mercedes-Benz**: Mercedes-Benz, Smart
- **Hyundai**: Hyundai, Genesis
- **Kia**
- **Renault pool**: Renault, Dacia, Alpine, Nissan, Mitsubishi
- **Stellantis**: Alfa Romeo, Chrysler, Citroën, Dodge, DS, Fiat, Jeep, Lancia, Opel, Peugeot, RAM
- **Tesla pool**: Tesla, Honda
- **Toyota pool**: Toyota, Lexus, Mazda, Suzuki, Subaru
- **Volvo Cars**: Volvo Cars (Polestar not included)
- **VW pool**: Audi, Bugatti, Cupra, Porsche, Seat, Skoda, Volkswagen, Aiways, eGo, LEVC, Lynk & Co, MG Motors, Nio

6.2. Most PHEVs will not be counted as ZLEV in 2025

Compared to our analysis in the 2021 car CO_2 report, the status of the ZLEV slightly changed. Initially PHEVs were included in the count of zero and low emissions vehicles below 50 g/km but the update of the utility factor in 2025 is expected to have consequences here. Figure 23 shows T&E expectations of the impact of the UF change to the sales distribution. While most PHEVs emissions were considered to be below 50 g/km in H1 2022, only about 13% of PHEVs are expected to be classified as ZLEV in 2025.



Scope: Registration data for the EU27 and Norway. Emissions measured with the WLTP. Models above 55 gCO2/km in 2022 excluded from the infographic.

Source: T&E analysis of passenger car registration data from the first half of 2022 from Dataforce and T&E estimate of the 2025 distribution

Figure 23: Expected distribution of PHEV sales

6.3. Powertrain emission forecast

The forecast of average emissions in the decade is based on the emission forecast for each powertrain and the change in the sales share of each powertrain from LMC Automotive's Global Hybrid & Electric Vehicle Forecast (Q2 2022 update). The emission forecast for each powertrain is based on the following hypotheses:

- ICEs emissions decrease by 1.5% every year until 2025
- Mild and full hybrid emissions decrease by 1.5% every year until 2025, then by 1% until 2030
- PHEVs emissions are based on a 40% increase of the electric range between 2022 and 2030. The utility factor is calculated based on the electric range and the change in the utility factor curve described in T&E analysis of the European Commission proposal for the update of PHEV utility factor [5].
- Each powertrain group was split between SUVs and non-SUVs in order to take into account the additional emission increase due to the SUV sales growth. Based on historical trends, the SUV share is expected to grow from 50% in 2022 to 74% in 2030.

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