Bridging the gap: Carmakers' progress toward the 2025 car CO2 targets

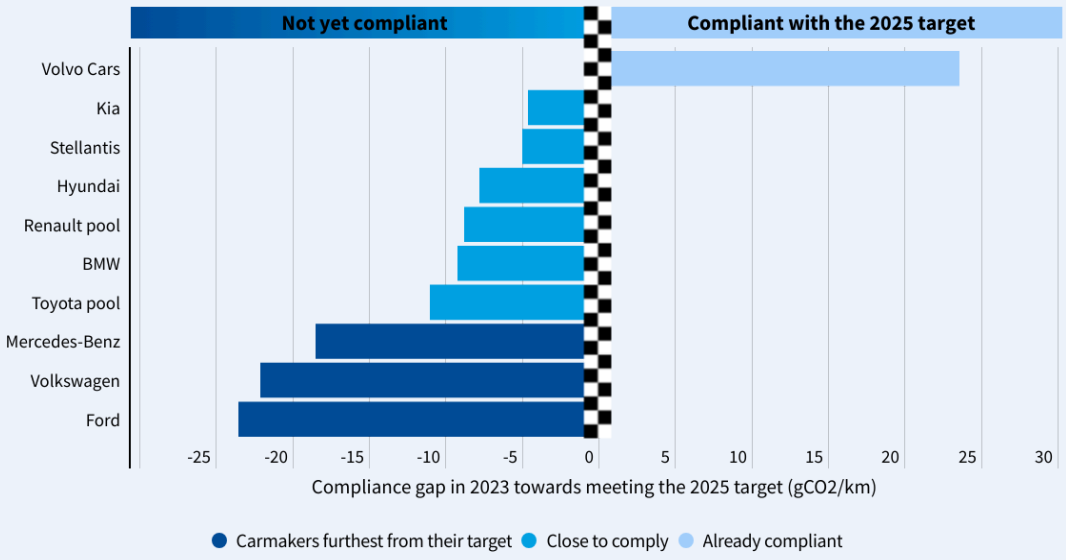
T&E's assessment of carmakers CO2 performance in 2023

April 2024

Summary

The car CO2 regulation is the single most important measure to reduce emissions from new cars in Europe. Thanks to this regulation, the CO2 emissions from new cars in the EU have been reduced by 28% since 2019. In 2025, the next stage of the regulation comes into force with a 15% reduction compared to the emissions baseline in 2021.

T&E has estimated carmakers' compliance gap with this 2025 target based on their emissions in 2023. The analysis shows that Volvo Cars would already meet its 2025 target based on its 2023 sales, while carmakers such as Kia or Stellantis have a gap of less than 5 gCO2/km and therefore appear to be well on track for their 2025 targets. Volkswagen and Ford are at the bottom with the largest gap at 22 and 24 g/km respectively and will need to redouble their efforts to meet their targets.



Scope: Passenger car registration in the EEA in 2023
Source: CO2 emissions from ICCT's Market Monitor (March 2023) and CO2 targets based on T&E's modelling

The key lesson from the 2020/21 target is that, despite carmakers being below the target in 2018-2019, they all met the target (or only missed it by a small margin). This shows that it is difficult to predict a carmaker's ability to meet a future target by looking at the progress made in the previous two years. However, what is clear is that carmakers have known the 2025 target since 2017 and have all prepared and adjusted their strategies to comply in 2025.

There are multiple strategies and flexibilities that carmakers can and are leveraging to meet the targets, ranging from higher BEV sales (the best long term strategy), to higher efficiency from combustion models to pooling emissions across a number of manufacturers. Carmakers can also do a lot to adjust their sales by adjusting prices and dealer incentives, or plan new models and variant availability for when they need to sell more EVs. However, many carmakers are currently prioritising larger and more expensive vehicles. These heavier vehicles are more polluting but offer higher profit margins. As a result, the lack of affordable EV models is holding back EV sales which explains some of the current significant gaps to the 2025 targets. After years of profits, it is high time for OEMs to launch affordable mass market EV models and adjust their pricing to incentivise their cleanest vehicles.

If carmakers do not improve their ICE sales compared to 2023, they would need to sell 24% BEVs in 2025. In addition to introducing new BEV models, carmakers can also sell more hybrids or downsize the most polluting models. In this case, the average BEV sales share could be reduced to 18% to meet the 2025 targets. Carmakers can also choose to "pool" their sales as Honda, JLR and Tesla did in 2022. Volvo Cars and Tesla could be candidates for pooling in 2025. If the carmakers such as VW, Ford and Mercedes pooled their sales with the top of the table (Tesla and Volvo Cars), the BEVs those three carmakers have to sell would decrease by 36%.

Putting this into perspective, the 2025 target is an easy one as it was limited to -15%, proposed in 2017 and left unchanged in the 2023 review as a compromise on the way to a higher 2030 ambition under the EU Green Deal. Given the global race to dominate the EV market, relaxing the one policy that drives European OEMs to invest in electrification would go against European industrial and sovereignty interests.

If the EU chooses to weaken its regulation or waiver the fines, it risks discrediting the EU's climate agenda and rules, and leave European carmakers at the mercy of the ambitions of global carmakers. Instead of questioning the rules, European carmakers should do the right thing for the climate and the EU economy and step up their efforts to comply and show that they are fully committed to the transition to electric.

1. Introduction

The car CO2 regulation is the single most important measure to reduce emissions from new cars in Europe[1]. Thanks to this regulation, the CO2 emissions from new cars in the EU have been reduced by 28% since 2019.

The EU reference target is set at 115 gCO2/km[2] between 2021 and 2024. For each carmaker (OEM), the specific target is calculated based on a mass adjustment that makes the target *less* stringent for carmakers with heavier vehicles. In 2025, the next stage of the regulation comes into force with a EU reference target of 93.6 gCO2/km calculated on the basis of a 15% reduction compared to the emissions baseline in 2021 (110.1 gCO2/km[3]). At the same time, the mass adjustment parameter of the regulation has been updated to reflect the reality of the market in 2021 and will result in a *stricter* target for carmakers with heavier vehicles. Including this change in the mass adjustment, the EU average target for 2025 would be reduced by 21% compared to 2021. See the annex for more information on the 2025 target calculation.

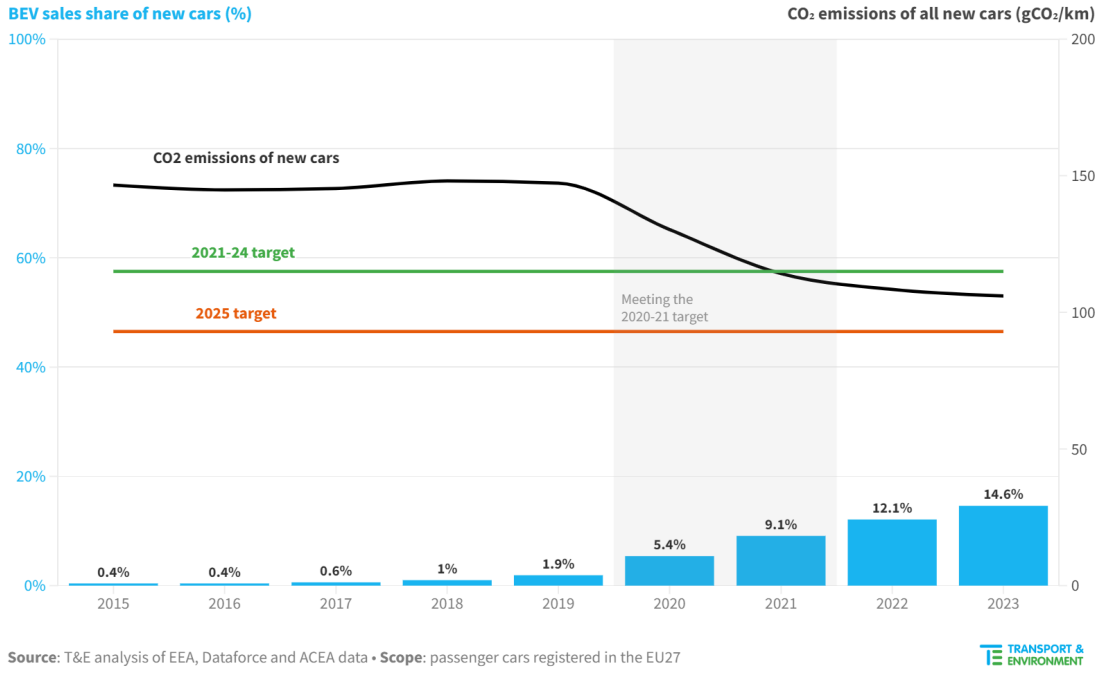


Figure 1: CO2 emissions and BEV sales share trends

[1] https://www.transportenvironment.org/discover/clean-solutions-for-all-tes-car-decarbonisation-roadmap/

[2] The target is 95 gCO2/km with the New European Driving Cycle (NEDC). This target is then converted to the Worldwide Harmonized Light Vehicles Test Procedure (WLTP) for each carmaker. On average, declared WLTP emissions were 21% higher than NEDC emissions in 2020, so the equivalent WLTP target is 115 gCO2/km. In practice, each carmaker has a different conversion factor based on their average WLTP and NEDC emissions in 2020.

[3] The baseline emission for 2021 is calculated from the weighted average of carmakers' target in 2021, excluding carmakers benefiting from a derogation. However, the methodology to convert from NEDC to WLTP is different from the 2021 OEM specific target as it is based on a weighted average of the *measured* WLTP emissions from all carmakers in 2020 instead of the *declared* emissions of each carmaker. Declared WLTP emissions were 4.8% higher than measured WLTP emissions in 2020.

Faced with the new target, carmakers such as Volkswagen[4] have called for softer targets or waived fines. Carmakers that fail to meet their 2025 target will be fined €95 fine per gCO2/km over the target and per car sold. Back in 2019, when the EU's first 2020 car CO2 target was about to come into force, many analysts predicted that OEMs would have to pay significant fines as they were expected to fail to meet the targets based on their emissions from the previous years. For instance, JATO Dynamics estimated that the EU carmakers would have to pay €34 billion[5] based on their 2018 emissions. However, in 2020, EU electric car sales increased by a factor of 3 in one year in 2020[6] and most carmakers met their targets this year[7]. This shows that big changes can be achieved in one year.

This short briefing looks ahead to 2025, analysing carmakers' compliance gap based on 2023 sales and assessing how all carmakers can adapt their sales strategy to meet the targets.

2. Many carmakers have made little efforts to meet their 2025 targets

According to the analysis by the International Council on Clean Transportation (ICCT)[8], average emissions in the European Economic Area (EEA) have fallen to 107 gCO2/km in 2023. Carmakers such as Volvo Cars are leading the way with an average of 66 gCO2/km, while Volkswagen and Ford are lagging behind with an average of 118 gCO2/km.

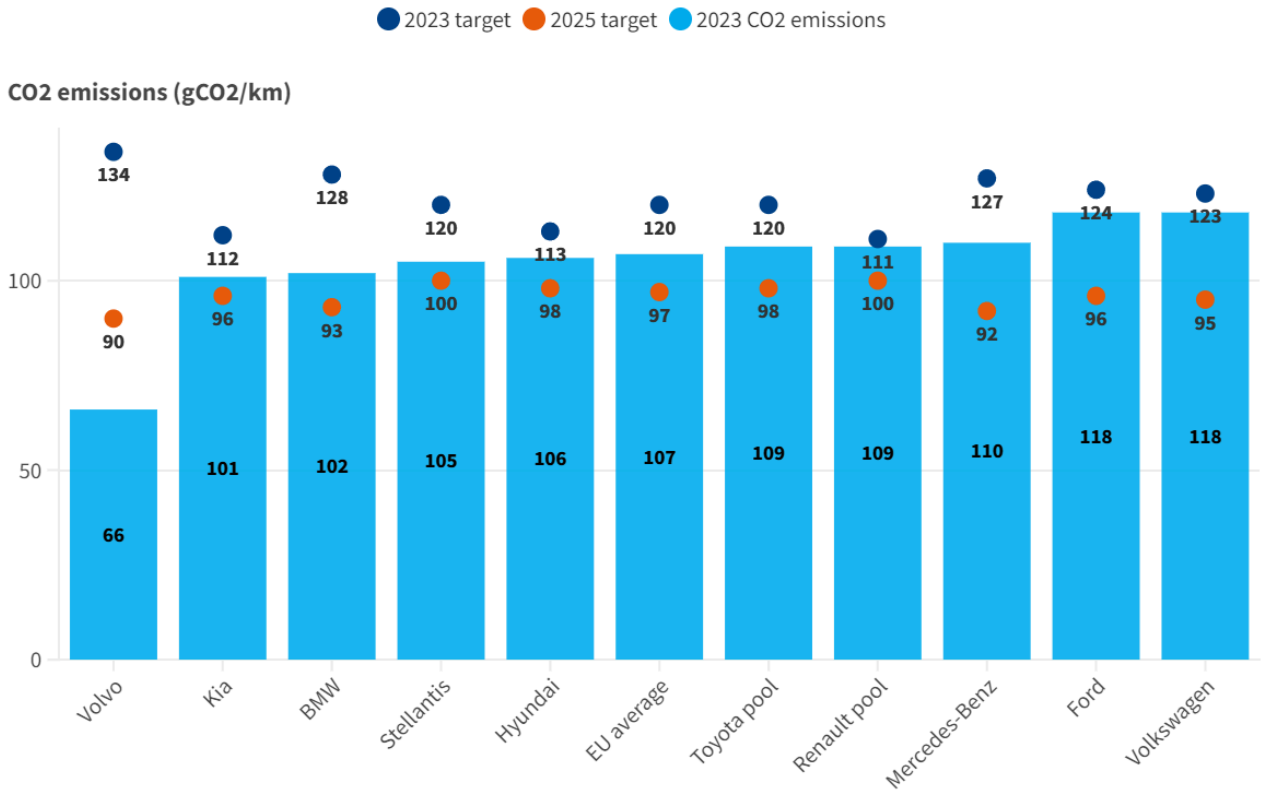
[4] https://europe.autonews.com/environmentemissions/vw-may-miss-europes-2025-co2-emissions-reduction-goal

[5] https://www.jato.com/2021-co2-targets-would-generate-e34-billion-euros-in-penalty-payments-within-europe/

[6] https://www.transportenvironment.org/discover/co2-targets-propel-european-ev-sales/

[7] Some carmakers missed their target by a small margin: Land Rover, Subaru, Suzuki and VW. https://www.transportenvironment.org/discover/electric-car-boom-at-risk/

[8] https://theicct.org/publication/eu-car-and-van-market-development-quarterly-december23-mar24/



Source: ICCT market monitor (March 2024) • **Scope**: passenger cars registered in the European Economic Area
Targets calculated including mass adjustment. The 2023 reference target (before mass adjustment) is the same in the 2021-2024 period. 2023 emissions including eco-innovation credits.

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Figure 2: Carmakers CO2 emissions in 2023

Several carmakers are only a few g/km under their 2023 target[9], namely Renault pool (-2 gCO2/km), Volkswagen (-5 gCO2/km), and Ford (-6 gCO2/km). This indicates that despite the fact that these carmakers had a couple of years to continue reducing CO2 emissions and increase the sales of BEV, they have done the minimum to comply with the regulation in the absence of more stringent targets. Instead they focused on selling large and expensive electric cars and held back the launch of new affordable electric car models (see T&E briefing analysing 2023 electric car sales for more[10]).

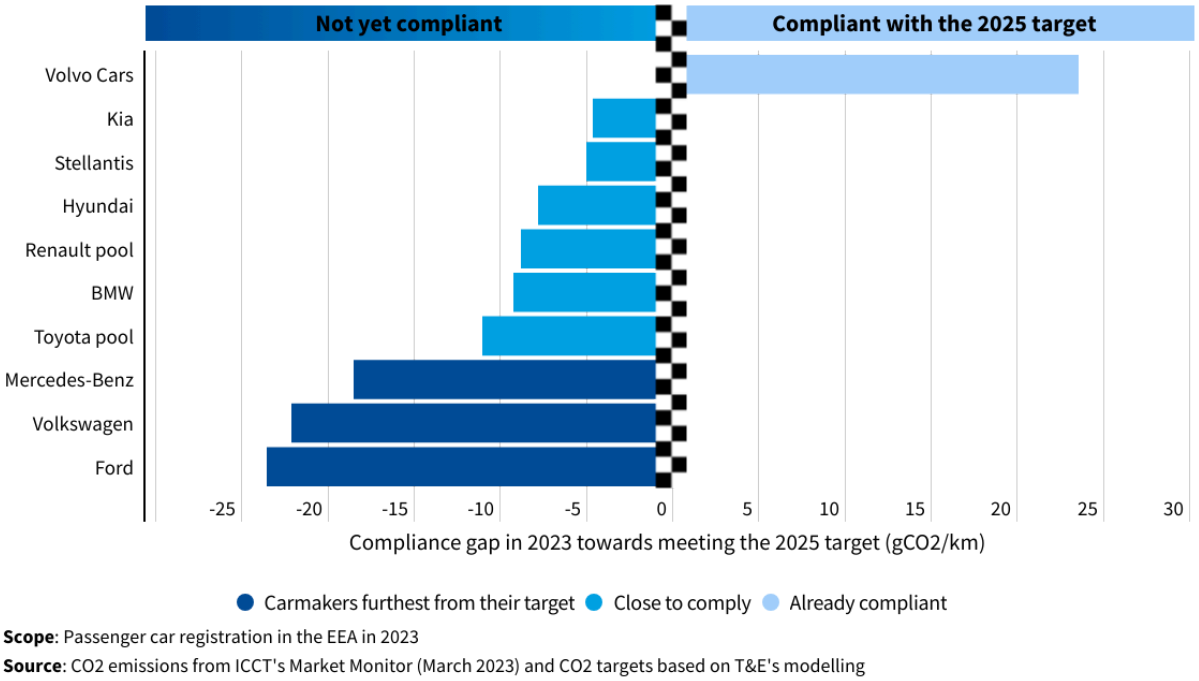
Based on 2023 emissions and the carmakers' expected targets for 2025 (more information on the target calculation methodology in Annex), we have calculated the gap[11] between carmakers 2025 target and their 2023 emissions, see Figure 3 below. The analysis shows that Volvo Cars is the only carmaker that

[9] The 2023 reference target (before mass adjustment) is the same for the period 2021-2024.

[10] https://www.transportenvironment.org/discover/europes-bev-market-defies-odds-but-more-affordable-models-needed/

[11] Including expected regulation flexibilities. Eco-innovations credits based on ICCT's 2023 estimate. Zero and low emissions vehicles (ZLEV) bonus based on the expected ZLEV share from GlobalData forecast. Mass adjustment estimated based on the mass of cars per OEM pool and powertrain in 2022 (data from the European Environmental Agency) and the share of powertrain expected in 2025 (GlobalData's Hybrid & EV sales forecast, Q3 2023).

would already meet its 2025 target based on its 2023 sales while carmakers such as Kia or Stellantis have a gap of less than 5 gCO2/km and therefore seem to be well prepared for their 2025 targets. Hyundai, the Renault pool[12] and BMW come next with a gap of less than 10 gCO2/km and will need to continue with their efforts to increase BEV sales. Finally, the Toyota pool[13], Mercedes-Benz, Ford and Volkswagen come last with gaps greater than 10 gCO2/km, with Volkswagen and Ford having the biggest gap at 22 g/km and 24 g/km respectively. These OEMs will need to double down on their efforts in 2024 and 2025 to close the gap.



Scope: Passenger car registration in the EEA in 2023

Source: CO2 emissions from ICCT's Market Monitor (March 2023) and CO2 targets based on T&E's modelling

Figure 3: Carmakers compliance gap with the 2025 car CO2 targets based on 2023 sales

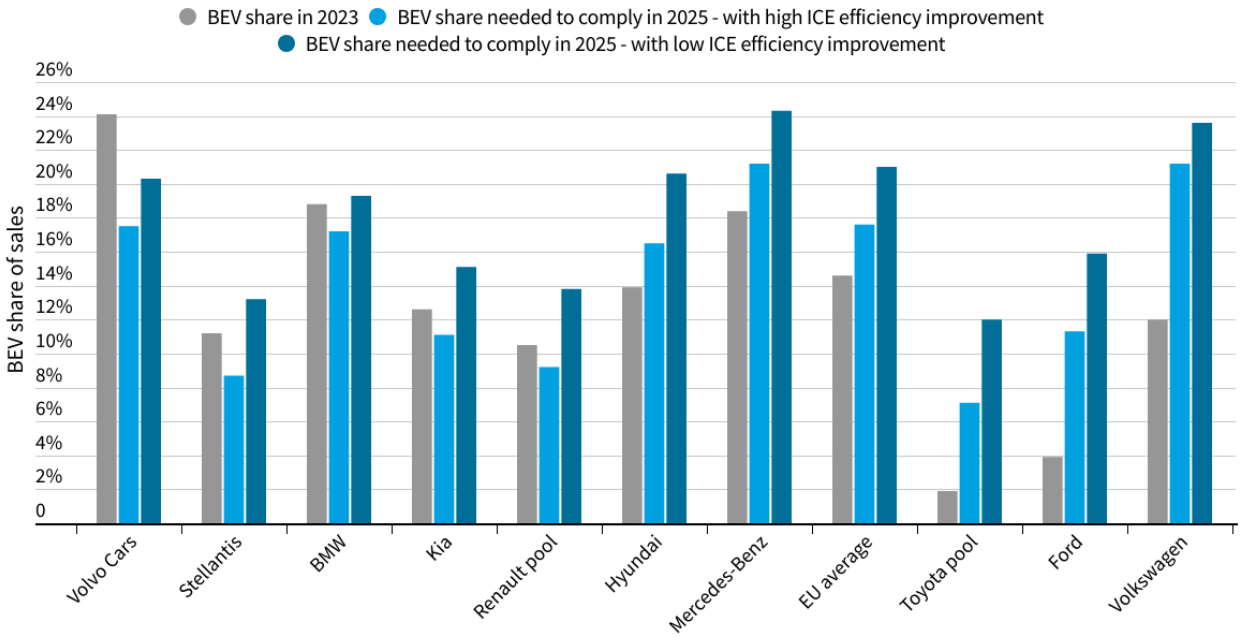
3. 2025 targets are achievable for all carmakers

T&E has modelled the minimum BEV share that would be required for each OEM pool to meet its expected 2025 targets (see Annex for details on calculation of the 2025 target). Overall, we estimate that the EU average BEV share would need to reach 20% in 2025. However, there is a wide range of possible outcomes depending on how carmakers optimise their sales of internal combustion engine vehicles (ICEs). If carmakers do not improve their ICE sales compared to 2023, they would need to sell 24% BEVs to compensate. On the other hand, carmakers could adopt strategies to improve the efficiency of their ICEs, by increasing hybridisation and by reducing the sales of their most polluting SUV models. In this case, the average BEV sales share could be reduced to 18% to meet the 2025 targets. Figure 4 shows the minimum BEV sales for OEMs with low and high ICE improvement scenarios[14].

[12] Renault, Nissan and Mitsubishi

[13] Toyota, Subaru and Suzuki

[14] Low ICE improvement based on a 2% efficiency improvement for each ICE powertrain with an increase of mild hybrids (MHEV) sales from about 18% of EU27 sales in 2023 to 28% in 2025.



Source: BEV share in 2023 from Dataforce and BEV share needed to meet the regulation based on T&E's modelling

Figure 4: Carmakers BEV sales needed to comply with the 2025 CO2 target

Looking at market forecasts such as GlobalData's, or looking at carmakers' own stated targets for 2025, most carmakers are expected to meet their targets based on the BEV share already planned.

Volkswagen Group currently has one of the largest gap but it has several options to meet its 2025 target and avoid fines:

- In an EV only strategy with little ICE improvement, Volkswagen would need to reach 24% of electric car sales in 2025.
- If VW were to maximise engine efficiency by reducing the sales of its most polluting models and if it would increase its MHEV share to 46% (from 12% in 2023), the OEM could meet the target with 21% BEV sales.
- VW could pool with Volvo Cars which is far ahead in its electrification strategy. In this case the VW's BEV sales could be limited to 19%.
- Finally, VW could pool with Tesla. In that case, a low ICE improvement and a 15% BEV sales would be sufficient to meet the target (instead of 24%).

It can be noted that VW would meet the European BEV sales needed based on its strategic plan announced in 2021[15]. VW has a 20% global BEV target for 2025 which would translate into a 29% BEV share

High ICE improvement based on a 3% efficiency improvement for each ICE powertrain with an increase of MHEV sales from about 18% of EU27 sales in 2023 to 35% in 2025, and an increase of full hybrid (HEV) sales from about 10% of EU27 sales in 2023 to 18% in 2025.

[15] https://www.volkswagen-group.com/en/volkswagen-group-strategy-day-new-auto-17292

in the European Economic Area[16]. So, VW would meet the 21-24% BEV share required to meet its target in 2025 without pooling.

Regarding pooling, we modelled a scenario where the 3 laggards in 2023 (VW, Ford and Mercedes-Benz, see figure 3) would pool with the 2 leaders (Tesla and Volvo Cars). For illustrative purposes, we assumed that VW would pool with Tesla and that Ford and Mercedes-Benz would pool with Volvo Cars. In this scenario, the following BEV sales would be needed:

- Without pooling, VW would need to increase BEV sales to bridge the gap between its 12% BEV sales in 2023 and the 24% BEV needed in 2025 in an EV only strategy. With pooling with Tesla, VW's BEV sales could be limited to 15%. This means that pooling would reduce the BEV sales gap by 74%.
- Without pooling, Ford would need to increase BEV sales to bridge the gap between its 4% BEV sales in 2023 and the 16% BEV needed in 2025 in an EV only strategy. With pooling with Volvo and Mercedes-Benz, Ford's BEV sales could be limited to 9%. Pooling would therefore reduce the BEV sales gap by 61%.
- Without pooling, Mercedes-Benz would need to increase BEV sales to bridge the gap between its 18% BEV sales in 2023 and the 24% BEV needed in 2025 in an EV only strategy. With pooling with Volvo and Ford, Mercedes-Benz's BEV sales could be limited to 17%. Pooling would therefore close the BEV sales gap entirely.
- Looking at their combined BEV sales volumes, pooling would allow the 3 laggards to reduce their BEV sales by 36%.

4. Conclusions: the car CO2 regulation shall not be weaken

The key lesson from the 2020/21 target is that it is difficult to predict a carmaker's ability to meet a future target by looking at the progress made during the two prior years. Some carmakers do have a large gap to close but these carmakers have known about the 2025 target since 2017 and they have done little to no efforts to reduce CO2 emissions since 2021.

All carmakers have carefully been planning and adapting their strategies to comply with the upcoming CO2 targets as part of their product roadmaps. Carmakers can adjust their sales by adjusting prices and dealer incentives or planning new models and variant availability for when they need to sell more EVs. However, many carmakers currently prioritise larger and more expensive vehicles. These heavier vehicles are more polluting but offer higher profit margins. This profit-optimising strategy has led to a lack of affordable EVs on the market today[17]. As a result, the lack of affordable EV models is holding back EV sales which explains some of the significant gaps with the 2025 targets.

[16] In 2023, VW's BEV share was 44% higher in the EEA than its global BEV share.

[17] https://www.transportenvironment.org/discover/europes-bev-market-defies-odds-but-more-affordable-models-needed/

However, after years of profits[18], it is high time for OEMs to launch affordable mass market EV models and adjust their pricing to incentivise their cleanest vehicles. More affordable EV models below €25,000 are expected to be launched by 2025, including cheaper vehicles from Renault, Skoda and Citroën.

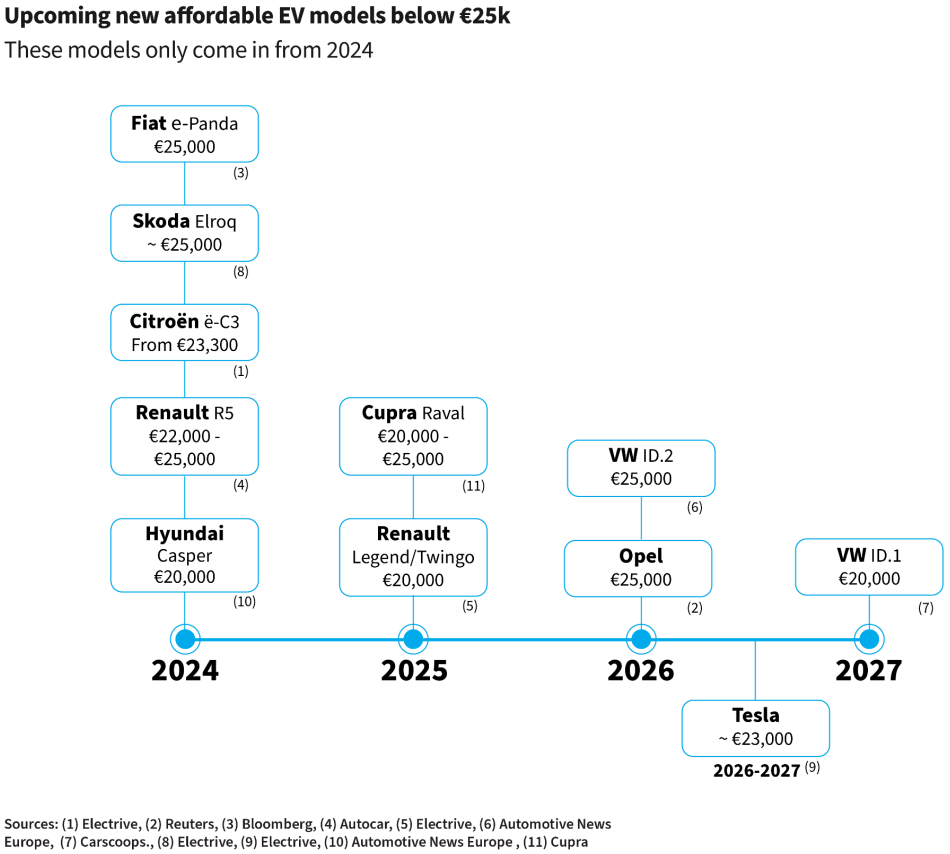


Figure 5: Entry-level models announced for the EU market[19]

In addition to introducing new BEV models, selling more hybrids or downsizing the most polluting models, there is also a lot of flexibility in the EU car CO2 legislation. Carmakers can choose to "pool" their sales as Honda, JLR and Tesla did in 2022. Volvo Cars (and Tesla) already meets its 2025 target from 2023 and may be another candidate for pooling.

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https://www.transportenvironment.org/discover/carmaker-greed-exposed-manufacturers-make-record-profits-but-fight-e150-pollution-fixes/

19 (1) Electrive. (2023) Citroën takes aim for more affordable EVs with the ë-C3, (2) Reuters. (2023) Opel expects to offer electric vehicle for around 25,000 euros by 2026, (3) Bloomberg. (2023) Stellantis Plans Sub-€25,000 Panda EV to Take on Renault, BYD, (4) Autocar. (2023) Renault 5 platform targets keen dynamics, low cost, (5) Electrive. (2023) Electric car from Renault for under 20,000 euros in 2025, Hatchback, (6) Automotive News Europe. (2024) VW said to delay small EV volume production amid Euro 7 changes, (7) Carscoops. (2023) VW Confirms Sub-$21k Entry-Level ID.1 Small Electric, (8) Electrive. (2023) Skoda announces plans for electric station wagon to release in 2026, (9) Electrive. (2023) Musk biography reveals plans for compact model and robot taxi on the same platform. (10) Automotive News Europe. (2024, 02, 04) Hyundai will launch a 20,000 euro mini EV in Europe, reports say. (11) Cupra website accessed 21/02/2024.

Finally, product development cycles are shortening, allowing carmakers to be more agile and flexible in how they plan to meet targets. Typical development cycles have gone from 4 years to 3 years, with some carmakers aiming for 2 years in order to compete with Chinese competitors[20]. Many of the new EV models to be launched in 2025 have been developed with such shorter cycles.

If we put in perspective, the 2025 target is actually a relatively easy target as it was limited to -15%, proposed in 2017 and left unchanged in the 2023 review as a compromise on the way to higher 2030 ambition under the EU Green Deal. Given the global race to dominate the EV market, relaxing the one policy that drives European OEMs to invest in electrification would go against European industrial and sovereignty interests. If the EU chooses to weaken its regulation or reduce the fines, this would discredit the EU climate agenda and rules and put European carmakers at the mercy of the ambition of global carmakers. Instead of questioning the rules, European carmakers should do the right things for the climate and the EU economy and intensify their efforts to comply and show that they are fully committed to the transition to electric.

Further information

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[20] https://europe.autonews.com/geneva-auto-show/renault-ceo-luca-de-meo-urges-airbus-build-evs-europe

5. Annex: Mass adjustment and calculation of the 2025 target

The European Commission's Joint Research Centre (JRC) has published a detailed report[21] in 2023 explaining how the 2025 target is calculated and how each parameter is defined. The general formula is as follows:

$$\mathrm{ref}_{m_i,\mathrm{WLTP}}^{(yy)} = \mathrm{target}_{EU-fleet,\mathrm{WLTP}}^{(2025)} + \mathrm{a}_{2025}\left(TM_{m_i}^{(yy)} - TM_0^{(yy)}\right)$$

The first parameter is the EU fleet-wide target which is calculated by applying a 15% reduction compared to the 2021 reference value. The EU fleet-wide reference value for 2021 is calculated as a weighted average of specific reference value of all carmakers, excluding those benefiting from a derogation in 2021. For each carmaker, the specific reference value is calculated by multiplying the NEDC target of 95 gCO2/km by the ratio between their average *measured* WLTP CO2 emissions and their declared NEDC emissions. Using this methodology, the JRC calculated that **the EU fleet-wide 2025 target is 93.6 gCO2/km**.

The second parameter "a" is a "slope" parameter that defines how the OEM specific target is adjusted depending on the average mass of the carmaker. Between 2020 and 2024, this slope parameter was positive and equal to 0.0333. This means that if a carmaker's average car weight was 100 kg above the market reference mass, its CO2 target would increase by 3.33 gCO2/km, making the target *less* stringent. However, the regulation's adjustment mechanism has been defined to automatically adjust this slope parameter based on the market reality in 2021. Due to the uptake of low emission vehicles that are on average heavier than other cars, the JRC calculated that this slope is now negative.

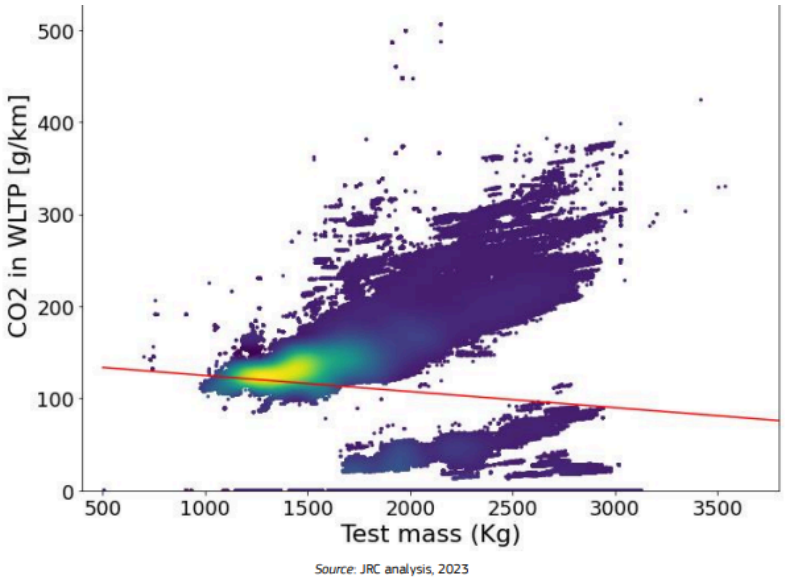

Figure 6: Best linear fitting of the WLTP CO2 emissions for cars registered in 2021, as a function of the test mass of the vehicle

[21] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC133502/JRC133502_01.pdf

This means that in 2021, on average, heavier vehicles emitted less than lighter ones because they were more electrified. The a_{2025} parameter was fitted[22] based on the relationship between emissions and mass in 2021 and the JRC calculated a value **a_{2025} = -0.0144.** For instance, if a carmaker has an average car weight that is 100 kg above the market reference mass, then this CO2 target for that carmaker would decrease by 1.44 gCO2/km, making the target *more* stringent. As a result, **carmakers that sold heavier cars** (and benefitted from weakened targets until 2024) **will now face an opposite situation with targets more stringent than the average.** Similarly, carmakers selling lighter cars will see their targets weakened (compared to the average) instead of made more stringent.

"TM" is the average test mass of a carmaker's new car fleet and TM0 is the market reference mass calculated from the average test mass of all new passenger cars registered in 2021. The JRC calculated **TM0 = 1609.6kg.**

While the EU fleet-wide target which is calculated by applying a 15% reduction compared to the 2021 reference value, **the specific target for each carmaker is not a 15% reduction compared to its 2021 target** for two reasons:

- First, the 2021 specific target is based on a conversion ratio to convert the 95 gCO2/km from NEDC to the carmaker's WTLP reference target. This ratio is different for the calculation of the 2025 target as it is based on the average *measured* WLTP emissions for all carmakers in 2020, whereas the 2021 target takes into account the average *declared* WLTP emission in 2020 of a specific carmaker. Moreover, the JRC states that the analysis of the 2020 dataset shows an average *declared*-WLTP of 129.3 g/km, while the average *measured*-WLTP was 123.4 g/km. The JRC explains that manufacturers over-declared CO2 emission values in order to avoid failing the conformity of production tests for new vehicles during the type approval process.
- The mass adjustment will change in 2025 with adjustment parameter going from positive to negative (a_{2025}), thus affecting carmakers in different ways as explained above.

For example, ICCT estimated that VW has a target of 123 gCO2/km in 2023, including the mass adjustment. Based on its expected mass in 2025 (a higher mass than in 2021 is expected due to higher sales of EVs) and a 5% zero and low emission vehicle bonus[23], we expect VW's target to be around 96 gCO2/km. This means that VW's 2025 target will be 22% lower than its 2023 target. Including the mass adjustment, the overall equivalent CO2 reduction at EU level between 2021 and 2025 is 21% (118 g/km in 2021[24] versus 93 g/km in 2025).

[22] A 2025 is the slope of the best linear fitting for the CO2 emissions versus test mass representation of all the vehicles registered in 2021.
[23] Carmakers' target is reduced when their sales share of zero and low emissions vehicles (vehicles with emissions below 50 gCO2/km) is above 25%.
[24] https://theicct.org/publication/market-monitor-eu-jan-to-dec-feb22/

Table 1: OEM specific targets (including mass adjustment) in gCO2/km

OEMs	2021-2024 target[25]	2025 target[26]	CO2 reduction between the 2021-2024 target and 2025	CO2 reduction (%)
BMW	128	93	35	-27%
Ford	124	97	27	-22%
Hyundai	113	96	17	-15%
Kia	112	96	16	-14%
Mercedes-Benz	127	92	35	-28%
Renault pool	111	98	13	-12%
Stellantis	120	100	20	-17%
Toyota pool	120	98	22	-18%
Volvo Cars	134	90	44	-33%
Volkswagen	123	96	27	-22%

[25] The reference target is similar over the period 2021-2024. The exact target provided in the table includes the mass adjustment for the year 2023.
[26] The 2025 target includes the bonus from the zero and low emissions benchmark.