



BRIEFING - September 2024

The drive to 2025

Carmakers' progress towards their EU CO2 target in H1 2024

Summary

After years of stagnant EV sales due to the lack of new car CO₂ targets, carmakers will face stricter standards in 2025, following the last targets set in 2021. **While some carmakers have been calling to weaken the regulation, T&E shows that all carmakers can meet their 2025 targets.** T&E breaks down the strategies carmakers are expected to use to comply based on modelling of compliance scenarios relying on: sales data, carmakers' public plans, and analysis of data from market research company GlobalData. The compliance options include increasing sales of full electric cars (BEVs), mild and full hybrids (HEVs) and plug-in hybrids (PHEVs), as well as various compliance flexibilities. This analysis provides an insight into carmakers' paths to comply with the target in 2025.

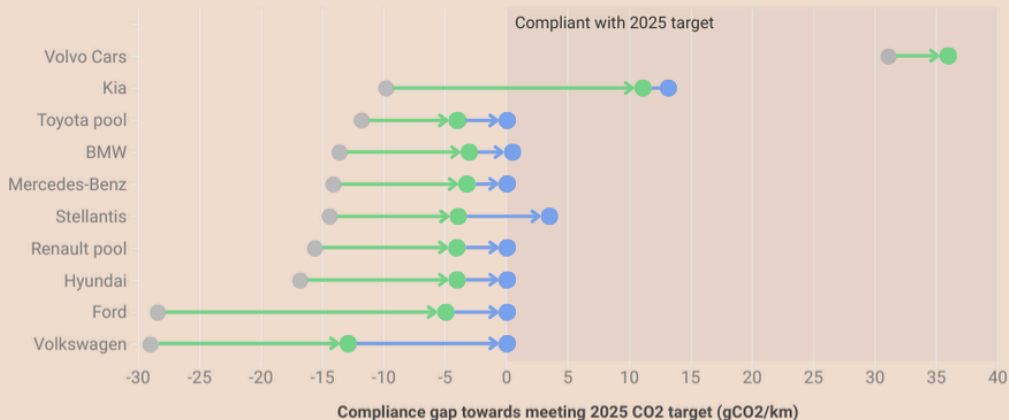
As with [past car CO₂ targets](#), carmakers are expected to close their compliance gap in the target year, rather than ahead of time. Between 2019 and 2020, carmakers furthest away from their targets improved their CO₂ performance by 20 gCO₂/km. In the first half of 2024, most carmakers are close to meeting their target with gaps ranging from 10-17 gCO₂/km. Leaders in EV sales such as Volvo Cars have already reached their 2025 target. Volkswagen (VW) and Ford are the furthest behind with gaps of 28-29 gCO₂/km and may consider forming compliance pools with leaders to reduce the gap. For instance, if VW pools with Tesla, it would only need to achieve a 17% BEV share in 2025 (down from 22%). Similarly, if Ford pools with Volvo again, BEVs would need to account for just 9% of its sales, instead of 21%.

It is crucial to stress that the 2025 target is **not an electric car mandate**, and - technically - no mandatory EV sales share is necessary. The target, proposed back in 2017 and unchanged since then, is a CO₂ average: selling more efficient petrol cars (or fewer SUVs) helps as much as selling electrics. In addition, **numerous flexibilities are allowed**: an additional bonus for >25% ZLEV sales, eco innovations, as well as pooling emissions with other manufacturers, e.g. pure EV players.

18 months out, carmakers are expected to close the gap to the 2025 target

Increase in BEV sales would be the main compliance strategy

CO₂ performance ● H1 2024 ● With expected BEV sales in 2025 (T&E central scenario)
● With expected hybrid and PHEV sales



Source: T&E analysis of H1 2024 sales in 23 EU countries and Norway from Dataforce, and T&E modelling of OEM 2025 compliance strategy based on sales forecasts informed by GlobalData



In 2025, carmakers are expected to boost EV sales in 2025. In T&E's central compliance scenario, EV sales are expected to rise to 24% market share in 2025 (from 14% in the first half of 2024), supported by an expansion of mass market EV offerings, including seven affordable (<€25,000) EVs available. If carmakers rely more on hybrids, they would need less BEVs to comply (20%). The growth in EV sales would account for more than half (60%) of the CO₂ reduction needed to reach 2025. This comes after three years of stagnation, due to carmakers focus on profits from ICE and higher-priced EVs.

While BEVs play the biggest role, carmakers also rely on other compliance options. In T&E's compliance scenario, on average, 20% of the CO₂ reduction would be achieved by selling more hybrids, while regulatory flexibilities would contribute to a 12% CO₂ reduction, and PHEVs could provide 8% of the improvements. Stellantis (33%) and VW (30%) would rely the most on HEV sales to meet their targets. As a result, despite not being a future proof option, the share of mild hybrids is expected to double (from 19% to 37%). BMW is expected to rely most on PHEVs (18%).

The car CO₂ regulation has proven effective and will continue to push carmakers towards electrification but needs to be **accompanied by national EV policies: charging masterplans and stable, targeted subsidy schemes.** To ensure Europe's automotive industry remains competitive and leads in the mass-market EV sector, **policymakers must resist calls to weaken the 2025-2035 targets or delay compliance.** The current lead enjoyed by Chinese EV makers only shows that the longer the EU protects its laggard automakers, the less competitive they will be.

1. Stagnation and growth: how the European EV market works

The BEV share of the European car market decreased slightly to 13.3% in the first half of 2024, compared to 13.8% in the first half of 2023 and 15.4% for the whole of 2023.

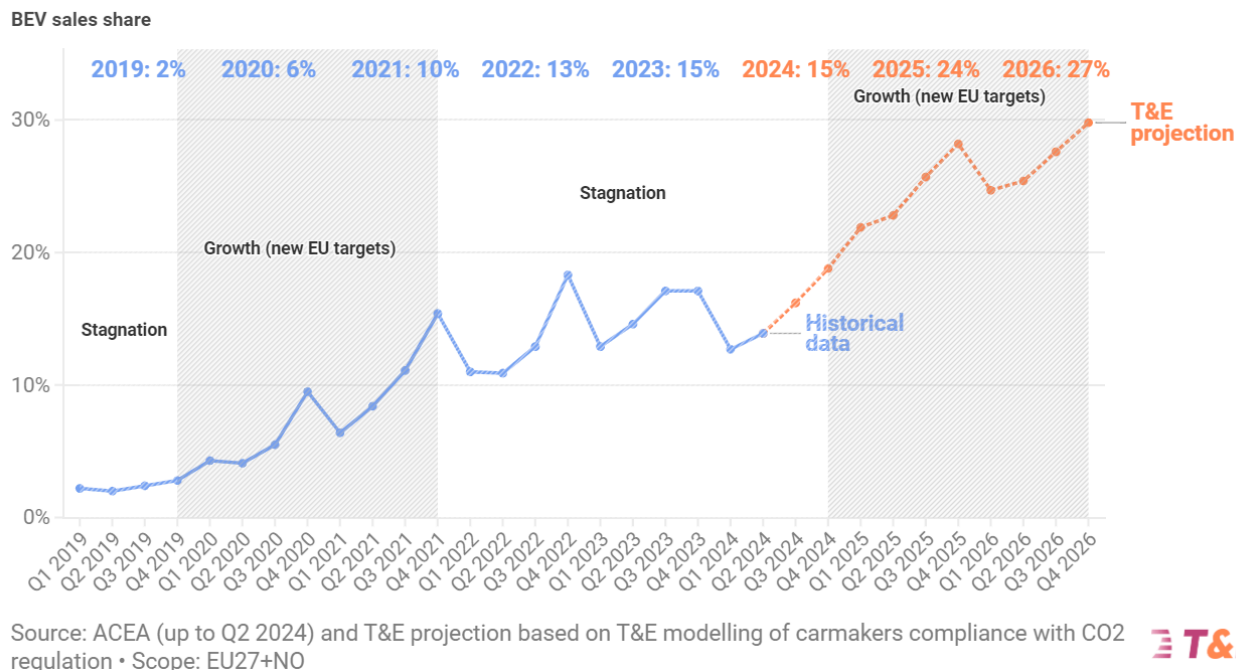


Figure 1 - The EV market is in between two growth phases

Stagnation phase: The slow growth of BEVs in the 2022-2024 period is due to the CO₂ standards design and carmakers profit driven strategy. This stagnation has been expected by [T&E](#) and [market analysts](#) since 2020.

- **The EU car CO₂ regulation is designed with 5-year steps with new targets in 2025 and 2030.** Past evidence shows that carmakers don't comply with car CO₂ targets in advance, but only when the targets require it. Previous [T&E analysis](#) showed carmakers were only half-way to the 2020 target 4 months before the start of 2020.
- **Carmakers focus on ICE profits ahead of the next growth phase driven by 2025 targets.** In the stagnation phase, carmakers prioritise short-term profits through the sale of high-margin vehicles (e.g. Volkswagen's "value over volume" [strategy](#)). Previous [T&E analysis](#) has shown that carmakers' disproportionate focus on larger, more premium models has resulted in high prices for EVs in Europe which has slowed down EV sales as a result.

Growth phase: Carmakers are expected to ramp up mass-market affordable EVs to meet 2025 targets

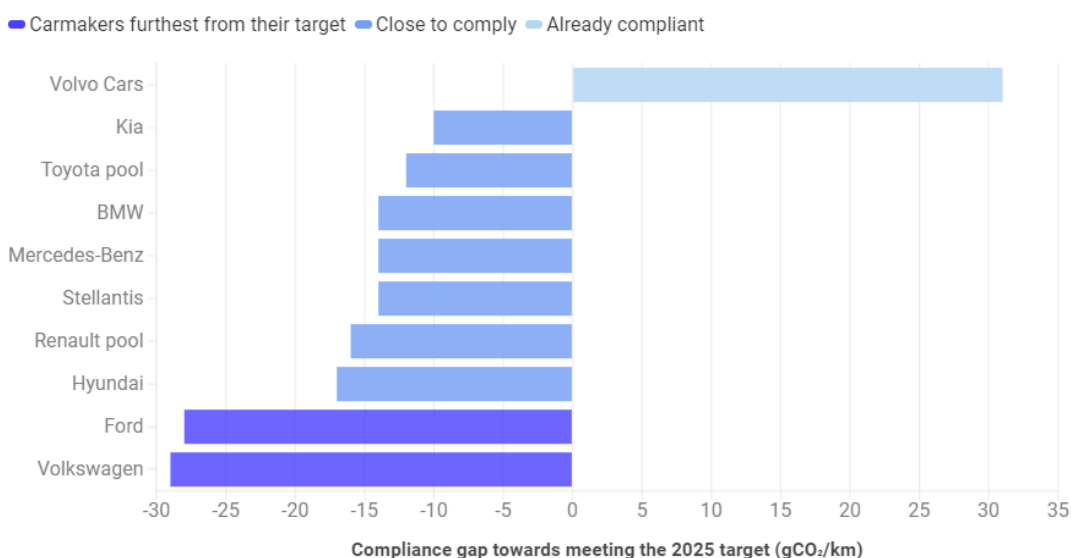
In the next growth phase from 2025 onwards, electric car sales would pick up as carmakers need to prioritise EV sales to meet the next car CO₂ target. As presented in section 4, T&E expects EV sales to grow to 20%-24% in 2025, partly thanks to affordable models coming to the

market (see section 3). This stop-and-go strategy creates a succession of stagnation and growth phases.

However, as carmakers prioritise their [profits](#) and shareholder payouts, many OEMs are calling on the European Commission to weaken the car CO₂ regulation despite the fact that the targets have first been proposed back in 2017. For instance, ACEA’s president [Luca De Meo](#) is calling for “a little more flexibility” in the regulation implementation while [Volkswagen](#) wants the EU to soften CO₂ emissions targets. This briefing looks ahead to 2025, analysing carmakers’ compliance gap based on sales in the first half of 2024 and describing how all carmakers can adapt their sales to meet the targets (methodology described in annex 6.1).

2. Carmakers' progress towards 2025 CO₂ targets is uneven

While Volvo Cars is already on track to meet its 2025 target based on sales in the first half of 2024, Volkswagen and Ford are furthest away. Other carmakers are in the middle and expected to meet their targets. This overall compliance picture with one leader, two laggards and other carmakers with a moderate gap around 10 gCO₂/km has not changed much since [2023](#). However, given there’s been a BEV slowdown since 2023, the compliance gap has slightly increased for most carmakers over the first half of 2024 (compared to the full year 2023). This situation is not new as most carmakers had similar gaps with their 2020 target in 2019 (see figure 3).



Source: T&E analysis of H1 2024 sales in 23 EU countries and Norway from dataforce



Figure 2 - Carmakers’ gap with the 2025 CO₂ targets based on sales in the first half of 2024

The BEV slow-down in the first half of 2024 led average CO₂ emissions to increase to 109 gCO₂/km from 107 gCO₂/km in 2023. Volvo Cars is the only legacy carmaker that is already compliant (over-compliance of 31 gCO₂/km). Among the non-compliant carmakers, Kia is the



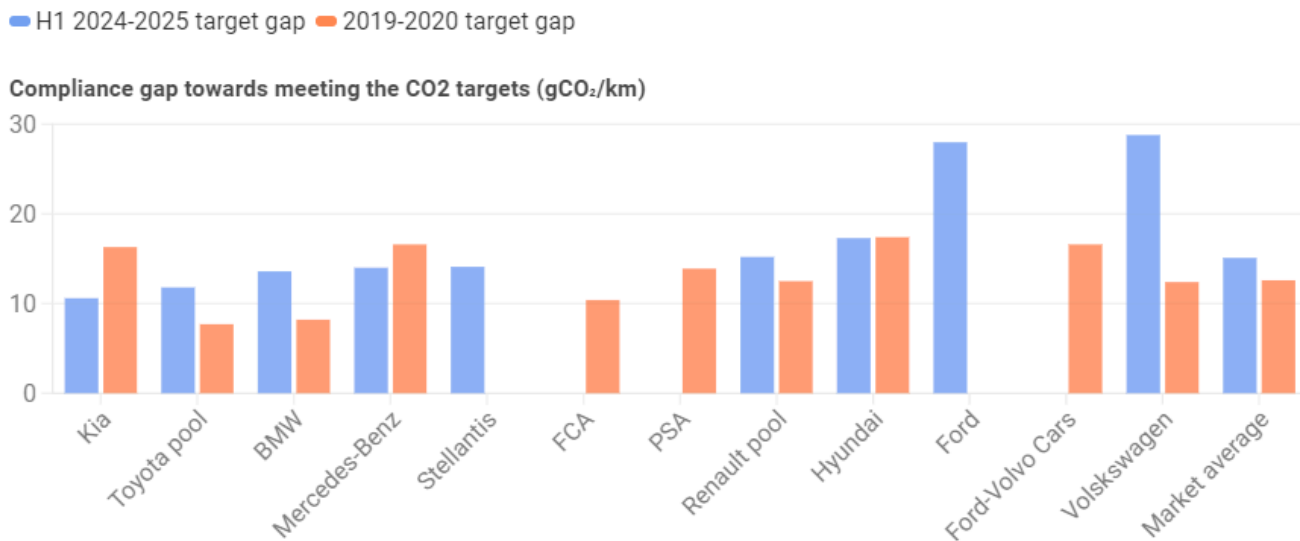
closest to the 2025 target with a gap of 10 gCO₂/km. Most of the carmakers' targets are well within reach with gaps ranging from 10 and 17 gCO₂/km.

To close the gap by 2025, Ford and Volkswagen will need to redouble their efforts.

Ford and Volkswagen are the furthest away from their targets with gaps of 28 and 29 gCO₂/km respectively. While these two carmakers will need to double down on their efforts in 2025 to close the gap, they have many possible compliance strategies as highlighted in section 4.

Back in 2019, carmakers also had large gaps with their 2020 targets.

Looking at the market average, the compliance gap is 15 gCO₂/km in H1 2024, a similar value as the 13 gCO₂/km gap in 2019 compared to the 2020 target. BEV sales are expected to normalise in the second part of 2024 as the market recovers from the abrupt [removal](#) of the subsidy in Germany (e.g. by lowering EV prices as VW has already [done](#)). The full year 2024 gap would be lower than the current 15 gCO₂/km and could even become lower than 2019. Hyundai was the major carmaker that was the furthest away from its 2020 target in 2019 with a gap of 17 gCO₂/km. Despite this gap, it still over-complied in 2020, improving its CO₂ performance by 20 gCO₂/km. Ford and Volkswagen currently have significantly higher gaps than in 2019 (Ford eventually formed a pool with Volvo Cars and VW with MG) while Kia and Mercedes-Benz are currently doing better than 5 years ago.



Source: T&E compliance analysis • H1 2024 emissions from Dataforce - 2019 emissions from EEA



Figure 3 - Carmakers' gap with the following year CO₂ targets in 2019 and H1 2024

3. Carmaker's strategies to comply with their CO₂ targets in 2025

Carmakers are expected to meet their 2025 CO₂ targets relying mostly on BEVs.

Methodology: T&E has modelled carmakers' expected compliance strategies starting from the market car sales forecast from GlobalData (Q2 2024) and modelling the additional share of BEV, PHEV and HEVs required for each carmaker to comply with their 2025 CO₂ target (see












methodology in annex 6.1). The central scenario is based on the assumption that carmakers would not use the pooling flexibility of the regulation but include other regulatory flexibilities like zero and low emission (ZLEV) benchmark and eco-innovation credits (annex 6.4). Scenarios accounting for pooling between carmakers are presented at the end of the section 3. Additional scenarios with high and low reliance on hybrids are presented in section 4. The full methodology is available in annex 6.1 and 6.2.

T&E's modelling of carmaker's compliance strategies shows clearly how carmakers can comply with the targets. Overall, the CO₂ improvements are expected to be achieved thanks to: BEV (60% of the average CO₂ improvements), HEVs (20%), flexibilities (12%), and PHEVs (8%). More details on the expected sales shares per powertrain is provided section 4 and annex 6.2.

Table 1 - Overview of carmakers' BEV strategy as expected by T&E

■ Share of CO₂ improvement from BEVs
 ■ Share of CO₂ improvement from HEVs and ICE improvements
 ■ Share of CO₂ improvement from PHEVs
 ■ Share of CO₂ improvement from regulatory flexibilities

Pool	CO ₂ improvements (T&E central scenario)	New BEV models	Growth of existing BEV models
BMW		Mini Aceman	BMW iX1, iX3, i5, Mini Cooper, Countryman
Ford		Ford Puma, Capri	Ford Explorer
Hyundai		Hyundai Inster , new IONIQ EV	Hyundai IONIQ 5
Kia		Kia EV3, EV4, EV5	Kia EV7
Mercedes-Benz		Mercedes-Benz CLA, GLC, Smart #5	Smart #3, Fortwo, Mercedes-Benz G-Class
Renault pool		Renault R5 , R4, new Nissan Leaf	Dacia Spring , Renault Megane, Scenic
Stellantis		New Fiat Panda , Leapmotor T03 , Opel Frontera, Alfa Romeo Stelvio	Citroën e-C3 , Alfa Romeo Junior Elettrica, Fiat 600, Peugeot e-3008
Toyota pool		Toyota bZ2X and bZ3X, Suzuki eVX	Toyota bZ4X
Volkswagen		Cupra Raval , Skoda Elroq, Audi A6 e-tron, Porsche Boxter, Cayenne	VW ID.3, ID.4, ID.7, Skoda Enyaq, Cupra Tavascan, Porsche Macan

Source: T&E analysis of carmakers compliance, T&E modelling of carmakers' compliance with sales forecasts for BEVs and hybrids in 2025 informed by GlobalData



All carmakers plan to launch new models in time for the new 2025 targets, including many new mass-market models from segments A to C. Among these, seven affordable models with price starting below €25,000 are expected to be available in 2025 and will be crucial for carmakers

compliance. T&E expects these affordable models to account for a growing proportion of total EV sales. In 2025, these models could account for up to 300,000 to 400,000 units - which would account for 10%-15% of the BEV market. The vast majority of these models would come from Renault and Stellantis as both will have several affordable models available in 2025. These models will support the growth of the BEV market, which could reach up to 2.8 million BEVs.

These affordable EV models are also in high demand. The European Commission published a survey under the European Alternative Fuels Observatory ([EAFO](#)) showing that 57% of respondents would like to buy an electric car but that the cost of BEVs is seen as the main barrier of current EVs. Similarly, a [survey](#) conducted by Yougov for T&E has shown that 25% of new car buyers already intend to buy an electric car in the next year, but when given the option of a €25,000 electric car, the share of new car buyers willing to buy a battery electric model increases to 35%. This would equate to an additional 1 million EVs being sold in Europe annually, replacing combustion equivalents.

Each carmaker's expected strategy in the T&E scenario is detailed below:

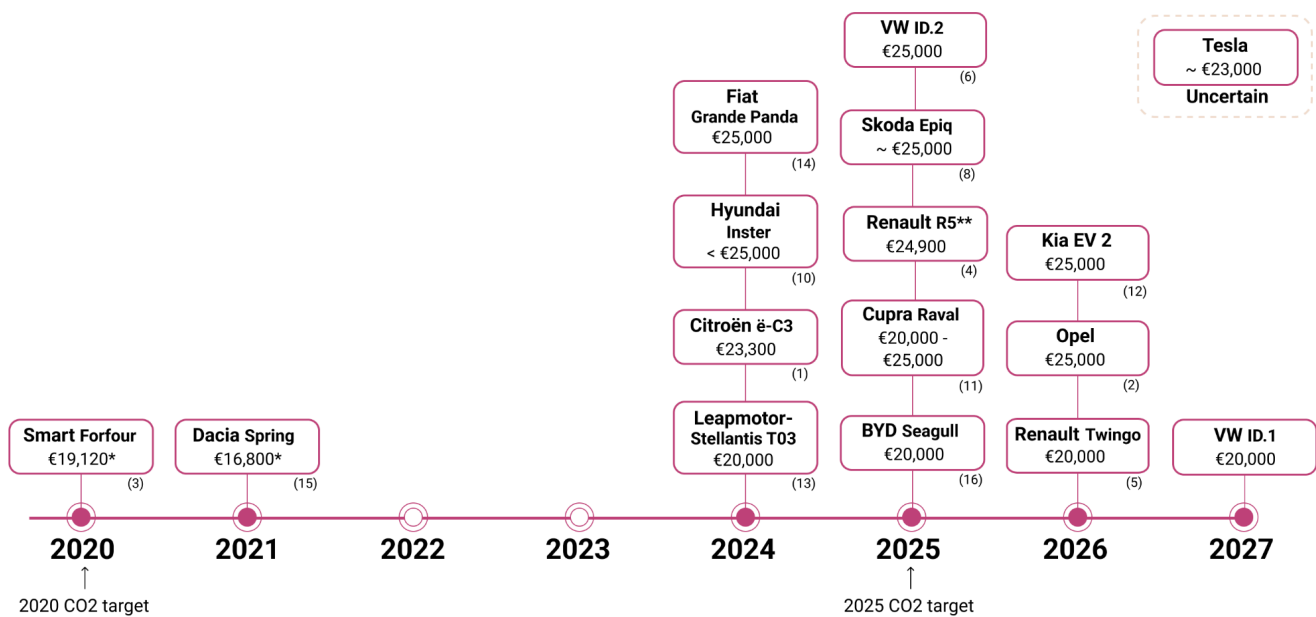
- **BMW** is expected to achieve 48% of CO₂ improvements based on the growth of the iX1, iX3 and i5 BEV models and the launch of the electric Mini Aceman to reach 25% BEV in 2025 according to GlobalData's forecast. Based on T&E modelling, the remaining CO₂ improvements are expected to come from regulatory flexibilities (32% of CO₂ improvements thanks to the full ZLEV bonus) and increase in PHEV sales, such as the BMW 1-Series (18% of improvements).
- **Ford** is expected to achieve a significant increase in its share of BEVs, which could reach as much as 21% according to GlobalData forecast. This increase is expected to mostly come from the launch of the B-segment Ford Puma Gen-E and C-segment Ford Capri, which could reach a significant mass market sales share, and increased sales of the Ford Explorer. T&E expects that BEV growth will account for 71% of Ford's CO₂ improvements.
- **Hyundai** is launching the affordable A-segment Inster model with a starting price around €20,000, as well as a new IONIQ EV model to be unveiled in the second part of 2024. The EV growth will be supported by the new variants of the IONIQ 5. Thanks to these new models, Hyundai's BEV share is expected to reach 22% in T&E compliance scenario, and these will achieve 72% of the CO₂ improvement.
- **Kia** is launching three new models, the B-segment Kia EV3 and the C-segment EV4 and EV5. The Korean carmaker's BEV share is expected to reach 26% thanks to these two models and the growth of the EV7 model. CO₂ improvements are expected to be achieved mainly from the BEV growth (72% of improvements) and regulatory flexibilities (24% mostly thanks to the full ZLEV bonus).

- **Mercedes-Benz's** BEV share is expected to reach 25% based on T&E modelling. The EV growth is expected to be supported by the launch of the C-segment Mercedes-Benz CLA and Smart #5 models, the D-segment GLC, and the growth of existing models such as the Smart #3 and large models such as the Mercedes-Benz G-Class. In T&E scenario, 58% of Mercedes-Benz' CO₂ improvement would be achieved by BEVs, 25% by flexibilities as the carmaker benefits from the full ZLEV bonus and 17% by HEVs.
- **Renault** is launching two affordable models in the B segment, first the Renault R5 with a base price of €24,900 in 2025, then the Renault R4. China made Dacia Spring, which gets a facelift in 2024, as well as the Renault Megane and Scenic could also support EV growth. Nissan is also expected to launch the new version of its C-segment Nissan Leaf. The Renault-Nissan-Mitsubishi pool could reach a BEV share of 17% in 2025 based on T&E modelling. This BEV growth would enable 68% of the CO₂ improvements. The pool is also expected to achieve 15% of its CO₂ improvements by increasing the sales share of FHEVs (full hybrids) and MHEVs (mild hybrids). For instance, by increasing the sales of popular hybrids models such as the Renault Clio or the Dacia Duster and new models such as the Renault Symbioz.
- **Stellantis** is expected to achieve 54% of the improvements in 2025 with BEVs and 33% with HEVs using a powertrain mix informed by GlobalData forecast. Compared to other carmakers, Stellantis is expected to rely the most on ICE improvements thanks to new MHEV models (with VW being second), such as the Opel Frontera, the Alfa Romeo Junior, the Citroën C3 Aircross and Jeep Recon. In addition to new EV models such as the affordable Fiat Grande Panda (less than €25,000), the Opel Frontera and the Alfa Romeo Stelvio, Stellantis is expected to increase sales of existing EV models in segments B and C such as the affordable Citroën e-C3 (entry-level version starting at €19,990 in 2025), the Alfa Romeo Junior Elettrica, The Fiat 600 and the Peugeot e-3008. In addition, Stellantis is expected to benefit from Leapmotor T03 small BEV model (starting price at €20,000) production at Stellantis' Polish plant as part of a new [joint venture](#). T&E expects Stellantis to reach a BEV share of 18% in 2025. T&E also expects the group to rely on a significant share of existing hybrid models with relatively low emissions such as the Citroën C3 and Opel Corsa.
- **Toyota** is launching two mass-market models, the B-segment bZ2X and the C-segment bZ3X, while Suzuki is launching the C-segment eVX. Supported also by an increase in sales of the bZ4X model, the Toyota pool's BEV share would reach 10% in T&E compliance scenario. 62% of CO₂ improvements are expected to be achieved by BEVs, 17% by PHEVs and 14% by HEVs.
- **Volkswagen (VW)** is expected to achieve 53% of its CO₂ improvements in 2025 with BEVs and 30% with HEVs based on T&E modelling. The low EV sales seen in H1 2024 are an anomaly as the manufacturer is adjusting its pricing strategy to the abrupt withdrawal of German subsidies, with EV sales expected to grow in H2 already. In 2025, Volkswagen group will sell a new affordable B-segment model with a starting price of around

€25,000, the Cupra Raval. New models will also include the C-segment Skoda Elroq as well as more premium models such as the Audi A6 e-tron, the Porsche Boxter and Cayenne. The German group is also expected to increase sales of existing BEV models, including the VW ID.3 and ID.4 (both of which have technical upgrades and price changes in 2024), the ID.7, the Cupra Tavascan and the Porsche Macan. As the demand for some EV models is rising, VW has already announced that it would increase production at some of its plants such as [Emden](#). By adopting new pricing strategies and increasing ICE prices while decreasing BEV prices, it should be able to achieve a 22% BEV share in 2025. The remaining CO₂ improvements could be achieved with new MHEV variants of many mass market models such as the VW Polo, T-Cross, T-Roc, Seat Ibiza, Ateca and Skoda Karoq, as well as increase in sales of existing MHEV models such as the VW Tiguan. The launch of new large BEV models competitive with their ICE equivalent would support a sales decline of Volkswagen's high-emission conventional ICE models (e.g. Porsche Cayenne, VW Touareg) which can be effective in reducing the group's overall CO₂ emissions. The CO₂ regulation is therefore expected to push Volkswagen to increase the focus on mass market BEVs in the coming years rather than short term profits from premium BEVs - which can help it connect with its historic DNA of selling 'people's car'.

Affordable sub €25,000 BEV available in Europe

2025 CO₂ target will bring a new wave of affordable EV models



Updated in August 2024 based on the latest announcements for models produced in Europe. The dates refer to official launch dates, while production generally ramps up to mass volume the following year. *Launch price in 2020 and 2021 Euros. **The R5 base model will be launched in 2025 while more expensive variants will be available from 2024. Sources: (1) Electrive, (2) Reuters, (3) EV Database, (4) Electrive, (5) Autocar, (6) Electrive, (7) Carscoops, (8) Autotrader, (9) Reuters, (10) Electrek, (11) Cupra, (12) ActualidadMotor, (13) Reuters, (14) Automotive News Europe, (15) Electrive, (16) Bloomberg.



Figure 4 - Affordable sub €25,000 BEV model in Europe

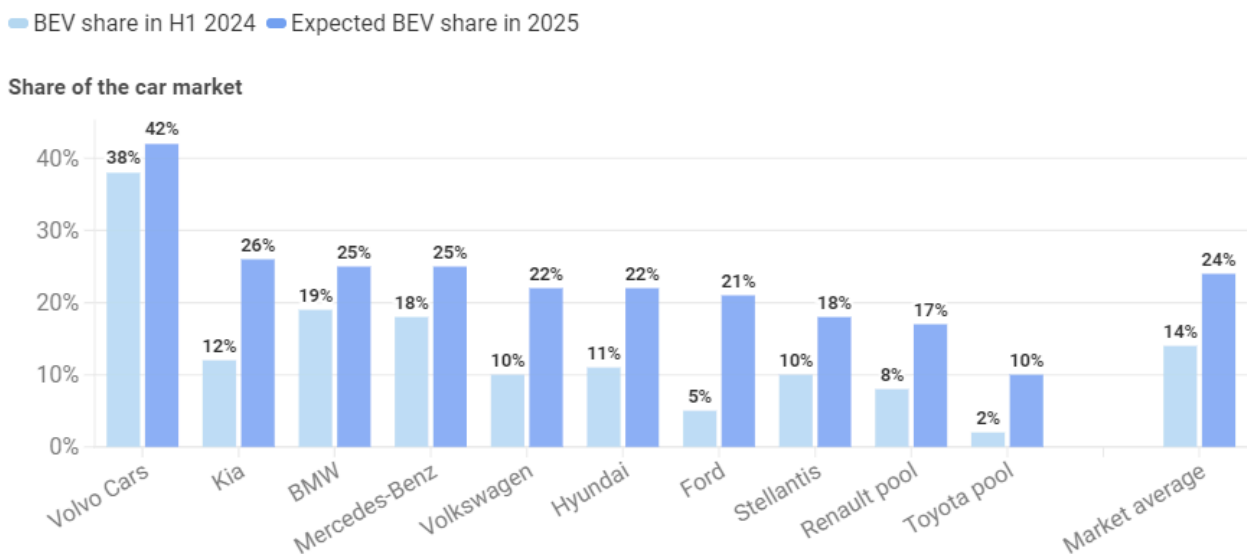
Alongside an expected push for more HEVs, Volkswagen and Ford can also reduce emissions by pooling with a frontrunner

The regulation allows carmakers to use a pooling flexibility. High-emission carmakers can pool with frontrunners to benefit from their higher EV sales and better CO₂ performance. For example, Volkswagen could pool with Tesla. In that case, Volkswagen would only need to reach a 17% BEV share in 2025 for the whole pool to comply instead of 22% without pooling. As done in 2020, Ford could pool with Volvo Cars and limit its BEV sales to 9% instead of 21% without pooling. In the case where Volkswagen pools with Volvo Cars, the German carmaker would only need to reach 21% BEV sales. With pooling, the BEV share of the overall market would be limited to 23% if both Volkswagen and Ford have to pool with competitors instead of 24% without pooling.

4. EV sales to grow as carmakers focus on compliance

Based on T&E’s central compliance scenario, the BEV market share is expected to reach 24% as all carmakers are expected to meet their 2025 targets.

Based on the analysis of carmakers' potential compliance strategies (section 3), T&E expects the BEV market share would rise to 24% in 2025 in the scenario where all carmakers are compliant without forming pools. In a scenario with no improvement in ICE powertrains, the BEV market would have to reach 26%, while 20% would be enough if all carmakers focus on improving their ICE efficiency, selling more hybrids and reducing the sales of the polluting SUVs.



Source: T&E analysis of Dataforce H1 2024 data, and T&E modelling of BEV share expected in 2025

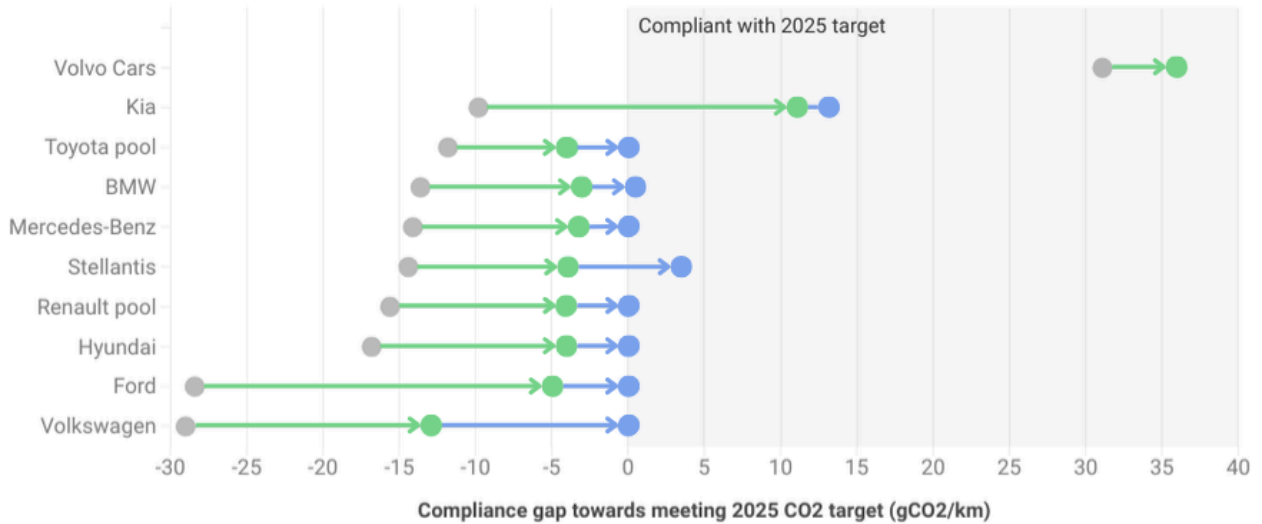


Figure 5 - Carmakers’ expected BEV sales in 2025

T&E expects that 60% of CO₂ improvements between H1 2024 and 2025 would come from BEVs.

In our compliance modelling, increasing BEV sales is expected to be the main compliance strategy, and the contribution of all ICE improvements is expected to be only 28% of the total CO₂ improvement.

CO2 performance ● H1 2024 ● With expected BEV sales in 2025 (T&E central scenario)
● With expected hybrid and PHEV sales



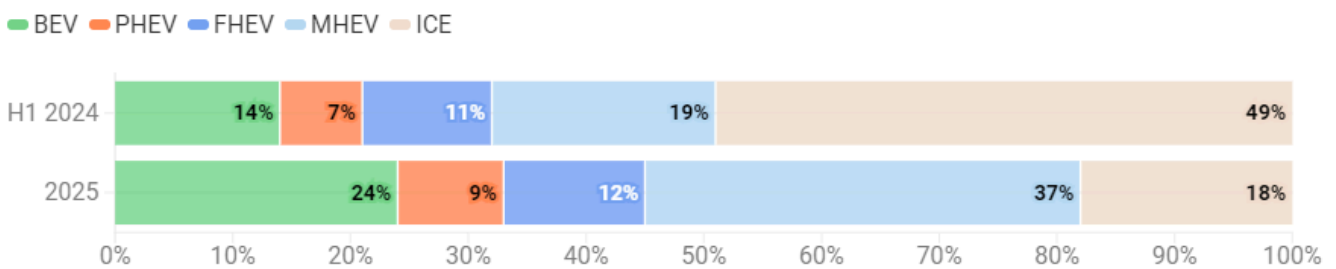
Source: T&E analysis of H1 2024 sales in 23 EU countries and Norway from Dataforce, and T&E modelling of OEM 2025 compliance strategy based on sales forecasts informed by GlobalData



Figure 6 - T&E modelling of carmakers' expected path to compliance in 2025

T&E expects that the HEV share would double as some carmakers focus on short-term compliance

After BEVs, sales of mild and full hybrids (HEVs) are expected to be the second most important compliance strategy in T&E's central compliance scenario. The share of mild hybrids (MHEVs) is expected to double from 19% to 37% as 20% of the CO₂ improvements are expected to be achieved by HEVs. PHEVs are then expected to achieve 8% of the improvements and would slightly grow from 7% to 9% of the market. Regulatory flexibilities which include the ZLEV benchmark and the eco-innovation credits account for 12% of the CO₂ improvements (see annex 6.4).



Source: T&E analysis of Dataforce (H1 2024) and T&E modelling of carmaker potential strategy to meet 2025 targets



Figure 7 - Expected change in powertrain mix between H1 2024 and 2025

5. Conclusion: the EU car CO₂ regulation is Europe's best industrial policy on cars

T&E's modelling of carmakers' potential compliance strategies shows that there is a clear path to compliance for all carmakers to reach their 2025 target. Carmakers can rely on a mix of increased BEV, PHEV and HEV sales, as well as compliance flexibilities - the exact mix varies from one OEM to another. T&E's analysis breaks down the most likely contribution of each of these compliance levers and does so for each carmaker, thus providing a unique picture and insight into how carmakers would comply with the target.

Despite this shift towards electrification, it is expected that carmakers will continue to be profitable even if some lower EV prices. For example, [UBS analysis](#) shows VW will still be profitable, with an operating profit margin of 6.2% even though the regulation compliance could cut VW's 2025 profits by €2bn. In other words, the regulation is pushing VW to steer its strategy towards volume mass-market BEVs and global competition rather than towards short-term profit-optimisation.

The rise of hybrid vehicles sales may be a short-term fix to help laggard carmakers to meet their 2025 targets. But this strategy is not smart. It is neither in line with climate goals given the high CO₂ emissions in real-world conditions (e.g. PHEV emissions of 100 gCO₂/km in real world compared to 27 gCO₂/km in laboratory tests - close to 4 times more - and other ICEs emissions of 152 gCO₂/km in real world compared to 128 gCO₂/km in laboratory tests - around 20% more -, see annex 6.3), nor with securing industrial competitiveness as carmakers need to have only zero emission car sales from 2035. Carmakers' strategy should focus on launching the affordable compact BEVs that are in high demand by the mass market.

The car CO₂ regulation is a crucial climate and industrial policy on cars. But it needs to be supported by national EV policies. In particular, national governments should implement comprehensive charging master plans and stable, targeted subsidy schemes like social leasing.

If policymakers want the European industry to remain competitive and become leaders in tomorrow's mass market EVs instead of remaining stuck in a technology of the past, they must resist calls to weaken the regulation or waive the 2025 compliance fines. Instead, they should **firmly commit to the 100% zero emission car target in 2035 as part of the review in 2026 and reward local EV and battery manufacturing with a green industrial plan** to complement the Green Deal. In July, EU Commission president Ursula von der Leyen already [confirmed](#) the EU's zero-emissions cars target for 2035. The longer the EU waits to make the transition, the less competitive the European automotive industry will become and the harder it will be to catch up with the global competition. Efforts are needed today to ensure that the European automotive industry takes part in the EV market boom, rather than remaining stuck in a technology of the past.

Further information

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6. Annex

6.1 Methodology

Data sources are listed below:

- **Sales and emissions data for the first half of 2024** (H1 2024) are from Dataforce. The data coverage for this briefing includes 23 European countries (Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden) and Norway. These 24 countries accounted for 98.3% of the car market in 2023 based on [ACEA](#) data. Vehicles identified by T&E as “special purpose vehicles” (e.g. motorhomes, camper vans, ambulances, ...) were excluded from the dataset.
- **Mass data** per carmaker and powertrain come from the European Environment Agency’s (EEA) [monitoring](#) of CO₂ emissions from new passenger cars registered in the EU27, Iceland and Norway. As full hybrids (FHEVs) and mild hybrids (MHEVs) are not distinguished in the EEA dataset, additional mass data was collected from [ADAC](#) to estimate the average FHEV-MHEV mass difference per carmaker pool.
- **T&E has acquired content supplied by GlobalData**; Copyright © Global Hybrid and EV sales Forecast, Q2 2024. All rights reserved; GlobalData is an independent provider of industry information. The sales forecast is based on GlobalData's model of the macro-environment, including economic and competitive developments. GlobalData uses industry contacts, press and media coverage, direct automotive manufacturer and supplier contacts, investment analysts, and other Globaldata assets. Permission to use GlobalData copyrighted reports, data and information does not imply endorsement by GlobalData of the manner, format, context, content, conclusion, opinion or viewpoint in which GlobalData reports, data and information or their derivatives are used or referenced herein.

Regulation modelling - methodology

T&E modelling is based on [Commission Implementing Decision \(EU\) 2023/1623](#) which specifies the values to be used for the calculation of the specific emission targets from 2025 onwards. Previously, the reference target was set at 115 gCO₂/km for the period 2021-2024. In 2025, the next stage of the regulation comes into force with a 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](#)). As explained by the [Joint Research Centre](#), due to methodological adjustments, the 2021 emissions baseline for the calculation of the post-2025 targets is slightly lower than the actual reference target for 2021-2024. In addition, a significant update has been made to the calculation of carmakers’ targets. As a result, carmakers that sold heavier cars (and benefited

from weaker targets until 2024) will now face the opposite situation with stricter targets than average.

- **Pools:** As a baseline, the carmaker's pools are based on 2023 or 2024 pools, as most 2025 pools were not confirmed at the time of the report writing. In addition to carmaker groups that form pools to cover all their brands, we considered the following pool: the Renault pool, which includes Renault Group, Nissan and Mitsubishi, and the Toyota pool, which includes Subaru, Suzuki and Toyota. Leapmotor was included in the Stellantis group from 2025 as a [joint venture](#) was set up in Europe.
- **Four compliance scenarios** were developed using different internal inputs and assumptions:
 - a. **Maximum BEV share with no ICE improvement:** In this scenario, powertrain emissions per carmaker are kept similar to H1 2024 (sales and emissions data from Dataforce). Each ICE powertrain's share of total ICE sales is held constant from H1 2024, while the BEV share is optimised so that each carmaker's pool meets its CO₂ target. The calculation is an optimisation process as increasing BEV share also changes the average mass of the carmaker pool, and thus the pool's CO₂ target. Eco-innovation credits are assumed to be similar to 2023 (EEA data). For the total market, this scenario leads to a 26% BEV share in 2025.
 - b. **Minimum BEV share with high ICE improvements:** In this scenario, the HEV powertrain sales share is increased by 20 percentage points (%p) for all carmaker pools compared to GlobalData's forecast (except when the carmaker sells 100% BEV). The efficiency of the pure ICE powertrain is assumed to improve by 3%. This improvement can be achieved both by technological improvement, and by the decline in sales of high emission models, which are gradually replaced by electric and hybrid variants. The efficiency improvement of HEV powertrains is calculated as the minimum of two possible values. Either a 3% improvement compared to H1 2024 emission or the efficiency of the additional 20%p HEVs sold in 2025 is calculated based on the average difference between emissions of HEV and ICE (for models having both HEV and conventional ICE variants). On average in H1 2024, MHEV variants emitted 7% less than pure ICE variants, and FHEV variants emitted 13% less than ICE variants. This second assumption is in line with carmakers' trend to hybridise more mass-market ICE models, so that the average HEV emission of new variants is based on a reduction from the average conventional ICE emissions, while early HEV variants were sometimes focused on large vehicles leading to higher emissions. In this scenario, the level of eco-innovation is assumed to increase by 50% compared to 2023 as carmakers implement eco-innovation technologies in many ICE models. For the total market, this scenario leads to a 20% BEV share in 2025.

- c. **T&E's central compliance scenario:** GlobalData's forecast is used by T&E to inform our in-house modelling of carmakers' compliance strategies. Based on the powertrain mix derived from this forecast, we have assessed the expected CO₂ performance of carmaker pools in 2025.

The calculation is first performed using GlobalData's powertrain mix for the pool and T&E's assumption of individual powertrain emissions per pool. In the case of compliance, we use GlobalData's forecast for the pool in T&E's scenario. In the case of non-compliance, an optimisation tool has been developed to define scenarios with the powertrain share and efficiency improvement required to comply, in addition to the GlobalData forecast and T&E powertrain efficiency assumptions. This main scenario is therefore based on the assumption that all carmakers would comply individually, with no additional pools between leaders and laggards.

Assumptions regarding the balance between BEV and ICE improvements are defined for each carmaker pool based on T&E's broad understanding of carmakers' strategies, including press releases mentioning EV and hybrid strategies, contacts with automotive experts and analysis of EV and HEV variants that are considered to have significant sales growth potential (e.g. mass-market models). To keep the uptake of powertrains realistic, BEV market share growth has been capped at 10%p above GlobalData's forecast for the main carmaker pools of the analysis, and HEV growth has been capped at an additional 30%p. The underlying assumption is that carmakers have the potential to achieve greater growth in HEV sales than in BEV sales due to the smaller modification in production processes and technology compared to pure ICE variants.

In terms of ICE improvements, T&E adds both additional HEV sales share to the GlobalData forecast and powertrain efficiency improvements compared to H1 2024. These parameters, grouped under the ICE improvements category, illustrate what carmakers could achieve by adjusting their model and variant sales mix for ICE (including HEVs). For example, carmakers can incentivise sales of HEV variants with rebates, while increasing the price of the most polluting conventional ICE variants or even discontinuing production of the most polluting engines. For this reason, we expect a growing share of HEVs to coincide with an improvement in the efficiency of conventional ICEs. In terms of the efficiency of the HEV powertrain group, carmakers are also expected to make significant savings by offering HEV variants of popular mass-market ICE models. Finally, the improvements in ICE powertrain efficiency can also be achieved if equivalent BEV variants of large models are available, as the growth of the BEV variant would coincide with a decline in sales of the ICE variants.

In terms of regulatory flexibility, it is expected that carmakers furthest from the target will seek to optimise the CO₂ savings from eco-innovations to ease their compliance burden (up to 50% increase in the contribution of eco-innovation credits). This can be achieved by equipping more

variants of a given model with these technologies. An increase in eco-innovation savings is also expected from the inclusion of air conditioning efficiency improvements in the scope of eco-innovation technologies from 2025.

The powertrain mix resulting from the T&E modelling is shown in Annex 6.2 with details of the assumptions used for each car manufacturer. For the total market, this scenario leads to a BEV share of 24% in 2025.

- d. **Pooling:** As presented in section 3, an additional scenario was developed where the two leaders pool with the two laggards. For the total market, this scenario leads to a BEV share of 22% BEV share in 2025.

PHEV emissions

In the first half of 2024, the average emissions of PHEVs are 29 gCO₂/km measured under laboratory conditions using the worldwide harmonised light vehicles test procedure (WLTP). In 2025, the emissions of new vehicles type-approved in the EU will be calculated using a different assumption for the share of electric driving by PHEVs (utility factor) in the WLTP. This new approach is expected to double the emissions of PHEVs based on the methodology defined in a previous T&E [analysis](#) (97% increase in emission between 2023 and 2025). The share of new PHEV models in 2025 is based on the GlobalData forecast. However, all models that were type-approved before 2025 and are still on sale in 2025 will still be rated using the previous WLTP methodology. For this mix of previous models, T&E's forecast of the increase in [electric range](#) is used to calculate the average CO₂ reduction between the 2023 PHEV model mix and the 2025 model mix (6% emission reduction expected). In each scenario presented above, the PHEV share of the mix is defined as the maximum between PHEV sales share in H1 2024 and the PHEV share expected by GlobalData, without specifying a larger share in the optimisation process. The underlying assumption is that carmakers are unlikely to focus significantly on PHEVs in coming years. Current trends show that PHEV sales have declined significantly (6.9% in H1 2024 compared to 9.4% in 2022 in the [EU](#)). As the large masses of PHEVs no longer benefit carmakers (before the change in 2025, the mass adjustment of the targets favoured heavier cars) and as the change in the utility factor will be fully applied in 2026, these vehicles become a less efficient compliance strategy. However, most PHEVs are still counted as low emission vehicles for the definition of the zero and low emission bonus (see annex 6.4).

6.2. Detail of assumptions per carmakers

In T&E's central compliance scenario, all carmakers are expected to comply without pooling and to adopt strategies mainly to increase BEV sales, but also to increase hybrid sales. This scenario involves specific assumptions for each carmaker, starting from a baseline informed by the GlobalData forecast and following the reasoning detailed in annex 6.1 and the BEV and HEV models presented in section 3:

- **BMW** is expected to be 0.4 gCO₂/km away from its 2025 target using the 2025 powertrain mix informed by GlobalData and powertrain efficiency similar to H1 2024. Given that GlobalData already expects BMW to achieve a significant increase in BEV share from 19% in H1 2024 to around 25% in 2025 (BEV models presented in section 3), T&E calculates that the remainder of the CO₂ improvement required to meet the target can be achieved with an additional 5%p increase in HEV sales on top of GlobalData's forecast and a small 0.5% improvement in ICE efficiency. Compared to CO₂ performance in H1 2024 (excluding flexibilities), the improvement would be 9 gCO₂/km from BEVs, 6 gCO₂/km from flexibilities (including the full ZLEV bonus) and 3 gCO₂/km from PHEVs.
- **Ford** is expected to be 6 gCO₂/km away from its 2025 target using the 2025 powertrain mix informed by GlobalData and powertrain efficiency similar to H1 2024. Given that GlobalData already expects Ford to achieve a significant increase in BEV share from 5% in H1 2024 to around 21% in 2025 (BEV models presented in section 3), T&E expects the carmaker to focus more on ICE improvements to close the rest of the gap. We calculate that an additional 10%p increase in HEV sales on top of the GlobalData forecast and a 1% improvement in ICE efficiency would allow Ford to meet its 2025 target. Compared to CO₂ performance in H1 2024 (excluding flexibilities), 21 gCO₂/km improvement would be achieved by BEVs, 4 gCO₂/km by flexibilities, 4 gCO₂/km by ICE improvements and 1 gCO₂/km by PHEVs.
- **Hyundai** is expected to be 7 gCO₂/km away from its 2025 target using the 2025 powertrain mix informed by GlobalData and powertrain efficiency similar to H1 2024. T&E expects the carmaker to focus both on increasing its EV sales (models presented in section 3) and on ICE improvements to close the rest of the gap. We calculate that an additional 4%p increase in BEV sales on top of GlobalData's forecast, a 10%p increase in HEV sales and a 1% improvement in ICE efficiency would allow Hyundai to meet its 2025 target. Compared to CO₂ performance in H1 2024 (excluding flexibilities), an improvement of 13 gCO₂/km would be achieved by BEVs, 3 gCO₂/km by ICE improvements, 1 gCO₂/km by flexibilities and 1 gCO₂/km by PHEVs.
- **Kia** is expected to be 13 gCO₂/km overcompliant using the 2025 powertrain mix informed by GlobalData and powertrain efficiency similar to H1 2024. Compared to the CO₂ performance in H1 2024 (excluding flexibilities), an improvement of 16 gCO₂/km would be achieved by BEVs, 6 gCO₂/km by flexibilities (including the full ZLEV bonus) and 1 gCO₂/km by PHEVs.

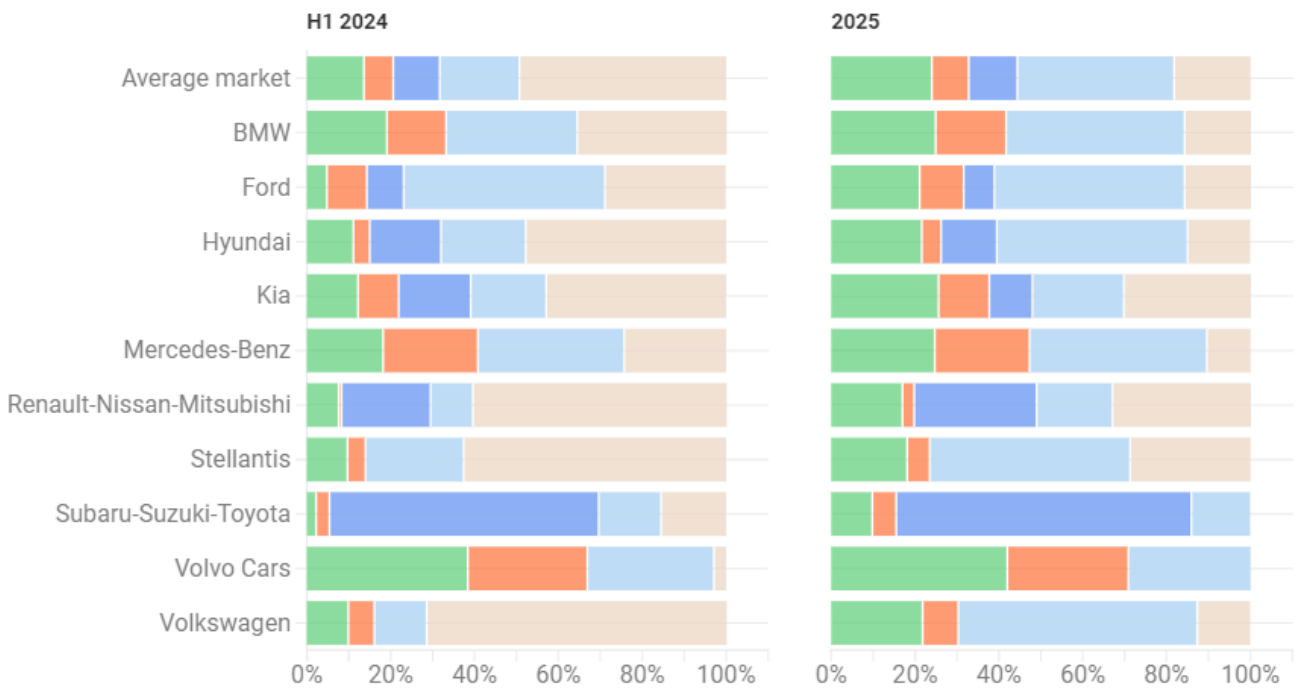
- **Mercedes-Benz** is expected to be 14 gCO₂/km away from its 2025 target using the 2025 powertrain mix informed by GlobalData and powertrain efficiency similar to H1 2024. Due to its premium positioning and EV portfolio (models presented in section 3), T&E expects that the carmaker has the potential to increase its BEV sales to a level similar to its peers (e.g. BMW) and would not achieve significant improvements in its ICE portfolio to continue to benefit from the margins of conventional ICE models. We calculate that an additional 4%p increase in BEV sales on top of GlobalData's forecast, a 5%p increase in HEV sales and a 0.5% improvement in ICE efficiency would allow Mercedes-Benz to meet its 2025 target. Compared to CO₂ performance in H1 2024 (excluding flexibilities), an improvement of 11 gCO₂/km would be achieved by BEVs, 5 gCO₂/km by flexibilities (including full ZLEV bonus) and 3 gCO₂/km by ICE improvements.
- **The Renault pool** is expected to be 2.5 gCO₂/km away from its 2025 target using the 2025 powertrain mix informed by GlobalData and powertrain efficiency similar to H1 2024. Given that GlobalData already expects the pool to double its BEV share from 8% in H1 2024 to around 16% in 2025 (BEV models presented in section 3), T&E expects the carmaker to focus more on ICE improvements to close the rest of the gap, combined with slightly higher volumes for Renault's new affordable R5 EV model. We calculate that an additional 1%p increase in BEV sales on top of GlobalData's forecast and a 5%p increase in HEV sales would allow Renault to meet its 2025 target. An increase in sales of the popular mass-market hybrid models mentioned in section 3 could allow a 1% improvement in efficiency. Compared to CO₂ performance in H1 2024 (excluding flexibilities), an improvement of 11 gCO₂/km would be achieved by BEVs, 3 gCO₂/km by ICE improvements, 2 gCO₂/km by PHEVs and 1 gCO₂/km by flexibilities.
- **Stellantis** is expected to be 3 gCO₂/km overcompliant using the 2025 powertrain mix informed by GlobalData and powertrain efficiency similar to H1 2024. Compared to CO₂ performance in H1 2024 (excluding flexibilities), an improvement of 10 gCO₂/km would be achieved by BEVs, 6 gCO₂/km by ICE improvements, 1 gCO₂/km by PHEVs and 1 gCO₂/km by flexibilities.
- **The Toyota pool** is expected to be 4 gCO₂/km away from its 2025 target using the 2025 powertrain mix informed by GlobalData and powertrain efficiency similar to H1 2024. Given that Toyota has always relied on its hybrid strategies, T&E expects the carmaker to focus more on ICE improvements to close the rest of the gap, while improvements can still be achieved by pushing Toyota's new mass-market model. We calculate that an additional 3%p increase in BEV sales on top of GlobalData's forecast, a 10%p increase in HEV sales and a 0.5% improvement in ICE efficiency would allow the pool to meet its 2025 target. Compared to CO₂ performance in H1 2024 (excluding flexibilities), an

improvement of 8 gCO₂/km would be achieved by BEVs, 2 gCO₂/km by ICE improvements, 2 gCO₂/km by PHEVs and 1 gCO₂/km by flexibilities.

- **Volkswagen** is expected to be 19 gCO₂/km away from its 2025 target using the 2025 powertrain mix informed by GlobalData and powertrain efficiency similar to H1 2024. Given that Volkswagen has delayed the launch of two upcoming affordable models until 2026, T&E expects the carmaker to focus more on ICE improvements to close the rest of the gap. We assume that the maximum plausible ICE improvements would be achieved with a large additional 30%p increase in HEV sales (models presented in section 3). In addition, Volkswagen will need to reduce sales of the most polluting ICE models and variants, with some being substituted by new EV variants. An ambitious reorganisation of the portfolio could enable Volkswagen to achieve efficiency improvements of 5%. As a reference, Volkswagen has the potential to reach a 9% reduction in conventional ICE efficiency if all SUVs and Sport cars are electrified, keeping conventional ICE powertrain for hatchback models. More reduction could even be reached by cutting sales of the most powerful engine variant of these hatchback models. The carmaker is also expected to focus on regulatory flexibility, for example by generalising eco-innovation technologies, including the new air conditioning efficiency improvements. However, given the large gap to close, Volkswagen would also need to implement an ambitious pricing and marketing strategy to boost sales of its BEV models (presented in section 3) in order to achieve an additional 7%p increase in BEV sales on top of GlobalData's forecast. Compared to CO₂ performance in H1 2024 (excluding flexibilities), an improvement of 16 gCO₂/km would be achieved by BEVs, 9 gCO₂/km by ICE improvements, 3 gCO₂/km by flexibilities and 2 gCO₂/km by PHEVs. If Volkswagen does not sufficiently improve its overall CO₂ performance, the group could pool with either Tesla or Volvo Cars as described at the end of section 3.

These compliance strategies are expected to lead to significant change in powertrain between the first half of 2024 and the whole year 2025 as shown below:

BEV PHEV FHEV MHEV ICE



Source: Dataforce (H1 2024); T&E modelling of carmaker potential strategy to meet 2025 targets



Figure 8 - Powertrain mix per carmaker in H1 2024 and 2025

Table 2 - Powertrain mix per carmaker in H1 2024 and 2025

H1 2024					
	BEV	PHEV	FHEV	MHEV	ICE
BMW	19%	14%	0%	31%	36%
Ford	5%	10%	9%	48%	29%
Hyundai	11%	4%	17%	20%	48%
Kia	12%	10%	17%	18%	43%
Mercedes-Benz	18%	23%	0%	35%	24%
Renault pool	8%	1%	21%	10%	60%
Stellantis	10%	4%	0%	23%	63%
Toyota pool	2%	3%	64%	15%	15%
Volkswagen	10%	6%	0%	12%	71%
Volvo Cars	38%	29%	0%	30%	3%
Market average	14%	7%	11%	19%	49%
BMW	19%	14%	0%	31%	36%
2025 (T&E central scenario)					
	BEV	PHEV	FHEV	MHEV	ICE
BMW	25%	17%	0%	43%	16%
Ford	21%	10%	7%	45%	16%
Hyundai	22%	5%	13%	45%	15%



Kia	26%	12%	10%	22%	30%
Mercedes-Benz	25%	23%	0%	42%	10%
Renault pool	17%	3%	29%	18%	33%
Stellantis	18%	5%	0%	48%	29%
Toyota pool	10%	6%	70%	14%	0%
Volkswagen	22%	9%	0%	57%	13%
Volvo Cars	42%	29%	0%	29%	0%
Market average	24%	9%	12%	37%	18%

6.3. Hybrid vehicles emissions

Plug-in hybrid electric vehicles

In the first half of 2024, the average emissions of PHEVs are 29 gCO₂/km measured under laboratory conditions using the worldwide harmonised light vehicles test procedure (WLTP). In 2025, the emissions of new vehicle types registered in the EU will be calculated using a different assumption for the share of electric driving by PHEVs in the WLTP. This new approach is expected to double the emissions of PHEVs. However, this new methodology will not be applied to all registered PHEVs until 2026. While this update is a step in the right direction, it is still a long way from real-world measurements. The [EEA](#) shows a 264% gap between real-world and laboratory conditions. Using the same gap and expected improvements, PHEV could be around 100 gCO₂/km in 2025, still 5% above the average CO₂ target.

Hybrid electric vehicles

Some carmakers will rely on increased sales of hybrid vehicles in order to limit the number of electric cars needed to meet the 2025 CO₂ regulation. In the first half of 2024, conventional ICEs emitted 140 gCO₂/km on average, while mild hybrids emitted on average 2% less (137 gCO₂/km) and full hybrids 21% less (110 gCO₂/km). However, even with some CO₂ improvement expected by T&E in 2025, full hybrids could average 109 gCO₂/km, which would still be 14% higher than the average 2025 target (around 96 gCO₂/km taking into account the expected mass of vehicles sold in 2025). Therefore, while mild and full hybrids can be considered as incremental improvements of conventional ICE powertrains, their emission savings are still limited.

In terms of real-world emissions, the EEA finds a 19.3% gap between real-world and laboratory conditions for the emission average of conventional ICEs, mild hybrids and full hybrids. Using the same gap and expected improvements, the ICE emission average (excluding PHEVs) could be around 152 gCO₂/km in 2025 (128 gCO₂/km measured with the WLTP).

1.6 million BEVs will be missing due to the low rated CO₂ emissions of ICEs

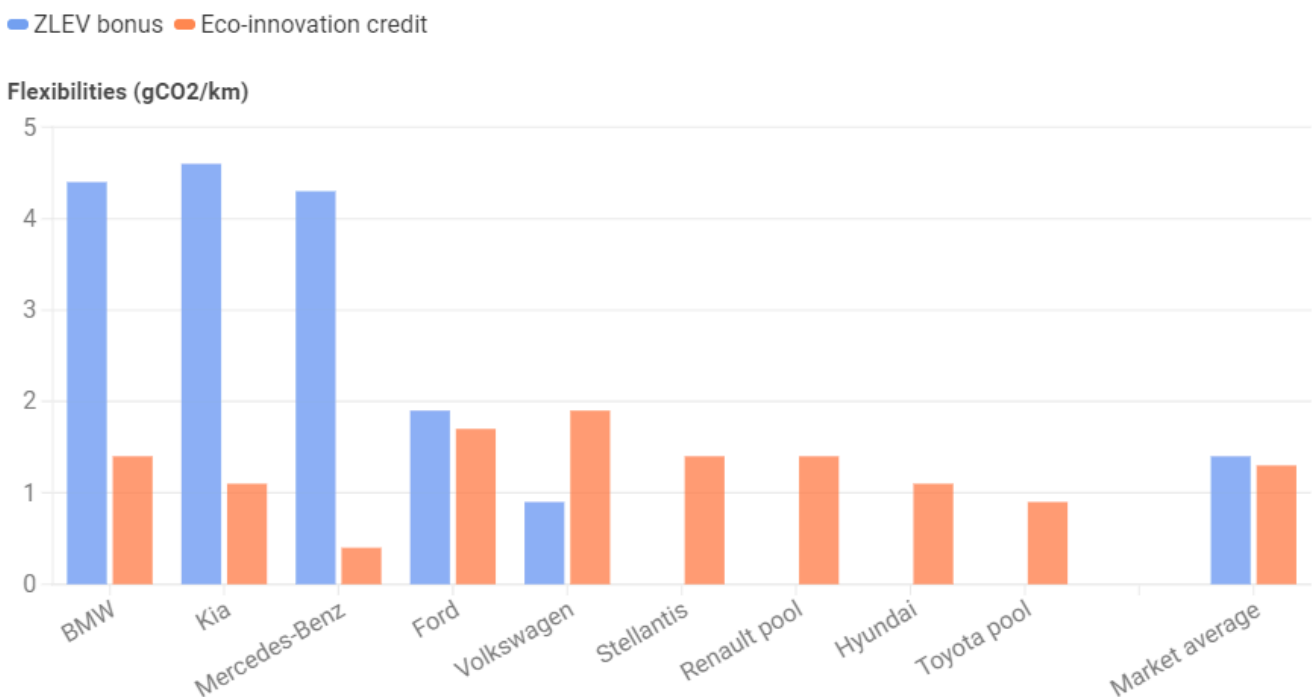
The low WLTP rating of ICE emissions will theoretically help carmakers to reduce their fleet average emissions, but their real world average will still be well above the target. In the T&E scenario, the WLTP rated emissions of all ICEs can be corrected to reflect the average real-world emissions gap. With this correction, the average BEV share would need to reach 38%. Without

the correction, the BEV market will be limited to 24%, so 1.6 million BEV sales would be missing due to the low CO₂ rating.

6.4. Regulatory flexibilities

Regulatory flexibilities such as eco-innovation credits, pooling and the zero and low emission (ZLEV) benchmark will ease compliance for carmakers

Eco-innovations (emission credits for carmakers that equip their ICEs with so-called innovative technologies), the ZLEV benchmark (less stringent CO₂ target for carmakers that sell more than 25% of vehicles emitting less than 50 gCO₂/km), and pooling are the main three regulatory flexibilities in 2025. Among flexibilities, sales of PHEVs help carmakers by increasing the ZLEV bonus given for zero and low emission vehicles given their low-rated emissions (see annex 6.3). T&E expects four major carmakers (BMW, Kia, Mercedes-Benz and Volvo Cars) to benefit from the maximum 5% ZLEV bonus on their targets (i.e. CO₂ target is weakened by 5%) while Volkswagen and Ford benefit from part of the bonus. On average, we expect carmakers to benefit from 2.7 gCO₂/km credits from both the ZLEV benchmark and eco-innovations (1.4 gCO₂/km and 1.3 gCO₂/km). Without these flexibilities, the BEV market share would need to increase to 26%, or an additional 800,000 BEV sales which are currently missing due to these flexibilities (compared to the T&E central scenario).



Source: T&E modelling of carmaker compliance strategies in 2025 (T&E central scenario)



Figure 9 - Expected credits from regulatory flexibilities