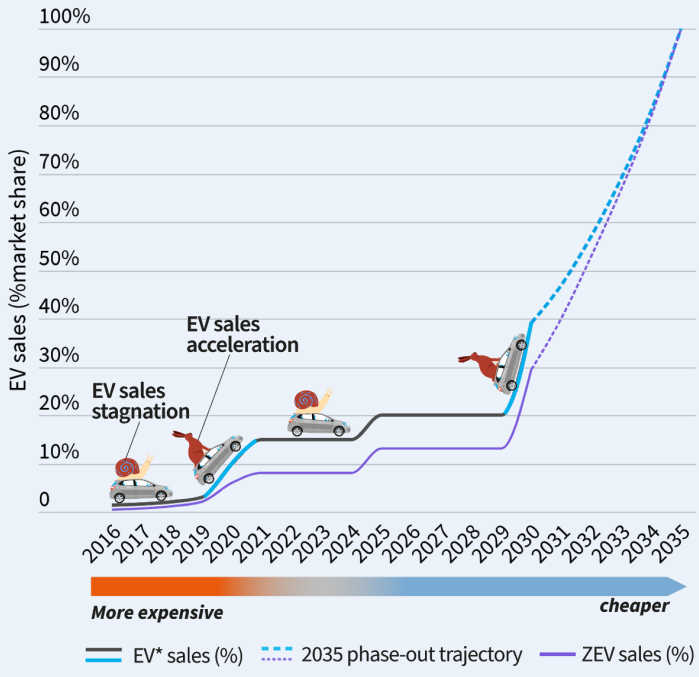
Cars CO2 review: Europe's chance to win the emobility race

Recommendations for the review of the EU Car CO2 standards

January 2021

Summary

EV sales briefly boom in 2020/21 but stagnate until 2029 under the current policy scenario



Following the entry into force of the 2020/21 EU car CO2 target of 95 g/km, sales of electric cars (EVs) have surged beyond even the most optimistic forecasts. EV sales reached over 10% in 2020 and are expected to hit 15% in 2021. This shows that once carmakers supply adequate models and market these effectively, consumers and companies alike are happy to purchase them. The current car CO2 targets have brought much investment into the automotive transition, including creating a market for dozens of battery gigafactories across Europe. Today it is not just a climate law, but a modern-day industrial policy.

But the growing EV market masks many regulatory flaws and failures to cut emissions, such as the growing CO2 emissions from new cars prior to 2020 and the push by some carmakers towards suboptimal plug-in hybrid technology. The biggest risk is that the EV momentum could stagnate between 2022-2029 unless the current post-2020 standards are strengthened.

The 2021 review is therefore necessary and timely. To ensure the regulation establishes Europe as an emobility leader, it should:

- ***Accelerate the transition to zero emission cars now***: Increase the 2025 CO2 target to at least -25% (below 2021 levels) and raise the 2030 target to -65%. Additional binding targets should be set in between (e.g. in 2027) to ensure continuous investment and CO2 improvement.

- ***Set a long-term zero emission goal***: Building on the momentum in many countries and cities, policy makers should set an EU-wide phase-out date for the sale of new cars with internal combustion engines, no later than 2035, flanked by a European automotive transition fund.

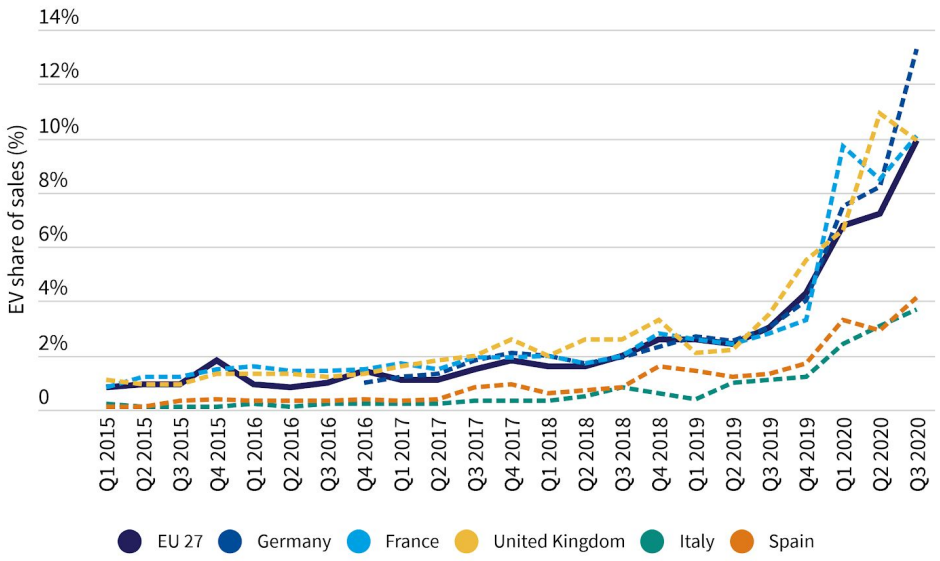
- ***Improve the regulatory design:***
    1. Remove the ZLEV benchmark as soon as electric car sales reach 25% (and remove the 0.7 multiplier, that benefits CO2-emitting plug-in hybrid vehicles, immediately);
    2. Set stronger provisions to use fuel consumption meters for real-world CO2 enforcement;
    3. Delete the OEM-specific mass adjustment of the target;
    4. Cap CO2 emissions from conventional internal combustion engines at 2021 levels to avoid any further weakening of the regulation as EV sales rise.

- ***Resist pressure from the oil & gas industry*** to weaken the regulation via fuel credits for alternative fuels, and ensure engines and fuels continue to be governed in separate tailored laws at EU level.

The 2021 review of both the ambition and the regulatory design of the car CO2 standards will determine whether or not there is sufficient electric vehicle supply and how quickly EU carmakers move away from suboptimal combustion engine and transition technologies towards future-proof zero emission vehicles. This is Europe's chance to win the global emobility race.

Introduction

As forecast by T&E analysis, sales of electric cars (EVs) - battery electric and plug-in hybrid[1] - reached over 10% in 2020 and will likely grow to at least 15% in 2021, as carmakers rush to comply with the EU's 95 g/km CO2 emission standard. After years of limited progress, the entry into force of the 2020/21 target is driving both investments in and the supply of electric car models in Europe. However, the anticipated plug-in sales figures for 2020/21 also underline the inadequacy of the 2025 and 2030 car CO2 targets, set in 2018, that require -15% and -37.5% CO2 cuts respectively. There is a real danger that investment and supply of electric cars will stagnate from 2022 onwards, just as Europe needs to accelerate the decarbonisation of its road transport sector.



Source: Transport & Environment analysis of ACEA Quarterly Alternative Fuel Vehicle Registrations

TRANSPORT & ENVIRONMENT transportenvironment.org

Figure 1: EV sales (BEV + PHEV) in Europe

By regulating the car industry directly, European vehicle CO2 standards are the main measure today to effectively increase the investment in and supply of EVs. Smart taxation and strong

[1] Throughout this paper, the terms 'EV' and 'plug-in' will be used to refer to all plug-in electric cars: battery electric (BEV) and plug-in hybrid (PHEV).

infrastructure policies drive demand for electric cars, but the supply is still limited EU-wide by how many EVs carmakers need to comply with the CO2 rules. This is expected to be the case throughout the mid-2020s until plug-ins match diesel and petrol cars on upfront price.

The European Commission announced its plan to review the post-2020 car (and van) CO2 targets as part of its major 2030 climate framework overhaul in June 2021. This should build on and accelerate the current emobility momentum by ensuring investment and the supply of electric cars continues to grow in the 2020s. This is also an opportunity to improve the various design flaws of the current regulation. This paper outlines T&E recommendations for the upcoming review.

1. Accelerating the transition *now*

Under the current car CO2 regulation, carmakers have to cut the CO2 emissions of their new vehicle sales by 15% from 2025 and by 37.5% from 2030 (both compared to a 2021 starting point). If the CO2 target remains unchanged until 2029[2] - as shown in Figure 1 below - Europe will see little push to increase the supply of electric vehicles and, as a result, stagnating sales throughout the 2020s (unless EVs are exported from overseas). This means that limited progress will be required by carmakers up to 2029 (just before the entry into force of the 2030 target), undermining efforts to ramp up emobility just as electric models become affordable and the transition to zero emissions mobility needs to accelerate. Leaving the current 2025 standard as it is also means new car sales - with cars being one of the largest climate contributors - will make next to no additional contribution to the EU's overall higher 2030 climate target of -55% greenhouse gas emissions.

The current car CO2 Regulation includes a sales benchmark for zero- and low-emission vehicles (ZLEV). The 2025 ZLEV sales benchmark is set at a mere 15% which means e.g. 15% battery electric vehicle (BEV) sales (and more if you sell plug-in hybrids which are counted less than 1). Given that the EU-wide EV market is expected to reach 15% already in 2021, many carmakers are likely to reach the 2025 ZLEV benchmark years earlier. While this is good news, overshooting this benchmark allows carmakers to increase (i.e. weaken) their 2025 CO2 target value (in terms of g CO2/km) by up to 5%, leading to a de facto meager 11% (rather than 15%) CO2 reduction target for the period 2025-2029.

[2] The current design of the Regulation sets targets that apply over 5-year periods (*see also below; section 3, 5-year vs annual targets*), i.e. the -37.5% target only starts in 2030, with the same 2025 target applying in 2025-2029. This means carmakers only have to take action to comply with the new target at the last moment. Therefore, by not amending the current 2025 target (which remains in force until the end of 2029), carmakers will only be required to invest in and supply new EVs beyond 2025 levels from 2030, meaning a stagnant market and sluggish emission reductions between 2021 to 2030.

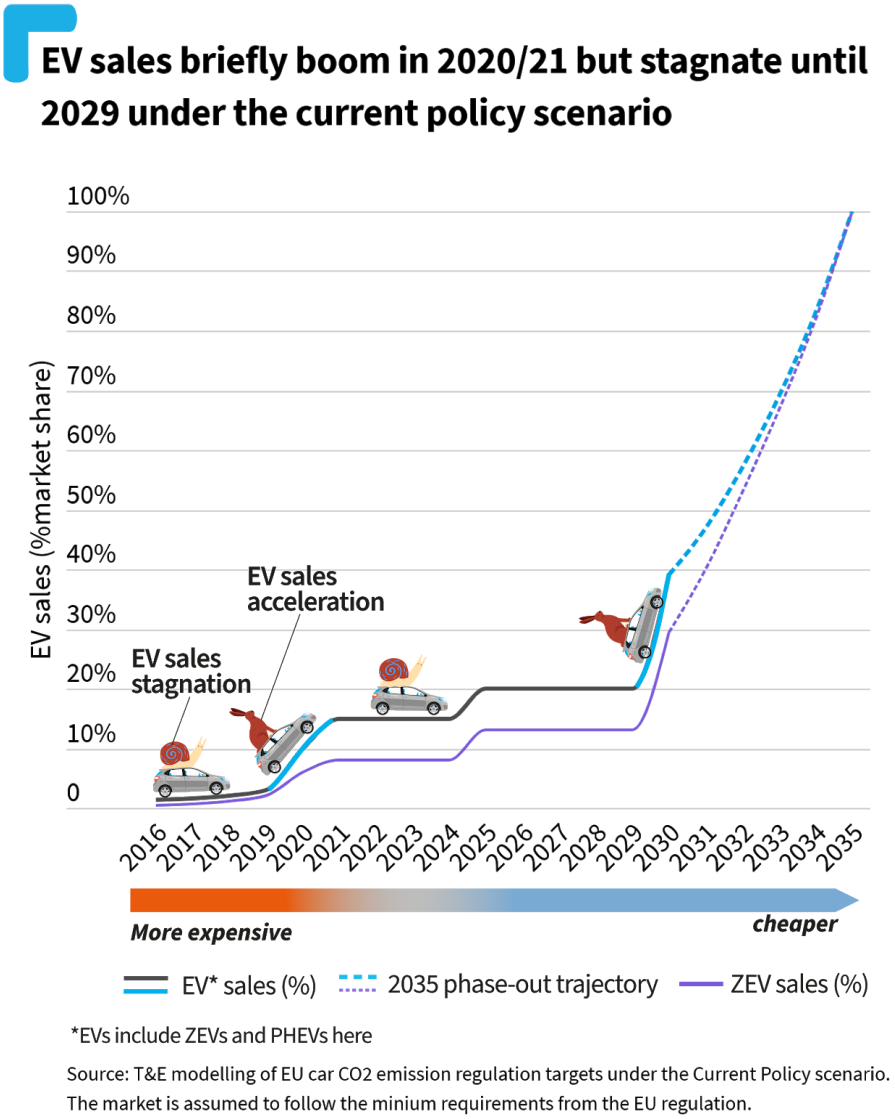


Figure 1: EV sales stagnation in the EU

It is therefore imperative to increase the ambition of the car CO2 standards in the 2020s, and not just the target that kicks in in 2030.

Both the 2025 and 2030 CO2 targets must be significantly increased in line with more cost-effective technology adoption curves for zero emission vehicle (ZEV) penetration given these will be the main compliance path for carmakers in the 2020s. Europe needs to move away from suboptimal low emission and transition technologies towards focusing on the supply of zero emission cars, such as battery electric and fuel cell vehicles. To stay on course for zero emissions by 2050 (in line with commitments under the European Green Deal), Europe should be aiming for 100% zero emission new vehicle sales by 2035 at the latest (*see section on ICE phase-out below*). To achieve this cost-effectively and optimally from the systems transition point of view, sales of zero emission cars (mostly battery electric vehicles) should reach at least 20% in 2025 and around 55% in 2030. The infographic below shows what different policy scenarios would mean for ZEV sales in the EU. The three scenarios considered are: the *Current Policies scenario*; a scenario where the 2030 CO2 target is increased to -50%, as hinted by the Commission[3] (called *Enhanced 2030*), and the proposed *T&E pathway*.

[3] Commission Communication, 'Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people', pg 10.

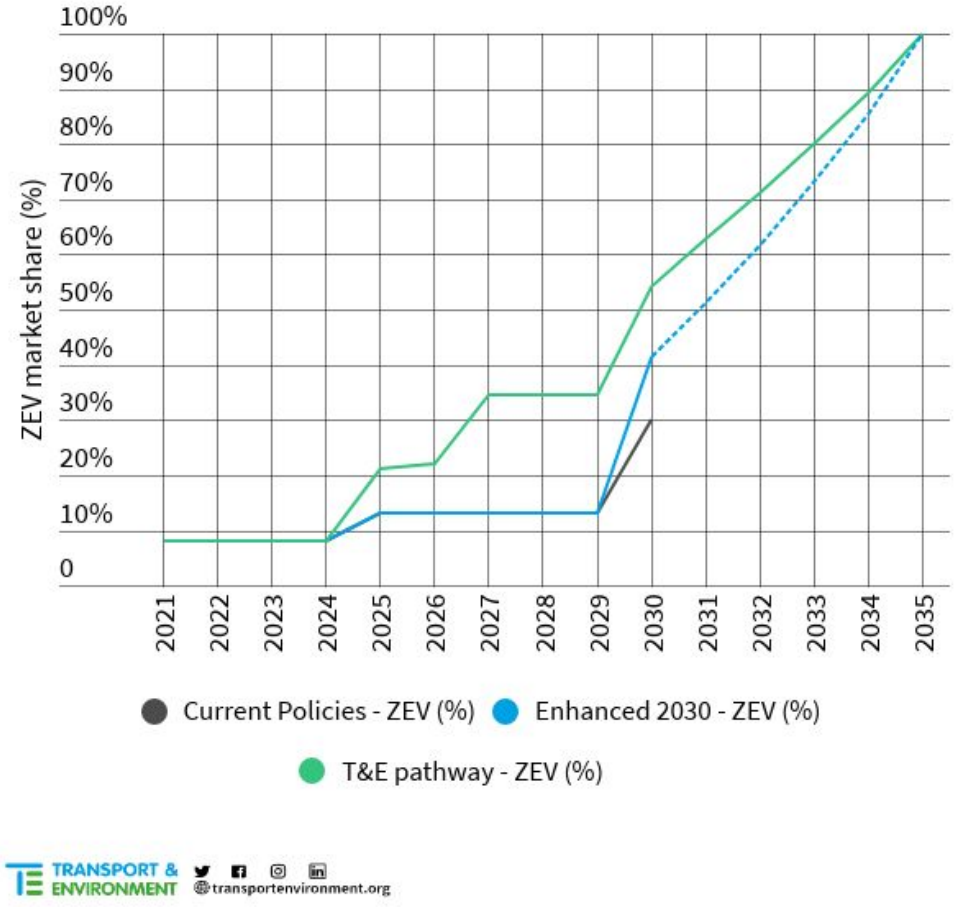


Figure 2: ZEV sales in the EU: 3 policy scenarios

Despite some stagnation seen in 2022-2024 under all scenarios, the above demonstrates the *T&E pathway* to be in line with the expected ramp up in ZEV sales that Europe will need to see in the 2020s to stay on a cost-effective trajectory to zero emissions by 2035.

The Norway example shows that such ambition is more than feasible. The country reached 3% ZEV sales in 2012 - seven years before the EU reached a similar level (2% ZEV in 2019) - and reached 50% only eight years later, in 2020. If the EU would continue on the same trend as Norway, its market would reach 50% ZEV sales in 2027 (around 30% ZEV in 2025). It should also be noted that Norway reached such high sales with much fewer (and more expensive) battery electric models on the market than is currently the case in the EU. By the end of this year, close to 150 battery and plug-in hybrid models will be available on the EU market.

Following some specific assumptions[4], the CO2 targets needed to achieve the continuous growth in ZEV sales in line with the Green Deal objectives - called *T&E pathway* - are -25% fleet-wide CO2 reduction in 2025 and -65% CO2 reduction in 2030. This would require a 28% average annual ZEV sales increase between 2021-2025 (compared to a mere 13% under the current regulation) and a further 21% average annual growth in 2025-2030 (compared to 18% under the current regulation).

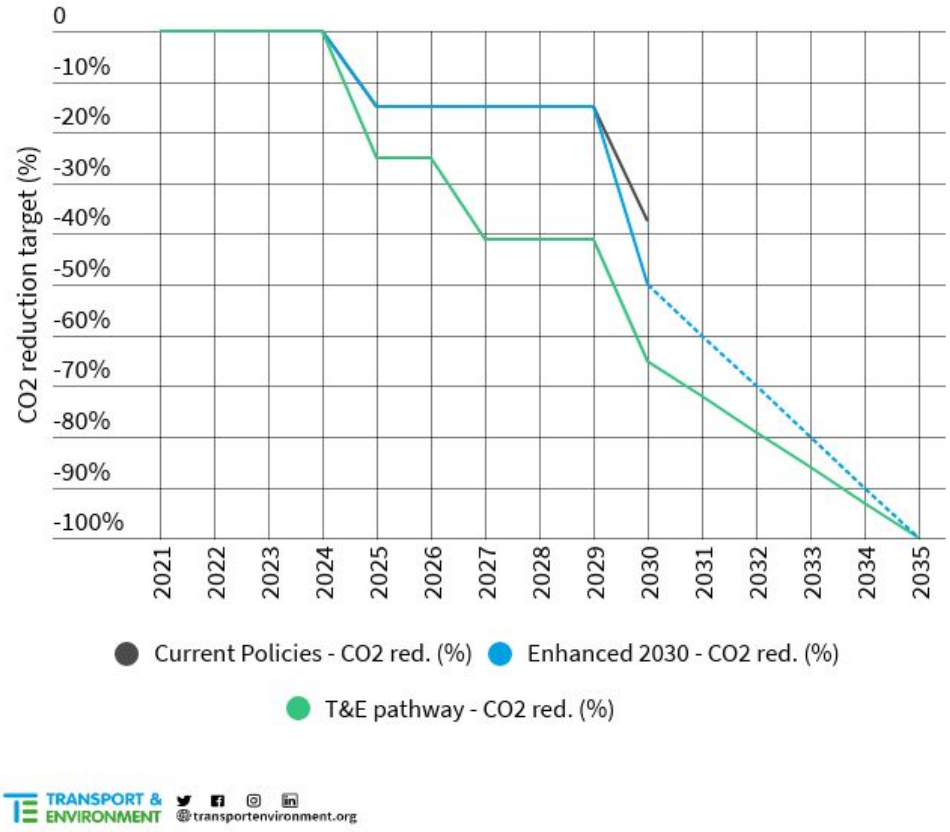


Figure 3: CO2 targets in the EU: 3 policy scenarios

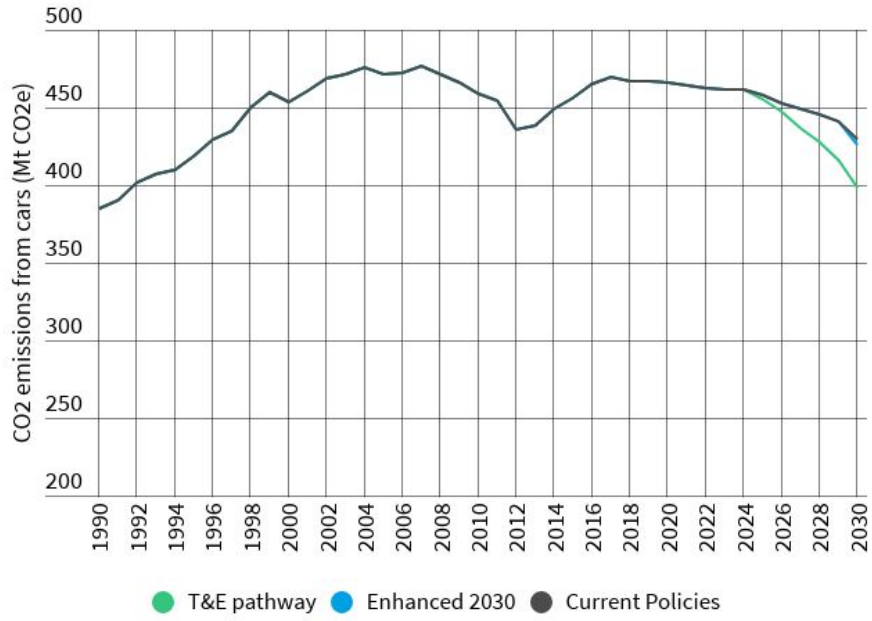
The infographic below (Figure 4), shows what these different scenarios actually mean for CO2 savings. Under the *Current Policies scenario*, the EU-wide car fleet stock would be emitting 430 Mt

[4] T&E has assumed: Annual improvement of internal combustion engine cars at 1.5% between 2021 and 2030 (including mild and full hybrids); The EV split between BEVs and PHEV to be 65% BEV and 35% PHEVs in 2025 (in line with forecast from IHS Markit), increasing to 75/80% BEV to 2030; 3 gCO2/km from eco-innovation credits for ICEs; No weakening from the mass adjustment or WLTP optimisation (conservative assumption).

of CO2 in 2030, which is 12% more than car emissions from 1990 (385 Mt). The *Enhanced 2030 scenario* reduces these total emissions by only 4 Mt in 2030, or slightly less than 1%, underlining that increasing the 2030 target alone falls well short of providing any meaningful contribution to the increased 2030 ambition.

On the other hand, the *T&E pathway* would bring down the emissions from the *Current Policies scenario* by 7%, to 398 Mt in 2030. Two thirds of this reduction of 32 Mt compared to the *Current Policies scenario* comes from the increase in ambition (i.e. the 2025 and 2030 targets), and one third - or 11 Mt - comes from the addition of an intermediate target in 2027 (*see section on 5-year vs annual targets below*). In other words, without the intermediate target, the 25% target in 2025 and 65% in 2030 would lower the emissions by 5% (compared to the Current Policies scenario).

With the EU's new objective to reduce GHG emissions by 55% in 2030 compared to 1990 levels, it is clear that the ambition level for car CO2 reduction should be set significantly higher so that cars are contributing their fair share. On top of ambitious car CO2 standards, more action to reduce the emissions from the wider fleet is needed, notably curbing the use of conventional cars currently in operation (via city ICE bans for example) and avoiding unnecessary private car journeys.



CO2 reduction targets: Current Policies: -15% in 2025 and -37.5% in 2030; Enhanced 2030: -15% and -50% in 2030; T&E scenario: -25% in 2025 and -65% in 2030 with intermediate target. We assume the market follows the targets from the EU regulation (based on previous market developments).
Source: T&E's in-house transport emission model, EUTRM.

Figure 4: CO2 emissions from EU car fleet stock, T&E modelling

To enable the market to be on a cost-effective trajectory to zero emissions by 2035, T&E recommends to:

- Increase the EU fleet-wide **CO2 reduction target to at least 25% for 2025**, which will increase supply of ZEVs to over 20% of total sales in 2025.
- Increase the EU fleet-wide **CO2 reduction target to at least 65% for 2030**, increasing the supply of EVs to around 55% of total sales in 2030.

2. ICE phase-out & automotive transition

ICE phase-out by 2035 latest

Legal analysis commissioned by T&E shows that the EU-wide CO2 standards are the best legal mechanism to set the trajectory for new car emissions to zero, or 100% zero emission (new) car

sales, across the entire single market. Such a trajectory will provide a clear direction of travel to the automotive (and energy) markets in terms of their investments and product portfolio, and will give a concrete timeline for industry and governments alike to prepare supply chains, infrastructure and the transition of the workforce.

T&E's 2050 cars decarbonisation strategy shows that sales of all vehicles with an internal combustion engine (ICE) emitting CO2 (diesel, petrol, gas, hybrids and plug-in hybrids) must be phased-out by 2035 at the latest so that emissions from all passenger cars on the road reach (close to) zero in 2050. This trajectory is supported by analysis commissioned by the European Commission on the average retirement age of cars in Europe, which shows that the average retirement age of cars in Europe is around 15 years (14 for diesel and 14.4 for petrol). However, after 15 years only 55% of cars are retired (and after 20 years - 97%). In other words, even the 2035 date is on the conservative side for the timely fleet renewal and therefore earlier phase-out dates in member states able to go sooner should be allowed and encouraged.

Some market segments (e.g. high-mileage fleets such as taxis), regions (e.g. EU capitals) and whole countries can and should go 100% zero emissions sooner, as an electric car is already the cheapest option from the total cost of ownership perspective and will reach price parity with conventional cars in the mid-2020s. But the current EU internal market rules make it difficult for individual member states to restrict registration or circulation of new cars in their territory. Given the urgency of the climate action, individual countries or groups thereof should be allowed to set 100% zero emission sales mandates sooner than 2035 (or whenever the EU phase out date is set), in order to achieve their national climate and air quality goals.

When individual countries go to higher/100% electric car sales due to national ICE phase-outs - the *additional* sales of electric cars due to national policies in these member states should not count towards the fleet-wide CO2 targets of carmakers after 2030. T&E suggests that the EV sales that OEMs continue to report for their EU fleet-wide target compliance in the countries where a national ICE phase-out has entered into force are capped at the average sales of the 3 previous years (prior to the phase-out date). Otherwise the risk is that a growing supply of EVs will be shifted to the member states where national phase-outs are in place. Unless the CO2 standards are not tightened accordingly, this will allow carmakers to continue selling CO2 emitting models for longer in countries without ICE phase-out plans. Cancelling out the additional EV sales would not be completely new in Europe, where similar provisions already apply in the energy sector with allowances due to national coal phase-out plans cancelled from the EU ETS.

T&E recommends:

- Set the EU-wide CO2 emissions standard at **0 gCO2/km by 2035.**

- Amend the provisions of the EU type approval framework to **allow individual member states or groups thereof to set earlier phase-out dates** to stop sales of internal combustion cars on their territory.
- **Exclude the additional EV sales resulting from national phase-out** measures, i.e. cap the EV sales that carmakers can claim towards their fleet-wide targets at the 3-year average share prior to the phase-out date.

Automotive transformation

A number of analyses have shown that the jobs impacts of this transition will, on balance, be positive, with many new jobs created in sectors such as battery manufacturing, chemicals, electricity, construction, power electronics, charging infrastructure installation and maintenance, and digital communications. For example, the latest bottom-up study by the European Electromobility Platform - with direct contribution from the industries across the emobility supply chain - shows that **over 1 million new jobs will be created from transport electrification by 2030**. A recent study by Boston Consulting Group also concluded that there is hardly any difference in the amount of personnel and work needed to build a battery electric car (BEV) vs. a vehicle with a combustion engine (ICE). Although an ICE requires more labour to build the engine, the production of the BEV powertrain (including battery cells and pack) and power electronic components bring the total labour required up to almost the same level as for conventional cars (99% of that required for an ICE).

Such economy-wide figures do, however, mask potential regional differences and, in the absence of targeted support, some regions will experience a net loss of employment opportunities. Many carmakers should be able to restructure across the entire company and various plants - and many such as Volkswagen, Renault and BMW are already doing so by retraining their workforce and investing into EV-dedicated platforms and battery supply chains. But some areas that today rely disproportionately on a single diesel car factory or supplier network[5] will be worse hit.

Electrification is, though, only a small part in this wider automotive transformation and wider structural change such as automation, the shift away from privately owned vehicles (so fewer sales) and productivity gains will take a bigger toll.

That is why it is important to start preparing for the full transition to ZEVs now, drawing on the experiences of the previous coal or steel regional reconversions. With regional specialisation, relocation and economies of scale at force, not everyone who manufactures diesel components

[5] In regions in the Czech Republic, Germany, Italy, Slovakia, Hungary, Romania and Sweden, the automotive sector provides more than 20% of total manufacturing employment.

today will get a job making electric motors. Instead they might find jobs in completely new industries and services that enter their regions. The key is for local, national and EU levels to work together and ensure new investments and business opportunities flow to replace old economy jobs. And 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.

To secure domestic future-proof jobs in the automotive sector, Europe also needs to establish a domestic EV supply chain. EV production will likely require a greater number of localised production networks compared to ICEs, including suppliers of battery cells and other power electronics components and carmakers. The sooner Europe can attract EV production (spurred by ambitious CO2 targets), the sooner jobs in battery manufacturing, as well as recycling, charging infrastructure, raw materials, etc. will also be established.

Europe needs a plan to manage this transition as diesel and petrol sales will continue to decline, whether we want to protect these jobs or not. Anticipation, early action and proactive management is key. It is crucial that - with growing demand for EVs (expected to continue throughout the 2020s) and declining sales of ICEs - European companies and policy makers alike take steps to ensure the door is not left open for Asian competitors to fill the growing demand. However, today there is no automotive transformation plan or jobs agenda at EU level.

T&E recommends:

- Accompanying an ICE phase out, the EU should establish a comprehensive **European automotive transition agenda, including a dedicated fund** to finance reconversion. This should support the transition towards new industries and skills in those regions where impact will be most acute due to reliance on old economy jobs.
- The Commission should map the social and jobs impacts at EU-wide level and require all member states to carry out regional stress-tests to identify the areas impacted and quantify the potential job/GDP losses no later than 2022. Member states must then, in cooperation with relevant stakeholders and social partners, put in place comprehensive reconversion plans no later than 2024. Those plans should be implemented no later than 2028.

3. Regulatory improvements

5-year vs annual targets

The current design of the car CO2 regulation - whereby targets kick-in in five year intervals with no emission reductions required in between - is suboptimal from the climate point of view. This leads to a situation where carmakers are way off target until the last minute, prioritising their profit strategies (including recouping investments made into high emitting SUVs), over making timely investments into clean technology. This has led to their average emissions to actually increase prior to the entry into force of the 2020/21 regulation. According to EEA data, CO2 emissions of new cars increased each year between 2016 and 2019.

From the climate perspective, a much more effective design would be to move towards annual CO2 reduction targets based on the 2030 trajectory of -65% CO2 reduction. Such design is already used in the United States and China. In the US, the so-called Safer Affordable Fuel Efficient (SAFE) Vehicles Rule requires automakers to improve fuel efficiency (directly related to how much CO2 a car emits) by 1.5%[6] annually from 2021 through to 2026 and includes a credit trading system for flexibility. In China, carmakers' CO2 emissions are also regulated based on fuel efficiency and are also subject to annual targets.

One third of the total 32 Mt CO2 reduction in the *T&E pathway* scenario - or 11 Mt - comes from the addition of an intermediate target in 2027 (*see section 1*). In other words, without the intermediate target, the -25% in 2025 and -65% in 2030 targets would lower the emissions by 5% instead of 7% (compared to the *Current Policies scenario*).

Although the optimal choice from a climate perspective would be for annual targets, the need for a relatively quick review of the legislation means such wholesale changes to the regulatory design might be difficult to achieve. Instead, a much simpler reform of adding additional targets in between 2025 and 2030 can also deliver significant CO2 benefits. Therefore, as a minimum, T&E calls for more regular and binding targets between 2025 and 2030, for example with the addition of a target in 2027. Based on a linear CO2 emission target trajectory, T&E recommends a 41% CO2 reduction target in 2027.

T&E recommends:

- In addition to more ambitious 2025 and 2030 CO2 targets, adding a binding interim target of **at least -40% CO2 reduction in 2027.**

[6] The standard is less stringent than the Obama-era rule it replaced, which would have required carmakers to improve fuel efficiency 5% each year from 2020–2025.

ZLEV benchmark

With super-credits (a flexibility which allows cars with emissions below 50 gCO2/km to be double counted towards targets) phased out by 2023, the 2025 and 2030 targets introduce zero and low emission vehicle (ZLEV) credits. A battery or a fuel cell car - as zero emissions technology - gets 1 credit, whereas plug-in hybrids up to 50 gCO2/km (WLTP) get lower credits based on their CO2 performance. Overshooting the ZLEV benchmark - by having higher EV sales - allows carmakers to claim a CO2 bonus to weaken their fleet-wide CO2 reduction targets by up to 5% in both 2025 and 2030.

As already shown, overshooting this benchmark allows carmakers to reduce their 2025 CO2 target down to 11% CO2 reduction. In fact, if a carmaker sells around 25% EVs in 2025[7], they could even increase the CO2 emissions of their conventional engine fleet by 1% annually and still be compliant.

While such an incentive is necessary to drive early market uptake, it is not fit for the fast growing and maturing electric car market when the market surpasses the 20-25% EV mark and becomes the cheapest compliance technology. With the electric vehicle market growing much faster than was originally expected in 2018 when the benchmark design was set, the current system of bonuses is now obsolete. Instead it creates the risk of regulatory gaming and loopholes: e.g. sales of EVs in Central and Eastern European (CEE) countries get a higher 1.85 multiplier if EV sales are below 5% (of total car sales) until 2030. This incentivises OEMs to keep EV sales low (below 5%), or even sell a car in a CEE country first, only to register it in a nearby mature market a few months later. It therefore represents a serious weakening of the overall CO2 ambition of the regulation.

T&E recommends:

- **ZLEV benchmark should be removed as soon as the EU-wide EV market reaches 25%, and no later than 2030,** leaving the CO2 targets as the mechanism to drive electrification.

Plug-in hybrids

Plug-in hybrid (PHEV) sales have been growing fast with the entry into force of the 2020/21 car CO2 target as carmakers need to sell low emission cars to comply: the first half of 2020 saw their share of all EVs increase to 49%, up from 37% in 2019. PHEVs are a compliance strategy for many

[7] Equivalent to a 20% ZLEV share based on T&E assumptions for BEV vs. PHEV split and average emissions from PHEVs.

carmakers as they earn the same super-credits as selling BEVs until 2022 and will receive ZLEV credits after 2025.

Many PHEVs on sale today tout very low CO2 emissions - a third, or less of an equivalent conventional combustion engined car. T&E recently tested three of the best selling PHEV models on the EU market with the results showing that they are no more that a compliance trick - emitting around 2-4, and even up to 12, times more CO2 in the real world, depending on driving mode. Even under favourable test conditions (tested starting with a fully charged battery) on T&E's 92km test, PHEV emissions were 28-89% higher than advertised, as CO2 emissions increase rapidly once the ICE turns on. Such numbers suggest that if corrective action is not taken soon, Europe could be sleepwalking towards another dieselgate.

T&E has shown that if the more realistic CO2 emissions were used, it would be much harder for carmakers to comply with the CO2 standards. As such, manufacturers are using PHEVs as a compliance strategy to easily meet their overall CO2 targets without the cars actually achieving these savings in the real world.

Some of the problems with PHEVs come from the use of overly optimistic assumptions about how much they drive electrically. So called 'utility factors' (defined as the proportion of distance travelled in electric mode using the battery) are used to establish the type approval CO2 emissions of PHEVs alongside their tested values on the WLTP test procedure.

In order to avoid another emissions scandal, real-world fuel consumption and CO2 data (which must be collected as of 2021) from on-board fuel consumption meters should be used to set real-world utility factors to declare the WLTP CO2 emissions of PHEVs. This will incentivise all carmakers to improve their PHEV offering, as well as promote driver awareness programmes to encourage regular charging.

Beyond the problem of how CO2 emissions of PHEVs are derived, much of the incentive to invest and produce the current inadequate models lies in the way the CO2 regulation is designed. The problem lies with the ZLEV benchmark that incentivises sub-optimal plug-in hybrid technology due to the 0.7 multiplier, which awards more ZLEV credits to each PHEV. This in particular benefits models with emissions close to 50 g/km (many of which are SUVs) as they now get a third of a credit instead of zero. Overall, this weakening almost doubles the number of credits earned by PHEVs[8]: T&E has shown that this is by far the worst loophole added to the regulation during

[8] Based on PHEV registration data (sales and NEDC test CO2 emissions) over the first half of 2020 from JATO Dynamics. The number of PHEV ZLEV credits increases by 91% compared to a scenario without the multiplier.

the last negotiations in 2018 . This may result in half of all EVs sold in 2025-2030 being pure compliance vehicles, or "fake electric", that are unlikely to deliver low CO2 emissions on the road.

T&E recommends:

- *Until the ZLEV benchmark is deleted*: **remove the 0.7 multiplier** from the calculation of ZLEV credits in the car CO2 regulation from 2025 onwards, going back to the original Commission and Parliament proposals from 2018.
- Once we will have real world fuel consumption and CO2 data for PHEVs collected from on-board fuel consumption meters from 2022 (*see also section below - 'Real world compliance'*), it is essential that it is used to set (and regularly update) real-world utility factors (UF) that should then be used to establish WLTP CO2 values. These should be **OEM-specific utility factors**, and set no later than 2025. However, for OEMs with a limited PHEV portfolio, an EU average UF should be used.
- To qualify for any ZLEV credits until the benchmark is removed, PHEVs should meet all of the following criteria: **electric motor power** should be equal or more than ICE engine power, at least **80 km range** and capable of **fast charging** (50 kW).

Real world compliance

The gap between new cars' laboratory test values and actual on-road emissions has grown constantly since 2008, rendering at least half of all the CO2 reductions achieved on paper by these cars meaningless.

While the new WLTP type approval test procedure (used to measure vehicle emissions before they can be placed on the market) closed some of the loopholes in the old NEDC test, there's a risk that this gap could persist mainly because of the so-called uplift between the NEDC and new WLTP test. With the phase in of the new (and phase out of the old) test, OEMs regrettably had an incentive to inflate the gap between the emissions recorded in the WLTP and NEDC tests in 2020 (e.g. via double-testing vehicles on both test procedures to artificially increase WLTP test values while achieving the low NEDC values for target compliance) because the difference between the two tests in 2020 is used to calculate the 2021 baseline for compliance with the 2025/2030 targets. By artificially inflating this baseline, OEMs would easily cut their post-2021 WLTP CO2 emissions and achieve compliance, but fail to achieve equivalent reductions on the road. As a result, the gap between the real world and the test emissions is likely to increase again from 2021 onwards. The larger this uplift in 2020, the more 'hot air' is created for test optimisation by carmakers, with clear and concerning parallels with the recent Dieselgate scandal.

To rectify this, the post-2020 car CO2 regulation introduced new provisions for real-world monitoring of CO2 emissions using fuel consumption meters (FCM). However, to effectively prevent the 2021 WLTP baseline from being weakened, additional correction and enforcement mechanisms will likely need to be applied on top of the monitoring and reporting obligations.

Firstly, such real-world data should enable easy comparison between different vehicle models. It is therefore not enough to publish the data aggregated by manufacturer only - as is implied in Article 12 of the current car CO2 regulation. Instead, it should be model-specific and differentiate between different generation models. This will allow consumers and independent researchers to compare the real-world fuel efficiency and CO2 emissions of individual cars with the real world fleet average of respective vehicle models. This will also highlight best in class vehicles, identify trends, and help target compliance, including remedy action where the real-world gap is growing.

As demanded by many in the European Parliament and several member states during the last review, real-world emissions data collected via on-board FCM technology should be used for proving compliance with vehicle CO2 standards, not just reporting. As explained in an earlier paper, measuring and setting a maximum gap for individual carmakers between their WLTP and on road CO2 emissions - a gap which they are not allowed to exceed as standards get stricter (or their targets are adjusted accordingly) - is an effective enforcement mechanism to avoid test manipulation in the future. Such a compliance mechanism should be implemented from 2025 onwards. FCM data can also be used to verify the real-world CO2 reductions of eco-innovation technologies; whereas moving to real-world CO2 emissions for compliance purposes removes the very need to have this complex modality in the first place.

T&E recommends:

- Real-world CO2 collected from FCMs data should be published per manufacturer, vehicle model, vehicle segment and powertrain/fuel type.
- Such FCM-derived **data should be used for consumer information** and vehicle labelling, either via a review of the car labelling directive, or via direct amendments to the Cars CO2 regulation.
- **Real world CO2 emissions should be used for compliance enforcement** with car CO2 regulations no later than 2025. The CO2 targets of carmakers whose WLTP-FCM gap grows should be adjusted.
- The real-world CO2 reduction contribution of **eco-innovations** should be verified using FCM data from 2025 onwards.

Mass adjustment

Under the current regulation, carmakers that sell heavier premium cars (and the wealthier drivers who can afford to buy them) are allowed to emit more CO2, via the so-called mass-adjustment of OEM CO2 targets. This loophole is not justifiable on climate, social justice, or technological grounds and is one of the principal reasons for the surging sales of heavy and highly-polluting SUVs across Europe.

Under the mass adjustment provisions, each carmakers' target is increased (or relaxed) if the average mass of the cars sold in a given year by the OEM is higher than the overall reference mass used in that year. This reference mass is based on the average mass of all vehicles sold two to four years prior to the target year. Because of the combined effect of using a continuously outdated reference mass and the steady increase in vehicle mass, the average mass of cars sold in a given year is usually above the reference value used that year, weakening the target.

This trend is also likely to continue throughout the next decade, as EVs continue to gradually replace ICEs in the overall fleet. Based on 2019 averages, PHEVs weigh close to two tonnes (1,938 kg) which makes them 39% heavier than ICEs (close to 1,400 kg), while BEVs (1,820 kg) are 26% heavier than ICEs.[9] The average vehicle mass in 2019 was 1,420 kg, and could likely reach more than 1,450 kg in 2020 and 1,480 kg in 2021. We project that, if this trend continues[10], the average mass of cars could increase by more than 20 kg per year and reach 1,570 kg in 2025 and 1,680 kg in 2030. Shown in Figure 7 below, this leads to significant weakening of the target throughout the 2020s. This mass adjustment factor is clearly not fit for the emobility transition as each heavy electric car sold has the impact of increasing (and therefore weakening) the carmaker's target and unnecessarily allowing them to sell higher-emitting CO2 models as a result.

[9] European Environment Agency, Average CO2 emissions from newly registered motor vehicles in Europe.
[10] Corresponding to an annual increase in EV sales of 4 percentage points (leading to around 30% EVs in 50% in 2030), combined with a steady continuation of SUV sales.

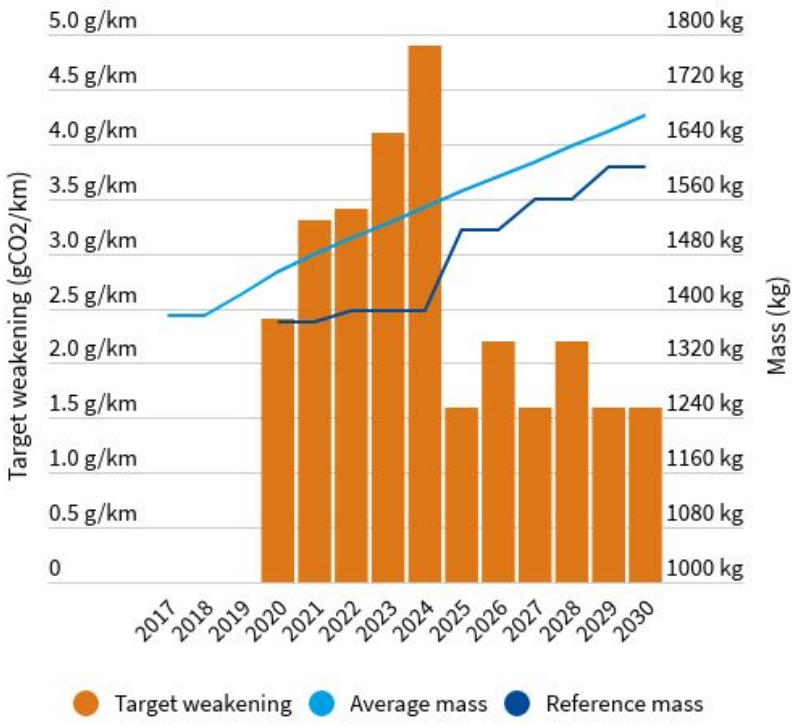


Figure 7: Result of the mass adjustment target in the CO2 regulation

With the uptake of electrification technology, heavy vehicles no longer need to emit more CO2. On the contrary it is more technically and economically feasible to electrify a larger heavier vehicle than a smaller one. Today's OEMs that sell the heaviest vehicles are Daimler, Jaguar, Land-Rover, and Volvo, for whom it is technically easy to fit e-technologies. The highest emitters are often premium models that can also absorb the additional technology cost.

Removing the target mass-adjustment mechanism has many benefits: it removes the structural weakening of the stringency of the regulation; ensures that all carmakers have the same target therefore pushing the larger and more polluting segments to electrify more rapidly, in line with their potential and heavier climate impact; it simplifies the regulation; and finally, it removes the incentive to sell more SUVs while incentivising carmakers to use lightweighting.

T&E recommends:

- **Remove the mass-adjustment part from the specific emissions reference target formula (effectively setting a_{2025} and a_{2030} at zero)** thus requiring all carmakers to achieve the same CO2 targets regardless of vehicle weight.

ICE emissions in the 2020s

In a scenario where loopholes and flexibilities in the regulation are not closed and the ambition level prior to 2030 is not increased during the upcoming revision, there is a risk that ICE emissions will increase in the 2020s. In the worst case scenario, we assume a 2 g CO2/km weakening from the mass adjustment and that WLTP test optimisation is used to achieve further CO2 reduction that is not achieved on the road[11]. In this scenario, ICEs could get 2% worse every year and the carmaker would still be compliant by selling 24% EVs in 2025 (and thus reach the full 5% bonus on the CO2 target from the ZLEV benchmark). In the case where ICEs get 1% less efficient (i.e. more polluting) each year, compliance would be achieved with a 22% share of EVs (3% bonus from the benchmark), while stagnation of ICE emissions at their current level would only necesitate 19% EV sales to ensure compliance. Finally, if ICEs improve by a reasonable 1.5% per year, then 15% EVs sales will be sufficient for OEMs to be compliant (10% BEV and 5% PHEV).

The share of EV sales needed to comply with the 2025 target detailed above would also be sufficient to ensure compliance up to 2029 under the current target design and level of ambition. With EV sales expected to reach 15% this year, carmakers could choose to exploit loopholes and not sell any additional EVs up to 2029.

Ultimately, higher CO2 targets will be the most effective incentive and will make electrifying highly-polluting ICEs the most cost-effective compliance strategy. But if the existing loopholes are maintained and the ambition for CO2 emission reduction is not increased with annual targets starting from 2025, then carmakers could either choose to improve ICEs and keep EV sales at the same level (approx. 15% from 2021 to 2029) or they could slowly ramp up EV sales (up to 22%-24% between 2025-2029) while continuing to sell polluting ICEs which get worse every year (1% to 2% CO2 emission increase per year) and still remain compliant throughout the decade.

To safeguard the regulation from low CO2 targets and/or weakening from flexibilities, and given the potential for further technical improvement for ICEs (including lightweighting and hybridisation), T&E recommends to set a cap on the average ICE emissions for each carmaker at their 2021 level.

T&E recommends:

[11] We model this by reducing the 21% WLTP-NEDC gap in 2020 to 15%

- **Limit average ICE emissions at 2021 levels** by ensuring that the OEM specific ICE-only average CO2 emissions (including hybrids) do not increase in any year after 2021, even when they claim ZLEV bonuses and sell more EVs.

4. What *not* to do: fuels vs CO2 standards

T&E analysis of the oil and gas industry proposals to add fuel credits into the vehicle CO2 standards shows why this is not a credible idea from a regulatory, environmental or cost point of view. There should be no CO2 credits given to carmakers for alternative or synthetic fuels used in their vehicles. Carmakers cannot guarantee how cars are used or fueled over their lifetime, so the vehicle regulation should only regulate what carmakers have control over, i.e. powertrains. Fuels should be regulated in appropriate EU legislation - as is the case already - such the EU Renewable Energy Directive and the EU Fuel Quality Directive. There isn't expected to be any volumes of synthetic fuels on the market until after 2030[12], by which time plug-in cars will be by far the most efficient, cheap and convenient option.

The biggest risk comes from the proposed banking of fuel credits, whereby a carmaker can simply purchase fuel credits corresponding to its car sales in e.g. 2026-2029 (when no additional CO2 targets exist) and bank them all for compliance in 2030. This will seriously delay timely investments into zero and low emission technologies and slow down the transition to emobility, undermining further the current flaw of vehicle standards that are tightened only every 5 years.

Importantly, using advanced and synthetic fuels is the least cost-effective path for carmakers, contrary to the affordability claims of the industry study. T&E calculations show BEVs to be the cheapest compliance strategy in 2025. Even the biodiesel route - which is not compatible with the EU climate neutrality goal - is slightly more costly. Complying using e-diesel and e-petrol credits raises compliance costs two-to-three-fold, on top of being 4-5 times less energy efficient than the battery pathway.

T&E recommends:

- **No CO2 credits to carmakers for alternative or synthetic fuels should be included into the car (or van) CO2 standards.**

[12] Even with very strong policy support and subsidies the potential volumes of CO2-based synthetic fuels would be limited to approximately 0.15% of total EU road transport fuel demand in 2030.

Conclusion

Following the entry into force of the EU car CO2 target of 95 g/km, the EU's electric car market has surged beyond anyone's expectation. Their share of sales have tripled from their 2019 levels as they reached higher than 10% in 2020 and are expected to increase further to 15% in 2021. This shows the growing and steady demand for these vehicles, proving that once carmakers bring adequate models and market them effectively, consumers and companies are happy to purchase them. The car CO2 regulation has also resulted in significant domestic investment into the automotive transition and electrification technologies, including creating a market for dozens of battery gigafactories to set up shop in Europe. It is not just a climate regulation, but a modern-day industrial policy.

Electric car demand in Europe is expected to grow further in the 2020s given the recent surge. But the question is who will benefit from what is expected to be one of the largest EV markets globally. The risk - if the current 2025 and 2030 standards are not reviewed upwards - is that investments into the European supply of EVs will start stagnating as early as 2022, opening the door to Asian competitors to fill the growing demand. The 2021 review of the ambition and regulatory design of the EU car CO2 standards will determine whether there is sufficient and timely investment by EU OEMs into electric vehicle supply and how fast they move away from sub-optimal transition technologies towards zero emissions only. As such, the review is key for Europe to mark its lead in the global emobility race.

Further information

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