Break-up with combustion engines

How going 100% electric for new cars & vans by 2035 is feasible in all EU countries

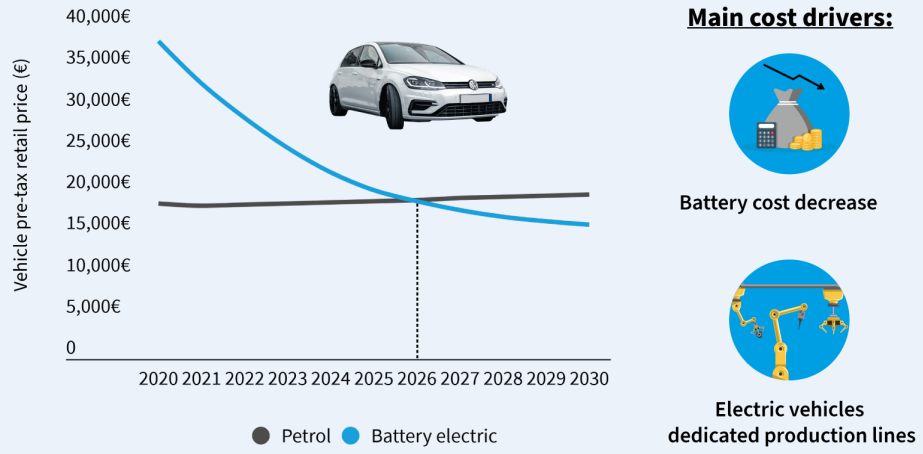
May 2021

Summary

Ten European countries, dozens of cities, a majority of urban dwellers and five major carmakers have all announced their ambition to go all out towards emissions-free electric cars in the future. Following the UK's commitment to phase out combustion engines from 2030, and ahead of the global climate summit in Glasgow, all eyes are now on the EU as it prepares its large package of climate legislation planned for July. From the climate, industrial and consumer perspective, electric cars and vans are the optimal future technology. The question is: can the entire EU go to 100% electric light-duty sales by 2035 to deliver on the European Green Deal? Can a small business as well as an average family, whether living in a city or a village, make the switch? T&E has commissioned BloombergNEF (BNEF) to analyse exactly this. The answer is clear: yes - with the right policy support - Europe can.

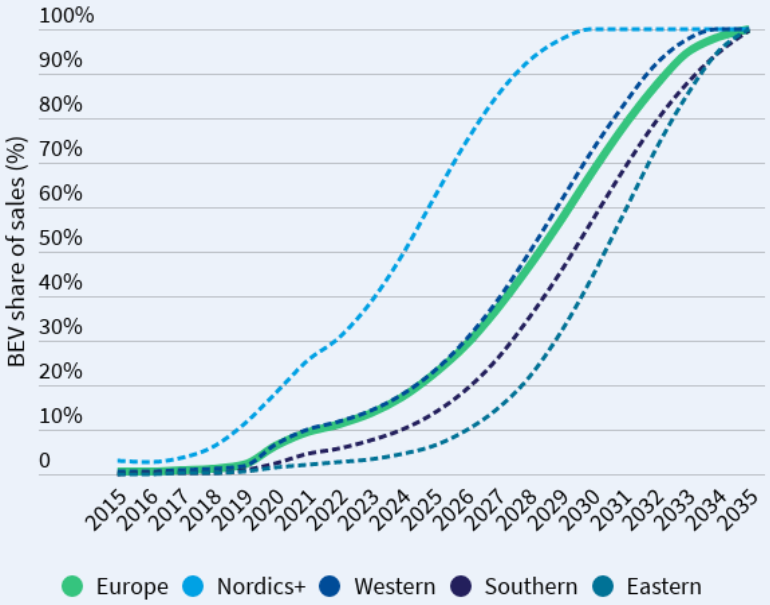
On average, battery electric vehicles reach the same price (before incentives) as equivalent petrol models between 2025 and 2027. Small vans reach price parity the earliest, in 2025, small cars are last in 2027, with medium and large sedans and SUVs hitting the parity point in 2026. In 2030, an average medium electric car is 18% cheaper than the equivalent petrol excluding taxes.

EVs will be cheaper than fossil-fuel vehicles in Europe by 2025-2027



The main drivers of this price drop are twofold: first, falling battery prices, which are expected to drop by 60% over the decade (from 120€/kWh in 2020 to around 50 €/kWh in 2030). The 100$/kWh frontier, said to be a key point for affordability of EVs, would be reached in 2024 (80€/kWh). The second major driver is the switch to dedicated BEV manufacturing platforms (and new vehicle architecture) which allow carmakers to reduce costs by 10%-30% thanks to simpler assembly, standardised battery packs and other components and higher volumes by producing various BEV models on the same chassis.

These findings hold in various sensitivity scenarios and bear a clear conclusion: electric cars and vans will be the cheapest option in six years time, allowing EU drivers to reap large economic benefits, and making the transition to affordable electric mobility economically feasible and desirable.

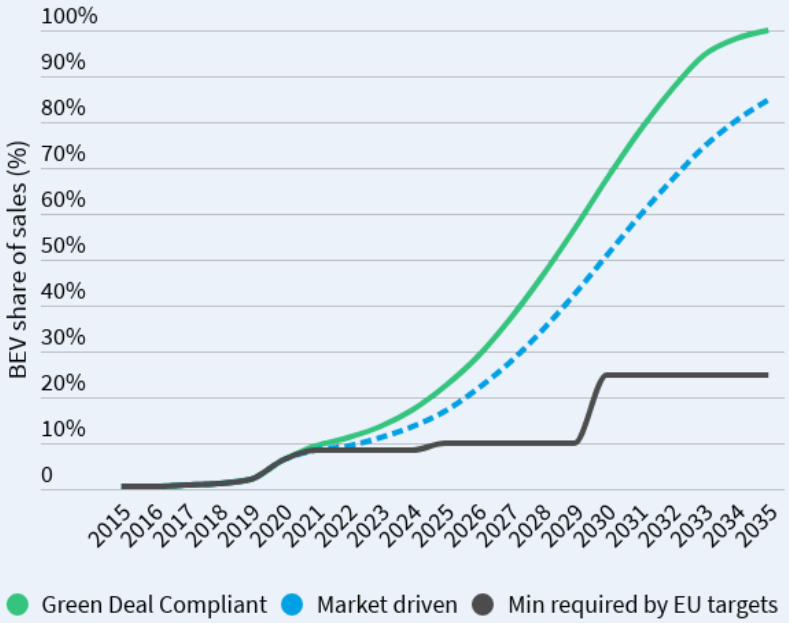


Based on their in-house model and the price parity points, BNEF then modelled the feasibility of going to 100% pure electric sales across Europe, in Northern, Western, Southern and Eastern blocs of countries. The results show that with the right policy support (which T&E refers to as the Green Deal compliant scenario), conventional cars and vans can be phased out in all European countries between 2030 and 2035. To achieve this most optimally, sales of battery electric vehicles need to hit 22% in 2025, 37% in 2027 and 67% in 2030.

Although an accelerated adoption is seen across all countries from 2025 as different segments hit price parity, not all Member States follow the same trajectory. In the Green Deal compliant scenario, the Nordics group would reach 100% BEVs as early as 2030, the Western group - which includes Germany, France and the UK - would hit 100% BEVs in 2034. This is compatible with the current UK phase-out commitment, where only plug-in cars would be allowed from 2030 and zero emission from 2035. Germany is a clear market leader in this group and it can hit 100% zero emissions even sooner if they enact ambitious policies. The Southern group (Italy, Spain and Portugal) follows a similar trajectory as the Western group, and reaches the full phase-out one year later, in 2035. Finally, the battery electric market in the Eastern group (12 countries including Poland, Greece and Romania) grows the fastest in the late 2020s as these countries start from a low base. Because the second-hand market remains large and the new car market is only 10% of the EU total, growth in new electric sales is slow in this region: BEVs hit 44% sales in 2030 despite having reached price

parity several years before. However, very rapid adoption rates are expected close to 2030 and beyond as battery models become cheap and more commonplace.

Crucially, the BNEF analysis highlights the importance of scaling up the production of electric vehicles early. This generates the cost reductions necessary to reach the 2025-2027 cost parity milestones across the light-duty vehicle categories. This has significant implications for the EU's principal supply side regulation; the car and van CO_2 standards that are up for review this July. The current CO_2 targets for 2025 and 2030 for both car and van makers are way below even the purely market driven trajectory in the 2020s. This means there might not be the timely investments in and supply of electric vehicles for the market to grow. Slow EV market growth in the 2020s will also put in jeopardy the current plans for battery gigafactories across Europe as they might lack the market to sell their product into.



T&E estimates that to be on the feasible path to 100% zero emission sales in 2035 based on the BNEF trajectory, Europe needs at least a 30% CO_2 reduction from new cars from 2025, 45% from 2027 and close to 80% CO_2 from 2030. Raising the 2030 target alone won't suffice as it will only spur investments towards the very end of the decade and from 2030 onwards. In other words, the long term goal of zero emissions mobility cannot be achieved without much more ambitious short and mid-term targets in the 2020s than the ones the EU has currently set itself. For vans, the situation is even worse as the 2025 and 2030 targets are far too low to drive electrification and without a significant increase in the targets prior to 2030, the CO_2 reduction needed from vans will be achieved through conventional engine fuel efficiency improvements only.

Beyond the supply side regulations, other policies such as smart fiscal incentives and speedy ramp up of charging infrastructure are needed to reach the BNEF scenarios. On taxation, the fast growing electric car sales mean that hefty purchase subsidies are becoming financially unsustainable. Instead, bonus-malus tax systems that use malus on CO2 emitting cars to pay for support on zero emission models - already in place in France, Sweden and Italy - are a much better way to divert car buyers away from CO_2 polluting engines and towards zero emission models. An adequate and seamless charging network - at home, work, in public space and across motorways - is also key. Europe's infrastructure law (AFID) should fill some gaps here, notably by setting binding targets on all EU countries so that drivers in Romania and Poland, not only Germany, have access to adequate public charging infrastructure. However, with most charging happening in private locations such as

home and work, a lot of levers lie at national level to make the approval and installation process quick and easy. This is why a direct link between AFID on the one hand and the ambition levels of the EU-wide vehicle CO_2 standards on the other, as recently suggested by the EU car lobby, is not appropriate.

It is becoming clear that the entire EU can go to 100% zero emissions new car and van sales by 2035. For some segments - notably corporate and urban fleets - a battery car is already the best option today, so these can phase-out conventional engines even sooner, and by 2030 at the latest. The risk now is that the EU automotive industry and suppliers don't move fast enough in the 2020s to capture the future market and develop the emobility value chain (and corresponding jobs) in Europe. With electric vehicles becoming cheaper to manufacture than conventional ones, the cost advantage will be on the side of those auto majors that convert to emobility quickly. Contrary to some outdated claims, the longer the industry wastes limited resources on conventional engines and fake solutions like e-fuels for road transport, the more of a financial liability they become. The financial markets have already started punishing OEMs that are moving slowly on electrification, fearing stranded engine assets. Faster transition with a clear zero emissions objective in mind will allow Europe to enter the emobility era on a winning horse, not an exhausted donkey.

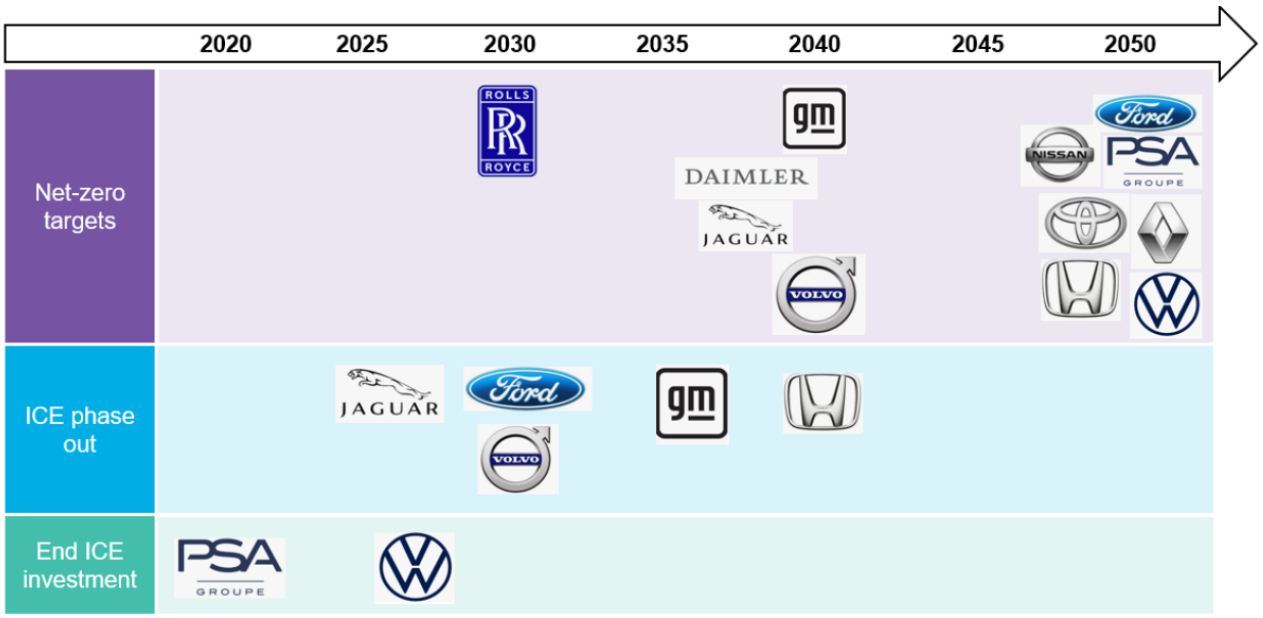
1. Engine phase-out debate so far: are we there yet?

Transport is Europe's largest source of carbon emissions, and light-duty vehicles (cars and vans) are the single biggest source of transport's emissions[1], so Europe cannot achieve its climate goals without upping its game on clean mobility. CO_2 emissions dropped in 2020 thanks in part to the EU's 2020 car CO_2 target, and will decrease further in 2021 - but Europe is nowhere near the trajectory it needs to be on to either reach its increased -55% greenhouse gas reduction target by 2030, or its climate neutrality pledge by 2050. To achieve the Paris Agreement goal of limiting global warming to well below 2°C and to avoid a climate emergency, road transport CO_2 emissions will need to be entirely decarbonised by 2050. Given the average lifetime of a car in Europe is around 15 years, this means the last new car or van with a conventional engine - including hybrids - should be sold by 2035 at the very latest[2]. The remaining legacy fleet of conventional cars sold before 2035 will need to be gradually removed from the roads by 2050 to reach zero emissions; while faster phase-outs in the early 2030s can also help retire these old polluting vehicles on time.

To enable Europe to achieve higher CO_2 reductions by 2030 and beyond, most of the EU's climate and energy legislation is being reviewed in 2021. The European Green Deal rightly commits to put light-duty vehicles "on a pathway towards zero emission mobility after 2025"[3] which marks a strong shift away from incremental improvements towards zero emission technologies. So the climate story is clear - the future is zero emission (predominantly battery electric) cars and vans. Battery electric cars are already on average 3 times cleaner than comparable diesels and petrols[4] when the entire lifetime emissions are taken into account, the advantage that will only increase as Europe's grids decarbonise and batteries are produced more sustainably.

Next comes the industrial story. Half a dozen carmakers including Volvo, Ford Europe and GM have already announced commitments to phase-out combustion engines, with four coming out in early 2021 alone. Others such as Volkswagen and Peugeot are ending investments in and development of new combustion engines. From the technology point of view, electrification of road vehicles is now inevitable and is the optimal and most cost-effective decarbonisation path for the automotive industry.

[1] Member State report of GHG Inventory to UNFCCC.
[2] Incremental improvements to existing ICEs vehicles will not achieve the required emissions reductions as there is a limit to the efficiency improvements possible and it is not possible to produce low and zero carbon fuels cost-effectively, sustainably and in the quantities required.
Transport & Environment (2018). *How to decarbonise European transport by 2050.* Link
[3] European Commission (2019). *Communication from the European Green Deal (COM(2019) 640 final).* Link
[4] Transport & Environment (2020), *How clean are electric cars.* Link



Source: BloombergNEF. Note: Ford ICE phase-out target is for Europe only.

Politicians are also joining the emobility momentum. Ten European countries have already committed to phase-out conventional engines between 2025 and 2040, including France, Spain, the UK and Slovenia. Many more cities want to ban polluting engines from their city centres completely. And there appears to be a wide public support for doing so: in a poll YouGov ran for T&E, two-thirds of urban residents[5] in cities from Madrid to Krakow to Paris support banning sales of fossil cars across Europe after 2030. Cities should lead the way by allowing only emission-free cars to be driven on urban roads after 2030 as part of a wider remake of urban mobility.

But some still question the feasibility and the economics of moving towards 100% zero emission vehicles. Will it be technically and economically feasible for all car user profiles and all vehicle segments to go electric in the timeframe required by the climate goals? Will the average Jane and Joe, or a small business with a delivery van, be able to make the switch, in rural as well as urban areas? T&E has commissioned BloombergNEF (BNEF) to answer exactly these questions and analyse whether different user profiles and different European countries can make the transition by 2035. The answer is clear: yes, Europe can.

[5] Transport & Environment (2021), *Support in European cities for only selling emissions-free cars after 2030.* Link

2. Combustion engine phase-out is feasible & economically desirable

a. Price parity in the mid 2020s

While battery electric vehicles (BEVs) are more expensive than internal combustion engine vehicles (ICEs) today (between 63% and 94% more expensive depending on the segment), this price difference is expected to shrink in the next few years as BEVs get much cheaper. The average battery electric vehicles reach the same price as equivalent ICEs within a tight window between 2025 and 2027. Light vans reach price parity the earliest, in 2025, small cars are the latest, in 2027, while other larger sedans, SUVs and heavy vans hit the parity point in 2026.

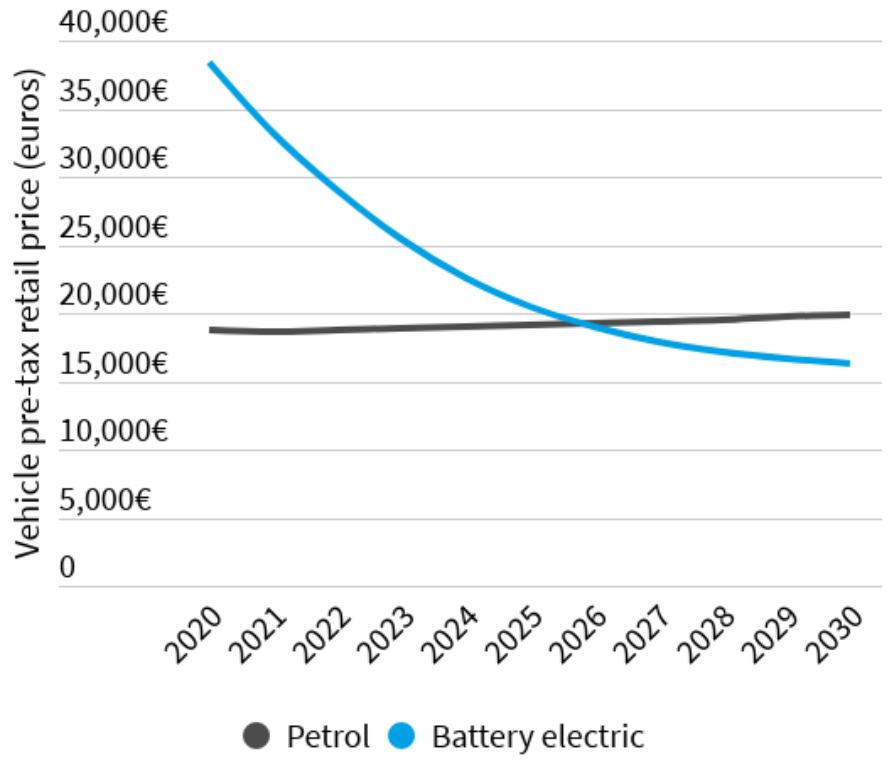
Segment	Price parity year (pre-tax)
Small cars (B-segment)	2027
Medium cars (C-segment)	2026
Large cars (D-segment)	2026
Small SUV (B-segment)	2026
Medium SUV (C-segment)	2026
Large SUV (D-segment)	2026
Light van	2025
Heavy van	2026

Source: Bloomberg NEF (2021), Hitting the EV Inflection Point

Table 1: BEV price parity year with petrol in Europe (pre-tax retail prices)

Prices considered in the BNEF analysis exclude any kind of taxation (pre-tax retail prices) and cover all direct manufacturing costs (including vehicle body, chassis, drivetrain, electronics, assembly etc.) as well as all overheads (including depreciation, R&D, dealers, margins etc.).

For a medium car with a range of 400 km, the pre-tax retail price of a BEV would drop from €38,000 in 2020 down to €20,000 in 2025 and €16,000 in 2030. The drop is much steeper in the first part of the decade with close to a 50% drop in the first five years and a reduction by around one fifth in the second part of the decade. As a result, in 2030, the average medium BEVs is 18% cheaper than the equivalent ICE.



Source: Bloomberg NEF (2021), *Hitting the EV Inflection Point*

Figure 1: Medium BEV and petrol car pre-tax prices in Europe

Experts from BNEF have identified the main drivers which underpin this rapid cost decline. The first driver is falling battery prices. Average battery prices are expected to fall by close to 60% over the decade. Starting from 120€/kWh in 2020 (137$/kWh), the average battery prices would break the 100$/kWh limit in 2024 (80€/kWh), then reach 74€/kWh in 2025 and around 50€/kWh in 2030. The four key underlying drivers for short term cost reduction are: decrease in material costs, increase in energy density, increase in production output and reduction in the amount of battery production scrap generated. BNEF highlights that adoption of new tech - such as solid-state cells or improvements to existing liquid-based systems - could be needed to realise the price decline expected in the 2nd half of this decade.

The second main driver of BEV cost reduction is the switch to dedicated BEV manufacturing platforms and new vehicle architectures. In 2020, a large majority of BEVs are produced on modified platforms which are not optimised for BEV production and incur heavier production costs. In the next few years, dedicated BEV platforms (like the Volkswagen MEB platform or the Tesla production platforms) are expected to be quickly adopted for the majority of BEVs sold in Europe, and by 2030 virtually all BEVs would be produced on dedicated platforms according to BNEF. The cost premium for going with the more expensive modified platform is estimated to be around 10-30% according to

BNEF (depending on the segment[6]), mainly thanks to simpler assembly, standardised battery packs and other components for BEV models and higher volumes by producing various BEV models on the same chassis.

Finally, as a result of the battery technology improvements and the above switch to dedicated BEV manufacturing platforms, BNEF shows that BEV efficiency improvements are higher than typically assumed. The study shows that average BEV efficiency is expected to improve by around 30% between 2020 and 2030, leading to smaller batteries needed to offer a given range. This improvement comes from enhanced battery density which makes the vehicle lighter, and thus more efficient, and the engineering improvements from dedicated platform designs.

The analysis performed by BNEF shows that the findings are robust to a wide range of sensitivities. The price parity years could shift by up to two years as a result of the changes in the main assumptions and range between 2025 and 2028 for the medium car (compared to 2026 for the central scenario). In the higher cost sensitivity, an average medium BEV with 600 km range would still be 10% cheaper than the equivalent petrol car in 2030 and the price parity is delayed by a maximum of only two years. Similarly, in the case of higher battery prices (+75%) - e.g. caused by a surge in raw material prices - the point of price parity would not be delayed more than two years. In fact, even if cobalt, lithium and nickel prices double[7], then battery pack prices would only increase by less than 25%, which would only have a limited impact on the price parity. On the other hand, the price parity year can come one year earlier - or 2025- with low battery prices or shorter driving ranges (e.g. 300 km medium range BEV).

The analysis shows there is an increasing clarity on the declinings cost of BEVs, which paves the way to a clear trajectory for BEVs to start hitting price parity in the next few years, and in the second half of the 2020s for the longer range BEVs. Thanks to lower vehicle costs across all segments and scenarios by 2030, the EU and drivers would reap huge economic benefits from a rapid adoption of affordable electric mobility.

Some vehicle buyers, especially fleet operators are much more focused on the total cost of ownership (TCO) of the vehicle. Because of lower operating costs for electric vehicles (cheap electricity and much less maintenance) compared to combustion vehicles, the price parity year for the TCO would be reached well before the upfront vehicle price parity. In particular, this can vary from one user profile to another with higher mileage drivers already benefiting from lower overall costs for driving electric rather than conventional vehicles[8]. Because of the diversity in buyers and use cases, the transition will start well before the average upfront price parity point (it has already started today) and will continue after this point is reached. The next subsection explores at what pace the EU and the different Member States can fully complete this transition to 100% zero emission vehicles.

[6] Dedicated platform manufacturing of medium cars (C-segment) in 2030 brings down the pre-tax retail price by 25% (21% in 2025).
[7] Compared to February 2021 prices
[8] Transport & Environment (2020), *Why Uber should go electric.* Link

b. Phase-out trajectory

Following a model of technology diffusion, BNEF has forecasted BEV sales uptake in Europe based on the price assessment detailed above (new sales only, not second hand sales). This techno-economic analysis shows that, with the right policies, ICEs can be fully phased out at EU level by 2035. The policies required to drive this adoption are detailed in the next two sections.

According to the modelling, Europe (EU27, UK, Switzerland, Norway and Iceland) would reach on average 22% BEV sales in 2025, 37% in 2027, 67% in 2030 and 100% in 2035. Although the BEV uptake curves are similar across all countries - showing an accelerated adoption from 2025 as different segments hit price parity in quick succession - not all Member States follow the exact same trajectory. Some countries see their BEV sales accelerate from the mid 2020s while others see more abrupt market transformation in the early 2030s. Similarly, some countries reach 100% BEV sales well before 2035, whereas others need a couple more years to reach 100% zero emission. Nonetheless, all countries reach 100% BEV in 2035 at the latest.

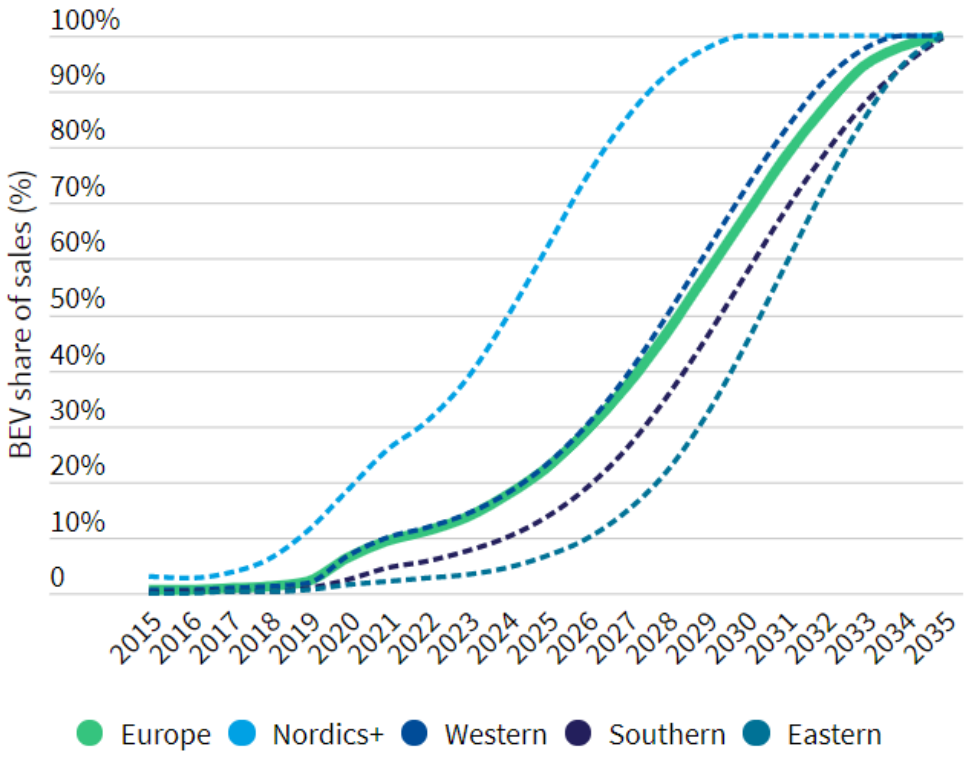
BNEF has grouped the European countries into four groups based on the current BEV sales as well as other metrics like GDP per capita and supporting EV policies:

- **Nordics+** are the 'early adopters' and 'innovators' which includes the Nordic countries as well as the Netherlands. This group makes up 8% of the total sales.
- **Western** Europe group is the 'early majority' and covers the largest car markets: Germany, France, the UK as well as Belgium, Luxembourg, Switzerland and Austria. Together, they account for the lion's share of European car sales (61%).
- **Southern** Europe group is the 'late majority' group. It includes Spain, Italy and Portugal (21% of car sales).
- **Eastern** Europe group is composed of the remaining EU countries[9] where the EV adoption has just started. Poland is the major market in this region, responsible for half of the group's overall sales. Most of these markets are characterised by relatively low sales of new vehicles (10% of all new cars sold in Europe) which

[9] Bulgaria, Croatia, Cyprus, Latvia, Lithuania, Malta, Czechia, Poland, Estonia, Romania, Slovakia, Slovenia, Greece, and Hungary

compares with a much higher share of the overall European fleet of vehicles on the road (21%). This is due to a large second-hand market which relies on imports from other parts of Europe.

Figure 2 below shows the different EV adoption trajectories for the four country groups. In these scenarios BNEF assumes that the EU and national governments introduce more supportive policies that push the market towards faster BEV adoption, notably thanks to higher CO_2 targets, and does not consider additional potential constraints, such as charging infrastructure and raw material availability.



Source: Bloomberg NEF (2021), Hitting the EV Inflection Point - accelerated scenario

Figure 2: Green Deal Compliant BEV sales scenarios in Europe

The **Nordics+** are expected to charge ahead on BEV adoption with Norway leading the pack and all countries in the group hitting 100% BEV in 2030 at the latest. On average this group started at 17.3% BEV in 2020 and hits 62% already in 2025. If Norway were to keep its current growth it could hit 100% by late 2023.

Western Europe is the second highest for BEV adoption and the biggest market for BEVs. In 2020, the average EV share was 5.7% and the region's EV sales are expected to gain impetus thanks to continued subsidies and increasing model offering from domestic manufacturers. BNEF forecasts 23% BEVs in 2025, 72% BEVs in 2030, then 98% in 2033 and 100% from 2034. This trajectory is compatible with the current announcement from the UK to phase out the sales of diesel and petrol

cars in 2030 with PHEV being phased-out from 2035[10]. Furthermore, 72% BEV sales in 2030 is a group average meaning some countries will go slower while others would go faster. E.g. Germany is a clear market leader in this group accounting for the highest share (10% in the first quarter of 2021) and volume of BEV sales[11], so it can easily lead this pack and hit 100% zero emission sooner than the other countries if they enact ambitious policies. In France as well an earlier phase out date is within reach with the adequate level of policy support.

Southern Europe follows a similar trajectory as the Western group, only with a couple years delay. The car markets in these two groups have some similarities and, as adoption increases in the region, BEVs rapidly start to become a competitive option in this group as well. The average BEV sales in 2020 was 2.2%, and current signs show that the BEV market could experience strong demand in the next few years. BEV sales have stayed above 5% in Portugal almost every quarter since early 2020, while Spain and Italy surpassed 3% BEVs in the last quarter of 2020. In this group, BEV adoption reaches 14% in 2025 and 57% in 2030 before reaching 100% in 2035. For example, in Spain, there would be 3 million battery electric cars and 600,000 battery electric vans on the road in 2030 under this scenario. In order to achieve the current target of 5 million EVs (cars, vans, buses and motorbikes) in 2030 set in the Spanish Energy and Climate Plan[12], the government should give priority to supporting stricter CO_2 targets at EU level, undertaking the long awaited vehicle tax reform and accelerating the roll-out of adequate and seamless charging infrastructure. In Italy, there would be close to 4.5 million BEVs on the road in 2030 under this scenario, which is 13% higher than the current 4 million Italian target[13]. This demonstrates that the current national target is not ambitious enough and falls short of the Green Deal compliant trajectory,which means that Italy should target a faster roll out of BEV that currently foreseen.

Eastern Europe grows the fastest in the 2020s as they start from a low base (1.4% in 2020). Despite cost-competitiveness, it takes until 2030 for the Eastern Europe region to hit 44% average BEV adoption. Consumer buying patterns take the longest to change as the second-hand market remains larger than elsewhere. This limits BEV growth for several years beyond the purchase price parity year. However, as EVs become more ubiquitous in other parts of Europe, there is a delayed, but very rapid, increase in adoption rates closer to 2030 and beyond. Additionally, brands such as Skoda or Dacia are likely to supply models that meet the preferences of this region, notably once the battery cell costs drop in the mid-2020s.

[10] Official text targets only selling cars that “have the capability to drive a significant distance with zero emissions” from 2030 to 2035 - which is considered to be PHEV here and not regular hybrids.
[11] Transport & Environment (2021), *Plugged-in: T&E's EV market watch.* Link
[12] Spanish Integrated National Energy and Climate Plan
[13] Integrated National Energy and Climate Plan

3. What does this mean for EU car and van CO_2 targets?

a. Current targets would lead to suboptimal BEV uptake

Under the current **car** CO_2 regulation, carmakers have to cut the CO_2 emissions of their new vehicle sales by 15% from 2025 and 37.5% from 2030 (compared to 2021). If the CO_2 target remains unchanged until 2030, Europe will see little push to increase the supply of electric vehicles and, as a result, stagnating EV sales throughout the 2020s. Indeed, electric car sales could be as low as 15% between 2025 and 2029 (10% BEVs plus 5% PHEVs) as the current regulatory design allows to weaken the stringency of the regulation via numerous flexibilities. From 2030, carmakers would not need to sell more than 25% BEVs to be compliant.

The current targets are far from what is needed to reach the 2035 ICE phase-out, and even fall significantly short of BNEF's market-driven scenario which is based on the economics of BEVs alone and does not assume any policy or regulatory push. In that scenario BEV sales would reach 17% in 2025, 28% in 2027 and 51% in 2030, see Figure 3 below.

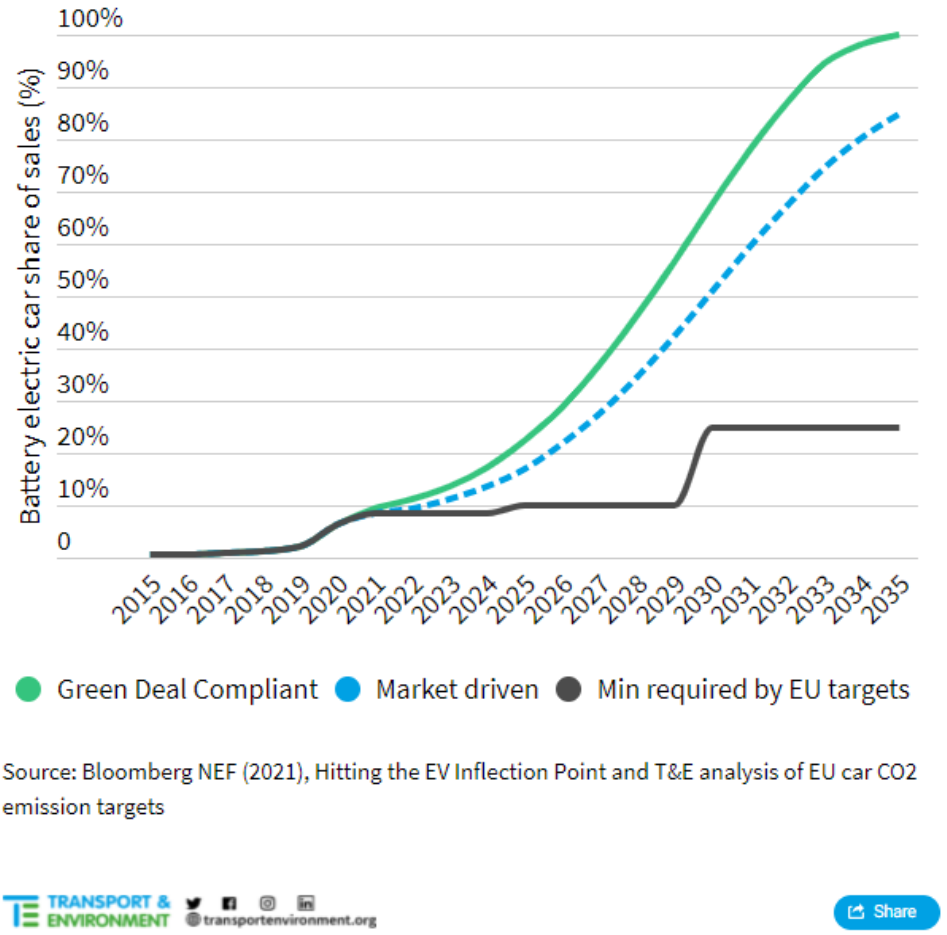
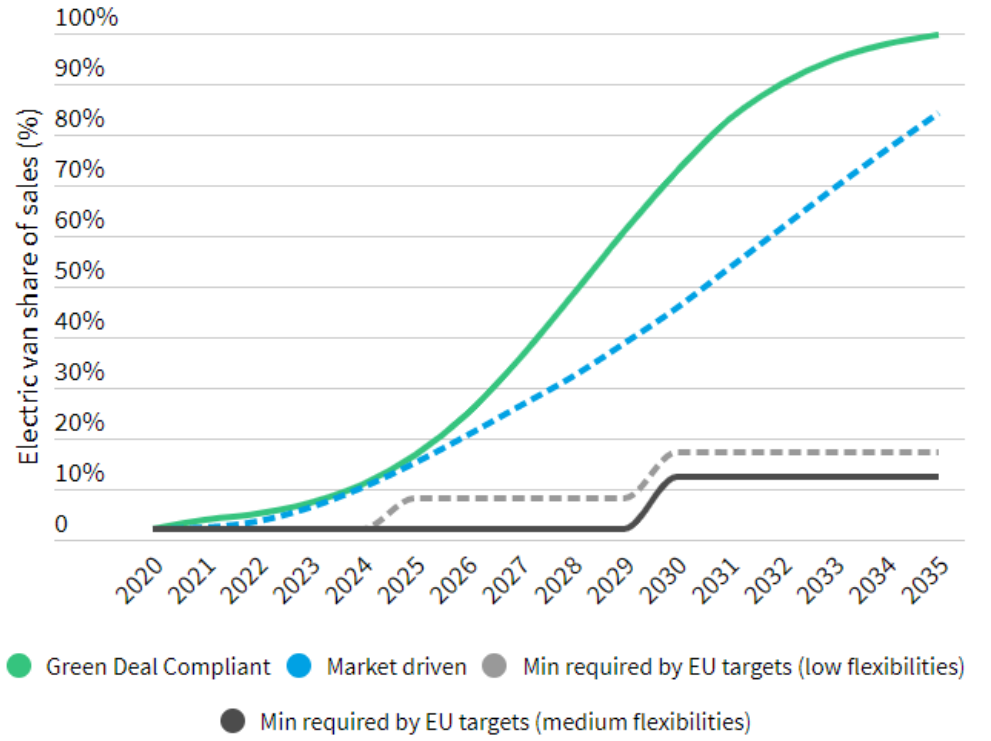


Figure 3: Green Deal compliant, market-driven, and current policies BEV uptake scenarios

The current weak regulation would therefore not be effective to drive the market at the level that the economics of cheaper technology diffusion would put it. This would lead to suboptimal BEV technology development and adoption as the EV market would likely be held back by carmakers looking to recoup investments from the ageing petrol and diesel technologies instead of investing in BEV technologies. As a result of lower investment, carmakers would be delaying the transition to dedicated BEV manufacturing platforms which would lead to more expensive and less performant BEVs (less efficient, heavier, shorter range, etc.). The current supply-side policy not only fails to deliver on the level of ambition needed to deliver on the very potential of the BEV technology, but also falls significantly short of what should be a Green Deal compatible trajectory.

For **vans**, the situation is even worse. Under the current van CO_2 targets, the EU regulation will continue to fail to deliver electric vans up to the late 2020s (Figure 4). This is because the baseline for future emissions reduction is set very high, and the 2025 and 2030 targets are far too low to drive electrification. Only between 2% and 8% electric van sales would be required up to 2029, and between 12% and 17% from 2030 (depending on the extent to which carmakers rely on regulatory flexibilities). In other words, without a significant increase in the targets prior to 2030, the CO_2 reduction needed from vans will be achieved through conventional engine fuel efficiency improvements and regulatory flexibilities. In effect, vans would be used to write off older generation diesel technologies from the passenger car segment.

BNEF's market driven scenario shows there is a strong techno-economic potential to electrify vans, with organic electric van sales reaching 15% in 2025 and 46% in 2030, or more than seven times higher than what the current targets would require in 2025. This is achieved in the market-driven scenario without much additional policy support, and thus highlights that a profound transformation of the minimum EU objectives is required, especially if the EU wants to put vans on a Green Deal compatible trajectory.



Source: Bloomberg NEF (2021), Hitting the EV Inflection Point and T&E analysis of EU car CO2 emission targets

Figure 4: Green Deal compliant, market-driven, and current policies electric van uptake scenarios

b. Car CO_2 targets: setting a path for the ICE phase-out

BNEF shows that in the market-driven scenario, BEV sales trajectory would be 17% in 2025, 28% in 2027 and 51% in 2030, which is in line with T&E recommendations[14] for the EU to set minimum CO_2 reduction targets at 25% from 2025, 40% from 2027 and at least 65% from 2030.

However, BNEF analysis - as described in section 2 - shows that BEV sales should be growing faster for an optimal 2035 phase-out trajectory, or a Green Deal compatible scenario. The CO_2 reduction targets which correspond to this ICE phase out trajectory are thus higher than what would be needed under the market driven scenario. To reach Green Deal compatible BEV sales levels, the following car CO_2 reduction targets should be set: 30% reduction from 2025, 45% reduction from 2027 and 80% in 2030 before going for 100% emission reduction in 2035.

[14] Transport & Environment (2021). *Car CO2 review: Europe's chance to win the e-mobility race.* Link

As for vans, BNEF's market driven scenario for electric van uptake is also in line with T&E recommendations[15]: 20% CO_2 reduction from 2025, 31% from 2027 and 60% from 2030 would lead to approximately 15% electric vans in 2025, 25% in 2027 and 50% in 2030. BNEF's Green Deal compatible vans trajectory would also translate into higher CO_2 reduction targets: 22% reduction from 2025, 42% reduction from 2027 and 78% in 2030 before going for 100% emission reduction in 2035.

The high targets required to put the European BEV market on the right path highlight the extent to which current targets are inadequate. They are even lower than the share of EVs some like VW and Renault have announced they will sell by 2030: the EU pooling provisions mean that carmakers that sell more EVs than the regulation requires can simply allow others to sell less, not leading to an overall increase in the market share.

The electric car and van market is at crossroads; the direction it takes in the next few years will be key to set the speed of the transformation in the next few years and to determine if the EU will phase-out the sales of conventional cars and vans by 2035 at the latest and reach its own Green Deal ambition. If the EU car and van CO_2 targets are left untouched in the 2020s, carmakers would choose to delay the investment and introduction of new BEVs, and the market could stagnate at 10% electric cars and 2% electric vans up to the end of the decade. On the other hand, if the car CO_2 reduction targets are made more ambitious in the 2020s, the market would take the right direction and aim towards 20% BEVs in 2025 and up to two-thirds in 2030.

This is particularly critical for the uptake of electric vans given that van makers are currently not planning any effective electrification strategy and there is high risk that the transition to electric vans would be delayed beyond what would be most effective from a techno-economic point of view. Because of the smaller scale in van production compared to cars, the transition to electric vans can happen much more rapidly once it has started[16].

Early action and supply-side targets are essential to reach EV sales volumes and phase out combustion cars by 2035. BNEF analysis highlights the importance of the early build up of BEV sales volume, as that drives cost reductions and also generates the necessary consumer buy-in for further adoption in the future. The earlier the EV market enters the phase of accelerated BEV sales, the easier it will be to reach the ICE phase-out and related climate goals.

[15] Transport & Environment (2021). *The modalities of regulating CO2 emissions from vans.* Link

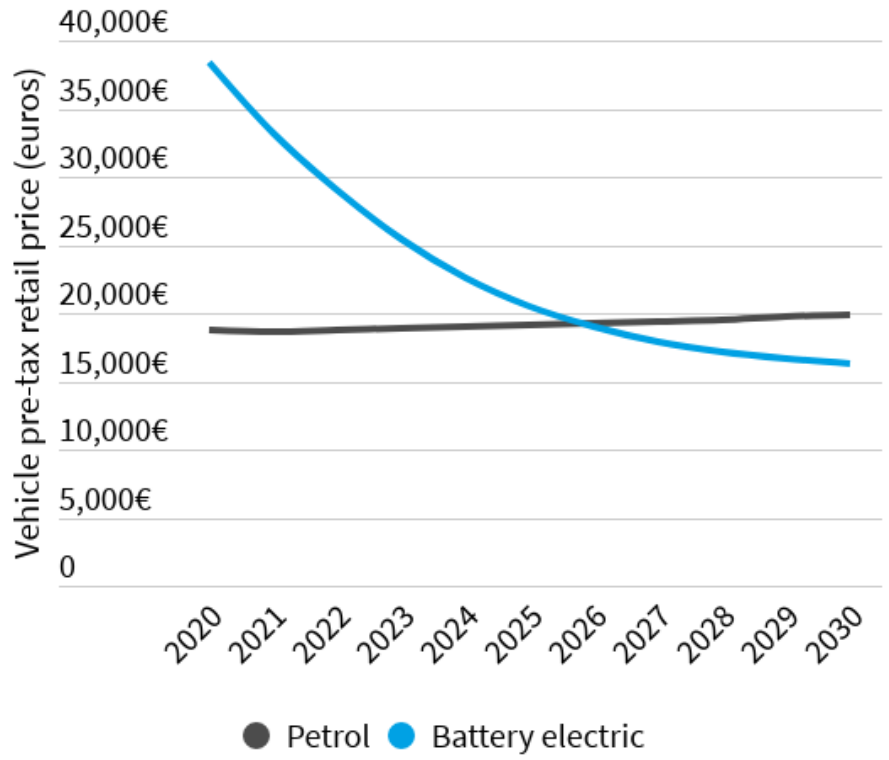
[16] Once the electric vans market picks up, it will likely be costly to maintain a flexible platform manufacturing approach (i.e. producing both diesel and electric vans on the same platform) which will eventually push van makers to transition the limited number of production platforms to dedicated electric van production (which would also greatly increase the performance and economics of electric vans thus reinforcing the trend).

4. Conclusions & policy implications

The analysis by BNEF shows that - with the right policy support - achieving 100% new electric car and van sales across all EU countries is feasible by 2035.

Electrics become cheaper than engines

At the heart of the economic feasibility of this is how fast battery electric vehicles reach price parity with their internal combustion counterparts as a rapid mass market adoption will happen once they are cost competitive for all user groups. In Europe, this will happen between 2025 and 2027, when the average vehicle in all light vehicle segments reaches price parity: light vans go first in 2025, followed by most segments such as medium cars, sedans, SUVs and heavy vans in 2026, and small cars go last in 2027. Falling battery prices and the development of dedicated electric vehicle manufacturing platforms, as well as higher production volumes, lead to this.



Source: Bloomberg NEF (2021), *Hitting the EV Inflection Point*

Plug-in hybrids - or PHEVs - do not benefit from the same cost reductions as battery electric cars because they cannot be produced on optimised BEV dedicated platforms and due to higher relative costs of battery packs compared to BEVs due to the smaller batteries used. This means the long-term economics of PHEVs is less favourable than full electric cars. On top of this, T&E has

already shown[17] how the current plug-in hybrid technology is rarely low emission, and often emits more than the official CO_2 labels even when the battery is charged. This makes the current trend in Europe of ever growing PHEV sales worrying, risking to slow down the transition to the future-proof technology and put European carmakers behind their global competitors who are going full electric. Policy signals are needed - in both national taxes and the EU car and van CO_2 standards - to limit the rewards given to PHEVs and steer the investments into full battery electric. Whether or not plug-ins will be part of the transition depends on how fast carmakers improve the technology so it is capable of being driven in electric mode most of the time and in most driving conditions (which is not the case today). From the climate perspective, only zero emissions vehicles - i.e. those powered by an electric motor - are compatible with the Green Deal objectives.

What policy is needed

Important policy such as smart taxation and speedy charging infrastructure roll-out are important to achieve the 2035 EU-wide phase out. But above all, the analysis highlights the importance of the early buildup of battery vehicle production and sales volume, i.e. the supply side. This generates the cost reductions necessary to reach the 2025-2027 price parity milestone. This has paramount implications for the EU's chief supply side regulation - the car and van CO_2 standards for auto-makers. These EU regulations currently give the volume certainty needed to recoup large investments into transforming manufacturing supply chains, notably developing dedicated platforms that are at the heart of going to affordable EVs.

But if we look at the current car CO_2 regulation, the impetus to invest and sell electric cars will slow down as early as 2022, as the 2021 target remains unchanged until 2025. Even from 2025 the CO_2 standards are relatively weak: the ambition can be as low as 2-6% CO_2 reduction if the maximum of flexibilities are used, and insignificant growth in EV sales is required up to 2029. This means no strong regulatory driver for the EU e-mobility market until late 2020s, delaying the scaling up of EV production and jeopardising Europe's growing battery investments. 460 GWh of battery capacity is planned to be produced in Europe in 2025, against the demand of less than 100 GWh from EVs if the 2025 regulation remains unchanged.[18] This highlights that - more than anything else - strengthening the CO_2 standards from 2025 and adding an additional 2027 target, rather than only upping the 2030 target, is critical for Europe to be on the cost-effective trajectory to 100% zero emission vehicles by 2035. Early action in the 2020s is crucial to meeting the zero emission ambition in the 2030s.

Other policies - many at national level - will be important alongside the EU supply side CO_2 standards. Fast roll-out of **charging** - at home, work, in public space and across motorways - is undoubtedly an important part of the mix. Even more so in Central and Eastern European (CEE) countries that currently lag behind. At European level the upcoming revision of the Alternative Fuels Infrastructure law (AFID) offers an opportunity to bridge the gap in coverage between eastern and western Europe to secure a truly European single charging market. There must be binding targets for public charge points in every member state to speed up the update in places such as Romania or Poland. The second hand electric market is likely to grow faster than new sales in those countries,

[17] Transport & Environment (2020). *Plug-in hybrids: Is Europe heading for a new Dieselgate?* Link
[18] Transport & Environment (2021). *Batteries vs oil: A comparison of raw material needs.* Link

for which charging availability is just as key as for buyers of new electric vehicles. However, it must be kept in mind that most charging - unlike fueling today - will happen at home (or nearby) and work, or what is referred to as private charging. This is why a direct link between AFID on the one hand and the ambition levels of the vehicle CO_2 standards on the other, as recently suggested by the EU car lobby, is not appropriate or justified. Plus, as calculated by T&E and announced by the European Commission in their Smart and Sustainable Mobility Strategy, three million public charge points are sufficient for the total electric car fleet in 2030 under a scenario compliant with the European Green Deal ambition. For private charging, the upcoming review of the EU Performance of Buildings Directive should support the deployment of chargers in new and existing buildings, but most levers lie at national level to make the approval and installation process quick and easy.

Smart support and **tax incentives** for companies and private drivers are also key for an accelerated transition. T&E does not believe large public subsidies should be a long-term option; instead moving to more revenue neutral schemes such as bonus-malus (or feebate) taxation - as in France and Italy - is a much more financially sustainable option once EV market reaches 5-7% of sales. Incentives on the corporate side such as zero benefit-in-kind rates for companies to purchase zero emission vehicles (and CO2 based malus on combustion engined ones), is another way to drive the uptake fast in the years to come. Given the difference in GDP and purchasing power between Northern & Western countries on one side, and Southern and Eastern ones on the other, targeted support and subsidies might be needed longer in the latter group, even after electric models reach price parity.

Beyond tax support, much more affordable BEV models - not yet widely available today - are needed to ensure **Eastern and Central EU countries** catch up with the rest of Europe and achieve the 2035 deadline. These 14 countries heavily rely on second hand diesel and petrol cars already today, representing only 10% of EU's new car sales overall. But with the right support measures and continuous support to produce and purchase affordable battery vehicle models in late 2020s, these countries can bridge the current gap and join the rest of the EU in going zero emissions by 2035. One major concern is a potential influx of relatively new and cheap second hand diesels and petrols coming from Western Europe, which can derail the electrification ambition in Central and Eastern European countries. Measures are needed - including taxes on such polluting vehicles - to disincentive their purchase while supporting electric cars. European regional funds and the EU post-Covid recovery programmes should help the Central and Eastern European country governments steer the market in the right direction as well as develop public and private charging infrastructure.

Vans still off track

The regulatory situation is even worse for **vans**. The BNEF analysis shows an even bigger economic potential for vans, with price parity of light vans achieved one year earlier than for cars, already in 2025. Despite this, only 2% of electric vans were sold in Europe last year, mostly due to low model availability due to the weak 147 g/km CO_2 standard that has failed to drive adequate supply of e-vans in the same way as the 95 g/km cars standard has done. With the 2020 vans baseline already weak, the reduction targets for 2025 and even 2030 will do little to change the lack of supply side push into electrification. Europe's 2025-29 ambition could be as low as 2% electric van sales (8% with limited use of flexibilities), or seven times below the economic potential of 15% identified by

Bloomberg in 2025 (and 39% in 2029). Individual measures by cities will not be able to replace the supply-side signal given by the CO_2 standard, as van makers will simply not be investing into enough European large scale production or battery cell supply because some cities want them to. The van CO_2 proposal coming this June is a once in a decade opportunity to reverse the problem and ensure enough electric vans come to market in 2020s to allow both businesses to exploit the economic potential, and cities to meet their zero emission plans.

On the speed of transition

All in all, this analysis shows not only that every EU member state can achieve 100% zero emission light-duty vehicle sales by 2035, but that electric vehicles will be the cheapest option across Europe from the mid-2020s onwards. Given the economics, some parts of the car market can go for ICE phase-outs even sooner, most notably corporate and urban fleets: their longer than average driving needs mean that battery electric is already the best option. T&E believes all corporate car and van registrations should be electric by 2030. Similarly, most cities should phase-out polluting engines from their streets no later than that, coupled with a switch to public, shared and active mobility modes.

For EU policy-makers preparing the large 2030 climate legislation package this summer, the key conclusions are:

1. Electric vehicles across all segments will be cheaper than conventional cars as soon as 2026 provided timely investments and scaling up of production take place. This means that the 2025-2029 CO_2 standard must be raised upwards, by both raising the 2025 target and introducing a new 2027 target to bring forward investments.

2. All member states, including in the Eastern part of the EU, can phase-out new diesel and petrol sales by 2035 at the latest. So setting a clear policy objective - via a 2035 car and van CO_2 standard set at 0 gCO_2/km - will give exactly the long-term signal needed for the transformation and policy support to happen on time.

With electric vehicles becoming cheaper to manufacture than conventional ones, the cost advantage will be on the side of those auto majors that convert to emobility fast. Contrary to some outdated claims, the longer the industry spends limited resources on conventional engines and fake solutions like e-fuels for road vehicles, the more of a financial liability they become. The financial markets have already started punishing OEMs that are moving slowly on electrification, fearing stranded ICE assets. Faster transition with a clear zero emissions objective in mind will allow Europe to secure the leading electromobility supply chain and future jobs. The emobility age is here, ready to replace the engine era. Setting higher CO_2 targets from 2025 onwards and going to zero emissions in 2035 is exactly the stick the automotive and supplier industry needs to enter it on a winning horse.

Further information

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