

Green Paper: New Road Vehicle CO₂ Emissions Regulatory Framework

FORD MOTOR COMPANY RESPONSE TO
CONSULTATION

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1. Executive Summary

Ford is taking significant steps in the transformation to Company-wide carbon-neutrality, with commitments to go allin on electrification for passenger cars by 2030 and to significantly grow and electrify our leading commercial vehicle business.

We fully support the UK Government ambitions to decarbonise the transportation sector and welcome the opportunity to collaborate on the development of the future CO2 emissions regulatory strategy for cars and vans.

Clarity and early communication on upcoming policies are necessary for a seamless transition, and it should be recognised that the rapid and profound change comes with a huge set of challenges. It is key to ensure the customer is brought along on this journey.

This response sets out the key low and zero emission technologies that are crucial to ensure continuation through the transition, not only for public adoption, but to ensure continuation of key commercial fleet businesses across the UK.

Light commercial vehicles deserve special consideration within the transition to ensure their wide use cases and varied infrastructure needs are accommodated.

Ford believes that **PHEV passenger and light commercial vehicles will play a significant role in the market up to 2030 and 2035** respectively due to their potential for significant zero emission capability compared to other hybrid technologies. The **Government's significant zero emission definition must therefore be consistent and neutral across technologies** to send a clear signal on hybrid technology capability.

Ford outlines CO2 as the preferred metric to define significant zero emissions capability. Ford believes it is in the industry and society's interests to maintain existing methodologies that are simple and well understood by consumers, whilst forcing the mix of lower and zero emission technologies. Consideration needs to be taken regarding the use cases differences between passenger cars and light commercial vehicles.

To ensure a sufficient uptake of ZEV's to 2035, Ford recommends implementing a CO2 target that is increased in stringency (preferably aligned to EU Fit for 55 targets). Harmonisation between regions is key for global manufacturers such as Ford, and any divergence in particular between the UK and EU27 can lead to added cost and product limitation. **Robust CO2 targets naturally drive ZEV uptake, and from Ford's experience of ZEV mandates in other global regions, the key driver is not the mandate itself, but instead the effective supporting market conditions, including meaningful retail consumer incentives** (where the UK is currently uncompetitive).

Finally, a smooth transition for the automotive industry and society will be only achievable in practice if **accompanied by ambitious charging infrastructure deployment objectives** to serve both public and business users. Government should take the lead to set targets and ensure the growth of public and private charging infrastructure whilst ensuring clean grid energy supply.

2. Introduction



2.1 Approach to Consultation

Ford employs around 7,000 people in the UK (excluding an additional credit company and extensive dealer network) and has been a sales leader in the UK for passenger cars and commercial vehicles for 44 and 55 consecutive years respectively. The UK is Ford's third largest global market and is our largest market in Europe. Ford, therefore, welcomes the opportunity to comment on the UK Government's ambition to end the sale of new petrol and diesel cars and vans from 2030, and for all new cars and vans to be zero emission at the tailpipe from 2035. We note the Minister's call for "**far more global ambition**" on decarbonisation, and the consultation's objective that legislated phase out dates will help the "**automotive sector transition at pace**".

Within our response, we have focused on the key zero-emission capable technologies which need to be considered within the transition period for both passenger cars and light commercial vehicles to 2035. As the leading light commercial vehicle brand within the UK, we have taken particular effort to highlight key considerations for decarbonising this sector. We have then responded to the questions outlined within the consultation document; namely, defining significant zero emissions capability and defining the new CO2 regulation framework for cars and vans.

2.2 Ford EV Commitments

Ford is committed to achieving global carbon-neutrality in line with the Paris agreement, including the decarbonisation of road transport, and has made ambitious plans to go "all-in" on electrification. We have committed to moving our passenger car vehicle range to all-electric by 2030 (UK and EU), and as Ford UK is the home of our global Transit business, we have similar ambitions to transition our commercial vehicle fleet. Two-thirds of Ford's commercial vehicle sales in Europe and UK are expected to be all-electric or plug-in by 2030.

We support a nationwide electrification strategy and collaborative effort between policymakers, energy providers and the automotive industry. Leading up to COP26, the UK has an opportunity to lead the way by delivering a clear, credible and robust plan.

Although Ford and Government are committed to leading the charge to the UK's full electric transition, we believe that this profound and rapid change in the automotive industry comes with a huge set of challenges. Critical to our success will be bringing the consumer, businesses, and the wider public along with us on this journey.



As a global OEM, the harmonisation of sustainable technology regulation and policy between regions is of utmost importance to ensure continued profitability in a challenging economic climate (e.g. COVID, semi-conductor shortages). It is therefore crucial for the UK to align to principles of neighbouring regions such as the EU to avoid unintended costs and complexity for global manufacturers. Although the UK is a significant and important market for new cars and vans, vehicle manufacturers' production volumes are geared for Europe as a whole. Any divergence in market requirements between the UK and the EU27, including placing the steering on the right-hand side of the vehicle, adds cost and will further limit the range of product choice for the UK consumer. Ford supports the UK's ambition to only allow sales of PHEV and ZEV new cars and vans post-2030 and understands and accepts that this timeline is more progressive than many high-volume EU countries.



3.1 Decarbonising Light Commercial Vehicles (LCV)

The light commercial vehicle business deserves special attention on the road to zero emissions. While it is smaller than the passenger car market, its customer requirements and vehicle duty cycles are far more complex. Unlike passenger cars, commercial vehicles are work tools which are required to meet specific operational needs leading to:

- Highly varied use cases and operating environments with higher energy demands, weight and size than passenger cars.
- Specific customised vehicle features to get the job done.
- Capability often cannot be compromised (e.g. payload, cargo space, power take-off and range).
- Lower production volumes (CV is 17% of PV market according to IHS / SMMT 2020 statistics) do not allow for the same economies of scale. This impacts the product life cycle and the rate of technological improvement.

It is critical to understand these differences through the development of the forthcoming New Road Vehicle CO₂ Emissions Regulatory Framework to ensure that the right targets, timelines and requirements are set for the commercial vehicle fleets and businesses.

BEV light commercial vehicle technology is rapidly developing and a proportion of the light commercial vehicle fleet is already ready to transition to BEV from a functional perspective. It should, however, be noted that certain use cases require heavy payloads, long daily distances and auxiliary power supply to meet business needs. Imagine the daily energy requirements for a roadside assistance van carrying a workshop of tools, towing a stranded vehicle in the remote Scottish Highlands during winter. The energy requirements are vastly different to a small florist's van making inner city deliveries. Due to currently limited battery energy densities, BEV technology is not always suitable to meet all light commercial vehicle applications, and therefore alternative solutions are needed in order to decarbonise higher energy fleets. Alternative technologies may include PHEV technology in the medium-term and eventually hydrogen (we note the publication of the Government's recent Hydrogen Strategy) and / or development in solid-state battery technology.

(Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004)



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In addition, vehicle up-time is critical for optimising total cost of ownership and, due to longer charging times for BEVs, the currently known BEV technology may not always be the right solution for a business in the short to medium term. **(Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004)**

(Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004)

Debate is on-going regarding the future of zero emission technology, particularly for higher energy applications. Hydrogen fuel cell and solid-state battery technology both have potential to cater for these use cases and improve up-



time. Hydrogen fuel cell has the potential to both improve payload optimisation, due to its higher energy density, and provide re-fuelling times similar to diesel and petrol.

Ford supports the Government's ambition to decarbonise the light-commercial sector, and these challenges outlined above, along with the right enablers need to be considered to ensure that UK businesses can continue to operate across the country. This includes operation across rural and city locations, allowing a breadth of technology options to cater for business needs – including PHEV, BEV and hydrogen fuel cell. In addition, it is crucial to consider the infrastructure requirements for light commercial vehicle applications to enable optimal zero-emission potential across fleets. Light commercial vehicles are dependent on the availability of a precisely tailored charging infrastructure, given the special demands on cargo space, minimised down-time and emphasis on total cost of ownership.

3.2 PHEV Role in the Transition to 2035

Ford believes that PHEVs are an essential technology in the UK transition plan to 100% zero emission at 2035. PHEVs allow a significant proportion of EV (zero emission) capability over trips, and where there is low access to the required charging infrastructure, can support customer range anxiety and build confidence in EV technology. It is therefore crucial to use a metric for significant zero emission capability that is commonly applied across all hybrid technologies to clearly distinguish between qualifying PHEV and FHEV capability.

PHEVs can be clearly differentiated compared to other hybrid technologies as PHEV batteries are typically 10 x larger than full hybrids. This therefore allows significantly increased potential for zero emission range capability. Although there has been recent criticism surrounding PHEV charging frequency (usually where fleets are disincentivised to charge when drivers are issued with fuel cards), a PHEV with a fully depleted battery operates equivalently to an FHEV. Therefore, the carbon reduction benefits realised for full-hybrids are also present in a worst case PHEV scenario without charge. In a normal use case, the PHEV technology will be charged from the grid, and therefore providing the added benefit of zero emission range capability which is unique to the PHEV hybrid.

(Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004)



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It is therefore critical to ensure that a fair comparison is made between the FHEV and PHEV technology within the final consultation outcome, which clearly demonstrates increased carbon reduction benefits from a PHEV in comparison to an FHEV.

The benefits of PHEVs can be further maximised: zero emission capability can be targeted to certain zones such as cities through PHEV geofencing technology. Other mechanisms can also be put in place to maximise the charging incentive for customers (e.g. increased infrastructure access, pricing signals and education).

It should be noted that for commercial fleets, total cost of ownership and the financial incentive is more critical than for passenger cars and therefore the incentive to plug-in increases. For a proportion of commercial vehicle operators, PHEVs are a necessary transition technology due to current limitations of BEV technology for high energy and high uptime use cases. Until future technology such as solid-state battery or hydrogen are commercialised, the PHEV will be necessary to serve many commercial fleets.

3.3 FHEV Role in the Transition to 2030

Depending on EV maturity status of the market (e.g. charging infrastructure, customer acceptance, etc.) FHEVs can offer an important cost proposition on the journey of electrification globally. However, the UK, as an advanced market, is now at a level where FHEVs beyond 2030 do not align with the Government's need for urgency and delivery at pace, and risk attempting to simultaneously accelerate and slow down technological improvement.

While PHEV is a relatively recent transitional technology that offers a genuine opportunity for significant zero emissions capability when charged with electricity from a renewable source, FHEVs are designed to improve the fuel efficiency of a conventional ICE vehicle. FHEVs have limited electric capability because of their small battery and cannot substantiate zero emission capability, as any time or distance in electric mode is derived entirely from fossil fuel combustion. Introduced a quarter of a century ago, full hybrids cannot be considered to be a necessary



transitional technology to meet UK ambitions to “go further in order to achieve more” on the road to full electrification. In 9 years’ time we can anticipate that the pressure to decarbonise transport will be more urgent than ever and defending such ICE-based technology will be unjustifiable.

Full hybrids are often seen as a more affordable choice for the consumer than PHEVs or full BEVs. This is due primarily to the differences in battery capacity, which are superior in vehicles offering genuine significant zero emission capability. Government is naturally concerned that the cost of decarbonising transport does not preclude certain socio-economic groups from accessing these technologies. From 2030 Ford expects convergent total cost of ownership between BEVs and ICEs, as well as a buoyant market in used PHEVs and BEVs. The argument that FHEVs will be required beyond 2030 on affordability grounds is, therefore, undermined.



4. Response to Consultation Questions

4.1 Defining Significant Zero Emission Capability (SZEC)

Ford supports CO₂ as an appropriate SZEC metric. Although not preferred, Ford can also accept range as a suitable metric.

Ford cannot support different metrics for different technologies (e.g. PHEV vs. FHEV) as this is not a technology agnostic approach. Ensuring that all technologies are subject to identical assessment criteria is the most important concept for Ford to adequately signal the capability of different hybrid technologies. For example, including a range requirement for a PHEV but not for an FHEV is not an acceptable approach, as this could have the unintended consequence of driving out the zero-emission capable PHEV technology whilst allowing the ICE-based FHEV to continue, risking the UK's leadership in electrification and decarbonisation.

As discussed, the PHEV has significantly increased zero emission capability compared to FHEV and therefore this must be reflected and easily distinguishable within the metric.

Q1 - WHAT METRIC, OR COMBINATION OF METRICS SHOULD BE USED TO SET ELIGIBILITY FOR CARS AND VANS BETWEEN 2030 AND 2035?

Q2 – FOR YOUR CHOSEN METRIC, WHAT THRESHOLD SHOULD NEW CARS AND VANS BE REQUIRED TO MEET FROM 2030?

Ford believes that tank-to-wheel CO₂ is the most appropriate metric to determine the eligibility for cars and vans between 2030 and 2035.

As the new framework will be implemented for a limited interim period, Ford believes that it does not make sense to invent new metrics which increase administrative burden, cost and complexity. CO₂ is an existing metric which is developed to be technology neutral and already acts as an appropriate environmental lever in many regulatory and policy scenarios. As an existing metric, this would mean lower administrative burden and greater understanding from customers – boosting confidence and comprehension. The information should be easily available within existing type-approval documentation, COCs and vehicle labelling material. A CO₂ metric will meet these criteria, while also being a transparent source of data for NGOs and other interested parties to access.



An appropriate CO₂ value needs to be determined which distinguishes the necessary performance to ensure hybrid vehicles are in fact significant zero emissions capable. Additionally, it is critical to ensure that commercial vehicles are treated separately to passenger cars due to their widely different customer usage cases (e.g. daily cycle energy demand significantly higher – weight, frontal area, payload, power take-off) and profiles compared to passenger cars. Due to this, commercial vehicles should be subject to a separate CO₂ limit, a concept which is historically accepted in many global regulation frameworks (e.g. weight-based fleet average; regulated tailpipe emissions limits distinguished between passenger and commercial vehicles).

As Ford will be 100% BEV for passenger cars by 2030, we do not feel it is appropriate to provide a recommended CO₂ threshold for passenger cars at 2030.

For light commercial vehicles Ford recommends a threshold of **120 g/km** or above per vehicle from 2030 (assuming WLTP Act 3 test procedures, forecasting an aggressive utility factor update for PHEV and commercial vehicle customer use case. Note that while the threshold will cover the worst-case CO₂ scenario, average fleet CO₂ emissions will be much lower than this.)

This CO₂ target should be linked to the overall declared CO₂ values, and in the case of a PHEV, linked to the Utility-Factor Weighted CO₂.

If an additional metric is required over and above CO₂, Ford can also accept zero emission range as a metric. Ford believes that this metric would indicate a progressive approach to demonstrate zero emission capability. It is, however, key to ensure that there is some low / zero emission technology choice between 2030-2035, and light commercial vehicles must also be considered. It is Ford's view that for light commercial vehicles the PHEV is necessary beyond 2030 to serve diverse fleet customer needs, and therefore any such additional metrics must ensure that PHEV light commercial vehicles are not driven out of the market. The range metrics should reflect the inherent capability differences between passenger cars and light commercial vehicles (high energy / weight).

As Ford will be 100% BEV for passenger cars by 2030, Ford does not feel it appropriate to provide a recommended range threshold for passenger cars at 2030.

For light commercial vehicles Ford recommends a maximum range threshold of **50 km** WLTP EAER city from 2030.

These thresholds would ensure that there is an improved zero emission capability within the hybrid fleet, whilst still maintaining some technology choice for light commercial vehicle customers through the transition. In order to optimise commercial vehicle PHEV product to allow for a suitable payload, trade-off decisions on battery size /



weight, payload and range need to be taken. Ford believes that for light commercial vehicles, 50km range offers a sweet spot which optimises air quality needs reflecting city distances on the one side, whilst additionally providing a solution for fleet customer energy and uptime requirements. Mechanisms such as geofencing can also be implemented to ensure targeted zero-emission operation in critical areas.

(Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004)

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Ford does not believe that percentage journey time in electric operation sufficiently demonstrates zero emission capability or progressive thinking as the electric power from some vehicles that could meet this criteria can be derived from any source, including fossil fuel. This means that some technologies may meet the eligibility criteria in this mode that are always *low* emission but not *zero* emission. **(Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004)** The metric therefore doesn't meet the spirit of the intended ICE phase-out. In addition, this metric would add complexity to existing test-processes and administrative procedures as the metric does not currently exist in type-approval and is non-transparent.



(Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004)

Q3 - WHAT OTHER REQUIREMENTS COULD BE INTRODUCED, IF ANY, TO MAXIMISE ZERO EMISSION CAPABILITY?

Sales of new vehicles beyond 2030 should be PHEV, BEV or hydrogen fuel cell. FHEVs or mHEVs do not meet any criteria for significant zero emission capability as they are fully fossil fuel reliant. It is however still possible to maximise zero emission capability and optimise charging behaviour for PHEV through mechanisms such as geofencing, increased infrastructure access, pricing signals and consumer education.

Q4 – WHAT WOULD THE IMPACT BE ON DIFFERENT SECTORS OF INDUSTRY AND SOCIETY IN SETTING AN SZEC (SIGNIFICANT ZERO EMISSION CAPABILITY) REQUIREMENT, USING EVIDENCE WHERE POSSIBLE?

A smooth transition for the automotive industry and society will be only achievable in practice if it is accompanied by ambitious charging infrastructure deployment objectives to serve both public and business users. To reach the UK goals, we need a rapid rollout of a dense, easy-to-use and clean infrastructure network in UK. There needs to be a clear signal to consumers that the number of public chargers will increase in line with the market uptake of electrically-chargeable cars in the future, and simultaneously signalling an increased renewable energy share. Furthermore, it must be as easy to charge an electric car as it is to fuel a petrol one. Having sufficient and convenient charging infrastructure is key towards consumer confidence and uptake of electric cars. With increasing EV uptake, drivers without access to private charging infrastructure, especially in urban areas, will need to move to battery electric vehicles. This will increase the demand for urban public charging infrastructure. There is also a need for stronger focus on workplace and home charging development and funding.



Government should be taking the lead to implement an infrastructure roll-out plan, and not solely relying on private investment and market forces. For example, the EU Green Deal proposal assumes a binding target for public chargers for their member states and recommends 1 kW installed capacity per EV. Although the framework of including binding targets is laudable, Ford and ACEA believe that 1kW per EV is insufficient as 60% of electricity is expected to be charged publicly by 2030. We encourage the UK to target at least 2 kW per EV to ensure meeting governmental goals and maintaining global UK leadership.




	2025	2030
	1 kW publicly installed charging capacity/registered BEV and 0,66kW/ registered PHEV	
	<p>Every 60 km on main routes one charge park with a total capacity of 300 kW (min 150 kW per CP).</p> <p>Every petrol station with >12 pumps must be equipped with at least one recharging point with a minimum capacity of 150kW</p>	<p>Increase of total capacity to 600 kW</p> <p>Every petrol station with >8 pumps must be equipped with at least one recharging point with a minimum capacity of 150kW</p>
	<p>Every 60 km on main routes one charge park with a total capacity of 1400 kW (min 350 kW per CP)</p>	<p>Increase of total capacity to 3500 kW (min. 2 chargers à 350 kW)</p>

Figure 6: EU Green Deal Infrastructure Commitments

Smart charging capabilities

According to the EU Alternative Fuel Infrastructure Regulation draft, all recharging points at which vehicles are typically parked for a longer period should support smart recharging. Communication standards aim to achieve full interoperability between different actors in the charging eco system. UK smart charging regulations and standards should be consistent with EU legislation to ensure full interoperability across Europe.

Light Commercial vehicle infrastructure

Electrified transport of goods is an important contribution to the UK's climate targets. Light commercial vehicles are dependent on the availability of a precisely tailored charging infrastructure, given the special demands relating to the amount of cargo space, increased parking space requirements and availability of DC / fast charging. Furthermore, a



significant number of vans will need to be charged close to the drivers' homes, which generally do not have a charging connection. This use case is especially relevant for vehicles deployed in the craft trades, making visits to customers, the service sector and in deliveries. For these use cases, no adequate solutions or suitable promotional programs have been established.

In addition, total cost of ownership is crucial for fleet managers, and subsequently fleets commonly purchase the smallest possible battery to suit their business needs. This means that a wider usable battery energy range is utilised compared to passenger cars, with increased frequency of overnight and fast charging. Appropriate fast / DC charging infrastructure is needed to support light commercial vehicle uptime.

Finally, hydrogen is fast becoming a sought-after solution for commercial vehicle applications where BEVs are not suitable, and therefore the infrastructure surrounding future hydrogen roll-out needs to be matched appropriately to support the development of this technology for commercial fleets.



4.2 New Regulation for Cars and Vans

Q5 - DO YOU HAVE ANY COMMENTS REGARDING OPTION 1, TO REPLICATE THE CURRENT REGULATORY FRAMEWORK, ALBEIT WITH STRENGTHENED TARGETS, TO MEET OUR WIDER CARBON REDUCTION TARGETS AND PHASE OUT DATES?

Q6 - DO YOU HAVE ANY COMMENTS REGARDING OPTION 2, TO INTRODUCE A ZEV MANDATE OR SALES TARGET ALONGSIDE A CO₂ REGULATION?

Q7 - DO YOU HAVE ANY VIEWS ON THE GOVERNMENT'S INITIAL PREFERENCE FOR THE REGULATORY APPROACH SET OUT IN OPTION 2?

Ford can support a regulatory regime based on *Option 1: CO₂ targets* if the UK matches EU CO₂ glidepath (55% (cars) and 50% (vans) at 2030). Although the UK is a significant market for new cars and vans, vehicle manufacturers' production volumes are geared for Europe as a whole. Any divergence in market requirements between the UK and the EU27, including placing the steering on the right-hand side of the vehicle, adds cost and will further limit the range of product choice for the UK consumer (**Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004**) The new EU Fit for 55 agreement supports the agreed Paris agreement and provides an ambitious glidepath to 2035.

It is essential to ensure that the necessary infrastructure aligns to the new targets, and the infrastructure roll-out should be developed without the need for a ZEV mandate. UK Government should set out clear targets for public infrastructure development. All technology options including highly efficient combustion engines, hybrids, battery electric and hydrogen vehicles must play a role in the phase out until 2030, and it should be recognised that passenger cars and light commercial vehicles will inherently take a different glidepath due to the product use cases.

Robust CO₂ fleet targets naturally drive the transition to zero emission technology and increased ZEV uptake, as stringent targets cannot be met without significant proportion of zero emission vehicles within the fleet. The end-of-sale ambition effectively establishes a ZEV mandate of 100% by 2035, and the automotive industry is already making public commitments to their own phase-out strategies and investments in transforming production processes and facilities (e.g. Ford 100% BEV for passenger cars by 2030). With the existing CO₂ regulations, it will be necessary to offset any higher emitting vehicles with a certain percentage of zero emission sales. This methodology allows industry to transition in the least disruptive and most flexible way, ensuring continued fleet renewal.



Consistent Government messaging and market signals around low and zero carbon technologies are critical success factors in driving up EV take-up. The Government's approach to diesel, for example, resulted in a low-CO2 technology being almost blacklisted, resulting in a significant rise in CO2 emissions between 2016 and 2019 even without any dirigiste regulatory measures.

Ford has significant concerns about the government's preference for *Option 2: ZEV Mandate combined with CO2 targets*. A more suitable approach is to improve customer demand and infrastructure along with appropriate CO2 targets (aligned to the EU) to drive zero emission technology. ZEV mandates may be suitable in markets where ZEV offerings are not yet sufficient, or where the industrial partners are unwilling, but this is not the situation in UK. The CO2 fleet regulation is more than sufficient to drive ZEV uptake as UK (and EU) 2021 targets have demonstrated, and therefore ZEV mandates in a mature market such as the UK are unnecessary, leading to administrative burden and double regulation without added value. Given that any changes in regime should not commence before 2025, annual ZEV mandates could prove extremely challenging to manage during the intervening years, removing flexibility for manufacturers to manage the transition to 2030 suitably for their business.

Given the wide selection of electrified product already on the UK market, incentivising demand should be a key priority for Government through this process, including infrastructure, incentives, customer awareness and education. Ford's US experience has demonstrated that the key driver for ZEV sales is not the ZEV mandate, but instead effective supporting market conditions. While the industry continues to drive down the battery cell costs, monetary incentives for consumers will provide the immediate assistance to eliminate cost barriers to EVs until there is a natural inflection point for customers to purchase ZEVs. This in addition to the right customer awareness and infrastructure availability will act as the key driver for consumer switch to zero emission technology. North America has ZEV mandates in 12 states, but has seen a significant increase in ZEV market demand in areas where there is effective infrastructure and incentives (California) – supporting this view. Additionally, if we look across Europe at where the ZEV market is thriving, it is being driven by factors such as strong retail incentives, without the need for a ZEV mandate.

From Ford's experience of ZEV mandates globally, it is clear that ZEV mandates do not ensure customer demand and are likely to lead to market failure. Forcing manufacturers to sell prescribed quotas of BEVs can be doubly damaging: firstly because, in the anticipated absence of incentives, they will have to sell these expensive-technology vehicles at a loss, and secondly because the vehicles will have to be heavily discounted in order to buy a product that consumers do not necessarily want. This effect has been observed in North America where BEVs are often registered by dealers in order to meet ZEV mandate requirements, resulting a low eventual transaction price and selling them at a significant loss. These discounts will also reduce residual values of BEVs and therefore increase the Total Cost of Ownership of other BEV owners – not a politically desirable effect.



It should be noted that the California ZEV mandate had a fitful start and targets have been revised eight times to better align with market demand and to preserve the program. The California Air Resources Board recognised more had to be done by way of market support and embarked on an ambitious set of supporting actions including public education (e.g. Veloz), infrastructure development (e.g. California Electric Transportation Coalition), and significant incentives in the form of rebates and credits from Federal and State Government and from public utilities. A Ford Mach-E attracts \$11,000 in consumer incentives in California while in the UK it attracts zero incentives.

Within the consultation, the UK Government has highlighted some areas of risk based on a CO2 only approach. Ford has provided comments on these risks:

1. WLTP shortcomings: WLTP regulation was developed successfully with input from many stakeholders through UNECE, including the UK Department for Transport, to decrease the gap between real-world and type-approval test procedures. Although it is widely understood that a laboratory test procedure cannot cover customer behaviour under all scenarios, Ford believes that WLTP is the right representation for regulatory purposes and provides a basis on which to set wider frameworks. It is possible to set the CO2 targets in line with WLTP to ensure the transition to zero emissions.

While the green paper describes some concerns about WLTP CO2, today the test cycle is far better than its predecessor and will continue to improve with further updates (Act 3 is imminent). In fact, the DG GROW 21-22 work plan shows that it will arrive at the EU TCMV Dec 2021 and a significant portion of the world is already or is beginning to use this process UNR 154 (the large teams of engineers working in these regulatory discussions are addressing the concerns raised in the green paper). Closing further the gap between WLTP and real-world CO2 will happen, and harmonisation bringing everyone along is more efficient than the potential for divergent UK standards. The WLTP process will see many updates during the period running up to 2030, due to a databased feedback loop from the various CO2 monitoring programs.

2. Lack of reference numbers for private sector investment in infrastructure: Without a functioning vehicle charging network, mainstream customers simply cannot adopt BEV technology. It is critical that infrastructure development is rolled out ahead of the supply, and therefore using the ZEV sales estimates as a target and relying on private investment for infrastructure roll-out is not the right approach. Government should take responsibility for the growth of the public and private charging infrastructure, much as it has done historically for the growth of almost all UK infrastructure. Taking an illiberal market approach towards the sale of ZEVs in order to create a liberal market in infrastructure growth is both divisive and contradictory.



If Government solely relies on private infrastructure, this can only lead to complexity and a high pricing structure, with certain income groups being unable to afford to use the network, and potentially fewer accessible stations and interoperability issues. The automotive industry is investing large sums in the electrification transition, and it must receive proportionate support via Government commitments to infrastructure targets for the transition to be a success.

Another critical factor to achieve profitable electric vehicle growth is to scale up battery and cell production – here, it is noted, UK Government's commitment to battery gigafactory investment is overshadowed by those of France and Germany in terms of investment.

3. Rewarding improvements in petrol / diesel risks slowing down ZEV deployment: Despite the cost for OEMs to invest in new technology, industry is rapidly committing to the development of and transition to zero emission technology. Ford, in particular has committed to 100% BEV technology for passenger cars by 2030, and many other manufacturers have made similar commitments whilst growing their ZEV product portfolio. Petrol and diesel are a slowing technology, and the long-term potential of ICE products is diminishing in the UK and EU. EURO 7 updates are already pushing the limits of known ICE technology causing increased costs and reduced attributes for ICEs, and it is likely that updates to EURO 7 will be largely the final major ICE updates for manufacturers.

Q8 - ARE THERE ALTERNATIVE APPROACHES THAT COULD DELIVER ON THE GOVERNMENT'S CARBON BUDGET AND 2030/2035 COMMITMENTS?

The existing system of fleet-wide CO₂ targets has been proven to work. The targets are expected to increase in stringency as we head towards 2035.

Q9 - DO YOU HAVE ANY VIEWS ON HOW EITHER, OR BOTH, OF THE OPTIONS COULD BE IMPLEMENTED?

Ford supports Option 1. Matching the EU CO₂ glidepath should be straightforward to implement. Ford does not support Option 2.

Q10 - DO YOU HAVE ANY FURTHER COMMENTS OR EVIDENCE WHICH COULD INFORM THE DEVELOPMENT OF THE NEW FRAMEWORK?

Ford does not support a new framework for the reasons given above.



4.3 Additional Issues for Consideration

4.3.1 Stringency of CO2 Targets

Q11 - IF DEPLOYING A COMBINED ZEV MANDATE AND CO2 REGULATORY FRAMEWORK, HOW SHOULD THE CO2 ELEMENT BE SET?

Ford does not support a ZEV mandate in any shape or form. Ford does support continuation of a CO2 regulatory framework if aligned to EU.

Q12 - SHOULD THE FOCUS BE ON DELIVERING THE LARGEST POSSIBLE CO2 SAVINGS, OR THE QUICKEST POSSIBLE SWITCH TO ZERO EMISSION MOBILITY?

Largest possible CO2 savings should be the focus leading up to 2030 through appropriate technology choice. Manufacturers are already eagerly switching to zero emission portfolios, and at 2030 ICE will be phased out for cars and vans. Allowing a CO2 driven approach will deliver a result that meets the Government's ambitions, whilst allowing as smooth a transition as possible for manufacturers who can more flexibly manage their fleet renewal strategies.

Q13 - HOW DO WE ENSURE THAT THE TARGET ALLOWS FOR SUFFICIENT SUPPLY OF LOW AND ZERO EMISSION VEHICLES; SUPPORTS INVESTMENT IN THE UK; AND DELIVERS OUR CARBON REDUCTION COMMITMENTS?

The UK market is already well-supplied with low emission vehicles, sales of ZEV are only trending upwards and manufacturers have made public commitments around the electrification of their passenger cars and vans. Further stringent CO2 targets (without a ZEV mandate) will naturally drive greater ZEV penetration which will be required to offset emissions of those model lines that have not yet made the ZEV transition.



4.3.2 Credit Levels

Q15 - SHOULD CREDITS BE AWARDED TO VEHICLES THAT MEET THE SZEC DEFINITION?

Credits should be awarded to ZEVs. Partial credits should be awarded to PHEVs. No credits should be awarded to HEVs.

Q16 - IF SO, SHOULD THIS BE A FIXED NUMBER OF CREDITS, OR SHOULD THERE BE A SLIDING SCALE THAT RECOGNISES THE DIFFERENCE IN CO₂ EFFICIENCY OF VARIOUS SZEC COMPLIANT VEHICLES?

Fixed credits. If a PHEV meets the SZEC criteria, it can be awarded partial credits. A ZEV should receive full credits. HEVs do not meet any sensible SZEC criteria and cannot be considered as a post-2030 transitional technology within the UK.

4.3.3 Credit Banking and Trading

Q17 - SHOULD CREDIT BANKING AND TRADING THIS BE CONSIDERED WITHIN THE NEW FRAMEWORK?

Time-limited credit banking should be considered to help with the peaks and troughs of model product cycles.

Q18 - IF SO, OVER WHAT TIMEFRAME SHOULD THEY REMAIN USABLE AND SHOULD CREDITS AND DEBITS BE TREATED THE SAME OR DIFFERENTLY?

They should be valid for the timeframe of regulation.

Q19 - WITHIN THE TRADING ELEMENT OF THE NEW SCHEME, SHOULD THERE BE LIMITS ON THE NUMBER OF CERTIFICATES/GRAMS OF CO₂ THAT CAN BE BOUGHT OR SOLD?

No, the market should be allowed to operate freely. Manufacturers who make earlier electrification investments should be permitted to recoup some of their costs through the sale of CO₂ credits.

Q20 - SHOULD SUCH A MARKET COVER THE WHOLE OF ROAD TRANSPORT OR SHOULD THERE BE SOME CONSTRAINTS IMPOSED ON TRADING ACROSS MANUFACTURING SECTORS (E.G. CARS AND HEAVY DUTY VEHICLES)?



Market should cover all vehicles with same CO2 test cycles/procedures and allow trading in-between.

4.3.4 Levels of Fines for Non-Compliance

Q21 - HOW, AND AT WHAT LEVEL, SHOULD FINES BE SET IN THE NEW UK REGULATORY FRAMEWORK AND SHOULD THIS VARY FOR DIFFERENT VEHICLE TYPES?

It should be set at a similar level as the current EU regulation.

4.3.6 Real-World Emissions

Q22 - WOULD THERE BE BENEFITS IN SEEKING TO ENSURE ANY CO2 TARGETS IN THE NEW UK REGULATORY FRAMEWORK TAKE INTO ACCOUNT REAL-WORLD EMISSIONS DATA ALONGSIDE THE LAB-TESTED WLTP CO2 EMISSIONS FIGURES? IF SO, HOW MIGHT THE TWO BE LINKED?

WLTP regulation was developed successfully with input from many stakeholders through UNECE including UK Department for Transport to decrease the gap between real-world and type-approval test procedures. Since the initial publication, the procedure has been improved through various amendments in order to further improve upon the realworld representation of the WLTP process. Although it is widely understood that a laboratory test procedure cannot cover customer behaviour under all scenarios, Ford believes that WLTP is an excellent representation for regulatory purposes, and provides a basis on which to set wider frameworks. With the introduction of EURO 7 legislation, the limits of the known ICE engine and transmission technology will be significantly challenged, and much wider boundary conditions and monitoring will ensure compliance and consistency with real-world performance.

Real-world CO2 data is being taken into account under the OBFCM requirements that all UK (LDV carbon fuel utilising) vehicles are built with. The EUs OBFCM regulation has created a data-based feedback loop for the WLTP CO2 process to evolve, so there will be updates under WLTP regulation that close further any gaps between WLTP and real-world usage. The UK can harmonise with this to resolve the concerns raised in the green paper.

Harmonisation is advised for strong reasons: the EU data pool creates a far larger data set yielding more accurate fleet representations than the UK market could create, and there is no need for the UK to finance its own data collection. In addition, improvements to WLTP process are continuing through UNECE working groups, and PHEVs include a Utility-Factor assumption which can be adjusted as required.



5. Extending the Framework to All Road Vehicles

5.1 Heavy Duty Vehicles (HDV)

Ford has interest in this area: we are mainly light duty but we have a range of heavy duty products from the lowest to the highest ends of the heavy duty vehicle sector. Ford does not support a ZEV mandate for heavy-duty vehicles and a ZEV mandate would not work if there is no well-established CO2 framework.

BEV is difficult for HDV heavy goods carrying vehicles, virtually all commercial usages due to battery energy density and payload conundrum (large batteries results in minimal payload or need multiple BEV N3s to do the work of one of today's HDVs). There needs to be a technology revolution in battery energy density and charging times for HDV if it is to be viable.

Hydrogen Fuel Cell is a promising long-term technology (zero emission) with low downtime (fuelling) but requires support to enable e.g. H2 storage, thermoplastic rather than thermoset, transport, (a hydrogen infrastructure across the UK). There are technological challenges to make these vehicles last longer, e.g. catalyst durability (suggest work with UK catalyst industry (**Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004**)).

Hydrogen ICE: do not dismiss this vehicle type especially in the HDV area. NOx and NH3 are the only potential emission issues (far less criteria emissions than fossil fuel combustion). With hydrogen already onboard you have a powerful reductant available for SCR NOx reduction, and you can use efficient flow-through catalysts as you have no filter requirement (no soot). N3 HDV can use vanadium SCR: this SCR can see no NH3 make limitation, ammox catalysts also exist to treat any NH3. There is a way to make a traditional HDV hydrogen ICE virtually emissions free (HDV are also speed limited easier to emissions calibrate vehicles). There is also a more complicated ICE route, HCCI low temperature combustion, meaning no NOx. I.e. there is a Hydrogen ICE route to zero emissions if the right research/development is channelled.

Problem with Hydrogen: CO2 emissions during production (WTW emissions are good but likely a bit worse than BEV). This issue is not though insurmountable as within the 10 point plan there is a green hydrogen plan. Green renewable energy can be supplied by electrolysis of sea or fresh water to make Hydrogen without CO2 emissions. If this green energy supply is limited, we would recommend channelling to the most difficult HDV users: N3 is most efficient.

Catenary Vehicles: Investment in research here is of low value add to the UK and not on the same level as fuel cell, hydrogen or battery technology research that will produce global benefits for all vehicle types. Catenary overhead power to the UKs roads ((**Redacted – Regulation 12(5)(e) of the Environmental Information Regulations 2004**)) is



not an appropriate investment or sustainable solution. Overhead electrification was removed from the UK's cities in the 1960s and this vehicle type was consigned to transport museums. Please see Sandtoft Trolley Bus Museum (interestingly next to the M180). This type of infrastructure for the UK's roads means significant infrastructure embedded CO₂. There will never be electric supply everywhere for this large vehicle type (as it would require mass demolition of roadside houses), meaning the vehicles will always also have to have the inefficiency of additional large batteries to move when not connected.

5.1 L-Category

Q26 - SHOULD THE PREFERRED REGULATORY APPROACH BE EXTENDED TO ALL L-CATEGORY VEHICLES OR SHOULD THE DIVERSITY OF THE SECTOR (MOTORBIKES, MOPEDS, MOTORISED TRICYCLES, QUADBIKES, MOTORISED QUADRICYCLES ETC) NECESSITATE DIFFERENT APPROACHES?

Policy should be balanced in all areas. As a sector, L-category vehicles emit less, but are not zero emission and should be included in the transition. The final 2035 zero emissions target should be the same.