Lifecycle emissions and vehicle CO2 standards

Why an LCA approach is not feasible or necessary as part of the current review of the EU car & van CO2 standards

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Introduction

The latest discussions on the review of the EU car and van CO2 standards in both the Council and European Parliament have seen several stakeholders calling for the current tailpipe emissions approach (which sets CO2 target compliance against emissions measured from the vehicle exhaust) to be replaced with a lifecycle (LCA) one (which aims to count all emissions connected to the vehicle). There is a particularly strong push from the oil, gas, and some auto supplier industries to include fuels into the scope of the regulation. They claim this would be the first step in moving towards an LCA approach. This short note provides arguments and evidence on why this would not be feasible or desirable.

INFO BOX: Know your vehicle emissions jargon

Well-to-tank (WtT): covers upstream or indirect emissions from the production, processing and delivery of the fuel (to the vehicle tank).

Tank to wheel (TtW)/tailpipe: covers the use of fuel in the vehicle and emissions during driving (from the tailpipe).

Well-to-wheel: the combination of both WtT and TtW stages.

Lifecycle analysis (LCA): covers all emissions and forms of environmental impact arising from raw material extraction to production, assembly and the usage phase of the vehicle, through to recycling of the materials.

1. There is no harmonised EU methodology or testing method to move the regulation to the life-cycle approach

Any law that requires compliance from the industry must be enforced in a robust, consistent, verifiable and comparable manner. In the case of auto manufacturers' compliance with the EU car and van CO2 standards regulation, this is done by test cycles such as WLTP (Worldwide Harmonised Light Vehicles Test Procedure), which measures a vehicle's fuel consumption and CO2 emissions. A similar harmonised EU method does not exist either for calculating vehicle lifecycle emissions or even well-to-wheel emissions (LCA minus end-of-life emissions).

The debate on moving to an LCA approach is not new, and was discussed in detail during the previous review of the car and van CO2 regulation in 2017/18. Back then the legislators tasked the Commission to carry out an analysis of a potential lifecycle methodology and the feasibility of its use for regulatory purposes (Art 7(10), Regulation 2019-631). Such an analysis was done in 2019-2020, with an extensive report by Ricardo published in July 2020. The comprehensive report shows battery electric cars to have the lowest lifecycle emissions of all powertrains assessed. However, the work has not led to the development of a harmonised LCA methodology, with the authors concluding:

> *In summary, developing a comprehensive vehicle policy LCA is a highly complex and time-consuming process, requiring a vast amount of data, the necessary utilisation of a range of key assumptions and standard datasets which can have a profound impact on the results, and a range of methodological decisions – some of which do not currently have good agreement across all major stakeholder groups.*

Due to the inherent variability of LCA analyses, it is not possible to use an LCA methodology in regulations covering one specific sector, e.g. vehicle CO2 standards. LCA studies can help identify where emissions occur and which hotspots should be prioritised, but they include actors as varied as individuals charging or fueling their cars, power companies, Chinese battery makers, EU carmakers, and myriad global small component businesses. There is no way a single vehicle LCA regulation could properly account for and verify all those actors, all at once, in a straight-forward, feasible and enforceable manner.

Despite this, LCAs are a good tool to assess different policy options, to compare technologies and understand trends and emission hotspots. Independent lifecycle analyses to date have repeatedly found battery electric cars to have the lowest lifecycle impacts out of all other technologies; these include studies from ICCT, Ricardo, and T&E.

2. Reducing lifecycle emissions of a vehicle is best achieved via a set of targeted laws, rather than placing entire economy-wide operations into one car regulation

Major lifecycle stages of a vehicle's climate impact, such as fuel supply or electricity production, are the responsibility of many economic actors other than carmakers. Oil suppliers, energy producers, battery manufacturers, recyclers, etc. all have to take responsibility for improving their processes and the carbon footprint of their products. Making carmakers responsible for those processes will result in an unenforceable and complex regulation that will fail to achieve its purpose. On the other hand, targeted laws governing many of the lifecycle stages of a vehicle already exist (or will do so soon) in the EU acquis:

- The Renewable Energy (RED) and Fuel Quality (FQD) Directives regulate fuel suppliers and what fuels they are placing on the market. RED covers synthetic and renewable fuels, biofuels and other alternative fuel sources, while FQD reduces the carbon footprint of conventional fossil diesel & petrol.
- The EU Emissions Trading System (ETS) regulates emissions from electricity production and generation, a sector which has reduced its emissions substantially thanks to the fast growth of renewables.
- The lifecycle of batteries, including extraction of metals, production of battery cells, and re-use and recycling at the end of life, will be regulated in the about to be finalised new EU Battery Regulation.

Moving the vehicle CO2 regulations towards (a non existent) lifecycle or well-to-wheel methodology will therefore dilute and duplicate these regulations that are better placed to regulate the relevant industries and align with their specificities.

3. Adding credits for advanced and synthetic fuels into the vehicle CO2 regulations will create an unenforceable law because carmakers do not control where and how their cars are fueled

In fact, the oil and supplier industries appear to agree that moving the EU vehicle CO2 regulations to a lifecycle methodology is infeasible. Instead - as "a first step" (so they claim) - lobbying has turned towards including the benefits of alternative fuels (synthetic fuels - or e-fuels - are produced by combining hydrogen and carbon in order to create a hydrocarbon, like petrol or diesel), notably CO2 credits for synthetic petrol and diesel to count towards carmaker CO2 targets.

Including e-fuel credits into the car CO_2 regulation cannot be justified from a regulatory perspective. Carmakers cannot guarantee how their cars are used or fueled after they have left the showroom: a vehicle engine that can run on e-petrol will also be able to use fossil petrol and carmakers do not have direct control over the choices of drivers, nor fuel suppliers' production processes. The very credibility of

the car CO_2 regulation could be undermined as car manufacturers could buy their way into compliance without making any improvements to vehicle efficiency. Based on the amount of credits bought, a certain number of conventional cars on the road would be considered zero emission in their eyes of the regulation. The vehicle regulation should only regulate what carmakers have control over, i.e. powertrains.

4. E-fuels are a costly, inefficient and unnecessary detour away from zero emissions technologies

Even if the administrative credibility of the vehicle CO2 standards could be assured, T&E has shown why producing and using synthetic fuels for cars is not a credible idea from an environmental, cost, or efficiency perspective.

From an environmental point of view, cars powered by e-fuels actually emit much more CO_2 (38-46% more) over their lifetime compared to a BEV. Given that direct electrification is up to 5 times more efficiency that turning renewables into synthetic fuels, the climate advantage of battery electric vehicles is due to the much lower overall electricity consumption (5 times less). This means BEVs can perform better than e-petrol/e-diesel cars even when the carbon intensity of the electricity used to charge the car is higher than the one used to produce the fuel. E-fuels also fail the test on improving air quality, with tests showing cars powered by e-petrol emit as much NOx as fossil petrol, alongside ammonia, carbon monoxide and other pollutants.

The very high cost of producing these fuels would place a significant cost burden on the average European driver. For both new and second hand cars in 2030, the TCO (total cost of ownership) premium for running a car on e-petrol compared to a BEV is €10,000, or 43% more expensive, for an average driver. Critically too, the TCO of running an existing petrol car on e-fuels would still be 10% higher than buying a new battery electric car. This shows why e-fuels are not a solution for the existing fleet - or those that "cannot afford to buy an electric car" as the e-fuel proponents claim - simply because they would be unaffordable and place an even greater cost burden on consumers just as battery electric cars are getting cheaper.

Compliance with the regulation using e-fuels would also cost carmakers around €10,000 in fuel credits for the amount of synthetic petrol needed to compensate for the emissions of an efficient petrol car placed on the market in 2030 (whilst the cost of a BEV battery could drop to as low as €3,000). The e-fuel route would therefore put the competitiveness of the European automotive industry at risk as it would divert investments away from the transition to emobility.

Finally, e-fuels are not yet available - while over a million of battery electric cars were sold in 2021 in Europe alone. The volumes of synthetic fuels on the market are expected to be very limited until after 2030. Given the urgency of decarbonising road transport, we simply cannot afford to wait while a truly zero emission alternative - batteries - already exists. Europe does in fact need renewable e-fuels, but for

sectors that have no other alternatives to decarbonise today – shipping, aviation, heavy industry. It will be important to reserve limited amounts for these uses, and not waste them on a sector for which a viable, scalable and affordable alternative already exists.

Conclusion

While regulating vehicle's emissions in a holistic way over its entire lifetime might seem like an attractive proposition, once you scratch the surface of what this would mean from a regulatory and administrative perspective, changing the current tailpipe approach to an LCA, or indeed expanding it to a fuels/well-to-wheel approach, would result in an unenforceable regulation, replete with loopholes.

Not only that, but doing so does not make sense from an environmental, cost, or efficiency perspective. The car CO2 standards regulation should only regulate what carmakers have control over, i.e. powertrains, leaving other lifecycle stages and emission hotspots to be regulated in other sectoral or production legislation.

Despite this, LCA analyses remain a helpful tool for us to understand trends and emission hotspots, and to assess and compare different technologies. LCA should be used for reporting and technology assessments, but is not a viable approach to base a sectoral regulation on. Battery electric vehicles already have the lowest LCA emissions compared to alternatives, so the current vehicle CO2 regulations are right to promote their deployment.

Further information

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