How to prevent an e-fuels loophole undermining the EU car CO_2 law

T&E position paper on the registration of e-fuel cars after 2035

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Summary

In 2022, a historic agreement was reached on ending sales of new polluting combustion engine cars by 2035 in the EU. In March this year, however, just before the final sign off by national governments in what had been considered a formality, the German government declared last-minute opposition. Backed by just three other countries (Italy, Bulgaria and Poland), the blocking minority demanded that sales of new cars with internal combustion engines (ICE) be allowed after 2035, if they run on e-fuels.

The basis of this opposition was the inclusion of a non-binding recital (Recital 11) in the new car CO_2 standards regulation that asks the Commission to propose a role for e-fuels - or CO_2 neutral fuels - in vehicles that are outside the scope of the regulation. An agreement was eventually found and the Commission agreed to make a proposal that would allow cars running only on climate neutral fuels to be registered under vehicle type approval rules, before setting out how these rules would be aligned with the car CO_2 standards.

Why using e-fuels in cars is a bad idea

T&E has previously set out why using synthetic e-fuels in cars is a bad idea (see both here and here) from both an environmental and economic perspective. Because **producing e-fuels is such an energy intensive process, running a car on synthetic petrol is close to five times less efficient than powering a BEV through direct electrification**. The overall efficiency of the direct electrification pathway is 77% whereas it is 16% for petrol cars powered with synthetic fuels, meaning over four fifths of the energy is lost along the way. This is an enormous waste of renewable energy, which is still a scarce resource and needed to decarbonise the rest of the economy.

Wasting limited e-fuels in new cars - the objective of the forthcoming provisions - will not only **undermine efforts to decarbonise sectors that cannot rely on direct electrification such as**

shipping and aviation, but will **also thwart efforts to clean up cars already on the road**. Carbon-neutral fuels can be a limited contributor to the task of decarbonising the existing fleet. However, using them in new car registrations would actually increase emissions as there would be less or no e-petrol to decarbonise the existing car stock. It would result in an additional 135 billion litres of fossil petrol being burned between 2030 and 2050 that could have been saved if e-petrol was used exclusively in the existing fleet, resulting in an extra 320 $MtCO_2e$ emissions by 2050.

Switching from importing conventional to synthetic fuels **risks continuing Europe's dependency on autocratic regimes, as with today's oil**. Carving out a loophole for e-fuels in cars also **risks creating a Trojan Horse for continued use of fossil fuels and unsustainable biofuel use.** As e-fuels are chemically similar to fossil and biofuels, both could still be used in e-fuel cars. As e-fuels will be much more expensive there would be a strong incentive for drivers to tamper and use regular fuel. Neither carmakers nor regulators can guarantee or control how cars are fueled over their lifetime.

How to prevent e-fuels undermining the car CO_2 standards

Crucially, if e-fuels are to be allowed to make a contribution towards Europe's zero emission cars goal, they have to demonstrate the necessary climate credentials. When burnt in petrol or diesel cars, synthetic fuels release similar amounts of CO_2 (and air pollution) as fossil fuel. It is only by reducing GHG in their production that can make them climate neutral, i.e. balance the CO_2 emitted in combustion with the CO_2 in their production. This means that the hydrogen used to produce these e-fuels must come from 100% renewable sources, while the carbon molecules necessary to turn the hydrogen into the fuel should be captured from air (Direct Air Capture - DAC). This means that only a car powered exclusively with e-fuel that delivers a 100% CO_2 reduction can be exempt from the 2035 deadline to comply with the derogation as agreed in March by the European Parliament and member states.

Although T&E remains opposed to any use of e-fuels in cars, with the Commission's stated aim to implement Recital 11 from the car CO_2 regulation, the following must be done to ensure the new rules are watertight and prevent the e-fuels loophole from undermining the EU car CO_2 law.

What fuels should be allowed and how the vehicles should be type approved

- **Only CO_2-neutral e-fuels or RFNBOs (Renewable Fuels of Non-Biological Origin) must be allowed under the scope.** Biofuels are not, and cannot be considered as, CO_2-neutral as none of the biofuels listed under the Renewable Energy Directive (Annex V) are able to deliver a 100% CO_2 reduction, delivering only an average reduction of 55-61%. Furthermore, advanced biofuels - those not derived from food and feed crops (which contribute to biodiversity loss, deforestation, and severe climate damage) are extremely limited and have competing uses. If all sustainable advanced biofuels were used in the aviation sector - which will rely heavily on fuels to decarbonise -, only 11% of EU's aviation needs by 2050 would be covered.

- **A new framework is needed to certify RFNBOs as carbon neutral.** RFNBOs as defined by current EU rules can not be considered CO_2-neutral. In the new RED methodology, RFNBOs require a 70% GHG emissions reduction compared to fossil fuel. Therefore, e-fuels placed on the market in Europe cannot currently be guaranteed to provide a 100% emissions reduction. To ensure e-fuels can be certified and guaranteed CO_2-neutral, new rules are needed to ensure that all of the electricity used in the full production process is both 100% generated from renewable energy sources and additional. The carbon used must also be from 100% direct air capture (DAC) to prevent any additional CO_2 being released into the atmosphere. This is not currently a requirement for RFNBOs.
- **Cars approved under the carbon neutral fuel car category must be exclusively fuelled by e-fuels and tested throughout their life.** Unlike changing powertrains, e-fuels and fossil fuels are hard to distinguish when in use - so it is critical to guarantee that the EU car CO_2 standards are not undermined through continuing use of fossil fuels in e-fuel approved cars. Every e-fuel approved car must be fitted with a sensor within the fuel tank which can determine if the vehicle is running exclusively on e-fuel certified as fully CO_2 neutral. This must be combined with inducement measures to prevent the vehicle's engine starting if the vehicle's tank is filled with the noncompliant fuel. The functioning of fuel monitors and inducement measures must be tested both at type-approval and throughout the entire lifetime of the vehicle via robust in-service conformity and market surveillance tests to prevent tampering and fraud.

How should e-fuels be counted towards EU Car CO_2 standards?

- **E-fuel cars should not be designated as zero-emission for the purposes of regulatory compliance.** Even if produced according to a CO_2-neutral pathway (100% additional renewable energy and direct air capture), when burned in an internal combustion engine, e-fuels still emit exactly the same CO_2 emissions as conventional fuels. In addition to CO_2, e-petrol and e-diesel also emit air pollutants, with tests showing that they emit as much toxic nitrogen oxides (NOx) as fossil fuel engines and much more carbon monoxide and ammonia, doing nothing to alleviate the air quality problems in our cities. So e-fuel type approved vehicles should not be allowed to have a ZEV denomination in certificates of conformity (CoC) for the purposes of EU vehicle standards, local emission rules or national taxation.
- **In line with Recital 11 of the new car CO_2 standards, e-fuel cars should be limited to niche applications outside the scope of the regulation.** The wording of Recital 11 states clearly that provisions for registering vehicles running on CO_2 should be "outside the scope of the fleet standards". According to EU regulation this includes only special purpose vehicles such as ambulances, mobile cranes and military vehicles and so-called small scale manufacturers that only register less than 1,000 units of cars or vans in the EU per year.

1. Introduction

1.1. Context

In October last year, EU negotiators on behalf of European governments and MEPs reached an agreement on new CO_2 standards for cars and vans. The deal made history as an agreement was reached on ending sales of new polluting combustion engine cars by 2035 - putting Europe on the path to becoming climate neutral by 2050.

However, despite having already agreed to the deal reached, the German government declared last-minute opposition, demanding that sales of new cars with internal combustion engines be allowed after 2035 if they run on e-fuels[1].

The basis of this opposition was the inclusion of a non-binding recital[2] that asks the Commission to propose a role for e-fuels - or CO_2 neutral fuels - in vehicles that are outside the scope of the regulation. The recital, which has no legal effect and would not apply until the new regulation had entered into force, was added following intense lobbying by the oil and gas industries. It became a key point of political contention as the German government asked for assurances from the European Commission on how they would make good on this request and ensure a role for combustion engine cars fuelled by e-fuels after 2035.

An agreement with Berlin was eventually found and the Commission agreed - outlined in an official statement - to make a proposal "without delay", allowing "E-Fuels-only vehicles" to be registered and sold in the EU. Under the agreement, **the Commission will first designate a new vehicle category for such cars as part of an implementing act within the existing Euro 6 type-approval rules**, and as a second step, present **a delegated act setting out how the sale of cars running exclusively on carbon neutral fuels will be aligned with the car CO_2 standards.**

Although the deal allowed the engine phase out to enter into law, by throwing the combustion engine an (albeit weak) lifeline, it raises serious questions about Europe's commitment to the industrial and climate transformation of its automotive sector.

What is at stake is not whether synthetic fuels will be a solution for decarbonising cars: they are not expected to be available in any meaningful quantities for cars and are an expensive and massively inefficient diversion from the transformation to electric.

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[1] E-fuels - or synthetic petrol and diesel - can be made by combining hydrogen and CO_2 to create a hydrocarbon. When the synthetic fuel is burned in engines it releases similar amounts of CO_2 and pollution as conventional fuel, however, provided Direct Air Capture technology is used to capture CO_2 from the air (not yet commercial), this can neutralise the CO_2 burnt and released (but not air pollutants like NOx).

[2] Recital 11: "Following consultation with stakeholders, the Commission will make a proposal for registering after 2035 vehicles running exclusively on CO_2 neutral fuels in conformity with Union law, outside the scope of the fleet standards, and in conformity with the Union's climate-neutrality objective."

However, what is at stake is the future of Europe's automotive industry and our wider industrial fabric. As China and the US continue to pour billions into winning the clean tech race – with battery supply chains at the heart of it – Europe risks losing precious time scrambling to accommodate a niche solution that will only be affordable for a small fraction of Porsche drivers. The 2035 ICE-phase out deadline gives certainty to industry and investors on the direction of travel of the world's largest market. By carving out a loophole for synthetic fuels, the EU risks undermining planning certainty for billion dollar industries as well as creating a Trojan horse for continued use of both fossil fuels and unsustainable biofuels.

This position paper has several aims:

- It first recalls and briefly outlines the reasons why using e-fuels in cars is a bad idea;
- It then sets out recommendations on the scope of the CO_2 neutral fuels that should (and should not) be considered under any new regulation;
- It then considers how to safeguard the integrity of the car CO_2 standards while still allowing e-fuels, including recommendations on the type approval requirements for such vehicles.

1.2. Why using e-fuels in cars is such a bad idea

It's a waste of precious and scarce renewable energy

Producing synthetic fuels is a very energy intensive process as you need to produce green hydrogen, capture carbon from the atmosphere and combine them to create a hydrocarbon. Because of this energy intensive process, **running a car on synthetic petrol is close to five times less efficient than powering a BEV through direct electrification**. The overall efficiency of the direct electrification pathway is 77% whereas it is 16% for petrol cars powered with synthetic fuels[3] (see Figure 1). That is an enormous waste of renewable energy, which is still a scarce resource and is needed to decarbonise the rest of the economy.

[3] https://www.transportenvironment.org/wp-content/uploads/2020/12/2020_12_Briefing_feasibility_study_renewables_decarbonisation.pdf

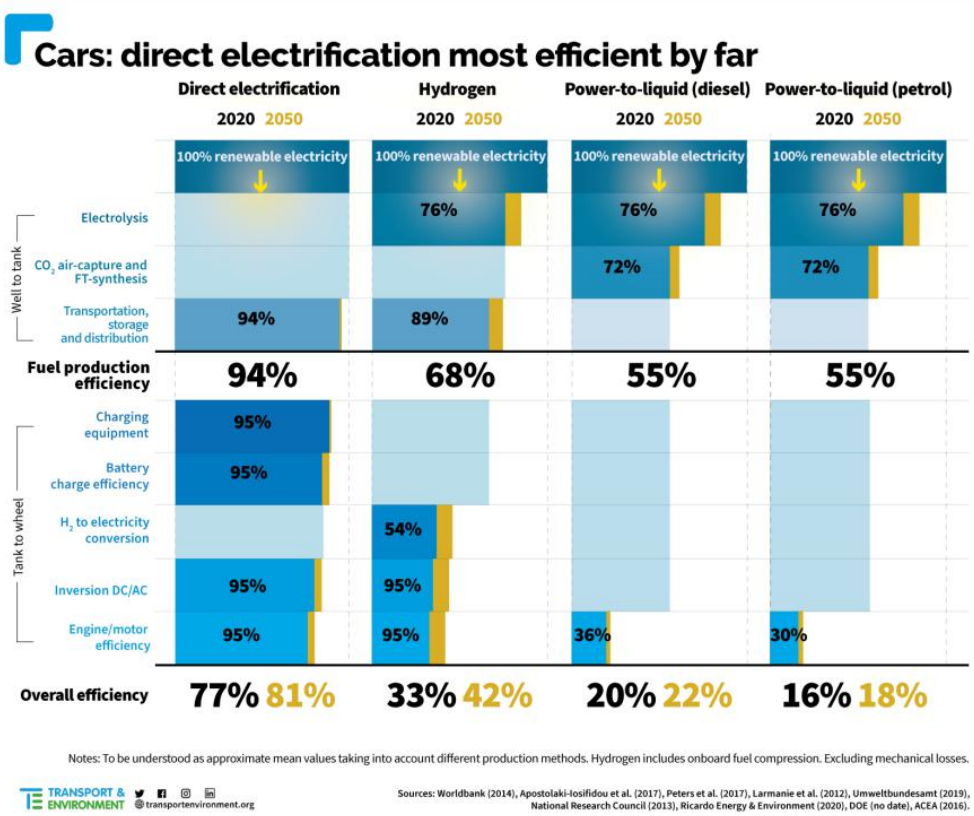

Figure 1: Conversion efficiencies of different technologies for cars

Even relatively small variations in the use of hydrogen and e-fuels can add up to large differences in terms of the renewable energy that will need to be produced. For example, if 100% of passenger cars were battery-electric, charging them would require 417 TWh in 2050 (just 15% compared to current total electricity demand). However, enabling only 10% hydrogen plus 10% of synthetic hydrocarbons in cars would push up demand to 598 TWh or a 43% increase[4]. With the whole economy relying on renewables, 'efficiency first' matters given the large impact it can have on the renewable electricity requirement. Therefore, using less renewables is also most optimal as regards cost-effectiveness towards the energy system.

Wasting e-fuels in new cars increases emissions in the existing car fleet

The current deal focuses solely on permitting the use of e-fuels in new car sales, neglecting the urgent need to decarbonise the existing fleet where carbon-neutral fuels can be an important - if not limited (see section above) - contributor. If e-petrol is used in cars already on the road, 0.3 $GtCO_2$ would be saved by 2050[5], with e-petrol covering about 61% of the remaining fuel consumption in the small remaining ICE fleet (about 42 million cars).

By promoting the use of e-petrol in new combustion engines instead - which would not provide any

[4] *Ibid*

[5] Cumulative savings over 2030-2050

additional CO_2 savings compared to a scenario where BEVs only are used to meet the 2035 target - an additional 135 billion litres of fossil petrol would be burned (corresponding to 0.3 $GtCO_2$) that could have been saved by using it in cars already on the road.

Rather, using these e-fuels in new cars looks like a golden opportunity for the oil and gas majors, as it will ensure the continued use of combustion cars and fossil fuels in the existing car fleet.

Limited e-fuels are better used in other sectors that really need them

The limited availability of scalable sustainable fuels means that there is no scope to use renewable electricity inefficiently for the production of e-fuels for road transport where other more efficient, cleaner and cheaper solutions are available. Promoting even a limited use of synthetic hydrocarbons in road transport now will divert the manufacturing and supply chains from being targeted at sectors such as aviation, maritime or the heavy industry. This makes the transition harder to accomplish and could seriously delay the decarbonisation of the economy sectors which cannot use batteries to decarbonise.

E-fuels risk repeating the mistakes of the past and creating a new fuel dependency for the EU

Producing a large quantity of e-fuel also requires a large quantity of green hydrogen (H_2) produced from renewables. Nevertheless, H_2 demand will be very high all over Europe to cover the needs of many sectors seeking to decarbonise. For example, H_2 is required in industrial sectors (chemicals, petrochemicals, steel), to produce fuels in hard-to-decarbonise transport sectors (e-kerosene for aviation and e-ammonia in shipping), and to support the decarbonisation of the heat sector (any process requiring heat generation as well as buildings). In a tight domestic production market[6], any additional hydrogen demand would likely have to be imported from non-EU countries.

Even before the additional demand that would come from using e-fuels in cars is taken into account, Germany will need to import 72% of its green hydrogen demand[7]. To meet this, Germany and Europe will have to import significant volumes of both e-fuels and hydrogen (needed to produce the e-fuel) from abroad. Middle-Eastern countries like Saudi Arabia are among the closest and most viable options, and in 2021 a memorandum of understanding was signed between Germany and Saudi Arabia, envisaging green hydrogen exports to Germany. Switching from importing conventional to synthetic fuels only risks continuing Europe's dependency on autocratic regimes, as with today's oil.

An opening for e-fuel cars can easily become a loophole for fossil fuels

E-fuels are chemically similar to conventional fossil fuels and can be blended into the regular fuel available at the pump. A vehicle hypothetically labelled as '100% e-fuel certified' that would be fueled with a blend of e-petrol and fossil petrol would clearly not achieve a 100% GHG emissions reduction and couldn't be considered as CO_2 neutral. There would be strong incentive for drivers to

[6] The REPowerEU plan targets 20 Mt hydrogen consumption with 10 Mt from domestic production and 10 Mt from imports. This suggests that the EU is not self-sustaining on green H_2 production.
[7] https://www.transportenvironment.org/wp-content/uploads/2023/03/2023_03_DE_e-fuel_paper.pdf

tamper due to the high potential cost savings as e-fuels will be much more expensive[8]. Indeed there needs to be a strong guarantee and control over how e-fuel certified cars are used or fueled over their lifetime (see section 3.1) - to prove that emissions have been reduced in the real world.

2. Which "CO_2-neutral" fuels should be allowed?

As part of the first step, outlined in their statement following the adoption of the cars CO_2 regulation, the Commission will submit an Implementing Regulation for type approvals of e-fuels-only vehicles, which will include a definition of CO_2-neutral fuels and what is included and, crucially, not included. A strict definition of CO_2-neutral fuels is a prerequisite for ensuring a water-tight regulation that does not go beyond the wording in, or intentions of, Recital 11.

2.1. Inclusion of biofuels and biomass fuels is a red line

2.1.1. Biofuels are not CO_2 neutral

The greenhouse gas (GHG) saving of biofuels and biomethane mainly depends on the feedstock used as well as the process involved. In the Annex V of the Renewable Energy Directive (RED), the EU lays out official values for the GHG emissions savings of liquid biofuels compared to their fossil fuel comparator. Out of the 35 biofuels and bioliquids compared, CO_2 savings range from 19% to 98%[9]. The average of the reduction values is around 60%. The 98% reduction corresponds to 'pure oil from waste cooking oil', which is available in limited supply and is subject to certification issues and fraudulent uses (see section 2.1.4 below).

Since none of these fuels reach 100% CO_2 reduction - which is the equivalent of being "CO_2 neutral"- biofuels and bioliquids cannot be considered CO_2 neutral under the EU definition and calculations.

2.1.2. The case of biogas from wet manure

Specifically looking at biomethane, which is sometimes claimed to be carbon neutral, Annex VI of the RED[10] considers three biomethane production systems: wet manure, maize whole plant and biowaste. GHG emission reductions range between 17% and 68% for maize biomethane, between

[8] https://www.transportenvironment.org/discover/over-e200-to-fill-up-a-car-the-cost-of-germanys-bid-to-keep-combustion-engines/

[9] The typical value and default value range from 32% to 98% and 19% to 98%. 'Typical value' means an estimate of the GHG emissions and GHG emissions savings for a particular biofuel, bioliquid or biomass fuel production pathway, which is representative of the Union consumption; 'default value' means a value derived from a typical value by the application of pre-determined factors and that may, in circumstances specified in this Directive, be used in place of an actual value.

[10] Annex VI covers biogas while Annex V focuses on biofuels

20% and 86% for biowaste, and between 72% and 206% for biomethane from wet manure - thus theoretically achieving a reduction superior to 100% in some cases[11].

Nonetheless there are 3 reasons why pure manure biomethane cannot and should not be considered a "CO_2 neutral" for cars.

Manure biomethane climate benefits are questionable if methane leaks are considered

According to the RED, the only pathway for biofuel or biogas which could claim to be CO_2 neutral would be pure wet manure produced during a specific production process (close digestate). However, the RED fails to take into account the high amount of methane leakage along the value chain.

An ICCT study shows that although the GHG intensity for manure biomethane in the report's central case is -30 g CO_2e/MJ, the uncertainty in upstream methane leakage (during the exploration, production, and transportation) can lead to a range of manure biomethane GHG intensities of -44 g CO_2e/MJ to 72 g CO_2e/MJ[12]. With a high leakage rate, manure biomethane only delivers a 20% emission savings compared to the 94 g CO_2/MJ fossil fuel comparator[13]. These numbers may underestimate methane leakage as the ICCT study did not account for potential significant methane leakage during the feedstock/biomethane storage and transport steps, although it is likely to happen in practice. The methodology also doesn't account for changes in GHG emissions that result from switching from current waste management practices to biomethane production.

As such there is no guarantee that biomethane from wet manure will be carbon neutral with potentially just a 20% GHG emission saving achieved.

There is no reasonable path to scale manure biomethane

Secondly, there is no reasonable path to scale biomethane from manure (see also next subsection 2.1.3. on availability) and other sectors like the heating and power sectors will compete for their use. A paper from the ICCT[14] estimated that the maximum technical potential for biomethane production from manure is approximately 12 bcm3 for transport and heating and 20 bcm3 for power in 2050 in the EU. This is just 8% of the EU's natural gas consumption in 2021 (412 bcm[3]).

Assuming that the 12 bcm3 is split equally between transport and heating, this would only cover around 3%-4% of the current energy demand from the EU's fleet of light duty vehicles[15].

[11] In the case that manure is mixed with maize during production - as is often the case -, the reduction from the mixed biomethane fuel rapidly falls below the 100% reduction mark as the relative benefits of manure biomethane are cancelled by the climate impacts of maize biomethane.

[12] https://theicct.org/sites/default/files/publications/lca-biomethane-hydrogen-eu-oct21.pdf

[13] On a 100-year timescale. This is assuming a 10% methane leakage rate during the anaerobic digestion of the manure and a 5% rate during the biomethane upgrading, which could be even worse in real-world cases

[14] https://theicct.org/wp-content/uploads/2021/06/Renewable_Gas_EU-28_20181016.pdf

[15] Figures could be lower given that biogas engines require more energy per tonne.kilometer than conventional engines, thus for the same amount of energy produced, fewer vehicles could be powered or less km driven.

It would therefore be extremely risky to allow such a biofuel within the definition of 'carbon neutral' fuels when its decarbonisation potential is low and the climate benefits are not guaranteed.

Certification of cars running on manure biogas would not be possible
Thirdly, it would ultimately be impossible to distinguish a biogas produced from wet manure with fossil gas or regular biogas given that the methane molecules are identical. In practice, this means that type approval certification of vehicles running exclusively on biogas from manure would not be technically feasible.

2.1.3. Limited availability of waste feedstocks for the production of advanced biofuels

Advanced biofuels are primarily based on waste and residue feedstocks, not derived from food and feed crops like first generation biofuels. However these feedstocks still have other competing uses and relying on advanced biofuels for decarbonising road transport impacts their availability for other uses. As an example, straw has many competing uses including incorporation into soil to improve soil health, animal bedding, mulch for vegetable production and growth medium for mushroom production[16]. This means that there is limited availability of such feedstocks for biofuel production. Furthermore, the biofuel produced also has competing uses, for example in the aviation sector where liquid fuels are the only decarbonisation technology available. If all sustainable advanced biofuels were used in the aviation sector, only 11% of EU's aviation needs by 2050 would be covered[17].

In short, creating new additional demand in the road sector for these fuels would reduce the chance of successfully decarbonising other hard to decarbonise sectors. It would also compete with and raise prices for the use of the feedstocks in other current rival uses.

2.1.4. Biofuel certificates are not reliable

There is widespread fraud and mislabeling in the biofuels industry, which over recent years has repeatedly shown that there is a lack of enforcement of regulations and that biofuel certificates are not reliable.

16 https://ieep.eu/wp-content/uploads/2022/12/IEEP_Agricultural_residues_for_advanced_biofuels_May_2012-2.pdf

17 https://www.transportenvironment.org/wp-content/uploads/2021/07/2018_10_Aviation_decarbonisation_paper_final.pdf

This issue has resurfaced recently with the scandal on the use of fraudulent used cooking oil (UCO). A group of biofuel traders in Europe have been accused of participating in a large-scale fraud scheme involving the sale of fake used cooking oil (UCO) biofuels which were actually biofuels produced from soy[18]. The traders allegedly mislabeled these cheap biofuels as expensive UCO-based fuels. This is highly problematic as soy biofuel is a primary biofuel produced from a food crop which negatively impacts food prices, biodiversity, is much worse for the climate than UCO and is linked to deforestation.

Fraudulent schemes take advantage of the EU's climate policies that encourage the use of biofuels to curb transport emissions. The fraud not only undermines the EU's climate goals but also results in the import of environmentally damaging first generation biofuels, which have been shown to pollute more than the fossil fuel they are replacing[19] and causing deforestation. Allowing advanced biofuels to be counted as carbon neutral fuels would increase the incentive for fraud. It opens the door for biofuels produced from food crops and environmentally damaging palm oil to enter the market. This, in turn, leads to widespread biodiversity loss, deforestation, and severe climate damage.

2.1.5. Risk of irreversible environmental damage

Risk of deforestation and other environmental degradation due to deforestation and indirect land use change is not limited to first generation biofuels.

Since many feedstocks used for the production of advanced biofuels have competing uses such as animal fats which are already used by other industries, such as the chemical industry to make cosmetics and soaps, pet food, livestock feed and plastics, their use for biofuel production will require substitute feedstocks for their original uses. This largely means swapping to less sustainable feedstocks such as palm oil. For the chemicals industry palm oil has been identified as the most likely substitute because it has similar chemical properties to animal fats and it is generally the cheapest palm oil on the market[20]. It is likely that cheap vegetable oil such as palm and soy oil will be used to substitute animal fat in other sectors also. Since the link between palm and soy industries and deforestation is well established and increasing their use due to use of animal fats for biofuel production is expected to increase pressure for further deforestation[21].

Finally, the lesson learnt from 10 years of failed EU policies to promote the use of crop-based biofuels in road transport is that including biofuels within the regulation would certainly lead to

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18 https://www.occrp.org/en/investigations/how-biofuels-scams-have-undermined-a-flagship-eu-climate-policy

19 https://www.transportenvironment.org/wp-content/uploads/2023/03/202303_IFEU-Study_TE_Briefing_EN.pdf

20 Cerulogy. (2023) The fat of the land.

21 *Ibid*

unintended damages and consequences undermining and damaging the credibility and effectiveness of the regulation.

2.2. Fuels covered by the new regulation must only be CO_2-neutral RFNBOs

In addition to the sustainability and environmental considerations, it is clear that the political intention of the Recital 11 in the car CO_2 regulation is to consider only e-fuels, not biofuel or biogas, in the new provisions. Indeed the press release published by the Council of the EU following adoption of the final car CO_2 text refers to a "reference to e-fuels"[22]. The statement[23] adopted by the Commission following the agreement also makes clear reference to RFNBOs (Renewable Fuel of Non-Biological Origin) as the only type of fuel to be considered as CO_2-neutral. However, being an RFNBO in itself is not sufficient to guarantee the fuel as CO_2-neutral.

The renewable energy directive (RED) does not guarantee carbon-neutral fuels.
Under the RED, the methodology to certify renewable liquid and gaseous fuels of non-biological origin (RFNBO) only ensures that synthetic fuels classed as RFNBOs sold in Europe need to meet a 70% GHG emissions reduction threshold over their full lifecycle. Therefore, e-fuels sold and certified in Europe under the current regulatory framework cannot be guaranteed to provide a 100% emissions reduction (needed to be considered CO_2-neutral), as some grid electricity (potentially coming from fossil sources) could still be used in e-fuel production.

Moreover, under the RED, renewables used for e-fuel production in Europe will only be guaranteed to be fully additional from 2038 onwards. Before this date, the use of existing renewable energy capacity for e-fuel production is allowed, which could reduce the renewable energy available to the grid. This reduces the amount of green electrons available to decarbonise the rest of the economy. If production of e-fuel increases overall electricity demand, additional electricity generation may be required from dispatchable energy sources, which often comes from fossil sources such as gas power plants.

The RED also allows the use of CO_2 for production of RFNBOs which is captured from industrial sources covered under the ETS and not carbon captured from the air (Direct Air Capture, or DAC). Use of industrial emissions is allowed until 2036 for emissions from power generation and 2041 for other ETS covered sources. It is likely that without further regulatory requirements, CO_2 from industrial

[22] "The regulation contains a reference to e-fuels, whereby following a consultation with stakeholders, the Commission will make a proposal for registering vehicles running exclusively on CO_2-neutral fuels, after 2035, in conformity with EU law, outside the scope of the fleet standards, and in conformity with the EU's climate neutrality objective."
https://www.consilium.europa.eu/en/press/press-releases/2023/03/28/fit-for-55-council-adopts-regulation-on-CO_2-emissions-for-new-cars-and-vans/

[23] https://data.consilium.europa.eu/doc/document/ST-6740-2023-ADD-1-REV-2/en/pdf

sources will be the main source of CO_2 for RFNBO's until the late 2030's as this technique is cheaper and more developed compared to DAC. Unlike DAC, use of point sources results in a net increase in atmospheric CO_2. It also has the unintended effect of encouraging industries to continue to rely on fossil fuels to enable the continuing production of fuels.

A new framework is required to legally certify carbon-neutral fuels.

The current regulatory framework does not contain sufficient provisions to ensure e-fuels sold in the EU deliver a 100% emissions saving. To do so, a new regulatory framework (building on the current RFNBO framework with additional and stringent requirements) would be needed to define the strict conditions needed to ensure that synthetic fuels are CO_2-neutral.

The following conditions need to be met for RFNBO fuel to be carbon-neutral:

- The electricity used for the entire production process (including hydrogen production) needs to be both 100% generated from renewable energy sources and additional.
    - To prove additionality, an RFNBO producer using a grid connection must have a Power Purchase Agreement (PPA) to purchase renewable electricity from an electricity producer, which has not received any operating or investment aid from public authorities (e.g. by means of feed-in tariffs or feed-in premiums). Moreover, an hourly temporal correlation between electricity generation and use is required together with geographic correlation (same bidding zone or adjacent interconnected bidding zone). Additionality combined with temporal and geographic correlation are key to avoid diverting renewables from the grid, which would result in more fossil fuel-fired power generation to fill the gap. Only with additionality would the RFNBO producer avoid competing with other clean electricity users.
- Carbon capture should be from 100% direct air capture (DAC) powered by 100% additional renewable electricity. If carbon capture industrial sources are considered, it will lock-in investment in fossil sources, slow down their decarbonisation and will delay investments in DAC. On the other hand, requiring use of DAC will send a signal to the market and create offtake demand, thus supporting the ramp up of DAC as the only sustainable and future-proof source of carbon feedstock for e-fuels.

To be fully renewable, transport and distribution of the efuel should rely on renewables, including powering any potential shipping with 100% GHG reduction RFNBOs. Given the early stages of efuel based shipping, if there are any residual GHG emissions associated with the transport and distribution of the RFNBO, these emissions should be offset by requiring DAC to store via carbon capture and storage (CCS) the equivalent amount of emissions associated with transport and distribution.

Only under this new framework and new conditions for CO_2-neutral RFNBO fuels could a fuel be considered "CO_2 neutral" and in conformity with Union law[24] (as per Recital 11). Such a framework

[24] In this case referring to the RED and Delegated Act on additionality of renewables.

would require a strong certification and traceability system in order to exclude RFNBOs produced with fossil fuels. Otherwise this would create risk of fraud, as we have observed with advanced biofuels (see section 2.1.4.).

3. Setting strong safeguards on the role of e-fuel cars

In addition to a strict definition of CO_2-neutral fuel, further safeguards will be needed to ensure a water-tight framework for the use of such vehicles so as not to undermine the environmental integrity of the EU's car CO_2 regulation.

3.1 CO_2-neutral vehicle type approval requirements

As part of the Commission's Implementing Regulation (first step), technical requirements for allowing cars exclusively fuelled on carbon neutral fuels to be sold in the EU will be proposed in order to, as per the Commission's statement, "[set] up a robust and evasion-proof type approval process for vehicles that are fuelled exclusively, in a permanent manner, with RFNBOs".

Technical requirements must ensure that cars can only be fuelled by e fuels

Ensuring that cars approved as CO_2-neutral under the new vehicle category are exclusively fuelled by CO_2-neutral e-fuels is critical to guaranteeing that the EU car CO_2 standards are not undermined through continuing use of fossil fuels in these cars especially if in the future carmakers are allowed to count these vehicles towards their CO_2 targets (foreseen under the second step in the delegated act). To ensure this, new technical requirements are needed for these vehicles.

It is critical that every e-fuel approved car is fitted with a sensor within the fuel tank which can, with 100% accuracy, determine if the vehicle is running exclusively on renewable e-fuel. This must be combined with inducement measures to prevent the vehicle's engine starting if the vehicle's tank is filled with the wrong fuel. While the use of separate fuel nozzles for e-fuel at petrol stations should be required to prevent fuelling mistakes at the pump, which can be costly for consumers, this alone cannot be used to ascertain that the correct fuel is used as a fuel tank adapter could easily be manufactured or 3D printed at home for a very low cost.

To ensure that fuel sensors and other hardware solutions function correctly and are capable of identifying misfuelling events or tampering, the implementing regulation must require their physical testing at type-approval to ensure that the technology is fit for purpose before the vehicle is sold. This must include testing to show that the vehicle cannot be run on any other fuel including pure fossil fuel as well as blended e-fuel/fossil fuel.

Once these vehicles are on the road it is equally important to ensure that the technology is able to guarantee that the car can only be fuelled by renewable e-fuel throughout the lifetime of the vehicle. This requires robust in-service conformity and market surveillance rules for these vehicles, which

test the functioning of fuel sensors, engine inducement and other measures throughout the entire lifetime of the vehicle. The new rules must specify and mandate that a sufficient number of vehicles running exclusively on CO_2 neutral fuels has to be tested by national authorities.

T&E strongly supports including the following technical requirements as part of the implementing regulation's vehicle type approval rules:

1) Fuel monitors must be fitted to all cars sold under the carbon neutral fuel category. These must be capable of identifying fossil fuel and e-fuel/fossil fuel mixes (e.g. 90% e-fuel, 10% fossil fuel, etc).
2) A misfuelled car (i.e. a car fuelled with anything other than 100% renewable e-fuel) must immediately be prevented from starting the engine by an inducement system.
3) The functioning of fuel monitors and inducement measures must be physically tested both at type-approval and throughout the entire lifetime of the vehicle via in-service conformity testing and market surveillance activities.
4) Carmakers must be responsible for ensuring fuel monitors and other hardware or related vehicle software remain functioning and tamper proof throughout the entire lifetime of the vehicle.
5) A minimum number of vehicles running exclusively on CO_2-neutral fuels should be tested for in-service conformity annually. This must include physical testing to ensure that the car cannot run on any other fuel apart from 100% renewable e-fuel. This should cover a minimum of 5% of the so called 'in-service conformity families'[25] of carbon neutral cars per manufacturer per year. Testing requirements should apply even if fewer than 5000 CO_2-neutral cars per vehicle family are sold per year, which is the current threshold for emissions in service conformity testing.
6) OBFCM (on-board fuel consumption meter)/OBM (on-board monitoring) capabilities and requirements should be expanded to record and transmit to type-approval authorities repeated misfuelling, 'suspicious' fuelling and tampering events.
7) Fuel inlets for e-fuel approved cars must have a unique design to prevent accidental or deliberate misfuelling.

Even with the above technical requirements it will not be possible to identify at the vehicle level e-fuels produced from 100% renewable electricity, green hydrogen, carbon from direct-air-capture from e-fuels produced using fossil fuels (e.g. using non-100% renewable electricity or fossil fuel feedstocks for the chemical process) as the resulting fuels can be chemically identical. Only a strong framework for certifying 100% renewable RFNBO's can ensure that no fossil fuel derived e-fuels are used in cars certified as carbon neutral.

Tampering will remain a significant risk due to cost saving incentive

[25] Used to group cars for emissions type-approval testing and includes vehicles with e.g the same engine, emission control system.

Even with the above mentioned technical safeguards, tampering and fraud will remain a risk due to the expected significant cost saving for drivers from using fossil fuels instead of synthetic fuels. T&E analysis has shown that, in 2030, fuelling an average car in Germany with e-fuel will cost €210, 50% more than fuelling a car with petrol today - meaning filling up the tank with e-fuels will cost drivers almost €800 more per year compared to normal petrol[26]. The continued use of red diesel[27] in cars proves that drivers will be ready to commit fraud to save money on fuel.

While the technical and testing requirements covered are important for ensuring that vehicles run on 100% renewable e-fuel, the checks only cover a small number of cars in the EU fleet and as such may not identify tampering events or technologies present on vehicles in the wider fleet. To deter and check for tampering in the whole fleet, updates to Periodic Technical Inspections (which regularly test the roadworthiness of all cars in the EU fleet) are needed, as well as the implementation of strong EU standardised deterrents (fines).

To identify and monitor tampering in the EU fleet T&E recommends the following provisions be added to Directive 2014/45/EU on periodic roadworthiness tests for motor vehicles:

- Checks on the functioning of the fuel monitor and inducement systems;
- Checking of OBFCM/OBM fuelling data;
- Checking for tampering, which, if identified, must result in an immediate fail of the PTI test and the details of which must be shared with both the OEM (so that the OEM can take action and close the loophole which was exploited) and national Type-Approval Authority.
- Implementation of strong EU wide standardised fines for tampering.

3.2. E-fuel approved cars should not be designated as zero emission

Once the first step - the scope of CO_2-neutral fuels and type approval requirements for e-fuelled cars - under the implementing regulation is agreed, the Commission will, as per its adopted statement, "propose a Delegated Act specifying how E-Fuels-only vehicles would contribute to the CO_2 emission reduction targets, in relation to the regulation of CO_2 emission standards for cars and light duty vehicles". In other words, the Commission will propose a regulation linking the new category of e-fuel vehicle to the cars CO_2 regulation and how these cars can contribute to carmakers' CO_2 reduction targets. Again, strict safeguards will be needed to preserve the environmental integrity of the CO_2 regulation and ensure the new e-fuel provisions don't become yet another loophole for carmakers to exploit.

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26 https://www.transportenvironment.org/discover/over-e200-to-fill-up-a-car-the-cost-of-germanys-bid-to-keep-combustion-engines/

27 https://www.dhnet.be/actu/societe/2022/08/09/les-cas-de-fraude-au-diesel-rouge-explosent-les-amendes-pleuvent-NKBT63CNH5GZJHXHZUXKZ5JQ2Y/

E-fuels are not zero emission and any future e-fuel approved cars must not be considered as zero-emission for the purposes of regulatory compliance.

Even if produced as CO_2-neutral, e-fuels still emit CO_2 at the tailpipe

As explained in section 2.2, it is currently not possible to certify and guarantee CO_2-neutral (i.e. guaranteeing a 100% GHG emission reduction) e-fuel under the current regulatory frameworks in Europe. However, if e-fuel is produced according to a CO_2-neutral pathway (100% additional renewable energy and direct air capture), when burned in an internal combustion engine, e-petrol and e-diesel still emit exactly the same CO_2 emissions as conventional fuels. For instance, in 2021 the average petrol car emitted 134 gCO_2/km[28] under the WLTP test and 14% more CO_2 under real-world driving conditions.

Cars powered by e-fuels still emit air pollution - unnecessarily damaging people's health

In addition to CO_2, e-petrol and e-diesel also emit air pollutants, notably toxic NO_2 and carcinogenic particles. T&E tests[29] (see figure 2) have shown that cars powered by e-fuel emit as much nitrogen oxides (NOx) as fossil fuel engines and much more carbon monoxide and ammonia, doing nothing to alleviate the air quality problems in our cities.

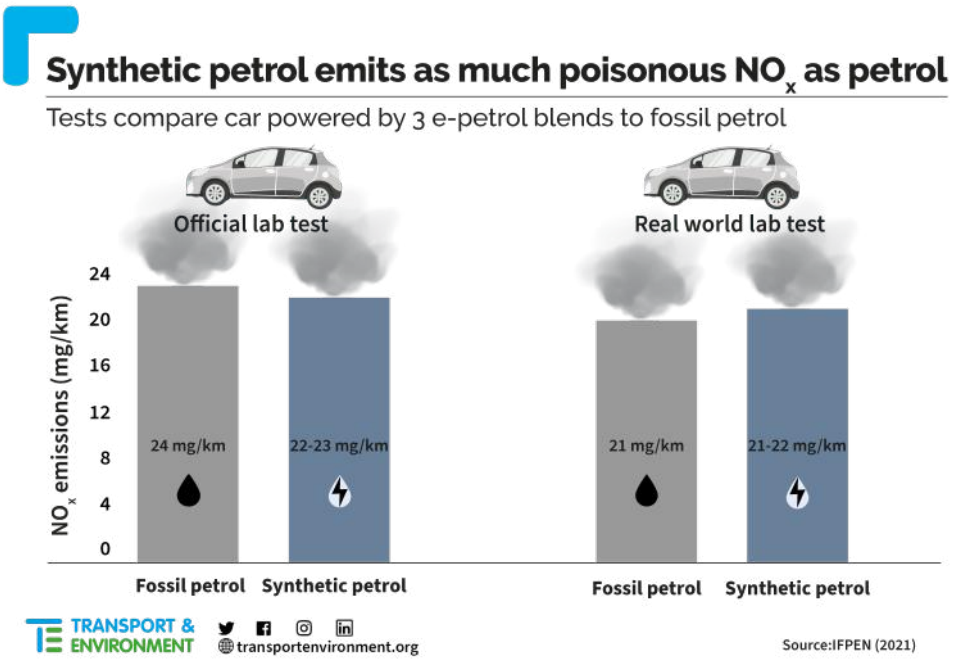
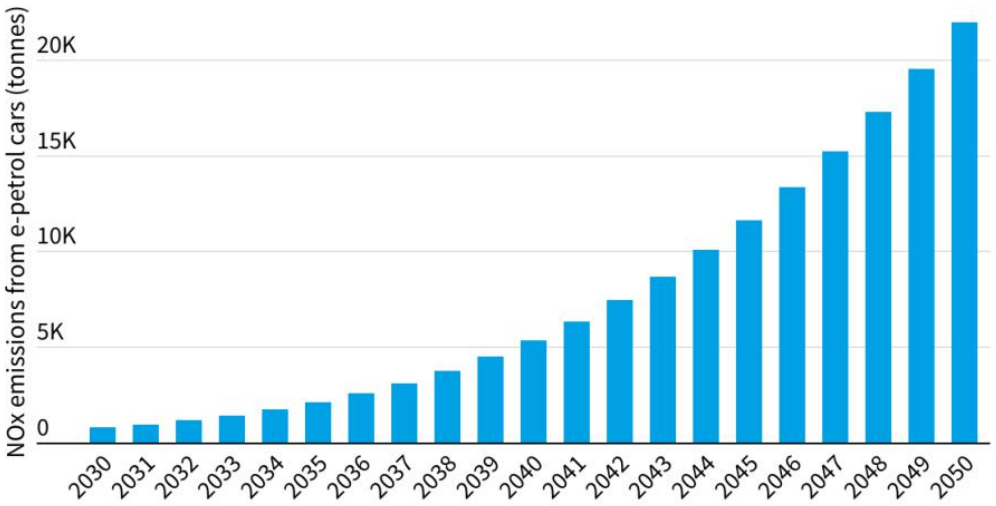


Figure 2: NOx emissions of a car running on fossil petrol and e-petrol. The results show that there is no reduction in NOx emissions from the use of e-fuel.

[28] 2021 average for a petrol car in the EEA according to: http:// CO_2cars.apps.eea.europa.eu/

[29] T&E. (2021) Magic green fuels: Why synthetic fuels in cars will not solve Europe's pollution problems.

Based on optimistic assumptions about the availability of e-petrol, if 46 million new conventional and hybrid cars would be sold by 2050 and would be fueled by pure e-petrol, these vehicles would still emit 160 thousand tonnes of NOx between 2030 and 2050 (see figure 3), more than Italy's entire fleet NOx emissions in 2019. These NOx emissions would have otherwise been completely eliminated by BEVs and cannot be offset (unlike with the CO_2 if the fuel is produced with DAC).



Scope: EU27
Source: T&E modelling of new e-petrol cars NOx emissions

Figure 3: NOx emissions from new e-petrol cars

Defining e-fuel vehicles as zero-emission or ZEVs will undermine action to reduce pollution from cars across Europe including by undermining existing and planned low- and zero-emission zones in cities across the EU by potentially allowing e-fuel vehicles to continue to enter and pollute in such zones.

Risk of confusing consumers

Defining e-fuelled cars as ZEVs will also risk confusing consumers, making it harder for drivers to choose less polluting vehicles. Carmakers will advertise these vehicles as ZEVs and so consumers will expect them to be zero emission when in reality they pollute as much and sometimes more than fossil-fuelled equivalents.

3.3. How the scope of the new regulation should be limited, in line with Recital 11 of the cars CO2 regulation

The wording of Recital 11 of the newly revised and adopted car CO_2 standards regulation states clearly that provisions for registering vehicles running on CO_2-neutral fuels should be "outside the scope of the fleet standards" and "after 2035".

Should the forthcoming provisions permit e-fuelled cars to be registered before 2035, it is important that these cars are not defined as zero-emission and therefore displace sales of battery electric and

fuel-cell electric vehicles (see section 3.2). However, for vehicles running on e-fuels registered after 2035, only very limited categories outside the scope of the cars CO_2 regulation should be considered.

Under Article 2 of the EU car CO_2 standards regulation, the following categories of vehicles are exempt - and therefore sit outside the scope of - the EU fleet standards:

- special purpose vehicles as defined in Part A, point 5, of Annex I to Regulation (EU) 2018/858. This includes vehicles such as ambulances, mobile cranes and military vehicles.
- car manufacturers which are responsible for registering less than 1,000 units of cars or vans in the EU per year.[30]

Following a precise reading and interpretation of Recital 11, these are the only vehicles that could be considered under the e-fuel exemption. Furthermore, limiting the scope to these niche applications would be consistent with the limited availability of e-fuels projected to be on the market by 2035 (see section 1.1 Context) and the need to prioritise these limited amounts for hard to decarbonise sectors like shipping and aviation.

If the Commission does decide to expand the scope of vehicles that can be registered beyond what was agreed by the co-legislators, this would raise questions as to whether the executive branch of the EU has overstepped its mandate by using its delegated powers to reopen the car CO_2 standards regulation.

Infobox - co-legislators should not regulate e-fuels in cars via Euro 7

Under the deal reached between the European Commission and Germany, the Commission agreed to carve out a new category of e-fuel-only vehicles inside the existing Euro 6 type approval rules. However, at the same time, co-legislators have proposed amendments within the Euro 7 regulation on non-CO_2 pollutant emission standards to circumvent this process.

MEPs in both the TRAN and ITRE committees - both mandated to provide Opinions to the lead ENVI committee on Euro 7 - have adopted amendments that include definitions and provisions to allow the continuing use of e-fuels and biofuels in ICE cars which circumvent the car CO_2 standards. Including provisions within the Euro 7 regulation risks delaying and undermining the work - via implementing and delegated acts - already started by the European Commission in cooperation with national governments in the TCMV (Technical Committee on Motor Vehicles).

MEPs in the lead ENVI committee should reject all amendments tabled related to e-fuels and biofuels as these are out of scope of the Euro 7 proposal.

[30] According to 2014 EEA data, there were 35 manufacturers responsible for a total of around 6 500 vehicles that benefited from this exemption (22 for passenger cars and 13 for vans). In 2018, there were 25 manufacturers benefiting from the exemption, registering a total of 3 800 cars.
https://www.eea.europa.eu/publications/co2-emissions-from-cars-and-vans-2018

Further information

Alex Keynes
Cars Policy Manager
Transport & Environment
alex.keynes@transportenvironment.org
Mobile: +32 (0) 493 50 82 47