

Update on eFuels: The Political Framework behind Synthetic Fuels

1. Introduction

The current European Commission initiated the largest revision of climate regulations the European Union has seen to date. With the fit-for-55 package, the EU has set the goal to reduce climate emissions by 55% until 2030 in comparison to 1990. The package includes 13 climate regulations, which have been proposed, discussed, and negotiated simultaneously in the last two years. The majority of the proposed climate regulations are finalized by now. This presentation analyses those regulations regarding the future development of synthetic fuels and their impact on the availability of the internal combustion engine in various sectors.

In the following, we provide an overview about the final state of the most important regulations for the development of synthetic fuels like the Renewable Energy Directive (RED), CO₂ emission standards for passenger cars, light and heavy-duty vehicles, as well as the revision of the Energy Taxation Directive (ETD). Furthermore, we will give an outlook, summarize our analysis, and give further political recommendations to foster the market uptake of hydrogen derived synthetic fuels.

2. Back to basics: What are synthetic fuels and what regulations are important?

One can find various terms for synthetic fuels online and a multitude of definitions, however we define synthetic fuels as ‘renewable liquid and gaseous transport fuels of non-biological origin (RFNBO)’ as determined in article 2 number 36 of the Renewable Energy Directive II,¹ which is one of the most important regulations when it comes to setting the standards for synthetic and biological fuels. RED II states that the electricity, which is crucial in the production of RFNBOs, is to originate from renewable sources. RFNBOs are CO₂ neutral and therefore environmentally friendly, as the process of production binds the same quantity of CO₂ that will be set free with incineration. Many lifecycle analysis state that a CO₂ reduction of more than 90% in comparison to fossil fuels is achievable.² Synthetic fuels are expected to play a major role in decarbonising the transport sector – not just for hard-to-abate sectors like maritime and aviation, but also for a large existing fleet stock of more than 300 million vehicles with an internal combustion engine (ICE) in the road sector.³ Even for new vehicles it can be a viable option if synthetic fuels can be scaled up in large quantities, representing a competitive alternative to their electric counterpart.

2.1. Renewable Energy Directive

The Renewable Energy Directive (RED) was first adopted in 2009 and has been revised three times since then. In essence, it defines the mandatory share of renewable energy in specific sectors. For the transport sector, all EU member states must assure a share of at least 10% renewable fuels in their fuel mix in 2020. A recent presentation by Müller-Langer et al. shows that 13 member states have missed that goal in 2021.⁴

¹ European Parliament, "Directive (EU) No 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast)," EU Directive 2018/2001, 2018, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001>, accessed on 26.07.2023.

² Jens Perner and Theresa Steinfort, "The overall CO₂ impact for drive technologies in individual transport today and in the future," 2016, https://www.efuel-alliance.eu/fileadmin/Downloads/RPT-Frontier-Uniti-LCA-16_01_2019_EN_stc.pdf, accessed on 26.07.2023.

³ European Commission, "EU Transport in figures, statistical pocketbook 2022," 2022, <https://op.europa.eu/en/publication-detail/-/publication/f656ef8e-3e0e-11ed-92ed-01aa75ed71a1>, accessed on 26.07.2023.

⁴ F. Müller-Langer, J. Schröder, and K. Naumann, "Overview of quota developments in selected EU Member States," presented at the 20th International Conference on Renewable Mobility "Fuels of the Future," Berlin, 23.-24.01.2023.

The first revision of the RED (so-called: REDII) from December 2018 establishes a new target level for 2030. Member states are obligated to achieve 14% of renewable fuels in their fuel mix.⁵ This target includes several multipliers of different energy carriers. For example, the renewable share of charging power for electric cars is counted fourfold. Hydrogen for fuel cell vehicles and advanced biofuels are only counted twofold. Resulting in overall less effort to achieve the targets and ultimately leading to market distortion.

The third revision of the RED increased the ambition level for the transport sector further. On the 30th of March 2023 the European Parliament and Council agreed on a target of 42.5 % renewable energies in all sectors by 2030. In the transport sector, emissions must be reduced by 14.5 % or a share of 29 % use of renewable energy must be achieved. A combined quota of 5.5 % advanced biofuels and synthetic fuels will be mandatory in the transport sector by 2030. However, a 2x multiplier on the 5.5 %, results in an actual quota of 2.75 %. In addition, a binding sub-quota of one percent, likewise with a multiplier, was adopted for RFNBOs. Presuming that synthetic fuels stay more expensive than biofuels until 2030, it can be assumed that fuel companies will only meet the binding sub-quota of 0.5 % considering the multipliers. This quota is to be further reduced because an additional multiplier of 1.5 exist for the usage of RFNBOs in the maritime and aviation sectors.⁶ For the first time, the EU has agreed on a binding quota for synthetic fuels in the transport sector although the result is relatively low taking into account the Commission proposal of a binding sub-quota of 2.6 %, which has been increased to 5 % in the RePowerEU package to reduce dependencies on fossil fuel imports as a consequence of Russians invasion in Ukraine, and the position of the European Parliament of 5,7 %. But member states have decided to negotiate it down to just 0.5%.

2.2. CO2 emission standards for new passenger cars and light -duty vehicles

In 2009 the EU introduced the first version of CO2 emission standards for new passenger cars and light duty-vehicles, setting mandatory emission reduction targets for new cars from 2015 onwards. Between 2015 and 2019 a 130g/km yearly average target for newly sold vehicles has been applied. Followed by a more ambitious quota of 95 g/km with a consumption of 4.1 l/100 km of petrol or 3.8 l/100 km of diesel from 2020 onwards.⁷ The weight of the vehicle sets individual targets for OEMs in different segments, meaning that heavier vehicles are allowed to emit slightly more CO2.

However, like most regulations it is not properly adjusted to the technological advancements of the past years. The initial goal of the regulation was to increase the efficiency of the internal combustion engine. Naturally, the way to assess CO2 emissions was to measure the tailpipe emissions of a vehicle while not considering the energy source. The possibility of electric vehicles wasn't in focus at this point. Now that electric vehicles are a common occurrence, this poses a challenge for the survival of the ICE. Electric vehicles receive automatic zero-emission credits, even when charged with fossil fuel-generated electricity. In contrast, vehicles with ICE are consistently branded as 100% reliant on fossil fuels, regardless of their potential use of renewable alternatives.

In April 2019, the European Parliament and the Council introduced CO2 standards for new cars and vans, with increasing targets of a 15% reduction by 2025 and a 37.5% reduction by 2030, relative to the 2021 baseline. Additionally, newly registered vans faced an elevated target of a 31% reduction by 2030. Various incentives were implemented for Battery Electric Vehicles (BEVs) and Plug-in Hybrid

⁵ European Parliament, "Directive (EU) No 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast)," EU Directive 2018/2001, 2018, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001>, accessed on 26.07.2023.

⁶ European Council, "Council and Parliament reach provisional deal on renewable energy directive," 2023, <https://www.consilium.europa.eu/en/press/press-releases/2023/03/30/council-and-parliament-reach-provisional-deal-on-renewable-energy-directive/>, accessed on 26.07.2023.

⁷ European Commission, "Reducing CO2 emissions from passenger cars - before 2020," 2021, https://climate.ec.europa.eu/eu-action/transport-emissions/road-transport-reducing-co2-emissions-vehicles/co2-emission-performance-standards-cars-and-vans_en, accessed on 27.07.2023.

Electric Vehicles (PHEVs), referred to as the "ZLEV mechanism." Moreover, pooling exemptions (notably for the top 5% of high-emission registrations, known as the "phase-in"), and exemptions for niche Original Equipment Manufacturers (OEMs) were established.

These mechanisms have taken on various forms of implementation and, in some cases, led to situations where manufacturers, like Fiat Chrysler Automobiles, reportedly paid Tesla significant sums, estimated at \$560 million, to pool their new vehicle registrations.⁸ When manufacturers fail to meet fleet targets, they face penalties known as "excess emission premiums" amounting to 95 €/g/km per vehicle sold, translating to CO₂ abatement costs of 475 € per ton, assuming an average mileage of 200,000 km over a vehicle's lifetime.⁹

Given this scenario, achieving these benchmarks effectively requires the adoption of zero-emission vehicles. Consequently, many car manufacturers have made electrification a priority, with some even adopting all-electric strategies, at least in the European market.

Within the scope of the Fit-for-55 package, CO₂ standards for cars and vans underwent further revision. Right from the outset, the European Commission proposed a 100% reduction target for 2035, symbolizing a de facto ban of the ICE, which was later endorsed by a provisional agreement between the European Council and Parliament in 2022. The revision failed to secure final approval due to a blocking majority formed by Germany, Hungary, and Italy, demanding an exception for vehicles running on synthetic fuels.

In March 2023, a compromise was reached among European legislators. The Commission will devise a methodology for establishing a new vehicle class in the type-approval regulation, exclusively for vehicles powered by synthetic fuels. Moreover, a delegated act pertaining to CO₂ emission standards will be proposed.¹⁰ One critical question is how to verify that a vehicle is solely utilizing synthetic fuels, necessitating a pragmatic approach. As of now, the Commission hasn't presented a viable solution to this challenge.

2.3. CO₂ emission standards for heavy-duty vehicles

A similar regulation for heavy-duty vehicles has been introduced in 2019. By 2025 truck manufacturers were mandated to lower CO₂ emissions for new vehicles by 15% and 30% by 2030. Similar to its light-duty counterpart this regulation, again, measures CO₂ emissions at the tailpipe. Resulting in an absolute disregard of the energy source and therefore synthetic fuels while the electric equivalent is seen as CO₂ neutral. Penalties for non-compliance were set to begin in 2025, imposing fines of 4,250 €/g/km per vehicle.¹¹

In February 2023, the Commission released a revision of CO₂ emission standards for heavy-duty vehicles as part of the Fit-for-55 package. The Commission proposed raising the ambition level for 2030 to a reduction of 45%, expanding the standards to include buses and other vehicle categories, and introducing more stringent targets beyond 2030, aiming for a 65% reduction by 2035 and a 90%

⁸ L. Totaro and D. Lepido, "Fiat to Pool Cars With Tesla to Meet EU Emissions Targets on CO₂," 2019, <https://www.bloomberg.com/news/articles/2019-04-07/fit-for-55-council-adopts-regulation-on-co2-emissions-for-new-cars-and-vans>, accessed on 27.07.2023.

⁹ FAZ, "100 Millionen Euro Strafe für VW wegen verfehlter CO₂-Ziele", 2021, <https://www.faz.net/aktuell/wirtschaft/unternehmen/verfehlte-co2-ziele-100-millionen-euro-strafe-fuer-vw-17157638.html>, accessed on 27.07.2023.

¹⁰ European Council, „Fit for 55’: Council adopts regulation on CO₂ emissions for new cars and vans“, 2023, <https://www.consilium.europa.eu/en/press/press-releases/2023/03/28/fit-for-55-council-adopts-regulation-on-co2-emissions-for-new-cars-and-vans/>, accessed on 27.07.2023.

¹¹ European Parliament, "Regulation (EU) No 2019/1242 of the European Parliament and of the Council of 20 June 2019 setting CO₂ emission performance standards for new heavy-duty vehicles and amending Regulations (EC) No 595/2009 and (EU) 2018/956 of the European Parliament and of the Council and Council Directive 96/53/EC," 2019, <https://eur-lex.europa.eu/eli/reg/2019/1242/oj>, accessed on 27.07.2023..

reduction by 2040.¹² It's important to note that achieving a reduction trajectory of 90% would primarily require truck manufacturers to focus on battery or hydrogen-powered trucks. Trucks with ICE engines, which could potentially use renewable fuels such as biomethane or synthetic options, are largely excluded from the political conversation.

The political process continues, with expectations that finalization will be reached in the first half of 2024. It's essential to highlight that it would be inconsistent if the Commission developed a solution for synthetic fuels for cars but not for trucks. Moreover, various political groups in the European Parliament have proposed amendments to account for the climate impact of renewable fuels.

The significance of addressing these regulations for the further development of synthetic fuels becomes evident. Not only does it send a clear political signal, particularly when compared to dedicated mandates for the aviation and maritime sectors, that renewable fuels should not be a long-term solution in the road sector. This could potentially decrease future demand and investments in new synthetic fuel projects. Furthermore, altering these regulations to consider renewable fuels could establish a viable market for synthetic fuels. Studies have indicated that a premium of up to 1.6 € per litre for synthetic fuels might be justifiable if car manufacturers could avoid penalties, translating to CO₂ abatement costs of up to 475 € per ton.¹³ Additionally, there's often the presence of by-products in the production of synthetic fuels, and if these by-products cannot be utilized in the road sector, synthetic fuels for aviation and maritime applications may need to cover the cost disparities, potentially causing an increase in price.¹⁴ While electric vehicles are undeniably set to play a substantial role in the road sector, it would be unwise to entirely exclude synthetic fuels from consideration at the outset.

2.4. Revision of the Energy Taxation Directive

The first version of the Energy Taxation Directive, published in 2003 defines minimum tax shares for different energy carriers. However, the Directive has been long outdated, disregarding technological advancements made in the past 20 years, including synthetic fuels which are being treated like fossil fuels in terms of taxation. When the EU legislation became aware of this problem in 2011, it attempted a revision towards a “More rational and targeted energy taxation” that “will contribute to a technology-neutral manner to cleaner and more efficient consumption of energy”.¹⁵ This attempt ultimately failed as setting new tax regulations proves difficult on EU level, due to the necessity of a unanimous vote. The 2011 proposal was rejected by Luxembourg, Poland in Germany.

The second attempt for a revision of the Energy Taxation Directive was introduced in 2019 as part of the European Green Deal, culminating in the release of a proposal in 2021 featuring low tax rates for synthetic fuels.¹⁶ A comprehensive consideration of the carbon footprint of energy carriers could boost the willingness of market participants to invest in renewable fuels. For instance, in Germany, climate-neutral petrol could enjoy a price advantage of up to 0.65 € per litre compared to fossil fuels. The

¹² European Commission, „Reducing CO₂ emissions from heavy-duty vehicles“, 2023, https://climate.ec.europa.eu/eu-action/transport-emissions/road-transport-reducing-co2-emissions-vehicles/reducing-co2-emissions-heavy-duty-vehicles_en, accessed on 27.07.2023.

¹³ C. Gatzen, M. Zähringer, and D. Bothe, „Crediting System for Renewable Fuels: Functionality & Benefits,“ 2020, <https://www.efuel-alliance.eu/fileadmin/Downloads/crediting-system-for-renewable-fuels.pdf>, accessed on 27.07.2023..

¹⁴A. Soler, “Role of e-fuels in the European transport system. Literature review,“ 2020, https://www.efuel-alliance.eu/fileadmin/Downloads/Rpt_19-14.pdf, accessed on 27.07.2023..

¹⁵ European Commission, “Communication from the Commission to the European Parliament, the Council and the European Economic and Social Committee, smarter energy taxation for the EU: Proposal for a revision of the Energy Taxation Directive,“ 2011, <https://eur-lex.europa.eu/legal-content/HR/TXT/?uri=CELEX:52011DC0168>, accessed on 27.07.2023..

¹⁶ European Commission, “Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity (recast),“ 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0563>, accessed on 27.07.2023.

revision of energy taxation is also crucial in light of massive tax incentives for green hydrogen and synthetic fuels offered by the United States of America.

3. Conclusion:

We have described important regulations for the production and use of eFuels. Many more regulations and delegated acts have to be mentioned. The recently finalized regulations within the European Green Deal will not create substantial demand for synthetic fuels in the transportation sector until 2030. According to RED mandates, the projected production of synthetic fuels will only reach approximately 10-12 terawatt-hours (TWh), corresponding to an electrolysis capacity of 2.2-2.7 gigawatts (GW) by 2030. This falls significantly short of the European hydrogen strategy's vision of 2x40 GW, with 40 GW within Europe and 40 GW through exports, and the plan to install 6 GW by 2024. While the industry and heating sectors may contribute additional capacity, they are unlikely to meet the strategic objectives.

This situation is even more concerning given that the European Commission has proposed a binding sub-quota of 5% for hydrogen and synthetic fuels in the RePowerEU package, which would necessitate a demand for 250 TWh and an electrolysis capacity of 55 GW. However, the implementation of the RED must occur at the national level, and some member states have already announced higher quotas for synthetic fuels in the transportation sector. For example, Romania has passed a hydrogen law establishing a binding sub-quota of 5% for hydrogen and synthetic fuels by 2030¹⁷. The previous Finnish government aimed for a 3% share of synthetic fuels by 2030¹⁸, and the Spanish government has mentioned targets exceeding 5% in their latest update of national energy and climate plans¹⁹.

To further advance the development of synthetic fuels in the transportation sector, we recommend the following policy actions:

1. Implement more ambitious quotas and mandates at the national level during the adoption of REDIII.
2. Include synthetic fuels in the consideration of CO2 emission standards for new vehicles to facilitate their use across all sectors and harness the potential for significant CO2 reduction in the road sector.
3. Revise energy taxation policies to account for the carbon footprint of different energy carriers, creating incentives for the adoption of climate-friendly solutions.

¹⁷ Lexology, "Romania announces new framework for hydrogen energy integration", 2023, <https://www.lexology.com/library/detail.aspx?g=c5e484da-e88a-4cc8-a4c4-99b82ff92da4>, accessed on 27.07.2023

¹⁸ Hydrogeninsight, "Competitive advantages' | Finland wants green hydrogen-based e-fuels to make up 3% of all transport fuels by 2030", 2023, <https://www.hydrogeninsight.com/production/competitive-advantages-finland-wants-greenhydrogen-based-e-fuels-to-make-up-3-of-all-transport-fuels-by-2030/2-1-1402625>, accessed on 27.07.2023

¹⁹ European Commission, "Spain - Draft Updated NECP 2021-2030", 2023, https://commission.europa.eu/publications/spain-draft-updated-necp-2021-2030_en, accessed on 27.07.2023

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