

On the way to industrialised production – Where are the main challenges for eFuels?

The European eFuel industry is still in dire need for a practical framework for investments. Recent news about the European hydrogen and eFuels development have led to questions for different stakeholders. First, in July 2024 the results of the €900 million H2Global funding scheme were published with just one winning bid for renewable ammonia from Egypt. For synthetic aviation fuel Hintco, the organizer of the funding program, reported there were more than 300 interested parties from 43 countries. However, no final bid was made due to regulative reasons like “uncertainties related to the implementation of the regulatory framework surrounding the GHG accounting” or “The EU Commission’s current interpretation of RED II DA 28(5) [Delegated acts of the Renewable Energy Directive, 2018/2001]” (Hintco, 2024). Second, in the same month Shell paused construction of the largest European low-carbon fuel project – mainly for sustainable aviation fuel (SAF) (Shell, 2024). Third, the Danish offshore wind pioneer Ørsted stopped a 70 MW eFuel project in Sweden (Akoto, P. 2024). While individual reasons can play a part in these developments, one thing is obvious: We are not on track.

At a glance

Hydrogen and eFuels are facing different challenges at the moment:

1. Low demand due to insufficient quotas in the REDIII
2. Too many restrictions on the production side (delegated acts of REDII)
3. No future for low carbon fuels in the road sector due to ban of the internal combustion engine in the CO₂ emission standards for new vehicles

As a result, the ramp up of eFuels will be limited, delayed and more costly. To correct this development, the European Commission and Member States should take the following actions into consideration:

- Make quotas in the national implementation of REDIII more ambitious and provide a long-term projection in combination with strong penalties for non-compliance
- Award overfulfillment of quotas by additional multipliers and banking of credits
- Improve funding schemes like ‘SAF allowances’, EU innovation fund and introduce maritime and aviation budgets in the auction of the European hydrogen bank
- Revise the European Energy Taxation Directive and introduce lower taxes for eFuels and advanced biofuels
- Revise the delegated acts on hydrogen and eFuel production
- Allow unavoidable industrial CO₂ sources to produce eFuels
- Grandfather first projects to rule out regulatory uncertainties
- Recognize the use of eFuels and advanced biofuels in the road sector

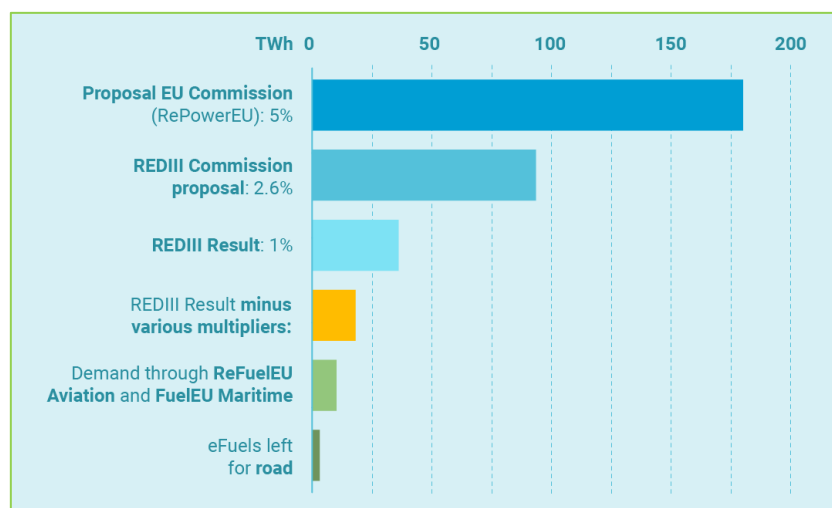
As eFuel Alliance, we represent 180 companies, associations and consumer organizations along the whole value chain – including around 25 eFuel producers and project developers. Therefore, we would like to take the opportunity to categorize and justify this unfortunate development. Below we will deliver short-term correcting political adjustments. We want to emphasize that we have always criticized insufficient quotas in the revision of the Renewable Energy Directive (REDIII) (Diemer & Wehrhold, 2023a), the missing pragmatism of REDII delegated acts (Diemer & Wehrhold, 2023b) as well as the exclusion of the road sector (Diemer & Wehrhold, 2024) as a potential target market for low-carbon fuels. Large scale investments in eFuels require long-term planning security. Multi-billion investments need amortization periods of up to 20 years. Therefore, long-term off-take agreements are obligatory. Operational expenditures matter more than capital

costs. **For that reason, a predictable and practical regulative framework is key for a successful market uptake.**

Europe has ambitious goals when it comes to hydrogen and its derivatives. In the EU Hydrogen strategy, it states that **6 GW electrolysis capacity shall be achieved in 2024 which is practically impossible anymore**. We have less than 0.5 GW installed at the moment. In 2030, 40 GW electrolysis capacity shall be installed in the EU and another 40 GW outside EU for imports to Europe (European Commission, 2020). After the Russian invasion in Ukraine, the European Commission even increased these targets in the REPowerEU plan (European Commission, 2022). In a publication of the Technical University of Graz, we calculated that this goal will be missed by at least factor 10 due to the decisions taken on the hydrogen and eFuels quotas for transport and industry sector in the REDIII (Block et. al, 2023). The biggest challenge for eFuels is currently the regulatory framework, especially the detailed implementation, which requires adapting existing regulations. For that reason, we frequently need to scrutinize framework conditions. In the following, we list the most important challenges for a market uptake of hydrogen and eFuels at the moment. These challenges often apply to all low carbon fuels like sustainable biofuels.

1. Insufficient quotas of the Renewable Energy Directive:

The Renewable Energy Directive (RED) sets targets for renewable energy and CO₂ reduction in different sectors. With Fit for 55, the REDII was revised and EU Parliament and Council agreed on the so-called REDIII in 2023. Unfortunately, proposals from the EU Commission to introduce a quota for Renewable Fuels of Non-Biological Origin (RFNBO, meaning hydrogen and eFuels made from green electricity) in the transport sector of 1% in 2028 and 2.6% in 2030 were ignored. The proposal was officially increased to 5% in the REPowerEU plan. Yet, legislators agreed on just 1% in 2030 and introduced multipliers for RFNBOs that further watered down the target. Making the situation worse, no targets were introduced before or beyond 2030. As mentioned above, this leads to restricted demand from the start: No market operator will bring more renewable energy into the market than regulatory obligated because it will reduce competitiveness.



The first eFuel plant will probably have higher production costs than the next one. Nobody wants to commit too early and pay higher prices as their competitors. As a consequence of this **so-called First Mover Disadvantage**, end-users hesitate to sign long-term offtake agreements which are required to finance a project. Some even factor in potential penalties due to low obligations in the beginning and too much project-related risk. As an obligation only exists from 2030, end-users tend to wait as they still have a few more years for final investment decisions and no benefit from committing early. If front-end engineering and design (FEED) as well as permits are available, projects can be constructed within 3-4 years, although risky. But project developers have invested

millions of euros for engineering (Pre-FEED and FEED), which will take around 2 years, before the final investment decision is made. They will only do this if they have a clear intention from a customer to purchase the production volume. Therefore, customers would have to commit now. Only then will offtake agreements be possible in 2026, for a commercial production start in 2030.

How to solve this issue?

Member states have until May 2025 to implement REDIII and should set more ambitious as well as short-term targets. Currently, potential supply of RFNBOs is higher than regulative demand. For that reason, according to the consultancy Strategy&, only 1.8% of all hydrogen projects have a final investment decision (strategy&, 2024). In our position paper on the national REDIII implementation, **we recommend setting a quota of 1% in 2028 and 5% in 2030 without multipliers** (eFuel Alliance e.V., 2024). In addition, it is important that long-term quotas are developed to increase investment security. Quotas need to be combined with strong enforcing mechanism. We recommend setting a penalty similar to ReFuelEU Aviation, which is at least twice the difference between the RFNBO fuel and conventional fuel, with an obligation to bring the RFNBO into the market in the subsequent reporting period.

The Netherlands is the first country, which came up with a proposal for national implementation. For the land sector as well as inland navigation RFNBO quotas from 2026 on are proposed (Rijksoverheid, 2024). This could lead to early markets and speed up the development. Another solution would be to **award additional amounts of eFuels** that are brought into market with multipliers. For example, if a fuel supplier brings in more eFuels into market than required by regulation, the company could get multiple credits for the additional amount – a practice which has already been used for e.g. biofuels in certain member states. **Banking of fuel credits should be allowed as well.** If a fuel provider exceeds the required amounts, these overcompliance credits should be able to be transferred to the following years. Enabling trading of the credits would increase the liquidity of the credits and decrease the risk of committing to longer offtake agreements.

Funding schemes like the European hydrogen bank or H2Global support early birds as well, although they will realize only few projects due to high operational expenditures. We want to encourage Member States to provide extra budget for the maritime and aviation sector within the Auction as a Service Modell of the European Hydrogen Bank. Addressing the price difference of fossil and renewable energy carriers is crucial to achieve a break-even point. These funding schemes are supporting fuel producers. The so-called 'SAF allowances' are supporting end-users who purchase eFuels. We highly welcome that certificates of the European Emission Trading Scheme (ETS) for aviation are used to compensate price difference between fossil fuels and SAF. However, **we recommend prolonging this instrument beyond 2030 and saving a certain budget for eFuels.** A comparable instrument for the maritime sector is missing although this sector got integrated in the ETS as well. The EU innovation fund should continue to support technological developments.

In addition, the biggest lever to close the price gap between fossil and renewable fuels is the European Energy Taxation Directive (ETD). Currently, renewable fuels like HVO or eFuels are taxed like fossil fuels. To promote climate-friendly technologies a differentiation is required. The EU Commission has proposed quite attractive low tax rates for advanced biofuels and eFuels. Due to unanimous vote in the Council a revision of the energy taxation has seen less progress. However, a change of the ETD could accelerate the market uptake of eFuels.

2. Impractical delegated acts of the Renewable Energy Directive:

Next to clear demand signals the supply side requires adjustments as well. In the REDII, production criteria were introduced with two delegated acts, setting out rules for the electricity consumption as

well as a methodology to calculate the carbon footprint of RFNBOs. While the REDII sets a deadline for the Commission to publish these delegated acts until end of 2021, a final proposal was only approved with significant delay in summer 2023. Numerous legal questions remain open and have been addressed partially by the EU Commission with a legally non-binding Q&A document (European Commission, 2024). The EU Commission finally approved the voluntary certification scheme for RFNBOs of three companies on September 9, 2024. Still national authorities have to confirm this certification process. Of course, this has led to delays and huge uncertainties. No final investment decision can be made if it is unclear whether all production criteria are met. **A missing certification scheme was the main reason for many project delays.**

The production criteria are much too restrictive, complex and bureaucratic. For grid-connected facilities only additional renewable electricity generation is allowed which comes from renewable energy plants that are not older than 36 months when the RFNBO production starts. In addition, a temporal (monthly until 2030 and then hourly) as well as geographical (same bidding zone) correlation needs to be proven. Most of the European hydrogen and eFuel production will be grid-connected. However, renewable installations like wind or photovoltaic can be built in 2 years whereas RFNBO plants take 3-4 years. There is a significant project risk, as the investment decision for both plants will not match in time. First studies have analyzed the impact of these regulatory burdens: The university of Cologne and Harvard have calculated that the switch from monthly to hourly correlation will increase hydrogen costs by a quarter (Ruhnau, O. & Schiele, J., 2023). Another recent publication by the university of Duisburg-Essen analyzed that the electricity criteria are reducing European electrolysis capacity by 33% (29.85 instead of 44.52 GW) in 2035. Different regions are facing different impact. Domestic production decreases by more than half in Central Europe (33.72 vs. 70.55 TWh). **The authors sum up: "RED constraints lead to higher system costs and dampen the expansion of electrolysis capacity in the EU (Radek, J., Breder, M. S. & Weber, C., 2024)."**

On September 20th, 2024, the German minister for economy and climate protection Robert Habeck wrote a letter to the European Commission and complained about the development of the hydrogen economy. According to this letter the hydrogen production increases by 2.4 € per kg only due to the restrictive criteria of delegated acts. He proposes to postpone the phase-in of grandfathering until 2035 and continue the monthly correlation until end of 2030. A revision of the delegated acts is necessary to achieve those changes (Tagesspiegel Background 2024).

When it comes to potential CO₂ sources, the delegated acts are even more restrictive. Industrial point sources are just allowed until 2041 and need to be in an effective carbon pricing system like the EU-ETS. However, an ETS-comparable system does not exist outside of the EU. **For that reason, all eFuels projects with an industrial point source outside of Europe would never be eligible in the RED framework.** There, just biogenic or CO₂ from ambient air could be used. But direct air capturing technologies are still in an early stage and biological sources not available everywhere. In addition, with RFNBO producers competing over the limited biogenic CO₂ sources, their cost has increased and will subsequently lead to a rise in the green premium off-takers would have to pay for RFNBO. Many potential production sites, especially in industrial areas suitable for bigger installations, are thus immediately disqualified. As Europe will continue to depend on energy imports, it is unreasonable to make the import of renewable energy carriers so difficult. Also, the mass balancing period for CO₂ sources displays another burden. According to the Q&A document of the Commission a period of 3 months is foreseen. That is insufficient e.g. for waste incineration plants in Nordic countries, which often produce more biogenic CO₂ in winter periods than summer due to combined power and heat generation. A larger eFuel facility could be built if a 12-month period for the mass balancing of CO₂ is chosen instead.

How to solve this issue?

We agree that clear production criteria of RFNBOs need to follow a sustainable pathway. However, the balance between what is sustainable and what is possible was clearly missed. Competing

technologies like heat pumps or electric vehicles don't have to fulfill similar criteria. Too many projects can't handle the high burden set by the regulation in the beginning. Therefore, **we call for an early revision of the delegated acts and a full exemption of electricity production criteria until 6 GW of electrolysis capacity are built in Europe.** The exemptions should be temporary to increase the planning security. This would also award first movers and support the issue we have described above. Also, we support the proposal of German minister Robert Habeck to postpone the phase-in of the additionality criteria to 2035 and continue with monthly correlation. During that period, **we would also advocate to allow a free allocation of eFuels in refineries.** Currently, a mass-based allocation is used. That lead to low shares of desired products like synthetic aviation fuels. If all synthetic fuels could be steered in one sector the economics are improved.

In addition, **industrial point sources like from Cement or steel industry should be allowed under the condition no technology exist on site to avoid those emissions.** The Commission should immediately work on a list of possible industrial carbon sources. We recommend **delete the definition of an 'effective carbon pricing'** and exchanging it by allowing unavoidable CO₂ of for industrial carbon sources inside and outside of Europe. It is clear that third countries e.g. Namibia or South Africa cannot afford ETS-comparable prices. Further, we call for a **grandfathering** of the first 6 GW production facilities for any political changes. If political changes on the production criteria are made in future existing plants should be excepted. This would reduce uncertainties and lead to earlier and more investment decisions. We are aware that a revision could delay project which are already in the pipeline. Therefore, the Commission should work on a smooth and fast revision on the above-mentioned items.

3. Include all potential target markets:

The last issue that is hindering an immediate market uptake is the exclusion of economic attractive target markets and biggest single carbon emitter in the EU like the road sector. During the past years, an ideological debate has taken place in which political groups tried to set technologies for different sectors following an 'efficiency first' paradigm. This led to the common belief that eFuels should only be used in so called hard-to-abate sectors like shipping and aviation. As a result, the EU Commission proposed a ban of the internal combustion engines for new cars and vans in 2035. For trucks, 90% of all new vehicles should have an electric engine in 2040. Following that decision, a potential large target market is excluded in future. We acknowledge that the electric mobility (BEV) will play a major role in future. But we question if it will be the only technology. Even if we do not know to what extent eFuels are used in road transport in the end this sector could be decisive for upscaling the technology. With BEV uptake not taking place as hoped, infrastructure remaining centered in few countries and trade disruptions leading to further insecurities – automotive manufacturers fear billion fines with upcoming CO₂ targets. At the same time BEV frontrunners use pooling to finance non-competitive vehicles. **The clear loser: climate, as road transport emissions have not seen a substantial decline which could be addressed by allowing renewable fuels to close the gap.**

Hard-to-abate sectors like shipping and aviation are more price-sensitive. Fuel prices account for up to 50% of end-user costs. These sectors are in a global competition to markets outside of Europe with less strict climate policies. For example, for intercontinental flights hubs outside of EU could be used for further connections. In addition, these sectors often have limited future visibility due to e.g. a changing flight plan in aviation or no fixed routes in tramp shipping, meaning long-term offtake contracts might be much riskier or not possible at all for those two applications. In contrast, for cars less rational consumer decisions are made. Often other criteria matter more like range, flexibility or an available infrastructure. The more potential target markets are neglected, the less investments will be made.

Often by-products exist which can only be sold to the road sector. For example, following the Fischer-Tropsch synthesis route, which is currently the only production route to meet aviation fuel standards, a mix of synthetic hydrocarbons is produced. By following a classic refinery process

around one third of kerosene is produced in average. The rest is naphtha, gasoline and diesel for industry and road sector. If these fuels can't be sold as eFuels to the road sector all additional costs will be charged on kerosene. Higher shares of kerosene are only possible with a dedicated hydro-cracking on-site, with still a share of by-products remaining. Then, existing refineries can't be used anymore.

How to solve this issue?

Although legislators agreed on an exemption for vehicles which are exclusively supplied with eFuels, we are still missing practical solutions how this will be implemented. The review of the EU CO₂ standards for cars and vans in 2026 offers the right opportunity to ensure that other alternative fuels, aside from electric mobility, are recognized as enabling technologies to decarbonize the road sector. Instead of exemptions for single pathways, we advocate for a more technology neutral approach and **recommend recognizing the CO₂ reduction of all low carbon fuels in the CO₂ emission standards of new vehicles**. First, a carbon correction factor should be introduced to take the existing share of low carbon fuels into account (get more information [here](#)). Second, a crediting system on top could eliminate remaining emissions on a voluntary basis (get more information [here](#)). Third, a new vehicle class should be created for vehicles which are using only low carbon fuels like sustainable biofuels or eFuels. This allows also for differentiation of taxes, such as vehicle tax or truck toll, to incentivize usage of climate friendly energy carriers.

All three options should be used complementary.

About the eFuel Alliance

The eFuel Alliance is a stakeholder initiative committed to promoting the political and social acceptance of eFuels and to securing their regulatory approval. We represent more than 170 companies, associations and consumer organizations along the value chain of eFuel production. We stand for fair competition and a level-playing field for all relevant emission reduction solutions. We are clearly committed to more climate protection and aim to win broader recognition of the significant contribution eFuels can make in the drive for sustainability and climate protection. Our goal is to facilitate the industrial production and widespread use of carbon neutral fuels made from renewable energy sources.

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