

Implementation of the RED II in the transport sector

Fostering the market ramp-up of powerfuels



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Executive Summary

The revised Renewable Energy Directive (RED II), adopted in 2018 sets goals for the use of renewable energy carriers in the transport sector¹ in the EU for the period 2021 to 2030. As the transport sector¹ is one of the sectors not covered by the Emissions Trading System (ETS), the RED II is highly relevant to reducing emissions from rail and road transport, which currently make up 25 % of EU-wide GHG emissions.

As well as offering policy support for different types of renewable fuels, the RED II also provides rules and standards for the crediting of sustainable fuels to the 14 % renewable energy transport target for 2030. Notably, the recast RED II gives member states greater flexibility in implementing this goal by acknowledging the potential of renewable fuels of non-biological origin (RFNBOs/powerfuels) to mitigate emissions. While the contribution of conventional biofuels is capped, advanced biofuels, renewable electricity in road and rail transport and powerfuels are eligible as contributors to the directive's renewable energy goal.

The availability of advanced biofuels in Europe is, however, limited, and the dedicated soft cap of 1.7 % for waste-based biofuels sends a signal to member states that support for such fuels should be restricted. The national renewable energy goals in transport set out in the NECPs show that only a few EU member states have declared a specific target for the direct use of renewable electricity by 2030 even though the importance of its role in all the countries covered by the analysis has been acknowledged. No targets are defined in the NECPs for the use of powerfuels in transport. They are, however, finding recognition as an option for the fulfilment of the obligations.

In 2030, the sum of powerfuels and renewable electricity could constitute between 2 and 18 percent of renewable fuels across the 10 member states considered in this paper². These member states jointly represented 74.7 % of the final energy consumption in the transport sector of the EU 27 in 2017³. Powerfuels could potentially account for up to 70 % of renewable fuels in the EU by 2050 (German Energy Agency & Ludwig-Bölkow-Systemtechnik, 2017). Such massive volumes need the support of policy measures at national and European levels to incentivise the development of a European powerfuels market - an idea that is starting to be reflected in recent developments:

¹ Excluding civil aviation.

² I. e. the unspecified portions of the analysed 2030 targets. Poland and Sweden are excluded from this observation, as the composition of their target in its entirety is not specified.

³ Own calculation based on (International Energy Agency, 2020).

On August 3 2020, the European Commission opened a public review process to discuss a possible revision of the RED II (European Commission, 2020b). The intention is to increase the penetration of renewable fuels in transport, especially in aviation, maritime and heavy-duty transport. The transposition into national law of the RED II and its possible revision within the context of the European Green Deal offer the possibility of creating better conditions for the production and use of powerfuels across the EU. Furthermore, synergies with other directives such as the Fuel Quality Directive (2009/30/EC) and the EU regulation on CO₂ emission performance standards for new road vehicles (2019/631 and 2019/1242) raise the prospect of stimulating a market ramp-up of powerfuels.

In order to scale up the emerging markets while providing them with the long-term stability needed to firmly establish powerfuels in the energy mix, strong policy support is required across the European Union. In this context, our proposal entails four action elements:

Action Elements

- 1 An energy quota for powerfuels should be included in the RED II.
- 2 A multiplier for powerfuels should be included in the RED II.
- 3 Member states should set higher national energy targets compared to those declared in their National Energy and Climate Plans (NECPs).
- 4 The use of powerfuels in refineries, and the resulting GHG reduction should be recognised.

Framing the EU Climate target plan

On September 19 2020, the European Commission published “The 2030 Climate target plan”, based on the climate ambitions set out in the European Green Deal (European Commission, 2020a). The plan includes several points which relate to the instruments established by and within the RED II that could foster the market development of powerfuels. Notable points are:

- The indication that the **share of renewable energy in transport “has to increase to around 24 % [by 2030] through further development and deployment of electric vehicles, advanced biofuels and other renewable and low carbon fuels [...]”** (p.8).
- The statement that **“clean hydrogen will be crucial for decarbonising heavy-duty transport and, through its derivatives, in the aviation and maritime sector”** (p.9).
- The reference to an update to the RED II **methodology to promote renewable fuels in a manner consistent with their GHG performance.**

The four instruments recommended in this work are aligned with, and reinforced by, said points of the Commission’s Climate target plan.

1 Obligations and targets for the transport sector in the RED II

In line with the Paris Agreement, the European Union has set itself the goal of achieving climate neutrality by 2050. The climate and energy framework for the years 2021 to 2030 adopted by the European Council in 2014 sets the binding near-term target of a reduction of at least 40 % in GHG emissions in the EU by 2030 compared to 1990 levels. A 32 % target for the share of renewable energy complements this goal (European Commission, 2020d). This climate

target of 40 % was augmented considerably in the recently introduced 2030 Climate Target Plan, which envisions a more ambitious goal of at least 55 % in emissions reductions by 2030 (European Commission, 2020c). Consequentially, the plan also foresees a set of actions across all sectors and announces the revision of key legislation to support its new goal in the next few months.



Regulation for climate targets of non-ETS sectors

For the achievement of these targets, the EU differentiates between the mitigation obligations of the sectors under the emissions trading system (ETS) and non-ETS sectors. Each category implies different emission targets and, while the ETS is regulated at EU level, the non-ETS sectors enjoy more flexibility. Sectors under the revised EU ETS are under obligation to curb their respective emissions by 43 % by 2030 compared to 2005 levels. Non-ETS sectors will have to mitigate their respective emissions by a total of 30 % compared to the same baseline. For the following period from 2030 to 2050, this distinction between reduction goals for ETS and non-ETS sectors has not yet been made. The only goal to have been adopted to date is an overall target in the range of minus 80 to 95 % compared to the 1990 baseline (European Commission, 2020d).

Currently, the sectors covered by the ETS cap-and-trade mechanism (namely power generation, energy-intensive industries and civil aviation) make up almost 45 % of EU-wide emissions (European Commission, 2020e). The larger share, however, is accounted for by the sectors not covered by the ETS (besides transport, these include buildings, waste, other industries and agriculture), amounting cumulatively to almost 55 % of total EU emissions (European Commission, 2020f). The transport sector alone produces almost 25 % of EU emissions (European Commission, 2020g). In emissions reporting, mitigation targets for non-ETS sectors are broken down into separate national targets for each member state, as specified under the 2018 EU Effort Sharing legislation. The regulation includes binding annual targets, calculated on the basis of the relative GDP per capita of the respective countries as well as other criteria. As the EU Commission points out, this wealth-based balancing of responsibility for emission reductions was chosen under consideration of cost-efficiency and fairness by allocating greater shares of mitigation obligations to richer countries (European Commission, 2020f). Individual reduction goals differ considerably, ranging from as little as 0 % for Bulgaria to 40 % in Sweden (by 2030, relative to 2005). The regulation also sets annual emissions budgets for each country, which form a linear trajectory from 2021 to 2030.

Table 1: Emission reduction targets for 2030 by member state

Member State	GHG emission reductions in 2030 in relation to their 2005 levels
Belgium	-35 %
Bulgaria	-0 %
Czech Republic	-14 %
Denmark	-39 %
Germany	-38 %
Estonia	-13 %
Ireland	-30 %
Greece	-16 %
Spain	-26 %
France	-37 %
Croatia	-7 %
Italy	-33 %
Cyprus	-24 %
Latvia	-6 %
Lithuania	-9 %
Luxembourg	-40 %
Hungary	-7 %
Malta	-19 %
Netherlands	-36 %
Austria	-36 %
Poland	-7 %
Portugal	-17 %
Romania	-2 %
Slovenia	-15 %
Slovakia	-12 %
Finland	-39 %
Sweden	-40 %
United Kingdom	-37 %

Source: European Parliament & European Council, 2018a

Under the Effort Sharing Regulation, each member state is free to choose how to reach these goals and how emissions from these sectors are to be curtailed. This provision thus grants member countries more flexibility in fulfilling the EU climate targets in accordance with their specific conditions and within the range of their possibilities. As part of the framework, countries must report their progress in complying with the self-determined trajectories in their National Energy and Climate Plans (NECPs) by means of biennial status reports, starting from 2023, which will then be evaluated by the European Commission. If a given state does not reach its target, it is required to revise its plans and measures appropriately. (Eurostat, 2018)

Additional flexibility is granted by the option for countries to bank, borrow, buy and sell their emission allotments: If annual emissions are lower than their emissions budget, member states can bank any surplus emission allocations and save them for use in later years⁴. On the other hand, in years in which emissions surpass the annual budget, allocations can be borrowed from the following years as a sort of emissions credit (credit limits are 10 % for 2021–2025 and 5 % for 2026–2029). In addition to banking and borrowing, which grant flexibility over time to adjust to the fluctuations over time of emissions output, states can also buy and sell their allotments to and from other states (limits for transfers are 5 % for 2021–2025 and 10 % for 2026–2030). This last feature in particular is intended to contribute to the cost-effectiveness of the system. Certain member states also have the option of covering their extra emissions with ETS allowances. Furthermore, every country is allowed to offset some of its emissions against reductions from land use, land-use change and forestry (LULUCF). Finally, poorer countries have the option of crediting some of their reductions from before 2020 to their goals up to 2030 (Clean Energy Wire, 2019).

EU climate goals for the transport sector and the role of the RED II

Besides the above-mentioned emissions reductions, member states are also under obligation to achieve binding national targets for the share of renewable energy in their energy consumption by 2030. The revised Renewable Energy Directive (RED II) of the European Union, which entered into force in 2018 as part of the 2016 “Clean Energy for all Europeans” package, formulates more long-term as well as more ambitious goals for renewable energy consumption in the EU for the period 2021 to 2030, compared to the 2020 goals laid down in the first RED (European Parliament & European Council, 2018b). Besides raising the overall renewable energy target to 32 % at EU level by 2030, the RED II most notably sets a sub-target for the transport sector, prescribing a share of at least 14 % renewable energy, and tasks fuel suppliers with delivering this target (Article 25).

Similarly to the Effort Sharing Regulation, the RED II defines annual targets for each member state. While these targets can be achieved through emissions reductions in all sectors, the 14 % transport sector target is binding on every state. As defined in the directive, the transport sector includes road and rail transport only. Renewable energy added to the fuel mix in the aviation and maritime transport sectors can optionally be counted towards the 14 % goal (European Commission, 2020i).

The RED II is also the central European regulation which provides wide-ranging definitions and applications for the use of sustainable fuels in the transport sector. As set out in Articles 25, 26, 27 and 28 of the directive, the use of different renewable transport fuels which can be credited to the 14 % goal is subject to certain rules (table 2). A key feature of the RED II is that it allows member states more flexibility in choosing how to meet their targets and, specifically, which fuels to use: According to Annex IX, besides renewable electricity and biofuels, renewable fuels of non-biological origin (RFNBOs) and recycled carbon fuels (RFCs) are also eligible for inclusion as contributors to the 14 % goal.

⁴ There is, however, a limit to how many surpluses can be collected.

Table 2: Fuel options to be credited towards the 14 % transport goal

Type of fuel	Regulation
Conventional biofuels (Art. 26): e. g. bio diesel, bio ethanol	<ul style="list-style-type: none"> ■ Min. GHG reduction: 50 – 65 %, depending on plant operation starting date ■ No multiplier ■ Cap: 7 %, 0 % until 2030 for high ILUC risk biofuels ■ If member states decide to lower the limit, the 14 % target will be reduced by the corresponding number of percentage points.
Advanced biofuels (Arts. 25, 27, Part A of Annex IX): e. g. bio methane	<ul style="list-style-type: none"> ■ Min. GHG reduction: 50 – 65 %, depending on plant operation starting date ■ Multiplier: 2x their energy content ■ Min. quota: 0.2 % (2022), 1 % (2025), 3.5 % (2030)
Waste-based biofuels (Art. 27, Part B of Annex IX): e. g. used cooking oil	<ul style="list-style-type: none"> ■ Min. GHG reduction: 50 – 65 %, depending on plant operation starting date ■ Multiplier: 2 x their energy content ■ Cap: 1.7 % (0.85 % if multiplier is 2, excl. Cyprus and Malta) ■ Cap may be raised if justified by the member state in accordance to RED II and approved by the Commission.
Renewable fuels of non-biological origin/RFNBOs (Arts. 25, 27): e. g. hydrogen, powerfuels	<ul style="list-style-type: none"> ■ Min. GHG reduction: 70 % from 2021 ■ No multiplier ■ No minimum quota ■ Sustainability criteria for electricity sources: renewability, temporal and geographical correlation, and additionality
Recycled carbon fuels/RCFs (Arts. 25, 28)	<ul style="list-style-type: none"> ■ Min. GHG reduction: not yet defined ■ No multiplier ■ Optional: Can be credited to the 14 % target but not the overall 32 % goal.

Source: European Parliament & European Council, 2018b

The use of biofuels in the RED II

The RED II allows the EU to move away from crop-based biofuels and introduces a stronger emphasis on advanced fuels. This is a “lesson learned” from the initial RED, adopted in 2009, which contributed considerably to the increased use of land-based biofuels. The recast RED not only puts in place rules for “high indirect land use change (ILUC) risk biofuels”⁵ but also removes the binding target for biofuels, while at the same time formulating a cap for conventional biofuels and setting a binding target for advanced fuels, which is 7 % in each case. The caps

send a policy signal to member states to limit support for both conventional and waste-based biofuels. For waste-based biofuels, however, this can instead be understood as a “soft” cap as it can be raised pursuant to Article 27. In addition, Article 26 gives member states some leeway as it permits them to reduce their overall transport target if their use of crop-based biofuels is low. This offers yet another incentive to reduce the use of crop-based biofuels.

⁵ The RED II sets limits on high ILUC risk biofuels, bioliquids and biomass fuels with a significant expansion in land with high carbon stock (0 % by 2030). It also introduces an exemption from these limits for biofuels, bioliquids and biomass fuels certified as low ILUC risk. Further, low risk and high risk are assessed according to methodology set out in a dedicated delegated act. member states may also exempt fuel suppliers supplying fuel in the form of electricity or liquid and gaseous RFNBOs from the requirement to comply with the minimum share of advanced biofuels and biogas produced from the feedstock listed in Part A of Annex IX with respect to those fuels.

Multipliers

The RED II also makes use of multipliers – the option to count multiples of the energy content of specific fuel types as contributing to the 14 % renewable energy transport target – as a tool targeted at increasing the support for advanced biofuels while withholding this kind of support from first-generation biofuels, thus further incentivising the use of alternative fuels in preference to unsustainable conventional biofuels.

However, these multipliers can create problems elsewhere. Due to the application of multipliers to renewable energy targets in the transport sector, the actual energetic share of renewable energies can be distorted, leading to more renewable energy being credited toward the 14 % goal than is actually used. It is thus effectively possible to achieve the 14 % target with considerably less actual renewable energy content, especially when multipliers are as high as factor 4 (table 3). Consequently, while EU policy can provide an incentive for the use of alternative fuels through multipliers in the RED II, its impact in terms of climate mitigation is uncertain.

The use of powerfuels in the RED II

For RFNBOs or powerfuels, the RED II is one of the first regulations to provide wide-ranging definitions and applications for their use in the transport sector. In the RED II, Article 25 establishes that RFNBOs can be used by member states to achieve the overall 14 % renewable energy target in the transport sector. By introducing the additional fuel category of RFNBOs, it has taken a step toward acknowledging the potential of powerfuels to mitigate GHG emissions in the transport sector. Nonetheless, RFNBOs are not on equal footing with alternative fuels in terms of multipliers as they are currently counted without a multiplier in place.

Table 3: Crediting options in different sectors (Art. 27)

Sector	Crediting
Aviation and maritime shipping	Multiplier: 1.2 (applicable for all fuel types except conventional biofuels)
Renewable electricity in rail transport	Multiplier: 1.5
Renewable electricity in road transport	Multiplier: 4

Source: European Parliament & European Council, 2018a

GHG emissions reduction

In addition, RFNBOs are subject to stricter sustainability criteria than advanced and even conventional biofuels. The required emissions savings compared to the fossil baseline range between 50 – 65 % reductions for biofuels, while RFNBOs are under obligation to deliver a higher minimum GHG emissions saving of 70 %. It is only in compliance with these standards that the respective fuels can be counted towards the renewables target (table 2). These lower GHG emissions reduction standards for biofuels vis-à-vis RFNBOs, in combination with the unequal application of multipliers, further raise the question of whether carbon reductions can effectively be achieved with the current rules in place. The potential of powerfuels in particular to bring about real reductions in emissions in the transport sector cannot currently be fully harnessed. Also to be considered in this context is the importance of costs: Achieving GHG reductions with biofuels is cheaper than it is with powerfuels, which further inhibits the widespread use of powerfuels.

Pending delegated acts of the RED II

With the national implementation pending, it is therefore necessary in a timely manner to exploit and develop the full potential of the RED II to ensure fulfilment of the EU climate goals through the elaboration of the delegated acts on sustainable transport fuels before the end of 2021.

The formulation of further details of the regulation includes the exact calculation methodology of GHG emissions reductions by RFNBOs and RCFS (Articles 25, 28) and sustainability criteria for RFNBOs (Article 27), as well as the implementation of the RED II at the national level. As set out in Article 27 of the RED II, the purchase of power for the production of RFNBOs must comply with four criteria (renewability, temporal correlation, geographical correlation and additionality), the exact definition of which is still pending and will need to be transposed into national law by June 2021. Powerfuels producers can purchase electricity through the grid by means of a Power Purchase

Agreement (PPA) with a renewable power plant. To guarantee the sustainability of the power supply, the above-mentioned four criteria need to be met. A detailed regulatory proposal can be found in the paper "Sustainable Electricity Sources – RFNBOs in the RED II".

Table 4: Regulation timetable

Delegated act Art. 25	1 Jan 2021
RED II National implementation	30 Jun 2021
Delegated acts Arts. 25, 27, 28, Annex IX	31 Dec 2021

Source: European Parliament & European Council, 2018a

The EU 2030 Climate Target Plan

The Climate Target Plan of the EU, released in September 2020, will likely have an impact on all of the legislation described above. It not only raises the overall 2030 emissions reductions goal from 40 % to at least 55 % (compared to 1990) but also announces the revision of several major pieces of legislation. As the climate ambitions set out by the Commission are raised, the regulatory framework will need to be adjusted and aligned with the new goal. The release of the plan has therefore started the process of developing proposals for the revision of any relevant climate and energy legislation by June 2021 (European Commission, 2020c). This includes:

- The Emissions Trading System Directive (ETS)
- The Effort Sharing Regulation
- The Renewable Energy Directive (RED II)

In particular, the plan proposes to integrate other sectors, including the transport sector, into the EU ETS and foresees stricter emissions standards for cars and light commercial vehicles (-50 % by 2030 compared to 2021). It also underlines that the current 2030 renewable energy target for transport is no longer sufficient to achieve the new carbon reductions goal, suggesting a target of approximately 24 % compared to the current 14 % goal. This would imply a considerable scaling-up of ambition for the transport sector and its use of renewable energy.

2 Implementation status in EU member states

Member states must transpose the REDII into national policies and measures and report to the EU Commission by June 30 2021 on their progress in implementation. The state of implementation in the EU member states and the role of RFNBOs in the fulfilment of the REDII targets are to be examined by asking:

1. How close is the member state to fulfilling the REDII targets?
2. Does the member state have policies and measures in place or under development to reach the targets?
3. How could these policies contribute to a market ramp up of powerfuels?

Share of renewable energy in transport in 2018

The current share of renewable energy in the transport sector can be described in both relative and absolute values.

Figure 1 shows that, in absolute terms, France and Germany were the largest consumers of renewable fuels in 2018, at 3142 ktoe and 2686 ktoe respectively. RED-compliant biofuels clearly dominated the renewable fuel mix in 2018. Electricity from renewable energies in rail transport accounts for the second largest share. According to the data provided by Eurostat, the contribution of RFNBOs is negligible.

Absolute renewable fuel consumption in 2018

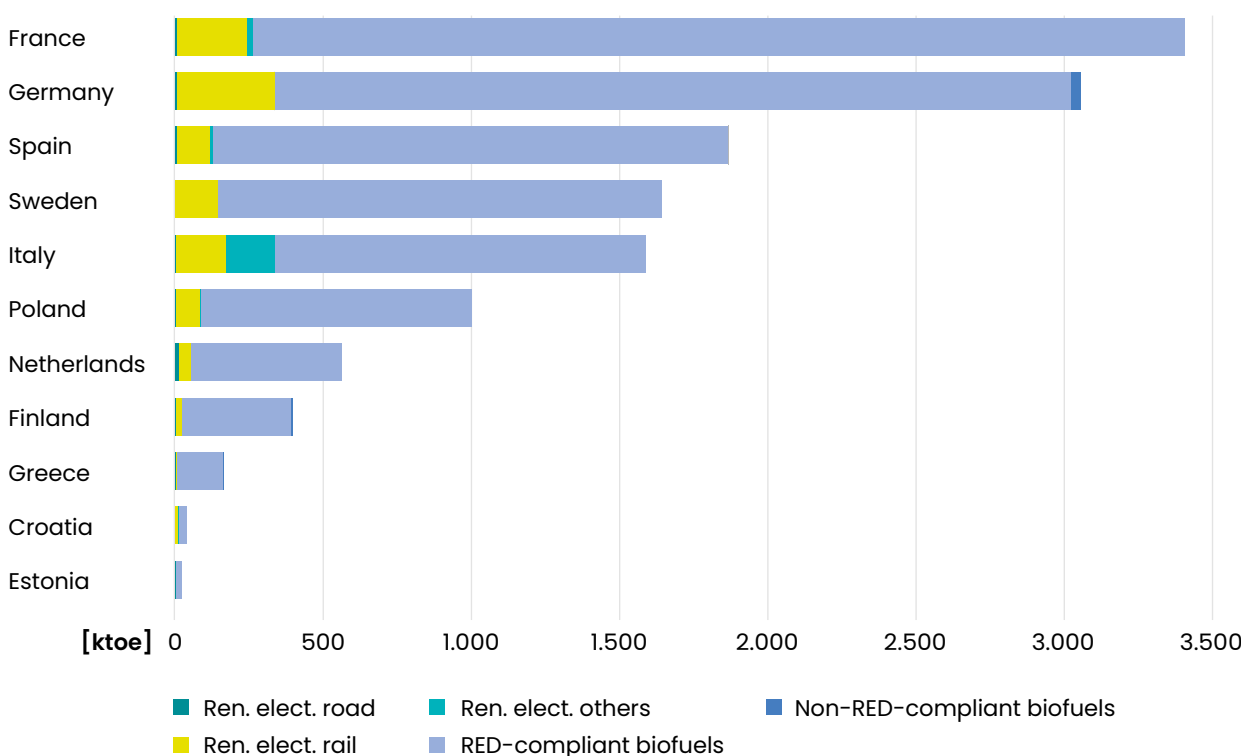


Figure 1: Absolute renewable fuel consumption in selected EU member states in 2018 (based on Eurostat, 2018).

In EU member states, the average relative share of renewable energies in the transport sector was 8.3 % in 2018, after the application of multipliers. The relative energetic share was therefore lower. Sweden and Finland had the highest relative shares, at 29.7 % and 14.9 % respectively. However, due to a lack of data on the advanced biofuel share, it cannot be concluded that Finland and Sweden are already meeting all REDII targets. None of the other analysed EU member states managed to achieve a share of 10 %. France recorded a share of 9 %, while that of Germany was 7.9 %. The lowest value was recorded by Estonia, at 3.3 %.

Generally, EU member states differ widely in terms of their absolute quantities of renewable fuel consumption and their relative shares of renewable energy in the transport sector. It will therefore be more difficult for some member states than others to achieve the target levels set in the REDII.

Target shares of renewable fuels in the transport sector in 2030

The EU Commission published the 'National Energy and Climate Plans' (NECP) on June 24 2020 for the

period 2021–2030, for which a first draft had to be submitted by each EU member state by the end of 2018. In their NECPs, member states describe the status quo of all energy sectors and their planned future development. For the selected member states, the targets for the relative share of renewable fuels in transport by 2030, calculated using multipliers, are shown in figure 2.

Seven out of the ten selected EU member states are planning to exceed the 14 % target set in the REDII. Sweden has the highest level of ambition, with a renewable share target in the transport sector, of 48 %, followed by Finland with 45 %. Germany and France, being the largest consumers of renewable fuels in the EU today, plan to achieve 27 % (GER) and 15 % (FR). Of all the selected member states, Croatia has set the lowest target, at 13 %. The gap between the target values of Sweden and Croatia demonstrates a substantial difference in ambition across the EU member states. Besides the overall targets for renewable fuels in the transport sector, most of the selected member states have set targets for specific fuel types, and these are shown in figure 2.

2030 target shares for renewable fuels in transport

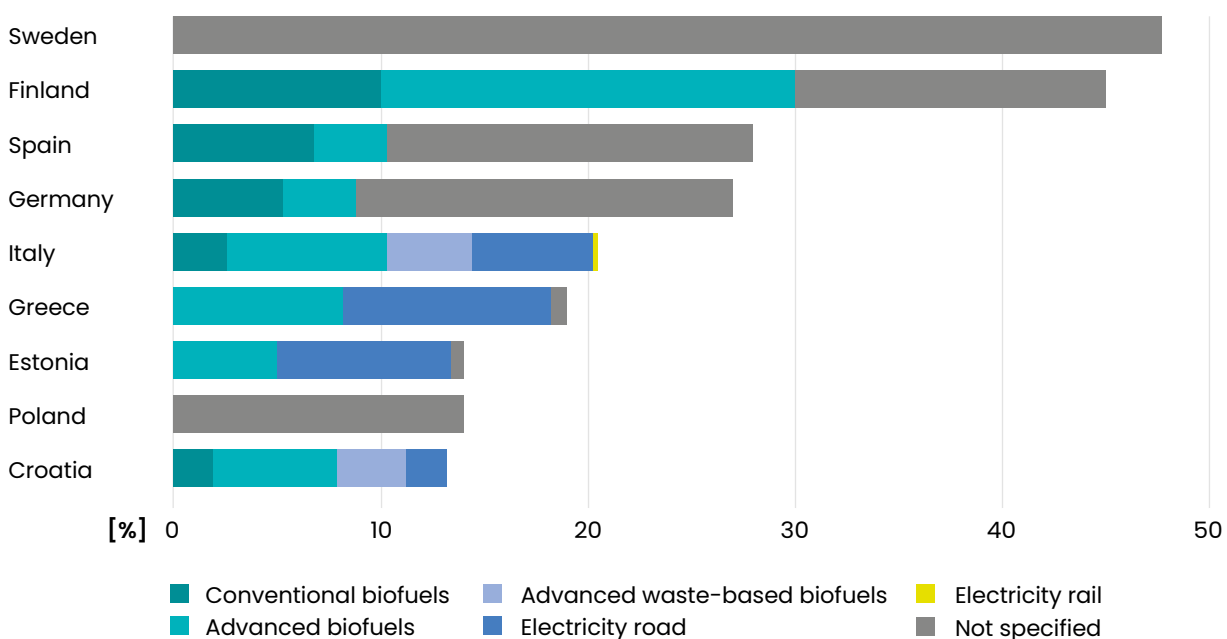


Figure 2: 2030 targets of selected EU member states for relative shares of renewable fuels using crediting multipliers (based on NECPs available at European Commission, 2020h).

Most member states have defined target shares for conventional and advanced biofuels. Advanced biofuels will contribute significantly and with the exception of Spain and Germany, all of the selected member states plan to go beyond the advanced biofuel quota of 3.5 % for 2030 that has been set at European level. Finland has the highest ambitions, with the target of a 20 % share of advanced biofuels in its overall fuel mix by 2030. Greece and Italy plan to have at least 8 % advanced biofuels in their fuel mix. Furthermore, Greece and Croatia have target shares for advanced waste-based biofuels in place.

As for the direct use of electricity from renewable energy sources in road transport, four of the ten selected Member States, namely Croatia, Estonia, Greece and Spain, have defined target shares in their NECPs. However, in Germany, France, Finland, Sweden and Spain, the use of renewable electricity in transport is being vigorously promoted, even though exact target shares have not yet been defined.

For the use of RFNBOs in the transport sector, most member states have not defined specific target shares in their NECPs. Of the analysed member states, only Italy has set a hydrogen target share of 1 % for 2030 (European Commission, 2020h). Even though RFNBOs do not play an important role in the NECPs for the achievement of the 2030 renewable energy targets in transport, they are recognised as a fulfilment option in most of the selected member states. The unspecified shares of the 2030 targets in Sweden, Finland, Spain, Germany, France and Poland are indicative of flexibility in the national implementation of the REDII and thereby create opportunities for the use of RFNBOs.

Fuel-specific strategies, policies and instruments

For the implementation of the REDII, member states need to adapt existing policies and measures or initiate the process of creating new ones. Article 36 of the REDII sets June 30 2021 as the reporting date for member states to communicate to the EU Commission how they intend to transpose the REDII into national laws, regulations and administrative provisions.

Biofuels

Biofuels are the dominant renewable fuels in the transport sector and, according to the targets set in the NECPs, will still account for a large share of the renewable fuel mix in 2030. All analysed member states have policies and measures in place to initiate and support the use of biofuels in the transport sector. The main instruments being used to bring them into national markets are quotas and binding emission reduction targets for fuel suppliers. These targets are fulfilled by blending biofuels with conventional fuels. In most of the selected EU member states, these instruments can be easily adapted to the quotas and caps set in the REDII for conventional and advanced biofuels.

Electricity

According to the NECPs of the analysed member states the use of electricity from renewable sources in road transport will play a key role in increasing the share of renewable energy in the transport sector.

With the exception of Estonia, all the analysed member states have policies and measures in place to promote the use of electric vehicles (EVs) in road transport. Some member states have set targets for a minimum number of EVs by 2030, for instance 7–10 million in Germany, 1 million in Poland, 5 million in Sweden and 3 million in Spain (European Commission, 2020h). The Netherlands has set the ambitious target of 100 % emissions-free car sales by 2030 (European Commission, 2020h). Many of the measures are financial instruments to foster the deployment of charging infrastructure and the sales of e-vehicles. Additionally, the EU Clean Vehicles Directive will support the use of electricity in road transport at the European level by defining quotas for clean mobility solutions for public procurement tenders.

RFNBOs

In their NECPs, most member states recognise RFNBOs as an option for increasing the share of renewable energy in transport but do not specify target shares for the use of powerfuels in road transport. Italy's NECP is alone in including the possibility of a target share of 1 % hydrogen by 2030. France has set a goal of having a hydrogen fleet of around 20,000 to 50,000 vehicles and 800 to 2,000 heavy-duty vehicles on the road by 2028 (European Commission, 2020h). In Germany, fuel cell vehicles are regarded as electric vehicles. Therefore, targets and measures for electric vehicles will also have an impact on the use of hydrogen in the transport sector. Some of the selected member states, for instance Germany, Netherlands, Sweden and Poland, have a hydrogen strategy in force or under development.

Significant portions of the 2030 targets of Sweden, Finland, Germany, Spain and Poland shown in figure 4 are not specified. These uncertainties indicate flexibility concerning the potential use of multiple fulfilment options – including RFNBOs – to achieve the 2030 targets.

Main takeaways

- EU member states differ widely in their current share of renewable energy in the transport sector and their targets to increase the share of renewable energy by 2030.
- Electricity from renewable sources and biofuels will be the key renewable fuels for meeting the national targets in the transport sector by 2030. Member states already have policies and measures in place for their promotion.
- Most of the analysed member states already recognise RFNBOs as an option for increasing the share of renewables in transport. Some of them, e.g. France and Italy, have referred to targets for the use of hydrogen and fuel cell vehicles in their NECPs. The transposition of the REDII into national policies and measures is, however, still pending.
- The NECPs of various member states reveal a significant proportion of unspecified renewable energy target shares in the transport sector. This indicates flexibility concerning the potential use of several fulfilment options – including RFNBOs – in achieving the 2030 targets.



3 Options and instruments for the market development of powerfuels

European member states and the European Commission can enforce a number of instruments to increase the production volumes of powerfuels while providing the security needed to foster long-term investments.

Transposition into national law of the RED II in its current form

In the transposition of the RED II into national laws, legislations and measures, member states have several options to stimulate the development of a powerfuels market:

1. Higher overall national renewable energy target for 2030 for the transport sector

While this is not a direct incentive for the development specifically of powerfuels, a high renewable energy target would constitute an indirect market-based incentive for the use of powerfuels. Since other options to achieve the renewable energy target are either capped or limited in quantity, powerfuels offer an additional source of renewable fuels that could contribute to the achievement of an ambitious renewable energy target.

However, other fulfilment options can be expected to be cheaper than powerfuels, especially if the current multipliers and other incentives are not adapted to create a level playing field for powerfuels.

The RED II indirectly supports the adoption of powerfuels: fuel suppliers bringing powerfuels into the market can be exempted from the binding minimum quotas for advanced biofuels. Thereby, investments otherwise destined for biofuels can be reallocated to the production of powerfuels.

2. National GHG emissions reduction targets

Member States can decide to implement measures to comply with the RED II in the form of an energy mandate or a GHG emissions reduction target. As outlined in chapter 2, mechanisms designed to reduce GHG emissions in the transport sector are in place in all analysed member states. The binding mechanisms put in place to achieve such targets can be amended, and new mechanisms created to allow for a contribution to be made by powerfuels by:

- recognising powerfuels as one option to reduce GHG emissions, and/or
- imposing a GHG reduction quota to be achieved with powerfuels alone.

Although the recognition of the GHG reduction potential of powerfuels is an important step towards their wider commercialisation, it is still a rather weak instrument given the cost-competitiveness of conventional and advanced biofuels. A GHG quota for powerfuels would be a stronger instrument, as it would provide a clear market signal that would foster the development of supply and demand volumes for powerfuels. It should additionally be considered that a quota for certain fuels would decrease fuel suppliers' flexibility in designing their product portfolio and thereby limit their options in choosing fulfilment options. On the other hand, a significant co-benefit of a GHG quota is that, if it is based on a robust GHG accounting methodology which includes indirect emissions, it can be anticipated to deliver higher shares of the most sustainable fuels and a greater reduction in GHG emissions compared to an energy mandate (The ICCT, 2017).



3. Including powerfuels in refining processes: powerfuels in co-processing, and hydrogen

Hydrogen can be employed in refining processes delivering conventional fuels⁶. By using hydrogen with a sufficiently low GHG balance in the production process, the well-to-pump GHG emissions of the final fuel decrease compared to the conventional production pathway.

Furthermore, in co-processing, synthetic “powerfuel” crude (syncrude) can be processed alongside fossil crude in refineries and thus in part replace the volume of fossil crude used. While only part of the final products of a refinery (typically 50 %) are used for transport, this is currently the only sector where appropriate regulatory conditions and incentives for the use of low-carbon hydrogen and co-processing are being developed. For context, it should be remarked that,

under the Fuel Quality Directive, the co-processing of biogenic material with fossil fuels has already been proven to be an effective way to increase the share of renewable energy in the fuel mix. It is therefore crucial that GHG emissions reductions achieved by low-carbon hydrogen and the co-processing of syncrude can be fully credited towards transport sector goals. Only partially recognising GHG reductions would considerably increase costs and reduce the number of viable projects. According to industry sources, the most economically viable scenario entails the co-processing of syncrude alongside fossil crude and crediting the derived GHG emissions savings to the final products. Furthermore, the use of green hydrogen should also be recognised in the production of biofuels. Such a measure would increase the overall use of green hydrogen in refineries.

⁶ Mainly in the hydrocracking of long hydrocarbons and the hydrotreating of several refining products.

Possible future amendments to the RED II, their implications and other options

1. An energy quota for powerfuels

The European Green Deal could open up the option of revising RED II, thereby potentially allowing for the addition of an energy quota for powerfuels to the directive. An energy quota could be transposed into national policy simultaneously across all member states, thereby potentially contributing to a unified European market for powerfuels. Additionally, an energy quota could be a justifiable incentive for powerfuels compared to the incentivising instruments (quotas and multipliers) in place for advanced biofuels and the direct use of renewable electricity. Such a quota should take the differences between member states into account. In doing so, rather than setting a unified quota to be achieved in each member state, the quota should be set as a binding average quota for the EU 27 as a whole. The quotas for each member state should be defined in a dedicated process. As for the framing of such a quota, the same principles outlined in the previous section on a national energy quota should apply.

A shortcoming of energy quotas is that they do not foster the highest GHG reduction potential for a given volume of fuel. When one compares an energy and a GHG quota, the latter is more likely to be achieved with a lower volume of fuel (based on (The ICCT, 2017)).

2. A multiplier for powerfuels

A multiplier would be a direct incentive for the use of powerfuels. A comparison to existing multipliers could justify the inclusion of a multiplier for powerfuels. Most of all, it would create a more level playing field for powerfuels compared to other advanced fuel types which already benefit from dedicated multipliers.

The use of multipliers means that the amount of renewable energy content credited to a fuel (or electricity) is higher than its actual physical energy content. The physical GHG emissions reductions associated with one credited unit of renewable fuel are thus lower than those calculated based on the credited quantities. This distortion could be corrected by raising the overall renewable energy target in transport. This would safeguard climate goals by increasing the physically achieved GHG emissions reductions.

3. Other: Synergies with EU emissions performance standards for new vehicles

A recent report (Frontier Economics & Flick Gocke Schaumburg, 2020) commissioned by the German Federal Ministry for Economic Affairs and Energy (BMWi) highlights possible synergies between the RED II and the EU emissions performance standards regulation, which could be used to foster the development of powerfuels.

Specifically, in the report the European Commission is asked to review the scope of Article 15 of EU Regulations 2019/631 (light-duty vehicles, LDV) and 2019/1242 (heavy-duty vehicles, HDV) to accredit the climate neutrality of “synthetic and advanced alternative fuels” (SAAF)⁷ in EU emissions performance standards for new vehicles.

Due to the high level of willingness to pay⁸ of the automotive sector, this measure is seen as an effective instrument for the ramp-up of a powerfuels market. On the other hand, such a regulation must be designed with a great deal of caution, since transferring the GHG emissions reductions from fuels to vehicles could lead to discrepancies between the physically achieved reductions and those which have been accounted for⁹.

⁷ A definition of SAAF was not included in any European regulation as of June 2020.

⁸ According to industry sources, up to 480 €/t CO₂.

⁹ A detailed discussion of this measure goes beyond the scope of this work. However, it is worth mentioning that in its current form, the proposal assumes a vehicle life which may be well below the real life of today's vehicles.

4. Other: exemption from the European Taxation Directive (ETD)

The European Energy Taxation framework in its current state contains incentives for fossil fuels, a state of affairs which conflicts with EU climate goals, especially with a view to the EU Green Deal. A revision will be completed by June 2021, with a consultation process due to get underway by October 2020 (European Commission, 2020j). In this process of improving the alignment of climate goals and energy taxation, easing the tax burden on electricity used for powerfuels production would certainly be beneficial to the market development of powerfuels, as taxation is a principal factor influencing both investment in and consumption of powerfuels.

Qualitative assessment of presented measures

To derive recommendations regarding the above-mentioned possible measures, these are rated quali-

tatively on the basis of four criteria, using a colour-coding system to indicate whether a criterion is met (dark green), partially met, or not achieved (light green). The four criteria established assess whether measures are:

- Effective, i.e. the extent to which adopting a measure contributes to increasing powerfuel production volumes;
- Efficient, i.e. the ratio of output and input, indicating the powerfuel quantity incentivised per unit of invested resource (i. e. time and other assets);
- Coherent, i. e. the level of compatibility with the existing regulatory frameworks;
- Implementable, i.e. the level of political support for a measure relative to other conceivable instruments.

Taking the evaluation matrix in Table 5 into account alongside the considerations from the previous sections, the recommendations set out in the next section emerge.

Table 5: Qualitative evaluation matrix of discussed measures

National transposition	Effective	Efficient	Coherent	Implementable	Overall
Measures/criteria					
National energy target for powerfuels	Dark Green	Light Green	Dark Green	Dark Green	Dark Green
Higher total national renewable energy target	Light Green	Dark Green	Dark Green	Dark Green	Light Green
National GHG reduction target	Light Green	Dark Green	Dark Green	Dark Green	Light Green
Full crediting of powerfuels in co-processing & substitution of fossil H ₂	Dark Green	Light Green	Dark Green	Dark Green	Dark Green
Amendments to the RED II					
Energy quota for powerfuels	Dark Green	Light Green	Dark Green	Light Green	Dark Green
Multiplier for powerfuels	Light Green	Dark Green	Dark Green	Light Green	Light Green
Criterion not met					criterion met

4 Recommendations

The European Union has committed itself to achieving climate neutrality by 2050. In order to achieve this ambitious goal, all viable technological options to reduce GHG emissions in the transport sector need to be scaled up rapidly, particularly in this decade. As an option allowing for deep decarbonisation, especially in hard-to-decarbonise applications, powerfuels will need to play a significant role in the future energy system, as shown, for example, in the dena E-Fuels study (German Energy Agency & Ludwig-Bölkow-Systemtechnik, 2017). In order for a stable market to be created in the 2020s and sustained over the next decades, powerfuels require strong regulatory and policy support today.

The REDII could be instrumental in the market ramp-up for powerfuels in Europe. In order for the directive to stimulate the use of powerfuels in the transport sector, the Global Alliance Powerfuels has adopted a position in support of the following measures:

1

Energy quota

An energy quota for powerfuels should be included in the RED II through the European Commission's ongoing revision process, as it is the instrument best placed to provide security for investments in powerfuels production and infrastructure. Such a quota should be set on the total final energy consumption in the EU 27 in 2030. Certain member states should be exempted from the RFNBO quota for reasons of economic feasibility, subject to approval by the Commission.

The value of the quota should:

- Be aligned with supranational GHG emission reduction goals in and beyond 2030;
- Translate into production volumes high enough to support the aspiration to develop powerfuels to the point where they become competitive with other alternative fuels;
- Consider the project development lead times and the projected availability of RFNBOs to give fuel suppliers enough time to comply with, and interested supply chains to adapt to, the quota.

2

Multiplier

A multiplier for powerfuels should be included in the RED II through the European Commission's ongoing revision process.

The value of the multiplier:

- should reflect the GHG emission reduction potential and environmental performance of RFNBOs vis-à-vis other alternative fuels;
- must create a higher incentive to choose RFNBOs as option to fulfil the quota and increase the competitiveness of RFNBOs compared to other fulfillment options.

3

Higher national renewable energy targets

Member states should set higher national renewable energy targets than those declared in their NECPs, especially if combined with a multiplier for powerfuels.

Specifically:

- In combination with an adequate multiplier, making the target more ambitious will create space for the adoption of powerfuels;
- Such a measure would create a market-based incentive to adopt powerfuels due to the capped or limited availability of other fuels.

4

Powerfuels in refineries

The use of powerfuels in refineries and the resulting GHG reductions should be recognised. The resulting GHG emission reduction should be creditable to transport fuels only.

Specifically:

- The GHG reduction potential of powerfuels should be recognised when they are used as co-processing feedstock;
- The GHG reduction potential of low-carbon hydrogen should be recognised when it is used as production feedstock, for both conventional and advanced fuels;
- Supporting the use of low-carbon hydrogen in refineries should not delay or hinder the provision of support to production facilities of hydrogen-derived powerfuels (such as Fischer-Tropsch fuels).

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