

The RED II Proposal and Its Impact on the Bio-based Material and CO₂ Utilization Sector

Open doors for CO₂-based fuels, but non-level playing field for the bio-based material sector continues and threatens access to tall oil, animal fats and glycerol by the chemical industry as well as access to pulp wood by the forest industry

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On 30 November 2016, the European Commission published a proposal for the recast of the Renewable Energy Directive (RED), providing a potential outline of the Union's renewable energy framework for the timeframe 2021 to 2030. This proposal is also known as the "RED II proposal".

The new proposal sets the overall target of a renewables share in the EU's energy consumption at 27% by 2030 and includes the sectors electricity, heating and cooling as well as transport. Several of the new provisions, e.g. a cap of fuels produced from food or feed crops to max. 3.8%; and the ambitious goals for advanced biofuels have been commented on and discussed by a multitude of stakeholders in press releases and official statements.¹

At nova, we are always concerned with the question of how the revisions in energy policy will impact the bio-based material sector. We have therefore analysed the new Commission proposal with a view on the bio-based materials sector and present the most important findings

in this paper. In addition, we also evaluated the proposal's coverage of CO₂-based fuels, as we are convinced of their huge potential. The latter will have strong impacts on bio-based fuels and energy and, indirectly, also on the material sector.

As a whole, the proposal can be seen as an attempt to assemble a wide range of support mechanisms for a multitude of energy forms under one roof. The first-ever comprehensive inclusion of CO₂-based fuels means that the available support will be spread between more forms of energy supply than before, which are less dependent on biomass. From a bio-based materials point of view, this gives some hope for improved access to biomass and a fairer competition. However, there is still a long way to go towards a completely level playing field and the optimal use of resources in Europe. Especially for feedstocks that are accepted for "advanced biofuels", the situation has potentially worsened.

The following table summarises our results. The text below explains each item in more detail.

	RED (until 2020)	New Proposal (RED II)	Expected impact on material use and CO ₂ utilization
(1)	Renewables quota per Member State	No binding Member State quotas	Difficult to predict, depending on each Member State's decisions
(2a)	10% transport quota for biofuels	1.5% (2020) to 6.8% (2030) quota of low-emission renewable fuels in the transport sector including CO ₂ -based fuels	Potentially positive – biofuel demand increase delayed and partly substituted by CO ₂ -based fuels; CO ₂ -based fuels supported for the first time
(2b)	Indicative target for advanced biofuels (0.5%)	Minimum share of advanced biofuels 3.6 % by 2030 (based on materials listed in Annex IX A)	Potentially negative, depending on the feedstock (e.g. tall oil, animal fats, glycerol, pulp wood)
(2c)	7% cap on biofuels produced from food or feed crops	Further reduction down to 3.8% by 2030	Positive – biofuel demand decreases for food-based fuels
(3)	Sustainability criteria only for liquid biofuels	Extension of sustainability criteria to biomass-based heating/cooling and electricity and also for forest biomass	Potentially negative (since sustainability requirements are indirectly expanded towards bio-based materials without a level playing field)
(4)	Aviation fuels excluded from the quota	Aviation fuels now included in quota, counted with 1.2 times their energy content	Slightly negative – new competition (if based on biomass)

¹ See for example <http://www.euractiv.com/section/energy/news/commission-under-fire-over-post-2020-biofuels-targets>, http://biofuels-news.com/display_news/11460/finnish-government_satisfied_with_new_eu_red_proposal, http://biofuels-news.com/display_news/11444/ec_releases_red_ii_proposes_firstgeneration_biofuels_phaseout_and_new_sustainability_criterion_for_forest_biomass (all accessed 2017-02-17)

(1) No binding targets for Member States

One of the most important structural changes of the new RED proposal is that the overall target for a 27% share of renewable energies by 2030 is binding on EU level, but is not connected to binding shares for each Member State.

“This target is binding at EU level and will be fulfilled through individual Member States’ contributions guided by the need to deliver collectively for the EU. In addition, the new framework also enables the collective delivery to be done without preventing Member States from setting their own, including more ambitious, national targets. Member States can support renewable energy, subject to State aid rules.” (EC 2016)

This means that more than ever, the implications of renewable energy policy will differ from one Member State to the other, depending on which technologies they choose to contribute to the overall target.

Impact on the bio-based material sector

Difficult to predict, depending on each Member State’s decisions.

(2) Mainstreaming renewable energy in the transport sector

In line with the abolition of Member States targets, there is no longer a fixed quota of transport energy in the new Commission proposal (up to 2020 it was 10% of overall transport energy). The issue of biofuels is addressed through several mechanisms.

(a) Low-emission fuels incl. CO₂-based fuels

The new proposal lays down a specific quota for low-emission and renewable transport energy, which increases from 1.5% in 2020 to 6.8% in 2030. The following fuels are accepted under this quota:

- Advanced biofuels (see 2c)
- Renewable liquid and gaseous transport fuels of non-biological origin
- Waste-based fossil fuels
- Renewable electricity

The inclusion of renewable liquid and gaseous transport fuels of non-biological origin as well as of waste-based fossil fuels constitutes a **large step in the renewable energy policy, as it provides, for the first time, a legal basis for CO₂-based fuels.**¹ While in the long run, CO₂ is a promising feedstock not just for fuels, but also for materials, this first step is important to set up CO₂ utilisation in an economically feasible way and to create a relatively short-term RoI (return of investment). The two fuels are defined as follows (Article 2):

“Renewable liquid and gaseous transport fuels of non-biological origin’ means liquid or gaseous fuels other than biofuels whose energy content comes from renewable energy sources other than biomass, and which are used in transport.”

“Waste-based fossil fuels’ means liquid and gaseous fuels produced from waste streams of non-renewable origin, including waste processing gases and exhaust gases.”

The main difference between these two categories is the fact that “renewable liquid and gaseous transport fuels” require their energy content to stem from renewable sources that are not biomass, most commonly in the form of renewable hydrogen produced from e.g. renewable electricity. Both the terms “renewable” and “non-biological origin” refer only to the energy source of the fuels. Since the CO₂ utilised in the process is not an energy source, it may stem from both fossil as well as biogenic sources.

While this definition sounds very clear and straightforward in terms of which energy sources are permissible to produce these fuels (only renewable ones which are not biomass), the following passage in the REDII proposal (art. 25, par. 3) seems to water down this provision:

“(a) When electricity is used for the production of renewable liquid and gaseous transport fuels of non-biological origin, either directly or for the production of intermediate products, either the average share of electricity from renewable energy sources in the Union or the share of electricity from renewable energy sources in the country of production, as measured two years before the year in question, may be used to determine the share of renewable energy. In both cases, an equivalent amount of guarantees of origin issued in accordance with Article 19 shall be cancelled.

However, electricity obtained from direct connection to an installation generating renewable electricity (i) that comes into operation after or at the same time as the installation producing the renewable liquid and gaseous transport fuel of non-biological origin and (ii) is not connected to the grid, can be fully counted as renewable electricity for the production of that renewable liquid and gaseous transport fuel of non-biological origin.”

This implies that for the production of renewable liquid and gaseous transport fuels of non-biological origin, the normal electricity mix can be used. It is left unclear whether this means that only the share of the fuels which corresponds to the share of electricity from renewable sources in the used energy mix is counted in the fuel quota.

From an environmental perspective, this way of handling the energy source is not ideal at all. To play a system relevant role in the renewables market design, the connection to the national grid is crucial for CO₂-based fuels. However, if the national emission factor corresponding to the mix of the electricity grid (still containing a lot of fossil sources) is taken as the basis for the sustainability calculation of CO₂-based fuels, that will result in a very unfavourable carbon footprint.

Therefore, the utilization of green electricity via certificates of origin should be fully recognized for CO₂-based fuels and should be mandatory according to the REDII regulation. The electricity used by CO₂-based fuels should be free from extra levies for end consumers or renewables incentives, because the electricity is not consumed but transformed to another usable energy form.

For “waste based fossil fuels”, the definition in the REDII proposal is unclear in terms of the energy source. There is no clear obligation that the energy content of the fuels (usually in the form of hydrogen and/or CO) can only stem from the waste stream or a renewable source.

2 For more information on CO₂-based fuels (what they are, what role they can play), please see our petition at <http://co2-chemistry.eu/CCU-petition>

This is a shortcoming of the proposal and should be clarified in order to prevent additional fossil energy to be used in the production of these fuels.

In principle, there are five ways in which hydrogen can be won:

1. Electrolysis a): Raw material water, process energy renewable
2. Electrolysis b): Raw material water, process energy fossil-based
3. Steam reforming + water shift: Raw material and energy source fossil methane, additional process energy in practice fossil-based (renewable additional process energy would hardly change the total GHG balance)
4. Hydrogen (and CO) contained in the waste stream
5. Hydrogen produced by microorganisms or via photocatalytic systems (artificial photosynthesis by renewable energy, as of now in R&D only)

From an ecological perspective, only options 1, 4 and 5 make sense. Options 2 and 3 are ecological disasters. Subsidising them under a Renewable Energy Directive will have severe negative impacts on GHG emissions and also on the credibility of this new technology.

While the general inclusion of CO₂-based fuels is a positive development, it can be criticized that an implementation starting from 1. January 2021 will imply a significant delay of technological developments due to a lack of security for investors. As a consequence, CO₂-based fuels might only contribute to the EU's energy and climate goals past 2024.

Impact on the bio-based material sector

Giving a clear incentive for the production of CO₂-based fuels could ease the pressure on biomass and related prices, however only if substitution of biofuels with sustainably produced CO₂-based fuels reaches relevant volumes. Currently CO₂-based fuels are still in their infancy and their further development can be expected to take time. However, some CO₂-based fuels have already reached a similar economic feasibility as certain advanced biofuels. For this reason, the effect of using CO₂-based fuels can be expected to be low in the near future. Still, given the facts that: (1) CO₂-based fuels' environmental impact is close to or even better than the impact related to advanced biofuels, and (2) CO₂-based fuels are not connected to agricultural supply chains (which are difficult to influence), the proposal might lead to a real shift towards CO₂-based fuels.

(b) Advanced biofuels

Within the overall low-emission transport quota, there is a sub-quota for advanced biofuels which by 2030 need to make up 3.6% of the overall share of transport energy.

Advanced biofuels are defined as "biofuels that are produced from feedstocks listed in part A of Annex IX" (Article 2). This in itself is a shortcoming of the proposal, since the definition is not based on scientific criteria and evidence. In comparison to previous versions of the RED, the feedstocks listed in this Annex are no longer called "wastes and residues", which can be read as an attempt to circumvent

extensive discussions on whether the feedstocks included here were really "wastes". Instead the definition refers only to itself without any scientific foundation what an advanced biofuel really is and without sticking to a legal definition of waste and residue according to the Waste Framework Directive or the definition given in Article 2 of the same proposal. This is not supportive to finding the most efficient and climate friendly use of resources, but is an open attempt to ensure feedstock access for the fuels industry without taking any other uses into consideration.

Impact on the bio-based material sector

The impact of this regulation is potentially negative and depends mainly on the feedstocks chosen by each Member State or company for fulfilling the advanced biofuels quota. As was discussed by several previous publications of nova-Institut as well as other players³, Annex IX A continues to contain materials that have been used by the chemical and material industries for decades or even centuries to process them into high value materials. Some examples of this are:

- **Tall oil** (which has been newly added to part A of Annex IX in this proposal), which is used by the pine chemicals industry (part of the oleochemical industry) to produce a vast range of every-day products.
- **Crude glycerine**, which is used as an intermediate in the chemical industry for glycerine acetate, propylene glycol, acrolein, epichlorohydrin for epoxy resins, nitroglycerin, and others. Purified glycerine is used in the food industry, as well as in pharmaceutical and personal care applications. For various chemicals, such as epichlorohydrin, the production from glycerine is far more environmentally friendly than a crude oil based process route, and there are several other processes in the R&D pipeline to use glycerine as (co-) feedstock for fermentation processes in the industrial biotechnology or as intermediate in the chemical industry.
- **Animal fats and used cooking oil (UCO)**, which are an important (also historical) feedstock for the oleochemical industry; more artificial demand from biofuels could mean limited access and higher prices for the oleochemical industry, which would be a hurdle for further developments. A slightly positive development is that the contribution of these feedstocks to the advanced biofuels sector is limited to 1.7% (Part B of Annex IX).

Furthermore, the strong focus on the so-called 2nd generation fuels will probably also mean a more difficult access to pulp wood for the forest-based industries.

The continued subsidies for the energetic use of these materials contribute to a continued **non-level playing field** for material and energy uses of biomass. In fact, it harms parts of Europe's chemical industry, as it has to compete for ever more expensive and limited resources. As a consequence, investments are now happening outside of the EU, leading to decreased production and employment within the Union (in comparison to the biofuels and bioenergy

³ See for example:

a) a video published by Arizona Chemical (a pine chemicals company, now Kraton) before the last RED revision under <https://www.euractiv.com/section/science-policy-making/video/cto-the-real-green-gold>

b) Fraunhofer UMSICHT: EU CTO – Value Added Study

c) nova-Paper #4: Proposals for a Reform of the Renewable Energy Directive (RED) to a Renewable Energy and Materials Directive (REMD), <http://bio-based.eu/nova-papers>

sector, the chemical industry's value chains generate approximately 5-10 times the revenue and employment rate from the same amount of raw material while achieving at least the same GHG reductions, some even more).

(c) Cap on fuels produced from food or feed crops

With the ILUC amendment, the RED had already reduced the share of first-generation biofuels and the proposal continues in the same direction. In Article 7 it puts a cap to the share of fuels produced from food or feed crops on the gross final renewable energy consumption in transport from 7 % in 2021 with a further reduction down to 3.8 % by 2030. Moreover, it extends the scope of the cap from biofuels to also include bioliquids and biomass fuels.

Impact on the bio-based material sector

The decreasing demand for biomass by first-generation biofuels will most probably allow an increase of biomass demand by bio-based materials, especially if prices go down accordingly. This is expected to contribute to an upswing of the bio-based materials sector, provided that the industry will not be frightened off by the bad image of first generation feedstocks. But even this image could experience an upward trend, since there are almost no reasons to not use surplus production of the food and feed sectors – which exists in many regions of the EU – in order to make high-value chemicals and plastics. Chemicals and plastics do not require any subsidies. Moreover, replacing even substantial amounts of petro-chemicals with bio-based alternatives would still require significantly less biomass than what is currently used for biofuels, making it possible to mostly use surplus from food and feed production.

(3) Extension of sustainability criteria to biomass-based heating/cooling and electricity and to forest biomass

The proposal extends the scope of the already existing sustainability criteria⁴ to also cover biogas and biomass used for heating/cooling and the generation of electricity. However, the applicability of these criteria is bound to a number of criteria (Article 26):

- In case of solid biomass fuels the fuel capacity of the installation needs to be equal to or exceed 20 MW;
- in case of gaseous biomass fuels the electrical capacity needs to be equal to or exceed 0,5 MW;
- the installation is not substantial for securing the electricity supply of the Member State;
- the feedstock in question is not a residue from industries and processing; these feedstocks only need to fulfil the GHG saving criterion.

Impact on the bio-based material sector

Overall, the additional sustainability criteria introduced by this proposal are not expected to have a significant impact, since they are not very strict and only apply to very large facilities (which make up only a small share of all bioenergy facilities in Europe).

The exemption of wastes and residues from this criterion is the same as in the current RED provisions. The main negative impact of this is expected from the inclusion of certain feedstocks in Annex IX (see discussion of 2b).

There might be an indirect negative effect on the bio-based material sector if the discussion on sustainability criteria covers more and more sectors. This could lead to an ever growing expectation that also bio-based materials should only be produced from feedstocks carrying a sustainability certification. While there is general agreement on cultivating feedstocks in a sustainable way, such expectation completely neglects two facts:

- Bioenergy only needs to fulfil these criteria in order to be counted in the quota and thus receives subsidies.
- Nobody ever questions the sustainability of fossil-based raw materials in chemicals or plastics.

In contrast, bio-based materials do not receive any kind of compensation in order to pay for more expensive feedstocks. In fact, they compete with a subsidised bioenergy sector on the one hand and with a long-standing petro-chemical sector which is not required to guarantee the sustainability of its feedstocks on the other hand. The growing expectation of certified feedstocks therefore indirectly furthers the non-level playing field, too.

(4) Aviation fuels now included in quota

For the first time, aviation fuels are included in the renewable energy quota and can thus contribute to Europe reaching its goal of 27% renewable energy by 2030. According to the proposal, aviation fuels shall be counted at 1.2 times their energy content.

Impact on the bio-based material sector

The impact of this new provision is difficult to predict. On the one hand, it might increase the competition for biomass if aviation fuels are going to be mainly produced from biomass. On the other hand, CO₂-based fuels present a very interesting opportunity for aviation fuels. Therefore, the new regulation might boost the market for aviation fuels made via carbon capture and utilisation.

⁴ Among others, these criteria also include a GHG saving potential, which is set at 80% for installations starting their operations past 1 January 2021.