

Hydrogen Europe Analysis

Summary and implication of the proposed Delegated Act on GHG calculation methodology for RFNBOs and RCFs under the Renewable Energy Directive

May 2022

1. GHG reduction threshold for Recycled Carbon Fuels (article 2)

70% GHG reduction threshold for Recycle carbon Fuels (RCFs) (similar to RFNBOs)

Not unexpected.

2. GHG threshold for hydrogen (used to produce RFNBOs and RCFs)

Fossil fuel comparator is **94 gCO_{2e}/MJ**

Meaning that with a 70% required reduction, the GHG footprint threshold for hydrogen is **3.38 tCO₂/tH₂**

But:

- This is before all other emissions - so in reality, the threshold is lower
- Emissions from hydrogen compression do not need to be taken into account
- Emissions from electricity used for liquefaction need to be taken into account further lowering the threshold for hydrogen production
- And further emissions from fuel transportation to the refuelling station need to be included as well lowering the threshold for hydrogen production even further

3. CO₂ accounting

Captured CO₂ can be deducted from the carbon footprint of the RFNBO or RCF in the following cases:

- If it is CO₂ captured in industries covered by ETS then only if the full CO₂ price was paid under the ETS (or an alternative CO₂ pricing system, if its imported CO₂ or RCF or RFNBO).
- CO₂ from Direct Air Capture
- CO₂ captured from the production or the combustion of biofuels, bioliquids or biomass fuels
- Furthermore in case of CO₂ from non-sustainable sources (fossil fuels) only until 2035

Comment:

The general idea that the CO₂ “credit” goes to the end user is sound. But several potential issues are here:

- Under the ETS, if you capture CO₂ and sell it you don't have to pay for CO₂ emissions. According to this DA, you cannot deduct this CO₂ from the carbon footprint of the fuel, unless it is paid for. It is unclear how exactly would that happen, legally for the ETS emitter to pay for emissions he is not emitting and then to certify that to the e-fuel producer. Would just a purchase of extra CO₂ allowances be enough? Then how to link those allowances to the CO₂ sold to the e-fuels producer? The mechanism of this is not clear at all.
- No mention of any exemptions – for example for CO₂ emissions from sectors where emissions are unavoidable – e.g. cement.
- No mention of CO₂ from waste incineration (I assume a portion of CO₂ equal to the biogenic fraction of burned waste can still be deducted, but what about the rest – only until 2035?). At least a clarification in the text would be welcome.

- It creates a problem with ETS for aviation. Under the ETS regulation regarding aviation, the emissions for biofuels are zero but for other fuels they should be calculated on the basis of the IPCC Guidelines. Those include only aviation gasoline or jet kerosene. Neither includes e-fuels. Therefore, for the e-kerosene case, the CO₂ cost would have to be paid twice - once by fuel producer and then again by the airline. To avoid that, the Directive 2003/87/EC would have to be changed to allow other emission factors to be used - based on LCA methodology (in a similar way to the FuelEU Maritime).

4. GHG footprint of electricity

The carbon footprint of electricity used to produce RFNBOs or RCFs (including electricity for electrolysis) is:

- If it is fully renewable (in line with the other “additionality” DA) then it is zero.
- If its not fully renewable according to the “additionality” DA then one of the following three approaches can be used to establish the carbon footprint:
 - a) the average carbon footprint of the member state should be used (but calculated including upstream emissions).
 - b) Alternatively: where the number of full load hours the electrolyser is producing is equal or lower than the number of hours in which the marginal price of electricity was set by installations producing renewable electricity or nuclear power plants in the preceding calendar year, grid electricity can also be counted as zero-emission. Where this number of full load hours is exceeded, grid electricity used in the production process of RFNBOs and RCFs shall be attributed a greenhouse gas emissions value of 183 g CO₂eq/MJ [*comment: equivalent to an open cycle gas turbine using natural gas as fuel*].
 - c) Alternatively, the greenhouse gas emissions value of the marginal unit generating electricity at the time of the production of the RFNBO [*comment: but not RCFs? as RCFs are omitted here for some reason*] in the bidding zone may be used if this information is publicly available from a reliable source.

Comment:

This creates additional opening outside of what is included in the additionality DA. There it is “if RES share is >90% electricity used can be counted as fully renewable”. Here it is more flexible – allowing for ELY utilization equal to number of hours where the merit order on the wholesale electricity market was closed by RES or nuclear. But here it does not allow the electricity to be counted as renewable but as zero-emission. The way its written is very unclear, however, it is not going to count as a RFNBO – only as zero emission “low-carbon” hydrogen.

Example of application:

Assuming: In France the number of hours in which the marginal price of electricity was set by installations producing renewable electricity or nuclear power plants is **4,000 h** (this is just an assumption). Also in France the RES share in power generation is **20%**.

One could then operate an electrolyser for 4,000 hours per year and would be able to produce:

- 20% renewable hydrogen,
- 80% low carbon hydrogen,
- 100% of hydrogen with a carbon footprint of zero.

5. Emissions from manufacturing of equipment

Emissions from manufacturing of equipment not taken into account (i.e. no need to calculate emissions from manufacturing of electrolysers, or vehicles and batteries, also all RES = zero GHG)

6. Emission from compression of hydrogen

Emissions from hydrogen compression not taken into account – and the reason given for that is that they are also excluded from fossil fuel comparator for hydrogen as well ... only that they are not excluded at all.

Comment: This is an artefact. In the previous (leaked) version there was a separate fossil fuel comparator for hydrogen (lower at 90 gCO₂/MJ to account for emissions from compression with EU mix electricity). Now the second fossil fuel comparator has been removed, but at the same time, emissions from hydrogen compression are still excluded. Not a point for Hydrogen Europe to raise as it is beneficial for us (even if a very, VERY small benefit). Still, we should expect this to be amended as most likely others will raise this point in public consultations. Therefore, most likely either the lower fossil comparator will be reintroduced or the exemption for hydrogen compression will be removed.

7. Rigid vs elastic inputs

Greenhouse gas emissions from the production and use of renewable liquid and gaseous transport fuels of non-biological origin or recycled carbon fuels shall be calculated as follows:

$$E = e_i + e_p + e_{td} + e_u - e_{ccs}$$

$e_i = e_{i \text{ elastic}} + e_{i \text{ rigid}} - e_{\text{ex-use}}$: emissions from supply of inputs (gCO₂eq / MJ fuel)

$e_{i \text{ elastic}}$ = emissions from elastic inputs (gCO₂eq / MJ fuel)

$e_{i \text{ rigid}}$ = emissions from rigid inputs (gCO₂eq / MJ fuel)

$e_{\text{ex-use}}$ = emissions from inputs' existing use or fate (gCO₂eq / MJ fuel)

e_p = emissions from processing (gCO₂eq / MJ fuel)

e_{td} = emissions from transport and distribution (gCO₂eq / MJ fuel)

e_u = emissions from combusting the fuel in its end-use (gCO₂eq / MJ fuel)

e_{ccs} = emission savings from carbon capture and geological storage (gCO₂eq / MJ fuel)

Greenhouse gas emission savings from renewable liquid and gaseous transport fuels of non-biological origin or from recycled carbon fuels shall be calculated as follows:

$$\text{Savings} = (E_F - E) / E_F$$

where:

E = total emissions from the use of renewable liquid and gaseous transport fuel of non-biological origin or recycled carbon fuel

E_F = total emissions from the fossil fuel comparator.

In many cases the challenge will come from proper assessment of which inputs to treat as rigid or elastic.

The reason for this distinction is to take into account that certain feedstocks that can be used to RCFs or RFNBOs may already have been in use to produce energy and the Commission decided it is appropriate to take the GHG emissions resulting from the diversion of the use of those rigid inputs from its current use into account when calculating the GHG footprint of RCFs and RFNBOs. It is not unexpected and is similar an approach to the one already used in the ETS Innovation Fund.

It still creates problems for using by-product hydrogen (or other by-products) for RCF/RFNBO production.

Example:

Following the proposed methodology if:

- a) A chlor-alkali plant is producing by-product hydrogen
- b) Today it is burned on site in a CHP plant
- c) If that hydrogen would be redirected to be used for RCF production, that hydrogen would have a carbon footprint of the heat and power that would have to be now generated to replace the previous use of hydrogen (for electricity, for example, one should use the average carbon intensity of grid electricity of the country where the by-product hydrogen was previously used)

In addition, there are also some unclear areas – especially when it comes to the use of wastes as feedstock. Theoretically using waste is OK, as the methodology allows the take into account: *“Emissions from existing use or fate include all emissions in the existing use or fate of the input that are avoided when the input is used for fuel production. These emissions shall include the CO₂ equivalent of the carbon incorporated in the chemical composition of the fuel that was or would have otherwise been emitted as CO₂ into the atmosphere.”*. So emissions avoided from existing use of waste could be included to drive down the overall GHG footprint of fuels below 70%.

Yet, it is not 100% clear what approach to take to calculate the counterfactual scenario. E.g. if MSW is used as feedstock, is the counterfactual scenario a landfill or a waste incineration? How to treat the non-biogenic fraction of MSW – will the CO₂ deduction no longer be possible after 2035? What if the feedstock is unrecyclable plastic? At least some clarifications would be useful.

8. "Standard values" for greenhouse gas emission intensities of elastic inputs

Upstream emissions for natural gas are set based on Russian gas. This is discriminatory towards natural gas sourced e.g. from Norway or the Netherlands, where the emissions are closer to 2-3 gCO₂/MJ than to 9-10.

Also, emission factors for lignite seem to be mixed up:

The GHG intensities of inputs other than electricity are shown in the table below:

	Total emissions gCO2eq/ MJ	Upstream emissions gCO2eq/ MJ	Combustion emissions gCO2eq/ MJ
Natural gas	66.0	9.7	56.2
Diesel	95.1	21.9	73.2
Gasoline	93.3	19.9	73.4
Heavy fuel oil	94.2	13.6	80.6
Methanol	97.1	28.2	68.9
Hard coal	112.3	16.2	96.1
Lignite	1.7	115.0	116.7



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