Q&A implementation of hydrogen delegated acts

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The original and potentially updated document is available here: https://energy.ec.europa.eu/document/download/21fb4725-7b32-4264-9f36-96cd54cff148_en?filename=2024%2003%2014%20Document%20on%20Certification.pdf

General questions

1. What evidence would be required to demonstrate that hydrogen qualifies as renewable?

Reply: The RED does not include a definition of renewable hydrogen. Instead, the RED includes a definition of renewable fuels of non-biological origin (RFNBO), which covers hydrogen produced via electrolysis from renewable electricity as well as its derivatives. The term renewable hydrogen is often used as a simplification for hydrogen that qualifies as a RFNBO under the RED [^3]. To count as an RFNBO, hydrogen is required to 1) fulfil the definition of an RFNBO as set out in Article 2(36) of RED, 2) comply with the rules set out in Article 27(6) of the RED for the sourcing of renewable electricity 3) achieve 70% emissions savings and (4) be traced through the supply chain in line with the rules set out in Article 30(1) and (2) RED. In this context the hydrogen delegated acts set out detailed rules for sourcing of renewable electricity that is used for the production of RFNBOs and for determining the GHG emission intensity (GHG methodology)[^4].

2. For what purposes do the rules on renewable hydrogen set out in RED apply?

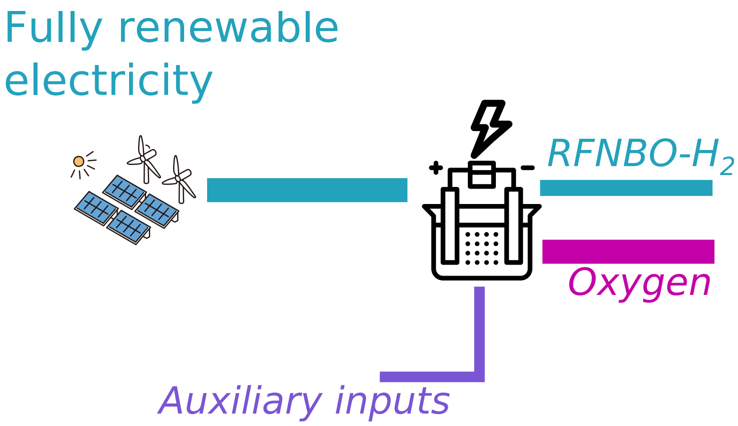
Reply: The rules have to be met to count renewable hydrogen towards the targets set out in the RED. Complying with the rules is not a prerequisite for importing hydrogen or for placing hydrogen on the EU market but may be a prerequisite for receiving public support.

3. Are the RFNBO delegated act and the GHG methodology interlinked?

Reply: The RFNBO delegated act complements the RED by setting out detailed rules on how fuel producers can source electricity that counts as fully renewable. The RED itself already includes a rule that allows sourcing electricity that counts as partially renewable (average share of renewable electricity in the country in the year n-2). The GHG methodology includes a life-cycle approach to determine the greenhouse gas emission intensity of RFNBOs (and recycled carbon fuels “RCF”). This approach distinguishes between electricity that counts as fully renewable and electricity that counts as partially renewable. In addition, the methodology includes a formula that allows deriving the amount of RFNBOs and RCF that is produced as this is required to derive the emission intensity. The delegated acts are therefore closely interlinked.

1: Water electrolysis, pure fully renewables

- How to allocate emissions to oxygen
- How to calculate the share of RFNBO with emissions from auxiliaries



Fully renewable electricity is attributed zero GHG emissions. Therefore, the only emissions come from auxiliaries.

Auxiliaries

Auxiliary inputs are all inputs not contributing to the heating value of the RFNBO. In the case of water electrolysis, this might be water supply and treatment, heat and other similar input.

To simplify the example, we grouped all of them together and displayed the impact directly related to the energy in the RFNBO output.

Emissions can be allocated to the co-products by the economic value (according to point 15(f), because oxygen has no energy content).

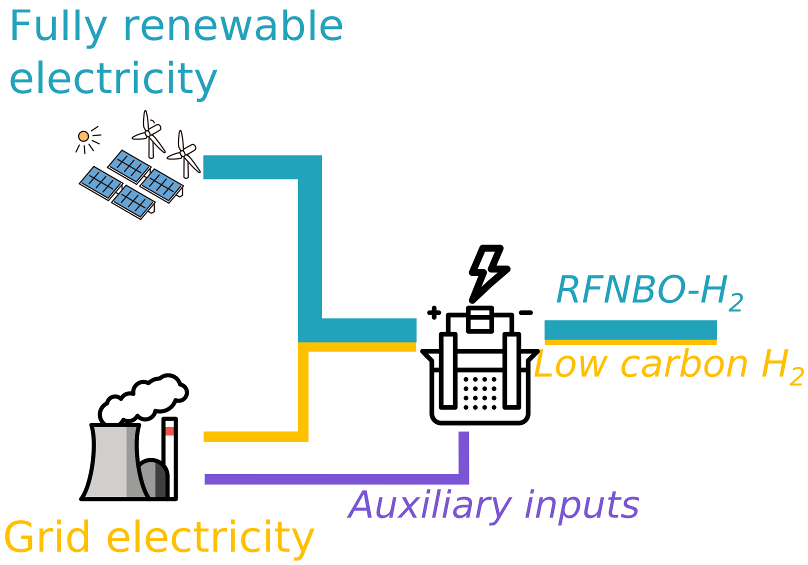
Assumptions

The main assumption is that the oxygen is valorized (sold) as a product. For electrolysers where the oxygen has no economic value, no emissions can be allocated to it.

Parameter	Symbol	Example value
Efficiency of the electrolyser	η_{ely}	$60\color{grey}{\%}$

2: Fully renewable and grid electricity

How to average over different timeframes



Electrolyser running at 764 MW with fully renewable, directly connected electricity, complemented by grid electricity. Oxygen is vented.

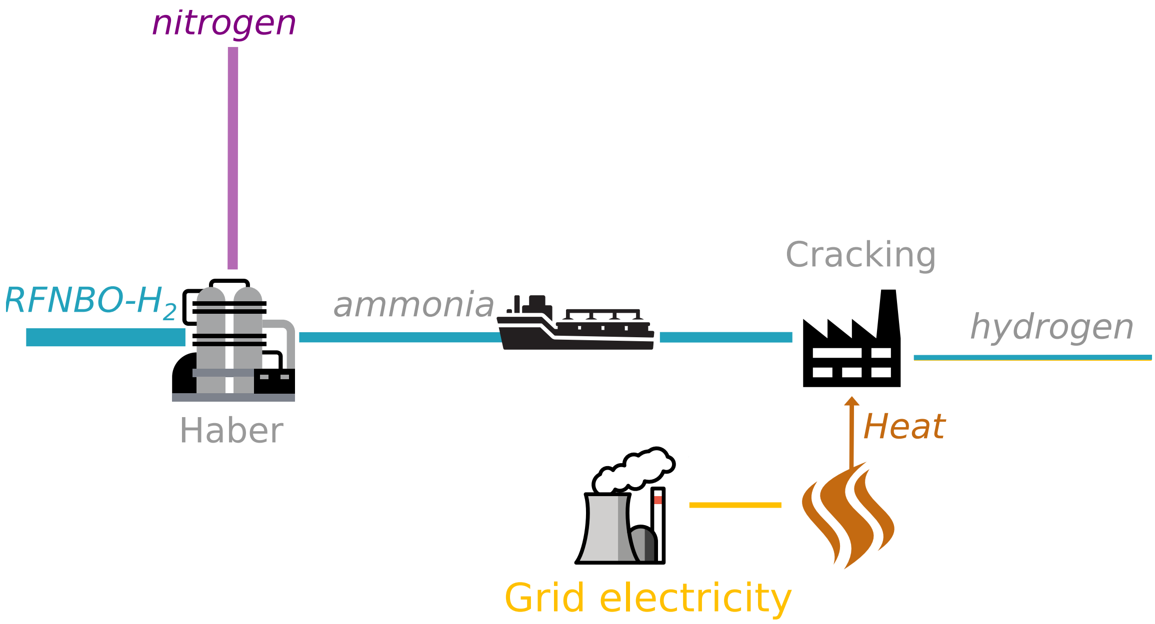
This case study shows that until 2030, it is possible to choose between monthly averaging or hourly averaging. As an example, we show an example of both. We pick one hour with particularly low renewables to exemplify how the calculation has to be done.

Assumptions

Parameter	Symbol	Monthly averaging	Hourly averaging, low renewables
Efficiency of the electrolyser	η_{ely}	$60\color{grey}{\%}$	
Relevant renewable electricity used	el_{ren}	$500\ \color{grey}{GWh}$	$264\ \color{grey}{MWh}$
Relevant grid electricity used	el_{grid_ely}	$50\ \color{grey}{GWh}$	$500\ \color{grey}{MWh}$

3: Ammonia + cracking

How to determine if an energy input is “relevant”



Cracking Ammonia is endothermic, the heat can be supplied electrically or by burning part of the ammonia. Here we assume that the energy is supplied electrically.

Assumptions

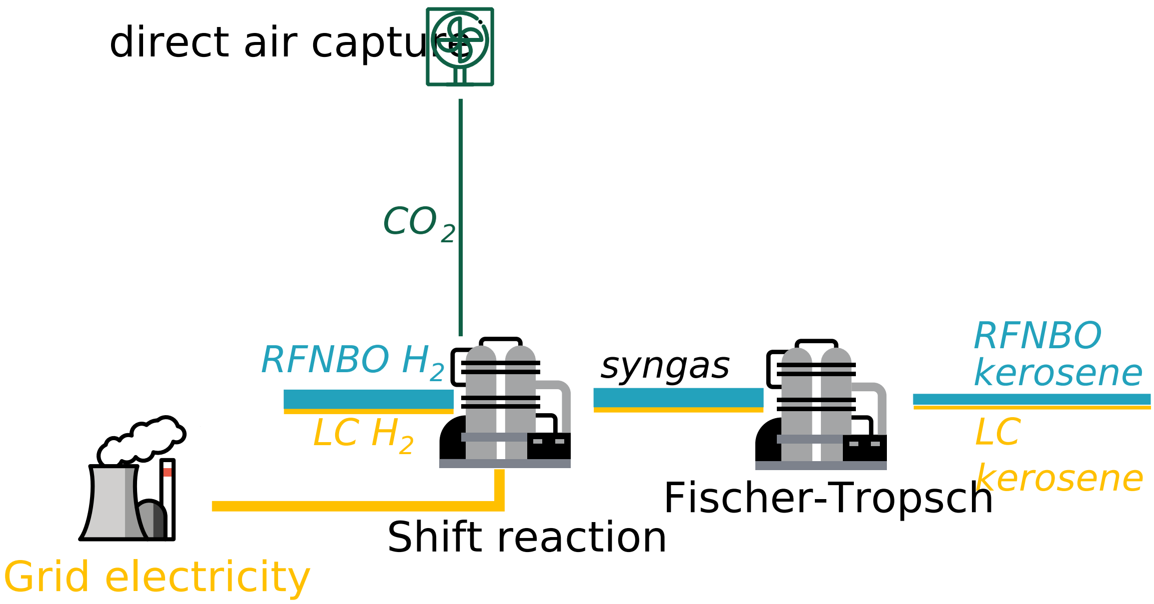
Transports

For this example, the transport process has been oversimplified. In reality, emissions caused by the transport need to be taken into account. This includes emissions from the ship, charging, uncharging and all other intermediate processes, including upstream emissions of the energy inputs.

Parameter	Symbol	Example value
Hydrogen demand Haber process (ammonia production)	\({hydrogen}_{input}\)	\(1.16\ \color{grey}{\left.MJ_{H_2}\middle/MJ_{{NH}_3}\right.}\)

4: Reverse Water Gas Shift and Fischer Tropsch synthesis to kerosene

How to count different integrated processes together



Hydrogen production as in case study 2, shift with CO_2 and subsequent Fischer Tropsch synthesis to kerosene, assuming only kerosene as output to simplify the example.

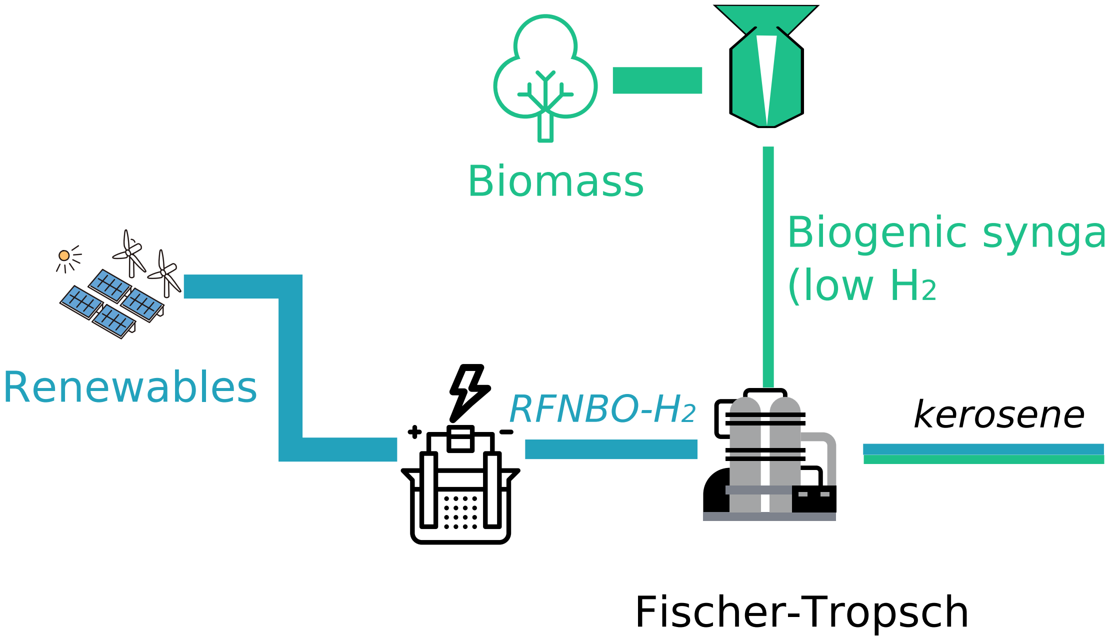
The shift reaction and Fischer Tropsch can be either seen as an integrated process, or as two separate processes. It is allowed to choose either one. We first calculate if the reaction adds to the heating value, in which case the grid electricity used for heating the reactor has to be counted as relevant input.

Assumptions

Parameter	Symbol	Example value
Amount of RFNBO hydrogen	${prod}_{RFNBO-H_2}$	$300\ \color{grey}{GWh}$
Amount of LC hydrogen	${prod}_{LC-H_2}$	$30\ \color{grey}{GWh}$
	${ci}_{H2}$	

5: Biogenic syngas with surplus CO and RFNBO hydrogen

How to split biogenic and RFNBO-parts



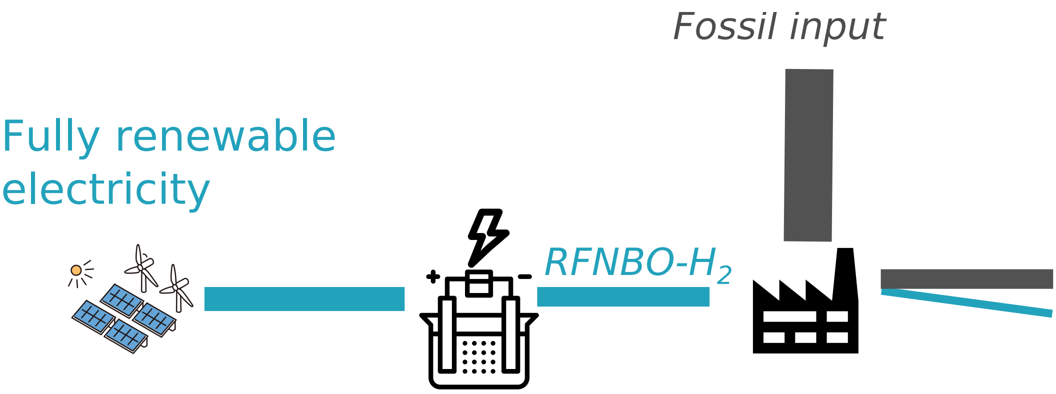
Instead of using a shift reaction to increase the H_2/CO ratio in biogenic syngas, RFNBO hydrogen is added to the Fischer-Tropsch process. According to the "co-processing exception" in Annex A point 1, a distinction on a proportional basis of the energetic value of inputs shall be made.

Assumptions

Parameter	Symbol	Example value
Energy ratio of syngas to hydrogen	\(r_{sh}\)	\(4\ \color{grey}{\left.MJ_{syngas}\middle/MJ_{hydrogen}\right.}\)
Efficiency of the FT reaction	\(\eta_{FT}\)	\(70\color{grey}{\%}\)
Fully renewable electricity carbon intensity	\(ci_{ren}\)	\(0\ \color{grey}{\left.g\,CO_2\,eq\middle/kWh_{el}\right.}\)

6: Partly replacing fossil inputs like in coal Fischer Tropsch

How to split RFNBO part from fossil inputs in existing fossil processes



Very similar to the biogenic syngas case, the fossil process part can be virtually split from the RFNBO part. Here, we show a case of coal gasification and Fischer Tropsch synthesis, but this could be applied to other fossil transformation processes.

Assumptions

Parameter	Symbol	Example value
Energy ratio of syngas to hydrogen	r_{sh}	$9\ \color{grey}{\left.MJ_{syngas}\middle/MJ_{hydrogen}\right.}$
Efficiency of the FT reaction	η_{FT}	$70\color{grey}{\%}$
Fully renewable electricity carbon intensity	ci_{ren}	$0\ \color{grey}{\left.g\,CO_2\,eq\middle/kWh_{el}\right.}$
Fossil syngas carbon intensity	ci_{syngas}	$120\ \color{grey}{\left.g\,CO_2\,eq\middle/MJ_{syngas}\right.}$

7: Full example: Mixed RFNBO and low-carbon hydrogen transported as methanol to EU and transformed to diesel and kerosene

How to combine the previous examples and where to find additional information.