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Talus, Kim

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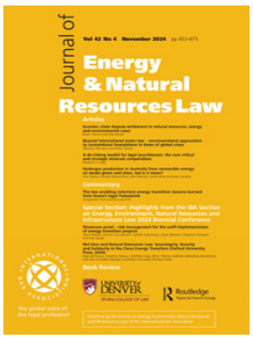

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Kim Talus, Francisca Gallegos & Jaqueline Pinto

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Research Article

Importing US-produced hydrogen and its derivatives into the EU – examples of unnecessary complications, barriers and distinctions

Kim Talus *European Energy Law and Director for the Center of Climate Change, Energy and Environmental Law (CCEEL), UEF Law School; Energy Law, University of Helsinki; Partner, Energy and Regulation Partners, Zug, Switzerland. Email: ktalus@uef.fi; kim.talus@erpartners.eu; kim.talus@uef.fi*; **Francisca Gallegos** *Doctoral Researcher at the Center of Climate Change, Energy and Environmental Law (CCEEL), UEF Law School*; **Jaqueline Pinto** *Doctoral Researcher at the Center of Climate Change, Energy and Environmental Law (CCEEL), UEF Law School*

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The European Union, like many other nations and governments, is counting on hydrogen to play a big role in the energy transition. The EU has set ambitious import targets for hydrogen. This article will examine and comment on select parts of the EU framework that impact the EU's plan for importing 10 million tonnes of hydrogen. This framework could have the effect of frustrating trade with third countries. Using the United States as an example of an importer, this article looks at (i) guarantees of origin, (ii) electricity market design, (iii) state aid, (iv) eligible carbon dioxide rules, and (v) the carbon border adjustment mechanism, with a view to ascertaining their effect on imports into the EU. The article finds that the EU framework causes unnecessary barriers to trade and may need to be tweaked to enable trade to fulfil its legislative targets.

Keywords: RFNBOs; hydrogen; trade law; EU Green Deal; guarantees of origin; regulatory framework; energy transition

1. Introduction

1.1. *Background*

Like many states and international actors, the European Union (EU) is banking on hydrogen being a significant piece of the renewable energy puzzle. Hydrogen will enable the decarbonisation of certain hard-to-abate sectors where the energy transition is more challenging. Heavy vehicle transport, maritime shipping, aviation as well as certain industrial segments are among the areas where hydrogen is seen as a key commodity for decarbonisation. In addition, hydrogen can provide a mechanism to store intermittent renewable energy for longer periods of time, supporting the EU's electricity sector, improving the flexibility of energy systems by balancing out supply and demand when there is either too much or not enough power being generated, and helping to boost energy efficiency through the EU, something that current battery technologies cannot do.

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The EU published an ambitious Hydrogen Strategy in 2020,[1] being the first step towards establishing the framework for all EU hydrogen activities. This was then bolstered by the introduction of the 'Fit-for-55'[2] package released in July 2021.[3] With the Russian invasion of Ukraine and the ensuing need to cut dependencies from fossil fuel sources, in 2022 the EU revised its hydrogen-specific targets with the introduction of the RePowerEU plan,[4] the specific focus of which is to promote the production of clean energy and diversify the energy supplies of the EU. The 'Hydrogen Accelerator' targets regarding hydrogen, published along with the RePowerEU plan, focus on both domestic production and hydrogen imports into the EU. According to the targets, the EU seeks to produce 10 million tonnes of domestic hydrogen and to import an equal amount by 2030. The objective is, therefore, to rely on both domestic production and imports of hydrogen and hydrogen derivatives from third countries.

Future imports of hydrogen into the EU are also impacted by the recently agreed market rules for hydrogen. The Hydrogen and Gas Package, consisting of a Directive[5] and a Regulation,[6] provide the regulatory framework for hydrogen and low-carbon gas market and include many details that directly affect any imports into the EU. This article will not focus on the EU hydrogen market rules, but it is worth noting that, for instance, long-term access regimes for hydrogen import terminals[7] and hydrogen storage[8] constitute important regulatory details impacting import projects.

1.2. *Problem statement*

This article will examine and comment on select parts of the EU framework that impact the EU's plan for importing 10 million tonnes of hydrogen. Looking at the details of the regulatory framework, it becomes clear that it poses significant challenges for third-country producers. The definition and requirements for qualification as renewable fuels of non-biological origins (RFNBO) is designed from an EU perspective and its application in third countries is difficult. In particular, the article will look at the United States (US) as a nation exporting to the EU. The reason for the focus on the US is that the US has incentivised the domestic production of hydrogen, so that it stands to be a

1 European Commission, 'Hydrogen Strategy for a Climate-Neutral Europe' (Communication) COM (2020) 301 final

2 European Commission, ''Fit for 55': Delivering the EU's 2030 Climate Target on the Way to Climate neutrality' (Communication) COM (2021) 550 final

3 This constitutes a package which introduced various legislative proposals that translate, amongst others, the European Hydrogen Strategy into more concrete policy proposals. For example, forming part of the package is the EU emission trading system (EU ETS) and carbon Border adjustment mechanism (CBAM) discussed later in this article.

4 European Commission 'REPowerEU Plan' (Communication) COM (2022) 230 final (REPowerEU Plan).

5 Council of the European Union, Proposal for a Directive of the European Parliament and of the Council on common rules for the internal markets in renewable and natural gases and in hydrogen (recast) (COM/2021/803 final). The agreed text version has not been published in the Official Journal of the EU but is available at <https://data.consilium.europa.eu/doc/document/ST-16516-2023-INIT/en/pdf> accessed 25 March 2024 (Hereafter 'Hydrogen and Low-Carbon Gas Directive')

6 Council of the European Union, Proposal for a Regulation of the European Parliament and of the Council on the internal markets for renewable and natural gases and for hydrogen (recast) (COM/2021/804 final). The agreed text version has not been published in the Official Journal of the EU but is available at <https://data.consilium.europa.eu/doc/document/ST-16522-2023-INIT/en/pdf> accessed 25 March 2024.

7 Hydrogen and Low-Carbon Gas Directive (n 5), Preamble 73 and art 32

8 Hydrogen and Low-Carbon Gas Directive (n 5), Preambles 72 and 73, and art 33

large producer of hydrogen. Furthermore, moving trade dependency towards a reliable ally, and buying renewable hydrogen rather than fossil fuels, will support energy security and assist the EU in meeting its emissions-reduction targets. Utilising the additional incentives provided by the Inflation Reduction Act[9] (IRA) to make green hydrogen, the US would benefit from a thriving export market for the plentiful solar and wind power in Texas through the shipment of green hydrogen-made fuels from Gulf Coast ports.[10]

The import of 10 million tonnes of hydrogen does not relate to any particular 'type' of hydrogen. The EU has set strict rules relating to the 'type' of hydrogen which will fulfil its legislated targeted requirement. These targets relate to renewable hydrogen. The definition and requirements for qualifying as 'renewable hydrogen' in the EU were introduced for the first time in the Recast of the Renewable Energy Directive 2018 (RED II),[11] and are referred to as RFNBOs. To ensure that the hydrogen is produced from renewable energy sources and achieves at least 70 per cent greenhouse gas (GHG) emission savings, the European Commission (hereafter the Commission) adopted two delegated acts in June 2023 (RFNBO Delegated Act[12] and GHG Methodology Delegated Act[13]). These acts, applicable to renewable hydrogen, define the criteria for products that fall under the 'renewable hydrogen' category and put forward a detailed scheme to calculate the life-cycle emissions of renewable hydrogen and recycled carbon fuels. The Commission's interpretation of the content of these two delegated acts is provided for in its 'Q&A Implementation of hydrogen delegated acts' document.[14] The first version of the Q&A document was published in July 2023. This version, however, left many issues unaddressed and created more questions. One notable example was the interpretation of the requirements for renewable power purchase agreements (PPAs). Around nine months later, a new version of this guiding document was published (on 14 March 2024). These new delegated acts will apply to both domestic producers and international producers exporting renewable hydrogen to the EU.

9 H.R. 5376 – 117th Congress: Inflation Reduction Act of 2022 (US)

10 Oleksiy Tatarenko, Nabil Bennouna and Natalie Janzow, 'Opinion: Why Transatlantic Trade in Green Hydrogen Will Happen Sooner than You Think' (*Energy Monitor,* 12 October 2023) <https://www.energymonitor.ai/opinion/why-transatlantic-trade-in-green-hydrogen-will-happen-sooner-than-you-think> accessed 15 January 2024

11 European Parliament and the Council Directive (EU) 2018/2001 of 11 December 2018 on the promotion of the use of energy from renewable sources (recast) [2018] OJ L328/82 (RED II)

12 Commission Delegated Regulation (EU) 2023/1184 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin [2023] OJ L 157/11 (RFNBO Delegated Act)

13 Commission Delegated Regulation (EU) 2023/1185 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a minimum threshold for greenhouse gas emissions savings of recycled carbon fuels and by specifying a methodology for assessing greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin and from recycled carbon fuels [2023] OJ L 157/20 (GHG Methodology Delegated Act)

14 European Commission, 'Q&A Implementation of Hydrogen Delegated Acts', version of 14 March 2024 (2024) <https://energy.ec.europa.eu/document/download/21fb4725-7b32-4264-9f36-96cd54cff148_en?filename=2024%2003%2014%20Document%20on%20Certification.pdf> accessed 25 March 2024 (herafter Q&A Implementation of Hydrogen Delegated Acts, version of 14 March 2024). This document is a non-binding view from the Commission on the interpretation of the delegated acts. However, in practice it has an impact on investors. From this perspective it is unfortunate that it has caused more confusion on important regulatory questions.

However, the definition and requirements for qualification as 'renewable hydrogen' within the EU framework have created barriers to international trade of RFNBOs as the framework is designed from an EU perspective, and its application in third countries is challenging. In the following sections, we will explain why this definition poses obstacles to the international trade of hydrogen, with a particular focus on the US. To exemplify the above, we will focus on (i) guarantees of origin (GOs), (ii) electricity market design, (iii) state aid, (iv) eligible CO_2 rules, and (v) the carbon border adjustment mechanism (CBAM).

One of the requirements that may be challenging to implement for third countries is GOs. GOs are electronic certificates that prove the electricity bought and consumed by an end-user comes from renewable sources.[15] For the certification of RFNBOs, GOs are an additional element necessary to ensure that the same unit of energy from renewable sources is taken into account only once, avoiding double issuance of GOs by ensuring that the GOs issued to the producer of renewable electricity are cancelled.[16] Other countries have comparable mechanisms in place. For instance, the US operates on a system of renewable energy certificates (RECs). However, US producers face a challenge because Article 19(11) of the 2023 Renewable Energy Directive (RED III)[17] states that:

> Member States cannot recognise GOs issued by a third country except where the EU has concluded an agreement with that third country on mutual recognition of GOs issued in the EU and compatible GO systems established in that third country, and only where there is direct import or export of energy.

Without such an agreement, recognition is not possible. It does not seem that such an agreement is in place with the US. While this problem can be overcome, it creates further administrative burdens, delays and barriers for US-based production.

The enforcement of RFNBO stipulations presents another hurdle in that the EU system is founded on EU electricity market design, which is based on specific bidding zones and transmission system operators with specific competencies and tasks.[18] Where these do not exist, compliance is much more challenging. The RFNBO qualifications also require that installations generating renewable electricity used to power the electrolyser producing the RFNBO have not received operating or investment aid.[19] In countries like the US, under the IRA, credit stacking is possible and any sensible investor would use the opportunity to take tax credits from both renewable electricity production and clean hydrogen production. However, where the RFNBO is destined for EU markets,

15 RED II, art 2 (12)

16 European Commission, 'Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023' (2023). Question 18 <https://energy.ec.europa.eu/system/files/2023-07/2023_07_26_Document_Certification_questions.pdf> accessed 10 January 2024 (herafter Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023)

17 European Parliament and the Council Directive (EU) 2023/2413 of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652 [2023] OJ L2023/2413 (RED III)

18 European Parliament and the Council Directive (EU) 2019/944 of 5 June 2019 on common rules for the internal market for electricity amending Directive (EU) 2012/27 (recast) [2019] OJ L158/125 (Electricity Directive) and European Parliament and the Council Regulation (EU) 2019/943 of 5 June 2019 on the internal market for electricity (recast) [2019] OJ L158/54 (Electricity Regulation)

19 RFNBO Delegated Act, art 5(b)

this cannot be done as the product would not qualify as an RFNBO where operating or investment aid has been received.

Additionally, there are strict criteria and requirements for CO_2 sources to qualify as RFNBOs. These requirements pose significant challenges for third country producers. For example, the use of recycled industrial CO_2 in the EU requires the existence of an 'effective carbon pricing system' in the country of production. This exposes RFNBO investors to ongoing annual qualification risks, as national policies naturally change with changes in government. This presents a high risk for investors and customers entering into multi-billion-dollar investments or long-term off-take contracts.

The use of biogenic CO_2 sources also presents challenges, as globally accepted sustainability certification does not fall within the scope of the RFNBO. The EU exclusively accepts EU sustainability certificates. Achieving mutual recognition of high-quality, globally accepted sustainability certificates tailored to specific natural conditions would significantly mitigate certification risks. Finally, where the producer is able to overcome these challenges, the CBAM will put it at a disadvantage in comparison to EU producers. This will be discussed separately in section 9 below.

While some of these concerns and challenges are more or less difficult to overcome and their practical impact may be more or less significant depending on the specific scenario, they all have the impact of placing the third-country producer in a different position than its EU competitors. While this may be beneficial for building the hydrogen industry within the EU, and the RFNBO industry in particular,[20] and/or for discouraging EU hydrogen producers from investing in the US, it will have an impact on the ability of the EU to import necessary RFNBO volumes. The challenges imposed by the EU's RFNBO framework are anticipated to result in a decrease in the volume of RFNBOs accessible in the EU market. This, in turn, is expected to lead to an increase in the prices of RFNBOs and their derivatives for the end consumer. Furthermore, the EU framework to import hydrogen must align with the World Trade Organization (WTO) framework, ensuring fair and competitive global hydrogen market access.

Depending on the details of the Commission's future delegated act on low-carbon hydrogen, similar concerns may be raised in connection with low-carbon hydrogen as well. This, again, can be critical to the emerging hydrogen trade between the EU and the US as it would mean that not only imported volumes of RFNBOs but also those of low-carbon hydrogen would be impacted and possibly disqualified under the EU rules. This could have an impact on planned investments. As an illustration, there is already a consortium of US companies aiming at the first clean hydrogen shipment by 2026 (in the form of ammonia and methanol), with the 2030 objective set at 3 million mt/year by 2030.[21]

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20 It is noteworthy that there have even been calls to put protective tariffs on potential US-based hydrogen imports to the EU. See Jonathan Packroff, 'EU Parliament Trade Chief Calls for Tariffs on US Hydrogen' (*Euractiv*, 5 July 2023) <https://www.euractiv.com/section/politics/news/eu-parliament-trade-chief-calls-for-tariffs-on-us-hydrogen> accessed 10 January 2024

21 See eg Santiago Canel Soria and James Burgess, 'Group Targets First US–Europe Clean Hydrogen Shipment by 2026' (*S&Global, Commodity Insights*, 12 October 2023) <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/101223-group-targets-first-us-europe-clean-hydrogen-shipment-by-2026> accessed 12 January 2024

1.3. *Outline*

This article starts by providing an outline of the EU's RFNBOs aims, including its import targets. Thereafter, the issues with the EU framework raised above will be discussed in order to ascertain their effect on possible imports. Since the specific regulations for low-carbon hydrogen have not yet been passed, the article focuses on RFNBOs. It will be evident that a number of issues need to be addressed, and areas need to be reexamined, in order to develop a framework that can draw in large global amounts of hydrogen.

2. EU sectoral targets for hydrogen

RED III[22] sets out specific hydrogen-related sectoral targets. It increases the share of renewable energy in the EU's overall energy consumption to 42.5 per cent by 2030 with an additional 2.5 per cent indicative top-up that would, in line with the RePowerEU Plan,[23] allow the EU to reach 45 per cent.[24] Under the new rules, hydrogen produced by relying on electrolysis powered by renewable electricity falls under the scope of RFNBO when the process meets certain requirements under EU law.

In terms of RED III and the complementary legislative acts,[25] the sectoral targets are as follows:

(1) **Industry:** RFNBOs should supply 42 per cent of the hydrogen used in industrial processes by 2030; by 2035, that number should increase to 60 per cent.[26] Member states may, however, rely on a derogation to reduce their RFNBO share in industry by 20 per cent by 2030 as a significant relaxation of these binding targets, provided that they: (i) are using renewable energy on track (ie their national contribution to the binding overall EU target meets their expected contribution); and (ii) are using no more than 23 per cent fossil-based hydrogen by 2030 and 20 per cent fossil-based hydrogen by 2035.[27] This requirement is conjunctive, so both conditions must be fulfilled for the derogation to apply.

(2) **Transport:** There is a binding combined sub-target of one per cent of fuels in transport by 2025 for advanced biofuels and RFNBOs in the transportation sector, rising to 5.5 per cent by 2030.[28] The binding minimum target of one per cent is set for RFNBOs by 2030.[29]

22 RED III
23 REPowerEU Plan
24 European Council, 'Council and Parliament Reach Provisional Deal on Renewable Energy Directive' (*Council of the EU. Press Release*, 30 March 2023) <www.consilium.europa.eu/en/press/press-releases/2023/03/30/council-and-parliament-reach-provisional-deal-on-renewable-energy-directive> accessed 15 December 2023
25 Complementary legislative acts include the FuelEU Maritime Regulation and ReFuel Aviation Regulation.
26 RED III, art 22(a)
27 RED III, art 22(b)
28 RED III, art 25(b)
29 RED III, art 25

(3) **Maritime:** In terms of RED III, by 2030, member states with marine ports shall endeavour that RFNBOs account for 1.2 per cent of the energy supplied to the maritime transport industry overall. The FuelEU Maritime Regulation,[30] which implemented further targets, aims to lower GHG emissions caused by the usage of energy in ships. The regulation establishes targets for RFNBOs in addition to specified targets for reducing GHG emissions.[31] The aim states that a two per cent binding target will be set for 2034 if the percentage of RFNBO is still less than one per cent in 2031.[32]

(4) **Aviation:** The ReFuelEU Aviation legislation[33] mandates that fuel suppliers in the aviation industry blend sustainable aviation fuels and, beginning in 2030, synthetic fuels with the jet fuel currently supplied at EU airports. [34] Fuel providers must utilise two per cent 'sustainable aviation fuels' by 2025, six per cent by 2030, and 70 per cent by 2050. The blending mandate for synthetic fuels (RFNBOs) will increase from 1.2 per cent in 2030 to 35 per cent in 2050.[35] Certified biofuels, RNFBOs, and recycled carbon aviation fuels are examples of 'synthetic aviation fuels' and 'sustainable aviation fuels' complying with RED III sustainability and emissions saving criteria. However, the shares of 'sustainable aviation fuels' are calculated on a volume basis; this differs from the accounting in RED III, which is on an energy basis. This produces contradictions on the complete GHG life-cycle approach and may cause confusion to importers.

These targets, as set out now in the legislative tools, are important milestones for the uptake of sustainable fuels and RFNBOs. By creating regulatory demand for these fuels, the legislator creates a stable demand that producers can rely on when making investment decisions. In this sense, they contribute to solving the chicken and egg problem from the creation of new markets in relation to the demand side. However, even with this significant hurdle being addressed, it will take time before the volumes of RFNBOs are significant enough to meet the regulatory demand.[36]

This article does not provide a detailed account of the entirety of the EU RFNBO rules. Rather, it refers to those rules that are of significance for the subject matter of the article, namely the difficulties created by the EU's regulatory framework for third-country imports of RFNBOs and, more specifically, imports from the US.

30 European Parliament and the Council Regulation (EU) 2023/1805 of 13 September 2023 on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC [2023] OJ L234/48 (ReFuelEU Maritime Regulation)

31 Kim Talus and Sirja-Leena Penttinen, 'Increasing Energy Sector Resilience after the Russian Invasion of Ukraine' (2023) 5 OGEL <www.ogel.org/article.asp?key=4108> accessed 25 January 2024

32 FuelEU Maritime Regulation, art 5

33 European Parliament and the Council Regulation (EU) 2023/2405 of 18 October 2023 on ensuring a level playing field for sustainable air transport [2023] OJ L2023/2405 (ReFuelEU Aviation Regulation)

34 ReFuelEU Aviation Regulation, Annex I

35 ReFuelEU Aviation Regulation, art 4

36 When discussing demand, it is also necessary to consider the technology to be able to utilise the new fuels. It will arguably take time before the existing engines of the current aviation or maritime fleets are replaced by engines that can use these fuels.

3. The applicability of certain EU RFNBO requirements in third-country circumstances

One of the critical areas for RFNBO production in the EU relates to the renewable nature of the electricity that powers the electrolyser that produces the hydrogen. These rules require that the electricity used for the production of RFNBOs is fully renewable. They also provide more detailed requirements. As set out above, the conditions for qualifying electricity as fully renewable are included in RED III, the RFNBO Delegated Act and the GHG Methodology Delegated Act. These rules apply to all hydrogen consumed in the EU, regardless of whether the hydrogen is produced inside or outside the territory of the EU.

These EU rules must be followed in order to count RFNBOs towards the targets set out in EU legislation. Compliance with the RFNBO criterion is not mandatory for importing hydrogen or for placing hydrogen on the EU market. However, the targets stimulate a preference for RFNBO. This is exemplified by the Hydrogen Bank, which provides financial incentives for RFNBOs. Therefore, the adherence to the RFNBO regulatory framework may be a prerequisite for receiving public support.[37]

The RFNBO Delegated Act distinguishes between electricity obtained through a direct connection with an electricity facility and electricity obtained via the grid. There are various regulatory requirements that need to be met before the hydrogen or hydrogen-based fuel producers may count electricity taken from the grid as fully renewable.[38] These are: (i) the bidding zone rule, (ii) the emissions intensity rule, or (iii) the imbalance settlement rule. If none of these alternatives apply, electricity taken from the grid can still be considered fully renewable where fuel producers: (i) produce an amount of renewable electricity in their own installations that is at least equivalent to the amount of electricity claimed as fully renewable; or (ii) have concluded directly, or via intermediaries, one or more renewable PPAs, and the conditions on additionality, temporal correlation and geographic correlation are met.[39]

These requirements will not be discussed in detail here; rather, the focus will be on the applicability of these rules in third countries. Given that the article is specifically analysing the position from the perspective of an importer into the EU, the specific issues that will be examined are the role of GOs, the application of the bidding zone and curtailment rules, as well as the rules concerning additionality, focusing on the 'no public support' rule.

4. Guarantees of origin

In most circumstances, RFNBO producers are required to have concluded directly, or via intermediaries, one or more renewable PPAs with economic operators producing renewable electricity.[40] An important element relating to renewable PPAs in the EU are GOs.

37 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Question 2. We have seen this with the Hydrogen Bank, which relates to 'renewable hydrogen' and provides financial incentives for renewable hydrogen. European Commission, 'On the European Hydrogen Bank' (Communication) COM (2023) 156 final

38 RFNBO Delegated Act, art 4 and 5

39 RFNBO Delegated Act, art 4, 5, 6 and 7

40 RFNBO Delegated Act, art 4 and 5

One GO certificate corresponds to 1 MWh of renewable generation.[41] GOs can be traded electronically in the voluntary market for RECs and are not tied to the physical delivery of electricity.

The GOs for a PPA need to comply with the general requirements in Article 19 of RED III, ensuring that a given unit of energy from renewable sources is taken into account only once in the RFNBOs certification.[42] In addition, they should carry the same attributes as the physical installation producing the electricity. This includes the location of the installation, the age of the installation, and the time of the production.[43] The related GOs need to be cancelled before the expiry of the validity period and the volume cancelled should match the volume claimed under the PPA.[44]

As mentioned above, instruments similar to the EU GOs exist in third countries. The equivalent in the US are the RECs. The difficulty for the US-based producer is that the use of GOs or the corresponding instruments from third countries is subject to an agreement between the EU and the third country. As already noted, Article 19(11) of RED III specifically prohibits the recognition of GOs from third countries unless an agreement has been concluded between the EU and such a country on the mutual recognition of GOs. Therefore, absent such an agreement, recognition is not possible.[45]

However, the Commission suggests that:

> GOs and systems characterized by a comparable degree of robustness may still be used as a tool for demonstrating compliance with the criteria of the RFNBO delegated act. For instance, it would be possible for the fuel producer to demonstrate via cancelling the required number of GOs that at least an equivalent amount of electricity that is claimed as fully renewable has been produced by the installations producing renewable electricity under the Renewables PPA only electricity produced by the contracted installations themselves is eligible. Accordingly, only GOs that have been issued for the installations covered by the renewables PPA can be used to demonstrate compliance with the conditions on additionality and temporal and geographic correlation.[46]

If one assumes that the notion 'systems characterised by a comparable degree of robustness' refers to systems other than EU GOs, including systems in third countries that are characterised by a comparable degree of robustness, then this statement by Commission and the rule in Article 19(11) appear to conflict. One way to reconcile this apparent conflict would be to read the Commission's statement as suggesting that while recognition of third country GOs is not possible without an agreement on mutual recognition, the information value of a GO from a third country could still be used as a part of a member state certification process.

The next section will discuss some of the rules around the electricity market design, on which the EU hydrogen framework is based.

41 RED III, art 19(2)
42 RFNBO Delegated Act, Recital 15
43 RFNBO Delegated Act, art 5
44 The requirements on GOs also apply in cases where the RFNBO Delegated Act does not require the conclusion of a renewable PPA. See Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Question 20
45 For example, no respective agreement exists on mutual recognition between the EU and the US, and therefore the US RECs are not recognised in the EU.
46 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Question 33

5. Bidding zone and imbalance settlement rules

The concept of 'bidding zones'[47] in the RFNBO Delegated Act is relevant for determining whether electricity obtained via the grid is renewable. The bidding zone is pertinent in particular for: (i) determining the share of renewable energy in the grid (in that particular bidding zone, where the fuel production facility is located); and (ii) the emission intensity of the grid power.

The rules for determining when electricity used for the production of RFNBOs can be considered fully renewable, including the bidding zone rule, apply equally to third-country production of RFNBO.[48] Moreover, Recital 3 of the RFNBO Delegated Act provides that:

> The rules set out in this Regulation should apply regardless of whether the liquid and gaseous transport fuel of non-biological origin is produced inside or outside the territory of the Union. Where reference is made to bidding zone and imbalance settlement period, concepts that exist in the Union but not in all other countries, it is appropriate to allow fuel producers in third countries to rely on equivalent concepts provided the objective of this Regulation is maintained and the provision is implemented based on the most similar concept existing in the third country concerned. In the case of bidding zones such concept[s] could be similar market regulations, the physical characteristics of the electricity grid, notably the level of interconnection or as a last resort the country.

The Commission has provided guidance for the practical application of these rules.[49] According to the Commission, the producers need to demonstrate compliance with the criteria set out in the regulation via certification of RFNBOs. For this purpose, producers can rely on a well-established system of certification by third parties, so-called voluntary schemes recognised by the Commission under Article 9 of the RFNBO Delegated Act.[50] In doing so, they should assess whether, at the location of the electrolyser, market regulations applied are similar to the rules set out for bidding zones in the EU Electricity Market Regulation.[51] In this context, 'similar' should be understood as the existence of rules which require establishing hourly prices for electricity in a given geographical area. If such rules are in place, the geographical area for which the prices are established should be considered a bidding zone for the purpose of the implementation of the methodology.[52]

For purposes of the US, the Treasury Guidance released in late 2023 has rules which, to some extent, mirror the EU position and could be considered 'similar' if adopted. The Treasury Guidance introduces the concept of temporal matching and deliverability (regionality) to the US hydrogen market. From 2028, hourly matching would be required and the relevant energy generation facility must be in the same geographic region as the

47 Under RFNBO Delegated Act, art 2 a 'bidding zone' means bidding zone as defined in Electricity Regulation, art 2(65) or an equivalent concept for third countries. Under Electricity Regulation, art 2(65), 'bidding zone' means the largest geographical area within which market participants are able to exchange energy without capacity allocation.

48 RFNBO Delegated Act, art 1

49 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Annex

50 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Questions 5 and 6

51 Electricity Regulation

52 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Annex

hydrogen production facility.[53] There has been controversy surrounding the Treasury Guidance and it remains subject to adoption. Questions regarding electricity supply and grid stability, the impact of the 'additionality' and 'hourly matching' requirements on building a hydrogen market have been posed by various stakeholders (among other questions such as the role of natural gas and nuclear power).[54]

Where similar concepts such as bidding zones do not exist or there is no such market mechanism in place, it is the responsibility of certifiers to evaluate the structure of the electricity network in the production country. They need to determine whether it is an integrated network or consists of multiple separate networks. If the latter, each network should be considered as an individual bidding zone when implementing the methodology. If, however, the electricity network of the country is integrated and there are no geographically differentiated electricity prices, the entire country can be considered one bidding zone for the purpose of the implementation of the RFNBO Delegated Act.[55]

Where specific conditions to be met related to the concept of a bidding zone are required, such as the average proportion of renewable electricity, the emissions intensity of electricity, or the price of electricity, the conditions can only be considered fulfilled if compliance can be established on the basis of reliable data from official sources.[56] This could include the latest data on the share of renewable electricity that has been published by the international energy agency (IEA) for third countries. The nation's statistical institutions may provide data if IEA data is unavailable. When bidding zones differ between countries, data from official national statistics produced using the same approach as the SHort Assessment of Renewable Energy Sources (SHARES) tool's technique for determining the renewable energy share in electricity (RES-E) share must be used.[57]

There are doubts and uncertainties regarding the methodology used to determine the RES-E share in bidding zones. This stems from the fact that the RFNBO Delegated Act in Article 4 only refers to the 'Renewable Energy Share' without specifying the calculation method. In contrast, the Commission's Q&A document[58] states that the average share of renewable electricity should be determined based on consumption in the bidding zone. Furthermore, the SHARES tool document refers to production. This divergence in the formulation of the calculation methodology for determining the RES-E shares between the Delegated Acts, the Commission's Q&A document, and the SHARE tool can lead to different interpretations of the calculation for the share of renewable electricity.

53 Casey S. August, Douglas A. Hastings, Kenneth M. Kulak, Mark A., Lazaroff, Andreas N. Andrews and M. Jared Sanders. 'Treasury and IRS Publish Much-Anticipated Guidance on Clean Hydrogen Tax Credit' (*MorganLewis, Lawflash*, 5 January 2024) <www.morganlewis.com/pubs/2024/01/treasury-and-irs-publish-much-anticipated-guidance-on-clean-hydrogen-tax-credit> accessed 26 January 2024

54 See eg Christian Robles, 'DOE Sides with Industry on Hydrogen Tax Rules' (*E&E news by Politico*, 29 February 2024 <www.eenews.net/articles/doe-sides-with-industry-on-hydrogen-tax-rules> accessed 25 March 2024; Caleb Harshberger, 'IRS Issues Corrections on Hydrogen Tax Credit Proposed Rules' (*Bloomberg Tax*, 1 March 2024) <https://news.bloombergtax.com/daily-tax-report/irs-issues-corrections-on-hydrogen-tax-credit-proposed-rules> accessed 25 March 2024; and Will Wade and Alix Steel, 'Green Hydrogen Boom Threatens to Tax Power Grid, AES Chief Says' (*Bloomberg Law*, 19 February 2024) <https://news.bloomberglaw.com/environment-and-energy/green-hydrogen-boom-threatens-to-tax-power-grid-aes-chief-says> accessed 25 March 2024

55 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Annex

56 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Annex

57 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Question 15

58 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Question 15

This uncertainty among RFNBO producers is a significant issue and should be clarified by the Commission.

Given the absence of EU-style competitive markets and bidding zones in many countries, these rules can make compliance for third-country producers somewhat complicated, though not impossible. It remains to be seen what the position will be with the US specifically depending on the fate of the Treasury Guidance. In terms of the imbalance settlement rule, hydrogen or hydrogen-based fuel producers may count electricity taken from the grid as fully renewable if the electricity used to produce hydrogen or hydrogen-based fuel is consumed during an imbalance settlement period during which the fuel producer must demonstrate that:

> (1) power-generating installations using renewable energy sources were redispatched downwards in accordance with Article 13 of Regulation (EU) 2019/943;
>
> (2) the electricity consumed for the production of renewable liquid and gaseous transport fuel of non-biological origin reduced the need for redispatching by a corresponding amount.[59]

Therefore, the production of RFNBOs contributes to reducing the congestion in the grid and has to be proved based on evidence from the national transmission system operator (TSO).[60]

According to the Commission, RFNBO producers will likely only rely on these rules in exceptional circumstances, and to avoid a misuse of the provision, the rules must be followed thoroughly. An implementation of this provision in third countries will, therefore, only be feasible if the third country has entities adopting the tasks of national TSOs as well as rules for redispatching.[61] Again, given the specifics of the EU's liberalised market model, compliance in most countries may be difficult.

6. No public support rule

Where the fuel producer has concluded directly, or via intermediaries, one or more renewable PPAs and the conditions on additionality, temporal correlation and geographic correlation are met, then the electricity can be considered fully renewable.[62] The additionality requirement under Article 5 of the RFNBO Delegated Act entails that hydrogen or hydrogen-based fuel producers conclude PPAs with new installations producing renewable electricity for an amount of renewable electricity that is at least equivalent to the amount of electricity that is claimed as fully renewable and the electricity claimed is effectively produced in the installations. Furthermore, the claimed electricity is subject to the fulfilment of the following criteria by the installation generating the renewable electricity:

(1) it must have come into operation not earlier than 36 months before the RFNBOs facility;[63] and

59 RFNBO Delegated Act, art 4(3)
60 RFNBO Delegated Act, art 4
61 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Annex
62 RFNBO Delegated Act, art 4
63 RFNBO Delegated Act, art 5(a)

(2) it must constitute unsupported renewable electricity generation capacity in that the 'installation generating renewable electricity has not received support in the form of operating aid or investment aid'. [64]

The Commission clarified that any payments made by public authorities for the building of renewable energy installations and any benefits received for the production of renewable energy, such as feed-in tariffs, feed-in premiums, production reductions, contracts for difference, or any direct payments associated with the generation of renewable energy, could be considered 'operating aid or investment aid'. It also indicated that the exclusion of operating aid or investment aid does not apply for directly connected installations generating renewable electricity.[65]

The reason for the 'additionality' requirement is to incentivise new renewable energy generation capacity and avoid the possibility that the production of renewable hydrogen sector may consume existing renewable energy, lowering the quantity of renewable energy that supplies green electricity to the grid. Whilst these objectives work as a part of the EU regulatory framework, they are not part of the frameworks in potential exporting countries. For example, whilst the US may introduce additionality in line with the Treasury Guidance, the US has a robust system for subsidies under the IRA.[66] It must be borne in mind that an important distinction between the EU and the US is that the Treasury Guidance relates to the US' rules for subsidies whilst the EU rules discussed relate to market access to the RFNBO sector.

While the IRA specifically prevents the possibility of credit stacking for low-carbon hydrogen producers,[67] it is possible for clean hydrogen producers to secure greater cost savings. The clean electricity tax credit allows any project producing zero-emissions electricity to receive either a 30 per cent investment tax credit or a 1.5 cents/kWh[68] production tax credit, and the IRA allows these subsidies to be combined with the hydrogen tax credit. The investment tax credit encourages investors to take the risk of investing

64 Q&A Implementation of Hydrogen Delegated Acts, version of 26 June 2023 (n 16), Question 21

65 RFNBO Delegated Act, art 5(b)

66 Compared to the state aid schemes in the EU with, for example, the requirements for calculation funding gap through the counterfactual scenario under the Guidelines on State aid for climate, environmental protection and energy 2022 (OJ C 80, 18 February 2022, p. 1–89) (especially para. 51) and the current Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty (*OJ* L 187 26.6.2014, p. 1), last amended on 9 March 2023 (specially para 118), the US subsidy mechanism for hydrogen is easier to understand and utilise by investors. For an overview of the financing mechanisms available, see The White House, 'Inflation Reduction Act Guidebook' (2022) <www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook> accessed 25 March 2024. The subsidy amounts available for the US investors is also significant. For budgetary impact, see University of Pennsylvania, Update: Budgetary Cost of Climate and energy provisions in the Inflation Reduction Act, 27 April 2023 <https://budgetmodel.wharton.upenn.edu/estimates/2023/4/27/update-cost-climate-and-energy-inflation-reduction-act> accessed 25 March 2024. For an overview of the financing mechanisms available, see The White House, 'Inflation Reduction Act Guidebook' (2022) <www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook> accessed 25 March 2024). The subsidy amounts available for the US investors is also significant. For budgetary impact, see University of Pennsylvania, Update: Budgetary Cost of Climate and energy provisions in the Inflation Reduction Act, 27 April 2023 <https://budgetmodel.wharton.upenn.edu/estimates/2023/4/27/update-cost-climate-and-energy-inflation-reduction-act> accessed 25 March 2024

67 In that the 45V and 45Q IRA tax credits cannot be used together.

68 The White House. 'Clean Energy Tax Provisions in the Inflation Reduction Act' (2023) <www.whitehouse.gov/cleanenergy/clean-energy-tax-provisions> accessed 28 January 2024

in clean hydrogen projects, and the clean hydrogen tax credit provides a certain rate of return. Therefore, if the source of the EU imported hydrogen is the US, the imported product cannot be RFNBOs under the EU framework and therefore cannot be counted towards the specific RFNBO targets examined above if the power production has received support under IRA.

However, it is important to note that in order to support the early scale-up of electrolysers, there is a transitional phase in which hydrogen or hydrogen-based fuel production capacity that comes into operation before 2028 is exempt from these additionality requirements for 10 years, until 1 January 2038.[69] This eliminates the problem for third countries where the production capacity comes into operation before 2028.

7. 'Renewable energy producer'

In order to qualify as RFNBO, the fuel producer must in most cases have concluded a PPA with the producer of renewable electricity. There is some confusion within the EU what this requirement actually entails. In addition, this requirement may sometimes be difficult to fulfil in third countries.

Under RED III, a 'renewables power purchase agreement' means a contract under which a natural or legal person agrees to purchase renewable electricity *directly from an electricity producer*' (emphasis added).[70] The requirement under the RFNBO Delegated Act for a PPA in turn is that 'fuel producers have concluded directly, or via intermediaries, one or more renewables power purchase agreements with economic operators producing renewable electricity'.[71]

The original version of the Q&A implementation of hydrogen delegated acts further explained that

> The requirements for renewable PPAs stem from the definition set out in the RED itself and the RFNBO delegated act. In the RED, a renewables PPA is defined as a contract under which a natural or legal person agrees to purchase renewable electricity directly from an electricity producer. The role of the intermediaries referred to in the RFNBO delegated act is therefore limited to the role of a facilitator of such contracts but not as a contracting party.[72]

This requirement of the PPA being concluded directly with the producer of renewable electricity caused questions and opposition. First, it had a direct impact on how a renewable electricity production project is organised, making it uncertain whether the condition can be met when the owner and operator of the renewable electricity production facilities are separate companies. Second, it was difficult to implement in the case of joint ventures, where the producing company does not have the control or right to decide on what to do with the electricity produced and the control has been contractually assigned to the shareholders.

The updated Q&A document version changed the approach, providing that

69 RFNBO Delegated Act, art 11
70 RED III, art 2 (14q)
71 For example, RFNBO Delegated Act, art 4 and 5
72 Q&A Implementation of Hydrogen Delegated Acts, version of 16 July 2023, Question 16. <https://energy.ec.europa.eu/document/download/21fb4725-7b32-4264-9f36-96cd54cff148_en?filename=2024%2003%2014%20Document%20on%20Certification.pdf> accessed 1 May 2024

> The renewable PPAs need to clearly identify the installations that produce the amount of renewable electricity that is used to produce the renewable hydrogen. Furthermore, the hydrogen producer can only claim the production of RFNBOs based on a renewable PPA if the electricity supplied under the contract has effectively been produced. Intermediaries referred to in the RFNBO delegated act may be involved by various means and for various purposes, including as a contracting party. For example, intermediaries can represent the electricity producers, but it is important that a direct relationship between the electricity producer and the hydrogen producer is maintained.[73]

This change provides important clarification on the role of intermediaries. This is particularly important as in the current electricity market, it is commonplace to contract via intermediaries. This is due to the known efficiency of such an arrangement, where the intermediaries undertake responsibilities and risks that renewable asset operators may not be able to handle. Restricting the role of intermediaries could lead to increased operational and contractual costs, limit sourcing options for the electrolyser, and potentially create even further barriers to the uptake of the hydrogen market.

Whilst the latest interpretation recognises intermediaries, a direct relationship between the renewable electricity producer and hydrogen producer is still required. It appears that this direct linkage can be established, for example, via a tripartite agreement signed by the producers of renewable electricity and hydrogen as well as the intermediary.

Despite this clarification, the requirement of a direct relationship may create problems in third countries where the third country has adopted a single-buyer model for its electricity markets and, due to strict requirements, this tripartite agreement model cannot be adopted. The result of this would be that in the absence of a direct link between renewable electricity and hydrogen producers, the RFNBO requirements would not be met for the hydrogen produced, even if it was produced from new renewable energy. This potential issue is, however, directly dependent on the details of the single-buyer model in each country.

8. Applicability of certain CO_2-related requirements in hydrogen-based fuel production in third countries

Another area where the EU legal framework for RFNBOs creates difficulties for importers into the EU is the production of RFNBOs fuels using CO_2. Electrofuels, also known as e-fuels, are produced by combining renewable hydrogen with captured CO_2. These e-fuels work in the same way as conventional fossil fuels, with the key difference that they are climate-neutral. When the fuels are consumed in an engine, CO_2 is released into the environment. However, the theory is that such emissions balance the quantity extracted from the environment to make the fuel, making the total amount CO_2-neutral. Furthermore, e-fuels, in their liquid and gaseous states, offer advantages over electricity in terms of storage and transportation. These e-fuels are compatible with the existing fossil fuel infrastructure while keeping the traditional internal combustion engine industry alive,[74] enhancing their practicality and ease of integration.

73 Q&A Implementation of Hydrogen Delegated Acts, version of 14 March 2024 (n 14), Question 19

74 This relates to those areas that are more difficult to electrify such as maritime shipping and aviation, but also agricultural machinery and perhaps also emergency vehicles.

E-fuels can be produced in either power-to-gas or power-to-liquid processes depending on the e-fuel required. While the first step is the production of hydrogen by electrolysis from renewable electricity, the required e-fuel dictates the rest of the steps – CO_2 is combined with hydrogen to produce e-crude and synthetic methane or e-methanol whereas nitrogen is combined to produce synthetic ammonia. Similar to its fossil fuel-based counterpart, synthetic crude oil must be refined to produce synthetic kerosene, e-gasoline or e-diesel.

As has been noted above, in terms of RFNBOs, the objective of the RED III and the Delegated Acts is to ensure that hydrogen is produced from renewable energy sources and achieves at least 70 per cent GHG emission savings.[75] The 70 per cent GHG emissions saving also applies to e-fuels, and if these fuels meet this threshold, they are considered RFNBOs under the EU framework. Therefore, if the producer aims to participate in the market for RFNBOs, it is necessary for any renewable fuel that contains carbon content to comply with this 70 per cent emission reduction requirement.[76]

In relation to eligible CO_2 sources for the production of RFNBOs, the GHG Methodology Delegated Act[77] states that

> [e]missions 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 include the CO_2 equivalent of the carbon incorporated in the chemical composition of the fuel that would have otherwise been emitted as CO_2 into the atmosphere. This means that the GHG Methodology Delegated Act treats sustainable CO_2 as carbon neutral as the release of CO_2 during combustion is still taken into account (and reduction only takes place at the level of fuel production) …

As long as at least one of the following requirements is met, this includes CO_2 that was caught and mixed with the fuel:

(1) **Industrial CO_2:** The CO_2 has been captured from an industrial activity.[78] The additional condition for this option is that there is an effective carbon pricing system and that the CO_2 is incorporated in the chemical composition of the fuel before 2036 (or 2041 in cases other than CO_2 stemming from the combustion of fuels for electricity generation).
(2) **Direct air capture of CO_2.**
(3) **Biogenic CO_2:** The captured CO_2 comes from the production or the combustion of biofuels, bioliquids or biomass fuels complying with the sustainability and GHG saving criteria; and the CO_2 capture did not receive credits for emission savings from CO_2 capture and replacement under Annex V and VI of the 2018 Directive.[79]

75 GHG Methodology Delegated Act, art 2 and recital 1
76 Given that the combustion of these fuels produces the same GHG emissions as fossil fuels, they rely on avoided emissions to meet the 70 per cent threshold. This can be achieved by capturing and reusing CO_2. Captured CO_2 can be deducted from the RFNBOs carbon footprint, according to the GHG Methodology Delegated Act. Annex (a)(1).
77 GHG Methodology Delegated Act, Annex (a)(10)
78 European Parliament and the Council Directive (EU) 2003/87/EC of 11 December 2018 of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC [2003] OJ L275/32, Annex I (ETS Directive)
79 Biomass may not be combusted strictly as a carbon source.

(4) **CO_2 from RFNBOs or recycled carbon fuels:** The captured CO_2 stems from the combustion of RFNBOs or recycled carbon fuels complying with the GHG saving criteria, set out in Article 25(2) and Article 28(5) of RED III and the GHG Methodology Delegated Act; or
(5) **Geological CO_2:** The captured CO_2 stems from a geological source of CO_2 and the CO_2 was previously released naturally.[80]

The GHG Methodology Delegated Act does not specifically mention CO_2 originating from fossil fuels; the Commission has stated that it is not forbidden to use fossil-based CO_2, but it would make it more challenging to achieve 70 per cent emissions savings. Further, the use of industrial (fossil[81]) CO_2 is only allowed until the end of 2040. Until 2041, the EU rules allow the use of industrial CO_2 where there is 'an effective carbon pricing system' and the CO_2 does not originate from electricity production. Where the CO_2 is derived from electricity production, the allowance is only until 2036. These requirements can be difficult to meet in third countries. Many countries outside of the EU do not have a carbon pricing system, which means that importers of green (synthetic) methane or methanol cannot count their product as RFNBOs within the EU framework.

The second related question in terms of 'an effective carbon pricing system' relates to the meaning of the word 'effective'. The criteria for an 'effective' carbon pricing system have not been explicitly provided in the EU framework. However, recital 6 of the GHG Methodology Delegated Act explains that

> emissions from industrial processes or from the combustion of non-sustainable fuels should be prevented, even if they could be captured and used to produce RFNBOs and recycled carbon fuels. These emissions are subject to carbon pricing to incentivise abating the emissions from non-sustainable fuels in the first place. Therefore, where such emissions are not taken into account upstream through an effective carbon pricing, those emissions must be accounted for and should not be considered as being avoided.

This means that the avoidance of emissions should be given priority wherever possible (this is ensured by putting a price on emissions), followed by their use as fuel, and then only for those emissions that could not be avoided, through the use of a carbon price. This may help in interpreting the word 'effective'.

In practice, the requirement of an effective carbon pricing mechanism poses challenges for third-country producers aiming to use recycled industrial CO_2. The certification for RFNBOs requires recognition by the EU of a national *effective carbon pricing system* when the RFNBO is produced.[82] In addition and as already mentioned above, the requirement exposes RFNBO investors to ongoing annual qualification risks, as national policies naturally change with changes in government.

The above framework also prohibits the use of CO_2 stemming from industrial sources for the production of RFNBOs from 2041 onwards. Unless the producer has access to geological CO_2, the remaining options are largely limited to direct air capture (DAC) or biogenic CO_2.

80 GHG Methodology Delegated Act, Annex (a)(10)
81 Q&A Implementation of Hydrogen Delegated Acts (n 16), Question 42
82 Q&A Implementation of Hydrogen Delegated Acts (n 16), Annex

Currently, DAC technology is still in the small-scale and prototype phase, not yet ready for full commercial deployment because of its high costs.[83] If the these costs can be reduced through advances in technology and scale, this option would be highly viable. This, however, requires that appropriate policy incentives are put in place. Unless significant developments take place, given the costs associated with DAC, the clear focus after 2041 is on biogenic CO_2.

Biogenic CO_2 includes CO_2 that comes from the combustion or production of 'sustainable biomass' as well as CO_2 from the treatment of biogenic waste. In order to count as emissions from existing use or fate e-ex-use,[84] biogenic CO_2 must not have received credits for emissions savings from CO_2 capture and replacement and must meet the sustainability and GHG savings criteria.[85]

The rules on biogenic CO_2 also create difficulties for potential producers. First, the imposition of EU sustainability criteria on external producers creates complications for these producers as they are now subject to both national and EU sustainability rules. However, this is arguably a difficulty that is well founded in legitimate environmental considerations and should be accepted. Nevertheless, the second problem that may arise is the availability of sustainable biomass in certain regions of the world. There are only a few regions in the world where biomass is available in high quantities and its sustainable use is already possible today. A partial solution to this problem is the use of biogenic waste fractions from household waste. However, the energetic use of waste is only starting in many regions of the world and not a reality yet for the production of e-fuels.

Today, one of the main challenges is the transportation of renewable hydrogen over long distances, as it leads to significant energy losses within the hydrogen value chain. One viable option in the short term is the use of carbon monoxide and combining it with renewable hydrogen for production of (synthetic) e-methanol, as its ease of storage and safety in handling make it an attractive alternative. Moreover, it is possible to process e-methanol to produce different kind of fuels that can be run in the same combustion engines as current fossil fuels, such as e-gasoline, e-kerosene or e-diesel.[86]

An alternative solution for transporting renewable hydrogen over long distances involves combining hydrogen with nitrogen to create synthetic ammonia. Unlike e-methane or e-methanol, this process does not require an eligible CO_2 source. However, engines that utilise ammonia are not yet ready for full commercial deployment. They must adhere to strict safety regulations and procedures for handling the hazardous liquids, which are still being developed. A further potential drawback for the green ammonia route for exports to the EU is the inclusion of ammonia under the CBAM.[87] This issue is discussed next, in the final section of this article.

83 Kattie Lebling, Haley Leslie-Bole, and Byrum Zach, 6 Things To Know About Direct Air Capture (*World Resources Institute*, 2 May 2022) <www.wri.org/insights/direct-air-capture-resource-considerations-and-costs-carbon-removal> accessed 27 March 2024

84 'emissions from inputs' existing use or fate'.

85 Q&A implementation of hydrogen delegated acts, Question 36

86 Isabelle Gerretsen, 'The Decarbonization Tradeoffs for Ammonia, Methanol and H_2' (*The Maritime Executive*, 22 July 2022) <https://maritime-executive.com/editorials/the-decarbonization-tradeoffs-for-ammonia-methanol-and-h2> accessed 22 January 2024

87 European Parliament and the Council Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism [2023] OJ L130/52 (CBAM Regulation)

9. Hydrogen imports and the CBAM factor

The EU's CBAM became applicable from 1 October 2023.[88] The CBAM sets up a mechanism that puts a price on the carbon emitted during the production of certain carbon-intensive goods that enter the EU market area. This price is based on the carbon price under the EU's internal Emissions Trading Scheme (ETS). The CBAM has a twofold objective:[89] (i) within the EU, it seeks to create a level playing field between EU and non-EU production of goods by linking the EU ETS to certain imported goods and ensuring that the carbon price of imports is equivalent to the carbon price of internal EU production; and (ii) it seeks to encourage cleaner industrial production in non-EU countries. As will be seen below, the first objective is not met and there is an unequal treatment of third-country producers of hydrogen, ammonia or other hydrogen derivatives.

The CBAM started to apply in its transitional phase, which runs from October 2023 to the end of 2025. The full application of the regulation will start in 2026 onwards.[90] The scope of CBAM is limited, at least initially, to cement, iron and steel, aluminium, electricity, hydrogen, and fertilisers including ammonia. The rationale for selecting these goods is that their production is carbon intensive, and they are recognised at the EU level as the sectors with the highest risk of carbon leakage. Carbon leakage refers to the scenario where EU-based companies shift their carbon-heavy production to countries with less rigorous climate regulations than the EU, or when products from the EU are supplanted by imports that have a higher carbon footprint. This phenomenon often occurs given that many non-EU countries have less stringent climate policies in place.[91]

Hydrogen is one of the goods covered by the CBAM. The rationale for including a good for which current imports are close to zero is the anticipation of a growing international trade in hydrogen.[92] However, given the challenges of transporting liquid hydrogen, which requires a temperature of −253°C and highly specialised ships, it is unlikely that international trade in pure hydrogen will materialise in the short or even medium term. The more likely alternative seems to be hydrogen derivatives, such as green methanol or green ammonia. With these fuels, CO_2 or nitrogen is added to the green hydrogen to create a more stable and easily transportable commodity.[93] Unlike liquid hydrogen, there is an existing carrier fleet and available port infrastructure for ammonia and methanol.

As with hydrogen, ammonia falls within the scope of the CBAM under 'fertilisers'. Interestingly, other imported hydrogen derivatives, such as green methanol or other e-fuels or synthetic gases, do not fall under the scope of the CBAM.[94] At present, although the CBAM was designed to be WTO-compliant, the different treatment of ammonia or hydrogen compared to other derivatives appears to create an uneven playing field and

88 Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism (OJ L 130, 16 May 2023, p. 52–104)

89 European Commission, 'Carbon Border Adjustment Mechanism' <https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en> accessed 15 December 2023

90 CBAM Regulation, art 36

91 European Commission, 'Carbon Border Adjustment Mechanism' (n 89)

92 CBAM Regulation, recital 37

93 The downside of this option is that cracking the derivative back to hydrogen would create energy losses. However, this is not always necessary, as ammonia can be directly combusted.

94 CBAM Regulation, art 2: goods are only within the scope of the CBAM where goods listed in Annex I, or '*processed products* from those goods *resulting from the inward processing procedure referred to in Article 256 of Regulation (EU) No 952/2013*, are imported into the customs territory of the Union' (emphasis added).

could lead to international market differentiation (EU imports would be based on hydrogen derivatives other than ammonia). In the future, this could mean that the scope of CBAM would be extended to cover these other hydrogen derivatives.

9.1. *What does it mean to fall under CBAM?*

During the transitional phase, from October 2023 to the end of 2025, importers of those goods that fall within the scope of CBAM will have to report on the volume of their imports and the GHG emissions embedded in their production. During this phase, the producers are only required to report, with no financial consequences. Embedded emissions under the CBAM include direct[95] and indirect emissions,[96] although for certain Annex II products like hydrogen, only direct emissions are taken into account.[97] For electrolyser-based renewable hydrogen this means zero emissions and no direct CBAM-related financial costs. Nonetheless, importers of renewable hydrogen continue to face notification and reporting requirements, which come with associated administrative burdens and costs. These should be reduced if the final aim of the EU is to encourage the import of renewable hydrogen. For example, the new rules on reporting are applicable to the authorised CBAM declarant that imports the goods. The importer must apply for the status of an authorised CBAM declarant through the CBAM Registry prior to importing goods falling under the scope of the CBAM.[98] Where an importer is not established in an EU member state, an indirect customs representative may be appointed, and this entity can submit the application for authorisation.[99]

When the full application of CBAM comes into force, the authorised CBAM declarant will have to declare the quantity of goods imported into the EU in the previous year, and the embedded GHG in these products.[100] There are detailed rules on the calculation of embedded emissions and the data to be included in the annual declarations.

Where the actual emissions cannot be adequately determined, and in the case of indirect emissions, the embedded emissions can also be determined using default values. Default values present a 'world' average, weighted by production volumes. They are based on estimations on embedded emissions in CBAM goods as carried out by the Commission's Joint Research Centre, where the emission intensities were estimated for different countries through a transparent methodology based on publicly available data. From 2026, declarants have two options to determine default values:

(1) a value set at the average emission intensity of each exporting country and for each type of good within the CBAM scope, increased by a proportionally designed mark-up; or

95 Under CBAM Regulation, art 3 (21), 'direct emissions' means emissions from the production processes of goods, including emissions from the production of heating and cooling that is consumed during the production processes, irrespective of the location of the production of the heating or cooling.

96 Under CBAM Regulation, art 3 (34), 'indirect emissions' means emissions from the production of electricity which is consumed during the production processes of goods, irrespective of the location of the production of the consumed electricity.

97 CBAM Regulation, art 7 and Annex II

98 CBAM Regulation, art 5

99 Details of the application information is provided for in art 5 of CBAM.

100 CBAM Regulation, art 22

(2) if reliable data for the exporting country cannot be applied to a type of good, the default values will be based on the average emission intensity of the X per cent worst performing EU ETS installations for that type of good.[101]

These default values are not a suitable option for any importing company that has taken measures to reduce its GHG emissions because their use will penalise such a company, as the emission reduction investments would have no impact on the additional costs under CBAM.

Based on the volume of imports and their embedded GHG emissions, the importer is required to surrender the corresponding number of CBAM certificates.[102] The price of these CBAM certificates is calculated based on the weekly average auction price of EU ETS allowances expressed in €/tonne of CO_2 emitted.[103] It is possible to claim a reduction in the number of CBAM certificates to be surrendered if the country of origin has a carbon pricing[104] mechanism and the importer had effectively paid this carbon price for the declared embedded emissions.[105]

As mentioned above, the price of CBAM certificates is connected to the EU ETS. While the new Article 10a[106] states that there will be no free allocation of EU ETS allowances for the production of goods listed in Annex I of the CBAM, the rules provide for a transitional period. During this period, the CBAM sectors can still benefit from free allocation. A factor will be applied to reduce the free allocation for the production of these goods (CBAM factor). This means that from 2026 onwards, free allocations will be gradually reduced by applying an annually decreasing CBAM factor.[107] From 2034 onwards, free allocations will have been phased out completely for CBAM sectors, and no CBAM factor should apply.[108] This will provide for a transition where CBAM is progressively phased in while free allowances in sectors covered by CBAM are phased out.

9.2. *Effect of CBAM on imports in hydrogen and hydrogen derivatives*

There exist differences between the EU ETS and the CBAM certificates. These same differences raise WTO concerns. First, unlike the EU ETS, a portfolio approach to the CBAM certificates is not possible as all CBAM certificates purchased during a calendar year must be resold back to the CBAM Registry at the same price as purchased. Pursuant to Article 23 of the CBAM, the authorised CBAM declarant must submit the repurchase request by 30 June of each year in which CBAM certificates were surrendered. In addition, the number of certificates that may be resold is also limited to one-third of

101 CBAM Regulation, art 7(2) and Annex IV point 4.1

102 Under CBAM Regulation, art 3 (24): a 'CBAM certificate' means a certificate in electronic format corresponding to 1 tonne of CO_2 of embedded emissions in goods.

103 CBAM Regulation, art 21

104 Under CBAM Regulation, art 3 (29): a 'carbon price' means the monetary amount paid in a third country, under a carbon emissions reduction scheme, in the form of a tax, levy or fee or in the form of emission allowances under a GHG emissions trading system, calculated on GHGs covered by such a measure, and released during the production of goods.

105 CBAM Regulation, art 9

106 ETS Directive

107 Up to the end of 2025, the CBAM factor being 100 per cent.

108 ETS Directive, art 10a (b) and recital 46

the total number of CBAM certificates purchased by the authorised CBAM declarant in the previous calendar year. Second, CBAM certificates cannot be traded as in the EU ETS but must be returned to the CBAM Registry at the purchase price. This puts the third-country producer in a different position to the EU producer.

In addition to treating the third-country producer differently from the EU producer, the CBAM also treats hydrogen derivatives differently. Depending on what type of RFNBO fuel is being produced and imported, the CBAM treatment will be different. Green hydrogen (RFNBO) and green ammonia are CBAM products, but green methanol and other hydrogen derivatives are not.

Of course, the practical or monetary impact of these differences should not be exaggerated. However, while the actual CBAM cost for green hydrogen or green ammonia is zero, and the cost for blue or turquoise hydrogen is not very significant, as most of the CO_2 can be removed either as carbon prior to fuel production (turquoise) or through carbon capture at the fuel production stage (blue), it still means that hydrogen and ammonia are subject to the reporting requirements under the CBAM, whereas other RFNBO fuels are not. These reporting tasks under CBAM requirements represent an administrative burden for renewable hydrogen importers. They will have to comply with procedures and formalities every year, which has the potential to act as a non-tariff barrier to trade.

Consequently, producers might be driven to focus on hydrogen derivatives and carriers not subject to the CBAM, converting them to liquid or gaseous hydrogen only after they have passed the EU borders,[109] which could potentially distort the import strategies of hydrogen producers. If these methods are widespread, the practical relevance of incorporating hydrogen and ammonia in the CBAM could be at risk, and the objectives of CBAM would be undermined.[110]

Thus, the impact of the CBAM on the imports of hydrogen and its derivatives is that: (i) those products that fall within the scope of the CBAM – hydrogen and ammonia – have a higher regulatory burden than those products that do not fall within the scope; (ii) it can potentially distort the import strategies of hydrogen producers; and (iii) imported products that fall within the scope of the CBAM are treated differently than the same products produced within the EU and subject to the EU ETS.

10. Conclusion

This article has examined and discussed various EU requirements for RFNBOs from the perspective of importing the targeted RFNBOs into the EU. In terms of the current EU framework, the same requirements apply to RFNBOs produced within the EU and those imported from third countries. While this, of course, is welcomed from a 'level playing field' perspective for domestic hydrogen producers, these rules create practical problems for third-country hydrogen producers. Different legal and factual situations

109 Hydrogen Europe, ETS and CBAM – implications for the hydrogen sector. Hydrogen Europe Position Paper. October 2022 <https://hydrogeneurope.eu/wp-content/uploads/2022/10/EU-ETS-and-CBAM-implications-for-the-hydrogen-sector_final.pdf> accessed 18 December 2023

110 Andrei Marcu and others, 'The inclusion of hydrogen in the EU CBAM, ERCST (Roundtable on Climate Change and Sustainable Transition' (2023) <https://ercst.org/the-inclusion-of-hydrogen-in-the-eu-cbam> accessed 13 January 2024

in third countries create unnecessary complications and disadvantages for importers of RFNBO fuels. Given that the target date for the 10 million tonnes of imports is set at 2030, only 6 years from now, and that some of the targets for specific sectors come even faster, the EU institutions, and in particular the Commission, should take note and avoid creating unnecessary complications. For example, it may well be that the sustainability rules for biogenic CO_2 are well founded and necessary, while other rules, such as the no public support rule, should be reconsidered. Other ways exist to create a level playing field for EU-produced and imported RFNBOs. If the EU is serious about its hydrogen import targets, it needs to think creatively and be flexible. This should also be borne in mind when designing the framework for low-carbon hydrogen.

There are ample opportunities to fine-tune the regulatory framework for RFNBOs and hydrogen more generally. RED III requires the Commission to revisit certain issues through delegated acts in the coming years, and these opportunities can be used to tweak the details of the legislative framework. Similarly, the Commission's guidance on specific questions can be adjusted without the need for a recast Directive. At the same time, it should be noted that importers also need to be aware of the various options available under the EU law. For example, as has been discussed in this article, imports of green ammonia are treated differently from imports of green methanol. Installations that start production before 2028 are treated differently from those that start RFNBO production after that. These types of opportunities and their impact on specific projects in specific countries need to be carefully considered.

With respect to trade between the EU and the US, the EU must ensure that the cost and technical requirements to produce RFNBOs are not so complex that they drive producers to market their hydrogen and its derivatives in other regions. The US appears to be mirroring the EU approach in some aspects. However, in order to enable this trade, a mutual agreement in respect of GOs and a changing attitude by the EU in respect of subsidisation will need to occur.

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