International Hydrogen Ramp-up Programme – H2Uppp

EU RFNBO Certification Compendium

Key Insights, Challenges and Solutions from Expert Workshops and Case Studies in Non-EU countries

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

LBST Ludwig Bölkow Systemtechnik

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As a federally owned enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

Published by:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
On behalf of the Federal Ministry for Economic Affairs and Energy

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Layout:
peppermint werbung berlin gmbh, Berlin

Bonn, February 2026

The International Hydrogen Ramp-up Programme (H2Uppp) is supporting entrepreneurial engagement in the ramping-up of hydrogen in the Global South and is a programme of the:

Federal Ministry for Economic Affairs and Energy

Implemented by:

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

1 Introduction and Background

1.1 Context

In the framework of the project "Implementation of the International Hydrogen Ramp-Up Programme (H2Uppp – Phase II)" implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and commissioned by the German Federal Ministry for Economic Affairs and Energy (BMWE), stakeholder consultation workshops have been and are being organised across four non-European countries: India, Colombia, Brazil, and South Africa. Workshops in India, Colombia and Brazil were held in March/ April 2025 while the one in South Africa is scheduled for March 2026.

Many countries in the Global South have excellent conditions for generating renewable electricity, such as abundant solar and wind resources, making them well-positioned to produce renewable hydrogen (H_2) and its derivatives competitively. This presents a major opportunity for these countries to play a key role in the global energy transition by becoming exporters of renewable hydrogen and Power-to-X (PtX) products. Meanwhile, their development benefits from reduced reliance on fossil fuel imports and lower domestic emissions. To facilitate exports to the EU, specifically to the premium markets for Renewable Fuels of Non-Biological Origin (the so-called RFNBOs), these workshops focus on the regulatory compliance of Power-to-X projects located in the abovementioned export jurisdictions, as well as the practical realisation of the RFNBO certification process under the EU Renewable Energy Directive (RED II)[1]. This way, private developers of PtX installations shall be supported to navigate and apply the relatively complex as well as new certification requirements within their regional contexts; while engaging local public authorities is essential to explore how they can support and facilitate private sector compliance. This report outlines the main points of discussion, open issues and concerns as well as relevant specific questions, and recommendations are derived to address the main pitfalls and misunderstandings by companies. This will furthermore provide European regulators with direct insights of practical, local implementation challenges in export jurisdictions helping to refine regulatory frameworks accordingly and thus ensure the successful importation of clean molecules from diverse geographies to European markets, while complying with the set emission reduction targets.

1.2 Workshops

The 2-day workshops feature presentations, in-person discussions and interactive working sessions. The workshops are organized, moderated and held by LBST (India, South Africa) and by Hinicio (Colombia, Brazil), with contributions by CertifHy - one of the so-called voluntary schemes for RFNBO compliant hydrogen certification recognised by the European Commission under RED II - and the CertifHy-trained and recognised certification body TÜV SÜD, ensuring practical knowledge exchange, an efficient solving of the stakeholders' specific doubts and effective implementation strategies, always considering the local context. The companies and experts conducting the workshops therefore represent the key stakeholders involved in Renewable Fuels of Non-Biological Origin (RFNBO) certification processes. The programme included detailed questions & answers sessions and further formats that allowed participants and presenters/ moderators to raise and discuss many general and specific questions and issues including issues related to the specific situation in the respective country context. The workshops also benefited from additional expertise as GIZ experts and partners (e.g. SAP) and national as well as international industry associations attended the workshops and shared their expertise on the local context.

The workshops held in India, Colombia and Brazil in March/ April 2025 were attended by 40-50 stakeholders each. Most of the participants represented project developers actively working on H_2 / PtX production projects in the respective country with a concrete interest in exporting the products to Europe under RFNBO certification. Further participants include ministries and other public authorities with responsibilities closely related to H_2/ PtX issues. Also, relevant associations and other stakeholders participated actively.

1.3 Case studies: India and Colombia

Two case studies have been conducted for RFNBO projects in India and in Colombia. The results summarized in section 2.1 provide key learnings, e.g., regarding common misconceptions, required data and documentation and their level of detail, and general recommendations. The two case studies are complementary in their scope, with the Indian case study focusing on the GHG calculation and the Colombian one on compliance with the sustainability requirements according to the revised RED II and the Delegated Acts. One case study in Morocco is ongoing.
LBST conducted a comprehensive GHG emissions calculation according to the methodology defined in the Commission Delegated Regulation (EU) 2023/1185 for a Power-to-Ammonia project located in India. Based on project-specific

[1] https://eur-lex.europa.eu/eli/dir/2018/2001/oj/eng; the original Directive of 2018 has been changed (sometimes referred to "RED III"); the current consolidated version is available under the before-mentioned link.

(confidential) data, compliance with the required GHG emissions savings of at least 70% compared to the fossil fuel comparator was assessed. More importantly, the project developer was provided with a GHG calculation tool compliant with the required transparency for actual certification.
Hinicio conducted a comprehensive regulation compliance assessment to evaluate a Power-to-Ammonia project located in Colombia against the mandatory criteria for RFNBO according to RED II/III and Delegated Acts. The assessment aimed to determine the project's alignment with the regulatory requirements and to identify potential non-compliance issues and risks. The results are summarized in section 2.1.

1.4 Structure of the report

In Section 2 the questions and answers and discussion **outcomes from the workshops and discussions as well as of case studies** are summarised. For that, case study results are provided in sections 2.1 and 2.1. Similar questions are grouped and categorised by topic in sections 2.3 to 2.8. Country-specific questions are covered in specific sub-sections to facilitate reading for specific countries.

This report does not aim to provide a comprehensive explanation of all requirements and certification procedures. Instead, it focuses on selected topics and concepts relevant to the analysis. For a more detailed overview of the fundamentals, the following resources are recommended:

- *Policy brief on EU requirements for renewable hydrogen and its derivatives* – PtX Hub[2]
- *Identification of suitable carbon as feedstock for PtX products to be exported to Europe* – PtX Hub[3]
- *Non-fossil Fuel Categories in EU Legislation and their Significance for Hydrogen* – PtX Hub[4]
- *Green Hydrogen & PtX Certification* (1.5 h online self-learning course, free of charge) – atingi / PtX Hub[5]
- *Framework of recognized certification schemes in the EU for RFNBO (currently ISCC, CertifHy, and REDcert)* – see respective scheme websites for details
- *How to become RFNBO-certified* – RVO[6]

In Section 3, the **recommendations targeted to private companies** outline the most effective and successful preparation for the aspired RFNBO certification process. The general perspective (section 3.1) covers, for example, documentation and management system planning, supply chain emission accounting, off-taker engagement and market dynamics, knowledge development on regulatory and certification topics, and strategic involvement with key stakeholders. In section 3.2, recommendations are provided by topic, which are relevant to all countries. In section 3.3, country-specific circumstances are included to the recommendations, e.g. the institutions responsible for providing official information for the audits.

Section 4 covers **recommendations for the national regulators and governments outside Europe** to support private companies in the process of certification. For general information, section 3.1 lists and explains the required information and data which should be made available to project developers from official sources. Section 3.2 is aimed at overcoming existing challenges and solving incompatibilities of the respective national regulatory frameworks with EU regulatory requirements by identifying these and providing recommendations on how to handle these issues.

Section 5 summarises **recommendations for action by European regulators** on the one hand, to address the previously identified regulatory incompatibilities from the European end. On the other hand, required clarifications on how concepts defined in the EU-context can be applied in non-EU countries are highlighted. Where possible, country-specific recommendations are included.

[2] https://ptx-hub.org/publication/policy-brief-on-eu-requirements-for-renewable-hydrogen-and-its-derivatives/
[3] https://ptx-hub.org/wp-content/uploads/2024/07/202407_International_PtX_Hub_Identification_Carbon_Paper.pdf
[4] https://ptx-hub.org/publication/eu-non-fossil-fuel-categories-for-hydrogen/
[5] https://online.atingi.org/enrol/index.php?id=4750
[6] https://www.rvo.nl/sites/default/files/2025-01/Report-How-to-become-RFNBO-certified.pdf

2 Summary of Workshop Q&As & Discussions and Case Studies

In this section the questions and answers and discussion outcomes from the workshops are summarised. For that, similar questions are grouped and categorised by topic. Furthermore, the two case study outcomes are summarised.

2.1 Case Study Results India

The GHG calculation is a key requirement for certification and is a core element of the audit. The GHG emission calculation methodology is defined in the Commission Delegated Regulation (EU) 2023/1185 and is applied on a well-to-grave basis. This includes emissions from the supply of energy inputs including upstream emissions and savings from eligible CO_2 sources (e_i), emissions from processing (e_p), emissions from transport, storage and distribution of the RFNBO (e_{td}), emissions from combustion of the fuel in its end-use (e_u) and emissions savings from carbon capture and geological storage (e_{CCS}) (see Figure 8 and section 2.6 for more details). For RFNBO compliance, 70% of GHG emissions savings compared to the fossil fuel comparator (FFC), i.e. 94 g_{CO2eq}MJ, must be achieved.

It is important to mention that the GHG calculation must provide sufficient **transparency**, including, but not limited to, the plant-specific technical data inputs, applied emission factors from standard values and other eligible sources, and underlying assumptions including the respective sources, as well as on the methodology applied and the actual calculation steps. According to Article 11 of the Implementing Regulation (EU) 2022/996, *"When a certification body conducts verification activities […] it shall also meet the applicable requirements of […] EN ISO 14065"*. Thus, the principles and requirements defined in ISO 14065 for the verification of the GHG emissions calculation are to be applied by the certification body. This underlines the importance of the GHG calculation being fully transparent and comprehensive in terms of sources and evidence.
It is further noteworthy that also in the framework of the Hintco tender auctions[7] a GHG calculation must be submitted. As this does not cover the full life-cycle from well-to-grave, but is limited to well-to-delivery point in Europe, it requires GHG savings of at least 73% compared to the fossil fuel comparator.

The GHG calculation carried out by LBST according to the methodology provided in the Commission Delegated Regulation (EU) 2023/1185 was based on (confidential) project-specific data for a green ammonia project in India for transport to Hamburg, Germany, for direct use of the ammonia excluding ammonia cracking. The first set of data delivered by the project developer showed that the required **comprehensiveness of data** necessary for a reliable, even if preliminary, GHG calculation was underestimated by the project developer. LBST identified the following data required additionally:

- Full load hours of the individual plant processes (electrolysis and ammonia production)
- Renewability of the entire electricity consumption (including auxiliary equipment, etc.) in alignment with the sustainability requirements defined in the Commission Delegated Regulation (EU) 2023/1184 in order to count as zero emissions
- Fresh water input into water treatment including upstream emissions
- Use of auxiliary materials (lubricants, cooling water, process chemicals, etc.) in all processes/ plants
- H_2 and NH_3 losses during the processes
- Electricity consumption of the export terminal at the port
- NH_3 losses during transport from both leakage and boil-off
- If applicable, data on the import terminal (e.g., electricity consumption for unloading, onward transport, etc.)
- If applicable, data on the ammonia cracker
- Waste heat from the electrolyser (where utilized)
- O_2 output from the electrolyser (where utilized)

Where no specific data was available, LBST made suitable assumptions based on reliable and publicly available data, which was documented accordingly.

Consistency of the data inputs is crucial. In the case of the Indian project developer, for example, LBST provided clarification that all emissions from wastewater treatment must be considered in the GHG emissions, even if parts of the wastewater are used e.g. for service water, cooling of equipment, steam generation etc. Furthermore, emissions at the import terminal must consider the reduced RFNBO amount from leakage and boil-off during the transport and thus typically deviate from the emissions at the export terminal. Especially, where measurement data is not yet available, data inputs and their approximate figures must be based on, and evidenced and explained by reliable data and information. For example, as in the case of the Indian project developer, for rather high full load hours of the electrolyser sourcing 100% renewable electricity, additional information on e.g. battery storage is required.

[7] See https://hintco.eu/

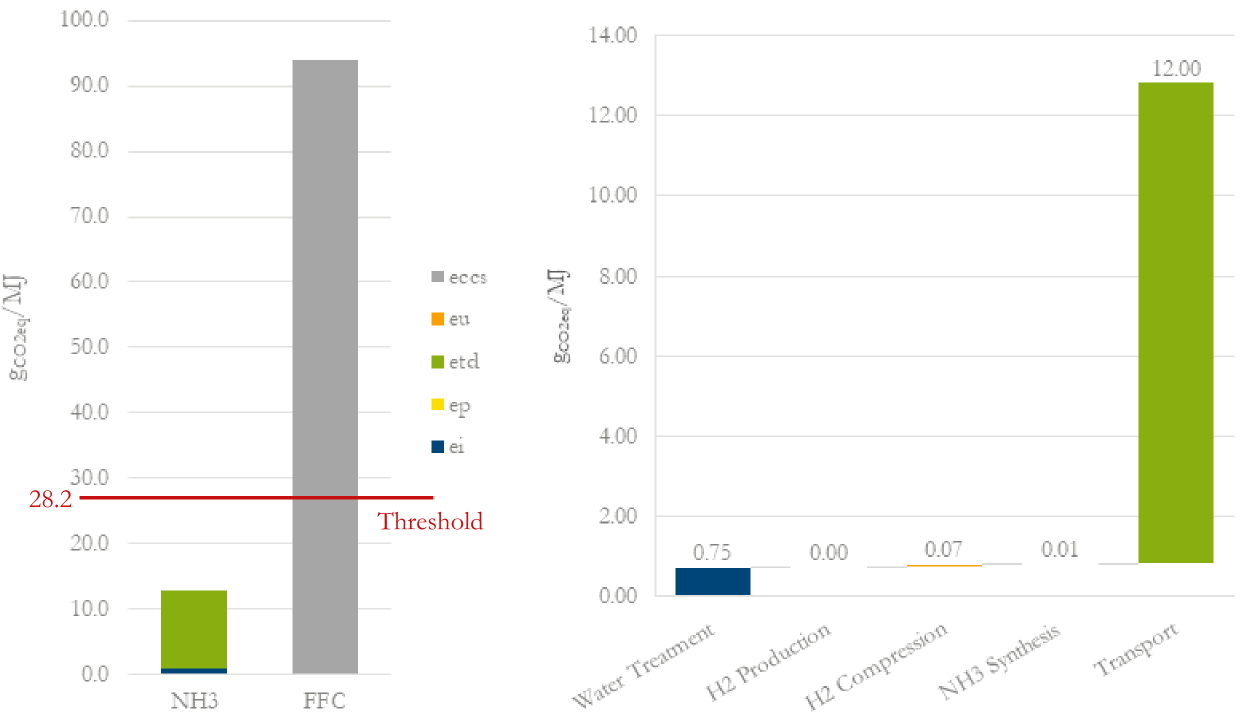

Figure 1: Contributions to GHG emissions for ammonia project in India

FFC: fossil fuel comparator, ei: emissions related to inputs, ep: emissions related to processing, etd: emissions related to transport and distribution, eu: emissions related to the use of the final fuel, eccs: emissions savings from carbon capture and geological storage

The results of the GHG calculation are illustrated in Figure 1. Shipping of ammonia to Hamburg is the highest contributor to GHG emissions for this project setup. A large-scale gas carrier capable of carrying up to 51,000 tonnes of ammonia was assumed for the transport. Upstream emissions as well as the combustion of heavy fuel oil for shipping leads to around 9.5 gCO_{2eq}/MJ of ammonia delivered at port. The remaining 2.5 gCO_{2eq}/MJ from transport result from grid electricity for the export and import terminal as well as fugitive ammonia emissions. As 100% renewable electricity is used for the water treatment, H_2 production, H_2 compression and NH_3 synthesis, these processes are only responsible for a low share of the overall emissions. Upstream emissions of tap water as well as emissions from wastewater treatment add up to 0.75 gCO_{2eq}/MJ. The remaining emissions result from KOH used in the electrolyser, from cooling water as well as fugitive ammonia emissions at the ammonia production stage. Overall, the project shows good compliance with the GHG savings requirements, with total GHG emissions savings of 86% compared to the fossil fuel comparator.

Overall, companies should adhere to the following principles when preparing a GHG calculation for RFNBO certification:

1. Ensure **transparency of the GHG calculation**, including the methodology and calculation steps used, as well as on the technical data and emission factors used.
2. Ensure **comprehensiveness of input data** covering the whole certification scope. Where applicable, provide reliable references (i.e. from **official sources**) for assumptions.
3. Ensure **consistency of data inputs** and provide explanations where necessary.

2.2 Case Study Results Colombia

The analysis which was based on project specific (confidential) information revealed that the project developer had no clarity on the additionality criterion; the project design considered the use of an existing small hydropower plant (SHPP) that has been operating for several decades for electricity supply under a PPA.
It was highly valuable for the developer to learn that the first phase of its project can benefit from transition rules until January 1st, 2038 for projects coming into operation before January 1, 2028. This means the facility can be supplied by a small hydropower plant that began operations in 1986, qualifying under the "grandfathering" provision. However, once this grandfathering period expires, the developer must adopt an alternative sourcing strategy if the project remains operational. Potential alternatives that were explained by Hinicio include:

- Establishing a new direct connection or repowering the existing SHPP, which would require investments exceeding 30% of the cost of building a comparable new installation.
- Purchasing electricity from the spot market, provided that the grid achieves at least 90% renewable generation in accordance with the RED II methodology.

Specifically, Hinicio advised the developer to either define another Renewable Energy Asset in compliance with the additionality criterion, or to explore repowering options for the SHPP and prepare a transition plan, given that grandfathering provisions might eventually cease to apply, requiring all projects to meet the full RFNBO requirements.

In addition, the assessment identified gaps related to the mass balance chain of custody requirements and traceability: the project did not yet include a comprehensive traceability system nor a strategy for data communication to the future certification bodies / auditors when realizing the plant's certification.

The case study did not include a calculation of the projects' end product's GHG emission intensity, but the main contributors to emissions were identified:

- **Transport:** The options considered by the developer included trucking, shipping to Europe, and pipeline transmission. Since the calculation of GHG emission intensity was outside the scope of this assessment, the share of transport-related emissions was not estimated. Additionally, Hinicio recommended the developer to define a midstream/downstream scenario to provide all relevant assumptions for GHG calculations up to the final consumer. For that purpose, a concrete supply chain from production in Colombia to final consumption in Europe would be developed to estimate the GHG intensity along the full supply chain, identifying main contributions to the GHG intensity and the overall savings achieved.
- **Water Intake:** Emissions associated with the water used for electrolysis, including its transport to the facility (where applicable), treatment processes, pumping operations, and other activities that carry an environmental footprint, whether from chemical use or electricity consumption. Although this may not be the primary source of GHG emissions, it should be accounted for in the overall emissions intensity calculation.
- **Chemical Inputs:** Auxiliary processes may involve GHG-emitting chemicals, primarily potassium hydroxide (KOH) in alkaline electrolysis, as well as impurity removers for hydrogen clean-up, catalysts for electrolysis and other processes, and oils for lubrication. For frequently used chemicals such as KOH, the entire life cycle should be considered, including manufacturing, transportation, and disposal. To achieve this, the indicators for each chemical provided under the RED II regulation can be considered.

Given that this was a high-level identification of the main GHG emission sources, it is recommended to carry out a detailed GHG intensity calculation following the RED II methodology, to confirm whether these are the major contributors and to define appropriate mitigation measures.

The overall insight of this case study evaluation demonstrated that developers in early-stage project development phases often overlook key compliance dimensions such as additionality transition rules and digital traceability systems, which are critical for certification. As a result, Hinicio provided targeted recommendations to align the project with EU-compliant RFNBO standards and to strengthen its overall regulatory readiness. From our experience, companies can work on:

- Implementing digital monitoring and registry systems to track all energy and material flows in real time, ensuring auditable evidence for compliance.
- Adopting a mass balance approach across the entire value chain, with clear definition of perimeters, periodicity (monthly until 2030, hourly thereafter), and responsibilities for each actor.
- Establishing a robust traceability strategy for Proofs of Sustainability (PoS), including chain of custody principles, and creating a user account in the Union Database (UDB)[8] on time.

[8] The Union Database will host all Proofs of Sustainability as the single registry of all relevant information on RFNBOs and biofuels; it is in operation for biofuels, but not yet for RFNBOs.

- Defining a comprehensive data management system, covering internal responsibilities, training programs, and internal auditing plans to guarantee transparency and accountability.
- Conducting a pre-certification exercise once the pre-FEED stage is completed, to clarify evidence requirements, identify gaps early, and align with voluntary schemes such as CertifHy.

2.3 RFNBO Certification in General

Overarching topics and questions are discussed in this section, while more specific questions related to the various requirements for RFNBO certification are discussed in the subsequent sections.

For RFNBO certification in general, only one country-specific question was raised in Brazil (see chapter 2.3.2).

2.3.1 General topics

- **Are there any countries that are restricted from RFNBO certification?**
  No, RFNBO production can be established in all countries world-wide, and the related certification can be carried out accordingly.

- **Is RED II currently applicable? Anything to consider about changes in the future?**
  - Yes, the revised RED II (sometimes referred to as "RED III")[9] is applicable.
  - To be kept in mind is the fact, that the revised RED II needs to be transposed into national law in the EU Member States. The RED II requirements have been put in place, and the RED II amendments of 2023 (RED III) had to be transposed into national law in the 27 EU Member States by May 2025; however, some delays in this process can be observed.
  - The certification requirements are not affected by the RED II amendments (RED III). Basically, the amendments enlarge the market.
  - RED II/III requires the European Commission to submit a report by 1 July 2028 assessing the impact of the Union certification methodology, including the impact of additionality and temporal and geographical correlation on production costs, greenhouse gas emissions savings, and the energy system. A dedicated research study has been started in late 2025 on this topic. Where the report concludes that the requirements fall short of ensuring sufficient availability and affordability of RFNBOs for industry and transport sectors and do not substantially contribute to GHG savings, energy system integration and the achievement of the Union targets for RFNBOs set for 2030, the Commission shall review the Union methodology and shall, where appropriate, adopt a delegated act to amend that methodology, providing the necessary adjustments to the criteria in order to facilitate the ramp-up of the hydrogen industry.

- **What is the relation between RFNBO certification and CBAM verification/requirements?**
  In general terms, RFNBO certification and Carbon Border Adjustment Mechanism (CBAM) are separate processes with separate requirements, and separate entities involved (e.g. RFNBO certification involves certification bodies, CBAM involves verification bodies). However, the CBAM Implementing Regulation 2023/1773 defines: *"Where the produced hydrogen has been certified to comply with Commission Delegated Regulation (EU) 2023/1184, an emission factor of zero for the electricity may be used."* In other words, the RFNBO certification may be used to evidence zero indirect emissions for CBAM purposes. This applies explicitly to hydrogen production through water electrolysis and through chlor-alkali electrolysis. However, CBAM does not explicitly define that RFNBO certification of ammonia can be used to evidence zero indirect emissions of ammonia for CBAM purposes, even where this is produced from renewable hydrogen.

- **Is the IEA database accepted as reliable and eligible data source for RFNBO certification?**
  CertifHy specifies that data on electricity production and fuel consumption shall be sourced from IEA Data and statistics that provides data on energy balances and electricity produced using various fuels, e.g. from IEA website, Data and Statistic section ("Energy Statistics Data Browser"[10]). For EU Member States, Eurostat data are more detailed and can be used instead[11]. Where the GHG emissions intensity is established at the level of bidding zones, data from official national statistics of the same level of detail as the IEA data shall be used. Where bidding zones are not identical to countries, data from official national statistics must be used. This data must have been derived in

[9] https://eur-lex.europa.eu/eli/dir/2018/2001/oj/eng; the original Directive of 2018 has been changed; the current consolidated version is available under the before-mentioned link.
[10] https://www.iea.org/data-and-statistics/data-tools/energy-statistics-data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource
[11] https://ec.europa.eu/eurostat/cache/visualisations/energy-balances/enbal.html?geo=EU27_2020&unit=KTOE&language=EN&year=&fuel=fuelMainFuel&siec=TOTAL&details=1&chartOptions=0&stacking=normal&chartBal=&chart=&full=0&chartBalText=&order=DESC&siecs=&dataset=nrg_bal_c&decimals=0&agregates=0&share=false&fuelList=fuelElectricity%2CfuelCombustible%2CfuelNonCombustible%2CfuelOtherPetroleum%2CfuelMainPetroleum%2CfuelOil%2CfuelOtherFossil%2CfuelFossil%2CfuelCoal%2CfuelMainFuel

accordance with the methodology applied for determining the RES-E share in the SHARES tool[12]. Fuel consumption data shall include available data at the highest level of detail available from national statistics[13]: solid fossil fuels, manufactured gases, peat and peat products, oil shale and oil sands, oil and petroleum products, natural gas, renewables and biofuels, non-renewable waste and nuclear.

- **What happens when there is insufficient capacity among certification bodies? Could this be an opportunity for national certification bodies/auditors?**
  During the workshops, participants expressed concern about a possible future shortage of certification bodies capable of conducting RFNBO certification, particularly outside the European Union. While this is not yet a confirmed constraint, Brazilian stakeholders mentioned that such a scenario could also represent an opportunity to strengthen domestic technical capacity and foster more active participation of national institutions in the RFNBO certification ecosystem. It is recommended to Brazilian entities to engage with EU-based certification schemes and bodies to train local auditors, build expertise in sustainability verification, and gradually position themselves as regional partners in the certification process (see Figure 2 for involved parties in RFNBO certification).

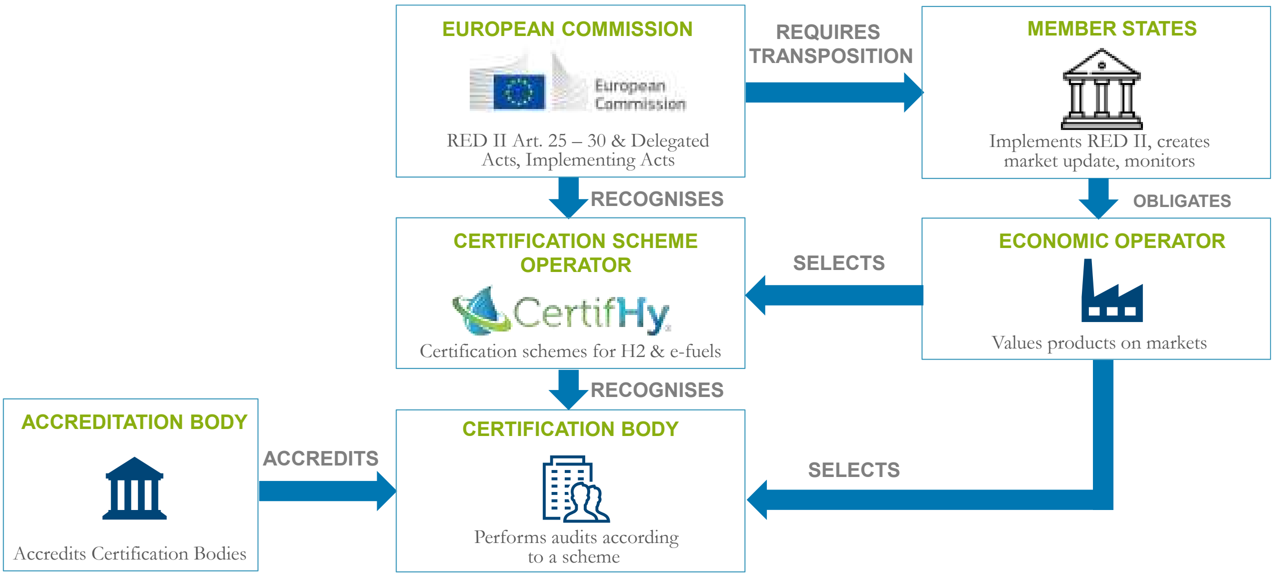

Figure 2: Roles and responsibilities among the different actors in the RFNBO certification system

- **Who issues the Proof of Sustainability (PoS), and who must provide information to enable the certification of others in the value chain?**
  Each certified entity issues its own PoS, and upstream actors must provide verifiable data to downstream partners for traceability and compliance (for more information on PoS, please see chapter 2.8 and Figure 10).

- **Are there alternative markets for low-emission products that fail to meet RFNBO criteria?**
  Yes, such products may still be eligible for other low-carbon markets, but not for the EU RFNBO market under RED II. In December 2025, the European Commission has brought into force the Commission Delegated Regulation 2025/2359 on low-carbon fuel (LCF) GHG calculation. Voluntary schemes for the certification of low-carbon fuels for the European market are in the development and recognition process and are anticipated to become available in 2026. Refer to Table 1 for alternative low-emission products markets.

[12] https://ec.europa.eu/eurostat/web/energy/database/additional-data#Short%20assessment%20of%20renewable%20energy%20sources%20(SHARES)
[13] Energy balances are also available from Eurostat at national level for EU counties, EFTA countries and EU enlargement candidate countries such as e.g. Bosnia and Herzegovina, Montenegro, etc.

Table 1: Different markets (applications) for clean molecules, driven by voluntary and legal targets

	Maritime fuel	Aviation fuel	Renewable transport fuel: RFNBO	Renewable feedstock for industry: RFNBO	Import	ETS: carbon intensive industry, built environment, heavy transport
Applicable molecules	NH_3, MeOH, e-diesel	e-kerosene	H_2, NH_3, MeOH, e-diesel	H_2 / Derivatives	H_2, fertilizers (incl. NH_3)	Any product that falls under ETS
Product classification	low carbon fuel	e-fuel	RFNBO (RED II compliant renewable fuel)	RED II compliant, renewable fuel	H_2, NH_3 and other fertilizers	Any product that falls under ETS
Applicable regulation	FuelEU Maritime, ETS	ReFuelEU Aviation (+ETS)	RED II Art. 25-30	RED II Art. 22a, 27, 29a, 30	CBAM (and ETS interplay)	ETS
Type of market	**Legally incentivized market**	**Mandatory market**	**Mandatory market/ legally incentivized market**	**Depending on national transposition of RED II Amendments**	**Legally incentivized market**	**Legally incentivized market**
Client business model	Avoid Carbon Penalty	Compliance	Compliance	Compliance/ Funding	Avoid carbon penalties for CBAM goods imported into EU	Avoid carbon penalties in ETS industries in EU
Product premium compared to fossil-based alternative	Product premium price / Willingness to Pay depends on regulatory drivers relevant to the market segment & country (Transposition into MS legislation & availability of competing solutions): there is no reference today for any market segment					

- **What does the "grandfathering" period mean?**
  The grandfathering period refers to a transitional grace period established under the Commission Delegated Regulation (EU) 2023/1184, during which hydrogen production installations that were already in operation or under development before the entry into force of the Delegated Act may comply with less stringent rules, particularly regarding electricity sourcing (e.g., additionality, temporal, and geographical correlation). This mechanism is intended to prevent early investors from being penalized by regulatory changes and to provide sufficient time for adjustment to the new framework. For example, in additionality requirements installations coming into operation before 1.1.2028 benefit until from grandfathering (don't need to comply with additionality requirements) until 31.12.2037.

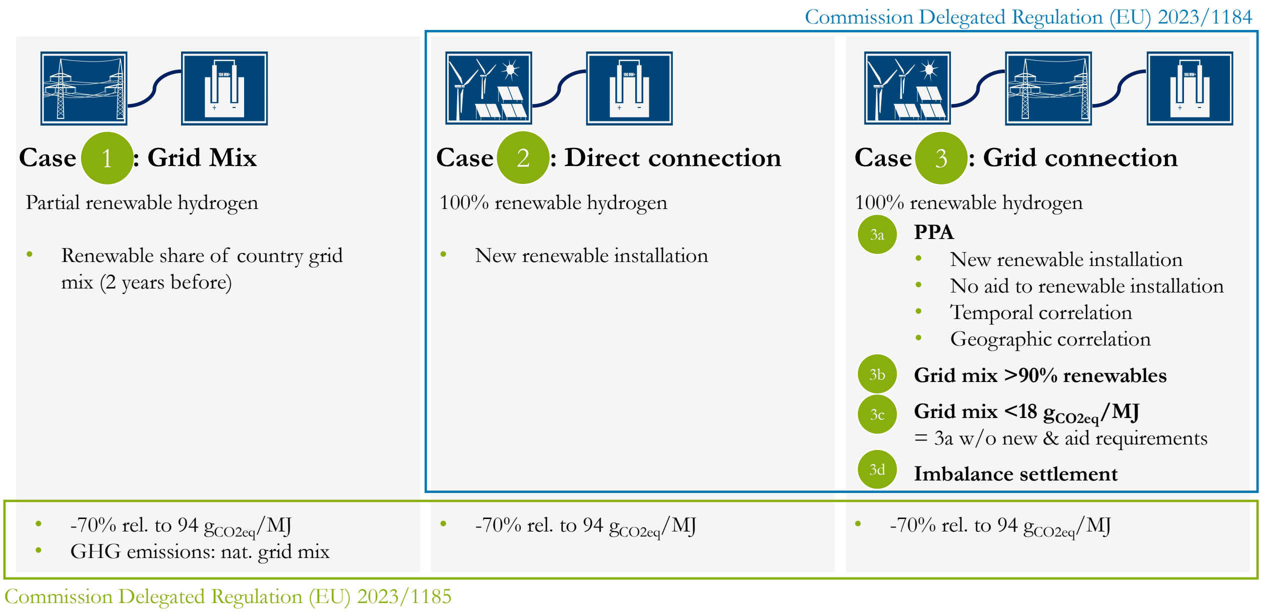

Figure 3: EU RED II Delegated Regulations foresee three different electricity supply cases (with sub-cases)

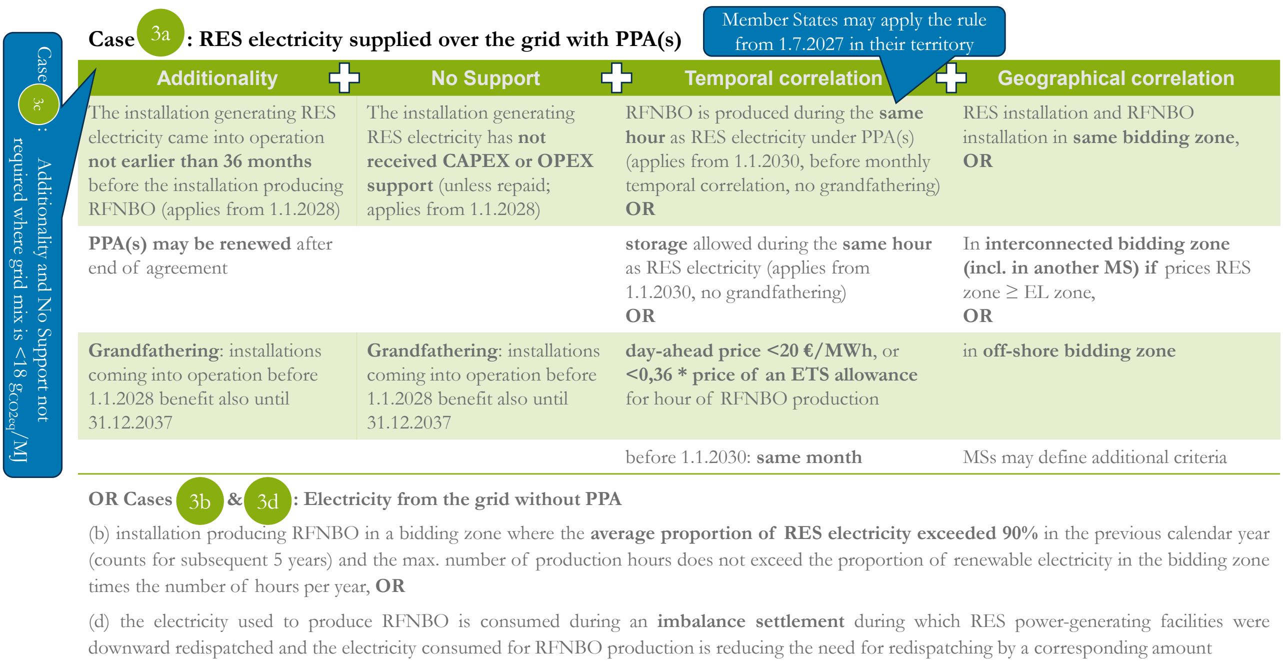

Figure 4: Delegated Regulation (EU) 2023/1184 details sustainability requirements related to the electricity supply cases

- **How frequently can mass balance reporting and GHG emissions be calculated?**
  According to Delegated Regulation 2023/1185: "*The greenhouse gas emissions intensity may be calculated as an average for the entire production of fuels occurring during a period of at most one calendar month but may also be calculated for shorter time intervals. Where electricity qualifying as fully renewable according to the methodology set out in Directive (EU) 2018/2001 is used as input that enhances the heating value of the fuel or intermediate products, the time interval shall be in line with the requirements applying for temporal correlation*[14]."

[14] Monthly until 31 December 2029, and hourly from 1 January 2030 onward.

According to Implementing Regulation 2022/996: "*the appropriate period of time for achieving the mass balance shall be (…) 3 months for all other economic operators." This includes RFNBO. In the CertifHy scheme requirements, the mass balancing period of 3 months is not related to the GHG calculation frequency.*

MASS BALANCING

- The mass balance principle is based on matching inputs and outputs all along the value chain and relying on avoiding double counting
  - It is performed around a spatially defined unit, e.g., a container, processing or logistic infrastructure, production site
- Auditing should confirm that all of the following points are being adhered to correctly and that there is no double counting

Double counting	No double-counting must occur *(also of individual sustainability characteristics)*	**Site specific**	Mass balance shall be site and legal entity specific
Mixing	Inputs with same sustainability characteristics can be mixed	**Mixing**	The size of the consignments with different characteristics remain assigned to the mixture
Balance period	Timeframe is 3 months and shall be continuous	**Mass balancing**	The amount of RFNBOs leaving any element shall not exceed the input to the respective element
Book-keeping	At the end of the balance period the sustainability data carried forward should be covered by physical stock	**Losses**	Any losses shall be accounted on a proportionate basis *(x% losses are equally applied to all consignments)*

Figure 5: Mass Balance is an accounting principle matching inputs and outputs all along the value chain

- **How is allocation of GHG emissions handled when producing coproducts (e.g., eSAF and eDiesel)?**
  When there are multiple outputs, the share of output of renewable origin is the same for all the products. Upstream and process emissions of each virtual process are allocated to its co-products in proportion to energy content. This results in these co-products having the same footprint per MJ (see Figure 6).

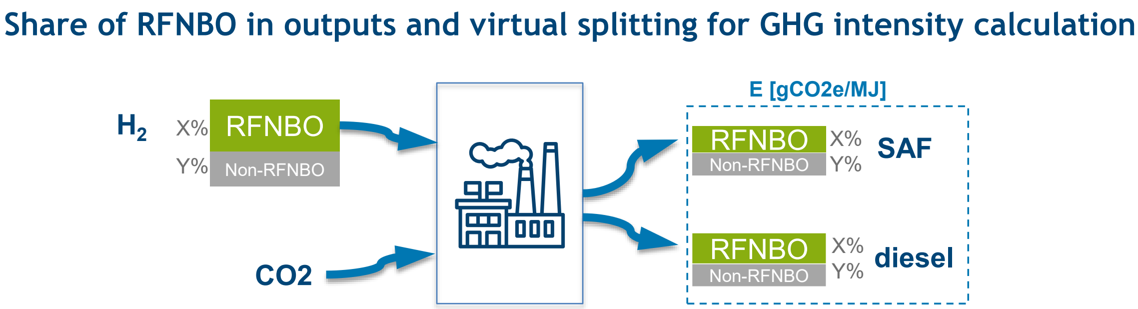

Figure 6: GHG emissions allocation in co-products

- **How can co-products (e.g., oxygen) be leveraged to improve project economics and reduce emissions?**
  - When oxygen is valorised (i.e., sold or used commercially rather than vented to the atmosphere), the total GHG emissions from the hydrogen production process must be allocated between the main product (hydrogen) and the co-product (oxygen). Allocation between co-products is performed based on their respective energy content (MJ). In the cases in which the co-product does not have energy content, such as the oxygen, then the GHG allocation is based on the economic value of the rather than energy content.
  - Valorising co-products such as oxygen can reduce overall emissions and improve financial viability. Companies are encouraged to explore industrial applications or partnerships to integrate these streams into the value chain.

- **How are "relevant energy inputs" defined (e.g., Fischer-Tropsch, cracking processes)?**
  These must be assessed case by case. If the energy input increases the product's heating value, it is considered "relevant energy" (see Table 3 and section 2.6.1 for more details). All energy inputs (relevant and non-relevant) affect GHG emissions. But only relevant energy inputs need to be of "renewable quality" in order to produce an RFNBO.

- **Can developers use 100% renewable electricity for relevant energy inputs and grid connection (non-renewable) for auxiliary needs?**
  Yes, as long as the electricity used for relevant energy inputs in the production of hydrogen and its derivatives meets the RED II requirements, developers can consider using non-compliant power for non-relevant energy inputs (to identify which inputs are relevant or not see Table 3). The GHG emissions of these non-relevant energy inputs still contribute to the overall GHG emissions of the product.

2.3.2 Brazil-specific topics

- **Stakeholder concerns about the renewable electricity share calculation methodology for grids:**
  The calculation methodology for renewable electricity share of national/bidding zone grids, excludes imported renewable electricity in the numerator, but includes it in the denominator, penalizing importing zones like Southern Brazil. Participants recommended that the Government should request a revision or clarification of this methodology to the European Commission, as further detailed in section 4.2.3. Calculation results of "Renewable Energy Share by Bidding Zone in Brazil" has been published by CCEE in September 2025.[15]

[15] https://www.ccee.org.br/documents/80415/30741511/Factsheet%20RES-E%20RFNBO%20JHPA%2025.09.2025%20v1.1.pdf/ea23e568-ae9d-021e-d4a1-92995be5b987

2.4 Additionality

Topics and questions related to additionality requirements are discussed in this section.

- **What is to be understood as "public support" (operating aid, investment aid)?**
  Public support to installations generating renewable electricity is excluded by the additionality requirements for electricity supplied under a PPA in order not to undermine efforts to decarbonize national electricity consumption. This is to be understood as any form of financial aid provided by public authorities that impacts the economic conditions under which a project operates. Operating aid or investment aid could be considered to include any payments received from public authorities for the construction of the installations generating renewable electricity and any benefits received from public authorities for the production of renewable electricity, including feed-in tariffs, feed-in premiums, reductions applying for the production, contracts for difference or any direct payments linked to the production of renewable electricity. Operating aid or investment aid does not include obligations or restrictions placed on energy consumers, producers or suppliers such as renewable energy obligations. However, support received by installations before their repowering, financial support for land or for grid connections, support that does not constitute net support and incentives provided via the renewable PPA are not considered.

- **What exact parts of the production need to comply with the no-support clause?**
  Primarily, this applies to the installations generating renewable electricity used to produce RFNBOs. Support received by installations before their repowering, financial support for land or for grid connections, support that does not constitute net support and incentives provided via the renewable PPA are not considered, i.e. are excluded from the no support clause. In other words, support received for such purposes is acceptable under RFNBO certification.

- **Is it possible for the RFNBO production plant to have received financial support?**
  The financial support requirements mainly apply to the installations producing renewable electricity. Therefore, RFNBO production plants may receive financial support.

- **Can subsidies for transmission cost reduction in a given country outside Europe apply to electricity used under a PPA?**
  Commission Delegated Regulation (EU) 2023/1184 stipulates that electricity generation used for RFNBO production must not have received investment aid., which would compromise its additionality status. Financial support for grid connections is specifically excluded from the no-support requirement. Subsidies for transmission cost reduction, however, are not related to renewable electricity generation, but to its transmission, and are thus not detrimental to RFNBO compliance.

- **If a producer meets the <18 g_{CO_2eq}/MJ requirement, do they still need to meet temporal matching requirements or hold a PPA?**
  Yes. Even if the grid mix emissions intensity in a bidding zone is below 18 g_{CO_2eq}/MJ (see section 3.2.3) and economic operators do not need to comply with additionality, they must still comply with temporal and geographical correlation requirements unless otherwise exempted (see Figure 3).

2.5 Other Sustainability Requirements: Renewability of Electricity

Topics and questions related to the renewability requirements related to electricity are discussed in this section.

2.5.1 General topics

- **Role of storage: Is electricity used from storage during the night still considered eligible for the production of RFNBOs?**
  - Electricity storage is allowed if the storage installation is on site. It needs to be behind the meter of one of the two sites (electricity production site or fuel production site). If it is located somewhere else, storage cannot be used for complying with the temporal correlation requirements. The measurement concept including the selection of measurement points and the data storage and management system (see section 3.2.6) must ensure that evidence of the storage operation can be provided at sufficient temporal resolution to substantiate temporal correlation compliance. Storage units located behind the meter of the renewable energy installation are included in that installation in terms of certification and is thus handled in combination with the renewables installation for certification purposes. Storage units located behind the meter of the RFNBO production unit are handled as part of the RFNBO installation for certification purposes.
  - As long as all requirements are met, electricity used from storage during the night is still considered eligible for the production of RFNBOs.

- **Can grid electricity be stored (e.g., via oversizing a plant) to meet hourly temporal correlation?**
  No. Under RED II, the grid cannot be used as a storage medium. Injected electricity must be accounted for as sold and cannot be reclaimed as self-generation.

- **Temporal correlation**
  - **How can temporal correlation be metered?**
    An appropriate metering system needs to be implemented based on a metering concept (notably in terms of definition of metering points and metering frequencies) that allows complying with the temporal correlation requirements[16]. Electricity metering devices and data storage systems are required.
  - **Is it possible to produce RFNBOs during times where no direct renewable electricity is produced (at night for example)?**
    This is possible by using electricity storage systems (see questions and answers above).
  - **Is temporal correlation required for ammonia synthesis?**
    No, temporal correlation only applies to relevant electricity input; this is a requirement for hydrogen production in electrolysers. Ammonia synthesis does not consume relevant energy in form of electricity (see Figure 7) and thus does not have to comply with temporal correlation. However, in facilities where electrolysis and ammonia synthesis take place in the same industrial complex and renewable electricity (under PPA or direct line) is claimed to be used for ammonia synthesis (at zero emissions), temporal correlation needs to be complied with also for ammonia synthesis in order for the electricity to count as zero emission (see also sub-section 2.6 on GHG calculation).
  - **Does the temporal correlation have to be based on monthly correlation (until 2030), or can it be shorter as well?**
    It is mandatory to apply at least monthly correlation. However, the operator is free to apply stricter temporal correlation requirements, e.g. shorter time intervals.

[16] Monthly correlation until end of 2029; hourly correlation thereafter; no grandfathering.

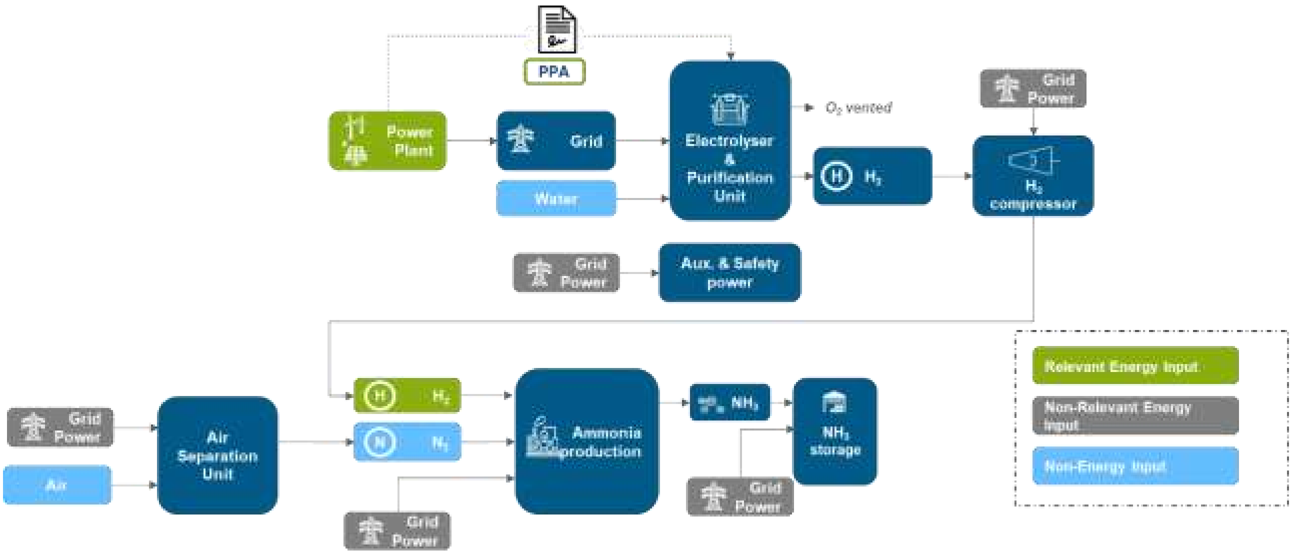

Figure 7: "Relevant" and "non-relevant energy" inputs: example; see also Table 3.

- **How should Smart Metering be practically implemented in projects?**
  Metering must be installed at points of input / output to obtain high precision of the material, energy and emissions flows. A special focus should be placed on design, cost, location, and data management requirements, which should be addressed during early project planning stages (see section 3.2.6).

- **Can I still declare that 100% of my hydrogen produced is renewable under the electricity sourcing of a grid that complies with the >90% renewability requirement, if my electrolyser has a higher load factor than the grid's renewable share in the previous year?**
  To declare that 100% of the hydrogen produced is renewable, the connected grid must have achieved at least 90% renewable electricity share (see section 3.2.3) in one of the previous five years (once this threshold has been reached, it can be considered as valid for the following five years). However, the electrolyser's load factor must remain aligned with the renewable share of the grid in year *n-1*. If the electrolyser operates beyond the equivalent proportion of renewable generation, only the portion corresponding to the renewable share can be claimed as renewable hydrogen. The remaining share, corresponding to the difference between the electrolyser's operating hours and the grid's renewable fraction, cannot be claimed as renewable unless complemented by additional renewable sourcing mechanisms.

- **In relation with the previous question: Can I cover the remaining 7% of electricity (if I have 93% RES) with a PPA to operate my electrolyser at 100% load factor?**
  Yes. In the scenario where the grid's renewable share is 93% in year n-1, all hydrogen produced using grid electricity can be considered renewable up to that 93% limit of the electrolyser's annual operating hours. For the remaining 7%, the developer can contract additional renewable electricity through a PPA that meets the RFNBO requirements and claims that 100% of the hydrogen production is renewable.

- **How is double counting avoided in countries without a GO/RECs system for renewable electricity?**
  In countries where a mandatory or voluntary GO/REC system is already established (for example, within the European Union, or in third countries with I-REC or Energy Attribute Certificate (EAC) schemes), it is mandatory the acquisition and cancellation of certificates corresponding with the consumed electricity that will be claimed renewable in the project. In countries that do not yet operate a GO/REC system or equivalent tracking mechanism, developers must rely on alternative verifiable evidence to prove the renewable origin and exclusivity of the consumed electricity. Acceptable evidence typically including for example: supplier or generator declarations confirming that the renewable electricity has been allocated exclusively to the hydrogen project and that the renewable attributes have not been claimed elsewhere, metering data demonstrating that the electricity physically supplied corresponds to renewable generation during the relevant correlation period, etc.

2.5.2 India-specific topics

- **What are the bidding zones in India?**
  The discussions of what constitutes the equivalent of bidding zones in India are ongoing (as of January 2026) between CertifHy and other recognized Voluntary Schemes, the European Commission, and the Indian government.

2.5.3 Colombia-specific topics

- **How should the challenges related to social acceptance in regions such as La Guajira be addressed in the development of renewable hydrogen projects?**
  Addressing the challenges of social acceptance in regions such as La Guajira requires a proactive and inclusive approach that goes beyond regulatory compliance. Although the EU RFNBO regulations primarily focus on environmental and carbon-intensity criteria, many voluntary certification schemes such as RSB and CertHiLAC, as well as other international regulations, incorporate explicit **social-sustainability safeguards**, including respect for human rights, land-use rights, labour conditions, and community well-being. In this context, early engagement with local communities is essential to ensure acceptance and alignment with local practices, cultural values, and social realities. Developers should initiate structured dialogues with community representatives from the earliest planning stages, ensuring transparent communication about the project's expected impacts, benefits, and mitigation measures. Furthermore, integrating local socio-economic priorities, such as employment creation, training programs, and community benefit-sharing mechanisms, into project development can strengthen local acceptance.

2.6 GHG Calculation & CO_2 Sourcing

Topics and questions related to GHG calculation and CO_2 sourcing requirements are discussed in this section.

2.6.1 General topics

- **Is the EU methodology aligned with ISO standards?**
  The RFNBO methodology is not explicitly aligned with ISO standards and full equivalence cannot be assumed. For example: If I have an ISO GHG emissions calculation, although some data points or emission factors can be considered for my RFNBO calculation, it is needed to still do a whole separate calculation following RFNBO methodology.

- **What is the GHG emissions scope for RFNBO certification?**
  The GHG emissions scope is well-to-grave, i.e. including all emissions from the upstream emissions of hydrogen production through the entire value chain until the final consumer, with the threshold of 70% savings in relation to the fossil fuel comparator (94g_{CO2eq}/MJ) which is then 28,2 g_{CO2eq}/MJ or 3,4 kg_{CO2eq}/kg, see Figure 8.

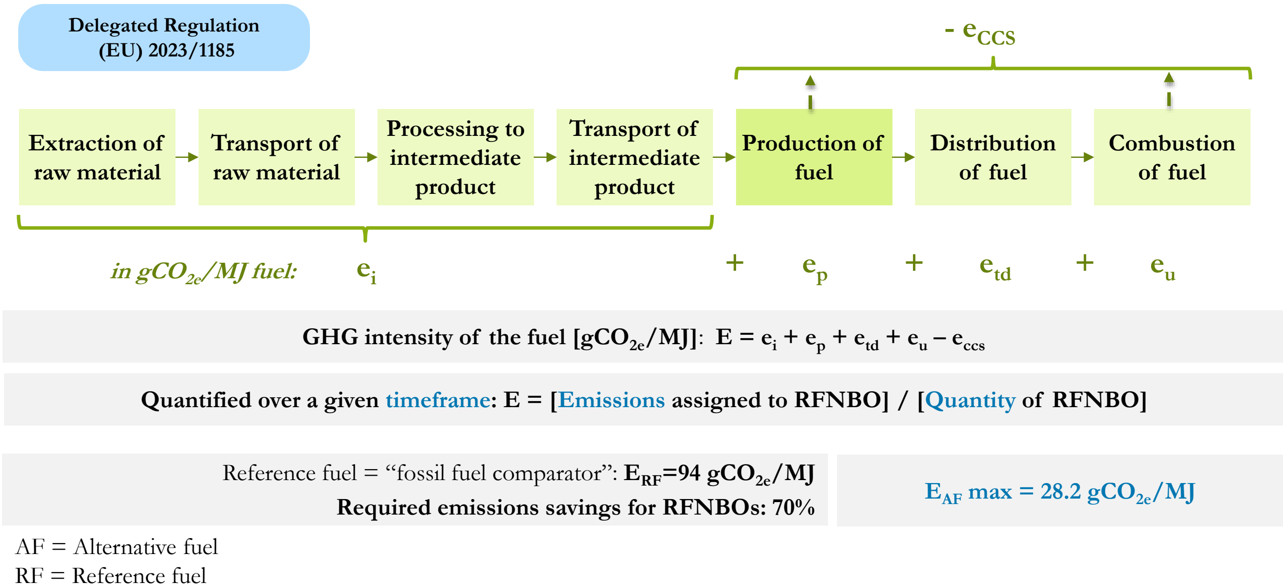

Figure 8: GHG calculation according to RED II and Delegated Acts

Table 2: GHG calculation of inputs incl. emissions of existing use or fate (use of CO_2)

$e_i = e_{i\_elastic} + e_{i\_rigid} - e_{ex\text{-}use}$	
$e_{i\_elastic}$ emissions from elastic inputs	Emissions from inputs the supply of which can be increased to meet extra demand, i.e. inputs that are not considered rigid, e.g.: electricity, natural gas, refinery products.
e_{i_rigid} emissions from rigid inputs	Emissions from inputs produced in fixed ratio by an incorporated process and which represent less than 10% of the economic value of the output are considered rigid. Incorporated processes include processes that take place in the same industrial complex, or that supply the input via a dedicated supply infrastructure, or that supply more than half of the energy of all inputs to the production of the RFNBO. **- Rigid inputs are burdened by the emissions from producing the electricity, heat or products that were previously generated using the input.**
$e_{ex\text{-}use}$ emissions from existing use or fate	All emissions in the existing use or fate of the input that are avoided when the input is used for fuel production, e.g.: avoided emissions from use of CO_2.

- **Are real values allowed for the GHG calculation of RFNBOs produced in third countries or only default ones?**
  - Projects may use either default or actual values, or a hybrid approach that allows the combination of actual and default values. Default values are pre-calculated emission factors provided directly in the Annexes of the Delegated Regulations, while actual values are project-specific, directly measured or calculated emissions obtained from the producer's own process data. The chosen approach must be clearly justified and consistently applied throughout the GHG emissions calculation. Certification bodies will assess whether the data source and verification approach are appropriate for each stage of the life cycle.
  - GHG emissions of elastic inputs (see Table 2 and Section 2.6 for more details) that are obtained from an incorporated process shall be determined based on data from their actual production process (actual values), emissions from elastic inputs that are not obtained from an incorporated process shall be determined based on default values included in Annex Part B of CDR 1185[17] .

- **How does one calculate and allocate GHG emissions in cases of common use infrastructure?**
  This question has not yet been fully clarified at European level. Where useful data (e.g. emissions intensity of the common use infrastructure) are published by the infrastructure operator, these may be used.

- **Is there a list of what is considered a "relevant energy input"?**
  No, there is no list defining what is considered a "relevant energy input". It is always necessary to look at the production chain and evaluate the role of the respective inputs. All energies that add to the heating value of the fuel is considered as relevant energy. Where the use of heat for reconversion of derivatives (e.g. ammonia) does not increase the heating value of the products, the share of RFNBO is not affected. To establish whether electricity and heat that are used in a process are adding to the heating value of the fuel, the heating value of the derivative that enters the process and qualifies as an RFNBO should be compared to the heating value of the hydrogen the process yields. If the heating value of the hydrogen that yields from the process exceeds the heating value of the RFNBO input, the heating value is increased and accordingly the electricity and heat is adding to the heating value of the fuel and must be considered as relevant energy. See Table 3.

Table 3: "Relevant" and "non-relevant" energy inputs

Relevant energy input	Inputs that enhance the heating value of the produced fuel or intermediate products. This includes: • For electricity inputs, the relevant energy is the energy of the electricity used to enhance the heating value of the fuel or intermediate products. • For material inputs, it is the lower heating value of the material that enters into the molecular structure of the fuel. • For fuels used as input to generate heat that enhances the heating value, the relevant energy is the lower heating value of these fuels.
Non-relevant energy input	Inputs that do not enhance the heating value of the products or intermediate products. • These do not need to be renewable. • Applies to energy inputs like electricity that are not used for increasing the heating value of the fuel but may be used for other processing steps.

- **What's the difference between CCS and CO_2 synthesis for RED II compliance?**
  - CCS is a specific element within the RED GHG emissions calculation methodology. It refers to the **permanent geological** storage of CO_2, such as through injection into suitable geological formations. When applied, this measure can reduce the total emissions attributed to the production process in the GHG intensity calculation, since the captured CO_2 is permanently removed from the atmosphere.
  - By contrast, CO_2 synthesis in the RFNBO context refers to the use of captured CO_2 as a feedstock in the production of e-fuels or other derivatives (for example, methanol or e-kerosene). This process does not store CO_2 permanently but re-utilizes it as a carbon source for fuel synthesis. Under the RED II methodology, this can be considered as avoided emissions and may be subtracted from the total GHG intensity of the produced fuel under specific conditions, classified as *ex-use* in the calculation framework (see **Fehler! Verweisquelle konnte nicht gefunden werden.**).

[17] "*If the input is not included in the list, information of the emission intensity may be drawn from the latest version of the JEC-WTW report, the ECOINVENT database, official sources such as the IPCC, IEA or government, other reviewed sources such as the E3 and GEMIS database and peer reviewed publications.*" (Delegated Regulation (EU) 2023/1185).

- **How to deal with captured CO_2 in the GHG calculation?**
  - The sources of the captured CO_2 need to be selected carefully. The Commission Delegated Regulation (EU) 2023/1184 defines CO_2 sources that are eligible for a negative CO_2 emissions intensity ($e_{ex\text{-}use}$; see Table 2). These emissions under $e_{ex\text{-}use}$ lead to a negative GHG intensity after the production of a carbon-containing RFNBO. The later end-use/ combustion of the RFNBO (e_u) will include the CO_2 emissions related to the carbon contained in the RFNBO; $e_{ex\text{-}use}$ will balance this e_u, which is a crucial aspect for reaching the GHG threshold if a carbon source is present.
  - These sources eligible for $e_{ex\text{-}use}$ are:
    - the CO_2 has been captured from an activity listed under Annex I of Directive 2003/87/EC20 (the EU Emission Trading System ETS) and has been taken into account upstream in an effective carbon pricing system and is incorporated into the chemical composition of the fuel before 2036. This date shall be extended to 2041 in other cases than CO_2 stemming from the combustion of fuels for electricity generation; or
    - the CO_2 has been captured from the air, or
    - the captured CO_2 stems from the production or the combustion of biofuels, bioliquids or biomass fuels complying with the sustainability and GHG emissions saving criteria and the CO_2 capture did not receive credits for emission savings from CO_2 capture and replacement, set out in Annex V and VI of RED II, or
    - the captured CO_2 stems from the combustion of RFNBOs or recycled carbon fuels complying with the GHG emissions saving criteria; or
    - the captured CO_2 stems from a geological source of CO_2, and the CO_2 was previously released naturally.
  - The European Commission defines in the Q&A document: *"The following systems can be considered to fulfil the requirement of upstream accounting in an effective carbon pricing system:*
    - *EU ETS which applies in the 30 States of the European Economic Area: the EU-27 Member States and in three EFTA States Iceland, Liechtenstein and Norway,*
    - *Swiss ETS,*
    - *UK ETS"*

- **How to deal with industrial CO_2 from cement plants for RFNBO methanol production in the GHG calculation?**
  - CO_2 from cement plants would fall under the following category in the EU methodology: (a) the CO_2 has been captured from an activity listed under Annex I of Directive 2003/87/EC20 (the EU Emission Trading System ETS) and has been taken into account upstream in an effective carbon pricing system and is incorporated into the chemical composition of the fuel before 2036. This date shall be extended to 2041 in other cases than CO_2 stemming from the combustion of fuels for electricity generation;
  - This contains the following conditions, under which the captured CO_2 can have an $e_{ex\text{-}use}$ in the GHG calculation, which would allow achieving the 70% GHG reduction requirement:
    - activity listed under Annex I of Directive 2003/87/EC (the EU Emission Trading System ETS): cement plants are listed under this Annex I (okay)
    - incorporated into the chemical composition of the fuel before 2036. This date shall be extended to 2041 in other cases than CO_2 stemming from the combustion of fuels for electricity generation: (okay until 2040)

- **Can CO_2 from industrial processes be used as a carbon source as feedstock in countries without an ETS system?**
  In the absence of an ETS, industrial CO_2 may not be eligible under current rules. Developers and authorities are encouraged to advocate for transitional mechanisms to enable participation while ETS systems are developed.

- **What needs to be considered for CO_2 sourcing from biogenic sources?**
  Operators need to demonstrate that the CO_2 source complies with the sustainability requirements[18] for biofuels (see question and answer above). As a consequence, biofuels certification according to RED II is required for the biofuels the CO_2 stems from either in their production or their combustion (in specific cases, self-declaration of the bio-energy source may be sufficient).

[18] Extensive sustainability requirements for bio-energy are defined in RED II Annex V and VI; these include among others: bio-energy shall not be made from raw material obtained from land with a high biodiversity value; bio-energy shall not be made from raw material obtained from land with high-carbon stock; bio-energy shall not be made from raw material obtained from land that was peatland in January 2008; bio-energy shall meet several criteria to minimise the risk of using forest biomass derived from unsustainable production; bio-energy shall meet several land-use, land-use change and forestry (LULUCF) criteria; etc.

- **Can CO_2 from biomass combustion be used without time restrictions to be considered as $e_{ex\text{-}use}$ for the production of hydrogen derivatives?**
  Yes, if the combustion is not solely for CO_2 capture and the biomass complies with RED II sustainability and emission criteria, the CO_2 is considered compliance for emissions savings and can be used for derivatives production without time limitations (see Figure 17).

- **How to calculate GHG emissions for electricity-based inputs coming from outside the own perimeter?**
  For sources of inputs such as water (e.g. from sea water desalination) or nitrogen for ammonia synthesis outside the own perimeter, grid mix emissions (see section 3.2.3) have to be assumed for their production and supply, even if they are actually using zero emissions electricity. Only possibility to assign zero emissions to those inputs is when this process takes place within the same industrial complex, and fully renewable electricity is used fulfilling all sustainability requirements.

- **How to deal with desalination plants? How does one calculate the GHG intensity (grid power, PPA, other energy sources)?**
  - Where the electricity used in desalination plants that are not part of the same industrial complex as the RFNBO production, it cannot be considered as fully renewable and thus cannot be assigned zero GHG emissions. Where it is part of the same industrial complex as the RFNBO production, fully renewable electricity with zero GHG emissions can be used for desalination based on the same criteria as for hydrogen production (under PPA or direct line). In all other cases, the emissions must be calculated based on the grid mix (see section 3.2.3).
  - In general, fully renewable electricity according to the RFNBO requirements (e.g. additionality, temporal and geographic correlation) can only be claimed for RFNBO production or processing, not for any other steps in the supply chain. For these electricity quantities, the GHG emissions intensity of the national or bidding zone grid mix has to be applied, or one of the two alternative methods defined in CDR 2023/1185[19] (see section 3.2.3).

- **Does one also need to take into account the GHG footprint for non-relevant energy input?**
  - Yes! Non-relevant energy is energy that does not increase the heating value of the RFNBO. For example, this includes energy used for cleaning and compressing hydrogen.
  - For example, in the case of sea water desalination (see question and answer above) one can use the annual average of the grid mix GHG intensity for the calculation of the GHG footprint (see section 3.2.3).
  - Another example is ammonia synthesis (see also question and answer above under "temporal correlation"), which requires air separation for the supply of nitrogen; the electricity consumed in air separation is non-relevant energy as it does not increase the heating value of the RFNBO. Where the air separation unit is not in the same industrial complex as the nitrogen synthesis, it is supplied with grid mix electricity, the emissions intensity of the nitrogen that needs to be included in the GHG calculation is thus based on the grid mix GHG intensity.

- **How are emissions allocated when different inputs sourcing options or co-processing are used?**
  - When electricity from both renewable and non-renewable sources is used in RFNBO production, the carbon intensity of the output must be calculated as a weighted average of all energy inputs (so the GHG intensity is identical for renewable and non-renewable hydrogen) and are allocated between the renewable and fossil outputs according to their respective energy yields. The proportion of fuel attributed to each energy source category is determined also based on the energy content of its inputs, following the methodologies defined in Commission Delegated Regulation (EU) 2023/1184.
  - In co-processing scenarios, such as when renewable and fossil or biogenic feedstocks are processed together in a single unit, a specific emissions intensity is determined for the RFNBO output based on the shares of inputs in energy terms. More precisely, there is an exception to the general rule that all outputs of a process have the same GHG intensity: "The exception to this rule is the case of co-processing where [RFNBO] […] are only partially replacing a conventional input in a process." Certification bodies will require transparent and auditable records to substantiate these allocations, preventing any double counting or artificial inflation of emission savings.

[19] Alternative 1: greenhouse gas emissions values shall be attributed depending on the number of full load hours the installation producing RFNBO is operating. Where the number of full load hours 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 for which reliable data are available, grid electricity used in the production process of RFNBO shall be attributed a GHG emissions value of zero g_{CO2eq}/MJ. Where this number of full load hours is exceeded, grid electricity used in the production process of RFNBO shall be attributed a GHG emissions value of 183 g_{CO2eq}/MJ; or
Alternative 2: the GHG emissions value of the marginal unit generating electricity at the time of the production of the RFNBO in the bidding zone may be used if this information is publicly available from the national transmission system operator.

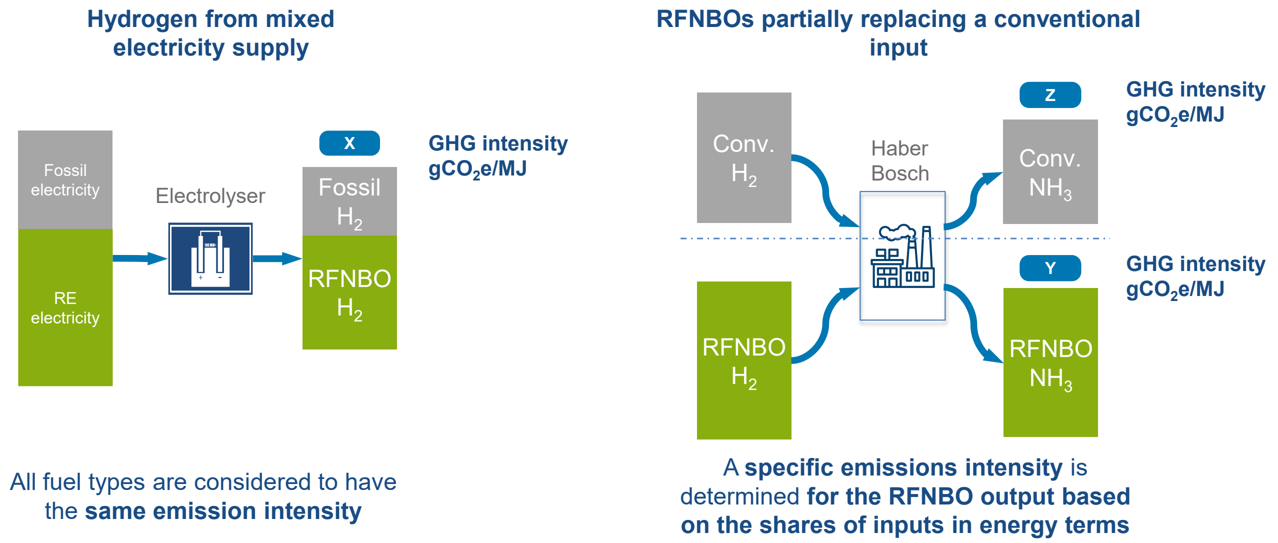

Figure 9: Emissions allocation when combining mixed electricity supply and when partially replacing conventional inputs.

- **Is the 94 $g_{CO_{2eq}}$/MJ threshold fixed or does it change over time?**
  The 94 $g_{CO_{2eq}}$/MJ value is the fixed fossil fuel comparator established under the RED II for calculating the GHG emission savings of RFNBOs. This comparator does not vary over time and must be applied consistently.

- **Does the fossil fuel comparator of 94 $g_{CO_{2eq}}$/MJ in the GHG emissions intensity calculation methodology include equipment emissions?**
  No. The fossil-fuel comparator of 94 $g_{CO_{2eq}}$/MJ, includes only operational (process) emissions from feedstock extraction, processing, transport, and combustion. It does not include embedded or capital-equipment emissions, that is, the emissions associated with the construction of electrolysers, renewable plants, or infrastructure (CAPEX emissions).

2.6.2 India-specific topics

- **How to deal with captured CO_2 in the GHG calculation?**
  - The European Commission provides a list of systems can be considered to fulfil the requirement of upstream accounting in an effective carbon pricing system.
  - This list is understood to be exhaustive, i.e. no other country has an "effective carbon pricing system" with respect to RFNBO certification. The Commission may extend this list based on requests from other countries. For RFNBO production in India, the Indian government would have to contact the European Commission and request the Indian emission trading system (CCTS) to be included in this Commission list. Until the Indian CCTS is officially included in the list of countries with "effective carbon pricing systems" by the European Commission, RFNBO production in India cannot use CO_2 captured from an activity listed under Annex I of Directive 2003/87/EC (the EU Emission Trading System ETS).

2.7 Chain of Custody and Traceability

Topics and questions related to chain of custody and traceability requirements are discussed in this section.

- **What is the responsibility of the producer in a given country outside the EU, i.e. what is the perimeter of the certification of an economic operator active in RFNBO production and supply in that country? Does one need to take the off-taker into account (with their distribution)?**
  In view of all elements of RFNBO certification, the producer in a given country outside the EU is responsible for their own perimeter, in most cases the production facility and possibly including handling facilities, e.g. in a port where the product is loaded to a ship to export to Europe. This covers the GHG calculation, mass balancing, etc. The transport emissions need to be taken into account by the receiving party in Europe; where the producer in a given country outside the EU is responsible for the shipping in contractual terms, they are responsible for making sure the receiving party receives the relevant data and evidence.

- **Is transportation certified by Certification Bodies?**
  No, transport is not certified, but the receiving economic operator being certified must include the upstream transport in their calculation (see also question and answer above). The transport operator thus needs to be (contractually) obliged to provide the relevant information / data plus related evidence.

- **Are hydrogen or gas grids considered to be one logistical facility?**
  While the European Union gas grid is considered a single logistical facility according to RED II, hydrogen or gas grids outside the EU are currently not considered one logistical facility (see also section 2.6.1).

- **How to clarify which actors are responsible for certification and emissions reporting (e.g., transporter, producer)?**
  Role definitions vary by value chain setup. Responsibilities must be contractually assigned and aligned with certification body requirements. In general, all economic operators along the value chain owning the RFNBO are required to be certified (including traders), while pure service providers such as shipping companies not owning the RFNBO are not certified, but need to provide relevant emissions data and evidence to the certified economic operators.

2.8 Certification Process

Topics and questions related to certification process are discussed in this section.

- **Does each step of the value chain need to be certified?**
  - Yes, each step of the value chain needs to be certified (except for electricity production plants, transport, and the final consumer). Each "step" is defined as each time the fuel changes ownership, i.e. each economic operator owning the fuel throughout the supply chain needs to be certified; this not only includes producers and processors, but also traders (see Figure 10).
  - Certification is carried out by Certification Bodies within the framework provided by a Voluntary Scheme.

- **Is certification always annual? What are the best practices for audits?**
  - In general, RFNBO certification is conducted on an annual basis, though the exact frequency depends on the specific requirements of each certification scheme[20] and the discretion of the certification body. If elevated risks or inconsistencies are identified, the certifier may shorten the review period and request a new audit sooner.
  - In addition, random or unannounced audits may occur to verify ongoing compliance. Developers are therefore strongly encouraged to maintain continuous readiness by conducting internal audits and mid-term reviews of data quality, documentation, and process controls. This proactive approach helps ensure data integrity and reduces the likelihood of non-conformities during official audits.

- **Is RFNBO certification obtained before or after operation, and what are the implications of this for the sale of hydrogen?**
  - Initial certification takes place prior to the start of operation, once the project design, documentation, and verification systems have been reviewed and approved by an accredited certification body under a recognized EU Voluntary Scheme. This means that hydrogen can be sold as RFNBO-compliant from the first day of production, provided that all conditions validated during the pre-operation certification remain in place and the operational data collected during production continues to demonstrate compliance. Following the initial certification, the project is subject to regular (typically annual) re-certification and surveillance audits to confirm ongoing conformity.
  - This pre-operation certification approach gives developers regulatory certainty and market access from the start of operations, while ensuring that the certification remains valid only as long as continuous compliance is demonstrated.

- **Who is responsible for issuing Proofs of Sustainability (PoS)?**
  It is the responsibility of the certified economic operator to issue PoS. PoS include the relevant information related to certification, notably renewability of the fuel as well as its GHG intensity, plus further information on the production installation, the off-taker, etc.

- **What is the typical timeline for the certification process?**
  Depending on the operator's preparation and the availability of auditors, the process typically takes about 1.5 to 3 months.

- **Does the final consumer receive several PoS from different suppliers?**
  For each consignment of product received, a PoS is delivered (see Figure 10). However, the details of who is the final party receiving the PoS at the end of the supply chain depends on the provisions in each of the EU Member States. In general, the PoS are submitted to the authorities in an EU Member State in order to receive recognition of the RFNBO quantities for counting them towards the obligation on fuel suppliers under RED II.

[20] According to the Implementing Regulation (EU) 2202/996: "*Voluntary schemes that allow a certificate duration longer than one year shall ensure the carrying out of an annual surveillance audit of all economic operators participating in the scheme*".

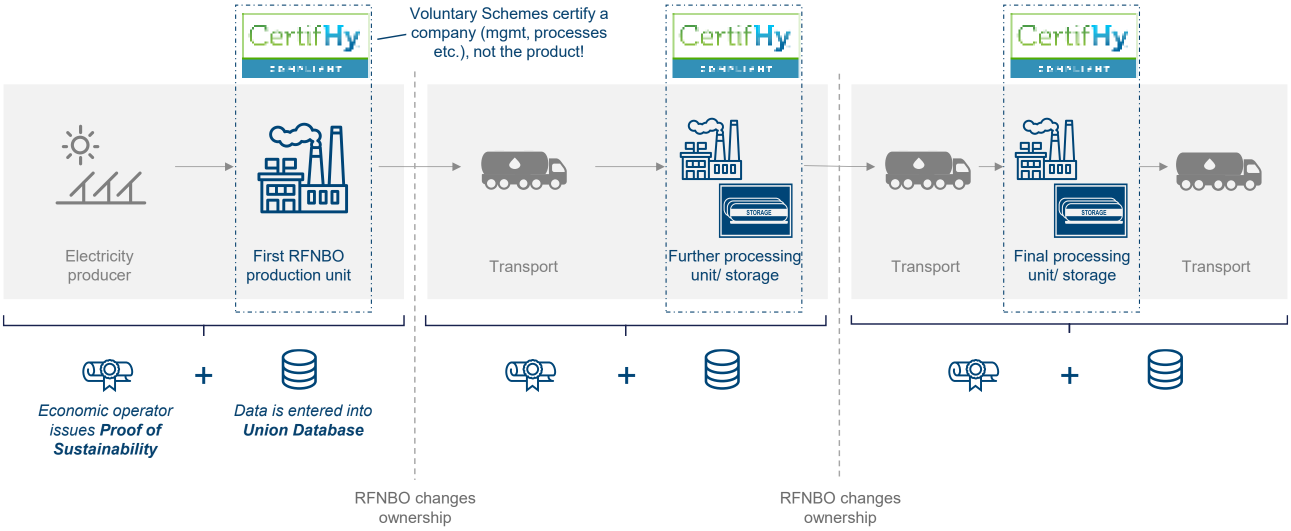

Figure 10: Certification according to RED II covers each economic operator separately; certification is modular along the supply chain

- **What are the costs related to certification?**
  Basically, there are two types of costs to be considered: the fees to be paid to the respective voluntary scheme (e.g. CertifHy), which can be found on their websites[21], on the one hand, and the costs related to the certification body (CB) and the audit on the other hand. In addition, the efforts of the producer for preparing and supporting the certification process are also to be counted, i.e. hours spent by the personnel.

- **How to prepare for certification?**
  Preparation for RFNBO certification should begin in early stages and be integrated into the project development process. Key preparatory steps include understanding applicable regulatory frameworks, develop robust traceability and data-management systems (see section 3.2.6), engage early in pre-certification (see section 3.2.5) or pilot audits and be aware of the certification process (see Figure 11).

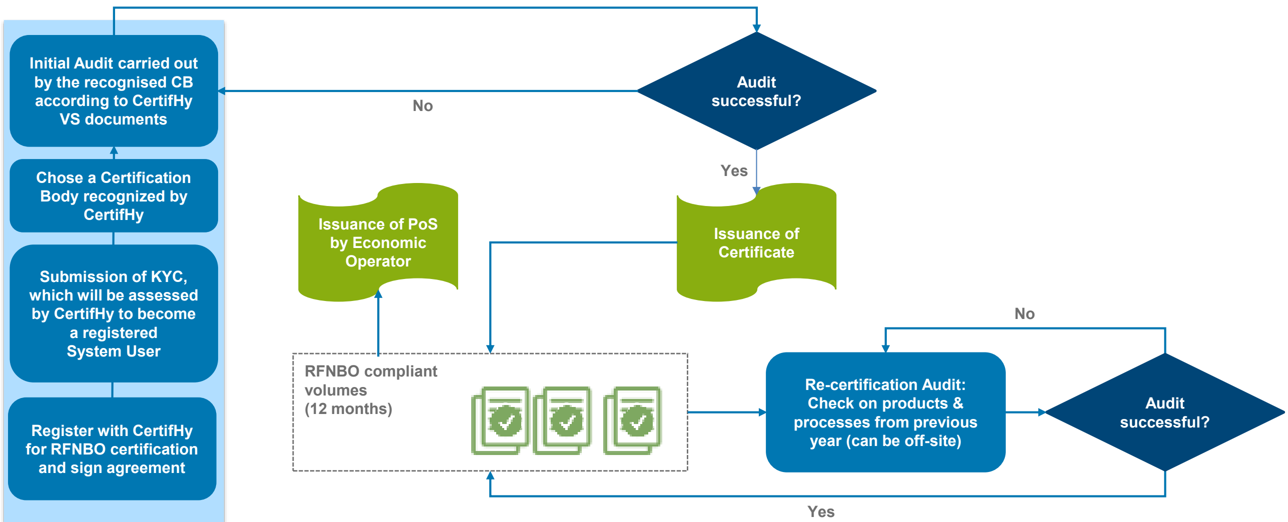

Figure 11: Certification steps[22]

[21] See e.g. CertifHy Fees and Pricing List at https://www.certifhy.eu/eu-rfnbo-scheme-documents/
[22] KYC: Know your customer

- **Why is it difficult to gather information for certification (e.g., metering, batch separation)?**
  The complexity and granularity of data required, especially regarding relevant inputs and hourly correlation, make early planning and system design crucial for a proper documentation planning process. Also, a proper mass balance system and documentation of the information must be applied according with regulatory requirements (see Figure 12).

MASS BALANCE Accounting Principles

- The mass balance principle is based on matching inputs and outputs all along the value chain and relying on avoiding double counting
  - It is performed around a spatially defined unit, e.g., a container, processing or logistic infrastructure, production site
- Auditing should confirm that all of the following points are being adhered to correctly and that there is no double counting

Double counting	No double-counting must occur *(also of individual sustainability characteristics)*	**Site specific**	Mass balance shall be site and **legal entity specific**
Timeframe	Timeframe is **3 months** and shall be **continuous**	**Mass balancing**	The amount of RFNBOs leaving any element shall not exceed the input to the respective element
Balance period	At the end of the balance period the sustainability data carried forward should be covered by physical stock	**Losses**	Any energy losses along the supply chain shall be considered to adjust the size of delivered batches

The sum of all consignements withdrawn shall have the same sustainability characteristic in equal quantities to the sum of the consingments added to the mixture. „INPUT = OUTPUT“

Figure 12: Mass balance accounting principles

3 Recommendations for Private Companies

In this section, the recommendations targeted to private companies outline the most effective and successful preparation for the aspired RFNBO certification process. The general perspective (section 3.1) covers, for example, the timeline, documents and information required for the audits and further recommendations derived from the certification requirements covered in the first day of the workshops. Section 3.2 provides recommendations related to specific topics in certification, e.g. bidding zone equivalents, grid mix electricity, etc. In section 3.3 country-specific circumstances are included to the recommendations, e.g. the institutions responsible for providing official information for the audits.

3.1 General Recommendations

The workshops facilitated the identification of key questions, comments, and challenges raised by private companies, while also providing clarification on general aspects commonly encountered in the industry with respect to RFNBO certification and RED compliance. By deeply understanding and addressing the compliance market, producers will be enabled to capture the highest possible premium value, while alternative voluntary markets may serve as options to obtain partial premiums in cases where one or more RFNBO compliance conditions are not met.

Table 4: Premium value potential across market pathways

<table>
<tr><th>Renewability</th><th>GHG emissions reduction (max CI of 28.2 g_{CO2eq}/MJ)</th><th>RED II compliance</th><th>Type of fuel</th><th>Compliance market?</th><th>Voluntary market?</th><th>Comments</th><th>Anticipated premium on the market</th></tr>
<tr><td>✓</td><td>✓</td><td>✓</td><td>RED II compliant RFNBO</td><td>✓</td><td>✓</td><td>This is only the case where the fuel can be used by obligated parties, i.e. coming with the maximum premium</td><td rowspan="4"></td></tr>
<tr><td>✗</td><td>✓</td><td>✗</td><td>Low-carbon electrolytic hydrogen</td><td>✓ (eligible under FuelEU Maritime and/or under ReFuelEU Aviation if non-fossil)</td><td>✓</td><td rowspan="2">• This fuel can be sold to stakeholders wishing to complete voluntary and disclosure objectives.
• The value of the fuel is based on the interest it represents for the offtaker and can be backed by voluntary certification schemes.
• Low-carbon fuels derived from low-carbon electrolytic hydrogen that are certified under the Gas Package will be eligible under FuelEU Maritime and/or ReFuelEU Aviation (only if of non-fossil origin for aviation).</td></tr>
<tr><td>✓</td><td>✗</td><td>✗</td><td>RFNBO</td><td></td><td>✓</td></tr>
<tr><td>✗</td><td>✗</td><td>✗</td><td>Electrolytic hydrogen</td><td></td><td></td><td>No specific premium value potential for this fuel.</td></tr>
</table>

The following recommendations aim to provide a clear pathway for successful RFNBO production to comply with RED criteria and its subsequent certification, addressing they main concerns identified.

- **Documentation and management system planning** (see section 3.2.6): A primary area of discussion was the practical steps for preparing for RFNBO certification audits. It is recommended that companies develop a timeline that allows a comprehensive information management system (e.g., identification of responsibilities, organigram, internal processes, etc.), and digital tools and management systems that allow continuous monitoring and tracking of operating conditions (e.g., Distributed Control Systems (DCS), Supervisory Control and Data Acquisition

(SCADA), Manufacturing Execution Systems (MES), Energy Management Systems (EMS), IoT-based Smart Meters and Sensors, Digital Twins/Plant Performance Dashboards that combine data from DCS, SCADA, EMS, and MES to provide a single overview of inputs and outputs)

It is important for project developers to bear in mind that RFNBO production can only commence once certification has been obtained (see Figure 13). Accordingly, an accelerated pace in gathering the required documentation and establishing the management system is recommended. This includes meticulously tracking renewable electricity sourcing, operational data (i.e., energy inputs, outputs volume, physical parameters, quality, etc.), and GHG emissions across the whole supply chain, aligning with the data granularity and format expected by the Voluntary Schemes which can be found in the respective scheme website[23]. This is crucial for providing the required information for audits, as highlighted by participants' inquiries about necessary documents and information.

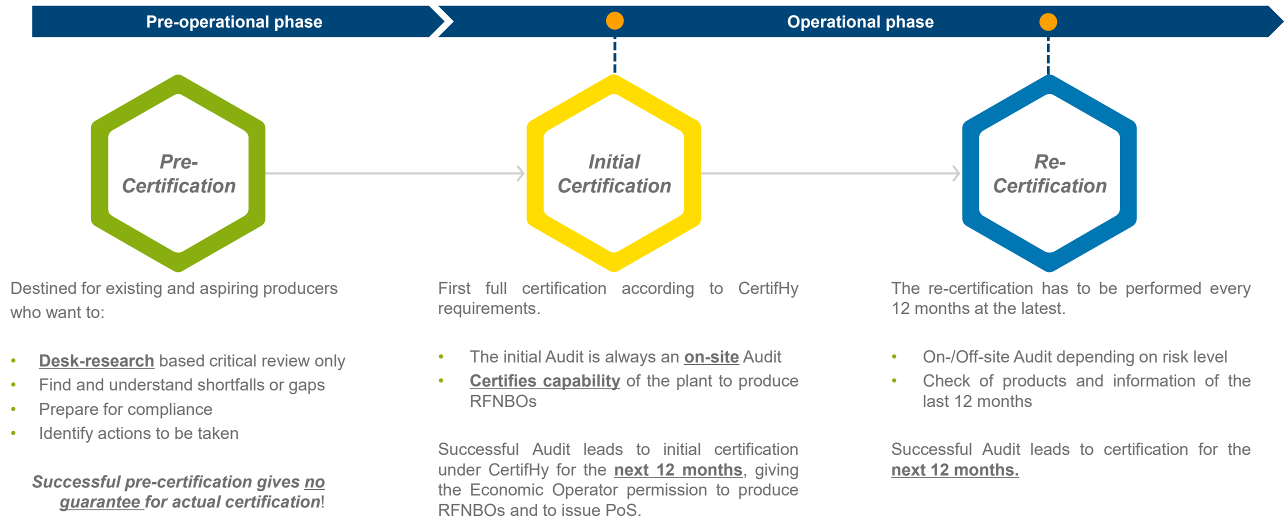

Figure 13: Types of certification according to project development stage

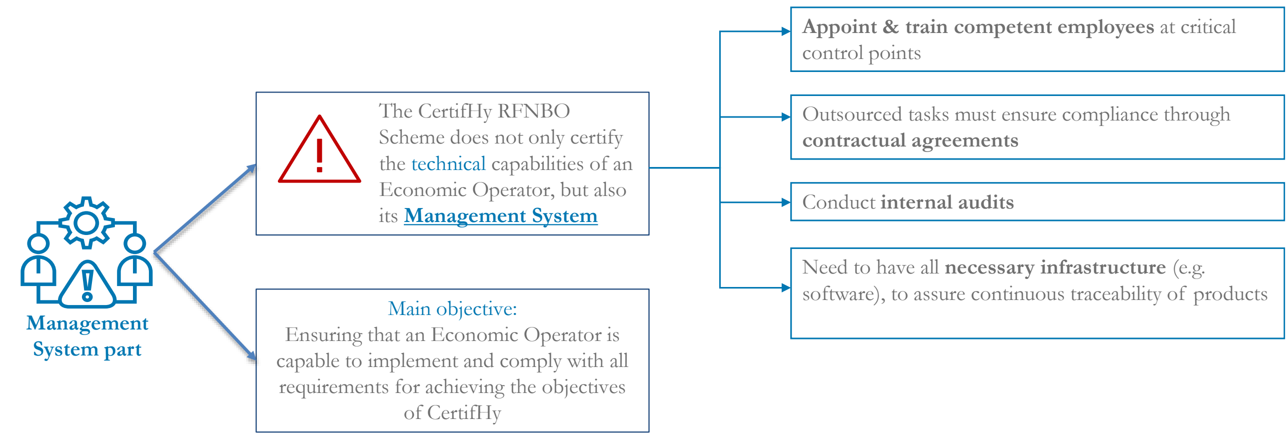

Figure 14: Certification of an Economic Operator includes requirements related to the management system.

- **Comprehensive supply chain emission accounting and responsibility:** The workshops highlighted significant concerns regarding the accounting of emissions across the entire value chain, particularly the roles and responsibilities of traders and transporters, since most of the emissions embedded in the product stem from shipping and downstream transport of the molecules. To mitigate these risks, companies are advised to establish internal methodologies for tracking emissions throughout the value chain. These should integrate digital tools and management systems (see Figure 14), as outlined in the previous point, and be reinforced through contractual

[23] CertifHy: https://www.certifhy.eu/eu-rfnbo-scheme-documents/
REDcert: https://www.redcert.org/en/redcert-systems/system-documents.html
ISCC: https://www.iscc-system.org/certification/iscc-documents/

agreements with transporters and other subcontractors. Such agreements should define maximum allowable emission contributions for downstream activities, assign responsibilities for data collection and evidence provision, and specify penalties for non-compliance with data reporting obligations or emission thresholds.

Drawing on Oil & Gas (O&G) contract methodologies for risk allocation provides a practical way to address the challenge faced by RFNBO producers: the potential loss of a molecule's aggregated premium value if its carbon footprint increases at a specific stage of the value chain. A clear understanding of the carbon budget available for different molecules, supported by a comprehensive supply chain emissions accounting by step and a thorough contractual agreement, is essential for setting contractual limits and ensuring accountability.

- **Early stage off-taker engagement and understanding global market dynamics of RFNBO supply and demand**: Recognizing the importance of securing premium prices and access to the EU market, companies should engage with potential off-takers as early as the project conceptual and FEED phases. Early engagement means initiating discussions on product specifications, contractual terms, and certification expectations before finalizing technology choices or design parameters. Failure to do so may result in projects not meeting off-taker requirements or RFNBO certification conditions, which could lead to lower-than-expected premium prices. Lessons from market experience suggest that projects often fail to achieve expected value when off-taker and certification requirements are only considered late in the project lifecycle. Ideally, early engagement should include dedicated commercial and technical teams, and findings should directly inform design and certification strategies to maximize value and market alignment.

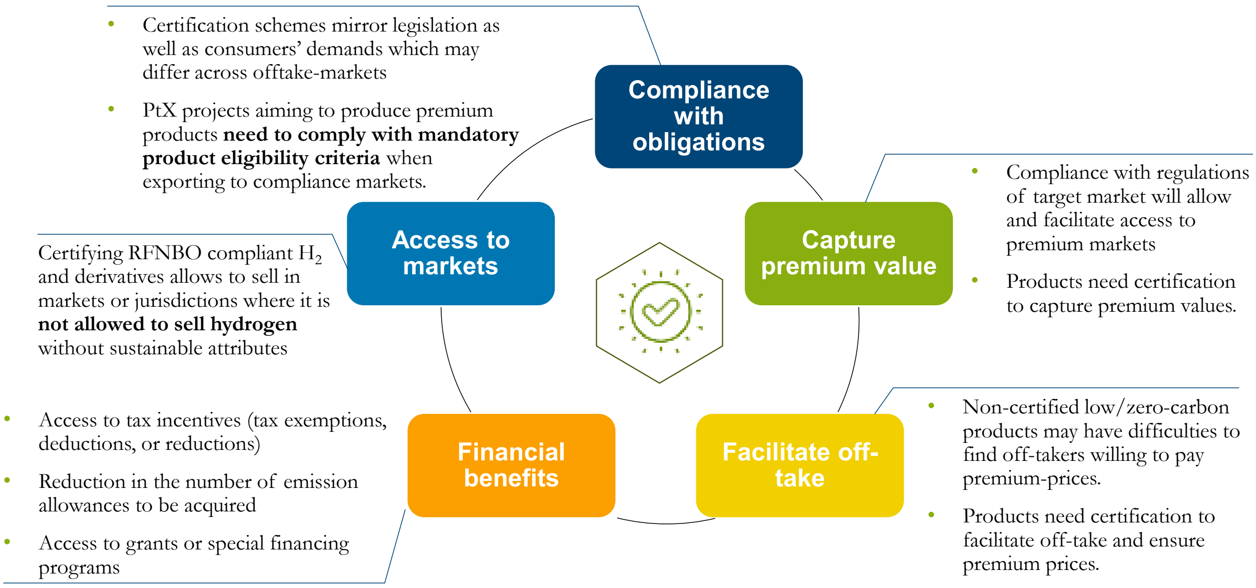

Figure 15: Legislation and certification benefits to RFNBO projects

- **Knowledge development on regulatory and certification topics:** Given the complexity and the numerous questions raised on specific regulatory aspects like temporal and geographical correlation, smart metering, relevant energy inputs, CO_2 sources and data formats and evidence, companies should embed continuous learning and training programs early in the project design phase. At a minimum, the project management team, engineering leads, and sustainability/compliance staff should be trained, ideally supported by a dedicated certification expert if internal expertise is limited. A clear internal management system (see section 3.2.6) is essential, including identification of responsibilities, internal processes, organizational structure, and a documented training plan. The training plan should also extend to external contractors and service providers to ensure access to relevant data at the right granularity and timeline. Properly documented evidence of these management systems and training activities will support compliance with RFNBO certification requirements.

- **Strategic involvement with key stakeholders:** In non-EU countries where the local translation of concepts like Bidding Zones is evolving, companies should actively engage with national regulatory authorities and EU Voluntary Certification Schemes, to align definitions and compliance expectations with project needs to facilitate RFNBO compliance. Recommended engagement strategies include participating in formal consultations, joining industry working groups, maintaining regular technical dialogues with regulators and certifiers, and taking part in workshops and training sessions organized by voluntary certification schemes. Such interactions should be led by a cross-functional team combining regulatory affairs, project management, and technical experts to ensure that inputs reflect both project design realities and certification requirements. Early and structured engagement helps shape regulatory interpretation in a way that facilitates RFNBO compliance and reduces uncertainty for project execution

3.2 Topical Recommendations

Recommendations covered in this section are relevant for all countries and are structured by topic.

3.2.1 CO_2 sources

CO_2 captured from certain industrial activities such as cement and steel plants, can in general terms be used for the synthesis of carbon-containing RFNBOs such as methanol under certain conditions. These conditions include the requirement that an **"effective carbon pricing system"** is in place in the respective country[24]. The European Commission has published a list of countries;[25] the following systems can be considered to fulfil the requirement of upstream accounting in an effective carbon pricing system:

- EU ETS which applies in the 30 States of the European Economic Area: the EU-27 Member States and in three EFTA States Iceland, Liechtenstein and Norway,
- Swiss ETS,
- UK ETS

This list is understood to be exhaustive, i.e. no other country has an "effective carbon pricing system" with respect to RFNBO certification. The Commission may extend this list based on requests from other countries. This means that currently, in countries outside the listed countries, CO_2 captured from these sources *cannot* be used for syntheses of carbon-containing RFNBOs, which leaves mainly biogenic sources as an option apart from Direct Air Capture.[26] For carbon-containing RFNBO production in such countries, the project developers should encourage the national government to contact the European Commission and request the national emission trading system of carbon tax or similar to be included in the Commission's list if it meets the outlined requirements.

3.2.2 Bidding Zones

The "bidding zone" concept is defined for the European electricity markets and is important in RFNBO certification. Bidding zones are defined in Article 2, point (65), of Regulation (EU) 2019/943 as follows: *"The largest geographical area within which market participants are able to exchange energy without capacity allocation"*.

In third countries where the concept of bidding zone does not exist, equivalent concepts shall be applied that maintain the objective of CDR 1184 in the context of RFNBO certification.

Recital 3 of CDR 1184 provides guidance: *"[…] 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 case of bidding zones such concept 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 equivalent of bidding zones in third countries is identified by the recognized voluntary schemes like CertifHy.
The following approach is applied:

1. It should be assessed whether at the location of the electrolyser, market regulations apply, which are similar to the rules set out for bidding zones in Regulation (EU) 2019/943. Similar means in this context that there are rules requiring establishing hourly prices for electricity in a geographical area. If such rules are in place, the geographical

[24] In addition to an "effective carbon pricing system", the industrial activities must be covered by the European Emission Trading System (EU-ETS), which in concrete terms is defined as "activity listed under Annex I of Directive 2003/87/EC"; furthermore, the CO2 must be "incorporated in the chemical composition of the fuel before 2036. This date shall be extended to 2041 in other cases than CO2 stemming from the combustion of fuels for electricity generation"; see Commission Delegated Regulation (EU) 2023/1185.

[25] See European Commission: "Q&A implementation of hydrogen delegated acts"; 14/03/2024; https://circabc.europa.eu/ui/group/8f5f9424-a7ef-4dbf-b914-1af1d12ff5d2/library/ca8efd4d-cb44-4aec-914d-3d95f95ea293/details

[26] See e.g.: PtX-Hub: Identification of suitable carbon as feedstock for PtX products to be exported to Europe; https://ptx-hub.org/publication/identification-carbon-feedstock-ptx-europe/

area for which the prices are established should be considered as a bidding zone for the purpose of the implementation of the methodology.

2. If such rules are not in place, it should be assessed whether the electricity network in the country of production is integrated or whether there are several separated networks. If there are several networks, each network should be considered as a bidding zone for the purpose of the implementation of the methodology.
3. If the electricity network of the country is integrated, and there are no geographically differentiated electricity prices, the whole country may be considered as one bidding zone for the purpose of the implementation of the methodology.
4. Identification of bidding zone equivalents will be based on reliable data from official sources.

The identification of bidding zone equivalents requires knowledge of the national electricity market. It is therefore important for the voluntary schemes to have support from stakeholders in the assessment and identification of bidding zones. Project developers should engage with voluntary schemes on the identification of bidding zone equivalents in their respective country, and to identify relevant official sources of reliable information required for identifying the bidding zone equivalent in the respective country.

3.2.3 Renewable share and emissions intensity of the grid mix

The average share of renewable electricity shall be determined by dividing the gross final consumption of electricity from renewable sources in the bidding zone by the gross electricity production from all energy sources, except from water previously pumped uphill, plus imports minus exports of electricity, as defined in CDR 1184.

The gross final consumption of electricity from renewable sources is equal to the electricity produced in a bidding zone from renewable sources, including the production of electricity from renewables self-consumers and renewable energy communities and electricity from RFNBO and excluding the production of electricity in pumped storage units from water that has previously been pumped uphill as well as the electricity used to produce RFNBO. The normalization factors for hydro and wind according to Annex II of RED II are considered as required.

A calculation of the GHG intensity of the electricity mix is necessary on an annual basis. The details of this calculation are set out in CDR 1185:

One of the three following alternative methods shall be applied during each calendar year to attribute GHG values to the electricity taken from the grid:

a) GHG emissions values shall be attributed according to the methodology provided below
b) GHG emissions values shall be attributed depending on the number of full load hours the installation producing RFNBO is operating. Where the number of full load hours 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 for which reliable data are available, grid electricity used in the production process of RFNBO shall be attributed a GHG emissions value of zero g_{CO2eq}/MJ. Where this number of full load hours is exceeded, grid electricity used in the production process of RFNBO shall be attributed a GHG emissions value of 183 g_{CO2eq}/MJ
c) the GHG emissions value of the marginal unit generating electricity at the time of the production of the RFNBO in the bidding zone may be used if this information is publicly available from the national transmission system operator.

GHG emissions values of the grid mix electricity are to be calculated as follows:

- The GHG emissions intensity of electricity must be determined at national or bidding zone level, but only at bidding zone level if the required data is publicly available.
- The calculation shall consider all carbon equivalent emissions, associated with the combustion and supply of the fuels used for electricity production. This relies on the amount of different fuels used in the electricity production facilities and the emission factors from fuel combustion and the upstream fuel emission factors.
- All primary energy sources for electricity generation, the type of plant, conversion efficiencies and the plant's own electricity consumption must be taken into account.
- All the upstream emissions from the cultivation, harvesting, collection, processing and transport of biomass shall be considered. Peat and the components of waste materials that are from fossil origins shall be treated as a fossil fuel.
- Emissions associated with the production of renewable electricity (wind, solar, hydro and geothermal) are zero.

Both the identification of the GHG values to the electricity taken from the grid as well as the calculation of the average share of renewable electricity is complex, requires related reliable data to be publicly available from official sources, and requires a thorough understanding of the data and methodologies.

It is therefore highly recommended that one national authority or body is nominated to ensure data availability and proper calculation of the renewable share and of the grid electricity GHG intensity, e.g. statistical offices. It is recommended that project developers exchange with their governments or public authorities on this.

3.2.4 Financial support including Special Economic Zones (SEZ)

On 16 July 2025, the European Commission has issued some clarification to CertifHy related to **"support"**[27], notably, the Commission has clarified under which conditions support can be accepted in cases where support is provided to both renewables installations and RFNBO production installations: *"The requirements set out under Article 5(b) are the same for fuel producers sourcing renewable electricity via a PPA and fuel producers sourcing renewable electricity from own installations. In both cases the intention of the criteria is to ensure that the production of RFNBOs is adding to the renewable deployment or to the financing of renewable energy and is not crowding out renewable energy that received public support for other purposes than RFNBO production. For this purpose, Article 5(b) restricts public support for the installations producing renewable electricity while no restrictions apply for support for RFNBO production. To demonstrate that operating and investment aid that is received by a fuel producer that sources renewable electricity from own installations is for RFNBO production and therefore in line with Article 5(b), evidence must be provided that either no relevant operating and investment aid is related to the installation generating renewable electricity or all relevant operating and investment aid is received under the condition that RFNBO is produced or an installation producing renewable fuels of non-biological origin is constructed. Assessing the evidence to support claims made by economic operators would be the responsibility of the voluntary scheme including the auditors conducting the certification."*

Special economic zones are established in many countries to incentivize exports of products. The specific conditions applicable in such zones are complex and should be carefully assessed by project developers in view of the "no support" aspect of the additionality requirements. All stakeholder in a given country joining forces in such assessment, e.g. supported and coordinated by relevant associations, and in close exchange with the respective national government is recommended.

Where support is provided that may not be compliant with the RFNBO requirements, e.g. reduced land costs for renewable installations, economic operators need to thoroughly assess compliance risks. In order to avoid risks (see also section 3.3.1 for electricity grid fee waivers in India), companies have several options: (a) discussions with the government about changes to the provisions related to the support in view of making them complaint with RFNBO requirements, (b) discussions with Voluntary Schemes to check for potential exceptions or alternatives, (c) not accepting the support or paying back the financial benefit, (d) potentially further options.

3.2.5 Pre-certification

Given the complexity of the RFNBO certification requirements, pre-certification was widely discussed during the workshops as an important measure to identify and address any compliance gaps or shortcomings in early project development stages. The best timing for pre-certification is between pre-FEED (where the technical design is fixed) and FEED (where detailed engineering is carried out. This allows for quick and cheap adjustments on the basis of a well-defined plant design.

It is essential to complete the pre-certification process before finalizing the design to avoid reiteration costs.

RFNBO project developers are recommended to consider engaging in a pre-certification process to ensure the potential RFNBO compliance risks are identified in early stages and therefore, the final design aligns with regulatory requirements.

Pre-certification is an activity aimed at de-risking a project under development in view of RFNBO-compliance. It identifies non-compliances and gaps through a full-scale audit by an independent third party (the Certification Body), and it recommends detailed options how to achieve actual certification at commissioning.

Pre-certification helps secure investments, loans, and commercial contracts: It convinces investors, lenders and off-takers, provides supporting evidence to applications for public funding, and it reassures external stakeholders on alignment of the project with RFNBO compliance requirements.

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[27] According to the Q&A released by the European Commission in 2024, financial support refers to: "*Any payments received from public authorities for the construction of the installations generating renewable electricity and any benefits received from public authorities for the production of renewable electricity, including feed-in tariffs, feed-in premiums, reductions applying for the production, contracts for difference or any direct payments linked to the production of renewable electricity*" (European Comission, 2024).

Internally, it convinces decision makers and internal stakeholders, it derisks the project development roadmap, it builds relevant expertise internally and activates advocacy actions, and it provides guidelines to operational and technical teams.

Pre-certification is carried out under a Voluntary Scheme (e.g., CertifHy) by a consultant (e.g., LBST[28], Hinicio[29]) and a recognized Certification Body. The consultant provides advisory services including recommendations for improvements, the Certification Body carries out an audit, and CertifHy ensures overall quality. Furthermore, CertifHy clarifies project-specific questions or brings them before the European Commission for clarification.

Pre-certification is carried out in four phases (see Figure 16):

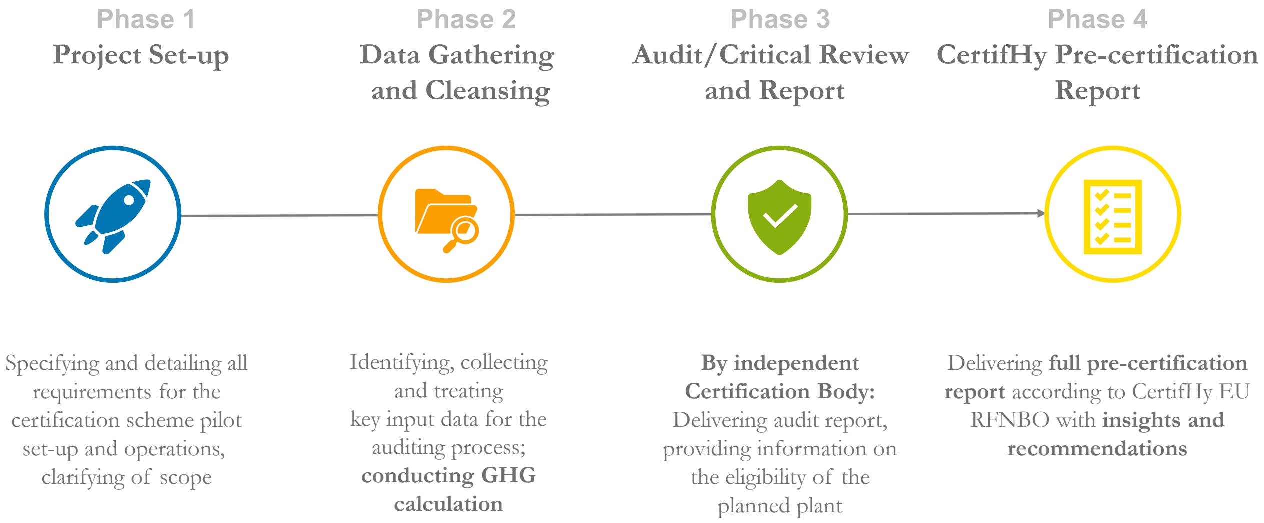

Figure 16: Pre-certification is carried out in four phases

Phases 1, 2 and 4 are carried out by the consultant in close collaboration with the project developer. Data gathering and cleansing (phase 2) results in a well-structured package of documents and data for the audit (phase 3). In addition to the detailed technical plant concept, the document package includes a GHG calculation according to RFNBO methodology, a mass balance concept and documentation of a data quality management system (see section 3.2.6) of the operator. Contractual documents, notably PPAs where applicable, and other evidence is also included. In close collaboration between the project developer and the consultant

Pre-certification delivers an audit report, which is a list of non-compliances (weaknesses and gaps). It further delivers a pre-certification report, which includes a roadmap to full compliance with options & recommendations for action for mitigation of non-compliances until actual certification at plant commissioning. It furthermore provides for a statement of achievability of compliance, stamped by CertifHy. However, it does not deliver a formal certificate.

3.2.6 Quality Management System

A comprehensive and robust quality management system has to be established by the economic operator of an RFNBO installation: To monitor, record, and report relevant sustainability and mass balancing data across the whole supply chain considering a well-to-grave-approach.

It is recommended that project developers prioritize the implementation of reliable and secure management software and systems for tracking their plants' operations and data, potentially seeking solutions from private providers or advocating for government-supported platforms.

Adequate management and procedures include:

- Commitment to certification criteria and procedures by top management
- An up-to-date list of relevant processes/ procedures/ process charts/ graphics for all relevant procedures available (process handbook)

[28] https://en.lbst.de/service/certifhy-rfnbo-pre-certification/
[29] https://hinicio.com/services/#policy-and-regulatory-support

- Management of staff/ responsible personnel
- Appointment of audit responsible person
- Initial and continuous training of involved and new personnel (training on RED, CDR 1184, CDR 1185, Voluntary Scheme, internal processes, etc.)
- Procedures for quality management are in place
- Quality Management System is recommended (e.g. ISO 9001)
- Internal risk assessment, Critical control points identified including plan of actions to mitigate the risks
- Internal Audits, Remedial actions taken based on internal audits
- Management review taking place at least once a year (management taking notice of the internal audit (e.g. during management review))
- Data storage/ bookkeeping: How and which GHG data are collected; GHG calculation tool; reporting of minimum emission reduction; how and which data are collected to demonstrate compliance with mass balance requirements; how to prove monthly(/hourly) correlation of electricity supply; references to offsite parties; all data of the off-taker(s) must be clearly registered; suppliers (power, water, other); retention period of stored data (at least 5 years)
- Data reporting
- Procedure for PoS issuing

Technical equipment adequacy of the management system includes:

- List of relevant meters, type, unit, tag no./location, date of calibration
- Frequent calibration of meters
- Electronic data management systems appropriate

Correctness of tools includes:

- GHG calculation (data sources)
- Mass balance system

Contracts required include:

- Electricity supply
- Sales of compliant product (cross check with sales of other product (double sales))

3.3 Country-specific Recommendations

The recommendations made in this section are specific to the country of RFNBO production.

3.3.1 India

The RFNBO regulation and certification training and workshop took place in Delhi, India, on March 5 and 7, 2025. The event was attended by approximately 60 participants from both the public and private sectors, including representatives from the Ministry of New and Renewable Energy (MNRE)/ National Green Hydrogen Mission, Grid India, the Delegation of the European Union to India, Hydrogen Europe, Green Hydrogen India as well as many key companies from the Indian hydrogen ecosystem.

The discussions focused on the European certification requirements considering India's national context. Participants highlighted the ongoing efforts by the Indian governmental institutions to advance and further implement the Indian Green Hydrogen Mission that supports and promotes the development of the hydrogen industry in India. The unique context of India, as revealed in the workshops, necessitates specific considerations for private companies.

Indian private companies proactively participate in discussions and provide input to national regulatory bodies (notably MNRE/ National Green Hydrogen Mission) and certification schemes to accelerate the resolution of key challenges and concerns affecting them. Green Hydrogen India plays a key role in this process.

In general terms, project developers should continue to **actively engage with the national authorities**, notably MNRE/ National Green Hydrogen Mission. Green Hydrogen India should continue to support and drive such engagements.

- **CO_2 captured from certain industrial activities** *cannot* be used for syntheses of carbon-containing RFNBOs in India, which leaves mainly biogenic sources as an option apart from Direct Air Capture.[30] For carbon-containing RFNBO production in India, the Indian project developers should encourage the government to contact the European Commission and request the Indian emission trading system (CCTS) to be included in the Commission list of countries with an "effective carbon pricing system" (see section 3.2.1).

- **Special economic zones** are established in India to incentivize exports of products. The specific conditions applicable in such zones are complex and should be carefully assessed by project developers in view of the "no support" aspect of the additionality requirements. Joining forces in such assessment, e.g. supported and coordinated by Green Hydrogen India, and in close exchange with the Indian government is recommended (see section 3.2.4).

- The situation of what constitutes the **bidding zones in India** (see section 3.2.2) has not yet been clarified (see also chapter 4.2.1). Project developers are well advised to closely monitor and support the ongoing clarification process (e.g. through GH2 India), and to consider project setups that are resilient to any potential conclusions on bidding zones in India.

- The **grid fees** for transporting renewable electricity in India may be waived for a certain time (ISTS – Inter-State Transmission System) as a means to foster renewable electricity deployment for hydrogen production in India. Where this waiver excludes the issuance of **renewable energy certificates** (RECs) or Energy Attribute Certificates (EACs) for the electricity producer, and thus their cancellation, which is mandated by the recognized EU certification schemes for RFNBOs ("Voluntary Schemes"). Project developers should carefully analyse such provisions to check for solutions. The CertifHy Voluntary Scheme provides for exceptions to the requirement of cancelling EACs in cases where the cancellation statements cannot be provided for legal reasons, which must be evidenced by the provisions of the relevant legal texts. Thus, in case a legal basis defines that EACs cannot be issued for renewable installations that use a grid fee waiver programme, CertifHy provide an exception to the requirement of providing EAC cancellation statements..

- Given the complexity of the RFNBO certification requirements, **pre-certification** was widely discussed as an important measure to identify and address any compliance gaps or shortcomings in early project development stages (see section 3.2.5).

[30] See e.g.: PtX-Hub: Identification of suitable carbon as feedstock for PtX products to be exported to Europe; https://ptx-hub.org/publication/identification-carbon-feedstock-ptx-europe/

3.3.2 Colombia

The RFNBO regulation and certification training and workshop took place in Bogotá, Colombia, on March 12 and 13, 2025. The event was attended by approximately 40 participants from both the public and private sectors, including representatives from the Ministry of Mining and Energy, as well as key companies from the hydrogen ecosystem such as Ecopetrol and Cenit, among others.

The discussions focused on regulation and certification requirements considering Colombia's national context. Participants emphasized the ongoing efforts led by governmental institutions to establish a regulatory and certification framework that supports and promotes the development of the hydrogen industry in the country.
These efforts take place within the current national power system configuration, where the electricity market is structured around the National Interconnected System (SIN), a single interconnected grid supplying most of the country's populated regions. The SIN is operated by XM, the same entity responsible for administering Colombia's energy market. Additionally, La Guajira stands out as a Non-Interconnected Zone (ZNI), operating independently from the SIN. The region offers particularly favourable conditions for renewable hydrogen and derivative production due to its exceptional wind and solar resources. However, socio-environmental challenges and permitting delays continue to hinder progress on planned grid interconnection and large-scale projects.

The unique context of Colombia, as outlined above and further highlighted during the workshops, requires tailored considerations for private sector actors. To effectively support and accelerate the development of the hydrogen industry in alignment with national objectives, Colombian private companies should proactively participate in structured dialogues with both national and international stakeholders to address project-specific challenges arising from the national context and to ensure full compliance with RFNBO requirements. Such interactions should include formal consultations and technical consultations with national regulatory bodies such as the Ministry of Mines and Energy (MME), the Energy and Gas Regulation Commission (CREG) and the national grid operation XM, as well as active participation in stakeholder workshops and pre-certification trainings organized by EU Voluntary Schemes like CertifHy, ISCC, or REDcert. By engaging early and consistently with these stakeholders, developers can ensure that their project design reflects regulatory expectations, reduce the risk of misalignment, and accelerate the resolution of key challenges.

The following points reflect the main concerns shared by RFNBO projects developers in the Colombian context:

- **Compatibility of tax benefits under Law 1715 with the additionality criteria:** Concerning the criterion of additionality, which states that installations generating renewable electricity should not have received any form of financial support (see section 3.2.4), the following issue was discussed in the Colombian context: Law 1715 in Colombia31, which provides tax benefits for renewable energy plants in Colombia, is aiming to foster the adoption of Non-Conventional Renewable Energies to the National Energy System since 2014. However, its potential conflict with the additionality criteria for RFNBO compliance, which would primarily challenge those projects in the country aiming to produce hydrogen from electricity sourced through a grid-based PPA (as they would be ineligible under the additionality criterion), has raised significant concerns among developers. Many stakeholders believe that being excluded from these subsidies would considerably impact their levelized cost of hydrogen (LCOH), creating uncertainty around project viability. There was strong insistence from participants on the need to clarify the interpretation of RFNBO criterion of non-financial support and whether it is compatible or not with the Colombian Law 1715.

- **Compatibility of transmission subsidies under Decree 1403 (2024) with the additionality criteria**: The ongoing development of renewable energy incentives in Colombia, which includes transmission subsidies stated in Decree 1403 (2024) aimed at reducing the cost of renewable electricity, has raised questions regarding their compatibility with the additionality criterion (see section 3.2.4). Specifically, it remains unclear whether renewable energy projects receiving such subsidies would still be considered compliant, as the RED II Delegated Acts and accompanying Q&A do not explicitly clarify whether the financial support/state aid restriction to renewable energy installations also applies to these types of financial support. To approach this, it is recommended that Colombian Power-to-X developers should actively engage with national authorities, such as XM, MME and CREG, to push them to clarify these eligibility criteria and potential conflicts between national incentives and the additionality criterion of non-funding support for electricity generation, while exploring viable scenarios for accessing these benefits. The potential conflict between these incentives needs careful consideration, since it could negatively impact the viability of Power-to-X projects in Colombia and thus the economic market outlook.

[31] For further information, please review: https://www.funcionpublica.gov.co/eva/gestornormativo/norma.php?i=57353

- **Translation of the bidding zone concept in the Colombian context** (see section 3.2.2): This presents a specific challenge due to the structure of Colombia's electricity grid, which combines centralized generation with notable transmission bottlenecks across regions. Areas with high renewable potential, such as La Guajira or the Caribbean coast, are often far or relatively disconnected from industrial demand centres, making the definition of bidding zones highly sensitive to grid topology and planned transmission expansions. Colombian Power-to-X developers should therefore conduct a thorough Plant Regulatory Assessment with a third-party expert to evaluate the consistency of the project planning and initial design with the regulatory requirements, and consider later engaging in a pre-certification process (see section 3.2.5) to ensure the risks are identified in early stages and therefore, the final design aligns with regulatory requirements. These exercises should include a reasoned interpretation of how the bidding zone concept applies in Colombia, which must be reviewed and validated by a Voluntary Certification Scheme (e.g., CertifHy) and, in the final instance, by the European Commission.

- **Alignment among national key stakeholders and influence in Bidding Zone resolution:** some stakeholders support the definition of the National Integrated System (SIN) as a single Bidding Zone, while others, particularly those in regions with greater renewable energy generation capacity, support a more granular support a more granular and region-specific definition. Dividing the country into smaller Bidding Zones could enable certain regions to increase their renewable share and attract RFNBO production. This could reduce competitiveness in other regions, generating reluctance among stakeholders to accept he proposed definitions. Therefore, Colombian PtX project developers should proactively engage in discussions with National Authorities to ensure clarity and alignment on this critical issue.

- **Contractual definitions towards the downstream partners:** Developers have further expressed particular concerns about downstream stages of the value chain (shipping, downstream conversion, transport and end-use) that, if not properly managed, could render a project economically unviable or expose it to reputational and financial risks due to non-compliance with sustainability criteria for RFNBO (renewability, 70% GHG emissions reduction, and Certification). For Colombian projects, these risks are amplified due to the necessity of transporting hydrogen or its derivatives by sea to access European markets Europe, considering that export routes from Colombia regularly depend on the Panama Canal, where traffic restrictions, unexpected delays, or operational interruptions could adversely affect delivery timelines. Such disruptions may lie entirely outside the control of Colombian developers yet still jeopardize compliance. Although there exist alternative markets for low-emission products that do not meet RFNBO standards, such as low-carbon fuels32 , the added value and premium price associated with accessing the RFNBO market would be lost if these requirements are not fully met. This underscores the need for project developers to assign contractual responsibilities and establish clear risk allocation frameworks. It is therefore recommended to consider existing methodologies that are used in oil and gas contracts, where penalties for non-compliance are clearly defined and can serve as examples.

Moreover, beyond the concerns of project developers, additional topics that should be considered in the Colombian context and that were raised during the workshops by the attendees include:

- **Role of biomass in Colombia's energy mix**: Biomass plays a substantial role in Colombia's current and future energy landscape, particularly due to the country's strong agricultural and agro-industrial sectors. This context requires careful differentiation between the use of biomass as a primary feedstock for biofuel production and the use of biomass-derived CO_2 as an input for the synthesis of RFNBO derivatives. The key regulatory challenge is to properly classify these products: when CO_2 originating from biomass is captured and used as a raw material for RFNBO production, the resulting fuel does not fall under the category of biofuel. However, it may still comply with RFNBO sustainability and GHG reduction requirements, provided that specific conditions established in EU regulation are met.
  To fully leverage Colombia's biomass potential while ensuring regulatory alignment with EU market expectations, Colombian companies must strengthen their understanding of the relevant provisions within *Commission Delegated Regulation (EU) 2023/1185*, particularly those concerning sustainability, additionality of biomass sources, and carbon accounting methodologies. Companies are encouraged to actively build internal capabilities in line with their project maturity, including early engagement with certification schemes and participation in pre-certification processes (see section 3.2.5) to validate compliance pathways (see Figure 17).

[32] For further information, please review: Non-fossil Fuel Categories in EU Legislation and their Significance for Hydrogen - PtX Hub

"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 would have otherwise been emitted as CO2 into the atmosphere. **This includes CO2 that was captured and incorporated into the fuel provided that at least one of the following conditions is fulfilled:**

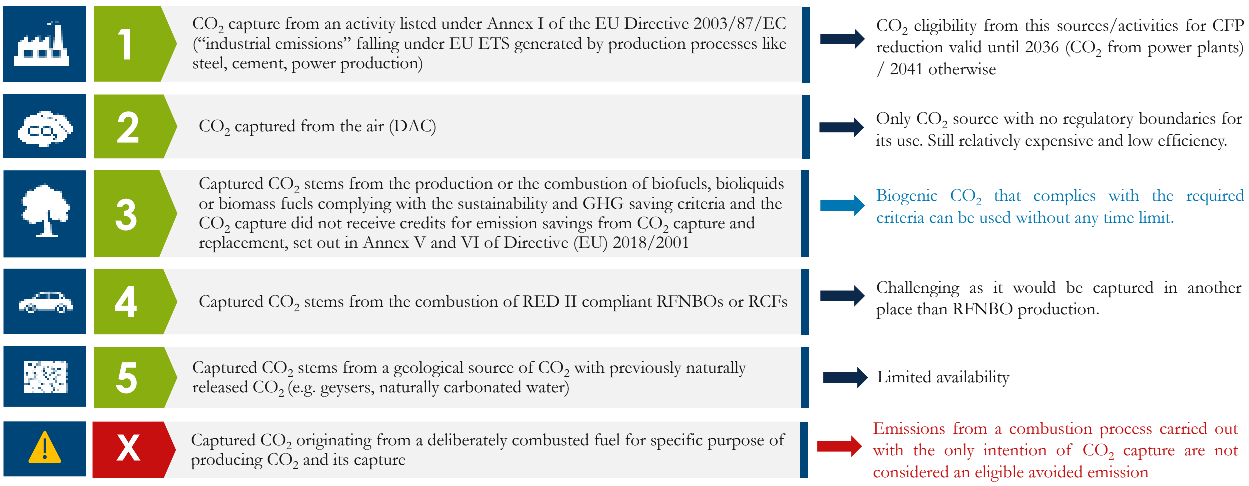

Figure 17: Alternative CO_2 sourcing in order to be considered avoided emissions in the production of RFNBO.

- **Conducting a socio-economic and environmental performance analysis:** Although RED does not request compliance with any socio-economic-environmental KPIs other than the additionality criterion, emission intensity threshold and temporal and geographical correlations. It is highly recommended that project developers in socio-economically complex areas like La Guajira prioritize early and direct engagement with local communities to build trust, identify their specific needs and based on those, define suitable impact compensation measures and mechanisms, to ensure social acceptance of the respective project and create local economic value. This is needed to mitigate potential social conflicts[33], strengthen the project's long-term viability, and align with international best practices on sustainability, such as the requirements applied under H2Global[34].

Finally, it is strongly recommended that project developers **begin early their compliance preparation before FEED stages when is still possible to change the technical design** (see section 3.2.5). This includes establishing robust information management (see section 3.2.6) and tracking systems, ensuring the proper implementation of the mass balance model along the whole supply chain, and setting up mechanisms for a clear traceability of the RFNBO molecules. Specific actions include:

- **Smart metering infrastructure**: To ensure accurate and real-time data for all energy inputs, its sourcing and consumption.
- **Comprehensive quality management systems**: To monitor, record, and report relevant sustainability and balancing data across the whole supply chain considering a well-to-grave-approach (see section 3.2.6).
- Given the complexity of these requirements, **pre-certification** was widely discussed as an important measure to identify and address any compliance gaps or shortcomings in early project development stages (see section 3.2.5).

[33] Further recommendations in Sustainability Briefing #6: Stakeholder participation in the context of Power-to-X - PtX Hub
[34] Hintco ESS requirements

3.3.3 Brazil

The workshops in Brazil were held on April 8 and 9, 2025 in São Paulo, Brazil. Approximately 35 participants from the hydrogen ecosystem attended, including representatives from the Ministry of Energy, Câmara de Comercialização de Energia Elétrica (CCEE), National Oil Agency ANP and key private sector companies. The workshop focused on the application of RFNBO regulation and certification requirements within the country, which presents a relatively unique context in LAC[35] Region.

Brazil is actively dedicating efforts to position itself as a strategic global actor in the renewable hydrogen and derivatives industry, leveraging its competitive renewable resources and the development of industrial hydrogen hubs strongly linked to port infrastructure to enable large-scale export. In parallel, public institutions have initiated important regulatory and policy efforts, such as the National Hydrogen Program (PNH_2) and RFNBO certification scheme of CCEE, in order to promote and develop the hydrogen economy. However, a **key challenge highlighted throughout the workshops in Brazil is the uncertainty surrounding how the premium value for RFNBO exports to Europe will effectively materialize**. Since many projects in the country are export-driven and highly dependent on access to European premium-value markets, even that developers acknowledge that achieving this premium requires full compliance with EU regulatory frameworks, the concrete mechanisms to secure it (e.g. certification pathways, pricing structures, and long-term offtake agreements) remain insufficiently defined. As a result, developers face significant commercial and regulatory risks: large-scale investments may advance without guaranteed access to the higher-value RFNBO market in the EU, with direct consequences for project bankability and long-term financial viability.
To mitigate these risks, it is recommended that private companies in Brazil proactively pursue collaborative approaches centred on shared infrastructure and joint regulatory assessment. Such collaboration can create momentum and synergies to both, drive the development of shared infrastructure required for the industry development and to help clarify local interpretations of European regulatory concepts ensuring that projects are fully compliant, a necessary precondition for accessing the premium value markets in the European Union. Collaborative mechanisms could include forming consortia, engaging in structured dialogue through Brazil's hydrogen and industry associations, or developing shared compliance and certification frameworks. Within this collaborative framework, companies should also actively engage potential off-takers to communicate and demonstrate the value proposition of certified RFNBO. Early engagement can provide market validation, showcase the benefits of regulatory-compliant production, and help distribute both commercial and regulatory risks across multiple stakeholders.

The **northern sub-markets currently have a renewable energy share in the grid exceeding 90%,** which allows production of 100% renewable hydrogen through a direct grid connection, without the need to secure a PPA or comply with additionality and temporal and geographical correlation requirements. In this context, participants expressed considerable concern regarding the requirement to ensure that, in at least one of the following five years, the grid will achieve over 90% renewable energy share in order to maintain eligibility for this electricity sourcing[36] and connection scenario. Given the dynamic nature of the electricity market, and the fact that renewable electricity is particularly vulnerable to fluctuations such as droughts or sudden increases in demand, developers must take a cautious approach and account for these potential variations in their project design and risk assessments[37].

In addition, stakeholders highlighted a structural system limitation: the grid in northern Brazil is not designed to accommodate unlimited gigawatt-scale Power-to-X developments connecting directly to the system under the >90% renewable eligibility criterion. As the number and scale of hydrogen projects grow, grid capacity, dispatch priorities, and future renewable expansion may not necessarily increase at the same pace. This could result in competition among developers for access to compliant renewable electricity, particularly as more projects seek to secure long-term RFNBO eligibility. These elements introduce material regulatory and technical risks that must be fully accounted for in project design, sizing strategies, and long-term risk assessments. To mitigate these risks, Brazilian Power-to-X developers are encouraged to conduct detailed projections of future grid renewability and analyse interannual variability risks, to consider hybrid electricity sourcing approaches that combine direct grid connection with dedicated renewable PPAs, and to pursue early coordination with other project developers and regulatory authorities to clarify long-term grid connection feasibility. By incorporating these measures, developers can improve resilience against system uncertainties and safeguard the long-term competitiveness of RFNBO export projects originating in northern Brazil.

There is also a need for clearer guidance on how to **optimize renewable electricity sourcing** under the scenarios of direct connection to grids with more than 90% renewable, since the load factor cannot exceed the renewability share of the grid of

[35] Latin America and the Caribbean
[36] Reference to Delegated Regulation (EU) 2023/1184 Paragraph (5)
[37] According to the corresponding EU methodology to calculate the renewability share of an electricity grid, both hydro power and wind power are to be normalised over 20 and 5 years, respectively.

the previous year (n-1). It is recommended that Brazilian Power-to-X developers conduct a detailed analysis of the renewability projection of the grid and their electrolyser load factors, and consider strategies such as including, in addition, a PPA with dedicated renewable energy to maximize the share of used renewable electricity. Additionally, it would be prudent to explore alternative markets for any volumes of low-carbon hydrogen that may fall short of full RFNBO compliance, only in the case the uncertainty with the grid connection cannot be resolved.

The varying interpretations of the concepts of Bidding Zones (see section 3.2.2) and grid renewability when applied to the Brazilian power system generated uncertainty among workshop participants. This highlights the need for clearer national guidance on how European regulatory definitions should be translated into Brazil's unique grid configuration. This has led to specific recommendations for private companies in the Brazilian energy sector:

- **RED Requirement for purchasing and cancelling Guarantees of Origin (GOs):** According to the RED regulation, the purchase and cancellation of renewable electricity GOs is required whenever a certification scheme exists in the country, regardless of whether it is mandatory or voluntary. While Brazil does not have a mandatory certification scheme for renewable electricity, it does have voluntary schemes in place, such as Energy Attribute Certificates (EACs) and International Renewable Energy Certificates (I-RECs). Therefore, to avoid double-counting of renewable electricity in Brazil, companied developing RFNBO projects are advised to adopt rigorous processes for documenting their electricity sourcing and ensuring full traceability of renewable energy contracts and associated certifications. This is especially important because EU Voluntary Schemes will require the acquisition and cancellation of relevant renewable energy certificates as part of the RFNBO certification process, and/or a supplier declaration confirming the exclusive allocation of these attributes can be used as evidence. This declaration should explicitly state that the renewable attributes are not sold or claimed elsewhere and must be verified by independent auditors at the time of certification. This ensures traceability, exclusivity, and alignment with RED principles.

- For **CO_2 from industrial activities** to be eligible for use in the production of RFNBOs, qualifying as avoided emissions when calculating the RFNBO's GHG emissions intensity, such emissions must be accounted for upstream in the value chain through an "**effective carbon pricing mechanism"** (see section 3.2.1). Brazil currently has its national Emissions Trading System called SBCE. This leads to the strategic recommendation that the Brazilian Government would have to contact the EU Commission to accept SBCE as "effective" for **RFNBO certification**.

- **The urgent need for a clear definition of "bidding zones" in Brazil was strongly** emphasized, as the determination of whether this will be at the national or sub-market/ macrozone level will fundamentally impact project design decisions and the calculation of renewable energy share and grid carbon intensity.

- Brazil's National Interconnected Electricity System (Sistema Interconectado Nacional, SIN) is divided into 4 sub-markets. These are defined based on physical transmission constraints and that have different spot prices. The system operates with a centralized dispatch defined by the National System Operator (ONS) for each sub-market and uses a suite of computational models to determine the most efficient hourly production schedule for each energy generation plant, considering the interactions and electrical restrictions between the four macro-zones: North, North-East, South and South-East. The Northern and Northeastern markets are mainly energy exporters to the Southern ones, with a grid renewable energy share exceeding 90%, a highly attractive scenario for the production of RFNBOs. According to Hinicio's analysis (unpublished; see CCEE publication [38]), **each submarket could potentially be considered as a bidding zone. Still, the official statement on Brazil's bidding zone definition must come from a Voluntary Scheme and afterwards be recognized by the European Commission.**

- The potential disadvantageous impact of the **renewable energy share calculation** in Article 7(2) of Directive (EU) 2018/2001[39] (see section 3.2.3) on southern Brazilian sub-markets was a major concern[40]. The core problem arises as the numerator of the equation does not consider electricity imported from other regions, while these imports are included in the denominator. For southern Brazilian sub-markets, which import a significant portion of their renewable energy from the north, this leads to an artificially lower calculated share of renewables. Conversely, northern regions that are net exporters of renewable energy end up with a renewable share exceeding 100%.

[38] https://www.ccee.org.br/documents/80415/30741511/Factsheet%20RES-E%20RFNBO%20JHPA%2025.09.2025%20v1.1.pdf/ea23e568-ae9d-021e-d4a1-92995be5b987

[39] https://eur-lex.europa.eu/eli/dir/2018/2001/oj/eng; the original Directive of 2018 has been changed; the current consolidated version is available under the before-mentioned link.

[40] This equation calculates the "Gross final consumption of electricity from renewable sources in the bidding zone" by taking the "Quantity of electricity produced in a Member State from renewable sources" as the numerator and the "Gross final consumption of electricity in that bidding zone" as the denominator.

- Given this critical uncertainty of these two last topics, it is recommended that Brazilian companies actively participate in discussions with national regulatory bodies (CCEE, MME, and further the European Commission) and advocate for both, a timely and transparent local definition of the bidding zone concept in Brazil, and clarification of the emission calculation method, highlighting the specific challenges faced by the aforementioned southern regions with significant renewable energy imports, and considering the potential impacts of both topics on the projects' decision-making processes.

Additionally, specific recommendations for developers in Brazil were elaborated, focusing on how to make informed decisions and design resilient projects to mitigate the identified challenges and enhance projects' success chances under the RFNBO certification framework:

- The benefit of having **co-products like oxygen** that, in case of being commercialized, enhance projects' viability and are able to reduce the overall emissions was discussed. This follows allocation emissions rules for RFNBO for non-energetic products based on economic value[41]. It is recommended that Brazilian project developers actively explore and develop applications and markets for these co-products (e.g., naphtha, propane, among others) to improve the economic and environmental performance of their hydrogen production.
- In this context, the doubt whether **oxygen is donated** to e.g. a hospital, would be also considered a "commercialized" O_2 with an economic value and thus be applicable for a molecules' carbon intensity reduction, arose. It was concluded that this alternative needs to be further investigated, given that no economic value would be assigned to the product.
- The importance of robust **management systems and data management** from early project stages was highlighted (see section 3.2.6). It is recommended that Brazilian project developers prioritize the implementation of reliable and secure management software and systems for tracking their plants' operations and data, potentially seeking solutions from private providers or advocating for government-supported platforms, such as the ones offered by CCEE[42].

[41] (EU) 2023/1185 of 10 February 2023, Annex Paragraph (4) https://eur-lex.europa.eu/eli/reg_del/2023/1185/oj/eng
[42] http://ccee.org.br/

4 Recommendations for National Regulators and Governments outside Europe

This section covers recommendations for the national regulators and governments to support private companies in the process of certification. For general information, section 3.1 lists and explains the required information and data which should be made available to project developers from official sources. Section 3.2 is aimed at overcoming existing challenges and solving incompatibilities of the respective national regulatory frameworks with EU regulatory requirements by identifying these and providing recommendations on how to handle these issues.

4.1 General Recommendations

Based on the discussions and concerns raised during the workshops, national regulators and governments in any country aiming to foster a renewable hydrogen industry should consider the following general recommendations:

- **Establish clear and consistent regulatory frameworks:** Develop transparent and stable regulatory frameworks that provide long-term certainty for investors and project developers in the renewable hydrogen sector. This includes clearly defined roles and responsibilities of different government agencies involved in permitting, environmental regulations, and certification support. For example, in Brazil, the Câmara de Comercialização de Energia Elétrica (CCEE) has developed a national certification scheme for renewable hydrogen that is aligned with European RFNBO regulatory standards[43]. The scheme was designed to translate the European regulatory criteria into the Brazilian context, incorporating national specifics. At the same time, it is promoted at a governmental level, integrated into Brazil's broader hydrogen strategy and energy permitting environment, facilitating alignment between national permitting/regulation and certification requirements. While countries do not necessarily need to develop their own full-fledged certification systems, national-level efforts can play a critical role in **bridging understanding** between project developers, national institutions and voluntary certification schemes.

- **Raising awareness and building capacity on regulatory requirements**: Given the complexity of European regulations, it is essential to promote a common understanding across stakeholders to rapidly interpret and apply the RFNBO criteria into the local context. This can be achieved through dialogues with the recognized certification schemes, the promotion of pilot (pre-)certification projects, and ensuring that **key European regulatory concepts are reflected in national regulatory decision-making**. These efforts will contribute to reducing barriers and accelerating projects' compliance with RFNBO requirements. For example, some developers may incorrectly assume that all the electricity used in RFNBO production must be renewable, when in fact only the relevant energy inputs, those that contribute to the energy content of the final molecule, are required to come from renewable sources. Auxiliary loads such as water treatment or compression equipment are not classified as relevant energy inputs. If these auxiliary loads are supplied by non-renewable electricity, the resulting hydrogen may have a lower production cost, potentially improving the business case and reducing entry barriers in countries with higher renewable electricity prices. Establishing a **common national understanding** of such distinctions helps create synergies among developers, thereby fostering a more coordinated and competitive national hydrogen industry.

- **Facilitate access to relevant data and analyses:** Ensure that project developers have easy access to reliable and granular data on renewable electricity generation and consumption, grid emission factors, and the characteristics as well as renewability outlook of the electricity system. For example, when governments ensure public and transparent access to information related to grid renewability (following methodologies that align with EU expectations), as well as the traceability of renewable energy certificates or PPAs, they provide greater certainty to both developers and international regulators. Clear oversight and robust data availability strengthen confidence in the traceability and reduce concerns related to double counting or non-compliance. Such measures can effectively lower regulatory barriers and accelerate the development of export-oriented hydrogen markets in third countries.
  There is key information that is needed for demonstrating compliance with temporal and geographical correlation requirements for RFNBO certification.
  - Where the **bidding zones** (see section 3.2.2) are not officially defined yet, public authorities should do the relevant assessments to identify the bidding zone equivalents based on the European requirements and guidance. Such assessments should be made available to project developers and should be submitted to the recognized voluntary schemes[44] for RFNBOs and to the European Commission for formal approval.
  - Given that it is necessary to demonstrate eligibility of my electricity sourcing to be considered as carbon neutral, the **share of renewable energy** in the electricity mix at the national level and at the level of the defined bidding

[43] CCEE Hydrogen and Derivatives Certification System (RFNBO) is undergoing recognition by the European Commission.
[44] https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/voluntary-schemes_en#approved-voluntary-schemes-and-national-certification-schemes

zone may be necessary for hydrogen producers wishing to comply with RFNBO requirements (see section 3.2.3). As the calculation is rather complex, national statistical offices or other public institutions may be charged to do these calculations based on official data and make them available publicly for the benefit of project developers. In the European Union, Eurostat publishes these calculations for the EU Member States and further European countries[45].

- The **greenhouse gas (GHG) intensity of the electricity mix** may be calculated for each bidding zone in the country on an annual basis, depending on the scenario of electricity sourcing. The methods for this calculation are defined in the Commission's Delegated Regulation (EU) 2023/1185[46], which includes the following elements:
  - The GHG intensity of electricity must be determined at the national level or at the level of the bidding zones, but at the level of the bidding zone only if the required data is publicly available. Thus, governments should ensure the publication of the relevant data at the level of the bidding zones.
  - All primary energy sources for electricity generation, the type of installation, conversion efficiencies, and the clean electricity self-consumption of power plants must be taken into account.
  - All CO_2 equivalent emissions related to the combustion and supply of fuels used for electricity generation must be considered (including upstream emissions of fuel supply).
  - Emissions associated with renewable electricity generation (wind, solar, hydro, and geothermal) are considered to be zero.
- **Additional information** may be required from official sources depending on the national context. This could include, in the future, detailed data on shared infrastructure for hydrogen transport, etc.

- **Foster international collaboration and knowledge sharing:** Engage in international collaborations to share best practices regarding regulatory and certification processes, learn from the experiences of other countries in developing a regulatory framework for hydrogen and its derivatives, and promote harmonization of certification standards and regulations where possible. For instance, countries such as **India and Brazil** have already made significant progress in identifying **bidding zones** and developing **national implementation guidelines** to align with EU RFNBO requirements. These countries have also actively engaged with the European Commission and voluntary certification schemes (e.g., CertifHy and ISCC[47]) to clarify the application of additionality, temporal and geographical correlation, and grid renewability rules within their national contexts – all national governments should actively engage with the European Commission and voluntary certification schemes to clarify specific aspects within their national contexts. By participating in international dialogues with such frontrunner countries, emerging hydrogen producers can benefit from existing lessons learned, anticipate compliance challenges, and accelerate the development of clear and consistent national frameworks. Important fora for international exchanges include the IPHE, the IEA, IRENA, the Hydrogen Council, etc. The recognized Voluntary Schemes (CertifHy, ISCC, REDcert) also provide up-to-date guidance on this topic).

- **Consider financial support mechanisms:** Explore and implement financial support mechanisms, such as grants, subsidies, tax incentives, and loan guarantees, to de-risk early-stage green hydrogen projects and make them economically viable. For example, providing financial support for project pre-certification exercises (see section 3.2.5) would enable developers to conduct early assessments of their projects' compliance with RFNBO requirements. These pre-certifications allow for the identification of potential regulatory or technical gaps, such as mismatches in renewable electricity sourcing, CO_2 origin, or monitoring and reporting procedures, before large capital investments are made. By addressing these issues at an early stage, developers can refine project design, ensure regulatory alignment, and avoid costly redesigns or delays during construction and operation.

- **Facilitate stakeholder engagement:** Foster regular dialogue and engagement among government agencies, private companies, local communities, and other relevant stakeholders to ensure that policies and regulations, as well as other concerns and challenges that developers may have, are well-informed and address the needs of all parties.

[45] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Greenhouse_gas_emission_footprints
[46] https://eur-lex.europa.eu/eli/reg_del/2023/1185/oj/eng
[47] https://contact.iscc-system.org/support/solutions/articles/103000361273-how-are-bidding-zones-implemented-in-non-eu-countries-

4.2 Country-specific Recommendations: Challenges and Incompatibilities of Regulatory Frameworks with EU Regulatory Requirements

4.2.1 India

- **CO_2 captured from certain industrial activities** such as e.g. cement and steel plants, etc. can be used for the synthesis of RFNBOs under certain conditions. This includes the requirement that an **"effective carbon pricing system"** is in place in the respective country. The European Commission has published a list of countries; the following systems can be considered to fulfil the requirement of upstream accounting in an effective carbon pricing system:
  - EU ETS which applies in the 30 States of the European Economic Area: the EU-27 Member States and in three EFTA States Iceland, Liechtenstein and Norway,
  - Swiss ETS,
  - UK ETS

  This list is understood to be exhaustive, i.e. no other country has an "effective carbon pricing system" with respect to RFNBO certification. The Commission may extend this list based on requests from other countries. For RFNBO production in India, the Indian government would have to contact the European Commission, DG ENER, and request the Indian emission trading system (CCTS) to be included in this Commission list.

- **Special economic zones** are established in India to incentivize exports of products (see section 3.2.4). The specific conditions applicable in such zones are complex – clarifications of whether they constitute "support" in the sense of the additionality requirements of RFNBO certification or not is specifically relevant. This would address the concerns of developers regarding potential conflicts and eligibility for RFNBO status. The Indian government may support project developers in clarifying this issue, and should engage with the European Commission, DG ENER, for aligning on this topic.

- An exchange between the Indian government and the European Commission was launched in November 2024 on clarifying the **bidding zones in India** (see section 3.2.2) for the purpose of RFNBO certification. This process should be brought to a close in the near future in order to provide clarity to all stakeholders. One element making the identification of bidding zones in India particularly complex resides in the regional electricity markets: while in formal terms each bid area in India has a separate pricing mechanism of electricity at hourly level, which would make each Indian "bid area" the equivalent of a European "bidding zone", the prices in the bid areas are identical except for a few hours per year. Considering restructuring the Indian electricity market could be beneficial for RFNBO certification without compromising the functionality of the electricity market.

- The **grid fees** for transporting renewable electricity in India may be waived for a certain time as a means to foster renewable electricity deployment for hydrogen production. Where this waiver excludes the issuance of **renewable energy certificates** (RECs) or Energy Attribute Certificates (EACs) for the electricity producer, the electricity cannot be used for RFNBO production as the cancellation of such certificates is mandated by Voluntary Schemes. The Indian government may consider revising such provisions.

4.2.2 Colombia

Addressing the needs and challenges identified by workshop participants, the following recommendations are made for the Colombian government to foster a supportive environment for the renewable hydrogen industry and facilitate RFNBO certification in Colombia.

The repeated call for dialogue with the European Commission requires that the Colombian government proactively initiates and maintains communication channels to discuss specific national circumstances and concerns raised during the workshops, related to the local translation of the RED II criteria. GIZ's facilitation of these conversations may be crucial.

As mentioned in the previous chapter, concerns regarding financial support for renewable energy installations, specifically in relation to the bills being evaluated that propose exemptions from transmission tariffs for RES plants, highlight the need for the Colombian government to engage with the European Commission. This engagement should aim to promote the provision of clear and consistent guidelines on such support mechanisms, explicitly clarifying their compatibility with the European RED II criteria for RFNBO and addressing any potential conflicts.

Given the need for project developers to access key information and data at the bidding zone level to assess project compliance (e.g., grid emission factors and the share of renewables in each bidding zone), the workshop highlighted the importance of the Colombian government, together with the national electricity operator, to actively work toward the prompt definition of bidding zones validated by the European Commission. This would clarify the applicable regulatory scope and enable the establishment of a clear national strategy for calculating and publishing accurate grid emission factors and renewability shares per bidding zone, in alignment with RED II requirements. This effort should also take into account the necessary temporal and spatial granularity of the required information to support developers' analyses.

4.2.3 Brazil

Based on the discussions and concerns raised during the workshops in Brazil, the following recommendations are directed at the Brazilian government to support private companies in the RFNBO certification process and foster the growth of the hydrogen industry in the country.

One key point raised during the workshop was the perception among participants of a lack of financing schemes tailored to the region or country that meet the RED II requirements for RFNBO production. This situation translates into reduced competitiveness for projects developed in Brazil compared to those in other regions, either due to their geographic proximity to target markets or access to more favourable financial mechanisms that enable higher profitability (specific example: H2Global South American and Oceanian Tender Lot, where Power-to-X projects of LAC region compete in the same tender lot with projects located in Australia, where much more public funding is available and granted to Power-to-X project developers and H2 Hub Initiatives). The potential absence of similar financial support is very likely limiting the ability of South American Power-to-X-projects to compete on equal footing, underscoring the need to promote and attract financing opportunities specifically designed for the Brazilian context.

Also, the Brazilian government should proactively engage with the European Commission to discuss several still pending aspects that impact Brazilian PtX projects:

- Discuss the **eligibility of CO_2 captured from industrial activities in Brazil for its use in RFNBO production,** as outlined in section 2.3.4., as well as clarifying the case of donating O_2 to e.g. a hospital that won't pay for it.

- **Advocate for a re-evaluation of the renewable energy share calculation methodology in Article 7(2) of Directive (EU) 2018/2001.** Under the current methodology, zones with high levels of imported renewable electricity may appear to have lower renewable shares (see section 3.2.3), which can disadvantage projects that would otherwise be eligible to connect directly to the grid and benefit from a system exceeding 90% renewable electricity, thus qualifying for RFNBO production under less stringent criteria. This issue particularly affects Brazilian sub-markets with substantial renewable imports (notably in the South), highlighting the need to propose a more equitable and context-sensitive calculation method.

- **A potential challenge identified during the workshop** was the possibility of a future shortage of certification bodies capable of conducting RFNBO certifications, particularly in countries outside the European Union. Participants expressed concern that this could become a bottleneck for project certification, potentially slowing down the verification and market entry of renewable hydrogen and its derivatives. Under current EU rules, RFNBO certification bodies must be **accredited by a national accreditation body belonging to an EU Member State**, which generally requires the certification entity to hold a **legal presence within the EU**. This framework could limit the immediate availability of certification services in third countries, especially during the early stages of market expansion. To address this potential constraint, it was suggested that governments, such as Brazil's, could promote exploring mechanisms that facilitate recognition or collaboration to **train and qualify local auditors** as part of European Certification Bodies, thereby strengthening local capacity, reducing logistical constraints, and supporting a smoother certification process as project pipelines grow.

5 Recommendations for European Regulators

This section summarises recommendations for action by European regulators on the one hand, to address the previously identified regulatory incompatibilities from the European end. On the other hand, required clarifications on how concepts defined in the EU-context can be applied in non-EU countries are pointed out. Where possible, country-specific recommendations are included.

5.1 General aspects

Stakeholders stressed the need for a clear explanation by the European Commission of how the Union Database will function for RFNBOs, including who must register what information, how it will be accessed, and how the PoS system will ensure compliance across the value chain. Clear and concise documentation on the Commission website for the UDB would be an important basis, webinars with Q&A sessions would be appreciated.

Furthermore, it is important that the European Commission in collaboration with the EU Member State governments ensures alignment of national databases with the Union Database, and that economic operators are not required to have double administrative burden of providing the same input both to the Union Database and additionally to national databases. Alignment between the European Commission and the EU Member States is necessary

5.2 Addressing Regulatory Incompatibilities

European regulators should provide clear guidelines on how **national renewable energy incentives in non-EU countries** (e.g., Colombia's draft law on transmission subsidies) are viewed within the context of RFNBO certification. Clarity is needed on whether projects benefiting from transmission incentives can still meet the additionality criteria and how these incentives might impact the assessment of market distortions. In more general terms, detailed clarifications are needed of what constitutes "support in the form of operating aid or investment aid" and what does not. Special economic zones are established in many countries to incentivize exports of products (see section 3.2.4 for more details). The specific conditions applicable in such zones are complex – clarifications of whether they constitute "support" or not is specifically relevant. This would address the concerns of developers regarding potential conflicts and eligibility for RFNBO status.

It is also required that these institutions provide clarification on whether it is possible to **use CO_2** as an emission-saving alternative (within the *ex-use* GHG emissions intensity calculation RED II formula for RFNBOs) when it originates from an industrial process in countries where no Emissions Trading System (ETS) is in place. Also, where a carbon pricing system is in place, it is unclear how to establish whether it is "effective" in the sense of RFNBO certification. The European regulators should publish guidelines for third countries on how to apply for a carbon pricing mechanism to be recognized as "effective" by the European regulators. This clarification is crucial for project developers considering such carbon capture and utilization pathways, both within Europe and potentially in collaboration with projects in non-EU countries like Colombia, Brazil or India. Understanding the eligibility of this CO_2 source will impact the economic viability and sustainability assessments of these projects under the RFNBO framework.

To directly address the expressed discouragement and uncertainty regarding the short-term market for RFNBOs and the lack of anticipated premium prices, the European regulators should implement **targeted short-term incentives and mechanisms** to de-risk early-stage projects. These measures would provide the necessary price signals and revenue certainty to overcome initial market hesitations, encourage investment, and facilitate the entry of producers, potentially including those from countries like Colombia, aiming to be early participants in the global RFNBO market. Such "targeted short-term incentives" may be Contracts-for-Difference Schemes specifically for Brazilian Power-to-X projects, that additionally should be molecule-specific, not as per the current tender energy content based, thus enabling competition of the same product types (ammonia or methanol or e-SAF) within the same region or, even better, economy. In this context, attendees to the workshop expressed concern that current support mechanisms tend to favour projects located geographically closer to Europe, which are perceived as more immediately attractive or logistically convenient for European offtakes. This situation risks excluding more distant yet highly competitive producers, such as those in Latin America or Africa, from benefiting from the first wave of hydrogen industry incentives.

5.3 Clarifications on the Application of EU Concepts in Non-EU Countries

5.3.1 Bidding Zones

European regulators should provide official statements of the application of the **"bidding zones"** concept in non-EU countries. This could involve outlining the key principles of bidding zones in each country and allowing for flexible implementation based on local grid characteristics. A list of countries should be established officially by the European regulators with the relevant information per country. This could be established for the most relevant third countries and enlarged over time. This is essential to streamline and facilitate decision-making of hydrogen project developers in these countries, as it has been identified as one of the main bottlenecks during the workshops in all three countries (India, Colombia, Brazil).

Clarifications on bidding zones are required now as project development relies heavily on the bidding zone equivalents. It is not sufficient to clarify the bidding zones in actual certifications, as clarity is required in early phases of project development, i.e. 3-5 years before certification and the start of operations!

5.3.2 Smart metering system

Support from European regulators with more practical guidance on the implementation of **smart metering** requirements in non-EU countries, would be very valuable for project developers. This could include outlining the key functionalities required and suggesting adaptable solutions that consider the existing metering infrastructure and technological capabilities in these regions. Addressing the cost implications of smart metering deployment in non-EU contexts would also be beneficial.

5.3.3 Renewable share and emissions intensity of the grid mix

While RED II specifies the use of public data and methodologies for calculating **grid emission factors and renewable shares** (see section 3.2.3), further guidance on how non-EU countries can accurately determine and report these factors, especially in the absence of fully liberalized markets or transparent data availability, would be valuable. Collaboration with international organizations to develop standardized approaches could be considered. This concern has been raised by government institutions and national electricity market operators, who have expressed a lack of clarity when applying these methodologies and identifying the type of information they are expected to provide. For example, in Brazil, when applying the methodology to calculate the carbon footprint of the grid, the northern sub-markets end up with renewable shares greater than 100%. This raises questions and uncertainty within the stakeholders responsible of providing this kind of information, as they struggle to fully understand the applicability or meaning of such a result.

In relation to this same topic, it could be extremely valuable if the European Commission re-examine the calculation methodology in Article 7(2) of Directive (EU) 2018/2001[48], considering the concerns raised about its negative impact on regions that import significant amounts of renewable energy, such as the southern sub-markets in Brazil. A more equitable approach that accounts for **imported renewable energy** in the numerator for consuming regions should be explored.

5.3.4 Accreditation of certification bodies

An important point raised during the workshops in South America was the limited capacity of **accredited certification bodies** to meet the potential demand from both EU and non-EU projects. Exploring mechanisms to recognize or partner with credible certification bodies based in non-EU countries like Brazil could also be considered.

5.3.5 Common use infrastructure

While **common use infrastructures**, e.g. hydrogen pipelines transporting hydrogen from production sites to further processing sites and/ or port terminal for loading onto ships may allow tapping important synergies, their applicability and the calculation of GHG emissions associated to their use require clarifications. This issue has not yet been fully clarified at European level, neither for Europe nor for third countries. Such clarification should also include the possible sources of relevant data, e.g. the infrastructure operators (public or private). Furthermore, it needs to be clarified under which conditions or in which circumstances hydrogen or gas grids are recognized as one logistical facility for RFNBO certification. While the European Union gas grid is considered a single logistical facility according to RED II, hydrogen or gas grids outside the EU do not seem to be considered one logistical facility. This issue requires clarifications on the following aspects:

[48] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018L2001

- Does RFNBO certification allow using Common Use Infrastructure?
- Which data sources are accepted?
- How to apply mass balancing?
- How to calculate GHG emissions? E.g. can fully renewable energy be used to power such infrastructure?

Clarifications are required on how to deal with **desalination plants** in terms of GHG calculations, use of renewable electricity, PPAs, etc. Stakeholders require clear guidelines of how to establish the emissions intensity of electricity used for sea water desalination; uncertainty exists notably on the exact understanding of term "same industrial complex" (see section 2.6.1).

5.3.6 Interplay with CBAM

Both RFNBO certification and the EU **Carbon Border Adjustment Mechanism (CBAM)** apply to hydrogen and ammonia production and export to Europe including certified/ verified GHG calculations. However, the requirements, processes and stakeholders involved are different. Stakeholders in third countries would benefit from clarifications on the relationship between RFNBO certification and CBAM verification and requirements. In line with this, clarification on how ReFuelEU Aviation and FuelEU Maritime interact with RED would also benefit stakeholders pursuing opportunities in the maritime and aviation sectors. E.g. could the verification of the GHG calculations for RFNBO and for CBAM be carried out by the same auditor in the same audit process? The European regulators responsible for the two pieces of legislation should provide co-ordinated information and clarifications in order to allow for tapping synergies.

6 Abbreviations

ANP	National Oil Agency (Brazil)
CBAM	Carbon Border Adjustment Mechanism
CCEE	Câmara de Comercialização de Energia Elétrica (Brazil)
CCTS	Carbon Credit Trading Scheme (India)
CCS	Carbon Capture and geological Storage
CDR 1184	Commission Delegated Regulation 2023/1184
CDR 1185	Commission Delegated Regulation 2023/1185
CDR 2359	Commission Delegated Regulation 2025/2359
CREG	Energy and Gas Regulation Commission (Colombia)
EAC	Energy Attribute Certificate
ETS	Emission Trading System
EU	European Union
FEED	Front End Engineering Design
FFC	Fossil Fuel Comparator
GHG	Greenhouse Gas
GO	Guarantee of Origin
H_2	Hydrogen
I-REC	International Renewable Energy Certificate
ISTS	Inter-State Transmission System (India)
KOH	Potassium Hydroxide
KYC	Know your customer
LAC	Latin America and the Caribbean
LCF	Low-Carbon Fuel
LCOH	Levelized Cost Of Hydrogen
MME	Ministry of Mines and Energy (Colombia)
MNRE	Ministry of New and Renewable Energy (India)
O&G	Oil & Gas
ONS	National System Operator (Brazil)
PNH_2	National Hydrogen Program (Brazil)
PoS	Proof of Sustainability
PPA	Power Purchase Agreement
PtX	Power-to-X
REC	Renewable Energy Certificate
RED II	EU Renewable Energy Directive (recast)
RED III	Amendments to RED II adopted in 2023
RES	Renewable Energy Source
RFNBO	Renewable Fuel of Non-Biological Origin
SAF	Sustainable Aviation Fuel
SBCE	national Emissions Trading System (Brazil)
SHPP	Small Hydro Power Plant
SIN	Sistema Interconectado Nacional (Brazil)
SIN	National Interconnected System (Colombia)
UDB	Union Database
ZNI	Non-Interconnected Zone (Colombia)