



Taking CertifHy to the next level - Roadmap for building a dual hydrogen certification infrastructure for Guarantees of Origin and for Certification of renewable hydrogen in transport

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Key definitions used in CertifHy

Certification System ¹	A legislative, administrative and/or contractual framework establishing a system of certificates.
Certificate ²	A certificate, record or guarantee (in any form including an electronic form) in relation to: attributes of the Input consumed in the production of a quantity of Output, and/or attributes of the method and quality of the production of a quantity of Output.
CertifHy Guarantee of Origin (GO) ³	An electronic document which provides proof that a given quantity of hydrogen was produced by a registered production device with a specific quality and method of production and which is maintained on a CertifHy Registry.
CertifHy Pilot	Consists of four hydrogen producing pilot plants to test the challenges of issuing GOs for different green/low carbon hydrogen producing pathways, as well as setting up a.
CertifHy Certification System	A system consisting of a dual “infrastructure” for tracking product characteristics suitable for various purposes: customer disclosure (GO according to art. 19 REDII), and certification of quantities contributing to the renewable fuels targets (according to Art. 3 and Art. 25 REDII) and possibly other energy and climate targets.
CertifHy Scheme document	A document outlining the overarching architecture / requirements of the CertifHy GO scheme. Defines the core principles of the CertifHy GO scheme
CertifHy procedure	A set of CertifHy Scheme subsidiary documents that specifies the procedures for a specific actions, such as GO issuing, transfer, cancellation, expiry, registration of account holders, etc.
CertifHy H ₂ criteria	Hydrogen must fulfil certain criteria in order to be labelled “CertifHy green hydrogen” or “CertifHy lo-carbon hydrogen”. Relevant ‘CertifHy H ₂ criteria’ are specified in a CertifHy Scheme Subsidiary Document.

¹ See EECS Rules of 26 March 2018: <https://www.aib-net.org/eees/eeesr-rules>

² Ibid.

³ Ibid.

Synthesis

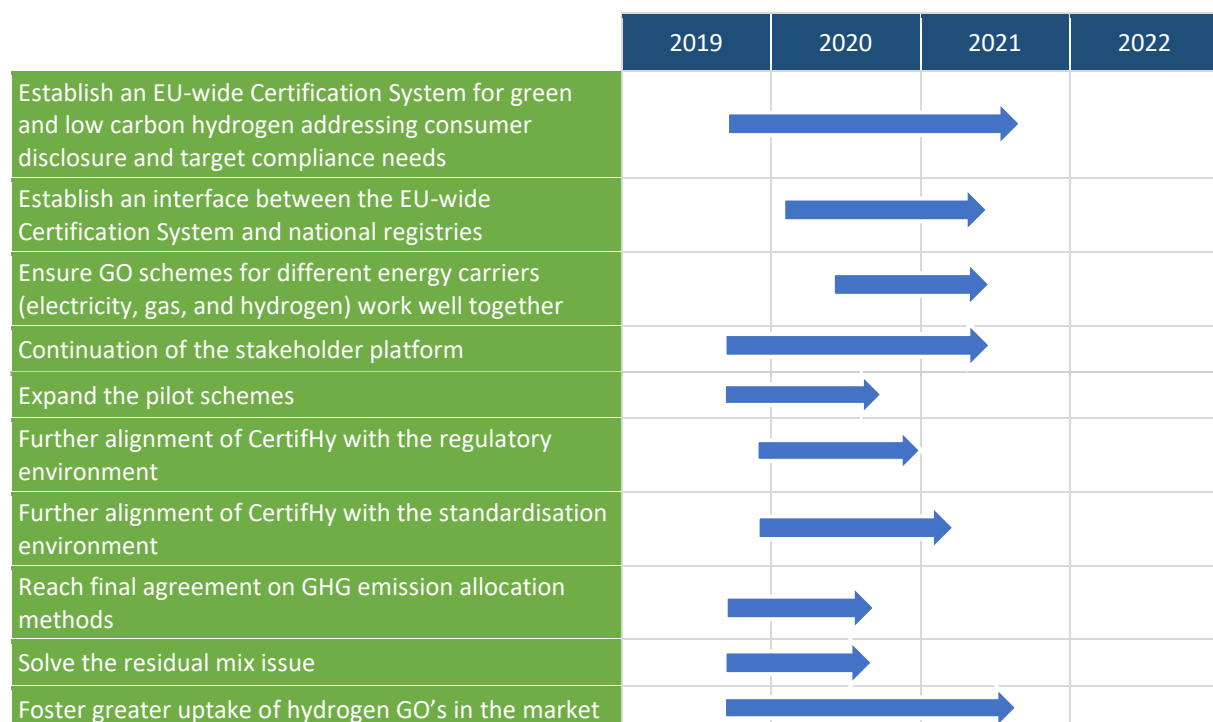
This document presents an updated Roadmap with key ambitions and actions for building a dual hydrogen certification infrastructure for Guarantees of Origin (GOs) and for Certification of renewable hydrogen in transport.

Between 2014 and 2016, the CertifHy (CertifHy 1) project brought together multiple stakeholders to develop an EU-wide green and low carbon GO scheme. As a final output, the CertifHy 1 project presented a roadmap with concrete steps for the implementation of an EU-wide GO scheme. A follow-up CertifHy study (CertifHy 2) was initiated in October 2017 to continue the momentum built by the first CertifHy project and to serve as a catalyst for establishing and implementing an EU-wide GO scheme for green and low carbon hydrogen.

A key objective in CertifHy 2 has been to gain practical experience with an operational pilot GO scheme, in order to ensure that all the practical issues raised by the implementation of the newly designed GO scheme for hydrogen are identified and addressed. A CertifHy Stakeholder Platform, consisting of a Steering Group, 4 Working Groups and a Secretariat, has governed the process.

The overarching ambition for the next CertifHy phase is to create an EU-wide *CertifHy Certification System* that **covers both GOs and Certificates** and, next to providing a Central European issuing body and registry, is capable of interfacing with national registries as well as with other energy carriers.

The key Roadmap actions & milestones to achieve this overarching ambition can be summarised as follows:



About this Roadmap

This document presents an updated Roadmap of the CertifHy project.

The objective of this updated Roadmap document is to present ambitions and actions for building a dual hydrogen certification infrastructure for Guarantees of Origin (GOs) and for Certification of renewable hydrogen in transport.

How to read this Roadmap:

- Part I “Setting the Scene” includes a brief presentation of the project background, summary of key developments underpinning the relevance of hydrogen, and the objectives of the second CertifHy phase.
- Part II “CertifHy progress and achievements” gives a brief summary of experience gained with the CertifHy pilot scheme and the involvement of CertifHy Platform stakeholders in addressing issues and challenges related to among others the scheme design and regulatory framework.
- Part III ‘Updated Roadmap ambitions and actions’, these are the ambitions and actions for the next phase of CertifHy.

The target groups for this Roadmap include policy and decision makers, producers and offtakers of hydrogen and other relevant industry players, traders and brokers, and all other parties interested in GOs as a means to promote green and low carbon hydrogen.

Part I: Setting the scene

1.1 Background: CertifHy 1 and the importance of GOs

The FCH 2 JU⁴ funded project CertifHy was established in June 2014 to develop a European Framework for the generation of Guarantees of Origin (GOs) for green and low carbon hydrogen. A GO is per definition an instrument that labels the origin of a product and provides information to customers on the source of their products. It operates as a tracking system ensuring the quality of a product such as hydrogen or electricity. Running through to October 2016, the first CertifHy project successfully delivered a definition for green and low-carbon hydrogen which was widely accepted among stakeholders, a GO scheme outline, and a roadmap for the implementation of such an initiative throughout the EU.

1.2 Increasing relevance of hydrogen

Due to its versatility, abundance and practical benefits, green and low carbon hydrogen offers one of the main pathways to decarbonisation - at scale and across all sectors (Hydrogen Council, 2017). Since the start of CertifHy 1 there have been several important developments underpinning the relevance of hydrogen. These are briefly presented in the following bullets:

- **UNFCCC - the Paris Agreement:** This agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C. It was signed at the Paris climate conference (COP21) in December 2015, 195 countries adopted a legally binding global climate deal, the so-called UNFCCC Paris Agreement⁵.
- **New EU decarbonisation scenarios:** A recent policy document from the European Commission is the Communication on a strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050 (COM(2018) 733)⁶. It presents a vision for a transition to a climate neutral economy by 2050, i.e. Europe's net GHG emissions will be zero in 2050, and highlights the role hydrogen can play in several different pathways towards net zero emissions by 2050. The strategy is in line with the Paris Agreement objective.
- **Hydrogen Council:** Launched at the World Economic Forum 2017, in Davos, the Hydrogen Council was formed to both underpin and leverage the enabling role of hydrogen. The Hydrogen Council is a global initiative of leading

⁴ Fuel Cell and Hydrogen 2 Joint Undertaking: <https://www.fch.europa.eu/news/fuel-cells-and-hydrogen-2-joint-undertaking-fch-2-ju-under-horizon-2020-launch-activities-and-f>

⁵ https://unfccc.int/sites/default/files/english_paris_agreement.pdf

⁶ https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf

companies within energy, transport and industry jointly working to promote hydrogen as a key component of the energy transition, and has the ambition to: Accelerate their significant investment in the development and commercialization of the hydrogen and fuel cell sectors; and Encourage key stakeholders to increase their backing of hydrogen as part of the future energy mix with appropriate policies and supporting schemes.

- **Mission Innovation:**⁷ - a coalition of 22 governments working to accelerate the clean energy revolution - announced in May 2018 the launch of the “Hydrogen Innovation Challenge” aiming to reduce costs along the value chain and further expand the deployment of hydrogen. Mission Innovation consists of a number of different Innovation Challenges, of which Innovation Challenge 8 (IC-8) has the objective to accelerate the development of a global hydrogen market by identifying and overcoming key technology barriers to the production, distribution, storage, and use of hydrogen at gigawatt scale. IC-8 was launched at the third Mission Innovation Ministerial (Berlin in October 2018), to address the need for further technology improvements to enable hydrogen to be cost-competitive in the energy system.
- **Linz Hydrogen Declaration:** Another important initiative established during the Austrian Presidency to the European Union in September 2018, is the Linz declaration. This declaration was signed in Linz, Austria by the European Commission, 25 Member States, 2 provinces (Upper Austria and Zuid-Holland) and 86 companies and organisations. It presents a new initiative in support of sustainable hydrogen technology for the decarbonisation of multiple sectors and the energy system, for the long-term energy security of the EU. Acknowledging climate change as a common global challenge and focusing on our commitments to the UNFCCC, the signatories underline the key role of sustainable energy technologies in the targeted process of decarbonisation.

1.3 CertifHy 2: aim and approach

A follow-up CertifHy study was initiated in October 2017 to continue the momentum built by the first CertifHy project and to serve as a catalyst for establishing and implementing an EU-wide GO scheme for green and low carbon hydrogen. The initial objective of the second CertifHy project has been to focus on defining a scheme governance as well as processes and procedures over the entire GO life cycle: from auditing hydrogen production plants, to certification of green or low carbon hydrogen production batches, and then to the issuing, trading to “usage” of GOs. As such, three important components of the second CertifHy project have been to

⁷ https://unfccc.int/sites/default/files/english_paris_agreement.pdf

- (1) set up and run a pilot GO scheme in order to gain practical experience and lessons learned for a large scale EU wide scheme, and
- (2) establish a well-functioning Stakeholder platform, acting as a governance framework.
- (3) ensure compatibility with EU legislation, in particular REDII (see **Box 2**).

Based on the lessons learned within the second CertifHy project as well as recent policy developments at EU-level, this updated roadmap presents ambitions and actions for the roll-out of an EU-wide certification scheme (see Part III of this Roadmap).

Why is a certification scheme important for the development of hydrogen as an energy carrier? The answer is simple. Next to conventional hydrogen produced from fossil resources, there is also at present a demand for green and/or low-carbon hydrogen (also referred to as premium hydrogen), which is projected to increase. As shown by the first CertifHy project, there is a significant potential and demand for premium hydrogen in several sectors, including transport and refining as well as in the steel, chemicals and other industries. In order to allow such premium hydrogen to be traded through conventional infrastructure, evidence of the premium production of hydrogen will need to exist. Both GOs and certificates can make this possible. Furthermore, a certification scheme for premium hydrogen empowers consumers to make informed choices based on transparent and reliable information, and thus to buy green or low-carbon hydrogen in full transparency.

A first description of CertifHy vision, mission and goal was presented in the first CertifHy roadmap⁸. Box 1 below provides an updated description of CertifHy's vision, mission and goal statements.

Box 1: CertifHy vision, mission and goal statements

CertifHy Vision	"A mature market for green and low carbon hydrogen so that the added value of these products can be made monetary."
CertifHy Mission	"Advance and facilitate the production, procurement, and use of hydrogen fulfilling ambitious environmental criteria in order to protect the climate and improve the living conditions of humankind."
CertifHy Goal	"Contribute to and promote an environmentally, socially and economically sustainable production of hydrogen in all uses including, among others, energy, mobility, chemical conversion."

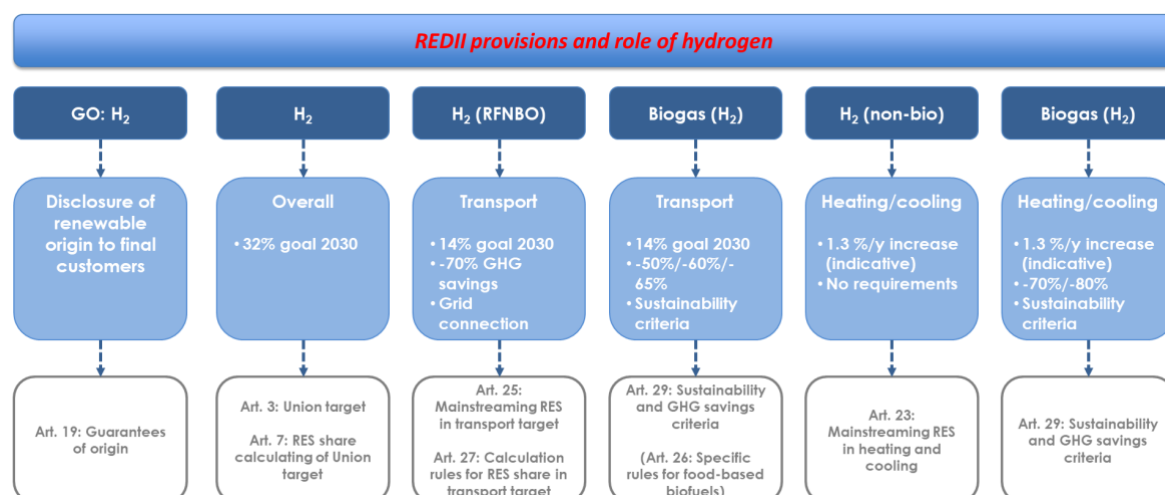
⁸ www.certifhy.eu/images/media/files/D5_1_Implementation_Roadmap-v15-final.pdf

Box 2: EU policy and legislation on the promotion of renewable energy and hydrogen

EU has made progress with regard to updating its energy policy framework so as to facilitate a clean energy transition and to make it fit for the 21st century. In November 2016, the European Commission presented its “Clean Energy for All” package, consisting of several legislative proposals, including the recast Renewable Energy Directive proposal (REDII).

REDII was finally published in the Official Journal of the European Union in December 2018. It covers the 2021 - 2030 timeframe, and Member States are required to transpose the directive into national legislation by June 2021. REDII sets an EU-wide binding renewable energy (RES) target of at least 32% by 2030, by which time GHG emissions are to be reduced by 40% with respect to 1990 levels. It also sets a 14% renewables in transport fuels by 2030 target, and a 1.3% yearly increase in the share of RES in heating and cooling. REDII introduces new and strengthened requirements regarding guarantees of origin as well as strengthened sustainability and GHG emission savings criteria. REDII also sets requirements and limitations for what may count towards the respective targets. However, some issues have yet to be addressed in delegated acts, due in 2021.

REDII covers hydrogen in a variety of aspects, as shown in figure below. Whilst covering hydrogen in transport (as well as the heating and cooling sector), REDII does not focus on the use of hydrogen in other important sectors, such as ammonia production and steel making. Nor does it cover non-renewable low carbon hydrogen.



In REDII the purpose of GOs continues to focus on consumer disclosure. However, the obligation on Member States to facilitate the issuance of GO, currently in place for renewable electricity and renewable heating and cooling, will be extended to cover renewable gas (including hydrogen), whilst also encouraging Member States to extend GOs to include non-renewable energy.

Part II: CertifHy progress and achievements

2.1 Point of departure for CertifHy 2

Between 2014 and 2016, the CertifHy project brought together multiple stakeholders to develop an EU-wide green and low carbon GO scheme. In addition to definitions for green and low-carbon hydrogen (and related considerations and impact of GHG thresholds in both definitions), it developed a first CertifHy scheme outline. Figure 1 presents a schematic overview of the key components of a GO scheme. In order to participate in this GO scheme every legal entity, i.e. accreditation body, certification body, production device, auditor, registry and account holder, has to comply with specific requirements. Experience gained by other schemes, such as the European Energy Certificate System (EECS)⁹ for renewable electricity GOs and national certification schemes for green gas/biomethane, proved to be an important input for developing this outline. Additionally, the first CertifHy project analysed the hydrogen market and the appetite for green and low carbon products. Concrete steps for the implementation of an EU-wide GO scheme were presented in a first CertifHy roadmap¹⁰.

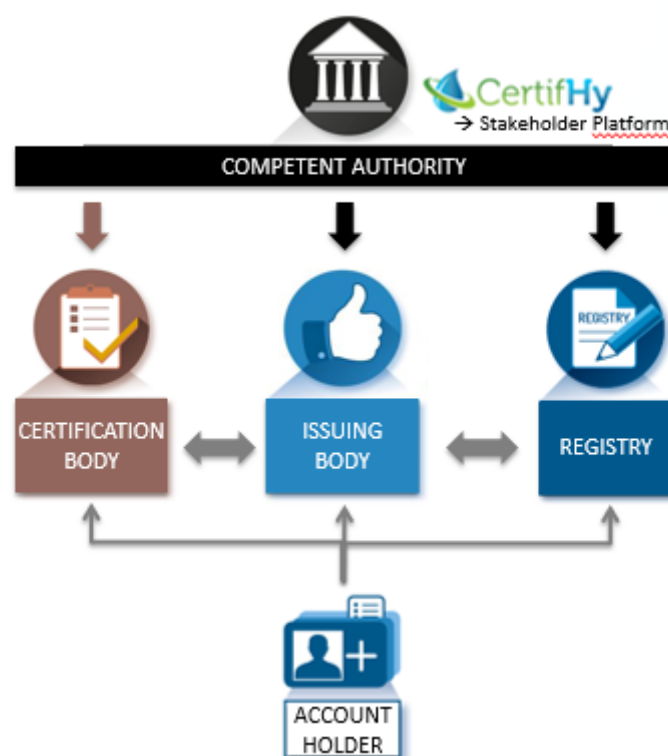


Figure 1: Organisation of a GO scheme.

Figure 1 represents an important starting point for CertifHy 2 (see chapter 2.3 for further details).

⁹ <https://www.aib-net.org/eecs>

¹⁰ https://www.certifhy.eu/images/media/files/D5_1_Implementation_Roadmap-v15-final.pdf

2.2 Governing the CertifHy process

CertifHy has established a highly inclusive and successful governance structure consisting of the following bodies: the Stakeholder Platform, the Steering Group, 4 Working Groups and a Secretariat. Figure 2 below is a schematic representation of the different governance bodies and their interactions (incl. with the Project Team).

An overview of the different stakeholder platform bodies, summarising their role in CertifHy as well as their powers, can be found in Annex II.

The Stakeholder Platform has brought together a large number and wide range of stakeholders that have allowed for stakeholder views and interests to be considered in the elaboration of the CertifHy scheme. It has functioned as a forum for discussion and as a channel through which CertifHy has been shaped: it has supported the implementation of the GO scheme and help gather momentum. A total of 2 Stakeholder Platform Plenary Sessions have been organised over the duration of CertifHy 2; a first plenary inform on the project development, and a final plenary to validate the results of the study.

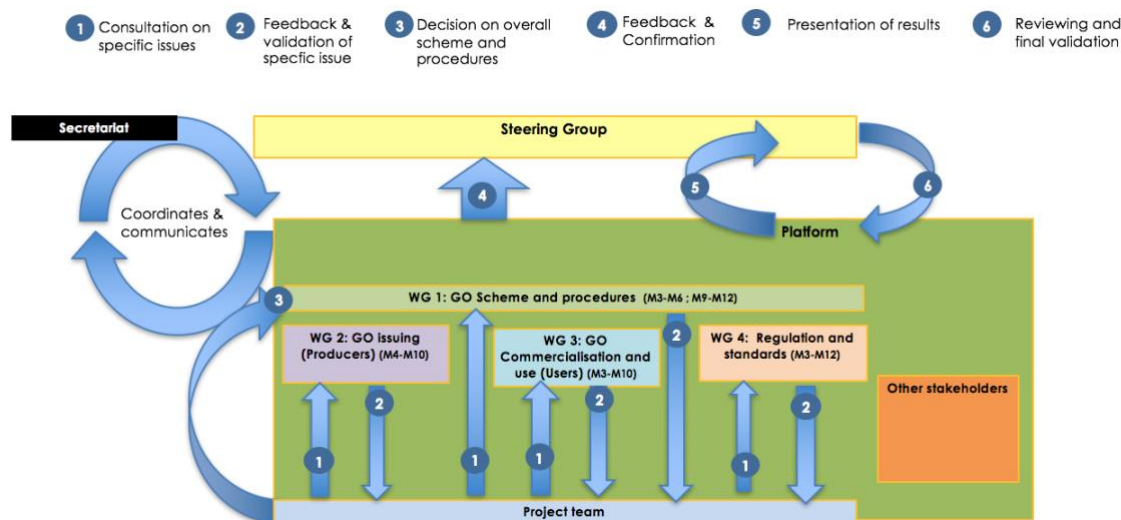


Figure 2 Schematic representation the CertifHy stakeholder platform; its bodies and their interactions

The Steering Group is the Platform's decision-making and conflict resolution body. It has been active during the CertifHy 2 project, and has been consulted on key issues and provided advice on how to resolve these. It has endorsed the final design of the CertifHy Scheme and its subsidiary documents, and this Roadmap. The 4 Working Groups (WGs), with representative of all actors across the GO value chain (see Figure 3 below), have been consulted to provide input on specific issues within their remit:

- WG 1 has contributed to the design of the overall GO scheme, providing information on how (other) GO schemes function, and what documents need to be developed to ensure the scheme is functional.
- WG 2 has focused on reaching consensus on the requirements which should apply to hydrogen production sites. WG 2 has also focused on gathering practical input from GO issuers (hydrogen producers) on their ability to collect and share information to determine whether their hydrogen production can be labelled as Green or Low Carbon.
- WG 3 has provided input on what information Green and Low Carbon hydrogen users need from the GO, and sought to define end-user expectations and requirements for a Green Hydrogen GO scheme.
- WG 4 has focused on identifying alignment issues with current and upcoming regulation, including evaluating whether the current REDII Directive presents any barriers to the proposed EU-Wide Green Hydrogen GO scheme.



Figure 3: Overview of member organisations of the CertifHy Platform Working Groups

2.3 Gaining practical experience with CertifHy GOs

A key objective in CertifHy 2 has been to gain practical experience with an operational pilot GO scheme, in order to ensure that the practical issues raised by the implementation of the newly designed GO scheme for hydrogen (see section 2.5) are identified and addressed.

For this purpose, a pilot scheme was launched consisting of four different producers with different production pathway which will lead to the issuance of GOs to the market. These four pilot plants were chosen in order to test different complexities

and challenges in the full chain from auditing the plants to verification of hydrogen production batches and handling GHG allocation to the issuance of GOs. Key characteristics of these pilot plants, including H₂ production capacity, and use cases for H₂ GOs are presented in Table 1. The CertifHy pilot comprises setting up a registry and a body to handle the issuance, transfer and cancellation of the GOs.

Implementation of the CertifHy scheme criteria was prepared through case studies addressing each pilot, in order to define precisely the data to be collected and how it should be processed to demonstrate compliance with the CertifHy requirements. A number of questions were raised through this process which were addressed through stakeholder consultation. The topic that required the most discussion and exchange was the GHG intensity calculation method to be applied for the particular cases of hydrogen from an SMR plant with carbon capture and utilisation (CCU) and for hydrogen from a chlor-alkali plant.



SMR Port Jerome | France

The pilot plant by Air Liquide produces Low Carbon hydrogen using steam methane reforming with a Carbon Capture unit or Green Hydrogen using BioMethane as feed gas.



Water electrolysis | Belgium

The pilot of the retailer Colruyt Group produces Green Hydrogen with electrolysis for their forklifts, heavy duty vehicles and passenger cars.



Chlor Alkali process | Netherlands

The pilot demonstration by Nouryon and Air Products uses a chlor alkali process to produce Green Hydrogen in Rotterdam Botlek.



Windgas Falkenhagen | Germany

The pilot by Uniper produces Green Hydrogen from wind energy via water electrolysis, that can be fed into the natural gas grid or used as input for methanation.

Where necessary, scheme procedures were adapted for pilot implementation, in order to stay within the time and resource limitations of the pilot. This includes a plant audit covering both the plant and the first production batch in order to avoid the delay caused by a sequential approach, which is the one required in a fully operational context.

The four pilot plants were recognised as meeting the defined requirements, and production batches validated for issuing GOs for each of them.

In parallel, a GO registry system was developed, which was obtained by adding hydrogen GO functionality to an existing operational GO registry system for electricity commissioned by Grexel. This IT system includes the user interfaces for registering plants, for opening accounts, for requesting GO issuing, and for GO cancellation or transfer. The system also allows account holders to consult their account, and the public at large to visualise charts on activity (list of plants, list of account holders, number of GOs issued, number of GOs cancelled).

The first renewable hydrogen GO was issued in December 2018. By late April 2019, 10 organisations are registered as account holders in the registry service, these represent producers and GO traders, and several additional companies have shown an interest in opening an account in the CertifHy register. Furthermore, more than 2800 renewable hydrogen GOs have been issued and close to 1660 GOs were cancelled.¹¹

A monitoring plan was developed to allow for collecting qualitative feedback on the operation of the scheme across the different functional steps (from audit to issuing to cancellation).

2.4 Towards estimating the costs and revenues of an EU-wide GO Scheme

A cost & revenue model was developed to estimate the costs and possible revenue streams of a complete GO scheme.

Two configurations were studied: (i) implementation of a single registry and issuing body at EU level, (ii) extension of existing registries for electricity or gas GO in each country to cover hydrogen GOs.

Based on rough estimates of the yearly operating costs of the different functional elements of a GO scheme (registry operator, issuing body, accreditation body, competent body, hub in the case of national registries), the total yearly cost of a central EU registry-based GO system is estimated at 1.3 M€, whereas the total yearly additional cost of a hydrogen GO system implementing 27 country registries and issuing bodies is estimated at 13 M€. This corresponds with the total income generated by fees¹² on electricity GO accounts and transactions of ca. 15 M€ in 11 countries charging such fees (for a total yearly volume of ca. 420 TWh).

This cost is substantial relative to the size of the hydrogen GO market, which is unlikely to exceed 5 TWh (equivalent to 220 000 Nm³/h of production capacity with

¹¹ For the most up-to-date statistics, see:

<https://cmo.grexel.com/Lists/PublicPages/Statistics.aspx?AspxAutoDetectCookieSupport=1>

¹² The fees charged by the European issuing bodies for electricity GOs are available on AIBs web site.

a load factor of 85%) by 2025. For this market volume, and considering a market fragmentation effect in the case of national registries reducing the total market by 50% compared to truly single EU market that a single EU registry and issuing body can provide, the GO system yearly cost per GO is estimated at 0.3 €/MWh with a central EU registry vs 5.3 €/MWh for the national registry based configuration. For comparison, issuing, cancellation, or transfer costs of electricity GOs are typically a few cents per MWh (based on the charged fees), and GO prices for renewable electricity ranges from € 0,20 for Nordic hydropower based GOs to € 7.00 - € 10,00 for Dutch wind power based GOs¹³.

This demonstrates that cost efficiency and market outreach are both essential for keeping GO system costs at an acceptable level in the coming years. The analysis points to the single EU registry configuration as being the one to target.

2.5 Challenges addressed with the Stakeholder Platform Working Groups

As mentioned earlier, the Working Groups within the CertifHy Stakeholder Platform have been important sparring partners in identifying and addressing different challenges with regards to the development of the CertifHy scheme. In the following, we highlight some of the key issues addressed in the four different Working Groups.

Working Group 1 on “Scheme and Procedures” and “Standardisation”

Scheme and Procedures

This Working Group has focused on developing the fundamental documents necessary for a robust operation of a certification scheme. To this end, an architecture including a central CertifHy Scheme document complemented by subsidiary documents was selected¹⁴. Most notably, the detailed procedures of operation were developed as subsidiary documents. These documents were drafted, discussed and agreed as preliminary versions serving as a basis for the pilot operations (see chapter 2.3), and later adapted based on the experiences gained in the pilots. Furthermore, a CertifHy Criteria document was drafted defining the requirements for issuing CertifHy Green or CertifHy Low-Carbon hydrogen on the basis of a similar document endorsed by the CertifHy stakeholder platform at the end of phase 1.

Independently, the uncertainty of the regulatory situation, notably the long decision-making process for the REDII, was a challenge for drafting and revising the documents. Following the final adoption of REDII, further adaptations were made to the CertifHy Scheme document. According to the current understanding of WG1 there are no fundamental roadblocks to a REDII compatible development of the

¹³ <https://wisenederland.nl/groene-stroom/prijslijst-garanties-van-oorsprong>

¹⁴ www.certifhy.eu

CertifHy Scheme. However, a number of outstanding issues will be clarified in the course of the coming two years in national transpositions and the development of delegated acts by the Commission. CertifHy documents have been developed based on the current regulatory status, i.e. without national transposition of REDII in place, but in a “REDII ready” fashion allowing adjusting and amending the documents step by step as uncertainties are removed.

Standardisation

Consensus has developed on the need for coherent standardisation of GOs for all types of energies. This can be addressed through a core CEN standard applicable to GOs for any type of energy carrier, with fuel specific details to be defined in schemes. As standardisation is a slow process, while markets may be more dynamic, a CEN standard will cover the fundamental issues not expected to need short-term adjustments, while issues that are subject to market developments should be covered by schemes such as EECs for electricity GOs or CertifHy for H₂ GOs.

CertifHy has been involved in the preparatory discussions at CEN-CENELEC and will continue to support the process which is led by the CEN-CENELEC Joint Technical Committee on Energy Management (CEN-CLC/TC 14). Recently, this body and CEN-CLC/JTC 6 ‘Hydrogen in energy systems’ jointly asked for the establishment of a CEN-CLC Joint Working Group, which would have the task to revise EN 16325 ‘Guarantees of Origin related to energy - Guarantees of Origin for Electricity’ and to enlarge its scope in order to cover all types of energies¹⁵. According to REDII art. 19(6) “Member States and designated competent bodies shall ensure that the requirements they impose comply with the standard CEN - EN 16325” in relation to energy GOs, which highlights the importance of this standard for GOs.

Working Group 2 on “GO issuance (producers)”

A key focus within this WG has been to find consensus on the methodological approach and criteria for issuing GOs that emerged during the audits of the pilot plants (amongst others GHG allocation methods). Discussions on the GHG allocation method have, in particular, focused on two of the pilot plants: hydrogen from SMR with CCU and hydrogen as a by-product from a chlor-alkali plant.

Since allocation methods raise questions of principle, the consultation was extended beyond WG 2 to all Working Groups on the methods that should be applied. While this consultation resulted in a path forward for hydrogen from a chlor-alkali plant, there was no majority support for the method proposed for the footprint calculation of hydrogen from an SMR with CO₂ capture. In fact, the question extends beyond the sphere of CertifHy because it concerns CCU in general and there are multiple

¹⁵ Recently, CEN-CLC/JTC 6 ‘Hydrogen in energy systems’ and CEN-CLC/JTC 14 ‘Energy management, energy audits, energy savings’ submitted a joint letter to ask for the establishment of a CEN-CLC Joint Working Group. This Joint Working Group would have the task to revise EN 16325:2013 + A1:2015 ‘Guarantees of Origin related to energy - Guarantees of Origin for Electricity’ (JW002006) developed by the CEN-CLC/JWG 2 ‘Guarantees of origin and Energy certificates’, now disbanded.

dimensions that need to be considered (Common practice for life cycle analysis of CCU, coverage by international standards such as ISO 14067, provisions in existing EU regulatory framework, European policy makers' perspective). To conclude, the discussion will therefore need to be extended to a wider group of stakeholders reflecting the various relevant dimensions.

The pilot operators were surveyed on the difficulties they encountered in relation to the plant and production batch audits as well as to GO registry operations, with the following main results:

- There is a need to recognize methods typically used in industry (e.g. by mass balancing) that are not based on direct measurement of all quantities
- Demonstrating that purity requirements were met for being able to consider the hydrogen as a marketable product was sometimes a challenge because analytical equipment was not necessarily operational throughout the production period.
- Various questions were raised around the different time limits impacting issuing and use of GOs: maximum duration of production batch, maximum time after production within which GOs must be issued, date of GO expiry, and maximum time frame of consumption to which the GOs may be applied.
- Templates should be made available for providing all data that are necessary for addressing the requirements for plant and production batch certification
- Basic instruction sheets (in registry user interface) are needed for the most common actions in registry (e.g. GO issuing request, GO transfer request, GO cancelation request)
- Making the account holders aware of the importance of providing the needed information on the hydrogen consumption for which GOs are cancelled, in order to ensure that a GO cannot be used for more than one consumption, requires particular attention.

Working Group 3 on “GO commercialisation and use (users)”

Distinct use cases regarding the use of CertifHy Certificates have been developed for four pilot plants. These are presented in Table 1 below. These use cases and the issues associated to each case were reviewed and validated by Working Group 2 (issuing). They serve to gain experience with different uses and to draw lessons with regards to encountered challenges and barriers.

Table 1: Pilot plants and their use cases

Pilot plants	Key characteristics	Use cases
Colruyt Group - H ₂ from water electrolysis (Alkaline + PEM) (Belgium)	H₂ production capacity: - 8,1 kg/h - PEM (2,7 kg/h) + Alkaline (5,4 kg/h) Storage: 85 kg Fuel Cell: 120 kW	Green GOs for heavy duty vehicles and passenger cars.
Uniper - H ₂ from water electrolysis / Windgas (Falkenhagen, Germany)	Electrolysis - H₂ production capacity: - 32 kg H₂/h - 360 m³ H₂/h 2 MWel Methanation - H₂ utilisation: - 19 kg H₂/h - 210 m³ H₂/h CO₂ (biogenic) utilisation: - 104 kg CO₂/h - 52,5 m³ CO₂/h SNG production capacity: - 41 kgSNG/h - 57 m³SNG/h	In a test environment, CertifHy and DENA did a trial to see whether DENA could accept CertifHy documentation for H ₂ injection into the gas grid where Uniper had to demonstrate that the H ₂ had 80% renewable content to comply as “Biogas” under German law (‘EnWG’).
Nouryon & Air Products - H ₂ from Chlor-Alkali (Botlek, Netherlands)	Nouryon - Chlor-Alkali plant, 200 MW - H₂ Production capacity: 18 kt/y H₂ utilisation: - Delivery to Air Products Air Products - Over 40 km H₂ pipeline - Feed-in by Nouryon and HyCO4 (SMR) - Supply to various refineries/chemical industry and to customers with liquid H₂ trailers (ex. Botlek) and gaseous H₂ trailers (ex. Pernis)	Green hydrogen GOs for are used for transport purposes: - H₂ Mobility Deutschland, an organisation operating a network of hydrogen fuelling stations in Germany. - London’s integrated transport authority, Transport for London, which operates hydrogen bus refuelling stations.
Air Liquide - H ₂ from SMR with CO ₂ capture (Port Jerome, France)	- H₂ production capacity: ~4500 kg/h - H₂ utilisation: Refining Industry, Merchant - CO₂ utilisations: Food industry, Water treatment PH control, Green houses	- Blue hydrogen for transport

During the pilot phase, four distinct use cases are tested, with a fifth case for investigation into the future could be to re-electrify the hydrogen, injecting the renewable electricity into the electricity grid and the issuance of corresponding RE GOs.

The case of Uniper to allocate ('convert') the green hydrogen GOs into "Biogas" GOs has been tested with DENA, the German Biogas Registrar¹⁶. DENA has accepted the CertifHy cancellation statement, albeit in a TEST environment, as formally they need a legal 'CertifHy' counterpart, which does not yet exist.

Working Group 4 on "Regulatory framework"

The design of an EU-wide CertifHy scheme needs to be closely aligned with current and foreseen regulatory frameworks at EU-level. The REDII which will enter into force in 2021, is the most relevant directive as it covers hydrogen in a variety of aspects as well as being the key EU acquis covering GOs. Notably, there is no strong legal basis for the promotion/definition of green and/or low carbon hydrogen in EU acquis at this point in time.

Considering the EU-level regulatory framework, Working Group 4 (and also Working Group 1) of the CertifHy Stakeholder Platform focused on REDII during the CertifHy 2 project. A challenge in addressing regulatory alignment issues between REDII and CertifHy is that several important aspects under REDII will remain unclear until they are addressed in delegated acts, which are expected to be adopted in late 2021. These include, among others, defining the additionality framework, methodology for assessing the GHG emission savings from renewable transport fuel of non-biological origin (RFNBO)¹⁷, and recycled carbon fuels¹⁸.

Despite these uncertainties, a general consensus was reached within Working Groups 1 and 4 of the CertifHy Stakeholder Platform that there should be a tracking system for hydrogen which extends beyond GOs. Given that hydrogen can contribute towards targets and obligations in both the transport and heating/cooling sectors at EU and Member State level, a tracking system to account for the contribution of hydrogen from renewable energy sources towards such targets/obligations should be included in a CertifHy scheme. Hence, there is consensus that CertifHy should develop a "tracking infrastructure" suitable for various purposes, i.e. customer disclosure (GO according to Art. 19 REDII) and certification of quantities contributing to the renewable fuels / heating / cooling targets, etc. This infrastructure could leverage major synergies between the purposes, e.g. provide proof for two purposes based on one audit.

Concerns have been raised with regard to certain flexibility Member States have in transposing the REDII provisions into national legislation, and the implications this

¹⁶ <https://www.biogasregister.de/en/home.html>

¹⁷ Liquid or gaseous fuels used for transport whose energy content comes from renewable energy sources other than biomass (e.g. Power-to-X such as hydrogen made from renewable electricity).

¹⁸ Liquid or gaseous fuels that are produced from non-renewable waste streams.

may have for developing an EU-wide CertifHy scheme. Furthermore, it has been highlighted that it will be important for CertifHy to remain independent of REDII as CertifHy has, in two important aspects, a broader scope; firstly, REDII only covers renewable energy, while CertifHy includes low-carbon hydrogen; and secondly, REDII focuses strongly on transport and to a lesser extent heating & cooling, while CertifHy covers all uses of hydrogen, such as steel making, speciality chemicals, ammonia (typical under ETS).

Part III: Roadmap for building a dual hydrogen certification infrastructure for Guarantees of Origin and for Certification of renewable hydrogen in transport

3.1 Introduction to the roadmap ambitions and actions

The overarching ambition for the next CertifHy phase is to create an EU-wide CertifHy Certification System that **covers both GOs and Certificates** and, next to providing a Central European issuing body and registry, is capable of interfacing with national registries as well as with other energy carriers.

The following sections (3.2 - 3.10) present the key actions that need to be addressed in terms of achieving the next-step ambitions for paving the way for an EU-wide Certification System. Section 3.11 summarises the actions and identifies the necessary milestones. It also presents a schematic overview of the components of a dual hydrogen infrastructure for renewable hydrogen GOs and Certificates.

3.2 Establish an EU-wide Certification System for green and low carbon hydrogen that addresses both consumer disclosure (GOs) and target compliance (certificates) needs

It is crucial for the transformation of the energy system to be able to characterise energy products; firstly, in order to inform consumers and enable consumer choice (also referred to as consumer disclosure); and secondly, to identify energy products that contribute to meeting regulatory requirements, such as those linked to specific policy targets (also referred to as target compliance).

This could be facilitated through a dual-purpose GO/certificate system, whereby GOs allow for disclosing product origin to end-users and certificates provide evidence in meeting EU/national requirements in connection with obligation. This is further referred to as the *CertifHy Certification System*.

The CertifHy Certification System should thus provide an “infrastructure” for tracking product characteristics suitable for various purposes: customer disclosure (GO according to art. 19 REDII), certification of quantities contributing to the renewable fuels targets (according to Art. 3 and Art. 25 REDII), and possibly other energy and climate targets. Such a System would leverage major synergies between the purposes, e.g. provide proof for two (or more) purposes based on one audit and using the one and the same infrastructure.

3.2 Establish an EU-wide Certification System, with an interface with national registries

It is the overarching goal of CertifHy from the start to create an EU-wide system as opposed to having many national systems. By setting a de facto standard, an EU-

wide system limits the national fragmentation and dispersion that tends to result if design and implementation of GO systems is in the hand of member states (such as in the case of biomethane or green gas GOs). This then becomes an obstacle to the establishment of a cross border market, even without considering costs. Implementing an EU-wide system allows GOs to be traded across the EU from the beginning at a much lower cost than interfacing national registries.

A key action for the next phase in CertifHy is therefore to create an EU registry for those Member States who do not wish to develop their own national GO scheme and in that sense ‘share’ a single (EU) registry. This would involve cost advantages for those countries as compared to developing their own scheme. The scheme could be operated on a voluntary basis until conditions are established for creating an EU-level competent body¹⁹ allowing an EU level issuing body to be designated. Member states adhering to this scheme would then be complying with the REDII obligation to make available a GO system for hydrogen.

For those countries that prefer a national GO scheme and competent body, the CertifHy EU registry would provide an interface that enables national registries to inter-communicate, in order to transfer certificates.

In addition to establishing an EU-wide GO Scheme for green and low carbon hydrogen with a national registry interface, the CertifHy Certification System also consists of a Certificate Scheme; An EU-wide ‘voluntary scheme’ for hydrogen, capable of verifying target compliance through the certification of quantities contributing to the renewable fuels targets (according to Art. 3 and Art. 25 of the REDII), as well as the certification of quantities contributing to other energy and climate targets, where relevant.

Key challenges for establishing such a System, include the different governance structures related to different purposes. GOs are governed by the Member States (art. 19 REDII), for example, whereas voluntary schemes are not governed by public entities, but may be accepted by the Commission according to Art. 30(4) REDII to provide reliable information²⁰. Furthermore, different purposes may have different requirements which lead to different information needs. The CertifHy Certification System should therefore be tailored towards such requirements defined by REDII to the extent suitable and possible, while it will be important for CertifHy to remain independent of REDII as CertifHy has a broader scope: REDII only covers renewable energy, while CertifHy includes also low-carbon hydrogen; REDII focuses on transport

¹⁹ As defined in “REDII Art.19(5): “Member States or designated competent bodies shall supervise the issuance, transfer and cancellation of guarantees of origin”.

²⁰ “provide accurate data on greenhouse gas emission savings for the purposes of Article 25(2) and Article 29(10), demonstrate compliance with Article 27(3) and Article 28(2) and (4), or demonstrate that consignments of biofuels, bioliquids or biomass fuels comply with the sustainability criteria laid down in Article 29(2) to (7)” [art. 30(4) RED II]

and heating/cooling, while CertifHy covers all uses of hydrogen (typically under ETS).

In this sense, adapting CertifHy to REDII needs to be done using a balanced approach.

3.3 Ensure that GO schemes for the different energy carriers (electricity, gas, and hydrogen) work well together for being able to certify and track the attribute of energy across the whole energy supply chain

Electricity, gas, and hydrogen are three different energy carriers that can be used in a variety of applications (e.g. industry, heating & cooling, transport) and which can be made from a variety of primary energy sources, using a variety of conversion steps typically involving another energy carrier: A substitute for natural gas can be made (i) from biomethane made from biomass, for example, or (ii) from hydrogen made from electricity made from wind, combined with CO₂.

As energy carriers may be produced by processing other energy carriers, it is essential to have a well-functioning EU GO market for all the main energy carriers. Indeed, defining the attributes of an energy carrier used as final energy, is dependent on proving the attributes of the energy carriers used for its production by means of GOs as well.

Whilst REDII mandates the expansion of GOs to include hydrogen and biomethane, it does not provide any guidance on use of GOs when producing one energy carrier from another one.

Physical conversion of an energy carrier to another does not involve a “conversion” of GOs from one energy carrier to another. In fact, no connection is technically necessary between the GO systems for different energy carriers: GOs are cancelled in one system and new GOs are issued in the other system based on the physical amounts of energy used and produced as measured in the field. Nonetheless, the GOs for the energy used need to contain the information that is required for determining if the criteria defined for GOs to be issued are met. Criteria for GO issuing are specific to each energy carrier.

The justification of a link between the GO systems for different energy carriers lies rather in the benefit for the end user of being able to trace the origins of energy consumed all the way up to the primary energies source in a transparent and fraud-free manner.

For being able to produce certified energy from energy in another form, two key conditions needed in the next phase are:

- For producing hydrogen to be considered as a renewable transport fuel of non-biological origin (RFNBO) from grid electricity: GOs for grid electricity

showing that the RED II requirements are met to be counted as 100% renewable will be needed (see section 2.7).

- For producing green hydrogen from biomethane: there needs to be a well-functioning EU market for biomethane GOs.

The information collected for issuing a CertifHy GO is expected to provide the needed data for verification of criteria (e.g. on origin, GHG intensity, support measures, etc.) applicable to gas or electricity made from hydrogen.

3.4 Continuation of the stakeholder platform

The Stakeholder Platform and its Bodies have been designed to be self-sustaining and with the vision to remain operational during the further EU-wide implementation of the Scheme. The Stakeholder Platform allows all interested stakeholders to participate in, and contribute to the further development of CertifHy Certification System, ensuring CertifHy to effectively and efficiently develop the market for green and low carbon hydrogen.

The Stakeholder Platform and its Bodies should take the role of the Competent Authority until a ‘legal’ Competent Authority or Competent Authorities is/are defined, much like it has operated during the second phase of CertifHy. This includes the Stakeholder Platform and its Bodies to:

- appoint or approve certain bodies necessary for the operation of the Scheme such as Issuing Body(ies), registry operator(s), Certification Bodies.
- endorse the CertifHy Scheme document and its subsidiary documents, which govern the CertifHy Scheme.

The Bodies (see section 2.5) should continue to improve the System by:

- exchanging and discussing information, views, insights, and visions;
- extending and adapting the CertifHy Scheme document and subsidiary documents;
- providing convergent input and influence on important Regulations, Codes and Standards (RCS) (see section 3.7);
- collecting experiences, views and expectations from the producer and the user perspectives;
- developing solutions to open issues and forthcoming challenges;
- developing the Stakeholder Platform further in order to tap opportunities, counter challenges and integrate additional stakeholders, sectors and European countries; and

- taking all necessary action to help fulfil CertifHy’s mission to advance and facilitate the production, procurement and use of clean and green hydrogen.

3.5 Expand the pilot schemes

The pilot plants should continue operating and keep issuing GOs during the next phase of CertifHy, at least initially, until the Scheme is formally implemented.

CertifHy should encourage plant operators to explore additional use cases to further test the Scheme under different circumstances, for example, regarding the re-electrification of hydrogen (and feeding this electricity into the grid), hydrogen injection into the natural gas grid, and for the production of renewable fuels (RFNBO). This will allow to gain more experience with use of CertifHy GOs.

Also, where possible and desired, it can be envisaged that the pilot is extended to also include new plants with different hydrogen production pathways and use cases such as SMR + CCS, biomass gasification, and SOEC electrolysis needing a high temperate source.

More importantly, the pilot scheme functionality should be expanded to operate as a voluntary scheme for demonstrating compliance with targets on the share of renewables in transport or heating & cooling, following the specific requirements that are applicable in that case (REDII articles 25, 27, 28, and 30).

In the next CertifHy phase, this will allow much more experience to be gained with the pilot scheme with trading and the definition of products requested by the market.

3.6 Further alignment of CertifHy with the regulatory environment

The adoption of REDII provides an important framework for the promotion of renewable energies in the coming decade. It includes pivotal changes for the promotion of hydrogen, as hydrogen is now included in EU’s energy and climate objectives towards 2030. While the outputs of CertifHy 2 include “REDII ready” scheme for green hydrogen GOs, there are still a number of issues to be resolved/clarified in forthcoming delegated acts. These clarifications are relevant to hydrogen and include:

1. Art. 27(3): Additionality framework
2. Art. 27(3): Delegated act on Union methodology setting out detailed rules by which economic operators are to comply with the requirements described in Art. 27(3) regarding for example type of grid connection of an electrolyser and how to prove the use of renewable energy in case of grid connection.

3. Art. 28(5): Delegated act on methodology for assessing GHG savings from RFNBO and from recycled carbon fuels. Art. 25(2) appropriate minimum thresholds for GHG emissions savings of recycled carbon fuels.
4. Art. 30(5): Implementing acts for decisions that voluntary national or international schemes provide accurate data on compliance with transport target.

Delegated acts and other documents are to be developed by the Commission that will provide further details and clarifications on provisions of REDII. A next step CertifHy action will be to follow the process and provide relevant input to the delegated acts.

Additionally, a revision of the EU gas directive and gas regulation is on its way. Since REDII does not provide any anchorage for low carbon hydrogen, nor does it cover the broader range of hydrogen applications, a necessary action in the next phase of CertifHy will be to look closely at the possibilities to provide a legal basis for hydrogen in a broader sense.

3.7 Further alignment of CertifHy with the standardisation environment

Following REDII, Member States and designated competent bodies now have to ensure that the requirements they impose with regards to GOs, comply with standard EN 16325. CertifHy stakeholders have discussed recasting this standard in order to address future needs in the framework of REDII. A consensus has developed on the need for coherent standardisation of GOs for all types of energies. This could be addressed through a core standard applicable to GOs for any type of energy carrier, with energy-specifics detailed in schemes. As standardisation is a slow process, while markets may be more dynamic, a CEN standard covering all energies will cover the fundamental issues not expected to need short-term adjustments, while issues that are subject to market developments should be covered by the schemes such as EECS for electricity GOs or CertifHy for hydrogen GOs.

3.8 Reach a final agreement on the methods for the allocation of GHG to the hydrogen produced

As previously indicated, no consensus was reached on the footprint calculation method for hydrogen from an SMR with CO₂ capture, due to differing views on how to handle carbon capture and utilisation (CCU). As this is a general question that extends beyond the scope of CertifHy, the discussion will need to be extended to a wider group of stakeholders, in order to address the various dimensions of the issue, considering common practice for life cycle analysis of CCU, international standards such as ISO 14067, provisions in the existing EU regulatory framework, and the point of view of the European policy makers.

3.9 Solve the residual mix issue

The introduction of a GO system also impacts the consumers of hydrogen within the perimeter of the GO system to which no GO was applied. This product is considered to be from the “residual mix”, an attribute designating the combination of all the hydrogen within the GO system perimeter for which no GOs were issued (or for which GOs were issued but not used before expiration).

The GO system perimeter determines how to address product consumed without a GO: product outside that perimeter has an attribute determined by its physical source, whereas product within that perimeter has an attribute determined by the residual mix.

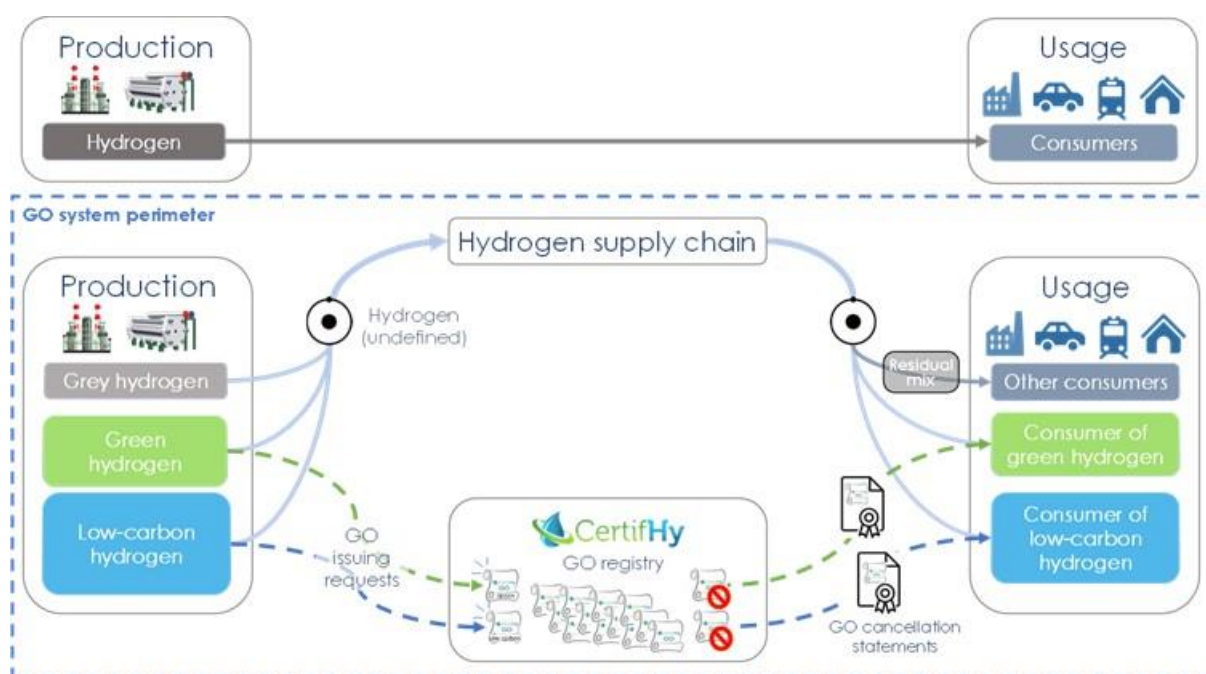


Figure 4: Operating principle of a GO system. (Source: Own illustration)

The operating principle of a GO system is illustrated in Figure 4. In the next CertifHy phase, a GO system perimeter needs to be defined in order to identify those users whose product attributes are still the physical attributes of the product consumed. Annex III highlights different ways to define the GO system perimeter as well as aspects to consider when defining the system perimeter.

3.10 Foster greater uptake of hydrogen GO's in the market

Anchored in EU regulation, GOs are a tool that gives consumers and businesses the option to choose the documented origin of the energy they demand. Thus, enabling consumers and investors to satisfy their demand for buying environmentally friendly products and services. For companies, compliance with recognized standards, such as those embedded in a GO, can be a powerful tool in the marketing of their products

or to attract investors. At present, there are many companies that buy, e.g. renewable electricity GOs in order to reduce their carbon footprint. In some cases, companies opt for GOs from specific power sources, if they believe this is valued by their customers. For electricity from renewable energy sources, we see in the market that “many companies buy the cheapest, basic renewable GO volumes to give them the right to make a renewable claim. Whilst others pay an additional premium for certain attributes that match their preferences and the preferences of their customers.”²¹

GOs for green hydrogen are new on the market. There is a need for concrete efforts to ensure a greater uptake of hydrogen GOs in the market. Concrete actions to do so will entail activities such as information campaigns to make the benefits of hydrogen GO’s more transparent.

3.11 Summary: Actions and milestones, and framework

On the basis of the outcomes of the CertifHy 2 phase, the aim is to establish an EU-wide Certification System fully operational by mid/end-2021. Figure 5 below summarises the updated Roadmap actions and milestones. It will be the responsibility of the consortium of the next CertifHy project (CertifHy 3) to follow up the actions in this Roadmap.

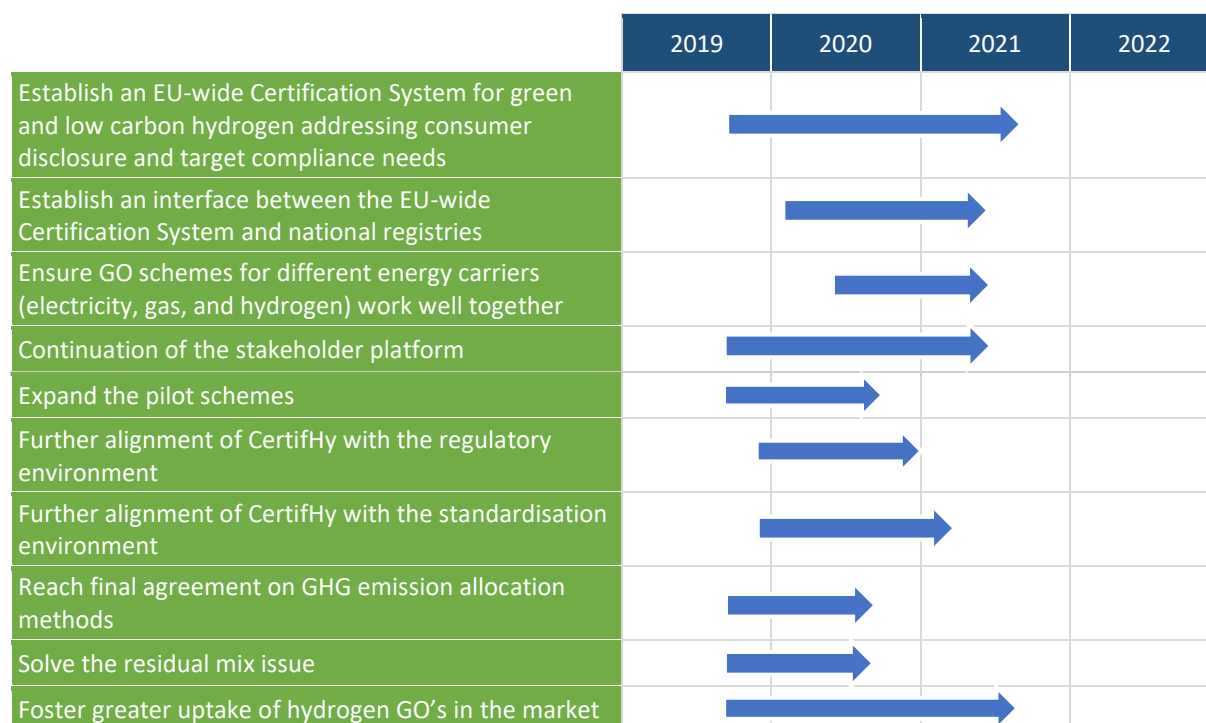


Figure 5: CertifHy Roadmap actions and milestones

²¹ <https://www.energinorge.no/contentassets/ac0b5a4fc38b4111b9195a77737a461e/analysis-of-the-trade-in-gos.-oslo-economics.pdf>

Figure 6 below illustrates a proposed framework with key components of a dual hydrogen infrastructure for renewable hydrogen GOs and Certificates.

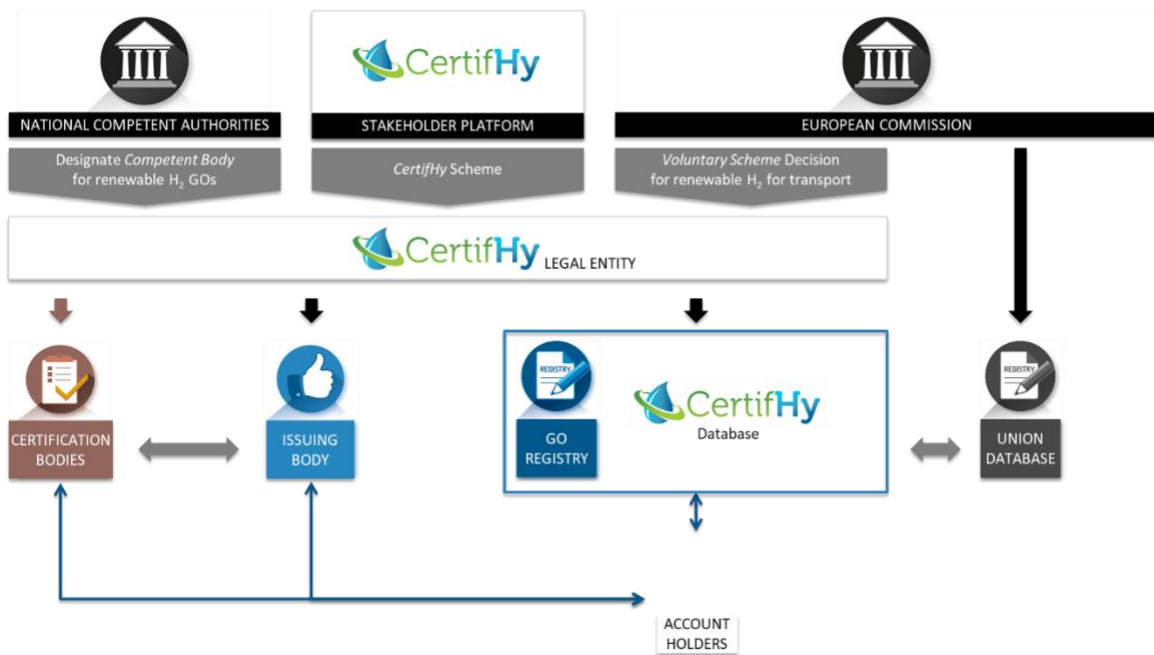


Figure 6: Schematic overview of key components of dual hydrogen infrastructure for renewable hydrogen GOs and Certificates.

Annex I: Key elements of a GO scheme

Key elements of a GO scheme were presented in section 4.2 of the first CertifHy roadmap. These include:

- Scheme governance
- Eligibility and registration of production plants
- The GO itself (and the information content)
- Issuance, transferability and cancellation of GO
- Registry system and trading platform

We will describe these briefly, highlighting also what these imply for a GO scheme for Green Hydrogen.

Governance of the GO scheme

In this context, the term ‘governance’ is used to refer to the required rules and regulations, and the continuous monitoring of their proper implementation, in order to ensure a reliable, accurate and verifiable GO scheme. The governance framework includes defining the purpose²² and core principles of the scheme, which include measurement rules, procedures for admission and expulsion, compliance rules, procedures for review and changes to the scheme, etc. It also includes defining the primary duties of key actors necessary to ensure the functioning and reliability of the scheme.

Eligibility and registration of producers/suppliers of Green hydrogen GO

Before any produced unit of green and/or low carbon hydrogen can be registered, the respective production unit must be registered. The definition of Green Hydrogen and Low GHG Hydrogen determine whether or not production units are eligible for a GO for their production or not. If production plants are not accredited they will not be registered or even eligible for GO issuance. In order to be registered under the GO scheme, the units must comply with rules and requirements under the governance framework. Auditors will typically be involved to ensure that plants fulfil the necessary requirements.

The GO itself (and its information content)

The GO itself is the essence of the GO scheme. Within existing schemes it is usually only available electronically and carries a set of information concerning the

²² A prime purpose of existing GO schemes has been to increase consumer transparency between renewable-based and non-renewable based energy - be it electricity, heat, gas or other energy carriers. Currently, the prime use of GO has been driven by the fuel mix disclosure obligation under the EU IEM Directive (insert) which requires licensed electricity suppliers to disclose to their customers the mix of fuels (coal, gas, nuclear, renewable and other) used to generate the electricity supplied annually. However, a GO scheme can serve additional purposes, such as proof of compliance of obligations, payment of Feed-in Tariff/Premium, etc.

production that it represents. Similar to a product label, a GO carries information telling the consumer facts about the product.

Some of the GO information under a GO scheme will be collected during the application and registration phase of a production plant, whereas some information will be collected on a rolling basis, e.g. monthly or quarterly. The latter information usually pertains to the plants generation, in this case the green and/or low carbon hydrogen production and its attributes.

Table 2 on the following page gives an overview of the type of information that to be collected under a GO scheme for green/low carbon hydrogen.

Table 2: Type of information collected for the issuance of a green/low carbon hydrogen GO

PART 1: Factual information	Comments
Account number	
- Identity of the Production Device - Production device identifier - Name - Location country - Location city - Commissioning date - Installed production capacity	
Date and time of hydrogen production: beginning and end of the production batch	dd.mm.yyyy
- Fuel (or heat source) and Technology - Fuel (or heat source) code(s) (see Annex A) for up to ten fuels including respective share of total fuel input - Technology code (see Annex B); including main/by-product	
- Financial support to hydrogen production or input fuel production - investment supported, and/or - production supported, and/or - supported scientific/demo/pilot project, or - unsupported, or - no information available	
Share of renewable energy for each input energy carrier for producing the hydrogen	%
- GHG balance: - GHG emissions intensity	g CO _{2eq} / MJ _{H2}
- GO identity - Identifier (the unique number which has been assigned to the GO)	ID dd.mm.yyyy

PART 1: Factual information	Comments
○ Issuing date ○ Cancellation/Expiry date	
• Certification Body	Name

PART 2: Evaluation of information	Comments
• CertifHy label: ○ CertifHy Green hydrogen ○ CertifHy Low-Carbon hydrogen	

Issuance, transfer and redemption

The most common guidelines for the control infrastructure for GOs are the well-established EECS rules. EECS stands European Energy Certificate System; these rules are used for GO schemes as well as for tradable certificates in the context of quota obligations and other support schemes. According to the EECS rules, the life cycle of a GO will encompass three phases: issuance, transfer and cancellation. Transition between these three states, is depicted in Figure 7.

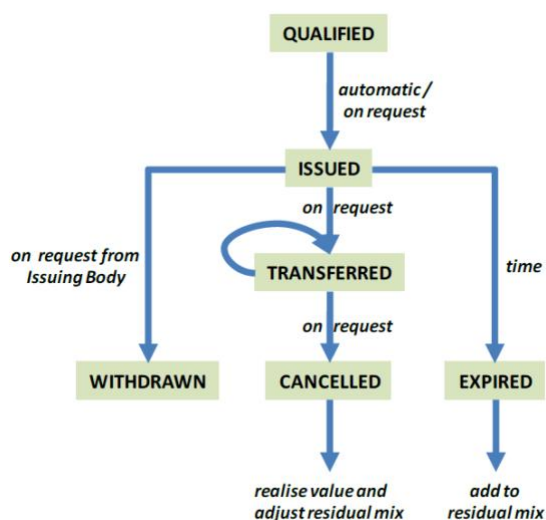


Figure 7: Life cycle of a GO. Source: AIB (2015a)

These ‘life cycle’ elements will also be applicable for a GO scheme for green hydrogen/low carbon hydrogen. Relevant aspects include:

- A GO is issued by a designated issuing body. The question remains open as to whether there would be one issuing body for the whole EU, or whether there would be national or regional specific issuing bodies. In the latter case, transparent and non-overlapping geographical domains would have to be agreed upon.

- GO may be transferred from the account of the producer to that of a trader, and so on; either within the country of origin or across countries in Europe which form a part the EU-wide scheme.
- Cancellation refers to the GO being removed from circulation. Following the EECS Principle, cancellation occurs at the point at which the value of the GO is realised. This is typically when a consumer pays for the GO in recognition of the qualities it represents. In the practice of hydrogen GOs, logical moments for cancellation would be:
 - The moment at which hydrogen is used in a factory that wants to claim the input to be green
 - The moment hydrogen is supplied to a filling station for FCEVs

Registry system and trading platform

To manage the issue, transfer and cancellation of GOs an electronic register holding all of the GOs and related information should be established and maintained. Each production and/or supplier holding GOs should have an account in such a register. Specifications for the design and functioning of an electronic registry need to be defined.

The objective of the register database (registry) is to generate unique GOs (electronic document) for each produced/registered energy unit of green and/or low carbon hydrogen and to track them from generation/issuance till use/cancellation, so that double use or double counting within the registry is excluded. The registry must be fraud-resistant, and should provide reports/statistical data for different kind of purposes (e.g. for the account holder itself, for the competent bodies, for European and national statistics, for the registry administrator).

Overall system control

A GO scheme enables a 'green' value to be accorded to specific types of product; and for this value to be traded. It is therefore essential that a GO scheme is reliable, accurate and verifiable. Among others, controlling the information and the accuracy of the GO is therefore of critical importance. Control will be carried out by different actors, such as the auditors, and the certification and issuing bodies.

Annex II: CertifHy Stakeholder Platform - roles and powers

The different stakeholder platform bodies are presented in the table below, summarising their role in CertifHy as well as their powers.²³

	Role/function	Powers
Stakeholder Platform	The Stakeholder Platform is composed of organisations represented by individual members (+800 early March 2019) interested in Green and/or Low Carbon Hydrogen Guarantees of Origin (GO) in Europe who have voluntarily adhered to the platform. It is open to all interested stakeholders that represent companies and are based in EU (or they are observers).	Members of the Stakeholder Platform have the power to: • Voice issues and concerns and make recommendations for the evolution of the Stakeholder Platform or for topics to be placed on the agenda of the next Plenary session to the Steering Group via the Secretariat; • Join Working Groups; • Vote on issues presented to the vote by the Steering Group
Steering Group	The Steering Group is the Platform's decision-making and conflict resolution body consisting of: • A platform college constituted by the Chair and co-Chair for each Working Group. • An institutional college with representatives of the FCH 2 JU and the European Commission ('the Observers').	The Steering Group has the powers to: • Validate and modify the Governance Rules of the SP; • Define the Plenary Session agendas; • Call for a Plenary Session; • Modify or revoke majority decisions taken by Working Groups when consensual decisions within Working Groups prove impossible; • Make decisions for Working Groups regarding issues which concern more than one Working Group; • Represent and make decisions in the name of the Stakeholder Platform; • Create a new Working Group; • Dissolve existing Working Groups.

²³ More details regarding the stakeholder platform bodies are elaborated in the document 'CertifHy Stakeholder Platform Governance Rules'. See www.certifhy.eu.

Working Groups	Working Groups are the operational units of the Stakeholder Platform. Their role is to provide input to the current project for the development of a Europe-wide Green and Low Carbon Hydrogen GO scheme. There are 4 Working Groups (WGs): 1. WG 1: GO Scheme and Procedures; 2. WG 2: GO Issuing; 3. WG 3: GO Commercialisation and Use; 4. WG 4: Regulatory Framework.	Working Groups have the power to: • Endorse documents put forward by the Working Group Chair and the Working Group Coordinator; endorsed documents will be analysed by the Secretariat. Issues and conflicts should be brought to the attention of the Steering Group; • Provide recommendations, inputs and answers to questions put forward by the Working Group Chair and the Working Group Coordinator; • Elect Working Group members to the positions of Working Group Chair and co-Chair; Address questions, comments and feedback to other Working Groups and to the Steering Group via their Working Group Coordinator.
Secretariat	The Secretariat is in charge of the logistical organisation of the Steering Group and Stakeholder Platform Plenary Sessions. The Secretariat is responsible for ensuring Stakeholders may apply to the Stakeholder Platform and that Working Group Coordinators are regularly made aware of Stakeholders wishing to join their Working Group.	The Secretariat holds the power to determine whether an organisation applying to the Stakeholder Platform has sufficient legitimate interest in Green and Low Carbon Hydrogen Guarantees of Origin.

Annex III: Residual mix - considerations

This Annex highlights considerations with regard to addressing the residual mix issue.

There are different ways to define the GO system perimeter, for instance:

- by defining the participating sources
- by defining the boundaries of the distribution system (e.g. for gas and electricity: a designated transport and distribution infrastructure)
- by defining the participating users.

Hybrid solutions for defining the perimeter of H₂ GO system can be considered; e.g. all the users delivered from participating plants plus other users for which the physical origin of the product is identified at time of GO use, in order to integrate that physical product into system.

Once the perimeter is defined, a mass balance needs to be performed to be able to determine the residual mix (by calculating the average property of all the gas supplied within the system, excluding the quantities for which GOs were issued and cancelled). In this sense, the hydrogen GO system as presented above is a mass balance system.

The following aspects need to be considered when defining system perimeter:

- All the producers, suppliers, and users within the perimeter must be informed that the attribute of the hydrogen within the system is defined on the basis of GOs, not physical origin, and that any product not covered by a GO has the “residual mix” attribute. If the perimeter is very wide (e.g. the whole EU), this can be a significant challenge with regards to acceptance and monitoring.
- There needs to be a way to ascertain that the physical hydrogen to which a GOs is applied is within the system perimeter, e.g. by collecting information on the source of that hydrogen at the time of GO cancellation. This can be a significant administrative burden, depending on how the perimeter is defined.
- Producers of high GHG intensity hydrogen included in the system perimeter will not any longer be accountable for that high intensity with regards to the users of the hydrogen, since the latter will acquire the attribute of the residual mix, i.e. the attribute given to all hydrogen used within the GO system perimeter without application of a GO. The inclusion of high carbon intensity sources can impact the acceptance of the scheme if this loss of accountability is not appropriately addressed.

Various solutions have been considered for defining the CertifHy GO system perimeter, each with their advantages and drawbacks in terms of market inclusiveness, administrative burden, and credibility.

Processes that are, or that can be significantly more carbon intensive than widely used methane based²⁴ processes are listed below:

- Water electrolysis (up to 470% of benchmark, depending on source of electricity)
- Coal gasification (250% of benchmark)
- Methanol cracking (150% of benchmark)

Depending on the allocation method used, hydrogen from a chlor-alkali process may also significantly exceed the benchmark. However, with value based allocation, this is currently not the case even if coal based electricity is used.

The fact that the most commonly used method for producing hydrogen is the benchmark process (SMR) allows to simplify the problem as follows:

- For hydrogen produced by a reforming process, the value for the user, the supplier and society, of applying a GO does not depend very much on whether or not the plant participates to the CertifHy scheme, as this does not introduce much distortion
- The identified potential issues can be tackled by simply addressing the cases where hydrogen can be delivered from a plant using a process that is significantly more carbon intensive than widely used reforming processes.

One way forward could be to identify geographic areas (e.g. countries) where none of the hydrogen consumed is from a high intensity source, and define the scope of the CertifHy system as being all the hydrogen consumed in those countries. A country-based definition simplifies information of the market about the existence of a GO system and its consequences, as well as the determination of which hydrogen consumption is within and outside of the CertifHy system.

The above approach requires the identification of the high intensity hydrogen sources in Europe. Areas having high intensity sources could be included in the system, if a system is put in place to identify the application of GOs to hydrogen from these sources, so that impact on residual mix is accounted for and supplier accountability for the supply of high intensity hydrogen maintained.

²⁴ or refinery off-gas based hydrogen with a GHG intensity similar to that of hydrogen made from methane.