



Towards a Dual Hydrogen Certification System for Guarantees of Origin and for the Certification of Renewable Hydrogen in Transport and for Heating & Cooling

Final Report of Phase 2



Towards a Dual Hydrogen Certification System for Guarantees of Origin and for the Certification of Renewable Hydrogen in Transport and for Heating & Cooling

Final Report of Phase 2

Authors:

Frederic Barth, Thomas Winkel and Wouter Vanhoudt (Hinicio), Antti Kuronen and Marko Lehtovaara (Grexel), Matthias Altmann and Patrick Schmidt (LBST), Karina Veum and Marcel Weeda (TNO/ECN), and Javier Castro and Klaus Nürnberger (TÜV SÜD)

PDF ISBN: 978-92-9246-333-5 doi: 10.2843/46282 EG-03-19-644-EN-N

© FCH 2 JU, 2019. Reproduction is authorised provided that the source is acknowledged.

The information and views set out in this report are those of the author(s) and do not necessarily reflect the official opinion of the FCH 2 JU. The FCH 2 JU does not guarantee the accuracy of the data included in this study. Neither the FCH 2 JU nor any person acting on the FCH 2 JU's behalf may be held responsible for the use which may be made of the information contained therein.

More information on the FCH 2 JU is available at <http://fch.europa.eu>

More information on the European Union is available at <http://www.europa.eu>

Contents

Abstract	4
Executive summary	5
1. An introduction to CertifHy	10
1.1 CertifHy phase 1, 2 and 3	10
1.2 A CertifHy Guarantee of Origin for Green and Low-carbon Hydrogen...	10
1.3 An additional hydrogen certification function in addition to consumer disclosure is needed to monitor the contribution of hydrogen to EU policy targets	17
1.4 The CertifHy project and its governance	19
1.5 The CertifHy Pilot	21
2. The CertifHy GO Scheme and its organisation	25
3. How to issue, trade and acquire a CertifHy GO	27
4. Outlook	30
Further information	32
Annex 1: Towards Establishing the Residual Mix	33
Annex 2: CertifHy Governance Structure	36
Annex 3: Information a CertifHy GO Discloses	38
Annex 4: Scheme Document and Subsidiary Documents	39

Abstract

This report summarises the results and main outcomes of the second phase of the FCH 2 JU financed project CertifHy ('CertifHy 2'). The objective of CertifHy 2 has been to continue the momentum built during the first phase of the project and to serve as a catalyst for establishing and implementing an EU-wide Guarantee of Origin (GO) scheme for Green & Low Carbon Hydrogen. The work involved gaining practical experience with an operational pilot to identify and address practical issues raised by the implementation of the GO scheme that was designed as part of CertifHy 1 and to ensure compatibility with evolving EU legislation. A highly inclusive Stakeholder Platform was set-up and governed the project.

A CertifHy GO discloses information on the hydrogen produced, including its energy source and greenhouse gas intensity. Two labels have been implemented: 'Green Hydrogen' and 'Low-carbon Hydrogen'. The CertifHy GO Scheme enables EU-wide consumption of Green and Low-carbon Hydrogen regardless of geographical location. By using a GO, the corresponding quantity of hydrogen consumed de-facto acquires the properties of the hydrogen covered by the GO, much like existing systems for electricity.

An additional hydrogen certification function in addition to consumer disclosure is needed to monitor the contribution of hydrogen to EU policy targets. While the focus of CertifHy has so far been on developing a GO Scheme, the recast RED2 also requires a tracking system for renewable energy to be consumed in specific sectors such as transport, which is typically done via "(Supply) Certificates". Therefore, the overarching ambition for the next CertifHy phase could be to create an EU-wide CertifHy Certification Scheme that covers both Guarantees of Origin and Supply Certificates.

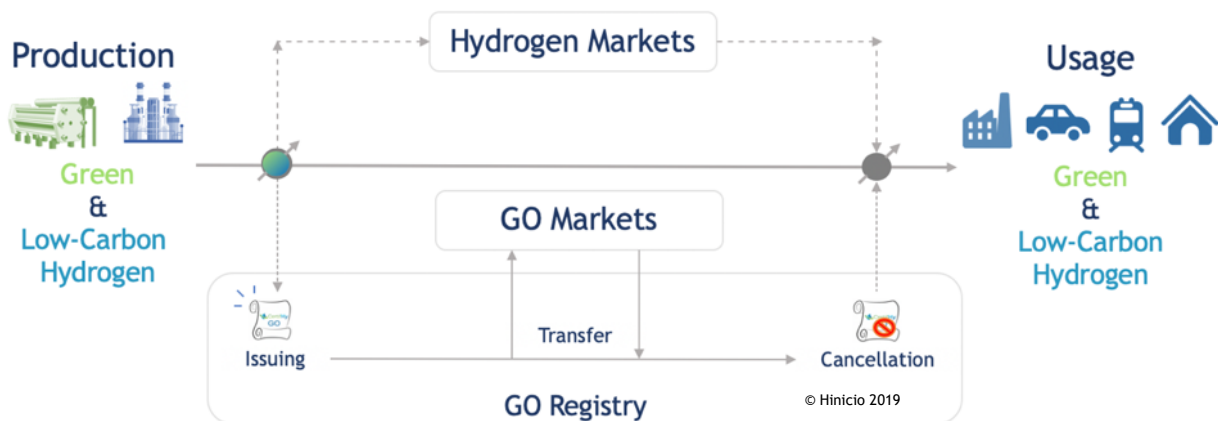
Executive summary

This report summarises the results and main outcomes of the second phase of the FCH 2 JU financed project CertifHy ('CertifHy 2'). The first phase ran from 2014 and 2016, while the second phase was executed between October 2017 and June 2019. The report also provides an outlook for the next and third CertifHy phase that is expected to commence later this year and is envisioned to run until the end of 2021.

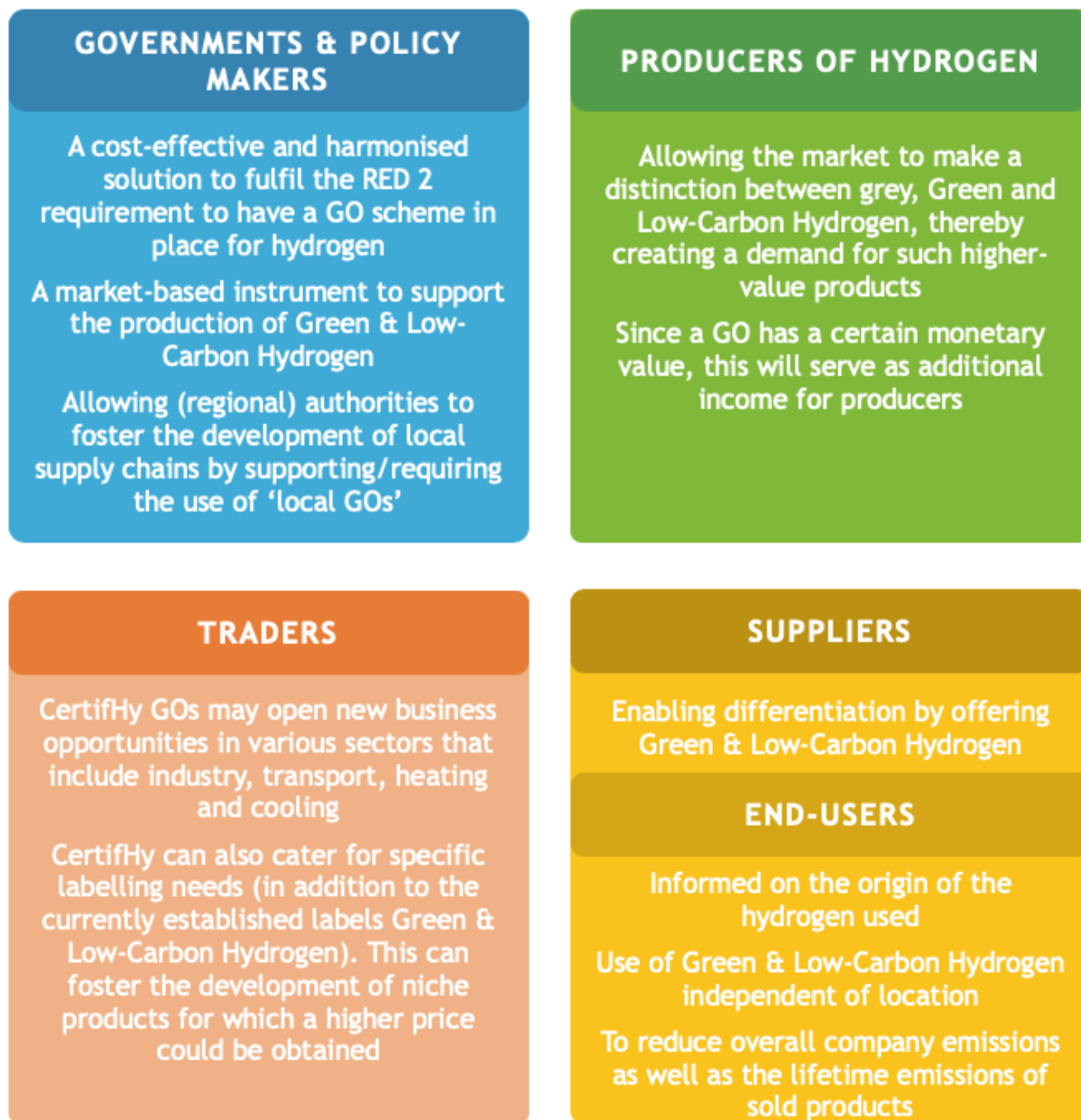
The objective of CertifHy 2 has been to continue the momentum built during the first phase of the project and to serve as a catalyst for establishing and implementing an EU-wide Guarantee of Origin (GO) scheme for Green & Low Carbon Hydrogen. More specifically, the work involved gaining practical experience with an operational pilot to ensure that the practical issues raised by the implementation of the GO scheme for hydrogen designed in phase 1, are identified and addressed and to ensure compatibility with EU legislation, in particular the recast Renewable Energy Directive (RED 2). A highly inclusive Stakeholder Platform was set-up to govern the project.

The purpose of a Guarantee of Origin is to inform end-users on the origin and environmental attributes of a product (also referred to as 'Consumer Disclosure'). The RED 2 recognises and further expands the role of a GO to all types of energy carriers produced from renewable energy sources, including hydrogen, and requires Member States to have a Guarantee of Origin scheme in place for the different energy carriers by 2021 (RED2, Art 19), thus confirming the fundamental relevance of CertifHy.

A CertifHy GO provides information on the hydrogen production plant, whether the plant received support, time of production, energy source and greenhouse gas intensity, etc. Two labels have been implemented: 'Green Hydrogen' and 'Low-carbon Hydrogen'. The CertifHy GO Scheme allows for the decoupling of physical hydrogen supply and its environmental attributes. As a result, a CertifHy GO enables EU-wide consumption of Green and Low-carbon Hydrogen regardless of geographical location. By using a GO, the corresponding quantity of hydrogen consumed de-facto acquires the properties of the hydrogen covered by the GO.



The CertifHy GO Scheme addresses various needs of the different stakeholders:



CertifHy has established a highly inclusive and successful project governance structure consisting of the following bodies: the Stakeholder Platform, the Steering Group, four topical Working Groups and a Secretariat.

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.

Four topical Working Groups (WGs), with in total over 200 representatives of organisations across the entire GO value chain, have been consulted to provide input on specific issues within their remit.

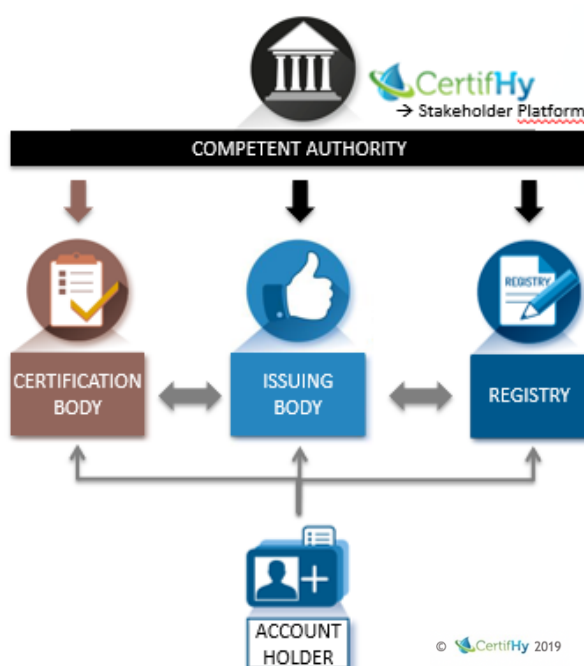
The Steering Group is the Platform’s decision-making and conflict resolution body and composed of the chair and co-chair of the topical working groups. It has been consulted on key issues and has provided advice on how to resolve these. It has endorsed the final design of the CertifHy Scheme and its subsidiary documents and the Roadmap.

The Stakeholder forum, including all members of the four working groups and other stakeholders has convened twice: the last Stakeholder Forum approved the Scheme Document and Subsidiary Documents and provided input for further development in phase 3.

The governance structure will be prolonged in the 3rd phase of CertifHy and organisations that wish to become a member of the Stakeholder Platform and one or multiple Working Groups are invited to sign-up [here](#).

The CertifHy GO Scheme has an organisation, designed comparable to EECS: the GO Scheme of the Association of Issuing Bodies (AIB) which manages today electricity GOs. It consists of the following entities and functions:

- **A Competent Authority** to decide on the approval of Certification Bodies and to appoint Issuing Bodies. This function is today realised by the Stakeholder Forum.
- **A Certification Body** to verify the eligibility of Production Devices through a Production Device Audit and to verify the attributes of Production Batches through a Production Batch Audit.
- **An Issuing Body**, that supervises the issuing, transfer and cancellation of a CertifHy GO, including the supervision of the operation of the CertifHy Registry.
- **The CertifHy Registry** that keeps track of issued, traded and cancelled Guarantees of Origin.
- **Account Holders** or users of the Scheme that have in their accounts Production Devices and/or CertifHy Guarantees of Origin.



During the 1st phase the CertifHy Scheme was designed and the Green and Low-Carbon Hydrogen labels established, the 2nd phase elaborated the different procedures for GO issuing, transfer and cancellation and tested them by means of a pilot. The pilot consists of four different producers with different production pathways that 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 issues, to the issuance of GOs:



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.

The CertifHy pilot also comprised the setting-up of a Registry and an Issuing Body to handle the issuance, transfer and cancellation of GOs.

The pilot has successfully led to the issuance of Guarantees of Origin to the market. Today, 76k CertifHy hydrogen Guarantees of Origin (i.e. 2,298 t of hydrogen) have been issued, of which 2.9k (86 t of hydrogen) were for hydrogen from renewable energy sources and 75k (2,212 t) for fossil energy-based hydrogen.

Emerging issues have since been identified and addressed. This has led to an updated scheme design and some of its procedures that have been endorsed by the Steering Group and the Stakeholder Platform in March 2019 (see Annex 4).

An additional hydrogen certification function in addition to consumer disclosure is needed to monitor the contribution of hydrogen to EU policy targets. While the focus of CertifHy has so far been on developing a GO Scheme, the RED2 also requires a tracking

system for renewable energy to be consumed in specific sectors such as transport, which is typically done via “(Supply) Certificates”. Therefore, the overarching ambition for the next CertifHy phase is to create an EU-wide CertifHy Certification Scheme that covers both Guarantees of Origin and Supply Certificates. The CertifHy Certification System will provide an “infrastructure” for tracking product characteristics suitable for various purposes: customer disclosure (GO according to RED 2 art. 19), certification of quantities contributing to the renewable transport fuels targets (according to RED 2 Art. 25 and 27) and possibly other targets, including besides energy, also feedstock used in industry. 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 one integrated infrastructure.

Currently, CertifHy is still ‘a project’ financed by the FCH 2 JU and run by a consortium of consultants, a research institute, a certification body and an ICT provider. **In the course of 2019, CertifHy intends to become a legal entity that will allow binding commitments with regards to compliance and continuity of services.** Moreover, CertifHy is in the process to be accepted as an observer within the AIB, a first step towards full membership, allowing CertifHy to issue AIB recognised EECS Guarantees of Origin.

Other core action points for the next phase of CertifHy, as stipulated in the Roadmap, are:

- To ensure the continuation of the CertifHy stakeholder platform;
- To expand the pilot scheme in order to gain further experience, in particular with regard to new plants with different hydrogen production pathways and use cases other than the ones already covered (see picture above);
- To fine-tune the design of an EU Voluntary Scheme, recognized by the European Commission, for demonstrating compliance with targets via the so-called Supply Certificates, on the share of renewables in transport or heating & cooling, following the specific requirements that are applicable in that case (RED 2 articles 25, 27, 28 and 30).

This report also includes a practical how-to-guide for issuing, trading and acquiring a CertifHy GO.

1. An introduction to CertifHy

1.1 CertifHy phase 1, 2 and 3

The FCH 2 JU funded project CertifHy was established in 2014 to develop a European Framework for Guarantees of Origin for Green and Low-carbon Hydrogen. A Guarantee of Origin (GO) is an electronic document informing the final consumers on the origin of a product. GO schemes are in place in Europe for renewable electricity, and in some countries also for biogas. It is already a legal requirement to use a GO for making a claim on the origin of electricity and this obligation has been extended by the recast Renewable Energy Directive (RED 2) to other energy carriers such as renewable gas and hydrogen.

Running through to October 2016, the first CertifHy project successfully delivered a definition for a label for Green and Low-carbon Hydrogen through a consensus building process with industry, policy makers and civil society, a GO scheme outline, and a roadmap for the implementation of such an initiative throughout the EU.

A second phase of CertifHy project was initiated in October 2017 with as initial objective to define the 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 and use of a GO. As such, three important components of the second CertifHy project have been to:

- (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;
- (2) establish a well-functioning Stakeholder platform, acting as a governance framework (see section 1.4, also regarding how to become a member);
- (3) ensure compatibility with EU legislation, in particular the RED 2.

While the project has so far developed a Scheme for Guarantees of Origin, the objective of the possible next phase of CertifHy ('CertifHy 3') could be to expand the CertifHy system for handling both a GO and what may be referred to as a 'Supply Certificate'. Both terms are further explained in the next section.

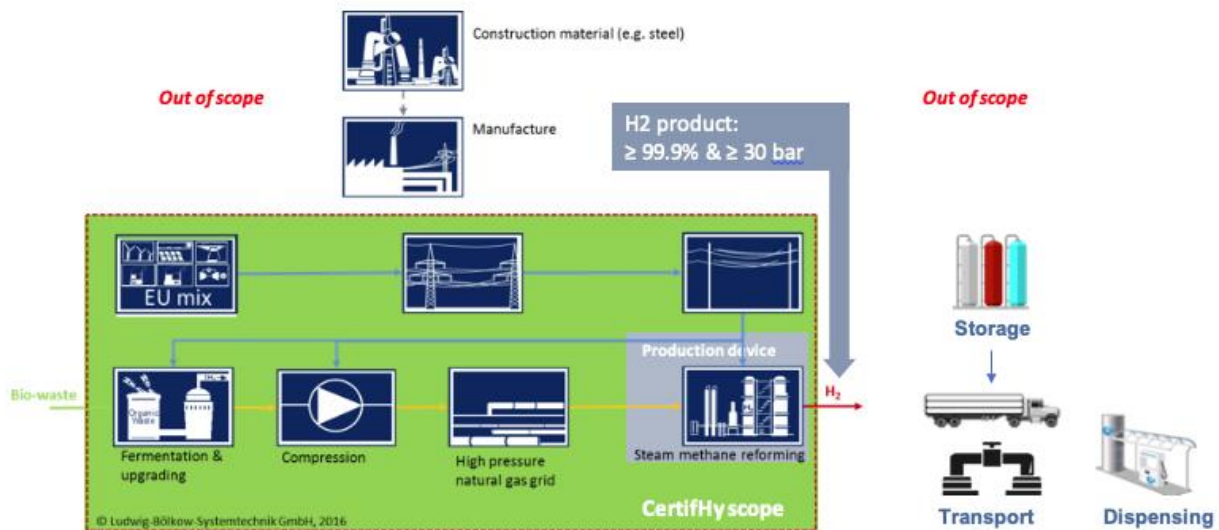
1.2 A CertifHy Guarantee of Origin for Green and Low-carbon Hydrogen

The purpose of a Guarantee of Origin is to inform the final consumer or end-user on the origin and environmental attributes of a product. A GO is the only instrument that is allowed by the RED to be used for communication of the attributes of energy carriers sold to households.

A CertifHy GO provides information on the hydrogen production plant, whether the plant received support, time of production, energy source, greenhouse gas intensity (and more - see Annex 3), proving to end-users that the hydrogen is either Green Hydrogen or CertifHy Low-carbon Hydrogen, based on the labels defined in phase 1. The CertifHy system can support other labels in the future as well.

Textbox 1 CertifHy Green and Low-carbon Hydrogen labels cover the whole generation pathway up to marketable product.

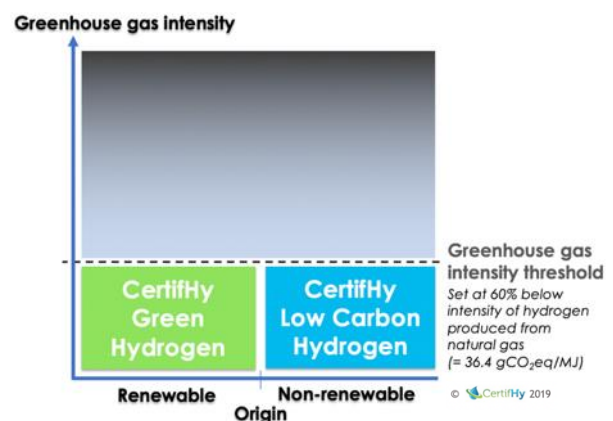
The CertifHy scheme considers both the origin of the hydrogen and its greenhouse gas (GHG) intensity. The threshold for the latter is referenced to a benchmark: the GHG intensity of hydrogen produced from natural gas in a Steam Methane Reforming plant (SMR) based on Best Available Technology, considering the whole production pathway (as referred to as “well-to-gate”):



Two labels are defined for hydrogen having a greenhouse gas intensity that is lower than the benchmark by at least 60%¹:

- **CertifHy Green Hydrogen** if the hydrogen is produced from renewable energy sources (biogas, hydro, wind, solar, etc.)
- **CertifHy Low-Carbon Hydrogen** covering hydrogen from non-renewable low-carbon energy sources (e.g. nuclear, fossil with CCS)

One GO corresponds to 1 MWh, based on the lower heating value (LHV).



¹ Benchmark: $40\% \times 91\text{gCO}_2\text{eq/MJ}$ (the GHG intensity of hydrogen from natural gas) = $36.4\text{gCO}_2\text{eq/MJ}$.

A Guarantee of Origin can be transferred from one holder to another, independently of the physical energy flow to which it corresponded originally, as is also the case for renewable electricity GOs. As a result, a CertifHy GO enables EU-wide consumption of Green and Low-carbon Hydrogen regardless of the location. By using a GO, the corresponding quantity of hydrogen consumed acquires the properties of the hydrogen covered by the GO, on a consignment to consignment basis (this is also known as ‘Mass Balancing’).

The GO is cancelled upon use, either when hydrogen is consumed or converted into another energy carrier, so that it may only be used once for making a claim on the hydrogen consumed. The provided electronic cancellation statement includes a link for online access to the full GO content.

The CertifHy GO Scheme is managed and operated at the moment from a single registry that records issuance, transfer and cancellation of the certificate.

Once a GO system is in place, product attributes are solely determined by the GO, not by the physical origin of the product (as illustrated by Figure 1).²

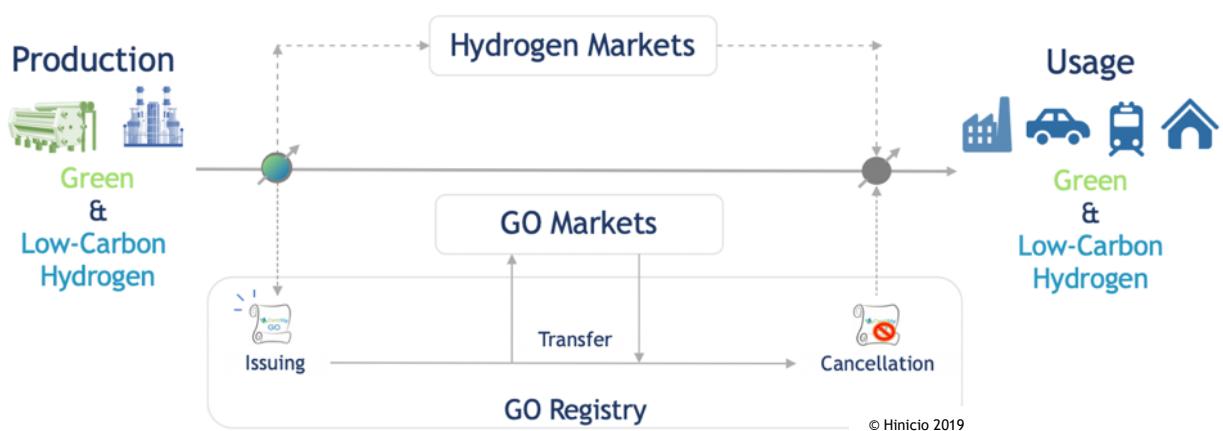


Figure 1 The CertifHy GO Scheme allows for the decoupling of physical hydrogen supply and its environmental attributes. Source: CertifHy .this report.

² The hydrogen that is consumed without being covered by a GO is considered to be from the “residual mix”, which is an attribute designating the combination of all the hydrogen for which no certificates were issued (or for which certificates were issued but not used before expiration). See further Annex 1.

A CertifHy GO addresses various needs of the different stakeholders, summarised in Figure 2 and further elaborated below.

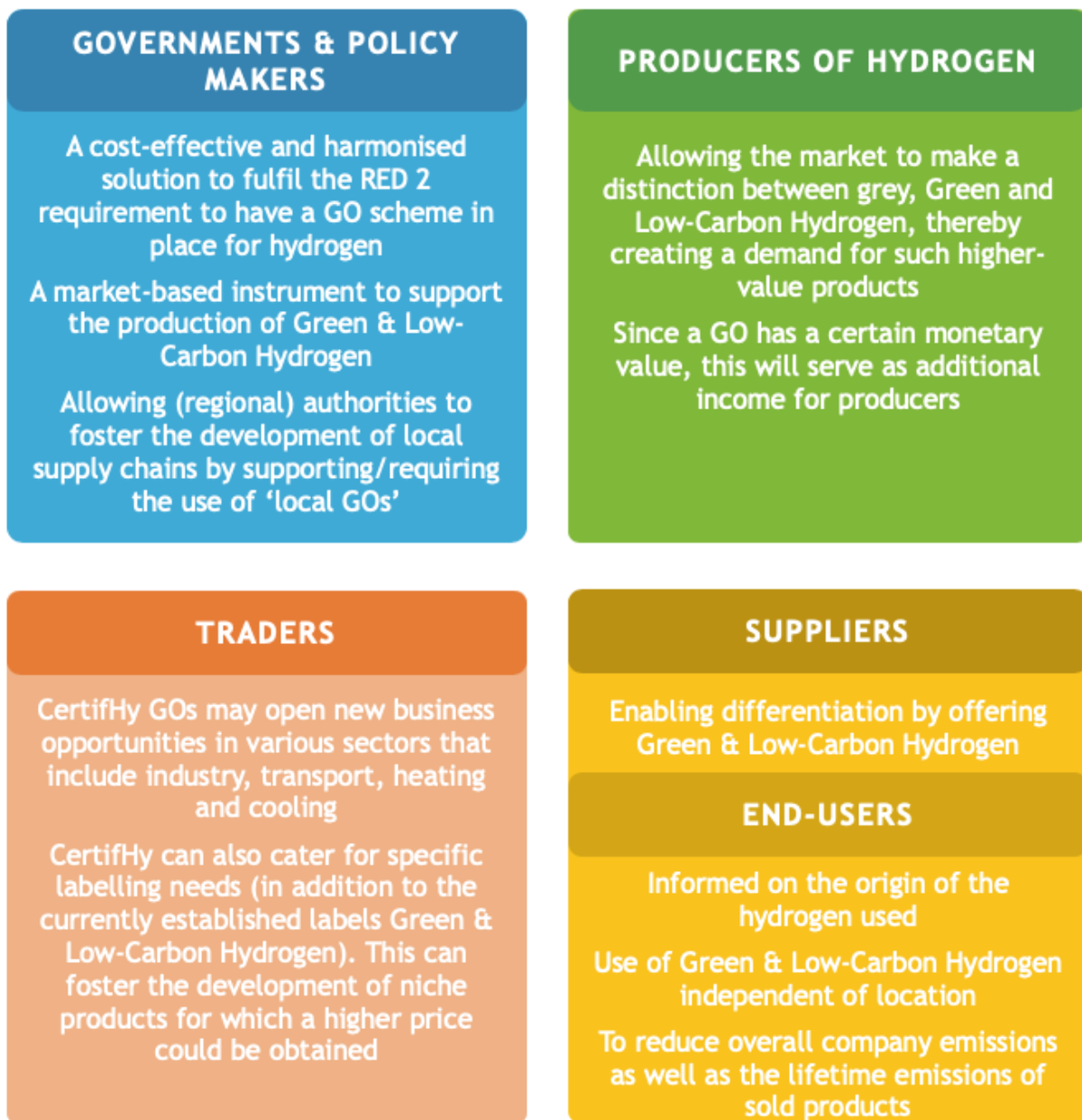


Figure 2 A CertifHy GO addresses various needs of the different stakeholders. Source: CertifHy

Governments and policy makers

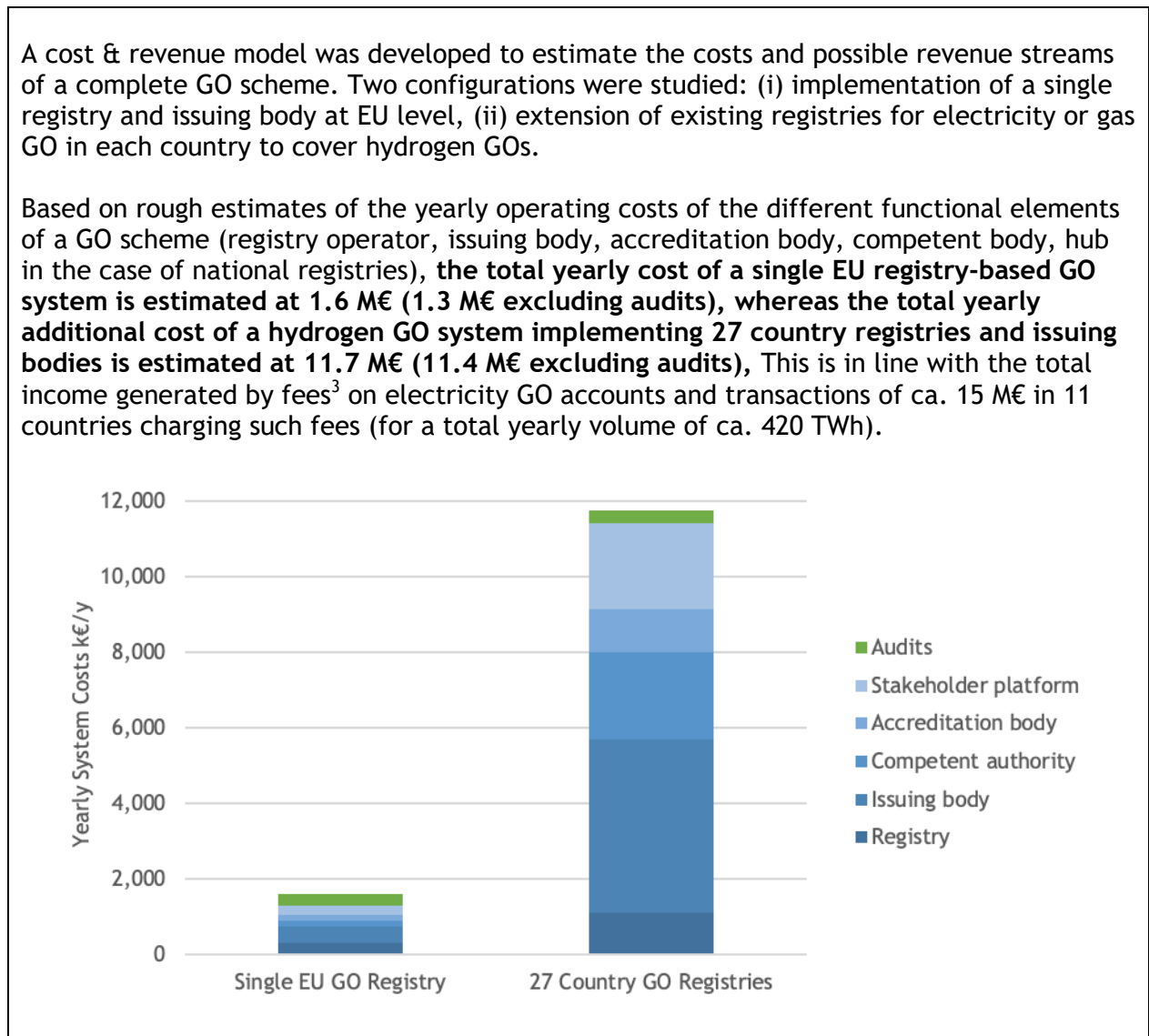
The recast Renewable Energy Directive (RED 2) recognises and further expands the role of a GO to all types of energy carriers including hydrogen, confirming the fundamental relevance of the CertifHy GO Scheme. It requires Member States to have a Guarantee of Origin scheme in place by 2021 for any type of energy carrier produced from renewable energy sources, including hydrogen (Art 19).

The overall aim of CertifHy is to create an EU-wide scheme: i.e. to have a GO throughout the EU with the same data fields, procedures, quality assurance, etc., in order to ensure

harmonisation i) enabling cross-border trade of a GO and ii) creating customer confidence. Setting up an EU-wide scheme aims to prevent bottom-up developments of inconsistent national GO schemes that can hamper establishing an effective European market for Green and Low-carbon Hydrogen (as is currently the case for biomethane/biogas). This would become an obstacle to the establishment of a cross border market, even without considering costs.

Implementing an EU-wide system allows a GO to be traded across the EU from the onset of the scheme at a much lower cost than interfacing national registries due to economies of scale, and the absence of redundancies linked to multiple registries and fragmentation at MS level (see Textbox 2 below). CertifHy acknowledges that Member States may wish to develop their own hydrogen GO registry. CertifHy is merely offering the possibility for MSs to take advantage of a harmonised and cost-effective solution.

Textbox 2 Towards estimating the costs and revenues of an EU-wide GO Scheme



³ The fees charged by the European issuing bodies for electricity GOs are available on AIBs web site.

This cost is substantial relative to the size of the hydrogen GO market, which is unlikely to exceed 5 TWh by 2025 (equivalent to 1.0 GW or 220,000 Nm³/h of production capacity with a load factor of 68%). 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 0.4 €/MWh with a central EU registry vs 5.9 €/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 GOs.⁴

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 most cost effective.

For those countries that nonetheless wish to set up a national hydrogen GO registry, the CertifHy EU Registry will provide an interface that enables national registries to inter-communicate, in order to transfer certificates. They can use the CertifHy Scheme Documents and Procedures developed as a blueprint for setting-up national hydrogen GO schemes (see Annex 4 for the detailed Scheme Document and Procedures⁵).

Because a GO has a monetary value (determined by supply and demand dynamics), it effectively is a market-based instrument that financially supports producers and thereby also the market for Green and Low-carbon Hydrogen. This is also the reason why RED 2 stipulates that when producers also receive financial support, “the market value of the guarantees of origin for the same production shall be appropriately taken into account in the relevant support scheme” (Article 19(2)).

A GO Scheme for Green and Low-carbon Hydrogen also allows national and local governments and authorities to differentiate between a GO that is produced within a certain geographical perimeter and one that originates from outside this perimeter. This allows supporting the consumption of national or local hydrogen, thereby allowing for the build-up of local supply chains.

Also, it will enable certain regions to set criteria on the hydrogen used (e.g. only Green Hydrogen, to exclude certain production pathways, thereby effectively creating their own label) in the case of for example public procurement and for certain funding programmes (e.g. for hydrogen fuel cell buses & vehicles and refuelling stations).

Hydrogen producers

For producers of Green and Low-carbon Hydrogen, CertifHy enables (improved) business cases. First of all, by allowing the market to make a distinction between Green and Low-carbon Hydrogen as well as ‘grey’ hydrogen, and thereby creating a demand for these

⁴ <https://wisenederland.nl/groene-stroom/prijslijst-garanties-van-oorsprong>

⁵ Also available on: <https://www.certifhy.eu/publications-and-deliverables.html>

higher-value products. Secondly, as a GO has a certain monetary value, this will serve as yet another stream of additional income for producers.

An EU wide certification system also gives trust to end-users. The two labels developed in CertifHy, as opposed to the creation of many niche products/labels, ensures market liquidity for each product.

Traders and Brokers

For traders, CertifHy opens new business opportunities in various sectors that include industry, transport, heating and cooling. Back in 2014, traders and brokers were requesting for a limited number of products (“Green” and “Low Carbon”) to ensure market liquidity. There seems to be tendency to develop more niche products for which a higher price can be captured: CertifHy can also cater for those more specialised labelling needs.

Suppliers and end-users

Regarding end-users of hydrogen, CertifHy enables the EU-wide consumption of Green and Low-carbon Hydrogen regardless of geographical location; by using a GO, the corresponding quantity of hydrogen consumed acquires the properties of the hydrogen covered by the GO. A CertifHy GO thus allows suppliers and/or end-users to evidence the purchase of Green and Low-carbon Hydrogen. It can enable suppliers to differentiate themselves by offering environmentally friendly products.

For end-users of hydrogen the use of a CertifHy GO can contribute to reducing a company’s emissions as well as the lifetime emissions of sold products, both under Scope 3 of the GHG protocol. Possibly in the future, a CertifHy GO can also have a positive impact on Scope 2 emissions. See

Table 1 below for more details on the definitions of Scope 1, 2 and 3 and

Table 2 for the specific impact of CertifHy GOs on the different Scopes.

Table 1 The Greenhouse Gas (GHG) Protocol categorises emissions into 3 Scopes (The GHG Protocol is a Product Life Cycle Accounting and Reporting Standard. Source: www.ghgprotocol.org)

Scope 1: Direct GHG emissions	Covers all direct GHG emissions from owned or controlled sources. It includes fuel combustion, company vehicles and fugitive emissions.
Scope 2: Indirect GHG emissions	Covers indirect GHG emissions resulting from the generation or conversion of purchased energy including electricity, heat, steam, etc.
Scope 3: Other indirect GHG emissions	Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions (e.g. the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities, outsourced activities, waste disposal, etc.)

Table 2 Impact of the use of a CertifHy GO on Scope 1-2-3 emissions.

	Impacted by a CertifHy GO?	Comments
Scope 1: Direct GHG emissions	No	The contribution of hydrogen consumption to Scope 1 emissions is always zero, independent of the origin of the hydrogen, because use of hydrogen does not generate GHG emissions (like electricity), only water.
Scope 2: Electricity indirect GHG emissions	Possibly in the future	Scope 2 covers the indirect emissions of energy consumed that does not produce direct emissions upon consumption: usually electricity, steam, heating and cooling. For electricity, the emission are linked to its - example coal based - generation. Today, hydrogen is considered to be a chemical substance, not an energy carrier, and is therefore not part of Scope 2 emissions. In the future hydrogen may be formally considered to be an energy carrier. If so, it's use will logically be included in Scope 2 emissions.
Scope 3: Other indirect GHG emissions	Yes	The use of hydrogen produced from renewable energy sources rather than from fossil energy reduces upstream emissions. In other words, the acquisition of a GO allows organisations to declare emissions reductions under Scope 3 for the hydrogen covered by the GO.

1.3 An additional hydrogen certification function in addition to consumer disclosure is needed to monitor the contribution of hydrogen to EU policy targets

As mentioned before, the recast Renewable Energy Directive (RED 2) further recognises and expands the role of a GO for all types of energy carriers including hydrogen. Another development is that RED 2 sets targets on the share of renewable energy in various sectors such as transport and Heating & Cooling (where hydrogen has an important role to play). Such obligations also require a certification and tracking instrument to be implemented in order to monitor their fulfilment. Here, instead of informing the end user, the purpose is to account for the amount of renewable hydrogen supplied by economic actors to designated sectors, in accordance to specific targets, by means of **supply certificates**. Conditions for issuance of such supply certificates may differ from those applied for issuing and cancelling of a GO as a GO has the sole function of consumer disclosure (RED 2, art.19). However, both systems are likely to have similar certification and tracking requirements. In particular, hydrogen producers will want to mutualise the certification burden for both purposes. Also, whereas GOs systems are to be set-up by MS, supply certificates are typically managed by “European Voluntary Schemes”, highlighting their distinct difference in terms of governance.

Furthermore, the two systems need to be based on the same information system in order to avoid contradicting claims from suppliers and end-users, or double counting. This

may happen, for example, if hydrogen is claimed by a supplier to be delivered to the transport sector via a supply certificate, while the same hydrogen is claimed to be consumed by an end-user of the Industry sector through the cancellation of a GO.

Textbox 3: EU policy and legislation on the promotion of renewable energy and hydrogen

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 (RED 2).

RED 2 was adopted and 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. RED 2 sets an EU-wide binding target on the share of renewables in final energy consumption 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% target on the share of renewables in transport by 2030, and a target on the increase of the share of RES in heating and cooling of 1.3 percentage points per year.

RED 2 increases sustainability and/or GHG emission savings requirements for all types of renewable fuels. Furthermore, additional requirements are set out for being able to consider electricity used to produce fuels as renewable (so-called Renewable Fuels of Non-biological Origin - RFNBOs). A number of applicable requirements remain to be defined by delegated acts, due in 2021. Hydrogen has a role to play through a variety of provisions, as shown in the figure below.

Role of hydrogen in RED 2 and related provisions

Ren. energy (H ₂)	RFNBO (H ₂)	Biomass fuel (H ₂)	Ren. energy non-bio (H ₂)	Biomass fuel (H ₂)
<div style="background-color: #0070c0; color: white; border-radius: 10px; padding: 5px; margin-bottom: 5px;">Overall</div> <ul style="list-style-type: none"> • 32% RE in 2030 	<div style="background-color: #0070c0; color: white; border-radius: 10px; padding: 5px; margin-bottom: 5px;">Transport</div> <ul style="list-style-type: none"> • 14% RE in 2030 • 70% CO₂ savings • Additionality, etc. 	<div style="background-color: #0070c0; color: white; border-radius: 10px; padding: 5px; margin-bottom: 5px;">Transport</div> <ul style="list-style-type: none"> • 14% RE in 2030 • 50%/60%/65% CO₂ savings • Sustainability criteria 	<div style="background-color: #0070c0; color: white; border-radius: 10px; padding: 5px; margin-bottom: 5px;">Heating&cooling</div> <ul style="list-style-type: none"> • +1.3 pp/yr RE (indicative) • No requirements 	<div style="background-color: #0070c0; color: white; border-radius: 10px; padding: 5px; margin-bottom: 5px;">Heating&cooling</div> <ul style="list-style-type: none"> • +1.3 pp/yr RE (indicative) • 70%/80% CO₂ savings • Sustainability criteria
<div style="border: 1px solid #ccc; border-radius: 10px; padding: 5px; width: fit-content; margin: 0 auto;">Art. 3 Art. 7</div>	<div style="border: 1px solid #ccc; border-radius: 10px; padding: 5px; width: fit-content; margin: 0 auto;">Art. 25 Art. 27</div>	<div style="border: 1px solid #ccc; border-radius: 10px; padding: 5px; width: fit-content; margin: 0 auto;">Art. 29 (Art. 26)</div>	<div style="border: 1px solid #ccc; border-radius: 10px; padding: 5px; width: fit-content; margin: 0 auto;">Art. 23</div>	<div style="border: 1px solid #ccc; border-radius: 10px; padding: 5px; width: fit-content; margin: 0 auto;">Art. 29</div>

© CertifiHy 2019

Whilst RED 2 addresses the use of hydrogen in transport as well as the heating and cooling sector, use of hydrogen in Industry, for instance for ammonia production and steel making which typically falls under ETS, is not yet specifically addressed. Furthermore, the implementation of non-renewable low-carbon energy (such as hydrogen produced from natural gas with CCS), though requested by Industry, is not mandatory by the EU regulatory framework.

CertifHy Supply Certificates

Supply certificates prove that a certain amount of hydrogen was produced and supplied in accordance to the applicable regulatory requirements for counting towards specific policy targets regarding hydrogen use in certain end-use sectors.

While the focus of CertifHy has so far been on developing a GO Scheme, **the overarching ambition for the next CertifHy phase could be to create an EU-wide CertifHy Certification Scheme that covers both Guarantees of Origin and Supply Certificates.** The CertifHy Certification System would thus provide an “infrastructure” for tracking product characteristics suitable for various purposes: customer disclosure (GO according to RED 2 art. 19), certification of quantities contributing to the renewable fuels targets (according to RED 2 Art. 25 and 27) and possibly other environmental targets, including besides energy, also feedstock used in industry. 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 one integrated infrastructure.

1.4 The CertifHy project and its governance

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. The figure below is a schematic representation of the different governance bodies and their interactions (incl. with the project’s consortium).

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 helped gather momentum. A total of 2 Stakeholder Platform Plenary Sessions have been organised over the duration of CertifHy 2; a first plenary to inform on the project development, and a final plenary to validate the results of the study.

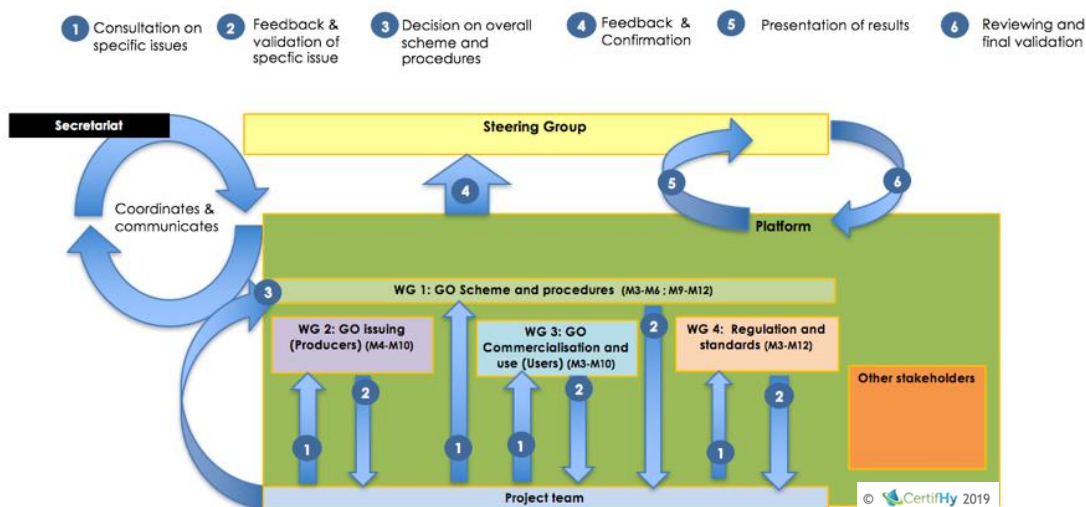


Figure 3 Schematic representation the CertifHy stakeholder platform; its bodies and their interactions

The Steering Group is the Platform’s decision-making and conflict resolution body. It has been consulted on key issues and has provided advice on how to resolve these. It has endorsed the final design of the CertifHy Scheme and its subsidiary documents and the Roadmap. The 4 Working Groups (WGs), with representatives of all actors across the GO value Chain (see Figure 4 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. WG1 has drafted all Scheme documents, and has adjusted them based on feedback from other WGs and the pilot experiences.
- WG 2 has focused on reaching consensus on the requirements which should apply to hydrogen production. 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 hydrogen GO scheme.
- WG 4 has focused on identifying alignment issues with current and upcoming regulations, including evaluating whether the current RED 2 Directive presents any barriers to the proposed EU-wide hydrogen GO scheme.

More details regarding the governance structure and the different stakeholder platform bodies, their role in CertifHy as well as their power, can be found in Annex 2.

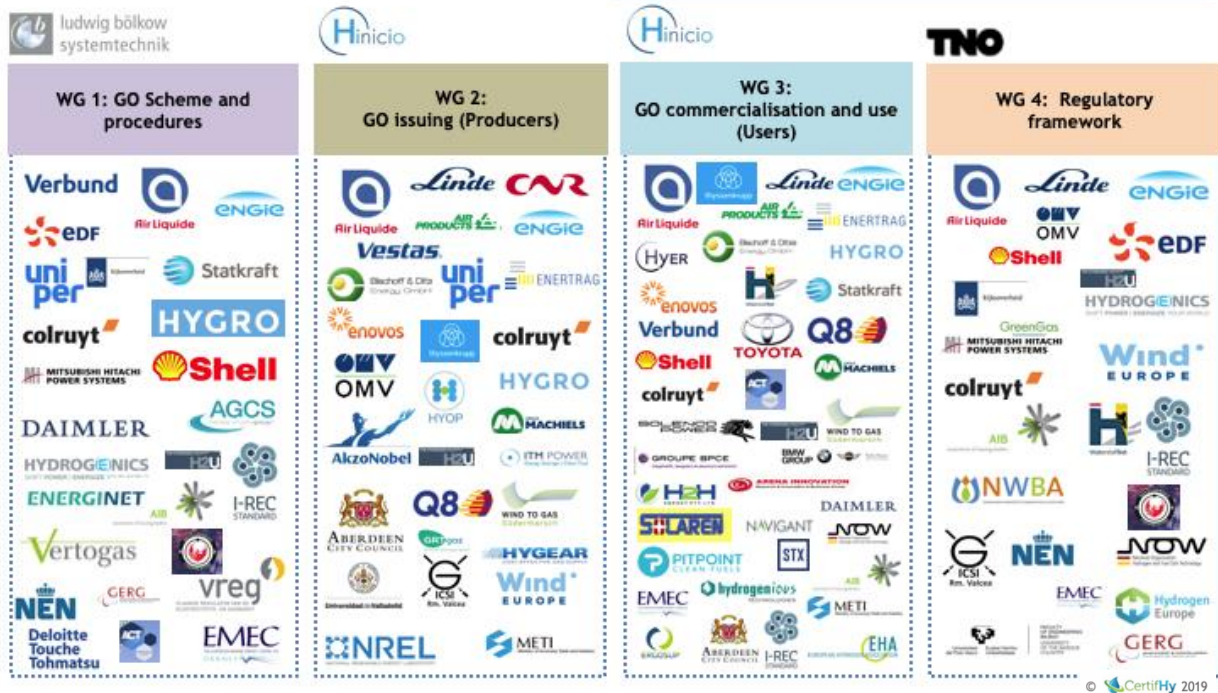


Figure 4 Overview of member organisations of the CertifHy Platform Working Groups. Currently 900 organisations are member of the Stakeholder Platform, more than 200 of these organisations are also Working Group members

We welcome new members to the CertifHy Stakeholder Platform all year round. If you are interested to join the Platform and one or more of its Working Groups, please complete the online form which is available [here](#).

1.5 The CertifHy Pilot

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 pathways:

- SMR of natural gas / biomethane + Carbon Capture & Utilisation (CCU);
- Water electrolysis fed by different electricity sources and configurations;
- Chlor Alkali based electrolysis;
- Water electrolysis + methanation.



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.

© CertifHy 2019

Figure 5 The CertifHy Pilot Plants and their distinct hydrogen production pathways. Source: CertifHy

These 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 issues, to the issuance of GOs. The CertifHy pilot comprises setting-up a Registry and an Issuing Body to handle the issuance, transfer and cancellation of GOs (see further chapter 3).

Draft CertifHy Scheme Procedures were applied in the pilot implementation, in order to stay within the time and resource limitations of the Pilot (for instance, plant audit covering both the plant and the first production batch, in order to avoid delays caused by a sequential approach, which is the one required in a fully operational context). Based on pilot experiences, the draft procedures were adjusted.

The 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, obtained by adding hydrogen GO functionality to an existing operational GO Registry system for electricity was developed and commissioned by Grexel. This IT system includes the user interfaces for registering hydrogen production plants, for opening accounts, for requesting GO issuing, cancellation or transfer, as well as for 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 Guarantees of Origin issued, number of Guarantees of Origin cancelled).

The screenshot displays the CMO.grexel website interface. At the top, there is a navigation bar with links for Home, EECS-GO, Reports, Users, Plants, My Page, and Support. A language selector is set to English, and the user is logged in as Supplier 1 (anttik@grexel.com). The main content area is divided into several sections:

- Welcome to CMO.grexel anttik@grexel.com:** A table showing account holder details for Supplier 1, including Email, Mobile Number, and Client certificate expiry (2019-01-23).
- Pending Tasks:** A section indicating "No pending tasks available."
- Registry announcements:** A table with columns for Title and Modified, showing a welcome message dated 2018-01-23 12:18.
- Search Criteria:** A form with various filters including Period Start (2017-12-23), Account (- All -), Transaction Number, Trading Schemes (CertifHy-Green, CertifHy-LowCarbon), Production Device (- All owned PDs -), and Fuel (FO0000000 - Unspecified, FO1000000 - Renewable, FO2000000 - Fossil).
- Account Statement:** A detailed view for Default Account - 643002406900001296, showing account holder information and a table of transactions. The transactions table includes columns for Transaction Date, Transaction Type, Transaction Number, Account From, Account To, and Volume. Two transactions are listed, both transfers, with a total volume of 190.

Figure 6 Selection of screenshots of the CertifHy Registry (courtesy of GREXEL).

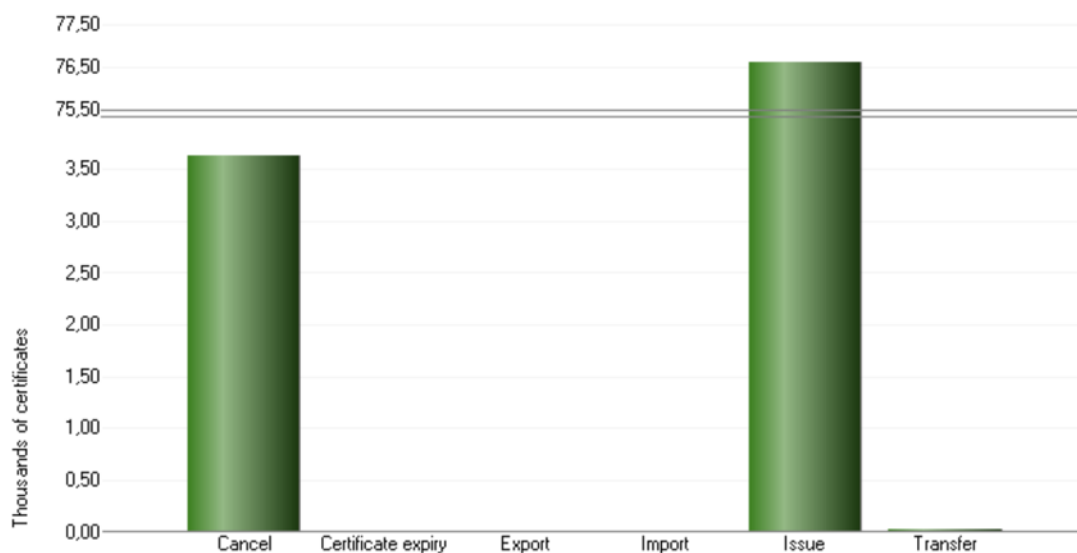
The first GO was issued in December 2018. Since then, 76,600 CertifHy hydrogen Guarantees of Origin (i.e. 2,298 t of hydrogen), of which 2,870 (86 t of hydrogen) were for hydrogen from renewable sources (electricity from wind and/or biogas) and 73,740 (2,212 t) for fossil energy-based hydrogen (from steam reforming of natural gas).

1,660 Guarantees of Origin for renewable based hydrogen were used (cancelled) to claim supplied hydrogen as being CertifHy Green, whereas 1,960 Guarantees of Origin for fossil-based hydrogen were used to claim compliance with a proprietary label developed by Air Liquide ('Blue Hydrogen'). The 1,660 GOs were used ('cancelled') for hydrogen delivered to passenger car refuelling stations (H₂ Mobility Deutschland) in Germany, and for bus refuelling (Transport for London) in the UK.

A small amount of Guarantees of Origin for hydrogen from renewable electricity (10) was transferred to a broker for trading.

Domain Transactions

Domain: CertifHy; Transaction Date: 2018-01-01 To 2019-04-30



Energy Source	Issue	Transfer	Cancel	Export	Import	Certificate expiry
F01000000 Renewable	2 868	10	1 663	-	-	-
F02000000 Fossil	73 739	-	1 964	-	-	-
Total	76 607	10	3 627	-	-	-

Figure 7 CertifHy GO transactions (status 30 April 2019). Source: CertifHy Registry, April 2019.

For the particular case where hydrogen is directly injected into the natural gas grid, a simplified procedure was tested in relation to the Uniper pilot plant (located in Germany) for issuing of Biogas Guarantees of Origin in the German biogas registry operated by DENA:

- Hydrogen Guarantees of Origin were issued in the CertifHy (test) registry;
- The CertifHy hydrogen Guarantees of Origin were cancelled;
- A transfer communication file was generated from the Cancellation statement;
- The communication file and cancellation statement were sent to DENA;
- DENA processed the file;
- DENA Biogas Guarantees of Origin were issued to the DENA registry with the data present in the transfer communication file.

It is only in the case of direct injection into the gas grid that one biogas GO can be created by cancellation of one hydrogen GO (both referring to 1 MWh of energy). The test demonstrated that DENA can recognize CertifHy certification documentation.

2. The CertifHy GO Scheme and its organisation

Figure 8 below presents the overview of the key components of the CertifHy GO Scheme. In order to participate, everybody, i.e. certification body, production device operator, issuing body, registry operator and account holder, has to comply with specific requirements that are further detailed in the Scheme document and Subsidiary Documents (see Annex 4). The CertifHy GO Scheme has an organisation which is designed comparable to EECS: the GO Scheme of the Association of Issuing Bodies (AIB) which manages electricity GOs.

The Competent Authority

It is the role of the Competent Authority (or a body designated by it) to:

- Decide on the approval of Certification Bodies;
- Appoint Issuing Bodies.

N.B. The CertifHy Stakeholder Platform takes the role of the Competent Authority until the time a Competent Authority or Competent Authorities is/are defined.

The Certification Body

It is the role of Certification Bodies to verify the eligibility of Production Devices through a Production Device Audit in the framework of a contract with the Registrant as well as to verify the attributes of Production Batches through a Production Batch Audit in the framework of a contract with the Account Holder.

N.B. During the pilot and until the Scheme is formally implemented, TÜV SÜD has acted as the Certification Body (under the governance of the Stakeholder Platform) and has assessed the delivered information and reports related to the production devices and whether the production devices meet the CertifHy Green and Low-carbon Hydrogen criteria.

The Issuing Body

The Issuing Body supervises the issuing, transfer and cancellation of a CertifHy GO. It is the responsibility of an Issuing Body to ensure that all aspects of the CertifHy Scheme as defined in the Scheme Document and all subsidiary documents to it, which are related to the issuing, transfer and cancellation of a CertifHy GO, are enforced. This includes the supervision of the operation of the CertifHy Registry.

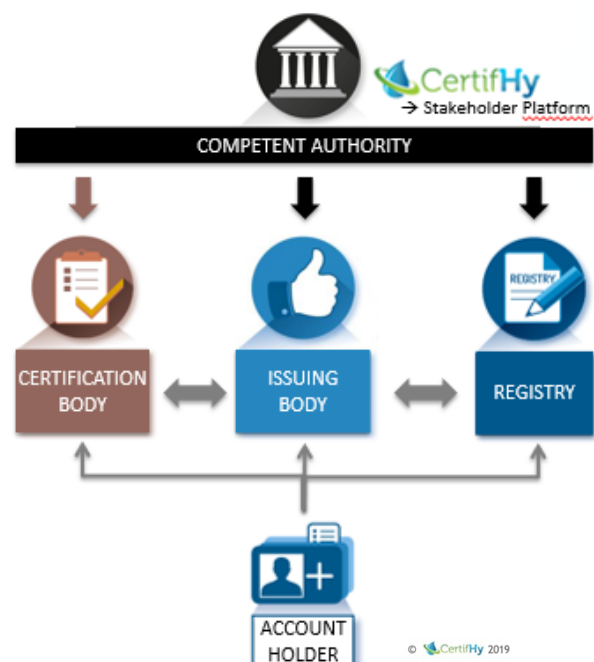


Figure 8 Organisation of the CertifHy GO Scheme.
Source: CertifHy, this report

It is the role of an Issuing Body to:

- Decide on the registration of Account Holders
- Decide on the registration of Production Devices
- Decide on the issuing of a CertifHy GOs
- Verify and satisfy itself, that GO transfer requests by Account Holders are valid and all information on the online form for GO transfers are accurate
- Decide on the cancellation of a CertifHy GO

N.B. During the pilot and until the Scheme is formally implemented, the tasks of the Issuing Body and the Registry (see below) have been taken up by GREXEL.

The CertifHy Registry

The CertifHy Registry is an ICT system that keeps track of issued, traded and cancelled Guarantees of Origin. The Registry⁶ is currently operated by GREXEL.

Account Holders

Account Holders have in their Accounts Production Devices and/or CertifHy Guarantees of Origin. It is the responsibility of the Account Holder to cancel a GO only against physical hydrogen consumption that he can ascertain as belonging to the specified GO system scope.

Registrants / Account Holders can:

- Register accounts with the Issuing Body in the CertifHy Registry
- Register Production Devices with the Issuing Body in the CertifHy Registry
- Select and contract a Certification Body for the verification of a Production Device and of the attributes of Production Batches
- Request GO issuing from the Issuing Body
- Request GO transfers from one Account to another to the Issuing Body
- Request GO cancellation to the Issuing Body.

⁶ <https://cmo.grexel.com/Lists/PublicPages/Statistics.aspx>

3. How to issue, trade and acquire a CertifHy GO

As mentioned, the Issuance, trading and the acquisition of a CertifHy GO is done via the CertifHy Registry that keeps track of an issued, traded and cancelled ('used') GO. Four types of CertifHy Scheme users can be distinguished:

- **Hydrogen producers** operating registered production devices that issue GOs and make them available for trade and end-use;
- **Traders** that buy and sell GOs on behalf of their clients (suppliers and/or end-users);
- **Suppliers** that sell hydrogen to their clients and are required as per the RED 2 to disclose the energy source and means of production to justify and provide Green and Low-carbon Hydrogen to their customers independent of the physical hydrogen.
- **End-users of hydrogen** that consume Green and Low-carbon Hydrogen irrespective of their geographical location and the physical hydrogen that is supplied to them. End-users (usually larger, industrial companies) are able to acquire and cancel GOs themselves via the Registry or this is done by hydrogen suppliers and/or traders on their behalf.

The above is depicted in the figure below.

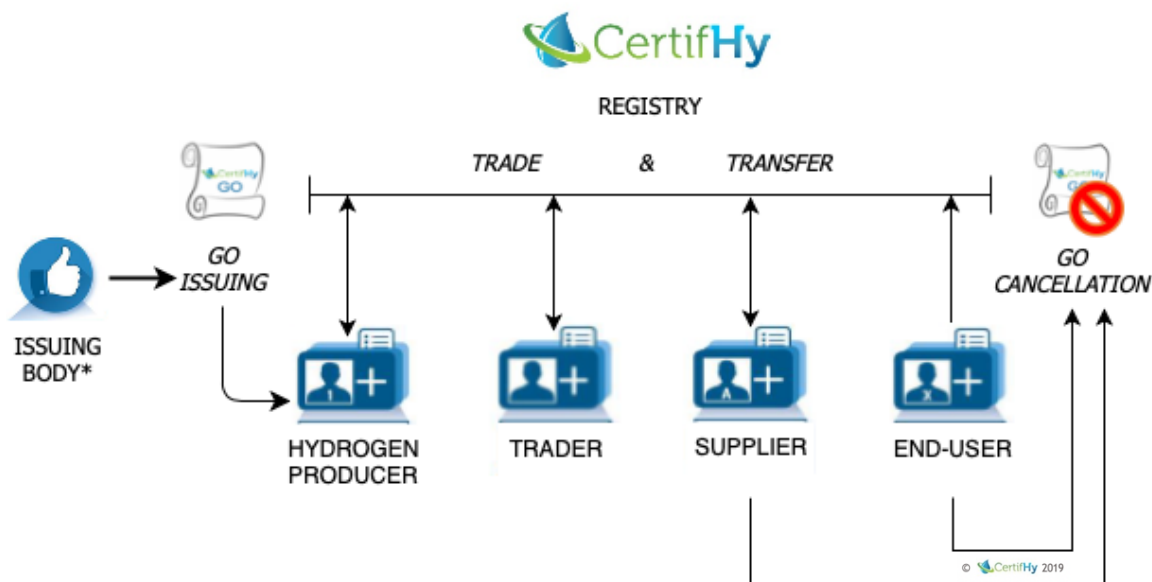


Figure 9 The functioning of the CertifHy Guarantee of Origin Scheme (simplified). How a GO is issued, transferred/traded and cancelled. Source: CertifHy, this report *During the pilot and until legal implementation, the role of Issuing Body is taken up by the CertifHy consortium through GREXEL (governed by the Stakeholder Platform).

The table below sets-out the different steps to register as an Account Holder and to issue, transfer and cancel a GO, addressing their relevance for the four different user types.

Table 3 The different steps to register as an Account Holder and to issue, transfer and cancel a GO, addressing their relevance for the four different user types.

	Producers	Traders	Suppliers	End-users
Registration as Account Holder	X	X	X	X
<i>To make use of the Scheme, producers, traders and suppliers are required to register with CertifHy.⁷ Applicants need first to download the Account opening application form, fill in the required information and return the document with attachments to support(at)grexel.com. More information on how to open an account as well as the application form can be found on the website of Grexel, here.</i>				
Registration of a Production Device	X			
<i>To request for Production Device registration in the CertifHy Registry, the producer must submit an online registration form to the Issuing Body (online, via the Registry). The Issuing Body will perform an initial review of the provided information and either gives clearance and await Production Device Audit results or dismiss and deny the registration of the Production Device. Upon clearance from initial review it is up to the operator to select and contract a Certification Body⁸ who will perform a Production Device Audit at the production site and determine the renewable energy content and GHG emissions. The Certification and Audit Report are reviewed and approved by the Issuing Body. Once registered, the Operator must notify the Issuing Body about major changes of the Production Device. Regular audits are required to be carried out every five years, and ad-hoc refresh Audits may be demanded by the Issuing Body at any time.</i>				
GO Issuing	X			
<i>Account Holders can register Production Batches and request GO issuing from the Issuing Body. Subject to the track-record of the Account Holder, Production Device and previous GO issuances, a Production Batch Audit is required which is done by an approved Certification Body of the Account Holder's choice. Subject to evidence, the Issuing Body gives clearance and a GO is issued in the Registry)</i>				
GO transfer from one party to another	X	X	X	(X)
<i>A GO can be transferred from one Account Holder to another in the Registry. Transfers are initiated by the sending Account Holder (the GO owner), are subject to review by the Issuing Body, and have to be committed by the receiving Account Holder through an acknowledgement of receipt.</i>				
GO Cancellation	X	X	X	(X)
<i>When a GO is acquired, as documentation for the hydrogen delivered or consumed, the GO is effectively cancelled in the Registry. The process of the GO cancellation is triggered by the respective GO owner through a cancellation request, including information about the claim for which the GO is being used. The Issuing Body may check completeness, purpose and alignment of the cancellation request with CertifHy principles. Upon GO cancellation the GO owner will be able to request a Cancellation Statement in the Registry. The owner of the GO can trade-transfer or cancel a GO until expiry time is reached. The process of GO expiration is hard-wired in the Registry. A GO automatically expires 12 months after the end of the production period.</i>				

(X) (Larger, industrial) end-users are able to acquire and cancel a GO themselves via the Registry or this is done by hydrogen suppliers and/or traders on their behalf.

⁷ The applicant, requesting for entry in the CertifHy Registry must be a legal entity, e.g. a private individual or an organisation. The identity of the legal entity is subject to proof for review by the Issuing Body.

⁸ It is up to the Account Holder to select and contract an approved Certification Body to initiate the auditing process. Certification Bodies have to be approved with CertifHy prior to offer certification services to operators of Production Plants. For this, candidate Certification Bodies apply with the relevant Approval Body who will decide based on the information provide.

The (simplified) procedures and steps for the different user-types can further be illustrated by flow-charts.

Producers

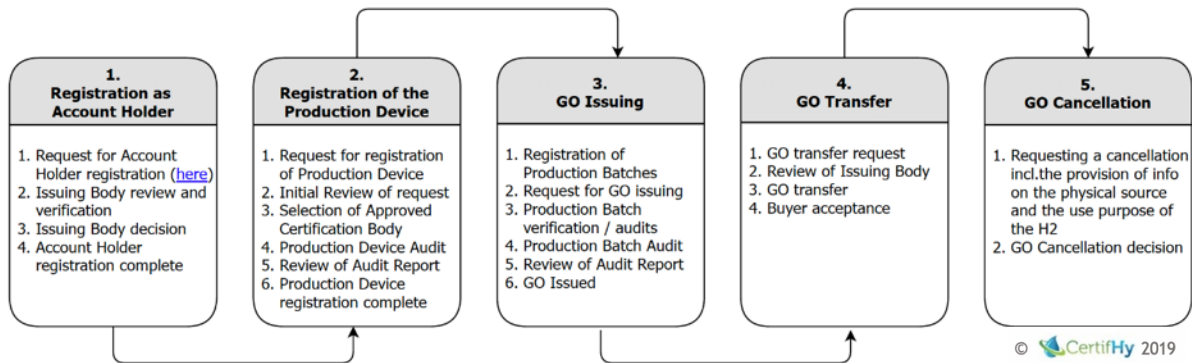


Figure 10 Hydrogen producers: how to register, issue, transfer and cancel a CertifHy GO. Source: CertifHy, this report.

Traders, suppliers and end-users:

As the required steps for traders, suppliers and end-users are comparable, these are presented in a single flow-chart:

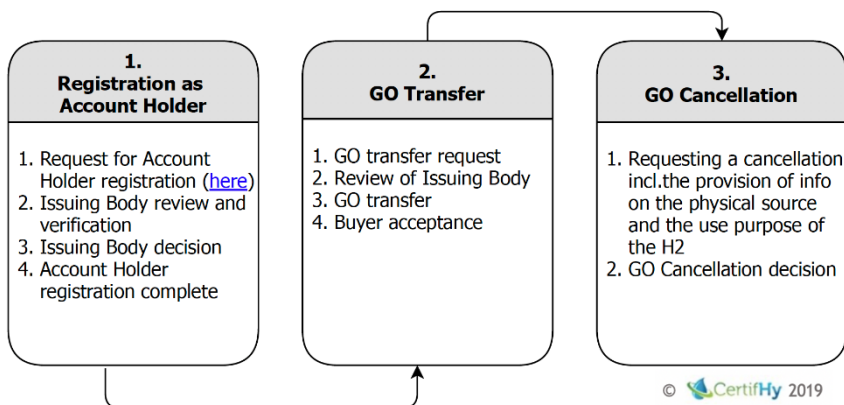


Figure 11 Hydrogen traders, suppliers and end-users: how to register, transfer, obtain and cancel a CertifHy GO. Source: CertifHy, this report.

Detailed procedures are included in Annex 4 and are also available on www.certifhy.eu.

4. Outlook

The CertifHy consortium has developed a roadmap⁹ consisting of three parts:

- 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; and
- Part III “Updated Roadmap - Ambitions and actions” includes a ten-point list of ambitions and actions for the next CertifHy phase. These are summarised below.

Currently, CertifHy is still ‘a project’ financed by the FCH 2 JU and run by a consortium of consultants, a research institute, a certification body and an ICT provider. In the course of 2019, CertifHy intends to become a legal entity that will allow binding commitments with regards to compliance and continuity of services. Moreover, CertifHy is in the process of being accepted as an observer within the AIB, a first step towards full membership, allowing CertifHy to issue AIB recognised EECS Guarantees of Origin.

The overarching ambition for the next phase of CertifHy could be to create an EU-wide CertifHy Certification System that is not only capable of covering Guarantees of Origin, but also certificates for target compliance. CertifHy could therefore create a dual-purpose GO/certificate system, whereby (1) a GO is to inform the final consumer on the origin and environmental attributes of the hydrogen and (2) Certificates that enable the identification of energy products that can contribute to meeting regulatory requirements, such as those linked to renewable fuel targets (according to the RED 2 Art. 25) and possibly other environmental targets (also referred to as target compliance). Such a system has the benefit of mutualising audit requirements for industry (one audit to allow the issuing of both a GO and a Certificate where applicable).

In addition to the overarching ambition, other core action points for the next phase of CertifHy, as stipulated in the Roadmap, could be:

- To ensure the continuation of the CertifHy stakeholder platform;
- To expand the pilot scheme in order to gain further experience. In particular with regard to new plants with different hydrogen production pathways and use cases other than the ones already covered (see section 1.5).
- To fine-tune the design of a voluntary scheme, recognized by the European Commission, for demonstrating compliance with targets on the share of

⁹ ‘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’. Ref: FCH JU 2017 D4415 Contract no.: FCH/OP/Contract 190. www.certifyhy.eu.

renewables in transport or heating & cooling, following the specific requirements that are applicable in that case (RED 2 articles 25, 27, 28 and 30).

For more details on the actions and ambitions and to download the complete Roadmap, please visit www.certify.eu.

Further information

Contact us:

✉ certify@hinicio.com

☎ +32 22 11 34 11

www.certify.eu

#CertifHy

Funded by



Project Coordinator



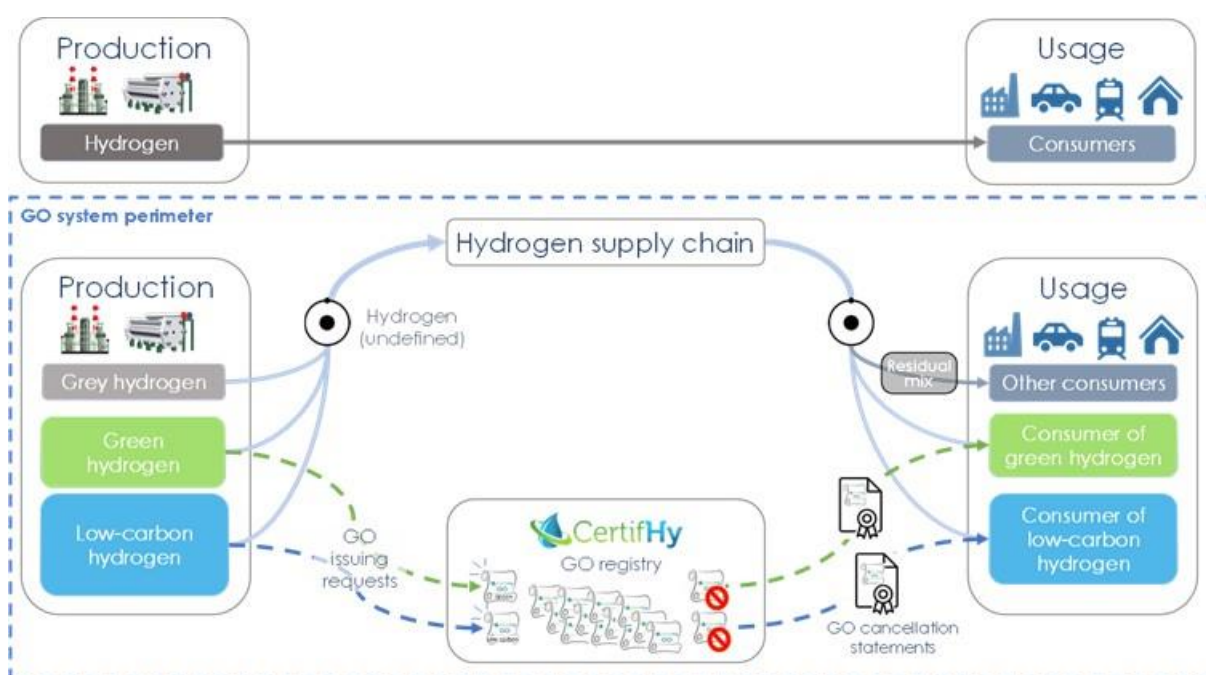
Consortium Partners



Annex 1: Towards Establishing the Residual Mix

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.



The operating principle of a GO system. (Source: Own illustration)

The operating principle of a GO system is illustrated in the figure above. 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.

Below we highlight different ways to define the GO system perimeter as well as aspects to consider when defining the system perimeter.

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 based¹⁰ 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:

¹⁰ or refinery off-gas based hydrogen with a GHG intensity similar to that of hydrogen made from methane.

- 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.

Annex 2: CertifHy Governance Structure

The different stakeholder platform bodies are presented in the table below, summarising their role in CertifHy as well as their powers.¹¹

	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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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.

¹¹ More details regarding the stakeholder platform bodies are elaborated in the document ‘CertifHy Stakeholder Platform Governance Rules’. See www.certifhy.eu.

<p>Working Groups</p>	<p>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):</p> <ol style="list-style-type: none"> 1. WG 1: GO Scheme and Procedures; 2. WG 2: GO Issuing; 3. WG 3: GO Commercialisation and Use; 4. WG 4: Regulatory Framework. 	<p>Working Groups have the power to:</p> <ul style="list-style-type: none"> • 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; <p>Address questions, comments and feedback to other Working Groups and to the Steering Group via their Working Group Coordinator.</p>
<p>Secretariat</p>	<p>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.</p>	<p>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.</p>

Annex 3: Information a CertifHy GO Discloses

A CertifHy GO contains the following information:

PART 1: Factual information	Comments
<ul style="list-style-type: none"> • Account number 	
<ul style="list-style-type: none"> • Identity of the Production Device <ul style="list-style-type: none"> ○ Production device identifier ○ Name ○ Location country ○ Location city ○ Commissioning date ○ Installed production capacity 	
<ul style="list-style-type: none"> • Date and time of hydrogen production: beginning and end of the production batch 	dd.mm.yyyy
<ul style="list-style-type: none"> • Fuel (or heat source) and Technology <ul style="list-style-type: none"> ○ Fuel (or heat source) code(s) for up to ten fuels including respective share of total fuel input ○ Technology code; including main/by-product 	
<ul style="list-style-type: none"> • Financial support to hydrogen production or input fuel production <ul style="list-style-type: none"> ○ investment supported, and/or ○ production supported, and/or ○ supported scientific/demo/pilot project, or ○ unsupported, or ○ no information available 	
<ul style="list-style-type: none"> • Share of renewable energy for each input energy carrier for producing the hydrogen 	%
<ul style="list-style-type: none"> • GHG balance: <ul style="list-style-type: none"> ○ GHG emissions intensity 	g CO _{2eq} /MJ _{H2}
<ul style="list-style-type: none"> • GO identity <ul style="list-style-type: none"> ○ Identifier (the unique number which has been assigned to the GO) ○ Issuing date ○ Cancellation/Expiry date 	ID dd.mm.yyyy
<ul style="list-style-type: none"> • Certification Body 	Name

PART 2: Evaluation of information	Comments
<ul style="list-style-type: none"> • CertifHy label: <ul style="list-style-type: none"> ○ CertifHy Green hydrogen ○ CertifHy Low-Carbon hydrogen 	

Annex 4: Scheme Document and Subsidiary Documents

- [CertifHy Scheme](#)
- [Procedure 0.1 Registration of Account Holder](#)
- [Procedure 0.2 Registration of Production Device](#)
- [Procedure 0.3 Approval of Certification Body](#)
- [Procedure 1.1 GO Issuing](#)
- [Procedure 1.2 GO Transfer](#)
- [Procedure 1.3 GO Cancellation](#)
- [Procedure 1.4 GO Expiry](#)