

“Definition of scope, main principles of the GO scheme as well as roles and tasks of the relevant actors”



Grant agreement no.: 633107

Deliverable No. D.4.1

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**Status:
final**

**Dissemination level:
“PU – Public”**

**Last update:
26 July 2016**



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Date: 26 July 2016

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Abbreviations

AIB	Association of Issuing Bodies
EECS	European Energy Certification System
EU	European Union
GHG	Greenhouse Gas
GO	Guarantee of Origin
H ₂	Hydrogen
RED	Renewable Energy Directive
SMR	Steam Methane Reforming

1 Introduction

The European project CertifHy develops the first EU-wide framework for the generation of Guarantees of Origin (GO) for green hydrogen. The objectives of this ambitious initiative are to develop and to design a robust GO scheme for green hydrogen (H₂), based on a widely accepted definition; and to propose a roadmap to implement the initiative throughout the EU.

For the present definition of scope, main principles of the GO scheme are based on the “Technical Report on the Definition of ‘CertifHy Green Hydrogen’” (CertifHy report No. D 2.4), the outcomes of “A review of past and existing GO systems” (CertifHy report No. D 3.1) as well as “Recommendations on the establishment of a well-functioning EU hydrogen GO system” (CertifHy report No. D 3.3).

1.1 Definition of CertifHy Green Hydrogen

The adopted approach within CertifHy report No. D 2.4 allows for the generation of (i) “CertifHy Green hydrogen” (combining renewable origin with low GHG emissions), and for (ii) hydrogen that carries a low level of greenhouse gas (GHG) emissions hereafter referred to as “CertifHy Low-carbon hydrogen”.

The following conditions for producing CertifHy Low-carbon and/or CertifHy Green H₂ are defined:

- Only facilities producing hydrogen (H₂) with GHG emissions lower than the benchmark value - 91.0 gCO_{2eq}/MJ¹ - since sign up or over the preceding 12 months are eligible, whichever duration is the shorter.
- Under the additional conditions listed further below, these facilities will be able to produce:
 1. CertifHy Low-carbon H₂
 2. CertifHy Green H₂ in proportion of the share of renewable energy² in the non-ancillary energy used.
- The further conditions are the following:

¹ This value has been calculated within the CertifHy project in: Altmann, M., Weindorf, W.: Extended Life-cycle Analysis of Hydrogen Production, Deliverable No. 2.3, 3 July 2015; the benchmark value should be re-evaluated regularly to accommodate for relevant changes such as e.g. efficiency improvements in the benchmark process.

² Any raw material input without energy content is not considered for the calculation of the renewable share.

Condition 1: The emissions associated to CertifHy Green H₂ and CertifHy Low-carbon H₂ must be lower than the Low Emissions Threshold, set at 36.4 gCO_{2eq}/MJ, i.e. benchmark value minus 60%.

Condition 2: H₂ produced by this facility that is neither CertifHy Green nor CertifHy Low-carbon must have emissions lower than the benchmark value.

Figure 1 presents the above mentioned conditions in a schema.

1.2 Existing GO schemes and interaction with a Green Hydrogen GO scheme

The key lessons learnt from existing GO schemes can be resumed as follows:

- The functional system, with clear roles for producers, traders, consumers and an issuing body, in which certificates are issued, traded and finally cancelled, has proven its value in other energy domains. This basic structure can be transferred to a green hydrogen GO system.
- For detailing of the system, the Association of Issuing Bodies (AIB) Rules and Principles for a European Energy Certificate Systems (EECS) are the best basis to start from.
- Any claims with respect to renewable origin of hydrogen consumed made by market parties in commercial messages will have to be proven by cancellation of the required hydrogen GO.
- A single European registry or national registries with identical data structures should be established.
- The GO scheme should cover all possible production routes and be open to all applications.
- A key element of the GO system should be the separation of information on the origin of the product and the part that specifies whether the product meets certain qualifications.
- Initially, the function of the GO system should be consumer disclosure.
- A harmonised GO scheme for the EU as a whole seems preferable.
- The GO scheme should be flexible to changes in the external environment.

- Virtual trade due to separation between attribute and physical trade.

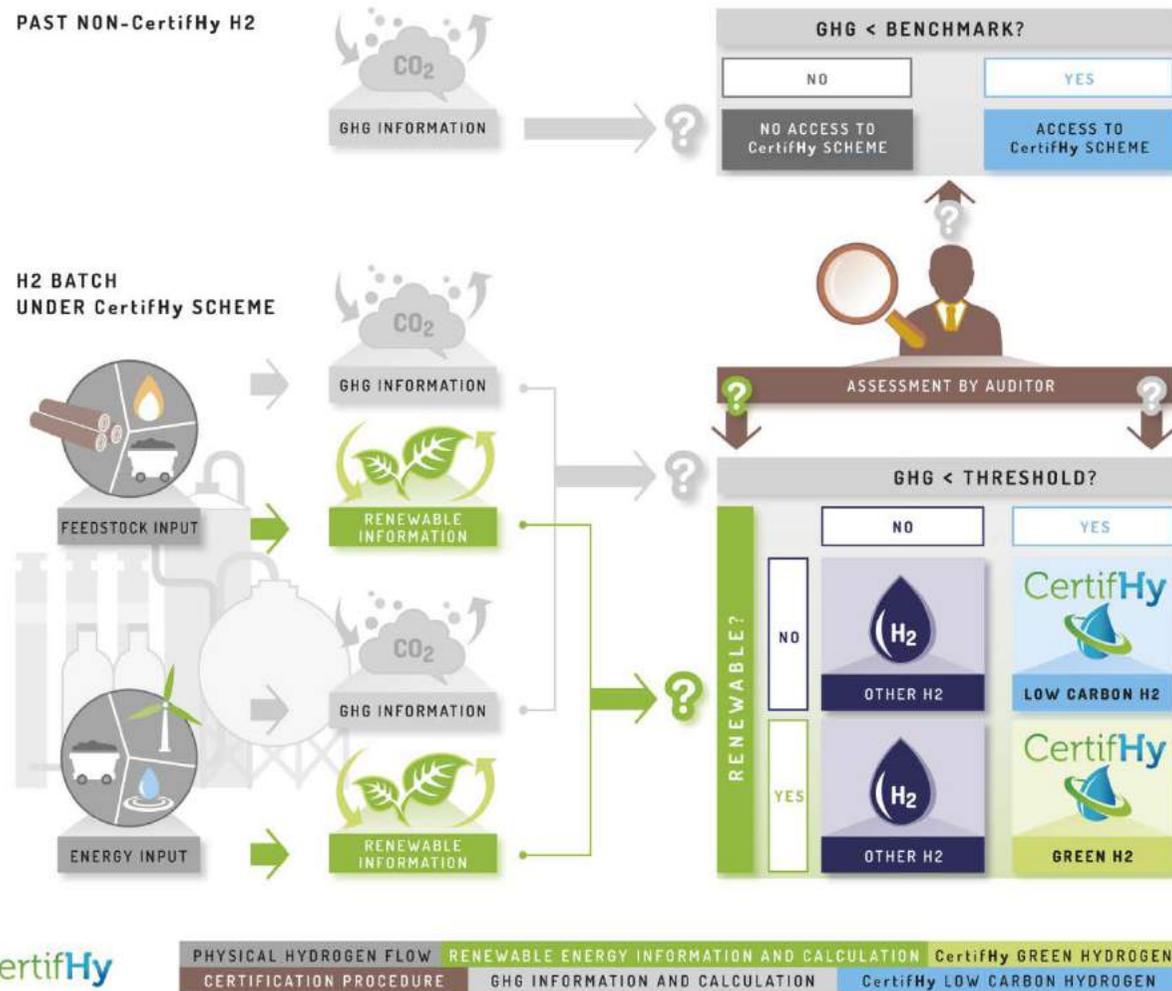


Figure 1. Assessment of Green and Low-carbon hydrogen definition

The key issues of existing schemes requiring attention in establishing a green hydrogen GO scheme are the following:

- Residual mix;
- Conversion of GO between different schemes;
- Transport and storage losses after production of green hydrogen;
- A GO system could provide information not only about the directly related GHG emissions, but also on the GHG emissions of the production system as a whole;

It is important to notice that the key interactions between existing GO schemes and a newly established Green H₂ GO scheme will occur when one energy carrier eligible for a Green H₂ GO is transformed into another energy carrier which is eligible for a GO under another scheme. Hence it is recommendable to:

- Harmonise GO schemes for the EU as a whole;
- Prevent double counting effects and safeguard consumer trust;
- Balance the comprehensiveness of the accounting system for conversion and the administrative burden of it.

1.3 Objective and structure of this report

This document seeks to elaborate on the scope of the GO scheme (chapter 2), to discuss the main principles (chapter 3) and to determine the different protagonists, their tasks and roles within the GO scheme (chapter 0).

2 Scope of the green hydrogen GO scheme

A GO scheme should be developed within a defined scope. The main aspects to be addressed are:

- Geographical boundaries;
- Type of technologies;
- Type of GO;
- Structure of GO scheme;
- GO-scheme process (from issuance to cancellation);
- Applications covered.

These aspects are discussed in the following subchapters.

2.1 Geographical boundaries

Taking into account that the CertifHy project is a European project aiming a harmonized EU-wide approach, the boundaries shall include at least all EU member states; it is recommended to expand to EFTA countries. The export and import of green hydrogen from and to the EU could be included in the scheme under the condition that reliable information is made available.

All account holders involved in the trading of green hydrogen GO shall also be established in the EU in order to have a clear and transparent traceability of issuance, transfer/trade and cancellation of green hydrogen GO.

As soon as green hydrogen GO leave the geographical boundaries, the respective number of GO is to be cancelled in the respective registry.

For a registry covering the full geographical boundaries there are two options:

- A single registry administered by one responsible entity, or
- A multi-Registry with separate registries for each Member State administered by the respective designated authority.

2.2 Type of Technologies

The definition of CertifHy Green hydrogen and CertifHy Low-carbon hydrogen does not require any specific technology to be used for the production of hydrogen. Hence, the GO scheme is technology neutral as long as the requirement to comply with the definitions is met.

Any technology that can provide evidence that the GHG emissions for the total amount of hydrogen produced – since sign up to the green hydrogen scheme or over the preceding 12 months – are lower than the benchmark value $91.0 \text{ gCO}_{2e}/\text{MJ}^3$ can be included in the scope of this GO scheme.

However, the commonly available technologies will be pre-defined as mentioned below (this list is not comprehensive or limiting):

- Electrolysis (incl. chloralkali electrolysis)
- Steam Methane Reforming (SMR)
- Chemical processes (partial oxidation (POX), cracking, etc.)

³ This value has been calculated within the CertifHy project in: Altmann, M., Weindorf, W.: Extended Life-cycle Analysis of Hydrogen Production, Deliverable No. 2.3, 3 July 2015; the benchmark value should be re-evaluated regularly to accommodate for relevant changes such as e.g. efficiency improvements in the benchmark process.

- New technologies (biomass gasification or pyrolysis, thermo chemical cycles, biological processes, etc.)

Additionally, the technologies producing hydrogen as by-product are included in the scope of the green hydrogen GO as far as transparent information about the main product is included in the GO and the basis of the GHG emissions allocation complies with the principles of the scheme.

2.3 Types of GO

The GO will contain two parts, the first one presenting factual information, while the second part will contain an evaluation based on the definitions presented above. The GO scheme will include two different GO labels/definitions - CertifHy Green hydrogen and CertifHy Low-carbon hydrogen -. The GO might be extended in order to include other definitions of premium hydrogen in the second part.

Furthermore, the scheme might include GO of conventional H₂ (which do not comply with the requirements for green hydrogen).

2.4 Structure of GO scheme

Taking into account that the “Principles and Rules of Operation of the Association of Issuing Bodies (AIB)” for the European Energy Certificate System (EECS) are available, a similar structure is envisaged for this scheme. The European standard EN 16325:2013 + A1:2015 – “Guarantees of Origin related to energy - Guarantees of Origin for Electricity” is also taken into account for this scheme as a best practice example.

The governance of the GO scheme refers 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 purpose 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. The governance is controlled and managed by the Competent Authority.

The creation/generation, maintenance, transfer/trade, cancellation, expiration, withdrawal/retirement and other processing of hydrogen GO - CertifHy Green hydrogen and CertifHy Low-carbon hydrogen – is under the responsibility of the Issuing Body, this entity is under direct control of the Competent Authority. The actual movement of GO will be

performed in a Registry; this can be managed by any entity and will be under the control of the Issuing Body.

In order to have a well establish system it is recommended to have Auditors to ensure the participants (Production Devices) to comply with the GO Scheme requirements. The Auditors ideally should be part of a Certification Body, which should at the same time have a relevant accreditation to perform this activity. The Accreditation Body control the quality assurance system of the Certification Body. Any Accreditation Body in Europe – member of the International Accreditation Forum – should be allowed to accredit Certification Bodies.

Figure 2 presents the structure of the GO scheme from the organizational point of view.

2.5 GO scheme process (from issuance to cancellation)

Figure 3 presents the procedural structure of the GO scheme. A GO scheme process starts with the creation of a Production Device account (registration). This account will be created only after an Auditor confirms the compliance with all GO requirements.

Once the registration is performed the Production Device can request the Issuing Body to create certain amounts of GO (CertifHy Green and/or Low-carbon GO). The issuance performed will be verified by an auditor periodically (e.g. yearly).

Any entity interested in participating in the system as Trader, Supplier or User can open an account in the Registry after submitting a defined set of information⁴.

The issued GO can be transferred within the Registry to any other account. Finally, when an account holder intends to claim CertifHy Green or Low-carbon hydrogen (User) the respective amount of GO will be cancelled in the Registry and stored in a Cancellation Account for traceability.

⁴ See CertifHy report D4.2 “Specification of rules and obligations of the GoO scheme (requirements, methodologies, certification process and registration of GoOs)”.

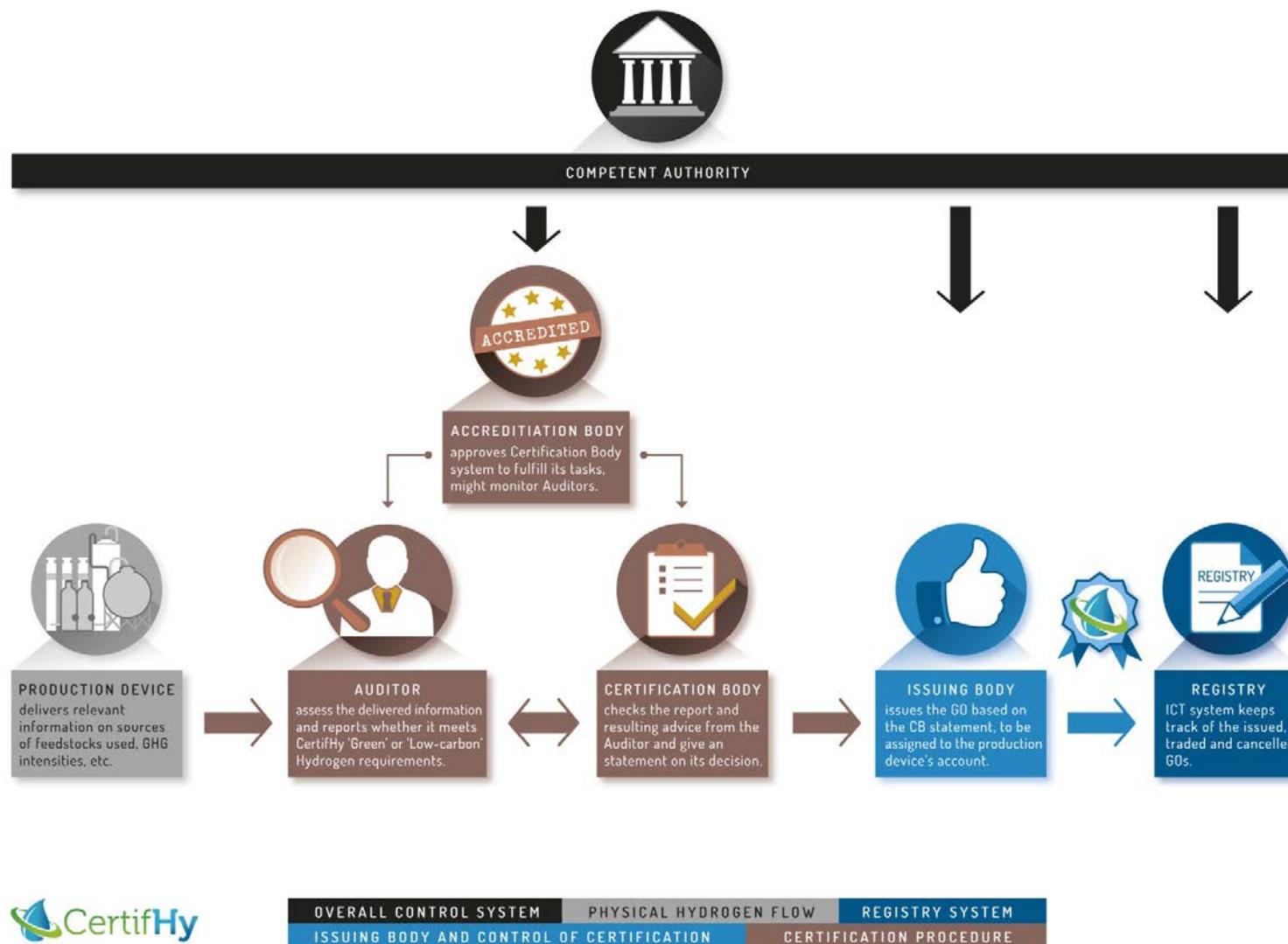


Figure 2. Organization of the GO scheme

The following examples related to claiming Green or Low-carbon hydrogen might clarify the use of this GO scheme (see as reference Figure 3):

- Supplier A can claim selling premium hydrogen to User Q to which it physically delivers hydrogen. In this case the supplier is the one cancelling the relevant amount of GO.
- User X can claim using premium hydrogen in relation to the production of a specific product. In this case the hydrogen user, who is also the product manufacturer, is responsible for cancelling the GO.
- A fuel station (User Y) claims selling premium hydrogen to private consumers (vehicles). In this case the fuel station will cancel the appropriate amount of GO.

In all these examples, no requirements related to the physically delivered hydrogen have been assumed. Within the implementation of the CertifHy Road map⁵ certain requirements may be defined for the physically delivered hydrogen. It is worth to mention that this important issue is still in discussion within the CertifHy project, in case that a definition is agreed within the project, this document will be updated accordingly.

2.6 Applications covered

The Green hydrogen GO scheme shall be open to all kinds of applications including energy, mobility, chemical conversion, etc.

In case of overlap or interaction with other GO schemes the principles presented below should be taken into account for the correct application of the GO.

⁵ See CertifHy report D.5.1 “Draft roadmap for the establishment of a well-functioning EU hydrogen GO system”.

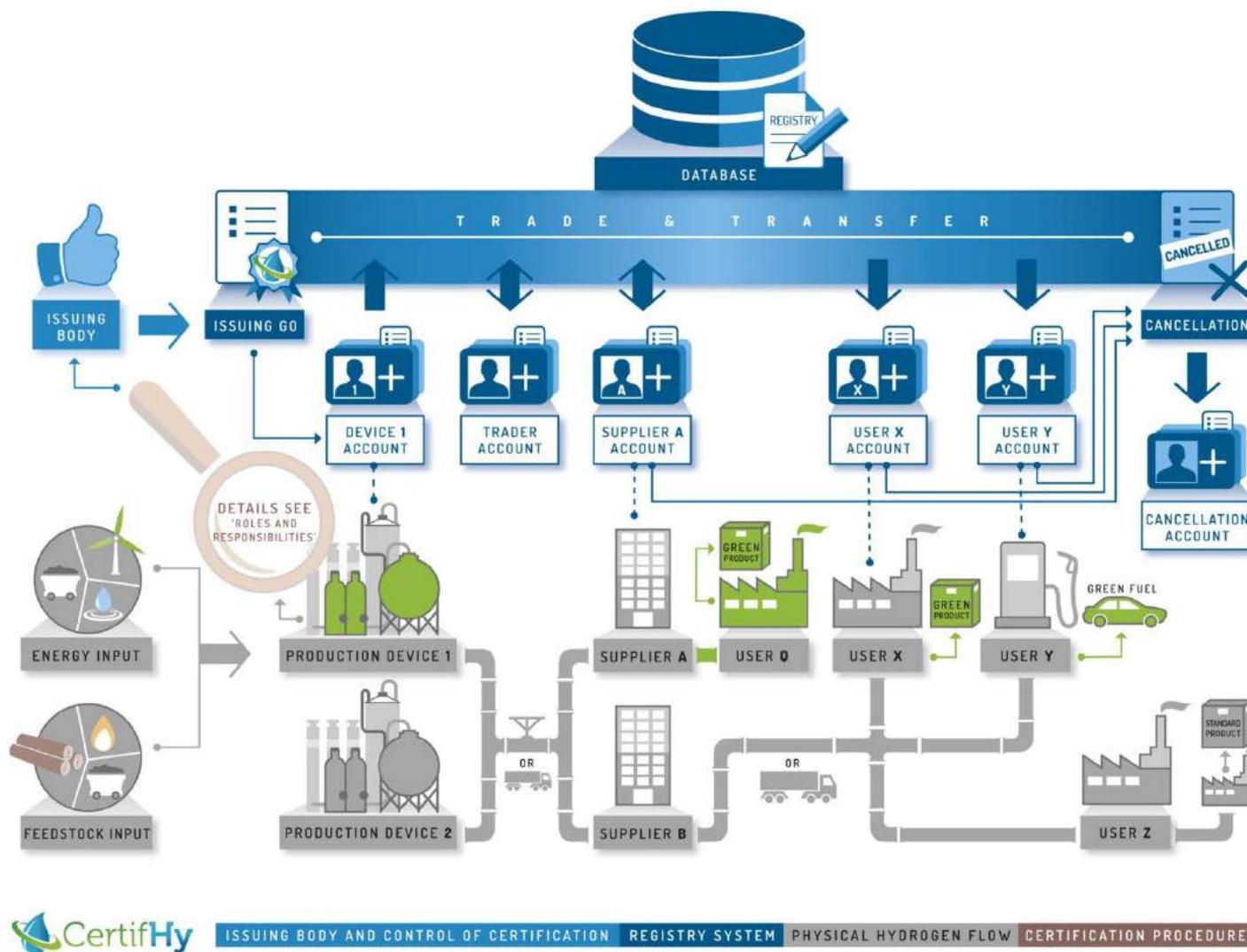


Figure 3. Structure of the GO scheme

3 Principles

Within this GO scheme certain principles need to be defined in order to assure a manageable system.

3.1 Virtual trade

In order to be consistent and harmonized with most of the existing GO schemes it is proposed to allow for the separation of the attributes – renewable and/or low carbon emissions – from the physical delivery of the hydrogen.

In order to avoid double counting, all physical delivery claimed to be Green or Low-carbon hydrogen shall be covered with cancellation of the respective amount of GO.

Any trade of GO must be performed by a transaction in the registry between valid accounts.

The system shall ensure that the communication to the buyers of hydrogen without GO but coming from a plant within the system is clear and transparent (residual mix issue)⁶.

3.2 Certificate Face Values

To be consistent with European GO schemes for electricity and heat from renewable sources hydrogen GO are issued with the following Face Value:

- 1 MWh

3.3 Quality

It is necessary that the hydrogen to be certified has to be conditioned in a way that it is ready for marketing or ready for transport to a supplier or to an external final consumer (e.g. onsite-connection to a H₂-filling station or an installation to inject hydrogen into a pipeline). Hence, it is required that the hydrogen produced is in a state to be physically transported to a different entity for its usage and that this hydrogen is available for a commercial trade.

⁶ CertifHy Low-GHG hydrogen or CertifHy Green hydrogen sold without generation of associated GO is hydrogen of the “residual mix”. The GHG emissions intensity of the residual mix is the average GHG emissions intensity of the hydrogen produced by the participating facilities that has not been sold as CertifHy Low-GHG nor CertifHy Green hydrogen.

In order to ensure a harmonized and fair evaluation especially of the GHG emissions related to the production of hydrogen it is necessary to define the quality to which the certificate face value will apply. A hydrogen concentration of 99.9% is considered appropriate to define the quality.

Independent of the physical state of the produced hydrogen (liquid or gaseous) the calculation of the GHG emissions equivalent for the production of 1 MWh is required.

3.4 Losses

The green hydrogen GO scheme is created to certify the origin of the hydrogen; hence the GO are created at the H₂ production. The possible losses especially with regard to further transport might be relevant.

However, for the establishment of the system and its first phase (implementation) it is recommended not to take into account these transport losses, this approach is also used by the electricity GO.

If operational practice in the future shows a suitable approach how to take losses into account, the system can be improved in this regard.

3.5 Measurement / accuracy

Only entities that are equipped with metering equipment based on best available practice and that comply with all relevant regulations for the trading of hydrogen (if available) shall be registered.

3.6 Renewable sources

The use of renewable energies for the labelling should be evidenced through acceptable EU wide energy GO certificates. In this case the energy GO must be cancelled in the respective registry before the CertifHy hydrogen GO is issued.

4 Stakeholder tasks and roles

This GO scheme will involve a wide number of stakeholders; their tasks and roles are summarized here.

Stakeholder	Definition	Tasks and roles
Competent Authority	In relation to the exercise or discharge of any legislative, governmental, regulatory or administrative function, the body duly authorised under the laws and regulations of the EU to exercise or discharge that function	Managing entity. Governance
Issuing Body	Entity responsible for registering entities, in case of a Production Device, the registration is based on an auditor assessment. Additionally, the entity is responsible for issuing GO	GO issuance
Registry administrator	Entity appointed by the Competent Authority and/or Issuing Body to operate and maintain the registry	Registration transactions
Account Holder	Person in respect of whom an account is maintained on the registry	Producing, supplying or using hydrogen, trading, transferring and cancelling GO
Accreditation Body	Entity accepted by the Competent Authority to assess and accredit the Certification Body	Accreditation
Certification Body	Entity entitled to act as an environmental verifier or environmental verification organisation and approved by an accreditation body	Certification of GO compliance
Auditor	Person who is appointed by a certification body in order to assess the production or conversion against the requirements of the GO scheme	Assessment of GO compliance
Measurement body	Entity responsible for collecting and determining (on behalf of the account holder) measured values of the output of a production device	Assurance of measurement accuracy
IT-Provider	Entity appointed by the Issuing body or competent authority responsible for the IT-System	Develop, establish and maintain the software and the data base
Service provider	Entity who is entitled by the account holder to administer the account	Administration of accounts