REGATRACE
Renewable Gas Trade Centre in Europe

D4.3 | Harmonised set of rules for the conversion of electricity into biomethane/renewable gas and hydrogen GOs

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Lead Author:	Katrien Verwimp (AIB)
Co-Author(s):	Liesbeth Switten (AIB), Mieke Decorte (EBA), Katharina Kramer, Matthias Edel (ERGaR), Stefanie Königsberger, Andreas Wolf, Franz Keuschnig (AGCS), Milenko Matosic, Katharina Sailer (dena), Matthieu Boisson (Hinicio - CertifHy)
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Coordinator:	Stefano PROIETTI, ISINNOVA
Tel:	0039 06. 32.12. 655
Fax:	0039 06. 32.13. 049
E-mail:	sproietti@isinnova.org

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1 Executive Summary

Harmonised rules are essential for a functional market for guarantees of origin that facilitates cross-border transfer from nationally governed GO systems. Harmonisation enables trust with regards to imported GOs from other countries and enhances efficiency in the management of the GO system. This report therefore proposes rules that follow logically from existing knowledge of energy conversion processes and energy attribute tracking systems.

While the market for guarantees of origin for gaseous energy carriers is still developing, it needs however to be acknowledged that there are still areas where the framework is not yet clear enough for proposing clear rules. In this regard, this report maps elements to take into account and to monitor for growing towards a harmonised rule while the landscape further develops.

This study recommends harmonising the following rules for handling guarantees of origin in relation with energy carrier conversion.

1.1 Recommended rules for certificate handling in relation with Conversion

This section summarises the recommendations for harmonised rules for handling GOs in relation with energy carrier conversion. The body of this report will elaborate on the arguments behind them.

RULE 1. CANCELLING GOS FOR INPUT ENERGY CARRIER

For issuing GOs for energy produced following Energy Carrier Conversion, GOs of the input Energy Carrier are to be cancelled to prove the energy source of the energy produced in the energy conversion.

EXCEPTION RULE 1. VOLUNTARY EQUIVALENT OF A GO

Alternative documents to be cancelled for proving the energy source for GOs to be issued following Energy Carrier Conversion, originating from Domains where no GOs are being issued for the Input Energy Carrier, can be Non-Governmental Certificates (NGCs) that are voluntary equivalents of GOs, if the respective Issuing Body for Conversion Issuance has formally recognised these NGCs. A condition is that these NGCs ensure to be the only proof of the Attributes of the corresponding energy production and do not conflict with GOs. In this case as well it remains crucial that these certificates are cancelled, cease to be transferrable and can no longer be used for any other claims. Accepting input NGCs as alternative for input GOs is not mandatory to any issuing body for Conversion Issuance.

EXCEPTION RULE 2. INPUT ENERGY CARRIER PRODUCED ONSITE

Cancellation of GOs for proving the energy source for GOs to be issued following Energy Carrier Conversion may be omitted ONLY IF the energy so fed into the Production Device for Energy Carrier Conversion:

(i) has demonstrably been produced on the site of this Production Device, or transferred to it through a Direct Line, reflecting the attributes that are requested to be indicated on these GOs to be issued following Energy Carrier Conversion, and

(ii) has not been or will not be subject to GOs or any other equivalent Certificates, and

(iii) will not be disclosed other than in relation with the GOs issued in relation with the Output of this Production Device for Energy Carrier Conversion.

RULE 2. ISSUING NEW GOS AFTER ENERGY CARRIER CONVERSION

Following Energy Carrier Conversion, new GOs may be issued upon request, on condition that the origin and other Attributes of the Input Energy Carrier are documented adequately, in accordance with the rules in previous sections.

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RULE 3. GO CONVERSION REQUIRES PHYSICAL ENERGY CARRIER CONVERSION

GO Conversion Issuance is subject to physical energy carrier conversion.

RULE 4. CANCEL ONLY GOS OF THE SAME ENERGY CARRIER AS THE PHYSICAL ENERGY INPUT INTO CONVERSION

For cancellation, only GOs of the same energy carrier as the actual energy carrier of the input into the conversion device shall be allowed.

RULE 5. MEASURING OUTPUT ENERGY FROM CONVERSION

The amount of energy output from the Energy Carrier Conversion shall be measured, for an according number of GOs to be issued

RULE 6. MEASURING INPUT ENERGY INTO CONVERSION

The amount of energy input into the Energy Carrier Conversion shall be measured, for determining the number of GOs to be cancelled in accordance with Conversion Issuance.

RULE 7. PROPORTIONAL ALLOCATION OF ATTRIBUTES FROM INPUT TO OUTPUT GOS

The proportion of measured input that is covered with cancelled GOs, determines the proportion of output for which corresponding GOs can be issued. The Attributes that are conveyed from the cancelled input GOs to the newly issued GOs after conversion, are carried forward in the same proportion, at least for the Attributes informing about the energy source.

RULE 8. GOS ARE PRIMARILY TO INFORM ABOUT THE ENERGY SOURCE

Energy source is the minimum information to retain from cancelled GOs to newly issued GOs

RULE 9. FULL CHAIN DATA TRACEABILITY

Registries shall keep track, for a period of minimum of three years, in relation with every conversion device, of the information on the cancelled GOs for every batch of issued GOs. This enables to back-track original energy production.

Particularly, in case of error-handling and double counting suspicion, such information is likely to be helpful

RULE 10. INFORMATION ON A CANCELLATION STATEMENT USED FOR CONVERSION ISSUANCE

The cancellation statement for the cancelled input GOs for conversion Issuance shall record that the corresponding GOs have been cancelled for the purpose of energy carrier conversion. It shall also identify the Conversion Device and the period of energy consumption in which the new Energy Carrier is produced.

RULE 11. DATA ON NEWLY ISSUED GOS FOR OUTPUT OF ENERGY CARRIER CONVERSION

1) The Energy Source of the cancelled GOs as an input to conversion is to be recorded on the new-to-be-issued GOs. In case of multiple energy sources of inputs, these shall be distributed to the new-to-be-issued output GOs pro rata these energy sources on the input GOs.

2) While the Purpose of GOs is Disclosure, the Purpose of the certificate following Conversion Issuance shall remain the Purpose recorded on the cancelled GOs for the Input Energy Carrier. No certificate with the purpose of Disclosure shall be issued following Conversion Issuance if the correspondingly cancelled certificates for the input energy carrier did not convey this same purpose to be Disclosure.

3) The new GO issued following Energy Carrier Conversion shall inform that the GO was issued as a result from Energy Carrier Conversion (conversion-tag).

RULE 12. ATTRIBUTES ON NEWLY ISSUED GOS NEEDING DEDICATED ATTENTION

For determining the following Attributes of the new GOs issued for the output of Energy Carrier Conversion, data from the cancelled GOs for the conversion input is recommended to be used:

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1) Label/independent criteria scheme: the label scheme operator may decide to use information of the cancelled GOs in order to judge the eligibility for its label for the output GOs to be issued after conversion. A GO following conversion only receives a label/ICS tag after certification by the label/ICS scheme operator.

2) Carbon footprint: Where GOs are issued with carbon footprint information, it is recommended that this takes into account the information from the cancelled GOs for Conversion Issuance. As conversion usually impacts the carbon footprint, this implies adding of an additional factor in the carbon foot print calculation equation after conversion. The same methodology and supply chain scope for the carbon footprint calculation are to be applied for both the cancelled GOs for the input carrier as for the GOs resulting from Conversion Issuance, while this methodology is to be displayed on the issued GOs.

The other Attributes to be recorded on the GOs issued following Energy Carrier Conversion, relate to the Production Device for Energy Carrier Conversion.

RULE 13. PROVISION OF PUBLICLY ACCESSABLE INFORMATION REGARDING NATIONAL DOMAIN SCHEME RULES

It is recommended for every issuing body to transparently publish its procedures for production device registration and inspection, account holder registration, GO issuance, transfer, cancellation, expiry, error handling, dispute handling.

RULE 14. AVOIDANCE OF DOUBLE COUNTING WHILE ACKNOWLEDGING IMPORTED GOS:

Criteria for acknowledging imported GOs, in relation with avoidance of double counting, relate to:

a) the processes for GO issuance (production registration, data flows, inspection, and control mechanisms); and

b) the processes for GO transfer (exclude the risk of duplication during transfer); and

c) the processes for GO registration and guarding over their lifetime.

RULE 15. TRANSPARANT LIABILITY ALLOCATION

It is recommended to transparently clarify to the parties involved along the chain of custody:

a) If and how the liability of the originating issuing body and registry operator of the GOs is limited, and how risk is addressed; and

b) What responsibility is allocated to any importing issuing body, registry operator of GOs and, if applicable, the organisation facilitating international transfer; and

c) If and how the liability of specific aspects of the GO system management is regulated towards the market participants / Account Holders who take part in registering, trading, cancelling and using GOs, both for intra-registry as for inter-registry transfers.

RULE 16. EX ANTE CHECK ON INPUT GO CANCELLATION WHERE POSSIBLE, ALTERNATIVELY ALLOW EX POST CANCELLATION WHILE INSTALLING AUDIT AND ENFORCEABLE PENALTY ON FRAUD

Where resources allow doing so, it is recommended to cancel GOs for the input energy into the conversion device before issuing new GOs for the output generated in Energy Carrier Conversion. (ex-ante cancellation check)

Where practices are not ready for performing an ex-ante cancellation check, or where they would cause an undefendable delay in the issuance process, it could be allowed to cancel GOs ex post, after the GO Conversion Issuance, on condition that a regular third party audit (e.g. annual) checks for the correct amount of GO cancellation. High fraud detection chance and a penalty in accordance with lacking the required GO cancellation could mitigate any risk and maintain the system's credibility.

RULE 17. CLASSIFY THE CANCELLATION AS "CANCELLATION FOR CONVERSION" PURPOSES.

Cancellations of guarantees of origin are recommended to be categorised in relation with the purpose of the cancellation. When GOs are cancelled for conversion issuance of GOs for another

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energy carrier, this shall be registered in the type of cancellation and on the cancellation statement.

1.2 Overview of elements to monitor while the market is further developing, to establish further harmonised rules in the future

Subsequently, on the following subjects this study recommends further elaborating arguments to come to a rule for handling guarantees of origin in relation with energy carrier conversion. For a basic kick-off not over burdening the evolving GO system, the following recommendations are brought forward.

KICK-OFF RECOMMENDATION 1. NEW GO VALIDITY PERIOD AFTER CONVERSION

The validity period for GOs issued following Energy Carrier Conversion starts at the end of the production period of the new Energy Carrier.

KICK-OFF RECOMMENDATION 2. PLAUSIBILITY CHECK OF INPUT-OUTPUT FLOWS VIA DEFAULT CONVERSION EFFICIENCY FACTORS

A sanity check is to be done regarding the plausibility to produce the reported output from the reported input.

KICK-OFF RECOMMENDATION 3. CONDITIONS FOR USING DEFAULT CONVERSION EFFICIENCY TO DETERMINE THE AMOUNT OF INPUT GOS TO BE CANCELLED

For determining the amount of GOs to be cancelled, if allowing to replace input energy measurement by a default conversion efficiency value to be applied on the measured output energy, this should be made subject to a framework of conditions. Such conditions are:

- existence of fraud detection mechanisms like dedicated inspections; and
- setting the default conversion efficiency value low enough, to ensure sufficient cancellation of input GOs and stimulate actual measurement but high enough to accommodate for situations with undefendable measurement cost and predictable efficiency.

Where a default efficiency value is available, it shall still be possible for the producer to prove higher conversion efficiency than the default value.

KICK-OFF RECOMMENDATION 4. LIMITATIVE DESCRIPTION OF DATA FORMAT OF GOS

When aiming for facilitating a growing market towards high volume of GOs, that enables cross-border transfer between various national registries, there is a need for standardised data formats of the electronic documents that constitute the GOs.

For easy ability to import GOs through a one-to-many connection, the definition of the data format should be limitative. For easy operation, the amount of data fields of a GO for the same energy carrier is recommended to be the same regardless whether the GO resulted from GO Conversion Issuance.

KICK-OFF RECOMMENDATION 5. IMMUTABILITY

The certificate data shall not change in any way once a GO has been properly issued, except to indicate that it has expired, cancelled, or withdrawn.

KICK-OFF RECOMMENDATION 6. LIMIT NUMBER OF ATTRIBUTES TO BE CONVEYED FROM INPUT GOS TO OUTPUT GOS

The principles of immutability, standardised data formatting and residue handling imply that for registry set-up, there is a benefit in retaining from the cancelled input GOs to the newly-issued Output GOs after conversion, as little data as strictly necessary to serve the market needs. This is to ensure practical operation and not install unnecessarily high overhead cost that hamper market functioning.

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KICK-OFF RECOMMENDATION 7. PRE-CONVERSION INFO ON PUBLIC SUPPORT: BALANCE COMPLEXITY OF DATA HANDLING WITH VALUE FOR ADDITIONALITY EVALUATION

When adding information regarding the type of public support on the GO after conversion, the technical complexity of conveying pre-conversion support info should be balanced against consumer need for additionality information, and the overall value of the information.

If public support has been recorded on the cancelled input GOs, either Production or Investment support, this could be carried forward as “production support” on the GOs after conversion.

Alternatively, if the GO standard would comprise a parameter value for the support information stating “no public support ever granted”, a rule could be installed stating that this parameter value is only allowed to be conveyed, where the cancelled GOs for conversion conveyed this parameter value “no public support ever granted”. Where the conversion device has received investment support, this is to be recorded on the newly issued GOs as investment support.

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2 Framework

2.1 REGATRACE in a nutshell

REGATRACE (REnewable GAs TRAde Centre in Europe) aims to create an efficient trade system based on issuing and trading biomethane/renewable gas certificates/Guarantees of Origin (GO) with exclusion of double sale.

This objective will be achieved through the following founding pillars:

- European biomethane/renewable gases GO system
- Set-up of national GO issuing bodies
- Integration of GO from different renewable gas technologies with electric and hydrogen GO systems
- Integrated assessment and sustainable feedstock mobilisation strategies and technology synergies
- Support for biomethane market uptake
- Transferability of results beyond the project's countries

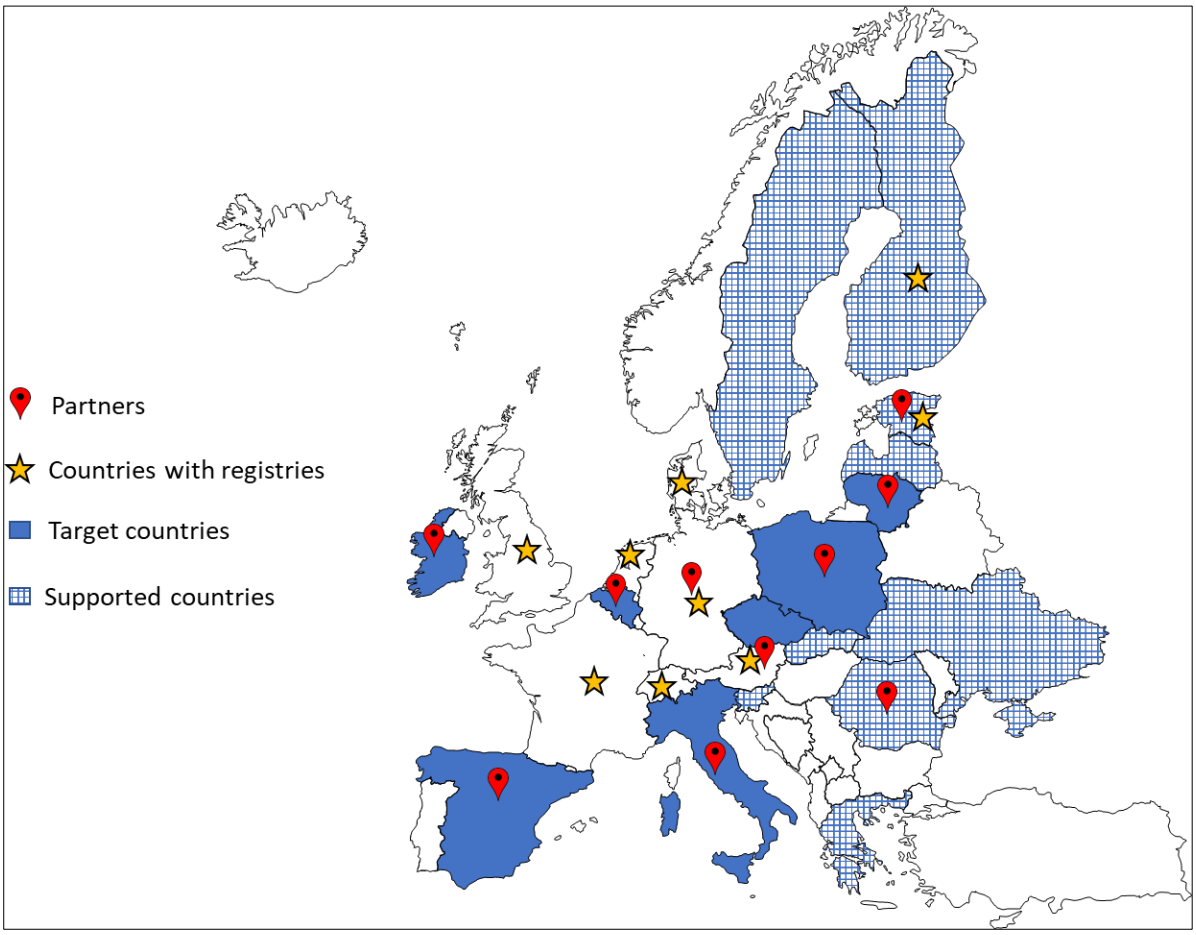

Figure 1: REGATRACE countries and partners

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2.2 Task 4 Integration of GOs from renewable gas technologies with electric and hydrogen GO systems

2.2.1 Context

To strengthen a market for renewable gas certificates, the concept of energy carrier conversion becomes of relevance. The integration of energy sectors depends on energy carriers being converted into each other. While procedures for documenting the renewable character of energy carriers are well established, transferring information documented on GOs of such energy carriers across energy carrier conversion still is not highly elaborated.

2.2.2 Task framework

The REGATRACE project task 4 "Integration of GOs from renewable gas technologies with electric and hydrogen GO systems" consists of 4 deliverables.

- Deliverable D4.1 (Guidelines for the verification of cross-sectoral concepts), under the lead of German Energy Agency (dena), was finalised end 2020.
- Deliverable D4.2 (Technical and operational comparison of the biomethane/renewable gas GO system and the electricity GO system), under the lead of the European Renewable Gas Registry (ERGaR) and was finalised in spring 2021.
- This report constitutes deliverable D4.3 (Harmonised set of rules for the conversion between electricity and biomethane/renewable gas and hydrogen GO) under the lead of the Association of Issuing Bodies (AIB).
- It will be followed up with deliverable D4.4 (Design study on the technical requirements of a coordinated conversion process) under the lead of the AIB.

Both deliverables D4.3 and D4.4. build upon information gathered in the reports D4.1 and D4.2, and their drafting takes place during a time when the regulatory framework contains high-level directions while being further finetuned. They are incorporating the aspects that have taken shape, such as the relevant existing certification schemes in AIB, ERGaR and CertifHy and the draft for the EN16325 standard for guarantees of origin, and develop recommendations for further development of the cancellation, transfer and issuance of GOs with relation to energy conversion in the changing landscape.

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3 Introduction

3.1 Aim

This report aims at developing a proposal for harmonised rules for handling guarantees of origin in relation with energy conversion. It also intends to support issuing bodies and registry operators by establishing a common understanding of the practical challenges and to recommend potential solutions. Strengthening an international market for guarantees of origin benefits from maximum harmonisation of rules, while it has to be acknowledged that rules are set at national (sometimes regional) level. The project team acknowledges it has no decision power to install rules, yet this report can serve as a basis for discussion by rule and policy makers because it intends to support the market for guarantees of origin to be extended to all energy carriers.

Specific practical challenges exist when handling corresponding GOs in relation to converting one energy carrier into another one. These challenges entail essential aspects for the overall GO system design. The goal of the REGATRACE partners in task 4.3 is to identifiy those challenges and propose solutions and implementation options which ensure reliability for consumers, efficiency for issuing bodies and a smooth process for traders and producers.

3.2 Process scoping: Energy Conversion in all directions

Energy can be conveyed by many carriers that can be converted into each other: there are many directions of energy carrier conversion, as illustrated in the REGATRACE D4.1 report.

The work of this REGATRACE task 4.3 on integration of GOs for various energy carriers will explore rules and processes to facilitate energy carrier conversion in all directions, between biomethane, electricity and hydrogen. It will set rules so that they can also be applied for conversion into and from another energy carrier, applicable not only for conversion of electricity, methane and hydrogen into each other, but generically applicable also for energy carriers like heating and cooling.

3.3 Certificate type scoping: Guarantees of origin

As elaborated in REGATRACE tasks 4.1 and 4.2, there are several types of energy certificates, and several purposes of certification.
The scope of REGATRACE task 4.3 on the coordination of certification systems focuses on the guarantee of origin (GO) certification system.

The regulatory framework for further certification for (some of) the involved energy carriers, mainly biomethane and hydrogen, is still under development while this D4.3 report is being drafted. Rules on certification for Renewable Fuels of Non-Biologic Origin (RFNBO) for compliance with the transport target of Directive 2018/2001 are being developed at the time of drafting this report and are expected to be published in a Delegated Act by 2021. Member States have sovereignty to define national support mechanisms in national legislation. At time of drafting this report, many Member States are either working on the implementation of RED II or considering new certification systems for the national implementation of rules based on RED II and EU ETS. The recommendations in this report can, however, be used as a basis for coordination of certification systems for various energy carriers that have additional requirements on top of the GO system, like in relation with a national support or target accounting system.

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3.4 Background: Guarantees of Origin

REDII defines a Guarantee of Origin (GO) as an "electronic document which has the sole function of providing evidence to a final customer that a given share or quantity of energy was produced from renewable sources". On the purpose of GOs it clarifies that they shall have no function in relation to counting towards the targets of the RED II. While it is not forbidden that a GO becomes part of a bigger electronic document that facilitates multiple purposes, here we focus on the function of the GO.

Besides the energy source, the REDII mentions some other Attributes regarding production of energy that have to be mentioned on the GO as a minimum.

3.4.1 Attributes on an electronic document for Book-and-claim

GOs are mainly used to inform consumers of the origin of the energy they consume, particularly for energy flows that are impossible to track physically, such as electrons in a copper cable or molecules in a pipeline. Therefore, the GO system is designed as a book-and-claim system. This implies issuance of an electronic GO in relation with the production of one MWh of energy, ability to transfer the GO independently from the physical commodity, and cancellation of a GO at the consumption of one MWh of energy. Processes that guarantee the uniqueness of a GO throughout its lifetime ensure the reliability of this system.

A GO is thus an electronic document, identified by a unique identification number and relevant Attributes being information regarding the production device (location, technology, capacity, etc), the energy produced (energy source, …) and some meta data (like type of public support granted), see REGATRACE D2.2 (Report on content and attributes of Guarantees of Origin). GOs are administered on a national or regional level in a database operated by an Issuing Body appointed by their government and are nationally and internationally transferable.

While the book-and-claim mechanism allows to completely detach GOs from the physical commodity and to document energy transfer which is physically impossible (like import from non-interconnected islands), GOs contain information that makes it possible to use them in close connection with the physical track of the corresponding energy commodity.

GOs facilitate consumer choice: through the GO, a supplier has a means to make reliable offers meeting the demand of his customers. Market mechanisms of supply and demand result in a market price for guarantees of origin. This way producers can receive an additional revenue from the GOs they sell on top of the price received for the physical energy commodity, in correspondence with consumers' willingness-to-pay for specific products of their preference.

GOs are not a commodity themselves, rather they provide information to consumers regarding the commodity of the consumed energy carrier. To this end, GOs carry the information regarding their Attributes, and enable suppliers to document their offers to consumers who base their choices of energy purchases on the Attributes of the corresponding GOs that are cancelled to document their energy consumption.

3.4.2 Reference documents and standards for guarantees of origin and voluntary certificates with similar purpose

In the framework for this document, GOs are referred to as framed in Article 19 of the Renewable Energy Directive 2001/2018(EU).

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The rules and procedures for operating guarantees of origin schemes will not be repeated in this document but are assumed to be in line with the CEN EN16325 standard on guarantees of origin. This standard is under revision while this report is being produced, but the main procedures have become clear by the time the present report was written and remain similar to the standard's original version that was only applicable for electricity.

Documents that describe the characteristics of GOs, can be found in REGATRACE D2.2 and D4.2 reports. They are also available in the form of the Rules of the European Energy Certificate System by AIB (description of the product EECS GO), the ERGaR CoO Scheme description, CertifHy certificates and national GOs.

3.5 Methodology

Harmonisation of rules is essential for a credible market with internationally transferable energy certificates.

In order to come to harmonised rules for practical handling and where EU legislation leaves implementation up to the Member States, it is important to have the organisations on board in the harmonisation process who determine and implement such rules in their day-to-day operations. Therefore, the general approach was to involve these parties, align knowledge levels amongst them and gain their expert views. From this, many joint needs could be identified. Any differences between issuing bodies' expert views were explored at a deeper level to understand the underlying concerns, and the recommendations in this report aim to meet these concerns.

The project partners organised a workshop for issuing bodies and registry operators with the aim to align understanding on the challenges and collect input from the participants on the outline of this task. This took place on March 11th, 2021, in an online setting with 84 participants from many issuing bodies across Europe. This included members of the AIB, ERGaR and also registry operators and issuing bodies or potential future issuing bodies not yet connected to an association that operates a certification scheme. There were several poll questions organised, which gave an initial direction for the roll-out of this report. Annex 2 entails the minutes of this workshop. The agenda and slides of this workshop are published on https://www.aib-net.org/news-events/aib-projects-and-consultations/regatrace. A recording, deleting contributions of individual participants due to privacy reasons, is available here: https://youtu.be/ZC4Q94rCz3I.

This workshop was followed by an extensive survey amongst issuing bodies and registry operators for more detailed feedback. Annex 1 comprises a report with the responses to this questionnaire, which was answered by representatives of 20 issuing bodies and registry operators from 16 countries in Europe. Material from this survey is used for the recommendations in this report, as it is highly relevant to consider the views of issuing bodies and registry operators in order to come to acceptance of the recommendations in this document, as a step-up to harmonised rules for handling GOs in relation with conversion.

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4 Principle Conversion rules

This chapter focuses on principle rules for handling certificates in relation with energy carrier conversion, while the following chapters deal with rules that relate to practical handling.

First a summary is given from the existing framework of conversion rules in advance of this study. These are evaluated and further elaborated with input from the involved issuing bodies and registry operators from the workshop and survey (Annex 1 and 2). Subsequently, this section comes to recommendations for harmonised rules for certificate handling in relation with energy carrier conversion at principle level.

4.1 Pre-existing framework for energy conversion rules

At the time of writing this report, there are already rules for handling certificates in relation with energy carrier conversion, both in the EECS Rules (sections C3.2.2, C3.6, C7.2) and in the committee draft of 18/11/2020 for a revised EN16325 standard on guarantees of origin (of which the conversion rules still stand in October 2021). Although these rules are not yet broadly implemented, the rules in both documents are similar. With regards to GOs, they come down to the following.

1) **GO conversion issuance is allowed only in relation with physical energy carrier conversion:**

   GOs can only be converted into GOs of another energy carrier in accordance with physical energy carrier conversion taking place.

2) **Cancelling GOs for input energy carrier, issuing new GOs for output energy carrier**:

   When converting energy from one energy carrier (input energy carrier) to another energy carrier (output energy carrier), the corresponding GOs from the input energy carrier needs to be cancelled, whereafter new GOs need to be issued for the output energy carrier.

3) **Accounting for conversion losses**:

   The number of GOs to be cancelled for the input energy carrier matches the measured energy input to the energy conversion device. The number of GOs to be issued for the output energy carrier, shall be based on the net measured output of the conversion device.

4) **Retain information on the original energy source**:

   Data from specific data fields is to be carried from the cancelled GOs on to the newly issued GOs for the new energy carrier after conversion. In the current versions of the rules (d.d. 11/3/2021), the data fields to be brought forward on the newly issued GOs are: energy source, support category. Optionally, carbon footprint data and labels could also be brought forward. Also, the purpose of certification should stay the same after conversion.

4.2 Elaboration of the principle rules

From the survey report in Annex 1, it can be concluded that these existing rules are broadly supported. However, the survey shows how they can be elaborated in further detail, it particularly provides material for deeper study on the rule on retention of information from the original GOs cancelled for the input for Conversion Issuance.

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4.2.1 Document to be cancelled for proving the source of energy with energy produced in Energy Carrier Conversion

The survey amongst experts from issuing bodies and registry operators for all energy carriers shows that it is broadly supported to require cancellation of GOs in accordance with the input energy carrier. This enables to avoid double counting of the attributes of energy for which a GO has been issued at production that may have been transferred to another party.

Since certificates exist for multiple purposes, such as disclosure of the origin of energy towards end consumers (Disclosure), national support mechanisms and target accounting, this raises the question whether this principle could be extended to other certificate types than GOs.

This brings in the concern of **avoiding double counting** produced energy. In this regard, it becomes clear that, in order to issue certificates for energy produced following Energy Carrier Conversion, it needs cancellation of certificates that had been issued for the same purpose. Guarantees of Origin (GOs) are certificates that have been issued for the purpose of disclosure of the origin of energy towards consumers under a legislative framework that relates with the Renewable Energy Directive (2018/2001(EU)). Hence, in order to be able to issue a GO for the newly produced Energy Carrier, the only acceptable certificate for cancellation is a GO, or a voluntary equivalent of a GO, that ensures avoidance of double counting and double claims of the same amount of produced energy. This leads to the following set of rules for documenting the origin and attributes of the Input Energy Carrier into the conversion device, in line with the report REGATRACE D4.1 (Guidelines for the verification of cross-sectoral concepts).

RULE 1. CANCELLING GOS FOR INPUT ENERGY CARRIER

For issuing GOs for energy produced following Energy Carrier Conversion, GOs of the input Energy Carrier are to be cancelled to prove the energy source of the energy produced in the energy conversion.

While GOs prove the origin of energy according to the Renewable Energy Directive and CEN EN16325, still other types of renewable energy documentation exist such as Non-Governmental Certificates (NGCs). These are certificates that have been issued for the purpose of disclosure of the origin towards consumers, inform about the relevant Attributes and for which mechanisms are in place that avoid multiple claims of the Attributes of the concerned energy but not based on a specific (national) legislative framework. They could be set up as a transition towards installing a GO system for the respective energy carrier. It may happen that an issuing body for guarantees of origin can acknowledge a non-governmental certificate that complies with all the requirements in its Domain and assures that double counting is prevented. In this case, it is proposed that issuing bodies can accept such NGC as proof of the energy input.

EXCEPTION RULE 1. VOLUNTARY EQUIVALENT OF A GO

Alternative documents to be cancelled for proving the energy source for GOs to be issued following Energy Carrier Conversion, originating from Domains where no GOs are being issued for the Input Energy Carrier, can be Non-Governmental Certificates (NGCs) that are voluntary equivalents of GOs, if the respective Issuing Body for Conversion Issuance has formally recognised these NGCs. A condition is that these NGCs ensure to be the only proof of the Attributes of the corresponding energy production and do not conflict with GOs. In this case as well it remains crucial that these certificates are cancelled, cease to be transferrable and

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can no longer be used for any other claims. Accepting input NGCs as alternative for input GOs is not mandatory to any issuing body for Conversion Issuance.

If the input energy is produced on the same site as where the conversion takes place, it could invoke unnecessary administrative overhead to first issue GOs for this input energy carrier, then cancel those as proof of the input into conversion and subsequently issue GOs for the output energy carrier after conversion. The administrative burden could be reduced by issuing GOs for the output energy carrier at once, as long as double counting is prevented. This condition can be phrased as follows.

EXCEPTION RULE 2. INPUT ENERGY CARRIER PRODUCED ONSITE

Cancellation of GOs for proving the energy source for GOs to be issued following Energy Carrier Conversion may be omitted ONLY IF the energy so fed into the Production Device for Energy Carrier Conversion:

(i) has demonstrably been produced on the site of this Production Device, or transferred to it through a Direct Line, reflecting the attributes that are requested to be indicated on these GOs to be issued following Energy Carrier Conversion, and

(ii) has not been or will not be subject to GOs or any other equivalent Certificates, and

(iii) will not be disclosed other than in relation with the GOs issued in relation with the Output of this Production Device for Energy Carrier Conversion.

4.2.2 Issuing new GOs after energy carrier conversion

The survey amongst experts from issuing bodies and registry operators for all energy carriers showed broad support for issuing new GOs following energy carrier conversion.

RULE 2. ISSUING NEW GOS AFTER ENERGY CARRIER CONVERSION

Following Energy Carrier Conversion, new GOs may be issued upon request, on condition that the origin and other Attributes of the Input Energy Carrier are documented adequately, in accordance with the rules in previous sections.

Having this rule in place, enables to introduce the concept of Conversion Issuance.

Conversion Issuance is the process whereby the renewable origin of energy produced through conversion of another energy carrier (e.g., biomethane) is proven with the cancellation of a corresponding amount of GOs for this energy carrier (e.g., biomethane) and an amount of GOs for the new energy carrier (e.g., renewable electricity) is issued.

4.2.3 GO Conversion Issuance only in relation with physical energy carrier conversion

It is recommended not to allow the conversion of GOs of one energy carrier into GOs of another energy carrier unless in relation with physical energy carrier conversion. Otherwise, the amount of Attributes represented by GOs would no longer reflect physical reality, thus jeopardizing the credibility of the GO book & claim system. In relation with rule setting on disclosure of the origin of energy towards end consumers, it is important that for each energy carrier, the total amount of Attributes of an energy carrier can be tracked back to the total amount of this energy carrier physically available on the market.

Conversion of one certificate into one for another energy carrier is not allowed if in correspondence no physical energy carrier is converted into another one.

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RULE 3. GO CONVERSION REQUIRES PHYSICAL ENERGY CARRIER CONVERSION

GO Conversion Issuance is subject to physical energy carrier conversion.

4.2.4 Cancel only GOs of same energy carrier as the physical energy input into conversion

For similar reasons, it is recommended to only allow cancellation of GOs of the same energy carrier as the actual input energy carrier into the conversion process. The reasoning is as follows.

If it would be allowed to use GOs from other energy carriers than the one of the actual energy being consumed, this could lead to a shortage in the overall attributes of one energy carrier in the pan-European system and an excess of another carrier's attributes. This would not match physical reality. Further it would undermine an adequate calculation of a residual mix for a certain energy carrier, which is the mix that is calculated for the total amount of produced energy from a certain energy carrier that is not cancelled with GOs or other reliable tracking mechanisms. Causing such imbalances is undermining the overall disclosure system's functioning. This is particularly true for electricity, where the quality of the residual mix relies on the system perimeter and the rules applicable in this geography with regards to GOs and disclosure of the origin of supplied energy. Leakage of attributes out of an energy carrier's system perimeter would damage the residual mix concept.

RULE 4. CANCEL ONLY GOS OF THE SAME ENERGY CARRIER AS THE PHYSICAL ENERGY INPUT INTO CONVERSION

For cancellation, only GOs of the same energy carrier as the actual energy carrier of the input into the conversion device shall be allowed.

4.2.5 The validity period of GOs issued following energy conversion

4.2.5.1 Expiry date is determined in the Domain where the GO resides

A GO does not explicitly record how long its validity period. This implies that expiry is determined in the Domain (country or region) where the GO resides. A GO does, however, record the start and end date of the production period of the corresponding energy for which the GO is issued. The legislative framework of REDII art. 19.3 instructs how long the GO is valid, being 12 months after the production of the relevant energy unit. In case different national regulations hold different interpretations of the text of this art. 19.3, the expiry date of a GO of a same production period may be different across Domains.

4.2.5.2 Harmonising the expiry date serves a liquid international GO market

The survey shows broad support for harmonising the expiry date for certificates issued after conversion. This makes sense in relation with efficient functioning of a cross-border market. Past experiences have shown that differences in tradability periods for GOs cause a lot of impracticalities. For example, misunderstandings lead to transferring GOs to a Domain in which they expired upon entrance. Issues like these result in administrative burdens such as error-handling and the need for additional communication particularly amongst traders and between traders and issuing bodies.

4.2.5.3 Ready for setting a harmonised expiry date after conversion?

Direct application of law and a liquid market: Re-setting the validity period on GOs issued after conversion?

Issuing new GOs following Energy Conversion has a logical consequence that these GOs follow the legal validity period as set out in Article 19.3 of RED II. As a result, the validity period for GOs issued

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following Energy Carrier Conversion starts at the end of the production period of the new Energy Carrier.

The survey tested the views of experts regarding this consequence. A 60% majority of experts are in favour of this rule of re-setting the 12 months validity period, 27% has no opinion.

Arguments are that a GO with new characteristics is created after Energy Carrier Conversion and the production period recorded on this GO is to be reflecting these new characteristics. A sufficiently long validity period should allow the market to maintain sufficient liquidity for all available GOs. It was raised that a GO could contribute as an instrument for energy transition to renewables through empowering consumer choice and funnelling extra funding for producers. In order to do so, maintaining on the new GO the lifetime of the original GO cancelled for proving the origin of the Input Energy Carrier, was seen to be too restrictive for potential new solutions and proper market functioning. Another argument stated that converted energy, particularly in gaseous state, may be stored, and having the GO with a 12-month tradability, could accommodate for the most occurring storage periods.

Avoiding abusive increase of lifetime: Maintain the expiry date of the original input GOs after conversion?

On the other side, 13% of survey respondents felt that the expiry data should remain the same as on the original GOs that have been cancelled for the Input Energy Carrier into the conversion. A concern was related to having only GO conversion without physical conversion. Another concern stated that this would lead to an almost indefinite lifetime as long as energy carrier conversion processes can take place. Creating a new lifetime after energy conversion would incentivise applying GOs to energy conversion before they expire, as a way to avoid losing the GO value for expiry. A new expiry date may direct GOs to energy conversion which could lead to distortions in the market for the output energy carrier GOs. This distortion particularly applies in case the GO is converted multiple times from power to methane/hydrogen and vice versa. A recommendation would be to establish safeguards that prevent from such market distortions.

In the same survey, however, a counter argument for this was brought forward by another respondent that physical energy carrier conversion would have to take place and significant costs come along with this technicality. Prolongation of a GO's lifetime does not give sufficient trigger to jeopardise the system.

Accepting lower liquidity and increased technical complexity?

Maintaining the validity period of the original GOs would include several challenges, on the one hand in market barriers (less liquidity) and, on the other hand, in a more complex technical implementation in GO registries. GOs issued following conversion then would have a shorter tradability period than other GOs, which would hamper their marketability and thus lower their market price. Technically, due to conversion energy losses, the number of input GOs usually does not equal the number of output GOs following Conversion Issuance. Where the various input GOs record different production periods, the proportional allocation to output GOs, leads to rounding errors. It also raises an exponential complexity in relation with recording the attributes of the residue (= production beyond the MWh), to be carried forward to the next production period.

Unjust situations?

Evaluating whether the burden of these challenges can be accepted, it deserves consideration whether re-setting the expiry date and the production period after Conversion Issuance would actually

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lead to unjust situations. The concern is that it could create incentives for prolonging the usability of the original renewable energy source attributes endlessly. As physical conversion must take place, there is no fraud in a producer's request for GO Conversion Issuance.

Rather this raises a question of additionality: are there additional conversion facilities built based on an actual need for producing the output energy carrier? The conversion trigger may help support the installation of new electrolysers while these are still low in volume. The contrary could be the case, too. If renewable hydrogen GOs would be facilitated through the conversion of excess biomethane GOs via steam methane reformation, the value of renewable hydrogen from electrolysers could be reduced resulting in a lower demand to build new electrolysers.

A concern was raised that existing infrastructure for conversion of fossil energy could be used to prolong the lifetime of a GO that is at the end of its life. For example, an end-of-life biomethane GO cancelled in relation with electricity production in gas engines/turbines and hydrogen production in steam methane reformers. This invokes the point that still GOs of the input energy carrier, here biomethane, need to be available for this conversion process. Some will argue that the legislative framework doesn't install the GO as an additionality instrument, but need to acknowledge that it is intended to inform the consumer. If rules do not prevent what some consumers want to avoid, the GO should display the information of their concern. This leads to the question which information the GO should record in this regard. As GOs mention the production technology, the basic information is provided. For further elements on additionality, see further down in this report in section 4.3.6 on public support data recorded on the GO.

Dealing with issuing body cost for higher number of transactions

It was raised whether Conversion Issuance with end-of-life GOs would lead to an increased number of transactions for issuing bodies and whether this would be problematic.

As most issuing bodies charge their Account Holders with activity-based fees, the cost for an issuing body related to such conversions is seen to be overcome.

Special case: liquefaction

This report has specified its focus on conversion of GOs for various energy carriers. While the REGATRACE D4.1 report considers the liquefaction of biomethane to bio-LNG as conversion, that is not the case for this report D4.3. D4.1 report proposes that the GO lifetime is maintained after liquefaction, which is not contested by the proposed rule here. Indeed, in line with the draft revision of the EN16325 standard for GOs, when the chemical composition is not changed, the same GO is maintained, regardless of the aggregation state of the methane. In the scope of this report, liquefaction is not seen as energy carrier conversion and therefore GO Conversion Issuance does not apply.

4.2.5.4 Conclusion

The argumentation elaborated above brings this issue back to its starting point and leads to following recommendation.

> **Kick-off Recommendation 1. New GO validity period after conversion**
>
> The validity period for GOs issued following Energy Carrier Conversion starts at the end of the production period of the new Energy Carrier.

With increasing market uptake of conversion technologies and routes, it is recommended to assess market impact and to develop safeguards preventing any potential market distortions.

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4.2.6 Accounting for losses: amount of input energy carrier to be measured, amount of output energy carrier to be measured

All survey respondents, except for one without opinion, agreed that the amount of energy output from the Energy Carrier Conversion should be measured before enabling GO Conversion Issuance. This is in accordance with the existing rules for issuing guarantees of origin in any production device, also direct production from primary energy sources.

RULE 5. MEASURING OUTPUT ENERGY FROM CONVERSION

The amount of energy output from the Energy Carrier Conversion shall be measured, for an according number of GOs to be issued.

Similarly, the survey showed full support (except for those without opinion) for the principle that the input energy into the conversion process should be measured and an according amount of GOs should be cancelled.

RULE 6. MEASURING INPUT ENERGY INTO CONVERSION

The amount of energy input into the Energy Carrier Conversion shall be measured, for determining the number of GOs to be cancelled in accordance with Conversion Issuance.

Furthermore, it may happen that GOs are not cancelled for the full quantity of the measured energy input into the conversion. In this case, the proportion of measured input that is covered with cancelled GOs, determines the proportion of output for which corresponding GOs can be issued.

In some cases, many different types of GOs are cancelled. As an example, for electricity input the cancelled GOs might come for 10% from wind, 30% from solar PV, 40% from agricultural biomass, and 20% from hydropower. Here it is proposed that these energy sources are carried forward to the Output GOs in these same proportions. In general: the attributes that are conveyed from the cancelled input GOs to the newly issued GOs after conversion are carried forward in the same proportion.

RULE 7. PROPORTIONAL ALLOCATION OF ATTRIBUTES FROM INPUT TO OUTPUT GOS

The proportion of measured input that is covered with cancelled GOs, determines the proportion of output for which corresponding GOs can be issued. The Attributes that are conveyed from the cancelled input GOs to the newly issued GOs after conversion, are carried forward in the same proportion, at least for the Attributes informing about the energy source.

4.2.7 Plausibility check of input-output flows via default conversion efficiency factors

Following the above recommendations, it should be checked that the cancelled GOs for conversion are matched with input measurement data for the conversion device for the relevant production period and that GOs are issued for the net eligible output measurement data.

Next, a sanity check is to be done regarding the feasibility to produce the resulting amount of output from the registered measured input data.

Default conversion factors may provide guidance for issuing bodies to crosscheck the plausibility of input and output flows of the conversion process.

Furthermore, producers could use them as a qualification of the performance of their production device.

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A challenge in composing a list of default conversion efficiencies is however in the fact that actual conversion efficiency is highly dependent of the technology used, capacity range, fuel input, operating conditions, output specifications.

Illustrations for default value ranges for conversion efficiencies, could be found in https://www.oeko.de/fileadmin/oekodoc/E-Fuels-im-Verkehrssektor-Hintergrundbericht.pdf , http://www.advancefuel.eu/contents/reports/d36-conversion-technology.pdf, JEC version 5 - 2020 | EU Science Hub (europa.eu), etc.

A dedicated study is recommended for every specific conversion technology and capacity range.

For a plausibility check of the conversion device being capable to produce the reported Output from the reported input, a sufficiently wide range for the control level of the conversion efficiency is recommended, to avoid the issuance process being blocked continuously on too tight values.

Kick-off Recommendation 2. Plausibility check of input-output flows via default conversion efficiency factors
A sanity check is to be done regarding the plausibility to produce the reported output from the reported input.

4.2.8 Conditions for replacing input measurement by default conversion efficiency

In the first place, it is recommended that producers measure the input, besides measurement of the output, and this determines the maximum eligible GO issuance for conversion.

Measurement of certain energy flows may be expensive, and the benefit of GO issuance may be insufficient to cover the measurement cost in some situations. Particularly for small energy flows, the cost of measurement, reporting, registration, and processing may hamper requests for GO issuance. In theory, the amount of input energy can also be determined by dividing the measured output energy by the efficiency of the conversion device. This requires the availability of a reliable default value for this efficiency.

To accommodate easy handling the survey explored whether the measurement of input energy could be replaced by measuring only the output energy and estimate the input energy based on a default value for the conversion. The results varied significantly. One respondent felt that such should be possible at all times. Five respondents felt that such should be possible only for production devices with small capacity, and two felt it should be possible also in specific other situations, while six stated that such should never be allowed.

There is substantial difference in efficiency for different technologies and capacity levels for conversion. Up until today there is no reference list of default conversion efficiencies that can be used for all technologies, fuel inputs, output specifications and capacity categories in relation with Energy Carrier Conversion. If such default conversion efficiency values would be allowed as a replacement of the input energy measurement, the issuing body would have to rely on well-founded proposals of the relevant production registrar or registrant of the production device.

Furthermore, there is a risk of fraud in case a producer would put in more energy than what would be calculated using a default conversion efficiency value. This would lead to an unjustified lower amount of GOs to be cancelled for the input into conversion. Such risk should be mitigated at all times. This could be done by determining default efficiencies in a conservative way and with sufficient granularity

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in power brackets (e.g., PDs 50 kW-250 kW, 250-500, etc.) in order to adequately account for the scale effect on efficiencies.

On the other hand, for certain production technologies, conversion efficiency is well-known, and it could be defended to use such where fraud risk is intrinsically omitted either by the production technology or by other compliance checks like annual inspections of the input energy flows.

Also, it is proposed, that in case default efficiencies are used, it is ensured that those are leading to a slightly higher amount of input GOs to be cancelled than in the situation of actual measurement. Such would stimulate actual measurement but accommodate for situations with an undefendable measurement cost.

Kick-off Recommendation 3. Conditions for using default conversion efficiency to determine the amount of input GOs to be cancelled

For determining the amount of GOs to be cancelled, if allowing to replace input energy measurement by a default conversion efficiency value to be applied on the measured output energy, this should be made subject to a framework of conditions. Such conditions are:

- existence of fraud detection mechanisms like dedicated inspections; and

- setting the default conversion efficiency value low enough, to ensure sufficient cancellation of input GOs and stimulate actual measurement but high enough to accommodate for situations with undefendable measurement cost and predictable efficiency.

Where a default efficiency value is available, it shall still be possible for the producer to prove higher conversion efficiency than the default value.

Note: In order for it to be acceptable, determining a default conversion efficiency value for a specific production device requires careful studying. In case no harmonised list of default conversion efficiencies exists per technology and capacity category, the registrant can be asked to provide a well-founded proposal, to be backed with documentation of the constructor of the production device, and where relevant, measurement data over at least one year of full load operating mode. Allowing this practice could be made subject to conditions, e.g., a threshold capacity (e.g., 50/200/1000 kW), fuel and/or technology.

4.3 Data to be retained after conversion

The result of GO handling in relation with energy carrier conversion is the issuance of GOs for the newly produced energy carrier. For a functional international GO market, it is to be harmonised which Attributes this new GO should carry on its data fields and, for filling in these data fields, which information is to be retained from the original GOs that were cancelled in accordance with the input for conversion. This section considers elements of relevance that together build up the logic for the recommended rules in section 4.3.11.

4.3.1 GO Data handling along the conversion process is not a straight-forward operation

As a consequence of the abovementioned recommendations, the amount of GOs to be cancelled for the input into conversion does not equal the amount of GOs to be issued after conversion. Further there may be a variety of cancelled GOs for an input carrier, so retaining data from the original

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cancelled GOs to the newly issued GOs after Conversion Issuance is not a straight-forward operation. While there is need for an auditable track regarding the input GOs cancelled for Conversion Issuance, it deserves consideration whether the information need can be covered by keeping information on cancelled GOs for Conversion Issuance in the registry or at the premises of the registry operator where the new GOs are issued, rather than recording such information on the newly issued GOs (see 4.3.5 below). A limitative description of data format of GOs enables to facilitate a liquid market.

Kick-off Recommendation 4. Limitative description of data format of GOs

When aiming for facilitating a growing market towards high volume of GOs, that enables cross-border transfer between various national registries, there is a need for standardised data formats of the electronic documents that constitute the GOs.

For easy ability to import GOs through a one-to-many connection, the definition of the data format should be limitative. For easy operation, the amount of data fields of a GO for the same energy carrier is recommended to be the same, regardless of whether the GO resulted from GO Conversion Issuance.

4.3.2 Immutability

A basic principle for retaining trust in the GO market after cross-border transfer, is to prohibit modifying or adding data to the GO after its issuance.

Kick-off Recommendation 5. Immutability

The certificate data shall not change in any way once a GO has been properly issued, except to indicate that it has expired, cancelled, or withdrawn.

4.3.3 Residues

While GOs are by legislation set to have a standardised face value of 1 MWh, many GO registries have the practice to register residual kWh and add this to the energy production of the next production period. In their automation process to facilitate high volumes, registries therefore established a data element with relation to a production device that remembers this “residue” from a measurement data set for a specific production period. The residue is then added to the measurement data of the next production period.

With many data elements to be copied from the cancelled Input GOs to the newly issued Output GOs, a challenge exponentially rises when accommodating GO Conversion Issuance for a variety of Input GOs for a single production period. Indeed, in this case, for a single production period to a single conversion production device there may no longer just be a single residue to be remembered until the next production period, but as many residues as there are possible combinations of parameter values of the data fields that are to be retained to the newly issued GOs. This results from the need to not add or reduce Attributes along the conversion process.

Kick-off Recommendation 6. Limit number of Attributes to be conveyed from input GOs to output GOs

The principles of immutability, standardised data formatting and residue handling imply that for registry set-up, there is a benefit in retaining from the cancelled input GOs to the newly issued Output GOs after conversion, as little data as strictly necessary to serve the

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market needs. This is to ensure practical operation and not install unnecessarily high overhead cost that hamper market functioning.

The sections below elaborate on pros and cons of retaining particular data elements, together with general options to deal with information.

4.3.4 Energy source

Disclosure of the origin of energy typically requires identification of the energy source. It would therefore be inappropriate for the energy source to be lost upon conversion. Indeed, after energy carrier conversion there is no new primary energy source. After conversion from electricity obtained from wind energy to hydrogen, the energy source of the produced hydrogen is still wind energy, as electricity is no primary energy source.

RULE 8. GOS ARE PRIMARILY TO INFORM ABOUT THE ENERGY SOURCE

Energy source is the minimum information to retain from cancelled GOs to newly issued GOs

This is confirmed by all survey respondents who replied to this question regarding the data to be retained on the GO after conversion.

4.3.5 Full accessibility of data from cancelled input GOs

The majority of survey respondents felt that the information to be carried forward after conversion should be restricted to the minimum in relation with the actual needs of the market. For several respondents this implies limitation to the energy source information. Several others indicate a limited few additional Attributes to be relevant, of which the following are the ones named to be retained from the original GOs: energy source, carbon footprint information, support information (either type of support or an indication as to whether or not public support was granted somewhere over the energy production chain), an indication that the GO has been obtained from Conversion Issuance, label or any other independent criteria scheme to which the GO relates (if the label scheme operator agrees).

On the other hand, the survey shows that 20% of the respondents favoured being able to access from the newly issued GOs all the information of the original GOs that were cancelled for the input to the conversion. From the practical need for a limitative description of the data fields, as mentioned above, if doing so, it could be considered to install such by referencing to original GOs cancelled for the input into conversion, rather than copying all data from these original GOs.

One option to do so is to copy the identification numbers of the input GOs to the output GOs. Implementing this in practice, entails some challenges, for its technical complexity:

- The number of cancelled input GOs does not equal the number of newly issued output GOs related to GO Conversion Issuance. There may be various batches of input GOs to be allocated to the output GO. Therefore, there is no one-to-one relationship between a single cancelled input GO and a newly issued output GO. Allocating the identification numbers of e.g., 1,4 input GOs to 1 output GO does not work in practice for a GO that should be tradeable across borders in a harmonised format in an automated data transfer protocol.
- In a longer chain of multiple conversions, if recording historic data of the chain preceding the last conversion, the amount of data to store on the GOs becomes huge. There cannot be put a limit on the amount of data fields that have to be foreseen on the GO. This hampers efficient handling of imports of GOs across registries.

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- It also is questionable whether recording the information on every GO, reflecting a MWh of production, will impact the market value of the GO. Rather than doing a detailed study of every individual GO, a buyer in a liquid GO market needs an instantly available check against his purchasing criteria.

Another, more practicable option is to ensure in the GO registry long-term accessibility of cancelled GOs for conversion in relation with the conversion production device and its measurement data. This facilitates audit at system level of the correctness of the issued GOs following conversion, without copying the data to the newly issued GOs after conversion. Any GO records information that identifies its production device. The production device in the registry then refers to the detail of the cancelled GOs for every batch of GOs issued following Conversion Issuance. Here is where the value of such information can be exploited: the auditability of the correctness of the issued GOs following conversion.

RULE 9. FULL CHAIN DATA TRACEABILITY

Registries shall keep track, for a period of minimum of three years, in relation with every conversion device, of the information on the cancelled GOs for every batch of issued GOs. This enables to back-track original energy production.

Particularly, in case of error-handling and double counting suspicion, such information is likely to be helpful.

For inspection by third party auditors other than the issuing body, of the specific batches of issued GOs for a specific production device after conversion, the GO cancellation statement(s) of the cancelled input GOs provide(s) already a quite extensive set of data for auditors, who need to make a one-time statement on compliance and/or data composing. Here it is relevant that the cancellation statement records that the corresponding GOs have been cancelled for the purpose of energy carrier conversion.

RULE 10. INFORMATION ON A CANCELLATION STATEMENT USED FOR CONVERSION ISSUANCE

The cancellation statement for the cancelled input GOs for conversion Issuance shall record that the corresponding GOs have been cancelled for the purpose of energy carrier conversion. It shall also identify the Conversion Device and the period of energy consumption in which the new Energy Carrier is produced.

4.3.6 Type of Public Support info

In line with art.19.7 of REDII GOs inform about the type of public support being granted either for the installation or for the unit of produced energy. This results into a data field on the GO that holds 5 possible parameter values:

a) No support
b) Investment support
c) Production support being received now
d) Combination of Investment and Production support
e) Unknown whether support is received

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The question arises what information to record after Conversion Issuance: should the information on the cancelled input GOs be included on the newly issued output GOs? And whether and how should the public support information to be mentioned on the output GOs be cumulated?

A general principle for conveying the information on GOs after conversion is to cumulate the support information mentioned on the cancelled input GOs with the newly issued output GOs. As an example, if the input GOs record "Production support" and the conversion device receives investment support, the newly issued GOs after conversion record "Combination of Investment and Production Support".

The survey shows that Issuing bodies and registry operators acknowledge the practical difficulty of carrying forward "type of public support" information related to the cancelled input GOs.

Due to conversion losses, there are usually more input GOs than output GOs, for which there is no one-to-one relationship between cancelled input GOs and newly issued output GOs for conversion. Also, there can be many different input GOs the information of which would have to be spread proportionally over the different individual output GOs. The particular challenge is related to copying the various parameter values for the support information:

1) Part of the data on the input GOs cannot be allocated to output GOs.
2) Residue: GOs have a fixed size of one MWh (REDII art. 19.2). Where the measured output is having a quantity of kWh as residue (see section 4.3.3), this residue is often stored/saved and added to the measured output of the next production period. Having multiple data field values for 'support' to be conveyed in this parked residue for next production period, puts complex registration burdens on registries.
3) The combination of multiple data fields to be conveyed from the different input GOs to the output GOs (source, support, etc.) makes the registration of this residue even more complex.

It is to be evaluated whether the cost of this registration of multiple support values of all the different GOs that document the pre-conversion chain, actually serves any need in the market: can simplifications be accepted, when considering the desired information at the consumer side?

It is relevant to take into account what consumers may want to evaluate based on this information on the GOs that are cancelled for their final energy consumption. The "Quantity of financial support" is not documented on a GO: this is not required by legislation neither is it feasible to be complete and accurate about all possible involved support mechanisms at the time of GO issuance.

On the technical side, existing GOs have a single data field for recording the support information. Against this background, different options for recording support type information on the GOs following Conversion Issuance, are:

- ⇨ Option 1: consider all support pre-conversion as 'production support' and cumulate it as such into the support type related to the conversion.
- ⇨ Option 2: don't carry forward the pre-conversion support information but foresee on the GO an additional parameter value for support info: "no support has ever been granted". For Conversion Issuance, this parameter value can only be used where both the input GOs record "no support has ever been granted" and there is no support mechanism involved for the conversion (no investment nor production support).
- ⇨ Option 3: retain full support type information of the pre-conversion support, with a mechanism that records the consequential information of chronological conversion steps

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- ⇨ Option 4: cumulate information of the pre-conversion support type with the support type for the conversion, resulting in one of the existing support type values (investment and/or production support, no support, unknown).
- ⇨ Option 5: no information on pre-conversion support of the input energy is given, only the support type for the conversion.

Option 1 builds upon the interpretation that pre-conversion support is not investment support, as it contributes to the produced MWh rather than to the investment into the conversion device.

Option 2 assumes that for the consumer it is less relevant to evaluate on production or investment support, but rather on whether or not ever support has been granted in the production chain of the energy.

Option 3 intends to retain full support type information of the cancelled GOs before conversion. It brings along a registration system complexity of which the benefits have not proven to outweigh the cost. This brings in the abovementioned technical complexity with matching the different quantities of input and output energy for conversion, since there is no 1-on-1 relationship between cancelled input-GOs and newly issued output-GOs. The cost of implementing it, particularly for correctly registering all possible data value combinations in residues beyond the MWh, is to be evaluated against the value for the consumer.

A preliminary assumption here is that the detailed support type information of the pre-conversion chain does not contribute to the consumers' purchasing choice. Whether investment or production support was granted in practice usually has the same impact for producers. For those consumers who do care about the support information detail, the conveyed public support information on the GO (lacking quantification of support) is probably not detailed enough either way.

Option 4 is still requesting to deal with conveying multiple data elements from input GOs to output GOs, which in the residues may end up with many series of data field combinations for which never a GO may be issued in the future.

Option 5 builds upon a literal interpretation that the support type mentioned in art. 19.7 (d) of REDII only relates to the conversion installation and the unit of energy produced in the conversion process. This may legally hold, though it is not yet proven whether consumers seeking additionality information on GOs feel satisfied.

Way forward

There is not sufficient feedback available from the consumer side of the story, but balancing out a consumer call for basic "additionality" information against avoiding technical overcomplexity, a general way forward in the kick-off phase would likely be in either option 1, or a combination of option 1 and 2.

Recording the information as in option 1 still allows to use the information for the qualification that would be done in option 2, if the latter would take place at national level or at consumer level.

Kick-off Recommendation 7.	**Pre-conversion info on public support: balance complexity of data handling with value for additionality evaluation**
When adding information regarding the type of public support on the GO after conversion, the technical complexity of conveying pre-conversion support info should be	

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balanced against consumer need for additionality information, and the overall value of the information.

If public support has been recorded on the cancelled input GOs, either Production or Investment support, this could be carried forward as "production support" on the GOs after conversion.

Alternatively, if the GO standard would comprise a parameter value for the support information stating "no public support ever granted", a rule could be installed stating that this parameter value is only allowed to be conveyed, where the cancelled GOs for conversion conveyed this parameter value "no public support ever granted". Where the conversion device has received investment support, this is to be recorded on the newly issued GOs as investment support.

4.3.7 Carbon footprint

Guarantees of origin may carry carbon footprint information as an optional data element. This implies that it may depend on the issuing body, technology, energy carrier, producer, or other aspects of influence whether this data element is filled in on the GO.

Where for a particular production device, GOs are to be issued with carbon footprint information, it is recommended that this takes into account the information from the cancelled GOs for Conversion Issuance.

To determine a meaningful carbon footprint to be recorded on a GO however, this carbon footprint is recalculated upon issuance of the new GO after conversion, and it needs to take into account both the carbon footprint of the conversion process and of the original energy input into this conversion process (and potentially of other processes like transport). The carbon footprint information is in fact carried to the newly issued GOs but not directly copied from the original GOs.

This only works if the same methodology and supply chain scope for the carbon footprint calculation are applied for both the cancelled GOs for the input carrier as for the GOs resulting from Conversion Issuance.

In case the GOs of the energy input carrier do not include any carbon footprint information or when no GOs are available (on-site conversion), information on carbon footprint can be added to the newly issued GOs after energy conversion with inclusion of the carbon footprint of the production of the initial energy carrier, but only if this information is provided through an equal methodology as for the newly issued GOs for the output energy carrier.

4.3.8 Indication that the GO was issued as result from Energy Carrier Conversion

Half of the respondents indicated the relevance of indicating on the GO that the GO was issued as a result from Energy Carrier Conversion.

In case the information on the GO regarding the production device technology (Technology Code) clarifies that this relates to Energy Carrier Conversion, there may be no need to add an additional data field as the information is included on the GO. Putting this into practice however may require the creation of additional parameter values of the Technology Code for all energy carriers. It is to be debated what has the higher cost of change for existing registries: a substantial amount of additional technology codes, or a new data field recording the tag of Conversion Issuance.

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The latter could be set up by installing an additional data field on all GOs. For instance, the data field could be called "Conversion Status", and have a predetermined set of applicable parameter values:

1. Produced directly from primary energy source;
2. Conversion from other Energy Carrier for which GOs were cancelled;
3. Conversion from other Energy Carrier produced on the site of the conversion device;
4. Unspecified.

An alternative is to include this list of parameter values in the coding structure for technology codes of the originating production device.

4.3.9 Geographical and temporal link between input and output from conversion

One survey response raised the relevance of the consumer being able to identify the geographical and temporal link between the input and output. Whereas guarantees of origin intrinsically record the production period and location, they allow such information to be checked.

Most GOs have a production period of one month. Where it would be desirable to have a higher granularity for the production period, e.g. (quarter-)hour of production, this would impose additional requirements on the basic GO structure (REGATRACE D4.1., 2021).

Organising for higher temporal granularity can be done either as an evolution of the GO system, or as a parallel interconnected system with the GO system.

4.3.10 Labels/independent criteria schemes

Adding a label on a GO after Conversion Issuance does not intrinsically differ from adding a label following normal GO issuance from a primary energy source: the label scheme operator has to certify the eligibility of the energy for its label. They may use information regarding the label(s) /independent criteria scheme(s) (ICS) attached to the cancelled GOs as input for conversion which is recorded on the cancellation statement. A sustainability certification scheme is one example of schemes where this could apply.

4.3.11 Recommendation for data on newly issued GOs after conversion

Taking into account the above, the following rules are recommended.

RULE 11. DATA ON NEWLY ISSUED GOS FOR OUTPUT OF ENERGY CARRIER CONVERSION

1) The Energy Source of the cancelled GOs as an input to conversion is to be recorded on the new-to-be-issued GOs. In case of multiple energy sources of inputs, these shall be distributed to the new-to-be-issued output GOs pro rata these energy sources on the input GOs.

2) While the Purpose of GOs is Disclosure, the Purpose of the certificate following Conversion Issuance shall remain the Purpose recorded on the cancelled GOs for the Input Energy Carrier. No certificate with the purpose of Disclosure shall be issued following Conversion Issuance if the correspondingly cancelled certificates for the input energy carrier did not convey this same purpose to be Disclosure.

3) The new GO issued following Energy Carrier Conversion shall inform that the GO was issued as a result from Energy Carrier Conversion (conversion-tag).

RULE 12. ATTRIBUTES ON NEWLY ISSUED GOS NEEDING DEDICATED ATTENTION

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For determining the following Attributes of the new GOs issued for the output of Energy Carrier Conversion, data from the cancelled GOs for the conversion input is recommended to be used:

1) Label/independent criteria scheme: the label scheme operator may decide to use information of the cancelled GOs in order to judge the eligibility for its label for the output GOs to be issued after conversion. A GO following conversion only receives a label/ICS tag after certification by the label/ICS scheme operator.

2) Carbon footprint: Where GOs are issued with carbon footprint information, it is recommended that this takes into account the information from the cancelled GOs for Conversion Issuance. As conversion usually impacts the carbon footprint, this implies adding of an additional factor in the carbon footprint calculation equation after conversion. The same methodology and supply chain scope for the carbon footprint calculation are to be applied for both the cancelled GOs for the input carrier as for the GOs resulting from Conversion Issuance, while this methodology is to be displayed on the issued GOs.

The other Attributes to be recorded on the GOs issued following Energy Carrier Conversion relate to the Production Device for Energy Carrier Conversion.

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5 Identification of practical challenges at implementation of principle conversion rules

There are four main challenges identified regarding the practical handling of GO conversion issuance for issuing bodies and registry operators. Here it is assumed that a fully operational system for GO handling is in place, for the relevant energy carriers.

1) Conversion Input GO quality check,
2) Match number of cancelled GOs with input measurement and corresponding data validation checks,
3) Making sure the input GOs are cancelled,
4) Issuing the GOs for the new energy carrier: transfer data attributes from the cancelled GOs.

While this report D4.3 recommends harmonised rules for conversion, the abovementioned challenges 1 and 2 are given consideration in the next chapters. Challenges 3 and 4 have a more practical nature and will be subject of focus in a subsequent report D4.4 in a design study on an integrated conversion process.

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6 Recognition of GOs that are input to GO conversion issuance

6.1 Relevance of recognition criteria

Role allocation

For a deeper dive into each of these challenges, it must be acknowledged that the European framework mandating the Member States to allocate roles for the oversight of their national GO system, resulted in differing configurations of role allocation between countries. There are issuing bodies with responsibility for operating GOs for multiple energy carriers, and issuing bodies for GOs for a single energy carrier. Where the registry operator and/or issuing body for GOs is not the same party with respect to the input and the output energy carrier of a conversion process, certificate handling becomes more complex than for the case where GOs for all energy carriers are managed in the same registry, and under the responsibility of the same operator.

Impact of role allocation on handling GOs for energy carrier conversion

When energy conversion takes place and the input GOs need to be cancelled in order to issue the new output GOs, the issuing body of the output GOs needs to be sure of the quality and reliability of the cancelled input GOs.

The main challenges for acknowledging the cancellation of an input GO for Conversion Issuance, are the following.

1. Issuing bodies acting under various certification schemes: an issuing body for gas GOs, facing market demand to import GOs that are issued under another scheme than the one it is participating in.
2. Issuing bodies responsible for a single energy carrier: an issuing body for a single energy carrier, in case a producer in its domain asks for GO Conversion Issuance, facing demand for either importing a GO from another carrier, or for acknowledging its cancellation that took place in another registry.
3. General recognition criteria for GOs issued by another issuing body.

While setting detailed recognition criteria is subject to national legislation, this report considers relevant areas to cover.

6.2 Issuing bodies acting under various certification schemes

When the to-be-cancelled GOs are issued under the same scheme as the to-be-issued GOs or if the GO scheme of the to-be-cancelled GO is already assessed positively by the issuing body which will issue the output GOs, generally this does not cause the same level of challenges, compared to the case where these GOs for the input and output energy carrier are operated under different schemes.

At the time of drafting this report, mid-2021, there are various European certification schemes for GOs for gaseous energy carriers. A comparison between these schemes is set out in the REGATRACE Report D4.2. AIB (EECS) and ERGaR both facilitate a certification scheme for gaseous energy carriers. The CertifHy scheme for hydrogen GOs is preparing for operation under EECS as a non-governmental certificate system.

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6.2.1 Bilateral agreements between national issuing bodies

This benefits from having harmonised rules for conversion, also for issuing bodies in the same country operating under separate European schemes. Ensuring that such are in place and enforced, the involved issuing bodies need to recognise each other's GOs.

Bilateral agreements between national issuing bodies for recognising each other's GOs, require the involved issuing bodies to thoroughly compare each other's certification schemes with their own schemes.

Therefore, bilateral agreements are less favoured as a long-term solution, as they involve a lot of administration, particularly when connecting with a high number of countries.

6.2.2 Issuing bodies connecting with two schemes

One possibility is for national issuing bodies to each join two (or more) European certification schemes. This solution seems not highly preferred by issuing bodies. Where these involve different IT data protocols, apart from the excessive overall implementation cost, it would in practice paralyse further innovation in the market. Indeed, IT data protocols need adaptation from time to time to stay up to date with latest requirements of technology or functionality. Planning for data protocol adaptation is a challenging work area to be done with all involved issuing bodies over multiple months or even years. If issuing bodies need to connect with two schemes and plan for data protocol adaptation in regard to one European scheme in one time schedule, and for the other European scheme in another time schedule, their life is significantly complexified. When this exercise has to take place for all involved issuing bodies, the complexity of dealing with multiple IT protocols becomes exponential to the number of registries involved.

As is set-out in the Vision for an IT architecture for GOs in the FaStGO Task 3.1 report[1], the main disadvantages to such way forward are:

- the cost for all national registries to connect to a different hub per certification scheme will greatly increase the overall system management cost.
- every change to a scheme-specific hub will demand the corresponding adaptation to every registry. When changes to one of the hubs contradicts the system design of another hub, a registry connected to both hubs would be placed in a compromising position.

The survey showed that only 2 respondents would be in favour of joining various certification schemes, though for these issuing bodies this was mainly relevant to join schemes for various energy carriers under a single certification system.

Seven respondents explicitly indicated not to be in favour of joining various certification schemes. Others gave a more nuanced view, referring to other decision-making bodies in their country or not knowing the framework yet. One raised that an interim solution can be a first step bridging the pathway towards harmonised systems.

[1]FaStGO stands for Facilitating Standards for Guarantees of Origin. FaStGO project (2020) made proposals as a service to the European commission under ENER/C1/2019-517: Technical support for RES policy development & implementation. Establishing technical requirements and facilitating the standardisation process for guarantees of origin on basis of Dir (EU) 2018/2001. https://www.aib-net.org/news-events/aib-projects-and-consultations/fastgo/project-deliverables

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6.2.3 Linkage or Integration of European schemes

6.2.3.1 A strong call for cooperation between European scheme operators

Issuing bodies need an easy manageable solution. The shape of such solution seems to depend on the current situation of the issuing body/registry operator.

The survey amongst issuing bodies and registry operators shows that half of the respondents are in favour of integrating the different certificate schemes into a single scheme per certification purpose.

40% of the respondents recommend an agreement between the different European scheme operators. 35% of the respondents recommend linking existing schemes, although some of them see this as a second-best solution compared to full integration of schemes.

Some are in favour of a gradual evolution from separate schemes per purpose to interconnected certification schemes, evolving to a single scheme with separate types of certificates depending on the purpose, which could eventually evolve to a single certification scheme to document all purposes. Others feel immediate integration of existing schemes would be more efficient.

While REGATRACE D4.2 report on comparison of existing schemes shows that there are differences between the areas covered by the different schemes, they are largely complementary. Linkage of /recognition between existing schemes is thus a completely different situation than integration of scheme operation. The mutual recognition of certificates between European Schemes will be assessed in D2.8 (Techno-economic feasibility study on a harmonized system for cross border title-transfer of the renewable character of gas in Europe).

6.2.3.2 Cost of change

Many registries are still in the phase of developing their gas GO registry, are manually operating a small relatively simple system. Many countries do neither have a registry nor any production facilities for certain energy carriers. Once GO volumes are high and automated handling is broadly implemented, the later cost of change will be substantial. Changes will be harder to implement the later they are announced and may be reason for issuing bodies not to join any updated harmonised scheme.

The longer a decision on a way forward is delayed, the higher the cost of change.

6.2.3.3 Next steps

REGATRACE report for Deliverable D2.8 will dive further into this and will assess various options for linking and/or integrating existing European schemes for tracking renewable gases.

6.3 Issuing bodies for multiple energy carriers vs issuing bodies responsible for a single energy carrier

Also, within a multi-energy carrier certification system (like EECS) there are challenges in relation to the mandate of an issuing body regarding the energy carriers for which it may implement GO import and cancellation procedures. Some issuing bodies have a mandate to issue GOs for multiple energy carriers, others only for a single energy carrier.

1. An issuing body for a single energy carrier should be able to deal with GOs of another energy carrier that are cancelled to prove the origin of the input in the conversion device of this issuing body's Domain. In case a producer in its domain asks for GO Conversion Issuance for

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the energy carrier of its responsibility, the issuing body faces demand for either importing a GO from another carrier, or for acknowledging its cancellation that took place in another registry. Also, if the single carrier issuing body operates in a multi-energy carrier European scheme, it must organise for dealing with conversion.

2. As issuing body operating a national multi-energy carrier certificate system, where an elaborated set of criteria installing trust already exists (see further), this challenge of Conversion Issuance is rather of practical nature than of principle nature. Therefore it will be addressed in D4.4 (Design study on an integrated conversion process).

6.4 Pillars for recognition

Regardless the questions above on scheme participation and pending developments that go in parallel to writing this report, it is relevant to consider what the important criteria are for issuing bodies to recognise GOs issued by other issuing bodies.

There is experience at issuing bodies with regard to recognising GOs from other countries for the same energy carrier.

A very similar question already arose two decades ago regarding the import criteria for electricity GOs issued by another issuing body in another country. Since import and export of electricity GOs has played an important role in the European GO market for electricity so far, some experience to build on has been developed.

Recognition in general bases on several pillars.

1. Avoiding fraud in issuance of the GO (incl. production verification)
2. Avoiding double counting of GOs
3. Liability coverage along the chain of custody

6.4.1 Avoiding fraud in issuance of the GO (incl. production verification)

80% of the survey respondents stated it to be important to ensure avoidance of fraud in the creation of, and data recorded on, the GO (production verification).

Some refer to EN16325 for enforcing the reliability of GOs.

Both the EECS Rules of AIB and ERGaR CoO Scheme Rules define certain requirements, how data has to be audited and documented by the System Participants and their account holders. All System Participants have to disclose information on their specifications regarding auditing, expiry date and other transfer related information.

Several favour to be able to publicly find a description of the procedures of an issuing body/registry operator, that allows assessment. Having such publicly available information on the rules of a Domain GO Scheme enhances trust for other issuing bodies who need to import the GOs from this Domain for conversion.

The EECS Domain Protocol, providing a publicly available and standardised template for issuing bodies to transparently describe their procedures on production device registration and inspection, account holder registration, GO issuance, transfer, cancellation, expiry, error handling, dispute handling, was named as a good practice.

RULE 13. PROVISION OF PUBLICLY ACCESSABLE INFORMATION REGARDING NATIONAL DOMAIN SCHEME RULES

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It is recommended for every issuing body to transparently publish its procedures for production device registration and inspection, account holder registration, GO issuance, transfer, cancellation, expiry, error handling, dispute handling.

6.4.2 Avoiding double counting of GOs

90% of the survey respondents consider as essential to avoid double counting of the GOs and the attributes represented by them. Indeed, if Attributes represented by GOs are double-counted, the GO system loses it merit.

When working with GOs that are issued outside the control of a specific issuing body, this implies the need for reliability with regard to:

1) the processes for GO issuance (production registration, data flows, inspection and control mechanisms);
2) the processes for GO transfer (exclude the risk of duplication during transfer);
3) the processes for GO registration and guarding over their lifetime.

On the question how this double counting is optimally to be prevented, 9 issuing bodies and registry operators replied that they favour a European scheme to ensure avoidance of double counting on all areas (double issuance, double transfer, double usage). However, 9 others feel that it suffices to know that the originating issuing body from whom the GO was imported is subject to a legal framework under the Renewable Energy Directive. Some add that in itself, compliance with REDII and CEN EN16325 is enough but verifying this compliance is an area of work benefitting from an overarching pan-European scheme.

As this comes back to the point of benefitting form an improved cooperation/integration between pan-European Scheme operators, reference is to be made to the previous section 6.2.3. Such cooperation is recommended to maximise efficiency in handling certificates in relation with each of the criteria for avoidance of double counting of certificates:

RULE 14. AVOIDANCE OF DOUBLE COUNTING WHILE ACKNOWLEDGING IMPORTED GOS:

Criteria for acknowledging imported GOs, in relation with avoidance of double counting, relate to:

a) the processes for GO issuance (production registration, data flows, inspection, and control mechanisms); and

b) the processes for GO transfer (exclude the risk of duplication during transfer); and

c) the processes for GO registration and guarding over their lifetime.

6.4.3 Liability coverage of the parties involved along the chain of custody

Significant financial value circulates in the GO market. This requires both technical data security mechanisms to be in place, as well as liability coverage of all parties involved. Some examples of damage can be:

- If GOs registered in a database of an issuing body are lost for reason of hacking, data system failure, or any other reason, the GO owner suffers damage.
- If an issuing body imports GOs from the registry of another issuing body and these GOs turn out to be fraudulent, the importing issuing body may face credibility damage.

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- If due to the time needed for import and conversion of GOs, the underlying GO is expired, the importing issuing body may face a damage claim from the involved market party.

Any party suffering damage incurred by the intentional or unintentional actions of another party may seek to exercise a legal claim against the other party. Both the registry operator and the issuing body may be exposed to such damage claims and their consequential cost.

Such legal action is subject to the relevant national laws of the claimant and results in high legal fees and complex lawsuits, apart from the actual damage compensations that may be required.

Limiting liability can be done through setting up a European framework consisting of:

- a contractual arrangement between issuing bodies (and possibly the association facilitating the international transfers limiting their respective liability);
- a contractual arrangement between each issuing body and its market parties in the form of standard terms and conditions including this limitation of liability;
  an obligation for issuing bodies to take out insurance cover for the operation of their certificate system.

A clear European contractual liability arrangement benefits not only issuing bodies and registry operators, but also the market parties involved in registering production and in trading, cancelling, and using GOs as it provides clarity. Such a contractual arrangement allocating liability and imposing limits to damage claims is possible despite differences in national legislation on condition that it is carefully drafted and harmonised.

While 9 survey respondents encourage a pan-European scheme to establish a liability arrangement aiming at limiting the liabilities of issuing bodies, and 4 suggesting that a pan-European scheme demands issuing bodies to take out appropriate insurance cover, there are also 9 respondents that feel the legal framework of REDII suffices.

Not having clarity of liability allocation and business risk may hamper market parties to take part in GO trading. It also may hamper trust for an importing issuing body. Therefore, it is recommended to clarify the liability framework an issuing body /registry operator engages in.

RULE 15. TRANSPARANT LIABILITY ALLOCATION

It is recommended to transparently clarify to the parties involved along the chain of custody:

a) If and how the liability of the originating issuing body and registry operator of the GOs is limited, and how risk is addressed; and

b) What responsibility is allocated to any importing issuing body, registry operator of GOs and, if applicable, the organisation facilitating international transfer; and

c) If and how the liability of specific aspects of the GO system management is regulated towards the market participants / Account Holders who take part in registering, trading, cancelling and using GOs, both for intra-registry as for inter-registry transfers.

6.4.4 Working across certification schemes

The survey shows a diverse view of respondents regarding the type of criteria relevant for a quality check of a cancelled GO for Conversion Issuance in their registry.

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While 33% recommend using only cancelled GOs that are issued under the same European certificate scheme for Conversion Issuance, 27% feel that it is acceptable to use GOs that come from a system with similar production verification mechanisms, similar liability arrangements and similar issuance, transfer and cancellation protocols including underlying quality assurance.

13% say that only cancelled GOs that are issued in their own country can be used for conversion issuance.

Although pan-European scheme operators are intensifying their cooperation, currently there are separate certification schemes, each having particular strengths in specific areas. As mentioned earlier, for reasons of operational efficiency, several issuing bodies have expressed to be in favour of integrating various existing certification schemes as operated in various non-profit organisations.

While such actual integration is out of the reach and the scope of the REGATRACE project, the current schemes can be taken as they are, and from there onwards, it can be considered how they can interact with each other.

Further, it is relevant to check, from the input in task 4.2 and further investigation, how and to what extent the various pillars are sustained in the different schemes. REGATRACE D2.8 will take this up further.

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7 Match cancelled GOs with Input measurement value

7.1 Challenge: balancing reliability versus overhead cost

In accordance with abovementioned recommended Rule 5 and Rule 6, in an energy conversion device the amount of input energy fed into the conversion is being measured. Consequently, the GOs to prove the origin of the input to the energy conversion need to be cancelled. The number of cancelled GOs needs to correspond to the input measurement.

It is self-evident that the issuing body responsible for the output GOs needs to be sure that the number of cancelled GOs matches the input measurement data. As this measurement data cannot be matched with the amount of cancelled GOs in an automated way in all cases, pragmatic implementation options need to be considered.
Moreover, the issuing body of the output GOs might want to install checks on the plausibility of the amount of input energy compared to the amount of output energy produced, using a list of default conversion efficiencies.

7.2 Assessment of options

With roles allocated to various registry operators and issuing bodies, the practicalities related to the matching of cancelled GOs to the Input measurement value are not self-evident in all situations.

Overhead cost should not hamper market operation, but sufficient level of trust has to be guaranteed. This requires a careful balance between the principles of trust-assurance and operational efficiency. There are basically two options for implementation of the rule on matching input measurement with cancelled GOs:

1) Ex Ante: cancelling GOs for conversion before GO Conversion Issuance can take place
2) Ex Post: allowing to cancel GOs after GO Conversion Issuance took place

In both options, for this assessment, measurement data validation procedures are assumed to be in place in the GO scheme, both for the input and the output energy of the conversion device.

7.2.1 Ex-Ante: GO cancellation before Conversion Issuance

58% of the issuing bodies and registry operators that answered to the survey favour the ex-ante check: they feel there must be adequate proof of the cancelled GOs before the new GOs following conversion are issued in their registry.

7.2.1.1 Credibility

In this implementation option, the issuing of the output GOs will only take place after the measurement value of the input energy has been checked against the amount of cancelled GOs. This is the most secure way of issuing output GOs following Energy Carrier Conversion.

7.2.1.2 Risk of delayed issuance and high verification cost may be overcome by automating processes

If there is no automated process in place to perform this check, the issuing of the output GOs might be delayed.

It also needs to be considered whether the administration cost for a monthly verification can be defended and born by the actors within the GO system.

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Once the volumes are sufficiently high, operational cost may be mitigated by automating the processes in the registry, and it comes down to a one-time investment cost for setting up this automation.

7.2.2 Ex Post: allowing to cancel GOs after GO Conversion Issuance took place

Only 16% of the issuing bodies and registry operators that answered to the survey are in favour of the Ex-post check of cancelled GOs. They feel it suffices after a producer received GOs following energy carrier conversion, he provides information on the cancelled GOs and is audited.

7.2.2.1 Pragmatism

In this implementation option, issuing of the output GOs can already take place, even before it is confirmed that an amount of cancelled GOs matches the measurement value of the input. In this case, an audit will check on a regular basis (e.g., once per year) upon the amount of cancelled GOs against the meter reading.

Resources needed for managing this option may be lower at the side of the issuing body. If there are other reasons for requiring a regular (e.g., annual) third party audit of a production device, also for the producer the cost may be marginal.

7.2.2.2 Risk

This is a low-cost option, but parties may find it less reliable due to the risk of fraud before an audit confirms correct handling.

Particularly in case of multiple subsequent energy conversion steps, e.g., electricity to hydrogen to synthetic methane, there is a risk of losing track, since the backtracking becomes more complex.

7.2.2.3 Mitigating fraud risk with high detection chance and penalty threat

A penalisation mechanism could be set-up mitigating the risk of fraud. Thus, this requires high detection chance and the penalty to be substantially higher than any benefit of undue enrichment through fraud.

Either way, this option requires that access to the cancelled GOs should be available for the interposed auditor.

7.2.3 Conversion efficiency

Like with GO issuance for all other technologies, also in relation with energy carrier conversion, an issuing body is recommended to install checks on the plausibility of the amount of input energy compared to the amount of output energy produced, using a list of default conversion efficiencies. Here we refer to section 4.2.7 above.

7.2.4 Directly classify the cancellation “for conversion”

It is recommended to provide processes that allow to classify the cancellation “for conversion” purposes, immediately from the moment that the cancellation is initiated by the market party. This avoids confusion and enables to track back the certificates cancelled for conversion, with benefits for the conversion issuance process, for statistical purposes, for ex-post verifications, etc. This might be implemented in domain registries by setting up a new transaction type “cancellation for conversion”, or to foresee that Account Holders performing a cancellation shall indicate the beneficiary of the cancellation to be a conversion device operator.

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7.3 Approach for matching input measurement with cancelled GOs

As an issuing body may face various types of resource challenges to accommodate his process management, it is hard to set a firm requirement.

RULE 16. EX ANTE CHECK ON INPUT GO CANCELLATION WHERE POSSIBLE, ALTERNATIVELY ALLOW EX POST CANCELLATION WHILE INSTALLING AUDIT AND ENFORCEABLE PENALTY ON FRAUD

Where resources allow doing so, it is recommended to cancel GOs for the input energy into the conversion device before issuing new GOs for the output generated in Energy Carrier Conversion. (ex-ante cancellation check)

Where practices are not ready for performing an ex-ante cancellation check, or where they would cause an undefendable delay in the issuance process, it could be allowed to cancel GOs ex post, after the GO Conversion Issuance, on condition that a regular third-party audit (e.g., annual) checks for the correct amount of GO cancellation. High fraud detection chance and a penalty in accordance with lacking the required GO cancellation could mitigate any risk and maintain the system's credibility.

RULE 17. CLASSIFY THE CANCELLATION AS "CANCELLATION FOR CONVERSION" PURPOSES.

Cancellations of guarantees of origin are recommended to be categorised in relation with the purpose of the cancellation. When GOs are cancelled for conversion issuance of GOs for another energy carrier, this shall be registered in the type of cancellation and on the cancellation statement.

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8 Conclusions

Just like with normal GO system operation, issuing bodies highly benefit from harmonised rules for GO conversion. Such rules are indispensable for building trust, efficiency and reliability when linking various national GO schemes. The proposed rules and recommendations in this document are a fundament for such harmonisation, which indisputably will need to be achieved by the joint efforts of issuing bodies of handling GOs in relation with energy carrier conversion.

By consciously setting up and implementing the recommended rules in view of efficient market operation, the overhead related to GO transaction cost and transaction acceptance cost will be kept as low as possible, while ensuring a reliable system.

For topics on which there is no consensus yet, various arguments are presented, and options developed. Some still need to be balanced out or require further assessment and development of measures, but determining the rules requires experience in the market, which is currently non-existing with regards to GO Conversion Issuance. In this respect, the report provides recommendations that could work for a kick-off.

9 Next steps

The upcoming report REGATRACE D4.4 will build further on this report D4.3 with a view to consider practical side of implementation, setting guidelines for an integrated conversion process.

REGATRACE D2.8 will assess options for integrating and interlinking two European Schemes. This aims to support the quality assessment of input GOs for Conversion Issuance.

The REGATRACE Network facilitates a forum to discuss any topics of relevance and the REGATRACE project will continue to support issuing bodies in the set-up of their gas GO systems.

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Glossary

Attribute	Data field on a GO specifying the characteristics of an energy unit produced by a Production Device in terms of the Input(s) used and/or the details (standing data) of that Production Device and production process;
CEN Standard EN16325	The standard on guarantees of origin related to energy, developed as CEN/CENELEC EN16325. This standard is under revision at the time of drafting this report;
Conversion Issuance, or GO Conversion Issuance:	Issuance of a GO for Output resulted from Energy Carrier Conversion, and for which GOs representing the Attributes of the Input to that Production Device have been cancelled;
Disclosure	Provision of information to a final customer on the share or quantity of the energy supplied to them as having specific Attributes;
Domain	Geographic area containing Production Devices with respect to which an Issuing Body is responsible for issuing GOs for the relevant Energy Carrier;
Energy Carrier	Substance or phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes and the means by which it is conveyed; used in this document to collectively refer to Electricity, Heating, Cooling, Energy Gas and Hydrogen;
Energy carrier conversion (or energy conversion):	Production of an Energy Carrier in a Production Device from one or more Inputs including at least one other Energy Carrier;
Guarantee of Origin (GO)	Electronic document relating to the Attributes for a specific amount of energy Issued by an Issuing Body under a Domain GO Scheme with the purpose of Disclosure;
Issuing Body	Competent Body or Competent Body Agent responsible for: - registering Production Devices and Account Holders in a Registration Database; - collecting measured values from Authorised Measurement Bodies; - issuing GOs; and - enabling and registering transfers and cancellation of GOs;
Independent Criteria Scheme (ICS) or Label Scheme:	A scheme whereby a unit of energy meets agreed criteria set by the ICS operator (such as Naturemade or TUV SUD), which are additional to those established for the GO and this assignment is recorded on the certificate;
Input	amount of energy from a specific energy source or material goods consumed by a Production Device for the production of Output;
Input Energy Carrier:	The energy carrier that is fed into a Production Device for Energy Carrier Conversion;
Issue	process of creating, as a GO, a record in an Account in a Registration Database;

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Label	Attribute on a GO reflecting that the Output and/or Production Device and/or Input to which a GO relates, conforms to a specific set of qualities defined in a Label Scheme, following an agreement between the Issuing Body and the corresponding Label Scheme Operator, in addition to those established for the GO;
Non-Governmental Certificate	a voluntary equivalent of a GO, which is not issued in the framework of a legislative certification scheme;
Production Device	separately measured device or group of devices that yields one or more Outputs from one or more Inputs, with one specific Technology Type;
Purpose	The purpose of certification, including the objective for which the certificate was issued;
Output	amount of Net Energy Production of a specific Energy Carrier yielded by a Production Device and measured by an Authorised Measurement Body in MWh;
REDII	Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources;
Registry (or Registration Database)	database operated by an Issuing Body or its Agent, comprising: a) Accounts and the GOs in those Accounts; b) standing data of Production Devices and information provided to the Issuing Body or a third party on its behalf in connection with the registration of those Production Devices; and c) standing data of GOs which have been transferred out of that Registration Database
Residual Mix	the mix of energy sources for energy supplied without being backed by cancellation of GOs or other reliable tracking mechanisms. In the European energy market, a residual mix is energy-carrier specific. The concept of Residual Mix is an integral part of the GO system for preventing double counting in energy source disclosure.
Public Support (or Support)	"Support scheme" (as defined in Article 2, paragraph 5 of the Directive 2018/2001/EC), meaning any instrument, scheme or mechanism applied by a State, or a group of States, that promotes the use of energy from renewable sources by reducing the cost of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased, including but not restricted to, investment aid, tax exemptions or reductions, tax refunds, renewable energy obligation support schemes including those using green certificates, and direct price support schemes including feed-in tariffs and sliding or fixed premium payments;
Technology Type (of a Production Device)	type of technology used by the Production Device in generating Output from Input.

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Annexes

Annex 1: Report of the responses to the questionnaire on “Mapping Challenges for handling certification in relation with Energy Carrier conversion”

Annex 2: Minutes of the workshop on 11 March 2021 “Mapping Challenges for handling certification in relation with Energy Carrier conversion”

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Annex 1: Results survey "Handling certificates in relation to energy carrier conversion"

REPORT OF THE RESPONSES TO THE QUESTIONNAIRE ON "MAPPING CHALLENGES FOR HANDLING CERTIFICATION IN RELATION WITH ENERGY CARRIER CONVERSION"

This questionnaire was directed towards issuing bodies and registry operators of energy certificate systems. They have received the minutes, slides, and the recording of the presentations of the workshop on March 11th, 2021, This provides the background information regarding the questions in this questionnaire. 20 organisations from 16 countries replied to the survey and this way contributed to determining optimal ways for handling of certificates in relation to energy carrier conversion! (http://www.regatrace.eu)

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1 Participants

The following organisations participated in the survey. They perform following other role(s) in the process of GO issuing or cancellation:

COUNTRY	ORGANISATION
Austria	AGCS Gas Clearing and Settlement AG
Belgium	BRUGEL - Brussels Regulator for Gas and Electricity Markets
Belgium	Hinicio
Belgium	VREG
Bulgaria	Sustainable Energy Development Agency
Denmark	Energinet
Estonia	Elering AS
Finland	Grexel Systems
France	GRDF
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)
Germany	UBA - Germany
Lithuania	Amber Grid
Luxembourg	ILR
Netherlands	CertiQ
Norway	Statnett
Slovakia	SPP - distribucia
Spain	Nedgia
Switzerland	Pronovo AG
Switzerland	VSG
United Kingdom	Green Gas Certification Scheme

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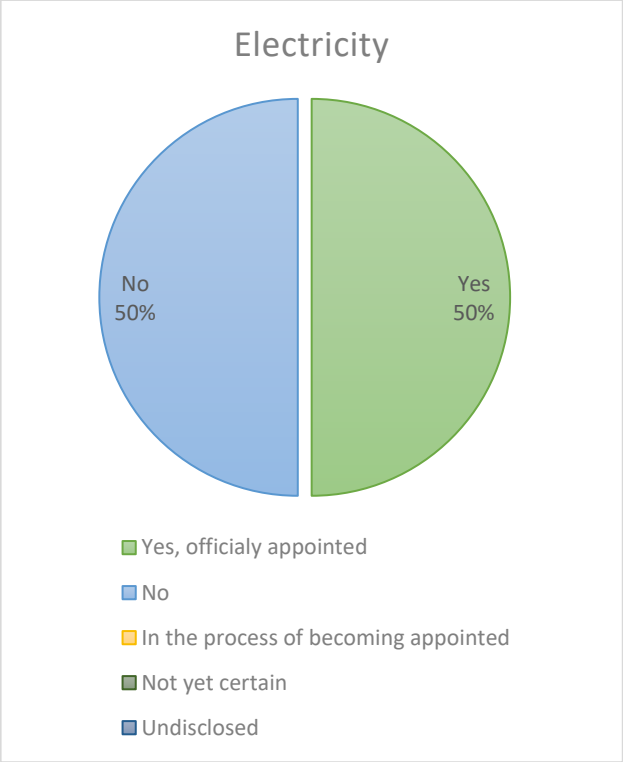
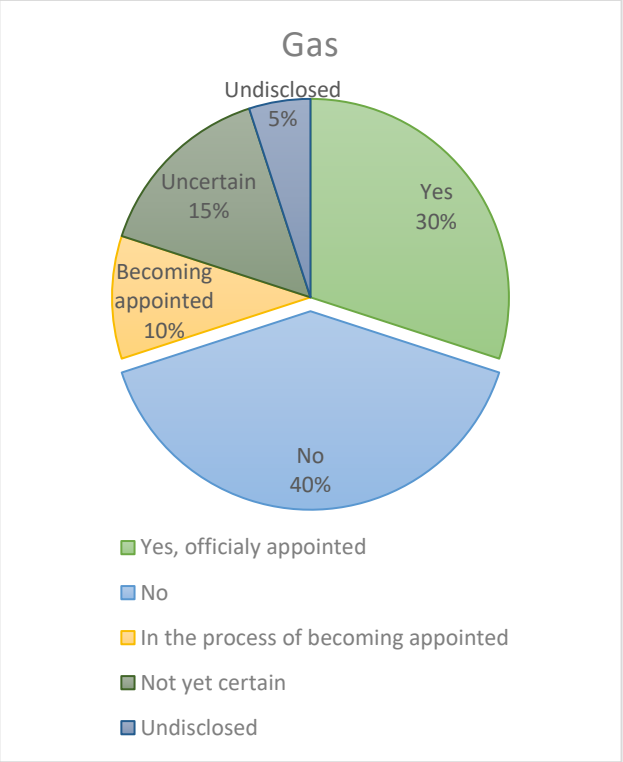
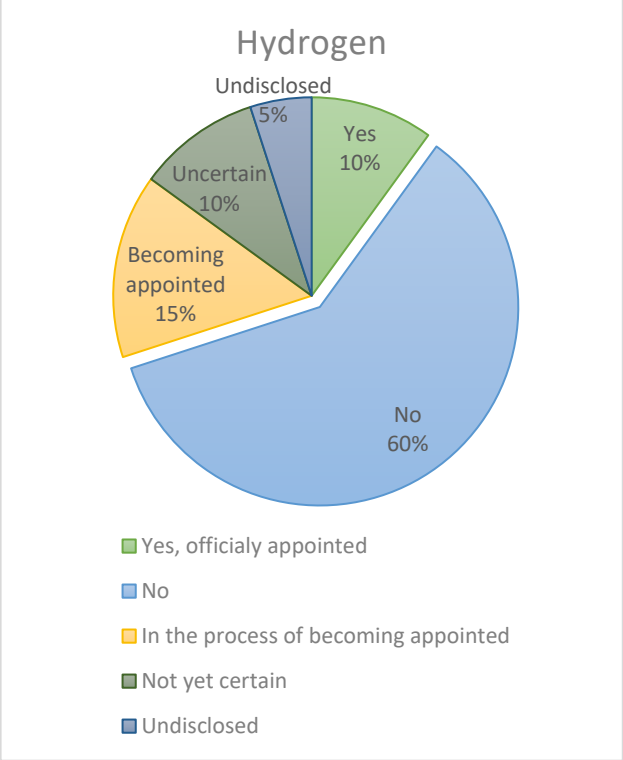
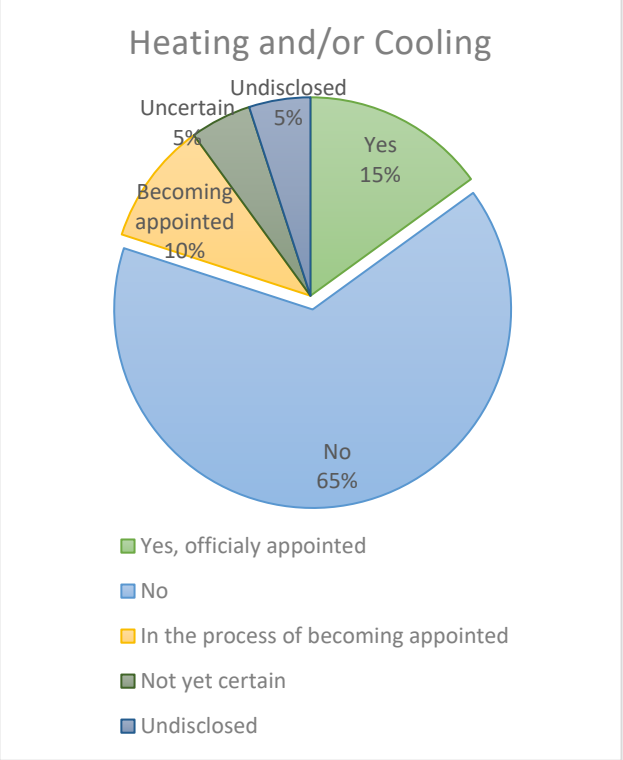
2 Information on the status and scope of your organisation regarding GO issuing

The following charts illustrate the organization's status and/or scope for being officially appointed by their government as Issuing body for GOs concerning electricity, gas, hydrogen, and heating and/or cooling.









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Following organisations perform also an other role in the process of GO issuing or cancellation:

COUNTRY	ORGANISATION	
Austria	AGCS Gas Clearing and Settlement AG	AGCS Gas Clearing and Settlement AG is the appointed operator of the Biomethane Registry Austria, issuing written proof of renewable gases injected into the Austrian natural gas grid. The original purpose of the certificates is their use as proof to receive the renewable power FiT. For other purposes of biomethane application, AGCS acts as production registry by providing the production/injection data to the respective authorised organisations, such as the Issuing Body for gas or the biofuels registry.
Belgium	Hinicio	"CertifHy provides an NGC scheme for hydrogen in Europe, together with two ICS (labels) CertifHy Green and CertifHy Low Carbon. CertifHy currently pilots the CertifHy scheme by operating a Voluntary Issuing Body with Grexel. In the future, Hinicio will operate a EECS Compliant Voluntary Issuing Body for CertifHy NGC and CertifHy ICSs (Green & Low Carbon) under the CertifHy scheme. "
Belgium	VREG	"Disclosure to consumers, coordination between production registrars for different energy carriers Mind that in our legislation, hydrogen is viewed as a gas. There is no separate issuing body or GO Scheme for hydrogen in Flanders. "
Estonia	Elering AS	Elering is also the TSO of electricity and gas, national agency for subsidies of renewable electricity and gas, operator for metering data hubs of electricity and gas, operator of trading platform of transport sector certificates.
Finland	Grexel Systems	We are registry provider for all energy carriers, as well as participating in the development of certification of all energy carriers through our clients and projects.
France	GRDF	As of 2023, the Issuing Body appointed at the time (the current public service delegation being renewed in April 2023) will have to issue the GO, then organize auctions on the stock before cancelling the GOs.
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	We operate the German Biogas register that issues certificates for biomethane and biogas both on book & claim and mass-balancing systems. Users can transfer and cancel their certificates using our electronic registry. We are also capable of performing international transfers on a book & claim basis to other European countries, such as UK, Austria, and Denmark.
Spain	Nedgia	Nedgia is the Distribution System Operator leader in Spain
Switzerland	Pronovo AG	We are becoming appointed to issue also GHG and liquid energy carriers.
Switzerland	VSG	Renewable gas fed into the Swiss gas grid is tracked via Clearing set up by VSG at the direction of the federal authorities. Fuel taxes in the transport sector and domestic CO2-levy for heating purposes are waived for such energy quantities. This system will evolve in the coming years due to planned changes in federal legislation and may lead to a unified national GO system for electricity, gas, hydrogen, and heating in the medium to longer term.

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COUNTRY	ORGANISATION	
United Kingdom	Green Gas Certification Scheme	We are in a unique situation - currently the UK has no intention of appointing an issuing body for gas, H2 heating or cooling. that may change in 2022. For now, we are a market-based scheme issuing certificates for biomethane and bio propane

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3 Evaluating the existing rules for conversion issuance

3.1 Recap of the existing rules for Conversion Issuance

The slides from the workshop on 11 March 2021 provide for a recap of the existing rules for Conversion Issuance. Currently these are in the EECS Rules and in the CEN/CENELEC committee draft for the EN16325 standard on GOs. They imply that:

- 'Energy Carrier Conversion' refers to energy carrier conversion, meaning the transfer of energy carried by one type of energy carrier into another type of energy carrier
- Conversion Issuance' refers to the issuance of a GO corresponding to Energy Carrier Conversion, and for which GOs representing input to that production device have been cancelled.
- For issuing of GOs following energy conversion, GOs of the input energy carrier are to be cancelled. (Unless the input energy is produced onsite and there are never GOs issued for it.
- An amount of GOs to be cancelled, corresponds to the measured amount of energy input into the conversion device. The maximum amount of GOs to be issued following conversion, relates to the measured amount of net Output from the conversion device.
- The newly issued GOs for the new energy carrier record at least the following data from the cancelled GOs for the original energy carrier, proportionally allocated from the input GOs to the output GOs:
    - Energy source
    - Information on whether support was granted for the production or production device, and an indication on whether this was investment support, production support, both, none and unknown. This data is cumulated with information regarding support for the conversion device.
    - A label may be carried forward if the label scheme provider consents.
    - Carbon footprint information (which is optional information on a GO) may be carried forward.
    - The purpose (an input certificate for disclosure enables issuing of an output certificate that may be used for disclosure).

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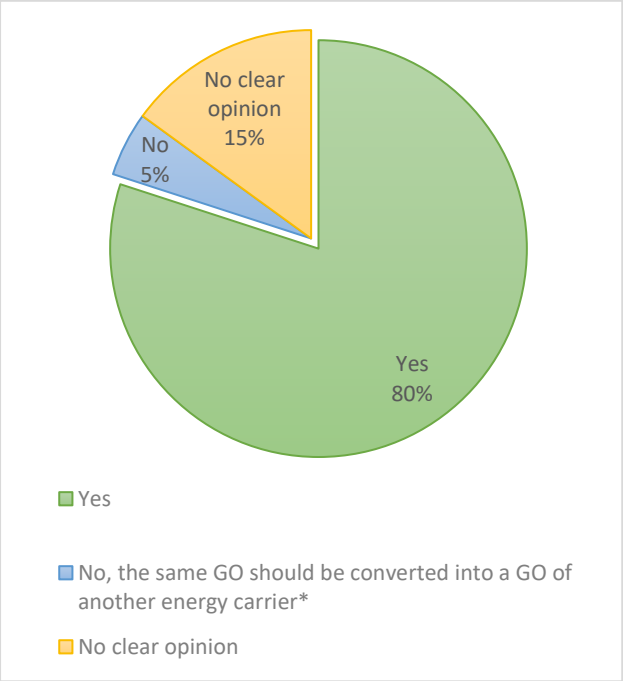
3.2 Do you agree that GOs of the input energy carrier are to be cancelled and new GOs are to be issued? *(Note: the amount of input energy can differ from the amount of output energy from the conversion.)*



*Specification from Spain – Nedgia: Direct energy conversion, in terms of MWh.

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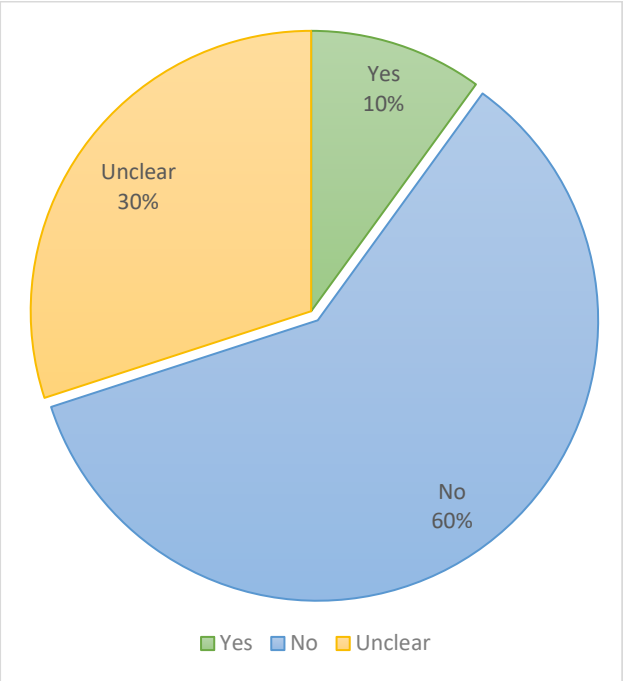
3.3 Are there specific procedures for handling GOs in relation with energy storage in your Country / Domain?



Those who have specific procedures for handling GOs, specified the high-level procedure for handling GOs in relation with storage as follows (e.g., What is the difference between energy storage and conversion according to your rules? Is storage considered as a conversion issuance process?):

COUNTRY	ORGANISATION	
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	In the Renewable Energy Ace (EEG), hydrogen is classified as “storage gas”. EEG provides state aid of reconverted storage gas in CHP plants according to the actual electricity source.
Switzerland	Pronovo AG	"It is only specified for electricity: Pump storage for hydro power plants. Procedures of energy storage for other energy carriers are in development (is unclear at the moment). "

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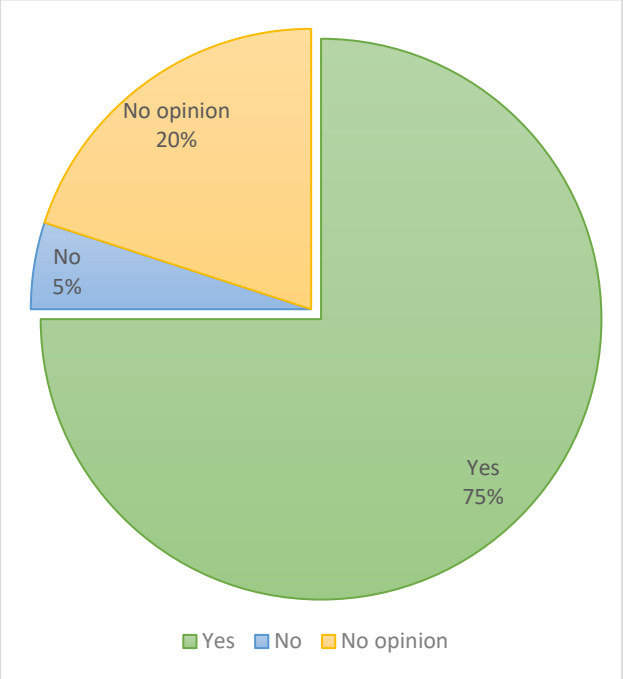
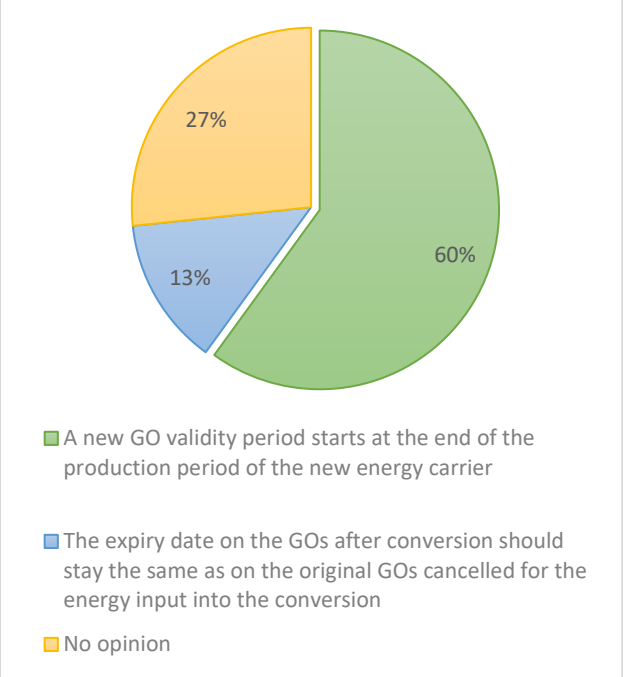
3.4 Should the expiry date for certificates issued after conversion be harmonized across Europe?



3.4.1 Resetting the production period

The organisations who answered 'yes', have following opinion on resetting the production period (and thus the expiry date) after conversion issuance:



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3.4.2 A new GO validity period

The organisations who answered *a new GO validity period starts at the end of the production period of the new energy carrier*, commented:

COUNTRY	ORGANISATION	
Austria	AGCS Gas Clearing and Settlement AG	Yes, any re-set should be harmonised among other application purposes to reduce "competition" between different application purposes (market segments)
Belgium	Hinicio	The CertifHy scheme, endorsed by the CertifHy Stakeholder platform, specifies that a CertifHy NGC expires 12 months after the end of the production period related to the H2 production batch.
Bulgaria	Sustainable Energy Development Agency	The approach should be the same as for guarantees without conversion and there is no reason to change the validity period.
Estonia	Elering AS	There's new primary energy, RED II rules apply. Suggestion to change the expiry of 18 months back to 12 months.
Finland	Grexel Systems	This is rather fundamental question on what kind of instrument we strive the GO to be. From my perspective the main quality of GO is to be an instrument for energy transition to renewables. Secondly, for this quality it empowers customer choice and funnels extra funding for producers. In this respect the main thing for energy carrier conversion is to help the energy transition and channel money to best causes. For this, I consider limiting the lifetime to the original GO lifetime to be too restrictive for potential new solutions. The caveat of this production period extension is the possibility to play the system and for traders/speculators to hold their positions longer. Still, when physical conversion is required for GO conversion, I have hard time seeing it to be feasible to game the system.
Netherlands	CertiQ	An amount of energy has been consumed by the converting production device, and another amount of energy with new characteristics produced by the same device. It only makes sense to have the GO reflect the period of production of the converted energy.
Anonymous		It is the simplest and most robust solution that guarantees transparency and accuracy. In particular, it allows to take into account the fact that GOs with different expiry dates may be used, and that the new energy carrier might be stored (example: conversion of renewable electricity into hydrogen).

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3.4.3 The same expiration dates.

The two organisations who answered that *the expiry date on the GOs after conversion should stay the same as on the original GOs cancelled for the energy input into the conversion*, commented:

COUNTRY	ORGANISATION	
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	The expiry date should not be re-set after conversion of one energy carrier into another because that would allow the initial GO issued for a specific energy carrier to have almost indefinite lifetime as long as energy carrier conversion processes can take place if the conversion losses are considered each time a conversion step takes place.
Spain	Nedgia	If it is only a GO conversion the period should stay the same.

If the expiry date on the GOs after conversion should stay the same, how to deal with the fact that the amount of input GOs and output GOs differs, and that there may be a variety of production periods for input GOs? Which production period should count for the newly issued GOs after conversion?

COUNTRY	ORGANISATION	
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	The set of input GOs with the largest volume is determining the production period of the corresponding set of output GOs.
Spain	Nedgia	Pro rata allocation of the production periods of the input GOs to the newly issued output GOs.

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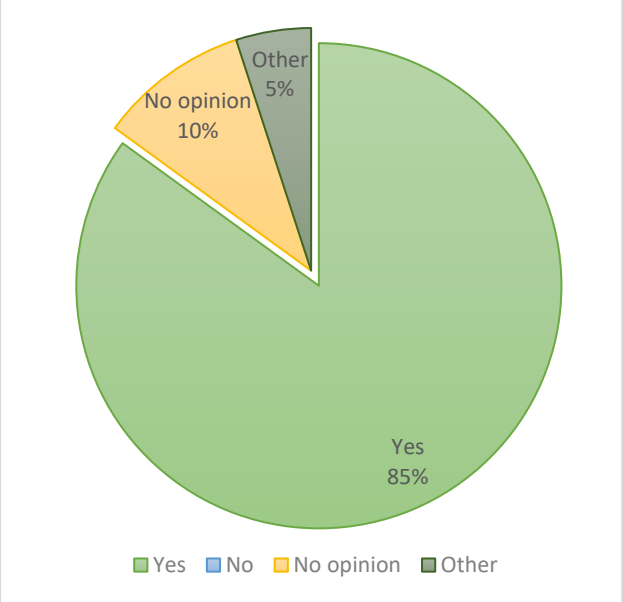
3.5 Dealing with losses: do you agree that the amount of energy input to the conversion process should be measured, and an according amount of GOs must be cancelled?



COUNTRY	ORGANISATION	COMMENT
Anonymous		All energy used, including losses and auto-consumption, should be measured, and accounted for. **Reasoning:** the easiest and most consistent way to do so is to measure both the input and the output. This allows to precisely know the amount of losses and / or auto-consumption.
Austria	AGCS Gas Clearing and Settlement AG	Measured data and information should be used for certificates; nevertheless, dealing with losses should be addressed in an equal manner by different application purposes.
Belgium	Hinicio	In the CertifHy scheme, "The renewable origin of energy consumed in the form of electricity, gas or heat from the grid, or a district heating network shall be established by cancelling Guarantees of Origin." **Reasoning:** Measuring input is required to calculate and allocate CO2 emissions of a given H2 production batch.
Belgium	VREG	We believe that it is prudent to measure in order to objectify the amount of energy used.
Bulgaria	Sustainable Energy Development Agency	In connection with the answer to v.12, this happens automatically. Revocation of guarantees for energy used for conversion and issuance of new guarantees for the amount of energy produced automatically reduces the amount of new guarantees.
Estonia	Elering AS	By measuring the output of the energy conversion process.
Finland	Grexel Systems	There is no good reason to disregard the physical reality. The renewable production is already moving on a such pace that there is no need to cut corners for increasing GO liquidity in this aspect.
Germany	German Energy Agency (Deutsche	In order to trace what the respective electricity GOs have been used for, electricity GOs should be cancelled according to the respective measured electricity input amounts.

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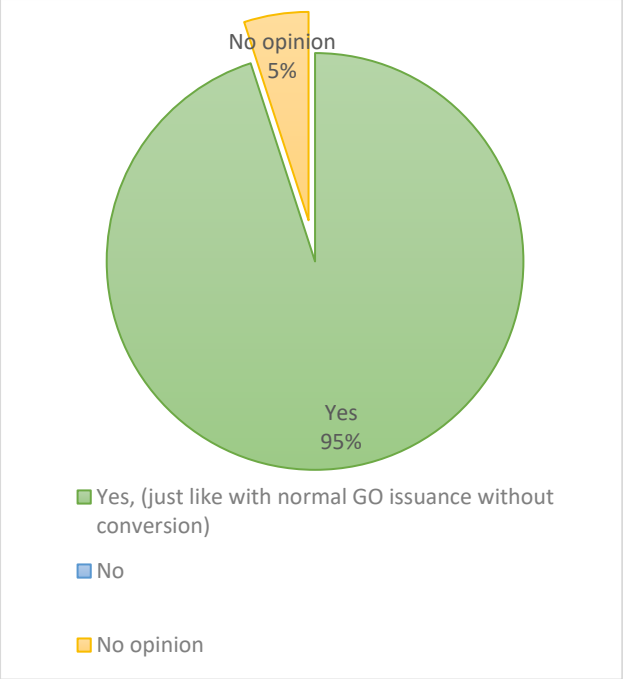
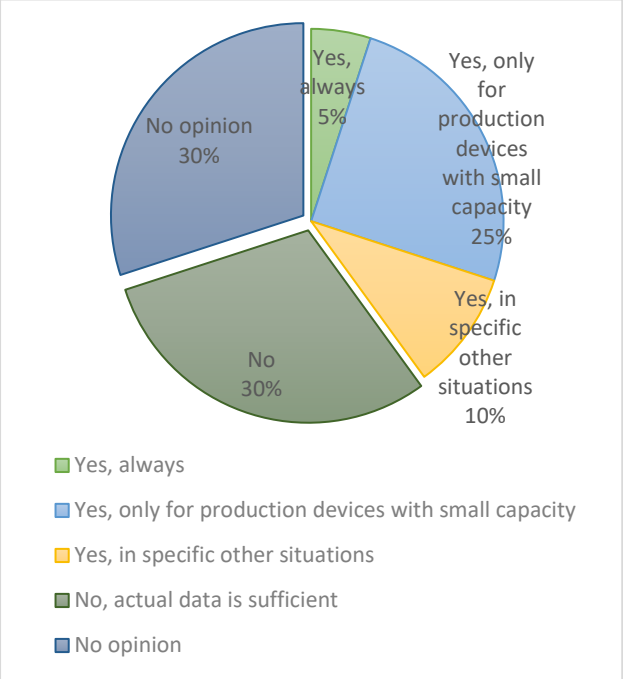
COUNTRY	ORGANISATION	COMMENT
	Energie-Agentur, dena)	**Reasoning:** In order to trace what the respective electricity GOs have been used for, electricity GOs should be cancelled according to the respective measured electricity input amounts.
Germany	UBA – Germany	Losses are losses and must be accepted as such. **Reasoning:** Increases credibility and ensures physical Energy flow
Netherlands	CertiQ	An amount of GOs cancelled should reflect the amount of energy consumed. and the amount of GOs issued should reflect the amount of energy produced by the converting production device. This is self-evident to us. **Reasoning:** Yes, input and output should be measured.
Norway	Statnett	Not sure if I understand the question correctly - In my opinion the gross volume of energy that goes into the process must be measured and GOs from the Gross volume must be cancelled.
Spain	Nedgia	all the energy should be measured
United Kingdom	Green Gas Certification Scheme	important step - GO already benefit from not being required to deal with transmission losses and it is an area of weakness in the system.

3.6 Dealing with losses: do you agree that the amount of net energy output from the conversion shall be measured, for an according amount of GOs to be issued?



3.7 Would you allow for only measuring the output energy, and estimate the input energy based on a default value for the conversion?



3.7.1 Suggestions for composing a list of default conversion efficiencies. Which reference source to use?

COUNTRY	ORGANISATION	
Anonymous		Devices with a capacity equal or inferior to 5kW, devices with a stable and well-known conversion efficiency (such an electrolyser, for example).
Belgium	VREG	We have insufficient expertise to suggest a list of default conversion efficiencies. We would have to rely on motivated proposals of the relevant production registrar.
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	"Based on reputable literature e.g., JRC, scientific papers. E.g., https://www.oeko.de/fileadmin/oekodoc/E-Fuels-im-Verkehrssektor-Hintergrundbericht.pdf "
Spain	Nedgia	Standard default value for the conversion

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3.7.2 Why either or not allowing to work with a default conversion efficiency?

COUNTRY	ORGANISATION	
Anonymous		Because it is less precise, and it would require regular measurements to ensure that the conversion efficiency remains stable over time.
Anonymous		It is very simple. GOs are issued for net energy production placed on the market. GOs are cancelled for net energy delivered to plant. Conversion factors have no role to play. Plant conversion efficiency will determine resulting conversion factor. High efficiency plant will be rewarded. Example: Electricity GOs are issued for electricity placed on the market. If from a gas fired plant claiming renewable gas evidence must be provided that renewable gas has been used if electricity GOs based on renewable gas are issued. This evidence could involve renewable gas GOs for the used gas.
Austria	AGCS Gas Clearing and Settlement AG	A conversion factor may be prepared (audited information) for cases of outages of measuring devices. Generally, only measured data shall be used – where no measured data are available, an equivalent should be used such as auditor information.
Belgium	Hinicio	Not addressed in the current version of the CertifHy scheme, no default value is provided.
Belgium	VREG	Allow in the case where measurements would be cost-ineffective. This will probably be linked to the production capacity, but the threshold value may vary for different technologies and should be studied in depth.
Bulgaria	Sustainable Energy Development Agency	There is no reliable practice, and it is better to rely on objective measurement instead of coefficients. At a later stage, with accumulating of experience, the approach may be adopted if it proves to be reliable.
Estonia	Elering AS	Small production devices - always, large scale production - input shall be measured.
Finland	Grexel Systems	I do not have enough knowledge on these choices. How much error would there be if default value for conversion would be used and is it hard to get the input measurement?
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	We would stick to the capacity stated by Article 19 RED II that allows simplified information to be recorded on GOs from installation of less than 50 kW.
Netherlands	CertiQ	Some data might be calculated from other measurements. But the source data should always trace back to actual measurement. Estimations are not acceptable.
United Kingdom	Green Gas Certification Scheme	any production device that is converting one type of energy to another should be able to provide a detailed breakdown of inputs and outputs - it is reasonable that they measure their inputs and allocated them to a set of outputs - allowing default conversion is a weaker standard that could be abused by some operators. it also fails to reward more efficient operators.

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3.8 After conversion, which information to be mentioned on the newly issued GOs should be retained from the original GOs.

Note: for consideration are both the relevance of the information after conversion, and the implementation cost. Also note the presentation by CertiQ on the complexity for handling residues. beyond the MWh in case a lot of data is to be retained.

After conversion, which information to be mentioned on the newly issued GOs should be retained from the original GOs?

Energy source	14
Support information, relating to the type of support (production support, investment support, both, none or unknown)	7
Support information, limited to be either 'public support was granted somewhere over the lifetime of the production device(s) in the conversion chain before' or 'no support was granted throughout the value chain'	4
Label or any other independent criteria scheme to which the GO relates (if the label scheme operator agrees)	4
Carbon footprint (if this optional information was included on the original GOs)	5
All information of the original GOs should be accessible from the newly issued GOs (Note the technical challenge that there are different quantities of input and output GOs in relation with the conversion process)	4
The GO ID number of the original GOs should be documented on the new GOs (Note that the amount of input and output GOs are likely to differ, which implies a challenge on allocating exact ID numbers unambiguously)	3
An indication that the GO has been obtained for energy Conversion Issuance, (i.e., the origin was proven with a GO from another energy carrier)	10
Other (specifications below)	2

The following graph visualises this same data in another way.

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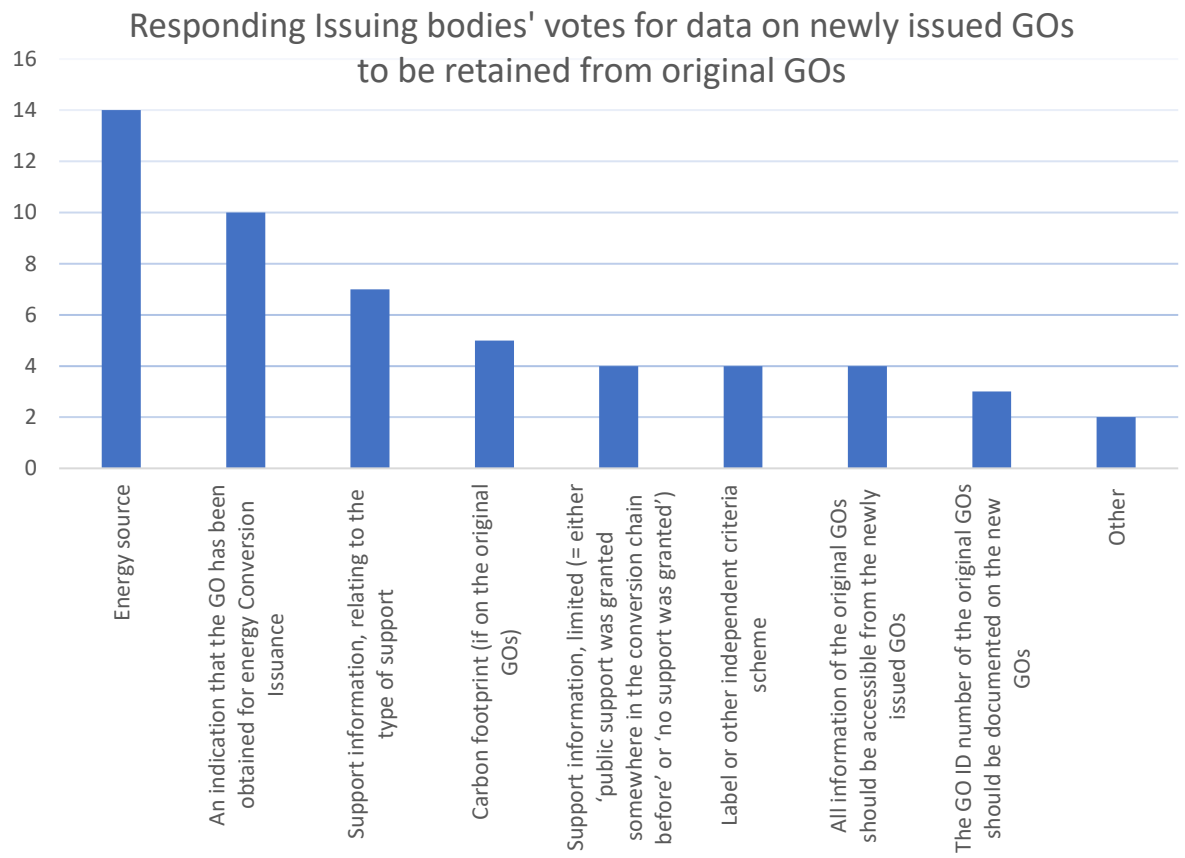

Comments

COUNTRY	ORGANISATION	OTHER (SPECIFICATION)
Belgium	Hinicio	Carbon footprint is recalculated upon issuance of a CertifHy NGC; hence the information is in fact carried but not directly from the original GO.
Bulgaria	Sustainable Energy Development Agency	We believe that this is the minimum necessary information that will not complicate the conversion process.
Finland	Grexel Systems	As per the CertiQ example, there is no use to make too complicated system. Original energy source is vital information. Other than that, everything is part of the normal issuing process of the output GOs. For example, for carbon footprint what is important is the carbon footprint of the energy represented by the output GO, not what was the original GOs used. For Label, the same thing, when requesting issuance in an energy carrier conversion case it should be the producer requesting the label (and meeting label specific requirements) and not about specifically retaining the information from previous GOs. The current experience from Hydrogen is, that this energy carrier conversion will be very much business as usual. Trust for the certification of the other energy carriers is essential and not trying to retain all information from GOs of the previous conversions (can be one or many).

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COUNTRY	ORGANISATION	OTHER (SPECIFICATION)
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	See the information included in the Deliverable 4.1 from the REGATRACE project
Germany	UBA – Germany	Tech Code should be added
Netherlands	CertiQ	The energy source is the only item that *must* be retained from the originating GO. This is because disclosure (at the very least for electricity) typically requires identification of the source. It would therefore be inappropriate for the source to become lost upon conversion. Carrying forward support information is highly impractical and contradictory to the Directive. At most, this should be limited to 'no support has ever been granted'. Labels would have the same problem as support information - it would be too difficult to carry forward. For information on carbon to be retained, there would have to be consensus and harmonisation on a) how to calculate such for the originating GO, and b) how to re-calculate for energy conversion. Since GO IDs are unlikely to line up between input and output of a production device, it would be unwieldy to retain, and neither would it be interesting to anyone using the GO. An indication that the GO resulted from conversion is something that can be added; since it is not a given on the originating GO, so it cannot be *retained*.
Spain	Nedgia	All information of the original GOs should be accessible
Switzerland	Pronovo AG	No final opinion yet. We are still in the process of evaluating.
United Kingdom	Green Gas Certification Scheme	as much information as is practical should be included. the issuing body will have the full cancellation statement for the GO of energy inputs it is just a question not technical ability to include information and presenting in a way that traders and consumer can understand. At a minimum, the consumer must be able to judge the geographical and temporal link between the input and output. This can all be included in an expanded “energy source” label as simplified information e.g., just the country and time of production not name address or producer. This is technically complicated but issuing GO for converted renewables should not be made so simple that the GO lack credibility. Energy source is clearing essential – we know the market demands information on types of biomasses used and it will also want to know solar vs wind vs hydro. Support - CertiQ highlight the problem of long chains of information about production and investment support – we should include as much information as possible with the option to revert to a simple statement that support of some kind was provided in the process. Carbon Footprint – a new GHG calculation should be done which uses the GHG information from the input GoO – I ‘m not sure if that would count as retaining the information? it may be that GHG information is not technically part of a GoO but with more conversations more energy is needed and it’s important that we don’t end up with energy that is renewable but has been through so many conversions the actual GHG impact is high and with very high losses. Indication that GO is from energy conversion based on GO tracked input – essential – consumers must

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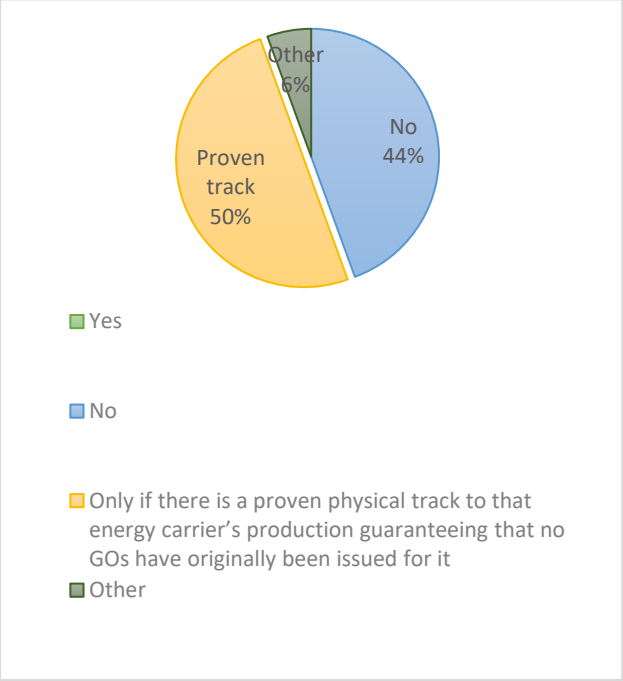
COUNTRY	ORGANISATION	OTHER (SPECIFICATION)
		be aware so they can form an opinion on if this is the "type" of renewables. E.g., Some will rightly feel that H2 produced with GO from hydro on the other side of Europe is a lower quality product than H2 with a direct connection to a renewable source.

3.9 Should it be allowed to issue GOs following conversion of another energy carrier if no GOs are cancelled for it?



Only 18 out of 20 organisations responded to this question.

COUNTRY	ORGANISATION	COMMENT
Belgium	Hinicio	Energy conversion should be allowed without GO cancelling where there is no GO scheme for the input energy carrier (e.g., no full disclosure or no GO scheme at all for a specific energy carrier).
Bulgaria	Sustainable Energy Development Agency	In Bulgaria, there is an opportunity to issue guarantees for all quantities of energy from renewable sources, regardless of whether they receive support from a support scheme.
Estonia	Elering AS	To avoid double-counting, renewable origin must be proved through GOs.
Finland	Grexel Systems	This is a good opportunity to bring the GO system a bit closer to physical reality. If cancelling GOs before conversion issuance is too difficult then the existing, GO systems must evolve into faster operations.
Spain	Nedgia	energy carrier's production must guarantee that no GOs have originally been issued for it

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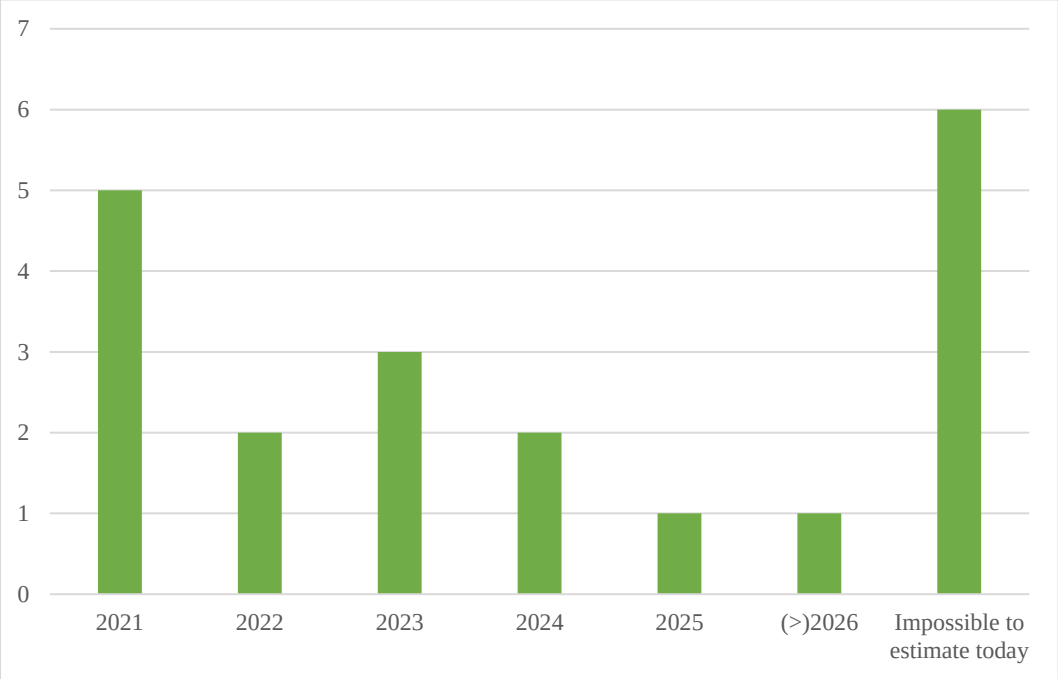
COUNTRY	ORGANISATION	COMMENT
United Kingdom	Green Gas Certification Scheme	Clearly, we must rule out that the input energy is not double counted. if there is physical connection e.g., private wire, at the issuing body for the output GO is given legal assurances that no GoO was issued then that would be suitable and no GoO would need to be cancelled.

3.10 Urgency estimation - By when do you expect the first demand for GO conversion issuance in your domain?



There are multiple answers possible.

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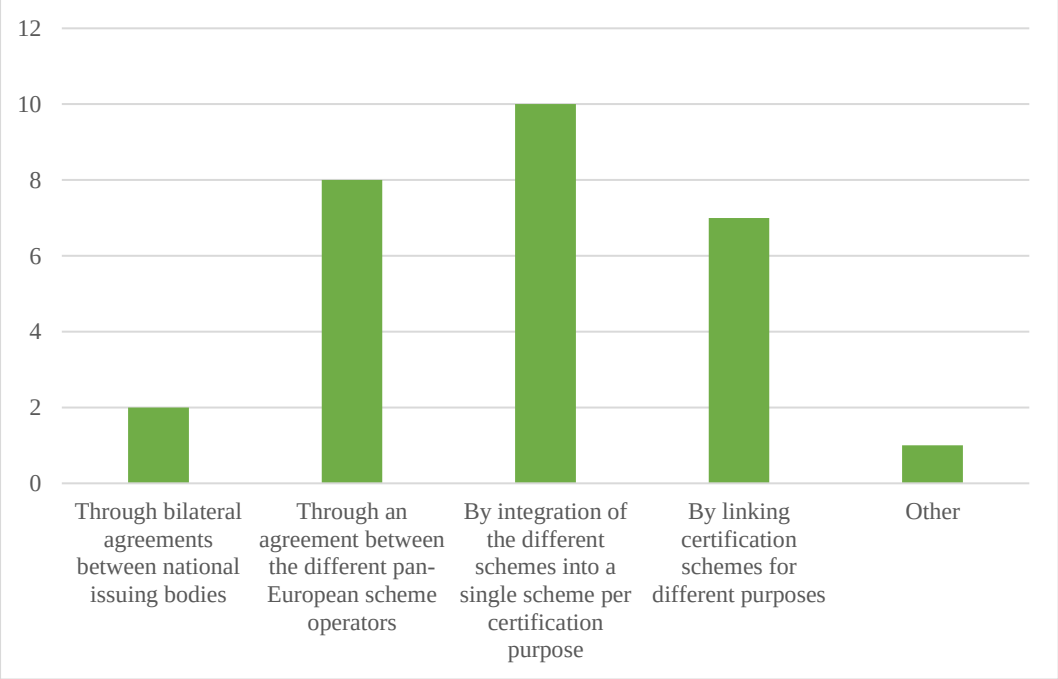
4 Dealing with various certification schemes

At the time of Q1 2021, there are various pan-European certification schemes for GOs for gaseous energy carriers. This is set out in the REGATRACE Report D4.2 which provides for a comparison between these schemes. AIB (EECS) and ERGaR both facilitate a GO scheme for gaseous energy carriers. The CertifHy scheme for hydrogen GOs is preparing for operation under EECS as a non-governmental certificate system.

If you are an issuing body for gas GOs, you may face market demand to import GOs that are issued under another pan-European scheme than the one you participate in.

If you are an issuing body for a single energy carrier in case a producer in your domain asks for, GO Conversion Issuance, there will be demand for either importing a GO from another carrier, or for acknowledging its cancellation.

4.1 How would you prefer the international transfer of certificates issued under different schemes to be facilitated?



There are multiple answers possible.

COUNTRY	ORGANISATION	COMMENT
Austria	AGCS Gas Clearing and Settlement AG	Different European schemes are mainly driven by different national registry systems for different application purposes – therefore harmonized national documentation should be requested to be implemented in European legislation to develop towards a single scheme in the long-run.

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COUNTRY	ORGANISATION	COMMENT
		However, until that, maximum flexibility of communication interfaces between parties is required. Scheme rules should be harmonised for each application purpose at least for cross-border transactions.
Belgium	Hinicio	To date, CertifHy does not anticipate cross scheme transfers for h2 ngcs.
Belgium	VREG	Linking certification schemes might be an option too, but it seems reasonable to aim for integrated (but separate) scheme per purpose first.
Estonia	Elering AS	The preferential choice would be to have an easily manageable solution.
Finland	Grexel Systems	Harmonization and agreements. Directive says that GOs from other member states must be acknowledged. Let us work the standard, pan-European schemes, and industry agreements that good that nobody needs to question this.
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	We would work together with the German issuing body for electricity GOs and make sure they are cancelled before we issue gas GOs for hydrogen.
Netherlands	CertiQ	Ideally, the different schemes should be integrated, failing which an agreement being scheme operators would be best. Individual agreements will be a lot of 'paperwork'.
Spain	Nedgia	A single scheme per certification purpose is needed for sector market development
United Kingdom	Green Gas Certification Scheme	I see that within the PoS system ISCC and REDCert have mutual recognition of PoS issued under the other scheme. Something similar could be explored for ERGaR and AIB so that exchanges were possible between an ERGaR member and Gas EEEC scheme participant. I think for now we need to wait until all countries have adopted RED II and there is more standardisation for GoO for gas. another possibility is that as a national scheme I must join both schemes - not very efficient! but might be easier than full integration of schemes at the European level in the short term.

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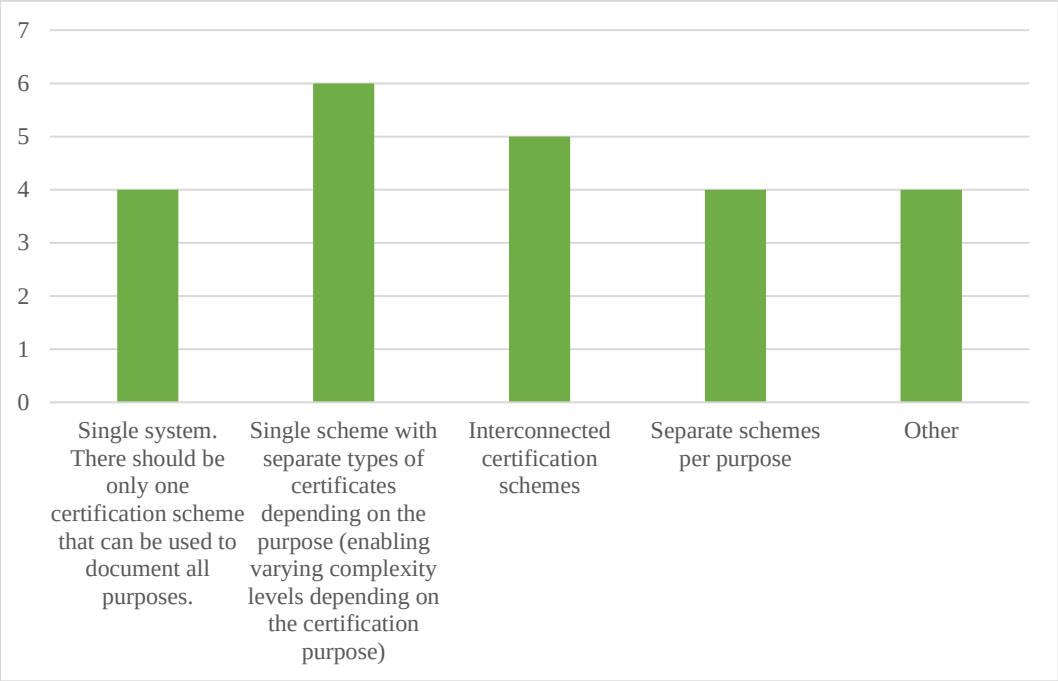
4.2 Regarding the extent of integration of certification mechanisms for various purposes in Europe, what do you deem to be beneficial?

In case there are separate certification schemes per purpose, the 'Cross purpose double counting risk' should be mitigated by not allowing to issue a certificate for disclosure purpose where for instance a certificate for target accounting purpose is issued.



There are multiple answers possible.

COUNTRY	ORGANISATION	COMMENT
Austria	AGCS Gas Clearing and Settlement AG	The currently fragmented market requests a considered ramp up. An evolution from d, to c, to b, to a should be envisaged on European level and supported with corresponding legislation.
Belgium	Hinicio	For the sake of flexibility, there should be different schemes per purposes (e.g., H2 GOs and rfnbos supply certificates), though those schemes should be interconnected in a general architecture, therefore eliminating double counting.
Estonia	Elering AS	Depending on the usage of GOs, different certificates could be used (for instance, for transport sector, carbon footprint tracking, off-grid production etc.).
Finland	Grexel Systems	In principle, as unified and as simple system as possible is beneficial. In practice, the overlaps are not complete and for example the lifecycle scope of GO is different than for mass balancing of sustainability certification. This is issue is very much interconnected across RED II because of openness in the wording. I would like to see that questions like this are though from the very fundamentals of what goal of such instruments is, and then try to see that what would be the best solution for this overall goal.

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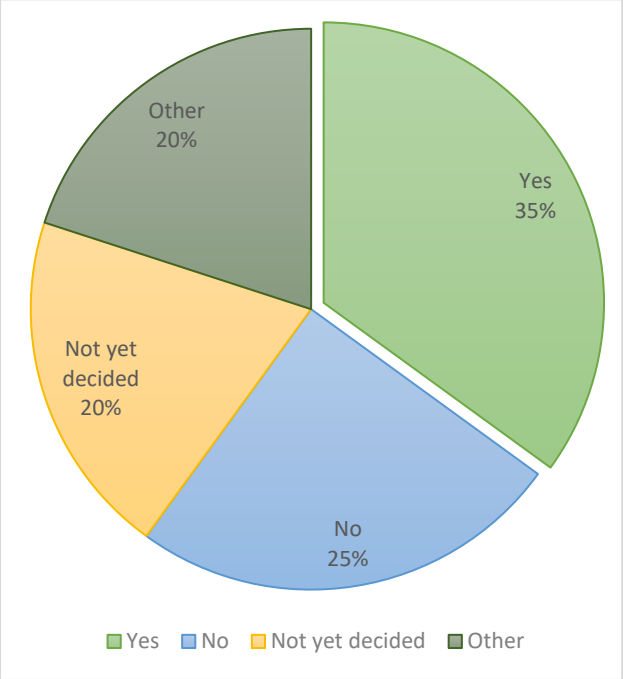
COUNTRY	ORGANISATION	COMMENT
Netherlands	CertiQ	It is impossible to answer this question without further information. For systems to be integrated into one, there would first have to be clarity on how such certificates will be issued, how they will be cancelled for each of their respective purposes, etc.
Spain	Nedgia	A single scheme is needed for sector market development
Switzerland	Pronovo AG	One standard with different schemes (the AIB approach)
Switzerland	VSG	Whatever leads to the fastest setting up of a European wide (or as many countries encompassing as possible) system.
United Kingdom	Green Gas Certification Scheme	I see separate systems for gas, electricity heating and cooling. conversions will take some effort on part of issuing bodies but no more than is already required in the Gas GoO sector to assess energy inputs.

4.3 Are there separate registries for electricity, gas, and hydrogen GOs in your country/domain?



COUNTRY	ORGANISATION	OTHER (SPECIFICATION)
Belgium	Hinicio	CertifHy is an NGC scheme only for hydrogen, not linked to a specific country.
Estonia	Elering AS	There is one integrated system of registries for different energy carriers.
Germany	German Energy Agency (Deutsche	Electricity and gas are separated, but we still do not know if gas and hydrogen will also be separated or not.

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	Energie-Agentur, dena)	
Switzerland	VSG	Currently, yes, but may change in the future.

4.4 How difficult is it for your national IT system for gas certification to adapt to scheme design changes of the international certification scheme your system is/aims to be connected to?

COUNTRY	ORGANISATION	
Anonymous		We do not have yet a gas certification system in place.
Austria	AGCS Gas Clearing and Settlement AG	To be answered by the IB.
Belgium	Hinicio	Not difficult
Belgium	VREG	Question is not how difficult, but how expensive. Will depend on the amount of change needed
Bulgaria	Sustainable Energy Development Agency	This scheme has not yet been implemented into our legislation thus we are not able to assess at this stage.
Estonia	Elering AS	Changes can be implemented: registries are developed in-house and integrated with business processes.
Finland	Grexel Systems	Business as usual?
France	GRDF	Not decided yet
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	Not difficult. We have already adapted it to connect to the ERGaR CoO Scheme.
Lithuania	Amber Grid	So far, we have not joined any of these schemes.
Luxembourg	ILR	not known, IT system sub-contracted
Netherlands	CertiQ	We are in the process of doing this, so we have no definitive answer yet. So far, it seems challenging, but doable.
Slovakia	SPP - distribucia	Not relevant, we are in the process of establishing gas GOs registry.
Spain	Nedgia	It is too early for this approach
Switzerland	Pronovo AG	We have not implemented it yet.
Switzerland	VSG	Rather difficult. Technical and legal limitations need to be tackled.
United Kingdom	Green Gas Certification Scheme	quite simple because we are connecting manually. this is fine for low volumes/transaction numbers. challenge will come later with there are 1000's of transactions/year.

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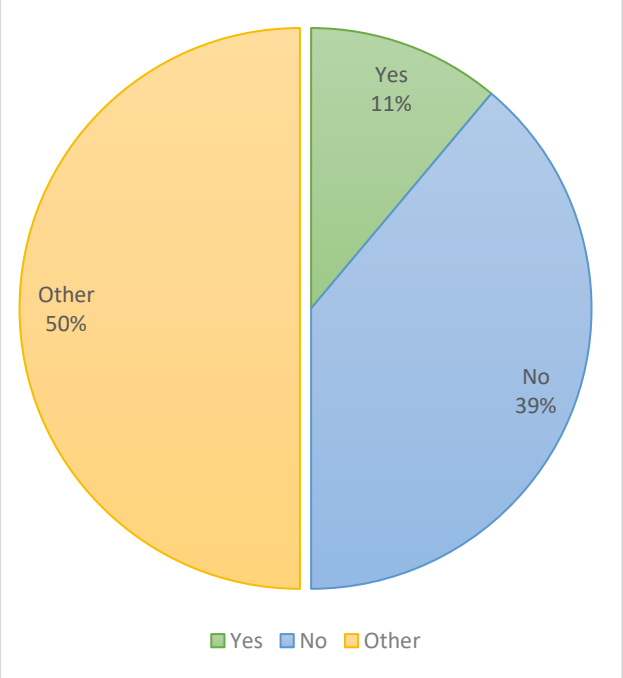
4.5 Are you as an issuing body in favour of joining various pan-European certification schemes and adjusting your registry mechanism to each of them?



Only 18 out of 20 organizations responded to this question.

COUNTRY	ORGANISATION	COMMENT
Anonymous		We would like to keep the certification system as simple and cost-effective as possible. We are also in favour of maximum harmonisation / uniformity between different domains/countries and reasonable centralisation.
Austria	AGCS Gas Clearing and Settlement AG	To be answered by the IB.
Belgium	Hinicio	I do not think I did properly understand the question. However, CertifHy will develop several certification schemes for hydrogen in Europe and Hinicio will provide Issuing Body & Registry services for each scheme.
Belgium	VREG	We will only join scheme(s) that fulfils the purpose for which we are responsible, and that is guaranteeing the origin of energy and disclosure.
Bulgaria	Sustainable Energy Development Agency	The Agency is an executive agency of the Ministry of Energy, therefore all such actions should be coordinated and specified with the Ministry.
Estonia	Elering AS	Preferential is to have one single nationally chosen EU scheme (following RED II).
Finland	Grexel Systems	Most of our clients are in favour of pan-European GO transfers, and for this purpose the pan-European certification schemes are important tools.

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COUNTRY	ORGANISATION	COMMENT
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	We do not know yet.
Netherlands	CertiQ	See our answer to question nos. 29 and 30.
Norway	Statnett	If/when conversion becomes a relevant issue in Norway
Spain	Nedgia	We are not an issuing body
United Kingdom	Green Gas Certification Scheme	could be a solution - seems likely that we will have to handle different certificate types in future - GoO, CoO, PoS, PoO - so being flexible and interacting with multiple schemes might be the best way forward if the chances of having "one scheme to rule them all" seem low unless the Union Database was imposed on everyone and expanded to include all Certificate types.

4.6 How agile is your certification system to conversion of GOs for other carriers?

COUNTRY	ORGANISATION	
Anonymous		We do not have yet a gas certification system in place.
Anonymous		We issue based on evidence of renewable production. We do not convert in our gas scheme.
Austria	AGCS Gas Clearing and Settlement AG	To be answered by the IB.
Belgium	Hinicio	The pilot Issuing Body operated under the CertifHy pilot projects is ready for energy conversion now.
Belgium	VREG	Still to be developed
Bulgaria	Sustainable Energy Development Agency	This is a matter of software upgrade and is achievable.
Estonia	Elering AS	Estonian system is very flexible and agile - all kind of changes can be implemented.
Finland	Grexel Systems	When energy carrier conversion is handled through cancellation and issuances that is basically nothing different than what has been the state of play for many years already.
France	GRDF	Not considered yet.
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	It is agile for it. We currently list 200 biomethane plants, 3 ptX plants and are open to extend the system to further energy carriers which relate to the renewable gas sector.
Netherlands	CertiQ	Not very agile, yet. It was designed for electricity and heating/cooling. But it will obviously have to be adjusted.
Norway	Statnett	We do not know - but the basic infrastructure is modular and probably we will be able to adapt if needed.

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COUNTRY	ORGANISATION	
Slovakia	SPP - distribucia	Not relevant.
Spain	Nedgia	We are not an issuing body
Switzerland	Pronovo AG	The system is not implemented yet.
United Kingdom	Green Gas Certification Scheme	quite - we have a manual process for issuing which can be adapted.

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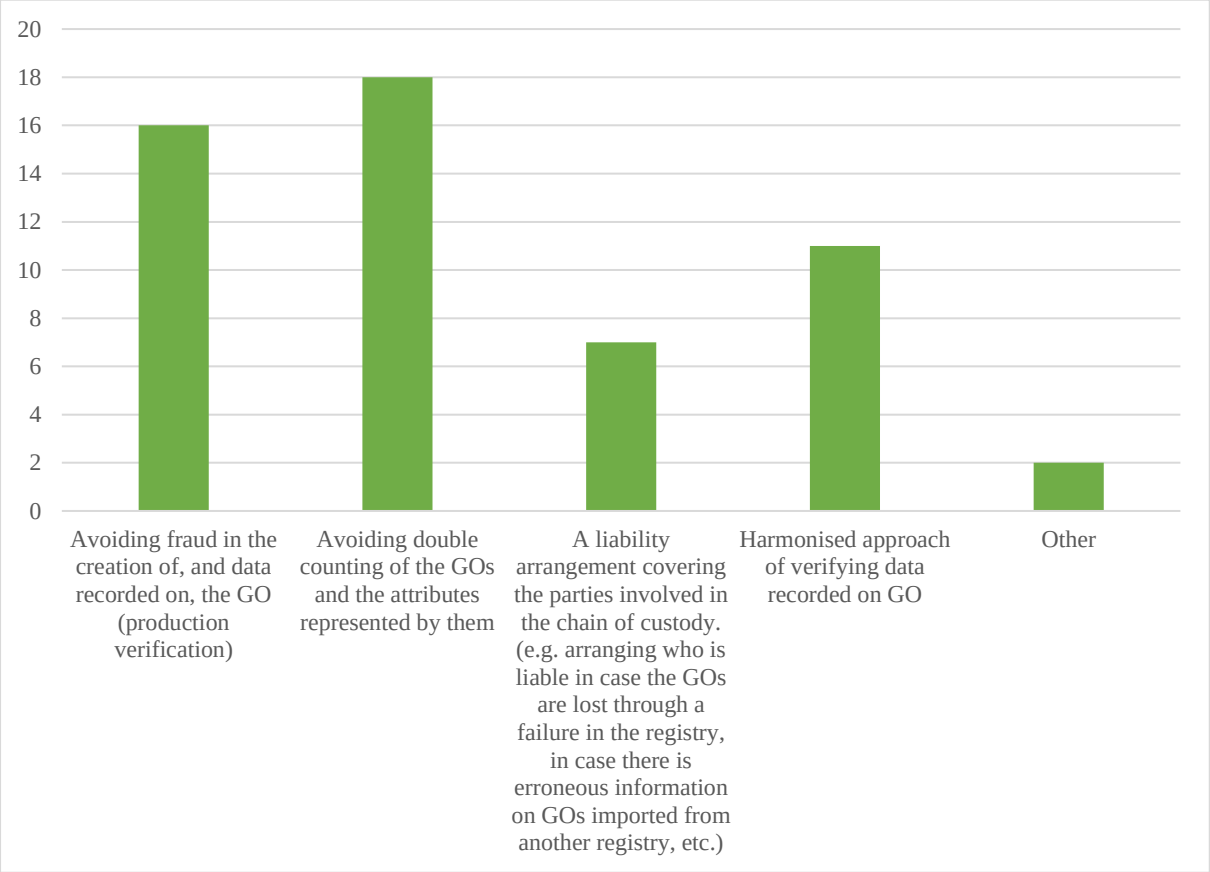
5 GO quality check

From the workshop on 11 March 2021, we learned that there is a substantial demand by issuing bodies that REGATRACE proposes criteria for a quality check of GOs that are cancelled for conversion.

5.1 Which principles do you consider essential for recognition of GOs from another issuing body?



There are multiple answers possible.

COUNTRY	ORGANISATION	COMMENT
Belgium	Hinicio	GO will have to comply with CEN EN16325 standard, therefore bringing trust for recognition.
Bulgaria	Sustainable Energy Development Agency	AIB's procedures and practices are largely in line with the harmonized approach to prevent double counting and fraud.
Estonia	Elering AS	Additionally, GOs must be transferred digitally.
Finland	Grexel Systems	The most important thing here is that CEN 16325 covers all the required aspects. Then the second question is just that who is checking the national GO schemes validity against CEN 16325? When

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COUNTRY	ORGANISATION	COMMENT
		national schemes are CEN 16325 compliant, then by RED II definitions no other validation should be needed.
Netherlands	CertiQ	It is difficult to judge whether a liability arrangement is essential before the system is up and running. After all, we have yet to experience these things. Also, how could such be enforced/verified?
United Kingdom	Green Gas Certification Scheme	As with issuing of any GoO you must be confident of the quality of the underlying data e.g., meter readings and recording of biomass inputs. EN 16325 offers some level of assurance, but I would like a mechanism to check the status of registry who issued the input GoO e.g., definitive list of who the issuing bodies are in each country and some details e.g., EECC domain protocol docs that are publicly assessable. we do not need total harmonisation on verification of data recorded on GoO some will want post hoc other ex-ante auditing of meter readings - if there are balancing/correction measure in place that is suitable. we must recognise there is a certain level of risk in all input data.

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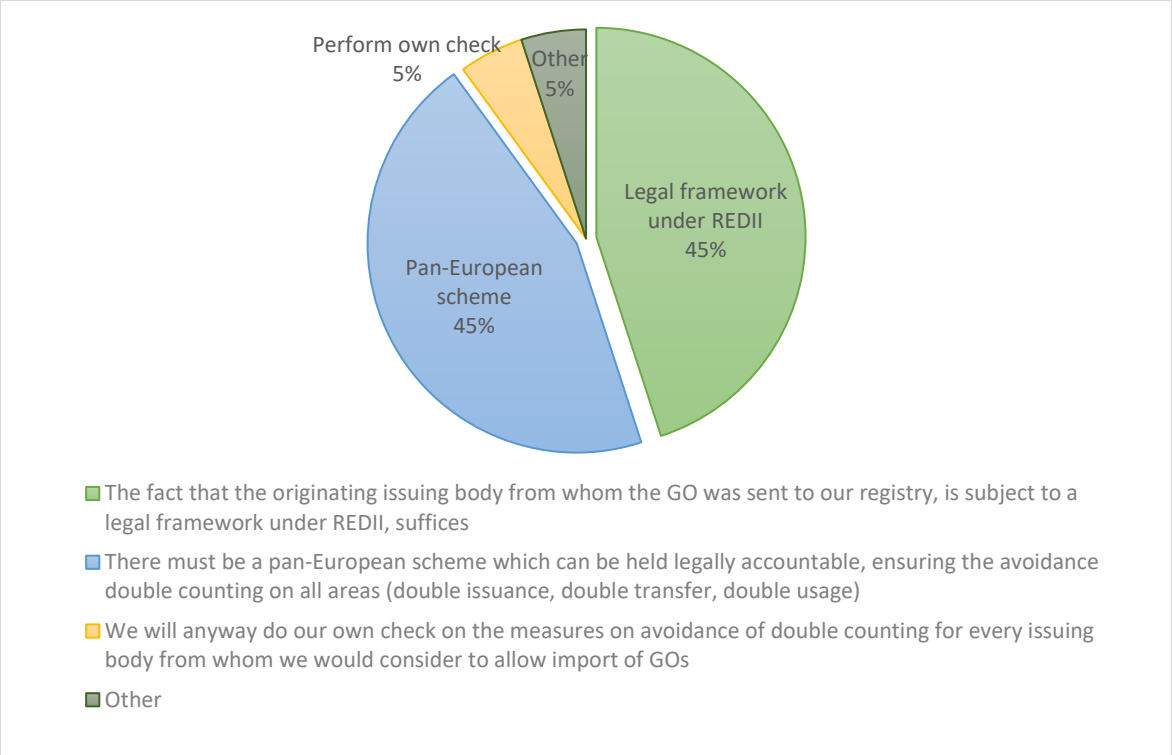
5.2 How should avoidance of double counting be ensured, for GOs that you accept as input for conversion?

Avoiding double counting, when working with (imported or cancelled) GOs that are issued outside the control of yourself as issuing body, this implies you needs to be able to have trust in : a) the processes for GO issuance (production registration, data flows, inspection and control mechanisms), b) the processes for GO transfer before the GO reached your registry (exclude the risk of duplication during transfer) and c) the processes for GO registration and guarding over its lifetime.



COUNTRY	ORGANISATION	COMMENT
Austria	AGCS Gas Clearing and Settlement AG	REDII clearly states the accountability of certificates and GO for a specific application purpose. This does not prevent the risk that the same energy amount may be counted for different application purposes, which is allowed according to REDII. Due to the number of participants and requirements on automated data processing, a harmonized approach is important on processes, data integrity and rules.
Belgium	Hinicio	To be further specified in the CertifHy scheme, currently handled case by case
Estonia	Elering AS	Each national GO issuing, and disclosure body is responsible for the GOs issued (correct measuring etc.) and cancelled in their registry.
Finland	Grexel Systems	The RED II and CEN 16325 compliance should be enough. How the compliance is verified is another question though.

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COUNTRY	ORGANISATION	COMMENT
France	GRDF	For us, nb 1 is relying too much on the infallibility of the national registries, a European unique scheme with the relevant liability assurances should be implemented, as the avoidance of double counting is one of, if not the reason why GoOs exist.
Netherlands	CertiQ	Pan-European schemes are an efficient way of verifying the accuracy, reliability, and veracity of a GO. However, we *must* implement the Directive, which means that we are bound to recognising GOs issued in another MS, regardless of whether that MS has 'subscribed' to a particular scheme. Where it has not, we will for sure have to do our own check.
Spain	Nedgia	a pan European scheme is highly recommended
United Kingdom	Green Gas Certification Scheme	we should as far as possibly rely on the RED II framework - a lot of effort has gone into the EN16325 standard. what is not clear to me though is who which certification bodies can CertifHy a registry as meeting this standard - in any other area a registry would be able to publish a certificate from say SGS or DEKRA saying we meet ISO9001, or we are ISCC certified. should be same for EN 16325.

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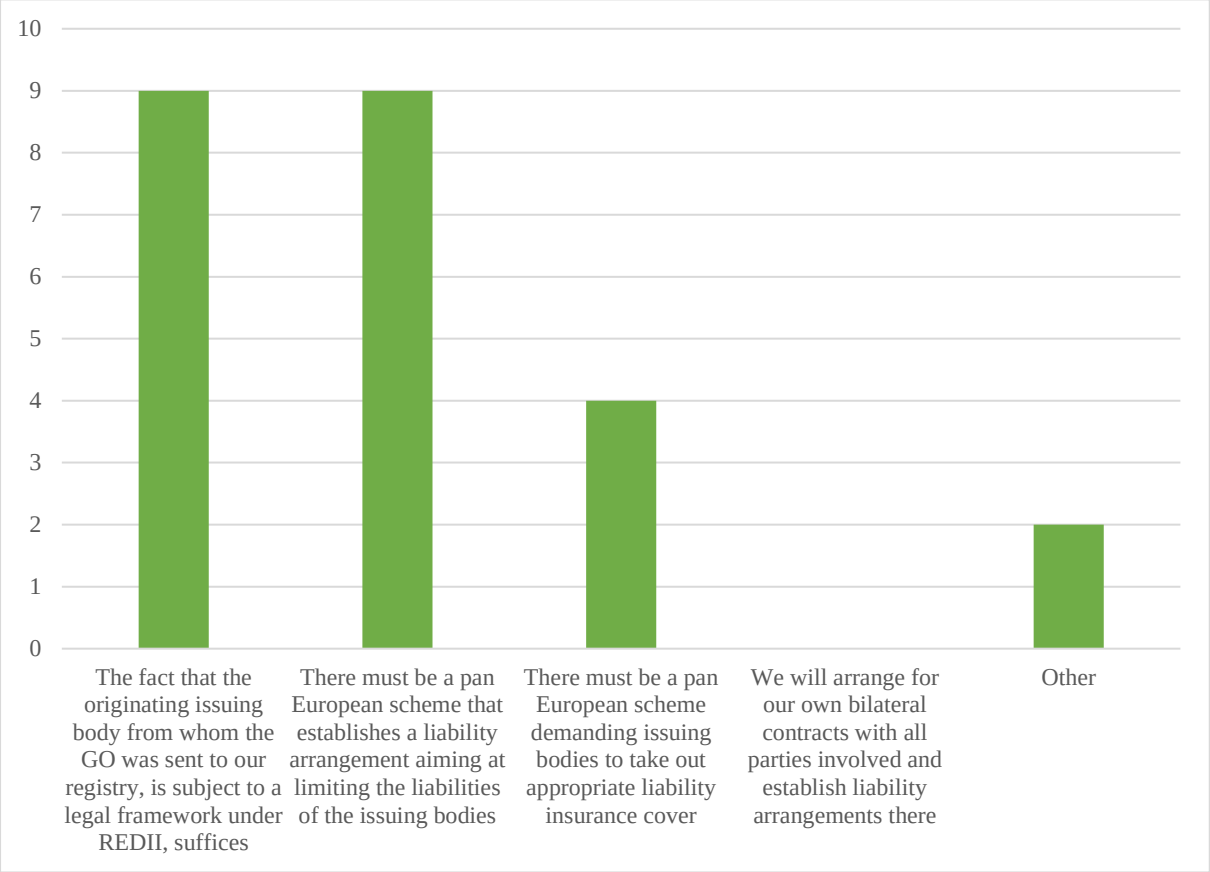
5.3 When entering cross-registry transfers, how to make sure liability is covered?

Liability of the parties involved in the chain of custody: Significant financial value goes on in the GO market. This requires both technical data security mechanisms to be in place, as well as liability arrangements covering all parties involved. It requires an unambiguous liability arrangement of the issuing body and registry operator of the GOs but also and of the liability of the market participants that take part in registering production and in trading, cancelling, and using GOs. Allocating liability explicitly allows for your own organization to assess the risk for indemnity claims and limit liability to those processes in your own control reach.



There are multiple answers possible.

COUNTRY	ORGANISATION	COMMENT
Austria	AGCS Gas Clearing and Settlement AG	A pan European scheme should precisely define the technical processes to verify that the REDII requirements are properly applied.
Belgium	Hinicio	No cross-registry transfers foreseen to date
Bulgaria	Sustainable Energy Development Agency	If there is a pan-European approach, the responsibility on issuing authorities will be reduced and the rights of participants in the scheme will be guaranteed.

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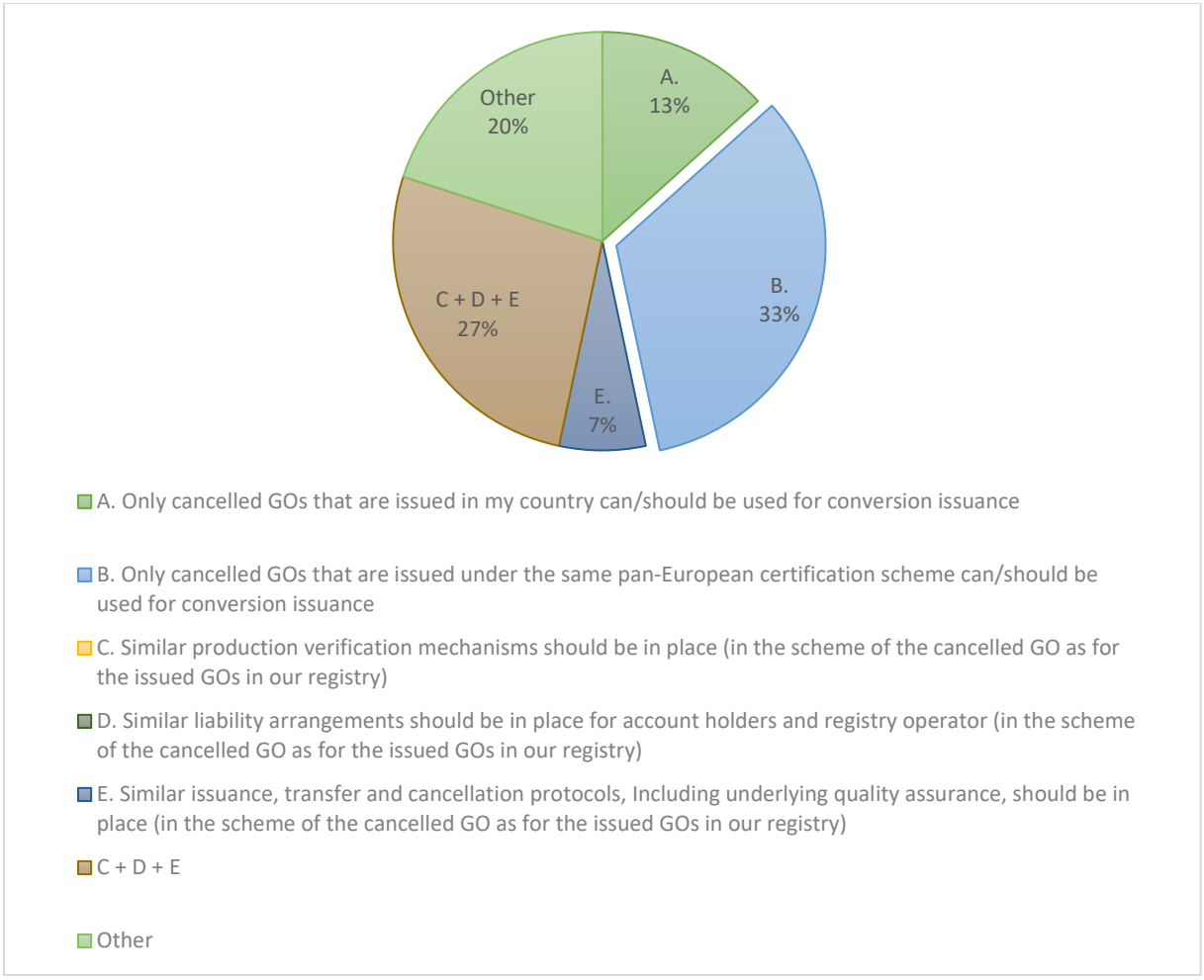
COUNTRY	ORGANISATION	COMMENT
Estonia	Elering AS	Each national GO issuing, and disclosure body is responsible for correctness of the data. Also, there are additional rules set be the pan European scheme.
Germany	UBA – Germany	We are subject to own liability rules as an authority
Netherlands	CertiQ	This is one for the lawyers. We will be happy to bring you into contact with ours.
Spain	Nedgia	a pan European scheme is highly recommended

5.4 What type of criteria do you deem relevant for a quality check of a cancelled GO for conversion issuance in your registry?

Please answer for the time where your registry aims to have implemented conversion rules, regardless of whether that is in the short-term or mid-term future.



Only 15 out of 20 organizations responded to this question.

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COUNTRY	ORGANISATION	COMMENT
Austria	AGCS Gas Clearing and Settlement AG	To be answered by the IB.
Estonia	Elering AS	The begin with, only a): Only cancelled GOs that are issued in my country can/should be used for conversion issuance. Additional solutions shall be determined in the future.
Finland	Grexel Systems	RED II compliant GOs. Other requirements only when specifically required by certain certification scheme.
Germany	UBA – Germany	No valid opinion so far
Lithuania	Amber Grid	No conversion rules in Lithuania
Netherlands	CertiQ	Again, liability is one for the lawyers. Regarding quality assurance: see our answer to question no. 41. For heating and cooling, specifically, we feel that GOs can only be cancelled to prove the origin of thermal energy supplied through the same network to which both producer and consumer are connected.
Norway	Statnett	Not sure if I understand the question fully: Cancellation related to conversion should happen at the same time and in the same place as the issuing of the conversion GO. Part of the process of issuing the conversion GOs must be to ensure that the sufficient amount of cancelled GOs is assigned for the conversion - Similar to the fuel declarations that needs to be in place before issuing electricity GOs for certain tech types.
Slovakia	SPP - distribucia	No opinion.
United Kingdom	Green Gas Certification Scheme	to be honest we have not considered this topic before, and it needs the input of our lawyers. for now, we would be happy with any GoO as long as we were aware of the status of the registry and had some assurances that they had a gov or market mandate and good processes in place. we would be happy to assess on case-by-case basis. medium term we would look for more structure and assurances.

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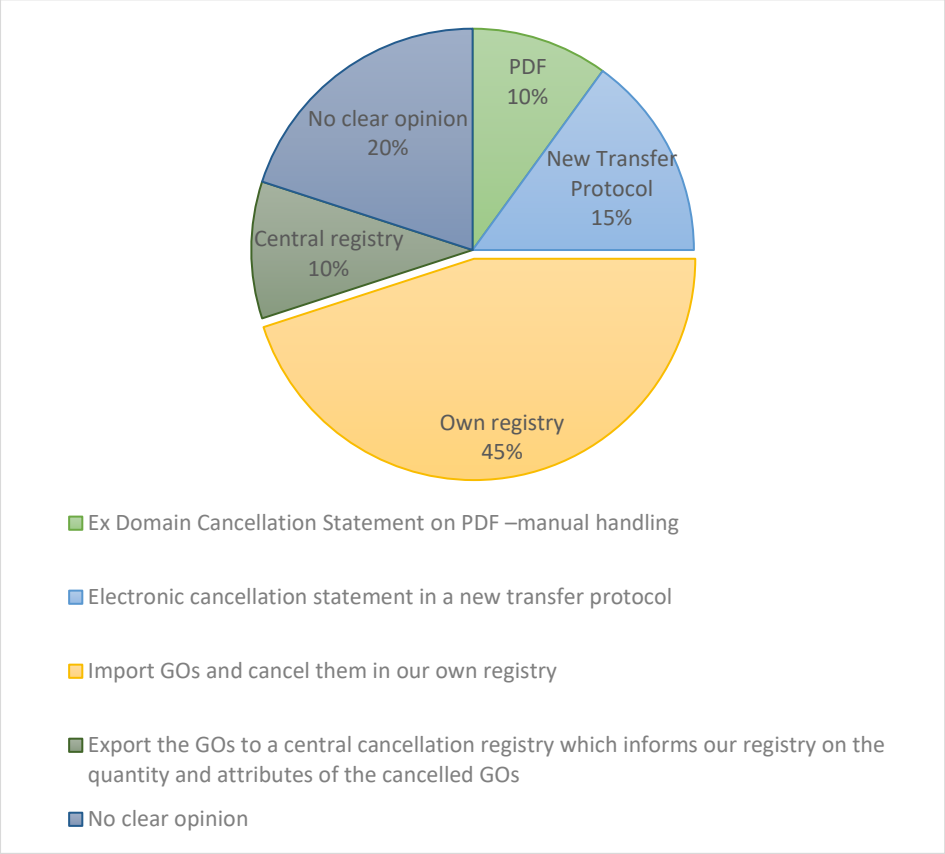
6 Importing GOs from another energy carrier, for conversion issuance

6.1 Cancellation process: When asked for import of a GO from another energy carrier for conversion, which pathway for cancellation of those GOs for conversion, originating from another registry, do you see optimal on the mid-term (3-5 years from now)



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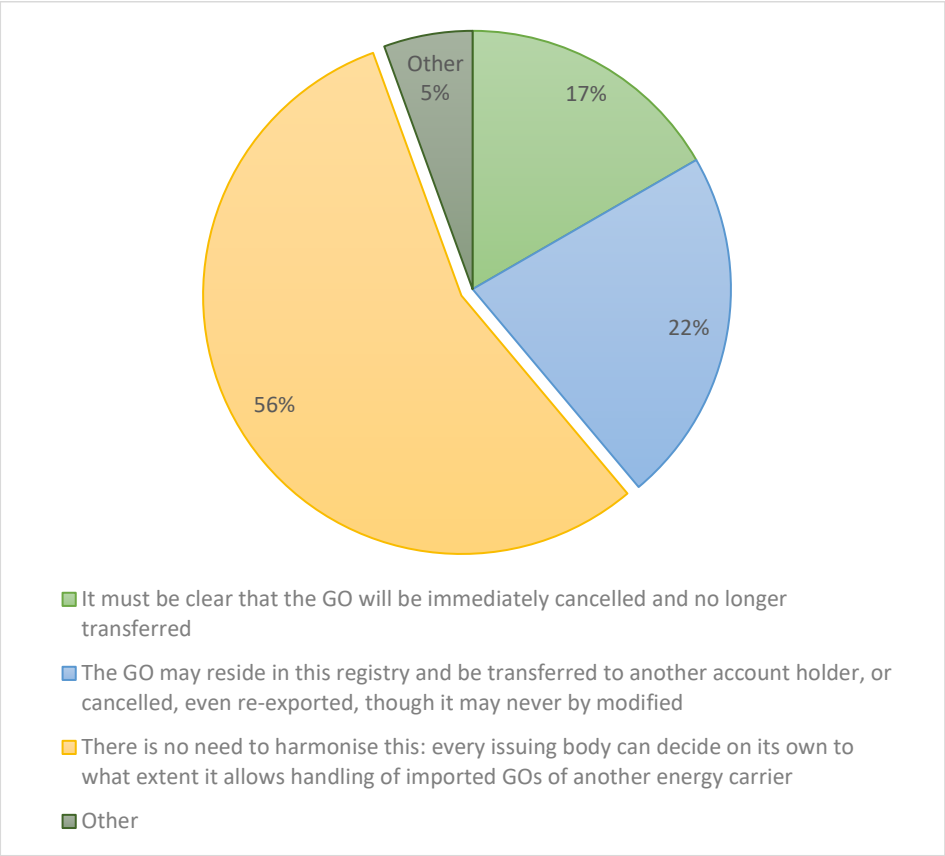
6.2 Cancellation process: In case of importing GOs of another energy carrier than the energy carrier for which the issuing body is appointed.



Only 18 out of 20 organizations responded to this question.

COUNTRY	ORGANISATION	COMMENT
Anonymous		Energinet will issue gas GOs based on renewable gas produced in Denmark.
Austria	AGCS Gas Clearing and Settlement AG	The consumption takes place at the production (conversion facility). Therefore, cancellation should be handled in the same country of the conversion. There should be an automated check during the transfer process whether the importing registry is operating for specific energy carriers. Such a list of registries and their responsibility should be publicly available for the avoidance of conflicts.
Belgium	Hinicio	Allowing transfer of GO for an energy carrier which is not handled by the registry within this registry could lead to data inconsistency / data loss
Belgium	VREG	Prefer a clear and uniform system, independent of country/domain or carrier, to avoid confusion and the risk of mistakes.
Bulgaria	Sustainable Energy	

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COUNTRY	ORGANISATION	COMMENT
	Development Agency	
Estonia	Elering AS	Each national registry can decide by itself (at least at the beginning). Solutions should be harmonised if concerned with residual mix calculations.
Finland	Grexel Systems	Alive GOs should be imported only to the issuing body registries which are for the specific energy carrier. If import is required as part of the energy carrier conversion process, the GOs should be cancelled in the exporting registry, or if this is not possible due to disclosure rules, then the GOs should be exported to the target country but to the registry of the same energy carrier, and then when needed cancelled for the purpose of energy carrier conversion.
France	GRDF	Once the GO is reissued, it should be GO fully equal to those in the registry
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	Each issuing body should be able to decide how to handle imported GOs of an energy carrier different to the one it was officially appointed for because it would give more flexibility to it in case it is allowed in the future to handle GOs of other energy carriers.
Netherlands	CertiQ	
Norway	Statnett	If a manual process is chosen (handling of PDFs) it would go against everything we stand for regarding credibility. Such a process would be riddled with human errors and should be avoided at all costs. Not to mention how expensive it would be - Each process would easily amount to hundreds of Euros in fees.
Slovakia	SPP - distribucia	
Spain	Nedgia	
Switzerland	Pronovo AG	
United Kingdom	Green Gas Certification Scheme	if the registry is able to handle GoO for other energy carriers and the conversion process was cancelled then they could be transferred onwards and used for any purpose - this would be up to the two-registry involved - e.g., the sending registry must have option to choose if it is sending a GoO that is only for conversion or if it is for conversion or further use.

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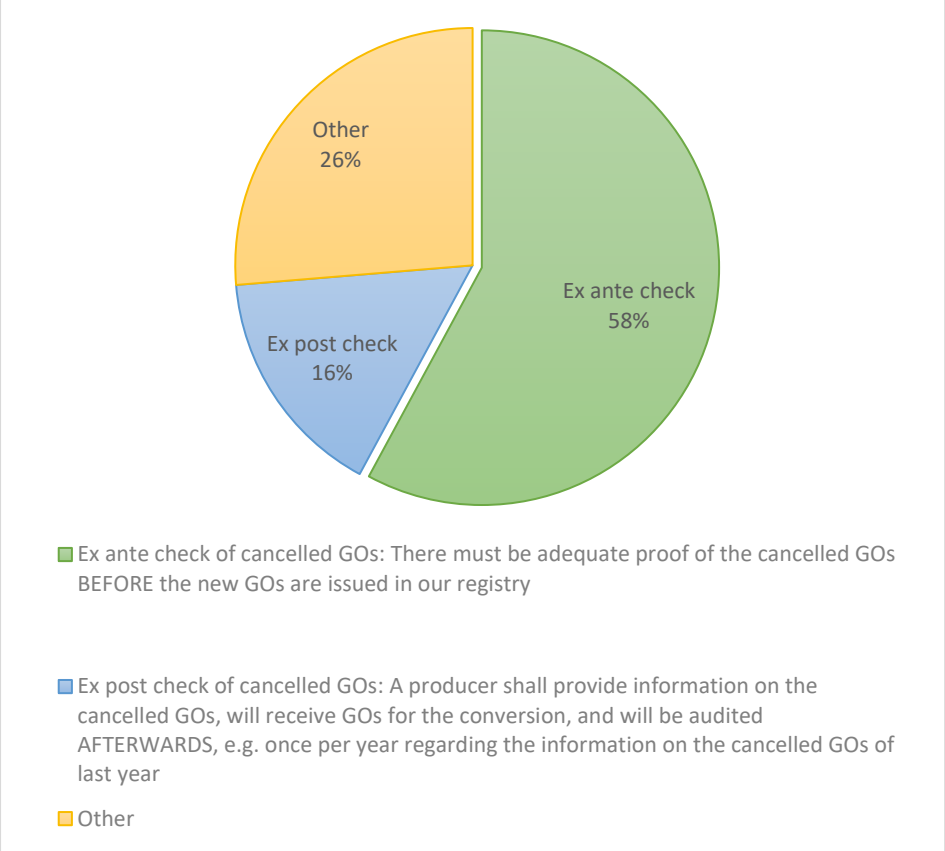
6.3 Consumption matching for conversion: What do you deem feasible in the processes in your registry, for checking the quantity and attributes of the cancelled GOs with the measured input to the conversion device:



Only 19 out of 20 organizations responded to this question.

COUNTRY	ORGANISATION	OTHER (SPECIFICATION)
Austria	AGCS Gas Clearing and Settlement AG	To be answered by the IB for the purpose of GO.
Belgium	Hinicio	Both can be considered, based on whether the audit of a production batch is required or not in the short term.
Norway	Statnett	Simultaneous - The GOs that are to be converted are cancelled as a part of the process of issuing the converted GOs.

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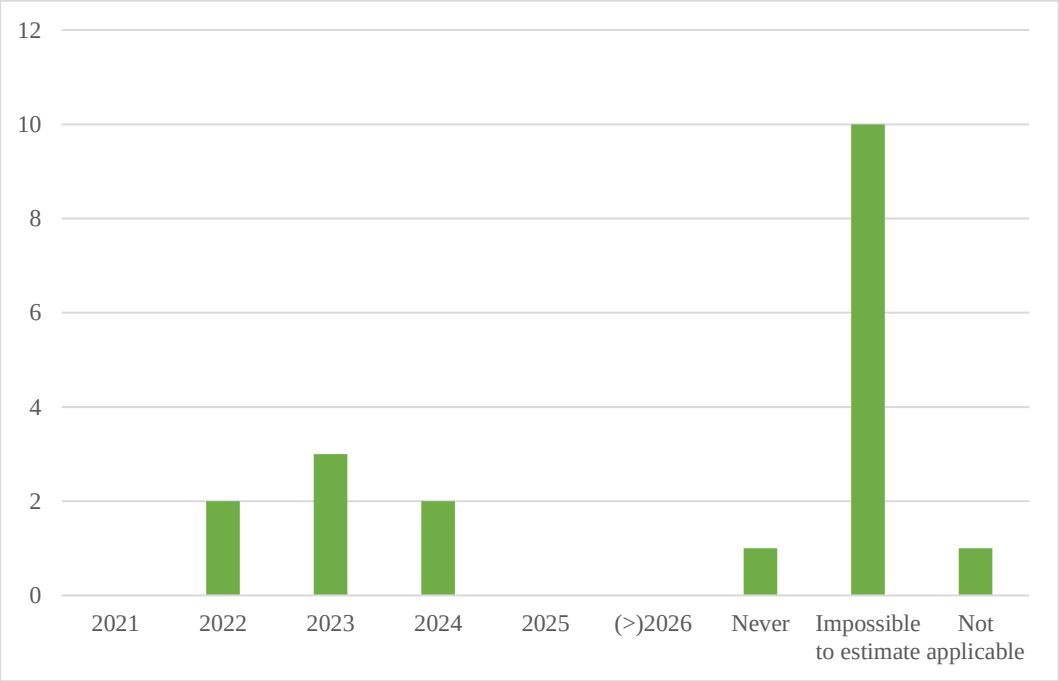
6.4 Conversion issuance: In your (rough) estimation, when will your registry start preparing for automated inserting of data from cancelled GOs on the GOs you will issue after conversion?



Only 19 out of 20 organizations responded to this question.

7 What do you hope this project helps you with, in the field of handling certificates for energy conversion?

COUNTRY	ORGANISATION	
Anonymous		We do not have a gas registry yet, and as we will need to implement one in the near future, we need to have at least a few general guidelines and rules.
Austria	AGCS Gas Clearing and Settlement AG	To get a mutual understanding of the conversion process, the complexity and consequently provide guidelines how to overcome these challenges in order to provide existing and future Issuing Bodies a fundamental documentation. Not invent wheel again but build on existing experience and harmonise established systems.
Belgium	Hinicio	Providing clear guidance on 1/ how to store information on in Cancelled energy inputs and 2/ how to ensure smooth operations between national GO IB and NGC IB.
Belgium	VREG	Establishing clear and harmonised principles to follow. Sharing/suggesting best practices for implementation of conversion processes in GO platform.
Bulgaria	Sustainable Energy Development Agency	Finding a common approach to be applied by all issuing authorities.
Estonia	Elering AS	To have an overview of solutions of other countries to move towards developing a harmonised, reliable, and transparent approach.
Finland	Grexel Systems	Harmonization of rules.
France	GRDF	Thinking of all the questions we might have missed beforehand.
Germany	German Energy Agency (Deutsche Energie-Agentur, dena)	We hope it helps us to have a better understanding on how to deal with GO conversion, especially when it comes to storage and how to deal with GOs issued after the storage stage.
Netherlands	CertiQ	
Norway	Statnett	This issue is not on the agenda in Norway yet - so we hope a sensible mechanism and a well-functioning standard will be waiting for us to implement the day we need it ;) For this to be of any potential market value at all it is vital that the processes are automized. The market is moving towards higher time granularity - Consider having manual processes to match input and out for hourly/15-minute resolution... Part of the value in conversion and storage lies in the possibility to switch the time of day of production of renewable energy - So it must me expected that hight time granularity will be a requirement.
Slovakia	SPP - distribucia	More harmonisation.
Spain	Nedgia	key tool for helping the sector development
Switzerland	Pronovo AG	Finding an optimal solution and guidelines for creating our new registry.

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COUNTRY	ORGANISATION	
Switzerland	VSG	Finding common ground on rules to facilitate Europe-wide cross-border trading of renewable energy, and government recognition thereof.
United Kingdom	Green Gas Certification Scheme	start exploring the challenges of conversion and work up a position for the GGCS late in 2021 - from a process perspective and technical challenges.

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Annex 2: Online workshop for issuing bodies and registry operators of energy attribute tracking systems – Minutes

"Mapping Challenges for certificate handling in relation with energy carrier conversion"

Agenda

Time	Topic	Speaker
13:00	Welcome & Introduction to Workshop	Liesbeth Switten, AIB
13:10	Energy carrier conversion – existing framework	Katrien Verwimp, AIB
13:25	Comparison between AIB & ERGaR & CertifHy schemes.	Matthias Edel, ERGaR
13:40	Challenges for implementation of energy carrier conversion in energy tracking certificate management	Katrien Verwimp, AIB
14:10	Practical challenges for conversion - Case study 1 - Austria	Harald Proidl, E-Control
14:25	**Break**	
14:40	Practical challenges for conversion - Case study 2 – Germany	Jakob Jegal, dena
14:55	Practical challenges for conversion - Case study 3 - the Netherlands	Remco van Stein Callenfels, CertiQ
15:10	Poll and Q&A	
15:35	Brainstorm – status in various countries, views on challenges and solutions	
15:55	Wrap up and way forward in REGATRACE task 4.3	Katrien Verwimp
16:00	Close	

1 Aim of the workshop

The aim of the workshop is to establish a common understanding of the practical challenges and potential solutions regarding the implementation of energy carrier conversion in energy tracking certificate management, and to collect feedback from the participant regarding the challenges they experience or foresee in their domain. The input from the workshop will be used to elaborate solution in the REGATRACE Task 4.3 regarding the coordination between the electricity and renewable gas and hydrogen certification (GO) systems.

While this workshop collects challenges and needs on the practical side, a separate public workshop will be organised later for a broad stakeholder audience, more focused on results.

2 Participants

Parties involved in the design and technical management of guarantees of origin (GOs) in relation to energy carrier conversion were invited to the workshop. These include issuing bodies, registry

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operators and parties who are considering operating a registry for GOs or voluntary energy attribute tracking systems. The workshop had a total of 85 participants (of which on average 50 simultaneously).

3 Minutes

Liesbeth Switten welcomed the participants.

At this webinar it is pointed out that it is especially important to talk to each other at a point in time where we do not know all the solutions yet. It aims to align the relevant stakeholders on the framework and the orientation of the work to be performed in REGATRACE task 4.3.

Katrien Verwimp introduced the framework of operation regardig energy carrier conversion.

Energy Conversion with relation to GO: Why bother?
If hydrogen or electricity is produced from biomethane, the renewable origin can only be proven with the cancellation of a corresponding amount of GOs for biomethane and the issuance of an amount of GOs for renewable electricity or hydrogen (corresponding the measured amount of physical electiricty or hydrogen produced). This process is called GO Conversion Issuance.

Specific practical challenges exist when handling corresponding GOs in relation to converting one energy carrier into another energy carrier. These challenges entail essential aspects for the overall GO system design. The goal of the Regatrace partners in task 4.3 is to identifiy those challenges and propose solutions and implementation options which ensure reliability for consumers, efficiency for issuing bodies and a smooth process for traders and procucers.

Scope
Energy can be conveyed by many carriers that can be converted into each other: There are many directions of energy carrier conversion. The work of this REGATRACE task 4.3 on integration of GOs for various energy carriers will explore rules and processes to facilitate energy carrier conversion in all directions, between biomethane, electricity and hydrogen.
As elaborated in REGATRACE task 4.1 and 4.2, there are several types of energy certificates, and several purposes of certification. Task 4.3 focuses at conversion processes related to guarantees of origin.

Background – existing framework and rulesets
There are already rules for handling certificates in relation with energy carrier conversion, both in the EECS Rules (sections C3.2.2, C3.6, C7.2) and in the committee draft of 18/11/2020 for a revised EN16325 standard on guarantees of origin. The rules in both documents are similar, and with regards to GOs, come down to the following.

1) Cancelling one GO, issuing a new GO: when converting energy from one energy carrier (input energy carrier) to another energy carrier (output energy carrier), the corresponding GOs from the input energy carrier need to be cancelled, whereafter new GOs need to be issued after energy conversion for the output energy carrier.

2) Accounting for conversion losses: The amount of GOs to be cancelled for the input energy carrier, matches the measured energy input to the energy conversion device. The amount of GOs to be issued for the output energy carrier, can be based on the net measured output of the conversion device.

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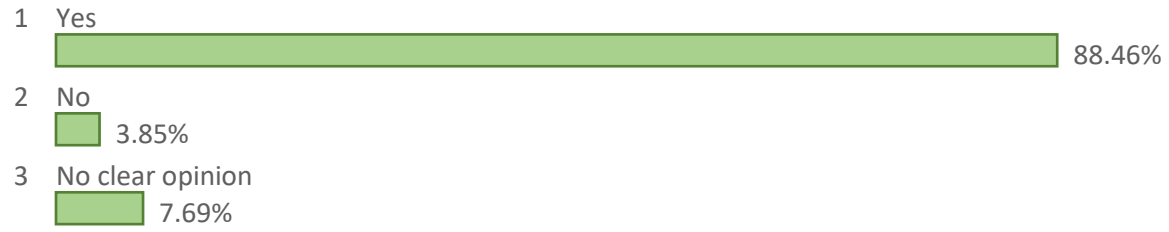
3) Retain information on the original energy source: Data from specific data fields is to be copied from the cancelled GOs to the newly issued GOs for the new energy carrier after conversion. In the current versions of the rules (dd 11/3/2021), the data fields to be brought forward on the newly issued GOs are: energy source, support category. Optionally carbon footprint data and labels could also be brought forward. Also, the purpose of certification should stay the same after conversion.

Poll question on conversion rules: Regarding the current rules for conversion issuance: do you agree that a GO of the input energy carrier is to be cancelled and a new GO is to be issued? (26 responses)



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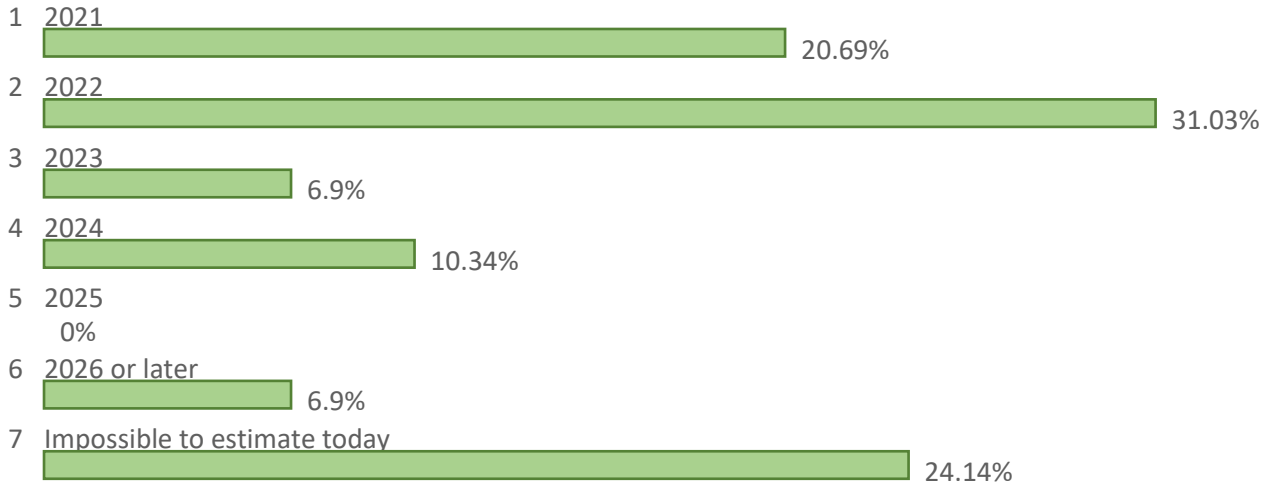
Poll question on urgency estimation: by when do you expect the first demand for GO conversion



issuance in your domain? (29 responses)

Comparison between the certification schemes for electricity (AIB), gas (ERGaR, AIB), hydrogen (CertifHy, ERGaR, AIB)

Matthias Edel presented the highlighted results of the REGATRACE task 4.2 report which made a comparison between the certification schemes of ERGaR, AIB and CertifHy.

Challenges for certificate handling in relation with energy carrier conversion

Katrien Verwimp presented the identified challenges for issuing bodies and registry operators in relation with energy carrier conversion.

There are issuing bodies with responsibility for operating GOs for multiple energy carriers, and issuing bodies for GOs for a single energy carrier. Where the registry operator and/or issuing body for GOs is not the same party with respect to the input and the output energy carrier of a conversion process, certificate handling becomes more complex than for the case where GOs for all energy carriers are managed in the same registry, and under the responsibility of the same operator.

There are 4 main challenges identified regarding the practical handling of GO conversion issuance for issuing bodies and registry operators. Here it is assumed that a fully operational system for GO handling is in place, for the relevant energy carriers.

5) Conversion Input GO quality check,
6) Making sure the input GOs are cancelled,
7) Match number of cancelled GOs with input measurement and corresponding data validation checks,
8) Issuing the GOs for the new energy carrier: transfer data attributes from the cancelled GOs.

Challenge 1: Conversion Input GO quality check

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When energy conversion takes place and the input GOs need to be cancelled in order to issue the new output GOs, the issuing body of the output GOs needs to be sure of the quality and reliability of the input GOs. When the to-be-cancelled GOs are issued under the same scheme as the to-be-issued GOs (and thus, by the same issuing body) or if the GO scheme of the to-be-cancelled GO is already assesed possively by the issuing body which will issue the output GOs, generally this does not cause the same complexity level of challenges, compared to the case where these GOs for the input and output energy carrier are operated under different schemes and/or by different issuing bodies.

When the above is not the case, experience from the field has shown that it is necessary that the GO scheme of the to-be-cancelled GOs needs to be assessed with a set of criteria by the issuing body of output GOs. No generic criteria for such an assessment are currently in place. A proposed flow chart for the quality check of input GOs is given in Figure 2.

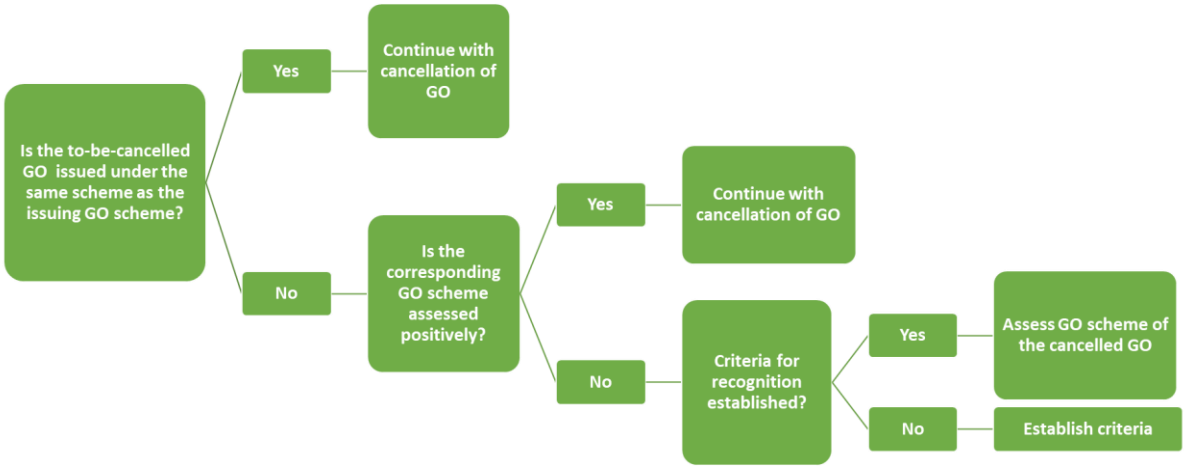
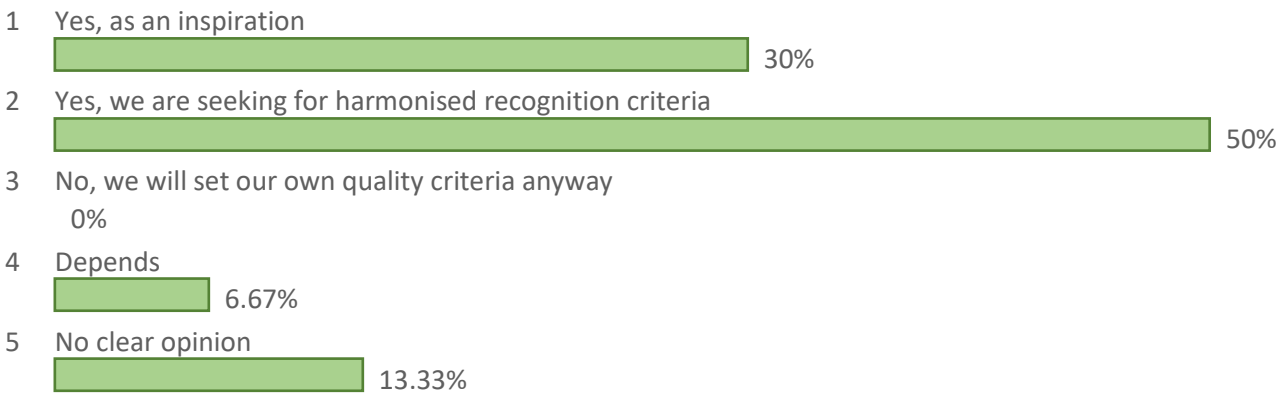


Figure 2: Flow chart for quality check of input GOs

Poll question: Would you appreciate if REGATRACE would propose criteria for a quality check of GOs that are cancelled for conversion in your registry? (30 responses)



From this poll result it was understood that there is a big demand for establishment of criteria and a verification process for the assesment of the GO scheme of the input GOs.

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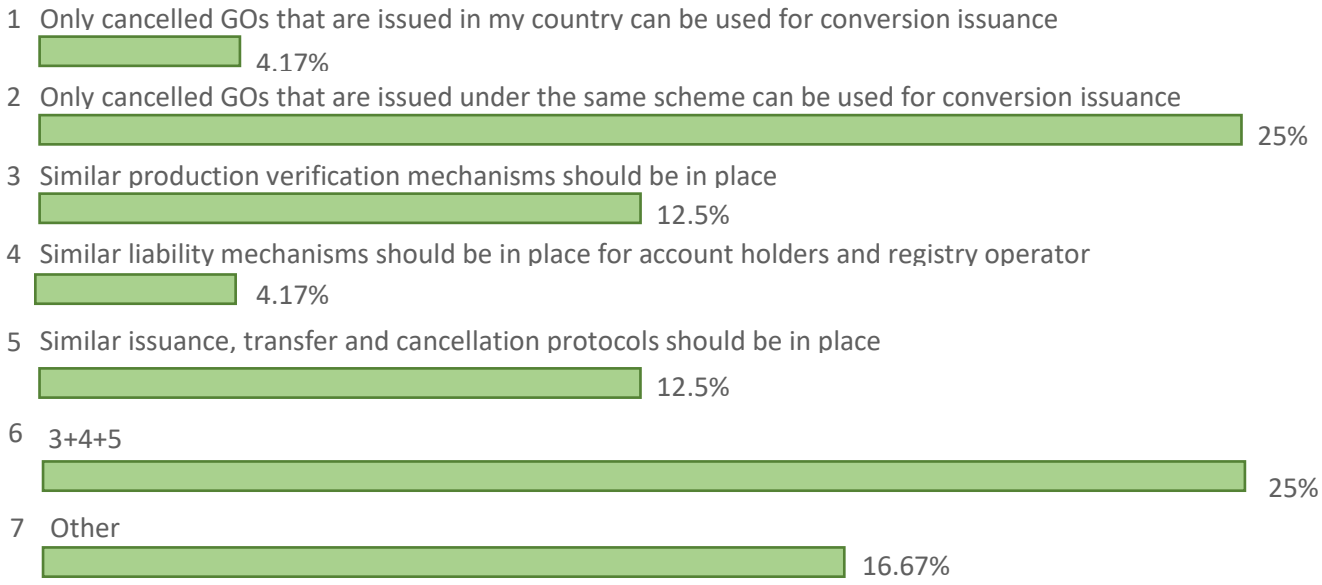
Poll question: What type of criteria would be relevant for a quality check of a cancelled GO for conversion issuance in your registry? (select 1 option only) (24 responses)



Following this survey question there was a brief discussion on the participant input pointing at the likely benefits of having only one certification scheme.

Several issuing bodies for both electricity and gas voiced that it would make issuing bodies' life a lot simpler to have one single certification system for the various energy carriers and purposes. It was noted that a subsequent survey should take into account this option of a single certification system for various purposes.

Challenge 2: GO cancellation preceding GO conversion issuance: making sure the input GOs are cancelled.

When an energy conversion takes place the input GOs need to be cancelled before issuing the new output GOs. The issuing body of the ouput GOs thus needs to be sure the related input GOs used for the energy conversion are cancelled. This becomes a challenge especially when the input GOs were issued by another issuing body than the issuing body responsible for issuance of the output GOs.

A distinction in approach can be made here between issuing bodies for a single energy carrier and issuing bodies for multiple energy carriers. For issuing bodies of multiple energy carriers, it is more evident to import the input GOs to their own registry (if not already there) and the cancellation thus can take place in their own registry. For issuing bodies of a single energy carrier, other ex domain options might be preferred, which means the cancellation takes place outside the own registry. An ex domain cancellation needs to be confirmed with a cancellation statement which confirms the cancellation to the issuing body issuing the output GOs.

Implementation option 1: Ex domain cancellation statement - PDF

The first implementation option is to cancel the input GOs ex domain with a cancellation statement in a pdf document. This means the GOs will be cancelled in another registry than where the GO will be

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used for documenting the attributes of the input to the conversion process. Consequently, a PDF file documents the information related to the cancelled GOs. This process is currently in place in AIB for cancelling GOs for usage in domains outside of EECS.

This option could be used for a start-up phase where only low volumes are to be managed: in this case it is easy, fast, and cheap to implement. However, when volumes increase, the manual workload increases and the option might be unsustainable. The option is also less reliable as pdf files can easily be copied and claimed multiple times. Therefore, the risk of double counting is substantially higher compared to other implementation options.

Implementation option 2: Ex domain cancellation statement – electronic transfer protocol between registries.

The second implementation option is to establish an electronic transfer protocol between registries. The information related to the cancellation of the input GOs will then be electronically confirmed to the issuing body responsible for the issuing the output GOs. This approach is more reliable and resistant to double counting compared to ex domain cancellation via pdf and it offers the same flexibility for different types of registries. However, in this case, both issuing bodies will need to invest in an additional transfer protocol and implementation of the protocol. It makes sense to assess the implementation cost in relation to options 3 and 4 in an overall cost-benefit approach.

Implementation option 3: Cancellation in issuing registry

As a third implementation option, the cancelation can take place in the registry of the issuing body responsible for issuing the output GOs. The input GOs will then be imported into the issuing body responsible of the output GOs whereafter they can be cancelled. This approach allows for automated processing of conversion but might be challenging to implement for issuing bodies of a single energy carrier. In the case of issuing bodies of a single energy carrier, the import of GOs of the other energy carrier needs to be made possible. For single energy carrier issuing bodies, the additional data fields from the other energy carriers need to be implemented in the registry. For issuing bodies importing GOs from another certification scheme, an investment is required for either:

a) Connect to the other scheme,
b) Interconnecting schemes, making the schemes interoperable.

Connecting to a new scheme has a set-up cost for an issuing body. On the other hand, making the different schemes interoperable may also imply scheme updating efforts that also entail costs for updating national registries by the issuing bodies taking part in this scheme.

Implementation option 4: Central cancellation

The fourth implementation option is the establishment of a central cancellation database. The input GOs will then be transfer towards and cancelled in a central database and thus outside the registry of the issuing body responsible for the output GOs. The central cancellation database will than inform on the quantity and attributes of the cancelled GOs. In this case, it is not required to create additional data fields in registries of a single energy carrier to allow for import of GOs from other energy carriers. In this approach investment in the central cancellation database is required and interfaces between

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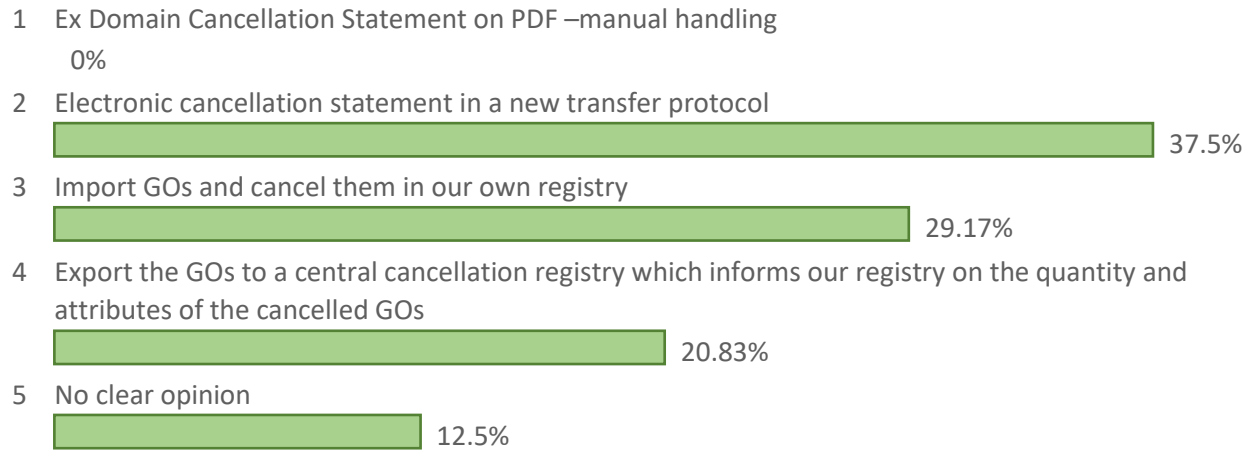
the cancellation database and the individual registries need to be established. The set-up cost for this option is to be compared with options 2 and 3 and consider additional system design-drivers.

Poll question: Which pathway for cancellation of GOs for conversion, originating from another registry, do you see optimal on the midterm (3-5 years from now)? (24 responses)



Challenge 3: Match number of cancelled GOs with input measurement and install checks.

In an energy conversion device, usually measurements take place on the amount of input energy fed into the conversion. Consequently, the GOs used for the energy conversion need to be cancelled and the amount of GOs cancelled need to correspond to the input measurement. It is self-evident that the issuing body responsible for the output GOs needs to be sure that the amount of cancelled GOs match the input measurement data. As this measurement data cannot be matched with the amount of cancelled GOs in an automated way in all cases, pragmatic implementation options need to be considered.

Moreover, the issuing body of the output GOs might want to install checks on the plausibility of the amount of input energy compared to the amount of output energy produced, using a list of conversion efficiencies.

Implementation option 1: ex ante

In this implemenation option, the issuing of the output GOs will only take place after the measurement value of the input energy has been checked against the amount of cancelled GOs. This option is the most secure way of issuing output GOs. However, if there is no automated process in place to perform this check, the issuing of the output GOs might be delayed. It also needs to be considered whether the administration cost for a monthly verification can be defended and born by the actors within the GO system.

Implementation option 2: ex post

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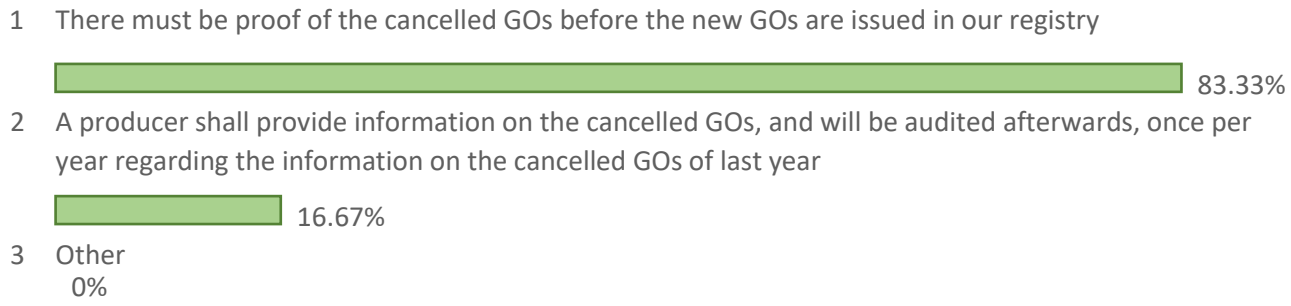
In this implementation option, issuing of the output GOs can already take place, even before it is confirmed that an amount of cancelled GOs matches the measurement value of the input. In this case, an audit will check on a regular basis (e.g. once per year) the amount of cancelled GOs against the meter reading. This is a low cost option, but might be less reliable.

Remark from the audience: access to the cancelled GOs should be available for the interposed auditor.

Poll question: What do you deem feasible in the process in your registry, for checking the quantity and attributes of the cancelled GOs with the measured input to the conversion device? (18 responses)



A comment to this survey question felt that it was important to check how the input data is validated. Indeed, while phrasing this question, measurement data validation procedures were assumed to be in place in the GO scheme regardless the conversion.

Further there was note of an additional challenge in relation with reliability of measurements for off-grid configurations.

Challenge 4: Issuing of the GOs of the new energy carrier – transfer data from the cancelled GOs.

Finally, the issuing of the GOs of the new energy carrier can take place, after performing the quality check on the GOs of the input energy, the cancellation of the input GOs and the matching of the number of cancelled GOs with the input measurement data. For this, some attributes of the input GOs (and thus the data from the input GOs) need to be transmitted to the newly issued GOs. A process needs to be established at the issuing body for conveying this information and ensuring it ends up correctly on the GOs to be issued.

Practical challenges for GO conversion – Case study 1: Austria

Harald Proidl presented the Austrian experiences with managing conversion. The actual experience bases on the conversion processes related to energy storage, in their case pumped hydro storage. Based on a first-in, first-out principle, GOs corresponding to energy fed into a storage station, are stored.

With regards to conversion between energy carriers, rules are developed. These entail the cancellation of the GO for the input energy carrier and the issuance of a GO for the output energy carrier.

The conversion efficiency to convert one energy carrier to another can be either a default value, fixed in the law or an actual efficiency provided and motivated by the operator of the conversion plant.

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The first approach for conversion or transformation of GOs in Austria was designed for pump-storage-power-plants. Electricy is used by a pump wich pumps water into a reservoir. When the water is released from the reservoir, again electricity is produced. In this sense, the first conversion of GOs related to storage of energy with the same energy carrier as an outcome, hence was no “nett” energy carrier conversion. Austria has a high installed capacity of pump storage (approx. 4 TW) and the criticism was that pump-storage is used to transform “dirty” electricity from coal and nuclear into “clean” hydrogen power. Therefore, a system needed to be implemented in the registry so that pump-storage could not be used as green-washing-machine. There was a clear demand from the market to create more transparancy on the ‘real’ origin of pump-storage-electricity production.

The pump system was treated as a final end consumer and the parties who deliver electricity to the pump needed to provide a specific disclosure statement for this specific end consumer being the pump. The GOs used for disclosing the attributes of the pumping energy are not cancelled but stored on a specific account. Consequently, the energy content of the GOs is reduced with 25% to account for transformation losses when the water is pumped into the resevoir. At this waterreservoir, there is also natural inflow of water. When water is released from the resevoir, electricity is generated and the GOs are released from the account with a first in, first out principle and in the same proportion as the GOs cancelled for energy consumed by the pump. Additionally, there will also still be a share of GOs issued for the electricity from the reservoir resulting from the natural inflow of water.

Based on the expierenced of the pump-storage-system, a similar conversion system for GOs was elaborated for Power-to-gas installations. The electricity supplier has to make a specific disclosure statement for the P2G plant, after which GOs for gas are issued based on the following rules:

- The energy content corresponding to the amount of input GOs is reduced for calculating the amount of output GOs to take into account the transformation process,
- The gas GOs are issued, in proportion to the part of the input documented with cancelled GOs (and thus inflow technologies),
- All electricity GOs must be valid at the moment of this transformation (on a monthly basis)
- All information from the electricity GOs are transferred to the gas GOs
- The GOs for gas have a new issuing-time-stamp and are valid according the RED II requirements
- At the end: A new gas-GO with information about the primary energ sources, status of supporting level, CO2 factor etc is available.

<u>Identified challenges in Austria:</u>

- How to deal with industrial sites were only part of the electricity and/or gas used is originating from the grid (e.g. hydrogen produced from on-site PV power)
- Gas in storage: the storage cycle potentially exceeds the validity of the GOs
- Calculation of the transformation losses (e.g. in P2G plants)
- Transformation of the environmental impact from the electricity-GOs to the gas-GOs

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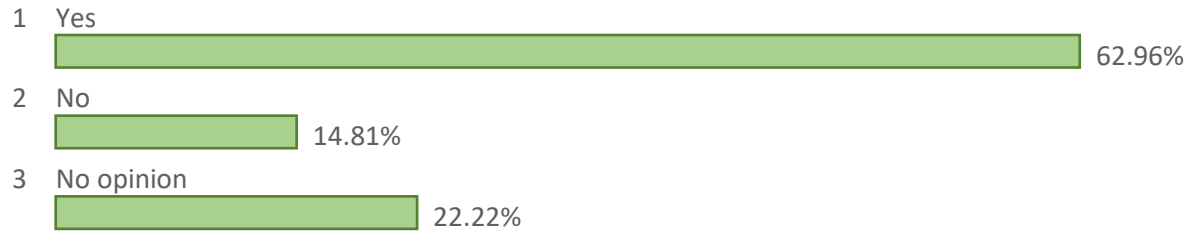
Poll question on conversion rules: Should after conversion issuance the expiry date be re-set? (i.e. starting at the end of the production period of new energy carrier) (27 responses)



Comment to this survey from 'no'-voters in the audience: Resetting the expiry date might cause the problem of using GOs that almost expire in a conversion process, thus bypassing the rules of expiry.

Practical challenges for GO conversion – Case study 2: Germany

In the Dena biogasregister currently 3 PtG plants are registered with an annual production of 3 GWh. These are pilot plants only. The dena biogasregisters has a list of criteria which need to be checked by an auditor and which need to be fulfilled before a GO can be issued to a PtG plant of which the most important ones are:

- Evidence that the electricity used to produce the storage gas from exclusively renewable sources was sufficient for the amount of storage gas produced,
- Proof of actual injection into the natural gas grid,
- Mass balancing until injection into the natural gas grid,
- The gas was produced exclusively from renewable electricity,
- The renewable electricity was temporarily stored before being fed into the electricity grid,
- The carbon dioxide/monoxide used was not deliberately produced from methanation.

Identified challenges in Germany:

- The information from the original electricity GO is not transferred to the biogasregister. The information on the original energy sources is thus not incluced on the GO. It would be recommended to at least upload the original GO into the register or have a database extension,
- Double counting risk,
- The cancelled electricity GO should still be able to be provided to the interposed auditor.

Practical challenges for GO conversion – Case study 3: The Netherlands

While implementing the aforementioned conversion rules, CertiQ developed a calculation model for conversion and by doing so, challenges were identified during its development.

Identified challenges:

- The value of 'financial support' information after conversion: Let's say the wind turbine received investmest support and the electrolyser receives production support, both types of

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support will be mentioned on the final hydrogen GO. The issue is that when there is a chain of production devices and the last production devices did not receive any support, the mentioned of received support keeps been carried forward on the GOs. While it makes sense to carry forward information on the energy sources, it might not make sens to keep carring forward information on the support schemes.

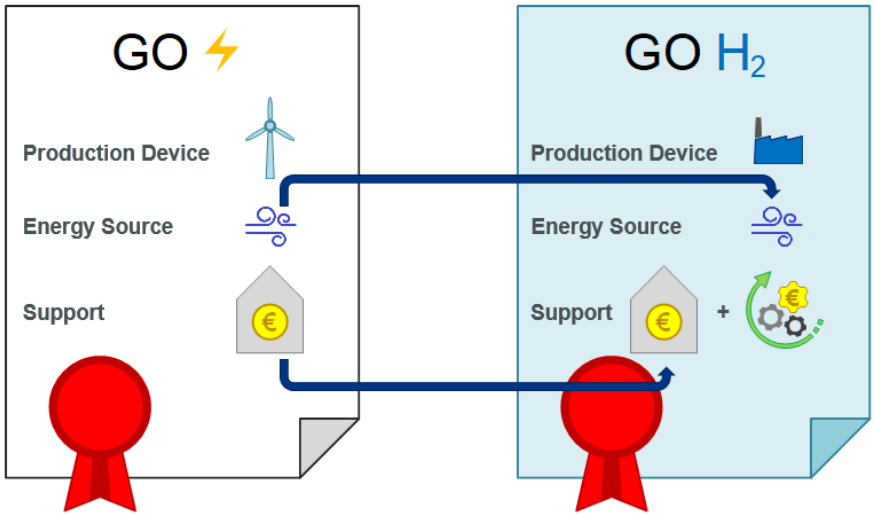

Figure 3: Carrying forward support information on GOs

- Cumulating support info: There exist impracticalities using the coding for received support on GOs in such a chain of conversions. The same outcome on the resulting GO can mean different things as illustrated in Table 1 below.
- Carrying forward residual kWh becomes complex: A GO is issued per MWh, the residual kWh can be carried forward to a next production period. Registering the values of the data fields in relation with this residual energy, requires excessive administrative effort which is out of proportion in relation with the small value the residue represents.
    - The more combinations of the various data fields to be carried forward, the more data packages are to be stored for the residual energy waiting to be issued GOs
    - Causes a bigger difference between production and actual GOs issued
    - Difficult to explain to producers

The proposal of CertiQ is to include on each GO only the investment support and/or production support granted to that production device and the energy it produces, hereby disregarding the support information on a GO cancelled for conversion.

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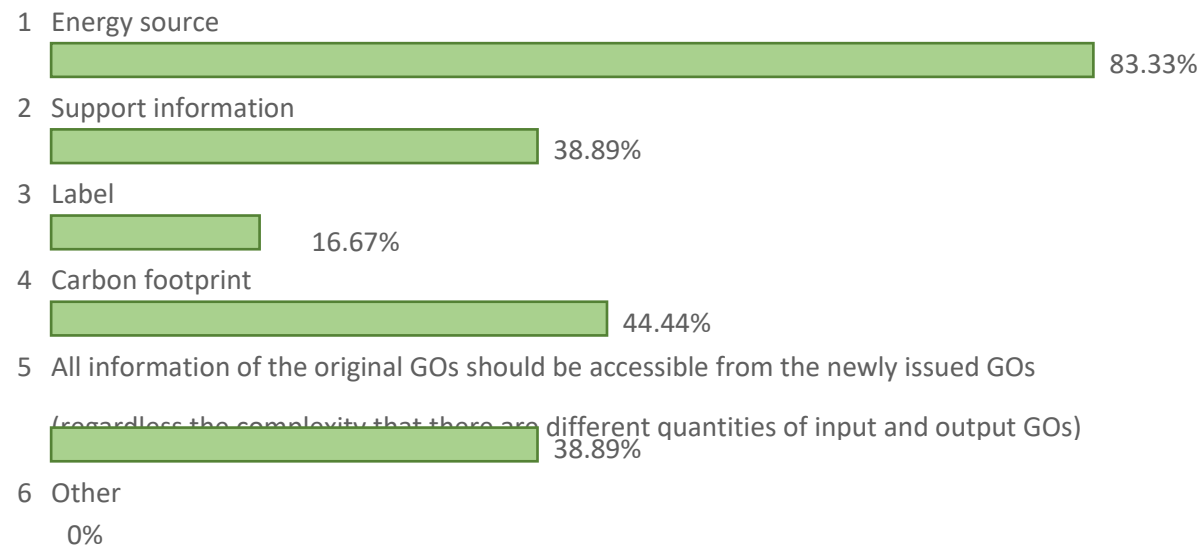
Table 1: Illustration of the outcome of different types of support received on the resulting GO

Cancelled GO	PD receives	Resulting GO includes
No support	No support	No support
	Investment support	Investment support
	Production support	Production support
	Both	Both
	Unknown	Unknown
Investment support	No support	Investment support
	Investment support	Investment support
	Production support	Both
	Both	Both
	Unknown	Investment support
Production support	No support	Production support
	Investment support	Both
	Production support	Production support
	Both	Both
	Unknown	Production support
Both	No support	Both
	Investment support	Both
	Production support	Both
	Both	Both
	Unknown	Both
Unknown	No support	Unknown
	Investment support	Investment support
	Production support	Production support
	Both	Both
	Unknown	Unknown

Poll question on conversion rules: Which information on the newly issued GOs should be retained from the original GOs after conversion? Multiple answers are possible. (18 responses)



Discussion forum – mapping the situation and views at various countries

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Some notes made during the discussions:

Belgium Flanders has conversion rules in place, in accordance with the existing framework in EECS and the draft CEN standard, yet no actual implementations.

Dutch issuing bodies reports an active cooperation between the issuing bodies for electricity and gas in the Netherlands.

A participant from an electricity issuing body noted that for now conversion seems to be step two, step one is issuing gas GOs and opening disclosure to gas.

Next steps

As next steps it was announced that a survey would follow, that in October a report on conversion rules will be finalised, and in April 2022 a design study for an integrated conversion process.

Outtro

The speakers and participants were thanked for their contributions and attendance. The following poll questions illustrate some closing feedback.

Poll question: What do you hope this project helps you with, in the field of conversion? Or what did we miss today? (free text, max 5 words) (8 responses)

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Poll question: What did you learn most today? (free text, max 5 words) (9 responses)