EUROPEAN COMMISSION
N° ENER/2023/MVP/0010

REGODISS

"Technical assistance to develop methodologies compliant with Disclosure obligations on RES gases"

T3: Draft methodology for Disclosure supervision and Residual Mix calculation for gases

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EXECUTIVE SUMMARY

This report aims to develop a **draft methodology for the calculation of the gas Residual Mix**. It presents a reasoning for the proposed methodology and discusses various aspects including the accuracy of the model, the complexity of the calculations, the transparency in terms of the information to consumers and a specification of the relevant data sources.

Before delving into the composition of the Residual Mix formula, this report analyses the inputs for setting design criteria: legislative frameworks, legal requirements and initial input from stakeholders.

First, concerning the legal frameworks, it is acknowledged that the Residual Mix only has value in a Disclosure framework with regulatory protection of the uniqueness of claims on renewable and low-carbon gas consumption. Several recent legislative initiatives aim to enhance the impact of energy tracking on the energy transition. Their practical implementation needs a **coherent approach** to ensure these intentions are realized.
Three EU Directives provide the main framework for Disclosure of the origin of gas. The recast Directive on the Common Rules for Gas and Hydrogen (hereafter referred to as recast Gas Directive)[1] installs the **first gas Disclosure obligation** on **suppliers** and requires the renewable and low-carbon origin of supplied gas to be stated on the bills, and at least for renewable gas, to substantiate this with **Guarantees of Origin** (GOs). The European Sustainability Reporting Standards (ESRS), issued under the Corporate Sustainability Reporting Directive (CSRD)[2] impose on **corporate energy consumers** the obligation to disclose the energy sources of their consumption and to base this Disclosure on contractual arrangements like GOs. The draft Green Claims Directive[3] intends to impose on Member States to ensure that Green Claims by **traders** are substantiated.

Second, the requirements for GOs are given in the Renewable Energy Directive (EU) 2023/2413 (REDIII)[4]. This Directive not only obliges Member States to **issue GOs** on request of a producer and to ensure that the same unit of renewable sources is taken into account only once, it also requires Member States to **publish** on an annual basis **the Residual Mix**, providing information on the untracked commercial offers. The Directive defines the Residual Mix as "the total annual energy mix of a Member State, excluding the share the share covered by cancelled GOs". Further, REDIII stipulates that the Residual Mix includes expired GOs.

Third, preliminary stakeholder views as mapped in a survey show a diversity of opinions, mainly on the instrument to be used for renewable gas consumption claims.

The calculation of the Residual Mix for gas needs to **prevent double claims**. This will depend on consistent implementation of different pieces of new European legislation. Challenges include the tracking of energy sources across Energy Carrier Conversion, like electricity from renewable sources

[1] Directive of the European Parliament and of the Council on common rules for the internal markets for renewable gas, natural gas and hydrogen, amending Directive (EU) 2023/1791 and repealing Directive 2009/73/EC (recast), PE_104_2023_REV_1, June 13th, 2024.
[2] Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards
[3] Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on substantiation and communication of explicit environmental claims (Green Claims Directive), COM/2023/166
[4] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652

that is converted to hydrogen and vice versa. Implementation of the criteria for Renewable Fuels of Non-Biological Origin (RFNBO) in the relevant Delegated Act to the RED is an essential area to monitor to prevent renewable origin being claimed more than once.

This report also acknowledges that **energy tracking has different purposes (Disclosure, target accounting, financial support)** and that those may build on different criteria (e.g. sustainability, GHG emission saving, additionality, temporal correlation, geographical deliverability) and different tracking mechanisms (e.g. book-and-claim, mass-balance, bundled sale of energy with tracking instrument).

As the Residual Mix provides information on the untracked commercial offers, all explicitly tracked gases must be excluded from its calculation. This report hence considers the impact of the co-existence of different tracking tools: GOs and the Union Database for sustainable biofuels (UDB).

A **formula for the calculation of the Residual Mix** (see Figure 1 on the next page) is elaborated in this report. It takes the methodology for the Residual Mix calculation for electricity as a basis, while including gas-specific topics. These topics are storage, Energy Carrier conversion, and import and export, as these are much more predominant for gas than they ever have been for electricity – although in time some of these aspects might be included in the update of the Residual Mix calculation for electricity as their relevance might increase.

A separate Residual Mix calculation per **system boundary**, per Member State is needed. This means a separate Residual Mix for the natural gas distribution and transmission system and a separate Residual Mix for the hydrogen network. Other Residual Mixes should theoretically apply to vehicle transported gases, but as these supply chains are much less regulated, preventing double claims is more challenging, raising questions about the relevance of having a Residual Mix in vehicle-transported gaseous supply chains.

Numerical data availability regarding production of gases, per energy source category, and consumption, per end-use sector, is a challenge, especially for certain types of gases and dissemination outside pipeline networks. Data sources need to be improved, and their definitions need to be aligned in order to come to a consistent Residual Mix for all dissemination system boundaries.

Timely availability of such numbers is another main challenge. If the origin of consumed gases is to be provided to consumers in a way that supports them in their supplier choices, the Residual Mix and their supplier's energy mix needs to be available not too long after the period of energy supply. Preferably, just as with electricity, the supplier mix should be available by 1 July of the year following the year of supply. This requires the Residual Mix to be available by 1 June of that year, with numerical data inputs to be collected in March and April, allowing for Residual Mix calculations to be performed, consulted and confirmed in May.

Today, the actual **implementation of** many rules in **recent legislation** impacting claims on renewable gas consumption, is **not yet fully established**, so their consistency cannot yet be confirmed in practice. Additionally, the numerical data is not yet systematically available to support accurate Residual Mix calculation across all Member States of the European Union and the interacting natural gas and

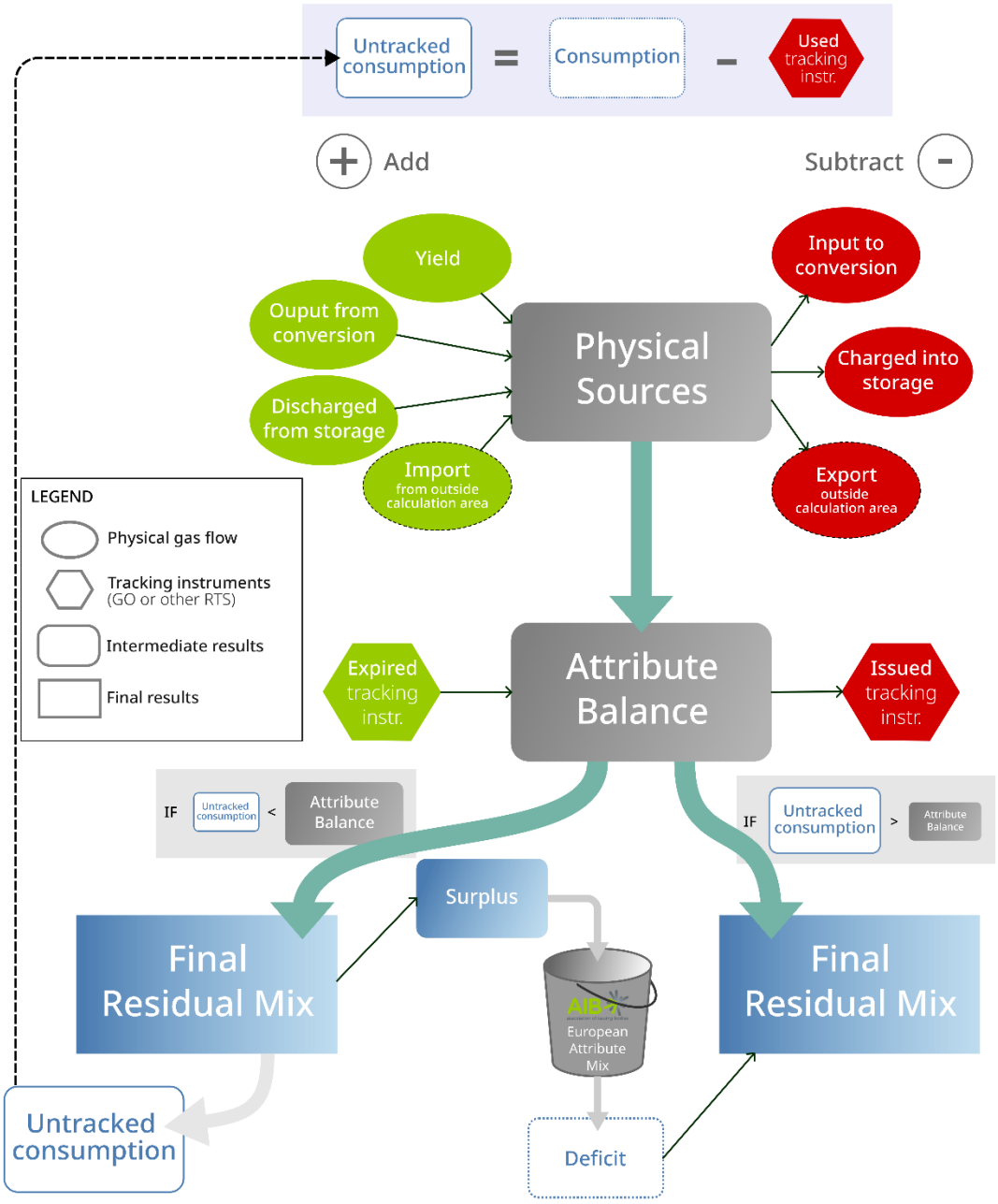

Figure 1: Detailed Residual Mix calculation methodology

hydrogen markets. Where it is available, the timely availability still needs improvement. Further, practice has shown that achieving consistent implementation of Residual Mix calculation methods across all Member States can take time. Moreover, a formally mandated organisation to ensure such consistency and coordinated roll-out is currently lacking.

Hence to date, it cannot yet be confirmed whether the EU is ready for a detailed calculation method for a Residual Mix for gases. Therefore, it should be considered whether an **alternative approach** can be used until the necessary conditions are established. This would mean assuming the Residual Mix for gaseous Energy Carriers consists of fossil natural gas.

When transforming the energy sources of the Residual Mix into emissions of the Residual Mix, further subcategorization of the fossil energy sources will however be needed, especially where there would be a big share of fossil gases with higher emission intensity than methane.

This study proposes potential variants of a model that could be discussed with the stakeholders in order to enable more effective harmonised calculations and ensuring a wider availability to users of residual mixes for all types of energy.

This report is subject to an open stakeholder consultation. Together with the consultation feedback, it will form the basis for the final REGADISS Report (Task 5).

1 INTRODUCTION

1.1 Introducing the REGADISS project

REGADISS - Reliable Gas Disclosure System is a one-year project under a service contract to DG ENER of the European Commission, based on the terms of reference N° ENER/2023/MVP/0010. The goal is to provide technical assistance to develop methodologies compliant with Disclosure obligations on gases from renewable energy sources.

The project aims at developing the basics for a methodology for a Residual Mix (RM) for gases, in line with the gas Disclosure obligation following Art. 19.8 of the Directive 2023/2413 as regards the promotion of energy from renewable sources (REDIII) and the Directive of the European Parliament and of the Council on common rules for the internal markets for renewable gas, natural gas and hydrogen, amending Directive (EU) 2023/1791 and repealing Directive 2009/73/EC (recast), PE_104_2023_REV_1, 13 June 2024 (awaiting final publication), in this document referred to as "the recast Gas Directive".

To achieve this objective, the project is structured in five tasks:

- Task 1: Analysis of the current legal framework and methodologies for the Residual Mix calculation in the EU Member States
- Task 2: Technical and legal requirements that a methodology for Residual Mix in gases shall comply with
- Task 3: Draft methodology for Disclosure supervision and Residual Mix calculation for gases
- Task 4: Stakeholder consultation & dissemination
- Task 5: Final version of the methodology

1.2 Situating this report within REGADISS

This report is the key deliverable of Task 3, but it uses the content that has been developed as part of Tasks 1 and 2. Where relevant, findings from these task reports (which are not publicly available) are inserted.

This report is subject to an open stakeholder consultation. Together with the consultation feedback, it will form the basis for the final REGADISS Report (Task 5).

1.3 Why Residual Mix: Guarantees of Origin and Disclosure

1.3.1 Disclosure

'Disclosure' in the context of this document means: *the provision of information regarding the origin of supplied energy, to the customer and to the general public*. This meaning stems from the definition in the draft revision of the Guarantee of Origin Standard of CEN/CENELEC - EN16325, dated May 2024, where Disclosure is identified as the Purpose of the Guarantee of Origin.

Disclosure of the origin of gas supplied to consumers, gives them a starting point for assessing their impact on the energy transition. It empowers them to make more active purchasing choices regarding the energy they consume.

1.3.2 Guarantees of Origin (GO)

Guarantees of Origin (GO) are by legislative design the instrument for informing consumers on the renewable origin of gases, including hydrogen, as well as electricity, heating and cooling. This follows from art. 19 the Renewable Energy Directive (hereafter referred to as the RED), as revised by Directive 2023/2413 (EU) (REDIII). GOs are issued upon request of a producer by a governmentally appointed issuing body and are due to follow the requirements set out in the EN16325 standard on Guarantees of Origin.

GOs are tracking instruments of the origin of energy in a market where physical tracking of the origin of energy flows is not possible. GOs are often used in a book-and-claim framework, where the GO is detached from the commercial transfer of the energy commodity, but there are also uses in a "bundled sale" of GO with energy / usage of the tracking instrument for confirming a mass-balancing approach. ANNEX V elaborates on the legal and standardisation framework for GOs. ANNEX VIII elaborates on the difference between mass-balance and book-and-claim chain of custody tracking systems.

1.3.3 Residual Mix (RM)

The Residual Mix is the energy source mix that is left over once the reliably tracked consumption is taken out from the generation mix. The gas Residual Mix is to be used where an end-user sources gas from an unknown origin: the energy source mix in this case shall be considered as the Residual Mix.

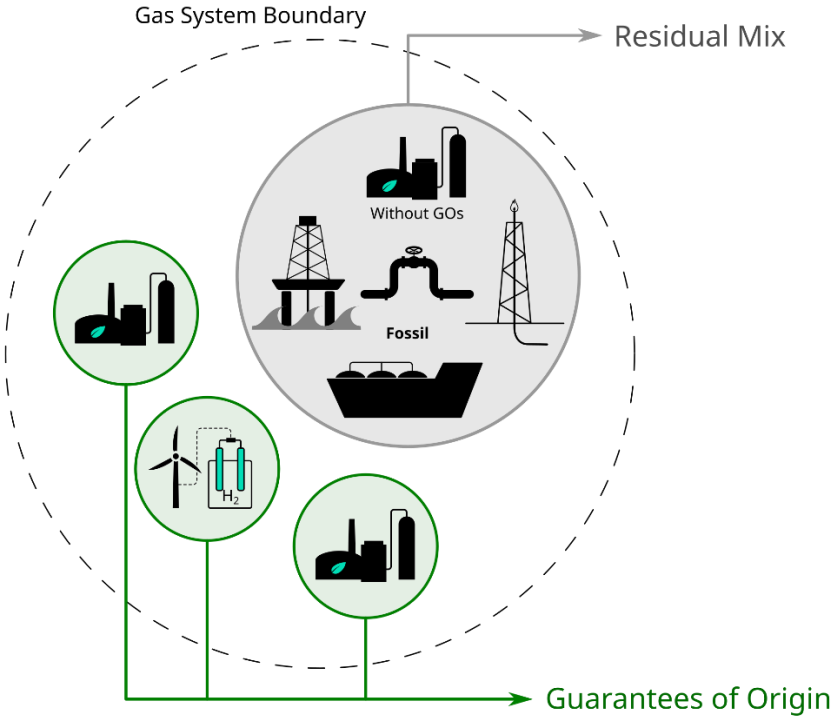

Figure 2: Illustration of Residual Mix

The goal of the concept of Residual Mix is to ensure the robustness of environmental claims of clean gas consumption. This is done by providing clarity on the climate impact of the default purchase for consumers and suppliers who do not make such an active consumer/purchasing choice. Hence, a

Residual Mix is an integral part of an energy certificate system for Disclosure towards consumers, in order to prevent double counting in energy source Disclosure.

1.4 The author: AIB – Association of Issuing Bodies

1.4.1 Association managing a standard for Guarantees of Origin

AIB is a non-profit association of 37 members from 30 European countries who have been appointed by their governments to manage the Guarantee of Origin for electricity and gas under Article 19 of the RED. The European Energy Certificate System, EECS®, the standard operated by and for issuing bodies of GOs, makes it easier to issue and trade standardised certificates of origin in Europe. AIB is driven by efficiency and trustworthiness. AIB's aim is to ensure an accessible and harmonised European energy Disclosure system.

1.4.2 What is EECS®?

The European Energy Certificate System, EECS® for short, is a standard developed by and for members of the AIB. Its aim is to make cross-border transfers of GOs (cost) efficient and reliable for big volumes. In that sense, it builds on and goes beyond Article 19 of the REDIII and the CEN EN 16325 Standard for GOs. To do that, further details on the GOs need to be harmonised. These harmonisation requirements constitute the EECS® Rules.[5]

EECS® Certificates are issued, transferred and cancelled to avoid duplicates for the same output. They are the sole proof of the qualities or attributes of energy output, with no other Disclosure used except during cancellation. If multiple certificates with different purposes are issued for the same output, each must contain a reference to the others. The purpose of a certificate must not conflict with that of any other certificates for the same output. Scheme members[6] must clearly communicate the certificate's purpose to account holders as a certificate can only be used as per its purpose.

The reader is referred to Annex V.2.1 for further information on the EECS® Rules.

1.5 Outlining this report on Residual Mix calculation method

This report works towards a methodology for determining the Residual Mix for gases.

As the Residual Mix is a concept to address a gap in the framework for Disclosure of the origin of energy, its requirements cannot be set without considering the overall Disclosure framework in which it is applied. Hence, this report uses the requirements for reliable Disclosure of gases as a foundation, and from there onwards, studies the needs to take into account for the Residual Mix. As legislation holds the strongest protection opportunities for reliable Disclosure, the analysis starts from the legal framework and from there onwards clarifies conditions for the Residual Mix. This includes considerations on how information exchange with the European Union Database for sustainable biofuels could be dealt with.

[5] See: https://www.aib-net.org/eecs/eecsr-rules

[6] AIB currently operates two Schemes under EECS®: the Electricity and Gas Scheme. A Scheme Member has successfully completed an application to the relevant Scheme and may Issue EECS Certificates under that Scheme, which can be transferred over the AIB Hub. All Scheme Members are periodically audited to confirm they comply with the EECS® Rules.

To facilitate evaluation of the feasibility of calculation in practice, considerations on the availability of data for such calculations are included, in terms of quality, credibility and timing for publication of the Residual Mix in a meaningful Disclosure context.

This report builds on two preceding reports with detailed analysis: report “REGADISS Task 1 - Analysis of the current legal framework and methodologies: overview of currently used approaches” and “REGADISS Task 2: Technical and legal requirements”. The main findings of these two reports are repeated in the reasoning in the next chapter, yet their details are elaborated in the Annexes to this report. Further, a stakeholder survey was conducted to get an insight in the existing logic of the stakeholders.

2 INPUT AND BACKGROUND

2.1 Reliable Disclosure fundamentals

2.1.1 Four pillars for reliable Disclosure

To make Energy Disclosure meaningful and reliable, double claiming shall be prevented. This benefits from the existing legal obligation that Member States shall ensure that the same unit of energy from renewable sources is taken into account only once (see RED, Art.19). The FaStGO Project identified the following 4 pillars for establishing a reliable Disclosure and avoiding double claims on the origin of energy, besides the management of a reliable Guarantee of Origin system:

1) Disclosure (as) obligation
   - There shall be an obligation on suppliers to inform consumers on the origin of all energy supplied to them, this may be done by means of information on their bills.
2) Unique Instrument
   - A single method to prove the origin of energy is needed, and this method shall ensure that every MWh produced with specific Attributes, is only disclosed once. To ensure the robustness, it needs protection by legislation which should define the unique instrument that can be used for making claims on the origin of consumed energy. Ideally, where this energy stems from renewable sources, this shall be proven by using GOs, except for the renewable share of the Residual Mix.
3) Residual Mix unless Full Disclosure
   - To compensate for energy tracked with GOs, the mix with leftovers must be determined and used for the supplies that are not backed with GOs. That mix must take into account cross-border flows of GOs. This is called the Residual Mix.
   - Only where legislation imposes for all energy consumption to be covered with cancelled GOs, no Residual Mix is needed. Such situation is referred to as “Full Disclosure”.
4) Supervision
   - Regarding the Disclosure obligation there is supervision on suppliers, which is independent from suppliers, including the verification that the disclosed information is reliable.

Further, in its recent advice “Guidelines of Good Practice for Trustworthy Information on Green Offers and Consumer Protection Against Misleading Marketing (‘Greenwashing’)”[7] the Council of European Energy Regulators CEER advises to base consumer information on the origin of gases on gas GOs under the supervision responsibility of the Member States. CEER has developed recommendations involving the Disclosure system and its main instrument, the GO.

Of further relevance are the Best Practice Recommendation (BPR) from the Reliable Disclosure Systems for Europe (RE-DISS), which constituted an IEEE funded project that ended in 2015 and developed a Residual Mix method for electricity. Until today these BPR serve as a guideline for the issuance, tracking, and cancellation of GOs. They also address the calculation of Residual Mix and the role of

[7] See Recommendations 4-5-6-7 (pp. 21-24) in Section 6.2, https://www.ceer.eu/documents/104400/-/-/832ddef0-87de-c539-38f8-ec4d6ce63269

Reliable Tracking Systems (RTS). Several important takeaways from electricity Disclosure recommendations are equally relevant for gases. While many are adopted in EU legislation since the closure of the RE-DISS project, the following recommendation remains particularly relevant for consideration in this report:

RE-DISS BPR §17

a) Besides GOs, only Reliable Tracking Systems and the Residual Mix should be available for usage for Disclosure. No other mechanism should be accepted.

Note: It needs clarification which other RTS exist for gases. Especially the tracking framework of Proofs of Sustainability in the UDB would benefit from clarification whether it legally entitles for gas Disclosure.

2.1.2 Why does a GO system need protecting Disclosure regulation?

The objective of obliging the relevant actors in the market to disclose the origin of their energy supply/consumption, is to avoid any implicit or explicit assumption on their energy mix that is not substantiated with proof.
The GO system is a robust system for avoiding double counting of energy attributes. While the GO is intended to be used for Disclosure of the origin of energy towards consumers, additionally there is a need for measures to facilitate Member States in exercising their obligations to avoid double claims of the underlying energy covered by the certificates. This relates to the framework of the GO system, enforcing the usage of the GO and setting requirements that prevent double claims. Lacking such, the GO system risks being undermined by parallel claims.

2.1.3 Ensure a unique instrument to prevent double claims:

As highlighted above, in order to establish a reliable Disclosure system, it is necessary to implement GOs and the Residual Mix. Additionally, where historically or politically established, other Reliable Tracking Systems can be incorporated as a third component. It is essential that every tracking instrument ensures that it uniquely represents the right to claim the Attributes of the underlying energy. Otherwise, there is a risk that for one unit of energy, multiple separate tracking instruments are issued. If they are used to disclose consumption information to multiple distinct end-consumers, that constitutes **double claims/double Disclosure**. Such double claims or double Disclosure undermine the reliability of the entire Disclosure system and should thus be avoided at all costs.

2.1.4 Why do we need the Residual Mix?

A Residual Mix is needed when there is a Disclosure requirement for the origin of supplied energy and when a substantial share of the consumption is explicitly tracked using energy certificates. In such cases, the Residual Mix provides a means of accounting of the untracked portion of energy consumption, thereby ensuring complete and reliable Disclosure of energy sources. For gases, such Disclosure obligation has just been introduced in EU legislation, namely in the recast Gas Directive.

Note that Art. 2 (13) of REDII defines 'Residual Energy Mix' as *the total annual energy mix for a Member State, excluding the share covered by cancelled Guarantees of Origin*. This definition deserves a careful interpretation, as elaborated further in this report.

Furthermore, disclosing the origin of gas supplied to customers gives them a starting point for their impact on the energy transition. It empowers them to make more active purchasing choices regarding the energy they consume.

Guarantees of Origin (GO) are by legislative design the instrument for informing consumers on the origin of the gas(es) they consume, as well as of their electricity, heating and cooling. This follows from the RED.

The Residual Mix is a crucial component in the context of reliable Disclosure, as it refers to the mix of energy sources left over after all claims of produced energy have been made. Until Full Disclosure is implemented everywhere, the Residual Mix is essential to ensure transparency. Full Disclosure, or Full Consumption Disclosure, requires issuing GOs for all production from every energy source (Full Issuance), AND cancellation of GOs for all consumption of energy.

The concept of Residual Mix aims to enhance the validity of environmental claims about clean gas consumption. It provides clear information to compare the climate impact of default purchases for consumers and suppliers with those who do make active purchasing choices.

2.1.5 Supervision and harmonised Residual Mix calculation method

Harmonisation of Disclosure practices is not only necessary to make sure the actors in different roles and different countries have the same understanding and apply the same principles, but also essential to prevent double claims. The method for determining the origin of energy and the Residual Mix must synchronise over interconnected markets. This will ensure that the Disclosure of the renewable origin of gas is as reliable and transparent as that of electricity, further empowering consumers to make informed energy choices. Not doing so risks that energy attributes are lost or duplicated between countries.

National competent authorities supervising the Disclosure practices ensure the following strengths:

- Compelling the Disclosure practices to the rules, which prevents duplicate claims or renewable energy consumption
- Publish at national level the figures for the Residual Mix
- Synchronise the methodology for the national Residual Mix calculation with other countries, to ensure consistency in the accounting of cross-border flows of renewable attributes.

The next section elaborates on the relevant aspects from EU legislation, and how this translates into technical requirements for the Residual Mix.

2.2 EU legal Disclosure obligations for actors in the supply chain

Many legislative initiatives are built on clean energy tracking. The recent legislative developments fill many former gaps on the road toward reliable Disclosure. However, an inconsistent implementation would feed the challenge of preventing double counting of the same renewable energy. This is especially at risk if different aspects of EU legislation would select their tracking methodologies separately from each other. This leads to the identification of technical requirements and options for overcoming this challenge while implementing a framework for reliable Disclosure.

That brings a focus on **identifying risks for double claims of consumption of the same renewable gas** and how those can be mitigated.

2.2.1 Disclosure by gas suppliers

The recast Gas Directive in its Annex 1§5 installs the **first gas Disclosure obligation** on **suppliers** and imposes to mention on the bills the renewable and low-carbon origin of supplied gas, and at least for renewable gas, substantiate this with **Guarantees of Origin**.

It partly mirrors the Disclosure obligations of the Internal Energy Market Directive (EU) 2019/944 Annex 1§5.

> **Annex I MINIMUM REQUIREMENTS FOR BILLING AND BILLING INFORMATION FOR**
>
> **NATURAL GAS AND HYDROGEN**
>
> (…)
>
> §5 Disclosure of energy sources
>
> ***Suppliers shall specify in bills the share of renewable and separately low-carbon gas purchased by the final customer*** *in accordance with the supply contract for natural gas and hydrogen (product level Disclosure). In the event of a mixture the supplier shall provide the same information* ***separately for different categories of gas, including renewable gas or low-carbon gas****.*
>
> *The following information shall be made available to final customers in, with, or signposted to within their bills and billing information:*
>
> *a) the share of renewable gas and low-carbon gas in the mix of the supplier (at national level, namely in the Member State in which the supply contract for gas has been concluded, as well as at the level of the supplier if the supplier is active in several Member States) over the preceding year in a comprehensible and clearly comparable manner;*
> *b) information on the environmental impact, in at least terms of CO_2 emissions resulting from the natural gas or hydrogen supplied by the supplier over the preceding year.*
>
> *As regards point (a) of the second subparagraph, with respect to natural gas and hydrogen obtained via a gas exchange or imported from an undertaking situated outside the Union, aggregate figures provided by the exchange or the undertaking in question over the preceding year may be used.*
>
> *The Disclosure of the share of renewable gas purchased by the final customers shall be done by using guarantees of origin based on Directive (EU) 2018/2001. When a customer consumes natural gas or hydrogen from a hydrogen or natural gas network, including gaseous renewable fuels of non-biological origin and biomethane, as demonstrated in the commercial offer by the supplier, Member States shall ensure that the guarantees of origin that are cancelled correspond to the relevant network characteristics.*
>
> *The regulatory authority or another competent national authority shall take the necessary steps to ensure that the information provided by suppliers to final customers pursuant to this point is reliable and is provided at a national level in a clearly comparable manner.*

The recast Gas Directive further installs a definition for Renewable Gas and for Low-Carbon Gas, and requires that both these categories of gas shall be certified towards the sustainability criteria and greenhouse gas emission saving criteria set out in the RED. For these purposes, Member States shall

require economic operators to use a mass balance system. Members States shall also ensure supervision on the reliability and comparability of the information disclosed by gas suppliers.

2.2.2 Disclosure by corporate energy consumers

The European Sustainability Reporting Standards (ESRS), issued under the Corporate Sustainability Reporting Directive (EU) 2022/2464[8] (CSRD) imposes on **corporate energy consumers** to disclose the energy sources of their consumption and to base this on contractual arrangements like GOs.

The CSRD entered into force on 5 January 2023 and Member States have until 6 July 2024 to transpose it into national legislation. The Directive strengthens the social and environmental reporting rules for the companies. A wider range of listed companies must report on sustainability according to the ESRS. These also apply to large public-interest companies with more than 500 employees. The Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplements Directive 2013/34/EU[9], as amended by the CSRD, regarding sustainability reporting standards.

The ESRS are divided into several annexes, each focusing on a different aspect of sustainability reporting. One of these is E1 – Climate Change. It provides disclosure requirements for organisations to report on their climate mitigation and climate adaptation efforts. It also covers energy related matters, to the extent that they are related to climate change.

This report only zooms in on the information to be disclosed related to the origin of consumed energy by the relevant consumers.

Relevant excerpts of the CSRD and ESRS are in ANNEX III.

2.2.2.1 Reflections

There may be a risk of double counting and by-passing the GOs, because of the relatively vague phrasing of the emboldened text below:

1. **The origin of electricity and gas has to be disclosed based on a market-based approach, but this is not restricted to the GOs only**. This is not consistent with the requirement of RED and IEM to base their energy origin on GOs only. (Similar for renewable gases once the recast Gas Directive comes out). If corporate consumers can build their own market-based instrument, this may double count energy for which GOs are issued, or that is included in the Residual Mix.
2. **Scope 2 GHG emissions (i.e. if electricity or gas is used) have to be calculated both based on market based AND location-based approach**.

This leads to confusion.

2.2.2.2 Strengths

The fact that now also corporates must disclose the origin of their energy is a significant step forward in strengthening reliable Disclosure.

2.2.2.3 Relevance of the Residual Mix for corporate Disclosure of the energy source mix

One might wonder whether the Residual Mix for gas can be ignored because gas suppliers are not obliged to mention it on the invoice.

[8] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022L2464
[9] Delegated regulation (EU) 2023/2772 - EN - EUR-Lex (europa.eu)

For electricity, the Supplier Disclosure requirements are going beyond those for gas, because non-renewables must also be stated on the invoice according to IEM Annex 1.5, where the Gas Directive Annex 1.5 includes only the supplier obligation to mention renewable and low-carbon gases on the invoice.

On the other hand, the ESRS require Disclosure of all energy sources. In terms of market-based reporting, under the ESRS dual reporting requirement, energy source reporting for corporates can only be consistent with the supplier Disclosure framework, if the Residual Mix is reported to cover the energy source of consumption for which no GOs are cancelled. This consistency is essential to prevent double claims of the same energy production from renewable sources.

2.2.3 Traders' Disclosure obligation: draft Green Claims Directive

The Green Claims Directive aims to oblige Member States to ensure that Green Claims by **traders** are substantiated.

The proposal for the Green Claims Directive COM (2023/0085)[10] mandates traders to substantiate their explicit environmental claims about products or business-to-consumer commercial practices.

Art 3§1 (h)

Member States shall ensure that traders carry out an assessment to substantiate explicit environmental claims. (…)

Who this applies to, follows from the definition of Trader:

Art2§2

'trader' means trader as defined in Article 2, point (b), of Directive 2005/29/EC;

Directive (EU) 2005/29/EC, art2§b

'trader' means any natural or legal person who, in commercial practices covered by this Directive, is acting for purposes relating to his trade, business, craft or profession and anyone acting in the name of or on behalf of a trader;

The draft Green Claims Directive has yet to be discussed in trilogue between the European Council, Parliament and Commission, so its final form and implementation by Member States are yet to be shaped. It has however the potential to close any remaining double counting risks and to ensure consistency in the claims made.

The draft also mandates differentiation of GHG emissions and offsets. This helps a lot in setting up a framework for reliable Disclosure as it keeps renewable gas Attributes within the gas consumption sector and prevents leakage of the Attributes outside of certain system boundaries, preventing to use them for offsetting emissions in other sectors.

[10] Proposal for a Directive of the European Parliament and of the Council on substantiation and communication of explicit environmental claims (Green Claims Directive) (Commission proposal – 2023| Parliament position March 2024 : https://www.europarl.europa.eu/news/en/press-room/20240308IPR19001/parliament-wants-to-improve-consumer-protection-against-misleading-claims

2.2.4 Reflection: opportunity and risk

The supplier Disclosure obligation set out in annex 1§5 of the Gas Directive is consistent with the Guarantee of Origin system framework defined in art. 19 of the RED. While Art.45 of ESRS E1 (2023/2772)[11] requires any undertaking to disclose their GHG emissions by using both location-based and market-based methods, the Member States' implementation of the Green Claims Directive at national level may further guide this process. As the latter requires to validate environmental claims using scientific evidence, it presents an opportunity to strengthen the GO as the unique instrument for reliable tracking of the origin of energy. However, where Member States would fail to confirm a unique instrument for reliable claims, there is a real risk of weakening the Disclosure framework and having double claims.

2.2.5 Existing guidance for Disclosure

ANNEX IV summarizes the main relevant parts of guidance for Disclosure from the CEER Advice on Trustworthy Green Offers and from the Best Practice Recommendations from the RE-DISS Project. These further flow into the guidance in Chapter 6 on Supplier Disclosure.

2.3 Interaction of different legal requirements on energy origin tracking

The Guarantee of Origin is the designated legal instrument for tracking renewable gas for the purpose of Disclosure of the origin of supplied energy towards consumers.

Not all European legislation regulating energy origin tracking for policy targets refers explicitly to the Guarantee of Origin. However, Member States are legally obliged and mandated to ensure that the same renewable energy shall be accounted for only once. Attention will be needed in the members states' implementation of European legislation to guarantee this prevention of double counting of the same quantity of renewable energy production.

2.3.1 Guarantees of Origin: instrument for informing consumers

The requirements for Guarantees of Origin are given in art.19 of the RED, which not only obliges Member States to **issue GOs** on request of a producer, but also to ensure that the same unit of renewable sources is taken into account only once. It also requires Member States to **publish the Residual Mix** on an annual basis and points out in art. 19.8 that this Residual Mix is for untracked commercial offers and is defined in the RED as the total annual energy mix for a Member State, excluding the share covered by cancelled GOs. It requires Member States to ensure that GOs comply with the CEN EN16325 standard for GOs, a standard for electricity GOs of which the revision including the update to gas and hydrogen GOs, is still in draft at the time of drafting this report.

ANNEX V elaborates on the legal framework for GOs. ANNEX VIII elaborates on the difference between mass-balance and book-and-claim, while exploring the requirements for a multi-purpose tracking instrument that can be used for both Disclosure and policy target accounting.

[11] http://data.europa.eu/eli/reg_del/2023/2772/oj

2.3.2 Preventing double claims

The **prevention of double claims** will depend on the consistent implementation of different pieces of new European legislation. Challenges include the tracking of energy sources across Energy Carrier conversion, like electricity from renewable sources that is converted into hydrogen and vice versa. Implementation of the RFNBO criteria in the relevant Delegated Act to the RED is an essential area to monitor to prevent renewable origin from being claimed more than once.

Further, there are **different purposes for energy tracking (Disclosure, target accounting, financial support)** and those may build on different criteria (e.g. sustainability, GHG emission savings, additionality, temporal correlation, geographical deliverability) and different tracking mechanisms (e.g. book-and-claim, mass-balance, bundled sale of energy with tracking instrument).

The GO's biggest strength is the uniqueness-guaranteeing properties in its system management. That aspect makes it an ideal building block for data gathering towards multiple purposes (for both Disclosure and policy target accounting) in one single mechanism.

As a general principle that needs consistent implementation, preventing double usage claims (= "double Disclosure") of the same renewable gas quantity requires:

1) A unique instrument for renewable gas claims, or otherwise well-identified mutually exclusive instruments, with transparent usage and reporting procedures; and
2) The definition of the Residual Mix which excludes all the instruments that are entitled for making green gas claims.

In summary, several recent European legislative initiatives aim to enhance the impact of energy tracking on the energy transition. Now, their practical implementation needs a **coherent approach** to ensure these intentions come true. Recommendations are phrased on enhancing reliable Disclosure, as the Residual Mix concept only adds value where a robust Disclosure framework is in place.

2.3.3 Tracking through the Union Database

2.3.3.1 The role of the UDB for tracking gases along their value chain

Following Article 31a of REDIII the information about injection and withdrawal of renewable gaseous fuels shall be provided in a Union Database (UDB). Economic operators are obliged to provide information on sustainability criteria, emission savings and other. This information is required up to the point of injection into the gas network as the interconnected gas system shall be considered as single mass balance system. This information shall be certified under National or Voluntary Schemes.

The UDB for the gaseous fuels value chain is expected by 21 November 2024, i.e. the legal deadline in the RED III. The set-up deadline and the developer and operator of the UDB, being the European Commission, are set in the REDIII.

ANNEX VII elaborates on the interaction between the Union Database and GOs for gases.

2.3.3.2 Conditions for preventing double counting with other reliable tracking systems than GOs

The analysis in ANNEX VII with a main focus on preventing double claims on the same renewable gas, leads to a list of conditions that need to be in place.

Currently, flows of records or certificates issued under voluntary schemes, especially if not registered in the UDB, are not systematically collected at Member State level. Exhaustive reporting requirements

are not yet in place. They are only in the UDB when PoS are used for target accounting purposes, not when used for consumption claims and national pull mechanisms.

This leads to the conclusion that in the current legal setting and data collection processes, any proof of sustainability for which no corresponding GO is cancelled and that is not registered in the UDB, would cause double counting, as these renewable gases are also in the Residual Mix. The national Disclosure supervisory authorities may be provided access to the UDB in order to validate which renewable gases are registered for consumption in their domain, and whether or not a GO is linked to it.

2.3.3.3 GOs and PoS should be inseparable at consumption

As such, GOs and PoS issued for the same unit of energy should be inseparable at the point of energy consumption where that specific unit of energy is claimed. Indeed, where both exist for the same unit of energy, their separate trade risks double claims of the same unit of energy.

While information flows on GOs and PoS, towards, within, and between GO registries and UDB, can be designed in multiple ways, either design will need to incorporate this principle.

2.3.4 Tracking towards RFNBO criteria

2.3.4.1 The Delegated Acts on RFNBOs

For Renewable Fuels of Non-Biological Origin (RFNBOs), very specific criteria apply. For RFNBOs, the further complexity that enters in the picture for Residual Mix calculation, is that of tracking across energy conversion.

The Delegated Act RFNBO[12] of 10 February 2023 sets out the rules for defining renewable fuels of non-biological origin (RFNBOs), such as hydrogen produced from renewable electricity. RFNBOs must have a life-cycle greenhouse gas emission saving of at least 70% compared to the fossil fuel comparator. The GHG DA[13] provides a methodology for calculating the life-cycle emissions, taking into account the emissions from electricity generation, processing, and transport.

ANNEX VI elaborates on the interaction between two delegated acts on RFNBOS and the Disclosure framework, with a main focus on preventing double claims. It first touches upon the general framework and subsequently on some attention points with impact on the Residual Mix and our focus regarding double claim prevention.

2.3.4.2 Tracking through PPAs, but all covered by GO and UDB

Bottomline of the analysis in ANNEX VI that the link between renewable energy production and consumption for RFNBO target accounting purposes, can in many cases be proven with the existence of Power Purchase Agreements (PPAs). Reading this together with the Member State obligation (RED art.19) to ensure that all energy sources are accounted only once, brings in an extra attention point for the Residual Mix calculation exercise. DG ENER clarified in its Q&A in 2023 that energy represented by GOs shouldn't be double counted. Further, tracking for target accounting, will be registered in the Union Database, when the system is rolled out.

[12] RFNBO DA: See Commission Delegated Regulation (EU) 2023/1184.
[13] GHG DA: See Commission Delegated Regulation (EU) 2023/1185

Considering that the RFNBOs will be registered in the UDB, and the UDB will have figures that indicate which RFNBOs are accompanied with GOs, the tracking instruments taken into account, into the RM formula developed in this report, will be the GO and the energy tracked in the UDB.

2.3.4.3 Conversion

Consistent handling of inputs into, and outputs from, Energy Carrier Conversion is essential for a robust Residual Mix calculation. This needs consistent approaches in the RM formulas for different Energy Carriers.

2.3.5 Tracking for EU-ETS

The European Emission Trading Scheme (EU-ETS) is a cap-and-trade system to reduce carbon emission via a market mechanism. The cap sets a limit on the total amount of greenhouse gases that can be emitted by sectors covered by the system: energy sector and manufacturing industry (around 10,000 installations), as well as aircraft operators flying within the EU and departing to Switzerland and the United Kingdom. From 2024, emissions from maritime transport are covered as well. From 2027, a parallel ETS2-system will start its operation, covering the CO_2 emissions from fuel combustion in buildings, road transport and small industry not covered by the existing EU ETS.

For the EU-ETS to operate effectively, it must be underpinned by robust, transparent, consistent and accurate mechanisms for monitoring and reporting of the greenhouse gas emissions of the installations and operations covered by the EU-ETS. While the legal basis for the EU-ETS follows from Directive (EU) 2023/959, the accounting principles are elaborated in the Commission Implementing Regulation (EU) 2018/2066 on the monitoring and reporting of greenhouse gas emissions (also known as the Monitoring and Reporting Regulation or MRR) and several Guidance Documents[14].

This Monitoring and Reporting Regulation stipulates that the monitoring and reporting shall cover all process emissions and combustion emissions from all emission sources. The combustion emissions shall be calculated by multiplying the activity data (expressed as TJ) by the combustion fuel's specific emission factor (expressed as t CO_2/TJ).

The Monitoring and Reporting Regulation further specifies the carbon emission factors for various solid, liquid and gaseous fuels.

- **For natural gas**, the Monitoring and Reporting Regulation sets the emission factors at 56,1 t CO_2/TJ (net calorific value), in line with the IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
- The emission factor **for renewable gases of biological origin** (landfill gas, sludge gas and other biogas) is set at zero t CO_2/TJ.
- **For renewable gases of non-biological origin**, no guidelines are provided yet by the Monitoring and Reporting Regulation. Article 14 of Directive (EU) 2023/959 mandates the EU Commission to adopt implementing acts specifying how to account for emissions from RFNBO and recycled carbon fuels (RCF), ensuring that such emissions are accounted for, and that double counting is avoided. Until then, Directive (EU) 2023/959 sets the emission factor for RFNBOs at zero t CO_2/TJ.
- **For mixed fuels**, the operator of an installation, included in the scope of the EU ETS, may determine the biomass fraction using purchase records of biogas of equivalent energy content,

[14] See: Monitoring, reporting and verification of EU ETS emissions - European Commission (europa.eu)

provided that the operator provides evidence that there is no double counting of the same biogas quantity, in particular that the biogas purchased is not claimed to be used by anyone else, including through a Disclosure of a Guarantee of Origin (Monitoring and Reporting Regulation 2018/2066, Art 39(4)a).
- **For aviation fuels**, an aircraft operator may use data recorded in the Union Database (Monitoring and Reporting Regulation 2023/2122).

From this follows that gases, registered in the UDB, do entitle for the EU-ETS requirements, provided that double counting is avoided. The Residual Mix calculation hence must take both tracking instruments into account: the GO-system and the Union Database. To avoid double counting, data must be provided on the quantities of gas tracked through the UDB that are accompanied by GOs.

2.4 Technical requirements for a Residual Mix calculation

A Residual Mix calculation needs clarity about the **system boundary** within which it is applicable. This report will consider the question of whether a separate Residual Mix per type of gas and per system boundary is required: should system boundaries be per type of gas, for gas networks, hydrogen networks and gases transported by vehicle? This question is not explicitly answered in EU legislation and a harmonised response is recommended to establish a credible framework for origin Disclosure that is trusted by energy consumers.

Numerical data availability regarding the production of gases, per energy source category, and consumption, per end-use sector, is a challenge, especially for certain types of gases and dissemination outside pipeline networks. Data sources need to be improved, and their definitions need to be aligned in order to come to a consistent Residual Mix for all dissemination system boundaries.

The timely availability of such numbers is another main challenge. If the origin of consumed gases wants to be provided to consumers in a way that supports them in their supplier choices, the Residual Mix and their supplier's energy mix need to be available not too long after the period of energy supply. Preferably, like with electricity, the supplier mix is available by 1 July of the year following the year of supply, which requires the Residual Mix to be available by 1 June of that year, and the numerical data inputs to be collected in March and April, so that Residual Mix calculations can take place and be consulted and confirmed in May.

Responsibilities for legislators and implementors related to energy origin tracking are mapped, as is touched upon the responsibilities of EU Member States, particularly upon the interaction with a centralised tracking tool for policy target accounting like the **Union Database for Sustainable Biofuels**.

Member States are obliged to annually publish the Residual Mix, including expired GOs , and follow its definition that Residual Energy Mix is "the total annual energy mix of a Member State, excluding the share the share covered by cancelled GOs". Observing diverging existing practices and strong views in the market, careful consideration is needed on how to implement the legal requirements for the calculation of the 'Residual Energy Mix' in REDIII.

In summary, the basic conditions for a reliable Residual Mix are:

- accurate and timely data collection,
- harmonised tracking systems,
- legislation that protects against double claims,
- standardised RM calculation methodologies,

- well-defined system boundaries.

This report (T3) will elaborate on the calculation methodology for the RM and taking into consideration initial stakeholder views.

2.5 State-of-play in the Member States

As a precursor to this Task 3 Report, REGADISS examined national legal frameworks on currently applied methodologies for electricity and gas Residual Mixes. Currently, 24 Issuing Bodies for gas GOs have been appointed by their governments, spread over 21 EU Member States and Switzerland. However, no country has yet – at the moment of writing – established a Residual Mix for gases, as first Disclosure rules need to be established before a Residual Mix can enable reliable and transparent Disclosure of energy sources.

The obligation for the Disclosure of the origin of supplied or consumed gaseous energy varies across different countries. Austria, Estonia, Ireland, Netherlands, Latvia, Lithuania, and Finland currently have a Disclosure obligation in place. However, in the Netherlands, this obligation applies only to renewable gases, not natural gas, which means there is no Disclosure information for customers for gas. Spain currently has no Disclosure obligation, but offers the possibility through the GO System. With the ongoing recast Gas Directive, Disclosure rules are expected to be gradually rolled out in all Member States.

Figure 3 and Table 1 summarize information on competence for Issuing gas GOs, Disclosure competence, for which Energy Carriers gas GOs are issued and any relevant national legislation. The Table is constructed based on a survey in the EECS® Gas Scheme Group, complemented with responses from the Datasheet GO and Disclosure survey, which was updated as part of project REGADISS.[15]

Table 1 shows a wide variation in implementation of gas GO issuance and Disclosure supervision. In many Member States, the competence for issuance and Disclosure supervision are embodied by the same authority as for electricity, but not everywhere. Numerous Member States have completed the transposition of REDII regarding GOs for gases, while others are consulting legislation or awaiting the finalisation of the CEN EN16325 standard for GOs.

Currently, little is known about the statistics of gas GOs. At AIB, besides the existing central collection of national electricity GO statistics[16], publication of gas GO statistics is still under development and will only be available by the end of 2024. This will relate to issuance, transfer, cancellation, expiry of gas GOs per country. Furthermore, Member States provide in their two-yearly report to the European Commission statistics on the issuing of gas GO and the resulting annual renewable energy consumption [17]. See further information in Section 2.6. ERGaR publishes aggregated data on total quantities transferred across borders[18], yet not indicating which relate to gas GOs and which to non-governmental certificates, and not indicating the countries to which issuance, import, export and consumption quantities relate.

[15] See https://www.aib-net.org/facts/national-datasheets-gos-and-disclosure for the revised survey template and the responses received.
[16] https://www.aib-net.org/facts/market-information/statistics
[17] Commission Implementing Regulation (EU) 2022/2299 Annex XVI:
[18] https://www.ergar.org/ergar-schemes/coo-scheme-statistics/

ANNEX IV.4 illustrates how the energy sources of supplied gas are displayed on the invoice of gas suppliers in Austria.

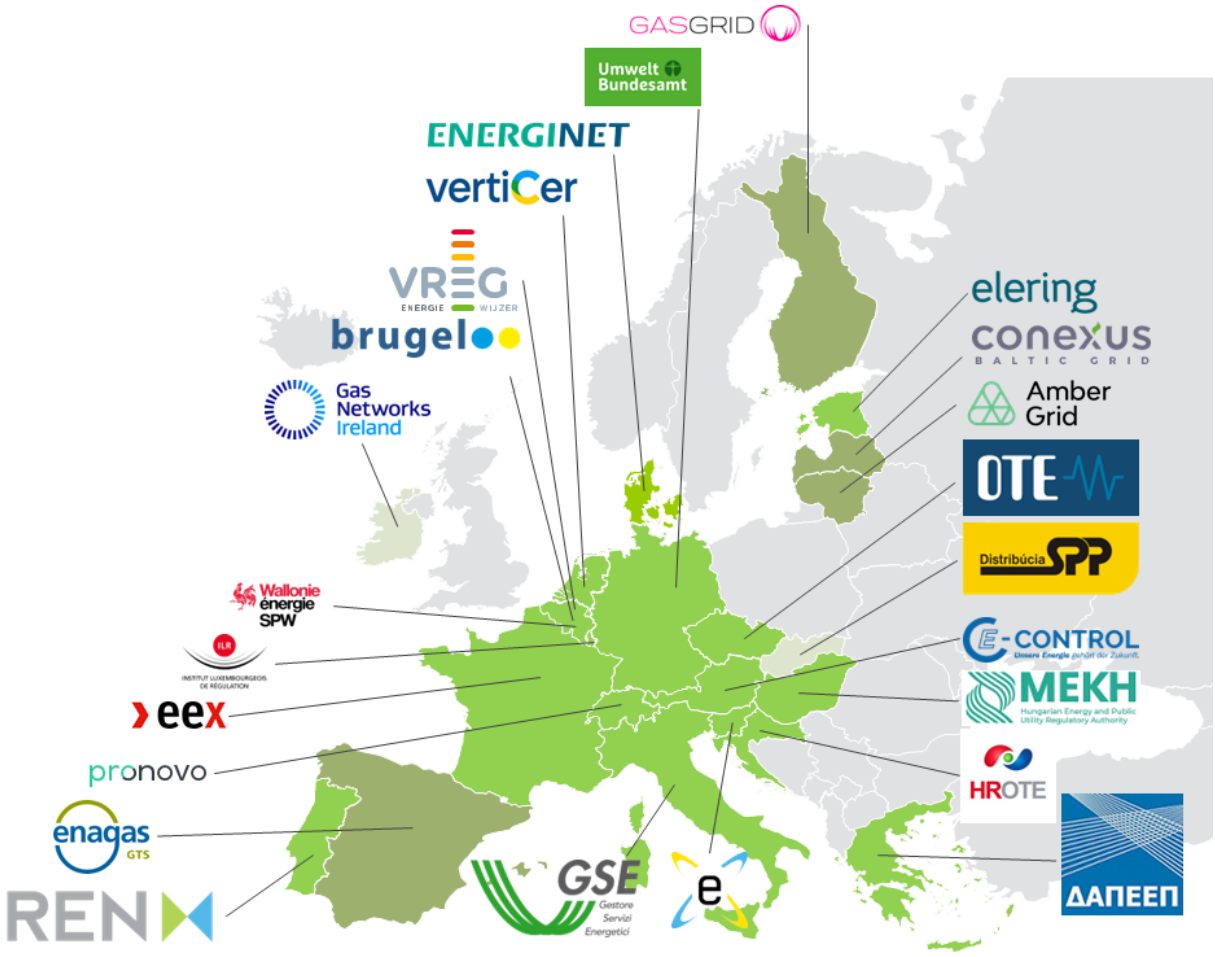

Figure 3: Countries where a Competent Body for gas GOs has been appointed. Countries in lime green have the same Competent Body for electricity and gas GOs, which is a Member of AIB. Dark green countries have separate Competent Bodies, both of which are AIB Members. Pale green countries (Slovakia and Ireland) have separate Competent Bodies, where the gas Issuing Body is not (yet) an AIB Member.

Table 1: Overview of State-of-Play in Member States regarding Issuance of gas GOs, Disclosure competence and any relevant legislation.

Country - Domain	Designated issuing Body for gas GO	Disclosure competent body*	Gaseous energy carriers for which GOs are issued**	Legislation link	Issued GOs?	Remark
Austria	E-Control	E-Control	Biomethane, Natural Gas, Hydrogen	See Austrian Domain Protocol, section C.1-C.2, pp. 13-15	✓	
Belgium – Brussels	BRUGEL	BRUGEL	Energy gas, Hydrogen	Gas Ordinance (FR – NL)		
Belgium – Flanders	VREG	VREG	Methane, Hydrogen and Other	Energy Order (NL)	✓	
Belgium – Wallonia	SPW	CWaPE	Methane	Government decree on Guarantees of Origin for Renewable Gases (FR)	✓	
Croatia	HROTE	-	Methane, Hydrogen	GO Regulation (HR)		
Czech Republic	OTE	ERU	Methane, Hydrogen	Act 165/2012 Coll (CZ)		
Denmark (Grid-injected)	Energinet	Energinet	Methane, Hydrogen	GO Order (DK)	✓	Off-grid Renewable Hydrogen: issued by Danish Energy Agency
Estonia	Elering	Elering	Natural gas including biomethane,	Energy Sector Organisation Act (EN) – Regulation on GOs (EE)	✓	
Finland	Gasgrid Finland	Energiavirasto (Energy Authority)	Natural Gas including biomethane and Hydrogen	GO Act (EN) – Govt. Decree on GOs (EN)	✓	
France	EEX	French Ministry of Energy Transition	Methane, Hydrogen	Energy Code (FR)	✓	
Germany	UBA	UBA	Biogas	GWKHV (DE)		

Country - Domain	Designated issuing Body for gas GO	Disclosure competent body*	Gaseous energy carriers for which GOs are issued**	Legislation link	Issued GOs?	Remark
Greece	DAPEEP	Regulatory Authority for Energy Water and Waste (RAEWW)		GO issuing body appointment (EN) Disclosure (GR)		RAEWW responsible for suppliers in general; no specific reference to Disclosure
Hungary	MEKH	MEKH	All renewable gases	Legislation under consultation		
Ireland	Gas Networks Ireland	GNI	Natural gas including (bio)methane	Statutory Instrument (National Legislation) No. 350 of 2022		
Latvia	Conexus Baltic Grid	Public Utilities Commission of Latvia (Energy Department)	Methane	Energy Law (EN)		
Lithuania	AB Amber Grid	VERT	Biomethane	GO Rules – Document provided by Amber Grid (EN)	✓	
Luxembourg	ILR	ILR	TBD	Amending Regulation (FR)		
Netherlands	VertiCer	ACM (Authority for Consumer and Market)	Methane, Hydrogen (and in principle other gases)	Gas Act, §5.16, Implementation of Gos for biomethane (NL) – Implementing Act RED for Gos, Implementation of Gos for other gases (NL) – Ministerial Regulation on Gos (NL)	✓	
Portugal – Mainland	REN/EEGO	ERSE	Renewable and Low-carbon gases	Decree-Law n° 84/2022 (PT) – Secondary legislation (EN)		
Slovakia	SPP Distribúcia	SPP Distribúcia		Act on Energy Act No. 251/2012		
Slovenia	AGEN-RS	AGEN-RS				

Country - Domain	Designated issuing Body for gas GO	Disclosure competent body*	Gaseous energy carriers for which GOs are issued**	Legislation link	Issued GOs?	Remark
Spain	ENAGAS GTS	-	Methane, Hydrogen and Unspecified (non-upgraded biogas)	Order on GOs for gas from RES (ES)	✓	Disclosures offered on voluntary basis – no supervision foreseen yet
Sweden	Swedish Energy Agency	Energy Markets Inspectorate (Ei)	All	Expected		Awaiting outcome of CEN EN 16325 revision process
Switzerland	Pronovo	SFOE (Swiss Federal Office of Energy)	All renewable gases and liquids	Rules for issuing renewable gas GOs and liquid GOs -active in 2025 (DE)		

*In some countries the Disclosure competent body is explicitly designated for checking compliance to gas Disclosure rules. In other countries the supervisor for electricity Disclosure is expected to be the competent body for gas Disclosure, but not yet tasked by national legislation for doing so.
** The terminology used for which energy carriers receive GOs is not harmonised.

2.6 Member States' report on RES consumption and GOs

Task 1 of REGADISS analysed the Member States' reports to the EU Commission on RES Consumption and GO Issuance and Cancellation in the framework of the reporting obligation in Annex XVI of the Commission Implementing Regulation (EU) 2022/2299. These reports for 2020 and 2021 were compared with the Residual Mix calculations for the corresponding years.

Although the comparison of the results for individual Member States lead to the conclusion that there are large differences between Member States' interpretations of the numbers to be reported, more importantly the aggregated statistics for all Member States in Figure 4 show clear shortcomings.

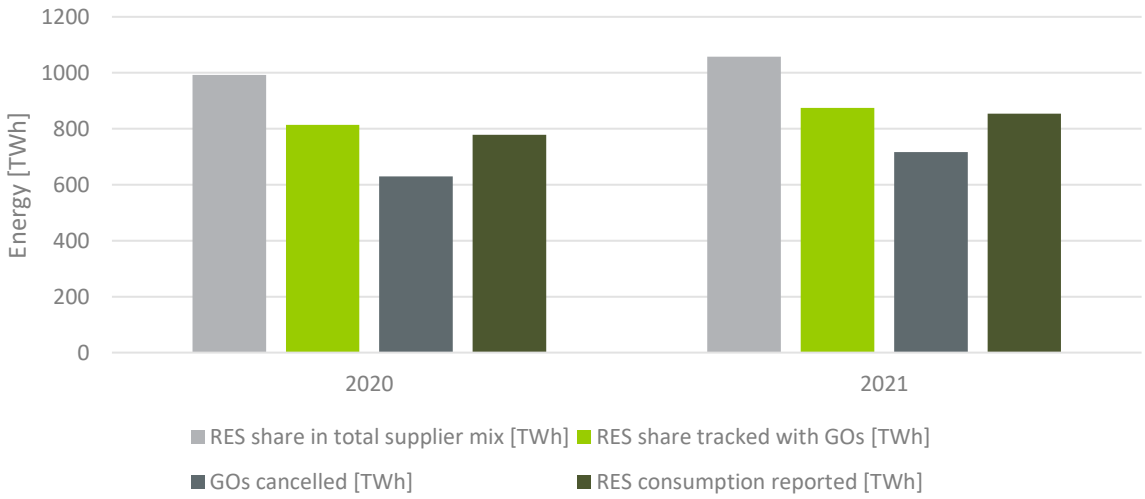

Figure 4: Comparison of the sum over all reporting Member States of 1) the calculated RES fraction in the Total Supplier Mix (TSM), 2) the remaining RES fraction in the TSM after the RES fraction from the Residual Mix has been subtracted, 3) the energy volume corresponding with the reported number of cancelled GOs and 4) the reported national RES consumption.

Indeed, in the ideal case, we would expect the reported national RES consumption to be equal to the RES fraction in the total supplier mix (light grey and dark green bars in Figure 4). Similarly, the RES fraction in the Total Supplier Mix, after the RES share in the Final Residual Mix has been subtracted, is expected to be equal to the sum of all cancelled GOs (for RES) (light green and dark grey bars in Figure 4). The statistics for 2020 and 2021 show that this is clearly not the case.

Although there are many reasons for the discrepancies between these statistics, the most important ones are:

- Misalignment between the timeframe for the issuance and cancellation GOs on which to report, and the timeframe for the Residual Mix calculation;
- Energy for which support is granted may not be issued a GO, but it may also not appear directly in the Residual Mix;
- Exclusion of RES fraction from expired GOs in the national Residual Mix used; and
- Discrepancies because of Ex-Domain Cancellations, mostly by which country they are to be reported.

It is concluded that the Member States' reports on RES Consumption and GOs may at one point feed the Residual Mix calculation with data, but currently the data quality is insufficient and the data is

gathered too late for the Residual Mix calculation. The lack in quality may be solved to a large degree by aligning the interpretations of different Member States on what to report.

2.7 Input from a stakeholder survey

Besides the mapping of existing rules and practices, REGADISS also gathers stakeholder views regarding Residual Mix calculations for gases. Any methodology proposal for the Residual Mix aims to be acceptable across the European Union and to the different stakeholders.

The project hence reached out to relevant stakeholders seeking opinions and/or advice on this topic. A survey invited views from various stakeholders regarding the methodology for determining the Residual Mix for gases, including specific views regarding the system boundaries within which claims are made, and for which a dedicated Residual Mix would need to be calculated. The respondents were also invited to list data sources regarding production and consumption of renewable and other gases, and regarding issuance, transfer and cancellation of tracking instruments used in reliable tracking mechanisms. The survey form and the detailed survey results are provided by ANNEX X.

In total 27 respondents provided feedback via this survey, covering a variety of activities and responsibilities, see Figure 5.

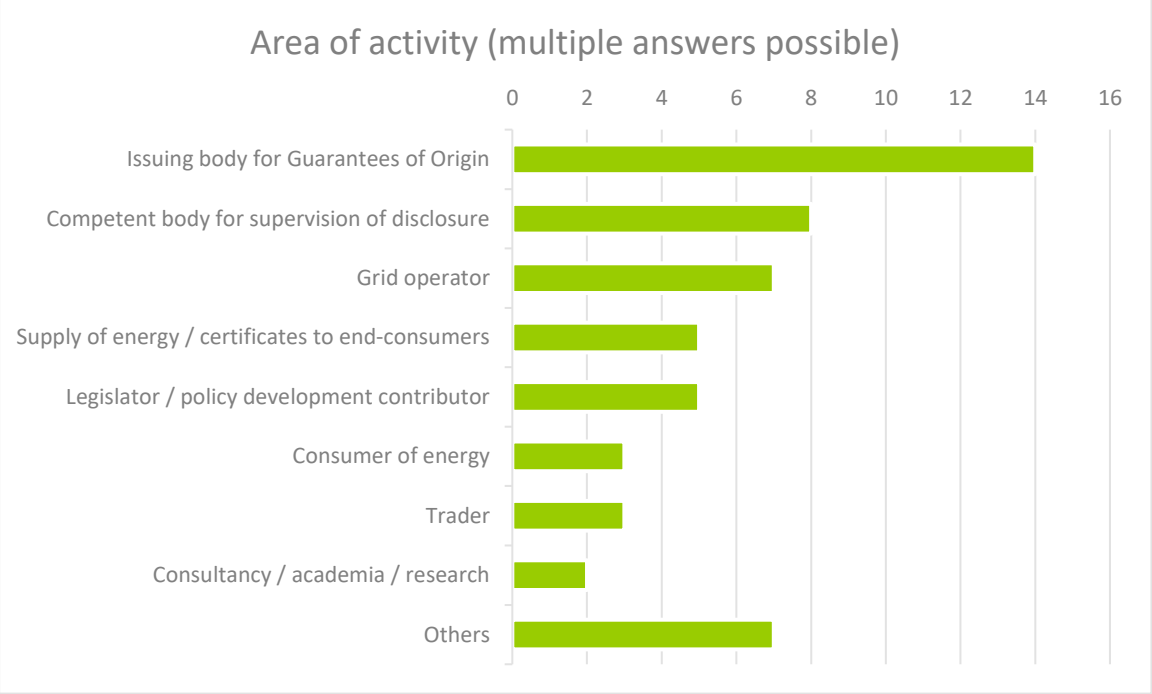

Figure 5: Activities of the respondents to the survey

More than half of the respondents highlight the relevance of a Residual Mix for gases as a key tool to inform end-consumer about the attributes of gas and to avoid double counting. About one in ten respondents find a Residual Mix for gases as it is too premature in view of the low volume of renewable gases.

Six in ten respondents expect that the Residual Mix calculation will lead to additional work and responsibilities. The other respondents need more details on its implementation before they can make an assessment.

There is no clear preference amongst the respondents whether a separate Residual Mix need to be determined within different distribution system boundaries (transport through an interconnected pipeline system, transport by vehicle, transfer of renewable characteristics without physical connection ...).

The respondents did not express one most preferred option for segregating between system boundaries. The following system boundaries have the highest preference:

- For gases taken from all European regulated natural gas grids
- For every single non-interconnected natural gas grid (= separately for local grids and for gases taken from the European interconnected natural gas grid)
- For every single hydrogen grid

On the question which energy sources need their own category in the Residual Mix for gases, roughly two in three respondents are in favour of distinguishing multiple categories for renewable energy sources and of considering fossil gases as one source of energy. Most respondents are in favour of considering nuclear as one source of energy, without further subcategories.

When calculating a separate Residual Mix per type of gas, most correspondents propose to define two categories of relevance: natural gas (compatible gas) and hydrogen, in line with Art 19.8 of RED III and the draft EN16325 standard.

Almost half of the respondents indicated that Proofs of Sustainability should not entitle for claiming the renewable characteristics of the origin of gases to end-consumers, nor for claiming the renewable characteristics of the origin of gases to end-consumers, while about one third of the respondents is in favour. The remainder part of the respondents is undecided. Amongst the respondents, the opponents include mostly issuing bodies and competent bodies for supervision of Disclosure, while the proponents include mostly suppliers and consumers of energy.

3 ACCURATELY CALCULATING THE RESIDUAL MIX – DESIGN ASPECTS

3.1 Approach

As elaborated above and in FaStGO T4.2, a Residual Mix can only add value where there is a reliable Disclosure framework in place: it needs legislation to protect the uniqueness of the instrument that is allowed to be used for making claims on the origin of consumed/supplied energy. Assuming this is in place, the calculation formula for the Residual Mix can be constructed.

In developing a methodology to calculate Residual Mix for gases, inspiration can be found in the existing calculation method for a Residual Mix for electricity, as in ANNEX II. However, adjustments to the specific characteristics of the gas sector are necessary. This chapter sets out the main design aspects for the Residual Mix calculation and brings them together into a general formula. Subsequently it considers how to fill in its terms.

3.2 System boundaries

Before establishing the formula, the challenge is to consistently determine the perimeter of Disclosure of the energy sources.

This needs acknowledgement of the system boundaries of the area where the environmental characteristics can be claimed. Within each system boundary where environmental characteristics of consumed/supplied gas can be disclosed to gas consumers, a separate RM needs to be calculated.

This section considers three main dimensions for defining the system boundaries. While first going into the geographical and geopolitical dimension, all jurisdictions subsequently need to apply the same further determination of system boundaries in terms of considered Energy Carriers and dissemination level. That is essential for determining the European Attribute Mix (EAM), as set out in Section 3.5 Residual Mix Calculation method in a consistent manner that prevents double counting across different countries.

3.2.1 Geographical/Geopolitical Demarcations

Geographical demarcations serve as a critical system boundary within the EU when calculating Residual Mixes for gases. The borders of a country or region indicate the zone where specific regulations and data collection mechanisms apply. As such, characteristics of a hydrogen and natural gas system need to be considered at the country level, as well as the relevant interactions per system of the production facilities, consumption patterns, and gas storage facilities. The borders of a country or region, hence set out the scope of analysis for calculating Residual Mixes, enabling tracking of the sources and types of gases produced, transferred and consumed within that jurisdiction.

As such, the first dimension this reports considers as system boundary, is a state.

3.2.2 Energy Carriers/Types of Gas

Beyond the location of consumption, we need to consider the composition of gases consumed in individual states. The physical composition of a gas has an impact on what the gas can be used for, and

which GOs a consumer would expect to be cancelled accordingly. Depending on the distribution channel, consumers count on a specific composition of the gas they acquire.

The way Energy Carriers and/or types of gas are defined in the applicable standards for Guarantees of Origin, here provides guidance. EECS® Fact Sheet 22 Type of Gas[19] holds a categorisation of gases that can be used here. The same categorisation of gases is included in the current draft of the EN16325 GO Standard, under the term Energy Carrier. It comes down to the following categories of gases:

- Methane,
- Ethane,
- Propane,
- Butane,
- Dimethyl Ether,
- Hydrogen,
- Ammonia,
- Unspecified Gas.

Not for all these types of gas, there exists a legal basis to collect the relevant data for a Residual Mix calculation for this type of gas. Such sector-overviewing data collection is only in sight for two of the above categories, namely methane and hydrogen. The gas composition is hardly ever occurring in a 100% purity of a single molecule. Therefore, the type of gas won't be considered a system boundary, where it is influenced by the way the gases are disseminated. This is elaborated in Section 3.2.3 Dissemination level – Network characteristics below.

3.2.3 Dissemination level – Network characteristics

As mentioned above, regulations provide protection of data integrity. Jurisdictions rather regulate certain distribution channels than composition aspects.

Setting a system boundary in accordance with harmonised concepts across the whole EU/EEA, has therefore the highest chance of coming to a practicable calculation method for the RM.

This needs a dive into the legislative aspects that help clarifying the system boundaries.

The recast of the Renewable Energy Directive (2023/2413) states in Article 19.8:

(…) When a customer consumes gas from a hydrogen or natural gas network, including gaseous renewable fuels of non-biological origin and biomethane, as demonstrated in the commercial offer by the supplier, Member States shall ensure that the guarantees of origin that are cancelled correspond to ***the relevant network characteristics****.*

This provides a reference to consider the Natural Gas Network and the Hydrogen Network as system boundaries. However, the concept of a "natural gas network" is not defined. A proposition suggests equating it with the Natural Gas System as defined in Art. 2 of the recast Gas Directive

(3) 'natural gas system' means a system of infrastructure, including pipelines, liquefied natural gas (LNG) terminals and natural gas storage facilities, which transports natural gas;

(4) 'hydrogen system' means a system of infrastructure, including hydrogen networks, hydrogen storage and hydrogen terminals, which contains hydrogen of a high grade of purity;

[19] See: https://www.aib-net.org/eecs/fact-sheets

(17) 'transmission' means the transport of natural gas through a network, which mainly contains high-pressure pipelines, other than an upstream pipeline network and other than the part of high-pressure pipelines primarily used in the context of local distribution of natural gas, with a view to its delivery to customers, excluding supply;

(19) 'distribution' means the transport of natural gas through local or regional pipeline networks with a view to its delivery to customers, excluding supply;

(21) 'hydrogen network' means a network of onshore and offshore pipelines used for the transport of hydrogen of a high grade of purity with a view to its delivery to customers, excluding supply;

(23) 'hydrogen transmission network' means a network of pipelines for the transport of hydrogen of a high grade of purity, in particular a network which includes hydrogen interconnectors or which is directly connected to hydrogen storage, hydrogen terminals or two or more hydrogen interconnectors or which primarily serves the purpose of transporting hydrogen to other hydrogen networks, hydrogen storage or hydrogen terminals, without excluding the possibility of such networks to serve the purpose of supplying directly connected customers;

(24) 'hydrogen distribution network' means a network of pipelines for the local or regional transport of hydrogen of a high grade of purity, which primarily serves the purpose of supplying directly connected customers and does not include hydrogen interconnectors, and which is not directly connected to hydrogen storage facilities or hydrogen terminals, unless the network in question was a natural gas distribution system on … [date of entry into force of this Directive] and has been partially or fully repurposed for the transport of hydrogen, or to two or more hydrogen interconnectors;

The Draft CEN EN16325 standard on GOs defines a data field on the GO called "Dissemination Level", and a list of parameter values for this data field.

Excerpt from the May 2024 draft of the EN16325 standard:

Annex E
(normative)

Dissemination level of the physical energy for which the GO is issued

The parameter value for the Attribute on the GO that indicates the dissemination level of the produced physical energy for which the GO is issued, as in 4.5.2.2 q), is one of the following:

1) Consumed by the operator of the production device [this applies for Electricity, Gas and Heating and Cooling];
2) Disseminated over a Distribution or Transmission System:
   a) for Electricity;
   b) for Natural Gas;
   c) for Hydrogen;
3) Disseminated over a Closed Distribution System:
   a) for Electricity;
   b) for Natural Gas;
   c) for Hydrogen;
4) Disseminated over any other network than a Distribution or Transmission System or Closed Distribution System:
   a) for Electricity;
   b) for Natural Gas;
   c) for Hydrogen;
   d) another Gas system;
5) Disseminated over a heating or cooling Grid [this applies for Heating and Cooling];
6) Disseminated by vehicle [this applies for Gas and Heating and Cooling];
7) Dissemination unspecified – not consumed by the operator of the Production Device [this applies for Gas].

An advantage of adopting these parameter values for the data field Dissemination Level, is that this update can help Member States to fulfil their obligation from REDIII, art. 19.8, which lays down that Member States shall ensure that cancelled gas GOs correspond to "the relevant network characteristics". This further enables to clarify the system boundary.

Note: The type of gaseous Energy Carrier that flows through the natural gas systems, is defined as follows:

Art. 2 of the recast Gas Directive

'natural gas' means gas that primarily consists of methane, including biomethane, or other types of gas, that can technically and safely be injected into, and transported through, the natural gas system;

Since the term "natural gas" includes both fossil and renewable sources, it is important to use this term without assumption of the energy source.

3.2.4 Mass balancing system

According to art. 9 of the recast Gas Directive

§1 Renewable gas shall be certified in accordance with Articles 29, 29a and 30 of Directive (EU) 2018/2001. Low-carbon fuels shall be certified in accordance with this Article.

§2 In order to ensure that the greenhouse gas emissions savings from the use of low-carbon fuels are at least 70 %, Member States shall require economic operators to show that that threshold and the

requirements established in the methodology referred to in paragraph 5 of this Article have been complied with. For those purposes, they shall ***require economic operators to use a mass balance system*** *in line with Article 30(1) and (2) of Directive (EU) 2018/2001.*

In cases where gas GO usage is limited to a specific mass balancing system, the Residual Mix calculation could be confined to that same system. This restriction ensures that the Residual Mix accurately reflects the energy attributes of the gases consumed within the defined system boundaries of the mass balancing system.

Particularly, over time, in regions where hydrogen networks are geographically confined, such as industrial clusters or specific urban areas, separate mass-balancing systems may be established to track hydrogen production, distribution, and consumption. This would imply that the environmental attributes of hydrogen are accurately accounted for within defined boundaries.

Currently, in practice this restriction of GO usage per mass balancing system, is not installed in the GO system rules. It may be applied on a voluntary basis but is not protected in EU legislation. Therefore, a separate RM per mass-balance system today cannot be applied consistently in the existing legal framework.

3.2.5 Combining and simplifying system boundaries

There are three potential options for defining system boundaries for the Disclosure system within which a Residual Mix can be calculated for gases.

1. A single-system boundary for all gases
   - In this option, both the hydrogen network and the natural gas system are considered within a single system boundary. This means that the Residual Mix calculation encompasses both hydrogen and natural gas without any distinction between the two.
   - Note that the report of FaStGO task 4.2 highlighted inconsistencies associated with utilising a single Residual Mix for natural gas and hydrogen. These inconsistencies include the ability to claim renewable hydrogen's environmental attributes without its injection into the gas network, potentially inflating consumption figures. Furthermore, it allows gas suppliers to claim tracked renewable energy without physically introducing it into the gas supply system, undermining efforts to reduce GHG emissions.
   - Additionally, cross-usage of GOs between different gaseous Energy Carriers complicates carbon footprint calculations along the value chain due to differing hydrogen and methane carbon footprints. Such an approach can cause confusion and lack of trust. This hinders market acceptance, necessitating exploration of alternative options.
2. Two separate boundaries for natural gas and hydrogen, further subcategorizing per dissemination level, as set out above in Section 3.2.3 Dissemination level – Network characteristics.
   - With this option, the Residual Mix calculation involves two distinct system boundaries—one for the natural gas system and another for the hydrogen network. Each system boundary is treated separately, allowing for independent calculations and analysis of the Residual Mix for natural gas and hydrogen.

- According to RED article 19.8, GO cancellations are constrained to the relevant network characteristics, which may help mitigate challenges associated with the cross-usage of GOs.

3. System Boundaries per Mass-Balancing System (Gas and Distinct Geographically Confined H_2 Networks)
   - This option involves defining system boundaries based on mass-balancing systems, which may vary for gas and distinct geographically confined hydrogen networks. The Residual Mix calculation would consider the mass-balancing systems separately for natural gas and hydrogen, accounting for any geographical confinement of hydrogen networks.

It is essential to ensure that the Residual Mix system boundaries coincide with the actual Disclosure system boundaries. This means that the width of the area where Guarantees of Origin are allowed to be claimed must correspond to the width of the system boundaries for which a dedicated Residual Mix is calculated.

Option 1 is disregarded as it doesn't consider the different use cases for specific gas compositions.

Option 3 does not work as GOs are allowed to be used outside the mass balancing system, and the Residual Mix has to compensate the fuel mix for the area where GOs are used.

Therefore, option 2 deserves further elaboration for setting the system boundary in which the RM is calculated. Considering the Dissemination Level distinguishes the natural gas system and the hydrogen system in categories of "own consumption", pipeline distribution, and vehicle transport. The category pipeline distribution could be kept as a whole. Alternatively, it can be distinguished further between private networks and networks that comply with the Gas and Hydrogen Directive's definition of "Distribution and Transmission System" and "Closed Distribution Systems".

3.2.6 Realistic and pragmatic system boundary selection for the RM calculation in practice: the natural gas transmission and distribution system

At present, both for natural gas and hydrogen there are, or will be foreseen, transparent and reliable data collection mechanisms, where these gases circulate in regulated systems.

Therefore, this report will focus on a RM calculation for Natural Gas and Hydrogen within the system boundary of the corresponding Natural Gas Distribution and Transmission System and Hydrogen Distribution and Transmission System. Where free choice of supplier applies, Closed Distribution Systems can be further included in those system boundaries.

A Residual Mix calculation can be developed for other dissemination levels and other Energy Carriers once centrally collected data becomes available.

For short-term RM calculations, it is acknowledged that the hydrogen network is primarily in the preparation phase. One of the challenges faced when considering the inclusion of the hydrogen network within the system boundaries is data scarcity. This lack of data poses a significant hurdle in performing any RM calculations for the system boundary of the hydrogen. On top of this, the general policy strategies seem not to enhance the usage of hydrogen for household consumers, being the audience for whom a Residual Mix is most relevant.

Therefore, it is proposed to set up RM calculations for the Natural Gas Distribution and Transmission System at this stage. This approach is practical and relevant given the constraints explained before. However, the potential of the hydrogen network and its role in the future is also recognised.

3.3 Which Energy Sources to disclose to consumers?

The energy sources to display in the Residual Mix, should align with the energy sources that suppliers disclose to consumers in their fuel mix on their bills.

The primary source of energy production is the core relevant information for Disclosure, and hence for the Residual Mix. Categorising energy sources in a fuel mix hence should be oriented to be of maximal value in relation with the interest of consumers. On the one hand, sufficient detail should be provided to a consumer to satisfy their hunger for information, on the other hand, an overload of detail may diffuse the consumer's understanding. The categorisation of energy sources that are provided to a consumer should maximally empower the consumer in his purchasing choices and, when applicable, in how he wants to impact the mix of the sources of the energy he consumes.

Legislation offers a starting point. The Gas Directive Annex 1§5 requires Disclosure of renewable and low carbon gases. This invites a look at the legislative definitions of renewable gas, energy from renewable sources and low-carbon gas.

Term	Definition	Legislation
Energy from renewable sources or renewable energy	energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas	Renewable Energy Directive (2018/2001)[20]
Renewable gas	means biogas as defined in Article 2, point (28), of Directive (EU) 2018/2001including biogas that has been upgraded to biomethane, and renewable fuels of non-biological origin as defined in Article 2, point (36), of that Directive	Consilium document PE-CONS 104/23 of 7 May 2024
Low-carbon gas	means the part of gaseous fuels in recycled carbon fuels as defined in Article 2, point (35), of Directive (EU) 2018/2001, low-carbon hydrogen and synthetic gaseous fuels the energy content of which is derived from low-carbon hydrogen, that meet the greenhouse gas emission reduction threshold of 70 % compared to the fossil fuel comparator for renewable fuels of non-biological origin set out in the methodology adopted pursuant to Article 29a(3) of Directive (EU) 2018/2001;	Consilium document PE-CONS 104/23 of 7 May 2024

[20] http://data.europa.eu/eli/dir/2018/2001/oj

At high level, energy sources for gas production can be categorised into renewable, fossil, and nuclear energy. For clarity, the categories of energy sources shall be mutually exclusive. Using the definition of renewable energy and responses from the survey (see ANNEX X) the renewable categories can be further divided into multiple subcategories such as biomass including biogas, solar, wind, hydropower, and other renewables. The fossil source category can also be divided into low-carbon and other fossil sources. Lastly, there may be little interest for the further subdividing the category of nuclear energy into more detailed subcategories.

The energy categories can be further elaborated by integrating compliance with the criteria of Advanced Biofuels, as elaborated in Annex IX of the Renewable Energy Directive which focuses on the production of biogas for transport and advanced biofuels. This addition would enable consumers to make more informed decisions on the environmental impact of the purchased gas.

Table 2: Energy Sources

	Energy Source
Renewable	- Biomass including biogas - Solar - Wind - Hydropower - Other renewables
Fossil	- Low carbon - Other fossil
Nuclear	- Nuclear

A significant challenge in implementing a comprehensive categorisation of energy sources is the availability of data. While the concept is categorising energy sources into renewable, fossil, nuclear, and further subcategories is straightforward in theory, obtaining accurate and up-to-date data for each subcategory of energy sources can be quite challenging in practice,

Where data is available, and when moving into emission calculations for the RM, further subcategorizations can be made, similar as the categorisation of energy sources in the RM calculation for electricity.

3.4 The instrument for renewable gas consumption claims

3.4.1 Untracked commercial offers

Art. 19 of the RED indicates that the Residual Mix is for non-tracked commercial offers (19.8), that Member States must publish the Residual Mix (19.4) and that, in doing so, they must include expired GOs in the Residual Mix (19.3). As the Residual Mix is for untracked commercial offers, following RED art.19.8, clarity is needed on the quantity of gas consumption for which a claim on the energy source already exists.

It needs a clear and harmonised understanding of the definition of the Residual Mix, which is given by RED art. 2.

Residual Mix =

"residual energy mix" means the total annual energy mix for a Member State, excluding the share covered by cancelled Guarantees of Origin

- MS shall **publish the Residual Mix annually**
- **Expired GOs must be in Residual Mix**
- Residual Mix = **for untracked commercial offers**

(Source: REDIII art. 2 & 19)

Figure 6: Provisions on the Residual Mix in the Renewable Energy Directive

The definition of the Residual Mix constitutes of two terms that are deducted from each other: 1) "the total annual energy mix for a Member State" and 2) "the share covered by cancelled GOs". For understanding this definition of the Residual Mix two options are elaborated.

3.4.2 Option 1) Only GOs qualify for reliable Disclosure

The definition of the Residual Mix in RED art.2 only excludes cancelled GOs from the annual energy mix for a Member State. This logic builds on the fact that the GO system has intrinsic double counting prevention measures in its design, protected by legislation.

This raises the question whether the definition of the Residual Mix leaves room for PoS based claims if they are not backed by GOs.

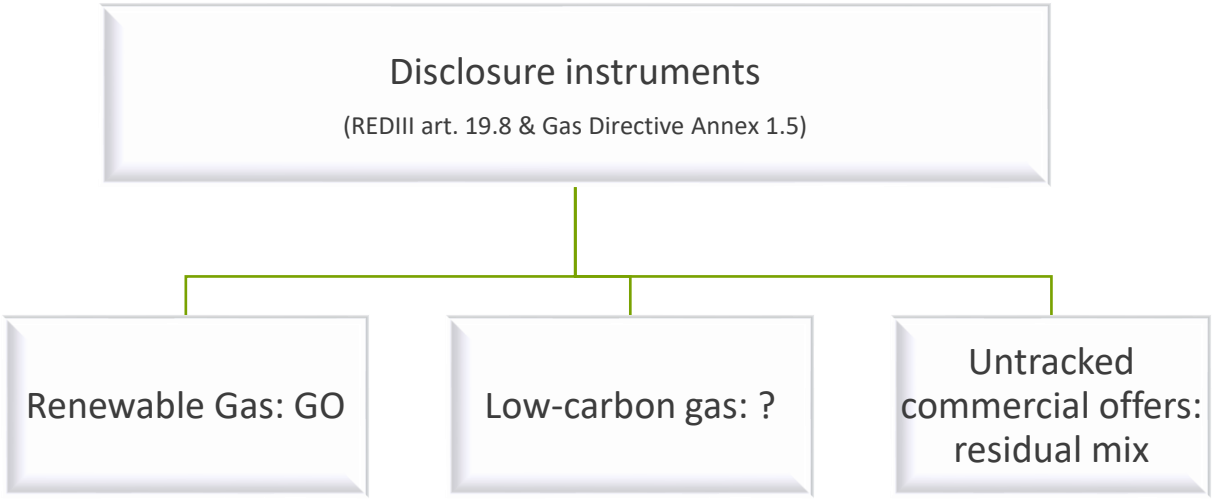

Figure 7: Disclosure instruments for gas suppliers

If the annual energy mix for a Member State is understood as the production mix, and if, in the Residual Mix, only GOs are deducted from the national production mix, there needs to be national legislation to prevent double counting. Indeed, if other tracking instruments than GOs were used as the basis for claiming renewable or low-carbon energy consumption, the attributes associated with them would be counted twice—once with the tracking instrument and again when incorporated into the Residual Mix.

The approach of disclosing renewable gases only when backed by cancelled GOs, includes the scenario where the GOs are transferred to the UDB. Yet, it has to be acknowledged that at the time of writing this report, there is an existing market with a habit of trading renewable gas Attributes also outside the official GO system. Whether this will continue to exist, will depend on Member States' implementation of the RED, CSRD and upcoming Green Claims Directive.

Option 1 is applicable in countries where national legislation only allows GOs for claims of renewable gas consumption, regardless of the actor of the claim.

3.4.3 Option 2) also UDB PoS without GO qualifies for consumption claims for renewable gas

3.4.3.1 Total annual energy mix for a Member State

In the definition of the RM, a closer look can be given to the "annual energy mix for a Member State".

The Union Database tracks Proofs of Sustainability for the purpose of accounting compliance towards policy targets. There may be PoS registered in the UDB, for which no GOs are issued. Unless national legislation foresees otherwise, it may be hard to change habits in a market that historically trades documentation based on PoS and making renewable gas consumption claims based on it. Whereas the European GO system has intrinsic double counting measures in its design criteria, alternative double counting prevention measures would need to be in place for documentation-based tracking. The Union Database for sustainable biofuels aims to provide such a measure.

While gas suppliers will be obliged to cancel gas GOs for their supply of renewable gases, corporates may declare consumption of renewable gases based on registered consumption of renewable gases in the Union Database. Ideally, these are also backed by Guarantees of Origin, for consistency, yet where this is not the case, still it must be prevented that the Residual Mix would count the same environmental attributes more than once.

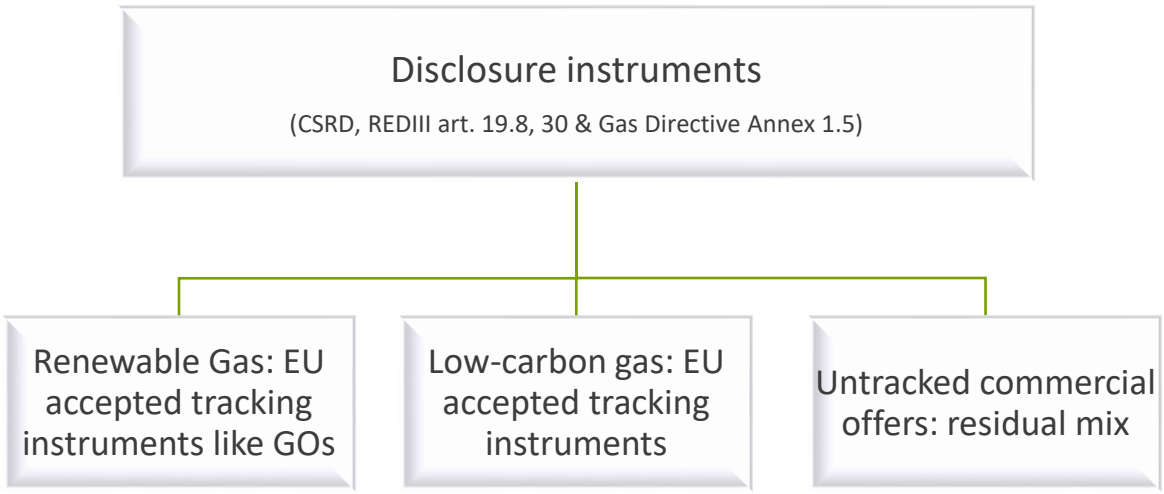

Figure 8: Gas Disclosure instruments for other than suppliers

The term "total annual energy mix for a Member State" in the definition of the residual energy mix then cannot be seen as only the energy sources of the national production mix, but also, accounts the energy sources of imports and exports that are tracked with mass balancing systems on condition that double counting measures are in place.

3.4.3.2 Condition for other than GO-based claims: Mass balancing complemented with double counting prevention measures

Where national legislation would allow to make claims on consumption of renewable gas, based on other tracking instruments/methods than GOs, this option needs clear consideration in the Residual Mix calculation methodology. Given Annex 1.5 of the recast Gas Directive, this option could only exist where national legislation allows so, and only for other parties than gas suppliers. Where national databases and/or the Union Database for sustainable biofuels aim to ensure the prevention of double counting, this can work. Attention needs to be given to certain aspects, to ensure consistency to the market, as elaborated here below.

3.4.3.3 Attention points to overcome hurdles for a reliable residual mix calculation

Where Member States would allow other instruments than GOs for renewable gas consumption claims, there are some work areas for the further refining of the interaction between multiple tracking systems.

Following questions are relevant to shape a complete picture of this option:

1. **Import from outside EU**: If PoS without GO can be used for Disclosure, does the same apply to gases imported from outside EU?
    - Would import of PoS entitle for renewable gas consumption claims? Would it be conditional to existence of legislation that forbids that these renewable attributes could still be claimed in the originating country? E.g. ensuring that the renewable electricity with which hydrogen is produced, is not claimed already elsewhere?
    - While import from Swiss and UK biomethane GOs is currently not allowed under RED art. 19, would import of their PoS entitle for a renewable gas consumption claim, when tracked in the UDB?

2. **Expiry**: PoS don't expire, while GOs have a maximum lifetime of 18 months (or less, depending on the country of usage).
    - Where a GO expired, for the gas that is still covered by a PoS in the UDB, if it is allowed to use PoS, it needs prevention of double counting with the Residual Mix.
        - Either the PoS shouldn't entitle for a renewable gas consumption claim, or
        - the expired GOs should not be added to the Residual Mix.

      The latter would go against RED art.19.
    - Where a producer chooses not to apply for GOs, would the buyer of his gas benefit from exemption of expiry date to which the GO is subject? Can PoS based consumption claims of renewable gas be seen as legally allowed circumventions of the GO expiry rule? If so, then why have a GO expiry rule? (or: would then the PoS get an expiry date?)
    - If claims are allowed based on tracking instruments that don't expire, there is an additional challenge in the RM calculation timeline. A workaround is needed for a meaningful Residual Mix calculation. Examples of workaround suggestions:
        - Collect data based on the transaction date of the cancellations, leaving the yet-uncancelled PoS to count for next year's RM, assuming the inaccuracy will balance itself out over the years, or
        - An ultimate PoS cancellation date for consumption year Y-1.
3. **Subsidised gases**:
    - Where a MS decides not to facilitate issuance of gas GOs for subsidised gases, it may have its own allocation system for declaring the renewable attributes of the relevant gases. Would the UDB features include a mechanism to check that this is the case? Would it display that the PoS doesn't entitle for a renewable gas claim where the originating MS has already allocated the renewable attributes? (e.g. Germany allocates them to the consumers who pay for the tax that pays for the subsidy, for electricity)
    - Where a MS decides to issue GOs for subsidised gases but not provide these GOs to the producer and auction the GOs (in order to recover part of the subsidy cost): the renewable attributes circulate with the GO in the market without the control of the producer. Would the UDB feature a mechanism for to check if auctioned GOs were issued with a PoS that is in the UDB? Or would it be forbidden to auction GOs (and lose control over the party owning it) if PoS are registered in the UDB?
4. Will there be a different right to claim the renewable attributes related to PoS in the UDB, where a producer chooses not to apply for GOs, then in the situation where the MS decides not to issue GOs for subsidised gases and has its own allocation system? Given the risk for double claims in the latter situation, would the UDB provide a display indicating that in this situation, renewable gas consumption claims are not allowed?
5. General: will all PoS without GO in the UDB entitle for renewable gas consumption claim or only those that cannot yet already be claimed elsewhere?

Finally, the question remains if a producer would make the effort of applying for GOs. If the GO and PoS issuance process are not integrated, this comes with separate workload for applying for it. Especially if non-GO based claims are coming with less restrictions, the producer might not see the benefit of applying for GOs. The standardisation of gas GOs in EN16325 has been under intense discussion over the past 5 years, which aims to protect the integrity of renewable gas consumption claims. Can the integrity be protected if the GO rules are circumvented?

3.5 Residual Mix Calculation method

3.5.1 Aim of the Residual Mix: determine attributes to disclose Untracked Consumption

This section sets up a formula with the aim of calculating the energy source mix of the Untracked Consumption, as is shown at the top of Figure 9 below. This is the overall aim of the Residual Mix calculation: to determine how to disclose any energy for which no tracking instruments have been used, and which fuel/source mix gas suppliers shall mention on their bills.

The Residual Mix must be understood as being complementary to the tracking instruments; anything that is not covered by reliable tracking instruments, should be accounted for in the Residual Mix. This also requires that, across the Residual Mix calculation area the sum of energy represented by available tracking instruments and the volume covered with the Residual Mix, equals the total volume of physical gas flows.

3.5.2 General formula

Figure 9 illustrates the proposed calculation methodology for the Residual Mix for gases.

All elements in the calculation (i.e., each term in the formula), consider two aspects in parallel, namely:

1) absolute volume of energy, and
2) the proportion of each energy source.

The following subsections explain in detail how this formula is established and out of which terms it is composed. Table 3 clarifies some of the frequently used terms in the Residual Mix calculation.

Table 3: Glossary relevant to Residual Mix formula

Term	Meaning
Attribute	Data field specifying the characteristics of an energy unit produced by a Production Device in terms of the input(s) used and/or the details (standing date) of the Production Device and Production Process. In the Residual Mix formula, *Attribute* mostly refers to information on energy sources and emissions.
Deficit	Refers to *Attribute Deficit*, where there are not enough Attributes in the Attribute Balance of a country to cover all untracked consumption. In this case, the missing attributes are derived from the European Attribute Mix (EAM)
EAM, European Attribute Mix	Pool of Attributes from which countries with a Deficit can supplement their Residual Mix.
Product Mix	A supplier of gas can offer his clients gases with a specific energy source mix. Where he backs his offering with tracking instruments, he can accordingly claim to have supplied gases with an attribute mix as covered by the used tracking instruments. Where an offer is not backed with cancellation of GOs or other RTS, the energy source mix of the offer equals the Residual Mix of that country. A supplier may offer different products, each with their own energy source mix.

Supplier Mix	The mix of energy sources in the total supply over all products of a gas supplier, is generally called the "supplier mix". Transparency on the supplier mix is recommended to inform customers, who may use their free choice of supplier to enhance the impact of their purchase in relation to an overall supplier profile.
Surplus	Refers to *Attribute Surplus*, where a country has more Attributes in its Attribute Balance than needed to cover the untracked consumption. The Surplus is transferred through the European Attribute Mix to countries with a Deficit.
Tracking Instrument	Guarantees of Origin (GO) and other Reliable Tracking Systems (RTS)
Used Tracking Instruments	Cancelled GOs and validated other RTS, with the aim of allocating the attributes of those tracking instruments to energy consumption

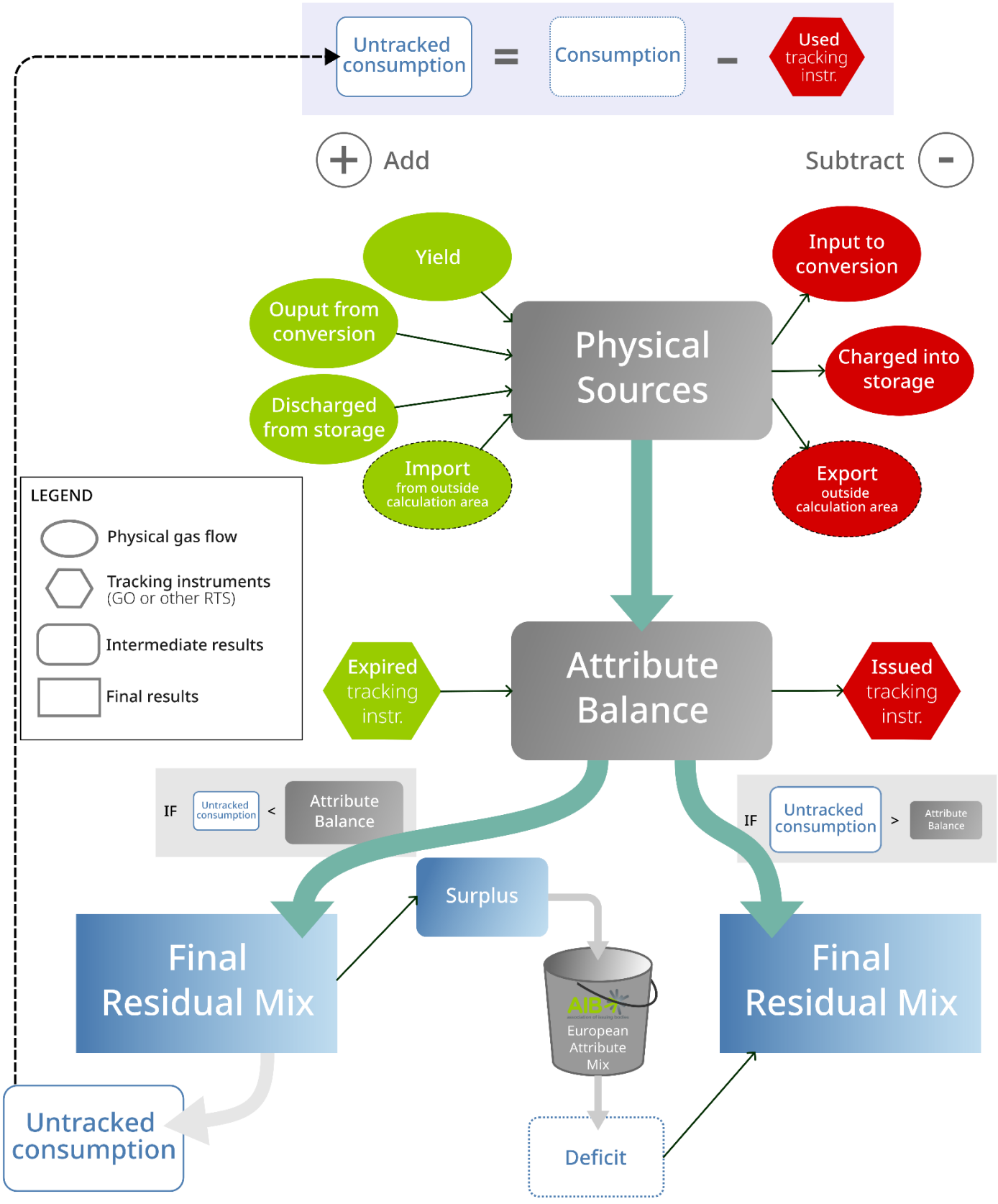

Figure 9: Residual Mix Calculation Methodology – conceptual representation.

3.5.3 Physical Sources: quantifying the attributes of the available physical gas

The Residual Mix calculation formula starts from considering the total **available quantity of energy** of **the considered** gaseous Energy Carrier, in a country, and the energy sources from which these originate.

Figure 10 shows a calculation example of the Physical Sources. This example will be elaborated in the remainder of this chapter. Note that both the energy volumes and the corresponding attributes (energy sources, emissions, etc) are needed inputs in this part of the formula. The volumes are proportional to the area in the block charts, where one square represents one energy unit. The attributes are represented by the colours; usually, green denotes energy from renewable, grey from fossil and red from nuclear sources. Although the balance of sources and attributes is respected in these examples, it may be that other attributes/sources are added, e.g., RFNBO or low-carbon gases. For the purposes of this chapter, the authors believe that three colours suffice to illustrate the point.

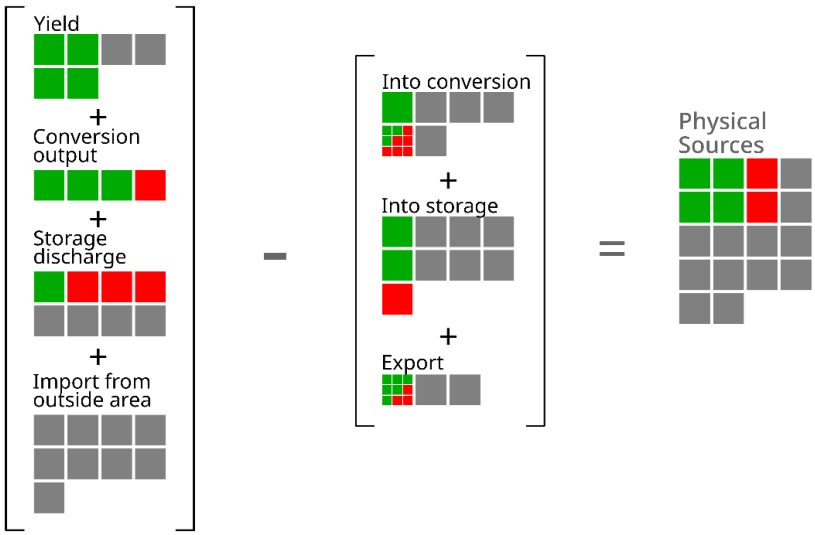

Figure 10: Calculation example to determine the mix of Physical Sources, considering both volumes of energy (1 square = 1 unit of energy) and corresponding attributes (different colour = different source/energy attribute).

3.5.3.1 Production & yields

The determination of "Physical Sources" starts with a quantification of the gas that is produced within the system boundary per energy source. In the scope explained below, this looks at the production and other yielding of natural gas (including biomethane), or of hydrogen within the country. Note this starts from statistics that quantify the available volumes of gas, regardless of their energy source: volumes of fossil natural gas are considered together with volumes of renewable gas production. This is subsequently complemented with data on volumes for each energy source

3.5.3.2 Import & export of gas outside calculation area

Import of gas yielded outside EU, and export of EU-yielded gas to areas outside EU, are highly impacting the available volumes of gas. The imports and exports of gases from outside the calculation area (EU) are proportionally much higher than those of electricity.

This paragraph considers which energy sources can be allocated to the imported gas volumes, and whether they are imported as having a dedicated energy source, or to be labelled as being "from

unknown origin" at the time of import. The assumption is that there will be a unique allocation of the energy source for renewable gases for 3rd countries, as they are registered in the UDB. Only gases registered in the UDB would be eligible to qualify as renewable. If the imported gas is not registered in the UDB, it will be considered fossil.

The same question applies to whether exported gas maintains the unique entitlement to claim its energy source at export, or whether the tracking instrument issue for any exported gas remains in Europe.

Disclosure of imported gases based on PoS in UDB?

In case it would be facilitated to disclose the origin of gas by a tracking system that relates to renewable gas production outside the EU, then figures of such tracking system should be integrated into the RM calculation formula.

Given the interest in the market to report imported biomethane for the EU targets for tracking in the Union Database (UDB), the instrument under consideration here would be a Proof of Sustainability related to imported gas. Such PoS might be issued under a voluntary or national scheme. Where the UDB set-up allows such PoS to be accounted for the EU policy targets, and in case there that would consequently also imply eligibility to disclose the gas as renewable gas consumption, then the energy sources of the gases certified with these PoS would need to be taken into account to determine the attributes of this imported gas.

Disclosure of imported gases based on Residual Mix?

In case however there is no legal option to disclose the origin of gas produced outside the EU, as being renewable gas, then attributes have to be allocated to these imported gases using the Residual Mix. Indeed, if any renewable character of any imported gas that had been produced as biomethane, would be already claimed in the country of origin, then these renewable characteristics should not again be attributed to the imported gas. Similarly, if the renewable electricity with which imported hydrogen is produced, is already accounted in the country of origin, the hydrogen shouldn't be imported as coming from renewable energy sources.

In theory, this would need the Residual Mix formula to acquire the surplus Attributes (see below) from the country from which the gas was imported. However, where this would not exist or not be considered sufficiently accurate, there a default Residual Mix being fossil gas might be deployed for imported gases, see Chapter 4 Simplified alternative: fossil Residual Mix while data flows are not yet synchronised.

At the time of writing this report, no such warranties exist that the imported gas is not already claimed in the country of origin, but this may change in the future. For now, we work under the assumption that all the imported gases are fossil gas, which may change once the UDB registers imported renewable gases or once EU recognises GOs from gases from non-EU and non-EEA countries.

3.5.3.3 Storage

Another difference with the electricity sector, is that quantities of stored gas are much higher than those of stored electricity and that they are often stored for long terms. Like import, the storage of natural gas is significant in the natural gas market. Furthermore, it serves a strategic purpose, securing the supply of natural gas to the EU economy. A similar trend can be anticipated for hydrogen.

Therefore, the fluctuations of stored gas over a year within the considered geography should be factored into the Residual Mix calculation.

To accurately capture the impact of storage in the determination of "physical sources", the "net gas release from storage" is integrated into the formula. This requires subtracting the "gas withdrawal from storage" from "gas injection into storage". Further, storage losses must be included in the consumption term as they represent energy that is no longer available for consumption.

$$Net\ realease\ from\ Storage = Gas\ withdrawal\ from\ storage - Gas\ injection\ into\ storage$$

Where the stored gases are registered with specific attributes, these are to be accounted for in the residual mix formula.

Where the stored gases are not registered as having specific attributes, it can be considered to proportionally assign to them the average proportion of the Attributes of physical gas while neglecting the impact of storage on the RM calculation.

3.5.3.4 Conversion

Next, the role of Energy Carrier Conversion in the calculation of the Residual Mix is to be considered. Gas conversion includes the conversion of one gas type into another and the conversion of electricity or heat into gas or hydrogen and vice versa. While converting one Energy Carrier into another, there will unavoidably be energy losses. These losses will be considered as the consumption of the converting installation since they represent energy that cannot be used further. They are relevant to acknowledge at macro level, as here certain Attributes disappear. Yet for the Residual Mix of a specific Energy Carrier, it is the total resulting volumes from conversion into an Energy Carrier, that play a role.

As the quantity of gases that comes as Output from conversion devices, is completely unrelated to the volume of gases that are fed as Input into other conversion devices, it is better to keep both terms in the above formula treated separate, rather than as the single parameter "resulting energy from conversion".

The rules for GO Conversion Issuance stipulate that the energy sources of the inputs are proportionally conveyed to the output Energy Carriers of conversion. Therefore, the proportions of energy sources of the conversion losses must be the same as those of each energy source in the input into the conversion device.

3.5.3.5 Geographical aspects

For the RM formula of electricity, the imports and exports are only taken into account to and from outside the calculation area. For gases tracked via Guarantees of Origin, the same principle can work as GOs may freely be transferred between EU Member States. For mass-balanced gases it is important to align with how these imports and exports are registered within the Union Database.

3.5.3.6 Transmission and distribution losses

Energy losses associated with the transmission and distribution of gases are much less than for electricity. Losses include gas consumed by compression stations, auxiliary gas at storage facilities, gas vented during grid maintenance activities and leaks.

Like the Residual Mix calculation for electricity, transmission losses are included in the consumption, see 3.5.5.2Consumption.

3.5.3.7 Summary: formula for available quantities of gas according to its "Physical Sources"

This leads to the following formula to determine the Physical Sources volume for a respective Energy Carrier, within the system boundary:

$$\begin{aligned} Physical\ Sources_{c,s} \\ &= Yield_{c,s} + Imports_{c,s} - Exports_{c,s} + Net\ realease\ from\ Storage_{c,s} \\ &- Input\ of\ this\ energy\ carrier\ into\ Conversion_{c,s} \\ &+ Output\ from\ Conversion\ to\ this\ energy\ carrier_{c,s} \end{aligned}$$

This formula is applied to all countries c and all energy sources s separately. Figure 10 illustrates the calculation of Physical Sources with concrete source shares and energy volumes for each of the terms in the formula.

3.5.4 Attribute balance: deducting "tracked" from "physical" sources

The Residual Mix serves to provide the fuel/source mix for untracked gas consumption. To establish how much energy needs to be covered with the Residual Mix to find out its fuel mix, first the energy that is covered with tracking instruments needs to be quantified. Subtracting the so-tracked energy from the Physical Sources, gives an intermediate result, which here is called the "Attribute Balance". This concept is comparable with the "Domestic Residual Mix" from the electricity Residual Mix formula in ANNEX II. This report choses however the term Attribute Balance to prevent it from being confused with the calculation end result for the Residual Mix.

Calculating the Attribute Balance within a system boundary, involves determining the attributes of the available volume of gas.

For the ease of reading, this text uses the term Tracking Instruments to refer collectively to **Guarantees of Origin and other Reliable Tracking Systems**, or shortly "GO and other RTS". Where national legislators allow other mechanisms than Guarantees of Origin to back a claim on the origin of consumed energy, the Residual Mix needs to account for them to prevent double claims. The precondition is of course that the relevant national framework prevents the other tracking systems from duplicating claims that are already made regarding the environmental attributes of that gas. The "R" in "RTS" underlines the assumption that the other Tracking Systems have mechanisms in place to be considered reliable, and to prevent double counting. Non-reliable tracking systems should not entitle for a claim on renewable or low-carbon gas consumption. Section 3.4 Instrument for renewable gas consumption claims elaborates on the instruments acknowledged for tracking energy sources and other attributes.

3.5.4.1 Issued Tracking Instruments

Deducting issued tracking instruments from Residual Mix calculations is the crucial purpose of the Residual Mix calculation, namely preventing double counting of the renewable and low-carbon attributes from produced gases.

Issued tracking instruments represent renewable attributes assigned to specific gas production. By deducting these tracking instruments from the Residual Mix calculation, double counting of renewable energy is prevented – once when issued and again when calculating the Residual Mix. This ensures accuracy and integrity in calculating the Residual Mix.

Furthermore, deducting these tracking instruments from the Physical Sources, promotes transparency by accurately reporting the true composition of the Residual Mix. It clarifies the renewable portion of the gas that is already accounted for through tracking instruments.

3.5.4.2 Expired Tracking Instruments

This section considers how to account in the RM for the energy that is covered GOs (or other RTS) which have expired.

Legislation foresees that Guarantees of Origin expire. This implies that they can no longer be used for claiming renewable energy consumption. RED art. 19 also explicitly states that Member States shall include expired GOs in the Residual Mix.

In case other Reliable Tracking Systems are used for Disclosure, and in case there are expiry rules for those systems, the same reasoning can apply.

Expired tracking instruments embody renewable attributes that were once valid but have since reached their expiration date. Despite their expiration, they still reflect the renewable attribute of the gas. Excluding them would overlook a portion of the renewable attribute, resulting in an incomplete assessment of the Residual Mix. Expired tracking instruments cannot be utilised for further claims in the gas market. By including them in the Attribute Balance (and thus in the Residual Mix), the renewable attributes are accounted for in the Residual Mix calculation.

3.5.4.3 Summary: Calculation of Attribute Balance

The formula for calculating the Attribute Balance involves subtracting the available GOs and RTS from the available volume and then adding the expired GOs and RTS:

$$Attribute\ Balance = Physical\ Sources - Issued\ Tracking\ Instruments + Expired\ Tracking\ Instruments$$

The Physical Sources represent the total available volume of gas per energy source, adjusted for gas storage and gas conversion. Subtracting the issued GOs and RTS ensures that renewable gas is not double counted in the Residual Mix calculation. Additionally, adding expired GOs and other RTS accounts for renewable gas that were previously tracked but are no longer valid, as they are expired and cannot be used for further claims. The calculation of the Attribute Balance, considering the Physical Sources, Expired and Issued Tracking Instruments, is illustrated in Figure 11.

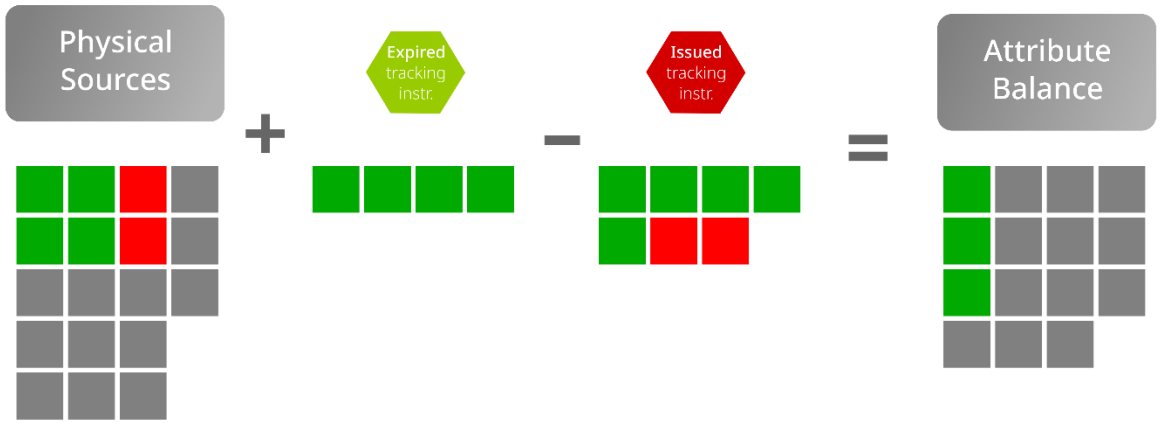

Figure 11: Calculation example of the Attribute Balance: subtracting Issued Tracking Instruments from the Physical Sources and adding Expired Tracking Instruments.

3.5.5 European Attribute Mix: Correcting for cross-border transfer of tracked Attributes

3.5.5.1 Untracked Consumption

Figure 12: Conceptual calculation of Untracked Consumption.

Figure 9, partly repeated in Figure 12, showed the aim of the residual mix formula, namely calculating the energy source mix of the Untracked Consumption. The untracked consumption refers to the portion of total gas consumption that is not covered by cancelled GOs nor by validation of other RTS. This represents the gas that cannot be directly attributed to specific energy sources. By subtracting the cancelled GOs and RTS from total consumption, untracked consumption is obtained.

$$Untracked\ Consumption = Consumption - Used\ tracking\ instruments$$

This demands a closer look to the terms “consumption” and the “use of reliable tracking instruments”.

3.5.5.2 Consumption

Not all gas taken from a gas network can be seen as end consumption of gas. Even if the term “end consumption” also includes transmission and distribution losses, there are other terms to take into account in the gas offtake from a network. Gas fed into storage plants and into Energy Carrier conversion should be deducted from the total figures of consumed or supplied gas.

While GOs may be cancelled for energy fed into storage or conversion, just like with normal end consumption of the gas, new GOs may be issued for the output from storage or conversion.

Input and output data of storage and conversion plants and their corresponding usage of tracking instruments (like GO cancellations) need to be treated consistently, to prevent the same quantity of renewable energy is declared more than once as final energy consumption.

Hence, the introduction of terms such as net release from storage and gas conversion in Section 3.5.3.3 and 3.5.3.4 respectively, aim to ensure consistency in the concept of consumption within the Residual Mix calculation formula . Nevertheless, losses from storage and conversion can be seen as final energy consumption. Gas off-take figures are therefore divided into three subcategories: gas consumption, storage loss treated as consumption and conversion loss treated as consumption.

3.5.5.3 Use of Reliable Tracking Instruments

When energy is tracked through cancellation of GOs or, where applicable, using other Reliable Tracking Systems (RTS), it means that these instruments have been used to disclose the origin of consumed gas. Thus, statistics on cancelled GOs and, where applicable, other RTS, provide the figures for the "consumption of tracked renewable gas".

With the adjusted calculation of Physical Sources in Section 3.5.3, there are three distinct subcategories for "use of tracking instruments":

1. **Gas consumption**
   This category includes GOs and RTS that are cancelled to reflect the origin of consumption of gas.
2. **Energy losses during Gas Storage**
   In this category, GOs and RTS that are cancelled to cover the energy source of storage losses are treated as consumption. This adjustment accounts for situations where gas stored is lost before being consumed.
3. **Energy Losses during Energy Carriers Conversion**
   This category addresses GOs and RTS cancelled to account for conversion losses. Conversion losses occur when one type of gas is converted to another, resulting in energy loss during the conversion process.

For the ease of writing, the term **used tracking instruments** will here be used to collectively refer to cancelled GOs and to validation of other RTS with the aim of allocating the attributes of those tracking instruments to energy consumption.

3.5.5.4 Filling the gaps after import and export inside Residual Mix area: Surplus, Deficit, and European Attribute Mix

If the Residual Mix is calculated for a single country, it is expected that the total consumed gas volume equals the available Physical Sources, and that the volume of untracked consumption equals that of the Attribute Balance. When considering multiple countries in the Residual Mix area, there may be cross-border flows of both physical gas and of Tracking Instruments. These cross-border flows within the calculation area are not explicitly accounted for in the Residual Mix formula. Instead, the European Attribute Mix is construed as a tool to level out imbalances caused by differences between cross-border flows in physical gas and in Tracking Instruments.

By balancing the energy source mix of physical flows, with the usage of tracking instruments, a national Attribute Balance is determined. Where the Attribute Balance is larger than the untracked consumption, there is a so-called "**Surplus of Attributes**". In such instances, the excess attributes are flowing into a pool of leftovers. This pool is called the "European Attribute Mix" or (EAM).

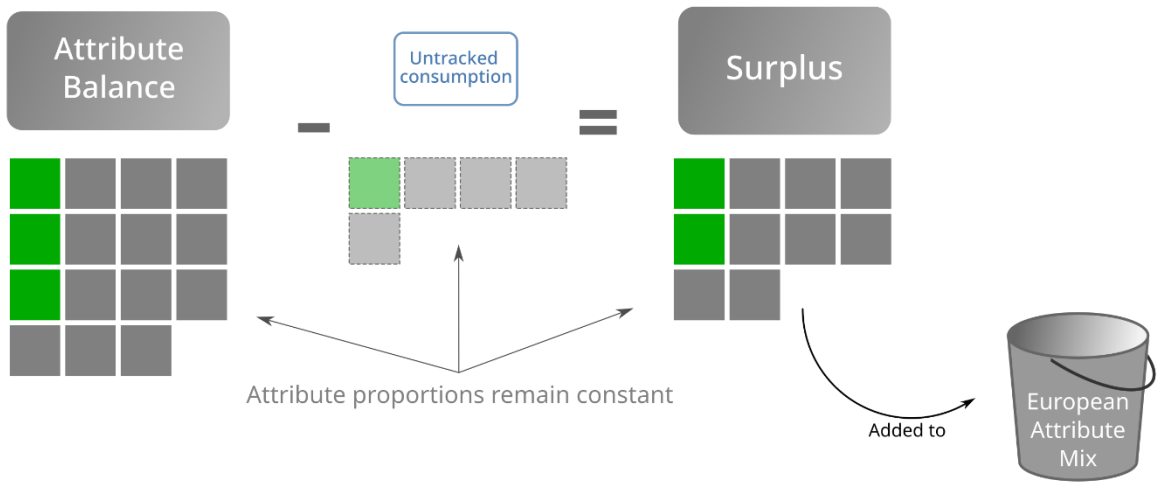

Figure 13: Visualisation of Surplus Attributes

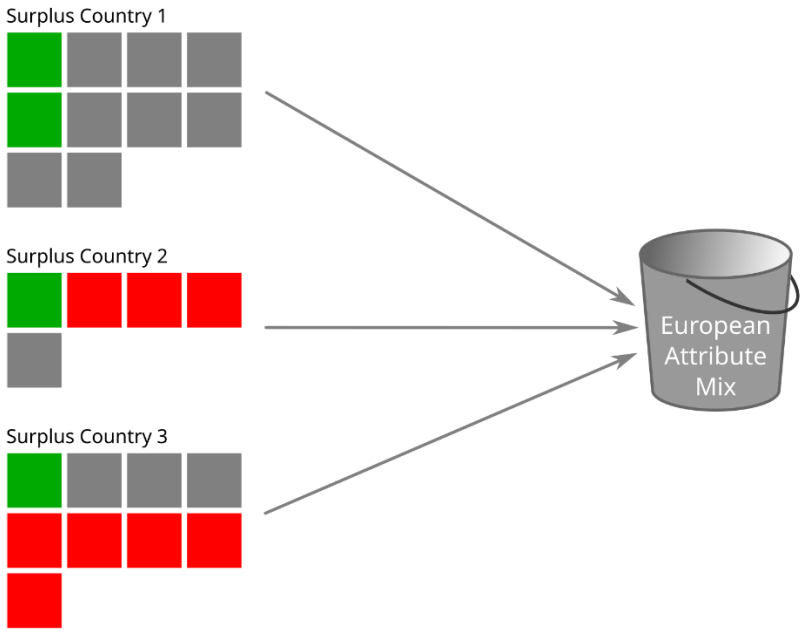

Figure 14: Bringing the surplus Attributes from all surplus Domains together in the EAM

The surplus attributes mirror the energy source distribution observed in the Attribute Balance. This EAM, as pool of leftover Attributes, has an essential function, as it fills the gaps of countries where there is a deficit of environmental Attributes after export.

Indeed, where the untracked consumption within one system boundary exceeds its Attribute Balance, it indicates an **attribute deficit**. In this scenario, the system boundary relies on the European Attribute Mix to supplement the deficit within its Domestic Residual Mix.

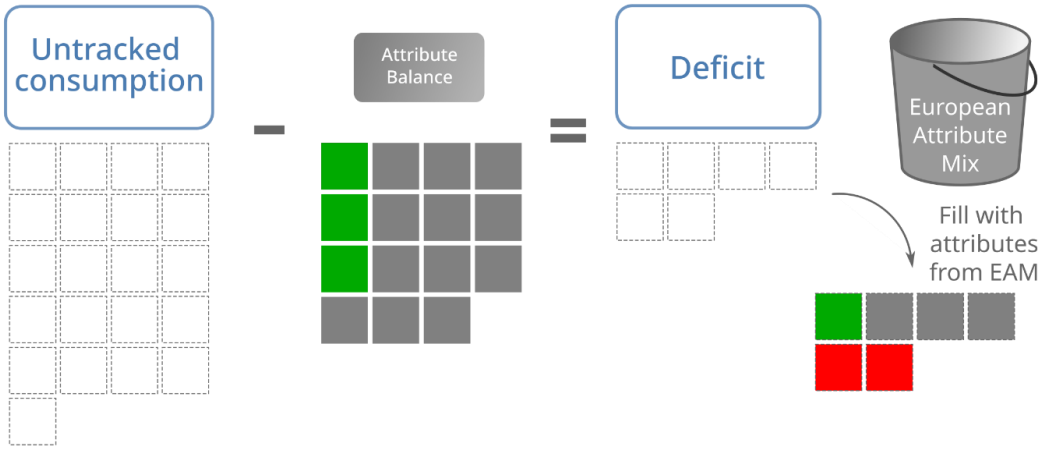

Figure 15: Visualisation of Deficit Attributes, and filling them with Attributes from the European Attribute Mix

The terms in the RM formula for "Physical Sources" and "consumption" should equal in overall quantity. However, in case exports/imports outside the calculation zone are not balanced with the exported/imported Tracking Instruments, the surpluses and deficits may not align in volume across the calculation zone as a whole. If the total volume in the European Attribute Mix would not cover the sum of all attribute deficits, it is important that the shortage is only made up using the assumption of fossil energy sources. If instead the EAM would be scaled up to the sum of all attribute deficits, this may lead to double counting.

3.5.6 Final Residual Mix: integration of corrections of the available volume with the tracked volume

In surplus countries, the composition of the Final Residual Mix mirrors the Attribute Balance. The surplus attributes are allocated to the European Attribute Mix (EAM) in the same proportions. Although the volume of attributes decreases between the Attribute Balance and the Final Residual mix, their respective shares remain unchanged (compare Untracked Consumption in Figure 14 and Final Residual Mix in Figure 16).

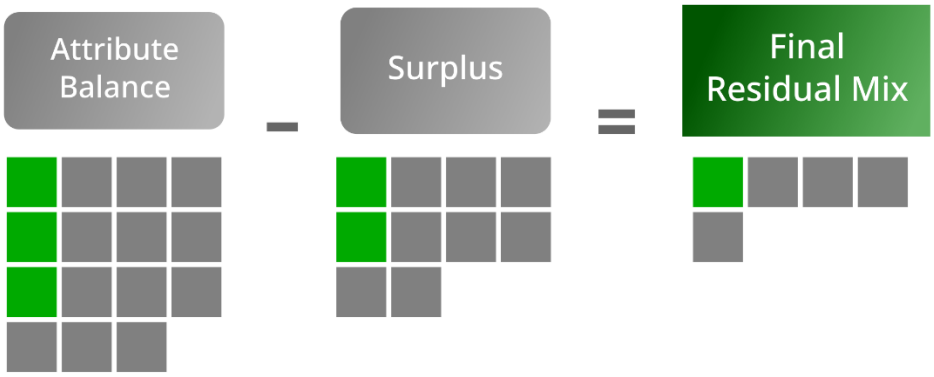

Figure 16: Final Residual Mix for Surplus Country

However, in deficit countries, the Attributes obtained from the EAM are added to those in the Attribute Balance to determine the Final Residual Mix, which covers the total quantity of untracked consumption (comparing Untracked Consumption from Figure 15 and Final Residual Mix in Figure 17).

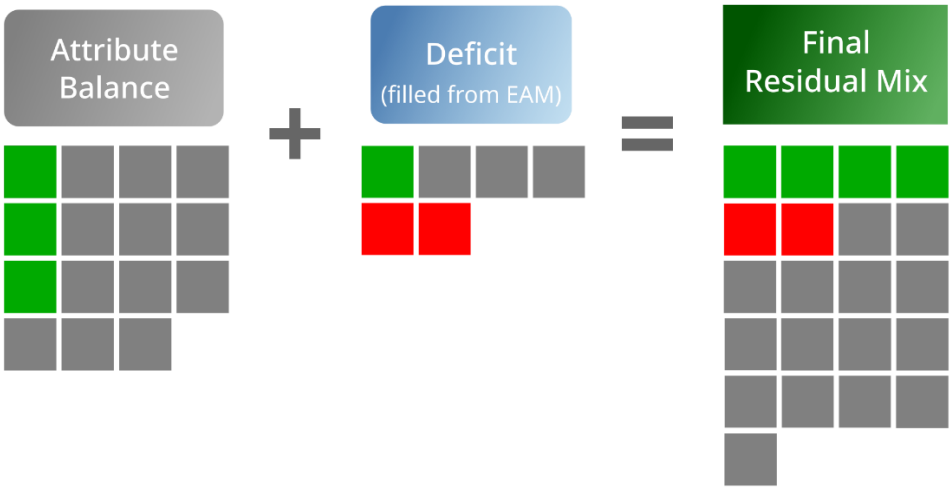

Figure 17: Residual Mix for Deficit Country

3.5.7 Total Supplier Mix: sum of all fuel mixes of all suppliers

The Total Supplier Mix or (TSM) refers to the overall volume of Attributes disclosed by all suppliers within a country, encompassing both explicitly tracked through Used Tracking Instruments and those disclosed through the Residual Mix. It is determined by aggregating the volume of Used Tracking Instruments per Attribute with the Final Residual Mix.

Figure 18: Total Supplier Mix: sum of Final Residual Mix and Used Tracking Instruments

The TSM volume equals the total gas consumption within the country, as Untracked Consumption is derived from subtracting Cancellations from the total consumption.

4 SIMPLIFIED ALTERNATIVE: FOSSIL RESIDUAL MIX WHILE DATA FLOWS ARE NOT YET SYNCHRONISED

As elaborated, the Residual Mix is the missing puzzle piece in a Disclosure framework of which the reliability needs protection by legislation. The previous chapter sets out the Residual Mix calculation for gases by following a formula similar to that used for electricity Residual Mix. In practice, there are some hurdles to take, in the areas of:

- Clarity on the instrument for Disclosure and prevention measures for double claims if the RM would contain renewable or low-carbon gases;
- Availability of data sources for the RM calculation;
- Timely publication of data input into the RM calculation.

Gas and hydrogen production for which no tracking instruments are issued, are however mostly based on fossil natural gas. As such, the Residual Mix could be considered “fossil natural gas”. Doing so, would eliminate the need for a Residual Mix calculation.

Pending solution of the availability and consistency of data sources, this approach can hold. It is clearer to provide a full fossil Residual Mix than to risk including double-claimed renewable gases in the Residual Mix, as long as the legal framework sustains some areas of confusion as explained in Section 3.4 The instrument for renewable gas consumption claims and as elaborated in 2020 in the FaStGO Task 4.2 report.

This approach provides clarity and avoids the risk of including double-claimed renewable gases until a clearer legal framework and reliable data sources are established. However, as renewable gas volumes increase, that may not all be disclosed to consumers, and especially where such volumes are transferred across borders, a more accurate Residual Mix calculation may become essential.

A more detailed Residual Mix calculation becomes really necessary when:

1) significant volumes of biomethane or hydrogen or low-carbon gases are injected into the gas grid without corresponding GOs or tracking into the UDB, or
2) when renewable gas and low-carbon gas production and the cross-border flows of their renewable attributes become substantial.

5 DATA SOURCES AND QUALITY / RM CALCULATION IN PRACTICE

5.1 Overview of data sources and available data inputs

To calculate the Residual Mix in practice, the terms in the formula, depicted by Figure 9, need to be populated by data. This chapter discusses which data sources can be used and assesses the quality of the available data provided by these data.

First, the data sources on the physical quantities of gases are discussed, depicted as ovals in Figure 9, followed by a discussion on the data sources on the number of energy attributes in all of the terms in Figure 9.

5.1.1 Data on physical quantities

Table 4 presents an overview of the data sources on physical quantities with characteristics of the available data inputs.

Table 4: Overview of data sources and available data inputs on physical quantities

SOURCE	Eurostat	IEA	GIE Aggregated Gas Storage Inventory	European Biogas Association	EU Hydrogen Observatory
Gas	Natural gas	Natural gas	Natural gas	Biogas / -methane	Hydrogen
Production	X	X		X	X
Import	X	X		X	X
Export	X	X		X	X
Storage	X	X	X		
Consumption	X	X		X	X
Time granularity	Monthly	Monthly	Daily	Annual	Annual
Geogr. coverage	EU 27	22 MS	EU	22 MS	24 MS
Available after	3,5 months	2 months	1 day	11 months	10 months
Cost	Free	Report: Free Database: 930 €	Free	Policy makers: free Others: 2067 €	Free

5.1.1.1 Eurostat data on Gas Supply, Consumption and Import-Export

Eurostat offers a dataset named "Supply, transformation, and consumption of Gas – monthly data[21]". The dataset is publicly available, free of charge.

The dataset covers **natural gas only**, it provides data on the following quantities:

Term in RM calculation	Data field in Eurostat-data
Production	Indigenous production

[21] https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_gasm__custom_9509653/default/table?lang=en

Imports – Exports	Imports – Exports + Transfer from other sources – International maritime bunkers
Storage	Changes in stock and in cushion gas
Consumption	Inland consumption

The dataset covers all EU Member States, EFTA-countries, EU candidate countries, and potential candidate countries. Data for the UK are available only for the period 1990-2019. Data is available per individual country and per month. The unit of measurement is million cubic meters and Terajoules (Gross Calorific Value). To utilise the data within the RM calculation, it will be needed to convert the units from million cubic meters or terajoules to multiples of MWh.

Eurostat disseminates short-term monthly data 1,5 months after the reference month, which still may show some data gaps. Within 3,5 months after the reference month, Eurostat disseminates a complete data set for the reference month.

5.1.1.2 International Energy Agency – Monthly Gas Data Service

The Monthly Gas Data Service contains monthly **natural gas** data for individual OECD countries[22]. The IEA published, based on these data, a monthly report on OECD Natural Gas Statistics. However, it is not clear whether 'natural gas' refers to fossil gas only or covers all natural gas compatible gases (including biomethane).

Term in RM calculation	Data field in IEA Monthly Gas Data Service	Monthly OECD Natural Gas Statistics
Production	Production	Indigenous production
Imports – Exports	Supply balances, trade (gaseous, LNG)	Imports (entries) – Exports (exits)
Storage	Stock changes	Stock changes
Consumption	Gross inland deliveries, own use and losses	Gross consumption

The units of the data are terajoules and (standard) cubic metres.

The databases, underpinning the IEA Monthly Gas Data Service, cover the period starting from January 1984 to current month with a time lag of 2 months for the most recent data (e.g. end-March data is available beginning June). The data are only available after subscription; the minimum annual fee is 930 € for one user.

The Monthly OECD Natural Gas Statistics provide natural gas balances for the month of publication – 4 (e.g. the report, published in June 2024, contains statistics of Feb 2024). Following periods are covered by the statistical report:

- The last statistical month (e.g. Feb 2024)
- The same month of the year before (e.g. Feb 2023)
- The quarter of the previous year (e.g. 4Q2023)
- The previous year (e.g. 2023)
- The year before (e.g. 2022)

[22] https://www.iea.org/data-and-statistics/data-product/monthly-gas-data-service-2#data-sets

Natural gas balances are provided for most of the EU Member States; the statistics do not include Bulgaria, Croatia, Cyprus, Malta and Romania. For some EU Member States, the origin of imports is provided as well.

The Monthly OECD Natural Gas Statistics is issued free of charge.

5.1.1.3 GIE – Aggregated Gas Storage Inventory

The GIE Aggregated Gas Storage Inventory (AGSI) provides information on the storage levels of all gas storage facilities in the EU (present in 18 EU Member States), Ukraine and the UK. A distinction is made between facilities for storing natural gas as gas and as LNG. Also aggregated data are provided per country.

The time granularity for the dataset is one day. The historical dataset allows to compare the quantity storage at the start of the year and at the end of the year. The unit of measurement for gas storage levels is TWh.

Term in RM calculation	Data field in GIE Aggregated Gas Storage Inventory
Production	(Not provided)
Imports – Exports	(Not provided)
Storage	Gas in storage
Consumption	(Not provided)

5.1.1.4 European Biogas Association – Statistical Report

The EBA Statistical Report[23] tracks the **biogas and biomethane** deployment across Europe. The annual report provides data for the different terms in the RM calculation, except for storage:

Term in RM calculation	Data field in EBA Statistical Report
Production	Production of biogas and biomethane / grid connected and off-grid (includes bio-CNG and bio-LNG)
Imports – Exports	Cross-border trade of biomethane
Storage	(Not provided)
Consumption	Renewables consumption and share of biogases

The report provides data for 27 countries, but the geographical coverage does not overlap with the EU; it does not include Bulgaria, Cyprus, Luxembourg, Malta and Romania and covers Norway, Serbia, Switzerland UK, Ukraine instead.

The Statistical Report on 2022 was published on 5 December 2023, so eleven months after the reference year.

The report is free of charge for members of EBA and for policy makers. Others need to purchase it for 2067€.

[23] EBA Statistical Report 2023 | European Biogas Association

5.1.1.5 EU Hydrogen Observatory

The European Hydrogen Observatory (EHO)[24] is an initiative from the Clean Hydrogen Partnership. Its aim is to strengthen and integrate EU scientific capacity, in order to accelerate the development and improvement of advanced clean hydrogen applications.

It publishes various reports to provide insights into the deployment of the hydrogen economy within the European Union. 'Report 1: The European hydrogen market landscape' provides statistics on 1) production and trade, 2) distribution and storage, 3) end-use, 4) costs of production and 5) technologies manufacturing. Alongside the reports that focus on key data, full datasets are made available as well.

The datasets provide annual data on the production, trade and consumption of **hydrogen**. The production data provide details on the type of hydrogen production technology, such as Electrolysis, Steam Reforming, Steam Reforming with Carbon Capture, by-product, … Yet, it is necessary that this level of detail is also provided for trade and consumption.

Data on storage of hydrogen are currently not yet available, as there is no storage facility for hydrogen operational yet. Data are provided for all EU Member States, except for three smallest ones: Cyprus, Luxembourg and Malta.

Term in RM calculation	Data field in EU Hydrogen Observatory
Production	Hydrogen production output by country with details on production technology
Imports – Exports	Imports – exports
Storage	(Not provided)
Consumption	Hydrogen demand

The data are publicly available free of charge. The statistical report on 2022 was published in November 2023, so 10 months after the reference period.

5.1.2 Data on number of energy attributes

Table 5 presents an overview of the data sources on the number of energy attributes (such as the energy source) with characteristics of the available data inputs.

Table 5: Overview of data sources and available data inputs on number of energy attributes

SOURCE	EECS® – Guarantees of Origin	ERGaR – Certificates of Origin	Union Database – Proof of Sustainability
Gas	Biogas / -methane	Hydrocarbon gases, biogas / -methane, hydrogen, other renewable gases	Gaseous fuels (biogas / -methane, hydrogen, …)
Import	X	X	
Export	X	X	
Issued	X		X

[24] Homepage | European Hydrogen Observatory (europa.eu)

Expire	X		
Cancel	X		X
Time granularity	Monthly	Quarterly	Monthly
Geographical coverage	5 MS	6 MS	EU27
Available after	(Not yet)	2 Months	(Not yet)
Cost		Free	

5.1.2.1 EECS® – Guarantees of Origin

While all EU Member States have a fully operational scheme for Guarantees of Origin for electricity, schemes for Guarantees of Origin according to the EECS® rules are in full development. Some EU Member States already have implemented such a scheme and maintain a registry, recording gas GOs that were issued, cancelled, transferred or expired: Austria, Czech Republic, Finland, Latvia and Spain. These numbers of GOs are input data for the Residual Mix calculation formula.

However, not all gas GO issuing bodies are yet approved members of the EECS® Gas Scheme to AIB, with some still elaborating their cross-border transfer processes. Aggregated statistics on gas GOs categorised by energy source are still under preparation.

AIB is preparing guidelines for its Scheme Members to provide monthly aggregated data on GOs per geographical Domain, per energy source, and per activity type in a single overview monthly. This will improve the data availability in the near future.

5.1.2.2 ERGaR – Certificates of Origin

While national gas GOs Schemes following the EECS® rules are in full development, market parties gather in the European Renewable Gas Registry (ERGaR)[25] as a European association dedicated to facilitating cross-border trade in renewable gas certificates.

These Certificates of Origin can be Guarantees of Origin as stated in the Renewable Energy Directive or other national certificates. For these other national certificates, ERGaR has adopted the term Certificates of Origin (CoO) to enable documentation of renewable gas injections. These certificates may hold the same information as a GO under Article 19 RED II but may not have been created by a national registry who has been appointed a “competent body”.

The ERGaR CoO Scheme is operated by the European Renewable Gas Registry (ERGaR) aisbl to facilitate the cross-border title transfer (ownership transfer) of CoOs between participating national biomethane registries. The Scheme provides harmonised rules on the issuance of CoOs and a protocol on the business processes for ownership transfer of CoOs from one country to another. In the scope of the Scheme are **hydrocarbon gases, hydrogen and biomethane**, as well as **other renewable gases** that have been injected into the natural gas network.

CoO registers are operational in eight countries: Austria, Denmark, Germany, Ireland, Lithuania, the Netherlands, Slovakia and the UK.

[25] https://www.ergar.org/

The statistics ERGaR publishes[26] only provide details on the total number of transfers per quarter and the energy quantity of biogas and biomethane these transfers represent. No details are provided on the share of GOs and CoOs. A collaboration with ERGaR is needed to collect more detailed statistics.

Note: at the time of writing this report, ERGaR doesn't publish import and export per country, only total aggregated import and export. The data can only be used if it is clear which country is importing and exporting which quantities. Currently that data is only available to the ERGaR members. ERGaR may publish such data over time but hasn't yet internally aligned on doing so.

5.1.2.3 Union Database – Proof of Sustainability

The Union Database for Biofuels (UDB)[27] is based on Clean Energy for all Europeans package and article 28(2) and (4) of the Renewable Energy Directive (RED II) to improve the traceability of gaseous and liquid fuels in Transport Sector with the objective to avoid double counting and mitigating the risks for irregularities and fraud.

For gaseous fuels, the EU gas network is considered as a single logistical facility from mass-balance perspective. Local networks are considered as a separate mass-balancing system. Any trades between networks must be reported to UDB as a trade transaction.

When injecting gaseous fuels into a network, Economic Operators (EO) or operators of a production unit must register injected monthly volume based on meter readings in their UDB account. After validation of these Proofs of Sustainability (PoS), the Economic Operators (EO) or operators of a production unit can transfer validated PoSs to any trader's account, to a gas final supplier account or to a large industrial consumer (with individual account in UDB).

Registration of consumption of energy units can be triggered by any of the EOs in possession of the PoS. The PoSs' unique identifiers are marked as "consumed and transferred to the national account of the consuming Member State" in UDB.

In case GOs have been issued for whole or part of the monthly volume, a reference between the UDB and the GO registry is established through a link between the accounts of the EO in both UDB and the GO registry. Linked GOs can be cancelled only through UDB upon their registration or withdrawal from the mass-balance system.

The Union Database for gaseous fuels is currently in development; it is planned to go live in November 2024. ANNEX VII describes the interaction with the Union Database on sustainable biofuels more in depth.

The UDB registers the quantities of gas injected in the grid with details on location and PoS and the quantities of gas consumed with details on location and PoS. This allows to generate reports on the number of PoS registered (issued) and withdrawn (cancelled). Transfer of PoS from one EU Member State to another are not registered as such. However, as the PoSs have unique identifiers, reports can be made on the number of PoS registered in one country and withdrawn in the other. PoSs do not expire, in contrast to GOs, hence, no data on expired PoS are available.

To conclude, a report with following data categories is needed from the data registered in the Union Database in order to feed the adequate calculation of the Residual Mix for gas:

[26] https://www.ergar.org/ergar-schemes/coo-scheme-statistics/
[27] Union Database for Biofuels (UDB) - About - Union Database for Biofuels Info-site - EC Public Wiki (europa.eu)

- Number of PoS registered per year for production of gases, per type of gas and per network type, in each of the EU Member States with details of the energy sources, and the number of those PoSs that corresponds to energy for which a GO is issued;
- Number of PoS withdrawn per year for consumption of gases, per type of gas and per network type, in each of the EU Member States, with details of the energy sources, accompanied by and the number of those PoSs that corresponds to energy for which GOs are cancelled, and the number of those PoSs that corresponds to energy for which GOs are issued, but for which the cancellation of that GO is not (yet) registered in the UDB;
- Number of PoS registered for production of gases in one EU Member State and withdrawn for consumption of gases in another EU Member State per year and per EU Member State of production and per Member State of Consumption.

5.1.3 Data surveys to national Disclosure competent bodies

The overview of the available data on the physical quantities and number of energy attributes reveals that not all EU Member States are covered by the data sources, discussed above. To compensate for these data gaps, data can be queried from the national authorities, such as energy agencies for data on production and consumption of low-carbon and renewable gases and competent Disclosure bodies for data on issued, expired and cancelled energy attributes. This builds on experience from the data collection mechanism for the current calculation process for the electricity Residual Mix.

While at pan-European level certain data is available, it is helpful if the members states provide, to the central calculation service provider of the EAM, the input they will use for their own Residual Mix calculation in exercise of their duty under RED art. 19.

It should be noted that some countries use a different dataset for a national Residual Mix than the data that is available to AIB, in this case, there will usually be discrepancies with the numerical RM calculation results from AIB. Indeed, AIB has no mandate to enforce the use of a harmonised Residual Mix. AIB annually queries the Disclosure competent bodies for numerical data related to their state, but when not receiving response, AIB bases its calculations on pan-European statistics like Eurostat and AIB GO statistics.

While at pan-European level certain data is available, it is helpful if the members states provide, to the central calculation service provider of the EAM, the input they will use for their own Residual Mix calculation in exercise of their duty under RED art. 19.

5.2 Data collection and calculation timeline

The Residual Mix calculation needs to deliver a calculation result in time. As recommended by the RE-DISS and FaStGO projects and learnt from current practices, the results are ideally available by the end of May of year Y+1 at the latest, so that the figures disclosing last year's energy sources can be included in supplier Disclosure publications latest from 1 July onwards.

Backcasting from there, this implies that statistical data must be available by 31 March of year Y+1, for it to be included in the reporting and calculation procedure for the RM. The upper part of Figure 19 depicts the timeline for the data collection process feeding the calculation of the Residual Mix. While this is the generally applied timeline for the RM for electricity, the same timeline is relevant for gases, given that supplier Disclosure obligations shouldn't refer to supply periods that are too far in the past.

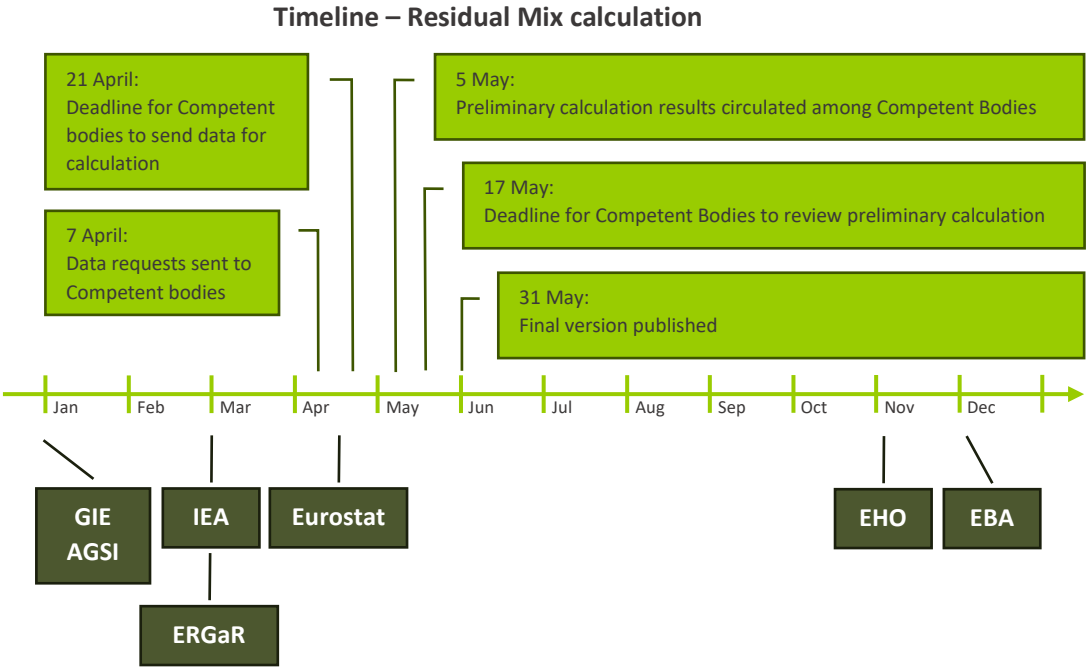

Figure 19: Timeline of the availability of data sources for RM calculation for gas versus timeline of RM calculation for electricity

It is therefore recommended that the data collection process feeding the calculation of Residual Mix for gas follows a similar timeline as for electricity and that the Residual Mix and supplier mix be available by 1 July. In this way, these data would be available not too long after the period of energy supply, which is instrumental in supporting the customers in making their supplier choices.

To facilitate this supplier's publication deadline of 1 July it requires the Residual Mix to be available by June 1st of that year, and the numerical data inputs to be collected in March and April so that Residual Mix calculations can take place and be consulted and confirmed in May.

However, when comparing this timeline with when the necessary data sources are available, one can observe a mismatch with the dates of publication of the statistical reports of the European Biogas Association (EBA) on the production, trade and consumption of biogas and -methane and of the European Hydrogen Observatory (EHO) on production, trade and consumption of hydrogen. Collaboration with these institutions or other providers of statistics is hence needed to improve the data collection and statistical report generating processes.

In addition, the AIB and the operator of the UBD also must organise their data handling processes in such a way that the necessary input data for the RM calculation are available by 21 April in Y+1.

6 SUPPLIER DISCLOSURE – THE FRAMEWORK IN WHICH THE RM IS USED

Ensuring transparency and reliability in the Disclosure of energy sources is critical for empowering consumers and preventing double claims. A robust legislative framework to prevent multiple claims of the same attributes and ensure the integrity of the Residual Mix Calculation. Besides those essential high -level framework aspects, this section includes guidelines for the accurate and consistent reporting of energy sources on gas supply bills, addressing the need for harmonised practices across different jurisdictions. They originate from the RE-DISS project, the AIB Disclosure Platform[28], CEER advice[29], and practical experience from Disclosure competent bodies.

6.1 Mention the energy sources on the bills

All gas supply bills should mention the energy sources, not limited to renewable and low-carbon gases. This comprehensive Disclosure allows consumers to understand the fuel mix of energy they are using. Mentioning also the non-renewable energy source mix on the bill, prevents consumers to assume being on a contract for renewable energy, when their supplier hasn't engaged to back this up with GOs.

6.2 Disclosure Statements

Domain GO schemes may provide additional rules related to the uniformity of Disclosure Statements. These could relate to the content, graphical representation or means of publication of such statements, e.g. provide that the supplier should inform the consumer of the origin of the supplied energy by means of the following parameters:

a. Informing on the mix of Energy Sources in:
    i. the specific energy product delivered to a consumer as agreed in the contract with that consumer (product/contract energy source mix) and
    ii. all energy of a specific Energy Carrier, as supplied by the supplier (supplier energy source mix for the Energy Carrier) and
    iii. all energy supplied by the supplier regardless of the Energy Carrier (overall supplier mix).
b. The level of detail of information regarding the Energy Source, which could be:
    i. Renewable, low-carbon, fossil, nuclear
    ii. A further breakdown of each of the above categories in:
        1. Renewable: Wind, solar, hydropower, biomass, geothermal, …
        2. Low-carbon: (to be further specified in an upcoming delegated act related to the recast Gas Directive)
        3. Fossil: Hard coal, Lignite (or Brown coal), Low-carbon, Oil, Unspecified and others.
        4. Nuclear.
    iii. A full listing of all Energy Sources energy sources as provided on the GO.

[28] https://www.aib-net.org/certification/disclosure-platform
[29] https://www.ceer.eu/documents/104400/-/-/832ddef0-87de-c539-38f8-ec4d6ce63269

c. Greenhouse gas emissions and radioactive waste corresponding to the supplied energy should be disclosed on the supplier and product/contract levels in direct relation to the energy source mix, which is being disclosed, and provision of comparison values;
d. Information on geographic origin;
e. Shares of energy that received public support;

Specifying a standardised format for the graphical representation of Disclosure statements. E.g. a pie chart/table/list. The example in the figure below from RE-DISS provides still relevant suggestions for a template Disclosure statement. (An example of real gas Disclosure statements from practice, is given in ANNEX IV.4 referring to actual figures on invoices of a gas supplier in Austria):

	Your Product "Green"	Average of your "Sample Supplier"	For comparison: [National] production mix
Nuclear	0,0%	15,0%	17,9%
Hard Coal	0,0%	11,0%	18,6%
Lignite	0,0%	24,0%	24,9%
Natural gas	0,0%	15,0%	13,7%
Other fossil	0,0%	10,0%	4,5%
of which oil	0,0%	0,0%	1,1%
of which unspecified & other	0,0%	0,0%	3,3%
Hydro power	85,0%	22,0%	3,0%
Other renewable	15,0%	3,0%	17,4%
of which wind	5,0%	1,0%	8,1%
of which biomass	10,0%	2,0%	5,0%
of which photovoltaic	0,0%	0,0%	3,2%
of which geothermal	0,0%	0,0%	0,5%
of which unspecified & other	0,0%	0,0%	0,6%
High-efficient cogeneration of electricity and heat	5,0%	7,0%	8,5%
CO_2 emissions	0 g/kWh	494 g/kWh	529 g/kWh
Radioactive waste	0 µg/kWh	450 µg/kWh	537 µg/kWh
The mark (◆) indicates the level of emissions of CO_2 and radioactive waste related to the fuel mix of your product and of the average fuel mix of your supplier compared to national average.			
Additional information with respect to your product **"Green"**	100% of this electricity production has been documented based on Guarantees of Origin.		
	85% of these Guarantees of Origin represent electricity production in [Country A]. 15% of these Guarantees of Origin represent electricity production in [Country B].		
	0% of this electricity production has received public support.		

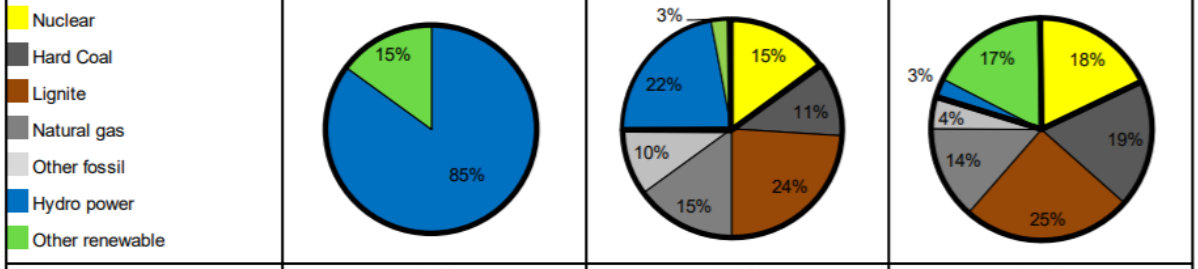

Figure 20: Mock-up for a Disclosure statement following basic recommendations by RE-DISS, co-funded by the Intelligent Energy Europe Programme of the European Union, see www.reliable-Disclosure.org

f. Specifying the means of publication of the Disclosure statement:
   i. The invoice: either any invoice or at least annually on an invoice,
   ii. The supplier's website
   iii. Any publicity means used by the supplier.
   iv. Etc.
g. Presentation of Disclosure information on a national platform.

6.3 Elements in the Disclosure framework for avoiding multiple claims

The Residual Mix needs to be based on the existing legislative and disclosure framework and enable Member States to avoid multiple claims of the same attributes.

a. This implies:
    i. Ensuring that suppliers provide fuel mix information on or with the bill and environmental information on the fuel mix at least in the form of information on reference sources, such as webpages.
    ii. Ensuring that the information provided by suppliers is presented in a comprehensible and, at a national level, clearly comparable manner.
    iii. Ensuring that the information provided by suppliers is reliable.
    iv. Nominating the regulatory authority or another competent national authority to supervise the reliability and comparability of this information.
b. A harmonised deadline for cancellation of GOs related to claims on the attributes of energy consumption in a preceding year is recommended, consistent with the broad implementation in the majority of Member States of the RE-DISS recommendation. In order to calculate a meaningful Residual Mix, which doesn't come with too much delay for usability and on the other hand allows for practical procedures to get finalised, a harmonised cancellation deadline could be set at 31 March of year X+1.
c. With a view to eliminate the need for a Residual Mix to be calculated, Member States could consider making the use of GOs mandatory for all energy supplied to final consumers.
d. Single tracking instrument for energy suppliers: ensure that all energy products offered by suppliers with claims regarding the origin of the energy (for example "renewable" or low-carbon energy) are based exclusively on cancelled GOs. No other tracking systems than the UDB and GOs should be allowed.

7 CONCLUSIONS AND RECOMMENDATIONS

The Residual Mix aims to be the cornerstone in a framework for reliable energy origin tracking. It provides the mix of energy sources in untracked commercial offers. Thus, to establish a relevant, accurate and timely residual mix, a detailed calculation is to be realized per system boundary, to account for non-tracked renewable energy and cross-border flows of tracking instruments.

This report has presented such an approach. It considers how various interacting regulatory requirements can be implemented in a consistent way, and how data flows can be defined, with a view to support a detailed calculation of the Residual Mix.

7.1 Two main options for the Residual Mix

Developing a Residual Mix calculation method for gases can follow two main approaches:

1. Detailed calculation of the Residual Mix, per system boundary, in order to account for non-tracked renewable energy and cross-border flows of tracking instruments; or
2. Assuming the Residual Mix is fossil natural gas.

This report elaborated on the first approach, on how various interacting regulatory requirements can be implemented in a consistent way, and how data flows can be defined, to support a detailed calculation of the Residual Mix.

7.2 Design criteria for a detailed calculation of the residual mix

When setting up the formula for a residual mix in detail, the following main high level design criteria are identified:

- Develop a Residual Mix per system boundary. This means a dedicated RM per Member State and a separate RM for natural gas over transmission and distribution systems, a separate RM for hydrogen transported over hydrogen networks, and a RM for gases that are not transported over any of the previously named systems, merely vehicle-transported gases, per mass-balancing system. In a first instance, a RM for natural gas transferred over the distribution and transmission systems in Europe is the first calculation exercise that is deemed feasible in regards of data availability;
- Follow the RM formula as set out in Section 3.5 Residual Mix calculation method;
- Take into account the tracking instruments that legally entitle for claiming renewable gas and hydrogen consumption, and consider the strength of the protection by their legal framework in preventing double claims;
- Elaborate the mix in at least the energy source categories: Renewable, low-carbon, other fossil and nuclear sources. Where possible, subcategorize at least the renewable sources, but also the fossil ones, to facilitate emission calculations per detailed energy source in future work (not included in this report).

7.3 Main challenges

This approach, aiming to produce accurate result, faces however several challenges:

i. Interacting regulatory requirements

a. It has to keep into account all regulatory requirements that direct the instruments for claims of renewable energy consumption. Developing the Residual Mix can only be done in a consistent manner, where there are sufficient controls over the tracking instruments used for renewable energy consumption. An overarching legislative framework needs to ensure consistency in the tracking instruments for different purposes, and/or the implementation of the rules has to be in a way that this consistency is there in practice.

ii. Numerical data
   a. Data sources have to be made available with the relevant level of detail and consistency,
   b. Timing: Data sources need to be available in time, being latest in March of the year following the monitored year.

iii. Consistent handling of inputs into, and outputs from, Energy Carrier conversion is essential for a robust Residual Mix calculation that prevents double consumption claims of renewable energy across different Energy Carriers. Therefore, this needs consistent approaches in the RM formulas for different Energy Carriers, across all Member States.

Interacting legal requirements are at least those on GOs, Union Database, RFNBOs, Gas Directive's Disclosure obligation on suppliers, corporate Disclosure obligation following CSRD-ESRS, traders' obligations to substantiate green claims (Green Claims Directive), CEN EN16325. In addition, more rules may develop over time.

7.4 Prerequisites

7.4.1 Timely availability of data

To allow consumers to make a well-informed supplier's choice, data on the supplier's and Residual Mixes need to be available shortly after the supply of the energy. Following the practices in place for electricity, it is recommended to have the supplier's fuel mixes ready by 1 July in the year following the year of supply.

That would need processes to ensure that statistical data is available by 31 March of the year Y+1 so that it can be included in the reporting and calculation procedure for the Residual Mix. This will allow the Residual Mix and supplier's energy mix to be available not too long after the period of energy supply.

7.4.2 Provide data with consistent and clear system boundaries

The Residual Mix needs to be calculated for clearly defined boundaries, such as geographical and energy system boundaries, and for selected Energy Carriers, such as natural gas and hydrogen. These boundaries and Energy Carriers should be set, as they are the building blocks for structuring the data sets, providing input to the Residual Mix calculation for gas.

7.4.3 Gross production and on-site consumption

The distinction between gross and net production should be consistently applied through the Residual Mix calculation formula and the available data sources. If a jurisdiction chooses to utilize gross

production, it's necessary to adjust the volumes to account for on-site consumption. This approach should be applied consistently across the jurisdiction's territory, for all terms in the Residual Mix calculation formula. In this case, production statistics reporting should encompass both gross production and on-site consumption (not only network-injection).

7.4.4 Categorising of energy sources

Implementing a consistent categorization system for energy sources within all inputs datasets for gas Disclosure and the RM, allows for a nuanced analysis of the gas supply mix. By categorizing energy sources into renewable, low-carbon, and fossil and nuclear fuel categories, it allows for an accurate picture of production and import-export figures, if these categories are defined consistently everywhere. Further subcategorization is welcomed however for more granular emission accounting.

7.4.5 Harmonise input data definitions and calculation methods

When developing the relevant data sources per energy source category, per type of gas, per system boundary and per geographic origin and possible further detail, the data definitions and/or methodologies used shall be synchronised and interoperable across the EU. Using the same methodology everywhere, and consistent in- or exclusion of the different stages in the chain of custody leads to more trustworthy Disclosure practices.

7.4.6 Harmonise the tracking system for gas attributes

While some EU Member States are implementing a GO scheme for gas, the Union Database is in full development and market players are developing commercial tracking systems. There is a need for a harmonisation and/or synchronisation between these different systems. These actions will help to promote transparency in the data collection method, including clear documentation and methodologies used. This will prevent double counting and in turn increase trust and reliability in the data.

7.4.7 Harmonise Disclosure rules and Residual Mix Calculation method

Harmonisation of Disclosure practices is necessary to ensure that actors in different roles and countries understand and apply the same principles. This is essential to prevent double claims.

The method for determining the origin of energy and the Residual Mix must be synchronised between interconnected markets. This will ensure that the Disclosure of the renewable origin of gas is reliable and transparent, further empowering consumers to make informed energy choices.

7.5 Current status

Today, the actual implementation of many of the rules in recent legislation impacting claims on renewable gas consumption, is not yet fully established, so the consistency of it cannot yet be confirmed by practice. Also, currently the numerical data is not yet systematically available to cover accurate Residual Mix calculation over all Member States of the full European Union and interacting natural gas and hydrogen market. Where it is available, the timely availability still needs to be worked on. Further, practice has shown that coming to consistent implementation of Residual Mix calculation methods in all Member States, can take time, and lacks a formal organisation that can ensure such consistency and coordinated roll-out.

Currently, it hence cannot yet be confirmed whether the EU is ready for a detailed calculation method for a Residual Mix for gases.

7.6 Simplicity

Therefore, it should be considered whether a temporary alternative approach can serve until the conditions are established. This means the Residual Mix for gaseous Energy Carriers to be assumed constituting from fossil natural gas.

When transforming the energy sources of the RM into emissions of the RM, it will however need further subcategorization of the fossil energy sources, especially where there would be a big share of fossil gases with higher emission intensity than methane. Especially for imported hydrogen based on coal-based electricity this is an attention point. As long as volumes for those are negligible, this may be considered marginal.

The main reasons for considering the Residual Mix to be fossil natural gas are:

1. It prevents double counting of renewables for sure, as the RM then does not include any renewables;
2. The market generally assumes that renewable gases will almost always be tracked with explicit tracking towards consumers, so the share of renewables in the RM is anyway assumed to be very low for gases;
3. It is simple and easy to explain to consumers.

To conclude, one can assume that the Residual Mix in practice will predominantly consist of fossil natural gas, hence the proposed simplified approach may work until the conditions for the more elaborated Residual Mix calculations are fulfilled.

7.7 Call for developing data sources

In order to prepare for emission-accounting of gas consumption claims, it is recommended to coordinate development of consistent data sources, in order to ensure an accurate and timely Residual Mix calculation in the future.

ANNEX I GLOSSARY AND REFERENCES

I.1 List of Abbreviations

Abbreviations	Full form
AIB	Association of Issuing Bodies – www.aib-net.org
B&C	Book and Claim
BPR	Best Practice Recommendations
CEER	Council of European Energy Regulators – www.ceer.eu
CoO	Certificate of Origin - https://www.ergar.org/ergar-schemes/ergar-coo-scheme/
DA	Delegated Act
DCB	Disclosure Competent Body
EECS®	The European Energy Certificate System
EDC	Ex-Domain Cancellation
FaSTGO	Facilitating Standards for Guarantees of Origin – project page: https://www.aib-net.org/news-events/aib-projects-and-consultations/fastgo
GO	Guarantees of Origin
MB	Mass Balance
MS	Member State/s
PoS	Proof of Sustainability
PPA	Power Purchase Agreement
RE-DISS	Reliable Disclosure System
REGADISS	Reliable Gas Disclosure System – project page: www.aib-net.org/regadiss
REGATRACE	Renewable Gas Trade Centre in Europe – project page: www.regatrace.eu
RFNBOs	Renewable Fuels of Non-Biological Origins
RM	Residual Mix
RTS	Reliable Tracking Systems
UDB	Union Database - https://wikis.ec.europa.eu/display/UDBBIS
VS	Voluntary Schemes

I.2 List of Referenced EU Legislation

Abbreviation	Reference name	Weblink
IEM	Internal Energy Market (2019/944)	http://data.europa.eu/eli/dir/2019/944/oj
Recast Gas Directive	PE_104_2023_REV_1, 13 June 2024	https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CONSIL:PE_104_2023_REV_1
REDII	Renewable Energy Directive (2018/2001)	http://data.europa.eu/eli/dir/2018/2001/oj
REDIII	Recast Renewable Energy Directive (2023/2413)	http://data.europa.eu/eli/dir/2023/2413/oj

RFNBO DA	Delegated Act 2023/1184	http://data.europa.eu/eli/reg_del/2023/1184/oj
GHG DA	Delegated Regulation 2023/1185	http://data.europa.eu/eli/reg_del/2023/1184/oj
CSRD	Corporate Sustainability Reporting Directive (2022/2646)	http://data.europa.eu/eli/dir/2022/2464/oj
ESRS	European Sustainability Reporting Standards	http://data.europa.eu/eli/reg_del/2023/2772/oj
Green Claims	Green Claims Directive COM (2023) 166	https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2023%3A166%3AFIN

I.3 Glossary

Term	Meaning
Account (source: Draft CEN EN 16325; May 2024)	Record on a registration database relating to a particular Account Holder in which GOs are held.
Attribute (source: Draft CEN EN 16325; May 2024)	Data field specifying the characteristics of an energy unit produced by a Production Device in terms of the input(s) used and/or the details (standing date) of the Production Device and Production Process.
Cogeneration (source: Draft CEN EN 16325; May 2024)	energy conversion from the same source into two or more utilised forms of energy within one common controlled process. Note 1 to entry: combined heat and power is a specific implementation of cogeneration used for the simultaneous production of heat and electricity.
Cancel (source: Draft CEN EN 16325; May 2024)	Mark, at the request of the holder of the account on which it is held, a GO as having been used for the purpose of Disclosure of consumed energy, and to prevent it from subsequently being: - Transferred to another Account, or - Marked again in this way.
Cancellation Statement (source: Draft CEN EN 16325; May 2024)	Electronic, non-transferrable receipt which provides evidence of the cancellation of one or more GOs for the purpose of Disclosure of the Attributes of those GOs for the beneficiary or beneficiaries of the cancellation.
Competent Body (source: Draft CEN EN 16325; May 2024)	Body duly authorised under the laws and regulations of any state (and, as the case may be region) to exercise or discharge any legislative, governmental, regulatory, administrative, or

	supervisory function associated with the administration of Domain GO scheme.
Conversion Issuance (or GO Conversion Issuance) (source: Draft CEN EN 16325; May 2024)	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 (3.47) have been cancelled
Disclosure (source: Draft CEN EN 16325; May 2024)	Provision of information to a final customer on the share or quantity of the energy supplied to them as having specific Attributes.
Disclosure Statement (source: Draft CEN EN 16325; May 2024)	Information provided as a result of Disclosure
Domain (source: Draft CEN EN 16325; May 2024)	Geographic area containing Production Devices with respect to which an Issuing Body is responsible for Issuing GOs for the relevant Energy Carrier.
Economic Operator (source: 2014/24/EU[30])	Any natural or legal person or public entity or group of such persons and/or entities, including any temporary associations of undertakings, which offers the execution of works and/or a works, the supply of products or the provision of services on the market
Energy Carrier (source: Draft CEN EN 16325; May 2024)	substance carrying the energy content of an *Energy Type (where Energy Type is defined as: substance 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, being electrical energy, gas or heating and cooling*
Energy Carrier Conversion (source: Draft CEN EN 16325; May 2024)	production of an energy carrier in a production device from one or more inputs including at least one other energy carrier
(source: EECS® Rules release 8 v1.8)	The transfer of energy carried by one type of energy carrier to another type of energy carrier.
Energy Storage or Storage (source: Draft CEN EN 16325; May 2024)	Device or system that is used to store energy, where the Energy Carrier injected into that device or system is the same as the Energy Carrier that flows out of it.
European Attribute Mix (source: RE-DISS II[31])	The EAM is a calculatory pool of surplus available Attributes in Residual Mixes and is needed for reliable coordination of Residual Mix calculation in Europe. EAM results from surpluses of available Attributes compared to untracked consumption in surplus countries. The EAM is used to cover deficits of available Attributes compared to untracked consumption in deficit countries.

[30] http://data.europa.eu/eli/dir/2014/24/oj
[31] https://www.aib-net.org/sites/default/files/assets/facts/residual-mix/RE-DISSII_RM_EAM_Calculation-Methodology.pdf

European Energy Certificate System or EECS® (source: EECS® Rules Release 8 v1.6)	The integrated European framework for the issuing, registration, transfer, Cancellation, and other processing of Certificates arising as a consequence of the implementation of the provision of the EECS® Rules. https://www.aib-net.org/eecs
Expiry (source: CEN EN 16325; May 2024)	Cessation of a GO being eligible for transfer or cancellation, as a consequence of the passage of a given period of time since the production of the associated energy.
Facilitating Standards for Guarantees of Origin or FaSTGO (source: Association of Issuing Bodies)	FaSTGO is a project that provided expert advice to the European Commission DG ENER. Terms or reference N° 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
GO issuing request (source: Draft CEN EN 16325; May 2024)	Request by the authorised representative of Production Device to an Issuing Body for the Issue of GOs in respect of that Production Device and a specific period of time.
Guarantees of Origin or GO (source: Draft CEN EN 16325; May 2024)	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.
Issue (source: Draft CEN EN 16325; May 2024)	Process of creating (as a GO) an account, i.e. a record in a Registration Database
Issuing Body (source: Draft CEN EN 16325; May 2024)	Competent body or competent body's 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 cancellations of GOs
Low-carbon Gas (source: Recast Gas Directive)	the part of gaseous fuels in recycled carbon fuels as defined in Article 2, point (35), of Directive (EU) 2018/2001, low-carbon hydrogen and synthetic gaseous fuels the energy content of which is derived from low-carbon hydrogen, that meet the greenhouse gas emission reduction threshold of 70 % compared to the fossil fuel comparator for renewable fuels of non-biological origin set out in the methodology adopted pursuant to Article 29a(3) of Directive (EU) 2018/2001
Production Device (source: Draft CEN EN 16325; May 2024)	Separately measured device or group of devices that yields one or more outputs from one or more inputs, with one specific technology type.

Proof of Sustainability (source: RED III)	a means of evidence showing the compliance of an amount of biofuels, bioliquids and biomass fuels with the sustainability and greenhouse gas emissions saving criteria. These criteria are laid down in REDIII Art. 29. REDIII also introduced Art. 29a, which adds sustainability criteria for RFNBOs and recycled carbon fuels. The verification of compliance with these criteria is delegated to Voluntary Schemes in REDIII Art. 30.
Public Support (source: Draft CEN EN 16325; May 2024)	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
Registration Database (source: Draft CEN EN 16325; May 2024)	Database operated by an issuing body or its agent, comprising: - accounts and the GOs in those accounts. - 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 - standing data of GOs which have been transferred out of that registration database.
Renewable Fuel of non-biological Origin or RFNBO (source: 2023/2413 EU[32])	Liquid and gaseous fuels the energy content of which is derived from renewable sources other than biomass
Renewable Gas (source: Recast Gas Directive)	Biogas defined in art 2, point (28) of Directive 2018/2001, including biogas that has been upgraded to biomethane, and renewable fuels of non-biological origins ('RFNBOs') as defined in art 2, point (36) of that Directive
Residual Mix or Residual Energy Mix (source: 2018/2001 EU[33])	The total annual energy mix for a Member State, excluding the share covered by cancelled Guarantees of Origin Practical implementation for electricity: https://www.aib-net.org/facts/european-residual-mix
Tracking Instruments	For the ease of the text flow, this text uses the term Tracking Instruments to refer collectively to GOs and other Reliable Tracking Systems (RTS). The latter would only apply where protection

[32] http://data.europa.eu/eli/dir/2023/2413/oj
[33] http://data.europa.eu/eli/dir/2018/2001/oj

	measures for the reliability are in place. Section 3.4 instrument for renewable gas consumption claims elaborates on the instruments acknowledged for tracking.
Withdraw (source: Draft CEN EN 16325; May 2024)	Correction by an issuing body of an error with regard to a GO held in its registry by removal of that Go from an account, or through amendment of its status in a way that it is no longer transferable and can no longer be cancelled.

I.4 Bibliography

This report in REGADISS builds on work done in other projects and groups. References are made throughout the document, yet the main preceding work is the following:

REDISS

EECS®: https://www.aib-net.org/eecs

- EECS® Rules: https://www.aib-net.org/eecs/eecsr-rules
- Subsidiary Documents: https://www.aib-net.org/eecs/subsidiary-documents
- Fact Sheets: https://www.aib-net.org/eecs/fact-sheets
- Best Practice Recommendations: https://www.aib-net.org/eecs/best-practice-recommendations

FASTGO: https://www.aib-net.org/news-events/aib-projects-and-consultations/fastgo

- List of project deliverables: https://www.aib-net.org/news-events/aib-projects-and-consultations/fastgo/project-deliverables

REGATRACE: https://www.regatrace.eu/

- Work packages: https://www.regatrace.eu/work-packages/

CEN EN16325 drafting process

CEER Advice on trustworthy green offers: https://www.ceer.eu/documents/104400/-/-/832ddef0-87de-c539-38f8-ec4d6ce63269

“Increased Ambitions Study”:

Technical support for RES policy development and implementation: delivering on an increased ambition through energy system integration” from Trinomics , E3-Modelling, Artelys, and Ludwig-Bölkow-Systemtechnik GmbH (LBST)

https://data.europa.eu/doi/10.2833/86135 - referencing here mainly Annex B “Improve Energy System Integration” Section 3.

ANNEX II FORMULA FOR THE RESIDUAL MIX FOR THE ELECTRICITY SECTOR

When the conditions for reliable Disclosure are in place, the formula from the electricity Residual Mix method (see Figure 21) can be applied.

The methodology starts with the calculation of domestic Residual Mix for a country. This step involves determining the availability of the attributes and considering the imports and exports from outside the calculation area. It then determines whether there is surplus or deficit of Attributes, considering environmental indicators, and negative balances.

The next step is to establish the European Attribute Mix or EAM. This step determines which countries have a surplus and establishes the Final Residual Mix in these countries. Following this, EAM is created. Finally, the Residual Mix is established in the deficit countries. The final step of the methodology is to establish Total Supplier mix which is done by adding the Cancelled attributes to the Residual Mix.

This method of calculating Residual Mix has been widely implemented and accepted.

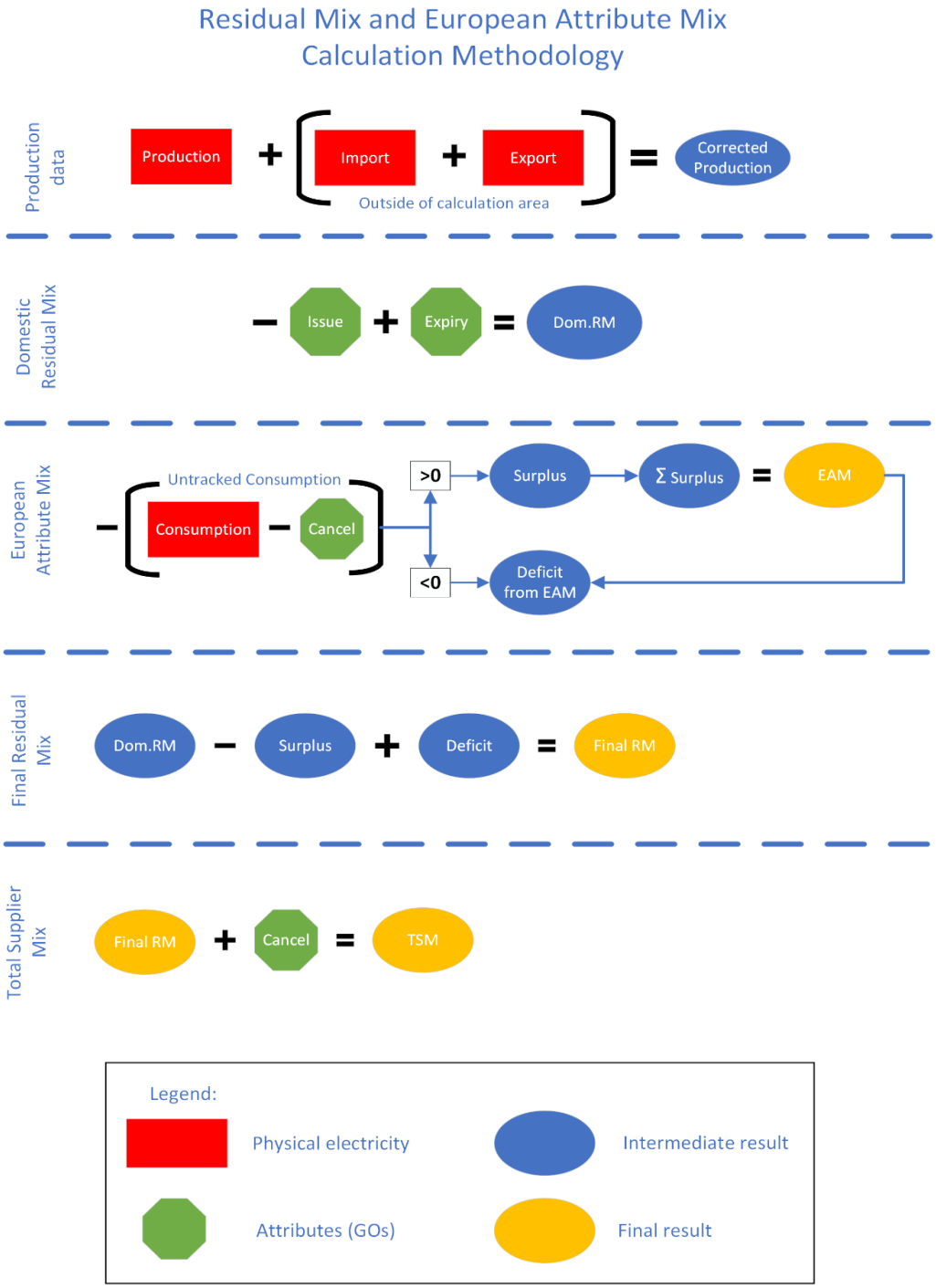

Figure 21: Calculation methodology for the Electricity Residual Mix

ANNEX III RELEVANT EXCERPTS FROM CSRD AND ESRS

III.1 Links to the legislation

CSRD: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022L2464
ESRS: Delegated regulation - EU - 2023/2772 - EN - EUR-Lex (europa.eu)

III.2 Disclosure of energy consumption and mix

Disclosure Requirement E1-5 – Energy consumption and mix, imposes the following:

35 The undertaking shall provide information on its energy consumption and mix.

36 The objective of this Disclosure Requirement is to provide an understanding of the undertaking's total energy consumption in absolute value, improvement in energy efficiency, exposure to coal, oil and gas-related activities, and the share of renewable energy in its overall energy mix.

37 The Disclosure required by paragraph 35 shall include the total energy consumption in MWh related to own operations disaggregated by:

(a) total energy consumption from fossil sources (footnote 33);
(b) total energy consumption from nuclear sources;
(c) total energy consumption from renewable sources disaggregated by:
i) fuel consumption for renewable sources including biomass (also comprising industrial and municipal waste of biologic origin), biofuels, biogas, hydrogen from renewable sources (footnote 34), etc.;
ii) consumption of purchased or acquired electricity, heat, steam, and cooling from renewable sources; and
iii) consumption of self-generated non-fuel renewable energy.

38 The undertaking with operations in high climate impact sectors shall further disaggregate their total energy consumption from fossil sources by:

(a) fuel consumption from coal and coal products;
(b) fuel consumption from crude oil and petroleum products;
(c) fuel consumption from natural gas;
(d) fuel consumption from other fossil sources;
(e) consumption of purchased or acquired electricity, heat, steam, or cooling from fossil sources;

39 In addition, where applicable, the undertaking shall disaggregate and disclose separately its non-renewable energy production and renewable energy production in MWh (footnote 36).

Footnote 33

This information supports the information needs of financial market participants subject to Regulation (EU) 2019/2088 because it is derived from a mandatory indicator related to principal adverse impacts as set out by indicator #5 in Table I of Annex I of Commission Delegated Regulation (EU) 2022/1288 with regard to Disclosure rules on sustainable investments ("Share of non-renewable energy consumption and production"). The breakdown serves as a reference for an additional indicator related to principal adverse impacts as set out by indicator #5 in Table II of the same Annex ("Breakdown of energy consumption by type of non-renewable sources of energy").

Footnote 34

Compliant with the requirements in delegated acts for hydrogen from renewable sources: Commission Delegated Regulation of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin; and Commission Delegated Regulation of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a minimum threshold for greenhouse gas emissions savings of recycled carbon fuels and by specifying a methodology for assessing greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin and from recycled carbon fuel.

Footnote 36

This information supports the information needs of financial market participants subject to Regulation (EU) 2019/2088 because it is derived from a mandatory indicator related to principal adverse impacts as set out by indicator #5 in Table I of Annex I of Commission Delegated Regulation (EU) 2022/1288 with regard to Disclosure rules on sustainable investments ("Share of non-renewable energy consumption and production").

ESRS – Appendix A – Application Requirement 32 further specifies:

When preparing the information on energy consumption required under paragraph 35, the undertaking shall:

(…)

(j) adopt a conservative approach when splitting the electricity, steam, heat or cooling between renewable and non-renewable sources based on the approach applied to calculate market-based Scope 2 GHG emissions. The undertaking shall only consider these energy consumptions as deriving from renewable sources if the origin of the purchased energy is clearly defined in the contractual arrangements with its suppliers (renewable power purchasing agreement, standardised green electricity tariff, market instruments like Guarantee of Origin from renewable sources in Europe (footnote 50) or similar instruments like Renewable Energy Certificates in the US and Canada, etc.).

Footnote 50

Based on 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.

III.3 Disclosure of Emissions

Companies are obliged to disclose their emissions according to "Disclosure Requirement E1-6 – Gross Scopes 1, 2, 3 and Total GHG emissions".

This implies they shall report Scope 1, 2, 3 gross emissions and total GHG emissions. The Scope 2 GHG gross emissions intended to provide an understanding of the indirect impacts on climate change caused by the undertaking's consumed energy whether externally purchased or acquired. The reporting on gross Scope 2 GHG emissions required shall include both methods:

- The gross **location-based** Scope 2 GHG emissions in metric tonnes of CO_2eq; **and**
- The gross **market-based** Scope 2 GHG emissions in metric tonnes of CO_2eq,

also known as "dual reporting."

These reporting methods are described as follows:

- ***Location-based*** *method quantifies Scope 2 GHG emissions based on average energy generation emission factors for defined locations, including local, subnational, or national boundaries.*

and

- ***Market-based*** *method quantifies Scope 2 GHG emissions based on GHG emissions emitted by the generators from which the reporting entity contractually purchases electricity bundled with instruments, or unbundled instruments on their own.*

The calculation guidance in Application Requirement 45 (Appendix A) states:

When preparing the information on gross Scope 2 GHG emissions required under paragraph 49, the undertaking shall:

(d) (…) Market-based method quantifies Scope 2 GHG emissions based on GHG emissions emitted by the generators from which the reporting entity contractually purchases electricity bundled with instruments, or unbundled instruments on their own (GHG Protocol, "Scope 2 Guidance", Glossary, 2015); in this case the undertaking may disclose the share of market-based scope 2 GHG emissions linked to purchased ***electricity bundled with instruments such as Guarantee of Origins*** *or Renewable Energy Certificates. The undertaking shall provide information about the share and types of contractual instruments used for the sale and purchase of energy bundled with Attributes about the energy generation or for unbundled energy Attribute claims.*

ANNEX IV EXISTING GUIDANCE ON DISCLOSURE BY SUPPLIERS

IV.1 CEER Advice on Green Offers

CEER advises in its recent advice "Guidelines of Good Practice for Trustworthy Information on Green Offers and Consumer Protection Against Misleading Marketing ("Greenwashing")[34]" on Disclosure of renewable gas (Recommendation 4-5-6-7 (p21-24) in Section 6.2) to base consumer information on the origin of gases on gas GOs under the supervision responsibility of the Member States. CEER has developed recommendations involving the Disclosure system and its main instrument, the GO. This paragraph highlights the aspects that are most relevant for the scope of REGADISS.

IV.1.1 GOs should be used as the only instrument for tracking renewable characteristics

Recommendation 4:

MS should have a GO system for: (i) electricity; (ii) gas, including hydrogen; or (iii) heating or cooling. For this purpose, national GO system convergence should be encouraged so that GOs are easily tradable across MS. When and where available, GOs should be used as the only instrument for tracking the characteristics of energy sources in offers within Disclosure systems, in particular those marketed as "green," including in the framework of a PPA or any contract with a renewable production plant (e.g. EU solar energy). In the absence of a certified GO, the offer cannot be marketed as "green".

IV.1.2 The cooperation of competent authorities for Disclosure should be enhanced

Recommendation 5:

GOs should be used as a basis for further harmonisation of Disclosure systems. An assessment of the use of GOs in electricity should be done at national and European level to identify improvements that could be made to the existing GO system in electricity, as well as best practices that can be applied to: (i) gas, including hydrogen; or (ii) heating or cooling. Good practices identified in the electricity Disclosure system should be extended to other energy Disclosure systems. The cooperation of competent authorities for Disclosure should be enhanced irrespective of the form of energy disclosed. The use of a common platform should be investigated.

IV.1.3 Make customers aware

Recommendation 6:

Further harmonisation of the existing Disclosure systems for electricity, and the introduction of a harmonised system for all types of energy on a European level, should make the systems more reliable and efficient. The competent bodies for Disclosure should ensure that the utmost is done to make customers aware of the information that is available to them regarding the energy with which they are supplied. To foster trust in Disclosure systems, customers should easily be able to find clear information about the functioning of these systems. The publication of an annual Disclosure report by the relevant competent body is a good practice that can further increase transparency in terms of the origin of supplied energy at national level.

[34] https://www.ceer.eu/documents/104400/-/-/832ddef0-87de-c539-38f8-ec4d6ce63269

IV.1.4 Full Disclosure: Cancelling GOs for all consumption is more consistent and reliable

Recommendation 7: In order to make the Disclosure information for customers more coherent, efficient and reliable, it is worth considering whether the issuing of GOs should be extended to all sources of electricity, including non-renewable sources. Full Disclosure, meaning the cancellation of GOs for all consumption, would help to make the Disclosure system more consistent and reliable, as well as to provide opportunities for marketing energy products based on specific non-renewable sources in a trustworthy manner. A single, coherent and properly designed system addressing all energy generation, from all sources (renewable and non-renewable), has the potential of reducing administrative burdens and costs. In order to avoid imposing an administrative burden and costs on energy producers, it could, as a first step, be introduced on a voluntary basis.

IV.1.5 Residual Mix needs to be calculated in harmonised way

Recommendation 7 (continued): Where full Disclosure is not technically feasible or cost-efficient, a Residual Mix should be determined at national level. The methodology to calculate the Residual Mix should be harmonised across all participating countries in the interconnected energy market, per Energy Carrier.

Another positive step would be to collect the different existing methodologies used to calculate the Residual Mix, so that a common harmonised methodology per Energy Carrier could be selected or built that could be shared and used across all participating countries.

Reflection

Harmonising methodologies for calculating the Residual Mix over the different European countries taking part in the single market, will ensure improved data quality, consistency and accuracy in energy reporting. It enhances the transparency in the energy market by providing a consistent method for calculating the Residual Mix.

IV.1.6 Considerations for Implementing Full Disclosure Systems

CEER observes "*flaws of having different GO and Disclosure systems functioning all together within a common European electricity market*".

CEER further elaborates:

Although the Electricity Directive leaves it up to MS to implement, having a full Disclosure system would help guarantee the consistency and reliability of the Disclosure system and should be considered as a goal to aim for. However, as it may require major changes and time for a MS to adopt a full Disclosure system, where full Disclosure is technically not feasible or not cost-efficient, the MS should take into consideration the opportunity to have a Residual Mix defined at national level.

IV.1.7 Challenges for energy Disclosure identified by CEER

CEER identified several challenges for energy Disclosure. A representative from CEER presented these at the meeting of the Disclosure Platform on 13 March 2024, and identified the following challenges:

- Inconsistencies in Disclosure timeframes and deadlines across MS lead to delay and lack of transparency. These differences can delay the calculation of the cross-border supplier mix for up to two years.

- The lack of a publicly accessible official list of Disclosure authorities impedes consumer access. CEER feels such a list could facilitate cooperation and information exchange among authorities (DG ENER website).
- The methodologies used for the energy Disclosure vary, thereby posing challenges. Certain MS mandate the matching of production and consumption years, while other do not impose such requirements.
- The methodologies for assessing the environmental impact of electricity supplied are also different.
- Categorisation of the energy sources provided in Disclosure figures lacks harmonisation.
- EU legislation does not define or outline the methodology for Residual Mix. Some MS discard the renewable fraction of the Residual Mix, while others do not.
- Low-Carbon gases do not systematically receive GOs, how to treat them consistently in the Residual Mix, given the RED definition of Residual Energy Mix that only excludes GOs?
- Regarding on-site (self) consumption, some MS issue GOs for renewable energy produced and consumed on the same site. However, most MS do not issue GOs for self-consumed energy. Several MS don't allow import of GOs issued for self-consumed energy.

IV.2 RE-DISS: Best Practice Recommendations for Disclosure

IV.2.1 What is RE-DISS

The first report of this REGADISS project, analysing the current legal framework and methodologies, elaborates on the RE-DISS project, its history and its main outcomes. Here below we list some main takeaways of this electricity Disclosure focused project that are also relevant for gases.

IV.2.2 Best Practice Recommendations for Disclosure from RE-DISS

The section outlines the Best Practice Recommendation (BPR) from the Reliable Disclosure Systems for Europe (RE-DISS). These BPRs serve as guidelines for the issuance, tracking, and cancellation of GOs. They also address the calculation of Residual Mix and the role of Reliable Tracking System (RTS).

Important takeaways from electricity Disclosure recommendations that are equally relevant for gases, are listed here:

RE-DISS BPR §2

a) If possible, the issuing of GOs should be done without delay after the end of each production period.
b) Wherever possible, the issuing of GOs for energy produced in year X should be done at the latest by 31 March X+1.

Note that the draft EN16325 revision installs the obligation on issuing bodies to issue the GOs within one month after the end of the production period or after receipt of the issuance request, whichever is the latest. The point is that GO issuance is recommended to take place as soon as practicable possible, with a view of making GOs available to the market in accordance with the consumption period that corresponds to the Disclosure supervision period.

RE-DISS BPR §3

> *a) The lifetime of GOs should be limited to a maximum of 12 months after the end of the production period.*

Note that the draft EN16325 revision clarifies the option that is foreseen in REDII & III to have 12 months transferability of GOs while allowing 18 months cancellability after the end of the production period of the underlying energy.

RE-DISS BPR §3 (continue)

> *b) GOs which have reached this lifetime should be considered as being "expired" and be collected into the Residual Mix.*

Through inclusion of expired GOs in the Residual Mix, the respective Attributes are not lost.

RE-DISS BPR §5

> *a) Cancellations of GOs which take place until a given deadline in year X+1 should be counted in Disclosure for year X. Later cancellations should be counted in Disclosure for year X+1.*

This enables to close down a Disclosure period and provide Disclosure figures that don't have to wait eternally for their availability. That in itself enhances the trust in the Disclosure figures. (Consumers would find it weird to receive Disclosure figures of years in the past.)

RE-DISS BPR §9

> *a) Market participants of the respective Domain should be provided the possibility to export their GOs and thus participate in the European internal market for [energy].*

RE-DISS BPR §16

> *a) GOs should be the only "tracking certificate" used. Any other tracking systems of a similar purpose and function as GOs should be converted to GOs*

Also, for gas Disclosure it needs to be ensured that every tracking instrument uniquely represents the environmental Attributes of the represented energy.

RE-DISS BPR §17

> *b) Besides GOs, only Reliable Tracking Systems and the Residual Mix should be available for usage for Disclosure. No other mechanism should be accepted.*

Note: It needs clarification which other RTS are there for gases. Especially the tracking framework of Proofs of Sustainability in the UDB benefits from clarification on whether it legally entitles for gas Disclosure.

RE-DISS BPR §26

> a) *The calculation of the Residual Mix should follow the methodology developed in the RE-DISS project.*

Note: some updates have been developed in the electricity Residual Mix since the closure of the RE-DISS project and for gases some additional challenges apply (different gaseous Energy Carriers, different system boundaries with different levels of regulation and the purpose of tracking for target accounting has an interaction with the GO system that is still being clarified).

b) *As part of this methodology, competent bodies should ensure that double counting between GOs they have issued, other Reliable Tracking Systems in use in their country and the Residual Mix is excluded.*

IV.2.3 Time considerations

Cancellations of GOs which take place until a given deadline in year X+1 should be counted in Disclosure for year X. Later cancellations should be counted in Disclosure for year X+1.

The timing of the calculation of the Residual Mix should be coordinated across Europe:

- *By 30 April X+1 all countries should determine their preliminary domestic Residual Mix and whether they have a surplus or deficit of Attributes.*
- *By 15 May X+1, the European Attribute Mix should be determined.*
- *By 31 May X+1, the final national Residual Mixes should be published.*
- *As of 1 July X+1 the Disclosure figures relating to year X can be published by suppliers*

Coordinating the timing of the most crucial steps for calculating Disclosure data across Europe is necessary. This coordination helps prevent market distortions and opportunities for arbitrage deals between different countries with varying deadlines. It also serves as a prerequisite for the suggested cooperation among European competent bodies in calculating their Residual Mixes (refer to RE-DISS BPR §26).

IV.2.4 Handling of Expired GOs and Ex-Domain Cancellations

IV.2.4.1 Expired GOs

The Disclosure information from expired GOs can be allocated either to the production year of the corresponding energy unit or to the year when the GOs have expired, depending on the methodology used for Residual Mix calculation in the respective Domain.

IV.2.4.2 Ex-Domain Cancellations

So-called ex-Domain cancellations of GOs, where a GO is cancelled in one registry and a proof of cancellation is then transferred to another country in order to be used there for Disclosure purposes, should only be used if a secure electronic transfer is not possible and if there is an agreement on such ex-Domain cancellations between the competent bodies involved.

Recommendation: Besides statistics on GO issuance (in the country of production) and GO cancellation (in the country of consumption), statistical information on all ex-Domain cancellations relating to a Disclosure year should be made available differentiated by energy source in order to support Residual Mix calculations.

IV.3 Added recommendations based on learnings from practice since the RE-DISS BPR

Ever since the RE-DISS BPR had been last updated in 2015, they have been THE blueprint for national implementation of Disclosure regulations. As such, almost a decade of experience was gained, of which learnings from practice can be drawn. Many of those have been raised in informal conversations with parties who work in the area of national supervision of suppliers' Disclosure obligation. The Disclosure Platform, as introduced in the report of Task 1, is a place where such thoughts are collected. This

section elaborates on two major topics that are systematically returning in discussions amongst Disclosure supervision experts.

IV.3.1 Supervise claims by other than suppliers

In this Disclosure Platform it has been raised multiple times that the BPR would benefit from elaborating requirements, monitoring and supervision on cancellation of GOs by/for consumers that are other than regulated suppliers. Ideally, these should be included in the overall Disclosure supervision exercise organised by Member States. This way all Disclosed origin of consumed energy is subject to supervision and not only the share supplied by licensed suppliers.

IV.3.2 Strengthen legislation to prevent double claims

Legislation strengthens double claim prevention if it:

1. assigns a unique instrument that is allowed to be used for Disclosure, like a Guarantee of Origin,
2. sets out that that unique instrument can only be used once, including that it ends its lifetime at usage, and only in relation with the usage for Disclosure, like the cancellation of a GO,
3. forbids origin claims that are not based on the legally assigned unique instruments (as there are Guarantees of Origin),
4. supervises all claims on the above principles, and
5. includes quality assurance measures to manage the uniqueness of the instrument, ensuring it can only be issued by a single competent body in each geography, for each Energy Carrier, and that it can only be cancelled in a single place that clarifies the country of destination.

IV.4 Example of gas Disclosure statements in Austria

Austria is the first country that has long enough experiences so far with actually supervising gas Disclosure on supplier invoices. Here below is an illustration how the energy sources of gas supply are displayed on invoices of gas suppliers in Austria.

Gaskennzeichnung
Versorgermix für den Zeitraum vom 01.01.2023 bis 31.12.2023 für [redacted] gemäß § 130 Gaswirtschaftsgesetz 2011 (GWG 2011) und Gaskennzeichnungsverordnung (G-KenV).

Erdgas unbekannter Herkunft: 99,87 %

Erneuerbare Gase (Biomethan): 0,13 %

Als Umweltauswirkungen fallen 200,74 g/kWh CO_2-Emissionen und keine radioaktiven Abfälle an.

Gaskennzeichnung

Energieträger	Versorgermix [redacted]	Ihr Produkt [redacted]"
Erdgas unbekannter Herkunft	99,35 %	80,00 %
Biomethan	0,65 %	20,00 %
CO_2-Emissionen:	199,69 g/kWh	160,80 g/kWh

Gaskennzeichnung der [redacted] den Zeitraum 1. Jänner bis 31. Dezember 2023 gemäß § 130 Abs. 9 GWG 2011 und Gaskennzeichnungsverordnung.

Das Produkt „[redacted]" wurde zu 20 % von kleinen Biogasanlagen in [redacted] eingekauft.
Es ist im Versorgermix von [redacted] enthalten.

Gaskennzeichnung

gem. § 130 GWG 2011 und Gaskennzeichnungs-VO idgF über den gelieferten Gasmix im Zeitraum vom 1. Jänner 2023 bis 31. Dezember 2023.

Versorgermix

Erdgas unbekannter Herkunft ..... 99,83 %
Erneuerbare Gase ..... 0,17 %

Umweltauswirkungen

CO_2-Emissionen ..... 200,66 g/kWh
Radioaktiver Abfall ..... 0,00 mg/kWh

Die eingesetzten Herkunftsnachweise von erneuerbaren Gasen stammen zu 100 % aus Österreich.

Produktinfo – [redacted]

Ihr Produkt setzt sich aus einem Biogasanteil aus österreichischer Produktion zusammen.
Erdgas unbekannter Herkunft ..... 40 %
Erneuerbare Gase ..... 60 %

Umweltauswirkungen

CO_2-Emissionen .....80,40 g/kWh
Radioaktiver Abfall ..... 0,00 mg/kWh

Gaskennzeichnung

der [redacted]

Periode

01.01.2023 - 31.12.2023

Rechtsgrundlagen

§ 130 GWG 2011, BGBl I 107/2011 idgF und
Gaskennzeichnungsverordnung – G-KenV, BGBl 275/2019 idgF

Versorgermix

Energieträger	Aufschlüsselung
Erdgas unbekannter Herkunft	100,00%
erneuerbare Gase	0,00%
sonstige Gase	0,00%

Umweltauswirkungen

CO2-Emissionen in Gramm je kWh 201,00 g/kWh

GASKENNZEICHNUNG

Gemäß § 130 Gaswirtschaftsgesetz 2011 (G-KGWG 2011) sowie gemäß Gaskennzeichnungsverordnung (G-KenV) für den Zeitraum von 1.1.2023 bis 31.12.2023

Energieträger	Versorgermix[1] in Prozent
1. Erdgas unbekannter Herkunft	99,86
2. Erneuerbare Gase aus Österreich	0,14
Summe	**100,00**
Bei der Erzeugung entstanden folgende Umweltauswirkungen	
CO_2-Emissionen	200,71 g/kWh

Energieträger	Produktmix[2] in Prozent
1. Erdgas unbekannter Herkunft	99,97
2. Erneuerbare Gase aus Österreich	0,03
Summe	**100,00**
Bei der Erzeugung entstanden folgende Umweltauswirkungen	
CO_2-Emissionen	200,93240 g/kWh

[1] Versorgermix: gesamte [redacted]

[2] Produktmix: [redacted]

ANNEX V GUARANTEES OF ORIGIN: LEGISLATION AND STANDARDISATION FRAMEWORK

V.1 GOs as a mandatory instrument for Disclosure of renewable gases: RED III

The Renewable Energy Directive mandates the issuance of Guarantees of Origin (GOs) for renewable gases upon request of a producer. It empowers consumers to stimulate demand for energy from renewable sources.

V.1.1 Status

On 18 October 2023 the recast of the Renewable Energy Directive, (EU) 2023/2413[35], here referred to as REDIII, was approved, and entered into force on 20 November 2023. It modifies the Directive (EU) 2018/2001[36] and shall be implemented by Member States by 20 May 2025.

V.1.2 Excerpts

Art. 2 of REDIII defines the legal definition of the Residual Mix:

"Residual Energy Mix" means the total annual energy mix for a Member State, excluding the share covered by cancelled Guarantees of Origin (GO).

This definition is an essential orientation point for the focus of this report. If no additional measures are taken that enforce the GO as the sole instrument for disclosing the origin of energy sources, the definition may have to be widened to prevent a risk of double counting the renewable origin of consumed gas.

The purpose of GOs is clarified in Art. 19 of REDIII.

Art. 19 §1: *For the purposes of demonstrating to final customers the share or quantity of energy from renewable sources in an energy supplier's energy mix and in the energy supplied to consumers under contracts marketed with reference to the consumption of energy from renewable sources, Member States shall ensure that the origin of energy from renewable sources can be guaranteed as such within the meaning of this Directive, in accordance with objective, transparent and non-discriminatory criteria.*

(…)

In short, we consider the purpose of GOs to be informing consumers of the origin of the energy supplied to them.

REDIII introduces the obligation on Member States to publish the Residual Mix. This is to be done annually:

Art.19.4. For the purposes of Disclosure referred to in paragraphs 8 and 13, Member States shall ensure that energy undertakings cancel guarantees of origin at the latest six months after the end of the

[35] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202302413
[36] http://data.europa.eu/eli/dir/2018/2001/oj

validity of the guarantee of origin. Furthermore, by 21 May 2025, ***Member States shall ensure that the data on their Residual Energy Mix are published on an annual basis****.'*;

Where GOs are issued that are not cancelled before their expiry date, the energy they represent gets included in the Residual Mix. The expiry date of GOs however varies between Member States:

Art.19.3. For the purposes of paragraph 1, guarantees of origin shall be valid for transactions for 12 months after the production of the relevant energy unit. Member States shall ensure that all guarantees of origin that have not been cancelled expire at the latest 18 months after the production of the energy unit.

Member States shall include expired guarantees of origin in the calculation of their Residual Energy Mix.

This varying expiry date poses a challenge on the calculation of the RM: GOs can only be included in the RM after they have formally expired, otherwise they risk being double counted. It, however, involves production of 12-18 months before. This implies that there will always be a discrepancy between total production and expired GOs. The fact that there are expiries on a continuous basis, however, reduces this discrepancy, and the effect balances out over the years. Therefore, it is seen to be acceptable to include expired GOs in the Residual Mix in the subsequent year if the expiry takes place too late for taking it into account in the year closer to the production period of the expired GO. In practice, the type of GOs that expire are rather constant. This inaccuracy is hence seen as acceptable.

The EN16325 standard on Guarantees of Origin has become binding for Member States to implement since 1 July 2020. As this standard has been under revision from February 2020, not all Member States have done so, so far. Key aspects of the latest available draft under revision will be touched upon in Section V.2.

Art.19 §6 Member States or the designated competent bodies shall put in place appropriate mechanisms to ensure that guarantees of origin are issued, transferred and cancelled electronically and are accurate, reliable and fraud-resistant. Member States and designated competent bodies shall ensure that the requirements they impose comply with the standard CEN - EN 16325.

REDIII clarifies that the Residual Mix is for non-tracked commercial offers:

Art. 19 §8: *(…) 'Where gas is supplied from a hydrogen or natural gas network, including gaseous renewable fuels of non-biological origin and biomethane, the supplier is required to demonstrate to final consumers the share or quantity of energy from renewable sources in its energy mix for the purposes of Annex I to Directive 2009/73/EC.* ***The supplier shall do so by using guarantees of origin except****:*

a) *as regards the share of its energy mix corresponding to* ***non-tracked commercial offers, if any, for which the supplier may use the Residual Energy Mix****;*
b) *where a Member State decides not to issue guarantees of origin to a producer that receives financial support from a support scheme. (…)*

It also introduces an obligation on Member States to ensure that for gas, the cancelled GOs shall correspond to the relevant network characteristics.

Art. 19 §8: *(…) When a customer consumes gas from a hydrogen or natural gas network, including gaseous renewable fuels of non-biological origin and biomethane, as demonstrated in the commercial*

offer by the supplier, Member States shall ensure that the guarantees of origin that are cancelled correspond to the relevant network characteristics.

V.2 Standardised operation of GO systems: CEN EN16325 and EECS®

As mentioned above in the previous section, RED Art.19.6 mandates that Member States shall ensure that the Guarantees of Origin they issue comply with the draft EN16325 GO standard. This standard is under revision at the time of writing this report. The below excerpts are from a draft that holds a significant status of consensus but is yet to be submitted to the formal voting process at the time of writing this report.

V.2.1 EECS

In the meantime, the GO system in practice is standardised under the European Energy Certificate System (EECS®)[37] framework. The EECS® Standard is publicly available and has largely been the basis of the certificate scheme requirements in EN16325. EECS® however goes beyond EN16325 where it includes cooperation engagements between issuing bodies and detailed standardisation of formatting requirements. Those are essential for efficient cooperation between national GO Domain Schemes, but need more frequent updating than is feasible under the CEN – CENELEC framework. The members of the Association of Issuing Bodies (AIB) have a joint decision-making process that enables them to update the EECS® Standard based on jointly agreed adjustment needs. As such, they ensure that the EECS® Standard will align with EN16325 as soon as the revision is finalised, and on the other hand, that EECS® may go further than CEN EN16325 e.g. where needed for efficient system functioning.

While the CEN requirements are mandatory through legislation, the below section lists main takeaways from Excerpts of the draft EN16325 from April 2024. Those are mostly aligned in EECS®.

V.2.1.1 Double claim prevention principles in EECS®

EECS® Rules sections A2.1, C3.3.1 and E3.3.14 mention GOs are issued for output that has not been disclosed in any other way, including through the issuance of any other type of certificate. An excerpt of the EECS® Rules related to prevention of double claims, is in ANNEX V.2.1. If the Product Rules for an EECS® Product contain a Legislative Disclosure Scheme, Scheme Members are required to put in place appropriate procedures. These procedures should ensure that GOs are used as the sole proof of the qualities of the associated output according to the relevant Product Rules.

V.2.2 CEN-CENELEC EN16325 standard for Guarantees of Origin

V.2.2.1 The purpose of GOs is Disclosure

The draft revision of the legally binding EN16325 standard, clearly defines the purpose of Guarantees of Origin, to be Disclosure, and it defines what Disclosure means.

4.9.2.1.4 A *GO shall only be cancelled for the purpose of Disclosure, and to demonstrate the origin of energy consumed:*

(a) During a period starting within 12 months after the last day on which the output to which the GO relates was produced; and

[37] See www.aib-net.org/eecs

(b) Before the date of cancellation of the GO, or in the consumption period during which the Cancellation takes place.

V.2.2.2 Definition of Disclosure: informing consumers

While the purpose of GOs is to be mentioned on GOs, and is fixed to be "Disclosure", the EN16325 clarifies the definition of this concept. This is in line with the phrasing of RED Art. 19.1.

"Disclosure" means provision of information to a final customer on the share or quantity of the energy supplied to them as having specific Attributes.

V.2.2.3 Cancelled GOs as basis for Disclosure Statements

Section 4.10 of the draft revision of the EN16325 standard mentions the purpose of calculation and preparation of Disclosure Statements. It also gives basic principles for the Residual Mix calculation.

4.10 A Domain GO Scheme should contain provisions for Disclosure Statements with regard to the timing of their publication and their visual presentation. Disclosure Statements for the share or quantity of energy should be calculated and prepared based on, as appropriate:

(a) GOs cancelled by the relevant Account Holder;
(b) Where applicable, the Residual Mix, which shall adjust the national production mix for the relevant Energy Carrier to take into account imported and exported GOs representing energy conveyed by this Energy Carrier;
(c) Where the provision of Domain GO scheme excludes the Issuance of GOs for Production Devices and/or units of energy in receipt of Public Support: statistical information on the origin of energy so supported or another mechanism specified in the Domain GO Scheme which avoids the same Attributes from being Disclosed more than once; and/or
(d) Where import of energy occurs "from a Domain outside the calculation area of the Residual Mix, or where import of energy occurs towards a Domain where no Residual Mix is available," aggregate figures or unambiguous proof; and/or
(e) such other sources of data as section 5.2.9 of this standard provides, while ensuring that the Attributes of the same Energy are only Disclosed once to a final customer.

As part of the Residual Mix calculation methodology for a given Energy Carrier, Competent Bodies shall ensure that multiple claims of the Attributes of energy are prevented. This implies that the consumption of energy with the same Attributes can only be claimed with either GOs, or possible other energy tracking systems in use in their country or the Residual Mix.

The requirements on electricity Disclosure are a bit more specific regarding data to be used.

5.2.9 For the purpose of calculation and preparation of Disclosure Statements only reliable and publicly available data shall be used, such as Residual Mix as calculated by the Disclosure Authority. Where a GO has been issued, only its cancellation shall for the purpose of Disclosure permit a claim to be made in relation to its Attributes.

V.2.2.4 Cancellation requests for gas GOs to inform on network characteristics of consumption

5.3.9 The cancellation request shall indicate whether the Gas GO cancelled correspond to the relevant network characteristics. (…)

The information on a cancellation request may help the Disclosure Competent Body interpret whether the obligations under Art. 19.8 are fulfilled, regarding the usage of gas GOs of which Member States shall ensure that the usage corresponds with the relevant network characteristics. On the other hand,

Member States may set out procedures for making this interpretation beyond that of the GO cancelling account holder.

V.2.2.5 What can be tracked: available data on GOs

V.2.2.6 Info on all electricity, gas, hydrogen, heating and cooling GOs

The Section 4.5.2.1 of the draft EN16325 standard sets out obligatory information that should be present on all GOs.

4.5.2.1 The GOs should contain at least the following Attributes:

a) the Energy Carrier;
b) the unique number assigned to the GO by the Issuing Body that issued it, see normative Annex C;
c) the nominal capacity of the Production Device as specified in subclauses 5.2, 5.3, and 5.4 in kW;
d) the date when the Production Device first became operational;
e) the first day on which the Output to which the GO relates was produced;
f) the last day on which the Output to which the GO relates was produced;

NOTE This day is at the latest one month after the first day on which the Output to which the GO relates, was produced.

g) the Source Type (see Annex A);
A GO may only refer to a single Source Type category which is allocated to it in accordance with 4.5.5 and 4.5.6 respectively.
h) the Technology Type (see Annex B);
i) the identity of the Originating Production Device, being the unique number which has been assigned to that Production Device by the relevant Competent Body;
j) the country in which the relevant Production Device is situated;
k) k) the location of that Production Device, being its geographical location either by latitude and longitude; and/or postal code, city and country;
l) the identity (and country or region) of the originating Issuing Body;
m) the date when the electronic Issuance of the GO took place;
n) an indication, as appropriate, as to whether
a. the Originating Production Device has received Public Support relating to investment in it;
b. the unit of energy to which the GO relates has benefited from Public Support;
c. both the Originating Production Device and the unit of energy have benefited from Public Support; or
d. neither the Originating Production Device, nor the unit of energy have benefited from Public Support; and the type of support scheme;
o) the purpose of the GO;
p) such additional information as is required in subclauses 5.2.5, 5.3.5, 5.4.4; and
q) dissemination level of the physical energy for which the GO is issued, as set out in Annex E
r) the Face Value, indicating the unit of energy represented by the GO.
s) an indication whether or not the GO was issued following Conversion Issuance.
t) *an indication whether or not the Certificate was issued following release from a Storage System in accordance with the provisions of section 4.5.7*

NOTE The Energy Type a GO relates to is represented on the GO by expression of the Energy Carrier as noted in a)

The above information is on all GOs. Optionally, also the following data may be mentioned on GOs.

4.5.2.2 Optional information on a GO

(…) a Domain GO Scheme may provide that a GO contains

(a) Where applicable, the capacity of the relevant production element of the Production Device and the date when this production element became operational;
(b) subject to the agreement of the Registrant, the name of the Production Device;
(c) where the GO has been issued in respect of the Production Device or an Input which is compliant with a Label Scheme and the Issuing Body is supporting that Label Scheme, the identifier of the relevant Label; More than one label can be mentioned on the GO;
(d) a quantification of carbon footprint of the output covered by the GO, and a reference to the methodology used for this quantification;
(e) such Energy Carrier-specific information;
(f) The start time of the production period to which the GO relates, expressed in local time, accompanied by the offset to UTC time in hh:mm;
(g) The end time of the production period to which the GO relates, expressed in local time, accompanied by the offset to UTC time;
(h) Where the Source Type relates to nuclear energy, a quantification of the radioactive waste produced per MWh of output to which that GO relates, and a reference to the methodology used for this quantification.

V.2.2.7 Additional information on a Gas GO

Along with the above information, Section 5.3.5 of draft EN16325 lays out additional mandatory information on a Gas GO (that is not available on electricity GOs):

(…) when a GO has been issued for an Energy Carrier for which the gas composition has been used to establish the proportion of that Energy Carrier of a Gas mix which contains more than one Energy carrier, then the GO shall contain the gas composition of that Gas mix expressed by the Fuel Index of the final Output. Where the Energy Carrier is unspecified Gas, the Fuel Index need not be specified.

The above applies only for where there would exist issuance of different GOs for separate components of a gas mixture. At the time of writing this report, this is not the case in any Domain.

The project team does not recommend making use of this option of the standard, as issuing separate GOs for separate components of gas mixtures would make it fairly impossible to calculate a meaningful Residual Mix and come to a complete overall Disclosure overview at macro level. On top, it risks confusing consumers.

More importantly, Section 5.3.6 of draft EN16325 presents additional optional information on a Gas GO.

5.3.6 Additional optional information on a GO for Gas

A GO for Gas may also contain the following information:

(a) Information on compliance of the Gas with applicable sustainability requirements;
a. Specified:

i. A reference to the legislative or other sources that sets sustainability requirements;
ii. A reference to the relevant sustainability certification scheme(s);
iii. Whether the abovementioned sustainability requirements are complied with; and
iv. A reference to the relevant reports, certificates or other documents produced by the sustainability certification scheme(s);

Or

b. unspecified

(b) if Output is produced from a mixture of Inputs, consisting of other than only the Input from the Source Type indicated in 4.5.2.2 g), in addition to the Attribute recorded as the Source Type for which the corresponding GO was issued, information on those Inputs, Source Type, and their share in total energy Input. This share shall be determined in accordance with the Energy Input Factor;
(c) in accordance with 4.5.2.2 d), where the Production Device consists of separate modules of which there is a plant which upgrades the Gas quality. the date on which the plant(s) became operational that produced the raw Gas and its/their capacity; and
(d) where the Output complies with specific requirements relating to the characteristics of the produced Gas, a reference to the relevant requirements.

Information in these optional fields, especially whether sustainability criteria are met, hold a key to the bridge between tracking for accounting of compliance towards policy targets elaborated in REDIII (e.g. Art. 25).

V.2.2.8 Energy source categories

It must be noted that the categories of energy sources mentioned on the GOs, as in Annex A of the draft EN16325 standard, don't display detailed feedstock information for all energy source categories. The optional tag on compliance with the advanced biofuel criteria is a relevant item to mention.

V.2.2.9 GO Cancellation

4.9.2.1.3 Cancelling a GO

The provisions of each Domain GO Scheme shall be such that where a GO has been issued for the Output of a Production Device, then the Attributes of such Output may only be Disclosed through Cancellation of the GO. The Attribute of GOs that expire will be included in the Residual Mix. (…)

The GO standards don't allow just any GO cancellation for just any other consumption Domain. This is equally the case in the already applicable EECS® Standard as in the draft CEN Standard:

4.9.2.1.4 Limitations for Cancellation

An Issuing Body may Cancel a GO solely:

a) for use in its own Domain; or

b) for use in any country or destination Domain, provided each of the following conditions is met:

1) such country or Domain is part of the European Economic Area or a country outside the European Economic Area for which

i. there is export of energy of the corresponding Energy Carrier from the cancelling Domain to the destination Domain; and

ii. an assessment report as in 4.11.2 proves compliance of the destination Domain GO Scheme with this EN 16325 standard; and

iii. a system for verification of Disclosure Statements as in 4.11.5 is in place in the GO Scheme of the destination Domain, of which, for the Energy Carriers for which section 5 foresees in the calculation of a Residual Mix, the Residual Mix is calculated in connection and in balance with the system for calculation of the Residual Mix of the Domain where the cancellation takes place; and

iv. for Energy Carriers for which Clause 5 does not foresee in the calculation of a Residual Mix, a mechanism is in place to ensure that the total quantity of cancelled GOs for the destination Domains per year does not exceed the total direct export of energy of that Energy Carrier to that Domain in that year; and

2) automated Transfer of GOs is temporarily impossible due to technical difficulties; and

3) the relevant Competent Body, being either the Issuing Body or, where existing, the Disclosure Authority in the Domain where the cancelled GOs will be used for Disclosure and the Issuing Body operating the registry where the cancellation is to be made, have agreed to such a cancellation; and

4) the Cancelling Issuing Body provides information on the cancelled GOs to the Issuing Body of the country/Domain for whom the GOs are cancelled; and

5) the inclusion on any related Cancellation Statement of the identity of the country/Domain for whom the GOs are cancelled. A GO may be cancelled until eighteen (18) months after the last day on which the Output to which the GO relates was produced, or until such earlier deadline as the relevant Domain GO Scheme provides.

A GO shall only be cancelled for the purpose of Disclosure, and to demonstrate the origin of energy consumed:

i. during a period starting within 12 months after the last day on which the Output to which the GO relates was produced; and
ii. ii. before the date of cancellation of the GO, or in the consumption period during which the Cancellation takes place

Maximum length of a consumption period being one calendar year. (…)

These restrictions imply that Ex Domain Cancellations, being the cancellation of a GO to cover a consumption claim in another country, are not allowed by default. They are only allowed as a transition measure while technical connections are still being established and on condition there exists a so-called Ex-Domain Cancellation agreement between the involved Issuing Bodies. that EDC agreement shall ensure that information on the cancelled GOs is provided to the relevant Competent Body for the receiving Domain.

This restriction becomes of relevance when considering data availability on cancelled GOs per consumption Domain.

V.2.3 Handling GOs across Energy Carrier conversion

V.2.3.1 Input from EECS® and REGATRACE

The draft revision of EN16325 built its rules for handling GOs across Energy Carrier conversion on the developed ideas amongst issuing bodies in AIB as adopted in the EECS® Rules in 2019 and the logic built up in the REGATRACE project in the deliverables on integration of GOs across multiple Energy Carriers, being D4.3 and D4.4[38].

V.2.3.2 Cancel GOs for measured input, issue GOs for measured output

Section 4.5.6 of the draft revision of the EN16325 states that during Energy Carrier Conversion, the Energy Input and Output from the Production Device are measured. The Attributes of an Input amount are determined by the Registrant's cancellation of a corresponding amount of GOs. GOs are cancelled for measured input into conversion and GOs for the Output Energy Carrier are issued for the output from conversion.

V.2.3.3 Data on post-conversion GOs

The energy source is conveyed from the input GOs to the output GOs, in accordance with 4.5.6.2.2, while the other information on the post-conversion GOs refers to the conversion device, except for the list of optional data on GOs:

4.5.6.2.3 Optional Data to be mentioned on GO after Conversion Issuance

On GOs issued following Conversion Issuance, additional data fields may be recorded, relating to the Input into the Energy Carrier Conversion Production Device, that inherit the following Attributes from the cancelled pre-conversion GOs

(a) The production period of the pre-conversion energy, (as in 4.5.2.2 e and f and 4.5.2.3 f and g);
(b) Identity of the pre-conversion production Device (as in 4.5.2.2.i);
(c) The location of the pre-conversion Production Device (in the format as in 4.5.2.2.k);
(d) The date when the pre-conversion Production Device became operational (in the format as in 5.25.2.2.d);
(e) An indication as to whether the pre-conversion Production Device or the Output of the pre-conversion Production Device has benefited from public support (in the categories set under 4.5.2.2.n);
(f) A quantification of carbon emissions related to the pre-conversion energy, taking into account the energy efficiency of such conversion, together with a reference to the methodology used (in the format as in 4.5.2.3d);
(g) A quantification of the radioactive waste related to the energy pre-conversion, taking into account the energy efficiency of such conversion, together with a reference to the methodology used (in the format as in 4.5.2.3h);
(h) Where the relevant Label Operator supports this, a label related to the pre-conversion energy (in the format as in 4.5.2.3 c).

This optional data, when available, provides a comprehensive understanding of the energy source and its environmental impact. This data can help for evaluation of compliance with RFNBO DA. Note also that post-conversion GOs (being GOs that are issued for output from an Energy Carrier conversion

[38] https://www.aib-net.org/news-events/aib-projects-and-other-news/regatrace

device, after GOs have been cancelled to prove the origin of the input to that device) hold a Conversion Tag. It will be important to distinguish between GO cancellations for conversion and for final consumption to ensure prevention of double counting by misinterpreting statistics.

Further, it is to be seen what the impact on the market of this concept of GO Conversion Issuance will be.

V.2.3.4 System boundaries: dissemination level of the energy for which a GO is issued

Annex E of the draft EN16325 sets out the possible dissemination levels that can be mentioned on the GO, in accordance with where the energy is made available.

Annex E (normative)

Dissemination level of the physical energy for which the GO is issued

The parameter value for the Attribute on the GO that indicates the dissemination level of the produced physical energy for which the GO is issued, as in 4.5.2.2.q, is one of the following:

1. *Consumed by the operator of the production device [this applies for Electricity, Gas and Heating and Cooling];*

The parameter value for the Attribute on the GO that indicates the dissemination level of the produced physical energy for which the GO is issued, as in 4.5.2.2.q, is one of the following:

1) *Consumed by the operator of the production device [this applies for Electricity, Gas and Heating and Cooling];*
2) *Disseminated over a Distribution or Transmission System:*
    a. *for Electricity;*
    b. *for Natural Gas;*
    c. *for Hydrogen;*
3) *Disseminated over a Closed Distribution System:*
    a. *for Electricity;*
    b. *for Natural Gas;*
    c. *for Hydrogen;*
4) *Disseminated over any other network than a Distribution or Transmission System or Closed Distribution System:*
    a. *for Electricity;*
    b. *for Natural Gas;*
    c. *for Hydrogen;*
    d. *another Gas system;*
5) *Disseminated over a heating or cooling Grid [this applies for Heating and Cooling];*
6) *Disseminated by vehicle [this applies for Gas and Heating and Cooling];*
7) *Dissemination unspecified – not consumed by the operator of the Production Device [this applies for Gas].*

This is a crucial data element on which statistics can be based that enable to categorize GOs issued per system boundary. With this as a basis, it has an opportunity to calculate the Residual Mix per system boundary.

V.2.3.5 GO Cancellation categories: for end-consumption or for conversion

The GO framework allows GO issuance for energy converted from another Energy Carrier, on condition that a GO is cancelled for the energy input. This follows from both the EECS® Rules and in the draft of the mandatory GO Standard CEN EN16325, as mentioned before. In this case, the energy source of the input Energy Carrier can be conveyed to the output Energy Carrier of the conversion.

It will need attention for some specific topics.

A risk would be that an original quantity of renewable energy production is counted as being consumed twice: at the time when converted into another Energy Carrier and at the time of consumption of that Energy Carrier. E.g. biomethane from agricultural biomass, for which GOs are cancelled to prove that biomethane is fed into a gas engine which produces electricity. For such electricity production, GOs can then be issued for electricity from agricultural biomass: the energy source is conveyed across Energy Carrier conversion. This is a logical principle, yet it needs measures to prevent that the cancelled gas GOs in this case would statistically be accounted as green gas consumption.

In order to prevent misinterpretation of GO cancellation statistics, it is important have transparency on which type of energy consumption a GO actually is cancelled for: end consumption or Energy Carrier conversion.

GO cancellation statistics are used in (at least annual) national Disclosure supervision exercises. They are interpreted by the national supervisory authority to evaluate the accuracy of supplier's Disclosure and to calculate the national Residual Mix. Where the statistics of cancelled GOs would relate to other claims than visible to this authority, there is risk of confusion, and potentially double claims of the represented Attributes of these cancelled GOs.

To avoid confusion and prevent double claims, cancellation statistics need to display a category of the cancellation. While "direct end consumption" of the respective Energy Carrier is one such category, another cancellation category is "Cancellation for conversion into another Energy Carrier".

V.3 Building blocks for a Residual Mix methodology

V.3.1 Inspiration from the formula for the electricity Residual Mix

Section 5.2.10 of the draft EN16325 elaborates on the main formula for determining the Residual Mix, albeit for electricity.

5.2.10 Residual mix calculation
In calculating the Residual Mix of their country for electricity, Competent Bodies shall deduct the volume of issued GOs for electricity and add the volume of GOs for electricity which are expired for cancellation, from the domestic electricity generation mix of a calendar year. When after this calculation, there is a deficit of Attributes in the domestic Residual Mix in order to cover total domestic electricity consumption, this deficit shall be complemented with Attributes from the European Attributes Mix.

In the geographic area where GO trade is facilitated, as determined under 4.7.3, Competent Bodies should cooperate in order to adjust their Residual Mixes in reflection of cross border transfers of physical electricity, GOs and other legal energy tracking systems in use in their country. Hereto they shall cooperate to determine the European Attribute Mix, which consists of the surplus of Attributes

from the domestic Residual Mixes of all participating countries which are not domestically used for claims on the origin of consumed energy.

V.3.2 A Residual Mix formula to be applied per dissemination system boundary for gases

The elaborated formula for the Residual Mix for electricity in EN16325 Section 5.2.10 provides inspiration for the general formula for elaborating the Residual Mix for gases. At the time of drafting the standard revision, the gas Disclosure requirement was not yet effective in Europe, for which the experts in CEN felt it to be too early to adopt a similar text for gas. For the purpose of this report, however, the same principle can be used.

On top of that comes that REDIII Art. 19.8 requires that Member States shall ensure that gas GOs at cancellation correspond to the relevant network characteristics:

REDIII Art.19.8: (*…) When a customer consumes gas from a hydrogen or natural gas network, including gaseous renewable fuels of non-biological origin and biomethane, as demonstrated in the commercial offer by the supplier, Member States shall ensure that the guarantees of origin that are cancelled correspond to the relevant network characteristics.*,

Section 5.3.9 of the draft EN16325 has been elaborated to support implementation and transparency at the level of Member States Domain GO Schemes:

5.3.9 Information on a cancellation request and a cancellation statement for the Gas GO
The cancellation request shall indicate whether the Gas GO cancelled correspond to the relevant network characteristics. (…).

This suggests that a Residual Mix for gases would best be calculated per perimeter of gas consumption that has the same network characteristics.

Using statistics of issued GOs per dissemination level, especially where the dissemination level categories accord with categories of network characteristics, enable then to determine a Residual Mix per system boundary that accords with the dissemination level categories.

ANNEX VI CRITERIA FOR RENEWABLE HYDROGEN FOR POLICY TARGET ACCOUNTING: DELEGATED ACT ON RFNBO

Delegated Act 2023/1184[39] on Renewable Fuels of Non-Biological Origin (RFNBO) establishes detailed rules for determining when electricity used for the production of renewable liquid and gaseous transport fuels of non-biological origin can be considered fully renewable. Here we first touch upon the general framework and subsequently on some attention points with impact on the Residual Mix and our focus regarding double claim prevention. Further, the guidance from DG ENER from the European Commission is analysed with the same focus.

VI.1 Two delegated Acts

The Commission has proposed detailed rules to define what constitutes renewable hydrogen in the EU, with the adoption of two Delegated Acts (DA) required under the Renewable Energy Directive. These Acts are part of a broad EU regulatory framework for hydrogen which includes energy infrastructure investments and state aid rules, and legislative targets for renewable hydrogen for the industry and transport sectors. These rules and targets aim to ensure that all renewable fuels of non-biological origin (also known as RFNBOs) are produced from renewable electricity. The two Acts are inter-related and the requirements in both acts are necessary for the fuels to be counted towards Member States' renewable energy target.

For certification of renewable hydrogen, producers can rely on a system of certification by third parties, so-called Voluntary Schemes.

VI.1.1 RFNBO DA

The Delegated Act RFNBO[40] of 10 February 2023 sets out the rules for defining renewable fuels of non-biological origin (RFNBOs), such as hydrogen produced from renewable electricity. Section VI.2 touches upon these rules and elaborates on how they may impact the framework for GOs and Disclosure.

VI.1.2 GHG DA[41]

RFNBOs must have a life-cycle greenhouse gas emission saving of at least 70% compared to the fossil fuel comparator. The act provides a methodology for calculating the life-cycle emissions, taking into account the emissions from electricity generation, processing, and transport.

VI.2 Criteria for renewable hydrogen

The RFNBO DA builds on the concept of “Renewable Electricity” as input for an electrolyser.

The exhaustive phrasing of and mutual interaction between so called “RFNBO-criteria” for eligibility of hydrogen under the RFNBO DA are to be read in the delegated regulation itself. There are multiple

[39] Commission Delegated Regulation (EU) 2023/1184 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin : https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R1184
[40] RFNBO DA: See Commission Delegated Regulation (EU) 2023/1184.
[41] GHG DA: See Commission Delegated Regulation (EU) 2023/1185

scenarios, forming a decision tree: if condition X is met, then criterion Y applies, if not criterion Z is applicable. This provides a structured approach to determining eligibility. GO market analyser Veyt summarizes the criteria as follows.

Direct connection	RES-E grid	Low carbon grid	Imbalanced grid	General grid
	Unbundled GOs	Bundled GOs	Unbundled GOs	Bundled GOs
		Temporal correlation		Temporal correlation
		Geographical correlation		Geographical correlation
Additionality				Additionality

Figure 22 Pathways for complying with RFNBO criteria considered from GO market perspective (Source: Veyt)

With "**bundled GOs**", a Power Purchase Agreement between electricity producer and electrolyser operator is meant, for which the electricity consumption is backed by the cancellation of GOs from the respective electricity Production Device.

Names given to some of the criteria are Additionality, Geographical and Temporal Correlation. They are defined in the DA.

Additionality: Where this criterion applies, hydrogen producers must ensure that the electricity used for hydrogen production is matched by renewable electricity production. This can be demonstrated either in the same installation or through a renewables power purchase agreement (PPA). The renewable electricity installation has not been operational for more than 36 months before the electrolyser and has not received any form of aid.

Geographical Correlation: Where this criterion applies, it requires hydrogen producers to ensure that the renewable electricity production is located where it can reach the location where the hydrogen is produced.

Temporal Correlation: Requires that renewable electricity and hydrogen are produced in the same time interval

VI.2.1 Information collection for compliance check

To verify the conditions are met, regarding the electricity from renewable sources with which the hydrogen is produced, there is need for information types that enable to qualify whether following conditions are met:

1. General eligibility for electricity from the grid:
   - Is the electricity injected on the grid in a bidding zone with 90% renewable production on average in preceding calendar year? (yes/no),
     or
   - Is the electricity injected on the grid in a bidding zone with emission intensity <18 gCO_2eq/MJ, and renewable PPA and temporal and geographical correlation criteria are met? (yes/no),
     or

- Are the “Downwards redispatching criteria” met during the imbalance settlement period - DA Art.4.3? (yes/no),
  or
- Does the electricity comply with the “additionality criteria” and the “temporal and geographic correlation criteria”? (yes/no),

2. Temporal correlation:
   - Monthly correlation till 31/12/2029, hourly correlation from 1/1/2030 onwards: does the production period of the hydrogen coincide with the production/storage release period of the electricity with which the hydrogen is produced – DA Art.6 ? (yes/no),

   OR
   - Is the Clearing price of electricity in day-ahead market in the bidding zone lower than a threshold of:
     1. 20 euro/MWh or
     2. 0,36 * emission allowance price /ton CO_2eq ? (yes/no)
3. Geographical correlation:
   - Bidding zone correlation – DA Art. 7: Is the electricity produced in the same bidding zone or Interconnected zone with equal or higher price as the one where the electrolyser is located ? (yes/no),
4. Additionality
   - Is the Electricity production device less than 3 years older than the RFNBO production device– DA Art.5.a? (Y/N),
   - Is there Absence of support for the pre-conversion electricity – DA Art. 5.b ? (yes/no)
5. Does there exist a Power Purchase Agreement (PPA) between the electricity producer and the RFNBO producer (needing the start date and end date of the contract) ? (yes/no)
6. Certifying party and reference to the certifying statement – (Voluntary Scheme or other) – DA Art.9
7. Is there a “Direct connection” between electricity production and electrolyser – DA Art.3 ? (yes/no).

It is obvious that the current GO system is not collecting all these information items needed to check compliance on the criteria. Yet part of the information can be sourced from electricity GOs, regarding the electricity input for hydrogen production. Doing so, would save time and expenses from the certification bodies operating under national or Voluntary Schemes and as such can lower the overall cost of certification. That is helpful for overcoming barriers for a liquid market.

VI.2.2 Renewable Hydrogen for policy target accounting may be produced in countries without a GO system

Art 9 of the Delegated Act 2023/1184 states:

Regardless of whether the renewable liquid and gaseous transport fuel of non-biological origin is produced inside or outside the territory of the Union, fuel producers may make use of national schemes or international voluntary schemes recognised by the Commission pursuant to Article 30(4) of Directive (EU) 2018/2001 to demonstrate compliance with the criteria set out in Articles 3 to 7 of this Regulation, in line with Article 8, as relevant.

Where a fuel producer provides evidence or data obtained in accordance with a scheme that has been the subject of a decision in accordance with Article 30(4) of Directive (EU) 2018/2001, to the extent that such decision covers the demonstrating of compliance of the scheme with Article 27(3), fifth and sixth subparagraphs of that Directive, a Member State shall not require the suppliers of renewable liquid and

gaseous transport fuels of non-biological origin to provide further evidence of compliance with the criteria set out in this Regulation.

Reflection

This reflects the reality that hydrogen may be imported from countries where no GO system is installed, while still complying with the criteria for policy target accounting. These import flows would however still be accounted for, through the framework that the UDB framework installs for recognition.

VI.3 Carbon/GHG emissions of RFNBOs

When coming to the stage in the Disclosure process where it must be determined what is the carbon footprint of gases that are supplied to consumers, it is important to know that there are varying pieces of legislation that set out an emissions calculation method. This in itself brings along the challenge that a future emissions calculation method for the Residual Mix may be torn between differing methodologies for emissions calculation.

The abovementioned RFNBO criteria in Sections VI.2 and 7.7VI.2.1 become a main market driver, as they entitle to be counted as being below the emission threshold in policy targets.

The GHG DA (2023/1185) sets a minimum limit for the savings of greenhouse gas emissions from recycled carbon fuels. It also outlines the method for calculating the savings of greenhouse gas emissions from renewable liquid and gaseous transport fuels of non-biological origin, as well as from recycled carbon fuels.

Art.3 states:

The greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin and from recycled carbon fuels shall be determined in accordance with the methodology set out in the Annex.

Annex A of this GHG DA (2023/1185):

Electricity qualifying as fully renewable according to Article 27(3) of Directive (EU) 2018/2001, shall be Attributed zero greenhouse gas emission.

When determining the emissions that gas suppliers must mention on the bill related to renewable and low-carbon gases, following annex 1.5 of the Gas Directive, it will likely be consistent to apply the same reasoning and consider RFNBO compliant gases as having zero emissions.

For applying this in an efficient manner, it may be convenient to have on a hydrogen GO a tag that indicates whether or not the hydrogen was produced with such (RFNBO criteria compliant) electricity that is Attributed to have zero greenhouse gas emissions.

VI.4 Clarifying Q&A by DG ENER on RFNBO

Multiple stakeholders provided their questions to DG ENER, seeking further interpretation of the DA RFNBO. The section presents a collection of responses from DG ENER to those questions, as provided on 26 July 2023[42], refined on 14 March 2024[43].

VI.4.1 Excerpts

Responding to stakeholders' questions, responses from DG ENER from 14 March 2024, are as follows:

18. ***Could concluding a renewables power purchasing agreement between an RFNBO producer and a retailer supplying physical electricity and associated GOs comply with the requirement set out in Article 4 (2)(a)?***

Reply: No. Fuel producers are required to have concluded directly, or via intermediaries, one or more renewables PPAs with economic operators producing renewable electricity. While electricity suppliers could act as intermediaries (i.e. facilitators of the contracting), the fuel producer would need to conclude renewables PPAs with economic operators producing renewable electricity. The associated GOs are an additional element necessary to ensure that the same unit of energy from renewable sources is taken into account only once.

19. ***What are the minimum requirements for "renewable PPA"?***

Reply: The requirements for renewable PPAs stem from the definition set out in the RED itself and the RFNBO delegated act. In the RED, a renewables PPA is defined as a contract under which a natural or legal person agrees to purchase renewable electricity directly from an electricity producer. The delegated act allows fuel producers to conclude one or more renewable power purchase agreements directly, or via intermediaries. The renewable PPAs need to clearly identify the installations that produce the amount of renewable electricity that is used to produce the renewable hydrogen. Furthermore, the hydrogen producer can only claim the production of RFNBOs based on a renewable PPA if the electricity supplied under the contract has effectively been produced. Intermediaries referred to in the RFNBO delegated act may be involved by various means and for various purposes, including as a contracting party. For example, intermediaries can represent the electricity producers, but it is important that a direct relationship between the electricity producer and the hydrogen producer is maintained. In addition, the requirements on cancelling Guarantees of Origin "GOs" as described under question 20, the requirements set out in Article 5 of the RFNBO delegated act, as well as the requirements set out in Article 19 RED (referred to in recital 15 of the RFNBO DA), have to be met.

20. ***Several provisions in the RFNBO delegated act require concluding renewables PPAs with economic operators producing renewable electricity. What requirements would apply for GOs in this context?***

Reply: The GOs for the PPA need to comply with the general requirements in Article 19 of RED and furthermore carry the same Attributes as the physical installation producing the electricity. This includes e.g. the location of the installation, the age of the installation, and the time of the production. The associated GOs need to be cancelled before the expiry of the validity period and the volume

[42] https://energy.ec.europa.eu/system/files/2023-07/2023_07_26_Document_Certification_questions.pdf
[43] https://energy.ec.europa.eu/document/download/21fb4725-7b32-4264-9f36-96cd54cff148_en?filename=2024%2003%2014%20Document%20on%20Certification.pdf

cancelled shall correspond to that claimed under the PPA. The RES-e producer is not allowed to sell or transfer the associated GOs to any other entity than the operator of the electrolyser under the PPA. To enforce this, the Member State may decide to immediately cancel the associated electricity GOs. The requirements on GOs also apply in cases where the RFNBO DA does not require the conclusion of a renewables PPA.

32. ***Which requirements on electricity GOs would apply when the RFNBO delegated act does not require the conclusion of a renewables PPA*** *(e.g. areas with more than 90% RES in the electricity mix)*

Reply: According to recital 15 of the RFNBO delegated act, Article 19 of RED obliges Member States to ensure that the same unit of energy from renewable sources is taken into account only once. Therefore, if RES GOs have been issued for the electricity used to produce the hydrogen, then these GOs need to be cancelled. The cancellation of the respective GOs can be done e.g. by the competent body designated by the Member States or by the producer of the hydrogen. It is up to the certifier of the installation to ensure that the amount cancelled corresponds to the volume of electricity used.

33. ***What is the role of GOs for the implementation of the RFNBO delegated act?***

Reply: The RFNBO delegated act does not set out rules for the use of GOs and the use of GOs is not required to implement the requirements of the hydrogen delegated acts. The requirements for GOs stem entirely from Article 19 RED and therefore apply only where GOs have been issued or are used. GOs and systems characterised by a comparable degree of robustness may still be used as a tool for demonstrating compliance with the criteria of the RFNBO delegated act. For instance, it would be possible for the fuel producer to demonstrate via cancelling the required number of GOs that at least an equivalent amount of electricity that is claimed as fully renewable has been produced by the installations producing renewable electricity under the renewable PPA. Only electricity produced by the contracted installations themselves is eligible. Accordingly, only GOs that have been issued for the installations covered by the renewables PPAs can be used to demonstrate compliance with the conditions on additionality and temporal and geographic correlation.

VI.4.2 Interaction with Disclosure

From the above referenced Q&A, it becomes clear that RFNBO criteria interact with the framework for Disclosure of hydrogen from RES. This is seen in the requirement to use GOs in the conjunction with renewable PPAs. It also clarifies that the associated GOs corresponding to the volume claimed under the PPA, should be cancelled before their validity period.

The cancellation of the GOs ensures that each unit of energy from the renewable sources is taken in account only once, preventing double counting. These GOs or units of energy results in removing renewable energy from the generation mix, impacting the Residual Mix calculation.

VI.5 Risks for double claims

VI.5.1 PPA based renewable claims without GOs

Stakeholders ask questions on how to prove that electrolysers produce green hydrogen from renewable energy: “Is a GO needed on the electricity side to prove the renewable property or is “only” a certification of temporal compliance sufficient to declare the hydrogen as green?”

The Q&A from DG ENER interprets the legal texts so that, when a GO is issued, this GO shall be used as part of the compliance proof, but that not all renewable production might have received a GO. In that case it might be possible to prove compliance without GOs.

Caution must however be given to ensure the prevention of double claims, and the absence of a GO for the same electricity should be confirmed.

Furthermore, the Residual Mix calculation for electricity would need adjustment:

The definition of Residual Energy Mix in RED Art.2 (13) excludes only GOs from a country's annual energy mix. As the Residual Mix is to be used for untracked commercial offers, in case other instruments (e.g. PoS, renewable PPA) entitle to claim renewable energy consumption, these should also be excluded from the definition of the Residual Energy Mix, in order to prevent double consumption claims of the same renewable characteristics. As Member States have an obligation to annually publish the Residual Mix, this can only be done if reporting and data collection systems are installed (regarding such alternative instruments) to ensure this exclusion.

Alternatively, to prevent confusion in the market and to prevent subsequent double claims, it should be clarified in explicit legislation that only GOs entitle to claim renewable energy consumption.

Note however that the RFNBO criteria "only" relate to policy target accounting. They by themselves do not put limitations on the origin Disclosure towards consumers, which suppliers must base on GOs, following the upcoming update of the Gas Directive, Annex 1§5.

VI.5.2 Renewable grid-based claims shall still cancel GOs

Another recurring stakeholder question is what will be the Residual Mix in countries with grids that have if the production mix of one of their bidding zones, or of the whole country is more than 90% renewables? (NO, SE1, SE2)

Stakeholders wonder whether it would be possible to sell the GOs from these renewable energy generation plants to other regions? There is worry that there would be double claiming. DG ENER's response to Q&A question 32 above however clarifies that such GOs should be cancelled and cannot be exported.

The Residual Mix will still balance out for the exported GOs for the electricity from renewables that is not claimed for RFNBO.

VI.5.3 Compensate in the electricity Residual Mix for renewable electricity that is counted as RFNBO input

In case the implementation of the RFNBO Criteria would be based on an interpretation that it would be possible to claim the renewable origin of electricity for RFNBOs without GOs, then still, ensure that the electricity, that is counted as renewable at a specific consumption point for the RFNBO criteria, is excluded from the Residual Mix.

ANNEX VII INTERACTION WITH UNION DATABASE ON SUSTAINABLE BIOFUELS

VII.1 What is the UDB?

The information about injection and withdrawal of renewable gaseous fuels shall be provided in the Union Database (UDB) (Art. 31a, RED III) to qualify for target accounting and financial support. Economic operators are obliged to provide information on sustainability criteria, emission savings and other information up to the point of injection into the gas network as the interconnected gas system shall be considered as single mass balance system. This information shall be certified under National or Voluntary Schemes.

While the data on the gaseous fuel transactions shall be entered into the UDB, the commercial aspect of such transactions are handled completely outside of UDB (in the same manner as they are handled outside of the Guarantees of Origin registries). UDB, in the same spirit as GO issuing bodies, registers transactions – but is in no means an intermediary for concluding those transactions, neither a contracting party. The transactions themselves are being concluded within the gas market as established today in Europe: either via organised markets, either over the counter – direct bilateral, or via brokers.

The UDB for the gaseous fuels value chain is expected to be operational by 21 November 2024, i.e. the legal deadline in the RED III.

Further national integration of the requirements as a consequence of the UDB will depend on the specific implementations the Member States apply with their transposition of RED III. Thus these will only be fully specified by 21st May 2025[44]

The set-up deadline and the creator of the UDB, being the European Commission, are set in the REDIII.

REDIII Art. 31a §1. *By 21 November 2024, the Commission shall ensure that a Union database is set up to enable the tracing of liquid and gaseous renewable fuels and recycled carbon fuels (the 'Union database').*

The actors for entering data into the UDB are the economic operators. They shall enter in the UDB, regarding the fuels they trade, data on:

(a) transactions made
(b) sustainability characteristics, and
(c) life-cycle greenhouse gas emissions.

REDIII Art. 31a §*2. Member States shall require the relevant economic operators to enter in a timely manner accurate data into the Union database on the transactions made and the sustainability characteristics of the fuels subject to those transactions, including their life-cycle greenhouse gas emissions, starting from their point of production to the moment they are placed on the market in the Union. (…)*

This information inserted in the UDB is hence a self-declaration by the economic operators, yet subject to audits under National or Voluntary Schemes.

[44] Deadline for the Member States transposition of the relevant articles in RED III

At the time of drafting this report, the integration of registration processes for tracking the gaseous value chain in the Union Database is under development. The part of the database for liquid biofuels is in a further stage than that for gaseous biofuels. A significant difference with the liquid biofuels sector is that in that sector no GOs exist, while for gases, Member States are obliged to issue them on producers' request if the production isn't supported, as described before.

This chapter considers the interaction between data registered in the UDB, and data used in Disclosure of the origin of energy by/for consumers. It aims at recognising the objective and design of the UDB having its prime purpose in tracking fuels for policy target accounting and not oriented towards Disclosure and takes the UDB design in its current status as an input. From there onwards, it considers design aspects of the interaction between the UDB and the GO system as they are known at the time of drafting this report.

VII.2 Consideration on system boundaries – Mass balancing

The RED relates the accounting of policy targets to the tracking mechanism of mass balancing.

REDIII Art.30 Verification of compliance with the sustainability and greenhouse gas emissions saving criteria

§1 *Where renewable fuels and recycled carbon fuels are to be counted towards the targets referred to in Article 3(1), Article 15a(1), Article 22a(1), Article 23(1), Article 24(4) and Article 25(1), Member States shall require economic operators to show, by means of mandatory independent and transparent* ***audits****, in accordance with the implementing act adopted pursuant to paragraph 8 of this Article, that the sustainability and greenhouse gas emissions saving criteria laid down in Article 29(2) to (7) and (10) and Article 29a(1) and (2) for renewable fuels and recycled-carbon fuels have been fulfilled. To that end, they shall require* ***economic operators to use a mass balance system*** *which (…)*

It also clarifies how to treat the gas network in this target accounting framework when interpreting the mass balancing mechanism.

REDIII Art. 31a § 2 *(…) For the purpose of entering data into the Union database****, the interconnected gas system shall be considered to be a single mass balance system****.*

(…)

A consideration in the scope of this report, is whether this "interconnected gas system" shall be a system boundary for the Residual Mix calculation. Alternatively, the RM boundary shall be wider, e.g. as broad as where the GOs are legally allowed to flow. Restricting it to the "interconnected gas system" would exclude local gas grids e.g. in the north of Scandinavia, and gases that are transported by vehicle, while gas GOs from disconnected grids are allowed to be cancelled for gas consumption in that region.

VII.3 Interaction between UDB and GO system

VII.3.1 Goal: preventing double claims

GOs, as the instrument for Disclosure, have a separate legal basis from the tracking system for sustainable liquid biofuels for target accounting. On top of that, the management of the GO system is delegated to the Member States (through RED Art. 19), while the aim of RED Art. 31a has been

explained as to organize the tracing for RED III target accounting in a centralised way at EU level in the Union Database.

As such, there could be a risk that the same gas is disclosed separately through different legislative tracking systems, namely GOs in national databases and the Proofs of Sustainability under National or Voluntary Schemes, reported by Economic Operators to the UDB. However, REDIII art.31a contains provisions that aim to overcome this risk, as shown in the relevant excerpts of this article here below.

VII.3.2 Legal embedding of the interaction UDB-GO framework

REDIII formalises the interaction between GOs and the UDB, with obligations for Member States and restrictions for the market flow of Guarantees of Origin:

REDIII Art. 31a §4 *Where guarantees of origin have been issued for the production of a consignment of renewable gas, Member States shall ensure that those guarantees of origin are transferred to the Union database at the moment when a consignment of renewable gas is registered in the Union database and are cancelled after the consignment of renewable gas is withdrawn from the Union's interconnected gas infrastructure. Such guarantees of origin, once transferred, shall not be tradable outside the Union database.*

It also establishes responsibilities from Member States regarding quality of data flows into the UDB:

REDIII Art. 31a§5 *Member States shall ensure in their national legal framework that the accuracy and completeness of the data entered by economic operators into the database is verified, for instance by using certification bodies in the framework of voluntary or national schemes recognised by the Commission pursuant to Article 30(4), (5) and (6) and which may be complemented by a system of guarantees of origin.*

Such voluntary or national schemes may use third-party data systems as intermediaries to collect the data, provided that such use has been notified to the Commission. (…)

Regarding the organisation of data flows at national level and EU-central level, Member States have the option to exploit their existing or new national database:

REDIII Art. 31a§5 (…) *Each Member State may use an already existing national database aligned to and linked with the Union database via an interface, or establish a national database, which can be used by economic operators as a tool for collecting and declaring data and for entering and transferring those data into the Union database, provided that:*

a) the national database complies with the Union database including in terms of the timeliness of data transmission, the typology of data sets transferred, and the protocols for data quality and data verification;
b) Member States ensure that the data entered into the national database are instantly transferred to the Union database.

Member States may establish national databases in accordance with national law or practice, such as to take into account stricter national requirements, as regards sustainability criteria. Such national databases shall not hinder the overall traceability of sustainable consignments of raw materials or fuels to be entered into the Union database in accordance with this Directive.

The verification of the quality of the data entered into the Union database by means of national databases, the sustainability characteristics of the fuels related to those data, and the final approval of transactions shall be carried out through the Union database alone. The accuracy and completeness

of those data shall be verified in accordance with Commission Implementing Regulation (EU) 2022/996 (*). They may be checked by certification bodies.

Member States shall notify the detailed features of their national database to the Commission. Following that notification, the Commission shall assess whether the national database complies with the requirements laid down in the third subparagraph. If that is not the case, the Commission may require Member States to take appropriate steps to ensure compliance with those requirements.

VII.4 Statistics from data in UDB will be essential for Residual Mix

VII.4.1 There will be statistics

REDIII also ensures that new statistics will become publicly available regarding data recorded in the UDB. This could help as data input for the Residual Mix calculation, if relevant. Currently, it is not yet fully specified which type of statistics will be published from UDB.

REDIII Art. 31a §6 Aggregated data from the Union database shall be made publicly available, with due regard to the protection of commercially sensitive information, and shall be kept up-to-date. The Commission shall publish and make publicly available annual reports about the data contained in the Union database, including the quantities, the geographical origin and feedstock type of fuels.

VII.4.2 Timing of statistics

Whether the data will be available in a timely manner and with the relevant granularity for the Residual Mix calculation, is however an essential question that has not yet been answered given the current stage of UDB development. Also because some elements may depend on the specific implementation that Member States will apply.

According to the timeline for Residual Mix calculation, discussed in 5.2 Data collection and calculation timeline, data from the UDB would annually be needed to feed into the RM calculations by 21 April, which is also the deadline for competent bodies to send data on GOs. This in order to facilitate updated origin disclosure figures by gas suppliers annually from July 1st onwards, and stick close enough to the year of supply for a meaningful disclosure.

VII.4.3 Categories in the statistics

Clarification on the type of statistics that will be published from UDB is needed. For transparency in the Disclosure of the sources of consumed energy, it is recommended to publish the number of PoS cancelled for consumption per Member State, per country of origin, and in categories on whether or not accompanied by GO cancellation. It is recommended to provide subcategories per energy source, at least differentiating between renewable and low-carbon gas, but also further detailed per energy source. Tags that are optionally available on GOs and in PoS on the UDB regarding the Advanced Biofuels character should be part of the categories in the statistics.

This will enable the parties who use the data from the UDB, among others for Residual Mix calculation, to have an overview and start their analysis from accurate data. The same goes for policy development and general monitoring on green claims.

For Member States' Disclosure supervisory authorities, not only aggregated data, but also the details of every consignment of gas that the UDB registers as consumed in their country, can be made

available at request. This would indicate whether or not accompanied by a GO in the UDB. Also it would clarify if the UDB displaying facilitates a consumption claim based on the record in the UDB or not. Such availability strengthens the Member States in their responsibilities regarding detecting of double counting when such would occur.

VII.5 Challenges on the interaction between national and EU central tracking responsibilities

Where it comes to responsibilities on tracking the energy source of energy, legislation foresees a shared responsibility between the European Commission and national level. The following paragraphs summarise challenges arising from these circumstances.

VII.5.1 Central tracking tasks at EU level

The European Commission monitors the quantities of biofuels and biomass eligible to be counted towards Targets based on the information provided from Member State authorities and economic operators. For doing so, there is a tracking throughout the supply chain of sustainability characteristics, which includes the Proof of Sustainability (PoS) and Greenhouse Gas (GHG) emissions.

VII.5.2 National responsibilities related to energy origin tracking and claims

On the other hand, national responsibilities encompass a wide range of tasks. Following REDIII, these tasks include:

- ensuring the origin of Renewable Energy Sources (RES) can be guaranteed;
- issuing Guarantees of Origin upon the request of the producer;
- ensuring that each unit of RES is counted only once to prevent double counting;
- calculating the Residual Mix;
- ensuring that used gas GOs correspond to the “network characteristics” of gas consumption;
- managing national support systems;
- require Economic Operators (EO) to show that criteria are met for target accounting;
- ensure the GOs they issue, adhere to the EN16325 GO standard;
- ensure that GOs expire, at maximum 18 months after the production period (but possibly earlier, depending on national system design choices).

MS also have to supervise reliable Disclosure as per the Recast Gas Directive and ensure substantiated green claims as per the draft Green Claims Directive.

Note that Member States can only execute their responsibilities on the condition that the cancellation of GOs takes place under the control of the country where the RES consumption is claimed. This is essential for a harmonised and reliable system for tracking and claiming renewable energy consumption.

VII.6 Conditions for preventing double counting with other reliable tracking systems than GOs

If consumption claims on renewable and low-carbon gases would legitimately be made based on other instruments than GOs, then, in order to prevent double claims of the same renewable & low-carbon Attributes:

1) These other Tracking Instruments should be following the physical flows of gases. This follows from the definition of the Residual Mix in Art. 19.2 13) of RED: "'Residual Energy Mix' means the total annual energy mix for a Member State, excluding the share covered by cancelled Guarantees of Origin". Indeed, only the share covered by cancelled GOs is excluded from the total annual energy mix of a Member State. Therefore, the energy covered by other tracking systems than GOs must be included in the "total annual energy mix" of a Member State; and
2) there should be double counting prevention measures for that "other reliable tracking instrument", in all stages of its existence, being ensuring uniqueness at issuance, transfer, cancellation, usage, including erroneous duplication prevention, and there should be rules that explicitly forbid claims being made outside the legitimate tracking systems; and
3) the Disclosure supervisory authority of the Member State should have insight in the data on these instruments, for which energy production they are issued, where they are used, and whether this is in line with the Disclosure rules for the country of consumption; and
4) if such instrument were to be PoS that are registered in the UDB, then in addition to the gas supplier, the national Disclosure supervisor and both the national and international party who calculate the Residual Mix would also need to know which PoS entitles for the Disclosure towards the respective consumer. Access to these parties to the relevant data inside the UDB can overcome this.
5) data collection mechanisms should be in place at national and central level for the whole calculation area of the Residual Mix.

While the integration of the gaseous value chain in the UDB is ongoing, these essential conditions need to be covered.

Currently, flows of records or certificates issued under voluntary schemes, are not systematically collected at Member State level, but this would be dealt with in the Union Database. Further exhaustive reporting requirements are not yet fully implemented. They are only in the UDB when PoS are used for target accounting purposes, not when used for other types of consumption claims.

This brings the conclusion that in the current legal setting and data collection processes, any proof of sustainability for which no corresponding GO is cancelled and that is not registered in the UDB, would cause double counting, as these renewable gases are also in the Residual Mix. Furthermore, the UDB may give access to the national Disclosure supervisory authorities regarding which renewable gases are registered for consumption in their domain, and whether or not a GO is linked to it.

VII.7 GOs and PoS should be inseparable at consumption

As such, GOs and PoS issued for the same unit of energy should be inseparable at the point of energy consumption where that specific unit of energy is claimed. Indeed,

1) Where both exist for the same unit of energy, their separate trade risks double claims of the same unit of energy,
2) Where no GO is issued, the energy covered in an PoS is already included in the Residual Mix.

ANNEX VIII MASS BALANCING VERSUS BOOK AND CLAIM, AND REQUIREMENTS FOR MULTI-PURPOSE TRACKING INSTRUMENTS

VIII.1 Chain of custody tracking mechanisms

Gases consist of molecules of which the origin characteristics are not physically visible or sensible. Chain of custody tracking mechanisms need to be deployed when making statements on the energy source of the gas.

It has occurred in discussions on the GO system and the certification of sustainability criteria that confusion came up on terminology regarding chain of custody tracking. Sometimes the purpose of a tracking system is confused for its tracking mechanism or the criteria on which the purpose is based.

The purpose of a GO is Disclosure, informing consumers on the origin of energy. The GO instrument can be used in a book-and-claim way, where the GO is sold separately from the energy of which it represents certain Attributes; yet is can also be sold together with this energy, generally called “bundled sale” in electricity, or “mass balancing” in the gas sector.

In order to account for EU policy targets and confirm certain criteria are met, sustainability characteristics and emissions of gases need to be tracked following the concept of mass balancing.

While the purposes of Disclosure and target accounting come together where they both relate to consumption of renewable gas at a certain consumption point, the relation between tracking mechanism deserves some discussion.

The below visual shows the various terms with the aim to clarify that tracking purposes, methods, instruments and tracked information can relate to each other in various ways, depending on tracking system design choices.

Tracking purposes

- Disclosure
- Support
- Target accounting

Tracking methods

- Book and claim
- Mass balancing

Tracking instruments

- GOs in national governmentally operated registries
- Pdf and excel records with information passed on between economic operators
- Records in a single registry (like UDB)

Tracked information

- Facts
- Criteria

Figure 23: Tracking methods, tracking instruments versus tracking purposes

This chapter discusses the concepts of book-and-claim and mass balancing and their optional touchpoint.

VIII.2 EU rules for mass balancing and Voluntary Schemes

Only energy that complies with the RED criteria can be counted towards the mandatory policy targets like the transport target in Art.25 of the RED. The RED in Art. 30 establishes EU Voluntary national or international schemes to ensure standards for the production of renewable and recycled carbon fuels, provide accurate greenhouse gas emission savings data, and demonstrate that consignments of biofuels, bioliquids, and biomass fuels meet the sustainability criteria.

The Commission Implementing Regulation (EU) 2022/996[45], outlines the requirements for Voluntary and National Schemes. These requirements include rules for verifying sustainability, greenhouse gas emissions saving, and criteria for low indirect land us change risk. It builds its chain of custody tracking on a mass balancing principle.

Art. 19.1 of Regulation 2022/996(EU) states:

Voluntary schemes *shall require the economic operators participating in the scheme to* ***use a mass balance system****, in accordance with Article 30(1) of Directive (EU) 2018/2001 that* ***allows the mixing*** *of raw material or fuels that differ in their sustainability and GHG emissions saving characteristics.*

VIII.3 GOs may track energy through book-and-claim or through mass balancing

Guarantees of Origin, through the standards they comply with, may track the energy they represent in a book-and-claim manner. Through the system design, they remain standing as a unique instrument for origin claims of energy consumption, even if they are disconnected from the energy they represent in the course of their lifetime. On the other hand, certain energy suppliers or consumers make a proposition of selling or using the GOs together with the energy they represent. This concept of bundled sale of GOs and energy could be seen as an implementation of the mass balancing principle. At any point in time they remain a unique, transferrable, instrument that entitles for a claim. EU legislation does not fix the chain of custody tracking mechanism under which it is to be transferred and used.

[45] Commission Implementing Regulation (EU) 2022/996 of 14 June 2022 on rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land-use change-risk criteria: https://eur-lex.europa.eu/eli/reg_impl/2022/996/oj

ANNEX IX MEMBER STATES' REPORT ON RES CONSUMPTION AND GO

IX.1 Reporting obligation

Member States are obliged to report to the European Commission the resulting annual national renewable energy consumption based on GOs. This obligation comes through Annex XVI of the Commission Implementing Regulation (EU) 2022/2299.[46]

Reporting element	Specification	Unit	Year	
			X-3	X-2
Electricity				
Guarantees of origin – issued (1)	M_{iap}	Number		
Guarantees of origin – canceled (2)	M_{iap}	Number		
Guarantees of origin - resulting annual national renewable energy consumption (3)	M_{iap}	GWh		
Gas				
Guarantees of origin - issued	M_{iap}	Number		
Guarantees of origin - canceled	M_{iap}	Number		
Guarantees of origin - resulting annual national renewable energy consumption (4)	M_{iap}	GWh		
Heating/cooling				
Guarantees of origin - issued	M_{iap}	Number		
Guarantees of origin - canceled	M_{iap}	Number		
Guarantees of origin - resulting annual national renewable energy consumption (4)	M_{iap}	GWh		
Measures taken to ensure reliability	M_{iap}	n/a		
Measures taken to protect against fraud of the system	M_{iap}	n/a		

Notation: X = reporting year; M_{iap} = mandatory if applicable

Notes:

(1) The number of guarantees of origin issued for energy that is produced from renewable energy sources in the Member State during the reporting period, based on the time of production of the energy.

(2) The number of guarantees of origin from renewable energy sources cancelled for energy that is consumed in the Member State during the reporting period.

(3) The quantity of energy consumption for which the origin has proven to originate from renewable energy sources, being determined as the cancelled guarantees of origin for energy consumption from renewable energy sources in the reporting period + the renewable share of the residual mix multiplied by the total energy consumption for the reporting period that is not covered with guarantees of origin cancellation.

(4) The quantity of energy consumption for which the origin has proven to originate from renewable energy sources, being determined as the cancelled guarantees of origin for energy consumption from renewable energy sources in the reporting period + the energy consumption from renewable energy sources through other reliable tracking mechanisms that avoid double counting (which may include "the renewable share of the residual mix multiplied by the total energy consumption for the reporting period that is not covered with guarantees of origin cancellation nor other reliable tracking mechanisms").

Figure 24: Reporting template for Member States to supply data to the European Commission on national renewable energy consumption statistics, following Annex 16 of (EU) 2022/2299

Citing from the Reporting Guidelines, the resulting annual national renewable electricity consumption for year X_i, is to be determined as the sum of the number of GOs for renewable energy sources

[46] Link to Commission Implementing Regulation: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R2299

cancelled for consumption during that year in the Member State, and the renewable fraction of energy consumed in that Member State and during that year, for which no RES-GOs were cancelled, based on the renewable fraction of the Residual Mix. For gas and heating/cooling, this definition is extended with other Reliable Tracking Mechanisms for renewable energy, assuming a Residual Mix calculation would be in place for these energy carriers, too.

IX.2 Consistency of different reporting on annual renewable electricity consumption per MS

An analysis of the reported data, in comparison to the total supplier mix per country as collected by AIB from the Disclosure supervisory authorities, shows there is confusion on which statistics to report. Aside from obvious data inconsistencies (wrong unit prefix, statistics not filled in…) comparison of the different MS teaches us there's a wide variety in interpretations of the statistics. Figure 25 and Figure 26 show the statistics for electricity per MS, and for 2020 and 2021, respectively.

Although the statistics are not enough to conclude the exact calculation principles per MS, it is clear that the number of GOs cancelled matches with the declared RES consumption in some MS (2021: BE[47], CZ, HU, NL, RO and SE), but in the other MS the reported consumption is higher than the number of cancelled GOs.

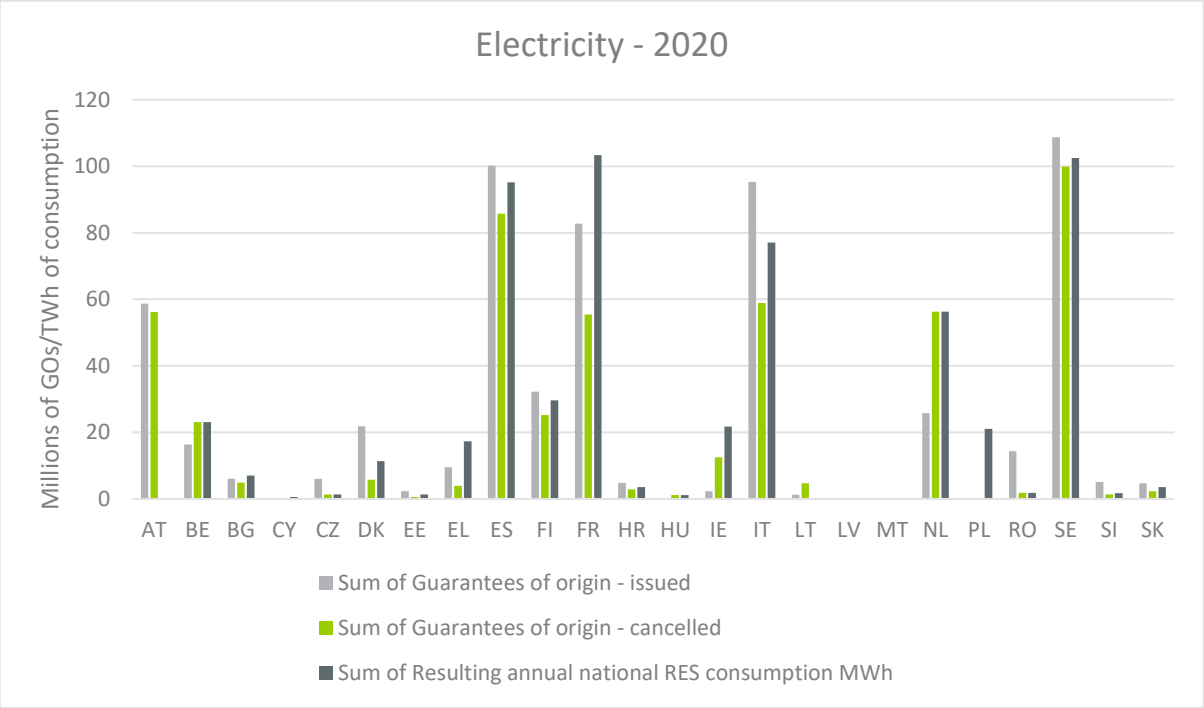

Figure 25: Summary of statistics, reported by Member States on electricity for 2020.

[47] Two-letter codes following ISO 3166-1 alpha-2, see https://en.wikipedia.org/wiki/ISO_3166-1_alpha-2

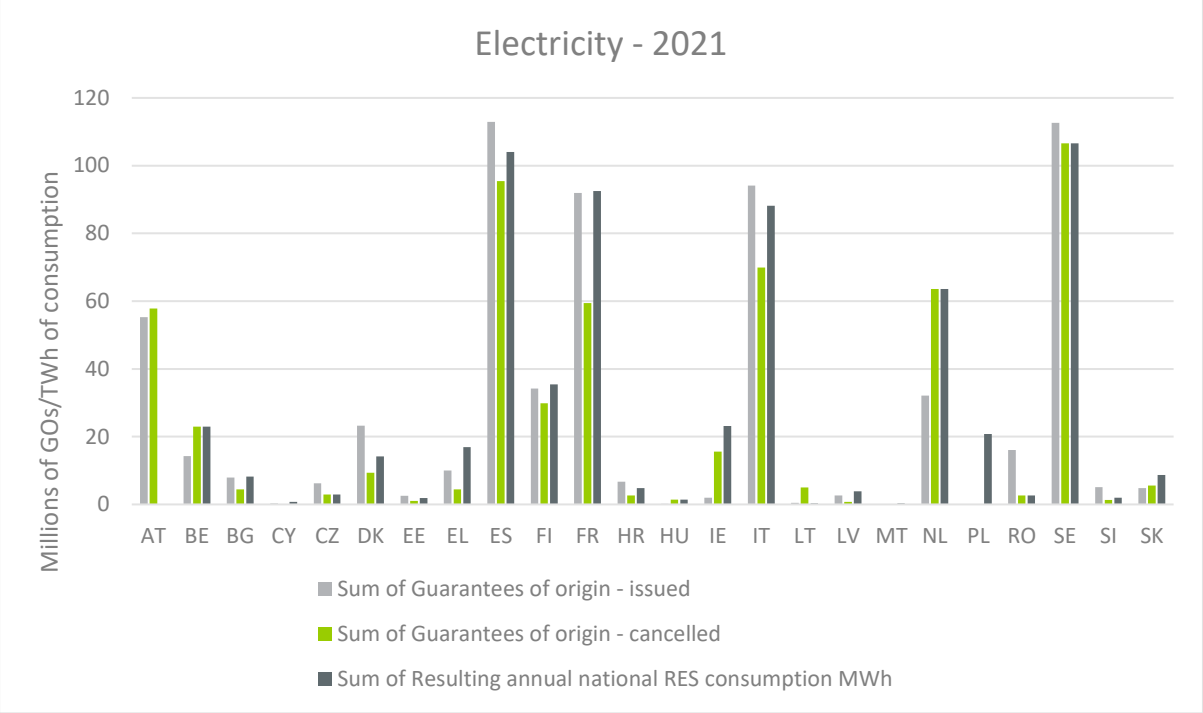

Figure 26: Summary of statistics, reported by Member States on electricity for 2021.

There are three likely clarifications for the RES consumption exceeding the volume of cancelled GOs:

1) The **renewable fraction in the Residual Mix** is not counted towards cancelled GOs – indeed, this fraction is the result of GOs expiring – but it is counted towards renewable consumption.[48]
2) **Self-consumed energy** is not eligible for GO issuance in all MS. However, self-consumption of energy from RES may be included towards the national RES consumption.
3) Somewhat related to self-consumption, **small production devices** (mostly residential solar PV installations) cannot apply for GOs in many MS. Their production might however be counted towards national RES consumption.

It may of course also be the case the national RES consumption in reality is higher than what some MS report, but the MS chooses only to consider the volume of cancelled GOs and nothing more.

In addition, the graphs in Figure 25 and Figure 26 reflect the fact that some countries have a surplus in issued GOs compared to consumption of renewable energy, while others have a deficit. Making the total sum of statistics for all MS, we expect to see an approximate balance between GOs Issued and Cancelled.

[48] A known example where this is NOT the case, is Flanders (Belgian region). Here, disclosure legislation requires that GOs are cancelled to prove the consumption of renewable energy. In that sense, expired GOs are not counted towards the consumption of renewable energy and the renewable fraction from the Residual Mix is discarded.

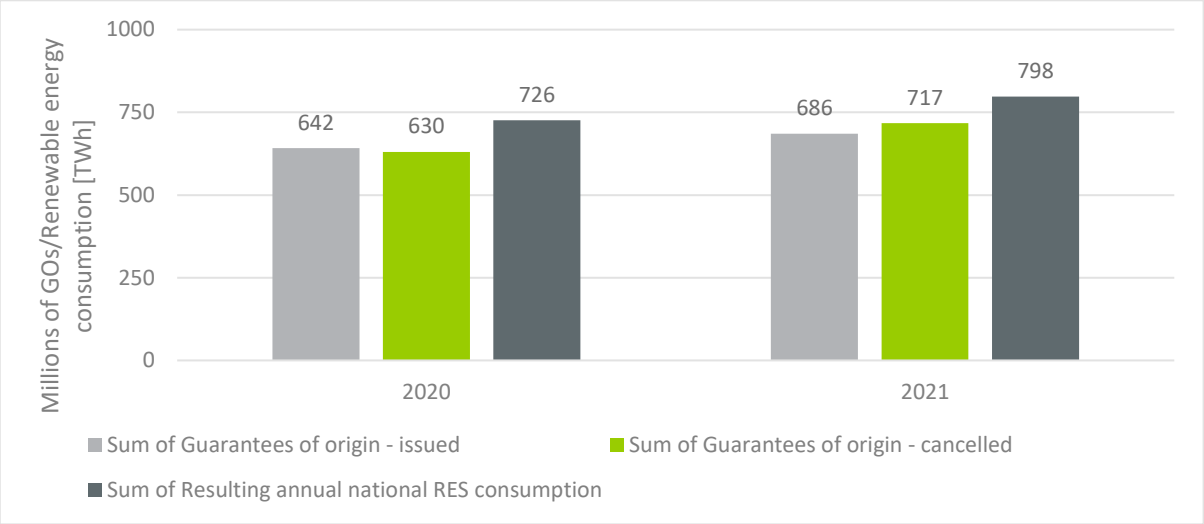

Figure 27: Total of issued and cancelled GOs, and resulting RES consumption for all reporting MS.

This sum is shown in Figure 27. Indeed, the statistics for issuance and cancellation of GOs are more or less balanced. Deviations can be explained by discrepancies between the time of issuance and cancellation. Still, the reported EU RES consumption in 2020 and 2021 exceeds the number of cancelled GOs by 15 and 11%, respectively. Note that this percentage should be higher, given that Austria has a full Disclosure system, but has not reported national RES consumption statistics.

IX.3 Consistency between MS reported data and Residual Mix Calculation for electricity

Next, consistency between the reported national RES consumption to the European Commission and the Total Supplier Mix in the Residual Mix calculations is verified. We use the following statistics, derived from the annual Residual Mix calculation:

- **RES fraction in Total Supplier Mix:** the RES fraction in the total supplier mix is calculated as the Total Supplied Volume multiplied by the sum of the renewable energy percentages in the total supplier mix.
- **RES fraction in Untracked Volume:** the RES fraction in the Untracked Volume is calculated as the Total Supplied Volume, multiplied by the fraction of untracked energy (i.e. the supplied volume for which the Residual Mix is used), multiplied by the fraction of RES in the Residual Mix. This is the supplied volume that is considered to be originating from RES sources based on expired RES GOs.
- **RES fraction tracked with GO:** this is the RES fraction in the Total Supplier Mix, diminished with the RES fraction in the Untracked Volume. This is the fraction from which the expired GOs have been deducted, and which should be tracked with GOs.

The resulting calculated values are shown in Figure 28 and Figure 29, and compared with the reported statistics under the Implementing Regulation. It appears that most countries have reported a RES consumption to the EU Commission that lies between the RES volume in the Total Supplier Mix and the number of cancelled GOs. It would be expected that the reported national RES consumption would be equal to the RES fraction of the total supplier mix, and that the number of cancelled GOs would be

equal to the RES fraction tracked with GO (i.e., the RES fraction of the Total Supplier Mix minus the RES fraction in the untracked volume).

Some interesting cases:

- *Germany:* the reported RES consumption is close to the number of cancelled GOs, which is much lower than the RES volumes in the total supplier mix (tracked and untracked). This may result from the fact that Germany does not issue GOs for supported energy.
- *France:* the reported RES consumption exceeds the RES volume in the total supplier mix, and is considerably higher than the volume of cancelled GOs.
- *Italy:* in 2020, the reported RES consumption is higher than the number of cancelled GOs, which is in turn far higher than the volume of RES that should be tracked with GOs, according to the Residual Mix.
- *Sweden:* number of cancelled GOs and the reported RES consumption exceed the RES fraction in the Total Supplier Mix (both tracked and untracked).

Note that for Austria (country with full Disclosure), the number of cancelled GOs equals the RES fraction of the total supplier mix, and the reported RES consumption is only slightly higher.

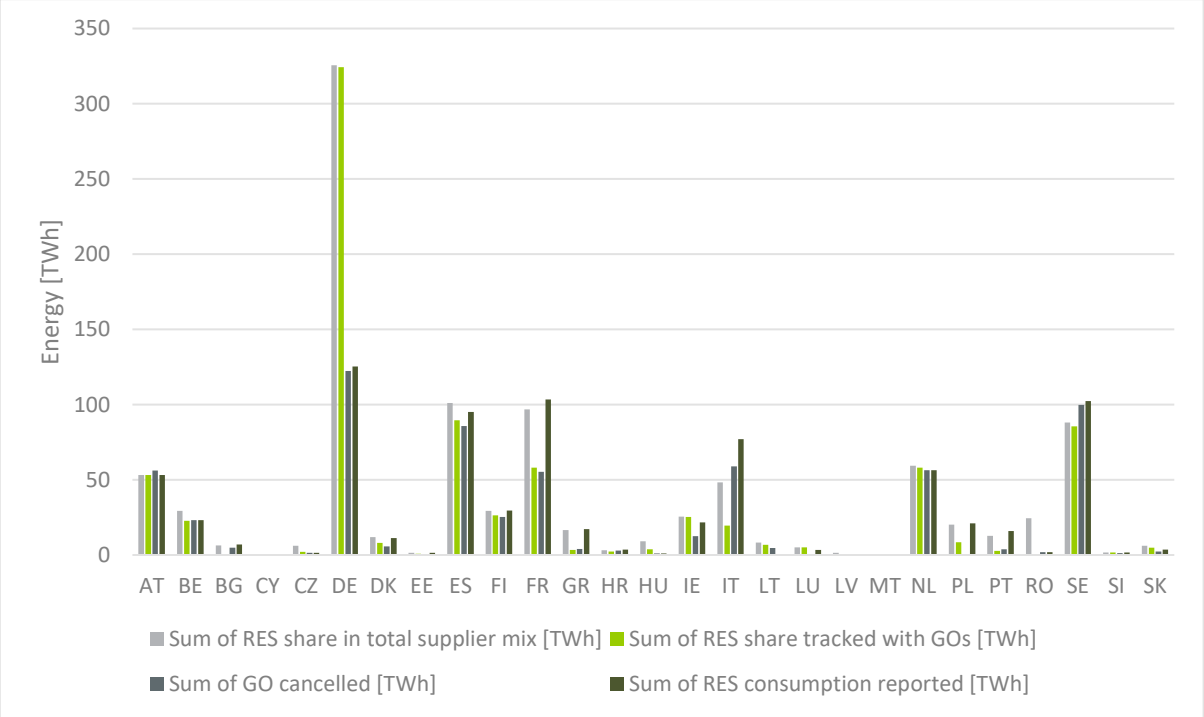

Figure 28: Comparison for 2020 of 1) the calculated RES fraction in the total supplier mix, 2) the remaining RES fraction after the RES fraction from the Residual Mix has been subtracted, 3) the energy volume corresponding with the reported number of cancelled GOs.

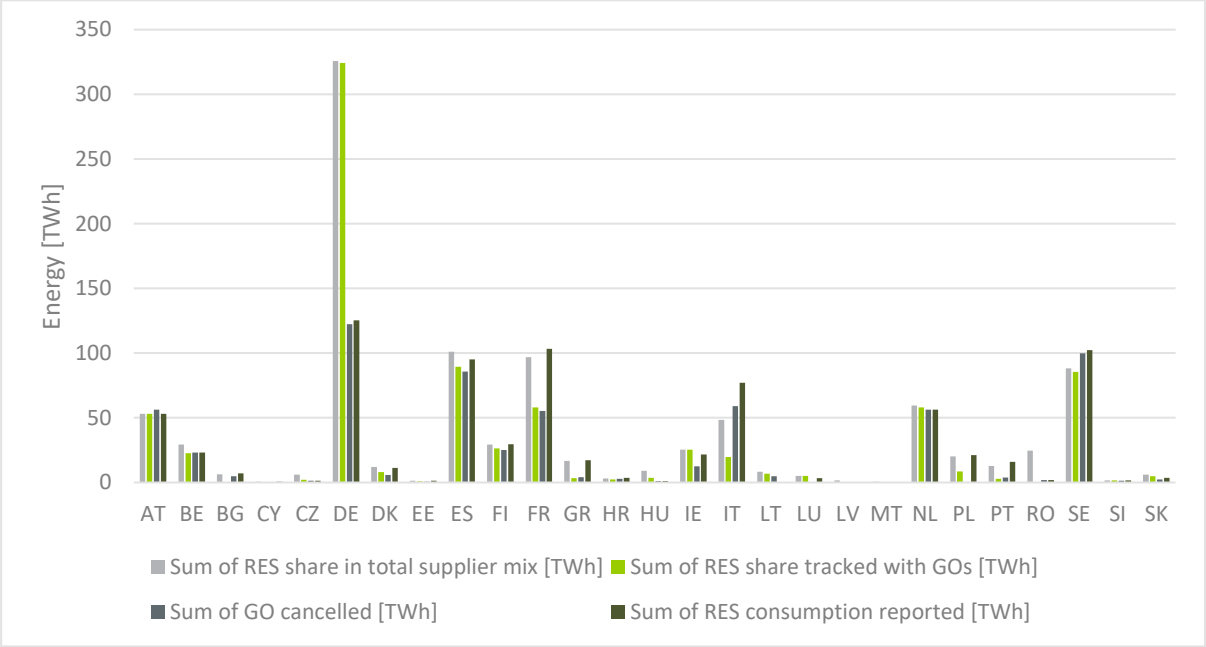

Figure 29: Comparison for 2021 of 1) the calculated RES fraction in the total supplier mix, 2) the remaining RES fraction after the RES fraction from the Residual Mix has been subtracted, 3) the energy volume corresponding with the reported number of cancelled GOs and 4) the reported national RES consumption.

Checking the sum over all MS, we see that the RES volume in the total supplier mix (both the fraction including and excluding expired GOs in the untracked part) was higher than the reported RES consumption in both years, as shown in Figure 30.

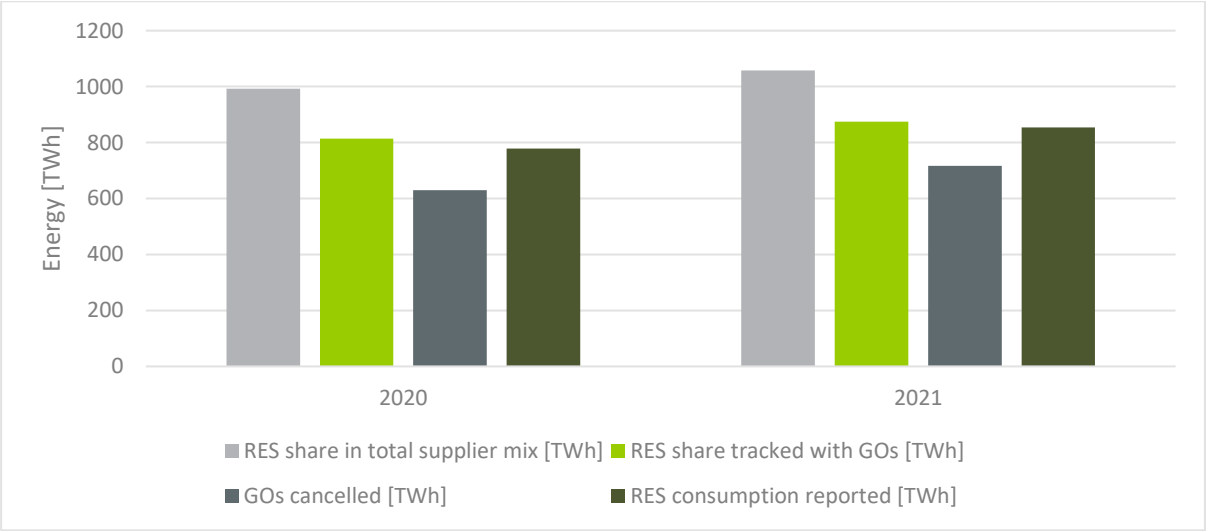

Figure 30: Comparison of the sum over all reporting Member States of 1) the calculated RES fraction in the total supplier mix, 2) the remaining RES fraction after the RES fraction from the Residual Mix has been subtracted, 3) the energy volume corresponding with the reported number of cancelled GOs and 4) the reported national RES consumption.

This leads us to conclude that there are clear opportunities to improve the quality of reporting, both towards the Residual Mix calculation and the EU Commission. Better guidance and harmonization are needed to reduce the discrepancies between the various reporting processes.

IX.4 Questions from MS reporting GO and RES Statistics

In early 2023, AIB members discussed how to interpret the statistics to be reported to the European Commission. At the time, it was clear that due to differences in national law and regulations, it would be difficult to report consistent statistics, given the instructions. Also, at the time it was not clear what the purpose of the reporting obligation was.

A subgroup discussed ways to understand the requested statistics. The following discrepancies were identified:

- **Self-consumption:** mostly for residential PV installations; not all MS issue GOs for (all or any) production from small PV installations. It was not clear whether self-consumption was to be accounted for in the national RES consumption figures.
- **Time discrepancy between issuance and cancellation:** some MS require that only GOs from the same year of production be cancelled for consumption in that year; others allow a longer cancellation window (up to 18 months after production).
- **Reporting year:** whether the statistics referred only to GOs issued and cancelled during the reporting year, or for the reporting year.
- **Energy receiving support is not always eligible for GOs:** most prominently in Germany, the rule is that no GOs are issued for energy from production devices that have received support. Question whether to include energy from these devices under national RES consumption.
- **Expired GOs:** if GOs are not cancelled within their lifetime, they expire and are included in the national Residual Mix. Some MS do not count this renewable fraction in the RM as consumption from RES. The reason for this is that energy may only be disclosed as energy from RES if GOs are cancelled for that consumption. Expiry does not count as a cancellation. Other countries may apply the same rule, to encourage as much cancellation of RES GOs as possible.
- **Ex-domain cancellations:** when electronic transfer of GOs between two domains is not possible, ex-domain cancellations (EDCs) may be used as a solution. In that case, GOs are cancelled in one domain, to prove consumption in another. It is unclear which Member State should report the cancellation of such GOs, and which domain should report RES consumption resulting from the EDC. The risk is that both domains report, resulting in double counting in the statistics.
- **Reporting parties:** the authorities who are responsible for the reporting don't always have a deep knowledge of the national GO system and statistics on renewable energy consumption using GOs. In practice, they have to reach out to either the issuing body and/or the Disclosure responsible body.

Overall, AIB Members agree that the key to providing clarity on these questions is the purpose of the reporting obligation.

IX.5 Conclusion

The data confirms the confusion that was signalled by AIB Members in 2023. The data reported under Implementing Regulation (EU) 2022/2299 by itself does not provide a lot of insight. In order to be conclusive, it must be combined with data from the Residual Mix calculation. Doing so shows a large degree of variation in the interpretation of what should be reported, depending on the Member State.

In addition, summing the statistics over all MS shows further discrepancies:

- The Issued and Cancelled GOs do not match;
- The reported RES consumption by the MS is lower than the RES fraction in the Total Supplier Mix, as calculated in the Residual Mix calculation; and
- The reported GO cancellations do not add up to the RES volume to be tracked with GOs, as calculated in the Residual Mix calculation.

While the intended interpretation of the Commission Implementing Regulation (EU) 2022/2299 is that the resulting renewable consumption is based on the renewable share of the residual Mix, from this analysis it can be concluded that most countries have used a different methodology.

Lastly, the collection of data lags too far behind to be of much use, other than to check the reported statistics and the Residual Mix calculations ex-post.

IX.6 Recommendations for clarification to MS on the reporting requirements

Judging from the conclusions in the previous section, it is recommended that the European Commission provides **further clarification to the Member States on the general goal of the MS report**, and **on the details of the required data**:

- GO Issuance statistic should be based on date of issuance, in line with the timings for the Residual Mix calculation (1.4.Y – 31.3.Y+1);
- GO Cancellation statistic should be based on date of cancellation, in line with the timings for the Residual Mix calculation (1.4.Y – 31.3.Y+1);
- Ex-domain cancellations should only be included in the statistics of the Member State for which the GOs have been cancelled;
- Clarify that supported energy and self-consumption, for which no GOs may have been issued, or GOs may have been immediately cancelled upon issuance, need to be considered in the national RES consumption;
- Repeat that the RES fraction in the Residual Mix must be included, even if it may be discarded on a national level;
- National RES consumption should include production from RES, for which no GOs have been issued.

Lastly, we recommend collecting the data sooner after the reporting period, in line with the deadline for submitting statistics for the Residual Mix Calculation, being 20 April of year Y for collecting data of year Y-1.

ANNEX X STAKEHOLDER SURVEY ON HIGH-LEVEL METHODOLOGY FOR RESIDUAL MIX FOR GASES

A survey was conducted from 9 March 2024 until 20 April 2024, aiming to collect preliminary stakeholder views on how a Residual Mix Calculation Methodology should be construed. This Annex provides an overview of the survey questions and summarizes the received feedback.

X.1 Survey Questions

1) Your name
2) Your organization
3) Country you operate from
4) The area of activity of your organization *(select one or more)*
    a. Supply of energy/Certificates to end consumers
    b. Legislator/policy development contributor
    c. Consumer of energy
    d. Trader
    e. Grid Operator (TSO/DSO)
    f. Issuing body for GOs
    g. Competent body for supervision of Disclosure
    h. Consultancy/academic/research
    i. Other, please specify
5) Do you feel that a residual mix for gases is relevant? (Yes/No)
6) Explain your reasoning to your above answer
7) Will it impact your work if there is a residual mix for gases? (Yes/No/Not sure)
8) Please explain how would it impact, why it would not, or why you are unsure
9) There are different distribution reaches for gases, depending on the means of transport and the type of gas. (transport through an interconnected pipeline system, transport by vehicle, transfer of renewable characteristics without physical connection ...)
   Do you feel that for a gases a separate residual mix need to be determined within different distribution system boundaries? (Yes/No/it depends)
10) Please elaborate on your response
11) Do you feel that a separate residual mix should be calculated specifically within the following system boundary (in terms of distribution reach): (select one or more)
    a. for gases taken from all European regulated natural gas grids?
    b. for every single non-interconnected natural gas grid? (= separately for local grids and for gases taken from the European interconnected natural gas grid)?
    c. as wide as gas GOs (all gases including hydrogen) are accepted in EU?
    d. for every single hydrogen grid?
    e. aggregated for all hydrogen grids
    f. aggregated for all hydrogen transported to their consumers by vehicle
    g. all hydrogen, irrespective of way of transport
    h. single RM for all gases including hydrogen, irrespective of the way of transport
    i. Other, please specify

12) Which energy sources need their own category in the Residual Mix for gases? (Multiple refers to further subcategorizing, e.g., Multiple Renewable Sources in this context could mean subdividing into Wind/Solar/Hydropower/Biomass/Other) (select one)
    a. Renewable / Fossil / Nuclear
    b. Multiple categories of Renewable Sources / Fossil / Nuclear
    c. Multiple Renewable Sources / Multiple Fossil / Nuclear
    d. Multiple Renewable Sources / Fossil / Multiple Nuclear
    e. Multiple Renewable Sources / Multiple Fossil / Multiple Nuclear
13) In case you selected a category with "multiple", which exact subcategories would you propose?
14) When calculating a separate residual mix per type of gas, how would you define categories of relevance to refer to the type of gas, for which a separate residual mix calculation is needed ? (considering natural gas / hydrogen / methane / propane / butane / ... or welcome to phrase such categories in any other way)
15) Optional: provide more information about which categories would be needed in your answer above.
16) Which data sources do you recommend, as an input for calculating the Residual Mix?
    a. natural gas consumed in your country from the natural gas grid
    b. the consumption of natural gas that is delivered to consumers by vehicle
    c. the consumption of hydrogen delivered through a pipeline system
    d. the consumption of hydrogen delivered to consumers by vehicle
    e. the production of renewable gas excluding hydrogen
    f. the production of hydrogen from renewable sources
    g. the production of hydrogen that complies with the criteria of the RFNBO Delegated act
    h. (number) the quantity of issued / expired/ exported/ imported/ cancelled gas GOs for a certain year of production/consumption
    i. the quantity of issued / expired/ exported/ imported/ cancelled hydrogen GOs for a certain year of production/consumption
    j. the quantity of issued / expired/ exported/ imported/ cancelled gas attributes covered with other Reliable Tracking Systems (= other than GO) for a certain year of production/consumption
    k. the quantity of issued / expired/ exported/ imported/ cancelled hydrogen attributes covered with other Reliable Tracking Systems (= other than GO) for a certain year of production/consumption
    l. the physical import of natural gas in your country the physical import of hydrogen in your country
    m. proofs of sustainability

    Welcome to add only a single data source or multiple sources you are aware of (if you just know data sources for one, just mention those you know)
17) What are the recommended data sources for the production of renewable gas in your country? (with reference to source, if possible)
18) What are the main challenges and potential solutions you see in calculating the residual mix for gases?
19) Do you feel that Proofs of Sustainability should entitle for claiming the renewable characteristics of the origin of gases to end consumers? (Yes/No/Not sure)

20) Do you feel that Proofs of Sustainability should entitle for claiming the low-carbon characteristics of the origin of gases to end consumers? (Yes/No/Not sure)
21) Please elaborate on your response to the above two questions
22) What general advice do you have for developing a residual mix calculation method for gases?
23) My responses may be displayed in the report that elaborates a proposal for a Residual Mix calculation methodology (Yes/Yes but without displaying my identity/Yes but without displaying the identity of myself and of my organisation)

X.2 Survey Report

X.2.1 Stakeholder readiness for a Residual Mix for gases

Survey question:
Is Residual Mix for Gases relevant?

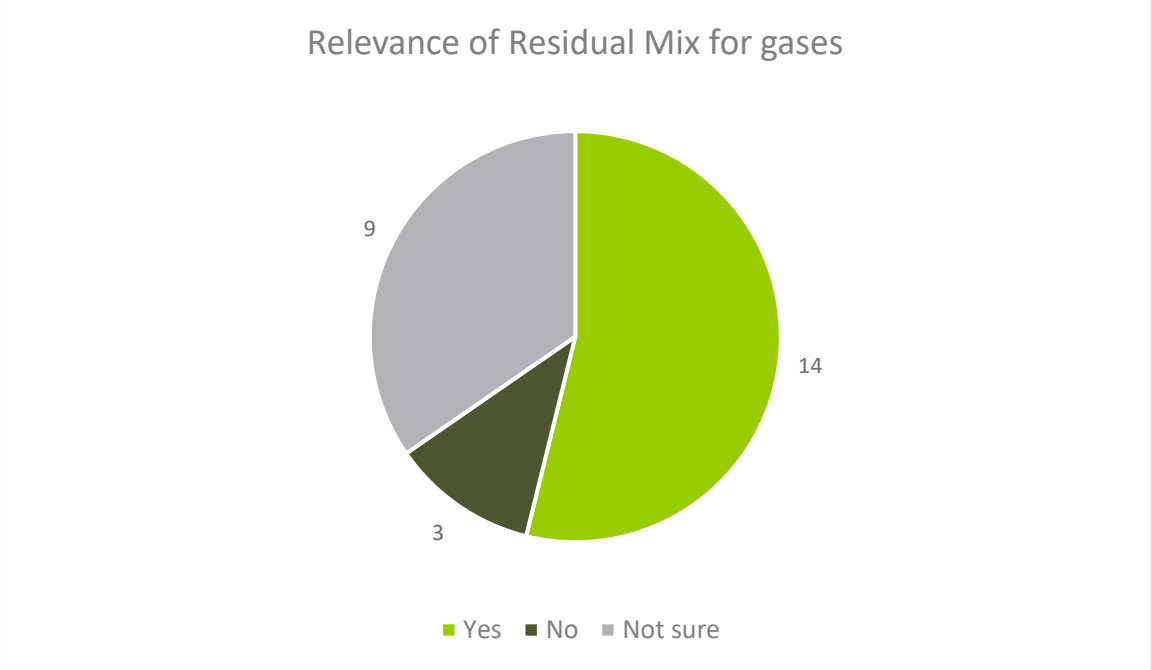

Figure 31: Is Residual Mix for gases relevant?

More than half of the respondents highlight the relevance of a Residual Mix for gases based on following arguments:

- The Residual Mix for gases is a key tool to inform end-consumer about the attributes of gas, such as the associated upstream emissions, and to make them aware of the decarbonisation potential.
- The purpose of the Residual Mix is to indicate the composition of sources of the provided energy for which no GO were cancelled, such as low carbon gases.

- When a country imports GOs for renewable gas, it exports at the same time attributes of fossil gas, and these should be allocated to the GO exporting country.
- The Residual Mix is instrumental in avoiding double counting.
- It helps to harmonize a common calculation methodology for all Member States.
- Public data on the Residual Mixes is important to make the energy attribute flows in Europe transparent.

The arguments of the respondents, indicating that the Residual Mix for gases is not relevant are:

- The quantities of renewables are currently too low and the introduction of a Residual Mix for gases is too premature; the costs would outweigh the benefits.
- Any renewable gas will be labelled with GO and/or PoS. So, there will not be amounts of non-labelled green gas.
- Today the GO system for electricity does not capture all the renewable electricity can be considered as a shortcoming of the system.

X.2.1.1 Impact of Residual Mix for gases for respondents

Survey question:
Will it impact your work if there is a Residual Mix for gases?

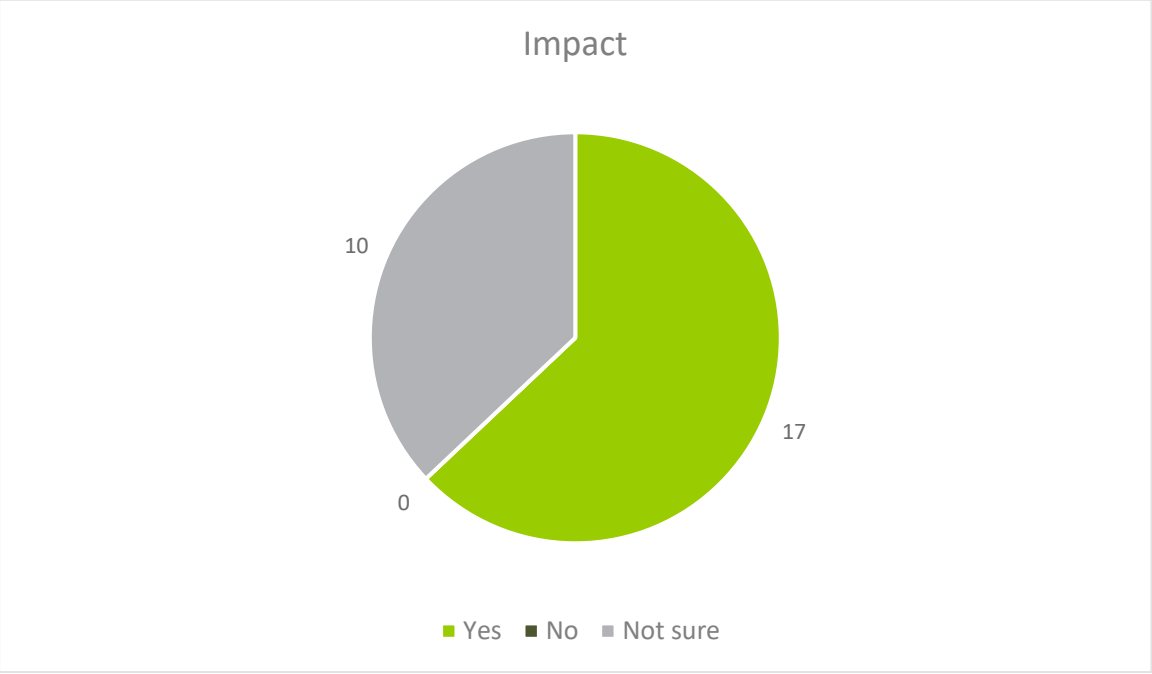

Figure 32: Impact of Residual Mix for gases on respondents

The majority of respondents indicated that the Residual Mix of gas will impact their work. Most indicated that it would lead to additional work and responsibilities.

Some energy consumers refer to the impact on the consumer choice as a positive outcome of the Residual Mix:

- The Residual Mix will encourage many end-users, such as local authorities, to seek Guarantees of Origin for their gas supply and will be challenged to decarbonise their gas supply from the operation of the GO system and the Residual Mix.

- We are a natural gas consumer interested in adopting a market-based approach for our gas consumption in order to reduce our scope 3 emissions and the product carbon footprint of the H_2 we produce from natural gas.

The respondents, indicating to be unsure about the impact of the Residual Mix, need more details on its implementation before they can make an assessment.

X.2.1.2 Residual Mix – distribution system boundaries

Survey question:
There are different distribution reaches for gases, depending on the means of transport and the type of gas. (transport through an interconnected pipeline system, transport by vehicle, transfer of renewable characteristics without physical connection ...).
Do you feel that for gases a separate Residual Mix need to be determined within different distribution system boundaries?

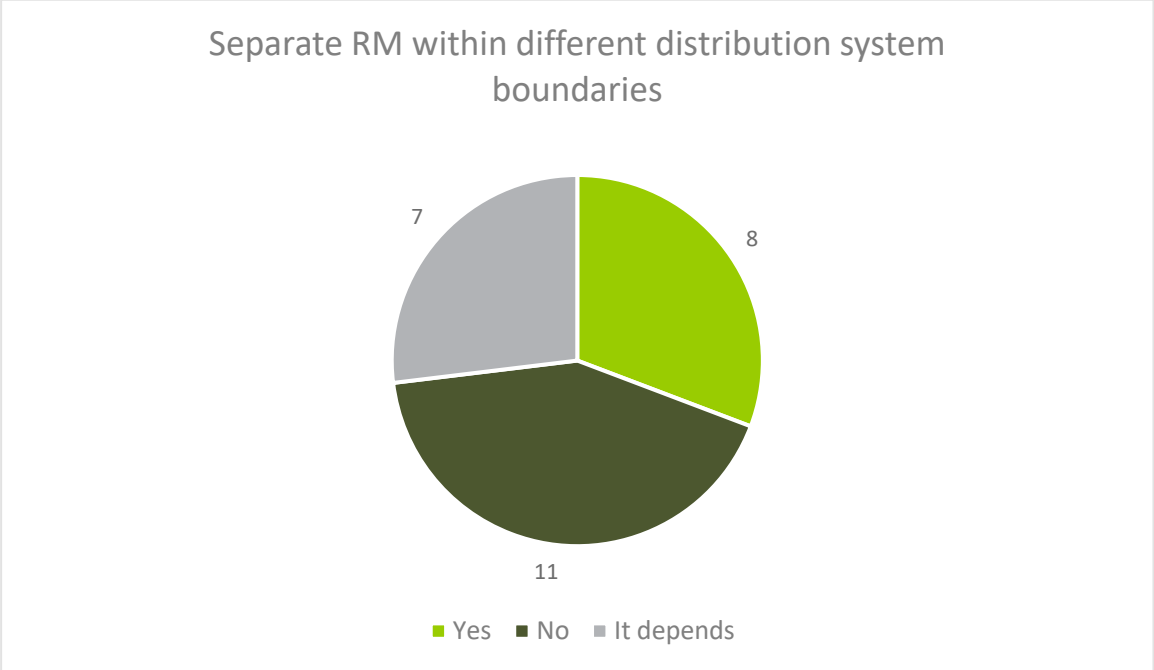

Figure 33: Need for a separate Residual Mix for different distribution system boundaries

The responses regarding whether a separate Residual Mix should be calculated within specific distribution reach boundaries reveal a spectrum of perspectives with an almost equal distribution between the respondents in favour for a separated Residual Mix for different distribution systems, not in favour, and undecided. Interestingly, opposite opinions can be observed concerning the separation based on interconnections of grids and for off-grid gases versus grid-injected gases. Moreover, there

is no correlation between the type of respondent (issuing body, regulator – supervising body, …) and the preference indicated.

The proponents raise a variety of arguments:

- Any gas that is transported by vehicle without being injected into the interconnected gas grid, shouldn't be counted for the residual gas mix.
- A distinction makes sense from the end consumer's point of view, as it is only relevant from his point of view what he receives from the respective distribution channel.
- The condition is to allow to distinguish between the different distribution reaches. The mass balance shall be respected. Also, the network characteristics shall be respected (RED III): local distribution grid, distribution grid, transmission system...

The arguments, raised by opponents, are:

- Some indicate that tracking would be too difficult when separated Residual Mixes would be considered for different distribution systems, which may lead to confusion or omissions.
- If there is an exchange of gas and GOs between the different systems, a single Residual Mix method would make sense.
- A German respondent refers to the high number of operators of distribution systems in this country (700) and recommends Disclosure at the European level as the European gas grid is well connected.
- Both grid-connected and off-grid projects are part of the gas system, and considering one single Residual Mix would favour the promotion of renewable gas injection projects due to their geographical scope, which is independent of the grid.

The respondents who are undecided, state:

- The Residual Mix for networks that are not connected to the interconnected gas system shall be determined for all the isolated networks of the same gas as a whole. On the opposite side, the Residual Mix for off-grid supply (transported by vehicle) can be included within the same Residual Mix as for the interconnected gas system, as most of the off-grid supply comes from the LNG terminals (so supplied by the same suppliers operating at the gas networks).
- Separate Residual Mix should be determined for the natural gas network and the hydrogen network at the national level. The origin of off-grid gas should be based on the physical gas molecule.
- As a transitory measure, having separate Residual Mixes for smaller isolated systems is probably cheaper and easier to implement to begin with.

Survey question:
Do you feel that a separate Residual Mix should be calculated specifically within the following system boundary (in terms of distribution reach)? (selection of multiple answers was allowed)

This question does not reveal one most preferred option for segregating between system boundaries. The following options have the highest preference:

- For gases taken from all European regulated natural gas grids
- For every single non-interconnected natural gas grid (= separately for local grids and for gases taken from the European interconnected natural gas grid)
- For every single hydrogen grid

The answers indicate a preference for interconnectivity of grids as a basis to demark system boundaries, although a mix opinion for local grids versus pan-European grid for natural gas can be observed.

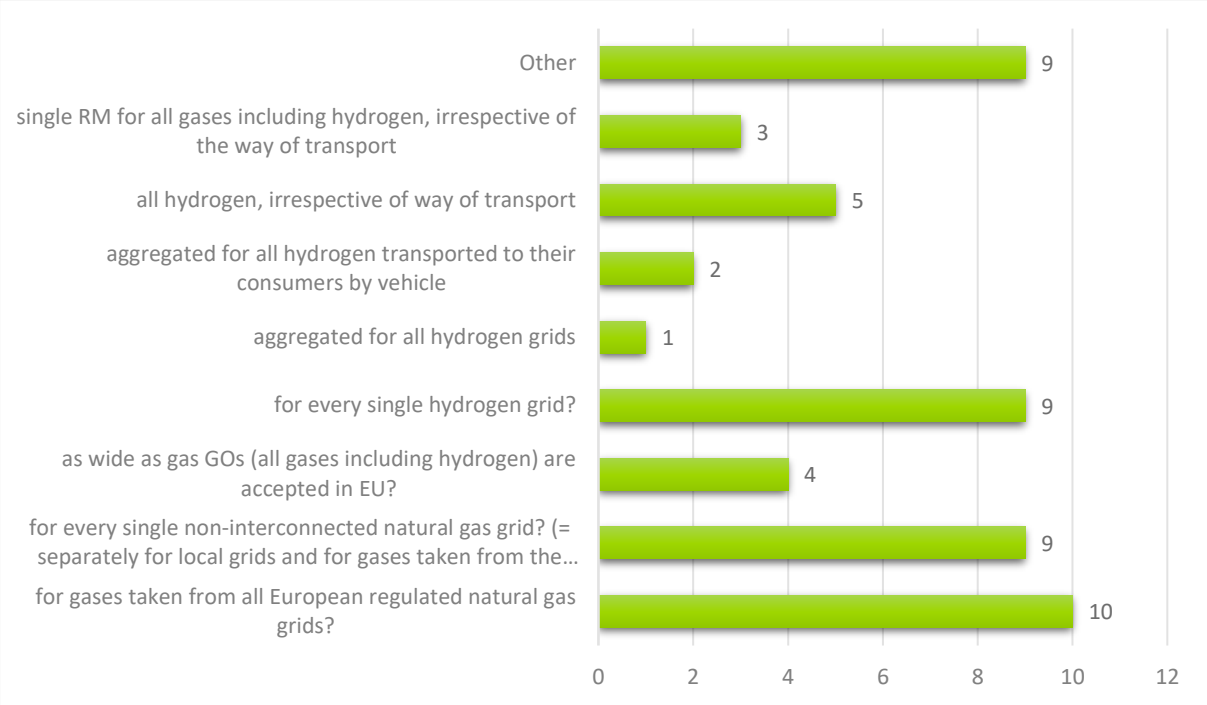

Figure 34: Different distribution reach

X.2.1.3 Residual Mix – energy source

Survey question:
Which energy sources need their own category in the Residual Mix for gases?

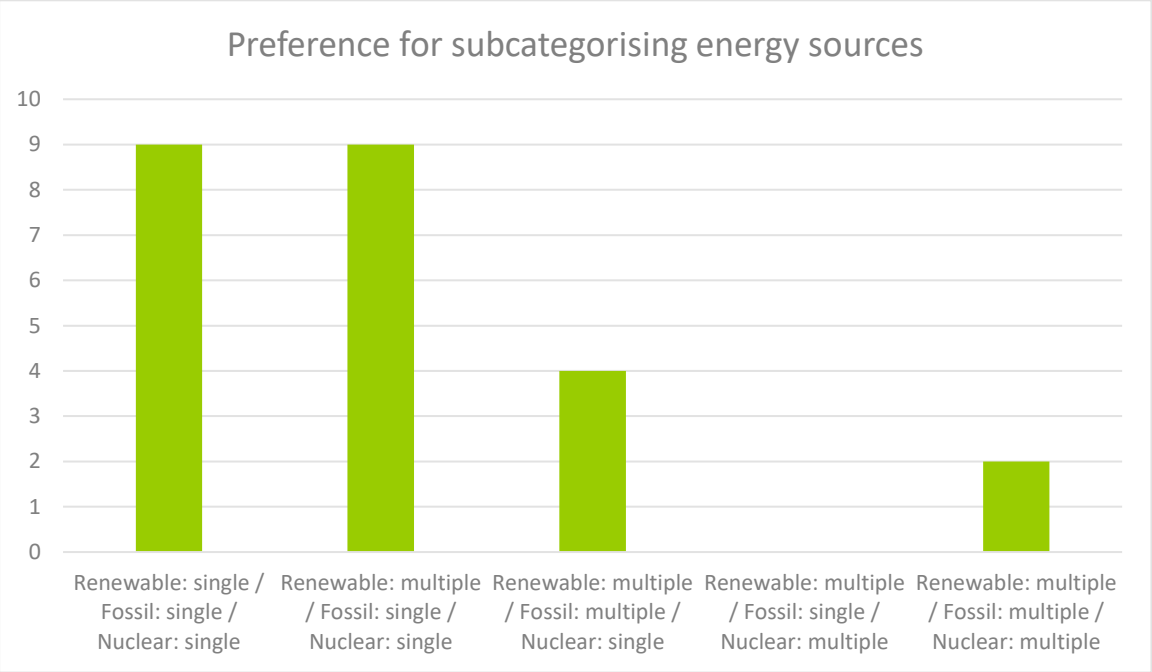

Figure 35: Categorisation of energy sources for determination of Residual Mix

In total 15 out of the 24 respondents are in favour of distinguishing multiple categories for renewable energy sources, while 18 out of 24 are in favour of considering fossil gases as one source of energy. Most respondents (22 of the 24) are in favour of considering nuclear as one source of energy.

Survey question:
In case you selected a category with "multiple", which exact subcategories would you propose?

The respondents, in favour of subcategorising energy sources, suggested various subcategories, the one more detailed than the other:

- Renewable split between: Waste (bio) / Other (bio) / solar / wind / hydro
- Wind/Solar / Hydropower / Biomass / other
- Energy Crops / Agricultural Residues / Sewage Sludge / Municipal Waste / Food & Beverage Waste / Landfill / No Info
- Biomethane / hydrogen / other renewable gases
- Renewable sources: green hydrogen / biomethane / synthetic gas from wind/solar / Multi fossil: natural gas, grey hydrogen
- Renewables: Biomethane, E-methane and Hydrogen.

Some respondents suggested aligning the categorisations with existing legislation and standards, such as the Renewable Energy Directive (RED) or EN 16325 standard, to ensure compliance and consistency. Others highlight the need to add the category ‘low-carbon’. One respondent referred to the level of detail required of national Disclosure obligations. For example, in the Netherlands 'renewables' must be broken down into at least wind, biomass, solar, etc. And 'fossil' into coal, gas, etc.

Survey question:
When calculating a separate Residual Mix per type of gas, how would you define categories of relevance to refer to the type of gas, for which a separate Residual Mix calculation is needed?

Most correspondents propose to define two categories of relevance: natural gas (compatible gas) and hydrogen, in line with Art 19.8 of RED III: "Member States shall ensure that the Guarantees of Origin that are cancelled correspond to the relevant network characteristics" and with the categorisation included in the draft EN16325 standard "Guarantees of Origin related to energy - Guarantees of Origin".

A few add not to expect other gas markets to develop next to natural gas and hydrogen and recommend limiting the number of gas types to reduce the complexity of the calculation and for the sake of clarity.

Another suggested making a distinction between fossil gas from the EU and from outside the EU.

X.2.1.4 Claiming renewable and low carbon characteristics of the origin of gases?

Survey question:
Do you feel that Proofs of Sustainability should entitle for claiming the renewable characteristics of the origin of gases to end consumers?

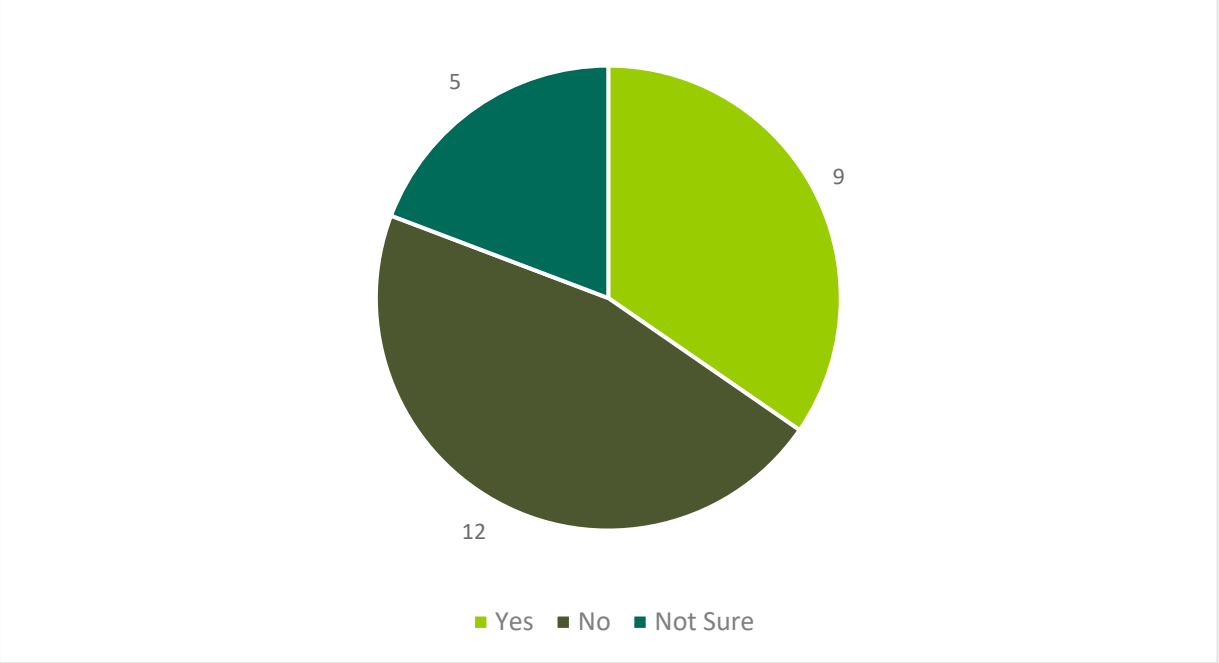

Figure 36: Should PoS be entitled to claim renewable characteristics of the origin of gases?

Almost half of the respondents indicated that Proofs of Sustainability should not entitle for claiming the renewable characteristics of the origin of gases to end-consumers. This group includes the majority of the issuing bodies and of competent bodies for supervision of Disclosure. About one third of the respondents indicated to be in favour of PoS as a tool to claim the renewable characteristics; this group includes most of the suppliers and consumers of energy.

Survey question:
Do you feel that Proofs of Sustainability should entitle for claiming the low-carbon characteristics of the origin of gases to end consumers?

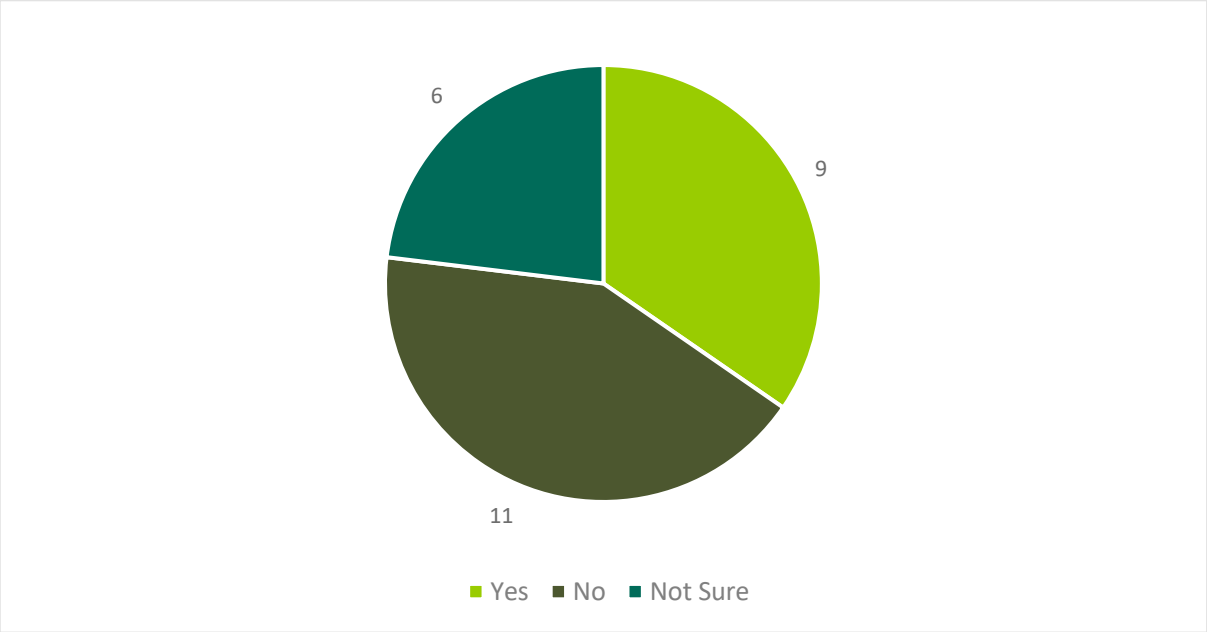

Figure 37: Should PoS be entitled to claim low-carbon characteristics of the origin of gases?

The survey reveals a divided opinion on both questions regarding the entitlement of claiming renewable and low-carbon characteristics of gases based on Proofs of Sustainability.

For both questions, almost half of the respondents indicated that Proofs of Sustainability should not entitle for claiming the renewable characteristics of the origin of gases to end-consumers. This group includes the majority of the issuing bodies and of competent bodies for supervision of Disclosure. About one third of the respondents indicated to be in favour of PoS as a tool to claim the renewable characteristics; this group includes most of the suppliers and consumers of energy.

The close split in responses highlights the need for further discussion and clarification on the criteria and implications of Proofs of Sustainability.

Similarly, respondents provided insights into their views on whether Proofs of Sustainability should entitle the claiming of the renewable and low-carbon characteristics of the origin of gases to end consumers:

Support for Entitlement of PoS for renewable gas consumption claims (Yes):

- Yes, BUT it shall be limited to the PoS from production from countries where the Art.19 has not been implemented. As long as producers have the possibility of having GOs, in order to avoid double counting, the PoS from this country shall no longer entitle claims.
- Guarantees of origin only contain information on GHG intensity on a voluntary basis. In the case of Proofs of sustainability, the focus is on GHG intensity and should therefore be usable as proof.
- The PoS is already recognised in combination with the proof of mass balancing for accounting towards the RES targets and also serves as proof towards the end customer.

- Yes, for target-compliance end-use. It is important that we ensure that the same energy is not claimed through GOs. This could be done by cancelling the GOs that have been used or not issuing a GO to start with.
- Because customer ask for POS to fulfil their compliance requirements, there is no economic advantages for GO and they would only lead to bureaucratic burdens.

Opposition to Entitlement of PoS for renewable gas consumption claims (No):

- Legally it is only a GO and should be used as basis.
- PoS should be used alongside GoO.
- GOs should only be issued if sustainability criteria are met (renewable=sustainable). Proof of sustainability needs to be integrated on the GO certificate and cannot be transferred separately.
- There is no standardized PoS format according to the EN standard, as is the case with GO. GOs are issued on the basis of output from a verified measurement device by an independent issuing body. For gaseous biofuels and LNG, there should be only one document, the GO with sustainability information, which would bring considerable simplification and order to the system.
- The purpose of the PoS should only be to demonstrate that RES and low carbon gases have been produced sustainably and with what emissions savings and that the energy entering the gas grid is certified.
- Information on the renewable gaseous fuel compliance with the EU sustainability criteria (also GHG emissions data and heating values) should be attributes of a GO as they are the characteristics of the gaseous fuel.

Uncertainty (Not sure):

- "Proofs of Sustainability" is an additional requirement of the source and is not directly related to whether it is renewable or not.
- They should be linked and be usable for any kind of purpose (target compliance, ETS market, voluntary market, ...). There should be only one climate value instrument: GO+PoS.