



Scheme principles for mass balance

Version EU 06

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1 Introduction

The term "traceability chain" describes the chronological documentation of a process. It is a tool to track material through every step in the process.

The mass balance system is a central element of the sustainability scheme. It establishes a connection between information or claims related to raw materials or intermediate and end products. It is an essential component of the system which ensures that information about the sustainability of raw materials, intermediate and end products is credible in relation to its origin and type and can be verified along the entire production and supply chain.

A mass balance system must be managed for each site by:

1. First gathering points: Companies that buy and resell biomass from the farmer/producer and collection points that accept waste/residues from waste producers
2. Processing companies that process biomass such as oil mills, biodiesel, ethanol plants, refineries, biogas facilities with feed-in to a methane filling station
3. Suppliers before and after the last interface

There are several ways to provide this proof. Directive (EU) 2018/2001 requires economic operators to use a mass balance system for sustainable bioliquids/biofuels and biomass fuels.

The application of the mass balance system to different types of raw materials and fuels must not lead or risk to lead to a situation where the rules set out in Article 26 and 27 of the Directive that apply for determining the contribution of biofuels, bioliquids and biomass fuels towards the targets for renewable energy are not correctly applied or circumvented. Furthermore, if a consignment of raw material or fuel has already been taken into account in the calculation of the share of renewable energy in any Member State, no further sustainability claims shall be issued for the consignment. Such a behaviour, usually called „multiple accounting“, is not only a major non-conformity with the scheme principles but obviously fraudulent behaviour.

This document describes the requirements for a mass balance system in accordance with the requirements of Directive (EU) 2018/2001 Article 30 (1). They guarantee the traceability of quantities of biomass in all phases of production and delivery in the supply chain for biofuels, bioliquids and biomass fuels.

2 Scheme principles for mass balance

If energy from biofuels, bioliquids and biomass fuels is to be taken into account for the purposes referred to in Article 29 (1) a), b) and c) of Directive (EU) 2018/2001, the economic operators must use a mass balance system that:

- allows consignments of raw material or biofuel with differing sustainability characteristics to be mixed
- allows consignments of raw materials with different energy contents to be mixed for the purposes of further processing, provided that the size of the consignments is adjusted according to their energy content, but, in order to reduce the administrative burden, the mass balance system may also be applied to different types of raw materials and fuels provided they have similar physical or chemical characteristics, heating values and/or conversion factors. Differences in the energy content are permitted if the raw materials are mixed for further processing e.g. in a co-digestion plant
- requires information about the sustainability and greenhouse gas emission saving characteristics and sizes of the consignments remain assigned to the mixture; and
- provides for the sum of all consignments withdrawn from the mixture to be described as having the same sustainability characteristics, in the same quantities, as the sum of all consignments added to the mixture and requires that this balance is achieved over an appropriate period of time.

These requirements are to be considered “minimum requirements” that have to be met by the economic operators. Depending on their individual process related to scope and complexity, they can opt for “stricter” specifications such as the identity preservation method.

Options for traceability chain	Information about the biomass properties (“certificate”/delivery slip) for every consignment	The biomass can be completely traced back to cultivation/origin	Complete separation of certified and non-certified biomass at one site
“book & claim”	YES	NO	NO
“Mass balance”	YES	YES	NO
“Identity preservation (hard/soft IP)”	YES	YES	YES

The methods mentioned are described below.

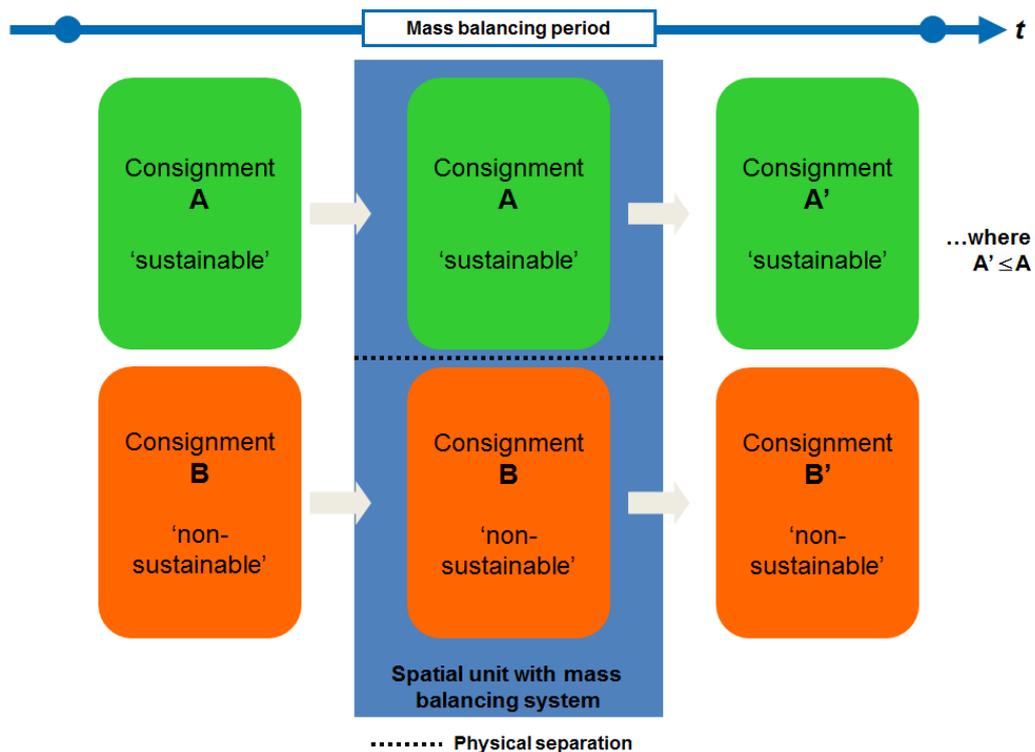
2.1 Identity preservation through physical separation

The most reliable process of preserving identity is the “hard IP method”.

When this method is used, the economic operators ensure that no consignment with biomass or biofuels/bioliquids is mixed with other products. It also has to be ensured that the sustainable product can be identified as sustainable throughout the entire process with no changes.

Individual consignments that are certified as sustainable are kept strictly separate from other products and raw materials during processing and storage so that their original characteristics are retained through to the end of the supply chain.

Fig. 1: Identity preservation ('hard-IP')



Consignments are also kept strictly separate during processing. This gives rise to the following mass balance formula:

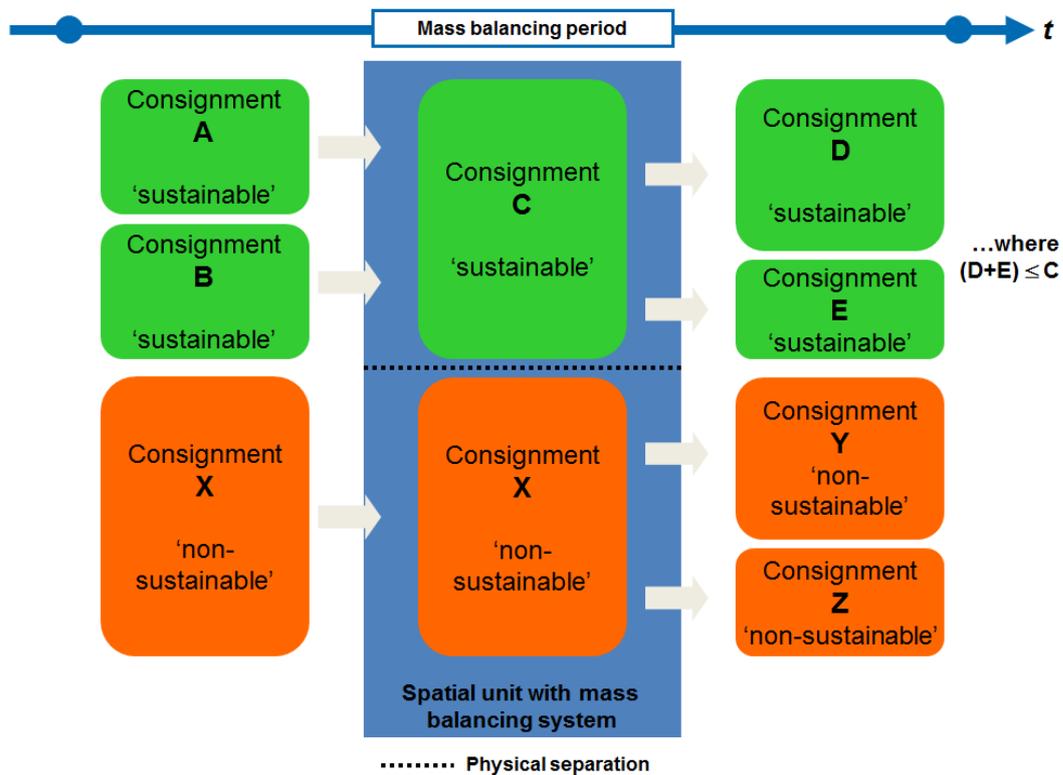
$$A'' \leq A$$

where $A'' = A \times [\text{conversion factor}]$

Note: Conversion factors describe the ratio of biomass input and output after a conversion process or after natural leakage, e.g. during storage or transport.

Another way to preserve identity is the “soft IP” method. Sustainable and non-sustainable biomass is also segregated here. Consignments with sustainable products, however, can also be mixed with products with other sustainability characteristics as long as the requirements shown in Fig. 2 are satisfied.

Fig. 2: Identity preservation ('soft-IP')



Sustainable and non-sustainable consignments are kept separate during processing. This gives rise to the following mass balance formula:

$$(A+B) = C \quad \text{and} \quad (D+E) \leq C$$

where $(D+E) = C \times [\textit{conversion factor}]$

2.2 Mass balance

The mass balance system described in Article 30 (1) of Directive (EU) 2018/2001 describes a system in which the “sustainability characteristics” remain assigned to “physical consignments”.

Sustainability characteristics are e.g.

- evidence showing compliance with the Directive’s sustainability criteria, and/or
- a statement that the raw materials used were obtained in a way that complies with the Directive’s land related sustainability criteria, and/or
- a greenhouse gas emission figure, and/or
- a description of the raw materials used while preserving product identity as well as their origin, and/or
- the statement “production has been awarded a certificate of type X from recognised voluntary scheme Y”, etc.
- where relevant, information on whether support has been provided for the production of that consignment, and if so, on the type of support scheme.

Sustainability characteristics would have to include information on the country of origin of the feedstock if several countries of origin can be specified for a specific consignment¹.

Please note that only actual GHG emission values are to be recorded/transmitted along the supply chain in the appropriate unit (i.e. dry matter basis for raw materials and intermediate products). Furthermore, actual values for each specific element must be reported (if appropriate). If (disaggregated) default values are applied then it should simply be stated “(Disaggregated) default value applied” or similar. For more information, see the “Scheme principles for the production of biomass, biofuels, bioliquids and biomass fuels” or “Scheme principles for GHG calculation”.

Further guidance on the type of information to be documented and to be traced along the supply chain is given in chapter 3.2 and 3.3.

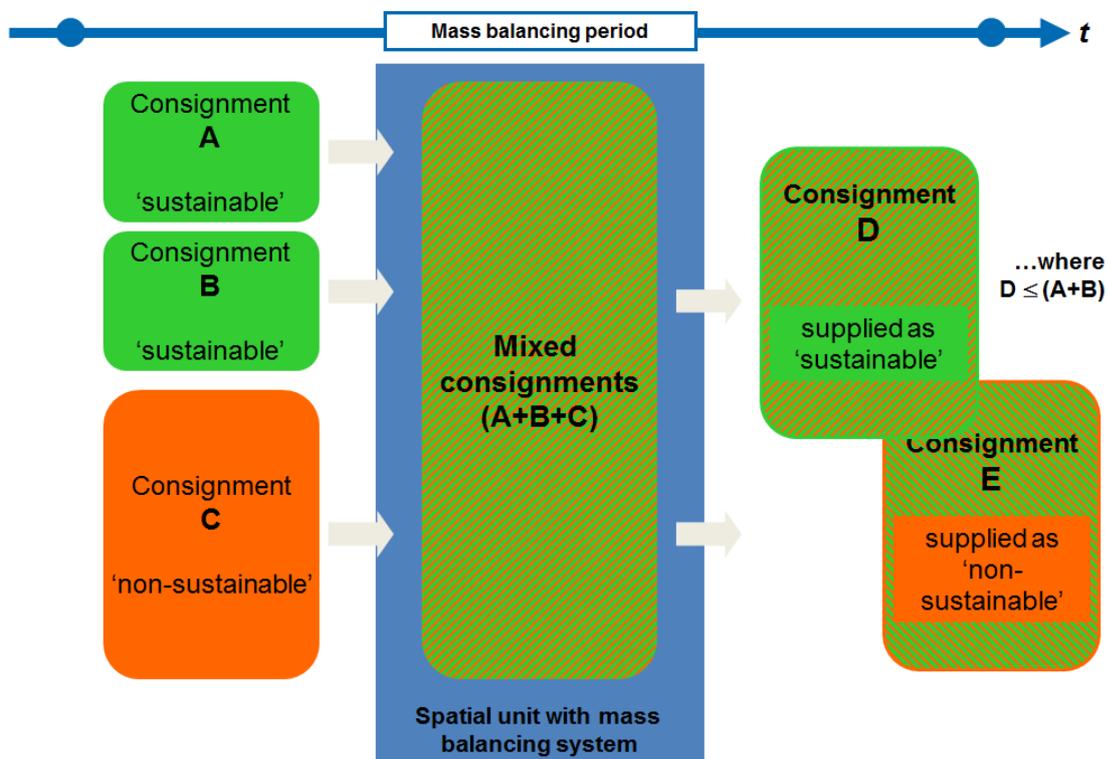
It’s important to stress that within a site, the so called „product identity“ must be preserved. That means sustainability characteristics can only be assigned to

¹ see Article 7a(1)(a) of Directive 2009/30/EC on fuel quality

the same material type that they originated from. This applies for feedstock as well as for final biofuels, bioliquids or biomass fuels.

Furthermore, a flexible reassignment of feedstock information is not allowed if the final fuels are subject to different rules for calculating their contribution towards the targets for renewable energy (e.g. Annex IX fuels, high/low ILUC fuels).

Fig. 3: Mass balancing



This gives rise to the following mass balance formula:

$$D \leq (A+B)$$

$$\text{where } D = (A+B) \times [\textit{conversion factor}]$$

When consignments with different sustainability characteristics (e.g. **A**, **B**) or no sustainability characteristics (e.g. **C**) are mixed, the respective conversion factors and sustainability characteristics as well as the size of the individual consignments remain assigned to the mixture.

If different GHG emissions, however, are assigned to these sustainability characteristics, these values must be kept separate for the respective partial consignments. These values cannot be offset against one another to prove that the sustainability requirements are fulfilled.

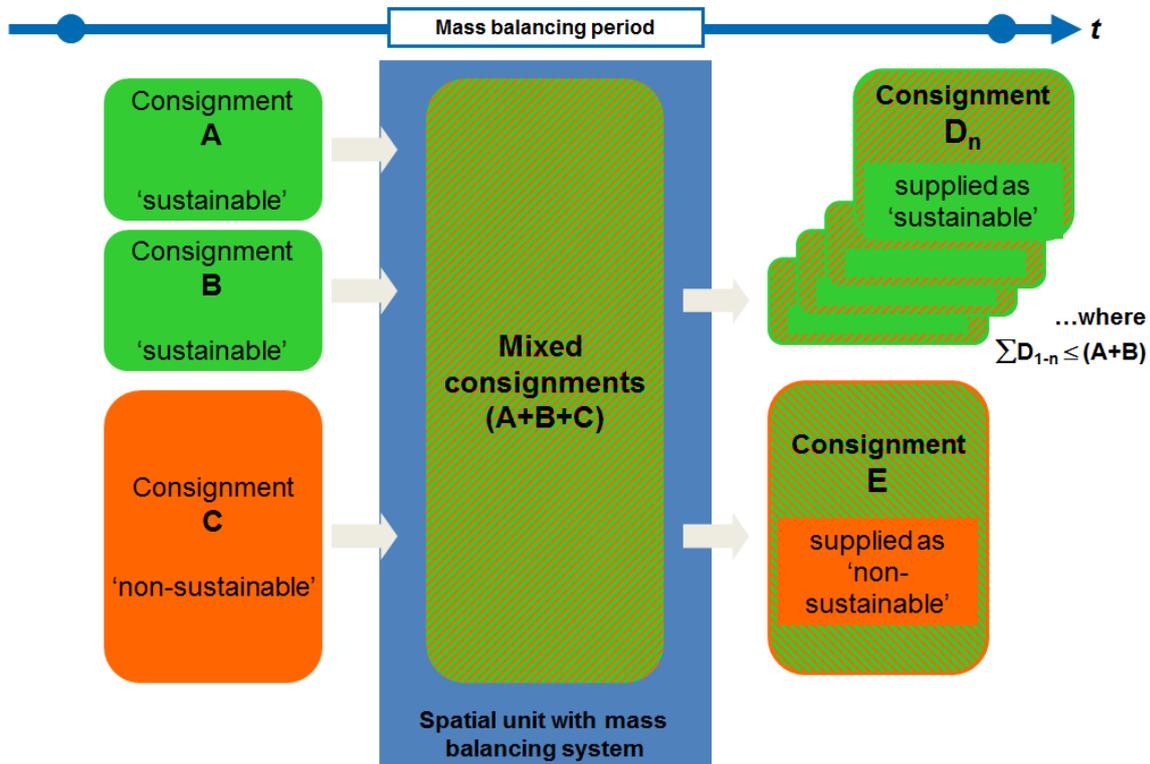
If consignments with identical sustainability characteristics are mixed, only the size of the consignment is adjusted accordingly. Sustainability characteristics are likely to be the same where the same feedstocks are used and use is made of "default values" or "actual regional values" for the GHG calculation.

If a mixture is split, any consignment taken out of it (e.g. D_1 ... D_n) can be assigned any of the sets of sustainability characteristics (9) as long as the combination of all consignments taken out of the mixture - in addition to the weight - has the same sizes for each of the sets of sustainability characteristics that were in the mixture. A "mixture" can have any form where consignments would normally be in contact, such as in a container, processing or logistical facility or site (defined as a geographical location with precise boundaries within which products can be mixed) and also in the transmission and distribution infrastructure for renewable gases (biomethane).

At each processing step or for losses, appropriate conversion factors must be used to adjust the size of a consignment. In case of processing a consignment of raw material yields only one output information on the sustainability and greenhouse gas emissions saving characteristics of the consignment shall be adjusted and assigned to the output that is intended for the production of biofuels the size of the consignment and the related quantities of sustainability and greenhouse gas emissions saving characteristics applying a conversion factor representing the ratio between the mass of the output that is intended for such production and the mass of the raw material entering the process (see Art. 30 (2) a) of Directive (EU) 2018/2001).

Furthermore, it should be kept in mind that the sustainability characteristics of the processed raw materials must be assigned in the same ratio to products and residues of this process. For example, if 50% of a mixture has been certified as sustainable, 50% of all products and residues of this mixture should also be considered sustainable. The only exception is the allocation of greenhouse gas emissions, which is subject to the rules in Annex VI of Directive (EU) 2018/2001.

Fig. 4: Mass balancing



The following mass balance formula applies here:

$$\sum D_{1..n} \leq (A+B)$$

$$\text{where } \sum D_{1..n} = A \times [\text{conversion factor}]_A + B \times [\text{conversion factor}]_B$$

In case of processing a consignment of raw material yields to more than one output that is intended declared as 'sustainable' for the production of biofuels, bioliquids or biomass fuels, renewable liquid and gaseous transport fuels of non-biological origin, or recycled carbon fuels, the operator has to apply a separate conversion factor and a separate mass balance for each output (see Art. 30 (2) b) of Directive (EU) 2018/2001).

2.3 Mass balance period

Economic operators are free to define a balance period after which the balance is positive (less outgoing than incoming biomass) as long as this period is not longer than **3 months**.

In the case of producers of agricultural and forest biomass and first gathering points that only source agricultural or forest biomass, it is possible to extend the balance period to **12**

months, but for any period longer than 3 months those parties should not be permitted to go into deficit.

Within a 3 month balance period, the balance may be temporarily negative (temporarily more sustainable biomass sold/delivered than received). At the end of the mass balance period, however, the overall result must be balanced out by receiving corresponding quantities of sustainable biomass.

If the economic operator decides to balance the sustainability data on an ongoing basis, the balance shall not be negative.

The accounting of a consignment in a mass balance has to correspond solely with its physical movement to or from the operating site (date of input/output). Other commercial incidents like contract/purchase or invoicing date cannot be taken into account.

If the quantity of sustainable biomass in the balance exceeds the physical quantity of biomass in the company, only the physically existing biomass can be carried forward to the next balancing period. This means that at the end of the mass balance period, the sustainability data/characteristics carried forward should be equivalent to the physical stock. Credit balances of sustainable biomass shall not be transferred to the next balancing period. This kind of situation can occur, for example, if sustainable rapeseed is included in the mass balance but during the balancing period a large quantity of it was sold for a use other than for the production of biofuels, bioliquids and biomass fuels (e.g. for use as food or animal feed).

Upon initial certification in the REDcert-EU system, biomass feedstock received no more than 12 months before the initial audit can be considered sustainable biomass in the mass balance, if

- the biomass was not processed,
- conformity with sustainability requirements in the REDcert-EU system is fully documented, and
- a self-declaration of the farm or the point of origin (waste and residue producer) was submitted retro-actively.

2.4 Spatial boundaries

For every company that produces, processes or stores biomass or biofuels, bioliquids and biomass fuels, the property line of the premises defines the geographic location. This demarcation is to be identified by clearly identifying the address of the property where the facility is located.

A mass balance system must be set up for every company/operating site. The balancing systems can either be physically separate in the operation, or every operating site can have its own balancing system if every consignment is documented is clearly identified by its location (operating site). Furthermore, if more than one legal entity operates a site then each legal entity is required to operate its own mass balance system.

For example, a first gathering point can operate two similar facilities in close proximity to one another (e.g. on both sides of a street). If these facilities have different addresses, two mass balance systems have to be set up (one for each facility).

2.5 External storage facilities/storage facilities with several users

If several economic operators/companies supply biomass to an external storage facility, e.g. forwarding, leased or tank warehouse, for storage, each of these economic operators/companies has to keep a mass balance system for the product he delivered.

This means again 'if more than one legal entity operates a site then each legal entity is required to operate its own mass balance system.'

2.6 Gas transmission and distribution infrastructure

Renewable biogas is – if not consumed directly on-site for the purpose of electricity production – upgraded to biomethane (additional conversion step) and injected into the natural gas grid. The gas grid represents a 'mean of transport' and a 'storage facility' at the same time. Therefore, biomethane can be mixed in this transmission and distribution infrastructure (gas grid), provided the infrastructure is interconnected.

The physical input (injection) and output (withdrawal) of gas must be documented by economic operators as part of their mandatory mass balance records which are essential for the certification process.

The physical input of renewable gas into the grid is usually accounted on a monthly base. As the accounting is performed on the basis of the energetic value of the gas [unit 'kWh']

REDcert has defined a standard procedure² for the conversion of gas quantities from energetic value to metric tons. With respect to the potential time gap between the injection and the accounting of a consignment of renewable gas by the grid operator, operators are required to issue a Proof of Sustainability (PoS) latest 30 days after closing a balance period (e.g. 3 month).

Traders of renewable gas have to establish their own accounting grid. All European member states have defined regions for which a specific accounting grid has to be established. A region could cover the whole country (e.g. Germany), but can also be defined on a lower level (e.g. Italy) where a country is split into several regions. The accounting grid has to contain all movements of renewable gas accounted and certified under the REDcert-EU scheme and is therefore essential for mass balancing. Market operators have to grant full access to the accounting grid and all related documentation for auditors during a certification process prior to an audit (see chapter 3.1).

A transfer of renewable gas from one country to another country via the gas grid is only possible if all countries involved (this includes transferring countries) are connected to the European gas grid. The current status of the European gas grid can be accessed via the 'system development map³' map published by the *Gas Infrastructure Europe* (gie). If a market operator located in a country which is not connected to the European gas grid or is connected to an isolated gas grid ('island grid') wants to import renewable gas for the purpose of fulfilling the GHG quota obligation he has to prove a physical transport of the gas by other means of transport to his location/the location of consumption or the injection point of the isolated grid.

In order to transfer natural or renewable gas via the grid into another country (maybe via additional countries) market operators possessing a consignment of gas are obliged to acquire sufficient and corresponding grid capacities for all affected transfer points by an authorized gas capacity trading platform (e.g. PRISMA⁴). Thus, commercial transactions of renewable gas between market operators via the gas grid must be covered by a sufficient transfer capacity corresponding in time and volume and are part of the mass balance documentation.

Where national biogas register are already established they shall be used for the purpose of identifying and tracking of particular consignments, too. As these registers are not fully

² reference value for biomethane conversion calculation: 50 MJ/kg (at a default density of 0,72 kg/m³)

³ GIE system development maps are available at <https://www.gie.eu/index.php/gie-publications/maps-data/system-development-map> (assessed on May, 6th 2021)

⁴ see <https://www.prisma-capacity.eu/> (assessed on May 6th 2021)

harmonized nor available all over Europe Auditors are requested to respect the specific situation in a particular country.

In future the provisions of the Union database have to be respected by all market operators. They may override provisions established in this document (see chapter 3.5).

Gas losses during the production and upgrading of biomethane as well as during the transmission and distribution must be taken into account for GHG emissions savings calculation where e.g. a standard industry factor can be applied for this purpose.

3 Documentation requirements

3.1 General requirements

The document requirements of the mass balance system do not relate to the format or medium of the documentation, but rather to the type of information to be documented (see 2.2). It is therefore largely left to the facilities and operating sites of the individual economic operator to decide how to set up a mass balance system for every operating unit that produces, processes or stores sustainability biomass or biofuels/bioliquids. Existing enterprise resource planning systems, e.g. can be used as long as they have the capability to record and process all of the necessary information.

The general specifications for documentation relate to

- reliability (verifiable accuracy of the balance figures)
- accessibility (time and format of the documentation archive)
- certainty (no subsequent changes to balances)

of the documentation of the mass balance system. This is to be checked by the independent certification bodies as part of the on-site inspections (for more information, see "Scheme principles for neutral inspections".)

All of the documents in the document management system must be kept for at least **5 years** regardless of any other legal requirements relating to retention period.

Economic operators must provide the auditor with all relevant mass balance information prior to the planned audit. The last mass balances completed during the period under review must be inspected.

During initial audits, the auditor should check whether appropriate precautions and preparations have been made to set up a mass balance system.

3.2 Sustainability characteristic to be documented

The information about sustainability characteristics of feedstock, intermediate product and final biofuel, bioliquid or biomass fuel have to be passed along the supply chain from one production step to another. Each step may add new information or accumulate the given information. A transfer of sustainability characteristics from one step to another as well as between different sites on the same step must always be accompanied by a physical transfer of material.

The following type of information is required to be documented on each step (if applicable) and to be passed forward to the next step:

- Voluntary scheme and Certificate number
- Proof of Sustainability (PoS) number (biofuels, bioliquids and biomass fuels only)
- Type of feedstock
- Scope of feedstock certification (e.g. whether feedstock is certified to sustainability criteria)
- Waste or Animal By Product permit number (waste code and/or biomass code according to 'nabisy')
- Fuel type
- Country of feedstock origin
- Country of fuel production
- GHG emission data (clear statement on 'default' value or actual value per supply chain step)
- Date on which a fuel production plant went first into operation
- Information about any incentive/subsidy and type of support (in the renewable energy sector) the material may have received so far (important for biogas/biomethane as it can be used in the transport sector as well as in the electricity sector)

3.3 Traceability information to be documented

To be able to trace a consignment of feedstock, intermediate or biofuel along the supply chain a set of transaction data is required and must be documented:

- Supplier company name and address
- Buyer company name and address
- Unique transaction ID (e.g. delivery number)
- Date of (physical) loading
- Place of (physical) loading or biomethane entry point
- Place of (physical) delivery or biomethane exit point
- Volume or weight (at a given density) of consignment

3.4 Issue of Sustainability certificates

Economic operators have to issue a 'sustainability certificate' (PoS) which contains all the required information on the sustainability characteristics of a consignment. Usually, such a certificate shall be issued at the time of delivery to provide the recipient all the required information for further processing and handling but not later than the end date of the corresponding mass balance period. For user of the nabisy system the BLE has determined the end date of a quarter (March 31st, June 30th, September 30th, December 31st) as deadline for the issue of a PoS.

With respect to the special conditions in the biomethane sector these deadlines can be shifted by another 30 days, because it takes additional time to receive a confirmation by the grid operators about the injected quantity of biomethane which may vary from the figures measured by the injecting site.

3.5 Documentation via the Union database

Economic operators are required to enter all relevant information concerning the incoming and outgoing sustainable consignments in the Union database as soon as the database starts officially. Additional guidance on this procedure will be provided by REDcert in due time.

4 Requirements for co-processing fossil fuels and biofuels

Even some member states already have defined rules for the determination of the accountable share of biofuel, and biogas for transport, resulting from biomass being processed with fossil fuels in a common process there is not yet a harmonized European approach for this procedure.

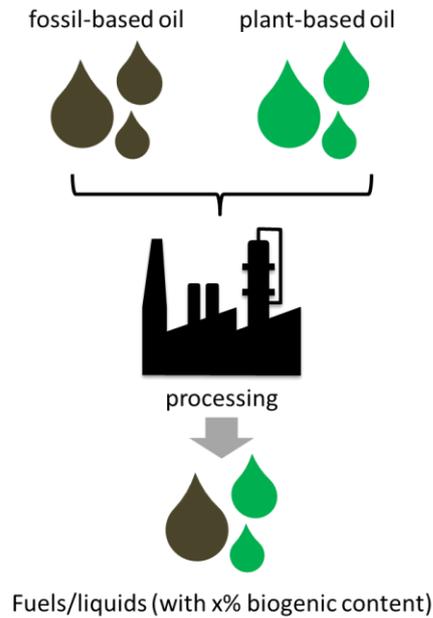
According to article 28 (5) of the Directive (EU) 2018/2001 by 31 December 2021, the European Commission shall adopt delegated acts in accordance with Article 35 to supplement the Directive by specifying the methodology to determine the share of biofuel, and biogas for transport, resulting from biomass being processed with fossil fuels in a common process, and by specifying the methodology for assessing greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin and from recycled carbon fuels, which shall ensure that credit for avoided emissions is not given for CO₂ the capture of which has already received an emission credit under other provisions of law.

REDcert will update its scheme principles in the light of this announced delegated acts in due time.

Until then the following provisions apply:

According to the stipulations in Directive (EU) 2015/652, the GHG intensity of fuels and energy sources must be factored in when biofuels and fossil fuels are processed together. Processing includes any modification during the life cycle of a fuel or energy supplied causing a change to the molecular structure of the product (see figure). The addition of denaturant does not fall under this processing.

Fig. 5: Combined processing of fossil fuels and biofuels



The quantity of the co-processed biofuel is determined according to the energy balance and efficiency of the co-processing process as set out in Council Directive (EU) 2015/652. The energy content and energy balance affect the quantity as well as the GHG intensity of the biogenic component. The national regulations apply when crediting the biogenic component from co-processing of biofuels and fossil fuels in the respective member states.

Should the Commission issue any further guidance/rules regarding co-processing (e.g. on determining the biogenic content of a fuel, or on GHG emission calculation) then this will be incorporated into the REDcert scheme with immediate effect.

5 Relevant Documents

The documentation structure of the REDcert-EU scheme includes the following:

No.	Document	Published/revised
1	Scope and basic scheme requirements	The current version of the REDcert-EU scheme principles is published on the website at www.redcert.org .
2	Scheme principles for the production of biomass, biofuels, bioliquids and biomass fuels	
3	Scheme principles for GHG calculation	
4	Scheme principles for mass balance	
5	Scheme principles for neutral inspections	
6	Scheme principles for Integrity management	
7	Phase-specific checklists	

REDcert reserves the right to create and publish additional supplementary scheme principles if necessary.

The legal EU regulations and provisions for sustainable biomass as well as biofuels, bioliquids and biomass fuels including other relevant references that represent the basis of the REDcert-EU documentation are published separately on REDcert's website at www.redcert.org. When legal regulations are referenced, the most current version is always assumed.

6 Revision information Version EU 06

Section	Change
1	Introduction <ul style="list-style-type: none"> - update of legal reference to RED II - prohibition of 'multiple' sustainability claims of a consignment in different Member States for the purpose of accounting towards the targets of renewable energy
2	Scheme principles for mass balance <ul style="list-style-type: none"> - update of requirements on a mass balance system
2.2	Mass balance <ul style="list-style-type: none"> - update of legal reference to RED II - editorial changes - requirements on the preservation of 'product identity' - prohibition of flexible reassignment of feedstock information if the final fuels are subject to different rules for calculation their contribution towards the RED II targets - update on specific the requirements and procedures of mass balancing
2.3	Mass balance period <ul style="list-style-type: none"> - additional option for balance period (12 month) - requirements on transferring sustainable biomass into the next balance period - accounting options for biomass already in stock at the initial certification
2.4	Spatial boundaries <ul style="list-style-type: none"> - mass balance requirements on multiple legal entities operating on the same site
2.6	NEW: Gas transmission and distribution infrastructure
3	Documentation requirements <ul style="list-style-type: none"> - split into several subtitles

3.1	<p>NEW: General requirements</p> <ul style="list-style-type: none"> - economic operators must provide auditor with all relevant mass balance information prior to an audit
3.2	<p>NEW: Sustainability characteristic to be documented</p> <ul style="list-style-type: none"> - update of sustainability criteria to be documented
3.3	<p>NEW: Traceability information to be documented</p> <ul style="list-style-type: none"> - update of traceability information to be documented
3.4	<p>NEW: Issue of Sustainability certificates</p> <ul style="list-style-type: none"> - update of requirements on issuing sustainability certificates
3.5	<p>NEW: Documentation via the Union database</p> <ul style="list-style-type: none"> - new requirements on the mandatory use of the future Union database
4	<p>Requirements for co-processing fossil fuels and biofuels</p> <ul style="list-style-type: none"> - outlook on future amendments of the scheme requirements according to the announced implementing act of the European Commission
6	<p>NEW: Revision information Version EU 06</p>