Technical guidance for mass balancing

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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 scheme 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 of an interface.

There are several ways to provide this proof. Directive (EU) 2018/2001 (RED II) requires economic operators to use a mass balance system for sustainably produced biomass fuels to produce electricity and/or heat.

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

The on-site inspections carried out in the SURE system by recognised certification bodies ensure that the economic operator meets the mass balancing requirements.

2 Technical guidance for mass balancing

If biomass fuels are to be used to produce electricity or heat in the SURE system, economic operators must use a mass balance system which

✓ allows consignments of raw material or fuels with differing sustainability and greenhouse gas emissions saving characteristics to be mixed for instance in a container, processing or logistical facility, transmission and distribution infrastructure or site,

✓ 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,

✓ requires information about the sustainability and greenhouse gas emission saving characteristics and sizes of the consignments remain assigned to the mixture, and
Technical guidance for mass balancing

✓ provides for the sum of all consignments withdrawn from the mixture to be described as having the same sustainability characteristics, in the same quantities, as the sum of all consignments added to the mixture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 be 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.

<table>
<thead>
<tr>
<th>Options for the traceability chain</th>
<th>Information about the biomass properties (“certificate”/delivery slip) for every consignment</th>
<th>The biomass can be completely traced back to cultivation/production</th>
<th>Complete separation of certified and non-certified biomass at one site</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Book &amp; claim”</td>
<td>✓</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>“Mass balancing”</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>“Identity preservation (hard/soft IP)”</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

| Table 1: Simplified diagram of “mass balancing” compared to other traceability processes. |

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

$$A' \leq A$$

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

*Side note:* Conversion factors describe the ratio of biomass input to biomass 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. However, consignments of sustainable products can also be mixed with products with other sustainability characteristics as long as the requirements in Figure 2 are met.
Sustainable and non-sustainable consignments are kept separate during processing. This gives rise to the following mass balancing formula:

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

where \((D + E) = C * \text{[conversion factor]}\)

### 2.2 Mass balancing

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 (e.g. land-related) sustainability criteria, and/or
- a greenhouse gas emission value 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.
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 certain consignment (see Article 7a(1)(a) of Directive 2009/30/EC on fuel quality)

This gives rise to the following mass balancing formula:

\[ D \leq (A + B) \]

where \( D = (A + B) \times \text{conversion factor} \)

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 raw materials are used and use is made of “default values” or “actual regional values” for the GHG calculation.

If a mixture is split, each partial consignment (quantity) (e.g. \( D_1 \ldots D_n \)) can be assigned part of the sustainability characteristics as long as the sum of all partial consignments withdrawn from the mixture - in addition to the weight - has the same sustainability characteristics as 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).

At each processing step or for losses, appropriate conversion factors must be used to adjust the size of a consignment. 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.

![Mass balancing diagram]

**Figure 4:** Mass balancing

The following mass balancing formula applies here:

\[
\sum D_{1\to n} \leq (A + B)
\]

whereby \( \sum D_{1\to n} = A \times [\text{conversion factor}]_A + B \times [\text{conversion factor}]_B \)

### 2.3 The mass balance system as guarantee of origin

The correct implementation of a mass balance system in all phases of production makes it possible to trace every step in the handling of a quantity of sustainable biomass along the production and supply chain, from the cultivation/waste and residue producer to the last interface, and to seamlessly verify the origin of the biomass. However, this requires that every interface, operation or operating site responsible for handling the quantity of sustainable biomass also assumes responsibility for correctly implementing the mass balance system.
The responsibility is based on the fact that the operation or operating site responsible has the power and control over the sustainable biomass. Each quantity of sustainable biomass must be recorded in the internal mass balance system as soon as the interface, the operation or the operating site has obtained the legal and actual control over the sustainable biomass. Here, the presence of the sustainable biomass at the respective site is the prerequisite for scheme-compliant handling of sustainable biomass.

Biomass that is not physically present at the respective site cannot be recorded in the mass balance system or removed from it. One exception is direct-to-customer commerce. In this case, the movements of goods are to be represented in a mass balance system and the necessary verification for tracing the sustainable biomass managed.

The seamless traceability of every quantity of sustainable biomass distributed along the production and supply chain can only be guaranteed when the data required to identify this biomass is consistently passed on. The data that is necessary to identify supplied quantities of sustainable biomass for accounting purposes and to distinguish other supplies quantities of sustainable biomass are called tracking attributes and accompany the supplied quantity of sustainable biomass along the production and supply chain. Here, however, all of the documentation starting from cultivation (or production) up through the last interface does not have to be passed on, only the information that is required for the respective downstream operations, operating sites and interfaces with a view to issuance of the sustainability certificates (e.g. the number of the inspection certificate or the certificate number, origin and type of biomass, quantity supplied and GHG emissions of the supplied quantity, name and address of the seller, etc.).

The handling of the sustainable biomass within the interface, the operation or the operating site also has to be tracked and documented as an internal process in the internal mass balance system. Quantities of sustainable biomass can be merged, split or processed in internal processes in compliance with the requirements of the respective phase as long as this involves the same product or same product type and new quantities of biomass are subsequently created. The product identity must be preserved up through and including the last interface, i.e. mass balancing is specific to a product type or raw material. Mass losses, e.g. in internal company processes or transport (also in the case of on-grid transmission of gaseous biomass fuels), must be taken into account via conversion factors.

The mass balance system also makes it possible to mix sustainable biomass with non-sustainable biomass but, in this case, it must be ensured that the quantity of biomass that fulfils the requirements of the ordinance is identified prior to mixing. At the same time, the mass balance system also has to guarantee that the quantity of scheme-compliant biomass taken from this mixture is not higher than the quantity that was identified before mixing. Mixing may only be carried out within an exactly defined geographic area (site). The physical biomass that is supplied to downstream interfaces, operations or operating sites does then not necessarily
correspond to the quantity of biomass that was originally purchased as sustainable, but only to an equivalent quantity of biomass.

The sourced quantities of sustainable biomass have to be balanced daily, monthly or quarterly. The timeframe for balancing must be defined ahead of time in accordance with the requirements for the mass balance period in Section 2.4. More sustainable biomass may not leave the premises than physically arrives at the premises within the defined balancing timeframe. Having control over the sustainable biomass means that the interface, the operation or the operating site has physically taken the sustainable biomass directly or indirectly into its possession, may carry out transport, storage, shipping and processing and may physically transport the biomass to a downstream interface or a downstream operation or operating site.

Upon initial certification in the SURE-EU system, biomass raw materials received no more than 12 months before the initial audit can be considered sustainable biomass in the mass balance. The prerequisites are:

✓ that the biomass was not processed,
✓ conformity with sustainability requirements in the SURE-EU system is fully documented, and
✓ a self-declaration of the producer/waste and residue producer was submitted retroactively.

When handing off a quantity of sustainable biomass to the downstream interface, the downstream operation or the downstream operating site, the respective quantity has to be removed from the internal mass balance system for the respective step. The data necessary is transmitted together with the consignment to the downstream interface, the downstream operation or the downstream operating site.

The details for calculating the GHG emissions and the GHG emission savings as well as the requirements for balancing biomass before the last interface are described in the SURE document “Technical guidance for GHG calculation”.

2.4 Mass balancing period

Economic operators are free to define a balancing 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, provided they do not have a negative balance from the 4th balance month onwards.
Within three months of the balance period, the balance may be temporarily negative (temporarily more outgoing sustainable biomass (sold/supplied) than incoming). In the case of balance balancing periods exceeding three months, a temporary negative balance is also only permissible for the first three balancing months. In all cases, temporary negative balances within the balance period of three months must be compensated for by acquiring appropriate quantities of sustainable biomass.

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

If the quantity of sustainable biomass in the balance exceeds the physical quantity of biomass in the operation, only the physically existing biomass can be carried forward to the next balancing period. Credit balances of sustainable biomass only recorded for accounting purposes but not physically available may not be transferred to the next balancing period. This kind of situation can occur, for example, if sustainably produced wood pellets are included in the mass balance but during the balancing period a large quantity of them was sold for a use other than for the production of electricity or heat in biomass installations required to provide proof of compliance (e.g. for heat production in the private sector).

2.5 Spatial boundaries

For every company that produces, processes or stores biomass or 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 operation/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).

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).

2.6 External storage facilities/storage facilities with several users

If several economic operators supply biomass to an external storage facility, e.g. shipping, leased or tank warehouse, for storage, each of these economic operators has to keep a mass balance system for the product he delivered.
3 Documentation 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. 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 biomass fuels. Existing enterprise resource planning systems, for example, 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 must be verified by the independent certification bodies as part of the on-site inspections (for more information, see “Scheme principles for neutral inspections”).

The documentation of the mass balance must contain the following information at a minimum:

✓ proof of all operating sites to be subject to certification (each operating site should have its own mass balance system)
✓ proof of all incoming and outgoing consignments of sustainable biomass or biomass fuels in the mass balance system (input/output) per facility, including a description of the material and the suppliers or customers
✓ proof of every conversion step that takes place when processing biomass raw materials to allow this result to be incorporated into the calculation
✓ Information about mass balancing should be provided through contracts, commercial documents, etc. documents, and should be traceable in accounting
✓ a defined period for the mass balance (no longer than 3 months, no longer than 12 months for producers of agricultural and forest biomass and first gathering points that only source agricultural or forest biomass)
✓ the results of each sustainable biomass balance (positive/balanced/negative balance)
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.

Phase-specific documentation requirements (interfaces, suppliers, conversion facilities) are set out in the SURE document “Scheme principles for the use, processing and distribution/trade of biomass fuels and their conversion to electricity and heat”.

4 Relevant documents

With regard to the documentation (scheme documents) in the SURE-EU system, reference is made here to the document “Scope and basic scheme requirements”.

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

The legal EU regulations and provisions for sustainable biomass and biomass fuels including other relevant references that represent the basis of the SURE documentation are published separately on SURE’s website at www.sure-system.org. References to legal regulations always relate to the current version.