KZR INiG System/7

Guidance for proper functioning of mass balance system

by The Oil and Gas Institute – National Research Institute

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1. Introduction

Economic operators participating in the KZR INiG System shall demonstrate compliance with the sustainability criteria through assurances of traceability of a given quantity of biomass (with the requisite certificate of compliance with the sustainability criteria) through the whole supply chain.

Provisions of this document ensure that economic operators participating in the KZR INiG System use a mass balance system in accordance with Article 30(1) of Directive (EU) 2018/2001.

A mass balance system is a set of statements and data ensuring supervision over quantities of biomass flowing through the chain of supply and production, from a point of origin to the final biofuels, bioliquids or biomass fuels producer. The mass balance system allows the mixing of raw material or fuels that differ in their sustainability and GHG emissions saving characteristics. The sustainability characteristics need to be passed down the supply chain as well as other information necessary to trace the consignment. The traceability must always start from the origin of the feedstock and must end at stage of use of biofuel, bioliquid or biomass fuel.

This document applies to all economic operators participating (*i.e., system participants*) in the *KZR INiG System* and at any sites where biomass, biofuel, bioliquids and biomass fuels products are legally and physically controlled by system participants. Compliance with all requirements of this mass balance system is demonstrated by system participants during audits carried out by independent certification bodies.

To ensure proper supervision over these streams, KZR INiG requires enterprises to develop and apply a mass balance system. In accordance with the directive, EU member states require system participants to apply the mass balance system as the basis for demonstrating compliance with the sustainability criteria. The mass balance system:

a) 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;

b) allows consignments of raw material with differing energy content to be mixed for the purposes of further processing, provided that the size of consignments is adjusted according to their energy content; Mixing under the mass balance system is only possible if raw material and fuels belong to the same product group[1];

[1] A product group can comprise for instance different types of non-food cellulosic material with similar physical and chemical characteristics, heating values and/or conversion factors or the types of ligno-cellulosic material covered under point q of Annex IX Part A of Directive (EU) 2018/2001.

c) requires information about the sustainability characteristics and sizes of the consignments referred to in point (a) to remain assigned to the mixture; and

d) 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.

The mass balance system shall ensure that each consignment is counted only for the purposes of calculating the gross final consumption of energy from renewable sources and shall include information on whether support has been provided for the production of that consignment, and if so, on the type of support scheme.

Rules defined in this document are to ensure that provisions 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 correctly applied.

2. Normative references

The normative references, covering all aspects of the KZR INiG System, are the following linked documents, which should be read in conjunction.

KZR INiG System /1/ Description of the KZR INiG System – general rules

KZR INiG System /2/ Definitions

KZR INiG System /3/ Reference with national legislation

KZR INiG System /4/ Land use for raw materials production – lands with high carbon stock

KZR INiG System /5/ Land use for raw materials production – biodiversity

KZR INiG System /6/ Land use for raw materials production – agricultural and environmental requirements and standards

KZR INiG System /7/ Guidance for proper functioning of mass balance system

KZR INiG System /8/ Guidelines for the determination of the life cycle per unit values of GHG emissions for biofuels, biomass fuels and bioliquids

KZR INiG System /9/ Requirements for certification bodies

KZR INiG System /10/ Guidelines for auditor and conduct of audit

KZR INiG System /11/ Forest biomass

3. Definitions

KZR INiG System/2/ Definitions

4. Guidelines for the construction of a mass balance system

4.1. General rules

Economic operators must enforce a mass balance system, in accordance with the regulations of the KZR INiG System. Each system participant is obliged to introduce a mass balance system, which is assessed during audits. It ensures that the mass balance is respected.

The mass balance system shall operate at least at the level of a site or transmission and distribution infrastructure. It means that consignments of raw material or fuels/biofuels can be mixed in a container, warehouses, processing or logistical facilities, transmission, and distribution infrastructure. This applies throughout the supply chain, including sites used for storage as well as processing.

Site is defined as a geographical location with precise boundaries within which products can be mixed. The mass balance system shall operate at a level where consignments could normally be in contact, such as in a container, processing or logistical facility or site. If more than one legal entity operates on a site, then each legal entity is required to operate its own mass balance system. The same rules apply to transmission and distribution infrastructure, where sustainable gases (bio-methane) are transferred. In addition, if there are different types of products kept at a single site (different "product groups"), the operator will need to keep separate mass balance records for the different product groups.

The mass balance system is to ensure traceability, supervision, and management of the biomass streams (processed biomass) meeting the sustainability criteria.

The mass balance shall be consistent within a site, even if it is run according to more than one voluntary scheme.

The mass balance is designed to facilitate flows in sustainability information in the parts of the supply chain where material is physically mixed (or can be physically mixed). For the parts of the supply chain where materials are not usually mixed for instance due to differences in their physical properties, typical uses, or price (even if those materials are located at the same site), trading without storage, then material should be sold with the sustainability characteristics that

relate to the specific material. For example, if a site contains short rotation coppice wood chips and wood industry residue chips that are not mixed, any unmixed chips sold from that site should be sold with the sustainability characteristics that relate to that feedstock/material.

It is the responsibility of each operator in the supply chain to keep records and evidence of their inputs and outputs to demonstrate that the chain of custody has operated correctly. These records can be subject to an audit. If there is a break in the chain of custody system, the link can no longer be made between the sustainably of the raw material and the sustainability of the end biomass and it will not be possible to make a claim that the material is sustainable under the REDII. In order to minimize the administrative burden for the economic operator (system participant), it is suggested that the operational system already existing in the company (financial bookkeeping system, storage system, etc.) be expanded, supplementing it with elements related to sustainability. The amounts of batches must be measured using reliable measuring devices.

It must be emphasized that the introduction of the mass balance system, and likewise the whole system of sustainability criteria, should not significantly disturb the existing document flow within the company.

When consignments with identical sustainability characteristics but different energy or moisture contents are mixed, the size of the consignments must be adjusted according to their energy or moisture content. This should be done as a weighted average. 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 coefficients. Differences in the energy content are permitted if the raw materials are mixed for further processing e.g. in a co-digestion plant.

The mass balance system aims to reduce the administrative burden for demonstrating compliance with the sustainability and GHG saving criteria by allowing mixing of raw material and fuel with differing sustainability characteristics and by allowing reassignment of the sustainability characteristics in a flexible manner to consignments withdrawn from such a mixture. In order to ensure transparency, mixing under the mass balance system is only possible if raw material and fuels belong to the same product group.

Raw material or fuels shall only be considered to be part of a mixture if they are mixed in a container, at a processing or logistical facility, or at a transmission and distribution infrastructure or site.

Different raw materials shall only be considered to be part of a mixture if they belong to the same product group, except where the raw material is mixed for the purpose of further processing. Further processing means further processing at the fuel production plant for the purpose of producing biofuels, bioliquids or biomass fuels.

Raw materials or fuels shall only be considered to be part of a mixture if they are physically mixed unless they are physically identical or belong to the same product group. Where raw materials or fuels are physically identical or belong to the same product group, they must be stored in the same interconnected infrastructure, processing or logistical facility, transmission and distribution infrastructure or site. If raw materials belong to different product groups or one of them is listed on Annex IX of 2018/2001 directive, then separate mass balance is carried out, in spite of the fact that products are physically mixed.

Fuels introduced into a logistical facility or a transmission or distribution infrastructure such as the gas grid or a pipeline network for liquid fuels, stored in LNG or other storage facilities shall only be considered to be part of a mixture where that infrastructure is interconnected. Interconnected infrastructure means a system of infrastructures, including pipelines, LNG terminals and storage facilities, which transports gases, that primarily consist of methane and include biogas and gas from biomass, in particular biomethane, or other types of gas that can technically and safely be injected into, and transported through the natural gas pipeline system, hydrogen systems as well as pipeline networks and transmission or distribution infrastructures for liquid fuels. Isolated grids, or parts that are not physically connected, cannot be considered part of the same mass balance system. Where liquid or gaseous fuels are introduced into an interconnected infrastructure and subject to the same mass balancing system, the respective sustainability and GHG emissions saving characteristics shall be assigned to the consignments entering and exiting the interconnected infrastructure. When transferring GHG characteristics from renewable gases to LNG (or bio-LNG) the GHG emissions from gas compression shall be taken into account, along with the relevant conversion factors. The input (injection) and output (withdrawal) of gas in interconnected infrastructure must be documented by economic operators and subject to independent auditing. Deficits in the mass balance system must not occur. Please see appropriate provisions in the document *KZR INiG System /1* and *KZR INiG System* /9 and *KZR INiG System /10*.

Economic operators are required to keep separate mass balances for raw materials and fuels which cannot be considered part of a mixture. Transfer of information about the sustainability and GHG emissions saving characteristics and sizes between different mass balances shall not be allowed. Raw materials inside biofuels, bioliquids or biomass fuels production facilities are considered to be part of a mixture. Therefore, the requirement to keep separate mass balances shall not apply to such facilities and a single mass balance can be kept.

The mass balance system shall include information about the sustainability and the GHG emissions characteristics and quantities of raw material and fuels, including information about the quantities of raw material and fuels for which no sustainability or GHG characteristics have been determined.

Where a consignment of raw material or fuel is delivered to an economic operator that is not participating in a voluntary scheme or national scheme, the delivery shall be reflected in the mass balance by withdrawing an equivalent quantity of raw material or fuel. The type of fuel to be booked out shall correspond to the physical nature of the raw material or fuel delivered.

Where a consignment of fuel is used to comply with an obligation placed on a fuel supplier by a Member State, it shall be considered to be withdrawn from the mixture of the mass balance.

Where biofuels, bioliquids or biomass fuels are blended with fossil fuels, the information about the sustainability and GHG emissions saving characteristics assigned to the blend shall correspond to the physical share of the biofuel, bioliquids or biomass fuels in the blend. For biofuels and bioliquids, Member States may further check the veracity of this information in accordance with Article 23 of COMMISSION IMPLEMENTING REGULATION (EU) of 14.6.2022 on rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land-use change-risk criteria.

The sustainability and GHG emissions saving characteristics of a consignment of raw material or fuel shall be considered as a set. Where consignments are withdrawn from a mixture, any of the sets of sustainability characteristics may be assigned to them provided that the sets of sustainability and GHG emissions saving characteristics are not split and the mass balance is achieved over the appropriate period of time.

Where relevant for transparency reasons, the mass balance system shall include information on whether support has been provided for the production of the fuel or fuel precursor, and if so, the type of support.

The appropriate period of time for achieving the mass balance shall be 12 months for producers of agricultural biomass and forest biomass and first gathering points sourcing only agricultural biomass and forest biomass, and 3 months for all other economic operators. The start and end of the period shall be aligned with the calendar year or, where applicable, the four quarters of the calendar year. As alternatives to the calendar year, economic operators may also use either the economic year that they use for bookkeeping purposes or another starting point for the mass balance period, provided that the choice is clearly indicated and applied consistently. At the end of the mass balance period, the sustainability data carried forward should be equivalent to the physical stock in the container, processing or logistical facility, transmission and distribution infrastructure or site. In case if the mass balance period does not match calendar year, the economic operator is obliged to report annual quantities of biomass fuels no later than 30 of March of the following year.

Where a consignment is processed, information on the sustainability and greenhouse gas emissions saving characteristics of the consignment shall be adjusted and assigned to the output in accordance with the following rules:

(a) when the processing of a consignment of raw material yields only one output that is intended for the production of biofuels, bioliquids or biomass fuels, renewable liquid and gaseous transport fuels of non-biological origin, or recycled carbon fuels, the size of the consignment and the related quantities of sustainability and greenhouse gas emissions saving characteristics shall be adjusted applying a conversion coefficient 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;

(b) when the processing of a consignment of raw material yields more than one output that is intended for the production of biofuels, bioliquids or biomass fuels, renewable liquid and gaseous transport fuels of non-biological origin, or recycled carbon fuels, for each output a separate conversion coefficient shall be applied, and a separate mass balance shall be used.

The mass balance records must contain information on both the inputs and the outputs of sustainable and unsustainable material (including where relevant fossil fuels) handled by the sites. Therefore, the mass balance includes following data:

- Initial stock;
- Production amounts;
- Sold amounts;
- Final stock.

4.2. Specific guidelines for mass balance operation

Step 1

The first step is to define the system's boundaries and to designate points of raw material/feedstock (biomass, waste, or residue) entry and final product exit. In order to run mass balance in an appropriate way, the economic operator is obliged to have a suitable documentation system.

Step 2

The second step is to define an input/output moment. In accordance with the *KZR INiG System*, the moment of physical receipt of biomass (or processed biomass) is the entry point (or the exit point) of a stream in the mass balance system of a given economic operator. Defining this moment is crucial due to the correct settlement from the point of view of mass balance. The economic operator is obliged to specify in his written procedures the type of document, the date of issue of which determines whether a given batch is included in a given mass balance period. Thus, receipt documents are an integral part of the mass balance system documents.

Step 3

The third step is to define process map. For correct implementation and usage of the mass balance, it is necessary to identify all processes occurring at the production plant, from the entry of the commodity to the moment of shipment to the customer. Development of a **process map** showing biomass pathways and connections between the individual processes will be helpful, ensuring traceability of biomass streams (thus complying with the sustainability criteria) and providing a basis for carrying out calculations of GHG emissions connected with this stage of the biofuel or bioliquids life cycle.

Ensuring traceability of the individual biomass batches, lots or consignments need not entail physical supervision over the individual shipments, but it must take place at the stage of purchase and sale of batches meeting sustainability criteria (defined points of entry to, and exit from, the system), and at the points of entry and exit to/from the individual processes, particularly those in which a change in mass or a conversion to another product occurs. Thus, each system participant (economic operator) performs a mass balance based on invoices (reception documents) and records of the quantity of product (complying with the sustainability criteria) bought and sold.

Step 4

The fourth step is to define rules of sustainability characteristics transmit. A mass balance system means record-keeping such that "sustainability characteristics" remain ascribed to a given batch, lot or consignment of the raw material, allowing each economic operator that processes, converts, transforms, manufactures, trades, stores, distributes and/or otherwise handles the biomass (processed biomass) to ensure traceability of every batch, lot or consignment of product that goes through the processing unit.

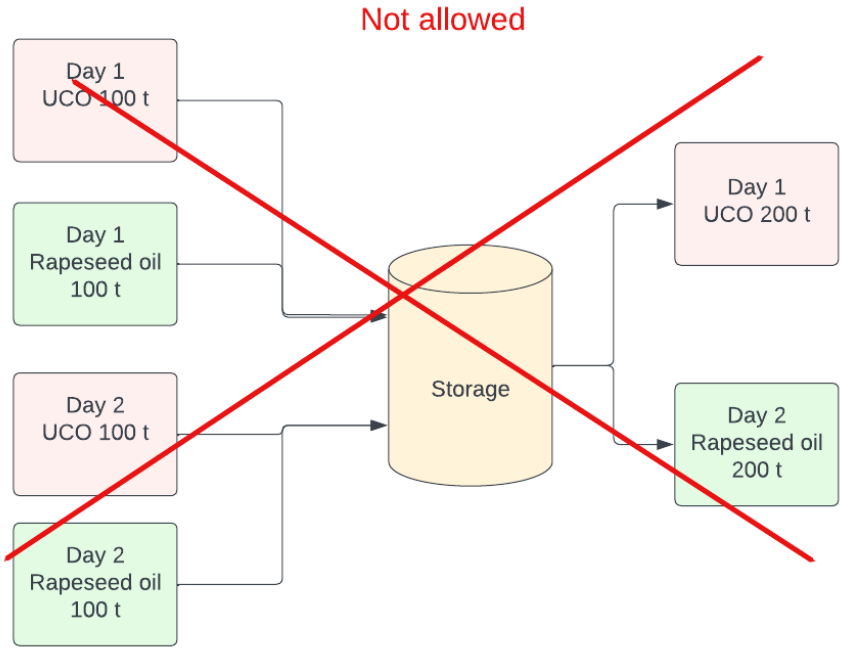
The sustainability characteristics of given batch are described by input/output data (see point 5). Sustainability characteristics can be allocated in a flexible manner to material taken out of the mixture. The mass balance approach is designed to facilitate flows in sustainability information in the parts of the supply chain where material is physically mixed (or can be physically mixed). For the parts of the supply chain where materials are not usually mixed for instance

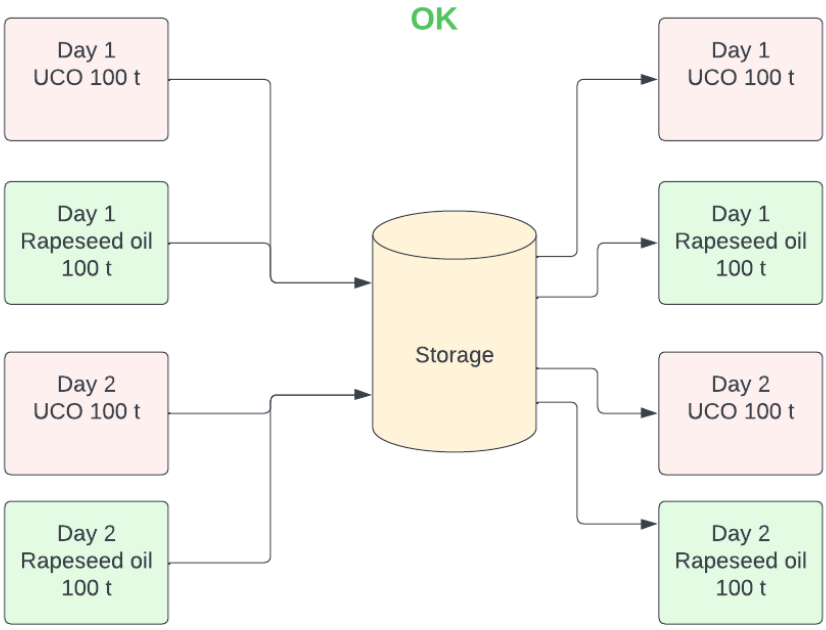
due to differences in their physical properties, typical uses, or price (even if the materials are located at the same site), then material should be sold with the sustainability characteristics that relate to the specific material. If raw materials in different product groups (e.g., rapeseed oil and UCO) are kept on the same site, the sustainability characteristics for outgoing consignments need to correspond to the raw material actually delivered. It means that it is not allowed to assign sustainability characteristic delivered with the product from one product group to the product form another product group (e.g., it is not allowed to assign UCO sustainability characteristic to rapeseed oil even if both are stored at the same site).

According to KZR INiG separate trading of physical material and sustainability certificates is not allowed.

Biofuel type (see minimum input/output data - point 5) shall be recorded by System participant in the mass balance system.

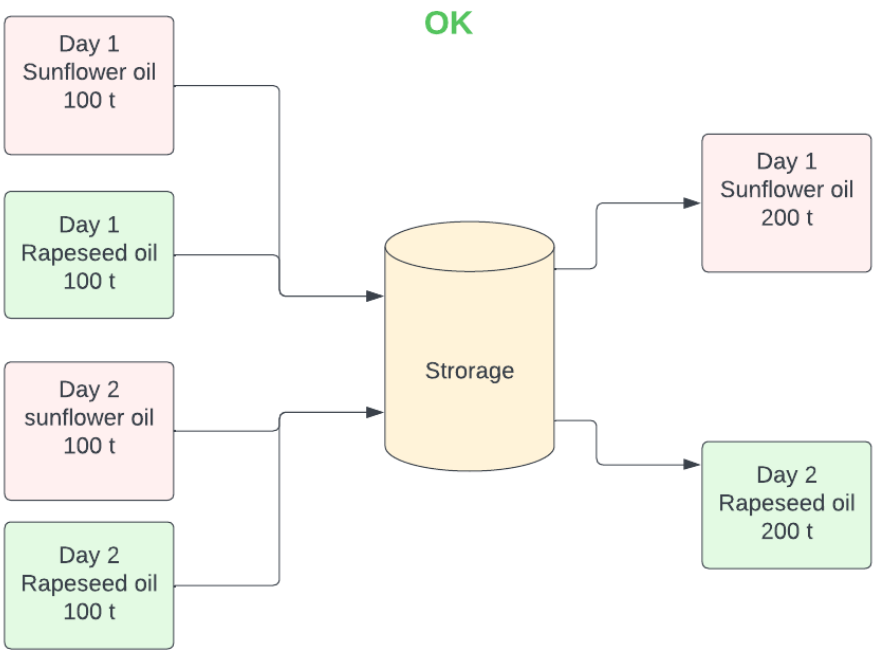
Example 1. Raw materials in different product groups on a site


Not allowed
Day 1
UCO 100 t
Day 1
Rapeseed oil
100 t
Day 2
UCO 100 t
Day 2
Rapeseed oil
100 t
Storage
Day 1
UCO 200 t
Day 2
Rapeseed oil
200 t


OK
Day 1
UCO 100 t
Day 1
Rapeseed oil
100 t
Day 2
UCO 100 t
Day 2
Rapeseed oil
100 t
Storage
Day 1
UCO 100 t
Day 1
Rapeseed oil
100 t
Day 2
UCO 100 t
Day 2
Rapeseed oil
100 t

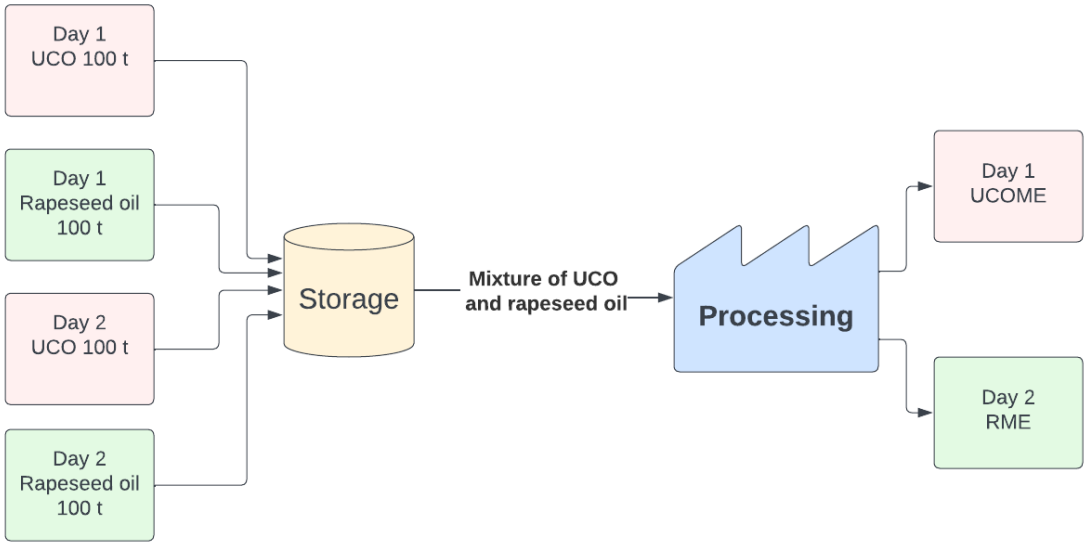
Rapeseed oil and used cooling oil (UCO) are stored on the same site. They are in different product groups, so it is not possible to deliver rapeseed oil with sustainability characteristics of UCO or vice versa, even if the mass balance is accounted positively in a given period of time.

Example 2. Raw materials in the same product group on a site



Rapeseed oil and sunflower oil are mixed on a site. As they are the same product group it is possible to sell outgoing consignments with sustainability characteristics related to either rapeseed oil or sunflower oil, or a combination, as long as the net mass balance is respected.

Example 3. Raw materials in different product groups mixed for further processing into biofuel



It is allowed to flexibly allocate sustainability characteristics to outgoing consignments of biofuel. E.g. When rapeseed oil and UCO are processed into FAME on the same site, it is possible to flexibly sell outgoing consignments with sustainability characteristics related to either rapeseed or UCO, or a combination, as long as the net mass balance is respected. Please note that conversion factor(s) shall be applied in order to account amounts of UCOME and RME within a mass balance period.

Step 5

The fifth step is to define rules of settlement of the mass balance. Information on quantities of inputs and outputs, as well as any conversion coefficients need to be documented and kept up to date by each batch in the supply chain. Records of commercial transactions should enable parties in the supply chain (and auditors) to trace back through the supply chain to verify any sustainability data claims made.

The mass balance system shall include invoice references, product name, volume, conversion coefficients, data on GHG emissions of all compliant batches, lots or consignments in a given accounting period, excluding GHG emissions that are ascribed to those that do not comply with the sustainability requirements. Operators should take care to always record the correct units for all data. This is especially important for volume data (note that the wood industry often works on a “dry weight” basis and the bioenergy industry often works on a “wet weight basis”) and greenhouse gas related data). Consignments with otherwise identical

sustainability characteristics, but different greenhouse gas values can be combined administratively. However, they cannot be combined for the purpose of averaging greenhouse gas values to meet the greenhouse gas threshold and become RED II compliant (i.e. consignments that would otherwise not meet the greenhouse gas saving threshold cannot be administratively combined with consignments that would meet the threshold).

Mixing of batches. In the case of mixing of batches, lots or consignments with identical sustainability characteristics, the total mass is taken into consideration in calculating GHG emissions. This means that, for the purpose of GHG emissions calculations, batches from different supply but with the same sustainability characteristics can be summed. Note that it is permitted if all sustainability characteristics are identical. Under the KZR INiG System, it is also permitted to allocate the worst GHG value to all batches that have otherwise the same sustainability characteristics.

When input batches, lots or consignments with various sustainability characteristics are mixed (processed together), the individual sizes and sustainability characteristics of each batch remain assigned to the mixture. This information shall be documented in the mass balance system records.

If the mixture is split up, the quantity of the compliant batch taken out of this mixture shall not be greater than the quantity of the input compliant batch introduced into the mixture (taking into account an efficiency coefficient or a conversion coefficient).

When material is mixed, operators need to decide how to assign sustainability characteristic to outgoing consignments taking into account information from what has entered the site. Under a mass balance system, it is permitted to freely assign data to outgoing consignments, as long as:

• The ‘set of sustainability characteristics’ remains together, and

• The overall mass balance principles are respected (i.e. inputs ≥ outputs taking into account conversion coefficients).

When more than one ‘product group’ is contained on a site, sustainability characteristics can only be assigned to the same ‘product group’ that they originated from.

The mass balance must **be conducted in a defined time period and verified regularly**. The balance in the system can be continuous in time, in which case a ‘deficit’, i.e. that at any point in time more sustainable material has been withdrawn than has been added, is required not to occur. Alternatively, the balance could be achieved over an appropriate period of time and regularly verified. In latter a three-month period is the maximum allowed in the KZR INiG System. In between this time, it could be possible for a deficit in sustainable material to occur. For producers of agricultural biomass or forest biomass and first gathering points sourcing only

agricultural biomass or forest biomass, it can be permitted for the mass balance period to be up to 12 months, but for any period longer than three months those parties should not be permitted to go into deficit.

At the end of each period, the mass balance shall be accounted (no deficit is permitted) and accepted by an economic operator. It is a subject of verification during an audit. Each individual producer shall design a mass balance method and adjust it to own operation profile, so as to allow monitoring and easy verification of the mass balance. If in a given time period an economic operator purchased more sustainable raw material than was sold, the excess quantity may be transferred to the next time period. This is only allowed when the amount of transferred feedstock is physically located in the warehouse. It is not permitted to transfer documents confirming sustainability of biomass if there is no suitable amount of goods in stock.

The opposite situation, the sale of an amount of sustainable biomass exceeding the amount purchased (including existing stock), is a breach of the rules of mass balance and causes withdrawal of a certificate.

Gains and losses of material may occur along the supply chain, for example, through variation in tolerances of meters and gauges, drying or degradation during storage or losses during handling or transportation. It is in the interest of companies to apply appropriate controls to minimise such gains or losses. Where gains and losses do occur, sustainability data should ideally be adjusted in proportion to the volume of material gained/lost at regular intervals. It is however recognised, that if gains and losses are negligible, adjusting all administrative consignments by a very small amount may be unnecessarily complex.

Processing. When the processing of a consignment of raw material yields only one output that is intended for the production of biofuels, bioliquids or biomass fuels, renewable liquid and gaseous transport fuels of non-biological origin, or recycled carbon fuels, the size of the consignment and the related quantities of sustainability and greenhouse gas emissions saving characteristics shall be adjusted applying a conversion coefficient 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.

When the processing of a consignment of raw material yields more than one output that is intended for the production of biofuels, bioliquids or biomass fuels, renewable liquid and gaseous transport fuels of non-biological origin, or recycled carbon fuels, for each output a separate conversion coefficient shall be applied, and a separate mass balance shall be used.

An efficiency coefficient or conversion coefficient must be defined for each production process or other process where a change in mass of the biomass may occur. Conversion coeffi-

cients need to be calculated as the ratio between the mass of the output and the mass of the raw material entering the process.

Conversion coefficients should be calculated based on an operator's own production data and updated at least annually. Companies are recommended to keep records of the conversion coefficient(s) including:

- To which input product it refers;
- To which output product it refers;
- The units in which the conversion coefficient is expressed;
- The value of the actual conversion coefficient;
- Dates when the specific conversion coefficient is valid; and
- Any calculations and supporting documentation that determines the conversion coefficient.

Whenever a processing step involves losses, appropriate conversion coefficients should be used to adjust the size of a consignment. In addition, it is important to note that, generally, the sustainability characteristics of the feedstock that is processed should be attributed to products and residues of that process equally. For instance, when 50% of a mixture has been certified as being sustainable, 50% of all products and residues from that mixture should also be considered sustainable. The only exception is the allocation of GHG emissions, which should follow the rules of *KZR INiG System /8*.

The figure 1 shows diagrammatically a simple example of a mass balance throughout the whole life cycle (production chain) of a biofuel or bioliquid.

The figure 2 shows diagrammatically a simple example of a mass balance throughout the whole life cycle (production chain) of a solid biomass fuel.

Rules of determining of mass balance for biogas production pathway are the same.

Fig. 1 Diagram of a mass balance under the INiG System – biofuels/bioliquids

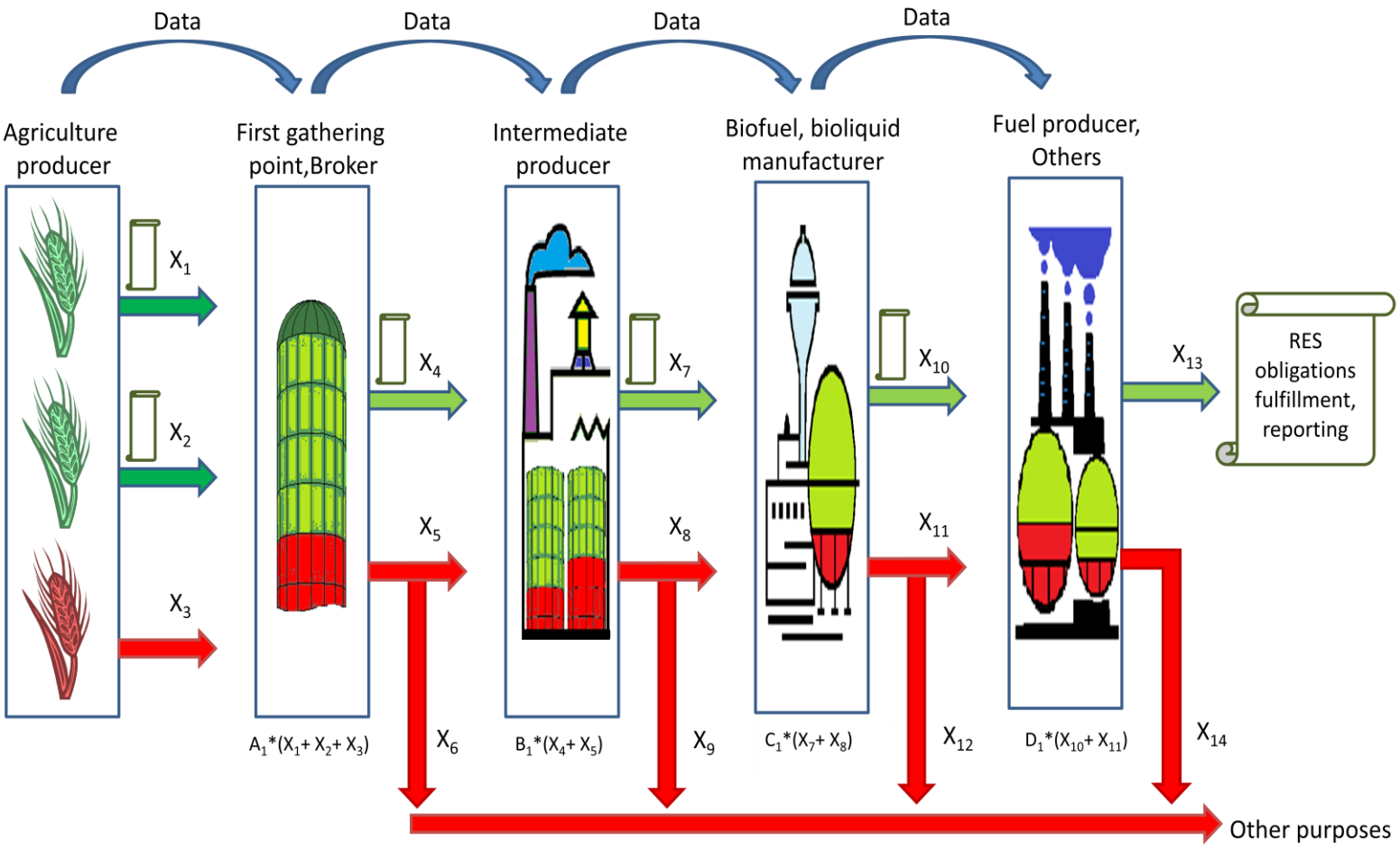
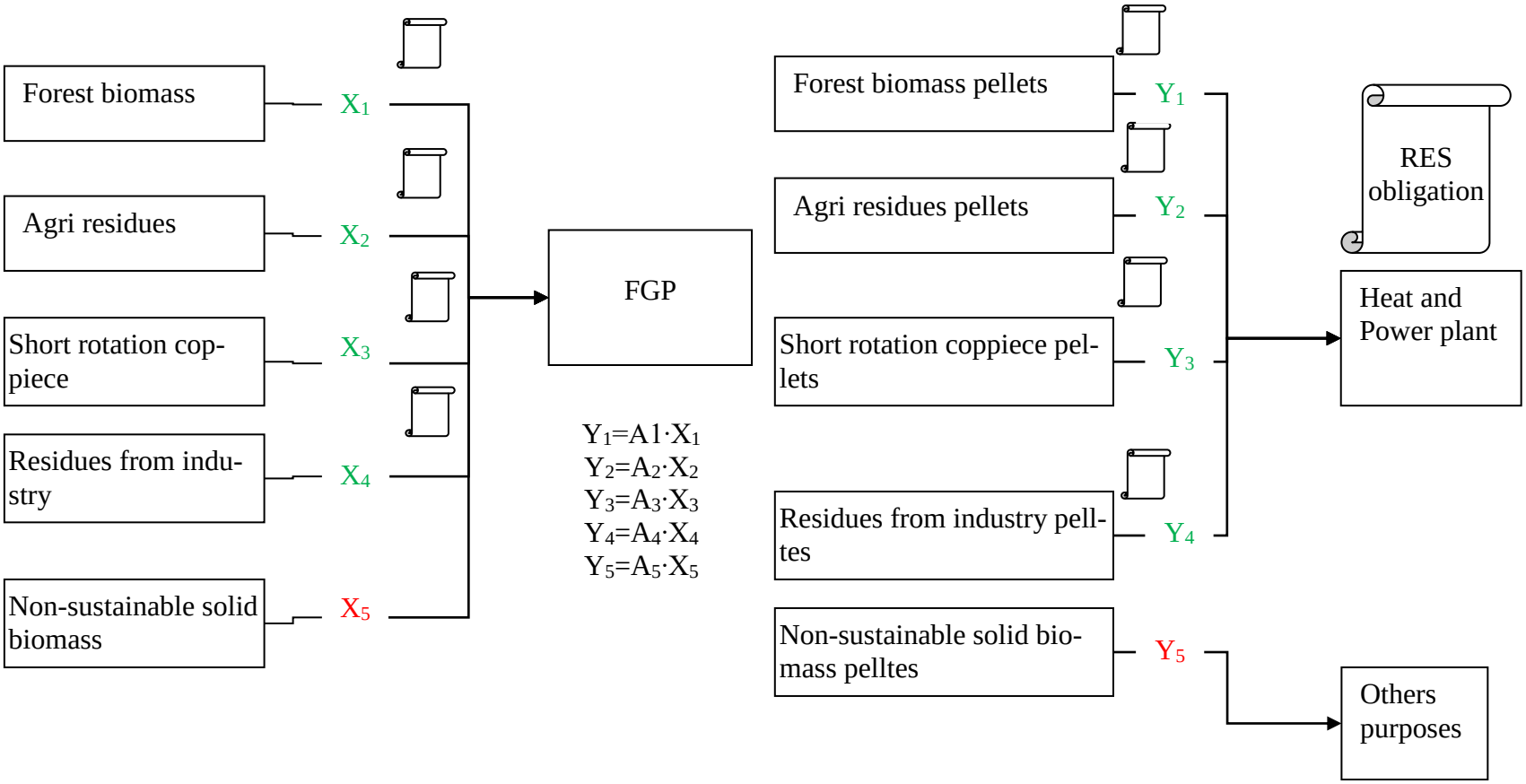


Fig. 2 Diagram of a mass balance under the INiG System – solid biomass fuels


Forest biomass
X1
Agri residues
X2
Short rotation cop-piece
X3
Residues from indu-stry
X4
Non-sustainable solid biomass
X5
FGP
Y1=A1·X1
Y2=A2·X2
Y3=A3·X3
Y4=A4·X4
Y5=A5·X5
Forest biomass pellets
Y1
Agri residues pellets
Y2
Short rotation coppiece pel-lets
Y3
Residues from industry pell-tes
Y4
Non-sustainable solid bio-mass pelltes
Y5
RES obligation
Heat and Power plant
Others purposes

The above diagram presents a mass balance system in the whole production chain of biofuel and bioliquids in an illustrative and very simplified way.

The blue rectangles define the boundaries of a mass balance system at each production site.

4.3. Specific cases

4.3.1. Agricultural producer

The agricultural producer is the first link (in the chain of custody) obliged to proof a mass balance system. He must define: the quantity of produced biomass and its sustainability characteristics; information concerning land-use change; and all data required to verify GHG emissions calculations (if applicable). In order to confirm the data, the agricultural producer must declare the size of the field and its yield per hectare. Mass balance shall prove that amounts of harvested crops (cultivated plants) are appropriate to land use area, taking into account fraction renewal.

4.3.2. First gathering point

The raw material batches purchased from the agricultural producer together with their characteristics are the input data. The first gathering point may accept biomass also from agricultural producers that do not declare meeting the sustainability criteria. In the figure 1, "X_3" is the raw material quantity from an agricultural producer that does not declare meeting the sustainability criteria, while X_1 and X_2 quantities come from an agricultural producer declaring meeting the sustainability criteria (see figure 1).

To these quantities, GHG emission values gCO_{2eq}/MJ (gCO_{2eq}/mass or volume unit) are ascribed, determined according to the methodology of a given system. The first gathering point identifies processes that the biomass undergoes within its boundaries. Energy demand necessary for calculating GHG emissions of the identified processes, and for processes that involve a change in biomass quantity, is determined (coefficient marked A_1 in the figure 1).

It is left to the discretion of the first gathering point to plan the document flow in a way ensuring that information on quantities of the raw material meeting and not meeting sustainability criteria and currently stored is available at every moment.

The simplest way to meet this requirement is a proper differentiation in the financial-bookkeeping system of the economic operators subject to audit. In cases where an invoice correction of biomass sold has occurred, proper changes in the mass balance must be introduced.

The first collection point must maintain evidence of where the material has been collected from, e.g. residues from managing municipal parks and roadways in municipality, or list of independent carpenters or joineries where wastes are collected.

4.3.3. Intermediate producer

The next system participant shall, like the first gathering point, identify pathways and processes that the biomass is undergoing, and define the performance coefficient or conversion coefficient (B_1 in the figure 1) for these processes. Given the fact that raw materials for biofuels and bioliquids production may have various GHG emissions indices, calculations of GHG emissions must be performed based on the intermediate producer's mass balance with regard to emissivity and energy consumption of the individual processes, and also after allocation of emissions to the individual products.

In the figure 1, X_4 and X_5 represent the quantities of compliant and non-compliant biomass entering the producer's mass balance system. The corresponding values in the output streams are X_7 and X_8. To these quantities, emission values gCO_{2eq}/MJ (gCO_{2eq}/mass or volume unit) are ascribed, determined according to the methodology of the KZR INiG System or another recognized EU scheme.

4.3.4. Biofuel/biomass fuel/bioliquids producer

An analogous procedure takes place at the subsequent stages, where „X_7","X_8" (see figure 1) are biomass quantity defined based on purchase – sale documents and an input data in the mass balance system at the system participant, and an input data in the mass balance system at the producer of the biofuel/biomass fuel/bioliquid. To these quantities emission values gCO_{2eq}/MJ (gCO_{2eq}/mass or volume unit) are ascribed, determined according to the methodology of the KZR INiG System or another recognized EU system. As in the previous stages, the producer of the biofuel/biomass fuel/bioliquids is required to:

- identify the biomass pathway in the production plant,
- develop a process map indicating the efficiency coefficient or a conversion coefficient (C_1 figure 1)), ensuring traceability of the product meeting the sustainability criteria,
- allocate emissions to the individual products.

In the above diagram, the efficiency coefficient or conversion coefficient is marked in a general way as C_1. Depending on the type of biofuel/biomass fuel/bioliquids manufactured and the technology used, the $C_1*(X_7 + X_8)$ equation will have a more complex, extended form.

4.3.5. Biogas/Biomethane plant

In case of biogas/biomethane producer rules for biomass fuel producer apply, however the following guidelines are fulfilled.

Renewable gases can be mixed in the transmission and distribution infrastructure (gas grid), provided the infrastructure is interconnected. If biomethane is injected into natural gas grid, the grid level mass balance is managed with the support of the Union Database (once up and running for biomethane). It means that input and data originate from the UDB, taking into account gas losses.

If biogas plant and entities beyond are certified according to both biofuel/bioliquid and biomass fuel certification pathway, carrying out separate mass balance for these two destinations is required. For previous certification scope there is no need to distinguish mass balance in this context.

In this case the batch is understood as amount of gas indicated on the invoice. However, the invoice cannot cover more than three months period. The PoS is issued for each batch. The amount of biogas/biomethane indicated in the PoS is expressed in both volume and energy units. The amount of gas is also adjusted for losses by biogas/biomethane plant.

In case an economic operator processes different sources of (bio)methane into another fuel (e.g. biomethanol), evidence shall be checked to ensure an appropriate mass balance of bioenergy content claims that enter and leave the process. For example, if biomethane is sourced via a direct connection to a biomethane plant, it must be checked that the capacity coming from the plant is consistent with the claim made by the biomethanol producer and the biomethane raw material is not also claimed by another economic operator. In case of multiple inputs of methane, the renewable energy content of the resulting output (e.g. biomethanol) could be subject to testing in accordance with the co-processing verification methods.

If biogas/biomethane is split into two or more streams which have different application (e.g. for electricity production and for LNG production), the sustainability characteristic can be assigned to streams in a flexible manner (according to mass balance rules).

If biomethane is transported via pipe-line mass balance shall take into account gas loses (see document System KZR INiG/1).

If biomethane is converted into biohydrogen via steam reforming process, sustainability characteristic is assigned to the total amount of biohydrogen according to the characteristic of biomethane, taking into account conversion factors and losses.

4.3.6. Fuel producer, final supplier, others

To ensure traceability of meeting the sustainability criteria of a biofuel, each economic operator shall introduce a mass balance system. A fuel producer, final supplier or other economic operator handling biomass (processed biomass, biofuel, bioliquids) is obliged to define input (X_{10}, X_{11}) and output (X_{13}, X_{14}) streams. To these quantities, emissions values gCO_{2eq}/MJ (gCO_{2eq}/mass or volume unit) are ascribed, determined according to the methodology of the KZR INiG System or another recognized EU system. In the above diagram, the efficiency coefficient or conversion coefficient is marked in a general way as D_1. Depending on the type of fuel production, and on other economic operators' activities, the $D_1*(X_{10} + X_{11})$ equation will have a more complex, extended form.

4.3.7. Co-processing of biomass/biogas with fossil raw material

Some processes of biomass conversion may be carried out simultaneously with the processing of fossil raw material.

Co-processing refers to an oil refinery unit processing biomass feedstock together with fossil feedstock and transforming them into final fuels. The biomass feedstock may for instance be lipid-based material, such as vegetable oil, crude tall oil or pyrolysis oil, and the fossil feedstock typically originates from crude oil. The final fuels produced from such a feedstock mix are usually diesel fuel, gasoline and sometimes propane gas, a constituent of Liquefied Petroleum Gas, while minor fractions of other products can also be present. Crucially, such co-processed fuels contain a share of biofuels and biogas.

In this context biogas refers to the gas originating from the biomass feedstock, and which is produced from co-processing of that biomass feedstock together with fossil feedstock to convert them into final liquid and gaseous fuels in the oil refinery.

In such cases, it is necessary to define the share of the product of biological origin in the total amount of co-product at a given stage of processing. Economic operators are obliged to apply the methodology set out in delegated acts adopted pursuant to Article 28(5) of Directive (EU) 2018/2001. After issuance by the European Commission of any further guidance/rules regarding co-processing (e.g. on determining the biogenic content of a fuel, or on GHG emissions calculation), these will be incorporated into the KZR INiG System with immediate effect. As long as the acts are not binding following rules apply.

Economic operators shall be required to thoroughly document the amounts and types of biomass entering the process as well as the amounts of biofuel and biogas that are produced from that biomass. Claims shall be substantiated with evidence including the results of control tests.

The frequency for carrying out the control tests shall be determined by taking into account the complexity and variability of the key parameters of the co-processing, in such a way as to ensure that at any time the share of biofuels and biogas claimed reflect their actual shares. Economic operators shall ensure that the share of biofuels or biogas is above the detection limit of the testing method.

Economic operators co-processing biomass may develop and use a company-specific or process-specific testing method to determine the share of bio-content that is adapted to their particular factory design and feedstock mix. That main testing method shall be based on either mass or energy balance, yield methods, or radiocarbon (^{14}C) testing (i.e. radiocarbon detecting through Accelerator Mass Spectrometry (AMS) or Liquid Scintillation Counting (LSC) method) of the outputs. Economic operators shall be obliged to define the whole refinery as system boundaries independently from the testing method used.

Mass balance method

If a mass balance method is used, the economic operator shall perform the full mass balance analysis of the total mass of inputs and outputs. The mass balance method shall ensure that the bio-content of all outputs is proportional to the bio-content of the inputs and that the same share of biogenic material is allocated to each output. The output shall take into account the mass lost in off-gases, in liquid industrial wastewaters and in solid residues. The mass balance method shall include additional analytic characterization of feedstocks and products, such as ultimate and proximate analyses of system mass flows.

If a mass balance method is used as the main method, the economic operators shall take into account in the calculation the moisture and other non-fuel impurities in their feedstock as well as in the outputs of their production process.

Energy balance method

If an energy balance method is used, the energy share of biogenic content in all outputs from a co-processing step in an oil refinery shall be determined as being equal to the energy share of the biogenic content at the refinery input. The energy balance method shall record the energy content in the biomass and the fossil feedstocks and the process energy entering the co-processing facility. The energy content of both biomass and fossil feedstocks shall be calculated by using the mass of the feedstock and its lower heating value (LHV, measured in MJ per kg). The bio-fraction, calculated as bio energy input divided by total energy input, shall be applied to all fuel outputs, which result from co-processing, in order to determine the bio-content in the final fuels produced.

The energy share of biogenic content in all outputs from a co-processing step in an oil refinery shall be determined as being equal to the energy share of the biogenic content at the refinery input. The energy balance method shall record the energy content in the biomass and the fossil feedstocks and the process energy entering the co-processing facility. The energy content of both biomass and fossil feedstocks shall be calculated by using the mass of the feedstock and its lower heating value (LHV, measured in MJ per kg). The bio-fraction, calculated as bio energy input divided by total energy input, shall be applied to all fuel outputs, which result from co-processing, in order to determine the bio-content in the final fuels produced.

Yield methods

Where a yield method is used, economic operators may use one of the two methods described below in order to obtain a yield factor to be applied to the common process of the fuel production:

(a) Yield Method A. The yields of the various products shall be first observed and recorded when the oil refinery operates with only pure fossil feedstock. Then, a share of biomass feedstocks shall be added to the input stream and the incremental effect on the yields shall be observed and recorded. The bio-content shall be then attributed to each product in proportion to the increase in its production. Each yield factor shall only be valid for the specific inputs and process conditions for which the yield factor had been established.

(b) Yield Method B. This method shall establish a relationship between the bio-input and the bio-output of a co-processing unit. The conversion factor shall be determined by running several batches of feedstock at known co-processing conditions, including a full characterization of inputs and outputs of the system. After having determined this yield factor correlation, it can be applied to the biogenic feedstock of the same type and quality that is used in the same co-processing unit working at the same operating conditions.

Economic operators may only use yield methods as a main method if the system is kept under reference operating conditions, including for feedstock quality. If economic operators use a yield method, they shall use the ^{14}C testing as a control method to verify its yield factor at least whenever they change operating conditions.

The economic operator shall demonstrate the continuous operation of the plant at known co-processing conditions by running each specific bio-input through ^{14}C testing, used to calculate its specific conversion factor.

Radiocarbon (^{14}C) testing

When carrying out radiocarbon (^{14}C) testing, economic operators shall apply the Accelerator Mass Spectrometry (AMS) method. However, they may apply alternatively, Liquid Scintillation Counting (LSC) methods if the bio-share is expected to be at least 1 volume % and if the sample is a clear liquid.

Economic operators shall ensure that, when conducting a ^{14}C test, the bio-share is at a sufficient level so that the ^{14}C test can reliably detect and quantify it. They shall provide details on the accuracy and precision of the results.

The ^{14}C control testing shall also quantify any loss of carbon from biogenic origin due to the process of removing oxygen from the biogenic feedstock.

If the ^{14}C testing, when used as a second verification testing method of the bio-content in an output, shows a deviation of more than 1% in absolute terms, compared to the results of the main method used by the economic operator, the lower value of both tests shall be considered valid. In addition, the economic operator shall review its main testing methods to correct any system errors leading to such deviation.

The frequency for carrying out the main testing method and the ^{14}C testing method when used as a second verification testing method shall be determined by taking into account the complexity and variability of the key parameters of the co-processing, in such a way as to ensure that at any time the claims of the bio-content reflect their actual shares. The economic operators shall perform the calculation of the bio-content share at least for each batch or consignment.

The share of hydrogen of biological origin

If the production system co-processes renewable hydrogen of biological origin, economic operators shall document and provide evidence about the origin of the hydrogen as well as a proof that the hydrogen entering the hydrotreater:

(a) has not been counted as a renewable energy elsewhere in order to avoid double-counting, and
(b) has been incorporated into the final fuel and not simply used to remove impurities such as sulphur.

Economic operators may use a common refinery elemental analysis such as CHN (Carbon, Hydrogen, Nitrogen) test to quantify the hydrogen content of the material before and after hydro treating as a way to document if there is any increase in hydrogen content of the fuel. Economic operators may account any such increase as an additional biofuel or biogas in the output. The biological origin of the hydrogen used in hydro treating or co-processing shall be certified

for its biological origin by the supplier or the economic operators themselves in case they are also producers before use.

In order to determine amounts of hydrogen the refinery is obliged to create mass balance according to following steps:

1. Define system boundaries including all refinery units using hydrogen and producing motor and heating fuels components.
2. Define sources and amounts of hydrogen: sustainable and non-sustainable.
3. Calculate the share of sustainable hydrogen in total hydrogen volume, hereinafter "sustainable share".
4. Define the inputs to each units. For each stream, sustainable and non-sustainable hydrogen content (expressed in mass units) shall be determined. For hydrogen streams two pathways are possible. First, the content of sustainable hydrogen equals the content of sustainable hydrogen delivered from unit producing given stream. Second pathway is used when there is no possibility to use first pathway. In this case sustainable hydrogen content is calculated according to point 3. Hydrogen which was incorporated into hydrocarbon streams on previous stages of crude oil processing should also be taken into account.
5. Define the outputs from each unit. Hydrogen content (expressed in mass units) shall be determined for each nonhydrocarbon stream. Please note that hydrogen sulfide and ammonia are also streams containing hydrogen. Amounts of hydrogen to be allocated to hydrocarbons is calculates as a difference between total input of hydrogen and amounts of hydrogen in non-hydrocarbon stream. Sustainable and non-sustainable hydrogen is allocated to hydrocarbon output streams proportionally or non-proportionally according to reaction chemistry and depth of conversion if it possible to proof it.
6. For each outputs define destination: fuels or others.
7. Calculate a share of hydrogen which was incorporated into fuels (both sustainable and non- sustainable) into total amounts of fuels produced, for each type of fuels separately.
8. The quantities of hydrogen to be reported as sustainable is calculated as a sum of hydrogen incorporated into fuels components.

The mass balance is performed in maximum three months period. In case of first year of certification, performing of mass balance according to above procedure is mandatory. In the following years exemption from performing mass balance is possible provided that:

- The refinery scheme stays unchanged.
- The refinery calculates the total share of hydrogen allocated into each type of fuels in relation to total amounts of hydrogen produced in the refinery. The calculations are performed for each time period separately. If these shares are constant (it means that the shares differ no more than 10%), the refinery may use medium of these shares to determine hydrogen amounts to be reported, hereinafter "average share".
- Hydrogen amounts to be reported as sustainable are calculated by multiplying average share of hydrogen and the sustainable share.

When economic operators report co-processing results, they shall provide details on the accuracy and precision of the testing method used. Economic operators shall account for and report any inaccuracies in their measurements of flows or heating values as part of their main testing method.

GHG emissions generated at this, and the following stages of processing shall be allocated to both the product of biological origin, and the fractions from fossil parts.

Record keeping, process control, auditing and reporting of abnormal deviations

When economic operators claim there is a specific share of biofuels or biogas in the fuel they put on the market, they shall keep samples for at least two years as well as records of measurement data and calculations. Economic operators shall provide certification bodies and their auditors with full access to such samples, records, and other evidence. Economic operators shall prepare a detailed description of the main testing method they used, including an indication of its accuracy and precision as also verified through the application the ^{14}C testing and together with a procedure for its application.

In order to avoid the risks of abnormal deviations and facilitate retrospective audit verification of the accuracy of claims made by refineries on the bio-share in their fuels, economic operators shall apply an overall mass balance system that indicates the biogenic share of input and output. They shall perform this mass balance calculation in parallel to the main testing method in order to check and compare the results of both methods on assessing the bio-share in final fuels produced.

If within the boundaries of the refinery, economic operators mix the output of co-processing with other fuels, they shall use a mass balance system that allows consignments of fuels pro-

duced resulting from biomass, being processed with fossil fuels in a common process, to be mixed with other fuels, while providing adequate information about the characteristics and sizes of the consignments, in accordance with Article 30 of Directive (EU) 2018/2001 and in accordance with this document.

Any abnormal deviations identified by the auditors of certification bodies shall be treated as major non-conformities and immediately notified to the voluntary schemes or other certification schemes that verify compliance of the fuel resulting from biomass with the sustainability and the greenhouse gas emissions saving criteria laid down in Article 29 (2) to (7) and (10) of Directive (EU) 2018/2001.

The competent authorities of Member States may also verify the claims of economic operators about the share of biofuels or biogas in the fuels they put on the market. Any deviations identified as a result of these control checks shall be immediately notified to the certification body and the KZR INiG System. In case of such notifications made either by certification bodies or the competent authorities of the Member States, the KZR INiG System takes immediate action by investigating the case. If the investigation confirms the findings of the certification body or the competent authority of the Member State, the KZR INiG System treats the deviations as a major non-conformity and immediately suspend the certificate of the economic operator. In order to rectify the accuracy of the claims, the lower values established by the control checks shall be used as a basis for recalculating the claims. In addition, the economic operator shall be urged by the KZR INiG System to review its testing methods to correct inter alia any system errors leading to such deviations. The effectiveness of the measures taken by the economic operator shall be validated by another audit of the certification body before the suspension of its certificate can be lifted.

The national regulations apply when crediting the biogenic component from co-processing of biofuels and fossil fuels in the respective member states.

4.3.8. Power plant, heating plant, CHP plant

Plant supervises amounts of bought biomass directed into heat/power production and in the stock. The mass balance includes amounts of biomass used and energy produced. Amounts of biomass is the input while amounts of energy produced is the output. The plant assigns the sustainability characteristics of biomass to heat, and power produced taking into account the efficiency. This way is to calculate the amount of heat/power originating from biomass. The mass balance takes into account sustainability characteristics of biomass. As final producers, plants shall document a confirmation of correctness of the mass balance. This confirmation shall be approved by entitled person and can be treated as a proof of the power and heat amounts produced from sustainable biomass. Proofs of sustainability characteristic (PoS) for each biomass

batch shall be linked to the confirmation. Specific case of plants using biomass is using it for burning for other purposes than production district heating. Usually, they use heat for technological purposes. These companies are exempt from the obligation of efficiency calculation and as an output in the mass balance amount of produced heat per unit of product is calculated.

5. Documenting the verified data

It is important that the introduction of a system for evaluating the sustainability criteria does not cause excessive administrative difficulties for the System participant. For the reason it is impossible to build one simple evaluation algorithm for the introduced mass balance system. However, immediate identification of the data to be collected by the System participant is critical.

A map of processes performed in the production unit, together with definition of input and output data for each process, is a starting point for the development of inventory tables. If, during the process, a change in mass or conversion to another product occurs, it is necessary to provide corresponding coefficients in the mass balance calculation.

In order to ensure traceability of product batches meeting the sustainability criteria, economic operators shall provide to the next operator the following information about input and output data that he is obliged to report, demonstrate during audit, and exchange and collect within the mass balance system. Attribution of minimum input/output data to a batch means that the batch is fully compliant with RED II requirements. The transfer of sustainability characteristics must always be accompanied by a physical transfer of material. Input/output minimum data can be assigned to a given batch as form of traditional document or by using electronic database The KZR INiG System requires that KZR INiG participants who intend on marketing their crops for biofuel production enter all relevant information in Union Database. A document containing sustainability characteristic is called “Proof of Sustainability (PoS)”. Sustainability characteristic shall be reported for each consignment of product. PoS is issued by certified companies. PoS documents are issued via UDB.

Required minimum input/output data:

- KZR INiG System;
- Proof of Sustainability number, certificate number;
- Data identifying the economic operators (name and address of supplier and receiver of the raw material);
- Sustainability and GHG emission savings characteristics, including:
  (i) statement on whether the raw material or fuel complies with the criteria set out in Article 29(2) to (7) of Directive (EU) 2018/2001;

(ii) GHG emission data calculated according to the methodology set out in Annexes V and VI to Directive (EU) 2018/2011 or Delegated Regulation (EU) 2019/807

(iii) description of when the installation started operation (for fuels only) – for definition of installation see NOTE 7;

- Name of raw material or name of raw material that the fuel is produced from;
- Waste or animal by-product permit number (if applicable);
- Fuel type[b]/(for fuels only);
- Country of origin of raw material;
- Country of fuel production;
- Statement on whether the raw material or fuel complies with the criteria set out for low indirect land-use change-risk biofuels;
- Information on whether support has been provided for the production of that consignment, and if so, the type of support scheme.
- Statement by the economic operator that delivered wastes/residues raw material, feedstock or biofuels produced from wastes/residues was not deliberately modified to meet wastes/residue definition[c];
- Date of (physical) loading;
- Place of (physical) loading or logistical facility or distribution infrastructure entry point;
- Place of (physical) delivery or logistical facility or distribution infrastructure exit point;
- Volume: For fuels, the energy quantity of the fuel must also be included. For the calculation of the energy quantity, conversion factors in Annex III to Directive (EU) 2018/2001 must be used.

NOTE 1

GHG emission data characterizing the batch are expressed according to the documents KZR INiG System/8. If default value (DV) or disaggregated default values (DDV) are used only DV/DDV information is entered.

Information on GHG emissions must include accurate data on all relevant elements of the emissions calculation formula. When default values are used, information on GHG emissions

[b] Biofuel type means a biofuel production process and/or a biofuel production pathway defined by the RED II

[c] Apply only for wastes/residues biofuel supply chain. Certification of wastes/residues collection point is unambiguous with the confirmation of no intentional contamination, but some schemes (national or voluntary) may require such additional confirmation. Therefore, placing this information on the delivery document is strongly recommended but not needed.

should only be reported for final biofuels and can be reported as an aggregate. When actual values are calculated, it is necessary to split the total amount of emissions into all elements of the GHG emission calculation formula that are relevant. This applies also to the elements of the formula that are relevant. Relevant refers in this context to elements for which reporting is obligatory (e.g. e_l in case of land use change), all elements for which actual values should be used instead of disaggregated default values and all elements related to emission savings (if applicable).

Annualised emissions from carbon stock changes caused by land-use change for data collected at the FGP stage is mandatory, for further link in a supply chain if no value is specified it means that the amount is zero.

In cases where default values are used, information on the amount of GHG emissions should not be transmitted through the chain of custody (before the last processing step) as it would be difficult to know, at later stages of the chain, whether these emissions represent actual values or are derived from (disaggregated) default values.

When default values are used, information on GHG emissions should only be reported for final biofuels and can be reported as an aggregate. If relevant, both, the process technology, transport distance and the raw material used need to be specified.

For raw materials and interim products, information on greenhouse gas emissions should be reported in g CO_2eq/dry-ton feedstock or g CO_2eq/dry-ton intermediary respectively. For biomass fuels, information on greenhouse gas emissions should be reported in g CO_2eq/MJ.

In the case of using a default value of GHG emissions, the biofuel production path shall be consistent with that given in the RED II Directive.

Final link in the supply chain enters GHG only saving values (expressed in percentage and rounded to the nearest integer).

NOTE 2

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 States, no further sustainable claims shall be issued for the consignment (no sustainability characteristic can be assigned to the consignment).

NOTE 3

Input/output minimum data shall be recorded by the system participants in their mass balances. If a company produces heat/electricity from biomass originating from its own production, internal PoSes are issued for biomass directed into energy production unit. Mass flow should be reflected in the process map. Internal PoS may not cover time period longer than 3 months. The same rule applies if biofuel (other fuels) is produced from biomass originating from (bio)fuel producer.

NOTE 4

A confirmation of sustainability of a given biofuel supply should not be issued for deliveries or sales of sustainable biofuel if the biofuel has already been used for any of the purposes specified in Article 29 (1) of the RED II, including the fulfillment of a national quota obligation.

NOTE 5

The final biomass fuel should be reported as a greenhouse gas intensity along with the heat/power plant efficiency and associated greenhouse gas saving. The efficiency information comes from the final operator in the chain, so providing this information does not add complexity to the supply chain. It is important that the greenhouse gas values are reported on a consistent basis and the units are clearly stated.

NOTE 6

The input (injection) and output (withdrawal) of gas must be documented by economic operators and subject to auditing.

NOTE 7

"installation" means a stationary technical facility or an assembly of such facilities in which one or more operational activities are carried out, and any other activity having a direct technical connection with the operational activities carried out on that site, which causes or affects emissions. An installation shall be considered to be in operation once the physical production of biofuels, biogas consumed in the transport sector and bioliquids, and the physical production of heating and cooling and electricity from biomass fuels has started.

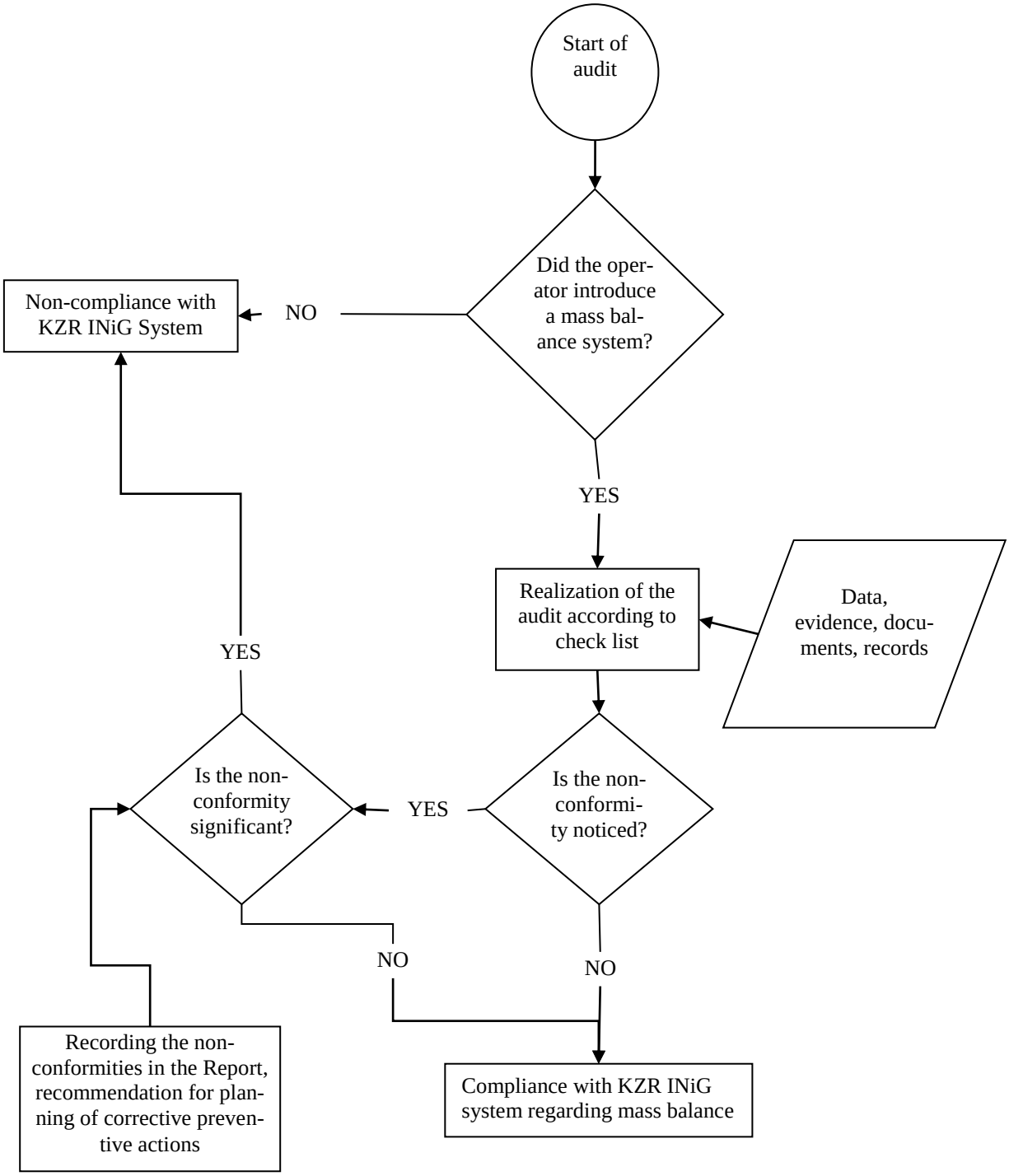
NOTE 8

If a company is a place of origin and performs other activity which is certified, the certificate shall also include “place of origin” certification scope. In this context it is not allowed to sign self-declaration for streams originating from “place of origin” certification scope. POS shall be issued for each sustainable streams outgoing from the company.

6. Decision tree

The diagram below shows a decision tree of the procedure for verifying the correctness of a mass balance system.

Figure 3. Procedure for verifying a mass balance system introduced into a processing unit



7. Checklist

The verification list with guidelines for auditors is given in the document *KZR INiG System/10*

8. Changes compared to the previous edition

Date	Section	Previous requirement	Current requirement
31/08/2022	1	Economic operators participating in the KZR INiG System shall demonstrate compliance with the sustainability criteria through assurances of traceability of a given quantity of biomass (with the requisite certificate of compliance with the sustainability criteria) through the whole supply chain. A mass balance system is a set of statements and data ensuring supervision over quantities of biomass flowing through the chain of supply and production, from a point of origin to the final biofuels, bioliquids or biomass fuels producer. The sustainability characteristics need to be passed down the supply chain as well as other information necessary to trace the consignment. The mass balance must always start from the origin of the feedstock and must end at stage of use of biofuel, bioliquid or biomass fuel	Economic operators participating in the KZR INiG System shall demonstrate compliance with the sustainability criteria through assurances of traceability of a given quantity of biomass (with the requisite certificate of compliance with the sustainability criteria) through the whole supply chain. Provisions of this document ensure that economic operators participating in the KZR INiG System use a mass balance system in accordance with Article 30(1) of Directive (EU) 2018/2001. A mass balance system is a set of statements and data ensuring supervision over quantities of biomass flowing through the chain of supply and production, from a point of origin to the final biofuels, bioliquids or biomass fuels producer. The mass balance system allows the mixing of raw material or fuels that differ in their sustainability and GHG emissions saving characteristics. The sustainability characteristics need to be passed down the supply chain as well as other information necessary to trace the consignment. The mass balance must always start from the origin of the feedstock and must end at stage of use of biofuel, bioliquid or biomass fuel
31/08/2022	4.1.	Economic operators must enforce a mass balance system, in accordance with the regulations of the KZR INiG System. Each system participant is obliged to introduce a mass balance system, which is assessed during audits.	Economic operators must enforce a mass balance system, in accordance with the regulations of the KZR INiG System. Each system participant is obliged to introduce a mass balance system, which is assessed during audits. It ensures that the mass balance is respected.
31/08/2022	4.1.	-	The mass balance system aims to reduce the administrative burden for demonstrating compliance with the sustainability and GHG saving criteria by allowing mixing of raw material and

			fuel with differing sustainability characteristics and by allowing reassignment of the sustainability characteristics in a flexible manner to consignments withdrawn from such a mixture. In order to ensure transparency, mixing under the mass balance system is only possible if raw material and fuels belong to the same product group. […] At the end of the mass balance period, the sustainability data carried forward should be equivalent to the physical stock in the container, processing or logistical facility, transmission and distribution infrastructure or site. In case if the mass balance period does not match calendar year, the economic operator is obliged to report annual quantities of biomass/fuels no later than 30 of March of the following year.
31/08/2022	4.3.	Co-processing of biomass/biogas with fossil raw material Some processes of biomass conversion may be carried out simultaneously with the processing of fossil raw material.	Co-processing of biomass/biogas with fossil raw material Some processes of biomass conversion may be carried out simultaneously with the processing of fossil raw material. Co-processing refers to an oil refinery unit processing biomass feedstock together with fossil feedstock and transforming them into final fuels. […] In this context biogas refers to the gas originating from the biomass feedstock, and which is produced from co-processing of that biomass feedstock together with fossil feedstock to convert them into final liquid and gaseous fuels in the oil refinery.
31/08/2022	4.3.	In such cases, it is necessary to define the share of the product of biological origin in the total amount of co-product at a given stage of processing.	In such cases, it is necessary to define the share of the product of biological origin in the total amount of co-product at a given stage of processing. Economic operators are obliged to apply the methodology set out in delegated acts adopted pursuant to Article 28(5) of Directive (EU) 2018/2001. After issuance by the European Commission of any further guidance/rules regarding co-processing (e.g. on determining the biogenic content of a fuel, or on GHG emissions calculation), these will be incorporated into the KZR INiG System

			with immediate effect. As long as the acts are not binding following rules apply. […] Economic operators co-processing biomass may develop and use a company-specific or process-specific testing method to determine the share of biocontent that is adapted to their particular factory design and feedstock mix. That main testing method shall be based on either mass or energy balance, yield methods, or radiocarbon (14C) testing (i.e. radiocarbon detecting through Accelerator Mass Spectrometry (AMS) or Liquid Scintillation Counting (LSC) method) of the outputs. Economic operators shall be obliged to define the whole refinery as system boundaries independently from the testing method used.
31/08/2022	4.3.	In order to determine the share of the fraction of biological origin (β) in the product obtained in co-processing, the following equation shall be used […]:	-
31/08/2022	4.3.7.	-	Mass balance method If a mass balance method is used, the economic operator shall perform the full mass balance analysis of the total mass of inputs and outputs. [...]
31/08/2022	4.3.7	-	Energy balance method If an energy balance method is used, the energy share of biogenic content in all outputs from a co-processing step in an oil refinery shall be determined as being equal to the energy share of the biogenic content at the refinery input. [...]
31/08/2022	4.3.7	-	Yield methods Where a yield method is used, economic operators may use one of the two methods described below in order to obtain a yield factor to be applied to the common process of the fuel production: [...]
31/08/2022	4.3.7	-	Radiocarbon (14C) testing When carrying out radiocarbon (14C) testing, economic operators shall apply the Accelerator Mass Spectrometry (AMS) method. However, they may apply alternatively, Liquid Scintillation

			Counting (LSC) methods if the bio-share is expected to be at least 1 volume % and if the sample is a clear liquid. [...]
31/08/2022	4.3.7	-	The share of hydrogen of biological origin If the production system co-processes renewable hydrogen of biological origin, economic operators shall document and provide evidence about the origin of the hydrogen as well as a proof that the hydrogen entering the hydrotreater: [...]
31/08/2022	4.3.7	-	Record keeping, process control, auditing and reporting of abnormal deviations When economic operators claim there is a specific share of biofuels or biogas in the fuel they put on the market, they shall keep samples for at least two years as well as records of measurement data and calculations. [...]
31/08/2022	5.	Required minimum input/output data: •System KZR INiG; [...] •Place of (physical) delivery or biogas/biomethane exit point;	Required minimum input/output data: •System KZR INiG; [...] •Volume: For fuels, the energy quantity of the fuel must also be included. For the calculation of the energy quantity, conversion factors in Annex III to Directive (EU) 2018/2001 must be used.
31/08/2022	5.	NOTE 1 GHG emission data characterizing the batch are expressed according to the documents KZR INiG System/8. If default value (DV) or disaggregated default values (DDV) are used only DV/DDV information is entered. If actual values or combination of actual and disaggregated default values are used each relevant component of formula No. 5 and formula No 11 (System KZR INiG/8) shall be reported separately. Final link in the supply chain enters GHG only saving values (expressed in percentage and rounded to the nearest integer).	NOTE 1 GHG emission data characterizing the batch are expressed according to the documents KZR INiG System/8. If default value (DV) or disaggregated default values (DDV) are used only DV/DDV information is entered. If actual values or combination of actual and disaggregated default values are used each relevant component of formula No. 5 and formula No 11 (System KZR INiG/8) shall be reported separately. Information on GHG emissions must include accurate data on all relevant elements of the emissions calculation formula. [...] [...] In the case of using a default value of GHG emissions, the biofuel production path shall be consistent with that given

			in the RED II Directive. Final link in the supply chain enters GHG only saving values (expressed in percentage and rounded to the nearest integer).
31/08/2022	5.	NOTE 2 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 States, no further sustainable claims shall be issued for the consignment (no sustainability characteristic can be assigned to the consignment). Information on GHG emissions must include accurate data on all relevant elements of the emissions calculation formula. [...] [...] In the case of using a default value of GHG emissions, the biofuel production path shall be consistent with that given in the RED II Directive	NOTE 2 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 States, no further sustainable claims shall be issued for the consignment (no sustainability characteristic can be assigned to the consignment).
31/08/2022	5.	NOTE 5 The final biomass fuel should be reported as a greenhouse gas intensity along with the heat/power plant efficiency and associated greenhouse gas saving. The efficiency information comes from the final operator in the chain, so providing this information does not add complexity to the supply chain. It is important that the greenhouse gas values are reported on a consistent basis and the units are clearly stated. The flexible reassignment of feedstock information cannot be permitted 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)	NOTE 5 The final biomass fuel should be reported as a greenhouse gas intensity along with the heat/power plant efficiency and associated greenhouse gas saving. The efficiency information comes from the final operator in the chain, so providing this information does not add complexity to the supply chain. It is important that the greenhouse gas values are reported on a consistent basis and the units are clearly stated.
19/12/23	4.1.	Different raw materials shall only be considered to be part of a mixture if they belong to the same product group, except where the	Different raw materials shall only be considered to be part of a mixture if they belong to the same product group, except where the raw material is mixed

		raw material is mixed for the pur-pose of further pro-cessing.	for the purpose of further pro-cessing. Further processing means further pro-cessing at the fuel production plant for the pur-pose of producing biofuels, bioliquids or biomass fuels.
19/12/23	4.2.	The sustainability characteristics of given batch are described by input/output data (see point 5). Sustainability characteristics can be allocated in a flexible manner to material taken out of the mixture. The mass balance approach is designed to facilitate flows in sustainability information in the parts of the supply chain where material is physically mixed (or can be physically mixed). For the parts of the supply chain where materials are not usually mixed for instance due to differences in their physical properties, typical uses or price (even if the materials are located at the same site), then material should be sold with the sustainability characteristics that relate to the specific material.	The sustainability characteristics of given batch are described by in-put/output data (see point 5). Sustaina-bility characteristics can be allocated in a flexible manner to material taken out of the mixture. The mass balance ap-proach is designed to facilitate flows in sustainability information in the parts of the supply chain where material is physically mixed (or can be physically mixed). For the parts of the supply chain where materials are not usually mixed for instance due to differences in their physical properties, typical uses or price (even if the materials are located at the same site), then material should be sold with the sustainability charac-teristics that relate to the specific mate-rial. If raw materials in different prod-uct groups (e.g., rapeseed oil and UCO) are kept on the same site, the sustaina-bility characteristics for outgoing con-signments need to correspond to the raw material actually delivered. It means that it is not allowed to assign sustainability characteristic delivered with the product from one product group to the product form another product group (e.g., it is not allowed to assign UCO sustainability characteristic to rapeseed oil even if both are stored at the same site).
19/12/23	4.2.	-	Added: Example 1. Raw materials in different product groups on a site Rapeseed oil and used cooling oil (UCO) are stored on the same site. They are in different product groups, so it is not possible to deliver rapeseed oil with sustainability characteristics of UCO or vice versa, even if the mass balance is accounted positively in a given period of time. Example 2. Raw materials in the same product group on a site Rapeseed oil and sunflower oil are mixed on a site. As they are the same

			product group it is possible to sell outgoing consignments with sustainability characteristics related to either rapeseed oil or sunflower oil, or a combination, as long as the net mass balance is respected. Example 3. Raw materials in different product groups mixed for further processing into biofuel It is allowed to flexibly allocate sustainability characteristics to outgoing consignments of biofuel. E.g. When rapeseed oil and UCO are processed into FAME on the same site, it is possible to flexibly sell outgoing consignments with sustainability characteristics related to ei-ther rapeseed or UCO, or a combination, as long as the net mass balance is respected. Please note that conversion factor(s) shall be applied in order to account amounts of UCOME and RME within a mass balance period.
19/12/23	4.3.5.	Renewable gases can be mixed in the transmission and distribution infrastructure (gas grid), provided the infrastructure is interconnected.	Renewable gases can be mixed in the transmission and distribution infrastructure (gas grid), provided the infrastructure is interconnected. If biomethane is injected into natural gas grid, the grid level mass balance is managed with the support of the Union Database (once up and running for biomethane). It means that input and data originate from the UDB, taking into account gas losses.
19/12/23	4.3.5.	-	Added: In case an economic operator processes different sources of (bio)methane into another fuel (e.g. biomethanol), evidence shall be checked to ensure an appropriate mass balance of bioenergy content claims that enter and leave the process. […] If biomethane is converted into biohydrogen via steam reforming process, sustainability characteristic is assigned to the total amount of biohydrogen according to the characteristic of biomethane, taking into account conversion factors and losses.
19/12/23	5.	In order to […] Input/output minimum data can be assigned to a given batch as form of traditional document or by using electronic database. After established Union	In order to […] Input/output minimum data can be assigned to a given batch as form of traditional document or by using electronic database. After established Union database based on Article

		database based on Article 28 of RED II Directive, The KZR INiG System will ensure that KZR INiG participants who intend on marketing their crops for biofuel production will enter all relevant information in Union Database. Using other databases requires acceptance of the KZR INiG A document containing sustainability characteristic is called “Proof of Sustainability (PoS)”. Sustainability characteristic shall be reported for each consignment of product. PoS is issued by certified companies	28 of RED II Directive, tThe KZR INiG System will ensurerequires that KZR INiG participants who intend on marketing their crops for biofuel production will enter all relevant information in Union Database. Using oth-er databases requires acceptance of the KZR INiG. A document containing sustainability characteristic is called “Proof of Sustainability (PoS)”. Sustainability characteristic shall be reported for each consignment of product. PoS is issued by certified companies. PoS docu-ments are issued via UDB.
19/12/23	5.	-	NOTE 7 "installation" means a stationary technical facility or an assembly of such facilities in which one or more operational activities are carried out, and any other activity having a direct technical connection with the operational activities carried out on that site, which causes or affects emissions. An installation shall be considered to be in operation once the physical production of biofuels, biogas consumed in the transport sector and bioliquids, and the physical production of heating and cooling and electricity from biomass fuels has started. NOTE 8 If a company is a place of origin and performs other activity which is certified, the certificate shall also include “place of origin” certification scope. In this context it is not allowed to sign self-declaration for streams originating from “place of origin” certification scope. POS shall be issued for each sustainable streams outgoing from the company.