ISCC EU Mass Balance Guidance Document

Version 1.0 - DRAFT

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1. Introduction

Under ISCC EU there are two distinct, allowable chain of custody options: physical segregation and mass balance. These chain of custody options differ in their connection between the physical material and the sustainability characteristics of the material. Under physical segregation different materials are kept physically separate from materials without the same specified characteristics. Under mass balance, certified and non-certified material may be physically mixed, but segregated on a bookkeeping basis. With the mass balance model, it can be ensured that no entity is able to claim more certified products than they sourced. Additionally, mass balance must follow the physical flow of the material throughout the supply chain.

The mass balance chain of custody option under the rules of the Renewable Energy Directive (RED) 2018/2001, and its Implementing Regulation 2022/996, in particular, raise a number of questions as to how the approach may be practically implemented by economic operators and verified by auditors. ISCC has received an increasing number of inquiries from system users regarding mass balance under the ISCC EU certification scheme. Such inquiries have often mainly highlighted ambiguities surrounding scenarios describing the practical implementation of mass balance rules (see ISCC System Document 203 “Traceability and Chain of Custody”, section 4.4 and Annex I).

To fully utilize the mass balance approach, it is important that stakeholders have an aligned understanding regarding the rules and limitations of mass balance structures. It is therefore necessary to provide expanded guidance to complement and reinforce the ISCC EU 203 “Traceability and Chain of Custody” system document. The results of this following guidance document have been developed by an ISCC multi-stakeholder expert group involving members of the ISCC Association and Certification Bodies. The aim is to clarify potential ambiguities in existing rules and to provide clarifications for alternate scenarios that may have not yet been considered.

Chapter 2 of this document provides visualization for mass balance guidelines to improve clarity surrounding the basic principles. This same chapter is divided into multiple sections, including section 2.1, which focuses on the procedures for the mass balancing of feedstocks and intermediates preceding the production of a final fuel (“upstream”). In the subsequent section, 2.2, mass balancing rules for final fuels between production and a final user are presented (“downstream”). Chapter 3 showcases a sample of application examples, so-called scenarios, which make the mass balance rules appear applicable based on concrete practical examples.

2. Mass Balance: The Basics

2.1 Mass Balance Rules from Feedstock to Final Fuel Production

The application of mass balance rules begins with determining whether the raw materials, intermediate products, and final fuels are physically identical or can be classified within the same product grouping. Physical identity may be assessed by referencing the most current version of the ISCC material list.

A product group comprises feedstocks and fuels which share similar physical and chemical properties and fall under the same category, as defined by the RED. Density and lower heating value (LHV) are similar if the values are within a tolerance zone of 2-5%, depending on the material. In the case of RED category, feedstocks and fuels must be subject to the same rules for sustainable fuels which contribute to the Member State targets for renewable energy. Thereby, this leads to five different RED categories: food and feed crop, high iLUC risk, Annex IX A, Annex IX B, and other. Figure 1, below, illustrates the outlined criteria on how to categorize whether material(s) may belong to the same product group.

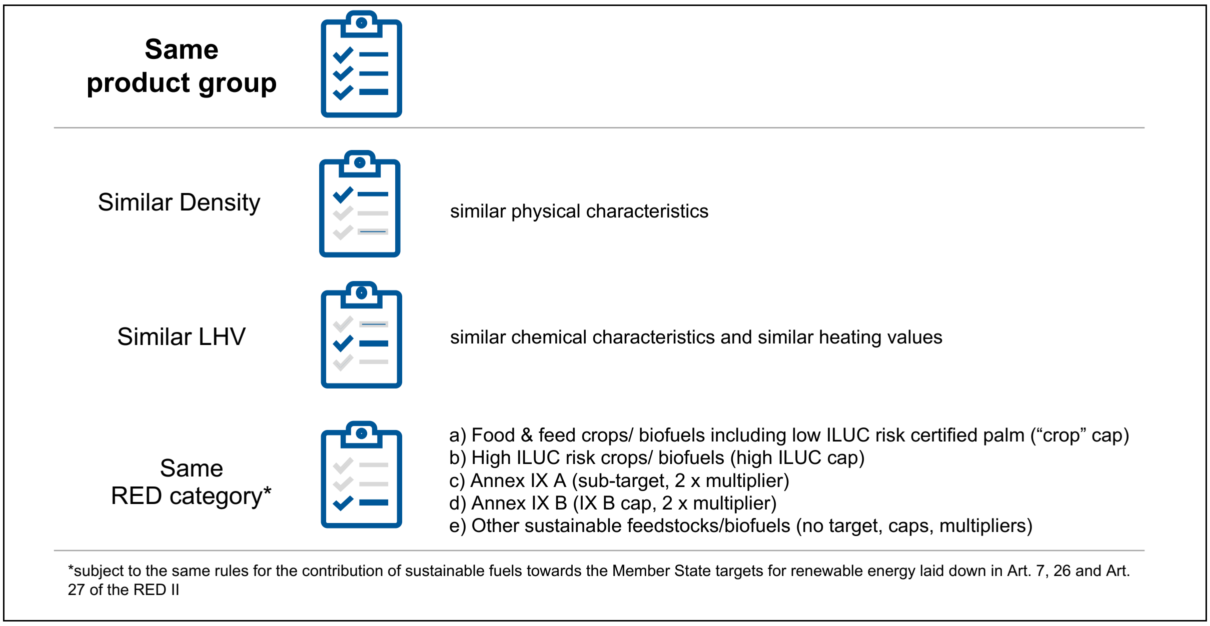

Figure 1: *Criteria for product groups*

Figure 2 showcases a decision tree to illustrate the assignment of sustainability characteristics for activities with raw materials and intermediates up to the processing to final fuels.

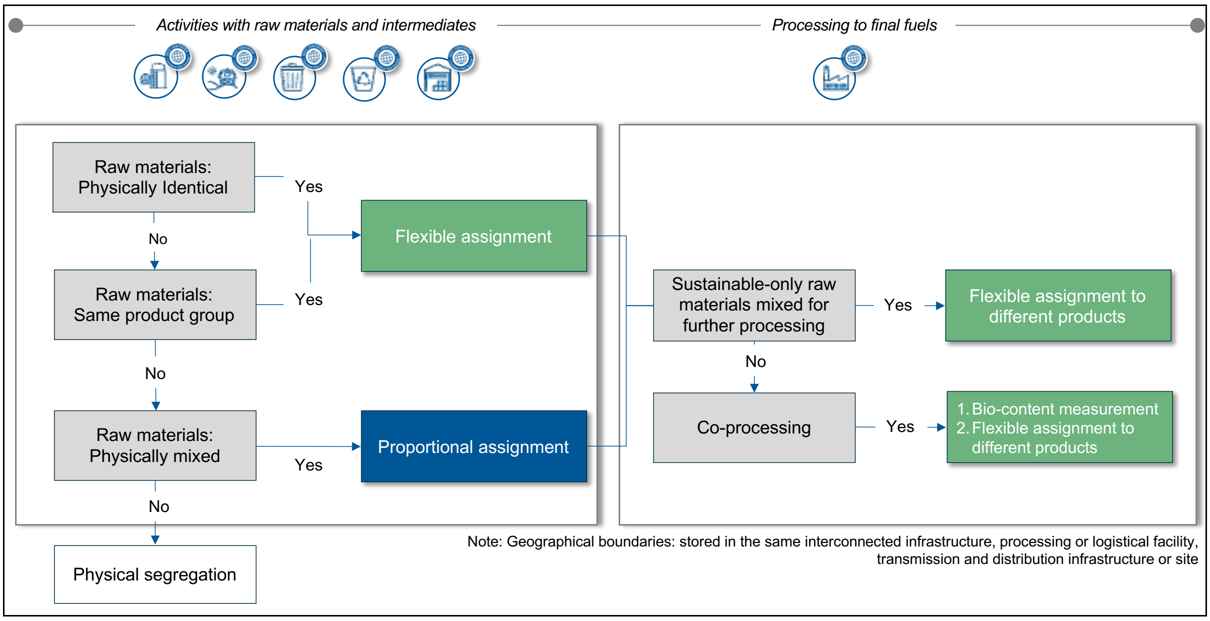

Figure 2: *Assignment of sustainability characteristics raw material to processing to final fuels*

Physically identical raw materials and intermediate products, or those belonging to the same product group, may be flexibly assigned (Implementing Regulation 2022/996 (IR), Art. 19, 2. (c)). However, physically non-identical raw materials and intermediates must be proportionally assigned.

Only one exception remains to this rule, which occurs when materials and intermediates are mixed for the purpose of further processing within the boundaries of the final fuel production plant (IR, Art. 19, 2. (b)). In this case, a flexible assignment of sustainability characteristics to different products becomes possible. Regarding co-processing, it is firstly required to determine the bio-content via an eligible measurement method (EU Delegated Act 2023/1640). After following such, a flexible assignment of sustainability characteristics to varying products is possible.

In proportional assignment, all outgoing batches must reflect an identical ratio as the mixture contained in the tank. In contrast, flexible assignment allows outgoing batches to be allocated freely, without maintaining this proportionality. Figure 3, below, illustrates the distinction between these two approaches to assigning sustainability characteristics.

- Proportional: Raw materials that are not identical and do not belong to the same product group *mixed for trading and storage*
- Flexible: Raw materials that are not identical and do not belong to the same product group *mixed for further processing*

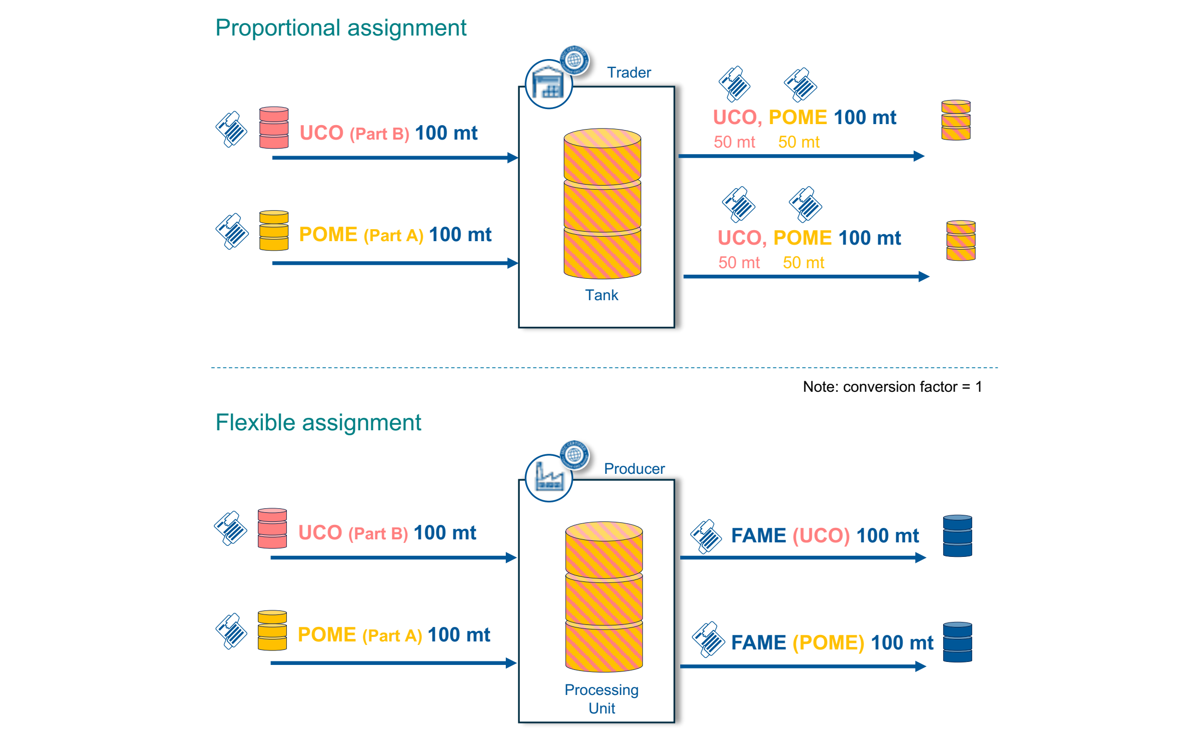

Figure 3: *Proportional vs. flexible assignment*

2.2 Mass Balance Rules after Final Fuel Production to Final User

RED mass balance methodology incorporates feedstock-specific differentiation, whereby sustainability characteristics and treatment of fuels are determined according to the production feedstock. However, the same framework acknowledges that sustainable fuels lose their molecular "feedstock identity" during the production stage, as a flexible assignment is allowed. Following production, consequently, feedstock information is kept administratively on "a bookkeeping basis" and passed down along the supply chain.

This leads to the following conclusions:

- Sustainable fuels **are** physically identical if: *Sustainable fuels produced under mass balance chain of custody model* can be considered as physically identical. Thus, a flexible assignment of sustainability characteristics in a mass balance approach can be applied.
- Sustainable fuels **are not** physically identical if: *Sustainable fuels produced under physical segregation chain of custody model* are not considered to be physically identical, and can only be flexibly assigned if their raw material can be assigned to the same product group or if the fuels are physically mixed.

The following Figure 4 illustrates in a decision tree the assignment of sustainability characteristics for activities with processed fuels up to final use.

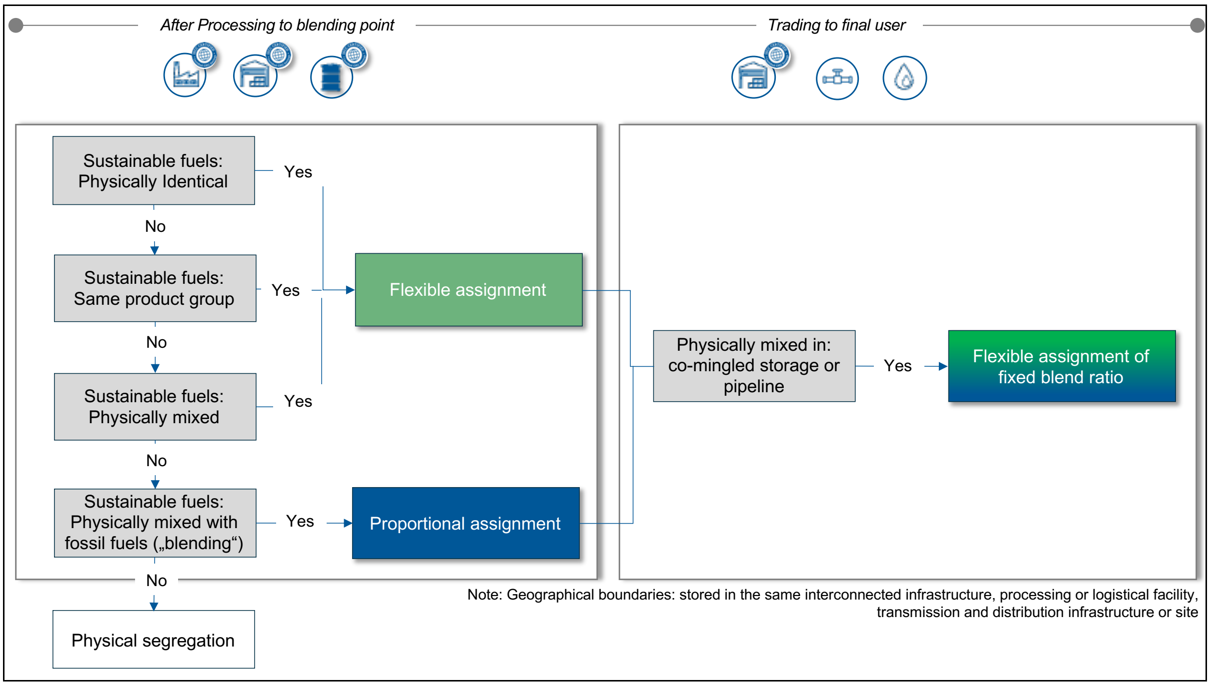

Figure 4: *Assignment of sustainability characteristics processed fuels to final use*

If the sustainable fuels are mixed with fossil fuels, then a proportional allocation must be made (IR, Art. 19, 2. (i)) which, in principle, is valid up to the final user. However, within certain sectors, e.g. aviation or the biogas market, there are more complex downstream supply chains with varying blending points, pipelines, and co-mingled storages (see figure 5).

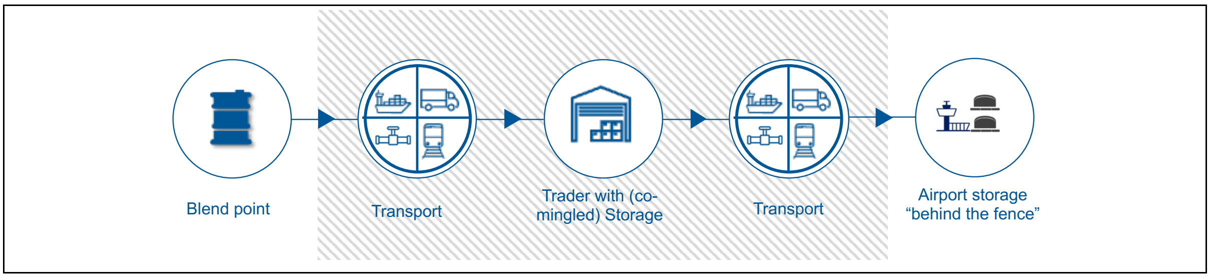

Figure 5: Complexity of downstream supply chains after the blend point

At such blending points, both sustainable and fossil fuels are intentionally physically mixed to achieve a certain ratio (blend ratio), e.g. to fulfil a technical specification requirement. In such cases, the term "blend" is used, and the sustainable fuel share is given as a percentage. For example, a "HEFA SAF (sustainable aviation fuel) blend (30%)" consists of 30% biofuel content (neat HEFA SAF) and 70% fossil fuel content. Therefore, a proportional allocation must be made up to and including the blend point. For pipelines and co-mingled storages in which fuels are often utilized and/or stored by numerous independent organizations, a proportional allocation is not possible. In such cases, a flexible allocation can be made based upon the "blend" that was input into the pipeline or co-mingled storage. A fixed blend ratio can be summed up in the simple formula "what goes in, goes out".

3. Implementation of Mass Balance Rules: Scenarios

3.1 Upstream Scenarios: Feedstock to Final Fuel Production

3.1.1 Multiple Final Products from Varying Sustainable-Only Raw Materials

Figure 6, below, illustrates the allocation of sustainability characteristics in scenarios involving the production of multiple final products derived (only) from varying sustainable raw materials. Considering the product yield and the conversion factor, the sustainability characteristics of the raw materials may be flexibly assigned to the final products.

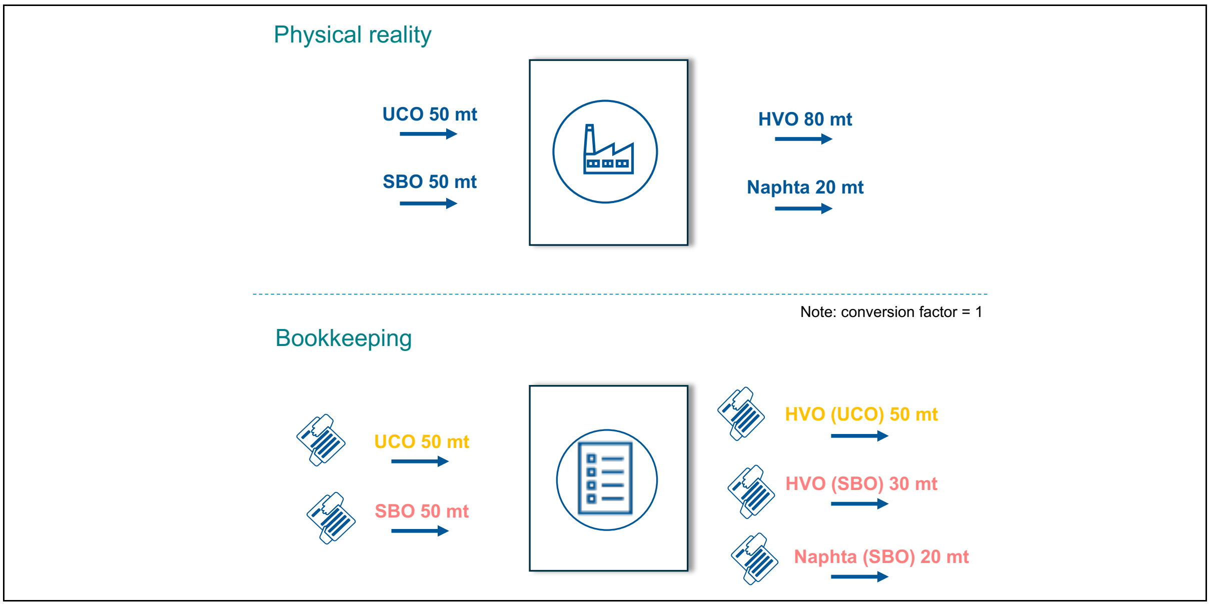

Figure 6: *Multiple sustainable-only final products: flexible assignment of sustainability characteristics to different products*

3.1.2 Multiple Final Products from Varying Sustainable and Fossil Raw Materials

Analogous to the scenario from 3.1.1, sustainability characteristics may also be freely assigned to different final products during the simultaneous processing of both sustainable and raw fossil materials (co-processing), as outlined within Figure 7. In addition to the product yield factor and the conversion factor, the bio-content measurement (EU Delegated Act 2023/1640) must be carried out before sustainable feedstocks can be assigned.

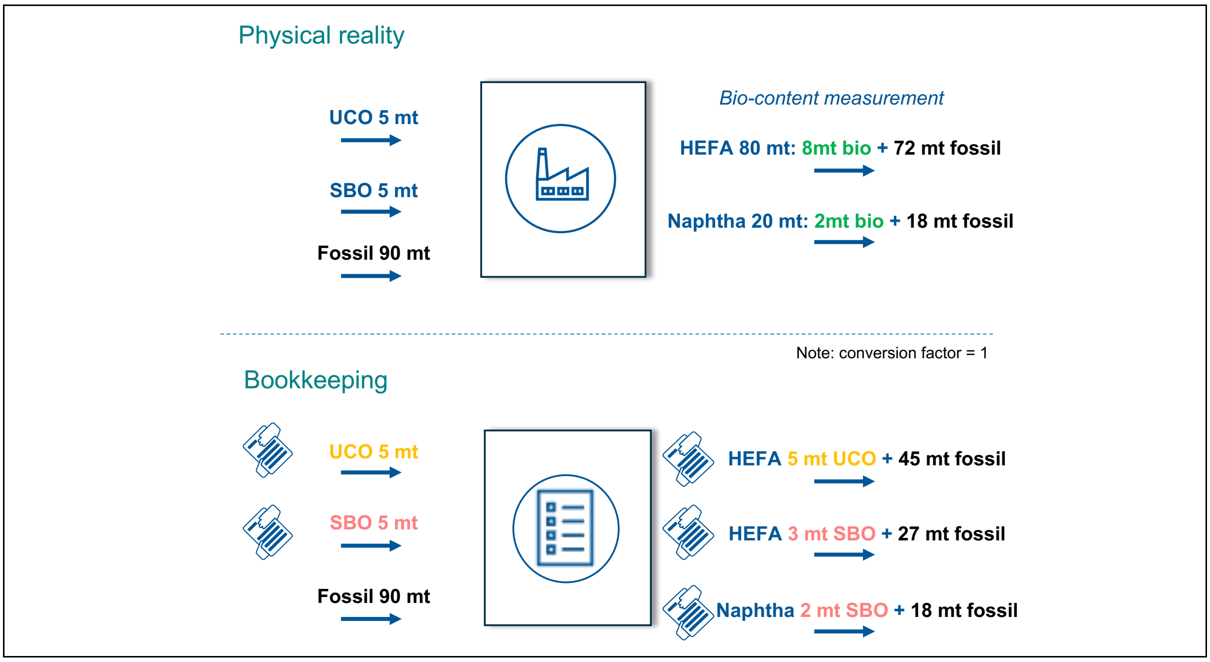

Figure 7: *Co-processing: flexible assignment of sustainable feedstocks to different products*

3.2 Downstream Scenarios: Final Fuel Production to Final User

3.2.1 Fuels Produced under Mass Balance vs. Physical Segregation

Another scenario requiring clarification involves cases where the same type of fuel (e.g. FAME), produced from feedstocks belonging to different product groups (e.g. UCO and rapeseed), is stored at a single site but kept physically separated in distinct tanks.

In such a case, the question of whether the fuels were produced *under mass balance* or *under physical segregation* must first be clarified:

- *Sustainable fuels produced under mass balance chain of custody model* can be considered as physically identical. Thus, a flexible assignment in a mass balance approach can be applied.
- *Sustainable fuels produced under physical segregation chain of custody model* are not considered to be physical identical and can only be flexibly assigned if their raw material can be assigned to the same product group or if the fuels are mixed.

Using the example of FAME, Figure 8 illustrates this differentiation. In the upper portion of Figure 8, FAME was produced under mass balance. The identity of the raw materials, in this case, UCO and RME, are only kept at the bookkeeping level. Therefore, a physical distinction of the two FAME batches is no longer possible and FAME can be considered physically identical. In the lower portion of Figure 8, FAME was produced under physical segregation. FAME (UCO) and FAME (RME) are not physically identical, and UCO and RME do not belong to the same product group. To enable flexible assignment, FAME (UCO) and FAME (RME) must be physically mixed in this case.

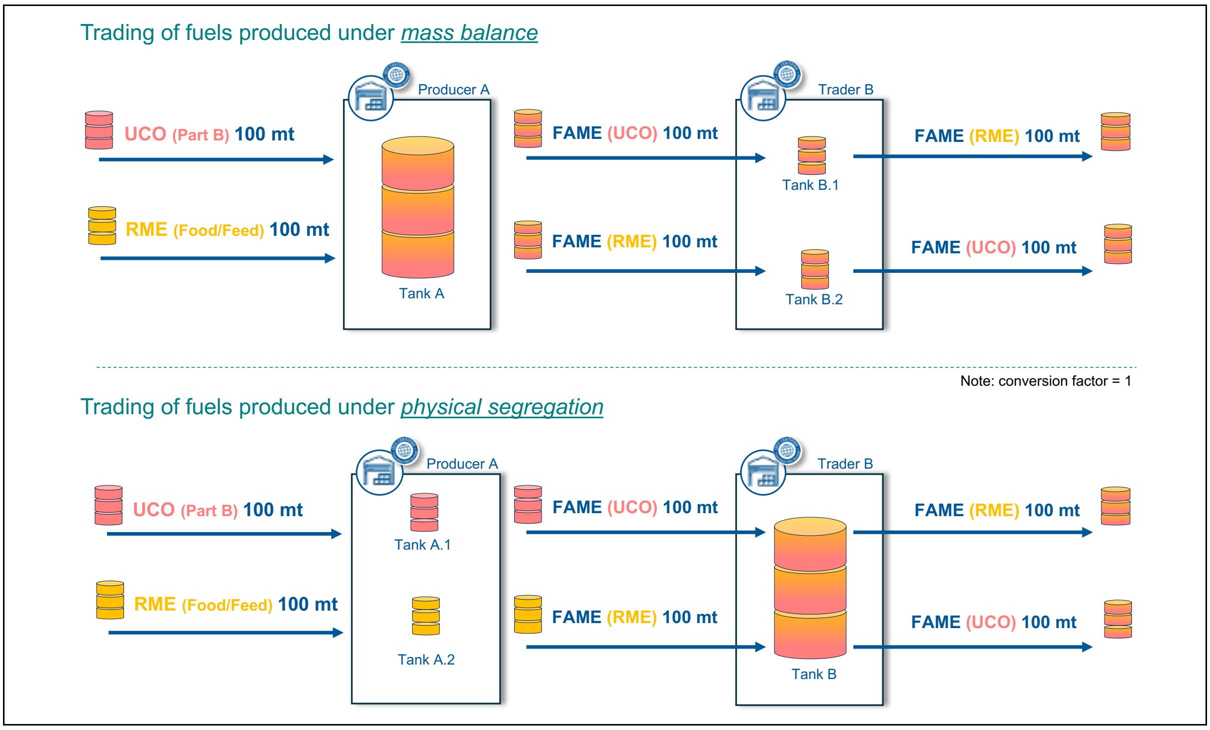

Figure 8: *Fuels produced under mass balance vs. physical segregation*

Consequently, this description clarifies scenario "5.1 Biofuels with raw materials from different product group are kept physically separated" within the ISCC 203 "Traceability and Chain of Custody. For such cases where sustainable fuels are produced under physical segregation scenario 5.1 remains applicable. According to the RED (Art. 30, 1.), the default chain of custody model is mass balance. However, this clarification presupposes that the chain of custody model ("mass balance" or "physical segregation") shall be indicated on the Proof of Sustainability (PoS).

3.2.2 Mixing of Fuels: Blend Point, Pipeline, and Co-Mingled Storage

Figure 9 provides a detailed numerical-based example for the "blend point/ trader with storage" scenario, which has been newly introduced in this document. Prior to the final blend point, traders have the option of adjusting the blend ratio via the addition of pure fossil fuel or fossil-blends with distinctive ratios of sustainable fuel. As outlined within chapter 2.2, in such cases a proportional assignment must always be applied.

This logic may be further applied to complex blending scenarios. Cases of complex blending must follow the incoming or initial blend level throughout the system, or keep a live blending level calculation – a combination of both is also accepted. ISCC cooperating certification bodies and their auditors verify compliance against mass balance rules for sustainable fuels as defined by the RED regulations. It remains important to highlight that said auditors do not verify fuel compliance against quality standards, as it is outside the bound of responsibility for Voluntary schemes.

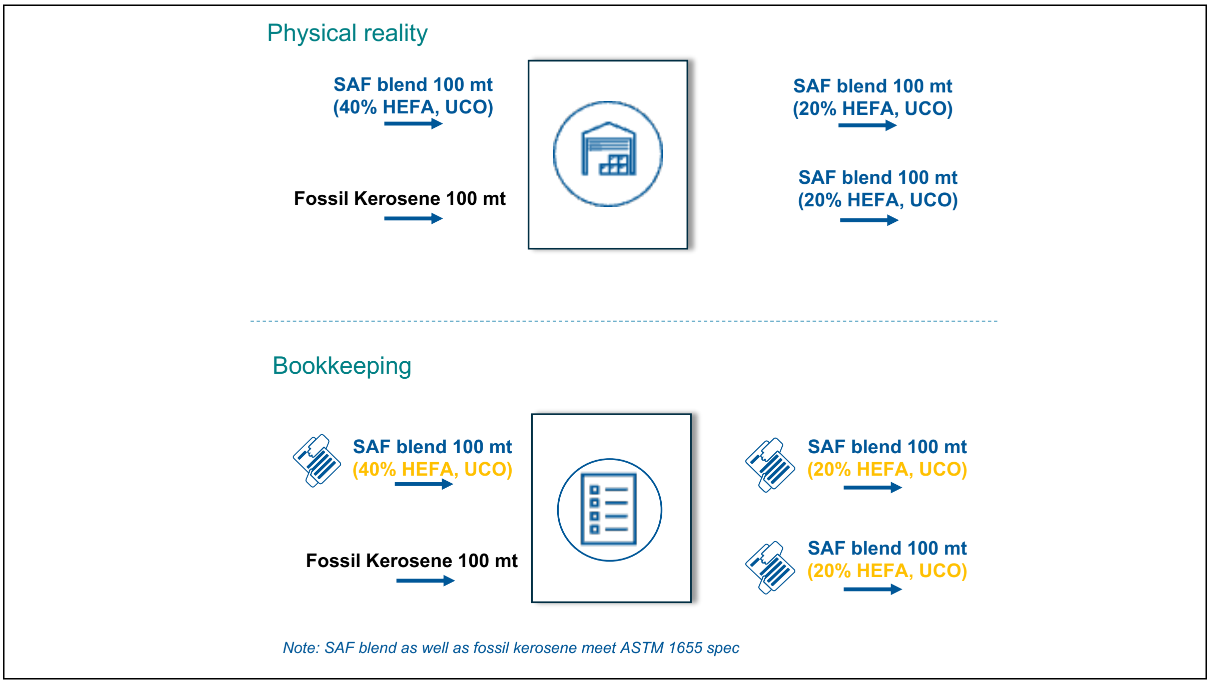

Figure 9: *Assignment of sustainability characteristics for blend point / trader with storage*

In addition, we introduce a further scenario for co-mingled storage and pipelines within Figure 10. In principle, the rule for pipelines and co-mingled storages is: “what goes in, goes out”. In the case of pipelines and co-mingled storages, each party retains its own records and bookkeeping. In Figure 10, Party A keeps a record of its own SAF blends (100 mt SAF blend with 40% HEFA, UCO) which are fed in.

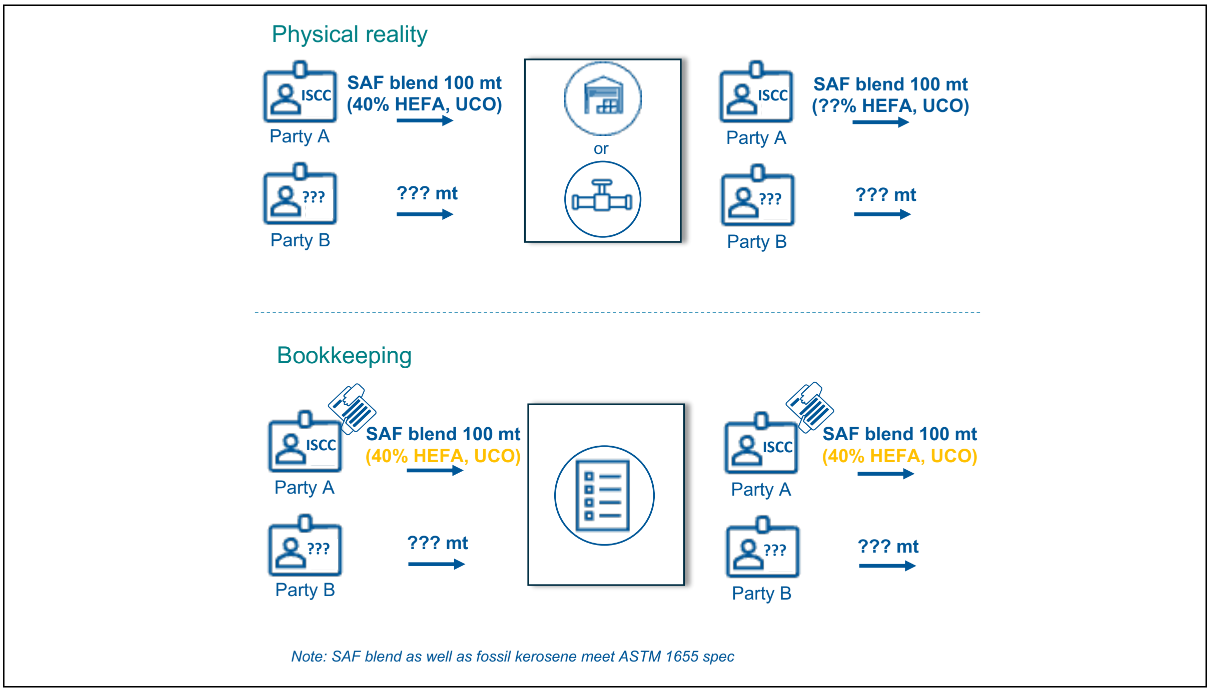

Figure 10: *Assignment of sustainability characteristics for co-mingled storage and pipelines*

Organizations retain the possibility of back-to-back trade of one (or several) original SAF blends or to keep an inventory. Keeping an in-stock inventory enables the possibility of splitting or combining SAF blends to further achieve new/additional blend ratios, as desired by customers. In this case, following/ calculating a live blend ratio within the commingled system also remains acceptable. This live blend would subsequently be adjusted based on every individual input and output. In the utilization of pipelines, it should be noted that SAF blends must be sold in order to pass on sustainability characteristics.

3.2.3 Biogas/Biomethane

Mass Balance System Boundaries

The European Union (EU) interconnected gas grid operates as a single mass balancing system, as defined within Implementing Regulation 2022/996 (IR, Art. 19, 2. (d)). It comprises low and high-pressure pipelines, LNG terminals, and storage facilities, all under regulatory oversight.

Mass balance boundaries of the EU interconnected gas grid contains both a physical and virtual transfer domain, as outlined in Figure 11. The physical transfer domain includes all metered injection and withdrawal points where biomethane, in either gas or liquid form, enters or exits the interconnected infrastructure. At these points, we may observe a physical flow of sustainable molecules.

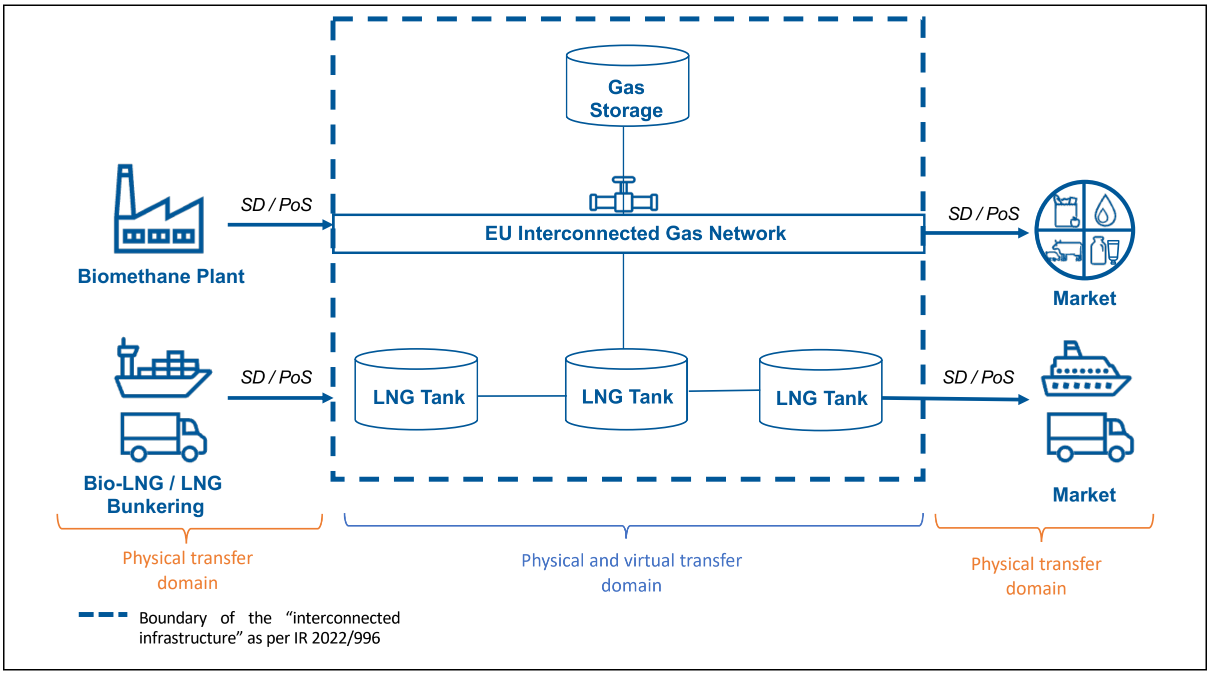

Figure 11: *Simplified Mass balance System Boundaries Interconnected EU gas grid*

The physical transfer domain includes biomethane plants and LNG terminals as injection points, as well as all withdrawal points, such as industrial sites and residential areas. LNG terminals are part of the interconnected infrastructure if they are physically connected to the gas grid, allowing regasified LNG to be injected into the network. Infrastructure without a physical connection to the gas grid is excluded from the EU's interconnected gas grid framework.

The EU's interconnected gas grid can be considered as one single storage facility, or a "big tank", where biomethane and natural gas are collectively stored and transported. Once biomethane physically enters the grid (in either gaseous or liquid form), it is considered a part of this shared storage, and may be virtually traded within the transfer domain. Ownership of biomethane is transferred on a virtual basis, and must always be accompanied by the corresponding PoS to maintain traceability.
Additionally, credits may be carried over from one mass-balance period to the next, provided the economic operator is able to demonstrate that an equivalent amount of gas remains in stock at the end of the three-months mass-balance period.

Within the system boundaries and as illustrated in Figure 12, the following roles and flows are defined:

Physical Transfer (1):

- Biomethane producers inject biomethane into the grid at metered points and sell the physical molecule in combination with the accompanying PoS to the immediately following economic operator.
- Transmission System Operators (TSOs)/ Distribution System Operators (DSOs) manage the pipeline network, oversee physical gas flows, and verify mass balance through metering at injection and withdrawal points. *Note: not illustrated for simplification reasons*.

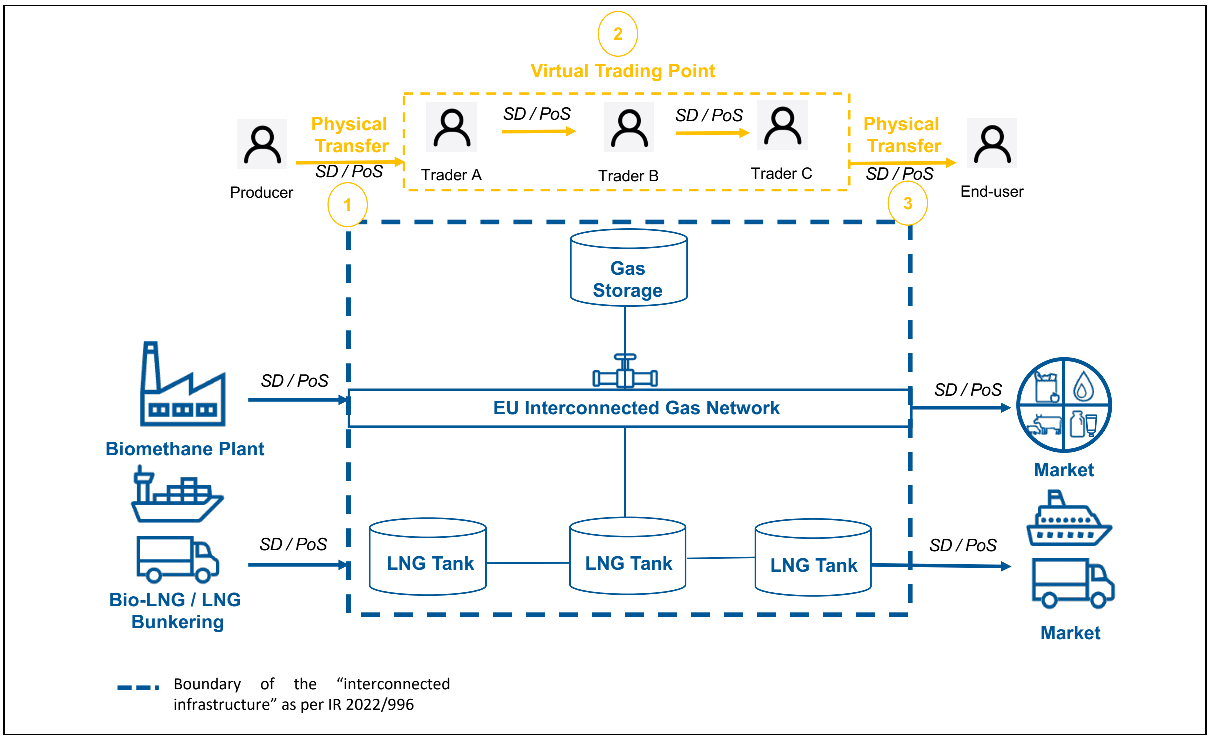

Figure 12: *Roles and flows within the mas -balance system boundaries*

Virtual Trading Point (VTP) (2):

- The VTP (often referred to as the gas hub) serves as a marketplace where gas is traded contractually, rather than physically transferred. Trades must align with mass balance principles, ensuring that every unit of biomethane bought and sold correspond to a physical volume injected into the grid.
- Traders must hold the necessary license to transport gas from the physical injection point to other parts of the grid, including the VTP. They take legal ownership of the biomethane at injection and facilitate its movement within the network, while maintaining mass balance. For example, as outlined in Figure 12, Trader A must be in possession of a valid licence to receive biomethane from the biomethane injection point, retain a contract with the corresponding infrastructure operation (TSO/DSO), and hold a contract with the biomethane producer. Trader C has similar requirements, but instead of operating at the point of injection, it operates at the point of withdrawal.

Physical Transfer (3):

- Off-taker or downstream gas suppliers (Trader C within Figure 12) withdraw gas at exit points in the system, and transfer it to the market end-users or for further processing (e.g., liquefaction). They must hold the appropriate license to operate in the VTP and to withdraw biomethane from the interconnected infrastructure and further ensure PoS documentation accompanies biomethane transfers.
- End-users are the entities that ultimately consumes the final fuels, such as biomethane or bioLNG, and subsequently receive the associated PoS.

Note on contractual coherence: Any “inverse” transaction, i.e., where biomethane is notionally swapped for fossil gas, may only occur at the VTP. This form of transaction may not occur at the point of physical injection or withdrawal. This ensures that each transaction aligns with actual grid flows and license requirements.

Biomethane Liquefaction

In Scenario 1 (Figure 13), Bio-LNG production occurs at a physical liquefaction facility, where biomethane is converted into liquefied biomethane (Bio-LNG). This applies to liquefaction units located either at a biomethane plant site or at an LNG terminal, for example. In this case, claims of Bio-LNG production must be directly linked to an actual, verifiable liquefaction process. The certified Processing Unit (Liquefaction Plant or LNG Terminal) receives biomethane as an intermediate product and processes it into Bio-LNG, issuing a new PoS. The new PoS must account for conversion factors, process losses, and GHG emissions from liquefaction and downstream transport. Actual values or available default values may be utilized for calculation of GHG emissions.

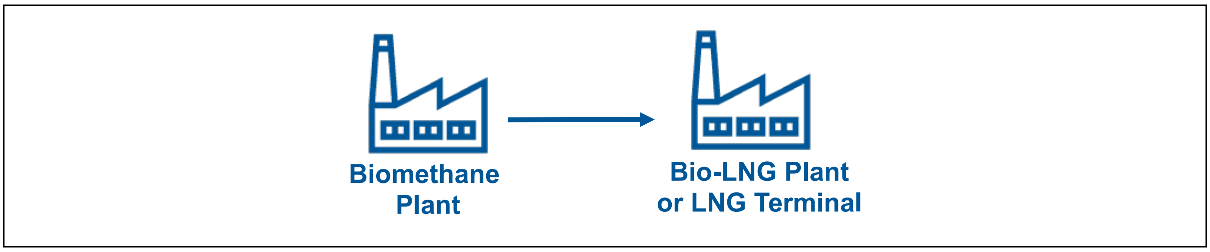

Figure 13: *Scenario 1: Physical biomethane liquefaction*

In Scenario 2 (Figure 14), Bio-LNG is produced on a mass balance basis, rather than via a direct physical conversion. As referenced within the ISCC EU 203 – Traceability and Chain of Custody "*sustainability characteristics can be transferred from biomethane to Bio-LNG under mass balance principles, provided that plausible conversion factors and GHG emissions equivalent to an actual liquefaction process are applied*". This approach, known as "Mass-Balanced Liquefaction" or "Virtual Liquefaction", allows for the recognition of Bio-LNG production without physically liquifying biomethane. Instead, it operates within the single mass-balance system concept, ensuring that the total certified volume of Bio-LNG corresponds to an equivalent amount of certified biomethane injected into the grid and accounted for in the system. The quantity of Bio-LNG or biomethane that can be claimed from a plant is limited to the amount that can physically be processed by the plant or the maximum daily onloading capacity of the corresponding certified LNG Terminal.

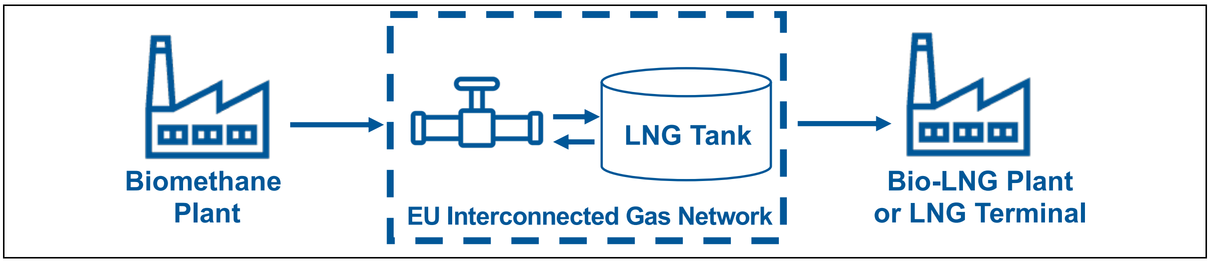

Figure 14: *Scenario 2: Mass-balanced biomethane liquefaction*

Annex I: Terms and Definitions

Term	Definition
Mass balance	Chain of Custody model in which materials with a set of specified characteristics are mixed according to defined criteria with materials without that set of characteristics, and where the transfer of characteristics may be free / non-proportional (ISEAL adapted from ISO 22095)
Physical segregation	A chain of custody model in which materials with specified characteristics are kept physically separate from materials without the same specified characteristics from initial input to the final output (ISEAL adapted from ISO 22095)
Final Fuel	A fuel is a final fuel when no further processing is needed to use the fuel
"Further processing"	Physical mixing of raw materials at the fuel production plant for the sole purpose of producing biofuels, bioliquids or biomass fuels.
Blending	Biofuels and fossil fuels are physically mixed to intentionally achieve a certain ratio (= blend ratio), e.g. to fulfil a technical specification requirement.
Co-mingled storage	Storages in which fuels are stored by several independent companies.
Interconnected infrastructure	Means a system of infrastructures (IR Art. 2, 18), e.g. pipelines, LNG terminals and storage facilities, distribution infrastructure for liquid fuels.
Site	Means a geographical location (IR Art. 2, 22)
Conventional jet fuel	Fuel used in aircraft produced from fossil non-renewable sources, ASTM 1655 certified.
Neat SAF	Synthetic blending component that fulfils sustainability characteristics of a certain regulatory scheme (e.g. EU RED), ASTM 7566 certified.
SAF blend (30%, HEFA, UCO)	Neat SAF + conventional jet, ASTM 1655 certified. In parenthesis: the blend ratio in %, the ASTM 7566 process and the feedstock may be added.

Annex II: List of Final Products

List of final products that can be considered as physically identical if produced under mass balance.

Based on list of material eligible for ISCC EU certification, as of 11 March 2025.

Declaration of material on ISCC EU certificate	
Bagasse briquettes	HVO
Biobutane	Hydrogen
Biobutanol	Bio-MTBE (the part from renewable sources)
Biobutene	Pellets
Biodiesel	RCF Diesel
Bioethanol	RCF Methane
Biogas	RCF LNG
Biogasoline	RCF Methanol
Bio-LNG	RCF SAF
Bio-LPG	Renewable diesel
Biomass briquettes	Renewable di-methyl ether (rDME)
Biomass fuel (solid)	RFNBO Ammonia
Biomethane	RFNBO FT Diesel
Biomethanol	RFNBO FT SAF
Bionaphtha	RFNBO Hydrogen
Biopropane	RFNBO Methane
Biopropanol	RFNBO Methanol
Bio heating oil	RFNBO LNG
Bio-DME (Biodimethylether)	TAEE (the part from renewable sources)
Bio-ETBE (the part from renewable sources)	TAME (the part from renewable sources)
HEFA	