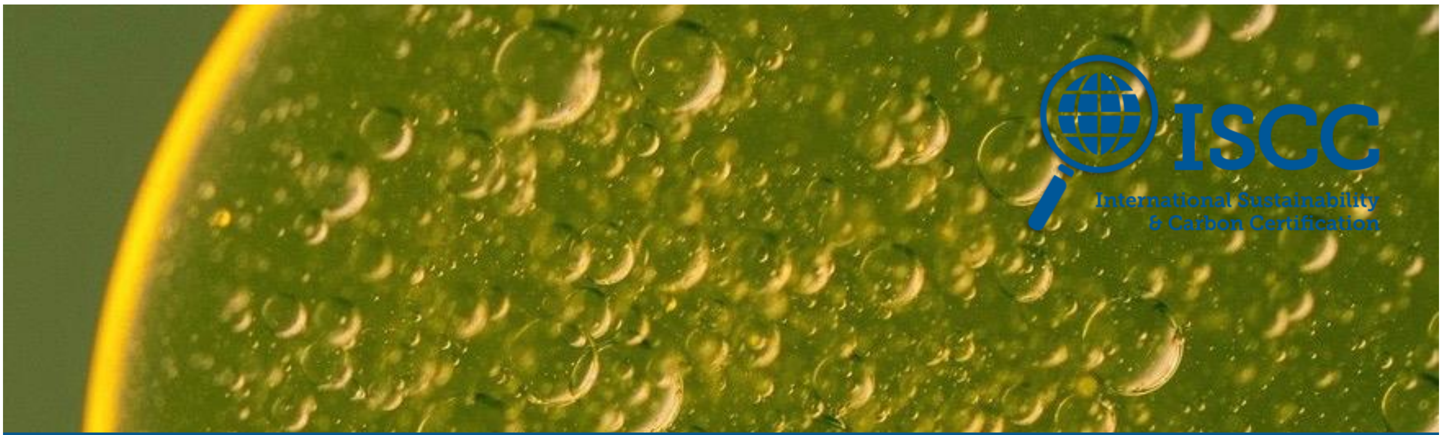
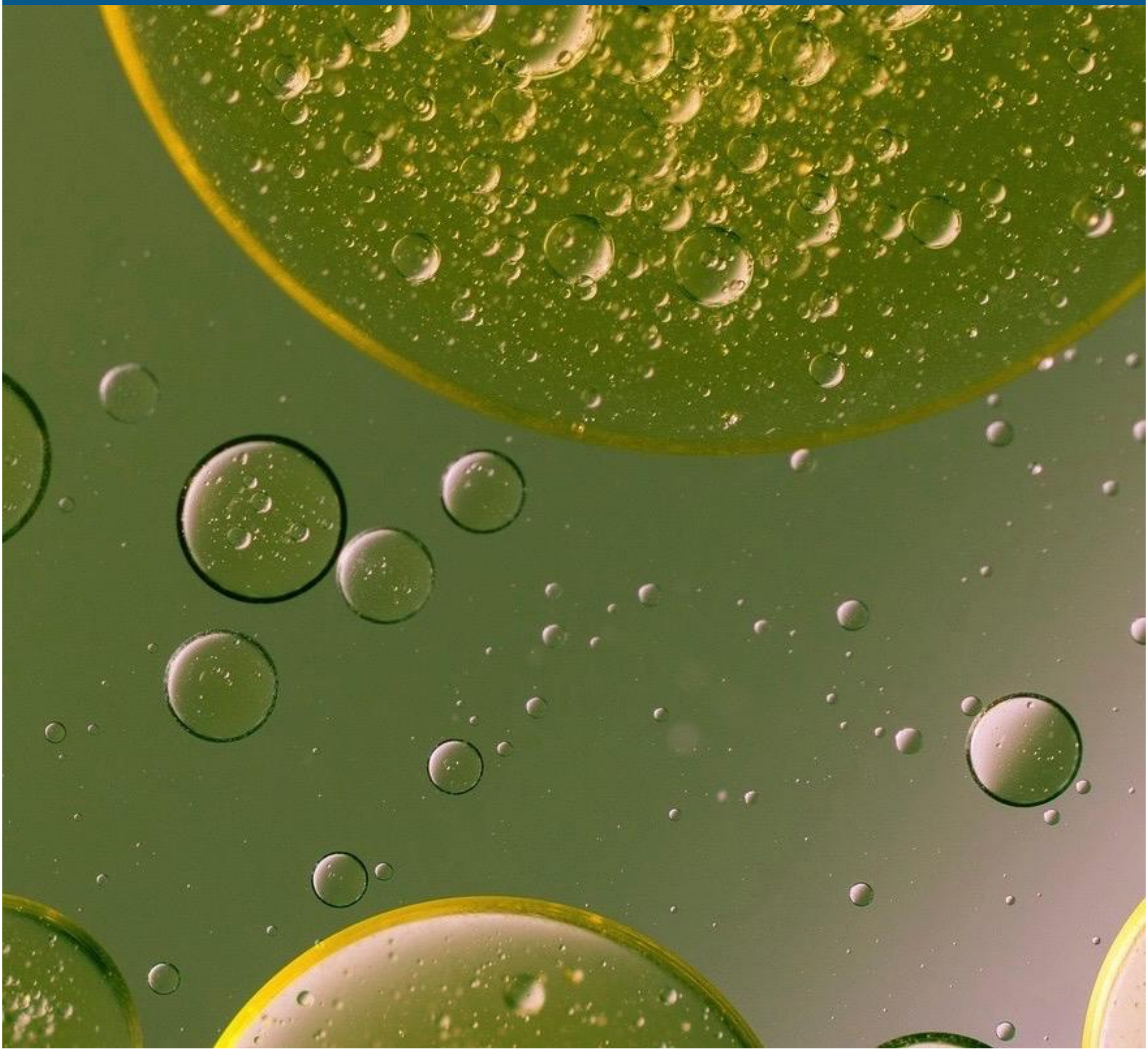


Questions and Answers on the Certification of Co-Processing

Version 1.0



Document Title: Questions and Answers on the Certification of Co-Processing

Version 1.0

Valid from: 22 September 2025

Content

Context

This document is a compilation of clarification on queries regarding the certification of co-processed fuels per the COMMISSION DELEGATED REGULATION (EU) 2023/1640 on the methodology to determine the share of biofuel and biogas for transport, produced from biomass being processed with fossil fuels in a common process. The questions are derived either through communication between ISCC and the Commission or feedback received from ISCC system users. Thorough consideration with regards to regulatory provisions, industrial processes and ISCC certification was put in deriving answers to the following questions. ISCC is open to receive data-driven insights on questions that might need further clarification.

1 General queries

Does the Delegated Regulation (EU) 2023/1640 (DR) apply to all biofuel co-processing production systems?

The methods described apply to all co-processing production systems and can be applied also to cases outside of the transport sector if relevant.

Does the extended requirements mentioned in the ISCC guidance document 203-1 also apply to SAF certified under ISCC CORSIA?

The ISCC 203-01: Guidance for the certification of co-processing is only applicable for the ISCC EU scheme. Requirements for co-processing certification under ISCC PLUS and ISCC CORSIA remain unchanged as of now.

Are all ISCC system users handling co-processed fuels expected to follow the improved co-processing requirements?

System users with a valid certificate for co-processed fuels obtained under the old requirements are still allowed to co-process, sell, and issue a PoS. This is relevant for all certificates that are valid even after April 3rd, 2025.

However, for any recertification of co-processed fuels after April 3rd, 2025, compliance with the new requirements needs to be reached. Due to the introduction of the new co-processing requirements, we allow recertification even if (complete) compliance is pending. This shall be stated explicitly in the certificate (as mentioned in the ISCC System Update from 17th July 2025). System users are not allowed to sell any volumes of co-processed fuel or their associated PoS until proven complete compliance. Once complete compliance is reached, the material annex can be amended and issuing a PoS is possible. The new requirements refer to the determination of bio-content, GHG calculation per visual split method and other mentioned in the DR 2023/1640 and ISCC guidance document on certification of co-processed fuels.

Note: ISCC has communicated the above-mentioned provision to the EC, which allows system users time to prove complete compliance. This provision remains valid until otherwise objected by the EC.

2 Direct ^{14}C testing method

Do all inputs need to be analysed for bio-carbon content, or only those of mixed bio and fossil wastes?

The system needs to be in position to consider all bio-carbon inputs. In case the bio-carbon input is separate and this way easy to measure, ^{14}C testing may not be needed. This needs to be decided by the economic operator and validated by the certification audit.

Can a gaseous output with a bio-content that has not been calculated through direct ^{14}C analysis be sold as having a biofuel content? For example, if all liquid outputs have been quantified using ^{14}C analysis, can a calculation method, in combination with other analytical techniques, be used to calculate the quantity that is biogas, an obvious example being propane which is difficult to quantify with ^{14}C?

The purpose of the methodology[1] is to establish the bio content in all outputs, respecting the minimum% or error prescribed by the Delegated Regulation 2023/1640. ^{14}C testing is applicable also to gaseous streams. Moreover, there are also specific sampling methodologies that allow to collect and sample light hydrocarbons.
However, by combining

a. GC MS and GC FID quantification on non-condensable gaseous streams,
b. ^{14}C on condensable liquid and solid products, and
c. elemental analysis of each valuable product, including a full characterization of mass & energy flows,

there may be some cases where ^{14}C on non-condensable gaseous stream can be omitted. This is possible only when several laboratories already expressed the incapacity to measure ^{14}C in such gaseous samples[2].
Propane production should come from glycerol separation by hydrotreating (from the triglycerides from lipids) and the next hydrogenation of hydroxyl radical. Therefore, propane can be detected through a combination of GC MS + GC FID techniques.
A possible method to calculate the potential bio-propane produced during co-processing of lipids, is to collect a sample of non-condensable gases from both the specific co-processing case study and the counterfactual scenario at 100% fossil-feed in, calculating then the offset in propanol content. Furthermore, a counterproof with the maximum bio-propanol share according to the reaction stoichiometry, based on fatty acids profile of the feedstock VS the bio-hydrocarbon chains quantified by 14C tests, should be provided as well.

[1]Commission Delegated Regulation (EU) 2023/1640 of 5 June 2023 on the methodology to determine the share of biofuel and biogas for transport, produced from biomass being processed with fossil fuels in a common process
[2] From our interaction with a renowned 14C testing service provider, it is clear that 14C testing through Accelerated Mass Spectrometry (AMS) can measure solid, liquid and gaseous samples.

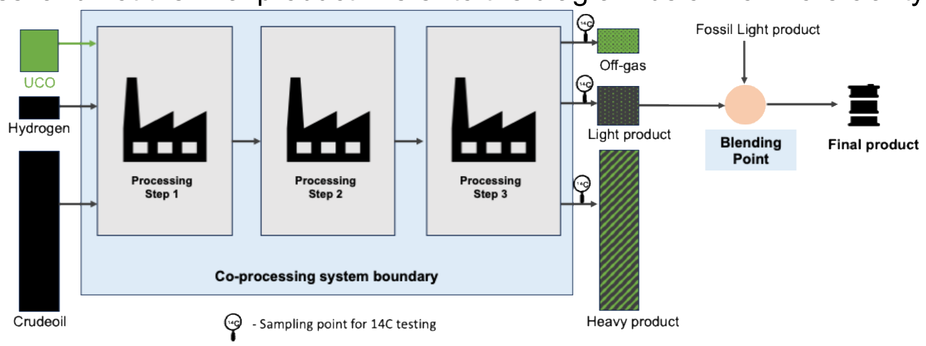
Could you please clarify if the expectation is that all CO_2 and CO should be quantified using 14C Analysis?

If the bio-content of mixed (biogenic/fossil) CO/CO_2 streams are claimed towards any credits (for e.g. biogenic combustion emission, CCS, CCU, ETS, industrial emission permits etc.,), ^{14}C testing is required. There may also be the possibility to combine other methodologies as described in the question.5. This is possible only when several laboratories already expressed the incapacity to measure ^{14}C in such gaseous samples.

Co-processed fuels are usually processed further downstream to produce final products that meet the required product specifications. Should ^{14}C testing be performed at the point of production of co-processed fuel or at the final product?

Example case: A final product, for e.g. sustainable diesel with 10% bio-content (SD-B10), is produced by mixing co-processed diesel with 15% bio-content (semi-finished product) with fossil diesel from another hydrotreater (semi-finished product). Should the bio-content be determined at the point of co-processed diesel or final product?

The co-processing system boundaries are defined to lie between the point of feeding where biomass and fossil feedstock enter a process simultaneously, and the point of exit of co-processed output. For co-processing pure biomass feedstocks with fossil feedstocks, ^{14}C testing shall be performed at the outputs of the co-processing system boundary. This will ensure determination of bio-content in co-processed outputs. When co-processed fuels are subjected to further downstream processing, like blending with other fuels, the resulting bio-content shall be determined based on the mass-balance approach. When co-processed biogenic and non-biogenic content of mixed waste feedstocks (e.g. Municipal Solid Waste, End of Life Tires), 14C testing of the inputs is also needed.
In the example case, ^{14}C testing shall be performed on the co-processed diesel and not the final product. Refer to the diagram below for more clarity.



2.1 Frequency of 14C testing

It appears there may be some unintentional incongruity in the legislation itself (DR 2023/1640) with regards to the degree of necessity for 14C testing. The legislation (and which is quoted by the ISCC document) states that:

> ***DR 2023/1640, Art.6:***
> *"5. ….. Unless a method is applied that can map the operating conditions related to carbon content in the output for each batch or consignment, the radiocarbon ^{14}C testing method shall be carried out every time that there is a change by more than 5 %, compared to the baseline conditions, in the feedstock composition in terms of the share of biogenic input or the amount of hydrogen and catalyst inputs in the total mass, the process parameters in terms of process temperature in absolute [K] or process pressure in absolute pressure [Pa] or the product composition.……. In all cases, the radiocarbon 14C testing method shall be carried out at least once every 4 months."*

This is indicating a 14C test should be carried out if a change in the composition of the products changes by more than 5%, which could in theory include a change in yield of a bio-fuel by 5% which is highly significant. It is therefore recommended that this "more than 5%" indication in Article 6, point 5, be interpreted alongside the article directly before it which aims for an overall upper limit in the difference between 14C test results and other methods of 1%.

While the DR states "in all cases, the radiocarbon 14C testing method shall be carried out at least once every 4 months", it also clearly states that Economic Operators should "regularly use radiocarbon (14C) testing of the outputs to verify the correctness of the main testing method used". We therefore firmly believe the "regularly" the DR refers to with respect to 14C testing means a frequency greater than 3 times in a year.

Depending on the nature of the processing step, various factors/parameters may influence the degree of conversion of raw materials to specific products. Usually, a pilot (or) lab scale study is performed to understand the impact of different process parameters on the conversion of biomass feedstocks to different fuel products, before co-processing at an industrial scale. Therefore, the impact of process parameters on the distribution of biomass in different products is understood well.
The DR lists these process parameters as baseline conditions. The baseline conditions shall be feedstock composition, amount of hydrogen, amount of catalyst, process pressure, process temperature, etc. When there is no system that can map changes in any of these baseline conditions to bio-content in the output, then a ^{14}C testing shall be carried out every time a change of more than 5% in baseline conditions occur.
If there is a system which can map changes in baseline operating condition with bio-content in output, then a ^{14}C testing every 4 months is sufficient.
It is clear that, time, money and effort are needed in order to create a system that is robust to map such changes and a 14C testing frequency greater than 3 times/year is expected to reach such robustness. However, once the characteristics of biomass feedstocks, their conversion pathway and a robust indirect method are established, the frequency of 14C testing would be optimized to 3 times/year.

2.2 Parametric influence

Is it possible that all the parameters listed in Annex I of the ISCC co-processing guidance may not influence the bio-content for a co-processing operation of interest?

It is common for industries to study the processing of biomass inputs in detail (via lab scale/pilot scale processing) before co-processing biomass/fossil inputs together at an industrial scale. Therefore, we understand the system user has a good understanding of which parameters might influence the distribution of bio-content in the outputs.
If any parameters listed in Annex I seems irrelevant for a specific-feedstock or processing step, this shall be demonstrated through valid evidence during audits.

2.3 Calculation of overall accuracy:

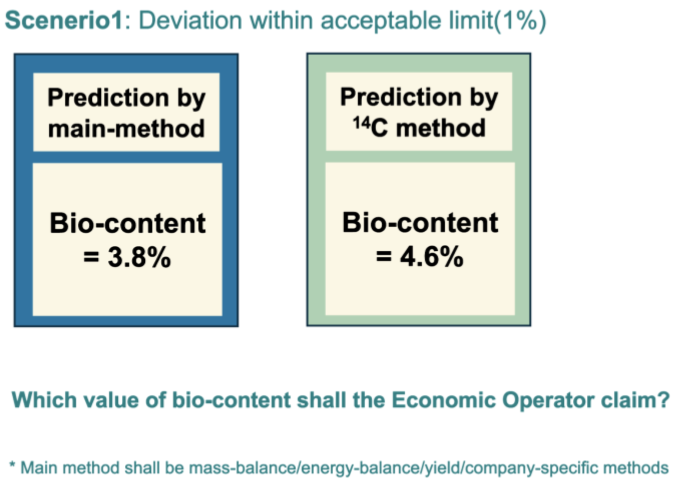
Would ISCC clarify the approach and expectations relating to the accuracy calculation of the main calculation method?

> ***ISCC 203-1, section 3.5, pg.11:***
> *"System users must report the accuracy and precision of their main calculation method and describe the reason for any inaccuracies in their calculation method (e.g. error margin of measurement flows or heating values used in calculations)"*

When an indirect method (mass/energy/yield method) is used to determine the bio-content of co-processed outputs, process data like mass flow, energy flow and reaction kinetics etc., are used to develop this mass/energy/yield model. The accuracy/precision of the metering system or analytics influences the accuracy and precision of this model. Economic operators shall evaluate and indicate the accuracy and precision of their indirect testing method. As process set-ups vary from one system user to another, ISCC does not provide guidance on how an overall accuracy/precision of the main calculation method used. The robustness of the indirect method must be demonstrated and validated during the certification audit.

In the case where an economic operator is using a method other than direct ^{14}C analysis to calculate the bio content of their outputs, but they take a direct ^{14}C measurement as part of routine checking, and there is a discrepancy between the two values that is less than the acceptable limit (3% for first year, 1% from second year), which bio content result should be used for this batch of material? (scenario visualized below)

Example case: In the first year of implementing co-processing requirements, ^{14}C testing estimated a bio-content of 3% and a yield method estimated a bio-content of 6%, what bio-content values should be applied eventually?



Even if the deviation between an alternative method and ^{14}C testing is within acceptable range, the bio-content determined by ^{14}C testing shall be taken as valid. In the example, the acceptable bio-content value is 3% and not 6%.
Reason: 14C testing (via AMS or LSC) is the best method, known so far, to determine bio-content in a co-processed fuel. Therefore, bio-content results from 14C testing are more accurate and reliable.

2.4 Normal operating window:

What does normal operating window refer to?

Normal operating window (also known as baseline operating condition) refers to a set of process parameters, at which the distribution of biomass-derived and fossil outputs is well known. An economic operator shall perform a parametric study to understand the influence of a specific process parameter (process T, H2/feed ratio etc.) on the distribution of biomass feedstock in different outputs. This will enable the operator to build a system that can map operating conditions to bio-content in outputs. When such a system does not exist, the operator shall perform 14C testing every time there is deviation of more than 5% compared to normal operating conditions.

3 Indirect ^{14}C testing method

Is it possible for an economic operator to develop and use an analytical technique other than direct ^{14}C analysis to measure the bio content of their input stream, as long as this alternative analytical technique is calibrated using ^{14}C and periodically checked in line with the requirements of the delegated regulation?

In principle, it is possible to use an alternative method (like mass-balance method, energy-balance method, yield method or any other analytical method) if its results are validated by the ^{14}C testing.

The DR gives four options for measuring bio-content, however only direct radiocarbon 14C analysis or a yield method calibrated using radiocarbon 14C analysis seem to be consistent with the rest of the DR. Are mass balance and energy methods viable options to determine bio-content and if so, how could these be implemented in practice?

The mass balance and energy methods are acceptable and viable methods if combined with validation through ^{14}C testing and other requirements as mentioned in the DR. The four different tracking methodologies to be complemented with the ^{14}C testing are introduced to offer more flexibility to the refinery operators in terms of the preferred methods according to their past experience and specific infrastructure.

Regarding the energy balance methods under article 3 of the Delegated Regulation, can you clarify the reason of taking into account also process energy?

It should be clarified that only the carbon of hydrogen from biological origin that enters the final molecular structure of the fuels can be counted as bio content. Considering also the process energy in applying the energy balance method, allows to have the full picture of process inputs and outputs, which is important for the GHG emissions intensity calculation of the co-processing unit. It would also facilitate in some cases the counting of such energy units for sectoral targets outside of the content fuels, if allowed by the legislation.

According to CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) documentation, the proportion of Sustainable Aviation Fuel (SAF) in Co-Processing can be calculated using process simulation or direct measurements. Notably, these guidelines do not specify that the 14C isotope dating method is required to verify biomass carbon content. This suggests that other established and internationally accepted methods are available to determine bio-content, offering greater flexibility without compromising accuracy. Restricting verification to the 14C method may therefore impose an unnecessarily stringent standard

The ISCC 203-01: Guidance for the certification of co-processing is only applicable for the ISCC EU scheme. Requirements for co-processing certification under ISCC PLUS and ISCC CORSIA remain unchanged.
Furthermore, DR 2023/1640 also recognises indirect methods (mass/energy/yield methods or simulations) when calibrated against ^{14}C testing to determine the bio-content of co-processed fuel. These indirect methods would offer flexibility and reduce frequency of direct ^{14}C testing to determine bio-content of co-processed fuel.

3.1 Drift of actual bio-content from MS defined yield factors

In cases whereby a yield factor has been established by a MS at a national level,

- ***a) If the operating conditions corresponding to the MS defined yield factors and the actual operating condition used by the operator are different, how can the MS defined yield factor be established?***
- ***b) if the audit confirms these do not represent the actual yields being claimed by a co-processing facility, it would be useful from the point of view of enhancing overall accuracy and trust in the system, for the MS to be provided with feedback showing there may be a discrepancy. In such a case it is recommended the MS consider they re-calibrate or adjust their yield factor.***

Any yield factors used are only valid for the measured reference inputs and specific process conditions, that are considered representative of the plant. Therefore, the MS defined yield factors must be verified and/or calibrated using ^{14}C testing. System users may use different yield factors for different processes or operating conditions, as long as they validate and/or calibrate the yield factor with ^{14}C analytical testing. Direct application of MS defined yield factors without validation is not possible.
System users shall communicate the deviation of yield factors with competent authorities of the MS and continuously update them.

In addition to the indirect 14C methods suggested (i.e. mass-balance, energy-balance and yield method), would methods such as elemental analysis (Carbon, Hydrogen, Nitrogen, Sulphur and Oxygen analysis) be used to determine the bio-content?

Irrespective of the method used to determine bio-content (direct or indirect method), determination of chemical characteristics of feedstocks, in terms of CHN, water content, solid content etc., is a common industrial procedure and forms part of the process information required to be documented. A reference to this can be found below:

> ***DR 2023/1640, Article.6:***
> ***(5)……*** An elemental analysis of carbon, oxygen and nitrogen, together with an analysis of the water and solids content, shall be provided as a basis for assessing the parameters of the product composition.,17

ISCC 203-1, section 3.5.1, pg.11:
"(1) Yield Method A:…. System users may use different yield factors for different processes or operating conditions, as long as they validate or calibrate the YF with 14C analytical testing. If different YF are used, radiocarbon (14C) testing shall be performed and checked against inputs and process conditions to reconfigure the YF if necessary."

As per the above-referred article, if the crude oil being processed is constantly changing, on average twice a month or even more frequently, does the yield factors should be redefined for each set?

Any such deviation in the characteristics of the crude oil shall be already accounted in the processing data representing the counterfactual scenario (pure fossil case).

Challenges with ^{14}C testing

Limited Applicability of the 14C Method to Non-Biomass Materials

The ^{14}C isotope dating method is well-suited for biomass-derived raw materials. However, feedstocks used in co-processing could be non-biomass, such as FT-crude from municipal solid waste or waste pyrolysis oil. These materials may not contain measurable ^{14}C isotopes, making it impossible to accurately assess their proportional contribution to the final product after co-Processing using this method. As a result, mandating ^{14}C verification may not be appropriate for all co-processing raw materials and could lead to incomplete or misleading evaluations of bio-content.

Co-processing as per DR 2023/1640 refers to an industrial process where a biomass-carbon-based feedstock and a fossil-carbon-based feedstock are processed simultaneously together in a same processing unit. If no biomass gets processed alongside fossil, then this is not considered co-processing.
A Fischer Tropsch (FT) crude from MSW/waste pyrolysis oil with undetectable amounts of ^{14}C isotopes is likely to have no bio-content in it. However, such FT crude derived from MSW may be an eligible Recycled Carbon Fuel (RCF) feedstock, if RCF requirements of the RED in DR 2023/1184 and 2023/1185 are met.

Detection of low bio-content

When relatively small fractions of biomass inputs are co-processed, and the biomass feedstock undergoes multiple processing steps, the amount of bio-content that end up in the co-processed output might be lower than the detection limits of the radiocarbon testing method used. How should this be handled?

As per the ASTM 6866, co-processed fuels with <0.5 pMC should be treated as if they have zero bio-content. This is applicable even if the analytical capacity of the radiocarbon testing method is below 0.5pMC.

We would wish for instructions on how to handle streams that cannot be sampled, such as streams with too high moisture content, gas that cannot be tested or samples that have too dark colour.

Upon confirmation from a renowned 14C testing lab, it is clear that solid, liquid and gaseous samples can be tested for bio-content using AMS. Darker samples and those with high moisture content can also be tested using AMS. However, nature of the sample can limit determination of bio-content using LSC. Economic operators can use AMS to determine bio-content of their dark coloured samples.

Sampling procedure for direct ^{14}C testing:

When ^{14}C testing is used as the main testing method, the guidance document suggests to have a dedicated tank from which co-processed fuel is sampled and sent for ^{14}C testing. This may not be practically feasible for all refinery infrastructure and may require major investments at the refinery. Taking a sample for ^{14}C testing from a static tank may provide an imprecise average over one full batch and may not account for any tank heel impact which could introduce a risk of double counting. An alternative approach would be to take multiple samples of the output streams of the co-processing unit and either a) analyse them individually by ^{14}C testing or b) create a combined sample to be analysed by ^{14}C testing.

Any samples sent for ^{14}C testing should be representative of a batch[3] of co-processed fuel produced in a facility. Therefore, sampling procedure should reflect the nature of the specific co-processing step of interest, especially taking into account factors like type of biomass feedstocks co-processed, co-processing period, process operating conditions, process dynamics (unsteady/steady state) etc.,

If refineries have infrastructure to collect co-processed fuel stream in a homogenizing tank, this shall be considered as a preferred space for extracting samples for ^{14}C testing. Based on the tank capacity, this may give an average bio-content of a batch of co-processed fuel produced throughout the entire period of co-processing.

However, if an economic operator wish to claim different bio-content throughout the co-processing period, or if co-processed fuel with varying bio-content is continuously processed further or/and blended with other fuel types, sampling of co-processed outputs at different time instants and testing them individually for 14C testing shall be preferred.

If the bio-content of a combined sample (composite sample) taken at several intervals and that of samples from a homogenizing tank are found to be the same, this can be validated through sufficient proofs at the audit. Economic operators can develop sampling procedures in such a way to ensure that at any time the claims of the bio-content reflect their actual shares.

Existing standards[4] on sampling procedure for petroleum products shall be followed while developing a 14C testing frequency. If an optimized testing frequency is applied, reasoning for such adaptation shall be demonstrated to the auditor.

[3] A 'batch' refers to a specific amount of material with the same sustainability characteristics and GHG emissions savings. For co-processed fuels, bio-content is an important sustainability characteristic

[4] Standards such as ASTM D4057-22, ASTM D4177-22e and similar standards offer guidelines on manual and automatic sampling procedures

Bio-hydrogen

Please confirm if the following interpretation is correct. The energy added to a fuel during co-processing, for example from hydrogenation of bio-derived fats, can be counted as renewable, regardless of the origin of the energy, in this example the origin of the hydrogen. The carbon intensity of the hydrogen is accounted for in the resultant carbon intensity of the biofuel produced. If bio-hydrogen is used, for example in co-processing in a refinery hydrotreater, it follows that no "extra" renewable energy can be claimed. The difference would be in the carbon intensity of the fuel produced which would use the carbon intensity of the bio-hydrogen.

This interpretation is correct.

Can you clarify what bio content shall be calculated in case the inputs in the co-processing unit consist of fossil carbon and hydrogen from biological origin?

In such a case the calculation of the share of hydrogen from biological origin shall be made in accordance with article 5 of the DR on co-processing. The total bio content in the final fuel can be respectively calculated based on the energy share of the hydrogen in the total energy share of the produced fuel.

Hydrogen is commonly used as a feedstock in refinery operations. Our data demonstrates that most every hydrotreating operation contributes atoms to the fuel, and thus hydrogen is a feedstock. Hydrogen should not be depicted as a separate category of input or called out for separate consideration. We recommend removing the "hydrogen" box and clarifying that "bio-feed" can be "bio-oil" and/or "bio-hydrogen". Likewise, "fossil-feed" can be "fossil-oil" and/or "fossil-hydrogen".

The focus of DR 2023/1640 is to determine the carbon-based bio-content of co-processed fuel. As hydrogen is an important input of hydrotreating, it has been shown as a separate category.

> ***ISCC 203-01, pg.5, last paragraph:*** *"Bio-content is defined as the percentage by mass of biomaterial in a material that is derived from both biomass and fossil feedstocks….., the bio-content of a material is defined proportional to the 14C content of a material."*

The definition of bio-content as stated above is good for biomaterial that contains 14C measurable content but is not appropriate for bio-hydrogen-containing materials. Hydrogen is appropriately characterized by its energy content, not its mass. References to hydrogen should not use the mass definition of "bio-content" – a different term should be used. The DR uses "biological origin." This should be based upon the % renewable energy content within the fuel.

When bio-hydrogen is used to process fossil feedstocks, the energy that corresponds to the amount of bio-hydrogen incorporated into the final fuel structure shall be considered as bio-content. When a bio-hydrogen is used to process a biofuel (e.g. HVO), no excess bio share is expected. The only influence will be on the GHG of the final biofuel.

Co-processing of mixed waste inputs (e.g. MSW)

For Municipal Solid Waste (MSW) diverted from landfill, only savings from methane leakage can be considered. These savings are associated with the biogenic waste share. With the proposed approach, an RCF from landfill MSW would therefore not meet the 70% GHG savings, however an RCF from waste diverted from energy recovery would. Is there a proposed solution for the landfill in this case?

For the question at hand Q46 of the RFNBO and RCF guidance document is relevant.

"Q 46: Assuming a process using municipal waste as feedstock that includes a mixture of biogenic feedstock and feedstock that can be used for the production of RCF, would the emissions from e_i including e rigid and e ex-use need to be allocated to all products or only to the products from non-biogenic origin?

As a general rule, in accordance with point 1 of the GHG methodology, all (fuel) types shall be considered to have the same emission intensity. The overall emissions from ei should thus be divided by the energy in the overall produced fuels.

This means that the emission intensity of RCF is determined based on the average emission savings of the whole process. Therefore, also the reduction of methane emissions is considered in the calculation. However, as you stated there is a differentiation between waste that was previously combusted and waste that was landfilled filled. In case of plastic waste that was landfilled the use of the carbon for fuel production does not lead to savings as the carbon was not / would not have been released in the landfill."

> ***ISCC 203-01, section 3.1., pg.7:*** *"*In some cases, it may be required to conduct radiocarbon 14C testing of inputs, for example where co-processing a waste of mixed bio- and non-bio-origin, such as municipal solid waste.*"*

Could ISCC specify whether each delivery in case of municipal waste needs to be tested by 14C testing or a bio-content declaration from supplier is sufficient?

A bio-content declaration from a waste supplier can be taken only as a reference value which has to be verified by 14C testing. The economic operator shall develop a 14C testing frequency that determines the actual bio-content of the mixed waste input.
Steps like homogenization of different batches of mixed waste inputs and better waste management practices can be used to determine an optimal frequency of 14C testing of the inputs.

Co-processing GHG methodology

Can you clarify what calculation method should be used for the calculation of actual GHG emission values, related to the co-processing?

As a main approach, the baseline scenario should record first all inputs and process emissions of the process running entirely on fossil feedstock. Then, a scenario should be recorded where biogenic feedstock is added, covering both possible cases when it adds an additional biogenic feedstock to the process, or when it replaces part of the fossil input. For all replaced fossil input, a share of all inputs of the baseline scenario should be attributed to the biofuel based on the reduced energy input of the fossil feedstock. All increased or additional inputs should also be attributed to the biofuel. The total GHG emissions should be calculated as a sum of the upstream GHG emissions of the biomass, the so calculated co-processing GHG emissions, as well as the GHG emissions originating from the transport and distribution and use of the fuel (in accordance with Annex V of the RED, disaggregated default values may be used for this category of life-cycle emissions) CO_2 emissions from biogenic sources are excluded from the accounting of fuel in use emission.

Can you clarify what calculation method should be used for the calculation of actual GHG emission values, related to the co-processing of mixed municipal or other type of waste?

The quantity of the waste from biomass shall be established first with the radiocarbon ^{14}C testing. This would allow to separate the biomass part and apply the co-processing methodology to it only. The non-biomass part of the waste shall be treated in accordance with the DR on RFNBOs and RCFs (DR 2023/1185).

For the GHG calculation, is there a defined time-period for the data collection of the baseline scenario (fossil-only) or the co-processing scenario (where bio-feedstock is added)? Are few hours of operation sufficient?

Each refinery has different start up time periods. It depends on the scale and the technology deployed. In any case, few hours should not be sufficient to have regular operation. Therefore, 24h minimum should be considered.
However, it should not be in the interest of a company to speed up this operation since a correct interpretation of the co-processing scenario should help to reduce the number of ^{14}C tests that must be carried out if their own tracking methodology fails.
In the case a refinery considers more than “few hours”- a long time (therefore not economically convenient), it is recommended to use only 14C as tracking methodology.

What data for GHG calculation is acceptable if a plant is co-processing continuously and does not have the baseline fossil-only case recorded? Should literature data be used instead?

In principle, a baseline calculation should be available from the period before starting with co-processing. It is assumed that lipids co-processing is considered since biocrudes co-processing is normally not operated continuously in the EU.

According to the scientific literature mentioned below, the GHG emissions calculations cannot result lower than the counterfactual scenario of the traditional HVO (used to calculate default values in the Annex VI), since co-processing is not a biofuel stand-alone process but a hybrid conversion pathway. Hydrotreating and/or hydrocracking within an oil refinery use specific catalysts that are not specifically developed for lipids deoxygenation only. This would lead to a lower conversion yield than HVO, therefore the biofuels shall have higher GHG emissions for processing.

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We understand the e_{ec} and e_{td} DDVs from REDII can be used in co-processing cases, except for e_p. Please confirm.

Emissions for transport are fine, but not e_{ec}. The latter should be recalculated on the basis of the real co-processing conversion yield. As explained above in question.33, the default values have been calculated for HVO.

Sustainability requirements

Could you please clarify if co-processed outputs, once out of the co-processing system boundary, can be mass balanced and sold as consignments with a bio-share other than the share determined by the calculation method? For example, by selling a 100% bio-share consignment (obviously ensuring the total amount of biofuel in the consignment doesn't change).

Once the bio content and respective GHG emission intensity of the biofuels outputs of the co-processing unit have been established, this consignment can be blended with other fuels as long as the general mass balancing rules are respected.

The topic of proportional or flexible assignment is still under discussion. Certain Member States (MS) are in favour of flexible allocation of sustainable attributes to a specific portion of the fuel, while others prefer proportional allocation until certain element of the supply chain (say until obligated fuel supplier or fuel user). As the ISCC mass balance guidance document is still awaiting approval from EC, flexible allocation of sustainability attributes shall be allowed until further notice. We expect that the EC will publish a first draft of a revised Implementing Regulation 2022/996 by the end of 2025/beginning of 2026.

At the processing unit a proportional assignment is required to comply with co-processing rules. When further trading the co-processed fuel, a flexible assignment shall be allowed until further notice from the EC and an updated Implementing Regulation 2022/996.

Please specify how can we take into consideration a potential change in biomass feedstock chemical characteristics. How should we account if incoming feedstocks are stored into the same store tank?

Even when feedstocks from multiple sources are stored in a single tank, the chemical characteristics (e.g., CHN, solid/water content, FFA etc.) of the mixed feedstocks have to be tested, and documented so that the biogenic carbon entering the co-processing unit and that end up in the co-processing output are conserved.

> ***ISCC 203-01, section 3.4.1, pg.18:***
> *"Where bio-based inputs with different sustainability characteristics (e.g. type of feedstock, country of origin, greenhouse gas (GHG) emissions) are co-processed with fossil inputs, the quantity and type of the different bio-based oils is taken into account in the calculation of the biofuel output amounts."*

The country of origin of the feedstock does not have an impact on the final biofuel output amounts, the parameters influencing the bio-content of outputs are specified on section 3.1.3. (pg.13). Therefore, we propose

to remove the country of origin as a sustainability characteristic from this paragraph.

Country of origin becomes relevant when
- reporting certified feedstocks originating from a specific country
- different values associated with actual GHG of feedstocks
- keeping materials separate in mass-balancing

Even if the country of origin might not influence the bio-content, it shall impact the GHG of the co-processed fuel and therefore, will be retained

Documentation and record keeping

Can you clarify if all samples of the radiocarbon ^{14}C testing shall be kept for at least 2 years or only the ones that are taken every four months?

The obligation to keep samples, together with calculations and other supporting documentation, for at least 2 year concerns all samples that have been taken and subject to the radiocarbon ***^{14}C*** testing by the economic operator.

The ISCC draft guidelines specify the requirement to store samples for a minimum of two years. While this is feasible for liquid products, this requirement opens up degradation concerns for gaseous products, where degradation over long periods may affect accuracy. It is therefore recommended to split and specify specific storage requirements (like duration period) depending on the phase of the product of the sample to be stored.

The ISCC EU Coprocessing guidance document reflects the storage requirements as defined in the Delegated Regulation 2023/1460. As these requirements are set by regulation, ISCC is not in a position to modify them further.
Furthermore, the storage requirements for co-processed fuels are retained due to the following reasons

- Common refinery gaseous fuels are made of alkanes of small carbon chain length (C1-C4). Material safety data sheet[5] suggest that these alkanes (methane, ethane, propane, butane etc.,) when contained under safe conditions shall remain stable for an elongated period. Even upon a degradation event, the ^{14}C distribution in the gaseous fuel would still stay unaltered, due to the half-life of ^{14}C isotope ($t^{1/2}$ = 5700 $\pm$ 30 years) thereby resulting in the same bio-content when subjected to ^{14}C testing in the future.
- A sample size of 1 mL is sufficient to determine bio-content of co-processed fuel using AMS method. Since fossil fuel infrastructures are run under co-processing mode for short periods (10 days to a few months), we expect the co-processed fuel samples to be stored with little effort.
- A co-processed fuel samples shall serve a vital role in evaluating the integrity of bio-content claims made through co-processed fuel.

During hydrotreatment, the oxygen groups in the biomass feedstocks (e.g. vegetable oil or fat) are removed either by the hydrogen input (via hydrodeoxygenation) or by the carbon in the feedstock (via decarboxylation or decarbonylation). Since the nature of the deoxygenation step affects the bio-yield of a co-processed fuel, should

[5] Air Liquide Deutschland, Produckte. &Services, MethanN25, Sicherheitsdatenblatt, https://de.airliquide.com/catalogue/methan-n25/P1715

the route of deoxygenation be reported in the "Proof of operating performance"?

The yield factor used for the process should reflect the nature of the deoxygenation route while hydrotreating co-processing feedstocks. Auditors shall verify

a) total quantity of hydrogen used in the process,
b) hydrogen consumed in removing oxygen in the feedstock (hydrodeoxygenation),
c) biogenic carbon lost as CO or CO2 (decarboxylation or decarbonylation)
d) hydrogen ending up in the fuel
e) the sum of biogenic carbon determined by 14C testing and those lost as CO/CO2 are conserved compared to the biogenic carbon entering the process

Could you please specify what is considered a non-fuel impurity?

> ***ISCC 203-01, section 3.1.1, pg.12:***
> *"Determination of the bio-content of the input requires the feedstocks' moisture and non-fuel impurities to be taken into account."*

Non-fuel impurities refers to components present in the feedstock that

a) do not contain any energetic content
b) do not end up in the structure of the final fuel
c) can interfere with processing or damage equipment
d) Some of these include metals, sulphur, nitrogen compounds, oxygenates, ash, chlorides etc.,