Delegated Act 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

FuelsEurope's interpretation of DELEGATED REGULATION (EU) 2023/1640

FuelsEurope, the European Association representing the fuels manufacturing industry, strongly supports the EU objective of net climate neutrality in 2050 and the circular economy, and stands ready to support policy makers to reach such goals. Fuels manufacturers are already transforming sustainable Low Carbon Liquid Fuels, including those produced via co-processing (strategy described in the Vision 2050 and CleanFuelsForAll publications). In this context, we welcome the recent release by the EU Commission of DELEGATED REGULATION (EU) 2023/1640 providing a methodology to determine the share of biofuel and biogas for Transport, produced from biomass being processed with fossil fuels in a common process. This delegated act incorporates some of the suggestions made by FuelsEurope over the last 12 months. As a result of our industry's technical analysis, we would like to share with the European Commission and third-party certification bodies some specific considerations of relevance for the practical interpretation of this delegated act and preparation of the systems document of voluntary schemes (summary and extended description here below).

Summary – FuelsEurope's interpretation to the Delegated Act on Co- Processing

1. Spreads: 1% absolute deviation of main method vs. measure and consideration of overall mass-balance:
   - The term "deviation" in article 6.4 should be understood as the spread in absolute percentage between the ^{14}C measure and the bio-content expected from the main method defined by the operator.
   - This "deviation" is not the inherent accuracy of the ^{14}C method.
2. Need for ^{14}C testing in case of 5% deviation of variables and process parameters from baseline
   - The 5% deviation in Art. 6.5 refers to absolute % changes of the co-processing unit's parameters and variables.
   - The deviation of parameters to the baseline should be appraised over an entire batch or consignment.
3. Default yield factors defined at Member State level
   - Use of default yields set at Member State level has validity across the European Union. Operators are free to derogate to these yield factors and seek independent certification.
4. Co-processing of waste-based bio and non-bio-origin feedstocks.
   - The methodology cannot apply to fully non-renewable waste feedstock material.
   - The delegated act on RFNBO/RCF greenhouse gases methodology rules over this delegated act if the non-bio-origin feedstock produces RCF or RFNBO or RFNBO. However, with regards to the share of renewable feedstock, flexibility should be granted to operators that would like to demonstrate a higher share of biomaterial through ^{14}C testing.
5. Role of ^{14}C testing when mass balance is the main method
   - ^{14}C testing is needed only for the initial setup of mass balance as main method before becoming a secondary method.
6. CHN Analysis
   - Reference to CHN elemental analysis in the Delegated Act is only indicative.
7. Sampling point
   - Member States shall not impose ^{14}C testing at the refinery gate.
8. Storage of gaseous samples
   - Gaseous samples have a shorter shelf-life than the required retention (2 years).
9. Compliance with Article 6.3 to quantify any loss of carbon from biogenic origin and compliance with the requirement to determine ^{14}C in gaseous samples:
   - Use of ^{14}C testing to quantify the loss of carbon from biogenic origin due to the process of removing oxygen from the biogenic feedstock is only illustrative as alternative methods exist

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Delegated Act on Methodology to determine the share of biofuel and biogas for Transport, produced from biomass being processed with fossil fuels in a common process

(DETAILS)

1 – Spreads: 1% absolute deviation of main method vs. measure and consideration of overall mass-balance

Summary

- The term "deviation" in article 6.4 should be understood as the spread in absolute percentage between the ^{14}C measure and the bio-content expected from the main method defined by the operator.
- This "deviation" is not the inherent accuracy of the ^{14}C method.

Article 6.4 of the Delegated Act indicates:

> *"If the radiocarbon ^{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 values of the radiocarbon ^{14}C testing shall be considered valid. In the first year of application of this methodology, the economic operators can apply an increased deviation of 3% instead of 1% in absolute terms, until they fine-tune their system of testing methods. In addition, the economic operator shall review its main testing methods to correct any system errors leading to such deviation and respectively calibrate the testing method if needed."*

Article 7.2 of the Delegated Act indicates:

> *"In order to avoid the risks of deviations and facilitate retrospective audit verification of the accuracy of claims made by refineries or other co-processing installation 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."*

Interpretation:

- The "*1% deviation in absolute terms*" (3% in the first 12 months) of Art. 6.4 refers to the spread between the absolute bio-content predicted by the operator's main method and the ^{14}C test result.
- This "*deviation*" is not the inherent accuracy of the ^{14}C test method.
- The ^{14}C test result to be used for this comparison should be the ^{14}C testing method result itself. The comparison should not consider the uncertainty associated to the ^{14}C testing method result.
- The need to review and calibrate the main testing method does not result in a non-conformity.
- In particular, no non-conformity can arise from deviations greater than 1% (3% in the first 12 months) for sake:
  - The operator claims a bio-content less or equal than the ^{14}C result, and
  - The claimed bio-content is not greater than the biogenic input into the system (coherence with the mass-balance indicated in Art. 7.2), and
  - The operator reviews its main method / eventually calibrates it.
- The review and calibration of the main method should only be applied to the batch or consignment on which the deviation occurred. It does not need to be retroactively applied to prior batches or consignments.
- Within the boundaries set by delegated regulation (EU) 2023/1640, voluntary schemes should provide for the flexibility needed by operators to adapt their main method at their initiative.

Please find below some scenarios to illustrate this interpretation **during the first 12 months**:

Scenario	^{14}C test measure	Main method prediction	Overall mass-balance allowed (Art.7.2)	Bio-content claim	Review of main method and eventual recalibration (3% deviation tolerance)
#1	4.0%	4.9%	6%	4.9%	Not needed – compliant case
#2	3.8%	4.9%	6%	4.9%	Not needed – compliant case
#3	6.0%	4.9%	6.0%	6.0%	Not needed – compliant case
#4	6.0%	4.9%	5.8%	5.8%	Not needed – compliant case

And these same scenarios to illustrate this interpretation **AFTER the first 12 months-period**:

Scenario	^{14}C test measure	Main method prediction	Overall mass-balance allowed (Art.7.2)	Bio-content claim	Review of main method and eventual recalibration (1% deviation tolerance)
#5	4.0%	4.9%	6.0%	4.9%	Not needed – compliant case
#6	3.8%	4.9%	6.0%	3.8%	Needed from occurrence
#7	6.0%	4.9%	6.0%	6.0%	Needed from occurrence
#8	6.0%	4.9%	5.8%	5.8%	Needed from occurrence

Illustrative comments on above tables:

- **Scenario #1 an #5**: the ^{14}C test measures a "4% bio-content", the main method predicts a "4.9% bio-content" and the overall balance allows for 6%. The economic operator could claim 4.9% as the spread is within the 1% absolute deviation tolerance and within the overall mass-balance. The prediction of the main method is deemed valid.

- **Scenario #2**: the ^{14}C test measures a "3.8% bio-content", the main method predicts a "4.9% bio content" and the overall balance allows for 6%. The prediction is within 3% of the measure, within the mass-balance's tolerance and thus the economic operator can claim a bio-content of the main method i.e., 4.9%. However, as it is not within 1% deviation expected after 12 months, the operator may consider calibrating its main method or wait until the end of the 12-months 'fine-tuning' period to do so.

- **Scenario #3**: Upward deviation within 3% tolerance, borderline with the overall mass-balance. In this case the economic operator may claim the 6.0% bio-content. As is not within 1% deviation expected after 12 months, the operator may consider calibrating its main method or wait until the end of the 12 months 'fine-tuning' period to do so.

- **Scenario #4**: Same as above #3 but the overall mass-balance caps the claim at 5.8%.

- **Scenario #6/7/8:** The prediction is beyond 1% of the measure. Hence, calibration of the main method is required from this batch/consignment onwards. No non-conformity arises as long as economic operator claims a bio-content not greater than the lesser between the content measured by ^{14}C and the overall mass-balance.

2 – Need for ^{14}C testing in case of 5% deviation of variables and process parameters from baseline

Summary

- The 5% deviation in Art. 6.5 refers to absolute % changes of the co-processing unit's parameters and variables.
- The deviation of parameters to the baseline should be appraised over an entire batch or consignment.

Article 6.5 of the Delegated Act indicates:

> *"The frequency for carrying out the main testing method and the radiocarbon ^{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.* ***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****. 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. In all cases, the radiocarbon ^{14}C testing method shall be carried out at least once every 4 months."*

Interpretation:

- The variables and process parameters are those of the co-processing unit and not of the refinery as a whole.
- The 5% deviation refer to absolute % changes. For example, if the baseline conditions are set at a bio-input of 5% it can be increased up to 10% without triggering a ^{14}C test.
- The amount of hydrogen is expressed as hydrogen / feed ratio.
- Time period for determining the 5% would be the time it takes to process a batch/consignment.

Consequently, we would like to point out that our interpretation of this paragraph is that a variation of more than 5% of the operating conditions would not require a ^{14}C testing under the following circumstances:

1) The operator sets up a method that correlates the operating conditions with the bio carbon content in the output of each consignment (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) OR (in absence of such method),
2) The variation of more than 5% takes place within the processing of a batch or consignment: deviations should be appreciated over the co-processing of an entire batch or consignment. In case the instantaneous operating conditions fluctuate by more than 5% but remain on average inside the 5% tolerance within a same batch or consignment, no ^{14}C testing in required.
   Should deviation of operating conditions averaged over an entire batch or consignment exceed 5%, the economic operator must perform at least a ^{14}C test or - at its discretion - average samplings/ ^{14}C tests performed during the co-processing of the batch/consignment.

In all cases, the radiocarbon ^{14}C testing method shall be carried out at least once every 4 months.

3 – Default yield factors defined at Member State level

Summary

- Use of default yields set at Member State level has validity across the European Union. Operators are free to derogate to these yield factors and seek independent certification.

Article 4.1 (a) of Delegated Act states:

"Each yield factor shall only be valid for the reference inputs and process conditions, for which the yield factor had been established. Member States, in accordance with the rules stipulated in this Regulation, may define the yield factors that economic operators have to use on their territory. If different yield factors are used, a radiocarbon ^{14}C test shall be carried out each time a new yield factor is used and the correlation between reference inputs and process conditions shall be checked and, if needed, updated."

Interpretation:

- Use of default yields set at Member State level has validity across the European Union.
- Economic operators remain free to derogate to yield factors defaulted by Member State by seeking direct independent certification with the general provisions of the delegated regulation.

4 – Co-processing of waste-based bio and non-bio-origin feedstocks.

Summary

- The methodology cannot apply to fully non-renewable waste feedstock material.
- The delegated act on RFNBO/RCF greenhouse gases methodology rules over this delegated act if the non-bio-origin feedstock produces RCF or RFNBO. However, with regards to the share of renewable feedstock, flexibility should be granted to operators that would like to demonstrate a higher share of biomaterial through ^{14}C testing.

Recital (1) of the Delegated Act states the following:

"(1) Co-processing typically refers to an oil refinery unit processing biomass feedstock together with fossil feedstock and transforming them into final fuels. However, this methodology may be also applied in other cases of installations treating bioliquids and fossil oil or in installation co-processing wastes of bio and non-bio-origin. (…)"

Interpretation:

This methodology only applies when co-processing of biomass content is involved. This delegated act is not covering fully non-renewable waste feedstock material.

Justification:

In line with Article 28.5 of Directive (EU) 2018/2001, the Delegated Act should define the methodology for calculation of the share of biofuels and biogas for transport sector when co-processed with fossil fuel feedstock. The delegated Act should not cover or provide guidance for non-renewable wastes alone that are by nature unable to produce biofuels.

Article 1.3 of the Delegated Act states the following:

"1.3 In the case of installations co-processing waste-based inputs, this methodology and verification through radiocarbon (^{14}C) testing can be applied only if a reliable and representative set of samples can be performed at the level of the inputs that allow to establish the bio content in the total inputs."

Interpretation:

In case of feedstock partially containing biomass, where the production of the non-biogenic part corresponds to Recycled Carbon Fuels (RCF) or RFNBO the Delegated Regulation (EU) 2023/1185 on RFNBO/ RCF GHG methodology shall rule over the Delegated Regulation (EU) 2023/1640 on co-processing, whereby the shares of the materials shall be determined by an energy balance method. However, with regards to the share of renewable feedstock, flexibility should be granted to operators that would like to demonstrate a higher share of biomaterial through ^{14}C testing.

Justification:

- ^{14}C is not present at all in non-renewable waste originating from fossil-based material. In case of a feedstock which is partially bio and partially fossil, this means that a ^{14}C testing would only measure the bio-share of such product.
- For bio-circular feedstock partially of bio-origin and partially of fossil waste-based origin, the DA on Co-processing and the DA on RFNBO/RCF GHG methodology are in overlap and call to different methods:
  - The co-processing DA suggest that the main method should be accompanied by a verification ^{14}C testing (unless ^{14}C testing is used as main method).
  - The DA on RFNBO/RCF GHG methodology requires their respective share is determine through the relevant energy share of the inputs.
- Economic operators could make use of ^{14}C methodology if they decide so. In this case, the allocation of fractions should be performed using a two-step approach:
  a. First step: measure with ^{14}C testing would provide the % of bio in the product obtained (%bio).
  b. Second step: from the remaining share (100%-%bio) the share of RCF and RFNBO would be established according to the delegated regulation 2023/1185 (share of relevant energy in the inputs)

5 – Role of ^{14}C testing when mass balance is the main method

Summary

- ^{14}C testing is needed only for the initial setup of mass balance as main method before becoming a secondary method

Article 2 of the Delegated Act states:

"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 share of biogenic material identified by the radiocarbon ^{14}C testing results is allocated to each output. Different conversion factors shall be applied for each output that most accurately correspond to the measured bio-content through the radiocarbon ^{14}C testing results. 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."

Interpretation:

We would like to clarify the role that the ^{14}C testing plays when the operator selects the "mass balance method" as a main method. Our interpretation is that when the operator sets up the mass balance method for the first time, the allocation of the biomass fraction to each output would need to be based on a radiocarbon ^{14}C testing results from the corresponding outputs. Once this allocation has been done the first time, ^{14}C testing will only be needed as a verification method on a regular basis as determined in Article 1.3. and Article 6.5.

6 – CHN Analysis

Summary

- Reference to CHN elemental analysis in the Delegated Act is only indicative.

Article 5.2 of the Delegated Act states:

"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."

Interpretation:

We would like to point out that the proposed elemental analysis will not be suitable to determine the differences in H content before and after the co-processing. According to the precision values in ASTM D 5291, the difference in H content between the input to the unit and the output should be larger than 1.5% m/m. Therefore, it is important to stress that the reference to this specific analytical method in the Delegated Act is done only as an illustration of a possible method and that other methods are possible and allowed. A non-exhaustive list of other examples of methods allowed is included below:

- The determination of the S and N content of the feed before and after the co-processing combined with the mass balance of the unit.
- The determination of the S, O and N content of the feed before and after the co-processing combined with the mass balance of the unit in case of carbon-containing bio-feedstock is processed.

Requirement listed in Art. 5.1(a) can only be evidenced by Proof of Sustainability issued by a registered certification body.

7 – Sampling point

Summary

- Member States shall not impose ^{14}C testing at the refinery gate.

Article 1.2 of the Delegated Act states:

"2. Economic operators shall consider the whole refinery, the installation treating bioliquids and fossil oil or the installation co-processing waste inputs as system boundaries independently from the testing method used. Blending of co-processed fuels with other fuels shall be considered as being outside the system boundaries. The radiocarbon (^{14}C) testing shall be done before the fuels produced through coprocessing are further blended with other fossil fuels or biofuels that were not part of the co-processing itself."

Article 1.4 of the Delegated Act states:

"4. Economic operators shall ensure that the detection limit of the testing method selected can effectively measure the expected share of biofuels or biogas in the process."

Article 7.1 of the Delegated Act states:

"1. 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 radiocarbon ^{14}C testing and together with a procedure for its application."

Interpretation:

- These samples should be those taken as a result of applying Article 6.5.
- Member States shall not impose ^{14}C testing for this purpose at the refinery gate.

8 – Storage of gaseous samples

Summary

- Gaseous samples have a shorter shelf-life than the required retention (2 years).

Article 7.1 of the Delegated Act states:

"1. 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 radiocarbon ^{14}C testing and together with a procedure for its application."

Interpretation:

- Gaseous samples would need special treatment in these cases as it is technically challenging to ensure the integrity of gaseous samples storage for two years because of the difficulty to guarantee airtight conditions for such a long period of time.
- Therefore, we suggest that gaseous samples are only kept for one month.

9 - Compliance with Article 6.3 to quantify any loss of carbon from biogenic origin and compliance with the requirement to determine ^{14}C in gaseous samples:

Summary

- Use of ^{14}C testing to quantify the loss of carbon from biogenic origin due to the process of removing oxygen from the biogenic feedstock is only illustrative as alternative methods exist.

Article 6.3 of the Delegated Act states:

"3. The radiocarbon ^{14}C testing shall also quantify any loss of carbon from biogenic origin due to the process of removing oxygen from the biogenic feedstock by making a comparison of biogenic and fossil carbon in the inputs and output products."

Interpretation:

- The determination of biocarbon in the inputs to the units can efficiently be done using alternative methods to ^{14}C such as Infrared Spectrometry.
- The determination of biocarbon content in gaseous samples can efficiently be done using alternative methods such as stoichiometry of the hydrotreatment reaction (e.g., for bio-propane) and alternative analytical methods such as gas chromatography for CO, CO2.
- An estimation of the loss of carbon from biogenic origin due to the process of removing oxygen from the biogenic feedstock can conclusively be done based on the data collected with the above common methods.

Justification:

Samples for which ^{14}C content cannot be determined by LSC (coloured liquid samples, samples with expected ^{14}C content < 1% and gaseous samples) need to be analysed using AMS. Availability of commercial analytical AMS services in Europe is very limited which forces most operators to have to send samples overseas to the USA.

This is especially challenging in the case of gaseous samples as their integrity can be compromised if sent over such long distances.

Gaseous samples:

Notwithstanding the above, the quantification of the bio-content in the gaseous samples concerned could be done by other means:

a) Bio-propane in the case of co-processing in hydrotreatment units of lipids: the bio-propane is produced during hydrogenation of the glycerine groups in the vegetable oil molecules. Therefore, it is possible to establish the amount of bio-propane produced based on the quantity of vegetable oil in the input.

b) CO, CO2: these gases are produced exclusively as a result of the hydrogenation of the biomass input to the unit as the fossil input contains only traces of oxygenates ('O' atoms in the crude oil are removed early in the refining process of crude oil or concentrated in the very heavy fractions[1]). Therefore, all the CO, and CO2 produced in the co-processing will have a biogenic origin. CO2 and CO can be easily quantified using gas chromatography.

Liquid coloured samples:

Typically, the inputs to the co-processing can present colour above the specification of the applicability of LSC direct measurement methodology, making this method not suitable. Fortunately, the biogenic input does present other chemical characteristics that allow for its differentiation from the fossil input and its quantification using alternative methods to the ^{14}C radiocarbon testing.
Infrared Spectrometry (IRS) is very frequently used to characterize and quantify vegetable oils. The IRS may provide an alternative to quantify the quantity of biocarbon in the feedstock avoiding the need to send the samples for analysis overseas.

FuelsEurope, the voice of the European fuel manufacturing industry. FuelsEurope represents with the EU institutions the interest of 39 companies manufacturing and distributing liquid fuels and products for mobility, energy & feedstocks for industrial value chains in the EU.

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[1] Literature provides for various references on the matter:
https://www.concawe.eu/wp-content/uploads/2016/05/Rpt_16-2.pdf
https://www.ncbi.nlm.nih.gov/books/NBK531269/
https://pubs.acs.org/doi/10.1021/ac60264a005#
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