UK Government

Department of Agriculture, Environment and Rural Affairs
An Roinn Talmhaíochta, Comhshaoil agus Gnóthaí Tuaithe
Depairtment o' Fairmin, Environment an' Kintra Matthers
www.daera-ni.gov.uk

Llywodraeth Cymru
Welsh Government

Scottish Government
Riaghaltas na h-Alba
gov.scot

UKETS03 MRR - Reporting biomass in installations

February 2025

Note

This document is intended to provide guidance for operators of installations. If there is any inconsistency between the guidance and legislation, the legislation prevails.

© Crown copyright 2025

This publication is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated. To view this licence, visit nationalarchives.gov.uk/doc/open-government-licence/version/3 or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

Where we have identified any third-party copyright information you will need to obtain permission from the copyright holders concerned.

Any enquiries regarding this publication should be sent to us at: emissions.trading@energysecurity.gov.uk

Contents

Overview

This guidance is intended to help operators of installations understand the requirements for monitoring and reporting biomass in the UK Emissions Trading Scheme (UK ETS), as set out in:

- **The Greenhouse Gas Emissions Trading Scheme Order 2020** (**The Order**) (https://www.legislation.gov.uk/uksi/2020/1265/contents) as amended from time to time
- **The Monitoring and Reporting Regulation (MRR)** (Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018) on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council (disregarding any amendments adopted after 11 November 2020) as given effect for the purpose of the UK ETS by article 24 of the Order, subject to the modifications made for that purpose from time to time
- **The Verification Regulation (VR)** (Commission Implementing Regulation (EU) 2018/2067 of 19 December 2018 on the verification of data and on the accreditation of verifiers pursuant to Directive 2003/87/EC of the European Parliament and of the Council (disregarding any amendments adopted after 11 November 2020), as given effect for the purpose of the UK ETS by article 25 of the Order, subject to the modifications made for that purpose from time to time
- **The Renewable Energy Directive (RED)** (Directive 2009/28/EC) on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

Operators using solid or gaseous biomass, or bioliquids for non-energy purposes, can apply an emission factor of zero for the fraction of the fuel or material that is biomass.

Greenhouse Gas Emissions (GHGE) permit holders using bioliquids to generate energy (such as electricity, heating and cooling), and wishing to apply an emission factor of zero, must retain evidence for their verifier that demonstrates that their bioliquid meets the sustainability criteria set out in Article 17(2) to (5) of the Renewable Energy Directive (Directive 2009/28/EC) and (Article 38(2) of the MRR.

Hospital or Small Emitter (HSE) permit holders using bioliquids may apply an emission factor of zero for the biomass fraction of a fuel or material without demonstrating that it meets sustainability criteria. (Article 38(2) of the MRR.

Compliance with sustainability criteria is only relevant to the monitoring and reporting of emissions and not relevant when assessing whether an installation is included in the scope of UK ETS.

1. Definitions

The terms biomass, bioliquid, biofuel, preliminary emission factor, mixed fuel and mixed material are defined in Article 3 of the Monitoring and Reporting Regulation.

The definitions of biomass, bioliquids and biofuels are the same as the definitions that were used in the Renewable Energy Directive.

2. Sustainability criteria for bioliquids

There are two sustainability criteria:

- Land use: which focuses on the land from which the biomass is sourced
- Greenhouse gas (GHG) emission savings which account for the life cycle GHG emissions of the biomass

Not all bioliquids must demonstrate compliance with both sustainability criteria. For example, bioliquids produced from waste and residues, other than agricultural, aquaculture, fisheries and forestry residues, do not have to demonstrate compliance with the land use criteria as they are already assumed to comply

2.1. Demonstrating compliance with sustainability criteria

To know which sustainability criteria applies, operators must work out if their bioliquid is a waste, a residue, or a product (or co-product). Appendix 3 of sustainability guidance[1] produced by The Office of the Gas and Electricity Markets (Ofgem) provides a non-exhaustive list of substances and categorises them as products, residues or waste. Check the Ofgem website for the latest version of the guidance.

To use the land use criteria exemption for waste, operators must provide evidence to their UK ETS verifier that the fuel is a waste. Examples of suitable evidence to demonstrate that a fuel is a waste or derived from a waste may include environmental permits or waste transfer notes.

Note that in this context, ‘waste’ means any substance or object which the holder discards, or intends or is required to discard, but does not include any substance or object that has been intentionally modified or contaminated for the purpose of transforming it into a waste.

2.1.1. Recognised voluntary schemes

Not all recognised voluntary schemes cover both sustainability criteria. UK ETS operators are responsible for checking and providing evidence to their verifier that the scope of recognition covers the whole supply chain; it may be necessary for the operator to use more than one scheme.

Operators must provide evidence of compliance with voluntary schemes for each consignment of fuel.

[1] https://www.ofgem.gov.uk/publications-and-updates/renewables-obligation-sustainability-criteria

2.2. Demonstrating compliance with greenhouse gas emissions savings criteria

If there's no recognised voluntary scheme, operators must provide either a default greenhouse gas emissions value, an actual greenhouse gas emissions value or calculate a value based on a combination of default and actual greenhouse gas emission values.

A list of disaggregated typical and default greenhouse gas emissions can be found in Annex V of the RED. Bioliquids listed in sections A and B of Annex V of the RED assume no net carbon emissions from land use change. Operators should be aware that these are conservative values and the RED describes situations where the default greenhouse gas emissions value can't be used.

Section C of Annex V of the RED describes the methodology for calculating greenhouse gas emissions from the production and use of transport fuels, biofuels and bioliquids. The UK has a Carbon Calculator tool to help with this approach and users should read the carbon calculation tool guidance carefully before using it.

Operators must retain evidence for their UK ETS verifiers that default greenhouse gas emission values and/or calculations of greenhouse gas emission savings have been used correctly.

2.2.1. Tallow

For the purposes of UK ETS, tallow is a bioliquid because although it's a solid at room temperature, when combusted it's a liquid. Tallow is complicated, not just by the physical state that it can exist in but by its potential classification under the Animal By-Product Regulation (EC) No 1069/2009 (ABPR) and the associated Animal By-Product Regulation implementing regulation No 142/2011 that are enforced through the Animal By-Products (Enforcement) Regulations.[2]

This legislation places tallow into three categories of processed animal by-products, depending on the level of health risk that it poses:

- category 1 tallow is considered to be a waste[3]

[2] The Animal By-Products (Enforcement) (England) Regulations 2013
https://www.legislation.gov.uk/uksi/2013/2952/contents
The Animal By-Products (Enforcement) Regulations (Northern Ireland) 2015
https://www.legislation.gov.uk/nisr/2015/332/contents/made
The Animal By-Products (Enforcement) (Wales) Regulations 2014
https://www.legislation.gov.uk/wsi/2014/517/contents/made
The Animal By-Products (Enforcement) (Scotland) Regulations 2013
https://www.legislation.gov.uk/ssi/2013/307/contents
[3] Table 12 Renewable Obligation Sustainability Criteria 2018
https://www.ofgem.gov.uk/publications/renewables-obligation-sustainability-criteria

- category 2 tallow is unsuitable for some uses as a raw material but does have economic value
- category 3 tallow is considered to be a product[4]

The RED contains default factors for the combustion of biodiesel from waste vegetable or animal oil. These factors can be used for ABPR category 1 and 2 animal oil products but cannot be used for ABPR category 3 animal oil products, including biodiesel from category 3 tallow. Tallow imported from outside of the UK may not be labelled as category 2 and category 3 tallow. In these circumstances, the tallow must be treated as of 'unknown category' and the requirements for category 3 tallow must be met.

UK ETS operators using tallow (regardless of the ABPR category) do not have to demonstrate compliance with the land use criteria because tallow is not obtained directly from the land.

The RED does not provide default factors for the combustion of tallow oil that isn't converted into biodiesel. The Renewables Obligation (RO) only allow the use of a RED default factors listed in Annex V of the RED. As a simplification that is only applicable if you are an UK ETS operator using category 1 and/or 2 tallow oil for the onsite generation of heat energy (typically operators of rendering plants) you may use the RED default figure for GHG emission savings of 83%. This means that the GHG emission savings criteria will have been met.

To qualify for this UK ETS specific exemption, and a zero-emission factor rating for the associated emissions, you will need to demonstrate to your UK ETS verifier that the category of tallow is a qualifying category. For the combustion of tallow oil, such as for electricity production or for production of biofuels or biogas you must determine the actual GHG emission saving values.

Table 1 summary of requirements for tallow

Category	Relevant sustainability criteria	GHG emission savings value
Category 1 (includes tallow from outside EU)	GHG criteria	83%
Category 2 (includes tallow oil used for generation of heat)	GHG criteria	83%

[4] Table 10 Renewable Obligation Sustainability Criteria 2018
https://www.ofgem.gov.uk/publications/renewables-obligation-sustainability-criteria

Category 3 (includes tallow of unknown category)	GHG criteria	Use actual carbon values

2.3. Demonstrating compliance with land use criteria

The chapter on land use criteria in Ofgem's guidance on sustainability criteria will help operators to identify which land use criteria are relevant to them. Note that if the bioliquid is produced from primary forest and land with high carbon stock it will not meet the land use criteria and will be treated as fossil fuel; bioliquids from these sources will not qualify for zero emissions. Note that the land use criteria refer to the production of the raw material and not the supply chain.

2.4. Demonstrating compliance with the mass balance rules

Operators using bioliquids that are composed of a mixture of multiple consignments of bioliquid must demonstrate compliance with the respective criteria for each consignment of biomass and throughout the entire supply chain. Operators can do this using a mass balance chain of custody that is covered by a recognised voluntary scheme or by collecting the information for each consignment.

3. Calculation factors

Operators must describe in their monitoring plans how they intend to determine the calculation factors, such as emission factors, preliminary emission factors and biomass fractions.

Article 38 of the MRR allows operators, where the proportion of biomass is equal to or greater than 97%, or due to the emissions associated with the fossil fraction of the fuel or material it qualifies as a de-minimis or marginal source stream, to use no-tier approaches, including the energy balance method, to determine calculation factors.

Where the proportion of biomass is less than 97%, the calculation factors must be determined according to the tiers described in section 2 of Annex II of the MRR.

If default values are used as calculation factors to comply with tier 1, the monitoring plan must include the value or, a reference to the source of the value.

3.1. Preliminary emission factors

The 'preliminary' emission factor is the emission factor that accounts for the total carbon dioxide (CO2) released by the combustion of the fuel or conversion of the material, regardless of whether the CO2 is stemming from fossil or biomass carbon. It is expressed as t CO2/TJ or t CO2/t. The example below describes how the preliminary emission factor may be calculated and how the preliminary emission factor fits into the calculation of overall emissions from a source stream. Note that if sustainability criteria were applicable to the fuel or material, but not met, the biomass fraction would be zero and the preliminary emission factor would be the same as the final emission factor.

Where the preliminary emission factor is determined by analyses in accordance with articles 32 to 35 (tier 3) of the MRR this emission factor is determined the same way as for other fossil fuels or materials.

Example where an installation is burning wood-based panels waste.

The carbon content of the waste wood panels is analysed:

Carbon Content (CC) = 0.5 t C/t waste.

Net calorific value (NCV) is 15 GJ/t waste.

Conversion factor (f) is 3.66 tCO2/t C

The preliminary emission factor ($EFpre$) is calculated using the following equation:

$EFpre$ = $CCtotal$ x f/NCV

0.5 x 3.66/15 = 122 t CO2/TJ

95% of the carbon contained in this source stream is stemming from biomass (the fossil carbon is contained in the resins used for gluing the wood fibres). The emissions (Em) from this source stream are calculated using the following equation:

$$Em = fuel\ quantity \times NCV \times EFpre \times (1 - biomass\ fraction) \times oxidation\ fraction$$

Sources of default values for preliminary emission factors include:

- Annex VI (tier 1) of the MRR
- values listed in Table 2 (tier 1)
- other values used in the IPCC (Intergovernmental Panel on Climate Change) Guidelines (tier 1)
- the National Greenhouse Gas Inventory (tier 2a)

Table 2 list of preliminary emission factors and associated net calorific values (tier 1)[5]

Biomass material	Preliminary EF [t CO2 / TJ]	NCV [GJ/t]
Wood / Wood waste	112	15.6
Sulphite lyes (black liquor)	95.3	11.8
Other primary solid biomass	100	11.6
Charcoal	112	29.5

[5] Source: preliminary emission factors and net calorific values (NCV) have been taken from the IPCC 2006 guidelines (lowest tier approach), except for the NCV value for biodiesels, which was taken from Annex III of the RED The IPCC guidelines also give values for the fossil fraction of municipal waste: EF (Emission Factor) = 91.7 t CO2/TJ; NCV = 10 GJ/t

Bio gasoline	70.8	27.0
Biodiesels	70.8	37.0
Other liquid biofuels	79.6	27.4
Landfill gas	54.6	50.4
Sludge gas	54.6	50.4
Other biogas	54.6	50.4
Municipal waste (biomass fraction)	100	11.6

3.2. Biomass fraction

The 'biomass fraction' refers the ratio of carbon stemming from biomass to the total carbon content of a fuel or material, expressed as a fraction. Operators can only claim an emission factor of zero for the fraction of the fuel or material that is biomass and, where relevant, for the fraction that meets applicable sustainability criteria. Operators also have the choice to assume that their biomass source stream contains no biomass and treat their source stream as a fossil source stream (see point 1 below).

This leads to the possibility that operators using biomass may have the following types of source streams, depending on whether sustainability criteria apply:

1. Fossil source streams (no biomass and all emissions count for the purpose of surrendering allowances)
2. Biomass where sustainability criteria apply:
    a. Criteria are satisfied: biomass is zero-rated
    b. Criteria are not satisfied: biomass is treated like a fossil source stream
3. Biomass where no sustainability criteria: apply biomass is zero-rated
4. Mixed source streams:
    a. Fossil / biomass mix (where either no sustainability criteria apply, or where they apply and are satisfied). The emission factor is the preliminary emission factor multiplied by the fossil fraction. Example: fibre wood panels, where biomass (wood, which is solid, and therefore no sustainability criteria are

applicable) is mixed with resins which are usually made from fossil raw materials.

b. Fossil/biomass mix (where sustainability criteria apply and are not satisfied). The whole source stream is treated as fossil. Example: the operator's supplier claims that the bioliquid is in part from biological origin, but the operator can't demonstrate compliance with the sustainability criteria to the satisfaction of the verifier.

c. Biomass mix or fossil/biomass mix, where only a part of the biomass satisfies the applicable sustainability criteria. These source streams are to be treated like those under point 4(a), with the non-sustainable part considered as part of the fossil fraction. An example would be rape seed methyl ester ("biodiesel"), where the rape seed oil satisfies the sustainability criteria and respective evidence is provided, while the methanol is either stemming from fossil sources, or where it is claimed to be biomass, but no evidence for meeting the sustainability criteria is available.

With so many possibilities, operators may find it challenging to describe biomass source streams in their monitoring plan. The simplest approach is for the operator to write a procedure where the operator attributes each batch of biomass used in the installation to either a (sustainable) "biomass" source stream or to a "fossil" source stream, depending on whether evidence is available for meeting the sustainability criteria or not.

Section 2.4 of Annex II of the MRR sets out the tiers applicable to the determination of the biomass fraction. The next two sections describe methodologies applicable to tier 2 and tier 3.

3.2.1. Estimation methods for biomass fractions

If the highest tier is technically not feasible or would incur unreasonable costs, or the regulator has approved the use of tier 2, the operator must apply an estimation method.

Estimation methods must be based on scientifically proven methods. Preference should be given to methods at least partly referring to EN, ISO or national standards as well as to peer-reviewed publications.

Two peer-reviewed papers providing a suitable estimation method for determining the biomass fraction have been published for waste-to-energy processes:

- Fellner J, Cencic O, Rechberger H. "A new method to determine the ratio of electricity production from fossil and biogenic sources in waste-to-Energy plants." Environ Sci Technol. 2007; 41(7); p. 2579-2586.

- Obermoser M, Fellner J, Rechberger H. "Determination of reliable CO2 emission factors for waste-to-energy plants." Waste Manag Res. 2009; 27(9); p. 907-913.

For fuels or materials originating from a production process with defined and traceable input streams, for example waste wood panels or biodiesel, article 39(2) of the MRR allows the operator to base such estimation on a mass balance of fossil and biomass carbon entering and leaving the process.

Please note that the mass balance estimation method described in the previous paragraph is different from the “energy balance method” which Article 38(4) of the MRR allows for estimating emissions for mixed fuels or materials with a biomass content equal to or higher than 97 %. Article 3(39) defines the ‘energy balance method’ to be a ‘method to estimate the amount of energy used as fuel in a boiler, calculated as the sum of utilisable heat and all relevant losses of energy by radiation, transmission and via the flue gas.’

The principle of this method is based on a complete energy balance of a boiler allowing emissions to be related directly to individual input materials. A suitable basis for such an approach is EN 12952-15 “Water-tube boilers and auxiliary installations – Part 15: Acceptance tests.” This standard describes principles for calculating the boiler efficiency as well as formulae for calculating relevant flue gas parameters. This ‘energy balance method’ gives the mass and heat flow of the fuel consumed as the result, allowing the determination of emissions from analysis of the fuel. This method is not applicable for mixed fuels with a lower biomass content than 97% or for determination of the biomass fraction of such a fuel.

3.2.2. Analytical methods for determining biomass content

Where the biomass fraction is less than 97%, the operator can assume that the biomass fraction is zero or determine the biomass fraction using laboratory analyses, in accordance with articles 32 to 35 of the MRR. The analysis must be based on appropriate standards, as described in Articles 32(1) and 39(2) of the MRR. Those standards must be appropriate for their use and must be the most up-to-date version of that standard. Standards are available from British Standards Institution for a charge.

The following is a list of current technical standards that may be used to determine the biomass content of a fuel or material. Operators may use more specific national or international standards as they become available.

3.2.2.1. Calculation-based methodologies

BS EN ISO 21644 ‘Solid recovered fuels. Methods for the determination of biomass content’ is a calculation methodology that offers three methods for determining the biomass fraction of a mixed material:

- The selective dissolution method
- The manual sorting method
- The radiocarbon (carbon-14) method

Operators must use the carbon-14 method unless they can demonstrate to the satisfaction of their regulator that this method leads to unreasonable costs or is technically not feasible. The justification must cover correct sampling, sample preparation and carbon-14 analysis by a suitably accredited laboratory.

To use either of the other two methods in this standard the operator must provide evidence that:

- Based on several representative samples the selected method has been validated using the carbon-14 method, and
- To use the selective dissolution method, the biomass percentage content between 10% and 90%.
- The content of natural and/or synthetic rubber in the solid recovered fuel is less than 10%, or if the sum of the content of hard coal, coke, brown coal, lignite, degradable plastics of fossil origin, non-degradable plastic of biogenic origin, oil or fat present as a constituent of biomass, wool, viscose, nylon, polyurethane, or other polymers containing molecular amino groups and silicon rubber is below 5%.
- To use the manual sorting method, particle size is greater than 10mm and the fractions are optically and physically distinguishable and can be separated and quantified.

The composition of solid waste can be highly variable. Sampling and sample preparation must be done carefully to ensure that that representative samples are selected for analysis. The standards describe how samples should be taken.

3.2.2.2. Measurement-based methodologies

Operators wishing to apply a measurement-based methodology to calculate CO2 stemming from biomass and subtract it from the total measured CO2 emissions may use:

- BS EN ISO 13833:2013 Stationary source emissions. Determination of the ratio of biomass (biogenic) and fossil-derived carbon dioxide. Radiocarbon sampling and determination
- BS ISO 18466:2016 Stationary source emissions. Determination of the biogenic fraction in CO2 in stack gas using the balance method
- ASTM D6866 – 21 Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis

3.2.3. Biomass fraction for waste tyres

Tyres are composed of a mixture of steel, textiles (which may include biomass materials such as viscose filament fibres), natural and synthetic latex, carbon black and other filler materials. The composition of tyres is highly variable and differs between manufacturers and the tyre type.

An industry derived value of 27.8% for the biomass fraction of waste tyres in the UK is based on sampling and analysis across a variety of manufacturers and tyre types and compared to similar analyses in other countries. Subject to approval from their regulator, operators may use this value due to the technical difficulty and excessive cost of requiring individual operators to obtain representative samples for every batch of tyres, as required by the MRR.

The UK national factor for waste tyres takes the biomass fraction into account and no further adjustment is required.

4. Biogas fraction in natural gas grids

The UK government has introduced a Green Gas Support Scheme that provides financial incentives for new anaerobic digestion biomethane plants to increase the proportion of green gas in the gas grid. However, it is not a financial support or guarantee of origin scheme for the direct combustion of biogas as a substitute for natural gas (as may be used by UK ETS operators). This means that UK ETS operators can't claim a certain amount of biogas injected into the natural gas grid as part of their purchased natural gas using certificates obtained from their biogas supplier.

5. List of biomass materials

This informative, non-exhaustive list has been added to help interpret the definition of biomass, as set out in the MRR.

Clarification for some materials

Peat, xylite (a by-product of lignite coal production) and fossil fractions or contaminations of the materials below are not biomass (see Article 38(3) of the MRR).

Bioliquids includes viscous liquids such as waste cooking oil, animal fats, palm oil, crude tall oil, tall oil pitch and tallow.

Black liquor from the pulp and paper industry is treated as solid biomass.

Biomass materials

If the materials listed are contaminated with fossil materials (such as in case of waste wood containing varnishes, colours, resins, etc), these materials must be treated as mixed materials.

Group 1: Plants and parts of plants:

- Straw
- Hay and grass
- Leaves, wood, roots, stumps, bark
- Crops, such as maize and triticale

Group 2: Biomass wastes, products, and residues:

- Industrial waste wood (waste wood from woodworking and wood processing operations and waste wood from operations in the wood materials industry)
- Used wood (used products made from wood and wood materials), products and by-products from wood processing operations
- Wood-based waste from the pulp and paper industries, for example, black liquor (with only biomass carbon)
- Crude tall oil, tall oil and pitch oil from the production of pulp
- Forestry residues

- Lignin from the processing of plants containing lignocellulose
- Animal, fish and food meal, fat, oil and tallow
- Primary residues from the food and beverage production
- Plant oils and fats
- Manure
- Agricultural plant residues
- Sewage sludge
- Biogas produced by digestion, fermentation or gasification of biomass
- Harbour sludge and other waterbody sludges and sediments
- Landfill gas
- Charcoal
- Natural rubber or latex

Group 3: Biomass fractions of mixed materials:

- The biomass fraction of flotsam from waterbody management
- The biomass fraction of mixed residues from food and beverage production
- The biomass fraction of composites containing wood
- The biomass fraction of textile wastes
- The biomass fraction of paper, cardboard, pasteboard
- The biomass fraction of municipal and industrial waste
- The biomass fraction of black liquor containing fossil carbon
- The biomass fraction of processed municipal and industrial wastes
- The biomass fraction of ethyl-tertiary-butyl-ether (ETBE)
- The biomass fraction of butanol
- The biomass fraction of waste tyres resulting from natural rubber and fibres

Group 4: Fuels whose components and intermediate products have all been produced from biomass

Where a fraction of the carbon contained in the list of the following substances stems from fossil sources, such as when biodiesel is produced using methanol produced from fossil sources, these substances must be treated as mixed materials:

- Bioethanol
- Biodiesel
- Etherised bioethanol
- Biomethanol
- Biodimethylether
- Bio-oil (a pyrolysis oil fuel) and biogas
- Hydro-treated vegetable oil (HVO)

If you need a version of this document in a more accessible format, please email alt.formats@energysecurity.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.