Department for Transport

RTFO Guidance for Recycled Carbon Fuels

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Contents

1. Introduction

Guidance Scope

1.1 This document contains supplementary guidance specific to Recycled Carbon Fuels (RCFs), explaining how RCFs are defined and treated under the Renewable Transport Fuel Obligation (RTFO). This includes guidance on how feedstock eligibility is determined and the specific carbon and sustainability criteria for RCFs. This guidance should be read in conjunction with the wider guidance of the RTFO scheme.

RCF eligibility under the RTFO

1.2 For fuel to be defined as a RCF under the RTFO Order, the fuel must be:

- made from a designated fossil waste which cannot be recycled, reused or prevented, and which has been designated as a relevant feedstock following the process and criteria outlining in Chapter 2, and,
- of a development fuel type (see paragraph 1.3 and Chapter 4 of the RTFO Compliance Guidance), and in the case of RCF hydrogen, must also meet paragraphs 1.3 and 1.4 below.

1.3 In the case of RCF hydrogen, in order to be eligible under the RTFO, the production pathway must include substantial carbon capture and storage (CCS) of the otherwise emitted carbon (see paragraph 1.4).

1.4 For the purposes of paragraph 1.3, to meet the requirement for “substantial CCS” for hydrogen, a supplier should be able to demonstrate that at least 50% of the carbon produced and otherwise emitted in the conversion process (e.g. as CO2 or CH4) has been captured and permanently stored in line with RTFO guidance on CCS (see paragraph 3.25). It is permissible to count carbon captured and stored elsewhere in the supply chain towards meeting the 50% requirement.

1.5 To be eligible for dRTFCs, **RCFs must meet the criteria for eligibility set out in the RTFO Order (also see Chapter 2)**. A list of currently eligible RCF feedstocks can be found in Annex A. Where a feedstock is not listed, suppliers can apply for a feedstock assessment following the process set out in Chapter 2.

1.6 A fuel which does not meet the definition of an RCF under paragraph 1.2 will be considered a fossil fuel and may incur an obligation under the RTFO if it is of an obligated fuel type and supplied for an obligated use in the UK (see the RTFO Compliance Guidance for more details).

1.7 Some feedstocks are part-biological, part-fossil in origin and so the finished fuel will be part-biofuel, part-fossil fuel. It is also possible that a portion of the fossil fuel will be eligible under the RTFO as an RCF, in which case the fossil portion should be further divided into RCF and non-RCF (fossil) portions. Similarly, if part of the energy input to the fuel is provided by a RFNBO (e.g. electrolytic hydrogen from renewable sources), then a proportion of the finished fuel will be a RFNBO. This guidance applies specifically to the portion of fuel which is attributable to the RCF portion. For the portion of fuel attributable to the biological portion of the feedstock or the non-RCF portion of the fossil portion, reporting parties should follow the RTFO Compliance Guidance. Any portion of the fuel attributable to RFNBOs should follow the RTFO Guidance for RFNBOs.

1.8 Where only part of the fuel is derived from an eligible RCF feedstock, the amount of eligible RCF produced should be calculated as follows:

$$\text{MJ of RCF} = \frac{\text{MJ of eligible RCF inputs}}{\text{MJ of all energy inputs}} \times \text{MJ of fuel produced}$$

1.9 Suppliers should follow the guidance on partially renewable fuels in Chapter 4 of the RTFO Compliance Guidance, regarding the evidence requirements for part RCF, part non-RCF fuels.

Requirements to receive RTFCs

1.10 Only RCFs which have been made from a designated feedstock (see Chapter 2), **and** that are of a development fuel type, **and** that meet the RTFO sustainability criteria, are eligible for dRTFCs. To apply for dRTFCs, suppliers must also meet the wider requirements of the RTFO such as the submission of fuel quantities, carbon and sustainability information, chain of custody requirements and having supplied fuel for use in relevant transport modes in the UK. Suppliers should refer to the RTFO Compliance Guidance for more information.

1.11 Eligible RCFs receive 1 dRTFCs per litre equivalent of eligible fuel. RCFs must be of a development fuel type and so are not eligible for general RTFCs.

1.12 Some RCFs are eligible for specific reward reflecting their energy content. Specific multipliers and RTFC reward rates are outlined in Chapters 1 and 6 of the RTFO Compliance Guidance.

1.13 Any fuel rewarded under the RTFO must meet the requirements with regards to multiple incentives, outlined in Chapter 6 of the RTFO Compliance Guidance.

1.14 To meet the sustainability criteria, an RCF must achieve the greenhouse gas saving set out in Chapter 3 relative to the fossil fuel comparator baseline of 94 gCO_2eq/MJ. GHG emissions must be calculated in line with the methodology set out in Chapter 3.

The RCF must also meet the sustainable waste management criteria also set out in Chapter 3.

1.15 Should a consignment of RCF fail to meet the sustainability criteria then this volume will not be eligible for dRTFCs. Moreover, this volume of unsustainable fuel will be added to the supplier's fuel supply from which its obligation is calculated, provided the supplier exceeds the reporting threshold (see Chapter 3 in the RTFO Compliance Guidance).

1.16 In line with the treatment of other fuels under the RTFO, suppliers must, on request by the Administrator, be able to provide evidence of a complete chain of custody for a given consignment of fuel from feedstock up to the assessment point. This chain of custody must follow the principles of mass balance. More information is provided in the RTFO Compliance Guidance.

2. Process for determining feedstock eligibility

Assessment process

2.1 To be classified as an RCF for the purposes of the RTFO, the finished fuel must firstly be derived from a feedstock that has been assessed by the RTFO Administrator to meet the eligibility principles set out in the RTFO Order. These principles and the assessment process are described in more detail in this Chapter. A list of feedstocks which have already been assessed can be found in Annex A.

2.2 Where a supplier wishes to use a feedstock not included in Annex A, the operator can apply to the Administrator for a material to be assessed by filling in a form available from the Administrator (email: rtfo-compliance@dft.gov.uk).

2.3 It is the responsibility of suppliers to demonstrate to the Administrator's satisfaction that materials are eligible to be designated as RCF feedstocks. The Administrator will ask the supplier to provide information on the process that results in the material, its economic value and other uses. This information will be considered according to the principles set out in this guidance (2.11 onwards).

2.4 Where appropriate, the Administrator will seek further information and advice, to inform their decision. This could include public consultation, and analysis by technical consultants to support eligibility decisions. Commercial information will only be shared with the express consent of the applicant and the Administrator will discuss with the applicant the procedure to be followed. The Administrator will use the available information to determine whether the material should be designated an eligible RCF feedstock.

2.5 Once a material has been assessed and a decision made, if the feedstock is deemed eligible it will be designated as an RCF feedstock, included in the list of materials in Annex A of the guidance and all suppliers will be informed. Applicants should be aware that assessments of RCF feedstock eligibility can take several months while evidence is collected, and the necessary consultation is undertaken. The Administrator will normally expect to complete an assessment within three months, although for complex cases it may be considerably longer.

2.6 As part of the assessment process, the Administrator will consider the appropriate counterfactual fate for the material being assessed. Where the appropriate counterfactual fate differs from the default counterfactual fate (see paragraph 3.31), the Administrator will define this fate and how the displaced GHG emissions should be taken into account (see Chapter 3).

2.7 Categorisations of materials will be applicable from the date of the RTFO Administrator's decision and applied to all fuel produced from that feedstock supplied from that point forwards.

2.8 The Administrator may decide to review and reassess the eligibility of materials, or redesignate the appropriate counterfactual fate, if sufficient evidence emerges to indicate that a material should be treated differently.

2.9 The Administrator's view on whether a feedstock is an eligible RCF feedstock is relevant to the RTFO scheme only and is not applicable to the status of the material under any other government policy.

2.10 The application for, and/or issuance of, dRTFCs under the RTFO does not certify that the fuels supplied are compliant with the Motor Fuel (Composition and Content) Regulations 1999. Suppliers are reminded that they have a wider obligation to consider the risks to human health and the environment. These impacts include that of air quality resulting from the combustion of novel and potentially contaminated feedstocks.

Feedstock eligibility principles

2.11 To be designated as an RCF feedstock under the RTFO, the material is firstly required to meet the RTFO definition of waste[1] and must be a waste that cannot be prevented, reused, or recycled – in accordance with the waste hierarchy.

2.12 Should a feedstock meet the definition of a waste or residue as set out in the previous section, the Administrator will then decide whether the derived fuel produces one or more of the ‘effects’ set out in the Energy Act (2004) S.126(4). These are the effects of the production, supply, or use of fuel from such feedstocks on:

- carbon emissions
- agriculture
- other economic activities
- sustainable development
- the environment generally

[1] As per the RTFO Order: *‘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.*

2.13 When making a decision the Administrator must consider any alternative uses and alternative disposal outcomes which could have been adopted or used for the relevant material.

2.14 In line with the effects outlined above, a material will not be considered eligible for support if there is a risk of adverse environmental outcomes. For example, if there is evidence that eligibility of a material might incentivise the increased production of the waste, disincentivise good waste management practices (e.g. separation of waste), or if the material is currently recyclable using best available techniques (BAT). In determining whether a material is recyclable, the RTFO Administrator may also take into account new technological developments anticipated in the short- to medium-term, such as a recycling technology which is proven but not yet scaled-up.

2.15 In considering alternative uses and disposal outcomes, a feedstock is unlikely to be deemed eligible if there is a risk that RCF eligibility will divert feedstock from end-of-life (EoL) fates with high counterfactual emissions (such as cases where the feedstock would be replaced purely by fossil fuels) or risks undermining the ability of other industries to decarbonise. Fuel producers are expected to seek out and maximise the use of feedstocks where they are not already critical to another industry's decarbonisation efforts. Where this is a potential risk, RCF producers will need to demonstrate to the Administrator that there is not a risk of diversion.

3. Carbon and sustainability requirements for RCFs

Requirements

3.1 In line with the treatment of eligible fuels under the RTFO, RCF suppliers must demonstrate that the fuel is sustainable to qualify for dRTFCs. RCF suppliers are also required to meet the broader requirements of the RTFO as set out in in the RTFO Compliance Guidance (see Chapters 1, 2, 5 & 6). These include, amongst others: having an account with the Administrator; being the owner of the fuel at the duty point (or equivalent assessment time for fuels which are not subject to duty); having paid all duty that is liable on fuel to HMRC; having supplied the fuel at, or for delivery into the UK for use in a relevant transport mode, and having the application verified by a third party verifier appointed by the supplier, in accordance with Chapter 12 of the RTFO Compliance Guidance.

3.2 With regards to the specific Carbon and Sustainability requirements, RCFs must meet the following criteria:

- GHG emission savings threshold (see paragraph 3.8 onwards)
- Sustainable waste management criteria (see paragraph 3.3)

Sustainable waste management criteria for RCFs

General requirements

3.3 The sustainable waste management criteria, as defined in Schedule 1 of the RTFO Order 2007, require that in the production of all consignments of RCF, adequate monitoring or management plans are in place to address the local environmental impacts caused as a result of sourcing or processing the waste. Annex B sets out how these criteria can be satisfied.

3.4 The sustainable waste management criteria can be met at a national or production plant level, depending on whether existing regulatory frameworks are in place and enforced in the location in which the RCF production takes place.

Demonstrating compliance

3.5 The RTFO Administrator will ask for evidence that the criteria outlined in paragraph 3.3 have been met as part of the existing fuel pathway in-principle assessment process. The RTFO Administrator is likely to ask for evidence, such as an environmental permit and description of processes, to ensure that a given site is following these principles.

3.6 Where a voluntary scheme is recognised as demonstrating compliance with the Sustainable Waste Management Criteria, suppliers can use voluntary scheme certification to demonstrate compliance.

3.7 In the absence of an eligible voluntary scheme or a relevant national scheme (such as the Environment Agency permit scheme), the RTFO Administrator may ask the reporting party to undertake Third-Party Audits against the Sustainable Waste Management Standard to demonstrate that the required criteria have been met.[2] This will be determined on a case-by-case basis. Any audits should follow the audit guidelines outlined in Annex J of the RTFO Compliance Guidance.

GHG emission savings requirements

3.8 The general requirements for demonstrating compliance with the greenhouse gas emission savings criteria are set out in Chapter 8 of the RTFO Compliance Guidance.

3.9 This subsection of the guidance sets out the specific GHG emissions savings threshold and calculation methodology which must be used to calculate the GHG emissions attributable to RCF consignments. A separate methodology is provided for biofuels in Chapter 8 of the RTFO Compliance Guidance and for renewable fuels of non-biological origin (RFNBOs) in the RTFO RFNBO guidance.

3.10 This methodology is distinct from the other GHG methodologies set out under the RTFO in that it is a counterfactual methodology, where emissions are calculated relative to the counterfactual fate. As set out in paragraphs 1.7 & 1.8, fuels that are any mix of RCF, RFNBO, biofuel, and/or fossil should be divided into appropriate consignments with GHG emissions calculated separately following the corresponding methodologies.

GHG emissions saving threshold

3.11 GHG emissions savings percentage from recycled carbon fuels should be calculated as follows:

[2] The Sustainable Waste Management Standard is under development and will be published in due course.

$$\text{GHG Saving (\%)} = \frac{(E_{FF} - E_{RCF})}{E_{FF}} \times 100$$

Where:

E_{RCF} = total emissions from the recycled carbon fuel

E_{FF} = total emissions from fossil fuel comparator for transport

3.12 To be eligible for dRTFCs, RCFs must demonstrate an emission saving relative to the fossil fuel comparator (FFC) of at least the RCF GHG emissions saving threshold. Put another way, the carbon intensity of the RCF fuel cannot exceed the maximum carbon intensity as calculated in paragraph 3.16.

3.13 The carbon intensity for fossil fuels (e.g. petrol, diesel, etc.), referred to as the fossil fuel comparator (FFC), is 94 gCO2e/MJ.

3.14 The maximum carbon intensity for RCFs can be expressed as follows:

$$CI_{max,y} = (1 - Threshold_{baseline}) \times FFC + \frac{Ef_e}{Ef_{RCF}} \times E_{e,y}$$

The emissions saving threshold percentage can then be calculated as follows:

$$\text{RCF GHG emissions saving threshold} = \frac{FFC - CI_{max,y}}{FFC}$$

A description and standard values for each parameter can be found in Table 1.

Parameter	Description	Value
$CI_{max,y}$	The maximum permissible carbon intensity for RCFs supplied in year y (gCO_2e/MJ)	Calculated following paragraph 3.14
$Threshhold_{baseline}$	The baseline threshold which RCF producers are required to meet (%)	75%
FFC	The fossil fuel comparator for the relevant year (gCO_2e/MJ)	94 gCO_2e/MJ
Ef_e	Standard efficiency of conversion in the counterfactual use (%)	22%
Ef_{RCF}	Standard efficiency of conversion to RCF (%)	50%
$E_{e,y}$	Emission factor of the UK electricity grid applicable to year y - the most recent available figure at the start of that year (gCO_2e/MJ)	Calculated following paragraph 3.16

Table 1 Description and standard values for each parameter in paragraph 3.11.

3.15 E_e is calculated each year by the Administrator from the Government conversion factors for company reporting of greenhouse gas emissions published by the Department for Energy Security and Net Zero. It includes both Scope 2 and Scope 3 emissions associated with electricity production and distribution (see paragraph 3.32) but does not include emissions associated with include transmission and distribution (T&D) emissions.

3.16 For **2024**, the figure for E_e is based on the figures published for 2023 in June 2023 which results in a value of E_e of 70.3 gCO2e/MJ and a figure for $CI_{max,2024}$ of **54.4 gCO2e/MJ**. This equates to a minimum savings threshold of **42.1%**.

Overall methodology

3.17 Greenhouse gas (GHG) emissions from the production and use of recycled carbon fuels (RCFs) shall be calculated as follows:

$$E_{RCF} = e_{prod} + e_{td} + e_{disp} - e_{ccs}$$

Where:

- E_{RCF} = total emissions from the use of the fuel (gCO2e/MJ)
- e_{prod} = emissions from production and processing
- e_{td} = emissions from transport and distribution (gCO2e/MJ)
- e_{disp} = emissions from displaced energy use (gCO2e/MJ)
- e_{ccs} = emission saving from carbon capture and geological storage (gCO_2e/MJ)

3.18 Emissions from the manufacture of machinery and equipment needed for RCF production shall not be taken into account.

3.19 GHG emissions from RCFs, E_{RCF}, shall be expressed in terms of grams of CO_2 equivalent per MJ of fuel, gCO_2e/MJ.

3.20 The greenhouse gases taken into account for the purposes of the equation in paragraph 3.17 shall be CO_2, N_2O and CH_4. For the purpose of calculating CO_2 equivalence, the global warming potential figures applied to those gases shall be as follows:

- CO_2: 1
- N_2O: 298
- CH_4: 25

3.21 GHG emission savings percentage from RCFs shall be calculated as follows:

$$\text{GHG Saving (\%)} = \frac{(E_{FF} - E_{RCF})}{E_{FF}} \times 100$$

Where:

E_{RCF} = total emissions from the RCF

E_{FF} = total emissions from fossil fuel comparator for transport

3.22 For the purposes of the calculations referred to in paragraph 3.21, the fossil fuel comparator E_{FF} shall be 94 gCO_2eq/MJ.

Guidance on calculating individual components

3.23 Emissions from processing, e_{prod}, shall include emissions:

- from the processing itself
- from waste and leakages
- from the production of chemicals or products used in processing including the CO_2 emissions corresponding to the carbon contents of fossil inputs, whether or not actually combusted in the process

However, for RCFs specifically, e_{prod} does not include emissions of CO_2 which derive from the feedstock itself, as these emissions are assumed to cancel out with the counterfactual fate.

In accounting for the consumption of electricity imported from an electricity grid rather than being generated on-site within the fuel production plant, the GHG emissions intensity of the production and distribution of that electricity shall be assumed to be equal to the average emission intensity of the production and distribution of electricity in a defined region.[3] By way of derogation from this rule, the electricity can be attributed a GHG emissions intensity of zero if the electricity can be demonstrated to be wholly additional renewable electricity as per Chapter 2 of the RTFO Guidance for RFNBOs. Guarantees of Origin are not considered acceptable evidence for demonstrating the use of additional renewable electricity.

In accounting for the consumption of methane or natural gas not produced within the fuel production plant, the gas consumed should be assumed to be entirely fossil gas (and appropriate GHG emissions factors applied). However, if it can be demonstrated that an equivalent quantity of renewable gas has been produced and mass balanced to the point of consumption, the GHG emissions intensity of the gas consumed can be taken to be that of the renewable gas. However, the GHG emissions intensity cannot be taken to be less than zero and the requirements of the RTFO Guidance for Biomethane must be met.

Emissions from processing shall include emissions from drying of interim products and materials where relevant.

3.24 Emissions from transport and distribution, e_{td}, shall include emissions from the transport of raw and semi-finished materials and from the storage and distribution of finished materials. In the case of municipal solid waste (MSW), the emissions associated with collecting the MSW from households or other premises need not be accounted for, but e_{td} should include any emissions associated with onward transport from an initial aggregation or processing location.

3.25 Emission savings from carbon capture and storage, e_{ccs}, that have not already been accounted for in e_{prod}, shall be limited to emissions avoided through the capture and permanent storage of otherwise emitted carbon directly related to the extraction,

[3] The figures used should take into account direct (Scope 2) emissions associated with electricity generation and indirect (Scope 3) emissions associated with the extraction, refining and transportation of primary fuels as well as electricity transmission and distribution.

transport, processing and distribution of the fuel.[4] Storage must be demonstrably permanent and stable. Examples may include geological sequestration of CO2, the permanent sequestration of solid carbon through inert underground storage, or integration into concrete or cement for use in construction.

3.26 Waste fossil CO_2 is considered to have zero lifecycle greenhouse gas emissions up to the point of collection, provided these materials meet the definition of a waste[5], evidence is provided that the carbon in these materials would have otherwise been emitted into the atmosphere, and the facility generating these waste materials does not claim a reduction in their emissions due to this use of the waste fossil CO_2.

3.27 If the waste fossil generating facility does wish to claim a reduction in their emissions[6], then these GHG emissions instead need to be assigned to the waste fossil material used to produce the RCF and must contribute to E_{RCF}, in line with the material's global warming potential (e.g. one tonne of waste fossil CO_2 would be assigned 1 tCO_2e/tonne). Similarly, if the carbon in the material would not otherwise have been emitted to the atmosphere (e.g. waste fossil plastic might have sequestered its carbon for centuries in landfill, or as a building insulation material), then the additional greenhouse gas emissions from this avoided sequestration also need to be assigned to the waste fossil material and contribute to E_{RCF}.

3.28 If a supplier wishes to carry out either of the practices outlined in paragraph 3.27, they should contact the Administrator for further guidance.

Calculating the displaced emissions

3.29 The emissions from displaced energy use, E_{disp}, shall be calculated as follows:

$$E_{disp} = \frac{Ef_e \times E_e}{Ef_{RCF}}$$

Where:

- Ef_e = Efficiency of conversion in counterfactual use (%)
- E_e = Emission factor of the displaced energy in counterfactual (gCO_2e/MJ)
- Ef_{RCF} = Efficiency of conversion to RCF (%)

3.30 Ef_{RCF} should be calculated as the yield, on an energy basis, as follows:

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[4] Where carbon is sequestered in a form other than CO_2, an equivalent quantity of CO_2 sequestered should be calculated based on the amount of elemental carbon sequestered. For example, if 1 kg of solid, elemental carbon is captured and sequestered, this would be equivalent to 3.66 kgs of sequestered CO_2.

[5] 'Waste' means any substance or object which the holder discards or intends or is required to discard. It excludes substances that have been intentionally modified or contaminated to for the purpose of transforming it into a waste.

[6] For example, from a desire to reduce their costs under the UK's Emission Trading Scheme, or other national taxes on emissions. The waste fossil generating facility cannot claim a GHG savings whilst the RCF manufacturer also claims a low carbon fuel is being made, as this would be an erroneous double claim of only one set of GHG savings - since the original fossil carbon is still ultimately ending up in the atmosphere.

$$Ef_{RCF} = \frac{\text{Energy in finished fuel (accounting for losses)}}{\text{Energy in feedstock}}$$

Ef_{RCF} should be calculated over the whole supply-chain, taking into account any losses. For example, if 100 MJ of fuel is initially produced, but 3% of that fuel is lost during subsequent stages of the supply chain, the "energy in the finished fuel" would be 97 MJ.

3.31 The default counterfactual fate for RCF feedstocks is Energy from Waste (EfW) where electricity is exported to the grid, but there is no heat export. In this default counterfactual fate, Ef_e should be taken as 22%, which is determined from the R1 standard, adjusted to account for parasitic load. E_e should be taken as the average emission intensity of the electricity grid for the most recent available full year in the country from which the feedstock arose. This shall be taken to be the national grid average unless the Administrator agrees that a regional grid average can be used.

3.32 For the purposes of paragraph 3.31, figures for the grid average GHG emissions should be sourced from reliable and authoritative sources such as government bodies and/or network operators. The figures used should take into account direct emissions associated with electricity generation and indirect (Scope 3) emissions associated with the extraction, refining and transportation of primary fuels.[7]

3.33 For non-gaseous RCF feedstocks, The RTFO Administrator may define, on a case-by-case basis, alternative counterfactual fates for specific feedstocks (see paragraph 2.6). In these cases, the Administrator will also specify any modifications to the E_{disp} calculation which should be followed. We note that EfW facilities are expected to increasingly export useful heat and install CCS, which will impact E_{disp}. The Administrator will define additional evidence-based factors for heat export and/or CCS if and when this becomes relevant.[8]

3.34 Similarly, for gaseous RCF feedstocks, derogations from the default counterfactual fate will be determined on an individual production plant level if sufficient evidence is provided. Additionally, suppliers of RCFs produced from industrial gases are required to demonstrate that heat generation is not displaced by the production of RCFs. If there is evidence that increased heating requirements arise due to the production of RCFs then the RTFO Administrator would consider heat generation to be the counterfactual use. This will be assessed on a plant-by-plant basis by the Administrator.

Allocation of GHG emissions

3.35 Where an RCF production process produces, in combination, the fuel for which emissions are being calculated and one or more other products ('co-products'), upstream and relevant process step GHG emissions shall be divided between the

[7] For the UK, figures can be taken from the most recent Government conversion factors for company reporting of greenhouse gas emissions: https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

[8] Indicatively, we would expect to consider the inclusion of additional factors once at least one quarter of EfW plants in the UK have substantial heat export and/or CCS installed.

fuel or its intermediate product and the co-products in proportion to their energy content using the following equation:

$$\text{Fuel allocation factor} = \frac{\text{Energy in fuel [MJ]}}{\text{Energy in fuel [MJ]} + \text{Energy in co-products [MJ]}}$$

In the case of co-products other than electricity and heat, the energy content of products and co-products should be determined based on the lower heating value LHV (wet) of the feedstock, which can be calculated as follows:

$$LHV_{wet} = LHV_{dry} \times (1 - \%\ \text{water content}) - 2.441 \times \%\ \text{water content}$$

The GHG intensity of excess useful heat or excess electricity is the same as the GHG intensity of heat or electricity delivered to the biofuel production process and is determined from calculating the GHG intensity of all inputs and emissions, including the feedstock and CH_4 and N_2O emissions, to and from the cogeneration unit, boiler or other apparatus delivering heat or electricity to the biofuel production process. In the case of cogeneration of electricity and heat, the calculation is performed following paragraph 3.37.

3.36 For the purposes of the calculation referred to in paragraph 3.35, the emissions to be divided shall be e_{disp} and those fractions of e_{prod}, e_{td} and e_{ccs} and that take place up to and including the process step at which a co-product is produced. If any allocation to co-products has taken place at an earlier process step in the life-cycle, the fraction of those emissions assigned in the last such process step to the intermediate fuel product shall be used for those purposes instead of the total of those emissions.

All co-products shall be taken into account for the purposes of that calculation. No emissions shall be allocated to wastes and residues. Co-products that have a negative energy content (LHV_{wet}) shall be considered to have an energy content of zero for the purposes of the emissions allocation calculation. Wastes and residues shall be considered to have zero life-cycle greenhouse gas emissions up to the point of collection of those materials irrespective of whether they are processed to interim products before being transformed into the final product.

In the case of fuels produced in refineries, other than the combination of processing plants with boilers or cogeneration units providing heat and/or electricity to the processing plant, the unit of analysis for the purposes of the calculation referred to in paragraph 3.35 shall be the refinery.

3.37 Where a cogeneration unit – providing heat and/or electricity to an RCF production process for which emissions are being calculated – produces excess electricity and/or excess useful heat, the GHG emissions shall be divided between the electricity and the useful heat according to the temperature of the heat (which reflects the usefulness (utility) of the heat). The useful part of the heat is found by multiplying its energy content with the Carnot efficiency, C_h, calculated as follows:

$$C_h = \frac{T_h - T_0}{T_h}$$

Where:

- T_h = Temperature, measured in absolute temperature (kelvin), of the useful heat at the point of delivery
- T_0 = Temperature of surroundings, set at 273.15 kelvin (equal to 0 °C)

If the excess heat is exported for heating of buildings, at a temperature below 150 °C (423.15 kelvin), C_h can alternatively be defined as follows:

C_h = Carnot efficiency in heat at 150 °C (423.15 kelvin), which is: 0.3546

For the purposes of this calculation, the actual efficiencies shall be used, defined as the annual mechanical energy, electricity and heat produced respectively divided by the annual energy input.

For the purposes of this calculation, the following definitions apply:

- ‘cogeneration’ shall mean the simultaneous generation in one process of thermal energy and electrical and/or mechanical energy
- ‘useful heat’ shall mean heat generated to satisfy an economically justifiable demand for heat, for heating or cooling purposes
- ‘economically justifiable demand’ shall mean the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions

Annex A Current eligible RCF feedstocks under the RTFO

Feedstock name	Description	Default counterfactual fate
Municipal solid waste (fossil portion)	Mixed biogenic/fossil non-hazardous waste which is either collected from households or is a household-like waste collected from commercial or industrial premises.	EfW (electricity only)
Industrial waste processing gasses	Industrial waste process gases rich in carbon monoxide, that are only suitable for incineration for energy recovery.	EfW (electricity only)

Table 1 RCF Feedstocks currently eligible under the RTFO

Annex B Sustainable waste management criteria

Wastes of fossil origin meet the sustainable waste management criteria if the fuel supplier provides evidence that satisfies the Administrator that adequate monitoring or management plans are in place to address the local environmental impacts caused as a result of sourcing or processing the waste. All applicable waste regulatory controls must be complied with in full in the country of origin, which includes all permissions, licences and permits required of waste management and processing operations and includes compliance with any regulatory controls applicable to trans boundary shipping of wastes. Waste must be handled in compliance with HSE/EA guidelines or an ISO 14001 accredited environmental management system, to the level of ISAE 3000 assurance, which ensures compliance with most of the key required criteria.

Criterion	Indicators	Evidence
Compliance with the Waste Hierarchy is demonstrated	Demonstration that material recovery options have been explored and found to be unsuitable based on economic, logistical or sustainability grounds. The process through which the waste feedstock is produced has not been intentionally modified to increase the production of the waste. • For biogenic wastes, there shall be no deliberate contamination of a material with the intention of classifying it as a waste.	Best available techniques have been used to maximise separation of waste and extract any recyclable material. Hazardous Waste Consignment Note confirming compliance with Reg 12 of the Waste (England and Wales) regulations 2011 Operating permit under the Environmental Permitting Regulations (England and Wales) Regulations 2010 or equivalent (Guidance)
Operators carrying out waste treatment shall obtain and comply with any relevant permit and registration requirements	The permit should specify: • the types and quantities of waste that may be treated; • for each type of operation permitted, the technical and any other requirements relevant to the site concerned; • the safety and precautionary measures to be taken; • the method to be used for each type of operation throughout the supply chain; • such monitoring and control operations as may be necessary; • such closure and after-care provisions as may be necessary.	Details of the permit shall be made available upon request. The permit shall be in date and apply to the operation in question. In addition: • Evidence of the existence of a waste management plan which should include risk assessment and management, target setting and monitoring performance against targets. • Evidence of any registration of exemptions for low-risk waste treatment operations.

Compliance with applicable laws relevant to waste management practices.	Evidence of compliance with applicable international, national and local laws and regulation with respect to waste management.	The operation should prove that: • it is familiar with relevant international, national and local legislation (i.e. Flood Defence Consent, planning permission requirements); • it complies with these legislations; • it remains informed on changes in legislation.
Appropriate records shall be kept	Traceability of wastes is ensured. Evidence shall be available to ensure that all prior elements of the supply chain of the waste have relevant permits/accreditations for the handling of the waste. Operators handling waste shall keep a chronological record of: • the quantity, nature and origin of that waste and the quantity of products and materials resulting from preparing for re-use, recycling or other recovery operations; • and where relevant, the destination, frequency of collection, mode of transport and treatment method foreseen in respect of the waste.	• Record keeping is made available to the relevant authority. (e.g. waste transfer/consignment notes) • A Sustainable Waste Management plan (Environmental Management Plans or international equivalent submitted as part of an application to the RTFO Administrator) including details of responsible parties in the organisation. • Records of risk assessments, monitoring and management measures undertaken, which shall be kept for at least 5 years. • Proof of no outstanding environmental enforcement actions against the operator
Health and safety of workers handling the waste shall be ensured	The operator shall ensure that workers are trained in the correct handling, transport and storage of waste, in particular for hazardous waste.	Evidence of work-based training • work-related health and safety risks and preventative measures for minimising the risk to health and safety (training as a minimum to ISO 45001 Occupational Health and Safety Standard) • work-related risks to the environment and/or society • correct application, transport, storage and handling of hazardous substances and waste
Hazardous waste shall be appropriately handled and stored	Hazardous waste shall be handled and stored safely in a manner appropriate to the risk of the waste. Hazardous waste shall be kept separate and not mixed with other waste unless there is evidence that human and environmental health will not be compromised, and the mixing conforms to Best Available Techniques.	• Any hazardous waste is stored and handled with clear identification. • Warning signs are placed where appropriate.

No waste activity is undertaken which endangers human health or harms the environment	• No risk to soil water or air quality. • Wastes shall not be in direct/indirect contact with soils, water sources and air outside processing and production units unless adherence to local or national guidelines is demonstrated. • No nuisance shall be created through noise or odours. • No adverse effects to human health or the environment	• Evidence should be produced to ensure waste is handled and stored in appropriate conditions to prevent any environmental contamination. • Evidence that there is control of emissions of major pollutants including carbon monoxide, nitrogen oxides, volatile organic compounds, particulate matter, sulphur compounds, dioxins and other substances recognised as potentially harmful for the environment or human health. • Evidence of emissions control via an air management plan
Energy efficiency	Measures shall be taken to implement efficient processes for conversion of residues, wastes or by-products into fuels, appropriate to the scale and intensity of the operation.	It is recommended that Best Available Techniques are used.

Table 2 Criteria and indicators for Sustainable Waste Management