REDcert

Scheme principles for GHG calculation

Version 04

1 Requirements for greenhouse gas saving

According to Directive 2009/28/EC and Directive 2009/30/EC which was most recently amended by Directive (EU) 2015/1513, the greenhouse gas emission saving from the biofuels and bioliquids used must be at least 35%. The greenhouse gas emission saving (GHG emission saving) denotes the percentage of greenhouse gas emissions (GHG emissions) that could be saved by using bioliquids/biofuels instead of fossil fuels.

This GHG saving threshold will increase

- on 1 January 2018 to at least 50% and
- at least 60% for biofuels produced in installations starting operation after 5 October 2015

An installation is considered to be in operation if the physical production of biofuels or bioliquids has taken place. It is important to verify whether the installation started operation after the cut-off date. The last interface supplying biofuel or bioliquids provides information on whether the biofuel or bioliquid was produced in an installation that was in operation on or before 5 October 2015.

Starting 1 April 2013, the minimum greenhouse gas emission saving must be met for the bioliquid/biofuel to comply with the REDcert scheme requirements, regardless of when the feedstock, biofuel or bioliquid was produced.

2 Scheme principles for the greenhouse gas calculation

2.1 Methodology for greenhouse gas calculation

The total GHG emissions and the GHG emissions saving arising from the use of biofuels and bioliquids are to be calculated in accordance with Directive 2009/28/EC Article 19 (1) to Article 19 (3) and Annex V of Directive 2009/28/EC as well as in accordance with the Commission Decision 2010/335/EU of 10 June 2010, the EC Communication 2010/C 160/02, Annex II and the Note on the conducting and verifying of actual calculations of the GHG emission saving.

Greenhouse gas emissions from the production and use of transport fuels, biofuels and bioliquids are to be calculated using the following formula[1]

[1] in accordance with Directive 2009/28/EC:

$$E = e_{ec} + e_l + e_p + e_{td} + e_u - e_{sca} - e_{ccs} - e_{ccr} - e_{ee}$$

where

E = *total emissions from the use of the biofuels and bioliquids*

e_{ec} = *emissions from production of the relevant raw materials, and especially in cultivation*
and harvesting of the biomass from which the bioliquids are produced. The carbon fixation during cultivation is not included

e_l = *annualised emissions resulting from carbon-stock changes caused by land-use change*

e_p = *emissions from processing*

e_{td} = *emissions from transport and distribution*

e_u = *emissions from the use of the bioliquid/biofuel. Combustion or degradation of the biomass is not taken into account*

e_{sca} = *emission saving from soil carbon accumulation*
via improved agricultural management

e_{ccs} = *emission saving from carbon capture and geological storage*

e_{ccr} = *emission saving from carbon capture and replacement*

e_{ee} = *emissions savings from excess electricity from cogeneration*

Greenhouse gas emissions from biofuels/bioliquids (E) are expressed in terms of grams of CO_2 equivalent per MJ of biofuel/bioliquid [gCO_2eq/MJ]. Greenhouse gas emissions from raw materials and intermediate products are expressed in terms of grams of CO_2 equivalent per kilogram of dry feedstock and intermediate products [gCO_2eq/kg dry].

Emissions from the manufacture of machinery and equipment are not taken into account. Emissions from fuel use (e_u) are assumed to be 0 for biofuels
and bioliquids.

Economic operators make available to the inspector all relevant information about the calculation of actual GHG emissions in advance of the planned inspection. All data measured and gathered on site which is relevant for the calculation of actual values must be documented and provided to the inspector for verification.

Information on GHG emissions must include accurate data on all relevant elements of the emission calculation formula (if applicable) according to Directive 2009/28/EC, Annex V, Part C, No. 1.

The inspector must record and document the greenhouse gas emissions (after allocation) produced at the site inspected and, if necessary, the savings in the inspection report or in accompanying documentation to show that the calculation has been thoroughly verified and understood.

If these emissions deviate significantly from typical values (in accordance with Annex V, Parts D and E of Directive 2009/28/EC), the reasons that explain the deviation should be included in the inspection report.

The GHG emission saving of biofuels/bioliquids is to be determined using one of the following alternatives as stipulated in Directive 2009/28/EC:

- using the default values (last interface)
- based on actual values calculated in accordance with the methodology in Directive 2009/28/EC (see the requirements below)
- using disaggregated default values and actual values

<u>Calculation using default values</u>:

Economic operators can use the default value for the GHG emission saving to provide proof of compliance with the greenhouse gas saving requirement if the production pathway is listed in Annex V of Directive 2009/28/EC and if the GHG emissions resulting from carbon-stock changes caused by land-use change (e_l value) are less than or equal to “0”. Default values

are to be taken from Annex V of Directive 2009/28/EC. The European Commission may update the default values.

Any updates will immediately enter into force in the REDcert scheme. When the total default value is used, information on GHG emissions should only be reported for final biofuels/bioliquids and can be reported as an aggregate. If the total default value can be applied, economic operators up to the last interface declare “Use of total default value” on their delivery documents. The disaggregated default values should also only be reported for final biofuels/bioliquids and they are applicable for certain elements in the supply chain (e_{ec}, e_p and e_{td}). If economic operators up to the last interface use the disaggregated default values, they have to declare “Use of disaggregated default value” on their delivery documents. For example “Use of disaggregated default value for e_{ec}” or “Use of disaggregated default value for e_{td}”. GHG emission data should only be included on documentation if actual values have been applied. Default values listed in Annex V can only be applied if the process technology and feedstock used for the production of the biofuel match their description and scope. In case specific technologies are set out, the default values can only be used if those technologies were actually applied. If necessary, both the process technology and the raw materials used must be specified.

Calculation using actual values:

Actual values can be used at any stage of the chain of custody regardless of whether there is a default value or not. Actual values of emissions can only be determined at the point in the chain of custody where they originate (e. g. actual values of emissions from cultivation (e_{ec}) can only be determined at the origin of the chain of custody). Similarly, economic operators will only be able to use actual values for transport if emissions of all relevant transport steps are taken into account. Actual values of emissions from processing can only be determined if emissions of all processing steps are recorded and transmitted through the chain of custody. Actual values are to be calculated in accordance with the methodology described in Directive 2009/28/EC. All GHG emissions (if applicable) that are linked with the incoming feedstock (upstream emissions from e_{ec}, e_l, e_p, e_{td} and e_{ee}) are to be adjusted to the respective intermediate product using the feedstock factor.

The following formula is to be used to determine the feedstock factor in relation to the intermediate product:

$$\text{Feedstock factor}_a = \frac{\text{feedstock}_a[\text{kg}_{\text{dry}}]}{\text{intermediate product}_a[\text{kg}_{\text{dry}}]}$$

Ratio of kg of dry feedstock required to make 1kg of dry intermediate product.

In addition to the upstream emissions, the emissions for the recipient that occur at the respective interface are to be included.

Whenever a processing step yields co-products, emissions need to be allocated (see section 2.2.9 “Allocation of the greenhouse gas emissions”).

An example is provided below to illustrate how the feedstock factor and allocation factor intermediate product are applied to emissions from cultivation (e_{ec}).

$$e_{ec}\,intermediate\ product_a \left[\frac{gCO_2eq}{kg_{dry}}\right]_{ec} = e_{ec}\,feedstock_a \left[\frac{gCO_2eq}{kg_{dry}}\right] * Feedstock\ factor_a * Allocation\ factor\ intermediate\ product_a$$

The upstream emissions for the processing step from e_{ec}, e_l, e_p, e_{td} and e_{ee} as well as the emissions to be included for this interface (if applicable) needs to be converted using the biofuel feedstock factor, the allocation factor biofuel/bioliquid and the lower heating value (LHV) into the unit CO_2eq/MJ of final biofuel/bioliquid.

The following formula is to be used to determine the biofuel feedstock factor in relation to the biofuel/bioliquid:

$$\text{Biofuel feedstock factor}_a = \frac{\text{feedstock}_a\,[\text{MJ}]}{\text{biofuel/bioliquid}_a\,[\text{MJ}]}$$

Ratio of MJ feedstock required to make 1 MJ biofuel/bioliquid.

Whenever a processing step yields co-products, emissions need to be allocated (see section 2.2.9 “Allocation of the greenhouse gas emissions”).

An example is provided below to illustrate how the biofuel feedstock factor and allocation factor biofuel/bioliquid are applied to emissions from cultivation (e_{ec}).

$$e_{ec}biofuel/bioliquid_a \left[\frac{gCO_2eq}{MJ\ biofuel/bioliquid}\right]_{ec} =$$

$$\frac{e_{ec}\ feedstock_a \left[\frac{gCO_2eq}{kg_{dry}}\right]}{LHV_a \left[\frac{MJ\ feedstock}{kg\ dry\ feedstock}\right]} * Biofuel\ feedstock\ factor_a * Allocation\ factor\ biofuel/bioliquid_a$$

For the purpose of this calculation feedstock factors based on plant data have to be applied. Please note that for the calculation of the biofuel feedstock factor, the LHV values per dry tonne need to be applied while for the calculation of the allocation factor LHV values for wet biomass need to be used as this approach was also applied for the calculation of the default values. For the purposes of allocation only, the “wet definition LHV” is used. This subtracts from the LHV of the dry matter, the energy needed to evaporate the water in the wet material.

Products with a negative energy content are treated at this point as having zero energy, and no allocation is made. See also 2009/28/EC, Annex V, Part C, point 18.

Once the last interface has determined the total GHG emissions for all elements (if applicable) of the formula in accordance with Directive 2009/28/EC, Annex V, Part C, No. 1 in gCO_2eq/MJ of biofuel/bioliquid, other or subsequent emissions for transport and distribution are to be included, see section 2.2.5 “Requirements for calculating greenhouse gas emissions from transport and distribution”. For information on calculating the greenhouse gas emission saving by the last interface, see section 2.2.9.

It is not necessary to include inputs in the calculation which have little or no effect on the result, e.g. low quantities of chemicals used in processing.[2] Inputs with little or no effects are those that have an impact of less than 0.5% on the total emissions of the respective production unit.

All information on actual GHG emissions is to be included in the GHG emission calculation for all elements of the formula in accordance with Directive 2009/28/EC, Annex V, Part C, No. 1 and passed along in the value chain (if applicable). Thus separate reporting of e_{ec}, e_l, e_{sca}, e_p, e_{td}, e_{ccs}, e_{ccr} and e_{ee} is necessary if relevant or applicable. This applies also to the elements of the formula which are not included in the default values such as e_l, e_{sca}, e_{ccr}, e_{ccs} and e_{ee}. If information necessary for the greenhouse gas calculation is missing, default values are to be used and this must be clearly evident in the report.

If emissions are not recorded along the production pathway and the result is that downstream operators can no longer calculate actual emissions consistently, this must be clearly indicated in the delivery documents at the phase where this gap occurred taking into account the accompanying documents.

The values (emission factors, heating values, etc.) published on the European Commission website should be used to calculate the actual GHGs: https://ec.europa.eu/energy/sites/ener/files/documents/Standard%20values%20v.1.0.xlsx.

If alternative values are used, appropriate reasons must be provided and clearly indicated in the economic operator's documentation to facilitate verification by the inspector.

Calculation using disaggregated default values and actual values:

Directive 2009/28/EC also provides disaggregated default values in accordance with sections A and D of Annex V which relate to a part of production and can be used in combination with

[2] Communication from the Commission on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels (2010/C 160/02)

actual values to calculate the GHG emissions. The disaggregated default values may then also be used if the main production took place in a region which is listed in the reports of the member states as a NUTS level 2 region in the Common classification of territorial units for statistics" (NUTS) or a region at a more disaggregated NUTS level[3], and in which the GHG emissions from cultivation correspond to the disaggregated default value stipulated in Annex V, Part D of Directive 2009/28/EC.
NUTS-2 values are to be indicated in the unit gCO_2eq/kg dry along the entire production chain. These values are alternatives to the individually calculated values. They are published on the website of the European Commission and are not default values. Consequently, they can only be considered input values to calculate individual values of the downstream interfaces. They are not, however, suitable for specifying emissions from cultivation in gCO_2eq/MJ of biofuel/bioliquid.

It is important to note here that there are no default emission values for the component "land-use changes" (e_l). If disaggregated default values are used for cultivation, GHG emissions from land-use changes always have to be added to them.

Disaggregated default values are to be taken from Annex V of Directive 2009/28/EC. The list of (disaggregated) default values can be updated by the Commission. Any changes made by the European Commission to the (disaggregated) default values will immediately enter into force in the REDcert scheme.

The (disaggregated) default values in Annex V of Directive 2009/28/EC are to be expressed in gCO_2eq/MJ of biofuel/bioliquid. The values are based on the background data of the Joint Research Center (JRC).

For every phase in the production and supply chain, the use of (disaggregated) default values and/or all details used to determine the actual values (methodology, measurements, data sources for non-measured values) must be documented.
If actual values are not used, the quantity of GHG emissions should not be transferred between various interfaces in the production chain because it is not possible to know whether this is a default value or an actual value in downstream phases. It is therefore the responsibility of downstream operators to include information about the (disaggregated) default GHG emission values for the final biofuels when reporting to the Member States.

[3] Consistent with Regulation (EC) 1059/2003 of the European Parliament and Council of level 2 of the "Common classification of territorial units for statistics" (NUTS) or regions classified as more disaggregated NUTS levels. Accessible at: http://ec.europa.eu/eurostat/de/web/nuts/overview (accessed on 24.10.2016):
National reports are accessible at: https://ec.europa.eu/energy/en/topics/renefwable-energy/biofuels/ (accessed on 24.10.2016)

2.2 Requirements for calculating GHG emissions based on actual values

2.2.1 Requirements for calculating greenhouse gas emissions from the production of raw material (e_{ec})

The GHG emissions from raw material production (e_{ec}) include the GHG emissions from cultivating and harvesting raw materials as well as the GHG emissions from the production of chemicals and other inputs used for cultivation. To calculate e_{ec}, the following data is collected on site at a minimum, i.e. the respective values are taken from, e.g. company documents:

- quantity of P_2O_5, K_2O, CaO, mineral and organic N fertilisers as well as crop residues [kg/(ha*a)] – total quantity used annually (in the year of cultivation)
- quantity of chemicals (e.g. pesticides) [kg/(ha*a)] – total quantity used annually (in the year of cultivation)
- fuel consumption [l/(ha*yr)] - total quantity of diesel used annually for, e.g. tractors and water pumps per hectare in the year of cultivation
- electricity consumption [kWh/(ha*a)] – total electricity consumption per hectare in the year of cultivation
- quantity and type of raw materials used [kg/(ha*yr)]
- harvest yield [kg dry harvest yield/(ha*a)] – quantity of the main/co-product in kg dry per hectare in the year of cultivation. If drying took place, the dry matter content of the dried product must be considered

The method for collecting measured data and the measured data for the calculation of the GHG emissions must be documented so that the calculations are also transparent. Actual values of emissions from cultivation can only be determined if greenhouse gas emissions relevant to the interface are recorded and consistently passed along through the production chain.

It must be kept in mind that the requirements above for calculations and formulas are examples. If other emissions are incurred, they must be recorded and included in the calculation. The data has to be placed in the formula in the right places.

The economic operator responsible calculates the GHG emissions for raw material production (e_{ec}) including the GHG emissions from cultivation and harvest of the raw material

as well as the GHG emissions from production of chemicals or products used in cultivation by using input data in the following formula (EM = emissions):

$$e_{ec}' = \frac{EM_{fertiliser}\left[\frac{kgCO_2eq}{ha*yr}\right] + EM_{pesticides}\left[\frac{kgCO_2eq}{ha*yr}\right] + EM_{fuel}\left[\frac{kgCO_2eq}{ha*yr}\right] + EM_{electricity}\left[\frac{kgCO_2eq}{ha*yr}\right] + EM_{N2O}\left[\frac{kgCO_2eq}{ha*yr}\right]}{crop\ yield_{main\ product}\left[\frac{kg\ crop\ \ yield}{ha*yr}\right]}$$

specified in mass units in relation to the dry harvest yield or dry main product ($kgCO_2eq/kg$ dry). The harvest yield relates to the dry matter content.

The formula below is to be used to specify the emissions of the dry matter in kg:

$$e_{ec}product_a\left[\frac{gCO_2eq}{kg_{dry}}\right] = \frac{e_{ec}\ product_a\left[\frac{gCO_2eq}{kg_{moist}}\right]}{(1 - moisture\ content)}$$

The moisture content is based on the delivery details. If it is missing or not known, it is based on the maximum value allowed in the supply contract.

Formula components in detail (EM = emissions; Ef = emissions factor):

$$EM_{fertilizer}\left[\frac{kgCO_2eq}{ha*yr}\right] = fertiliser\left[\frac{kg}{ha*yr}\right] * \left(Ef_{production-fertiliser}\left[\frac{kgCO_2eq}{kg\ fertiliser}\right] + Ef_{field}\left[\frac{kgCO_2eq}{kg\ fertiliser}\right]\right)$$

$$EM_{pesticides}\left[\frac{kgCO_2eq}{ha*yr}\right] = pesticides\left[\frac{kg}{ha*yr}\right] * Ef_{production\ \ pesticides}\left[\frac{kgCO_2eq}{kg}\right]$$

$$EM_{fuel}\left[\frac{kgCO_2eq}{ha*yr}\right] = fuel\left[\frac{l}{ha*yr}\right] * Ef_{fue}\left[\frac{kgCO_2eq}{l}\right]$$

$$EM_{electricity}\left[\frac{kgCO_2eq}{ha*yr}\right] = electricity\left[\frac{kWh}{ha*yr}\right] * Ef_{EU\ mix}\left[\frac{kgCO_2eq}{kWh}\right]$$

The values (emission factors, heating values, etc.) published on the European Commission website should be used to calculate e_{ec}:
https://ec.europa.eu/energy/sites/ener/files/documents/Standard%20values%20v.1.0.xlsx
Alternatively a scientific literature source or scientifically recognised database (e.g. BioGrace, ecoinvent database) can be used:

- $Ef_{production\ fertiliser}$ – emission factor fertiliser production [$kgCO_2eq/kg$ fertiliser]
- Ef_{field} – emission factor of nitrous oxide (N_2O) [$kgCO_2eq/kg$ N fertiliser]

For synthetic and organic nitrogen fertilisers as well as crop residues left on the field N_2O field emissions must be calculated.

An appropriate way to take into account N_2O emissions from soils is the IPCC methodology, including what are described there as both “direct” and “indirect” N_2O emissions N_2O emissions[4]. All three IPCC tiers can be used by economic operators. Tier 3 is based on detailed measurement and/or modelling. The BioGrace calculation tool provides details on the calculation of the N_2O emissions from the cultivation of the crop using IPCC Tier 1 (http://www.biograce.net/home). Another way to include these emissions is the Global Nitrous Oxide Calculator (GNOC) developed by the Joint Research Center for the biomass types not included in the BioGrace calculator http://gnoc.jrc.ec.europa.eu/

- $Ef_{pesticides}$– emission factor pesticides [$kgCO_2eq/kg$ pesticides]
- Ef_{fuel}– emission factor fuel in agricultural machinery [$kgCO_2eq/l$ fuel]
- $Ef_{EU\ electricity\ mix}$ – emission factor EU electricity mix [$kgCO_2eq/kWh$]

The data has to be placed in the formula accordingly. The source must be cited (in particular, the author, title, magazine, volume, year) for values taken from scientific literature sources or scientifically recognised databases. The values taken from literature sources or databases must be based on scientific and peer-reviewed work – with the precondition that the data used lies within the commonly accepted data range when available

The life cycle greenhouse gas emissions from waste, agricultural crop residues and production residues, including crude glycerine (unrefined glycerine), from the production of biofuels and bioliquids are considered to have zero emissions until the point of their collection.[5]

2.2.2 Requirements for calculating greenhouse gas emissions resulting from land-use change (e_l)

Land use change taking place after the cut-off date of 1 January 2008 has to be included in the calculation of the GHG emissions according to the methodology in the RED Annex V and Commission Decision 2010/335/EU of 10 June 2010. GHG emissions must be calculated for any land-use change. Land-use change should be understood as referring to changes in terms of land cover between the six land categories used by the IPCC (forest land,

[4] See 2006 IPCC guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 11 (http://www.ipcc-nggip.iges.or.jp/public/ 2006gl/pdf/4_Volume4/V4_11_Ch11_N2O&CO2.pdf)

[5] According to Annex 5 of Directive 2009/28/EC

grassland, cropland, wetlands, settlements and other land) plus a seventh category of perennial crops, i.e. multi-annual crops whose stem is usually not annually harvested such as short rotation coppice and oil palm (because such land has features of both cropland and forest land). DIRECTIVE (EU) 2015/1513, Annex 1 therefore clarifies that “cropland” and “perennial cropland” shall be regarded as one land use. For all land which according to the definition laid down in Article 1(1) of 307/2014 (EU) was grassland in January 2008 or has become grassland in the meantime, it needs to be established whether the grassland would remain or cease to be grassland in the absence of human intervention. This can be natural highly biodiverse grassland or non-natural highly biodiverse grassland. Biomass from land which is or was “non-natural highly biodiverse grassland” in January 2008 may not be used for the production of biofuels and bioliquids (see “Scheme principles for the production of biomass, bioliquids and biofuels”). This means, for example, that a change from grassland to cropland is a land-use change, while a change from one crop (such as maize) to another (such as rapeseed) is not. Cropland includes fallow land (i.e. land set at rest for one or several years before being cultivated again). A change of management activities, tillage practice or manure input practice is not considered land-use change.[6] GHG emissions from changes in carbon stocks resulting from land-use change (e_l) are to be calculated in accordance with the Commission Decision of 10 June 2010.[7]

The Commission Decision provides details on the calculation of emissions from changes in carbon stock resulting from land-use change (http://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32010D0335&from=DE).

Annualised GHG emissions from carbon stock changes caused by land-use change (el) are calculated by dividing total emissions equally over 20 years. These emissions are calculated as follows:

$$e_l = (CS_R - CS_A) \times 3.664 \times 1/20 \times 1/P - e_B^{(1)}$$[8]

(1)The quotient obtained by dividing the molecular weight of CO_2 (44.010 g/mol) by the molecular weight of carbon (12.011 g/mol) is equal to 3.664.

[6] Communication from the Commission on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels (2010/C 160/02)

[7] Commission Decision of 10 June 2010 on guidelines for the calculation of land carbon stocks for the purpose of Annex V to Directive 2009/28/EC (notified under document C(2010) 3751)

[8] For an example of calculating e_l, please see: https://ec.europa.eu/energy/sites/ener/files/2010_bsc_example_land_carbon_calculation.pdf

e_l = annualised greenhouse gas emissions from carbon stock change due to land-use change (measured as mass (grams) of CO_2-equivalent per unit biofuel energy (megajoules)). Cropland and perennial cropland shall be regarded as one land use;

CS_R = the carbon stock per unit area associated with the reference land use (measured as mass of carbon per unit area, including both soil and vegetation). The land use of the reference areas is the land use in January 2008 or 20 years before the raw material was obtained, whichever was later.

CS_A = the carbon stock per unit area associated with the actual land use (measured as mass of carbon per unit area, including both soil and vegetation). In cases where the carbon stock accumulates over more than one year, the value attributed to CSA shall be the estimated stock per unit area after 20 years or when the crop reaches maturity, whichever is earlier.

P = the productivity of the crop (measured as biofuel or bioliquid energy per unit area per year)

e_B = bonus of 29 gCO_2eq/MJ biofuel if biomass is obtained from restored degraded land under the conditions provided for in point 8

The bonus for the use of degraded/restored land (e_B) cannot be applied until the Commission has provided definitions. When e_l is not zero, the annualised GHG emissions from changes in carbon stocks due to land use must be transferred as the value of e_l in gCO_{2eq}/kg of dry matter of biomass to the next economic operator. The biomass producer shall therefore use the same formulas as above with productivity of the crop (P) expressed in kg of dry matter content of the biomass per ha and per year for the calculation.

For converted land where cultivation is permitted pursuant to Article 17 of Directive 2009/28/EC, the accumulated GHG emissions resulting from changes in land use must be calculated and added to the other emission values. The land-use category the cultivated land falls into as of 1 January 2008 therefore has to be determined.

If evidence is provided that the cropland was categorised as “cropland” before 01.01.2008 and no changes in land use occurred after the cut-off date of 1 January 2008, e_l equals “0”.

2.2.3 Requirements for the use of aggregate and measured values for agricultural management

Either measured or aggregate values may be used for agricultural management (e_{ec} and e_l). When using aggregate values:

- Aggregate GHG values may be calculated for farmers operating as a group in a certain region, and on the condition that this takes place on a more fine-grained than a NUTS2 or equivalent level.
- The calculation of aggregate values for cultivation shall follow the methodology for e_{ec} as described in section 2.2.1 “Requirements for calculating greenhouse gas emissions from the production of raw material”.
- Input data should primarily be based on official statistical data from government bodies if available and of good quality. If not available, statistical data published by independent bodies may be used. As a third option, the numbers may be based on scientifically peer-reviewed work, with the precondition that data used lies within the commonly accepted data range when available.
- The data used shall be based on the most recent available data from the above-mentioned sources. Typically, the data should be updated over time, unless there is no significant variability of the data over time.
- For fertiliser use, the typical type and quantity of fertiliser used for the crop in the region concerned shall be used.
- If a measured value for yields is used (as opposed to an aggregated value) for the calculations, it is required to also use a measured value for fertiliser input and vice versa.

Economic operators must specify the methods and sources used to determine the input data (e.g. average values based on representative yields, fertiliser input, N_2O emissions and changes in the carbon stock).

2.2.4 Requirements for the calculation of emissions savings from soil carbon accumulation via improved agricultural management (e_{sca})

According to the communication from the Commission on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels (2010/C 160/02), “improved agricultural management” can include, e.g. the following practices:

- shifting to reduced or zero-tillage
- improved crop rotations and/or cover crops, including crop residue management
- improved fertiliser or manure management
- use of soil improver (e.g. compost)

Emissions savings from such improvements can be taken into account if evidence is provided that the soil has carbon increased, or solid and verifiable evidence is provided that it can reasonably be expected to have increased, over the period in which the raw materials concerned were cultivated.

Measurements of soil carbon can constitute such evidence, e.g. by a first measurement in advance of the cultivation and subsequent ones at regular intervals several years apart.

In such a case, before the second measurement is available, increase in soil carbon would be estimated using a relevant scientific basis. From the second measurement onwards, the measurements would constitute the basis for determining the existence of an increase in soil carbon and its magnitude.

The emission savings in terms of gCO_2eq /MJ can be calculated by using a formula as indicated in point 7 of Annex V in Directive 2009/28/EC, replacing the divisor “20” by the period (in years) of cultivation of the crops concerned.

Emission savings from soil carbon accumulation through improved agricultural management (e_{sca}) shall be calculated according to the following formula:

$$e_{sca} = (CS_R - CS_A) \times 3.664 \times 1/20 \times 1/P - e_B^{(1)}$$

(1)The quotient obtained by dividing the molecular weight of CO_2 (44.010 g/mol) by the molecular weight of carbon (12.011 g/mol) is equal to 3.664.

CS_R = the carbon stock per unit area associated with the reference land use (measured as mass of carbon per unit area, including both soil and vegetation). The land use of the reference areas is the land use in January 2008 or 20 years before the raw material was obtained, whichever was later.

CS_A = the carbon stock per unit area associated with the actual land use (measured as mass of carbon per unit area, including both soil and vegetation). In cases where the carbon stock accumulates over more than one year, the value attributed to CSA shall be the estimated stock per unit area after 20 years or when the crop reaches maturity, whichever is earlier.

P = the productivity of the crop (measured as biofuel or bioliquid energy per unit area per year)

e_B = bonus of 29 gCO_2eq/MJ biofuel if biomass is obtained from restored degraded land under the conditions provided for in point 8

The bonus for the use of degraded/restored land (e_B) cannot be applied until the Commission has provided definitions. Emission savings from e_{sca} are only applicable if the measure for agricultural improvement was undertaken after January 2008.

2.2.5 Requirements for calculating greenhouse gas emissions from transport and distribution (e_{td})

Emissions from transport and distribution/supply include the emissions from the transport and storage of raw materials (e_{td}) and from the storage and distribution of finished materials (bioliquids/biofuels) as well as the emissions from filling stations. Economic operators along the bioliquid/biofuel supply chain that receive biomass calculate the GHG emissions from transport using the following formula (e_{td}):

$$e_{td}\left[\frac{kgCO_{2eq}}{kg}\right] = \frac{\left(d_{loaded}[km] * K_{loaded}\left[\frac{l}{km}\right] + d_{empty}[km] * K_{empty}\left[\frac{l}{km}\right]\right) * Ef_{fuel}\left[\frac{kgCO_{2eq}}{l}\right]}{m_{product}[kg]}$$

specified in mass units in relation to dry matter content of the transported biomass ($kgCO_2eq/kg$ dry).

It must be kept in mind that this formula only applies for a single transport step. If there are more transport steps, the corresponding emissions must be calculated individually. Actual transport emissions can only be determined if the information for the transport steps is recorded and consistently passed along through the production chain. If not, the actual value cannot be accepted. The GHG emissions already included for production and cultivation do not have to be included again in the calculation. Other emissions from transport and distribution have to be added to e_{td}.

The values (emission factors, fuel consumption, etc.) published on the European Commission website should be used to calculate e_{td}:
https://ec.europa.eu/energy/sites/ener/files/documents/Standard%20values%20v.1.0.xlsx

Alternatively a scientific literature source or scientifically recognised database (e.g. BioGrace, ecoinvent database) can be used:

- d_{loaded} [km] – transport distance across which the biomass/bioliquid/biofuel was transported
- d_{empty} [km] – transport distance when the transport vehicle was empty (if the transport vehicle is not empty upon return, it does not have to be included)
- means of transport used (e.g. 40 t diesel truck)
- mproduct [kg dry] – measured mass of the transported biomass/bioliquid/biofuel
- Ef_{fuel} [$kgCO_2eq/l$] – emission factor fuel
- K_{loaded} [l/km] – fuel consumption of the means of transport used per km when loaded
- K_{empty} [l/km] – fuel consumption of the transport vehicle used per km when empty

If upstream transport is calculated, the actual GHG emissions must be divided by the amount of dry matter content of the transported biomass. Conversion plants calculate upstream transport emissions in gCO_2eq/kg of dry matter content of the transported biomass. The upstream transport emissions therefore have to be adapted by applying a feedstock factor and an allocation factor to provide the GHG emissions for the product to the recipient (see section 2.1 “Methodology for greenhouse gas calculation - Calculation using actual values”).

The last interface is responsible for calculating the emissions from transport and distribution of the final product The last interface must determine these emissions up to the place of final use and specify which countries and regions the product (bioliquid/biofuel) can be transported to without falling short of the minimum GHG emission saving.

The GHG emissions related to the storage of biofuels and bioliquids as well as the emissions produced by filling stations also have to be included.

These GHG emissions are based on use for electricity production. It is possible that several depots need to be included individually in the calculation for imported biofuels. Figures for GHG emissions at depots and filling stations are published by BioGrace[9] at: http://www.biograce.net/home.

The European Commission (EC) provided additional background information on depot and filling station emissions to the EU voluntary schemes in a document entitled “Note on emissions from filling stations and depots”. This document serves as a guide (see Annex 1).

[9] The primary reference source for these figures is JRC, 2008

2.2.6 Requirements for calculating greenhouse gas emissions from processing (e_p)

Every processing facility must ensure that all GHG emissions from processing (e_p) are incorporated into the calculation of the GHG emissions. This includes emissions from processing itself, from waste and leakage and from the production of chemicals or products used in processing. The following formula, which only applies for a single processing step, applies:

$$e_p\left[\frac{kgCO_2eq}{kg}\right] = \frac{EM_{electrisity}\left[\frac{kgCO_2eq}{yr}\right] + EM_{heat}\left[\frac{kgCO_2eq}{yr}\right] + EM_{inputs\ \ production}\left[\frac{kgCO_2eq}{yr}\right] + EM_{wastewater}\left[\frac{kgCO_2eq}{yr}\right]}{Yield_{main\ \ product}\left[\frac{kgYield}{yr}\right]}$$

specified in mass units in relation to the dry matter content of the main product ($kgCO_2eq/kg$ dry).

$$EM_{electricity}\left[\frac{kgCO_2eq}{yr}\right] = electricity\ consumption\left[\frac{kWh}{yr}\right] * Ef_{electricity}\left[\frac{kgCO_2eq}{kWh}\right]$$

$$EM_{heat}\left[\frac{kgCO_2eq}{yr}\right] = fuel\ consumption\left[\frac{kg}{yr}\right] * Ef_{fuel}\left[\frac{kgCO_2eq}{kg}\right]$$

$$EM_{inputs\ \ production}\left[\frac{kgCO_2eq}{yr}\right] = inputs\ \ production\left[\frac{kg}{yr}\right] * Ef_{inputs\ \ production}\left[\frac{kgCO_2eq}{kg}\right]$$

$$EM_{wastewater}\left[\frac{kgCO_2eq}{yr}\right] = wastewater\left[\frac{l}{yr}\right] * Ef_{wastewater}\left[\frac{kgCO_2eq}{l}\right]$$

$$Yield_{main\ product}\left[\frac{kgYield}{yr}\right] = \text{yield of the main product in kg per year}$$

The annual yield of the main product relates to the dry matter content.

[10] The term “EM” = emissions refers to the total emissions and not only to the emissions of the main product.

The formula below is to be used to specify the emissions of the dry matter in kg:

$$e_p \text{product}_a \left[\frac{gCO_2eq}{kg_{dry}}\right] = \frac{e_p \text{ product}_a \left[\frac{gCO_2eq}{kg_{moist}}\right]}{(1 - \text{moisture content})}$$

To calculate the GHG emissions from processing (e_p), the following data at a minimum must be collected on site, i.e. the respective values are taken from, e.g. company documents:

- electricity consumption [kWh/yr] – total externally procured electricity consumption per year (i.e. not produced in one's own combined heat and power (CHP) plant)
- heat generation – type of fuel/combustible used to produce steam (e.g. heating oil, gas, agricultural crop residues)
- fuel consumption [kg/yr] – total annual consumption of fuel for heat generation, (e.g. heating oil [kg], gas [kg], bagasse [kg])
- production of inputs [kg/yr] – quantity of chemicals or additional products (inputs) used in processing
- wastewater quantity [l/yr] – quantity of wastewater per year
- yield main product [kg dry/a] – annual harvest of the main product

Input data for calculating emissions from processing steps in the production chain must be measured or based on technical specifications of the processing facility. If the range of emissions for a group of processing facilities (which the respective facility belongs to) is known, the most conservative emission value (highest) for this group is to be used Actual values of emissions for processing can only be determined if all of the information about emissions relevant to the interface is recorded and consistently passed along through the production chain. Other emissions from processing have to be added to e_p. Biodiesel derived by transesterification of fats with methanol (FAME) are regarded in the Renewable Energy Directive as being 100% of renewable origin. Similar to other inputs, the carbon footprint of the methanol used in the in esterification process needs to be taken into account in the calculation of the GHG emission intensity of the biofuel. This approach has been used in the calculation of the default values. In the case of conventional methanol in the original RED calculations, 0.0585 MJ of methanol was used per MJ of FAME produced, with an emissions factor of 99.57 g CO_2eq per MJ of methanol. This factor is included along with those for other inputs in the list of standard values published on the Commission's website.
The values (emission factors, heating values, etc.) published on the European Commission website should be used to calculate e_p:
https://ec.europa.eu/energy/sites/ener/files/documents/Standard%20values%20v.1.0.xlsx

Alternatively a scientific literature source or scientifically recognised database (e.g. BioGrace, ecoinvent database) can be used:

- Ef_{fuel} [$kgCO_2eq/kg$] – emission factor fuel
- $Ef_{wastewater}$ [$kgCO_2eq/l$] – emission factor wastewater
- $Ef_{EU\ electricity\ mix}$ [$kgCO_2eq\ /kWh$] – emission factor EU electricity mix
- $Ef_{input\ production}$ [$kgCO_2eq/kg$] – emission factor chemicals or additional products used in processing

The source must be cited for values taken from scientific literature sources or scientifically recognised databases. If there are different values from producers, the most conservative value is to be used. It is also important to include the emissions arising from chemicals and energy that are also indirectly linked to the production of biofuels and bioliquids.

In accounting for the consumption of electricity not produced within the conversion plant, the GHG emission intensity of the production and distribution of that electricity is to be assumed to be equal to the average emission intensity of the production and distribution of electricity in a defined region. The Directive requires the use of the average emission intensity for a "defined region". In the case of the EU the most logical choice is the whole EU. In the case of third countries, where grids are often less linked-up across borders, the national average, e.g. could be the appropriate choice.[11] If electricity from renewable energy sources (e.g. windmill, biogas plant) is consumed either off-grid or independently of the grid, and the quantity can be validated by a suitable electricity meter, the emission factor for the type of renewable electricity may be set to zero. Guarantees of origin for electricity from renewable energy sources or other certificates are not applicable to reduce greenhouse gas emissions.

Emission saving from excess electricity from combined heat and power plants (e_{ee}) cannot be allocated if the CHP runs on fossil fuels, bioenergy (where this is not a co-product from the same process) or agricultural crop residues, even if they are a co-product from the same process.

The reduction in GHG emissions resulting from the excess electricity is the quantity of GHG emissions that would be emitted in the production of a corresponding quantity of electricity in a power station that uses the same fossil fuel as the cogeneration plant. The greenhouse gas emission saving resulting from excess electricity from cogeneration (e_{ee}) is calculated using the following formula:

[11] European Commission DG ENER: Note on the conducting and verifying actual calculations of GHG emission savings (02.10.2015) at: https://ec.europa.eu/energy/sites/ener/files/documents/Note%20on%20GHG%20final.pdf (accessed on 10.10.2016).

$$e'_{ee}\left[\frac{kg\,CO_2eq}{kg\,main\,product}\right]=\frac{excess\,electricity\left[\frac{kWh}{yr}\right]*Ef_{fuel}\left[\frac{kg\,CO_2eq}{kWh}\right]}{yield_{main\,product}\left[\frac{kg}{yr}\right]}$$

The yield of the main product relates to the dry matter content.

Where the CHP supplies heat not only to the biofuel/bioliquid process but also for other purposes, the size of the CHP should be notionally reduced — for the calculation — to the size that is necessary to supply only the heat necessary for the biofuel/bioliquid process. The primary electricity output of the CHP should be notionally reduced in proportion. To the amount of electricity that remains - after this notional adjustment and after covering any actual internal electricity needs - a greenhouse gas credit should be assigned that should be subtracted from the processing emissions. The amount of this benefit is equal to the life cycle emissions attributable to the production of an equal amount of electricity from the same type of fuel in a power plant.[12]

To calculate e_{ee}, the following data is measured and documented on site:

- excess electricity [kWh/yr] – electricity fed into an external grid per year that was produced in one's own combined heat and power plant
- type of fuel that is used in the heat and power plant (e.g. heating oil, gas, coal)
- type of cogeneration plant (e.g. combined heat and power plant (CHP), steam and heat plant, gas and turbine plant (gas and steam/combined power plants).
- yield of the main product per year [kg dry/a]

The emission factor of the fuel is to be taken from the European Commission website as a unit value for the respective type of cogeneration plant in in $kgCO_2eq/kWh$: https://ec.europa.eu/energy/sites/ener/files/documents/Standard%20values%20v.1.0.xlsx

Alternatively a scientific literature source or scientifically recognised database (e.g. BioGrace, ecoinvent database) can be used:

[15] Communication from the Commission on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels (2010/C 160/02)

2.2.7 Requirements for calculating the emission saving from carbon dioxide capture and replacement (e_{ccr})

The definition of this emissions saving in accordance with Annex V Section C No. 15 of the Directive 28/2009/EC is:

> *"Emission saving from carbon capture and replacement (e_{ccr}) shall be limited to emissions avoided through the capture of CO_2 which the carbon originates from biomass and which is used to replace fossil-derived carbon dioxide used in commercial products and services."*

The requirement "used to replace fossil-derived CO_2" is assumed to be satisfied as long as it is common commercial practice to consume only CO_2 with fossil origin for "commercial products and services".

In this case, there is no need for the certifying company to provide evidence of the actual (end) use of the biogenic CO_2 to replace fossil-derived CO_2 on a case-by-case basis. However, verifiable objective evidence on the CO_2 quantities produced from biogenic carbon in defined time periods must be kept, whereby only those quantities can be credited that are actually sold on the market as directly commercially usable CO_2 or those that are used directly.

The following parameters are to be considered when calculating the emission saving (e_{ccr}):

- produced quantity of biofuels or bioliquids
- produced quantity of biogenic CO_2

The following are also to be determined in relation to the processing of CO_2 (compression and liquefaction to carbon dioxide):

- consumed quantity of energy (electricity, heat, etc.)
- consumed quantity of auxiliary materials
- other process-specific, energy-related input variables are included here

as well as the respective greenhouse gas emissions values for these consumed quantities

The emissions saving e_{ccr} [g CO_2eq/MJ biofuel/bioliquid] is calculated as follows:

$$e_{ccr} = \frac{\text{quantity produced } CO_2\,[t] - \text{energy consumed [MWh]} * EF\left[t\frac{CO_2eq}{MWh}\right] - \text{auxiliary materials consumed}[t] * EF\left[t\frac{CO_2eq}{t}\right]}{\text{produced quantity of biofuel/bioliquid}[t] * LHV\left[\frac{GJ}{t}\right]} * 1000$$

The balancing period of the emission saving (e_{ccr}) must be linked to the greenhouse gas balancing period of the respective production pathway of the main product (biofuels or bioliquids). These GHG savings are, however, excluded from the allocation and are thus allocated 100% to the main product (in accordance with RED 2009/28 Annex V, C.17 & C.18 of Directive 2009/28/EC)

If the CO_2 is not captured continuously, it may be appropriate to attribute different quantities of savings to biofuels or bioliquids obtained from the same process.

However, higher savings of CO_2 should never be allocated to a given batch of biofuels or bioliquids per MJ than the savings from the average quantities of CO_2 in a hypothetical process which captures the total CO_2 from the process.

For example, it would not be justified to allocate different quantities of savings to different biofuels and bioliquids obtained from the same process. All biofuels and bioliquids originating from the process are treated equally in this respect.

All emissions and information related to CO_2 capture and savings must be included in the greenhouse gas calculation and documentation.

2.2.8 Requirements for calculating the emission savings from carbon dioxide capture and geological storage (e_{ccs})

Emission saving from carbon capture and geological storage e_{ccs}, that has not already been accounted for in e_p are limited to emissions prevented by the capture and sequestration of CO_2 emissions directly linked to the extraction, transport, processing and distribution of fuel.

The following parameters are to be considered when calculating the emission saving (e_{ccs}):

- produced quantity of biofuels or bioliquids
- produced quantity of biogenic CO_2

The following are also to be determined in relation to the processing of CO_2 (compression and liquefaction to carbon dioxide):

- consumed quantity of energy (electricity, heat, etc.)
- consumed quantity of auxiliary materials
- other process-specific, energy-related input variables are included here

as well as the respective greenhouse gas emissions values for these consumed quantities

The emissions saving e_{ccs} [gCO_2eq/MJ of biofuel/bioliquid] is calculated as follows:

$$e_{ccs} = \frac{\text{quantity produced } CO_2\,[t] - \text{energy consumed [MWh]} * EF\left[t\frac{CO_2eq}{MWh}\right] - \text{auxiliary materials consumed}[t] * EF\left[t\frac{CO_2eq}{t}\right]}{\text{produced quantity of biofuel/bioliquid}[t] * LHV\left[\frac{GJ}{t}\right]} * 1000$$

The emission savings from carbon dioxide capture and geological storage ($e_{ccs)}$ can only be taken into account if there is valid evidence that CO_2 was effectively captured and safely stored. If the CO_2 is directly stored it should be verified whether the storage is in good condition and that leakages are non-existent. The balancing period of the emission saving (e_{ccs}) must be linked to the greenhouse gas balancing period of the respective production pathway of the main product (biofuels or bioliquids). These GHG savings are, however, excluded from the allocation and are thus 100% allocated to the main product (in accordance with RED 2009/28 Annex V, C.17 & C.18 of Directive 2009/28/EC) If the CO_2 is not continuously captured, see section 2.2.7 “Requirements for calculating the emission saving from carbon dioxide capture and replacement (e_{ccr})”.

2.2.9 Allocation of the greenhouse gas emissions

Allocation takes place in every process step that the main product passes through in which a co-product is produced. All GHG emissions up to this process step are to be distributed to the main and co-product proportional to their energy content. The portion of GHG emissions allocated to the elements of the formula according to Directive 2009/28/EC, Annex V, Part C, No. 1 is to be calculated using the following formula (if applicable):

$$e'_{allocated} = total\ GHG * allocation\ factor$$

The variable *totalGHG* in the formula above is the sum of all GHG gas emissions that are produced up to and including the process step in which the co-product is produced. For the purposes of the calculation, the emissions to be divided shall be e_{ec} + e_l + those fractions of e_p, e_{td} and e_{ee} that occur up to and including the process step at which a co-product is produced. If GHG emissions were already allocated to co-products in an earlier process step, the portion of these greenhouse gas emissions that was assigned to the respective intermediate product in the last process step is used for the total (*total GHG*).

To calculate the allocation factor for intermediate products and biofuels/bioliquids, the following data is collected at a minimum on site, i.e. the respective values are taken from, e.g. company documents:

- mass of intermediate product/biofuel or bioliquid [kg dry]
- mass of the co-product [kg]

The formula for calculating the allocation factor for the intermediate product is as follows:

$$Allocation\ factor\ intermediate\ product_a = \left[\frac{Energy\ in\ intermediate\ product_a}{Energy\ in\ intermediate\ product_a\ and\ co-products_a}\right]$$

The formula for calculating the allocation factor for biofuel/bioliquid is as follows:

$$Allocation\ factor\ biofuel/bioliquid_a = \left[\frac{Energy\ in\ biofuel/bioliquid_a}{Energy\ in\ biofuel/bioliquid_a\ and\ co-products_a}\right]$$

where:

$$\text{energy content}_{\text{intermediate product}}[\text{MJ}] = \text{yield}_{\text{intermediate product}}[\text{kg}_{\text{dry}}] * \text{LHV}_{\text{main product}}\left[\frac{\text{MJ}}{\text{kg}}\right]$$

$$\text{energy content}_{\text{biofuel/bioliquid}}[\text{MJ}] = \text{yield}_{\text{biofuel/bioliquid}}[\text{kg}_{\text{dry}}] * \text{LHV}_{\text{main product}}\left[\frac{\text{MJ}}{\text{kg}}\right]$$

$$\text{energy content}_{\text{co-product}}[\text{MJ}] = \text{yield}_{\text{co-product}}[\text{kg}_{\text{dry}}] * \text{LHV}_{\text{co-product}}\left[\frac{\text{MJ}}{\text{kg}}\right]$$

The energy content is determined using the LHV and the yield. The LHV used in applying this rule should be that of the entire (co-)product, not of only the dry fraction of it. In many cases, however, notably in relation to nearly-dry products, the latter could give a result that is an adequate approximation. Because heat does not have a lower heating value, no emissions can be allocated to it on this basis.

No emissions should be allocated to waste, agricultural crop residues and processing residues, since they are considered to have zero emissions until the point of their collection[13].

Allocation should be applied directly after a co-product (a substance that would normally be storable or tradable) and biofuel/bioliquid/intermediate product are produced at a process step. This can be a process step within a plant after which further “downstream” processing takes place for either product. However, if downstream processing of the (co-) products concerned is interlinked (by material or energy feedback loops) with any upstream part of the processing, the system is considered a “refinery”[14] and allocation is applied at the points where each product has no further downstream processing that is interlinked by material or energy feedback loops with any upstream part of the processing.

The energy content of co-products with negative energy content is set to zero.

[13] Similarly, if these materials are used as raw materials, they start with zero emissions at the collection point.

[14] See Communication of the EU Commission (2010/C 160/02), Annex II

The allocation rule does not apply to electricity from combined heat and power plants if the CHP runs on fossil fuels, bioenergy (where this is not a co-product from the same process) or agricultural crop residues, even if they are a co-product from the same process. In the case of fuels produced in refineries, the unit of analysis for the purposes of the calculation is the refinery.

2.2.10 Calculating the greenhouse gas emission saving by the last interface

The last interface calculates the total GHG emissions in gCO_2eq/MJ biofuel/bioliquid. If actual values are applied, see section 2.1 “Methodology for greenhouse gas calculation - Calculation using actual values”.

The GHG emission saving of the supplied bioliquid/biofuel is then calculated compared to the respective reference value for fossil fuels using the following formula:

$$\text{GHG emission savings } (\%) = \frac{E_F - E_B}{E_F} * 100$$

where:

E_B [gCO_2eq/MJ] = total emissions from the production and use of bioliquids/biofuels

E_F [gCO_2eq/MJ] = total emissions of the reference value for fossil fuels

The following values are used as reference values for fossil fuels when calculating the GHG emission saving of biofuels/bioliquids:

- for use in electricity production: 91 gCO_2eq/MJ
- for use in combined heat and power (CHP) plants 85 gCO_2eq/MJ
- for use in heat production: 77 gCO_2eq/MJ
- for fossil fuels: the fossil fuel comparator (E_F) is the most recently available actual average emissions from the fossil portion of the petrol and diesel consumed in the EU according to the definition in Directive 98/70/EC. If this data is not available, a value of 83.8 gCO_2eq/MJ is to be used.[15]

If the fossil fuel comparators change, the revised values will be implemented in the scheme with immediate effect.

[15] See the Communication from the Commission on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels (2010/C 160/02)

2.2.11 Balancing greenhouse gas emissions when mixing bioliquids/biofuels

GHG emissions may only be balanced when the GHG values are identical.

3 Relevant Documents

The documentation structure of the REDcert-EU scheme includes the following:

No.	Document	Published/revised
1	Scope and basic scheme requirements	The current version of the REDcert-EU scheme principles is published on the website at www.redcert.org.
2	Scheme principles for the production of biomass, biofuels and bioliquids	
3	Scheme principles for GHG calculation	
4	Scheme principles for mass balancing	
5	Scheme principles for neutral inspections	
6	Sanction system	
7	Complaint management system	
8	Phase-specific checklists	

REDcert reserves the right to create and publish additional supplementary scheme principles if necessary.

The legal EU regulations and provisions for sustainable biomass as well as biofuels and bioliquids including other relevant references that represent the basis of the REDcert-EU documentation are published separately on the REDcert website at www.redcert.org. When legal regulations are referenced, the most current version is always assumed.

Annex 1

Note on emissions from filling stations and depots

(Source: Additional background information on depot and filling station emission provided from the European Commission to the EU voluntary schemes)

The Communication 160/02 says (see section 2.1):

“Member States need to define which economic operators need to submit the information concerned. Most transport fuels are subject to excise duty, which is payable on release for consumption (9). The obvious choice is to place the responsibility for submitting information on biofuels on the economic operator who pays the duty. At this point information with regard to the sustainability criteria along the entire fuel chain should be available (10).”

Footnote (10): The one exception could be the greenhouse gas emissions from distribution of the fuel (if needed for the calculation of an actual value). It would be appropriate to use a standard coefficient for this.

Therefore it would make sense to use a standard coefficient for this (the BioGrace excel sheets show what numbers are used for filling stations in the typical/default values; those numbers a scheme could consider using).

In addition, the emissions at the fuel depot also need to be included. Emissions at the depot and filling station both relate to electricity usage. One important point to note is that for imported biofuels there may be several depots that need to be included in the calculation (e.g. import and export terminals).

BioGrace includes the following depot and filling station emissions (for all biofuels):

Storage: 0.11 gCO_2/MJ fuel (based on electricity usage of 0.00084 MJ/MJ fuel and the standard values for Electricity NG CCGT and Electricity EU mix LV) Filling station: 0.44 gCO_2/MJ fuel (based on electricity usage of 0.0034 MJ/MJ fuel and the default value for Electricity EU mix LV)