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ANNEX V

RULES FOR CALCULATING THE GREENHOUSE GAS IMPACT OF BIOFUELS, BIOLIQUIDS AND THEIR FOSSIL FUEL COMPARATORS

A. TYPICAL AND DEFAULT VALUES FOR BIOFUELS IF PRODUCED WITH NO NET CARBON EMISSIONS FROM LAND-USE CHANGE

Biofuel production pathway	Greenhouse gas emissions saving – typical value	Greenhouse gas emissions saving – default value
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	67 %	59 %
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	77 %	73 %
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant (*))	73 %	68 %
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant (*))	79 %	76 %
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant (*))	58 %	47 %
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant (*))	71 %	64 %
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	48 %	40 %
corn (maize) ethanol, (natural gas as process fuel in CHP plant (*))	55 %	48 %
corn (maize) ethanol (lignite as process fuel in CHP plant (*))	40 %	28 %
corn (maize) ethanol (forest residues as process fuel in CHP plant (*))	69 %	68 %
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	47 %	38 %
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant (*))	53 %	46 %
other cereals excluding maize ethanol (lignite as process fuel in CHP plant (*))	37 %	24 %
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant (*))	67 %	67 %

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Biofuel production pathway	Greenhouse gas emissions saving – typical value	Greenhouse gas emissions saving – default value
sugar cane ethanol	70 %	70 %
the part from renewable sources of ethyl-tertio-butyl-ether (ETBE)	Equal to that of the ethanol production pathway used	
the part from renewable sources of tertiary-amyl-ethyl-ether (TAEE)	Equal to that of the ethanol production pathway used	
rape seed biodiesel	52 %	47 %
sunflower biodiesel	57 %	52 %
soybean biodiesel	55 %	50 %
▼C1 palm oil biodiesel (open effluent pond)	33 %	20 %
▼B palm oil biodiesel (process with methane capture at oil mill)	51 %	45 %
waste cooking oil biodiesel	88 %	84 %
animal fats from rendering biodiesel (**)	84 %	78 %
hydrotreated vegetable oil from rape seed	51 %	47 %
hydrotreated vegetable oil from sunflower	58 %	54 %
hydrotreated vegetable oil from soybean	55 %	51 %
hydrotreated vegetable oil from palm oil (open effluent pond)	34 %	22 %
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	53 %	49 %
hydrotreated oil from waste cooking oil	87 %	83 %
hydrotreated oil from animal fats from rendering (**)	83 %	77 %
pure vegetable oil from rape seed	59 %	57 %
pure vegetable oil from sunflower	65 %	64 %
pure vegetable oil from soybean	63 %	61 %
pure vegetable oil from palm oil (open effluent pond)	40 %	30 %
pure vegetable oil from palm oil (process with methane capture at oil mill)	59 %	57 %
pure oil from waste cooking oil	98 %	98 %

(*) Default values for processes using CHP are valid only if all the process heat is supplied by CHP.

(**) Applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1069/2009 of the European Parliament and of the Council [1], for which emissions related to hygenisation as part of the rendering are not considered.

[1] Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation) (OJ L 300, 14.11.2009, p. 1).

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B. ESTIMATED TYPICAL AND DEFAULT VALUES FOR FUTURE BIOFUELS THAT WERE NOT ON THE MARKET OR WERE ON THE MARKET ONLY IN NEGLIGIBLE QUANTITIES IN 2016, IF PRODUCED WITH NO NET CARBON EMISSIONS FROM LAND-USE CHANGE

Biofuel production pathway	Greenhouse gas emissions saving - typical value	Greenhouse gas emissions saving - default value
wheat straw ethanol	85 %	83 %
▼C1 waste wood Fischer-Tropsch diesel in free-standing plant	83 %	83 %
▼B farmed wood Fischer-Tropsch diesel in free-standing plant	82 %	82 %
▼C1 waste wood Fischer-Tropsch petrol in free-standing plant	83 %	83 %
▼B farmed wood Fischer-Tropsch petrol in free-standing plant	82 %	82 %
▼C1 waste wood dimethylether (DME) in free-standing plant	84 %	84 %
▼B farmed wood dimethylether (DME) in free-standing plant	83 %	83 %
▼C1 waste wood methanol in free-standing plant	84 %	84 %
▼B farmed wood methanol in free-standing plant	83 %	83 %
Fischer-Tropsch diesel from black-liquor gasification integrated with pulp mill	89 %	89 %
Fischer-Tropsch petrol from black-liquor gasification integrated with pulp mill	89 %	89 %
dimethylether (DME) from black-liquor gasification integrated with pulp mill	89 %	89 %
Methanol from black-liquor gasification integrated with pulp mill	89 %	89 %
the part from renewable sources of methyl-tertio-butyl-ether (MTBE)	Equal to that of the methanol production pathway used	

C. METHODOLOGY

1. Greenhouse gas emissions from the production and use of transport fuels, biofuels and bioliquids shall be calculated as follows:

(a) greenhouse gas emissions from the production and use of biofuels shall be calculated as:

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

where

E	=	total emissions from the use of the fuel;
e_{ec}	=	emissions from the extraction or cultivation of raw materials;

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e_l	=	annualised emissions 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 fuel in use;
e_{sca}	=	emission savings from soil carbon accumulation via improved agricultural management;
e_{ccs}	=	emission savings from CO_2 capture and geological storage; and
e_{ccr}	=	emission savings from CO_2 capture and replacement.

Emissions from the manufacture of machinery and equipment shall not be taken into account.

(b) Greenhouse gas emissions from the production and use of bioliquids shall be calculated as for biofuels (E), but with the extension necessary for including the energy conversion to electricity and/or heat and cooling produced, as follows:

(i) For energy installations delivering only heat:

$$EC_h = \frac{E}{\eta_h}$$

(ii) For energy installations delivering only electricity:

$$EC_{el} = \frac{E}{\eta_{el}}$$

where

$EC_{h,el}$ = Total greenhouse gas emissions from the final energy commodity.

E = Total greenhouse gas emissions of the bioliquid before end-conversion.

η_{el} = The electrical efficiency, defined as the annual electricity produced divided by the annual bioliquid input based on its energy content.

η_h = The heat efficiency, defined as the annual useful heat output divided by the annual bioliquid input based on its energy content.

(iii) For the electricity or mechanical energy coming from energy installations delivering useful heat together with electricity and/or mechanical energy:

$$EC_{el} = \frac{E}{\eta_{el}}\left(\frac{C_{el} \cdot \eta_{el}}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h}\right)$$

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(iv) For the useful heat coming from energy installations delivering heat together with electricity and/or mechanical energy:

$$EC_h = \frac{E}{\eta_h} \left(\frac{C_h \cdot \eta_h}{C_{el} \cdot \eta_{el} + C_h \cdot \eta_h} \right)$$

where:

$EC_{h,el}$ = Total greenhouse gas emissions from the final energy commodity.

E = Total greenhouse gas emissions of the bioliquid before end-conversion.

η_{el} = The electrical efficiency, defined as the annual electricity produced divided by the annual fuel input based on its energy content.

η_h = The heat efficiency, defined as the annual useful heat output divided by the annual fuel input based on its energy content.

C_{el} = Fraction of exergy in the electricity, and/or mechanical energy, set to 100 % (C_{el} = 1).

C_h = Carnot efficiency (fraction of exergy in the useful heat).

The Carnot efficiency, C_h, for useful heat at different temperatures is defined as:

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

where

T_h = Temperature, measured in absolute temperature (kelvin) of the useful heat at 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 that calculation, the following definitions apply:

(a) ‘cogeneration’ means the simultaneous generation in one process of thermal energy and electricity and/or mechanical energy;

(b) ‘useful heat’ means heat generated to satisfy an economical justifiable demand for heat, for heating and cooling purposes;

(c) ‘economically justifiable demand’ means the demand that does not exceed the needs for heat or cooling and which would otherwise be satisfied at market conditions.

2. Greenhouse gas emissions from biofuels and bioliquids shall be expressed as follows:

(a) greenhouse gas emissions from biofuels, E, shall be expressed in terms of grams of CO_2 equivalent per MJ of fuel, g CO_2eq/MJ.

(b) greenhouse gas emissions from bioliquids, EC, in terms of grams of CO_2 equivalent per MJ of final energy commodity (heat or electricity), g CO_2eq/MJ.

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When heating and cooling are co-generated with electricity, emissions shall be allocated between heat and electricity (as under 1(b)), irrespective if the heat is used for actual heating purposes or for cooling ([1]).

Where the greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} are expressed in unit g CO_2eq/dry-ton of feedstock, the conversion to grams of CO_2 equivalent per MJ of fuel, g CO_2eq/MJ, shall be calculated as follows ([2]):

$$e_{ec}fuel_a\left[\frac{gCO_2eq}{MJ\ fuel}\right]_{ec} = \frac{e_{ec}feedstock_a\left[\frac{gCO_2eq}{t_{dry}}\right]}{LHV_a\left[\frac{MJ feedstock}{t\ dry\ feedstock}\right]} \times Fuel\ feedstock\ factor_a \times Allocation\ factor\ fuel_a$$

where

$$Allocation\ factor\ fuel_a = \left[\frac{Energy\ in\ fuel}{Energy\ fuel + Energy\ in\ co-products}\right]$$

$$Fuel\ feedstock\ factor_a = [\ Ratio\ of\ MJ\ feedstock\ required\ to\ make\ 1\ MJ\ fuel\ ]$$

Emissions per dry-ton feedstock shall be calculated as follows:

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

3. Greenhouse gas emissions savings from biofuels and bioliquids shall be calculated as follows:

(a) greenhouse gas emissions savings from biofuels:

SAVING = $(E_{F(t)} - E_B)/E_{F(t)}$,

where

E_B	=	total emissions from the biofuel; and
$E_{F(t)}$	=	total emissions from the fossil fuel comparator for transport

(b) greenhouse gas emissions savings from heat and cooling, and electricity being generated from bioliquids:

SAVING = $(EC_{F(h\&c,el)} - EC_{B(h\&c,el)})/EC_{F(h\&c,el)}$,

where

$EC_{B(h\&c,el)}$ = total emissions from the heat or electricity; and

([1]) Heat or waste heat is used to generate cooling (chilled air or water) through absorption ***chillers***. Therefore, it is appropriate to calculate only the emissions associated to the heat produced per MJ of heat, irrespectively if the end-use of the heat is actual heating or cooling via absorption chillers.

([2]) The formula for calculating greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} describes cases where feedstock is converted into biofuels in one step. For more complex supply chains, adjustments are needed for calculating greenhouse gas emissions from the extraction or cultivation of raw materials e_{ec} for intermediate products.

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$EC_{F(h\&c,el)}$ = total emissions from the fossil fuel comparator for useful heat or electricity.

4. The greenhouse gases taken into account for the purposes of point 1 shall be CO_2, N_2O and CH_4. For the purposes of calculating CO_2 equivalence, those gases shall be valued as follows:

CO_2	:	1
N_2O	:	298
CH_4	:	25

5. Emissions from the extraction or cultivation of raw materials, e_{ec}, shall include emissions from the extraction or cultivation process itself; from the collection, drying and storage of raw materials; from waste and leakages; and from the production of chemicals or products used in extraction or cultivation. Capture of CO_2 in the cultivation of raw materials shall be excluded. Estimates of emissions from agriculture biomass cultivation may be derived from the use of regional averages for cultivation emissions included in the reports referred to in Article 31(4) or the information on the disaggregated default values for cultivation emissions included in this Annex, as an alternative to using actual values. In the absence of relevant information in those reports it is allowed to calculate averages based on local farming practises based for instance on data of a group of farms, as an alternative to using actual values.

6. For the purposes of the calculation referred to in point 1(a), greenhouse gas emissions savings from improved agriculture management, e_{sca}, such as shifting to reduced or zero-tillage, improved crop/rotation, the use of cover crops, including crop residue management, and the use of organic soil improver (e.g. compost, manure fermentation digestate), shall be taken into account only if solid and verifiable evidence is provided that the soil carbon has increased or that it is reasonable to expect to have increased over the period in which the raw materials concerned were cultivated while taking into account the emissions where such practices lead to increased fertiliser and herbicide use ([1]).

7. Annualised emissions from carbon stock changes caused by land-use change, e_l, shall be calculated by dividing total emissions equally over 20 years. For the calculation of those emissions, the following rule shall be applied:

$$e_l = (CS_R - CS_A) \times 3{,}664 \times 1/20 \times 1/P - e_B, \text{ }(^2)$$

where

([1]) 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 on the basis of representative experiments or soil models. From the second measurement onwards, the measurements would constitute the basis for determining the existence of an increase in soil carbon and its magnitude.

([2]) 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.

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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 of biofuel or bioliquid energy (megajoules)). 'Cropland' (1) and 'perennial cropland' (2) shall be regarded as one land use;
CS_R	=	the carbon stock per unit area associated with the reference land-use (measured as mass (tonnes) of carbon per unit area, including both soil and vegetation). The reference land-use shall be the land-use in January 2008 or 20 years before the raw material was obtained, whichever was the later;
CS_A	=	the carbon stock per unit area associated with the actual land-use (measured as mass (tonnes) 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 CS_A shall be the estimated stock per unit area after 20 years or when the crop reaches maturity, whichever the earlier;
P	=	the productivity of the crop (measured as biofuel or bioliquid energy per unit area per year) and
e_B	=	bonus of 29 g CO_2eq/MJ biofuel or bioliquid if biomass is obtained from restored degraded land under the conditions laid down in point 8.

8. The bonus of 29 g CO_2eq/MJ shall be attributed if evidence is provided that the land:

(a) was not in use for agriculture or any other activity in January 2008; and

(b) is severely degraded land, including such land that was formerly in agricultural use.

The bonus of 29 g CO_2eq/MJ shall apply for a period of up to 20 years from the date of conversion of the land to agricultural use, provided that a steady increase in carbon stocks as well as a sizable reduction in erosion phenomena for land falling under (b) are ensured.

9. 'Severely degraded land' means land that, for a significant period of time, has either been significantly salinated or presented significantly low organic matter content and has been severely eroded.

(1) Cropland as defined by IPCC.

(2) Perennial crops are defined as multi-annual crops, the stem of which is usually not annually harvested such as short rotation coppice and oil palm.

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10. The Commission shall review, by 31 December 2020, guidelines for the calculation of land carbon stocks [1] drawing on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories – volume 4 and in accordance with Regulation (EU) No 525/2013 and Regulation (EU) 2018/841 of the European Parliament and of the Council [2]. The Commission guidelines shall serve as the basis for the calculation of land carbon stocks for the purposes of this Directive.

11. Emissions from processing, e_p, shall include emissions from the processing itself; from waste and leakages; and 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.

    In accounting for the consumption of electricity not produced within the fuel production plant, the greenhouse gas 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. By way of derogation from this rule, producers may use an average value for an individual electricity production plant for electricity produced by that plant, if that plant is not connected to the electricity grid.

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

12. 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. Emissions from transport and distribution to be taken into account under point 5 shall not be covered by this point.

13. Emissions of the fuel in use, e_u, shall be taken to be zero for biofuels and bioliquids.

    Emissions of non-CO_2 greenhouse gases (N_2O and CH_4) of the fuel in use shall be included in the e_u factor for bioliquids.

14. Emission savings from CO_2 capture and geological storage, e_{ccs}, that have not already been accounted for in e_p, shall be limited to emissions avoided through the capture and storage of emitted CO_2 directly related to the extraction, transport, processing and distribution of fuel if stored in compliance with Directive 2009/31/EC of the European Parliament and of the Council [3].

15. Emission savings from CO_2 capture and replacement, e_{ccr}, shall be related directly to the production of biofuel or bioliquid they are attributed to, and shall be limited to emissions avoided through the capture of CO_2 of which the carbon originates from biomass and which is used to replace fossil-derived CO_2 in production of commercial products and services.

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(1) Commission Decision 2010/335/EU of 10 June 2010 on guidelines for the calculation of land carbon stocks for the purpose of Annex V to Directive 2009/28/EC (OJ L 151, 17.6.2010, p. 19).

(2) Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (OJ L 156, 19.6.2018, p. 1).

(3) Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (OJ L 140, 5.6.2009, p. 114).

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16. Where a cogeneration unit – providing heat and/or electricity to a fuel production process for which emissions are being calculated – produces excess electricity and/or excess useful heat, the greenhouse gas 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 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 that 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 that calculation, the following definitions apply:

(a) ‘cogeneration’ shall mean the simultaneous generation in one process of thermal energy and electrical and/or mechanical energy;

(b) ‘useful heat’ shall mean heat generated to satisfy an economical justifiable demand for heat, for heating or cooling purposes;

(c) ‘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.

17. Where a fuel production process produces, in combination, the fuel for which emissions are being calculated and one or more other products (co-products), greenhouse gas emissions shall be divided between the fuel or its intermediate product and the co-products in proportion to their energy content (determined by lower heating value in the case of co-products other than electricity and heat). The greenhouse gas intensity of excess useful heat or excess electricity is the same as the greenhouse gas intensity of heat or electricity delivered to the fuel production process and is determined from calculating the greenhouse 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 fuel production process. In the case of cogeneration of electricity and heat, the calculation is performed following point 16.

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18. For the purposes of the calculation referred to in point 17, the emissions to be divided shall be e_{ec} + e_l + e_{sca} + those fractions of e_p, e_{td}, e_{ccs}, and e_{ccr} 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.

    In the case of biofuels and bioliquids, 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 shall be considered to have an energy content of zero for the purposes of the calculation.

    Wastes and residues, including tree tops and branches, straw, husks, cobs and nut shells, and residues from processing, including crude glycerine (glycerine that is not refined) and bagasse, shall be considered to have zero life-cycle greenhouse gas emissions up to the process of collection of those materials irrespectively 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 point 17 shall be the refinery.

19. For biofuels, for the purposes of the calculation referred to in point 3, the fossil fuel comparator $E_{F(t)}$ shall be 94 g CO_2eq/MJ.

    For bioliquids used for the production of electricity, for the purposes of the calculation referred to in point 3, the fossil fuel comparator $EC_{F(e)}$ shall be 183 g CO_2eq/MJ.

    For bioliquids used for the production of useful heat, as well as for the production of heating and/or cooling, for the purposes of the calculation referred to in point 3, the fossil fuel comparator $EC_{F(h\&c)}$ shall be 80 g CO_2eq/MJ.

D. DISAGGREGATED DEFAULT VALUES FOR BIOFUELS AND BIOLIQUIDS

Disaggregated default values for cultivation: 'e_{ec}' as defined in Part C of this Annex, including soil N_2O emissions

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
sugar beet ethanol	9,6	9,6
corn (maize) ethanol	25,5	25,5
other cereals excluding corn (maize) ethanol	27,0	27,0
sugar cane ethanol	17,1	17,1

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Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	
rape seed biodiesel	32,0	32,0
sunflower biodiesel	26,1	26,1
soybean biodiesel	21,2	21,2
▼C1		
palm oil biodiesel	26,0	26,0
▼B		
waste cooking oil biodiesel	0	0
animal fats from rendering biodiesel (**)	0	0
hydrotreated vegetable oil from rape seed	33,4	33,4
hydrotreated vegetable oil from sunflower	26,9	26,9
hydrotreated vegetable oil from soybean	22,1	22,1
▼C1		
hydrotreated vegetable oil from palm oil	27,3	27,3
▼B		
hydrotreated oil from waste cooking oil	0	0
hydrotreated oil from animal fats from rendering (**)	0	0
pure vegetable oil from rape seed	33,4	33,4
pure vegetable oil from sunflower	27,2	27,2
pure vegetable oil from soybean	22,2	22,2
pure vegetable oil from palm oil	27,1	27,1
pure oil from waste cooking oil	0	0

(**) Applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1069/2009, for which emissions related to hygenisation as part of the rendering are not considered.

Disaggregated default values for cultivation: 'e_{ec}' – for soil N_2O emissions only (these are already included in the disaggregated values for cultivation emissions in the 'e_{ec}' table)

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
sugar beet ethanol	4,9	4,9
corn (maize) ethanol	13,7	13,7
other cereals excluding corn (maize) ethanol	14,1	14,1
sugar cane ethanol	2,1	2,1
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	

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Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
rape seed biodiesel	17,6	17,6
sunflower biodiesel	12,2	12,2
soybean biodiesel	13,4	13,4
palm oil biodiesel	16,5	16,5
waste cooking oil biodiesel	0	0
animal fats from rendering biodiesel (**)	0	0
hydrotreated vegetable oil from rape seed	18,0	18,0
hydrotreated vegetable oil from sunflower	12,5	12,5
hydrotreated vegetable oil from soybean	13,7	13,7
hydrotreated vegetable oil from palm oil	16,9	16,9
hydrotreated oil from waste cooking oil	0	0
hydrotreated oil from animal fats from rendering (**)	0	0
pure vegetable oil from rape seed	17,6	17,6
pure vegetable oil from sunflower	12,2	12,2
pure vegetable oil from soybean	13,4	13,4
pure vegetable oil from palm oil	16,5	16,5
pure oil from waste cooking oil	0	0

(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1069/2009, for which emissions related to hygenisation as part of the rendering are not considered.

Disaggregated default values for processing: 'e_p' as defined in Part C of this Annex

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	18,8	26,3
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	9,7	13,6
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant (*))	13,2	18,5
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant (*))	7,6	10,6
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant (*))	27,4	38,3

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant (*))	15,7	22,0
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	20,8	29,1
corn (maize) ethanol, (natural gas as process fuel in CHP plant (*))	14,8	20,8
corn (maize) ethanol (lignite as process fuel in CHP plant (*))	28,6	40,1
corn (maize) ethanol (forest residues as process fuel in CHP plant (*))	1,8	2,6
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	21,0	29,3
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant (*))	15,1	21,1
other cereals excluding maize ethanol (lignite as process fuel in CHP plant (*))	30,3	42,5
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant (*))	1,5	2,2
sugar cane ethanol	1,3	1,8
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	
rape seed biodiesel	11,7	16,3
sunflower biodiesel	11,8	16,5
soybean biodiesel	12,1	16,9
palm oil biodiesel (open effluent pond)	30,4	42,6
palm oil biodiesel (process with methane capture at oil mill)	13,2	18,5
waste cooking oil biodiesel	9,3	13,0
animal fats from rendering biodiesel (**)	13,6	19,1
hydrotreated vegetable oil from rape seed	10,7	15,0

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
hydrotreated vegetable oil from sunflower	10,5	14,7
hydrotreated vegetable oil from soybean	10,9	15,2
hydrotreated vegetable oil from palm oil (open effluent pond)	27,8	38,9
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	9,7	13,6
hydrotreated oil from waste cooking oil	10,2	14,3
hydrotreated oil from animal fats from rendering (**)	14,5	20,3
▼C1		
pure vegetable oil from rape seed	3,7	5,2
▼B		
pure vegetable oil from sunflower	3,8	5,4
pure vegetable oil from soybean	4,2	5,9
pure vegetable oil from palm oil (open effluent pond)	22,6	31,7
pure vegetable oil from palm oil (process with methane capture at oil mill)	4,7	6,5
pure oil from waste cooking oil	0,6	0,8

(*) Default values for processes using CHP are valid only if all the process heat is supplied by CHP.
(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1069/2009, for which emissions related to hygenisation as part of the rendering are not considered.

Disaggregated default values for oil extraction only (these are already included in the disaggregated values for processing emissions in the ‘e_p’ table)

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
rape seed biodiesel	3,0	4,2
sunflower biodiesel	2,9	4,0
soybean biodiesel	3,2	4,4
palm oil biodiesel (open effluent pond)	20,9	29,2
palm oil biodiesel (process with methane capture at oil mill)	3,7	5,1
waste cooking oil biodiesel	0	0
animal fats from rendering biodiesel (**)	4,3	6,1
hydrotreated vegetable oil from rape seed	3,1	4,4
hydrotreated vegetable oil from sunflower	3,0	4,1

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
hydrotreated vegetable oil from soybean	3,3	4,6
hydrotreated vegetable oil from palm oil (open effluent pond)	21,9	30,7
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	3,8	5,4
hydrotreated oil from waste cooking oil	0	0
hydrotreated oil from animal fats from rendering (**)	4,3	6,0
pure vegetable oil from rape seed	3,1	4,4
pure vegetable oil from sunflower	3,0	4,2
pure vegetable oil from soybean	3,4	4,7
pure vegetable oil from palm oil (open effluent pond)	21,8	30,5
pure vegetable oil from palm oil (process with methane capture at oil mill)	3,8	5,3
pure oil from waste cooking oil	0	0

(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1069/2009, for which emissions related to hygenisation as part of the rendering are not considered.

Disaggregated default values for transport and distribution: ‘e_{td}’ as defined in Part C of this Annex

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	2,3	2,3
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	2,3	2,3
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant (*))	2,3	2,3
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant (*))	2,3	2,3
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant (*))	2,3	2,3
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant (*))	2,3	2,3
corn (maize) ethanol (natural gas as process fuel in CHP plant (*))	2,2	2,2

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	2,2	2,2
corn (maize) ethanol (lignite as process fuel in CHP plant (*))	2,2	2,2
corn (maize) ethanol (forest residues as process fuel in CHP plant (*))	2,2	2,2
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	2,2	2,2
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant (*))	2,2	2,2
other cereals excluding maize ethanol (lignite as process fuel in CHP plant (*))	2,2	2,2
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant (*))	2,2	2,2
sugar cane ethanol	9,7	9,7
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	
rape seed biodiesel	1,8	1,8
sunflower biodiesel	2,1	2,1
soybean biodiesel	8,9	8,9
palm oil biodiesel (open effluent pond)	6,9	6,9
palm oil biodiesel (process with methane capture at oil mill)	6,9	6,9
waste cooking oil biodiesel	1,9	1,9
▼C1		
animal fats from rendering biodiesel (**)	1,6	1,6
▼B		
hydrotreated vegetable oil from rape seed	1,7	1,7
hydrotreated vegetable oil from sunflower	2,0	2,0
hydrotreated vegetable oil from soybean	9,2	9,2
hydrotreated vegetable oil from palm oil (open effluent pond)	7,0	7,0
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	7,0	7,0

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
hydrotreated oil from waste cooking oil	1,7	1,7
hydrotreated oil from animal fats from rendering (**)	1,5	1,5
pure vegetable oil from rape seed	1,4	1,4
pure vegetable oil from sunflower	1,7	1,7
pure vegetable oil from soybean	8,8	8,8
pure vegetable oil from palm oil (open effluent pond)	6,7	6,7
pure vegetable oil from palm oil (process with methane capture at oil mill)	6,7	6,7
pure oil from waste cooking oil	1,4	1,4

(*) Default values for processes using CHP are valid only if all the process heat is supplied by CHP.
(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1069/2009, for which emissions related to hygenisation as part of the rendering are not considered.

Disaggregated default values for transport and distribution of final fuel only. These are already included in the table of 'transport and distribution emissions e_{td}' as defined in Part C of this Annex, but the following values are useful if an economic operator wishes to declare actual transport emissions for crops or oil transport only).

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	1,6	1,6
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	1,6	1,6
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant (*))	1,6	1,6
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant (*))	1,6	1,6
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant (*))	1,6	1,6
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant (*))	1,6	1,6
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	1,6	1,6

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
corn (maize) ethanol (natural gas as process fuel in CHP plant (*))	1,6	1,6
corn (maize) ethanol (lignite as process fuel in CHP plant (*))	1,6	1,6
corn (maize) ethanol (forest residues as process fuel in CHP plant (*))	1,6	1,6
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	1,6	1,6
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant (*))	1,6	1,6
other cereals excluding maize ethanol (lignite as process fuel in CHP plant (*))	1,6	1,6
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant (*))	1,6	1,6
sugar cane ethanol	6,0	6,0
the part of ethyl-tertio-butyl-ether (ETBE) from renewable ethanol	Will be considered to be equal to that of the ethanol production pathway used	
the part of tertiary-amyl-ethyl-ether (TAEE) from renewable ethanol	Will be considered to be equal to that of the ethanol production pathway used	
rape seed biodiesel	1,3	1,3
sunflower biodiesel	1,3	1,3
soybean biodiesel	1,3	1,3
palm oil biodiesel (open effluent pond)	1,3	1,3
palm oil biodiesel (process with methane capture at oil mill)	1,3	1,3
waste cooking oil biodiesel	1,3	1,3
animal fats from rendering biodiesel (**)	1,3	1,3
hydrotreated vegetable oil from rape seed	1,2	1,2
hydrotreated vegetable oil from sunflower	1,2	1,2

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
hydrotreated vegetable oil from soybean	1,2	1,2
hydrotreated vegetable oil from palm oil (open effluent pond)	1,2	1,2
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	1,2	1,2
hydrotreated oil from waste cooking oil	1,2	1,2
hydrotreated oil from animal fats from rendering (**)	1,2	1,2
pure vegetable oil from rape seed	0,8	0,8
pure vegetable oil from sunflower	0,8	0,8
pure vegetable oil from soybean	0,8	0,8
pure vegetable oil from palm oil (open effluent pond)	0,8	0,8
pure vegetable oil from palm oil (process with methane capture at oil mill)	0,8	0,8
pure oil from waste cooking oil	0,8	0,8

(*) Default values for processes using CHP are valid only if all the process heat is supplied by CHP.
(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1069/2009, for which emissions related to hygenisation as part of the rendering are not considered.

Total for cultivation, processing, transport and distribution

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
sugar beet ethanol (no biogas from slop, natural gas as process fuel in conventional boiler)	30,7	38,2
sugar beet ethanol (with biogas from slop, natural gas as process fuel in conventional boiler)	21,6	25,5
sugar beet ethanol (no biogas from slop, natural gas as process fuel in CHP plant (*))	25,1	30,4
sugar beet ethanol (with biogas from slop, natural gas as process fuel in CHP plant (*))	19,5	22,5
sugar beet ethanol (no biogas from slop, lignite as process fuel in CHP plant (*))	39,3	50,2

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
sugar beet ethanol (with biogas from slop, lignite as process fuel in CHP plant (*))	27,6	33,9
corn (maize) ethanol (natural gas as process fuel in conventional boiler)	48,5	56,8
corn (maize) ethanol, (natural gas as process fuel in CHP plant (*))	42,5	48,5
corn (maize) ethanol (lignite as process fuel in CHP plant (*))	56,3	67,8
corn (maize) ethanol (forest residues as process fuel in CHP plant (*))	29,5	30,3
other cereals excluding maize ethanol (natural gas as process fuel in conventional boiler)	50,2	58,5
other cereals excluding maize ethanol (natural gas as process fuel in CHP plant (*))	44,3	50,3
other cereals excluding maize ethanol (lignite as process fuel in CHP plant (*))	59,5	71,7
▼C1		
other cereals excluding maize ethanol (forest residues as process fuel in CHP plant (*)	30,7	31,4
sugar cane ethanol	28,1	28,6
▼B		
the part from renewable sources of ETBE	Equal to that of the ethanol production pathway used	
the part from renewable sources of TAEE	Equal to that of the ethanol production pathway used	
rape seed biodiesel	45,5	50,1
sunflower biodiesel	40,0	44,7
soybean biodiesel	42,2	47,0
▼C1		
palm oil biodiesel (open effluent pond)	63,3	75,5
palm oil biodiesel (process with methane capture at oil mill)	46,1	51,4
▼B		
waste cooking oil biodiesel	11,2	14,9
▼C1		
animals fats from rendering biodiesel (**)	15,2	20,7

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
hydrotreated vegetable oil from rape seed	45,8	50,1
hydrotreated vegetable oil from sunflower	39,4	43,6
hydrotreated vegetable oil from soybean	42,2	46,5
▼C1		
hydrotreated vegetable oil from palm oil (open effluent pond)	62,1	73,2
hydrotreated vegetable oil from palm oil (process with methane capture at oil mill)	44,0	47,9
▼B		
hydrotreated oil from waste cooking oil	11,9	16,0
hydrotreated oil from animal fats from rendering (**)	16,0	21,8
pure vegetable oil from rape seed	38,5	40,0
pure vegetable oil from sunflower	32,7	34,3
pure vegetable oil from soybean	35,2	36,9
▼C1		
pure vegetable oil from palm oil (open effluent pond)	56,4	65,5
pure vegetable oil from palm oil (process with methane capture at oil mill)	38,5	40,3
▼B		
pure oil from waste cooking oil	2,0	2,2

(*) Default values for processes using CHP are valid only if all the process heat is supplied by CHP.
(**) Note: applies only to biofuels produced from animal by-products classified as category 1 and 2 material in accordance with Regulation (EC) No 1069/2009, for which emissions related to hygenisation as part of the rendering are not considered.

E. ESTIMATED DISAGGREGATED DEFAULT VALUES FOR FUTURE BIOFUELS AND BIOLIQUIDS THAT WERE NOT ON THE MARKET OR WERE ONLY ON THE MARKET IN NEGLIGIBLE QUANTITIES IN 2016

Disaggregated default values for cultivation: 'e_{ec}' as defined in Part C of this Annex, including N_2O emissions (including chipping of waste or farmed wood)

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
wheat straw ethanol	1,8	1,8
waste wood Fischer-Tropsch diesel in free-standing plant	3,3	3,3
farmed wood Fischer-Tropsch diesel in free-standing plant	8,2	8,2
▼C1		
waste wood Fischer-Tropsch petrol in free-standing plant	3,3	3,3
farmed wood Fischer-Tropsch petrol in free-standing plant	8,2	8,2

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
waste wood dimethylether (DME) in free-standing plant	3,1	3,1
farmed wood dimethylether (DME) in free-standing plant	7,6	7,6
waste wood methanol in free-standing plant	3,1	3,1
farmed wood methanol in free-standing plant	7,6	7,6
Fischer-Tropsch diesel from black-liquor gasification integrated with pulp mill	2,5	2,5
Fischer-Tropsch petrol from black-liquor gasification integrated with pulp mill	2,5	2,5
dimethylether (DME) from black-liquor gasification integrated with pulp mill	2,5	2,5
Methanol from black-liquor gasification integrated with pulp mill	2,5	2,5
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

Disaggregated default values for soil N_2O emissions (included in disaggregated default values for cultivation emissions in the 'e_{ec}' table)

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
wheat straw ethanol	0	0
waste wood Fischer-Tropsch diesel in free-standing plant	0	0
farmed wood Fischer-Tropsch diesel in free-standing plant	4,4	4,4
waste wood Fischer-Tropsch petrol in free-standing plant	0	0
farmed wood Fischer-Tropsch petrol in free-standing plant	4,4	4,4
waste wood dimethylether (DME) in free-standing plant	0	0
farmed wood dimethylether (DME) in free-standing plant	4,1	4,1
waste wood methanol in free-standing plant	0	0
farmed wood methanol in free-standing plant	4,1	4,1

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
Fischer-Tropsch diesel from black-liquor gasification integrated with pulp mill	0	0
Fischer-Tropsch petrol from black-liquor gasification integrated with pulp mill	0	0
dimethylether (DME) from black-liquor gasification integrated with pulp mill	0	0
Methanol from black-liquor gasification integrated with pulp mill	0	0
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

Disaggregated default values for processing: 'e_p' as defined in Part C of this Annex

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
wheat straw ethanol	4,8	6,8
waste wood Fischer-Tropsch diesel in free-standing plant	0,1	0,1
farmed wood Fischer-Tropsch diesel in free-standing plant	0,1	0,1
waste wood Fischer-Tropsch petrol in free-standing plant	0,1	0,1
farmed wood Fischer-Tropsch petrol in free-standing plant	0,1	0,1
waste wood dimethylether (DME) in free-standing plant	0	0
farmed wood dimethylether (DME) in free-standing plant	0	0
waste wood methanol in free-standing plant	0	0
farmed wood methanol in free-standing plant	0	0
Fischer-Tropsch diesel from black-liquor gasification integrated with pulp mill	0	0
Fischer-Tropsch petrol from black-liquor gasification integrated with pulp mill	0	0

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
dimethylether (DME) from black-liquor gasification integrated with pulp mill	0	0
methanol from black-liquor gasification integrated with pulp mill	0	0
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

Disaggregated default values for transport and distribution: 'e_{td}' as defined in Part C of this Annex

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
wheat straw ethanol	7,1	7,1
▼C1		
waste wood Fischer-Tropsch diesel in free-standing plant	12,2	12,2
▼B		
farmed wood Fischer-Tropsch diesel in free-standing plant	8,4	8,4
▼C1		
waste wood Fischer-Tropsch petrol in free-standing plant	12,2	12,2
▼B		
farmed wood Fischer-Tropsch petrol in free-standing plant	8,4	8,4
▼C1		
waste wood dimethylether (DME) in free-standing plant	12,1	12,1
▼B		
farmed wood dimethylether (DME) in free-standing plant	8,6	8,6
▼C1		
waste wood methanol in free-standing plant	12,1	12,1
▼B		
farmed wood methanol in free-standing plant	8,6	8,6
Fischer-Tropsch diesel from black-liquor gasification integrated with pulp mill	7,7	7,7
Fischer-Tropsch petrol from black-liquor gasification integrated with pulp mill	7,9	7,9
dimethylether (DME) from black-liquor gasification integrated with pulp mill	7,7	7,7
methanol from black-liquor gasification integrated with pulp mill	7,9	7,9
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

▼B

Disaggregated default values for transport and distribution of final fuel only. These are already included in the table of 'transport and distribution emissions e_{td}' as defined in Part C of this Annex, but the following values are useful if an economic operator wishes to declare actual transport emissions for feedstock transport only).

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
wheat straw ethanol	1,6	1,6
waste wood Fischer-Tropsch diesel in free-standing plant	1,2	1,2
farmed wood Fischer-Tropsch diesel in free-standing plant	1,2	1,2
waste wood Fischer-Tropsch petrol in free-standing plant	1,2	1,2
farmed wood Fischer-Tropsch petrol in free-standing plant	1,2	1,2
waste wood dimethylether (DME) in free-standing plant	2,0	2,0
farmed wood dimethylether (DME) in free-standing plant	2,0	2,0
waste wood methanol in free-standing plant	2,0	2,0
farmed wood methanol in free-standing plant	2,0	2,0
Fischer-Tropsch diesel from black-liquor gasification integrated with pulp mill	2,0	2,0
Fischer-Tropsch petrol from black-liquor gasification integrated with pulp mill	2,0	2,0
dimethylether (DME) from black-liquor gasification integrated with pulp mill	2,0	2,0
methanol from black-liquor gasification integrated with pulp mill	2,0	2,0
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	

Total for cultivation, processing, transport and distribution

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
wheat straw ethanol	13,7	15,7
▼C1		
waste wood Fischer-Tropsch diesel in free-standing plant	15,6	15,6

▼B

Biofuel and bioliquid production pathway	Greenhouse gas emissions – typical value (g CO_2eq/MJ)	Greenhouse gas emissions – default value (g CO_2eq/MJ)
farmed wood Fischer-Tropsch diesel in free-standing plant	16,7	16,7
▼C1 waste wood Fischer-Tropsch petrol in free-standing plant	15,6	15,6
▼B farmed wood Fischer-Tropsch petrol in free-standing plant	16,7	16,7
▼C1 waste wood dimethylether (DME) in free-standing plant	15,2	15,2
▼B farmed wood dimethylether (DME) in free-standing plant	16,2	16,2
▼C1 waste wood methanol in free-standing plant	15,2	15,2
▼B farmed wood methanol in free-standing plant	16,2	16,2
Fischer-Tropsch diesel from black-liquor gasification integrated with pulp mill	10,2	10,2
Fischer-Tropsch petrol from black-liquor gasification integrated with pulp mill	10,4	10,4
dimethylether (DME) from black-liquor gasification integrated with pulp mill	10,2	10,2
methanol from black-liquor gasification integrated with pulp mill	10,4	10,4
the part from renewable sources of MTBE	Equal to that of the methanol production pathway used	