

[<sup>F1</sup>ANNEX IV

## RULES FOR CALCULATING LIFE CYCLE GREENHOUSE EMISSIONS FROM BIOFUELS

### Textual Amendments

- F1** Substituted by Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC (Text with EEA relevance).

A. Typical and default values for biofuels if produced with no net carbon emissions from land use change

| Biofuel production pathway  | Typical greenhouse gas emission saving               | Default greenhouse gas emission saving |
|---|--|--|
| Sugar beet ethanol  | 61 %   | 52 %                                   |
| Wheat ethanol (process fuel not specified)  | 32 %   | 16 %                                   |
| Wheat ethanol (lignite as process fuel in CHP plant)                                | 32 %   | 16 %                                   |
| Wheat ethanol (natural gas as process fuel in conventional boiler)                  | 45 %   | 34 %                                   |
| Wheat ethanol (natural gas as process fuel in CHP plant)                            | 53 %   | 47 %                                   |
| Wheat ethanol (straw as process fuel in CHP plant)                                  | 69 %   | 69 %                                   |
| Corn (maize) ethanol, Community produced (natural gas as process fuel in CHP plant) | 56 %   | 49 %                                   |
| Sugar cane ethanol  | 71 %   | 71 %                                   |
| 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   | 45 %   | 38 %                                   |

**a** Not including animal oil produced from animal by-products classified as category 3 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules concerning animal by-products not intended for human consumption

**b** OJ L 273, 10.10.2002, p. 1.

*Status: EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.*

|   |      |      |
|---|------|------|
| Sunflower biodiesel   | 58 % | 51 % |
| Soybean biodiesel   | 40 % | 31 % |
| Palm oil biodiesel (process not specified)  | 36 % | 19 % |
| Palm oil biodiesel (process with methane capture at oil mill)                       | 62 % | 56 % |
| Waste vegetable or animal <sup>a</sup> oil biodiesel                                | 88 % | 83 % |
| Hydrotreated vegetable oil from rape seed   | 51 % | 47 % |
| Hydrotreated vegetable oil from sunflower   | 65 % | 62 % |
| Hydrotreated vegetable oil from palm oil (process not specified)                    | 40 % | 26 % |
| Hydrotreated vegetable oil from palm oil (process with methane capture at oil mill) | 68 % | 65 % |
| Pure vegetable oil from rape seed   | 58 % | 57 % |
| Biogas from municipal organic waste as compressed natural gas                       | 80 % | 73 % |
| Biogas from wet manure as compressed natural gas                                    | 84 % | 81 % |
| Biogas from dry manure as compressed natural gas                                    | 86 % | 82 % |

<sup>a</sup> Not including animal oil produced from animal by-products classified as category 3 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules concerning animal by-products not intended for human consumption

<sup>b</sup> OJ L 273, 10.10.2002, p. 1.

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 January 2008, if produced with no net carbon emissions from land use change

| <b>Biofuel production pathway</b> | <b>Typical greenhouse gas emission saving</b> | <b>Default greenhouse gas emission saving</b> |
|-----------------------------------|---|---|
| Wheat straw ethanol               | 87 %  | 85 %  |
| Waste wood ethanol                | 80 %  | 74 %  |
| Farmed wood ethanol               | 76 %  | 70 %  |

**Status:** EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.

|   |   |      |
|---|---|------|
| Waste wood Fischer-Tropsch diesel                                   | 95 %  | 95 % |
| Farmed wood Fischer-Tropsch diesel                                  | 93 %  | 93 % |
| Waste wood dimethylether (DME)                                      | 95 %  | 95 % |
| Farmed wood DME   | 92 %  | 92 % |
| Waste wood methanol   | 94 %  | 94 % |
| Farmed wood methanol  | 91 %  | 91 % |
| The part from renewable sources of methyl-tertio-butyl-ether (MTBE) | Equal to that of the methanol production pathway used |      |

### C. Methodology

- Greenhouse gas emissions from the production and use of biofuels shall be calculated as:

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

where

|           |  |
|-----------|--|
| $E$       | = total emissions from the use of the fuel;  |
| $e_{ec}$  | = emissions from the extraction or cultivation of raw materials;                       |
| $e_l$     | = 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 carbon capture and geological storage;                         |
| $e_{ccr}$ | = emission savings from carbon capture and replacement; and                            |
| $e_{ee}$  | = emission savings from excess electricity from cogeneration.                          |

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

- Greenhouse gas emissions from fuels,  $E$ , shall be expressed in terms of grams of CO<sub>2</sub> equivalent per MJ of fuel, gCO<sub>2eq</sub>/MJ.
- By derogation from point 2, values calculated in terms of gCO<sub>2eq</sub>/MJ may be adjusted to take into account differences between fuels in useful work done, expressed in terms of km/MJ. Such adjustments shall only be made where evidence of the differences in useful work done is provided.
- Greenhouse gas emission savings from biofuels shall be calculated as:

$$SAVING = (E_F - E_B)/E_F$$

where

---

*Status: EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.*

---

$E_B$  = total emissions from the biofuel; and  
 $E_F$  = total emissions from the fossil fuel comparator.

5. The greenhouse gases taken into account for the purposes of point 1 shall be CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>. For the purpose of calculating CO<sub>2</sub> equivalence, those gases shall be valued as follows:

CO<sub>2</sub> : 1  
 N<sub>2</sub>O : 296  
 CH<sub>4</sub> : 23

6. Emissions from the extraction or cultivation of raw materials,  $e_{ec}$ , shall include emissions from the extraction or cultivation process itself; from the collection of raw materials; from waste and leakages; and from the production of chemicals or products used in extraction or cultivation. Capture of CO<sub>2</sub> in the cultivation of raw materials shall be excluded. Certified reductions of greenhouse gas emissions from flaring at oil production sites anywhere in the world shall be deducted. Estimates of emissions from cultivation may be derived from the use of averages calculated for smaller geographical areas than those used in the calculation of the default values, as an alternative to using actual values.

[<sup>F27</sup>] 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:

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

where

$e_l$  = annualised greenhouse gas emissions from carbon stock change due to land-use change (measured as mass (grams) of CO<sub>2</sub>-equivalent per unit biofuel energy (megajoules)). ‘Cropland’<sup>(2)</sup> and ‘perennial cropland’<sup>(3)</sup> 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 is the earlier;

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

$e_B$  = bonus of 29 gCO<sub>2eq</sub>/MJ biofuel if biomass is obtained from restored degraded land under the conditions provided for in point 8.]

#### Textual Amendments

**F2** Substituted by [Directive \(EU\) 2015/1513 of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending](#)

Directive 2009/28/EC on the promotion of the use of energy from renewable sources (Text with EEA relevance).

8. The bonus of 29 gCO<sub>2eq</sub>/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) falls into one of the following categories:
    - (i) severely degraded land, including such land that was formerly in agricultural use;
    - (ii) heavily contaminated land.

The bonus of 29 gCO<sub>2eq</sub>/MJ shall apply for a period of up to 10 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 (i) are ensured and that soil contamination for land falling under (ii) is reduced.

9. The categories mentioned in point 8(b) are defined as follows:
- (a) ‘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 been severely eroded;
  - (b) ‘heavily contaminated land’ means land that is unfit for the cultivation of food and feed due to soil contamination.

Such land shall include land that has been the subject of a Commission decision in accordance with the fourth subparagraph of Article 7c(3).

10. The guide adopted pursuant to point 10 of Part C of Annex V to Directive 2009/28/EC shall serve as the basis of 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.

In accounting for the consumption of electricity not produced within the fuel production plant, the greenhouse gas emission 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. As an exception to 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.

12. Emissions from transport and distribution,  $e_{td}$ , shall include emissions from the transport and storage 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 6 shall not be covered by this point.
13. Emissions from the fuel in use,  $e_u$ , shall be taken to be zero for biofuels.
14. Emission savings from carbon 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 sequestration of emitted CO<sub>2</sub> directly related to the extraction, transport, processing and distribution of fuel.

---

*Status: EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.*

---

15. Emission savings from carbon capture and replacement,  $e_{ccr}$ , shall be limited to emissions avoided through the capture of CO<sub>2</sub> of which the carbon originates from biomass and which is used to replace fossil-derived CO<sub>2</sub> used in commercial products and services.
16. Emission savings from excess electricity from cogeneration,  $e_{ee}$ , shall be taken into account in relation to the excess electricity produced by fuel production systems that use cogeneration except where the fuel used for the cogeneration is a co-product other than an agricultural crop residue. In accounting for that excess electricity, the size of the cogeneration unit shall be assumed to be the minimum necessary for the cogeneration unit to supply the heat that is needed to produce the fuel. The greenhouse gas emission savings associated with that excess electricity shall be taken to be equal to the amount of greenhouse gas that would be emitted when an equal amount of electricity was generated in a power plant using the same fuel as the cogeneration unit.
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).
18. For the purposes of the calculation referred to in point 17, the emissions to be divided shall be  $e_{ec} + e_l$  + those fractions of  $e_p$ ,  $e_{id}$  and  $e_{ee}$  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 this purpose instead of the total of those emissions.

All co-products, including electricity that does not fall under the scope of point 16, shall be taken into account for the purposes of that calculation, except for agricultural crop residues, including straw, bagasse, husks, cobs and nut shells. Co-products that have a negative energy content shall be considered to have an energy content of zero for the purpose of the calculation.

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

In the case of fuels produced in refineries, the unit of analysis for the purposes of the calculation referred to in point 17 shall be the refinery.

19. For the purposes of the calculation referred to in point 4, the fossil fuel comparator  $E_F$  shall be the latest available actual average emissions from the fossil part of petrol and diesel consumed in the Community as reported under this Directive. If no such data are available, the value used shall be 83,8 gCO<sub>2eq</sub>/MJ.

D. Disaggregated default values for biofuels

Disaggregated default values for cultivation: 'e<sub>cc</sub>' as defined in Part C of this Annex

| Biofuel production pathway | Typical greenhouse gas emissions(gCO <sub>2eq</sub> /MJ)   | Default greenhouse gas emissions(gCO <sub>2eq</sub> /MJ) |
|----------------------------|--|--|
| a                          | Not including animal oil produced from animal by-products classified as category 3 material in accordance with Regulation (EC) No 1774/2002. |  |

---

**Status:** EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.

|   |  |    |
|---|--|----|
| Sugar beet ethanol  | 12   | 12 |
| Wheat ethanol   | 23   | 23 |
| Corn (maize) ethanol,<br>Community produced                   | 20   | 20 |
| Sugar cane ethanol  | 14   | 14 |
| The part from renewable sources of ETBE                       | Equal to that of the ethanol production pathway used |    |
| The part from renewable sources of TAAE                       | Equal to that of the ethanol production pathway used |    |
| Rape seed biodiesel   | 29   | 29 |
| Sunflower biodiesel   | 18   | 18 |
| Soybean biodiesel   | 19   | 19 |
| Palm oil biodiesel  | 14   | 14 |
| Waste vegetable or animal <sup>a</sup> oil biodiesel          | 0  | 0  |
| Hydrotreated vegetable oil from rape seed                     | 30   | 30 |
| Hydrotreated vegetable oil from sunflower                     | 18   | 18 |
| Hydrotreated vegetable oil from palm oil                      | 15   | 15 |
| Pure vegetable oil from rape seed                             | 30   | 30 |
| Biogas from municipal organic waste as compressed natural gas | 0  | 0  |
| Biogas from wet manure as compressed natural gas              | 0  | 0  |
| Biogas from dry manure as compressed natural gas              | 0  | 0  |

<sup>a</sup> Not including animal oil produced from animal by-products classified as category 3 material in accordance with Regulation (EC) No 1774/2002.

Disaggregated default values for processing (including excess electricity): 'e<sub>p</sub> – e<sub>ce</sub>' as defined in Part C of this Annex

| <b>Biofuel production pathway</b>          | <b>Typical greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> | <b>Default greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> |
|--|---|---|
| Sugar beet ethanol                         | 19  | 26  |
| Wheat ethanol (process fuel not specified) | 32  | 45  |

*Status: EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.*

|   |  |    |
|---|--|----|
| Wheat ethanol (lignite as process fuel in CHP plant)                                | 32   | 45 |
| Wheat ethanol (natural gas as process fuel in conventional boiler)                  | 21   | 30 |
| Wheat ethanol (natural gas as process fuel in CHP plant)                            | 14   | 19 |
| Wheat ethanol (straw as process fuel in CHP plant)                                  | 1  | 1  |
| Corn (maize) ethanol, Community produced (natural gas as process fuel in CHP plant) | 15   | 21 |
| Sugar cane ethanol  | 1  | 1  |
| The part from renewable sources of ETBE   | Equal to that of the ethanol production pathway used |    |
| The part from renewable sources of TAAE   | Equal to that of the ethanol production pathway used |    |
| Rape seed biodiesel   | 16   | 22 |
| Sunflower biodiesel   | 16   | 22 |
| Soybean biodiesel   | 18   | 26 |
| Palm oil biodiesel (process not specified)  | 35   | 49 |
| Palm oil biodiesel (process with methane capture at oil mill)                       | 13   | 18 |
| Waste vegetable or animal oil biodiesel   | 9  | 13 |
| Hydrotreated vegetable oil from rape seed   | 10   | 13 |
| Hydrotreated vegetable oil from sunflower   | 10   | 13 |
| Hydrotreated vegetable oil from palm oil (process not specified)                    | 30   | 42 |
| Hydrotreated vegetable oil from palm oil (process with methane capture at oil mill) | 7  | 9  |
| Pure vegetable oil from rape seed   | 4  | 5  |



*Status: EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.*

|   |    |    |
|---|----|----|
| Biogas from municipal organic waste as compressed natural gas | 14 | 20 |
| Biogas from wet manure as compressed natural gas              | 8  | 11 |
| Biogas from dry manure as compressed natural gas              | 8  | 11 |

Disaggregated default values for transport and distribution: 'e<sub>td</sub>' as defined in Part C of this Annex

| <b>Biofuel production pathway</b>                             | <b>Typical greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> | <b>Default greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> |
|---|---|---|
| Sugar beet ethanol  | 2   | 2   |
| Wheat ethanol   | 2   | 2   |
| Corn (maize) ethanol, Community produced                      | 2   | 2   |
| Sugar cane ethanol  | 9   | 9   |
| 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   | 1   |
| Sunflower biodiesel   | 1   | 1   |
| Soybean biodiesel   | 13  | 13  |
| Palm oil biodiesel  | 5   | 5   |
| Waste vegetable or animal oil biodiesel                       | 1   | 1   |
| Hydrotreated vegetable oil from rape seed                     | 1   | 1   |
| Hydrotreated vegetable oil from sunflower                     | 1   | 1   |
| Hydrotreated vegetable oil from palm oil                      | 5   | 5   |
| Pure vegetable oil from rape seed                             | 1   | 1   |
| Biogas from municipal organic waste as compressed natural gas | 3   | 3   |
| Biogas from wet manure as compressed natural gas              | 5   | 5   |

*Status: EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.*

|  |   |   |
|--|---|---|
| Biogas from dry manure as compressed natural gas | 4 | 4 |
|--|---|---|

Total for cultivation, processing, transport and distribution

| <b>Biofuel production pathway</b>   | <b>Typical greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> | <b>Default greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> |
|---|---|---|
| Sugar beet ethanol  | 33  | 40  |
| Wheat ethanol (process fuel not specified)  | 57  | 70  |
| Wheat ethanol (lignite as process fuel in CHP plant)                                | 57  | 70  |
| Wheat ethanol (natural gas as process fuel in conventional boiler)                  | 46  | 55  |
| Wheat ethanol (natural gas as process fuel in CHP plant)                            | 39  | 44  |
| Wheat ethanol (straw as process fuel in CHP plant)                                  | 26  | 26  |
| Corn (maize) ethanol, Community produced (natural gas as process fuel in CHP plant) | 37  | 43  |
| Sugar cane ethanol  | 24  | 24  |
| 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   | 46  | 52  |
| Sunflower biodiesel   | 35  | 41  |
| Soybean biodiesel   | 50  | 58  |
| Palm oil biodiesel (process not specified)  | 54  | 68  |
| Palm oil biodiesel (process with methane capture at oil mill)                       | 32  | 37  |
| Waste vegetable or animal oil biodiesel   | 10  | 14  |
| Hydrotreated vegetable oil from rape seed   | 41  | 44  |
| Hydrotreated vegetable oil from sunflower   | 29  | 32  |

**Status:** EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.

|   |    |    |
|---|----|----|
| Hydrotreated vegetable oil from palm oil (process not specified)                    | 50 | 62 |
| Hydrotreated vegetable oil from palm oil (process with methane capture at oil mill) | 27 | 29 |
| Pure vegetable oil from rape seed   | 35 | 36 |
| Biogas from municipal organic waste as compressed natural gas                       | 17 | 23 |
| Biogas from wet manure as compressed natural gas                                    | 13 | 16 |
| Biogas from dry manure as compressed natural gas                                    | 12 | 15 |

E. Estimated disaggregated default values for future biofuels that were not on the market or were only on the market in negligible quantities in January 2008  
Disaggregated values for cultivation: 'e<sub>cc</sub>' as defined in Part C of this Annex

| <b>Biofuel production pathway</b>       | <b>Typical greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> | <b>Default greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> |
|---|---|---|
| Wheat straw ethanol                     | 3   | 3   |
| Waste wood ethanol                      | 1   | 1   |
| Farmed wood ethanol                     | 6   | 6   |
| Waste wood Fischer-Tropsch diesel       | 1   | 1   |
| Farmed wood Fischer-Tropsch diesel      | 4   | 4   |
| Waste wood DME                          | 1   | 1   |
| Farmed wood DME                         | 5   | 5   |
| Waste wood methanol                     | 1   | 1   |
| Farmed wood methanol                    | 5   | 5   |
| The part from renewable sources of MTBE | Equal to that of the methanol production pathway used         |   |

Disaggregated values for processing (including excess electricity): 'e<sub>p</sub> - e<sub>cc</sub>' as defined in Part C of this Annex

| <b>Biofuel production pathway</b> | <b>Typical greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> | <b>Default greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> |
|-----------------------------------|---|---|
| Wheat straw ethanol               | 5   | 7   |

*Status: EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.*

|   |   |    |
|---|---|----|
| Wood ethanol                            | 12  | 17 |
| Wood Fischer-Tropsch diesel             | 0   | 0  |
| Wood DME                                | 0   | 0  |
| Wood methanol                           | 0   | 0  |
| The part from renewable sources of MTBE | Equal to that of the methanol production pathway used |    |

Disaggregated values for transport and distribution: 'e<sub>id</sub>' as defined in Part C of this Annex

| <b>Biofuel production pathway</b>       | <b>Typical greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> | <b>Default greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> |
|---|---|---|
| Wheat straw ethanol                     | 2   | 2   |
| Waste wood ethanol                      | 4   | 4   |
| Farmed wood ethanol                     | 2   | 2   |
| Waste wood Fischer-Tropsch diesel       | 3   | 3   |
| Farmed wood Fischer-Tropsch diesel      | 2   | 2   |
| Waste wood DME                          | 4   | 4   |
| Farmed wood DME                         | 2   | 2   |
| Waste wood methanol                     | 4   | 4   |
| Farmed wood methanol                    | 2   | 2   |
| The part from renewable sources of MTBE | Equal to that of the methanol production pathway used         |   |

Total for cultivation, processing, transport and distribution

| <b>Biofuel production pathway</b>  | <b>Typical greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> | <b>Default greenhouse gas emissions(gCO<sub>2eq</sub>/MJ)</b> |
|------------------------------------|---|---|
| Wheat straw ethanol                | 11  | 13  |
| Waste wood ethanol                 | 17  | 22  |
| Farmed wood ethanol                | 20  | 25  |
| Waste wood Fischer-Tropsch diesel  | 4   | 4   |
| Farmed wood Fischer-Tropsch diesel | 6   | 6   |
| Waste wood DME                     | 5   | 5   |
| Farmed wood DME                    | 7   | 7   |
| Waste wood methanol                | 5   | 5   |

---

**Status:** EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.

---

|   |  |   |
|---|--|---|
| Farmed wood methanol                    | 7  | 7 |
| The part from renewable sources of MTBE | Equal to that of the methanol production pathway used] |   |

---

*Status: EU Directives are being published on this site to aid cross referencing from UK legislation. After IP completion day (31 December 2020 11pm) no further amendments will be applied to this version.*

---

- (1) [<sup>F1</sup> [<sup>F2</sup> The quotient obtained by dividing the molecular weight of CO<sub>2</sub> (44,010 g/mol) by the molecular weight of carbon (12,011 g/mol) is equal to 3,664.]]
- (2) [<sup>F1</sup> [<sup>F2</sup> Cropland as defined by IPCC.]]
- (3) [<sup>F1</sup> [<sup>F2</sup> 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.]]

#### **Textual Amendments**

- F1** Substituted by Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC (Text with EEA relevance).
- F2** Substituted by Directive (EU) 2015/1513 of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources (Text with EEA relevance).