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Appendix A (C_f calculation examples)

Due to the significant oxygen content of FAME and its blends, the Lower Calorific Value (or Net Specific Energy Value) cannot be calculated using the formulae as given in Annex H to ISO 8217, but must instead be determined by testing – i.e. ASTM D240. However, for those biofuels such as HVO, which are compositionally indistinguishable from high grade petroleum fuels, the distillate formula as given in ISO 8217 can be used.

Example using the ISCC Certificate sample that should accompany your bio blend BDN:

Proof of Sustainability (PoS) for Biofuels, Bioliqids and Biomass Fuels V2.3
Applies under the Renewable Energy Directive (EU) 2018/2001 (RED II)

Unique Number of the PoS: EU-ISCC-Cert-DE-105-88445402-2066052.0
Date of Issuance of the PoS: 08-May-23
www.iscc-system.org

Supplier Recipient

1. General information

Type of Product: Biodiesel
Type of Raw Material: Used cooking oil (UCO) entirely of veg. origin
Additional Information (voluntary):
Country of Origin (of the raw material): China
Quantity: 140.570 m³/15°C ☒ m³ ☐ metric tons
Energy content (MJ): 4,638,810 MJ
EU RED Compliant material? ☒ Yes
ISCC Compliant material (voluntary)? ☐ Yes
Chain of custody option (voluntary):

2. Scope of certification of raw material

The raw material complies with the relevant sustainability criteria according to Art. 29 (2) - (7) RED II? ☐ Yes ☒ No
The agricultural biomass was cultivated as intermediate crop (if applicable) ☐ Yes ☒ No
The agricultural biomass additionally fulfils the measures for low ILUC risk feedstocks (if applicable) ☐ Yes ☒ No
The raw material meets the definition of waste or residue according to the RED II? ☒ Yes ☐ No

3. Greenhouse Gas (GHG) emission information

Total default value according to RED II applied ☐ Yes ☒ No

E = E_{ec} + E_l + E_p + E_{ld} + E_u⁵ + E_{sc}⁶ + E_{cc} + E_{ccr} = 9.6 gCO₂eq/MJ

GHG emission saving⁸:

89.8% Biofuels for transport	94.8% Biomass fuels for the production of electricity
94.8% Bioliqids for electricity	88.0% Biomass fuels for the production of useful heat, as well as for the production of energy for heating and/or cooling
88.0% Bioliqids for the production of useful heat, as well as for the production of energy for heating and/or cooling	92.3% Biomass fuels for the production of useful heat, in which a direct physical substitution of coal can be demonstrated

Date when the final biofuel, bioliqid or biomass producer started operation? 20.08.2012
For biogas supply chains:
Were incentives/subsidies received for the production of the biogas? ☐ Yes ☐ No
If yes, please specify:

GHG Emission
RED II
EI= 9.6 gCO₂eq/MJ

Case example 1

Ship received 350MT of 100% biofuel FAME (B100).

1. Certified by either ISCC or RSB as having an Emissions Intensity (EI) of 18 gCO₂e/MJ and a Lower Calorific Value (LCV) of 37.7 MJ/kg – 0.0377 MJ/g.

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2. That Emissions Intensity value does not exceed 33 gCO₂e/MJ, hence the fuel can be considered “sustainable” for the purposes of MEPC.1/Circ.905. This EI value is given in terms of CO₂e (CO₂ equivalence). However, for the purposes of the application of this interim guidance, that can be taken simply as CO₂. C_f value = EI x LCV = 18 x 0.0377 = 0.6786 g CO₂/g fuel.
3. In the EEDI Guidelines – MEPC.364(79) – the C_f values are given in terms of tonnes of CO₂ per tonne of fuel and to a precision of three decimal places. Consequently, the C_f value to be used in either CII calculations or the IMO Data Collection System (DCS) returns in respect of the use of that fuel should be expressed as: C_f = 0.679 t- CO₂/t-fuel.
4. In completing the DCS returns, in accordance with the current SEEMP Guidelines – MEPC.346(76) – this quantity of biofuel would be entered under “Other” as: “Other (sustainable biofuel) 350 MT – C_f 0.679 in accordance with MEPC.1/Circ.905”.

The sustainability documentation received with this fuel should be retained on board in the same way as the Bunker Delivery Note – Regulation 18.6 of MARPOL Annex VI.

Case example 2

Ship received 350MT of VLSFO grade B30 biofuel – where the biofuel component is given as FAME.

1. The sustainability documentation received with this fuel gives details of the FAME component which is stated as 103MT – hence 247MT of VLSFO as the other part of that blend.
2. Certified by either ISCC or RSB as having an Emissions Intensity (EI) of 18.8 g CO₂e/MJ and a Lower Calorific Value (LCV) of 37.5 MJ/kg – 0.0375 MJ/g.
3. That Emissions Intensity value does not exceed 33 gCO₂e/MJ, hence the FAME component of the fuel can be considered as being “sustainable” for the purposes of the circular. The FAME C_f value is determined as in Example 1 above: FAME C_f value = EI x LCV = 18.8 x 0.0375 = 0.705 t- CO₂/t-fuel.
4. In the EEDI Guidelines – MEPC.364(79) – the three liquid petroleum derived fuels are distinguished in terms of their ISO 8217 grades. In this case, the VLSFO residual blend component has been assumed to be low viscosity and hence falls into the category of RMD80 corresponding to the “Light Fuel Oil” with assigned C_f value of 3.151 t- CO₂/t-fuel and a LCV of 41,200 kJ/kg (41.2 MJ/kg).
5. C_f value for a blend should be determined on the basis of the weighted average of energy contents of the components rather than on a weight basis. On that energy basis, the overall CF value for the whole of the fuel as delivered is determined as follows:

	LCV	Fuel	Energy	Energy	C _F	
	MJ/kg	kg	MJ	Fraction	t-CO ₂ /t-fuel	Blend
FAME	37.5	103000	3862500	0.275	0.705	0.194
VLSFO	41.2	247000	10176400	0.725	3.151	2.284
Total		350000	14038900			2.478

6. Hence the energy weighted average C_f of that blend is determined by multiplying the respective Energy Fractions by the corresponding C_f values for each component and then adding the results of those to obtain the shown overall value for the blend of 2.478 t- CO₂/t-fuel.

As regards blends, the interim guidelines do not give direction beyond establishing an overall value for the product as delivered. Therefore, no guidance is given as to how that is to be entered into the DCS returns. Since an overall value for the blend needs to be determined, it is assumed at this time that it is this blend data which is to be entered – rather than the component parts (i.e. FAME tonnage and C_f value to “Other (Biofuel)” and the VLSFO tonnage to the “Light Fuel Oil”

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category where the given C_f value is applied). On that basis, the biofuel blend would be entered into the DCS under “Other” as: “Other (sustainable biofuel-VLSFO blend) 350 MT – CF 2.478 in accordance with MEPC.1/Circ.905”.

The sustainability documentation received with this fuel should be retained on board in the same way as the Bunker Delivery Note – Regulation 18.6 of MARPOL Annex VI.

Case example 3

Ship received 350MT of VLSFO grade B40 biofuel – where the biofuel component is given as FAME.

1. However, in this instance the ISCC or RSB certification states that FAME blend component as having an Emissions Intensity of 38 g CO₂e/MJ – that is above the maximum 33 g CO₂e/MJ as allowed by the interim guidelines. Another scenario is that no such sustainability documentation is provided or unavailable from the supplier.
2. In these instances, the interim guidelines states that if the biofuel component is not documented as being “sustainable” as required, the C_f value as applicable to the equivalent fossil fuel type is to be used. Given that FAME generally has viscosity and density characteristics which correspond to those of the distillate grades in ISO 8217, then a C_f value of 3.206 t- CO₂/t-fuel would be assigned to that FAME fraction with the resulting calculation undertaken otherwise as given in Example 2 above. However, from a pragmatic perspective, the total fuel consignment could instead be considered as a VLSFO and duly accorded the corresponding default C_f value of 3.151 t- CO₂/t-fuel.
3. As above, the interim guidelines do not give guidance as to how such a fuel should be entered in the DCS returns. Yet on the basis of what is given, it would seem that such a biofuel blend would still be entered into the DCS under “Other”, but in this case as: “Other (not sustainable biofuel-VLSFO blend) 350 MT – C_f 3.151 t-CO₂/t-fuel – in accordance with MEPC.1/Circ.905”.

Such documentation as received with this fuel should be retained on board in the same way as the Bunker Delivery Note – Regulation 18.6 of MARPOL Annex VI.