Gold Standard

Methodology for Biodiesel from waste oil/fat from biogenic origin for use as fuel

I. SOURCE AND APPLICABILITY

1. Source

This methodology is based on the approved CDM methodology AM0047, version 2, "Production of biodiesel based on waste oils and/or waste fats from biogenic origin for use as fuel".

As with AM0047, version 2, this methodology also refers to the latest version of the "Tool for the demonstration and assessment of additionality", ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" [1] and AMS I.D "Grid connected renewable electricity generation."

2. Applicability

The methodology is applicable to project activities that reduce emissions through the production, sale and consumption of blends of petrodiesel with biodiesel to be used as fuel, where the biodiesel is based on waste cooking oil and/or waste fat from biogenic origin (henceforth referred to as "waste oil/fat"). For the purpose of this methodology the following definitions apply:

- biogenic means that the oils and/or fats originate from either vegetable or animal biomass, but not from mineral (fossil) sources;
- petrodiesel is 100% fossil fuel diesel;
- biodiesel is 100% trans-esterified biofuel diesel; and,
- blended biodiesel is defined as any blending fraction of petrodiesel with biodiesel greater than 0 and smaller than 100%.

The methodology ensures that the emission reductions can only be issued to the producer of the biodiesel and not to the consumer.

The following conditions apply to the methodology:

Feedstock inputs

a) For this specific methodology, *waste oil/fat* is defined as a residue or waste stream from restaurants, agro and food industry, slaughterhouses or related commercial sectors. Any biodiesel volumes produced by other sources must be clearly identified and a new methodology should be proposed to account for them. No emission reductions can be claimed under this methodology for biodiesel that is not produced from waste oil/fat.
b) The waste oil/fat is sourced from within the boundaries of the host country.
c) The project applicant shall provide convincing evidence that the biodiesel has been produced from renewable biomass resources[2] and shall include this in the Sustainability Monitoring Plan.
d) The project applicant shall provide convincing evidence that the biodiesel has not been produced from existing biomass resources to the detriment of other existing uses of the same resources (e.g. food, heating, other industrial process, etc.). Evidence must be provided that the current users are in agreement with the shift of use, e.g. by inviting representatives of current users to the stakeholder

[1] Please refer to: http://cdm.unfccc.int/goto/MPappmeth
[2] As defined in Annex 18 EB 23, http://cdm.unfccc.int/EB/Meetings/023/eb23_repan18.pdf

consultation meetings and gauge their consent on the project activity. In the absence of such an agreement, the project applicant shall demonstrate that biodiesel has been produced from surplus biomass[3], and shall include this in the Sustainability Monitoring Plan.

Product outputs

a) The petrodiesel, the biodiesel and their blends comply with national regulations or with suitable international standards.
b) The by-product glycerol is not disposed of or left to decay. It should be either incinerated or used as raw material for industrial consumption.

Consumption of biodiesel

a) The blended or pure biodiesel is supplied to consumers within the host country whose existing stationary installations or vehicles, that actually combust the blend, are included in the project boundary.
b) The consumers (end-users) of blended biodiesel in the transport sector is a captive fleet.
c) The consumers and the producer of the blended or pure biodiesel are bound by a contract that allows the producer to monitor the consumption of blended biodiesel and states that the consumer shall not claim emission reductions resulting from its consumption.
d) No major modifications in the consumer stationary installations or in the vehicles engines are deemed necessary to consume/combust the blended biodiesel. In case of stationary installations, the blending fraction can have any value between 0 and 100%. In case of vehicles use, the blending proportion must be low enough to ensure that the technical performance characteristics of the blended biodiesel do not differ significantly from those of pure petrodiesel. The default value for the maximum allowable blending proportion is 20% by volume (B20)[4]. If the project participants use a blending proportion more than 20%, and they wish to claim VERs, they shall justify in the PDD that the technical performance characteristics of the blended biodiesel do not differ significantly from those of pure petrodiesel. Blending is done by the producer, the consumer or a third party who is contractually bound to the producer to ensure that blending proportions and amounts are monitored and meet all regulatory requirements.
e) Blended biodiesel may be consumed in uncontrolled blends in mobile sources[5] in which case emission reductions cannot be claimed. This does not release the project participants from their obligation to monitor the amount of biodiesel consumed with appropriate means in order to have a complete balance of production and consumption.

Activities for which emission reductions are claimed

a) Project participants claim emission reductions only for the CO_2 emissions from petrodiesel displaced by the biodiesel.
b) Project participants **do not** claim emission reductions for the following: (i) Reductions in life-cycle emissions associated with the production of displaced petrodiesel; (ii) Biodiesel consumed for non-energy purposes; (iii) Utilization of by-products such as glycerol; (iv) Avoidance of methane emissions from waste water treatment due to the reduction of waste oil in waste wate

[3] See section on Leakage from the displacement of existing uses of waste oil/fat, p.12
[4] 2004 Biodiesel Handling and Use Guidelines, U.S. Department of Energy.
[5] In this methodology, mobile sources are defined as sources where the fuel is used to propel a vehicle (i.e. in an internal combustion engine) e.g. cars, tractors, lorries, motorbikes as opposed to the transport of a diesel generator on wheels.

II. BASELINE METHODOLOGY

1. Project boundary

The spatial extent of the project boundary encompasses:

- Transportation of waste oil/fat to the project site (e.g. road transport by vehicles);
- Biodiesel production plant at the project site, comprising the esterification unit plus other installations on the site (e.g. storage, refining, blending, etc.);
- Transportation of biodiesel to the facility where the biodiesel is blended with petrodiesel;
- Facility where the biodiesel is blended with petrodiesel; (regardless of the ownership of the blending facility)
- Transportation of the blended biodiesel to the final consumer (end-user);
- Vehicles and existing stationary combustion installations where the blended biodiesel is consumed.

Relevant emission sources within this boundary include the following (see table below for details):

- Emissions from combustion of petrodiesel and biodiesel, taking into account the fossil carbon contained in methanol used in biodiesel production;
- Emissions from fuel and electricity consumed in the production of biodiesel;
- Emissions from the transport of waste oil/fat to the biodiesel plant;
- Emissions from the transport of biodiesel to the facility where the biodiesel is blended with petrodiesel. These emissions are to be added to the project emissions only if the current distribution of the petrodiesel being displaced does not involve similar transport of fuel to a blend/distribution location.

Emissions associated with the production of methanol used for esterification are excluded from the project boundary, but are accounted for as leakage.

Table 1: Summary of gases and sources included in the project boundary, and justification / explanation where gases and sources are not included.

	Source	Gas	Included?	Justification / Explanation
Baseline	Vehicles and stationary combustion sources consuming petrodiesel	CO_2	Yes	Main source of baseline emissions
		CH_4	No	Excluded for simplification. CH_4 and N_2O emissions are assumed to be very small. No systematic difference to project activity
		N_2O	No	
Project Activity	Transportation of waste oil/fat to project site	CO_2	Yes	May be a significant emissions source
		CH_4	No	Excluded for simplification. CH_4 emissions are assumed to be very small.
		N_2O	No	Excluded for simplification. N_2O emissions are assumed to be very small.
	On site energy consumption at biodiesel production plant	CO_2	Yes	May be a significant emissions source
		CH_4	No	Excluded for simplification. CH_4 emissions are assumed to be very small.
		N_2O	No	Excluded for simplification. N_2O emissions are assumed to be very small.
	Transportation of biodiesel to blending facility	CO_2	Yes	May be a significant emissions source
		CH_4	No	Excluded for simplification. CH_4 emissions are assumed to be very small.
		N_2O	No	Excluded for simplification. N_2O emissions are assumed to be very small.

	Source	Gas	Included?	Justification / Explanation
	Vehicles and stationary combustion sources consuming blended biodiesel	CO_2	Yes	Fossil carbon contained in methanol used for esterification. It is a significant source of emissions . Other biodiesel carbon is climate neutral (i.e. from residual waste oil/fat)
		CH_4	No	Excluded for simplification. CH_4 and N_2O emissions are assumed to be very small. No systematic difference to baseline scenario
		N_2O	No	

2. Procedure for the selection of the most plausible baseline scenario

The baseline scenario should be separately determined for the following elements:

- **Production of fuels (P)**: What would have happened at the production level in the absence of the CDM project activity?
- **Consumption (C):** Which fuel would have been consumed in the absence of the CDM project activity?
- **Material (M)**: What would have happened to the material used as input for production of biofuel in the absence of the CDM project activity?

For the **fuel production** level, project participants shall identify the most likely baseline scenario among all realistic and credible alternatives(s), applying steps of the latest approved version of the "Tool for the demonstration and assessment of additionality". Step 3 should be used to assess which of these alternatives is to be excluded from further consideration (i.e. alternatives where barriers are prohibitive or which are clearly economically unattractive) and Step 2 should be applied for all remaining alternatives. In case project proponent is a company already producing fuels other than biodiesel then only step 2 should be applied for all options identified (barrier analysis is not allowed). Where more than one credible and plausible alternative scenario remains, project participants shall, as a conservative assumption, adopt the alternative that results in the lowest baseline emissions as the most likely baseline scenario.

At the production level the realistic and credible alternative(s) may include, *inter alia*:

P1 Continuation of current practices with no investment in biodiesel production capacity;
P2 The project activity implemented without the CDM; and
P3 Investment in any other alternative fuel replacing partially or totally the baseline fuel.

For the **consumption of fuel**, the baseline should be determined as follows:

Step 1: Identify all realistic and credible alternatives for the fuel used by end consumers.

Project participants should at least consider the following alternatives with respect to the intended consumer of blended biodiesel:

C1 Continuation of petroleum diesel consumption;
C2 Consumption of biodiesel from other producers;
C3 Consumption of other single alternative fuel such as CNG or LPG, etc;
C4 Consumption of a mix of above alternative fuels;
C5 Consumption of biodiesel from the proposed project plant.

Step 2: Eliminate alternatives that are not complying with applicable laws and regulations

Eliminate alternatives that are not in compliance with all applicable legal and regulatory requirements. Apply Sub-step 1b of the latest version of the "Tool for the demonstration and assessment of additionality".

Step 3: Eliminate alternatives that face prohibitive barriers

Scenarios that face prohibitive barriers (e.g technical barrier) should be eliminated by applying Step 3 of the latest version of the "Tool for the demonstration and assessment of additionality".

Step 4: Compare economic attractiveness of remaining alternatives

Compare the economic attractiveness for all the remaining alternatives by applying Step 2 of the latest version of the "Tool for the demonstration and assessment of additionality". Provide all the assumptions in the CDM-PDD.

Include a sensitivity analysis applying Sub-step 2d of the latest version of the "Tool for the demonstration and assessment of additionality". If the sensitivity analysis is conclusive (for a realistic range of assumptions), then the most cost effective scenario is the baseline scenario. In case the sensitivity analysis is not fully conclusive, select the baseline scenario alternative with least emissions among the alternatives that are the most economically attractive according to the investment analysis and the sensitivity analysis.

For the **material (M)** level, the previous steps 1 through 4 shall be taken. Project participants should at least consider the following alternatives.

M1 Use of material for production of biofuels (by the project proponent or by others);
M2 Use for material production of substances other than fuel
M3 Incineration of material for the purpose of energy recovery
M4 Incineration of material without energy recovery
M5 Disposal of material in an anaerobic or aerobic manner

This methodology is applicable for the baseline scenario which combines P1, C1, and any one of the M scenarios . For material scenarios M1, M2 and M3, possible leakage from the displacement of existing uses of waste oil/fat needs to be assessed, as stated in the leakage section.

3. Additionality

The additionality of the project activity shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the CDM Executive Board, and available on the UNFCCC CDM web site.

Additionality is assessed only for the project activity (i.e. the construction and operation of the biodiesel plant). Additionality is established ex-ante for the duration of the crediting period, i.e. the relevant parameters are not subject to monitoring, and only need to be revalidated at the renewal of the crediting period.

Where Step 2 of the "Tool for the demonstration and assessment of additionality" (Investment Analysis) is used, the investment analysis shall include a sensitivity analysis of the biodiesel sales price, the feedstock costs and fuel costs.

4. Baseline emissions

Baseline emissions from displaced petrodiesel are determined using the following equation:

$$BE_y = BD_y \cdot CF_{PD} \cdot EF_{CO2,PD} \cdot NCV_{PD} \quad \textbf{(1)}$$

Where:

BE_y = Baseline emissions during the year y (tCO_2)

BD_y = Most conservative value among production of biodiesel ($P_{BD,y}$), consumption of biodiesel ($C_{BD,y}$) and consumption of blended biodiesel times blending fraction ($C_{BBD,y}$*$f_{\%}$). Only blended biodiesel from waste oil/fat shall be considered and that which is consumed by identified in-country consumers to substitute petrodiesel in the year y (tonnes)

CF_{BD} = Conversion factor from biodiesel to petrodiesel (tonnes petrodiesel/tonnes biodiesel)

$EF_{CO2,PD}$ = Carbon dioxide emissions factor for petrodiesel (tCO_2/GJ)

NCV_{PD} = Net calorific value of petrodiesel (GJ/tonne)

In determining emission coefficients, emission factors or net calorific values in this methodology, guidance by the 2000 IPCC Good Practice Guidance[6] should be followed. Project participants may either conduct regular measurements or they may use accurate and reliable local or national data where available. Where such data is not available, IPCC default emission factors[7] (country-specific, if available) may be used if they are deemed to reasonably represent local circumstances. All values should be chosen in a conservative manner and the choices should be justified.

The conversion factor (CF_{PD}) shall be calculated based on the respective net calorific values of biodiesel and petrodiesel, as shown in equation (2):

$$CF_{PD} = \frac{NCV_{BD}}{NCV_{PD}} \quad \textbf{(2)}$$

Where:

CF_{PD} = Conversion factor from biodiesel to petrodiesel (tonnes petrodiesel/tonnes biodiesel)

NCV_{BD} = Net calorific value of biodiesel (GJ/tonne)

NCV_{PD} = Net calorific value of petrodiesel (GJ/tonne)

5. Project Emissions

Project activity emissions include four components:

- CO_2 from consumption of fuels at the biodiesel production facility;
- CO_2 from consumption of electricity at the biodiesel production facility;

[6] IPCC 2000, Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories

[7] IPCC 2006, Revised 2006 Guidelines for National Greenhouse Gas Inventories, Reference Manual

- CO_2 from combustion of fossil carbon contained in methanol that is chemically bound in the biodiesel during the esterification process, and released upon combustion;
- CO_2 from transport of both waste oil/fat to the project site and biodiesel from the project site where the blending takes place.

The petrodiesel fraction in the blend is excluded from the calculations.

$$PE_y = PE_{fuel,y} + PE_{elec,y} + PE_{MeOH,y} + PE_{Tr,y} \quad \textbf{(3)}$$

Where:

PE_y = Project emissions during the year y (tCO_2)
$PE_{fuel,y}$ = Project emissions from combustion of fuels (i.e. for required steam) in biodiesel production in year y (tCO_2)
$PE_{elec,y}$ = Project emissions from electricity consumption in the biodiesel plant in year y (tCO_2)
$PE_{MeOH,y}$ = Project emissions from combustion of fossil fuel derived methanol in the biodiesel ester in year y (tCO_2)
$PE_{Tr,y}$ = Project emissions from transport of both waste oil/fat to the project site and biodiesel to the facility where the blending takes place in year y (tCO_2)

Emissions from fossil fuel consumption

Emissions from fuel consumption (i.e. for steam production) are calculated on the basis of measured consumption of heating fuel(s) on either the biodiesel production site or the site of an external supplier of steam as shown in equation (4).

$$PE_{fuel,y} = \sum_i \left(FC_{BDP,i,y} \times NCV_i \times EF_{CO2,i} \right) \quad \textbf{(4)}$$

Where:

$PE_{fuel,y}$ = Project emissions from combustion of fuels (i.e. for required steam) in biodiesel production in year y (tCO_2)
$FC_{BDP,i,y}$ = Fuel of type i consumed on-site for biodiesel production in year y (tonnes)
NCV_i = Net calorific value of fuel type i (GJ/tonne)
$EF_{CO2,i}$ = Carbon dioxide emissions factor for fuel i (tCO_2/GJ)

Emissions from electricity consumption

Emissions from electricity consumption are calculated on the basis of measured electricity consumption at the biodiesel production site, as shown in equation (5).

$$PE_{elec,y} = EC_y \times EF_{CO2,elec} \quad \textbf{(5)}$$

Where:

$PE_{elec,y}$ = Project emissions from electricity consumption in the biodiesel plant in year y (tCO_2)
EC_y = Electricity consumption at project site in year y (MWh)
$EF_{CO2,elec}$ = Emissions factor for grid electricity (tCO_2/MWh)

The emission factor ($EF_{CO2,elec}$) shall be calculated in accordance with the latest version of the following approved methodologies:

- ACM0002 shall be used if the consumption exceeds the CDM small scale thresholds as defined by the Executive Board.
- AMS I.D may be used if the consumption does not exceed the CDM small scale thresholds as defined by the Executive Board.

Emissions from fossil carbon content in methanol

Methanol is normally produced from natural gas, hence the carbon is fossil fuel derived. The carbon in the methanol is incorporated into the methyl ester biodiesel fuel, and is oxidized into CO_2 during combustion of the fuel. The emissions from combustion of methanol are based on the measured consumption of methanol in the biodiesel plant and the mass fraction of fossil carbon in the methanol, as shown in equation (6). The methanol consumption should be net of any water content. Methanol spilled and evaporated on the project site should be considered as consumption for estimating the emissions.

$$PE_{MeOH,y} = MC_{MeOH,y} \times EF_{C,MeOH} \times \frac{44}{12} \quad \textbf{(6)}$$

Where:

$PE_{MeOH,y}$ = Project emissions from combustion of fossil fuel derived methanol in the biodiesel ester in year *y* (tCO_2)
$MC_{MeOH,y}$ = Mass of methanol consumed in the biodiesel plant, including spills and evaporations in year *y* (tonnes)
$EF_{C,MeOH}$ = Carbon emissions factor of methanol, based on molecular weight (tC/tMeOH) (= 12/32)
44/12 = Molecular weight ratio to convert tonnes of carbon into tonnes of CO_2 (tCO_2/tC)

Transport Emissions

For transport emissions (to and from the biodiesel plant) project participants may choose between two different approaches to determine emissions: an approach based on distance and vehicle type (option 1) or on actual monitored vehicle fuel consumption (option 2).

Emissions from transport of biodiesel to the blending station are to be added to the project emissions only if the current distribution of the petrodiesel being displaced does not involve similar transport of fuel to a blend/distribution location.

Option 1:
Emissions are calculated on the basis of distance and the average truck load:

$$PE_{tr,y} = \left(\frac{WOF_{tr,y}}{TL_{WOF}} \times AVD_{WOF} \times EF_{km,tr} \right) + \left(\frac{P_{BD,y}}{TL_{BD}} \times AVD_{BD} \times EF_{km,tr} \right) \quad \textbf{(7)}$$

Where:

$PE_{tr,y}$ = Project emissions from transport of both waste oil/fat to the project site and biodiesel to the facility where the blending takes place in year *y* (tCO_2)
$WOF_{tr,y}$ = Waste oil/fat used as biodiesel feedstock in year *y* (tonnes)
TL_{WOF} = Average truck load for vehicles transporting waste oil/fat (tonnes)
AVD_{WOF} = Average distance travelled by vehicles transporting waste oil/fat (km)
$EF_{km,tr}$ = Carbon dioxide emissions factor for vehicles transporting waste oil/fat or biodiesel (tCO_2/km)

$P_{BD,y}$ = Quantity of biodiesel from waste oil/fat that is used by host country consumers to substitute petrodiesel in the year *y* (tonnes)
TL_{BD} = Average truck load for vehicles transporting biodiesel (tonnes)
AVD_{BD} = Average distance travelled by vehicles transporting biodiesel to the blending plant (km)

Option 2:
Emissions are calculated based on the actual quantity of fossil fuel consumed for transportation.

$$PE_{tr,y} = \sum_i \left(FC_{WOF,i,y} \times NCV_i \times EF_{CO2,i}\right) + \sum_i \left(FC_{BD,i,y} \times NCV_i \times EF_{CO2,i}\right) \quad \textbf{(8)}$$

Where:
$PE_{Tr,y}$ = Project emissions from transport of waste oil/fat to the project site and biodiesel to the facility where the blending takes place in year *y* (tCO_2)
$FC_{WOF,i,y}$ = Fuel consumption of type *i* for transporting waste oil/fat in year *y* (tonnes)
NCV_i = Net calorific value of fuel type *i* (GJ/tonne)
$EF_{CO2,i}$ = Carbon dioxide emissions factor for fuel type *i* (tCO_2/GJ)
$FC_{BD,i,y}$ = Fuel consumption of type *i* for transport biodiesel to blending plant in year *y* (tonnes)

6. Leakage

This methodology distinguishes two categories of leakage:
- Emissions associated with the production of the methanol used for esterification;
- Displacement of existing uses of waste oil/fat that may result in increased demand for fossil fuels elsewhere.

$$LE_y = LE_{MeOH,y} + LE_{WOF,y} \quad \textbf{(9)}$$

Where:
LE_y = Leakage emissions in year *y* (tCO_2)
$LE_{MeOH,y}$ = Leakage emissions associated with production of methanol used in biodiesel production in year *y* (tCO_2)
$LE_{WOF,y}$ = Leakage emissions from displacement of existing utilization of waste oil/fat in year *y* (tCO_2)

Leakage from methanol production

Emissions from production of methanol that are used in the trans-esterification process to produce the biodiesel.

$$LE_{MeOH,y} = MC_{MeOH,y} \cdot EF_{MeOH,PC} \quad \textbf{(10)}$$

Where:
$LE_{MeOH,y}$ = Leakage emissions associated with production of methanol used in biodiesel production in year *y* (tCO_2)
$MC_{MeOH,y}$ = Mass of methanol consumed in the biodiesel plant, including spills and evaporation on site,

in year *y* (tonnes)

$EF_{MeOH,PC}$ = Pre-combustion (i.e. upstream) emissions factor for methanol production (tCO_2/t MeOH).

Parameters	Value	References or Sources	Vintage	Spatial level	Monitored?	Comments
$LE_{MeOH,y}$	Calculated	-	-	-	No	-
$MC_{MeOH,y}$	Obtained through monitoring	Biodiesel plant data	latest	Project specific	Yes	-
$EF_{MeOH,PC}$	Default : 1.95	Apple 1998: http://edj.net/sinor/SFR4-99art7.html and 2006 IPCC Guidelines		International	Yes	

Leakage from the displacement of existing uses of waste oil/fat

For material scenarios M1, M2 and M3, Project participants shall demonstrate that the use of the waste oil/fat by the project activity does not result in increased fossil fuel consumption elsewhere. For this purpose, project participants shall monitor the total supply of waste oil/fat used in the project plant. The project participant shall also consider all the alternative uses of the waste oil/fat.

Applicants shall demonstrate that there is a surplus of waste oil/fat in the region of the project activity, which is not currently recovered or used for any purpose where fossil fuel could be used as an alternative. For micro-scale and small-scale project activities, this needs to be demonstrated ex-ante, at the beginning of each crediting period[8]. For large-scale projects activities, this needs to be demonstrated annually. For the purpose of this methodology, "surplus" is defined as

1. the quantity of available waste oil/fat produced in the region being at least 25% larger than the quantity of waste oil/fat that is recovered(e.g. for energy generation or as feedstock), including the project activity, **OR**
2. all of the waste oil/fat in the situation where no alternative uses of waste oil/fat have been identified, **OR**
3. all of the waste oil/fat the situation where all the alternative uses of waste oil/fat have been identified and the project proponent can demonstrate that current users are in agreement with the shift of use and determine that these alternative uses will not shift to fossil fuel due to implementation of the project activity.

Applicants shall clearly define the geographical boundary of the region and document it in the project documentation. In defining the geographical boundary of the region within which the leakage issue must be assessed, project participants must take into account the maximum distance over which waste oil/fat is transported, with as the upper limit the borders of the host country. The geographical boundary can be province(s) or state(s) where the waste oil/fat is sourced from, or a circular region defined by a radius equal to the longer distance over which the oil is transported with the conversion facility as the center. In case the project activity is located in a country where province or state boundaries are not clearly and officially defined, applicants must make use of the radius approach or consider the country as a whole.

Applicants are required to use at least two of the following methods from the four methods defined below to capture the data on leakage. For micro-scale and small-scale projects, the DOE must check reliability of

[8] In line with clause 18 of Annex 28 EB 47„General guidance on leakage in biomass project activities",http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentC.pdf

used data sources at the Validation stage and deliver a statement as part of the Validation Report. For large-scale projects, the DOE must check reliability of used data sources at the Validation stage and at the Verification stage and deliver related statements as part of the Validation Report and Verification Reports.

a. Reliable official data from authorities: this option can be used for e.g in cases where information on waste oil/fat generated from industries and its disposal/sale is reported to Pollution Control Authorities in the region/country by the respective industries and can be made available. This information should not be more than three years old from the time period when validation started.
b. Scientific publications: this can be a useful source of information for e.g if research papers or articles have been published and are available in public domain that provide specific information about current uses/disposal practices of the waste oil/fat used by the project. Such information should not be more than three years old from the time period when validation started. This can support other data sources but cannot be considered as only means to capture the intended data.
c. Interviews with waste collection companies and companies utilizing waste oil/fat: this can be used as a source of information for e.g by identifying waste collection companies that would supply waste oil/fat to the project activity. Representatives of these companies can be then invited to stakeholder consultation meeting/or separate meeting can be organised and information on sources for waste oil and its current use/disposal practice can be collected. Customised questionnaires may be designed to collect this information.
d. Third party statistically representative surveys: these surveys can be used to capture quantitative information on waste generation and its use.

For small-scale projects, applicants must make use of any two of the four approaches defined above. For large-scale projects, applicants must make use of a combination of one of the first two options above (a, b) with one of the next two options above (c, d), so that the demonstration is based on both published data and from a cross-checking survey/consultation on the ground.

Where project participants cannot demonstrate that the total quantity of waste oil/fat used by the project activity does not result in increased fossil fuel use elsewhere, a leakage penalty shall be applied.

Where the project participant can demonstrate that current users are in agreement with the shift of use of the waste oil/fat and that the total quantity of waste/fat used by the project activity does not result in increased fossil fuel use elsewhere (by using $WOF_{l,y}$ or UWO_Y), the leakage penalty shall not be applied.

The penalty is calculated as follows: For scenario M2, this applies where the most likely substitute, taking into account common practice of the region, is derived from fossil fuel.

$$LE_{WOF,y} = WOF_{L,y} \cdot NCV_{BD} \cdot EF_{CO2,L} \text{ (for scenario M1 and M3)} \quad \textbf{(11a)}$$

$$LE_{WOF,y} = COEF_{WOF,L} \cdot WOF_{L,y} \cdot NCV_{L} \cdot EF_{CO2,L} \text{ (for scenario M2 where the substitute for substance is likely to be derived from fossil fuel)} \quad \textbf{(11b)}$$

If UWO_Y = "False" then $WOF_{l,y} = 0$ **(11c)**

Where:

$LE_{WOF,y}$ = Leakage emissions from displacement of existing utilization of waste oil/fat in year y (tCO_2)

$WOF_{L,y}$ = Waste oil/fat that causes increased fossil fuel consumption elsewhere (tonnes)
NCV_{BD} = Net calorific value of biodiesel (GJ/tonne)
NCV_L = Net calorific value of the fossil fuel likely to substitute waste oil / fat (GJ/tonne)
$EF_{CO2,L}$ = Carbon dioxide emissions factor of most carbon intensive fuel oil in the country (tCO_2/GJ)
$COEF_{WOF,I}$ = Coefficient of substitution of fossil fuel to waste oil / fat to produce the substance previously produced by waste oil / fat
UWO_Y = If any alternative use/s of waste oil/fat in the defined area is identified that could be replaced fossil fuels then UWOY = "True"
If no alternative use/s of waste oil/fat in the defined area would shift to fossil fuels, as demonstrated via the methods described above, then UWOY = "False"

Determination of $WOF_{L,y}$

$$WOF_{L,y} = \begin{cases} \frac{(1.25 \times WOF_{D,y}) - WOF_{S,y}}{1.25} & if\ (1.25 \times WOF_{D,y}) > WOF_{S,y} \\ 0 & if\ (1.25 \times WOF_{D,y}) \leq WOF_{S,y} \end{cases} \quad \textbf{(12)}$$

with

$$WOF_{D,y} = WOF_{DS,y} + u_D$$
$$WOF_{S,y} = WOF_{SS,y} - u_S$$

Where:
$OF_{L,y}$ = Waste oil/fat that causes increased fossil fuel consumption elsewhere (tonnes)
$OF_{D,y}$ = Demand for waste oil/fat , including the project activity, in the defined region (tonnes), corrected for uncertainties associated with its determination
$OF_{S,y}$ = Supply of waste oil/fat in the defined region (tonnes), corrected for uncertainties associated with its determination
$WOF_{DS,y}$ = Statistical mean value obtained from surveys or other sources for the demand for waste oil/fat , including the project activity, in the defined region (tonnes),
$WOF_{SS,y}$ = Statistical mean value obtained from surveys or other sources for the supply of waste oil/fat in the defined region (tonnes)
u_D = Uncertainty for waste oil/fat demand (tonnes)
u_S = Uncertainty for waste oil/fat supply in the defined region (tonnes)

Methods to determine $WOF_{D,y}$, $WOF_{S,y}$ and the associated uncertainties are indicated in the monitoring methodology section below.

In the case that overall emission reductions from the project activity are negative in a given year because of the leakage penalty, emission reductions are not issued to project participants for the year concerned and in subsequent years, until emission reductions from subsequent years have compensated the quantity of negative emission reductions from the given year.

7. Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{(13)}$$

Where:
ER_y = Emission reductions during the year *y* (tCO_2/yr)
BE_y = Baseline emissions during the year *y* (tCO_2/yr)
PE_y = Project emissions during the year *y* (tCO_2/yr)
LE_y = Leakage emissions during the year *y* (tCO_2/yr)

8. Changes required for methodology implementation in 2nd and 3rd crediting periods

No changes required. Compliance with the applicability conditions, baseline scenario (i.e. baseline fuels) and additionality all need be fully revalidated upon renewal of the crediting period.

9. Data and parameters not monitored

Baseline Emissions

ID Number:	1
Parameter:	NCV_{PD}
Data unit:	GJ/tonne
Description:	Net calorific value of petrodiesel
Source of data:	2006 IPCC Guidelines for GHG Inventories.
Measurement procedures (if any):	
Any comment:	

ID Number:	2
Parameter:	$EF_{CO2,PD}$
Data unit:	tCO_2/GJ
Description:	Carbon dioxide emissions factor for petrodiesel
Source of data:	Default value may be derived from 2006 IPCC Guidelines, or from national statistics, if available.
Measurement procedures (if any):	
Any comment:	Local or national data should be preferred. Default values from the IPCC may be used alternatively.

Project emissions

ID Number:	3
Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2/GJ
Description:	Carbon dioxide emissions factor for fuel type *i*
Source of data:	Measurements or local / national data are preferred. Default values from the 2006 IPCC Guidelines may be used alternatively.
Measurement procedures (if any):	
Any comment:	Local or national data should be preferred. Default values from the 2006 IPCC Guidelines may be used alternatively and should be chosen in a conservative manner.

ID Number:	4
Data / Parameter:	NCV_i
Data unit:	GJ/tonne of fuel
Description:	Net calorific value of fuel type *i*
Source of data:	Measurements or local / national data are preferred. Default values from the 2006 IPCC Guidelines may be used alternatively.
Measurement procedures (if any):	
Any comment:	Local or national data should be preferred. Default values from the 2006 IPCC Guidelines may be used alternatively and should be chosen in a conservative manner.

Leakage

ID Number:	5
Parameter:	$EF_{MeOH\ PC}$
Data unit:	tCO_2/t methanol
Description:	Specific emission per tonne of produced methanol
Source of data:	Apple 1998: http://edj.net/sinor/SFR4-99art7.html and 2006 IPCC Guidelines.
Measurement procedures (if any):	1.95 tCO_2/tonne produced methanol
Any comment:	Based on 30 GJ/tonne energy requirement and average of IPCC emissions factors for natural gas and diesel oil.

ID Number:	6
Parameter:	NCV_L
Data unit:	GJ/tonne
Description:	Net calorific value of the fossil fuel likely to substitute waste oil / fat
Source of data:	2006 IPCC Guidelines for GHG Inventories.
Measurement procedures (if any):	
Any comment:	Identification of the fossil fuel shall be made taking into account common practice

ID Number:	7
Data / Parameter:	$EF_{CO2,L}$
Data unit:	tCO_2/GJ
Description:	Carbon dioxide emission factor of the most carbon intensive fuel oil in the country
Source of data:	Reliable official data (e.g. official statistics and government publication publications).
Measurement procedures (if any):	
Monitoring frequency:	Annually
Any comment:	Local or national data should be preferred. Default values from the 2006 IPCC Guidelines may be used alternatively and should be chosen in a conservative manner.

ID Number:	8
Data / Parameter:	$COEF_{WOF,l}$
Data unit:	Dimensionless
Description:	Carbon dioxide emission factor of the most carbon intensive fuel oil in the country
Source of data:	Reliable official or industry data (e.g. official statistics, government and industry publication publications). If such data are not existent, a default of 1 is taken.
Measurement procedures (if any):	
Monitoring frequency:	Annually
Any comment:	Local or national data should be preferred. Identification of the fossil fuel shall be made taking into account common practice

III. MONITORING METHODOLOGY

1. Monitoring procedures

Biodiesel production must apply national industry standards on QA/QC or, if there are no national QA/QC standards yet, apply industry standards from mature biodiesel production markets such as in Brazil, Europe or US.

The quality manual necessary under the above mentioned QA/QC standards shall include a section describing the elements of the monitoring procedures and how to assure and control their quality. A quality management representative from the project participant shall ensure that the monitoring procedures are established and that they meet the requirements as specified in this methodology.

Monitoring the plant inputs and outputs required for calculating leakage, baseline and project emissions shall be based on a complete documented mass balance, adjusted for stock changes, covering:

- Amounts of waste oil/fat purchased and processed;
- Amounts of catalysts purchased, processed and recovered;
- Amounts of methanol purchased and processed;
- Amounts of glycerol produced and incinerated and/or sold for utilization;
- Amounts of blended biodiesel delivered to consumers and consumed.

This mass balance shall be based on a combination of purchase/sales records and records of measurements, in accordance with the measuring instruments available at the plant and stationary consumers or fuelling stations of the captive fleet owner in case of use in transport sector. The mass balance serves as a QA/QC instrument to crosscheck results of monitoring parameters as defined in the following section.

The following procedure shall be used to verify the actual amount of biodiesel from waste oil/fat that is consumed by the end user for displacement of petrodiesel and its correspondence with the produced amount of biodiesel from waste oil/fat :

- The produced amount of biodiesel from waste oil/fat shall be recorded by the producer within a maximum uncertainty of 5% taking into account the stock changes where applicable;

- The amount of biodiesel produced from waste oil/fat transported to the storage of the blender is recorded by a calibrated metering system at the point of filling the (road) tankers and at the point of delivery at the blender site;

- During the process of creating the biodiesel blend at the blending station, the blending operation shall be monitored to assure adequate mixing of the products in the specified proportions. This includes measuring and recording the volumes and blend levels as verified through bills of lading, meter printouts or other auditable records of both the biodiesel and diesel fuel, which comprise the blended biodiesel;

- Contractually the biodiesel producer has to monitor consumption by the consumer as follows:
  - The receiving amount of blended biodiesel in the gas station or final distributor has to be recorded by a calibrated metering system and the storage fill level is recorded by a calibrated filling level indicator;
  - The amount of the blended biodiesel filled into the installation or vehicle where combustion takes place must be recorded by a calibrated metering system;
  - If blending is done by a third party contractual arrangement shall be made, that the same monitoring procedure as described above can be applied.

In the case of distribution of pure biodiesel to individual customers (e.g. farmers) showing up at biodiesel dispensing stations to purchase small amounts (Jerry Cans) for use in small, decentralised agricultural stationary installation like pumps and generators or in vehicles like tractors, the monitoring approach below can be used. However, for such end-users emission reductions can be claimed for the use of pure biodiesel for stationary applications such as pumps and small generators, but not for mobile applications (e.g. tractors).

- The amount of pure biodiesel received by the distributor shall be recorded by a calibrated instrument.
- Information on the use of the biodiesel in stationary and mobile sources can be recorded by appropriate methods for example electronic data loggers or individual user records which can be cross checked.
- A Monitoring Template is used based on a similar approach as in Table 2 below. This approach is used to record the intended use of pure biodiesel at the time of purchase from retail dispensing stations. Single sales of 10 litres or more will be eligible for ERs and must be recorded in a Customers & Sales database together with the necessary information for subsequent sampling procedures, i.e. name, address and contact details of customers, etc.
- Cross check surveys must be conducted once for each monitoring period to compare the information provided by these retail customers on the intended use of the biodiesel with the actual use, and potentially reconcile conservatively inconsistencies between the two. Project proponents may choose between the two following options[9]:

  - Option (a): Cross-check for the total customer population. The calculation of baseline emissions is based on all questionnaires collected, once the customers coming back to the dispensing station provide information on the actual use of the biodiesel previously bought. Total baseline emissions for the total number of customers is calculated as the sum of individual customer diesel consumptions given by formula (1). Emission reductions cannot be claimed for the biodiesel supplied to customers who do not provide appropriate information on the actual use.

  - Option (b): Cross-check through survey in sample of the total customer population performed by a third party at appropriate frequency with respect to the length of the monitoring period. To yield statistically representative results, the sample group must have a minimum size. In this approach, baseline emissions are adjusted by the margin of error at a 95% confidence interval from sampling biodiesel use in order to ensure that emission reductions are estimated in a conservative manner. Moreover, emission reductions can only be claimed if ≥ 60 customers are sampled. The entire retail customer base that purchase biodiesel from dedicated dispensing stations supplied by the project activity is eligible to be part of the sample

[9] The advantage of option (a) is that no margin of error needs to be subtracted from the average CO2 emissions in the baseline situation. Thus more emission reductions can be claimed.

and the customers from the sample should be selected randomly for this sampling process. This process is to be supported by an independent, suitably qualified, organisation.

Table 2: Example Monitoring Template (used at point of receipt of pure biodiesel and, if available, in conjunction with electronic loggers)

Name and Address:

Type of equipment	**Capacity**	**Intended amount of biodiesel to be used (first purchase)**	**Actual amount of biodiesel used (subsequent purchase)**	**Crosscheck and reconcile conservatively inconsistencies between type, use of biodiesel**
Stationary **1)** **2)** **Etc**				
Mobile **1) Tractor** **2)** **Etc.**				

2. Data Archiving

All data need to be archived electronically until two years after end of the crediting period.

3. Data and parameters monitored

Applicability Conditions

Data / Parameter:	$f_{\%}$
Data unit:	%
Description:	Fraction of biodiesel in the blended biodiesel
Source of data:	Records from blending operations
Measurement procedures (if any):	Recording volumes or flows with calibrated meters.
Monitoring frequency:	Every produced blend must be monitored.
QA/QC procedures:	During the process of creating the blend biodiesel at the blending station, the blending operation shall be monitored to assure adequate mixing of the products in the correct proportions. For automotive purposes the blending ratio must not exceed 20%. This includes measuring and recording the volumes and blend levels as verified through bills of lading, meter printouts or other auditable records of both the biodiesel and diesel fuel, which comprise the blend.
Any comment:	See "BQ-9000 Quality Assurance Program Requirements for the Biodiesel industry" for further information.

Data / Parameter:	Various parameters; Compliance of biodiesel produced with national regulations
Data unit:	Various data units
Description:	Compliance of produced biodiesel with national regulation, biofuel properties
Source of data:	Various measurements based on national or international standards.
Measurement procedures (if any):	Various methods of measurement and uncertainty analysis.
Monitoring frequency:	According to national regulation, at least annually.
QA/QC procedures:	According to national or international standards.

Data / Parameter:	$MP_{Glyc,y}$
Data unit:	Tonnes (t)
Description:	Amount of byproduct glycerol produced during plant operation
Source of data:	Measured (volumetric and/or weighed)
Measurement procedures (if any):	Volumetric measurement OR load cell to measure the weight of produced glycerol during a specific time period, taking into account the stock changes where applicable. The volumteric measurement of the amount of glycerol produced can be based on volumteric flow meter including a volume integrator OR on stock measurement at the storage tanks with the use of standardized dip stick and calibrated tanks, standardised volume charts (specific to the calibrated tanks and dip sticks). The amount of glycerol sold can be monitored based on calibrated road tankers volume or weighbridge measurements. This data can be monitored daily. Project participants can use other equivalent methods which capture the complete data for measurement of these parameters in a batch process.
Monitoring frequency:	All quantity of produced glycerol will be recorded
QA/QC procedures:	Volumetric measurement and load cell calibrated periodically. Measured amounts to be crosschecked against mass balance of the biodiesel production unit.

Data / Parameter:	$MU_{Glyc,y}$
Data unit:	Tonnes (t)
Description:	Amount of by-product glycerol sold or used.
Source of data:	Sales data and internal records in case of use inside the plant.
Measurement procedures (if any):	-
Monitoring frequency:	All produced glycerol must be tracked via sales data or internal records or its mode of disposal checked by DOE (incl. visual inspection of facilities and record of incineration or disposal if any).
QA/QC procedures:	DOE to check the produced glycerol was marketed.

Baseline Emissions

Data / Parameter:	BD_y
Data unit:	Tonnes
Description:	Most conservative value among production of biodiesel ($P_{BD,y}$), consumption of biodiesel ($C_{BD,y}$) and consumption of blended biodiesel times blending fraction ($C_{BBD,y}$*$f_{\%}$). The biodiesel from waste oil/fat alone and that consumed by identified in-country consumers to substitute petrodiesel in the year *y* (tonnes) shall be considered for claiming emission reductions.
Source of data:	See $P_{BD,y}$, $C_{BD,y}$, $C_{BBD,y}$ below
Measurement procedures (if any):	See $P_{BD,y}$, $C_{BD,y}$, $C_{BBD,y}$ below
Monitoring frequency:	See $P_{BD,y}$, $C_{BD,y}$, $C_{BBD,y}$ below
QA/QC procedures:	See $P_{BD,y}$, $C_{BD,y}$, $C_{BBD,y}$ below
Any comment:	See $P_{BD,y}$, $C_{BD,y}$, $C_{BBD,y}$ below

Data / Parameter:	$P_{BD,y}$
Data unit:	Tonnes
Description:	Quantity of produced biodiesel from waste oil/fat that is used by host country consumers to substitute for petrodiesel.
Source of data:	The amount of biodiesel produced by operator during a specific time period shall be recorded (volumetric and/or weighed) within a max uncertainty of 5% taking into account stock changes where applicable[10]. The volumteric measurement of the amount of biodiesel produced can be based on stock measurement at the storage tanks and amount sold during one particular day. The stock measurements at storage tanks can be based on standardized dip stick and calibrated tanks, standardised volume charts (specific to the calibrated tanks and dip sticks). The amount of biodiesel sold can be monitored based on calibrated road tankers' volume or weighbridge measurements. This data can be monitored daily. Project participants can use other equivalent methods which capture the complete data for measurement of these parameters in a batch process.
Measurement procedures (if any):	Use calibrated or certified measurement equipment that is maintained regularly and checked for proper functioning.
Monitoring frequency:	All produced biodiesel must be metered
QA/QC procedures:	Cross check production and consumption data with sales records.
Any comment:	Measured for reference purposes to ensure consumption of biodiesel does not exceed production of biodiesel.

[10] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:229:0001:0085:EN:PDF

Data / Parameter:	$C_{BD,y}$
Data unit:	Tonnes
Description:	Quantity of biodiesel from waste oil/fat consumed by host country consumers to substitute for petrodiesel
Source of data:	Metering system at consumer/distributor site.
Measurement procedures (if any):	Use calibrated/certified measurement equipment or recording system (e.g. electronic loggers) that is maintained regularly and checked for proper functioning
Monitoring frequency:	All consumed biodiesel must be recorded
QA/QC procedures:	Cross check production and consumption data with sales records. In case of sales of pure biodiesel to small individual customers, a cross-check survey is conducted in line with the description provided in the section on Monitoring procedures.
Any comment:	This will include pure biodiesel used in stationary sources and biodiesel that is blended under controlled conditions where the blend is B20 or less when data is presented to show that the technical performance of the blend is equivalent to petrodiesel. It does not apply to biodiesel that is consumed in uncontrolled blended proportions (no emission reductions can be claimed for in that case), for example, where users pump pure biodiesel into mobile source tanks which already contain petrodiesel. This exclusion does not release the project participants from their obligation to monitor the amount of biodiesel consumed with appropriate means in order to have a complete balance of production and consumption.

Data / Parameter:	$C_{BBD,y}$
Data unit:	Tonnes
Description:	Quantity of blended biodiesel from waste oil/fat consumed by host country consumers to substitute for petrodiesel.
Source of data:	Metering system at fuelling station
Measurement procedures (if any):	Use calibrated measurement equipment that is maintained regularly and checked for proper functioning
Monitoring frequency:	Continuous recording of filling consumers´ stationary combustion installations or vehicles.
QA/QC procedures:	Cross check production and consumption data with sales records.
Any comment:	

Data / Parameter:	NCV_{BD}
Data unit:	GJ/tonne
Description:	Net calorific value of biodiesel.
Source of data:	Laboratory analysis.
Measurement procedures (if any):	Measured according to relevant national or international standards regulating determination of NCV by calibrated equipment.
Monitoring frequency:	Annually.
QA/QC procedures:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements.
Any comment:	Analysis has to be carried out by accredited laboratory. A sample is representative if uncertainty of the NCV does not exceed ±5% at 95% confidence level.

Project emissions

Data / Parameter:	FC_{BDP,i_y}
Data unit:	Tonnes
Description:	Fuel consumption of fuel type i for biodiesel production
Source of data:	The quantity of fuel consumed for the production of biodiesel shall be monitored (volumetric or weighed) by the operator with a maximum uncertainty of 5% taking into account stock changes where applicable
Measurement procedures (if any):	Use calibrated/certified measurement equipment that is maintained regularly and checked for proper functioning.
Monitoring frequency:	All consumed fuel must be metered
QA/QC procedures:	Crosscheck fuel purchase data with average consumption for the type of vehicle provided by the manufacturer.
Any comment:	Fuel purchase data must be adjusted for stock changes. Subscript i denotes different fuel types.

Data / Parameter:	EC_y
Data unit:	MWh
Description:	Electricity consumption at project site.
Source of data:	Electricity meter.
Measurement procedures (if any):	Use calibrated measurement equipment that is maintained regularly and checked for proper functioning.
Monitoring frequency:	Continuously
QA/QC procedures:	No specific QA/QC procedures, small impact on total emission reductions.
Any comment:	----

Data / Parameter:	$EF_{CO2,Elec}$
Data unit:	tCO_2/MWh
Description:	Emission factor for grid electricity.
Source of data:	Grid supplier data, reliable official publications.
Measurement procedures (if any):	As per ACM0002 or AMS I.D, whichever is appropriate
Monitoring frequency:	Once or annually, depending on option chosen.
QA/QC procedures:	No specific QA/QC procedures, small impact on total emission reductions.
Any comment:	
Data / Parameter:	$MC_{MeOH,y}$
Data unit:	Tonnes
Description:	Amount of methanol consumed in the biodiesel plant.
Source of data:	Volumetric measurement (including density) AND/OR load cell to measure the weight of produced methanol during a specific time period taking into account the stock changes where applicable. The amount of methanol produced can be based on stock measurement at the storage tanks and amount purchased during one particular day. The stock measurements at storage tanks can be based on standardized dip stick and calibrated tanks, standardised volume charts (specific to the calibrated tanks and dip sticks). The amount of methanol purchased can be based on calibrated road

	tankers' volume or weighbridge measurements. This data can be monitored daily. Project participants can use other equivalent methods which capture the complete data for measurement of these parameters in a batch process.
Measurement procedures (if any):	Use calibrated measurement equipment that is maintained regularly and checked for proper functioning.
Monitoring frequency:	All methanol consumed shall be recorded.
QA/QC procedures:	Crosscheck against methanol purchase receipts
Any comment:	Adjust for stock changes when comparing purchase data with consumption data; also used for leakage calculations. Use most conservative values. Any spills on-site and evaporation are accounted as consumption.

Data / Parameter:	$WOF_{tr,y}$
Data unit:	Tonnes
Description:	Waste oil/fat used as biodiesel feedstock.
Source of data:	Plant record, Records of truck operators.
Measurement procedures (if any):	Mass or volumetric (including quantity integrator) meters (e.g. load cell).
Monitoring frequency:	All waste oil/fat must be monitored
QA/QC procedures:	Crosscheck data provided by trucks delivering waste oil/fat with measured feedstock inputs at plant. Use most conservative values.
Any comment:	

Data / Parameter:	AVD_{WOF}
Data unit:	Km
Description:	Average distance travelled by vehicles transporting waste oil/fat.
Source of data:	Records of truck operator.
Measurement procedures (if any):	Vehicle odometer and/or vehicle related transport log books.
Monitoring frequency:	Annually
QA/QC procedures:	Check consistency of distance records provided by the truck operators by comparing recorded distances with other information from other sources (e.g. maps).
Any comment:	If waste oil/fat is supplied from different sites, this parameter should correspond to the mean value of km travelled by trucks that supply the biodiesel plant

Data / Parameter:	AVD_{BD}
Data unit:	Km
Description:	Average distance travelled by vehicles transporting biodiesel to the blending plant.
Source of data:	Records of truck operator.
Measurement procedures (if any):	Vehicle odometer and/or vehicle related transport log books.
Monitoring frequency:	Annually
QA/QC procedures:	Check consistency of distance records provided by the truckers by comparing recorded distances with other information from other sources (e.g. maps).
Any comment:	If biodiesel is transported to different blending sites, this parameter should correspond to the mean value of km travelled by trucks that transport the biodiesel.

Data / Parameter:	TL_{WOF}
Data unit:	Tonnes
Description:	Average truck load for vehicles transporting waste oil/fat .
Source of data:	Records of truck operator; plant records, vehicle manufacturer information.
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	Cross check against vehicle manufacturer's capacity rating.
Any comment:	

Data / Parameter:	TL_{BD}
Data unit:	Tonnes
Description:	Average truck load for vehicles transporting biodiesel.
Source of data:	Records of truck operator; Plant records, vehicle manufacturer information.
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	Cross check against vehicle manufacturer's capacity rating
Any comment:	

Data / Parameter:	$EF_{km,tr}$
Data unit:	tCO_2 /km
Description:	Carbon dioxide emission factor for vehicles transporting waste oil/fat and biodiesel.
Source of data:	Measurements or local / national data should be preferred. Default values from the IPCC may be used alternatively.
Measurement procedures (if any):	
Monitoring frequency:	Annually.
QA/QC procedures:	Check consistency of measurements and local / national data with default values from IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements.
Any comment:	Local or national data should be preferred. Default values from the IPCC may be used alternatively and should be chosen in a conservative manner.

Data / Parameter:	$FC_{WOF,i,y}$
Data unit:	Tonnes
Description:	Fuel consumption of fuel type i for transportation waste oil/fat .
Source of data:	Truck operator records.
Measurement procedures (if any):	
Monitoring frequency:	All consumed fuel must be metered.
QA/QC procedures:	Crosscheck fuel purchase data with average consumption for the type of vehicle provided by the manufacturer.
Any comment:	Fuel purchase data must be adjusted for stock changes. Subscript i denotes different fuel types.

Data / Parameter:	$FC_{BD,i,y}$
Data unit:	Tonnes
Description:	Fuel consumption of fuel type i for transportation of biodiesel to blending plant.
Source of data:	Truck operator records.
Measurement procedures (if any):	
Monitoring frequency:	All consumed fuel must be metered.
QA/QC procedures:	Crosscheck fuel purchase data with average consumption for the type of vehicle provided by the manufacturer.
Any comment:	Fuel purchase data must be adjusted for stock changes. Subscript i denotes different fuel types.

Leakage

Data / Parameter:	UWO_Y
Data unit:	Boolean variable (true/false)
Description:	If any alternative use/s of waste oil/fat in the defined area is identified that could be replaced fossil fuels then UWO_Y = "True" If no alternative use/s of waste oil/fat in the defined area is identified that could be replaced fossil fuels then UWO_Y = "False"
Source of data:	Usage of waste oil/fat can be determined from: reliable official data from authorities; scientific publications; interviews with waste collection companies and companies utilizing waste oil/fat ; third party statistically representative surveys, etc (see section on leakage from displacement of existing uses of waste oil/fat).
Measurement procedures (if any):	--
Monitoring frequency:	Once, ex-ante at the beginning of each crediting period for micro-scale and small-scale projects. Annually for large-scale projects.
QA/QC procedures:	Identified alternative usage of waste oil/fat shall be based on an appropriate combination of the above mentioned data sources. For micro-scale and small-scale projects, the DOE must check reliability of used data sources at the Validation stage. For large-scale projects, the DOE must check reliability of used data sources at the Validation stage and at the Verification stage.
Any comment:	When no alternative usage of waste oil/fat has been identified **OR** when all the alternative use/s of waste oil/fat have been identified and the project proponent can determine that the current users are in agreement with the shift of use and that these alternative use/s will not shift to fossil fuel use due to the project activity, the project participant shall not apply the leakage penalty. If at any instance of time during the crediting period, new use/s of waste oil/fat are identified which would shift to fossil fuel use due to the project activity, then the leakage penalty shall be applied at that instance.

Data / Parameter:	$WOF_{DS,y}$
Data unit:	Tonnes
Description:	Formal and informal market demand for waste oil/fat , including the project activity, in the defined region. Statistical mean value obtained from surveys or other sources for the demand for waste oil/fat , including the project activity, in the defined region (tonnes).
Source of data:	Demand by the project activity is known. Other demand can be determined by: reliable official data from authorities; scientific publications; market data from waste collection companies and companies utilizing waste oil/fat ; third party statistically representative surveys that shall include a list of potential uses of waste oil/fats, interviews with collection companies or companies using waste oil/fats, etc.
Measurement procedures (if any):	--
Monitoring frequency:	Once, ex-ante at the beginning of each crediting period for micro-scale and small-scale projects. Annually for large-scale projects.
QA/QC procedures:	The calculated demand for waste oil/fat shall be based on an appropriate combination of the above mentioned data sources and associated uncertainties.

	For micro-scale and small-scale projects, the DOE must check reliability of used data sources at the Validation stage. For large-scale projects, the DOE must check reliability of used data sources at the Validation stage and at the Verification stage.
Any comment:	

Data / Parameter:	$WOF_{SS,y}$
Data unit:	Tonnes
Description:	Supply for waste oil/fat in the defined region. Statistical mean value obtained from surveys or other sources for the supply of waste oil/fat in the defined region (tonnes).
Source of data:	Reliable official data from authorities; scientific publications; market data from waste collection companies; third party statistically representative survey that shall include oil consumption data, information about fat absorption data of cooked food, etc; compare with data from other countries.
Measurement procedures (if any):	--
Monitoring frequency:	Once, ex-ante at the beginning of each crediting period for micro-sclae and small-scale projects. Annually for large-scale projects..
QA/QC procedures:	The calculated supply for waste oil/fat shall be based on an appropriate combination of the above mentioned data sources and associated uncertainties. For micro-scale and small-scale projects, the DOE must check reliability of used data sources at the Validation stage. For large-scale projects, the DOE must check reliability of used data sources at the Validation stage and at the Verification stage.
Any comment:	

Data / Parameter:	u_D
Data unit:	Tonnes
Description:	Uncertainty for waste oil/fat demand.
Source of data:	Demand by the project activity is known. Other demand can be determined by: reliable official data from authorities; scientific publications; market data from waste collection companies and companies utilizing waste oil/fat ; third party statistically representative surveys that shall include a list of potential uses of waste oil/fats, interviews with collection companies or companies using waste oil/fats, etc.
Measurement procedures (if any):	--
Monitoring frequency:	Once, ex-ante at the beginning of each crediting period for micro-scale and small-scale projects. Annually for large-scale projects.
QA/QC procedures:	The calculated demand for waste oil/fat shall be based on one or more of the above mentioned data sources and associated uncertainties. For micro-scale and small-scale projects, the DOE must check reliability of used data sources at the Validation stage. For large-scale projects, the DOE must check reliability of used data sources at the Validation stage and at the Verification stage.
Any comment:	Surveys must be realized with a 95% confidence interval. This confidence interval corresponds to the guidelines issued by the EB in its 22nd meeting Annex 2 (EB 22 report Annex 2, D, page 3): “Methodologies employing sampling to derive parameters in estimating emissions reductions shall quantify these parameter uncertainties at the 95% confidence level”.

Data / Parameter:	u_S
Data unit:	Tonnes
Description:	Uncertainty for waste oil/fat supply.
Source of data:	Supply of waste oil/fat in the region defined by the project can be determined by: reliable official data from authorities; scientific publications; market data from waste collection companies and companies utilizing waste oil/fat ; third party statistically representative surveys that shall include a list of potential uses of waste oil/fats, interviews with collection companies or companies using waste oil/fats, etc.
Measurement procedures (if any):	--
Monitoring frequency:	Once, ex-ante at the beginning of each crediting period for micro-scale and small-scale projects. Annually for large-scale projects..
QA/QC procedures:	The calculated supply for waste oil/fat shall be based on one or more of the above mentioned data sources and associated uncertainties. For micro-scale and small-scale projects, the DOE must check reliability of used data sources at the Validation stage. For large-scale projects, the DOE must check reliability of used data sources at the Validation stage and at the Verification stage.
Any comment:	Surveys must be realized with a 95% confidence interval. This confidence interval corresponds to the guidelines issued by the EB in its 22nd meeting Annex 2 (EB 22 report Annex 2, D, page 3): "Methodologies employing sampling to derive parameters in estimating emissions reductions shall quantify these parameter uncertainties at the 95% confidence level".