CLEAN DEVELOPMENT MECHANISM

AMS-I.H

Small-scale Methodology

Biodiesel production and use for energy generation in stationary applications

Version 02.0

Sectoral scope(s): 01

United Nations
Framework Convention on
Climate Change

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key elements

Typical project(s)	Biodiesel is produced from oilseeds cultivated on dedicated plantations and from waste oil/fat and used to generate thermal; mechanical or electrical energy in equipment including cogeneration
Type of GHG emissions mitigation action	Renewable energy. Displacement of more-GHG-intensive fossil fuel for combustion in stationary installations

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology comprises activities involving the cultivation of oilseeds and the sourcing of waste oil/fat for production of biodiesel to generate thermal/mechanical/electrical energy including cogeneration to displace fossil fuel and/or fossil fuel based technologies.

2.2. Applicability

3. The methodology is applicable under the following conditions:

(a) Pure biodiesel and blends above 10 per cent with fossil fuel shall be used in equipment[1] that is specially built or modified;

(b) Biodiesel must comply with national quality regulations;

(c) The retailers, final users and the producer of the biodiesel or its blend are bound by a contractual agreement allowing emission reductions to be claimed only by the project proponent;

(d) The alcohol used for esterification is methanol from fossil fuel origin. The biodiesel produced using alcohol other than methanol (for example, ethanol) shall not be included in the quantity of biodiesel for which emission reductions are claimed;[2]

(e) Co-firing with solid fuels is not allowed;

[1] For internal combustion engines conversion measures include adaptations of fuel supply, combustion and injection mechanisms.

[2] Only methanol from fossil fuel origin is included because the methodology does not provide procedures for estimating emissions associated with the use of other alcohols than methanol from fossil fuel origin. Project proponents are invited to propose procedures to estimate the emissions associated with the production of other alcohols that could be used for esterification, such as ethanol or methanol from renewable sources, as a revision to this methodology.

(f) The export of biodiesel produced under this category is not allowed.

4. The biodiesel produced by the project activity may be used as a blend with pure petrodiesel or with petrodiesel that has already been blended with biofuel.[3] In the latter case baseline emissions only from the petrodiesel fraction shall be calculated, the biofuel content of the primary blend shall be considered as carbon neutral, however, in the calculation of the project emissions, the fuel used for blending (primary blend) shall be considered as pure petrodiesel i.e. 100 per cent petrodiesel fraction. This conservative approach is used because it may not be feasible to determine the upstream emissions associated with the production of the biodiesel used for the primary blending.

5. If the project activity utilizes oil seeds sourced from dedicated plantations, the applicability conditions prescribed in the methodological tool "Project emissions from cultivation of biomass" shall apply.

6. Project eligibility limits (capacity limits) are in accordance with the guidelines in:

(a) AMS-I.C. for thermal energy and cogeneration applications;

(b) AMS-I.B. for mechanical energy applications;

(c) AMS-I.D., AMS-I.F. or AMS-I.A. as the case may be for electricity applications.

2.3. Entry into force

7. The date of entry into force is the date of the publication of the EB 81 meeting report.

3. Normative references

8. Project participants shall apply the "General guidelines for SSC CDM methodologies" and "Guidelines on the demonstration of additionality of small-scale project activities" provided at <https://cdm.unfccc.int/Reference/Guidclarif/index.html> mutatis mutandis.

9. This methodology also refers to the latest approved versions of the following approved methodologies and tools:

(a) "AMS-I.A.: Electricity generation by the user";

(b) "AMS-I.B.: Mechanical energy for the user with or without electrical energy";

(c) "AMS-I.C.: "Thermal energy production with or without electricity";

(d) "AMS-I.D.: Grid connected renewable electricity generation";

(e) "AMS-I.F.: Renewable electricity generation for captive use and mini-grid";

(f) "AMS-III.G.: Landfill methane recovery";

(g) "AMS-III.F.: Avoidance of methane emissions through composting;

(h) "AMS-III.H.: Methane recovery in wastewater treatment;

[3] It is expected that biodiesel is blended with pure petrodiesel, however, where the project proponent has no access to pure petrodiesel (e.g. due to local regulations requiring sale of blended petrodiesel in the region/country) blended fuel may be used.

(i) "Project emissions from cultivation of biomass";

(j) "Project and leakage emissions from transportation of freight";

(k) "Upstream leakage emissions associated with fossil fuel use";

(l) "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";

(m) "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

4. Definitions

10. The definitions contained in the Glossary of CDM terms shall apply.

11. Furthermore, for this methodology, the following definitions apply:

(a) **Waste oil/fat** is a residue or waste stream of biogenic origin from restaurants, agro and food industry, slaughterhouses or related commercial sectors;

(b) **Biodiesel** is a diesel fuel consisting of long-chain alkyl (methyl, propyl or ethyl) esters which is produced by esterification of vegetable oils and/or waste oil/fat with alcohols from biogenic and/or fossil origin.

5. Baseline methodology

5.1. Project boundary

12. The project boundary is the geographical area of the cultivation, production and processing of oil-seeds, disposal of waste products and the areas where biodiesel is processed/blended. The boundary also extends to the users where biodiesel is consumed in the project equipment to produce thermal/electrical/mechanical energy and the end users of the produced energy.

5.2. Baseline emissions

13. The energy baseline and the corresponding baseline emissions for biodiesel based renewable energy sources and/or technologies shall be chosen as follows:

(a) As per the procedures of AMS-I.A. if the project activity is for standalone off-the-grid power systems supplying electricity to households/users included in the boundary;

(b) As per the procedures of AMS-I.F. if the project activity displaces electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit;

(c) As per the procedures of AMS-I.D. if the project activity supplies electricity to a regional or national grid;

(d) As per the procedures of AMS-I.C. of the project activity produces thermal energy and/or cogenerates heat and electricity;

(e) As per the procedures of AMS-I.B. if project activity is generating mechanical energy.

14. For project activities that involve retrofit of an existing facility and/or capacity addition at an existing facility, the baseline emissions shall be calculated following the applicable principles described in AMS-I.D.

5.3. Project emissions

15. Project emissions consists of:

(a) CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", including the consumption of fossil fuels for processing (e.g. pressing and filtering, transesterification, degumming, neutralization) of plant oil and excluding the consumption of fossil fuels related to the cultivation of oil seeds, if any;

(b) CO_2 emissions from electricity consumption by the project activity using the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", including the consumption of fossil fuels for processing (e.g. pressing and filtering, transesterification, degumming, neutralization) of plant oil and excluding the consumption of electricity related to the cultivation of oil seeds, if any;

(c) Project methane emission from solid waste disposal, wastewater are calculated as per provisions in AMS-III.G. (landfill); AMS-III.F. (composting) and AMS-III.H. (waste water treatment) in the cases where the waste are disposed in anaerobic conditions;

(d) The project emissions from cultivation of oil seeds are calculated using the latest version of the tool "Project emissions from cultivation of biomass";

(e) Project emissions from fossil fuel carbon in the biodiesel due to the use of methanol from fossil origin in the esterification process are estimated as follows:

$$PE_{MeOH,y} = MC_{MeOH,y} \times EF_{C,MeOH} \times \frac{44}{12} \qquad \text{Equation (1)}$$

Where:

$PE_{MeOH,y}$ = Project emissions from fossil carbon in the biodiesel due to esterification with methanol of fossil origin in year *y* (t CO_2e)

$MC_{MeOH,y}$ = Quantity of methanol consumed in the biodiesel plant, including spills and evaporations in year *y* (tonnes)

$EF_{C,MeOH}$ = Carbon emission factor of methanol, based on molecular weight (tC/tMeOH) (= 12/32)

$\frac{44}{12}$ = Molecular weight ratio to convert tonnes of carbon into tonnes of CO_2 (t CO_2/tC)

(f) Project emissions from transportation of oil seeds to the oil production plant are estimated using the latest version of the tool "Project and leakage emissions from transportation of freight"; if the transportation distance is more than 200 km, otherwise they can be neglected.

5.4. Leakage

16. Leakage emissions are calculated as follows:

$$LE_y = LE_{BR} + LE_{MeOH,y} - LE_{upstream,y} \quad \text{Equation (2)}$$

Where:

$LE_y =$	=	Leakage in year *y* (t CO_2)
LE_{BR}	=	Leakage due to biomass residues in year *y* (t CO_2)
$LE_{MeOH,y}$	=	Leakage emissions associated with production of methanol used in biodiesel production in year *y* (t CO_2)
$LE_{upstream,y}$	=	Negative leakage due to reducing indirect emissions associated with the production of petrodiesel (t CO_2)

17. In case biodiesel is produced from waste oil/fat, the "General guidance on leakage in biomass project activities" for small-scale projects shall be taken into account. LE_{BR} shall be estimated accordingly.

18. Leakage effects due to the upstream emissions for the methanol production may be disregarded, if the leakage due to the avoided production of petrodiesel (including production of crude oil and refining of crude oil) is also disregarded. Otherwise, the leakage emissions due to the production of methanol used in the esterification process shall be calculated as follows:

$$LE_{MeOH,y} = MC_{MeOH,y} \times EF_{MEOH,PC} \quad \text{Equation (3)}$$

Where:

$LE_{MeOH,y}$	=	Leakage emissions associated with production of methanol used in biodiesel production in year *y* (t CO_2)
$MC_{MeOH,y}$	=	Quantity of methanol consumed in the biodiesel plant, including spills and evaporation on-site in year *y* (t MeOH)
$EF_{MEOH,PC}$	=	Pre-combustion (i.e. upstream) emissions factor for methanol production (t CO_2/t MeOH)

19. The substitution of biodiesel for petrodiesel reduces indirect ("upstream") emissions associated with the production of petrodiesel ($LE_{upstream}$) and is treated as negative leakage[4] and can be calculated as per the methodological tool "Upstream leakage emissions associated with fossil fuel use".

[4] Emission reduction from reducing international bunker fuel consumption is not eligible under CDM as per the EB 25 report, paragraph 58.

5.5. Emission reductions

20. Emission reductions are calculated as follows:

$$ER_y = BE_y - MAX(PE_y + LE_y, 0) \quad \text{Equation (4)}$$

Where:

ER_y = Emission reductions in year *y* (t CO_2e)

BE_y = Baseline emissions in year *y* (t CO_2e)

PE_y = Project emissions in year *y* (t CO_2)

LE_y = Leakage emissions in year *y* (t CO_2)

21. The emissions from the production of plant oil are compared to the emissions from the production of the petrodiesel, which is avoided by displacing petrodiesel consumption with plant oil and is considered as negative leakage. The project emissions from the production of plant oil may be compensated by this negative leakage. However, project proponents shall not claim emission reductions from this comparison.

6. Monitoring

22. Monitoring parameters shall be as prescribed by the applicable Type I methodology chosen in section 5.2 and the applicable tools. Project emissions are monitored as per section 5.3. The applicable requirements specified in the "General guidelines for SSC CDM methodologies" (e.g. calibration requirements, sampling requirements) are also an integral part of the monitoring guidelines.

23. If paragraph 3(a) is applicable, then the equipment modification or the installation of the new equipment shall be monitored.

7. Project activity under a programme of activities

24. The methodology is applicable to a programme of activities; no additional leakage estimations are necessary other than that indicated under leakage section above.

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Document information

Version	*Date*	*Description*
02.0	28 November 2014	EB 81, Annex 16 This revision removes the applicability conditions related to land eligibility and project emission calculations related to the cultivation of biomass, removes the restriction for application of methodology in PoAs in methodologies and includes reference to the approved tools.
01.0	30 July 2010	EB 55, Annex 29 Initial adoption.

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