CLEAN DEVELOPMENT MECHANISM

AMS-I.I.

Small-scale Methodology

Biogas/biomass thermal applications for households/small users

Version 06.0

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)	Activities for generation of renewable thermal energy using renewable biomass or biogas for use in residential, commercial and institutional applications. Examples of these technologies that displace or avoid fossil fuel use include, but are not limited to, biogas cook stoves, biomass briquette cook stoves, small-scale baking and drying systems, water heating, or space heating systems
Type of GHG emissions mitigation action	Renewable energy: Displacement of more-GHG-intensive thermal energy generation

2. Scope, applicability, and entry into force

2.1. Scope

2. This category comprises activities for generation of renewable thermal energy using renewable biomass or biogas for use in residential, commercial, institutional applications (e.g. for supply to households, small farms or for use in built environment of institutions such as schools).[1] Examples of these technologies that displace or avoid fossil fuel use include but are not limited to biogas cook stoves, biomass briquette cook stoves, small scale baking and drying systems, water heating, or space heating systems.

2.2. Applicability

3. This methodology is applicable to project activities where:

   (a) The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal;[2]

   (b) Each unit (e.g. cook stove, heater) shall have a rated capacity equal to or less than 150 kW thermal.[3] Projects that include units with rated capacity greater than

[1] Hereafter these applications are denoted by the term 'user' in this document.

[2] For thermal applications of biomass/biogas, the limit threshold of 45 MW_{th} is the installed/rated capacity of the thermal application equipment or device/s. Refer to the latest version of the "General Guidelines to SSC CDM methodologies". The manufacturers' specifications on the installed/rated thermal output may be used. In the absence of manufacturers' specification, the installed/rated thermal output shall be determined based on a laboratory test undertaken by a nationally approved/accredited laboratory or alternatively by a laboratory complying with the requirements of a relevant national or international standard, e.g. ISO/IEC 17025. Relevant national/international standards for testing shall be used.

[3] This is consistent with the policy of the Board to allow for simplifications using the size of units included in the project as a criterion, e.g. micro scale additionality guidelines (see annex 15 of EB 54), debundling guidelines (see annex 13 of EB 54).

150 kW thermal may explore “AMS-I.C.: Thermal energy production with or without electricity”.

4. For projects utilizing biomass residues processed as a fuel (e.g. briquettes, wood chips), project participants shall be demonstrated that:

   (a) It is produced using solely renewable biomass[4] (more than one type of biomass may be used). Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded;

   (b) Leakage emissions associated with biomass are estimated based on the provisions from the “TOOL16: Project and leakage emissions from biomass”;

   (c) The project participant can monitor the mass, moisture content and NCV of the resulting biomass fuel, through sampling that meets the confidence/precision level of 90/10;

   (d) Where the project participant is not the producer of the biomass residue, the project participant and the biomass residue producer are bound by a contract that shall enable the project participant to monitor the source of the biomass residues to account for any emissions associated with biomass production (as per 4(b) above). Such a contract shall also ensure that there is no double counting of emission reductions.

2.3. Entry into force

5. The date of entry into force is the date of the publication of the EB 113 meeting report on 11 March 2022.

2.4. Applicability of sectoral scopes

6. For validation and verification of CDM projects and programme of activities by a designated operational entity (DOE) using this methodology, application of sectoral scope 01 is mandatory and application of sectoral scopes 13 and 15 is conditional.

3. Normative references

7. Project participants shall apply the General guidelines for SSC CDM methodologies, and the TOOL21: Demonstration of additionality of small-scale project activities available at <http://cdm.unfccc.int/Reference/Guidclarif/index.html#meth> mutatis mutandis.

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

   (a) “Standard for sampling and surveys for CDM project activities and programme of activities”;

   (b) “AMS-I.C.: Thermal energy production with or without electricity” (hereinafter referred as “AMS-I.C.”);

[4] Refer to the “Glossary: CDM terms” for the definition of renewable biomass.

(c) "AMS-III.D.: Methane recovery in animal manure management systems" (hereinafter referred as "AMS-III.D.");

(d) "TOOL16: Project and leakage emissions from biomass" (hereinafter referred as "TOOL16").

4. Definitions

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

5. Baseline methodology

5.1. Project boundary

10. The project boundary is the physical, geographical sites of the equipment producing thermal energy during the crediting period.

5.2. Baseline

11. The baseline is the fuel consumption of the thermal application used or that would have been used in the absence of the project activity.

5.3. Emission reductions

12. The emission reductions of the project activity shall be determined based on thermal energy generated as follows:

$$ER_y = \sum_k \left(N_{k,0} \times n_{k,y} \times UF_b \times BS_{k,y} \times EF_{Fuel,BL} \times n_{PJ/BL} \times NCV_{biomass}\right) - LE_y \quad \text{Equation (1)}$$

Where:

ER_y	=	Emission reductions during the year *y* (tCO_2)
$N_{k,0}$	=	Number of thermal applications *k* commissioned (number)
$n_{k,y}$	=	Proportion of $N_{k,0}$ that remain operating in year *y* (fraction)
UF_b	=	Net-to-gross adjustment factor (fraction). Apply 0.89 in cases where the operationality ($n_{k,y}$) is determined based on questionnaire survey[5]. In other cases, apply 1.0
$BS_{k,y}$	=	The net quantity of renewable biomass or biogas consumed by the thermal application *k* in year *y* (mass or volume units, dry basis)
$EF_{Fuel,BL}$	=	CO_2 emission factor of the fuel used or that would have been used in the absence of the project activity (tCO_2/GJ)

[5] This is to account for uncertainties of the questionnaire survey method estimated to be in the range 30-50% (See "Annex III Table of conservativeness factors", FCCC/SBSTA/2003/10/Add.2, page 25).

$n_{PJ/BL}$	=	Ratio of efficiencies of project equipment and baseline equipment (e.g. cook stove using coal) measured once prior to validation applying the same test procedure (e.g. lab test), as per a national or an international standard. Official data or scientific literature can be used for cross-check purposes
$NCV_{biomass}$	=	Net calorific value of the biomass (GJ/unit mass or volume, dry basis). For biogas, use default value: 0.0215 GJ/m^3 biogas (assuming NCV of the methane: 0.0359 GJ/m^3, default methane content in biogas: 60%)
LE_y	=	Leakage during the year *y* (tCO_2e)

13. The CO_2 emission factor of the fuel used or that would have been used in the absence of the project activity is calculated as follows:

$$EF_{Fuel.BL} = \sum_j x_j \times EF_{FF,j} \quad \text{Equation (2)}$$

Where:

x_j	=	fraction representing fuel type *j* used by the baseline thermal applications displaced by biomass/biogas
$EF_{FF,j}$	=	CO_2 emission factor of fossil fuel type *j* (tCO_2/GJ)

5.4. Leakage

14. In case of biogas digesters which are not part of a Type III CDM project activity:

    (a) Any leakage due to change in manure management practice shall be taken into account, e.g. referring to methods provided in AMS-III.D.;[6]

    (b) Physical leakage of biogas shall be accounted for, as per the methods specified in AMS-III.D.

15. For project activities utilizing biomass and/or biomass residues, the TOOL16 shall be applied to determine the leakage. Project participants shall indicate in the PDD which leakage sources are included. If emission sources are not considered, the project participants shall provide proper justification in the PDD.

6. Monitoring methodology

16. Emission reductions can only be applied to systems that are demonstrated to be operational during the monitoring period and in compliance with the manufacturer's required maintenance procedures.

17. Relevant parameters shall be monitored as per the following section. The applicable requirements specified in the "General Guidelines to SSC CDM methodologies" (e.g. calibration requirements, sampling requirements) are also an integral part of the

[6] Under certain situations it is possible that biogas for energy generation is sourced from a manure treatment system that replaces a pre-project manure treatment system with lesser emission intensity with a consequent net positive contribution to anthropogenic emissions. For example, animal manure treated in the baseline in 'dry lots' is now treated in 'biogas digesters' to supply biogas to the Type I project activity.

monitoring guidelines specified below and therefore shall be referred to by the project participants.

6.1. Data and parameters monitored

Data / Parameter table 1.

Data / Parameter:	$N_{k,0}$
Data unit:	Number
Description:	Number of thermal applications *k* commissioned
Source of data:	Installation records
Measurement procedures (if any):	At the time of installation all project activity systems shall be inspected and undergo acceptance testing (commissioning) for proper operation in compliance with specifications. The installation date of each system shall be recorded
Monitoring frequency:	Once, at the time of installation
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	$n_{k,y}$
Data unit:	Fraction
Description:	Proportion of $N_{k,0}$ that remain operating at year *y*
Source of data:	-
Measurement procedures (if any):	Monitoring of operationality of the biogas systems shall be conducted using one of the following methods: (a) Census of users or survey of the users at randomly selected sample sites; (b) Based on on-going rental/lease payments or a recurring maintenance fee by users; (c) Measurement campaigns using biogas flow meters. For all cases where sampling is applied, the "Standard: Sampling and surveys for CDM project activities and programme of activities" shall be used for determining the sample size to achieve 90/10 (for annual monitoring) or 95/10 (for biennial monitoring) confidence/precision levels. For the case of measurement campaigns using biogas flow meters, it may be undertaken at randomly selected sample sites. The selected samples should take into account possible stratification of the population according to the capacity,biogas digester types and region where the digesters are installed (e.g. 6 cubic metre or 8 cubic metre capacity, fixed dome or floating dome type, regions where seasons influence average ambient temperature). For each measurement campaign at each site, continuous measurement shall be carried out for at least 30 days.

	The operational rate of each system is determined by dividing the number of days in operation by the length of the campaign. An operational day is a day in which biogas is consumed
Monitoring frequency:	At least once every two years (biennial) during the crediting period
QA/QC procedures:	Net-to-gross adjustment factor of 0.89 is applicable in cases where the operationality is determined based on questionnaire survey, i.e. when using option (a) above, to account for uncertainties
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	$BS_{k,y}$
Data unit:	mass or volume units
Description:	The net quantity of renewable biomass or biogas consumed by the thermal application *k* in year *y*
Source of data:	-
Measurement procedures (if any):	(a) In the specific case of biogas project activities using biogas flow meters to monitor accumulated biogas supplied to thermal energy equipment: • Measurement campaigns shall be undertaken at randomly selected sample sites in each year of the crediting period; • The "Standard: Sampling and surveys for CDM project activities and programme of activities" shall be used for determining the sample size to achieve 90/10 confidence/precision levels; • The selected samples should take into account possible stratification of the population according to the capacity, types and region where the digesters are installed (e.g. 6 cubic metre or 8 cubic metre capacity, fixed dome or floating dome type, regions where seasons influence average ambient temperature); • For each measurement campaign at each site, continuous measurement shall be carried out for at least 30 days; • To account for seasonal variation in biogas generation from biogas digesters, it may be measured over a year during several disjointed periods (e.g. one week per quarter), but still covering at least 30 days for a year. These figures are then turned into an annual figure for a biogas digester. However, if disjoint periods are not practical or too expensive, then a single period may be chosen, from which an annualised figure is derived taking into account seasonality. If adjustment for seasonality is not possible, then a conservative approach shall be taken where a single period is chosen corresponding to the least amount of biogas generation, which is then scaled; • Alternatively, project proponents may use a default biogas generation rate of 0.13 $Nm^3.m^{-3}.day^{-1}$ (i.e. volume of biogas generated in normal conditions of temperature and pressure per unit useful volume of the digester per day) for

	regions/countries where annual average ambient temperature is higher than 20°C; (b) For the case of processed renewable biomass (e.g. briquettes) data shall be collected for mass, moisture content, and NCV with an appropriate sampling frequency. Cross-check with annual energy/mass balance that is based on purchased/sold quantities and stock
Monitoring frequency:	Annual
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$NCV_{biomass}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of biomass type
Source of data:	-
Measurement procedures (if any):	Measurement in laboratories according to relevant national/international standards. Measure the NCV based on dry biomass. Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC
Monitoring frequency:	Annual
QA/QC procedures:	-
Any comment:	-

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Document information

Version	*Date*	*Description*
06.0	11 March 2022	EB 113, Annex 22 Revision to indicate the emission sources that are relevant in the calculation of project emissions associated with biomass and biomass residues, in line with "TOOL16: Project and leakage emissions from biomass" (version 05.0).
05.0	27 May 2021	EB 110, Annex 5 Revision to allow the use of biogas flow meters to demonstrate operationality of the biogas system remotely.
04.0	20 July 2012	EB 68, Annex 25 Revision to include a default biogas generation rate for regions/countries where annual average ambient temperature is higher than 20°C.

Version	*Date*	*Description*
03.0	2 March 2012	EB 66, Annex 61 Revision to: • Remove the requirement of monitoring the project/baseline efficiency rate; • Include a correction of the NVC value of biogas.
02.0	03 June 2011	EB 61, Annex 15 Revision to: • Provide simplified options for the measurement of fossil fuel consumption; • Provide a cross-check method on the measurement of fossil fuel consumption; • Provide clarifications on calculation of CO_2 emission factor for Option 2.
01.0	18 February 2011	EB 59, Annex 2 Initial adoption.

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