CLEAN DEVELOPMENT MECHANISM

CDM-SSCWG39-A06

Draft Small-scale Methodology

AMS-II.G: Energy efficiency measures in thermal applications of non-renewable biomass

Version 05.0

Sectoral scope(s): 03

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. The proposed draft revision of the approved SSC methodology AMS-II.G is based on the submitted request for a revision *SSC_654: Revision of AMS-II.G to include monitoring requirements for replaced project technologies*. It also incorporates elements regarding the submissions SSC_659 and SSC_660 (requests for clarification considered at the 39th meeting of the SSC WG).

2. The submission SSC_654 was considered by the SSC WG at its 39th meeting in accordance with the "*Procedures for the revision of an approved small scale methodology by the executive board*" (EB 34, annex 7).

2. Purpose

3. The purpose of the proposed revision is to clarify the monitoring requirements for kitchen performance test, water boiling and controlled cooking testing procedures of AMS-II.G.

3. Key issues and proposed solutions

4. The proposed draft revision of the methodology addresses issues such as: (a) clarification on monitoring requirements under different options and (b) provision of a wood to charcoal conversion factor.

4. Impacts

5. The proposed changes contribute to the improvement of clarity of requirements and the extension of applicability of the methodological standard.

6. So far 31 projects and 4 PoA have been registered applying this methodology. 43 project and 44 PoAs are currently listed as under validation applying this methodology.

5. Proposed work and timelines

7. The proposed draft revision of the methodology is recommended by the SSC WG to be considered by the Board at its seventieth meeting. No further work is envisaged.

6. Recommendations to the Board

8. The secretariat recommends the Board to approve the revision of the methodology.

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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)	Introduction of high-efficient thermal energy generation units utilizing non-renewable biomass or retrofitting of existing units (e.g. complete replacement of existing biomass fired cook stoves or ovens or dryers with more-efficient appliances) reduces use of non-renewable biomass for combustion
Type of GHG emissions mitigation action	(a) Energy efficiency. Displacement or energy efficiency enhancement of existing heat generation units results in saving of non-renewable biomass and reduction of GHG emissions

2. Scope, applicability, and entry into force

2.1. Scope

2. This category comprises ~~appliances involving the~~ energy efficiency improvements in ~~the~~ thermal applications of non-renewable biomass. Examples of ~~these~~ applicable technologies and measures include the introduction of high efficiency[1] biomass fired cook stoves[2] or ovens or dryers and/or energy efficiency improvements ~~of energy efficiency~~ in ~~of~~ existing biomass fired cook stoves or ovens or dryers.

3. Project participants shall be~~are~~ able to show that non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.

2.2. Applicability

4. See other sections of the methodology.

2.3. Entry into force

5. The date of entry into force of the revision is 14 days after the date of the publication of the EB 70 meeting report on the 7 December 2012.

2.4. Normative references

6. Project participants shall apply the "*General guidelines for SSC CDM methodologies*", "*Guidelines on the demonstration of additionality of small-scale project activities*" ~~Guidelines on the Demonstration of Additionality of SSC Project Activities~~ and "*General guidance on leakage in biomass project activities*" (Attachment C to Appendix B)

[1] The efficiency of the project systems as certified by a national standards body or an appropriate certifying agent recognized by ~~it~~ that body. Alternatively, manufacturers' specifications may be used.

[2] Single pot or multi pot portable or in-situ cook stoves with specified efficiency of at least 20%.

available at <http://cdm.unfccc.int/Reference/Guidclarif/index.html#meth> mutatis mutandis.

3. Definitions

7. The definitions contained in the "*Glossary of CDM terms*" shall apply.

8. The definitions of demonstrably renewable woody biomass and non-renewable biomass provided in paragraph 16 and 17 shall apply.

4. Baseline methodology

4.1. Project boundary

9. The project boundary is the physical, geographical site of the efficient devices that burn ~~systems using~~ biomass.

4.2. Baseline emissions

10. It is assumed that in the absence of the project activity, the baseline scenario is~~would be~~ the use of fossil fuels for meeting similar thermal energy needs.

11. Emission reductions ~~would be~~ are calculated as:

~~$$ER_y = B_{y,savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel}$$~~

Equation (1)

$$ER_y = B_{y,savings} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} \times N_{y,i}$$

Where:

ER_y	=	Emission reductions during ~~the~~ year *y* in t CO_2e
$B_{y,savings}$	=	Quantity of woody biomass that is saved in tonnes per device
$f_{NRB,y}$	=	Fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable biomass using survey methods or government data or default country specific fraction of non-renewable woody biomass (fNRB) values available on the CDM website[3]
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, wet basis)

[3] Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/DNA/fNRB/index.html>.

$EF_{projected\_fossilfuel}$ = Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 t CO_2/TJ[4]

$N_{y,i}$ = Number of project devices of type i operating in year *y*, determined as per paragraph 22

12. $B_{y,savings}$ is estimated using one the following methods:

Option 1:

~~$B_{y,savings} = B_{old} - B_{y,new}$~~

Equation (2)

$$B_{y,savings} = B_{old} - B_{y,new,KPT}$$

Where:

B_{old} = Quantity of woody biomass used in the absence of the project activity in tonnes per device

~~$B_{y,new}$~~ $B_{y,new,KPT}$ = Annual quantity of woody biomass used ~~during the project activity~~in year *y* in tonnes per device, measured as per the Kitchen Performance Test (KPT) protocol. The KPT should be carried out in accordance with national standards (if available) or international standards or guidelines (e.g. the KPT procedures specified by the Partnership for Clean Indoor Air (PCIA) <http://www.pciaonline.org/node/1049)>

Option 2:[5]

~~$B_{y,savings} = B_{old} * (1 - \frac{\eta_{old}}{\eta_{new}})$~~

Equation (3)

$$B_{y,savings} = B_{old} \times (1 - \frac{\eta_{old}}{\eta_{new,y}})$$

[4] This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. It is assumed that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). Thus a 50% weight is assigned to coal as the alternative solid fossil fuel (96 t CO_2/TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 t CO_2/TJ for kerosene and 63.0 t CO_2/TJ for liquefied petroleum gas (LPG).

[5] Based on whether $\eta_{new,y}$ or $B_{y,new,survey}$ is used for monitoring, either the Equation (3) or (4) can be used.

$$B_{y,savings} = B_{y,new,survey} \times \left(\frac{\eta_{new,y}}{\eta_{old}} - 1\right)$$ Equation (4)

Where:

B_{old} = Quantity of woody biomass used in the absence of the project activity in tonnes per device

$B_{y,new,survey}$ = Annual quantity of woody biomass used during the project activity in tonnes per device, determined through a survey

η_{old} = 1. Efficiency of the ~~system~~ device being replaced (fraction); measured using representative sampling methods or based on referenced literature values ~~(fraction),~~ use weighted average values if more than one type of device ~~system~~ is being replaced;
2. A default value of 0.10 may be optionally used if the replaced ~~system~~ device is a three stone fire, or a conventional device ~~system~~ with no improved combustion air supply or flue gas ventilation ~~system~~, that is without a grate or a chimney; for other types of devices ~~systems~~, a default value of 0.2 may be optionally used

~~η_{new}~~ $\eta_{new,y}$ = Efficiency of the device ~~system~~ being deployed as part of the project activity (fraction), as determined annually[12] using the water boiling test (WBT) protocol carried out in accordance with national standards (if available) or international standards or guidelines.[6] Use weighted average values if more than one type of system is being introduced by the project activity

Option 3:

~~$B_{y,savings} = B_{old} * (1 - \frac{SC_{new}}{SC_{old}})$~~ ~~Equation (4)~~

$$B_{y,savings} = B_{old} \; x \; (1 - \frac{SC_{new,y}}{SC_{old}})$$ Equation (5)

[6] In all cases the testing protocol shall be the same for both the device being replaced and the device being deployed.

Where:

SC_{old} = Specific fuel consumption or fuel consumption rate[7] of the baseline devices ~~system/s~~ i.e. fuel consumption per quantity of item/s processed (e.g. food cooked) or fuel consumption per hour, respectively. Use weighted average values if more than one type of device ~~system~~ is being replaced

~~SC_{new}~~ $SC_{new,y}$ = Specific fuel consumption or the fuel consumption rate in year *y* of the devices ~~system/s~~ deployed as part of the project i.e. fuel consumption per quantity of item/s processed (e.g. food cooked) or fuel consumption per hour respectively. Use weighted average values if more than one type of system is being introduced by the project activity.

13. B_{old} is determined with one of the following two options:

(a) Calculated as the product of the number of ~~systems~~ devices multiplied by the estimated average annual consumption of woody biomass per ~~appliance~~ device (tonnes/year). This may be derived from historical data or a survey of local usage;

OR

(b) Calculated from the thermal energy generated in the project activity as:

$$B_{old} = \frac{HG_{p,y}}{NCV_{biomass} * \eta_{old}} \quad \text{Equation (6)}$$

Where:

$HG_{p,y}$ = Amount of thermal energy generated by the project devices ~~technology~~ in year y (TJ), if the thermal output of the devices can be directly measured

14. Where charcoal is used as the fuel, the quantity of woody biomass (B_{old} or $B_{y,new,KPT}$ or $B_{y,new,survey}$ or $B_{y,savings}$) may be determined by using a default wood to charcoal conversion factor of 6 kg of firewood (wet basis) per kg of charcoal (dry basis).[8] Alternatively, credible local conversion factors determined from a field study or literature may be applied.

4.2.1. Differentiation between non-renewable and renewable woody biomass

15. Project participants shall determine the shares of renewable and non-renewable woody biomass in B_{old} (the quantity of woody biomass used in the absence of the project

[7] Specific fuel consumption or fuel consumption rate are to be determined using the controlled cooking test (CCT) protocol carried out in accordance with national standards (if available) or international standards or guidelines (e.g. the CCT procedures specified by the Partnership for Clean Indoor Air (PCIA) <http://www.pciaonline.org/node/1050>).

[8] <http://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1ref3.pdf>.

activity) the total biomass consumption using nationally approved methods (e.g. surveys or government data if available) and then determine $f_{NRB,y}$ as described below. The following principles shall be taken into account:

4.2.2. Demonstrably renewable woody biomass[9] (DRB)

16. Woody[10] biomass is "renewable" if one of the following two conditions is satisfied:

(a) The woody biomass ~~is~~ originate~~sing~~ from land areas that are forests[11] where:

(i) The land area remains a forest;

(ii) Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and

(iii) Any national or regional forestry and nature conservation regulations are complied with;

(b) The biomass is woody biomass and originates from non-forest areas (e.g. croplands, grasslands) where:

(i) The land area remains as non-forest or is reverted to forest;

(ii) Sustainable management practices are undertaken on these land areas to ensure ~~in particular~~ that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and

(iii) Any national or regional forestry, agriculture and nature conservation regulations are complied with.

4.2.3. Non-renewable biomass

17. *NRB* is the quantity of woody biomass used in the absence of the project activity (B_{old}) minus the *DRB* component, as long as at least two of the following supporting indicators are shown to exist:

(a) A trend showing an increase in time spent or distance travelled for gathering fuel-wood, by users (or fuel-wood suppliers) or alternatively, a trend showing an increase in the distance the fuel-wood is transported to the project area;

(b) Survey results, national or local statistics, studies, maps or other sources of information, such as remote-sensing data, that show that carbon stocks are depleting in the project area;

[9] This definition uses elements of annex 18, EB 23.

[10] In ~~cases of~~ the case of charcoal produced from woody biomass, the demonstration of renewability shall be done for the areas where the woody biomass is sourced.

[11] The forest definitions as established by the country in accordance with the decisions 11/CP.7 and 19/CP.9 should apply.

(c) Increasing trends in fuel wood prices indicating a scarcity of fuel-wood;

(d) Trends in the types of cooking fuel collected by users that indicate a scarcity of woody biomass.

18. Thus the fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable is:

$$f_{NRB,y} = \frac{NRB}{NRB + DRB} \qquad \text{Equation (7)}$$

19. Project participants shall also provide evidence that the identified trends ~~identified~~ are not occurring due to the enforcement of local/national regulations.

4.3. Leakage

20. Leakage related to the non-renewable woody biomass saved by the project activity shall be assessed based on ex post surveys of users and the areas from which this woody biomass is sourced (using 90/30 precision for a selection of samples). The ~~following~~ potential source of leakage due to the use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources shall be considered. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass ~~used~~ by the non-project households/users, that is attributable to the project activity, then B_{old} is adjusted to account for the quantified leakage. Alternatively, B_{old} is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

21. If devices ~~equipment~~ currently being utilised ~~is transferred from~~ outside the project boundary are transferred to the project activity, then leakage is to be considered.

5. Monitoring methodology

22. Monitoring shall ~~also~~ consist of checking of all ~~appliances~~ devices or a representative sample thereof, at least once every two years (biennial) to determine if they are still operating ~~or are replaced by an equivalent in service appliance~~; those devices that have been replaced by an equivalent in-service device can be counted as operating.

23. Monitoring shall also consist of checking the efficiency of all devices ~~appliances~~ or a representative sample thereof annually[12] as below: ~~at least once every two years (biennial) to ensure that they are still operating at the specified efficiency ( ) or replaced by an equivalent in service appliance. Where replacements are made, monitoring shall also ensure that the efficiency of the new appliances is similar to the appliances being replaced~~.

(a) For project activities using the Kitchen Performance Test Protocol to determine the quantity of fuel saved (i.e. paragraph 12, Option 1), monitoring shall

[12] Biennial monitoring (i.e. monitoring once every two years) may be chosen, if the project proponents are able to demonstrate that the efficiency of the cook stove does not drop significantly as compared to the initial efficiency of the new device, over a time period of two years of typical usage.

determine the fuel consumption per operating device ($B_{y,new,KPT}$) of all operating devices or a representative sample thereof, annually.[12] ~~If the quantity of fuel saved is determined using the KPT (i.e. paragraph 6, Option 1), monitoring shall ensure that fuel consumption during the period of the project activity is monitored annually;~~

(b) For project activities using the Water Boiling Test protocol (i.e. paragraph 12, Option 2), monitoring shall consist of determining the efficiency of all operating devices or a representative sample thereof, annually[12].For the purpose of calculating emissions reductions, the ex post monitored value of the efficiency of the operating devices ($\eta_{new,y}$) shall be used;

(c) For project activities using the Controlled Cooking Test protocol (i.e. paragraph 12, Option 3), monitoring shall consist of determining the specific fuel consumption of all operating devices or a representative sample thereof, annually.[12]

24. If Option (b) in paragraph 13 is chosen for determining B_{old}, monitoring shall also determine ~~include~~ the amount of thermal energy generated by the project technology *t* in year *y*.

25. In order to assess the leakage described above, monitoring shall include data on the amount of woody biomass saved under the project activity that is used by non-project households/users (who previously used renewable energy sources). Other data on non-renewable woody biomass use required for leakage assessment shall also be collected.

26. Monitoring shall ensure that either:

(a) ~~Either~~ The replaced low efficiency devices ~~appliances~~ are disposed of and not used within the boundary or within the region; or

(b) If baseline stoves continue to be used, monitoring shall ensure that the fuel-wood consumption of those stoves is excluded from B_{old}.

27. ~~The following~~ Relevant parameters shall be monitored and recorded during the crediting period as indicated in section 5.1 below. The applicable requirements specified in the "*General guidelines for SSC CDM methodol*ogies" are also an integral part of the monitoring guidelines specified below and therefore shall be followed by the project participants.

5.1. Data and parameters monitored

Data / Parameter table 1.

Data / Parameter:	N_y
Data unit:	-
Description:	Number of project devices that are operating in year *y*
Source of data:	-
Measurement procedures (if any):	As per paragraph 11 and 22

Monitoring frequency:	At least once every two years (biennial)
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	$B_{y,new,KPT}$
Data unit:	t/year
Description:	Annual quantity of woody biomass used during the project activity in tonnes per device
Source of data:	-
Measurement procedures (if any):	As per paragraph 12 and 23(a)
Monitoring frequency:	Yearly (or biennially)
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	$B_{y,new,survey}$
Data unit:	t/year
Description:	Annual quantity of woody biomass used during the project activity in tonnes per device
Source of data:	-
Measurement procedures (if any):	As per paragraph 12. If the efficiency of the device is being monitored ($\eta_{new,y}$), then $B_{y,new,survey}$ is not required. Based on the parameter that is used for calculating $B_{y,savings}$, either $B_{y,new,survey}$ or $\eta_{new,y}$ can be monitored
Monitoring frequency:	Yearly (or biennially)
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$HG_{p,y}$
Data unit:	TJ
Description:	Amount of thermal energy generated by the project technology in year *y*

Source of data:	-
Measurement procedures (if any):	As per paragraph 13 and 24
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	$\eta_{new,y}$
Data unit:	Fraction
Description:	Efficiency of the device being deployed as part of the project activity in year *y*
Source of data:	-
Measurement procedures (if any):	As per paragraph 12 and 23(b)
Monitoring frequency:	Yearly (or biennially)
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 6.

Data / Parameter:	$SC_{new,y}$
Data unit:	t fuel/unit output or t fuel/hour
Description:	Specific fuel consumption or fuel consumption rate in year *y* of the device(s) deployed as part of the project that is fuel consumption per quantity of item/s processed (e.g. food cooked) or fuel consumption per hour respectively
Source of data:	-
Measurement procedures (if any):	As per paragraph 12 and 23 (c)
Monitoring frequency:	Yearly (or biennially)
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 7.

Data / Parameter:	$f_{NRB,y}$
Data unit:	-
Description:	Fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable biomass
Source of data:	-
Measurement procedures (if any):	As per paragraph 11
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

5.2. Representative sampling methods

28. A statistically valid sample of the locations where the devices ~~systems~~ are deployed, with consideration, in the sampling design, of occupancy and demographic differences can be used to determine parameter values used to calculate ~~determine~~ emission reductions, as per the relevant requirements for sampling in the *"Standard for sampling and surveys for CDM project activities and programmes of activities".* When biennial inspection is chosen a 95% confidence interval and a 10% margin of error ~~requirement~~ shall be achieved for the sampling parameter. On the other hand when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error ~~requirement~~ shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision or 95/10 precision are not achieved, the lower bound of the 90% or 95% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/10 precision.

5.3. Project activity under a programme of activities

29. The use of this methodology in a project activity under a programme of activities is legitimate if the following leakages are estimated and accounted for, as required on a sample basis using a 90/30 precision for the selection of samples:

(a) Use of non-renewable woody biomass saved under the project activity to justify the baseline of other CDM project activities can also be a potential source of leakage. If this leakage assessment quantifies a portion of non-renewable woody biomass saved under the project activity that is then used as the baseline of other CDM project activities then Bold is adjusted to account for the quantified leakage;

(b) Increase in the use of non-renewable woody biomass outside the project boundary to create non-renewable woody biomass baselines can also be a potential source of leakage. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass outside the project boundary then B_{old} is adjusted to account for the quantified leakage;

(c) As an alternative to subparagraphs (a) and (b), B_{old} can be multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

30. ~~The following further conditions apply~~ To determine ~~for~~ the value of the fraction of non-renewable (fNRB) to be applied in a component project activity (CPA) of a POA, use one of the two options as follows: ~~The choice between~~ (a) Conduct local ~~own~~ studies to determine the local fNRB value (sub national values); ~~and then apply those values in the CPAs;~~ or (b) Use default national values approved by the Board (see footnote 3); The choice of which option to use shall be made ex ante. However, a switch from a national value of fNRB (i.e. option ~~choice~~ (b)) to sub-national values (i.e. option ~~choice~~ (a)) is permitted, under the condition that the selected approach is consistently applied to all CPAs.

31. Monitoring approaches for $B_{y,savings}$ (Option 1, 2 or 3 in paragraph 6),[13] and values for parameters fNRB (when Option (a) in paragraph 30 is chosen) and the quantity of woody biomass B_{old}, may be determined either at the CPA level before the inclusion of CPA or at the PoA level before the registration of the PoA-DD.

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[13] Any one of the three options in paragraph 12 may be used for a particular CPA, but there should be no change in the chosen option during the crediting period.

Document information

Version	*Date*	*Description*
05.0	25 October 2012	SSCWG39, Annex 6 To be considered at EB 70. Includes clarification on monitoring requirements under different options; and provides a provision of wood to charcoal conversion factor.
04.0	20 July 2012	EB 68, Annex 23 Includes a reference to the available country specific default values for fNRB and specifies requirements of using national or local fNRB values for CPAs under a PoA.
03	15 April 2011	EB 60, Annex 21 KPT for stove testing included, requirements for leakage estimation simplified, default net gross adjustment factor is included as an option to account for any leakages, emission factor for the projected fossil fuel revised, more options for sampling and survey included.
02	04 December 2009	EB 51, Annex 18 To include: (a) Default efficiency factors for baseline cook stoves; (b) Procedures for sampling, (c) Revised procedures for determination of quantity of woody biomass that can be considered as non-renewable; and (d) Clarifications as to which leakage requirements are appropriate for projects versus PoAs.
01	01 February 2008	EB 37, Annex 7 Initial adoption.

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