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TYPE I - RENEWABLE ENERGY PROJECTS

Project participants shall apply the general guidelines to small-scale (SSC) clean development mechanism (CDM) ~~SSC CDM~~, information on additionality (attachment A to appendix B) and general guidance on leakage in biomass project activities (attachment C to appendix B) provided at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html> *mutatis mutandis*.

I.E. Switch from non-renewable biomass for thermal applications by the user

Technology/measure

1. This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. Examples of these technologies include, but are not limited to biogas stoves, solar cookers, passive solar homes, renewable energy based drinking water treatment technologies (e.g. sand filters followed by solar water disinfection; water boiling using renewable biomass).

2. Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.

Boundary

3. The project boundary is the physical, geographical site of the use of biomass or the renewable energy.

Baseline

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

5. Emission reductions would be calculated as:

$$ER_y = B_y * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel} \quad \textbf{(1)}$$

Where:

ER_y	Emission reductions during the year y in tCO_2e
B_y	Quantity of woody biomass that is substituted or displaced in tonnes
$f_{NRB,y}$	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using survey methods or government data or approved default country specific fraction of non-renewable woody biomass *(fNRB)* values available on the CDM website[1]

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

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$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO2/TJ[2]

6. B_y is determined by using one of the following options.

(a) Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year); This can be derived from historical data or estimated using survey methods; or

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

$$B_y = HG_{p,y} / (NCV_{biomass} * \eta_{old}) \quad \textbf{(2)}$$

Where:

$HG_{p,y}$	Quantity of thermal energy generated by the new renewable energy technology in the project in year *y* (TJ) For a biogas digester, it shall be monitored as per the requirements stipulated in the Table 1 of AMS-I.I "Biogas/biomass thermal applications for households/small users". Alternatively project proponents may use a default biogas generation value 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
η_{old}	1. Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of system is being replaced; 2. A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems a default value of 0.2 may be optionally used

[2] 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 tCO_2/TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 tCO_2/TJ for kerosene and 63.0 tCO_2/TJ for liquefied petroleum gas (LPG).

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(c) In the specific case of renewable energy based water treatment technologies, B_y is calculated as the product of target population of the project multiplied by the volume of drinking water per person per day and the mass of woody biomass that would have been required to boil one litre of water as per the equation (3).

$$B_y = N_{p,y} * QDW_{p,y} * WB_{BL} * 365 * 10^{-3} \quad \textbf{(3)}$$

Where:

$N_{p,y}$	Project population in year *y* (number). For establishing the project population a baseline survey shall be conducted to demonstrate target population supplied with renewable energy based water treatment technology by the project would have used water boiling as the water purification method in the absence of the project activity
$QDW_{p,y}$	Volume of drinking water in litres per person per day (litres). The volume of drinking water in litres per person per day shall be established using survey methods, subject to a cap of 5.5 litres[3]
WB_{BL}	Mass of woody biomass that would have been required to boil one litre of water (kg/litre). The quantity of mass of woody biomass that would have been required to boil one litre of water for five minutes determined through a water boiling test (World Health Organization (WHO) recommends a minimum duration of five minutes of water boiling)[4]

Differentiation between non-renewable and renewable woody biomass

7. Project participants shall determine the shares of renewable and non-renewable woody biomass in B_y (the quantity of woody biomass used in the absence of the project 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:

Demonstrably renewable woody biomass[5] (DRB)

Woody[6] biomass is "renewable" if one of the following two conditions is satisfied:

1. The woody biomass is originating from land areas that are forests[7] where:

[3] Based on WHO recommendations (Domestic Water Quantity, Service Level and Health, Table 2: Volumes of water required for hydration, WHO 2003).

[4] WHO guidelines for emergency treatment of drinking water at point of the use - <http://www.searo.who.int/LinkFiles/List_of_Guidelines_for_Health_Emergency_Emergency_treatment_of_drinking_water.pdf>.

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

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

(a) The land area remains a forest;

(b) 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

(c) Any national or regional forestry and nature conservation regulations are complied with.

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

(a) The land area remains cropland and/or grasslands or is reverted to forest;

(b) 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

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

Non-renewable biomass

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

- 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;
- 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;
- Increasing trends in fuel wood prices indicating a scarcity of fuel-wood;
- Trends in the types of cooking fuel collected by users that indicate a scarcity of woody biomass.

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

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

$$f_{NRB,y} = \frac{NRB}{NRB + DRB} \quad \textbf{(4)}$$

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

Leakage

10. 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 shall be considered:

(a) The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources. 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_y is adjusted to account for the quantified leakage. Alternatively, B_y is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

11. If the equipment currently being utilised is transferred from outside the boundary to the project boundary, leakage is to be considered.

Monitoring

12. Monitoring shall consist of checking of all appliances or a representative sample thereof, at least once every two years (biennial) to ensure that they are still operating or are replaced by an equivalent in service appliance.

13. In order to assess the leakages specified under paragraph 10, 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.

14. Monitoring should confirm the displacement or substitution of the non-renewable woody biomass at each location. In the case of appliances switching to renewable biomass the quantity of renewable biomass used shall be monitored.

15. In case Option (b) in paragraph 6 is chosen for baseline calculations, monitoring shall include the amount of thermal energy generated by the new renewable energy technology in the project in year *y*, where applicable.

16. In the case of renewable energy based water treatment technologies, water quality shall be monitored to ensure that it conforms to drinking water quality specified in relevant national microbiological water quality guidelines/standards of the host country. In case a national

standard/guideline is not available, the standards/guidelines by the WHO or United States Environmental Protection Agency (US-EPA) shall be applied.

Representative sampling methods

17. A statistically valid sample of the locations where the systems are deployed, with consideration, in the sampling design, of occupancy and demographics differences can be used to determine parameter values used to determine emission reductions, as per the relevant requirements for sampling in the "Standard for sampling and surveys for CDM project activities and programme of activities~~General guidelines for sampling and surveys for small-scale CDM project activities~~". When biennial inspection is chosen a 95% confidence interval and a 10~~5~~% 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~~5~~ precision is not achieved, the lower bound of a 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~~5~~ precision.

Project activity under a programme of activities

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

(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 B_y 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_y is adjusted to account for the quantified leakage;

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

19. The following further conditions apply for the value of fraction of non-renewable (fNRB) applied in a component project activity (CPA) of a POA. The choice between (a) conduct own studies to determine the local fNRB value and then apply those values in the CPAs; and (b) use default national values approved by the Board; shall be made ex-ante. A switch from national value i.e. choice (b) to sub-national values i.e. choice (a) is permitted, under the condition that the selected approach is consistently applied to all CPAs.

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History of the document

Version	Date	Nature of revision
05.0	20 July 2012	EB 68, Annex # To include: • A reference to the available country specific default values for fNRB; • A default biogas generation rate for regions/countries where annual average ambient temperature is higher than 20°C; and To specify: • The requirements of using national or local fNRB values for CPAs under a PoA.
04	EB 60, Annex 20 15 April 2011	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.
03	EB 56, Annex 17 17 September 2010	To expand the applicability to renewable energy water treatment technologies.
02	EB 53, Annex 18 26 March 2010	To include the changes below which are consistent with the changes to AMS-II.G approved by the Board at its fifty-first meeting: • Further clarification on the eligible technology/measures; • Default efficiency factors for baseline cook stoves; • Procedures for sampling; • Revised procedures for quantity of woody biomass that can be considered as non-renewable; and • Clarifications as to which leakage requirements are appropriate for projects versus PoAs.
01	EB 37, Annex 6 1 February 2008	Initial adoption.
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