VCS Methodology VM00XX

Version 1.0

"Fuel Switch to Renewable Biomass for Thermal Applications"

Sectoral Scope 4 - Manufacturing industries

1. SOURCES

This Methodology is based on elements of the following CDM methodologies:

[1] AMS-I.E. Switch from Non-Renewable Biomass for Thermal Applications by the User - Version 2;
[2] AMS-I.C. Thermal energy production with or without electricity - Version 16;
[3] AMS-III.Z. Fuel Switch, process improvement and energy efficiency in brick manufacture - Version 2;
[4] AM0036 Fuel switch from fossil fuels to biomass residues in heat generation equipment - Version 3.

This methodology also refers to the following tools and standards:

[5] UNFCCC; General guidance on leakage in biomass project activities (Version 03) http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid04.pdf
[6] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html
[7] UNFCCC; Annex 8 of EB 20; http://cdm.unfccc.int/EB/Meetings/020/eb20rep.pdf
[8] UNFCCC; Annex 18 of EB 23; http://cdm.unfccc.int/EB/023/eb23_repan18.pdf
[9] VCSA; Voluntary Carbon Standard 2007.1; http://www.v-c-s.org/docs/Voluntary%20Carbon%20Standard%202007_1.pdf

2. DEFINITIONS

- Renewable Biomass: as per Annex II;
- Non-renewable Biomass: as per Annex II;
- Non-renewable Fuel: any fuel which is **not** Renewable Biomass

3. APPLICABILITY

3.1. The methodology comprises a shift to an alternative production process or partial substitution of Non-renewable Fuel with the Renewable Biomass, in thermal applications. Utilization of any combination of fuels that are compliant with the aforementioned definition of Renewable Biomass during crediting period is allowed.

3.2. The measures may replace, modify or retrofit systems in existing facilities or be installed in a new facility (Greenfield project). Project participants have to be able to show that Non-renewable Fuel has been used at the facility since 31 December 1989 using survey methods. Provided such proof does not exist, it can be alternatively shown that same type(s) of Non-renewable Fuel(s) has been commonly used in the region where the project operates using survey methods.

3.3. This methodology is not applicable if local regulations require the use of proposed technologies or raw materials for industrial use, unless widespread non compliance (less than 50% of production in the industry/sector complies within the country) of the local regulation evidenced.

4. PROJECT BOUNDARY

4.1. The project boundary is the physical, geographical location where the production takes place (i.e. production facility coordinates) during both the baseline and crediting periods.

5. ADDITIONALITY

5.1. Project participants shall demonstrate that the project is additional using one of three tests as described in the Voluntary Carbon Standard 2007.1, clause 5.8 [9] or the latest version of the Voluntary Carbon Standard.

6. EMISSION REDUCTIONS

6.1. The baseline emissions are the Non-renewable Fuel, consumption-related emissions (amount of fuel consumed multiplied by its emission factor) associated with the system(s), which were or would have otherwise been used, in the production facility(ies) in the absence of the project activity.

6.1.1. For projects that involve replacing, modifying or retrofitting systems in existing facilities, the average of one-year historical fuel consumption data shall be used to determine an average annual baseline fuel consumption value. Similarly, one-year historical production data (excluding abnormal months) for the existing facility shall be used to determine an average annual historical baseline production rate in units of weight or volume. For calculating the emission factor, reliable local or national data shall be used. IPCC default values shall be used only when country or project-specific data are not available or demonstrably difficult to obtain;

6.1.2. For projects involving installation of systems in a new facility, the average annual historical baseline fuel consumption value and the baseline production rate shall be determined as that which would have been consumed and produced, respectively, under an appropriate baseline scenario. If the baseline scenario identified includes different technologies with different levels of energy consumption, a weighted-average energy use of these technologies can be considered for determining the baseline

emissions of the facility or facilities.

The emissions are calculated as below:

$$ER_y = EF_{BL} * P_{PJ,y} \quad \textbf{(1)}$$

Where:

ER_y	Emission reductions during the year *y* (of the crediting period) in $tCO2_e$
EF_{BL}	The annual production specific emission factor for year *y*, in tCO_2/kg or m^3
$P_{PJ,y}$	The annual amount of units produced at the facility in year *y*, in kg or m^3 or quantity of units produced

The annual production specific emission factor (EF_{BL}) can be calculated *ex ante* as follows:

$$EF_{BL} = \sum(FC_{BL,ij} \times NCV_j \times EF_{CO_2,j}) / P_{Hy} \quad \textbf{(2)}$$

$FC_{BL,i,j}$	Average annual baseline Non-renewable Fuel consumption value for fuel type *j* combusted in the process *i*, using volume or weight units
NCV_j	Average net calorific value of fuel type *j* combusted, TJ per unit volume or mass unit
$EF_{CO2,j}$	CO_2 emission factor of fuel type *j* combusted in the process *i* in tCO_2/TJ
P_{Hy}	Average annual historical baseline production rate in kg or m^3 or quantity of units produced

7. LEAKAGE

7.1. In case the project activity involves replacement of equipment and the leakage effect from the use of the replaced equipment in another activity is neglected because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented.

7.2. Leakage emissions shall be calculated as per Annex III.

7.3. Use/diversion of Non-renewable 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 biomass used by the non-project households/users attributable to the project activity, then ER_y shall be adjusted to account for the quantified leakage.

8. MONITORING

8.1. Monitoring shall consist of an annual check of all appliances or a representative sample thereof to ensure that they are still operating or are replaced by an appliance that is equivalent in service.

8.2. Monitoring should confirm the displacement or substitution of the Non-renewable Fuel at each location.

8.3. Monitoring during the crediting period shall include:

8.3.1. The amount of units produced at the facility (kg or m3 or quantity of units produced per month);

8.3.2. The Renewable Biomass consumption at the production facility (kg or m^3 per month). Each type of biomass shall be monitored separately.

9. ANNEXES

I. DEFINITION OF BIOMASS AND BIOMASS RESIDUES [7]

a) Biomass means non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms. This shall also include products, by-products, residues and waste from agriculture, forestry and related industries as well as the non-fossilized and biodegradable organic fractions of industrial and municipal wastes. Biomass also includes gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material.

b) Biomass residues means biomass by-products, residues and waste streams from agriculture, forestry and related industries.

II. DEFINITION OF RENEWABLE BIOMASS [8]

Biomass[1] is "*renewable*" if one of the following five conditions applies:

1) The biomass is originating from land areas that are **forests**[2] where:
   a) The land area remains a forest; and
   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 **croplands and/or grasslands** where:
   a) The land area remains cropland and/or grasslands or is reverted to forest; and
   b) Sustainable management practices are undertaken on these land areas to ensure in

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

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.

3) The biomass is **non-woody** biomass and originates from **croplands and/or grasslands** where:

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

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.

4) The biomass is a **biomass residue**[3] and the use of that biomass residue in the project activity does not involve a decrease of carbon pools, in particular dead wood, litter or soil organic carbon, on the land areas where the biomass residues are originating from. For example, if bagasse from sugar production would in the absence of the CDM be dumped or left to decay and is used for energy generation under the CDM, it can be assumed that the use of the bagasse does not affect the sugar cane cultivation practices and hence the carbon pools of the respective soils. In contrast, where a CDM project involves the collection of dead wood from a forest, which would not be collected in the absence of the CDM, the extracted biomass cannot be regarded as renewable, since it would result in a decrease of carbon stocks.

5) The biomass is the non-fossil fraction of an industrial or municipal waste.

Otherwise, where none of these conditions applies, the biomass is considered as "non-renewable".

III. LEAKAGE ASSESSMENT [5]

I. Definition of Renewable Biomass

1. Definition of renewable biomass – as per Annex II

II. <u>Project Boundary for biomass projects</u>

2. Table 1 below identifies different emission sources based on type of biomass being considered.

[3] As per Annex I

Table 1. Emission source per type of biomass

Biomass type	Activity / source	Shift of pre-project activities	Emissions from biomass generation / cultivation	Competing use of biomass
Biomass from forests	Existing forests	-	-	x
	New forests	x	x	-
Biomass from croplands or grasslands (woody or non- woody)	In the absence of the project the land would be used as cropland / wetland	x	x	-
	In the absence of the project the land would be abandoned	-	x	-
Biomass residues or wastes	Biomass residues or wastes are collected and used	-	-	x

III. Leakage

3. The following guidelines identify potentially significant sources of leakage and project emissions for renewable biomass projects and suggest methodological approaches to address them.

Identification of relevant emission sources

4. For small-scale energy CDM project activities involving renewable biomass, there are three types of emission sources that are potentially significant (>10% of emission reductions) and attributable to the project activities:

A. **Shifts of pre-project activities.** Decreases of carbon stocks, for example as a result of deforestation, outside the land area where the biomass is grown, due to shifts of pre- project activities.

B. **Emissions** related to the production of the biomass.

C. **Competing uses for the biomass.** The biomass may in the absence of the project activity be used elsewhere, for the same or a different purpose.

5. These emission sources may be project emissions (if under the control of project participants, i.e. if the land area where the biomass is grown is included in the project boundary) or sources of leakage (if the source is not under control of project participants). Table 1 summarizes, for different types of biomass, the cases where the emission source is relevant and the cases where it is not.

A. Shifts of pre-project activities

6. Shifts of pre-project activities are relevant where in the absence of the project activity the land areas would be used for other purposes (i.e. agriculture). For example: where cropland is converted to forest to produce wood for energy purposes, the pre-project activity (crop production) might be shifted to other land areas. In the worst case, this shift of the pre-project activity could result in deforestation on other land areas.

7. Consequently, as a first guidance, project participants may neglect leakage effects due to shifts in pre-project activities, where the land would not be used or where the land use (inside the project boundary) does not change as a result of the project activity. This is the case for the extraction of biomass from existing forests, the cultivation of biomass on lands that would be abandoned in the absence of the project or in the case of biomass residues or wastes. In this latter case, it can be reasonably assumed that the use of the residue or waste is unlikely to affect the generation of the residue or waste. For example, in case of sugar cane, rice husks or residues from wood panel production the main activity (sugar, rice or panel production) occurs independently of the CDM project activity. Thus, emissions associated with that generation of the biomass are not affected by a CDM project using the biomass residues.

8. For other types of biomass, deforestation on other land areas as a result of shifts of pre- project activities might be the most important potential leakage source. For the assessment of whether a project activity results in deforestation elsewhere, it can be necessary to evaluate whether there is significant land pressure in the area, e.g., in cases where there are large areas of abandoned land, it is very unlikely that a project activity will result in deforestation elsewhere, whereas in cases of high land pressure, it is more likely that the project results in a shift of pre-project activities.

9. Project participants should assess the possibility of leakage from the displacement of activities or people considering the following indicators:

- Percentage of families/households of the community involved in or affected by the project activity displaced (from within to out of the project boundary) due to the project activity;

- Percentage of total production of the main produce (e.g., meat, corn) within the project boundary displaced due to the generation of renewable biomass.

10. If the value of these two indicators is lower than 10%, then leakage from this source is assumed to be zero. If the value of any of these two indicators is higher than 10% and less than or equal to 50%, then leakage shall be equal to 15% of the difference between baseline emissions and project emissions. If the value of any of these two indicators is larger than 50%, then this methodology is not applicable and a new procedure must be submitted for the approval of the Board.

B. Emissions from the production of the renewable biomass

11. Potentially significant emission sources from the production of renewable biomass can be:
(a) Emissions from application of fertilizer[4]; and
(b) Project emissions from clearance of lands.

12. These emissions sources should respectively be included in a simplified manner, not involving any significant transaction costs. All other emission sources are likely to be smaller than 10% (each) - including transportation of raw materials and biomass, fossil fuel consumption for the cultivation of plantations - and can therefore be neglected in the context of SSC project activities.

(a) Emissions from the application of synthetic fertilizer

13. Project participants should monitor the type and quantity of fertilizer applied in the project boundary.

14. N_2O emissions from the use of synthetic and organic fertilizers in the project boundary should be estimated according to provisions outlined in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Chapter. 4.5) [6].

(b) Project emissions from clearance of lands

15. Project emissions from clearance of lands can be significant in cases where an area is deforested to produce the biomass. In other cases, the land area (e.g., abandoned land) can regenerate in the absence of production of the biomass resulting in increasing carbon stocks in carbon pools. As a consequence, carbon stocks in carbon pools could be higher in the baseline scenario than in the project scenario. However, as a simplification, it is suggested to neglect this latter case. The potential of deforestation due to the implementation of the CDM project activity must be addressed by considering the following applicability condition:

[4] While this emission source may be small for most forest plantations, it may be very large (>30% of emission reductions through fossil fuel substitution) for some energy crops.

16. Where the project activity involves the use of a type of renewable biomass that is not a biomass residues or waste, project participants should demonstrate that the area where the biomass is grown was not a forest (as per DNA forest definition) and has not been deforested, according to the forest definition by the national DNA, prior to the implementation of the project activity. In the absence of forest definition from the DNA, definitions provided by relevant international organizations (e.g., FAO) shall be used.

C. Competing uses for the biomass

17. In some cases, the biomass used in the project activity could be used for other purposes in the absence of the project. For example, biomass residues from existing forests could have been used as fuel wood or agricultural biomass residues could have been used as fertilizers or for energy generation. Competing uses for biomass are not relevant, where the biomass is generated as part of the project activity (new forests or cultivations).

18. The project participant shall evaluate *ex ante* if there is a surplus of the biomass in the region of the project activity, which is not utilized. If it is demonstrated (e.g., using published literature, official reports, surveys etc.) at the beginning of each crediting period that the quantity of available biomass in the region (e.g., 50 km radius), is at least 25% larger than the quantity of biomass that is utilized by the project activity, then this source of leakage can be neglected otherwise this leakage shall be estimated and deducted from the emission reductions.

10. DOCUMENT HISTORY

Versio	Date of Issue	Comment
1.0		