CLEAN DEVELOPMENT MECHANISM

CDM-SSCWG46-A17

Small-scale Methodology

AMS-III.Z.: Fuel Switch, process improvement and energy efficiency in brick manufacture

Version 06.0 - Draft

Sectoral scope(s): 04

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. While considering top-down development of a standardised baseline for brick production sector, it is noticed that baseline fuel type used in the sector of the host country is primarily non-renewable biomass. However, the current version of the methodology is not applicable for project activities involving non-renewable biomass. The proposed revision will not only allow its application in combination with the standardised baseline under development, but also expand the applicability to normal project activities.

2. Purpose

2. The purpose of this proposed revision is to expand the applicability of the methodology to allow project activities for reducing or displacing non-renewable biomass used in the baseline.

3. Key issues and proposed solutions

3. The key issue is to include non-renewable biomass as the eligible baseline fuel type, and determine a conservative emission factor for it. In doing so, the proposed revision refers to the approved methodology AMS-II.G, which provides detailed guidance on the demonstration of renewability of the biomass, as well as its emission factor.

4. Impacts

4. The proposed revision will expand the applicability of the methodology to allow project activities for reducing or displacing non-renewable biomass used in the baseline.

5. Subsequent work and timelines

5. The SSC WG, at its 46th meeting, agreed on the draft revised methodology. After receiving public inputs on the document, the SSC WG will continue working on the methodology, at its 47th meeting, for recommendation to the Board at a future meeting of the Board.

6. Recommendations to the Board

6. Not applicable (call for public input).

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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)	Switch to a more-energy-efficient brick production process and/or switch from fossil fuel to renewable biomass or less-carbon-intensive fossil fuel; energy saving through improved efficiency of brick production
Type of GHG emissions mitigation action	• Energy efficiency; • Renewable energy; • Fuel or feedstock switch. Reduction of emissions from decreased energy consumption per brick produced and from the use of fuels with lower carbon intensity, either at an existing brick kiln or at a new facility

2. Scope, applicability and entry into force

2.1. Scope

2. The methodology comprises one or more technology/measures listed below in brick[1] production facilities:

(a) Shift to an alternative brick production technology/process; or

(b) Complete/partial substitution of fossil fuels or non-renewable biomass (NRB) with renewable biomass (including biomass from dedicated plantations or solid biomass residues such as sawdust and food industry organic liquid residues);[2] or

(c) Complete/partial substitution of high carbon fossil fuels with low carbon fossil fuels;[3]

(d) Reduce the consumption of fossil fuels or NRB due to improvement of the production process.

2.2. Applicability

3. The measures may replace, modify, retrofit[4] or add capacity to systems in existing facilities or be installed in a new facility.

[1] Brick in the context of this methodology includes solid bricks and blocks as well as hollow blocks used in building construction.

[2] Fatty acids from oil extraction, waste oil and waste fat of biogenic origin (includes waste oil from restaurants, agro and food industry, slaughterhouses or related commercial sectors). The sources/origin of waste oil/fat and respective volumes must be identified and clearly documented in the PDD. No CERs from waste oil/fat can be claimed under this methodology if it is not produced from biogenic origin, biogenic shall mean the oils and/or fats originate from either vegetable or animal biomass, but not from mineral (fossil) sources.

[3] For example from anthracite coal to natural gas.

4. ~~Complete or partial fuel substitution and associated activities may also result in improved energy efficiency of existing facility; however project activities primarily aimed at emission reductions from energy efficiency measures shall apply "AMS-II.D: Energy efficiency and fuel switching measures for industrial facilities". Thus,~~The methodology is applicable for the production of:

   (a) Bricks that are the same in the project and baseline cases; or

   (b) Bricks that are different in the project case versus the baseline case due to a change(s) in raw materials, use of different additives, and/or production process changes resulting in reduced use or avoidance of fossil fuels for forming, sintering (firing) or drying or other applications in the facility as long as it can be demonstrated that the service level of the project brick is comparable to that of the baseline brick (see paragraph 11). Examples include pressed mud blocks (soil blocks) with cement or lime stabilization[5] and other 'unburned' bricks that attain strength due to fly ash, lime/cement and gypsum chemistry.

5. New facilities (Greenfield projects) and project activities involving capacity additions are only eligible if they comply with the requirements for Greenfield projects and capacity increase projects specified in the "General guidelines for SSC CDM methodologies".

6. The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the "General guidelines for SSC CDM methodologies". If the remaining lifetime of the affected systems increases due to the project activity, the crediting period shall be limited to the estimated remaining lifetime, i.e. the time when the affected systems would have been replaced in the absence of the project activity.

7. For existing facilities, it shall be demonstrated, with historical data, that for at least three years immediately prior to the start date of the project implementation, only fossil fuels or NRB (no renewable biomass) were used in the brick production systems that are being modified or retrofitted. In cases where small quantities of renewable biomass were used for experimental purposes this can be excluded.

8. The renewable biomass utilized by the project activity shall not be chemically processed (e.g. esterification to produce biodiesel, degumming and/or neutralization by chemical reagents) prior to the combustion but it may be processed mechanically (e.g. pressing, filtering) and/or thermally (e.g. gasification to produce syngas).[6]

9. In cases where the project activity utilizes charcoal produced from renewable biomass as fuel, the methodology is applicable provided that:

   (a) Charcoal is produced in kilns equipped with a methane recovery and destruction facility; or

[4] For example to, replace and/or modify an existing heating and/or firing facility(/-ies) to enable the use of biomass residues.

[5] May involve mechanical and hydraulic systems for energy transmission to the soil block via a lever, toggle, cam, pivot, ball and socket joint, piston, etc.

[6] The syngas shall be derived from gasification of renewable biomass only and no methane emissions are to be released to the atmosphere, thus demonstrating the complete use for combustion of the syngas in the project equipment.

(b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. A default value of 0.030 t CH_4/t charcoal may be used in accordance with "AMS-III.BG.: Emission reduction through sustainable charcoal production and consumption";

(c) In case charcoal is produced from other CDM project activities, it shall be ensured that no double counting of the emission reductions occurs.

10. In the case of project activities involving changes in raw materials (including additives), it shall be demonstrated that additive materials are abundant in the country/region, according to the following procedures:

(a) **Step 1:** using relevant literature and/or interviews with experts, a list of raw materials to be utilized is prepared based on the historic and/or present consumption of such raw materials;

(b) **Step 2:** the current supply situation for each type of raw material to be utilized is assessed and their surplus availability is demonstrated using one of the approaches below:

(i) Approach 1: demonstrate that the raw materials to be utilized, in the region of the project activity, are not fully utilized. For this purpose, demonstrate that the quantity of material is at least 25 per cent greater than the demand for such materials or the availability of alternative materials for at least one year prior to the project implementation;

(ii) Approach 2: demonstrate that suppliers of the raw materials to be utilized, in the region of the project activity, are not able to sell all of their supply of these materials. For this purpose, project participants shall demonstrate that a representative sample of suppliers of the raw materials to be utilized, in the region, had a surplus of materials (e.g. at the end of the period during which the raw material is sold) that they could not sell and that is not utilized.

11. This methodology is applicable under the following conditions:

(a) The service level of project brick shall be comparable to or better than the baseline brick, i.e. the bricks produced in the brick production facility during the crediting period shall meet or exceed the performance level of the baseline bricks (in terms of, for example dry compressive strength, wet compressive strength, density). An appropriate national standard shall be used to identify the strength class of the bricks; bricks that have compressive strengths lower than the lowest class bricks in the standard are not eligible under this methodology. Project bricks are tested in nationally approved laboratories at six-month intervals (at a minimum) and test certificates on compressive strength are made available for verification;

(b) The existing facilities involving modification and/or replacement shall not influence the production capacity beyond ±10 per cent of the baseline capacity unless it is demonstrated that the baseline for the added capacity is the same as that for the existing capacity in accordance with paragraph 5 above;

(c) Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

12. This methodology is not applicable if local regulations require the use of the proposed technologies or raw materials for the manufacturing of bricks unless widespread non-compliance (i.e. less than 50 per cent of brick production activities in the country comply) of the local regulation evidenced.

13. In cases where the project activity utilizes biomass sourced from dedicated plantations, applicability conditions prescribed in the tool "Project emissions from cultivation of biomass" shall apply. In case project activity involves reducing the NRB consumption, project participants shall be able to show that NRB has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.

14. The following cases are exempted from 'determining the occurrence of debundling' as per the "Guidelines on assessment of debundling for SSC project activities":

(a) Project activities that aggregate brick units with holistic production cycles i.e. from raw material procurement to finished product, where each unit is not larger than 5 per cent of the Type III small-scale CDM project activity thresholds i.e. 3,000 t CO_2e; or

(b) Project activities that aggregate brick units, where each unit qualifies as Type III microscale CDM project activity and the geographic location of the project activity is a least developed countries/small island developing states (LDC)/(SIDS) or special underdeveloped zone (SUZ) of the host country as identified by the government in accordance with the guideline on "Demonstrating additionality of microscale project activities".

2.3. Entry into force

15. Not applicable (call for public input).

3. Normative references

16. Project participants shall apply the "General guidelines for SSC CDM methodologies", "Guidelines on the demonstration of additionality of small-scale project activities" 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.

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

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

~~(b) "AMS-II.D.: Energy efficiency and fuel switching measures for industrial facilities";~~

(c) "AMS-II.H.: Energy efficiency measures through centralization of utility provisions of an industrial facility";

(d) "AMS-III.BG.: Emission reduction through sustainable charcoal production and consumption";

(e) "AMS-III.K.: Avoidance of methane release from charcoal production by shifting from traditional open-ended methods to mechanized charcoaling process";

~~(f) "AMS-III.AK.: Biodiesel production and use for transport applications";~~

(g) "AMS-II.G.: Energy efficiency measures in thermal applications of non-renewable biomass";

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

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

(j) Tool: "Project emissions from cultivation of biomass".

4. Definitions

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

5. Baseline methodology

5.1. Project boundary

19. The project boundary is the physical, geographical site where the brick production takes place during both the baseline and crediting periods. It also includes all installations, processes or equipment affected by the switching. In cases where the renewable biomass is sourced from dedicated plantations it also includes the area of the plantations. In cases involving thermo-mechanical processing of the biomass (e.g. charcoal; briquettes; syngas) the sites where these processes are carried out shall be within the project boundary.

5.2. Baseline emissions

20. The baseline emissions are the fossil fuel and NRB consumption related emissions ~~(fossil fuel consumed multiplied by an emissions factor~~) associated with the system(s), which were or would have otherwise been used, in the brick production facility(ies) in the absence of the project activity.

(a) For projects that involve replacing, modifying or retrofitting systems in existing facilities, the average of the immediately prior three-year historical fossil fuel or NRB consumption data, for the existing facility, shall be used to determine an average annual baseline fossil fuel or NRB consumption value. Similarly, prior three-year historical production data (excluding abnormal years) for the existing facility, shall be used to determine an average annual historical baseline brick production rate in units of weight or volume. For calculating the emission factor for fossil fuel, 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. For emissions associated with NRB equation 2 below shall be used;

(b) For projects involving the installation of systems in a new facility or a capacity addition in an existing system, the average annual baseline fossil fuel consumption value and the baseline brick production rate shall be determined as that which would have been consumed and produced, respectively, under an appropriate baseline scenario. If the baseline scenario identification as per paragraph 5 above results in more than one alternative technologies with different levels of energy consumption, the alternative with the least emissions intensity should be chosen for determining the baseline emissions of the facility.

21. The emissions are calculated as below:

$$BE_y = EF_{BL} \times P_{PJ,y} \qquad \text{Equation (1)}$$

Where:

BE_y = The annual baseline emissions from fossil fuels or NRB displaced by the project activity in t CO_2e in year *y* (of the crediting period)

EF_{BL} = The annual production specific emission factor for year *y*, in t CO_2/kg or m^3

$P_{PJ,y}$ = The annual net production of the facility in year *y*, in kg or m^3

22. The annual production specific emission factor EF_{BL} shall be calculated ex ante for project activities that involve replacing, modifying or retrofitting systems in existing facilities as follows:

$$EF_{BL} = \frac{\sum_{j,i}\left(FC_{BL,i,j} \times NCV_j \times EF_{CO_2,j}\right)}{P_{Hy}} \qquad \text{Equation (2)}$$

Where:

$FC_{BL,i,j}$ = Average annual baseline fossil fuel or NRB consumption value for fuel type *j* combusted in the process *i*, using volume or weight units[7]. For the case of NRB, it is determined by the total woody biomass consumption multiplied with the fraction of the NRB (fNRB)[8]

NCV_j = Average net calorific value of fuel type *j* combusted, TJ per unit volume or mass unit. For the case of NRB, IPCC default for wood fuel, 0.015 TJ/tonne based on the gross weight of the wood that is 'air-dried', shall be used

$EF_{CO_2,j}$ = CO_2 emission factor of fuel type *j* combusted in the process *i* in t CO_2/TJ. For the case of NRB, emission factor for the fossil fuels projected to be used for substitution of NRB by similar consumers. Use a value of 81.6 t CO_2/TJ

[7] Volume or weight units will be used depending on which best defines the fuel consumption requirements of the brick making process(es).

[8] fNRB shall be determined by following the procedure outlined in the AMS-II.G.

P_{Hy} = Average annual historical baseline brick production rate in accordance with paragraph 19(a), in units of weight or volume, kg or m^3

23. Annual production specific emission factor (EF_{BL}) for installation of systems in a new facility or for capacity addition in an existing system shall be determined using one of the options below:

(a) Using manufacturers' specifications such as for brick production rate, energy consumption in the process;

(b) Using specifications of comparable units having similar techno-economic parameters;

(c) Using reference plant approach.[9]

5.3. Project emissions

24. The project emissions should be calculated as follows:

$$PE_y = PE_{elec,y} + PE_{fossilfuel,y} + PE_{transport,y} + PE_{cultivation,y} + PE_{CH4,y} \quad \text{Equation (3)}$$

Where:

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

$PE_{elec,y}$ = Project emissions due to electricity consumption in year *y* (t CO_2)

$PE_{fossilfuel,y}$ = Project emissions due to fossil fuel or NRB consumption in year *y* (t CO_2)

~~$PE_{transport,y}$~~ = ~~Project emissions from transportation of the renewable biomass from the places of their origin to the manufacturing facility site in year *y* (t CO_2)~~

$PE_{cultivation,y}$ = Project emissions from cultivation of biomass in a dedicated plantation in year *y* (t CO_2e)

$PE_{CH4,y}$ = Project emissions due to the production of charcoal in kilns not equipped with a methane recovery and destruction facility in year *y* (t CO_2e)

5.3.1. Calculation of $PE_{elec,y}$

25. The emissions include electricity consumption (including auxiliary use) $PE_{elec,y}$ associated with the biomass treatment and processing, calculated as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

[9] This shall be consistent with the definition of "baseline reference plant approach" provided in the approved small-scale methodologies such as AMS-II.H.

5.3.2. Calculation of $PE_{fossilfuel,y}$

26. The emissions include fossil fuel or NRB consumption (including auxiliary use) $PE_{fossilfuel,y}$ associated with the operation of the manufacturing process and the biomass treatment and processing. For the case of fossil fuels, it is calculated as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". For the case of NRB, it is calculated by multiplying the quantity of NRB consumption during the project with its NCV and EF, which are the same in Equation (2) above.

~~**5.3.3.Calculation of $PE_{transport,y}$**~~

~~26.Project emissions from the transportation of the renewable biomass from its source to the manufacturing production site shall be accounted for following the procedures in "AMS-III.AK: Biodiesel production and use for transport applications" if the transportation distance is more than 200 km, otherwise they can be neglected.~~

5.3.3. Calculation of $PE_{cultivation,y}$

27. In cases where the project activity utilizes biomass sourced from dedicated plantations, the project emissions from biomass cultivation shall be calculated according to the methodological tool "Project emissions from cultivation of biomass".

5.3.4. Calculation of $PE_{CH4,y}$

28. The project methane emissions from the charcoal produced in kilns not equipped with a methane recovery and destruction facility and methane emissions from the production of charcoal shall be accounted for as per the relevant procedures of "AMS-III.K.: Avoidance of methane release from charcoal production by shifting from traditional open-ended methods to mechanized charcoaling process". Alternatively, conservative emission factor values from peer reviewed literature or from a registered CDM project activity can be used, provided that it can be demonstrated that the parameters from these are comparable, e.g. the source of biomass, characteristics of biomass such as moisture, carbon content, type of kiln and operating conditions such as ambient temperature.

5.4. Leakage

29. Leakage emissions on account of the diversion of biomass residues from other uses (competing uses) shall be calculated as per the "General guidance on leakage in biomass project activities". Specifically, where NRB is involved, the leakage specified in leakage section of AMS-II.G. shall also be considered.

30. In the case of project activities involving a change in the production process or a change in the type or quantity of raw and/or additive materials as compared to the baseline, the incremental emissions associated with the production/consumption and transport of those raw and/or additive materials consumed as compared to baseline, shall be calculated as leakage.

~~31.In cases where the collection, processing and transportation of biomass residues is outside the project boundary and due to the implementation of the project activity biomass residues are transported over a distance of 200 kilometres CO_2 emissions from the collection, processing and transportation of biomass residues to the project site shall be taken into account as leakage using with the latest version of tool to calculate "Project and leakage emissions from transportation of freight".~~

5.5. Emission reductions

31. Emission reductions (ER_y) achieved by the project activity will be calculated as the difference between the baseline emissions and the sum of project emissions and leakage as follows:

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

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)

6. Monitoring methodology

32. The applicable requirements specified in the "General guidelines for SSC CDM methodologies" and the "Standard on sampling and surveys for CDM project activities and PoAs" are also an integral part of the monitoring guidelines specified below and therefore shall be referred to by the project participant.

33. Monitoring during the crediting period shall include:

(a) Production output (kg or m^3 per day);

(b) Principal raw and additive material purchases on monthly basis;

(c) Tests to validate that the project bricks meet the performance requirements and specifications at six-month intervals;

(d) Project emissions associated with the electricity use shall be monitored as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption";

(e) Project emissions due to the fossil fuels consumption shall be monitored as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";

(f) Daily consumption of biomass (including NRB) of the production facility. Each type of solid/liquid biomass shall be monitored separately. Cross-checking with purchase invoice, delivery notes and the stock is required;

(g) In order to assess the compliance with the applicability conditions concerning organic liquid residues as defined in footnote 3, monitoring shall include data on the origin of organic residue liquids;

(h) The calorific value of each fossil fuel type and the density, mass fraction and carbon content of each biomass fuel type used;

~~(i) Parameters for determining project emissions from renewable biomass cultivation and from transportation of renewable biomass over distances of 200 km shall be monitored as per the relevant provisions of AMS-III.AK.;~~

(j) Parameters for determining methane emissions from the charcoal produced in kilns not equipped with a methane recovery and destruction facility shall be monitored as per the relevant procedures of AMS-III.K.

6.1. Project activity under a programme of activities

34. Leakage resulting from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary shall be considered, as per the guidance provided in the "Upstream leakage emissions associated with fossil fuel use". If leakage emissions in the baseline scenario are higher than leakage emissions in the project scenario, leakage emissions may be set to zero.

35. In case NRB is involved, leakage specified in the section titled "Project activity under a programme of activities" of AMS-II.G. shall also be considered.

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Document information

Version	*Date*	*Description*
Draft 06.0	7 November 2014	SSCWG 46, Annex 17 A call for public input will be issued on this draft revised methodology. To include non-renewable biomass as the eligible baseline fuel type, and determine a conservative emission factor for it and to refer to the approved methodology AMS-II.G, which provides detailed guidance on the demonstration of renewability of the biomass, as well as its emission factor.
05.0	1 June 2014	EB 79, Annex 18 To include the criteria for debundling check as per EB 77 mandate, and include a reference to tool "Project emissions from cultivation of biomass".
04.0	11 May 2012	EB 67, Annex 21 To expand its applicability for a complete switch from fossil fuel to renewable biomass and provide further guidelines to determine baseline emissions for Greenfield and capacity-addition project activity.
03.0	28 May 2010	EB 54, Annex 10 To include project activities involving complete/partial substitution of high carbon fossil fuels with low carbon fossil fuels.
02.0	28 May 2009	EB 47, Annex 25 To simplify the requirements to establish the comparability level of service (e.g. comparability of compressive strength) of baseline

Version	*Date*	*Description*
		bricks and the project bricks.
01.0	25 March 2009	EB 46, Annex 20 Initial adoption.

Decision Class: Regulatory
Document Type: Standard
Business Function: Methodology
Keywords: biomass, fuel switching , retrofit, simplified methodologies, type (iii) projects