CLEAN DEVELOPMENT MECHANISM

CDM-SSCWG46-A08

Draft Small-scale Methodology

AMS-I.F.: Renewable electricity generation for captive use and mini-grid

Version 03.0

Sectoral scope(s): 01

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. Following the approval of the methodological tool "Project emissions from cultivation of biomass" at the seventy-fifth meeting of the Executive Board of the clean development mechanism (CDM) (hereinafter referred to as the Board), the Small-Scale Working Group (SSC WG) requested a mandate from the Board to integrate this tool into SSC methodologies. Consequently, the Board mandated this task at its seventy-sixth meeting (EB 76, para 53).

2. The SSC WG, at its 45th meeting, agreed on the draft revised methodology and decided to launch a call for public inputs. No inputs were received. At its 46th meeting, the SSC WG agreed to recommend this draft revised methodology to the Board for approval.

2. Purpose

3. The draft revision:

   (a) Introduces the methodological tool "Project emissions from cultivation of biomass", streamlines biomass cultivation procedures across small and large scale methodologies;

   (b) Removes restrictions for application in a PoA.

3. Key issues and proposed solutions

4. None.

4. Impacts

   (a) Increased environmental integrity;

   (b) Simplified and streamlined procedures.

5. Subsequent work and timelines

5. The methodology is recommended by the SSC WG for consideration by the Board at its eighty-first meeting. No further work is envisaged.

6. Recommendations to the Board

6. The SSC WG recommends that the Board adopt this final draft revised methodology, to be made effective at the time of the Board's approval.

TABLE OF CONTENTS **Page**

1. Introduction

1. The following table describes the key elements of the methodology.

Table 1. Methodology key elements

Typical project(s)	Production of electricity using renewable energy technologies such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s)
Type of GHG emissions mitigation action	Renewable energy. Displacement of electricity that would be provided to the user(s) by more-GHG-intensive means

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below:

(a) A national or a regional grid (grid hereafter);

(b) Fossil fuel fired captive power plant;[1]

(c) A carbon intensive mini-grid.

2.2. Applicability

3. Illustration of respective situations under which each of the methodology (AMS-I.D., AMS-I.F. and AMS-I.A.[2]) applies is included in Table 3.

4. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:

(a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir;

(b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2;

[1] Where the users of the captive electricity are also connected to the grid in the project site.

[2] "AMS-I.D.: Grid connected renewable electricity generation", "AMS-I.F.: Renewable electricity generation for captive use and mini-grid" and "AMS-I.A: Electricity generation by the user".

(c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.

~~5. For biomass power plants, no other biomass other than renewable biomass[3] are to be used in the project plant.~~

5. This methodology is applicable for project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition,[4] (c) Involve a retrofit[5] of (an) existing plant(s); or (d) Involve a replacement[6] of (an) existing plant(s).

6. In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[7] from the existing units.

7. In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.

8. If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel,[8] the capacity of the entire unit shall not exceed the limit of 15 MW.

9. Combined heat and power (co-generation) systems are not eligible under this category.

~~[3] Refer to EB 23, annex 18 for the definition of renewable biomass.~~

[4] A capacity addition is an increase in the installed power generation capacity of an existing power plant through: (i) The installation of a new power plant beside the existing power plant/units; or (ii) The installation of new power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.

[5] Retrofit (or rehabilitation or refurbishment). A retrofit is an investment to repair or modify an existing power plant/unit, with the purpose to increase the efficiency, performance or power generation capacity of the plant, without adding new power plants or units, or to resume the operation of closed (mothballed) power plants. A retrofit restores the installed power generation capacity to or above its original level. Retrofits shall only include measures that involve capital investments and not regular maintenance or housekeeping measures.

[6] Replacement. Investment in a new power plant or unit that replaces one or several existing unit(s) at the existing power plant. The new power plant or unit has the same or a higher power generation capacity than the plant or unit that was replaced.

[7] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered “physically distinct”.

[8] A co-fired system uses both fossil and renewable fuels, for example the simultaneous combustion of both biomass residues and fossil fuels in a single boiler. Fossil fuel may be used during a period of time when the biomass is not available and due justification are provided.

10. If electricity and/or steam/heat produced by the project activity is delivered to a third party, i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.

11. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.

2.3. Entry into force

12. The date of entry into force is the date of the publication of the EB 81 meeting report on 28 November 2014.

3. Normative references

13. Project participants shall apply the "General guidelines ~~to~~ for SSC ~~the~~ CDM methodologies", ~~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~~> <https://cdm.unfccc.int/Reference/Guidclarif/index.html> mutatis mutandis.

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

(a) "Project emissions from cultivation of biomass" ~~AM0042 "Grid-connected electricity generation using biomass from newly developed dedicated plantations"~~;

(b) "ACM0002: Grid-connected electricity generation from renewable sources";

(c) "AMS-I.A.: Electricity generation by the user";

(d) "AMS-I.C.: Thermal energy production with or without electricity";

(e) "AMS-I.D.: Grid connected renewable electricity generation";

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

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

(h) "Tool to calculate the emission factor for an electricity system".

4. Definitions

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

16. For the purpose of this methodology, a mini-grid is defined as small-scale power system with a total capacity not exceeding 15 MW (i.e. the sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW) which is not connected to a national or a regional grid.

5. Baseline methodology

5.1. Project boundary

17. The spatial extent of the project boundary includes industrial, commercial facilities consuming energy generated by the system. In the case of electricity generated and supplied to distributed users (e.g. residential users) via mini/isolated grid(s) the project boundary may be confined to physical, geographical site of renewable generating units. The boundary also extends to the project power plant and all power plants connected physically to the electricity system[9] that the CDM project power plant is connected to.

5.2. Baseline emissions

18. For a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel, the baseline emissions is the annual electricity generated by the renewable energy unit times an emission factor for a modern diesel generating unit of the relevant capacity operating at optimal load as given in Table 2.

Table 2 Emission factors for diesel generator systems (in kg CO2e/kWh[(a)]) for three different levels of load factors[(b)]

Cases	Mini-grid with 24 hour service	(a) Mini-grid with temporary service (4-6 hr/day); (b) Productive applications; (c) Water pumps	Mini-grid with storage
Load factors [%]	**25%**	**50%**	**100%**
<15 kW	2.4	1.4	1.2
>=15 <35 kW	1.9	1.3	1.1
>=35 <135 kW	1.3	1.0	1.0
>=135<200 kW	0.9	0.8	0.8
> 200 kW[(c)]	0.8	0.8	0.8

(a) A conversion factor of 3.2 kg CO_2 per kg of diesel has been used (following revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories);

(b) Values derived from figures reported in RETScreen International's PV 2000 model retrieved from: <http://retscreen.net/>;

(c) Default values.

19. Baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor.

$$BE_y = EG_{BL,y} \times EF_{CO_2,y} \qquad \text{Equation (1)}$$

[9] Refer to the latest approved version of the "Tool to calculate the emission factor for an electricity system" for definition of an electricity system.

Where:

BE_y = Baseline emissions in year *y* (t CO_2)

$EG_{BL,y}$ = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year *y* (MWh)

$EF_{CO2,y}$ = Emission factor (t CO_2/MWh)
- Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D.;
- For a mini-grid system other than described in paragraph ~~13~~ 18 above, the baseline emission factor shall be determined as per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D.;
- Emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"

20. For project activities that displace grid electricity and fossil fuel fired on-site captive electricity, the baseline emission factor should reflect the emissions intensity of the grid and the captive power plant in the baseline scenario i.e. the weighted average emission factor for the displaced electricity is calculated using values based on the historical, prior three year ratios of electricity from captive plants and the grid.[10] For new facilities, the most conservative (lowest) of the emission factor for the two power sources should be used.

21. For landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for captive use the baseline shall be calculated in accordance with paragraphs below. If the recovered methane is used for heat generation or cogeneration, it is eligible under ~~category~~ methodology AMS-I.C. and if generated electricity is supplied to a grid then use AMS-I.D.

22. For project activities that involve retrofit of an existing facility and/or capacity addition at an existing facility, the baseline emissions shall be calculated following the applicable procedures prescribed in AMS-I.D. with the exception that emission factor ($EF_{CO2,y}$) is calculated as described in this methodology.

23. The quantities and types of biomass and the biomass to fossil fuel ratio (in case of co-fired system) to be used during the crediting period should be explained and documented transparently in the CDM-PDD. For the selection of the baseline scenario, an ex ante estimation of these quantities should be provided.

[10] For example if in the baseline 80 per cent of annual electricity requirement was met by grid import and the remaining by captive generation, the weighted average emission factor ($EF_{electricity}$) would be 0.8 EF_{grid} + 0.2 $EF_{captive}$.

5.3. Project emissions

24. For most renewable energy project activities, PE_y = 0. However, for the following categories of project activities, project emissions including relevant definitions have to be considered following the procedure described in the most recent version of ACM0002.[11]

    (a) Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);

    (b) Emissions from water reservoirs of hydro power plants.

25. CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".~~;~~

26. In case biomass is sourced from dedicated plantations, the procedures in the tool "Project emissions from cultivation of biomass" shall be used.

5.4. Leakage

27. General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues~~If the energy generating equipment is transferred from another activity, leakage is to be considered~~.

5.5. Emission reductions

28. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$ Equation (2)

Where:

ER_y	=	Emission reductions in year *y* (t CO_2e/y)
BE_y	=	Baseline Emissions in year *y* (t CO_2/y)
PE_y	=	Project emissions in year *y* (t CO_2/y)
LE_y	=	Leakage emissions in year *y* (t CO_2/y)

6. Monitoring methodology

6.1. Parameters for monitoring during the crediting period

29. Relevant parameters shall be monitored as indicated in the tables below.

[11] "ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Data / Parameter table 1.

Data / Parameter:	$EF_{CO2,y}$
Data unit:	t CO_2/MWh
Description:	CO_2 emission factor for the grid/minigrid/captive electricity in year *y*
Measurement procedures (if any):	As prescribed in paragraph ~~13~~ 18-~~15~~ 20 of this methodology
Monitoring frequency:	-
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	**-**
Data unit:	t CO_2/MJ
Description:	CO_2 emission factor of fossil fuel type *i*
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	**-**
Data unit:	MJ per unit volume or mass unit
Description:	Net calorific value of fossil fuel type *i*
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	**-**
Data unit:	Mass or volume unit/y
Description:	Quantity of fossil fuel consumed in year *y*
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh/y
Description:	Quantity of net electricity displaced in year *y*
Measurement procedures (if any):	Measurements are undertaken using energy meters. Calibration should be undertaken as prescribed in the relevant paragraph of the "General guidelines ~~to~~ ~~for~~ SSC CDM methodologies". In the case of electricity sold to a third party, measurement results shall be cross-checked with records of sold/purchased electricity (e.g. invoices/receipts). The net electricity displaced is the gross energy generation by the project activity power plant minus the auxiliary/station electricity consumption
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording
Any comment:	-

Data / Parameter table 6.

Data / Parameter:	**-**
Data unit:	Tonne/y
Description:	Quantity of biomass consumed in year *y*
Measurement procedures (if any):	Use mass or volume based measurements. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity of biomass shall be measured continuously or in batches. If more than one type of biomass fuel is consumed, each shall be monitored separately. Cross-check the measurements with an annual energy balance that is based on purchased quantities (e.g. with sales receipts) and stock changes. Check the consistency of measurements ex post with annual data on energy generation, fossil fuels and biomass used and the efficiency of energy generation as determined ex ante
Monitoring frequency:	Continuously or estimate using annual mass/energy balance
Any comment:	-

Data / Parameter table 7.

Data / Parameter:	**-**
Data unit:	%
Description:	Moisture content of the biomass (wet basis)
Measurement procedures (if any):	On-site measurements. Ex ante estimates should be provided in the PDD and used during the crediting period. In case of dry biomass, monitoring of this parameter is not necessary

Monitoring frequency:	The moisture content of biomass of homogeneous quality shall be determined ex ante. The weighted average should be calculated and used in the calculations
Any comment:	-

Data / Parameter table 8.

Data / Parameter:	**-**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of biomass type *k*
Measurement procedures (if any):	Measurement in laboratories according to relevant national/international standards. Measure quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period. Measure the NCV based on dry biomass. Check the consistency of the measurements by comparing the measurement results with, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements
Monitoring frequency:	Determine once in the first year of the crediting period
Any comment:	-

30. Parameters relevant to hydro and geothermal plants not included in ~~this~~ the tables above shall be monitored following the most recent version of ACM0002.

Table 3. Applicability of AMS-I.D, AMS-I.F and AMS-I.A based on project types

	Project type	**AMS-I.A**	**AMS-I.D**	**AMS-I.F**
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid[12] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

[12] The sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW.

7. Project activity under a Programme of Activities

31. The methodology is applicable to a programme of activities; no additional leakage estimations are necessary other than that indicated under leakage section above.

32. The following conditions apply for use of this methodology in a project activity under a programme of activities:

33. In the specific case of biomass project activities the applicability of the methodology is limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.[13]

34. In the specific case of biomass project activities the determination of leakage shall be done following the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B[14] of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.

35. In case the project activity involves the replacement of equipment, and the leakage 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. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.

- - - - -

[13] AM0042 "Grid-connected electricity generation using biomass from newly developed dedicated plantations".

[14] Available on <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>.

Document information

Version	*Date*	*Description*
03.0	7 November 2014	SSC WG 46, Annex 8 To be considered by the Board at EB 81. The draft revised methodology was available for public input from 9 to 24 September 2014. No inputs were received. The revision: • Introduces the methodological tool "Project emissions from cultivation of biomass", streamlines biomass cultivation procedures across small and large scale methodologies; • Removes restrictions for application in a PoA.
02.0	3 June 2011	EB 61, Annex 18 The revision: • Simplifies the monitoring requirements for quantity, net calorific value and moisture content of biomass; • Clarifies the applicability conditions.
01.0	28 May 2010	EB 54, Annex 5 Initial adoption.

Decision Class: Regulatory
Document Type: Standard
Business Function: Methodology
Keywords: electricity generation, electric power transmission, simplified methodologies, type (i) projects