CLEAN DEVELOPMENT MECHANISM

AMS-III.B

Small-scale Methodology

Switching fossil fuels

Version 17.0

Sectoral scope(s): 01

United Nations
Framework Convention on
Climate Change

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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)	The fossil fuel switching in new or existing industrial, residential, commercial, institutional or electricity generation applications
Type of GHG emissions mitigation action	Switch to a fossil fuel with a lower GHG intensity (in Greenfield or retrofit or replacement activities)

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology comprises fossil fuel switching in industrial, residential, commercial, and institutional or electricity generation applications[1] (e.g. fuel switch from fuel oil to natural gas in an existing captive electricity generation or replacement of a fuel oil boiler by a natural gas boiler).

3. Fuel switch may be in a single element process or may include several element processes[2] within the facility. Multiple fossil fuel switching in an element process however is not covered under this methodology. In other words, only element processes utilizing a single fuel in the baseline as well as in the project scenario are eligible, dual or multiple fuel utilization by an element process is not covered.[3]

2.2. Applicability

4. This methodology is applicable for new facilities as well as for retrofit or replacement of existing installations.[4]

5. Fuel switching may also result in energy efficiency improvements. If the project activity primarily aims at reducing emissions through fuel switching, it falls into this methodology. If fuel switching is part of a project activity focussed primarily on energy efficiency, the project activity falls under a Type-II methodology.

[1] Fuel switch in transportation technologies is not eligible under this methodology.

[2] An 'element process' is defined as fuel combustion, energy conversion or energy use in a single equipment. Each element process generates a single output (such as electricity, steam, hot air) by using a single energy source. This methodology covers switch of energy sources in several element processes (i.e. project participants may submit one CDM-PDD for fuel switch in several element processes within a facility).

[3] For example fuel oil was used in a boiler in the baseline. The project used only natural gas in the boilers (i.e. the project plant does not use more than one fuel in one element process).

[4] It also includes installation of new energy generating facility to replace existing energy generating facility that is solely fuelled by liquid petroleum fuel such as diesel or fuel oil.

6. New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements related to demonstration of the baseline scenario prescribed in the latest approved version of the "General guidelines to for SSC CDM methodologies".[5] The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the latest approved version of the "General guidelines to 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. The following types of fuels as listed under the 2006 IPCC Guidelines for greenhouse gas inventories (volume 2, chapter 1, table 1.1) are eligible under this methodology:

   (a) Liquid fuel (crude oil and petroleum products);

   (b) Solid fuel (coal and coal products);

   (c) Gas (natural gas).

8. This methodology excludes the use of derived gases (from coal and coal products) listed in the table mentioned in paragraph 7 above.

9. This methodology is not applicable to project activities that propose switch from fossil fuel use in the baseline to renewable biomass, biofuel or renewable energy in the project scenario. A relevant Type I methodology shall be used for such project activities that generate renewable energy displacing fossil fuel use. This methodology is also not applicable to project activities involving the use of waste energy (e.g. waste gases from H_2SO_4 facilities etc.); these project activities might be eligible under "AMS-III.Q: Waste energy recovery (gas/heat/pressure) projects".

10. The methodology is limited to fuel switching measures which require capital investments. Examples of capital investment include creating infrastructure required to use project fuel or retrofitting existing installations.

11. The facility may involve grid connected elemental processes; however, this methodology does not cover emission reductions on account of shift from use of a grid electricity or electricity exported to a grid.[6]

12. This category is applicable to project activities where it is possible to directly measure and record the energy use/output (e.g. heat, steam and electricity) and consumption (e.g. fossil fuel) within the project boundary. In case of project activities that meet the criteria under paragraph 27 below, this methodology is applicable only where it is possible to directly measure and record at least the energy consumption in the element process (e.g. fossil fuel input).

13. Heat, steam or electricity produced under the project activity shall be for on-site captive use and/or export to other facilities included in the project boundary. In case of electricity

[5] Refer to the "General guidelines for SSC CDM methodologies" available at <http://cdm.unfccc.int/Reference/Guidclarif/index.html#meth>.

[6] Grid here refers to national/regional grid.

generation plants, the generated electricity may also be supplied to users via mini/isolated grid(s) system[7] exclusively supplied by fossil fuel units.

14. In case energy produced by the project activity is delivered to another facility, or facilities, within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into specifying that only the facility generating the energy can claim emission reductions from the energy displacement.

15. Regulations do not constrain the facility from using the energy sources cited in paragraph 2 before or after the fuel switch. Regulations do not require the use of low carbon energy source (e.g. natural gas or any other fuel) in the element processes.

16. The project activity does not result in integrated process change. The purpose is to exclude measures that affect other characteristics of the process besides switch of energy sources e.g. operational conditions, type of raw material processed, use of non-energy additives, change in type or quality of products manufactured etc.

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

2.3. Entry into force

18. The date of entry into force is the date of the publication of the EB 77 meeting report on 21 February 2014.

3. Normative references

19. Project participants shall apply the latest approved version of the "General guidelines for SSC CDM methodologies", information on additionality (attachment A to appendix B) and abbreviations provided at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>.

20. This methodology refers to the latest version of the following methodological tools and guidelines[8]:

    (a) "AMS-III.Q: Waste energy recovery (gas/heat/pressure) projects";

    (b) "General guidelines for SSC CDM methodologies";

    (c) "ACM0009: Consolidated baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas".

4. Definitions

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

22. For the purpose of this methodology, the following definitions also apply:

[7] Stand alone or interconnected grid system that is not connected to a national/regional grid.

[8] Please refer to: <https://cdm.unfccc.int/Reference/index.html>.

(a) **Existing facilities** - existing facilities are those that have been in operation for at least three years immediately prior to the start date of the project activity.

5. Baseline methodology

5.1. Project boundary

23. The project boundary comprises the physical, geographical site where the switching of energy source takes place. It includes all installations, processes or equipment affected by the switching. In case energy produced by the project activity is delivered to another facility, the boundary also extends to the industrial, commercial facilities consuming energy generated by the system.[9]

24. In case energy produced by the project activity is delivered to another facility, the boundary also extends to the industrial, commercial facilities consuming energy generated by the system.[10]

5.2. Baseline emissions

25. In case of existing facilities, historical information (detailed records) on the use of fossil fuels and the energy output (e.g. heat, steam or electricity) in the element process from at least three years prior to project implementation shall be used in the baseline calculations, e.g. information on coal use and heat output by a district heating plant, diesel use and steam generated by an industrial plant, liquid fuel oil use and electricity generated by a generating unit (records of fuel used and output can be used in lieu of actual collecting baseline validation data).[11] For existing facilities, which have three years of operation history but do not have sufficient operational data, all historic information shall be available for the purpose of determining baseline (a minimum of one year operational data is required).

26. For existing facilities having no historical data/information on baseline parameters such as efficiency, energy consumption and output (e.g. the available data is not reliable due to various factors such as the use of imprecise or non-calibrated measuring equipment), the baseline parameters can be determined using a performance test/measurement campaign to be carried out prior to the implementation of the project activity. The project proponent may follow the relevant provisions from the latest version “Tool to determine baseline efficiency of thermal and electricity systems”. In the case of project activities that export energy to other facilities within the project boundary, historical data from the recipient plants is also required.

[9] 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 generating units where it can be demonstrated that the users were or would have been supplied with electricity solely from higher carbon intensive source in the baseline via mini/isolated grid(s).

[10] 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 generating units where it can be demonstrated that the users were or would have been supplied with electricity solely from higher carbon intensive source in the baseline via mini/isolated grid(s).

[11] In the case of coal, the emission coefficient shall be based on test results for periodic samples of the coal purchased if such tests are part of the normal practice for coal purchases.

27. In case of project activities where the estimated annual emission reductions of each of the element processes are equal to or less than 600 t CO_2e per year per element process an alternative approach may be used to calculate baseline emissions as per paragraph 31 using equation (3) instead of applying equation (1).

28. Baseline emissions shall be determined as follows:

$$BE_y = EF_{BSL} \times Q_{PJ,y} \quad \text{Equation (1)}$$

Where:

BE_y	=	Baseline emissions in the project activity in year *y* (t CO_2e)
EF_{BSL}	=	Emission factor for the baseline scenario (t CO_2/MWh)
$Q_{PJ,y}$	=	Net energy output in the project activity in year *y* (MWh)

29. The net energy output in the project activity ($Q_{PJ,y}$) is limited to the installed capacity in the baseline scenario, unless it has been demonstrated in accordance with paragraph 6 that the new installation (Greenfield project) or the added capacity has the same baseline scenario.

30. The emission factor in the baseline scenario (EF_{BSL}) is the coefficient for the fossil fuel used in the baseline expressed as emissions per unit of energy output.

$$EF_{BSL} = \sum_i \sum_i (FC_{BL,i,j,y} \times NCV_j \times EF_{CO_2,j}) \div Q_{BSL,i,j} \quad \text{Equation (2)}$$

Where:

EF_{BSL}	=	Emission factor for the baseline scenario (t CO_2/MWh)
$FC_{i,j,BL,y}$	=	Amount of fuel *j* consumed by the element process *i* during the year *y* operating at the baseline scenario (mass or volume unit)
NCV_j	=	Net calorific value of the fuel type *j* (kJ/ mass or volume unit)
$EF_{CO_2,j}$	=	CO_2 emission factor of the fuel type *j* (t CO_2/kJ)
$Q_{BSL,j}$	=	Net energy generated in the element process *j* in the baseline scenario during the corresponding period of time for which the total fuel consumption was taken (MWh)

31. In case of project activities where the estimated annual emission reductions of each of the element processes are equal to or less than 600 t CO_2e per year per project element process, the amount of fossil fuel consumed in the project activity in year *y* (FC_y) can be used as a proxy for determining baseline emissions using the following equation:

$$BE_y = FC_{PJ,y} \times NCV_{FF,PJ,y} \times EF_{FF,CO_2,BL} \quad \text{Equation (3)}$$

Where:

$FC_{PJ,y}$ = Amount of fuel consumed in the project activity during year *y* (mass or volume unit)

$NCV_{FF,PJ,y}$ = Net calorific value of the fossil fuel used in the project activity (kJ/mass or volume unit)

$EF_{FF,CO_{2,BL}}$ = CO_2 emission factor of the fossil fuel used in the baseline activity (t CO_2/TJ)

32. For the emission factor ($EF_{CO_{2,j}}$) and the net calorific value (NCV_j) of the fuels used, guidance by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories shall be followed where appropriate. Project participants may either conduct measurements or they may use accurate and reliable local or national data where available. In the case of coal, the data shall be based on test results for periodic samples of the coal purchased if such tests are part of the normal practice for coal purchases. Where such data is not available, IPCC default emission factors (country-specific, if available) may be used if they are deemed to reasonably represent local circumstances. All values shall be chosen in a conservative manner (i.e. lower values for the baseline and higher values for the project should be chosen within a plausible range) and the choice shall be justified and documented in the SSC-CDM-PDD. Where measurements are undertaken, project participants shall document the measurement results and the calculated average values of the emission factor or net calorific value, either for the ex ante investment analysis and efficiency determination, or for the ex post determination of the baseline and project emissions.

5.3. Project emissions

33. Project emissions from on-site consumption of fossil fuel should be calculated as follows:

$$PE_y = FC_{PJ,y} \times NCV_{FF,PJ,y} \times EF_{FF,CO_2,PJ} \quad \text{Equation (4)}$$

Where:

PE_y = Project emissions in year *y* (t CO_2e)

$NCV_{FF,PJ,y}$ = Net calorific value of the fossil fuel used in the project activity (TJ/mass or volume unit)

$EF_{FF,CO_2,PJ}$ = CO_2 emission factor of project fuel combusted in the project activity (t CO_2/TJ)

5.4. Leakage

34. No leakage calculation is required.

5.5. Emission reductions

35. The emission reduction achieved by the project activity will be calculated as the difference between the baseline emissions and the project emissions.

$$ER_y = BE_y - PE_y \quad \text{Equation (5)}$$

Where:

ER_y = Emission reductions in the year *y* (t CO_2e)

6. Monitoring methodology

36. Monitoring shall include:

(a) Monitoring of the fossil fuel consumption (FC_y) and energy output of element process *i* after the project activity has been implemented ($Q_{PJ,y}$) (e.g. gas use and heat output by a district heating plant, diesel use and steam generated by an industrial plant, gas use and electricity generated by a generating unit) for project activities. Monitoring of energy output is not required in the case of project activities described under paragraph 27;

(b) For electricity/thermal energy exported to other facilities, monitoring of the use of electricity and thermal energy shall be undertaken in the recipient end.[12]

6.1. Project activity under a programme of activities

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

(a) Leakage emissions 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 leakage section of "ACM0009: Consolidated baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas". In case leakage emissions in the baseline situation are higher than leakage emissions in the project situation, leakage emissions will be set to zero.

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Document information*

Version	*Date*	*Description*
17.0	21 February 2014	EB 77, Annex 10 Revision to clarify leakage issues associated with switching of fossil fuels.
16.0	2 March 2012	EB 66, Annex 56 Revision to include a simplified approach for estimating emission reductions for small energy generation appliances with annual

[12] In the case of electricity generated and supplied to distributed users via mini/isolated grid(s) the 'recipient end' is defined as the mini/isolated grid.

* This document, together with the 'General Guidance' and all other approved SSC methodologies, was part of a single document entitled: Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities until version 07.

Version	*Date*	*Description*
		emission reduction less than 0.6 ktCO2e/year.
15	18 February 2011	EB 59, Annex 8 To clarify issues related to the installation of new energy generating facility (low carbon intensive) to replace an existing energy generating facility (carbon intensive) connected to an isolated grid(s) system.
14	28 May 2009	EB 47, Annex 23 Broaden the applicability, for example, to cases involving multiple elemental processes using different fuels in the baseline shifting to single fuel use in the project; reference to combined tool for the selection of baseline scenario.
13	02 August 2008	EB 41, Annex 18 The applicability condition is expanded to new facilities and guidance on treatment of capacity expansions is included.
12	19 October 2007	EB 35, Annex 33 A paragraph is added under technology/measures to provide clarity that the methodology is not applicable to project activities that generate renewable energy displacing fossil fuel use.
11	27 July 2007	EB 33, Annex 30 Revision of the approved small-scale methodology AMS-III.B to allow for its application under a programme of activities (PoA).
10	15 December 2006	EB 28, Meeting Report, Para. 54 Removed the interim applicability condition i.e. 25 $ktCO_2e$/yr limit from all Type III categories.
09	21 July 2006	EB 25, Annex 31 Introduce the limit of 15 kilo tonnes of CO2 equivalent as annual project activity direct emissions.
08	12 May 2006	EB 24, Meeting Report, Para, 64 Introduced the interim applicability condition i.e. 25$ktCO_2e$/yr limit for all Type III categories

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

History of the document: Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities

Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities contained both the General Guidance and Approved Methodologies until version 07. After version 07 the document was divided into separate documents: 'General Guidance' and separate approved small-scale methodologies (AMS).

Version	*Date*	*Description*
07	25 November 2005	EB 22, Para. 59 References to "non-renewable biomass" in Appendix B deleted.
06	20 September 2005	EB 21, Annex 22 Guidance on consideration of non-renewable biomass in Type *i* methodologies, thermal equivalence of Type II GWhe limits included.
05	25 February 2005	EB 18, Annex 6 Guidance on 'capacity addition' and 'cofiring' in Type *i* methodologies and monitoring of methane in AMS-III.D included.
04	22 October 2004	EB 16, Annex 2 AMS-II.F was adopted, leakage due to equipment transfer was included in all Type *i* and Type II methodologies.
03	30 June 2004	EB 14, Annex 2 New methodology AMS-III.E was adopted.
02	28 November 2003	EB 12, Annex 2 Definition of build margin included in AMS-I.D, minor revisions to AMS-I.A, AMS-III.D, AMS-II.E.
01	21 January 2003	EB 7, Annex 6 Initial adoption. The Board at its seventh meeting noted the adoption by the Conference of the Parties (COP), by its decision 21/CP.8, of simplified modalities and procedures for small-scale CDM project activities (SSC M&P).

Decision Class: Regulatory
Document Type: Standard
Business Function: Methodology