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TYPE II - ENERGY EFFICIENCY IMPROVEMENT PROJECTS

Project participants shall take into account the general guidance to the methodologies, information on additionality, abbreviations and general guidance on leakage provided at http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

II.F. *Energy efficiency and fuel switching measures for agricultural facilities and activities*

Technology/Measure

1.   This category comprises any energy efficiency and/or fuel switching measure implemented in agricultural activities ~~of~~ or facilities or processes. This category covers project activities that encourage energy efficiency or involves fuel switching. Examples of energy-efficient practices include efficiency measures for specific agricultural processes (e.g. efficient irrigation such as drip irrigation ~~less irrigation, etc.~~), and measures leading to a reduced requirement of farm power per unit area of land, reflected in less and smaller tractors, longer lifetime of tractors and less farm equipment. Further energy efficient measures would be reducing fuel use in agriculture, such as reduced machinery use through, e.g. the elimination of tillage operations, reduction of irrigation, use of lighter machinery, etc.

2.   The measures may be a replacement on existing equipment or equipment being installed in a new facility. The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh per year.

Boundary

3.   The physical, geographical location of the farming operations or measure (each agricultural practice) being implemented. Project activities might apply to single facilities (farms), or activities using similar processes on different farms may be bundled together, as long as the combined total energy savings do not exceed the equivalent of 60 GWh per year.

~~Baseline~~ Emission reductions

4.   The energy baseline consists of the energy use of:

   (a)   The existing activity that is reduced in the case of retrofit measures; or

   (b)   The facility that would otherwise be installed in the case of a new facility.

5.   If the energy displaced is a fossil fuel, the energy baseline is the existing fuel consumption or the amount of fuel that would be used by the practice that would have been implemented otherwise, i.e. total fuel consumption in the project area per year for field operations and average fuel consumption per unit area (ha), crop yield and year.

6.   Project participants are to demonstrate the baseline and project scenarios of fuel consumption against reference agricultural activities, including cultivated acreage and crop yield from the project land.

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7.   The demonstration of additionality is necessary especially with respect to some financial indicators. Project participants shall demonstrate that reduced energy consumption is not prompted by financial constraints leading to downscaled operations, but rather CDM-driven.

8.   Each energy form in the emission baseline/project is multiplied by an emission coefficient (in kg CO_2e/kWh) in order to derive the baseline and project emissions. For the electricity displaced, the emission coefficient is calculated in accordance with provisions under category I.D. For fossil fuels, the IPCC default values for emission coefficients may be used.

Leakage

9.   If the equipment currently being utilised is transferred from outside the boundary to the project activity, leakage is to be considered. If the energy-efficiency technology is equipment transferred to another activity or if the existing equipment is transferred to another activity, leakage calculation is required.

Monitoring

10.   In the case of retrofit measures (includes fuel switch measures), monitoring shall consist of:

(a)   Documenting the specifications of the equipment replaced;

(b)   Metering the energy use of the agricultural facility, processes or the equipment affected by the project activity (individually or on sample basis with a confidence/precision level of 90/10, applying the "Standard for sampling and surveys for CDM project activities and programme of activities"[1]);

(c)   Calculating the energy savings using the metered energy obtained from subparagraph (b).

11.   In the case of a new facility, monitoring shall consist of:

(a)   Metering the energy use of the equipment installed (individually or on sample basis with a confidence/precision level of 90/10, applying the "Standard for sampling and surveys for CDM project activities and programme of activities");

(b)   Calculating the energy savings due to the equipment installed.

12.   Monitoring will also involve the scale (e.g. number of ha cultivated, crop yield) of agricultural activities, in order to ensure that reduced energy consumption is not due to downscaling of activities. Energy use must be for equivalent services.

Project activity under a programme of activities

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

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[1] http://cdm.unfccc.int/Reference/Standards/index_poa.html.

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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.

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

14. In case the project activity involves fossil fuel switching measures, leakage resulting from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary shall be considered. The guidance provided in the leakage section of ACM0009 as in annex 1 of this document shall be followed for this purpose. .

15. In case the project activity involves the replacement of equipment, and the leakage effect of 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.

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II.F. Energy efficiency and fuel switching measures for agricultural facilities and activities (cont)

Annex 1 (guidance on leakage below concerns project activity under a programme of activities)

Leakage

1.   Leakage may result from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary. This includes mainly fugitive CH_4 emissions and CO_2 emissions from associated fuel combustion and flaring. In this methodology, the following leakage emission sources shall be considered:[2]

- Fugitive CH_4 emissions associated with fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of natural gas used in the project plant and fossil fuels used in the grid in the absence of the project activity.
- In the case LNG is used in the project plant: CO_2 emissions from fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression into a natural gas transmission or distribution system.

Thus, leakage emissions are calculated as follows:

$$LE_y = LE_{CH4,y} + LE_{LNG,CO2,y}$$

Where:
LE_y Leakage emissions during the year y in t CO_2e
$LE_{CH4,y}$ Leakage emissions due to fugitive upstream CH_4 emissions in the year y in t CO_2e
$LE_{LNG,CO2,y}$ Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO_2e

Note that to the extent that upstream emissions occur in Annex I countries that have ratified the Kyoto Protocol, from 1 January 2008 onwards, these emissions should be excluded, if technically possible, in the leakage calculations.

Fugitive methane emissions

For the purpose of determining fugitive methane emissions associated with the production – and in case of natural gas, the transportation and distribution of the fuels – project participants should multiply the quantity of natural gas consumed in all element processes *i* with a methane emission factor for these upstream emissions ($EF_{NG,upstream,CH4}$), and subtract for all fuel types *k* which would be used in the absence of the project activity the fuel quantities multiplied with respective methane emission factors ($EF_{k,upstream,CH4}$), as follows:

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[2] The Meth Panel is undertaking further work on the estimation of leakage emission sources in case of fuel switch project activities. This approach may be revised based on outcome of this work.

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*II.F. Energy efficiency and fuel switching measures for agricultural facilities and activities
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$$LE_{CH4,y} = \left[FF_{project,y} \cdot NCV_{NG,y} \cdot EF_{NG,upstream,CH4} - \sum_k FF_{baseline,k,y} \cdot NCV_k \cdot EF_{k,upstream,CH4} \right] GWP_{CH4}$$

with

$$FF_{project,y} = \sum_i FF_{project,i,y} \quad \text{and}$$

$$FF_{baseline,k,y} = \sum_i FF_{baseline,i,k,y}$$

Where:

$L_{CH4,y}$	Leakage emissions due to upstream fugitive CH_4 emissions in the year y in t CO_2e
$FF_{project,y}$	Quantity of natural gas combusted in all element processes during the year y in m^3
$FF_{project,i,y}$	Quantity of natural gas combusted in the element process i during the year y in m^3
$NCV_{NG,y}$	Average net calorific value of the natural gas combusted during the year y in MWh/m^3
$EF_{NG,upstream,CH4}$	Emission factor for upstream fugitive methane emissions from production, transportation and distribution of natural gas in t CH_4 per MWh fuel supplied to final consumers
$FF_{baseline,k,y}$	Quantity of fuel type k (a coal or petroleum fuel type) that would be combusted in the absence of the project activity in all element processes during the year y in a volume or mass unit
$FF_{baseline,i,k,y}$	Quantity of fuel type k (a coal or petroleum fuel type) that would be combusted in the absence of the project activity in the element process i during the year y in a volume or mass unit
NCV_k	Average net calorific value of the fuel type k (a coal or petroleum fuel type) that would be combusted in the absence of the project activity during the year y in MWh per volume or mass unit
$EF_{k,upstream,CH4}$	Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal or petroleum fuel type) in t CH_4 per MWh fuel produced
GWP_{CH4}	Global warming potential of methane valid for the relevant commitment period

Where reliable and accurate national data on fugitive CH_4 emissions associated with the production, and in case of natural gas, the transportation and distribution of the fuels is available, project participants should use this data to determine average emission factors by dividing the total quantity of CH_4 emissions by the quantity of fuel produced or supplied respectively.[3] Where such data is not available, project participants may use the default values provided in Table 2 below. In this case, the natural gas emission factor for the location of the project should be used, except in cases where it can be shown that the relevant system element (gas production and/or

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[3] GHG inventory data reported to the UNFCCC as part of national communications can be used where country-specific approaches (and not IPCC Tier 1 default values) have been used to estimate emissions.

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*II.F. Energy efficiency and fuel switching measures for agricultural facilities and activities
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processing/transmission/distribution) is predominantly of recent vintage and built and operated to international standards, in which case the US/Canada values may be used.

Note that the emission factor for fugitive upstream emissions for natural gas ($EF_{NG,upstream,CH4}$) should include fugitive emissions from production, processing, transport and distribution of natural gas, as indicated in the Table 2 below. Note further that in case of coal the emission factor is provided based on a mass unit and needs to be converted in an energy unit, taking into account the net calorific value of the coal.

Table 2: Default emission factors for fugitive CH$_4$ upstream emissions

Activit	Unit	Default emission factor	Reference for the underlying emission factor range in Volume 3 of the *1996 Revised IPCC Guidelines*
Coal			
Underground mining	t CH4 / kt coal	13.4	Equations 1 and 4, p. 1.105 and 1.110
Surface mining	t CH4 / kt coal	0.8	Equations 2 and 4, p.1.108 and 1.110
Oi			
Production	t CH4 / PJ	2.5	Tables 1-60 to 1-64, p. 1.129 - 1.131
Transport, refining and storage	t CH4 / PJ	1.6	Tables 1-60 to 1-64, p. 1.129 - 1.131
Total	t CH4 / PJ	4.1	
Natural gas			
USA and Canada			
Production	t CH4 / PJ	72	Table 1-60, p. 1.129
Processing, transport and distribution	t CH4 / PJ	88	Table 1-60, p. 1.129
Total	t CH4 / PJ	160	
Eastern Europe and former USSR			
Production	t CH4 / PJ	393	Table 1-61, p. 1.129
Processing, transport and distribution	t CH4 / PJ	528	Table 1-61, p. 1.129
Total	t CH4 / PJ	921	
Western Europe			
Production	t CH4 / PJ	21	Table 1-62, p. 1.130
Processing, transport and distribution	t CH4 / PJ	85	Table 1-62, p. 1.130
Total	t CH4 / PJ	105	
Other oil exporting countries / Rest of world			
Production	t CH4 / PJ	68	Table 1-63 and 1-64, p. 1.130 and 1.131
Processing, transport and distribution	t CH4 / PJ	228	Table 1-63 and 1-64, p. 1.130 and 1.131
Total	t CH4 / PJ	296	

Note: The emission factors in this table have been derived from IPCC default Tier 1 emission factors provided in Volume 3 of the 1996 Revised Guidelines, by calculating the average of the provided default emission factor range.

CO$_2$ emissions from LNG

Where applicable, CO$_2$ emissions from fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a

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II.F. Energy efficiency and fuel switching measures for agricultural facilities and activities (cont)

natural gas transmission or distribution system ($LE_{LNG,CO2,y}$) should be estimated by multiplying the quantity of natural gas combusted in the project with an appropriate emission factor, as follows:

$$LE_{LNG,CO2,y} = FF_{project,y} \cdot EF_{CO2,upstream,LNG} \tag{#}$$

Where:

$LE_{LNG,CO2,y}$ Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO_2e

$FF_{project,y}$ Quantity of natural gas combusted in all element processes during the year y in m^3

$EF_{CO2,upstream,LNG}$ Emission factor for upstream CO_2 emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system

Where reliable and accurate data on upstream CO_2 emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system is available, project participants should use this data to determine an average emission factor. Where such data is not available, project participants may assume a default value of 6 t CO_2/TJ as a rough approximation.[4]

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[4] This value has been derived on data published for North American LNG systems. "Barclay, M. and N. Denton, 2005. Selecting offshore LNG process. http://www.fwc.com/publications/tech_papers/files/LNJ091105p34-36.pdf (10th April 2006)".

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History of the document*

Version	Date	Nature of revision
10	EB 66, Annex # 02 March 2012	To remove the relevant requirement associated with the financial indicator from the methodology, allowing measurement using sampling approach and removing the scrapping requirement in PoA section of the methodology.
09	EB 33, Annex 27 27 July 2007	Revision of the approved small-scale methodology AMS-II.C to allow for its application under a programme of activities (PoA).
08	EB 28, Annex 25 23 December 2006	To broaden its applicability to include retrofit project activities, and to exclude technical line losses from the calculation of the emission factor.
Decision Class: Regulatory **Document Type**: Standard **Business Function**: Methodology		

* 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.

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**	**Nature of revision**
07	EB 22, Para. 59 25 November 2005	References to "non-renewable biomass" in Appendix B deleted.
06	EB 21, Annex 22 20 September 2005	Guidance on consideration of non-renewable biomass in Type I methodologies, thermal equivalence of Type II GWhe limits included.
05	EB 18, Annex 6 25 February 2005	Guidance on 'capacity addition' and 'cofiring' in Type I methodologies and monitoring of methane in AMS-III.D included.
04	EB 16, Annex 2 22 October 2004	AMS-II.F was adopted; leakage due to equipment transfer was included in all Type I and Type II methodologies.
03	EB 14, Annex 2 30 June 2004	New methodology AMS-III.E was adopted.
02	EB 12, Annex 2 28 November 2003	Definition of build margin included in AMS-I.D, minor revisions to AMS-I.A, AMS-III.D, AMS-II.E.
01	EB 7, Annex 6 21 January 2003	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		