CLEAN DEVELOPMENT MECHANISM

PROPOSED NEW METHODOLOGY: MONITORING (CDM-NMM)
Version 01 - in effect as of: 1 July 2004

CONTENTS

SECTION A. Identification of methodology

A.1. Title of the proposed methodology:

Monitoring methodology for project activities involving energy efficiency, self-generation, cogeneration, and/or fuel switching measures at an industrial facility

A.2. List of category(ies) of project activity to which the methodology may apply:

The UNFCCC CDM web site appears not to provide a list of categories of project activities, from which one might choose that applicable for this proposed new methodology.

If one were to use the "Sectoral Scope" classification as applied to Designated Operational Entities, possible categories might be: (3) Energy demand or, due to the project activity is developed at an industrial facility, (4) Manufacturing industry or (5) Chemical industry.

A more specific category of project activity might be "industrial energy efficiency, self-generation, cogeneration, and fuel switching."

A.3. Conditions under which the methodology is applicable to CDM project activities:

This methodology would apply to the case where the project activity involves any one or any combination of the following activities at the industrial site:

- Changes in the energy efficiency of any equipment (fuel and electricity savings)
- Installation of electricity self-generation equipment or changes in electricity self-generation equipment
- Installation of electricity cogeneration equipment or changes in electricity cogeneration equipment
- Fuel switching for equipment

These activities can generate improvements in the production process —giving rise to a better energy efficiency leading to fuel and electricity savings—, fuel usage, and management of electricity demand. The improvements can be achieved, for example, through equipment replacement or adaptations, development and incorporation of more advanced technologies, partial redesign of some processes, better use of process heat (which can be used for additional energy generation), etc.

A.4. What are the potential strengths and weaknesses of this proposed new methodology?

The potential strengths of the proposed new methodology include the following:

- It is applicable to a number of types of project activities

- It is straightforward to apply
- It is adequate both for simple processes as well as for complex processes involving variables that are difficult to predict

Variables resulting from the proposed methodology are simple to be monitored. Thus, no weaknesses are identified in this methodology.

SECTION B. Proposed new monitoring methodology

B.1. Brief description of the new methodology:

The methodology is based on monitoring fuel used to produce heat to meet demand at an industrial facility. Fuels may also be used to generate electricity to meet all or a part of the industrial demand. Electricity may also be sold from the industrial facility through a power grid to which the industry is connected.

Project emissions

According to the baseline methodology motivating this monitoring methodology, project emissions are directly related to fuel consumption at the industrial facility, so that only project fuel consumption needs to be monitored in order to determine them.

Baseline emissions related to fuel consumption

In order to estimate the *ex-post* baseline emissions from fuel combustion, the proposed methodology provides the following two options:

Option 1

Baseline emissions from fuel combustion would be determined in a dynamic manner from project monitoring data. The constraint is that heat output in the project and baseline scenarios must be the same. In order to determine baseline emissions from fuel combustion it is therefore needed to estimate heat output in the project scenario and then to estimate baseline fuel consumption. In each case, fuel consumption and heat output are related by equipment efficiency, which needs to be monitored. This procedure is similar to than the earlier methodology AM0008 “Industrial fuel switching from coal and petroleum fuels to natural gas without extension of capacity and lifetime of the facility.” Essential aspects of the earlier approved methodology are included in the proposed new methodology, which is expected to be more generally applicable.

Option 2

Baseline emissions from fuel combustion would be determined in a *quasi*-dynamic manner from project monitoring data and relations between fuel consumption in the baseline and adequate process variables that act as control variables. These relations will be established *ex-ante* and considered unalterable during the crediting period. In order to determine baseline emissions from fuel combustion it is therefore needed to measure the control variables identified, during project implementation, and then to estimate baseline fuel consumption.

Baseline emissions related to electricity and steam purchase/sale

Changes in electricity purchase or sale from the connected power grid and/or a private plant as a result of the project activity would cause changes in emissions outside the industrial facility. A determination of these emissions requires collecting emission factors of the connected grid and/or the private plant.

If the project activity involves purchase/sell of electricity from/to the grid, this new methodology incorporates the approved consolidated monitoring methodology ACM0002: "Consolidated monitoring methodology for zero emissions grid-connected electricity generation from renewable sources."

In the same way, changes in steam purchase or sale would cause changes in emissions outside the industrial facility, and a determination of these emissions requires collecting emission factors of the steam provider plant.

The *ex-post*, baseline emissions related to *net* energy sold can be determined from project monitoring data, and the *ex-post* baseline emissions related to *net* energy purchases can be determined in a *quasi*-dynamic manner from project monitoring data and relations between steam and electricity purchases/sales in the baseline and adequate process variables that act as control variables. These relations will be established *ex-ante* and considered unalterable during the crediting period. In order to determine baseline emissions related to *net* energy purchases it is therefore needed to measure the control variables identified, during project implementation, and then estimate baseline *net* energy purchases.

Leakage

Leakage emissions are small and would be estimated without additional monitoring.

B.2. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario:

B.2.1. Data to be collected or used in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table B.7)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	*Quantity of fuel i consumed at the industrial facility* Q_{Fi}	*Industrial facility*	*m^3/year or tonne/year*	*m*	*monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*It corresponds to each fuel i used at the industrial facility in the project scenario. Before calculation of project emissions, it shall be converted to energy units by multiplying by the correspondent Lower Heating Value.*
2	*Project emissions E*	*Industrial facility*	*tCO_2e/year*	*c*	*monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*It will be calculated using data 1, as explained in Section B.2.2.*

B.2.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

The project activity may involve replacing some or all fossil fuels currently being used by other lower carbon fuels for providing heat and electricity at the industrial facility. The project activity may also include fuel and electricity saving, increased electricity generation at the facility, and sales of energy. Either of these components would reduce GHG emissions compared to the baseline.

The project emissions E (tCO_2e/year) are given by:

$$E = \Sigma_i FC_i \times [CEF_i + MEF_i \times GWP(CH_4) + NEF_i \times GWP(N_2O)]$$

where:

FC_i	Consumption of fuel *i* used in the project scenario, measured in energy units (MMBtu)
EF_i	Carbon dioxide emission factor per unit energy of combusted fuel *i* ($kgCO_2e$/MMBtu)
MEF_i	Methane emission factor per unit energy of combusted fuel *i* ($kgCH_4$/MMBtu)
$GWP(CH_4)$	Global warming potential of CH_4 set as 21 tCO_2e/tCH_4 for the 1st commitment period
NEF_i	Nitrous oxide emission factor per unit energy of combusted fuel *i* (kgN_2O/MMBtu)
$GWP(N_2O)$	Global warming potential of N_2O set as 310 tCO_2e/tN_2O for the 1st commitment period

Project emissions correspond to the emissions from fuels burnt at the industrial facility. These fuels may produce both heat and electricity. If any electricity and/or steam were exported from the facility, this would offset emissions from energy generation outside the industrial facility. Such emissions are thus counted in baseline emissions, as well as emissions associated with net energy purchases in the baseline scenario.

Following project implementation, fuel consumption at the industrial facility shall be monitored, and the measured values will be used for the *ex-post* calculation of project emissions.

B.2.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of greenhouse gases (GHG) within the project boundary and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to table B.7)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
3	*Efficiency of the equipment* $\eta_{n,i}$	*Industrial facility*	*%*	*m*	*annually*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*It corresponds to each equipment and fuel combination involved in the project scenario. It will be used to calculate baseline emissions related to fuel consumption if Option 1 is selected.*
4	*Value of the control variables*	*Industrial facility*		*m*	*monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*It corresponds to each control variable identified. It will be used to calculate baseline emissions related to energy purchase/sale, and related to fuel consumption if Option 2 is selected.*
5	*Quantity of fuels consumed at industrial facility in the baseline* BFC_i	*Industrial facility*	*MMBtu/year or GJ/year*	*c*	*monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*If Option 1 is selected, it will be calculated using data 1 and 3, as explained in Section B.2.4. If Option 2 is selected, it will be calculated using data 4, as explained in Section B.2.4.*
6	*Net baseline electricity purchase NBEP*	*Industrial facility*	*MWh*	*c*	*monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*It will be calculated using data 4 as explained in Section B.2.4.*
7	*Net project electricity sale NPES*	*Industrial facility*	*MWh*	*m*	*monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	

8	*Emission Factor from Electricity Generation EFel*	*Power grid and/or private plant*	*tCO_2/MWh*	*c*	*annually*	*100%*	*Paper (field record) Electronic (spreadsheet)*	
9	*Net baseline steam purchase NBSP*	*Industrial facility*	*GJ/year*	*c*	*monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*It will be calculated using data 4 as explained in Section B.2.4.*
10	*Net project steam sale NPSS*	*Industrial facility*	*GJ/year*	*m*	*monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	
11	*Emission factor from steam generation EFst*	*Steam supplier*	*tCO_2e/GJ steam*	*c*	*annually*	*100%*	*Paper (field record) Electronic (spreadsheet)*	
12	*Baseline emissions BE*	*Industrial facility*	*tCO_2e/year*	*c*	*monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*It will be calculated using data 5 to 11 as explained in Section B.2.4.*

B.2.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

Baseline emissions *BE* (tCO_2e/year) are given by:

$$BE = \Sigma_j BFC_j \times [CEF_j + MEF_j \times GWP(CH_4) + NEF_j \times GWP(N_2O)] +$$
$$+ \Sigma_j (NBEP_j + NPES_j) \times EFel_j + \Sigma_j (NBSP_j + NPSS_j) \times EFst_j$$

where:

BFC_j	Consumption of fuel *j* used in the baseline scenario, measured in energy units (*e.g.* GJ)
CEF_j	Carbon dioxide emission factor per unit energy of fuel *j* (*e.g.* tCO_2/GJ)
MEF_j	Methane emission factor per unit energy of fuel *j* (*e.g.* tCH_4/GJ)
$GWP(CH_4)$	Global warming potential of CH_4 set as 21 tCO_2e/tCH_4 for the 1st commitment period
NEF_j	Nitrous oxide emission factor per unit of energy of fuel *j* (*e.g.* tN_2O/GJ)
$GWP(N_2O)$	Global warming potential of N_2O set as 310 tCO_2e/tN_2O for the 1st commitment period
$NBEP_j$	Net electricity purchased (electricity purchased less electricity sold) in the baseline. Include net electricity purchased from the grid and/or a private plant (*e.g.* MWh). Each seller/buyer of electricity is denoted by *j*.
$NPES_j$	Net electricity sold (electricity sold less electricity purchased) in the project scenario. Include net electricity sold to the grid (*e.g.* MWh). Each buyer/seller of electricity is denoted by *j*.
$EFel_j$	Baseline emission factor from electricity generation, including electricity generation by the grid and/or a private plant (*e.g.* tCO_2e/MWh). Each source of electricity is denoted by *j*.
$NBSP_j$	Net steam purchased (steam purchased less steam sold) in the baseline. Include net steam energy purchased (*e.g.* GJ/year). Each seller/buyer of steam is denoted by *j*.
$NPSS_j$	Net steam sold (steam sold less steam purchased) in the project scenario. Include net steam energy sold (*e.g.* GJ/year). Each buyer/seller of steam is denoted by *j*.
$EFst_j$	Baseline emission factor from steam generation (*e.g.* $kgCO_2e$/GJ steam). Each source of steam is denoted by *j*.

Baseline emissions include the emissions from fuels burnt at the industrial facility in the baseline scenario. Electricity purchased to meet a part or all of the demand at the facility would cause emissions elsewhere in the power grid and/or in the private plant. Such emissions are also included in baseline emissions. If, following project implementation, electricity were sold from the industrial facility through the power grid, the emissions would be offset elsewhere in the grid. In the absence of such electricity supply in the baseline scenario, there would be additional emissions in electricity generation, which are also included in baseline emissions. In the same way, steam purchased results in emissions outside the industrial facility. Such emissions are included in baseline emissions. If, following project

implementation, steam were sold from the industrial facility, the emissions would be offset in the plant where steam came from. Such emissions are also included in baseline emissions.

Note that we consider *net* energy (electricity and steam) purchased in the baseline scenario and *net* energy (electricity and steam) sold in the project scenario, as explained in the definitions of *NBEP* and *NPES*, and *NBSP* and *NPSS*. This equation allows for any of these quantities to be negative. To avoid confusion these emissions are included in the baseline emissions equation only. In the typical project, all terms are expected to be positive or zero.

***Ex-post* baseline emissions associated with fuel consumption**

In order to estimate baseline emissions from fuel combustion, the proposed methodology brings the following two options:

Option 1

In this case, the procedure is essentially identical to the baseline we proposed earlier for industrial fuel switching projects, and that has now been approved as AM0008.

This option can be used by projects that involve fuel switching, cogeneration, and/or self generation without changes in energy efficiency, and when the baseline scenario consists in continuing with the fuel or fuels currently being used at the facility and maintain all equipment currently in use.

The *ex-post* baseline emissions related to fuel consumption can be determined in a dynamical manner from project monitoring data in such a way that the heat output of the industrial facility is maintained constant. In other words, baseline emissions related to fuel consumption would correspond to the consumption of fuels used in the baseline scenario in order to provide the same amount of heat as is actually measured in the project scenario. The procedure for determining the dynamic baseline is given below.

The variables in the baseline emissions and the project emissions are linked with the constraint relation:

$$\Sigma_i \, BFC_{n,i} \times \eta_{n,i} = \Sigma_i \, FC_{n,i} \times \eta_{n,i}$$

for each element process (or equipment) n which uses the fuel i in either the baseline or the project scenario. Here $\eta_{n,i}$ is the efficiency of process (or equipment) n for use of fuel i , measured either in unit of output per unit of thermal energy (e.g., tonnes of steam output/Joule) or ratio of the output thermal energy to the input energy (i.e. percentage). To the extent possible, $\eta_{n,i}$ should be representative of actual operating conditions, such as typical load factor. In this sense a direct measurement of heat output vs. fuel input provides a more reliable indicator than an efficiency measurement based on flue gas analysis, which usually correspond to full-load conditions, and moreover does not take into account jacket losses from boilers and furnaces.

For equipment and fuel combinations that are used in the baseline but not in the project scenario, it will not be possible to monitor the efficiency of the equipment, as it would apply to the baseline scenario. In such cases, and in any other data limitations, conservative values should be assumed, i.e. assumptions that would tend to reduce baseline emissions and increase project emissions. Thus conservative assumptions for efficiency estimates imply high values for the baseline and low for the project scenarios.

The methodology proposed here is applicable to industrial facilities that may be producing electricity as well as thermal energy. The constraint relation expressed above matches heat output in the project scenario in order to determine the fuel consumption in the baseline scenario required to provide the same amount of heat output.

Our basic assumption of equalizing thermal energy rather than some combination of thermal and electrical energy, i.e. that the industrial production scales with heat demand, is clearly a simplification based on the consideration that the magnitude of the heat demand is likely to be much higher than the magnitude of the electricity generated in the facility. For specific projects, other scaling arrangements may be presented for determining the dynamic baseline. However, since industrial output is likely to scale equally with heat and electricity demand, so that this assumption is unlikely to introduce a significant error in estimating fuel consumption.

A more serious problem arises when there are multiple fuels and multiple processes or equipment involved in providing heat and electricity to the industrial facility. A single constraint equation such as given above cannot be used to determine *BFC* for each equipment and fuel, since many combinations of equipment and fuels could provide the same amount of heat output. Here, additional constraints need to be introduced and justified for specific projects. Such constraints could include:

- Equipment and processes that only operate on certain fuels
- Certain equipment are preferred over others because of fuel efficiency
- Certain fuels are preferred because of price, etc.

A good starting point for such determination is the actual equipment and fuel use patterns in recent years prior to project implementation. The dynamic baseline is intended to be a minor adjustment to this established pattern, and fuel consumption patterns in the dynamic scenario should not differ significantly from previous patterns.

If establishing a dynamic baseline proves to be very difficult, or the baseline determination difficult to justify, a constant baseline may be used instead, as a conservative alternative.

In any case, the constraint relation and other assumptions will help determine consumption of different fuels in the baseline (BFC_i).

Option 2

This option can be used by projects that involve any one or any combination of fuel switching, energy efficiency, self-generation and cogeneration activities, and when the baseline scenario can be any of the scenarios mentioned in the Baseline Methodology.

The *ex-post* baseline emissions related to fuel consumption can be determined in a *quasi*-dynamic manner from project monitoring data and relations between fuel consumption in the baseline and adequate process variables that act as control variables. These relations will be established *ex-ante* and considered unalterable during the crediting period. The procedure for determining the *quasi*-dynamic baseline is given below.

The first step for determining the *quasi*-dynamic baseline is the identification of process variables (*e.g.* total production of the plant, quantity of an specific raw material consumed at the plant, etc) that act as control variables for the project, and that will be monitored during project implementation.

The second step involves the establishment, for each process or equipment, or combinations of processes or equipment, of an adequate relation between fuel consumption in the baseline scenario and the control

variables identified. Preferably, these relations would be uniquely defined (bijective function), meaning that there is a one-to-one correspondence between fuel consumption and the control variable.

These relations are based on:

- Trends in consumption prior to project implementation, if the baseline scenario consists of continuing with the current fuel consumption patterns and maintaining all energy-intensive equipment currently in use;
- Estimations from studies and/or simulations, if any one or any combination of energy efficiency, self-generation, cogeneration and fuel switching measures, different from the project activity, would be executed in the absence of the project.

These relations will be established *ex-ante* and considered unalterable for the project life. As a consequence, any estimation of fuel consumption in the baseline scenario that is used to establish these relations needs an adequate justification able to be verified by a DOE.

During project implementation, the *ex-post* baseline fuel consumption will be determined through the relations established *ex-ante,* based on measurements of the control variables during project implementation. In other words, baseline fuel consumption is the quantity of fuel that would be consumed by each process or equipment, or combinations of processes or equipment in the baseline scenario, when the control variables have the values measured in the project scenario.

This procedure is illustrated below.

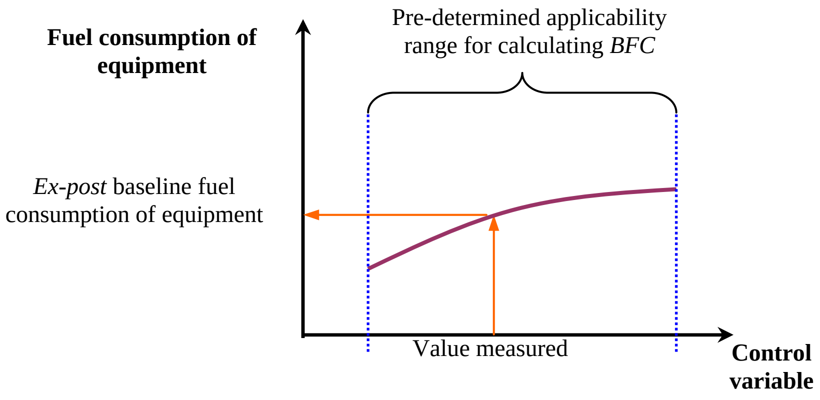

Fig. 1. Determination of fuel consumption in the baseline scenario

The procedure gives the possibility of grouping the equipment and the fuels as needed. Each relation may involve one piece of equipment o combinations of equipment, and one or more fuels.

This procedure is applicable to a number of types of project activities. The only restriction is that during project implementation the values of the control variables should not exceed the range previously determined (related to the current or foreseen maximum production capacity of the industrial facility).

***Ex-post* baseline emissions associated with purchase/sell of energy (electricity or steam)**

The emissions associated with energy generation outside the industrial facility depend on the sum of the *net energy purchased* in the baseline scenario and the *net energy sold* in the project scenario, and the emissions factor for energy generation.

Net energy purchases in the baseline scenario

The *ex-post* baseline emissions related to *net* energy purchases can be determined in a *quasi*-dynamic manner from project monitoring data and relations between steam and electricity purchases/sales in the baseline and adequate process variables that act as control variables. These relations will be established *ex-ante* and considered unalterable during the crediting period. The procedure is the same that is described in Option 2 above for estimation of *ex-post* baseline emissions related to fuel consumption.

Net energy sold in the project scenario

The *ex-post*, baseline emissions related to *net* energy sold can be determined from project monitoring data.

Emissions factor for energy generation outside the industrial facility

If the project activities involve purchase/sell of electricity from/to the grid, the Methodology Panel and CDM Executive Board have already proposed a consolidated methodology for determining the emission factor. We recommend to incorporate this approved consolidated baseline methodology, denominated ACM0002, as a component of the proposed new methodology. ACM0002 offers some alternative pathways for determining the emission factor, and each specific PDD should adopt an own specific procedure, according to its circumstances.

Note that ACM0002 is actually designated “Consolidated baseline methodology for grid-connected electricity generation from renewable sources.” When the project involves electricity generation from renewable sources, project emissions for electricity generation are negligible, and the baseline emissions are emissions avoided elsewhere in the power grid. The new methodology being proposed here is related to electricity generation at an industrial facility using fuels, which need not be renewable. However, the emissions from these fuels are being estimated and counted as part of project emissions due to fuel consumption at the facility, and thus, as far as the baseline is concerned, ACM0002 should be perfectly applicable. Indeed, another approved methodology, “Natural gas-based package cogeneration,” was accepted as AM0014 under the condition that the consolidated methodology for grid-connected electricity generation from renewable sources be used.

AM0014 offers an alternative procedure for estimating the emission factor, namely the “Simplified Methodology for Small-scale CDM Project Activities,” which would be applicable in case electricity displaced is less than 15 MW equivalent.

Thus, when the project activity involves purchase/sell of electricity from/to the grid, this proposed new methodology recommends the use of either ACM0002 or the simplified methodology for small-scale projects, as appropriate.

On the other hand, if the proposed project activity involves purchase/sell of steam and/or purchase of electricity from a private plant, emission factors of the plants providers of steam and/or electricity should be used.

B.3. Option 2: Direct monitoring of emission reductions from the project activity:

B.3.1. Data to be collected or used in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table B.7)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

N/A

B.3.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

N/A

B.4. Treatment of leakage in the monitoring plan:

B.4.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity:

ID number *(Please use numbers to ease cross-referencing to table B.7)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	*Quantity of fuel i consumed at the industrial facility* Q_{Fi}	*Industrial facility*	*m^3/year or tonne/year*	*m*	*Monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*It corresponds to fuels transported to the industrial facility in the project scenario, as well as fuels that have fugitive methane emissions associated. Before calculation of leakage, it shall be converted to energy units by multiplying by the correspondent Lower Heating Value.*
5	*Quantity of fuels consumed at industrial facility in the baseline* BFC_i	*Industrial facility*	*MMBtu/year or GJ/year*	*c*	*Monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	
13	*Leakage LE*	*Industrial facility*	*tCO_2e/year*	*c*	*Monthly*	*100%*	*Paper (field record) Electronic (spreadsheet)*	*It will be calculated using data 1 and 5 as explained in Section B.4.2.*

B.4.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

This section is similar to that in AM0008.

Emissions from fuel production, pipeline and distribution, and CO_2 emissions from fuel transportation are considered as leakage. Emissions from fuel production/transportation is counted only if the fuel is produced/transported in a non-Annex I country.

Typical fuels might be natural gas, diesel, heavy fuel oil, bunker fuel, coal, etc., the former more likely in the project scenario and that latter more likely in the baseline. Fugitive methane emissions are associated with natural gas production and pipeline leakage. Fugitive methane emissions are also associated with coal mining. In case that the effect of these methane emissions cannot be neglected, they should be included here.

The leakage LE is expressed as

$$LE = \Sigma_i (FC_i - BFC_i) \times FE_i (CH_4) \times GWP (CH_4) + \Sigma_j PTF_j \times EF_j - \Sigma_j BTF_j \times EF_j$$

where $FE_i (CH_4)$ is the IPCC default methane emission factor of fuel i associated with fugitive emissions.

The second and third terms in the above formula refer to emissions from fuel transportation in the project and baseline scenarios, respectively, shown as a product of the energy content of the fuels consumed in transporting fuels to the facility and the corresponding CO_2 emissions factor for the fuels consumed by the different transportation modes (such as marine, railroad or truck). In view of the relatively small magnitude of CO_2 emissions from fuel transportation to typical industrial facilities, IPCC emission factors can be used.

The quantity of fuels consumed in transporting fuels to the facility (PTE_j or BTE_j in energy units) can be obtained in a facility-specific way. It can be calculated as the product of the specific energy consumption of the transport mode (quantity of fuel consumed per unit of fuel transported in the round trip) and the quantity of fuel transported (fuel consumed at the industrial facility). The specific energy consumption of the transport mode is determined *ex-ante* from historical data or estimations, and it is considered fixed during the crediting period. This simplification is valid since the relatively small magnitude of CO_2 emissions from fuel transportation to typical industrial facilities.

Thus to estimate the leakage after project implementation it is necessary to calculate the *ex-post* consumption of fuel i used in the baseline and project scenario (BFC_i and PFC_i), which can be determined as explained in Section B.2.

B.5. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

The emission reductions ER (tCO_2e/year) by the project activity are given by:

$$ER = BE - E - LE$$

Total emission reductions should be determined following project implementation as explained in Sections B.2.2, B.2.4, and B.4.2 above.

B.6. Assumptions used in elaborating the new methodology:

The monitoring methodology and its application is compatible with the baseline methodology and the development of the baseline scenario for this type of projects.

The assumptions regarding heating values and emission factors of fuels are unchanged throughout the project. These factors should be country specific. However, where data from other sources are not available, IPCC default emission factors may be used. In any case, these factors should be listed in the PDD.

Emissions from grid-connected electricity generation require data that are specified in ACM0002 (or in the Simplified methodology for small-scale CDM project activities), and depend on the specific methodological option chosen among several alternatives proposed therein.

Leakage calculations are likely to be small compared to other components of baseline and project emissions; so that IPCC default values may be chosen for these estimates. However, in the calculation of emissions from fuel transport, the specific energy consumption of the transport mode is determined *ex-ante* from historical data or estimations, and it is considered fixed during the crediting period. This simplification is valid since the relatively small magnitude of CO_2 emissions from fuel transportation to typical industrial facilities.

Dynamic baseline calculation

The dynamic baseline calculation is used to calculate baseline emissions related to fuel consumption when Option 1 is chosen.

Dynamic baseline calculation requires data on the fuel efficiency of each combination of equipment and fuel that produce heat. A preferred source of efficiency data would be based on direct measurements of heat output and fuel input. When it is not possible, efficiency measurements may be based on stack gas analysis (measurements of temperature and oxygen or CO_2 concentration).

***Quasi*-dynamic baseline calculation**

The *quasi*-dynamic baseline calculation is used to calculate baseline emissions related to energy purchase/sale, and also baseline emissions related to fuel consumption (when Option 2 is applicable).

The *quasi*-dynamic baseline calculation involves the establishment, for each process or equipment, or combinations of processes or equipment, of an adequate relation between fuel and/or energy consumption in the baseline scenario and a control variable.

This relation will be established *ex-ante* and considered unalterable during the crediting period. As a consequence, any estimation of fuel consumption and energy purchase/sale in the baseline scenario, that is used to establish the relation, needs an adequate justification.

When fuel consumption and/or energy purchase/sale remain approximately constant prior to project implementation, and it is also estimated that they would be constant in the absence of the project, this methodology includes the possibility of considering them as fixed values for the baseline scenario.

B.7. Please indicate whether quality control (QC) and quality assurance (QA) procedures are being undertaken for the items monitored:		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1. Q_{Fi}	*Low*	*The industrial facility shall have a series of internal procedures that ensures data have low uncertainties during monitoring process. These procedures are specific for each industrial facility and shall be explained in the PDD.*
3. $\eta_{n,i}$	*Low*	*The industrial facility shall have a series of internal procedures that ensures data have low uncertainties during monitoring process. These procedures are specific for each industrial facility and shall be explained in the PDD.*
4. Control variables	*Low*	*The industrial facility shall have a series of internal procedures that ensures data have low uncertainties during monitoring process. These procedures are specific for each industrial facility and shall be explained in the PDD.*
8. NPES	*Low*	*The industrial facility shall have a series of internal procedures that ensures data have low uncertainties during monitoring process. These procedures are specific for each industrial facility and shall be explained in the PDD.*
11. NPSS	*Low*	*The industrial facility shall have a series of internal procedures that ensures data have low uncertainties during monitoring process. These procedures are specific for each industrial facility and shall be explained in the PDD.*

B.8. Has the methodology been applied successfully elsewhere and, if so, in which circumstances?

There are several methodologies that are referred by this new proposal. However, the new proposed methodology has not been applied before.

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