CLEAN DEVELOPMENT MECHANISM

PROPOSED NEW METHODOLOGY: MONITORING (CDM-NMM)

Version 01 - in effect as of: 1 July 2004

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SECTION A. Identification of methodology

A.1. Title of the proposed methodology:

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GHG Destruction in Industrial Processes Monitoring Methodology

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

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4-Manufacturing industries, 5-Chemical Industries, 8-Mining/mineral production, 10-Fugitive emissions from fuels (solid, oil or gas), 11- Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride, 13-Waste handling and disposal, 15-Agriculture.

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

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This methodology is applicable to project activities where the GHG is captured and destroyed, through combustion or other means, thus reducing or eliminating its greenhouse gas effect. For example, the methodology is applicable to carbonization plants that introduce a new technology to prevent the release of methane during charcoal manufacturing. The monitoring methodology can be applied in two different ways: through direct monitoring or through the monitoring of a proxy indicator. The project proponent will choose which option is the most appropriate to the project.

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

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Strengths: Simple and widely applicable methodology, cost reduction, realistic simulation of investment decision and applicable to a wide range of activities involving GHG destruction or modification, data required for calculations are usually available since most industrial processes are very well understood and all the data required is routinely collected by producers. Because this is a generic methodology, it can be used in a wide variety of situations.

Weakness: Because this is a generic methodology, applicable to a wide range of technologies and situations, it is more dependent than usual on judgment of the DOE to ensure the complete, transparent and conservative application of methodology. Examples are provided in this document about its use to the case study of reduction of methane from charcoal manufacturing activities, but this is meant to illustrate the use of the methodology only.

SECTION B. Proposed new monitoring methodology

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B.1. Brief description of the new methodology:

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This methodology allows the monitoring and calculation of ERs from company activities that currently emit greenhouse gases (GHG) and are considering the adoption of new equipment or technology that enables the capture and destruction of GHGs. Financial reasons or other barriers related to technology improvement have traditionally prevented the use of such equipment or technology. For example, this methodology could be used by charcoal production companies using carbon finance to introduce methane destruction devices in carbonization kilns which traditionally released methane to the atmosphere. The methodology is applicable to a wide range of activities, including carbonization improvements, landfill projects, or any other project involving the capture and destruction of methane, N_2O, and HFCs.

This methodology is based on the approved monitoring methodology AM003, which states that "The methodology is currently mainly applicable to waste management projects involving methane destruction. In principle, all project types that involves the treatment of measurable GHG quantities that would otherwise be released are conducive to the application of modified forms of the proposed direct monitoring methodology. Such project types are: geological sequestration of CO_2 (e.g. in oil wells) and other applications that directly bind CO_2 or destroy or modify GHGs in a chemical or physical process that removes or diminishes their global warming potential."

The monitoring of emissions of this type of activity can be done in two different ways:

- Option 1: monitoring of a proxy indicator that is correlated with the GHG generation (*e.g.* if there is an emission factor for a certain product, monitor just the amount of product produced); or
- Option 2: direct monitoring of the emission reductions from project activity (as described in the landfill monitoring methodology AM.0003).

The first option is applicable to a wider range of situations and can be used for projects for which the GHG destruction activities are not centralized in a single location (e.g. carbonization kilns used for charcoal production). Given that the method of direct measurements of emission reductions is already described in methodology AM.0003, this methodology will focus on the use of proxy indicators, but explanation will also be given about Option 2.

The methodology focuses on the monitoring of parameters used to:

- Define the baseline scenario as the most plausible scenario in the absence of project activities;

- Prove project additionality;
- Calculate emissions reductions achieved during project activities; and
- Estimate the amount of leakage to be deducted from the emissions reductions calculated for the project activity.

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

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The precise list of data to be collected depends on the peculiarities of the project type. In essence, the quantity of GHG destroyed is estimated through the use of a proxy indicator that allows the calculation of the GHG emissions associated with the production process in the baseline and project scenarios. The most important factors to be monitored are the proxy indicator (i.e., the quantity of product produced) and the emissions factor of the indicator. As there is no expected variation in the other data involved in the emissions calculations, there is no need for monitoring these parameters.

The table below provides examples based on the case study of a project to reduce methane emissions during a charcoal manufacturing process.

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	Proxy Indicator (production level of a given product) (QP)	Project Developer	Tonnes	M	Continuously	100%	Electronic and paper	In the case of the carbonization project, this is the amount of charcoal produced per year, in tonnes.
2	Emissions factor for the product in the project scenario (EF_p)	In most cases this parameter will be available in internationally recognised references. The reliability of all this data will be evaluated by DOE conductiong the validation.	tCO_2e/ t of product	M	At the beginning of each crediting period	100%	Electronic and paper	The emission factor for charcoal production in batch kilns is 0,054 t CH_4/t of charcoal, or 1,13 t of CO_2e/t of charcoal
3	% of gas Destroyed in the project scenario	Equipment manufacturer, Scientific publications, or any other recognized sources. To be checked by DOE.	%	M	At the beginning of each crediting period	100%	Electronic and paper	This is the amount of GHG emissions that is actually captured and destroyed by new or improved GHG destruction device introduced by the project, taking into account the efficiency of GHG destruction of this device.

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

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As described in section D.7 of new baseline methodology, the formula to calculate the project emission is:

$$E_p = (QP_p * EF_p) * (1- (\% \text{ destroyed}_p)$$

Where:

E_p: Emissions in project scenario (tonnes CO_2e)

QP_p: Amount of produced product in project scenario (tonnes or unit). In most situations, this will be the same as in the baseline, as the level of production should not be altered by the introduction of the project activities.

EF_p: Emissions Factor in the project scenario (tonnes CO_2e/tonnes or unit). In most situations, this will have the same value as in the baseline, as the production of GHG should be similar, with only the % Destroyed differing between the scenarios.

% Destroyed$_p$: It is the amount of GHG emissions that is actually captured and destroyed by new or improved GHG destruction device introduced by the project, taking into account the efficiency of GHG destruction of this device.

As in the baseline calculations, the only parameter expected to fluctuate along time is the quantity of industrial product produced (QP). The QP of baseline and project scenario are, by in most cases the same, since the new project improvement should not change the production line. The parameters *emission factor and % destroyedin the project scenario* are expected to remain constant during the project .

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	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
4	Proxy Indicator (production level of a given product) (QP)	Project Developer	Tonnes	M	Continuously	100%	Electronic and paper	Given that QP is the same in baseline and project scenarios, it is measured just once and applied in both formulas.
5	Emissions factor for the product in the baseline scenario (EF_b)	In most cases this parameter will be available in internationally recognised references. The reliability of all this data will be evaluated by DOE conductiong the validation.	tCO_2e/ t of product	E	At the beginning of each crediting period	100%	Electronic and paper	This value is usually the same as in the project scenario. The emission factor for charcoal production is batch kilns is 0,054 t CH_4/t of charcoal, or 1,13 t of CO2e/t of charcoal
6	% of gas Destroyed in the project scenario	Equipment manufacturer, Scientific publications, or any other recognized sources. To be checked by DOE.	%	E	At the beginning of each crediting period	100%	Electronic and paper	This is the amount of GHG emissions that is actually captured and destroyed in the baseline scenario, prior to the introduction of new or improved GHG destruction devices. Following the example above, usually there is no gas capture in traditional carbonization kilns, thus, 0% of gas is collected.
7	Discount rate	To be indicated by the project proponent and checked by DOE	%	M	At the beginning of each crediting period	100%	Electronic and paper	Value used for baseline and additionality definition

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

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As described in section D.6 of new baseline methodology, the formula to calculate the project emission is:

$$E_b = QP_b * EF_b *(1-(\% \text{ Destroyed}_b))$$

Where:

E_b: Emissions in the baseline scenario (tonnes CO_2e), for more details, see *section D.7*.

QP_b: Amount of produced product in the baseline scenario (tonnes or unit). In most situations, this will be the same as in the project, as the level of production should not be altered by the introduction of the project activities.

EF_b: Emissions Factor of the baseline scenario (tonnes CO_2e/tonnes or unit). In most situations, this will have the same value as in the project, as the production of GHG should be similar, with only the % Destroyed differing between the scenarios.

% Destroyed_b: It is the amount of GHG emissions that is actually captured and destroyed in the baseline scenario, prior to the introduction of new or improved GHG destruction devices.

The only parameter expected to fluctuate along time is the quantity of product produced (QP). The parameters *emission factor*, and *% destroyed of baseline scenario* are expected to be constant during the project lifetime.

The emission factor will be calculated as the GHG emission per tonne or unit of product, multiplied by the GWP of the respective GHG analysed. The GWP values used to calculate it will be those indicated by the IPCC.

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

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As explained in the section B.1, the monitoring of emissions activity related to GHG destruction can be done in two different ways:

- monitoring of a proxy indicator that is correlated with the GHG generation (*e.g.* if there is an emission factor for a certain product, monitor just the amount of product produced); or
- direct monitoring of the emission reductions from project activity (as described in the landfill monitoring methodology AM.0003).

The first option was described in section B.2. In some occasions, direct measurement of emissions is also possible for projects involving GHG destruction (i.e., in the case of landfill gas collection and combustion projects).Given that the method of direct measurements of emission reductions is already described in methodology AM.0003, this is not repeated here.

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

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Emissions taking place outside of the project boundary will be treated as leakage, and deducted from the emission reductions attributed to the project activity. Leakage is calculated as the difference in the consumption of input materials or energy used for the production lines of the project and baseline scenarios, multiplied by the emission factors associated with these materials or energy.

The most plausible potential source of CO_2 emissions attributable to the project and out of boundary is the increase in the consumption of energy. If the energy is produced inside the boundary (*e.g.* by an own oil thermoelectric), it is considered project emission, but if the energy is produced outside the boundary (*e.g.* imported from grid), it is considered leakage and must be included in the calculations. The emissions related to the grid must be calculated using the total weighted average factor. The formula is the same to an unexpected project emission or leakage, the only difference will be the location where emissions take place (if it is inside or outside the boundary). This is shown in the table below.

Another possible source of leakage applies to situations where the GHG collected is transformed into another GHG of lower global warming potential (GWP). In this case, it is necessary to calculate the amount of this secondary GHG that is produced as part of the project, and deduct its CO_2e from the emission reductions calculation. An example is the combustion of methane, producing CO_2. In this case, it is necessary to determine whether the material that gave rise to the methane in the first place is from a renewable source or not. If it is (as in the case of renewable forests, agricultural products, biodegradable urban waste), there is no need to deduct this amount of CO_2 from the emissions reduction calculation (as in the case of the approved methodology AM0003). As this is most likely the case of all applications of this methodology, this subje ct will not be dealt in further detail in this document.

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	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
8	Demand of input material or energy used in the project scenario (D_p)	Project proponent data	tonnes, units or MWh / year	*M*	Continuously	*100%*	Electronic and paper	
9	Demand of input material or energy used in the baseline scenario (D_b)	Project proponent data	tonnes, units or MWh / year	*E*	Continuously	*100%*	Electronic and paper	
10	Emission factor of input material or energy (EF)		CO_2e / tonne, unit or MWh	*M*	Continuously	*100%*	Electronic and paper	*In most cases this parameter will be available in internationally recognised references. The reliability of all this data will be evaluated by DOE, which is conducting the validation.*

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

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As described in section D.9 of new baseline methodology, the formula to calculate the leakage is:

$$L = (D_p - D_b) * EF$$

Where:

L: Leakage (tonne CO_2 / year)

D_p: Demand of input material or energy used in the project scenario (tonnes, units or MWh / year)

D_b: Demand of input material or energy used in the baseline scenario (tonnes, units or MWh / year)

EF: Emission factor of input material or energy (CO_2e/tonne, unit or MWh)

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.):

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The greenhouse gas emission reduction achieved by the project activity (ER) during a given year is the difference between the amount of GHG emitted in the absence of the project activity (E_b) and the amount of GHG actually emitted (E_p), considering the GHG that is captured and destroyed in both scenario. After that, discount any leakage emission measurable and reasonable attributable to the project. As described in section D.6 of new baseline methodology, the formula to calculate the emission reduction is

$$ER = E_b - E_p - L$$

Where:

ER: Emission Reduction (tonnes CO_2e)

E_b: Emissions in the baseline scenario (tonnes CO_2e)

E_p: Emissions in the project scenario (tonnes CO_2e)

L : Leakage (tonnes CO_2e)

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

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The assumptions used in this monitoring methodology are outlined below:

- If the raw material used in the production process is from renewable sources (e.g. agricultural waste, biomass from renewable forest plantations), it is considered 'carbon neutral' and therefore it is assumed that it has a net carbon intensity of zero. This is consistent with the treatment of CO_2 emissions from landfills, as in methodology AM0003;
- The project developer will need to identify the emission factors and technical parameters to be used for the monitoring methodology (e.g. fuel emission factors, efficiency of GHG destruction equipment, etc.), but these will need to be from internationally recognized sources;
- The methodology can only be applied in cases where such recognized emission factors do exist (as in the case of carbonization activities, where US.EPA and IPCC values are available)
- The methodology can only be used if there is a simple, transparent and accurate way to measure the proxy indicator. This is usually the case, as the proxies tend to be industrial products that are generally very well monitored;
- The Global Warming Potential values for GHGs will need to be those approved by the IPCC.
- All the other variables included in the baseline definition, additionality test or emission reduction calculation not included in this monitoring plan are expected to be constant for the project duration.
- The need of inclusion of one or more variable based on sector or national policies and circumstances will be evaluated by the local DOE.

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	Low	*The project proponent usually measures it with rigor, especially when it is its core business. The project developer may already have quality control procedures for the collection and recording of this information, if not, QA/QC procedures must be planned.*
2	Medium	*In most cases this parameter will be available in internationally recognised references. If not, the project developer must measure and/or calculate it. All the steps, procedures, assumptions, data source and data collected must be described. The DOE conducting the validation will evaluate the reliability of all this data.*
3	Low	*The Equipment manufacturer usually provides all the technical and specific information about their equipment. No additional QA/QC procedure is necessary to be undertaken. Regular maintenance will ensure optimal operation equipment.*
4	Low	*The project proponent usually measures it with rigor, especially when it is its core business. The project developer may already have quality control procedures for the collection and recording of this information, if not, QA/QC procedures must be planned.*
5	Medium	*In most cases this parameter will be available in internationally recognised references. If not, the project developer must measure and/or calculate it. All the steps, procedures, assumptions, data source and data collected must be described. The DOE conducting the validation will evaluate the reliability of all this data.*
6	Low	*The Equipment manufacturer usually provides all the technical and specific information about their equipment. No additional QA/QC procedure is necessary to be undertaken. If the project is implemented, the baseline scenario will not happen, and the equipment capture efficiency cannot be measured, so it will be estimated from the Equipment manufacturer's data.*
7	Low	*This is not a default economic parameter. The project proponent can choose the discount rate based on his conduct faced to the risk. The DOE conducting the validation will evaluate the reliability, transparency and conservativeness of this data.*
8	Low	*This is a performance indicator, usually measured by the companies. It is very simple to measure and no special procedures are required.*
9	Low	*This is a performance indicator, usually measured by the companies. It is very simple to measure and no special procedures are required. Moreover, If the project is implemented, the baseline scenario will not happen, and the input material or energy cannot be measured, so it will be estimated in a conservative approach.*
10	Medium	*This kind of information is out of control of project proponent. It is not easy to obtain this information in countries with complex grid composition and dispatch. It is responsibility of DOE to check if it is from secure and reliable sources.*

In addition, a further quality control could be introduced to confirm that the common practices prevailing in the project region are not those of the project activity. To verify if the baseline continues to be accurate, a survey of the 10 peer-competitors of the project company (the 'Control Group') could be conducted to determine how many of these companies adopt similar practices as those proposed by the project (a common practice analysis). This survey could be repeated at the beginning of each new crediting period, to determine whether the project baseline continues to be valid. A threshold of 50% is proposed to determine whether the baseline needs to be re-evaluated (i.e., if 50% or more of the control group has adopted the project practices without carbon finance or other incentives, the emission reductions from this activity will no longer be additional and the Project will not be able to claim them anymore).

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

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The monitoring processes proposed for Emission Reductions from GHG Destruction Projects are very simple and based simply on chain of custody records and controls. Similar systems have been used extensively for other purposes like environmental management programs.

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