CLEAN DEVELOPMENT MECHANISM

PROPOSED NEW METHODOLOGY: MONITORING (CDM-NMM)

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SECTION A. Identification of methodology

A.1. Title of the proposed methodology:

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NMM00XX 'Monitoring Emission Reductions from technological improvements in industry'

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, 6-Construction, 7-Transport, 8-Mining/mineral production, 9-Metal Production, 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 technological improvements in industrial or manufacturing processes lead to the reduction in the level of GHG emissions per unit of industrial output. It follows the process outlined in the IPCC Guidelines for National Greenhouse Gas Inventories (1996), Volume 3 (Reference Manual), Chapter 2 (Industrial Processes). For example, the methodology is applicable to cement factories that introduce a new technology that reduces the amount of clinker needed to produce cement, thus reducing associated GHG emissions. It has to be noted that, if the proposed project activity leads to GHG emission reductions due to less electricity consumption from a grid, this will have to be monitored according to a suitable methodology.

The monitoring methodology can be applied through the monitoring of a proxy indicator, i.e., the final product produced, and applying a carbon emissions factor calculated for this proxy indicator.

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 improvements of industrial or manufacturing activities, 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 the introduction of a new methodology to grind clinker in the cement production process

(thus reducing its use and associated CO_2 emissions), 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 would lead to the reduction in GHGs per unit of industrial or manufacturing output. 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 cement production companies using carbon finance to introduce new technologies to improve clinker production efficiency, reducing the amount of clinker needed for the production of cement and consequently the emissions associated with cement production. The methodology is applicable to a wide range of activities, including cement production, chemical production, or any other industrial or manufacturing project involving the reduction of GHG emissions previously associated with the production process. In principle, all project types that involves the introduction of new methodologies that lead to the reduction of GHG emissions associated with industrial or manufacturing processes are conducive to the application of modified forms of the proposed direct monitoring methodology.

The monitoring of emissions of this type of activity is based on the 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).

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. 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 that reduces CO_2 emissions due to improved clinker and cement production 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 a cement production project, this is the amount of cement 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 conducting the validation.	tCO_2e/ t of product	M	At the beginning of each crediting period	100%	Electronic and paper	The emission factor for cement production is 0.626 tCO2/t cement produced, based on the default of 0.782 tCH_4/t clinker produced (IPCC, 1996), as well as energy inputs. The exact EF for the project needs to be determined at the beginning of each crediting period, using project specific parameters.
3	Consumption level of fuel in project scenario	Project Developer	volume or energy	m	continuously	100%	electronic and paper	
4	Emission factor for the fuel consumption in project scenario	In most cases this parameter will be available in internationally recognised references. The reliability of all this data will be evaluated by DOE conducting the validation.	tCO_2e/ unit of volume or energy	M	At the beginning of each crediting period	100%	electronic and paper	

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:

$$\mathbf{E_p = (QP_p * EF_p) + (QF_p * EFF_p)} \qquad \textbf{Equation 1}$$

Where:

$\mathbf{E_p}$: Emissions in project scenario (tonnes CO_2e)

$\mathbf{QP_p}$: Amount of produced product in project scenario (tonnes or unit). By definition, this should be the same as in the baseline. Use QP_p for calculations of both project and baseline emissions.

$\mathbf{EF_p}$**:** Emissions Factor in the project scenario (tonnes CO_2e/tonnes or unit). In most situations, this will be lower than in the baseline, due to the technological innovations introduced in the production process.

$\mathbf{QF_p}$: Amount of fuel used in project scenario (volume or energy unit).

$\mathbf{EFF_p}$: IPCC emission factor for fuel used in project scenario (tCO_2/ volume or energy unit).

While the parameter QP may fluctuate from year-to-year, the emission factor EF is expected to remain constant throughout the project lifetime. EF will be calculated as the GHG emission per tonne or unit of product, times the GWP of the respective GHG. The GWP values used to calculate it will be based on the IPCC values.

For example, in the case of cement production, most process emissions come from the transformation of $CaCO_3$ into lime (CaO) which is added to other components to form clinker. According to the IPCC (1996), this process leads in average to the emission of 0.571 tCO_2 per tonne of clinker produced. In addition, this process requires heat that, if coming from fuel oil, would increase overall emissions to 0.782 tCO_2 per tonne of clinker produced. In general, cement production uses around 0.8 tonnes of clinker per tonne of cement produced, consequently leading to the emissions of 0.626 tCO2/t cement produced. One way of reducing the amount of emissions in the cement production process is to grind clinker to a finer grade, so that a smaller amount of clinker is used per tonne of cement produced. If this was reduced by 10 %, the new carbon emissions factor of this cement would be 0.563 tCO2/t cement produced.

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
3	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 in the project scenario and applied in both formulas.
4	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 higher than in the project scenario. In the example of cement production, the emission factor would be higher than in the project, as the baseline cement would use more clinker and thus lead to higher emissions. The exact EF for the baseline needs to be determined at the beginning of each crediting period, using project specific parameters.
5	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
6	Consumption level of fuel in baseline scenario	Project Developer	volume or energy	m	continuously	100%	electronic and paper	

7	Emission factor for the fuel consumption in baseline scenario	In most cases this parameter will be available in internationally recognised references. The reliability of all this data will be evaluated by DOE conducting the validation.	tCO_2e/ unit of volume or energy	M	At the beginning of each crediting period	100%	electronic and paper	

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:

$$E_b = (QP_b * EF_b) + (QF_b * EFF_b) \qquad \textbf{Equation 2}$$

Where:

E_b: Emissions in the baseline scenario (tonnes CO_2e).

QP_b: Amount of product produced in the baseline scenario (tonnes or unit). As in some cases the new technology may increase production efficiency and the level of production, QP_b should by definition be the same as in the project.

EF_b: Emissions Factor of the baseline scenario (tonnes CO_2e/tonnes or unit). This will be higher than in the project scenario.

QF_b: Amount of fuel used in baseline scenario (volume or energy unit).

EFF_b: IPCC emission factor for fuel used in baseline scenario (tCO_2/ volume or energy unit).

While the parameter QP may fluctuate from year-to-year, the emission factor EF is expected to remain constant throughout the project lifetime. EF will be calculated as the GHG emission per tonne or unit of product, times the GWP of the respective GHG. The GWP values used to calculate it will be based on the IPCC values.

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.

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
6	Demand of input material used in the project scenario (D_p)	Project proponent data	tonnes, units / year	*M*	Continuously	*100%*	Electronic and paper	
7	Demand of input material used in the baseline scenario (D_b)	Project proponent data	tonnes, units / year	*E*	Continuously	*100%*	Electronic and paper	
8	Emission factor of input material		CO_2e / tonne, unit	*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 used in the project scenario (tonnes, units / year)

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

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

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). After that, discount any leakage emission measurable and reasonable attributable to the project. The equation to calculate emission reductions 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:

- 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 cement production activities, where 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 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.*
4	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.*
5	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.*
6	Low	*This is a performance indicator, usually measured by the companies. It is very simple to measure and no special procedures are required.*
7	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.*
8	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 peer-competitors of the project company (the ‘Control Group’, with 5-10 companies) 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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