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:

>>

Activities for the promotion of electricity efficiency, through the replacement of unitary equipment, by parties that are not the energy consumers.

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, a possible category would be: (3) Energy demand.

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

>>

The methodology is intended for programmes that encourage the adoption of energy-efficient equipment such as lamps, ballasts, refrigerators, motors, fans, air conditioners, other appliances, etc. at many sites. These technologies may replace existing equipment or be installed at new sites. This methodology is applicable to programmes that promote the replacement of inefficient equipment in operation by high-efficiency new equipment meeting the same end-use.

In order to ensure that energy savings and emissions reductions are real, this methodology requires that the inefficient equipment be removed and disabled from further use.

The methodology would be applicable to the promotion of energy efficiency realized by organizations that are not the end users of energy. The methodology is applicable to electricity efficiency, where the emissions reductions correspond to power plants supplying the grid connected to the electricity users where the energy efficiency measures would be applied.

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

>>

The methodology is straightforward insofar as it is based on estimates of energy consumption, power plant emissions factor and transmission and distribution losses. Moreover, the emissions factor for power plant emissions is determined by an approved consolidated methodology (ACM0002).

SECTION B. Proposed new monitoring methodology

>>

B.1. Brief description of the new methodology:

>>

The methodology is based in monitoring data that permit a determination of the electricity consumption of the equipment affected by the energy efficiency measures before and after project implementation.

This new methodology incorporates the following approved methodology:

- Approved consolidated baseline methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

It also builds on aspects covered in the following methodologies:

- Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. Appendix B 1 of the simplified modalities and procedures for small-scale CDM project activities (Version 30 June 2004). The sections specially relevant is one related to demand-side energy efficiency improvements:
  - II.C. Demand-side energy efficiency programmes for specific technologies

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
P.1	*i*	*Sponsor of efficiency program*	*text*	*m*	*Once*	*100%*	*Electronic*	*Equipment covered by the energy efficiency program. There may be several types of equipment.*
P.2	n_i	*Sponsor of efficiency program*	*unit*	*m*	*annual*	*100%*	*Electronic*	*Number of equipment (of each type i) subject to replacement by efficient models. Applicable to equipment with fixed power input.*
P.3	pn_i	*Sponsor of*	*kW*	*m*	*For each*	*100%*	*Electronic*	*For equipment i with fixed power*

		efficiency program			*efficient model i*			*input.*
P.4	o_i	*Previous studies by program sponsor or others*	*hours per year*	*e*	*For each efficient model i*	*100%*	*Electronic*	*Estimates of hourly use determined in samples of users of similar equipment "i"*
P.5	$EF_{elec.\ gen,,k}$	*Emissions factor for electricity generation in the grid "k"*	*kg CO_2e/MWh*	*c*	*annual*	*See comment*	*Electronic*	*The emissions factor for power generation should be based on the approved consolidated methodology ACM0002. This methodology includes several options, each with their data and analysis requirements.*
P.6	TDL_k	*Reports of the electricity supplier or grid operator*	*fraction*	*m*	*annual*	*100%*	*Electronic*	
P.7	$n_{i,j}$	*Sponsor of efficiency program*	*units*	*m*	*anual*	*100%*	*Electronic*	*Number of equipment (of each type "i" and located in climate "j") subject to replacement by efficient models.. Applicable to equipment characterized by a fixed annual energy consumption..*
P.8	$en_{i,j}$	*Previous studies by program sponsor or others*	*kWh/year*	*m*	*For each efficient model "i" in climate "j"*	*100%*	*Electronic*	*For each equipment characterized by a fixed annual energy consumption. Values should be based on measurements on a representative sample of each equipment "i" in each climate "j".*
P.9	L_i	*Survey by project sponsor*	*years*	*m*	*For each type of efficient model "i"*	*10%*	*Electronic*	*For each type of equipment, equipment life should be determined by an annual survey of users of efficient equipment.*

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 scenario corresponds to the case in which efficient equipment are installed, the electricity demand and the consumption of fossil fuels decrease.

Project emissions *E* (tonne CO_2e/yr) are given by:

$$E = \sum_k EP_k \cdot EF_{elec\ gen,\ k} / (1 - TDL_k)$$

where

EP_k is the total electricity purchased by all participants from the grid k, in the project scenario (e.g. MWh)

$EF_{elec\ gen,\ k}$ is the emissions factor for power generation in grid k (e.g. kg CO_2e/MWh)

TDL_k are the transmission and distribution losses for the grid k (fraction)

Case A. Equipment with constant power input

For equipment with a fixed power input, total electricity purchase is given by the product of equipment quantity, power input, and no. of operating hours per year. Project emissions *E* (tonne CO_2e/yr) are given by:

where

i = type of technology that is proposed to be replaced (e.g. 75 W incandescent bulb, 5 hp motor

S_i = the sum over the group of "i" devices replaced (e.g. 75 W incandescent bulb, 5hp motor), for which the replacement is operating during the year, implemented as part of the project.

n_i = the number of devices of the group of "i" devices replaced (e.g. 75 W incandescent bulb, 5hp motor) for which the replacement is operating during the year.

pn_i = the power input of the efficient devices of group "i" (e.g. 18 W compact fluorescent lamp, high efficiency 5 hp motor), taking into account the variation of efficiency over time; the calculation of energy consumption varies based on the type of technology. In the case of a retrofit programme, "power input" is the weighted average of the new devices.

o_i = the average annual operating hours of the devices of the group of "i" devices replaced.

k = the number of interconnected systems that supply of energy the geographic area of the base line of the project activity (MWh)

$EF_{elec\ gen,\ k}$ = the emissions factor for power generation in grid k (e.g. kg CO_2e/MWh)

TDL_k = the transmission and distribution losses for the grid k (fraction)

Case B. Equipment with variable power input

Some equipment, for example, air conditioners and refrigerators operate intermittently, controlled by a thermostat according to demand. Thus, energy consumption of each piece of equipment cannot be characterised by the product of power input and hours of operation. Energy use may de characterised by and determined in terms of average annual consumption. The value may vary according to equipment model "i" as well as climate "j". In this case, Project emissions *E* (tonne CO_2e/yr) are given by:

$$E = \sum_k \sum_j \sum_i \left(n_{i,j} en_{i,j}\right)_k \cdot EF_{elec\ gen,\ k} /(1 - TDL_k)$$

where the variables have the same meaning as in Case A, except for:

j = The number of climate zones needed to characterise equipment energy consumption. For each zone "j", the consumption of a type of equipment "i" is constant.

$n_{i,j}$ = The number of devices of group "i" located in climate zone "j" replaced as part of the project.

$en_{i,j}$ = Annual energy consumption of new efficient equipment "i" located in climate "j".

The life of new, efficient equipment installed (whether of constant power input or not) needs to be determined by a survey of users where the equipment is installed in order to make sure that it is operating. This may be based on a sample of all users, and will be used to determine the useful life of the equipment, L_i, years.

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

B.1	p_i	*Program sponsor*	*kW*	*m*	*For each (inefficient) model in use*	*100%*	*Electronic*	*For equipment characterised by constant power input.*
B.2	$En_{i,j}$	*Previous studies by program sponsor or others*	*kWh/year*	*m*	*For each (inefficient) model in use in each climate*	*100%*	*Electronic or paper*	*For each equipment characterised by a fixed annual consumption. Values should be based on a representative sample of each equipment "i" in each climate "j".*
B.3	RL_i	*Previous studies by program sponsor or others*	*years*	*e*	*For each type of equipment "i"*	*N.A.*	*Electronic or paper*	*Median remaining life of equipment to be removed should be determined from other studies, if possible. See section B.5.*

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

>>

The baseline scenario is that existing equipment will continue to be used unless the project activity takes place.

Baseline emissions *BE* (expressed in tonne CO_2equivalent per year, tonne CO_2e/yr) are given by:

$$BE = \sum_k BEP_k \cdot EF_{elec\ gen,\ k} / (1 - TDL_k)$$

where

BEP_k = the total electricity purchased by all participants of the program from the grid k, in the baseline scenario (e.g. MWh)

$EF_{elec\ gen,\ k}$ = the emissions factor for power generation in grid k (e.g. kg CO_2e/MWh)

TDL_k = transmission and distribution losses for the grid k (fraction)

Note that the only difference with respect to project emissions is in electricity use, since the emissions factor for power generation as well as transmission and distribution losses are the same as in the baseline scenario.

Electricity purchases from a power grid increases the requirement for generation at power plants supplying the grid by an amount that exceeds the magnitude of electricity purchases because of transmission and distribution losses (TDL). TDL values need to be determined for each grid involved in the project activity.

Note that the emissions factor for power generation $EF_{elec\ gen,\ k}$ is determined using the approved consolidated methodology ACM0002.

As in the case of baseline (and project) emissions, energy use may be characterized by a constant power (Case A) or by an average annual consumption (Case B).

In **Case A**, baseline emissions are given by:

where the variables have the same meaning as before, except:
pi = Power input of equipment i in use (inefficient)

In **Case B**, baseline emissions are given by:

$$E = \sum_k \sum_j \sum_i \left(n_{i,j} e_{i,j}\right)_k \cdot EF_{elec\ gen,\ k} / (1 - TDL_k)$$

where the variables have the same meaning as before, except:

$e_{i,\ j}$ = Annual energy consumption of inefficient equipment "i" in use in climate zone "j".

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

>>

NOT APPLICABLE.

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

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

>>

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

>>

Leakage could be present in case the equipment comes from other end users. However, this methodology is only applicable to project activities where all the equipment installed is new, and where existing equipment is removed by implementing agency and disabled from further use, so the project activity does not increase the energy consumption in the grid and does not increase emissions outside of the project. Thus, there are no leakage associated with projects covered by this methodology.

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

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

>>

Not Applicable (no leakage expected).

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 emissions reduction *ER* by the project activity is given by the difference between baseline and project emissions, since there is no leakage to be considered:

$$ER = BE - E$$

expressed in tonnes of CO_2 equivalent per year (tCO_2e/yr).

The values of *BE* and *E* are estimated as explained in the previous sections.

Emissions reduction would accrue for the project life. Since the project involves replacement of existing equipment, project life is the remaining life (RL, years) of the equipment that would be replaced. Since the remaining life may be difficult to determine, a conservative, low, project life should be assumed, unless (a) it is possible to ascertain equipment age with precision, and (b) studies exist that relate the remaining life to equipment age with reasonable accuracy. In most cases, the life of new equipment (L) will be longer than the remaining life of the equipment to be replaced. Thus, it is the value of RL, and not L, that will limit project life.

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

>>

There are no assumptions in the new methodology, other than those already stated in the formulae and text above.

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.
P.1	*None*	*These are records of project sponsor.*
P.2	*Low*	*These are records of project sponsor.*
P.3	*Low*	*Nameplate data should be verified through laboratory measurements in a sample of devices of each type.*
P.4	*Low*	*Uncertainty should be reduced using a large sample of users*
P.5	*Low*	*See ACM0002*
P.6	*Low*	*This information from the power sector is usually known to high accuracy.*
P.7	*Low*	*These are records of project sponsor.*
P.8	*Low*	*Data should be determined by laboratory measurements and verified by measurements in a sample of users.*
P.9	*Medium*	*Uncertainty should be reduced using a large sample of users*
B.1	*Low*	*Nameplate data should be verified through laboratory measurements in a sample of devices of each type.*
B.2	*Low*	*Data should be determined by laboratory measurements and verified by measurements in a sample of users.*
B.3	*Medium*	*Uncertainty should be reduced using a large sample of users*

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

>>

No, the entire methodology is proposed for application here for the first time. However, it incorporates the approved consolidated monitoring methodology ACM0002 applicable to electricity generation, and is based on aspects of the simplified monitoring methodologies for small-scale CDM projects.

- - - - -