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:

"Demand-side electricity management for food retailers, supermarkets, hypermarkets, shopping centers and other similar commercial activities"

Version of the document: 1
Date of the document: May 30rd, 2005

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

Methodology applies to Sectoral Scope 3, energy demand, and the category is energy efficiency.

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

Methodology is applicable in the following conditions:

1. Project activity is developed in food retailers, supermarkets, hypermarkets, shopping centers and other similar commercial activities.

2. Electricity management program results in the reduction of electricity consumption at one site or a group of different sites where the project activity is developed.

3. Electricity consumption is directly related to the sales area of the set of project sites. The quotient between electricity consumption and sales area is used to characterize the electricity intensity of the project activity.

There is no other approved methodology for the same conditions of application.

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

Strengths

There are no other approved methodologies similar to this one. This is the first of its kind. For this reason, it may incentive other similar projects. The methodology is general and may apply to different projects in the demand-side electricity efficiency category in the commercial sector.

Weaknesses

Methodology aims at capturing the global efficiency improvement in the activity, measured by the reduction of electricity consumption with regards to the sales area. For this reason, the methodology addresses the calculation of emissions reduction in a aggregate manner and it is not possible to relate reduction of electricity consumption, and consequent emissions reductions, to each specific action developed in the electricity management program. The results obtained reflect the aggregate results obtained by the project activity.

SECTION B. Proposed new monitoring methodology

B.1. Brief description of the new methodology:

Worldwide, electricity generation is one of the most important sources of greenhouse gases because of the consumption of fossil fuels in thermo power plants. Therefore, the reduction of electricity consumption in a facility, or group of facilities, is likely to reduce greenhouse gases emissions, because of the reduction of either grid electricity generation or specific plant electricity generation.

In the other hand, the improvement of energy efficiency standards, not only by changing processes, but also by reducing quantities of energy consumed, offers a powerful tool for achieving sustainable development by reducing the need for investment in energy infrastructure and by cutting fuel costs. Lower demand for energy will reduce energy security concerns and will improve commercial competitiveness.

Energy intensity and energy efficiency may be defined in several different manners. Energy efficiency refers to the ratio between energy output (services such as light, heat and mobility) and input (fuels). Energy intensity is a statistical concept defined as energy consumption per unit of output at different levels of aggregation. For instance, at a production plant level, electricity intensity may be measured as total final consumption of electricity divided by the total production of a good or service.

The rationale of this methodology takes into consideration the concept of electricity intensity. This concept reflects the fact that, normally, electricity consumption is directly related with some parameter that may be identified in the economic activity in which project is developed, referred to as the reference parameter. Electricity intensity can be defined, then, as the quotient of electricity consumption and this reference parameter. If the quotient decreases, more efficient operation is taking place, because more production is being accomplished with less consumption of electricity.

In the case of commercial acitivties, such as food retailing, shopping centers, supermarkets and hypermarkets, one intuitive parameter is sales area. The final product of this type of activity is sales that occur in the sales areas of the stores. Electricity consumption for lighting, air conditioning, ventilation and food refrigeration are directly related to the total area of the store.

In this sort of project, it is almost unfeasibele to work with the concept of electrical efficiency because, despite it is a simple concept, it is difficult to be measured on a large scale, since there is no single measure of the services (lumens of lighting, volume of refrigerated space and food conservation) that energy-using devices provide to the stores. In the absence of a viable measure, electricity intensity is proposed here to capture the improvement of energy efficiency.

Baseline scenario is determined, hence, considering the average value of the quotient between electricity consumption and sales area, in the three years previous to project activity. Project activity scenario is the monitored consumption of electricity within the project boundary. When project scenario is compared with the baseline scenario, electricty consumption reduction is determined together with greeenhouse gases emissions reductions.

The demonstration of project additionality is accomplisehd with the approved "Tool for the demonstration and assessment of additionality".

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*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recordin g frequenc	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comm ent

cross-referencing to table B.7)					y			
1. TDL_n	*Transmission and distribution losses*	*Obtained from the national authority that operates the electricity system or another reliable source*	*%*	*e*	*Annualy*	*100%*	*Electronic and paper*	-
2. EF_n	*Emission factor of electricity*	*Calculated from the technical literature and monitored variables in the project*	*tCO_2/MWh*	*c*	*Once, at the validation*	*100%*	*Electronic and paper*	-
3. EF	*Emission factor for a specific fuel*	*Calculated from the "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories"*	*tC/mass or volume units of the fuel*	*c*	*Once, at the validation*	*100%*	*Electronic and paper*	-

		and lower heating value of the fuel						
4. EC_n	*Electricity consumption in the project activity, for each source n of electricity within the project boundary, monitored in each year of the crediting period*	*Monitored in the project*	*MWh*	*m*	*Annualy*	*100%*	*Electronic and paper*	-
5. OS_n	*Emissions from other sources inside project activity, related to project activity*	*Calculated from the technical literature and monitored variables in the project*	tCO_2	*c*	*Annualy*	*100%*	*Electronic and paper*	-
6. FC_n	*Fuel consumption in each one of other sources n, monitored in each year of the crediting period*	*Monitored in the project*	*volume or mass units of fuel*	*m*	*Annualy*	*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.):

Project activity emissions, *PE*, are calculated as:

$$PE = \sum_n \left[EC_n \cdot \left(1 + \frac{TDL_n}{100}\right) \cdot EF_n \right] + \sum_n OS_n \quad [tCO_2]$$

- EC_n is the electricity consumption in the project activity, for each source n of electricity within the project boundary, monitored in each year of the crediting period, in [MWh].

- EF_n is the emission factor of electricity, for each source n of electricity, within the project boundary, in [tCO_2/MWh].

- OS_n are the emissions from other sources inside project activity, related to project activity, in [tCO2]. For instance, LPG gas ovens.

- TDL_n is the factor that characterizes transmission and distribution losses associated with each specific source of electricity within the project boundary, in [%].

Other Sources

Generally, other sources of greenhouse gases emissions due to project activity are fossil fuel related emissions induced by the reduction of electricity consumption, for instance, electrical ovens are substituted by gas ovens. In these cases, emissions are calculated as:

$$OS = FC \cdot \frac{44}{12} \cdot EF \quad [tCO_2]$$

- FC is the fuel consumption, monitored in each year of the crediting period, in [volume or mass units of fuel].

- EF is the emission factor of the fuel, in [tC/volume or mass units of fuel].

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

7. SA	*Sales area, monitored in each year of the project activity*	*Monitored in the project*	*m^2*	*m*	*Annualy*	*100%*	*Electronic and paper*	-
8. EI_n	*Electricity intensity in the baseline, for each source n of electricity*	*Calculated from monitored variables, in the project*	*MWh/m^2*	*c*	*Once, at the validatio n*	*100%*	*Electronic and paper*	-
9. TDL_n	*Transmission and distribution losses*	*Obtained from the national authority that operates the electricity system or another reliable source*	*%*	*e*	*Annualy*	*100%*	*Electronic and paper*	-

10. EF_n	*Emission factor of electricity*	*Calculated from the technical literature and monitored variables in the project*	*tCO_2/MWh*	*c*	*Once, at the validatio n*	*100%*	*Electronic and paper*	-
11. EF_C	*Emission factor for a specific fuel*	*Obtained from the "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories"*	*tC/TJ*	*e*	*Once, at the validatio n*	*100%*	*Electronic and paper*	-
12. OXID	*Oxidization factor for specific fuel*	*Obtained from the "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories"*	*%*	*e*	*Once, at the validatio n*	*100%*	*Electronic and paper*	-

13. 44/12	*Carbon conversion factor*	*Obtained from the technical literature*	*tCO_2/tC*	*e*	*Once, at the validation*	*100%*	*Electronic and paper*	-
14. 0.0036	*Energy units conversion factor*	*Obtained from the technical literature*	*TJ/MWh*	*e*	*Once, at the validation*	*100%*	*Electronic and paper*	-
15. η	*Thermal efficiency of the plant*	*Obtained from the technical literature*	*non dimensional*	*e*				
16. OM	*Operating margin of the grid, calculated in accordance with ACM0002*	*Calculated*	*tCO_2/MWh*	*c*	*Once, at the validation*	*100%*	*Electronic and paper*	-
17. BM	*Build margin of the grid, calculated in accordance with ACM0002*	*Calculated*	*tCO_2/MWh*	*c*	*Once, at the validation*	*100%*	*Electronic and paper*	-

18. w_1	*Weight for the operating margin, calculated in accordance with ACM0002*	*Calculated*	*non dimensional*	*C*	*Once, at the validation*	*100%*	*Electronic and paper*	-
19. w_2	*Weight for the build margin, calculated in accordance with ACM0002*	*Calculated*	*non dimensional*	*C*	*Once, at the validation*	*100%*	*Electronic and paper*	-
20. EC_n	*Electricity consumption in the project activity, for each source n of electricity within the project boundary, monitored in each year of the crediting period*	*Monitored in the project*	*MWh*	*m*	*Annualy*	*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.):

Baseline emissions, *BE*, are calculated as:

$$BE = SA \cdot \sum_n \left[EI_n \cdot \left(1 + \frac{TDL_n}{100}\right) \cdot EF_n \right] \quad [tCO_2]$$

- *SA* is the sales area, monitored in each year of the project activity, in [m^2].

- EI_n is the electrical intensity in the baseline scenario, for each source *n* of electricity within the project boundary, calculated with basis on the average electricity intensity of, at least, three years previous to project activity, in [MWh/m^2].

- TDL_n is the factor that characterizes transmission and distribution losses associated with each specific source of electricity within the project boundary, in [%].

- EF_n is the greenhouse gases emission factor of each source *n* of electricity, within the project boundary, in [tCO_2/MWh].

(1) EI_n

EI_n is electrical intensity in the baseline scenario, for each source *n* of electricity within the project boundary, calculated as the average from the monitored electricity consumption related to the sales area, at least, for three years during project implementation:

$$EI_n = \frac{\sum_{i=1}^{3} (EI_n)_i}{3} \quad [\text{MWh/reference units}]$$

$(EI_n)_i$ is the electrical intensity of the stores within project boundary, for each source *n* of electricity, in each one of the three baseline years *i*, in [MWh/m^2], calculated as:

$$(EI_n)_i = \frac{(EC_n)_i}{SA_i} \quad [MWh/m^2]$$

- $(EC_n)_i$ is the electricity consumption of the facilities within the project boundary in year i of the baseline period, for each source n of electricity, in [MWh].

- SA_i is the sales area of the project in year i of the baseline, in [m^2].

(2) TDL_n

TDL_n is the factor that characterizes transmission and distribution losses associated with each specific source of electricity within the project boundary, in [%].

Losses in electricity supply systems depend on several factors: distances involved, quality of the equipment, operation and maintenance procedures and voltage levels. Despite high average efficiencies in most electricity grids, significant losses can take place in transmissions lines, distribution transformers, distribution lines, etc.

In a conservative approach, the losses monitored and recognized preferably by the oficial authority operating the electricity system must be used. Other reliable sources may be considered.

(3) EF_n

The electricity emission factor is calculated in one of the following manners:

Electricity from a specific power plant

If electricity is generated from a specific power plant, for instance, a cogeneration plant, emissions must be calculated using specific fuel consumption and fuel emission factor. The general equation would be:

$$EF_n = \frac{f \cdot COEF}{e} \quad [tCO_2/MWh]$$

In the equation, f is the amount of fuel, in mass or volume units, that would be consumed by the power plant to generate e [MWh] of electricity, and $COEF$ is the CO_2 coefficient of fuel, in [tCO_2/mass or volume unit of the fuel].

Since this is the baseline scenario, no actual consumption of fuel takes place. For this reason, the product (f . $COEF$) must be estimated from the following formulae:

$$f = \frac{e \cdot 0.0036}{\eta \cdot NCV} \quad \text{[fuel mass or volume]}$$

$$COEF = NCV \cdot EF_C \cdot 44/12 \cdot OXID \quad [tCO_2\text{/fuel mass or volume}]$$

$$\left(f \cdot COEF\right) = \frac{e \cdot EF_C \cdot OXID \cdot 44/12 \cdot 0.0036}{\eta} \quad [tCO_2]$$

Variables and parameters are:

- e is the electricity actually consumed by the project activity, in [MWh].
- EF_C is the emission factor, obtained from the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, in [tC/TJ].
- *OXID* is the oxidization factor, obtained from the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, in [%].
- 44/12 is the carbon conversion factor, in [tCO_2/tC].
- 0.0036 is the energy units conversion factor, in [TJ/MWh].
- η is the thermal efficiency of the plant, [non dimensional].
- *NCV* is the net calorific value of fuel *i* and is not used.

Hence,

$$EF_n = 0.0036 \cdot \frac{44}{12} \cdot \frac{EF_C \cdot OXID}{\eta} \quad [tCO_2/MWh]$$

Electricity from the grid

In the case of electricity being purchased from the grid, formulae to determine the emission factor of the baseline are the same as that of the Approved Consolidated Methodology 0002, section **Baseline emission due to displacement of electricity**. In this case, the influence of the project activity is the avoidance of electricity in the combined margin of the grid, for the same reasons as that of grid connected generation of renewable electricity. ACM0002 calculates the emission factor of the grid, EF_n in [$kgCO_2$/MWh], based on the concepts of operating and build margins:

$$EF_n = w_1 \cdot OM + w_2 \cdot BM \quad [tCO_2/MWh]$$

Variables and parameters are:

- *OM* is the operating margin of the grid, calculated as indicated in ACM0002, in [tCO_2/MWh].
- *BM* is the build margin of the grid, calculated as indicated in ACM0002, in [tCO_2/MWh].
- w_1 is the weight for the operating margin, calculated as indicated in ACM0002, [non dimensional].
- w_2 is the weight for the build margin, calculated as indicated in ACM0002, [non dimensional].

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
NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

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

Not applicable.

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

Not applicable

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
NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

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

Not applicable

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.):

Project emissions reductions are calculated as:

$$ER = BE - PE - L$$

[tCO_2]

$$ER = SA \cdot \sum_n \left[EI_n \cdot \left(1 + \frac{TDL_n}{100}\right) \cdot EF_n \right] - \sum_n \left[EC_n \cdot \left(1 + \frac{TDL_n}{100}\right) \cdot EF_n \right] - \sum_n OS_n - L$$

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

Project activity is developed in food retailers, supermarkets, hypermarkets, shopping centers and other similar commercial activities.

Electricity management program results in the reduction of electricity consumption at one site or a group of different sites where the project activity is developed.

Electricity consumption is directly related to the sales area of the set of project sites. The quotient between electricity consumption and sales area is used to characterize the electricity intensity of the project activity.

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.
NA	*NA*	*NA*
NA	*NA*	*NA*

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

No, the methodology hasn't been applied successfully elsewhere.

- - - - -