CLEAN DEVELOPMENT MECHANISM
PROPOSED NEW METHODOLOGY: BASELINE (CDM-NMB)
Version 01 - in effect as of: 1 July 2004

CONTENTS

SECTION A. Identification of methodology

A.1. Proposed methodology title:

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

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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. Overall summary description:

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”.

SECTION C. Choice of and justification as to why one of the baseline approaches listed in paragraph 48 of CDM modalities and procedures is considered to be the most appropriate:

C.1. General baseline approach:

☒ **Existing actual or historical emissions, as applicable**;

☐ Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment;

☐ The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category.

C.2. Justification of why the approach chosen in C.1 above is considered the most appropriate:

The approach chosen is the most appropriate because the scenario that would best describe greenhouse gases emissions in the absence of the project activity is the continuation of electricity consumption monitored in the baseline, represented by the historical consumption of electricity inside the project boundary.

SECTION D. Explanation and justification of the proposed new baseline methodology:

D.1. Explanation of how the methodology determines the baseline scenario (that is, indicate the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases (GHG) that would occur in the absence of the proposed project activity):

The baseline scenario is the continuation of electricity consumption previous to project activity implementation. The justification of this choice is that, in the absence of the CDM incentives, the actions towards electricty consumption reduction would not occur, with historical trends being maintained. The confirmation of this baseline scenario is subject to the additionality assessment of the project, as explained in Section D.3.

Normally, for demand side energy management type of projects, the only alternative would be the maintenance of the situation prevailing before the project implementation. Companies normally do not consider different alternatives when implementing energy management programs. This type of programs are, normally, on going actions implemented during several years that result in improvements of energy intensity and efficiency.

The electricity intensity that characterizes the baseline scenario is the electricity consumption monitored in the period of project activity starting. Electricity consumption and the sales area, within project boundaries, must be monitored for, at least, three years in the period of project implementation. After the characterization of the baseline electricity intensity, the emissions in the baseline scenario is obtained from the monitored sales area, during the crediting period.

Emissions in the project scenario are determined straighforwardly by multiplying the monitored electricity consumption durign each year of the crediting period by the corresponding electricity emission factor. Other sources of emissions, involved in the project implementation, must also be considered.

Emissions reductions are determined, then, by the difference between the baseline and project activity emissions.

D.2. Criteria used in developing the proposed baseline 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.

D.3. Explanation of how, through the methodology, it can be demonstrated that a project activity is additional and therefore not the baseline scenario (section B.3 of the CDM-PDD):

Methodology adopts the approved "Tool for the demonstration and assessment of additionality". Project participants must apply this tool, with no further adjustments, to demonstrate that the project activity is additional and therefore not the baseline scenario.

D.4. How national and/or sectoral policies and circumstances can been taken into account by the methodology:

If project activity is not demanded or restricted by national and/or sectoral policies, then national and/or sectoral policies and circumstances do not affect methodology. If any national and/or sectoral policy and circumstance that afect project activity appear, then, project participants must identify in the PDD and take into account accordingly, in a project specific basis.

The methodology was developed considering that there are no national and/or sectoral policies and circumstances that influence the decisions or impose obligations to the proposed project activity. This is a very likely situation in most of the cases because, normally, electricity consumption is not restricted nor imposed by any local legislation.

D.5. Project boundary (gases and sources included, physical delineation):

Methodology considers only the emissions of CO_2, since this the most significant greenhouse gas involved in electricity related projects. Also, this is a more conservative approach.

The project boundary, represented in Figure 1, includes all the facilities where the project is being developed (it can be more than one, located in different sites), the electricity grid that supplies electricity to the facilities and the power plants from which facilities obtain electricity.

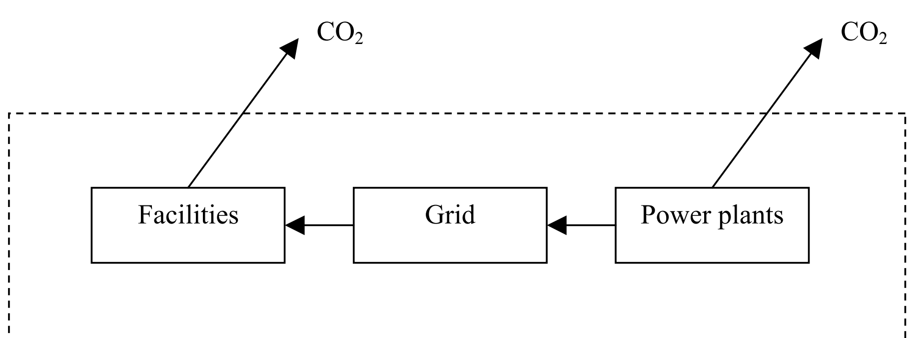

Figure 1 – Project boundary and emissions sources.

D.6. Elaborate and justify formulae/algorithms used to determine the baseline scenario. Variables, fixed parameters and values have to be reported (e.g. fuel(s) used, fuel consumption rates):

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:

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

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

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

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].

D.7. Elaborate and justify formulae/algorithms used to determine the emissions from the project activity. Variables, fixed parameters and values have to be reported (e.g. fuel(s) used, fuel consumption rates):

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].

D.8. Description of how the baseline methodology addresses any potential leakage of the project activity:

Potential leakages of the project activity would be the emissions derived from fossil fuel and/or electricity consumption increase in other sites directly affected by project activity. Leakages must be investigated on a case by case basis and accounted for when they appear to be significant.

D.9. Elaborate and justify formulae/algorithms used to determine the emissions reductions from the project activity. Variables, fixed parameters and values have to be reported (e.g. fuel(s) used, fuel consumption rates):

Project emissions reductions are calculated as:

$$ER = BE - PE - L$$

[tCO_2]

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

SECTION E. Data sources and assumptions:

E.1. Describe parameters and or assumptions (including emission factors and activity levels):

Emission factors required for the application of the methodology are the necessary to calculate electricity baseline emissions and fossil fuel emissions. In this case, reliable local or national data should be used, if available. When such data is not available, IPCC default values should be chosen in a conservative manner.

Other data required are fixed parameters, found in the technical literature, and values monitored directly in the project activity. The values and parameters involved are described in sections D.6 and D.7. Please, refer also to Table 1, below.

E.2. List of data used indicating sources (e.g. official statistics, expert judgement, proprietary data, IPCC, commercial and scientific literature) and precise references and justify the appropriateness of the choice of such data:

Table 1 – List of data and parameters used and references

Variable or parameter	Description	Unit	Reference
SA	Sales area, monitored in each year of the project activity	m^2	Monitored in the project
EI_n	Electricity intensity in the baseline, for each source *n* of electricity within the project boundary, calculated with basis on the average electricity intensity of the three years previous to project activity	MWh/m^2	Calculated from monitored variables, in the project
TDL_n	Factor that characterizes transmission and distribution losses associated with each specific source *n* of electricity within the project boundary	%	Obtained from the national authority that operates the electricity system or another reliable source
EF_n	Emission factor of electricity, for each source *n* of electricity within the project boundary	tCO_2/MWh	Calculated from the technical literature and monitored variables in the project
$(EC_n)_i$	Electricity consumption of the project in year *i*	MWh	Monitored in the project

	of the baseline period, for each source *n* of electricity within the project boundary.		
SA_i	Sales area of the project in year *i* of the baseline	m^2	Monitored in the project
EF_C	Emission factor for a specific fuel, obtained from the "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories"	tC/TJ	Obtained from the "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories"
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	Calculated from the "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories" and lower heating value of the fuel
OXID	Oxidization factor for specific fuel, obtained from the "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories"	%	Obtained from the "Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories"
44/12	Carbon conversion factor	tCO_2/tC	Obtained from the technical literature
0.0036	Energy units conversion factor	TJ/MWh	Obtained from the technical literature
η	Thermal efficiency of the plant	non dimensional	Obtained from the technical literature
OM	Operating margin of the grid, calculated in accordance with ACM0002	tCO_2/MWh	Calculated
BM	Build margin of the grid, calculated in accordance with ACM0002	tCO_2/MWh	Calculated
w_1	Weight for the operating margin, calculated in accordance with	non dimensional	Calculated

	ACM0002		
w_2	Weight for the build margin, calculated in accordance with ACM0002	non dimensional	Calculated
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	MWh	Monitored in the project
OS_n	Emissions from other sources inside project activity, related to project activity	tCO_2	Calculated from the technical literature and monitored variables in the project
FC_n	Fuel consumption in each one of other sources *n*, monitored in each year of the crediting period	volume or mass units of fuel	Monitored in the project

E.3. Vintage of data (e.g. relative to starting date of the project activity):

Data are available continuously as project operates.

E.4. Spatial level of data (local, regional, national):

All data are obtained locally, in the project activity site, except for data necessary to calculate grid electricity emissions.

SECTION F. Assessment of uncertainties (sensitivity to key factors and assumptions):

There are no additional factors and assumptions that have a significant impact on the baseline and/or the calculation of baseline emission levels. Therefore, no uncertainties need to be assessed.

SECTION G. Explanation of how the baseline methodology allows for the development of baselines in a transparent and conservative manner:

Methodology is simple and robust, without special requirements to calculate baseline and project emissions. There are no uncertainties involved and all parameters and values used are publicly available and easily obtained.

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