<mark>Draft</mark> methodological tool

"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"

(Version 01)

I.   SCOPE, APPLICABILITY AND PARAMETERS

This tool provides procedures to estimate the baseline, project and/or leakage emissions associated with the consumption of electricity. The tool may, for example, be used in methodologies where auxiliary electricity is consumed in the project and/or the baseline scenario. The tool can also be applied in situations where electricity is only consumed in the baseline or in the project or as leakage source.

The tool provides several options to project participants. These options aim to provide flexibility to project participants, while ensuring that the estimation of emission reductions is conservative. Some options provide more rough estimates of the emission reductions and rely on conservative default values or conservative simplifications, whereas other options provide more accurate estimates but require more accurate project or country specific data.

Methodologies which refer to this tool should

(a) Specify clearly which sources of project, baseline and leakage electricity consumption should be calculated with this tool;

(b) Provide the necessary procedures, equations and monitoring provisions to determine the quantity of electricity that is consumed by each identified source; and

(c) Provide the necessary procedures to determine the most likely baseline scenario for each source of <u>baseline</u> electricity consumption.

The tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption:

Scenario A: **Electricity consumption from the grid.** The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any on-site captive power plant exits, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: **Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s).** One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario C: **Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s).** One or more fossil fuel fired captive power plants operate at the site of the electricity consumption source. The captive power plant(s) can provide electricity to the electricity consumption source. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumption source can be provided with electricity from the captive power plant(s) and the grid.

This tool is **not** applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO_2 emissions.

This tool also refers to the latest approved version of the following tools:

- "Tool to calculate the emission factor for an electricity system";
- "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

Parameters

This tool provides procedures to determine the following parameters:

Parameter	SI Unit	Description
$PE_{EC,y}$	tCO_2/yr	Project emissions from electricity consumption in year y
$BE_{EC,y}$	tCO_2/yr	Baseline emissions from electricity consumption in year y
$LE_{EC,y}$	tCO_2/yr	Leakage emissions from electricity consumption in year y

If the generic approach to calculate emissions from electricity consumption is used, the following data are required by this tool:[1]

Parameter	SI Unit	Description
$EC_{PJ,j,y}$	MWh/yr	Quantity of electricity consumed by the project electricity consumption source j in year y
$EC_{BL,k,y}$	MWh/yr	Quantity of electricity that would be consumed by the baseline electricity consumption source k in year y
$EC_{LE,l,y}$	MWh/yr	Net increase in electricity consumption of source l in year y as a result of leakage[2]

II. BASELINE METHODOLOGY PROCEDURE

Emissions from electricity consumption include CO_2 emissions from the combustion of fossil fuels at any power plants at the site(s) of electricity consumption and, if applicable, at power plants connected physically to the electricity system (grid) from which electricity is consumed.

Project participants should document transparently in the CDM-PDD and in monitoring reports which sources of electricity consumption are calculated with this tool and, for each source, which scenario (A, B or C, as described above) applies.

In the following, first a generic approach to calculate emissions from consumption of electricity is introduced. This approach can be used in all applicable scenarios (A, B or C). Then guidance on the determination of the emission factor for electricity generation is provided. Finally, simplified alternative

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[1] In some simplified approaches, this data is not required.

[2] A net increase of electricity consumption as a result of the CDM project activity should be reflected in a positive value for $EC_{LE,l,y}$. If electricity consumption decreases as a result of the CDM project activity, $EC_{LE,l,y}$ should be assumed as zero.

approaches to the generic approach are introduced. These simplified alternative approaches are only applicable to scenario B and to project and leakage emissions.

Generic approach

In the generic approach, project, baseline and leakage emissions from consumption of electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses, as follows:

$$PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$ **(1)**

$$BE_{EC,y} = \sum_{k} EC_{BL,k,y} \times EF_{EL,k,y} \times (1 + TDL_{k,y})$$ **(2)**

$$LE_{EC,y} = \sum_{l} EC_{LE,l,y} \times EF_{EL,l,y} \times (1 + TDL_{l,y})$$ **(3)**

Where:

$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (tCO$_2$/yr)
$BE_{EC,y}$	=	Baseline emissions from electricity consumption in year y (tCO$_2$/yr)
$LE_{EC,y}$	=	Leakage emissions from electricity consumption in year y (tCO$_2$/yr)
$EC_{PJ,j,y}$	=	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EC_{BL,k,y}$	=	Quantity of electricity that would be consumed by the baseline electricity consumption source k in year y (MWh/yr)
$EC_{LE,l,y}$	=	Net increase in electricity consumption of source l in year y as a result of leakage[2] (MWh/yr)
$EF_{EL,j,y}$	=	Emission factor for electricity generation for source j in year y (tCO$_2$/MWh)
$EF_{EL,k,y}$	=	Emission factor for electricity generation for source k in year y (tCO$_2$/MWh)
$EF_{EL,l,y}$	=	Emission factor for electricity generation for source l in year y (tCO$_2$/MWh)
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to source j in year y
$TDL_{k,y}$	=	Average technical transmission and distribution losses for providing electricity to source k in year y
$TDL_{l,y}$	=	Average technical transmission and distribution losses for providing electricity to source l in year y
j	=	Sources of electricity consumption in the project
k	=	Sources of electricity consumption in the baseline
l	=	Leakage sources of electricity consumption

Determination of the emission factor for electricity generation (EF$_{EL,j/k/l,y}$)

The determination of the emission factors for electricity generation (EF$_{EL,j/k/l,y}$) depends on which scenario (A, B or C) applies to the source of electricity consumption:

Scenario A: Electricity consumption from the grid

In this case, project participants may choose among the following options:

Option A1: Calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system" ($EF_{EL,j/k/l,y} = EF_{grid,CM,y}$).

Option A2: Use the following conservative default values:

- A value of 1.3 tCO_2/MWh if

    (a) Scenario A applies only to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources; or
    (b) Scenario A applies to: both baseline and project (and/or leakage) electricity consumption sources; <u>and</u> the electricity consumption of the project and leakage sources is <u>greater</u> than the electricity consumption of the baseline sources.

- A value of # tCO_2/MWh for electricity grids where hydro power plants constitute less than 50% of total grid generation in 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production, and a value of 0.25 tCO_2/MWh for other electricity grids. These values can be used if

    (a) Scenario A applies only to baseline electricity consumption sources but not to project or leakage electricity consumption sources ; or
    (b) Scenario A applies to: both baseline and project (and/or leakage) electricity consumption sources; <u>and</u> the electricity consumption of the baseline sources is <u>greater</u> than the electricity consumption of the project and leakage sources.

Scenario B: Electricity consumption from an off-grid captive power plant

In this case, project participants may choose among the following options:

Option B1: The emission factor for electricity generation is determined based on the CO_2 emissions from fuel combustion and the electricity generation in the captive power plant(s) installed at the site of the electricity consumption source. In case of plants that co-generate heat and power (cogeneration plants), project participants may

- Ignore, as a conservative assumption, the heat generation, if

    (a) The source of electricity consumption is a project or leakage electricity consumption source but not a baseline electricity consumption source; or
    (b) Electricity generated by the captive power plant is consumed by one or several project electricity consumption sources and one or several baseline electricity consumption sources; and, the electricity consumption by the project electricity consumption sources connected to the power plant is **greater** than the electricity consumption of the baseline electricity consumption sources connected to that power plant.

- Allocate the emissions of the captive power plant to heat and power, using an emissions credit for the co-product of heat. This credit is calculated by assuming that without cogeneration the heat would be generated in a boiler, using the same type of fossil fuel(s) that are used in the captive power plant. Note that this option requires determining the heat generation of the captive power plant(s).

In case where none of the captive power plants is a cogeneration plant or where the heat generation is ignored (subject to the conditions outlined above), the emission factor of the captive power plant(s) is calculated as follows:

$$EF_{EL,j/k/l,y} = \frac{\sum_n \sum_i FC_{n,i,t} \times NCV_{i,t} \times EF_{CO2,i,t}}{\sum_n EG_{n,t}}$$ (4)

Where:
$EF_{EL,j/k/l,y}$ = Emission factor for electricity generation for source j, k or l in year y (tCO$_2$/MWh)
$FC_{n,i,t}$ = Quantity of fossil fuel type i fired in the captive power plant n in the time period t (mass or volume unit)
$NCV_{i,t}$ = Average net calorific value of fossil fuel type i used in the period t (GJ / mass or volume unit)
$EF_{CO2,i,t}$ = Average CO$_2$ emission factor of fossil fuel type i used in the period t (tCO$_2$ / GJ)
$EG_{n,t}$ = Quantity of electricity generated in captive power plant n in the time period t (MWh)
i = are the fossil fuel types fired in captive power plant n in the time period t
j = Sources of electricity consumption in the project
k = Sources of electricity consumption in the baseline
l = Leakage sources of electricity consumption
n = Fossil fuel fired captive power plants installed at the site of the electricity consumption source j, k or l
t = Time period for which the emission factor for electricity generation is determined (see further guidance below)

In other cases the CO$_2$ emission factor for electricity generation is calculated by allocating the fuel consumption between electricity and heat generation, as follows:[3]

$$EF_{EL,j/k/l,y} = \frac{\sum_n \left[\sum_i \left(FC_{n,i,t} \times NCV_{i,t} \right) - \frac{HG_{n,t}}{\eta_{boiler}} \right] \times EF_{CO2,n,t}}{\sum_n EG_{n,t}}$$ (5)

Where:
$EF_{EL,j/k/l,y}$ = Emission factor for electricity generation for source j, k or l in year y (tCO$_2$/MWh)

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[3] Note that this equation can be applied to both cogeneration plants and power plants without cogeneration. In the latter case, the term $HG_{n,t}$ is zero.

$FC_{n,i,t}$	=	Quantity of fossil fuel type i fired in the captive power plant n in the time period t (mass or volume unit)
$NCV_{i,t}$	=	Average net calorific value of fossil fuel type i used in the period t (GJ / mass or volume unit)
$HG_{n,t}$	=	Quantity of heat co-generated in captive power plant n in the time period t (GJ)
η_{boiler}	=	Efficiency of the boiler in which heat is assumed to be generated in the absence of a cogeneration plant
$EF_{CO2,n,t}$	=	Average CO_2 emission factor of the fossil fuels fired in the captive power plant n in the time period t (tCO_2 / GJ)
$EG_{n,t}$	=	Quantity of electricity generated in captive power plant n in the time period t (MWh)
i	=	are the fossil fuel types fired in captive power plant n in the time period t
j	=	Sources of electricity consumption in the project
k	=	Sources of electricity consumption in the baseline
l	=	Leakage sources of electricity consumption
n	=	Fossil fuel fired captive power plants installed at the site of the electricity consumption source j, k or l
t	=	Time period for which the emission factor for electricity generation is determined (see further guidance below)

The time period t should correspond to

- The monitored period (e.g., the year y) for

    (a) Project and leakage electricity consumption sources;
    (b) Baseline electricity consumption sources if existing or new captive power plant(s) are operated during the monitored period at the site of the baseline or leakage electricity consumption source.[4]

- The most recent historical three years prior to the implementation of the project activity for baseline electricity consumption sources if no captive power plant is operated during the monitored period at the site of the baseline or leakage electricity consumption source.

The average CO_2 emission factor of the fossil fuels fired in the captive power plant n ($EF_{CO2,n,t}$) is determined as follows:

- In case of captive power plants that have only used one single fuel type since their start of operation, use the CO_2 emission factor of that fuel type ($EF_{CO2,n,t} = EF_{CO2,i}$);
- In the case of captive power plants that have used multiple fuel types since their start of operation, choose among the following options:[5]

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[4] In some cases, the captive power plant(s) at the site of a baseline or leakage electricity consumption source may stop their operation after the implementation of the project activity.

[5] These provisions aim to address the following issues:
(a) The provision avoids that emission reductions can be claimed for changing the fuel mix in the captive power plant. If project participants wish to credit emission reductions from switching the fuel mix in a captive power plant, a fuel switch methodology needs to be applied. The scope of this tool is not to claim emission reductions from fuel switches;
(b) The provisions aim to avoid the situation that project participants may face perverse incentives to use in their captive power plants fuel types with higher CO_2 emission factors. This may, for example, apply if a project activity saves electricity at a site where a dual fuel captive power plant is installed and operated by the project participants. In

(a) Use the fuel type with the highest or lowest – whatever is more conservative[6] – fossil fuel CO_2 emission factor ($EF_{CO2,i,t}$) among the fuel types that have been used in the period from three years prior to the start of the project activity or the start of the project activity – whatever is earlier – until the end of the monitored period in question;

(b) Calculate an average CO_2 emission factor for the period t, provided that the decision on the fuel mix is outside the control of the project participants (e.g., in the case of leakage electricity consumption sources or in cases where the fuel mix is fixed through mandatory regulations or determined by a centralized dispatch authority, as follows:

$$EF_{CO2,n,t} = \frac{\sum_i FC_{n,i,t} \times NCV_{i,t} \times EF_{CO2,i,t}}{\sum_i FC_{n,i,t} \times NCV_{i,t}} \tag{6}$$

Where:

$EF_{CO2,n,t}$	=	Average CO_2 emission factor of the fossil fuels fired in the captive power plant n in the time period t (tCO$_2$ / GJ)
$FC_{n,i,t}$	=	Quantity of fossil fuel type i fired in the captive power plant n in the time period t (mass or volume unit)
$NCV_{i,t}$	=	Average net calorific value of fossil fuel type i used in the period t (GJ / mass or volume unit)
$EF_{CO2,i,t}$	=	CO_2 emission factor of fossil fuel type i used in the time period t (tCO$_2$ / GJ)
i	=	are the fossil fuel types fired in captive power plant n in the time period t
n	=	Fossil fuel fired captive power plants installed at the site of the electricity consumption source j, k or l
t	=	Time period for which the emission factor for electricity generation is determined (see further guidance below)

(c) Calculate the average CO_2 emission factor, as per equation (6) above, for (a) the period of the most recent three years prior to the implementation of the project activity and for (b) the monitored period in question, and use the value that is more conservative.[6]

The selected approach should be documented in the CDM-PDD and, once selected, not be changed during the crediting period.

Option B2: Use the following conservative default values:

- A value of 1.3 tCO$_2$/MWh if

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this case, the use of a fuel type with a higher emission factor would, without these provisions, result in the issuance of more CERs.

[6] The more conservative value is the value that results in the lower overall emission reductions of the project activity. This may imply using the higher or the lower value, depending on the specific configuration of the project activity.

(a) The electricity consumption source is a project or leakage electricity consumption source; or

(b) The electricity consumption source is a baseline electricity consumption source; <u>and</u> the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is <u>less</u> than the electricity consumption of all project electricity consumption sources at the site of the captive power plant(s).

- A value of 0.4 tCO_2/MWh if

(a) The electricity consumption source is a baseline electricity consumption source; or

(b) The electricity consumption source is a project electricity consumption source <u>and</u> the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is **<u>greater</u>** than the electricity consumption of all project electricity consumption sources at the site of the captive power plant(s).

<u>Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s)</u>

Under this scenario, the consumption of electricity in the project, the baseline or as a source of leakage may result in different emission levels, depending on the situation of the project activity. The following three cases can be differentiated:

Case C.I: **Grid electricity.** The implementation of the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant. This applies, for example,

- If at all times during the monitored period the total electricity demand at the site of the captive power plant(s) is, both with the project activity and in the absence of the project activity, larger than the electricity generation capacity of the captive power plant(s); or
- If the captive power plant is operated continuously (apart from maintenance) and feeds any excess electricity into the grid, because the revenues for feeding electricity into the grid are above the plant operation costs; or
- If the captive power plant is centrally dispatched and the dispatch of the captive power plant is thus outside the control of the project participants.

Case C.II: **Electricity from captive power plant(s).** The implementation of the project activity is clearly demonstrated to only affect the quantity of electricity that is generated in the captive power plant(s) and does not affect the quantity of electricity supplied from the grid. This applies, for example, in the following situation: A fixed quantity of electricity is purchased from the grid due to physical transmission constraints, such as a limited capacity of the transformer that provides electricity to the relevant source. In this situation, case C.II would apply if the total electricity demand at the site of the captive power plant(s) is at all times during the monitored period, both with the project activity <u>and</u> in the absence of the project activity, larger than the quantity of the electricity that can physically be supplied by the grid.

Case C.III: **Electricity from both the grid and captive power plant(s).** The implementation of the project activity may affect both the quantity of electricity that is generated in the captive power plant(s) and the quantity of electricity supplied from the grid. This applies, for example,

- If the captive power plant(s) is/are not operating continuously; or

- If grid electricity is purchased during a part of the monitored period; or
- If electricity from the captive power plant is fed into the grid during a part of the monitored period.

Project participants should document in the CDM-PDD and in monitoring reports which case applies, justify why the case applies and provide the relevant evidence. The DOE should carefully evaluate the case. In the case of doubts, case C.III should be identified, as a conservative approach.

Where case C.I has been identified, the guidance for scenario A above should be applied (use option A1 or option A2). Where case C.II has been identified, the guidance for scenario B above should be applied (use option B1 or B2). Where case C.III has been identified, as a conservative simple approach, the emission factor for electricity generation should be the more conservative[6] value between the emission factor determined as per guidance for scenario A and B respectively. This means that the more conservative value should be chosen between a) the result of applying either option A1 or A2 and b) the result of applying either option B1 or B2.

Alternative approaches for project and/or leakage emissions

This section provides for alternative approaches to estimate project and/or leakage emissions. The approaches outlined below can be used if

   (a) Scenario B applies to a electricity consumption source; and
   (b) The electricity consumption source is a project or leakage source.

If these conditions apply, project participants may use the following alternative options to determine project and/or leakage emissions from electricity consumption:

Option B3:   Project or leakage emissions from consumption of electricity are determined by calculating the CO_2 emissions from <u>all</u> fuel combustion in the captive power plant. These emissions should be calculated using the latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". This option provides an accurate estimate if all the power generated by the captive power plant is consumed by the proposed CDM project activity. In other cases, this option can also be used; however note that it may result in overestimation of project and/or leakage emissions.

Option B4:   Project or leakage emissions from consumption of electricity are determined based on the rated capacity of the captive power plant(s), assuming, as a very conservative simplification, an emission factor of 1.3 tCO_2/MWh and an operation of 8,760 hours per year at the rated capacity, as follows:

$$PE_{EC,j,y} = 11,400 \frac{tCO_2}{MW} * PP_{CP,j} \tag{7}$$

$$LE_{EC,l,y} = 11,400 \frac{tCO_2}{MW} * PP_{CP,l} \tag{8}$$

Where:
$PE_{EC,j,y}$ = Project emissions from electricity consumption by source(s) j in year y

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\begin{aligned}
&\qquad\qquad\qquad (tCO_2 / yr)\\
LE_{EC,l,y} \quad &= \text{Leakage emissions from electricity consumption by source(s) } l \text{ in year } y\\
&\quad\ (tCO_2 / yr)\\
PP_{CP,j} \quad &= \text{Rated capacity of the captive power plant(s) that provide the project electricity}\\
&\quad\ \text{consumption source(s) } j \text{ with electricity (MW)}\\
PP_{CP,l} \quad &= \text{Rated capacity of the captive power plant(s) that provide the leakage electricity}\\
&\quad\ \text{consumption source(s) } l \text{ with electricity (MW)}\\
j \quad &= \text{Project electricity consumption sources that are supplied with power from}\\
&\quad\ \text{captive power plant(s) installed at one site}\\
l \quad &= \text{Leakage electricity consumption sources that are supplied with power from}\\
&\quad\ \text{captive power plant(s) installed at one site}
\end{aligned}
$$

Note that this option does not require monitoring any parameters. Note further that this option can be used to cover all project or leakage emissions sources that are supplied with captive power plant(s) installed at one site.

Parameters not monitored

Data / Parameter:	$PP_{CP,j}$ and $PP_{CP,l}$
Data unit:	MW
Description:	Rated capacity of the captive power plant(s) that provide the project or leakage consumption source(s) l or j with electricity
Source of data:	Name plate capacity of the captive power plant, manufacturer's specifications or catalogue references
Measurement procedures (if any):	-
Any comment:	In case of uncertainty a conservative value should be chosen

III.   MONITORING METHODOLOGY PROCEDURE

Monitoring procedures

Describe and specify in the CDM-PDD all monitoring procedures, including the type of measurement instrumentation used, the responsibilities for monitoring and QA/QC procedures that will be applied. Where the methodology provides different options (e.g. use of default values or on-site measurements), specify which option will be used. Meters should be installed, maintained and calibrated according to equipment manufacturer instructions and be in line with national standards, or, if these are not available, international standards (e.g. IEC, ISO).

All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data should be monitored if not indicated differently in the comments in the tables below.

Data and parameters monitored

Data / parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for the grid in year *y*
Source of data:	Calculate the combined margin emission factor, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system"
Measurement procedures (if any):	As per the "Tool to calculate the emission factor for an electricity system"
Monitoring frequency:	As per the "Tool to calculate the emission factor for an electricity system"
QA/QC procedures:	As per the "Tool to calculate the emission factor for an electricity system"
Any comment:	Only applicable to scenarios A and C (cases C.I and C.III)

Data / parameter:	$TDL_{j,y}$ and $TDL_{k,y}$ and $TDL_{l,y}$
Data unit:	-
Description:	Average technical transmission and distribution losses for providing electricity to source *j*, *k* or *l* in year *y*

Source of data:	In case of scenario B and scenario C, case C.II, assume $TDL_{j/k/l,y} = 0$ as a simplification. In case of other scenarios (scenario A and scenario C, cases C.I and C.III), choose one of the following options:
	• Use recent, accurate and reliable data available within the host country;
	• Use as default values of 20% for
	    (a) project or leakage electricity consumption sources;
	    (b) baseline electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is <u>larger</u> than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.
	• Use as default values of 3% for
	    (a) baseline electricity consumption sources;
	    (b) project and leakage electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is <u>smaller</u> than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.

Measurement procedures (if any):	For a): $TDL_{j/k/l,y}$ should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed CDM project activity is connected to. The technical distribution losses should not contain other types of grid losses (e.g. commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, network operators or other official documentation.
Monitoring frequency:	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
QA/QC procedures:	
Any comment:	

Data / parameter:	$FC_{n,i,t}$
Data unit:	Mass or (normalized) volume unit per year (in m³, ton or l)
Description:	Quantity of fossil fuel type i fired in the captive power plant n in the time period t
Source of data:	Annual data during the crediting period: Onsite measurements Historical data: Historical records / onsite measurements
Measurement procedures (if any):	Use weight or volume meters
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	Only applicable if option B1 is used.

Data / Parameter:	$EG_{n,t}$
Data unit:	MWh
Description:	Quantity of electricity generated in captive power plant n in the time period t
Source of data:	Onsite measurements
Measurement procedures (if any):	Use electricity meters
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	Cross check measurement results with records for sold electricity where relevant
Any comment:	Only applicable if option B1 is used

Data / parameter:	$HG_{n,t}$
Data unit:	GJ
Description:	Quantity of heat co-generated in captive power plant n in the period t
Source of data:	Onsite measurements
Monitoring frequency:	Use meters
Measurement procedures (if any):	Heat generation is determined as the difference of the enthalpy of the steam or hot water generated minus the enthalpy of the feed-water and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.
QA/QC procedures:	Cross check measurement results with records for sold heat and the other energy measurements where relevant.
Any comment:	Only applicable if option B1 is used and if heat generation is not ignored (subject to the conditions outlined above)

Data / parameter:	$\eta_{boiler,y}$
Data unit:	-
Description:	Efficiency of the boiler in which heat is assumed to be generated in the absence of a cogeneration plant
Source of data:	Choose among the following options: a) Measurement of the efficiency in the case that a heat-only boiler is installed and in operation at the site of the captive power plant(s) b) Assume a default value of 100% in case of a project or leakage emission source and 60% in case of a baseline emission source
Monitoring frequency:	a) Once at the start of the project activity b) Not applicable
Measurement procedures (if any):	a) Use national or international standards to determine the boiler efficiency b) Not applicable
QA/QC procedures:	-
Any comment:	Only applicable to option B1 and in cases where CO_2 emissions from cogeneration are allocated to heat and power

Data / parameter:	$NCV_{i,t}$
Data unit:	GJ / mass or volume unit
Description:	Average net calorific value of fossil fuel type i used in the period t
Source of data:	The following data sources may be used if the relevant conditions apply:

<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Values provided by the fuel supplier in invoices</td><td>This is the preferred source</td></tr>
<tr><td>b) Measurements by the project participants</td><td>If a) is not available</td></tr>
<tr><td>c) Regional or national default values</td><td>If a) is not available

These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper or lower limit – whatever is more conservative[6] – of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table>

Monitoring frequency:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average values for the period t should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards.
QA/QC procedures:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall out this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Only applicable if option B1 is used

Data / parameter:	$EF_{CO2,i,t}$
Data unit:	t CO_2 / GJ
Description:	CO_2 emission factor of fossil fuel type i used in the period t
Source of data:	The following data sources may be used if the relevant conditions apply: {table below}
Monitoring frequency:	For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average values for the period t should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, options b), c) or d) should be used.
QA/QC procedures:	
Any comment:	Only applicable if option B1 is used

Within "Source of data":

Data source	Conditions for using the data source
a) Values provided by the fuel supplier in invoices	This is the preferred source.
b) Measurements by the project participants	If a) is not available
c) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).
d) IPCC default values at the upper or lower limit – whatever is more conservative[6] – of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available

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History of the document

Version	Date	Nature of revision(s)
01	EB 39, Annex #, 16 May 2008	To be considered at EB 39