Draft revision to the approved consolidated baseline and monitoring methodology ACM0002

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

I. SOURCE, DEFINITIONS AND APPLICABILITY

Sources

This consolidated baseline and monitoring methodology is based on elements from the following proposed new methodologies:

- NM0001-rev: Vale do Rosario Bagasse Cogeneration (VRBC) project in Brazil whose Baseline study, Monitoring and Verification Plan and Project Design Document were prepared by Econergy International Corporation;
- NM0012-rev: Wigton Wind Farm Project in Jamaica whose Baseline study, Monitoring and Verification Plan and Project Design Document were prepared by Ecosecurities ltd;
- NM0023: El Gallo Hydroelectric Project, Mexico whose Baseline study, Monitoring and Verification Plan and Project Design Document were prepared by Prototype Carbon Fund (approved by the CDM Executive Board on 14 April 2004);
- NM0024-rev: Colombia: Jepirachi Windpower Project whose Baseline study, Monitoring and Verification Plan and Project Design Document were prepared by Prototype Carbon Fund;
- NM0030-rev: Haidergarh Bagasse Based Co-generation Power Project in India whose Baseline study, Monitoring and Verification Plan and Project Design Document was submitted by Haidergarh Chini Mills, a unit of Balrampur Chini Mills Limited;
- NM0036: Zafarana Wind Power Plant Project in the Arab Republic of Egypt whose Baseline study, Monitoring and Verification Plan and Project Design Document were prepared by Mitsubishi Securities;
- NM0043: Bayano Hydroelectric Expansion and Upgrade Project in Panama whose Baseline study, Monitoring and Verification Plan and Project Design Document were prepared by Econergy International Corporation;
- NM0055: Darajat Unit III Geothermal Project in Indonesia whose Baseline study, Monitoring and Verification Plan and Project Design Document were prepared by URS Corporation and Amoseas Indonesia Inc.

This methodology also refers to the latest approved versions of the following tools:

- Tool to calculate the emission factor for an electricity system;
- Tool for the demonstration and assessment of additionality;
- Combined tool to identify the baseline scenario and demonstrate additionality;
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion.

For more information regarding the proposed new methodologies and the tools as well as their consideration by the Executive Board please refer to <http://cdm.unfccc.int/goto/MPappmeth>.

Selected approach from paragraph 48 of the CDM modalities and procedures

"Existing actual or historical emissions, as applicable".

or

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

Definitions

For the purpose of this methodology, the following definitions apply:

~~**Power plant/unit.** A power plant / unit[1] is a facility for the generation of electric power. Several power units at one site comprise one power plant, whereby a power unit characterizes that it can be operated independently of the other power units at the same site. Where several identical power units (i.e. with the same capacity, age and efficiency) are installed at one site, they may be considered as one single power unit.~~

Installed power generation capacity (or installed capacity or nameplate capacity). The installed power generation capacity of a power unit is the capacity, expressed in Watts or one of its multiples, for which the power unit has been designed to operate at nominal conditions. The installed power generation capacity of a power plant is the sum of the installed power generation capacities of its power units.

~~**Electricity capacity addition.** An electricity capacity addition is an increase in the installed power generation capacity of an electricity system which either results from the installation of a new power plant or from the installation of additional power units at an existing power plant.~~

Capacity addition. A capacity addition is an increase in the installed power generation capacity of an existing power plant through: (i) the installation of a new power plant beside the existing power plant/units, or (ii) the installation of new power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.

~~**Modification and retrofit.** A modification or retrofit of an existing electricity generation plant/unit is a change that leads to an electricity capacity addition.~~

~~**Net electricity generation.** Net electricity generation is the difference between the total quantity of electricity generated by the power plant/unit and the auxiliary electricity consumption of the power plant/unit (e.g. for pumps, vans, controlling, etc).~~

~~**Grid/project electricity system.** Grid/project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.~~

[1] ~~The following are examples of power units: an hydro-turbine connected to an electricity generator (hydro-generator set), a steam turbine connected to an electricity generator (steam-generator set), a gas turbine connected to an electricity generator (gas-generator set), an internal combustion engine connected to an electricity generator (engine-generator set), a wind mill connected to an electricity generator (wind-generator set) etc.~~

Retrofit (or Rehabilitation or Refurbishment). A retrofit is an investment to repair or modify an existing power plant/unit, with the purpose to increase the efficiency, performance or power generation capacity of the plant, without adding new power plants or units, or to resume the operation of closed (mothballed) power plants. A retrofit restores the installed power generation capacity to or above its original level. Retrofits shall only include measures that involve capital investments and not regular maintenance or housekeeping measures.

Replacement. Investment in a new power plant or unit that replaces one or several existing unit(s) at the existing power plant. The new power plant or unit has the same or a higher power generation capacity than the plant or unit that was replaced.

In addition, the definitions in the latest approved version of the "Tool to calculate the emission factor for an electricity system" apply.

Applicability

This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s). ~~involve electricity and capacity additions.~~

The methodology is applicable under the following conditions:

- The project activity is the installation, ~~or modification/retrofit of a~~, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;
- In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;
- In case of hydro power plants, one of the following conditions must apply:
    - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or
    - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or
    - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.

- ~~The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available;~~
- ~~Applies to grid connected electricity generation from landfill gas to the extent that it is combined with the approved "Consolidated baseline methodology for landfill gas project activities" (ACM0001); and~~

- ~~5 years of historical data (or 3 years in the case of non hydro project activities) have to be available for those project activities where modification/retrofit measures are implemented in an existing power plant.[2]~~

The methodology is not applicable to the following:

- Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;
- Biomass fired power plants;
- Hydro power plants[3] that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.

In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".

In addition, the applicability conditions included in the tools referred to above apply.[4]

II. BASELINE METHODOLOGY PROCEDURE

Identification of the baseline scenario

If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

> Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

If the project activity is ~~the modification/retrofit of an~~ a capacity addition to existing grid-connected renewable power plant/unit, the baseline scenario is the following:

> In the absence of the CDM project activity, the existing facility would continue to ~~provide~~ supply electricity to the grid at historical levels, until the time at which the generation facility would likely be replaced or retrofitted ($DATE_{BaselineRetrofit}$). From that point of time onwards, the baseline scenario is

[2] ~~If 5 years of historical data (or 3 years in case of non hydro project activities) are not available, e.g. due to recent retrofits or exceptional circumstances, project participants may request a revision to the approved consolidated methodology or submit a new methodology.~~

[3] Project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

[4] The condition in the "Combined tool to identify the baseline scenario and demonstrate additionality" that all potential alternative scenarios to the proposed project activity must be available options to project participants does not apply to this methodology, as this methodology only refers to some steps of this tool.

assumed to correspond to the project activity, and no emission reductions are assumed to occur. ~~electricity to the grid ($EG_{baseline}$, in MWh/year) at historical average levels ($EG_{historical}$, in MWh/year), until the time at which the generation facility would likely be replaced or retrofitted ($DATE_{BaselineRetrofit}$). From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline electricity production ($EG_{baseline}$) is assumed to equal project electricity production (EG_y, in MWh/year), and no emission reductions are assumed to occur.~~

If the project activity is the retrofit or replacement of existing grid-connected renewable power plant/unit(s) at the project site, the following step-wise procedure to identify the baseline scenario shall be applied:

Step 1: Identify realistic and credible alternative baseline scenarios for power generation

Apply Step 1 of the "Combined tool to identify the baseline scenario and demonstrate additionality". The options considered should include:

P1: The project activity not implemented as a CDM project;

P2: The continuation of the current situation, i.e. to use all power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance. The additional power generated under the project would be generated in existing and new grid-connected power plants in the electricity system; and

P3: All other plausible and credible alternatives to the project activity that provide an increase in the power generated at the site, which are technically feasible to implement. This includes, inter alia, different levels of replacement and/or retrofit at the power plant/unit(s). Only alternatives available to project participants should be taken into account.

Step 2: Barrier analysis

Apply Step 2 of the "Combined tool to identify the baseline scenario and demonstrate additionality".

Step 3: Investment analysis

If this option is used, apply the following:

- Apply an investment comparison analysis, as per step 3 of the "Combined tool to identify the baseline scenario and demonstrate additionality", if more than one alternative is remaining after Step 2 and if the remaining alternatives include scenarios P1 and P3;
- Apply a benchmark analysis, as per Step 2b of the "Tool for the demonstration and assessment of additionality", if more than one alternative is remaining after Step 2 and if the remaining alternatives include scenarios P1 and P2.

Additionality

The additionality of the project activity shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the CDM Executive Board, which is available on the UNFCCC CDM website.

Project boundary

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system[5] that the CDM project power plant is connected to.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table 1.

Table 1: Emissions sources included in or excluded from the project boundary

	Source	Gas	Included ?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam.	CO_2	Yes	Main emission source.
		CH_4	Yes	Main emission source.
		N_2O	No	Minor emission source.
	~~For geothermal and solar power plants, CO_2 emissions from combustion of fossil fuels required to operate the power plants.~~	~~CO_2~~	~~Yes~~	~~Main emission source.~~
		~~CH_4~~	~~No~~	~~Minor emission source.~~
		~~N_2O~~	~~No~~	~~Minor emission source.~~
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	Yes	Main emission source.
		N_2O	No	Minor emission source.
	~~For all renewable energy plants, CO2 emissions from backup power generation.~~	~~CO_2~~	~~Yes~~	~~Main emission source.~~
		~~CH_4~~	~~No~~	~~Minor emission source.~~
		~~N_2O~~	~~No~~	~~Minor emission source.~~

Project emissions

For most renewable power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation: ~~for following categories of project activities, project emissions have to be considered.~~

[5] Refer to the latest approved version of the "Tool to calculate the emission factor for an electricity system" for definition of an electricity system.

~~*Backup Power*~~

~~Back-up power project emissions for all renewable energy plants should be calculated in accordance with the equation 1, where~~ $\cancel{PE_{FC,j,y}}$ ~~represents the CO2 emissions due to fossil fuel consumption in the year~~ $\cancel{y}$ ~~for the operation of the backup power equipment.~~

~~*Solar Power plants*~~

~~For solar project activities, project participants shall account for the CO2 emissions resulting from combustion of fossil fuels related to the operation of the solar power plant, where applicable. Project emissions are calculated as follows:~~

$$\cancel{PE_y = PE_{FC,j,y}} \tag*{~~(1)~~}$$

~~Where:~~

$\cancel{PE_y}$	=	~~Project emissions in year~~ $\cancel{y}$ ~~(~~$\cancel{tCO_2/yr}$~~)~~
$\cancel{PE_{FC,j,y}}$	=	~~CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2/yr). This parameter shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" where *j* stands for the processes required for the operation of the solar power plant~~

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \tag{1}$$

Where:

PE_y	=	Project emissions in year y (tCO_2e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year y (tCO_2/yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year y (tCO_2e/yr)

The procedure to calculate the project emissions from each of these sources is presented next.

~~*Geothermal power plants*~~

~~For geothermal project activities, project participants shall account the following emission sources, where applicable: fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam; and, carbon dioxide emissions resulting from combustion of fossil fuels related to the operation of the geothermal power plant[6 7]. Project emissions are calculated as follows:~~

~~[6] Fugitive carbon dioxide and methane emissions due to well testing and well bleeding are not considered, as they are negligible.~~

~~[7] In the case of retrofit projects at geothermal plants, this methodology does not currently subtract baseline emissions from steam components or fossil fuel combustion. Project proponents are welcome to propose new methodologies or methodology revisions to address these baseline emissions.~~

Fossil Fuel Combustion ($PE_{FF,y}$)

For geothermal and solar thermal projects, which also use fossil fuels for electricity generation, CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$).

$PE_{FF,y}$ shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

Emissions of non-condensable gases from the operation of geothermal power plants ($PE_{GP,y}$)

For geothermal project activities, project participants shall account fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam.[8,9] Non-condensable gases in geothermal reservoirs usually consist mainly of CO_2 and H_2S. They also contain a small quantity of hydrocarbons, including predominantly CH_4. In geothermal power projects, non-condensable gases flow with the steam into the power plant. A small proportion of the CO_2 is converted to carbonate / bicarbonate in the cooling water circuit. In addition, parts of the non-condensable gases are reinjected into the geothermal reservoir. However, as a conservative approach, this methodology assumes that all non-condensable gases entering the power plant are discharged to atmosphere via the cooling tower. Fugitive carbon dioxide and methane emissions due to well testing and well bleeding are not considered, as they are negligible.

$PE_{GP,y}$ is calculated as follows:

$$\cancel{PE_y = PES_y + PEFF_y} \qquad \cancel{(2)}$$

~~Where:~~

~~PE_y~~	~~=~~	~~Project emissions in year y (tCO_2/yr)~~
~~PES_y~~	~~=~~	~~Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant in year y (tCO_2/yr)~~
~~$PEFF_y$~~	~~=~~	~~Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO_2/yr)~~

$$PE_{GP,y} = \left(w_{steam,CO2,y} + w_{steam,CH4,y} \cdot GWP_{CH4}\right) \cdot M_{steam,y} \qquad (2)$$

Where:

$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$w_{steam,CO2,y}$	=	Average mass fraction of carbon dioxide in the produced steam in year *y* (tCO_2/t steam)
$w_{steam,CH4,y}$	=	Average mass fraction of methane in the produced steam in year *y* (tCH_4/t steam)

[8] ~~Fugitive carbon dioxide and methane emissions due to well testing and well bleeding are not considered, as they are negligible.~~

[9] In the case of retrofit or replacement projects at geothermal plants, this methodology does not account for baseline emissions from release of non-condensable gases from produced steam or fossil fuel combustion. Project proponents are welcome to propose revisions to this methodology to account for these baseline emissions.

GWP_{CH4}	=	Global warming potential of methane valid for the relevant commitment period (tCO_2e/tCH_4)
$M_{steam,y}$	=	Quantity of steam produced in year *y* (t steam/yr)

~~Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant is calculated as:~~

$$\cancel{PES_y = \left(w_{Main,CO2} + w_{Main,CH4} \cdot GWP_{CH4}\right) \cdot M_{S,y}} \quad (\cancel{3})$$

~~Where:~~

~~PES_y~~	=	~~Project emissions due to release of carbon dioxide and methane from the produced steam in the geothermal power plant in year *y* (tCO_2/yr)~~
~~$w_{Main,CO2}$~~	=	~~Average mass fraction of carbon dioxide in the produced steam (non-dimensional).~~
~~$w_{Main,CH4}$~~	=	~~Average mass fraction of methane in the produced steam (non-dimensional)~~
~~GWP_{CH4}~~	=	~~Global warming potential of methane valid for the relevant commitment period (tCO_2e/tCH_4)~~
~~$M_{S,y}$~~	=	~~Quantity of steam produced during the year *y* (tonnes)onnes/yr~~

~~Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant is calculated as:~~

$$\cancel{PEFF_y = PE_{FC,j,y}} \quad (\cancel{4})$$

~~Where:~~

~~$PEFF_y$~~	=	~~Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year *y* (tCO_2/yr)~~
~~$PE_{FC,j,y}$~~	=	~~CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2/yr). This parameter shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" where *j* stands for the processes required for the operation of the geothermal power plant~~

~~Hydro power plants~~ Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

For hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir, ~~project emissions,~~ estimated as follows:

(a) If the power density of the project activity (*PD*) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000} \quad (3)$$

Where:

$PE_{HP,y}$	=	Project emissions from water reservoirs (tCO_2e/yr)
EF_{Res}	=	Default emission factor for emissions from reservoirs of hydro power plants in year *y* ($kgCO_2e/MWh$)
TEG_y	=	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh)

(b) If the power density of the project activity (*PD*) is greater than 10 W/m^2:

$$PE_{HP,y} = 0 \tag{4}$$

The power density of the project activity (*PD*) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \tag{5}$$

Where:

PD	=	Power density of the project activity (W/m^2)
Cap_{PJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity (W)
Cap_{BL}	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
A_{PJ}	=	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	=	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

Baseline emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$\cancel{BE_y = \left(EG_y - EG_{baseline}\right) \cdot EF_{grid,CM,y}}$$

~~Where:~~

~~BE_y~~	~~=~~	~~Baseline emissions in year *y* (tCO_2/yr)~~
~~EG_y~~	~~=~~	~~Electricity supplied by the project activity to the grid (MWh)~~
~~$EG_{baseline}$~~	~~=~~	~~Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero~~
~~$EF_{grid,CM,y}$~~	~~=~~	~~Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"~~

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad (6)$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ is different for (a) greenfield plants, (b) retrofits and replacements, and (c) capacity additions. These cases are described next:

(a) Greenfield renewable energy power plants

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility,y} \quad (7)$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

~~The methodology assumes that all project electricity generation above baseline levels ($EG_{baseline}$) would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in EF_y.~~

~~*Calculation of $EG_{baseline}$*~~

~~If the project activity is the installation of a new grid-connected renewable power plant/unit:~~

$$\cancel{EG_{baseline} = 0} \quad \cancel{(8)}$$

~~If the project activity is the installation of additional power units at an existing grid-connected renewable power plant:~~

$$\cancel{EG_{baseline} = MAX\left(EG_{historical}, EG_{existing,y}\right), \text{ until } DATE_{BaselineRetrofit}} \quad \cancel{(9)}$$

$$\cancel{EG_{baseline} = EG_y, \text{ on/after } DATE_{BaselineRetrofit}} \quad \cancel{(10)}$$

~~Where:~~

~~$EG_{baseline}$~~	~~=~~	~~Baseline electricity supplied to the grid in the case of modified or retrofit~~

		~~facilities (MWh)~~
~~$EG_{existing,y}$~~	=	~~The actual, measured electricity production of the existing units in year y (MWh)~~
~~$EG_{historical}$~~	=	~~Average of historical electricity delivered by the existing facility to the grid (MWh)~~
~~EG_y~~	=	~~Electricity supplied by the project activity to the grid (MWh).~~
~~$DATE_{BaselineRetrofit}$~~	=	~~Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)~~

(b) Retrofit or replacement of an existing renewable energy power plant

If the project activity is the retrofit or replacement of an existing grid-connected renewable power plant, the baseline scenario is the continuation of the operation of the existing plant. The methodology uses historical electricity generation data to determine the electricity generation by the existing plant in the baseline scenario, assuming that the historical situation observed prior to the implementation of the project activity would continue.

The power generation of renewable energy projects can vary significantly from year to year, due to natural variations in the availability of the renewable source (e.g. varying rainfall, wind speed or solar radiation). The use of few historical years to establish the baseline electricity generation can therefore involve a significant uncertainty. The methodology addresses this uncertainty by adjusting the historical electricity generation by its standard deviation. This ensures that the baseline electricity generation is established in a conservative manner and that the calculated emission reductions are attributable to the project activity. Without this adjustment, the calculated emission reductions could mainly depend on the natural variability observed during the historical period rather than the effects of the project activity.[10]

$EG_{PJ,y}$ is calculated as follows:

$$EG_{PJ,y} = EG_{facility,y} - (EG_{historical} + \sigma_{historical})\text{; until } DATE_{BaselineRetrofit} \qquad \textbf{(8)}$$

and

$$EG_{PJ,y} = 0\text{; on/after } DATE_{BaselineRetrofit} \qquad \textbf{(9)}$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)
$EG_{historical}$	=	Annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh/yr)

[10] As an alternative approach for hydropower plants, the baseline electricity generation could be established as a function of the water availability. In this case, the baseline electricity generation would be established ex-post based on the water availability monitored during the crediting period. Project participants are encouraged to consider such approaches and submit the related request for a revision to this methodology.

$\sigma_{historical}$	=	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh/yr)
$DATE_{BaselineRetrofit}$	=	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

~~*Calculation of $EG_{historical}$*~~

~~*$EG_{historical}$* is the average of historical electricity delivered by the existing facility to the grid, spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e., by 5% or more), expressed in MWh per year. A minimum of 5 years (120 months) (excluding abnormal years) of historical generation data is required in the case of hydro facilities. For other facilities, a minimum of 3 years data is required. Data for periods affected by unusual circumstances such as natural disasters, conflicts, transmission constraints shall be excluded.~~

$EG_{historical}$ is the annual average of historical net electricity generation, delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity. To determine $EG_{historical}$, project participants may choose between two historical periods. This allows some flexibility: the use of the longer time period may result in a lower standard deviation and the use of the shorter period may allow a better reflection of the (technical) circumstances observed during the more recent years.

Project participants may choose among the following two time spans of historical data to determine $EG_{historical}$:

(a) The five last calendar years prior to the implementation of the project activity; or
(b) The time period from the calendar year following $DATE_{hist}$, up to the last calendar year prior to the implementation of the project, as long as this time span includes at least five calendar years, where $DATE_{hist}$ is latest point in time between:
    (i) The commercial commissioning of the plant/unit;
    (ii) If applicable: the last capacity addition to the plant/unit; or
    (iii) If applicable: the last retrofit of the plant/unit.

(c) Capacity addition to an existing renewable energy power plant

In the case of hydro or geothermal power plants, the addition of a new power plant or unit may significantly affect the electricity generated by the existing plant(s) or unit(s). For example, a new hydro turbine installed at an existing dam may affect the power generation by the existing turbines. Therefore, the same approach as for retrofits and replacements is used for hydro power plants and geothermal power plants.

In the case of wind, solar, wave or tidal power plants, it is assumed that the addition of new capacity does not significantly affect the electricity generated by existing plant(s) or unit(s).[11] In this case, the electricity fed into the grid by the added power plant(s) or unit(s) could be directly metered and used to determine $EG_{PJ,y}$.

If the project activity is a capacity addition, project participants may use one of the following two options to determine $EG_{PJ,y}$:

Option 1: Use the approach applied to retrofits and replacements above. $EG_{facility,y}$ corresponds to the total electricity generation of the existing plant(s) or unit(s) and the added plant(s) or unit(s). A separate metering of electricity fed into the grid by the added plant(s) or unit(s) is not necessary under this option. This option may be applied to all renewable power projects.

Option 2: For wind, solar, wave or tidal power plant(s) or unit(s), the following approach can be used provided that the electricity fed into the grid by the added power plant(s) or unit(s) addition is separately metered:

$$EG_{PJ,y} = EG_{PJ\_Add,y} \tag{10}$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EG_{PJ\_Add,y}$	=	Quantity of net electricity generation supplied to the grid in year *y* by the project plant/unit that has been added under the project activity (MWh/yr)

Project participants should document in the CDM-PDD which option is applied.

Calculation of $DATE_{BaselineRetrofit}$

In order to estimate the point in time when the existing equipment would need to be replaced/retrofitted in the absence of the project activity ($DATE_{BaselineRetrofit}$), project participants may take the following approaches into account:

(a) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.
(b) The common practices of the responsible company regarding replacement/retrofitting schedules may be evaluated and documented, e.g. based on historical replacement/retrofitting records for similar equipment.

[11] In this case of wind power capacity additions, some shadow effects can occur but are not accounted under this methodology.

The point in time when the existing equipment would need to be replaced/retrofitted in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.

Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). T hese emissions sources are neglected.
~~The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects – see applicability conditions above). Project participants do not need to consider these emission sources as leakage in applying this methodology. Project activities using this baseline methodology shall not claim any credit for the project on account of reducing these emissions below the level of the baseline scenario.~~

Emission reductions

Emission reductions are calculated as follows:

$$\cancel{ER_y = BE_y - PE_y - LE_y}$$

$$\mathrm{ER_y = BE_y - PE_y} \quad \textbf{(11)}$$

Where:

ER_y	=	Emission reductions in year *y* (t CO_2e/yr)
BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
PE_y	=	Project emissions in year *y* (t CO_2e/yr)
~~LE_y~~	~~=~~	~~Leakage emissions in year *y* (t CO_2/yr)~~

Estimation of emissions reductions prior to validation

Project participants should prepare as part of the CDM-PDD an estimate of likely emission reductions for the proposed crediting period. This estimate should, in principle, employ the same methodology as selected above. Where the grid emission factor ($EF_{CM,grid,y}$) is determined *ex-post* during monitoring, project participants may use models or other tools to estimate the emission reductions prior to validation.

Changes required for methodology implementation in 2nd and 3rd crediting periods

At the start of the second and third crediting period project proponents have to address two issues:

- Assess the continued validity of the baseline; and
- Update the baseline.

In assessing the continued validity of the baseline, a change in the relevant national and/or sectoral regulations between two crediting periods has to be examined at the start of the new crediting period. If at the start of the project activity, the project activity was not mandated by regulations, but at the start of the second or third crediting period regulations are in place that enforce the practice or norms or technologies that are used by the project activity, the new regulation (formulated after the registration of the project activity) has to be examined to determine if it applies to existing plants or not. If the new regulation applies to existing CDM project activities, the baseline has to be reviewed and, if the regulation is binding, the baseline for the project activity should take this into account. This assessment will be undertaken by the verifying DOE.

For updating the baseline at the start of the second and third crediting period, new data available will be used to revise the baseline scenario and emissions. Project participants shall assess and incorporate the impact of new regulations on baseline emissions.

Data and parameters not monitored

In addition to the parameters listed in the tables below, the provisions on data and parameters not monitored in the tools referred to in this methodology apply.

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential of methane valid for the relevant commitment period
Source of data:	IPCC
Value to be applied:	For the first commitment period: 21 tCO_2e/tCH_4
Any comment:	-

Data / Parameter:	~~$EG_{historical}$~~
Data unit:	~~MWh~~
Description:	~~Average of historical electricity delivered by the existing facility to the grid~~
Source of data:	~~Project activity site~~
Measurement procedures (if any):	~~Calculate as the average of historical electricity delivered by the existing facility to the grid, spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e., by 5% or more), expressed in MWh per year.~~ ~~A minimum of 5 years (120 months) (excluding abnormal years) of historical generation data is required in the case of hydro facilities. For other facilities, a minimum of 3 years data is required. Data for periods affected by unusual circumstances such as natural disasters, conflicts, transmission constraints shall be excluded.~~ ~~In the case that 5 years of historical data (or three years in the case of non hydro project activities) are not available -- e.g., due to recent retrofits or exceptional circumstances as described in footnote 2 -- a new methodology or methodology revision must be proposed.~~
Any comment:	~~-~~

Data / Parameter:	$EG_{historical}$
Data unit:	MWh/yr
Description:	Annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity
Source of data:	Project activity site
Measurement procedures (if any):	Electricity meters
Any comment:	-

Data / Parameter:	$\sigma_{historical}$
Data unit:	MWh/yr
Description:	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity
Source of data:	Calculated from data used to establish $EG_{historical}$
Measurement procedures (if any):	Parameter to be calculated as the standard deviation of the annual generation data used to calculate $EG_{historical}$ for retrofit or replacement project activities
Any comment:	-

Data / Parameter:	~~$DATE_{BaselineRetrofit}$~~
Data unit:	~~date~~
Description:	~~Point in time when the existing equipment would need to be replaced in the absence of the project activity~~
Source of data:	~~Project activity site~~
Measurement procedures (if any):	~~In order to estimate the point in time when the existing equipment would need to be replaced in the absence of the project activity, project participants may take the following approaches into account:~~ ~~a) The typical average technical lifetime of the type equipment may be determined and documented, taking into account common practices in the sector and country, e.g. based on industry surveys, statistics, technical literature, etc.~~ ~~b) The common practices of the responsible company regarding replacement schedules may be evaluated and documented, e.g. based on historical replacement records for similar equipment.~~ ~~The point in time when the existing equipment would need to be replaced in the absence of the project activity should be chosen in a conservative manner, i.e. if a range is identified, the earliest date should be chosen.~~
Any comment:	~~-~~

Data / Parameter:	$DATE_{BaselineRetrofit}$
Data unit:	date
Description:	Point in time when the existing equipment would need to be replaced in the absence of the project activity
Source of data:	Project activity site
Measurement procedures (if any):	As per provisions in the methodology above
Any comment:	-

Data / Parameter:	$DATE_{hist}$
Data unit:	date
Description:	Point in time from which the time span of historical data for retrofit or replacement project activities may start
Source of data:	Project activity site
Measurement procedures (if any):	$DATE_{hist}$ is the latest point in time between: (i) The commercial commissioning of the plant/unit; (ii) If applicable: the last capacity addition to the plant/unit; or (iii) If applicable: the last retrofit of the plant.
Any comment:	-

Data / Parameter:	EF_{Res}
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emissions from reservoirs
Source of data:	Decision by EB23
Value to be applied:	90 $kgCO_2e/MWh$
Any comment:	-

Data / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity. For new hydro power plants, this value is zero
Source of data:	Project site
Measurement procedures (if any):	Determine the installed capacity based on recognized standards
Any comment:	-

Data / Parameter:	A_{BL}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.
Source of data:	Project site
Measurement procedures (if any):	Measured from topographical surveys, maps, satellite pictures, etc.
Any comment:	-

III. MONITORING METHODOLOGY

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 otherwise in the tables below. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

In addition, the monitoring provisions in the tools referred to in this methodology apply.

Data and parameters monitored

Data / Parameter:	$w_{steam,CO2,y}$
Data unit:	tCO_2/t steam
Description:	Average mass fraction of carbon dioxide in the produced steam in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	~~Non-condensable gases in geothermal reservoirs usually consist mainly of CO_2 and H_2S. They also contain a small quantity of hydrocarbons, including predominantly CH_4. In geothermal power projects, non-condensable gases flow with the steam into the power plant. A small proportion of the CO_2 is converted to carbonate / bicarbonate in the cooling water circuit. In addition, parts of the NCGs are reinjected into the geothermal reservoir. However, as a conservative approach, this methodology assumes that all NCGs entering the power plant are discharged to atmosphere via the cooling tower.~~ Non-condensable gases sampling should be carried out in production wells and at the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single phase steam only). The CO_2 and CH_4 sampling and analysis procedure consists of collecting non-condensable gases samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. Hydrogen sulphide (H_2S) and carbon dioxide (CO_2) dissolve in the solvent while the residual compounds remain in their gaseous phase. The gas portion is then analyzed using gas chromatography to determine the content of the residuals including CH_4. All alkanes concentrations are reported in terms of methane ~~The non-condensable gases sampling and analysis should be performed at least every three months and more frequently, if necessary.~~

Monitoring frequency:	~~Every 3 months~~ At least every 3 months and more frequently, if necessary
QA/QC procedures:	-
Any comment:	Applicable to geothermal power projects

Data / Parameter:	$w_{steam,CH4,y}$ ~~$w_{Main,CH4}$~~
Data unit:	tCH_4/t steam
Description:	Average mass fraction of methane in the produced steam in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	~~Non-condensable gases in geothermal reservoirs usually consist mainly of CO_2 and H_2S. They also contain a small quantity of hydrocarbons, including predominantly CH_4. In geothermal power projects, non-condensable gases flow with the steam into the power plant. A small proportion of the CO_2 is converted to carbonate / bicarbonate in the cooling water circuit. In addition, parts of the NCGs are reinjected into the geothermal reservoir. However, as a conservative approach, this methodology assumes that all NCGs entering the power plant are discharged to atmosphere via the cooling tower.~~ ~~Non-condensable gases sampling should be carried out in production wells and at the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single phase steam only). The CO_2 and CH_4 sampling and analysis procedure consists of collecting non-condensable gases samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. Hydrogen sulphide (H_2S) and carbon dioxide (CO_2) dissolve in the solvent while the residual compounds remain in their gaseous phase. The gas portion is then analyzed using gas chromatography to determine the content of the residuals including CH_4. All alkanes concentrations are reported in terms of methane. The non-condensable gases sampling and analysis should be performed at least every three months and more frequently, if necessary.~~ As per the procedures outlined for $w_{steam,CO2,y}$
Monitoring frequency:	~~Every 3 months~~ As per the procedures outlined for $w_{steam,CO2,y}$
QA/QC procedures:	-
Any comment:	Applicable to geothermal power projects

Data / Parameter:	~~$M_{S,y}$~~
Data unit:	~~tonnes~~
Description:	~~Quantity of steam produced during the year *y*~~
Source of data:	~~Project activity site~~
Measurement procedures (if any):	~~The steam quantity discharged from the geothermal wells should be measured with a venture flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the venture meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on international standards. The measurement results should be summarized transparently in regular production reports~~
Monitoring frequency:	~~Daily~~
QA/QC procedures:	~~-~~
Any comment:	~~-~~

Data / Parameter:	$M_{steam,y}$
Data unit:	t steam/yr
Description:	Quantity of steam produced in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	The steam quantity discharged from the geothermal wells should be measured with a venture flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the venture meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on international standards. The measurement results should be summarized transparently in regular production reports
Monitoring frequency:	Daily
QA/QC procedures:	-
Any comment:	Applicable to geothermal power projects

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	Electricity meters
Monitoring frequency:	Continuous measurement and at least monthly recording
QA/QC procedures:	Cross check measurement results with records for sold electricity
Any comment:	-

Data / Parameter:	$EG_{PJ\_Add,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied to the grid in year y by the project plant/unit that has been added under the project activity
Source of data:	Project activity site
Measurement procedures (if any):	-
Monitoring frequency:	Continuous measurement and at least monthly recording
QA/QC procedures to be applied:	-
Any comment:	Applicable to wind, solar, wave or tidal power plant(s) or unit(s), provided that option 2 in the baseline methodology is applied

Data / Parameter:	~~EG_y~~
Data unit:	~~MWh~~
Description:	~~Electricity supplied by the project activity to the grid~~
Source of data:	~~Project activity site~~
Measurement procedures (if any):	~~-~~
Monitoring frequency:	~~Hourly measurement and monthly recording~~
QA/QC procedures:	~~Electricity supplied by the project activity to the grid. Double check by receipt of sales~~
Any comment:	~~-~~

Data / Parameter:	~~EGexisting,y~~
Data unit:	~~MWh~~
Description:	~~The actual, measured electricity supplied to the grid by existing units in year y (MWh)~~
Source of data:	~~Project activity site~~
Measurement procedures (if any):	~~This parameter will be zero except in the case where one or more of the existing units is/are not modified as part of the project activity, continue to operate after the implementation of the project activity, and the configuration permits their generation to be measured separately~~
Monitoring frequency:	~~Hourly measurement and monthly recording~~
QA/QC procedures to be applied:	~~-~~
Any comment:	~~-~~

Data / Parameter:	TEG_y
Data unit:	MWh/yr
Description:	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y*
Source of data:	Project activity site
Measurement procedures (if any):	Electricity meters
Monitoring frequency:	Continuous measurement and at least monthly recording
QA/QC procedures:	-
Any comment:	Applicable to hydro power project activities with a power density of the project activity (PD) greater than 4 W/m^2 and less than or equal to 10 W/m^2

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"
Source of data:	As per 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:	-

Data / Parameter:	$PE_{FF,y}$
Data unit:	tCO_2/yr
Description:	Project emissions from fossil fuel consumption in year *y*
Source of data:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Any comment:	Applicable to geothermal and solar thermal projects, which also use fossil fuels for electricity generation

Data / Parameter:	~~$PE_{FC,j,y}$~~
Data unit:	~~tCO_2/yr~~
Description:	~~CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr). This parameter shall be calculated as per the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" where j stands for the processes required for the operation of the solar/geothermal power plant and/or backup power generation~~
Source of data:	~~As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"~~
Measurement procedures (if any):	~~As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"~~
Monitoring frequency:	~~As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"~~
QA/QC procedures:	~~As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"~~
Any comment:	~~As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"~~

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project site
Measurement procedures (if any):	Determine the installed capacity based on recognized standards
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data:	Project site
Measurement procedures (if any):	Measured from topographical surveys, maps, satellite pictures, etc
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

IV. REFERENCES AND ANY OTHER INFORMATION

Not applicable.

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History of the Document

Version	Date	Nature of Revision
10	EB 47, Annex # 28 May 2009	The revision expands the applicability of the methodology to project activities that retrofit or replace renewable energy power generation units, to restore the installed power generation capacity to or above its original level. This revision includes the required provisions in the (i) definitions, (ii) baseline identification, and (iii) baseline emissions sections, in order to allow these types of project activities, as well as (iv) editorial changes in order to improve the overall clarity of the approved methodology.
09	EB 45, Annex 10 13 February 2009	Inclusion of project emissions for operation of solar power plant and backup power generation of all the renewable energy plants.
08	EB 44, Annex 12 28 November 2008	Incorporate changes in equation 9 of baseline emissions to account for the cases where the expansion of existing capacity of plant takes place as an additional energy generation unit is installed under CDM project activity.

07	EB 36, Annex 11
	30 November 2007
		• General editorial revision of the methodology to put it in the new format;
		• Inclusion of the “Tool to calculate the emission factor for an electricity system”;
		• Inclusion of the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”;
		• Inclusion of the definitions for power plant/unit, installed power generation capacity, electricity capacity addition, modification and retrofit, net electricity generation and grid/project electricity system;
		• Editorial revisions of the applicability conditions to clarify:
		  o That the methodology is applicable only to electricity capacity additions;
		  o The requirements for hydro power plants in terms of reservoir and power density;
		  o The minimum vintage of baseline data that has to be available;
		  o That the methodology is not applicable to biomass power plants and to hydro power plants with power density less than $4 W/m^2$.
		• Inclusion of an equation to calculate the power density of hydro power plants;
		• Deletion of the parameters related to emissions associated with well testing in case of geothermal power plants, as those parameters were not necessary in the methodology.

06	EB 24, Annex 7 19 May 2006	• Revision of the applicability conditions to include hydro power plants with new reservoirs that have power density greater than $4 W/m^2$ and inclusion of the equation to calculate the emissions from the reservoir in the emissions reductions section; • Revision of the baseline section to allow ex-ante calculation of the simple OM, simple-adjusted OM and average OM emission factors; • Inclusion of the clarification that the choice between ex-ante and ex-post vintage for calculation of the build margin and the operating margin should be specified in the PDD and cannot be changed during the crediting period; • Inclusion of guidance and clarifications on the selection of alternative weights for the calculation of the combined margin.

05	EB 23, Annex 9 03 March 2006	Inclusion of guidances in the baseline section stating that power plant capacity additions registered as CDM project activities should be excluded from the calculation of emission factors and that if 20% falls on partial capacity of a plant in the determination of the group of power plants used for the calculation of the build margin, that plant should be fully included in the calculation.
04	EB 22, Annex 6 28 November 2005	Inclusion of a procedure in the project boundary section on how to deal with cases where the application of the methodology does not result in a clear grid boundary.
03	EB 21, Annex 8 30 September 2005	Revision of the baseline section in order to include project activities that modify or retrofit an existing electricity generation facility and the corresponding procedure to determine the baseline scenario in this case ($EG_{baseline}$).
02	EB 17, Meeting Report 03 December 2004	Inclusion of the following paragraph in the Baseline section as per request by the Board: “Which of the plausible alternatives scenarios, as listed in step 1 of the additionality text, is the most likely baseline scenario? Please provide thorough explanation to justify your choice, based on the factors (investment or other barriers) described in the additionality methodology. This methodology is applicable only if the most likely baseline scenario is electricity production from other sources feeding into the grid”.
01	EB 15, Annex 2 03 September 2004	Initial adoption.