Draft revision to the 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 cases:

- 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;
- 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;

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 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.

Applicability

This methodology is applicable to grid-connected renewable power generation project activities that involve electricity capacity additions .

The methodology is applicable under the following conditions:

[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.

- The project activity is the installation or modification/retrofit 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 case of hydro power plants:

  - The project activity is implemented in an existing reservoir, with no change in the ~~hose~~ volume of reservoir.
  - The project activity is implemented in an existing reservoir, where the ~~ich~~ volume ~~is~~ 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.
  - 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 ~~lower~~ less than 4 W/m^2.

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

[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.

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 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 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.

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[4] 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.

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

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 is 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 power plants, CO_2 emissions from combustion of fossil fuels required to operate the geothermal power plant.	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.

Project emissions

For most renewable energy project activities, $PE_y = 0$. However, for following categories of project activities, project emissions have to be considered.

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[5, 6]. Project emissions are calculated as follows:

$$PE_y = PES_y + PEFF_y \quad (1)$$

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).

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:

$$PES_y = \left(w_{Main,CO2} + w_{Main,CH4} \cdot GWP_{CH4}\right) \cdot M_{S,y} \quad (2)$$

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).

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

$$PEFF_y = PE_{FC,j,y} \quad (3)$$

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

[6] 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.

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

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 project emissions, estimated as follows:

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

$$PE_y = \frac{EF_{Res} \cdot TEG_y}{1000} \quad \textbf{(4)}$$

Were:

PE_y	=	Emission from reservoir expressed as tCO_2e/year
EF_{Res}	=	is the default emission factor for emissions from reservoirs, and the default value as perEB23 is 90 Kg CO_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 (*PD*) of the power plant is greater than 10 W/m^2:

$$PE_y = 0 \quad \textbf{(5)}$$

The power density of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \textbf{(6)}$$

Where:

PD	=	Power density of the project activity, in 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, calculated as follows:

$$BE_y = \left(EG_y - EG_{baseline}\right) \cdot EF_{grid,CM,y} \quad \textbf{(7)}$$

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".

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:

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

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

$$EG_{baseline} = EG_{historical}\text{, until } DATE_{BaselineRetrofit} \quad \textbf{(9)}$$

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

Where:

$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (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).

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.

Calculation of $DATE_{BaselineRetrofit}$

In order to estimate the point in time when the existing equipment would need to be replaced 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 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.

Leakage

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:

$$ER_y = BE_y - PE_y - LE_y \qquad \textbf{(11)}$$

Where:

ER_y	=	Emission reductions in year y (t CO_2e/yr).
BE_y	=	Baseline emissions in year y (t CO_2e/yr).
PE_y	=	Project emissions in year y (t CO_2/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 project emission reductions for the proposed crediting period. This estimate should, in principle, employ the same methodology as selected above. Where the emission factor (EF_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_2/tCH_4
Description:	Global warming potential of methane valid for the relevant commitment period.
Source of data:	IPCC
Measurement procedures (if any):	Default value 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:	$DATE_{BaselineRetrofit}$
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:	EF_{Res}
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emissions from reservoirs.
Source of data:	-
Measurement procedures (if any):	The default value as per EB23 is 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.
Monitoring frequency:	Yearly
QA/QC procedures:	-
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:	$w_{Main,CO2}$
Data unit:	tCO_2/t steam
Description:	Average mass fraction of carbon dioxide in the produced steam.
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 4 months
QA/QC procedures:	-
Any comment:	-

Data / parameter:	$w_{Main,CH4}$
Data unit:	tCH_4/t steam
Description:	Average mass fraction of methane in the produced steam.
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 4 months
QA/QC procedures:	-
Any comment:	-

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:	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:	TEG_y
Data unit:	MWh
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):	-
Monitoring frequency:	Hourly measure-ment and monthly recording
QA/QC procedures:	-
Any comment:	-

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:	As per the “Tool to calculate the emission factor for an electricity system”.

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 geothermal power plant.
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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