Approved baseline methodology AM0024

"Baseline methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants"

Source

This baseline methodology is based on the "Taishan Huafeng Cement Works Waste Heat Recovery and Utilisation for Power Generation Project" in China, whose baseline study, monitoring and verification plan and Project Design Document were prepared by Westlake Associates Ltd and Natsource Europe Ltd. For more information regarding the proposals and their consideration by the Executive Board, please refer to case NM0079-rev: "Taishan Huafeng Cement Works Waste Heat Recovery and Utilisation for Power Generation Project, China" on http://cdm.unfccc.int/methodologies/approved.

This methodology also refers to the "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002) and the latest version of the "Tool for the demonstration and assessment of additionality".

Selected approach from paragraph 48 of the CDM modalities and procedures

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

Applicability

This methodology is applicable to project activities that use waste heat gas generated in clinker making process (i.e. in the cement kilns) to produce electricity,

The methodology is applicable under the following conditions:
1) The electricity produced is used within the cement works where the proposed project activity is located and excess electricity is supplied to the grid; it is assumed that there is no electricity export to the grid in the baseline scenario (in case of existing captive power plant);
2) Electricity generated under the project activity displaces either grid electricity or from an identified specific generation source. Identified specific generation source could be either an existing captive power generation source or new generation source;
3) The grid or identified specific generation source option is clearly identifiable;
4) Waste heat is only to be used in the project activity;
5) In the baseline scenario, the recycling of waste heat is possible only within the boundary of the clinker making process (e.g. clinker production lines in baseline scenario could include some heat recovery systems to capture a portion of the waste heat from the cooler end of the clinker kiln and use this to heat up the incoming raw materials and fuel - so called Type 1 Waste Heat Utilization as described in explanatory note below).

This methodology is NOT applicable to project activities,
1) Where the current use of waste heat or the identified alternative business as usual use of waste heat is located outside of the clinker making process (so called Type 2 Waste heat utilization as described in explanatory note below);
2) That affect process emissions from cement plants.

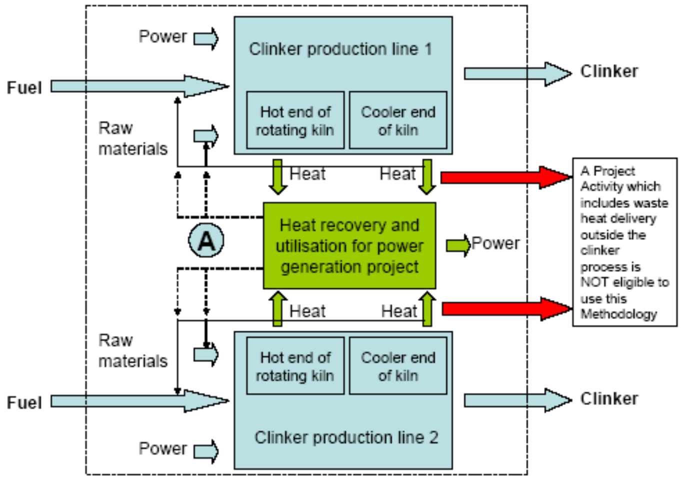

Figure 1. Schematic of sample Project Activity

Explanatory note to applicability criteria 5 above

Figure 1 shows an example of a project activity where two clinker production lines are connected to a waste heat recovery and utilization for power generation project to explain the concept of Type 1 and Type 2 waste heat utilization.

a) The project activity instead of venting the waste heat from the clinker making process, produces electricity from heat captured at the hot end and cooler end of the kiln using heat recovery boiler(s) and generation unit(s).
b) Clinker production lines are sometimes designed with some heat recovery systems already in place to capture a portion of the waste heat from the cooler end of the clinker kiln and use this to heat up the incoming raw materials and fuel. This is shown in Figure 1 as the thin solid lines. The waste heat is sometimes de-tempered prior to use in warming up the incoming coal to the milling machines.
c) After a project activity is installed then the waste heat from the project activity itself (i.e. exhaust from the heat recovery boiler) can be used instead to pre-heat the raw materials and fuel. This is shown as the dotted lines at point marked A.
d) Before and after measurements of the specific fuel consumption per unit clinker output of the clinker lines connected to the project activity would, by definition, capture the real impact of any change in emissions resulting from this change in waste heat flows.
e) For the purposes of assessing the conditions under which the methodology is applicable, the potential use of waste heat in the baseline scenario is divided into two categories:
    I. Type 1 Waste Heat Utilization: This is when waste heat is used in the baseline scenario within the energy balance boundary of the clinker making process and which is reflected in the specific fuel consumption of the clinker line per unit output of clinker.
    II. Type 2 Waste Heat Utilization: This is current or identified alternative business as usual use of waste heat supplied to applications outside the boundary of the clinker making process e.g. to other local industrial users, local heating schemes, etc.

This baseline methodology shall be used in conjunction with the approved monitoring methodology for "Greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants" (AM0024).

Identification of the baseline scenario

The baseline scenario for the project will be identified through the following steps:

- ***Step 1: Determination of technically feasible alternatives to the project activity:***

1.A Identify and list, within the local context, the current business, as usual utilization of, and options technically feasible for, waste heat utilization. Include an assessment of potential use of waste heat in the cement work. For identifying and assessing the potential alternative waste heat uses in the baseline, the following approach should be used:
  - o Identify the current use of waste heat from the kilns at the cement works and identify the normal uses for waste heat in the cement production process in the local context, which would be replaced by the project activity;
  - o Establish whether there are other demands for any additional waste heat use that should be considered as part of the baseline;
  - o Demonstrate that this waste heat is within the energy balance boundary of the clinker making process (Type 1 waste heat utilization as earlier defined which is a condition of applicability of this methodology).

1.B Identify and list the source of electric energy supply for the cement plants, in the local context. The current and future situation of the electricity demand and supply to the cement plant, where the project activity is located, should be included in the CDM-PDD in order to determine what electricity supply is likely to be displaced by the project activity.
  - o For identifying the current electricity supply and demand baseline, the following should be used:
    - i. E_{CEMENT} and E_{LOAD} are the electricity demand of the cement works and other local loads, which should be included in the Project Design Document for at least two years prior to the start date of the project activity. Ex-ante projection of these demands over the crediting period should be presented. The meter records and production plan of the cement works and load design data of the cement works can be used for this estimate as can the data for other local loads (if any).
    - ii. $EG_{ATEXIST}$ is the baseline electricity generation of the existing captive power plant (if existing). Production data for at least the two years prior to the start date of the project activity should be included in the Project Design Document. Ex-ante projection of production capacity for the crediting period too should be included. The production records and plan of the captive power plant can be used for this estimate.
    - iii. The data in (i) and (ii) above should be collected once at the start of each crediting period of the project activity and can be analyzed to see if there is an increase of energy demand expected and how this demand could be met, by supply from the grid or alternative captive power sources.
  - o The following broad categories of options should be analyzed to identify baseline electricity options:
    - Supply from grid;

  - Supply from existing capacity or in case of increase of energy demand expansion of captive power generation source, if one exists; and
  - Construction of a captive plant with different fuel options if electricity demand is increasing.
- ***Step 2: Compliance with regulatory requirements:*** Delete those options, identified after administrating Step 1, that do not meet the regulatory requirements. Typical policies and laws that should be considered while evaluating regulatory compliance are: energy efficiency / conservation laws; laws on cleaner production; and environmental protection laws.
- ***Step 3: Undertake economic analysis of all options that meets the regulatory requirements.***
  - The option with the highest IRR is the baseline scenario for waste heat recovery and electricity supply to the cement works**.** ***This methodology is not applicable if the baseline scenario as defined above is different from the current waste heat recovery in the clinker production of the cement plant where the proposed project activity will be implemented.***

Project boundary

For the purpose of determining GHG emissions of the **project activity**, project participants shall include the following emissions sources:

- CO_2 emissions from on-site fuel consumption of fossil fuels.

For the purpose of determining the **baseline**, project participants shall include the following emission sources:

- On-site fossil fuel consumption within project boundary; and
- From electricity generation, either in captive power generation source or the generation sources connected to grid that serves the proposed project site, as in the identified baseline scenario.

The physical boundary includes the facilities constructed/erected on account of the project activity at the cement plant. In the case of displaced grid electricity, it further includes the local power grid system connected to the project activity; in the case of captive power, it also includes the "inside the fence" electrical system.

The spatial extent of the project electricity system, including issues related to the calculation of the build margin (BM) and operating margin (OM), as further defined in the "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002)[1].

Table 1 illustrates which emissions sources are included and which are excluded from the project boundary for determination of both baseline and project emissions.

[1] The latest version of the Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002) is available on http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

Table 1: Overview on emissions sources included in or excluded from the project boundary

	Source	Gas		Justification / Explanation
Baseline	Grid electricity generation/ identified specific generation source	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project activity	On-site fossil fuel consumption due to the project activity	CO_2	Included	May be an important emission source.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

Emission Reduction

The project activity reduces CO_2 emissions either from the grid or from an identified specific electricity generation source by using waste heat to produce electricity. The emission reduction, ERy, during a given year y[2] is given by:

$$ER_y = EB_y - PE_y \quad \textbf{(1)}$$

where:

EB_y are the baseline emissions in year y, expressed in tCO_2.

PE_y are the project emissions due to possible fuel consumption changes in the cement kilns, of the cement works where the proposed project is located, as a result of the project activity in year y, expressed in tCO_2.

In determining emission coefficients, emission factors or net calorific values in this methodology, guidance by the 2000 IPCC Good Practice Guidance for LULUCF should be followed where appropriate. Project participants may either conduct regular measurements or they may use accurate and reliable local or national data where available. Where such data is not available, IPCC default emission factors (country-specific, if available) may be used if they are deemed to reasonably represent local circumstances. All values should be chosen in a conservative manner and the choice should be justified.

[2] Throughout the document, the suffix y denotes that such parameter is a function of the year y, thus to be monitored at least annually.

Project activity

Project emission (PE_y) is the difference in CO_2 emissions from use of fossil fuel in the clinker making process in cement manufacturing unit, where the project is being implemented, before and after the project implementation.

PE_y, is determined as follows:

$$PEy = (EI_{P,y} - EI_B) * O_{clinker,y} * COEF_{fuel,y} \quad \textbf{(2)}$$

where:

EI_B	is the pre-project energy consumption per unit output of clinker in TJ/ton of clinker produced (i.e. measured before the Project activity goes into operation).
$EI_{P,y}$	is the ex-post energy consumption per unit output of clinker for given year, y, in TJ/ton of clinker produced.
$COEF_{fuel,y}$	is the carbon coefficient (tCO2 / TJ of input fuel) of the fuel used in the cement works in year y to raise the necessary heat for clinker production.
$O_{clinker,y}$	Is the clinker output of the cement works in a given year y.

$$EI_B = \frac{F_B}{O_{clinker,B}} \quad \textbf{(3)}$$

where:

FB	is the average annual energy consumption, expressed in TJ, of clinker making process prior to the start of operation of the project activity. At least one full year of data should be used. If a year's worth of pre-Project Activity data is not available, then the Project Developer should outline the plan for ensuring conservativeness based on a combination of the ex-ante design estimate of energy consumption plus available measured data.
$O_{clinker,B}$	is the average annual output, expressed in tonnes, of clinker prior to the start of operation of the project activity. At least one full year of data should be used.

$$EI_{P,y} = \frac{F_{P,y}}{O_{clinker,y}} \quad \textbf{(4)}$$

where:

$F_{P,y}$	is monitored annual energy consumption in a year y, expressed in TJ, of clinker making process;
$O_{clinker,y}$	is monitored annual output, expressed in a year y, in tonnes of clinker.

$$COEF_{Fuel,y} = NCV_{fuel,y} * EF_{CO_2,fuel,y} * OXID_{fuel} \quad (5)$$

where:

$NCV_{fuel,y}$ is the net calorific value (energy content) per mass or volume unit of a fuel used in clinker making process in year y;
$OXID_{fuel}$ is the oxidation factor of the fuel (see Table 1-6, page 1.29 in the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories), expressed as percentage;
$EF_{CO2,fuel,y}$ is the CO_2 emission factor per unit of energy of the fuel used in year y, expressed as tCO_2 per unit mass or volume unit.

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Local values of $NCV_{fuel,y}$ and $EF_{CO2,fuel,y}$ should be used where available. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance for LULUCF) are preferable to IPCC world-wide default values.

The project proponents should report ex-ante estimate of PE_y in the CDM project design document (CDM-PDD). Ex-ante estimate of PE_y could be based on feasibility report for the project activity. The ex-ante estimate of PE_y can be calculated using the following formula:

$$PEy = \sum_i \Delta EI_i * [O_{clinker,i}] * COEF_{fuel,i} \quad (6)$$

where:

i is the index for each clinker production line in the cement plant where the project activity is being implemented;
ΔEI_i is the ex-ante design estimate of the change in the energy consumption of each clinker kiln in TJ / ton Clinker, due to project implementation.

Baseline emissions

The baseline emissions are those from electricity generation source(s) that:
(a) would have supplied the cement works and
(b) would have been generated by the operation of grid-connected power plants in absence of the proposed CDM project activity. The baseline emissions during a given year y are calculated as:

$$EB_y = EG_{CP,y} * EF_{Elec,y} + EG_{Grid,y} * EF_{Grid,y} \quad (7)$$

where:

$EG_{CP,y}$ is the electricity supplied from the project activity to the cement plant , expressed in MWh;
$EF_{Elec,y}$ is the emissions factor of the baseline electricity supply source, expressed as tCO_2 / MWh. If in the baseline scenario electricity is supplied from the grid, then $EF_{Elec,y}$ is the emission factor of the grid - $EF_{Grid,y}$; if electricity is supplied from the identified specific captive power generation source, then $EF_{Elec,y}$ is the emission factor of it – $EF_{Captive,y}$
$EG_{Grid,y}$ is the electricity supplied from the project activity to the grid , expressed in MWh;
$EF_{Grid,y}$ is the emissions factor of the electricity grid, expressed as tCO_2 / MWh.

Emission Factor (EF) if the baseline electricity supply source is the grid

The emission factor estimation method for displacing grid sourced electricity ($EF_{Grid,y}$) shall be calculated following the baseline section of the approved methodology "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002).

Emission Factor (EF) if the baseline electricity supply source is an identified specific generation source

The baseline emission factor $EF_{Captive,y}$ is estimated ex-ante as follows:

$$EF_y = EF_{IGS} = [FI_{IGS} * COEF_{IGS}] \quad \textbf{(8)}$$

where:

FI_{IGS} is the fossil fuel consumption rate of the identified generation source (IGS) to supply EG_Y, expressed as GJ per MWh.

$COEF_{IGS}$ is the emission coefficient of the fuel used in identified generation source, expressed as tCO_2/ per GJ lower heating value. This can be estimated using the formulae described in Equation 7 above.

The EF_{IGS} should be calculated at the start of the crediting period and be fixed for the whole crediting period.

If the identified generation source is the existing captive generation plant, FI_{IGS} is estimated using recorded data.

$$FI_{IGS} = \frac{F_{IGS}}{GEN_{IGS}} \quad \textbf{(9)}$$

where:

F_{IGS} is the annual average fossil fuel consumption of the identified generation source (IGS), expressed as GJ. At least one year's data prior to start of the project should be used.

GEN_{IGS} is the annual average generation of the identified generation source, expressed as MWh. At least one year's data prior to start of the project should be used.

If the baseline scenario is the construction of a new power plant to supply electricity to the cement works, then the FI_{IGS} can be based on design net heat rate for plants of similar capacity and using the fuel available in the area local to the cement plant.
$COEF_{IGS}$ should be calculated using equation 5 using fuel specific local values. If local data is not available then IPCC values can be used giving preference country specific IPCC default values.

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, available at the UNFCCC CDM web site*[3].

Leakage

The project activity could lead to the following leakages:

Construction and fuel handling: the main indirect 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). Corresponding emissions are negligible and can therefore be ignored.

[3] Please refer to: < http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

Approved monitoring methodology AM0024

"Monitoring methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants"

Source

This monitoring methodology is based is based on the "Taishan Huafeng Cement Works Waste Heat Recovery and Utilisation for Power Generation Project" in China, whose baseline study, monitoring and verification plan and Project Design Document were prepared by Westlake Associates Ltd and Natsource Europe Ltd. For more information regarding the proposals and their consideration by the Executive Board, please refer to case NM0079-rev: "Taishan Huafeng Cement Works Waste Heat Recovery and Utilisation for Power Generation Project, China" on http://cdm.unfccc.int/methodologies/approved.

This methodology also refers to the "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002) and the latest version of the "Tool for the demonstration and assessment of additionality".

Applicability

This monitoring methodology shall be used in conjunction with the approved baseline methodology "Greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants" (AM0024).

The methodology is applicable to the projects that meet the applicability conditions mentioned in the associated baseline methodology.

Monitoring Methodology

The monitoring methodology should monitor the following parameters during project operation:

Baseline

- Electricity demand of cement works and other local loads within the complex of cement works prior to start of the project.
- Electricity generation of existing captive power generation, if any.
- Waste heat use within the cement works and normal uses of waste heat in cement production commonly practiced in the region or host country.
- Regulations and/or policy that could influence the use of waste heat and generation of power in the region.
- Project electricity generation.
- If the baseline is supply of electricity from the grid:
    - Electricity generation, fuel consumption, and fuel specific energy content and emission factor of power generation sources connected to the grid to estimate operating margin and build margin.
    - Electricity imports and exports.
    - Electricity generation from the proposed project activity.

  - Annual determination of the emission factor of the grid (weighted average excluding zero and low cost sources) to recalculate the operating margin with monitored data.
  - Annual determination of the emission factor of the grid (weighted average of recently built plants - represented by the 5 most recent plants or the most 20% of the generating units built) to recalculate the build margin with monitored data.
  - Annual determination of the combined margin.
  - Confirmation to meet applicability.
- If the baseline is an identified generation source and in particular existing captive power plant:
  - Fuel consumption and electricity generation.

Project Emissions

- Fuel consumption, emission factor and energy content used in operation of clinker making process post project implementation.
- Fuel consumption in clinker making process prior to project implementation.
- Electricity generated by the project

Project emissions parameters

ID number	Data Type	Data Variable	Data unit	Measured (m) calculated (c) estimated (e)	Recording frequency	Pro-portion of data monitored	How will data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
1. PE_y	Emissions	Project emissions	tCO_2	c	Annually	100%	Electronic and paper	During the credit period	It is calculated using formulae described in Equation 4, in the baseline methodology.
2. $COEF_{fuel,y}$	Emission factor	Emissions Factor for fuel used in Clinker production	tCO_2/TJ	c	Monthly	100%	Electronic and paper	During the credit period	It should be calculated using formulae described in baseline methodology.
3. $NCV_{fuel,y}$	Calorific Value	Calorific Value of fuel used in Clinker Production	TJ/ unit mass or volume	m	Monthly	100%	Electronic and paper	During the credit period	The NCV value will be based on measurement on site.
4. $EF_{CO2,fuel,y}$	Emission factor	Emission factor of fuel used in Clinker production	tCO_2/ unit mass or volume	m	Monthly	100%	Electronic and paper	During the credit period	
5. $OXID_{fuel}$	Fraction	Oxidation ratio of fuel used in Clinker Production	Fraction	e	At start of project	100%	Electronic and paper	During the credit period	The default IPCC values can be used.
6. EI_B	Energy Intensity	Energy consumption per unit clinker production prior to project implementation	TJ/ ton Clinker	c	Annually	100%	Electronic and paper	During the credit period	The value is calculated using Equation 5 described the Baseline methodology. If project specific data is not available, data from industrial norm in the host country could be used.

ID number	Data Type	Data Variable	Data unit	Measured (m) calculated (c) estimated (e)	Recording frequency	Pro-portion of data monitored	How will data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
7. F_B	Energy	Average annual energy (fuel) consumption of clinker making process prior to project implementation.	TJ	m	At the start of project	100%	Electronic and paper	During the credit period	
8. $O_{clinker, B}$	Quantity	Average annual production of Clinker prior to implementation of project.	Ton	m	At the start of the project	100%	Electronic and paper	During the credit period	
9. $EI_{P,y}$	Energy Intensity	Energy (fuel) consumption per unit Clinker production after project implementation.	TJ/ton Clinker	c	Annually	100%	Electronic and paper	During the credit period	The quantity is estimated using Equation 6, described in the baseline methodology.
10. $F_{P,y}$	Energy	Annual energy (fuel) consumption of clinker making process after project implementation.	TJ	m	Continuously	100%	Electronic and paper	During the credit period	

ID number	Data Type	Data Variable	Data unit	Measured (m) calculated (c) estimated (e)	Recording frequency	Pro-portion of data monitored	How will data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
11. $O_{clinker,y}$	Quantity	Annual production of Clinker after implementation of project.	Ton	m	Continuously	100%	Electronic and paper	During the credit period	

Baseline emission parameters

Note that data required to calculate the emissions factor for displacement of electricity ($EF_{Grid,y}$) is contained in the "Consolidated monitoring methodology for zero-emission grid-connected electricity generation from renewable sources" (ACM0002)[1]. Next to the parameters listed in the table below, project participants shall monitor in addition all baseline emission parameters included in ACM0002.

ID number	Data Type	Data variable	Data unit	Measured (m) calculated (c) estimated (e)	Recording frequency	Pro-portion of data monitored	How will data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
12. $EG_{ATEXIST}$	Electricity quantity	Net Electricity generation of existing captive generation plant prior to project	MWh	m	Once at start of project	100%	Electronic	During the crediting period	At least two years data should be reported in CDM-PDD. This data is used to ex-ante projection of future electricity demand.

[1] The latest version of the Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002) is available on http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

ID number	Data Type	Data variable	Data unit	Measured (m) calculated (c) estimated (e)	Recording frequency	Pro-portion of data monitored	How will data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
13. E_{cement}	Electricity quantity	Electricity consumption of cement works prior to project	MWh	m	Once at start of project	100%	Electronic	During the crediting period	At least two years data should be reported in CDM-PDD. This data is used to ex-ante projection of future electricity demand.
14. E_{load}	Electricity quantity	Electricity consumption of other load in the Cements work complex prior to project	MWh	m	Once at start of project	100%	Electronic	During the crediting period	At least two years data should be reported in CDM-PDD. This data is used to ex-ante projection of future electricity demand.
15. EB_y	Emission quantity	Baseline emission for year y	tCO_2	c	Annually	100%	Electronic	During the crediting period	The quantity is estimated using formulae described in Equation 8 in the baseline methodology.
16. $EG_{CP,y}$	Electricity quantity	Quantity of electricity supplied to cement plant	MWh	m	Continuously	100%	Electronic	During the crediting period	
17. $EF_{Elec, y}$	Emission Factor	Emission factor of electricity displaced by project implementation	tCO_2/MWh	c	Annually	100%	Electronic	During the crediting period	Emission factor is estimated, depending on what is the source of Baseline electricity supply.
18. $EG_{Grid, y}$	Electricity quantity	Quantity of electricity supplied to the grid	MWh	m	Continuously	100%	Electronic	During the crediting period	

ID number	Data Type	Data variable	Data unit	Measured (m) calculated (c) estimated (e)	Recording frequency	Pro-portion of data monitored	How will data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
19. $COEF_{i/igs}$	Emission coefficient	Emission coefficient of fuel 'i' used for power generation or for identified generation source (igs)	tCO_2/TJ	c	Annually	100%	Electronic	During the crediting period	
20. $NCV_{i/igs}$	Calorific Value	Calorific Value of fuel 'i' used for power generation for identified generation source (igs)	TJ/ unit mass or volume	e	Annually	100%	Electronic	During the crediting period	Country specific values should be used from published sources (e.g. National Communications). In absence of a country specific data IPCC values could be used.
21. $EF_{i/igs}$	Emission factor	Emission factor of fuel 'i' used for power generation for identified generation source (igs)	tCO_2/TJ	e	Annually	100%	Electronic	During the crediting period	Country specific values should be used from published sources (e.g. National Communications). In absence of a country specific data IPCC values could be used.

ID number	Data Type	Data variable	Data unit	Measured (m) calculated (c) estimated (e)	Recording frequency	Pro-portion of data monitored	How will data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
22. $OXID_{Fuel/igs}$	Fraction	Oxidation ratio of fuel 'i' used for power generation for identified generation source (igs)	Fraction	e		100%	Electronic	During the crediting period	The default IPCC values can be used
23. EF_{IGS}	Emission factor	Emission factor if the baseline electricity supply is from an identified electricity supply source	tCO_2/MWh	c	Once at the start of the credit period and each renewal thereof	100%	Electronic	During the crediting period	If the identified generation source is existing captive generation source, actual captive plant specific data should be used to estimate the emission factor (in this case $EFIGS=EF_{Captive,y}$), else, heat rate data corresponding to identified generation source could be used.
24. FI_{IGS}	Fuel intensity	Fuel intensity of power generation for identified generation source	TJ/MWh	m or e	Once at the start of the credit period and each renewal thereof	100%	Electronic	During the crediting period	If the identified generation source is existing captive generation source, captive plant specific annual fuel consumption and net electricity generation data should be used to estimate the emission factor, else, heat rate data of most efficient plant similar to identified generation source could be used.

ID number	Data Type	Data variable	Data unit	Measured (m) calculated (c) estimated (e)	Recording frequency	Pro-portion of data monitored	How will data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
25. F_{IGS}	Fossil fuel consumption	Annual average fossil fuel consumption of the identified generation source (IGS)	GJ	m or e	Once at the start of the credit period and each renewal thereof	100%	Electronic	During the crediting period	
26. GEN_{IGS}	Generation	Annual average generation of the identified generation source.	MWh	m or e	Once at the start of the credit period and each renewal thereof	100%	Electronic	During the crediting period	

Leakage

The potential leakage due to construction and fuel handling is negligible and can be ignored.

Quality Control (QC) and Quality Assurance (QA) Procedures

All variables used to calculate project and baseline emissions are directly measured or are from publicly available official data. To ensure the quality of the data, in particular those that are measured, the data are double-checked against commercial data. All measurements should use calibrated measurement equipment that is maintained regularly and checked for its functioning. QA/QC procedures for the parameters to be monitored are illustrated in the following table. Parameters monitored contained in the "Consolidated monitoring methodology for zero-emission grid-connected electricity generation from renewable sources" (ACM0002) shall follow QC and QA procedures from ACM0002.

Data	Uncertainty Level of Data (High/Medium/Low)	Are QA/QC procedures planned for these data?	Outline explanation how QA/QC procedures are planned
1-3, 6-22.	Low	Yes	Any direct measurements with mass or volume meters at the plant site should be cross-checked with an annual energy balance that is based on purchased quantities and stock changes.
4, 5.	Low	No	IPCC default values can be used.