CLEAN DEVELOPMENT MECHANISM
PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-PoA-DD) Version 01

CONTENTS

Annexes

NOTE:

This form is for the submission of a CDM PoA whose CPAs apply a large scale approved methodology.

At the time of requesting registration this form must be accompanied by a CDM-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-CPA-DD (using a real case).

SECTION A. General description of programme of activities (PoA)

A.1 Title of the programme of activities:

>>
Southern African Renewable Energy (SARE) Programme
Version Number of the Document: 01.1
Date: 14/09/2011

A.2. Description of the programme of activities:

>> Here the following information will be included

1. General operating and implementing framework of PoA

This programme of activities (hereafter referred to as the "PoA") is a programme for the development of renewable energy projects that will supply energy to the national grid within the country of concern. The programme is geographically located in 8 Southern African countries. These are: Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe (hereafter referred to as "the Countries"). The PoA is an initiative undertaken by EcoMetrix Africa (hereafter referred to as "EcoMetrix"), who are the coordinating and managing entity (CME).

2. Policy/measure or stated goal of the PoA

The stated objective of this programme is to incentivise broad scale investment in renewable energy technology and reduce dependence on fossil fuels electricity. This will help to reduce the associated CO_2 emissions in Southern Africa by displacing electricity produced by coal or other carbon-intensive fossil fuels through the use of renewable energy (solar, wind, hydro, geothermal, wave and tidal power).

In addition the PoA will contribute to activities aimed at growing and strengthening the renewable energy industry in the Countries. Whilst the countries involved in this PoA are well known to have little or no oil or natural gas reserves, they do have well developed coal reserves and considerably undeveloped, but promising renewable energy resources. Programmes such as this one are necessary to move away from the current dependence on the most prevalent fossil fuel resources and encourage the uptake of the prevalent/abundant renewable resources.

3. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.

The PoA is a voluntary action, not required by law, undertaken by EcoMetrix who is the coordinating/managing entity for the PoA.

A.3. Coordinating/managing entity and participants of POA:

>> Here the following information shall be included

1. Coordinating or managing entity of PoA as the entity which communicates with the Board

Ecometrix will be the coordinating and managing entity (CME) of the PoA and will be responsible for ensuring that all renewable energy CPA project activities are installed under the correct CDM

specifications as detailed by the programme; as well as implementing and effectively executing the monitoring plan.

2. **Project participants being registered in relation to the PoA. Project participants may or may not be involved in one of the CPAs related to the PoA.**

Project Participants
Ecometrix Africa

A.4. Technical description of the programme of activities:

A.4.1. Location of the programme of activities:

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The PoA is located within the following Southern African countries: Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.

A.4.1.1. Host Party(ies):

>>

Botswana
Lesotho*
Mozambique*
Namibia
South Africa
Swaziland
Zambia*
Zimbabwe.

* indicates that the Host Country is a Least Developed Country (LDC)

A.4.1.2. Physical/ Geographical boundary:

>> Definition of the boundary for the PoA in terms of a geographical area (e.g., municipality, region within a country, country or several countries) within which all CDM programme activities (CPAs) included in the PoA will be implemented, taking into consideration the requirement that all applicable national and/or sectoral policies and regulations of each host country within that chosen boundary;

The boundary of the PoA is defined as the geographical area within which all the implemented CDM programme activities (CPAs) included in the PoA will be physically installed. All installations of renewable energy projects which are enrolled in the CPAs under this PoA will be within the borders of the Host Parties listed in A.4.1.1 (the Countries listed above).

Each CPA will define the geographical boundary within which it operates. Multiple CPAs can operate within the same geographic location as the monitoring plan will ensure that there is no double counting of installed systems.

A.4.2. Description of a typical CDM programme activity (CPA):

>>

A typical CPA will consist of a grid-connected renewable power generation project that is eligible under ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" version 12.1.0. Typical CPAs will include power generation by solar, hydro, wind, geothermal, wave, or tidal power technology which will supply power to the grid.

A typical CPA project activity is one of:

a) installation of 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) involves a capacity addition;
c) involves a retrofit of (an) existing plant(s); or
d) involves a replacement of (an) existing plant(s). The grid-connected renewable power generation CPA project activity will be developed within the borders of the Countries.

A.4.2.1. Technology or measures to be employed by the CPA:

>>

As stated above, a typical CPA will consist of a grid-connected renewable power generation project that is eligible under ACM0002. The methodology is applicable for 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).

A grid-connected renewable power generation CPA may be one technology of either a:

- 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.

A CPA under this PoA may be a single plant or a cluster of such plants employing the same technology undertaken by the same project developer.

The Programme will initially involve the following technologies:

- Different types of photovoltaic 'solar' panels that generate electrical power by converting solar radiation into electricity via a panel composed of a number of cells containing a photovoltaic material. The panels are placed in direct sunlight and may be complemented with a battery pack to store electricity for use after dark;
- Solar thermal plants, i.e. concentrated solar thermal, that use solar energy to produce high temperatures in a working fluid which is used to produce electricity usually through a steam turbine;
- Hydro power plants which use the potential energy stored in water reservoirs or the natural course of rivers, to produce electricity;

- Wind turbine farms which use wind energy converted via a large wind turbine into electrical energy which is supplied to the grid;
- Geothermal energy plants which use the heat available in subterranean locations to heat a working fluid which is then used to produce electricity usually by way of a steam turbine.

A.4.2.2. Eligibility criteria for inclusion of a CPA in the PoA:

>> Here only a description of criteria for enrolling the CPA shall be described, the criteria for demonstrating additionality of CPA shall be described in section E.5

The eligibility criteria for the inclusion of a CPA in a PoA are as follows:

1. Each CPA must meet the eligibility criteria of ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" version 12.1. The methodology is applicable for 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).

   The methodology is applicable under the following conditions:

   i. The project activity is the installation, 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.

   ii. In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 11 of ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" version 12.1.0, to calculate the parameter EGPJ,y):
      - 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.

   iii. In the 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/m2; 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.

iv. The project 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; and
- hydro power plants 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.

2. Each CPA must implement the baseline and monitoring methodology ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" version 12.1.0.

3. Each CPA must demonstrate the additionality of the CPA according to section A.4.3

4. Each CPA must implement the operational and management plan as detailed in section A.4.4.1.

5. Each CPA must provide, monitor and collect data as specified by the parameters as listed in sections E.6.3 and E.7.1. (related to the specific technology employed by the project).

6. The coordinating entity will ensure that all CPAs under its PoA are neither registered as an individual CDM project activity nor included in another registered PoA, and that the CPA is subscribed to the PoA

7. Each CPA shall be uniquely identified within a database of all CPAs maintained by the CME. Therefore the following data must be provided to the CME prior to inclusion in the PoA:

i. Name of the CPA;
ii. Name of the implementing entity of the CPA;
iii. Contact details of the implementing entity including contact person, address, telephone and email address;
iv. Type of renewable energy (solar, wind, hydro etc.);
v. Installed capacity and other relevant technical specifications of each CPA;
vi. Location of the CPA (GPS coordinates of the power house for example);
vii. Verification status and monitoring reports of each CPA.

8. Each CPA is developed at a location within the borders of the Countries and is connected to the national or regional electricity grid of that particular country.

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

>> Here the following shall be demonstrated:

(i) The proposed PoA is a voluntary coordinated action;
(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;
(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;
(iv) If mandatory a policy/regulation are enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

The information presented here shall constitute the demonstration of additionality of the PoA as a whole.

(i) The proposed PoA is a voluntary, coordinated action

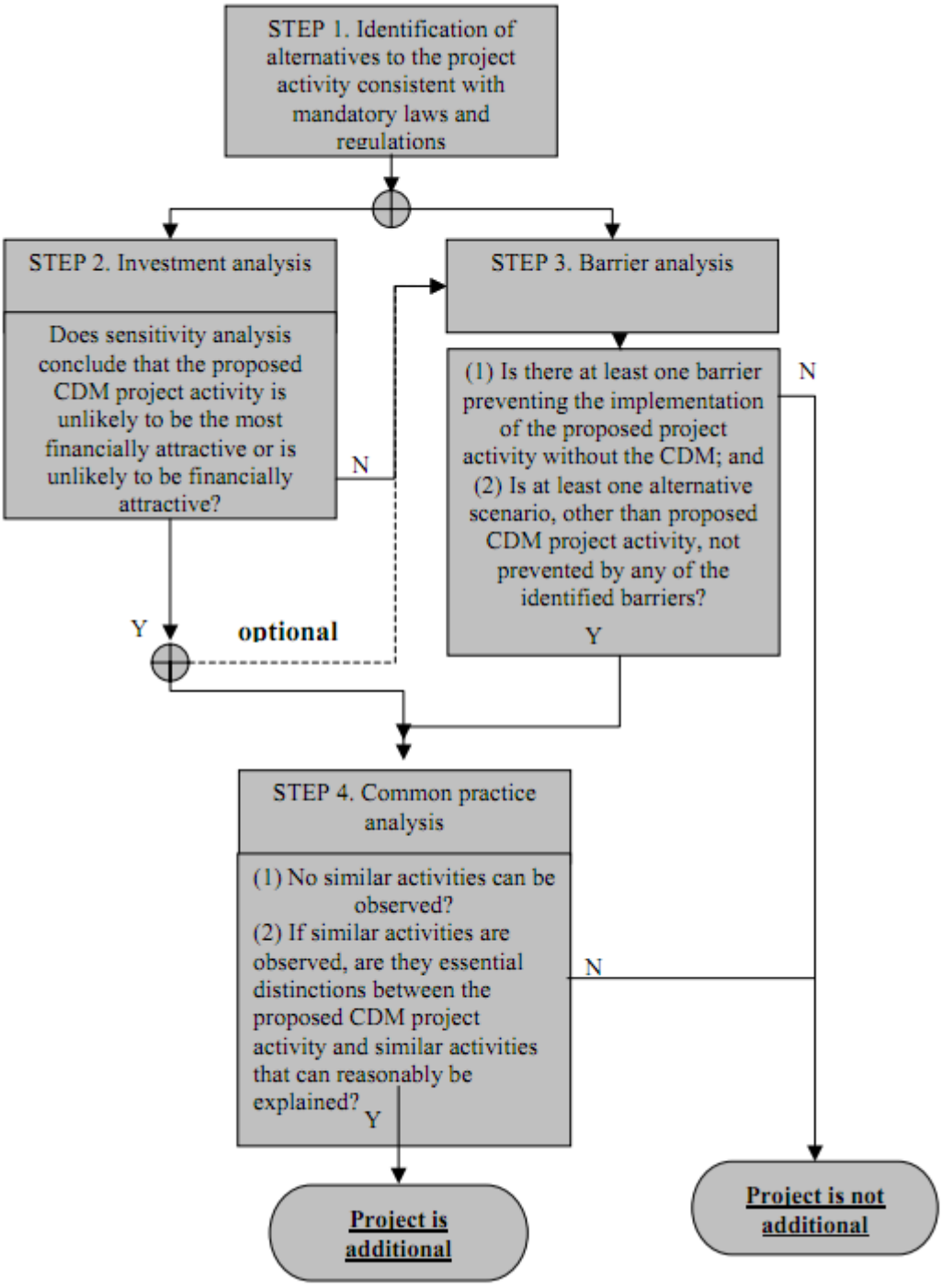
The PoA is a voluntary action, coordinated and implemented by the CME in order to support the objective of incentivising broad scale investment in renewable energy technology and reducing dependence on fossil fuels electricity. This will hence help to reduce the associated CO_2 emissions in Southern Africa by displacing electricity produced by coal or other carbon-intensive fossil fuels through the use of renewable energy (solar, wind, hydro, geothermal, wave and tidal power).

There is no mandatory requirement for the development of such technologies. The grid connected renewable power generation CPA project activity implemented in a typical CPA under the PoA are developed by those who voluntarily apply to be included in the PoA.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA

The methodology ACM0002 stipulates the use of the "*Tool for the demonstration and assessment of additionality*". The tool follows a stepwise approach (outlined in the figure below) consisting of:

- Identification of alternatives to the project activity;
- Investment analysis;
- Barrier analysis; and
- Common practice analysis.



Each CPA will demonstrate additionality within a CPA-DD following this stepwise approach.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:
Identify realistic and credible alternative(s) available to the project developer, for example,

a) The project is undertaken without registration as a CDM project; or
b) No project activity is undertaken.

Sub-step 1b: Consistency with mandatory laws and regulations:

The alternative(s) shall be in compliance with all mandatory applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. (This Sub-step does not consider national and local policies that do not have legally-binding status.)

If an alternative does not comply with all mandatory applicable legislation and regulations, then show that, based on an examination of current practice in the country or region in which the law or regulation applies, those applicable legal or regulatory requirements are systematically not enforced and that noncompliance with those requirements is widespread in the country. If this cannot be shown, then eliminate the alternative from further consideration;

If the proposed project activity is the only alternative amongst the ones considered by the project participants that is in compliance with mandatory regulations with which there is general compliance, then the proposed CDM project activity is not additional.

Outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the CPA project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

The implementing entity is then to proceed to Step 2 (Investment analysis).

Step 2: Investment Analysis

Sub-step 2a: Determine the appropriate investment analysis method

Determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis (Sub-step 2b). If the CDM project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III).

Since it is envisioned that in the majority these CPAs will produce revenue through the sale of renewable energy, and one alternative will include not investing in the project, a benchmark investment comparison analysis is expected to be the be most appropriate choice for most CPAs.

Sub-step 2b: Option III. Apply a benchmark analysis

For the purpose of this analysis an equity IRR is calculated and compared to the expected general market return rate as a benchmark. The benchmark may be determined using the Capital Asset Pricing Model (CAPM) or any other benchmark considered appropriate for CDM purposes. The tool states that discount rates and benchmarks shall be derived from:

a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial expert or documented by official publicly available financial data;
b) Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds required return on comparable projects;
c) A company internal benchmark (weighted average capital cost of the company). The project developers shall demonstrate that this benchmark has been consistently used in the past;
d) Government/official approved benchmark where such benchmarks are used for investment decisions;
e) Any other indicators, if the project participants can demonstrate that the above mentioned options are not applicable and their indicator is appropriately justified.

This CAPM model takes into account the non-diversifiable risk of the asset, the expected return of the market and the expected return of a risk-free asset using the following formula:

$$E(R_i) = R_f + \beta_i(E(R_m)-R_f)$$

Where:
$E(R_i)$ = the expected return of the capital asset
R_f = the risk free rate of interest such as arising from government bonds
β_i = the sensitivity of the expected excess asset returns to the expected excess markets returns
$E(R_m)$ = the expected return of the market

Furthermore, "Guidelines on the assessment on investment analysis", EB62, Annex 5, provides default values for the expected rate of return on equity (calculated after taxes) for different countries. These default values may be used if calculating the cost of equity is based on data sources which the DOE will be unable to clearly validate and justify or as a simple default option if a company internal benchmark is used. For the purpose of determining the adjustment factor to reflect the risk of projects in different sectoral scopes, three different project categories are distinguished according to the sectoral scopes under CDM. Group 1 includes:

- Energy industries (sectoral scope 1)
- Energy Distribution (sectoral scope 2)
- Energy Demand (sectoral scope 3)
- Waste handling and disposal (sectoral scope 13)

Sub-step 2c: Calculation and comparison of financial indicators

Calculate the suitable financial indicator for the proposed CPA project activity. Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (excluding CER revenues, but possibly including inter alia subsidies/fiscal incentives, ODA etc. where applicable), and as appropriate, non-market cost and benefits in the case of public investors if this is standard practice for the selection of public investments in the host country.

Present the investment analysis in a transparent manner and provide all the relevant assumptions, preferably in the CPA-DD, or in separate annexes to the CPA-DD. Refer to all critical techno-economic

parameters and assumptions (such as capital costs, fuel prices, lifetimes, and discount rate or cost of capital). Justify and/or cite assumptions in a manner that can be validated by the DOE. In calculating the financial/economic indicator, the project's risks can be included through the cash flow pattern, subject to project-specific expectations and assumptions (e.g. insurance premiums can be used in the calculation to reflect specific risk equivalents).

Assumptions and input data for the investment analysis shall not differ across the CPA project activity and its alternatives, unless differences can be well substantiated.

Present, in the CPA-DD, a clear comparison of the financial indicator for the proposed CPA project activity and the financial benchmark (from option III - benchmark analysis), as well as, if necessary, the "EB62 Annex 5 Guidelines on the assessment on investment analysis" country specific benchmark. If the CDM project activity has a less favourable indicator (e.g. lower IRR) than the benchmark, then the CPA project activity cannot be considered as financially attractive and can thus be concluded to be additional.

Further for projects in South Africa specifically:

In South Africa there is an opportunity for the project to be awarded a Renewable Energy Independent Power Producer (IPP) Procurement Programme[1] tariff. This procurement programme is a competitive bidding process. The South African government originally put in place a REFIT (Renewable Energy Feed in Tariff) programme whose objective was to reduce the emissions of GHGs associated with electricity production by promoting the development of renewable energy sources. The REFIT policy was abandoned by the South African government and replaced by the Renewable Energy IPP Procurement Program.

The South African Renewable Energy IPP Procurement programme is the process whereby bidders are required to bid on a competitive tariff and satisfy the identified socio-economic development objectives of the Department of Energy (DoE). The REFIT (Renewable Energy Feed In Tariff) tariffs (July 2011) are essentially the maximum tariff that a bidder may bid – the request for proposal (July 2011) outlines the absolute maximum tariffs that can be submitted in the bid process.

The Renewable Energy IPP tariff should be ignored for the purpose of this analysis as it awarded to projects that reduce emissions in South Africa only. Including the tariff here would induce a counter incentive contrary to the nature of the CDM and this was confirmed by the CDM Executive Board[2].

Nonetheless, for CPAs in South Africa, for the purposes of being conservative, one should use the Medium Term Power Purchase Program tariff of ZAR/kWh 0.65 as this is the only program to date that has resulted in electricity from an Independent Power Producer being purchased and supplied onto the grid[3]. This rate is significantly higher than the tariff at which electricity is sold, known as the megaflex rate, electricity in low demand season costs ZAR/kWh 0.28 and in high demand season ZAR/kWh 0.32, and therefore by using the Medium Term Power Purchase Program tariff, a conservative approach is maintained with respect to the power tariff.

[1] The South African Renewable Energy IPP Procurement programme is tasked with promoting the renewable energy sector in order to reduce emissions in SA. The REFIT (Renewable Energy Feed In Tariff) tariffs (Nersa - July 2011) are essentially the maximum tariff that a bidder may bid.

[2] "As a general principle, national and/or sectoral policies and circumstances are to be taken into account on the establishment of a baseline scenario, without creating perverse incentives that may impact host Parties' contributions to the ultimate objective of the Convention" (EB 22, Annex 3, paragraph 5).

[3] Engineering Weekly (Source: http://www.engineeringnews.co.za/article/eskom-concludes-two-power-purchase-contracts-four-more-close-2010-05-19, accessed 24/05/11)

The table below provides details of tariffs used in CDM projects that are currently registered or in validation in SA.

Project:	Tariff	Further details
Durban landfill gas to electricity – Marianhill and La Mercy landfills (registered 15/12/2006)	US $0.0422	Total generation cost
Kanhym farm manure to energy project (Registered 18/07/2008)	R246/MWh (increasing by 10% annually)	No further information in PDD
Durban landfill gas – Bisasar Road (Registered (26/03/2009)	US $0.0422/kWh	Total generation cost
Alton landfill gas to energy project (Registered 24/08/2009)	R320/MWh	Electricity base tariff + renewable energy tariff
Ekhurleni landfill gas recovery project – South Africa (Registered 26/10/2010)	R121.7/MWh	Megaflex weighted average cost
Cookhouse Windfarm in South Africa (validation 2011)	R0.66/kWh	NERSA revenue application decision (Feb 2010)
Grid connected wind power plant in Klawer , South Africa (validation 2011)	R52.30/MWh	"Price of electricity from the national grid"
Grid connected wind power plant in Witberg, South Africa (validation 2011)	R52.30/MWh	"Price of electricity from the national grid"
De Aar grid connected 100.5 wind farm, South Africa (validation 2011)	R0.6585/kWh	"NERSA's decision on Eskom's required revenue application - multi-year price determination 2010/11 to 2012/13 (MYPD 2) 24 February 2010, page 2, paragraph 1".
Prieska grid connected 20MW solar park (validation 2011)	R0.6585/kWh	"NERSA's decision on Eskom's required revenue application - multi-year price determination 2010/11 to 2012/13 (MYPD 2) 24 February 2010, page 2, paragraph 1".
Springbok grid connected 55.5MW wind farm, South Africa (validation 2011)	R0.6585/kWh	"NERSA's decision on Eskom's required revenue application - multi-year price determination 2010/11 to 2012/13 (MYPD 2) 24 February 2010, page 2, paragraph 1".

Sub-step 2d: Sensitivity Analysis (applicable to options II and III)

Include a sensitivity analysis that shows whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially/economically attractive (as per Step 2c para 11a) or is unlikely to be financially/economically attractive (as per Step 2c para 11b).

Outcome of Step 2: If after the sensitivity analysis it is concluded that: (1) the proposed CDM project activity is unlikely to be the most financially/economically attractive (as per Step 2c para 11a) or is unlikely to be financially/economically attractive (as per Step 2c para 11b), then proceed to Step 4 (Common practice analysis). Step 3 is an optional step and will only be conducted if the IRR is greater than or equal to the benchmark value.

Step 4: Common practice analysis

Identify and discuss the existing common practice through the following Sub-steps:

Sub-step 4a: Analyse other activities similar to the proposed project activity:

Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant region.

Sub-step 4b: Discuss any similar Options that are occurring:

If similar activities are widely observed and commonly carried out, it calls into question the claim that the proposed project activity is financially unattractive (as contended in Step 2). Therefore, if similar activities are identified above, then it is necessary to demonstrate why the existence of these activities does not contradict the claim that the proposed project activity is financially/economically unattractive or subject to barriers. This can be done by comparing the proposed CPA project activity to the other similar activities, and pointing out and explaining essential distinctions between them that explain why the similar activities enjoyed certain benefits that rendered it financially/economically attractive (e.g., subsidies or other financial flows) and which the proposed CPA project activity cannot use If necessary data/information of some similar projects are not accessible for project developers to conduct this analysis, such projects can be excluded from this analysis. In case similar projects are not accessible, the CPA-DD should include justification about non-accessibility of data/information.

Outcome of Step 4: If Sub-steps 4a and 4b are satisfied, i.e.(i) similar activities cannot be observed or (ii) similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the proposed project activity will be seen to be additional.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;

There is no mandatory requirement for the development of grid connected renewable power generation plants/units.

(iv) If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

There is no mandatory requirement for the development of grid connected renewable power generation plants/units.

A.4.4. Operational, management and monitoring plan for the programme of activities:

A.4.4.1. Operational and management plan:

>> Description of the operational and management arrangements established by the coordinating/managing entity for the implementation of the PoA, including:

(i) a record keeping system for each CPA under the PoA,
(ii) a system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as CDM project activity or as a CPA of another PoA,
(iii) the provisions to ensure that those operating the CPA are aware and have agreed that their activity is being subscribed to the PoA;

(i) A record keeping system for each CPA under the PoA,

The CME will establish and maintain an extensive database for each and every CPA wherein the following data will be recorded:

- Name of the CPA;
- Name of the implementing entity of the CPA;
- Contact details of the implementing entity including contact person, address, telephone and email address;
- Type of renewable energy (solar, wind, hydro etc.);
- Installed capacity and other relevant technical specifications of each CPA;
- Location of the CPA (GPS coordinates of the power house for example);
- Verification status and monitoring reports of each CPA.

All the above parameters will be provided by each CPA implementing entity at the time of registration. The CPA will record the data in its data collection system which is made available to the CME.

The CME will be responsible for the management of records and data associated with each CPA and all records will be stored for a period of two years after the end of the relevant crediting period. Relevant data capture, verification and storage procedures will be followed in maintaining the data to ensure its accuracy, validity and completeness.

(ii) A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA,

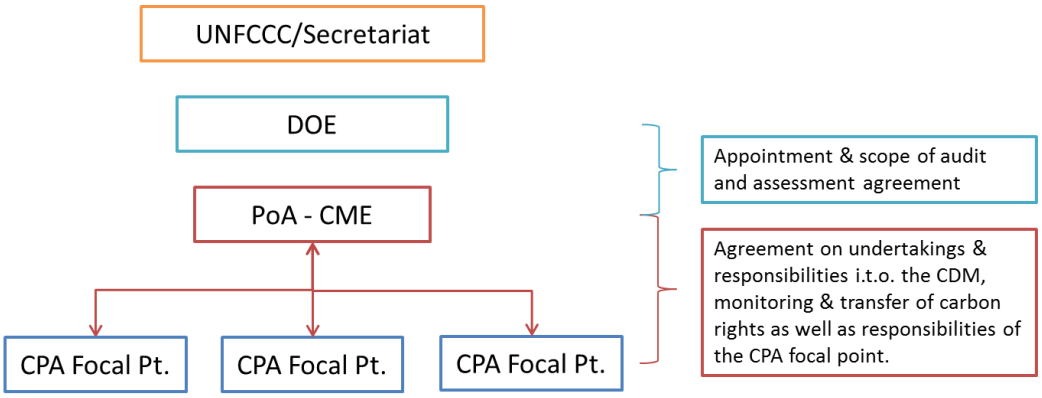
Each CPA shall be uniquely identified within the database described in (i) above. The addition of any new CPAs will be cross-checked against the database to ensure that there is no double accounting for any CPAs already enrolled and therefore that there will be no new CPA's included in the programme that have already been registered under the PoA.

The geographical boundary for the PoA is limited by the borders of the Countries. The database will contain the physical location of each CPA.

Prior to registering a new CPA within the proposed PoA, the coordinating entity will check the CDM project database to establish whether a CDM project activity or CPA of another PoA for grid-connected renewable power generation has already been registered within the borders of the Countries. This search will cover registered project activities, project activities requesting registration, project activities under review and project activities for which either a review or corrections have been requested.

In an instance where a CPA of another PoA or CDM project activity is already registered in a Country, the coordinating entity will ensure through cross-checking the database of the other CPA or CDM project that there is no double counting of the individual CPA for this PoA.

(iii) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA



Contractual relations will be established throughout the supply chain to ensure that all parties are aware of the Programme and how they are affected by its CDM registration. The agreements will include a **CPA CDM Undertaking Agreement**: CPA participants (CPA Focal Point) agree to adhere to the requirements of the Programme – this will include a contract of undertaking wherein the role and responsibility of the project developer in the PoA/CPA is prescribed especially in respect to additionality criteria and monitoring requirements.

A.4.4.2. Monitoring plan:

>> Here the following information will be provided:

(i) Description of the proposed statistically sound sampling method/procedure to be used by DOEs for verification of the amount of reductions of anthropogenic emissions by sources or removals by sinks of greenhouse gases achieved by CPAs under the PoA.

The CME opts for a verification method that does not use statistical sampling. All CPAs will be verified.

(ii) In case the coordinating/managing entity opts for a verification method that does not use sampling but verifies each CPA (whether in groups or not, with different or identical

verification periods) a transparent system is to be defined and described that ensures that no double accounting occurs and that the status of verification can be determined anytime for each CPA;

The CME will implement a monitoring protocol that allows the Designated Operational Entity (DOE) to verify all CPAs in the PoA. As described previously a database will be established that contains all the CPA specific data required to identify and locate each CPA. Each CPA will comprise a single project activity, and hence the data will be monitored directly.

Monitoring will be carried out by each CPA. For each CPA, all parameters included in E.7.1 will be monitored by the implementing entity of the CPA according to the procedures established in E.7.2. The main measure for the PoA is the measure of net electricity supplied to the grid and assuring the correct operation and maintenance of the measuring equipment. This will be done by respecting the calibration frequency as per the manufacturer's requirements. The CME will store all the data in an electronic database. Primary data will be stored by the implementing entities.

Verification will occur either separately for each CPA or in groups. The CME will in responsible for the preparation of the Monitoring Reports and communication with the DOE during verification activities. The Monitoring Report will collate all required monitoring information in order to allow the DOE to verify the emission reductions for each monitoring period of each CPA. The Monitoring Report will unambiguously set out the data on emission reductions generation by each CPA during the monitoring period consistent with the requirements of this PoA-DD and the corresponding CPA-DD. The use of the database of CPA information and QA/QC procedures will ensure that double counting is not possible.

The start and end dates of each monitoring period for each individual CPA, together with the emission reductions attributable to that monitoring period will be recorded in the database. Record keeping procedures undertaken by the CME will ensure that the data attributed to a monitoring period can be clearly attributed to an individual CPA and will furthermore prevent double counting of emission reduction data.

The monitoring plan for parameters included in section E.7.1 will be implemented for each CPA with assistance from the CME as follows:

- CPA implementing entities will implement each CPA individually and monitor and record all parameters included in section E.7.1.
- The CME will provide guidance to the CPA implementing entity on how the monitoring should be conducted and data should be collected with regards to emission reduction calculations.
- The CPA owners will provide data on monitored parameters included in section E.7.1 to the CME.
- The CME will document and store all data related to parameters included in section E.7.1 provided by CPA implementing entities in an electronic database, while primary data will be stored by each CPA implementing entity. The data will be kept for at least two years after the end of the last crediting period.
- The CME will review relevant monitoring documents, prepare the Monitoring Report, and provide the Monitoring Report to the DOE.

A.4.5. Public funding of the programme of activities:

>>

The proposed PoA will not receive any public funds resulting from official development assistance from Parties included in Annex I to the Convention.

SECTION B. Duration of the programme of activities

B.1. Starting date of the programme of activities:

>>

1 March 2012

B.2. Length of the programme of activities:

>>

28 Years

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

>>

1. Environmental Analysis is done at PoA level	☐
2. Environmental Analysis is done at CPA level	X

The PoA allows for large scale project activities for various renewable energy types and hence it is inappropriate to conduct an environmental analysis at the PoA level. The type of CPA activity and location will determine whether or not a full scale EIA process will be needed.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>

The environmental impacts analysis or environmental analysis as required by the host country will be done at a CPA level.

The positive environmental benefits of the implemented CPAs at a PoA level may include:

- Decreased air pollution linked to the use of the fossil fuels;
- Displacement of fossil fuels and GHG emission reductions; and
- Decreased dependency on fossil fuels.

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),:

>>

The degree of complexity and detail required for each individual CPA may vary depending on the installed capacity and other technical specifications, as well as local regulations. The CME will evaluate if a CPA wishing to be included in the PoA complies with local regulations related to EIAs.

It is anticipated that on most occasions some form of EIA will be required. For example, in South Africa a Basic Assessment may be required instead of the full Scoping and Environmental Impact Report.

SECTION D. Stakeholders' comments

>>

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local stakeholder consultation is done at PoA level ☐
2. Local stakeholder consultation is done at CPA level X

Each CPA operates within a geographically defined region and within any one of the Host Countries. For this reason local stakeholder consultation is done on a CPA level to ensure that the stakeholders within the region that are actually affected by the project activity are adequately informed and consulted.

Note: If local stakeholder comments are invited at the PoA level, include information on how comments by local stakeholders were invited, a summary of the comments received and how due account was taken of any comments received, as applicable.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

>>

Local Stakeholder consultation is performed at CPA level.

D.3. Summary of the comments received:

>>

N/A

D.4. Report on how due account was taken of any comments received:

>>

N/A

SECTION E. Application of a baseline and monitoring methodology

This section shall demonstrate the application of the baseline and monitoring methodology to a typical - CPA. The information defines the PoA specific elements that shall be included in preparing the PoA specific form used to define and include a CPA in this PoA (PoA specific CDM-CPA-DD).

E.1. Title and reference of the approved baseline and monitoring methodology applied to each CPA included in the PoA:

>>

The approved consolidated baseline and monitoring methodology ACM0002 version 12.1.0 *Consolidated baseline methodology for grid-connected electricity generation from renewable sources* is applied to each CPA included in the PoA.

In addition to the methodology the following tools are referred to in this PoA:

- Tool for the demonstration and assessment of additionality v5.2.1, EB39, Annex10;
- Tool to calculate the emission factor for an electricity system v2.2.0, EB61, Annex 12 ;

- Combined tool to identify the baseline scenario and demonstrate additionality v.3, EB60, Annex7;
- Tool to calculate project or leakage CO2emissions from fossil fuel combustion, v.2, EB41, Annex 11;

E.2. Justification of the choice of the methodology and why it is applicable to each CPA:

>>

The applicability criteria of ACM0002 version 12.1.0:	**Methodology ACM0002 version 12.1.0 is applicable to a CPA under the proposed PoA:**
The methodology is applicable for 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).	A CPA will consist of a renewable energy power generation project that is grid-connected and falls under one of options (a) – (d).
The project activity is the installation, 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.	A CPA will consist of a renewable energy power generation project that is grid-connected. The CPA will be of one of the types listed here.
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 11 of ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" version 12.1.0, to calculate the parameter EGPJ,y): • 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	In the case of capacity additions, retrofits or replacements (for hydro and geothermal projects), the CPA will consist of an: • existing plant that started commercial operation prior to the start of a minimum historical reference period of five years; and • no capacity expansion or retrofit of the plant will have been undertaken between the start of this minimum historical reference period and the implementation of the project activity.

implementation of the project activity.	
In the 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/m2; 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.	If a CPA is a grid-connected hydropower plant: • the project activity will be implemented in an existing reservoir, with no change in the volume of reservoir; or • the project activity will be 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, will be greater than 4 W/m2; or • the project activity will result in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, will be greater than 4 W/m^2.
The project 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; and • hydro power plants 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.	The PoA will not include any CPAs consisting of: • a project activity that involves switching from fossil fuels to renewable energy sources at the site of the project activity; • biomass fired power plants; and • hydro power plants 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.	If a CPA is a project activity that consists of a retrofit, replacement or capacity addition then it will be seen to that: • 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.

E.3. Description of the sources and gases included in the CPA boundary

>>

Source		Gas	Included?	Justification / Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	According to ACM0002, baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.
		CH_4	No	Minor source of emissions
		N_2O	No	Minor source of emissions
Project activity	For geothermal power plants, fugitive emissions of CH4 and CO2 from noncondensable gases contained in geothermal steam	CO_2	Yes	Significant emission source
		CH_4	Yes	Significant emission source
		N_2O	No	Minor source of emissions
	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plant	CO_2	Yes	Significant emission source
		CH_4	No	Minor source of emissions
		N_2O	No	Minor source of emissions
	For hydro power plants, emissions of CH4 from the reservoir	CO_2	No	Minor source of emissions
		CH_4	Yes	Significant emission source
		N_2O	No	Minor source of emissions

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

>>

Due to the differing nature of the renewable power generation projects potentially applicable under ACM0002, within each CPA a description of how the baseline scenario for that CPA is identified and a description of that identified baseline scenario will be provided.

If the CPA project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is then the electricity delivered to the grid by the CPA 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 CPA project activity is a capacity addition to existing grid-connected renewable power plant/unit, the baseline scenario is then that in the absence of the CDM project activity, the existing facility would continue to 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 assumed to correspond to the CPA project activity, and no emission reductions are assumed to occur.

If the CPA 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 by the implementing entity within the CPA-DD:

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.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the CPA being included as registered PoA (assessment and demonstration of additionality of CPA): >>

>>

As per ACM0002, each CPA will be a grid connected renewable power generation project activity. The likely scenario is that the CPA project activity is the installation of a new grid-connected renewable power plant/unit. The baseline scenario in the absence of that CPA project activity is power generated by the operation of grid-connected power plant and by the addition of new generation sources using carbon-intensive fossil fuels, hence the anthropogenic emissions are reduced below those that would have occurred in the absence of the CPA. This baseline is in line with all laws and regulations of the Countries.

E.5.1. Assessment and demonstration of additionality for a typical CPA:

>> Here the PPs shall demonstrate, using the procedure provided in the baseline and monitoring methodology applied, additionality of a typical CPA.

The methodology ACM0002 stipulates the use of the Tool for the demonstration of additionality. The tool follows a stepwise approach consisting of:

- Identification of alternatives to the project activity;
- Investment analysis;
- Barrier analysis; and
- Common practice analysis.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:
The following are realistic alternatives available to the project developer

a) The project is undertaken without registration as a CDM project; or
b) A fossil fuel fired power plant project is undertaken; or
c) No project activity is undertaken.

Sub-step 1b: Consistency with mandatory laws and regulations:

Alternative a: This alternative, and likewise the project activity, should be shown to be in compliance with the national legislation of the host country. If in contravention then this alternative should be eliminated.

Alternative b: This alternative, should be shown to be in compliance with the national legislation of the host country or if in contravention then this alternative should be eliminated.

Alternative c: There should be no requirement imposed on the project developers to build a renewable energy plant, and therefore not undertaking the project activity would not be in contravention of any host country laws or regulations. If in contravention then this alternative should be eliminated.

The CPA should list the alternatives that remain after ensuring consistency with mandatory laws and regulations and removing those alternatives that do not comply.

Step 2: Investment Analysis

Sub-step 2a: Determine the appropriate investment analysis method

Since the project will produce revenue through the sale of renewable energy, and one alternative includes not investing in the project, a benchmark investment comparison analysis is most appropriate.

Sub-step 2b: Option III. Apply a benchmark analysis

For the purpose of this analysis an equity IRR is calculated and compared to the expected general market return rate. The benchmark is determined using the Capital Asset Pricing Model (CAPM). This model takes into account the non-diversifiable risk of the asset, the expected return of the market and the expected return of a risk-free asset using the following formula:

$$E(R_i) = R_f + \beta_i(E(R_m)-R_f)$$

Where:
$E(R_i)$ = the expected return of the capital asset
R_f = the risk free rate of interest such as arising from government bonds
β_i = the sensitivity of the expected excess asset returns to the expected excess markets returns
$E(R_m)$ = the expected return of the market

Using this formula and the parameters listed in the table below the benchmark [**$E(R_i)$**] is determined. The CPA must supply those parameters stipulated in the table below as well as references or supporting documentation.

Parameter
$E(R_i)$
R_f
β_i
$E(R_m)$

Furthermore, "Guidelines on the assessment on investment analysis", EB62 Annex 5, provides default values for the expected rate of return on equity (calculated after taxes) for different countries. These default values may be used if calculating the cost of equity is based on data sources which the DOE will be unable to clearly validate and justify or as a simple default option if a company internal benchmark is used. For the purpose of determining the adjustment factor to reflect the risk of projects in different sectoral scopes, three different project categories are distinguished according to the sectoral scopes under CDM. Group 1 includes:

- Energy industries (sectoral scope 1)
- Energy Distribution (sectoral scope 2)
- Energy Demand (sectoral scope 3)
- Waste handling and disposal (sectoral scope 13)

Sub-step 2c: Calculation and comparison of financial indicators
The CPA shall calculate the equity IRR and compare this to the benchmarks derived above.

Sensitivity Analysis

A sensitivity analysis will be conducted over the main external parameters that drive the financial model. Each parameter listed in the table below should be increased by 10% and decreased by 10% and the effect on the equity IRR noted.

Parameter
Energy yield
Tariff
Total construction cost
Average O&M cost

E.5.2. Key criteria and data for assessing additionality of a CPA:

>> Here the PPs shall provide the key criteria for assessing additionality of a CPA when proposed to be included in the registered PoA. The criteria shall be based on additionality assessment undertaken in E.5.1 above. The project participants shall justify the choice of criteria based on analysis in above section.
It shall be demonstrated how these criteria would be applied to the additionality of a typical CPA at the time of inclusion.

NOTE: Information provided here shall be incorporated into the CDM-CPA-DD that has been specified for this PoA and shall be included in documentation submitted by project participants at registration of PoA.

Each CPA is expected to assess and demonstrate additionality using an investment analysis approach (following the approach described in the "*Tool for the demonstration and assessment of additionality*" described in A.4.3 and E.5.1.). The financial viability of the CPA project activity will be compared with a scenario where the CPA implementation entity does not undertake the project and uses the financial resources that would have been used to finance the construction of the project for alternative investments. To this end the project IRR (without CDM revenues) will be compared with a benchmark rate for investment returns available to a local investor in the host country (see sub-step 2b in E.5.1) or the country specific benchmark from "Guidelines on the assessment on investment analysis", EB62, Annex 5. These benchmarks represent the minimum project IRR that is required for the project to be financially viable relative to the "do-nothing" scenario.

Furthermore, a sensitivity analysis showing whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions, and a common practice analysis will be performed.

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical CPA:

>>

Each CPA under this PoA will use ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" version 12.1.0. A grid-connected renewable power generation CPA may be one of either a:

- 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.

The methodology is applicable for CPAs 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).

Every CPA, which will use one of the renewable energy types listed above to generate power, will have to determine its condition as one of (a)-(d) described above, along with the further eligibility criteria for each source of grid connected renewable power generation.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a CPA:

>>

For each CPA, all parameters included in E.7.1 will be monitored by the implementing entity of the CPA and recorded electronically. The CPA owners will provide data on monitored parameters included in section E.7.1 to the CME. The CME will document and store all data related to parameters included in section E.7.1 provided by CPA implementing entities in an electronic database, while primary data will be stored by each CPA implementing entity.

Project emissions

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

$$\mathbf{PE_y = PE_{ff,y} + PE_{GP,y} + PE_{HP,y}} \quad \mathbf{(1)}$$

Where:

$\mathbf{PE_y}$	=	Project emissions in year *y* (tCO_2e/yr)
$\mathbf{PE_{ff,y}}$	=	Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)
$\mathbf{PE_{GP,y}}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$\mathbf{PE_{HP,y}}$	=	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 here:

Fossil fuel combustion ($PE_{FF,y}$)

For geothermal and solar thermal CPA 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 "Tool to calculate project or leakage CO_2emissions from fossil fuel combustion".

Equations from the "Tool to calculate project or leakage CO_2emissions from fossil fuel combustion".

CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (1)$$

Where:

$PE_{FC,j,y}$	=	Are the CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2/yr)
$FC_{i,j,y}$	=	Is the quantity of fuel type *i* combusted in process *j* during the year *y* (mass of volume unit/yr)
$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
i		Are the fuel types combusted in process *j* during the year *y*

The CO_2 emission coefficient $COEF_{jy}$ can be calculated using one of the following two options, depending on the availability of data on the fossil fuel type *i*, as follows:

Option A:
The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type *i*, using the following approach:

If $FC_{i,j,y}$ is measured in a mass unit: $\mathbf{COEF_{i,y} = w_{c,i,y} * 44/12}$ **(2)**

If $FC_{i,j,y}$ is measured in a volume unit: $\mathbf{COEF_{i,y} = w_{c,i,y} * \rho_{i,y} * 44/12}$ **(3)**

Where:

$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* (tCO_2/mass or volume unit)
$w_{c,i,y}$	=	Is the weighted average mass fraction of carbon in fuel type *i* in year *y*
$\rho_{i,y}$	=	Is the weighted average density of fuel type *i* in year *y* (mass unit/volume unit of the fuel).
i	=	Are the fuel types combusted in process *j* during the year *y*

Option B:
The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i*, as follows:

$$\mathbf{COEF_{i,y} = NCV_{i,y} * EF_{CO2,I,y}} \quad \mathbf{(4)}$$

Where:

$\mathbf{COEF_{i,y}}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
$\mathbf{NCV_{i,y}}$	=	Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$\mathbf{EF_{CO2,I,y}}$	=	Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
i	=	Are the fuel types combusted in process *j* during the year *y*

Option A should be the preferred approach, if the necessary data is available.

Each CPA will document which option has been applied.

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

For geothermal CPA project activities, project developers shall account fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam. 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 re-injected 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:

$$\mathbf{PE_{GP,y} = (w_{steam,CO2,y} + w_{steam,CH4,y} * GWP_{CH4}) * M_{steam,y}} \quad \mathbf{(2)}$$

Where:

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

		y (tCH_4/t steam)
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)

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

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

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

$PE_{HP,y} = 0$ **(4)**

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (5)$$

Where:

PD	=	Power density of the CPA project activity (W/m^2)
Cap_{PJ}	=	Installed capacity of the hydro power plant after the implementation of the CPA 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)

$\mathbf{A_{BL}}$ = 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.

Each CPA will document which option has been applied.

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 will be calculated as follows:

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

Where:

$\mathbf{BE_y}$ = Baseline emissions in year *y* (tCO_2/yr)

$\mathbf{EG_{PJ,y}}$ = Quantity of net electricity generation that is poroduced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$\mathbf{EF_{grid,CM,y}}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the 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.

(a) Greenfield renewable energy power plants

If the CPA 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:

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

Where:

$\mathbf{EG_{PJ,y}}$ = 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)

$\mathbf{EG_{facility,y}}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

(b) Retrofit of an existing renewable energy power plant

If the CPA 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.

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

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

and

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

Where:

$\mathbf{EG_{PJ,y}}$	=	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)
$\mathbf{EG_{facility,y}}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)
$\mathbf{EG_{historical}}$	=	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)
$\mathbf{\sigma_{historical}}$	=	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)
$\mathbf{DATE_{BaselineRetrofit}}$	=	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

$EG_{historical}$ 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 CPA project activity. To determine $EG_{historical}$, project developers 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.

One of the following two time spans of historical data will be chosen to determine $EG_{historical}$:

(a) The five last calendar years prior to the implementation of the CPA 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). 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, one of the following two options will be used 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:

$$\mathbf{EG_{PJ,y} = EG_{PJ\_Add,y}} \quad \mathbf{(10)}$$

Where:

$\mathbf{EG_{PJ,y}}$	=	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)
$\mathbf{EG_{PJ\_Add,y}}$	=	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)

Each CPA will document which option has been applied.

Equations from the "Tool to calculate the emission factor for an electricity-system"

Each CPA will calculate the Grid Emission Factor ($\mathbf{EF_{grid,CM,y}}$) as per the "*Tool to calculate the Emission Factor for an electricity system*." The combined margin (CM) is calculated to determine the CO_2 emission factor for grid connected power generation The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the "operating margin" (OM) and the "build margin" (BM). The OM is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the proposed CPA project activity. The BM is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the proposed CPA project activity.

The tool prescribes a step-based approach to calculate the CM:

Step 1: Identify the relevant electricity systems
A project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the CPA project activity e.g. the renewable power plant location.

None of the project electricity systems for any of the Host Countries are located in an Annex-I country. The geographical extent of the CPA electricity system will be documented transparently and all grid power plants/units connected to the system will be identified.

Electricity transfers from connected electricity systems to the CPA project electricity system are defined as electricity imports and electricity transfers to connected electricity systems are defined as electricity exports. Where electricity imports and/or exports exist, these will be identified and electricity exports will not be subtracted from electricity generation data used for calculating and monitoring the electricity emission factors.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)
This programme selects option I to calculate the operating margin and build margin emission factor whereby only grid power plants are included in the calculation.

Step 3: Select a method to determine the operating margin (OM)
The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

The below criteria will be considered by each CPA in determining the selection of the method to calculate OM. Each CPA will outline their choice and justification for the method employed in line with the below restrictions.

The simple OM method (Option a) can only be used if low-cost/must-run resources constitute less than

50% of total grid generation in:
1) average of the five most recent years, or
2) based on long-term averages for hydroelectricity production.

The dispatch data analysis (Option c) cannot be used if off-grid power plants are included in the project electricity system as per Step 2 above; however, this will not be a constraint as off-grid power generation is specifically excluded from the grid-connected baseline scenario according to AMS-I.F. Dispatch data analysis will therefore not be used as the method to calculate OM by a CPA.

The simple adjusted OM method (Option b) could be used, but detailed data is needed for this method and is not available for all of the Host Countries. Therefore this method is excluded and will not be selected by a CPA.

The average OM (Option d) method should only be used if the data for simple OM is not available. This method should therefore be used in the case where the Host country does not have the data available to use the simple OM method.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either *ex ante* or *ex post* data vintages. An ex-ante approach will be adopted for all CPAs included in the PoA. The emission factor is determined once at the validation stage and thus no monitoring and recalculation of the emissions factor during the crediting period will be required.
For grid power plants a 3-year generation-weighted average, based on the most recent data available at the time of inclusion of the CPA will be used.

Step 4: Calculate the operating margin emission factor according to the selected method
Only the simple OM or average OM method may be used by a CPA. The two methods are outlined below:

(a) Simple OM

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. The simple OM may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit[4] or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:
a) The necessary data for Option A is not available; and
b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
c) Off-grid power plants are not included in the calculation

[4] Power units should be considered if some of the power units at the site of the power plant are low-cost/must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost/must-run units or if all power units at the site of the power plant do not belong to the group of low-cost/must-run units.

Option A - Calculation based on average efficiency and electricity generation of each plant

Under this option, the simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_{m} EG_{m,y} \cdot EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad \textbf{(1)}$$

Where:

$\mathbf{EF_{grid,OMsimple,y}}$	=	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$\mathbf{EG_{m,y}}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$\mathbf{EF_{EL,m,y}}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
M	=	All power units serving the grid in year y except low-cost / must-run power units
Y	=	The relevant year as per the data vintage chosen in Step 3

Determination of $\mathbf{EF_{EL,m,y}}$

The emission factor of each power unit m should be determined as follows:

• Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_{i} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}} \quad \textbf{(2)}$$

Where:

$\mathbf{EF_{EL,m,y}}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$\mathbf{FC_{i,m,y}}$	=	Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit)
$\mathbf{NCV_{i,y}}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$\mathbf{EF_{CO2,i,y}}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)

$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	=	All power units serving the grid in year *y* except low-cost/must-run power units
i	=	All fossil fuel types combusted in power unit m in year *y*
y	=	The relevant year as per the data vintage chosen in Step 3

• Option A2. If for a power unit m only data on electricity generation and the fuel types used is available, the emission factor should be determined based on the CO2 emission factor of the fuel type used and the efficiency of the power unit, as follows:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \cdot 3.6}{\eta_{m,y}} \quad (3)$$

Where:

$EF_{EL,m,y}$	=	CO2 emission factor of power unit *m* in year *y* (tCO2/MWh)
$EF_{CO2,m,i,y}$	=	Average CO2 emission factor of fuel type *i* used in power unit *m* in year *y* (tCO_2/GJ)
$\eta_{m,y}$	=	Average net energy conversion efficiency of power unit m in year *y* (ratio)
m	=	All power units serving the grid in year *y* except low-cost/must-run power units
y	=	The relevant year as per the data vintage chosen in Step 3

Where several fuel types are used in the power unit, use the fuel type with the lowest CO_2 emission factor for $EF_{CO2,m,i,y}$.

• Option A3. If for a power unit *m* only data on electricity generation is available, an emission factor of 0 tCO_2/MWh can be assumed as a simple and conservative approach.

Determination of $EG_{m,y}$

For grid power plants, $EG_{m,y}$ should be determined as per the provisions in the monitoring tables.

Option B - Calculation based on total fuel consumption and electricity generation of the system.

Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}\right)}{EG_y} \quad (7)$$

Where:

$\mathbf{EF_{grid,OMsimple,y}}$	=	Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$\mathbf{F_{Ci,y}}$	=	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
$\mathbf{NCV_{i,y}}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$\mathbf{EF_{CO2,i,y}}$	=	CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)
$\mathbf{EF_{CO2,i,y}}$	=	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh)
i	=	All fossil fuel types combusted in power sources in the project electricity system in year *y*
y	=	The relevant year as per the data vintage chosen in Step 3

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant m.

(d) Average OM

The average OM emission factor ($EF_{grid,OM\text{-}ave,y}$) is calculated as the average emission rate of all power plants serving the grid, using the methodological guidance as described under (a) above for the simple OM, but including in all equations also low-cost/must-run power plants.

Option B should only be used if the necessary data for Option A is not available.

Step 5: Calculate the build margin emission factor

The vintage of data used by the CPAs will be that as classified under **Option 1** where:

- For the first crediting period, the build margin emission factor is calculated *ex ante* based on the most recent information available on units already built for sample group *m*. Most recent refers to the time at which the CPA is submitted for inclusion under the PoA. For the second crediting period, the build margin emission factor will be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

The sample group of power units *m* used to calculate the build margin should be determined as below:

a) Identify the set of five power units that have started to supply electricity to the grid most recently (excluding power units registered as CDM project activities) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$ in MWh);
b) Determine the annual electricity generation of the CPA electricity system (excluding power units registered as CDM project activities). Identify the set of power units that stared to supply electricity to the grid most recently and that comprise 20% of the AEG_{total} and determine their annual electricity generation ($AEG_{SET>20\%}$ in MWh).
c) From the $SET_{5\text{-}units}$ and $SET_{>20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}).

CPAs should then identify the date when the power units in the SET_{sample} started to supply electricity to the grid. If none of the power units in SETsample started to supply electricity to the grid more than 10 years ago, then use SET sample to calculate the BM.
Otherwise:

d) Exclude from the SETsample the power units which started to supply electricity to the gird more than 10 years ago. Include that set the power units registered as CDM project activity (if any) starting with power units that started to supply electricity to the grid most recently, until the electricity generation set comprises 20% of the annual electricity generation of the project electricity system. Determine for the resulting set ($SET_{sample-CDM}$) the annual electricity generation ($AEG_{SET-sample-CDM}$ in MWh).

If the annual electricity generation of that set comprises at least 20% of the annual electricity generation of the project electricity system i.e. $AEG_{SET-sample-CDM} > 0.2 \times AEG_{total}$, then the CPA should use the sample group $SET_{sample-CDM}$ to calculate the BM;
Otherwise:

e) Include in the sample group $SET_{sample-CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the project electricity system.
f) The sample group of power units *m* used to calculate the BM is the resulting set. ($SET_{sample-CDM>10yrs}$)

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad \textbf{(13)}$$

Where:

$\mathbf{EF_{grid,BM,y}}$	=	Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$\mathbf{EG_{m,y}}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$\mathbf{EF_{EL,m,y}}$	=	CO_2 emission factor of power unit m in year *y* (tCO_2/MWh)
M	=	Power units included in the build margin
Y	=	Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) should be determined as per the guidance in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

Step 6: Calculate the combined margin (CM) emissions factor
The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \textbf{(14)}$$

Where:

$\mathbf{EF_{grid,BM,y}}$	=	Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$\mathbf{EF_{grid,OM,y}}$	=	Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$\mathbf{w_{OM}}$	=	Weighting of operating margin emissions factor (%)
$\mathbf{w_{BM}}$	=	Weighting of build margin emissions factor (%)

The following default values should be used for w_{OM} and w_{BM}:

• Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

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 ($DATE_{BaselineRetrofit}$), the CPA 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.

The point in time when the existing equipment would need to be replaced/retrofitted in the absence of the CPA 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). These emissions sources are neglected.

Emission reductions

Emission reductions are calculated as follows:

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

Where:

$\mathbf{ER_y}$	=	Emission reductions in year *y* ($t\ CO_2e/yr$)
$\mathbf{BE_y}$	=	Baseline emissions in year *y* ($t\ CO_2/yr$)
$\mathbf{PE_y}$	=	Project emissions in year *y* ($t\ CO_2e/yr$)

Estimation of emissions reductions prior to validation

Project developers should prepare as part of the CPA-DD 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 developers 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.

E.6.3. Data and parameters that are to be reported in CDM-CPA-DD form:

Project emissions:

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

(Copy this table for each data and parameter)

Data / Parameter:	**$GWPCH_4$**
Data unit:	$tCO2e/tCH_4$
Description:	Global warming potential of methane valid for the relevant commitment period
Source of data used:	IPCC
Value applied:	For the first commitment period: 21 tCO_2e/tCH_4
Justification of the choice of data or description of measurement methods	2006 IPCC Guidelines for National Greenhouse Gas Inventories

and procedures actually applied :	
Any comment:	-

Emissions from water reservoirs of hydro power plants:
If the power density of the project activity is greater than 4W/m^2 and less than or equal to 10M/m^2.

Data / Parameter:	**EF_{Res}**
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emissions from reservoir
Source of data used:	Decision at EB23
Value applied:	90 $kgCO_2e/MWh$
Justification of the choice of data or description of measurement methods and procedures actually applied :	EB 23 Annex 5: Hydroelectric power plants with power densities greater than 4 W/m^2 but less than or equal to 10 W/m^2 can use the currently approved methodologies, with an emission factor of 90 gCO_2eq/kWh for project reservoir emissions.
Any comment:	-

Emissions from water reservoirs of hydro power plants:
If the power density of the project activity is greater than 10W/m^2:

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 used:	Project developer records at the project site
Value applied:	To be determined using project developer records
Justification of the choice of data or description of measurement methods and procedures actually applied :	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 used:	Project developer records at the project site
Value applied:	To be determined using project developer records
Justification of the choice of data or description of	Measured from topographical surveys, maps, or satellite pictures, etc.

measurement methods and procedures actually applied :	
Any comment:	-

Baseline emissions:

All projects:

(Copy this table for each data and parameter)	
Data / Parameter:	**$EF_{grid,CM,y}$**
Data unit:	tCO_2/MWh
Description:	Combined margin CO2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system".
Source of data to be used:	Calculated.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	As per the data vintage stipulated in the "Tool to calculate the emission factor for an electricity system"
Description of measurement methods and procedures to be applied:	Calculated.
QA/QC procedures to be applied:	
Any comment:	-

Retrofit or replacement of an existing renewable energy power plant:

Data / Parameter:	**$EG_{historical}$**
Data unit:	MWh/y
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 used:	Project developer records at the project site
Value applied:	To be determined using developer records
Justification of the choice of data or description of measurement methods and procedures actually applied :	One of the following two time spans of historical data will be chosen to determine $EG_{historical}$: (a) The five last calendar years prior to the implementation of the CPA 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.
Any comment:	-

Data / Parameter:	$\sigma_{historical}$
Data unit:	MWh/y
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 used:	Calculated from data used to establish $EG_{historica}$
Value applied:	Calculated
Justification of the choice of data or description of measurement methods and procedures actually applied :	Parameter to be calculated as the standard deviation of the annual generation data used to calculate $EG_{historical}$ for retrofit or replacement CPA 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 CPA project activity.
Source of data used:	Project developer records at the project site
Value applied:	To be determined using project developer records
Justification of the choice of data or description of measurement methods and procedures actually applied :	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 ($DATE_{BaselineRetrofit}$), the CPA 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.
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 used:	Project developer records at the project site
Value applied:	To be determined using project developer records
Justification of the choice of data or description of measurement methods and procedures actually applied :	$DATE_{hist}$ 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:	-

E.7. Application of the monitoring methodology and description of the monitoring plan:

D.7.1. Data and parameters to be monitored by each CPA:

Project emissions:

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

(Copy this table for each data and parameter)

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 to be used:	Physical sample measurements of the non-condensable gases collected at the CPA project site and analysed
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	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 analysed using gas chromatography to determine the content of the residuals including CH_4. All alkanes concentrations are reported in terms of methane. Monitoring to take place at least every 3 months and more frequently, if necessary.
QA/QC procedures to be applied:	Sampling carried out according to ASTM Standard Practice E1675

Any comment:	Applicable to geothermal power projects

(Copy this table for each data and parameter)	
Data / Parameter:	$\mathbf{w_{steam,CH4,y}}$
Data unit:	tCH_4/t steam
Description:	Average mass fraction of methane in the produced steam in year *y*
Source of data to be used:	Physical sample measurements of the non-condensable gases collected at the CPA project site and analysed
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	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 analysed using gas chromatography to determine the content of the residuals including CH_4. All alkanes concentrations are reported in terms of methane. Monitoring to take place at least every 3 months and more frequently, if necessary.
QA/QC procedures to be applied:	Sampling carried out according to ASTM Standard Practice E1675
Any comment:	Applicable to geothermal power project

(Copy this table for each data and parameter)	
Data / Parameter:	$\mathbf{M_{steam,y}}$
Data unit:	t steam/y
Description:	Quantity of steam produced in year *y*
Source of data to be used:	Direct, physical measurements as recorded by metering equipment at CPA project site.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of	The steam quantity discharged from the geothermal wells should be measured

measurement methods and procedures to be applied:	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 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 to take place daily.
QA/QC procedures to be applied:	Calibration certificates in line with manufacturers requirements will be available for on site verification.
Any comment:	Applicable to geothermal power projects

Emissions from water reservoirs of hydro power plants:
If the power density of the project activity is greater than 4W/m^2 and less than or equal to 10M/m^2.

(Copy this table for each data and parameter)	
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 to be used:	Direct, physical measurements as recorded by metering equipment (electricity meter) at CPA project site.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	Direct, physical measurements as recorded by metering equipment (electricity meter). Continuous measurement and at least monthly recording.
QA/QC procedures to be applied:	Cross check measurement results with records for sold electricity
Any comment:	Applicable to hydro power CPA 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.

Fossil fuel combustion ($PE_{FF,y}$)

(Copy this table for each data and parameter)	
Data / Parameter:	**$PE_{FF,y}$**
Data unit:	tCO2/yr
Description:	Project emissions from fossil fuel consumption in year *y*
Source of data to be	As per the "Tool to calculate project or leakage CO2 emissions from fossil fuel

used:	combustion"
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	Calculated
QA/QC procedures to be applied:	-
Any comment:	Applicable to geothermal and solar thermal projects, which also use fossil fuels for electricity generation

Emissions from water reservoirs of hydro power plants:
If the power density of the project activity is greater than 10W/m^2:

(Copy this table for each data and parameter)	
Data / Parameter:	**Cap_{PJ}**
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the CPA project activity
Source of data to be used:	Project developer records at the project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	Determine the installed capacity based on recognized standards, using project developers standards. Monitoring to take place yearly.
QA/QC procedures to be applied:	Determine the installed capacity based on recognized standards.
Any comment:	-

(Copy this table for each data and parameter)	
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 to be	Project developer records at the project site

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, or satellite pictures, etc. Monitoring to take place yearly.
QA/QC procedures to be applied:	-
Any comment:	-

Baseline emissions:

Greenfield renewable energy power plants:

(Copy this table for each data and parameter)	
Data / Parameter:	**$EG_{facility,y}$**
Data unit:	MWh/y
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data to be used:	Direct, physical measurements as recorded by metering equipment (electricity meter) at CPA project site..
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	Direct, physical measurements as recorded by metering equipment (electricity meter). Continuous measurement and at least monthly recording.
QA/QC procedures to be applied:	Cross check measurement results with records for sold electricity
Any comment:	-

Capacity addition to an existing renewable energy power plant:

(Copy this table for each data and parameter)	
Data / Parameter:	**$EG_{PJ\_Add,y}$**
Data unit:	MWh/y
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 to be used:	Direct, physical measurements as recorded by metering equipment (electricity meter) at CPA project site..
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	Direct, physical measurements as recorded by metering equipment (electricity meter). Continuous measurement and at least monthly recording.
QA/QC procedures to be applied:	Cross check measurement results with records for sold electricity
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.

Other Tools to be used:

Parameters from the "Tool to calculate project or leakage CO_2emissions from fossil fuel combustion"

(Copy this table for each data and parameter)	
Data / Parameter:	**$FC_{i,j,y}$**
Data unit:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description:	Quantity of fuel type *i* combusted in process *j* during the year *y*
Source of data to be used:	Direct, physical measurements as recorded by metering equipment at CPA project site.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions. Monitoring frequency is continuously.

QA/QC procedures to be applied:	The consistency of metered fuel consumption quantities should be cross checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Any comment:	-

(Copy this table for each data and parameter)	
Data / Parameter:	$w_{C,i,y}$
Data unit:	tC/mass unit of the fuel
Description:	Weighted average mass fraction of carbon in fuel type *i* in year *y*
Source of data to be used:	The following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source** a) Values provided by the fuel supplier in invoices / This is the preferred source b) Measurements by the implementing entity / If a) is not available
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	Measurements should be undertaken in line with national or international fuel Standard. Monitoring frequency: The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
QA/QC procedures to be applied:	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Applicable where Option A in the tool is used

(Copy this table for each data and parameter)	
Data / Parameter:	$\rho_{i,y}$
Data unit:	Mass unit/volume unit

Description:	Weighted average density of fuel type *i* in year *y*
Source of data to be used:	The following data sources may be used if the relevant conditions apply: **Data source Conditions f using the data sourc** / **Data source Conditions for using the data source** a) Values provided by the fuel supplier in invoice / This is the preferred source b) Measurements by the implementing entity / If a) is not available c) Regional or national default value / If a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA
Description of measurement methods and procedures to be applied:	Measurements should be undertaken in line with national or international fuel Standards. Monitoring frequency: The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
QA/QC procedures to be applied:	-
Any comment:	Applicable where Option A in the tool is used and where $FC_{i,j,y}$ is measured in a volume unit. Preferably the same data source should be used for $w_{C,i,y}$ and $\rho_{i,y}$.

(Copy this table for each data and parameter)	
Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ per mass or volume unit (e.g. GJ/m³, GJ/ton)
Description:	Weighted average net calorific value of fuel type *i* in year *y*
Source of data to be used:	The following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source** a) Values provided by the fuel supplier in invoice / This is the preferred source if the carbon fraction of the fuel is not provided (Option A b) Measurements by the implementing entity / If a) is not available c) Regional or national default / If a) is not available

	value	These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).
	d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be stipulated by the CPA	
Description of measurement methods and procedures to be applied:	For a) and b): Measurements should be undertaken in line with national or international fuel standards. Monitoring frequency: For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account.	
QA/QC procedures to be applied:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards	
Any comment:	Applicable where Option B in the tool is used	

(Copy this table for each data and parameter)

Data / Parameter:	**$EF_{CO2,i,y}$**
Data unit:	tCO_2/GJ
Description:	Weighted average CO_2 emission factor of fuel type *i* in year *y*
Source of data to be used:	The following data sources may be used if the relevant conditions apply:

Data source	**Conditions for using the data source**
a) Values provided by the fuel supplier in invoices	This is the preferred source if the carbon fraction of the fuel is not provided (Option A

	b) Measurements by the implementing entity	If a) is not available
	c) Regional or national default value	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).
	d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available
Value of data applied for the purpose of calculating expected emission reductions in section B.5		
Description of measurement methods and procedures to be applied:	To be stipulated by the CPA	
QA/QC procedures to be applied:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards	
Any comment:	Applicable where option B in the tool is used. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.	

E.7.2. Description of the monitoring plan for a CPA:

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The purpose of the monitoring plan will be to measure and record the net electricity delivered to the electrical grid. Details of the CPA monitoring plan will be described within each CPA, considering the following elements:

1. Management structure and responsibilities

The CME will implement a monitoring protocol that allows the Designated Operational Entity (DOE) to verify all CPAs in the PoA. Monitoring will be carried out be each CPA. For each CPA, all parameters included in E.7.1 will be monitored by the implementing entity of the CPA. The main measure for the PoA is the measure of net electricity supplied to the grid and assuring the correct operation and maintenance of the measuring equipment.

Data collection:
The CME will establish and maintain an extensive database for each and every CPA wherein the following data will be recorded:

- Name of the CPA;
- Name of the implementing entity of the CPA;
- Contact details of the implementing entity including contact person, address, telephone and email address;
- Type of renewable energy technology (solar, wind, hydro etc.);
- Installed capacity and other relevant technical specifications of each CPA;
- Location of the CPA (GPS coordinates of the power house for example);
- Verification status and monitoring reports of each CPA.

Each CPA will comprise a single project activity, and hence the data will be monitored directly at that CPA project site. Monitoring will be carried out be each CPA. The CME will provide guidance to the CPA implementing entity on how the monitoring should be conducted and data should be collected with regards to emission reduction calculations The start and end dates of each monitoring period for each individual CPA, together with the emission reductions attributable to that monitoring period will be recorded in the database.

Data recording:
For each CPA, all parameters included in E.7.1 will be monitored by the implementing entity of the CPA and recorded electronically. The CPA owners will provide data on monitored parameters included in section E.7.1 to the CME. The CME will document and store all data related to parameters included in section E.7.1 provided by CPA implementing entities in an electronic database, while primary data will be stored by each CPA implementing entity.

Data calibration:
This will be done by respecting the calibration frequency as per the manufacturer's requirements. The CME will store all the data in an electronic database. Primary data will be stored by the implementing entities.

Data reporting:
The CME will in responsible for the preparation of the Monitoring Reports and communication with the DOE during verification activities. The Monitoring Report will compile all required monitoring information in order to allow the DOE to verify the emission reductions for each monitoring period of each individual CPA. The Monitoring Report will unambiguously set out the data on emission reductions generation by each CPA during the monitoring period consistent with the requirements of this PoA-DD and the corresponding CPA-DD. Record keeping procedures undertaken by the CME will ensure that the data attributed to a monitoring period can be clearly attributed to an individual CPA and will furthermore prevent double counting of emission reduction data.

Data archiving:
The CME will be responsible for the management of records and data associated with each CPA and all records will be stored for a period of two years after the end of the relevant crediting period.

2. Data quality control
The data and reports provided by each CPA implementing entity to the CME will be checked internally to ensure the accuracy and completeness of data. In case of mistakes, corrective action will be applied to avoid future similar mistakes.

3. Training and monitoring personnel
The CME will ensure that all persons that participate in the monitoring process will be suitably qualified and trained in the operation and maintenance of the CPA project activity. These persons will also receive training on the application of the monitoring plan.

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). These emissions sources are neglected.

E.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

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The baseline study and monitoring methodology were completed on 09 September 2011 by:

Graham Paul	Sean Buchanan
EcoMetrix Africa (Pty) Ltd	EcoMetrix Africa (Pty) Ltd
Graham.Paul@ecometrix.co.za	Sean.Buchanan@ecometrix.co.za

Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Refer to section A.4.5.

Annex 3

BASELINE INFORMATION

Refer to section B.4.

Annex 4

MONITORING INFORMATION

Refer to section E.7.

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