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

CONTENTS

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:

South African Large Scale Grid Connected Solar Park Programme

Version number: 3.0

Date: 11/12/2012

A.2. Description of the programme of activities:

The energy system of the Republic of South Africa (RSA) is heavily dependent on fossil fuels, and the uptake on grid connected Renewable Energy (RE) power plants in the country is slow due to substantial coal reserves[1]. As of 31/03/2010 the total net capacity of coal-fired power plants servicing the national grid of the RSA was 34,658 MW (84.80% of the total net maximum capacity of all power plants servicing the grid)[2].

The main objective of the South African Large Scale Grid Connected Solar Park Programme is to contribute to the development and promotion of RE in the RSA by building a framework to secure carbon revenue for solar park[3] developers. The programme seeks to develop a series of grid connected solar power projects that supply clean electricity to either the national grid of the RSA or an identified consumer via RSA's grid. CDM programme activities (CPAs) included into this programme envisage the installation and operation of a solar park on a site where no solar park has been operated prior to the implementation of the CPA (Greenfield installation) as well as the capacity addition to an existing solar park. Each CPA will implement either Photovoltaics (PV) technology or Concentrated Solar Power (CSP) technology.

Participation in this programme will enable the solar park developers to increase the economic viability of solar park construction projects due to the revenue from selling CERs.

The reduction of GHG emissions as a result of the implementation of CPAs will be achieved through reduction of CO_2 emissions from combustion of fossil fuel at the existing grid-connected power plants and plants which would likely be built in the absence of the CPAs.

The Coordinating and Managing Entity of this programme is Blue World Carbon Asset Management (Pty) Ltd (BWC). BWC will act as a carbon consultant to develop all necessary CDM documentation, conduct procedures for PoA approval by the CDM Executive Board, facilitate CPA inclusion, monitor CPAs, and sell CERs in the international market for all CPAs under the PoA.

1. General operating and implementing framework of the PoA

The energy system of the RSA is managed by the state-owned company Eskom which is in charge of generation, transmission and distribution of power to end-users.

Independent Power Producers (IPPs) within the power generation sector of the RSA were called upon to promote renewable energy based power projects, by the South African Department of Minerals and Energy by releasing the "White Paper on Renewable Energy" as far back as 2003[4]. However the first

[1] The RSA has the world's 6th largest recoverable coal reserve (nearly 50 billion tones). www.sajs.co.za/index.php/SAJS/article/download/369/412 paragraph 2

[2] Eskom Annual Report 2010, page 298, http://financialresults.co.za/2010/eskom_ar2010/downloads/eskom_ar2010.pdf

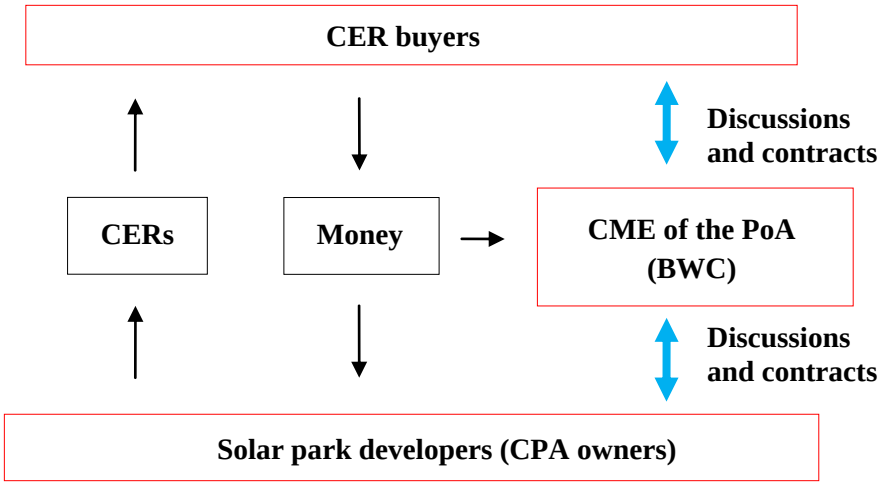
[3] In this PoA 'solar' exclusively refers to production of electricity by the use of solar energy.

[4] http://www.energy.gov.za/files/policies/whitepaper_renewables_2003.pdf

Regulatory Guidelines on "Renewable Energy Feed-in Tariff (REFIT)" were only published by the National Energy Regulator of South Africa (NERSA) in 03/2009. In 03/2011 the NERSA published revised values for REFIT for public discussion wherein the tariffs for most types of RE were significantly reduced[5]. On the 31/07/2011[6] the Department of Energy released a competitive bidding scheme under which interested project developers were invited to participate in the construction of renewable energy projects[7]. Currently the REFIT for solar generated electricity is below 2.85 R/kWh[8]. It should be noted that to date no solar park developers managed to sign a Power Purchase Agreement (PPA) with any state-owned entity and managed to obtain a REFIT for their PPA (hereafter 'Government PPA')[9] so far. The solar park developers also have an opportunity to sell power at a market price either to local municipalities or private consumers transporting power via the national grid or directly to the local municipalities (hereafter 'Private PPA'). Both Government PPAs and Private PPAs are eligible under this PoA.

The Coordinating and Managing Entity (CME) of this programme is Blue World Carbon Asset Management (Pty) Ltd. BWC will act as a carbon consultant to develop all necessary CDM documentation, conduct procedures for PoA approval by the CDM Executive Board, facilitate CPA inclusion, monitor CPAs, and sell CERs in the international market for all CPAs under the PoA. BWC receives a fee for their services. A schematic diagram of the flow of money and CERs between BWC, solar park developers and CER buyers can be seen in Figure A.2-1 below.

Participation in the PoA is voluntary. A solar park developer may choose whether or not to participate in the programme. If the developer decides to join the PoA, he has to sign a servicing agreement with BWC.



[5] http://www.nersa.org.za/Admin/Document/Editor/file/Electricity/Consultation/Documents/Review%20of%20Renewable%20Energy%20Feed-In%20Tariffs%20Consultation%20Paper.pdf

[6] http://www.info.gov.za/speech/DynamicAction?pageid=461&sid=31810&tid=88651 paragraph 8

[7] http://www.ipp-renewables.co.za/

[8] From point 5.1.4.5 in the "Request For Qualification And Proposals For New Generation Capacity Under the IPP Procurement Programme Part A: General Requirements, Rules And Provisions", dated 03/08/2011.

[9] Definition 'Government PPA' is referred to cases when the produced electricity is sold via specially determined Renewable Energy Feed-In Tariff for solar power generation projects, which usually has a higher value compared to the market values (such as tariffs of Private PPAs and existing electricity tariffs). Therefore, the REFIT value is established due to national and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies (RE technologies) over more emissions-intensive technologies.

Figure A.2-1: A schematic diagram of the flow of money and CERs between BWC, solar park developers and CER buyers (the arrows with blue lines indicate discussions and contacts)

2. Policy/measure or stated goal of the PoA

The main goal of the PoA is to establish a CDM framework to which solar power projects can be added as CPAs thus overcoming financial barriers that solar park developers face.

The other goals are the contribution to achievement of the goal to generate 10,000 GWh of electricity from renewable energy by 2013[10] and the objective to reduce RSA's GHG emissions by approximately 34.00% below the current emissions baseline by 2020.[11]

The programme satisfies all sustainable development criteria identified by the DNA of the RSA[12]. The sustainable development is defined as "the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations"[13]. The main benefits of the implementation of the present PoA are:

1. Social and economic: Promotion and development of solar power technology in the RSA which in turn will lead to the creation of new job opportunities both during the construction and operation phases and to growth in tax revenues. Sales of carbon credits generated by each CPA will result in increased foreign direct investment;
2. Environmental: Mitigation of the negative environmental impact. Combustion of fossil fuels (mostly coal) at Eskom's power plants and hereby emissions of the harmful substances into the atmosphere, such as flue ash, oxides of sulphur and nitrogen will be reduced due to the implementation of each CPA under this PoA;

Another advantage of solar power is the fact that it does not utilize water in order to produce energy[14]. The RSA is a semi-arid country with freshwater being the country's most limiting natural resource. The available freshwater resources are already almost fully-utilised and under stress.[15] Eskom consumes 1.34 L/kWh[16] which amounts to approximately 32 GL/a. The large-scale implementation of solar parks will reduce the water footprint of RSA's energy sector.

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

This PoA is not established as a result of a mandatory policy or regulation of the Government of the RSA. The proposed PoA is a voluntary action and initiative of BWC (the CME of this PoA). Participation under this PoA is voluntary.[17]

[10] http://www.energy.gov.za/files/renewables_frame.html

[11] http://www.unep.org/climatepledges/Default.aspx?pid=68 paragraph 2

[12] South African DNA released the Letter of Approval for the proposed programme.

[13] Sustainable development criteria for approval of CDM projects by the DNA of the CDM, Department of Minerals and Energy, RSA (page 1) http://www.energy.gov.za/files/esources/kyoto/Web%20info/Annex%203%20SA%20Sustainable%20Development%20Criteria.pdf

[14] http://www.waterfootprint.org/?page=files/Water-energy

[15] http://www.ngo.grida.no/soesa/nsoer/issues/water/ (Freshwater systems and resources, Dr R. D. Walmsley et al, from department of water affairs and forestry)

[16] Eskom Annual Report 2010, page 2, http://financialresults.co.za/2010/eskom_ar2010/index.htm

[17] Official declaration of voluntary action by the CME

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

Name of Party involved ((host) indicates a Host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of South Africa (Host Party)	• Blue World Carbon Asset Management (Pty) Ltd (Private company)	No

The Coordinating and Managing Entity (CME) of this programme is Blue World Carbon Asset Management (Pty) Ltd (BWC). BWC will act as a carbon consultant to develop all necessary CDM documentation, conduct procedures for PoA approval by the CDM Executive Board, facilitate CPA inclusion, monitor CPAs, and sell CERs in the international market for all CPAs under the PoA. BWC receives a fee for their services and manage the PoA according to the PoA management system and communicates with the CDM Executive Board.

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

A.4.1. Location of the programme of activities:

A.4.1.1. Host Party(ies):

The Republic of South Africa (RSA)[18]

A.4.1.2. Physical/ Geographical boundary:

The geographical boundary for this PoA is the Republic of South Africa (Figure A.4-1).

A range of GPS coordinates are given to cover the whole of the RSA:

Geographical latitude: -22 to -35 (Decimal Degrees).

Geographical longitude: 16 to 33 (Decimal Degrees).

Time zone: GMT +02:00

[18] At later stage the CME may wish to expand the PoA to other regions.

Figure A.4-1: Geographical boundaries of the RSA

All CPAs under this PoA must comply with NEMA[19] regulation regarding environmental impact assessment and proposal of mitigation measures.[20]

National policies and circumstances relevant to the PoA and CPA

The Electricity Regulation Act, 2006 (Act No. 4 of 2006)[21] (ERA) provides an enabling framework for development of the power sector in the RSA.

NERSA is a regulatory authority established as a juristic person of the National Energy Regulator Act, 2004 (Act No. 40 of 2004)[22]. NERSA's mandate is to regulate, amongst others, the Electricity industry in terms of the ERA.[23]

[19] The Nation Environmental Management Act (NEMA) of the RSA. Also refer to section C.3 for details.

[20] Related to the capacity, size or other characteristics of the plant

[21] http://www.energy.gov.za/files/policies/ELECTRICITY%20REGULATION%20ACT%204%20OF%202006.pdf

[22] http://www.energy.gov.za/files/policies/NationalEnergyRegulatorAmendmentBill.pdf

[23] http://www.nersa.org.za/

The electricity system of the RSA is managed by the state-owned company Eskom which is in charge of generation, transmission and distribution of power to end-users. The most recent data on the electricity supplied to the national grid of the RSA, as per Eskom Annual Report 2010, is presented in Table E.6-1 of Section E.6 below. The graphical representation of the mentioned statistics for year 2010 is given in Figure A.4-2 below. It can be observed that RSA's grid is dominated mostly by fossil fuel based power plants with a negligible amount of renewal energy, share of electricity supplied from coal-fired power plants exceed 92.00%, from renewable energy is less than 0.50%.

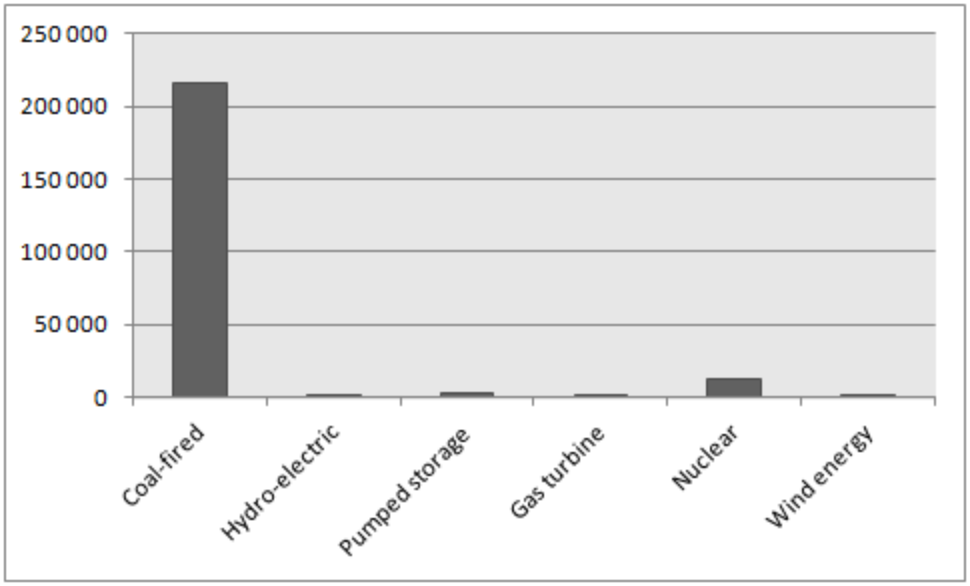


Figure A.4-2: Annual electricity supply for 2010 (GWh)

In 05/2011 Government and NERSA developed "Integrated resource plan for electricity 2010-2030"[24] (IRP) in line with the ERA. This document summarises the balanced scenario of development of RSA's energy system during the project crediting period and demonstrates current and future dependence of RSA on coal fired power plants. In spite of the proposed increase in renewable technologies, such as wind, solar, hydro and a few others, which will be promoted by the government by introducing the Independent Power Purchase Procurement Programme and to which the proposed project is related to, constriction of the fossil-fuel power plants will be carried on. The share of new renewable is expected to increase from less than 0.50% to 25.00%; nevertheless business as usual is expected to be dominated by non renewable (fossil fuel).

The IRP also states in Section 6 that there is a risk involved "*in moving from dependence on a historically certain fuel supply, specifically coal in South Africa's case, to different commodities and technologies which are less certain (from a historical perspective).*"

Thus, the national policy clearly prefers fossil fuel based power generation which forms the basis of the baseline scenario.

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

A typical CPA under this PoA is one of the following:

[24] http://www.energy.gov.za/IRP/2010/IRP_2010.pdf

1. The installation of a new grid connected solar park at a site where no solar park was operated prior to the implementation of the CPA; or
2. The capacity addition of an existing grid connected solar park[25].

Solar-generated electricity is supplied to either the national grid of the RSA or an identified consumer via the RSA's grid.

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

This PoA falls under sectorial scope: *Energy industries (renewable-/ non renewable sources)*; Type: *Renewable energy;* and category: *Electricity generation and supply*[26].

Each CPA under this PoA envisages the construction and operation of either a solar park or a capacity addition of an existing solar park. A solar park is a type of power plant where the sunlight is converted into electricity. Such power plants may use the following technologies, but are not limited to: Photovoltaics (PV) and Concentrated Solar Power (CSP).

PV Technologies

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun. "Photo" refers to light and "voltaic" to voltage. Solar cells are made of semi-conducting material, most commonly silicon, coated with special additives. When light strikes the cell, electrons are knocked loose from the silicon atoms and flows in a built-in circuit, producing electricity. If a load is connected under these conditions, an electrical current will result, which is capable of doing work. The current produced is proportional to the amount of light absorbed by the device. In a solar cell the photovoltaic effect is manifested as the generation of voltage at its terminals while being struck by the sun's rays. A solar panel is a packaged interconnected assembly of photovoltaic cells. Figure A.4-3 shows a typical PV solar panel. A PV solar park consists of several arrays of photovoltaic panels connected with each other to produce electricity.

Variations to this technology may include, but are not limited to:

1. Stationary PV: The PV solar panels remain stationery.
2. Concentrated PV: Optics such as lenses is used to concentrate a large amount of sunlight onto a small area of solar PV materials to generate electricity.
3. PV with solar trackers: PV panels are fitted with trackers. The solar tracker is a device which turns the panel towards the sun in order to maximise the amount of direct sunlight on the panel.

[25] A capacity addition is an increase in the installed power generation capacity of an existing solar park through: (i) the installation of a new solar park beside the existing solar park, or (ii) the installation of new solar park electricity generating equipment, additional to the existing solar park. The existing solar park continues to operate after the implementation of the activity. Therefore the capacity addition does not significantly affect the performance of the existing solar park and the electricity fed into the grid by the capacity addition is directly metered.

[26] CDM Methodology Booklet (page15), 11/2011, http://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf

Figure A.4-3: Typical PV solar panel

CSP technologies

Concentrated solar power (also called concentrating solar power and CSP) systems use mirrors or lenses to concentrate a large area of sunlight, onto a small area. This type of technologies is also called 'solar thermal energy'. Electrical power is produced when the concentrated light is converted to heat, which drives a heat engine (usually a steam turbine) connected to an electrical power generator in so called Rankin cycle or Organic Rankin cycle. This technology also allows for the storage of thermal energy which can be used during the night.

Variations to this technology may include, but are not limited to:

1. Solar power tower: Solar power tower consists of an array of dual-axis tracking reflectors (heliostats) that concentrate light on a central receiver on top of a tower; the receiver contains a fluid that is heated and then used as a heat source for a power generation or energy storage system. Figure A.4-4 shows a typical CSP plant with tower.
2. Parabolic trough: Parabolic trough consists of a linear parabolic reflector that concentrates light onto a receiver positioned along the reflector's focal line. The receiver is a tube positioned directly above the middle of the parabolic mirror and filled with a working fluid. The reflector follows the sun during the daylight hours by tracking along a single axis. A working fluid is heated to 150–350 °C as it flows through the receiver and is then used as a heat source for a power generation system.
3. Fresnel reflectors: This technology is similar to parabolic trough but consists of many flat linear mirrors instead of a parabolic mirror.
4. Dish Stirling or Dish engine: This system consists of a stand-alone parabolic reflector that concentrates light onto a receiver positioned at the reflector's focal point. The reflector tracks the Sun along two axes. The working fluid in the receiver is heated to 250–700 °C and then used by a Stirling engine to generate power.

Figure A.4-4: Typical CSP plant (with tower)

The amount of electricity which is produced by the solar park is dependent on the irradiation intensity at the site and the type of technology. Solar-generated electricity will be supplied to either the national grid of the RSA or an identified consumer via the national grid.

Solar electricity generated using PV technology is clean and, unlike fossil generated electricity, does not produce CO_2 emissions. Therefore the construction of PV solar parks for meeting the growing electricity demand of the RSA displaces CO_2 intensive electricity production from fossil fired electricity plants.

In spite of solar electricity generated using CSP technology will produce CO_2 emissions, since auxiliary fossil fuel consumption will take place, the GHG emissions per MWh for CSP power plants will be less than CO_2 intensity of electricity production from fossil fired electricity plants and therefore GHG emission reductions will take place.

Solar power is regarded as an environmentally friendly technology[27], which will also be confirmed as part of the CPA inclusion (see Section A.4.2.2., Eligibility Criterion 10). Solar parks under this PoA must undertake an environmental assessment[28] to identify the negative environmental effects and propose migratory measures according to the RSA's legislation. The main negative environmental effects of a typical solar park include: aesthetic disturbance to nearby communities, and possibly disturbance of some ecosystems. Please refer to Section C.3 for the environmental assessments requirement in the RSA.

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

For a CPA to be eligible under the present PoA it has to be assessed against the list of criteria by the CME at the time when the CPA applies to enrol in the PoA.

According to the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities" (Version 02.0, EB 70, Annex 05)[29]the eligibility criteria shall cover as a minimum the conditions set out in Table A.4-1.

Table A.4-1: Eligibility criteria

	Requirements as per "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities" (EB 65, Annex 3)	PoA eligibility criteria[30]	Mean of proof/The documents required to be submitted as a proof of fulfilling the criteria
(a)	The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA	1. The CPA shall be in the geographical area of the Republic of South Africa (RSA).	1. a) Environmental Authorization (EA) from the relevant Competent Authority (CA) of the RSA[31] and b) Host Country approval

[27] Department of Energy of the RSA (http://www.energy.gov.za/files/esources/renewables/r_solar.html)

[28] Related to the capacity, size or other characteristics of the plant

[29] http://cdm.unfccc.int/Reference/Standards/index.html this version of the tool will be used throughout this document

[30] Phrases given in this column without sequence number at the beginning are not eligibility criteria. Such phrases explain why a criterion was not established for the certain requirement of the Standard (EB 65, Annex 3). Refer to the second columns of Table A.4-1 of the PoA-DD

[31] The Department of Environmental Affairs at the time of PoA-DD drafting

			from the DNA
(b)	Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo);	2. The location of the CPA is uniquely identified by the GPS coordinates. The GPS coordinates has been crosschecked with previous records of GPS coordinates of existing CPAs under this PoA to ensure that no overlap between activities can occur. 3. The CPA owner has contractually agreed and signed the following: a) The CPA has neither been and will not be registered as a CDM project activity, nor as a CPA under another PoA; and b) The owner is aware that the activity will be subscribed to the present PoA. 4. The CME has checked the UNFCCC CDM project database to verify that the proposed CPA has not been previously submitted to the UNFCCC. If the CPA has been submitted to the UNFCCC for validation or registration, the CPA developer has to prove that the process of validation or registration has been withdrawn.	2. The GPS coordinates of the CPA and EA from the relevant CA of the RSA or EIA or basic assessment report 3. Signed declaration from the owner of the CPA 4. Signed declaration from the CME or from the CPA owner (if applicable)
(c)	The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications;	5. The CPA is one of the following: a) The installation of a new grid connected solar park at a site where no solar park was operated prior to the implementation of the CPA; or b) The capacity addition of an existing grid connected solar park, herewith the electricity generation at existing solar park should not be affected by the CPA. 6. The CPA is connected to the national grid of the RSA via either: a) The national transmission, distribution or reticulation lines;[32] or	5. Completed EIA or basic assessment report 6. Power Purchase Agreement or permission to connect to the grid or application for any programme which intends to supply power to the grid or

[32] 'Eskom grid' at the time of drafting of the PoA-DD

		b) A municipal electricity network that is connected to the national transmission, distribution or reticulation lines.	(in case documents mentioned above are not available) completed EIA or basic assessment report or feasibility study report
(d)	Conditions to check the start date of the CPA through documentary evidence;	7. The start date of the CPA is clearly defined in the CPA-DDwith supporting documentary evidence and is later than the date of start of global stakeholder process for the PoA (05/04/2012).	7. In case the project has started (anyone of the documents below): a) financial close; b) the signed contract with the construction company to build the solar park or other evidence to confirm that construction has started; c) Signed contract with a supplier of solar electrical system or Purchase Order. The CME shall check the documents and determine the earliest one and take the date of the document as a start date of the CPA, then compare the date with the 05/04/2012. If the start date is later than 05/04/2012, consider for inclusion. In case the project has not started (future project): the signed declaration from the CPA owner regarding anticipated starting date
(e)	Conditions that ensure compliance with applicability and other requirements of single or multiple methodologies applied by CPAs;	8. The CPA is in line with the applicability conditions of ACM0002 (Version 12.3.0)	8. Signed declaration from the CME
(f)	The conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality;	9. Additionality will be demonstrated individually by the CPA according to the procedures described in the Section E.5.1 of the CDM-CPA-DD.	9. <u>If Step 0 in Section E.5.1 is demonstrated:</u> The list of power plant servicing the grid and their capacity. <u>If Step 0 in Section E.5.1 is not demonstrated:</u> IRR worksheets together with documentary evidence for all input parameters and assumptions. The list of power plant servicing the grid and their capacity.

(g)	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis;	10. The environmental impact assessment required by the NEMA[33] regulations and local stakeholder consultations has been completed.	10. EA from the relevant CA of the RSA and photo copy of newspaper where invitation was published or copies of invitation sent to local stakeholders, and minutes of the meeting and list of attendance and list of comments received.
(h)	Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance;	11. No official Development Aid will be involved or diverted as a result of the CPA. The official declaration of 'no development aid' has been provided by the solar park developer. If Annex 1 countries are involved, then a declaration from the concerned agency in Annex 1 country should also be submitted.	11. Signed declaration from the CPA developer and the concerned agency in Annex 1 country (if involved)
(i)	Where applicable, target group (e.g. domestic/commercial/industrial, rural /urban, grid-connected/off-grid) and distribution mechanisms (e.g. direct installation);	The target group for this PoA includes grid-connected solar parks and capacity additions of existing grid-connected solar parks, where electricity generation at existing solar park is not affected by the CPA. In addition to criteria 5 and 6, criterion 12 was established. 12. In case the CPA involves capacity addition to an existing solar park, it does not affect the radiation received by the existing power plant and the electricity fed into the grid by the added power plant addition is separately metered	12. Feasibility study report and power plant design or site visit to confirm that the electricity generation at the existing power plant will not be affected by the CPA and the electricity fed into the grid by the added power plant addition is separately metered
(j)	Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys;	The eligibility criterion is not required for the proposed PoA, since no sampling is required under this PoA. Each CPA will be monitored individually.	Not applicable
(k)	Where applicable, the conditions that ensure that CPA in aggregate meets the small-scale or micro-scale threshold criteria and remain within those thresholds throughout the crediting period of the CPA;	The eligibility criterion is not required for the proposed PoA, since all CPAs will apply the large scale methodology ACM0002.	Not applicable
(l)	Where applicable, the	The eligibility criterion is not	Not Applicable

[33] NEMA: National Environmental Management Act. Also see section C.3.

	requirements for the debundling check, in case CPAs belong to small-scale (SSC) or microscale project categories.	required for the proposed PoA, since all CPAs will apply the large scale methodology ACM0002.	
-	Additional criteria requested by the DOE to be included (refer to footnote 2 of the Annex 5 to EB 70)	13. The owner of the CPA is duly registered/incorporated entity of the RSA.	13. Company registration / incorporation certificate issued by Registrar of Companies
-	Additional criteria requested by the DOE to be included (refer to footnote 2 of the Annex 5 to EB 705)	14. The CME has checked that the CPA satisfies all eligibility criteria of the registered version of the PoA-DD.	14. Signed declaration by the CME

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):

(i) The proposed PoA is a voluntary coordinated action

This PoA is not implementing any mandatory policy or regulation of the Government of the RSA. In South Africa project developers that seek to privately produce electricity are free to take up any projects and to choose the type of technology as long as the appropriate environmental, construction and operational permits have been obtained. The proposed PoA is a voluntary coordinated action and initiative of BWC (the CME of this PoA). Participation under this PoA is voluntary[34].

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

As per paragraph 73 of the 47th EB meeting report "*additionality is to be demonstrated either at the PoA level or at CPA level*".[35]

The additionality for CPAs under this PoA will be demonstrated at CPA level in accordance with the latest version (at the time of drafting the PoA-DD) of the "Tool for the demonstration and assessment of additionality" (Version 07.0.0), EB 70, Annex 08[36]. To demonstrate the additionality for a CPA the project developer will have to choose whether the propose project is the first-of-its-kind or to apply an investment analysis together with the common practise analysis, which would conclusively prove that the project would not have been implemented in the absence of PoA. These aspects are addressed in Sections E.5.1 and E.5.2.

The decision to demonstrate additionality at CPA level is governed by the variability of factors that affect the possible demonstration of first-of-its-kind, or investment analysis. Over time the projects may not be able to demonstrate first-of-its-kind and at the same time factors like investment cost, electricity price and exchange rates may vary to such an extent that it could surpass the scope of a generic investment analysis at PoA level..

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

[34] Official declaration of voluntary action by the CME
[35] http://cdm.unfccc.int/EB/047/eb47rep.pdf
[36] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf (this version of the tool will be applied throughout the document.)

Not applicable since there is no mandatory policy or regulation in connection with this PoA.

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

Not applicable since there is no mandatory policy or regulation in connection with this PoA.

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

A.4.4.1. Operational and management plan:

According to the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities"the CME is required to develop a management system. The 'Management System for South African Large Scale Grid Connected Solar Park Programme (Version 02)' has been developed to meet all the requirements of the above standard, and to facilitate efficient management of this PoA. A summary of this is given in Table A.4-2.

Table A.4-2: Requirements for a Management System of a PoA

a)	A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;	Refer to Section 3 of the Management System for this PoA The CME is in charge of conducting procedures for CPA inclusion in the PoA as well as maintaining, updating and enforcing this management system. Solar Park management is in charge of gathering, checking and supplying of data to the CME required for inclusion of the activity to the CPAs.
b)	Records of arrangements for training and capacity development for personnel;	Refer to Section 3 of the Management System for this PoA The CME's management will ensure that the company staff that will collect the data has been trained for this, to guarantee that monitoring is correctly performed. Records of training shall be collected by the CME. The CME shall keep records of training at least for 2 years after the end of the crediting period.
c)	Procedures for technical review of inclusion of CPAs;	Refer to Section 4 of the Management System for this PoA CPA inclusion will be conducted in 5 phases: gathering of information, checking of eligibility criteria, drafting, reviewing and submitting of CPA-DD. The CME will only submit the CPA to the DOE when it has checked that the CPA satisfies the eligibility criteria of the latest (registered) version of the PoA-DD and CPA-DD. Once CPA drafting is complete the document will be

		sent to the solar park developer for approval.
d)	A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA);	Refer to Section 4 of the Management System for this PoA as well as eligibly criteria 2, 3 and 4 (Section 4.2.2 of the PoA-DD). The GPS coordinates of the CPA have to be crosschecked with previous records of GPS coordinates of existing CPAs under this PoA to ensure that no overlap between CPAs can occur. Before inclusion the owner of each CPA has to contractually agree and sign the following: a) The CPA has neither been and will not be registered as a CDM project activity nor as a CPA under another PoA; and b) The owner is aware that the CPA will be subscribed to the present PoA. Before inclusion the CME has to check the UNFCCC CDM project database to verify that the proposed CPA has not been previously submitted to the UNFCCC. If the CPA has been submitted to the UNFCCC for validation or registration, the solar park developer has to prove that the process of validation or registration has been withdrawn.
e)	Records and documentation control process for each CPA under the PoA;	Refer to Sections 4 and 5 of the Management System for this PoA All documents that are requested from the solar park developers will be checked and stored by the CME. A summary of CPA information will be available on the PoA-database. The information required for the monitoring report (see Section B.6 of the CPA-DD) will be collected by the solar park management and transferred to the CME, who will check the data and draft the monitoring report.
f)	Measures for continuous improvements of the PoA management system;	Refer to Section 6 of the Management System for this PoA The CDM documentation in connection with this PoA shall be updated in accordance with the UNFCCC rules. The management system will be updated at least once a year by the CME to facilitate more efficient management of the PoA.
g)	Any other relevant elements	

The solar park management shall only report to the CME; which in this case is BWC. Only the CME reports to the DOE or CDM Executive Board (EB), as can be seen in Figure A.4-5.

The CME will undertake all measures in order to estimate and justify the expected GHG emission reductions due to the implementation of all CPA's.

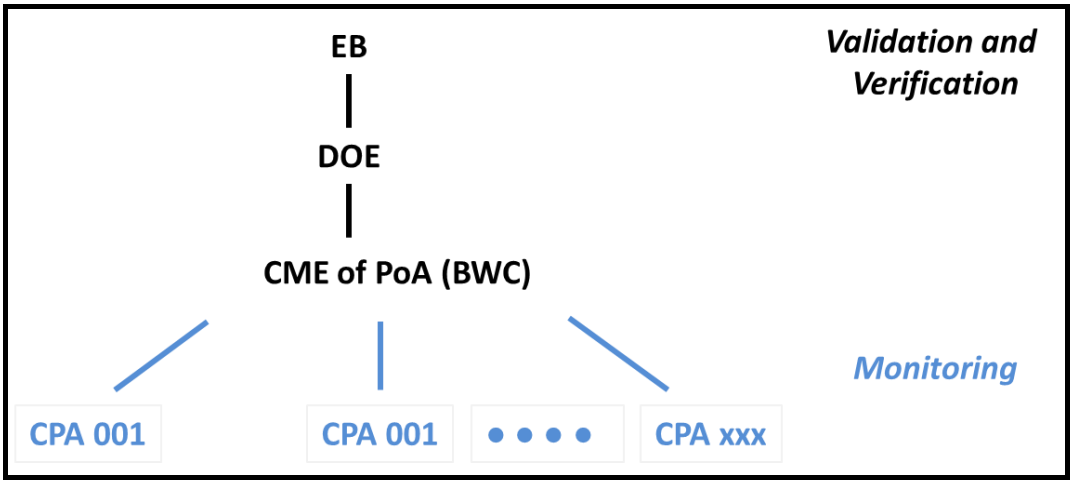


Figure A.4-5: PoA Management Structure

The solar park management will communicate with the CDM specialist in charge of the specific project (as shown in Figure A.4-6).

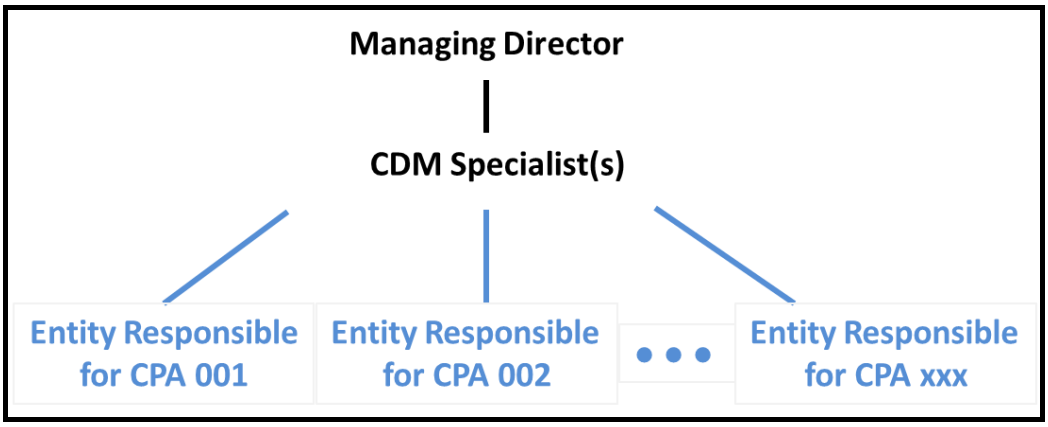


Figure A.4-6: BWC Management Structure

Below the responsibilities of Solar Park management (Table A.4-3) and CME (Table A.4-4) are described.

Table A.4-3: Solar Park management

The solar park management shall provide the CME with accurate and timely data as per the requirements of the Management System, this CDM-PoA-DD and the respective CDM-CPA-DD.

At least one person[37] shall be appointed by the solar park management to deal with the CDM aspects of the relevant CPA. The person shall have a degree in engineering, science or economics and experience in renewable energy industry of 1 year. The person's competence is to be checked annually.

The tasks of the solar park management includes:

(1) Gathering, primary check and supplying of data to the CME

- Required for compiling the monitoring report according to the monitoring plan, such as recording of the net amount of electricity (MWh) supplied to the grid by the activity, records for sold electricity

(2) Calibration of the electricity meters according to SABS regulations and with the manufacturer's requirements. (as described in section E.7 of this PoA-DD)

(3) Arrangement of necessary training related to operation and maintenance of the solar park and all of the installed equipment as well as gathering data required for the monitoring. Submission of the records of training to the CME.

Table A.4-4: CME management

The Coordinating and Managing Entity (CME) of this PoA is Blue World Carbon Asset Management (Pty) Ltd (or BWC).

BWC's team includes managing director of the company (MD) and the CDM Specialists[38]. MD shall appoint CDM Specialists to manage this PoA according to the requirements of this management system. The CDM Specialists shall have a degree in engineering, science or economics and experience in CDM industry of 1 year. The CDM Specialists' competence is to be checked annually.

The tasks of the CDM specialists includes the following:

- Communication with entities responsible for the CPAs
- Collection of data required for required CPA inclusion and preparation of the monitoring reports
- Development of all necessary CDM documentation;
- Conducting procedures for PoA approval by the CDM Executive Board;
- Conducting procedures for CPA inclusion in the PoA (refer to Section 4 of the Management System) ;
- Conducting the monitoring of CPAs (refer to Section E.7 of the CPA-DD);

[37] BWC's management will facilitate training for the appointed person to ensure that monitoring is correctly performed.

[38] It is the responsibility of the CME to ensure that the employees are suitably trained to perform the necessary tasks required for managing the PoA.

- Instructing the solar electrical system management to ensure that monitoring is correctly performed.

The CDM Specialists are in charge of maintaining, updating, and enforcing this management system, PoA-database, as well as PoA-DD and CPA-DD.

The CME shall keep records of training at least for 2 years after the end of the crediting period.

CPA inclusion will be conducted in 5 subsequent phases.

Phase 1: Request all CPA information and documentary evidence. The CME will maintain an electronic database with information for each CPA that seeks to be subscribed to the PoA.
Phase 2: The CME shall check each of the 14 eligibility criteria according to Table A.4-1.
Phase 3: Drafting of the CDM-CPA-DD.
Phase 4: Reviewing of CDM-CPA-DD
Phase 5: Submission of CDM-CPA-DD together with supporting document for inclusion

As stated in the management system, the following operational and management arrangements have been established by the coordinating entity for the implementation of the PoA:

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

A PoA database will be set up to prove that CPAs do not overlap with other CDM projects or CPAs under this PoA or other PoAs and also to display information from CPAs to facilitate efficient management of the PoA. The PoA-database will be continuously improved by BWC and data will be archived electronically and be kept at least for 2 years after the end of the last crediting period.

(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,

This will be done according to eligibility criteria 2, 3 and 4 as follows. The owner of the project shall provide the signed Table 4 of the Management System of the PoA; which provides the GPS coordinates of the activity along with additional project information. An EA from the relevant CA of the RSA or EIA or basic assessment report is also required. This will be crosschecked with previous records of GPS coordinates of activities under the existing CPAs under this PoA to ensure that no overlap between activities can occur.

Furthermore, the owner of the project shall provide an agreement with the CME where he shall contractually agree that the activity has neither been and will not be registered as a CDM project activity nor as a CPA under another PoA; and

BWC shall check the UNFCCC CDM project database to verify that each activity to be included in the proposed CPA, has not been previously submitted to the UNFCCC, before inclusion into the CPA, as well as provide a declaration for the same.

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

The owner of the project shall provide an agreement with CME where he shall contractually agree that he is aware that the activity will be subscribed to the present PoA.

A.4.4.2. Monitoring plan:

(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

Not Applicable since each CPA will be individually monitored, no sampling methods are required.

(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;

Refer to the eligibility criteria 2, 3 and 4 (Section A.4.2.2., requirement b) for provisions to avoid double counting.

The owner of the project under the CPA has to contractually agree and sign the following:

a) The CPA has neither been and will not be registered as a CDM project nor as a CPA under another PoA; and
b) The owner is aware that the CPA will be subscribed to the present PoA.

BWC as the CME will provide a declaration, stating that the UNFCCC CDM project database has been checked, to verify that the project under the proposed CPA has not been previously submitted to the UNFCCC, before inclusion into the CPA. If a project has been submitted to the UNFCCC for validation or registration, the project developer has to prove that the process of validation or registration has been withdrawn.

Furthermore, BWC will crosscheck the GPS coordinates of each CPA with previous records of GPS coordinates of existing CPAs under this PoA to ensure that no overlap between CPAs can occur.

Each CPA is monitored individually by its own measurement equipment. The monitoring plan will be devised at the CPA level as per the approved consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0). The CME will oversee that monitoring reports, ensure they are in conformity with the methodological requirements and will submit the monitoring reports to verification team for each CPA individually.

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

The PoA will not receive public funding[39].

[39] Official declaration of No Public funding by BWC

SECTION B. Duration of the programme of activities

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

01/03/2013

B.2. Length of the programme of activities:

28 years (0 months)

SECTION C. Environmental Analysis

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 ✔

The environmental analysis will be done at a CPA level. The localized impact of each CPA will need to be assessed individually which justifies separate environmental analyses.

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

The environmental analysis will be done at a CPA level. The different type of environmental analyses is discussed in section C.3. Since all CPAs are grid connect solar parks they will contribute to the reduction of greenhouse gas (GHG) emissions by replacing electricity from fossil fuel based power plants. The positive environmental benefits include:

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

There are no transboundary impacts as a result of this PoA.

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):

Solar power is a recognised form of clean renewable energy. Using solar power will contribute to South Africa's sustainable development and effectively reduce GHG emissions and the dependence on fossil fuels in the country. In order to apply for environmental authorisation of a solar power project governmental laws and regulations should be followed.

The National Environmental Management Act (NEMA) 107 of 1998, amended in 06/2010[40], governs Environmental Impact Assessment (EIA) and requires a scoping assessment and EIA or Basic Assessment (BA) depending on the capacity (or other characteristics) of the activity. The Act is to provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state; and to provide for matters connected therewith.

[40] http://www.capegateway.gov.za/eng/pubs/public_info/N/200703

The Listing Notices specify measures which cannot be started without environmental authorization from the competent authority. The localized impact of each CPA will need to be assessed individually, which justifies separate environmental analyses. The legislation regarding the electricity production is given below.[41]

Notice	Description of activity involving electricity production	Effect
NEMA listing notice 1:	The construction of facilities or infrastructure for the generation of electricity where: (a) the electricity output is more than 10 megawatts but less than 20 megawatts; or (b) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare.	Basic assessment is required
NEMA listing notice 2:	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.	Scoping assessment and EIA is required

[41] Other legislations may also be applicable to certain activities under the CPA. The details of such activities will be discussed in the EIA or BA and may alter the scope of the environmental assessment that is required.

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 ✔

Stakeholder consultation will be conducted at CPA level in order to include essential project specific information and to ensure that the all the affected parties have the best opportunity to attend.

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

Local stakeholders will be invited to participate in the stakeholders' meeting. This will comprise a face-to-face meeting with the local community in the CPA's geographical boundary and inviting comments via e-mail.

The local stakeholders will be invited to the meeting via Public Invitation, a newspaper notice, placed in a local newspaper before the stakeholder meeting or through personal invitations. Newspaper notice will also invite any interested parties to submit comments via e-mail. Description of the invitation procedure shall be presented in Section D.2 of the specific CPA.

D.3. Summary of the comments received:

Comments received via e-mail and collected during the meeting shall be recorded, analysed and evaluated. The summary of the comments shall be presented in Section D.3 of the specific CPA.

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

CME and the CPA owners have to consider all comments received and take necessary action if required. Information demonstrating that all comments received have been considered and necessary action has been taken shall be presented in Section D.4 of the specific CPA.

SECTION E. Application of a baseline and monitoring methodology

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

The latest version which was published before EB66 of the consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0) from EB 66, Annex 35[42] is applicable to all CPAs registered under this PoA.

The methodology ACM0002 is applicable to grid-connected renewable power generation project activities that propose to install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity, or involves the capacity addition of an existing facility.

The latest version (at the time of drafting of the PoA-DD) of the "Tool to calculate the emission factor for an electricity system" (Version 03.0.0), from EB 70, Annex 22[43] is used to calculate the combined margin CO_2 emission factor of RSA's grid.

The latest version (at the time of drafting of the PoA-DD) of the "Tool for the demonstration and assessment of additionality" (Version 07.0.0), from EB 70, Annex 08[44] is used to demonstrate and assess the additionality of each CPA.

The latest version (at the time of drafting of the PoA-DD) of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02), from EB 41, Annex 11[45] is used to calculate project emissions from fossil fuel consumption.

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

The ACM0002 methodology is applicable to grid-connected renewable power generation project activities[46] 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 proposed CPAs will be grid connected and need to fall under item (a) or (b) to be eligible under this PoA according to the eligibility criteria listed in Section A.4.2.2 (refer to eligibility criteria 5 and 6). Moreover the CPA should meet all necessary applicability conditions of the ACM0002 methodology as listed in Table E.2-1 below.

[42] http://cdm.unfccc.int/methodologies/PAmethodologies/approved (this version of the methodology will be applied throughout the document.)
[43] http://cdm.unfccc.int/methodologies/PAmethodologies/tools (this version of the tool will be applied throughout the document.)
[44] http://cdm.unfccc.int/methodologies/PAmethodologies/tools (this version of the tool will be applied throughout the document.)
[45] http://cdm.unfccc.int/methodologies/PAmethodologies/tools (this version of the tool will be applied throughout the document.)
[46] The methodology ACM0002 refers to a "project activity". In the case of a PoA the "project activity" is referred to as a CDM Programme Activity (CPA).

Table E.2-1: Applicability conditions for ACM0002

Applicability condition	Applicability	Reasoning
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.	Applicable	The CPA involves either the installation or capacity addition of a solar power plant (refer to eligibility criterion 5).
In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): 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 addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	Not Applicable	This condition does not apply to capacity addition under this PoA. The electricity generation of existing power plants will not be affected (refer to eligibility criterion 5).

Applicability condition	Applicability	Reasoning
In case of hydro power plants, at least one of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or • The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity; or (i) The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity	Not applicable	The CPA involves solar power and therefore it does not need to satisfy this applicability condition.

Applicability condition	Applicability	Reasoning
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 after the implementation of the project activity all of the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; • All reservoirs and hydro power plants are located at the same river and where are designed together to function as an integrated project that collectively constitutes the generation capacity of the combined power plant; • The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • The total installed capacity of the power units, which are driven using water from the reservoirs with a power density lower than 4 W/m^2, is lower than 15MW; • The total installed capacity of the power units, which are driven using water from reservoirs with a power density lower than 4 W/m^2, is less than 10.00% of the total installed capacity of the project activity from multiple reservoirs.	Not applicable	The CPA involves solar power and therefore it does not need to satisfy this applicability condition.
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.	Not applicable	Switching from fossil fuels to Renewable Energy is not allowed under this PoA. (According to the ACM0002, the CPA must not satisfy this applicability condition.)
Biomass fired power plants.	Not applicable	Biomass fired power plants are not eligible for a CPA under this PoA. (According to the ACM0002, the CPA must not satisfy this applicability condition.)

Applicability condition	Applicability	Reasoning
Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the reservoir is less than 4 W/m^2.	Not applicable	Hydro power plants are not eligible for a CPA under this PoA. (According to the ACM0002, the CPA must not satisfy this applicability condition.)
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"	Applicable	Capacity additions of the existing solar parks under this PoA will not affect the primary input and output for the existing power units. The output from the CPAs will be independently measured. Thus, the CME does not intent to include CPAs for which the baseline is as per equation (8) of the applied methodology

ACM0002 refers to the following tools:

(a) Tool to calculate the emission factor for an electricity system

(b) Tool for the demonstration and assessment of additionality

(c) Combined tool to identify the baseline scenario and demonstrate additionality

(d) Tool to calculate project or leakage CO2 emissions from fossil fuel combustion

Tool (a) determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system. CPAs under this PoA displace electricity generation in RSA's electricity system, thus the tool is applicable.

Tool (b) is applicable as per paragraph 2 of the tool itself and section "Additionality" of ACM0002.

Tool (c) will not be used as indicated in Section II, step 1 of ACM0002.

Tool (d) applied to calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. Some CPAs under this PoA may involve project emissions that can be significant, thus the tool is applicable.

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

The spatial extent of the CPA boundary includes the proposed renewable energy power plants and all power plants physically connected to the grid of the Republic of South Africa (Figure E.3-1).

The greenhouse gases and emission sources that are included in or excluded from the CPA boundary are shown in Table E.3-1.

Table E.3-1: Emissions sources included in or excluded from the CPA boundary

Source		Gas	Included ?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the CPA	CO_2	Yes	Main emission source
		CH_4	No	Minor emission sources, which are not included in the baseline
		N_2O	No	
CPA	GHG emissions from the proposed CPA	CO_2	Yes	Main emission source for CSP technology, since auxiliary fossil fuel is used and GHG emissions for PV solar power generation projects are equal to zero.
		CH_4	No	Minor emission sources
		N_2O	No	

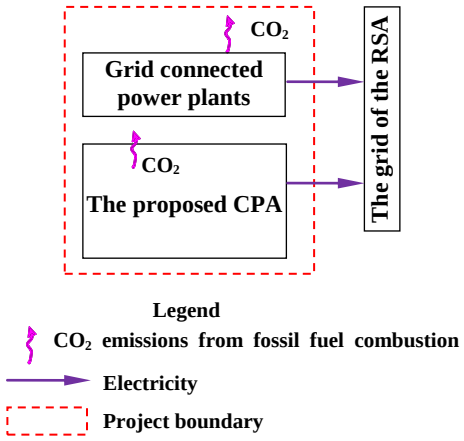


Figure E.3-1: CPA boundary

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

According to the ACM0002:

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

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

2. *If the project activity is a capacity addition to existing grid-connected renewable power plant/unit, the baseline scenario is the following:*

In the absence of the CDM project activity, the existing facility would continue to 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 project activity, and no emission reductions are assumed to occur.

The CPA is one of the following:

1. The installation of a new grid connected solar park at a site where no solar park was operated prior to the implementation of the activity; or
2. The capacity addition of an existing grid connected solar park.

The baseline scenario of the proposed CPAs is:

Type of a CPA	Baseline scenario
1	Electricity delivered to the grid by the solar park would have otherwise been generated by the operation of Eskom's grid-connected power plants and by the addition of new generation sources that is reflected in the CM calculations presented in Section E.6.
2	In the absence of the CPA, 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 ($DATE_{BaselineRetrofit}$). Electricity delivered to the grid by the capacity addition(s) of the solar park would have otherwise been generated by the operation of Eskom's grid-connected power plants and by the addition of new generation sources that is reflected in the CM calculations presented in Section E.6.

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): >>

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

As discussed in Section A.4.3 the additionally will be demonstrated at the CPA level.

The additionality of the CPA is demonstrated and assessed using the "Tool for the demonstration and assessment of additionality" (Version 07.0.0) (hereinafter in Section E.5.1 referred to as 'the Additionality Tool').

According to paragraph 14 of the Additionality Tool, Step 0 is optional and if it is not applied it shall be considered that the proposed project activity is not the first-of-its-kind (FOIK). Therefore if the project participant decides not to demonstrate FOIK, Step 0 is not applicable and can be skipped, otherwise Step 0 will be applied as follows:

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

Project participant will demonstrate that a project is first-of-its-kind according to the definition provided in the "Guidelines on additionality of first-of-its-kind project activities" (Version 02.0)[47] Annex 7, EB69, (hereinafter in Section E.5.1 referred to as 'the Guidelines'). According to paragraph 2(b) of the Guidelines, each CPA under this PoA will fall under "power generation based on renewable energy".

The CPA will be first-of-its-kind as per the paragraph 5 of the Guidelines if:

(a) The CPA is the first in the applicable geographical area (RSA) that applies a technology that is different from technologies that are implemented by any other project, which are able to deliver the same output and have started commercial operation in the applicable geographical area (RSA) before the CPA is published for global stakeholder consultation or before the start date of the proposed CPA, whichever is earlier;

(b) The project implements one or more of the measures (this criterion will be satisfied for all CPAs under this PoA since they apply "power generation based on renewable energy");

(c) The project participants selected a crediting period for the CPA that is "a maximum of 10 years with no option of renewal".

As per paragraph 4: *Different technologies are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed clean development mechanism (CDM) project activity and applicable geographical area):*

(a) Energy source/fuel (example: energy generation by different energy sources such as wind and hydro and different types of fuels such as biomass and natural gas);

(b) Feed stock (example: production of fuel ethanol from different feed stocks such as sugar cane and starch, production of cement with varying percentage of alternative fuels or less carbon-intensive fuels);

(c) Size of installation (power capacity)/energy savings:

(i) Micro (as defined in paragraph 24 of decision 2/CMP.5 and paragraph 39 of decision 3/CMP.6);

(ii) Small (as defined in paragraph 28 of decision 1/CMP.2);

(iii) Large.

Typically the following characteristics of each proposed project activity looking to demonstrate FOIK will be required:

1. **Technology**: PV solar electrical system or CSP.
    - **Energy source:** Energy generation by solar radiation

[47] http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid43.pdf

- **Size of installation**: Large or small

2. **Output**: Electricity to be supplied to the national grid.
3. **Geographical aria**: The applicable geographical area for this project is Republic of South Africa
4. **Measure**: Power generation based on renewable energy
5. **Project start date**: This need to be specified for the particular project in the format dd/mm/yyyy
6. **Date of start of GSC**: 05/04/2012
7. **Crediting Period**: A crediting period of 10 years with no option of renewal will be used

Once it has been demonstrated that the proposed CPA is FOIK then as stated in Paragraph 18 of the Additionality tool and Paragraph 6 of the Guidelines, it will be additional.

If Step 0 was skipped, the additionality of the CPA will be demonstrated using the "Tool for the demonstration and assessment of additionality" (hereinafter in Section E.5.1 referred to as 'the tool') read with the "Guidelines on the Assessment of Investment Analysis" (Version 05.0.0), from EB 62, Annex 05[48] (hereinafter referred to as 'the guidance'). Accordingly, all the CPAs under this PoA will assess the additionality using the following steps:

Step 1: Alternatives to the project activity

The alternatives available to the solar park developers include:

(a) The proposed project activity undertaken without being registered as a CDM project activity;

(b) Continuation of the current situation (no project activity or other alternatives undertaken).

Both the alternatives are credible, realistic and are in conformity with the applicable mandatory legal and regulatory requirements as the implementation of the project activity is a voluntary initiative, is not mandated by any legal requirement and there is no legal requirement on the choice of a particular technology or restriction on the use of solar energy. Moreover, the approved methodology ACM0002 also prescribes the baseline. Where the approved methodology prescribes the baseline, discussion on alternatives is not necessary. Accordingly, all the CPAs included under this PoA will use the baseline prescribed by the methodology ACM0002.

Step 2: Investment Analysis

Since the baseline for all the CPAs do not require any investment and is outside the direct control of the CPA operator, the CPA developer shall demonstrate the project activity in the proposed CPA is not economically or financially feasible using benchmark analysis (Option III), in conformity with guidance 19 of Annex 5, EB 62, as well as sensitivity analysis, as per guidance 20 and 21 of Annex 5, EB 62 read with sub-step 2d of the Additionality Tool (Version 07) and then proceed to the common practice analysis as follows[49]:

Sub-step 2b: Apply benchmark analysis (Option III)

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

Sub-step 2d: Sensitivity analysis

[48] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf this version of the Guidelines will be used throughout this document.

[49] Refer to paragraphs 2, 8, 29 and 31 of the "Tool for the demonstration and assessment of additionality" (version 07.0.0) as well as "Guidelines on the assessment of investment analysis" (Version 05)

Step 4 : Common practice analysis

Details of each step are presented below.

Sub-step 2b: Apply benchmark analysis (Option III)

According to paragraph 36 of the "Tool for the demonstration and assessment of additionality" the most suitable financial/economic indicator, namely, *post tax project Internal Rate of Return* (IRR) will be used as financial indicator. However, where the project is financed 100.00% by equity, *post tax equity IRR* will be used as financial indicator to demonstrate the additionality of the project

After selecting the most suitable financial indicator for the project type and decision making context, the CPA developer shall determine the appropriate benchmark.[50]

In accordance with paragraph 12 of Annex 5, EB 62, commercial lending rate or WACC will be chosen as benchmark for the project IRR. Where commercial lending rate is chosen as the benchmark, the rate will be term lending rates sourced from the latest Quarterly Bulletin published by the South African Reserve Bank[51] available at the time of decision making. Where WACC is used as benchmark, debt equity ratio applicable to renewable energy projects will be used as the weights; term lending rates sourced from the latest Quarterly Bulletin published by the South African Reserve Bank available at the time of decision making will be used for cost of debt; the average tax rate applicable to the project activity based on the projected profitability statement[52] will be used to arrive at the post cost of debt and expected return on equity will be arrived at by (a) selecting the default values provided in the latest version of the "Guidelines on the assessment of investment analysis" duly converted to nominal rate based on the guidance provided in the Appendix to Annex 5, EB 62; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated.

Required/expected returns on equity are appropriate benchmarks for equity IRR. The return on equity will be determined in the project context either by (a) selecting the default values provided in the latest version of the "Guidelines on the assessment of investment analysis" duly converted to nominal rate based on the guidance provided in the Appendix to Annex 5, EB 62; or by (b) calculating the cost of equity using best financial practices, or by (c) selecting the commercial lending rate as the expected return on equity based on data sources which can be clearly validated.

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

In the course of this step the CPA developer shall calculate the chosen financial indicator for each CPA and compare it with the benchmark**.**

The project developer will *include all relevant costs (including, for example, the investment cost, the operations and maintenance costs, administrative cost, insurance cost, socio-economic development cost etc), and revenues (excluding CER revenues, including inter alia subsidies/fiscal incentives[53], ODA, etc* while calculating the financial indicator.

Table E.5-1 shows the typical input data that is required to calculate IRR for each activity under the CPA.

[50] Refer to paragraph 36 of "Tool for the demonstration and assessment of additionality" (version 07.0.0) as well as paragraph 12 of the "Guidelines on the assessment of investment analysis" (Version 05)

[51] The rate will be sourced from Quarterly Bulletin published by the South African Reserve Bank www.reservebank.co.za

[52] The conversion of cost of debt to post cost basis is done to remove the tax shield provided by the interest. In several cases the CPAs will not be required to pay taxes in the initial years due to accelerated depreciation benefits given to solar parks projects by the Income Tax Act of South Africa. When the project itself is not subject to taxation, the question of interest providing tax shield does not arise. Hence, the average tax rate of the project is proposed to be considered, which is appropriate

[53] "*See EB guidance on the consideration of national/local/sectoral policies and measures for the baseline setting"*

Table E.5-1: Typical input data to calculate IRR for each activity under the CPA

Parameter	Unit[54]	Data source/comment
Capacity of the solar park	MW	Board resolution and/or approved Business Plan and/or Feasibility Study and/or EIA and/or Basic assessment and/or, purchase order and/or PPA
Load factor of the solar park (PLF)/Generation	Ratio/MWh	Report developed by a third party contracted by the project participants and/or, PLF provided to banks and/or equity financiers while applying the activity for financing, and/or to the government while applying the activity for implementation approval
Transmission and transformation losses	MWh/year (or ratio)	Feasibility Study and/or estimation carried out by a third party
Auxiliary electricity consumption	MWh/year (or ratio)	Feasibility Study and/or estimation carried out by a third party
Electricity tariff	ZAR/MWh	Applicable average NERSA Tariff available in public domain conforming to guidance 6 of Annex 5, EB 62. (Please see further explanation given below)
The cost of transportation of electricity to the consumer	ZAR/MWh	Agreement or MOU or Letter of Intent between the solar park developer and the operator of power lines, through which the electricity will be supplied (applicable only for private sale)
Wheeling charges	ZAR/MWh	Agreement or MOU or Letter of Intent between the solar park developer and the operator of power lines, through which the electricity will be supplied (applicable only for private sale)
Total investment cost	ZAR in mn.	Feasibility Study and/or offer letters/quotations from the machinery supplier/construction/O&M contractors conforming to guidance 6 of Annex 5, EB 62
Debt/Equity ratio	Ratio	Feasibility study report or the Board Note or the term sheet from the lending bank or the debt equity ratio applicable to solar power projects in RSA or the default ratio of 50/50 as per guideline 18 of Annex 5, EB 65 if the debt equity ratio applicable to solar power projects in RSA is not available

[54] Other currencies may also be used.

Parameter	Unit[54]	Data source/comment
The cost of debt	%	Feasibility study report or the Board Note or the term sheet from the lending bank or term lending rates sourced from the latest Quarterly Bulletin published by the South African Reserve Bank or the cost of debt reckoned in the establishing of the benchmark
Repayment period	Years	Feasibility study report or Board Note or the term sheet from the lending bank or any credible document
Initial grace period	Months/years	Feasibility study report or Board Note or the term sheet from the lending bank or any credible document
Operations and Maintenance (O&M) costs	ZAR/MW or ZAR/WTG or ZAR in mln.	Feasibility Study and/or offer letters/quotations from the machinery supplier/construction/O&M contractors conforming to guidance 6 of Annex 5, EB 62
Administrative expenses	ZAR /year	Board Note duly supported by the organizational structure and wage/salary level including benefits, travel and conveyance, communication expenses etc.
Escalation for tariff, O&M cost and administrative expenses	Percent	CAGR of Consumer Price Index from 2008 till the decision making date. The data will be sourced from Statistics South Africa

Parameter	Unit[54]	Data source/comment
Lease rent for land	ZAR/year or % or ZAR/year per turbine	Term sheet / Agreement between the project developer and the land owner or land operator
Insurance premiums	ZAR (or ZAR/year)	Offer letter from the insurance company or credible public domain documents
Social development fee	Percent of revenue or ZAR/MWh or ZAR/year	The agreement or MoU or Letter of Intent between the solar park developer and the payee or the bid document or the Board resolution
The useful lifetime of the CPA	years	Technical specifications from the machinery supplier or the default life of the project as given in Tool to determine the remaining lifetime of equipment (Annex 15, EB 50)[55]
The period of assessment	years	The period of assessment shall be commercial lifetime of the solar park limited to 20 years[56] in conformity with guidance 3 of Annex 5, EB 62
Depreciation rate	Ratio	South African Revenue Service
Salvage value -Land cost (if free hold) -Other assets	100.00% 5.00 %	International best practice
Income tax rate	%	South African revenue service, http://www.sars.gov.za/
ZAR exchange rate[57]	ZAR/Currency	Publically available data source at the time of decision making

Financial indicator calculation will conform to accepted accounting and financial management principles and relevant tax laws.

In South Africa, electricity prices for renewable energy projects are contractually determined by means of a Power Purchase Agreement (PPA). Two options are considered under this PoA.

1. Government PPA: In 08/2011, the Department of energy abandoned the Refit scheme in favour of a tender mechanism. Refit scheme was introduced in 03/2009 and guaranteed purchase prices

[55] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf
[56] Guidelines on the assessment of investment analysis, http://cdm.unfccc.int/Reference/Guidclarif/index.html#pdd
[57] The exchange rate will typically be required if the solar park equipment is imported. Any applicable currency may be applied, which will depend on information provided by the project participants.

(ZAR 3,940/MWh) and long term contracts of 20 years. However, the tariffs that had been established in 2009 were due to be significantly reduced (ZAR 2,311/kWh) at a review on 26/05/2011 before the programme was dissolved completely. Under tender mechanism bidders will have to propose tariff which will fall under technology dependent cap (ZAR 2,850MWh has been fixed for solar power projects under this cap). The proposed prices should make a single adjustment on April 1 each year in line with expected decreasing costs. In selecting the bidders 70.00% weight is given to financial aspects of the project and 30.00% to economic development which includes job creation, local content, ownership, management control, preferential procurement, enterprise development and socio economic development. .

2. Private PPA: in this case the produced electricity will be sold to a grid connected entity (typically a municipality or other identified consumer) at a predetermined market price[58].

In either case, as the project developer would not have entered into PPA at the time of decision making, CPAs will use the latest NERSA average tariff as available in public domain conforming to guidance 6 of Annex 5, EB 62. However, the additionality of the project will also be demonstrated by considering the tariff at which the project envisages to bid, (which will take into consideration the latest bid tariff available to PP, the cost structure and the tariff expected to be quoted by other bidders) as a part of sensitivity analysis, as till the bid is submitted, accepted by the Department Energy and PPA signed, the PP could not be certain about the tariff.

The input parameters given in Table E.5-1 are exhaustive and no additional parameters will be included. Financial indicator calculation will conform to accepted accounting and financial management principles and relevant tax laws.

Moreover CME has prepared an IRR calculation template. The template clearly states the input parameters (requiring manual entry) used and results of calculations (which the system automatically does once the input parameters are entered). All the cells are linked and with slight manual intervention the template will yield the financial indicator.

Outcome of Sub-step 2c (for each activity), if:

IRR of the activity ≥ Benchmark	**The CPA is economically feasible without the revenue from the sale of CERs. The CPA is not additional.**
IRR of the activity < Benchmark	**The CPA is not economically feasible. This serves as a strong argument in favour of additionality. The CPA developer has to proceed to Sub-step 2d (Sensitivity analysis)**

Sub-step 2d: Sensitivity analysis

The CPA developer will determine the reasonable range of variations for each parameter under the CPA in the project context.

In general sensitivity analysis will cover the range of +10.00% and -10.00%, unless it is not deemed appropriate in the context of the specific project circumstances.

After the reasonable variation has been established, the CPA developer will calculate IRR for the chosen range (for each input parameter) and compare it with the benchmark**.**

In general, the following variables will be considered for the analysis:

[58] This may include additional fees for the use of the national grid to transfer power.

- Investment cost; and
- Electricity tariff/Load factor of the solar park
- Tariff
- Operations and Maintenance (O&M) costs
- Administration cost

The results of the sensitivity analysis shall be displayed in table format as illustrated in Table E.5-2.

Table E.5-2: Sensitivity analysis of the IRR of the activity

Variable	Variation		
	-value%	0.00%	+value%
Electricity Price			
Load factor			
Investment Cost			
O&M Cost			
Administration cost			

In the sensitivity analysis all variables will be varied individually. If any one of the IRR values calculated in Table E.5-2 is higher than or equal to the benchmark, the activity will be deemed to be economically feasible without the sale of CERs, unless the CPA is able to establish, with documentary evidence that such escalation / reduction to the extent envisaged, is unlikely to occur.

Outcome of Sub-step 2d (for each activity), if:

Any one of the IRR values presented in Table E.5-2 for the activity ≥ Benchmark	**The investment analysis does not provide a valid argument in favour of additionality. The CPA is not additional.**
All IRR values presented in Table E.5-2 for the activity < Benchmark	**The investment analysis provides a valid argument in favour of additionality. The CPA developer has to proceed to proceed to Step 4 (Common practice analysis).**

Step 4: Common practice analysis

According to paragraph 13(b) and 57 of the Additionality Tool, the CME shall proceed to Sub-step 4a since each CPA under this PoA will fall under "power generation based on renewable energy".

Sub-step 4a: The proposed CDM project activity(ies) applies measure(s) that are listed in the definitions section of the Additionality Tool

Common practice analysis will be demonstrated by each CPA in conformity with the stepwise approach in the "Guidelines on common practice" (Version 02.0), Annex 8, EB69[59]. The data presented will be credible, reliable and authentic. Each CPA will conclusively demonstrate that the CPA is not a common practice in the selected geographical region.

[59] http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid44.pdf this version of the tool will be used throughout this document

Step 1: Calculate applicable output range as +/-50.00% of the design output or capacity of the proposed project activity;

Step 2: In the applicable geographical area, identify all plants that apply the same measure as the proposed CPA and deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity. At the same time the identified plants should have started commercial operation before the start date of the CPA or before the CPA is published for global stakeholder consultation.

Step 3: Within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all};

Step 4: Within plants identified in Step 3, identify those that apply technologies different than the technology applied in the proposed project activity. Note their number N_{diff};

Step 5: Calculate factor $F=1-N_{diff}/N_{all}$, representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

The proposed project activity is a "common practice" within a sector in the applicable geographical area if both the following conditions are fulfilled:

a) The factor F is greater than 0.2; and

b) N_{all}-Nd_{iff} is greater than 3.

Outcome of Sub-step 4a: If:

There are no similar activities to the CPA in the RSA.	**The proposed CPA is additional.**
There are similar project activities to the CPA in the RSA.	**The proposed CPA is not additional.**

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

The requirements for demonstration of additionally are defined in Section E.5.1 (and A.4.3). The key criteria for assessing additionality of CPA are *FOIK analysis, investment analysis (benchmark analysis and sensitivity analysis),* and *common practice analysis*.

The flowing information will be furnished for assessing additionality, either point 1 or points 2-5:

1. Demonstration that project is FOIK (step 0)
2. Identification of Benchmark (sub-step 2b)
3. Financial indicator calculation (Sub-step 2c)
4. Sensitivity analysis results (sub-step 2d)
5. Common practice analysis

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:

ACM0002 will be used to establish the baseline and calculate GHG emission reductions. This methodology also refers to the "*Tool to calculate the emission factor for an electricity system*" for calculations of CM emission factor. The applicability of ACM0002 has already been demonstrated in Section E.2.

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

Project emissions

Since the CPA uses solar energy to generate electricity the project emissions are equal to zero (equation 1 in ACM0002):

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \text{(E.6-1)}$$

Where:

PE_y = CPA emissions in year *y* (tCO_2e/yr)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2e)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO_2e)

Since there will be no operation of geothermal power plants and no hydro power plants, project emissions for these two parameters will be zero.

Project emissions from CPAs which employ PV technology will be zero, since no auxiliary fossil fuel consumption will take place. However, CPAs which employ CSP technology involve project emissions that are significant. Therefore equation E.6-1 becomes:

$$PE_y = PE_{FF,y} \quad \text{(E.6-2)}$$

Where:

PE_y = CPA emissions in year *y* (tCO_2e)

$PE_{FF,y}$ = CPA emissions from fossil fuel consumption in year *y* (tCO_2)

CPA emissions from fossil fuel consumption in year *y* are calculated as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" using the following formula (equation 1 in the Tool):

$$PE_{FF,y} = \sum_i FC_{i,y} \times COEF_{i,y} \quad \text{(E.6-3)}$$

Where:

$PE_{FF,y}$ = CPA emissions from fossil fuel consumption in year *y* (tCO_2)

$FC_{i,y}$ = The quantity of fuel type *i* combusted during the year *y* (mass or volume unit/yr)

$COEF_{i,y}$ = The CO_2 emission coefficient of fuel type *i* in the year *y* (tCO_2/mass or volume unit)

i = The fuel types combusted during the year *y*

The CO_2 emission coefficient of fuel type *i* in the year *y* is calculated as follows (equation 4 in the Tool):

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad \text{(E.6-4)}$$

Where:

$COEF_{i,y}$ = The CO_2 emission coefficient of fuel type *i* in the year *y* (tCO_2/mass or volume unit)

$NCV_{i,y}$ = The weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = The weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)

i = The fuel types combusted during the year *y*

Baseline emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the CPA. The ACM0002 methodology stipulates that electricity delivered to the grid[60] by the solar park would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. The baseline emissions are calculated as follows (equation 6 in ACM0002):

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad \text{(E.6-5)}$$

Where:

BE_y = Baseline emissions in year *y* (tCO_2/yr)

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

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

The method for calculation of $EG_{PJ,y}$ may be one of the following possibilities:

1. New grid-connected solar park; or
2. Capacity addition of an existing solar park

New grid-connected solar park

Since the CPA is the installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the CPA, $EG_{PJ,y}$ is calculated as follows (equation 7 in ACM0002):

[60] The 'grid' refers to the national grid of the RSA and includes the transmission, distribution, reticulation lines ('Eskom grid' at the time of drafting of the PoA-DD) and municipal networks.

$$EG_{PJ,y} = EG_{\text{facility,y}} \quad \text{(E.6-6)}$$

Where:

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

$EG_{\text{facility,y}}$ = Quantity of net electricity generation supplied by the solar park to the grid in year *y* (MWh/yr)

Capacity addition of an existing solar park

According to ACM0002: In the case where the addition of new capacity does not affect the electricity generated by existing plant(s) or unit(s), the following approach can be used provided that the electricity fed into the grid by the added power plant(s) or unit(s) addition is separately metered, $EG_{PJ,y}$ is determined as follows (equation 10 in ACM0002):

$$EG_{PJ,y} = EG_{PJ\_add\_y} \quad \text{(E.6-7)}$$

Where:

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

$EG_{\text{PJ\_add\_y}}$ = Quantity of net electricity generation supplied to the grid in year *y* by the capacity addition(s) under the CPA (MWh/yr)

This will be applicable to all capacity additions under this PoA.

Calculation of $EF_{grid,CM,y}$

Combined margin CO_2 emission factor for grid connected power generation in year *y* ($EF_{grid,CM,y}$) is calculated using the "Tool to calculate the emission factor for an electricity system". According to this tool the following six steps shall be applied:

Step 1: Identify the relevant electricity systems;

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional);

Step 3: Select a method to determine the operating margin (OM);

Step 4: Calculate the operating margin emission factor according to the selected method;

Step 5: Calculate the build margin (BM) emission factor;

Step 6: Calculate the combined margin (CM) emissions factor.

Step 1: Identify the relevant electricity systems

Electricity generated by the proposed CPA will be supplied to the national grid of the RSA which is defined as a project electricity system by default. The national grid of the RSA is managed by the state-owned company Eskom which is the only company in the South Africa in charge of generation, transmission and distribution of power to end-users.

The basic scheme of the Eskom electricity network is presented in Annex 3-1.

Data on Eskom's grid-connected power plants as of 31/03/2010 is presented in Annex 3-2.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

The project participant may choose between the following two options to calculate the operating margin and build margin emission factors:

Option I: Only grid power plants are included in the calculation; or

Option II: Both grid power plants and off-grid power plants are included in the calculation.

Option I was chosen to calculate the operating margin and build margin emission factors.

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, which are described under Step 4:

(a) Simple OM; or

(b) Simple adjusted OM; or

(c) Dispatch data analysis OM; or

(d) Average OM.

Option (a) (Simple OM method) can only be used if low-cost/must-run resources constitute less than 50.00% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

The most recent data on the electricity supplied to the national grid of the RSA is presented in Table E.6-1. Share of electricity supplied from the low-cost/must-run sources in total grid generation on average of the five most recent years constitute 7.03%. Thus, Option (a) (Simple OM method) has been chosen to calculate the operating margin emission factor.

Table E.6-1: Electricity supplied to the national grid of the RSA, GWh[61]

Type of power plant	Years*					Average	Share
	04/2005 – 03/2006	04/2006 - 03/2007	04/2007 - 03/2008	04/2008 - 03/2009	04/2009 – 03/2010		
Coal-fired	206,606	215,211	222,908	211,941	215,940	214,521	92.84%
Hydro-electric	1,141	2,443	751	1,082	1,274	1,338	**0.58%**
Pumped storage	2,867	2,947	2,979	2,772	2,742	2,861	**1.24%**
Gas turbine	78	62	1,153	143	49	297	0.13%
Nuclear	11,293	11,780	11,317	13,004	12,806	12,040	**5.21%**
Wind energy	3	2	1	2	1	2	**0.00%**
Total net generation	221,988	232,445	239,109	228,944	232,812	231,060	100.00%

*A reporting year for Eskom starts on the 01/04 and finishes on the 31/03.

[61] Eskom Annual Report 2010, page 1, http://financialresults.co.za/2010/eskom_ar2010/index.htm

For the Simple OM the emission factor can be calculated using either of the two following data vintages:

- *Ex ante option*: The emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average;
- *Ex post option*: The emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

Ex ante option was chosen to calculate the OM emission factor for all CPAs under this PoA.

Step 4: Calculate the operating margin emission factor according to the selected method

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 by one of the following two options:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; 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 A is used as data on the net electricity generation and a CO_2 emission factor of each Eskom's power plant is available. The OM emission factor is calculated as follows:

$$EF_{grid,OM} = EF_{grid,OMsimple} \quad \text{(E.6-8)}$$

Where:

$EF_{grid,OM}$	=	Operating margin CO_2 emission factor calculated ex ante (tCO_2/MWh)
$EF_{grid,OMsimple}$	=	Simple operating margin CO_2 emission factor calculated ex ante (tCO_2/MWh)

The simple operating margin CO_2 emission factor is calculated as follows (Equation 1 in the Tool):

$$EF_{grid,OMsimple} = \frac{\sum_{m,y} EG_{m,y} \cdot EF_{EL,m,y}}{\sum_{m,y} EG_{m,y}} \quad \text{(E.6-9)}$$

Where:

$EF_{grid,OMsimple}$	=	Simple operating margin CO_2 emission factor calculated ex ante (tCO_2/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh). Data is presented in Annex 3-3
$EF_{EL,m,y}$	=	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. The list of power plants included into the operating margin is presented in Annex 3-3
y	=	The relevant year as per the data vintage chosen in Step 3

Data for the three most recent reporting years on operation of Eskom's power plants included into the operating margin is presented in Annex 3-3.

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

As data on fuel consumption and electricity generation for each coal-fired power unit *m* is available, the emission factor ($EF_{EL,m,y}$) for these units is determined as follows (*Option A1*) (Equation 2 in the Tool):

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}} \quad \text{(E.6-10)}$$

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$FC_{i,m,y}$	=	Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (mass or volume unit). Data is presented in Annex 3-3
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit). Constant value was adopted.
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ). Constant value was adopted.
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh). Data is presented in Annex 3-3
m	=	All power units serving the grid in year *y* except low-cost/must-run power units. The list of power plants included into the operating margin is presented in Annex 3-3
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

As only data on electricity generation for gas turbine power plants is available, *Option A2* is used to determine $EF_{EL,m,y}$ for these plants (Equation 3 in the Tool):

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \cdot 3.6}{\eta_{m,y}} \quad \text{(E.6-11)}$$

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$EF_{CO2,m,i,y}$	=	Average CO_2 emission factor of fuel type *i* used in power unit *m* in year *y* (tCO_2/GJ). Constant value was adopted
$\eta_{m,y}$	=	Average net energy conversion efficiency of power unit *m* in year *y* (ratio). Constant value was adopted
m	=	All power units serving the grid in year *y* except low-cost/must-run power units. Option A2 is only used for gas turbine power plants (see Annex 3-3)
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

The calculation of the operating margin emission factor is presented in Annex 3-5.

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. This option does not require monitoring the emission factor during the crediting period; or

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available.

Option 1 was chosen.

The build margin calculation algorithm is presented in the Figure E.6-1. For simplification three levels were identified for the calculation of the BM.

Level A: Inclusion of power units which started to supply electricity to the grid less than 10 years ago, excluding power units registered as CDM project activities;

Level B: Inclusion of power units which started to supply electricity to the grid less than 10 years ago and power units registered as CDM project activities; and

Level C: Inclusion of power units which started to supply electricity to the grid more than 10 years ago and power units registered as CDM project activities.

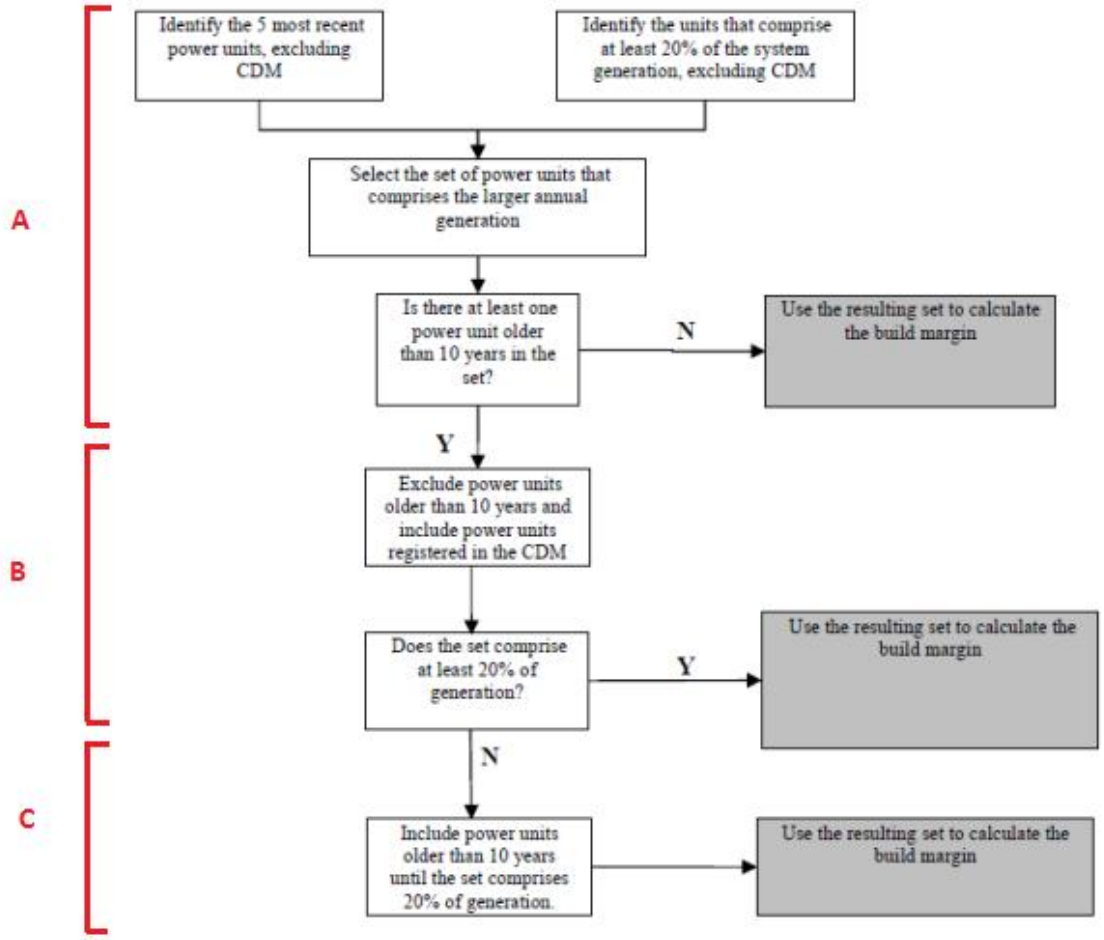


Figure E.6-1: Build margin calculation algorithm

The following procedures were applied to determine the sample group of power units *n* used to calculate the build margin:

a. Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

b. Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20.00% of AEG_{total} (if 20.00% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

c. From $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f);

The sets of power units $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ were identified (see Annex 3-4). The set of power units $SET_{\geq 20\%}$ that comprises the larger annual electricity generation was chosen as SET_{sample}. As SET_{sample} includes power units which started to supply electricity to the grid more than 10 years ago, the conditions for *Level A* have therefore not been satisfied and the project developer move to step (d).

d. Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20.00% of the annual electricity generation of the project electricity system (if 20.00% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

   If the annual electricity generation of that set comprises at least 20.00% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f);

The annual electricity generation of $SET_{sample\text{-}CDM}$ comprises less than 20.00% of the annual electricity generation of the national grid of the RSA (see Annex 3-4). The conditions for *Level B* have not been satisfied. Therefore continue to step (e) and (f).

e. Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20.00% of the annual electricity generation of the project electricity system (if 20.00% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

f. The sample group of power units *n* used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{->}10yrs}$).

The power units in $SET_{\text{sample-CDM ->10yrs}}$ was used to calculate the build margin. The list of power plants included into the build margin is presented in Annex 3-4.

The build margin emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *n* included into the build margin during the most recent year *y* (2010 reporting year) for which electricity generation data is available, calculated as follows (Equation 12 in the Tool):

$$EF_{grid,BM,y} = \frac{\sum_n EG_{n,y} \cdot EF_{EL,n,y}}{\sum_n EG_{n,y}} \qquad \text{(E.6-12)}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (2010 reporting year) (tCO_2/MWh)
$EG_{n,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *n* in year *y* (MWh). Data is presented in Annex 3-4
$EF_{EL,n,y}$	=	CO_2 emission factor of power unit *n* in year *y* (tCO_2/MWh)
n	=	Power units included in the build margin. The list of power plants included into the build margin is presented in Annex 3-4

y = Most recent historical year for which electricity generation data is available. The 2010 reporting year was selected

The CO_2 emission factor of power unit *n* in year *y* ($EF_{EL,n,y}$) is calculated using Formulas (E.6-10) and (E.6-11).

According to the "Tool to calculate the emission factor for an electricity system" if the power units included in the build margin *n* correspond to the sample group $SET_{sample\text{-}CDM\text{->}10yrs}$, then, as a conservative approach, only *Option A2* from *Step 4* can be used to calculate $EF_{EL,n,y}$ and the default values provided in Annex 1 of the Tool shall be used to determine the parameter $\eta_{m,y}$. Therefore Formula (E.6-11) was used to calculate $EF_{EL,n,y}$ for Majuba and Kendal power plants.

The calculation of the build margin CO_2 emission factor is presented in Annex 3-5.

Step 6: Calculate the combined margin emissions factor

The combined margin emission factor is calculated as follows (Equation 13 in the Tool):

$$EF_{grid,CM,y} = EF_{grid,CM} = EF_{grid,OM} \cdot w_{OM} + EF_{grid,BM,y} \cdot w_{BM} \quad \text{(E.6-13)}$$

Where:

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* (tCO_2/MWh)

$EF_{grid,CM}$ = Combined margin CO_2 emission factor for grid connected power generation calculated ex ante (tCO_2/MWh)

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in the most recent year *y* (2010 reporting year) (tCO_2/MWh)

$EF_{grid,OM}$ = Operating margin CO_2 emission factor (tCO_2/MWh)

w_{OM} = Weighting of operating margin emission factor

w_{BM} = Weighting of build margin emission factor

According to the "Tool to calculate the emission factor for an electricity system" the following default values should be used for solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25.

The calculation of the combined margin CO_2 emission factor is presented in Annex 3-5.

Leakage

According to ACM0002:

"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 and transport). These emissions sources are neglected."

Therefore CPA leakage is therefore zero:

$$LE_y = 0 \quad \text{(E.6-14)}$$

Where:

LE_y = CPA leakage (tCO_2e/yr)

Emission reductions

Emission reductions are calculated as follows (ACM0002, equation 11):

$$ER_y = BE_y - PE_y \quad \text{(E.6-15)}$$

Where:

ER_y	=	Emission reductions in year *y* (tCO_2e/yr)
BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
PE_y	=	CPA emissions in year *y* (tCO_2e/yr)

The equations E.6-2, E.6-3, E.6-4, E.6-5, E.6-6, E.6-13 and E.6-15 can be combined:

$$ER_y = EG_{CPA,y} \times EF_{grid,CM} - \sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y} \quad \text{(E.6-16)}$$

Where:

ER_y	=	Emission reductions in year *y* (tCO_2e/yr)
$FC_{i,y}$	=	The quantity of fuel type *i* combusted during the year *y* (mass or volume unit/yr)
$NCV_{i,y}$	=	The weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
i	=	The fuel types combusted during the year *y*
$EF_{CO2,i,y}$	=	The weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
$EG_{CPA,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CPA in year *y* (MWh/yr)
$EF_{grid,CM}$	=	Combined margin CO_2 emission factor for grid connected power generation calculated ex ante (tCO_2/MWh)

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

CPAs shall always apply the fixed parameters of the latest version of the PoA-DD. Following parameters are fixed for all CPAs during the first crediting period of the PoA: [62]

Data / Parameter:	$EG_{m,y}$
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y*
Source of data used:	Eskom's statistic data
Value applied:	See Annex 3-3
Justification of the choice of data or description of measurement methods	Official statistics, publicly available and reliable data source

[62] http://cdm.unfccc.int/EB/032/eb32_repan39.pdf

and procedures actually applied :	
Any comment:	The data for the three most recent reporting years is provided.

Data / Parameter:	$FC_{i,m,y}$
Data unit:	mass or volume unit
Description:	Amount of fossil fuel type *i* consumed by power unit *m* in year *y*
Source of data used:	Eskom's statistic data
Value applied:	See Annex 3-3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics, publicly available and reliable data source
Any comment:	The data for the three most recent reporting years is provided.

Data / Parameter:	$NCV_{coal,y}$
Data unit:	GJ/t
Description:	Net calorific value of Other Bituminous Coal
Source of data used:	2006 IPCC Guidelines for National GHG Inventories, volume 2: Energy, chapter 1, Table 1.2
Value applied:	19.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	For the sake of a conservative approach the IPCC default value at the lower limit of the uncertainty at a 95.00% confidence interval is used.
Any comment:	This value was appointed as a constant for the first crediting period.

Data / Parameter:	$EF_{CO2,coal,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of Other Bituminous Coal
Source of data used:	2006 IPCC Guidelines for National GHG Inventories, volume 2: Energy, chapter 1, Table 1.4
Value applied:	0.0895
Justification of the choice of data or description of measurement methods and procedures actually applied :	For the sake of a conservative approach the IPCC default value at the lower limit of the uncertainty at a 95.00% confidence interval is used.
Any comment:	This value was appointed as a constant for the first crediting period.

Data / Parameter:	$EF_{CO2,NG,y}$

Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of Natural Gas
Source of data used:	2006 IPCC Guidelines for National GHG Inventories, volume 2: Energy, chapter 1, Table 1.4
Value applied:	0.0543
Justification of the choice of data or description of measurement methods and procedures actually applied :	For the sake of a conservative approach the IPCC default value at the lower limit of the uncertainty at a 95.00% confidence interval is used.
Any comment:	This value was appointed as a constant for the first crediting period.

Data / Parameter:	η_{OCGT}
Data unit:	Ratio
Description:	Average net energy conversion efficiency of open cycle gas turbine power plant
Source of data used:	Tool to calculate the emission factor for an electricity system, Annex 1 the first Table
Value applied:	0.395
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value is used
Any comment:	This value was appointed as a constant.

Data / Parameter:	$\eta_{m,y}$
Data unit:	Ratio
Description:	Average net energy conversion efficiency of coal fired power plant that has operated for more than 10 years for calculation of the Build Margin.
Source of data used:	Tool to calculate the emission factor for an electricity system, Annex 1 the first Table
Value applied:	0.37
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value is used
Any comment:	This value was appointed as a constant to Majuba and Kendal power plants for the calculation of build margin CO_2 emission factor (refer to Annex 3-5).

Data / Parameter:	$EG_{n,y}$
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid by power unit *n* in year *y*

Source of data used:	Eskom's statistic data
Value applied:	See Annex 3-4
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics, publicly available and reliable data source
Any comment:	The data for 2010 reporting year is provided.

Data / Parameter:	$FC_{i,n,y}$
Data unit:	mass or volume unit
Description:	Amount of fossil fuel type *i* consumed by power unit *n* in year *y*
Source of data used:	Eskom's statistic data
Value applied:	See Annex 3-4
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistics, publicly available and reliable data source
Any comment:	The data for 2010 reporting year is provided.

The following parameters will be reported in the CDM-CPA-DD for the CPA.

Data / Parameter:	P_y
Data unit:	MW
Description:	Power capacity of the CPA in year *y*
Source of data used:	Solar park developer
Value applied:	–
Justification of the choice of data or description of measurement methods and procedures actually applied :	Decision of CPA developer
Any comment:	The value reflects the expected maximum power output of the activity.

Data / Parameter:	$EF_{grid,CM}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation calculated ex ante
Source of data used:	PoA-DD
Value applied:	**0.988**
Justification of the choice of data or description of measurement methods	Calculated *ex ante* based on the "Tool to calculate the emission factor for an electricity system" on the PoA level

and procedures actually applied :	
Any comment:	This value was appointed as a constant for the first crediting period..

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

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

Data / Parameter:	$EG_{CPA,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CPA in year *y*
Source of data to be used:	On-site measurement with electricity meters, yielding the net electricity supplied to the grid of the RSA. Readings are cross-checked with records for sold/purchased electricity.
Value of data:	–
Description of measurement methods and procedures to be applied:	Calculated as the difference between the measured quantities of the grid electricity export and the import from grid. The meters will be installed at the point of supply which defines the commercial boundary between Eskom and the solar park owner. The export electricity meter will be equipped with the check meter. The exported and imported electricity will be continuously measured and recorded monthly. Data will be digitally archived at least on a monthly basis. The meter class will be CPA dependent.
QA/QC procedures to be applied:	Electricity meters will be calibrated according to South African Bureau of Standards (SABS)[63] (relevant industry standards in the RSA), as shown in Table E.7-1 below; which is in line with paragraph 8 of Annex 60 to EB52. Readings are cross-checked with records for sold/purchased electricity.
Any comment:	-

Data / Parameter:	$FC_{i,y}$
Data unit:	Mass or volume unit/yr
Description:	The quantity of fuel type *i* combusted during the year *y*
Source of data to be used:	On-site measurements
Value of data:	–
Description of measurement methods and procedures to be applied:	Measurement by means of mass or volume meters. The fuel consumption will be continuously measured and recorded at the end of the operation or on a monthly basis (whichever is earlier) by the CPA personnel. Data on fuel consumption will be digitally archived and submitted to the CME. 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

[63] According to the SABS the SANS 474 regulation should be followed as per Table 5 on page 22 section 4.7.4.1.

	and have a book of control for recording the measurements (on a daily basis or per shift)
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.
Any comment:	On-site measurement of fossil fuel consumption is only applicable for CSP technology

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/mass or volume unit
Description:	The weighted average net calorific value of the fuel type *i* in year *y*
Source of data to be used:	2006 IPCC Guidelines for National GHG Inventories, volume 2: Energy, chapter 1, Table 1.2
Value of data:	–
Description of measurement methods and procedures to be applied:	For the sake of a conservative approach the IPCC default value at the upper limit of the uncertainty at a 95.00% confidence interval should be used
QA/QC procedures to be applied:	-
Any comment:	NCV of fossil fuel used on-site will only be determined for CSP technology

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2/GJ
Description:	The weighted average CO_2 emission factor of fuel type *i* in year *y*
Source of data to be used:	2006 IPCC Guidelines for National GHG Inventories, volume 2: Energy, chapter 1, Table 1.4
Value of data:	–
Description of measurement methods and procedures to be applied:	For the sake of a conservative approach the IPCC default value at the upper limit of the uncertainty at a 95.00% confidence interval should be used
QA/QC procedures to be applied:	-
Any comment:	EF of fossil fuel used on-site will only be determined for CSP technology

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

The monitoring plan is devised as per approved consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable

sources". Each CPA will be monitored. The operational and management plan is as described in section A.4.4.1. of this PoA-DD, including Figures A.4-5 and A.4-6 showing the hierarchy within the organisation, along with the roles and responsibilities of each element in Table A.4-3 and Table A.4-4.

The following procedures shall be applied:

1. Monitoring period

The monitoring period starts from the date of commissioning of the CPA or the date of registration of the proposed CPA under the PoA (whichever is later).

2. Data monitored and sources

The CME will measure data and parameters as per identified parameters in the CPA like the quantity of net electricity generation that is produced and fed into the grid by the CPA in year *y*.

The quantity of net electricity generation that is produced and fed into the grid by the CPA in year *y* shall be determined on the basis of electricity meters. The generated electricity will be continuously measured and recorded at least on a monthly basis by the CPA personnel. The metering instruments shall be installed in accordance with the requirements of the Grid and the Distribution Metering Codes at the point of supply which defines the commercial boundary between the solar park owner and the grid. Readings of the electricity meters shall be cross-checked with records for sold electricity. Data on electricity supply will be digitally archived and submitted to the CME.

For CPAs which employ CSP technology the quantity of fuel type *i* combusted during the year *y* will also be continuously measured and recorded at the end of the operation or on a monthly basis (whichever is earlier) by the CPA personnel. Data on fuel consumption will be digitally archived and submitted to the CME. 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. The weighted average net calorific value of the fuel type *i* in year *y* and the weighted average CO_2 emission factor of fuel type *i* in year *y* used in CSP power plants will be determined based on 2006 IPCC Guidelines for National GHG Inventories.

The sources of data for calculation of GHG emission reductions in the course of monitoring shall be the internal electricity billing reports of the solar parks.

The emission reductions shall be calculated using the Formula (B.6-16).

3. The monitoring team

The solar park staff shall undergo the necessary training related to operation and maintenance of the solar park and all of the installed equipment[64]. The maintenance personnel of the solar park are responsible for daily control over the monitoring plan implementation.

The Chief Engineer of the solar park is responsible for timely calibration of all instrumentation in accordance with the manufacturer's requirements and requirements of the South African Bureau of Standards[65]. The respective CPA entity will be responsible for implementation and overall control as well as collection of all data, and submit the data to the CME on a monthly basis.

Specialists of BWC will calculate GHG emission reductions with data that will be provided by the respective CPA entity.

[64] The CME shall facilitate training for CPA management and personnel to ensure that that monitoring and data capture is done in accordance with this PoA.
[65] According to the SABS the SANS 474 regulation should be followed as per page 12 section 4.4.3 and page 20-23 section 4.7.

In case of any doubts as to the accuracy of the data, the specialists of the respective CPA entity shall check and correct the data. The preliminary version of the monitoring report shall be submitted to the specialists of respective CPA entities for review. In case any mistakes are found in the calculations of GHG emission reductions, the specialists of BWC shall correct these calculations accordingly.

Specialists of BWC shall regularly (at least annually) carry out ”Test verifications” with a view to ensure that the monitoring plan of the respective CPA entity is applied correctly.

4. Data storage

All data collected as part of monitoring plan should be archived electronically and be kept at least for 2 years after the end of the last crediting period.

5. Instrumentation calibration

The instrumentation calibration and check-out shall be carried out by contracted specialized organisations that are licensed for this type of activity, according to the requirements of the manufacturing company, and the South African Bureau of Standards (SABS). The following table will be followed according to the SABS standards for electricity meters:

Table E.7-1: Intervals for periodic calibration of electricity meters according to SABS standards

1	2
Load	**Calibration interval** (years)
> 100 MVA	5
10 MVA to < 100 MVA	5
1 MVA to < 10 MVA	10
100kVA to < 1MVA	10
<100kVA	20

6. Emergency situations

If any instrument that is used in the monitoring process fails, the respective CPA entity shall remedy the situation as soon as possible and if necessary shall replace the instrument. A conservative approach will be taken when determining the CER’s during any failures in that, any electricity produced during the failure and repair or replacement of the metering equipment, will not be taken into account for CER calculations.

In case of breakdown of any vital electricity generation equipment the electricity generation will go down, and amount of electricity supplied to the grid by the solar park will be reduced. All accidents that may occur at the solar park shall be recorded by the respective CPA entity. Information on major accidents shall be included in the monitoring report.

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)

The date of completing the baseline study and monitoring methodology: 01/04/2012

Baseline was developed by Blue World Carbon Asset Management (Pty) Ltd (BWC is not the project participant).

Contact persons for baseline and monitoring:

- Ilya Goryashin (ilya.goryashin@blueworldcarbon.com); and

- Louie Eggers (louie.eggers@blueworldcarbon.com)

Contact person/ and entity responsible for the PoA:

- Blue World Carbon Asset Management (Pty) Ltd (The CME), Joost van Lier (Head of CME) (joost.van.lier@blueworldcarbon.com).

Annex 1

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

Organization:	Blue World Carbon Asset Management (Pty) Ltd
Street/P.O.Box:	Suite 101, Block A, 7 West Quay Road
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Annex 3-1. Eskom electricity network[66]

[66] http://www.eskom.co.za/content/2008EskomPoster.jpg

Annex 3-2. Data on Eskom's grid-connected power plants (at the 31/03/2010)[67,68]

Name of power plant	Location	Type of power plant (PP)	Type of fuel	Date of commissioning/ (Re-commissioning)*	Total net maximum capacity, MW
Arnot	Middelburg, Mpumalanga	Thermal PP	Coal	1971/09/21	2,232
Camden[69]	Ermelo, Mpumalanga	Thermal PP	Coal	(2005/03/31)	1,440
Duvha	Witbank, Mpumalanga	Thermal PP	Coal	1980/01/18	3,450
Grootvlei[70]	Balfour, Mpumalanga	Thermal PP	Coal	(2008/03/31)	760
Hendrina	Mpumalanga	Thermal PP	Coal	1970/05/12	1,865
Kendal	Witbank, Mpumalanga	Thermal PP	Coal	1988/10/01	3,840
Komati[71]	Middelburg, Mpumalanga	Thermal PP	Coal	(2009/01/05)	170
Kriel	Bethal, Mpumalanga	Thermal PP	Coal	1976/05/06	2,850
Lethabo	Viljoensdrift, Free State	Thermal PP	Coal	1985/12/22	3,558
Majuba	Volksrust, Mpumalanga	Thermal PP	Coal	1996/04/01	3,843
Matimba	Lephalale, Limpopo	Thermal PP	Coal	1987/12/04	3,690
Matla	Bethal, Mpumalanga	Thermal PP	Coal	1979/09/29	3,450
Tutuka	Standerton, Mpumalanga	Thermal PP	Coal	1985/06/01	3,510

[67] Eskom Annual Report 2010, page 298, http://financialresults.co.za/2010/eskom_ar2010/index.htm
[68] Data Requirements for Calculating the Carbon Emission Factor (CEF) for the South African Grid, General Information, http://www.eskom.co.za/content/calculationTable.htm
[69] Re-commissioned power plant, Eskom Annual Report 2009, page 63 http://www.financialresults.co.za/eskom_ar2009/ar_2009/downloads.htm
[70] Re-commissioned power plant, Eskom Annual Report 2010, page 126, http://financialresults.co.za/2010/eskom_ar2010/index.htm
[71] Re-commissioned power plant, Eskom Annual Report 2010, page 127, http://financialresults.co.za/2010/eskom_ar2010/index.htm

Name of power plant	Location	Type of power plant (PP)	Type of fuel	Date of commissioning/ (Re-commissioning)*	Total net maximum capacity, MW
Acacia	Cape Town, Western Cape	Gas turbine PP	Kerosene	1976/05/13	171
Port Rex	East London, Eastern Cape	Gas turbine PP	Kerosene	1976/09/30	171
Ankerlig	Atlantis, Western Cape	Gas turbine PP	Natural gas	2007/03/29	1,327
Gourikwa	Mossel Bay, Western Cape	Gas turbine PP	Natural gas	2007/03/30	740
Colley Wobbles	Mbashe River, Eastern Cape	Hydro PP	-	1900/01/01	0
Ncora	Ncora River, Eastern Cape	Hydro PP	-	1900/03/01	0
First Falls	Umtata River, Eastern Cape	Hydro PP	-	1900/02/01	0
Gariep	Norvalspont, Free State	Hydro PP	-	1971/09/08	360
Second Falls	Umtata River, Eastern Cape	Hydro PP	-	1900/04/01	0
Vanderkloof	Petrusville, Northern Cape	Hydro PP	-	1977/01/01	240
Drakensberg	Bergville Kwazulu-Natal	Hydroelectric Pumped Storage PP	-	1981/06/17	1,000
Palmiet	Grabouw, Western Cape	Hydroelectric Pumped Storage PP	-	1988/04/18	400
Koeberg	Cape Town, Western Cape	Nuclear PP	-	1984/07/21	1,800
Klipheuwel	Klipheuwel, Western Cape	Wind farm	-	**	3

* Re-commissioned units are: Camden, Grootvlei and Komati.

**No data available

Annex 3-3. Data on operation of Eskom's grid-connected power plants included into the operating margin for the 3 most recent reporting years

The list of power plants included into the operating margin[72]

Name of power plant	Type of power plant (PP)	Type of fuel	Total net maximum capacity, MW
Arnot	Thermal PP	Coal	2,232
Camden	Thermal PP	Coal	1,440
Duvha	Thermal PP	Coal	3,450
Grootvlei	Thermal PP	Coal	760
Hendrina	Thermal PP	Coal	1,865
Kendal	Thermal PP	Coal	3,840
Komati	Thermal PP	Coal	170
Kriel	Thermal PP	Coal	2,850
Lethabo	Thermal PP	Coal	3,558
Majuba	Thermal PP	Coal	3,843
Matimba	Thermal PP	Coal	3,690
Matla	Thermal PP	Coal	3,450
Tutuka	Thermal PP	Coal	3,510
Ankerlig	Gas turbine PP	Natural gas	1,327
Gourikwa	Gas turbine PP	Natural gas	740

[72]Kerosene-fired gas turbine power plants were excluded from the operating margin since they were not operated for the 3 most recent reporting years.

Net quantity of electricity generated and delivered to the grid by the power plants included into the operating margin ($EG_{m,y}$)[73]

Name of power plant	Type of fuel	Unit	Years*			Total 04/2007 - 03/2010
			04/2007 - 03/2008	04/2008 - 03/2009	04/2009 - 03/2010	
Arnot	Coal	MWh	11,905,060	11,987,281	13,227,864	37,120,205
Camden	Coal	MWh	5,171,057	6,509,079	7,472,070	19,152,206
Duvha	Coal	MWh	23,622,732	21,769,489	22,581,228	67,973,449
Grootvlei	Coal	MWh	237,138	1,249,556	2,656,230	4,142,924
Hendrina	Coal	MWh	13,756.351	12,296,687	12,143,292	38,196,330
Kendal	Coal	MWh	26,517,420	23,841,401	23,307,031	73,665,852
Komati	Coal	MWh	0	0	1,016,023	1,016,023
Kriel	Coal	MWh	17,762,398	18,156,686	15,906,816	51,825,900
Lethabo	Coal	MWh	25,701,723	23,580,232	25,522,698	74,804,653
Majuba	Coal	MWh	23,680,971	22,676,924	22,340,081	68,697,976
Matimba	Coal	MWh	29,021,742	26,256,068	27,964,141	83,241,951
Matla	Coal	MWh	24,549,833	21,863,400	21,954,536	68,367,769
Tutuka	Coal	MWh	20,980,242	21,504,122	19,847,894	62,332,258
Ankerlig**	Natural gas	MWh	1,153,000	143,000	49,000	1,345,000
Gourikwa**	Natural gas	MWh				
					Total net electricity generation:	651,882,496

*A reporting year for Eskom starts on the 01/04 and finishes on the 31/03.

**Data was taken from Table B.6-1.

[73]Data Requirements for Calculating the Carbon Emission Factor (CEF) for the South African Grid, General Information, http://www.eskom.co.za/content/calculationTable.htm

Amount of fossil fuel consumed by the power plants included into the operating margin ($FC_{i,m,y}$)[74]

Name of power plant	Type of fuel	Unit	Years*			Total 04/2007 - 03/2010
			04/2007 - 03/2008	04/2008 - 03/2009	04/2009 - 03/2010	
Arnot	Coal	tonnes	6,210,700	6,395,805	6,794,134	19,400,639
Camden	Coal	tonnes	3,218,873	3,876,211	4,732,163	11,827,247
Duvha	Coal	tonnes	12,425,531	11,393,553	11,744,606	35,563,690
Grootvlei	Coal	tonnes	130,748	674,538	1,637,371	2,442,657
Hendrina	Coal	tonnes	7,794,220	7,122,918	6,905,917	21,823,055
Kendal	Coal	tonnes	15,986,131	15,356,595	13,866,514	45,209,240
Komati	Coal	tonnes	0	0	664,497	664,497
Kriel	Coal	tonnes	9,059,934	9,420,764	8,504,715	26,985,413
Lethabo	Coal	tonnes	18,314,572	16,715,323	18,170,227	53,200,122
Majuba	Coal	tonnes	12,853,342	12,554,406	12,261,833	37,669,581
Matimba	Coal	tonnes	14,862,323	13,991,453	14,637,481	43,491,257
Matla	Coal	tonnes	13,795,309	12,689,387	12,438,391	38,923,087
Tutuka	Coal	tonnes	10,627,575	11,231,583	10,602,839	32,461,997
Ankerlig	Natural gas	thousand m^3	N/A**	N/A	N/A	N/A
Gourikwa	Natural gas	thousand m^3	N/A	N/A	N/A	N/A
					Total coal consumption:	369,662,482

*A reporting year for Eskom starts on the 1st of April and finishes on the 31st of March.

**No data available

[74]Data Requirements for Calculating the Carbon Emission Factor (CEF) for the South African Grid, General Information, http://www.eskom.co.za/content/calculationTable.htm

Annex 3-4. Determination of power units included into the build margin[75]

Determination of the set of power units SET_{sample}

			Name of power plant	Type of power plant (PP)	Type of fuel	Date of commissioning	Net electricity generation ($EG_{n,y}$), MWh	Weight fraction in total net electricity generation*	Accumulated weight fraction
SET_{sample}	$SET_{\geq 20\%}$	$SET_{5\text{-units}}$	Komati	Thermal PP	Coal	2009/01/05	1,016,023	0.0044	0.0044
			Grootvlei	Thermal PP	Coal	2008/03/31	2,656,230	0.0114	0.0158
			Gourikwa	Gas turbine PP	Natural gas	2007/03/30	49,000	0.0002	0.0160
			Ankerlig	Gas turbine PP	Natural gas	2007/03/29			
			Camden	Thermal PP	Coal	2005/03/31	7,472,070	0.0321	**0.0481**
			Majuba	Thermal PP	Coal	1996/04/01	22,340,081	0.0960	0.1440
			Kendal	Thermal PP	Coal	1988/10/01	23,307,031	0.1001	**0.2441**

*Total net electricity generation in 2010 reporting year is 232,812 GWh (see Table B.6-1).

$AEG_{SET\text{-}5\text{-}units}$ = 11,193,323 MWh,

$AEG_{SET\text{-}\geq 20\%}$ = 56,840,435 MWh.

[75]Based on data presented in Annexes 3-2 and 3-3

The sets of power units $SET_{sample\text{-}CDM}$

	Name of power plant	Type of power plant (PP)	Type of fuel	Date of commissioning	Net electricity generation ($EG_{n,y}$), MWh	Weight fraction in total net electricity generation*	Accumulated weight fraction
$SET_{sample\text{-}CDM}$	Bethlehem Hydro	Small Scale Hydro	Renewable	2009/07/18	34,031	0.0001	0.0001
	Komati	Thermal PP	Coal	2009/01/05	1,016,023	0.0044	0.0045
	Grootvlei	Thermal PP	Coal	2008/03/31	2,656,230	0.0114	0.0159
	Gourikwa	Gas turbine PP	Natural gas	2007/03/30	49,000	0.0002	0.0161
	Ankerlig	Gas turbine PP	Natural gas	2007/03/29			
	Camden	Thermal PP	Coal	2005/03/31	7,472,070	0.0321	0.0482

*Total net electricity generation in 2010 reporting year including power units registered as CDM project activities is 232,846 GWh (see Annex 3-5)

$AEG_{SET\text{-}sample\text{-}CDM}$ = 11,227,354 MWh

Data on operation of Eskom's grid-connected power plants and power plants registered as CDM project activities included into the build margin during 2010 reporting year

Name of power plant	Type of power plant (PP)	Type of fuel	Date of commissioning	Fuel consumption ($FC_{i,n,y}$), tonnes	Net electricity generation ($EG_{n,y}$), MWh	Weight fraction in total net electricity generation*	Accumulated weight fraction
Bethlehem Hydro[76]	Small Scale Hydro	Renewable	2009/07/18	0	34,031	0.0001	0.0001
Komati	Thermal PP	Coal	2009/01/05	664,497	1,016,023	0.0044	0.0045
Grootvlei	Thermal PP	Coal	2008/03/31	1,637,371	2,656,230	0.0114	0.0159
Gourikwa	Gas turbine PP	Natural gas	2007/03/30	N/A**	49,000	0.0002	0.0161
Ankerlig	Gas turbine PP	Natural gas	2007/03/29				
Camden	Thermal PP	Coal	2005/03/31	4,732,163	7,472,070	0.0321	0.0482
Majuba	Thermal PP	Coal	1996/04/01	12,261,833	22,340,081	0.0959	0.1442
Kendal	Thermal PP	Coal	1988/10/01	13,866,514	23,307,031	0.1001	**0.2443**

*Total net electricity generation in 2010 reporting year including power units registered as CDM project activities is 232,846 GWh (see Annex 3-5)

**No data available

[76] http://cdm.unfccc.int/Projects/DB/SGS-UKL1245061289.99, CDM PDD, page 12

Annex 3-5. The calculation of the combined margin emission factor

Total net electricity generation in 2010 reporting year including power units registered as CDM project activities, MWh

Net electricity generation	Value
Total Eskom	232,812,000
Bethlehem Hydro	34,031
Total	**232,846,031**

CO_2 emission factors of power units *m* in year *y* ($EF_{EL,m,y}$), tCO_2/MWh

Name of power plant	Years		
	04/2007 - 03/2008	04/2008 - 03/2009	04/2009 - 03/2010
Arnot	0.929	0.950	0.915
Camden	1.109	1.061	1.128
Duvha	0.937	0.932	0.926
Grootvlei	0.982	0.961	1.098
Hendrina	1.009	1.032	1.013
Kendal	1.074	1.147	1.060
Komati	-	-	1.165
Kriel	0.908	0.924	0.952
Lethabo	1.269	1.263	1.268
Majuba	0.967	0.986	0.978
Matimba	0.912	0.949	0.932
Matla	1.001	1.034	1.009
Tutuka	0.902	0.930	0.951
Ankerlig	0.495	0.495	0.495
Gourikwa			

CO_2 emissions of power units *m* in year *y* ($EG_{m,y} \cdot EF_{EL,m,y}$), tCO_2

Name of power plant	Years			Total 04/2007 - 03/2010
	04/2007 - 03/2008	04/2008 - 03/2009	04/2009 - 03/2010	
Arnot	11,061,567	11,391,248	12,100,692	34,553,508
Camden	5,732,974	6,903,726	8,428,219	21,064,918
Duvha	22,130,492	20,292,488	20,917,731	63,340,710
Grootvlei	232,868	1,201,386	2,916,240	4,350,494
Hendrina	13,881,896	12,686,273	12,299,783	38,867,952
Kendal	28,472,099	27,350,864	24,696,955	80,519,917
Komati	0	0	1,183,502	1,183,502
Kriel	16,136,195	16,778,852	15,147,323	48,062,370
Lethabo	32,619,168	29,770,826	32,362,083	94,752,077
Majuba	22,892,445	22,360,025	21,838,938	67,091,407
Matimba	26,470,540	24,919,477	26,070,086	77,460,103
Matla	24,570,135	22,600, 433	22,153,396	69,323,964
Tutuka	18,928,242	20,004,011	18,884,186	57,816,440
Ankerlig	570,604	70,769	24,249	665,622
Gourikwa				
			Total emissions:	659,052,985

Calculation of simple operating margin CO_2 emission factor ($EF_{grid,OM,simple}$)

Parameter	Unit	Value
Total net electricity generation of power units *m* for the 3 most recent reporting years	MWh	651,882,496
Total CO_2 emissions of power units *m* for the 3 most recent reporting years	tCO_2	659,052,985
Simple operating margin CO_2 emission factor	**tCO_2/MWh**	**1.011**

Calculation of build margin CO_2 emission factor ($EF_{grid,BM,y}$)

Name of power plant	Net electricity generation ($EG_{n,y}$), MWh	CO_2 emission factor ($EF_{EL,n,y}$), tCO_2/MWh	CO_2 emissions ($EG_{n,y} \cdot EF_{EL,n,y}$), tCO_2	Build margin CO_2 emission factor ($EF_{grid,BM,y}$), tCO_2/MWh
Bethlehem Hydro	34,031	0	0	
Komati	1,016,023	1.165	1,183,502	
Grootvlei	2,656,230	1.098	2,916,240	
Gourikwa	49,000	0.495	24,249	
Ankerlig				
Camden	7,472,070	1.128	8,428,219	
Majuba	22,340,081	0.871*	19,453,984	
Kendal	23,307,031	0.871*	20,296,015	
Total	**56,874,466**		**52,302,209**	**0.920**

*Recalculated emission factor for power plants which started to supply electricity to the grid more than 10 years ago

Calculation of combined margin CO_2 emission factor ($EF_{grid,CM}$)

Parameter	Unit	Value
Operating margin CO_2 emission factor	tCO_2/MWh	1.011
Weighting of operating margin emission factor	-	0.75
Build margin CO_2 emission factor	tCO_2/MWh	0.920
Weighting of build margin emission factor	-	0.25
Combined margin CO_2 emission factor	**tCO_2/MWh**	**0.988**

Annex 4

MONITORING INFORMATION

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Appendix 1

LIST OF ABBREVIATION

BA	Basic Assessment
BM	Build Margin
BWC	Blue World Carbon Asset Management (Pty) Ltd
CA	Competent Authority
CERs	Certified Emission Reductions
CM	Combined Margin
CME	Coordinating and Managing Entity
CPA	CDM programme activity
DNA	Designated National Authority
EA	Environmental Authorization
EB	Executive Board
EIA	Environmental Impact Assessment
ERA	The Electricity Regulation Act, 2006 (Act No. 4 of 2006)
GHG	Greenhouse gas
IPPs	Independent Power Producers
IRP	Integrated resource plan for electricity 2010-2030
IRR	Internal Rate of Return
NEMA	The National Environmental Management Act
NERSA	National Energy Regulator of South Africa
OM	Operating Margin
O&M	Operations and Maintenance
PoA	Programme of activities
PLF	Project Load Factor
PP	Power Plant
RE	Renewable Energy
REFIT	Renewable Energy Feed - In Tariff
PPA	Power Purchase Agreement
RSA	The Republic of South Africa
SABS	South African Bureau of Standards
WACC	Weight Average Cost of Capital