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

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NOTE:

(i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.

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

SECTION A. General description of small-scale programme of activities (PoA)

A.1 Title of the small-scale programme of activities (PoA):

Small-scale solar electrical programme, South Africa
Version number: 08
Date: 12/11/2012

A.2. Description of the small-scale programme of activities (PoA):

Solar energy is the most readily accessible renewable energy resource in the Republic of South Africa (RSA). Most areas in the country have more than 2 500 hours of sunshine per year, and average solar radiation levels range between 4.5 and 6.5 kWh/m^2 in one day[1].

However, most electricity in the RSA is generated by burning coal. The energy system of the country is managed by the state-owned company Eskom which is in charge of generation, transmission and distribution of power to end-users. The company's total net maximum capacity as of 31 March 2010 is 40 870 MW, most of which is coal-fired (34 658 MW)[2].

The objective of this programme is to boost the use of renewable energy by domestic consumers and private companies of the RSA. A typical CPA under this PoA is either:

Type 1: The group of the independent activities under the predetermined province of the RSA, each of which is no larger than 0.15 MW installed capacity. Activities will be added *ex post* during the crediting period of the corresponding CPA (actual independent activities may not be known before the registration of the CPA under the PoA); or

Type 2: The identified independent activity or a group of identified independent activities of any capacity which taken together do not exceed 15 MW. The activities will be included in the corresponding CPA *ex ante* (actual independent activities will be known before the registration of the CPA under the PoA).

Activities included into a typical CPA envisage either:

Option (1) Installation of a solar electrical system at the demand-side where there was no solar electrical system operating prior to the implementation of the activity; or

Option (2) a capacity addition[3].

Electricity which will be produced by the independent activity (solar electrical systems installed) may under the CPA be supplied to either:

[1] http://www.energy.gov.za/files/esources/renewables/r_solar.html

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

[3] A capacity addition envisages an increase in the installed power generation capacity of an existing solar electrical system through: the installation of a new solar electrical system beside the existing solar electrical system; or the installation of new solar electrical system, additional to the existing solar electrical system. The existing solar electrical system continues to operate after the implementation of the activity, furthermore the addition of the new capacity does not significantly affect the electricity generation by the existing solar electrical system and the electricity produced by the added solar electrical system could be directly and separately measured.

Scenario (a) An identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; or

Scenario (b) The national grid of the RSA.

Participation in this programme will enable the solar electrical system owners to discount the purchased price of the solar electrical system or get an annual income in the form of rebate in exchange for cession of their rights to claim greenhouse gas (GHG) emission reductions to the coordinating entity of this PoA. The owners of large installation will also be given an option to sell CERs generated to an independent buyer.

Each CPA will apply: either (1) only AMS-I.F or (2) only AMD-I.D or (3) a combination of both methodologies. There are no cross effects between the technologies/measures applied. Moreover both methodologies define that in the absence of the project activity (baseline scenario) electricity supplied by the CPA would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources.

GHG emissions from the electricity generation for the solar electrical systems amount to zero. The reduction of GHG emissions as a result of the implementation of the independent activities will be achieved due to 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 independent activities.

The coordinating entity of this PoA is Blue World Carbon Capital PCC (BWCC), which will either purchase rights to claim CERs produced under this PoA or receive a fee for their services.

General operating and implementing framework of the PoA

Participation in this programme will enable the solar electrical system owners either to:

(a) Get a discount for the purchased price of the solar electrical system or an annual rebate in exchange for cession of their rights to claim GHG emission reductions which will be achieved due to reduction in electricity generation at grid connected power plants. This case is presented in the Figure A.2-1; or

(b) Independently engage in the sale of CERs, therefore BWCC will receive a fee for their service. This case is presented in the Figure A.2-2.

Case (a) envisages that the companies which sell the solar electrical systems and BWCC shall sign the Emissions Reduction Purchase Agreement (ERPA). BWCC will purchase rights to claim CERs generated as a result of the implementation of independent activities from sellers.

In case (b) owners of independent activities retain rights to dispose issued CERs, therefore they may sign ERPA with a buyer other than BWCC. BWCC and the owner of the independent activity shall sign a service agreement which appoints BWCC to act as a carbon consultant.

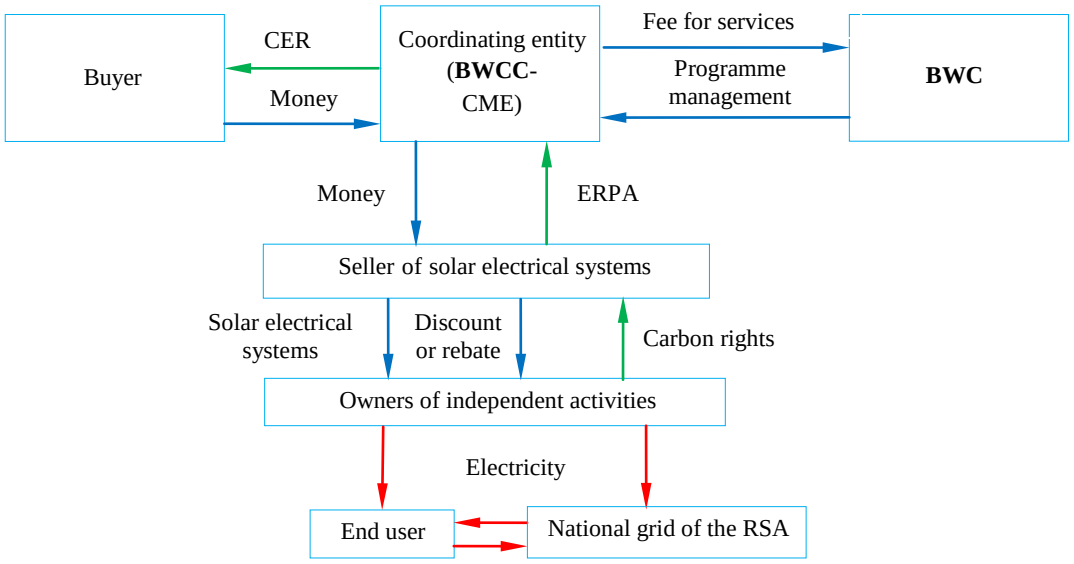

Figure A.2-1: Operating and implementing framework of the PoA for case (a)

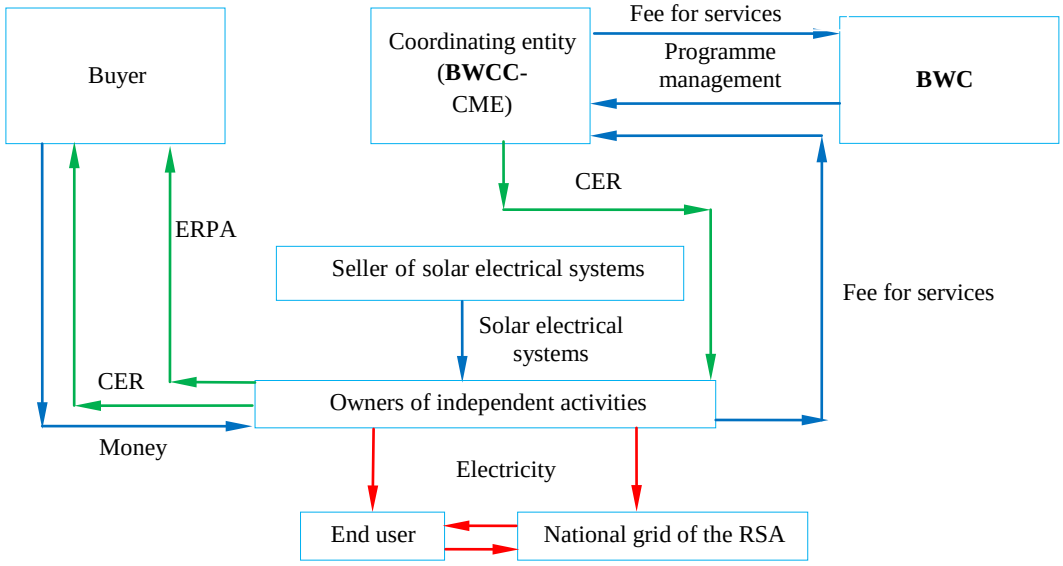

Figure A.2-2: Operating and implementing framework of the PoA for case (b)

BWCC appoints Blue World Carbon Asset Management (Pty) Ltd (BWC) to undertake all measures in order to estimate and justify the expected GHG emission reductions due to the implementation of all independent activities as well as to compile them under the corresponding CPA. The PoA shall be monitored by BWC.

In the case when electricity is supplied to the identified consumer (end user) in addition this consumer and the owner of the independent activity are not the same company/person, they have to sign a special

agreement confirming that the GHG emission reductions will not be claimed by the identified consumer of electricity for using a zero-emission energy source.

Policy/measure or stated goal of the PoA

The programme satisfies all sustainable development criteria identified by the DNA of the RSA. The programme will promote:

- Development of renewable energy projects in the RSA, thus contributing materially to achieving the established RSA's energy target of having at least 10 000 GWh of electricity generated annually from renewable energy starting from 2013[4] as well as the established GHG mitigation target of getting a deviation below the current emissions baseline of around 34% by 2020[5];
- Enhancement of the motivation of the households and private companies in the RSA to use solar electrical systems for power generation purposes in order to reduce demand for Eskom's electricity;
- Creation of new jobs for the people and increase of tax revenues for the RSA budget; and
- 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 independent activity under this PoA.

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

National policies and circumstances relevant to the baseline of the project activity

The Electricity Regulation Act, 2006 (Act No. 4 of 2006)[6] (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)[7]. NERSA's mandate is to regulate, amongst others, the Electricity industry in terms of the ERA.[8]

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.2-3 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%, from renewable energy is less than 0.5%.

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

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

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

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

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

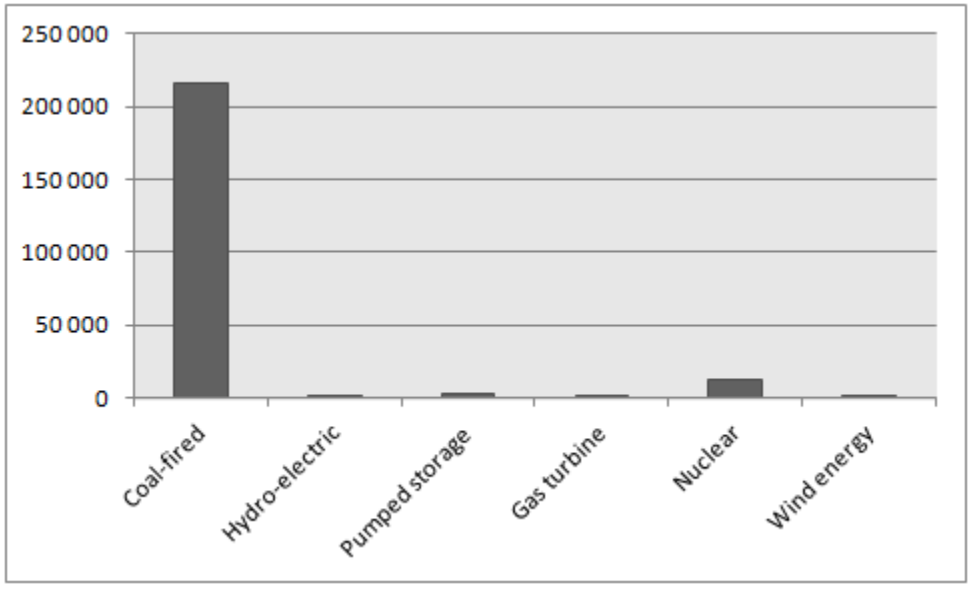

Figure A.2-3: Annual electricity supply for 2010 (GWh)

In May 2011 Government and NERSA developed "Integrated resource plan for electricity 2010-2030"[9] (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 0.5% to 25%, 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.

Based on this it can be deduced that this PoA is not implementing any mandatory policy or regulation of the Government of the RSA. It is a voluntary action and initiative of BWCC. Participation in the PoA is also voluntary; the buyers of solar electrical systems (owners of independent activities) will be given a choice whether to participate in the programme or not.

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

A.3. Coordinating/managing entity and participants of SSC-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 Capital PCC (Private company)	No

BWCC is the coordinating and managing entity of the PoA. BWCC will purchase rights to claim CERs generated as a result of the implementation of independent activities from the sellers of the solar electrical systems. BWCC may also receive a fee for their services. BWCC will be the entity responsible for communication with the EB. BWCC appoints BWC to act as a carbon consultant to develop all necessary CDM documentation, conduct procedures for PoA approval by the CDM Executive Board, direct CPA and activity inclusion and monitor all CPAs and activities under the PoA. BWC will manage the PoA according to the PoA management system.

A.4. Technical description of the small-scale 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)

A.4.1.2. Physical/ Geographical boundary:

All independent activities included into the PoA shall be located within the geographical boundaries of the RSA (Figure A.4-1); which define the boundary of the PoA. The national and /or sectoral policies in the relevant sector i.e. Solar (PV) Power generation are the same within the geographical boundary of RSA.[10]

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

[10] - National Environmental Management Act 107 of 1998
- The Electricity Regulation Act, 2006 (Act No. 4 of 2006)
- Integrated resource plan for electricity 2010-2030

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

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

A typical CPA under this PoA is either:

Type 1: The group of the independent activities under the predetermined province of the RSA, each of which is no larger than 0.15 MW installed capacity. Activities will be added *ex post* during the crediting period of the corresponding CPA (actual independent activities may not be known before the registration of the CPA under the PoA); or

Type 2: The identified independent activity or a group of identified independent activities of any capacity which taken together do not exceed 15 MW. The activities will be included in the corresponding CPA *ex ante* (actual independent activities will be known before the registration of the CPA under the PoA).

Electricity which will be produced by activities under the CPA is supplied either to:

Scenario (a) An identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; or

Scenario (b) The national grid of the RSA.

Each independent activity under the PoA envisages either:

Option (1) Installation of a solar electrical system at the demand-side where there was no solar electrical system operating prior to the implementation of the activity; or

Option (2) a capacity addition.

A capacity addition envisages an increase in the installed power generation capacity of an existing solar electrical system through: the installation of a new solar electrical system beside the existing solar electrical system; or the installation of new solar electrical system, additional to the existing solar electrical system. The existing solar electrical system continues to operate after the implementation of the activity, furthermore the addition of the new capacity does not significantly affect the electricity generation by the existing solar electrical system and the electricity produced by the added solar electrical system could be directly and separately measured.

The CPA size for both types is limited by 15 MW installed capacity.

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

This PoA falls under sectorial scope 1: *Energy industries (renewable-/ non renewable sources) Type*: *Renewable energy projects;* and Category: *I.D. Grid connected renewable electricity generation and I.F. Renewable electricity generation for captive use and mini-grid*[11].

Each SSC-CPA comprises either the group of the independent activities or identified specific activity that uses solar electrical technologies which enable to convert solar radiation into electrical energy, taking advantage of the photovoltaic (PV) effect. Such technologies may include, but are not limited to: wafers (cells) made from single crystal silicon, polycrystalline silicon and ribbon silicon as well as advanced thin film technologies.

The cell absorbs solar radiation which energizes the electrons inside the cell and produces electricity. Individual solar cells are linked and placed behind a protective glass sheet to form a PV panel. PV panels may be connected together to form a solar array (see Figure A.4-2). PV panels may also be fitted with trackers. The solar tracker is a device capable of turning after the sun, which means following the sun track from it is rising in the east to its setting in the west[12].

A thin film solar cell (TFSC), also called a thin film photovoltaic cell (TFPV), is a solar cell that is made by depositing one or more thin layers (thin film) of photovoltaic material on a substrate (see Figure A.4-3). The thickness range of such a layer is wide and varies from a few nanometers to tens of micrometers. Many different photovoltaic materials are deposited with various deposition methods on a variety of substrates.

The solar electrical system may be connected either directly to the LV grid of the end user or the national grid of the RSA or via batteries for storage of the electrical energy.

[11] CDM Methodology Booklet (page 15), May 2012, http://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf

[12] In case PV panels are fitted with trackers, the trackers will consume electricity either produced by PV panels or supplied from the grid of the RSA, no fossil fuel consumption will take place on the CPA site. Amount of electricity consumed by the trackers will be accounted in calculations of GHG emission reductions, since quantity of net electricity supplied is measured as per the monitoring plan.

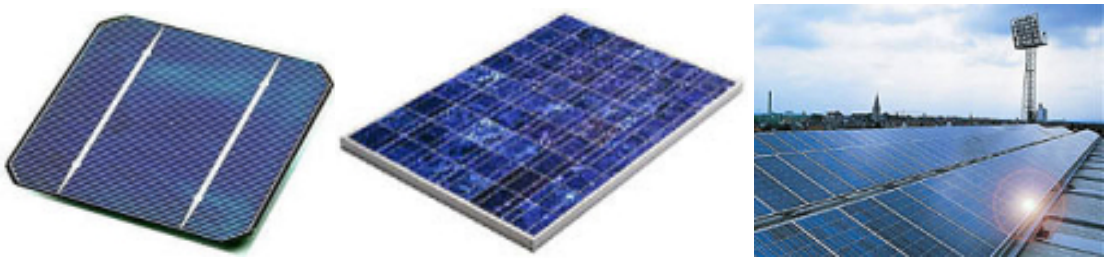

Figure A.4-2: Solar cell, solar panel and solar array

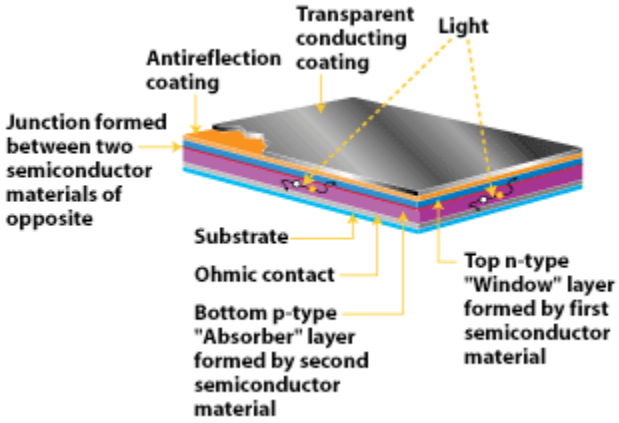

Figure A.4-3: Cross-section of thin film polycrystalline solar cell

Since the procedures set for the CDM do not define 'technology transfer'[13], it is generally interpreted as meaning the use of equipment and/or knowledge by the CDM project, not previously available in the host country; and therefore there is no technology transfer for this project.

Solar electricity is clean. Unlike fossil generated electricity, clean energy does not produce CO_2 emissions. The solar electrical system will be connected to the grid of the RSA or to the independent consumer who is connected to the grid of the RSA. Therefore the construction of solar electrical system displaces greenhouse gas emission intensive electricity production from fossil fired electricity plants.

Solar power is regarded as an environmentally safe technology[14] (see Section C.3 for a detailed explanation), which will also be confirmed as part of the CPA inclusion (see Section A.4.2.2, Eligibility criteria number 7). Solar electrical systems under this PoA must comply with NEMA[15] regulations regarding environmental impact assessment and proposals of mitigation measures[16]. The main negative environmental effects of a typical solar electrical system include: aesthetic disturbance to nearby

[13] "The Contribution of the Clean Development Mechanism under the Kyoto Protocol to Technology Transfer" - http://cdm.unfccc.int/Reference/Reports/TTreport/TTrep10.pdf

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

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

[16] Related to the capacity, size or other characteristics of the system

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 SSC-CPA in the PoA:

The criteria developed are based on the requirements of the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities." (Version 01.0) reported as Annex 3 to EB 65[17]. The list of criteria covers the applicability conditions of the methodology AMS-I.F. (Version 02) and methodology AMS-I.D. (Version 17).

The CPA will be assessed against this list of criteria by the CME at the time when the CPA applies to enrol in the PoA. The eligibility criteria shall cover as a minimum the conditions set out in Table A.4-2.

Table A.4-2: 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[18]**	**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 (type 1 and type 2) shall be located within the geographical boundaries of the RSA.	1. For CPA Type 1: the signed form from the owner of activity to be included into the CPA providing the following information: Name, address, GPS coordinates (Management system, Table 6) and Power Purchase Agreement (if applicable) For CPA Type 2: the signed form from the owner of activity to be included into the CPA providing the following information: Name, address, GPS coordinates (Management system, Table 6) and Environmental Authorisation (EA) from the relevant Competent Authority (CA) of the RSA[19] (if applicable) and Power Purchase Agreement (if applicable)
(b)	Conditions that avoid double counting of emission reductions like unique	2. For CPA Type 1: the seller of solar electrical system for each activity shall provide the signed	2. For CPA Type 1: the signed form from the owner of activity to be included into the CPA as per Table 6

[17] See paragraph 14, http://cdm.unfccc.int/Reference/Standards/meth/meth_stan04.pdf

[18] Phases 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.4-2 of the PoA-DD

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

	identifications of product and end-user locations (e.g. programme logo)	Table 6 of the Management System of the PoA and agreement with the owner of activity where he shall contractually agree and sign the following before inclusion into the CPA: a) The activity 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. For CPA Type 2: the owner of each activity shall provide the signed Table 6 of the Management System of the PoA and agreement with CME where he shall contractually agree and sign the following before inclusion into the CPA: a) The activity 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. Moreover for CPA Type 2, 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.	of the Management system and agreement with the seller. For CPA Type 2: the signed form from the owner of activity to be included into the CPA as per Table 6 of the Management system and agreement with the CME and declaration from BWC.
(c)	The specifications of technology/measure including the level and type of service, performance	3. Technology: Each activity to be included into the CPA (type 1 and type 2) shall only use solar PV systems. For CPA type	3. Technology: For both CPA types: Technical specification from the seller of the electrical system/ technology supplier.

	specifications including compliance with testing/certifications	1: the installed capacity of each activity shall be equal or less than 0.15 MW. For CPA type 2: the installed capacity of the CPA shall be equal or less than 15 MW. Services: Electricity generation. Measure for AMS-I.D. or AMS-I.F. or combination of both: GHG emission reduction due to displacement of grid electricity. Each activity under the CPA (type 1 and type 2) shall be connected to either: i) An identified consumer (end user) or group of consumers, which would have been supplied with electricity from the national grid[20] of the RSA in the absence of the activity (where excess electricity may be supplied to the grid) or; ii) to the national grid of the RSA Furthermore the owner of each activity under the CPA connected to (i) and using methodology AMS-I.F. shall be connected to the grid before the activity implementation.	Services: for grid-connected systems (both CPA types): PPA with the relevant authority as per the host country; For captive users: signed Table 6 of the Management system of the PoA from the owner of the activity. For identified consumer: signed Table 6 of the Management system of the PoA/contract (between seller and end user) from the owner of the activity. For identified consumer using AMS-I.F.: Electricity bill or proof of pre-paid electricity from the owner. Measure: For AMS-I.D.: GHG emission reduction due to the supply of electricity to the grid. For AMS-I.F.: GHG emission reduction due to the displacement of electricity which would have been generated in the grid and consumed by the user in absence of the Solar PV technology, as per a CPA of this PoA; excess electricity under this methodology would also be supplied to the grid. Hence, the measure would primarily remain the same in case of both the methodologies and usage of the combination of the above-mentioned methodologies in the same CPA under this PoA shall not result in any cross-effects. This combination is also allowed as explained in section E.2 of this PoA.

[20] The national grid of the RSA includes the national transmission, distribution or reticulation lines ('Eskom grid' at the time of drafting of the PoA-DD) and a municipal electricity network that is connected to the national transmission, distribution or reticulation lines.

(d)	Conditions to check the start date of the CPA through documentary evidence	4. The start date of the activity under CPA (type 1 and type 2) shall be after the date of start of global stakeholder process for the PoA (23/12/2011).	4. Signed equipment purchase contract with a seller of the solar electrical system/technology provider
(e)	Conditions that ensure compliance with applicability and other requirements of single or multiple methodology/ies applied by CPAs	5. Both CPA type 1 and type 2 shall meet the applicability conditions and other requirements of either AMS-I.D. (version 17) or AMS-I.F. (version 02) or combination of both methodologies.	5. For both CPA types: Technical specification from the seller of the electrical system/technology supplier and PPA with the relevant authority as per the host country (if applicable) and signed Table 6 of the Management system of the PoA from the owner of the activity. For identified consumer: signed Table 6 of the Management system of the PoA/contract (between seller and end user) from the owner of the activity. For identified consumer using AMS-I.F.: Electricity bill or proof of pre-paid electricity from the owner.
(f)	The conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality as specified in Section A above	6. Both CPA types shall demonstrate additionality as per Annex 27 of EB 68 (Version 09.0) Each and every CPA to be included into this PoA has to employ the solar technologies as per eligibility criteria 3. This criterion also states that "Each activity under the CPA (type 1 and type 2) shall be connected to either: i. An identified consumer (end user) or group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity (where excess electricity may be supplied to the grid) or; ii. to the national grid of the RSA"	6. Technology/measure: For both CPA types: Technical specification from the seller of the electrical system/ technology supplier. Services: for grid-connected systems (both CPA types): PPA with the relevant authority as per the host country; For captive users: signed Table 6 of the Management system of the PoA from the owner of the activity and Electricity bill or proof of pre-paid electricity from the owner. For identified consumer: signed Table 6 of the Management system of the PoA/contract (between seller and end user) from the owner of the activity or Electricity bill or proof of pre-paid electricity from the owner.
(g)	The PoA-specific	7. For CPA (type 1 and type 2)	7. For both CPA types: EIA or basic

	requirements stipulated by the CMEs including any conditions related to undertaking local stakeholder consultations and environmental impact analysis	environmental impact assessment shall be carried out in line with NEMA[21] regulation[22]	assessment along with environmental authorisation (if applicable).
(h)	Conditions to provide an affirmation that funding from Annex I party, if any, does not result in a diversion of official development assistance	8. No official Development Aid shall be involved or diverted as a result of activities under the CPA (type 1 and type 2).	8. For CPA type 1: The declaration from the seller of the solar electrical system. For CPA type 2: The declaration from the owner of the activity
(i)	Where applicable, target group (e.g. domestic/ commercial/industrial, rural /urban, grid-connected/ off-grid) and distribution mechanisms (e.g. direct installation)	9. For both CPA types where applicable, target group (e.g. domestic/commercial/ industrial, rural/urban, grid-connected/off-grid) and distribution mechanisms (e.g. direct installation) shall be identified in accordance with applied methodology or methodologies i.e., either AMS-I.D. (version 17) or AMS-I.F. (version 02) or combination of both methodologies.	9. Since this requirement has particularly been reflected in eligibility criterion (3), no supplementary evidence required
(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	10. For CPA (type 1 and type 2) sampling requirements shall be assessed and carried out in line with requirements of Annex 4 & 5 of EB 69.	10. This PoA and CPA do not use the sampling method for monitoring, therefore no supplementary evidence is required.
(k)	Where applicable, the conditions that ensure that CPA in aggregate meets the small-scale or micro-scale threshold criteria and remains within those thresholds throughout the crediting period of the CPA	11. For both CPA types where applicable, the conditions that ensure that CPA in aggregate meets the small-scale or micro-scale threshold criteria and remains within those thresholds throughout the crediting period of the CPA shall be assessed in accordance with either Annex 26 of EB 68 (version 04.0) for micro-scale threshold or CMP.2,	11. Since this requirement has particularly been reflected in eligibility criterion (3), no supplementary evidence required.

[21] NEMA: National Environmental Management Act. Also see section C.3.
[22] Related to the capacity, size or other characteristics of the plant

		§ 28 for small-scale thresholds.	
(l)	Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) or microscale project categories	12. For CPA (type 1 and type 2) debundling checks shall be performed in line with EB 54 Annex 13.	12. For both CPA types: confirmation in CPA-DD that the SSC-CPA is not a debundled component of a large scale CPA or CDM project activity For CPA type 2: the declaration from the owner of the activity and the CME
(m)	The conditions related to leakage for activities within a CPA	13. For both CPA types leakage shall be assessed and carried out in accordance with applied methodology or methodologies i.e., either AMS-I.D. (version 17) or AMS-I.F. (version 02) or combination of both methodologies, as shown in Table E.2-1 and E.2-2 in the PoA-DD.	13. For both CPA types: Signed equipment purchase contract with a seller of the solar electrical system or technology provider and signed Table 6 of the Management system of the PoA from the owner of the activity. and signed Table 6 of the Management system of the PoA from the owner of the activity.

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

The proposed PoA is a voluntary coordinated action

National policies and circumstances relevant to the baseline of the project activity

The Electricity Regulation Act, 2006 (Act No. 4 of 2006)[23] (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)[24]. NERSA's mandate is to regulate, amongst others, the Electricity industry in terms of the ERA.[25]

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.4-1 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%, from renewable energy is less than 0.5%.

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

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

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

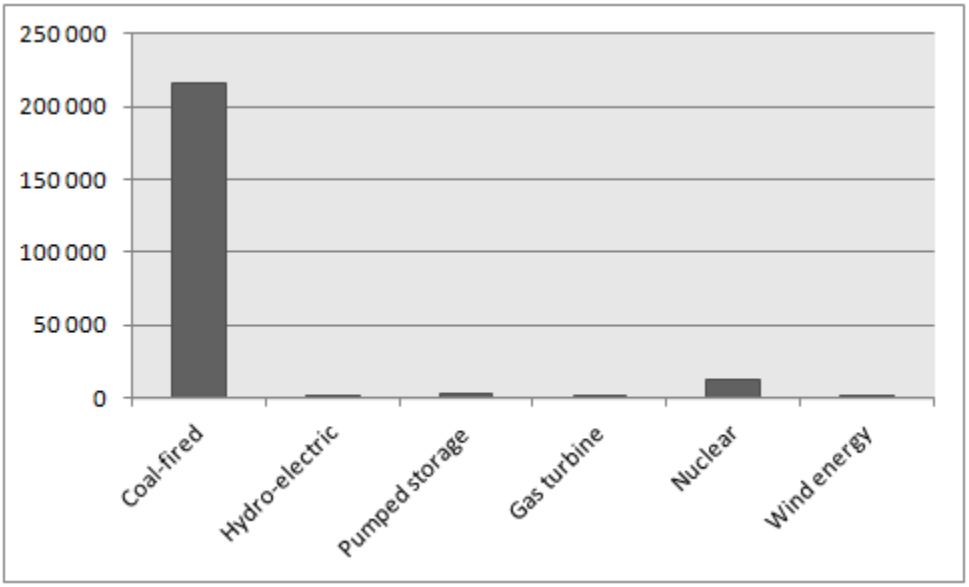

Figure A.4-1: Annual electricity supply for 2010 (GWh)

In May 2011 Government and NERSA developed "Integrated resource plan for electricity 2010-2030"[26] (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 0.5% to 25%, 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.

Based on the above, this PoA is not implementing a mandatory policy or regulation of the Government of the RSA. In fact, in the RSA there is not any mandatory policy and/or regulation that require installation and/or use of solar electrical systems or technologies for electricity supply to the end users or the national grid of the RSA. The programme described above is a voluntary coordinated action and an initiative of BWCC (the CME of this PoA) supported by private sellers of solar electrical systems. Participation under this PoA is voluntary [27] ; the buyers of solar electrical systems (owners of independent activities) will be given a free choice whether to participate in the programme or not.

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

[27] Official declaration of voluntary action by CME was received on 18/06/2012

If the PoA is implementing a voluntary coordinated action, SSC-CPA 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*".[28]

The additionality is demonstrated on the PoA level in accordance with the "Standard for demonstration of additionality of GHG emission reductions achieved by a programme of activities" (Version 01.0), reported as Annex 2 to EB 63[29]. Paragraph 8 of this standard reads as follows:

> *"8. "PoAs that will include one or more small-scale projects as CPAs shall include eligibility criteria derived from all the relevant requirements of Attachment A of Appendix B of the "Simplified modalities and procedures for small-scale CDM project activities"."*

Since CPA size must be smaller or equal to 15 MW installed capacity the additionality of the program is demonstrated using the "Guidelines on the demonstration of additionality of small-scale project activities" (Version 09), reported as Annex 27 to EB 68[30].

Paragraph 2 of this document states:

Documentation of barriers, as per paragraph 1 in these guidelines*," is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW). The positive list comprises of:*

> *"The following grid-connected and off-grid renewable electricity generation technologies:*
>
> *(i) Solar technologies (photovoltaic and solar thermal electricity generation);*
>
> *(ii) Off-shore wind technologies;*
>
> *(iii) Marine technologies (wave, tidal);*
>
> *(iv) Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW."*

Each and every CPA that will be included into this PoA has to employ the solar technologies, as per eligibility criteria 3. This criterion also states that *"Each activity under the CPA (type 1 and type 2) shall be connected to either:*

i. An identified consumer (end user) or group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity (where excess electricity may be supplied to the grid) or;

ii. to the national grid of the RSA"

Furthermore the identified consumer or group of consumers which will be supplied electricity from the activities under the CPA shall be connected to the grid before the activity implementation in line with the requirements of § 1 of AMS-I.F. (Version 02),

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[28] http://cdm.unfccc.int/EB/047/eb47rep.pdf

[29] http://cdm.unfccc.int/Reference/Standards/meth/meth_stan01.pdf

[30] http://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf this version of the guidelines will be used throughout the document

Thus, any CPA to be included into this PoA is additional and would not be implemented in the absence of the PoA.

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

Not applicable as the PoA is not implementing any mandatory policy/regulation. No such policy/regulation is in place in the RSA

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

Not applicable as the PoA is not implementing any mandatory policy/regulation. No such policy/regulation is in place in the RSA

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

A.4.4.1. Operational and management plan:

Data will be collected ex post (in case activities are added during the crediting period of the corresponding CPA) or ex ante (in case activities have been identified before inclusion of the CPA to the PoA).

According to the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities" (Version 1.0, EB 65 Annex 3, paragraph 17)[31] the CME is required to develop a management system. 'The Management System for the South African Small-Scale Solar Electrical Programme' (Version 1) (hereafter called 'The Management System') was developed to meet all the requirements of the above standard, and to facilitate efficient management of this PoA.

BWC is appointed by the CME to undertake all measures in order to estimate and justify the expected GHG emission reductions due to the implementation of all independent activities as well as to compile them under the corresponding CPA. BWC reports to the DOE or CDM Executive Board (EB). This is illustrated in Figure A.4-2. This figure also illustrates that single and multiple activities can be added under a CPA. Different solar electrical systems (or capacity addition to existing solar electrical systems) under a CPA are referred to as activities.

[31] http://cdm.unfccc.int/Reference/Standards/meth/meth_stan04.pdf

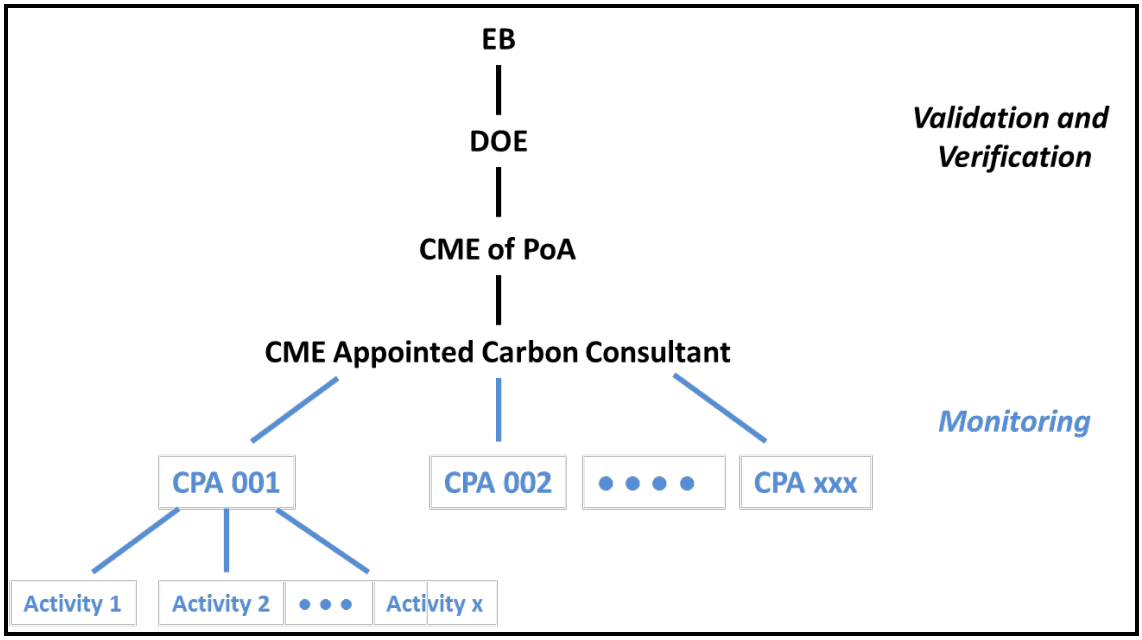

Figure A.4-2: PoA Management Structure

The solar park management[32] for each activity will communicate with the CDM specialist in charge of the specific activity (as shown in Figure A.4-3).

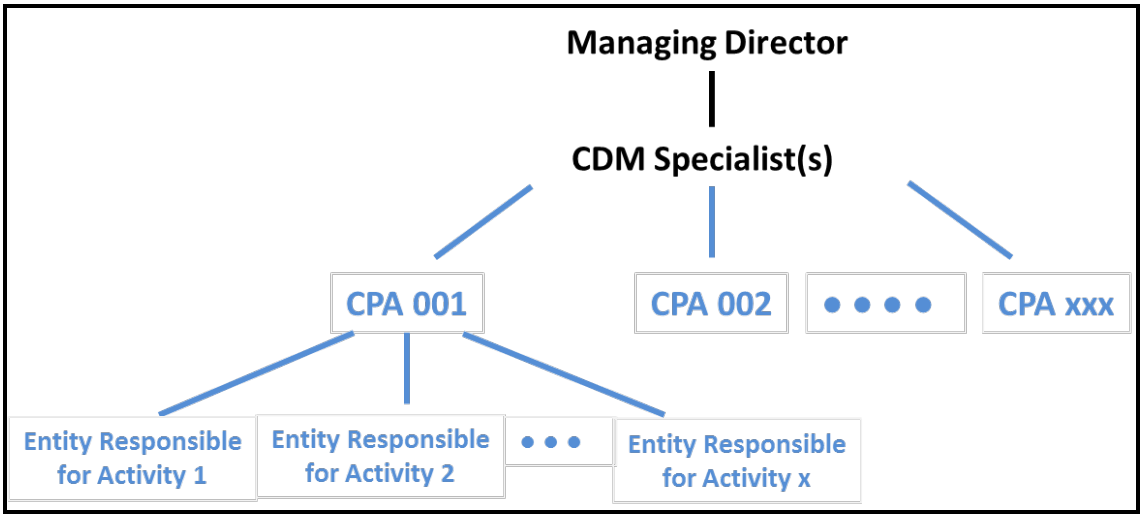

Figure A.4-3: BWC Management Structure

CPA inclusion will be conducted in 5 subsequent phases.

[32] Defined in section 3 of the Management System

- **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 eligibility criteria according to Table A.4-2.
- **Phase 3**: Drafting of the CDM-CPA-DD by the CDM specialist
- **Phase 4**: Reviewing of CDM-CPA-DD
- **Phase 5**: Submission of CDM-CPA-DD together with supporting document for inclusion

For CPA Type 1, any activities to be included into the CPA will need to be checked against the criteria and follow the procedures in the Management system before they can be included into the CPA.

Along with this 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 a CDM project activity or as a CPA of another PoA,

For CPA Type 1: the seller of solar electrical system for each activity shall provide the signed Table 6 of the Management System of the PoA and agreement with the owner of activity where he shall contractually agree and sign the following before inclusion into the CPA:

a) The activity 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.

For CPA Type 2: the owner of each activity shall provide the signed Table 6 of the Management System of the PoA and agreement with CME where he shall contractually agree and sign the following before inclusion into the CPA:

a) The activity 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.

Moreover for CPA Type 2, 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 SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

In order to avoid registering a CPA that is in fact a de-bundled component of another CPA or CDM project activity, BWC follows the guidelines provided in the "Guidelines on assessment of de-bundling for SSC project activities" (Version 03), reported as Annex 13 to the EB 54[33].

For SSC-CPA Type 1

Paragraph 10 of the guidelines reads as follows:

"10. " If each of the independent subsystems/measures (e.g., biogas digester, solar home system) included in the CPA of a PoA is no larger than 1% of the small-scale thresholds defined by the methodology applied, then that CPA of PoA is exempted from performing de-bundling check i.e., considering as not being a de-bundled component of a large scale activity."

Each independent activity under the CPA Type 1 will not be larger than 1% of the small-scale thresholds therefore CPA Type 1 under the PoA is exempted from performing de-bundling check.

For SSC-CPA Type 2

The de-bundling check will be conducted on the CPA level according to the guidelines as explained below.

An activity within a proposed CPA[34] *of this PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity*[35]*, which satisfies both conditions (a) and (b) below:*

a) It has the same activity implementer as the proposed small scale CPA activity or has a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure, and;

b) The boundary is within 1 km of the boundary of the proposed small-scale CPA activity, at the closest point.

If a proposed activity of a small-scale CPA of this PoA is deemed to be a debundled component in accordance with the criteria above, but the total size of such a CPA activity combined with a registered small-scale CPA of a PoA or a registered CDM project activity does not exceed the limits for small-scale CDM project activities, the activity of a CPA of this PoA can qualify to use simplified modalities and procedures for small-scale CDM project activities.

iv. The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA;

The seller (for CPA Type 1) or the owner (CPA Type 2) of each activity under the CPA has to contractually agree and sign the following:

[33] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf

[34] Since there might be more than one activity within a CPA, the de-bundling check will be done for all activities within a Type 2 CPA and not only at CPA level.

[35] Which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity

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) They are aware that the CPA will be subscribed to the present PoA.
c) No official development aid has been and will be involved or diverted as a result of the activity. If Annex 1 countries are involved, then a declaration from the concerned agency in Annex 1 country should also be submitted before inclusion into the CPA

A.4.4.2. Monitoring plan:

The monitoring plan is designed to calculate the GHG emission reductions at the CPA level. The parameters to be monitored are described in section E.7.1. For both type of activities, the parameters in section E.7.1. will be measured continuously and recorded at least on a monthly basis.

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 for the proposed PoA, since the CME opts for 100% monitoring and verification for each CPA.

This PoA does not use a sampling method but will verify each CPA.

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;***

All introduced system by this PoA has input/output data and monitoring equipment will be installed at each project system to check the input/output data of this project. Each CPA will report its monitoring data to CME and CME manages the monitoring data. The CPA project database includes the following data-set that can unambiguously determine the emission reductions attributable to each CPA:

Table A.4-3: Sample of data-set

Data Type	List of Data
System Information	• Serial Number • System Type • Location • Introduced date
Energy Production	• Generated electricity quantity

The CME will produce a monitoring report and sent to the DOE to verify, corresponding to the preceding monitoring period of each CPA. This report will unambiguously set-out the data related to the emission reductions generated by that specific CPA during the monitoring period.

PoA record keeping procedures will prevent double counting across CPAs. The data-set corresponding to each CPA will be mutually exclusive of the data-set of another CPA under the PoA.

Verification of each CPA will be performed at the end of each monitoring period. The project database will record the start and end dates of each monitoring period and record the emission reductions attributable to each monitoring period. Appropriate record keeping procedures will be implemented to ensure that each monitoring period can be transparently attributed to its corresponding CPA, preventing any occurrences of double counting. An audit of the project data base will be able to determine the current status of each CPA – the duration of previous monitoring periods, groups delivering monitoring data and current verification activities.

A.4.5. Public funding of the programme of activities (PoA):

No public funding of the programme of activities (PoA)

SECTION B. Duration of the programme of activities (PoA)

B.1. Starting date of the programme of activities (PoA):

01/01/2013 or date of registration whichever is later (the date after publishing of the PoA for global stakeholder consultation)

B.2. Length of the programme of activities (PoA):

28 years

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 SSC-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 either grid connected solar electrical systems or solar electrical systems where an identified consumer (end user) or group of consumers would have been supplied with electricity from the national grid of the RSA in the absence of the activity, 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.

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. The use of solar energy for electricity generation is a non-consumptive use of a natural resource and consumes no fuel for continuing operation. 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. Solar electrical systems do not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers. In order to apply for environmental authorisation of a solar power project governmental laws and regulations should be followed.

The National Environmental Management Act 107 of 1998[36], amended in June 2010, governs Environmental Impact Assessment (EIA) and requires a scoping assessment and EIA or Basic Assessment (BA) depending on the nature 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. The Listing Notices specify measures which cannot be started without environmental authorisation from

[36] http://www.info.gov.za/view/DownloadFileAction?id=70641

the competent authority. The localised impact of each CPA will need to be assessed individually, which justifies separate environmental analyses. The legislation regarding the electricity production is given below.
Within the framework of CPA type 1, there will be installed independent activities with capacity of up to 0.15 MW each and hence both EIA and Basic Assessment are not required for the measures undertaken under this CPA.

For CPA type 2 according to the NEMA listing notice 1 basic assessment is required.

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

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 SSC-CPA level ☐

As the geographical boundary of the PoA is the country and the PoA is coordinated on a national level by BWCC, the project participants considered appropriate to carry out the local stakeholder consultation at PoA level.

Please see section D.2 and D.3 of the SSC-PoA-DD for information on how comments by local stakeholders were invited, a summary of the comments received and how due account was taken of any comments received.

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

Comments from local stakeholders where invited via a local newspaper (Sunday times). The adverts were placed on 27th of November inviting people to a public participation meeting, and to submit comments and queries via phone and email. Comments were invited until the 15th December 2011.

The public participation meeting was held on the 12th December 2011 in BWC Office in the V&A Marina (Suite 102, 7 West Quay Rd, Cape Town), and it included presentation of the programme and discussion around it. Meeting started at 10 a.m., and 4 people attended.

This meeting was held before submission of this PoA and therefore had CDM in mind before submission. Also, as previously mentioned, BWCC appointed BWC to develop the PoA under CDM. BWCC uses the incentives of CDM to encourage participation in this programme by enabling solar electrical system owners to either:

i) Get a discount for the purchased price of the solar electrical system or an annual rebate in exchange for cession of their rights to claim GHG emission reductions which will be achieved due to reduction in electricity generation at grid connected power plants, or

ii) Independently engage in the sale of CERs, therefore BWCC will receive a fee for their service.

D.3. Summary of the comments received:

All stakeholders' comments and concerns were recorded. No negative comments were raised by the stakeholders as can be seen below:

Summary of comments received:

- How can we join your PoA?
- How many installations in a PoA?
- What type of monitoring equipment is required?
- Do you get carbon credits for off-grid projects?
- Can we include backdated Projects?

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

All the stakeholders' comments were addressed during the meeting and concerns were taking into account in the present version of the PoA-DD. All stakeholders attended were provided with more information and explanation on how to join the programme, and how credits could be obtained.

The number of installations in a PoA was explained as per section A.4.2 of this PoA-DD.

Each installation will have an electricity meter as monitoring equipment.

The interest of the stakeholders on the programme was positive.

SECTION E. Application of a baseline and monitoring methodology

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

Methodology 1 : AMS-I.F., Version 02, EB 61[37];
Title : Renewable electricity generation for captive use and mini-grid;

Methodology 2 : AMS-I.D., Version 17, EB 61[38];
Title : Grid connected renewable electricity generation.

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

A typical CPA under this PoA is either:

Type 1: The group of the independent activities under the predetermined province of the RSA, each of which is no larger than 0.15 MW installed capacity. Activities will be added *ex post* during the crediting period of the corresponding CPA (actual independent activities may not be known before the registration of the CPA under the PoA); or

Type 2: The identified independent activity or a group of identified independent activities of any capacity which taken together do not exceed 15 MW. The activities will be included in the corresponding CPA *ex ante* (actual independent activities will be known before the registration of the CPA under the PoA).

Electricity which will be produced by activities under the CPA is supplied either to:

Scenario (a) An identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; or

Scenario (b) The national grid of the RSA.

Activities included into a typical CPA envisage either:

Option (1) Installation of a solar electrical system at the demand-side where there was no solar electrical system operating prior to the implementation of the activity; or

Option (2) a capacity addition.

The CME applies the combination of small-scale methodologies. Combinations of the AMS-I.F. and AMS-I.D. are eligible according to the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities"[39] (see paragraph 29 (c)). This has also been clarified in the "Clarification on the applicability of AMS-I.F and possibility of the combined use of AMS-I.D and AMS-I.F in one PDD".[40]

[37] http://cdm.unfccc.int/methodologies/DB/9V3T8W0N5PMCJH4YVEA04YYFTVHP3Q valid for the whole PoA

[38] http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X valid for the whole PoA

[39] http://cdm.unfccc.int/Reference/Standards/meth/meth_stan04.pdf

[40] SSC_565 (SSC WG 34, § 21, Page: 4) (http://cdm.unfccc.int/Panels/ssc_wg/meetings/034/ssc_034_report.pdf)

Solar electrical technology will be applied consistently in each CPA using multiple combinations of the methodologies; either only AMS-I.F. or only AMD-I.D or a combination of both methodologies. There are no cross effects between the technologies/measures applied.

Methodology AMS-I.F. is only applicable to CPA Type 1 and 2, where produced electricity is supplied to an identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid. The applicability criteria of the methodology are defined and addressed as follows:

Table E.2-1: Applicability conditions for AMS-I.F.

Applicability criterion	Applicability	Comment
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: a) A national or a regional grid (grid hereafter); b) Fossil fuel fired captive power plant; c) A carbon intensive mini-grid.	Applicable	Each CPA comprises renewable electricity generation, by means of solar electrical systems. Furthermore electricity will be supplied to users which would have been supplied electricity from the national grid of the RSA.
For the purpose of this methodology, a mini-grid is defined as small-scale power system with a total capacity not exceeding 15 MW (i.e. the sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW) which is not connected to a national or a regional grid.	Not applicable	Electricity will not be supplied to users which would have been supplied electricity from a carbon intensive mini-grid. Thus, it does not need to satisfy this applicability condition.

Applicability criterion	Applicability	Comment
Illustration of respective situations under which each of the methodology (AMS-I.D, AMS-I.F and AMS-I.A) applies is included in Table 2[41].	Applicable	Each activity which envisages supplying produced electricity to an identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; falls under methodology AMS-I.F. since it displaces grid electricity consumption at the end user.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2.	Not applicable	Any CPA is not the installation of a hydro power plant, so it does not need to satisfy this applicability condition.
For biomass power plants, no other biomass other than renewable biomass is to be used in the project plant.	Not applicable	Any CPA is not the installation of a biomass power plant, so it does not need to satisfy this applicability condition.

[41] AMS-I.F. (version 02), page 11

Applicability criterion	Applicability	Comment
This methodology is applicable for project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating 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).	Applicable	Each independent activity under the PoA envisages either: (a) Installing a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity; or (b) Involves a capacity addition.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	Applicable	In case the independent activity involves the capacity addition, the added capacity will be lower than 15 MW according the eligibility criteria (5) and be physically distinct from the existing units according to Section A.4.2.
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Not applicable	Each independent activity under the PoA does not involve retrofit or replacement of an existing facility, so it does not need to satisfy this applicability condition.
If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	Not applicable	Any CPA does not have non-renewable components, so it does not need to satisfy this applicability condition.
Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable	Any CPA does not involve co-generation. According to the AMS-I.F., the CPA must not satisfy this applicability condition.
If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.	Applicable	In case electricity produced by the independent activity under the CPA is delivered to a third party a contract between the supplier and consumer(s) of the energy will be signed. See eligibility criterion (2).
The following conditions apply for use of this methodology in a project activity under a programme of activities:		

Applicability criterion	Applicability	Comment
In the specific case of biomass project activities the applicability of the methodology is limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.	Not applicable	Any CPA is not the installation of a biomass power plant, so it does not need to satisfy this applicability condition.
In the specific case of biomass project activities the determination of leakage shall be done following the general guidance for leakage in small-scale biomass project activities attachment C of Appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.	Not applicable	Any CPA is not the installation of a biomass power plant, so it does not need to satisfy this applicability condition.
In case the project activity involves the replacement of equipment, and the leakage from the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	Not applicable	Any CPA does not involve replacement of equipment, so it does not need to satisfy this applicability condition.

Methodology AMS-I.D. is applicable for both CPA types and where produced electricity is supplied to the national grid of the RSA. The applicability criteria of the methodology are defined and addressed as follows:

Table E.2-2: Applicability conditions for AMS-I.D.

Applicability criterion	Applicability	Comment
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: a) Supplying electricity to a national or a regional grid; or b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	Applicable	Each CPA comprises renewable electricity generation, by means of solar electrical systems. Furthermore electricity will be supplied to the national electricity grid of the RSA.
Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies is included in Table 2[42].	Applicable	Each activity which envisages produced electricity to be supplied to the national electricity grid of the RSA, falls under methodology AMS-I.D. since it supplies electricity to the national grid.
This methodology is applicable for project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating 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).	Applicable	Each independent activity under the PoA envisages either: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity; or (b) Involve a capacity addition.

[42] AMS-I.D. (version 17), page 15

Applicability criterion	Applicability	Comment
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2.	Not applicable	Any CPA is not the installation of a hydro power plant, so it does not need to satisfy this applicability condition.
If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	Not applicable	Any CPA does not have non-renewable components, so it does not need to satisfy this applicability condition.
Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable	Any CPA does not involve co-generation. According to the AMS-I.D., the CPA must not satisfy this applicability condition.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	Applicable	In case the independent activity involves the capacity addition, the added capacity will be lower than 15 MW according the eligibility criteria (5) and be physically distinct from the existing units according to Section A.4.2.

Applicability criterion	Applicability	Comment
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Not applicable	Each independent activity under the PoA does not involve retrofit or replacement of an existing facility, so it does not need to satisfy this applicability condition.
The following conditions apply for use of this methodology in a project activity under a programme of activities:		
In the specific case of biomass project activities the applicability of the methodology is limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.	Not applicable	Any CPA is not the installation of a biomass power plant, so it does not need to satisfy this applicability condition.
In the specific case of biomass project activities the determination of leakage shall be done following the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.	Not applicable	Any CPA is not the installation of a biomass power plant, so it does not need to satisfy this applicability condition.
In case the project activity involves the replacement of equipment, and the leakage from the use of the replaced equipment in another activity is neglected because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	Not applicable	Any CPA does not involve replacement of equipment, so it does not need to satisfy this applicability condition.

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

According to AMS-I.F.:

- *"The spatial extent of the project boundary includes industrial, commercial facilities consuming energy generated by the system. In the case of electricity generated and supplied to distributed users (e.g. residential users) via mini/isolated grid(s) the project boundary may be confined to physical, geographical site of renewable generating units. The boundary also extends to the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to."*

According to AMS-I.D.:

- *"The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to."*

Thus the spatial extent of the CPA boundary includes each independent activity, each end user of electricity as well as all power plants connected physically to RSA's grid.

The greenhouse gases and emission sources 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 connected to the grid of the RSA	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
CPA	GHG emissions from the combustion of fossil fuel for electricity generation in the independent installations	CO_2	No	GHG emissions for the CPA are equal to zero and no fossil fuels combustion will occur as part of the CPA.
		CH_4	No	
		N_2O	No	

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

According to paragraphs 1 and 14 of AMS-I.F.:

- *"The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below:*

  (a) A national or a regional grid (grid hereafter)

  (b) Fossil fuel fired captive power plant;

  (c) A carbon intensive mini-grid."

- *"Baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor...Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D"*

According to paragraph 10 of AMS-I.D.:

- *"The baseline scenario is that the 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 into the grid."*

In the case of capacity addition, the end of paragraph 15 mentions:

- *"In the case of wind, solar, wave or tidal power plants, it is assumed that the addition of new capacity or retrofitting of existing unit to increase capacity does not significantly affect the electricity generated by existing plant(s) or unit(s). In this case, the electricity produced by the added power plant(s) or unit(s) could be directly metered and used to determine $EG_{BL,y}$. provided that the electricity produced by the added power plant(s) or unit(s) addition is separately metered."*

According with eligibility criterion (3) in case electricity is supplied to the identified consumer (end user) or the group of consumers, these consumers would have been supplied with electricity from the national grid of the RSA in the absence of the activity. Thus, both methodologies suggest that in the absence of the project activity electricity supplied 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. Baseline scenario is as follows:

- The electricity delivered to the grid by the independent activities as well as electricity supplied to the end users would have otherwise been generated by the operation of grid-connected Eskom power plants and by the addition of new generation sources to the grid.

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 SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA):

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

The additionality of a typical CPA is demonstrated on the PoA level using the "Guidelines on the demonstration of additionality of small-scale project activities" (Version 09), reported as Annex 27 to EB 68.

Paragraph 2 of this document states:

Documentation of barriers, as per paragraph 1 in these guidelines*," is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW). The positive list comprises of:*

"The following grid-connected and off-grid renewable electricity generation technologies:

(i) Solar technologies (photovoltaic and solar thermal electricity generation);

(ii) Off-shore wind technologies;

(iii) Marine technologies (wave, tidal);

(iv) *Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW."*

Each and every CPA that will be included into this PoA has to employ the solar technologies as per eligibility criteria 3. This criterion also states that *"Each activity under the CPA (type 1 and type 2) shall be connected to either:*

i. An identified consumer (end user) or group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity (where excess electricity may be supplied to the grid) or;

ii. to the national grid of the RSA"

Furthermore the identified consumer or group of consumers which will be supplied electricity from the activities under the CPA shall be connected to the grid before the activity implementation in line with the requirements of § 1 of AMS-I.F. (Version 02).

Thus, any CPA to be included into this PoA is additional and would not be implemented in the absence of the PoA.

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

The criteria for assessing additionality of a CPA are reflected in applicability criteria, which require:

i) All activities to be included into the CPA shall:
- Use solar electrical technologies to produce electricity; and
- Envisage either a new installation or a capacity addition

ii) The CPA size shall be smaller or equal to 15 MW installed capacity

iii) The activity to be connected to either:
   a. An identified consumer (end user) or group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity (where excess electricity may be supplied to the grid) or;
   b. to the national grid of the RSA via either:
      i. The national transmission, distribution or reticulation lines; or
      ii. A municipal electricity network that is connected to the national transmission, distribution or reticulation lines.

iv) Furthermore the identified consumer or group of consumers which will be supplied electricity from the activities under the CPA shall be connected to the grid before the activity implementation in line with the requirements of § 1 of AMS-I.F. (Version 02).

The CPA is additional since it satisfies these criteria.

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 SSC-CPA:

Both methodologies AMS-I.F. "Renewable electricity generation for captive use and mini-grid" (Version

02) and AMS-I.D. "Grid connected renewable electricity generation" (Version 17) are applicable to a typical CPA depending on the electricity consumer.

The methodology AMS-I.F. is applicable to renewable energy generation units, such as photovoltaic that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.

The methodology AMS-I.D. is applicable to renewable energy generation units, such as photovoltaic supplying electricity to:

Scenario (a) An identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; or

Scenario (b) The national grid of the RSA.

The applicabilities of AMS-I.D and AMS-I.F have already been demonstrated in section E.2.

Each CPA will apply: either (1) only AMS-I.F or (2) only AMD-I.D or (3) a combination of both methodologies. There are no cross effects between the technologies/measures applied. Moreover both methodologies define that in the absence of the project activity (baseline scenario) electricity supplied by the CPA would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources.

"Tool to calculate the emission factor for an electricity system" (Version 02.2.0)[43] is used to calculate the combined margin CO_2 emission factor of RSA's grid.

Equations used to calculate the GHG emission reductions as well as justifications of chosen methods are discussed in Section E.6.2.

Provisions regarding the revisions of the CPAs in case the methodologies are put on hold or withdrawn.

- If the approved methodologies are put on hold or withdrawn, for any reason other than for the purpose of inclusion in a consolidated methodology, no new CPAs shall be included to the PoA.

- If the methodology is subsequently revised or replaced by inclusion in a consolidated methodology, the PoA shall be revised accordingly and the changes shall be validated by a DOE and approved by the Board if new CPAs are to be included. The Board's approval defines a new version of the PoA and the PoA specific CPA-DD.

- Once changes have been approved by the Board, each new CPA shall use the latest version of the PoA specific CPA-DD.

- CPAs that were included before the methodology were put on hold, shall apply the latest version of the PoA specific CPA-DD at the time of the renewal of the crediting period.

[43] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.0.pdf valid for the whole PoA

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

Electricity which will be produced by activities under the CPA is supplied either to:

Scenario (a) An identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; or

Scenario (b) The national grid of the RSA.

Baseline emissions

For both CPA types which envisage scenario (a) according to AMS-I.F. baseline emissions are calculated as follows:

$$BE_y = EG_{BL,y} \cdot EF_{CO_2,y} \quad \text{(E.6-1)}$$

Where:

BE_y = Baseline emissions in year y (tCO_2)

$EG_{BL,y}$ = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO_2,y}$ = Emission factor (tCO_2/MWh)

For both CPA types which envisage scenario (b) according to AMS-I.D. baseline emissions are calculated as follows:

$$BE_y = EG_{BL,y} \cdot EF_{CO_2,grid,y} \quad \text{(E.6-2)}$$

Where:

BE_y = Baseline emissions in year y (tCO_2)

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO_2,grid,y}$ = CO_2 emission factor of the grid in year y (tCO_2/MWh)

Calculation of $EG_{BL,y}$

Each independent activity under the PoA envisages either:

Option (1) Installation of a solar electrical system at the demand-side where there was no solar electrical system operating prior to the implementation of the activity; or

Option (2) A capacity addition.

For combination of *option (1) and scenario (b)*, where there is an installation of a solar electrical system at the demand-side where there was no solar electrical system operating prior to the implementation of the activity and the electricity is supplied to the national grid of the RSA, $EG_{BL,y}$ is calculated as follows:

$$EG_{BL,y} = EG^{b}_{Solar\ systems,y} \quad \text{(E.6-3)}$$

Where:

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EG^{b}_{Solar\ systems,y}$ = Net quantity of electricity supplied to the national grid of the RSA from all independent activities (solar electrical systems installed) under the CPA in year *y* (MWh)

According to paragraph 15 of AMS-I.D.: *"In the case of wind, solar, wave or tidal power plants, it is assumed that the addition of new capacity or retrofitting of existing unit to increase capacity does not significantly affect the electricity generated by existing plant(s) or unit(s). In this case, the electricity produced by the added power plant(s) or unit(s) could be directly metered and used to determine* $EG_{BL,y}$ *provided that the electricity produced by the added power plant(s) or unit(s) addition is separately metered"*.

Since the electricity produced by the added solar electrical systems can be directly metered, $EG_{BL,y}$ for combination of *option (2) and scenario (b)*, where the electricity from a capacity addition is supplied to the national grid of the RSA, $EG_{BL,y}$ is also calculated using Formula (E.6-3).

For combination of *option (1) and scenario (a)*, where there is an installation of a solar electrical system at the demand-side where there was no solar electrical system operating prior to the implementation of the activity and the electricity is supplied to an identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; $EG_{BL,y}$ is calculated as follows:

$$EG_{BL,y} = EG^{a}_{Solar\ systems,y} \quad \text{(E.6-4)}$$

Where:

$EG_{BL,y}$ = Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year *y* (MWh)

$EG^{a}_{Solar\ systems,y}$ = Net quantity of electricity supplied to end users from all independent activities (solar electrical systems installed) under the CPA in year *y* (MWh)

According to paragraph 17 of AMS-I.F. $EG_{BL,y}$ *"shall be calculated following the applicable procedures prescribed in AMS-I.D with the exception that emission factor (* $EF_{CO_2,y}$ *) is calculated as described in this methodology"*. Paragraph 15 of AMS-I.D. is described above.

Since the electricity produced by the added solar electrical systems can be directly metered, $EG_{BL,y}$ for combination of *option (2) and scenario (a)*, where the electricity from a capacity addition is supplied to an identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; $EG_{BL,y}$ is also calculated using Formula (E.6-4).

Following on from this, since there are two different scenario's in terms of where electricity can be supplied to, namely:

Scenario (a) An identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; or

Scenario (b) The national grid of the RSA,

each scenario is given its own baseline parameter for clarity purposes ($EG^{a}_{Solar\ systems,y}$ and $EG^{b}_{Solar\ systems,y}$ respectively), instead of just the one ($EG_{BL,y}$) given in the methodologies.

Calculation of emission factor

According to paragraph 12 of AMS-I.D.: *"the emission factor can be calculated in a transparent and conservative manner as follows:*

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system"; or

(b) The weighted average emissions (in tCO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used."

Choice (a) has been selected for electricity supplied to the national grid of the RSA (*scenario (b)*).

Thus $EF_{CO_2,grid,y}$ is calculated as follows:

$$EF_{CO_2,grid,y} = EF_{grid,CM,y} \quad \text{(E.6-5)}$$

Where:

$EF_{CO_2,grid,y}$ = CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for the project electricity system in year *y* (tCO_2/MWh)

According to paragraph 14 of AMS-I.F, for all independent activities under the CPA which envisages electricity supplied to an identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid *(scenario (a))*:

"(a)Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D;

(b) For a mini-grid system other than described in paragraph 13 above, the baseline emission factor shall be determined as per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D;

(c) Emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"."

Choice (a) has been selected.

Paragraph 12 of AMS-I.D. is described above. Choice (a) has also been selected. Thus $EF_{CO_2,y}$ is calculated as follows:

$$EF_{CO_2,y} = EF_{grid,CM,y} \quad \text{(E.6-6)}$$

Where:

$EF_{CO_2,y}$ = Emission factor (tCO_2/MWh)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for the project electricity system in year *y* (tCO_2/MWh)

According to the "Tool to calculate the emission factor for an electricity system" $EF_{grid,CM,y}$ is determined in the following six steps:

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; and

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

Step 1: Identify the relevant electricity systems

A project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

Electricity generated by all activities in the CPA will displace the power production in 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 March 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:

(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% 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[44]

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 1st of April and finishes on the 31st of March.

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.

[44]Eskom Annual Report 2010, page 1, http://financialresults.co.za/2010/eskom_ar2010/downloads/eskom_ar2010.pdf

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:

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.

The *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:

$$EF_{grid,OM} = EF_{grid,OMsimple} \quad \text{(E.6-7)}$$

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:

$$EF_{grid,OMsimple} = \frac{\sum_{m,y} EG_{m,y} \cdot EF_{EL,m,y}}{\sum_{m,y} EG_{m,y}} \quad \text{(E.6-8)}$$

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*):

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}} \quad \text{(E.6-9)}$$

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 (see tables at end of Section E.6.2)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ). Constant value was adopted (see tables at end of Section E.6.2)
$EG_{m,y}$	=	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:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \cdot 3.6}{\eta_{m,y}} \quad \text{(E.6-10)}$$

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$EF_{CO2,m,i,y}$	=	Average CO_2 emission factor of fuel type *i* used in power unit *m* in year *y* (tCO_2/GJ). Constant value was adopted (see tables at end of Section E.6.2)
$\eta_{m,y}$	=	Average net energy conversion efficiency of power unit *m* in year *y* (ratio). Constant value was adopted (see tables at end of Section E.6.2)
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 Fig. E.6-1. For simplification three levels of analysis 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.

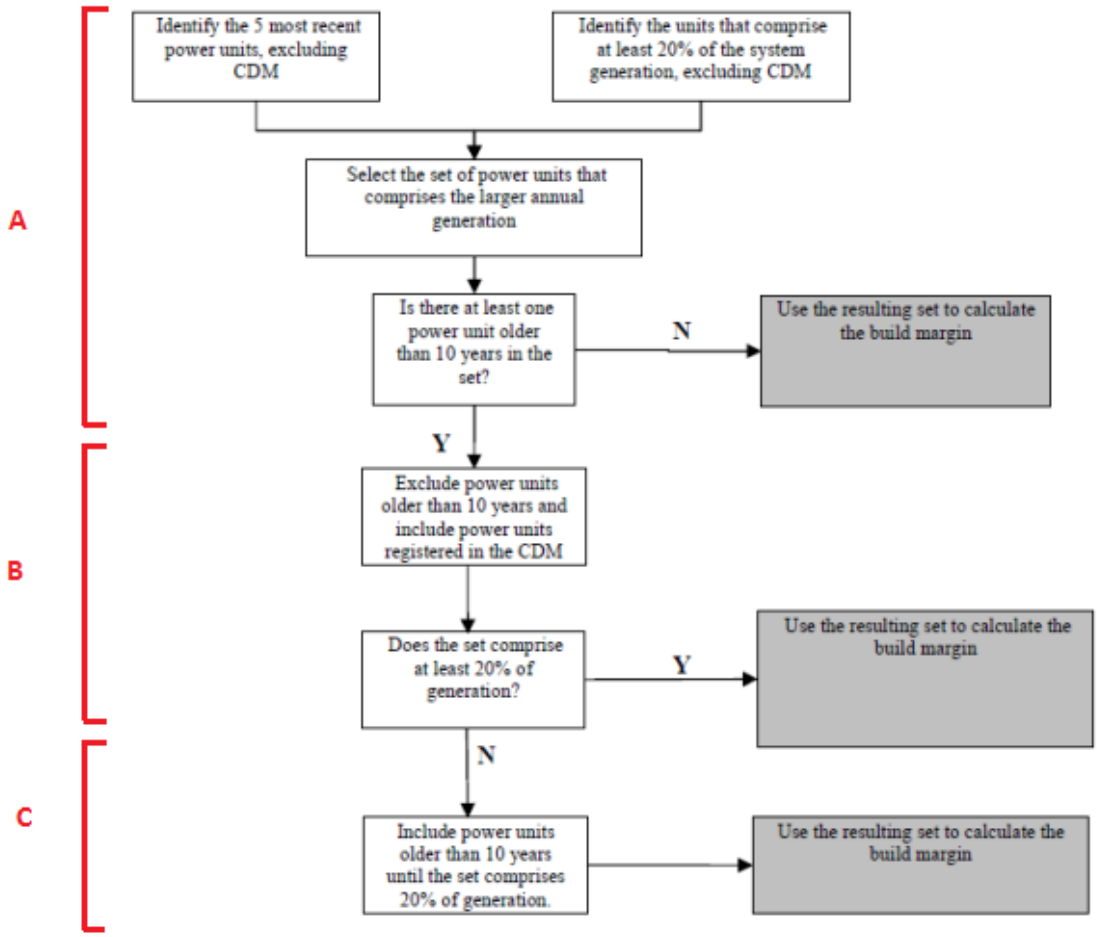

Fig. E.6-1: Build margin calculation algorithm

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% of AEG_{total} (if 20% 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. 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 activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% 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% 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% 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% of the annual electricity generation of the project electricity system (if 20% 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 $SET_{sample\text{-}CDM\text{ ->}10yrs}$ 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 power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_n EG_{n,y} \cdot EF_{EL,n,y}}{\sum_n EG_{n,y}} \quad \text{(E.6-11)}$$

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 power 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.6-9) and (E.6-10).

According to the "Tool to calculate the emission factor for an electricity system" (Version 02.2.0) 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.6-10) 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 (CM) emissions factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,CM} = EF_{grid,OM} \cdot w_{OM} + EF_{grid,BM,y} \cdot w_{BM} \quad \text{(E.6-12)}$$

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.

Project emissions

According to AMS-I.F. and AMS-I.D. no project emissions need to be taken into account. Therefore:

$$PE_y = 0 \quad \text{(E.6-13)}$$

Leakage

Solar electrical systems are not transferred from another activity, so no leakage is to be considered. Therefore:

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

Emission reductions

Emission reductions are calculated as follows:

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

Where:

ER_y = Emission reductions in year *y* (tCO_2/y)

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

PE_y = Project emissions in year *y* (tCO_2/y)

LE_y = Leakage emissions in year *y* (tCO_2/y)

Considering formulas (E.6-1), (E.6-2), (E.6-3), (E.6-4), (E.6-5), (E.6-6), (E.6-13), (E.6-14) and (E.6-15) emission reductions for both CPA types will be calculated as follows:

$$ER_y = \left(EG^{a}_{Solar\ systems,y} + EG^{b}_{Solar\ systems,y}\right) \cdot EF_{grid,CM} \quad \text{(E.6-16)}$$

Where:

ER_y = Emission reductions in year *y* (tCO_2e/y)

$EG_{BL,y}$ = $\left(EG^{a}_{Solar\ systems,y} + EG^{b}_{Solar\ systems,y}\right)$

$EG^{a}_{Solar\ systems,y}$ = Net quantity of electricity supplied to end users from all independent activities (solar electrical systems installed) under the CPA in year *y* (MWh)

$EG^{b}_{Solar\ systems,y}$ = Net quantity of electricity supplied to the national grid of the RSA from all independent activities (solar electrical systems installed) under the CPA in year *y* (MWh)

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

CPAs shall always apply the fixed parameters of the latest version of the PoA-DD.

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

Following parameters are fixed for all CPAs during the first crediting period of the PoA:

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 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. This value will be a constant for each crediting period.

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. This value will be a constant for each crediting period.

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	For the sake of a conservative approach the IPCC default value at the lower

choice of data or description of measurement methods and procedures actually applied :	limit of the uncertainty at a 95% confidence interval is used. The default NCV that is available on the Eskom website is 0.02509 TJ/t fuel.[45] The 2006 IPCC Guidelines references the NCV of the different types of coal. The Eskom default value corresponds to the NCV of 'other bituminous coal'. Therefore the IPCC value for 'other bituminous coal' was applied to calculate the grid emission factor.
Any comment:	This value will be a constant for each crediting period.

Data / Parameter:	$EF_{CO_2,coal,y}$
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% confidence interval is used. The default emission factor that is available on the Eskom website is 25.8 tC/TJ.[46] The 2006 IPCC Guidelines references the carbon content of the different types of coal. The Eskom default value corresponds to the carbon content of 'other bituminous coal'. Therefore the IPCC value for 'other bituminous coal' was applied to calculate the grid emission factor.
Any comment:	This value will be a constant for each crediting period.

Data / Parameter:	$EF_{CO_2,NG,y}$
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% confidence interval is used.
Any comment:	This value will be a constant for each 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

[45] http://www.eskom.co.za/c/article/236/cdm-calculations/
[46] http://www.eskom.co.za/c/article/236/cdm-calculations/

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 will be a constant for each crediting period.

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
Source of data used:	Tool to calculate the emission factor for an electricity system, Annex 1
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). This value will be a constant for each crediting period.

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. This value will be a constant for each crediting period.

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. This value will be a constant for each crediting period.

Data / Parameter:	$LF_{Solar\ systems}$
Data unit:	-
Description:	Load factor of the solar systems
Source of data used:	The National Energy Regulator of South Africa, Review of Renewable Energy Feed - In Tariffs, Table A7, page 30[47]
Value applied:	To be determined for each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value
Any comment:	This value is used to predict the annual net electricity generation. This value is required in order to perform calculations for expected CER's. Since these are small installations, there is not a set value for this, and each CPA will have a different value, therefore an estimate is required to perform the initial calculation.

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:	Calculated (see Annex 3)
Value applied:	0.988
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated ex ante based on the "Tool to calculate the emission factor for an electricity system" (version 02.2.0)
Any comment:	This value will be a constant for each crediting period and then recalculated for

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

	each new 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 SSC-CPA:

Since there are two different scenario's in terms of where electricity can be supplied to, namely:

Scenario (a) An identified consumer (end user) or the group of consumers, which would have been supplied with electricity from the national grid of the RSA in the absence of the activity, furthermore excess electricity may be supplied to the grid; or

Scenario (b) The national grid of the RSA,

each scenario is given its own baseline parameter for clarity purposes ($EG^{a}_{Solar\ systems,y}$ and $EG^{b}_{Solar\ systems,y}$ respectively), instead of just the one ($EG_{BL,y}$) given in the methodologies.

Data / Parameter:	$\boldsymbol{EG^{a}_{Solar\ systems,y}}$
Data unit:	MWh
Description:	Net quantity of electricity supplied to end users from all independent activities (solar electrical systems installed) under the CPA in year *y* (MWh)
Source of data to be used:	Measurement with electricity meters
Value of data:	–
Description of measurement methods and procedures to be applied:	Measurement by means of electricity meters installed for each independent activity under the CPA. Net electricity supplied will be calculated by deducting electricity import from electricity export. The generated electricity will be continuously measured and recorded. Data on electricity supply will be digitally archived at least on a monthly basis.
QA/QC procedures to be applied:	Electricity meters are regularly calibrated. In the case of electricity sold to a third party, measurement results shall be cross-checked with records of sold/purchased electricity (e.g. invoices/receipts).
Any comment:	This parameter will be used instead of $EG_{BL,y}$, in order to clarify that this is applicable to scenario (a).

Data / Parameter:	$\boldsymbol{EG^{b}_{Solar\ systems,y}}$
Data unit:	MWh
Description:	Net quantity of electricity supplied to the national grid of the RSA from all independent activities (solar electrical systems installed) under the CPA in year *y* (MWh)
Source of data to be used:	Measurement with electricity meters
Value of data:	–
Description of measurement methods	Measurement by means of electricity meters installed for each independent activity under the CPA. Net electricity supplied will be calculated by deducting

and procedures to be applied:	electricity import from electricity export. The generated electricity will be continuously measured and recorded. Data on electricity supply will be digitally archived at least on a monthly basis.
QA/QC procedures to be applied:	Electricity meters are regularly calibrated; readings are cross-checked with records for sold electricity.
Any comment:	This parameter will be used instead of $EG_{BL,y}$, in order to clarify that this is applicable to scenario (b).

Data / Parameter:	$P^{a}_{Solar\ system,\ y}$
Data unit:	MW
Description:	Total capacity of all independent activities which supply electricity to end users under the CPA in year *y*
Source of data used:	BWC
Value applied:	To be determined
Justification of the choice of data or description of measurement methods and procedures actually applied :	Forecast or actual data
Any comment:	This parameter will be used in order to clarify that this is applicable to scenario (a).

Data / Parameter:	$P^{b}_{Solar\ system,\ y}$
Data unit:	MW
Description:	Total capacity of all independent activities which supply electricity to the national grid of the RSA under the CPA in year *y*
Source of data used:	BWC
Value applied:	To be determined
Justification of the choice of data or description of measurement methods and procedures actually applied :	Forecast or actual data
Any comment:	This parameter will be used in order to clarify that this is applicable to scenario (b).

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

The monitoring plan is designed to calculate the GHG emission reductions at the CPA level. The monitoring plan was designed based on AMS-I-D., AMS-I-F and "General Guidelines to SSC CDM

methodologies" (Version 17)[48]. The following procedures shall be applied to the monitoring for all CPA under this PoA:

1. Monitoring period

The 7-year renewable crediting period was chosen for the PoA. The monitoring period starts from the date of commissioning of the first activity under the CPA or the date of registration of the proposed CPA under the PoA (whichever is later). At the end of each reporting year monitored data shall be aggregated to a monitoring report.

2. Data monitored and sources

Quantity of net electricity supplied to end users from all independent activities (solar electrical systems installed) under the CPA in year *y*, and quantity of net electricity supplied to the national grid of the RSA from all independent activities (solar electrical systems installed) under the CPA in year *y*, shall be determined on the basis of electricity meters.

For all activities the applicable parameter in section E.7.1 will be monitored continuously and recorded at least on a monthly basis by the CPA personnel. Data on electricity supply will be digitally archived and submitted to the CME.

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

Combined margin CO_2 emission factor for grid connected power generation calculated *ex ante* is fixed for all CPAs of the PoA.

GHG emission reductions for both CPA types shall be calculated using formula (E.6-16).

3. The monitoring team

The management of BWCC is fully responsible for the coordination and overall control of this PoA.

The personnel of the seller of solar electrical systems as well as the independent activity owners are responsible for correct installation and maintenance of solar electrical systems.

The company staff that will collect the data will undergo the necessary training for this. Operation and maintenance of the solar electrical system will be done by either the trained personnel of the solar electrical system suppliers or by the trained personnel employed by the owners of the system.

The CPA shall be monitored by BWC. BWC will undertake, either itself or through another credible company specially appointed for that, to install meters and/or other instrumentation and measurement equipment as is necessary to provide for accurate data needed for the calculation of GHG emission reductions, and to collect such data in a timely manner.

The GHG emission reductions shall be calculated by BWC specialists on the basis of data representing operation of solar electrical systems collected by BWC or by another company employed by BWC. In case of any doubts as to the accuracy of the input data, the specialists of the company shall check and correct the data. The preliminary monitoring report shall be submitted to BWCC for review. In case any mistakes are found, BWC will undertake to correct such.

4. Data storage

[48] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf

All data collected as part of monitoring should be archived electronically and kept at least for 2 years after the end of the crediting period. Data collection will occur on a monthly basis

5. Instrumentation calibration

BWC or another company employed by BWC will be responsible for timely calibration of all installed meters, instrumentation and other measurement equipment in accordance with the manufacturer's requirements and the South African Bureau of Standards (SABS)[49].

6. Emergency situations

In case of breakdown of any of the solar electrical system the electricity generation will go down, and amount of net electricity supplied by the system will be reduced. If any measuring instrument that is used in the monitoring process fails, either BWC or another company employed by BWC shall remedy or, if necessary, replace it as soon as possible.

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)

Date of completion: 05/12/2011

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

Contact persons for baseline and monitoring:

- Ilya Goryashin (ilya.goryashin@blueworldcarbon.com)
- Louie Eggers (louie.eggers@blueworldcarbon.com)

[49] SANS 474:2009 Edition 1.1: Code of practice for electricity metering

Annex 1

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

Organization:	Blue World Carbon Capital PCC (BWCC)
Street/P.O.Box:	Green Street
Building:	Channel House
City:	St Helier
State/Region:	
Postfix/ZIP:	
Country:	Jersey
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	Mr.
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Direct tel:	
Personal E-Mail:	joost.van.lier@blueworldcarbon.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Annex 3-1. Eskom electricity network[50]

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

Annex 3-2. Data on Eskom's grid-connected power plants (at the 31st of March 2010)[51,52]

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[53]	Ermelo, Mpumalanga	Thermal PP	Coal	(2005.03.31)	1 440
Duvha	Witbank, Mpumalanga	Thermal PP	Coal	1980.01.18	3 450
Grootvlei[54]	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[55]	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

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

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

[53] Re-commissioned power plant, Eskom Annual Report 2009, page 63 http://www.financialresults.co.za/eskom_ar2009/ar_2009/downloads.htm

[54] Re-commissioned power plant, Eskom Annual Report 2010, page 126, http://financialresults.co.za/2010/eskom_ar2010/downloads/eskom_ar2010.pdf

[55] Re-commissioned power plant, Eskom Annual Report 2010, page 127, http://financialresults.co.za/2010/eskom_ar2010/downloads/eskom_ar2010.pdf

Name of power plant	Location	Type of power plant (PP)	Type of fuel	Date of commissioning/ (Re-commissioning)*	Total net maximum capacity, MW
Matla	Bethal, Mpumalanga	Thermal PP	Coal	1979.09.29	3 450
Tutuka	Standerton, Mpumalanga	Thermal PP	Coal	1985.06.01	3 510
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[56]

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

[56]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 ($EG_{m,y}$)[57]

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 1st of April and finishes on the 31st of March

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

[57]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 ($FC_{i,m,y}$)[58]

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

[58]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[59]

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.

[59] 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[60]	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

[60] 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 ($EF_{grid,OMsimple}$)

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	-
Grootvlei	2 656 230	1.098	2 916 240	-
Komati	1 016 023	1.165	1 183 502	-
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 PLAN