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

CONTENTS

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):

ETA Solar Water Heater Programme in South Africa

Version ~~4.2~~5

~~02~~23/0~~5~~7/2012

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

Policy / measure or stated goal of the PoA:

The ETA Solar Water Heater Programme in South Africa (hereafter referred to as "the PoA") is a small-scale CDM programme of activities with the goal of increasing the use of solar water heaters (SWH) in residential ~~and commercial~~ applications throughout the Republic of South Africa. The PoA contributes to this goal by supplying and installing SWHs as well as by providing a comprehensive financing, warranty and maintenance package.

The SWH installed under the PoA replace existing water heating systems (mostly electric geysers). The PoA therefore helps to reduce grid-based electricity and fossil fuel consumption and the resulting carbon emissions. The displaced electricity would have been sourced from the national power grid and transmitted over long distances from centralised power stations, which utilize a mix of primary energy sources that are predominantly fossil fuel-based. As a result, the PoA contributes towards a sustainable low carbon economy and the 10,000 GWh renewable energy target set by the government in November 2003.[1].

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

The PoA is a voluntary initiative coordinated by ETA Energy (hereafter referred to as "ETA"). ETA is a 100% subsidiary owned by CEF (Central Energy Fund). There are no laws or regulations that mandate the installation of SWHs in residential ~~or commercial~~ applications in South Africa. ETA is under no obligation to offer a programme for the installation of SWHs, and the participation of customers in the PoA is strictly voluntary.

[1] The White Paper on Renewable Energy by the Department of Minerals and Energy was published in November 2003. It is available at: http://www.dme.gov.za/pdfs/energy/renewable/white_paper_renewable_energy.pdf

General operating and implementing framework of PoA

The general operating and implementing framework of the PoA is presented in the diagram below:

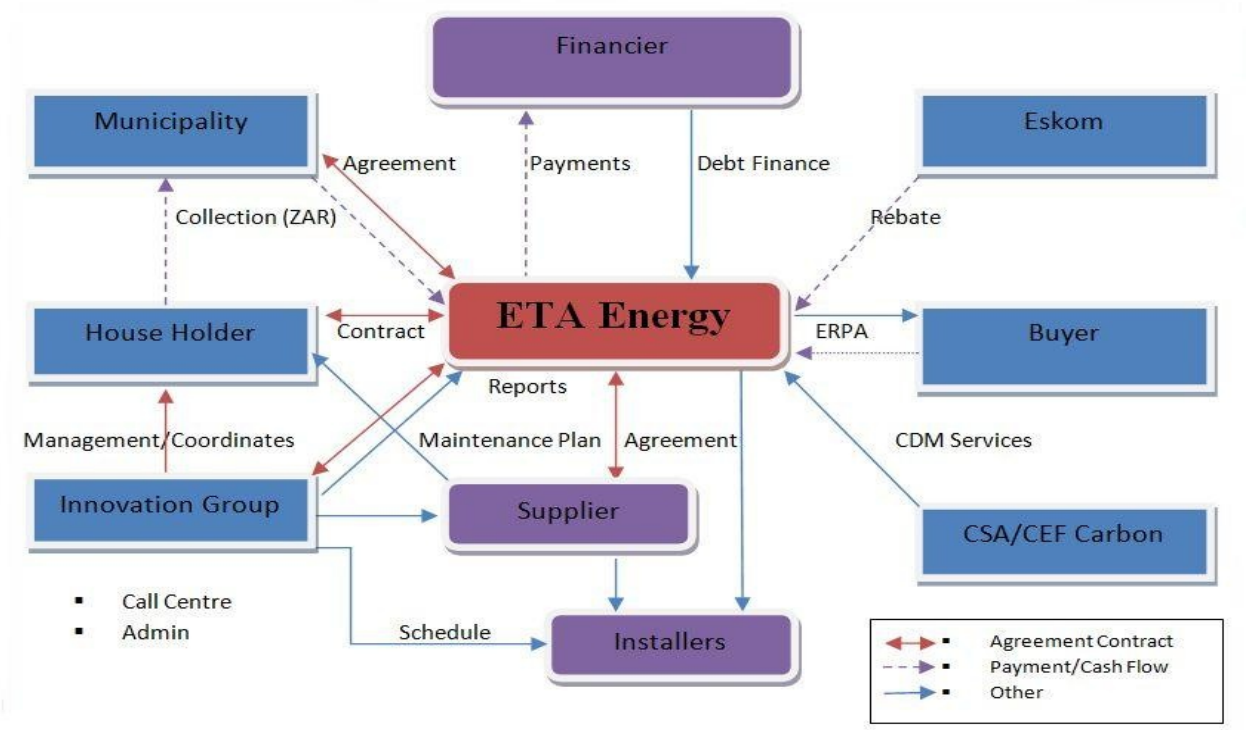

Figure 1: Operating and implementing framework of the PoA

ETA Energy

ETA is the coordinating entity of the PoA as well as the entity responsible for implementing the CDM Programme Activities (hereafter CPAs). ETA has separate agreements with all key stakeholders of the PoA: the participating customers, the suppliers, the installers and Innovation Group.

ETA provides medium-term financing of up to 72 months to the participating customers. The monthly payments are made via a participating customer's electricity account. To enable this transfer ETA has an agreement with the municipality where the costumer is located. In addition to receiving the monthly payments, ETA has the right to the carbon credits as well as to the subsidy under the Eskom SWH program (the Eskom rebate). ETA has acquired these rights via the Customer Participation Agreement.

Along with the SWHs, ETA provides a 10-year warranty and a 6-year maintenance plan to the participating customers. ETA also ensures that all SWH-types installed under the PoA have successfully completed South African Bureau of (SABS) testing. This is a prerequisite to get the subsidy from Eskom. Moreover, ETA has contracted Innovation Group (IG) to run a designated call centre for the SWH installed under the PoA. Participating customers can report any problem with a SWH system via the call centre.

Finally ETA is a project participant in the PoA. It has contracted CEF Carbon and CarbonStream Africa (CSA) to take the lead in the development of the PoA and the marketing of the carbon credits. ETA is responsible for the implementation of the monitoring plan, the calculation of the resulting emission reductions and the preparation of the monitoring reports.

Innovation Group
Innovation Group (IG) has been contracted by ETA for the operational management of the PoA and the coordination between participating customers, suppliers and installers.

Suppliers & Installers
ETA ensures that all SWH systems and their major components have successfully completed quality testing by the South African Bureau of Standards (SABS), including thermal performance testing and mechanical qualification testing. ETA also ensures that all SWH are installed in accordance with the SABS Code of Practice for Installation and that all installers have the necessary qualifications, experience and training for the installation of SWH.

Municipality
The participating municipalities facilitate the monthly payments via the electricity accounts in the municipal billing system. The monthly payments for the SWHs are collected by the municipality and forwarded to ETA.

Eskom
Eskom is the state-owned electricity company which provides the participating customers with a one-time rebate. According to the Customer Participation Agreement, ETA receives the rebate on behalf of the participating households.

CEF Carbon and CarbonStream Africa (CSA)
CEF Carbon and CSA jointly offer carbon management services to ETA. These range from the development of the PoA-DD, the CPA-DDs and the Monitoring Reports to the management of the entire CDM cycle up to the issuance of CERs.

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

Coordinating or managing entity of the PoA as the entity which communicates with the CDM Executive Board
ETA is the coordinating entity of the PoA. ETA is a wholly-owned subsidiary of the Central Energy Fund (CEF).

Project participants being registered in relation to the PoA

Name of party involved	Private and/or public entity(ies)	Kindly indicate if the party

((host) indicates a host party)	project participants (as applicable)	involved wishes to be considered as project participant
The Republic of South Africa (host)	ETA Energy (Pty) Ltd	No
Finland	Ministry for Foreign Affairs of Finland	Yes
Finland	Nordic Carbon Fund Ky (NCF)	No
Finland	Fine Carbon Fund Ky (FCF)	No
Finland	Climate Opportunity Fund Ky (COF)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

A.4. Technical description of the small-scale programme of activities:

A.4.1. Location of the programme of activities:

The PoA is located within the geographical boundaries of the Republic of South Africa

Figure 2: Map of South Africa

A.4.1.1. Host Party (ies):

Republic of South Africa

A.4.1.2. Physical/ Geographical boundary:

All SWHs included in the PoA must be installed within the territory of the Republic of South Africa. The addresses where the SWHs have been installed are recorded to document this.

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

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

The purpose of any CPA under the PoA is the installation of SWHs in residential ~~or commercial~~ applications in the Republic of South Africa. The installed SWHs replace existing water heating systems (predominantly electric geysers) that would otherwise have been used to produce hot water and that

would otherwise have consumed grid-based electricity or fossil fuels. As a result, the CPAs reduce the consumption of grid-based electricity or fossil fuels as well as the related carbon emissions.

The PoA allows different SWH systems to be included in a CPA as long as they have successfully completed quality testing by the South African Bureau of Standards (SABS). All major components of the installed SWH systems are quality-tested in order to ensure that the installed SWHs are able to withstand local climatic and water quality conditions. All SWHs are installed by South African companies that have the necessary qualifications, experience and training for the installation of SWH.

SWH system may use different technologies, such as flat plate or evacuated tube collector technologies. Both direct and indirect SWH systems qualify for the inclusion into a CPA. In direct systems, the drinking water is heated directly by the solar panels. In indirect systems an anti-freeze fluid circulates in the solar collectors but is physically separated from the hot water circuit. The two systems are connected via a heat exchanger.

Each direct system typically consists of:
1. Solar panels;
2. Storage tank;
3. Equipment to protect against potential high pressure;
4. Piping and equipment to link collector and tank;
5. Solar collector array support/fixation structure;
6. Piping system for cold water supply and hot water supply to user;
7. Electrical backup (if the system is connected to an electrical supply);
8. Regulated circulation pumps (if the system is forced circulation).

Each indirect system typically consists of:
1. Anti-freezing liquid;
2. Heat exchanger;
3. Solar panels;
4. Storage tank (existing or new);
5. Equipment to protect against potential high pressure;
6. Piping and equipment to link collector and tank;
7. Solar collector array support /fixation structure;
8. Piping system for cold water supply and hot water supply to user;
9. Electrical backup (if the system is connected to an electrical supply);
10. Regulated circulation pump (if the system is forced circulation).

In countries where SWH systems have been installed, they have been shown to have effective operating lifetimes in excess of ten years.[2]

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

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

[2] Solar Direct Website 2 May 2010: http://www.solardirect.com/swh/swh.htm

No:	Criteria
1.	Only CPAs whose purpose is the installation of residential ~~or commercial~~ SWH for hot water production are eligible to be included in the PoA.
2.	A CPA shall demonstrate that the SWH systems displace electricity or fossil fuel that would otherwise have been used to produce hot water. It is sufficient to demonstrate that each SWH replaces an existing electric or fossil fuel-based water heating system. This can be done by demonstrating that an existing electric or fossil fuel-based system has been permanently disabled.
3.	Only CPA that do not exceed the small-scale threshold for SWH projects of 64000 m^2 in aperture area are eligible for inclusion in the PoA.
4.	For each CPA it shall be demonstrated that the energy savings are based on the hot water consumption as defined in paragraph 5 of AMS I.J. For CPAs that use the stipulated energy savings method it is sufficient to demonstrate that the average energy demand exceeds the stipulated energy savings of 450 kWh / year per m^2, as per section 10 (c) (iv) of AMS I.J.
5.	For each CPA energy savings are determined by one of the methods listed in §10 of AMS I.J.: Model-based method / System metering method / Stipulated energy savings method
6.	For each CPA, it has to be demonstrated that the applicability conditions of the chosen method (See 5.) to calculate energy savings are fulfilled.
7.	For each CPA monitoring is done according to paragraphs 13 and 14 of AMS I.J.
8.	For each CPA it has to be demonstrated that it is neither being registered as a single CDM project outside the PoA nor being included in another registered PoA.
9.	For each CPA it has to be demonstrated that it is not a de-bundled component of a large-scale CDM project activity.
10.	All installations in a CPA shall take place within the geographical boundaries of the Republic of South Africa.
11.	For all SWHs included in a CPA there must be a Customer Participation Agreement between the ETA and the owner of the SWH.
12.	Each CPA and each SWH in a CPA shall be uniquely identified by way of unique identifying numbers.
13.	For each CPA included in the PoA additionality shall be demonstrated using one of the following guidelines and applicable tools approved by the CDM Executive Board. 1. "Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 09.0".[3] It needs to be shown that in the absence in the CPA, emission reductions would not occur due to the existence of barriers. If the barriers for the CPAs are identical to the barriers faced by the overall PoA as detailed in section A.4.3, it is sufficient to demonstrate that the barriers preventing the PoA are still in existence at the starting date of the CPA. Inasmuch as the penetration rate of SWHs in South Africa is relevant to demonstrate the existence of barriers, it should be distinguished between those SWHs that are installed with the benefit of carbon revenue from the CDM and those SWH that are installed without such revenue. Only SWH that are installed without carbon revenue should be counted as part of the penetration rate.

[3] The document is available at http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid05.pdf.

	2. "Guidelines for Demonstrating Additionality of Micro-scale Project Activities", Version 04.[4] In particular it needs to be demonstrated that (a) the installed capacity of the SWHs in the CPA is less than 5 MW; (b) the CPA is designed for distributed energy generation (, i.e. the SWHs are not connected to a national or regional grid); (c) Each of the SWHs in the CPA is smaller than or equal to 1500kW electrical installed capacity; (d) End users of the SWHs are residential households

Table 1: Eligibility criteria for inclusion of a SSC-CPA into the PoA

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):

Prior Consideration of CDM

According to paragraph 2 of the Guidelines on the Demonstration and Assessment of Prior Consideration of the CDM, the PoA is a new project. The PoA start date was on February 24, 2010, the date when the Board of CEF, the mother company of ETA, approved the pilot phase of the PoA. This was after the August 2, 2008 cut-off date included in the Guidelines. The notification of the project activity was submitted to UNFCCC and the South African DNA on April 7, 2010, i.e. well within six months of the project start date.

DATES	EVENTS
24/02/2009	PIN submitted to DNA
04/04/2009	LoNo (Letter of no objection) issued to the project
02/07/2009	ERPAs signed
24/02/2010	Approval on the pilot phase of the PoA by the Board of the Central Energy Fund (CEF) (the starting date of the project activity)
07/04/2010	Notification submitted to Host Country DNA and the UNFCCC Secretariat

Table 2: Timeline of Events

The proposed PoA is a voluntary coordinated action

[4] The document is available at http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid22.pdf.

The PoA is a voluntary action, coordinated and implemented by ETA in order to supply, install and finance SWHs in residential ~~and commercial~~ applications in South Africa. The project contributes to the target of 10 TWh of renewable energy set in the White Paper on Renewable Energy by the Department of Minerals and Energy[5], published in November 2003, as well as the government's target, announced in late 2009, to roll out one-million SWHs by 2014. However, both targets have been set without any mandatory requirements for households ~~or commercial enterprises~~, and hence there is no regulation for the installation of SWHs in South Africa. ETA is voluntarily coordinating the PoA. The participating customers are voluntarily installing the SWHs and have voluntarily agreed to include them into the PoA and the relevant CPA.

The PoA would not be implemented in the absence of the PoA

The demonstration that the programme would not be implemented in the absence of the PoA follows paragraph 28 of the Simplified Modalities and Procedures for Small-Scale Clean Development Mechanism Project Activities. The Simplified Modalities and Procedures require project proponents to demonstrate "that the project activity would otherwise not be implemented due to the existence of one or more of the barriers listed in the Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 09.0~~Attachment A to Appendix B" of the Simplified Modalities and Procedures~~.

Customer-level Barriers:

The large-scale adoption of SWHs in South Africa is primarily prevented by the lack of financial resources for the purchase and installation of SWHs. The barrier is listed in paragraph 1 (d) of ~~Attachment A to Appendix B~~the "Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 09.0" as "Other Barrier: Financial Resources". Technological barriers and barriers due to prevailing practice aggravate the situation.

The large-scale adoption of SWH would not have occurred in the absence of the project. According to a 2009 study[6] less than 100,000 SWHs have been installed even though there are close to 9 million households. The reasons for the low penetration rate of approximately 1% include high upfront costs of SWHs, insufficient financial incentives for their installation and lack of consumer awareness[7].

The high upfront capital cost of SWHs is the key barrier to the large-scale adoption of SWHs in South Africa[8]. SWHs cost between ZAR 12,000 and ZAR 35,000[9], approximately three times the cost of comparable electric geysers (ZAR 3000 and ZAR 10,000)[10]. SWH installation costs by themselves are

[5] The document is available at: http://www.dme.gov.za/pdfs/energy/renewable/white_paper_renewable_energy.pdf

[6] Report on the South African Solar Water Heater Industry – July 2009 W.Cawood, S.Theobald

[7] http://www.createacceptance.net/fileadmin/create-acceptance/user/docs/CASE_19.pdf

[8] http://www.erc.uct.ac.za/Research/publications/06Visagie-Prasad%20RET.pdf

[9] http://www.timeslive.co.za/sundaytimes/article155336.ece

[10] Averaged price of electric water heaters from quotations received from 3 geyser suppliers in South Africa (will be attached as an appendix/reference file.)

between ZAR 2,000 and ZAR 6,000.[11] With a payback period (through electricity savings) of 5-6 years, the high upfront cost of SWHs is the biggest barrier for most South African customers, especially if they already have electric geysers installed.

Financial incentives for the installation of SWHs are small. In 2008 the South African government launched a SWH program via Eskom, the national power utility.[12] The program provides a one-time subsidy for the installation of a SWH. The amount of the rebate is based on the technical performance (Q-factor) of the SWH as determined by the South African Bureau of Standards (SABS). However, the Eskom subsidy is not sufficient to cover all costs associated with the purchase, installation and maintenance of a SWH over a 10-year period.[13] As a result, by the end of 2009 less than 5,000 SWHs had been installed under the Eskom program,[14] falling far short of the target set by the Department of Energy of South Africa in late 2009 of installing one-million SWHs by 2014. [15] The very limited success of the Eskom subsidy program clearly shows that even with the Eskom rebate the customers prefer an electric geyser. Moreover, a large share of South African households spend most of their income on basic needs and are unable to afford a technology with high upfront costs.

The financial barriers are aggravated by a lack of awareness and technical concerns on the part of potential customers. The perception of SWHs in South Africa is still often poor due to a past history where the industry was beset by inferior products and poorly qualified installers. As a result, customers have been following the practice of using electric geysers due to their perceived lower cost, better quality and greater security of supply[16]. Customers are reluctant to switch from a familiar and secure technology to a more costly new technology.

The above analysis shows that in the absence of the PoA the large-scale adoption of SWHs faces significant barriers. The barriers prevent the implementation of the programme in the absence of the PoA, but they do not affect the baseline alternative, i.e. continuing use of the existing water heating systems (predominantly electric geysers).

PoA-Level Barriers

Coordinated voluntary programmes, such as the proposed PoA need to provide substantial additional incentives to customers in order to provide an affordable SWH solution that overcomes the aforementioned barriers.

As a result, the PoA offers participating customers a SWH financing scheme that makes the upfront investment costs of switching from an existing water heating system to a SWH unit manageable. The PoA

[11] http://www.eskomidm.co.za/residential/residential-technologies/solar-water-frequently-asked-questions#install

[12] For details on the program see http://www.eskomidm.co.za/residential/residential-technologies.

[13] Eskom Annual Report 2008.

[14] Eskom Distribution 2010, Solar Water Heating Programme, Monthly Status Report March 2010

[15] http://www.cef.org.za/solar_market_survey.pdf - Page 20, 6.1.1.

[16] http://www.cef.org.za/solar_market_survey.pdf - Page 20, 6.1.1.

offers customers the opportunity to pay the cost of their SWHs over a medium financing term (up to 72 months) with fixed instalments that are comparable to the savings in their electricity bill.

To address customer-level technology and prevailing practice barriers, the PoA provides the SWHs with a maintenance plan throughout the 6-year financing term, which greatly reduces the customer risk. The PoA also provides a 10-year warranty for each SWH system. This long-term programme is far beyond what is available in the current electric geyser or SWH market. In addition, the PoA offers user support via a call centre and thus further reduces the customer's risk associated with switching to a SWH.

The PoA service package involves the following,

- upfront financing of SWH units on behalf of households
- provision of a medium-term repayment scheme by households to ETA Energy
- organisation of procurement and installation of SWH units
- programme publicity
- monitoring
- maintenance and user support
- legal arrangements between all actors

The costs for setting up and managing such a voluntary, coordinated action are very significant. ETA also faces significant risks, such as possible payment defaults of participating customers as well as the possible failure to attract a sufficient number of participating customers to cover the significant administrative and managerial costs.

Furthermore, the previously low demand for SWHs and the uncertainty in the market for SWH systems has prevented the development of a skills base to develop and support the mass scale-up of the SWH market[17]. The PoA faces additional risks when aiming to scale up SWH adoption in such an undeveloped SWH market with the uncertain availability and price of equipment and qualified installers.

These above costs and risks make the implementation of the PoA unattractive to ETA, and revenue from the sale of carbon credits is required to make the programme viable for ETA.

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

A.4.4.1. Operational and management plan:

The operational and management arrangements established by ETA for the implementation of the PoA include the following components:

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

[17] http://www.environment.gov.za/HotIssues/2009/CTF-InvestmentPlan/cleantechnologyfund.pdf - Page 145, P 49

A central electronic database is set up by ETA. It includes the following information about each SWH in all CPAs that are included in the PoA:

ID	Description	Source	Purpose
1	CPA ID number	Assigned to each SWH in the central database, at the time when the SWH is entered into the PoA database. The CPAs are continuously numbered from 001 to 999.	Unique identification of the CPA. Unique assignment of each SWH to a CPA.
2	Customer ID number (tax invoice number)	Customer Participation Agreement	Unique identification of each SWH installed under the PoA
3	SWH ID number	Assigned to each SWH in the central data base, at the time when the SWH is entered into the PoA database. The SWHs are continuously numbered from 00001 to 20000.	Unique identification of each SWH installed under the PoA. Continuous numbering facilitates the random sampling of SWH for the bi-annual inspection.
4	Name of owner (first name, family name)	Customer Participation Agreement	
5	Telephone number of owner	Customer Participation Agreement	
6	Street address where SWH is installed	Customer Participation Agreement	Confirmation that SWH is within geographical area of PoA and CPA
7	Confirmation ~~whether~~ that the SWH is installed in a residential ~~or commercial~~ application	Customer Participation Agreement	Meet criteria in paragraph 10 of AMS I.J
8	For residential application, confirmation whether the building where the SWH is installed is the primary residence of the household, which has hot water consumption year-round.	Customer Participation Agreement	Meet criteria in paragraph 10 of AMS I.J.
9	Date of installation	Plumbing Certificate of Compliance	Emission reduction calculation
10	Type of SWH (supplier / model)	ESKOM Rebate Form	Unique assignment to SABS test reports
11	SWH collector area	SWH Technical	Meet criteria in

		Specification. Documented in "SWH System Specs" sheet	paragraph 10 of AMS I.J
12	SWH tank size	SWH Technical Specification. Documented in "SWH System Specs" sheet	Meet criteria in paragraph 10 of AMS I.J
13	SWH serial number	ESKOM Rebate Form	Unique identification of SWH
14	Existence of SABS Test Document for SWH type	SABS test reports / approvals. Documented in "SWH System Specs" sheet.	Meet criteria in paragraph 10 of AMS I.J
15	Confirmation that installed SWH is new and has not been transferred from another activity	Customer Participation Agreement	Meet criteria in paragraph 12 of AMS I.J
16	Confirmation of the fuel type of existing hot water system (i.e. electric geyser, natural gas fired system, etc.).	Customer Participation Agreement	Meet criteria in paragraph 10 of AMS I.J
17	Confirmation that existing hot water system has been disabled	ESKOM Rebate Form	Meet criteria in paragraph 12 of AMS I.J
18	Tilt and orientation of the SWH	Supplemental Installation Checklist	Meet criteria in paragraph 10 of AMS I.J
19	Confirmation that there is no shading of the SWH	Supplemental Installation Checklist	Meet criteria in paragraph 10 of AMS I.J
20	Date of Acceptance Test	Plumbing Certificate of Compliance	Meet criteria in paragraph 13 of AMS I.J.
21	Confirmation that acceptance test was successfully completed	Plumbing Certificate of Compliance	Meet criteria in paragraph 13 of AMS I.J.
22	For residential applications, number of people in household	Eskom Rebate Form or CPA	Meet criteria in paragraph 10 of AMS I.J
23	Identifying number of Customer Participation Agreement	Customer Participation Agreement	Demonstrate existence of Customer Participation Agreement and demonstrate that ETA has rights to carbon credits.

24	Confirmation that SWH is operational during biannual inspection	Inspection Protocol	Meet criteria in paragraph 14 of AMS I.J
25	Confirmation that SWH has complied with manufacturer-required maintenance procedures	Inspection Protocol	Meet criteria in paragraph 14 of AMS I.J
26	Date of inspection	Inspection Protocol	Meet criteria in paragraph 14 of AMS I.J

In addition to the central electronic database, ETA will keep copies of the following original documents:

1. Customer Participation Agreements
2. Plumbing Certificate of Compliance
3. Eskom Rebate Forms
4. Supplemental Installation Protocols
5. Inspection Protocols

In a separate sheet data about the individual SWH types will be collected, including

6. Technical specifications, such as tank size and collector area
7. SABS Test Reports and SABS Approvals
8. Maintenance requirements for all SWH types

All data and records will be stored for at least two years after the end of the crediting period of that particular CPA.

(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,

Before including a new CPA into the PoA, ETA obtains a written statement from the entity implementing the CPA confirming that the CPA has not been registered as a CDM project or as a CPA of another PoA. For the special case that ETA is the entity implementing the CPA such a statement is not necessary. In addition ETA checks the UNFCCC data base to confirm that the CPA has not been registered as a CDM project or as a CPA of another PoA and provides a written statement in section A.4.7 of the CPA-DD.

The following procedure is used to ensure that each SWH is only included into one CPA. Before entering a SWH to the PoA database, ETA confirms that the following documents are available; “Customer Participation Agreement”, Eskom rebate form, Plumbing Certificate of Compliance, and the Supplemental Installation Protocol. ETA also checks that the serial number of the SWH, the installation address and the electricity account number are not already included in the PoA database. As a result, double-counting of individual

SWHs is avoided. At the time of verification the DOE can check the overall database to crosscheck that there are not two SWHs with the same serial number, the same address or the same electricity account number in the PoA database.

(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 accordance with §10 of the "Guidelines on assessment of debundling for SSC project activities (version 03)"[18], the CPA is exempted from performing a debundling check. Each of the independent subsystems/measures installed as part of the CPA, i.e. the individual residential SWH systems is no greater than 1% of the small scale thresholds defined by the methodology. AMS I.J. refers to §4(d) of the "General Guidelines to SSC CDM methodologies, i.e. a threshold of 64,000 m^2 of aperture area of the solar collectors. 1% of the threshold is 640m^2, which far exceeds the typical collector areas for residential SWH. The collector area for a typical SWH installed as part of the CPA is expected to be between 1.8 m^2 and 4.2 m^2.

The collector area of each SWH is included in the central database. SWH systems with a collector area of more than 640 m^2 are included in the CPA with an area of exactly 640 m^2:

(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

ETA signs an agreement with the entity implementing the CPA. The agreement specifies that the activity is included in the PoA. In the special case that ETA is the entity implementing the CPA, such an agreement is not necessary.

All customers sign "Participating Customer Agreements" with ETA. The agreement explicitly assigns all rights to the carbon credits to ETA. The agreements ensure that customers are aware that their SWH will be included in a CPA and that the coordinating entity is the legal owner of the CERs generated by the installed SWH. Customers will not be included in the CPA unless they have signed a "Participating Customer Agreement" with ETA. The agreement also includes that ETA has the right to arrange inspections of the SWH-systems for monitoring purposes.

A.4.4.2. Monitoring plan:

ETA is opting for a verification method that verifies each CPA separately, based on the monitoring plan in section B.6 of the CPA-DD.

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

ETA is implementing a system that will allow the DOE to verify the emission reductions for each individual CPA and to consolidate the CPAs to determine the emission reductions for the PoA as a whole. Each SWH is assigned exclusively to one single CPA, and the emission reductions can therefore be calculated for each CPA according to the available methods in AMS I.J, and no double-counting can occur.

The monitoring periods for all CPAs are calendar years.

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

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

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

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

The starting date for the PoA is 24/02/2010. This is the date when the Board of the Central Energy Fund (CEF) approved the pilot phase of the PoA and allocated funds to the project team (ETA). CEF is the mother company of ETA. This approval shows the time when the project participant was committed to real action, as the release of the ZAR10 million was for the rollout of the first 500 SWHs. From that point on ETA incurred expenses, large and small, for the implementation of the pilot phase of the project.

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 a procedure 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 ☐

Environmental analysis is undertaken at the PoA level, since the type of impacts of all CPAs is identical.

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

The PoA does not have any significant negative impacts on the environment or the people in South Africa There are also no negative transboundary impacts on other countries. The project reduces the consumption of fossil fuels, either directly or indirectly via decreasing the consumption of grid-based electricity. The project therefore reduces carbon emissions as well as emissions of other air pollutants (SO_2, NO_x, particulates). The installations take place in existing infrastructure i.e. residential buildings. Hence, the environmental effects gained from the project implementation are of a positive nature.

The positive environmental benefits of the installation of SWH include:

1. Decreased air and water pollution linked to the use of the fossil fuels;
2. Displacement of fossil fuels and reduction of greenhouse gas (GHG) emissions;

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),:

Under the South African law, the National Environmental Management Act 107 of 1998 does not require an environmental impact assessment (EIA) or any other assessment (i.e. basic assessment, scoping report) for the installation of SWHs.

More information on the national EIA law and process available at
http://www.eiatoolkit.ewt.org.za/process/what.html

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 ☒

The CPAs are intended to focus on certain geographical areas, for example municipalities. The impact of each CPA is very localized, all the benefits occur locally, and there are no negative environmental impacts that affect the wider region.

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

Not applicable. Local stakeholder comments are invited at the CPA-level.

D.3. Summary of the comments received:

Not applicable. Local stakeholder comments are invited at the CPA-level.

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

Not applicable. Local stakeholder comments are invited at the CPA-level.

SECTION E. Application of a baseline and monitoring methodology

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

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

Any SSC-CPA being included in the PoA shall apply the following methodology:
AMS-I.J: Solar water heating systems (SWH)[19]

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

Criteria	Justifications
1 ~~1. This methodology is applicable for the installation of residential~~	According to section A.4.2.2 only CPAs whose purpose is the installation of residential ~~or commercial~~ SWH for hot water production are eligible to be included in the PoA.

[19] The methodology is available at the UNFCCC website:
http://cdm.unfccc.int/methodologies/DB/GX9DV8QFP9X8BNR5GI1UUJD55EJ03A

~~solar water heating (SWH) systems and commercial SWH systems for hot water production.~~ This category comprises the installation of residential solar water heating (SWH) systems and commercial SWH systems for hot water production. The SWH systems displace electricity or fossil fuel that would otherwise have been used to produce hot water.	According to section A.4.2.2 a CPA shall demonstrate that the SWH systems displace electricity or fossil fuel that would otherwise have been used to produce hot water.
~~2. The SWH systems displace electricity or fossil fuel that would otherwise have been used to produce hot water.~~	~~According to section A.4.2.2 a CPA shall demonstrate that the SWH systems displace electricity or fossil fuel that would otherwise have been used to produce hot water.~~
2 There are two types of projects included in this category: retrofits and new construction. For the purposes of defining baselines and other requirements the following definitions apply: (a) Retrofit projects are SWH project(s) that replace existing electric or fossil fuel based water heating system(s) in existing facility(ies); (b) New construction projects are: (i) SWH project(s) installed in new facility(ies); (ii) SWH project(s) installed in existing facility(ies) that, prior to the project implementation, do not have installed water heating systems; (iii) SWH project(s) installed in existing facility(ies) which require	Only CPAs that are retrofit projects qualify for the PoA. According to section A.4.2.2 a CPA shall demonstrate that the SWH systems displace electricity or fossil fuel that would otherwise have been used to produce hot water. It needs to be demonstrated that each SWH replaces an existing electric or fossil fuel-based water heating system. This can be done by demonstrating that an existing electric or fossil fuel-based system has been permanently disabled.

water heating capacity expansions; or (iv) Replacement of failed solar water heating system(s). This methodology is applicable if it is shown (as per paragraph 8) that for new construction projects, conventional electric or fossil fuel based water heating system(s) would have been installed in the absence of the project activity.	
3 Commercial SWH systems shall include operational indicators that may be easily interpreted by the intended users of the systems and that indicate that water is being heated by solar energy. The minimum requirement for such an indicator is a visible temperature display (thermometer) on the solar preheat storage tank. The thermometer does not require calibration.	Not applicable. According to section A.4.2.2 only CPAs whose purpose is the installation of residential SWH for hot water production are eligible to be included in the PoA.
4 ~~3.~~ To qualify as a small-scale project, the definitions in paragraph 4(d) in the "General Guidelines to SSC CDM methodologies" (version 15), or the related paragraphs in the latest version of the guidelines are applicable.	The small-scale threshold for SWH projects in terms of aperture area is 64,000 m^2. According to section A.4.2.2 only CPAs that do not exceed the threshold are eligible for inclusion in the PoA.
5 ~~4.~~ For residential and commercial SWH projects the hot water consumption rate and temperature at which the hot water is supplied to the load, are used to determine emissions savings. The	According to section A.4.2.2 the energy savings have to be based on the hot water consumption as defined in paragraph 5 of AMS I.J. For CPAs that use the stipulated energy savings method it is sufficient to demonstrated that the average energy supply is less than the average energy demand as per ~~section~~ paragraph 10 (c) (iv) of AMS I.J.

consumption rate (and temperature) is the rate (and temperature) of water actually utilized and is not the rate (and temperature) at which hot water is produced.	

Table 3: Applicability criteria of AMS I.J for CPA

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

According to AMS-I.J the CPA boundary is the the physical, geographical site of the SWH systems. The boundary also extends to the facilities consuming the heated water generated by the SWH systems.

The GHG reduced by a CPA under the PoA is CO_2. The emission reduction takes place by displacing electricity or fossil fuels that would have been used at the existing electric or fossil fuel-based water heating systems, which are replaced by the SWH.

Source No.	Source	Green-house Gas	Direct / Indirect	Included / Excluded	Justification / Explanation
SB1	Electricity consumption at the existing water heating systems	CO_2	Indirect	Included	SWH systems included in the CPA replace existing water heating systems that would have consumed grid-based electricity in order to produce hot water.
SB2	Fossil fuel consumption at the existing water heating systems	CO_2	Direct	Included	The source should be included if the SWH systems included in the CPA replace existing water heating systems that would have consumed fossil fuels in order to produce hot water.
SP1	Electricity consumption by SWH systems	CO_2	Indirect	Included	SWH systems included in the CPA consume grid-based electricity for auxiliary equipment, such as pumps or back-up heaters.
SP2	Fossil fuel consumption by the SWH systems	CO_2	Direct	Included	The source should be included if SWH systems included in the CPA consume fossil fuels for auxiliary equipment.

Table 4: Baseline & Project Emission Sources

For the special case of a CPA that uses the Stipulated Energy Savings method, emission reductions are calculated directly as per paragraph 10 (c) (i) and (ii) of AMS I.J. A detailed calculation of baseline and project emissions is then not necessary.

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

The purpose of the PoA is the installation of SWHs as retrofit for an existing water heating system.

According to AMS I.J the baseline is defined as follows:

For retrofit projects, the baseline system(s) are the operating water heating system(s) and fuel source (fossil fuel or electricity) that existed immediately prior to the start of the SWH project activity.

In South Africa, hot water is predominantly heated by electric water heating systems. The domestic sector uses about 13 % from the total electricity consumption in the country and about 40 % of it is used for water heating. There are approximately 11 million households in the country of which the high and middle income households use electric geysers to heat water. More than 76 % of these income groups have an electric geyser. In the low income and poor segment households the penetration level of electric geysers is 21 %. In this income group there are over five million households that have an electricity connection, but cannot afford a geyser. These households heat up the water with kettles and stoves that use electricity or paraffin.[20][21]

For the special case of CPAs that use the Stipulated Energy Savings method to calculate emission reductions, only SWH that replace existing electric geysers qualify for inclusion in the CPA. The type of existing water heating system replaced by the SWH is recorded on the installation protocol along with a confirmation that the replaced water heating system has indeed been disabled.

For all CPAs, emission reductions are calculated according to paragraph 9 of AMS I.J as the energy savings that result from the project implementation multiplied by an emission factor for the electricity and/or fossil fuel displaced.

Section E.6.2 presents the equations used to calculate the baseline emissions.

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:

[20] O.D Dintchev 2004, Evaluation of Domestic Solar Water Heaters – Domestic Use of Energy Conference 2004.

[21] N. Magubabe 2009, Speaking Notes of the Acting Director-General of Department of Energy Ms Nelisiwe Magubabe, Johannesburg 5 November 2009.

For each CPA included in the PoA additionality shall be demonstrated using one of the following guidelines and applicable tools approved by the CDM Executive Board.

1. "Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 09.0". It needs to be shown that in the absence in the CPA, emission reductions would not occur due to the existence of barriers. If the barriers for the CPAs are identical to the barriers faced by the overall PoA as detailed in section A.4.3, it is sufficient to demonstrate that the barriers preventing the PoA are still in existence at the starting date of the CPA. Inasmuch as the penetration rate of SWHs in South Africa is relevant to demonstrate the existence of barriers, it should be distinguished between those SWHs that are installed with the benefit of carbon revenue from the CDM and those SWH that are installed without such revenue. Only SWH that are installed without carbon revenue should be counted as part of the penetration rate.

2. "Guidelines for Demonstrating Additionality of Micro-scale Project Activities", Version 04. In particular it needs to be demonstrated that
(a) the installed capacity of the SWHs in the CPA is less than 5 MW;
(b) the CPA is designed for distributed energy generation (, i.e. the SWHs are not connected to a national or regional grid);
(c) Each of the SWHs in the CPA is smaller than or equal to 1500kW electrical installed capacity;
(d) End users of the SWHs are residential households

~~A CPA included in the PoA can demonstrate its additionality using one of the following guidelines and applicable tools approved by the CDM Executive Board.~~
~~"Attachment A to Appendix B of the "Simplified modalities and procedures for small-scale CDM project activities". It needs to be shown that in the absence in the CPA, emission reductions would not occur due to the existence of barriers.~~
~~"Guidelines for demonstrating additionality of renewable energy projects =< 5 MW and energy efficiency projects with energy saving <=20 GWh per year". It needs to be shown that the total maximum energy savings potential of the SSC CPA is below the indicated thresholds.~~

~~For CPAs that use Attachment A of Appendix B of the Simplified Modalities and Procedures to demonstrate additionality, the barriers are identical to those faced by the PoA as detailed in section A.4.3.~~

For CPAs using the Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 09.0 the barriers for the CPA are identical to those for the overall PoA.

Customer-level Barriers:

The large-scale adoption of SWHs in South Africa is primarily prevented by the lack of financial resources for the purchase and installation of SWHs. The barrier is listed in paragraph 1 (d) of Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 09.0 ~~Attachment A to Appendix B~~ as "Other Barrier: Financial Resources". Technological barriers and barriers due to prevailing practice aggravate the situation.

The large-scale adoption of SWH would not have occurred in the absence of the project. According to a 2009 study[22] less than 100,000 SWHs have been installed even though there are close to 9 million households. The reasons for the low penetration rate of approximately 1% include high upfront costs of SWHs, insufficient financial incentives for their installation and lack of consumer awareness[23].

The high upfront capital cost of SWHs is the key barrier to the large-scale adoption of SWHs in South Africa[24]. SWHs cost between ZAR 12,000 and ZAR 35,000[25], approximately three times the cost of comparable electric geysers (ZAR 3000 and ZAR 10,000)[26]. SWH installation costs by themselves are between ZAR 2,000 and ZAR 6,000.[27] With a payback period (through electricity savings) of 5-6 years, the high upfront cost of SWHs is the biggest barrier for most South African customers, especially if they already have electric geysers installed.

Financial incentives for the installation of SWHs are small. In 2008 the South African government launched a SWH program via Eskom, the national power utility.[28] The program provides a one-time subsidy for the installation of a SWH. The amount of the rebate is based on the technical performance (Q-factor) of the SWH as determined by the South African Bureau of Standards (SABS). However, the Eskom subsidy is not sufficient to cover all costs associated with the purchase, installation and maintenance of a SWH over a 10-year period.[29] As a result, by the end of 2009 less than 5,000 SWHs had been installed under the Eskom program,[30] falling far short of the target set by the Department of Energy of South Africa in late 2009 of installing one-million SWHs by 2014.[31] The very limited success of the Eskom subsidy program clearly shows that even with the Eskom rebate the customers prefer an electric geyser. Moreover, a large share of South African households spend most of their income on basic needs and are unable to afford a technology with high upfront costs.

The financial barriers are aggravated by a lack of awareness and technical concerns on the part of potential customers. The perception of SWHs in South Africa is still often poor due to a past history where the industry was beset by inferior products and poorly qualified installers. As a result, customers have been following the practice of using electric geysers due to their perceived lower cost, better quality

[22] Report on the South African Solar Water Heater Industry – July 2009 W.Cawood, S.Theobald

[23] http://www.createacceptance.net/fileadmin/create-acceptance/user/docs/CASE_19.pdf

[24] http://www.erc.uct.ac.za/Research/publications/06Visagie-Prasad%20RET.pdf

[25] http://www.timeslive.co.za/sundaytimes/article155336.ece

[26] Averaged price of electric water heaters from quotations received from 3 geyser suppliers in South Africa (will be attached as an appendix/reference file.)

[27] http://www.eskomidm.co.za/residential/residential-technologies/solar-water-frequently-asked-questions#install

[28] For details on the program see http://www.eskomidm.co.za/residential/residential-technologies.

[29] Eskom Annual Report 2008.

[30] Eskom Distribution 2010, Solar Water Heating Programme, Monthly Status Report March 2010

[31] http://www.cef.org.za/solar_market_survey.pdf - Page 20, 6.1.1.

and greater security of supply[32]. Customers are reluctant to switch from a familiar and secure technology to a more costly new technology.

The above analysis shows that in the absence of the PoA the large-scale adoption of SWHs faces significant barriers. The barriers prevent the implementation of the programme in the absence of the PoA, but they do not affect the baseline alternative, i.e. continuing use of the existing water heating systems (predominantly electric geysers).

CPA-Level Barriers

An activity such as the proposed CPA needs to provide substantial additional incentives to customers in order to provide an affordable SWH solution that overcomes the aforementioned barriers.

As a result, the CPA offers participating customers a SWH financing scheme that makes the upfront investment costs of switching from an existing water heating system to a SWH unit manageable. The PoA offers customers the opportunity to pay the cost of their SWHs over a medium financing term (up to 72 months) with fixed instalments that are comparable to the savings in their electricity bill.

To address customer-level technology and prevailing practice barriers, the CPA provides the SWHs with a maintenance plan throughout the 6-year financing term, which greatly reduces the customer risk. The CPA also provides a 10-year warranty for each SWH system. This long-term programme is far beyond what is available in the current electric geyser or SWH market. In addition, the CPA offers user support via a call centre and thus further reduces the customer's risk associated with switching to a SWH.

The service package involves the following,

- upfront financing of SWH units on behalf of households
- provision of a medium-term repayment scheme by households to ETA Energy
- organisation of procurement and installation of SWH units
- programme publicity
- monitoring
- maintenance and user support
- legal arrangements between all actors

The costs for setting up and managing such a voluntary, coordinated action are very significant. ETA also faces significant risks, such as possible payment defaults of participating customers as well as the possible failure to attract a sufficient number of participating customers to cover the significant administrative and managerial costs.

Furthermore, the previously low demand for SWHs and the uncertainty in the market for SWH systems has prevented the development of a skills base to develop and support the mass scale-up of the SWH

[32] http://www.cef.org.za/solar_market_survey.pdf - Page 20, 6.1.1.

market[33]. The CPA faces additional risks when aiming to scale up SWH adoption in such an undeveloped SWH market with the uncertain availability and price of equipment and qualified installers.

These above costs and risks make the implementation of a CPA unattractive to ETA and revenue from the sale of carbon credits is required to make the CPA viable for ETA.

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

For each CPA included in the PoA additionality shall be demonstrated using one of the following guidelines and applicable tools approved by the CDM Executive Board.

1. "Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, Version 09.0." It needs to be shown that in the absence in the CPA, emission reductions would not occur due to the existence of barriers. If the barriers for the CPAs are identical to the barriers faced by the overall PoA as detailed in section A.4.3, it is sufficient to demonstrate that the barriers preventing the PoA are still in existence at the starting date of the CPA. Inasmuch as the penetration rate of SWHs in South Africa is relevant to demonstrate the existence of barriers, it should be distinguished between those SWHs that are installed with the benefit of carbon revenue from the CDM and those SWH that are installed without such revenue. Only SWH that are installed without carbon revenue should be counted as part of the penetration rate.

2. "Guidelines for Demonstrating Additionality of Micro-scale Project Activities", Version 04. In particular it needs to be demonstrated that
(a) the installed capacity of the SWHs in the CPA is less than 5 MW;
(b) the CPA is designed for distributed energy generation (, i.e. the SWHs are not connected to a national or regional grid);
(c) Each of the SWHs in the CPA is smaller than or equal to 1500kW electrical installed capacity;
(d) End users of the SWHs are residential households
~~A CPA to be included in the PoA shall fulfil the following criteria for demonstrating additionality.~~

~~(1) A CPA included in the PoA can demonstrate its additionality using one of the following guidelines and applicable tools approved by the CDM Executive Board.~~
~~Attachment A to Appendix B of the "Simplified modalities and procedures for small scale CDM project activities". It needs to be shown that in the absence in the CPA, emission reductions would not occur due to the existence of barriers.~~
~~"Guidelines for demonstrating additionality of renewable energy projects =< 5 MW and energy efficiency projects with energy saving <=20 GWh per year". It needs to be shown that the total maximum energy savings potential of the SSC CPA is below the indicated thresholds.~~

~~(2) If barrier analysis according to Attachment A is used to demonstrate the additionality of a CPA under the PoA, then the barriers that prevent the implementation of the PoA overall, also prevent the~~

[33] http://www.environment.gov.za/HotIssues/2009/CTF-InvestmentPlan/cleantechnologyfund.pdf - Page 145, P 49

~~implementation of an individual CPAs. It shall be demonstrated for each CPA that the barriers that apply for the PoA continue to exist at the starting date of the CPA. Inasmuch as the penetration rate of SWHs in South Africa is relevant to demonstrate the existence of barriers, it should be distinguished between those SWHs that are installed with the benefit of carbon revenue from the CDM and those SWH that are installed without such revenue. Only SWH that are installed without carbon revenue should be counted as part of the penetration rate.~~

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:

Emission reductions

Emission reductions for each CPA included in the PoA shall be calculated according to paragraphs 9 to 11 of AMS I.J, version 1.

According to paragraph 9 of AMS I.J "emission reductions are calculated as the energy savings that result from the project implementation multiplied by an emission factor for the electricity and/or fossil fuel displaced. For calculating the emission factor for displaced fossil fuels, reliable local or national data shall be used. IPCC default values shall be used only when country or project specific data are documented to be either not available or not reliable."

For the emission factor for displaced electricity, an annual emission factor for grid-based electricity has been derived below in accordance with the provisions in AMS-I.D "Grid connected renewable electricity generation".

According to paragraph 10 of AMS I.J "energy savings that result from the project implementation shall be determined using one of following methods", i.e. Model-based method, System Metering Method or Stipulated Energy Savings method. The choice of a method shall be made ex-ante and specified in the SSC-CPA and cannot be changed during the crediting period.

For the special case of a SSC-CPA that applies the Stipulated Energy Savings method the following approach is used.

1. It is demonstrated in section B.2 of the SSC-CPA-DD that the CPA fulfills the applicability conditions of the Stipulated Energy Savings method in paragraph 10 (c) of AMS I.J.
2. For each installed SWH it is determined whether it "can be reasonably demonstrated to have substantial hot water consumption demand year-round." For all SWH applications in primary residences no further demonstration of year-round hot water consumption demand is necessary. The classification of a building as primary residence is done by the installer and recorded in the installation protocol.
3. The stipulated energy savings values are applied according to paragraph 10 (c) (i) and (ii).
4. The stipulated energy savings are multiplied by the emission factor for grid-based electricity, which is derived below.

Calculation of emission factor for grid-based electricity

As the project activity generates electricity into the national grid system the $CEF_{elec,BL,y}$ is calculated according the version 2.2.1 of the "Tool to calculate the emission factor for an electricity system"[34].

Step 1: Identify the relevant electricity system

In South Africa Eskom dominates the electricity supply market and only a few municipal and private generators exists. For Eskom power plants public information exists until 2010, for the private generators information is available only partly and until 2005. It is considered to be acceptable that the Eskom represent the electricity production industry in South Africa, as it produces over 96 % of electricity in South Africa. Only less than 4 % comes from private and municipal generators. [35] Therefore, Eskom grid is identified as the relevant electricity system.

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

No off-gird power plant is chosen in the Eskom grid.

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

Because the low-cost/must run resources of Eskom grid is less than 50% of total grid generation[36], the option A of Simple OM is selected here.

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

Option A is applied here, which is based on data of fuel consumption and net electricity generation of each power plant/unit.

$EF_{grid,OMsimple,y} = [\sum_m EG_{m,y} * EF_{EL,m,y}] / \sum_m EG_{m,y} = 0.9694 \text{ t } CO_2 / MWh$ (1)

where

$EF_{EL,m,y} = \sum_i [\sum_m FC_{i,m,y} * NCV_{i,y} * EF_{CO2,i,y}] / \sum_m EG_{m,y}$ (2)

~~$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} * NCV_{i,y} * EF_{CO2,i,y}}{\sum_m EG_{m,y}} = 0.9694 \text{ t } CO_2 / MWh$ (28)~~

with~~Where,~~

[34] The detailed data and calculations have been provided to the DOE in a separate supporting spreadsheet.

[35] Electricity supply statistics for South Africa, 2005, published by National Energy Regulator of South Africa, page 6, 14

[36] Eskom database: http://www.eskom.co.za/live/content.php?Item_ID=4226&Revision=en/3

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in the year *y*, tCO_2/MWh
$FC_{i,m,y}$ = Amount of fossil fuel type *i* consumed by power plant/unit *m* in the year *y*, mass or volume unit
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y*, tCO_2/GJ
$EG_{m,y}$ = Net electricity generated and delivered to the grid in year *y*, MWh
m = All power plants/units serving the grid in year *y* except low-cost/must-run power plants/units
i = All fossil fuel types combusted in the power plant/unit *m* in year *y*
y = Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (*ex-ante* option) or the applicable year during monitoring (*ex-post* option).

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

Option 1 is applied, i.e. the ex-ante option.

(a) $SET_{5\text{-units}}$: The five most recently built power plants have been selected as: Kendal (1988), Majuba (1996), Ankerlig (2007), Gourikwa (2007) and Palmiet (1988). The annual generation of the five plants is 45,659,232 MWh.

(b) $SET_{>20\%}$: The annual electricity generation of the project electricity system was 215,953,317 MWh in 2009/10. The four most recently built power plants comprise slightly more than 20% of the annual generation. Kendal (1988), Majuba (1996), Ankerlig (2007) and Gourikwa (2007). The annual generation of the four plants is 45,659,232 MWh.

(c) SET_{sample} = $SET_{5\text{-units}}$, since $SET_{5\text{-units}}$ comprises more power plants than $SET_{>20\%}$.[37] The following power plants are more than 10 years old: Kendal (1988), Majuba (1996) and Palmiet (1988).

(d) The ESKOM database does not include any power plants that are registered as CDM projects.

(e) Kendal (1988), Majuba (1996) and Palmiet (1988) have to be included in order to reach 20% of annual generation.

(f) $SET_{sample\text{-}CDM\text{->}10yrs}$ includes the following power plants: Kendal (1988), Majuba (1996), Ankerlig (2007), Gourikwa (2007) and Palmiet (1988).

The build margin emission factor is calculated as follows,

[37] It is not clear which set of power plants has the higher annual generation, since the oldest plant is a hydro pump storage plant, which is a net consumer of energy.

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}} = 0.9780 \text{ t } CO_2 / \text{MWh} \quad (29\text{3})$$

Where,

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in the year *y*, tCO_2/MWh

$EG_{,m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y*, MWh

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y*, tCO_2/MWh

$EG_{m,y}$ = Net electricity generated and delivered to the grid by power unit *m* in year *y*, MWh

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

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

Step 6: Calculate the combined margin emission factor

$$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM} = 0.9737 \text{ t } CO_2 / \text{MWh} \quad (30\text{4})$$

For this project, W_{OM} = 0.5 and W_{BM} = 0.5 for the crediting period.

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

According to paragraphs 9 and 11 of AMS I.J "emission reductions are calculated as the energy savings that result from the project implementation multiplied by an emission factor for the electricity and/or fossil fuel displaced."

$$ER_y = EF_y * ES_y / (1 - TDL) \quad (31\text{5})$$

Data/parameter	Description
ER_y	Emission reductions in year y (t CO_2)
EF_y	Carbon emission factor for grid-based electricity in year y (t CO_2 / MWh)
TDL	Transmission and distribution losses (%)
ES_y	Electricity savings in year y (MWh)

$$ES_y = P_{plan,y} * \sum_j f_{j,y} * [A_{j,corr} * (YRD_j * 450\ kWh + (1 - YRD_j) * 300\ kWh)] + P_{noplan,y} * \sum_k f_{k,y} * [A_{k,corr} * (YRD_k * 450\ kWh + (1 - YRD_k) * 300\ kWh)] \quad (\text{~~32~~}26)$$

with

$$P_{plan,y} = \sum_m I_{m,y} \quad (\text{~~32a~~}6a)$$

$$P_{noplan,y} = \sum_l I_{l,y} \quad (\text{~~32b~~}6b)$$

Data/parameter	Description
ES_y	Electricity savings in year y (MWh)
$f_{i,y}$	Fraction of year y, during which SWH_i was operational
$A_{i,corr}$	Corrected collector area of SWH_i (m^2) in order to ensure conservativeness in line with the requirements of AMS I.J.
YRD_i	Confirmation whether SWH application has hot water consumption demand year-round. YRD takes the value 1 if there is year-round hot water consumption, for example whenever a residential building is the primary residence. YRD takes the value 0 if there is no year-round hot water consumption, for example if a residential building is a secondary residence or rented to tourists.
$P_{plan,\ y}$	Percentage of SWH systems operating and in compliance with manufacturer-required maintenance procedures among SWHs that are either maintenance-free or are under a maintenance plan during the monitoring period. The percentage is established via bi-annual inspection of a sample of SWHs as described in section B.6.1.
$P_{noplan,\ y}$	Percentage of SWH systems operating and in compliance with manufacturer-required maintenance procedures Percentage of SWHs that have successfully passed the bi-annual inspection among SWH that require maintenance and are not covered by a maintenance plan during the monitoring period. The percentage is established via bi-annual inspection of a sample of SWHs as described in section B.6.1.
$I_{m,y}$	Result of bi-annual inspection in year y. $I_{m,y}$ = 1 if the SWH m successfully passes the inspection. $I_{m,y}$ = 0 if the SWH m fails the inspection.
$I_{l,y}$	Result of bi-annual inspection in year y. $I_{l,y}$ = 1 if the SWH l successfully passes the inspection. $I_{l,y}$ = 0 if the SWH l fails the inspection.
j	j = 1,2,3,…n; for SWH installed in buildings that have substantial hot water consumption year-round
k	k = 1,2,3,…n; for SWH installed in buildings that do not have substantial hot water consumption year-round
m	m = 1,2,3,…M; where M is the sample size for SWHs that are either maintenance-free or are under a maintenance plan
l	L = 1,2,3 … L; where L is the sample size for SWHs that require maintenance and are not covered by a maintenance plan

The actual collector area Ai is corrected in order to ensure conservativeness in line with the requirements of AMS I.J., in particular applicability condition (iii) and (iv) on page 5 of the methodology:

Applicability condition (iii) requires that "Thermal storage volume (preheat tank volume) is either: (a) At least 50 litres per square meter of collector area; or (b) Adequate to bridge time gap between solar supply and load demand during an average winter day for a typical installation, as demonstrated by calculation or model." By setting a maximum for Ai,corr of TSi / (50l/m2) it is ensured that any SWH included in the database will always meet condition (a).

Applicability condition (iv) requires that "The sizing calculations of the SHW systems are documented to be such that the average annual, daily amount of water heated by the SWH systems is less than or equal to the average annual, daily hot water demand for a typical installation." By setting a maximum for Ai,corr of Ai,demand it is ensured that any SWH included in the database will always meet this condition. Ai,demand is calculated based on the number of people in the household, the average hot water consumption per person, the hot water temperature, the inlet water temperature, and the stipulated energy savings per m2 according to AMS I.J.[38]

$$A_{i,corr} = \min [A_i ; TS_i / (50l/m^2) ; A_{i,demand}] \quad (3\text{~~3~~}7)$$

Data/parameter	Description
$A_{i,corr}$	Corrected collector area of SWHi (m^2)
A_i	Actual collector area of SWHi (m^2)
TS_i	Tank size of SWHi (liters)
$A_{i,demand}$	Collector area required to produce average annual hot water demand (m^2)
i	i = 1,2,3,…n; for SWH installed in buildings that have substantial hot water consumption year-round

$$A_{i,demand} = N_i * V_d * m * G * (T_h - T_c) / Q_{450} \quad (3\text{~~4~~}8)$$

Where

N_i	Number of people in household served by SWHi (unit-less)
V_d	Average annual hot water consumption per person (50 liters / day)
m	Mass of water (1.00 kg / liter)
G	Specific heat capacity of water (4.18 kJ / (°C * kg)
T_h	Temperature of hot water (65°C)
T_c	Temperature of cold inlet water (14°C)
Q_{450}	Stipulated energy supply for SWH in households with hot water consumption demand year-round (4.438 MJ / m^2/ day, equivalent to 450 kWh per year)

[38] A supporting spreadsheet has been provided to the validation team in order to demonstrate how Ai,corr and Ai,demand will be calculated.

Leakage

According to paragraph 12 of AMS I.J leakage is to be considered "if the project equipment is transferred from another activity and/or baseline equipment is not destroyed".

All SWH installed under any SSC-CPA are new and have not been transferred from another activity. This is confirmed by the installer in the installation protocol which is archived by ETA.

All existing water heating systems replaced by SWH under any SSC-CPA are permanently disabled. This is confirmed by the installer in the installation protocol which is archived by ETA.

As a result no leakage has to be considered.

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

The following data and parameters are available at the time when SSC-CPA is included into the PoA:

Data / Parameter:	**TDL**
Data unit:	%
Description:	Transmission and distribution loss
Source of data used:	**Eskom Holdings Limited** Integrated Report 2011, Customer Network Business, Distribution division p. 186 [downloaded from http://financialresults.co.za/2011/eskom_ar2011/ http://www.eskom.co.za/c/84/annual-report/ http://www.eskom.co.za/live/click.php?u=http%3A%2F%2Ffinancialresults.co.za%2F2011%2Feskom_ar2011%2Findex.php&o=Item%2B600&v=990da8
Value applied:	8.25 %
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is official data published by the national power utility Eskom.
Any comment:	n/a

Data / Parameter:	**EF_{grid}**
Data unit:	tCO_2/MWh
Description:	Carbon emission factor for grid-based electricity
Source of data used:	Section E.6.1 of the PoA-DD.
Value applied:	0.9737 tCO_2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually	The factor has been calculated according to the "Tool to calculate the emission factor for an electricity system"

applied :	
Any comment:	A supporting spreadsheet detailing the calculations has been made available to the verifier.

Data / Parameter:	**Q_{450}**
Data unit:	MJ / m^2 / day
Description:	Stipulated daily energy supply for SWH in households with hot water consumption demand year-round
Source of data used:	Calculated based on value of 450 kWh / m^2 per year in stipulated energy savings in AMS I.J
Value applied:	4.438
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to AMS I.J stipulated energy savings are 450 kWh / m^2 per year. At a 100% efficiency factor for the baseline equipment the annual stipulated energy supply from the SWH is also 450 kWh per year or 4.438 MJ per day. The assumption of 100% efficiency is conservative since the stipulated energy supply would be lower at lower efficiencies. A lower stipulated energy supply would result in more cases where energy demand exceeds energy supply so that more SWH qualify for the CPA.
Any comment:	

Data / Parameter:	**V_d**
Data unit:	
Description:	Daily hot water demand per person
Source of data used:	Josua P. Meyer. A review of domestic hot-water consumption in South Africa. R&D Journal, 2000, 16 (3), p.59.
Value applied:	59
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is for houses in medium-density communities, which are representative of the developed communities targeted by the PoA.
Any comment:	

Data / Parameter:	**T_h**
Data unit:	°C
Description:	Temperature of hot water that corresponds to daily hot water demand per person
Source of data used:	Meyer
Value applied:	65
Justification of the choice of data or description of measurement methods and procedures actually	Josua P. Meyer. A review of domestic hot-water consumption in South Africa. R&D Journal, 2000, 16 (3), p.57.

applied :	
Any comment:	

Data / Parameter:	**T_c**
Data unit:	°C
Description:	Temperature of cold water entering the SWH system
Source of data used:	Dr. Riaan Rankin & Dr. Martin van Eldik: An Investigation into the Energy Savings and Economic Viability of Heat Pump Water Heaters applied in the residential sector – A Comparison with Solar Water Heating Systems. Updated: Current Market Economics. M-Tech Industrial (Pty) Ltd / North-West University October 2010 (Original Article released in September 2008), page 5.
Value applied:	14°C
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

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:

For any SSC-CPA included into the PoA all data and parameters necessary for the application of the chosen method to calculate emission reductions (See paragraph 10 of AMS I.J) shall be monitored.

For the special case of where the Stipulated Energy Savings method has been chosen for a SSC-CPA, the following data/parameters shall be monitored throughout the crediting period of the CPA:

Data / Parameter:	**A_i**
Data unit:	M^2
Description:	Collector area of SWH_i, where i is the ID number of a particular SWH in the CPA
Source of data to be used:	Technical Specifications of each SWH type. The data is included in the sheet "SWH System Specs".
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3.41 m^2 (on average)
Description of measurement methods	The installer enters the value into the installation protocol.

and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\mathbf{A_{i,corr}}$
Data unit:	m^2
Description:	Corrected collector area of SWH_i, where i is the ID number of a particular SWH in the CPA. The collector area is corrected in order to ensure conservativeness with regard to the applicability conditions (iii) and (iv) on page 5 of AMS I.J.
Source of data to be used:	Calculated based on equation (33).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3.41 m^2 (on average). The number of SWHs where corrections are necessary is expected to be very small.
Description of measurement methods and procedures to be applied:	The calculation is based on the monitored values of A_i, TS_i and N_i, the latter indirectly via Ai,demand.
QA/QC procedures to be applied:	See tables for A_i, TS_i and N_i.
Any comment:	

Data / Parameter:	$\mathbf{A_{i,demand}}$
Data unit:	m^2
Description:	Collector area of SWH_i that would be sufficient to provide the stipulated energy savings according to AMS I.J, where i is the ID number of a particular SWH in the CPA
Source of data to be used:	Calculated based on equation (34).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	>3.41 m^2 (on average). The value is expected to regularly exceed the actual collector area.
Description of measurement methods and procedures to be applied:	The calculation is based on the monitored value for N_i, the number of people in the household.
QA/QC procedures to be applied:	See table for N_i.
Any comment:	

Data / Parameter:	**TS_i**
Data unit:	litres
Description:	Tank size of SWH_i, where i is the ID number of a particular SWH in the CPA
Source of data to be used:	Installation Protocol
Value of data applied for the purpose of calculating expected emission reductions in section B.5	251 litres (on average)
Description of measurement methods and procedures to be applied:	The installer enters the value into the installation protocol.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	**N_i**
Data unit:	Unit-less
Description:	Number of people in the household served by SWHi, where i is the ID number of a particular SWH in the CPA
Source of data to be used:	Eskom rebate Application Form
Value of data applied for the purpose of calculating expected emission reductions in section B.5	4 (on average)
Description of measurement methods and procedures to be applied:	The installer enters the value on the Eskom application form.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	**$f_{i,y}$**
Data unit:	%
Description:	Fraction of the year y, for which SWH_i was operational
Source of data to be	The monitored emission reductions are calculated based on installation records

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	For the ex-ante emission reduction calculation the following values are applied: 100%, if SWH is already installed at the beginning of year y 40%, if SWH is installed during year y The 40% reflects that SWHs that are installed during year y contribute energy savings only for a portion of the year. 50% could be used as a default given that it is unknown in advance at what time during the year the SWH will be installed. 40% has been chosen in order to ensure conservativeness.
Description of measurement methods and procedures to be applied:	The installer enters the date into the installation protocol.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\mathbf{AT}_i$
Data unit:	Success / Failure
Description:	Result of acceptance test
Source of data to be used:	Acceptance test protocol
Value of data applied for the purpose of calculating expected emission reductions in section B.5	For the emission reduction calculation it is assumed that 100% of the installed SWH will pass the acceptance test.
Description of measurement methods and procedures to be applied:	Acceptance test covers: • system operation per-design specifications • change-of-operating modes over a range of typical operating conditions SWH that do not pass the acceptance test are not included in the CPA
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\mathbf{I}_{m,y}$, $\mathbf{I}_{l,y}$
Data unit:	Dimensionless
Description:	Result of bi-annual inspection in year y
Source of data to be used:	Inspection records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1, if the SWH successfully passes the inspection 0, if the SWH fails the inspection For the ex-ante emission reduction calculation it is assumed that 95% of the installed SWH pass the inspection.

Description of measurement methods and procedures to be applied:	The inspection covers the following items: • Check that system is in operation • Review of maintenance records. Compliance with manufacturer-required maintenance procedures.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	**$P_{plan,y}$**
Data unit:	%
Description:	Probability that a SWH that is either maintenance-free or covered by a maintenance plan is operating and in compliance with manufacturer-required maintenance procedures
Source of data to be used:	Calculated based on results of biannual inspection
Value of data applied for the purpose of calculating expected emission reductions in section B.5	95%. The ex-ante emission reduction calculation is based on the fact that during the first six years all the SWHs are covered by a maintenance plan. Beyond the first six years it is assumed that 50% of the SWHs are maintenance-free. This is conservative since the most popular models are maintenance-free. The details of the calculation are included in the "Emission Reduction Calculation" spreadsheet.
Description of measurement methods and procedures to be applied:	Calculated based on equation (32a). • $P_{plan,y} = \sum_m I_{m,y}$
QA/QC procedures to be applied:	Not applicable
Any comment:	

Data / Parameter:	**$P_{noplan,y}$**
Data unit:	%
Description:	Probability that a SWH that requires maintenance and is not covered by a maintenance plan is operating and in compliance with manufacturer-required maintenance procedures
Source of data to be used:	Calculated based on results of biannual inspection
Value of data applied for the purpose of calculating expected emission reductions in section B.5	50%
Description of measurement methods and procedures to be applied:	Calculated based on equation (32b). • $P_{noplan,y} = \sum_l I_{l,y}$
QA/QC procedures to be applied:	Not applicable

Any comment:	

Data / Parameter:	**YRD_i**
Data unit:	No dimension
Description:	Confirmation whether the SWH application has hot water consumption demand year-round
Source of data to be used:	Customer Participation Agreement
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1, if SWH application has year-round demand 0, if SWH application does not have year-round demand For the emission reduction calculation it is assumed that 99% of the installed SWH are in applications that have year-round hot water consumption demand.
Description of measurement methods and procedures to be applied:	The Customer Participation Agreement contains a clause whether the application is a primary residence. If so, then it is assumed to have year-round hot water consumption demand.
QA/QC procedures to be applied:	
Any comment:	

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

One-time monitoring at the time of installation
(1) Collector area
(2) Tank size
(3) Household size
(4) Type of existing water heating system
(5) Confirmation of permanent dismantling of the existing water heating system
(6) Confirmation that SWH has successfully passed SABS testing
(7) Confirmation that SWH is installed in a ~~R~~residential ~~or commercial~~ application
(8) Year-round hot water consumption demand or not
(9) Tilt and orientation of the SWH
(10) Confirmation that there is no shading on SWH

One-time monitoring at the time of the acceptance test
(6) Confirmation that acceptance test was successfully passed

Bi-annual inspection

(7) Confirmation that SWH was operational at the time of the inspection
(8) Confirmation that SWH complied with maintenance requirements

According to paragraph 14 of AMS I.J, not all of the SWHs have to undergo bi-annual inspection. Instead a sampling approach can be used to determine the percentage of systems operating and in compliance with manufacturer-required maintenance procedures. According to paragraph 15 of AMS I.J "when biennial inspection is chosen a 95% confidence interval and 5% margin of error shall be achieved for the sampling parameter. A common sampling plan is undertaken for the whole PoA, i.e. the populations of all CPAs are clubbed together, sample size is determined and a single survey is undertaken to collect data. This is justified because the PoA is homogeneous, i.e. has a high degree of standardization across CPAs. The same types of SWHs are installed across all CPAs and the same warranty and maintenance plans are offered. As a result the parameter of interest, the share of SWHs that remains operational and in compliance with the maintenance procedures, is not expected to change over the short or medium term.[39]

The statistical properties of the sample results are assumed to follow the characteristics of the binomial distribution.

The assumption of a binomial distribution is valid under the following conditions:
(a) an experiment is repeated a fixed number of times
(b) each trial of the experiment has two possible outcomes
(c) the probability of success is the same for each trial
(d) the trials are statistically independent

The assumption is justified due to the following reasons:

(a) The experiment is whether a certain SWH passes the inspection. The experiment is repeated n times, where n is the sample size.
(b) There are two possible outcomes, either the SWH passes the inspection or it does not pass.
(c) Each SWH is covered by a 10-year warranty and a 6-year maintenance plan, unless a SWH type is completely maintenance-free. If a SWH fails to operate it will be repaired. The probability of a successful inspection is therefore likely to be very similar across SWH, with the exception of SWHs, which require maintenance and where the maintenance plan has expired after year 6.
(d) The ability of one SWH to operate is independent from other SWHs.

The needed sample size is determined by the required 95% confidence interval ($\alpha = 0{,}05$) and the 5% margin of error ($e = 0{,}05$), where $e = | \theta - p |$ is the absolute value of the difference between the observed probability (p) in the sample and the true probability. The z-value for the 95% confidence interval is $z = 1.96$, according to the table for the binomial distribution.

The confidence interval depends on the probability of success (p) and is determined reliably by the Wilson Score Interval [40]

[39] The conditions of the draft standard for sampling and surveys for CDM Project Activities and Programme of Activities (paragraphs 18-22) are met. See http://cdm.unfccc.int/public_inputs/2011/eb63_05/draft_standard_sampling.pdf

[40] The Wilson Score Interval has better statistical properties than the Normal Approximation Interval. http://en.wikipedia.org/wiki/Binomial_proportion_confidence_interval. The excellent performance of the Wilson Score Interval method is also emphasized in a paper by Sean Wallis of the University College of London:

http://www.ucl.ac.uk/english-usage/staff/sean/resources/binomialpoisson.pdf

$\{p + 1 / (2 * n) * z^2 \pm z * [(p * (1 – p)) / n + z^2 / (4 * n^2)]^{(1/2)}\} / (1 + (1 / n) * z^2)$

Using this formula it can be determined whether a certain sample size (n) is sufficient depending on the observed probability of success (p) and the maximum error margin (e). The below sample sizes are sufficient, since they meet the condition that the margin of error (e) is below 5%:

$\{p + 1 / (2 * n) * z^2 \pm z * [(p * (1 – p)) / n + z^2 / (4 * n^2)]^{(1/2)}\} / (1 + (1 / n) * z^2) – p < e$, with e = 5%

P	0.5	0.2	0.1	0.05	0.02	0.01	0.005
N	400	300	200	150	125	100	100
e	4,88%	4,89%	4,94%	4,75%	4,24%	4,45%	4,11%

Table 5: Required sample size for different probabilities in the binomial distribution

At least 150 randomly chosen SWH will be monitored. If the sample size turns out not to be sufficient because the share of failed inspections exceeds 5%, then further random sampling will be done in steps of at least 50 SWH until the required sample size is reached.

SWHs that are not either maintenance-free or covered by a free maintenance program will be sampled separately, since the failure rate (inability to demonstrate compliance with maintenance requirements) is expected to be higher. The sampling size for this group of SWH is 400, which is sufficient for any failure rate. As long as the numbers for such SWHs is small, PPs may choose not to conduct sampling on these SWHs and forego the related emission reductions.

All SWHs have to pass an acceptance test in order to receive their Certificate of Compliance. As a result no sampling is required in years 2011 and 2012. The values for $P_{plan,2011}$, $P_{plan,2012}$, $P_{noplan,2011}$, $P_{noplan,2012}$ are 1. The first sampling will take place in year 2013, and the obtained percentage will be applied to years 2013 and 2014. The second sampling will take place in year 2015, and the obtained percentage will be applied to years 2015 and 2016 and so on. This is in accordance with paragraph 14 of AMS I.J.

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

The baseline study and monitoring methodology were completed on ~~15~~23/07~~10~~/201~~21~~ by

Organizations:	CarbonStream Africa
Address:	152 Ann Crescent, Strathavon, Sandton
Postal Zip/city:	Johannesburg
Country:	Republic of South Africa
Represented by:	Seoka, Lehlogonolo Tel: +27 (0) 102014817 Email: lehlogonolos@cefgroup.co.za

Organizations:	GreenStream Network Plc
Address:	Lapinlahdenkatu 3
Postal Zip/city:	00180 Helsinki
Country:	Finland
Contact Information:	Jürgen Wiesmann Telephone: +358 20 743 7800 Fax: +358 20 743 7810 info@greenstream.net

Annex 1

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

Organization:	ETA Energy (Pty) Ltd.
Street/P.O.Box:	125 Ann Crescent, Strathavon, Sandton
Building:	CEF House, Block C, Upper Grayston Office Complex
City:	Johannesburg
State/Region:	Gauteng
Postfix/ZIP:	2146
Country:	Republic of South Africa
Telephone:	+27 10 201 4700
FAX:	
E-Mail:	
URL:	www.cefgroup.co.za
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Shabalala
Middle Name:	
First Name:	Jabulani
Department:	ETA Energy
Mobile:	
Direct FAX:	
Direct tel:	+2710 201 4726
Personal E-Mail:	jabulanis@cefgroup.co.za

Organization:	Ministry for Foreign Affairs of Finland
Street/P.O.Box:	P.O. Box 512, Meripaja, Katajanokanlaituri 3
Building:	Department for Development Policy Unit for International Environmental Policy
City:	Helsinki
State/Region:	
Postcode/ZIP:	00023 Government
Country:	Finland
Telephone:	+358 9 1605 5592
FAX:	+358 9 1605 6055
E-Mail:	keo-60@formin.fi
URL:	
Represented by:	Elina Ruoho
Title:	
Salutation:	Ms.
Last name:	Ruoho
Middle name:	
First name:	Elina
Department:	Department for Development Policy
Mobile:	+358 40 739 6883
Direct FAX:	+358 9 1605 6055
Direct tel:	+358 91 605 6180
Personal e-mail:	

Organization:	Nordic Carbon Fund Ky
Street/P.O.Box:	Lapinlahdenkatu 3, 4th floor
Building:	
City:	Helsinki
State/Region:	
Postcode/ZIP:	00180
Country:	Finland
Telephone:	+358 20 743 7800
FAX:	+358 20 743 7810
E-Mail:	jussi.nykanen@greenstream.net
URL:	
Represented by:	Jussi Nykänen
Title:	
Salutation:	Mr.
Last name:	Nykänen
Middle name:	Ilmari
First name:	Jussi
Department:	
Mobile:	+358 40 840 8001
Direct FAX:	+358 20 743 7810
Direct tel:	+358 40 840 8001
Personal e-mail:	jussi.nykanen@greenstream.net

Organization:	Fine Carbon Fund Ky
Street/P.O.Box:	Lapinlahdenkatu 3, 4th floor
Building:	
City:	Helsinki
State/Region:	
Postcode/ZIP:	00180
Country:	Finland
Telephone:	+358 20 743 7800
FAX:	+358 20 743 7810
E-Mail:	jussi.nykanen@greenstream.net
URL:	
Represented by:	Jussi Nykänen
Title:	
Salutation:	Mr.
Last name:	Nykänen
Middle name:	Ilmari
First name:	Jussi
Department:	
Mobile:	+358 40 840 8001
Direct FAX:	+358 20 743 7810
Direct tel:	+358 40 840 8001
Personal e-mail:	jussi.nykanen@greenstream.net

Organization:	Climate Opportunity Fund Ky
Street/P.O.Box:	Lapinlahdenkatu 3, 4th floor
Building:	
City:	Helsinki
State/Region:	
Postcode/ZIP:	00180
Country:	Finland
Telephone:	+358 20 743 7800
FAX:	+358 20 743 7810
E-Mail:	jussi.nykanen@greenstream.net
URL:	
Represented by:	Jussi Nykänen
Title:	
Salutation:	Mr.
Last name:	Nykänen
Middle name:	Ilmari
First name:	Jussi
Department:	
Mobile:	+358 40 840 8001
Direct FAX:	+358 20 743 7810
Direct tel:	+358 40 840 8001
Personal e-mail:	jussi.nykanen@greenstream.net

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I countries has been received for this PoA

Annex 3

BASELINE INFORMATION

Please see section E.1 to E.4.

The supporting spreadsheet where the carbon emission factor for grid-based electricity is calculated has been provided as a separate document to the verifier.

Annex 4

MONITORING INFORMATION

Please see section E.7.