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# VERIFICATION / CERTIFICATION REPORT

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## “SASSA LOW PRESSURE SOLAR WATER HEATER PROGRAMME” IN SOUTH AFRICA

(UNFCCC Registration Ref. No. 4302)

REPORT No. 2012-9794

REVISION No. 03

Monitoring Period:  
12 March 2011 to 31 December 2011

DET NORSKE VERITAS<sup>TM</sup>



## MANAGING RISK

Date of first issue: 7 January 2014	Project No.: PRJC-417049-2012-CCS-ITA
Approved by: Michael Lehmann	Organisational unit: Climate Change Services
Client: International Carbon	Client ref.: Laura Lathi

### Summary:

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions reported for the programme of activities “SASSA Low Pressure Solar Water Heater Programme” in South Africa (UNFCCC Registration Ref. No. 4302) for the period 12 March 2011 to 31 December 2011.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (version 06) of 13 January 2014 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology AMS-I.C (version 17) and the monitoring plan contained in the PoA-DD version 05 of 22 May 2013.

DNV Climate Change Services AS is able to certify that the emission reductions from the programme of activities “SASSA Low Pressure Solar Water Heater Programme” in South Africa during the period 12 March 2011 to 31 December 2011 amount to 14 227 tonnes of CO<sub>2</sub> equivalent.

Report No.: 2012-9794			<b>Indexing terms</b>	
Report title: “SASSA Low Pressure Solar Water Heater Programme” in South Africa				
Work carried out by: Francesca Feller			Key words Climate Change Kyoto Protocol Validation Clean Development Mechanism	Service Area Verification
Work verified by: Felipe Lacerda Antunes				Market Sector
Date of this revision: 14 July 2014			<input checked="" type="checkbox"/> No distribution without permission from the client or responsible organisational unit <input type="checkbox"/> free distribution within DNV after 3 years <input type="checkbox"/> Strictly confidential <input type="checkbox"/> Unrestricted distribution	Renewable energy
Rev. No.: 03	Number of pages: 59			
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### *Abbreviations*

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CH <sub>4</sub>	Methane
CL	Clarification request
CO <sub>2</sub>	Carbon dioxide
CO <sub>2e</sub>	Carbon dioxide equivalent
CPA	Component project activity
CPA-DD	CDM component project activity design document
CRC	Cyclic Redundancy Check
DNV	Det Norske Veritas
DNA	Designated National Authority
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MoC	Modalities of communication
PCP	Clean Development Mechanism Project Cycle Procedure
PoA	Programme of Activities
PoA-DD	Programme of Activities Design Document
PS	Clean Development Mechanism Project Standard
SABS	South Africa Bureau of Standards
SANS	South Africa National Standards
SQL	Service Quality Level
SWH	Solar Water Heater
TCP/IP	Transmission Control Protocol/Internet Protocol
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard



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# 1 INTRODUCTION

International Carbon has commissioned DNV Climate Change Services AS (DNV) to carry out the verification and certification of emission reductions reported for the CDM programme of activities (PoA) 4302 “SASSA Low Pressure Solar Water Heater Programme” in South Africa (the project) for the period 12 March 2011 to 31 December 2011.

During the selected monitoring period, the only active crediting period was that of CPA-001, therefore the verification only extended to the emissions reductions attributable to this CPA.

This report contains the findings from the verification and a certification statement for the certified emission reductions.

## 1.1 Objective

Verification is the periodic independent review and *ex post* determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM PoA during a defined monitoring period.

Certification is the written assurance by a DOE that, during a specific period in time, a PoA achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the “SASSA Low Pressure Solar Water Heater Programme” for the period 12 March 2011 to 31 December 2011.

## 1.2 Scope

The scope of the verification is to verify that:

- The PoA has been implemented and operated in accordance with the registered PoA-DD and CPA-DD or any approved revised PoA-DD and CPA-DDs;
- The monitoring plan complies with the monitoring methodology and the actual monitoring complies with the monitoring plan, including compliance with any guidance provided by the Board regarding deviations from the provisions of a registered monitoring plan and/or methodology;
- The data and calculation of GHG emission reductions have been assessed to correctly support the emission reductions being claimed.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.

## 1.3 Description of the programme of activities

PoA Parties:	South Africa (host), United Kingdom
Title of PoA:	SASSA Low Pressure Solar Water Heater Programme
UNFCCC registration No:	4302
UNFCCC registration date:	12 March 2011



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Baseline and monitoring methodology	AMS-I.C (version 17)
Project Participants:	Solar Academy of Sub Saharan Africa (Pty) Ltd; Standard Bank Plc; International Carbon Ltd; Eneco Energy Trade B.V.
Location of the PoA:	Republic of South Africa
PoA's crediting period:	12 March 2011 to 11 March 2021
Period verified in this verification:	12 March 2011 to 31 December 2011

### 1.4 Methodology for determining emission reductions

According to the applied methodology AMS-I.C, 17, the emission reductions for the PoA are determined as the difference between the baseline emissions, project emissions and leakage:

$$ER_y = BE_y - PE_y - LE_y$$

$PE_y$  and  $LE_y$  are considered as to be zero as stated in the registered PoA-DD, CPA-DD and validation report. Therefore, the emission reductions are accounted as:

$$ER_y = BE_y = EG_{BL, y} * EF_{CO2}$$

where  $EF_{CO2}$  is the emission factor of the grid to which the installations that are part of the PoA are connected, and has been calculated following AMS-I.D. version 16 as the weighted average emissions (in tCO<sub>2</sub>/MWh) of the generation mix of the year in which the generation occurs.

$EG_{BL, y}$  is the energy baseline in year y, which is determined by SABS test as follows:

$$Q = \alpha_1 H + \alpha_2 (T_a - T_c) + \alpha_3$$

Where:

Q = Energy output in MJ

H = The energy input i.e. irradiation in MJ per m<sup>2</sup>

$T_a$  = The ambient air temperature and

$T_c$  = Incoming cold water temperature

$\alpha_1$  = H coefficient determined in the SABS test,

$\alpha_2$  = Delta T coefficients determined in the SABS test,

$\alpha_3$  = Intercept coefficients determined in the SABS test.

Both the baseline energy generation and the grid emission factor are monitored.



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## 2 METHODOLOGY

DNV has assessed and determined that the implementation and operation of the PoA, and the steps taken to report emission reductions comply with the CDM criteria and relevant guidance provided by the Board.

The assessment involved a desk review of relevant documentation as well as an on-site visit(s).

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the PoA. These include:

- i) Review of programme documentation;
- ii) The energy baseline which is multiplied with a monitored grid emission factor of 0.9861 tCO<sub>2</sub>e/MWh;
- iii) The actual installed capacity of the low pressure solar water heaters installed as part of the CPA to ensure the conformance with the descriptions in the registered PoA-DD, CPA-DD.

### Verification team

<i>Role</i>	<i>Last Name</i>	<i>First Name</i>	<i>Country</i>	<i>Type of involvement</i>					
				Desk review	Site visit	Reporting	Supervision of work	Technical review	TA 1.2 competence
Team leader (Verifier)	Feller	Francesca	Italy	✓	✓	✓			✓
Technical reviewer	Antunes	Felipe	Brazil					✓	✓

### Duration of verification

Monitoring report publication:	16 November 2012
Desk review:	14 January 2013 to 21 January 2013
On-site assessment:	22 January 2013 to 24 January 2013
Reporting, calculation checks and QA/QC:	30 January 2013 to 7 January 2104
Resubmission in response to issues raised in completeness check of UNFCCC	2 April 2014
Resubmission in response to issues raised in requests for review	14 July 2014



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### 2.1 Desk review

In addition to the monitoring report /1/ (version 01 dated 30 October 2012 and 06 dated 13 January 2014), DNV reviewed:

- The registered PoA-DD and CPA-DD for the Programme of activities (both the registered PoA-DD of 23 February 2011 and the revised PoA-DD dated 22 May 2013) /2/ /3/;
- The validation report /63/;
- The emission reduction calculation template for a generic CPA /62/;
- The emission reduction calculations for CPA-001 /4/;
- Baseline and monitoring methodology AMS-I.C, version 17 /75/;
- Baseline and monitoring methodology AMS-I.D version 16 /76/;
- The Programme's online database /12/.

The monitoring report, version 01 dated 30 October 2012, has been made publicly available on the CDM website. In addition to the monitoring report /1/ (version 01 dated 30 October 2012 and version 06 dated 13 January 2014), the verification has been performed based on the review of the following documentation provided by the project participants:

- The PoA-DD and CPA-DD, including the monitoring plan and the corresponding validation report;
- The approved baseline and monitoring methodology AMS-I.C, 17 /75/ applied by the project
- Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board
- Other information and references relevant to the PoA resulting emission reductions

During the desk review, DNV has applied standard auditing techniques to assess the quality of information provided. The following activities were performed:

- A review of the data and information presented to verify their completeness;
- A review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures; and
- An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

### 2.2 On-site assessment

On 22 January 2013 to 24 January 2013 DNV performed an on-site assessment. The key personnel of the programme were interviewed or assisted the verification team.



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During the on-site assessment, DNV has applied standard auditing techniques to assess the quality of information provided. The following aspects of the CDM programme of activities have been verified:

- The implementation and operation of the CDM PoAs;
- The information flow for generating, aggregating and reporting of the monitoring parameters; and
- The operational and data collection procedures are implemented in accordance with the monitoring plan in the PoA-DD and CPA-DD.

Further, the following activities were performed:

- A cross-check between information provided in the monitoring report /1/ and data from other sources;
- A check of the monitoring equipment including calibration performance /29/ to /49/ and observations of monitoring practices against the requirements of the PoA-DD and CPA-DD /2/ /3/ and the selected methodology /75/;
- A review of calculations and assumptions made in determining the GHG data and emission reductions /4/; and
- A review of the quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

The data presented in the monitoring report was assessed through a review of the detailed PoA documentation and production records, as well as by interviews with personnel at the CME and at the database management company, observation of collection of measurements, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment.

Given the large amount of data to be verified, DNV adopted an acceptance sampling approach. The verification of the PP's sampling was based on the requirements of the Standard for sampling and surveys for CDM project activities and programme of activities /74/ (which was the most recent guidance available at the time of performing the site visit) and consisted in the following steps:

DNV selected a sample of the PP's records. The sample was selected from the PP's database so to comprise installations from different geographical areas within the boundaries of CPA-001, and to include at least 1 of the 8 measurement sites (one of the 8 households where the pyranometer, thermometer and flow meter had been installed), but was otherwise random. The sample size was calculated in order to have a 5% probability to wrongly accept the PP's records, and a 5% probability to wrongly reject the PP's records the minimum sample size, which resulted in a sample size of 54 (Null hypothesis: proportion of discrepancy is  $\leq 1\%$ ; alternative hypothesis: proportion of discrepancy is  $\geq 10\%$ ; Alpha/Type I error = 0.05; Power/1-type II error =  $1 - 0.05 = 0.95$ ). In practice, during the site visit DNV's team aimed to have a sample size of 100 in order to account for unavailable/non-respondent users. The sample that was eventually reached amounted to 66 households, and since it is above 54 users it was considered acceptable. In order to verify the full range of information relevant to the calculation of emissions reductions, DNV chose to apply the following methods of field/onsite checks to the selected sample:



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- a. Check of database entries for the selected 66 households against documental evidence stored at the CME office in Johannesburg, South Africa: this method of verification allowed DNV to check the data that are relevant to the calculation of emissions reductions, as well as the PoA's management system. Information verified through this method included the number of systems installed, operational during the monitoring period, and linked to a monitoring site, information on solar irradiation, ambient air temperature and incoming water temperature recorded for the monitoring period, installation and calibration of monitoring equipment, and all agreements and relevant documentation signed by the recipient family. For all selected households DNV verified the data contained in the ER calculation spreadsheet against the database.
- b. Check whether SWH had been received and installed by the CME for the selected 66 households whether they were functioning correctly, and whether there was any maintenance issue to report: This check was performed as a combination of household visits and telephone interviews with households. As each method has different strengths and weaknesses, these methods provided DNV with the information needed for the applied acceptance sampling approach
  - i) Household visit (in person): this method of verification allowed DNV to observe the installed system in a limited geographical area, gather approximate information on when the system was installed from the residents (the memories of the residents, however, proved to be rather unreliable in this respect), and occasionally check if maintenance had been performed and whether relevant documentation had been received by the residents (in case the family had kept the documentation);
  - ii) Telephone interviews: this method of verification allowed DNV to check a purely random sample of households, covering the entire geographical scope of the PoA, and check whether a SWH had been received and installed by the CME, whether it was functioning correctly, and whether there was any maintenance issue to report;

DNV performed household visits to 20 households (7 in Welbedach West near Durban, and 13 in the Hidelberg near Johannesburg). DNV visited the household where the system had been installed, and performed in person interviews with users concerning the programme's management system (documents they filled out, response time in case of failures, etc.) /90/ to /109/.

For the remaining 46 households the accuracy of the information contained in the database was verified through telephone interviews (/110/ to /155/).

Moreover, it should also be noted that at the time of writing this report DNV has performed in total three field/onsite checks to verify emission reductions report for this PoA:

Date	Calculated minimum sample size	Actual sample size	Field/onsite checks		
			Database checks	Household visit	Telephone interviews
22-24 Jan 2013	54	66	66	20	46



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7-9 Aug 2013	54	109	109	35	74
17-18 Feb 2014	38	54	54	11	43
Total:			229	66	163

DNV checked the acceptability of the data for each record in the PPs sample record. Based on the sample size selected, the acceptability level was calculated to be 1 – meaning that the sample had to be rejected if 1 inconsistency with the PPs records was found.

For the samples selected by DNV during the three field/onsite checks performed, the database checks, household visits and telephone interviews found that the observed information was in agreement with the PPs records. Hence, DNV concluded that the PP's records are acceptable.

This acceptance sampling approach has enabled the verification team to assess the accuracy and completeness of reported monitoring results; to verify the correct application of the approved monitoring methodology and the determination of the emission reductions.

In addition, all parameters required by the monitoring methodology AMS-I.C, version 17, and the management system were assessed during the site visit.

DNV performed an additional site visit in May 2014 and visited in person 103 households in the proximity of the cities of Johannesburg, Cape Town, Port Elizabeth, Durban and Kroonstad. The questions asked to residents were the same as those previously asked by phone. The sample of communities was selected considering proximity to airports and was limited to areas which were considered as safe for DNV staff to visit. However once suitable communities were selected, the individual households in these communities were selected randomly for interviews. Details of the additional households visited are listed in section 5 of this report. The additional site visit resulted in a total of 169 households visited, compared to a calculated sample of 146. The additional household visits confirmed the earlier reached conclusion that the solar water heaters had been received and installed, and that maintenance was being performed as described in the registered PoA-DD.

### 2.3 Closing out of verification findings

The objective of this phase of the verification was to resolve any issues which needed be clarified prior to DNV's conclusion that i) the programme has been implemented and operated in accordance with the registered PoA-DD and CPA-DD or any approved revised PoA-DD and CPA-DDs, ii) the monitoring plan complies with the monitoring methodology and the actual monitoring complies with the monitoring plan and iii) the data and calculation of GHG emission reductions are correct.

A corrective action request (CAR) is issued, where:

- i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;
- ii. Modifications to the implementation, operation and monitoring of the registered PoA has not been sufficiently documented by the project participants;



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- iii. Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions;
- iv. Issues identified in a FAR during validation/or previous verification to be verified during verification that have not been resolved by the project participants.

A clarification request (CL) shall be raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is issued for actions if the monitoring and reporting require attention and/or adjustment for the next monitoring period.

The verification identified 7 CARs and 6 CLs, but no FARs. The CARs and CLs were satisfactorily addressed by the project participants by among other revising the monitoring report (please refer to Appendix A for further details). In addition to the changes made to the monitoring report as a result of the verification findings, the following changes to the monitoring report (version 06 dated 13 January 2014) were made compared to the initial version of the monitoring report received for verification (version 01 of 30 October 2012):

- The title of the PoA indicated in the MR was corrected from “SASSA Low Pressure Solar Water Heater Programme - CPA-001” to “SASSA Low Pressure Solar Water Heater Programme”



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### 3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the “SASSA Low Pressure Solar Water Heater Programme” for the period 12 March 2011 to 31 December 2011.

#### 3.1 Remaining issues, CARs, FARs from previous validation / verification

The validation report /63/ recorded no FARs to be addressed during following verifications. This is the first verification being undertaken for this programme, and therefore no issues remain from previous verifications.

#### 3.2 Post registration changes

The post registration changes described in Appendix B were identified by DNV during this verification. These post registration changes were assessed by DNV.

For post registration changes requiring prior approval by the CDM EB in accordance with Appendix 1 to the CDM Project Standard /72/, the changes obtained approval by the CDM EB prior to the request for issuance for this monitoring period.

The assessment of compliance with the PoA description and the monitoring plan contained in the PoA-DD and CPA-DD, as described in the following sections, is based on the revised PoA-DD and CPA-DD (version 05 of 22 May 2013).

#### 3.3 Project implementation

As part of the site visit DNV was able to confirm that the implementation of CPA-001 is in accordance with the description contained in the revised PoA-DD and CPA-DD (version 05 of 22 May 2013).

The verification team confirmed through visual inspection and document review that all physical features of the CPA including data collection systems and storage systems have been implemented in accordance with the revised PoA-DD and CPA-DD.

DNV confirmed during the on-site visit that the CPA is completely operational, although it has not been fully operational during the first monitoring period.

CPA-001 consists of the installation of 59 000 low pressure solar water heaters in residential buildings in the Republic of South Africa. However, 58 984 units were installed between July 2010 and December 2011 and only 38 974 units could be monitored and hence form the total population of the CPA-001 in 2011. This was verified against the programme’s online database /12/, which contains 59 000 records for CPA 1, and in the ER calculation spreadsheet /4/, which is based on 38 974 units. The reason for the delay in the CPA implementation and installation of the monitoring equipment is the start date of installation (July 2011 instead of March 2011), and the fact that the selection of monitored households could only take place once all systems in a specific area had been installed and uploaded in the database, an effort that took longer than expected.

The CPA was implemented between July 2010 and December 2011, after its inclusion on 12 March 2011. The selected monitoring period 12 March 2011 to 31 December 2011 is within the first crediting period of 12 March 2011 to 11 March 2021.



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The CPA's installation capacity consists of 59 000 sets of low pressure solar water heaters each with a rated capacity determined by SABS test of 13.692 MJ. All systems have a collector area of 1.08 m<sup>2</sup>, and a tank volume of 110 liters, and are manufactured by Tasol, of which SASSA is the sole distributor. The actual implementation of the CPA during this verification period was verified based on the technical specifications of the systems /61//6/ and test reports issued by SABS to Tasol /13/ to /16/, monitoring equipment and their accuracy levels /29/to /49/, as well as observation of a number of installations in the areas of Welbedacht West and Hidelberg and interviews to staff both at the CME and at the database management company (/77/ to/89/) and users both on site (/90/ to /109/ and /156/ to /258/) and by phone (/110/ to /155/).

The heat generated is supplied to households that would have otherwise heated water through kettles and electric stoves. 1 in 10 000 installations is monitored by recording solar irradiation, daily average ambient temperature, temperature of cold water fed to the tank, temperature of hot water delivered to the house, and quantity of water fed to the house.

DNV confirmed that neither a notification nor request for approval of changes has been requested to CDM Executive Board.

### **3.4 Information (data and variables) provided in the monitoring report that is different from that stated in the registered PoA-DD and CPA-DD**

The energy output reported in this monitoring period is 14 427.48 MWh in the period from 12 March 2011 to 31 December 2011 (i.e. 294 days). The expected annual generation in the registered CPA-DD is 81 904MWh (annual average), which corresponds to 65 972 MWh in 294 days. Hence, actual generation is considerably lower than expected. The same comparison on a CO<sub>2</sub>e basis indicates that the project was expected to reduce emissions by 76 954 tCO<sub>2</sub>e in a year (average), and 63 580 tCO<sub>2</sub>e in 2011, whereas it actually reduced emissions by 14 227 tCO<sub>2</sub>e.

The variation is deemed to be within a reasonable range due to the following reasons:

- i) The number of installations for which all relevant parameters could be monitored reported in this monitoring period is 38 974 units in the period from 12 March 2011 to 31 December 2011 /77//86//87/. The expected number of installations for 2011 in the registered CPA-DD is 59 000 units. Hence, actual number of installations that could be fully monitored during the monitoring period is considerably lower than expected.
- ii) The quantity of water used by households recorded was lower than the one estimated, since at the time of registration the PP assumed usage of the maximum amount of water that could be contained by the water tank (i.e. 110 liters) for conservativeness, while in reality the amount of water used was less than the amount of water available to households /77//86//87/;
- iii) Eskom introduced restrictions on the number of installations allowed per month after the programme was registered, which resulted in SASSA operating below capacity for the duration of the CPA implementation /8/

As a result of lower electricity generation, actual emission reductions are lower than the emission reductions estimated in the registered CPA-DD.



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### 3.5 Compliance of monitoring plan with monitoring methodology

According to AMS-I.C (version 17) monitoring shall consist of:

- i) The number of systems operating; and
- ii) Estimating the annual hours of operation of the average system.

Operationality of systems has been addressed in the monitoring plan through a provision for visiting 1% of households to check whether the system is operational.

The number of operating hours in the case of solar water heaters is calculated based on the energy baseline  $EG_{BL,y}$  and the capacity of the SWH as per SABS tests:

$$h = EG_{BL,y} [kwh] / Q [kw]$$

In order to determine the capacity (Q), the following parameters are monitored:

- Solar irradiation;
- Ambient air temperature;
- Cold water temperature.

To calculate the energy baseline, Q is adjusted by monitoring water flow, and maintenance and downtime.

Since the energy baseline is adjusted to account for failures when the systems were not in operation, the above equation gives the time the average system was in operation during the monitoring period.

The PP has opted for a calibrated simulation approach, where the results of SABS tests are cross-checked on the ground through direct monitoring of 1 every 10 000 households. This is done in a way that each SWH is linked in the data base to the nearest measurement point (with a maximum distance of 50 km). In case the measured daily energy output is less than 13 692 MJ (the maximum output according to SABS tests), the daily energy output of all the SWHs linked to that specific measurement point are reduced accordingly. No adjustments are done if measurement results give higher daily energy outputs. This is a conservative approach that is not explicitly requested by the methodology, but was accepted at registration stage.

DNV is able to confirm that the monitoring plan contained in the revised PoA-DD and CPA-DD (version of ) is in accordance with the approved methodology applied by the PoA, i.e. AMS-I.C (version 17).

### 3.6 Compliance of monitoring with the monitoring plan

The monitoring has been carried out in accordance with the monitoring plan contained in the revised PoA-DD and CPA-DD of . All parameters stated in the revised monitoring plan are monitored and reported appropriately. The monitoring report lists each parameter required by the monitoring plan and the information flow (i.e. from data generation, aggregation, to recording, calculation and reporting) for these parameters is provided in the monitoring report. The information flow for each parameter is further verified in the following sections. DNV confirms that neither a revision nor a deviation to the monitoring plan has been requested to CDM Executive Board.

#### 3.6.1 Monitoring parameters

According to the monitoring plan of the revised PoA-DD and CPA-DD, there are 8 parameters to be monitored:



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- Number of SWH operating in the year;
- Solar energy output by the SWHs in the year y, kWh;
- Annual average irradiation;
- The average annual ambient air temperature;
- The average annual cold water temperature;
- Volume of daily cold water flow;
- Solar energy output by the SWHs in the year y, MWh;
- The emission factor for the electricity system.

The below tables describe for each parameter, which is to be measured according to the monitoring plan, how DNV has verified that i) the actual monitoring complies with the monitoring plan and that ii) data have been assessed to correctly support the emission reductions being claimed.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	N Number of SWH operating in the year
Measuring frequency:	Annual sample.
Reporting frequency:	Annual sample.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	No monitoring frequency is indicated in the registered PoA-DD, and the PP selected to take annual samples and indicated this in the MR. In addition to the annual sample, the parameter is monitored continuously based on failure reporting. The annual sample was surveyed in February 2012, once the monitoring period was concluded, and is therefore representative of the entire monitoring period. Failure reporting took place from the beginning of installation to the end of the monitoring period (continuous). The combination of annual sampling and continuous monitoring through failures is considered acceptable.
Type of monitoring equipment:	The parameter is monitored through site visits: visual and technical checks, as well as failure reporting.
Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's	The accuracy of the measurement meets the requirements indicated in the monitoring plan. Appendix 5 of the PoA-DD indicates that in order to confirm the number of operating systems 1% of the installations in each CPA are to be sampled for functionality. This sample size was selected because the PP demonstrated



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specification?	at the time of registration that the sample was sufficient to meet the required 90/10 confidence/precision level. 1% of 38 974 is equal to 390 installations to be checked. The PP visited 589 households for this purpose, so the sample size is considered acceptable. None of the systems was found not to be in operation; therefore at 90% the error was found to be 0. The calculation of the precision achieved is included in Appendix 1 /4/.
Calibration frequency /interval:	Not applicable. The parameter is monitored through site visits: visual and technical checks, as well as failure reporting.
Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications (if local/national standards or the manufacturer's specifications are not available, international standards may be used)?	Not applicable. The parameter is monitored through site visits: visual and technical checks, as well as failure reporting.
Is the calibration of measuring equipment carried out by an accredited person or institution?	Not applicable. The parameter is monitored through site visits: visual and technical checks, as well as failure reporting.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Not applicable. The parameter is monitored through site visits: visual and technical checks, as well as failure reporting.
Is(are) calibration(s) valid for the whole reporting period?	Not applicable. The parameter is monitored through site visits: visual and technical checks, as well as failure reporting.
If applicable, has the reported data been cross-checked with other available data?	The operability data were cross-checked with another CDM registered project involving the installation of SWH in South Africa, project 0079 /68/. Two monitoring reports have been made publicly available, and both indicate that 100% of the systems remained in operation during the first (1 September 2005 – 28 Feb 2009) and second monitoring period (1 March 2009 – 15 November 2010). However, the status of both verifications appears as "awaiting



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	issuance request”.
How were the values in the monitoring report verified?	The values in the Monitored report were verified against the paper copies of the checklist completed by technicians on site, and kept at SASSA’s office /61/.
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The operationality checklist was adapted in the course of the first survey in order to fully capture all required information. In fact, additional questions related to whether the selected house was available for inspection, or whether the neighbouring home had to be inspected instead was added following feedback from surveyors. Moreover, data storage procedures include safe storage of hard copies, CD’s backups and electronic backups that are eventually stored in an external drive kept in a safe. In its final form, the data management ensure correct transfer of data and reporting of emission reductions and the necessary QA/QC processes are in place.
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	In one case the home owner was not at home at the time of the inspection, and a neighbour house was checked instead for operationality. The substitution is considered acceptable since a neighbouring household to a randomly selected household still consists of a randomly selected household.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	Q <sub>y</sub> Solar energy output by the SWH in the year y, kWh
Measuring frequency:	Daily
Reporting frequency:	Daily
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	The monitoring plan does not indicate the monitoring and reporting frequency. Since this parameter is calculated based on other parameters monitored directly and discussed below, and that the data relevant to these parameters is measured every 5 minutes and aggregated daily, the monitoring and reporting frequency is considered acceptable.
Type of monitoring equipment:	Not applicable: this parameter is calculated.
Is accuracy of the monitoring equipment as	Not applicable: this parameter is calculated.



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stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	
Calibration frequency /interval:	Not applicable: this parameter is calculated.
Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications (if local/national standards or the manufacturer's specifications are not available, international standards may be used)?	Not applicable: this parameter is calculated.
Is the calibration of measuring equipment carried out by an accredited person or institution?	Not applicable: this parameter is calculated.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Not applicable: this parameter is calculated.
Is(are) calibration(s) valid for the whole reporting period?	Not applicable: this parameter is calculated.
If applicable, has the reported data been cross-checked with other available data?	No other data was available to cross-check this parameter.
How were the values in the monitoring report verified?	The values reported in the MR were verified against the ER calculations /4/, as well as against the database where measurements are recorded /12/.
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	<p>The data management system ensures correct transfer of data and reporting of emission reductions, and necessary QA/QC processes are in place /50/.</p> <p>In fact, the logged information is sent via GSM (GPRS) via TCP/IP protocol to the company responsible for the management and maintenance of the database. The propriety protocol takes care of all handshaking and CRC checks to make sure not data is lost and arrives in the correct order.</p> <p>All data is written to a SQL database with its</p>



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	own proprietary driver. The database has been designed specifically for this PoA based on the monitoring requirements of the CDM methodology, and the monitoring plan described in the PoA-DD. The database is designed in such a way that Tables that require human input have an “audit” function, to identify and address mistakes, and values that are not in the correct format are not saved by the system, but give an error message.
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	Full data are available for the 38 974 systems which form the population of the first monitoring period.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	H <sub>year</sub> Irradiation
Measuring frequency:	Data is recorded every 5 minutes.
Reporting frequency:	Data is aggregated daily.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The measuring and reporting frequency is indicated in the registered PoA-DD, and the applicable methodology does not give indications on the minimum monitoring frequency, as this parameter is not explicitly contemplated by the methodology, but used to calculate parameter Q <sub>on-site</sub> .
Type of monitoring equipment:	Irradiation is measured by means of a pyranometer.
Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	The accuracy of the pyranometer is not indicated in the registered PoA-DD. The pyranometers have a maximum accuracy of ±5% and a typical accuracy of ±3%. This is the accuracy indicated by the instruments' technical specifications issued by the manufacturer /37/.
Calibration frequency /interval:	The instruments have been calibrated by the manufacturer at the time of commissioning, and replacement or recalibration will be needed after 4 years of service in the field /38/. At the end of the 4 years period in the field the PP intends to replace the pyranometers.



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Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications (if local/national standards or the manufacturer's specifications are not available, international standards may be used)?	The monitoring plan does not specify the frequency of calibration. The PP submitted a letter issued and signed by the manufacturer indicating that the instruments have been calibrated by the manufacturer at the time of commissioning, and replacement or recalibration will be needed after 4 years of service in the field /38/. At the end of the 4 years period the PP intends to replace the pyranometers.
Is the calibration of measuring equipment carried out by an accredited person or institution?	The calibration has been performed by Inteltronics Instrumentation, which is the entity performing all accredited calibration for Campbell Scientific Africa (the Manufacturer). A statement stating this and signed by Campbell Scientific Africa has been submitted to DNV /40/. Inteltronics Instrumentation is a calibration laboratory accredited by the South African National Accreditation System. A certificate of accreditation have been submitted to DNV, the first dated 13 October 2008/38/.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	The 8 certificates submitted (/29/ to /36/) confirm that the equipment is calibrated.
Is(are) calibration(s) valid for the whole reporting period?	The calibration certificates are dated:  25 September 2009 (SN PY67126) 15 July 2010 (SN PY69976) 8 September 2010 (SN PY71635) 8 September 2010 (SN PY71636) 8 September 2010 (SN PY71637) 8 September 2010 (SN PY71638) 8 September 2010 (SN PY71639) 8 September 2010 (SN PY71645)  All are valid for a period of 4 years (/29/ to /36/).
If applicable, has the reported data been cross-checked with other available data?	No other data was available to cross-check this parameter.
How were the values in the monitoring report verified?	Data were verified against the database /12/.
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The data management system ensures correct transfer of data and reporting of emission reductions, and necessary QA/QC processes are in place /50/.



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	<p>In fact, the logged information is sent via GSM (GPRS) via TCPIP protocol to the company responsible for the management and maintenance of the database. The propriety protocol takes care of all handshaking and CRC checks to make sure not data is lost and arrives in the correct order.</p> <p>All data is written to a SQL database with its own proprietary driver. The database has been designed specifically for this PoA based on the monitoring requirements of the CDM methodology, and the monitoring plan described in the PoA-DD. The database is designed in such a way that Tables that require human input have an “audit” function, to identify and address mistakes, and values that are not in the correct format are not saved by the system, but give an error message.</p>
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	Full data are available for the 38 974 systems which form the population of the first monitoring period.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	T <sub>a</sub> , year Ambient air temperature
Measuring frequency:	Data is recorded every 5 minutes.
Reporting frequency:	Data is aggregated daily.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The measuring and reporting frequency is indicated in the registered PoA-DD, and the applicable methodology does not give indications on the minimum monitoring frequency, as this parameter is not explicitly contemplated by the methodology, but used to calculate parameter Q <sub>on-site</sub> .
Type of monitoring equipment:	Temperature is measured by means of a temperature probe.
Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment,	The accuracy of the temperature probe is not indicated in the registered PoA-DD. The temperature probes have a maximum accuracy of $\pm 0.15$ °C at 0 °C, and $\pm 0.35$ °C at



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does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	100 °C. This is the accuracy indicated by the instruments' technical specifications issued by the manufacturer /43/.
Calibration frequency /interval:	The instruments have been calibrated by the manufacturer at the time of commissioning. The instruments cannot be calibrated, but it is recommended that a function test is performed every 4 to 5 years /44/. At the end of this period the PP intends to replace the probes.
Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications (if local/national standards or the manufacturer's specifications are not available, international standards may be used)?	The monitoring plan does not specify the frequency of calibration. The PP submitted a letter issued and signed by the manufacturer indicating that the instruments have been calibrated by the manufacturer at the time of commissioning, and that a function test should be performed every 4 to 5 years /44/. At the end of this period the PP intends to replace the probes.
Is the calibration of measuring equipment carried out by an accredited person or institution?	The calibration has been performed by Wika Instruments, the manufacturer /41//42/.  Wika Instruments is a calibration laboratory accredited by the South African National Accreditation System. A certificate of accreditation dated 22 December 2008 and expiring on 21 December 2013 has been submitted to DNV /45/.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	The certificate confirms that the equipment conforms to the technical specifications /41//42/.
Is(are) calibration(s) valid for the whole reporting period?	Two calibration certificates were submitted, and the correspondence between the calibration certificate and the serial number of individual temperature probes is indicated in the MR table 6.  Certificate WCT-CF-DBN-T1001 is dated 15 March 2010, while certificate WCT-CF-DBN-T1118/1 is dated 4 August 2011.  Calibration is to be considered valid for a period of 4 to 5 years /44/.
If applicable, has the reported data been	No other data was available to cross-check this



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cross-checked with other available data?	parameter.
How were the values in the monitoring report verified?	Data were verified against the database /12/.
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	<p>The data management system ensures correct transfer of data and reporting of emission reductions, and necessary QA/QC processes are in place /50/.</p> <p>In fact, the logged information is sent via GSM (GPRS) via TCP/IP protocol to the company responsible for the management and maintenance of the database. The propriety protocol takes care of all handshaking and CRC checks to make sure not data is lost and arrives in the correct order.</p> <p>All data is written to a SQL database with its own proprietary driver. The database has been designed specifically for this PoA based on the monitoring requirements of the CDM methodology, and the monitoring plan described in the PoA-DD. The database is designed in such a way that Tables that require human input have an “audit” function, to identify and address mistakes, and values that are not in the correct format are not saved by the system, but give an error message.</p>
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	Full data are available for the 38 974 systems which form the population of the first monitoring period.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	T <sub>c</sub> , year Incoming cold water temperature SABS test
Measuring frequency:	Data is recorded every 5 minutes.
Reporting frequency:	Data is aggregated daily.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes. The measuring and reporting frequency is indicated in the registered PoA-DD, and the applicable methodology does not give indications on the minimum monitoring frequency, as this parameter is not explicitly contemplated by the methodology, but used to



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	calculate parameter $Q_{on-site}$ .
Type of monitoring equipment:	Temperature is measured by means of a temperature probe.
Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	<p>The accuracy of the temperature probe is not indicated in the registered PoA-DD.</p> <p>The temperature probes have a maximum accuracy of <math>\pm 0.15</math> °C at 0 °C, and <math>\pm 0.35</math> °C at 100 °C. This is the accuracy indicated by the instruments' technical specifications issued by the manufacturer /43/.</p>
Calibration frequency /interval:	The instruments have been calibrated by the manufacturer at the time of commissioning. The instruments cannot be calibrated, but it is recommended that a function test is performed every 4 to 5 years /44/. At the end of this period the PP intends to replace the probes.
Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications (if local/national standards or the manufacturer's specifications are not available, international standards may be used)?	The monitoring plan does not specify the frequency of calibration. The PP submitted a letter issued and signed by the manufacturer indicating that the instruments have been calibrated by the manufacturer at the time of commissioning, and that a function test should be performed every 4 to 5 years /44/. At the end of this period the PP intends to replace the probes.
Is the calibration of measuring equipment carried out by an accredited person or institution?	<p>The calibration has been performed by Wika Instruments, the manufacturer /41//42/.</p> <p>Wika Instruments is a calibration laboratory accredited by the South African National Accreditation System. A certificate of accreditation dated 22 December 2008 and expiring on 21 December 2013 has been submitted to DNV /45/.</p>
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	The certificate confirms that the equipment conforms to the technical specifications /41//42/.
Is(are) calibration(s) valid for the whole reporting period?	<p>Two calibration certificates were submitted, and the correspondence between the calibration certificate and the equipment serial number is indicated in the MR table 6.</p> <p>Certificate WCT-CF-DBN-T1001 is dated 15</p>



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	March 2010, while certificate WCT-CF-DBN-T1118/1 is dated 4 August 2011. Calibration is to be considered valid for a period of 4 to 5 years /44/.
If applicable, has the reported data been cross-checked with other available data?	No other data was available to cross-check this parameter.
How were the values in the monitoring report verified?	Data were verified against the database /12/.
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	<p>The data management system ensures correct transfer of data and reporting of emission reductions, and necessary QA/QC processes are in place /50/.</p> <p>In fact, the logged information is sent via GSM (GPRS) via TCPIP protocol to the company responsible for the management and maintenance of the database. The propriety protocol takes care of all handshaking and CRC checks to make sure not data is lost and arrives in the correct order.</p> <p>All data is written to a SQL database with its own proprietary driver. The database has been designed specifically for this PoA based on the monitoring requirements of the CDM methodology, and the monitoring plan described in the PoA-DD. The database is designed in such a way that Tables that require human input have an “audit” function, to identify and address mistakes, and values that are not in the correct format are not saved by the system, but give an error message.</p>
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	Full data are available for the 38 974 systems which form the population of the first monitoring period.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	V Volume of daily cold water flow
Measuring frequency:	Continuous
Reporting frequency:	Continuous
Is measuring and reporting frequency in	The measuring frequency is in line with that



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accordance with the monitoring plan and monitoring methodology? (Yes / No)	indicated in the revised PoA-DD, and the applicable methodology does not give indications on the minimum monitoring frequency, as this parameter is not explicitly contemplated by the methodology, but used to calculate parameter $Q_{on-site}$ .
Type of monitoring equipment:	Volumetric flow meter.
Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	<p>The accuracy of the flow meters is not indicated in the registered PoA-DD.</p> <p>The flow meters have a maximum accuracy of <math>\pm 2\%</math>. This is the accuracy indicated by the instruments' technical specifications issued by the manufacturer /48/.</p>
Calibration frequency /interval:	The instruments are supplied by the manufacturer as calibrated units from the factory. It is recommended that the equipment is recalibrated or replaced every 7 to 8 years from the first day of operation /49/. At the end of this period the PP intends to replace the meters.
Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications (if local/national standards or the manufacturer's specifications are not available, international standards may be used)?	The monitoring plan does not specify the frequency of calibration. The PP submitted a letter issued and signed by the manufacturer indicating that the instruments are supplied by the manufacturer as calibrated units from the factory. The manufacturer recommends that the equipment is recalibrated or replaced every 7 to 8 years from the first day of operation /49/. At the end of this period the PP intends to replace the meters.
Is the calibration of measuring equipment carried out by an accredited person or institution?	<p>The calibration has been performed by Sensus, the manufacturer /46/.</p> <p>Sensus is accredited by the South African National Accreditation System. An accreditation certificate dated 3 January 2011 and expiring on 2 January 2015 has been submitted to DNV /48/. Since measurements started in March 2011, the certificate is considered acceptable.</p>
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	The manufacturer produced a single document certifying the performed calibration of a batch



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	of 39 meters, including the 8 used as part of CPA-001. The certificate confirms that the equipment conforms to the technical specifications /46/.
Is(are) calibration(s) valid for the whole reporting period?	The calibration certificate is dated 13 June 2011, but indicates that the calibration took place on 26 June 2008. This is because the equipment is sold already calibrated and without a calibration certificate unless requested by the buyer. A certificate was requested to Sensus for the purpose of this verification, hence the discrepancy between calibration date and the certificate date. The calibration is valid for a period of 4 to 5 years /49/.
If applicable, has the reported data been cross-checked with other available data?	No other data was available to cross-check this parameter.
How were the values in the monitoring report verified?	Data were verified against the database /12/.
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	<p>The data management system ensures correct transfer of data and reporting of emission reductions, and necessary QA/QC processes are in place /50/.</p> <p>In fact, the logged information is sent via GSM (GPRS) via TCPIP protocol to the company responsible for the management and maintenance of the database. The propriety protocol takes care of all handshaking and CRC checks to make sure not data is lost and arrives in the correct order.</p> <p>All data is written to a SQL database with its own proprietary driver. The database has been designed specifically for this PoA based on the monitoring requirements of the CDM methodology, and the monitoring plan described in the PoA-DD. The database is designed in such a way that Tables that require human input have an “audit” function, to identify and address mistakes, and values that are not in the correct format are not saved by the system, but give an error message.</p>
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by	Full data are available for the 38 974 systems which form the population of the first monitoring period.



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the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	
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	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	Q <sub>on-site</sub> Solar energy output by the SWH
Measuring frequency:	Daily
Reporting frequency:	Daily
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	The monitoring plan does not indicate the monitoring and reporting frequency. Since this parameter is calculated based on other parameters monitored directly and discussed above, and that the data relevant to these parameters is measured every 5 minutes and aggregated daily, the monitoring and reporting frequency is considered acceptable.
Type of monitoring equipment:	Not applicable: this parameter is calculated.
Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Not applicable: this parameter is calculated.
Calibration frequency /interval:	Not applicable: this parameter is calculated.
Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications (if local/national standards or the manufacturer's specifications are not available, international standards may be used)?	Not applicable: this parameter is calculated.
Is the calibration of measuring equipment carried out by an accredited person or institution?	Not applicable: this parameter is calculated.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Not applicable: this parameter is calculated.
Is(are) calibration(s) valid for the whole	Not applicable: this parameter is calculated.



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reporting period?	
If applicable, has the reported data been cross-checked with other available data?	No other data was available to cross-check this parameter.
How were the values in the monitoring report verified?	The values reported in the MR were verified against the ER calculations /4/, as well as against the database where measurements are recorded /12/.
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	<p>The data management system ensures correct transfer of data and reporting of emission reductions, and necessary QA/QC processes are in place /50/.</p> <p>In fact, the logged information is sent via GSM (GPRS) via TCPIP protocol to the company responsible for the management and maintenance of the database. The propriety protocol takes care of all handshaking and CRC checks to make sure not data is lost and arrives in the correct order.</p> <p>All data is written to a SQL database with its own proprietary driver. The database has been designed specifically for this PoA based on the monitoring requirements of the CDM methodology, and the monitoring plan described in the PoA-DD. The database is designed in such a way that Tables that require human input have an “audit” function, to identify and address mistakes, and values that are not in the correct format are not saved by the system, but give an error message.</p>
In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	Full data are available for the 38 974 systems which form the population of the first monitoring period.

	Assessment/ Observation
Data / Parameter: (as in monitoring plan):	EF <sub>grid</sub> The emission factor for the electricity system
Measuring frequency:	Calculated at the time of each issuance
Reporting frequency:	Calculated at the time of each issuance
Is measuring and reporting frequency in accordance with the monitoring plan and	This parameter is calculated at the time of each issuance



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monitoring methodology? (Yes / No)	
Type of monitoring equipment:	Not applicable: this parameter is calculated.
Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Not applicable: this parameter is calculated.
Calibration frequency /interval:	Not applicable: this parameter is calculated.
Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications (if local/national standards or the manufacturer's specifications are not available, international standards may be used)?	Not applicable: this parameter is calculated.
Is the calibration of measuring equipment carried out by an accredited person or institution?	Not applicable: this parameter is calculated.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Not applicable: this parameter is calculated.
Is(are) calibration(s) valid for the whole reporting period?	Not applicable: this parameter is calculated.
If applicable, has the reported data been cross-checked with other available data?	The grid emission factor calculated by the PP was cross-checked with the last three registered solar power CDM projects in South Africa (at the time of writing the final version of this verification report) /59//60//61/ and found to be in line with the grid emission factor calculated by other project developers.
How were the values in the monitoring report verified?	The values reported in the MR were verified against the ER calculations /4/, as well as against Eskom's website /64/.
Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The calculation of the grid emission factor relies on data from one source only (Eskom), and no QA/QC process is required for its calculation.
In case project participants have	Not applicable: the parameter is calculated, and



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temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	relies on data monitored by Eskom.
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Calibration records and accreditation certificates have been provided to the verification team. DNV can confirm that the meters were calibrated covering this monitoring period as per the monitoring plan.

The monitoring plan contained in the revised PoA-DD has been properly implemented and followed by the project participants.

Baseline emissions have been monitored and updated based on the parameters stated in the monitoring plan, and the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan. The equipment used for monitoring is in accordance with the requirements of the VVS, and is controlled and calibrated in accordance with the manufacturer's specification; monitoring results are consistently recorded as per approved frequency; and the quality assurance and quality control procedures have been applied in accordance with the revised monitoring plan.

The revised monitoring plan is in accordance with the requirements of the applicable methodology, in that it comprises following:

- Continuous operation of the equipment/system: this is monitored through technical checks performed on 1% of the installations every year, as well as recorded system failures;
- Net quantity of thermal energy supplied by the PoA during the year y: this is measured through SABS test results and through real- time measurement of average annual solar radiation, annual average ambient temperature, inlet and outlet water temperature, and water flow for 1 every 10 000 units installed in order to adjust the energy output determined in the SABS tests for the specific SWH.
- The grid emission factor is monitored as required by AMS-I.D.

The results of these checks confirm the quality of data is acceptable.

### 3.7 Assessment of data and calculation of emission reductions

DNV confirms that appropriate methods and formulae for calculating baseline emissions, project emissions and leakage have been followed, and the assumptions, emission factors and default values that are applied in the calculation have been justified.

As stated in the section 1.4, the emission reductions  $ER_y$  by the PoA during the monitoring period is the difference between the baseline emission, project emissions or leakage.

$$ER_y = BE_y - PE_y - LE_y$$

#### 3.7.1 Baseline emissions

Baseline emissions ( $BE_y$  in  $tCO_2$ ) are the product of the baseline emission factor ( $EF_{CO_2}$  in  $tCO_2/MWh$ ) times the net electricity supplied by the PoA to the grid ( $EG_{BL,y}$  in MWh).



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$EF_{CO_2}$  is the emission factor of the South African's grid, and has been calculated following AMS-I.D. version 16 as the weighted average emissions (in  $tCO_2/MWh$ ) of the generation mix of the year in which PoA generation occurs. This is calculated based on the fuel consumption, net calorific value and emission factor for the fuel used, and electricity generation for each power plant, and in 2011 amounted to  $0.9861 tCO_2/MWh$  based on the information on fuel consumption and electricity generation published in 2012 by Eskom for 2011 /64/. The source of data used for the calculation of the grid emission factor is consistent with the one indicated in the revised PoA and CPA-DD /65//66/, and the data were verified against Eskom's published electricity generation and fuel consumption data /64//65//66/ and found to be correct.

$EG_{BL,y}$  is the solar energy output ( $Q_y$ ) of SWHs, which is multiplied by the operationality ratio (i.e. number of SWHs operational,  $N$ ) and further adjusted with maintenance downtime.

The rated capacity of the SWH was calculated in accordance with the formula provided by the SABS. The specific coefficients  $\alpha_1$ ,  $\alpha_2$  and  $\alpha_3$  used were verified against the SABS test report issued to Tasol's SWH /13/, and are considered acceptable as they reflect the local environmental conditions that influence the energy output, while the values used for average ambient temperature, solar irradiation, and average cold water temperature were recorded at 8 monitored sites. Measurements were taken every 5 minutes, aggregated daily, and input in the calculations. DNV was given access to the programme's database /12/, where measurements can be observed in real time for each measured site, and where records for each monitored site are stored. Moreover, since the ER calculations are performed directly within the database, an excel spreadsheet with sample measurements was created by the project participant where the calculations are shown in a transparent way /4/.

The operationality of the systems was based on the results of the operationality survey performed in 2012 (once the monitoring period was concluded), which recorded 100% of the systems checked were found to be operational, and thus achieving the required confidence/precision level. DNV checked the 589 paper forms completed by the technicians responsible for the operationality checks /61/ and stored at SASSA's office, and observed that all systems were recorded as operational. The high number of operational systems recorded can be explained by the fact that maintenance is provided in all locations, and that non-operational systems are replaced by SASSA on a continuous basis. This was also confirmed by the staff responsible for maintenance on site /80//81//82/. Maintenance and downtime was calculated based on the call log kept during the monitoring period.

Hence,

$$EG_{BL,y} = Q_y * N - MD = 14\,426.88 \text{ MWh}$$

$$BE_y = EF_y * EG_{BL,y} = 14\,227 \text{ tCO}_2e$$

### 3.7.2 Project emissions

The project emissions are regarded as zero according to the methodology AMS-I.C.

### 3.7.3 Leakage

There are no leakages that need to be considered in applying the methodology AMS-I.C.



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### 3.7.4 Emission reductions

Therefore, the emission reductions in this monitoring period are:

$$ER_y = BE_y - PE_y - L_y = 14\,227 - 0 - 0 = 14\,227 \text{ tCO}_2\text{e.}$$

The yearly expected emission reductions in the registered CPA-DD for the period between 12 March 2011 and 31 December 2011 are 63 580 tonnes of CO<sub>2</sub> equivalent, and hence the reported emission reductions are considerably lower than expected.

As outlined above, the input data for calculating the emission reductions, the calculating process and the result are complete and transparent. Therefore, DNV is able to confirm the accuracy of the emission reductions.

### 3.8 Quality of evidence to determine emission reductions

DNV confirms that a complete set of data for this monitoring period was available to be verified and was in accordance with the registered PoA-DD and CPA-DD.

All necessary documentation were collected, referenced and aggregated and were easily accessible in hard-copy and electronic format. Measurements are performed by calibrated equipment, and the key data were cross-checked via other sources. No assumptions are used that have any material influence on reported emission reductions.

### 3.9 Management system and quality assurance

SASSA is responsible for the operation and maintenance of the programme, the monitoring equipments and data collection. The management system for the programme has been verified to be in place by DNV on site. The organization structure with the responsibilities, personnel competencies, monitoring procedure and monitoring management have been properly identified and put into operation.

DNV confirms that the responsibilities and authorities in the management and operational system for monitoring and reporting are in accordance with the responsibilities and authorities stated in the registered PoA-DD and CPA-DD and monitoring plan.



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### 4 CERTIFICATION STATEMENT

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions that have been reported for the CDM programme of activities (PoA) 4302 “SASSA Low Pressure Solar Water Heater Programme” in South Africa for the period 12 March 2011 to 31 December 2011.

The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the PoA.

It is DNV’s responsibility to express an independent verification statement on the reported GHG emission reductions from the PoA. DNV does not express any opinion on the selected baseline scenario or on the validated PoA-DD and CPA-DD.

DNV conducted the verification on the basis of the baseline and monitoring methodology AMS-IC (version 17), the monitoring plan contained in the revised PoA-DD and CPA-DD (version 05 of 22 May 2013) and the monitoring report (version 06) dated 13 January 2014. The verification included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

DNV’s verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. DNV planned and performed the verification by obtaining evidence and other information and explanations that DNV considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions reported for the PoA for the period 12 March 2011 to 31 December 2011 are fairly stated in the monitoring report (version 06) dated 13 January 2014.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AMS-IC (version 17) and the monitoring plan contained in the revised PoA-DD and CPA-DD (version 05 of 22 May 2013).

DNV Climate Change Services AS is able to certify that the emission reductions from the CDM programme of activities 4302 “SASSA Low Pressure Solar Water Heater Programme” in South Africa during the period 12 March 2011 to 31 December 2011 amount to 14 227 tonnes of CO<sub>2</sub> equivalent.

*Venice and Oslo, 14 July 2014*

Francesca Feller  
Verifier  
DNV Venice, Italy

Michael Lehmann  
Director of Services and Technologies  
DNV Climate Change Services AS



## MANAGING RISK

## 5 REFERENCES

### Documentation provided by the project participants

- /1/ International Carbon: *CDM monitoring report for the programme of activities "SASSA Low Pressure Solar Water Heater Programme" for the monitoring period 12 March 2011 to 31 December 2011*, version 01 of 30 October 2012 and version 06 of 13 January 2014
- /2/ International Carbon: *CDM-PoA-DD for PoA "SASSA low pressure solar water heater programme"*, version 05 of 23 February 2011 and version 05 of 22 May 2013
- /3/ International Carbon: *CDM-CPA-DD for CPA "SASSA low pressure solar water heater programme – CPA-001"*, version 05 of 23 February 2011, and version 05 of 22 May 2013
- /4/ International Carbon: *Appendix I*, version 02 of 25 March 2013
- /5/ SASSA: Warranty and Maintenance Plan, 23 January 2013
- /6/ SASSA: Report on the absorber area calculation for Tasol evacuated tubes, 13 May 2010
- /7/ Eskom: Low Pressure Solar Water Heater Rebate, 1 November 2010
- /8/ Eskom: Eskom notification on installation limits, 24 June 2011
- /9/ Eskom: Summary of Eskom process outline, 20 July 2010
- /10/ Eskom: Eskom SWH rebate programme update, 21 September 2012
- /11/ Tasol: CDM programme process, 29 January 2013
- /12/ Real Time Energy: Solar Tracker database, available at:  
<http://www.rtenergy.co.za/RTETelemetryV1/> (accessed: January 2013)
- /13/ South Africa Bureau of Standards: Testing to SANS 6211-1:2003, 27 August 2009
- /14/ South Africa Bureau of Standards: Testing to SANS 1307:2009, 14 December 2011
- /15/ South Africa Bureau of Standards: Testing to SANS 151:2010, 14 December 2011
- /16/ South Africa Bureau of Standards: Mark of Approval SAS 1307\_2009, 21 December 2011
- /17/ South Africa Bureau of Standards: Testing to SANS 6211-1:2003, 10 April 2012
- /18/ South Africa Bureau of Standards: Validity of SANS 6211-1:2003, 14 February 2013
- /19/ SASSA: Community uplifting agreement, 12 October 2010
- /20/ SASSA: Community uplifting agreement, 10 August 2010
- /21/ SASSA: Community uplifting agreement, 11 August 2010
- /22/ SASSA: Community uplifting agreement, 6 September 2010
- /23/ SASSA: Community uplifting agreement, 6 April 2010
- /24/ SASSA: Community uplifting agreement, 6 August 2010
- /25/ SASSA: Community uplifting agreement, 17 August 2010
- /26/ SASSA: Community uplifting agreement, 8 September 2010
- /27/ SASSA: Community uplifting agreement, 2 September 2010
- /28/ SASSA: Community uplifting agreement, 1 November 2010



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- /29/ Campbell Scientific: Certificate of calibration – serial number PY67126, 25 September 2009
- /30/ Li-COR: Certificate of calibration – serial number PY69976, 15 July 2010
- /31/ Li-COR: Certificate of calibration – serial number PY71635, 25 September 2009
- /32/ Li-COR: Certificate of calibration – serial number PY71636, 8 September 2010
- /33/ Li-COR: Certificate of calibration – serial number PY71637, 8 September 2010
- /34/ Li-COR: Certificate of calibration – serial number PY71638, 8 September 2010
- /35/ Li-COR: Certificate of calibration – serial number PY71639, 8 September 2010
- /36/ Li-COR: Certificate of calibration – serial number PY71645, 8 September 2010
- /37/ Li-COR: LI-COR Solar radiation sensors, October 2010
- /38/ Li-COR: Calibration interval of the LI-COR LI-200 pyranometer, 26 November 2012
- /39/ SANAS: Certificate of accreditation, 13 October 2008
- /40/ Campbell Scientific Africa: Calibration Relationship between Campbell Scientific Africa (CS Africa) and Inteltronics Instrumentation, 23 April 2013
- /41/ Wika Instruments: Temperature conformity certificate WCT-CF-DBN-T1118/1, 4 August 2011
- /42/ Wika Instruments: Temperature conformity certificate WCT-CF-DBN-T1001, 15 March 2010
- /43/ Wika Instruments: Usage limitations and accuracies of platinum resistance thermometers (DIN EN 60751:2009) in industrial application, October 2010
- /44/ Wika Instruments: Information on calibration interval, 19 December 2012
- /45/ Wika Instruments: *Certificate of accreditation*, 22 December 2008
- /46/ Sensus metering systems: Meter verification certificate, calibration date: 26 June 2008, certificate date: 26 April 2012
- /47/ Sensus metering systems: Flow meter technical specifications, 11 February 2008
- /48/ South African National Accreditation System: *Certificate of Accreditation*, 3 January 2011 (expires 2 January 2015)
- /49/ Joat sales & services: Meter lifespan, 7 March 2013
- /50/ Real Time Energy: Measurement System Architecture, 16 November 2012
- /51/ Tasol: Non-pressurised solar water heating systems, 3 August 2012
- /52/ Tasol: Non-pressurised solar water heating systems, 3 August 2012
- /53/ Tasol: Operationality inspection, 18 February 2012
- /54/ Tasol: Operationality inspection, 20 February 2012
- /55/ Tasol: Operationality inspection, 20 February 2012
- /56/ Tasol: Operationality inspection, 20 February 2012
- /57/ Tasol: Operationality inspection, 20 February 2012
- /58/ Tasol: Operationality inspection (all), various dates
- /59/ Moyeng Energy: PDD for project “Rheboksfontein Wind Energy Facility” (Ref: 8346), registered on 13 December 2013
- /60/ South African Renewable Green Energy: PDD for project “Karoo Renewable Energy Facility (Nobelsfontein Solar PV)” (Ref: 8148), registered on 14 November 2012



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- /61/ Solafrica Thermal Energy : PDD for project “Bokpoort CSP (Concentrating Solar Power) Project, South Africa” (Ref: 7841), registered on 26 October 2012

### Other project documents or documents used by DNV to verify the information provided by the project participants

- /62/ International Carbon: *Appendix III ER for generic CPA*, of 28 December 2010
- /63/ Japan Consulting Institute (JCI): PoA validation report, 4 March 2011
- /64/ Eskom: CDM calculations, available at: <http://www.eskom.co.za/c/article/236/cdm-calculations/> (accessed in January 2013)
- /65/ Eskom: annual Report 2010, 2011
- /66/ Intergovernmental Panel on Climate Change: Guidelines for National Greenhouse Gas Inventories, available at: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html> (accessed: January 2013)
- /67/ Eneco EnergyTrade B.V.: Modalities of Communication Form – Annex 2: Addition/change of name of project participant, 18 April 2012
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- /69/ DNV: Validation opinion for post-registration changes, 2 April 2013, approved on 13 October 2013
- /70/ UNFCCC: CDM – Home, available at <http://cdm.unfccc.int/> (accessed: January to December 2013)

### Methodologies, tools and other guidance by the CDM Executive Board

- /71/ CDM Executive Board: *Clean Development Mechanism Validation and Verification Standard*, version 05.0
- /72/ CDM Executive Board: *Clean Development Mechanism Project Standard*, version 05.0
- /73/ CDM Executive Board: *Clean Development Mechanism Project Cycle Procedure*, version 05.0
- /74/ CDM Executive Board: *Sampling and surveys for CDM project activities and programme of activities*, version 04.0
- /75/ CDM Executive Board: *Baseline and monitoring methodology AMS-I.C*, version 17
- /76/ CDM Executive Board: *Baseline and monitoring methodology AMS-I.D*, version 16

### Persons interviewed during the verification

	Date / Type of interview	Name / Organization	Topic
/77/	22-24 Jan 2013 <input checked="" type="checkbox"/> On-site <input checked="" type="checkbox"/> Face-to-face at	Alida Streeter SASSA	<ul style="list-style-type: none"> <li>• Operations, data collection and storage, management system, Eskom programme</li> </ul>



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	office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/78/	22 Jan 2013	Shaun Worthmann Real Time Energy	<ul style="list-style-type: none"> <li>• Data collection and storage, measurement equipment, database design and management, ER calculations</li> </ul>
	<input checked="" type="checkbox"/> On-site		
	<input checked="" type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/79/	22 Jan 2013	Michael Dickerson Real Time Energy	<ul style="list-style-type: none"> <li>• Data collection and storage, measurement equipment, database design and management, ER calculations</li> </ul>
	<input checked="" type="checkbox"/> On-site		
	<input checked="" type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/80/	22 Jan 2013	Garret SASSA	<ul style="list-style-type: none"> <li>• CPA implementation, maintenance, users support</li> </ul>
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/81/	22 Jan 2013	Leon SASSA	<ul style="list-style-type: none"> <li>• CPA implementation, maintenance, users support</li> </ul>
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/82/	22 Jan 2013	Jess SASSA	<ul style="list-style-type: none"> <li>• CPA implementation, maintenance, users support</li> </ul>
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/83/	23-24 Jan 2013	Laura Lahti International Carbon	<ul style="list-style-type: none"> <li>• PoA design, ER calculations, application of methodology</li> </ul>
	<input checked="" type="checkbox"/> On-site		
	<input checked="" type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/84/	23 Jan 2013	Violet Sekoto SASSA	<ul style="list-style-type: none"> <li>• Data management system, Eskom programme</li> </ul>
	<input type="checkbox"/> On-site		
	<input checked="" type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



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/85/	23Jan 2013 <input type="checkbox"/> On-site <input checked="" type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Michael Keyser SASSA	<ul style="list-style-type: none"> <li>• Data management system, Eskom programme</li> </ul>
/86/	23Jan 2013 <input type="checkbox"/> On-site <input checked="" type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Chris Nelson SASSA	<ul style="list-style-type: none"> <li>• SWH production, certification and testing, management system, Eskom programme</li> </ul>
/87/	23Jan 2013 <input checked="" type="checkbox"/> On-site <input checked="" type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Riaan Swanepoel SASSA	<ul style="list-style-type: none"> <li>• SWH production, certification and testing, management system, Eskom programme</li> </ul>
/88/	23-24 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Abraham SASSA	<ul style="list-style-type: none"> <li>• SWH production</li> </ul>
/89/	23-24 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Urshula SASSA	<ul style="list-style-type: none"> <li>• SWH production</li> </ul>
/90/	22 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3314, Welbedacht West, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/91/	22 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3302, Welbedacht West, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/92/	22 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Household 3561, Welbedacht West, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system,</li> </ul>



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	office		baseline.
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/93/	22 Jan 2013	Household 2007, Welbedacht West, Chatsworth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/94/	22 Jan 2013	Household 2037, Welbedacht West, Chatsworth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/95/	22 Jan 2013	Household 1903, Welbedacht West, Chatsworth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/96/	22 Jan 2013	Household 2019, Welbedacht West, Chatsworth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/97/	23 Jan 2013	Household 6159, Hidelberg (Ratanda)	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/98/	23 Jan 2013	Household 6214, Hidelberg (Ratanda)	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/99/	23 Jan 2013	Household 6219, Hidelberg (Ratanda)	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



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/100/	23 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 6257, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/101/	23 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 6266, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/102/	23 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 6265, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/103/	23 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 6298, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/104/	23 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 6264, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/105/	23 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 7342, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/106/	23 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 6344, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/107/	23 Jan 2013 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Household 6404, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system,</li> </ul>



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	office		baseline.
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/108/	23 Jan 2013	Household 6346, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/109/	23 Jan 2013	Household 6348, Hidelberg (Ratanda)	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/110/	22 Jan 2013	Household 2361, Botshabelo	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/111/	22 Jan 2013	Household 2383, Botshabelo	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/112/	22 Jan 2013	Household 2412, Botshabelo	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/113/	22 Jan 2013	Household 2017, Botshabelo	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/114/	22 Jan 2013	Household 9239, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



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/115/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 9241, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/116/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 9271, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/117/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 9275, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/118/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 9281, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/119/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 9284, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/120/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 9286, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/121/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 9287, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/122/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Household 9302, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system,</li> </ul>



## MANAGING RISK

	office		baseline.
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/123/	22 Jan 2013	Household 9301, Port Elizabeth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/124/	22 Jan 2013	Household 9749, Port Elizabeth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/125/	22 Jan 2013	Household 8917, Port Elizabeth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/126/	22 Jan 2013	Household 9829, Port Elizabeth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/127/	22 Jan 2013	Household 9841, Port Elizabeth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/128/	22 Jan 2013	Household 9855, Port Elizabeth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/129/	22 Jan 2013	Household 9860, Port Elizabeth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



## MANAGING RISK

/130/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 9897, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/131/	22 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 12561, Port Elizabeth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/132/	23 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 17284, Potchefstroom	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/133/	23 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 18329, Potchefstroom	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/134/	23 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 18317, Potchefstroom	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/135/	23 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 18312, Potchefstroom	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/136/	23 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 18294, Potchefstroom	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/137/	23 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Household 18291, Potchefstroom	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system,</li> </ul>



## MANAGING RISK

	office		baseline.
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/138/	23 Jan 2013	Household 18286, Potchefstroom	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/139/	23 Jan 2013	Household 18273, Potchefstroom	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/140/	23 Jan 2013	Household 18206, Potchefstroom	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/141/	23 Jan 2013	Household 18201, Potchefstroom	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/142/	23 Jan 2013	Household 18370, Potchefstroom	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/143/	23 Jan 2013	Household 17459, Potchefstroom	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/144/	24 Jan 2013	Household 2651, Chatsworth	• Maintenance and downtime, documentation, general experience with the system, baseline.
	<input type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input checked="" type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



## MANAGING RISK

/145/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3324, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/146/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3337, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/147/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3514, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/148/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3525, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/149/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3542, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/150/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3679, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/151/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3691, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/152/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Household 3698, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system,</li> </ul>



## MANAGING RISK

	office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail		baseline.
/153/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3709, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/154/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 3714, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/155/	24 Jan 2013 <input type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Household 4545, Chatsworth	<ul style="list-style-type: none"> <li>• Maintenance and downtime, documentation, general experience with the system, baseline.</li> </ul>
/156/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 1544, Impumelelo, Deven	Operationality, maintenance
/157/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 1505, Impumelelo, Deven	Operationality, maintenance
/158/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 1675, Impumelelo, Deven	Operationality, maintenance
/159/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 1997, Impumelelo, Deven	Operationality, maintenance



## MANAGING RISK

/160/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 2174, Impumelelo, Deven	Operationality, maintenance
/161/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 2208, Impumelelo, Deven	Operationality, maintenance
/162/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 2184, Impumelelo, Deven	Operationality, maintenance
/163/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 2164, Impumelelo, Deven	Operationality, maintenance
/164/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 2166, Impumelelo, Deven	Operationality, maintenance
/165/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 2247, Impumelelo, Deven	Operationality, maintenance
/166/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 3671, 24 <sup>th</sup> Street, Etwatwa	Operationality, maintenance
/167/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Resident of house 3588, 25 <sup>th</sup> Street, Etwatwa	Operationality, maintenance



## MANAGING RISK

	office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/168/	26 May 2014	Resident of house 6345, Bee-eater Street, Etwatwa	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/169/	26 May 2014	Resident of house 8355, Sparrow Street, Etwatwa	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/170/	26 May 2014	Resident of house 7894, Sparrow Street, Etwatwa	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/171/	26 May 2014	Resident of house 7772, Guinea Fowl Street, Etwatwa	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/172/	26 May 2014	Resident of house 7743, Lovebird Street, Etwatwa	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/173/	26 May 2014	Resident of house 7621, Shrike Street, Etwatwa	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/174/	26 May 2014	Resident of house 7620, Shrike Street, Etwatwa	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



## MANAGING RISK

/175/	26 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 7721, Kingfisher Street, Etwatwa	Operationality, maintenance
/176/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 11, Gould Street, Vredenburg	Operationality, maintenance
/177/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 14, Gould Street, Vredenburg	Operationality, maintenance
/178/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 27, Gould Street, Vredenburg	Operationality, maintenance
/179/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 24, Copper Street, Vredenburg	Operationality, maintenance
/180/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 18, Copper Street, Vredenburg	Operationality, maintenance
/181/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 44, Iwster Street, Vredenburg	Operationality, maintenance
/182/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Resident of house 7, Nickel Street, Vredenburg	Operationality, maintenance



## MANAGING RISK

	office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/183/	27 May 2014	Resident of house 32, Mika Street, Vredenburg	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/184/	27 May 2014	Resident of house 32, Mangwan Street, Vredenburg	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/185/	27 May 2014	Resident of house 17, Mangwan Street, Vredenburg	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/186/	27 May 2014	Resident of house 8, Mangwan Street, Vredenburg	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/187/	27 May 2014	Resident of house 10, Mbanze Street, Vredenburg	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/188/	27 May 2014	Resident of house 56, Mbanze Street, Vredenburg	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/189/	27 May 2014	Resident of house 58, Mbanze Street, Vredenburg	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



## MANAGING RISK

/190/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 98, Mbanze Street, Vredenburg	Operationality, maintenance
/191/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 96, Mbanze Street, Vredenburg	Operationality, maintenance
/192/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 31, Jonga Street, Vredenburg	Operationality, maintenance
/193/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 16, Kanze Street, Vredenburg	Operationality, maintenance
/194/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 15, Kanze Street, Vredenburg	Operationality, maintenance
/195/	27 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 11, Kanze Street, Vredenburg	Operationality, maintenance
/196/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 34, Schauder Street, Holland Park, Port Elizabeth	Operationality, maintenance
/197/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Resident of house 82, Schauder Street, Holland Park, Port Elizabeth	Operationality, maintenance



## MANAGING RISK

	office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/198/	28 May 2014	Resident of house 35, Maple Square, Holland Park, Port Elizabeth	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/199/	28 May 2014	Resident of house 18, Maple Square, Holland Park, Port Elizabeth	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/200/	28 May 2014	Resident of house 36, Maple Square, Holland Park, Port Elizabeth	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/201/	28 May 2014	Resident of house 21, Jameson Rd, Shoulder Road area, Port Elizabeth	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/202/	28 May 2014	Resident of house 161, Jameson Rd, Shoulder Road area, Port Elizabeth	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/203/	28 May 2014	Resident of house 49, Phyllis Street, Shoulder Road area, Port Elizabeth	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/204/	28 May 2014	Resident of house 5, Brown St, Shoulder Road area, Port Elizabeth	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



## MANAGING RISK

/205/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 35, Brown St, Shoulder Road area, Port Elizabeth	Operationality, maintenance
/206/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 26, Brown St, Shoulder Road area, Port Elizabeth	Operationality, maintenance
/207/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 313, Matanzima Road, Motherwell, Port Elizabeth	Operationality, maintenance
/208/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 305, Matanzima Road, Motherwell, Port Elizabeth	Operationality, maintenance
/209/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 156, Gaba Street, Motherwell, Port Elizabeth	Operationality, maintenance
/210/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 53, Qhude Road, Motherwell, Port Elizabeth	Operationality, maintenance
/211/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 31, Mbabala Road, Motherwell, Port Elizabeth	Operationality, maintenance
/212/	28 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Resident of house 28, Mbabala Road, Motherwell, Port Elizabeth	Operationality, maintenance



## MANAGING RISK

	office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/213/	28 May 2014	Resident of house 56, Dembu Crescent, Greenfields, Uitenhage	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/214/	28 May 2014	Resident of house 15, Dembu Crescent, Greenfields, Uitenhage	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/215/	28 May 2014	Resident of house 4, Kingfisher Street, Rosendale, Uitenhage	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/216/	28 May 2014	Resident of house 71, Kingfisher Street, Rosendale, Uitenhage	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/217/	28 May 2014	Resident of house 66, Kingfisher Street, Rosendale, Uitenhage	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/218/	29 May 2014	Resident of house 3653, Kingsborough, eThekweni	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/219/	29 May 2014	Resident of house 3637, Kingsborough, eThekweni	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



## MANAGING RISK

/220/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 3627, Kingsborough, eThekweni	Operationality, maintenance
/221/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 3629, Kingsborough, eThekweni	Operationality, maintenance
/222/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 3598, Kingsborough, eThekweni	Operationality, maintenance
/223/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 3601, Kingsborough, eThekweni	Operationality, maintenance
/224/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 4183, Kingsborough, eThekweni	Operationality, maintenance
/225/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 4188, Kingsborough, eThekweni	Operationality, maintenance
/226/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 4217, Kingsborough, eThekweni	Operationality, maintenance
/227/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Resident of house 4218, Kingsborough, eThekweni	Operationality, maintenance



## MANAGING RISK

	office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/228/	29 May 2014	Resident of house 4373, Graceland Road, Welbedacht	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/229/	29 May 2014	Resident of house 4864, Sarva Road, Welbedacht	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/230/	29 May 2014	Resident of house 4283, Sarva Road, Welbedacht	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/231/	29 May 2014	Resident of house 4288, Sarva Road, Welbedacht	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/232/	29 May 2014	Resident of house 2968, Isoleni Close, Welbedacht	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/233/	29 May 2014	Resident of house 2969, Isoleni Close, Welbedacht	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/234/	29 May 2014	Resident of house 2973, Isoleni Close, Welbedacht	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



## MANAGING RISK

/235/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 2960, Isoleni Close, Welbedacht	Operationality, maintenance
/236/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 789, Highland Ridge, Welbedacht	Operationality, maintenance
/237/	29 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 694, Highland Ridge, Welbedacht	Operationality, maintenance
/238/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 11726, Kroonstad	Operationality, maintenance
/239/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 11858, Kroonstad	Operationality, maintenance
/240/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 11886, Kroonstad	Operationality, maintenance
/241/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 11726986, Kroonstad	Operationality, maintenance
/242/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Resident of house 986, George Street, Kroonstad	Operationality, maintenance



## MANAGING RISK

	office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/243/	31 May 2014	Resident of house 29, Colbert Street, Kroonstad	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/244/	31 May 2014	Resident of house 12183, David Street, Kroonstad	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/245/	31 May 2014	Resident of house 5192, Sicily Street, Kroonstad	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/246/	31 May 2014	Resident of house 5527, Serroto Street, Kroonstad	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/247/	31 May 2014	Resident of house 5473, Serroto Street, Kroonstad	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/248/	31 May 2014	Resident of house 1486, Kroonstad	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		
/249/	31 May 2014	Resident of house 10897, Snake Park, Kroonstad	Operationality, maintenance
	<input checked="" type="checkbox"/> On-site		
	<input type="checkbox"/> Face-to-face at office		
	<input type="checkbox"/> Telephone		
	<input type="checkbox"/> E-mail		



## MANAGING RISK

/250/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 14052, Snake Park, Kroonstad	Operationality, maintenance
/251/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 13956, Snake Park, Kroonstad	Operationality, maintenance
/252/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 13906 Snake Park, Kroonstad	Operationality, maintenance
/253/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 13855, Snake Park, Kroonstad	Operationality, maintenance
/254/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 14913, Snake Park, Kroonstad	Operationality, maintenance
/255/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 14901, Snake Park, Kroonstad	Operationality, maintenance
/256/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at office <input type="checkbox"/> Telephone <input type="checkbox"/> E-mail	Resident of house 14854, Snake Park, Kroonstad	Operationality, maintenance
/257/	31 May 2014 <input checked="" type="checkbox"/> On-site <input type="checkbox"/> Face-to-face at	Resident of house 15087, Snake Park, Kroonstad	Operationality, maintenance



## MANAGING RISK

office  
☐ Telephone  
☐ E-mail  
/258/ 31 May 2014      Resident of house 15444, Snake      Operationality, maintenance  
         ☒ On-site      Park, Kroonstad  
         ☐ Face-to-face at  
office  
         ☐ Telephone  
         ☐ E-mail

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## **APPENDIX A**

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### **CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS**

## Corrective action requests

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 1	<p>According to the PoA-DD, a confirmation that the dwelling has electricity and water connection is to be included in the database. This information is not contained in the database, although it was observed on site that it is a pre-requisite for installation by SASSA. Moreover, the PoA-DD indicates that households are identified in the database based on street address and GPS coordinates, ERF number. Following the implementation of the CPA, the identification system was revised to include an additional unique ID number allocated to each system in the database. To comply with paragraph 212 of the Project Standard, the project participant is requested to document this correction in a revised PoA and CPA-DD, and submit it these to DNV for submission at the time of request for issuance.</p>	<p>SASSA has established an online database with help of RTE, where following information for each SWH installed in a SSC-CPA is recorded:</p> <ul style="list-style-type: none"> <li>• Site Details: street address and GPS coordinates;</li> <li>• Residence details: first name, surname, ID number and contact details;</li> <li>• Installer Details: installation date, installer name and company;</li> <li>• Installation Details: Serial Number, SWH type, and collector area;</li> <li>• CPA unit identification number;</li> <li>• A unique identification number created by the database company for each individual installation.</li> </ul> <p>The above information enables unique identification of each installation, and geographical placement. Furthermore the copy of persons ID, installation sheet / Eskom subsidy application, which include home owner and installation details and Carbon Ceding Form, are filed electronically as well as hardcopies for each individual installation. The availability of water and electricity connection is confirmed by SASSA installation team, but not recorded into the database. The availability of water and electricity connection is a requirement for Eskom subsidy (please see email from</p>	<p>The Project Participant submitted revised copies of the PoA-DD and CPA-DD (Version ) to DNV with updated information on the data recorded in the database, as well as the household identification system, in order to accurately describe the management system actually implemented. The documents have been created using the latest available template at the time of verification.</p> <p>DNV confirms that the revised information regarding the database and the household identification system are in line with what observed on site.</p> <p>Moreover, DNV verified the information contained in the revised PoA and CPA-DD against the registered versions available on the UNFCCC website /70/, and can confirm that the revised copies contain the same information as the registered version apart from the following:</p> <ul style="list-style-type: none"> <li>– Eneco Energy Trade B.V from the United Kingdom has been added as project participant in section A.4 of the PoA-DD since this PP was added after registration, as confirmed by the MoC (Annex 2) found on the UNFCCC website and valid from 8 May 2012 /70/. This change is considered acceptable as the addition of a project participant was</li> </ul>

		Hlengiwe Ntimba, Eskom 14 February 2013). The PoA-DD and CPA-DD has been revised accordingly.	<p>approved by the UNFCCC before the current verification;</p> <ul style="list-style-type: none"> <li>– References to different sections of the PoA-DD have been adapted to the version 02 of the PoA-DD template for clarity;</li> <li>– References to the generic CPA-DD have been adapted to refer to part II of the PoA-DD for clarity;</li> </ul> <p><u>CAR1 is closed.</u></p>
CAR 2	According to paragraph 197 of the Project Standard, in relation to the calculation of emission reductions project participants shall identify the formulae used and provide the calculations of baseline, project and leakage emissions and GHG emission reductions. The ER calculations submitted do not fully show the calculations performed to determine baseline emissions.	The Emission Reduction calculations have been revised to follow the formulas identified in the design document.	<p>The revised ER calculations submitted are transparent enough that the equations indicated in the PoA-DD and CPA-DD can be followed through the different levels of data aggregation.</p> <p><u>CAR 2 is closed.</u></p>
CAR 3	The NVC value for coal used for the calculation of the grid emission factor refers to the average NCV of the years 2006-2010. This is not in compliance with paragraph 12 of AMS-I.D. version 16, which requires the grid emission factor to be calculated as the weighted average emissions (in tCO <sub>2</sub> /MWh) of the current generation mix, where the data of the year in which project generation occurs must be used.	The NCV value applied has been revised. The value applied is the latest available NCV value from the year 2011. Also the recently published 2011 data has been applied for fuel consumption and electricity generation. Updated emission reduction calculations have been provided to the DOE.	<p>The grid emission factor of South Africa has been correctly calculated using the lower boundary of the confidence level of IPCC 2006 /66/ default values of the fuels indicated by Eskom in its website /64/.</p> <p><u>CAR 3 is closed.</u></p>
CAR 4	The number and names of the sites listed in the ER calculations submitted (sheet: Sites) are different from the number and names of the sites indicated in the Monitoring Report. This is not in compliance with paragraph 17 of the Project Standard.	The names have been harmonised to use the full address of the measured sites for the emission reduction calculations and the Monitoring Report.	<p>The list of sites listed in the ER calculation spreadsheet is consistent with the one indicated in the MR.</p> <p><u>CAR 4 is closed.</u></p>

CAR 5	The description of monitored parameters provided in the Monitoring report does not comply with the requirements of paragraph 195 of the Project Standard.	The section D of the Monitoring Report has been improved and supporting documents have been provided to the DOE.	The description of monitored parameters provided in the Monitoring report section D complies with the requirements of paragraph 195 of the Project Standard.  <u>CAR 5 is closed.</u>
CAR 6	The emission factor for the electricity system is mentioned in the Monitoring Report in different ways: $EF_{grid}$ (page 25), $EF_{CO_2}$ (page 27)	The Monitoring Report has been updated and only “ $EF_{CO_2}$ ” is applied.	The parameter “emission factor for the electricity system” is now mentioned consistently in the programme documentation.  <u>CAR 6 is closed.</u>
CAR 7	Parameter $T_c$ – Incoming cold water temperature – is mentioned the registered PoA-DD in the section describing the equations used to calculate baseline emissions, and has been monitored by the PP. However, it does not appear in the list of monitored parameters in Section D.7.1. of the registered PoA-DD. Moreover, parameter V - Volume of daily cold water flow – is indicated in the MR but does not appear in the registered PoA-DD. The list of monitored parameters indicated in the MR is not in accordance with the information provided in the registered PoA-DD.	The PoA-DD and MR has been revised to include all relevant parameters.	The list of parameters monitored indicated in the MR version 06 is consistent with the list provided in the revised PoA-DD and CPA-DD /1//2//3/.  <u>CAR7 is closed.</u>

## Clarification requests

CL ID	Clarification request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 1	In order to demonstrate compliance with paragraph 187 of the Project Standard, the project participant is requested to submit valid documentation for the installed systems complying with the following standards: SANS 6211-1:2003, SANS 151-2009 and SANS 1307:2003 during the entire period of production of the systems deployed as part of CPA-001.	The relevant SANS reports and a statement letter from SABS has been provided to the DOE.	<p>DNV was provided with the SABS test report given to TASOL Solar /13/ to /18/, who manufactures the Tasol 110 litre storage tank and 12 evacuated tube collector solar water heater used throughout CPA-001.</p> <p>The PP also provided a letter produced and signed by SABS (South Africa Bureau of Standards) /18/ explaining that once the systems underwent and passed all mechanical tests (SANS 1307), the system is only tested for thermal performance (SANS 6211, which falls under SANS 1307). The document clarifies that thermal performance is a once off test.</p> <p>The SANS mark of approval was obtained by SASSA on 21 December 2011, and will last until 21 December 2014. The mark of approval was not part of the SABS certification systems in the years before 2011, when compliance was certified through SANS reports. SANS reports dating back to 2009 have been submitted by the PP, confirming compliance of the systems against SANS 6211-1:2003; SANS 151-2010, and SANS 1307:2003 (/13/ to /18/)</p> <p><u>CL 1 is closed.</u></p>

CL ID	Clarification request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 2	In order to demonstrate compliance with paragraph 187 of the Project Standard, the project participant is requested to submit evidence for the installations taking place in residential buildings.	All installations take place in residential buildings in low income community as demonstrated for the verifying during the onsite audit. This can be packed up with the MoUs signed with the relevant Municipalities.	<p>As evidence that the installations take place in residential buildings, the PP submitted the agreements signed with the municipalities involved in the implementation of CPA-001.</p> <p>The agreement clearly states: "SASSA will be able to offer low pressure SABS approved systems to low and middle income households free of charge" /19/ to /28/</p> <p><u>CL 2 is closed.</u></p>
CL 3	During the site visit, it was observed that 5 of the forms filled in as part of the 2012 operationality check were left blank. The Project participant is requested to provide an explanation for this occurrence.	SASSA investigated this and was able to backtrack the relevant forms. The relevant maintenance team that did do the operationality checks initially went out, but could not find the units. It was later on noted that the maintenance team had gone out to wrong extension (please note that the low income areas are often extensive and rather confusing for orientation). SASSA's administration team then located the units and instructed the maintenance team to go out again to the correct area and the correct units were inspected few days later. Both forms have been provided to the DOE.	<p>The PP's response to the occurrence /61/ demonstrates the quality management system in place is solid enough to deal with instances where households are not found at the first attempt without compromising the quality and representativeness of the survey.</p> <p><u>CL 3 is closed.</u></p>

CL ID	Clarification request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 4	<p>According to the incident management procedure described in the Monitoring Report, in case an incident is reported, the unit is considered non-operational for 48, based on the PP's 24 hours response time for fixing failures. However, most users interviewed as part of the site visit reported that failures were communicated in person to the local councillor, and that the person responsible for maintenance contacted local councillors on a weekly basis.</p> <p>The Project Participant is requested to clarify how the failures reported through councillors are accounted for in the calculation of ER.</p>	<p>Incident management time/ maintenance down time has been increased and the calculations emission reduction calculations have been revised based on a call survey that took place in March 2013.</p> <p>SASSA interview telephonically 8 maintenance team representatives around the country. The maintenance teams are formed mainly from personnel within the community and hence the maintenance team is present in community. The 8 interviewed people gave in total 10 answers in terms of to who incidents are reported to and how quickly this take usually place.</p> <p>The results show that most incidents are reported directly to local SASSA maintenance team (50%), and thereafter to ward cancellers (30%). The incidents are typically reported immediately (80 %), but in some instances the reporting takes a few days (20%). Four days was the longest reporting period mentioned and this has been applied to maintenance down time i.e. the total maintenance down time is calculated to be 6 days (4 days for reporting and 2 days for response). Supporting evidence and revised calculation have been provided to the DOE.</p>	<p>The revised maintenance and downtime is considered acceptable.</p> <p><u>CL 4 is closed.</u></p>

CL ID	Clarification request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 5	In the calculation of the grid emission factor, the PP has used the same source of data indicated in the registered PoA-DD and CPA-DD. The Project Participant is requested to clarify how the fuel consumption and electricity generation for the Ankelig and Gourikwa diesel power plants have been accounted for in the calculations.	The grid emission factor calculation in annex I has been revised with the recently published Eskom data for 2011. The new data includes the Ankelig and Gourikwa diesel power plants.	The list of power plants considered for the calculation of the grid emission factor is consistent with the information published on the Eskom's website /64/. This is the source indicated in the PoA-DD, and is therefore considered acceptable.  <u>CL 5 is closed.</u>
CL 6	In the description of monitored parameter $Q_{on-site}$ , it is indicated that the SWHs are measured for irradiation, ambient air temperature, for water inlet and outlet temperature and water flow to determine daily solar energy output. However, water outlet temperature is not included in the SABS equation used to determine parameter $Q$ , and this is reflected in the calculations submitted for this parameter. The project participant is requested to clarify the calculation method for parameter $Q_{on-site}$ .	<p>This is not correct. <math>Q_{on-site}</math> is calculated based on irradiation, ambient air temperature, water inlet temperature and water flow. It is the daily solar energy output calculated based on the SABS formula. The Monitoring Report has been corrected and "water outlet temperature" has been taken out.</p> <p>Please also note that "Solar energy output by the SWH in the year y, <math>Q_y</math>" bases on <math>Q_{on-site}</math> and is further adjusted based on SABS <math>Q</math> factor limit (i.e. 13.692 MJ) and realtime water flow.</p> <p>This is a conservative way of calculating emission reductions.</p>	The calculations of parameter $Q_{on-site}$ is now consistent with the description of the calculations presented in the MR.  <u>CL 6 is closed.</u>

**Forward action requests from previous verification**

<b>FAR ID</b>	<b>Forward action request</b>	<b>Summary of how FAR has been addressed in this reporting period</b>	<b>Assessment of how FAR has been addressed</b>
	Not applicable: this is the first verification for this programme.	-	-

**Forward action requests from this verification**

<b>FAR ID</b>	<b>Forward action request</b>	<b>Response by Project Participants</b>
FAR 1	No forward action requests have been identified.	-

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## **APPENDIX B**

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### **POST REGISTRATION CHANGES**

Type of post registration change	Description of post registration change*	Is prior approval by CDM EB required**?	In case prior approval by CDM EB is required, when was post registration change approved?
Correction	The list of information to be recorded in the database has been modified to exclude the confirmation that the dwelling has electricity and water connection, since this is a pre-requisite for installation by SASSA. Moreover, the PoA-DD now indicates that households are identified in the database based on street address, GPS coordinates, and an additional unique ID number allocated to each system in the database, since the PP realized during the implementation of the programme that ERF numbers were not univocal	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Not applicable	13 October 2013.
Correction	In the CPA-DD, parameter EF grid was moved to the monitoring plan. In the CPA-DD template version available at the time of inclusion this parameter was listed among the data and parameters available at validation, but the registered monitoring plan clearly indicated the parameter has to be updated at the time of each issuance. The correction therefore makes it more clear that the parameter is monitored	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Not applicable	13 October 2013.
Permanent changes from the registered monitoring plan or applied methodology	Parameter $T_c$ – Incoming cold water temperature – and V - Volume of daily cold water flow have been added to the list of parameters to be monitored by CPAs in section B.7.1 of the revised PoA-DD. This because both parameters were included in the monitoring plan of the registered PoA-DD, but were absent from the list of parameters to be monitored. Section B.7.1 of the revised PoA-DD is now in line with the registered monitoring plan	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	13 October 2013.

Type of post registration change	Description of post registration change*	Is prior approval by CDM EB required**?	In case prior approval by CDM EB is required, when was post registration change approved?
Permanent changes from the registered monitoring plan or applied methodology	<p>in order to address instances where residents were not at home at the time the household was visited as part of the operationality survey, the project participant intends to apply the following criteria:</p> <ol style="list-style-type: none"> <li>1. If access can be gained to the SWH unit, without breaching Health and Safety regulations or causing damage to property and the unit can be inspected without the home owner being present, then the unit is inspected according to the operationality checklist;</li> <li>2. If the home owner is not home and there is no access to the unit and it cannot be inspected, the house in closest proximity (next door), to the random sampled house where the home owner was present would be inspected according to the operationality checklist. This incident would be indicated and declared on the operationality checklist to manage quality control.</li> </ol>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	13 October 2013.

\* For further details refer to the “Post-registration changes request form” (F-CDM-PRC) and DNV’s assessment opinion on the changes

\*\* Refer to Appendix 1 Appendix 1 to the CDM Project Standard /71/

## **APPENDIX C**

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### **CURRICULA VITAE OF THE VERIFICATION TEAM MEMBERS**

**Francesca Feller** started working in 2004 on research and training on sustainable development and CSR for businesses in Italy, and subsequently moved on to work as Climate Change Officer in London, in a large urban regeneration project. The role involved achieving carbon reductions in all new developments (residential, schools, hospitals, commercial), by embedding energy efficiency, renewable energy technologies, and improved energy distribution in planning conditions. The role also included ensuring compatibility with a large district heating scheme under construction, and incorporating climate change adaptation measures in new developments. In 2009 Francesca moved to a company specialised in taking part to tenders financed by the United Nations, the World Bank, the European Union and the Italian Ministry of Foreign Affairs for development programmes. Her role as Project Manager focused on the supply of off-grid renewable energy technologies for rural electrification.

The current Project Manager position involves executing and managing CDM/JI validation and verification assignments, verification under voluntary schemes, and third party services within the institutional climate change department, providing advisory services on climate change adaptation and mitigation to institutional customers, sharing DNV's community of practice on Programmes of Activities under the UNFCCC, managing relations with large customers, and providing global support and training in the relevant specialized technical areas within the DNV global Climate Change Services team.

**Felipe Antunes** holds a Master's Degree in Production Engineering (Quality) and a Post Graduate Diploma in Environmental Management and Industrial Waste Management and Treatment. Possesses an International experience of more than 10 years in the field of quality and environmental auditing, working two years as the responsible of the QMS of Rede Metrológica RS and since 1999 as a QMS and EMS auditor in DNV.

He has experience of more than 3 years in validation and verification of numerous CDM projects in DNV, both in South America & abroad. He has also been actively involved in Management System Audits such as ISO 9001, ISO 140001 and OHSAS 18001 standards in various industrial sectors for more than 10 years in DNV.

His qualification and experience in CDM demonstrate him sufficient sectoral competence in energy generation from renewable energy sources, waste handling and disposal, and animal waste management.